## SERVICE MANUAL



Before use this instrument, be sure to read this manual collectively.

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## 1. General

### 1.1 Features

| Refracometry |  |
| :---: | :---: |
| Vertex Distance(VD) | $0.0,10.0,12.0,13.5,15.0 \mathrm{~mm}$ |
| Sphere Power(SPH) | $-25.00 \sim+22.00 \mathrm{D}$ (at the vertex distance of 12 mm ) (Increments selectable between 0.12 and 0.25D) |
| Cylinder Power(CYL) | $0.00 \sim \pm 10.00 \mathrm{D} \quad \text { (Increments selectablebetween } 0.12 \text { and } 0.25 \mathrm{D} \text { ) }$ |
| Axis(AX) | $1 \sim 180^{\circ} \quad$ (Increments: $1^{\circ}$ ) |
| Cylinder Form | -, +, MIX |
| IOL Switch | - |
| Pupil Distance(PD) | $10 \sim 85 \mathrm{~mm}$ |
| Minimum Pupil Diameter | 2.0 mm |
| Eye fixation target | Scene with a red roof house |
| Keratometry |  |
| Radius of curvature (Increment) | $5.0 \sim 10.2 \mathrm{~mm} \quad$ (Increments: 0.01 mm ) |
| Refractive power (Increment) | $\begin{aligned} 33.00 \sim 67.50 \mathrm{D} \quad & \text { (whencornea equivalentrefractive index is 1.3375) } \\ & \text { (Increments selectable from 0.05, 0.12, 0.25) }\end{aligned}$ |
| Astigmatism (Increment) | $0.00 \sim-15 \mathrm{D} \quad$ (Increments selectable from $0.05,0.12,0.25$ ) |
| Axis (Increment) | $1 \sim 180^{\circ} \quad\left(\right.$ Increments: $1^{\circ}$ ) |
| Cornea equivalent refractive index | 1.3375, 1.332, 1.336 |
| Measurement range | $\varnothing 2.0 \mathrm{~mm}$ |
| Contact lens base curve measurement | $\bigcirc$ |
| Other Features |  |
| PD measurement | $10 \sim 85 \mathrm{~mm}$ |
| Corneal size measurement | $2.0 \sim 12.0$ mm (Increments: 0.1 mm ) |
| User key | LCD monitor down side |
| Vertical movement of measurement head | By rotation of operation lever |
| Stage sliding method | Sliding lever |
| Stage lock | Stage holding knob |
| TV camera | Basis (Two-dimensional sensor) |
| Image position and focus adjustment | Mechanical |
| LCD monitor | 6.4 inches |
| Printing method, paper width | Thermal, 58 mm |
| Measurement button | Pushbutton switch |
| Power saving system | Select OFF, 3 MIN, 5 MIN and 10 MIN |
| Clock | $\bigcirc$ |
| Stage movement range | Right and Left: $90 \pm 3 \mathrm{~mm}$, Back and forth: $50 \pm 3 \mathrm{~mm}$ |
| Measurement Head Vertical movable range | $25 \pm 3 \mathrm{~mm}$ |
| Chin Rest Vertical Moving amout | $55 \pm 3 \mathrm{~mm}$ |

Dimension $\quad 248(\mathrm{~W}) \times 476(\mathrm{D}) \times 475(\mathrm{H}) \mathrm{mm}$
Weight Approximately 21 kg

### 1.2 Dimensions



## 2. Operational Description

### 2.1 Measurement Principle

### 2.1.1 Refractometry

(1) A ray of light from the light source is reflected in the retina of examinee.
(2) According to refraction of examinee's eye, the reflected light in the examinee's eye exits as follow.

1) In case of emmetropia, the ray of light is parallel.
2) In case of near-sightedness, the ray of light is convergence.
3) In case of a farsighted eye, the ray of light is divergence.
(3) Then, the ray of light through the optical system imaged in the camera as six spot.
(4) Calculate the distance of coordinate of six spots and the center, obtain SPH, CYL and AX value.

+D

### 2.1.2 Keratometry



Mire Light is reflected examinee's cornea, is imaged on the camera after through the Optical System. Circular Mire Light is reflected circular or ellipse form by Radius of curvature and Astigmia of Examinee cornea, coordinates of refracted light (XY Coordinates) on the camera is inputted the MPU, calculate that data and obtain the Radius of Circle or the major axis and the minor axis of ellipse, Angle of Rotation .

$R, \theta$ and $h$ are correlated Snell's Low as follows ( $R$ is radius of curvature of cornea, $\theta$ is incident angle of Mire Light in the comea, h is distance between position of Mire Light image at the comea and Optical Axis), obtain the long or short radius of curvature of comea by this formula.

$$
R=\frac{h}{\sin (\theta / 2)}
$$

$R, D$ and $n$ are correlated as follows ( $R$ is radius of curvature of comea, $D$ is refractive power of the comea, n is refractive index of the cornea), obtain the diopter( D ) of comea by R , long or short radius of curvature of the cornea..
$D=\frac{1000(n-1)}{R(m m)}$
Comea equivalent refractive index $\mathrm{n}=1.3375,1.336$,

### 2.2 Layout of Optical System



Layout of Optical System

1: Examinee's Eye
2-1, 2-2: Extemal Led
3: Mire Ring Unit for Keratometry
4-1: Half Mirror
4-2: Half Mirror
4-3: Total Reflection Mirror
5: Objective Lens
6-1: Aperture Mirror
6-2: Aperture
7: Half Mirror
8-1: Aiming Light Source
8-2: Aiming Pattern
9: Light Source for Refractometry
10-1: Division Pattern
10-2: Prism Lens
11: Relay Lens
12: Camera for Refractometry
13: Coneal Relay Lens
14: Camera for Keratometry
15: Refractive Poser Revision Lens
16: Internal Chart
17: Internal Chart Illuminator

Route of Optical System

Extemal illumination system: $2-1 \rightarrow 2-1 \rightarrow 1$
System for the fogging method system: $17 \rightarrow 16 \rightarrow 15 \rightarrow 4-3 \rightarrow 4-2 \rightarrow 4-1 \rightarrow 1$
Keratometry system: $3 \rightarrow 1 \rightarrow 4-1 \rightarrow 4-2 \rightarrow 13 \rightarrow 14$
Refractometry system: $9 \rightarrow 7 \rightarrow 6-2 \rightarrow 6-1 \rightarrow 5 \rightarrow 4-1 \rightarrow 1 \rightarrow 4-1 \rightarrow 5 \rightarrow 6-1 \rightarrow 10-1 \rightarrow 10-2 \rightarrow 11 \rightarrow 12$
Automatic measurement system: $3 \rightarrow 1$

### 2.3 Electrical System

### 2.3.1 Block Diagram



### 2.3.2 Electrical Wiring



### 2.3.3 Eyeball Diagram Generated by the REF Measurement

It is possible to print the refrection state diagram regarding the result of the REF measurement to the intemal printer. This function will be performed when 'PRINT=ALL' in the Page $2 / 5$ of the SETUP MODE.

See the following table and diagram for further information.

|  | Classification of Data |  |  | NOT | NEA | FAR | AS |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Emmetropia | $-0.5 \leq \mathrm{S} \leq+0.5$ | $-0.5 \leq C \leq 0.0$ |  | - |  |  |  |
| Myopia | S <-0.5 | $-0.5 \leq C \leq 0.0$ |  |  | $\odot$ |  |  |
| Simple Myopic Astigmatism | $-0.5 \leq \mathrm{S} \leq 0.0$ | $C<-0.5$ |  |  | ๑ |  | ๑ |
| Compound <br> Myopic <br> Astigmatism | S <-0.5 | $C<-0.5$ |  |  | $\odot$ |  | $\odot$ |
| Mixed <br> Astigmatism | $0.0<5$ | $C<-0.5$ | $S+C<0.0$ |  |  |  | ๑ |
| Hyperopia | $+0.5<$ S | $-0.5 \leq \mathrm{C} \leq 0.0$ | $0.0<5+C$ |  |  | $\odot$ |  |
| Simple Hyperopic <br> Astigmatism | $+0.5<$ S | $C<-0.5$ | $\begin{aligned} & 0.0 \leq \mathrm{S}+\mathrm{C} \leq \\ & +0.5 \end{aligned}$ |  |  | $\odot$ | $\odot$ |
| Compound <br> Hyper- <br> opic <br> Astigmastism |  |  | $+0.5<S+C$ |  |  | ๑ | ๑ |

Table Eyeball Output by REF Measurement

Emmetropia / Nomal


Mixed Astigmatism


Hyperopia / Far Sightedness


Simple Myopic Astigmatism


Simple Hyperopic Astigmatism


Compound Myopic Astigmatism


Compound Hyperopic Astigmatism


Figure
Diagram of the eye ball output by REF Measurement

## 3. Repair Guide

### 3.1 Disassembly and Adjustments

### 3.1.1 Disassembling of Covers

3.1.1.1 J oystick decoration (A)

1) Remove the J oystick decoration
3.1.1.2 Stage holding knob (B)
2) Remove the Stage holding knob
3.1.1.3 Main cover-L (D)
3) Remove the seven caps (C) and seven screws (1)

### 3.1.1.4 Main cover-R (F)

1) Remove the seven caps (E) and seven screws (2)
2) Remove the head left cover claw as pushing down the cover (2 point)
3) Remove the Printer cable connector

### 3.1.1.5 Rear cover (H)

1) Remove the two caps (G) and two screws (3)
2) Remove the external led connector


### 3.1.2 Disassembling of LCD module

3.1.2.1 LCD module (A)

1) Remove the connectors
2) Remove the four screws (1) and then remove the LCD module
3.1.2.2 LCD monitor (B)
3) Remove the three screws (3)
4) Remove the fourscrews (4) \& LCD Bracket ©
3.1.2.3 Remove the LCD window (D)
3.1.2.4 User key module (E)
5) Remove the four screws (6)


### 3.1.3 Disassembling of main PCB (A)

1) Remove the connectors
2) Remove the four screws (1) and then remove the main PCB


### 3.1.4 Disassembling of Optical head assembly

3.1.4.1 Connectors

1) Remove the all connectors
3.1.4.2 Bracket support"A" ${ }^{\prime}(A)$
2) Remove the two screws (1)
3.1.4.3 Bracket support"B" ${ }^{\prime}$ (B)
3) Remove the two screws (3)
3.1.4.4 Head cover (C)
4) Remove the four screws (4)
3.1.4.5 Optical head assembly (D)
5) Remove the four screws (5) and then remove the optical head assembly


### 3.1.5 Disassembling of printer

3.1.5.1 Printer assembly (A)

1) Remove the fourscrews (1) and then remove the printer assembly

### 3.1.5.2 Printer PCB (B) \& printer cable

1) Remove the four screws (2)
2) Carefully remove FPC connector from PCB (B)
3.1.5.3 Open the printer door (C)
3.1.5.4 Remove the Printer Roll (F) and Printer Paper (D)
3.1.5.4 Thermal printer (E)
3) Remove the four screws (3)


### 3.1.6 Disassembling of SMPS

3.1.6.1 Base cover (A)

1) Remove the fourscrews (1) and then remove the four foots(A)

### 3.1.6.2 SMPS (B)

1) Remove the four screws (3)
2) Remove the connector
3) Remove the three screws (4)


### 3.1.7 Disassembling of headrest

3.1.7.1 Headrest assembly (A)

1) Remove the fourscrews (1) and then remove the headrest assembly
3.1.7.2 Headrest body cover (B)
2) Remove the four screws (2)
3.1.7.3 Knob gear assembly (C)
3) Remove the setscrew (3) and then remove the knob gear assembly

### 3.1.7.4 Headrest body assembly (D)

1) Remove the four screws (4) and then remove the headrest body assembly.


### 3.1.8 Slit and Photosensor Space Adjustment

### 3.1.8.1 Disassembly photosensor \& limit switch

1) Remove the two screws (1) and then remove the sensor Bracket (A)
2) Remove the connector
3) Remove the two screws (2) and then remove the photosensor
4) Remove the two screws (4) and then remove the limits switch

3.1.8.2 Photosensor and slit plate adjustment
5) Loosen the two screws (1)
6) Adjust the space between the slit and photo sensor is within 0.1 to 0.5 mm .
7) Fasten the two screws (1)


### 3.2 Calibration

### 3.2.1 Refractometry calibration

(1) Purpose

To refractometry calibration after refractometry CCD camera adjustment,etc.
(2) Units

1) Model eye lens adapter
2) Spherical model eye lens(-20D ~+20D)

(3) Preparation
3) Attach model eye lens adapter to head base.
4) Insert Unit (2) in Unit (1).
(4) Calibration
5) Press the MENU button.

6) Press the $\uparrow$, $\downarrow$ button.
7) Select CODE and then press EDIT button.

## USER SETTING

PRINT NO.
DATA PREUIEW
SCREEN SAUE
USER MESSAGE
DATE FORM
24H MODE
DATE
TIME CODE

ON OFF RESET
OFF ON
OFF 3510 SETUP
YMD DMY MDY 12 H 24 2005/09/04 AM $11: 36: 53$
$\square$
$\downarrow$ † EDIT
EXIT
4) Press 2154225342.

USER SETTING - CODE CODE : $\quad \square$

\section*{| 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | :--- | :--- |}

5) Press REF button.

## USER TUNING

UNICOS. Co. Ltd
210-4. Maero-Dong. Seo-Gu
Daejeon. Korea
TEL : +82-42-581-0047
FAX : +82-42-581-0053
ht tp://www. e-unicos. com
Ver 2. 00 2006. 07. 25
SERIAL KT-----
REF KER ETC
EXIT
6) Insert OD spherical model eye lens to model eye lens adapter then
press measure button.

7) Move as 2.0 mm the model eye lens toward the head base and then press measure button.

8) Move as 1.0 mm the model eye lens toward the model eye lens adapter and
then press measure button

| USER TUNING - REF | 0.0 |  |  |
| :---: | :---: | :---: | :---: |
| 0.00 | 0.00 | 0.00 | 0 |

1922


## NEW DATA

9) Move as 2.0 mm the model eye lens toward the model eye lens adapter and
then press measure button

10) Move as 1.0 mm the model eye lens toward the model eye lens adapter and then press measure button.

11) Save the value as Press SET button.

12) Repeat 6) $\sim 11$ ) about each spherical model eye lens.
13) Press EXIT button.

14) Press YES button.
```
USER TUNING - REF
19. 9
154. 23 154. 90 154. \(23-0.5\) 1757
```

Do you want to save?

YES
NO

### 3.2.2 Keratometry calibration

(1) Purpose

To keratometry calibration after keratometry CCD camera adjustment and mire ring ass $\begin{aligned} & \text { y } \\ & \text {, etc. }\end{aligned}$
(2) Units

1) Model eye lens adapter
2) Keratometry model eye lens
$>5.82 \mathrm{R}$
$>6.70 \mathrm{R}$
> 7.41 R
> 7.95 R
> 8.69 R
> 9.50 R

(3) Preparation
3) Attach model eye lens adapter to head base.
4) Insert Unit (2) in Unit (1).
(4) Calibration
5) Press the MENU button.

REF MODE R
S:
C= A=
I
$\Gamma$
7
STEP 0.01 UD 12.0 CYL -

L
」
$X=512$
$T=61.67$
2) Press the $\uparrow, \downarrow$ button.
3) Select CODE and then press EDIT button.

USER SETTING
PRINT ND. DATA PREUIEW SCREEN SAUE USER MESSAGE DATE FORM
24H MODE
DATE
TIME CODE

ON OFF RESET
OFF ON OFF 3510 SETUP
YMD DMY MDY 12 H 24 H 2006/09/01
PM 04:39:58
4) Press 2154225342.

## USER SETTING - CODE

## CODE : $\quad$ _

| 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | :--- | :--- |

5) Press KER button.

## USER TUNING

UNICOS. Co. Ltd
210-4. Maero-Dong. Seo-Gu
Daejeon. Korea
TEL : +82-42-581-0047
FAX : +82-42-581-0053
ht tp: //www. e-unicos. com Ver 2. 00 2006. 07. 25
SERIAL KT-----
REF KER ETC
EXIT
6) Insert 5.82R model eye lens to model eye lens adapter then
press measure button.

7) Move as 2.0 mm the model eye lens toward the head base and then
press measure button.

8) Move as 1.0 mm the model eye lens toward the model eye lens adapter and
then press measure button.

9) Move as 2.0 mm the model eye lens toward the model eye lens adapter and
then press measure button.

10) Move as 1.0 mm the model eye lens toward the model eye lens adapter and then press measure button.

11) Save the value as Press SET button.

12) R epeat 6) $\sim 11$ ) about each spherical model eye lens.
13) Press EXIT button.

USER TUNING - KER $\begin{array}{ll}0.00 & 0.00\end{array}$
0. 00

2405


NEW DATA
EXIT
14) Press YES button.

## USER TUNING - KER <br> 7.95 <br> $60.67 \quad 60.22 \quad 50.000 .1$ 2492

Do you mant to save?

## 4. SERVICE PARTS LIST

### 4.1 PARTS CATALOG

### 4.1.1 COVER area

| Illust No. | Part No. | Part Name | Specification | Q'ty | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1-01 |  |  |  |  |  |
|  |  | STAGE HOLDING KNOB |  | 1 |  |
|  | 11 |  |  |  |  |
| 1-02 | AAM-MP7- |  |  |  |  |
|  |  | JOYSTICK DECORATION |  | 1 |  |
|  | $01$ |  |  |  |  |
| 1-03 | AAM-AS1-23 | MAIN COVER-L |  | 1 |  |
| 1-04 | 1DF-040-06 | TRUSS-HEAD SCREW | M4x6 | 14 |  |
|  | AAM-MP0- |  |  |  |  |
| 1-05 |  | SCREW CAP |  | 14 |  |
|  | 16 |  |  |  |  |
| 1-06 | AAM-AS2-21 | SLIDER COVER ASS'Y |  | 1 |  |
| 1-07 | 2PF-030-07 | PLAIN WASHER | M3 | 6 |  |
| 1-08 | 1BF-030-06 | BIND-HEAD SCREW | M3x6 | 6 |  |
|  | AAM-MPO- |  |  |  |  |
| 1-09 |  | SCREW CAP |  | 2 |  |
|  | 17 |  |  |  |  |
| 1-10 | AAM-PF4-12 | EXTERNAL LED HOLDER |  | 4 |  |
| 1-11 | AAE-Y00-09 | PCB ASS'Y | EXT. LED | 4 |  |
| 1-12 | 1TF-023-08 | TAPPING SCREW | $\varnothing 2.3 \times 8$ | 8 |  |
| 1-13 | 1RF-020-04 | ROUND-HEAD SCREW | M $2 \times 4$ | 8 |  |
|  | AAE-Z00-25 | CABLE HARNESS | EXT. LED | 1 |  |
| 1-14 | AAM-AS1-24 | MAIN COVER-R |  | 1 |  |
|  | AAM-MPO- |  |  |  |  |
| 1-15 |  | PRINTER HOUSING |  | 1 |  |
|  | 19 |  |  |  |  |
| 1-16 | 1TF-030-08 | TAPPING SCREW | Ø3x8 | 4 |  |


| 1-17 | AAM-MPO- |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | 20 |  |  |  |
| 1-18 | AAE-B00-11 | PRINTER DRIVER |  | 1 |
| 1-19 | 1TF-030-08 | TAPPING SCREW | Ø3x8 | 7 |
| 1-20 | AAM-PF4-10 | PRINTER BASE |  | 1 |
| 1-21 | 1TF-030-08 | TAPPING SCREW | Ø $3 \times 8$ | 4 |
| 1-22 | AAE-B00-12 | PRINTER |  | 1 |
| 1-23 | AAM-PF4-11 | PRINTER ROLL HANDLE |  | 1 |
| 1-24 | AAM-BX0-16 | PRINTER ROLL |  | 1 |
| 1-25 | AAM-XX0-13 | PRINTING PAPER |  | 1 |
|  | AAE-ZOO- $16$ | CABLE HARNESS | PRINTER | 1 |
| 1-26 | AAM-MP0- $13$ | LCD COVER |  | 1 |
| 1-27 | AAE-Y00-08 | PCB ASS'Y | USER KEY | 1 |
| 1-28 | 1TF-023-08 | TAPPING SCREW | $\varnothing 2.3 \times 8$ | 2 |
| 1-29 | 1TF-023-06 | TAPPING SCREW | $\varnothing 2.3 \times 6$ | 5 |
| 1-30 | AAM-XMO- $01$ | LCD WINDOE |  | 1 |
| 1-31 | AAE-B00-10 | LCD MODULE |  | 1 |
| 1-32 | AAM-BF4-01 | LCD SUPPORT |  | 4 |
| 1-33 | AAM-MPO- $14$ | BUTTON KNOB LCD |  | 1 |

$\qquad$
$\qquad$
$\qquad$


### 4.1.2 HEAD area

| Illust No. | Part No. | Part Name | Specification | Q'ty | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 2-01 | AAM-AT1-02 | OPTICAL HEAD ASS'Y |  | 1 |  |
| 2-02 | AAM-AS1-30 | HEAD COVER ASS' $Y$ |  | 1 |  |
| 2-03 | 1SF-030-08 | SEM,S SCREW | M3x8 | 4 |  |
| 2-04 | 1BF-030-08 | BIND-HEAD SCREW | M3x8 | 4 |  |
| 2-05 | 2PF-030-07 | PLAIN WASHER | M3 | 6 |  |
| 2-06 | $\begin{gathered} \text { AAM-MPO- } \\ 03 \end{gathered}$ | MIRE PATTERN RETAINER |  | 1 |  |
| 2-07 | $\begin{gathered} \text { AAM-MPO- } \\ 02 \end{gathered}$ | MIRE PATTERN COVER |  | 1 |  |
| 2-08 | $\begin{gathered} \text { AAM-GPO- } \\ 05 \end{gathered}$ | MIRE PATTERN |  | 1 |  |
| 2-09 | $\begin{gathered} \text { AAM-MPO- } \\ 01 \end{gathered}$ | MIRE PCB MOUNT |  | 1 |  |
| 2-10 | AAO-LLE- ${ }^{\text {a }}$ - 01 | BOX WINDOW |  | 1 |  |
| 2-11 | AAE-Y00-04 | PCB ASS ${ }^{\text {P }}$ | KER. RING | 1 |  |
|  | AAE-Z00-04 | CABLE HARNESS | KER LED | 1 |  |
| 2-12 | 1TF-023-08 | TAPPING SCREW | $\varnothing 2.3 \times 8$ | 4 |  |
| 2-13 | AAM-PF4-04 | SLIDER COVER BRACKET |  | 1 |  |
| 2-14 | 1HF-030-08 | HEX.SOCKET HEAD SCREW | M3x8 | 2 |  |



### 4.1.3 LOWER BASE area

| Illust No. | Part No. | Part Name | Specification | Q'ty | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 3-01 | AAM-GC3- <br> 01 | LOWER BASE |  | 1 |  |
| 3-02 | $\begin{gathered} \text { AAM-MPO- } \\ 04 \end{gathered}$ | BASE COVER |  | 1 |  |
| 3-03 | AAM-PF8-01 | SLIDING PLATE |  | 1 |  |
| 3-05 | $\begin{gathered} \text { AAM-GSO- } \\ 10 \end{gathered}$ | STAGE FIXING BOLT |  | 1 |  |
| 3-08 | $\begin{gathered} \text { AAM-GB1- } \\ 01 \end{gathered}$ | STAGE FIXING COLLAR |  | 1 |  |
| 3-09 | AAE-B00-06 | FUSE HOLDER |  | 2 |  |
|  | AAE-Z00-21 | CABLE HARNESS | FUSE HOLDER-1 | 1 |  |
|  | AAE-Z00-22 | CABLE HARNESS | FUSE HOLDER-2 | 1 |  |
| 3-10 | AAE-B00-08 | FUSE |  | 2 |  |
| 3-11 | AAM-PF3-01 | SWITCH BRACKET |  | 1 |  |


| 3-12 | AAE-B00-04 | POWER SWITCH |  | 1 |
| :---: | :---: | :---: | :---: | :---: |
|  | AAE-Z00-23 | CABLE HARNESS | SWITCH-1 | 1 |
|  | AAE-Z00-24 | CABLE HARNESS | SWITCH-2 | 1 |
| 3-13 | AAE-B00-05 | AC INLET |  | 1 |
|  | AAE-Z00-18 | CABLE HARNESS | AC IN-1 | 1 |
|  | AAE-Z00-19 | CABLE HARNESS | AC IN-2 | 1 |
|  | AAE-Z00-20 | CABLE HARNESS | SMPS-FG | 1 |
| 3-16 | AAE-B00-07 | RCAJACK |  | 1 |
|  | AAE-Z00-15 | CABLE HARNESS | EXT. MONITOR | 1 |
| 3-17 | AAE-Z00-17 | CABLE HARNESS | RS232 | 1 |
| 3-19 | AAM-BRO-01 | FOOT |  | 4 |
| 3-20 | 2PF-040-16 | PLAIN WASHER |  | 4 |
| 3-22 | AAE-B00-03 | SMPS |  | 1 |



### 4.1.4J OYSTICK area

| Illust No. | Part No. | Part Name | Specification | Q'ty | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 4-01 | AAM-GAO- <br> 01 | MAIN POLE HOUSING |  | 1 |  |
| 4-02 | $\begin{gathered} \text { AAM-GSO- } \\ 08 \end{gathered}$ | STRAIGHT PIN | Ø3x6 | 1 |  |
| 4-03 | $\begin{gathered} \text { AAM-GPO- } \\ 02 \end{gathered}$ | UPPER BUSH |  | 1 |  |
| 4-04 | $\begin{gathered} \text { AAM-GSO- } \\ 01 \end{gathered}$ | MAIN POLE |  | 1 |  |
| 4-05 | $\begin{gathered} \text { AAM-GPO- } \\ 01 \end{gathered}$ | LOWER BUSH |  | 1 |  |
| 4-06 | AAM-GBO- $01$ | MAIN POLE SHAFT |  | 1 |  |
| 4-07 | AAM-BXO-03 | BALL BEARING | 6906ZZ | 1 |  |
| 4-08 | 4RF-024-00 | C-RING | R24 | 1 |  |
| 4-09 | 4SF-030-00 | C-RING | S30 | 1 |  |
| 4-10 | $\begin{gathered} \text { AAM-MPO- } \\ 05 \end{gathered}$ | SUB SHELL |  | 1 |  |
| 4-11 | $\begin{gathered} \text { AAM-MPO- } \\ 06 \end{gathered}$ | TIMMING PULLEY- JOYSTICK |  | 1 |  |
| 4-12 | AAM-PF4-08 | FLANGE-B |  | 1 |  |
| 4-13 | 1TF-030-08 | TAPPING SCREW | $\varnothing 3 \times 8$ | 4 |  |
| 4-14 | AAM-MPO07 | JOYSTICK |  | 1 |  |
| 4-15 | $\begin{gathered} \text { AAM-MP0- } \\ 08 \end{gathered}$ | POLE J OYSTICK |  | 1 |  |
| 4-16 | AAM-PF4- | MSR. BUTTON BRACKET |  | 1 |  |
| 4-17 | AAE-B00-09 | MSR. BUTTON |  | 1 |  |
| 4-18 | $\begin{gathered} \text { AAM-MPO- } \\ 10 \end{gathered}$ | CAP KNOB J OYSTICK |  | 1 |  |
| 4-19 | $\begin{gathered} \text { AAM-MRO- } \\ 01 \end{gathered}$ | RUBBER J OYSTICK |  | 1 |  |
| 4-20 | $\begin{gathered} \text { AAM-MPO- } \\ 09 \end{gathered}$ | BUTTON KNOB J OYSTICK |  | 1 |  |
| 4-21 | AAM-BX0-05 | BALL BEARING | MR148 | 2 |  |
| 4-22 | 1TF-023-08 | TAPPING SCREW | Ø2.3x8 | 2 |  |
|  | $\begin{gathered} \text { AAE-ZOO- } \\ 13 \end{gathered}$ | CABLE HARNESS | MEASUREMENT KEY | 1 |  |

$\qquad$


### 4.1.5 BODY area

| Illust No. | Part No. | Part Name | Specification | Q'ty | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 5-01 | $\begin{gathered} \text { AAM-GCO- } \\ 01 \end{gathered}$ | UPPER BASE |  | 1 |  |
| 5-02 | AAM-AS2-25 | STAGE HOLDING NUT AAS'Y |  | 1 |  |
| 5-03 | $\begin{gathered} \text { AAM-GBO- } \\ 03 \end{gathered}$ | STAGE HOLDING PIN |  | 1 |  |
| 5-04 | $\begin{gathered} \text { AAM-GAO- } \\ 06 \end{gathered}$ | HOLDING PIN MOUNT |  | 1 |  |
| 5-05 | 5XF-006-00 | E-RING | E6 | 1 |  |
| 5-06 | 1SF-030-16 | SEM'S SCREW | M $3 \times 16$ | 2 |  |
| 5-07 | AAM-GF4-02 | WEIGHT |  | 2 |  |
| 5-08 | 1HF-040-12 | HEX.SOCKET HEAD SCREW | M4x12 | 8 |  |
| 5-09 | 2SF-040-00 | SPRING WASHER | M4 | 18 |  |
| 5-10 | 2PF-040-09 | PLAIN WASHER | M4 | 20 |  |
| 5-11 | $\begin{gathered} \text { AAM-GAO- } \\ 02 \end{gathered}$ | CYLINDER SPACER |  | 4 |  |
| 5-12 | 1TF-030-12 | TAPPING SCREW | $\varnothing 3 \times 12$ | 4 |  |
| 5-13 | AAM-PF4-07 | FLANGE-A |  | 1 |  |
| 5-14 | AAM-BXO-15 | TIMMING BELT | 210XL | 1 |  |
| 5-15 | $\begin{gathered} \text { AAM-MPO- } \\ 12 \end{gathered}$ | TIMMING PULLEY-SCREW |  | 1 |  |
| 5-16 | 1EF-040-04 | SET SCREW | M4x4 | 1 |  |
| 5-17 | AAM-PF4-14 | CYLINDER BRACKET |  | 1 |  |
| 5-18 | 1HF-040-08 | HEX.SOCKET HEAD SCREW | M4x8 | 4 |  |
| 5-19 | 1HF-050-12 | HEX.SOCKET HEAD SCREW | M5x12 | 4 |  |
| 5-20 | $\begin{gathered} \text { AAM-GAO- } \\ 03 \end{gathered}$ | BEARING WASHER |  | 1 |  |
| 5-21 | AAM-BX0-03 | BALL BEARING | 6000ZZ | 1 |  |
| 5-22 | 4SF-010-00 | C-RING | S10 | 1 |  |
| 5-23 | AAM-GF7-01 | UP-DOWN SCREW |  | 1 |  |
| 5-24 | $\begin{gathered} \text { AAM-GAO- } \\ 04 \end{gathered}$ | CYLINDER UP-DOWN |  | 1 |  |
| 5-26 | 4RF-026-00 | C-RING | R26 | 1 |  |
| 5-26 | 4RF-045-00 | C-RING | R45 | 1 |  |
| 5-27 | AAM-BX0-06 | BALL BUSH | LM30UU | 1 |  |
| 5-28 | AAM-XF4-02 | HEAD UP-DOWN SPRING |  | 1 |  |
| 5-29 | $\begin{gathered} \text { AAM-GSO- } \\ 02 \end{gathered}$ | UP-DOWN SHAFT |  | 1 |  |
| 5-30 | AAM-PF4-01 | COVER BRACKET-L |  | 1 |  |


| 5-31 | $\begin{gathered} \text { AAM-GSO- } \\ 03 \end{gathered}$ | UP-DOWN <br> SCREW WASHER |  | 1 |
| :---: | :---: | :---: | :---: | :---: |
| 5-32 | 1RF-040-10 | ROUND-HEAD SCREW | M4x10 | 10 |
| 5-33 | $\begin{gathered} \text { AAM-GSO- } \\ 09 \end{gathered}$ | STOPPER WASHER-B |  | 1 |
| 5-34 | AAM-GF5-01 | GUIDE SHAFT |  | 1 |
| 5-35 | 1FF-040-10 | FLAT-HEAD SCREW | M4x10 | 4 |
| 5-36 | 1HF-040-16 | HEX.SOCKET HEAD SCREW | M4x16 | 2 |
| 5-37 | $\begin{gathered} \text { AAM-GAO- } \\ 05 \end{gathered}$ | $\begin{array}{ll} \text { COVER } & \text { BRACKET } \\ \text { SUPPORT-B } & \end{array}$ |  | 1 |
| 5-38 | AAM-GAO- $11$ | STOPPER WASHER-B |  | 1 |
| 5-39 | AAM-PF4-15 | HEAD SUPPORT |  | 1 |
| 5-40 | 6XX-030-20 | PCB SUPPORT |  | 4 |
| 5-41 | AAM-GF4-01 | BRACKET SUPPORT-A |  | 1 |
| 5-42 | $\begin{gathered} \text { AAM-GAO- } \\ 08 \end{gathered}$ | BRACKET SUPPORT-B |  | 1 |
| 5-43 | AAM-PF4-02 | COVER BRACKET-B |  | 1 |
| 5-44 | AAM-XS0-01 | ENCODER SLIT |  | 1 |
| 5-45 | $\begin{gathered} \text { AAM-GAO- } \\ 10 \end{gathered}$ | $\begin{array}{ll} \text { COVER } & \text { BRACKET } \\ \text { SUPPORT-A } \end{array}$ |  | 1 |
| 5-46 | AAM-PF4-03 | SLIDER BRACKET |  | 1 |
| 5-47 | AAM-BXO-02 | SLIDER-S |  | 2 |
| 5-48 | 2PF-030-07 | PLAIN WASHER | M3 | 3 |
| 5-49 | AAM-PF4-06 | SLIT BRACKET |  | 1 |
| 5-50 | AAM-BX0-01 | SLIDER-L |  | 2 |
| 5-51 | 1DF-040-06 | TRUSS-HEAD SCREW | M4x6 | 14 |
| 5-52 | 1RF-030-06 | ROUND-HEAD SCREW | M3x6 | 9 |
| Illust No. | Part No. | Part Name | Specification | Q'ty Remarks |
| 5-53 | AAM-PF4-05 | SENSOR BRACKET |  | 1 |
| 5-54 | AAE-Z00-11 | CABLE HARNESS | PD SENSOR | 1 |
| 5-55 | 2PF-020-05 | PLAIN WASHER | M2 | 4 |
| 5-56 | 1RF-020-10 | ROUND-HEAD SCREW | M2x10 | 2 |
| 5-57 | AAE-Y00-05 | PCB ASS | PD SENSOR | 1 |
| 5-58 | 1RF-020-04 | ROUND-HEAD SCREW | M $3 \times 4$ | 2 |
| 5-59 | 1SF-030-08 | SEM'S SCREW | M4x8 | 2 |
| 5-60 | AAE-Y00-06 | PCB ASS'Y | RK MAIN | 1 |
| 5-61 | AAE-Y00-07 | PCB ASS ${ }^{\text {P }}$ | OSD | 1 |



### 4.1.6 HEADREST area

| Illust No. | Part No. | Part Name | Specification | Q'ty | Remarks |
| :---: | :---: | :--- | :--- | :---: | :--- |
| 6-01 | AAM-AS1-26 | HEADREST <br> ASS' | FRAME | 1 |  |
| 6-02 | 1HF-050-16 | HEX.SOCKET <br> SCREW | HEAD | M5x16 | 4 |
| 6-03 | 1DF-040-06 | TRUSS-HEAD SCREW | M4x6 | 1 |  |
| 6-04 | 2PF-040-09 | PLAIN WASHER | M4 | 1 | 1 |


| 6-06 | ITF-030-10 | TAPPING SCREW | $03 \times 10$ | 4 |
| :---: | :---: | :---: | :---: | :---: |
| 6-07 | AAM-PF3-02 | HEADREST BODY COVER |  | 1 |
| 6-08 | 1RF-030-25 | ROUND-HEAD SCREW | M3x25 | 4 |
| 6-09 | 1EF-040-04 | SET SCREW | M4x4 | 2 |
| 6-10 | AAM-GAO- $07$ | HEADREST BODY |  | 1 |
| 6-11 | 1HF-030-16 | HEX.SOCKET HEAD SCREW | M3x16 | 2 |
| 6-12 | AAM-BX0-08 | BALL | $\varnothing 4$ | 4 |
| 6-13 | $\begin{gathered} \text { AAM-GPO- } \\ 04 \end{gathered}$ | BALL CAGE |  | 1 |
| 6-14 | 1HF-030-10 | HEX.SOCKET HEAD SCREW | M3x10 | 2 |
| 6-15 | 2PF-030-07 | PLAIN WASHER | M3 | 2 |
| 6-16 | $\begin{gathered} \text { AAM-GA1- } \\ 33 \end{gathered}$ | $\begin{aligned} & \text { CHINREST POLE } \\ & \text { LOCK } \end{aligned}$ |  | 1 |
| 6-17 | $\begin{gathered} \text { AAM-MPO- } \\ 23 \end{gathered}$ | BEVEL GEAR-POLE |  | 1 |
| 6-18 | AAM-GA1- $01$ | $\begin{aligned} & \text { CHINREST POLE } \\ & \text { GUIDE } \end{aligned}$ |  | 1 |
| 6-19 | 1RF-030-08 | ROUND-HEAD SCREW |  | 1 |
| 6-20 | $\begin{gathered} \text { AAM-MPO- } \\ 24 \end{gathered}$ | CHINREST |  | 1 |
| 6-21 | $\begin{gathered} \text { AAM-MPO- } \\ 26 \end{gathered}$ | HEADREST KNOB |  | 1 |
| 6-22 | AAM-GF7-02 | PIN HOUSING |  | 1 |
| 6-23 | AM-GS0-04 | KNOB GEAR PIN |  | 1 |
| 6-24 | 5XF-006-00 | E-RING | E6 | 1 |
| 6-25 | $\begin{gathered} \text { AAM-MPO- } \\ 25 \end{gathered}$ | BEVEL GEAR-KNOB |  | 1 |
| 6-26 | $\begin{gathered} \text { AAM-GBO- } \\ 04 \end{gathered}$ | CHINREST POLE NUT |  | 1 |



### 4.2 SERVICE PARTS LIST

### 4.1.1 OPTICAL HEAD ASSEMBLY (AAM-AT1-01)

| Part No. | Part Name | Specification | Q'ty | Illust No. | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| AAM-AT1-02 | OPTICAL HEAD ASS'Y |  | 1 | 2-01 | RETURN only |
| AAM-AS1-30 | HEAD COVER ASS'Y |  | 1 | 2-02 |  |
| $\begin{gathered} \text { AAM-MPO- } \\ 03 \end{gathered}$ | MIRE PATTERN RETAINER |  | 1 | 2-06 |  |
| $\begin{gathered} \text { AAM-MPO- } \\ 02 \end{gathered}$ | MIRE PATTERN COVER |  | 1 | 2-07 |  |
| AAM-GP0-05 | MIRE PATTERN |  | 1 | 2-08 |  |
| AAM-MPO01 | MIRE PCB MOUNT |  | 1 | 2-09 |  |
| AAO-LLE-01 | BOX WINDOW |  | 1 | 2-10 |  |
| AAE-Y00-04 | PCBASS'Y | KER. RING | 1 | 2-11 |  |
| AAE-Z00-04 | CABLE HARNESS | KER LED | 1 |  |  |
| AAM-PF4-04 | SLIDER COVER BRACKET |  | 1 | 2-13 |  |

### 4.2 LOWER BASE ASSY (AAM-AT1-03)

| Part No. | Part Name | Specification | Q'ty | Illust No. | Remarks |
| :--- | :--- | :--- | :--- | :--- | :--- |
| AAM-GC3- | LOWER BASE |  |  |  |  |
| 01 |  |  |  |  |  |

NOTE 1: 3-09,3-10,3-11,3-12,3-13,3-14,3-16,3-17,3-18

### 4.3 J OYSTICK ASS' (AAM-AT1-04)

| Part No. | Part Name | Specification | Q'ty | Illust No. | Remarks |
| :--- | :--- | :---: | :---: | :---: | :---: |
| AAM-AT1-05 | J OYSTICK ASS'Y | 1 | NOTE 1 | RETURN only |  |
| 1 |  | 1 |  |  |  |


| AAM-MPO09 | BUTTON KNOB J OYSTICK | 1 | 4-20 |
| :---: | :---: | :---: | :---: |
| AAM-MRO01 | RUBBER J OYSTICK | 1 | 4-19 |
| AAM-MPO- $10$ | CAP KNOB J OYSTICK | 1 | 4-18 |

NOTE 1: 4-01,4-02,4-03,4-04,4-05,4-06,4-07,4-08,4-09,4-10,4-11,4-12,4-13,4-14,4-15,4-16,4-17,4-21,4-22,4-23

### 4.4 UPPER BASE ASS'Y (AAM-AT1-06)

| Part No. | Part Name | Specification | Q'ty | Illust No. | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { AAM-GCO- } \\ & 01 \end{aligned}$ | UPPER BASE |  | 1 | 5-01 | RETURN only |
| AAM-AS2-17 | $\begin{aligned} & \text { STAGE HOLDING KNOB } \\ & \text { ASS'Y } \end{aligned}$ |  | 1 | 5-02,5-03,5-04,5-05 |  |
| AAM-MPO11 | STAGE HOLDING KNOB |  | 1 | 1-01 |  |
| AAM-GA0-02 | CYLINDER SAPCER |  | 4 | 5-11 |  |
| AAM-GF4-02 | WEIGHT |  | 2 | 5-07 |  |
| AAM-PF4-05 | SENSOR BRACKET |  | 1 | 5-53 |  |
| AAE-Y00-05 | PCB ASS'Y | PD SENSOR | 1 | 5-57 |  |
| AAE-Z00-11 | CABLE HARNESS | PD SENSOR | 1 | 5-54 |  |
| AAM-AS1-20 | CYLINDER ASS'Y |  | 1 | NOTE 1 | RETURN only |
| AAM-AS2-19 | TIMMING PULLEY ASS'Y |  | 1 | 5-12,5-13,5-15,5-16 |  |
| AAM-GA0-05 | COVER BRACKET SUPPORT-B |  | 1 | 5-37 |  |
| AAM-GA0-10 | COVER BRACKET <br> SUPPORT-A  |  | 1 | 5-45 |  |
| AAM-PF4-01 | COVER BRACKET-L |  | 1 | 5-30 |  |
| AAM-PF4-02 | COVER BRACKET-R |  | 1 | 5-43 |  |
| AAM-GF4-01 | BRACKET SUPPORT "A" |  | 1 | 5-41 |  |
| AAM-GA0-08 | BRACKET SUPPORT "B" |  | 1 | 5-42 |  |
| AAM-PF4-15 | HEAD SUPPORT |  | 1 | 5-39 |  |
| AAM-GF5-01 | GUIDE SHAFT |  | 1 | 5-34 |  |
| AAM-GA0-11 | STOPPER WASHER B |  | 1 | 5-38 |  |
| 6XX-030-20 | PCB SUPPORT |  | 4 | 5-40 |  |
| AAE-Y00-06 | PCB ASS'Y | RK MAIN | 1 | 5-60 | RETURN only |
| AAE-Y00-07 | PCB ASS'Y | OSD | 1 | 5-61 | RETURN only |

NOTE 1: 5-09,5-10,5-17,5-18,5-20,5-21,5-22,5-23,5-24,5-25,5-26,5-27,5-28,5-29,5-31,5-32,5-33

### 4.5 COVER ASSY (AAM-AT1-07)

| Part No. | Part Name | Specification | Q'ty | Illust No. | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| AAM-MPO $13$ | LCD COVER |  | 1 |  |  |


| AAM-XMO- $01$ | LCD WINDOW |  | 1 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| AAE-B00-10 | LCD MODULE |  | 1 |  | RETURN only |
| AAM-BF4-01 | LCD SUPPORT |  | 4 |  |  |
| $\begin{aligned} & \text { AAM-MPO- } \\ & 14 \end{aligned}$ | BUTTON KNOB LCD |  | 1 |  |  |
| AAE-Y00-08 | PCB ASS'Y | USER KEY | 1 |  |  |
| AAE-Z00-12 | CABLE HARNESS | FUNCTION KEY | 1 |  |  |
| AAM-AS1-23 | MAIN COVER-L ASS'Y |  | 1 | 1-03 |  |
| $\begin{aligned} & \text { AAM-MPO- } \\ & 16 \end{aligned}$ | SCREW CAP |  | 14 | 1-04 |  |
| AAM-AS1-24 | MAIN COVER-R ASS'Y |  | 1 | 1-14 |  |
| $\begin{aligned} & \text { AAM-MPO- } \\ & 19 \end{aligned}$ | PRINTER HOUSING |  | 1 | 1-15 |  |
| AAE-B00-11 | PRINTER DRIVER |  | 1 | 1-18 | RETURN only |
| AAM-PF4-10 | PRINTER BASE |  | 1 | 1-20 |  |
| AAE-B00-12 | PRINTER |  | 1 | 1-22 | RETURN only |
| AAE-Z00-16 | CABLE HARNESS | PRINTER | 1 |  |  |
| AAM-PF4-11 | PRINTER ROLL HANDLE |  | 1 | 1-23 |  |
| $\begin{aligned} & \text { AAM-MPO- } \\ & 20 \end{aligned}$ | PRINTER DOOR |  | 1 | 1-17 |  |
| AAM-AS2-21 | SLIDER COVER ASS'Y |  | 1 | 1-06 |  |
| AAM-PF4-12 | EXTERNAL LED HOLDER |  | 4 | 1-10 |  |
| AAE-Y00-09 | PCB ASS'Y | EXT. LED | 4 | 1-11 |  |
| AAE-ZOO-25 | CABLE HARNESS | EXT. LED | 1 |  |  |
| AAM-MPO17 | SCREW CAP |  | 2 | 1-09 |  |
| AAM-MP701 | J OYSTICK DECORATION |  | 1 | 1-02 |  |
| AAM-MPO- $13$ | LCD COVER |  | 1 |  |  |

### 4.6 HEADREST ASS'Y (AAM-AT1-08)

| Part No. | Part Name | Specification | Q'ty | Illust No. | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| AAM-AS1-26 | HEADREST FRAME ASS'Y |  | 1 | 6-01 | RETURN only |
| AAM-GA0-07 | HEADREST BODY |  | 1 | 6-10 |  |
| AAM-GP0-04 | BALL CAGE |  | 1 | 6-13 |  |
| AAM-BX0-08 | BALL |  | 4 | 6-12 |  |
| AAM-AS2-23 | CHINREST POLE NUT ASS'Y |  | 1 | 6-17,6-26 |  |
| AAM-GS0-05 | CHINREST POLE |  | 1 | 6-05 |  |
| $\begin{aligned} & \text { AAM-MPO- } \\ & 24 \end{aligned}$ | CHINREST |  | 1 | 6-20 |  |
| AAM-GA1-01 | CHINREST POLE GUIDE |  | 1 | 6-18 |  |


| AAM-GA1-33 | CHINREST POLE LOCK | 1 | 6-16 |
| :---: | :---: | :---: | :---: |
| AAM-AS2-24 | KNOB GEAR ASS'Y | 1 | NOTE 1 |
| AAM-PF3-02 | HEADREST BODY COVER | 1 | 6-07 |

NOTE 1: 6-09,6-21,6-22,6-23,6-24,6-25

### 4.7 ACCESSORY (AAM-AT1-07) (These parts supplied only for SALE base)

| Part No. | Part Name | Specification | Q'ty | Illust No. | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| AAE-B00-13 | POWER CORD SET (Standard) |  | 1 |  |  |
| AAE-B00-14 | POWER CORD SET (US) |  | 1 |  |  |
| AAE-B00-15 | POWER CORD SET (CHINA) |  | 1 |  |  |
| AAM-AS1-29 |  |  | 1 |  |  |
| AAM-XX0-13 | PRINTING PAPER |  | 2 |  |  |
| AAM-XX0-14 | CHINREST PAPER |  | 100 |  |  |
| AAM-XP0-03 | DUST COVER |  | 1 |  |  |
| AAT-XX0-01 | OPERATION <br> MANUAL <br> (KOREAN) |  | 1 |  |  |
| AAT-XX0-02 | OPERATION <br> MANUAL <br> (ENGLISH) |  | 1 |  |  |
| AAM-MRO $04$ | LED HOUSING CAP |  | 1 |  |  |

