SERVICE MANUAL

cardiolife

Defibrillator

TEC-5601/TEC-5602
TEC-5611/TEC-5621
TEC-5631

TEC-5600 series

0634-901030B

NIHON KOHDEN

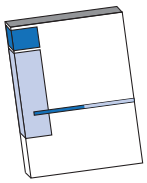
About This Manual

In order to use this product safely and fully understand all its functions, make sure to read this manual before using the product.

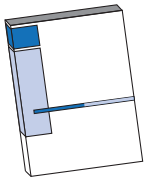
Keep this manual near the instrument or in the reach of the operator and refer to it whenever the operation is unclear.

Accompanying Documentation

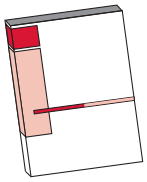
The TEC-5600 series defibrillator comes with the following manuals. Refer to the manual depending on your needs.



Operator's Manual
Describes general information, defibrillation, pacing and parameter monitoring. Read this manual before use.



Administrator's Guide
For administrators. Describes the settings on the SYSTEM SETUP screen. Read the Operator's Manual together with this manual.



Service Manual (This Manual)
For qualified service personnel. Describes information on servicing the defibrillator. Only qualified service personnel can service the defibrillator.

This product stores personal patient information. Manage and operate the information appropriately.

Patient names on the screen shots and recording examples in this manual are fictional and any resemblance to any person living or dead is purely coincidental.

The contents of this manual are subject to change without notice.

If you have any comments or suggestions on this manual, please contact us at: www.nihonkohden.com

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GENERAL HANDLING PRECAUTIONS

This device is intended for use only by qualified medical personnel.
Use only Nihon Kohden approved products with this device. Use of non-approved products or in a non-approved manner may affect the performance specifications of the device. This includes, but is not limited to, batteries, recording paper, pens, extension cables, electrode leads, input boxes and AC power.

Please read these precautions thoroughly before attempting to operate the instrument.

1. **To safely and effectively use the instrument, its operation must be fully understood.**

2. **When installing or storing the instrument, take the following precautions:**
   (1) Avoid moisture or contact with water, extreme atmospheric pressure, excessive humidity and temperatures, poorly ventilated areas, and dust, saline or sulphuric air.
   (2) Place the instrument on an even, level floor. Avoid vibration and mechanical shock, even during transport.
   (3) Avoid placing in an area where chemicals are stored or where there is danger of gas leakage.
   (4) The power line source to be applied to the instrument must correspond in frequency and voltage to product specifications, and have sufficient current capacity.
   (5) Choose a room where a proper grounding facility is available.

3. **Before Operation**
   (1) Check that the instrument is in perfect operating order.
   (2) Check that the instrument is grounded properly.
   (3) Check that all cords are connected properly.
   (4) Pay extra attention when the instrument is combined with other instruments to avoid misdiagnosis or other problems.
   (5) All circuitry used for direct patient connection must be doubly checked.
   (6) Check that battery level is acceptable and battery condition is good when using battery-operated models.

4. **During Operation**
   (1) Both the instrument and the patient must receive continual, careful attention.
   (2) Turn power off or remove electrodes and/or transducers when necessary to assure the patient's safety.
   (3) Avoid direct contact between the instrument housing and the patient.

5. **To Shutdown After Use**
   (1) Turn power off with all controls returned to their original positions.
   (2) Remove the cords gently; do not use force to remove them.
   (3) Clean the instrument together with all accessories for their next use.

6. **The instrument must receive expert, professional attention for maintenance and repairs. When the instrument is not functioning properly, it should be clearly marked to avoid operation while it is out of order.**

7. **The instrument must not be altered or modified in any way.**

8. Maintenance and Inspection

(1) The instrument and parts must undergo regular maintenance inspection at least every one year.

(2) If stored for extended periods without being used, make sure prior to operation that the instrument is in perfect operating condition.

(3) Technical information such as parts list, descriptions, calibration instructions or other information is available for qualified user technical personnel upon request from your Nihon Kohden representative.

9. When the instrument is used with an electrosurgical instrument, pay careful attention to the application and/or location of electrodes and/or transducers to avoid possible burn to the patient.

WARRANTY POLICY

Nihon Kohden Corporation (NKC) shall warrant its products against all defects in materials and workmanship for one year from the date of delivery. However, consumable materials such as recording paper, ink, stylus and battery are excluded from the warranty.

NKC or its authorized agents will repair or replace any products which prove to be defective during the warranty period, provided these products are used as prescribed by the operating instructions given in the operator's and service manuals.

No other party is authorized to make any warranty or assume liability for NKC's products. NKC will not recognize any other warranty, either implied or in writing. In addition, service, technical modification or any other product change performed by someone other than NKC or its authorized agents without prior consent of NKC may be cause for voiding this warranty.

Defective products or parts must be returned to NKC or its authorized agents, along with an explanation of the failure. Shipping costs must be pre-paid.

This warranty does not apply to products that have been modified, disassembled, reinstalled or repaired without Nihon Kohden approval or which have been subjected to neglect or accident, damage due to accident, fire, lightning, vandalism, water or other casualty, improper installation or application, or on which the original identification marks have been removed.

In the USA and Canada other warranty policies may apply.

CAUTION

United States law restricts this product to sale by or on the order of a physician.

EMC RELATED CAUTION

This equipment and/or system complies with IEC 60601-1-2 International Standard for electromagnetic compatibility for medical electrical equipment and/or system. However, an electromagnetic environment that exceeds the limits or levels stipulated in IEC 60601-1-2, can cause harmful interference to the equipment and/or system or cause the equipment and/or system to fail to perform its intended function or degrade its intended performance. Therefore, during the operation of the equipment and/or system, if there is any undesired deviation from its intended operational performance, you must avoid, identify and resolve the adverse electromagnetic effect before continuing to use the equipment and/or system.

The following describes some common interference sources and remedial actions:

1. Strong electromagnetic interference from a nearby emitter source such as an authorized radio station or cellular phone:

   Install the equipment and/or system at another location. Keep the emitter source such as cellular phone away from the equipment and/or system, or turn off the cellular phone.

2. Radio-frequency interference from other equipment through the AC power supply of the equipment and/or system:

   Identify the cause of this interference and if possible remove this interference source. If this is not possible, use a different power supply.

3. Effect of direct or indirect electrostatic discharge:

   Make sure all users and patients in contact with the equipment and/or system are free from direct or indirect electrostatic energy before using it. A humid room can help lessen this problem.

4. Electromagnetic interference with any radio wave receiver such as radio or television:

   If the equipment and/or system interferes with any radio wave receiver, locate the equipment and/or system as far as possible from the radio wave receiver.

5. Interference of lightning:

   When lightning occurs near the location where the equipment and/or system is installed, it may induce an excessive voltage in the equipment and/or system. In such a case, disconnect the AC power cord from the equipment and/or system and operate the equipment and/or system by battery power, or use an uninterruptible power supply.

6. Use with other equipment:

   When the equipment and/or system is adjacent to or stacked with other equipment, the equipment and/or system may affect the other equipment. Before use, check that the equipment and/or system operates normally with the other equipment.

7. Use of unspecified accessory, transducer and/or cable:

   When an unspecified accessory, transducer and/or cable is connected to this equipment and/or system, it may cause increased electromagnetic emission or decreased electromagnetic immunity. The specified configuration of this equipment and/or system complies with the electromagnetic requirements with the specified configuration. Only use this equipment and/or system with the specified configuration.

Caution - continued

8. Use of unspecified configuration:

   When the equipment and/or system is used with the unspecified system configuration different than the configuration of EMC testing, it may cause increased electromagnetic emission or decreased electromagnetic immunity. Only use this equipment and/or system with the specified configuration.

9. Measurement with excessive sensitivity:

   The equipment and/or system is designed to measure bioelectrical signals with a specified sensitivity. If the equipment and/or system is used with excessive sensitivity, artifact may appear by electromagnetic interference and this may cause mis-diagnosis. When unexpected artifact appears, inspect the surrounding electromagnetic conditions and remove this artifact source.

If the above suggested remedial actions do not solve the problem, consult your Nihon Kohden representative for additional suggestions.

For EMC compliance, refer to “Specifications - Electromagnetic Compatibility” in the Reference section.

The CE mark is a protected conformity mark of the European Community. Products with the CE mark comply with the requirements of the Medical Device Directive 93/42/EEC.

NOTE about Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC
For the member states of the European Union only:
The purpose of WEEE directive 2002/96/EC is, as a first priority, the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste.
Contact your Nihon Kohden representative for disposal.

Contents

Conventions Used in this Manual and Instrument

Warnings and Cautions

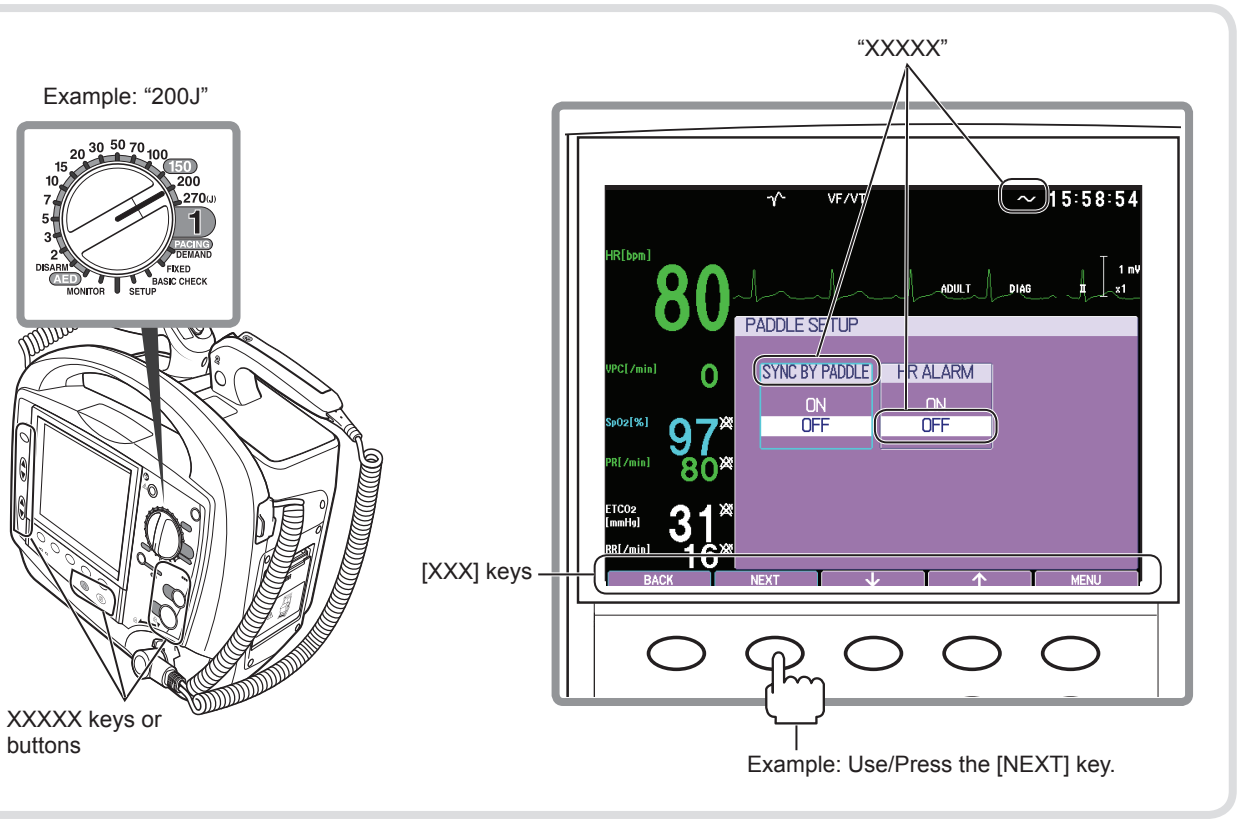
Level	Description
⚠ WARNING	A warning alerts the user to possible injury or death associated with the use or misuse of the instrument.
⚠ CAUTION	A caution alerts the user to possible injury or problems with the instrument associated with its use or misuse such as instrument malfunction, instrument failure, damage to the instrument, or damage to other property.

Icons in this Manual

Icon	Description
	Indicates the important points and other operation methods.
	Indicates related pages in this manual which give more detailed explanations.

Text Conventions in this Manual

Style	Description
Defibrillator	TEC-5600 series
XXXXX key/XXXXX button	Key or button on the front panel or the operation panel below the LCD display.
[XXXXX] key	Key displayed in the window
Use/Press the [XXXXX] key.	Press the function key 1 to 5 that corresponds to the key name displayed in the window.
“XXXXX”	Selected position of the control dial
“XXXXX”	Message, item, or parameter displayed in the window



Safety Standards

Safety Standard Classification of the Defibrillator

Type of protection against electrical shock

- When connecting to an AC power (commercial use): Class I ME equipment
- When not connecting to an AC power (commercial use): Internally powered ME equipment

Degree of protection against electrical shock

- Type BF applied parts: External paddles, disposable pads
- Type CF applied parts: Internal paddles, internal paddles (with switch)
- Defibrillation-proof type CF applied parts: ECG connection cable, electrode leads, SpO_2 probes, CO_2 sensor kit

Protection against harmful ingress of water or fine particulates

- IP44: TEC-5621 and TEC-5631 with a pad adapter or internal paddles, TEC-5611
- IP41: TEC-5621 and TEC-5631 with external paddles, TEC-5601, TEC-5602

Applicable when connecting all patient cables (except the recorder)

Sterilization or disinfection methods specified by manufacturers

- Internal paddles, internal paddles with switch: High-pressure steam sterilization (autoclave sterilization), plasma gas sterilization, ethylene oxide gas sterilization (EOG sterilization)
- Except internal paddles and internal paddles (with switch): Not for sterilization

Qualifications for use in a high-oxygen atmosphere

Not qualified

Safety level for use in air and flammable anesthetic gas or oxygen/nitrous oxide and flammable anesthetic gas

Not applicable

Mode of operation

Continuous operation

Installation conditions

Indoor and in-vehicle uses

Frequency of use (class by IEC 60601-2-4: 2010)

High frequent use

1 General

Introduction

This service manual provides useful information to qualified service personnel to understand, troubleshoot, service, maintain and repair this TEC-5600 series defibrillator.

The information in the operator's manual is primarily for the user. However, it is important for service personnel to thoroughly read the operator's manual and service manual before starting to troubleshoot, service, maintain or repair this defibrillator. This is because service personnel need to understand the operation of the defibrillator in order to effectively use the information in the service manual.

Models and Functions

Functions		TEC-5601	TEC-5602	TEC-5611	TEC-5621	TEC-5631
Defibrillation	External paddles	Build in	Build in	—	Standard	Standard
	Internal paddles	—	—	—	Option	Option
	Disposable pads	—	—	Option	Option	Option
AED		—	—	Standard	Standard	Standard
Pacing		—	—	—	—	Standard
Playing voice		Standard	Standard	Standard	Standard	Standard
Sound recording		Standard	Standard	Standard	Standard	Standard
Lead ECG		—	Standard	Standard	Standard	Standard
SD card		Option	Option	Option	Option	Option
Battery pack		Option	Option	Option	Option	Option
Bluetooth® module		Option	Option	Option	Option	Option
SpO_2, CO_2		Option	Option	Option	Option	Option
Printing		—	Standard	Standard	Standard	Standard
Synchronous discharge		—	Standard	Standard	Standard	Standard

Parameters

Functions	TEC-5601	TEC-5602	TEC-5611	TEC-5621	TEC-5631
ECG monitoring	—	Available	Available	Available	Available
SpO_2, CO_2 monitoring	Option	Option	Option	Option	Option

General Information on Servicing

Note the following information when servicing the defibrillator.

CAUTION

Safety

- There is the possibility that the outside surface of the defibrillator, such as the operation keys, could be contaminated by contagious germs, so disinfect and clean the defibrillator before servicing it. When servicing the defibrillator, wear rubber gloves to protect yourself from infection.
- There is the possibility that when the lithium battery is broken, a solvent inside the lithium battery could flow out or a toxic substance inside it could come out. If the solvent or toxic substance touches your skin or gets into your eye or mouth, immediately wash it with a lot of water and see a physician.

Liquid ingress

- The defibrillator is not waterproof, so do not install the defibrillator where water or liquid can get into or fall on the defibrillator. If liquid accidentally gets into the defibrillator or the defibrillator accidentally drops into liquid, disassemble the defibrillator, clean it with clean water and dry it completely. After reassembling, verify that there is nothing wrong with the patient safety checks and function/ performance checks. If there is something wrong with the defibrillator, contact your Nihon Kohden representative to repair.

Environmental safeguards

- Depending on the local laws in your community, it may be illegal to dispose of the lithium battery in the regular waste collection. Check with your local officials for proper disposal procedures.

Disinfection and cleaning

- To disinfect the outside surface of the defibrillator, wipe it with a non-abrasive cloth moistened with neutral detergent.

Transport

- Use the specified shipment container and packing material to transport the defibrillator. If necessary, double pack the defibrillator. Also, put the defibrillator into the shipment container after packing so that the buffer material does not get into the inside of the defibrillator.
- When transporting a board or unit of the defibrillator, be sure to use a conductive bag. Never use an aluminum bag when transporting a board or unit which a lithium battery is mounted. Also, never use a styrene foam or plastic bag which generates static electricity to wrap the board or unit of the defibrillator.

Handling the defibrillator

- Because the outside surface of the defibrillator is made of resin, the outside surface of the defibrillator is easily damaged. So when handling the defibrillator, remove clutter from around the system and be careful to not damage the defibrillator or get it dirty.
- Because most of the boards in the defibrillator are multilayer boards with surface mounted electrical devices (SMD), when removing and soldering the electrical devices, a special tool is required. To avoid damaging other electrical components, do not remove and solder SMD components yourself.

Measuring and test equipment

- Maintain the accuracy of the measuring and test equipment by checking and calibrating it according to the check and calibration procedures.

Preventing infection

- Follow the local laws or regulations to prevent infection.

Service Policy, Service Parts and Patient Safety Checks

Service Policy

Our technical service policy for this defibrillator is to replace the faulty unit, board or part or damaged mechanical part with a new one. Do not perform electrical device or component level repair of the multilayer board or unit. We do not support component level repair outside the factory for the following reasons:

- Most of the boards are multilayer boards with surface mounted electrical devices, so the mounting density of the board is too high.
- A special tool or high degree of repair skill is required to repair the multilayer boards with surface mounted electrical devices.

Only disassemble the defibrillator or replace a board or unit in an environment where the defibrillator is protected against static electricity.

As background knowledge for repair, note the following:

- You can reduce the repair time by considering the problem before starting repair.
- You can clarify the source of most of the troubles using the information from the troubleshooting tables. Refer to "Troubleshooting" of this manual.

Service Parts

Refer to "Cable List" (p.3-11) and "Replaceable Parts" (p.5-1) for the service parts for technical service that we provide.

NOTE: When ordering parts or accessories from your Nihon Kohden representative, please quote the code number and part name which is listed in this service manual, and the name or model of the unit in which the required part is located. This will help us to promptly attend to your needs. Always use parts and accessories recommended or supplied by Nihon Kohden Corporation to assure maximum performance from your defibrillator.

Patient Safety Checks

Periodic maintenance procedures and diagnostic check procedures are provided in this manual to ensure that the defibrillator is operating in accordance with its design and production specifications. To verify that the defibrillator is working in a safe manner with regard to patient safety, patient safety checks should be performed on the defibrillator before it is first installed, periodically after installation, and after any repair is made on the defibrillator.

For patient safety checks, perform the following checks as described in the IEC60601-1 "Medical electrical equipment - Part 1: General requirements for basic safety and essential performance":

- Protective earth resistance check
- Earth leakage current check

- Touch current check
- Patient auxiliary current check
- Withstanding voltage check

NOTE: When using a delivery checker to input ECG to the defibrillator, the ECG polarity depends on the delivery checker model and connection of the pads/paddles. For details on a delivery checker, refer to the manual of the delivery checker.

Maintenance Equipments and Tools

Item to be Checked		Equipment and Tool
Appearance	Power cord	Earth resistance meter
Defibrillator	Recorder	• Ruler • Stopwatch • Recording paper
Defibrillation and pacing	• Defibrillation • Synchronized cardioversion • AED • Pacing (TEC-5631 only)	• AX-103V defibrillation analyzer (Nihon Kohden) • Oscilloscope • Stopwatch • JC-865V pad adapter • JC-906P ECG connection cord • BR-903P electrode lead
Monitoring	ECG	• AX-400G medical instrument checker (Nihon Kohden) • JC-906P ECG connection cord • BR-906P electrode lead
	CO_2 (defibrillator)	• AX-400G medical instrument checker (Nihon Kohden) • H-0753 BSS cable for AX-400G medical instrument checker
	CO_2 (CO_2 sensor kit)	• CO_2 5% sensitivity gas A-4 • PR-150 flow regulator • CO_2 sensor kit • Airway adapter
	SpO_2	• AX-400G medical instrument checker (Nihon Kohden) • JL-900P SpO_2 connection cord • H-0750 SpO_2 connection cable
Safety	Leakage current	LCC-1101 leakage current checker (Nihon Kohden)

NOTE: When using a delivery checker to input ECG to the defibrillator, the ECG polarity depends on the delivery checker model and connection of the pads/paddles. For details on a delivery checker, refer to the manual of the delivery checker.

Notes after Servicing

Perform the basic checks after servicing to check that the defibrillator works properly. Refer to “Basic Checks” in Section 12 of the operator’s manual.

Even if the basic check results are all OK, the status indicator may be red, such as after speaker replacement.

If the indicator is red, change the current date and time so that the monthly self-test is performed now and the status indicator changes to green. Refer to “Self Tests” in Section 12 of the operator’s manual.

Procedure

1. Display the SELF TEST TIME window to check the time of the self-test. Refer to “DEVICE SETUP” in Section 5 of the operator’s manual.
2. Display the DATE AND TIME window and change the current date and time to the date and time of the self-test.
   - MONTH: This month
   - DAY: 15
   - HOUR: Same hour as the self-test time
   - MINUTE: A few minutes before the self-test time
3. When the self-test time comes, the self-test starts. Check that the status indicator becomes green.
4. Display the DATE AND TIME window and set the current date and time.

Specifications

Functions

Defibrillator

Manual mode: For charging to a user-specified energy level by using the CHARGE/AED button

Manual sync mode: For charging to a user-specified energy level by using the CHARGE/AED button, then discharging in synchronization with the R-wave of an ECG after the SHOCK button is pressed

AED mode: For charging up to the automatically specified energy level when defibrillation is required for the ECG. The energy level varies, depending on the sequence defined in advance

AED mode (child mode): For charging up to the automatically specified energy level for a child when defibrillation is required for the ECG. The energy level varies, depending on the sequence defined in advance. This mode is for preschool children only

Output energy (with loading of 50 Ω)

External paddles: 2, 3, 5, 7, 10, 15, 20, 30, 50, 70, 100, 150, 200, or 270 J selectable

Internal paddles: 2, 3, 5, 7, 10, 15, 20, 30, or 50 J selectable

Disposal pads: 2, 3, 5, 7, 10, 15, 20, 30, 50, 70, 100, 150, 200, or 270 J selectable

AED mode: 1st: 150 J, 2nd: 200 J, 3rd: 200 J (default settings)
(The settings can be selected from among 50, 70, 100, 150, 200, and 270 J.)

AED mode (child mode):

1st: 50 J, 2nd: 70 J, 3rd: 70 J (default settings)
(The settings can be selected from among 50, 70, and 100 J.)

VF/VT analysis: Analysis is performed in the background or when the AED button is pressed (depending on the setting). In AED mode, the requirement for defibrillation is determined for ventricular fibrillation waveform of amplitude more than 0.1 mV and a ventricular tachycardia more than 180 bpm.

Internal discharge: For discharging the charged energy to the internal resistance in the following cases:

- When power is turned off
- When the control dial is set to DISARM, AED, MONITOR, BASIC CHECK, PACING, or SETUP
- When 40 seconds or more have elapsed from when a charge completed, depending on the setting of “Charge Holding Time” (default setting: 40 seconds) in the system setup
- When a paddle is disconnected from the defibrillator
- When a disposal pad is disconnected from the patient
- When discharging with the released external or internal paddles
- When detecting an ECG that requires no defibrillation in AED mode

TTR detection: For measuring the transthoracic electric resistance of a patient

Discharged energy detection:
For measuring the discharged energy

Transcutaneous Pacing

Demand mode: For delivering pacing pulses at the specified pacing output current when there is no spontaneous QRS within the time calculated from the specified pacing rate

Fixed mode: For delivering pacing pulses at the specified pacing rate and output current for a patient having no spontaneous QRS

Monitor

Electrocardiogram (ECG)

Induction

Disposal pads: Pads

External or internal paddles: Paddles

3 leads: I, II, III

6 leads: I, II, III, aVR, aVL, aVF, Va, Vb

External ECG input: AUX

Filter: "DIAGNOSIS", "MONITOR", or "MAXIMUM" selectable for ECG

Pacemaker pulse rejection: Equipped with a function activated to prevent output waveforms of the pacemaker installed in a patient from being detected as QRS

Hum filter: "ON" or "OFF" selectable for the hum noise (50 or 60 Hz)

ESU filter: Equipped with a filter for rejecting noise incorporated into the ECG when an ESU is used

Electrode disconnection detection: Equipped with a function to detect disconnection of an electrode

Abnormal polarization detection: Equipped with a function to detect possible distortion of an ECG caused by polarizing voltage

Arrhythmia analysis: When arrhythmia analysis is "ON" in monitor mode (with the limb/chest lead selected), the analysis is performed. Depending on the setting for QRS detection type, the method of arrhythmia analysis is switched between "CHILD" and "ADULT".

SpO_2

Pulse rate, pulse wave, and SpO_2 value can be measured by connecting a probe to the SpO_2 socket.

CO_2

$ETCO_2$ value, CO_2 waveform, and respiration rate can be measured by connecting a CO_2 sensor kit to the CO_2 socket.

Indications

Screen Indications

Display: 6.5-inch diagonal, color TFT-LCD

Display area: 132.48 mm × 99.36 mm

Number of pixels: 640(H) × 480(V) pixels

Waveform Indications

Number of waveforms

ECG only: 1 trace of ECG waveform or 2 traces of ECG cascade[1]

In SpO_2 measurement: Pulse waveform[1]

In CO_2 waveform measurement:
Respiration waveform[1]

[1] Selectable by the setup

Waveform sensitivity

ECG: 1/4, 1/2, 1, 2, or 4

Pulse wave: 1/8, 1/4, 1/2, 1, 2, 4, 8, or automatic

CO_2: 0 to 20 mmHg, 0 to 40 mmHg, or 0 to 80 mmHg

Sweep rate

ECG, SpO_2: 25 or 50 mm/s

CO_2: 12.5 or 6.25 mm/s

Numeric Indications

Displayed parameters: HR, SpO_2, PR, $ETCO_2$, RR

Defibrillator energy indications (with loading of 50 Ω):
In manual mode, the current energy value at the high-pressure condenser is displayed during a charge operation and the output energy is displayed after the charge operation is completed.

Pacing rate indication: The currently set pacing rate is displayed in pacing mode.

Pacing current intensity indication:
The currently set pacing current intensity is displayed in pacing mode.

Pacing duration indication:
The pacing duration time is displayed during pacing.

Clock indication: The current clock setting is displayed.

Timer indication: The time from when pressing the [START TIMER] key to when pressing the [STOP TIMER] key is displayed in AED mode.

Character, Symbol, and Graphic Symbol Indications

Battery remaining: Indicates the battery remaining.

Recorder operation: Indicates operation statuses of the recorder.

SD card operation: Indicates operation statuses of an SD card.

Bluetooth® indication: Indicates connection statuses of a Bluetooth® module.

Defibrillation mode: Indicates manual mode, synchronized cardioversion mode, AED mode, or AED mode (child mode) for defibrillation.

Pacing mode: Indicates the selected mode, fixed or demand, with “PACING”.

Analysis/charging/charging complete messages:
Indicate “ANALYZING” in VF analysis, “CHARGING” in energy charging, or “CHARGING COMPLETE” when charging is complete.

Number of discharges: Indicates the number of discharges after power-on.

Voice message indication: Displays the same messages as the voice messages in AED mode.

Vital alarm: Displays an alarm message if any measured value of a parameter exceeds the upper or lower limit of an alarm or if an arrhythmia is detected.

Technical alarm: If an error for the defibrillator or for measurement environment is detected, an alarm message is displayed.

Display language: Language selection is enabled by a setting. Installing the software program enables you to select the language.

Status Indicator

After a self test, the indicator shows "○" in green if the test ends normally. During a self test or if any problem occurs in the defibrillator, the indicator shows "×" in red.

Alarm Indicator

The indicator lights or blinks in cyan, yellow or red if vital information exceeds the upper or lower limit of an alarm, or depending on the measurement environment and defibrillator status such as a battery status.

LED Indications

AC power lamp: Lights when the power cord is connected and an AC power is supplied to the defibrillator.

Battery charging lamp: Lights when the power cord is connected and the installed battery is in charging. If the battery temperature is not suitable for charging, the lamp blinks.

Battery charging completion lamp:
Lights when the power cord is connected and charging to the installed battery is completed.

PACING PULSE lamp: Lights in synchronization with pacing pulse outputs.

SHOCK button lamp: The SHOCK button flashes when energy charging is completed and discharging is enabled.

Shock button lamps: The shock buttons on external paddles flash when energy charging is completed and discharging is enabled.

Paddle contact lamp: Lights in green, yellow or orange, depending on the resistance (in 3 stages) between the external paddles.

Frozen Waveform Display

Pressing the [FREEZE] key in monitor mode freezes the displayed waveform for 3 minutes.

Recording

Waveform Recording

Continuous real-time recording:
Pressing the record button initiates continuous waveform recording with no delay, in accordance with the user setting.

Continuous delayed recording:
Pressing the record button initiates continuous waveform recording with a delay, in accordance with the user setting.

Event recording: When the [EVENT] key is pressed, data for the certain periods before and after pressing the key are recorded. The function can be turned on/off by a user setting.

Alarm recording: Recording is automatically started when a vital alarm is generated. The function can be turned on/off by a user setting.

Periodic recording: Recording is started at the user-specified time.

Charging start recording: Recording automatically starts when charging begins, and it automatically stops after defibrillation. The function can be turned on/off by a user setting.

Report Recording

Defibrillator report:	Stores an ECG waveform in the defibrillator when defibrillation is performed, enabling it to be printed as a discharged waveform when required. Defibrillator information can also be stored in the defibrillator when defibrillation is performed, enabling it to be printed as a defibrillation report when required.
Alarm report:	Stores a waveform in the defibrillator when a vital alarm is generated, enabling it to be printed when required.
Event report:	Stores the waveforms before and after your pressing the [EVENT] key in the defibrillator, enabling them to be printed when required.
VF analysis report:	Stores an ECG waveform for which VF analysis is performed in the defibrillator, enabling it to be printed as an analyzed waveform report.
Trend report:	Stores the past vital data in the defibrillator, which can be provided as a trend graph output.
Periodic list report:	Stores HR, SpO_2, PR, $ETCO_2$, and RR data measured at the specified times.
Self-test report:	Stores the self-test result as a report.
Basic-check report:	Stores the basic-check result as a report.
Event list:	Outputs an event report, listing the time and defibrillator status data in time-series format.
Operation history:	Stores a history of defibrillator operations.
Defibrillator history:	Stores a history of errors, basic checks and other items related to the defibrillator.

Recording Information

- Record types can be printed.
- Additional information with respect to recording can be printed.
- Present or delayed vital information can be printed.
- When pacing is performed in pacing mode, information of pacing can be printed.
- Information regarding the performed defibrillation can be printed.

Continuous Waveform Recording

ECG, ECG+SpO_2, or ECG+CO_2 can be selected by a user setting. However, SpO_2 and CO_2 are valid only when measuring the concerned parameters.

Recording Speed

25 mm/s or 50 mm/s can be selected by a user setting.

Recording Paper

Rolls of 50 mm in width can be used.

SD Card Storage

- Continuous ECG data with voice and numeric data of parameters being measured can be stored in SD cards.
- Report data can be stored in SD cards.
- Data stored in SD cards can be displayed on a PC on which the QP-551VK Defibrillator report viewer software is installed.

Sounds

In Normal Operations

Sound when buttons or keys are pressed:
Sounds when a button, switch or key is pressed.

Sound for heart rate or pulse wave synchronization:
Sounds in synchronization with QRS of an ECG or SpO_2 pulse waves when enabled by a user setting.

Sound for heart rate synchronization:
The tone for heat rate synchronization varies, depending on SpO_2 values. The function can be turned on/off by a user setting.

For Defibrillation

Sound during charging: Continuous sound is heard during charging.

Sound at charge completion:
Continuous sound is heard when charging is complete.

Operation sounds: In manual mode, the function can be turned on/off by a user setting. In AED mode, continuous sound is heard except when analyzing an ECG.

For Alarms

Technical alarm sound: An alarm sound is generated when an error occurs in the defibrillator or in the measurement environment.

Vital alarm sound: An alarm sound is generated when vital information on any parameter exceeds the upper/lower limits of the allowable range.

Alarm sound priority: Alarm sounds have priority and vary in tone in accordance with the priority.

Voice

AED mode: Voice instructions are made for the sequence in AED mode.

AED mode (child mode): Voice output is made to announce child mode. Voice instructions for the sequence are the same as those in AED mode.

Microphone input: Ambient sounds are captured by the microphone and stored with ECG, SpO_2, and CO_2 on an SD card.

Sound Volume Adjustment

Volumes of synchronization sounds, charging sounds, operation sounds, alarm sounds, and voice instructions can be adjusted to the values in accordance with the user settings in setup mode.

External Interface

Transmission output: Defibrillation, alarm, event or VF analysis reports, SD card data, and data in internal memory can be output via a Bluetooth® module.

SD card: The measured data can be stored. Recovery of the defibrillator software is also possible.

External ECG input: Applying 1/1000 to an external ECG enables you to enter it in the lead ECG, which is displayed on the screen.

Maintenance

Self Tests

The defibrillator automatically performs the self test at power on/off or power cord connection/disconnection, every day or every month.

Operation when an abnormality is detected:
The status indicator is set to the disabled condition (red).

Basic Checks

This mode enables easy daily inspection.

SD card check:	To check whether an SD card can be written and read. The remaining capacity can also be checked.
System check:	To check whether there is an error history.
Paddle check:	To check the type of paddles connected to the paddle connector.
Defibrillation check:	To check the capacity of the high-pressure condenser. By discharging to the external paddles or to the test load connected, the supplied energy, TTR, and charge time are measured for normal or abnormal determination.
Pacing check:	To check a pacing output for normal or abnormal determination (TEC-5631 only).
Status indicator check:	To check whether indications of the status indicator change.
Voice check:	To check whether voice instructions can be heard.
Alarm check:	To check the alarm indicator and alarm sounds.
ECG check:	To check whether communication is properly made with the lead ECG section (except TEC-5601).
Multi-parameter check:	To check whether communication is properly made with the multi parameter unit (only when QI-564V is connected).
Battery check:	To check the battery remaining and expiration date.
Bluetooth® check:	To check communication with an external device (only when QI-832V is connected).
Recorder check:	To check whether data can be normally printed on papers (except TEC-5601).

Maintenance Information

Defibrillator history: When an error occurs, the history is used to store the error generation status for subsequence investigation.

Time for battery replacement:
A message to prompt battery replacement is displayed upon time for replacement.

Operations

Control dial: Using this rotary switch, the following modes can be selected.

- Power OFF
- Monitor mode
- AED mode
- Internal discharge
- Energy setting
- Setup
- Basic check
- Transcutaneous pacing fixed mode
- Transcutaneous pacing demand mode

SYNC button: Press for synchronized defibrillation.

CHILD MODE button: To select AED mode for children, turn the control dial to the AED position while holding this button pressed.

CHARGE/AED button: To start an energy charge in manual mode. VF analysis can also be started by pressing the button in AED mode.

SHOCK button: Press the SHOCK button to start discharging. It flashes when charging is complete.

Function keys (1 to 5): The key functions are changed in accordance with the operation screens.
- Initial assignments in monitor mode:
  LEAD (to select the ECG lead), SENSITIVITY (to select the ECG sensitivity), EVENT, FREEZE, and GUIDE
- Major function keys in other statuses:
  Start/stop pausing the analysis, start/stop the timer, medication events, internal discharge in AED mode, start/stop CPR operation sound, CO_2 calibration

Record key: To start/stop recording.

Alarm cancel key: To temporarily stop alarms.

PACING RATE up/down keys:
To increase/decrease the pacing rate.

PACING OUTPUT up/down keys:
To increase/decrease the pacing output current.

PACING START/STOP key:
To start/stop pacing.

Charge button: To start energy charging in manual mode when external paddles are connected.

Shock buttons (external paddles):
To apply a shock, press the buttons on the left or right of the connected external paddles. The buttons flash when charge is complete.

Shock buttons (internal paddles):
To apply a shock when you press the buttons on the handles of the connected internal paddles (with switch).

Transportation

Cart: You can carry the defibrillator mounted on a cart.

Bed rail hook: You can hang the defibrillator over the hook.

Wall mount: You can mount the defibrillator in a vehicle, using the wall mount.

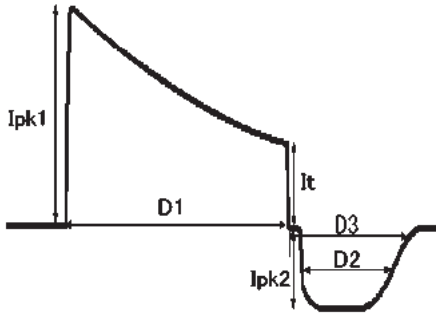
Performance

Defibrillator

Output Waveforms

Discharging waveform: Truncated exponential constant power biphasic

Shape of discharging waveform:



Parameters for load resistances of the above discharged waveform must conform to the values in the following tables.

NOTE: D2 of the discharged waveform indicates the width at 50% of Ipk2, and D3 indicates the width up to 10% between the end of the first phase and Ipk2.

Parameters for Load Resistances [Standard Values]

Output energy: 270 J

Parameter	Load resistance						
	25 Ω	50 Ω	75 Ω	100 Ω	125 Ω	150 Ω	175 Ω
First-phase pulse width D1 (ms)	3.85	6.35	8.86	11.4	13.9	16.4	18.9
Second-phase pulse width D2 (ms)	3.62	3.62	3.62	3.62	3.62	3.62	3.62
Second-phase pulse width D3 (ms)	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5
Time between the first and second phases (ms)	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
First-phase peak current Ipk1 (A)	67.3	41.1	29.5	22.9	18.8	15.9	13.8
First-phase terminal current It (A)	26.8	15.5	11.0	8.5	6.94	5.86	5.08
Second-phase peak current Ipk2 (A)	15.5	12.7	11.0	9.81	8.96	8.29	7.76

Output energy: 200 J

Parameter	Load resistance						
	25 Ω	50 Ω	75 Ω	100 Ω	125 Ω	150 Ω	175 Ω
First-phase pulse width D1 (ms)	3.85	6.36	8.86	11.4	13.9	16.4	18.9
Second-phase pulse width D2 (ms)	3.62	3.62	3.62	3.62	3.62	3.62	3.62
Second-phase pulse width D3 (ms)	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5
Time between the first and second phases (ms)	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
First-phase peak current Ipk1 (A)	58.1	35.4	25.4	19.8	16.2	13.7	11.9
First-phase terminal current It (A)	22.6	13.3	9.45	7.32	5.97	5.05	4.37
Second-phase peak current Ipk2 (A)	13.0	10.9	9.45	8.45	7.71	7.14	6.67

Output energy: 150 J

Parameter	Load resistance						
	25 Ω	50 Ω	75 Ω	100 Ω	125 Ω	150 Ω	175 Ω
First-phase pulse width D1 (ms)	3.85	6.36	8.86	11.4	13.9	16.4	18.9
Second-phase pulse width D2 (ms)	3.62	3.62	3.62	3.62	3.62	3.62	3.62
Second-phase pulse width D3 (ms)	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5
Time between the first and second phases (ms)	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
First-phase peak current Ipk1 (A)	50.4	30.8	22.1	17.2	14.1	11.9	10.3
First-phase terminal current It (A)	19.6	11.5	8.19	6.34	5.18	4.37	3.79
Second-phase peak current Ipk2 (A)	11.3	9.42	8.19	7.32	6.69	6.18	5.78

Output energy: 50 J

Parameter	Load resistance						
	25 Ω	50 Ω	75 Ω	100 Ω	125 Ω	150 Ω	175 Ω
First-phase pulse width D1 (ms)	3.86	6.37	8.88	11.4	13.9	16.4	18.9
Second-phase pulse width D2 (ms)	3.62	3.62	3.62	3.62	3.62	3.62	3.62
Second-phase pulse width D3 (ms)	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5
Time between the first and second phases (ms)	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
First-phase peak current Ipk1 (A)	29.4	17.9	12.9	10.0	8.20	6.95	6.02
First-phase terminal current It (A)	11.3	6.67	4.73	3.66	2.99	2.53	2.19
Second-phase peak current Ipk2 (A)	6.52	5.45	4.73	4.23	3.86	3.57	3.34

Allowable ranges of parameters

Parameter	Specified energy	
	2 to 15 J	20 to 270 J
First-phase pulse width D1 (ms)	±15%	±10%
Second-phase pulse width D2 (ms)	±20%	±10%
First-phase peak current Ipk1 (A)	±15%	±10%
First-phase terminal current It (A)	±15%	±10%
Second-phase peak current Ipk2 (A)	±20%	±20%

Load resistance range of biphasic waveform:
15 to 175 Ω

Output Energy

Output energy (with loading of 50 Ω):
2, 3, 5, 7, 10, 15, 20, 30, 50, 70, 100, 150, 200 or 270 J

Upper limit of charge energy

External paddles:	270 J
Disposal pads:	270 J
Internal paddles:	50 J
Internal paddles (with switch):	50 J
AED mode:	1st: 50 J, 2nd: 200 J, 3rd: 200 J (default settings) (The settings can be selected from among 50, 70, 100, 150, 200, and 270 J.)
AED mode (child mode):	1st: 50 J, 2nd: 70 J, 3rd: 70 J (default settings) (The settings can be selected from among 50, 70, and 100 J.)

Output Energy Accuracy[1]

[1]Essential performance in EMC

Load resistance of 50 Ω

2 J:	±0.5 J
3 J:	±1 J
5, 7, 10, 15 J:	±2 J
20 J or more to 270 J or less:	±10%

Load resistance of 25 Ω

2 J:	(0.85 × Eset)±1 J
3 J:	(0.85 × Eset)±2 J
5, 7, 10, 15 J:	(0.85 × Eset)±3 J
20 J or more to 270 J or less:	(0.85 × Eset)±15%

Load resistance of 75 Ω

2 J:	(1.06 × Eset)±1 J
3 J:	(1.06 × Eset)±2 J
5, 7, 10, 15 J:	(1.06 × Eset)±3 J
20 J or more to 270 J or less:	(1.06 × Eset)±15%

Load resistance of 100 Ω

2 J:	(1.10 × Eset)±1 J
3 J:	(1.10 × Eset)±2 J
5, 7, 10, 15 J:	(1.10 × Eset) ±3 J
20 J or more to 270 J or less:	(1.10 × Eset)±15%

Load resistance of 125 Ω

2 J:	(1.12 × Eset)±1 J
3 J:	(1.12 × Eset)±2 J
5, 7, 10, 15 J:	(1.12 × Eset)±3 J
20 J or more to 270 J or less:	(1.12 × Eset)±15%

Load resistance of 150 Ω

2 J:	(1.14 × Eset)±1 J

3 J: (1.14 × Eset)±2 J

5, 7, 10, 15J: (1.14 × Eset)±3 J

20 J or more to 270 J or less: (1.14 × Eset)±15%

Load resistance of 175 Ω

2 J: (1.16 × Eset)±1 J

3 J: (1.16 × Eset)±2 J

5, 7, 10, 15 J: (1.16 × Eset)±3 J

20 J or more to 270 J or less: (1.16 × Eset)±15%

Energy Charge Time

Charge time

Manual mode (from the beginning to the end of charging)

AC (rated voltage): Less than 5 seconds for 270 J and less than 4 seconds for 200 J

Battery (fully charged new battery at 20°C, −4°F):
Less than 5 seconds for 270 J and less than 4 seconds for 200 J

AC (90% of the rated voltage):
Within 7 seconds for 270 J

Battery (after 15 discharges of 270 J using a fully charged new battery at 20°C, −4°F):
Within 7 seconds for 270 J

AED mode (from the beginning of analysis to the end of charging)

AC (rated voltage): Within 8 to 15 seconds for 270 J

Battery (fully charged new battery at 20°C, −4°F):
Within 8 to 15 seconds for 270 J

AC (90% of the rated voltage):
Within 12 to 21 seconds for 270 J

Battery (after 15 discharges at 270 J using a fully charged new battery at 20°C, −4°F):
Within 12 to 21 seconds for 270 J

Charge time from when power is turned on to when the charge is complete

Manual mode

AC (90% of the rated voltage):
Within 10 seconds for 270 J

Battery (after 15 discharges at 270 J using a fully charged new battery at 20°C, −4°F):
Within 10 seconds for 270 J

AED mode

AC (90% of the rated voltage):
Within 14 to 23 seconds for 270 J

Battery (after 15 discharges at 270 J with a fully charged new battery at 20°C, −4°F):
Within 14 to 23 seconds for 270 J

Sync Mode[1]

[1] Essential performance in EMC

Delay from R wave to discharge

Paddle ECG: 60 ms or less

Lead ECG: 60 ms or less

VF/VT Analysis

Analysis time

When "Continuous VF Analysis" in AED Setup is "Off":
Analysis of shockable rhythm: Minimum 5 seconds
Analysis of non-shockable rhythm: Minimum 8 seconds

When "Continuous VF Analysis" in AED Setup is "On":
Analysis of shockable rhythm: Minimum 3 seconds
Analysis of non-shockable rhythm: Minimum 5 seconds

Shockable rhythm: Ventricular fibrillation of amplitude 0.1 mV or more and ventricular tachycardia of 180 bpm or more

Waveform analysis accuracy[1]

Sensitivity to shockable rhythm (VF):
more than 90%

Sensitivity to shockable rhythm (VT):
more than 75%

Specificity to non-shockable rhythm:
more than 95%

[1] Essential performance in EMC
The verifications have been made using official database provided by AHA (American Heart Association) and MIT (Massachusetts Institute Technology) and a database of over 3000 ECGs from hospitals in Japan. The accuracies meet IEC60601-2-4: 2010 201.107.

Influence of pacemaker pulses:
Pacemaker pulses of amplitude less than 2.0 mV and pulse width less than 1.3 ms satisfy the above analysis accuracies.

Internal Discharge

Charge holding time: The charged energy is reset when:
- 40±5 seconds have elapsed after full charge.
- the control dial is set to OFF, the positions for internal discharge, or those for other than defibrillation mode.
- discharging with the paddles released.
- the paddles are disconnected.

TTR

Detecting range: 15 to 254 Ω

Measuring accuracy: 15 to 100 Ω ±10% or ±5 Ω (whichever greater)
101 to 254 Ω ±15%

Discharged Energy Detection

Load resistance range: 15 to 225 Ω

Measuring accuracy: ±10% (for 50 to 270 J)

Paddle Contact Lamp

The lamp lights in accordance with the paddle contact (contact resistance between the paddles and a patient) as follows (allowable error range: ±20%).

Paddle Contact Lamp Color	Status of Paddle Contact (contact resistance with a patient)
Green	0 Ω < Paddle contact (Ω) ≤ 100 Ω
Yellow	100 Ω < Paddle contact (Ω) ≤ 200 Ω
Orange	200 Ω < Paddle contact (Ω)

Transcutaneous Pacing

Pacing waveform: Modified trapezoidal

Pulse width: 40 ms±10%

Pacing output current (with a load resistance of 250 Ω)

Setting range: 0 mA, 8 mA to 200 mA

Accuracy: ±10% or ±2 mA (whichever greater)

Pacing rate (with a load resistance of 250 Ω)

Setting rate: 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, or 180 ppm

Accuracy: ±10%

Maximum load resistance: 350 Ω (at 200 mA)

Refractory period

When the pacing rate is between 30 and 90 ppm: 350 ms

When the pacing rate is between 100 and 180 ppm: 240 ms

ECG

ECG Inputs

Paddles/pads

Sensitivity: 10 mm/mV±15% (sensitivity ×1)

Input impedance: 100 kΩ or more (when a polarization of ±300 mV is added at 10 Hz, 2 mVp-p)

Hum filter attenuation: –20 dB at 50 and 60 Hz

Transient property: 0.32 seconds or more, 1 second or less

Maximum input voltage: ±5 mV or more

Frequency response: 0.5 to 20 Hz (attenuation of 3 dB or less for 10 Hz)

Heart rate measurement: 0, 15 to 300 bpm ±3% ± 1 bpm

Monitor recovery

Defibrillation output from an external device: Within 3 seconds

Internal defibrillation output: Within 3 seconds

VF recognition time: Within 20 seconds

Recovery time for disposable pads attached:
Within 10 seconds

VF recognition time for disposable pads attached:
Within 20 seconds

Monitor disturbance: Disturbance during charge or internal discharge
0.2 mV or less and under 20% at a sinusoidal input of 10 Hz, 1 mVp-p

QRS detection level: Input conversion 0.5 mV or more (at sensitivity ×1)

Leads

Sensitivity: Within 10 mm/mV±5% (sensitivity ×1)

Input impedance: 5 MΩ or more (when a polarization of ±600 mV is added at 10 Hz and 2 mVp-p)

Hum filter attenuation

Monitor mode

Power frequency 50 Hz:
–20 dB or more at 50 Hz

Power frequency 60 Hz:
–20 dB or more at 60 Hz

Manual mode/pacing mode

–20 dB or more at 50 and 60 Hz

Transition property

DIAGNOSIS filter: 3.2 seconds or more

MONITOR filter: 0.32 seconds or more, 1 second or less

Anti-polarization voltage: ±400 mV or more

Frequency response: 0.05 to 150 Hz (attenuation of 3 dB or less for 10 Hz: recording only)

Pacemaker pulse rejection:
±2 mV to ±0.7 V, not synchronized with 0.1-ms to 2-ms square pulses (at sensitivity ×1)

QRS detection level: Input conversion 0.5 mV ore more (at sensitivity ×1)

Heart rate measurement range

Defibrillation mode and monitor mode:
0, 15 to 300 bpm

Pacing mode: 0, 15 to 220 bpm

Heart rate measurement error:
±3% ±1 bpm (rounded to the closest whole number)

Monitor recovery

Defibrillation output from an external device:
Within 10 seconds

Internal defibrillation output:
Within 3 seconds

Monitor disturbance: Disturbance during charge or internal discharge
Less than 0.2 mV and under 20% at a sinusoidal input of 10 Hz, 1 mVp-p

ECG Input (AUX)

Input impedance: 100 kΩ ±10%

Frequency response: 0.05 to 150 Hz (attenuation of 3 dB or less for 10 Hz: recording only)

SpO_2

SpO_2 measurement accuracy (rms[1]):
±2%SpO_2 (80%SpO_2 ≤ SpO_2 ≤ 100%SpO_2)
±3%SpO_2 (70%SpO_2 ≤ SpO_2 ≤ 80%SpO_2)
Not specified for SpO_2 < 70%SpO_2
(Accuracy-guaranteed ambient temperatures: 18ºC to 40ºC, 64.4ºF to 104ºF)

Heart rate measurement accuracy (rms[1]): ±3% ±1 bpm (30 to 300 bpm)

[1] The rms is the difference between measurement value and standard reference values by root-mean square.

CO_2

The specifications in this section depend on TG-900-series models.

Measurement range
0 to 13.3 kPa (0 to 99 mmHg)

Measurement accuracy

TG-900P/TG-920P: ±0.40 kPa (0 ≤ CO_2 ≤ 1.33 kPa) (±3 mmHg (0 ≤ CO_2 ≤ 10 mmHg))
±0.53 kPa (1.33 < CO_2 ≤ 5.33 kPa) (±4 mmHg (10 < CO_2 ≤ 40 mmHg))
±10% reading (5.33 < CO_2 ≤ 13.3 kPa) (40 < CO_2 ≤ 99 mmHg)
At 1 atmospheric pressure, air inspiration, no condensation

TG-970P: ±0.27 kPa (0 ≤ CO_2 ≤ 5.33 kPa) (±2 mmHg (0 ≤ CO_2 ≤ 40 mmHg))
±5% reading (5.33 < CO_2 ≤ 9.33 kPa) (40 < CO_2 ≤ 70 mmHg)
±7% reading (9.33 < CO_2 ≤ 13.3 kPa) (70 < CO_2 ≤ 99 mmHg)
No condensation

Detectable respiration counts
3 to 150 counts/minute±10%

Screen Displays

Waveform display sensitivity:
10 mm/mV±10% or less (sensitivity ×1, including ECG amplifier)

Waveform sweep speed: 25 mm/s, 50 mm/s±10% or less

Recorder

Recording sensitivity: 10 mm/mV±10% or less

Frequency response: 0.05 to 150 Hz (attenuation 3 dB or less) for a sinusoidal input of 2 mVp-p and 10 Hz as the reference

Recording paper speed: 25 mm/s±10% or less or 50 mm/s±10% or less

SD Card Storage

Storage capacity: 1 GB (QM-001D) or 2 GB (QM-002D)

Time for storage: QM-001D: Max. 24 hours of continuous ECG data with voice
QM-002D: Max. 50 hours of continuous ECG data with voice

Alarm Functions

Alarm Range

Upper or lower limit alarms

Parameter		Upper limit	Lower limit	Step	Importance
HR/RR	beat/min	35 to 300, OFF	OFF, 30 to 295	1	Warning
VPC	count/min	1 to 99, OFF	—	1	Advisory
RR	count/min	2 to 150, OFF	OFF, 0 to 148	2	Warning
SpO_2	% SpO_2	51 to 100, OFF	OFF, 50 to 99	1	Warning
APNEA	s	5 to 40, OFF	—	5	Warning
$ETCO_2$	mmHg	2 to 99, OFF	OFF, 1 to 98	1	Warning
	kPa	1.0 to 13.5, OFF	OFF, 0.5 to 13.0	0.5	Warning

Alarm Levels

The alarms of the defibrillator are classified according to the importance, as follows:

Crisis alarm: Generated in an abnormal condition of a patient or of the defibrillator, or if no proper operation is performed. If no immediate action is taken, the patient's life may be at risk.

Warning alarm: Generated in an abnormal condition of a patient or of the defibrillator, or if no proper operation is performed, requiring prompt action.

Advisory alarm: Generated if the condition is not appropriate for accurate measurement or proper treatment.

Colors of the Alarm Indicator

Alarms for patients or the defibrillator are indicated.

Crisis: Blinks in red

Warning: Blinks in yellow

Advisory: Lit in cyan

Indications by the Alarm Indicator

Crisis alarm: Blinks in red at a frequency of approx. 1.6 Hz (approx. 640 ms), duty 50%

Warning alarm: Blinks in yellow blinking at a frequency of approx. 0.8 Hz (approx. 1280 ms), duty 50%

Advisory alarm: Lit in cyan

Alarm Sounds

Crisis alarm: Sound conforming to IEC 60601-1-8

Warning alarm: Sound conforming to IEC 60601-1-8

Advisory alarm: Sound conforming to IEC 60601-1-8

Alarm Sound Volume

Volume range: 45 to 85 dB (A)

Alarm Suppression

To temporarily silence an alarm sound:

When an alarm is generated, press the silence alarms key to stop the alarm sound for a certain time (temporary silence time: 2 minutes).

To suspend all the alarm sounds:

While no alarm is generated, press the silence alarms key to suspend all alarm sounds for a certain time (suspend time: 2 minutes).

Power Requirements

Alternate Current (AC)

Power-supply voltage range:

100 V to 240 V

Power frequency: 50 Hz or 60 Hz

Power Input

Continuous loading: 150 VA or less

Intermittent loading: 300 VA or less

Battery

Type: Ni-MH battery

Capacity: 2800 mAh

Rated voltage: 12 V (allowable voltage variable range: 9.0 to 18.0 V)

Operation time

Fully charged new battery at 20ºC, 68ºF

Defibrillation (270 J) in manual mode:

100 discharges or more

Monitor mode: 180 minutes or more (defibrillator and external paddles connected, other parts or accessories not connected)

Pacing: 120 minutes or more (180 ppm, 200 mA)

Fully charged new battery at 0ºC, 32ºF

Defibrillation (270 J) in manual mode:

50 discharges or more

Defibrillation (270 J) in AED mode:

50 discharges or more

Charging request: At least 3 charge/discharge cycles for 270 J are allowed after a request for charging is instructed

Charge complete indication: “CHARGING COMPLETE” indicated

7 days unattended

7 days unattended (at 20ºC, 68ºF, 65%)

15th 270 J charge time in manual mode:

15 seconds or less

From the 15th VF input to charging completion in AED mode:

30 seconds or less

Applicable Laws and Regulations

Applicable Laws

- Medical Device Directive (Classification: Class II b)
- WEEE Directive
- RoHS Directive

Applicable Regulations

- IEC 60601-1: 2005
- IEC 60601-1 Amendment 1: 2012
- IEC 60601-1-2: 2007
- IEC 60601-1-6: 2010
- IEC 60601-1-8: 2006
- IEC 60601-1-8 Amendment 1: 2012
- IEC 60601-1-9: 2007
- IEC 60601-2-4: 2010
- IEC 60601-2-27: 2011[1 2 4]
- IEC 60601-2-49: 2011[1 2]
- ISO 10993-1: 2009
- ISO 14971: 2007
- EN ISO 14971: 2012
- ISO 80601-2-55: 2011[1 3]
- ISO 80601-2-61: 2011[1 3]
- EN 1789: 2007
- EN 1789 Amendment 1: 2010

[1] Applicable only for monitor mode (when limb and chest lead ECG selected)

[2] This defibrillator complies with clause 201.11.8 when using the battery pack.

[3] This defibrillator complies with clause 201.11.8.101 when the battery remaining alarm is not generated.

[4] The hum filter setting of this defibrillator is not displayed. This defibrillator complies with IEC 60601-2-27: 2011 except for clause 201.12.4.101.1.

Classifications

Type of protection against electrical shock

- When connecting to an AC power (commercial use):
  Class I ME equipment
- When not connecting to an AC power (commercial use):
  Internally powered ME equipment

Degree of protection against electrical shock

- Type BF applied parts:
  External paddles, disposable pads
- Type CF applied parts:
  Internal paddles, internal paddles (with switch)
- Defibrillation-proof type CF applied parts:
  ECG connection cable, electrode leads, SpO_2 probes, CO_2 sensor kit

Protection against harmful ingress of water or fine particulates

- IP44: TEC-5621 and TEC-5631 with a pad adapter or internal paddles, TEC-5611
- IP41: TEC-5621 and TEC-5631 with external paddles, TEC-5601, TEC-5602

Applicable when connecting all patient cables (except the recorder)

Sterilization or disinfection methods specified by manufacturers

- Internal paddles, internal paddles with switch:
  High-pressure steam sterilization (autoclave sterilization), plasma gas sterilization, ethylene oxide gas sterilization (EOG sterilization)
- Except internal paddles and internal paddles (with switch):
  Not for sterilization

Qualifications for use in a high-oxygen atmosphere

Not qualified

Safety level for use in air and flammable anesthetic gas or oxygen/nitrous oxide and flammable anesthetic gas

Not applicable

Mode of operation

Continuous operation

Installation conditions

Indoor and in-vehicle uses

Frequency of use (class by IEC 60601-2-4: 2010)

High frequent use

Environment Conditions

Storage Environments

Ambient temperature:	–25 to +70ºC, –13 to +158ºF
Relative humidity:	10 to 95% (noncondensing)
Atmospheric pressure:	500 to 1060 hPa

Transport Environments

Ambient temperature:	–25 to +70ºC, –13 to +158ºF
Relative humidity:	10 to 95% (noncondensing)
Atmospheric pressure:	500 to 1060 hPa

Operation Environments and Power Requirements

Operation Environments

Ambient temperature:	–5 to +45ºC, +23 to +113ºF
Relative humidity:	15 to 95% (noncondensing)
Atmospheric pressure:	620 to 1060 hPa

For operation environments of the accessories and options, refer to the operator's manuals.

Power Requirements

For both AC and DC

Power voltages

AC operation:	100 V to 240 V (allowable variation range: 80 V to 264 V)
Battery operation:	12 V (allowable variation range: 9 V to 18 V)
Power input:	150 VA or less with continuous loading or 300 VA or less with intermittent loading
Power frequency:	50 or 60 Hz
Battery rated capacity:	2800 mAh
Battery charging current:	2000 mA

Noise

Less than 48 dB SPL

Cooling System

Natural cooling

Mechanical Strength

Protection against Vibration

- MIL-STD-810F 514.5 Category 4 Restrained Cargo
- Exposure level Annex A 2.2.1C(1)
- MIL-STD-810F 514.5 Category 9 Helicopter
  Exposure time: 4 hours for each of XYZ axes
- EN 1789: 2007
- EN 1789 Amendment 1: 2010

Impact

- IEC 60068-2-27: 2008
  Impact peak value: 50G
  Impact peak value: 10G, repeated times: 1000±10 times
- EN 1789: 2007
- EN 1789 Amendment 1: 2010

Drop

- IEC 60068-2-32: 1975
- IEC 60068-2-32 Amendment 2: 1990
- EN 1789: 2007
- EN 1789 Amendment 1: 2010

EMC Application Standards

- IEC 60601-1-2: 2007
- IEC 60601-2-4: 2010

Dimensions and Weight

Dimensions

311(W) × 288(H) × 242(D) mm±10%

Weight

TEC-5601:	6.4 kg±10% (defibrillator, battery pack, external paddles, external paddle holders)
TEC-5611:	5.7 kg±10% (defibrillator, battery pack)
TEC-5602, TEC-5621:	6.8 kg±10% (defibrillator, battery pack, external paddles, external paddle holders)
TEC-5631:	6.9 kg±10% (defibrillator, battery pack, external paddles, external paddle holders)

Requirements from International Standards

IEC 60601-1-8 Amendment 1: 2012

Alarm Delay Time

Heart rate

When increasing the heart rate from 80 to 120 bpm (upper limit: 100 bpm): 10 seconds or less

When decreasing the heart rate from 80 to 40 bpm (lower limit: 60 bpm): 10 seconds or less

Time to generate an alarm for tachycardia

When ventricular tachycardia (heart rate 206 bpm, 1 mVp-p) generated

at ×1 gain (test waveform: aami4a[1]): 4 to 10 seconds

at ×0.5 gain (test waveform: aami4a_h[1]): 4 to 10 seconds

at ×2 gain (test waveform: aami4a_d[1]): 4 to 10 seconds

When ventricular tachycardia (heart rate 195 beats/min, 2 mVp-p) generated

at ×1 gain (test waveform: aami4b[1]): 4 to 10 seconds

at ×0.5 gain (test waveform: aami4b_h[1]): 4 to 10 seconds

at ×2 gain (test waveform: aami4b_d[1]): 4 to 10 seconds

[1] The test waveforms (aami4a through aami4b_d) can be downloaded at: http://www.physionet.org

Pulse rate

When increasing the pulse rate from 80 to 120 bpm (upper limit: 100 bpm): 15 seconds or less

When decreasing the pulse rate from 80 to 40 bpm (lower limit: 60 bpm): 20 seconds or less

VPC

Approx. 1 second after a measurement value reaches the alarm threshold

Respiration rate

Within 3 seconds after a measurement value reaches the alarm threshold (calculated from intervals among the previous 4 breaths)

SpO_2

Within 3 seconds after a measurement value reaches the alarm threshold

CO_2 partial pressure (mainstream method)

Within 3 seconds after a measurement value reaches the alarm threshold (calculated when the next breath is detected)

IEC 60601-2-27: 2011

Electrocardiogram (ECG)

Electrode disconnection detection

The detecting function is available for each electrode.

Active electrode: Less than 100 mA

Reference electrode: Less than 900 mA

Influence by ESU and defibrillation

Influence on the measurement accuracy:

Use of an ESU or defibrillation may cause a temporary decrease in measurement accuracy. However, the original operation mode is resumed within 10 seconds. There is no influence on the security of patients of the defibrillator, as well as the stored data.

Time to resume normal operations after defibrillation voltage applied

Monitor recovery

Defibrillation output from an external device:

Within 10 seconds

Internal defibrillation output:

Within 3 seconds

Waveform display

Aspect ratio (ECG display sensitivity ratio to the sweep speed)

Standard: 0.4 seconds/mV

Setting range: 0.05 to 6.4 seconds/mV

Heart rate displays

Delay time (sync mark): 100 to 200 ms or less (after detecting QRS)

Display update cycle: Once per second

Calculation of the average heart rate

Instant heart rate calculation for the average rate:

Calculated using the nearest 4 or 12 beats (min. 4 beats and max. 12 beats)

High T-wave rejection capability

Complies with ANSI/AAMI EC13: 2002 Sect. 4.1.21(c)
(T-wave level: 0 to 1.2 mV)

Heart rate meter accuracy and response to irregular rhythms

Ventricular bigeminy (test waveform: aami3a[1]): 80 bpm

Slow alternating ventricular bigeminy (test waveform: aami3b[1]): 60 bpm

Rapid alternating ventricular bigeminy (test waveform: aami3c[1]): 120 bpm

Bidirectional systoles (test waveform: aami3d[1]): 90 bpm

[1] The test waveforms (aami4a through aami4b_d) can be downloaded at:
http://www.physionet.org

Response time of the heart rate meter to change in heart rate

When increasing the heart rate from 80 to 120 bpm: 6 to 9 seconds

When decreasing the heart rate from 80 to 40 bpm: 6 to 8 seconds

Pacemaker pulse rejection capability

Pacemaker pulse detection for fast ECG signals

Slew rate at which the pacemaker pulse detector responds:

6 to 8 V/s
The test is made according to the method specified in ANSI/AAMI EC13: 2002 Sect. 4.1.4.3.

Pacemaker pulse rejection, without overshoot

Complies with ANSI/AAMI EC13: 2002 Sect. 4.1.4.1. In this section, the pacemaker pulse is defined as follows:
- Pacemaker pulse: ±2 to ±700 mV
- Pulse width: 0.1 to 2 ms

Pacemaker pulse rejection, with overshoot

Rejectable overshoot: When QRS detection type is "ADULT":
±0.18 mV/100 ms to ±2 mV/4 ms (overshoot amplitude/time constant)
When QRS detection type is "CHILD":
±0.22 mV/100 ms to ±2 mV/4 ms (overshoot amplitude/time constant)
The test is made in accordance with method B specified in ANSI/AAMI EC13: 2002 Sect. 4.1.4.2. In method B, the amplitude and width of a pacemaker pulse are specified as follows.

- Pacemaker pulse: ±4 mV/2 ms to ±80 mV/0.1 ms

ISO 80601-2-61: 2011

SpO_2

Display update cycle: Every 3 seconds

Averaging time: 8 seconds

Setting range: 0 to 100%SpO_2

SpO_2 measurement accuracy (rms[1]):
±2%SpO_2 (80%SpO_2 ≤ SpO_2 ≤ 100%SpO_2)
±3%SpO_2 (70%SpO_2 ≤ SpO_2 ≤ 80%SpO_2)
Not specified for SpO_2 < 70%SpO_2
(Accuracy-guaranteed ambient temperatures: 18 to 40ºC, 64.4 to 104 ºF)

Pulse rate measurement accuracy (rms[1]):
±3% ±1 bpm (30 to 300 bpm)

[1] The SpO_2 accuracy was tested using the TL-201T, TL-271T and TL-273T SpO_2 probes and JL-302T SpO_2 connection cord. The testing was performed during induced hypoxia on healthy volunteers (Ethnicity: 10 Caucasians, 2 Africans, 1 Asian and 3 Indians), (Skin: 8 Light, 4 Medium, 4 Dark), (Age: 21 to 34), (5 women and 11 men) under the condition of no motion. Arterial blood was sampled and measured by a CO-oximeter. The difference between SpO_2 measured by the SpO_2 probe and functional SaO_2 measured by a CO-oximeter was calculated using the root-meansquare (rms). This measurement accuracy figure represents 2/3 of all test measurements.

NOTE: A pulse oximeter tester that generates simulated signals can be used to check the difference from the design specification, but it cannot be used as a replacement for human signals for testing accuracy.

Monitor recovery

Defibrillation output from an external device:
Within 3 seconds

Alarm condition delay: Within 12 seconds after a measurement value reaches the alarm threshold

Alarm signal generation delay:
Within 3 seconds after a measurement value reaches the alarm threshold

ISO 80601-2-55: 2011

CO_2

Display update cycle: Every 3 seconds

Measurement range

0 to 13.3 kPa (0 to 99 mmHg)

Measurement accuracy

TG-900P, TG-920P: ±0.40 kPa ($0 \leq CO_2 \leq 1.33$ kPa) (±3 mmHg ($0 \leq CO_2 \leq 10$ mmHg))
±0.53 kPa ($1.33 < CO_2 \leq 5.33$ kPa) (±4 mmHg ($10 < CO_2 \leq 40$ mmHg))
±10% reading ($5.33 < CO_2 \leq 13.3$ kPa) ($40 < CO_2 \leq 99$ mmHg)
At 1 atmospheric pressure, air inspiration, no condensation

TG-970P: ±0.27 kPa ($0 \leq CO_2 \leq 5.33$ kPa) (±2 mmHg ($0 \leq CO_2 \leq 40$ mmHg))
±5% reading ($5.33 < CO_2 \leq 9.33$ kPa) ($40 < CO_2 \leq 70$ mmHg)
±7% reading ($9.33 < CO_2 \leq 13.3$ kPa) ($70 < CO_2 \leq 99$ mmHg)
No condensation

Detectable respiration counts:

3 to 150 counts/minute±10%

Enter respiration using a pseudo respiration generator and check that the error is within the allowable range.

Monitor recovery

Defibrillation output from an external device:

Within 3 seconds

Electromagnetic Emissions and Immunity

Electromagnetic Emissions

The TEC-5600 series essential performances in EMC standard satisfy the following criteria.

The TEC-5600 series is intended for use in the electromagnetic environment specified below. The customer or the user of the TEC-5600 series should assure that it is used in such an environment.

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The TEC-5600 series uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The TEC-5600 series is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Electromagnetic Immunity

The TEC-5600 series essential performances in EMC standard satisfy the following criteria.

The TEC-5600 series is intended for use in the electromagnetic environment specified below. The customer or the user of the TEC-5600 series should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/ burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment. When there is large noise on the AC power line, supply the power from the battery pack.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (> 95 % dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95 % dip in U_T) for 5 seconds	< 5% U_T (> 95% dip in U_T) for 0.5 cycles 40% U_T (60 % dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95 % dip in U_T) for 5 seconds	Mains power quality should be that of a typical commercial or hospital environment. If the user of the TEC-5600 series requires continued operation during power mains interruptions, it is recommended that the TEC-5600 series be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE 1: U_T is the AC mains voltage prior to application of the test level. NOTE 2: Noise from the AC power line may generate noise which is superimposed on the ECG waveforms.			

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the TEC-5600 series, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	$d = 1.2\sqrt{P}$
Radiated RF IEC61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = 1.2\sqrt{P}$ 80 to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz
	Requirement of IEC-60601-2-4:		Additional requirement of IEC 60601-2-4
	Correct operation of RRD:		Correct operation of RRD:
	10 V/m 80 MHz to 2.5 GHz	10 V/m	$d = 0.4\sqrt{P}$ 80 to 800 MHz $d = 0.7\sqrt{P}$ 800 MHz to 2.5 GHz
	No inadvertent energy delivery is allowed:		No inadvertent energy delivery is allowed:
	20 V/m 80 MHz to 2.5 GHz	20 V/m	$d = 0.2\sqrt{P}$ 80 to 800 MHz $d = 0.4\sqrt{P}$ 800 MHz to 2.5 GHz
			where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[1] should be less than the compliance level in each frequency range.[2] Interference may occur in the vicinity of equipment marked with the following symbol: 

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2: These guidelines might not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[1] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the TEC-5600 series is used exceeds the applicable RF compliance level above, the TEC-5600 series should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the TEC-5600 series.

[2] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

• RRD is the abbreviation of Rhythm Recognition Detector.

Recommended Separation Distances between Portable and Mobile RF Communications Equipment

The TEC-5600 series is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the TEC-5600 series can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the TEC-5600 series as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 0.4\sqrt{P}$	800 MHz to 2.5 GHz $d = 0.7\sqrt{P}$
0.01	0.12	0.04	0.07
0.1	0.38	0.13	0.22
1	1.2	0.4	0.7
10	3.8	1.3	2.2
100	12	4	7
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2: These guidelines might not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
The equations and values in the above table show the condition that the RRD (Rhythm Recognition Detector) regulated in IEC 60601-2-4: 2010 does not receive electromagnetic interference.			

System Composition for EMC Test

The TEC-5600 series is tested to comply with IEC 60601-1-2: 2007 and IEC 60601-2-4: 2010 with the following composition. If any part which is not specified by Nihon Kohden is used, the EMC specifications might not comply.

Units	Cable length (m)
TEC-5631 defibrillator	—
JC-865V pad adapter	3.5
JC-906P ECG connecting cord	3.0
BR-926P electrode lead	1.5
QI-564V multi parameter/SpO_2 unit	—
JL-900P SpO_2 connection cord	2.5
TL-201T finger probe	1.6
TG-970P CO_2 sensor kit	3.5
QI-832V Bluetooth® module	—
NKB-301V battery pack	—
QM-002D SD memory card	—
Power cord	2.5

Symbols

The following symbols are used with the defibrillator. The names and descriptions of each symbol are as shown in the table below.

On Defibrillator

Symbol	Description
	Alternating current
	Charging
	Charged (Battery charging is finished)
	Silence alarms
	Recording
	SD card slot
	Input/Output (SD card slot)
	Defibrillation-proof type CF applied part
	Type BF applied part
	Caution
IP41	• Protects against access to hazardous parts with a wire 1.0 mm in diameter. • Protected against solid foreign objects 1.0 mm or greater in diameter. • Protected against harmful effects of vertically falling water drops.
IP44	• Protects against access to hazardous parts with a wire 1.0 mm in diameter. • Protected against solid foreign objects 1.0 mm or greater in diameter. • Protected against harmful effects of splashes of water.

Symbol	Description
	Pacing start
	Pacing stop
	Paddle connector locked
	Paddle connector unlocked
 Background color: Blue	Follow instructions for use
	Protective earth (ground)
CE 0086	The CE mark is a protected conformity mark of the European Community. Products marked with this symbol comply with the requirements of the Medical Device Directive 93/42/EEC.
	Products marked with this symbol comply with the European WEEE directive 2002/96/EC and require separate waste collection. For Nihon Kohden products marked with this symbol, contact your Nihon Kohden representative for disposal.

Transport Package

Symbol	Description
	This way up
	Fragile

Symbol	Description
	Keep away from rain
	Stacking limit by number

On Screen

Symbol	Description
	Alternating current
	Battery fully charged
	More than 2/3 battery charge remains
	More than 1/3 battery charge remains
	Remaining battery power is less than three 270 J discharges
	Battery operation not available
	Remaining battery power unknown
	Audio off
	Audio pause
	Alarm off
	QRS sync mark
	ECG cascaded display
	Pacing mark
	Pacing reject OFF
	The point of implanted pacemaker pulse output
	Arrhythmia alarm off (other than VF/VT)
	VF/VT alarm off
	SpO_2 pulse wave unstable
	AED analysis paused

Symbol	Description
	Infinite pause duration
	During CPR
	Number of electrical shocks
	Out of paper
	Recording
	Report recording
	Standby. (There is no unsaved data in the defibrillator.)
	Standby. (There is still unsaved data in the defibrillator to be written to the SD card.) Do not remove the SD card.
	Writing to the SD card. Do not remove the SD card.
	Cannot write to the SD card. SD card or defibrillator is faulty.
	Free space of the SD card is low.
	Standby. (There is still unsaved data to be written but the SD card is full and the oldest data will be overwritten.) Do not remove the SD card.
	Storing waveform report
	Bluetooth connected
	Bluetooth connected (device type: PC)
	Bluetooth connected (device type: mobile phone)
	Bluetooth connected (device type: unknown)
 Background color: Blue	Follow instructions for use

JC-865V, JC-855V Pad Adapter

Symbol	Description
	Type BF applied part

Symbol	Description
	Caution

Optional ND-860V Series and ND-890V Series Internal Paddles

Symbol	Description
	Type CF applied part

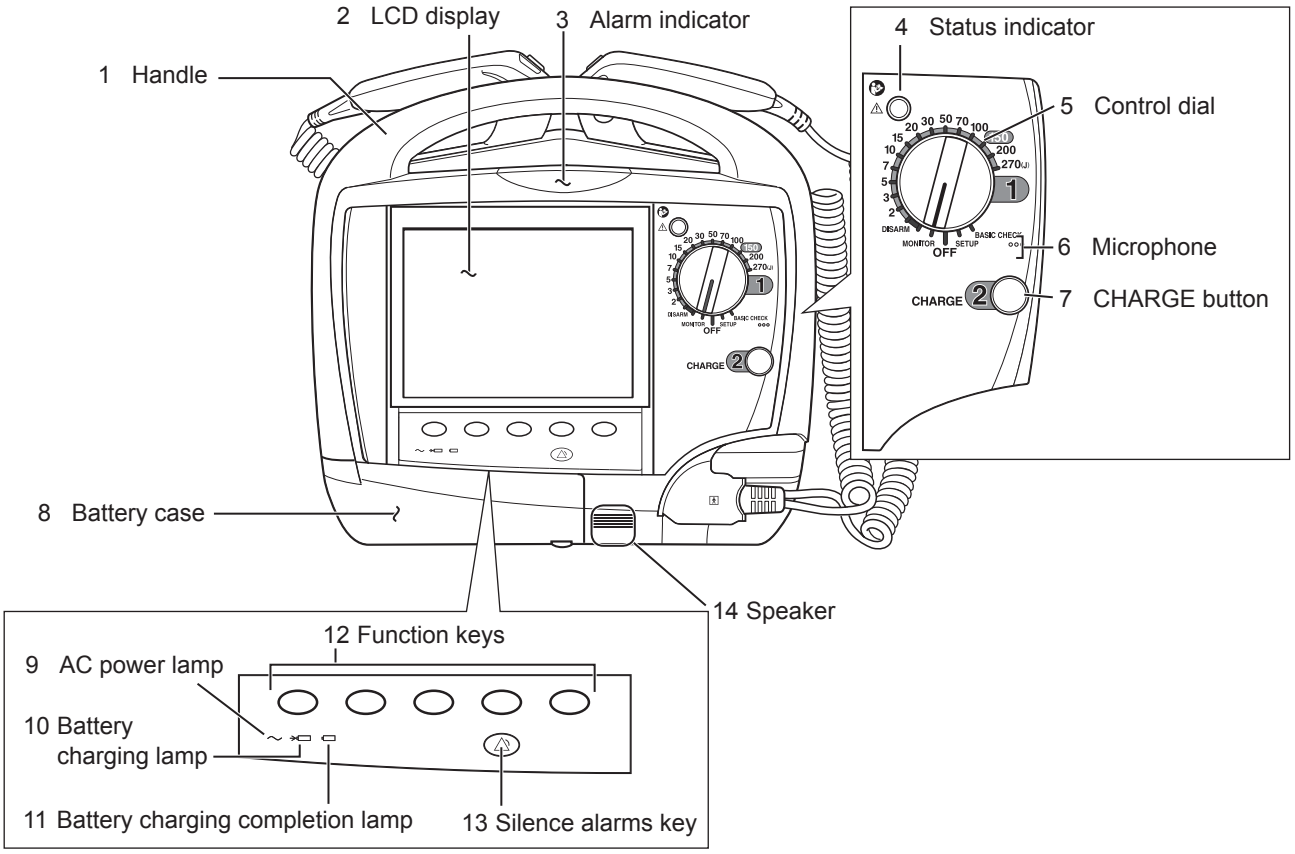
Symbol	Description
	Caution

Panel and Parts Descriptions

TEC-5601

Front Panel

When a function key or a button on the front panel of the defibrillator is pressed, a pip sounds. There is no pip sound if the KEY SOUND setting of VOLUME in the SETUP window is set to "0".



1 Handle
For carrying the defibrillator

2 LCD display
Displays waveforms, alarms and other information and settings.

3 Alarm indicator
Lights or blinks if an alarm is generated.

4 Status indicator
Indicates the defibrillator condition based on the daily self check.
Green: OK
Red: Refer to "Troubleshooting".

5 Control dial
Selects the operation mode (MONITOR, SETUP, BASIC CHECK), selects the output energy in manual defibrillation mode, and turns the defibrillator ON/OFF.

6 Microphone
Records the ambient sound.

7 CHARGE button
Starts charging in manual defibrillation mode.

8 Battery case
Holds the optional NKB-301V battery pack.

9 AC power lamp
Lights when the defibrillator is operating on AC power.

10 Battery charging lamp
Lights while the battery is being charged.

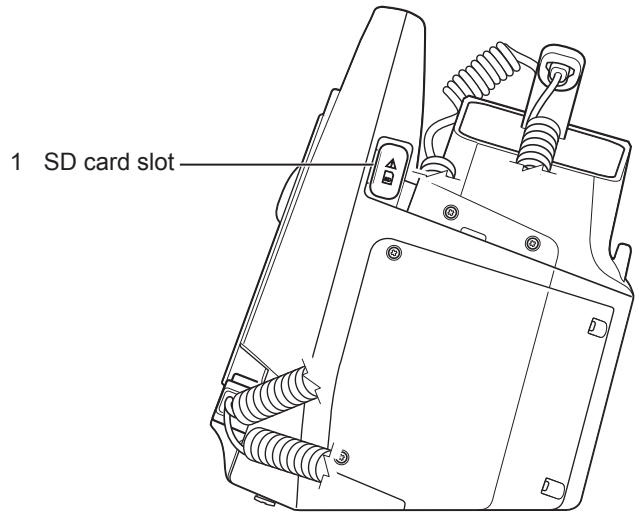
11 Battery charging completion lamp
Lights when the battery charging is completed.

12 Function keys
The function depends on the operation screen.

13 Silence alarms key
Temporarily mutes or suspends an alarm.

14 Speaker
Outputs sound and alarms.

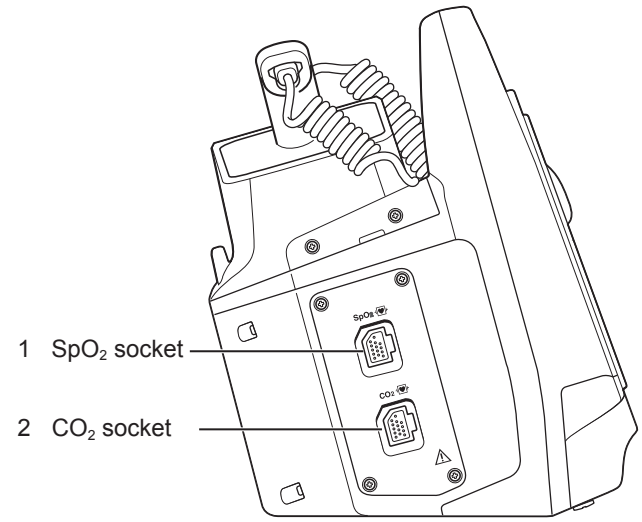
Right Side Panel



1 SD card slot

Insert an SD memory card.

Left Side Panel



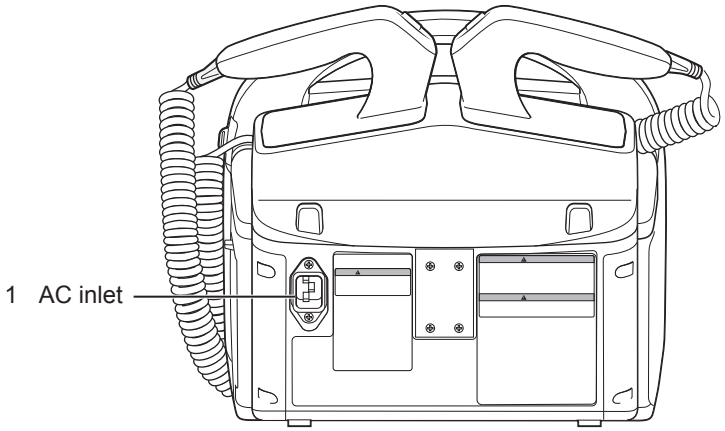
1 SpO_2 socket (when the QI-564V is incorporated)

Connect the SpO_2 connection cord.

2 CO_2 socket (when the QI-564V is incorporated)

Connect the CO_2 sensor kit.

Rear Panel



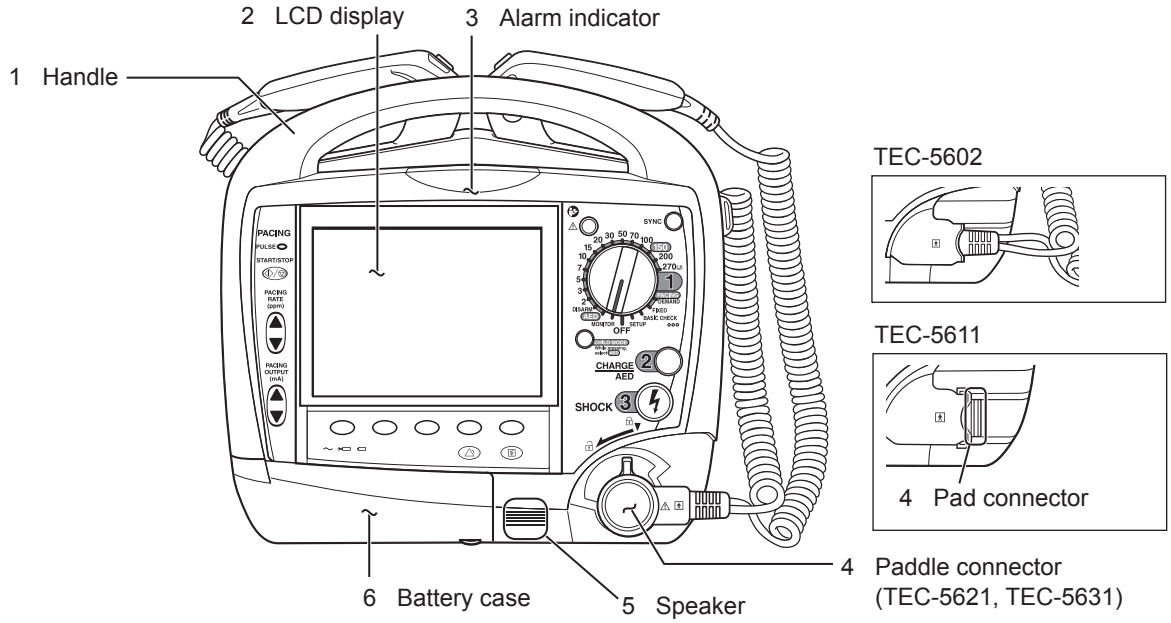
1 AC inlet

Connect the supplied power cord.

TEC-5602, TEC-5611, TEC-5621, TEC-5631

When a function key or a button on the front panel of the defibrillator is pressed, a pip sounds. There is no pip sound if the KEY SOUND setting of VOLUME in the SETUP window is set to “0”.

Front Panel



1 Handle

For carrying the defibrillator

2 LCD display

Displays waveforms, alarms and other information and settings.

3 Alarm indicator

Lights or blinks if an alarm is generated.

4 Paddle connector (TEC-5621, TEC-5631)

Connect the optional external paddles, internal paddles or pad adapter.

Pad connector (TEC-5611)

Connect disposable pads.

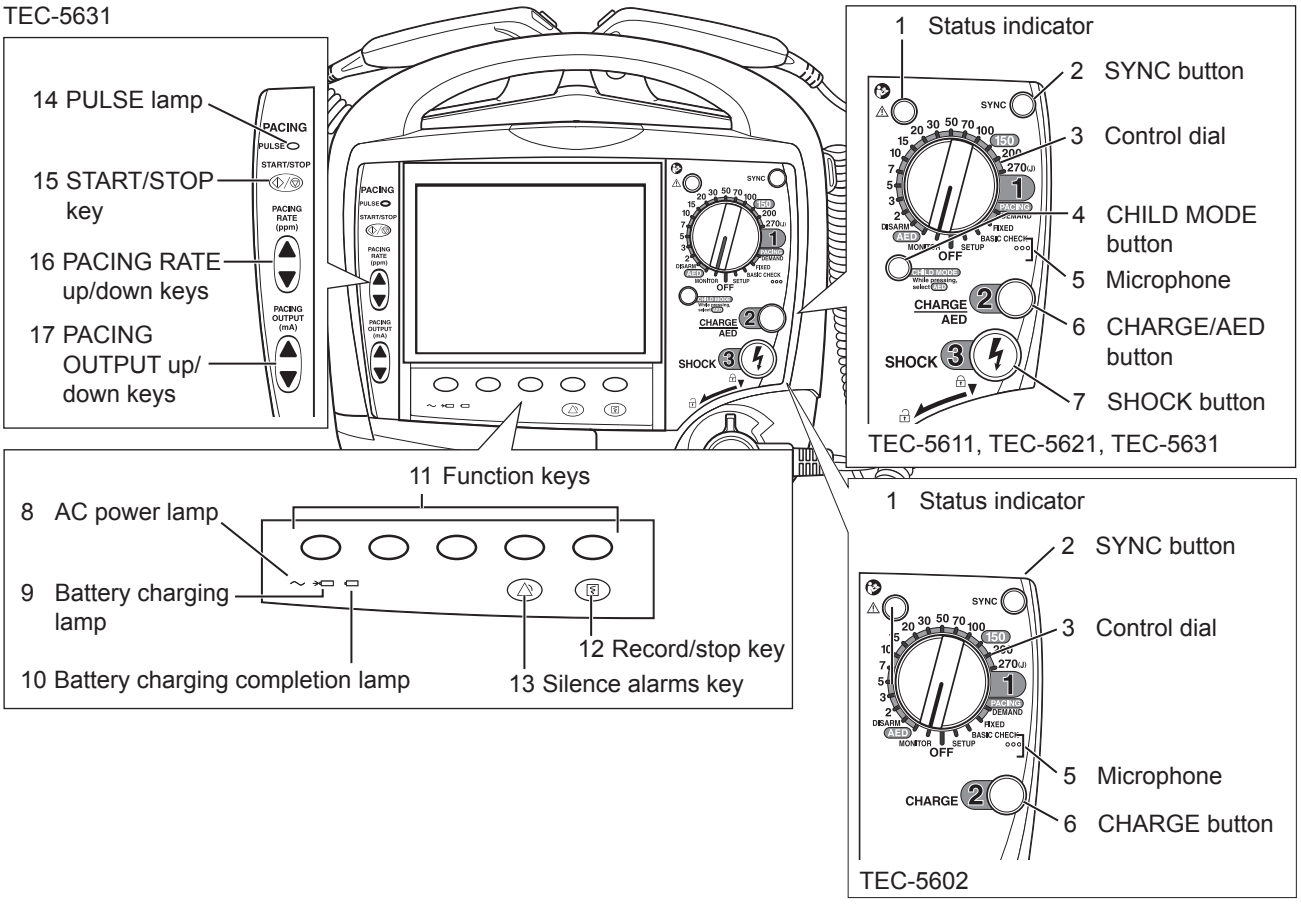
5 Speaker

Outputs sound, alarms and CPR sound.

6 Battery case

Holds the optional NKB-301V battery pack.

Operation Panel (on the Front Panel)



1 Status indicator

Indicates the defibrillator condition based on the daily self check.
Green: OK
Red: Refer to "Troubleshooting".

2 SYNC button

Toggles between the synchronized cardioversion and the defibrillation (asynchronous) modes.

3 Control dial

Selects the operation mode (AED, MONITOR, SETUP, BASIC CHECK, FIXED PACING, DEMAND PACING), selects the output energy in manual defibrillation mode, and turns the defibrillator ON/OFF.

4 CHILD MODE button (TEC-5611, TEC-5621, TEC-5631)

To enter child mode for AED, set the control dial to AED while pressing and holding this button.

5 Microphone

Records the ambient sound.

6 CHARGE/AED button (TEC-5611, TEC-5621, TEC-5631)

In manual defibrillation mode: starts charging.
In AED mode: starts ECG analysis. If the defibrillator judges that defibrillation is required after analyzing an ECG, it automatically starts charging.

CHARGE button (TEC-5602)

Starts charging.

7 SHOCK button (TEC-5611, TEC-5621, TEC-5631)

Discharges the energy in the manual defibrillation and AED modes if disposal pads or internal paddles are connected.

8 AC power lamp

Lights when the defibrillator is operating on AC power.

9 Battery charging lamp

Lights while the battery is being charged.

10 Battery charging completion lamp

Lights when the battery charging is completed.

11 Function keys

The function depends on the operation screen.

12 Record/stop key

Starts and stops continuous recording with the recorder. In the SETUP mode, this key outputs the selected report.

13 Silence alarms key

Temporarily mutes or suspends an alarm.

14 PULSE lamp

Blinks in synchronization with the pacing pulses in transcutaneous pacing.

15 START/STOP key

Starts and stops transcutaneous pacing.

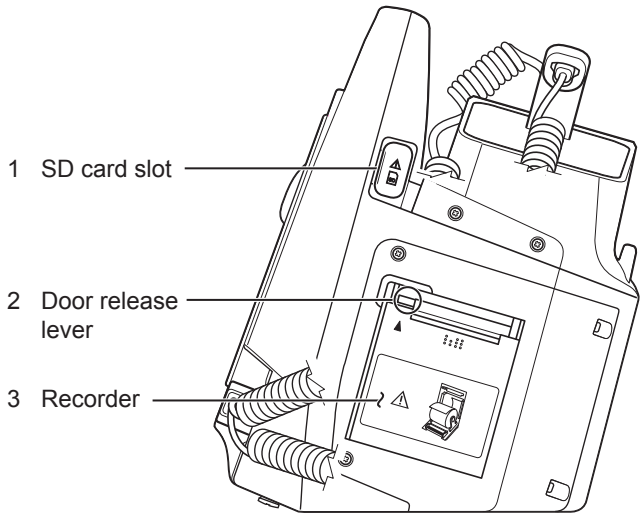
16 PACING RATE up/down keys

Sets the pacing rate.

17 PACING OUTPUT up/down keys

Sets the pacing current intensity.

Right Side Panel



1 SD card slot

Insert an SD memory card.

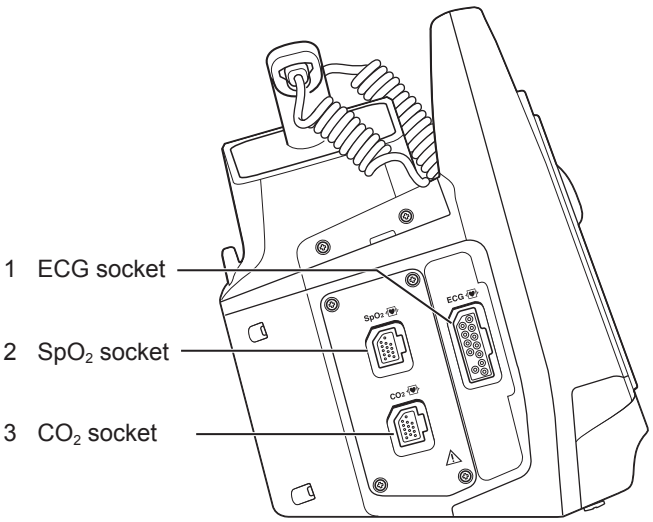
2 Door release lever

Pull the lever up to open the paper container door.

3 Recorder

This is a thermal array recorder of 50 mm width.
Load the consumable recording paper (RQS50-3) specified by Nihon Kohden.

Left Side Panel



1 ECG socket

Connect the ECG connection cord.

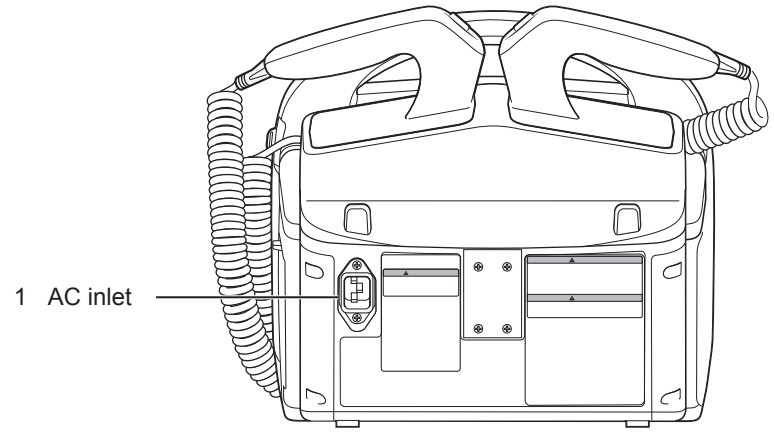
2 SpO_2 socket (when the QI-564V is incorporated)

Connect the SpO_2 connection cord.

3 CO_2 socket (when the QI-564V is incorporated)

Connect the CO_2 sensor kit.

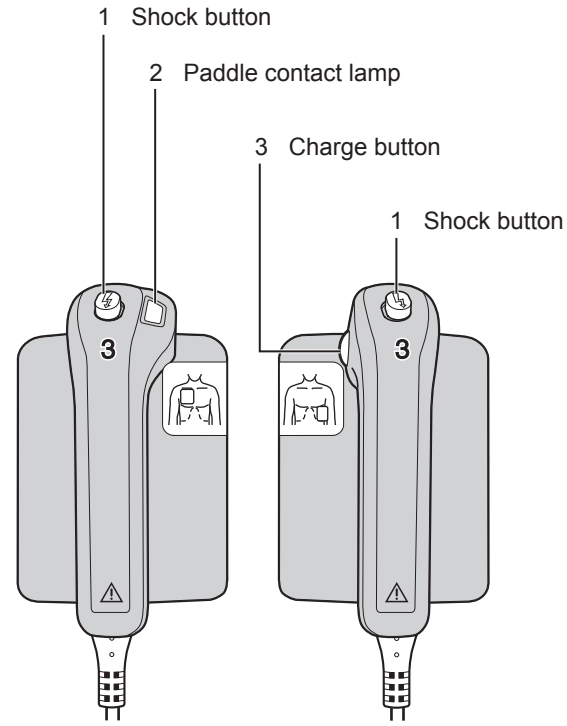
Rear Panel

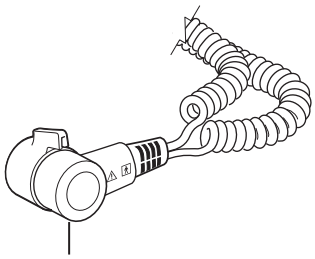


1 AC inlet

Connect the supplied power cord.

External Paddles





1 Shock button

Simultaneously press both buttons to discharge the charged energy. In synchronized cardioversion, the defibrillator discharges energy at the appropriate timing after these buttons are pressed. When the defibrillator is charged, these buttons start blinking.

2 Paddle contact lamp

Indicates the quality of contact between the paddles and patient.

- 0 to 100 ohms : Lights in green (good contact).
- 100 to 200 ohms : Lights in yellow.
- 200 ohms or higher : Lights in orange.

3 Charge button (on paddles)

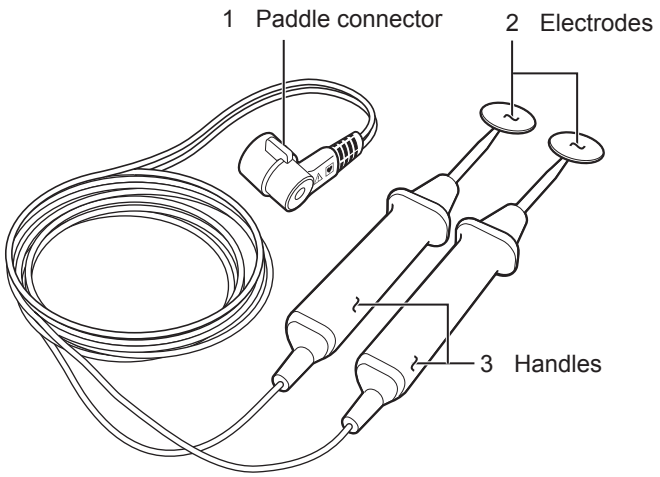
Charges the defibrillator.

4 Paddle connector (TEC-5621, TEC-5631)

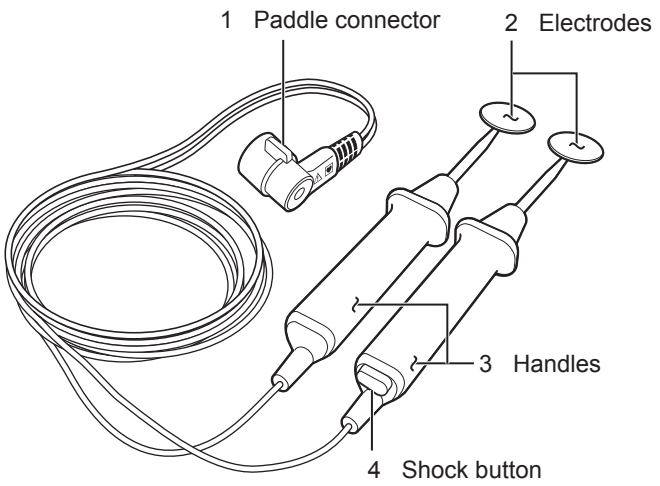
Connect to the paddle connector of the defibrillator.

Internal Paddles (Option)

ND-860V series (without switch)



ND-890V series (with switch)



1 Paddle connector

Connect to the paddle connector of the defibrillator.

2 Electrodes

These electrodes deliver energy in direct contact with the heart.

3 Handles

Keep the handles firmly gripped during charge and discharge.
Be sure to grip the paddles between the cable and the guard.

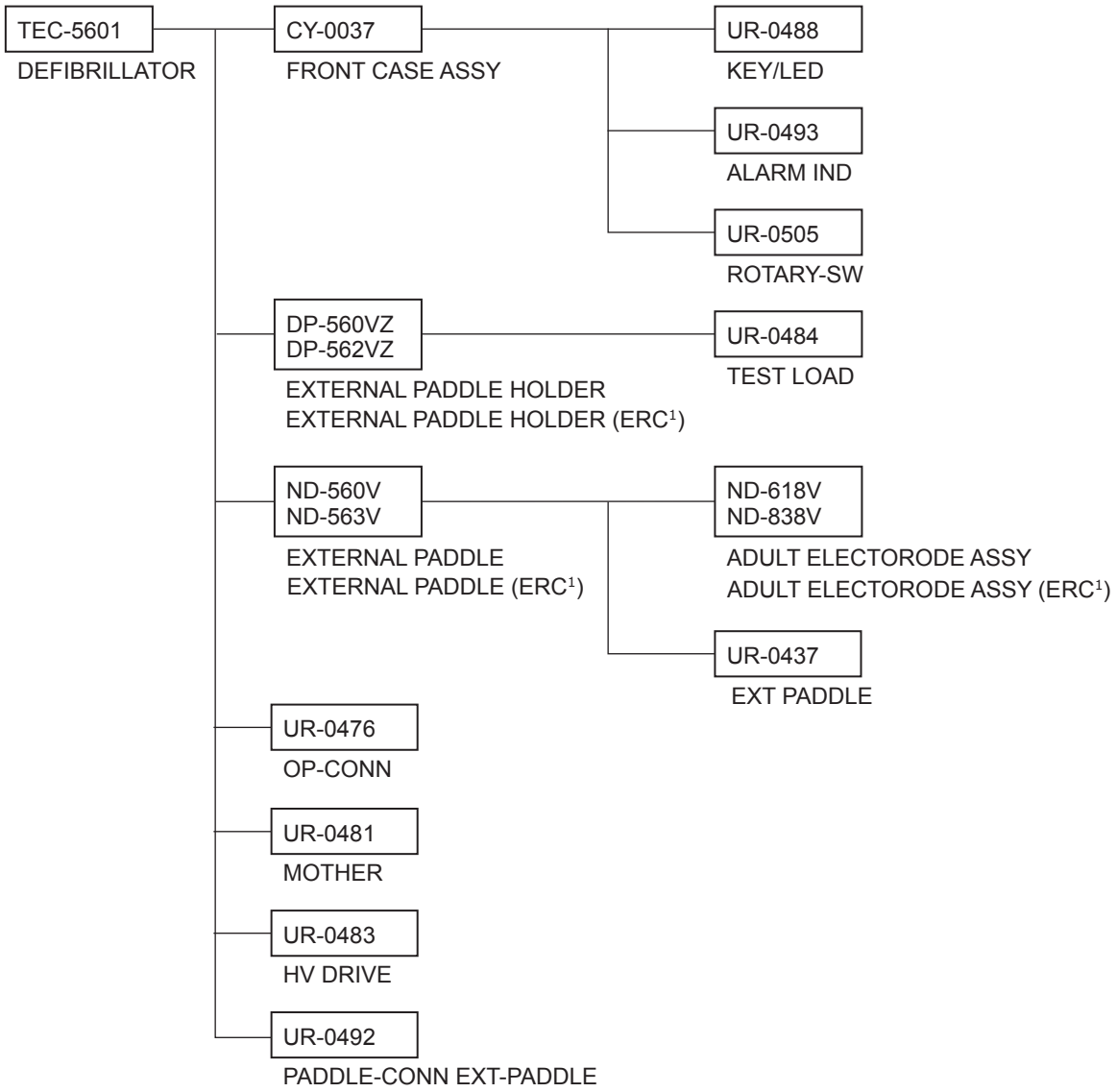
4 Shock button (ND-890V series)

Press to discharge energy. In synchronized cardioversion, the defibrillator discharges energy at the appropriate timing after this button is pressed.

Composition

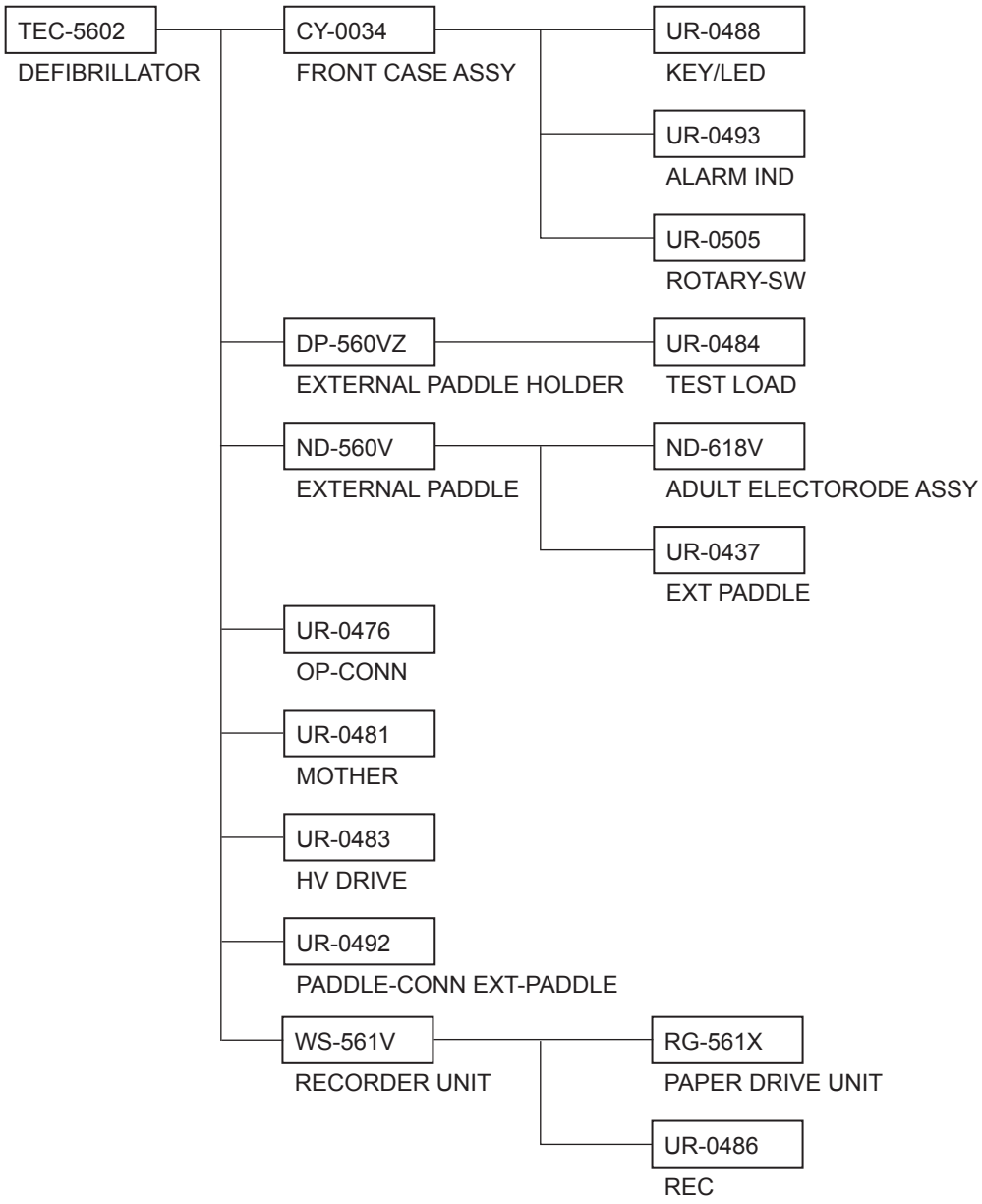
Standard Components

TEC-5601

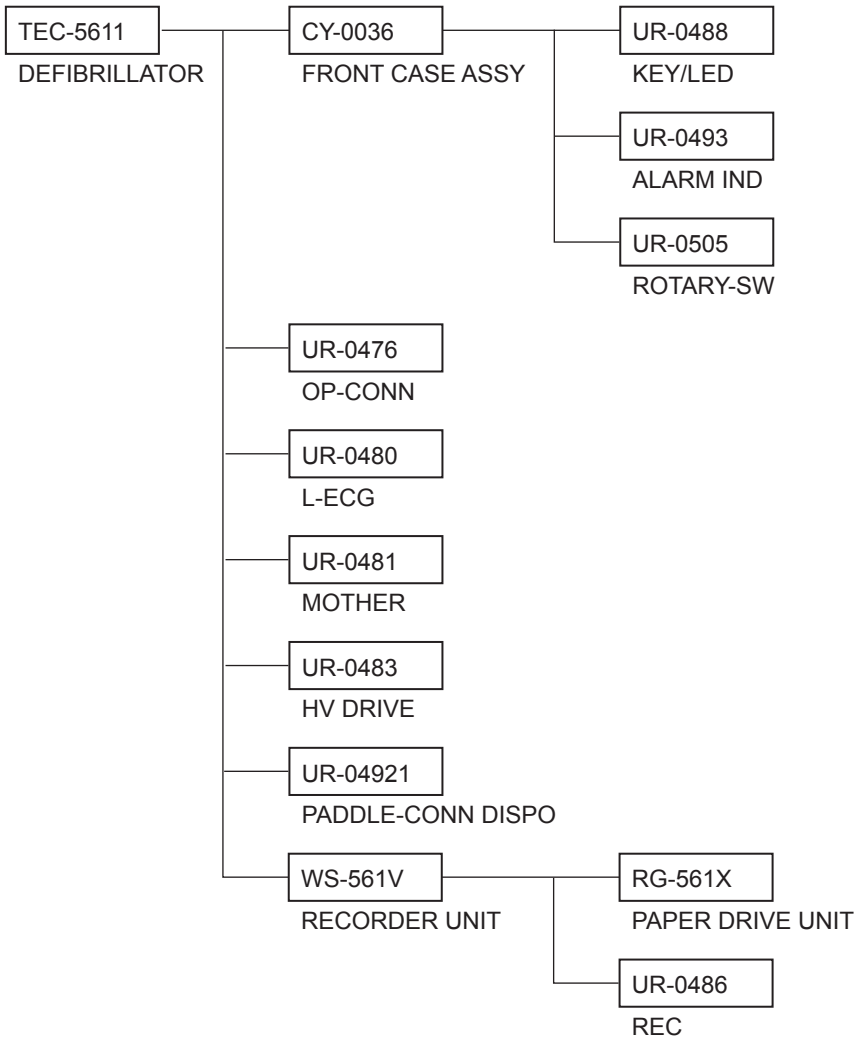


[1] For European models only. European Resuscitation Council (ERC) compatible.

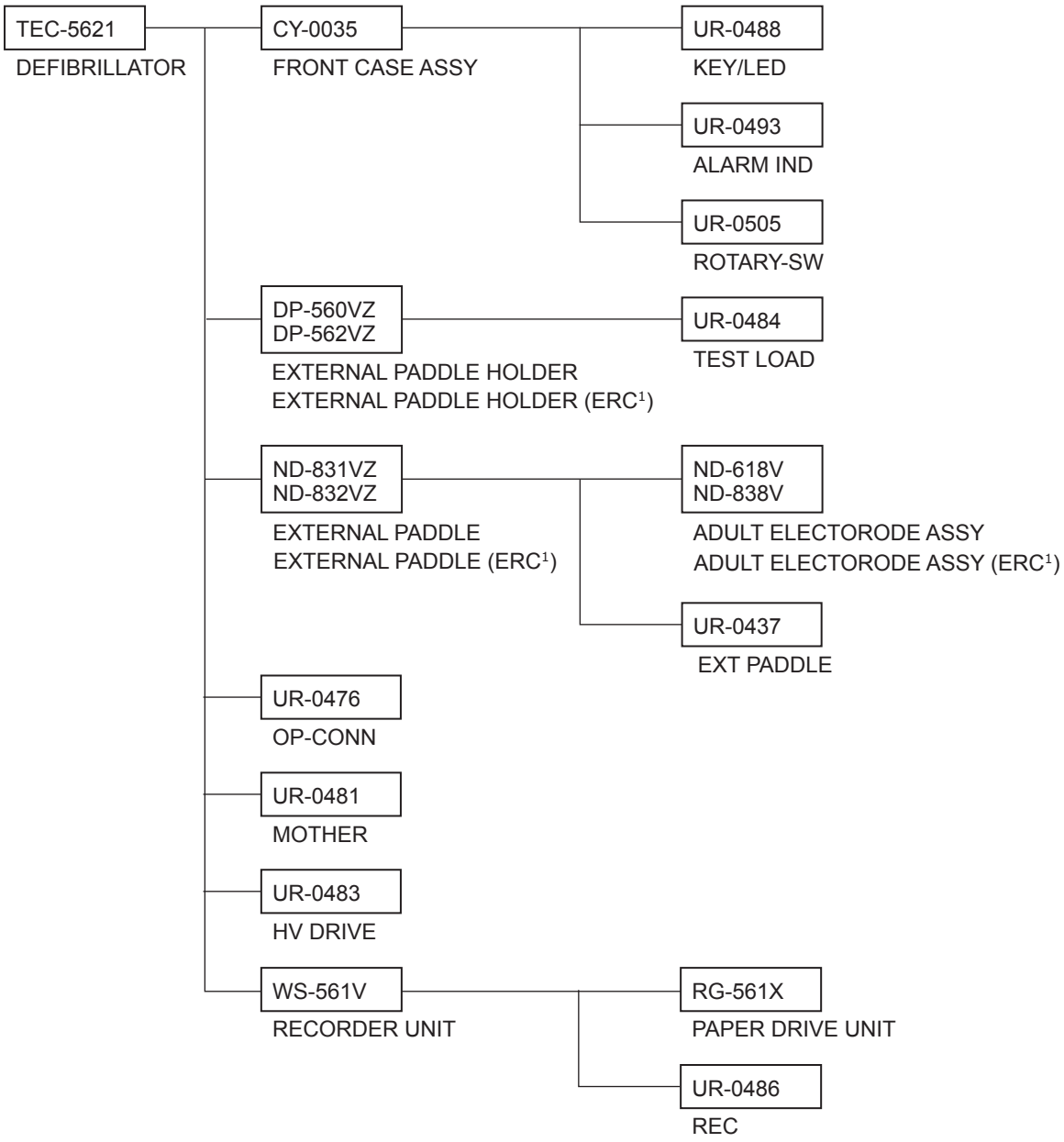
TEC-5602


TEC-5602
DEFIBRILLATOR
CY-0034
FRONT CASE ASSY
UR-0488
KEY/LED
UR-0493
ALARM IND
UR-0505
ROTARY-SW
DP-560VZ
EXTERNAL PADDLE HOLDER
UR-0484
TEST LOAD
ND-560V
EXTERNAL PADDLE
ND-618V
ADULT ELECTORODE ASSY
UR-0437
EXT PADDLE
UR-0476
OP-CONN
UR-0481
MOTHER
UR-0483
HV DRIVE
UR-0492
PADDLE-CONN EXT-PADDLE
WS-561V
RECORDER UNIT
RG-561X
PAPER DRIVE UNIT
UR-0486
REC

TEC-5611

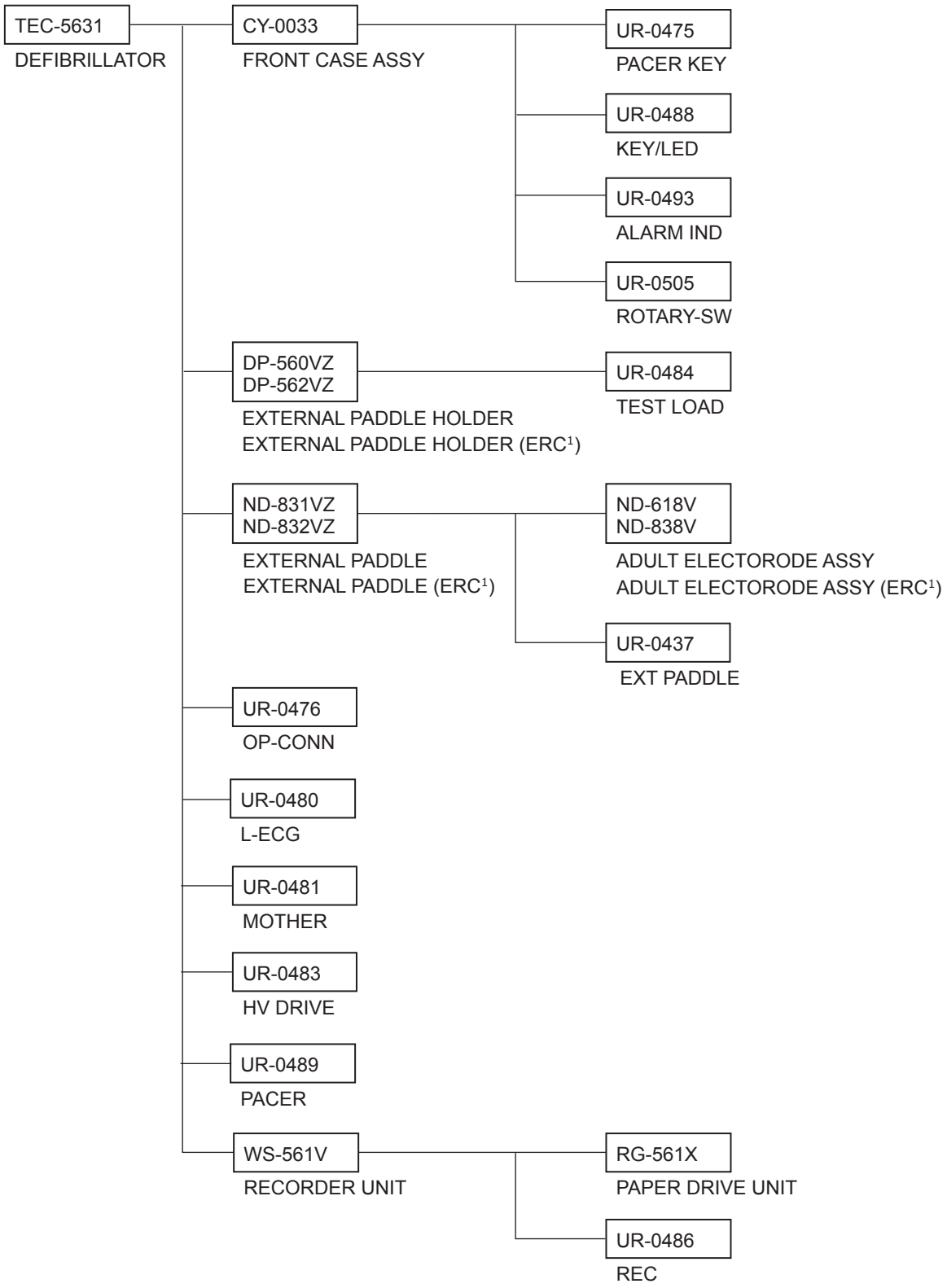

TEC-5611
DEFIBRILLATOR
CY-0036
FRONT CASE ASSY
UR-0488
KEY/LED
UR-0493
ALARM IND
UR-0505
ROTARY-SW
UR-0476
OP-CONN
UR-0480
L-ECG
UR-0481
MOTHER
UR-0483
HV DRIVE
UR-04921
PADDLE-CONN DISPO
WS-561V
RECORDER UNIT
RG-561X
PAPER DRIVE UNIT
UR-0486
REC

TEC-5621



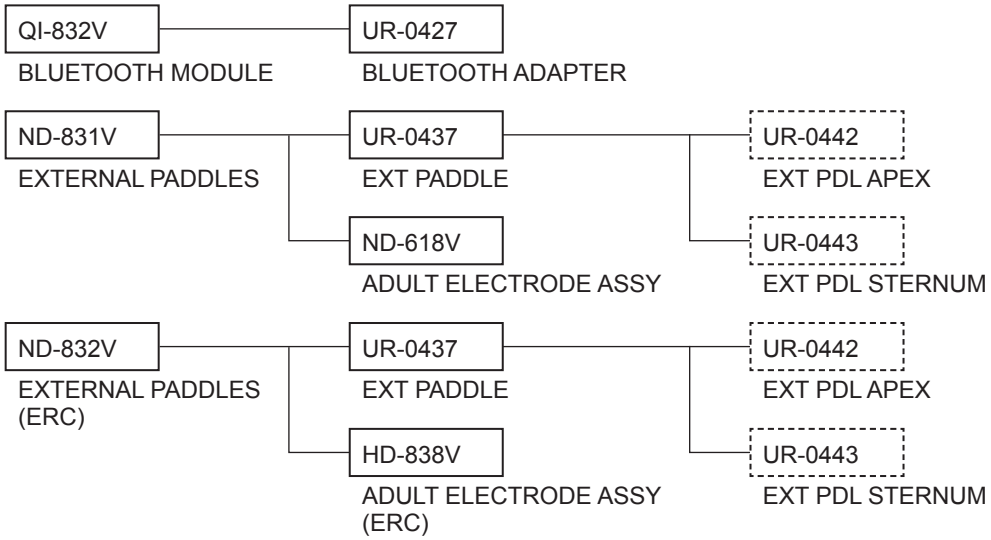
[1] For European models only. European Resuscitation Council (ERC) compatible.

TEC-5631



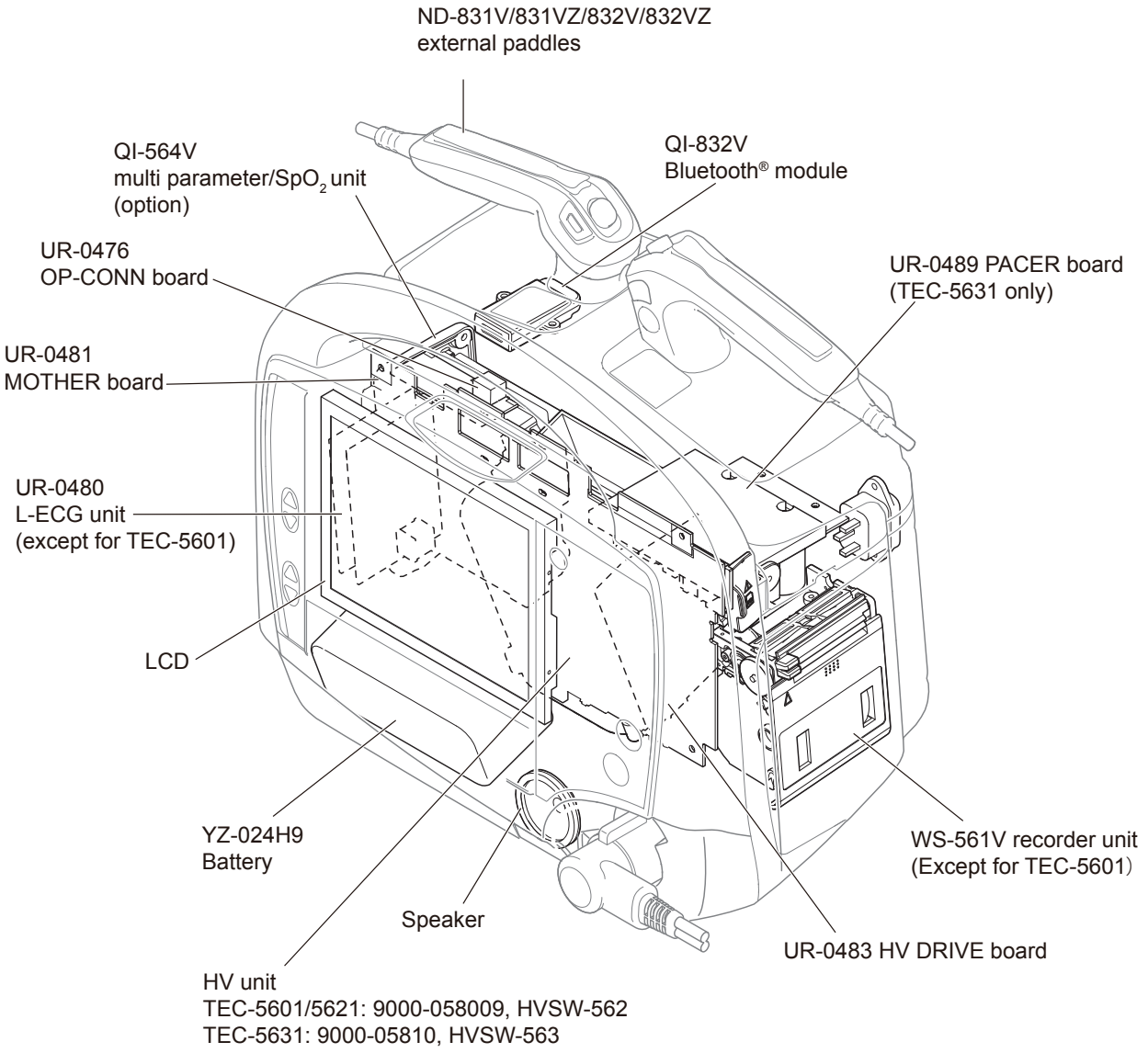
[1] For European models only. European Resuscitation Council (ERC) compatible.

Options



JC-855V PAD ADAPTER	ND-863V INTERNAL PADDLE ELECTRODE Φ35	QS-831V UPGRADE KIT
JC-865V PAD ADAPTER	ND-864V INTERNAL PADDLE ELECTRODE Φ45	YZ-047H4 BED RAIL HOOK
P-511 DISPOSABLE PADDLES	ND-865V INTERNAL PADDLE ELECTRODE Φ55	YZ-024H9 NKB-301V BATTERY PACK
P-513 DISPOSABLE PADDLES	ND-866V INTERNAL PADDLE ELECTRODE Φ65	KG-561V WALL MOUNT
P-521 DISPOSABLE PADDLES	ND-867V INTERNAL PADDLE ELECTRODE Φ75	DI-831V BASKET
P-530 DISPOSABLE PADDLES	ND-893V INTERNAL PADDLE ELECTRODE Φ35 WITH SW	KD-561V CART
P-532 DISPOSABLE PADDLES	ND-894V INTERNAL PADDLE ELECTRODE Φ45 WITH SW	YZ-025H0 PASTE HOLDER KIT
P-711 DISPOSABLE PADDLES	ND-895V INTERNAL PADDLE ELECTRODE Φ55 WITH SW	YZ-052H4 TOP COVER 5600
P-713 DISPOSABLE PADDLES	ND-896V INTERNAL PADDLE ELECTRODE Φ65 WITH SW	
AX-250V TEST LOAD UNIT	ND-897V INTERNAL PADDLE ELECTRODE Φ75 WITH SW	
AX-251V TEST LOAD UNIT	ND-844V PEDIATRIC ELECTRODE ASSY Φ44	

Board and Unit Location



2 Troubleshooting

How to Troubleshoot

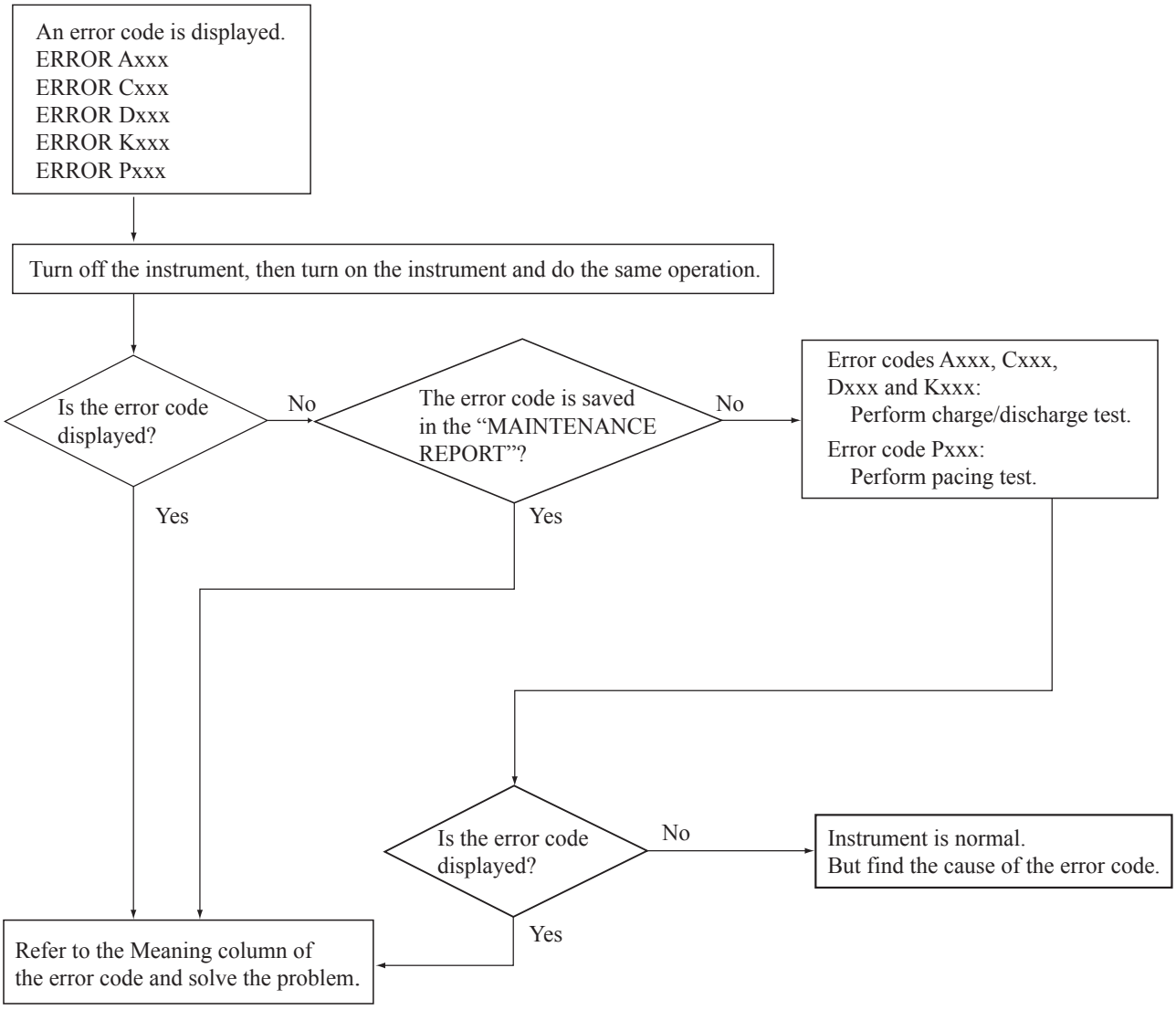
1. Determine which troubleshooting table to use. Also refer to “Messages and Troubleshooting” in Section 11 of the Operator’s Manual.
2. In the “Error Codes”, “Message” or “Problem” column of each table, find the trouble item that matches the problem or error message.
3. Do the action recommended in the “Action” column. (Do the first action recommended in the “Action” column.)
4. If the problem or error message is not solved, do the next action recommended in the “Action” column. (If this does not solve the problem, do the next recommended sections.)

NOTE: Before contacting your Nihon Kohden representative for technical support, please complete a copy of the Maintenance Check Sheet (the original copy is provided at the end of the Section 4 “Maintenance”), and if possible, provide additional detailed information on the problem. Send the complete copy of the Maintenance Check Sheet to your Nihon Kohden representative. This will allow your Nihon Kohden representative to provide you with the best support.

Error Codes

The defibrillator displays an error code if it detects an error when the power is turned on and during operation.

NOTE
- For problems that are not reproducible, open the SYSTEM SETUP – 7. DEVICE HISTORY screen and print the MAINTENANCE REPORT. Refer to the Administrator's Guide for the detail of this procedure. The error code will be lost when the power is turned off.
- Always check all the cable connections in the defibrillator before performing the action recommended in the troubleshooting tables in this section. This is because a loose cable connection can cause the defibrillator to display the error code.



Defibrillation

When an Axxx error code appears on the screen, check the connections of the harnesses which are connected to the biphasic HV unit, HV DRIVE board and MOTHER board before referring to the following table.

Error Code	Meaning	Possible Cause	Action
A501	During standby mode, the HV capacitor has more than 1 J energy for more than one second.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A512	When charging is started, the HV capacitor energy did not reach 1 J within 2 seconds.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A513	The energy does not reach the selected energy within the specified time.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A524	After charging, the capacitor energy decreases the specified value for each energy.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A527	After charging, the capacitor energy is about 15% above the selected energy.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A529	After charging, the actual charged energy is different from the selected energy.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A552	The switch that controls output from HV unit is faulty.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A556	Internal discharge takes more than 20 seconds to complete.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A566	HV capacitor's voltage did not reach its target value 20 seconds after adjusted internal discharge.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A570	HV monitoring error signal is detected.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A585	The voltage of the HV capacitor exceeds its specified voltage.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A587	When the disposable pad is used, 12.5% or more of the charged energy remains in the HV capacitor 2 seconds after external discharge.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.
A597	When discharging, the second phase pulse is not output.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty MOTHER board.	Replace the MOTHER board.
		Faulty HV DRIVE board.	Replace the HV DRIVE board.

Operation Panel

When a Kxxx error code appears on the screen, check the connections of the harnesses which are connected to the KEY/LED board, Membrane switch and MOTHER board before referring to the following table.

NOTE
- When the power is on and a key or button is pressed and held for more than 10 seconds, an error code is displayed.
- If no key was pressed and held for more than 10 seconds, check the key function on the System Maintenance screen. Refer to “System Maintenance Screen – Check Hardware Screen – Check Key Screen” in Section 4.

Error Code	Meaning	Possible Cause	Action
K503	The silence alarm key error is detected.	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty Membrane SW.	Replace the Membrane SW.
		Faulty MOTHER board.	Replace the MOTHER board.
K505	The record/stop key error is detected.	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty Membrane SW.	Replace the Membrane SW.
		Faulty MOTHER board.	Replace the MOTHER board.
K507	The SYNC button error (front panel) is detected.	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty MOTHER board.	Replace the MOTHER board.
K508	The CHARGE/AED button error (front panel) is detected.	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty MOTHER board.	Replace the MOTHER board.
K509	The SHOCK button error (front panel) is detected.	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty MOTHER board.	Replace the MOTHER board.
K511	The CHARGE/AED button error (apex external paddle) is detected.	Faulty external paddles.	Replace the external paddles.
		Faulty MOTHER board.	Replace the MOTHER board.
K512	The SHOCK button error (apex external paddle) is detected.	Faulty external paddles.	Replace the external paddles.
		Faulty MOTHER board.	Replace the MOTHER board.
K513	The SHOCK button error (sternum external paddle) is detected.	Faulty external paddles.	Replace the external paddles.
		Faulty MOTHER board.	Replace the MOTHER board.
K516	The PACING START/STOP key error is detected.	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty PACER KEY board.	Replace the PACER KEY board.
		Faulty MOTHER board.	Replace the MOTHER board.
K517	PACING RATE Up key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty PACER KEY board.	Replace the PACER KEY board.
		Faulty MOTHER board.	Replace the MOTHER board.
K518	PACING RATE Down key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty PACER KEY board.	Replace the PACER KEY board.
		Faulty MOTHER board.	Replace the MOTHER board.
K519	PACING CURRENT Up key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty PACER KEY board.	Replace the PACER KEY board.
		Faulty MOTHER board.	Replace the MOTHER board.
K520	PACING CURRENT Down key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty PACER KEY board.	Replace the PACER KEY board.
		Faulty MOTHER board.	Replace the MOTHER board.
K524	CHILD MODE button error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty MOTHER board.	Replace the MOTHER board.

Error Code	Meaning	Possible Cause	Action
K531	F1 key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty Membrane SW.	Replace the Membrane SW.
		Faulty MOTHER board.	Replace the MOTHER board.
K532	F2 key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty Membrane SW.	Replace the Membrane SW.
		Faulty MOTHER board.	Replace the MOTHER board.
K533	F3 key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty Membrane SW.	Replace the Membrane SW.
		Faulty MOTHER board.	Replace the MOTHER board.
K534	F4 key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty Membrane SW.	Replace the Membrane SW.
		Faulty MOTHER board.	Replace the MOTHER board.
K535	F5 key error	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty MEMBRANE board.	Replace the MEMBRANE board.
		Faulty MOTHER board.	Replace the MOTHER board.

Communication

When a Cxxx error code appears on the screen, check the connections of the harnesses which are connected to the item in the Possible Cause column.

Error Code	Meaning	Possible Cause	Action
C501	CO_2 sensor does not respond.	Faulty CO_2 sensor.	Replace the CO_2 sensor.
		Faulty MP/SpO_2 unit.	Replace the MP/SpO_2 unit.
C502	SpO_2 module does not respond.	Faulty MP/SpO_2 unit.	Replace the MP/SpO_2 unit.
C507	When the power is turned on, the communication error between the RTC (real time clock) and main CPU is detected for one second.	Faulty MOTHER board.	Replace the MOTHER board.
C511	The sub CPU does not respond.	Faulty MOTHER board.	Replace the MOTHER board.
C514	The pacing CPU does not respond.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.
C516	RTC backup battery is detected to be empty.	Backup battery is empty.	Replace the backup battery.
C519	• The MP unit does not respond for more than 4 seconds. • When turning the defibrillator on, information reception retry for the system information sent after releasing the MP unit reset failed three times.	Faulty MP/SpO_2 unit.	Replace the MP/SpO_2 unit.
		Faulty MOTHER board.	Replace the MOTHER board.
C521	Bluetooth® module does not respond.	Faulty Bluetooth® module.	Replace the Bluetooth® module.
		Faulty MOTHER board.	Replace the MOTHER board.
C522	E-CPU does not respond.	Faulty L-ECG unit.	Replace the L-ECG unit.
		Faulty MOTHER board.	Replace the MOTHER board.
C523	K-CPU does not respond.	Faulty KEY/LED board.	Replace the KEY/LED board.
		Faulty MOTHER board.	Replace the MOTHER board.
C524	SV-CPU does not respond.	Faulty MOTHER board.	Replace the MOTHER board.
C525	SSV-CPU does not respond.	Faulty MOTHER board.	Replace the MOTHER board.
		Backup battery is empty.	Replace the backup battery.

Data Error

Error Code	Meaning	Possible Cause	Action
D501, D502	Data in the DRAM or flash memory is not read out correctly (summation error).	Faulty DRAM or flash memory.	Replace the MOTHER board.
D503, D504	The text area in the flash memory is damaged.	Faulty flash memory.	Replace the MOTHER board.
D511	When the power is turned on, settings in the System Maintenance screen do not match the backup data in the flash memory.	After settings in the System Maintenance screen are changed, the “Flash Save” procedure is not performed.	Perform the “Flash Save” procedure in the System Maintenance screen.
		During power off sequence, power down occurs.	Restart the defibrillator and check that “D511” does not appear again.
		Faulty MOTHER board.	Replace the MOTHER board.
D512	When the power is turned on, damaged waveform report data in the flash memory is detected.	During power off sequence, power down occurs.	Delete the report data in the Setup screen.
		Faulty MOTHER board.	Replace the MOTHER board.

Pacing (TEC-5631 Only)

When a Pxxx error code appears on the screen, check the connections of the harnesses which are connected to the PACER board and MOTHER board before referring to the following table.

Error Code	Meaning	Possible Cause	Action
P501	Actual pacing output rate is 12.5% above or below the setting rate.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.
P502	Pulse width of the pacing output pulse is larger or smaller than the selected width.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.
P503	Current intensity of the pacing output pulse is larger than the selected value.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.
P504	Current intensity of the pacing output pulse is smaller than the selected value.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.
P505	Pacing output that is not requested by the CPU is detected.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.
P506	Pacing output voltage exceeds the upper limit.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.
P511	Error was detected in the short-mode of the transistor.	Faulty PACER board.	Replace the PACER board.
		Faulty MOTHER board.	Replace the MOTHER board.

SV-CPU Error

Error Code	Meaning	Possible Cause	Action
E001	Power FET is damaged.	Faulty MOTHER board.	Replace the MOTHER board.
		Restart the defibrillator after the SV-CPU software is upgraded.	Restart the defibrillator and check that “E001” does not appear again.
E011	An invert error occurred on the Status Indicator (SI).	Faulty flash memory.	Replace the MOTHER board.
		Backup battery is almost empty.	Replace the backup battery.

Messages

Defibrillation and Cardioversion

Message	Description	Action
CHECK PADS	In manual defibrillation or AED mode, the contact impedance of the disposable pads is too high.	• Shave hair on the skin where pads are placed, then firmly attach the disposable pads to the patient chest. • Firmly connect the pad adapter and disposable pads.
	When PAD lead is selected, disposable pads are not attached to the patient firmly.	
	The pad adapter is disconnected from the disposable pads.	Firmly connect the pad adapter and disposable pads.
CONNECT PADDLES/ PADS	In manual defibrillation mode, paddles or pad adapter are not connected to the defibrillator.	Connect the paddles or pad adapter to the defibrillator.
	The CN205 harness on the KEY/LED board is disconnected or broken.	Connect the CN205 harness to the connector on the KEY/LED board. Check the continuity of the CN205 harness.
	Paddle connector pin is broken or bent.	• Replace the paddles. • Replace the paddle connector of the defibrillator.
	If the message appears when the paddles/pads are connected to the defibrillator, KEY/LED board is faulty.	Replace the KEY/LED board.
ENERGY WAS NOT DELIVERED TO PATIENT	There is remaining energy in the defibrillator two seconds after defibrillation was performed. The remaining energy is internally discharged.	Check the paddle or pad connection.
HIGH IMPEDANCE	Skin-paddle contact impedance is too high.	Press the paddles onto the patient firmly.
LOW IMPEDANCE	Skin-paddle contact impedance is too low.	Check that the paddles or pads do not touch each other.
HV MONITOR ERROR	• Faulty biphasic HV unit. • Faulty HV DRIVE board. • Faulty MOTHER board.	• Replace the biphasic HV unit. • Replace the HV DRIVE board. • Replace the MOTHER board.
RELAY DRIVE ERROR	• Faulty biphasic HV unit. • Faulty HV DRIVE board. • Faulty MOTHER board.	• Replace the biphasic HV unit • Replace the HV DRIVE board. • Replace the MOTHER board.
Set energy to 50 J or less	Above 50 J is selected when the internal paddles are connected to the defibrillator.	Turn the MOTHER dial to 50 J or less.
	The CN205 harness on the KEY/LED board is disconnected or broken.	Connect the CN205 harness to the connector on the KEY/LED board. Check the continuity of the CN205 harness.
	Paddle connector pin is broken or bent.	• Replace the paddles. • Replace the paddle connector of the defibrillator.

AED

Message	Description	Action
Could not analyze heart rhythm.	In AED mode, the defibrillator cannot analyze ECG due to noise.	• Following the instruction, start CPR. • If possible, remove cause of noise. When the CPR is necessary, make CPR a priority over removing noise.
	If the message still appears when cause of noise is removed: • HV DRIVE board is faulty. • MOTHER board is faulty.	• Replace the HV DRIVE board. • Replace the MOTHER board.
CHECK PADS	• The pads are disconnected from the pad adapter. • The pads are not properly attached to the patient.	• Connect the pads to the pad adapter. • Properly attach the pads to the patient.
CONNECT PADS	In AED mode, the pad adapter is not connected to the defibrillator.	Connect the pad adapter to the defibrillator.
	The CN205 harness on the KEY/LED board is disconnected or broken.	Connect the CN205 harness to the connector on the KEY/LED board. Check the continuity of the CN205 harness.
	Paddle connector pin is broken or bent.	• Replace the paddles. • Replace the paddle connector of the defibrillator.
	If the message appears when the paddles/pads are connected to the defibrillator, KEY/LED board is faulty.	Replace the KEY/LED board.
HIGH IMPEDANCE	Skin-paddle contact impedance is too high.	Press the paddles onto the patient firmly.
LOW IMPEDANCE	Skin-paddle contact impedance is too low.	Check that the pads do not touch each other.
USE DISPOSABLE PADS	In AED mode, only disposable pads are available. External paddles and internal paddles are not available.	Use disposable pads in AED mode.

Pacing

Message	Description	Action
CHECK PADS	The pad adapter is disconnected from the disposable pads.	Firmly connect the pad adapter and disposable pads.
	In FIXED or DEMAND pacing mode, the disposable pad is not firmly attached to the patient.	Firmly attach the disposable pads to the patient chest.

Message	Description	Action
Pacing stopped. (ECG lead disconnected)	Pacing stopped because: • An electrode lead is disconnected from an electrode. • An electrode is detached from the patient. • Electrode lead is disconnected from the connection cable. • Bad contact between the electrode and lead clip. • Electrode lead discontinuity. • Abnormally high polarization voltage. When none of above occurred, L-ECG unit is faulty.	 • Properly connect the electrode lead to the ECG electrode. • Replace the electrodes with new ones. • Properly connect the electrode lead to the connection cable. • Replace the electrode lead with a new one. • Replace the electrode lead with a new one. • Replace the electrodes with new ones. When none of above solve the problem, L-ECG unit is faulty. Replace the L-ECG unit.
Pacing stopped. (pad disconnected)	Pacing stopped because: • The pad adapter is disconnected from the disposable pads or the defibrillator. • The disposable pads are detached from the patient. When none of above occurred, PACER board is faulty.	 • Firmly connect the pads to the pad adapter. Firmly connect the pad adapter to the paddle connector of the defibrillator. • Attach the disposable pads to the patient. When none of above solve the problem, PACER board is faulty. Replace the PACER board.
USE DISPOSABLE PADS	In FIXED or DEMAND pacing mode, only disposable pads are available. External paddles and internal paddles are not available.	Use disposable pads in pacing mode.

Monitoring

ECG

Message	Description	Action
CANNOT ANALYZE	Noise interference for more than 30 seconds and heart rate cannot be counted and arrhythmia cannot be analyzed.	Remove noise.
	If the message still appears when cause of noise is removed: • L-ECG unit is faulty. • MOTHER board is faulty.	 • Replace the L-ECG unit. • Replace the MOTHER board.
CHECK Ca ELECTRODE	Ca electrode is detached from the patient.	Attach the Ca electrode to the patient.
CHECK Cb ELECTRODE	Cb electrode is detached from the patient.	Attach the Cb electrode to the patient.
ECG: CHANGE ELECTRODES	An electrode is deteriorated.	Replace the electrode with a new one.
ECG: CHANGE PADS	The disposable pads are deteriorated.	Replace the pads with new ones.
ECG: CHECK CHEST ELECTRODES	The chest electrode is detached from the patient.	Properly attach the electrode to the patient. If the electrode cannot be attached firmly, replace the electrode.

Message	Description	Action
ECG: CHECK ELECTRODES	The electrode is detached from the patient.	Properly attach the electrode to the patient. If the electrode cannot be attached firmly, replace the electrode.
	The electrode lead is disconnected from the ECG connection cord.	Connect the electrode lead to the ECG connection cord.
	The clip of the lead is not properly attached to the electrode.	Properly attach the clip to the electrode.
	Broken electrode lead	Replace the electrode lead.
	The external ECG cable is disconnected from the defibrillator.	Connect the external ECG cable.
ECG: CHECK PADS	The disposable pad is detached from the patient or paddles used for ECG monitoring are not placed on the patient properly.	When using the disposable pads, attach the disposable pads to the patient or replace the disposable pads with the new ones. When using the paddles, place the paddles on the patient.
ECG: CONNECT PADDLES/PADS	When PADDLE lead is selected in the monitor mode, paddles or pad adapter are not connected to the defibrillator.	Connect the paddles or pad adapter to the defibrillator.
	When the paddles or pads are connected to the defibrillator, KEY/LED board is faulty.	Replace the KEY/LED board.
	The CN205 harness on the KEY/LED board is disconnected or broken.	Connect the CN205 harness to the connector on the KEY/LED board. Check the continuity of the CN205 harness.
	Paddle connector pin is broken or bent.	• Replace the paddles. • Replace the paddle connector of the defibrillator.
F (LL) LEAD OFF	LL electrode is detached from the patient.	Attach the LL electrode to the patient.
L (LA) LEAD OFF	LA electrode is detached from the patient.	Attach the LA electrode to the patient.
R (RA) LEAD OFF	RA electrode is detached from the patient.	Attach the RA electrode to the patient.
Ca LEAD OFF	Ca electrode is detached from the patient.	Attach the electrode to the patient.
Cb LEAD OFF	Cb electrode is detached from the patient.	

SpO_2

Message	Description	Action
SpO_2: CHECK PROBE	The probe is detached from the patient.	Check the probe attachment condition and remove the cause.
	The probe is disconnected from the SpO_2 connection cord.	Securely connect the probe to the SpO_2 connection cord.
	When the SpO_2 probe is correctly connected: • SpO_2 board is faulty. • MP/SpO_2 board is faulty.	Replace the SpO_2 board and/or MP/SpO_2 board.
SpO_2: CHECK PROBE SITE	SpO_2 probe is deteriorated.	Replace the probe with a new one.
SpO_2: CONNECTOR OFF	Connector of the SpO_2 connection cord is disconnected. If the SpO_2 connection cable is properly connected: • SpO_2 board is faulty. • MP/SpO_2 board is faulty.	Check the connection of the SpO_2 connection cord. If it does not solve the problem: • Replace the SpO_2 board. • Replace the MP/SpO_2 board.

Message	Description	Action
SpO_2: CORD DISCONNECTED	SpO_2 probe is disconnected from the connection cable.	Connect the SpO_2 probe to the connection cable.
SpO_2: LIGHT INTERFERENCE	Too much light on the probe.	Remove light or cover the probe site with blanket.
SpO_2: LOW QUALITY SIGNAL	Considerable body movement.	When the message is displayed frequently, check the patient condition and, if necessary, change the attachment site.
	The probe is not attached to the patient properly.	
SpO_2: MODULE ERROR	Faulty SpO_2 board.	Replace the SpO_2 board.
SpO_2: PROBE ERROR	The probe lifetime is expired.	Replace the probe with a new one.
	Probe discontinuity or short-circuit.	Replace the probe with a new one.
	Faulty SpO_2 connection cord.	Replace the SpO_2 connection cord with a new one.
	Faulty SpO_2 probe.	Replace the SpO_2 probe with a new one. If the message still appears, replace the SpO_2 adapter.

CO_2

Message	Description	Action
CO_2: APNEA	Respiration was not detected for the period set on the CO_2 SETUP window for CO_2 alarm settings.	—
CO_2: CHANGE ADAPTER	The CO_2 adapter is damaged, deteriorated or the cable is broken.	Replace the CO_2 adapter with a new one.
CO_2: CHECK SENSOR	Insufficient sensor light.	Refer to the CO_2 sensor kit manual. If necessary, replace the kit with a new one.
CO_2: CONNECTOR OFF	The CO_2 sensor kit is disconnected from the defibrillator.	Connect the CO_2 sensor kit properly. When CO_2 monitoring is not necessary, press the Silence Alarms key to silence the alarm.
	The CO_2 sensor kit is damaged.	Replace the CO_2 sensor kit with a new one.
	When the CO_2 sensor kit is correctly connected and the CO_2 sensor kit is not deteriorated, MP/SpO_2 board is faulty.	Replace the MP/SpO_2 board.
CO_2: SENSOR ERROR	CO_2 sensor is damaged, deteriorated or cord is broken.	Replace the CO_2 sensor with a new one.
	When the CO_2 sensor kit is not damaged or deteriorated or cord is not broken, MP/SpO_2 board is faulty.	Replace the MP/SpO_2 board.

System

General

Message	Description	Action
Defibrillator error. Use another defibrillator.	HV error is found during basic checks.	• Replace the biphasic HV unit. • Replace the HV DRIVE board. • Replace the MOTHER board.
	An error that prevents defibrillation occurs.	• Replace the biphasic HV unit. • Replace the HV DRIVE board. • Replace the MOTHER board.

Message	Description	Action
ERROR Axxx	Faulty HV.	Refer to “Error Codes” in this section.
ERROR Cxxx	Communication error.	
ERROR Dxxx	Faulty memory.	
ERROR Kxxx	Faulty keys.	
ERROR Pxxx	Faulty pacing unit.	
ERROR Exxx	Faulty SV-CPU.	
HV MONITOR ERROR	• Faulty biphasic HV unit. • Faulty HV DRIVE board. • Faulty MOTHER board.	• Replace the biphasic HV unit. • Replace the HV DRIVE board. • Replace the MOTHER board.
MP MODULE ERROR	Faulty MP/SpO_2 board.	Replace the MP/SpO_2 board.
Overheating	External discharge: • Discharging 20 times or more in 20 minutes with more than 70 J. • Discharging 9 times or more in 2 minutes with more than 70 J.	Turn the MOTHER dial to the OFF position to turn the defibrillator off. Leave the defibrillator for 20 minute then turn it on. In an emergency, you can use the defibrillator even if this message is displayed.
	External discharge to low load resistance: Discharging 3 times or more in 9 minutes against load resistance less than 15Ω at any energy.	
	Internal discharge: • Discharging more than 15 times in 35 minutes at any energy. • Discharging more than 7 times in 7 minutes at any energy.	
PARAMETER NOT AVAILABLE	The connector of a device that is not available for the TEC-5600 series defibrillator is connected.	Use parameters that are available for TEC-5600 series defibrillator.
RELAY DRIVE ERROR	• Faulty biphasic HV unit. • Faulty HV DRIVE board. • Faulty MOTHER board.	• Replace the biphasic HV unit. • Replace the HV DRIVE board. • Replace the MOTHER board.
Errors defected in self test.	An error is detected during the self test.	Check the result of 8. Latest Self Test on the SYSTEM SETUP screen.

Battery

Message	Description	Action
ABNORMAL VOLTAGE	• Abnormal battery power is detected in the battery pack. • Abnormal power is detected in the AC/DC unit.	• Replace the battery pack in battery slot. • Replace the AC/DC unit.
BATTERY CHARGE ERROR	• Faulty battery pack. • Faulty MOTHER board.	• Replace the battery pack. • Replace the MOTHER board.
BATTERY IS LOW	The battery remaining mark is 1~3 or .	Replace the battery pack with a fully charged battery pack or connect to AC power.
BATTERY TEMP OUT OF RANGE	Abnormal temperature is detected in the battery pack.	Put the defibrillator in a place at the specified temperature range and wait until the message disappears.
CHARGE BATTERY IMMEDIATELY	Battery pack is empty.	Replace the battery pack with a fully charged battery pack or connect to AC power.
NO BATTERY PACK	The battery slot is empty.	—
NOW OPERATING ON BATTERY	The defibrillator is switched to battery power operation.	—

Recording

Message	Description	Action
OUT OF PAPER	Out of recording paper.	Set a role of recording paper.
	Recorder door is open.	Press the recorder door until it clicks.
	When the recording paper is set and the recorder door is closed: • The recorder unit is faulty. • The REC board is faulty. • The sensors on the recorder are dirty.	 • Replace the recorder unit. • Replace the REC board. • Clean the sensors. Refer to “Cleaning the Recorder (TEC-5602, TEC-5611, TEC-5621, TEC-5631)” (p.4-31).

Troubleshooting

In the following tables, possible causes are listed in the order of most to least likely.

General

Problem	Possible Cause	Action
The instrument heats up.	The instrument is used for many hours.	There is no abnormality in the instrument. Turn the defibrillator off and place it in a cooler place to cool the defibrillator down.
	Surrounding temperature is high.	Check the surrounding temperature.
	Faulty BIPHASIC HV unit.	Replace the BIPHASIC HV unit.
	Faulty battery pack.	Replace the battery pack.
	Faulty MOTHER board.	Replace the MOTHER board.
	Faulty AC/DC unit.	Replace the AC/DC unit.
The defibrillator does not turn on.	The power cord is disconnected.	Firmly connect the power cord to the AC outlet and the defibrillator.
	The battery pack is not installed.	Install the specified battery pack.
	Faulty LCD unit.	Replace the LCD unit.
	Faulty MOTHER board.	Replace the MOTHER board.
	Faulty AC/DC unit.	Replace the AC/DC unit.
	Faulty battery pack.	Replace the battery pack with a new one.
	Faulty KEY/LED board.	Replace the KEY/LED board.
The defibrillator turns off immediately after power on without user operation.	Remaining power of the battery pack is low.	Charge the battery pack.
The defibrillator turns on but the defibrillator does not start operation.	Faulty MOTHER board.	Replace the MOTHER board.
Screen is black. Waveform and characters are not seen.	Faulty LCD unit.	Replace the LCD unit.
	Faulty MOTHER board.	Replace the MOTHER board.
Screen is white. Waveform and characters are not seen.	Faulty LCD unit.	Replace the LCD unit.
	Faulty MOTHER board.	Replace the MOTHER board.
Screen is dim. Waveform and characters are not seen.	Faulty LCD unit.	Replace the LCD unit.
The printed date is JAN/01/13.	The backup battery is almost discharged.	Replace the backup battery.
The report data are not saved.	Faulty internal memory.	Replace the MOTHER board.
	On the REPORT SETUP window, the report data were deleted.	Deleted data cannot be recovered.
All settings set in the SETUP windows and SYSTEM SETUP screen return to the default settings without user operation.	Faulty internal memory.	Replace the MOTHER board.
The date and time printed on the recording paper is incorrect.	—	Set the date and time.
	The backup battery for the clock is discharged.	Replace the backup battery.
	Faulty MOTHER board.	Replace the MOTHER board.
On the screen, there are some pixels which have randomly abnormal color or do not light.	For the TFT LCD screen, it is considered normal if some pixels have randomly abnormal color or do not light.	—

Problem	Possible Cause	Action
No sound is heard.	Volume setting is low.	Increase the volume on the VOLUME window.
	Faulty speaker or speaker cable discontinuity.	Replace the speaker or speaker cable.
No sound is heard when pressing the button or key.	Faulty KEY/LED board.	Replace the KEY/LED board.
	Faulty MOTHER board.	Replace the MOTHER board.
	The VOLUME setting for KEY SOUND is set to 0.	Increase the volume. Refer to the operator's manual for details.

Defibrillation

Problem	Possible Cause	Action
While charging for defibrillation or cardioversion, the defibrillator internally discharges the energy.	In battery operation, the battery is almost empty.	Operate the defibrillator on AC power. The battery is automatically charged when the defibrillator is connected to AC power.
	Faulty BIPHASIC HV unit. (An error code appears on the screen.)	When an error code appears on the screen, solve the problem referring to the Defibrillation table in "Error Codes" in this section.
Cannot switch to synchronized mode. (There is key click sound.)	Appropriate lead is not selected.	Change to the appropriate lead.
	You tried to perform synchronized cardioversion with the PADDLE lead but synchronized cardioversion with the PADDLE lead is set to OFF on the PADDLE SETUP window.	On the PADDLE SETUP window, set the "SYNC BY PADDLE" to ON.
	Faulty MOTHER board.	Replace the MOTHER board.
Cannot switch to synchronized mode. (There is no key click sound.)	Faulty KEY/LED board.	Replace the KEY/LED board.
"0 J" is printed on the defibrillation report recording.	TTR (transthoracic resistance) is 15 Ω or less.	Check that the paddles do not touch each other.
	TTR (transthoracic resistance) is 255 Ω or more.	Press the paddles on the patient firmly.

Pacing (TEC-5631 Only)

Problem	Possible Cause	Action
Although the PULSE lamp is lit, pacing pulse does not appear on the ECG.	Faulty PACER board.	Replace the PACER board.
	Faulty MOTHER board.	Replace the MOTHER board.
Although the START/STOP key is pressed, pacing does not start.	Pacing current is set to 0 mA.	Set the appropriate pacing current with the PACING OUTPUT Up/Down key.
	In DEMAND mode, selected pacing rate is slower than the patient heart rate.	Set the pacing rate appropriate for the patient heart rate. When the patient heart rate is slower than the selected pacing rate, pacing pulse is output automatically.
	Faulty PACER board.	Replace the PACER board.
	Faulty MOTHER board.	Replace the MOTHER board.
	Faulty KEY/LED board.	Replace the KEY/LED board.

Monitoring

ECG

Problem	Possible Cause	Action
Dotted lines appear instead of the ECG waveforms.	• An ECG electrode is detached. • An electrode lead is disconnected from the electrode. • The ECG connection cable is disconnected from the defibrillator. • An electrode lead is faulty. • The L-ECG unit is faulty.	Remove the cause. If it does not solve the problem, change the lead. If changing the lead does not solve the problem, replace the L-ECG unit.
Baseline drifting.	Patient body movement.	Check the patient.
AC interference (50 or 60 Hz sine wave is superimposed on the ECG waveform.)	On the ECG SETUP window, HUM FILTER is set to off.	• On the ECG SETUP window, set the HUM FILTER to on. • Check if there is AC interference with other instruments, and remove the cause.
	2-prong power cord is used.	Use a 3-prong power cord.
	AC Line Frequency settings on the SYSTEM SETUP screen is not correct.	Select the correct frequency for your country or area.
ECG waveform does not appear on the screen although electrodes are connected properly.	• Electrode lead discontinuity. • Dirty electrode.	Replace the electrodes or leads with new ones.
	New and old or different types of electrodes are used together.	Use the same type of electrodes which are purchased together.
No sync sound.	Sync sound volume setting is low.	Increase the volume on the VOLUME window.
	Sync source is set to "SpO_2".	Set "SYNC SOURCE" to "ECG".
	Faulty speaker or speaker cable discontinuity.	Replace the speaker or speaker cable.
	Faulty MOTHER board.	Replace the MOTHER board.
QRS sync mark is not displayed.	On the ECG SETUP window, PACING REJECT is set to ON and large amplitude AC interference noise is on the ECG waveform.	• Remove the cause of the noise. • On the ECG SETUP window, set PACING REJECT to OFF.
Sync sound is irregular although there is no arrhythmia.	Noise is misjudged to be QRS.	Remove the cause of the noise.
No alarm is generated.	The Silence Alarms key on the defibrillator front panel is pressed.	Press the Silence Alarms key again.
	On the SETUP window, alarm is set to OFF.	On the SETUP window, set the upper/lower limit of each vital alarm.
	Faulty speaker or speaker cable discontinuity.	Replace the speaker or speaker cable.
	Faulty MOTHER board.	Replace the MOTHER board.
The arrhythmia alarm occurs frequently when heart rate is normal.	The dominant QRS is not appropriate for arrhythmia monitoring.	Re-learn the patient ECG.
	Patient moved or EMG noise is superimposed.	Change the electrode position to where there is less muscle.

SpO_2

Problem	Possible Cause	Action
SpO_2 value is not displayed on the screen.	The SpO_2 connection cord is disconnected from the SpO_2 connector of the defibrillator.	Connect the SpO_2 connection cord to the SpO_2 connector of the defibrillator.
	The SpO_2 probe is disconnected from the SpO_2 connection cord.	Firmly connect the probe to the SpO_2 connection cord.
	Cable discontinuity in SpO_2 connection cord or probe.	Replace the SpO_2 connection cord or probe.
	SpO_2 probe attachment to the patient is loose.	Firmly attach the probe to the patient.
Dotted lines appear instead of the pulse waveforms.	SpO_2 probe attachment to the patient is loose.	Firmly attach the probe to the patient.
	Faulty SpO_2 probe.	Replace the SpO_2 probe.
	Faulty SpO_2 connection cord.	Replace the SpO_2 connection cord.
	Faulty SpO_2 board.	Replace the SpO_2 board.
	Faulty MP/SpO_2 board.	Replace the MP/SpO_2 board.
Pulse waveform is not displayed on the screen.	SpO_2 probe is disconnected from the SpO_2 connection cord.	Connect the probe to the SpO_2 connection cord.
	SpO_2 connection cord is disconnected from the defibrillator.	Connect the SpO_2 connection cord to the defibrillator.
	Faulty SpO_2 probe.	Replace the SpO_2 probe.
	Faulty SpO_2 connection cord.	Replace the SpO_2 connection cord.
	Faulty SpO_2 board.	Replace the SpO_2 board.
	Faulty MP/SpO_2 board.	Replace the MP/SpO_2 board.
Unstable SpO_2 value.	The probe size is inappropriate.	Use the correct size probe.
	The probe is attached to the same limb that is used for NIBP or invasive blood pressure measurement.	Attach the probe to the other limb.
	An ESU is used.	Locate the ESU as far as possible from the probe and wait until the pulse wave stabilizes.
	Faulty SpO_2 board.	Replace the SpO_2 board.
	Measuring on the venous pulse.	Cannot measure correctly.
Probe is damaged.	Probe is disinfected by an unspecified procedure.	Disinfect the probe using the specified method or replace the probe with a new one.
	The probe is repeatedly used.	Replace the probe with a new one when it is deteriorated.
Sine wave noise on the pulse wave.	Light interference.	Cover the attachment site with a blanket.
No sync sound.	Sync sound volume settings is small.	Increase the volume on the VOLUME window.
	Sync source is set to “ECG”.	Set “SYNC SOURCE” to “SpO_2”.
	Faulty speaker or speaker cable discontinuity.	Replace the speaker or speaker cable.
	Faulty MOTHER board.	Replace the MOTHER board.

CO_2

Problem	Possible Cause	Action
The measured value is not displayed on the screen.	The CO_2 sensor kit cable is disconnected from the multi connector of the defibrillator.	Connect the CO_2 sensor kit cable to the multi connector of the defibrillator.
	CO_2 gas is in the inspiration.	With the CO_2 sensor kit, measurements are based on the assumption of no CO_2 gas in the inspiration. Do not connect a Jackson Rees respiration circuit or Mapleson D respiration circuit to the patient. Measurement cannot be done correctly.
	The airway adapter is dirty.	Replace the airway adapter with a new one.
	The measurement is performed where atmospheric pressure is low, such as at high altitude.	Consider the atmospheric pressure when making evaluations.
The measured value is high.	N_2O is mixed in the inspiration or when high concentration of oxygen is inspired.	Remove the cause and measure again.
The measured value is inaccurate.	Jackson Rees respiration circuit or Mapleson D respiration circuit is connected to the patient.	Cannot measure correctly. Do not connect a Jackson Rees respiration circuit or Mapleson D respiration circuit to the patient.
	The respiration rate of the patient is very high.	Cannot measure correctly.
	The respiration is irregular.	Cannot measure correctly.
	Oscillation	Check the respirator and remove the cause.
	Currently doing suction.	Do not let the suction catheter in the airway adapter.
CO_2 value does not change.	The airway adapter is detached from the patient.	Check the airway adapter attachment.
	The patient is in apnea.	The previous value is displayed on the screen until the next inspiration is detected. Check patient ventilation.
	Faulty CO_2 sensor kit.	Replace the CO_2 sensor kit.
The respiration waveform does not appear.	Oscillation	Check the respirator and remove the cause.
	The CO_2 sensor is disconnected from the respiration circuit.	Connect the CO_2 sensor to the respiration circuit.
	Faulty CO_2 sensor kit.	Replace the CO_2 sensor kit.
	Faulty MP/SpO_2 board.	Replace the MP/SpO_2 board.
The red LED on the CO_2 adapter blinks.	CO_2 sensor or CO_2 adapter is faulty.	Replace the CO_2 sensor or CO_2 adapter with a new one.
	The respiration has not been detected for longer than 20 s.	The red LED blinks when the respiration has not been detected for longer than 20 s regardless of the alarm setting on the defibrillator.

Recording

Problem	Possible Cause	Action
Printing is blurred. Dots are missing.	The thermal head is dirty.	• Clean the thermal head with Nihon Kohden specified head cleaning pen (option). If it does not solve the problem, the recorder unit is faulty. Replace the recorder unit. • Perform the RECORDER TEST on the SYSTEM SETUP screen to check the print function.
	Nihon Kohden specified paper is not used.	Use Nihon Kohden specified recording paper.
Recording paper cannot be set correctly.	Nihon Kohden specified paper is not used.	Use Nihon Kohden specified recording paper.
Nothing is printed.	The recording paper is not loaded.	Load recording paper.
	Recorder door is not properly closed.	Close the door until it clicks.
	The recording paper is set with the wrong side facing up.	Set the recording paper correctly.
	Faulty REC board.	Replace the REC board.
	Faulty recorder unit.	Replace the recorder unit.
	Faulty MOTHER board.	Replace the MOTHER board.
Paper skews to one side.	The recording paper is not loaded correctly.	Set the paper straight.
Printout is faint.	The recorder unit temperature is too hot.	Put the defibrillator in a cooler place. If this does not solve the problem, the recorder unit or MOTHER board is faulty. Replace the recorder unit or MOTHER board.

Battery

Problem	Possible Cause	Action
The battery charging lamp or battery charging completion lamp is blinking.	The battery temperature is out of specified range.	Place the defibrillator in the place at the specified range.
After starting battery charging, the charging stops. (Neither battery charging lamp nor battery charging completion lamp lights.)	Faulty battery pack.	Replace the battery pack with a new one.
	When battery pack replacement does not solve the problem, MOTHER board is faulty.	Replace the MOTHER board.
The “REPLACE BATTERY” message appears.	The battery pack is deteriorated.	Replace the battery pack with a new one.

SD Card

Problem	Possible Cause	Action
Data cannot be saved in the SD card.	Upgrade kit is inserted instead of an SD card.	Insert a card for storage.
	The card is not inserted.	Insert a specified card.
	The card is not inserted properly.	Properly insert the card.
	A card other than specified card is inserted.	Insert a specified card.
	Memory is full.	Use a new card or delete unnecessary data.
	The card is write-protected.	Remove the write-protect.
	The card is not formatted.	Format the card in the SYSTEM SETUP screen.
	The SD card was removed while the defibrillator power was on and the defibrillator was affected by static electricity.	Turn the MOTHER dial to the OFF position to turn the defibrillator off then turn the defibrillator on again.

3 Disassembly

The procedures in this section explain how to remove or disassemble major components in the defibrillator.

Before you Begin

Caution

⚠ CAUTION

Before disassembling the defibrillator, be sure to cut off the power from the defibrillator.

- If the AC power lamp is lit, set the control dial to OFF to turn off the power.
- Disconnect the power cord from the defibrillator.
- Remove the battery pack from the defibrillator.

Refer to “Removing the Battery Pack” (p.3-12) for removing the battery pack.

Required Tools

- Anti-static bench mat
- Wrist ground strap
- Screwdriver (insulated type, for M2.6 and M3 screws)[1]
- Hex socket driver (for 3 mm spacer bolt and nut)[1]
- Tweezers

[1] Use a screwdriver and hex socket driver with managed torque.

Screws and Spacer Bolts

Basic Screws

Outside (Except for L-ECG unit)

Part	Function
BH4×10	Fixing the defibrillator front and rear case (including handle)
BH3×8	Fixing the defibrillator left and right side and paddle holder

Inside

Part	Function
BH3×8	Fixing the resin part
PS3×8	Fixing metal parts or boards
3×8 P screw	Fixing the inside the front case (Tightening torque 68.6 N•cm)

Other Screws and Spacer Bolts

Part	Qty	Function
PSW3×8	1	Fixing the HV chassis and screws for HV spring
3×11 spacer bolt	1	Fixing the HV drive to the HV unit (upper left corner)
PSW3×8	1	Fixing the cable tie of the harness between the HV DRIVE and PACER boards to the spacer bolt
PS3×10	2	Fixing the plate of the HV unit to the AC unit inside the defibrillator (upper part)
PS3×8	2	Fixing the plate of the HV unit to the AC unit inside the defibrillator (lower part)
PSW2×4	4	Fixing the LCD to the plate (beside LCD)
3 ×8 P screw	2	Fixing the OP-CONN board to option case (Tightening torque 68.6 N•cm)
P2204-2 P screw	4	Fixing the front bezel from the rear side to the front
Washer	4	
3×8 P screw	5	Fixing the UR-0488 to the front case (Tightening torque 68.6 N•cm)
BH3×12	2	Tightening the battery connector and cover to the front
PSW3×10	4	Prepare the screws in the bed rail hook attachment area of the rear of the defibrillator (waterproofed)

Screw Torque

To prevent loosening, damage or deformation of screws, tighten the screws with the specified torque. The following table shows the rated value for each screw.

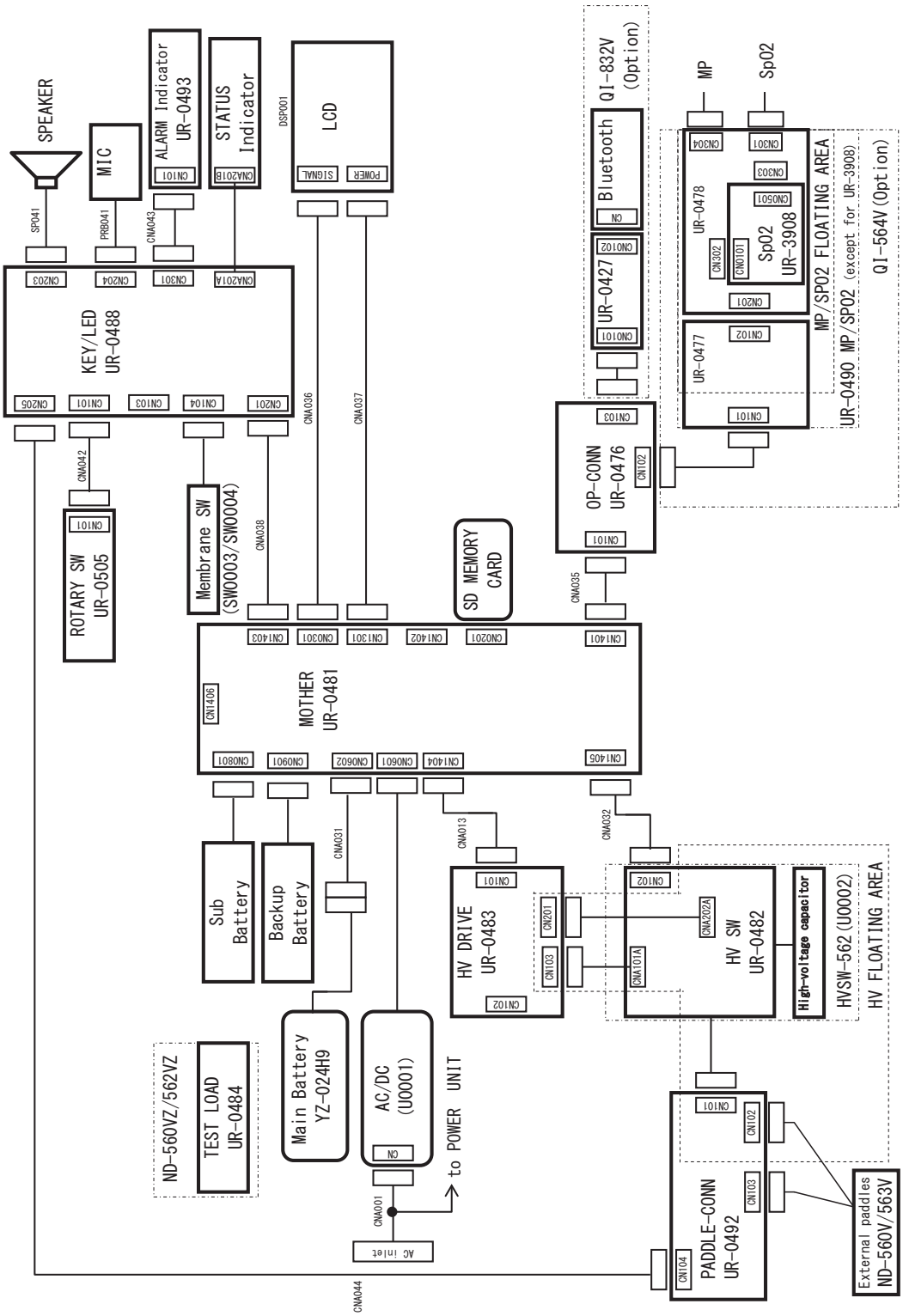
Nominal Diameter	Standard Torque (N•cm)	Tightening Torque (N•cm)
M2	18.6	15.7 to 20.6
M2.3	29.4	24.5 to 33.3
M2.6	41.2	36.3 to 47.0
M3	65.7	55.9 to 75.5
M4	152.9	130.3 to 174.4
M5	307.7	263.6 to 351.8
M6	521.4	445.9 to 595.8

Depending on where the screw is used, a different torque may be specified. Use the specified torque.

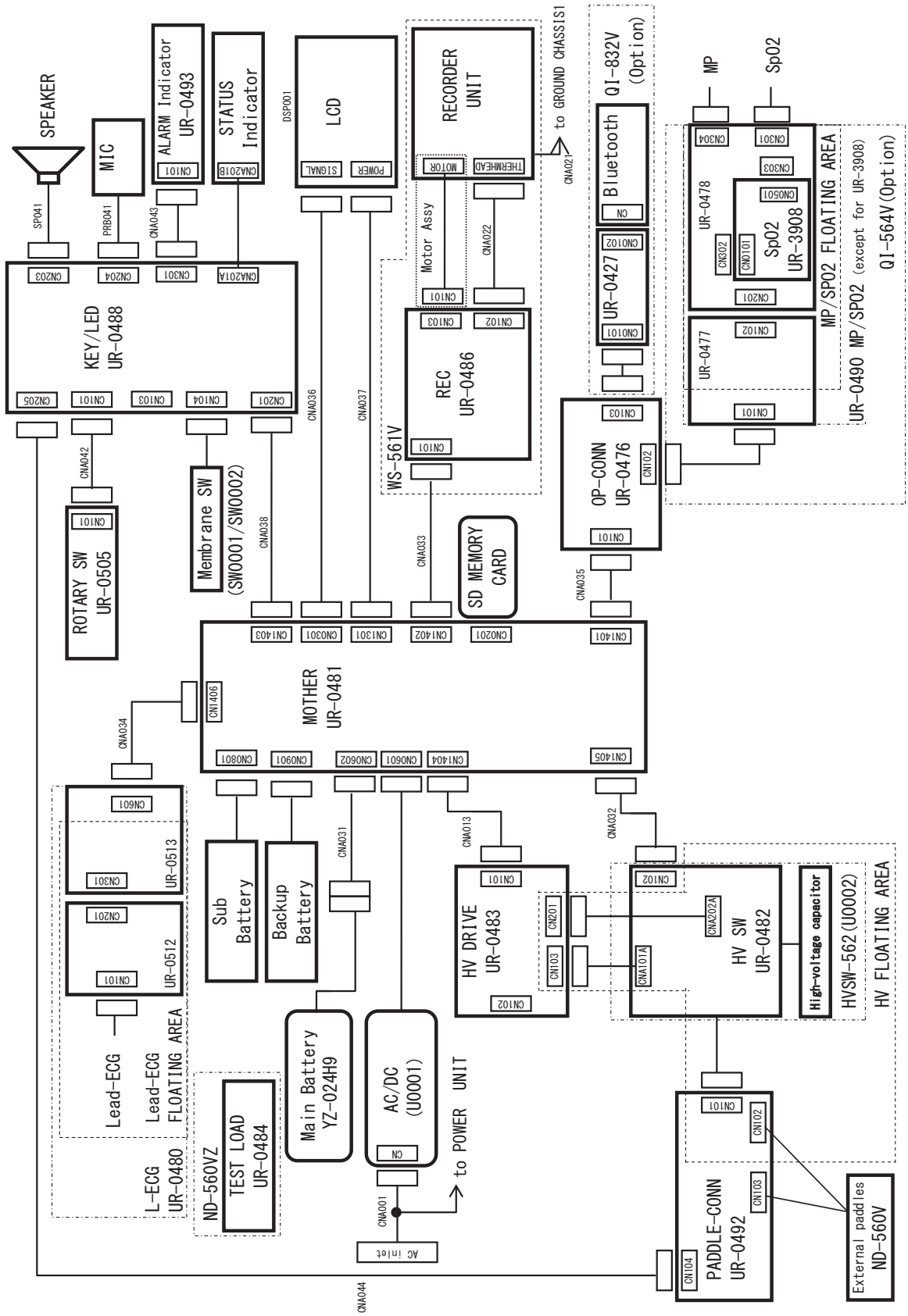
Connection Diagram

For replacing the cable or harness, refer to “Cable List” (p.3-11)“.

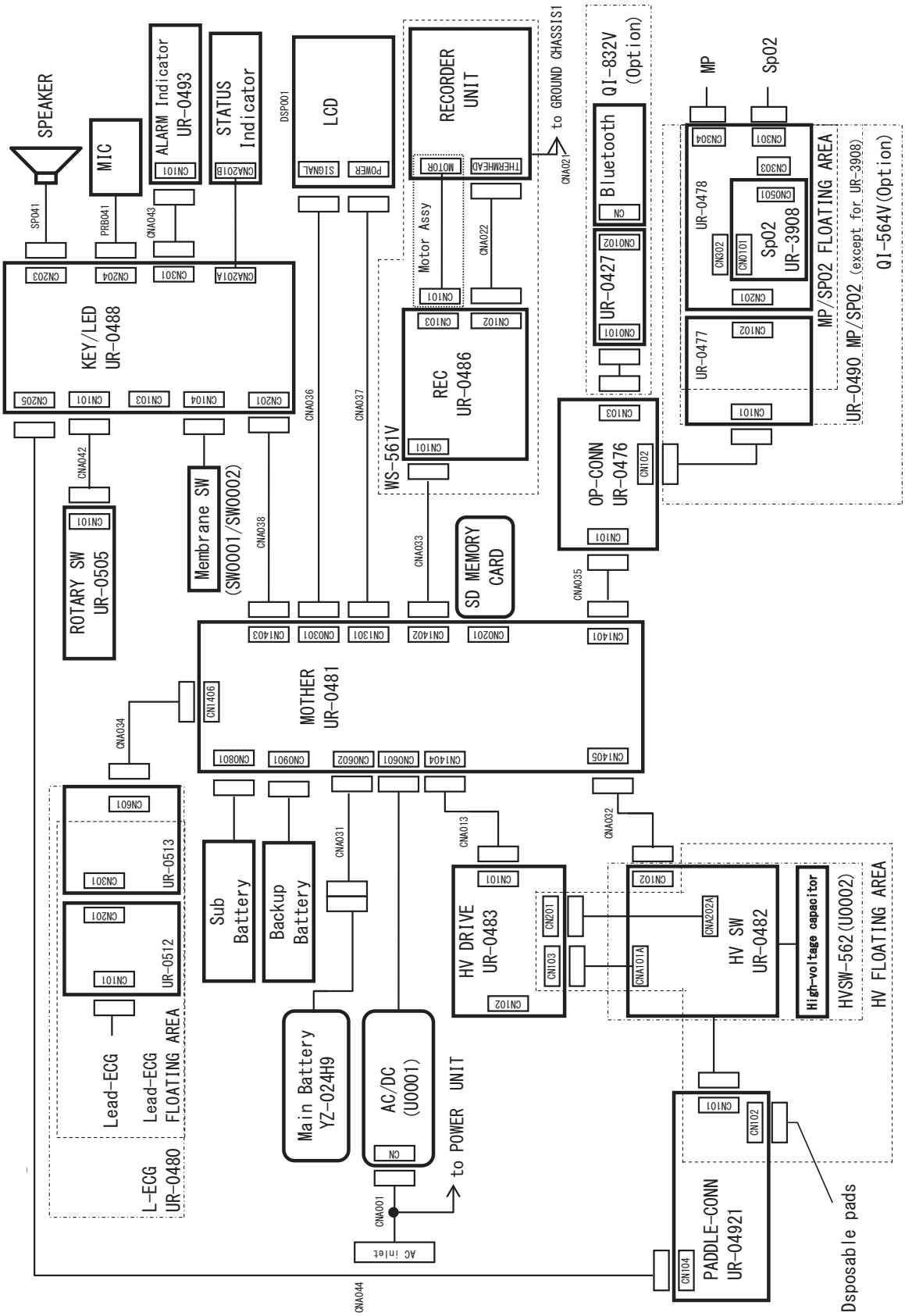
TEC-5601 Defibrillator



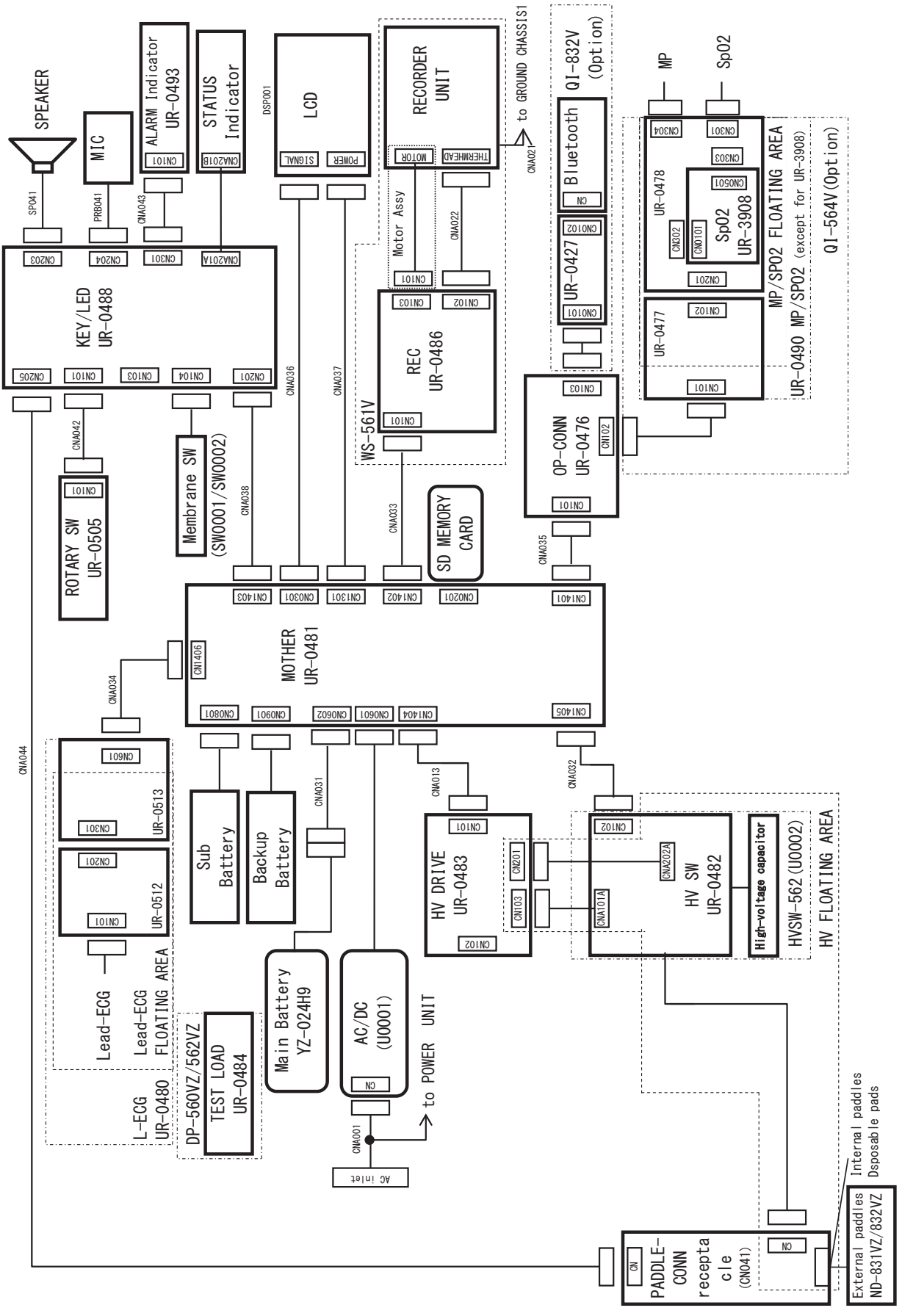
TEC-5602 Defibrillator



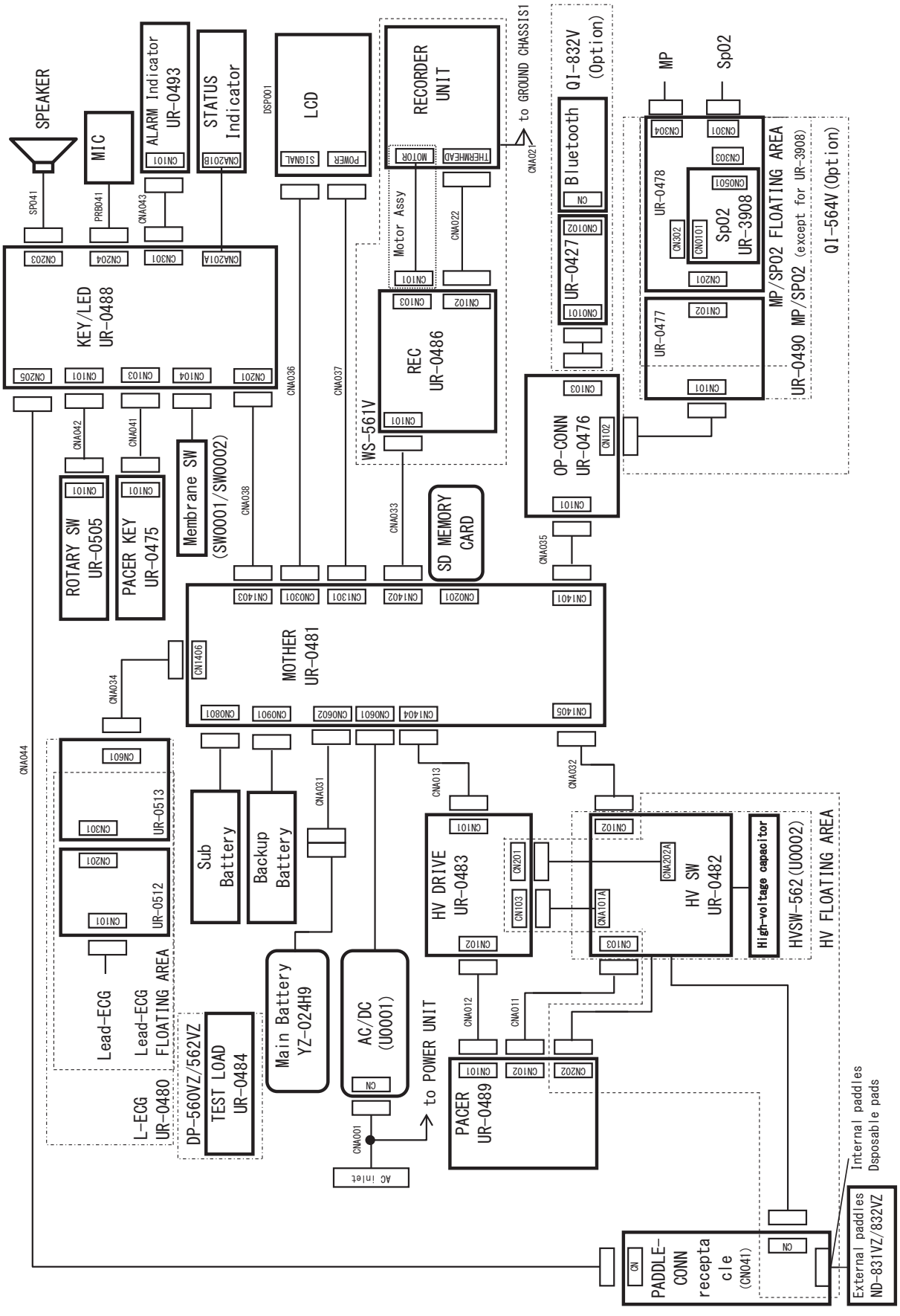
TEC-5611 Defibrillator



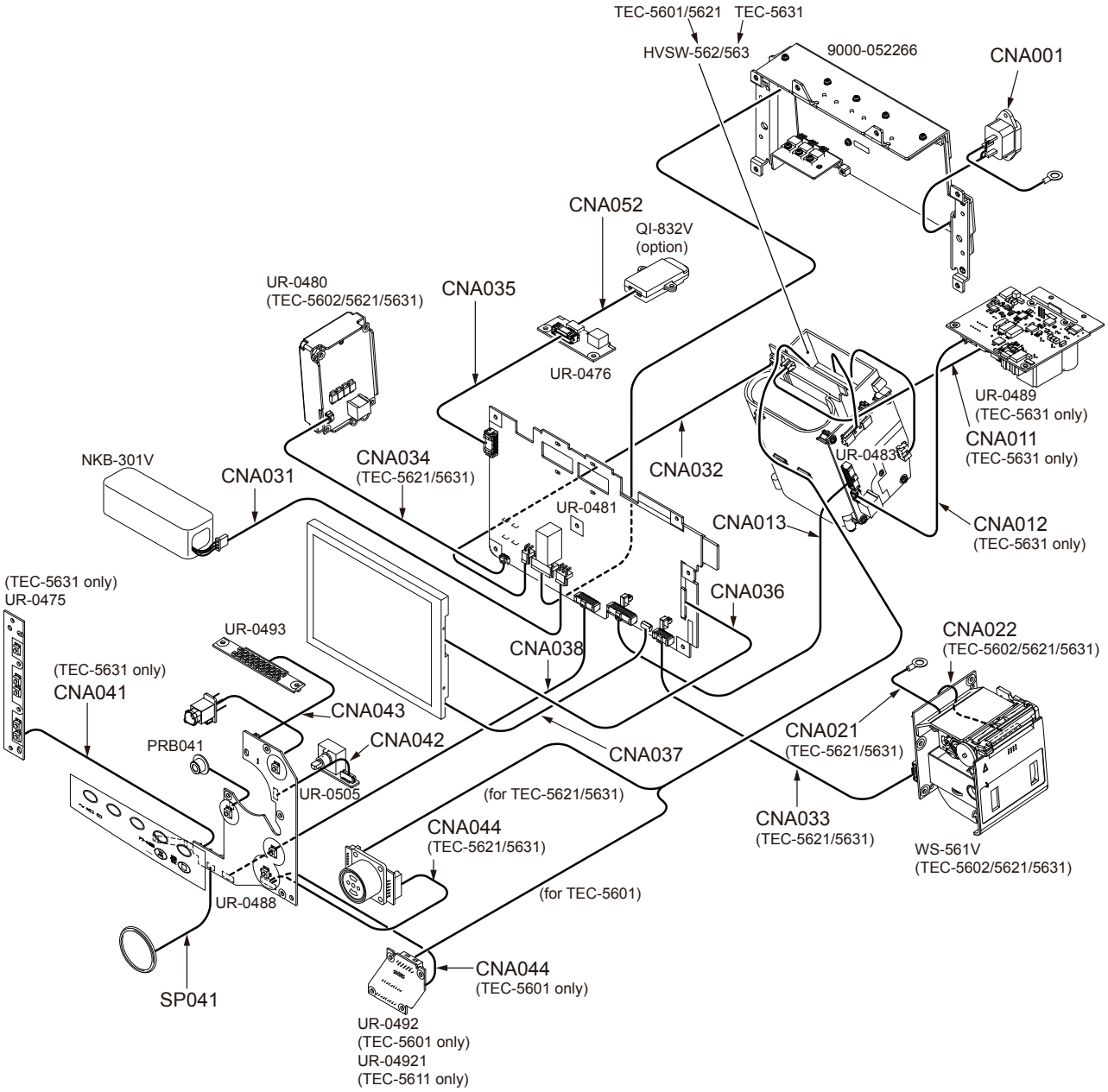
TEC-5621 Defibrillator



TEC-5631 Defibrillator



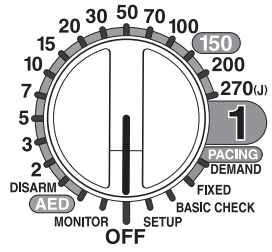
TEC-5600 series Connection Diagram



Cable List

Location Number	Code No.	Qty	Description
CNA001	9000-050107	1	CABLE, CNA001 AP-300/2CON, W90/40
CNA011	9000-050125	1	CABLE, CNA011 PAP-02V-S, W150
CNA012	9000-050143	1	CABLE, CNA012 501189-2010, W145
CNA013	9000-050152	1	CABLE, CNA013 501189-5010, W70
CNA021	9000-050161	1	CABLE, CNA021 V1.25-3, S120
CNA022	9000-055646	1	CABLE, CNA022 51021-1500, W75
CNA031	9000-050116	1	CABLE, CNA031 VHR-3N/1-179553-3, W100
CNA032	9000-050134	1	CABLE, CNA032 VHR-2N, W130
CNA033	9000-008876	1	CABLE, CNA033 501189-3010, W70
CNA034	9000-050188	1	CABLE, CNA034 501330-0700, W60
CNA035	9000-050197	1	CABLE, CNA035 503110-3000, W80
CNA036	9000-050214	1	CABLE, CNA036 FI-S20S, W160
CNA037	9000-050348	1	CABLE, CNA037 SHR-08V-S-B, W60
CNA038	9000-050223	1	CABLE, CNA038 501189-4010, W140
CNA041	9000-050232	1	CABLE, CNA041 51021-0800, W175
CNA042	9000-050241	1	CABLE, CNA042 ZHR-7, W40
CNA043	9000-050259	1	CABLE, CNA043 ZHR-8, W100
CNA044	9000-050277	1	CABLE, CNA044 502578-1200, W105
CNA052	9000-050205	1	CABLE, CNA052 3240-8P-C, W100
PRB041	9000-050268	1	CABLE, PRB041 ZHR-2/KUC3523, W70
SP041	932929B	1	SPEAKER, TL-C40U0837

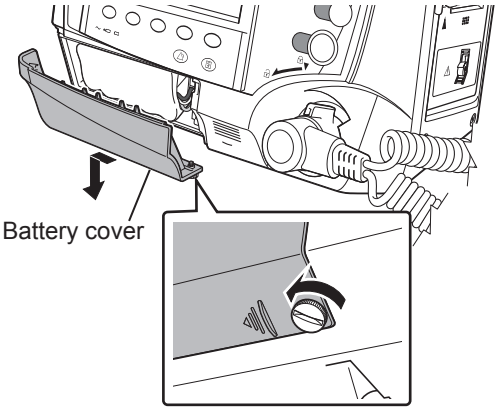
Removing the Battery Pack



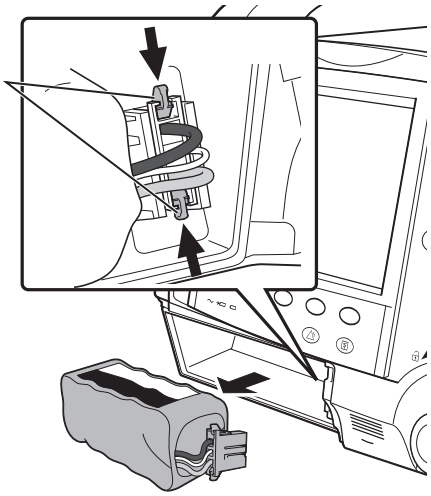
1 Set the control dial to OFF to turn off the power, then disconnect the power cord from the defibrillator.

> **⚠ CAUTION**
>
> When inserting or removing the battery, disconnect the power cord from the defibrillator. Otherwise, the operator may receive electrical shock.

NOTE: Never disconnect the power cord while the “Saving data and shutting down. Do not touch the AC power cord” message is displayed. Otherwise, the data in the defibrillator may be damaged.



2 Loosen the screw with a flat-blade screwdriver, and remove the battery cover.

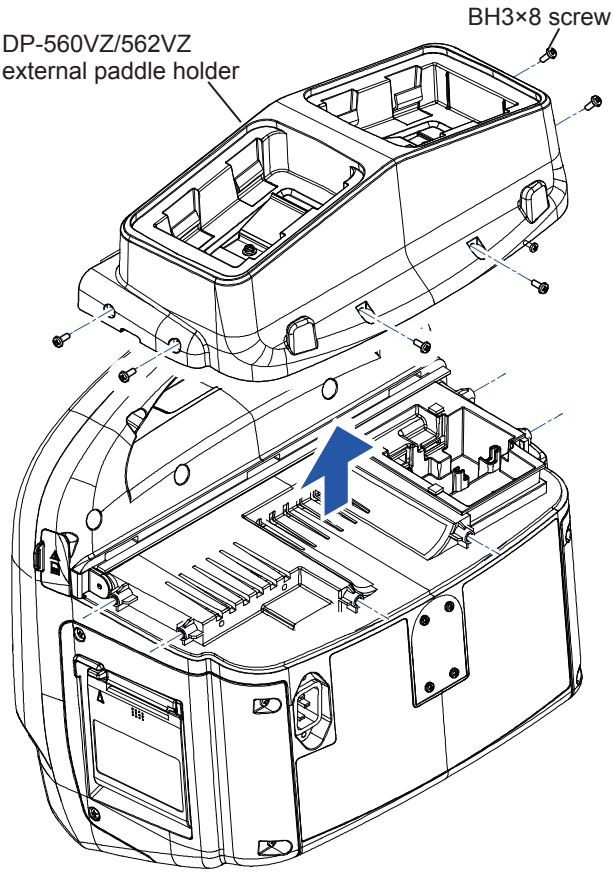


3 Disconnect the battery cable connector and remove the battery pack from the battery case.

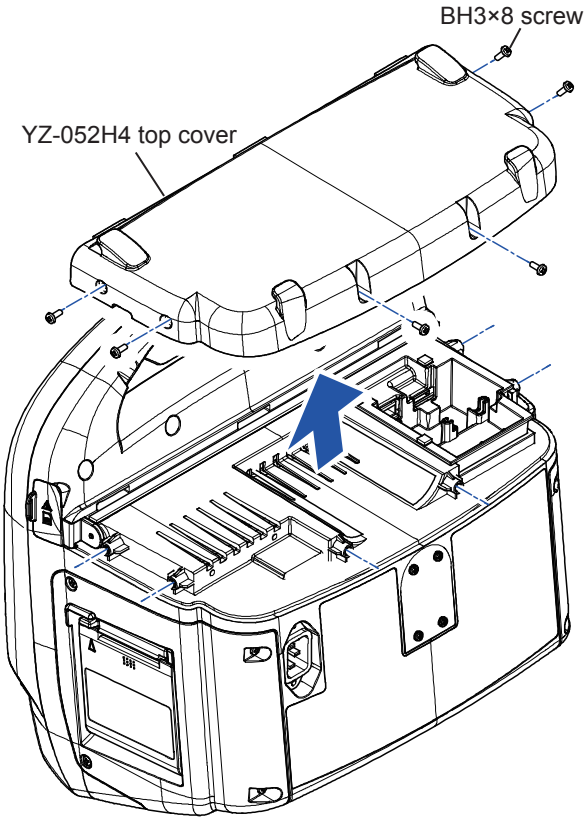
NOTE: Do not pull the cable forcibly. Disconnect the cable while holding the lock pressed.

Removing the External Paddle Holder

Remove the six BH3×8 screws which secure the DP-560VZ or DP-562VZ external paddle holder. (TEC-5601/5602/5621/5631 only).



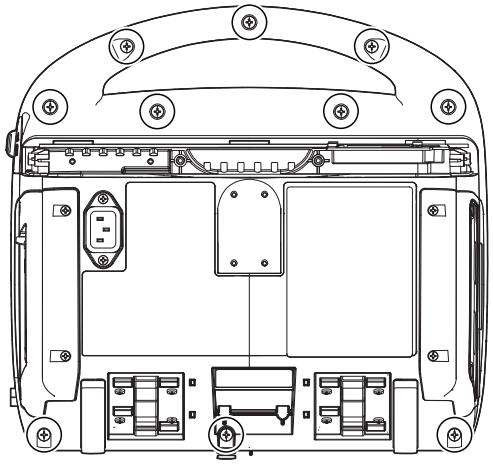
If the YZ-052H4 top cover is installed to use the disposable paddles, remove the six BH3×8 screws and remove the top cover.



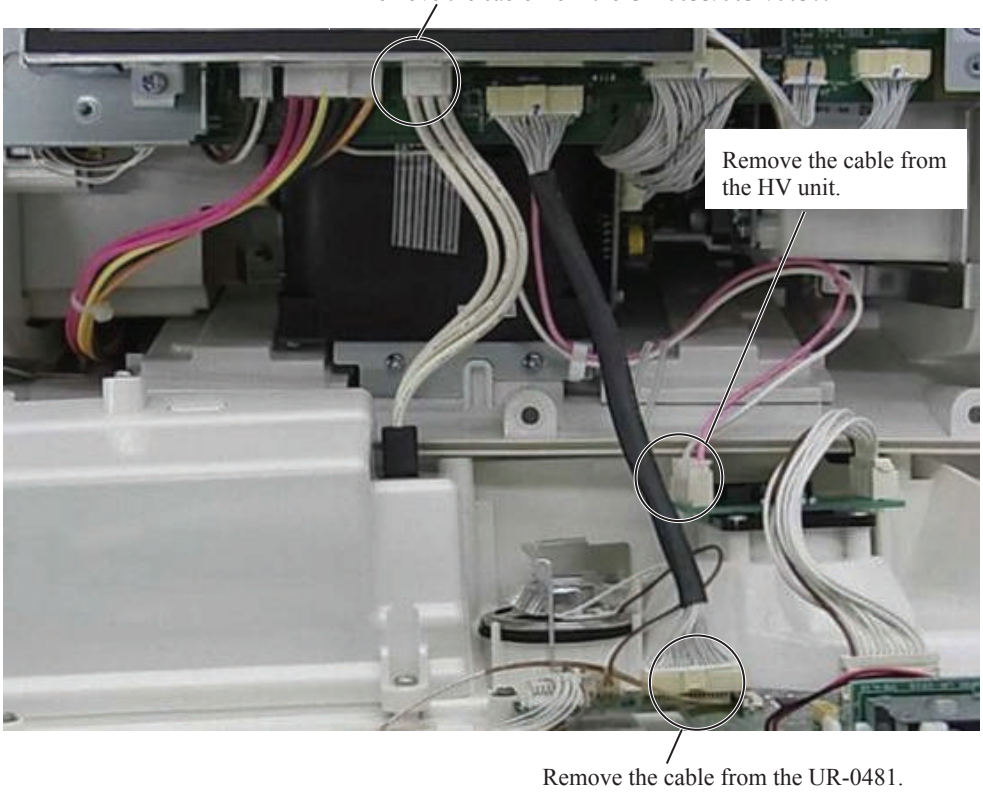
Removing the Front Case and Rear Case

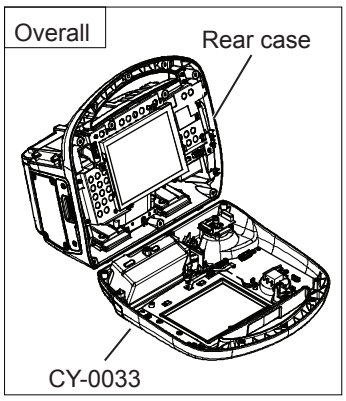
1 Remove the ten BH4×10 screws which secure the front case and rear case.

This example shows TEC-5631.



2 Remove the harnesses which connects at the front and rear side.





Note for Reassembling the Defibrillator after the Front Case and Rear Case Replacement

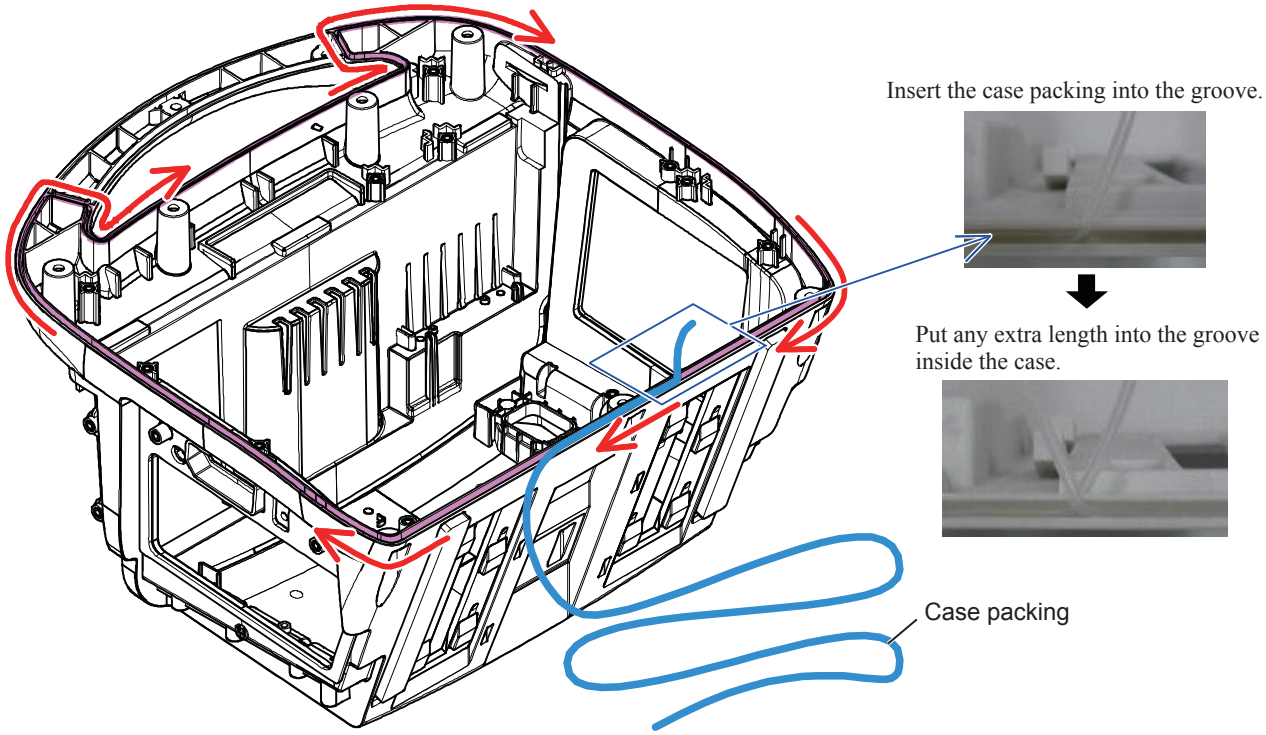
NOTE: If it is difficult to align the handle parts of front and rear cases, press the handle halves together while attaching the center screw.

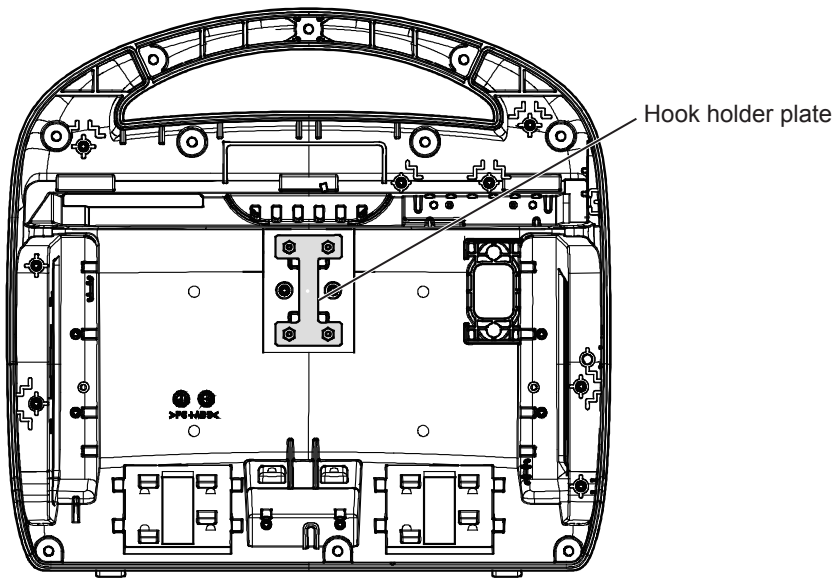
Disassembling the Rear Case

NOTE: The hook holder plate can be reused. When attaching the hook holder plate, be careful not to confuse the front and rear side. The press nut side is front.

Note for Reassembling the Rear Case

NOTE
- Replace the case packing when replacing the rear case.
- Insert the case packing in the peripheral groove without stretching or compressing it.

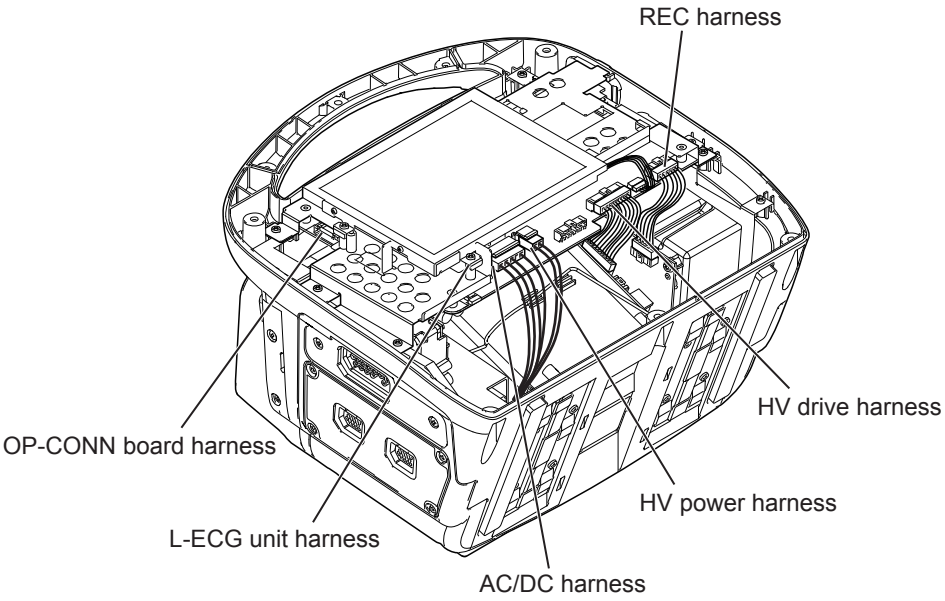




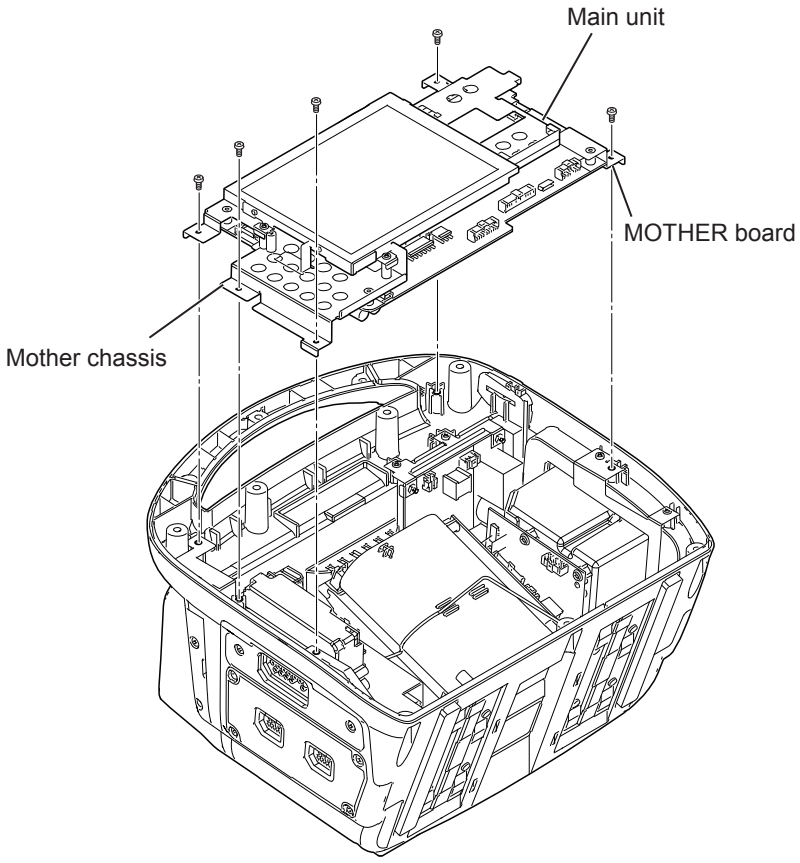
Removing the Main Unit

1 Remove the harnesses of OP-CONN board, L-ECG unit, HV power, AC/DC and HV drive.

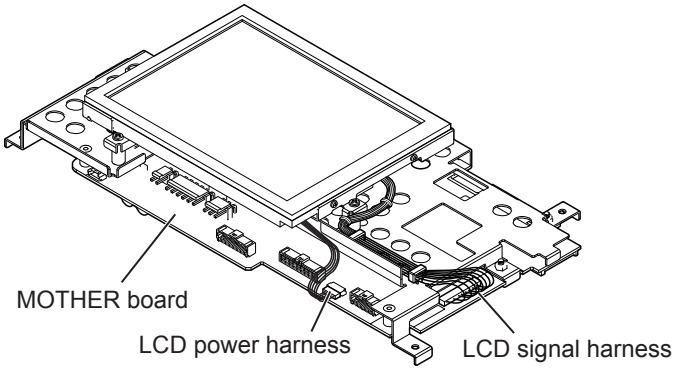
NOTE: The harness of OP-CONN board is located at the top left. Do not to remove the harness.



2 Remove the five PS3×8 screws which secure the main unit to the chassis.



3 Remove the LCD signal harness and LCD power harness from the MOTHER board connector.

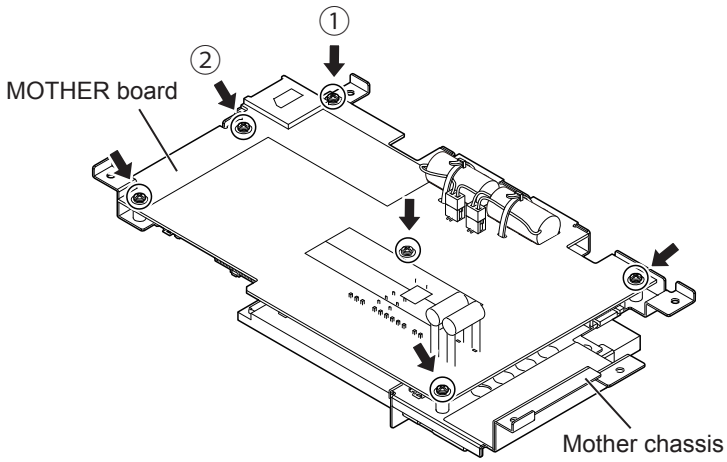


4 Remove the six PS3×8 screws which secure the MOTHER board to the mother chassis.

1) Remove the screw from position 1.

2) Remove the screw from the position 2.

3) Remove any other screws.

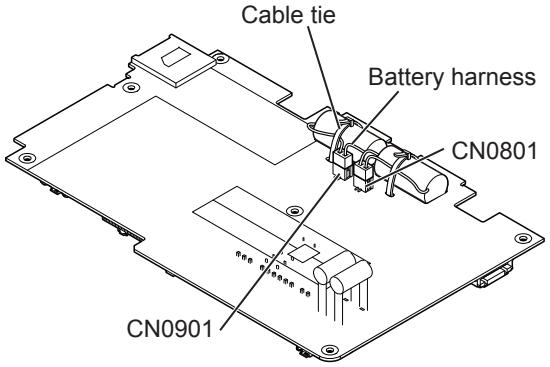


5 Remove the right battery harness on the MOTHER board from the CN0801.

6 Remove the left battery harness on the MOTHER board from the CN0901.

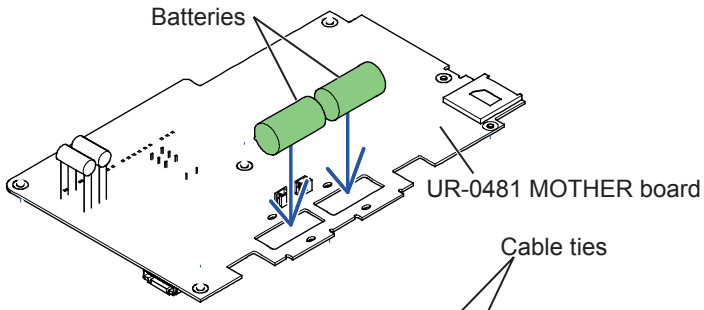
7 Cut the BK-1 cable tie which secures the CR-2/3AZC36K battery and remove the two batteries from the two battery cases.

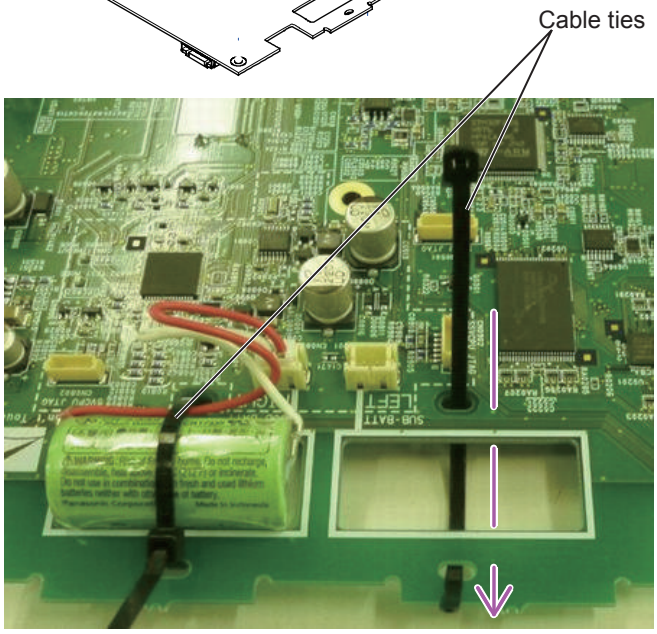
NOTE: Replace the two CR-2/3AZC36K batteries at the same time. The cable tie is cut when replacing the batteries. When ordering the two CR-2/3AZC36K batteries also order two BK-1 cable ties.



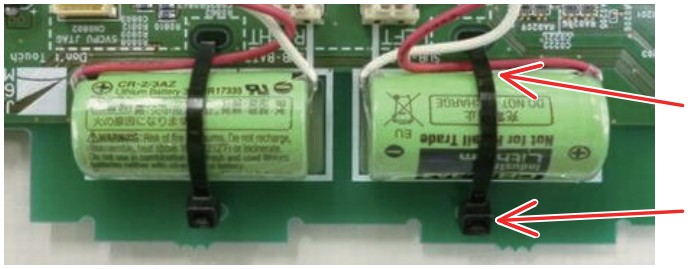
Note for Replacing the Batteries on the UR-0481 MOTHER Board

Note the following points when replacing the CR-2/3AZC36K batteries.

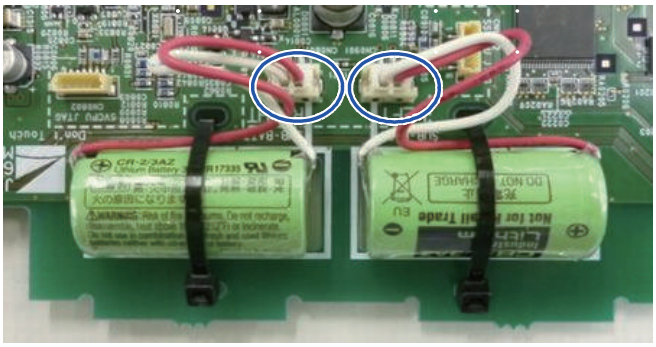




- Pass the cable tie through the board in the direction of the arrow.



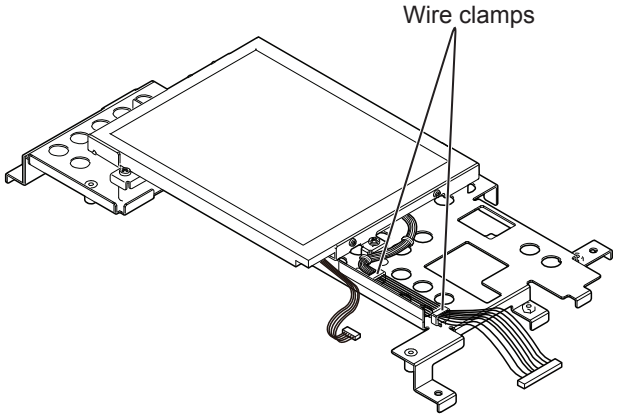
- Locate the CR-2/3AZC36K batteries on the UR-0481 MOTHER board and secure them with a cable tie.
- Make sure that the cable is not pinched between the cable tie and battery.
- Fix the cable tie so that the joint comes to the board side.



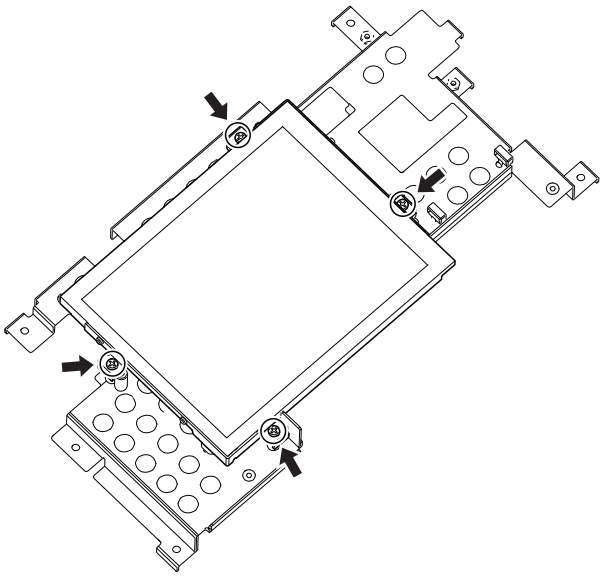
- Immediately after fixing the batteries with the cable ties, connect the battery cable to the board connector. If there is a delay of more than 30 seconds between connecting the left and right side of the battery cable to the board connector, an error occurs after the assembly.

If an error occurs, delete the error history after the battery replacement. To delete the history, refer to “Deleting the Operation History” (p.4-122).

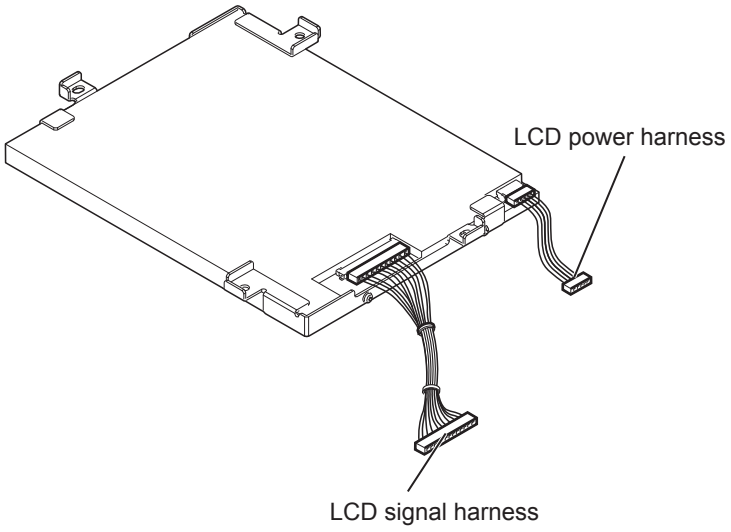
8 Remove the clamp of the LCD signal harness, and then two white wire clamps from the lower right of the LCD through the hole of the main frame.



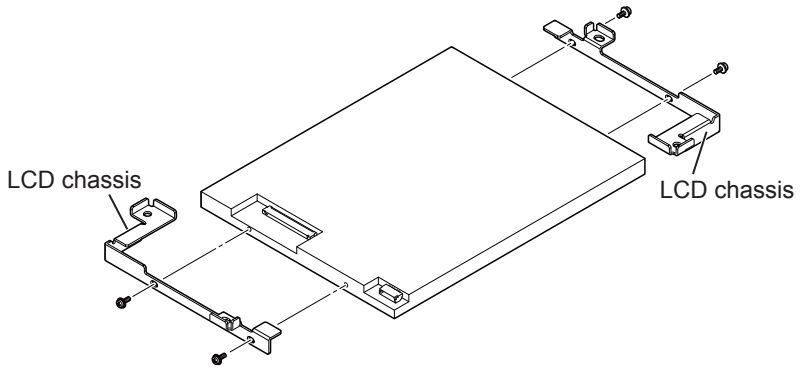
9 Remove the four PS3×8 screws which secure the LCD chassis to the mother chassis.



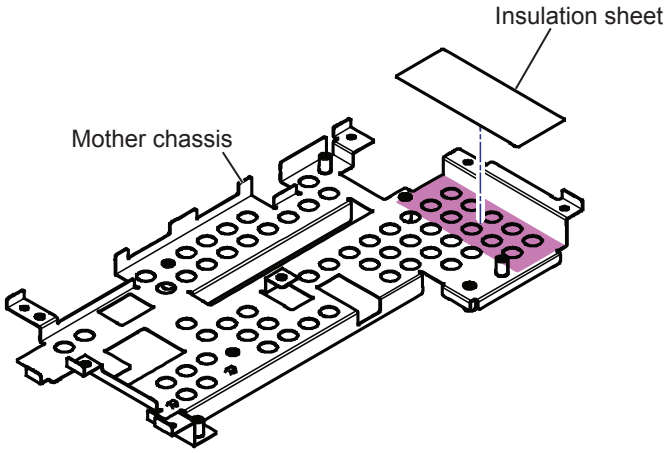
10 Remove the LCD signal harness and LCD power harness.



11 Remove the four PSW2×4 screws which secures the LCD chassis to the right and left side of the LCD.

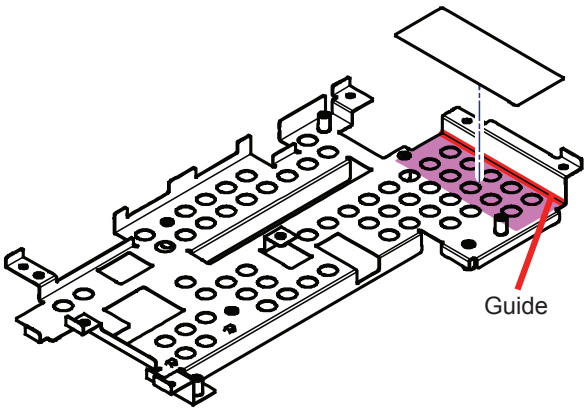


12 Remove the insulation sheet from the main frame plate.



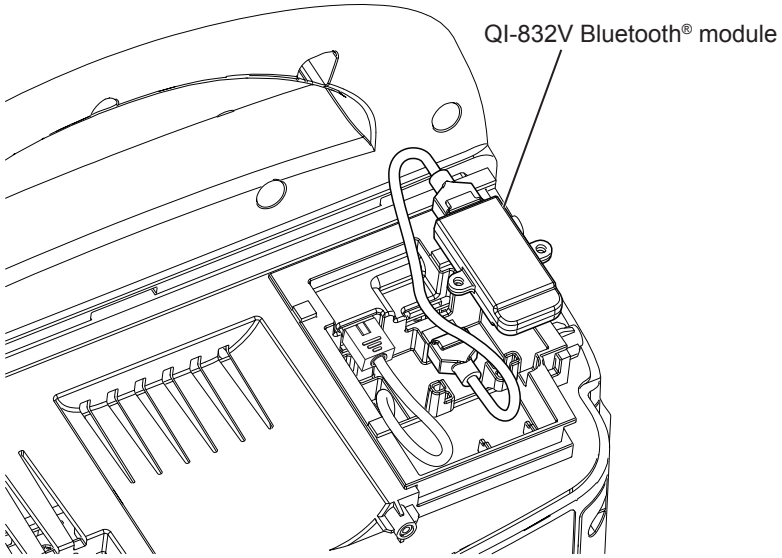
Note for Replacing the Insulation Sheet

The insulation sheet protects the L-ECG unit to be exposed. Wipe the attachment area with alcohol when replacing the insulation sheet.



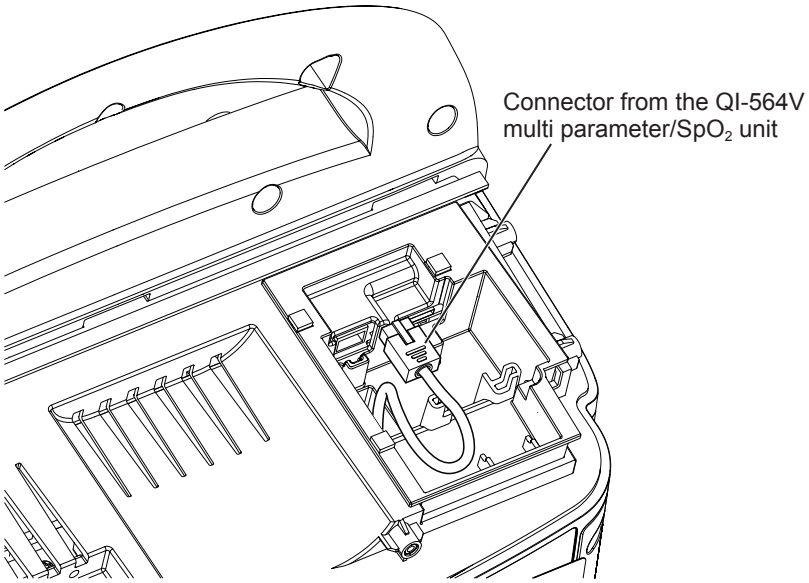
Removing the Option Case

1 When the QI-831V Bluetooth® module is installed, remove the module.

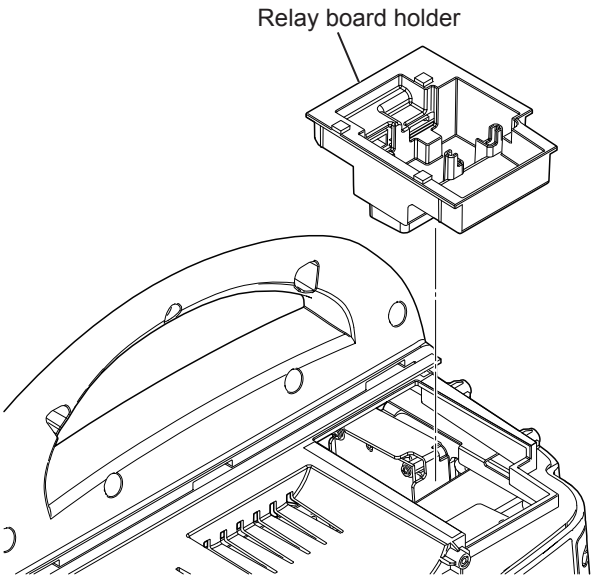


2 When the QI-564V multi parameter/SpO_2 unit is installed, remove the unit.

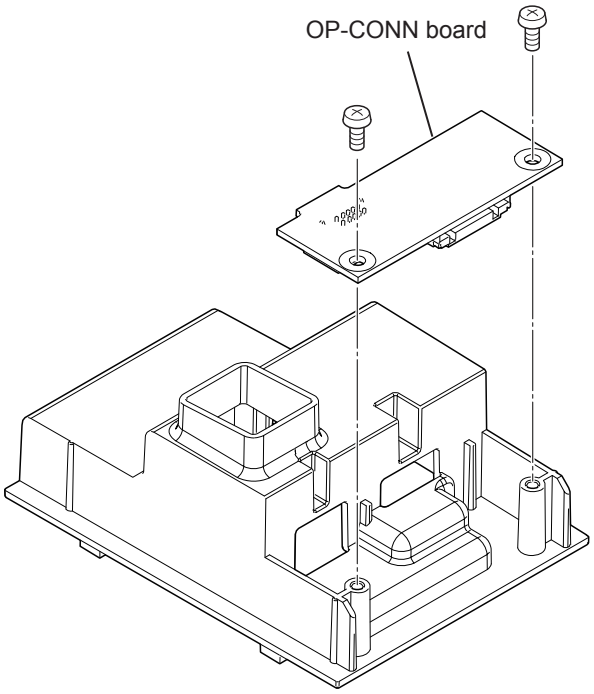
NOTE: When removing the unit, press the connector tab on the QI-564V multi parameter/SpO_2 unit connector with tweezers firmly.



3 Remove the relay board holder from the defibrillator. It is only inserted, not fixed.

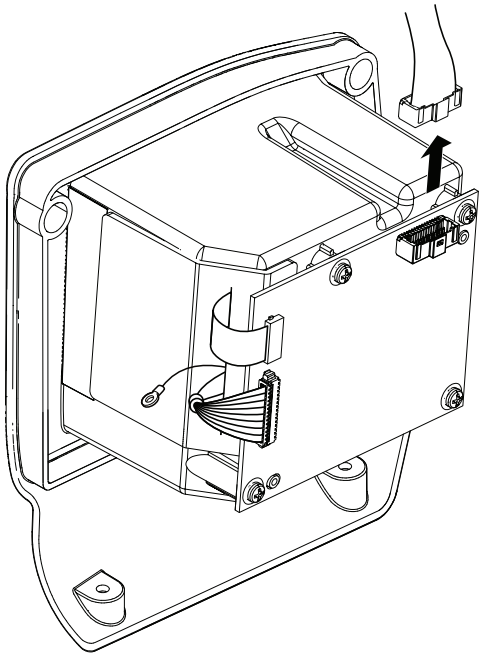


4 Remove the two 3×8 P screws which secure the OP-CONN board to the upper option case. (Tightening torque 68.6 N•cm)

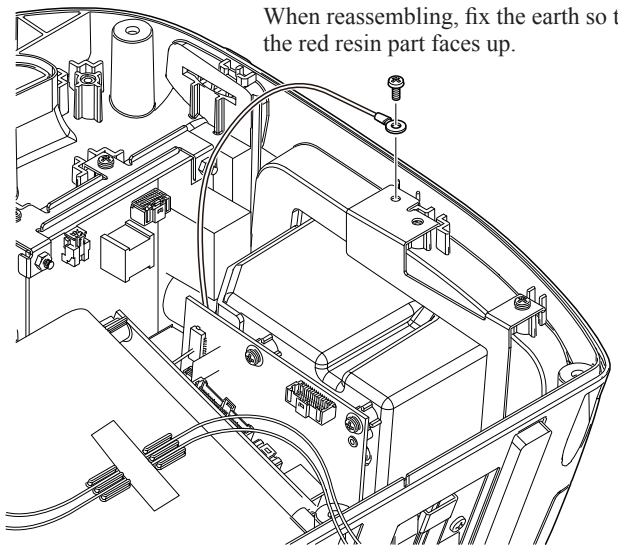


Removing the Recorder Unit

1 Remove the recorder signal harness.

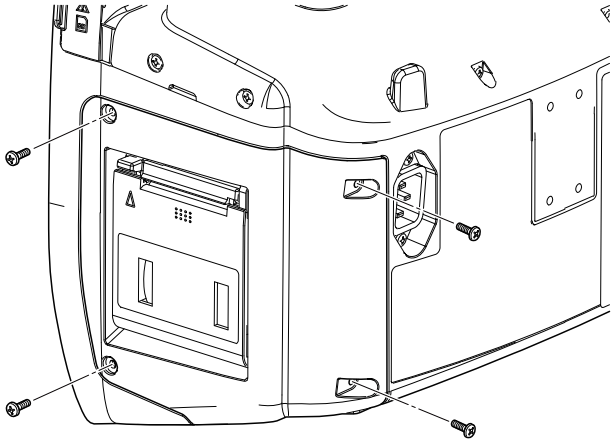


2 Remove the PS3×8 screw which secures the earth wire from the WS-561V recorder unit.

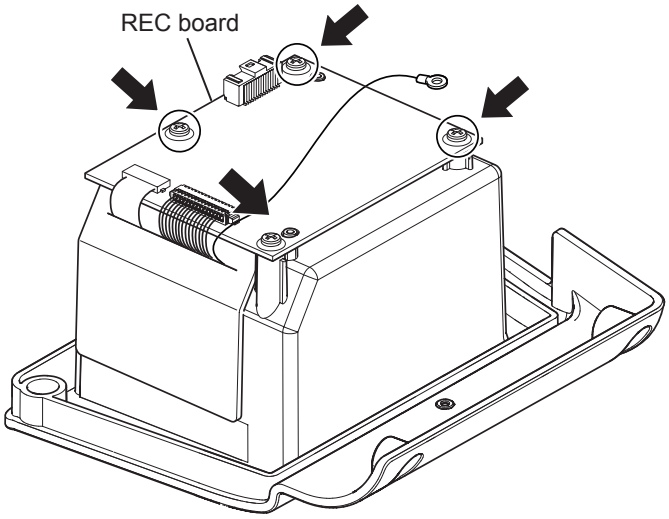


NOTE: When attaching the earth wire, fix the earth wire at the angle shown above so that the mother chassis does not bump into the earth wire when installing the mother chassis.

3 Remove the four BH3×8 screws which secure the recorder unit.

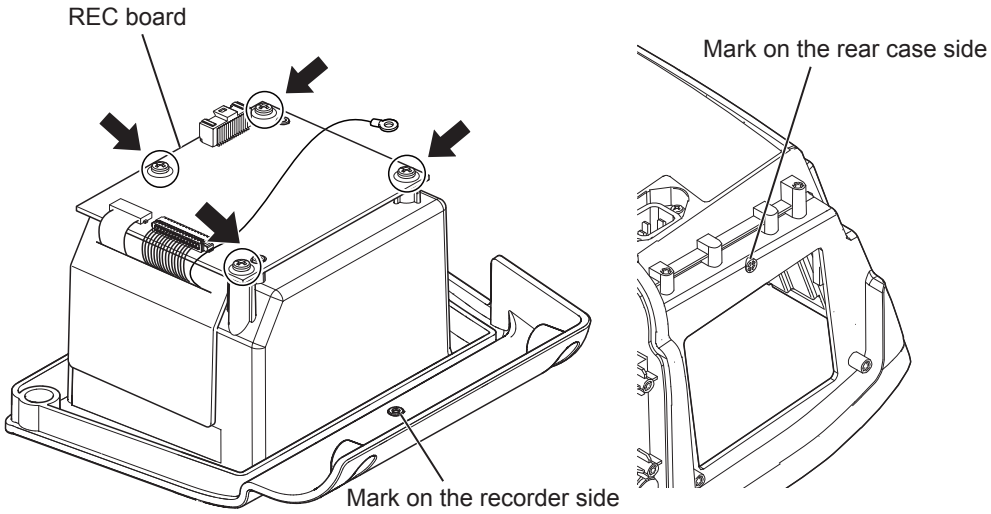


4 Remove the four PS3×8 screws which secure the REC board.

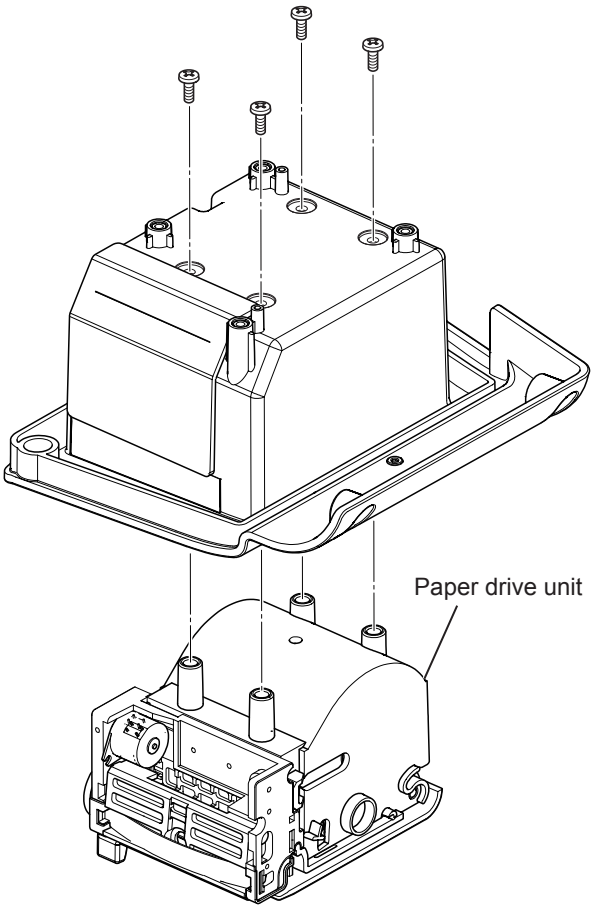


Note for Reassembling the Recorder Unit

When reassembling, align the line of the recorder unit and defibrillator. The recorder unit has a mark on the rear side and there is a corresponding mark on the defibrillator. By pressing and holding the curved side at the middle of the two screws, the position can be aligned with the line.

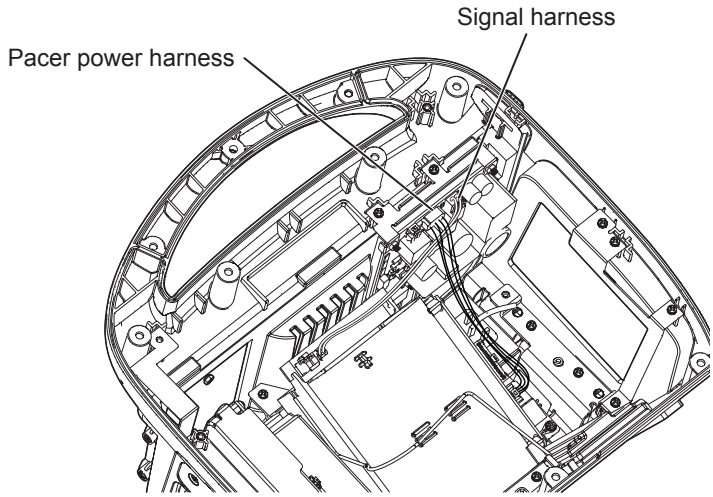


5 Remove the four BH3×8 screws which secure the paper drive unit to the recorder case.



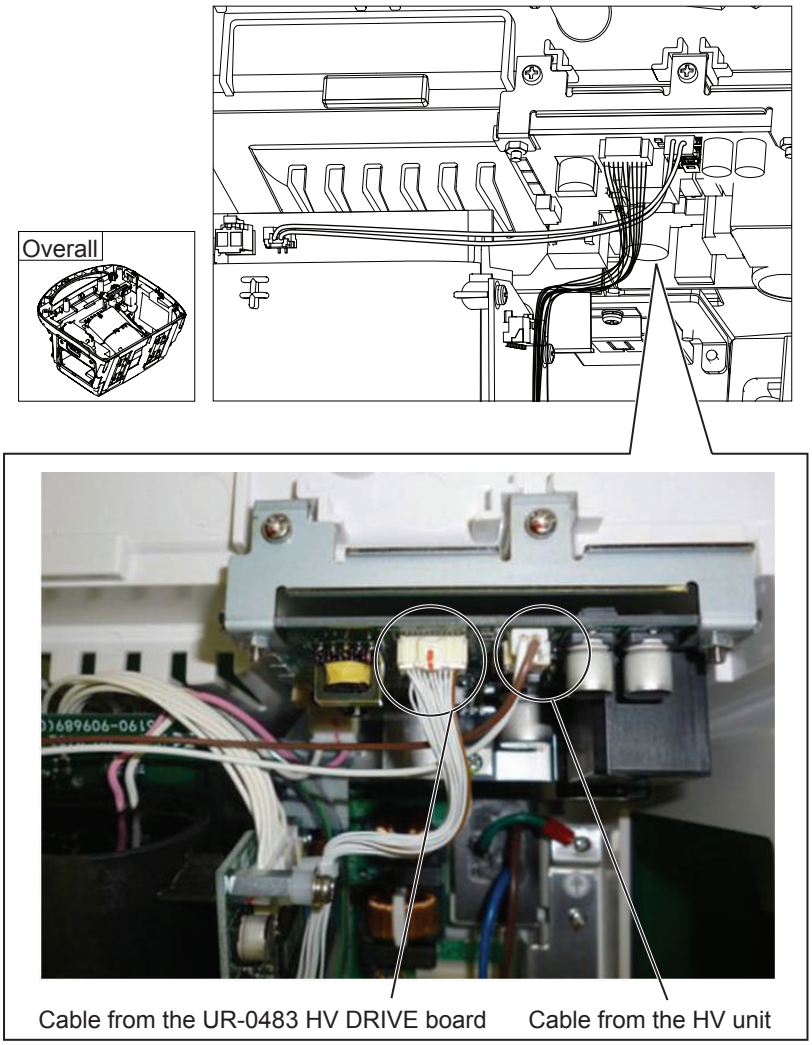
Removing the PACER Board

1 Remove the signal harness, and then remove the pacer power harness (brown and white cables).



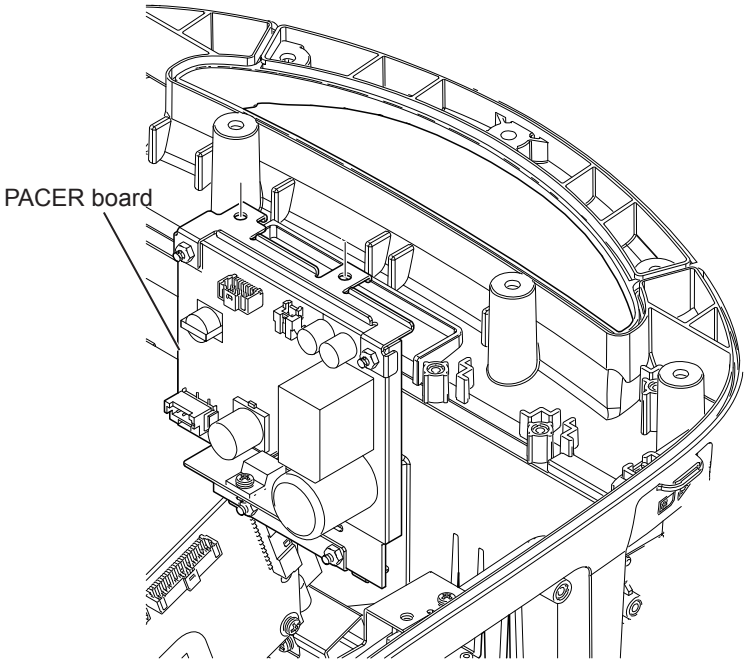
When rewiring, wire the them in the following position.

NOTE: Incorrect rewiring affects the EMC performance of the defibrillator.



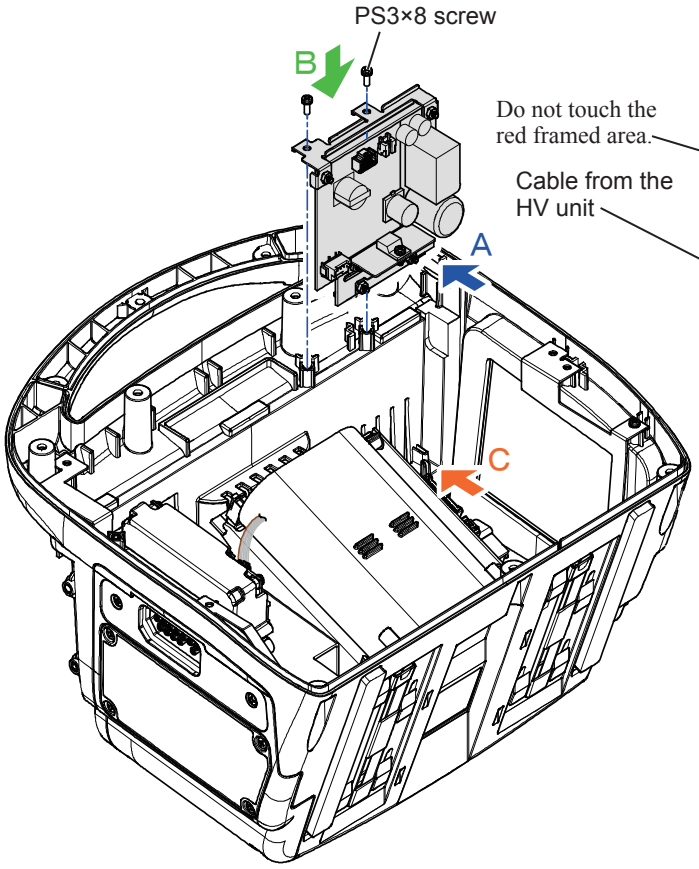
2 Remove the HV power harness.

3 Remove the two PS3×8 screws on the front and two BH3×8 screws on the rear which secure the UR-0489 PACER board.



Note for Installing the UR-0489 PACER Board

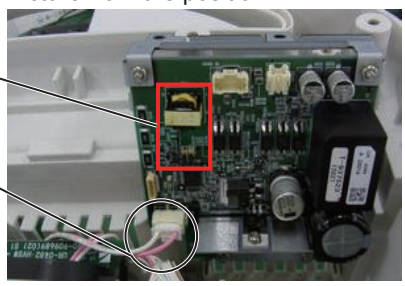
Be careful of the following points when installing the UR-0489 PACER board.



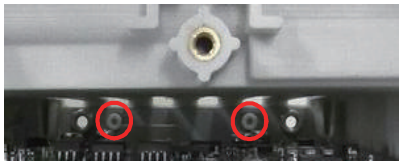
Do not touch the red framed area.

Cable from the HV unit

Picture from the position A



Picture from position B ○: Decide the position.

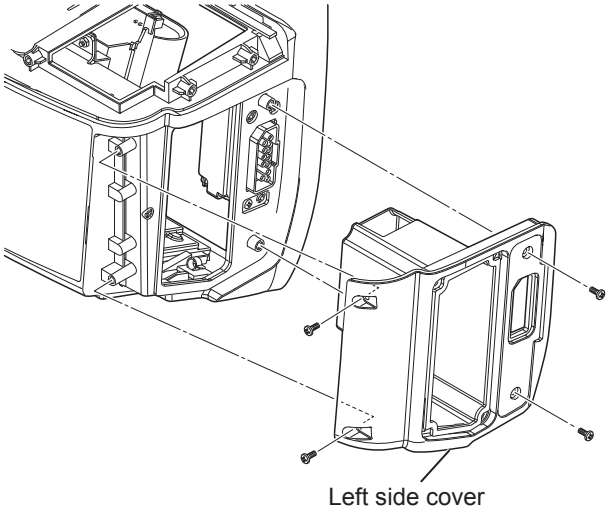


Picture from position C

Board is installed inside the rib.

Removing the L-ECG Unit

1 Remove the four BH3×8 screws which secure the left side cover.

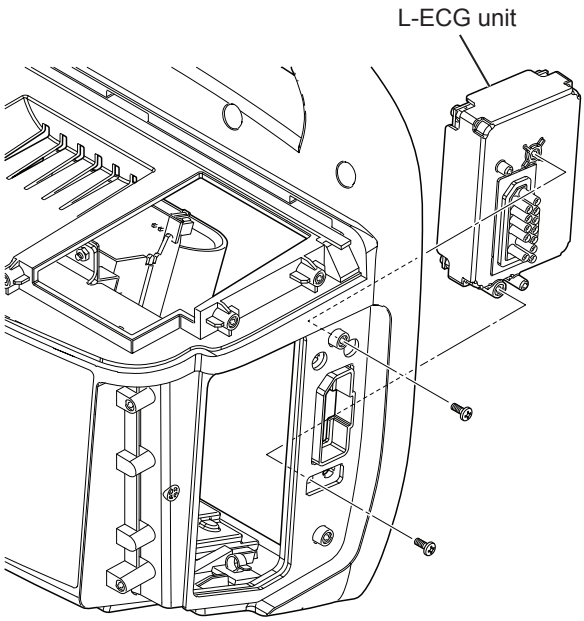


Note for Installing the UR-0480 L-ECG Unit

NOTE: When reassembling, align the line of the left side cover and defibrillator. The left side cover has a mark on the rear side and there is a corresponding mark on the defibrillator. By pressing and holding the curved side at the middle of the two screws, the position can be aligned with the line.

2 Remove the two BH3×8 screws which secure the L-ECG unit to the side panel.

NOTE: Do not touch the L-ECG unit surface and parts with bare hands.

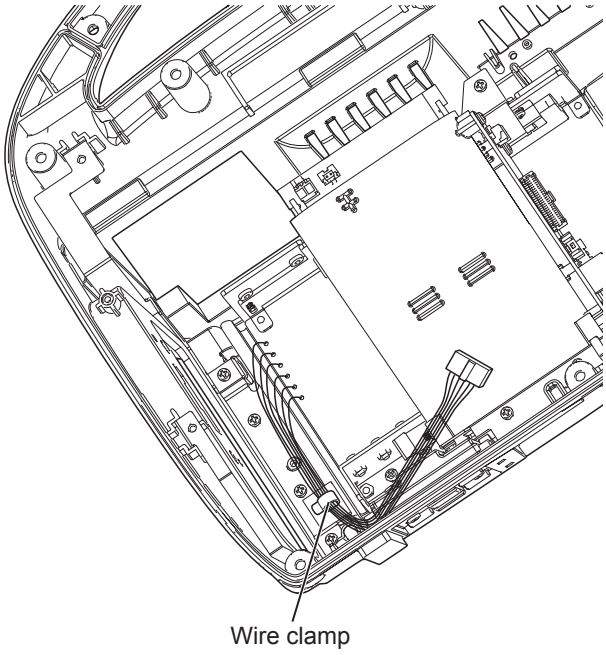


Removing the HV Unit

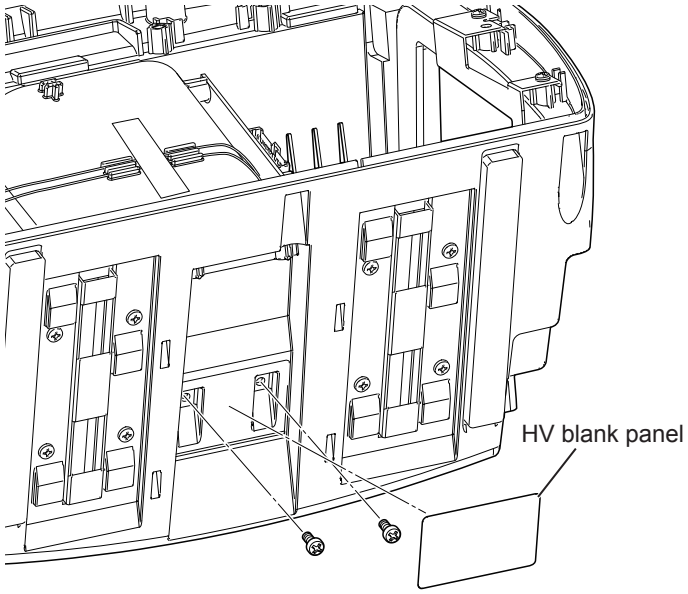
Required screws (not basic screws) when fixing the HV unit to the AC unit inside the chassis

Upper part: two PS3×10 screws (lower part: two PS3×8 screws)

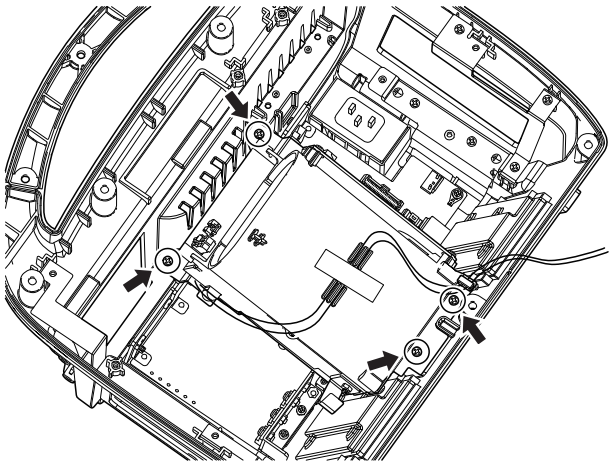
1 Remove the power harness from the AC/DC board, and the remove the wire clamp from the lower left depressed part of the AC plate. Pull out the power harness from inside the wing rib at the bottom.



2 Remove the two BH3×8 screws which secure the HV blank panel to the bottom of the defibrillator.

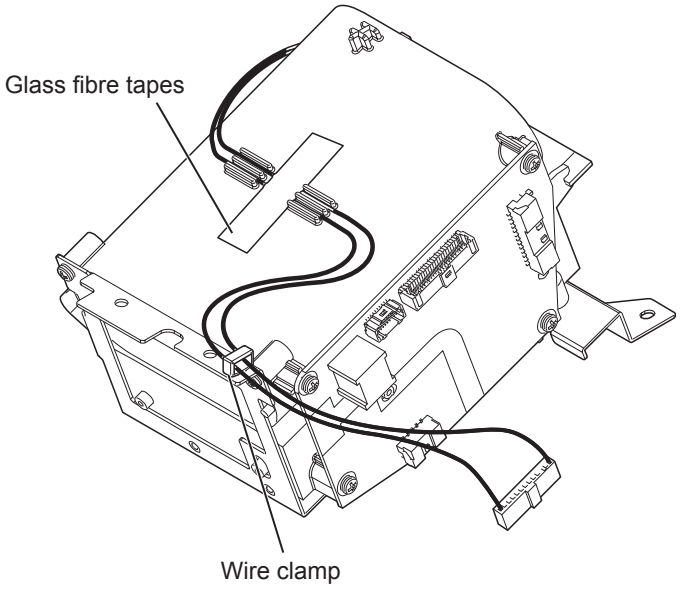


3 Remove the four PS3×8 screws which secure the HV unit to the defibrillator.



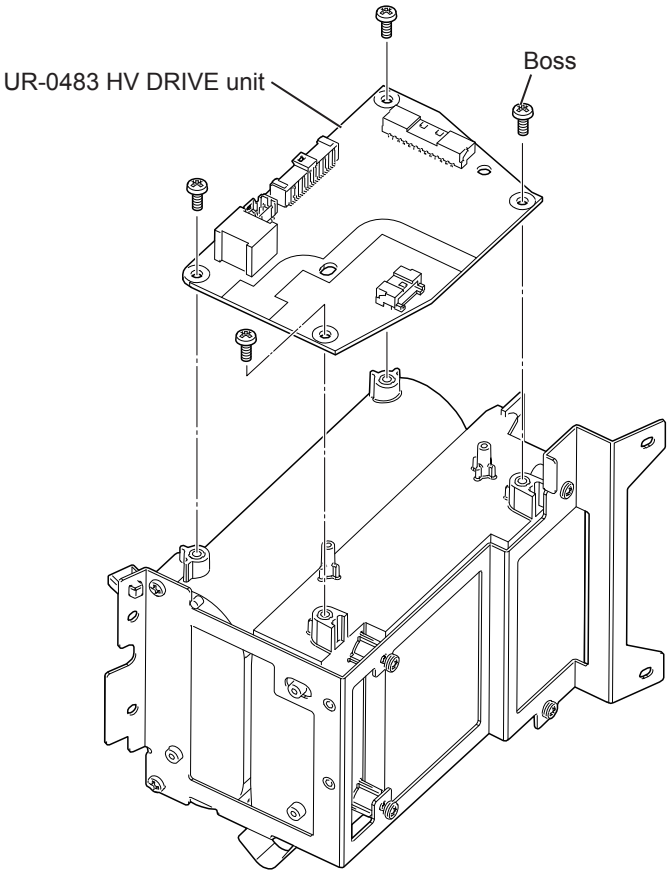
4 Remove the white wire clamp from the hole in the lower right corner of the board, and the remove the high-voltage cable from the clamp.

5 Remove the glass fibre tape which secures the high-voltage cable (pink and white).

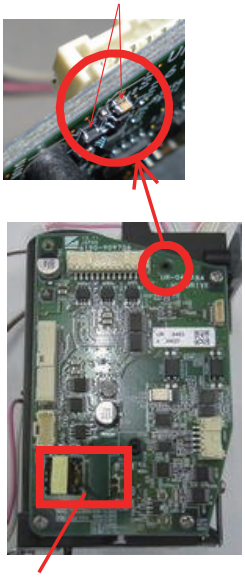


6 Remove the one spacer bolt and three PS3×8 screws which secure the HV DRIVE board to the HV unit.

NOTE: When installing the UR-0483 HV DRIVE board, if the installed position is misaligned, the screw support and board support part touch the parts on the rear side of the board and the parts may be damaged. Install the board straight against the screw positions.

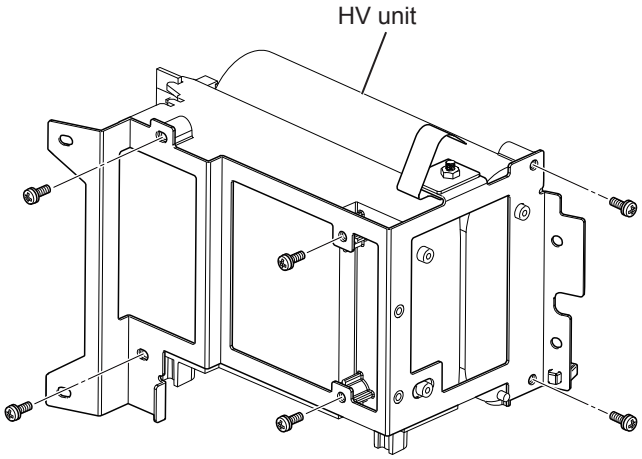


Do not to contact the boss and mounted parts on the UR-0483 HV DRIVE board.

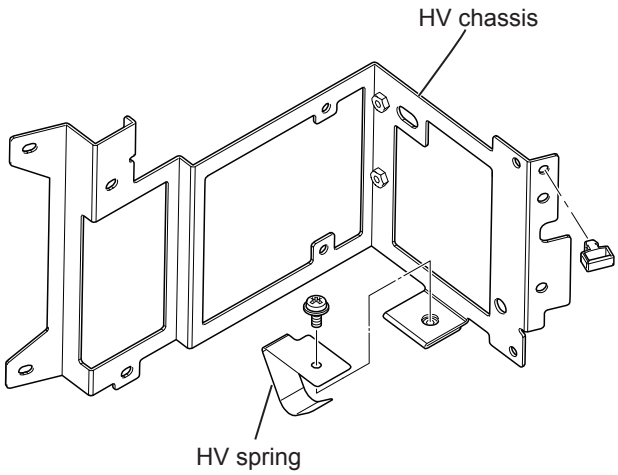


Do not touch the red framed area.

7 Remove the two PS3×8 screws at the bottom and the four PS3×8 screws on the rear which secure the HV unit to the HV board.



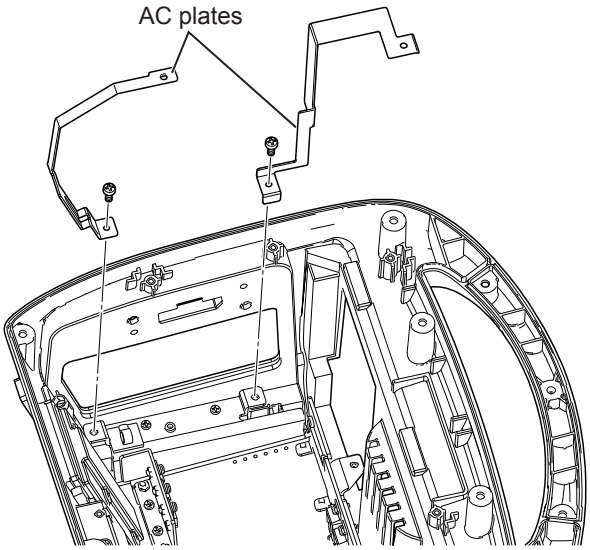
8 Remove the PSW3×8 screws which secure the HV spring to the HV chassis.

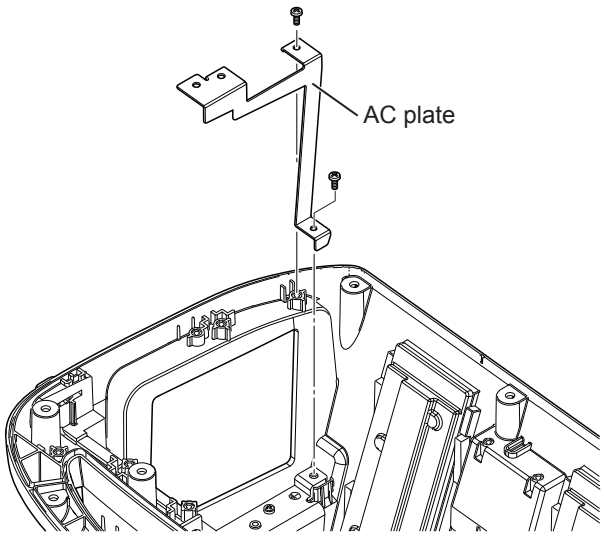


Removing the AC Unit

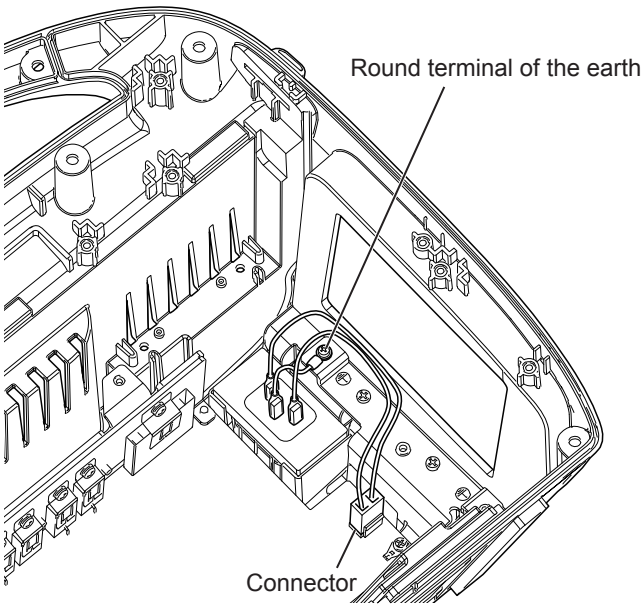
1 Remove the three AC plates for grounding.

(upper left: one PS3×8 screw, lower left: one PS3×8 screw, lower right: two PS3×8 screws)

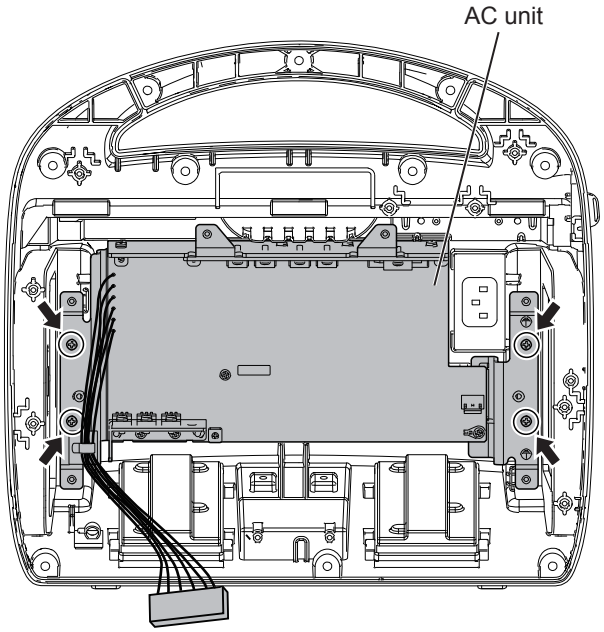




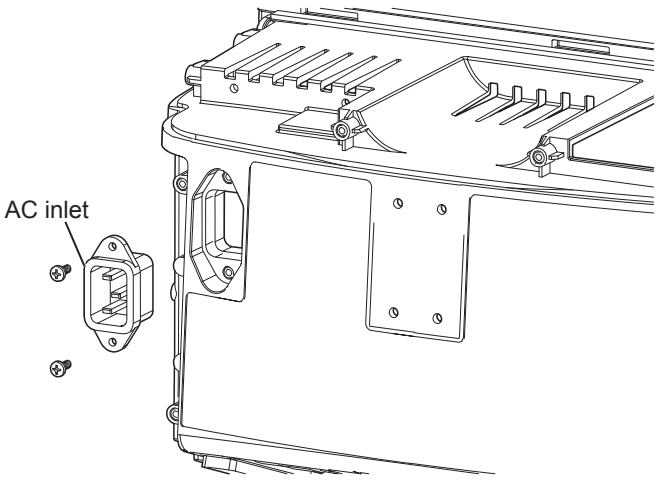
2 Remove the PS3×8 screw which secures the round terminal of the earth and remove the connector from the AC inlet.



3 Remove the four PS3×8 screws which secure the AC unit.

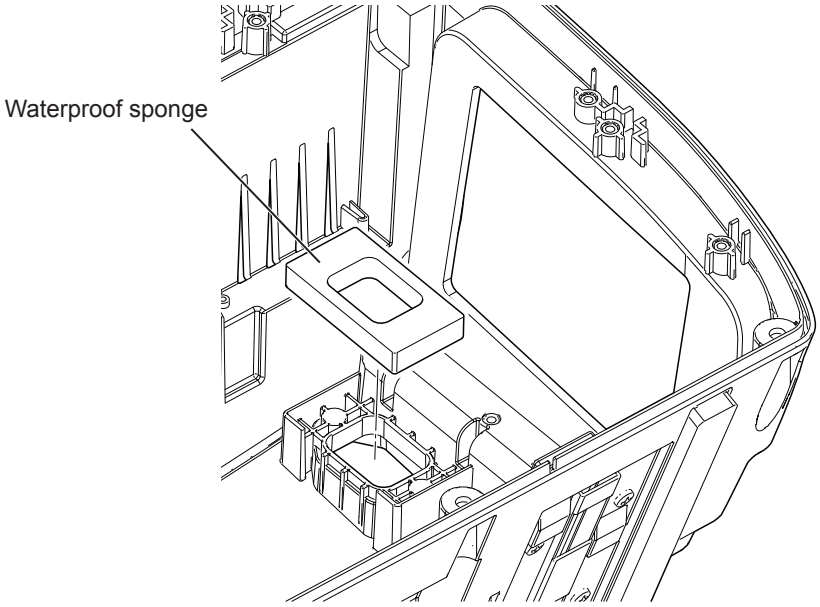


4 Remove the two BH3×8 screws which secure the AC inlet.

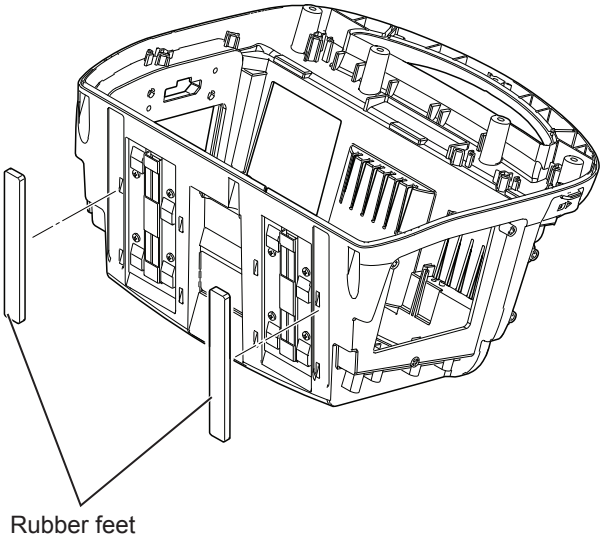


Disassembling the Rear Case

1 Remove the waterproof sponge from the AC inlet.

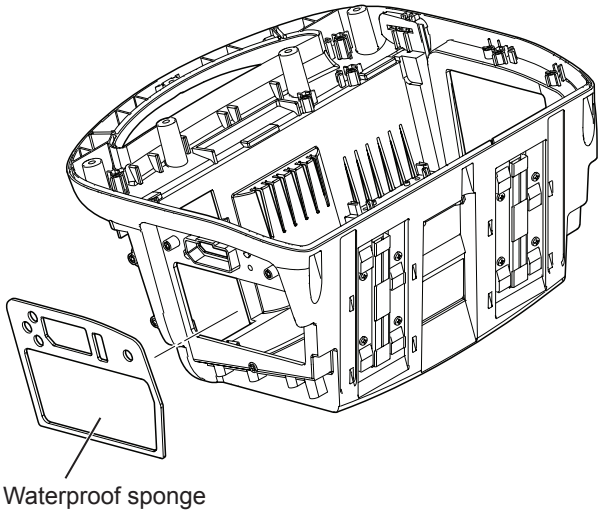


2 Remove the two long and thin rubber feet at the bottom.

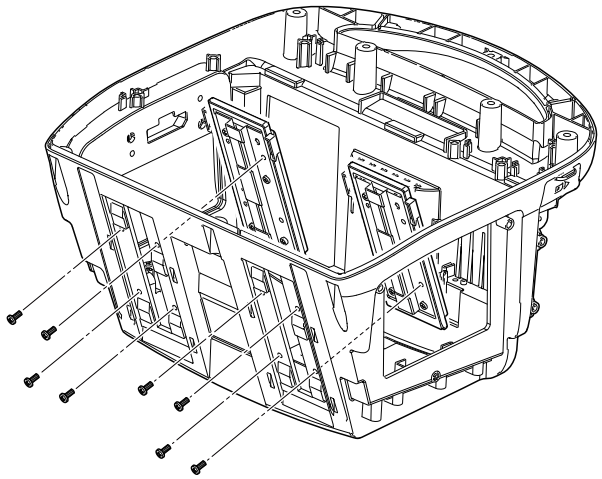


3 Remove the waterproof sponge inside the resin part.

NOTE: The waterproof sponge cannot be reused.

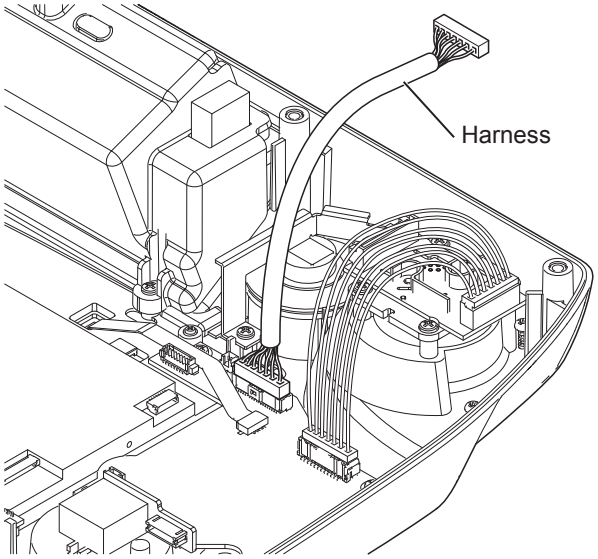


4 Remove the eight BH3×8 screws which secure the two sets of bottom holders for the cart to the bottom case.

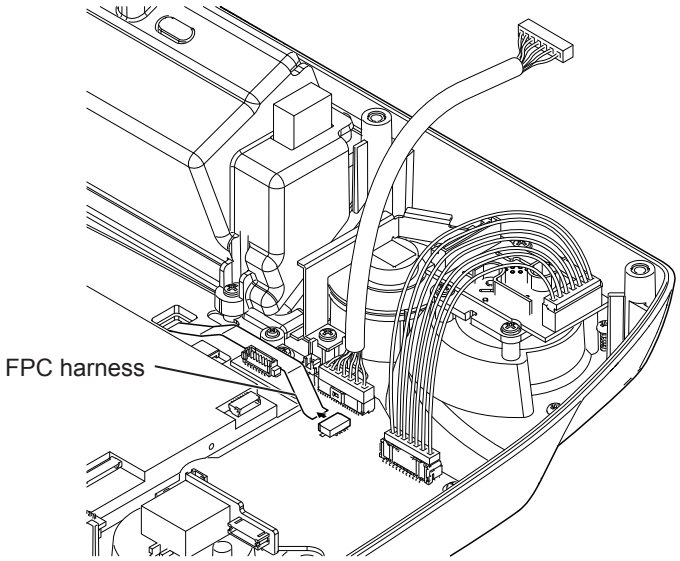


Removing the Boards and Parts from the Front Case

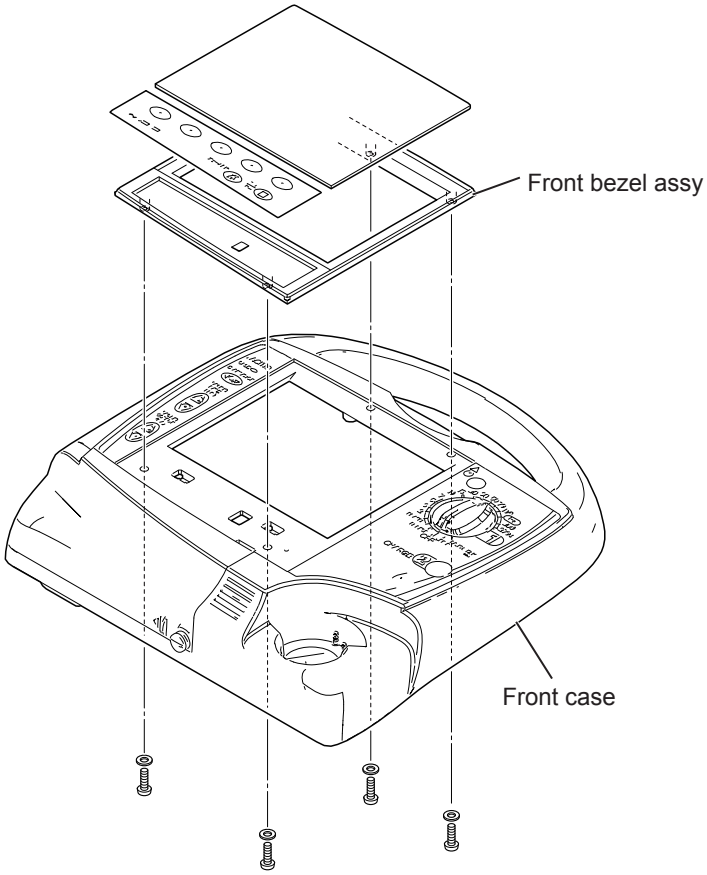
1 Remove the harness which connects the KEY/LED board and defibrillator.



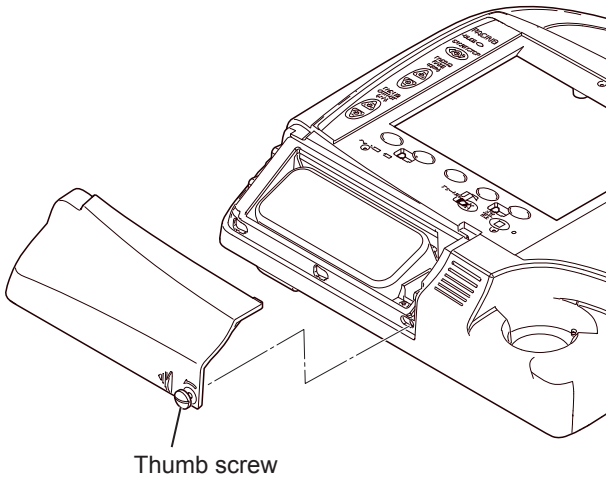
2 Remove the FPC harness of the membrane from the connector on the KEY/LED board.



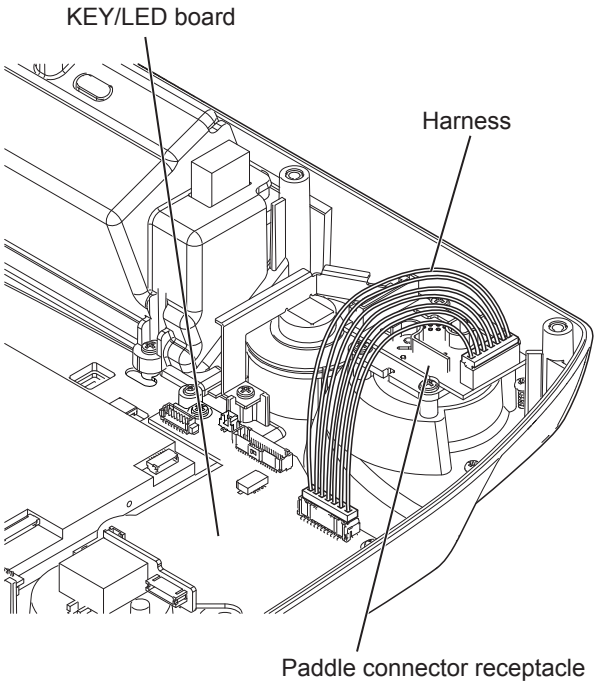
3 Remove the eight T 2204-2 P screws and four washers which secure the front bezel assy to the front case. Peel off the double-sided tape which fixes the front case and front bezel assy. (Tightening torque 29.4 N•cm)



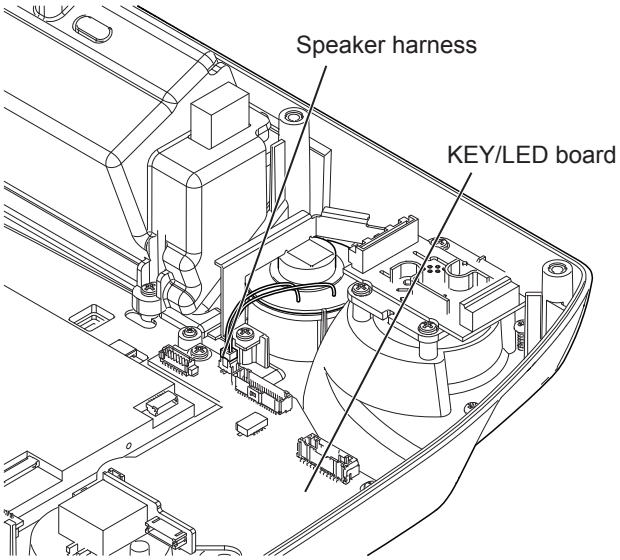
4 Pull out the battery cover from the front case while turning the thumb screw.



5 Remove the harness between the paddle connector receptacle and KEY/LED board.

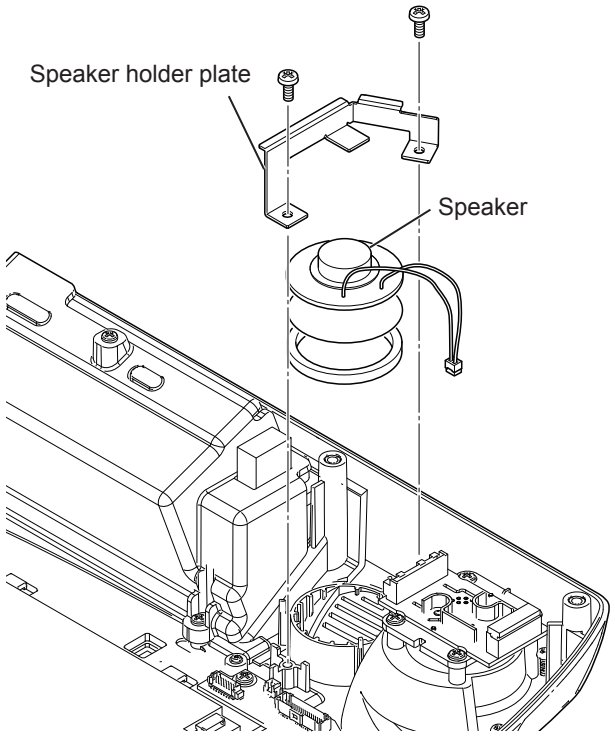


6 Remove the speaker harness from the connector on the KEY/LED board.

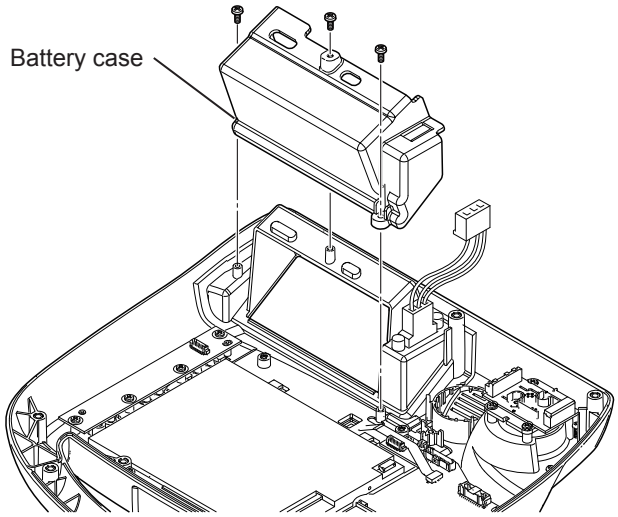


7 Remove the two 3×8 P screws which secure the speaker holder plate.

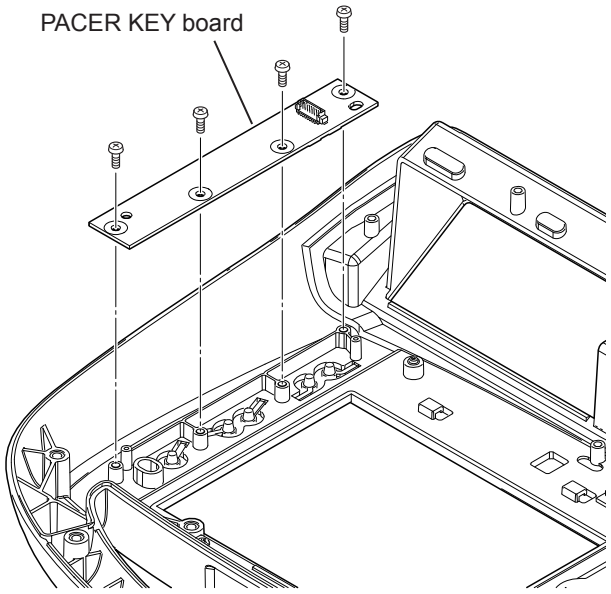
8 Remove the speaker. (Tightening torque 68.6 N•cm)



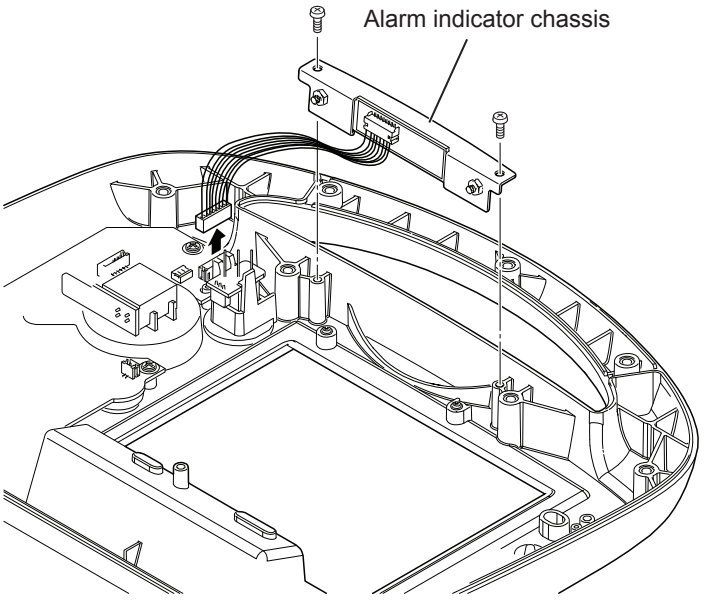
9 Remove the three 3×8 P screws which secure the battery case inside the front case. (Tightening torque 68.6 N•cm)



10 Remove the four 3×8 P screws which secure the PACER KEY board to the front case. (Tightening torque 68.6 N•cm)

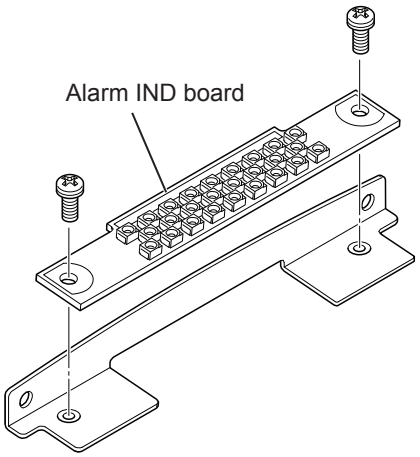


11 Remove the alarm indicator harness from the KEY/LED board, and then remove the two 3×8 P screws which secure the alarm indicator chassis to the front case. (Tightening torque 68.6 N•cm)

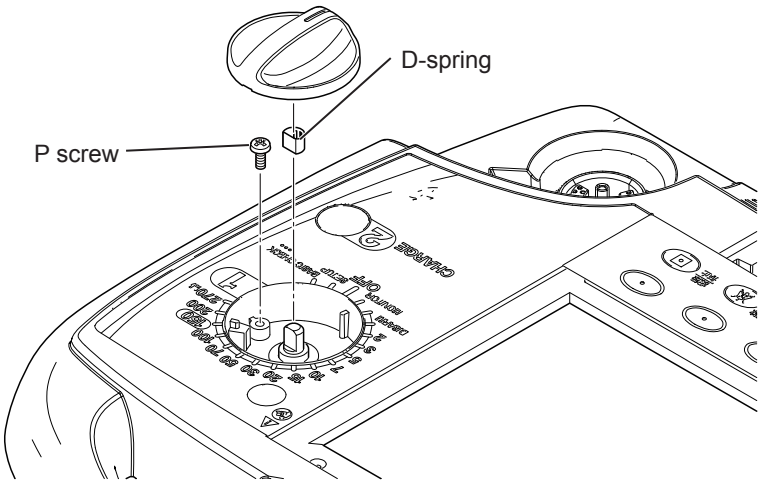


12 Remove the harness from the ALARM IND board.

13 Remove the two PS3×8 screws which secure the ALARM IND board to the plate.

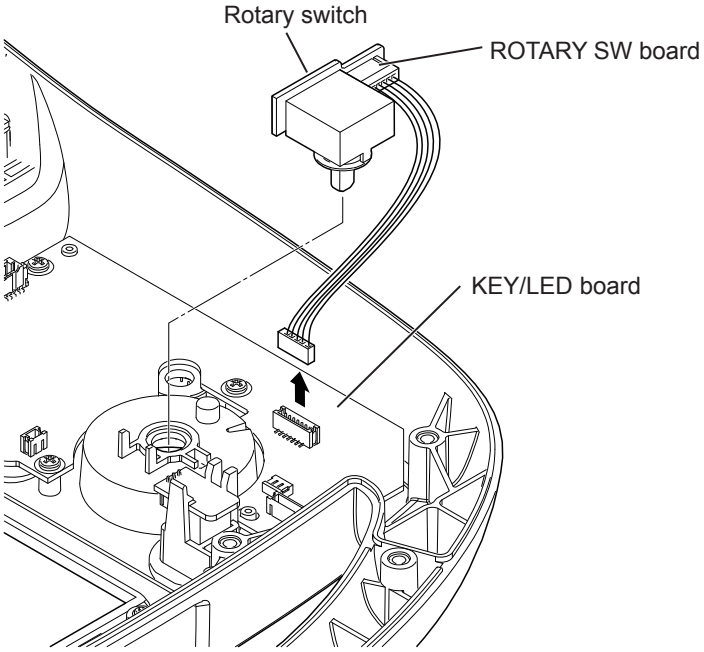


14 Remove the rotary switch with the D-spring.

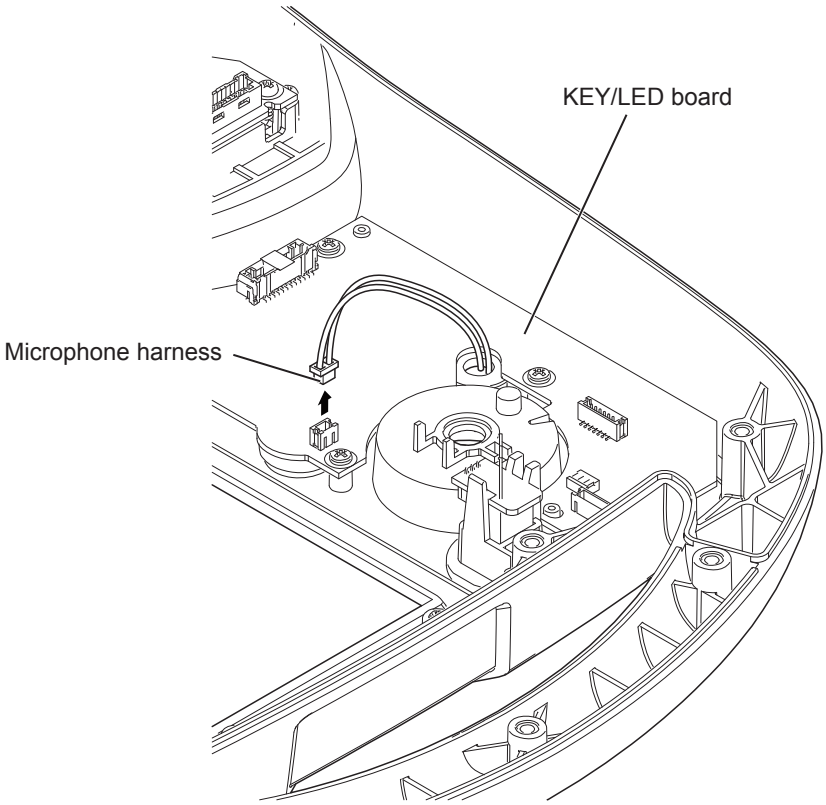


15 Remove the P screw inside the front case. (TEC-5601/5621 without pacing mode)

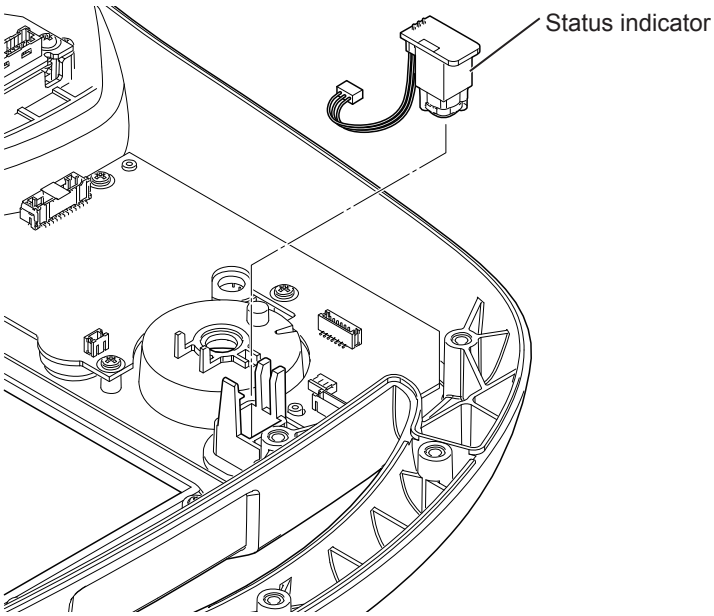
16 Remove the harness from the ROTARY SW board and remove the rotary switch from the front case.



17 Remove the microphone harness from the connector on the KEY/LED board.

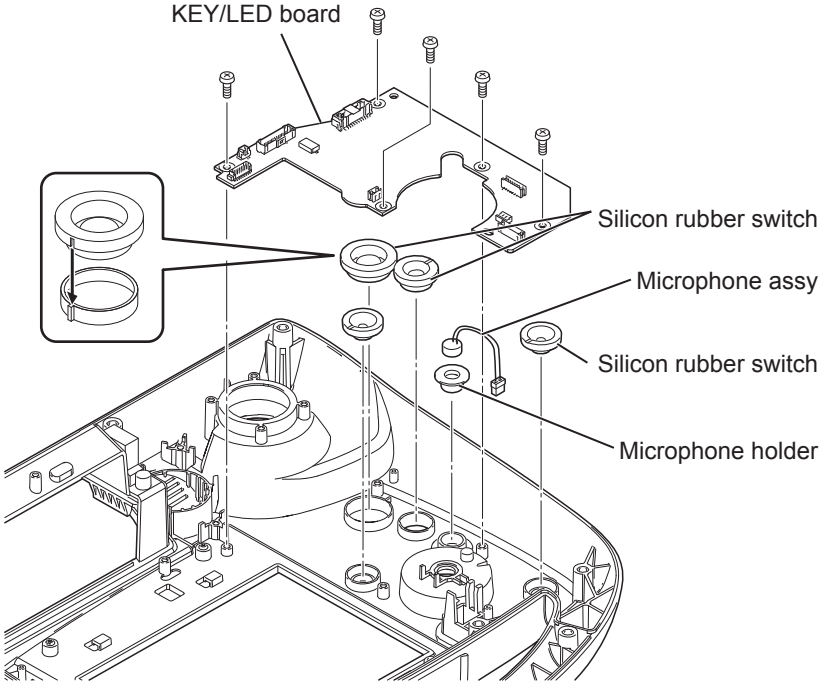


18 Remove the status indicator.



19 Remove the five 3×8 P screws which secure the KEY/LED board. (Tightening torque 68.6 N•cm)

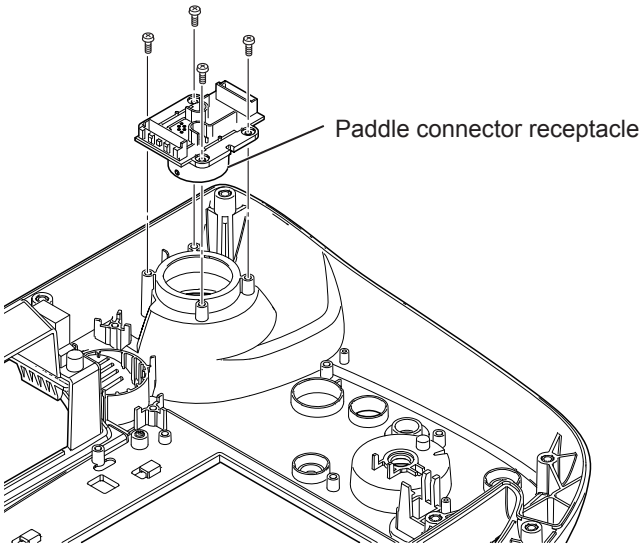
20 Remove the silicon rubber switches.



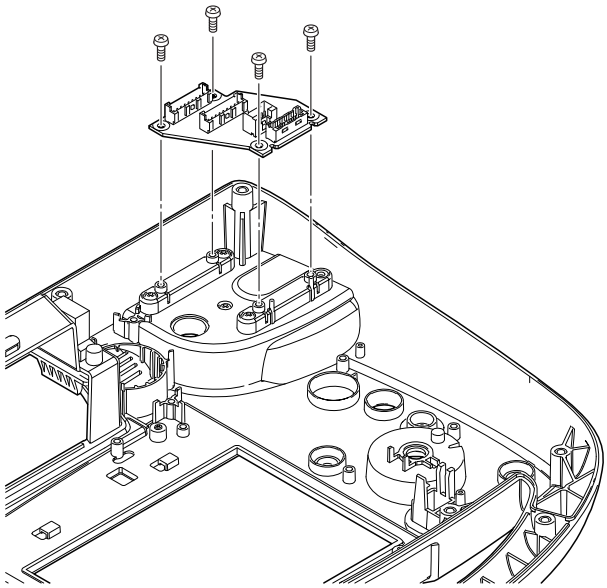
21 Remove the microphone assy from the front.

22 Remove the four 3×8 P screws which secure the paddle connector receptacle (black round multi connector). (Tightening torque 68.6 N•cm)

TEC-5621/5631



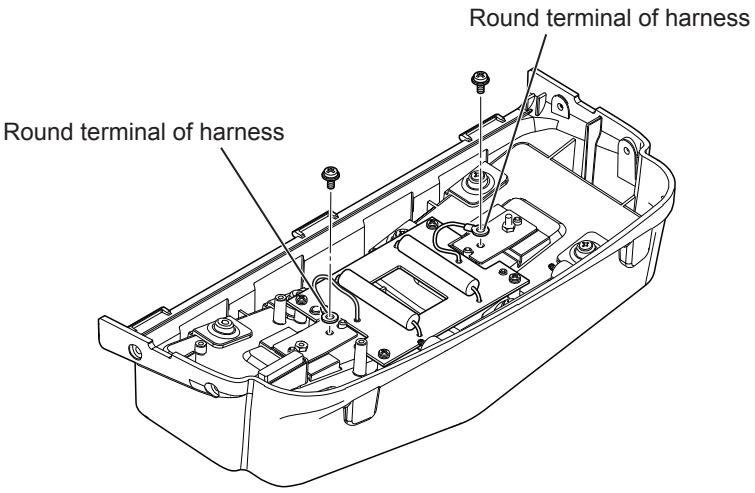
TEC-5601/5602 with UR-0492 PADDLE-CONN EXT-PADDLE board



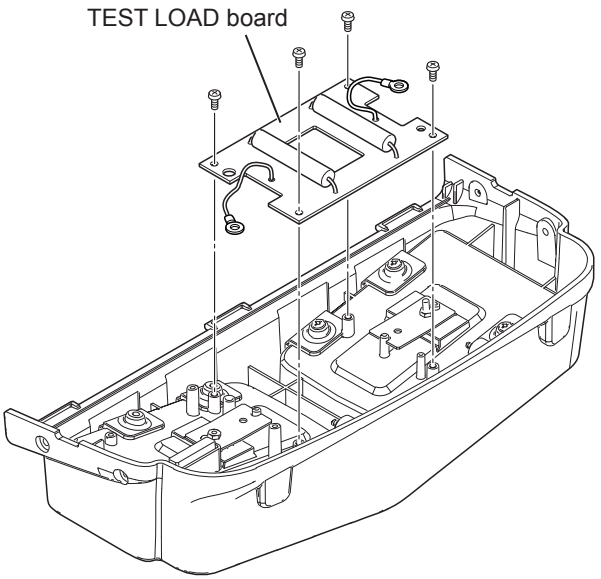
Removing the Paddle Holder

Support the nut plate on the rear side in steps from 1 to 4.

1 Remove the two 3×8 P screws which secure the round terminal of the harness to the nut plate. (Tightening torque 68.6 N•cm)

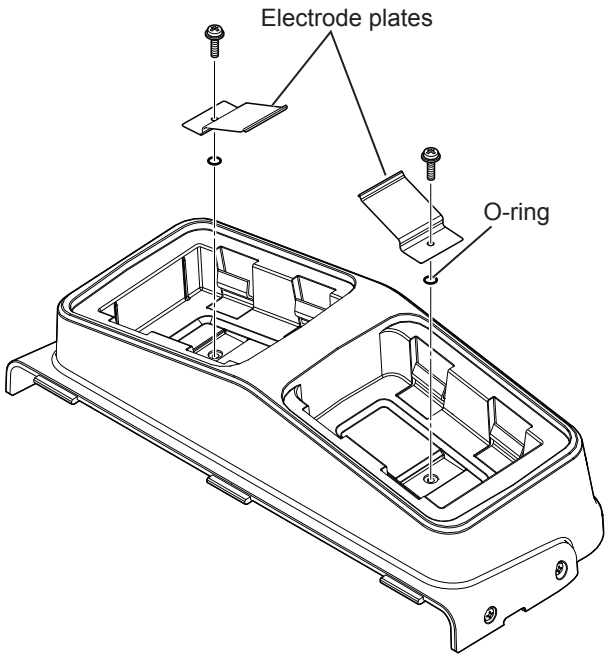


2 Remove the four 3×8 P type screws which secure the TEST LOAD board on the rear. (Tightening torque 68.6 N•cm)



3 Remove the two PSW3×14SUS screws (Code No. 6114-923673) which secure the electrode plate (nickel silver).

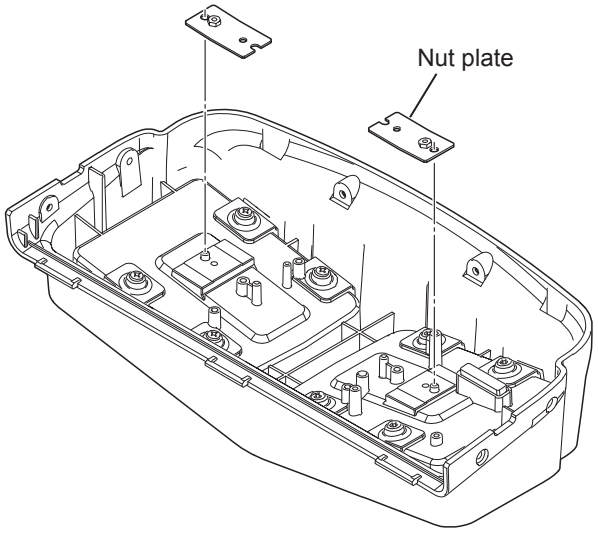
4 Remove the transparent P-3 O-ring (slicon) from the screw hole in the middle of the cup. (waterproofed)



NOTE: The electrode plate (nickel silver) is a periodic replaceable parts.If the electrode plate is corroded or dirty severely, replace them with new ones.

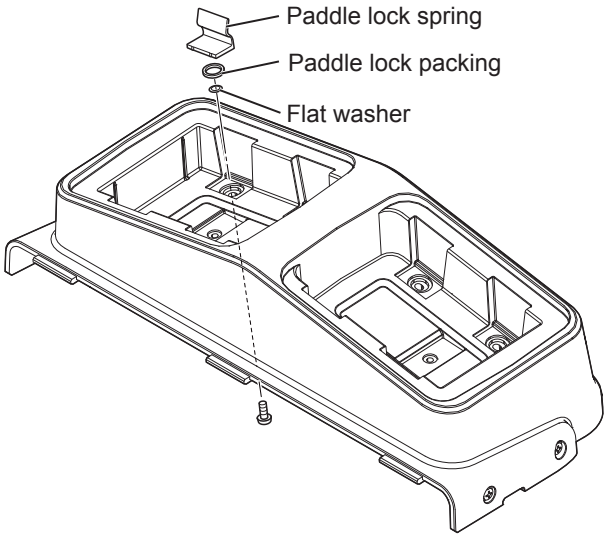
5 Remove the nut plates from the rear of the two cups.

When turning over the paddle cup, the nut plate slips down because of the weight of the plate itself. When attaching the electrode plate, keep supporting the nut plate from the rear side.



6 Remove the eight BH3×8 screws which secure the paddle block spring and the flat washer.

7 Remove the eight black paddle lock packing from the white paddle lock spring.



4 Maintenance

General

> ⚠ **CAUTION**
>
> Before maintenance, cleaning or disinfection, turn the defibrillator power off and disconnect the power cord from the AC socket. Failure to follow this instruction may result in electrical shock and defibrillator malfunction.

Daily Checks

Perform the Basic Checks every day. Refer to “Basic Checks” (p.4-7) and “Cleaning, Disinfecting and Storage” (p.4-31).

Monthly Checks

Perform the following tests and checking once a month.

- Battery test
- Recorder test
- Defibrillation check (manual and synchronized cardioversion)
- AED function
- Pacing function (TEC-5631)

Check the recorder thermal head and clean the recorder roller every 6 months.

Repair Parts Availability Policy

Nihon Kohden Corporation (NKC) shall stock repair parts (parts necessary to maintain the performance of the instrument) for a period of 8 years from the date of delivery. In that period NKC or its authorized agents will repair the instrument. This period may be shorter than 8 years if the board or part necessary for the faulty section is not available.

Periodic Replacement Parts

The following parts must be replaced periodically at the described intervals to maintain the function and performance of the defibrillator.
For replacing the periodic replacement parts, contact your Nihon Kohden representative.

Periodic Replacement Part	Expiration
Defibrillator	
NKB-301V battery pack (option)	Usable for approx. 2 years
Electrode springs (Code No. 6114-927936) (test electrode plates in the right and left paddle holders)	Usable for approx. 2 years
Supplied Accessory (TEC-5621, TEC-5631)	
JC-865V pad adapter	Usable for approx. 2 years

Effect of Board or Unit Replacement

Some report data and settings are not preserved when some boards or units are replaced.

Replaced Board or Unit	Report Data									Settings							
	Defibrillation waveform	VF analysis waveform	Alarm waveform	Trendgraph recording	Periodic list	Event list	Maintenance report	Self test report	Operation history report	SETUP settings	SYSTEM SETUP settings	System Maintenance settings	Date and time	ECG AD	HV AD	Battery AD	Paddle contact AD
HVSW-563 (TEC-5631) HVSW-562 (other models)	—	—	—	—	—	—	—	—	—	—	—	—	—	(7)	(7)	—	(7)
UR-0480 L-ECG unit (all models except for TEC-5601)	—	—	—	—	—	—	—	—	—	—	—	—	—	(7)	—	—	—
UR-0481 MOTHER board	(1)	(1)		(2)	(2)	(3)	(3)	(3)	(3)	(4)	(4)	(5)	(6)	(7)	(7)	—	(7)
BAT031 sub battery (SV) (UR-0481 connected to CN0801)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BAT032 sub battery (MC/SSV) (UR-0481 connected to CN0901)	—	—	—	—	—	—	—	—	—	—	—	—	(6)	—	—	—	—
UR-0483 HV DRIVE board	—	—	—	—	—	—	—	—	—	—	—	—	—	(7)	(7)	—	(7)

— : Preserved

1: Saved to SD card only if [SAVE TO CARD] key is pressed on the SETUP → SAVE REPORT → SAVE REPORT WAVEFORMS.

2: Not perserved. Print these on the recording paper manually.

3: Saved to SD card only if [SAVE TO CARD] key is pressed on the SYSTEM SETUP → 7. DEVICE HISTORY → 1. MAINTENANCE REPORT, 2. SELF TEST REPORT or 3. OPERATION HISTORY REPORT.

(The settings of the SETUP and SYSTEM SETUP can be loaded from an SD card if the OK is selected on SYSTEM SETUP – MENU → 1. SYSTEM SETUP → 35. Load Settings.)

4: Saved to SD card only if OK is selected on SYSTEM SETUP – MENU → 1. SYSTEM SETUP → 36. Save Settings. SETUP and SYSTEM SETUP settings are saved.

5: Not preserved. Write the settings manually (languages settings and battery insert messages settings).

6: Not preserved. After replacing, change the date and time manually on the SETUP → DATE AND TIME.

7: Not preserved. Reset these settings after replacement.
Refer to “Adjust AD Screen” (p.4-89).

NOTE • The affected data and settings may depend on the software version.

• ECG waveform data with voice is not affected by the board replacement because the data is saved in the SD card directly.

Data and Settings Storage

Some settings are not preserved in the following operations.

Operation	Report Data									Settings							
	Defibrillation waveform	VF analysis waveform	Alarm waveform	Trendgraph recording	Periodic list	Event list	Maintenance report	Self test report	Operation history report	SETUP settings	SYSTEM SETUP settings	System Maintenance settings	Date and time	ECG AD	HV AD	Battery AD	Paddle contact AD
SYSTEM SETUP : 38. Initialize Settings	—	—	—	—	—	—	—	—	—	(1)	(1)	—	—	—	—	—	—
System Maintenance: 10. Default Settings	—	—	—	—	—	—	—	—	—	(2)	(2)	(2)	—	—	—	—	—
System Maintenance: 6. Version Up	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

— : Preserved

1: Returns to Flash Save state.

2: System settings are initialized.

NOTE • The affected data and settings may depend on the software version.

• ECG waveform data with voice is not affected by the board replacement because the data is saved in the SD card directly.

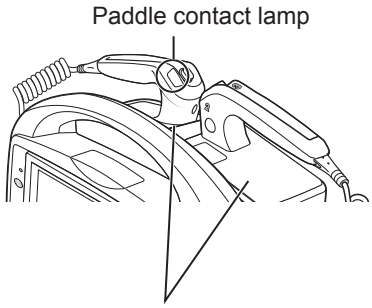
Basic Checks

Preparations for the Basic Checks

The following preparations are necessary before starting the basic checks.
The necessary preparations depend on the connected paddles/pads.

To perform basic checks for disposable pads or internal paddles, the AX-103VK defibrillator analyzer manufactured by Nihon Kohden is required.

When Using the External Paddles



Place the paddles on the paddle holders.

When using the external paddles, place them on the paddle holders (paddle cups) and turn the control dial to the DISARM position. Then confirm that the paddle contact lamp lights in green.

If the paddle contact lamp lights in orange or yellow, clean the external paddles and test electrode plates. (You can apply electrical shocks even when the lamp lights in orange or yellow.)

"External Paddles" (p.4-34)

⚠ WARNING

Never perform defibrillation to a person or object other than the patient or discharge test equipment (test electrode plate or energy checker). When performing the defibrillation check using the external paddles, keep the paddles in the paddle holders. Failure to follow this instruction may result in electrical shock.

When Using Disposable Pads

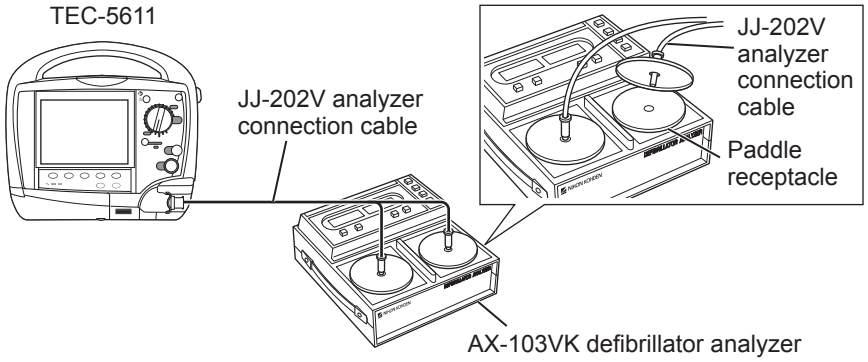
Connect the defibrillator and the AX-103VK defibrillator analyzer using the JJ-202V analyzer connection cable.

The JJ-202V analyzer connection cable is provided with the AX-103VK defibrillator analyzer.

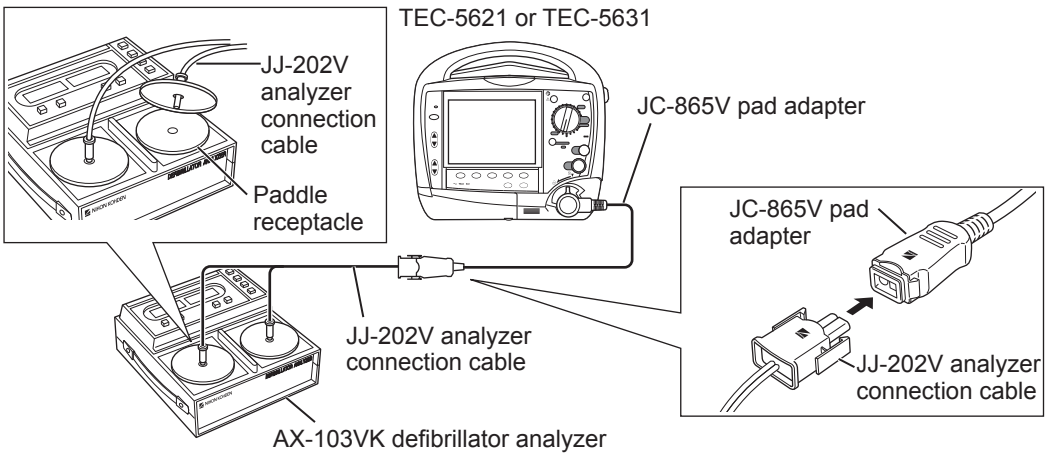
⚠ WARNING

When performing a basic check, make sure that the disposable pads are not attached to the patient. Failure to follow this warning may lead to unintended electrical shock to the patient.

Connection between TEC-5611 and AX-103VK defibrillator analyzer



Connection between TEC-5621 or TEC-5631, and AX-103VK defibrillator analyzer

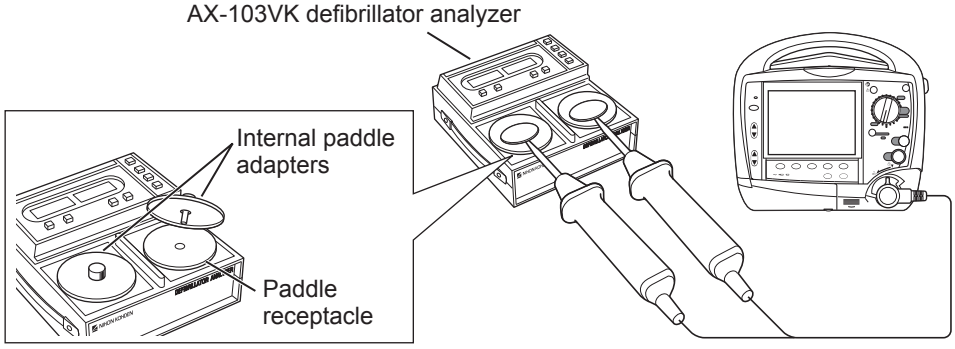


When Using the Internal Paddles

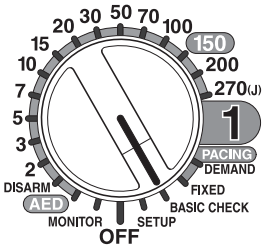
Using the internal paddle adapters, connect the AX-103VK defibrillator analyzer to the defibrillator. When the sterilized internal paddles are connected for the basic checks, sterilize the internal paddle adapters as well.

For details on sterilization of the internal paddle adapters, refer to the operator's manual supplied with the AX-103VK defibrillator analyzer.

The internal paddle adapters are supplied with the AX-103VK defibrillator analyzer.



Performing the Basic Checks



For the basic checks, proceed as follows.

During the basic checks, "ALL ALARMS OFF" is displayed, indicating that all alarms (except some technical alarms) are suppressed.

1 Check that the paddles or pads are not connected to a patient.

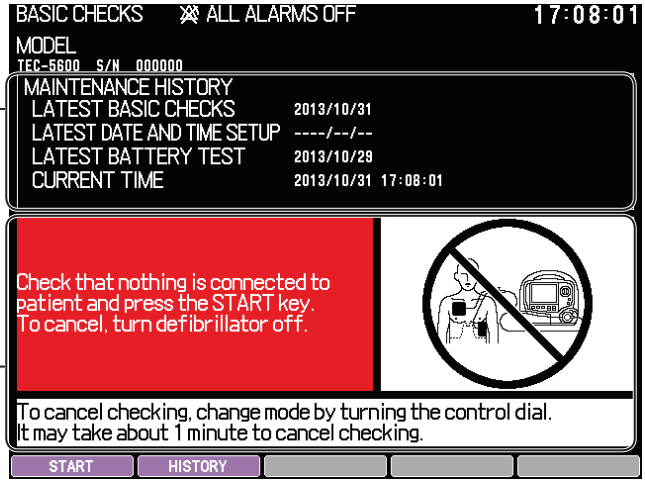
2 Set the control dial to the BASIC CHECK position to open the BASIC CHECK window.

The maintenance history (such as the date/time of the latest checks) is displayed in the window when opened.

MAINTENANCE HISTORY
Indicates the historical data, including the date of execution of the latest checks.

- LATEST BASIC CHECKS
  If more than two days have elapsed since the latest basic checks have been performed, the date is indicated in yellow.
- LATEST DATE AND TIME SETUP
- LATEST BATTERY TEST
  If one month or more has elapsed since the latest battery test, the date is indicated in yellow.
- CURRENT TIME

Displays guidance messages.



Pressing the [HISTORY] key opens the basic check history window, permitting you to confirm the history of the basic checks.

"Confirming the Checking History" (p.4-26)

3 Press the [START] key to start the basic checks. The checks are started from the SD card check, and performed in sequence. Proceed with the checks by pressing the specified keys in accordance with the on-screen guidance.

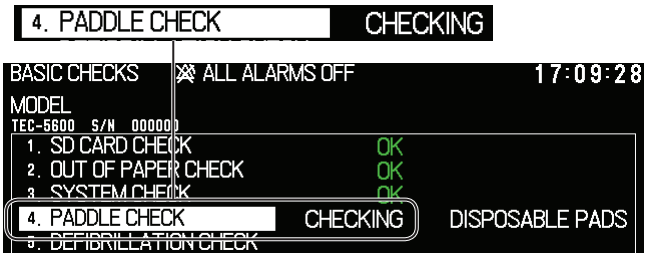
For details, refer to the corresponding items mentioned on the subsequent pages.

From “SD Card Check” (p.4-11) to “Recorder Check (TEC-5602, TEC-5611, TEC-5621, TEC-5631)” (p.4-24)

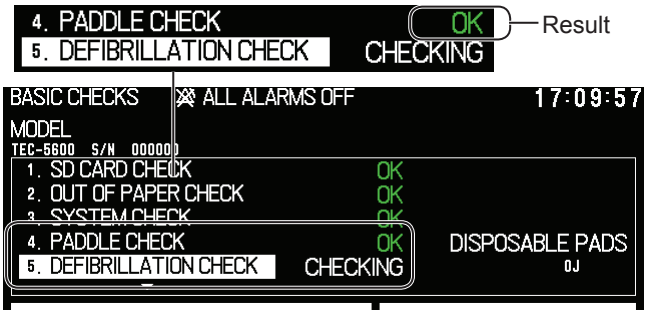
- The item being checked is highlighted on the screen and “CHECKING” is displayed.
- When the current check is finished, the result is displayed in the right column for the item and “CHECKING” appears for the next check item.

Example: Paddle Check

Check in progress



Check completed



4 When the basic checks have been completed, the check result window is displayed and the all results are recorded.

NOTE: Make sure that the date and time printed on the recording paper are correct. The dates and times on the recording paper are important parts of the medical records.

“Confirming the Check Results” (p.4-25)

SD Card Check

The defibrillator performs writing/reading check to the SD card.

When “Basic Check Type” is set to “Detailed” on the SYSTEM SETUP screen, the capacity (remaining) of the SD card is also checked.

Administrator’s Guide: “System Setup”

After confirming that the pads are not attached to a patient, press the [START] key.

If you use an SD card other than the optional QM-001D or QM-002D, the “Insert SD card and press NEXT” message is displayed on the screen. Press the [CANCEL] key to skip the SD card check.

NOTE: When the “NOT ENOUGH SPACE 0.00 MBYTE” message is displayed on the screen, the SD card writing check cannot be performed. Delete unnecessary data then perform the SD card check again. Otherwise, data may not be saved in the SD card even when there is enough free space in the SD card.

Check Result	Description	Action
OK	SD card check has been completed without problems.	–
ERROR	Could not detect an SD card.	Replace the SD card and check again. If the problem is not solved, replace the UR-0481 MOTHER board.
ACCESS ERROR	Read/write error	
WRITE-PROTECTED	The SD card is write-protected.	Release the write-protect lock of the SD card then perform the SD card check again.
NOT ENOUGH SPACE	Not enough free space in the SD card	Delete unnecessary data in the SD card then perform the SD card check again.
INVALID FILE	There are invalid files in the SD card (in the DEFSOUND folder).	Delete the invalid files and perform the SD card check again.
NOT CHECKED	SD card check was canceled.	–

Out-of-Paper Check (TEC-5602, TEC-5611, TEC-5621, TEC-5631)

The defibrillator checks if recording paper is properly loaded.

Set the recording paper then press the [NEXT] key.

Operator's Manual: Section 4 "Loading the Recording Paper (TEC-5611, TEC-5621, TEC-5631)"

If the out-of-paper check has been completed without problems, recording starts for the recorder check.

If you press the [CANCEL] key during out-of-paper check, "NOT CHECKED" is displayed in the result column and the next check is started.

Check Result	Description	Action
OK	Out-of-paper check has been completed without problems.	–
ERROR	Could not detect recording paper.	Clean the sensor. Refer to the "Cleaning the Recorder (TEC-5602, TEC-5611, TEC-5621, TEC-5631)" in this section. Also, check that the recording paper is RQS-50-3. If the recording paper is RQS-50-3, replace the WS-561V recorder unit.
NOT CHECKED	Out-of-paper check was canceled.	–

System Check

The defibrillator checks if there is any system error.

The system check is automatically started and the check result is displayed.

If an error is detected in the system check, the basic checks are canceled.

Check Result	Description	Action
OK	System check has been completed without problems.	–
ERROR	An error is detected in the system.	RTC backup battery is empty. Replace the battery (Code No. 9000-058011).
RTC BATTERY EMPTY	The built-in RTC backup battery is empty.	Replace the battery (Code No. 9000-058011) or the UR-0481 MOTHER board. When the error is detected, the following error code appears with the message.

Error Code

Error Code	Description
MEM:00000400	D511 setting data error
MEM:00000800	D512 report data error
COM:00000400	C511 S-CPU communication error
COM:00002000	C514 P-CPU communication error
COM:00004000	C515 H-CPU communication error
COM:00008000	C516 no RTC battery
COM:00000040	C507 timer communication error
COM:00010000	C519 MP-CPU communication error
COM:00040000	C521 BT module communication error
COM:00080000	C522 E-CPU communication error
COM:00100000	C523 KCPU communication error
COM:00200000	C524 SVCPU communication error
COM:00400000	C525 SSVCP communication error

Paddle Check

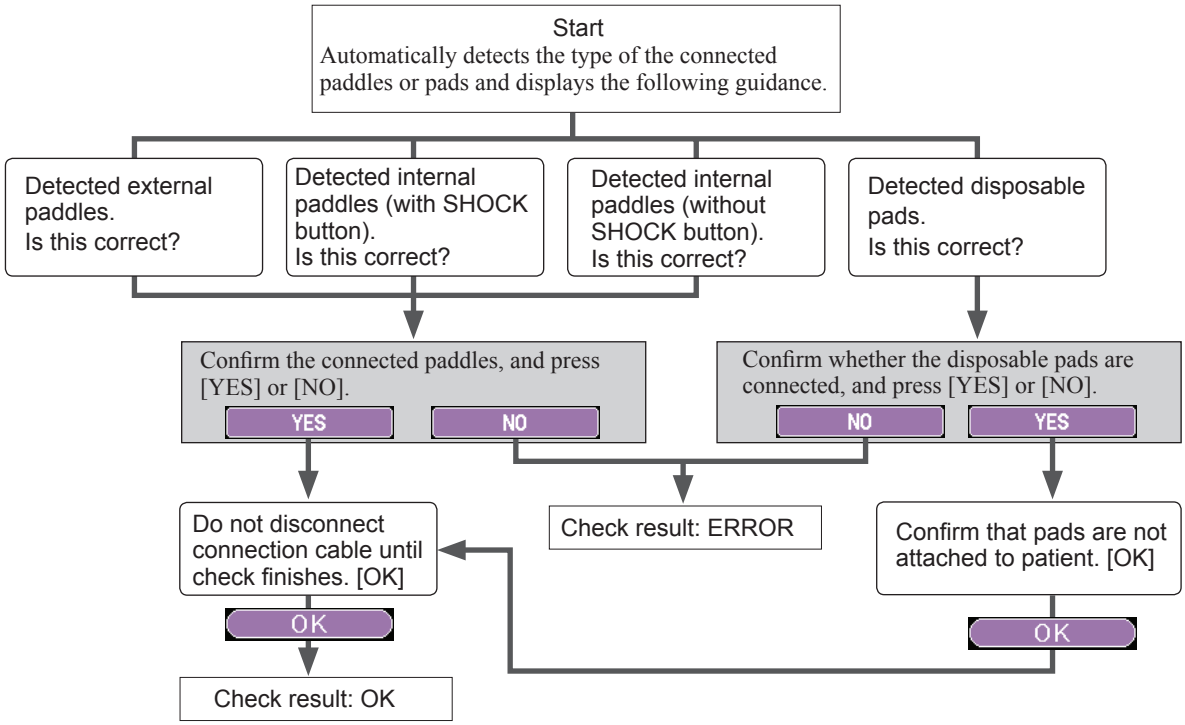
The defibrillator checks the type of connected device (paddle or pads) and if they are properly connected.

Follow the guidance displayed in the BASIC CHECKS window.

If you press the [CANCEL] key during a paddle check, "NOT CHECKED" is displayed in the result column. The defibrillation check and pacing check (only for TEC-5631) are skipped and the battery check is started.

If the paddle check resulted in "ERROR", the defibrillation check and pacing check (only for TEC-5631) are skipped and the battery check is started.

Paddle Check Flow



Check Result	Description	Action
OK	Paddle check has been completed without problems.	–
ERROR	Could not detect paddles or pads.	TEC-5621/5631: Replace the ND-831VZ external paddles or the UR-0488 KEY/LED board. TEC-5601/5602: Replace the ND-560V external paddles, UR-0492 PADDLE-CONN EXT-PADDLE board or UR-0488 KEY/LED board.
NOT CHECKED	Paddles check was canceled.	–

Defibrillation Check

NOTE: When operating the defibrillator on the battery and the mark indicating remaining battery power is 1~3 or 0, the defibrillation check cannot be performed. Charge the battery before the defibrillation check.

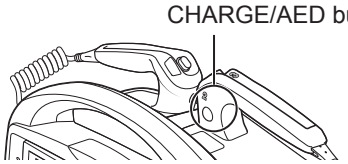
If you press the [CANCEL] key during a defibrillation check, "NOT CHECKED" is displayed in the result column and the next check is started.

1 When the remaining battery power is enough and paddle or pad contact is good enough for check, the message "Press the CHARGE/AED button" is displayed.

If the paddles or pads are not connected properly, an error message is displayed to indicate that they need to be set to the paddle holders or defibrillator analyzer. Connect them properly then press the [NEXT] key.

Connections of the paddles/pads:
"Preparations for the Basic Checks" (p.4-7).

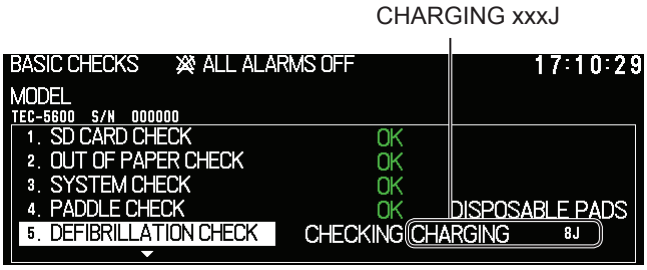
When using the external paddles



When using the internal paddles or disposable pads

2 Press the charge or CHARGE/AED button to start charging.

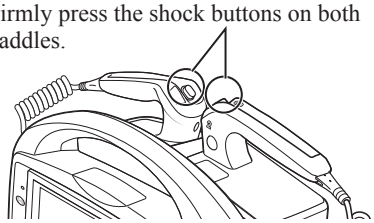
Intermittent peep sounds are generated and the message "CHARGING xxxJ" is displayed on the screen.



When using the external paddles

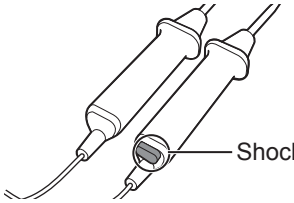
Shock buttons

Firmly press the shock buttons on both paddles.



When using the internal paddles (with no shock button) or disposable pads

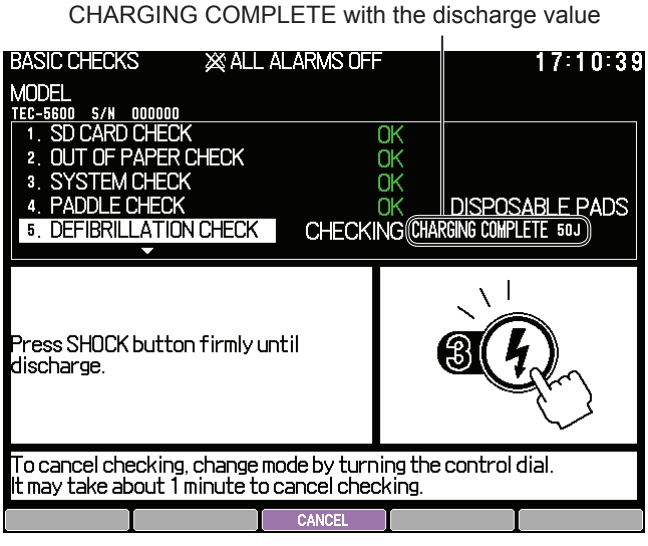
When using the internal paddles (with a shock button) or disposable pads



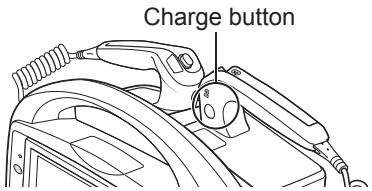
3 When charging completes, a continuous beep sound is generated and the screen displays the guidance "Press SHOCK button firmly until discharge".

Check that the message "CHARGING COMPLETE" and the discharged energy value "50J" are displayed on the screen, and firmly press the shock button(s) to start discharging.

Example: When the external paddles are connected



When using the external paddles

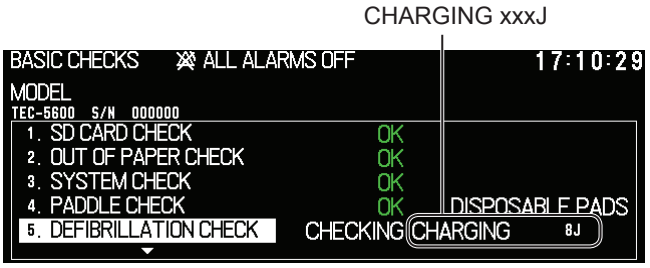


When using the internal paddles or disposable pads

4 When discharging completes, the message “Press CHARGE/AED button” is displayed.

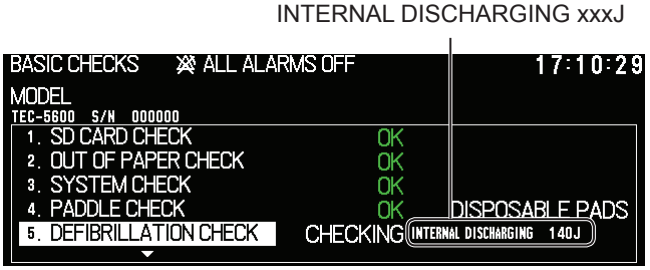
5 Press the charge or CHARGE/AED button to start charging.

Intermittent peep sounds are generated and the message “CHARGING xxxJ” is displayed on the screen.



6 When the charging completes, the energy is discharged internally. The message “INTERNAL DISCHARGING xxxJ” is displayed on the screen.

When the internal discharging is complete, the defibrillation check is terminated.



Check Result	Description	Action
OK	Defibrillation check has been completed without problems.	–
PADDLE ERROR	Connection of the paddles or pads has been changed.	Connect the paddles or pads correctly and perform the defibrillation check again.
BATTERY LOW	Remaining battery power is too low to perform the defibrillation check.	Charge the battery or connect an AC power. Then perform the defibrillation check again.
TIMEOUT	The shock button has not been pressed for the specified period after charging was completed.	Perform the defibrillation check again. The shock button must be pressed soon after charging is completed.
ERROR	An error detected.	TEC-5621/5631: Replace the ND-831VZ or ND-832VZ external paddles, UR-0481 MOTHER board, UR-0483 HV DRIVE board or HVSW-562 or HVSW-563 HV unit. TEC-5601/5602: Replace the ND-560V or ND-562V external paddles, UR-0492 PADDLE-CONN EXT-PADDLE board, UR-0481 MOTHER board or HVSW-562 HV unit.
NOT CHECKED	• Defibrillation check was canceled. • Paddle check was canceled.	–

Pacing Check (TEC-5631)

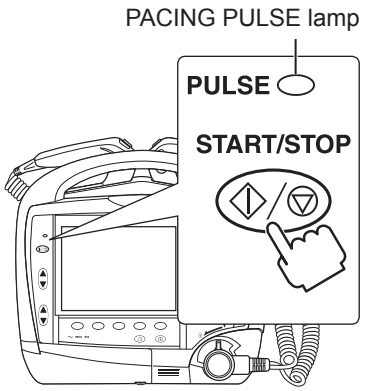
The defibrillator checks the output current for pacing.

If you press the [CANCEL] key during the pacing check, "NOT CHECKED" is displayed in the result column and the next check is started.

1 When the paddles or disposable pads are properly connected, the guidance "Press START/STOP key" is displayed.

If the paddles or pads are not connected properly, an error message is displayed to indicate that they need to be set to the paddle holders or defibrillator analyzer. In this case, connect the paddles or the disposable pads properly then press the [NEXT] key.

Connections of the paddles/pads:
"Preparations for the Basic Checks" (p.4-7)

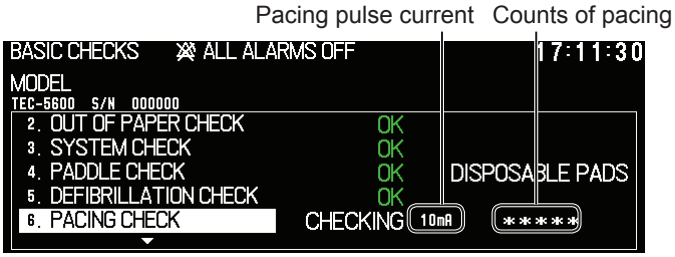


2 Press the START/STOP key to start the pacing check.

The check is performed with changing the pacing pulse current.

- Pacing mode: Fixed
- Pacing rate: 180 ppm
- Pacing pulse current: 10 to 200 mA

Each pacing pulse current is checked eight times.
Each time the pacing pulse is detected properly, an "*" mark is displayed on the screen.



The pacing check is terminated once pacing has been performed on every current.

Check Result	Description	Action
OK	Pacing check has been completed without problems.	–
PADDLE ERROR	Connection of the paddles or pads has been changed.	Connect the paddles or pads correctly and perform the pacing check again.
ERROR	An error detected in pacing check.	Replace the UR-0489 PACER board or the UR-0483 HV DRIVE board.
NOT CHECKED	• Pacing check was canceled. • Paddle check was canceled.	–

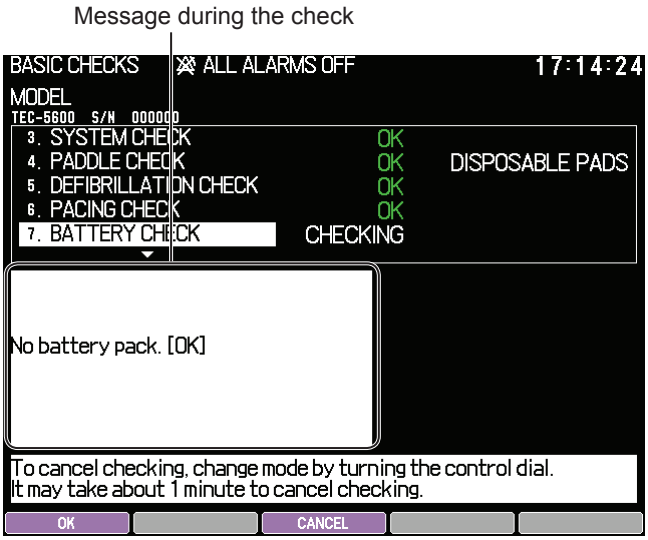
Battery Check

The defibrillator checks the condition of the battery connected to the instrument.

The check is automatically performed and the check result is displayed.

If you press the [CANCEL] key during the battery check, “NOT CHECKED” is displayed in the result column and the next check is started.

When a message is displayed on the screen during the battery check, confirm the content and press the [OK] key.



Check Result	Description	Action
OK	Battery check has been completed without problems.	–
1/3	Battery remaining:	Charge the battery.
EMPTY	Battery remaining: 1~3 or 0	
EXPIRATION DATE	Expired battery	Replace the battery with a new one. Refer to “Expiration Date, Replacement and Disposal” (p.4-27).
ERROR	An error other than above occurred.	Replace the NKB-301V battery pack or the UR-0481 MOTHER board.
NOT CHECKED	Battery check was canceled.	–
NOT CONNECTED	No battery is connected.	–

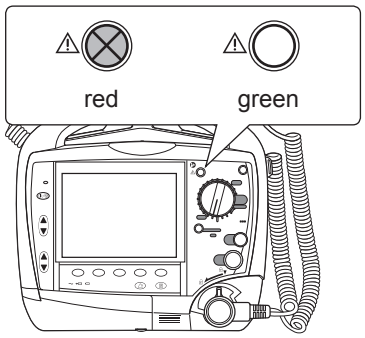
Status Indicator Check

The defibrillator checks that the status indicator works correctly.

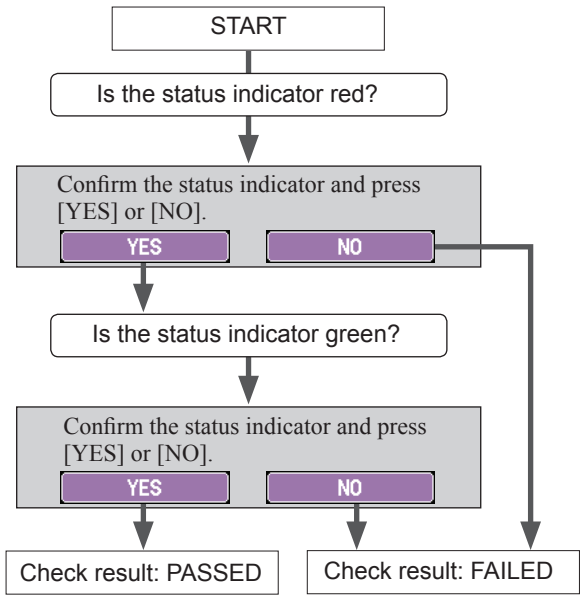
Follow the guidance displayed on the screen.

If you press the [CANCEL] key during the status indicator check, "NOT CHECKED" is displayed in the result column and the next check is started.

Status indicator indications



Status Indicator Check Flow



Check Result	Description	Action
PASSED	Status indicator check has been completed without problems.	–
FAILED	The status indicator did not function properly.	Replace the UR-0488 KEY/LED board.
NOT CHECKED	Status indicator check was canceled.	–

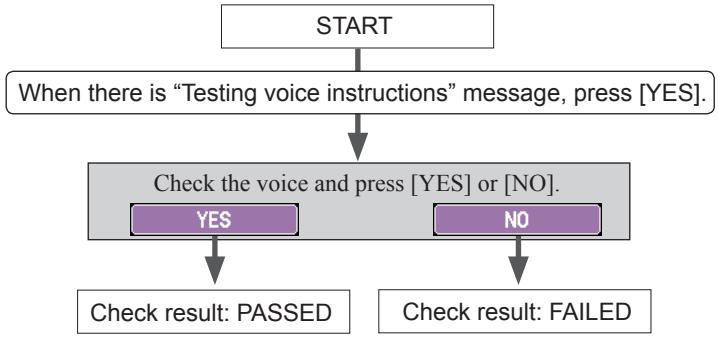
Voice Check

The defibrillator checks that voice instructions are properly output and the speaker lead is not disconnected.

Follow the guidance displayed on the screen.

If you press the [CANCEL] key during the voice check, "NOT CHECKED" is displayed in the result column and the next check is started.

Voice Check Flow



Check Result	Description	Action
PASSED	Voice check has been completed without problems.	–
FAILED	• Voice is not output properly. • Speaker disconnected	Replace the speaker (Code No. 932929B) or the UR-0488 KEY/LED board.
NOT CHECKED	Voice check was canceled.	–

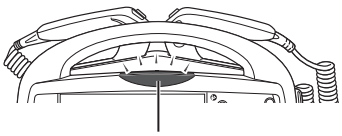
Alarm Check

The defibrillator checks alarm sound generation and alarm indicator operation.

Operator's Manual: "Defibrillator's Operation when an Alarm is Generated"in Section 9

Follow the guidance displayed on the screen.

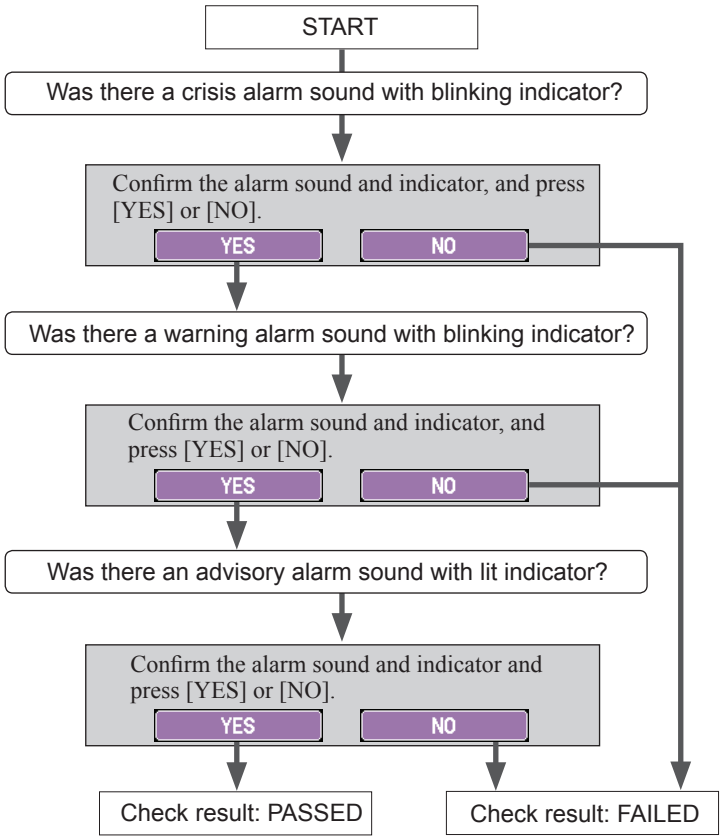
If you press the [CANCEL] key during the alarm check, "NOT CHECKED" is displayed in the result column and the next check is started.



Alarm indicator

In the alarm check, the defibrillator gives the appropriate alarm sound or indicator light for each instruction.

Alarm Check Flow



Check Result	Description	Action
PASSED	Alarm check has been completed without problems.	–
FAILED	Alarm sound and/or indicator did not work properly.	Replace the UR-0493 ALARM IND board.
NOT CHECKED	Alarm check was cancelled.	–

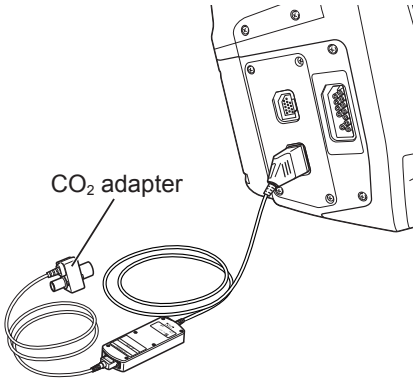
ECG Check (TEC-5602, TEC-5611, TEC-5621, TEC-5631)

The defibrillator checks that the built-in ECG module operates properly.

The ECG check is automatically performed and the check result is displayed.

Check Result	Description	Action
OK	ECG check has been completed without problems.	–
ERROR	An error was detected in the defibrillator.	Replace the UR-0480 L-ECG unit or UR-0481 MOTHER board.

Multi-Parameter Check

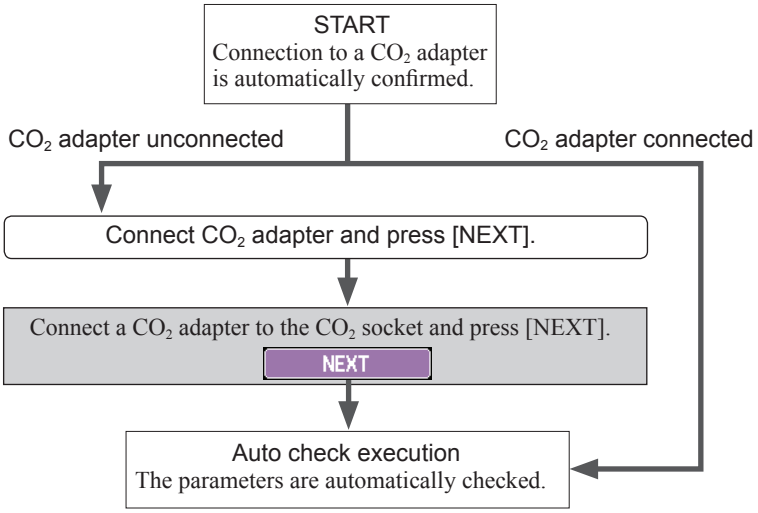


If an optional multi parameter/SpO_2 unit is mounted, the defibrillator checks that there is no abnormality in the CO_2 module.

The multi-parameter check is performed with a CO_2 adapter connected to the CO_2 socket.

The following two items are checked in the multi-parameter check.
1) Communication error and start-up check
2) CO_2 module check
If no CO_2 adapter is connected, pressing the [CANCEL] key cancels the check without performing "(2) CO_2 module check".
In this case, if "(1) Communication error and start-up check" is successfully terminated, "OK" is displayed in the result column and the next check is started.

Multi-Parameter Check Flow



Check Result	Description	Action
OK	Multi-parameter check has been completed without problems.	–
CO_2 ERROR	• Could not detect the CO_2 adapter. • CO_2 module error	Connect another CO_2 adapter and perform the multi-parameter check again. If an error is detected again, contact your Nihon Kohden representative.
SpO_2 ERROR	An error was detected in the respective modules.	Connect another SpO_2 sensor or CO_2 adapter. If the problem is not solved, replace the QI-564V multi parameter/SpO_2 unit or UR-0481 MOTHER board.
MULTI PARA ERROR		
NOT CONNECTED	No optional multi parameter/SpO_2 unit is mounted.	–
NOT CHECKED	Multi-parameter check was canceled.	–

Bluetooth® Check (When Connecting QI-832V)

The defibrillator checks that the optional QI-832V Bluetooth® module operation.

The Bluetooth check is automatically performed and the check result is displayed.

If you press the [CANCEL] key during the Bluetooth check, “NOT CHECKED” is displayed in the result column and the next check is started.

Check Result	Description	Action
OK	Bluetooth check has been completed without problems.	–
ERROR	No destination device was detected.	Check that the destination device is correctly set in the BLUETOOTH SETUP window. (Operator’s Manual: Section 10-2 “Setting the Device to be Connected”)
	An error was detected in the Bluetooth module.	Replace the QI-832V Bluetooth® module.
CONNECTION FAILED	Could not connect to the registered destination device.	• Make sure that the destination device is operating. • Check that the destination device is correctly set in the BLUETOOTH SETUP window. (Operator’s Manual: “Setting the Device to be Connected” in Section 10-2)
NOT CONNECTED	Optional Bluetooth® module is not connected.	–
NOT CHECKED	Bluetooth check was canceled.	–

Recorder Check (TEC-5602, TEC-5611, TEC-5621, TEC-5631)

Confirm the data recorded after the out-of-paper check to check that the recorder operates properly.

Follow the guidance displayed on the screen.

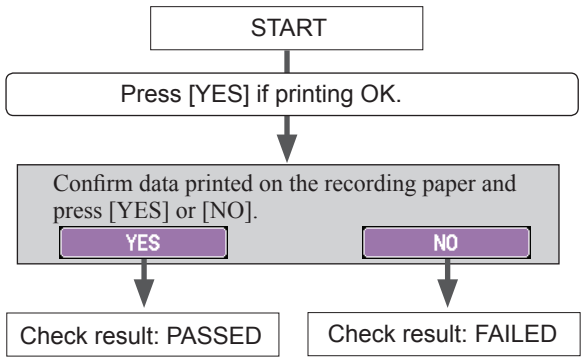
If you press the [CANCEL] key during the recorder check, “NOT CHECKED” is displayed in the result column and the recorder check is terminated.

When the recorder check results in “PASSED”, the basic check result window is displayed and all results are recorded.

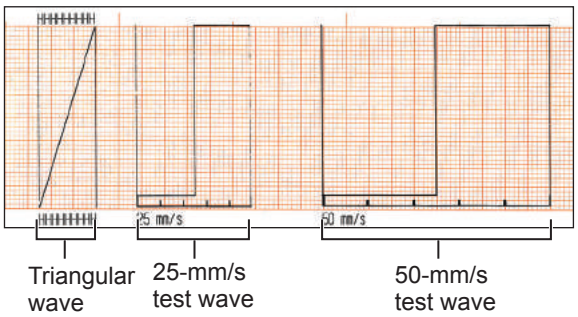
NOTE: Make sure that the date and time printed on the recording paper are correct. The date and time on the recording paper are important parts of the medical records.

“Confirming the Check Results” (p.4-25)

Recorder Check Flow



Test recording example



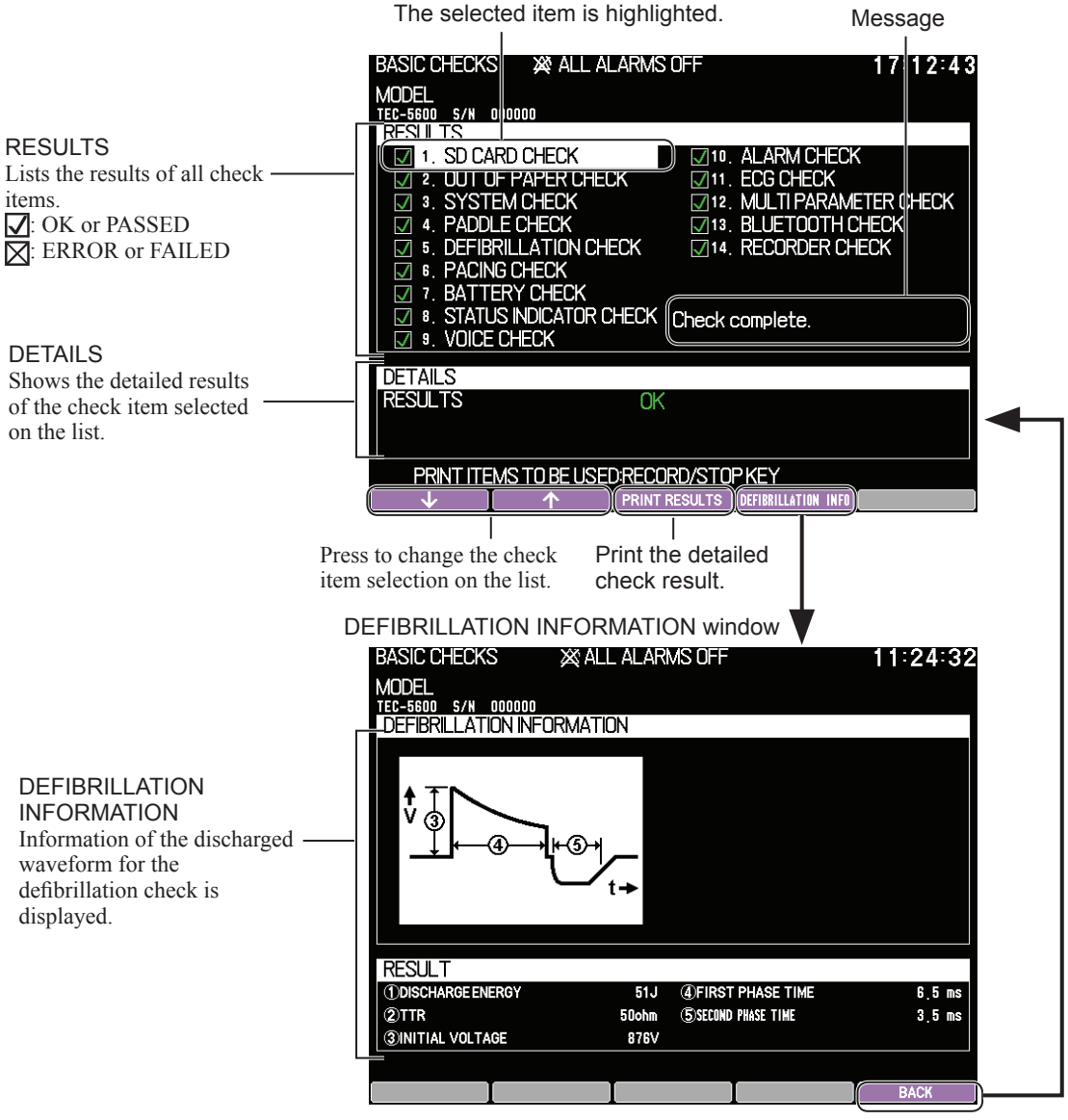
Check Result	Description	Action
PASSED	Recorder check has been completed without problems.	–
FAILED	Data could not be recorded properly.	Clean the recorder or the replace the WS-561V recorder unit.
NOT CHECKED	Recorder check was canceled.	–

Confirming the Check Results

When the basic checks have been completed, the check result window appears. The results of all checked items are displayed in the check result window, showing the detailed results of the selected item.

Press the record/stop key on the front panel to print the manual check list on recording paper.

- The item for which the detailed results is displayed can be changed by pressing the [↓] or [↑] key.
- When you press the [DEFIBRILLATION INFO] key, the defibrillation information window appears. Pressing the [BACK] key restores the check result window.
- Press the [PRINT RESULTS] key to print the detailed check result.



Confirming the Checking History

You can confirm the historical data of the basic checks in the history result window.

The basic check history list window displays a maximum of 31 basic check executions (including the latest one).

Press the record/stop key on the front panel to print the history list from the selected date/time to the latest ones on recording paper.

1 Press the [HISTORY] key on the BASIC CHECKS window to display the history list window.

2 To confirm the results of a certain execution, display the history result window.

1) Press the [↓] or [↑] key and select the date and time to display the results of the basic checks.
2) Press the [DISPLAY] key to display the history result window.

History of a maximum of 31 basic check executions can be stored in an SD card. When the number of executions reaches 31, the data for the oldest execution are removed.

Expiration Date, Replacement and Disposal

Defibrillator

Periodic Replacement Parts

The following parts must be replaced periodically at the described intervals to maintain the function and performance of the defibrillator.

For replacing the periodic replacement parts, contact your Nihon Kohden representative.

Periodic Replacement Part	Expiration
Defibrillator	
NKB-301V battery pack (option)	Usable for approx. 2 years
Electrode springs (Code No. 6114-927936) (test electrode plates in the right and left paddle holders)	Usable for approx. 2 years
Supplied Accessory (TEC-5621, TEC-5631)	
JC-865V pad adapter	Usable for approx. 2 years

Disposal

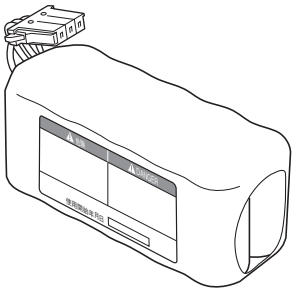
⚠ CAUTION

Dispose of Nihon Kohden products according to your local laws and your facility's guidelines for waste disposal. Otherwise, it may affect the environment. If there is a possibility that the product may have been contaminated with infection, dispose of it as medical waste according to your local laws and your facility's guidelines for medical waste. Otherwise, it may cause infection.

When an optional NKB-301V battery pack has been installed, remove it before disposal.

NKB-301V Battery Pack (Option)

Expiration Date



NKB-301V battery pack

Replace the battery pack with a new one every 2 years.

If it is used continuously without replacement over 2 years, the defibrillator may not fully enable its functions and the backup time in battery operation may be shortened.

Estimated Battery Operation Time

Note that the operation time depends on the usage conditions.

The following operation times are estimated using a fully charged new battery at 20°C (68°F) ambient temperature.

Defibrillation

100 discharges or more of 270 J defibrillation energy
(3 charge/discharge cycles in a minute followed by a pause for a minute)

Monitoring

Continuous monitoring for 180 minutes or more

Pacing (TEC-5631)

Pacing at 180 ppm and 200 mA in fixed mode for 120 minutes

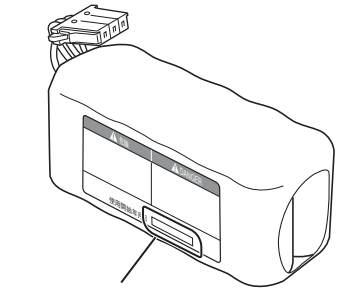
The following operation time is estimated using a fully charged new battery at 0°C (32°F) ambient temperature.

Defibrillation

50 discharges or more of 270 J defibrillation energy
(3 charge/discharge cycles in a minute followed by a pause for a minute)

Replacement

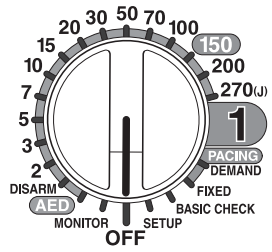
NOTE
- Use only the NKB-301V battery pack.
- Be sure to write the date of replacement on the label of a new battery before installing it.
- Leave battery replacement to your Nihon Kohden representative or a person with expertise.
- When replacing the battery in TEC-5602, TEC-5611, TEC-5621 or TEC-5631, be careful not to face the right side panel downward. This may damage the door release lever, and result in disabling the recorder.



Write the date when use of the battery is started.

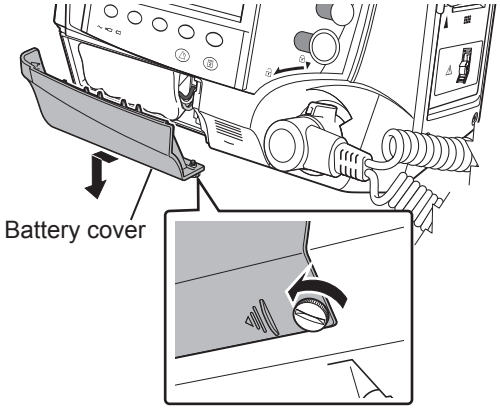
1 Before replacement, write the date of first use of the battery pack on the battery pack label and on the start date label provided with the battery pack, and attach the start date label on an easy to see location on the defibrillator. Use the date as the guide for replacement.

2 Set the control dial to OFF to turn off the power, then disconnect the power cord from the defibrillator.

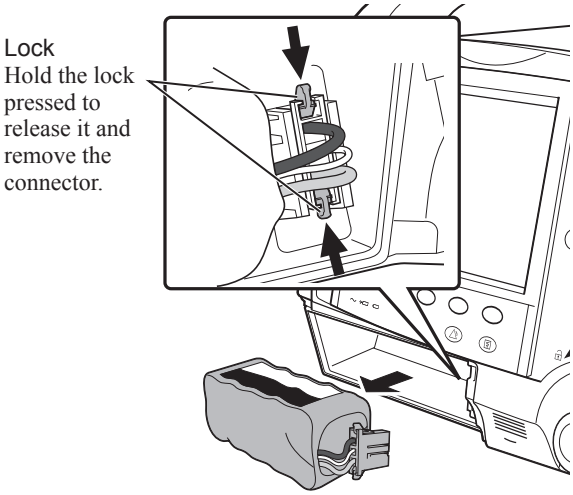


> **⚠ CAUTION**
>
> When inserting or removing the battery, disconnect the power cord from the defibrillator. Otherwise, the operator may receive electrical shock.

NOTE: Never disconnect the power cord while the “Saving data and shutting down. Do not touch the AC power cord” message is displayed. Otherwise, the data in the defibrillator may be damaged.

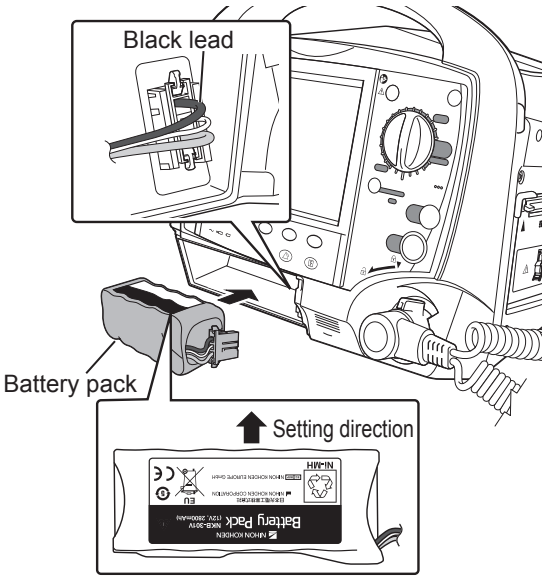


3 Loosen the screw with a flat-blade screwdriver, and remove the battery cover.



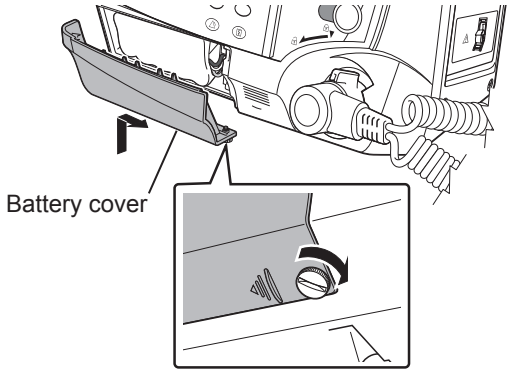
4 Disconnect the battery cable connector and remove the battery pack from the battery case.

NOTE: Do not pull the cable forcibly. Disconnect the cable while holding the lock pressed.



5 Set the new battery pack in the battery case and connect the battery cable connector.

NOTE
- Insert the battery pack and the battery cable connector in the correct direction.
- Make sure that the connector clicks and is securely locked.



6 Attach the battery cover with the screw. Make sure the battery cable is not pinched under the cover.

7 Perform the battery test, referring to the Administrator's Guide.

Administrator's Guide: "Battery Test Procedure"

NOTE: Press the [RESET] key during the battery test to update the date of battery replacement.

Disposal

This battery pack is a nickel-metal hydride. Before disposing of the battery pack, check with your local solid waste officials for details about recycling options or proper disposal in your area. The battery pack is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery pack into the municipal waste stream.

When disposing of the defibrillator, it is necessary to remove the battery pack from it.

JC-865V Pad Adapter (TEC-5621, TEC-5631)

Expiration Date and Replacement

Replace the JC-865V pad adapter every two years.

Disposal

To dispose of the JC-865V, contact authorized personnel for medical waste.

Disposable Pads (Option)

Expiration Date and Replacement

The expiration date of disposable pads is indicated on the package. Be sure to observe the date.

⚠ WARNING

Do not use the disposable pads if they are past the expiration date on the package. Failure to follow this warning may lead to skin burn or insufficient delivery of shock.

⚠ CAUTION

When disposable pads are attached to a patient, replace them every 24 hours. After 24 hours, the gel becomes dry and this may reduce performance of the pads.

Disposal

To dispose of used pads, contact authorized personnel for medical waste.

Other Options

Refer to the documents (including the operator's manuals) supplied with the respective products.

Cleaning, Disinfecting and Storage

Defibrillator

> **⚠ CAUTION**
> Before maintenance, cleaning or disinfection, turn the defibrillator power off and disconnect the power cord from the AC socket. Failure to follow this instruction may result in electrical shock and defibrillator malfunction.

NOTE: Avoid using flammable disinfectants such as ethanol in a closed place. Ventilate the room if you use flammable disinfectants.

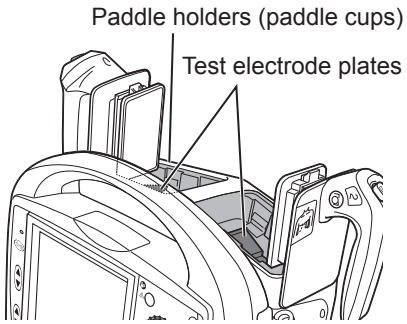
Cleaning the Exterior

When to clean: Every time after use

After use, wipe with a non-abrasive cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C or 59°F), neutral detergent diluted with water, or isopropyl alcohol.

When connecting the external paddles, wipe off any dirt from both paddle holders (paddle cups) and any contact gel (GELAID) remaining on the test electrode plates.

When the external paddles are connected



NOTE
- Do not use organic solvents such as thinners, benzine or industrial alcohol. These may melt or crack the surface.
- Do not leave saline-soaked gauze on the paddle holders. It would cause discoloration (rusting) of the metal surfaces of the test electrode plates or paddles.

Cleaning the Recorder (TEC-5602, TEC-5611, TEC-5621, TEC-5631)

When to clean: Every 6 months

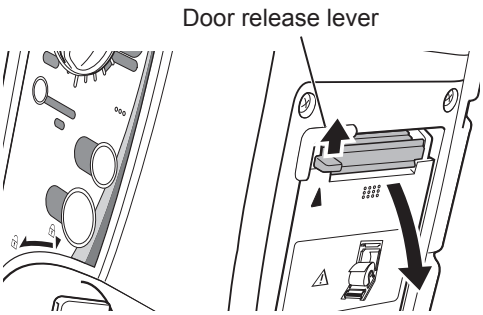
To maintain clear printing, clean the thermal head, paper feed roller, and sensors.

When paper has been set, once detach it and set it again after cleaning.
Operator's Manual: "Loading the Recording Paper (TEC-5611, TEC-5621, TEC-5631)" in Section 4

> **⚠ CAUTION**
> Do not touch the thermal head inside the recorder unit. The thermal head may be damaged by static electricity or become dirty and cause printing failure.

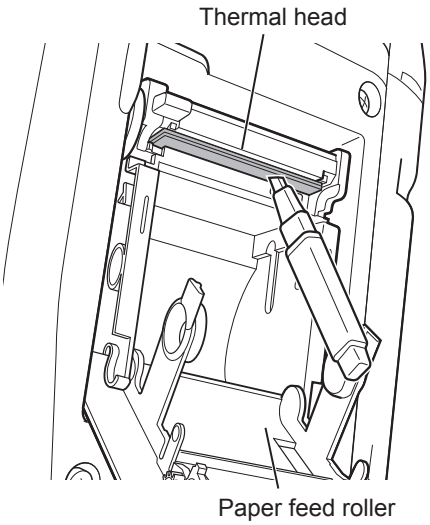
NOTE: Be sure to clean the recorder in the power-off status.

To clean the thermal head and paper feed roller



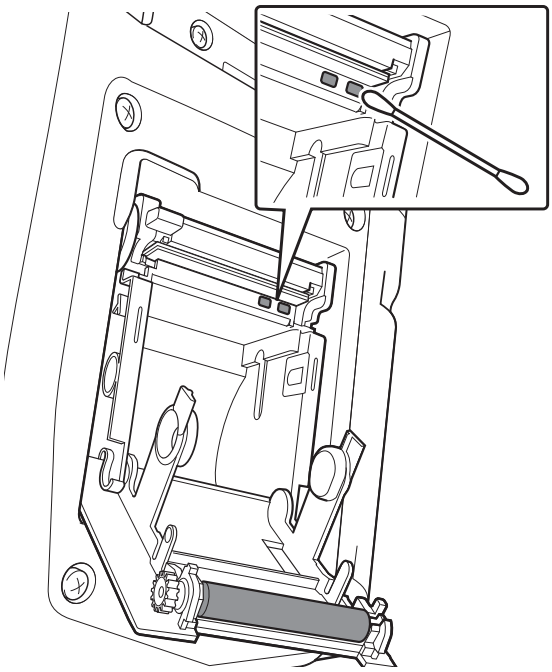
1 Push up the door release lever and open the recorder door.

The door once stops at the half-opened position for security reasons. Pull the door by hand to fully open it.



2 Clean the gold-colored part (heat generation block) of the thermal head with the supplied Y-001 thermal head cleaning pen.

3 Clean the paper feed roller with a soft cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C or 59°F).



To clean the sensors

To properly detect the out-of-paper status, clean the sensor surfaces with a cotton swab.

Storage of Recording Paper (TEC-5602, TEC-5611, TEC-5621, TEC-5631)

Long-term storage at high temperature or high humidity or under direct sunlight or fluorescent light causes discoloration of the color-developing surface. Especially avoid a place exceeding 50°C (122°F) or a place exposed to drops of water. Storage in a dry, cool, dark place is recommended.

Cables and Paddles

NOTE
- For details on cleaning and disinfecting leads, cables and cords, also refer to the manual.
- Use the described cleaning and disinfection methods.
- Avoid using flammable disinfectants such as ethanol in a closed place. Ventilate the room if you use flammable disinfectants.

Pad Adapter, Electrode Leads, ECG Connection Cord

When to clean: After every use

Cleaning

After use, wipe with a non-abrasive cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C or 59°F) or neutral detergent diluted with water, and then wipe dry with a dry cloth.

NOTE: Do not wet the connector.

Disinfecting

Wipe with a non-abrasive cloth moistened with any of the disinfectants listed below.

Glutaraldehyde solution:	2%
Alkyldiaminoethylglycine hydrochloride:	0.5%
Benzalkonium chloride:	0.2%
Benzethonium chloride solution:	0.2%
Chlorhexidine gluconate solution:	0.5%

NOTE
- Do not wet the connector.
- Always use the correct disinfectant concentration.
- Do not disinfect with hypochlorous acid.
- Do not sterilize or disinfect with ultraviolet light or ozone.

SpO_2 Connection Cord

When to clean: After every use

Cleaning

After use, wipe with a non-abrasive cloth moistened with neutral detergent diluted with water, and then wipe dry with a dry cloth.

NOTE: Do not wet the connector.

Disinfecting

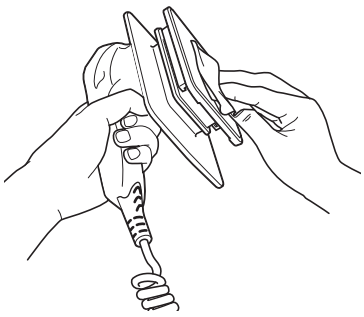
Wipe with a non-abrasive cloth moistened with any of the disinfectants listed below.

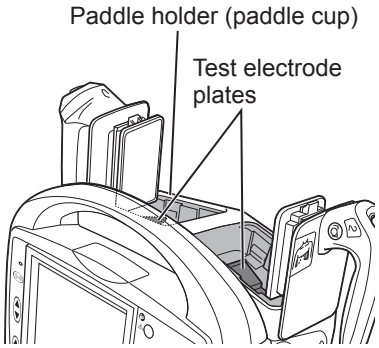
Glutaraldehyde solution:	2%
Alkyldiaminoethylglycine hydrochloride:	0.5%
Benzalkonium chloride:	0.2%
Benzethonium chloride solution:	0.2%
Chlorhexidine gluconate solution:	0.5%

NOTE
- Do not wet the connector.
- Always use the correct disinfectant concentration.
- Do not disinfect with hypochlorous acid.

- Do not sterilize or disinfect with ultraviolet light or ozone.

External Paddles





To clean and disinfect the external paddles

When to clean: After every use

After use, wipe off the contact gel (GELAID) on the electrode surfaces or handles with a soft cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C or 59°F).

When cleaning the external paddles, also wipe dirt off on the paddle holders (paddle cups) and the contact gel (GELAID) of the test electrode plates. Also remove the ND-618V adult electrode assy from the external paddles and clean the child electrode of the external paddles side and the spring of the rear of the adult electrode.

NOTE
- The external paddles cannot be disinfected.
- Do not expose the external paddles to heat over 60°C (140°F), and prevent their being dropped into water or other liquid.

Internal Paddles

To clean, disinfect, and sterilize the internal paddles

When to clean: After every use

For details on cleaning, disinfecting and sterilization of the internal paddles, refer to the document (including operator's manual) supplied with the paddles.

Other Options

Refer to the documents (including operator's manuals) supplied with the respective products.

Before Monthly Check

Recording and Saving the Reports

The data in the internal memory may be lost while checking. Before check, record the data in the internal memory or save the data in the internal memory to an SD card.

For recording and saving the data in an SD card, refer to the Operator's Manual.

When Using a Loaner Defibrillator

The settings on the SETUP windows and SYSTEM SETUP screen can be changed manually and saved in the defibrillator. When using a loaner defibrillator during maintenance, set all the settings on the SETUP windows and SYSTEM SETUP screen of the loaner defibrillator to the same as the settings of the defibrillator which will be checked or repaired.

The energy setting and alarm settings of the AED mode may be customized too. Make sure that the SETUP settings, energy setting in the AED mode and alarm settings on the loaner defibrillator are correct.

NOTE: If you do not use a loaner defibrillator during maintenance and change the defibrillator settings during maintenance, make sure to return the settings after maintenance and turn the defibrillator off. The settings are applied immediately after changing.

Copying the Settings to the Loaner Defibrillator

1. Insert the SD card into the defibrillator which will be checked and save the settings using "36. Save Settings"on the SYSTEM SETUP screen. For details, refer to the Administrator's Guide.
2. Remove the SD card from the defibrillator and insert it into the loaner defibrillator. Load the settings from the SD card using "35. Load Settings" on the SYSTEM SETUP screen. For details, refer to the Administrator's Guide.

Checking the Appearance

Check the following.

Defibrillator

- The defibrillator is not dirty.
- The defibrillator is not cracked or damaged.
- No labels are removed or torn.
- No connectors or switches are cracked or loose.
- Blood or chemical on the defibrillator is cleaned.

Power Cord

- A specified 3-prong power cord is used.
- The metal parts on the connector are not deformed.
- There are no scratches on the cable and cable cover is not torn.
- Using a tester, check that the protective earth is not broken.

External Paddles

- Resin of the external paddles and electrodes for the adult are not cracked or broken.
- No scratches or cracks on the curled cable or cable mold.
- Paddle electrodes and the metal plates on the paddle holder are not rusted, dirty, rotten or damaged.
- Confirm that the shock button on the paddle is not removed when pulling it. If the button is removed, the button must be replaced.

Accessories

- Cables are not broken, bent abnormally or cut.
- Connectors are not damaged or cracked.
- Pins on the connector are not deformed.
- Screws are not loose.
- Pad adapter is not expired.
- The lifetime of the pad adapter is two years. Replace the pad adapter immediately if it is expired.

Checking the NKB-301V Battery Pack

Appearance

Check the following and if the battery pack is faulty, replace it.

- No damage or crack on the battery pack.
- No labels are removed or torn.
- The battery pack is not expired.

  The life time of the battery pack is two years. Replace the battery pack immediately if it is expired.

Battery Test

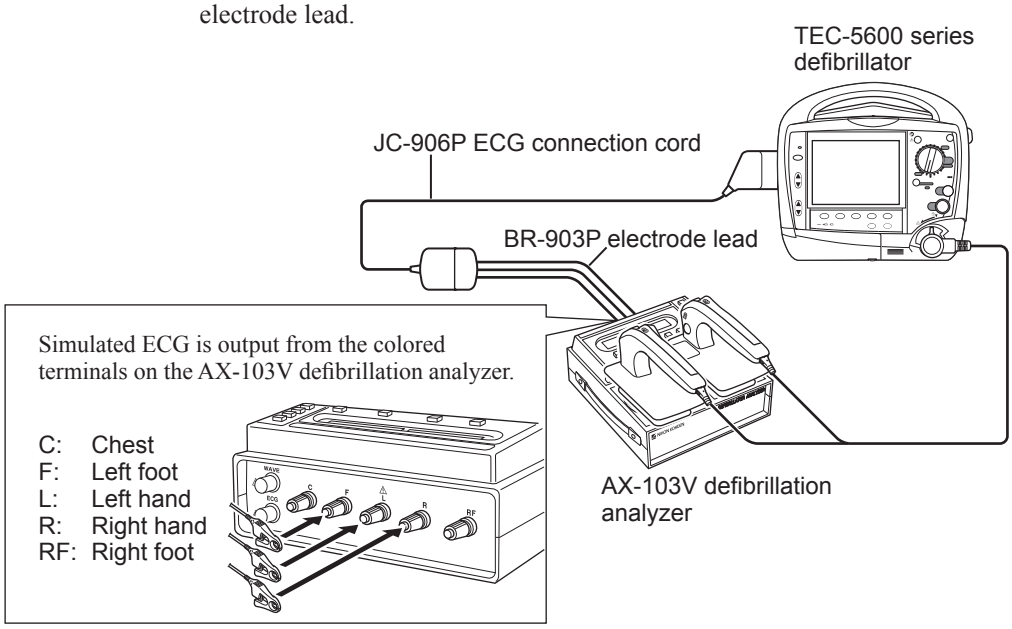
Perform the battery test once a month using “3. BATTERY TEST” on the SYSTEM SETUP MENU screen. For details, refer to the Administrator’s Guide.

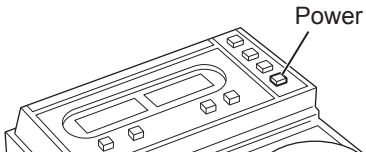
Checking the Defibrillator

Connecting the Checker and Turning the Defibrillator On

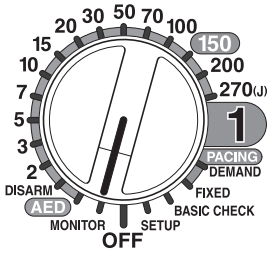
For connection, also refer to the AX-103V defibrillation analyzer Operator's Manual.

1 Connect the AX-103V defibrillation analyzer and TEC-5600 series defibrillator using the JC-906P ECG connection cord and the BR-903P electrode lead.





2 Turn the defibrillation analyzer on. The simulated ECG is output from the defibrillation analyzer.



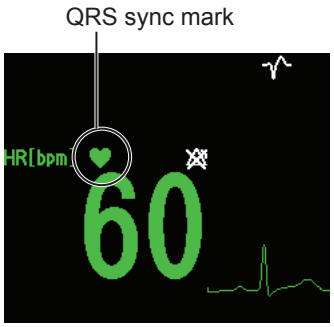
3 Turn the defibrillator control dial to the MONITOR position and confirm that there no abnormalities such as abnormal sound, smell or excess heat.

4 Set the lead to "II" by pressing the [LEAD] key.

Wait for several seconds then confirm the following.

- There are no error messages on the defibrillator screen and ECG is displayed correctly.
- The defibrillator screen is not dark.

Adjusting the Sync Sound

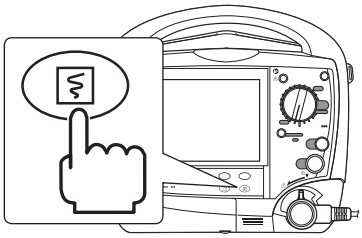


1 After turning the defibrillator power on, confirm that there is a sync sound and QRS sync mark blinks synchronized with the ECG on the screen.

2 On the SYNC SOUND setting on the VOLUME window, confirm that the sound volume can be changed. For the volume settings, refer to Operator's Manual.

Checking the Recorder

Record/Stop Key



Press the record/stop key on the front panel to record the waveforms. Confirm that the ECG is recorded correctly and the recording paper feeds correctly and is not skewed. To stop recording, press the record/stop key on the front panel again.

Date and Time Printed on the Recording Paper

Confirm that the date and time printed on the recording paper is correct. If not, correct the date and time setting on the DATE AND TIME window. For the settings, refer to Operator's Manual.

Event Key

On the monitoring screen, press the [EVENT] key to confirm that waveforms for 12 seconds are recorded.

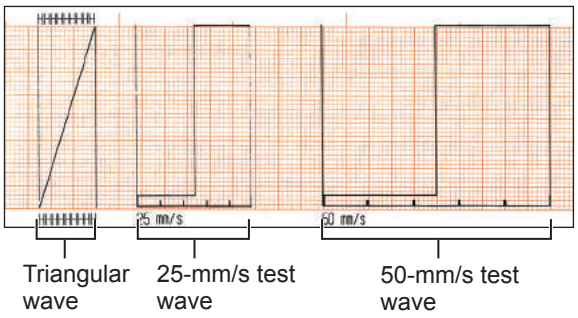
For details on recording, refer to Operator's Manual.

Recording Quality

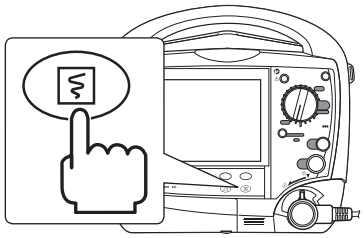
On the SYSTEM SETUP MENU screen, perform “4. RECORDER TEST” and confirm that the following.

- There are no missing dots.
- The recorded items are not too pale or too dark.
- The width of one cycle of calibration waveform is in the range of 22.5 to 27.5 mm.

For details on the recorder test, refer to the Administrator’s Guide.



Detecting Out of Paper



1 Removing the recording paper from the recorder and close the recorder cover.

2 Press the record/stop key on the front panel to confirm that the defibrillator operates as follows.

Alarm	Operation
Message	The “OUT OF PAPER”message is displayed in blue.
Sound	There is an alarm sound of “ec” in interval of 20 seconds.
Indicator	Lights in blue.

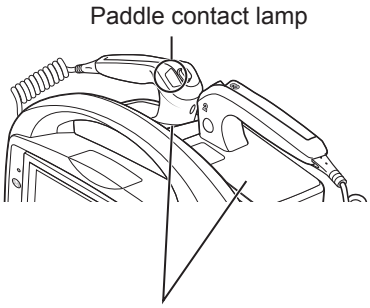
Checking the Defibrillation Function in Manual Mode

Check the defibrillation function in manual mode once a month.

To check charging and discharging, the AX-103V defibrillation analyzer is necessary. When checking the defibrillation function, operate the defibrillator on the AC power. For AC operation, refer to the Operator's Manual.

When performing "Checking the Duration of Charging Energy" and "Checking the Discharged Energy" in this section, operate the defibrillator on the battery power.

Checking the Connector Off Detection



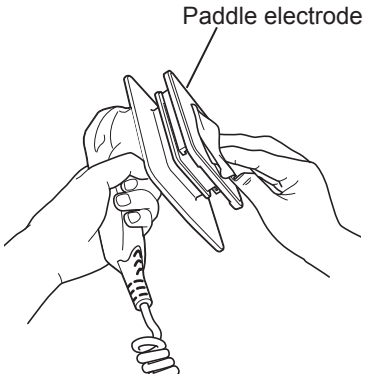
Place the paddles on the paddle holders.

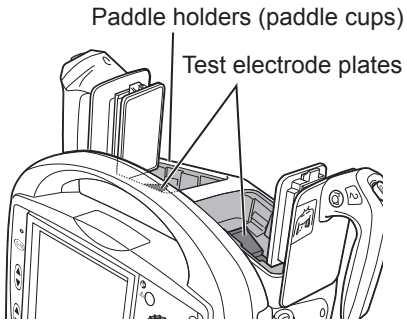
1 When using the external paddles, check the paddle contact. When using the disposable pads, connect the jigs to the defibrillator.

When using the external paddles

Put the external paddles on the paddle holder and turn the control dial to the DISARM position. Then confirm that the paddle contact lamp lights in green.

If the paddles contact lamp lights in orange or yellow, clean the paddle electrodes and the test electrode plates on the paddle holders.

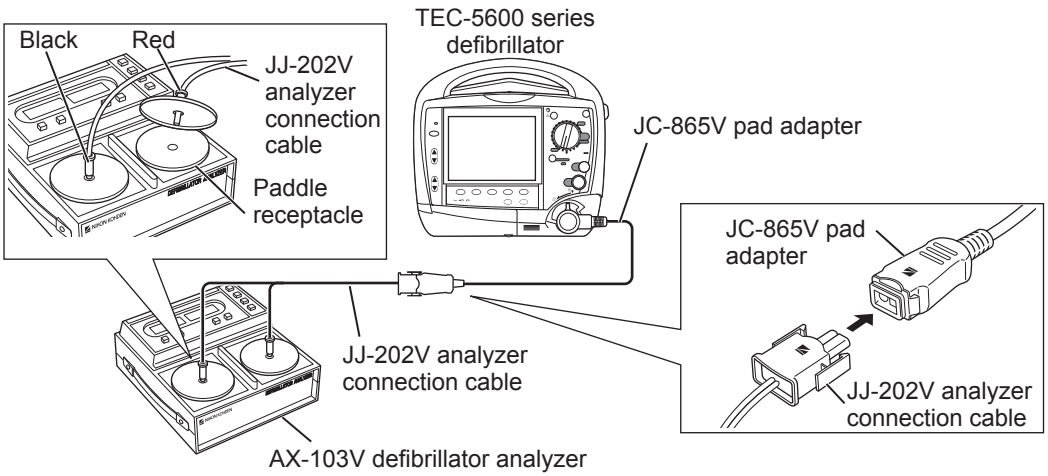




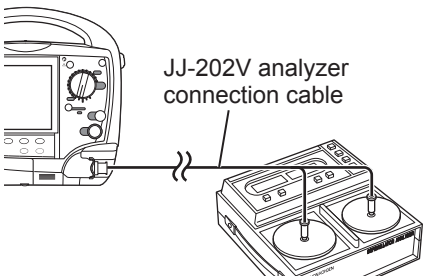
When using the disposable pads

Using the JC-865V pad adapter and JJ-202V analyzer connection cable*, connect the defibrillator and the AX-103V defibrillation analyzer.

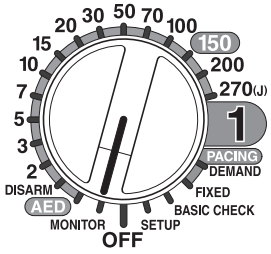
* An accessory of the AX-103V defibrillation analyzer.



TEC-5611



When using the TEC-5611 defibrillator, the JC-865V pad adapter is not necessary.

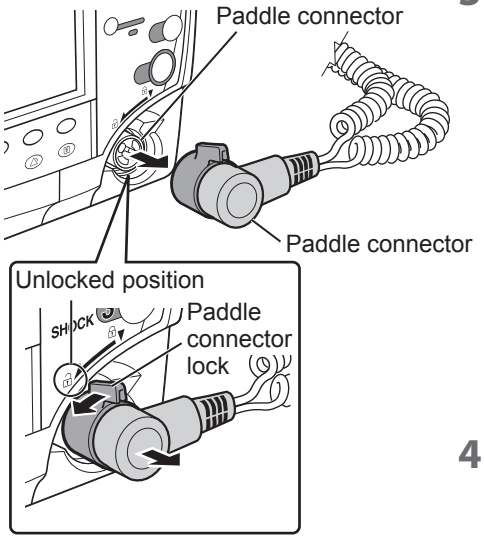


2 Turn the defibrillator control dial to the MONITOR position and confirm that the ECG lead is “PADDLE”.

If other lead is selected, set the lead to “PADDLE” by pressing the [LEAD] key.

3 Turn the paddle connector to the left to unlock the connector and remove the connector from the defibrillator. Then confirm that the “CONNECT PADDLES/PADS” message appears on the screen.

NOTE: Hold the paddle connector when removing the paddle/pad adapter from the defibrillator. Holding the part other than paddle connector may damage the connector or break the paddle/pad adapter cable.

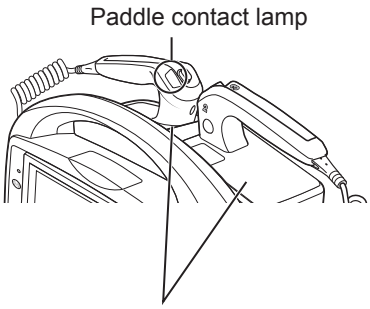


4 Connect the external paddles or pad adapter removed in step 3 to the defibrillator.

Checking the Duration of Charging Energy

Confirm that energy in charged within 5 seconds on AC power operation and battery power operation using a stopwatch or a second hand of a clock.

AC Power

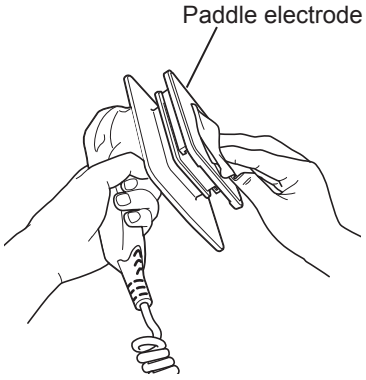


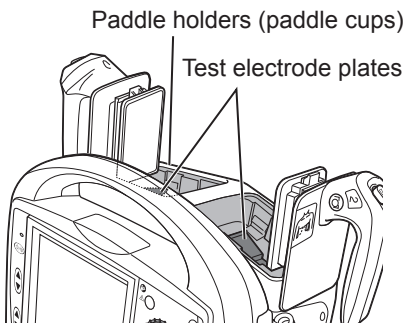
Place the paddles on the paddle holders.

When using the external paddles

Before checking the duration of charging energy, put the external paddles on the paddle holder and turn the control dial to the DISARM position. Then confirm that the paddle contact lamp lights in green.

If the paddles contact lamp lights in orange or yellow, clean the paddle electrodes and the test electrode plates on the paddle holders.

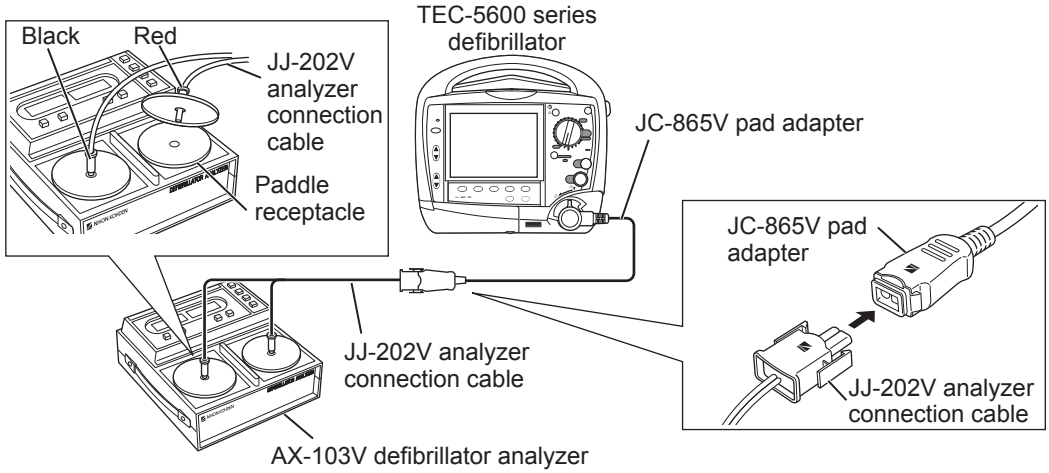




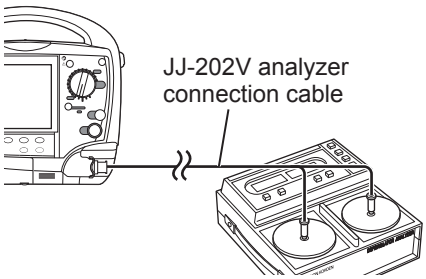
When using the disposable pads

Using the JC-865V pad adapter and JJ-202V analyzer connection cable*, connect the defibrillator and the AX-103V defibrillation analyzer.

* An accessory of the AX-103V defibrillation analyzer.

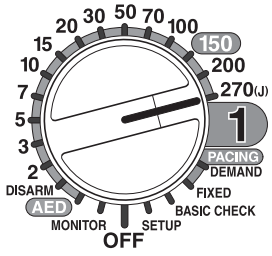


TEC-5611



When using the TEC-5611 defibrillator, the JC-865V pad adapter is not necessary.

Procedure



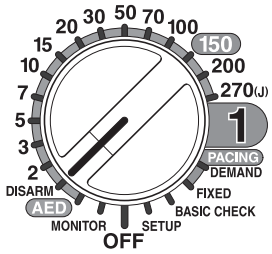
1 Operate the defibrillator on the AC power.

2 Turn the control dial to the 270 J position.

3 Press the CHARGE/AED button on the front panel to start charging and measure the time from pressing the button to the "CHARGED" message appears on the screen and there is a beeping sound. Confirm that the measured time is within 5 seconds.

> ⚠ **WARNING**
>
> When charging or discharging, do not touch anything other than the handles of the paddles. If any other part of the defibrillator is touched during charging or discharging, the operator receives an electrical shock.

> ⚠ **WARNING**
>
> Do not move or transport the defibrillator when any residual charge remains in the defibrillator. If the defibrillator receives any impact, such as from falling, it may discharge and can cause electrical shock.

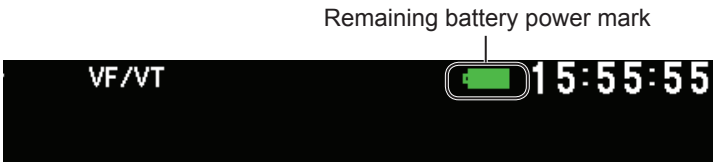


4 Turn the control dial to the DISARM position to discharge the energy internally.

Battery Power

1 Disconnect the power cord from the AC inlet to operate the defibrillator on the battery power.

2 Confirm that the ▬ icon (fully charged) is displayed on the screen. If the battery pack is not fully charged, charge the battery pack.



3 Do step 2 to 4 of the "AC Power" procedure in the previous and this pages to confirm that the defibrillator charges the energy correctly on the battery power operation.

Checking the Discharged Waveform

Using the AX-103V or Fluke Impulse 6000D/7000DP defibrillation analyzer and oscilloscope, check the shape of the discharged energy. Refer to the manuals of the defibrillation analyzer and oscilloscope together with this manual.

1 Connect the defibrillator and the oscilloscope to the defibrillation analyzer.

When the AX-103V is used

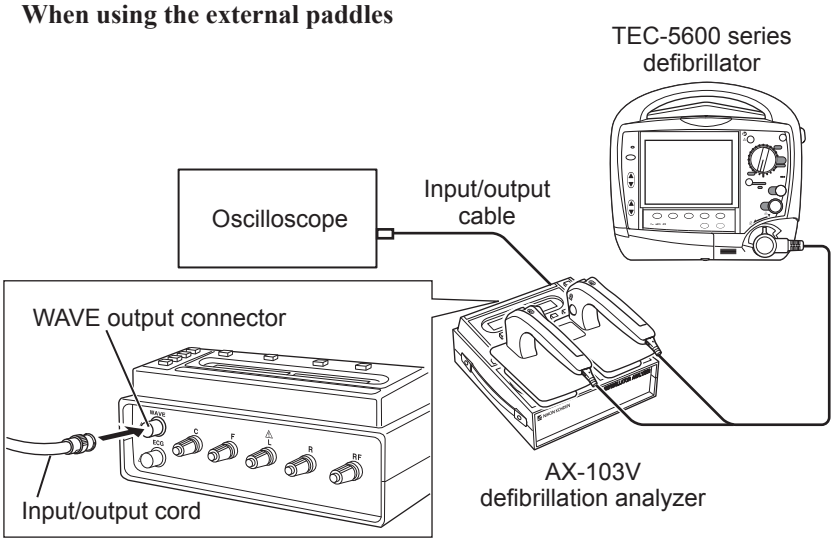
Recommended oscilloscope settings

Sensitivity: 0.5V/div

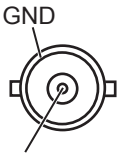
Sweep speed: 2ms/div

NOTE: Use the input/output cable to connect the AX-103V defibrillation analyzer and the oscilloscope.

When using the external paddles

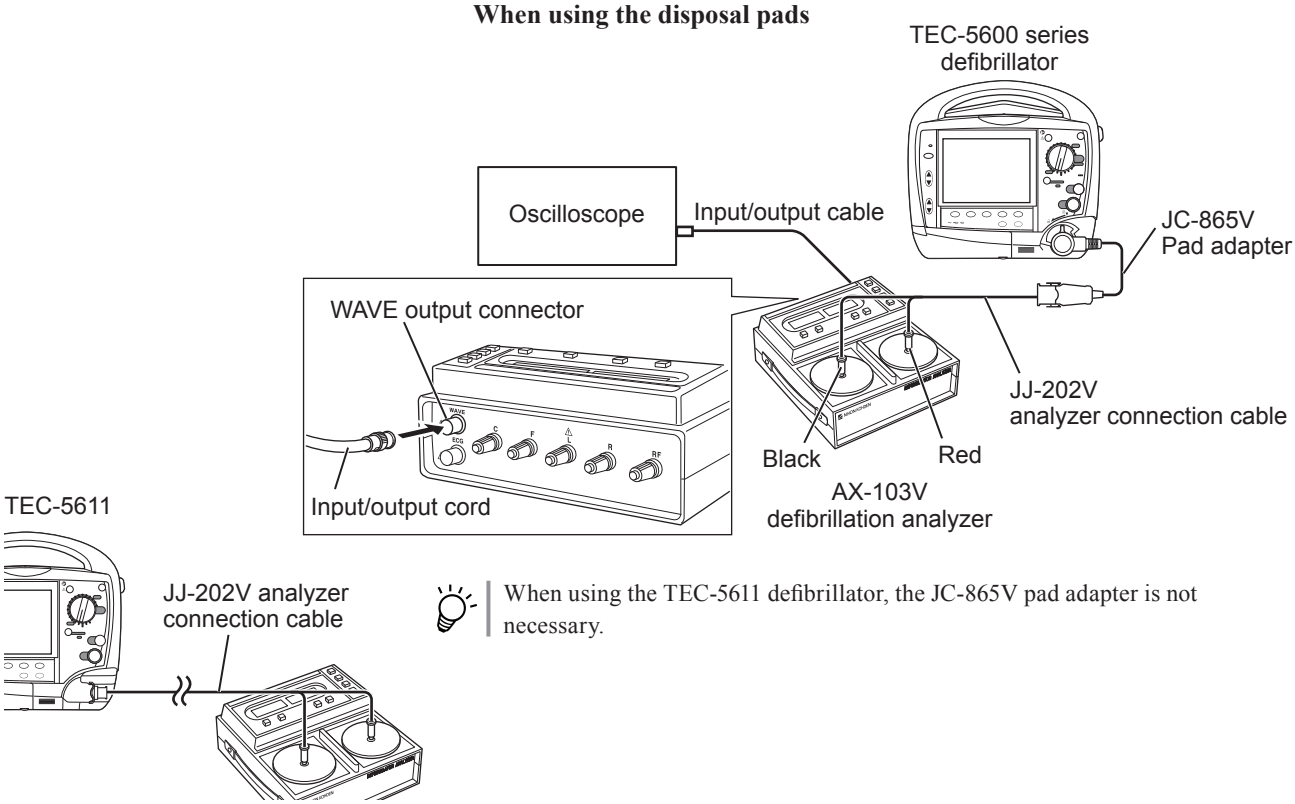


WAVE Connector (BNC)



The discharged waveform of the following attenuation is output.
HIGH: 1/2400
LOW: 1/960
You can switch HIGH and LOW using the SENS button on the defibrillation analyzer.

When using the disposal pads

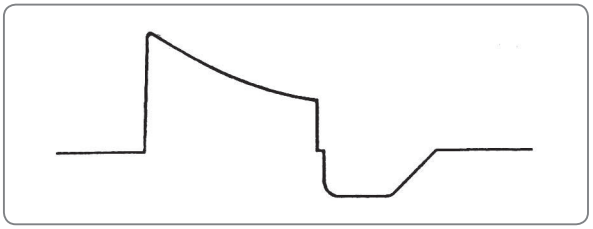


When using the TEC-5611 defibrillator, the JC-865V pad adapter is not necessary.

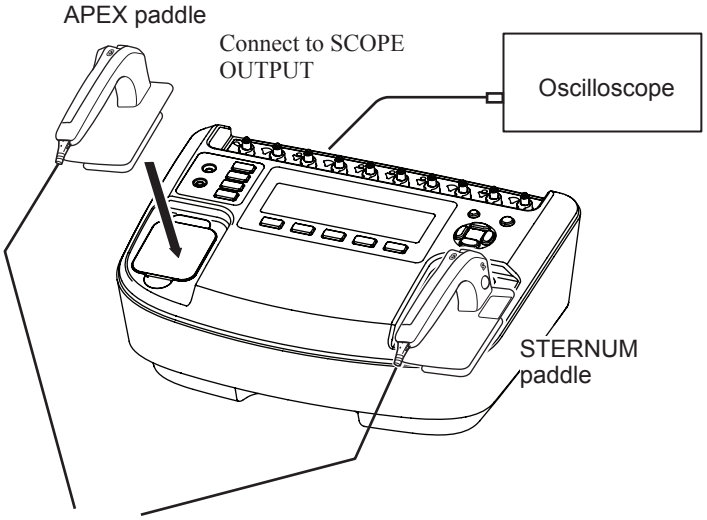
When the Fluke Impulse 6000D/7000DP is used

When the JC-865V disposable pad adapter is used, connect the specified connector to the JJ-225X checker connection cable (Code No.: 735625). When the JC-855V disposable pad adapter is used, use the specified cable.

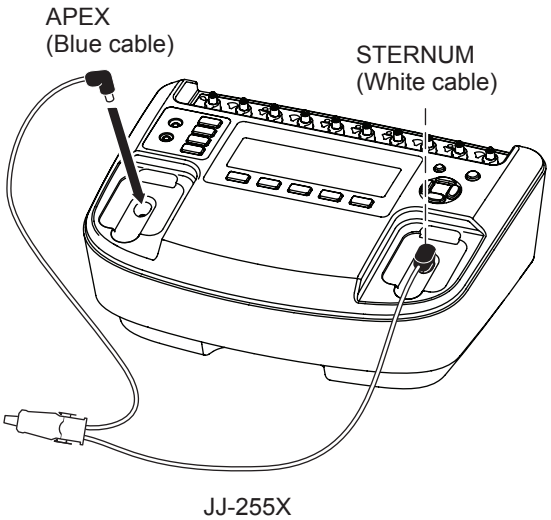
Check the connection polarity so that the displayed discharged waveform has the following shape.

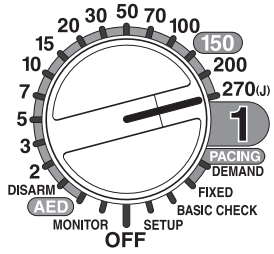


When using the external paddles



When using the JC-865V disposable pad adapter

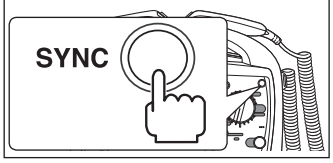




2 Turn the control dial to the 270 J position and confirm the following.

- Confirm that the defibrillation mode is MANUAL. If "SYNC mode" is displayed on the screen, change the mode to MANUAL by pressing the SYNC button on the front panel.

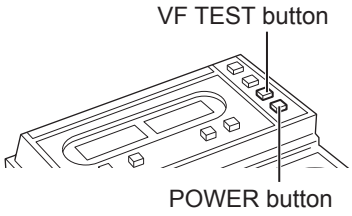
If "SYNC MODE" is displayed



- Confirm that the ECG lead is PADDLE or PAD. If other lead is selected, set the lead to "PADDLE" or "PAD" by pressing the [LEAD] key.

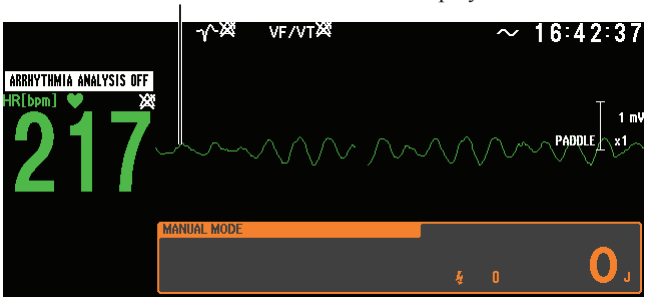
Lead: PADDLE or PAD

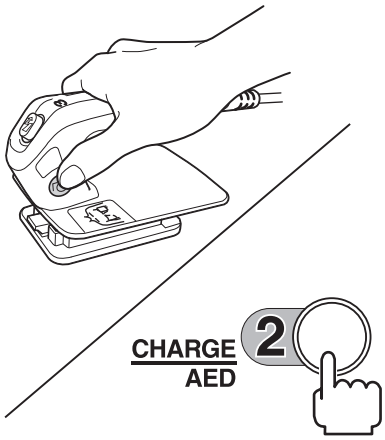
Mode indication: MANUAL MODE



3 Turn the defibrillation analyzer on and press the VF TEST button on the defibrillation analyzer to output the simulated VF waveform. Confirm that a VF waveform is displayed on the screen.

Confirm that a simulated VF waveform is displayed.





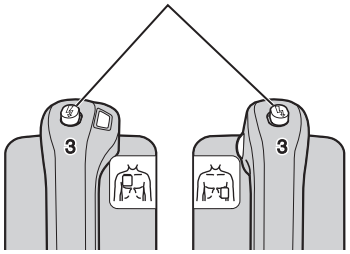
4 Press the charge button on the APEX paddle or CHARGE/AED button on the front panel to start charging.

During charging, there is a continuous buzzing sound and the "CHARGING" message appears on the screen.

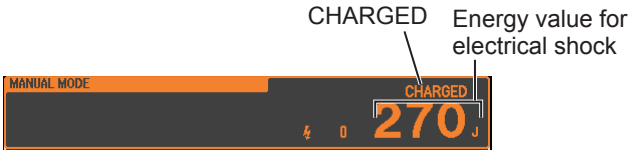
CHARGING

The energy value increases.

The shock buttons flash.



When charging is completed, the message “CHARGED” and some guidance are displayed on the screen, and a continuous beep sounds. At the same time, the shock buttons on the external paddles start flashing.



When using the pad adapter and JJ-202V analyzer connection cable, the CHARGE/AED button flashes.

Example: Wrong way of holding the external paddle

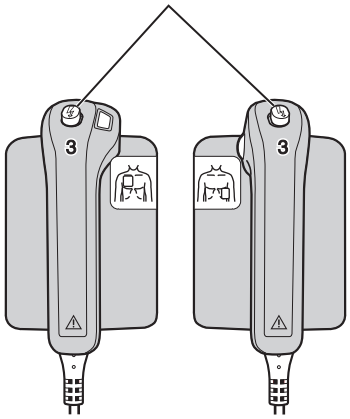
⚠ WARNING

When charging or discharging, do not touch anything other than the handles of the paddles. If any other part of the defibrillator is touched during charging or discharging, the operator receives an electrical shock.

⚠ WARNING

Do not move or transport the defibrillator when any residual charge remains in the defibrillator. If the defibrillator receives any impact, such as from falling, it may discharge and can cause electrical shock.

Shock buttons

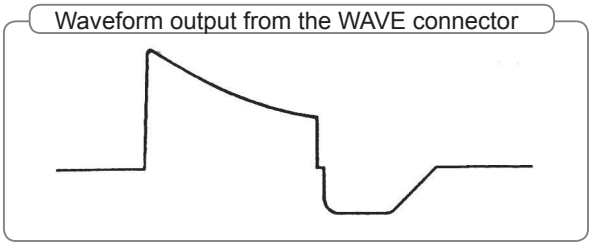


5 After confirming that the shock buttons flash, press both shock buttons on the paddles at the same time to discharge the energy.

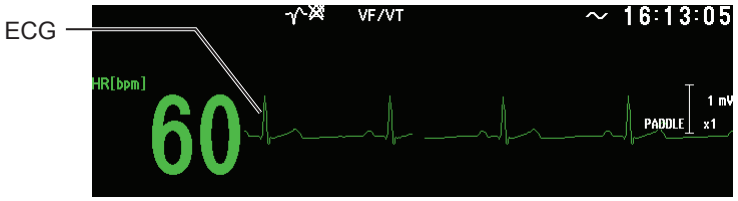
When using the pad adapter and JJ-202V analyzer connection cable, press the flashing CHARGE/AED button firmly.

NOTE: Do not discharge the energy with external paddle electrodes pressed against each other. This may damage the defibrillator.

Confirm that the waveform from the AX-103V defibrillation analyzer is biphasic with the oscilloscope.



6 Confirm that normal ECG is displayed on the screen.

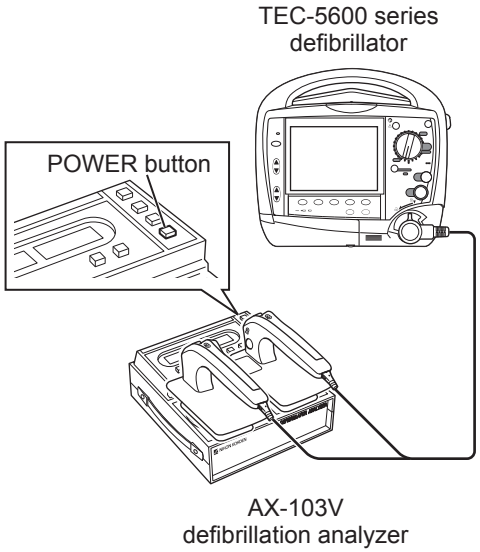


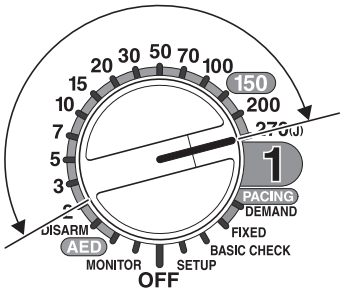
Checking the Discharged Energy

On AC power operation and battery power operation, confirm that the discharged energy is within range the specified by IEC. Use the external paddles for this check. When the external paddles are not used, skip this check.

Connect the defibrillator to the AX-103V defibrillation analyzer and turn the defibrillation analyzer on.

NOTE: Set the defibrillation mode to SYNC MODE for this check.

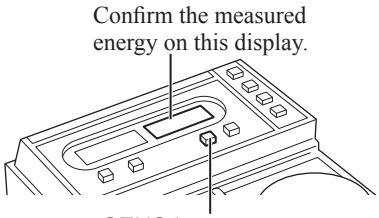




Perform defibrillation with the every energy setting (2, 3, 5, 7, 10, 15, 20, 30, 50, 70, 100, 150, 200 and 270 J). To change the energy setting, turn the control dial on the front panel.

For details on defibrillation, refer to “Checking the Discharged Waveform” in this section or the Operator’s Manual.

For each energy setting, confirm that the energy is charged as set on the control dial and energy measured by the AX-103V defibrillation analyzer is as follows.



Energy Accuracy According to the IEC 60601-2-4

Within ±15% or ±3 J of the energy set by the control dial, whichever greater.

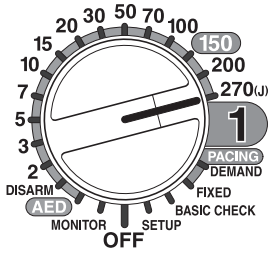
NOTE
- When confirming the discharged energy on the AX-103V defibrillation analyzer, change the measurement range as follows. You can change the measurement range by pressing the SENS button on the defibrillation analyzer.
  - 0 to 70 J: LOW
  - 100 to 270 J: HIGH
- When you discharge the energy repeatedly in a short period, repeat the following cycle; discharge the energy three times in one minute then leave the defibrillator for one minute without discharging.

Battery Power

Operate the defibrillator on the battery power for this check.

NOTE • Set the defibrillation mode to SYNC MODE for this check.

• Set the measurement range of the defibrillation analyzer to HIGH.

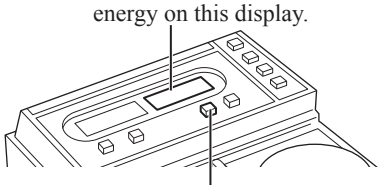


Turn the control dial to the 270 J position and discharge the energy.

For details on defibrillation, refer to “Checking the Discharged Waveform” in this section or the Operator’s Manual.

Confirm that the energy is charged as set on the control dial and energy measured by the AX-103V defibrillation analyzer is as follows.

Confirm the measured energy on this display.



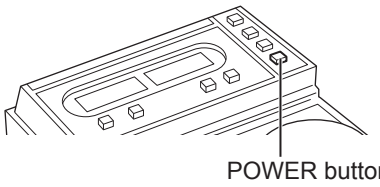
SENS button
Set the measurement range to HIGH.

Energy Accuracy According to the IEC 60601-2-4

Within 270 J ±15%

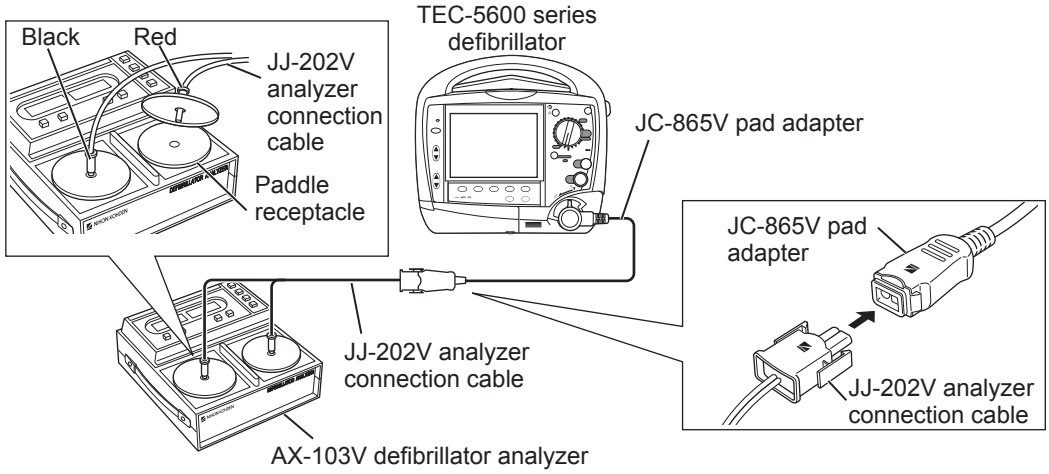
Checking the Discharge for When Using the Disposable Pads

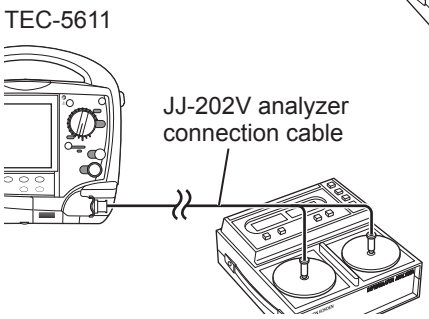
Confirm that the discharged energy is within the range specified by IEC on AC power operation.



1 Using the JC-865V pad adapter and JJ-202V analyzer connection cable*, connect the defibrillator and the AX-103V defibrillation analyzer. Then turn the defibrillation analyzer on by pressing the POWER button of the defibrillation analyzer.

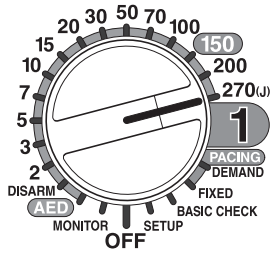
* An accessory of the AX-103V defibrillation analyzer.





When using the TEC-5611 defibrillator, the JC-865V pad adapter is not necessary.

NOTE
- Set the defibrillation mode to SYNC MODE for this check.
- Set the measurement range of the defibrillation analyzer to HIGH.



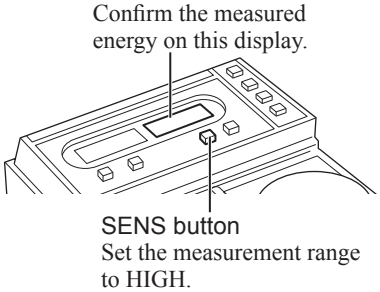
2 Turn the control dial to the 270 J position and discharge the energy.

For details on defibrillation, refer to “Checking the Discharged Waveform” in this section or the Operator’s Manual.

3 Confirm that the energy is charged as set on the control dial and energy measured by the AX-103V defibrillation analyzer is as follows.

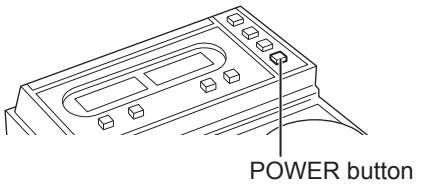
Energy Accuracy According to the IEC 60601-2-4

Within 270 J ±15%



Checking the Discharge for When Using the Internal Paddles

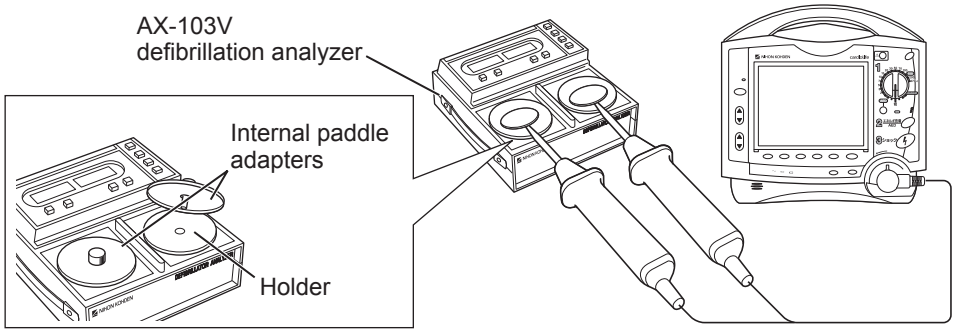
Confirm that the discharged energy is within the range specified by IEC on AC power operation.



1 Using the internal paddle adapters*, connect the defibrillator and the AX-103V defibrillation analyzer. Then turn the defibrillation analyzer on by pressing the POWER button of the defibrillation analyzer.

* An accessory of the AX-103V defibrillation analyzer.

When the internal paddles are sterilized, use the sterilized internal paddle adapters to prevent the internal paddles from getting contaminated.



NOTE
- Set the defibrillation mode to SYNC MODE for this check.
- Set the measurement range of the defibrillation analyzer to LOW.
- When you discharge the energy repeatedly in a short period, repeat the following cycle; discharge the energy three times in one minute then leave the defibrillator for one minute without discharging.

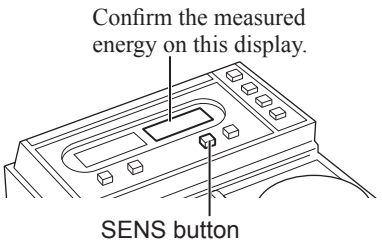
2 Perform defibrillation with the every energy setting (2, 3, 5, 7, 10, 15, 20, 30 and 50 J). To change the energy setting, turn the control dial on the front panel.

For details on defibrillation, refer to “Checking the Discharged Waveform” in this section or the Operator’s Manual Part I.

3 Confirm that the energy is charged as set on the control dial and energy measured by the AX-103V defibrillation analyzer is as follows.

Energy Accuracy According to the IEC 60601-2-4

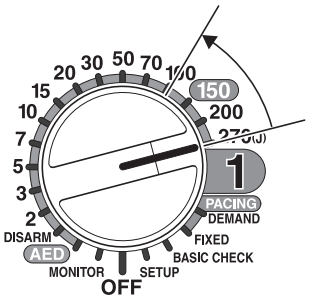
Within ±15% or ±3 J of the energy set by the control dial, whichever greater.



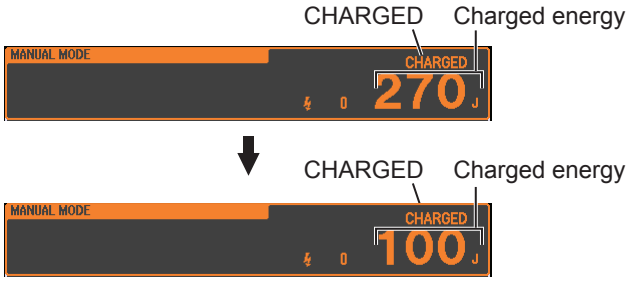
Checking for Changing the Energy Setting After Charging is Complete

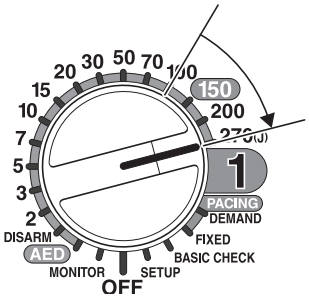
Check that the defibrillator operates correctly when you change the energy setting after charging for defibrillation is complete.

For details on defibrillation, refer to “Checking the Discharged Waveform” in this section or the Operator’s Manual.

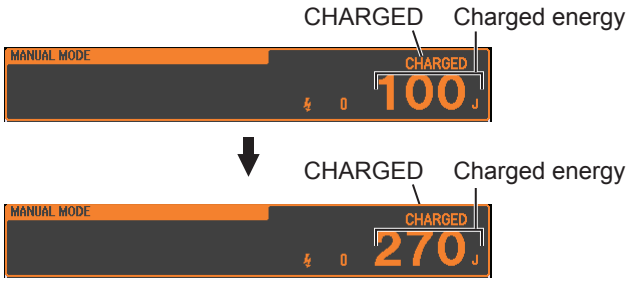


1 Charge the energy to 270 J. After charging complete, turn the control dial to the 100 J position and confirm that the charged energy on the screen changes to 100 J.





2 Charge the energy to 100 J. After charging complete, turn the control dial to the 270 J position and confirm that the charged energy on the screen changes to 270 J.

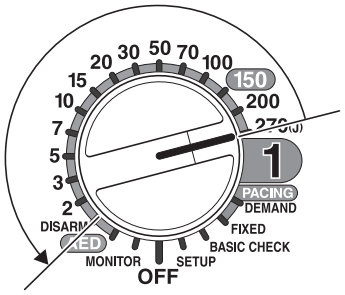


Checking Internal Discharge

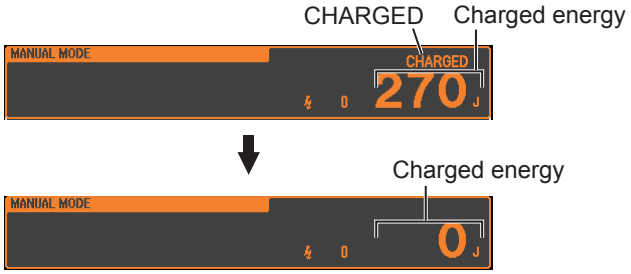
Check that the defibrillator internally discharges the energy correctly.

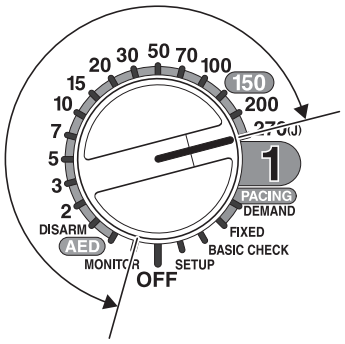
For details on defibrillation, refer to “Checking the Discharged Waveform” in this section or the Operator’s Manual.

1 Charge the energy to 270 J, then measure the time from charging complete to internal discharge using a second hand of watch or a stopwatch. Confirm that the measured time is within ±5 seconds of the time set on “7. Charge Holding Time” on the SYSTEM SETUP screen.

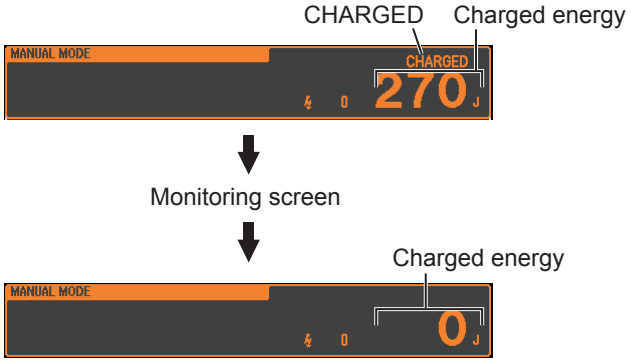


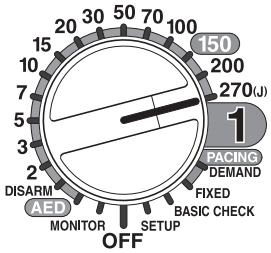
2 Charge the energy to 270 J, then turn the control dial to the DISARM position and confirm that the charged energy changes to 0 J within 15 seconds.



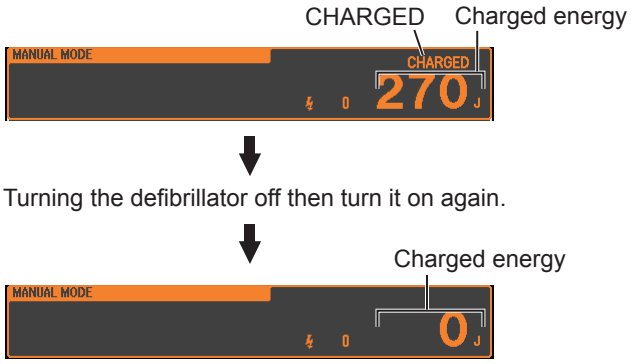


3 Charge the energy to 270 J, turn the control dial to the MONITOR position then turn the control dial to the 270 J position again and confirm that the charged energy changes to 0 J within 15 seconds.





4 Charge the energy to 270 J, turn the control dial to the OFF position to turn the defibrillator off then turn the control dial to the 270 J position again and confirm that the charged energy changes to 0 J within 15 seconds.



Checking the Synchronized Cardioversion

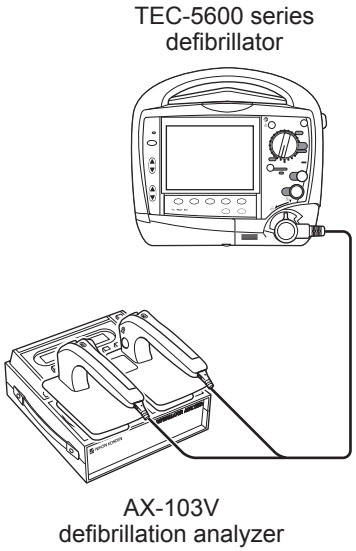
Check the defibrillation function in sync mode once a month.

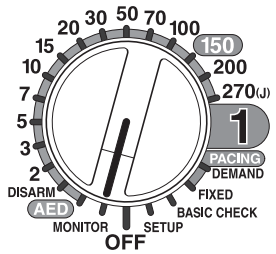
To check charging and discharging, the AX-103V defibrillation analyzer is necessary. When checking the defibrillation function, operate the defibrillator on the AC power. For AC operation, refer to the Operator's Manual.

Checking the Synchronized Cardioversion Using the Paddle Lead

When the external paddles are not used, skip this procedure.

1 Connect the defibrillator to the AX-103V defibrillation analyzer.

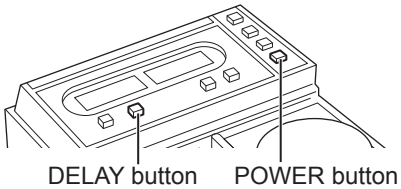


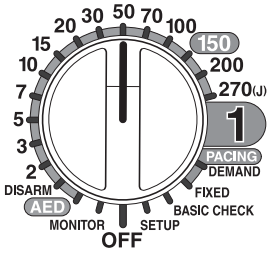


2 Turn the control dial to the MONITOR position.

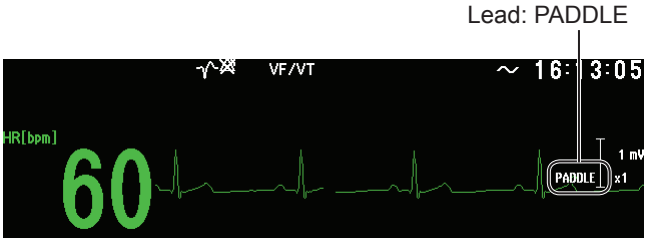
On the PADDLE SETUP window, set the SYNC BY PADDLE setting to ON. (For SETUP windows, refer to the Operator's Manual.) Then, set the lead to PADDLE by pressing the [LEAD] key.

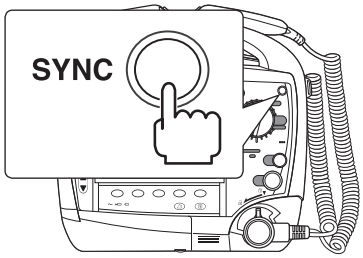
3 Turn the defibrillator analyzer on and press the DELAY button on the defibrillation analyzer.





4 Turn the control dial to the 50 J position and confirm that the lead is set to PADDLE.

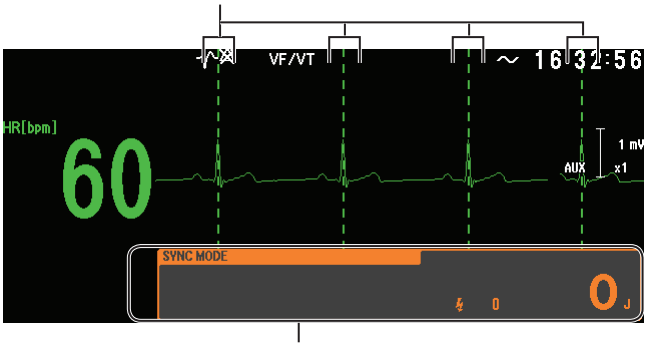




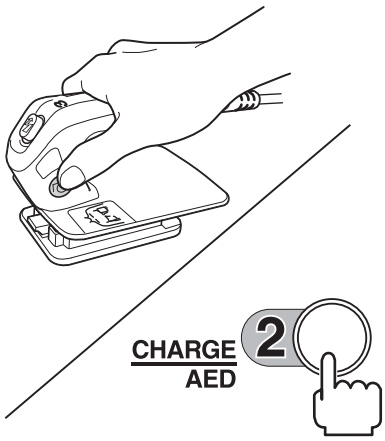
5 Press the SYNC button then check the mode indication and synchronization points.

- Check that "SYNC MODE" is displayed on the screen.
- Check that the "┆" lines indicating the synchronization positions are displayed at the rising part (Q–R) of each QRS wave of the ECG waveform being displayed.

Synchronization positions "┆"
Check that the "┆" lines are indicated at the rising part of each QRS wave.



Synchronized discharge mode

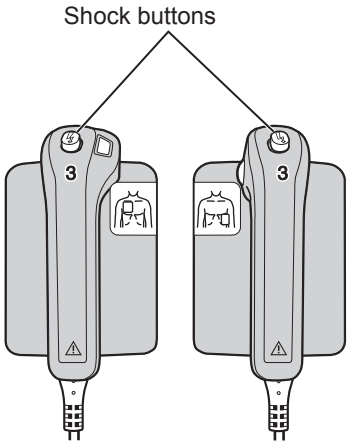


Example: Wrong way of holding the external paddle

6 Press the charge button on the APEX paddle or CHARGE/AED button on the front panel to start charging.

> **⚠ WARNING**
>
> When charging or discharging, do not touch anything other than the handles of the paddles. If any other part of the defibrillator is touched during charging or discharging, the operator receives an electrical shock.

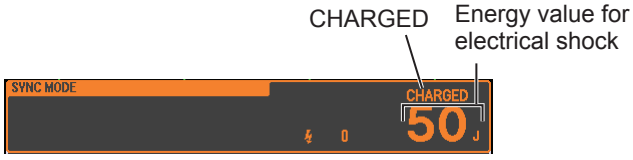
> **⚠ WARNING**
>
> Do not move or transport the defibrillator when any residual charge remains in the defibrillator. If the defibrillator receives any impact, such as from falling, it may discharge and can cause electrical shock.



During charging, there is a continuous buzzing sound and the "CHARGING" message appears on the screen.

The energy value increases.

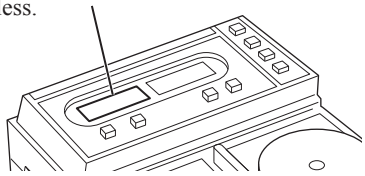
When charging is completed, the message "CHARGED" and some guidance are displayed on the screen, and a continuous beep sounds. At the same time, the shock buttons on the external paddles start flashing.



7 With the external paddles connected to the defibrillator analyzer, simultaneously press the shock buttons on the external paddles to deliver electrical shock.
Hold the shock buttons pressed until electrical shock is delivered, because discharge is performed when the first synchronization point is detected after the shock buttons are pressed.

NOTE: Never deliver electrical shock while the electrodes of the paddles are in contact with each other. The defibrillator may be damaged.

Delay time (ms)
Check that the delay time is 60 ms or less.



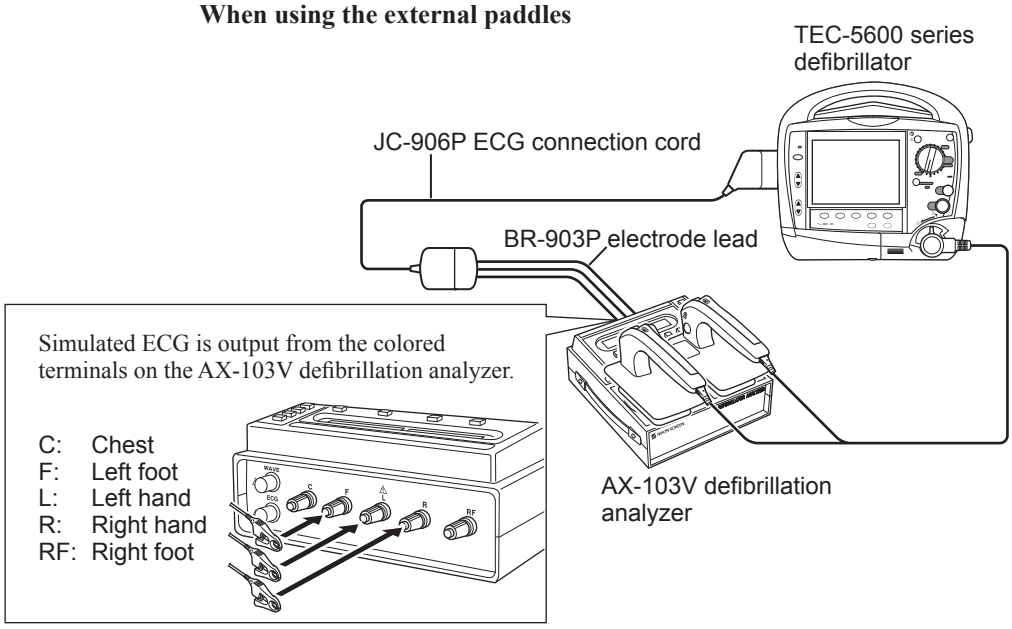
8 Check that the delay time displayed on the display of the defibrillator analyzer is 60 ms or less.

Checking the Synchronized Cardioversion Using the ECG Lead

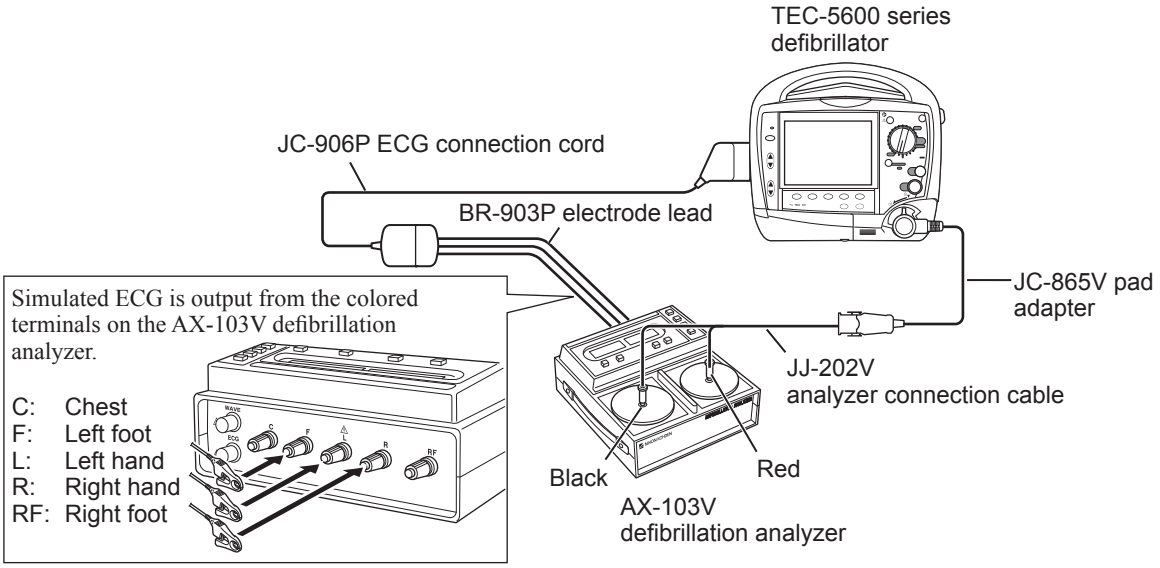
Confirm that synchronized cardioversion is performed correctly when using ECG acquired by the ECG lead as synchronization source.

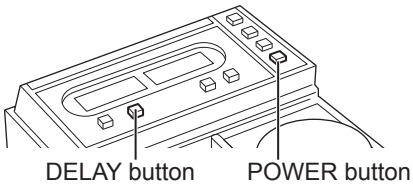
1 Connect the AX-103V defibrillation analyzer and TEC-5600 series defibrillator using the JC-906P ECG connection cord and the BR-903P electrode lead.

When using the external paddles

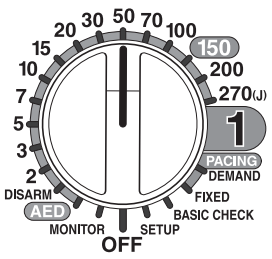


When using the disposable pads

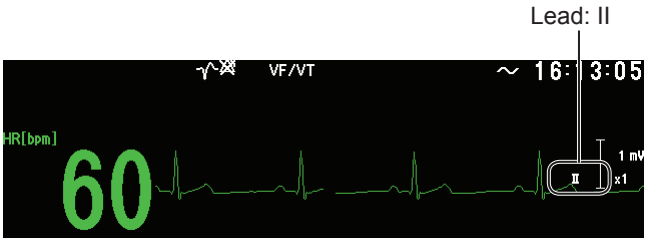




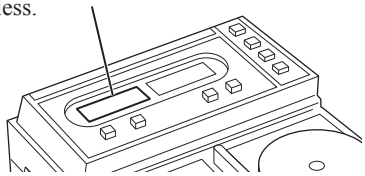
2 Turn the defibrillator analyzer on and press the DELAY button on the defibrillation analyzer.



3 Turn the control dial to the 50 J position and confirm that the lead is set to II.



Delay time (ms)
Check that the delay time is 60 ms or less.



4 Do steps 5 to 8 of the “Checking the Synchronized Cardioversion Using the Paddle Lead” procedure in this section and check that the delay time displayed on the display of the defibrillator analyzer is 60 ms or less.

Checking in the AED Mode

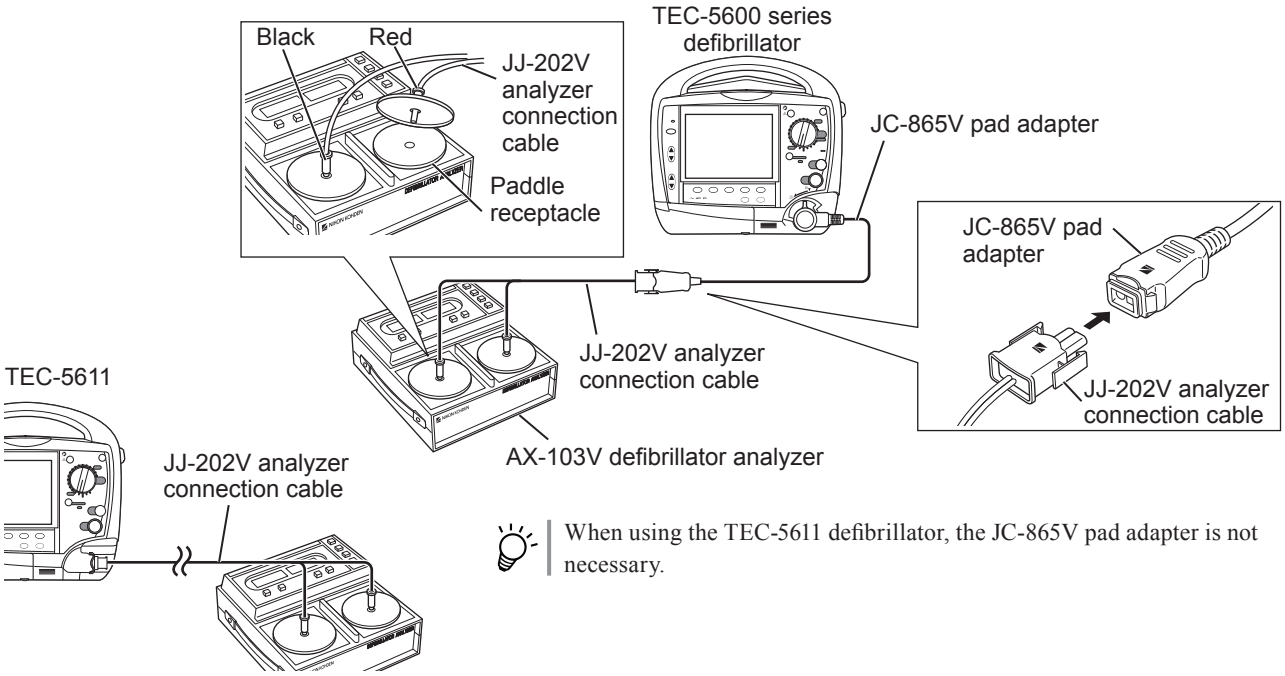
Check the defibrillation function in AED mode once a month.

To check charging and discharging, the AX-103V defibrillation analyzer is necessary. When checking the defibrillation function, operate the defibrillator on the AC power. For AC operation, refer to the Operator's Manual.

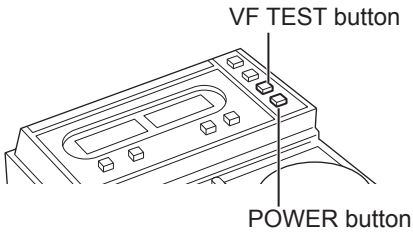
Preparation

1 Using the JC-865V pad adapter and JJ-202V analyzer connection cable*, connect the defibrillator and the AX-103V defibrillation analyzer.

* An accessory of the AX-103V defibrillation analyzer.

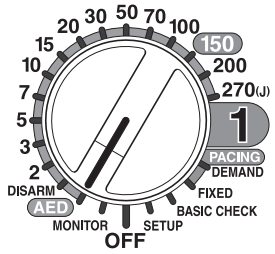


When using the TEC-5611 defibrillator, the JC-865V pad adapter is not necessary.



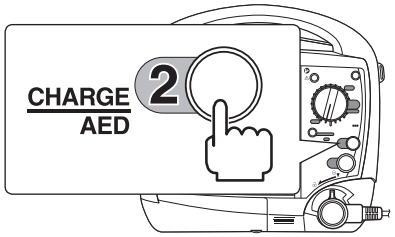
2 Turn the defibrillator analyzer on and press the VF TEST button to output the simulated VF waveform.

Checking ECG Analysis in AED Mode, Charge and Discharge

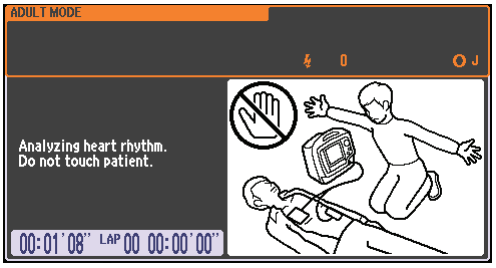


1 Turn the control dial to the AED position and confirm the following.

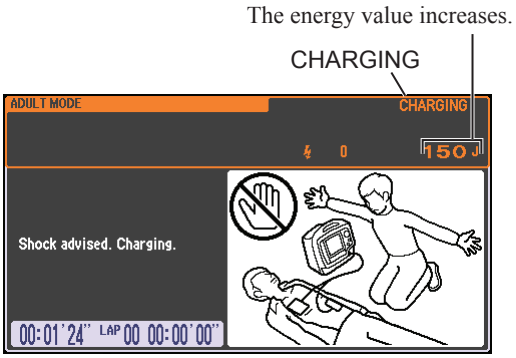
- "ADULT MODE" is displayed on the screen.
- The energy set on "6. Discharged Energy for Adult (J)" of the AED Setup screen is displayed on the screen. For the AED Setup screen, refer to the Administrator's Guide.



2 Press the CHARGE/AED button to start an AED analysis.
After the AED analysis is started, the message “Analyzing heart rhythm. Do not touch patient” is displayed in the guidance area of the screen.



3 Confirm that defibrillator judges that defibrillation is necessary and starts charging energy. While charging the energy, the message “Shock advised. Charging” is displayed in the guidance area and beeps sounds intermittently.

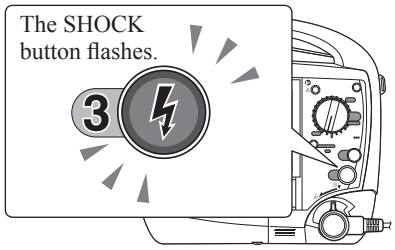


⚠ WARNING

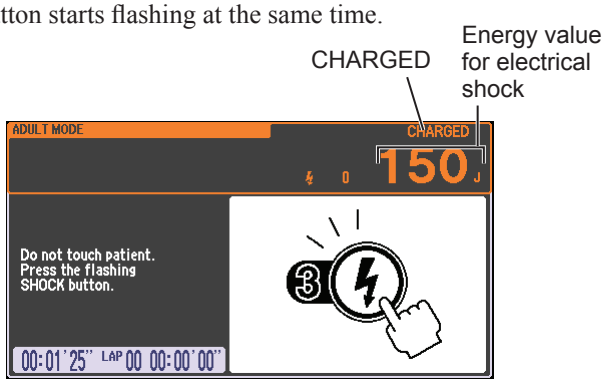
When charging or discharging, do not touch the pads or connector. If you touch any other part of the defibrillator during charging or discharging, you will receive an electrical shock.

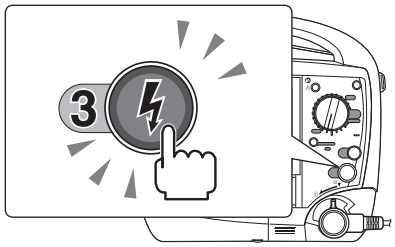
⚠ WARNING

Do not move or transport the defibrillator when any residual charge remains in the defibrillator. If the defibrillator receives any impact, such as from falling, it may discharge and can cause electrical shock.



When charging is completed, the message “CHARGED” and some guidance are displayed on the screen, and a continuous beep sounds. The SHOCK button starts flashing at the same time.

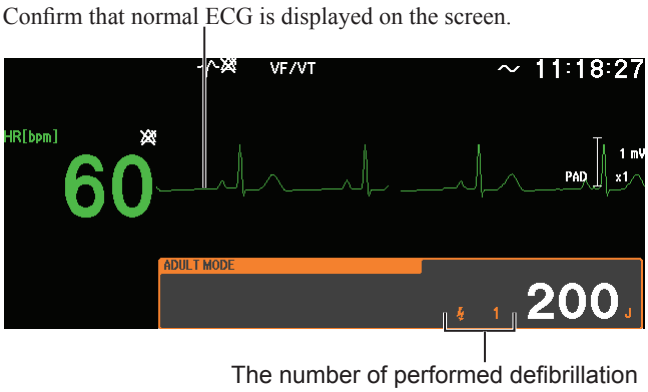




4 After charging complete, press the SHOCK button on the front panel to discharge the energy.

NOTE: Firmly press the SHOCK button.

5 Confirm that normal ECG is displayed on the screen and the number of performed defibrillation (once) is displayed.



Checking the Display

While doing the “Checking ECG Analysis in AED Mode, Charge and Discharge” procedure in this section, confirm that the messages and instructions are displayed correctly. For details on the messages and instructions, refer to Operator’s Manual.

Checking the Voice Instruction

While doing the “Checking ECG Analysis in AED Mode, Charge and Discharge” procedure in this section, confirm that there are voice instructions and they are correct. For details on voice instructions, refer to Operator’s Manual.

Checking the Pacing Function

Check the pacing function once a month.

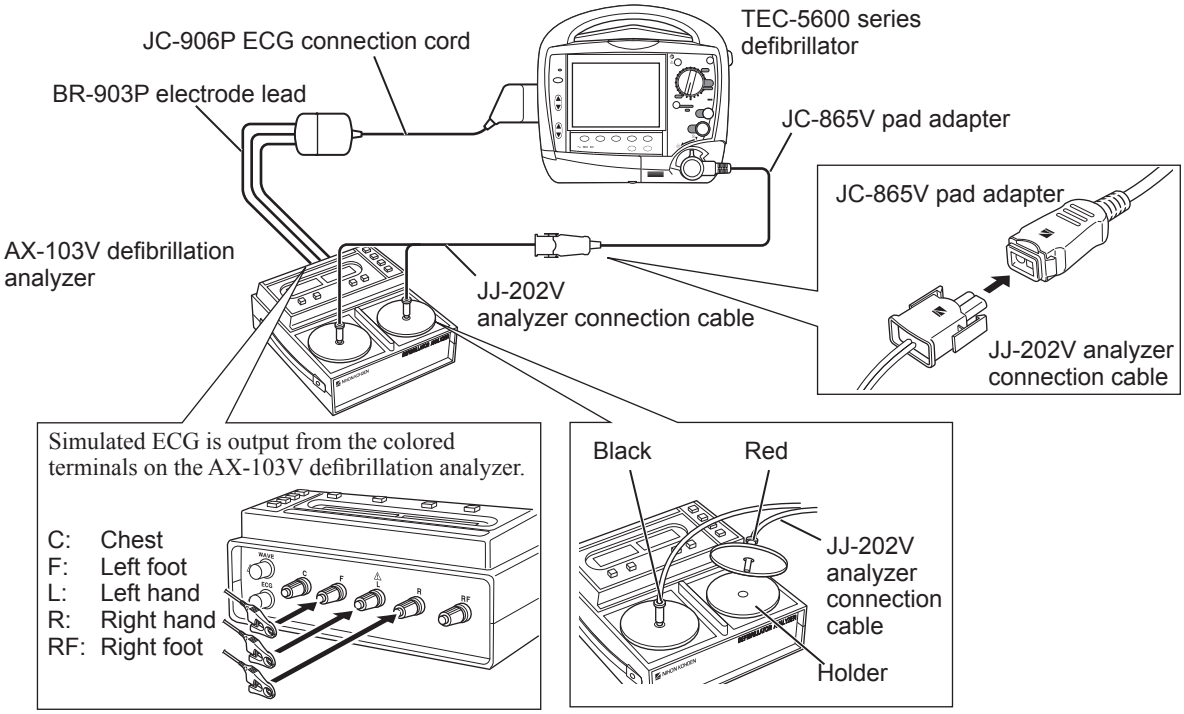
To check the pacing function, the AX-103V defibrillation analyzer is necessary.

Preparation

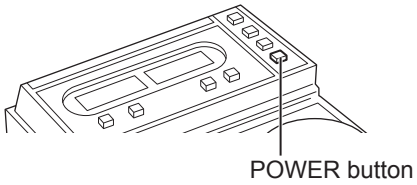
1 Connect the AX-103V defibrillation analyzer and TEC-5600 series defibrillator using the following.

- JC-865V pad adapter
- JJ-202V analyzer connection cable[1]
- JC-906P ECG connection cord
- BR-903P electrode lead

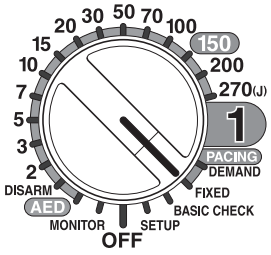
[1] An accessory of the AX-103V defibrillation analyzer.



2 Turn the defibrillation analyzer on. The simulated waveform of 60 bpm is output from the colored terminals on the AX-103V defibrillation analyzer.



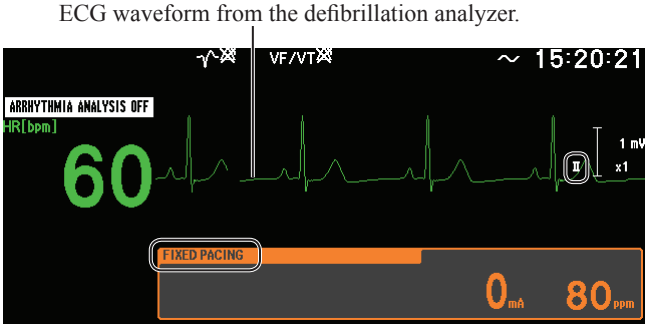
Checking the Pacing in Fixed Mode

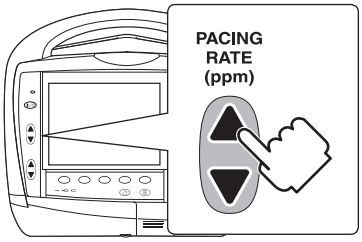


1 Turn the control dial to the FIXED position, set the ECG lead to "II" and confirm the following.

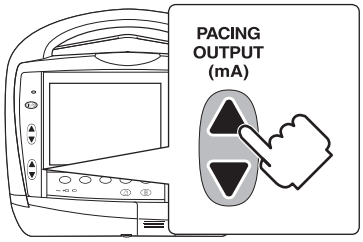
- No error message on the screen.
- "FIXED PACING" is displayed on the screen.
- ECG waveform from the defibrillation analyzer is displayed on the screen.

ECG waveform from the defibrillation analyzer.

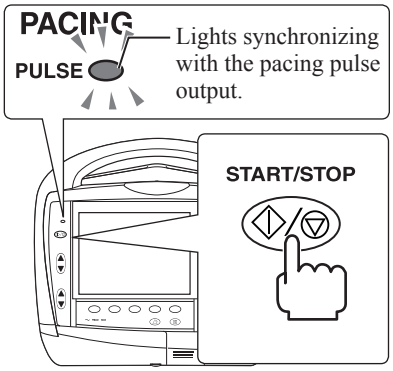




2 Set the pacing rate to 80 ppm by pressing the PACING RATE key on the front panel. The selected rate appears on the message window.



3 Set the intensity to 100 mA by pressing the PACING OUTPUT key on the front panel. The selected intensity appears on the message window.



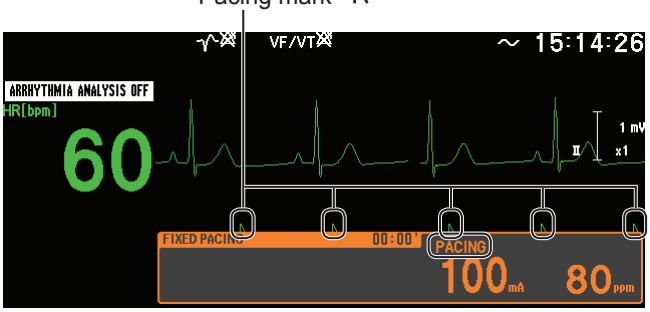
4 Press the START/STOP key on the front panel to start pacing.

NOTE: Pacing starts 3 seconds after the START/STOP key on the front panel is pressed.

Then confirm the following.

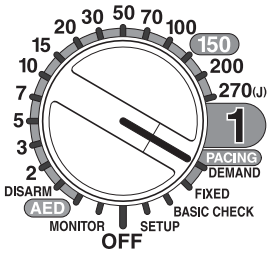
- The "PACING" message appears.
- "Λ" mark appears below the ECG waveforms in interval of 80 times per minute and the PULSE lamp lights synchronizing with the pacing pulse output.
- Pacing is performed regardless of whether there are QRS or not.

Pacing mark "Λ"



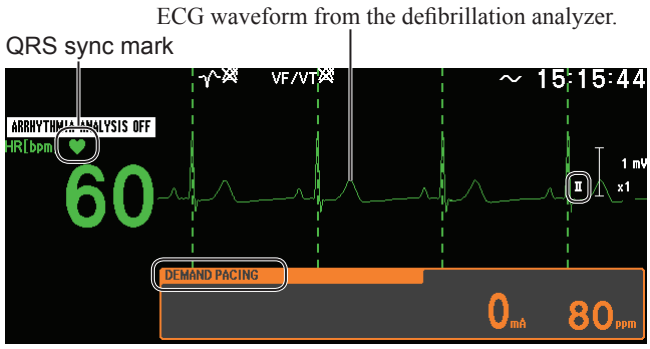
5 Press the START/STOP key on the front panel to stop pacing.

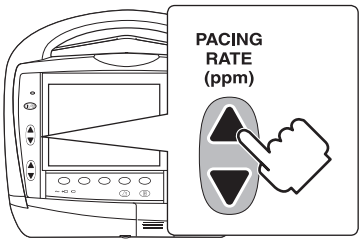
Checking the Pacing in Demand Mode



1 Turn the control dial to the DEMAND position, set the ECG lead to "II" and confirm the following.

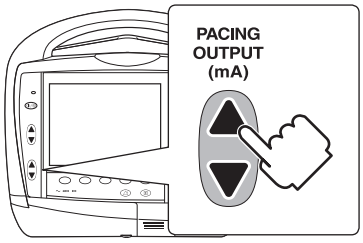
- No error message on the screen.
- "DEMAND PACING" is displayed on the screen.
- ECG waveform from the defibrillation analyzer is displayed on the screen.
- Check that the " ¦ " line appears on the rising slope of every QRS wave.
- QRS sync mark is displayed on the screen and blinks synchronized with QRS.



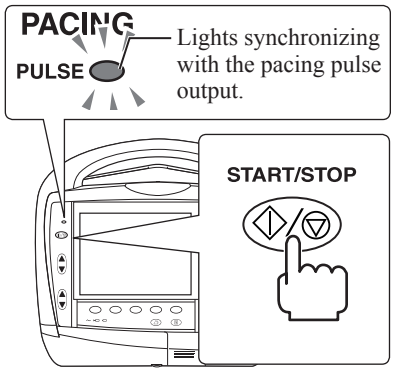


2 Set the pacing rate to 80 ppm by pressing the PACING RATE key on the front panel. The selected rate appears on the message window.

NOTE: When the pacing rate is set to other than 80 ppm, the heart rate might not be displayed correctly.



3 Set the intensity to 100 mA by pressing the PACING OUTPUT key on the front panel. The selected intensity appears on the message window.



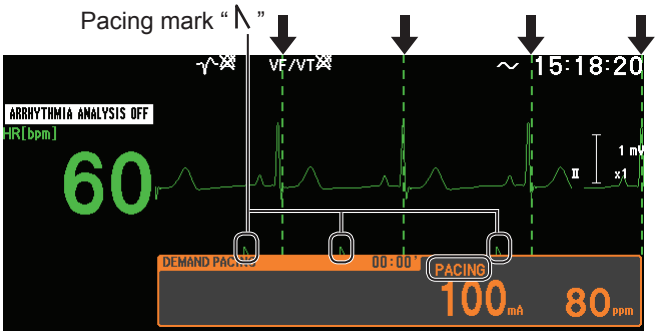
4 Press the START/STOP key on the front panel to start pacing.

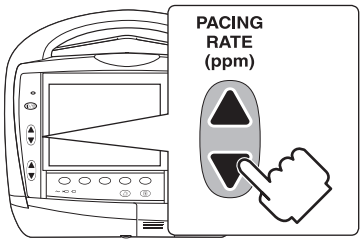
NOTE: Pacing starts 3 seconds after the START/STOP key on the front panel is pressed.

Then confirm the following.

- The "PACING" message appears.
- "Λ" mark appears below the ECG waveforms and the PULSE lamp lights synchronizing with the pacing pulse output.
- The "┆" line appears on the rising slope of every QRS wave.

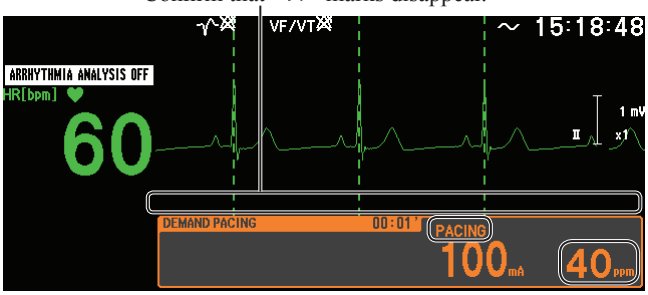
Pacing mark "Λ"

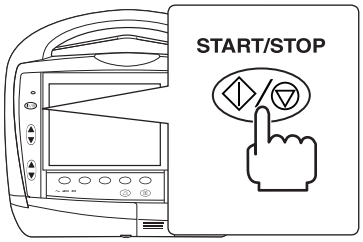




5 Set the pacing rate to 40 ppm by pressing the PACING RATE key on the front panel. The selected rate appears on the message window.

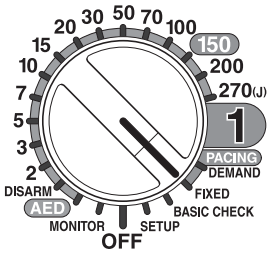
Confirm that "Λ" marks disappear.

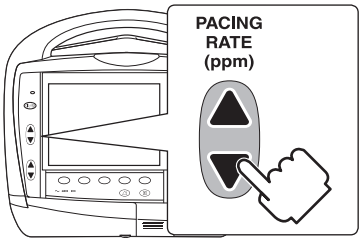


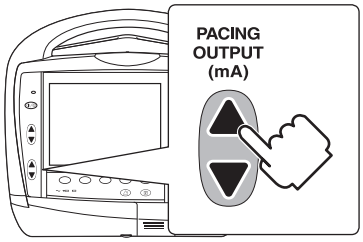


6 Press the START/STOP key on the front panel to stop pacing.

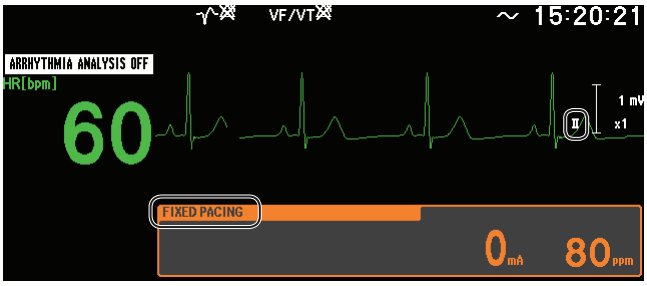
Checking the Pacing Rate and Output Current







1 Turn the control dial to the FIXED position.



2 Set the pacing rate to 60 ppm by pressing the PACING RATE key on the front panel. The selected rate appears on the message window.

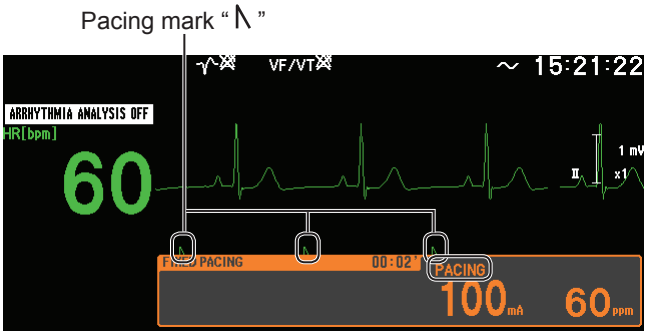
3 Set the intensity to 100 mA by pressing the PACING OUTPUT key on the front panel. The selected intensity appears on the message window.

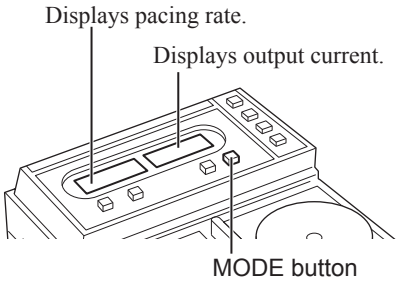
4 Press the START/STOP key on the front panel to start pacing.

- The "PACING" message appears.
- "Λ" mark appears below the ECG waveforms in interval of 60 times per minute and the PULSE lamp lights synchronizing with the pacing pulse output.

NOTE: Pacing starts 3 seconds after the START/STOP key on the front panel is pressed.

Pacing mark "Λ"

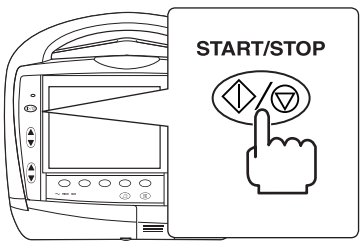




5 Press the MODE button on the defibrillation analyzer to change the measurement mode to pacing rate/current intensity measurement mode.

6 Confirm that the measured pacing rate and current intensity are as follows.

- Current intensity (CURRENT): 100 mA ±10%
- Pacing rate (RATE): 60 ±10 bpm



7 Press the START/STOP key on the front panel to stop pacing.

Checking the Monitoring Parameters

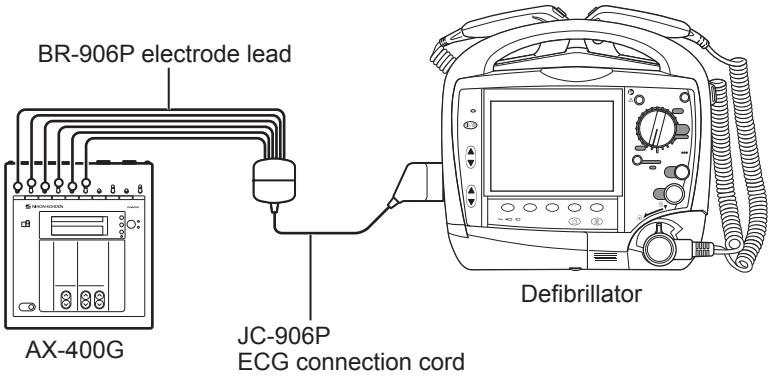
Checking the Electrocardiogram (ECG)

Connect the AX-400G vital sign simulator to the defibrillator, and check the accuracy of the heart rate as well as the amplitude of ECGs in each lead. Additionally, check if the alarm works normally.

After the check, return the current settings to your own settings.

Preparations

1 Connect the AX-400G vital sign simulator to the defibrillator with the JC-906P ECG connection cord and the BR-906P electrode lead.



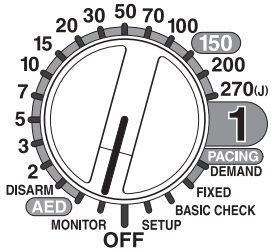
2 Set the following items on the defibrillator. For details on settings on the SYSTEM SETUP screen, refer to Administrator's Guide. For details on SETUP window, refer to Operator's Manual.

SYSTEM SETUP Screen

Setting Item	
11. ECG Leads	6 Lead

SETUP Window

Window	Setting Item	
ECG SETUP	FILTER	DIAGNOSIS
SpO_2 SETUP	SYNC SOURCE	ECG
RECORDING SETUP	RECORDING WAVES	ECG

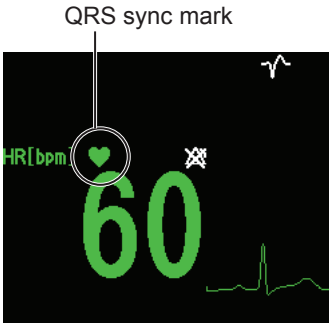


3 Turn the control dial to the MONITOR position to display the monitoring screen.

4 Set the lead to "II" by pressing the [LEAD] key.

5 Set the ECG sensitivity to "× 1" by pressing the [SENSITIVITY] key.

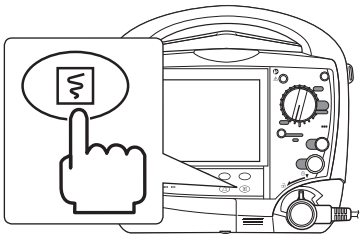
Checking the Accuracy of the Heart Rate and the Generation of Synchronous Sound



Set the heart rate in ECGs produced from the AX-400G vital sign simulator in the following way and check that the heart rate displayed on the defibrillator is within the accuracy shown in the table below. Additionally, check that there is a sound synchronous with the QRS and QRS sync mark blinks synchronized with the QRS.

Setting on the AX-400G	Display on the Defibrillator
BRADY 30	28 to 32 beat/min
NORMAL 80	78 to 82 beat/min
TACHY 160	158 to 162 beat/min

Checking the Sensitivity of ECG



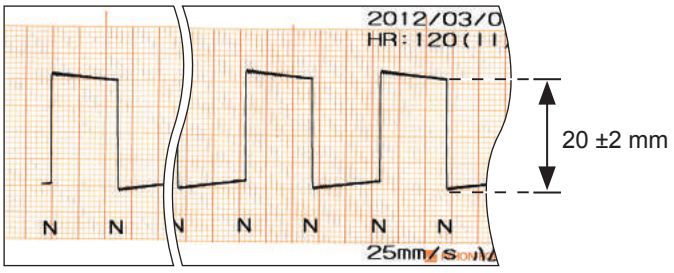
Check the amplitude of the lead I, II, III, Ca, and Cb. Perform checking for each lead by the following procedure.

1. Set the AX-400G to 1 mV 0.25 Hz. The signal of 2 mVp-p is output to lead II.
2. Press the record/stop key on the front panel to start recording.

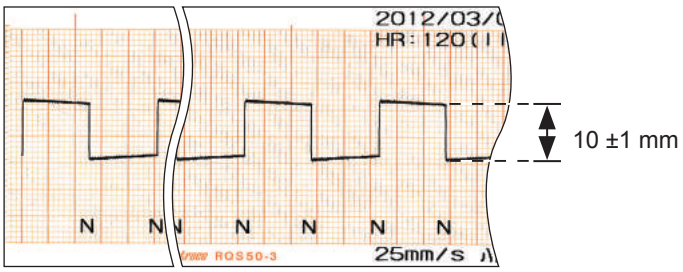
   To stop recording, press the record/stop key on the front panel again.
3. For each lead, confirm that the amplitude of rise and fall of the waveform is as follows.

Lead	Amplitude
II	20 ±2 mm
I, III, Ca, Cb	10 ±1 mm

Recording Example of Lead II



Recording Example of Lead I, III, Ca, Cb



4. Press the [LEAD] key to change the lead and repeat the steps 2 and 3 for every lead.

Checking the Detection of the Heart Rate and Electrode-Off Alarms

Check that the alarms for the upper and lower limits of the heart rate and for the electrode-off event are normally generated. For details on settings on the SETUP window and displayed item on the monitoring screen, refer to the Operator's Manual.

1 Set the ECG settings on the defibrillator as follows.

SETUP Window	Setting Item		
ECG SETUP	ECG ALARM	HR	Lower limit: 90

2 Set the lead to "II" by pressing the [LEAD] key.

3 Set the heart rate in ECGs produced from the AX-400G vital sign simulator to "NORMAL 80" and check that the defibrillator works in the following way.

Alarm	Operation of the Defibrillator
Display of the heart rate	Numerical data is highlighted.
Message display	Only when the optional QS-831V upgrade kit for arrhythmia analysis; Setting "ARRHYTHMIA ANALYSIS" to "ON" on the ARRHYTHMIA SETUP window displays the BRADYCARDIA message highlighted in yellow.
Alarm sound	The alarm sound of "ceg" is generated.
Alarm indicator	The alarm indicator blinks in yellow.

4 Check that the defibrillator works in the following way when you remove any of the R, F or RF lead wires connected to the AX-400G vital sign simulator.

Alarm	Operation of the Defibrillator
Message display	The "XX LEAD OFF" (XX: removed lead name) message appears. When the RF is removed, the electrode name is not displayed.
Alarm sound	The alarm sound of "ec" is generated in the interval of 20 seconds.
Alarm indicator	The alarm indicator lights in blue.

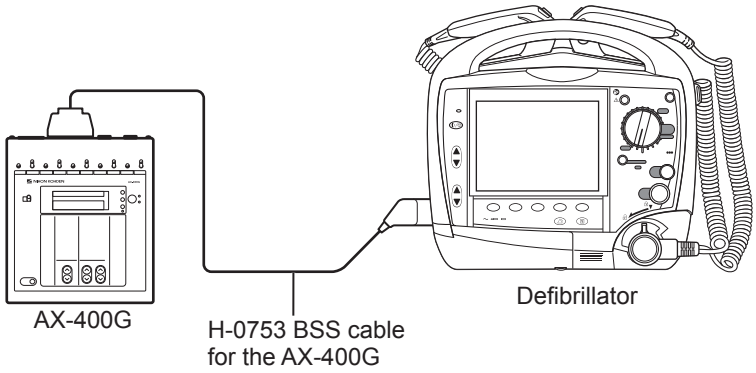
Checking the CO_2 Value

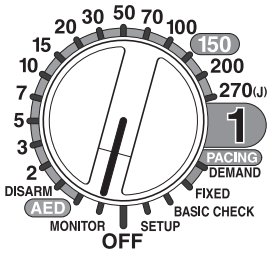
Connect the AX-400G vital sign simulator to the defibrillator and check the CO_2 value and alarm with all MULTI sockets. Additionally, check the accuracy of the CO_2 sensor kit, as required.

After the check, return the current settings to your own settings.

Preparation

1 Connect the AX-400G vital sign simulator to the defibrillator with the H-0753 BSS cable for the AX-400G.





2 Turn the control dial to the MONITOR position to display the monitoring screen.

Checking the Accuracy of the Respiration Rate and the CO_2 Value

Set the ECG heart rate output from the AX-400G vital sign simulator to "NORMAL 80" and check that the respiration rate displayed on the defibrillator is between 18 and 22 count/min and that the CO_2 value is between 40 and 46 mmHg.

Checking the Detection of Alarm for the CO_2 and RR Value and an Connector-Off Alarm

Check that the alarms for the upper and lower limits of the CO_2 and RR value and for the electrode-off event are normally generated.

1 Set the CO_2 settings on the defibrillator as follows.

SETUP Window	Setting Item		
CO_2 SETUP	CO_2 ALARM	$ETCO_2$	Lower limit: 50
		RR	Lower limit: 25

2 Check that the defibrillator works in the following way when the CO_2 signal is being entered from the AX-400G vital sign simulator.

Alarm	Operation of the Defibrillator
Displaying the $ETCO_2$, RR value	Numerical data is highlighted.
Alarm sound	The alarm sound of "ceg" is generated.
Alarm indicator	The alarm indicator blinks in yellow.

3 Check that the defibrillator works in the following way when you remove the connector for the CO_2 sensor kit from the defibrillator.

Alarm	Operation of the Defibrillator
Message display	The "CO_2: CONNECTOR OFF" message appears.
Alarm sound	The alarm sound of "ec" is generated in the interval of 20 seconds.
Alarm indicator	The alarm indicator lights in blue.

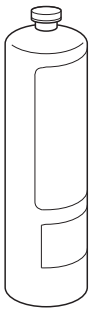
Checking the Measurement Accuracy of the CO_2 Sensor Kit

If the CO_2 measurement involves significant error, use the gas for sensitivity calibration to check the accuracy. To obtain stable measurement accuracy, perform the accuracy check regularly every six months.

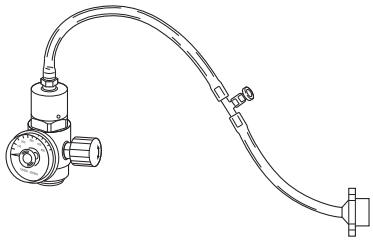
Preparation

Only use the gas cylinder for sensitivity calibration and flow regulator specified by Nihon Kohden to check the accuracy. Also, prepare a CO_2 sensor kit and airway adapter.

Gas cylinder for sensitivity calibration
CO_2 5% sensitivity gas A-4



Flow regulator
PR-150



⚠ CAUTION

Follow the CAUTION label on the CO_2 gas cylinder.

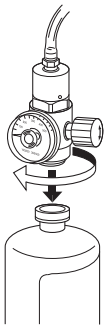
NOTE • The gas cylinder for sensitivity calibration and flow regulator specified by Nihon Kohden must be purchased locally. Use CO_2 cylinders with the following specifications.

Manufacturer:	Nellcor Puritan Bennett, Scott Medical Products Division of Air Liquide Healthcare, or other
Outlet fitting:	CGA 600
Gas component:	5% CO_2, 21% O_2 and N_2 mix
Expiration:	3 years after the gas is packed in the cylinder
Accuracy:	±0.03% absolute

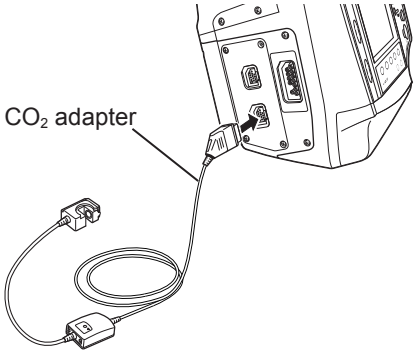
If the above CO_2 cylinders are not available in your country, find highly compressed disposable gas cylinders with the same specifications from other manufacturers.

- The gas cylinder for sensitivity calibration has its expiration date. Using the gas cylinder whose expiration date has been reached would not guarantee the accuracy of calibration. Take a look at the expiration date (EXP. DATE) which is shown on the gas cylinder.
- Only use the PR-150 in which the pressure meter has a full scale of 700 psi. Using a non-specified flow regulator might damage the pressure meter.
- When disposing of calibration gas after use, please ask the business from which you purchased the gas for instruction.

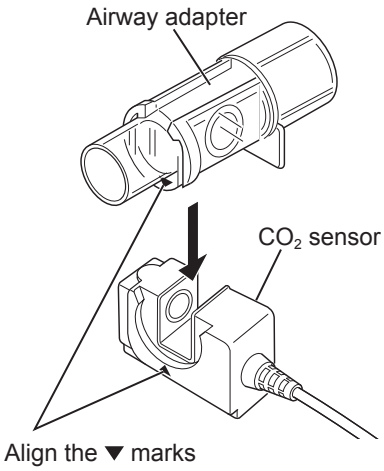
Checking the Accuracy of the TG-900P



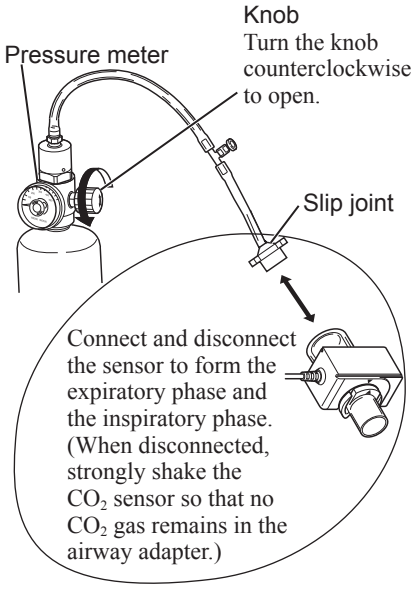
1 Rotate the flow regulator to attach it firmly to the top of the gas cylinder for sensitivity calibration.



2 Connect the CO_2 sensor kit to the CO_2 socket.



3 Connect the airway adapter to the CO_2 sensor.



4 Let the CO_2 gas flow.

Turn the knob of the flow regulator counterclockwise by about a half turn to let the CO_2 gas flow. Turn the knob slowly.

5 Form the expiratory and inspiratory phases and display the value of the CO_2 partial pressure (preparation).

1) Connect the slip joint and the air adapter (expiratory phase).
2) Disconnect the air adapter from the slip joint section (inspiratory phase).
3) Repeat steps 1) and 2) three times to display the value of the CO_2 partial pressure.

6 Check the accuracy.

1) Connect the slip joint and the air adapter (expiratory phase).
Check that the value of the CO_2 partial pressure displayed on the screen is between 34 and 42 mmHg. (See the "Supplementary" information on the next page.)

2) Disconnect the air adapter from the slip joint section (inspiratory phase).
Check that 0 mmHg is read in the CO_2 display area on the defibrillator.

3) Repeat steps 1) and 2) to check the accuracy.

NOTE: Measuring the CO_2 value in the TG-900P is based on the inspiratory compensation method; therefore, the CO_2 condensation in inspiratory mode should be calibrated to 0 mmHg. After the CO_2 gas equivalent to expiratory air is made to flow and the airway adapter is removed from the slip joint, strongly shake the CO_2 sensor so that no CO_2 gas remains (that is, the CO_2 gas in the airway adapter shows a reading of 0 mmHg), with the result that the existing CO_2 gas is completely replaced.

7 After checking the measurement accuracy, firmly turn the knob of the flow regulator clockwise to stop the CO_2 gas.

NOTE: Once the pressure meter of the flow regulator shows a reading of 0, the gas cylinder for sensitivity calibration should be replaced with a new one.

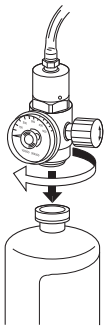
Supplementary

- The TG-900P is calibrated at a temperature of 37°C in exhaled gas; therefore, the indication will show a change of approximately –0.4%/°C at any other temperature. Generally, the gas to be calibrated is low in temperature and it might indicate a pressure of 40 mmHg.
- With the TG-900P, the unit of 1 atm is used for calibration. The indication will change at a rate of 1 mmHg/30 hPa in an environment of other than 1 atm.

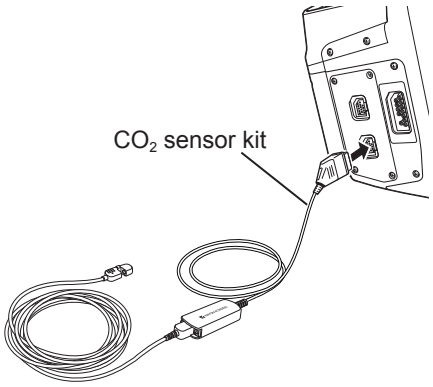
Example 1: Checking the accuracy at high air pressure
Condensation of CO_2 calibration gas: 38 mmHg (5%); atmospheric pressure: an increase of 60 hPa
The measurement is higher by the amount of 1 mm Hg × (60hPa / 30hPa) = 2 mmHg.
Therefore, 40 mmHg is indicated.

Example 2: Checking the accuracy at a high altitude
Condensation of CO_2 calibration gas: 38 mmHg (5%); altitude: 1,000 m
Change in atmospheric pressure = 1013 hPa × 0.1 (altitude-based rate of change in atmospheric pressure) = 101.3 hPa
101.3 hPa / 30 hPa = 3.4 mmHg
38 mmHg – 3.4 mmHg = 34.6 mmHg
Therefore, 34.6 mmHg is indicated.

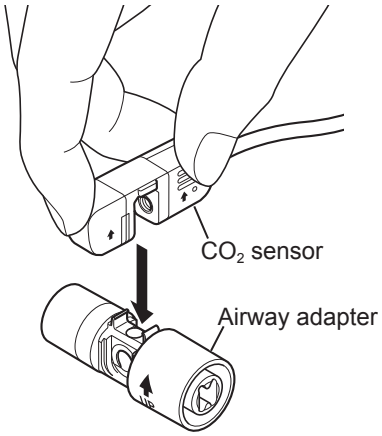
Checking the Accuracy of the TG-970P



1 Rotate the flow regulator to attach it firmly to the top of the gas cylinder for sensitivity calibration.

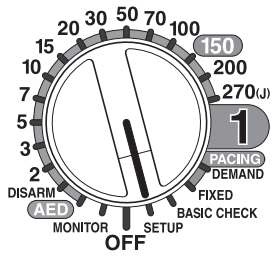


2 Connect the CO_2 sensor kit to the CO_2 socket.



3 Connect the airway adapter to the CO_2 sensor. You can attach the sensor in either direction.

4 Expose the airway adapter placed in the CO_2 sensor kit to room air.



5 Follow steps 1) to 5) to perform zero calibration of the CO_2 sensor (Air calibration).

1) Turn the control dial to the SETUP position to display the SETUP window.

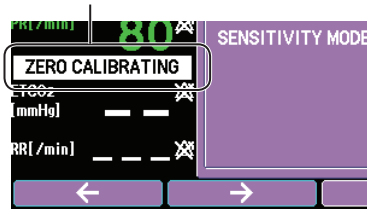
2) Press the [←] or [→] key to select a SETUP menu item CO_2 SETUP.

3) Press the [ITEM ↓] or [ITEM ↑] key to select CALIBRATE (AIR).

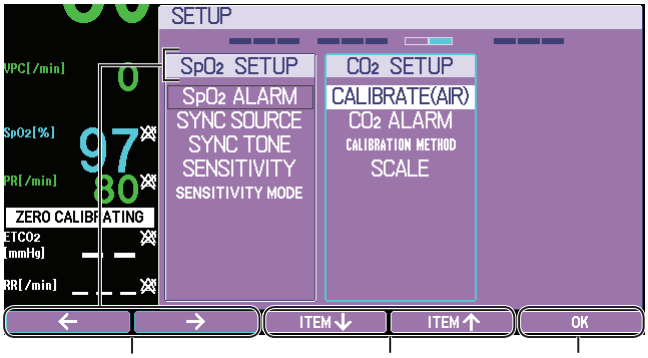
If the setting is CALIBRATE (N2), set CALIBRATION METHOD to AIR.

4) Press the [OK] key.
During calibrating, "ZERO CALIBRATING" is displayed. When calibration is completed, the message disappears and there is a "BING bong" sound.

Displayed during calibrating.

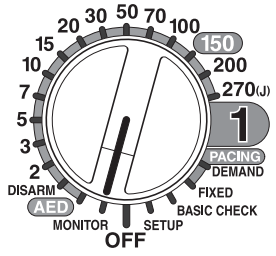


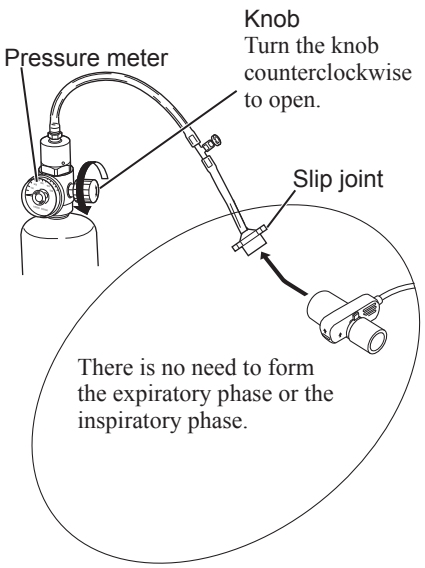
If calibration has failed, there is a "bong BING" sound.



2) Select a SETUP menu item. 3) Select an item. 4) [OK]

5) Turn the control dial to the MONITOR position to display the monitor screen.





6 Turn the knob of the flow regulator counterclockwise by about a half turn to let the CO_2 gas flow. Turn the knob slowly.

7 Connect the split joint and the airway adapter. Check that the value of the CO_2 partial pressure displayed on the screen is between 36 and 40 mmHg.

8 After checking the measurement accuracy, firmly turn the knob of the flow regulator clockwise to stop the gas.

NOTE: Once the pressure meter of the flow regulator shows a reading of 0, the gas cylinder for sensitivity calibration should be replaced with a new one.

Supplementary

- The TG-970P is calibrated at a temperature of 37°C in exhaled gas; therefore, the indication will show a change of approximately –0.4%/°C at any other temperature. Generally, the gas to be calibrated is low in temperature and it might indicate a pressure of 40 mmHg.
- When the TG-970P is used, atmospheric compensation is already performed. There is no need to read the indication again.

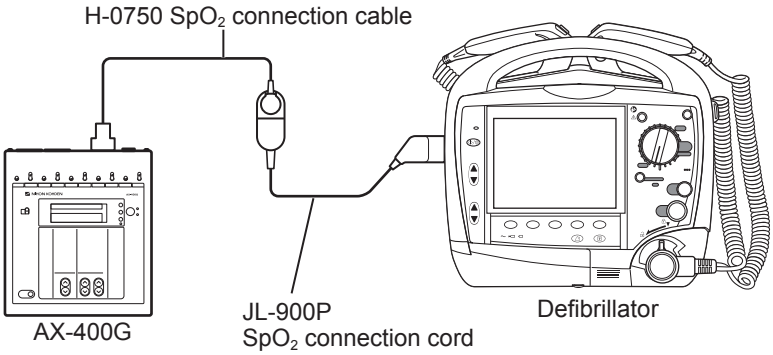
Checking the SpO_2 Value

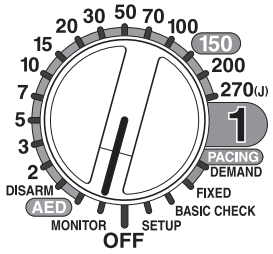
Connect the AX-400G vital sign simulator to the defibrillator to check the SpO_2 value and the accuracy of the pulse rate. Additionally, check that the alarm is normally generated.

After the check, return the current settings to your own settings.

Preparation

1 Connect the AX-400G vital sign simulator to the defibrillator with the JL-900P SpO_2 connection cord and H-0750 SpO_2 connection cable.





2 Turn the control dial to the MONITOR position to display the monitoring screen.

Checking the Accuracy of the SpO_2 Value and the Pulse Rate

Check the accuracy of the SpO_2 value and the pulse rate.

1 Set the SpO_2 settings on the defibrillator as follows.

SETUP Window	Setting Item	
SpO_2 SETUP	SYNC SOURCE	SpO_2

2 Set the SpO_2 value produced from the AX-400G vital sign simulator in the following way and check that the SpO_2 value and the pulse rate (SpO_2-PR) displayed on the defibrillator are within the accuracy shown in the table below. Additionally, check that there is a sound synchronous with the pulse wave.

Setting on the AX-400G		Display on the Defibrillator
SpO_2	97%SpO_2	95 to 99% SpO_2
	80%SpO_2	78 to 82% SpO_2
	70%SpO_2	66 to 74% SpO_2
ECG	NORMAL 80	76 to 84 bpm (SpO_2-PR)

Checking the Detection of Alarm for the SpO_2 Value and a Connector-Off Alarm

Check that alarms for the upper and lower limits of the SpO_2 value and a connector-off alarm are normally generated.

1 Set the SpO_2 settings on the defibrillator as follows.

SETUP Window	Setting Item		
SpO_2 SETUP	SpO_2 ALARM	SpO_2	Lower limit: 90

2 Set the SpO_2 value produced from the AX-400G vital sign simulator to "80" and check that the defibrillator works in the following way.

Alarm	Operation of the Defibrillator
Displaying the SpO_2 value	Numerical data is highlighted.
Alarm sound	The alarm sound of "ceg" is generated.
Alarm indicator	The alarm indicator blinks in yellow.

3 Check that the defibrillator works in the following way when you remove the SpO_2 connection cable and the SpO_2 connection cord.

Alarm	Operation of the Defibrillator
Message display	The "SpO_2: CONNECTOR OFF" message appears.
Alarm sound	The alarm sound of "ec" is generated in the interval of 20 seconds.
Alarm indicator	The alarm indicator lights in blue.

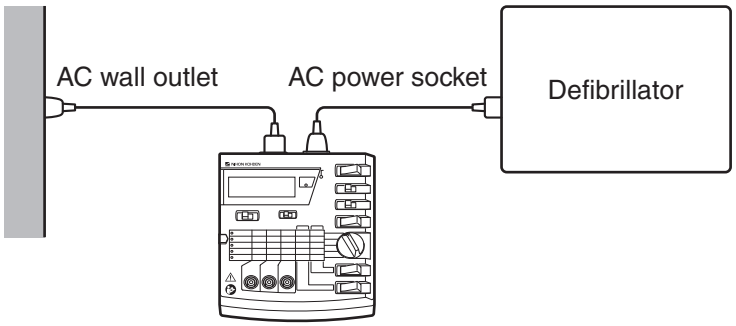
Safety Check

Safety check is performed while the components are connected. You need to measure three different currents (earth leakage current, touch current, and patient leakage current) in both the normal condition and a single-fault condition to make sure that the allowable value is not exceeded. You also need to record the measured values.

NOTE: Performing safety inspection requires a special instrument for measuring leakage currents.

Refer to the operator's manual supplied with the LCC-1101 leakage current checker.

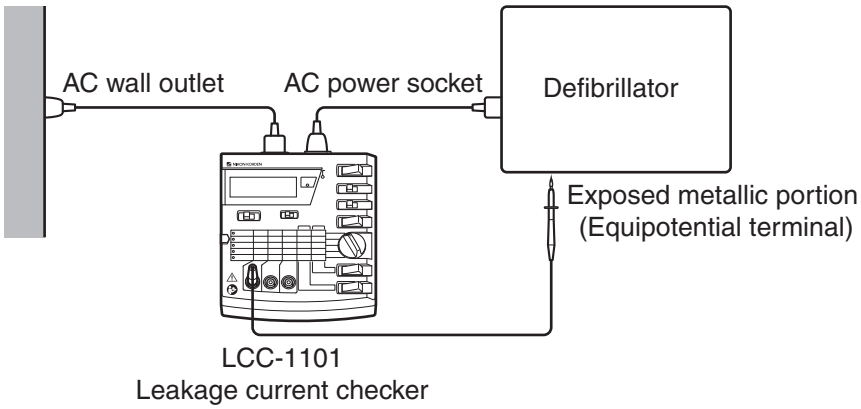
Example of measuring earth leakage current



- Make sure that the measured value is within the range below.

Normal condition	500 μA or less
Single-fault condition	1 mA or less

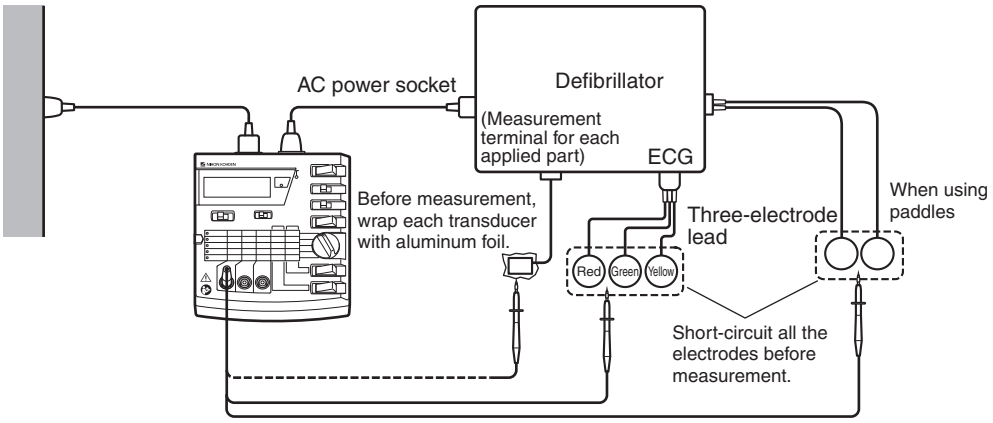
Example of measuring touch current



- Make sure that the measured value is within the range below.

Normal condition	100 μA or less
Single-fault condition	500 μA or less

Example of measuring patient leakage current



Measure the patient leakage current flowing in the measurement system for each parameter other than CO_2. For the ECG, short-circuit all the electrode leads before measurement. For the other parameters, wrap the transducer with aluminum foil before measurement.

• Make sure that the measured value is within the range below.

Type BF	Normal condition	DC: 10 μA or less AC: 100 μA or less
	Single-fault condition	DC: 50 μA or less AC: 500 μA or less
Type CF	Normal condition	DC/AC: 10 μA or less
	Single-fault condition	DC/AC: 50 μA or less

* If you are using the LCC-1101 leakage current checker as a leakage current measuring instrument, first measure the current in the AC mode or the DC+AC mode to make sure that the above DC range is satisfied. If the allowable value is exceeded, you need to measure the current in the DC mode again; the result is considered successful if the above DC range is satisfied.

External Paddles

1. Short the paddles and connect the probe of the leakage current checker to the shorted paddles.
2. Change the lead to “PADDLE” by pressing the [LEAD] key and check the patient leakage current.

Pad Adapter

1. Connect the pad adapter to the defibrillator and connect the JJ-202V analyzer connection cable to the pad adapter. Short the analyzer connection cable tips and connect the probe of the leakage current checker to the shorted tips.
2. Change the lead to “PADDLE” by pressing the [LEAD] key and check the patient leakage current.

ECG (Electrode Lead)

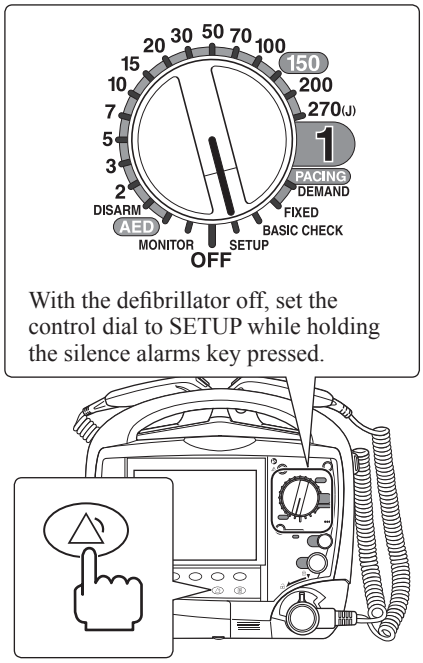
1. Short all the electrode leads and connect the probe of the leakage current checker to the leads.
2. Change the lead to “I” by pressing the [LEAD] key and check the patient leakage current.

SpO_2 Probe

1. Wrap the SpO_2 probe with an aluminum foil and connect the probe of the leakage current checker to the foil.
2. Turn the control dial to the MONITOR position and measure patient leakage current.

System Maintenance Screen

Displaying the System Maintenance Screen

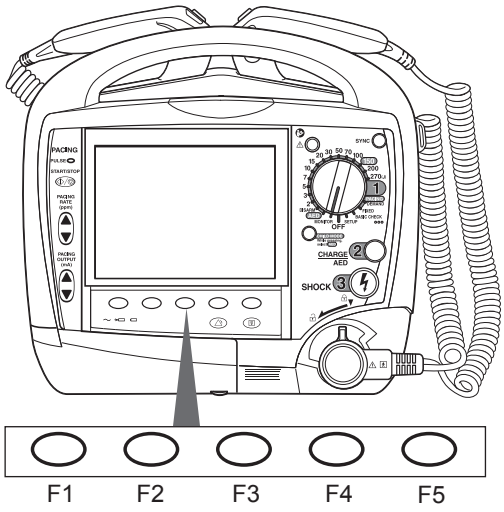


1 Turn the control dial to the OFF position to turn the defibrillator off.

2 Set the control dial to the SETUP position while holding the silence alarms key pressed.

Hold the silence alarms key pressed until the SYSTEM SETUP – MENU screen is displayed.

3 On the SYSTEM SETUP – MENU screen, press [F1] then [F3] then [F2] while pressing [F4] key.



The System Maintenance – Menu screen appears.

System Maintenance – Menu Screen

Operation on the System Maintenance – Menu Screen

- To select the item, press the [ITEM ↓] key or [ITEM ↑] key to move the cursor and press the [OK] key. The selected screen is displayed.
- To exit the System Maintenance screen, turn the control dial to any position other than SETUP.

Saving the Settings before Maintenance (Flash Save Procedure)

Do the following procedure after changing or adjusting any setting in the Configuration screen to save the changed setting in memory.

> **⚠ CAUTION**
>
> Write down the settings or save the settings on the System Maintenance screen as a bitmap file before changing the settings or performing “flash save”. Changing settings related to HV, ECG or battery on the System Maintenance screen might decrease the performance of the defibrillator.

> **⚠ CAUTION**
>
> Do this procedure after any setting in the Configuration screen is changed. The new setting is not applied and saved until the “Flash Save” procedure is performed. Otherwise, the “D511” error code appears the next time the power is turned on.

1 In the System Maintenance – Menu screen, select “1. Configuration” with the [ITEM ↓] or [ITEM ↑] key then press the [OK] key. The System Maintenance – Configuration screen appears.

2 Select “8. Flash Save” with the [ITEM ↓] or [ITEM ↑] key.

3 Press the [EXEC] key. The setting changes from “Off” to “Exec” and the function keys change as follows:

4 Press the [OK] key to save the changed or adjusted setting in memory.

To cancel saving, press the [CANCEL] key.

To return to the System Maintenance – Menu screen, press the [EXIT] key.

Changing the Settings to Factory Default

1 In the System Maintenance – Menu screen, select “1. Configuration” with the [ITEM ↓] or [ITEM ↑] key then press the [OK] key. The System Maintenance – Configuration screen appears.

2 Select “10. Default Setting” with the [ITEM ↓] or [ITEM ↑] key.

3 Press the [EXEC] key. The setting changes from “Off” to “Exec” and the function keys change as follows:

4 Press the [OK] key to change the settings to factory default.

To cancel, press the [CANCEL] key.

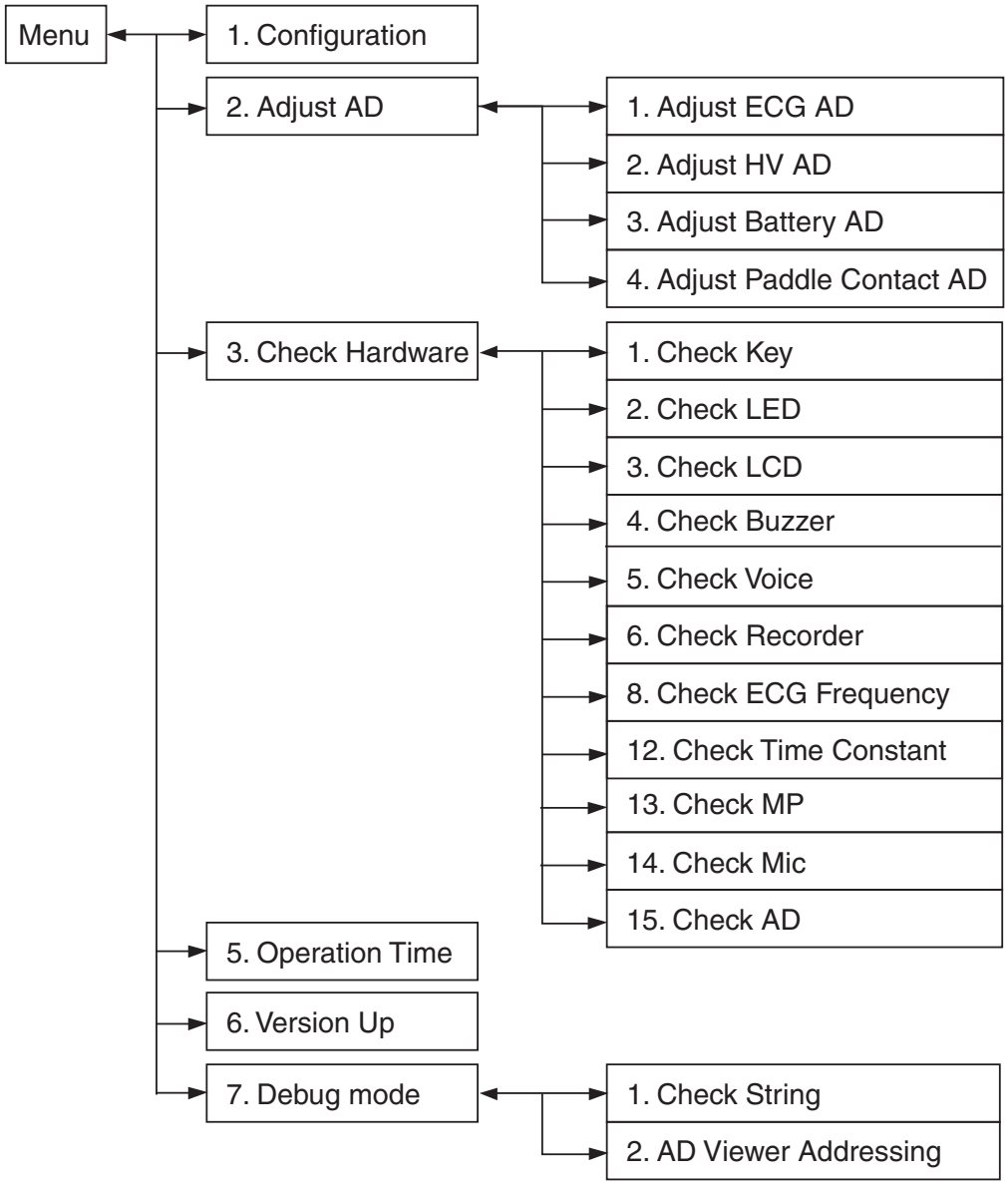
To return to the System Maintenance – Menu screen, press the [EXIT] key.

About the Menu Items

There are six items in the System Maintenance – Menu screen.

Item		Description
1	Configuration	Changes the settings in the following items: Installed Language, Flash Save, Charge Times Clear, Default Setting
2	Adjust AD	Changes the A/D values for ECG waveform acquisition, biphasic HV unit, battery voltage and paddle contact impedance threshold.
3	Check Hardware	Checks the operation of the keys, buttons, LEDs, recorder, memories, sounds, etc.
5	Operation Time	Displays the count of external discharges and operation time.
6	Version Up	You can install the system program and data.
7	Debug mode	Displays the characters used in this defibrillator and checks the flash memory.

System Maintenance Screen Flowchart



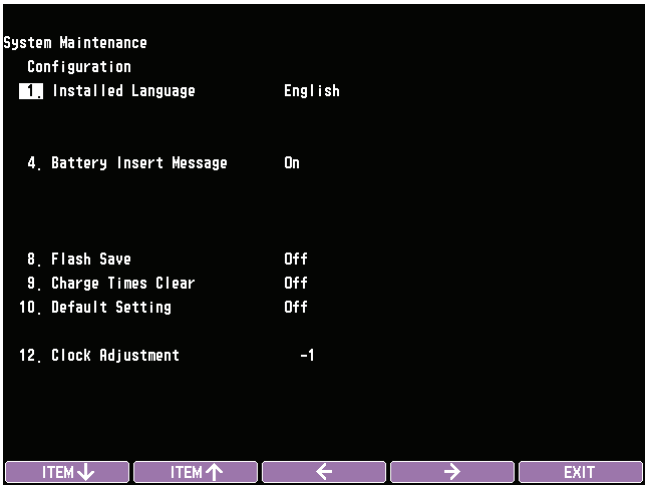
Default Settings

The factory default settings are underlined.

Screen	Item	Setting
Configuration	Installed Language	Select the language or country. Selection list: English, Japanese, American, Chinese, Spanish, French, German, Italian, Norwegian, Finnish, Other 1 to 5
	Flash Save	Select "Exec" to save the current settings in the System Maintenance screen in the flash ROM. Selection list: Off, Exec
	Charge Times Clear	Deletes the count of external discharges and operation time. Selection list: Off, Exec
	Default Setting	Select "Exec" to return all settings including the alarm settings to the factory default settings. Before doing this operation, write down the necessary settings for each item or save the setting screen as a bitmap file. Selection list: Off, Exec
Adjust AD → Adjust ECG AD	Gain	Adjust the A/D value for the ECG sensitivity. Setting range: 0 to 31 in steps of 1
	Offset	Adjust the A/D value for the ECG offset. Setting range: –99 to +99 in steps of 1
Adjust AD → Adjust HV AD	CHARGE AD	Adjust the A/D value to measure the charged energy in the HV capacitor. Setting range: –25 to +25 in steps of 1
	TTR AD	Adjust the A/D value to measure the TTR (transthoracic resistance). Setting range: –25 to +25 in steps of 1
	DELIVERED ENERGY	Adjust the A/D value to measure the delivered energy from the HV capacitor. Setting range: –25 to +25 in steps of 1
	Charge Time (AC)	Adjust the energy charging time in AC operation. Setting range: –25 to +25 in steps of 1
	Charge Time (Batt)	Adjust the energy charging time in battery operation. Setting range: –25 to +25 in steps of 1
Adjust AD → Adjust Battery AD	AUTO ADJUST	Adjust the A/D value of the battery voltage.
	BATTERY VOLTAGE	Adjust the A/D value of the voltage that is applied to the battery. Setting range: –25 to +25 in steps of 1
Adjust AD → Adjust Paddle Contact AD	100 ohm, 200 ohm, 350 ohm	Adjust the A/D value to measure the skin-paddle contact impedance for 100, 200 and 350 Ω.

Configuration Screen

You can set the several default settings for the defibrillator.



To select a setting for “1. Installed Language”

1 Press the [ITEM ↓] or [ITEM ↑] key to select “1. Installed Language”.

2 Select the setting with the [←] or [→] key.

For “1. Installed Language”, the setting changes as follows:

English ↔ Japanese ↔ American ↔ Chinese ↔ Spanish ↔ French ↔ German ↔ Italian ↔ Norwegian ↔ Finnish ↔ Other 1 to 5

To save the settings (flash save procedure)

Make sure to perform “flash save” to save the changed setting in memory. Refer to “Saving the Settings before Maintenance (Flash Save Procedure)” in this section.

> **⚠ CAUTION**
> Do this procedure after any setting in the Configuration screen is changed. The new setting is not applied and saved until the “Flash Save” procedure is performed. Otherwise, the “D511” error code appears the next time the power is turned on.

NOTE: Do not change the value of the “12. Clock Adjustment”. If the value is changed, the clock accuracy becomes worse.

To clear charge times or return all the settings to the factory default

1 Press the [ITEM ↓] or [ITEM ↑] key to select “9. Charge Times Clear” or “10. Default Setting”.

2 Press the [EXEC] key. The setting changes from “Off” to “Exec” and the function keys change as follows:

3 Press the [OK] key to clear the charge times or initialize the settings.

To cancel it, press the [CANCEL] key.

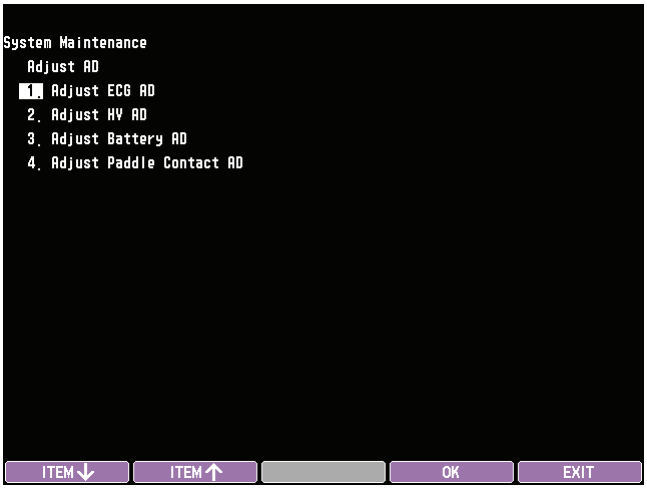
To return to the System Maintenance – Menu screen, press the [EXIT] key.

NOTE: Make sure to perform “flash save” after changing any settings on the System Maintenance – Configuration screen. Refer to “Saving the Settings before Maintenance (Flash Save Procedure)” in this section.

Adjust AD Screen

You can adjust the ECG sensitivity, charge energy, charge time, delivered energy, TTR and battery voltage settings by changing the A/D value for each item.

Peform the AD adjustment when replacing the boards. Refer to “Effect of Board or Unit Replacement” (p.4-5).

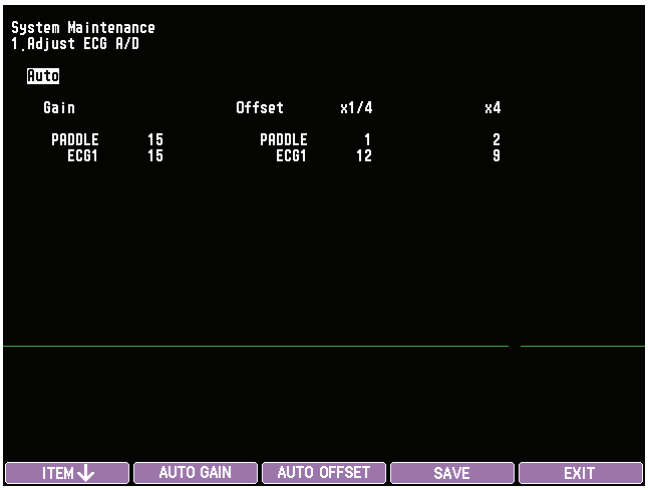


- To call up a sub-screen, select the item with the [ITEM ↓] or [ITEM ↑] key then press [OK] key.
- To return to the System Maintenance – Menu screen, press the [EXIT] key.
- Make sure to save the settings after adjustment by pressing the [SAVE] key or performing “flash save” procedure. Refer to “Saving the Settings before Maintenance (Flash Save Procedure)” in this section.

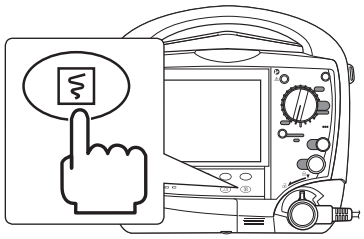
Adjust ECG A/D Screen

You can adjust the A/D value for the ECG offset and ECG sensitivity with the automatic adjustment mode or manual adjustment mode.

NOTE: Automatic adjustment is not recommended.



Manual Adjustment



Adjust the amplitude and/or baseline of the sine wave on the screen to 2 cm ("0200h" for offset) with the [↓] or [↑] key. You can print the ECG A/D screen during adjustment by pressing the record/stop key (To stop recording, press the record/stop key again). The temporary A/D values are determined and displayed on the screen.

Adjusting ECG sensitivity

1 Apply a 2 mVp-p, 10 Hz sine wave between lead R (RA) and L (LA)/F (LF).

2 Select the item to adjust with the [ITEM ↓] key. The function key change as follows.

3 Adjust the amplitude of the sine wave with the [↓] or [↑] key.

To return to the Adjust AD screen, press the [RETURN] key.

4 Press the [SAVE] key or do the "flash save" procedure to save the changed setting in the flash memory. Refer to "Saving the Settings before Maintenance (Flash Save Procedure)" in this section.

⚠ CAUTION

Do this procedure after any setting in the Adjust AD screen is changed or adjusted. The new setting or adjustment is not applied and saved until the "Save" or "Flash Save" procedure is performed. Otherwise, the "D511" error code appears the next time the power is turned on.

Adjusting ECG Offset

1 Short-circuit the external paddles.

2 Select the item to adjust with the [ITEM ↓] key. The function key change as follows.

3 Adjust the offset with the [↓] or [↑] key.

To return to the Adjust AD screen, press the [RETURN] key.

4 Press the [SAVE] key or do the "flash save" procedure to save the changed setting in the flash memory. Refer to "Saving the Settings before Maintenance (Flash Save Procedure)" in this section.

> **⚠ CAUTION**
>
> Do this procedure after any setting in the Adjust AD screen is changed or adjusted. The new setting or adjustment is not applied and saved until the "Save" or "Flash Save" procedure is performed. Otherwise, the "D511" error code appears the next time the power is turned on.

Adjust HV AD Screen

You can adjust the settings for delivered energy, TTR, charged energy and charging time. To adjust the charging time, a new fully charged battery pack or power supply is necessary (required voltage: 13 V, 15 A).

⚠ WARNING

This procedure must be performed when the delivered energy is out of the following range when you check delivered energy with the required delivery checker after replacing the HV capacitor and biphasic HV unit.

Selected energy level	Allowable delivered energy range on the delivery checker
2 J	± 0.5 J
3 J	± 1 J
5, 7, 10 J	± 2 J
20 J or more	± 10%

Required delivery checker:

- Nihon Kohden AX-103V
- Fluke Impulse 6000D
- Impulse 7000DP

The checker must be checked for accuracy and performance every year by its manufacturer or approved electrical safety organization.

1 Check and adjust the charged energy.

1) When the Adjust HV AD screen is displayed, the “SELECT 270J” message appears on the screen. Place the external paddles or disposable pads on the electrode plate of the delivery checker.
2) Turn the control dial on the front panel to 270 J. The “PUSH CHARGE/ AED BUTTON” message appears and the selected energy is displayed beside the message.
3) Press the charge button on the APEX external paddle or the CHARGE/ AED button on the front panel. The charged energy is displayed beside “Charge Energy” and the elapsed time from starting charging is displayed beside “Charge Time”.
4) When the energy charging is complete, the “PUSH SHOCK BUTTON” message appears. Press both shock buttons on the external paddles when using the external paddles. Press the SHOCK button on the front panel when using the disposable pads. The TTR AD (ohm) and delivered energy are displayed.
5) Check the delivered energy displayed on the delivery checker. If the delivered energy is not 270 J, continue the adjustment procedure.
6) Select “2. CHARGE AD” with the [ITEM ↓] key. The function keys change as follows.

7) Press the [↓] or [↑] key to change the energy that will be charged in the capacitor at the 270 J setting. The new CHARGE AD value is displayed beside “2. CHARGE AD” (Setting range: –25 to +25, The default setting is 0).
8) Select “1. Check HV” and repeat steps 2) to 7) until the delivered energy displayed on the delivery checker is in the range of 267 J to 273 J.

The charging time is automatically measured and displayed at “Charge Time”.

2 Adjust the AD values for the TTR and delivered energy measurement.

1) Select “3. TTR AD” with the [ITEM ↓] key.
2) Press the [↓] or [↑] key so that the TTR value displayed beside “3. TTR AD” changes 51 Ω to 50 Ω when performing “1. Check HV”.
3) Select “4. DELIVERED ENERGY” with the [ITEM ↓] key.
4) Press the [↓] or [↑] key so that the delivered energy displayed beside “4. DELIVERED ENERGY” is in the range of 267 J to 273 J.

3 If the charging time is more than 5 seconds, do the following steps.

⚠ WARNING

Do not repeatedly charge and discharge the energy. Otherwise, the defibrillator may heat up.

For AC operation:

1) Do steps 1) to 5) in step 1.
2) Select “5. Charge Time (AC)” with the [ITEM ↓] key.
3) Press the [↓] or [↑] key to change the charging time. (Setting range: –5 to +5).
4) Repeat steps 1) to 3) until the charging time becomes less than 5 seconds.

For battery operation:

5) Insert a new fully charged NKB-301V battery pack.
6) Disconnect the AC power cord from the defibrillator and AC outlet.
7) Do steps 1) to 5) in step 1.
8) Select “6. Charge Time (Batt)” with the [ITEM ↓] key.
9) Press the [↓] or [↑] key to change the charging time. (Setting range: –5 to +5).
10) Repeat steps 7) to 9) until the charging time becomes less than 5 seconds.

4 Press the [SAVE] key or do the “flash save” procedure to save the changed setting in the flash memory. Refer to “Saving the Settings before Maintenance (Flash Save Procedure)” in this section.

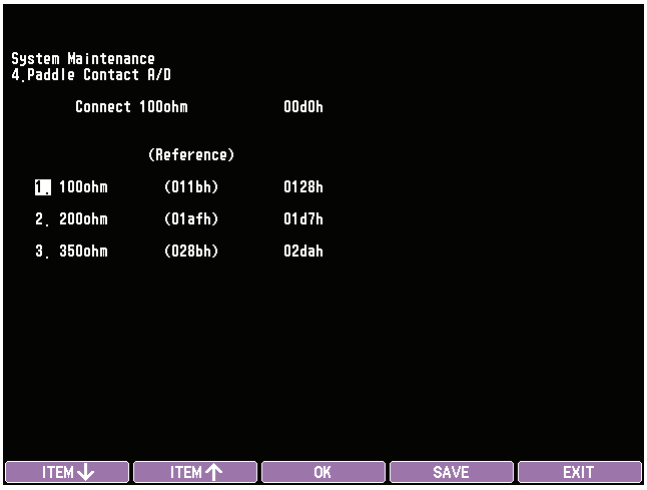
> **⚠ CAUTION**
> Do this procedure after any setting in the Adjust AD screen is changed or adjusted. The new setting or adjustment is not applied and saved until the “Save” or “Flash Save” procedure is performed. Otherwise, the “D511” error code appears the next time the power is turned on.

Adjust Battery AD Screen

NOTE: Do not change the A/D value of the battery voltage from the default value.

Paddle Contact A/D

Adjusts the AD values to determine the threshold of the skin-paddle contact impedance.

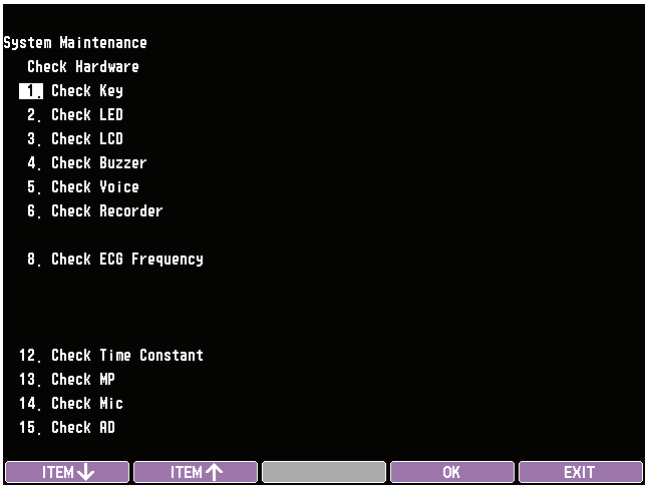


1. Connect the resistance to adjust.
2. Select the resistance with the [ITEM ↓] or [ITEM ↑] key.
3. Press the [OK] key. The temporary A/D value to determine the threshold of the skin-contact impedance is automatically adjusted and displayed beside the selected resistance.
4. Press the [SAVE] key or do the “flash save” procedure to save the changed setting in the flash memory. Refer to “Saving the Settings before Maintenance (Flash Save Procedure)” in this section.

> **⚠ CAUTION**
>
> Do this procedure after any setting in the Adjust AD screen is changed or adjusted. The new setting or adjustment is not applied and saved until the “Save” or “Flash Save” procedure is performed. Otherwise, the “D511” error code appears the next time the power is turned on.

Check Hardware Screen

You can check the function of the following hardware in the defibrillator.



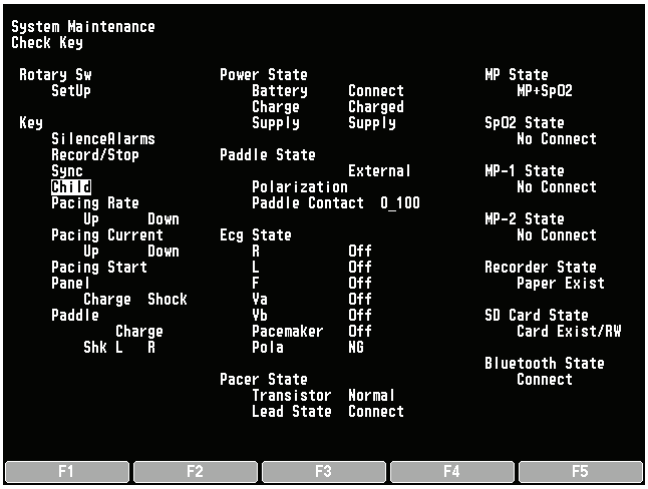
- To select an item to check, press the [ITEM ↓] or [ITEM ↑] key and press [OK] key.
- To return to the System Maintenance – Check Hardware screen from the screen for each check item, press the [EXIT] key.
- To return to the System Maintenance – Menu screen, press the [EXIT] key.

Check Key Screen

You can check the dial and key operation and status of connected devices.

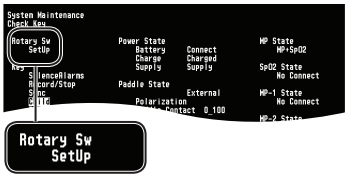
To check the dial or key operation, turn the dial or press the key. The selected mode or pressed key is displayed highlighted.

The status for each item is displayed beside the item name.



To return to the System Maintenance – Check Hardware screen, press the [F5] key.

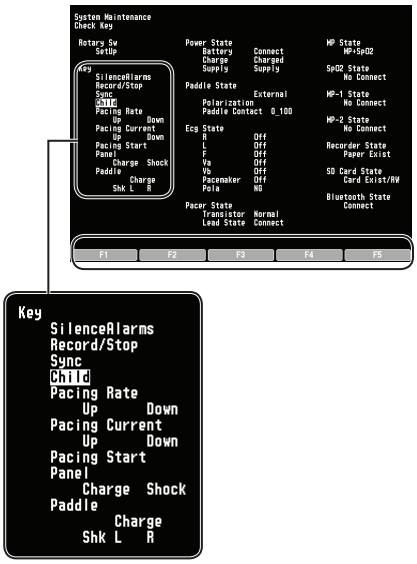
Check Items in the Check Key Screen



For Dial

Part Name		Description
Rotary SW	SetUp	Turn the control dial. The selected mode is displayed.

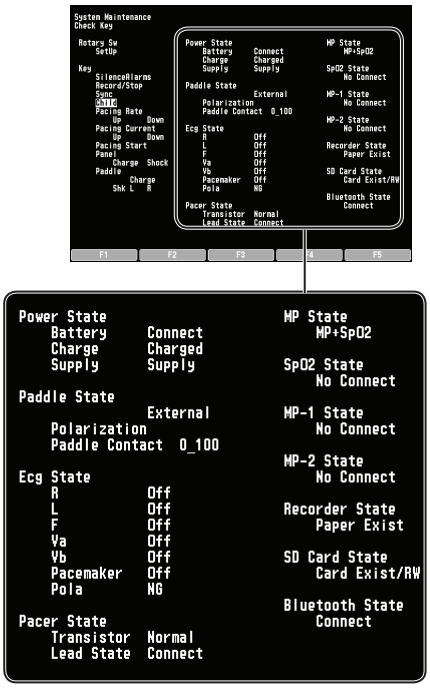
For Keys



The name of the key is highlighted when the corresponding key is pressed. Each item name shows the following keys.

Part Name			Description
Key	Silence Alarms		Silence Alarms key
	Record/Stop		Record/Stop key
	Sync		Sync button
	Child		Child mode button
	Pacing Rate	Up	Pacing rate Up/Down keys
		Down	
	Pacing Current	Up	Pacing current Up/Down keys
		Down	
	Pacing Start		Pacing Start key
Panel	Charge		Charge/AED button
	Shock		Shock button
Paddle	Charge		Charge button of the external paddle
	Shk	L	Shock button of each external paddle
		R	
[F1] to [F5]			Function key 1 to 5

For Connected Devices



Device		Status	Description
Power State	Battery	No Connect, Connect	Displays the battery state.
	Charge	No Charging, Charging, charged	Displays the battery pack charging state.
	Supply	Supply, No Supply	Displays the state for power supply.
Paddle State		No Connect, External, Internal, Dispo	Connect the pads or paddles to the defibrillator and confirm that the displayed device is correct.
	Polarization	Normal, NG	Connect the polarization check jig to the defibrillator and confirm that “Normal” is displayed.
	Paddle Contact	0_100, 100_200, 200_350, Over 350	Connect the impedance check jig to the defibrillator and check the impedance.
Ecg State	R, L, F, Va,Vb	Off, Connect	Connect the lead to check and confirm that “Connect” is displayed for the connected lead.

Device		Status	Description
Ecg State	Pace Maker	Off, On	Input pacemaker pulse and confirm that On is displayed.
	Pola	Normal, NG	Connect the polarization check jig to the defibrillator and confirm that "Normal" is displayed.
Pacer State		No Connect, Connect	For TEC-5601/TEC-5611/TEC-5621, confirm that "No Connect" is displayed. For TEC-5631, confirm that "Connect" is displayed.
	Transistor	Normal, Error	Confirm that "Normal" is displayed.
	Lead state	Off, Connect	Connect a pacing electrode and check that the status correctly changes.
SpO_2 State		No Connect, SpO_2	Connect the SpO_2 probe to the defibrillator and check that "SpO_2" is displayed.
MP-1 State		No Connect	—
MP-2 State		No Connect, CO_2	Connect the device to the CO_2 socket and confirm that the displayed device is correct.
Recorder State		Paper Exist, Out Of Paper	Set or remove the recording paper and check that correct status is displayed.
SD Card State		No Card, Card Exist/RW, Card Exist/RO	Insert and remove the SD card and confirm that correct status is displayed.
Bluetooth State		No Connect, Connect	When the optional QI-832V *Bluetooth*® module is installed, confirm that "Connect" is displayed.

Check LED Screen

You can check the LED function on the defibrillator. The LED lights when the item is selected and [ON] key is pressed. When the [AUTO] key is pressed, all LEDs are checked and lit one by one.

NOTE: Make sure that there are no alarms during check. If you check the LED when there is an alarm, the LED does not blink or light correctly.

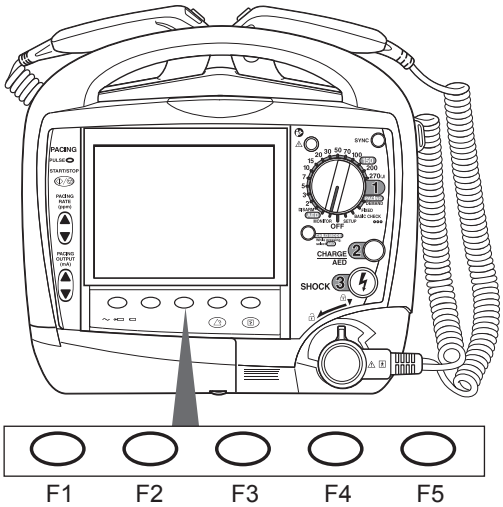
- To select an item to check, press the [ITEM ↓] or [ITEM ↑] key.
- To return to the System Maintenance – Check Hardware screen, press the [EXIT] key.

Check LCD Screen

You can check the LCD screen. When “3. Check LCD” on the System Maintenance – Check Hardware screen is selected and the [OK] key is pressed, the screen is displayed in black.

Every time you press the [F1] key, the screen color changes as follows.
black → white → color bar → black....

When the [F2] key is pressed, the screen color automatically changes as follows.
black → white → color bar → black....



To return to the System Maintenance – Check Hardware screen, press the [F5] key.

Check Buzzer Screen

You can check the sound generated by the defibrillator. The voice instruction can be checked in the Check Voice screen.

NOTE: Make sure that there are no alarms during check. If you check sound when there is an alarm, alarm sounds are not correctly generated.

To Check Automatically

Press the [AUTO] key to start checking sound. The sounds for item 1 to 9 are sequentially generated for 1 second. For “1. QRS”, pitch of the sound automatically changes from 81% to 100% in steps of 1 then returns to 81% after check.

To Check Manually

Select the item to check with the [ITEM] key then press the [OK] key to check the sound. The sound for each item is generated for 1 second.

NOTE: When “1. QRS” or “5. Operation Sound in AED Mode” is selected and the [ON] key is repeatedly pressed, each sound might not be heard. This is because those sounds do not continue for 1 second.

- To change the frequency of the QRS sound, press the [FREQUENCY] key.
- To change the frequency of the operation sound in AED mode, press the [FREQUENCY] key.
- To change the pulse width of the operation sound in AED mode, press the [DURATION] key.

- To return to the System Maintenance – Check Hardware screen, press the [EXIT] key.

Check Voice Screen

You can check the voice instructions on this screen.

To Check Automatically

Press the [AUTO] key to start playing voice instructions. All voice instructions are sequentially played.

To Check Manually

Select the instruction to play with the [ITEM ↓] or [ITEM ↑] key. Message in the center of the screen changes every time you press the [ITEM ↓] or [ITEM ↑] key.

To play the voice instruction, press the [ON] key.

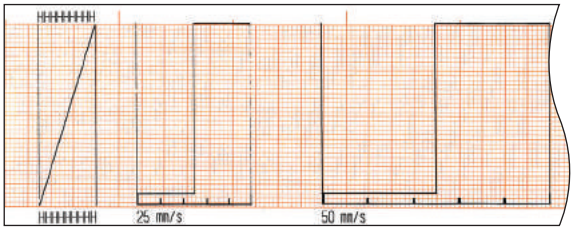
To return to the System Maintenance – Check Hardware screen, press the [EXIT] key.

Message List
Adult mode.
Child mode.
Child mode. If patient is an adult, set the control dial to AED without pressing the CHILD MODE button.
Adult mode. Stay calm. Follow voice instructions.
Child mode. Stay calm. Follow voice instructions. If patient is an adult, set the control dial to AED without pressing the CHILD MODE button.
Confirm that patient is not responding and is not breathing.
Remove all clothing from patient's chest.
Open package and remove pads.
Remove pads from liner and apply to right upper chest and left side as shown.
Check pad cable connection to defibrillator.
Do not touch patient.
Analyzing heart rhythm. Do not touch patient.
Shock advised. Charging.
Charging.
Do not touch patient. Press the flashing SHOCK button.

Message List
Shock delivered.
No shock advised.
Heart rhythm changed.
It is safe to touch patient. Start CPR.
Continue CPR.
Do 5 more chest compressions. Do not touch patient.
Check skin contact and cable connection.
Battery empty. Connect AC power.
Defibrillator not working. Do not use defibrillator. Start CPR.
Remove pads from liner and apply to patient as shown.
Could not analyze heart rhythm.
Shock canceled.
Press AED button.
Use disposable pads.
Testing voice instructions.
Synchronized cardioversion.
Energy was not delivered to patient.

Check Recorder Screen

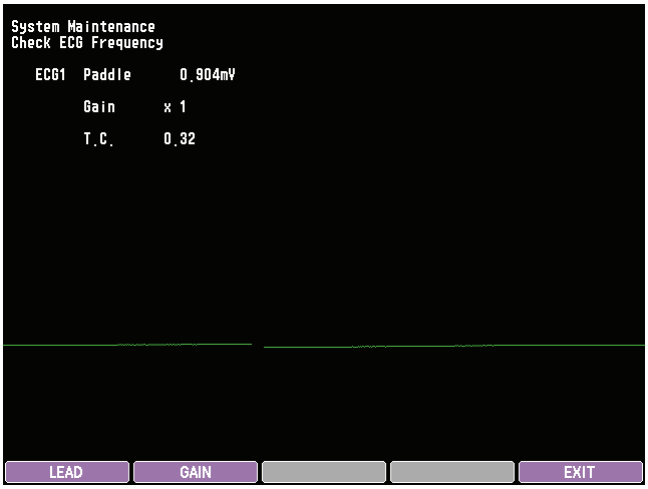
You can check the recorder in the Check Recorder screen. When checking starts, the following waveforms are printed, then all the text messages which can be used for recording are printed.



NOTE: If necessary, stop recording when the recorder starts printing text messages. You can check for missing dots just by checking the waveforms. Printing all the text messages uses a lot of recording paper.

Check ECG Frequency Screen

You can check the frequency response when acquiring the ECG waveforms from the external paddles, internal paddles, disposable pads or ECG disposable electrodes (lead II). The maximum and minimum amplitude are calculated and displayed on the screen.



- To change the lead, press the [LEAD] key.

  The lead changes as follows every time you press the [LEAD] key.

  ECG1 Paddle → ECG1 II LEAD → ECG1 Paddle...

- To change the gain, press [GAIN] key.

  The gain changes as follows every time you press the [SENSITIVITY] key.

  ×1 → ×2 → ×4 → ×1/4 → ×1/2 → ×1...

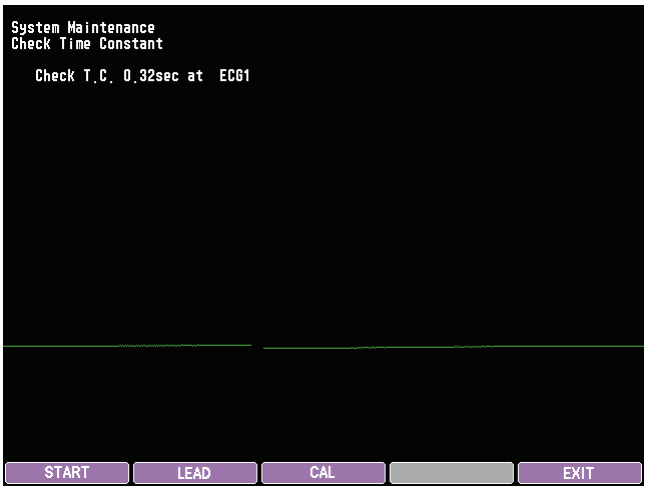
- When “II LEAD” is selected, you can change the time constant by pressing the [TIME CONSTANT] key. You can select 0.32 or 3.2.

To print the check result, press the Record/Stop key on the front panel.

To return to the System Maintenance – Check Hardware screen, press the [EXIT] key.

Check Time Constant Screen

You can check the time constant of the ECG amplifier.



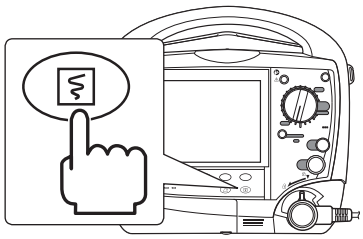
To Check Automatically

Press the [START] key. The defibrillator checks the time constant 0.32 and 3.2. The check result is automatically printed on the paper.

To stop checking, press the [STOP] key.

To Check Manually

You can check the time constant by printing the calibration waveforms on the paper.



1 Select the time constant and lead by pressing the [LEAD] key. Every time you press the [LEAD] key, the time constant and lead change as follows:

time constant: 0.32 s, lead: ECG1 → time constant: 3.2 s, lead: ECG1 → time constant: 0.32 s, lead: ECG1...

2 Press the Record/Stop key on the front panel and during printing, press the [CAL] key to apply the calibration waveforms.

3 Check that the waveforms are calibrated to the baseline and press the Record/Stop key.

4 Calculate the time constant from the printed waveforms.

To return to the System Maintenance – Check Hardware screen, press the [EXIT] key.

Check MP Screen

On this screen, you can check the MULTI connectors.

This screen is for factory use and is not used for maintenance.

Check Microphone Screen

On this screen, you can check the microphone.

This screen is for factory use and is not used for maintenance.

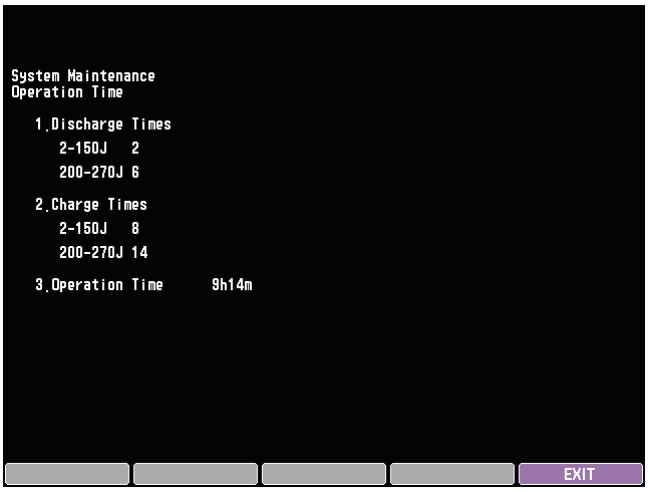
Check AD

On this screen, you can check the AD values.

This screen is for factory use and is not used for maintenance.

Operation Time Screen

This screen displays the number of external discharges and operation time.

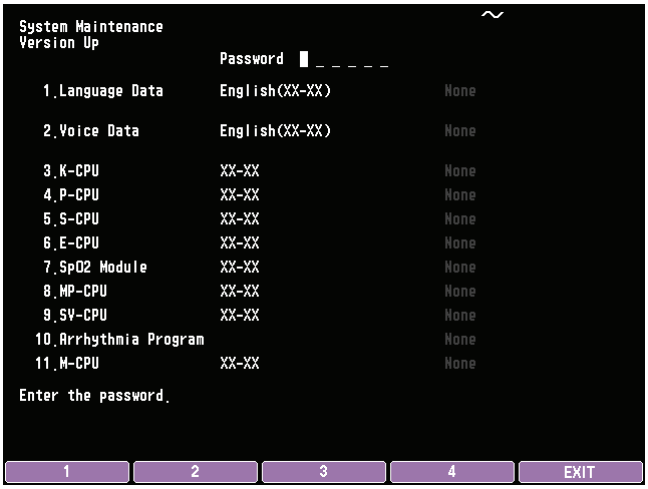


To return to the System Maintenance – Menu screen, press the [EXIT] key.

Version Up Screen

This screen is used to install programs of the defibrillator.

When an software kit (SD card) is inserted into the SD card slot, the program versions of the defibrillator and software kit are displayed on the screen.



Install Procedure

Refer to the installation guide supplied with the software kit.

NOTE • Do not turn off the defibrillator during installation. Turning off the defibrillator during installation may damage the defibrillator.

• To install the program, connect the power cord to supply AC power.

1 Select the item to install with the [ITEM] key.

2 Press the [EXEC] key to install the program. “No” displayed beside the item changes to “Yes”.

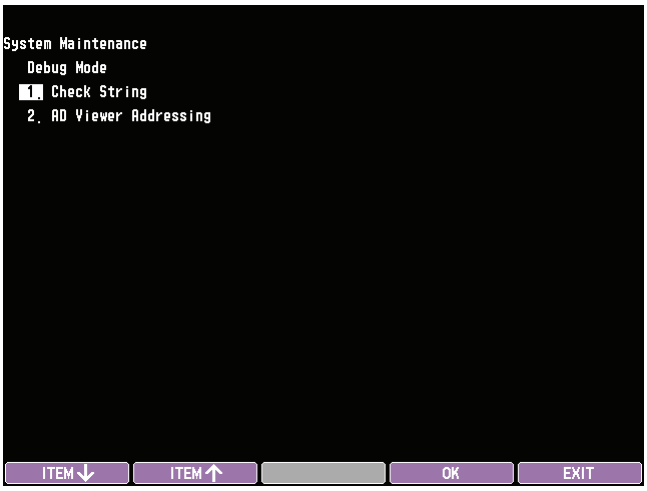
Not to install the selected item, press the [CANCEL] key to change “Yes” beside each item to “No”.

3 Press the [OK] key to start installation. All programs set to “YES” are sequentially installed.

To return to the System Maintenance – Menu screen, press the [EXIT] key.

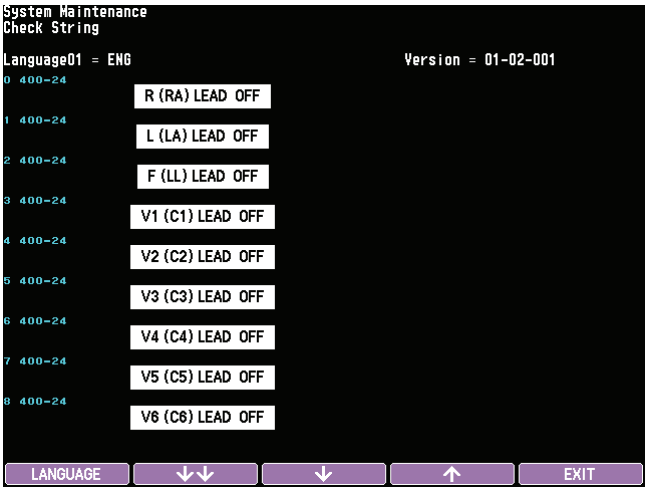
Debug Mode Screen

Debug mode screens are for factory use.



Check String Screen

This screen is used to check the text messages used in the defibrillator. You can display the language which is selected in “Installed Language” (System Maintenance – Menu screen) by pressing the [LANGUAGE] key.



- To display the next or previous page, press the [↓] or [↑] key.
- To jump 5 pages forward, press the [↓↓] function key.
- To return to the System Maintenance – Debug Mode screen, press the [EXIT] key.

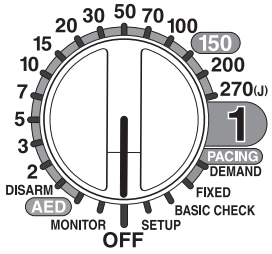
AD Viewer Addressing Screen

This screen displays each AD value that the main CPU currently receives.

This screen is for factory use and is not used for maintenance.

Saving the System Setup Screens as Bitmap Files

You can save the system setup screens as bitmap files in the SD card.



1 Turn the control dial to the OFF position to turn the defibrillator off.

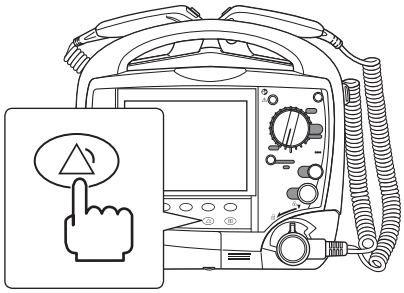
NOTE: Never unplug the power cord while the message “Saving data and shutting down. Do not touch the AC power cord” is displayed. If you do, the data inside the defibrillator may be damaged.

2 Insert an SD card into the SD card slot on the defibrillator right side panel.

Operator’s Manual: Section 10-2 “Inserting/Removing an SD Card”

3 Display the System Setup screen that you want to save.

Administrator’s Guide: “How to Change Settings on the SYSTEM SETUP Screens”



4 Save the system setup screens as bitmap files.

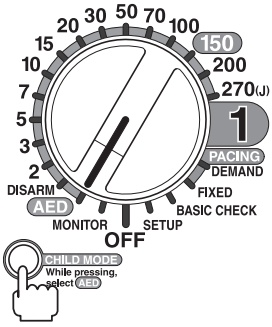
TEC-5601, TEC-5602

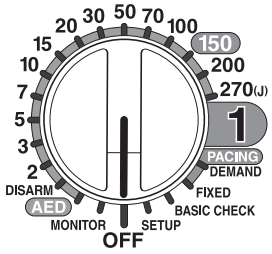
Press the silence alarms key on the front panel and wait about 8 seconds.

TEC-5611, TEC-5621, TEC-5631

Press the silence alarms key or the CHILD MODE button on the front panel. The SHOCK button on the front panel lights.

Wait about 8 seconds until the SHOCK button turns off.





5 Turn the control dial to the OFF position to turn the defibrillator off.

NOTE: Never unplug the power cord while the message “Saving data and shutting down. Do not touch the AC power cord” is displayed. If you do, the data inside the defibrillator may be damaged.

6 Remove the SD card from the SD card slot.

Operator’s Manual: Section 10-2 “Inserting/Removing an SD Card”

Installing Board Software, Languages, and Other Settings

General

When replacing a board, you need to use a defibrillator jig and SD card to install the board software.

After installing the M-CPU MOTHER board software, you must restore the following settings.

- Restore languages and select system language if more than 1 language is installed
- Register the defibrillator serial number
- Register the defibrillator model number
- Set date and time

The defibrillator jig and SD card with M-CPU MOTHER board software are also required to change the language and clear the operation history.

Installation Flow for MOTHER Board

The M-CPU software must be installed before installing any other software.

NOTE: The M-CPU software must be installed first. Otherwise, the other CPU software cannot be installed.

1. Check the information on the defibrillator labels
2. Mount the replacement board in the defibrillator jig
3. Load the software onto an SD card
4. Install the M-CPU software on the MOTHER board
5. Install languages
6. Select the system language
7. Install other software on the MOTHER board (S-CPU, SV-CPU, arrhythmia software)
8. Set the defibrillator model number
9. Delete defibrillator operation history
10. Set the defibrillator serial number
11. Set the defibrillator date and time
12. Install the replacement board into the defibrillator

Installation Flow for Other Boards

1. Check the information on the defibrillator labels
2. Mount the replacement board in the defibrillator jig
3. Load the software onto an SD card
4. Install other software on the board
5. Install the replacement board into the defibrillator

Boards and Software

The following table shows the software for each board.

Board	Model and Unit	Software
MOTHER board	UR-0481	M-CPU software
		S-CPU software
		SV-CPU software
		QS-831V arrhythmia software (option)
L-ECG unit	UR-0480 (TEC-5611/5621/5631)	E-CPU software
KEY/LED board	UR-0488	K-CPU software
PACER board	UR-0489 (TEC-5631)	P-CPU software
MP/SpO_2 board	UR-0490 (QI-564V)	MP-CPU software
QI-X SpO_2 BD board	UR-3908 (QI-564V)	SpO_2 software

Software and Language Installation Notes

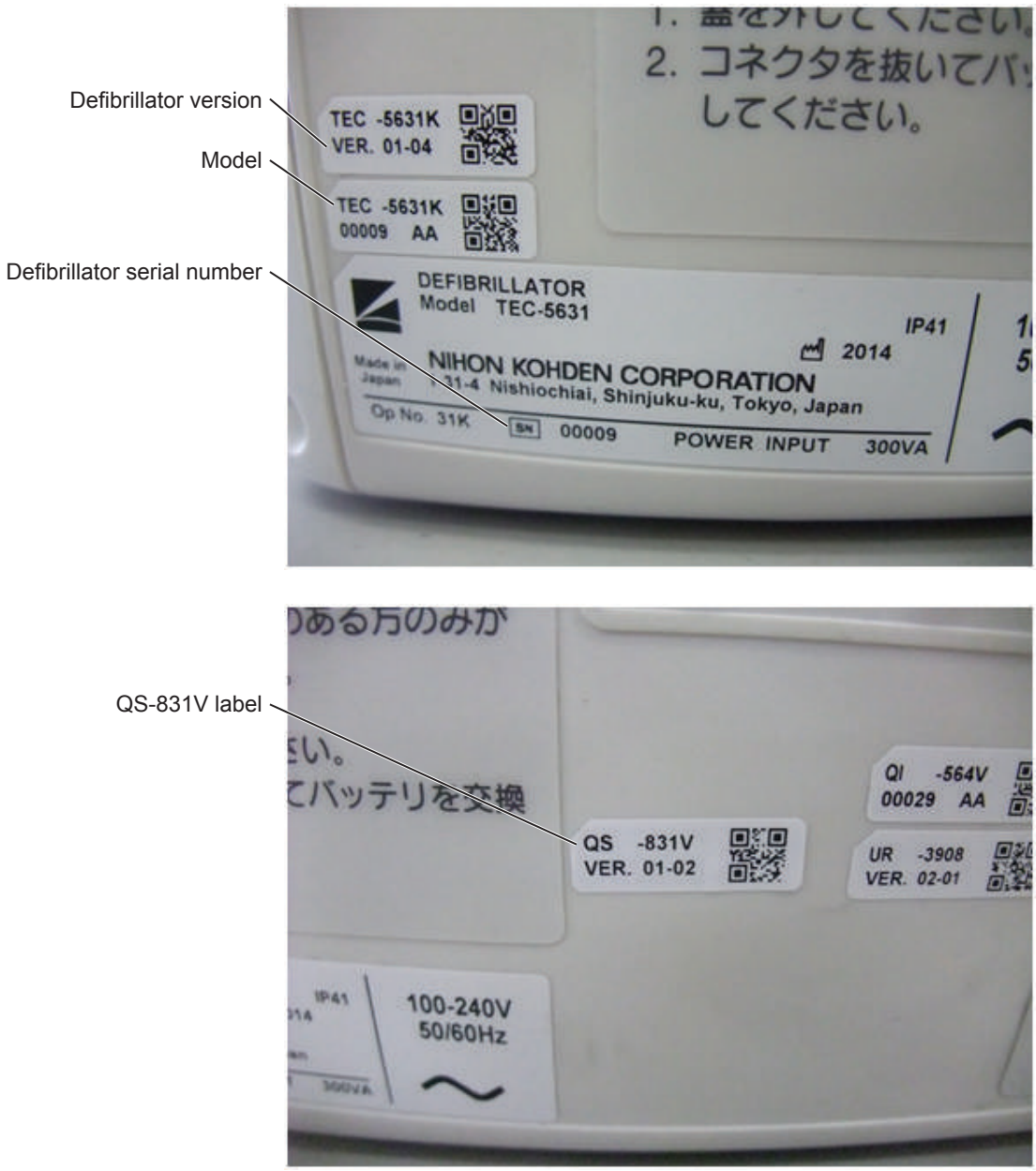
- To install software, insert the battery pack with at least 1/3 remaining battery power and connect the power cord to the wall AC outlet. If there is sudden power failure or the power is turned off due to the low battery power during installation, the defibrillator might not restart.
- After installation finishes, indicated by the progress bar, the defibrillator restarts and a sound is generated.

  When installing the M-CPU software, do not turn off the defibrillator before it restarts. Turning off the defibrillator before restart may damage the defibrillator.

  When installing software other than M-CPU, you can turn off the defibrillator when the “Upgrading complete” message appears.
- While upgrading the SV-CPU program, if the defibrillator is not restarted soon after the “Upgrading complete” message appears, an ERROR E001 message appears the next time the defibrillator is restarted. In that case, restart the defibrillator again and check that the ERROR E001 message does not appear.
- Up to five languages can be installed. Japanese and English are installed as the default. If five languages are already installed and you add another language, the new language overwrites the selected language. If Russian is installed, the overwritten language is the language that was installed second.

Checking the Information on the Defibrillator Labels

Check the information on the labels on the defibrillator rear panel: model, serial number, version. Also check whether the QS-831V arrhythmia software is installed.



Defibrillator rear panel labels

Checking the System Language

Do this to check the system language.

1. Display the SYSTEM SETUP – MENU screen.

   Administrator's Guide: "How to Change Settings on the SYSTEM SETUP Screens"

2. Display the System Maintenance screen.

   Service Manual: "System Maintenance Screen" (p.4-83)

3 Select “1. Configuration”.

4 Select “1. Installed Language”.

Mounting the Board in the Defibrillator Jig

1 Check that the battery pack is removed and the AC power cord is disconnected from the defibrillator jig.

2 Mount the board in the defibrillator jig. Make sure that all harnesses are connected to the connector in the defibrillator jig.

3 Install the battery pack and connect the AC power cord to the defibrillator jig.

Loading the Software onto an SD Card

An SD card containing the specified software is needed to install the software for the board, languages, and change maintenance settings.

1 Obtain the software from Nihon Kohden.

2 Install the specified software onto an SD card.

3 With the defibrillator power off, insert the SD card into the SD card slot on the defibrillator jig. Do not turn the power on yet.

Installing the M-CPU Software on the MOTHER Board

The M-CPU software must be installed on the MOTHER board before installing other software or other boards.

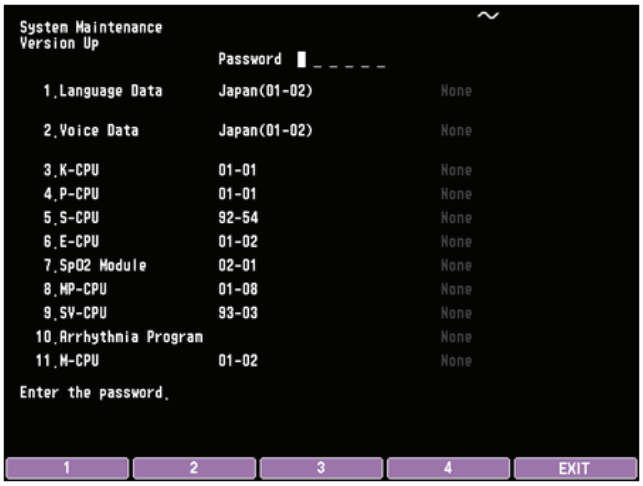
1 Display the SYSTEM SETUP – MENU screen.

Administrator’s Guide: “How to Change Settings on the SYSTEM SETUP Screens”

2 Display the System Maintenance screen.

Service Manual: “System Maintenance Screen” (p.4-83)

3 Press the [ITEM ↓] or [ITEM ↑] key to select “6. Version Up” then press the [OK] key. The System Maintenance – Version Up screen appears.



4 Enter the password (123412). The upgrade version of each item appears to the right of the current version.

5 Select “11. M-CPU” and press the [EXEC] key.

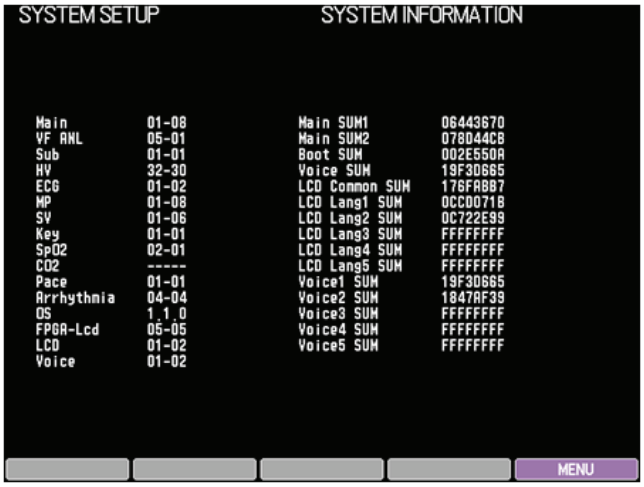
- If the upgrade version is newer than the current version, a message “Start upgrading?” appears.
- If the upgrade version is the same or older than the current version, a message “The Upgrade kit version is older than the current version. OK to downgrade” appears.

6 Press the [OK] key to start installation.

NOTE: The screen becomes dark and there is a buzzer sound for 40 seconds while upgrading the M-CPU. Do not turn off the defibrillator until the defibrillator restarts and the SYSTEM SETUP — MENU screen appears.

After installation, the defibrillator restarts and the SYSTEM SETUP – MENU screen appears.

7 Select "6. SYSTEM INFORMATION" and press the [OK] key. The SYSTEM SETUP – SYSTEM INFORMATION screen appears.



8 Check that the version of "Main" is correct.

Example: Main 01-08

Installing Languages

You can install up to 5 languages. After installing languages, you can select the system language.

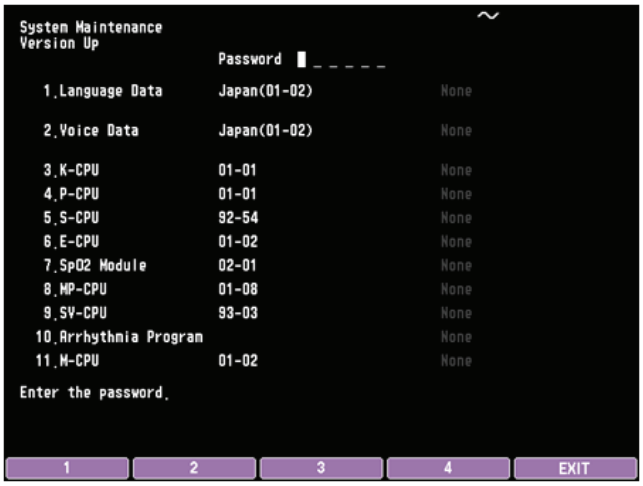
1 Display the SYSTEM SETUP – MENU screen.

Administrator's Guide: "How to Change Settings on the SYSTEM SETUP Screens"

2 Display the System Maintenance screen.

Service Manual: "System Maintenance Screen" (p.4-83)

3 Press the [ITEM ↓] or [ITEM ↑] key to select “6. Version Up” then press the [OK] key. The System Maintenance – Version Up screen appears.



4 Press the [ITEM] key to select “1. Language Data”.

5 Press the [NEXT LANG] or [PRE LANG] key to select the language to install.

6 Press the [EXEC] key.

If the upgrade version is the same or older than the current version, a message “The Upgrade kit version is older than the current version. OK to downgrade” appears.

7 Press the [OK] key to continue. A “Start Upgrading?” message appears. Press the [OK] key to install the language.

Selecting the Language

You can select the system language out of the installed languages.

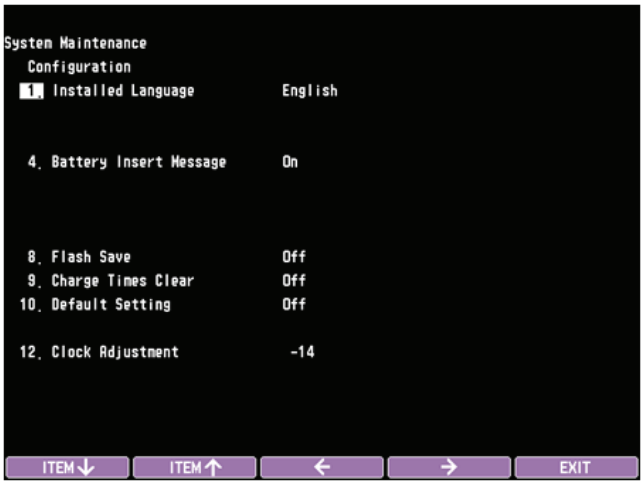
1 Display the SYSTEM SETUP – MENU screen.

Administrator's Guide: "How to Change Settings on the SYSTEM SETUP Screens"

2 Display the System Maintenance screen.

Service Manual: "System Maintenance Screen" (p.4-83)

3 Select "1. Configuration" and press the [EXEC] key. The System Maintenance – Configuration screen is displayed.



4 Select "1. Installed Language" and press the [←] or [→] key to change the language.

If you do not see your desired language, you must install the language.

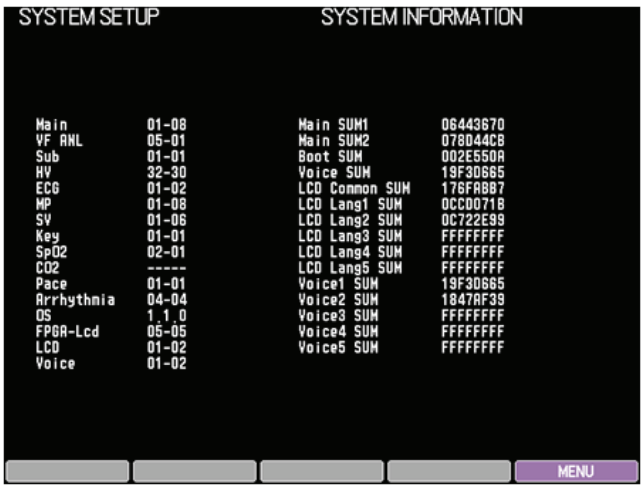
5 Check that the language version (LCD and Voice) are correct.

Example

LCD 01-02

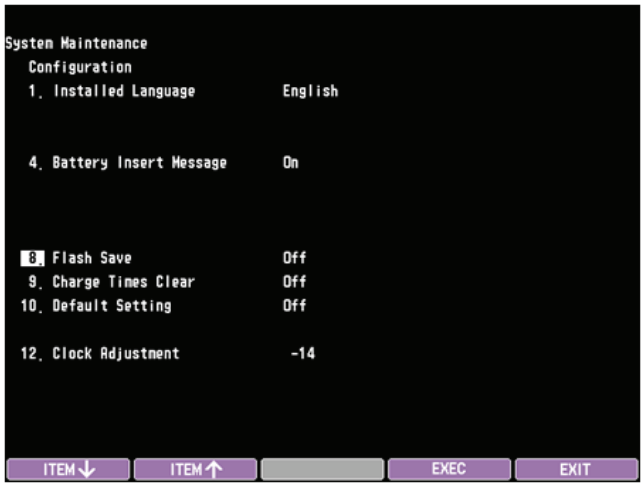
Voice 01-02

On the SYSTEM SETUP screen, select "6. SYSTEM INFORMATION" and press the [OK] key. The SYSTEM SETUP – SYSTEM INFORMATION screen appears.



6 Select “8. Flash Save” and press the [EXEC] key then the [OK] key to apply the selected language.

A progress bar is displayed then a “Complete” message appears after the language is applied.



Installing Other Software on the MOTHER Board (S-CPU, SV-CPU, Arrhythmia Software)

The M-CPU software must be installed on the MOTHER board before installing other software.

If the QS-831V arrhythmia software is installed in the defibrillator, “10. Arrhythmia Software” must be installed.

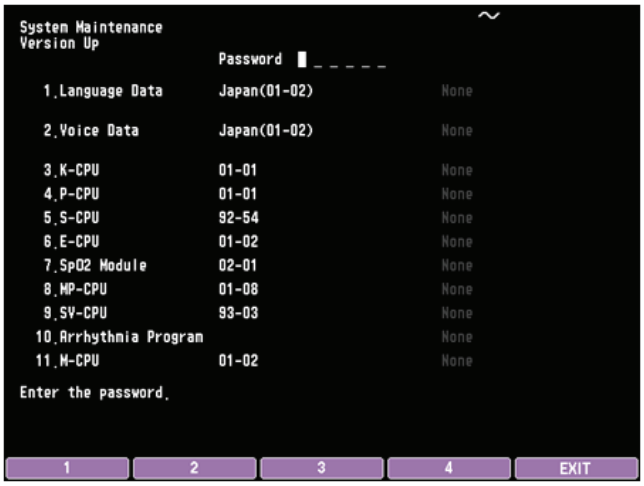
1 Display the SYSTEM SETUP – MENU screen.

Administrator’s Guide: “How to Change Settings on the SYSTEM SETUP Screens”

2 Display the System Maintenance screen.

Service Manual: “System Maintenance Screen” (p.4-83)

3 Press the [ITEM ↓] or [ITEM ↑] key to select “6. Version Up” then press the [OK] key. The System Maintenance – Version Up screen appears.



4 Enter the password (123412). The upgrade version of each item appears to the right of the current version.

5 Select the desired CPU item, SpO_2 module or arrhythmia program and press [EXEC].

- If the upgrade version is newer than the current version, a message “Start upgrading?” appears.

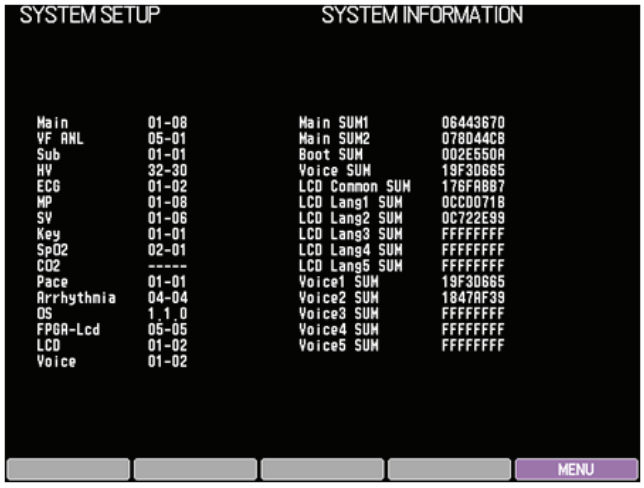
- If the upgrade version is the same or older than the current version, a message “The Upgrade kit version is older than the current version. OK to downgrade” appears.

6 Press [OK] to start installation.

NOTE: While upgrading the SV-CPU program, if the defibrillator is not restarted soon after the “Upgrading complete” message appears, an ERROR E001 message appears the next time the defibrillator is restarted. In that case, restart the defibrillator again and check that the ERROR E001 message does not appear.

After installation, the defibrillator restarts and the SYSTEM SETUP – MENU screen appears.

7 Select “6. SYSTEM INFORMATION” and press the [OK] key. The SYSTEM SETUP – SYSTEM INFORMATION screen appears.



8 Check that the version of the upgraded item is correct.

Example: SV 01-06

9 When the “Upgrading Complete” message appears, turn off the defibrillator power.

Depending on the upgraded item, the power might not turn off immediately. Wait up to 40 seconds until the power turns off.

NOTE: When you install the SV-CPU software, an ERROR E001 message may appear when the control dial is not turned to the OFF position after the “Upgrading complete” message appears and the defibrillator is restarted.

10 Check that installation was performed properly.

On the SYSTEM SETUP screen, select “6. SYSTEM INFORMATION” and press the [OK] key. The SYSTEM SETUP – SYSTEM INFORMATION screen appears. Check that the software is installed.

Registering the Model Number

When the MOTHER board M-CPU software is upgraded, you must do the following to make the defibrillator recognize the model number.

NOTE: SD card for registering the model number is required.

1 Insert the SD card in the SD card slot on the defibrillator.

2 With the power off, press and hold the [F1] and [F3] keys and turn the control dial to the SETUP position. The System Maintenance screen appears.

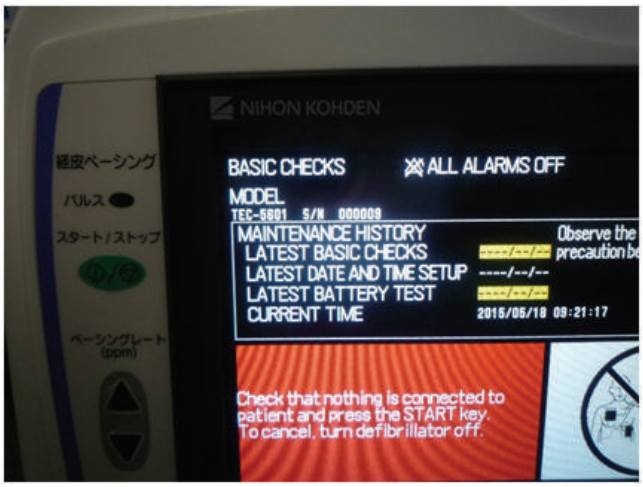
3 Enter the password. The password is “123412”.

4 The “Please Push Product Type” setting appears. Press the [model] key and wait about 20 seconds until the setting is complete. After the setting is complete, the changed model is displayed in cyan.

Change Product Type setting

5 Turn the defibrillator power off.

6 On the BASIC CHECKS screen, check that the model is correct.



7 Turn the defibrillator power off and remove the SD card.

Deleting the Operation History

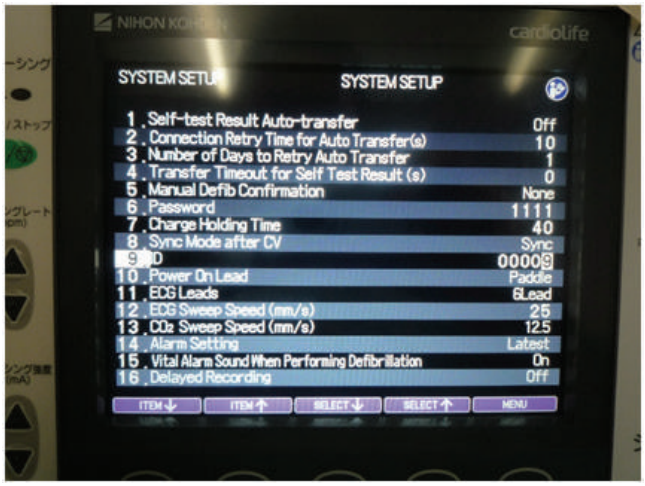
You can delete the operation history on the MOTHER board.

1 Display the SYSTEM SETUP – MENU screen.

Administrator's Guide: "How to Change Settings on the SYSTEM SETUP Screens"

2 Select "1. SYSTEM SETUP". The SYSTEM SETUP – SYSTEM SETUP screen appears.

3 Select "9. ID" and enter "CLEAR".



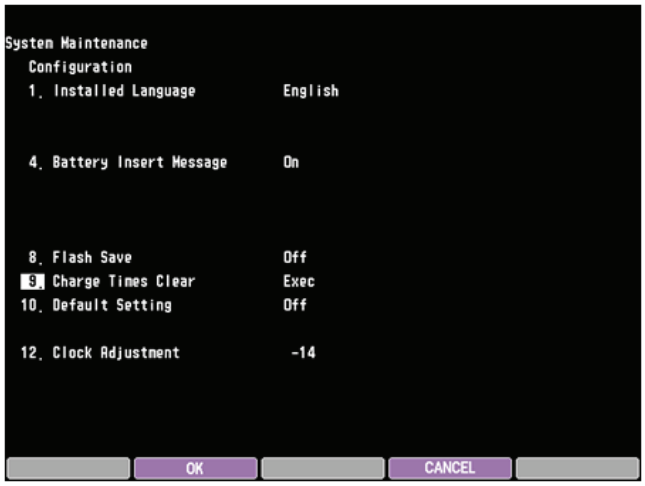
4 Display the SYSTEM SETUP – MENU screen.

5 Display the System Maintenance screen.

Service Manual: "System Maintenance Screen" (p.4-83)

6 Select "1. Configuration". The System Maintenance – Configuration screen appears.

7 Select "9. Charge Times Clear" and change "Exec" to "OK". The operation history is deleted.



8 Display the SYSTEM SETUP – MENU screen.

9 Select "1. SYSTEM SETUP". The SYSTEM SETUP – SYSTEM SETUP screen appears.

10 Select “9. ID” and enter the original ID.

Registering the Serial Number

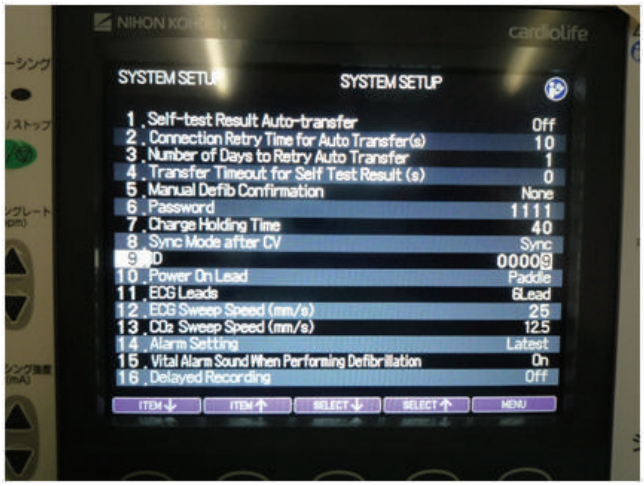
The defibrillator serial number is reset to “00000” when the MOTHER board is replaced. You must register the serial number when the MOTHER board is replaced or the M-CPU software is upgraded.

If you are changing an existing serial number, you must first delete the existing serial number.

1 Display the SYSTEM SETUP – MENU screen.

Administrator’s Guide: “How to Change Settings on the SYSTEM SETUP Screens”

2 Select “1 SYSTEM SETUP”. The SYSTEM SETUP – SYSTEM SETUP screen appears.



3 Select “9. ID” and enter the serial number.

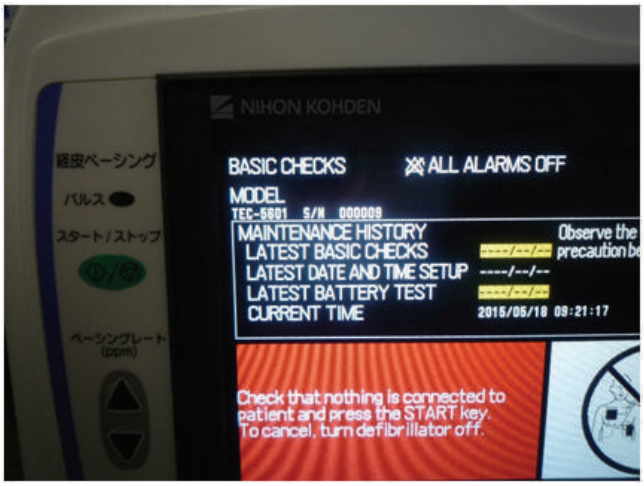
4 Display the SYSTEM SETUP – MENU screen.

5 Display the System Maintenance screen.

Service Manual: “System Maintenance Screen” (p.4-83)

6 Select “1. Configuration” → “8. Flash Save” to apply the serial number. When the confirmation messages appear, press the [EXEC] key then the [OK] key.

7 Display the BASIC CHECKS screen and check that the serial number is registered.



If you entered an incorrect serial number, do this procedure to delete the wrong serial number. Then enter the correct serial number.

1 Display the System Maintenance screen.

2 Select “1. Configuration”.

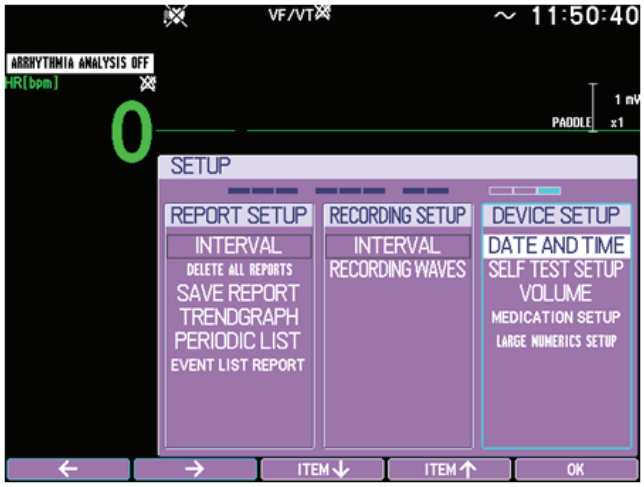
3 Change “10. Default Setting” from “Exec” to “OK”. The serial number is deleted.

Setting the Date and Time

You must set the date and time after the MOTHER board is replaced.

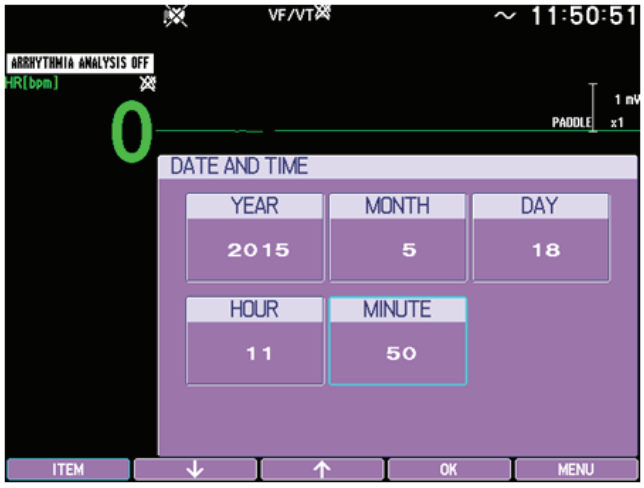
1 Turn the control dial to the SETUP position to display the SETUP screen.

2 Press the [ITEM] key to select the DATE AND TIME and press the [OK] key.



3 Adjust the date and time and press the [OK] key.

NOTE: The change is not applied if the [OK] key is not pressed.



4 Turn the defibrillator power off.

Installing Software on Other Boards

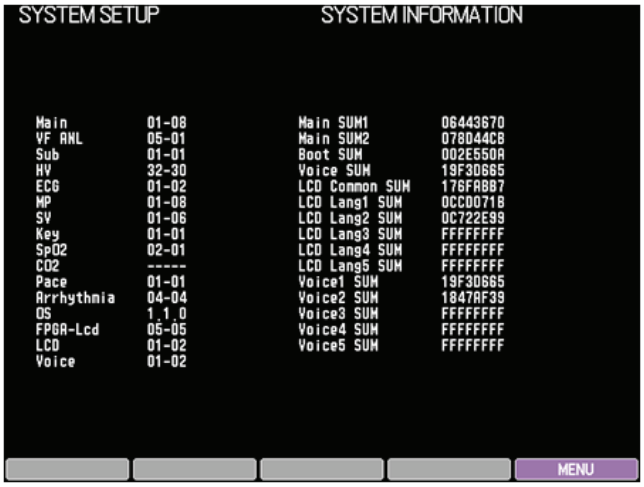
For boards other than the MOTHER board, you only need to install the software on that board. No settings need to be changed.

Board	Model and Unit	Software
L-ECG unit	UR-0480 (TEC-5611/5621/5631)	E-CPU software
KEY/LED board	UR-0488	K-CPU software
PACER board	UR-0489 (TEC-5631)	P-CPU software
MP/SpO_2 board	UR-0490 (QI-564V)	MP-CPU software
QI-X SpO_2 BD board	UR-3908 (QI-564V)	SpO_2 software

The procedure is the same as the procedure for installing the M-CPU software, except that on the System Maintenance – Version Up screen you will select a different item than M-CPU.

And on the System Setup – System Information screen, you will check the installed version of the upgraded item instead of “Main”.

Example: SpO2 02-01



Installing the Board into the Defibrillator

After installing software into the boards and restoring necessary settings, install the board in the defibrillator.

1. Turn the defibrillator jig power off.
2. Remove the SD card from the defibrillator jig.
3. Remove the board from the defibrillator jig and install it in the defibrillator.

Periodic Inspection

To ensure correct performance for use in an emergency, check the following items every one year. If any abnormality is found, attach a “Not available” or “Repair requested” label on the defibrillator and contact your Nihon Kohden representative.

For detailed procedures, refer to “Checking the Defibrillator” to “Safety Check” in this manual.

Appearance

- The defibrillator is not dirty.
- The defibrillator is not cracked or damaged.
- No labels are removed or torn. (Labels are readable.)
- No connectors or switches are cracked or loose.
- Blood or chemical on the defibrillator is cleaned.
- A specified 3-prong power cord is used.
- The metal parts on the connector are not deformed.
- There are no scratches on the cable and cable cover is not torn.
- Using a tester, check that the protective earth is not broken.
- When using the external paddles, the paddles are not broken.
- Connectors are not damaged or cracked.
- Pad adapter is not expired.

Battery Pack

- No damage or crack on the battery pack. No labels are removed or torn.
- The battery pack is not expired.
- The battery test is performed.

Defibrillator

- The defibrillator correctly turns on and the display operates correctly.
- QRS sync sound is normal and can be adjusted.
- Recorder operates correctly.
- Recorded date and time is correct.
- Event recording can be performed correctly.
- There are not missing dots or uneven tone on the recording paper.
- Sweep speed of the recording paper is within the specified range.
- Out of paper is correctly detected.
- Connector off is correctly detected.
- Charging time is within 5 seconds.
- Defibrillation is performed correctly.
- The waveform of the discharged energy is biphasic.

Defibrillation (Manual)

- Connector off is correctly detected.
- Charging time is within 5 seconds.
- Defibrillation is performed correctly.
- The waveform of the discharged energy is biphasic.
- Discharged energy when using the external paddles is correct in both AC operation and battery operation.
- Discharged energy when using the disposable pads is correct.
- Discharged energy when using the internal paddles in AC operation is correct.
- The charged energy can be changed.
- Internal discharge is correctly performed.

Sync

- The synchronized cardioversion using the paddle lead is correctly performed.
- The synchronized cardioversion using the ECG lead is correctly performed.

AED

- VF is correctly detected.
- Charging automatically starts when VF is detected.
- Defibrillation is performed correctly.
- Messages and illustrations are correctly displayed.
- The defibrillator correctly generates voice instructions.

Pacing

- Fixed pacing can be performed correctly.
- Demand pacing can be performed correctly.
- Pacing output is correct.

Monitoring

- Heart rate accuracy is correctly displayed and QRS sync tone is correctly generated.
- Sensitivity of ECG wave is correct.
- Heart rate alarm and ECG connector off alarm are correctly generated.
- Display accuracy for the respiration rate and CO_2 value is confirmed.
- CO_2 and RR upper/lower limit and CO_2 connector off alarm is correctly generated.
- Measurement accuracy of the CO_2 sensor kit is confirmed.
- Display accuracy for the SpO_2 value and pulse rate is confirmed and QRS sync tone is correctly generated.
- SpO_2 upper/lower limit and SpO_2 connector off alarm are correctly generated.

Safety Check

- Earth leakage current, touch current, patient leakage current (Type BF and CF applied part) in normal condition and single-fault condition are allowable values.

Maintenance Check Sheet

Issuance No. _____

Facility name	Inspection date	Person in charge
Address	Delivery date	Signature
Model	Serial number and revision	

Check tools		**Options/Consumables**			
Product name	Serial number	Product name	Q'ty	Product name	Q'ty

Overall judgment	**Conditions of use**
[ ] No error	Duration of usage: year(s)
[ ] AED is usable but needs to be repaired soon.	Used by:
[ ] AED needs to be repaired immediately.	

		Item	Result	Action
Appearance	1	The defibrillator is not dirty.		
		The defibrillator is not cracked or damaged.		
		No labels are removed or torn. (Labels are readable.)		
		No connectors or switches are cracked or loose.		
		Blood or chemical on the defibrillator is cleaned.		
	2	A specified 3-prong power cord is used.		
		The metal parts on the connector are not deformed.		
		There are no scratches on the cable and cable cover is not torn.		
		Using a tester, check that the protective earth is not broken.		
	3	When using the external paddles, the paddles are not broken.		
	4	Connectors are not damaged or cracked.		
		Pad adapter is not expired.		
Battery Pack	5	No damage or crack on the battery pack. No labels are removed or torn.		
		The battery pack is not expired.		
	6	The battery test is performed.		
Defibrillator	7	The defibrillator correctly turns on and the display operates correctly.		
	8	QRS sync sound is normal and can be adjusted.		
	9	Recorder operates correctly.		
		Recorded date and time is correct.		
		Event recording can be performed correctly.		
		There are not missing dots or uneven tone on the recording paper.		
		Sweep speed of the recording paper is within the specified range.		
		Out of paper is correctly detected.		

		Item	Result	Action
Defibrillation (Manual)	10	Connector off is correctly detected.		
	11	Charging time is within 5 seconds.		
	12	Defibrillation is performed correctly.		
		The waveform of the discharged energy is biphasic.		
	13	Discharged energy when using the external paddles is correct (write the measured value below): AC operation 2 J: _____ J 3 J _____ J 5 J _____ J 7 J: _____ J 10 J _____ J 15 J _____ J 20 J: _____ J 30 J _____ J 50 J _____ J 70 J: _____ J 100 J _____ J 150 J _____ J 200 J: _____ J 270 J _____ J Battery operation 270 J _____ J	—	
	14	Discharged energy when using the disposable pads is correct (write the measured value below): 270 J _____ J	—	
	15	Discharged energy when using the internal paddles is correct (write the measured value below): AC operation 2 J: _____ J 3 J _____ J 5 J _____ J 7 J: _____ J 10 J _____ J 15 J _____ J 20 J: _____ J 30 J _____ J 50 J _____ J	—	
	16	The charged energy can be changed.		
	17	Internal discharge is correctly performed.		
Sync	18	The synchronized cardioversion using the paddle lead is correctly performed.		
	19	The synchronized cardioversion using the ECG lead is correctly performed.		
AED	20	VF is correctly detected.		
		Charging automatically starts when VF is detected.		
		Defibrillation is performed correctly.		
	21	Messages and illustrations are correctly displayed.		
	22	The defibrillator correctly generates voice instructions.		
Pacing	23	Fixed pacing can be performed correctly.		
	24	Demand pacing can be performed correctly.		
	25	Pacing output is correct.		
Monitoring	26	Heart rate accuracy is correctly displayed and QRS sync tone is correctly generated.		
		Sensitivity of ECG wave is correct.		
		Heart rate alarm and ECG connector off alarm are correctly generated.		
	27	Display accuracy for the respiration rate and CO_2 value is confirmed.		
		CO_2 and RR upper/lower limit and CO_2 connector off alarm is correctly generated.		
		Measurement accuracy of the CO_2 sensor kit is confirmed.		
	28	Display accuracy for the SpO_2 value and pulse rate is confirmed and QRS sync tone is correctly generated.		
		SpO_2 upper/lower limit and SpO_2 connector off alarm are correctly generated.		

Safety Check	Earth leakage current	Normal condition	µA	
		Single-fault condition	µA	
	Touch current	Normal condition	µA	
		Single-fault condition	µA	
	Patient leakage current (Type BF applied part)	Normal condition	µA	
		Single-fault condition	µA	
	Patient leakage current (Type CF applied part)	Normal condition	µA	
		Single-fault condition	µA	

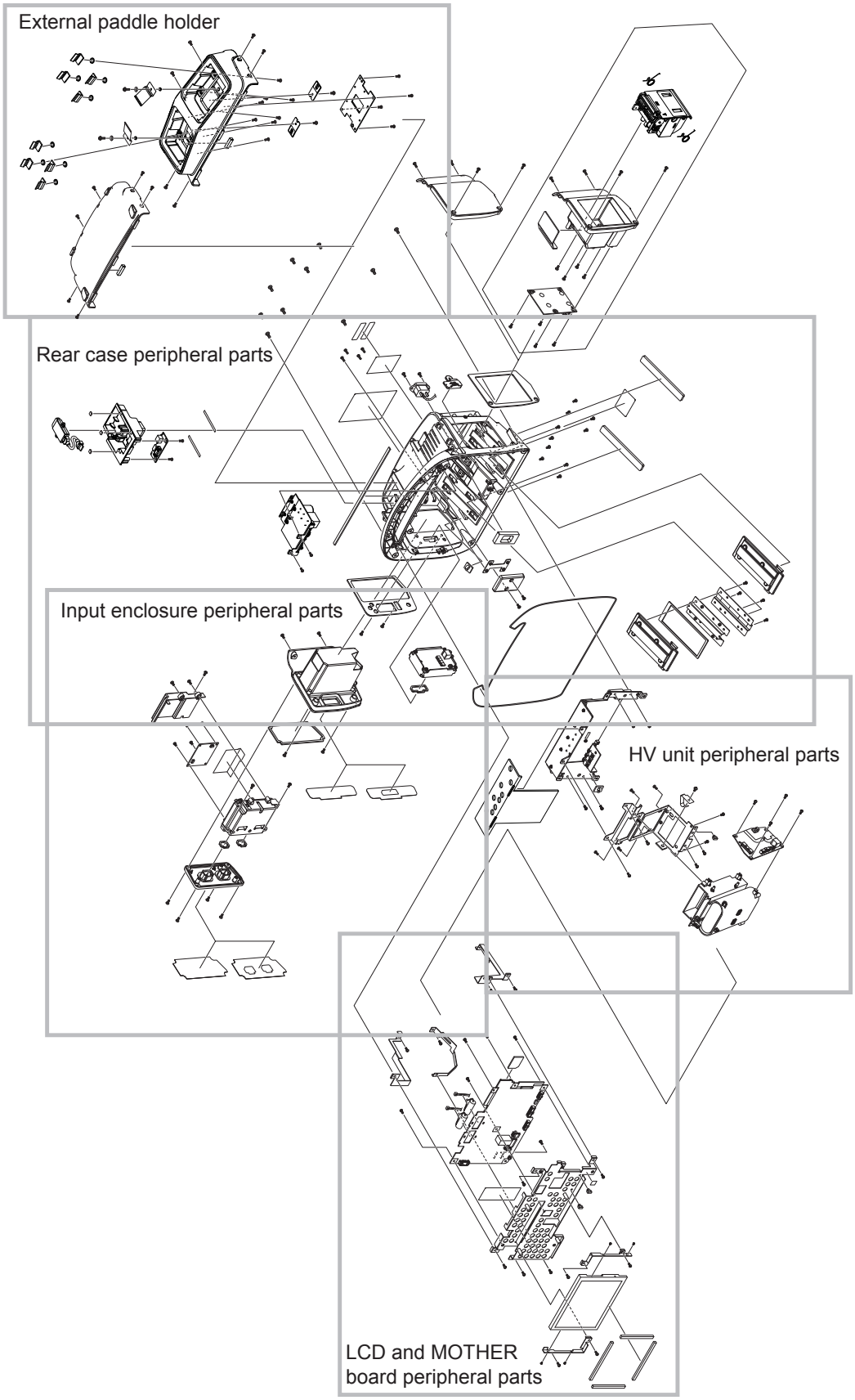
Comments

5 Replaceable Parts

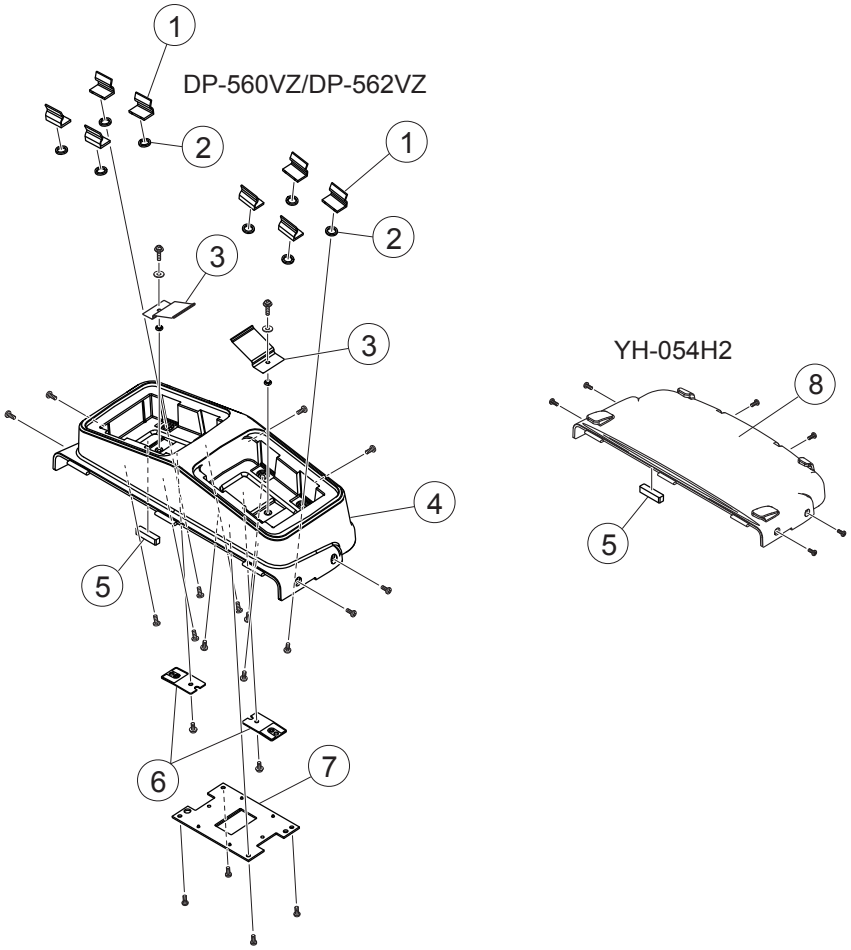
When ordering parts or accessories, please quote the code number and part name which are listed in this service manual, and the name or model of the unit in which the part is located. This will help us to promptly attend to your needs. Always use Nihon Kohden parts and accessories to assure maximum performance from your defibrillator.

Defibrillator Rear Parts

Overall Exploded Diagram

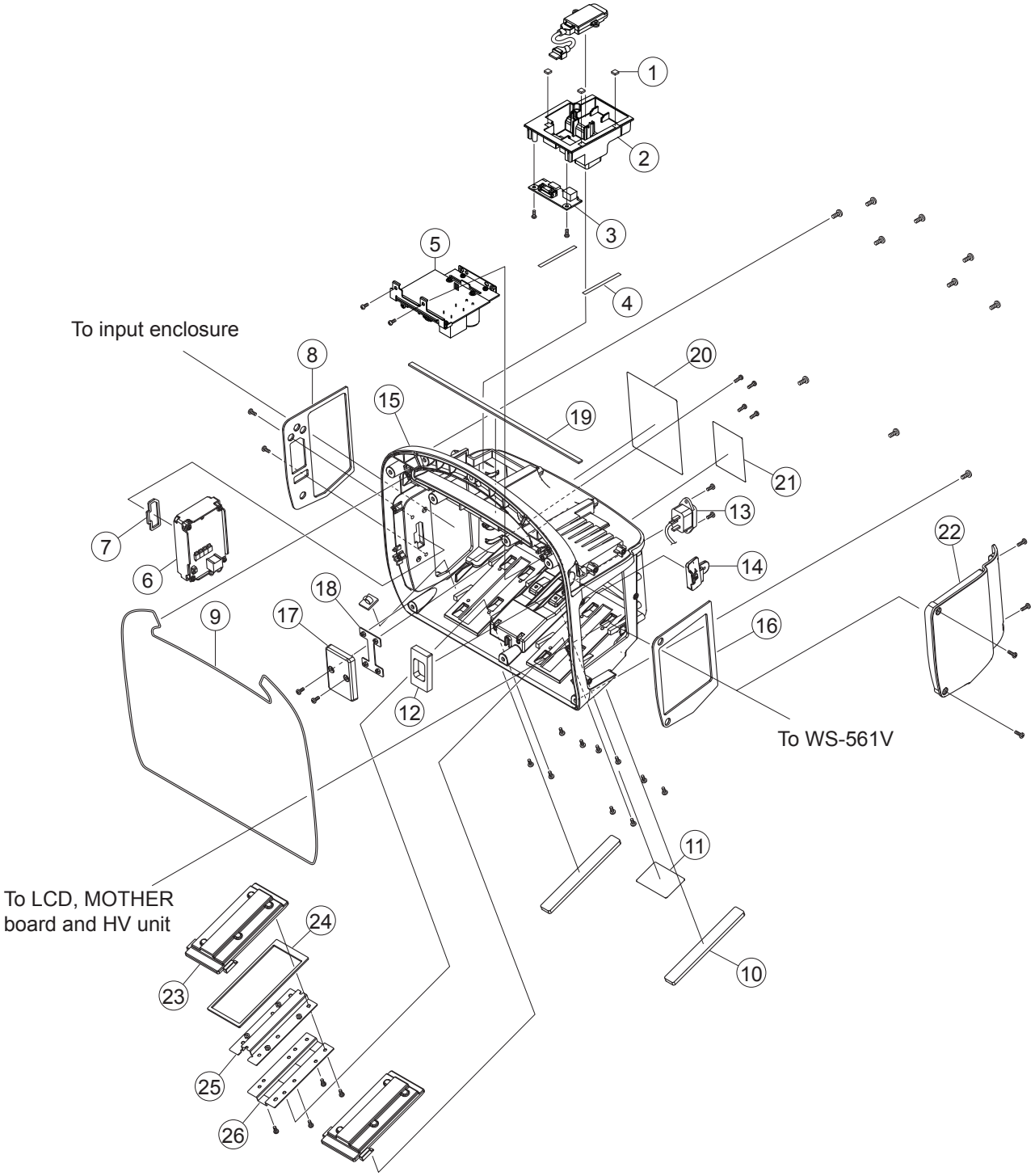


External Paddle Holder



No.	Code No.	Qty	Description
DP-560VZ EXTERNAL PADDLE HOLDER			
1	6114-069677A	8	PADDLE LOCK SPRING, K-718
2	6114-035802A	8	PADDLE LOCK PACKING
3	6114-927936	2	ELECTRODE PLATE, NICKEL SILVER
4	6114-905401	1	PADDLE CUP OUTER
5	6114-934588	1	SPONGE, 26×6
6	6114-927945	2	NUT PLATE, DP-831VK
7	UR-0484	1	TEST LOAD BOARD
DP-562VZ EXTERNAL PADDLE HOLDER, ERC			
1	6114-069677A	8	PADDLE LOCK SPRING, K-718
2	6114-035802A	8	PADDLE LOCK PACKING
3	6114-927936	2	ELECTRODE PLATE, NICKEL SILVER
4	6111-905394	1	PADDLE CUP OUTER, ERC
5	6114-934588	1	SPONGE, 26×6
6	6114-927945	2	NUT PLATE, DP-831VK
7	UR-0484	1	TEST LOAD BOARD
YH-054H2 TOP COVER 5600, OPTION			
5	6114-934588	1	SPONGE, 26×6
8	6111-905385	1	PADDLE CUP

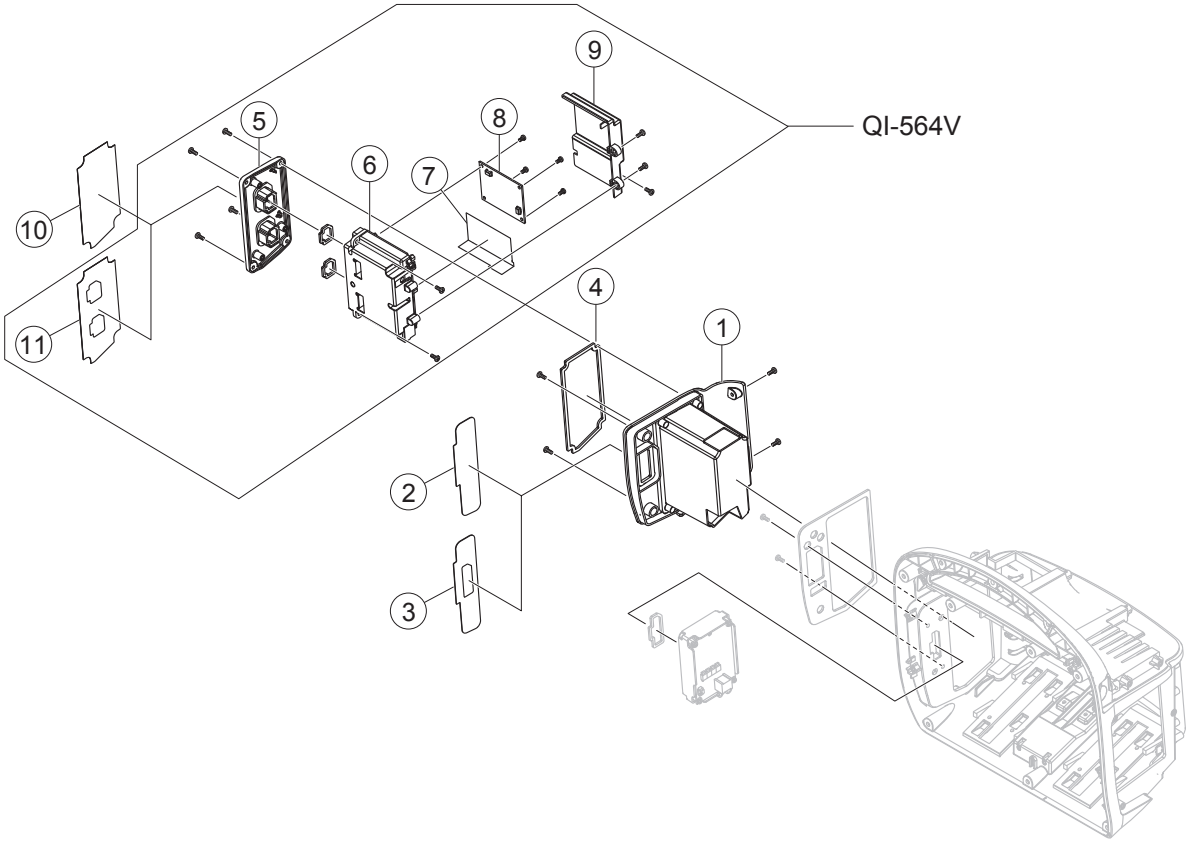
Rear Case Peripheral Parts



No.	Code No.	Qty	Description
1	6114-934587	3	SPONGE, 6×6
2	6112-911101	1	RELAY BOARD HOLDER
3	UR-0476	1	OP-CONN BOARD
4	6114-934694	2	TAPE, 60×4
5	UR-0489	1	PACER BOARD FOR TEC-5631
6	UR-0480	1	L-ECG UNIT FOR TEC-5602/5611/5621/5631
7	6114-137185	1	12P CONNECTOR PACKING FOR TEC-5602/5611/5621/5631
8	6113-923327	1	WATERPROOF SPONGE, INPUT FOR TEC-5621/5631
9	6114-923744	1	CASE PACKING, TEC-8321
10	6114-934521	2	RUBBER FEET
11	6124-912106	1	HV BLANK PANEL
12	6114-934541	1	AC INLET SPONGE
13	9000-050107	1	AC INLET, AP-300/2CON, W90/40
14	6113-923773	1	SD CARD COVER
15	6111-905396	1	REAR CASE
16	6113-923252	1	WATERPROOF SPONGE, REC
17	6113-923251	1	HOOK COVER
18	6114-919428A	1	HOOK HOLDER PLATE
19	6114-934584	1	WATERPROOF SPONGE, PADDLE
20	6123-906624	1	PL PANEL BRAZIL (5601), B VERSION FOR TEC-5601
	6123-906625	1	PL PANEL BRAZIL (5611), B VERSION FOR TEC-5611
	6123-906626	1	PL PANEL BRAZIL (5621), B VERSION FOR TEC-5621/5631
	6123-906455	1	PL PANEL CHINA (5611), C VERSION FOR TEC-5602
	6123-906457	1	PL PANEL CHINA (5621), C VERSION FOR TEC-5621
	6123-906495	1	PL PANEL FRANCE (5601), F VERSION FOR TEC-5601
	6123-906497	1	PL PANEL FRANCE (5611), F VERSION FOR TEC-5611
	6123-906499	1	PL PANEL FRANCE (5621), F VERSION FOR TEC-5621/5631
	6123-906486	1	PL PANEL GERMANY (5601), G VERSION FOR TEC-5601
	6123-906488	1	PL PANEL GERMANY (5611), G VERSION FOR TEC-5611
	6123-906490	1	PL PANEL GERMANY (5621), G VERSION FOR TEC-5621/5631
	6123-906418	1	PL PANEL (5601K), GB VERSION FOR TEC-5601
	6123-906420	1	PL PANEL (5621K), GB VERSION FOR TEC-5621/5631
	6123-906468	1	PL PANEL ITALY (5601), I VERSION FOR TEC-5601
	6123-906470	1	PL PANEL ITALY (5611), I VERSION FOR TEC-5611
	6123-906472	1	PL PANEL ITALY (5621), I VERSION FOR TEC-5621/5631
	6123-906418	1	PL PANEL (5601K), K VERSION FOR TEC-5601
	6123-906419	1	PL PANEL (5611K), K VERSION FOR TEC-5611
	6123-906420	1	PL PANEL (5621K), K VERSION FOR TEC-5621/5631
	6123-906594	1	PL PANEL KOREA (5601), L VERSION FOR TEC-5601
	6123-906593	1	PL PANEL KOREA (5611), L VERSION FOR TEC-5611
	6123-906592	1	PL PANEL KOREA (5621), L VERSION FOR TEC-5621/5631
	6123-906504	1	PL PANEL RUSSIA (5601), R VERSION FOR TEC-5601
	6123-906507	1	PL PANEL RUSSIA (5611), R VERSION FOR TEC-5611
	6123-906509	1	PL PANEL RUSSIA (5621), R VERSION FOR TEC-5621/5631
	6123-906477	1	PL PANEL SPAIN (5601), S VERSION FOR TEC-5601

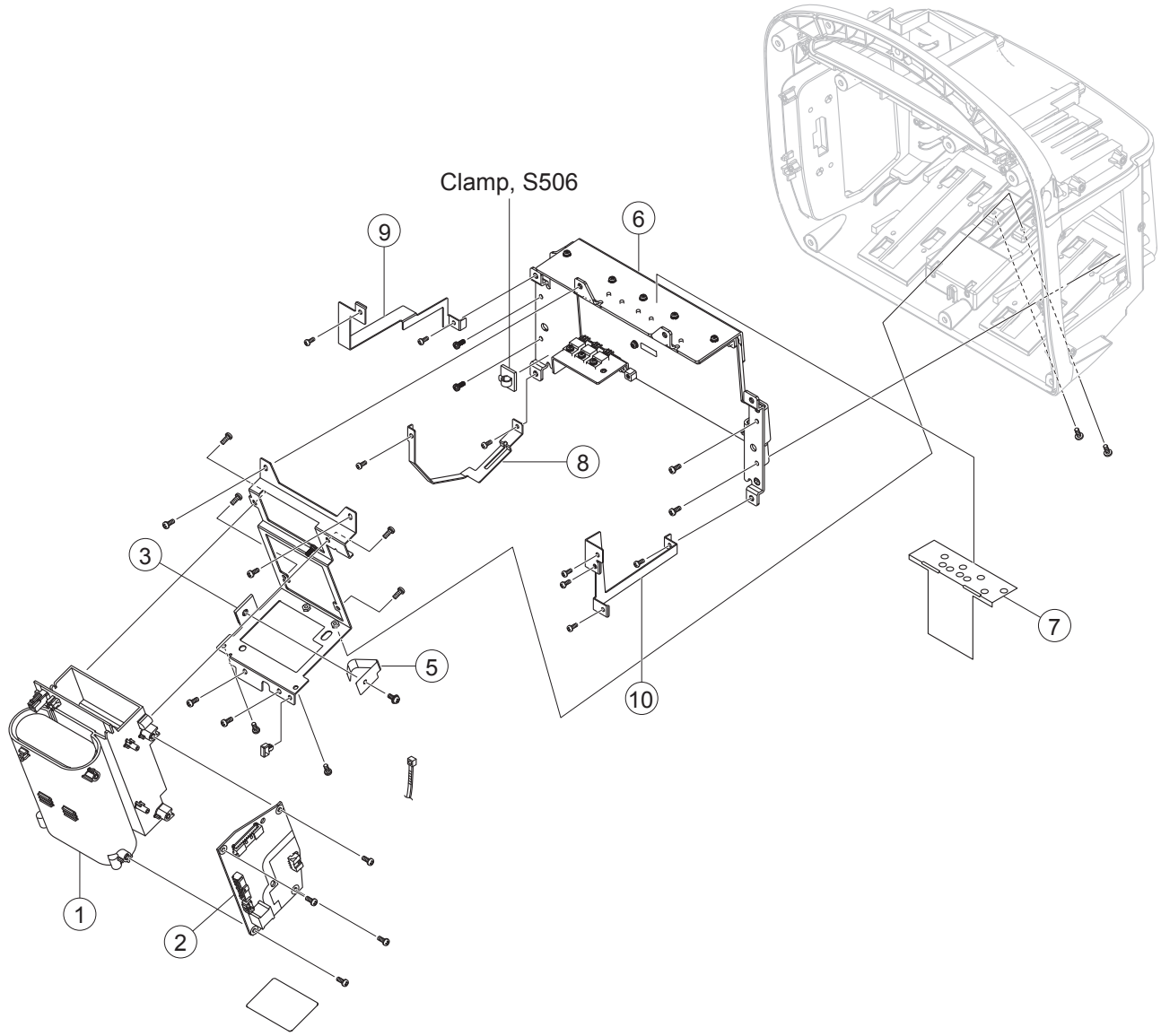
No.	Code No.	Qty	Description
20	6123-906479	1	PL PANEL SPAIN (5611), S VERSION FOR TEC-5611
	6123-906481	1	PL PANEL SPAIN (5621), S VERSION FOR TEC-5621/5631
	6123-906514	1	PL PANEL TURKISH (5601), TR VERSION FOR TEC-5601
	6123-906516	1	PL PANEL TURKISH (5611), TR VERSION FOR TEC-5611
	6123-906518	1	PL PANEL TURKISH (5621), TR VERSION FOR TEC-5621/5631
21	6123-906622	1	BATT INSTRUCTION PANEL BRAZIL, B VERSION
	6123-906454	1	BATT INSTRUCTION PANEL CHINA, C VERSION
	6123-906476	1	BATT INSTRUCTION PANEL SPAIN, E VERSION
	6123-906494	1	BATT INSTRUCTION PANEL FRANCE, F VERSION
	6123-906485	1	BATT INSTRUCTION PANEL GERMANY, G VERSION
	6123-906417	1	BATT INSTRUCTION PANEL (5601K), GB/K VERSION
	6123-906523	1	BATT INSTRUCTION PANEL ITALY, I VERSION
	6123-906591	1	BATT INSTRUCTION PANEL KOREA, L VERSION
	6123-906503	1	BATT INSTRUCTION PANEL RUSSIA, R VERSION
	6123-906476	1	BATT INSTRUCTION PANEL SPAIN, S VERSION
	6123-906513	1	BATT INSTRUCTION PANEL TURKISH, TR VERSION
22	6111-905393	1	REC ENCLOSURE BLANK PANEL FOR TEC-5601
23	6113-923280	2	BOTTOM HOLDER COVER
24	6113-923341	2	BOTTOM HOLDER SPONGE
25	6113-923282	2	BOTTOM HOLDER PLATE A
26	6113-923283	2	BOTTOM HOLDER PLATE B

Input Enclosure Peripheral Parts



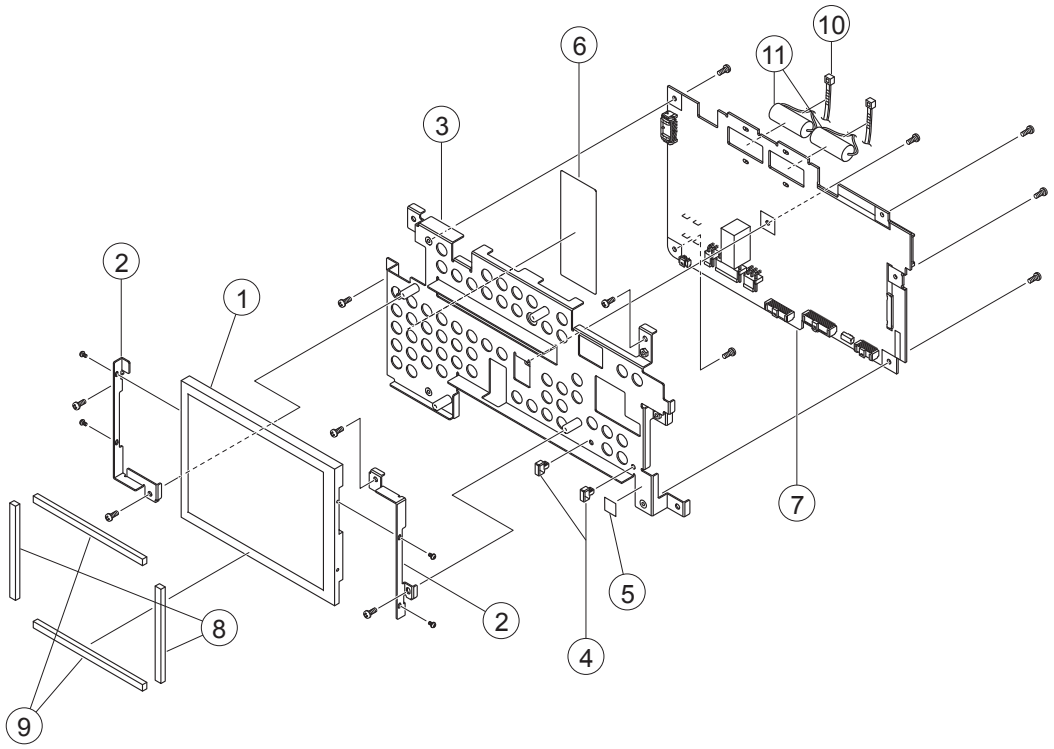
No.	Code No.	Qty	Description
1	6111-905395	1	INPUT ENCLOSURE
2	6123-906426	1	ECG BLANK PANEL FOR TEC-5601
3	6123-906425	1	ECG PANEL FOR MODELS EXCEPT GERMANY AND RUSSIA
	6123-906540	1	ECG PANEL GERMANY, G VERSION
	6123-906541	1	ECG PANEL RUSSIA, R VERSION
4	6113-923328	1	OPTION ENCLOSURE SPONGE
5	6112-911106	1	OPTION ENCLOSURE FOR QI-564V
6	UR-0490	1	MP/SpO_2 BOARD FOR QI-564V
7	6114-934599	1	MP2 INSULATION SHEET FOR QI-564V
8	UR-3908	1	QI-X SpO_2 BOARD FOR QI-564V
9	6112-911108	1	OPTION BOARD CASE 2 FOR QI-564V
10	6123-906428	1	MP BLANK PANEL
11	6123-906427	1	MP PANEL FOR QI-564V

HV Unit Peripheral Parts



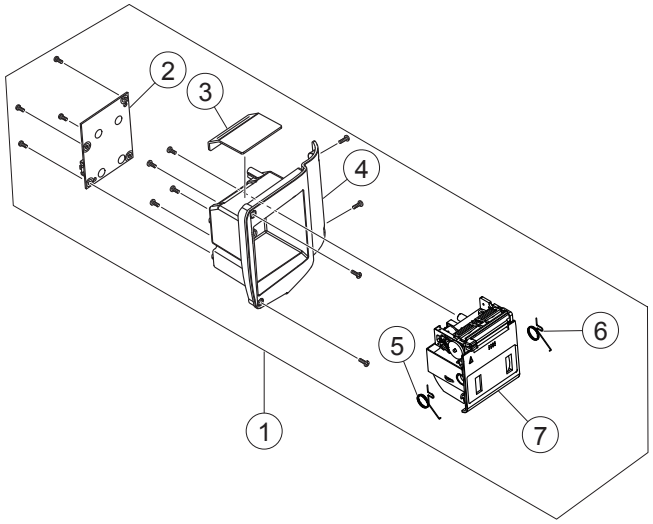
No.	Code No.	Qty	Description
1	9000-058009	1	HVSW-562 HV UNIT FOR TEC-5601/5602/5611/5621
	9000-058011	1	HVSW-563 HV UNIT FOR TEC-5631
2	UR-0483	1	HV DRIVE BOARD
3	6111-905408	1	HV CHASSIS
5	6114-934580	1	HV SPRING
6	9000-052266	1	POWER UNIT, NJD-9657
7	6113-923407	1	INSULATION SHEET, POWER
8	6113-923262	1	GROUND CHASSIS 2
9	6113-923263	1	GROUND CHASSIS 3
10	6113-923261	1	GROUND CHASSIS 1

LCD and MOTHER Board



No.	Code No.	Qty	Description
1	9000-049555	1	LCD, NL644BC20-30A, 6.5 inch
2	6113-923316	2	LCD CHASSIS
3	6111-905420	1	MOTHER CHASSIS
4	902989	2	TUBE TIE, RMS-1V0
5	6124-009937A	1	EARTH LABEL 2
6	6114-934598	1	INSULATION SHEET, ECG
7	UR-0481	1	MOTHER BOARD
8	6114-934692	2	SPONGE, 150×5
9	6114-934693	2	SPONGE, 102×5
10	132019	2	INSULATION LOCK (CABLE TIE)
11	9000-058011	2	BATTERY, CR 2/3AZC36K

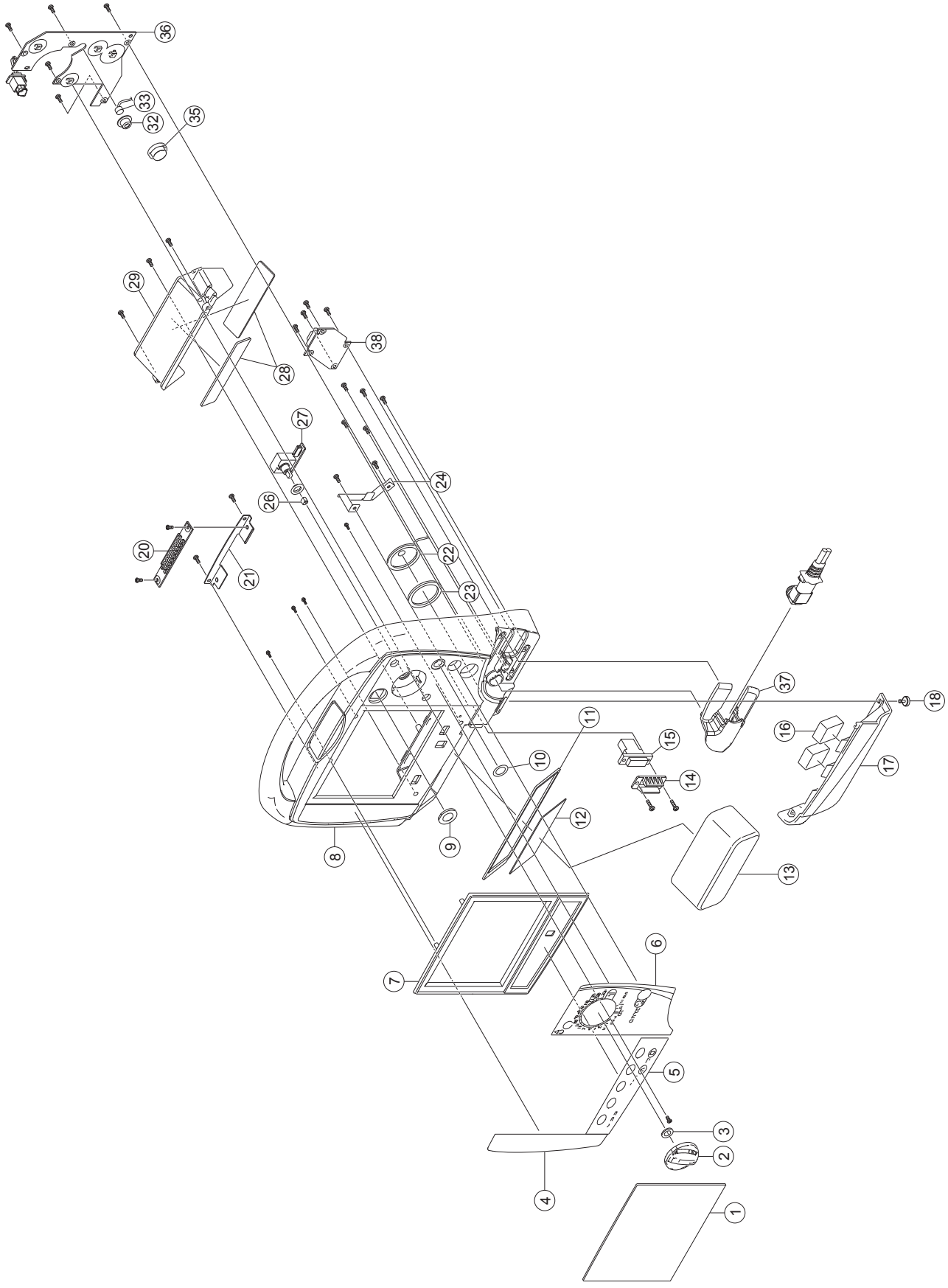
WS-561V Recorder Unit



No.	Code No.	Qty	Description
1	WS-561V	1	RECORDER UNIT
2	UR-0486	1	REC BOARD
3	6114-934540	1	RECORDER SPONGE
4	6111-905392	1	RECORDER ENCLOSURE
5	6114-914344	1	MAGAZINE SPRING, L
6	6114-914326	1	MAGAZINE SPRING, R
7	RG-561X	1	PAPER DRIVE UNIT

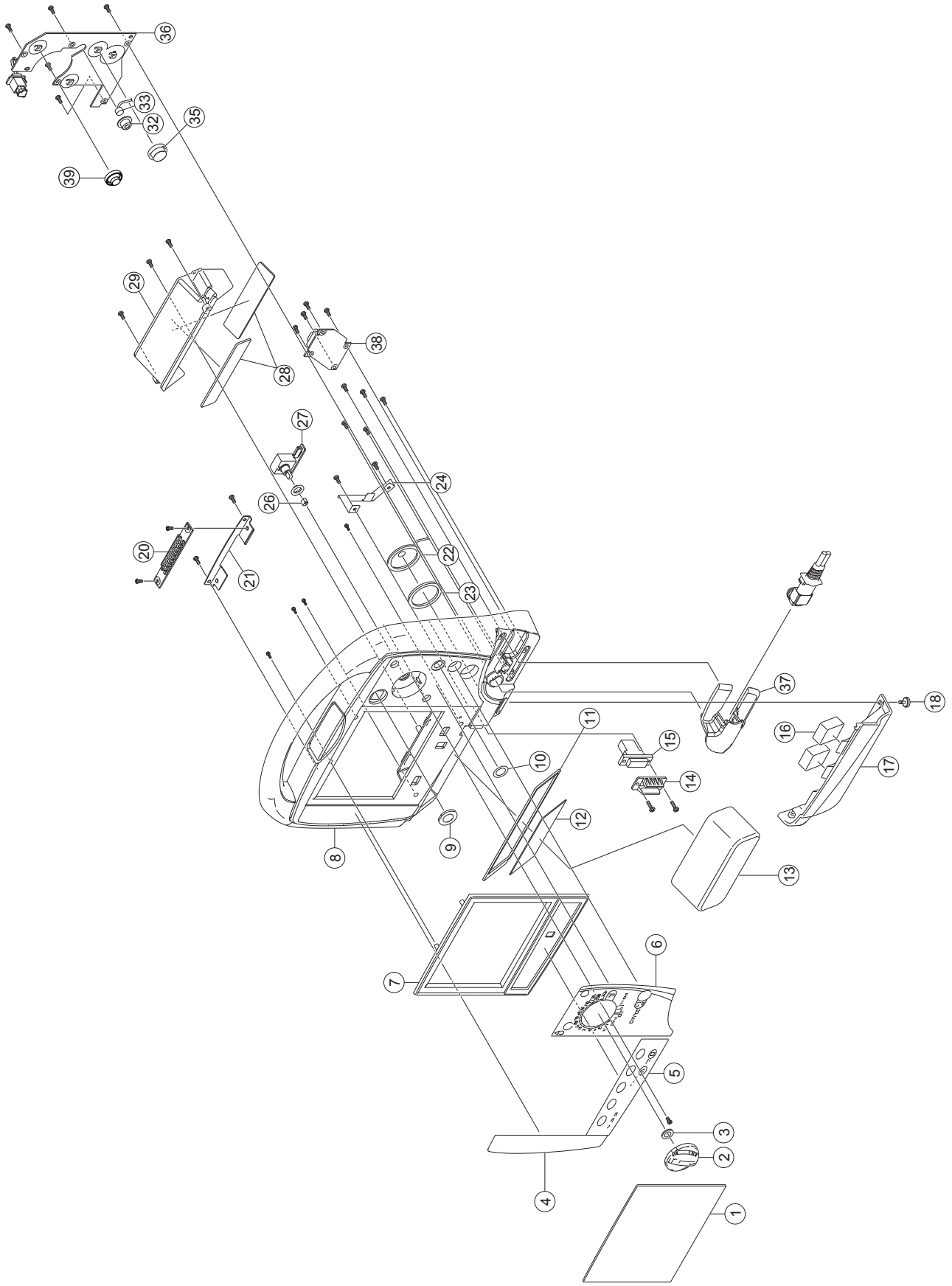
Defibrillator Front Parts

TEC-5601 Defibrillator



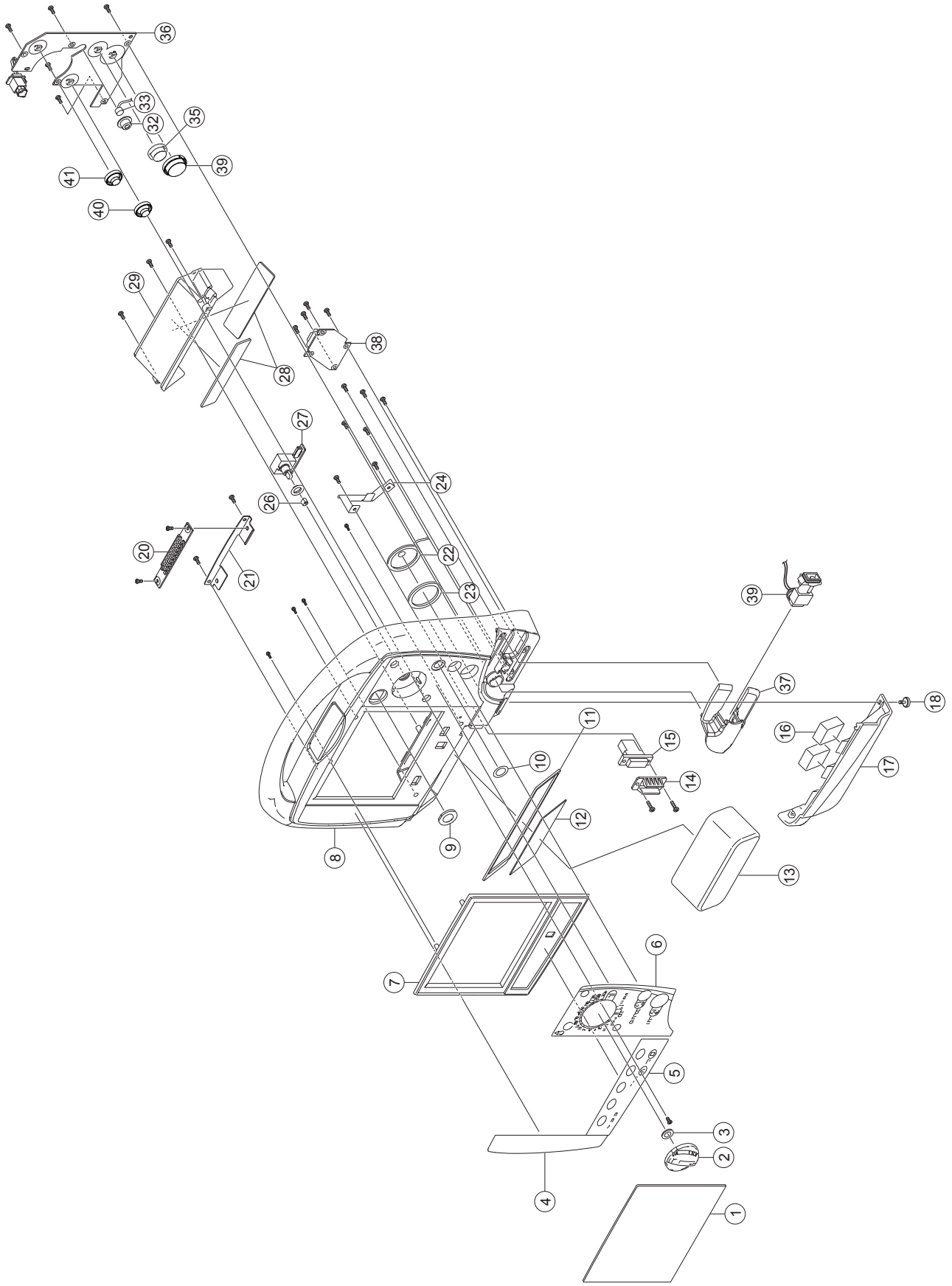
No.	Code No.	Qty	Description
1	6122-901600	1	LCD FILTER
2	6113-923241	1	ENERGY SELECTOR, 5600
3	674949	1	O-RING, P-9, RED
4	6123-906433	1	PACE OP BLANK PANEL
5	9000-058015	1	MEMBRANE, ME-1295S1F4, 6 KEYS
6	6123-906618	1	DEF OP PANEL BRAZIL (5601), B VERSION
	6123-906475	1	DEF OP PANEL SPAIN (5601), E VERSION
	6123-906493	1	DEF OP PANEL FRANCE (5601), F VERSION
	6123-906484	1	DEF OP PANEL GERMANY (5601), G VERSION
	6123-906432	1	DEF OP PANEL (5601K), GB VERSION
	6123-906467	1	DEF OP PANEL ITALY (5601), I VERSION
	6123-906432	1	DEF OP PANEL (5601K), K VERSION
	6123-906589	1	DEF OP PANEL KOREA (5601), L VERSION
	6123-906502	1	DEF OP PANEL RUSSIA (5601), R VERSION
	6123-906475	1	DEF OP PANEL SPAIN (5601), S VERSION
	6123-906512	1	DEF OP PANEL TURKISH (5601), TR VERSION
7	6143-902981	1	FRONT BEZEL ASSY
8	6111-905400	1	FRONT CASE, 5601
9	6114-918251B	1	NVI FILTER, 8300
10	6114-934561	1	O-RING, S-NTF-1026-J FAI16
11	6113-923342	1	WATERPROOF SPONGE, BATTERY
12	6123-906522	1	BATTERY PANEL
13	YZ-024H9	2	BATTERY PACK, NKB-301V
14	6114-901108	1	CONNECTOR COVER, 5500
15	9000-050116	1	SOCKET HOUSING, VHR-3N/1-179553-3, W100
16	6114-934590	2	SPONGE, 30×24
17	6112-911105	1	BATTERY COVER
18	6114-934685	1	BATTERY COVER SET SCREW 2
20	UR-0493	1	ALARM IND BOARD
21	6114-934537	1	ALARM INDICATOR CHASSIS
22	932929B	1	SPEAKER, TL-C40U0837/DF13-2S-1.25C, W80
23	6114-934560	1	WATERPROOF SOUND FILTER
24	6114-934556	1	SPEAKER HOLDER PLATE
26	551805	1	D-SPRING
27	UR-0505	1	ROTARY-SW BOARD
28	6114-934591	2	SPONGE, 117×25
29	6112-911104	1	BATTERY CASE
32	6114-907593A	1	MIC HOLDER, 2500
33	9000-050268	1	MICROPHONE, PROB KUC3533-010130
35	6113-923288	1	CHARGE SWITCH
36	UR-0488	1	KEY/LED BOARD
37	6113-923291	1	CONNECTOR COVER
38	UR-0492	1	PADDLE-CONN EXT-PADDLE BOARD

TEC-5602 Defibrillator



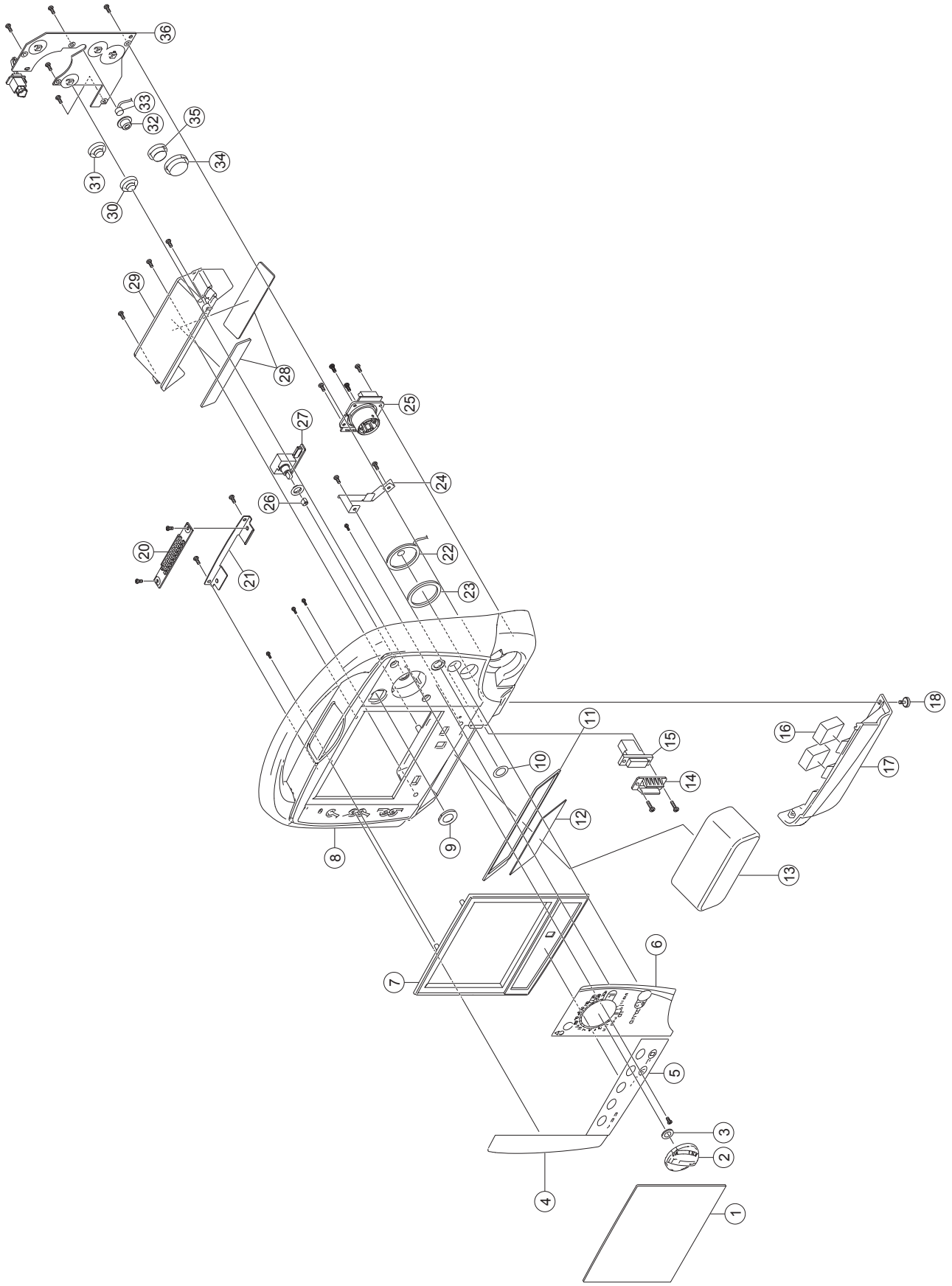
No.	Code No.	Qty	Description
1	6122-901600	1	LCD FILTER
2	6113-923241	1	ENERGY SELECTOR, 5600
3	674949	1	O-RING, P-9, RED
4	6123-906433	1	PACE OP BLANK PANEL
5	9000-058012	1	MEMBRANE, 7 KEYS
6	6123-906453	1	DEF OP PANEL CHINA (5602)
7	6143-902981	1	FRONT BEZEL ASSY
8	6111-905400	1	FRONT CASE, 5601
9	6114-918251B	1	NVI FILTER, 8300
10	6114-934561	1	O-RING, S-NTF-1026-J FAI16
11	6113-923342	1	WATERPROOF SPONGE, BATTERY
12	6123-906522	1	BATTERY PANEL
13	YZ-024H9	2	BATTERY PACK, NKB-301V
14	6114-901108	1	CONNECTOR COVER, 5500
15	9000-050116	1	SOCKET HOUSING, VHR-3N/1-179553-3, W100
16	6114-934590	2	SPONGE, 30×24
17	6112-911105	1	BATTERY COVER
18	6114-934685	1	BATTERY COVER SET SCREW 2
20	UR-0493	1	ALARM IND BOARD
21	6114-934537	1	ALARM INDICATOR CHASSIS
22	932929B	1	SPEAKER, TL-C40U0837/DF13-2S-1.25C, W80
23	6114-934560	1	WATERPROOF SOUND FILTER
24	6114-934556	1	SPEAKER HOLDER PLATE
26	551805	1	D-SPRING
27	UR-0505	1	ROTARY-SW BOARD
28	6114-934591	2	SPONGE, 117×25
29	6112-911104	1	BATTERY CASE
31	6113-923285	1	OPERATION SWITCH, K-761
32	6114-907593A	1	MIC HOLDER, 2500
33	9000-050268	1	MICROPHONE, PROB KUC3533-010130
35	6113-923288	1	CHARGE SWITCH
36	UR-0488	1	KEY/LED BOARD
37	6113-923291	1	CONNECTOR COVER
38	UR-0492	1	PADDLE-CONN EXT-PADDLE BOARD

TEC-5611 Defibrillator



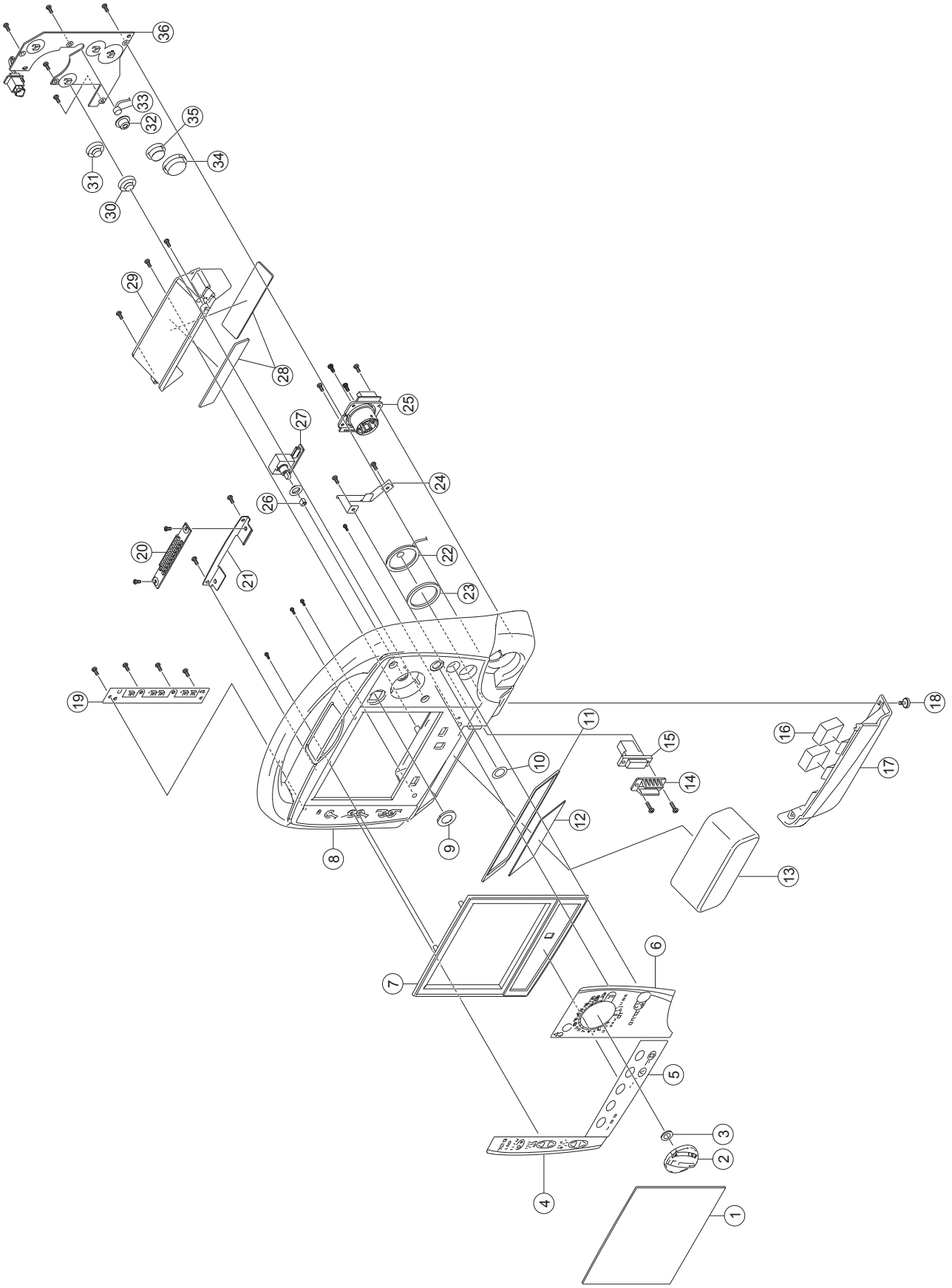
No.	Code No.	Qty	Description
1	6122-901600	1	LCD FILTER
2	6113-923241	1	ENERGY SELECTOR, 5600
3	674949	1	O-RING, P-9, RED
4	6123-906433	1	PACE OP BLANK PANEL
5	9000-058012	1	MEMBRANE, 7 KEYS
6	6123-906619	1	DEF OP PANEL BRAZIL (5611), B VERSION
	6123-906478	1	DEF OP PANEL SPAIN (5611), E VERSION
	6123-906496	1	DEF OP PANEL FRANCE (5611), F VERSION
	6123-906487	1	DEF OP PANEL GERMANY (5611), G VERSION
	6123-906430	1	DEF OP PANEL (5611K), GB/K VERSION
	6123-906469	1	DEF OP PANEL ITALY (5611), I VERSION
	6123-906588	1	DEF OP PANEL KOREA (5611), L VERSION
	6123-906505	1	DEF OP PANEL RUSSIA (5611), R VERSION
	6123-906478	1	DEF OP PANEL SPAIN (5611), S VERSION
	6123-906515	1	DEF OP PANEL TURKISH (5611), TR VERSION
7	6143-902981	1	FRONT BEZEL ASSY
8	6111-905400	1	FRONT CASE, 5601
9	6114-918251B	1	NVI FILTER, 8300
10	6114-934561	1	O-RING, S-NTF-1026-J FAI16
11	6113-923342	1	WATERPROOF SPONGE, BATTERY
12	6123-906522	1	BATTERY PANEL
13	YZ-024H9	2	BATTERY PACK, NKB-301V
14	6114-901108	1	CONNECTOR COVER, 5500
15	9000-050116	1	SOCKET HOUSING, VHR-3N/1-179553-3, W100
16	6114-934590	2	SPONGE, 30×24
17	6112-911105	1	BATTERY COVER
18	6114-934685	1	BATTERY COVER SET SCREW 2
20	UR-0493	1	ALARM IND BOARD
21	6114-934537	1	ALARM INDICATOR CHASSIS
22	932929B	1	SPEAKER, TL-C40U0837/DF13-2S-1.25C, W80
23	6114-934560	1	WATERPROOF SOUND FILTER
24	6114-934556	1	SPEAKER HOLDER PLATE
25	9000-009732A	1	PADDLE CONNECTOR RECEPTACLE, HCV14A-R-NKD
26	551805	1	D-SPRING
27	UR-0505	1	ROTARY-SW BOARD
28	6114-934591	2	SPONGE, 117×25
29	6112-911104	1	BATTERY CASE
30	6113-923286	1	OPERATION SWITCH, K-760
31	6113-923285	1	OPERATION SWITCH, K-761
32	6114-907593A	1	MIC HOLDER, 2500
33	9000-050268	1	MICROPHONE, PROB KUC3533-010130
34	6123-906396	1	SHOCK SWITCH
35	6113-923288	1	CHARGE SWITCH
36	UR-0488	1	KEY/LED BOARD
37	6113-923291	1	CONNECTOR COVER
38	UR-04921	1	PADDLE-CONN EXT-PADDLE BOARD
39	9000-059590	1	DEF CONNECTOR ASSY, TEC-5611

TEC-5621 Defibrillator



No.	Code No.	Qty	Description
1	6122-901600	1	LCD FILTER
2	6113-923241	1	ENERGY SELECTOR, 5600
3	674949	1	O-RING, P-9, RED
4	6123-906433	1	PACE OP BLANK PANEL
5	9000-058013	1	MEMBRANE, ME-1295S1F2, 7 KEYS
6	6123-906620	1	DEF OP PANEL BRAZIL (5621), B VERSION
	6123-906456	1	DEF OP PANEL CHINA (5621), C VERSION
	6123-906480	1	DEF OP PANEL SPAIN (5621), E VERSION
	6123-906498	1	DEF OP PANEL FRANCE (5621), F VERSION
	6123-906489	1	DEF OP PANEL GERMANY (5621), G VERSION
	6123-906431	1	DEF OP PANEL (5621K), GB/K VERSION
	6123-906471	1	DEF OP PANEL ITALY (5621), I VERSION
	6123-906587	1	DEF OP PANEL KOREA (5621), L VERSION
	6123-906508	1	DEF OP PANEL RUSSIA (5621), R VERSION
	6123-906480	1	DEF OP PANEL SPAIN (5621), S VERSION
	6123-906517	1	DEF OP PANEL TURKISH (5621), TR VERSION
7	6143-902981	1	FRONT BEZEL ASSY
8	6111-905397	1	FRONT CASE, 5621
9	6114-918251B	1	NVI FILTER, 8300
10	6114-934561	1	O-RING, S-NTF-1026-J FAI16
11	6113-923342	1	WATERPROOF SPONGE, BATTERY
12	6123-906522	1	BATTERY PANEL
13	YZ-024H9	2	BATTERY PACK, NKB-301V
14	6114-901108	1	CONNECTOR COVER, 5500
15	9000-050116	1	SOCKET HOUSING, VHR-3N/1-179553-3, W100
16	6114-934590	2	SPONGE, 30×24
17	6112-911105	1	BATTERY COVER
18	6114-934685	1	BATTERY COVER SET SCREW 2
20	UR-0493	1	ALARM IND BOARD
21	6114-934537	1	ALARM INDICATOR CHASSIS
22	932929B	1	SPEAKER, TL-C40U0837/DF13-2S-1.25C, W80
23	6114-934560	1	WATERPROOF SOUND FILTER
24	6114-934556	1	SPEAKER HOLDER PLATE
25	9000-009732A	1	PADDLE CONNECTOR RECEPTACLE, HCV14A-R-NKD
26	551805	1	D-SPRING
27	UR-0505	1	ROTARY-SW BOARD
28	6114-934591	2	SPONGE, 117×25
29	6112-911104	1	BATTERY CASE
30	6113-923286	1	OPERATION SWITCH, K-760
31	6113-923285	1	OPERATION SWITCH, K-761
32	6114-907593A	1	MIC HOLDER, 2500
33	9000-050268	1	MICROPHONE, PROB KUC3533-010130
34	6123-906396	1	SHOCK SWITCH
35	6113-923288	1	CHARGE SWITCH
36	UR-0488	1	KEY/LED BOARD

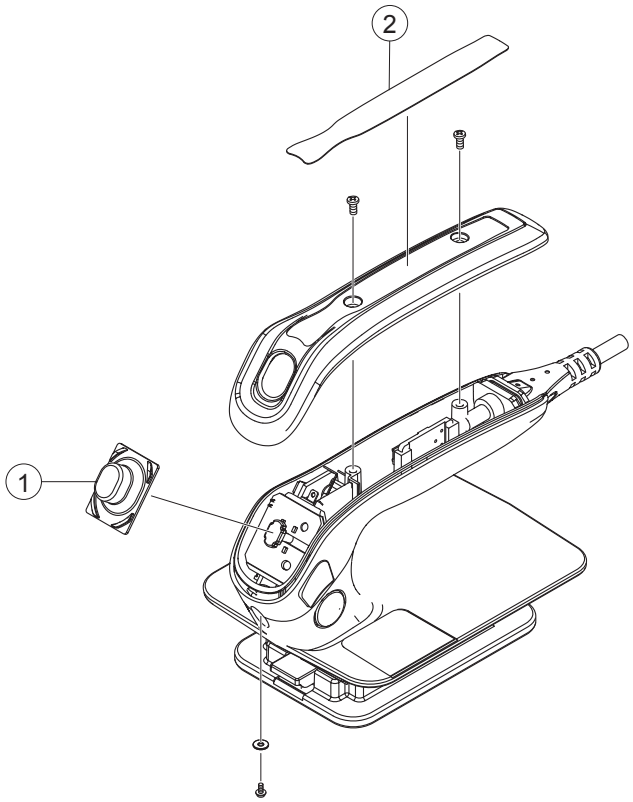
TEC-5631 Defibrillator



No.	Code No.	Qty	Description
1	6122-901600	1	LCD FILTER
2	6113-923241	1	ENERGY SELECTOR, 5600
3	674949	1	O-RING, P-9, RED
4	6123-906623	1	PACE OP PANEL BRAZIL (5631), B VERSION
	6123-906459	1	PACE OP PANEL CHINA (5631), C VERSION
	6123-906501	1	PACE OP PANEL FRANCE (5631), F VERSION
	6123-906492	1	PACE OP PANEL GERMANY (5631), G VERSION
	6123-906423	1	PACE OP PANEL (5631K), GB/K VERSION
	6123-906474	1	PACE OP PANEL ITALY (5631), I VERSION
	6123-906590	1	PACE OP PANEL KOREA (5631), K VERSION
	6123-906511	1	PACE OP PANEL RUSSIA (5631), R VERSION
	6123-906483	1	PACE OP PANEL SPAIN (5631), S VERSION
	6123-906520	1	PACE OP PANEL TURKISH (5631), TR VERSION
5	9000-058013	1	MEMBRANE, ME-1295S1F2, 7 KEYS
6	6123-906621	1	DEF OP PANEL BRAZIL (5631), B VERSION
	6123-906458	1	DEF OP PANEL CHINA (5631), C VERSION
	6123-906482	1	DEF OP PANEL SPAIN (5631), E VERSION
	6123-906500	1	DEF OP PANEL FRANCE (5631), F VERSION
	6123-906491	1	DEF OP PANEL GERMANY (5631), G VERSION
	6123-906422	1	DEF OP PANEL (5631K), GB/K VERSION
	6123-906473	1	DEF OP PANEL ITALY (5631), I VERSION
	6123-906586	1	DEF OP PANEL KOREA (5631), L VERSION
	6123-906510	1	DEF OP PANEL RUSSIA (5631), R VERSION
	6123-906482	1	DEF OP PANEL SPAIN (5631), S VERSION
	6123-906519	1	DEF OP PANEL TURKISH (5631), TR VERSION
7	6143-902981	1	FRONT BEZEL ASSY
8	6111-905397	1	FRONT CASE, 5621
9	6114-918251B	1	NVI FILTER, 8300
10	6114-934561	1	O-RING, S-NTF-1026-J FAI16
11	6113-923342	1	WATERPROOF SPONGE, BATTERY
12	6123-906522	1	BATTERY PANEL
13	YZ-024H9	2	BATTERY PACK, NKB-301V
14	6114-901108	1	CONNECTOR COVER, 5500
15	9000-050116	1	SOCKET HOUSING, VHR-3N/1-179553-3, W100
16	6114-934590	2	SPONGE, 30×24
17	6112-911105	1	BATTERY COVER
18	6114-934685	1	BATTERY COVER SET SCREW 2
19	UR-0475	1	PACER KEY BOARD
20	UR-0493	1	ALARM IND BOARD
21	6114-934537	1	ALARM INDICATOR CHASSIS
22	932929B	1	SPEAKER, TL-C40U0837/DF13-2S-1.25C, W80
23	6114-934560	1	WATERPROOF SOUND FILTER
24	6114-934556	1	SPEAKER HOLDER PLATE
25	9000-009732A	1	PADDLE CONNECTOR RECEPTACLE, HCV14A-R-NKD
26	551805	1	D-SPRING
27	UR-0505	1	ROTARY-SW BOARD

No.	Code No.	Qty	Description
28	6114-934591	2	SPONGE, 117×25
29	6112-911104	1	BATTERY CASE
30	6113-923286	1	OPERATION SWITCH, K-760
31	6113-923285	1	OPERATION SWITCH, K-761
32	6114-907593A	1	MIC HOLDER, 2500
33	9000-050268	1	MICROPHONE, PROB KUC3533-010130
34	6123-906396	1	SHOCK SWITCH
35	6113-923288	1	CHARGE SWITCH
36	UR-0488	1	KEY/LED BOARD

ND-831VZ, ND-831V, ND-832V, ND-832VZ External Paddles



No.	Code No.	Qty	Description
1	6124-905362D	1	SHOCK SWITCH OUTER
2	6124-906102A	1	PADDLE LABEL, ND

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Contact information is accurate as of Jan 2015. Visit www.nihonkohden.com for the latest information.

The model and serial number of your instrument are identified on the rear or bottom of the unit.
Write the model and serial number in the spaces provided below. Whenever you call your representative concerning this instrument, mention these two pieces of information for quick and accurate service.

Model _____ Serial Number _____

Your Representative

TEC-5600_0634-901030B

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