

Digital Pneumatic Tourniquet system

DTS-3000

USER MANUAL



Indications
for safety use

Read this manual carefully. This manual is for user's safety and preventing any property-loss. Before using our device, please read this manual inevitably.

This product is medical device using under doctor's instructors.

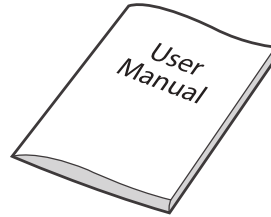
3

Product package

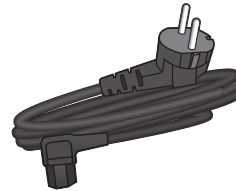
3-1. Device part



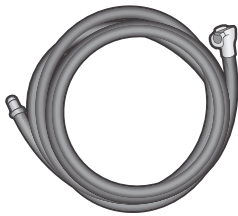
DTS-3000
(Device)



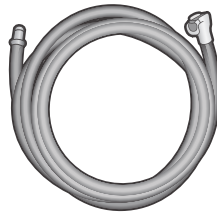
User manual



Power cord



Blue main hose
(1EA)



Red main hose
(1EA)



Gray main hose
(2EA)

3-2. Cuff and accessory configuration

Select and purchase the cuffs depending on user's status or application areas.



Single Cuff



Double Cuff



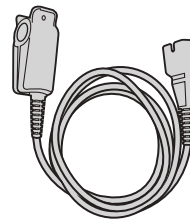
Cone Single Cuff



Cone Double Cuff



Silicone Bladder Cuff



IOP Sensor

- * The cuff is a consumable product.
- * The cuff is defined as the mounting part in IEC 60601-1.
- * The IOP sensor is defined as the mounting part in IEC 60601-1.

* Accessories Information

- Other

Names	Size	Ref.No.
RED MAIN HOSE	3m	1000180
BLUE MAIN HOSE	3m	1000190
GRAY MAIN HOSE	3m	1000200
IOP SENSOR	1m	0100090

- General cuff

Ref.No.	Bladder size		Minimum recommended size		Maximum recommended size		Cleaning	Sterilization possible
	cm	inch	cm	inch	cm	inch		
SINGLE								
DTC-S02	40 X 7	16 X 2.7	25 <	9.8 <	< 33	< 12.9	O	X
DTC-S04	52 X 7.5	20 X 2.9	30 <	11.8 <	< 45	< 17.7		
DTC-S05	61 X 9	24 X 3.5	39 <	15.3 <	< 54	< 21.2		
DTC-S06	80 X 9	31 X 3.5	53 <	20.8 <	< 73	< 28.7		
DTC-S07	86 X 10	34 X 3.9	59 <	23.2 <	< 79	< 31.1		
DTC-S08	107 X 10	42 X 3.9	80 <	31.4 <	< 100	< 39.3		
DOUBLE								
DTC-D04	57 X 10	22 X 3.9	35 <	13.7 <	< 50	< 19.6	O	X
DTC-D05	80 X 15	31 X 5.9	53 <	20.8 <	< 73	< 28.7		
DTC-D06	107 X 15	42 X 5.9	80 <	31.4 <	< 100	< 39.3		
DTC-D07	57 X 15	22 X 5.9	35 <	13.7 <	< 50	< 19.6		
CONE SINGLE								
DTC-C25	70 X 10	27 X 3.9	48 <	18.8 <	< 63	< 24.8	O	X
DTC-C26	90 X 12	35 X 4.7	63 <	24.8 <	< 83	< 32.6		
DTC-C27	107 X 14	42 X 5.5	80 <	31.4 <	< 100	< 39.3		
CONE DOUBLE								
DTC-CD25	70 X 10	27 X 3.9	48 <	18.8 <	< 63	< 24.8	O	X
DTC-CD26	90 X 12	35 X 4.7	63 <	24.8 <	< 83	< 32.6		
DTC-CD27	107 X 14	42 X 5.5	80 <	31.4 <	< 100	< 39.3		

- Silicone bladder cuff

Ref.No.	Bladder size		Minimum recommended size		Maximum recommended size		Cleaning	Sterilization possible
	cm	inch	cm	inch	cm	inch		
SINGLE								
DTC-SA01	30 X 11	12 X 4.3	10 <	3.9 <	< 23	< 9	O	O
DTC-SA02	46 X 11	18 X 4.3	23 <	9 <	< 39	< 15.3		
DTC-SA05	61 X 11	24 X 4.3	39 <	15.3 <	< 54	< 21.2		
DTC-SA06	76 X 11	30 X 4.3	54 <	21.2 <	< 69	< 27.1		
DTC-SA07	86 X 11	34 X 4.3	64 <	25.1 <	< 79	< 31.1		
DTC-SA15	52 X 7	21 X 2.8	30 <	11.8 <	< 45	< 17.7		
DTC-SA1243	30 X 11	12 X 4.3	10 <	3.9 <	< 23	< 9		
DTC-SA1843	46 X 11	18 X 4.3	23 <	9 <	< 39	< 15.3		
DTC-SA2443	61 X 11	24 X 4.3	39 <	15.3 <	< 54	< 21.2		
DTC-SA3043	76 X 11	30 X 4.3	54 <	21.2 <	< 69	< 27.1		
DTC-SA3443	86 X 11	34 X 4.3	64 <	25.1 <	< 79	< 31.1		
DTC-SA2128	52 X 7	21 X 2.8	30 <	11.8 <	< 45	< 17.7		
DTC-SA1228	30 X 7	12 X 2.8	10 <	3.9 <	< 23	< 9		
DTC-SA4563	110 X 16	45 X 6.3	83 <	32.6 <	< 103	< 40.5		
CONE SINGLE								
DTC-CS1843	46 X 11	18 X 4.3	23 <	9 <	< 39	< 15.3	O	O
DTC-CS2443	61 X 11	24 X 4.3	39 <	15.3 <	< 54	< 21.2		
DTC-CS3043	76 X 11	30 X 4.3	54 <	21.2 <	< 69	< 27.1		
DTC-CS3443	86 X 11	34 X 4.3	64 <	25.1 <	< 79	< 31.1		
DTC-CS4443	112 X 11	44 X 4.3	85 <	33.4 <	< 105	< 41.3		
CONE DOUBLE								
DTC-CD1855	46 X 14	18 X 5.5	23 <	9 <	< 39	< 15.3	O	O
DTC-CD2455	61 X 14	24 X 5.5	39 <	15.3 <	< 54	< 21.2		
DTC-CD3055	76 X 14	30 X 5.5	54 <	21.2 <	< 69	< 27.1		
DTC-CD3455	86 X 14	34 X 5.5	64 <	25.1 <	< 79	< 31.1		
DTC-CD4475	112 X 19	44 X 7.5	85 <	33.4 <	< 105	< 41.3		

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Product description

ENGLISH

4-1. Device specifications

Items		Specification
Model		DTS-3000
Protection Type		Class I, BF-type Device
Rated Voltage		AC100-240V, 50/60Hz
Power Consumption		120VA
Setting Pressure		20-700mmHg \pm 4mmHg (Unit : 1, 5mmHg)
Setting Time		1-240min (Unit : 1min, 5min)
Dimension		180(W) x 200(D) x 260(H)mm
Weight		3kg
Device Life Time		9year
Rated Voltage of Battery		DC 14.4V
Current Consumption of Battery		2600mAh
Working Hours of Battery		About 6 Hours (varying on the battery status)
Certification	SAFETY	IEC60601-1
	EMC	IEC60601-1-2

Rx ONLY Setting pressure should be operated under doctor's instructions.

4-2. Device views



Back



Top



Left side



Front



Right side

4-3. Names and Functions of Parts
















No	Name	Function
1	LCD Screen	Display the operating status of the device.
2	1CH Air Socket	- Socket for inserting red hose into 1ch when using single cuff. - Socket for inserting red hose and gray hose into 1ch when using double cuff.
3	2CH Air Socket	- Socket for inserting blue hose into 2ch when using single cuff. - Socket for inserting blue hose and gray hose into 2ch when using double cuff.
4	IOP Socket	Socket to connect IOP Sensor.
5	Alarm LED	LED indicating the operating status and errors. - Green: Standby, operating status. - Red: Errors
6	SD Card Slot	Slot to insert SD Card to save the operating status by a user.
7	Hose Holder	Holder for the air hose.
8	Holder fixing pin/ Handle	- Pin to fix the device on the holder. - Use the handle when moving the device.
9	Battery Cover	- Battery mounted on the device. - Do not open the battery cover and do not change the battery.
10	Power Inlet	Inlet to connect power cord.
11	Power ON/OFF Switch	Switch to turn power on or off.

4-4. Names and Functions of Control Panel









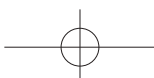
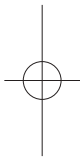
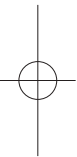
ENGLISH










No	Name	Function
1	<p style="text-align: center;">▲ PRESSURE ▼</p> <p>1CH Pressure Control Button</p>	<p>Control of Pressure of 1CH</p> <p>The previous setting is saved and displayed. The pressure can be adjusted from 20 to 700mmHg depending on patient's status and application areas.</p> <p>Set the pressure using the Pressure button (▲,▼). Press for about 3 seconds. The pressure can be adjusted during operation. (Unit : 5mmHg (Long push), 1mmHg (Short push))</p> <p>Furthermore, SET is displayed on the pressure value before pressure is applied. SET is changed to RUN when pressure is supplied and the current pressure value is displayed.</p>

2	 INFLATE	1CH Inflation Button	<p>Inflation of the cuff of 1CH</p> <p>Press the Inflate button long (3 seconds) to apply preset pressure to a cuff.</p> <p>When pressure is applied to a cuff, LCD displays </p> <p>When pressure reaches to the preset value,  is displayed.</p>
3	 TIME	1CH Time Setting Button	<p>Time setting of 1CH</p> <p>The previous value is saved and displayed. It can be adjusted to 1 to 240 minutes depending on patient's status or operation types. Press the Time Setting button (, ) to set the time.</p> <p>User can change the set pressure during operation. (Unit : 5min (Long push), 1min (Short push)). The time displayed during operation indicates the elapse time. Time can be adjusted during operation using the button (, ).</p>
4	 DEFLATE	1CH Deflate Button	<p>Deflate the cuff of 1CH</p> <p>For deflating a cuff, press the Deflate button long (3seconds). LCD displays  during deflating.</p>
5	 CHANGE	1CH Cuff Change Button	<p>Change the hemostasis area while using double cuff of 1CH</p> <p>When operation continues for a long time, change the hemostasis area while using double cuff to prevent damage of skin, nerve or muscle.</p> <p>Press the Cuff Change button long (3 seconds) while using the Cuff A. Pressure is applied to the Cuff B and then the Cuff A is deflated. In this case, LCD shows the change from the Cuff A to the Cuff B at the bottom of the screen.</p> 
6	 IOP	1CH IOP Button	<p>Set IOP of 1CH</p> <p>IOP notifies the proper pressure for hemostasis by measuring of a patient's IOP.</p> <p>For using IOP, press the IOP button long (3 seconds) after putting a cuff on, and IOP measurement starts.</p>

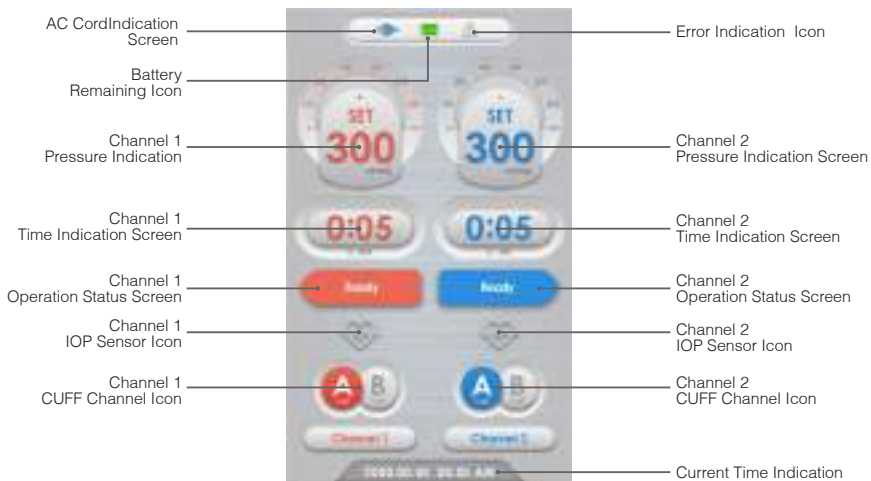


<p>6</p>  <p>IOP</p>	<p>1CH IOP Button</p>	<p>Then, IOP automatically estimates and notifies the proper pressure for a patient. To start, press the Inflate button to activate. The icon  below is activated on the LCD during IOP measurement. IOP icon color is changed as shown below.</p> 
<p>7</p> <p>▲ PRESSURE ▼</p>	<p>2CH Pressure Control Button</p>	<p>Control of Pressure of 2CH</p> <p>The previous setting is saved and displayed. The pressure can be adjusted from 20 to 700mmHg depending on patient's status and application areas.</p> <p>Set the pressure using the Pressure button (▲,▼). Press for about 3 seconds. The pressure can be adjusted during operation. (Unit : 5mmHg (Long push), 1mmHg (Short push))</p> <p>Furthermore, SET is displayed on the pressure value before pressure is applied. SET is changed to RUN when pressure is supplied and the current pressure value is displayed.</p>
<p>8</p>  <p>INFLATE</p>	<p>2CH Inflation Button</p>	<p>Inflation of the cuff of 2CH</p> <p>Press the Inflate button long (3 seconds) to apply preset pressure to a cuff.</p> <p>When pressure is applied to a cuff, LCD displays </p> <p>When pressure reaches to the preset value  is displayed.</p>
<p>9</p> <p>▲ TIME ▼</p>	<p>2CH Time Setting Button</p>	<p>Time setting of 2CH</p> <p>The previous value is saved and displayed. It can be adjusted to 1 to 240 minutes depending on patient's status or operation types. Press the Time Setting button (▲,▼) to set the time. User can change the set pressure during operation. (Unit : 5min (Long push), 1min (Short push)). The time displayed during operation indicates the elapse time. Time can be adjusted during operation using the button (▲,▼).</p>





10	 DEFLATE	2CH Deflate Button	Deflate the cuff of 2CH For deflating a cuff, press the Deflate button long (3seconds). LCD displays  during deflating.
11	 CHANGE	2CH Cuff Change Button	Change the hemostasis area while using double cuff of 2CH When operation continues for a long time, change the hemostasis area while using double cuff to prevent damage of skin, nerve or muscle. Press the Cuff Change button long (3 seconds) while using the Cuff A. Pressure is applied to the Cuff B and then the Cuff A is deflated. In this case, LCD shows the change from the Cuff A to the Cuff B at the bottom of the screen. 
12	 IOP	2CH IOP Button	Set IOP of 2CH IOP notifies the proper pressure for hemostasis by measuring of a patient's IOP. For using IOP, press the IOP button long (3 seconds) after putting a cuff on, and IOP measurement starts. Then, IOP automatically estimates and notifies the proper pressure for a patient. To start, press the Inflate button to activate. The icon  below is activated on the LCD during IOP measurement. IOP icon color is changed as shown below. 
13	 RECORD	Record Button	Record the history of application Setting values or errors are saved during the application.
14		Power Button	Power Button Turn power on or off with this button.

4-5. LCD Screen



4-5-1. LCD Information

AC Cord Indication Screen	The icon of indicating the connection of AC cord to the product * Inactivate if there is no AC cord connection
Battery Remaining Icon	The icon of indicating battery remaining by 4 steps of marking
Error Indication Icon	Activated if there is an error in the product * Alarm LED at Errors: Red color
Pressure Indication Screen	-The screen of indicating pressure values by pressing PRESSURE ▲, ▼ button. - The screen of indicating pressure values of INFLATE
Time Indication Screen	- The screen of indicating time values by pressing TIME ▲, ▼ button. - Indicate the elapsed time while operating
Operation Status Screen	- When INFLATE  button is pressed, the READY icon is changed to the OK icon after compression.
IOP Sensor Icon	The IOP sensor icon is activated based on IOP sensor connection to the product.
CUFF Channel Icon	- In the use of DOUBLE CUFF, the compression is through CUFF A ↔ CUFF B when the CHANGE  button is pressed.
Current Time Indication	Indication of current date and time







4-5-2. Power Status

- Display the power status on the top of LCD.

4-5-3. Battery Status

- Display the battery status in four steps depending on the charging amount.

The battery is automatically charged when AC power is supplied.

	Full Charge		External power connection
	Medium Charge		
	Charge Required (Supply Power)		External power Cutt-off
	No Power (Supply Power)		

* Disassembly and Replacement of Battery

- Open the battery cover at the back of the device and separate the connector connected to the battery.
- For replacement of battery, contact the service center of your seller.
- The battery is consumable. The warranty for battery is 6 months from the date when you purchase.

5

Product use and procedure

5-1. Before using a device

Use this device in accordance with the instruction from a doctor.

Select proper application area, types of cuffs and pressure level in consideration of a patient's status and operation area. Improper application may have adverse impact to patients during operation.

5-2. Use and install

- 1) Connect the cuff and the air hose.
- 2) Put a bandage on the application area of a patient and put the cuff on it.
- 3) Connect the power cord to the device.
- 4) Push the ON/OFF switch at the back of the device to ON. Touch the Power button on the front.
- 5) Set the pressure and time in accordance with a patient's status and operation area.
- 6) Touch the Inflate button long (3 seconds) to apply the pressure to the cuff.
- 7) When "OK" message is displayed on the LCD screen, the pressure is completely applied to the cuff. At this point, check the blood flow at the end of limbs and start operation.
- 8) For changing the hemostasis area while using the double cuff, touch the Cuff Change button long (3 seconds) to change the pressure area.
- 9) For deflating the cuff after the completion of operation, touch the Deflate button long (3 seconds) to deflate the cuff.
- 10) After the air is completely deflated from the cuff, disconnect the power cable and touch the power button to shut off the power completely.

* Even when power is forcibly off, the cuff is not deflated.

(When power cord is pulled off, the device works with the battery so that power is not turned off).

* Do not press the deflate button during surgery.

(There is a risk of bleeding when the cuff is deflated.)

* The log stored in the SD card is maintained even when the power down. When the SD card becomes full, content of the log are not saved. Please back up the SD card periodically.

* The power down time is not recorded in the log.

5-3. IOP Application

- 1) Connect the parts as described from Step No. 1 to 5 above in Application and Installation section.
- 2) Put the IOP sensors to the index finger or index toe of the limb where the cuff is applied.
- 3) Touch the IOP button long (3 seconds), and IOP starts measuring and displays the proper pressure value for a patient.
- 4) For using the recommended pressure value by IOP sensor, touch the Inflate button to apply the pressure to the cuff. Or set the pressure value as desired using the Pressure Control button without using the recommended pressure value.
- 5) After the pressurization is complete, remove the IOP sensor worn by the patient.

5-4. Cuff connection

5-4-1. Single cuff



- Connect the air hose to the channel until you hear the 'click' sound.
(When the Lock Pin is not pressed in the air socket in the device, press the top to open it with the sound 'click')



- For separating the air hose from the device, pull the air hose as pressing the top of air socket, and the air hose is easily removed.



- Connect the single cuff to the other end of the air hose until you hear the 'click' sound



- Use the device after checking the proper connection.

5-4-2. Double cuff connection



- Connect the air hose to the channel until you hear the 'click' sound.
(When the Lock Pin is not pressed in the air socket in the device, press the top to open it with the sound 'click')



- For separating the air hose from the device, pull the air hose as pressing the top of air socket, and the air hose is easily removed.



- Connect the double cuff to the other end of the air hose until you hear the 'click' sound



- Use the device after checking the proper connection.

5-5. IOP connection



- Connect the port of IOP Sensor to the device.



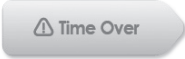
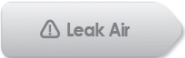
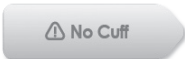


- Put the IOP Sensor to the index finger or index toe of the limb where the cuff is applied. Put a finger or a toe deep into the sensor. Use the IOP function after checking the proper connection.

* Remove all foreign substances including nail polish on fingers or toes where the IOP Sensor is applied.

6

Troubleshooting

6-1. Alarm messages

No	Alarm Code	Description	Actions
1		Indicate the set time is over.	<ul style="list-style-type: none"> - Take the follow-up actions in accordance with the instructions from a doctor. - Finish alarm rings after the set time. (However, the device is not turned off and cuffs are not deflated.) - Press the Deflate button to deflate the cuffs.
2		A certain pressure is detected, but pressure doesn't reach to the set value or a cuff is continuously deflated.	<ul style="list-style-type: none"> - Check the connection of a cuff and a hose. - Check air leakage of a cuff and a hose. - If the error persists even checking a cuff and a hose, contact your vendor.
3		A cuff is not connected to the device.	<ul style="list-style-type: none"> - Check the connection of a cuff and a hose. - If the error persists even checking the connection of a cuff and a hose, contact your vendor.
4		Voltage error while using the battery.	<ul style="list-style-type: none"> - Charge the battery by supplying AC power. - When the battery is used continuously without AC power supply, it may reduce the life span of device due to battery discharge.
5		Errors during IOP operation.	<ul style="list-style-type: none"> - Check the connection of IOP Sensor. - If the error persists even checking IOP connection, contact your vendor.

* The alarms of product is high priority alarm conditions that require prompt action.

* When an alarm occurs, Alarm LED turns red and occurred audible alarm signal of 56.8dB~60.7dB.

Press the Alarm button, and alarm stops. However, Low Battery Alarm keeps ringing and Time Over Alarm is activated 30 seconds after the first alarm. Alarms occurred are displayed in the numbers as shown in the table above on the top of LCD. When the errors occur in both 1CH and 2CH at the same time, more urgent error is displayed.

6-2. General Troubleshooting

No	Problem	Cause	Solution
1	No electric power	Power connection alarm	Check that the plug is correctly inserted into the power outlet
		Rated power	Check if your power supply is in the range of AC100-240V, 50/60Hz
		FUSE shortcut	Check if FUSE is in the state of shortcut. (FUSE is located inside AC INLET.)
2	Power on but not operating	Power supply alarm	Turn power to the controller off and on
3	Noisy during operating	Setting condition	Check that the device is installed horizontally or fixed the screw hard-locking.
			Check that there is nothing laying on top of the device or underneath.
4	No air in the hose	Hose connection alarm	Check that the hose is inserted correctly into the device.
		Bent hose	Check that the hose is not bent.

6-3. Troubleshooting

No	Problem	Cause	Solution
1	Weak air injection	Air hose damage	Contact the seller if there is a defect in the inner hose or cuff connection.
		Air hose socket damage	
		Defect of Inner parts of cuff	
2	Power on but not operating	Defect of Inner parts	Check that the plug is correctly inserted into the outlet.

* We can't be responsible for any defect occurred from user's careless use, even though warranty period.

* Please contact your dealer or the place where you purchased the product for repairs or repurchase.

* If you can't solve the problem by this way, please contact our service center.

* If you can't solve the problem by this way, please check the Service Manual (RND-R-MSM-201-01).

7

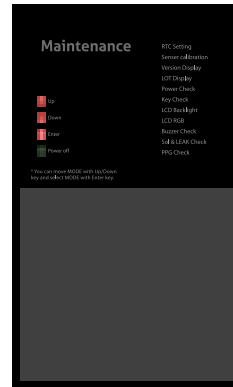
Maintenance and safety instructions



Once a year, please check the maintenance by a service center agent or distributor.


7-1. Test mode Set-up

- 1) Remove the cuff and IOP sensor to DTS-3000, then connect the AC cord.
- 2) Turn on power switch ON/OFF located at the back of the device.
- 3) Press Alarm Button + Power Button together and go to Maintenance mode.
- 4) Press Power button with long key to quit Maintenance mode.




7-2. Test method

7-2-1. RTC Setting

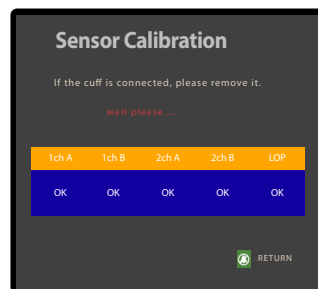
- Enter the RTC Setting in the Maintenance mode to set the date and time of the device.
- After setting the time, press the  RETURN button to return the maintenance mode.




7-2-2. Senser Calibration

- In maintenance mode, enter the Sensor Calibration to calibrate the device of pressure sensor and IOP sensor.
- After finishing the Sensor Calibration, press the  RETURN button to return the maintenance mode.
- If there is no error in pressure sensor and IOP sensor, 'OK'
- 'Fail' if the pressure sensor and IOP sensor are faulty.

* If 'Fail' appears after calibration, please contact your dealer or service center. If you open the device arbitrarily, it can get a malfunction and injury.



7-2-3. Version Display


- If you enter Version Display in Maintenance mode, you can check the version of mainboard and sub-board of the device.
- After checking the version of the product, press the  RETURN button to return the maintenance mode.

- * Main board : It is mainly controls Drive that manipulate LCD display, Button input control, IOP control, SD DATA SAVE.
- * Sub board : It is the board that will proceed for the order coming from Main board after giving command using UART communication.
- * If there is communication error between Main board and Sub board, Sub board version won't be shown. In this reason user can notices if the data communicates or not.






7-2-4. LOT Display

- When you enter the LOT Display in Maintenance mode, you can check the date of manufacture.
- After checking the version of the device, press the  RETURN button to return the maintenance mode.





ENGLISH

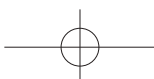
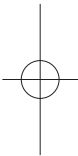
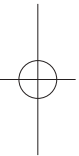
7-2-5. Power Check

- In maintenance mode, enter the Power check to check the power and battery status of the product.
- After checking the battery and pressing  RETURN button, return to maintenance mode.





7-2-5-1. Power display

Display	Status	Test method
	AC cord not connected	After booting into maintenance mode with the battery in the device, disconnect and unplug the power cord and check that the 'AC Connected' and 'AC Non Connected' statuses are working properly on the LCD screen.
	AC cord connected	




7-2-5-2. Battery indicator

Display	Status	Test method
	Battery is not connected	- After booting in maintenance mode with the power cord connected to the device, check that 'Battery Connected' and 'Battery Non Connected' are working properly on the LCD screen while removing the battery.
	- Battery is connected - Remaining battery capacity and permissible range indication	- Make sure that the remaining capacity of the battery is within the permissible range. If the battery is below 13.3V, it is 'low battery', so you need to charge it and make sure that it is charged when the power is connected.

* Check the service manual for battery specifications and replacement instructions.

7-2-6. Key Check

- In maintenance mode, enter the Key check to check whether each button on the device is operating normally.
- After Key Check, press the  RETURN button to return to maintenance mode.

