

TEC-7621C  
TEC-7631C  
TEC-7621E  
TEC-7631E  
TEC-7621K  
TEC-7631K  
TEC-7721E  
TEC-7731E  
TEC-7721K  
TEC-7731K

# SERVICE MANUAL

## DEFIBRILLATOR

**TEC-7600/TEC-7700**

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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 in combination 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 6 months.
  - (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 distributor.

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.

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### **CAUTION**

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

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## EMC RELATED CAUTION

This equipment and/or system complies with the International Standard IEC60601-1-2 for electromagnetic compatibility for medical electrical equipment and/or system. However, an electromagnetic environment that exceeds the limits or levels stipulated in the IEC60601-1-2, 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 if it is interfered with by an emitter source such as an authorized radio station. Keep the emitter source such as cellular phone away from the equipment and/or system.
- 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.

If the above suggested remedial actions do not solve the problem, consult your Nihon Kohden Corporation subsidiary or distributor for additional suggestions.

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In IEC 60601-1-2 Medical Electronic Equipment, Part 1: General Requirements for Safety, 2. Collateral Standard: Electromagnetic compatibility-Requirements and test. Section 36. 202. 2 Radiated radio-frequency electromagnetic fields, PATIENT COUPLED EQUIPMENT and/or SYSTEMS applicable IMMUNITY test methods are under consideration at SC62A/WG13. The 3 V/m IMMUNITY level may be inappropriate especially when measuring SpO<sub>2</sub> because physiological signals can be much smaller than those induced by a 3 V/m electromagnetic field.

When measuring SpO<sub>2</sub>, various interference may produce false waveforms which look like pulse waveforms. SpO<sub>2</sub> value and pulse rate may be measured from these false waveforms, causing the alarm to function improperly.

When installing the monitor, avoid locations where the monitor may receive strong electromagnetic interference such as radio or TV stations, cellular phone or mobile two-way radios.

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



## Conventions Used in this Manual and Instrument

### Dangers, Warnings, Cautions and Notes

Dangers, Warnings, cautions and notes are used in this manual to alert or signal the reader to specific information.

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#### DANGER

A danger is used to alert the user to a hazardous situation which will cause death or serious injury.

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#### WARNING

A warning alerts the user to the possible injury or death associated with the use or misuse of the instrument.

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#### 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.

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














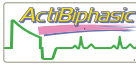

#### NOTE

A note provides specific information, in the form of recommendations, prerequisites, alternative methods or supplemental information.

## Explanations of the Symbols in this Manual and Instrument










The following symbols found in this manual/instrument bear the respective descriptions as given.

### On main unit

Symbol	Description	Symbol	Description
	Alternating current		Defibrillation-proof type BF applied part
	Charging		Equipotential
	Charged (Battery charging is finished)		Dangerous voltage
	ECG lead		Input
	ECG sensitivity		ECG
	Alarm off		Pacing start
	Check alarms		Pacing stop
	Real time/delayed recording		Pacing intensity
	Event recording		Attention, consult operator's manual
	Inserting or removing the memory card		Defibrillation-proof type CF applied part
	Output	<b>IPX1</b>	Complying with IEC60529 IPX1
<b>IPX4</b>	Complying with IEC60529 IPX4	<b>IPX7</b>	Complying with IEC60529 IPX7
	Biphasic defibrillation		The CE mark is a protected conformity mark of the European Community. The products herewith comply with the requirements of the Medical Device Directive 93/42/EEC.

Biphasic defibrillation: TEC-7700 series only

## On LCD

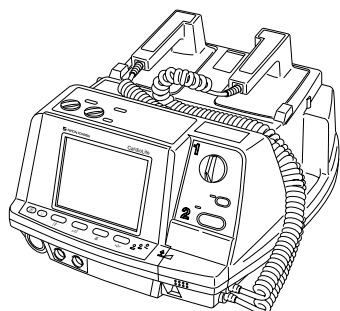
Symbol	Description	Symbol	Description
	Full battery charge remains		Add Z-fold recording paper
	More than 2/3 battery charge remains		QRS sync mark
	Battery discharged		The point of implanted pacemaker pulse output
	Battery power for one 360 J charging remains		Alternating current (AC power operation)
	Battery operation not available		

# *Section 1 General*

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## Introduction



This service manual provides useful information to qualified service personnel to understand, troubleshoot, service, maintain and repair this TEC-7600 and TEC-7700 series defibrillator (referred to as “instrument” in this service manual).

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 instrument.

This is because service personnel needs to understand the operation of the instrument in order to effectively use the information in the service manual.

## Models and Functions

Functions		TEC-7621	TEC-7631	TEC-7721	TEC-7731
Defibrillation and synchronized cardioversion	External paddles	Standard	Standard	Standard	Standard
	Internal paddles	Option	Option	Option	Option
	Disposable pads	Option	Standard	Option	Standard
	Pediatric electrode assy 44 mm dia.	Option	Option	Option	Option
3 lead ECG		Standard	Standard	Standard	Standard
AED function		Standard	Standard	Standard	Standard
Noninvasive pacing		Not available	Standard	Not available	Standard
SpO2 measurement		Option	Option	Option	Option
CO2 measurement		Option	Option	Option	Option
Voice prompt		Option	Option	Option	Option
5 lead ECG		Option	Option	Option	Option
External ECG input		Option	Option	Option	Option
External ECG output		Option	Option	Option	Option
Memory card slot		Standard	Standard	Standard	Standard
NIBP measurement		Option	Option	Option	Option
12 lead ECG measurement		Option	Option	Option	Option
Transmitter		Option	Option	Option	Option

## General Information on Servicing

Note the following information when servicing the instrument.

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### CAUTIONS

#### Safety

- There is the possibility that the outside surface of the instrument, such as the operation keys, could be contaminated by contagious germs, so disinfect and clean the instrument before servicing it. When servicing the instrument, 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 instrument is not waterproof, so do not install the instrument where water or liquid can get into or fall on the instrument. If liquid accidentally gets into the instrument or the instrument accidentally drops into liquid, disassemble the instrument, 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 instrument, contact your Nihon Kohden representative for 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 instrument, wipe it with a non-abrasive cloth moistened with any of the disinfectants listed below. Do not use any other disinfectants or ultraviolet rays to disinfect the instrument.

- |   |      |
|---|------|
| - Chlorohexidine gluconate solution:      | 0.5% |
| - Benzethonium chloride solution:         | 0.2% |
| - Glutaraldehyde solution:                | 2.0% |
| - Benzalkonium chloride:                  | 0.2% |
| - Hydrochloric alkyl diaminoethylglycine: | 0.5% |

**Caution - continued****Transport**

- Use the specified shipment container and packing material to transport the instrument. If necessary, double pack the instrument. Also, put the instrument into the shipment container after packing so that the buffer material does not get into the inside of the instrument.
- When transporting a board or unit of the instrument, be sure to use a conductive bag on. Never use an aluminum bag when transporting a board or unit on 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 instrument.

**Handling the instrument**

- Because the outside surface of the instrument is made of resin, the outside surface of the instrument is easily damaged. So when handling the instrument, remove clutter from around the instrument and be careful to not damage the instrument or get it dirty.
- Because most of the boards in the instrument 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.

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## Service Policy, Service Parts and Patient Safety Checks

### Service Policy

Our technical service policy for this instrument 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 instrument or replace a board or unit in an environment where the instrument is protected against static electricity.

As background knowledge for repair, pay special attention to 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 “Replaceable Parts List” of this manual for the service parts for technical service that we provide.

#### NOTE

**When ordering parts or accessories from your Nihon Kohden representative, please quote the NK 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 instrument.**

## Patient Safety Checks

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

For patient safety checks, perform the following checks as described in the IEC60601-1 “Medical electrical equipment - Part 1: General requirements for safety”:

- Protective earth resistance check
- Earth leakage current check
- Enclosure leakage current check
- Patient leakage current check
- Withstanding voltage check

## Maintenance Equipments and Tools

### Test equipment

When repairing or calibrating the instrument, the following test equipment is required.

- Oscilloscope: 2 channels or more for input signal, 50 mV to 5 V input range, 1/10 attenuating probe and 100 MHz or more frequency response characteristic must be provided.
- Power supply
- Oscillator: standard type
- Digital voltmeter: standard type (An oscilloscope can be used instead of the digital voltmeter.)

## Important Safety Information

### General

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#### DANGER

- Never use the defibrillator in a flammable atmosphere (i.e. areas with flammable anesthetics, concentrated oxygen, hyperbaric oxygen) or in an environment in which an electrical arc could ignite an explosion. Otherwise, the defibrillator will explode or fire.
  - Never use the defibrillator in a high-pressure oxygen medical care tank. Otherwise, the defibrillator will explode or fire.
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#### WARNING

- The defibrillator generates high voltage. The defibrillator must only be operated by trained and qualified medical personnel.
  - Radiofrequency or Electromagnetic Field  
Do not use any kind of non-essential non-patient care device within a radius of 1 meter around the defibrillator. The use of non-essential non-patient care devices that emit radiofrequency or electromagnetic fields may interfere with the operation of the defibrillator by causing noise on the ECG waveform or error messages. If a non-essential non-patient care device is accidentally placed near the defibrillator, quickly remove it.
  - MRI examination
    - Do not install this defibrillator in an MRI examination room. The defibrillator may not operate properly due to high-frequency magnetic noise from the MRI.
    - When performing MRI tests, remove all electrodes and transducers from the patient which are connected to this defibrillator. Failure to follow this warning may cause serious electrical burn on the patient due to local heating caused by dielectric electromotive force. For details, refer to the instruction manual for the MRI.
  - Using with ESU
    - When using this defibrillator with an ESU, the ESU return plate and the electrodes for monitoring must be firmly attached to the patient. If the return plate is not attached correctly, it may burn the patient's skin where the electrodes are attached. Refer to the instruction manual for the ESU.
    - When using an ESU, use this defibrillator only in the MONITOR mode and use the ECG electrodes for monitoring. Do not monitor ECG with disposable pads, external paddles or internal paddles. Otherwise, high frequency energy from the ESU causes abnormal current to flow in the patient and unexpected discharge. This causes serious electrical burn, shock, or other injury and damages the defibrillator.
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### WARNING continued

- **Surrounding Conditions**  
Fluids such as Ringer's saline solution and blood are excellent electrical conductors; to avoid creating potentially dangerous electrical paths, keep the defibrillator and the immediate area clean and dry at all times.
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### CAUTION


- Install the defibrillator and ESU appropriately and perform equipotential grounding. Otherwise, noise from the ESU may be falsely recognized as QRS and ECG monitoring may not be performed properly.
  - Use only Nihon Kohden products and specified parts and accessories. When other products, parts or accessories are used, the defibrillator heats up and breaks down, and monitoring stops.
  - Do not reuse disposable products.
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## Installation

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### WARNING

- Connect only the specified instrument to the defibrillator by following the specified procedure. Otherwise, electrical leakage current may harm the patient and operator.
  - Connect only the specified instruments to the connector or sockets marked with  by following the specified procedure. Otherwise, electrical leakage current may harm the patient and operator.
  - Only use the provided power cord. Using other power cords may result in electrical shock or other injury to the patient and operator. When the provided power cord cannot be used, operate the defibrillator on battery power.
  - For patient safety, equipotential grounding of all instruments must be performed. Consult with a qualified biomedical engineer.
  - Do not connect several grounding leads directly to the equipotential terminal because the grounding lead may be disconnected from the terminal.
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### CAUTION

- The defibrillator should only be connected to external equipment which complies with the CISPR 11 Second Edition 1990-09, Group 1 and Class B standard.
  - Use only the KD-022A cart for this defibrillator. If another cart is used, the cart may tip over or the defibrillator may fall off.
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## Battery

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### DANGER

- Keep the battery pack away from fire. Do not heat the battery pack. Otherwise, the electrolyte comes out and the battery pack explodes.
- Never short-circuit the + and – terminals on the battery pack with a wire. Never store or carry the battery pack with metal such as necklace or hair pins. The battery pack short-circuits and a large current flows, causing leakage of the substance inside the battery and battery explosion.
- Never disassemble or modify the battery pack. Never damage or directly solder the sheath tube. The battery pack short-circuits, the electrolyte comes out and the battery pack explodes.
- Do not subject the battery pack to a strong mechanical shock. The battery leaks and explodes.
- Do not use a battery which is damaged, such as from falling. There is a gas discharge valve inside the battery and if this valve is damaged, the gas cannot be discharged, causing the battery to explode.
- If the battery pack is damaged and the substance inside the battery (alkaline liquid) contacts the eyes or skin, wash immediately and thoroughly with water and see your physician. Never rub your eyes, otherwise you may lose your eyesight.
- The battery pack has + and – polarity. Make sure that the battery is installed with the correct polarity direction. Otherwise, the substance inside the battery leaks and the battery pack explodes.
- Do not charge the battery pack with an instrument other than this defibrillator. With another instrument, abnormal current flows and the substance inside the battery leaks and the battery explodes.
- Do not connect the battery pack to an AC outlet or lighter socket in a car. The substance inside the battery leaks and the battery pack explodes.

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### WARNING

- Check the battery performance once a month.
  - When you start using a new battery pack, write down the date of battery first use on the label on the battery pack.
  - Replace the battery pack every one year.
  - During the battery test, the defibrillator cannot perform defibrillation or cardioversion with battery power. Use the defibrillator on AC operation or use another defibrillator. If the battery is deteriorated or is not charged enough, defibrillation or cardioversion cannot be performed.
  - Do not immerse the battery pack in water or seawater. The battery heats up and rusts and the substance inside the battery leaks.
  - Never use a battery pack which is damaged, discolored or has leakage. A damaged battery explodes if used. WARNING continued
  - Do not leave the battery unused for more than one year. The battery may leak.
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### CAUTION

- When inserting or removing the battery, disconnect the power cord from the defibrillator. Otherwise, the operator may get electrical shock.
  - To keep the battery fully charged, always keep the power cord connected to the AC outlet even when the defibrillator is not used.
  - Do not expose the battery pack to direct sunlight or leave in a high temperature place. The lifetime of the battery pack may be shortened, the performance of the battery may be degraded and the substance inside the battery may leak.
  - The battery pack must be inserted by a qualified service personnel.
  - Keep the battery pack away from children.
  - Before disposing of the battery, check with your local solid waste officials for details in your area for recycling options or proper disposal. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream.
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## Disposable Pads

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### WARNING

- Failure to comply with the following warnings may cause serious skin burn or insufficient energy discharge and pacing current to the heart.
    - Do not reuse disposable pads. The pads are disposable.
    - If the pad package is broken, dispose of the pads and do not use them.
    - Do not use the pads if they are past the expiration date on the package.
    - Use the disposable pads as soon as possible after removing them from the package. Do not use a pad which is left for a long period of time after being removed from the package.
    - Do not use the disposable pads if the gel has become dry, or the gel breaks down and releases water.
    - Do not use the disposable pads if the color of the gel changes to dark brown and dark brown gel is on the protective liner.
  - If any pad or connector gets wet, replace it with a new one. If a wet pad or connector is used, it may cause electrical shock.
  - Replace the disposable pads after 1 hour pacing.
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### CAUTION



- When using the disposable pads for long term ECG monitoring, replace them every 24 hours. Failure to follow this caution may cause insufficient pacing current and insufficient energy discharge to the heart.
  - Do not attach a disposable pad over another pad. Failure to follow this caution may cause serious skin burn.
  - Do not put heavy objects on the disposable pads or bend the pads. Otherwise the pads get damaged and deteriorated, resulting in skin burn on the patient.
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## Defibrillation, Cardioversion and AED

### General

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#### WARNING

- Before defibrillation and cardioversion, make sure that no one is in contact with either the patient or any metal part of any equipment or cables which supports or is connected to the patient. Failure to follow this warning causes serious electrical shock or injury.
  - Before defibrillation and cardioversion, remove all electrodes, probes and transducers connected to a connector without a “” or “” mark from the patient. Otherwise the operator may get electrical shock and the connected instrument may be damaged.
  - Before defibrillation and cardioversion, move all electrodes and medicine on the patient’s chest to positions where the defibrillator paddle or disposable pad will not touch. If the defibrillator paddle or disposable pad directly touches electrodes or medicine, it causes skin burn on the electrode or medicine attachment site.
  - Do not carry or move the defibrillator when the charged energy remains in the defibrillator. If the defibrillator falls, it discharges energy and can cause electrical shock.
  - For this defibrillator, the CONTACT lamp on the STERNUM paddle indicates skin-paddle contact impedance. If the yellow or orange lamp lights, the defibrillator may cause serious electric burn on the patient’s skin and poor energy discharge to the patient. In case of an emergency, medical personnel should decide whether to execute discharge immediately, regardless of the CONTACT lamp display, or take action to make good contact before discharge.
  - Pay careful attention to the energy selection when using the pediatric electrode plates. Applying high energy with the pediatric electrode plates can cause serious electrical burn because the electrode plates are small.
  - Use the ECG monitoring electrodes (disposable electrodes) to monitor the ECG waveforms. Stable ECG cannot be acquired with the PADDLE lead because it is difficult to hold the paddles stable. ECG acquired from external paddles, internal paddles or disposable pads is unstable after discharge because of high polarization voltage.
  - Do not perform defibrillation or cardioversion in a wet place. Before defibrillation or cardioversion, move the patient and defibrillator to a dry place. Otherwise the operator may get electrical shock.
  - Do not discharge near a person or object other than the patient or test electrode plate or energy checker. It may cause electrical shock to the person or object.
  - Confirm that there is no artifact on the ECG. If there is artifact on the ECG, signals other than ECG are misrecognized to be QRS and accidental discharge may occur which is not synchronized with the patient’s QRS wave.
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### WARNING continued

- Do not perform synchronized cardioversion with the PADDLE lead unless it is absolutely necessary. In synchronized cardioversion with the PADDLE lead, artifact may be misrecognized as QRS and accidental discharge may occur which is not synchronized with the patient's QRS wave.
- Never select "TEST" for the ECG lead. "TEST" is for maintenance and the waveform displayed on the screen is not the patient's ECG. If synchronized cardioversion is performed with the TEST lead, accidental discharge occurs which is not synchronized with the patient's QRS wave and it may cause ventricular fibrillation.
- For safe synchronized cardioversion, a defibrillator discharge must occur within 60 ms of the peak of the ECG's R wave. The TEC-7600 detects the peak of the R wave and effects the discharge within 25 ms of the detected peak of R wave. When an external instrument is used to provide the ECG signal, it must amplify the ECG signal from the patient 500-1000 times and output the amplified ECG signal to the TEC-7600 within 35 ms of the peak of the R wave so that the overall delay from the peak of the R wave to discharge does not exceed 60 ms. If these conditions are not met, the cardioversion may be ineffective or may cause ventricular fibrillation.
- The apex-posterior placement is not suitable for ECG monitoring or AED analysis.
- The anterior-posterior placement is not suitable for defibrillation, cardioversion, ECG monitoring or AED analysis. Use this placement only for pacing.

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### CAUTION

When performing synchronized cardioversion, confirm that the SYNC lamp is lit before every discharge. If "Sync mode after CV" is set to Defib on the System Setup-Configuration screen, the defibrillator automatically turns to the asynchronous defibrillation mode.

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### With External Paddles

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### WARNING

- Apply contact gel only to the electrode plates of the external paddles. If contact gel gets on any other part of the defibrillator, it may cause electrical shock to the operator.
  - Do not apply contact gel by hand. Failure to follow this warning may cause serious electrical burn, shock, or other injury.
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**WARNING continued**

- Do not grasp the paddle handles with the wet hand or the hand with contact gel attached. Failure to follow this warning may cause electrical shock to the operator.
  - Apply contact gel to the electrode plates of the external paddles. Failure to apply contact gel causes serious skin burn.
  - Do not touch the electrode plate or edge of the paddle. Failure to follow this warning may cause serious electrical burn, shock, or other injury.
  - When charging or discharging, do not touch anything other than the handles. Failure to follow this warning causes electrical shock to the operator.
  - Before discharging, confirm that the paddles are firmly pressed against the chest wall. Failure to follow this warning causes serious skin burn or poor energy discharge to the heart.
  - Do not perform open discharge into the air. This may cause electrical shock to the operator or damage the defibrillator.
  - Do not discharge the energy if the paddles are shorted to each other by contact gel. Failure to follow this warning causes serious electrical burn and poor energy discharge to the heart.
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**CAUTION**

- If the patient's body is wet, thoroughly wipe the moisture off the skin so that the paddles do not short to each other.
  - Do not discharge when the paddles touch each other. This may damage the defibrillator.
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**With Disposable Pads**

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**WARNING**

- Do not attach pads on the papilla, electrodes or medicine on the patient's body. Failure to follow this warning causes serious skin burn.
  - Fit the pad closely to the body surface so that current flows uniformly through the pad. Failure to follow this warning causes serious skin burn or insufficient energy discharge to the heart.
  - During charging or discharging, do not touch the pads or connectors. Failure to follow this warning causes electrical shock to the operator.
  - Before discharging, confirm that the pads are firmly applied to the chest wall. Failure to follow this warning causes serious skin burn or poor energy discharge to the heart.
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### WARNING continued

- Do not discharge if the pads overlap each other or if the pads are shorted to each other by anything conductive such as contact gel. Failure to follow this warning causes serious electrical burn and poor energy discharge to the heart.
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### CAUTION

- When connecting the pad adaptor to the paddle connector, do not bend or damage the connector pin. Otherwise energy cannot be discharged to the pads.
  - If the patient's body is wet, thoroughly wipe the moisture off the skin so that the pads do not short to each other.
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### With Internal Paddles

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### WARNING

- Always sterilize the internal paddles before use. Failure to follow this warning may cause serious infection.
  - Pay careful attention to the energy selection when using internal paddles. Applying high energy to the heart may cause cardiac muscle necrosis. Low energy is recommended.
  - During charging and discharging, grip the internal paddles between the guard at the top of the handle and the cable. If you grip the handle between the electrode and the guard, you may get an electrical shock.
  - Before discharging, confirm that the paddles are firmly positioned against the heart. Failure to follow this warning causes serious skin burn or poor energy discharge to the heart.
  - Do not perform open discharge into the air. This may cause electrical shock to the operator or damage the defibrillator.
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### CAUTION

- Do not twist the internal paddle holding the electrode part or give strong impact to the paddle. It damages the electrode part.
  - When connecting the internal paddles to the paddle connector, do not bend or damage the connector pin. Otherwise energy cannot be discharged to the paddles.
  - Do not discharge when the paddles touch each other. This may damage the defibrillator.
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## AED

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### WARNING

- Do not attach pads on the papilla, electrodes or medicine on the patient's body. Failure to follow this warning causes serious skin burn.
  - Fit the pad closely to the body surface so that current flows uniformly through the pad. Failure to follow this warning causes serious skin burn or insufficient energy discharge to the heart.
  - When you perform defibrillation in an ambulance, stop the car.
  - During charging or discharging, do not touch the pads or connectors. Failure to follow this warning cause electrical shock to the operator.
  - Before discharging, confirm that the pads are firmly applied to the chest wall. Failure to follow this warning causes serious skin burn or poor energy discharge to the heart.
  - Do not discharge if the pads overlap each other or if the pads are shorted to each other by anything conductive such as contact gel. Failure to follow this warning causes serious electrical burn and poor energy discharge to the heart.
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### CAUTION

- Before AED analysis or defibrillation, confirm that the patient is unconscious and has no respiration and no pulse.
  - The ECG of a child or a patient with a implanted pacemaker cannot be analyzed correctly. For these patients, follow the physician's instruction.
  - During AED analysis, do not touch or move the patient, pad adaptor and disposable pad cable. Stop the life saving treatment such as CPR. Otherwise, correct analysis result cannot be obtained. If the ECG baseline is wandering because of surrounding conditions, measurement conditions or electrode conditions, remove the causes before performing AED analysis.
  - When connecting the pad adaptor to the paddle connector, do not bend or damage the connector pin. Otherwise energy cannot be discharged to the pads.
  - If the patient's body is wet, thoroughly wipe the moisture off the skin so that the pads do not short to each other.
  - Do not discharge when the paddles touch each other. This may damage the defibrillator.
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## Pacing

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### WARNING

- Do not perform pacing while using an ESU. Before using an ESU, turn the defibrillator power off and remove disposable pads from the patient. Otherwise, high frequency energy from the ESU causes abnormal current to flow in the patient and causes serious electrical burn, shock, or other injury. It also damages the defibrillator.
  - Always monitor the ECG waveform with the ECG connection cable and ECG electrodes.
  - Confirm that there is no artifact on the ECG. If there is artifact on the ECG, signals other than ECG are misrecognized to be QRS and correct pacing cannot be performed.
  - Do not touch the patient during pacing. Failure to follow this warning may cause electrical shock.
  - During pacing, do not touch the pads or connectors. Failure to follow this warning causes electrical shock to the operator.
  - The pacing rate must be determined by qualified medical personnel based on the heart rate of the patient in a normal state.
  - The pacing current must only be increased by qualified medical personnel decision.
  - Keep the current intensity as low as possible to minimize pain and discomfort to the patient.
  - Failure to follow the following warnings causes serious skin burn.
    - Do not attach the pads over ECG electrode.
    - Do not attach pads on the papilla or medicine on the patient's body.
    - Fit the pad closely to the body surface so that current flows uniformly through the pad. This reduces the required pacing current and pain and discomfort to the patient.
  - The apex-posterior placement is not suitable for ECG monitoring or AED analysis.
  - The anterior-posterior placement is not suitable for defibrillation, cardioversion, ECG monitoring or AED analysis. Use this placement only for pacing.
  - Never select "TEST". "TEST" is for maintenance and the waveform displayed on the screen is not the patient's ECG. Failure to follow this warning causes accidental pacing which is not synchronized with the patient's QRS wave.
  - Do not change the sensitivity or ECG lead setting after pacing is started. If one of these settings is changed, the pacing stops for 3 seconds. Failure to follow this warning may cause serious heart attack.
  - For 300 ms after the pacing pulse is output, no signal can be detected as a QRS wave.
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### CAUTION

- Check that the pacing pulse is effectively working by observing ECG on the screen.
  - When connecting the pad adaptor to the paddle connector, do not bend or damage the connector pin. Otherwise energy cannot be discharged to the pads.
  - If the patient's body is wet, thoroughly wipe the moisture off the skin so that the pads do not short to each other.
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## ECG Monitoring

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### WARNING

- When using a defibrillator together with the monitor, use Ag/AgCl electrodes. Other types of electrodes, stainless steel in particular, will adversely affect the ECG waveform by slowing the baseline recovery on the monitor and result in no monitoring immediately following defibrillation.
  - False low heart rate indicators may occur with certain pacemakers because of electrical overshoots.
  - Keep pacemaker patients under close observation. The pacemaker rate may be counted during cardiac arrest and certain arrhythmias. Do not rely only on heart rate alarms and the displayed heart rate.
  - The apex-posterior placement is not suitable for ECG monitoring or AED analysis.
  - The anterior-posterior placement is not suitable for defibrillation, cardioversion, ECG monitoring or AED analysis. Use this placement only for pacing.
  - With the pacing pulse rejection ON, narrow width QRS of a premature baby or infant cannot be detected correctly and the defibrillator may miscount QRS. In this case, set the pacing pulse rejection to OFF.
  - Turn the pacing pulse rejection to OFF when monitoring a child. Otherwise child's QRS may not be recognized.
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### CAUTION

- When the "Check ECG Electrodes" message is displayed, ECG cannot be monitored and the ECG alarm does not function. Check the electrode, ECG connection cable, electrode leads and connection cable and if necessary, replace it with a new one.
  - Turn the pacing pulse rejection to ON when monitoring a pacemaker patient. Otherwise QRS and pacemaker spike may not be distinguished and pacemaker failure may not be recognized.
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## SpO<sub>2</sub>

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### WARNING

- **Measurement may be incorrect in the following cases.**
  - When the patient's carboxyhemoglobin or methemoglobin increases abnormally
  - When dye is injected in the blood
  - When using an electrical surgery unit
  - During CPR
  - When there is body movement
  - When there is vibration
  - When measuring at a site with venous pulse
  - When the pulse wave is small (insufficient peripheral circulation)
  - When using an IABP (intra-aortic balloon pump)
- **When not monitoring SpO<sub>2</sub>, disconnect the SpO<sub>2</sub> adapter cable from the defibrillator. Otherwise, noise from the probe sensor may interfere and incorrect data is displayed on the screen.**
- **When using a disposable probe, change the measuring site every 8 hours. The skin temperature may increase at the attached site by 2 or 3°C and cause a burn or pressure necrosis. When using the probe on the following patients, take extreme care and change the measurement site more frequently according to symptoms and degree.**
  - A patient with a fever
  - A patient with a peripheral circulation insufficiency
  - Neonate or low birth weight infant with delicate skin
- **To avoid poor circulation, do not wrap the tape too tight when fixing the probe with surgical tape. Check the blood circulation condition by observing the skin color and congestion at the skin peripheral to the probe attachment site. Even for short-term monitoring, there may be burn or pressure necrosis from poor blood circulation, especially on neonates or low birth weight infants whose skin is delicate. Accurate measurement cannot be performed on a site with poor peripheral circulation.**
- **When measuring SpO<sub>2</sub> of a patient who is in a state of shock or in CPR (cardiopulmonary resuscitation), the acquired SpO<sub>2</sub> data may be incorrect due to the patient's body movement.**
- **Do not use the probe during MRI examination because it may cause skin burn on the probe attachment area. For details, follow the MRI operator's manual.**

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### CAUTION

- **For long term monitoring, check the circulation condition by observing the skin color of the measuring site. To avoid circulation insufficiency and skin burn, change the measurement site every specified hours. Refer to the operator's manual of the probe.**
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**CAUTION continued**

- Do not pull or bend the probe cable, and do not let caster feet run over the probe cable. Do not immerse the probe cable in chemical solutions or water. Failure to follow these cautions may cause cable discontinuity, short circuit, skin burn on the patient and incorrect measurement data. Replace any broken probe with a new one.
  - Under normal conditions, normal light has negligible effect on this probe. However, when measuring under strong light (surgical light, sunlight, etc.), cover the probe with a blanket or cloth. Otherwise, measurement accuracy is affected.
  - Turn off the power of cellular telephones, small wireless devices and other devices which produce strong electromagnetic interference. Otherwise, the waveforms and measurements are affected by interference and the displayed data may be incorrect.
  - Only use the specified probes. Otherwise SpO<sub>2</sub> cannot be monitored properly and instrument performance may be degraded.
  - Do not use a probe which is past the expiration date on the package.
  - Do not use a damaged or disassembled probe.
  - Disposable probes are not sterilized.
  - Use the disposable probe only once and for one patient only. Do not reuse the disposable probe for another patient. It will cause cross infection.
  - When the attachment site is wet with blood or when the patient has nail polish on, remove the dirt and nail polish before attaching the probe. The transmitted light may decrease due to the blood or nail polish and the measurement data may be incorrect.
  - If the skin gets irritated or redness appears on the skin by the probe, change the attachment site or stop using the probe.
  - If the probe is attached to the same limb that is used for NIBP measurement or an IBP catheter, the blood circulation at the attachment site is affected and the measurement may not be correct. Attach the probe to a limb where the blood circulation is not affected.
  - If patient's nail is long, cut it or attach the probe to another finger. The probe cannot be attached properly to a finger with a long nail.
  - Refer to the probe instruction manual for details.
  - Be careful when removing the tape from neonatal skin.
  - When removing a probe that is taped to the skin, do not pull the cable part of the probe because this can damage the probe's cable connection.
  - If the "Check SpO<sub>2</sub> unit", "Check SpO<sub>2</sub> probe site", "SpO<sub>2</sub> probe not working", "SpO<sub>2</sub> module not working" or "SpO<sub>2</sub> measurement unstable" message appears frequently even when the probe is attached on a site with appropriate thickness, the probe is deteriorated. Replace the probe with a new one.
  - When error messages which indicate faulty probe or SpO<sub>2</sub> adapter appear, stop monitoring and replace the probe or SpO<sub>2</sub> adapter with a new one.
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### CAUTION continued

- Do not use the probe over its stated lifetime. Otherwise the SpO<sub>2</sub> measurement accuracy cannot be guaranteed.
  - Do not use disposable probes for other patients. If the probe is dirty with blood or bodily fluids, replace it with a new one.
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CO<sub>2</sub>

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### WARNING

- When performing defibrillation or cardioversion during CO<sub>2</sub> monitoring with the CO<sub>2</sub> sensor kit, remove the sensor from the patient. When the sensor cannot be removed, do not touch the sensor cable because the discharged energy may cause serious electrical burn, shock or other injury.
  - With the TG-901T3 CO<sub>2</sub> sensor kit, measurements are based on the assumption of no CO<sub>2</sub> gas in the inspiration. The CO<sub>2</sub> concentration in the respiration is calculated by taking the CO<sub>2</sub> concentration in the inspiration as 0 mmHg. Therefore, measuring CO<sub>2</sub> by connecting the CO<sub>2</sub> sensor kit to a patient under mouth-to-mouth respiration or to a Jackson Rees circuit or Mapleson D circuit where CO<sub>2</sub> gas may be present during inspiration may result in the acquired data being lower than the actual value.
  - With the TG-901T3 CO<sub>2</sub> sensor kit, the defibrillator cannot monitor CO<sub>2</sub> of patients younger than 3 years old or weighing less than 10 kg (22 lbs).
  - Before MRI examination, remove the CO<sub>2</sub> sensor kit from the patient. Failure to follow this warning may cause serious electrical burn on the patient due to local heating caused by dielectric electromotive force. For details, refer to the MRI operator's manual.
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### CAUTION

- The measurement may be inaccurate when a patient with an extremely high respiration rate or patient with irregular respiration is monitored. Read the measured values carefully.
  - Measured value may be incorrect when the operating temperature changes greatly.
  - When the "CO<sub>2</sub> sensor not working" or "CO<sub>2</sub> adapter abnormality" message is displayed, check the CO<sub>2</sub> sensor kit and replace it if necessary. CO<sub>2</sub> cannot be monitored while the message is displayed.
  - Only use the specified parts.
  - Obey the CAUTION label on the CO<sub>2</sub> gas cylinder.
  - After the lifetime of the CO<sub>2</sub> gas cylinder expires, the measurement accuracy cannot be guaranteed.
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## CO<sub>2</sub> Sensor Kit and Airway Adapter

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### WARNING

- Do not use the airway adapter on neonates because the dead space volume of the airway adapter is about 5 cc.
  - When using the airway adapter on children or patients with low ventilatory amount, the CO<sub>2</sub> may mix in the inspiration due to the airway adapter's dead space volume (5 cc), resulting in inaccurate measured values or difficulty in detecting apnea.
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### CAUTION

- The airway adapter is not sterilized and is disposable. It can only be used once. Do not reuse it for another patient. Otherwise it causes cross infection.
  - Do not sterilize the airway adapter. Safety cannot be guaranteed if the airway adapter is sterilized.
  - Use the Nihon Kohden specified airway adapter.
  - Secure the CO<sub>2</sub> sensor cable to the respiration circuit so that it is parallel to the floor. If the cable is perpendicular to the floor, water droplets may get onto the transparent film of the airway adapter, and affect the measurement accuracy.
  - The transparent film of the airway adapter is coated with the anti-fogging material to prevent the moisture of the expiration and inspiration from making the inside of the airway adapter foggy. Under the operating environment specified in the TG-901T3 CO<sub>2</sub> sensor kit specifications, the anti-fogging material works for about 24 hours. When this transparent film becomes dirty or is damaged, CO<sub>2</sub> cannot be measured correctly. For the optimum performance of the anti-fogging material and correct measurement, follow the instructions below.
    - Do not use the airway adapter more than 24 hours.
    - Replace the airway adapter if blood, sputum or mucus adheres to the transparent film of the airway adapter.
    - Do not damage the transparent film, and do not let dust or chemical solutions contact the transparent film. Do not touch the transparent film with your fingers, do not wipe it, and do not wash it with alcohol or other detergents.
  - Replace the airway adapter with a new one every 24 hours. Using the airway adapter for longer than 24 hours affects measurement accuracy.
  - When the transparent film of the airway adapter becomes dirty, replace the airway adapter with a new one instead of cleaning it. Attempting to remove the stain, touching with fingers or washing with a cleaner damages the transparent film and makes correct measurement impossible.
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## Alarms

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### WARNING

All alarms except for instrument alarm group 1 are suspended during two minutes alarm suspension.

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### CAUTION

- When the alarm limit is set to OFF, there will be no alarm for that limit. Be careful when you set the alarm to OFF.
  - Alarms about a parameter do not occur until the measurement of the parameter starts.
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## Maintenance

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### WARNING

- When performing energy discharge test, discharge the energy with the paddles kept in the paddle holders. Do not discharge with the paddle released in the air or when the paddles are shorted. Failure to follow this warning may cause serious electrical shock and damage to the instrument.
  - If defibrillation or cardioversion is necessary during battery test, cancel the battery test and operate the defibrillator on AC power. Do not use battery power because the battery may have been discharged by the battery test.
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### CAUTION

- Before maintenance (cleaning, disinfection), turn the defibrillator power off, disconnect the power cord from the AC outlet and then remove the battery from the defibrillator. Failure to follow this caution may result in electrical shock and instrument malfunction.
  - Before battery replacement, turn off the defibrillator power and disconnect the AC power cord from the defibrillator. Otherwise, the operator may get an electrical shock.
  - Do not disassemble or repair the instrument. Disassembly and repair must be performed by qualified service personnel.
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## Storage

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### CAUTION

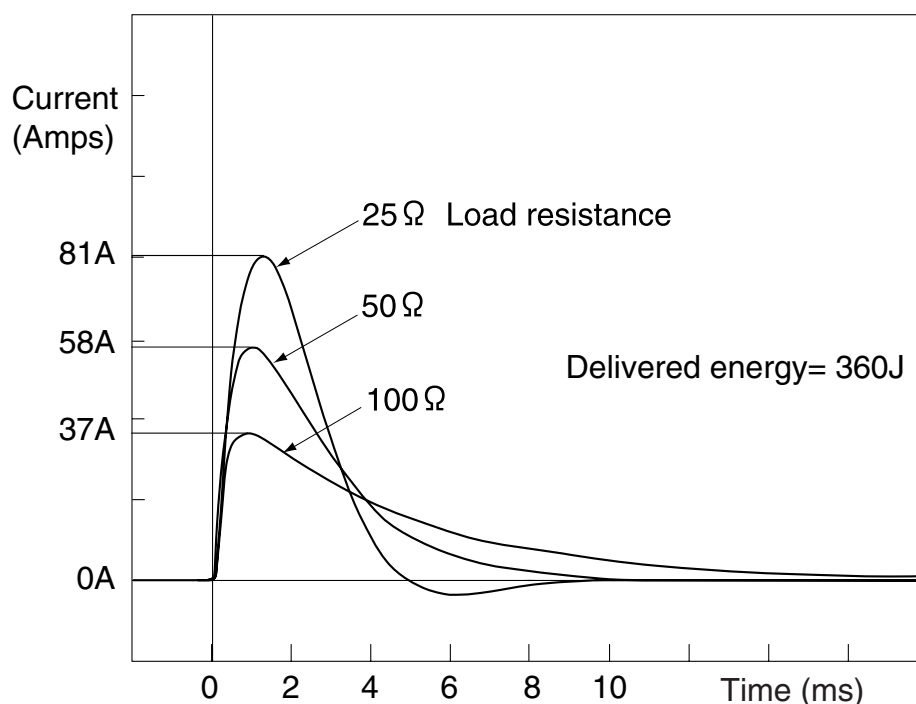
- To prevent overheating, leave the defibrillator lying flat and do not cover it.
  - Store the disposable pads in an environment described on the pads package. If stored in an environment other than specified, the pads become unusable.
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## Specifications

### Defibrillator

#### TEC-7600 Series

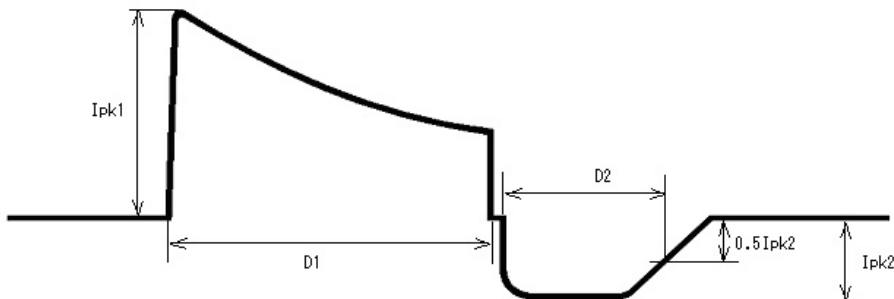
Output energy (across 50 $\Omega$ )	2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 150, 200, 300, and 360 J
Energy accuracy	2 J: $\pm 0.5$ J 3 J: $\pm 1$ J 5 to 10 J: $\pm 2$ J 20 to 360 J: $\pm 10\%$
Output waveform	Edmark, single phase pulse (across 50 $\Omega$ )
Charging time	When powered by AC 100V to 240V: to 360 J, maximum 5 s to 200 J, maximum 3 s When powered by 90% of the rated mains voltage: to 360 J, maximum 5 s When powered by a fully charged new battery at 20°C ambient temperature: to 360 J, maximum 10 s After 15 discharges at 360 J with a fully charged new battery at 20°C ambient temperature: to 360J, maximum 10 s
Charging display	Displays the charged energy value on the screen
Synchronized discharge	Available From the peak of R wave to the peak of discharge: within 60 ms
Maximum continuous charge/discharge cycles at 360 J	60 cycles: 3 cycles per minute with 1 minute cool down period after every 1 minute charge/discharge period 15 cycles: 3 cycles per minute with no cool down period



# 1. GENERAL

## TEC-7700 Series

Output energy (across 50 Ω)	2, 3, 5, 7, 10, 15, 20, 30, 50, 70, 100, 150, 200 and 270 J
Energy accuracy	2 J: ±0.5 J
	3 J: ±1 J
	5 to 15 J: ±2 J
	20 to 270 J: ±10%
Output waveform	Biphasic, truncated exponential constant power (across 50 Ω)
Charging time	When powered by AC 100V to 240V:
	to 270 J, maximum 5 s
	to 150 J, maximum 3 s
	When powered by 90% of the rated mains voltage:
	to 270 J, maximum 5 s
Charging display	When powered by a fully charged new battery at 20°C ambient temperature:
	to 270 J, maximum 10 s
Synchronized discharge	After 15 discharges at 270 J with a fully charged new battery at 20°C ambient temperature: to 270J, maximum 10 s
	Displays the charged energy value on the screen
Maximum continuous charge/discharge cycles at 270 J	Available
	From the peak of R wave to the peak of discharge: within 60 ms
	60 cycles: 3 cycles per minute with 1 minute cool down period after every 1 minute charge/discharge period
	15 cycles: 3 cycles per minute with no cool down period



Load resistance (Ω)	First phase		Second phase	
	Ipk1 (A)	D1 (ms)	Ipk2 (A)	D2[ms]
25	67.3	3.85	15.5	3.62
50	41.1	6.35	12.7	3.62
75	29.5	8.86	11.0	3.62
100	22.9	11.4	9.81	3.62
125	18.8	13.9	8.96	3.62
150	15.9	16.4	8.29	3.62
175	13.8	18.9	7.76	3.62

**Non Invasive Blood pressure, NIBP ((When optimal SG-761VC/VE/VK NIBP Unit is installed)**

Display parameters:	Systolic pressure, mean pressure, diastolic pressure, cuff pressure
Measuring range:	0 to 300 mmHg
Accuracy:	±3 mmHg (0 mmHg ≤ NIBP < 200 mmHg) ±4 mmHg (200 mmHg ≤ NIBP ≤ 300 mmHg)
Safety:	Cuff inflation maximum pressure: Adult 300 to 330 mmHg Neonate 150 to 165 mmHg Cuff inflation time limiter: Adult ≤ 180 s Neonates ≤ 90 s When sudden power loss occurs, automatic rapid deflation is performed.
Measurement mode:	Manual STAT (continuous) Automatic (periodic)
Alarm:	Adult Upper limit range: 15 to 260 mmHg in 5 mmHg steps, OFF Lower limit range: OFF, 10 to 255 mmHg in 5 mmHg steps Neonate Upper limit range: 10 to 125 mmHg in 5 mmHg steps, OFF Lower limit range: OFF, 5 to 120 mmHg in 5 mmHg steps

**Noninvasive Pacing (TEC-7631/7731 series only)**

Pacing rate	40 to 180 pulse/min in 10 pulse/min steps
Output current	8 to 200 mA in 1 mA steps
Pacing modes	Fixed and Demand
Maximum load resistance	Outputs 200 mA across 250 Ω, 120 mA across 500 Ω

**External Paddle (ND-782VC/VE/VK)**

Paddle electrode size	For adults: 70 ±3 × 106 ±3 (mm <sup>2</sup> ) For children: 45 ±3 × 53 ±3 (mm <sup>2</sup> )
Paddle cord length	2.0 m or more

**Battery**

Type	Ni-MH battery Nominal voltage: 12 V Rated capacity: 2800 mAh
Capacity	TEC-7621/7631 series: With fully charged new battery at 20°C ambient temperature - Minimum 70 discharges at 360 J - Minimum 150 minutes continuous monitoring - Minimum 90 minutes fixed mode pacing (180 pulse/min, 200 mA) With the fully charged new battery at 0°C, the defibrillator can perform: - Minimum 50 discharges at 360 J TEC-7721/7731 series: With fully charged new battery at 20°C ambient temperature - Minimum 100 discharges at 270 J - Minimum 150 minutes continuous monitoring - Minimum 90 minutes fixed mode pacing (180 pulse/min, 200 mA) With the fully charged new battery at 0°C, the defibrillator can perform: - Minimum 50 discharges at 270 J

**Clock Accuracy**

## 1. GENERAL

At surrounding temperature 25°C (77°F): ±3 min/month

At storage temperatures -20 to 70°C (-4 to 158°F): ±5 min/month

### Environment

Operating temperature: 0 to 45°C (32 to 113°F)  
Operating humidity: 0 to 40°C: 30 to 95% (relative humidity, non-condensing)  
40 to 45°C: 30 to 80% (relative humidity, non-condensing)  
Operating atmospheric pressure: 70 to 106 kPa  
  
Storage temperature: -20 to 70°C (-4 to 158°F)  
Storage humidity: 10 to 95% (relative humidity, non-condensing)  
Storage atmospheric pressure: 50 to 106 kPa

### Electromagnetic Compatibility

IEC60601-1-2 (1993)

IEC61000-3-2 (1995)

Emissions: CISPR11 Group1, Class B

### Safety

Safety standard IEC 60601-1 (1988)  
IEC 60601-1 Amendment 1 (1991)  
IEC 60601-1 Amendment 2 (1995)  
IEC 60601-2-4 (1983)  
IEC 60601-2-30 (1995)

According to the type of protection against electrical shock

Battery power: INTERNALLY POWERED EQUIPMENT  
AC power: CLASS I EQUIPMENT

According to the degree of protection against electrical shock

DEFIBRILLATION-PROOF TYPE BF APPLIED PART:

External paddles, disposable pads, SpO<sub>2</sub> adapter and CO<sub>2</sub> sensor kit, NIBP cuff

DEFIBRILLATION-PROOF TYPE CF APPLIED PART:

Internal paddles, ECG connection cable

According to the degree of protection against harmful ingress of water: IPX1

According to the degree of safety of application in the presence of a FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE:

EQUIPMENT not suitable for use in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE

Mode of operation

Continuous operation with intermittent load: Operation at defibrillation mode  
Continuous operation: All operation except above mentioned

### Monitor

Effective display area 115.2(W) × 86.4(H) mm (5.7 inch)  
Sweep length 97 mm  
Sweep speed 25 mm/s, 50 mm/s  
Sensitivity 10 mm/1mV ±5% (sensitivity × 1)  
Amplitude limit 40 mm

### ECG Amplifier

Input signal	PADDLE, I, II, III, aVR, aVL, aVF, V, AUX
Frequency response	Through paddles: 0.5 to 20 Hz (-3 dB) Through ECG connection cable: 0.05 to 80 Hz (-3 dB), at AC filter off AUX: 0.05 to 80 Hz (-3 dB)
Input impedance	Through paddles: $\geq 100 \text{ k}\Omega$ Through ECG connection cable: $\geq 5 \text{ M}\Omega$ (at 10 Hz 1mV) AUX: $\geq 100 \text{ k}\Omega$
CMRR	$\geq 100 \text{ dB}$ (against chassis ground) at AC filter On
AC filter	Available (common with 50/60 Hz) ON at $\geq -20 \text{ dB}$ , OFF
Pacing pulse rejection	ON, OFF
External ECG input sensitivity	10 mm/V $\pm 5\%$ (sensitivity $\times 1$ )
Heart rate counting range	Defibrillation or monitoring mode: 15 to 300 bpm Pacing mode: 15 to 220 bpm

### Recorder

Paper speed	Real time/delayed ECG waveform recording: 50, 25, 5 mm/s
Types of recording	Manual recording: real time/delayed waveform recording, report recording, event recording Automatic recording: record on charging after discharge, alarm recording, periodic recording

### Rhythm Recognition Detector

We evaluated the rhythm recognition detector of the TEC-7600/7700 series defibrillator using the official electrocardiogram database provided by AHA (American Heart Association) and MIT (Massachusetts Institute of Technology) and an electrocardiogram database of over 3000 electrocardiograms from hospitals in Japan. According to our own evaluation, the rhythm recognition detector of the TEC-7600/7700 series defibrillator meets the equivalent of AAMI standards ANSI/AAMI DF-39-1993 3.3.18.

### Power Requirements

#### AC

Line voltage:	100 to 240 V
Line frequency:	50/60 Hz (automatic switching)
Power input:	Intermittent load: 450 VA or less Continuous load: 200 VA or less

#### DC (Battery)

Power voltage:	12V
Power consumption	Intermittent load, 14 A or less
Continuous load:	4.2 A or less
Charging time:	3 hours or less

### Dimensions and Weight



## 1. GENERAL

Dimensions 336W × 242H × 377 D mm

### Weight

TEC-7621 series defibrillator:

7.8 kg (External paddles use, AC unit w/o battery)

6.9 kg (Pad adaptor use, AC unit w/o battery)

TEC-7631 series defibrillator:

8.1 kg (External paddles use, AC unit w/o battery)

7.2 kg (Pad adaptor use, AC unit w/o battery)

TEC-7721 series defibrillator:

8.1 kg (External paddles use, AC unit w/o battery)

7.2 kg (Pad adaptor use, AC unit w/o battery)

TEC-7731 series defibrillator:

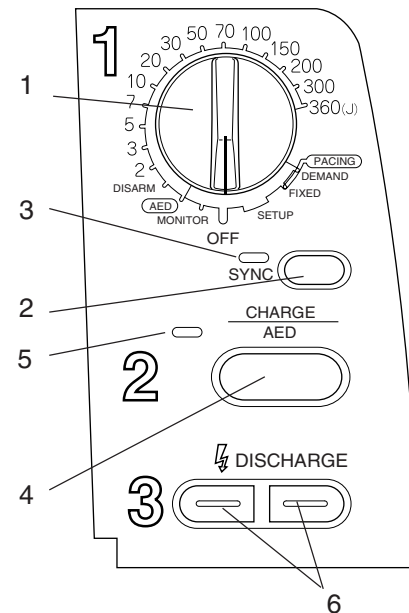
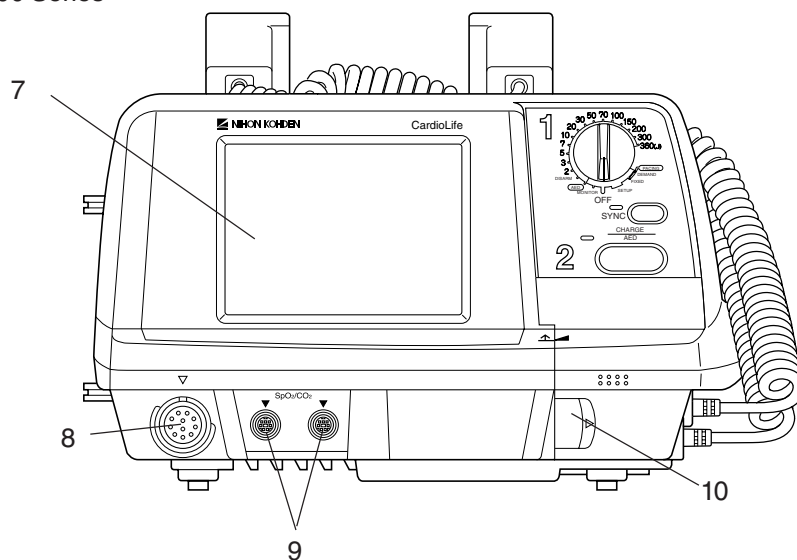
8.4 kg (External paddles use, AC unit w/o battery)

7.5 kg (Pad adaptor use, AC unit w/o battery)

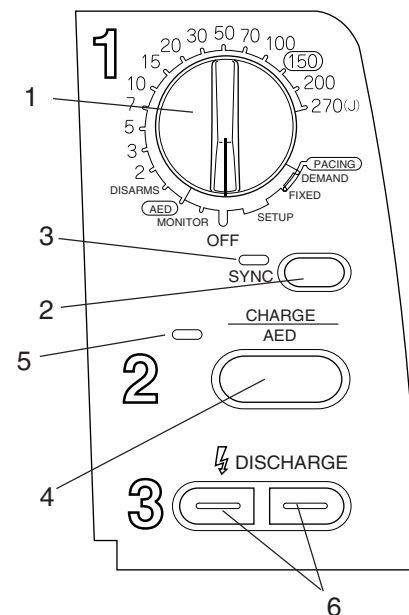
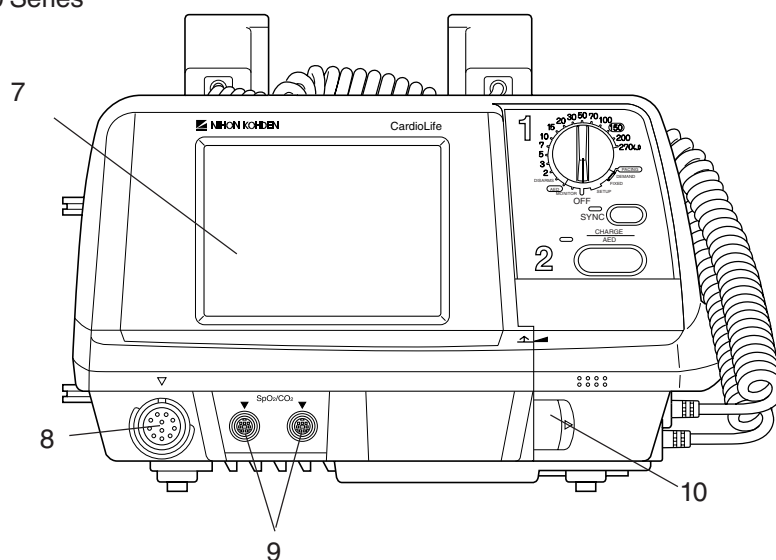
## Panel Description

### Front Panel

#### TEC-7600 Series



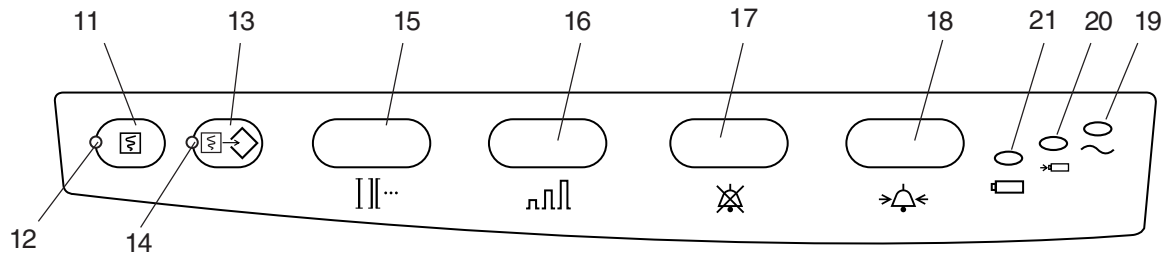
#### TEC-7700 Series



#### Name

1. Energy/Mode Select control
2. SYNC button
3. SYNC lamp
4. CHARGE/AED button
5. CHARGE button
6. DISCHARGE button
7. Screen
8. ECG input connector
9. SpO<sub>2</sub>/CO<sub>2</sub> connector (on the optional QI-762V DSI Interface Unit)
10. Paddle connector

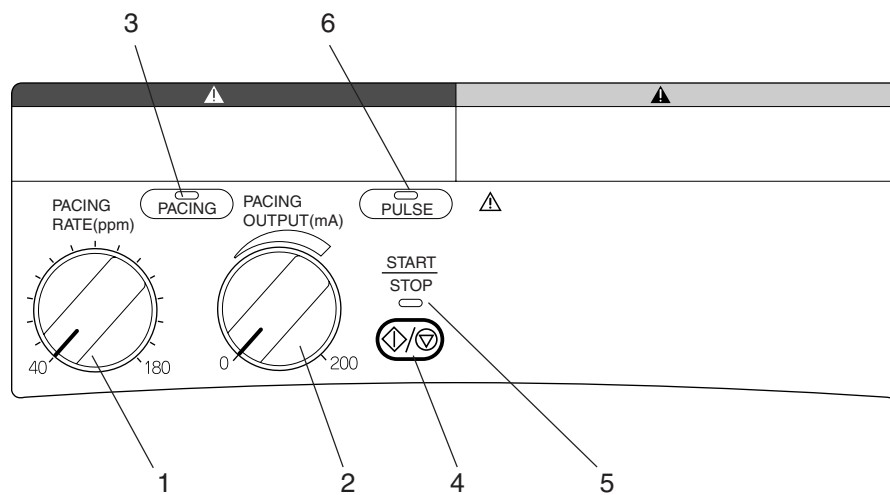
## 1. GENERAL



### Name

- 11. Record key
- 12. Recording lamp
- 13. Event key
- 14. Event lamp
- 15. ECG lead key
- 16. ECG sensitivity key
- 17. SILENCE ALARM key
- 18. Alarm setting key
- 19. AC lamp
- 20. Battery charging lamp
- 21. Battery charge complete lamp

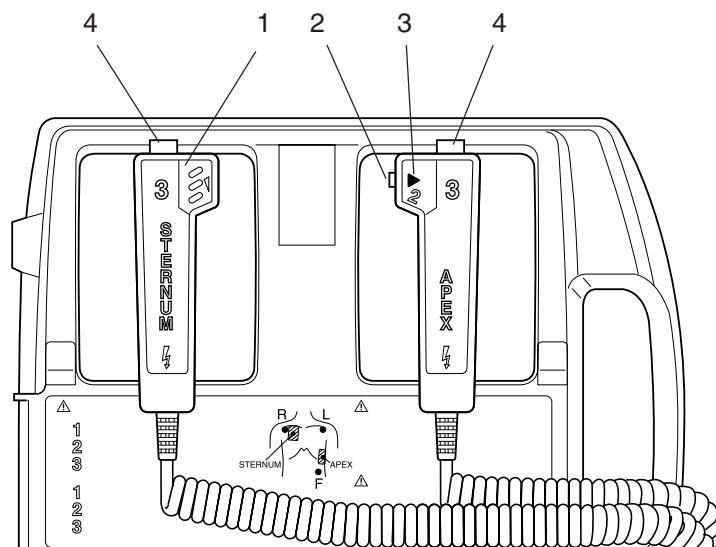
## Top Panel (TEC-7631/7731 Series Only)



### Name

- 1. PACING RATE control
- 2. PACING OUTPUT control
- 3. PACING lamp
- 4. START/STOP key
- 5. START/STOP lamp
- 6. PULSE lamp

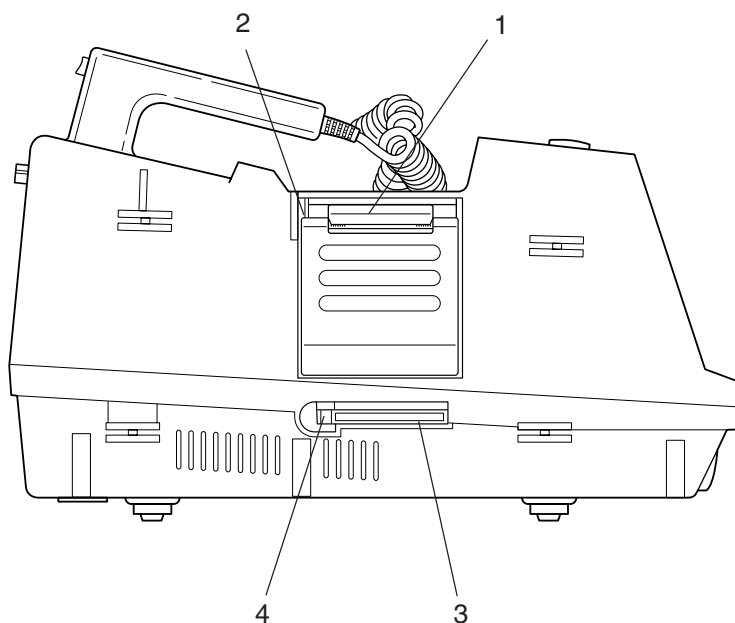
## External Paddles



### Name

1. CONTACT lamp
2. CHARGE button
3. CHARGE lamp
4. DISCHARGE buttons

## Left Side Panel

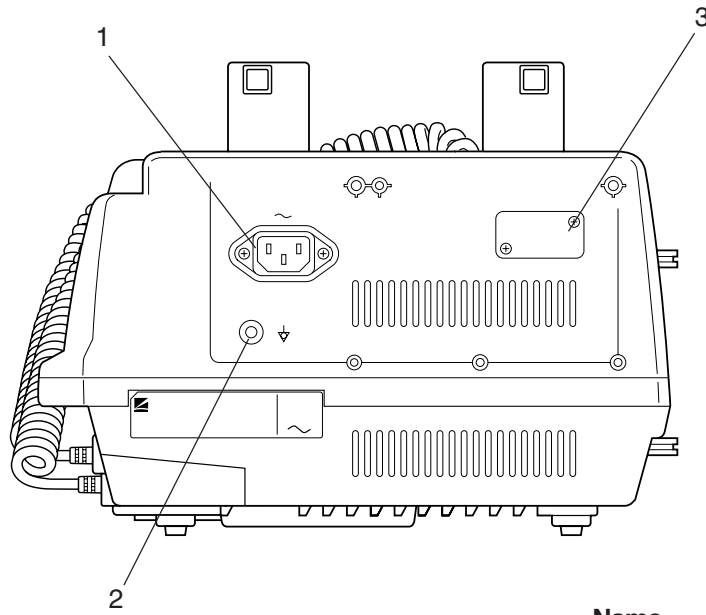


### Name

1. Recording paper exit
2. Door release lever
3. Card slot
4. Card eject button

# 1. GENERAL

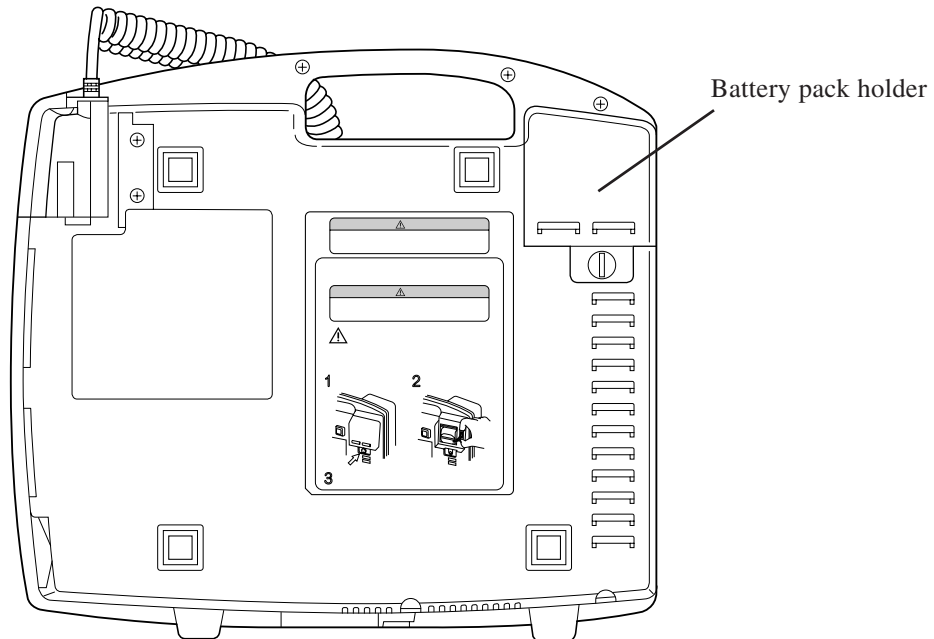
## Rear Panel



### Name

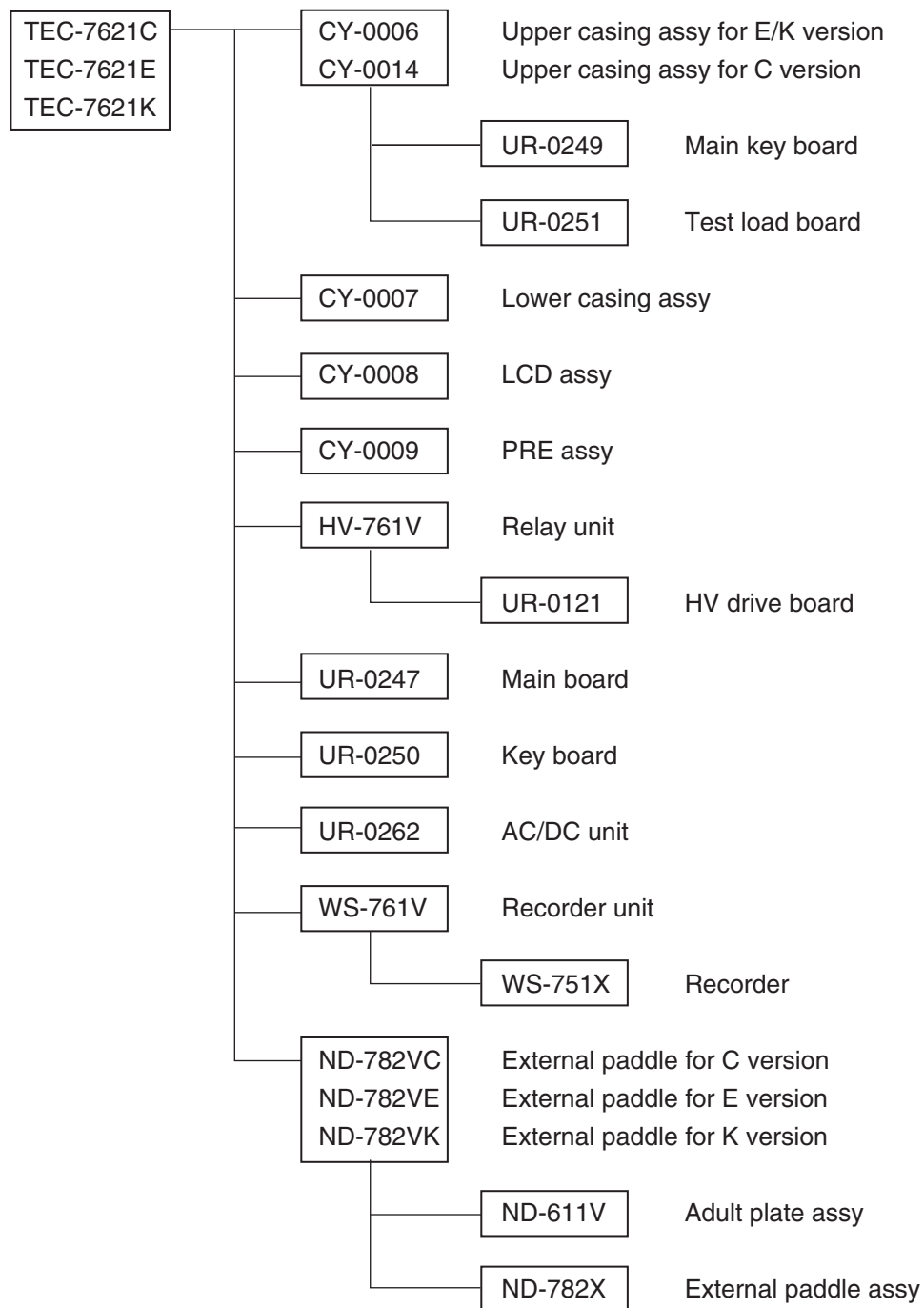
- 1. AC SOURCE socket
- 2. Equipotential ground terminal
- 3. Optional unit connector

## Bottom Panel

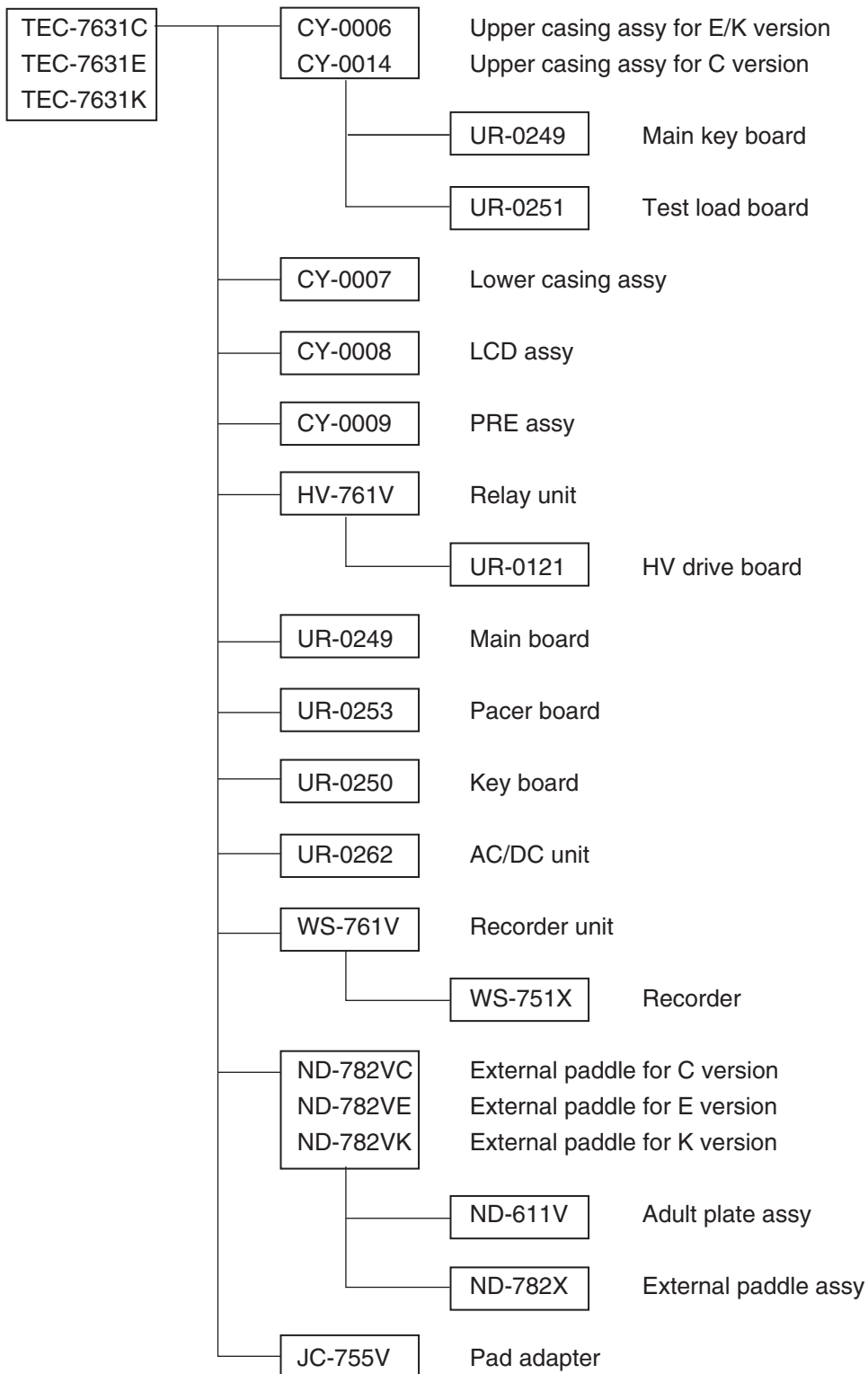


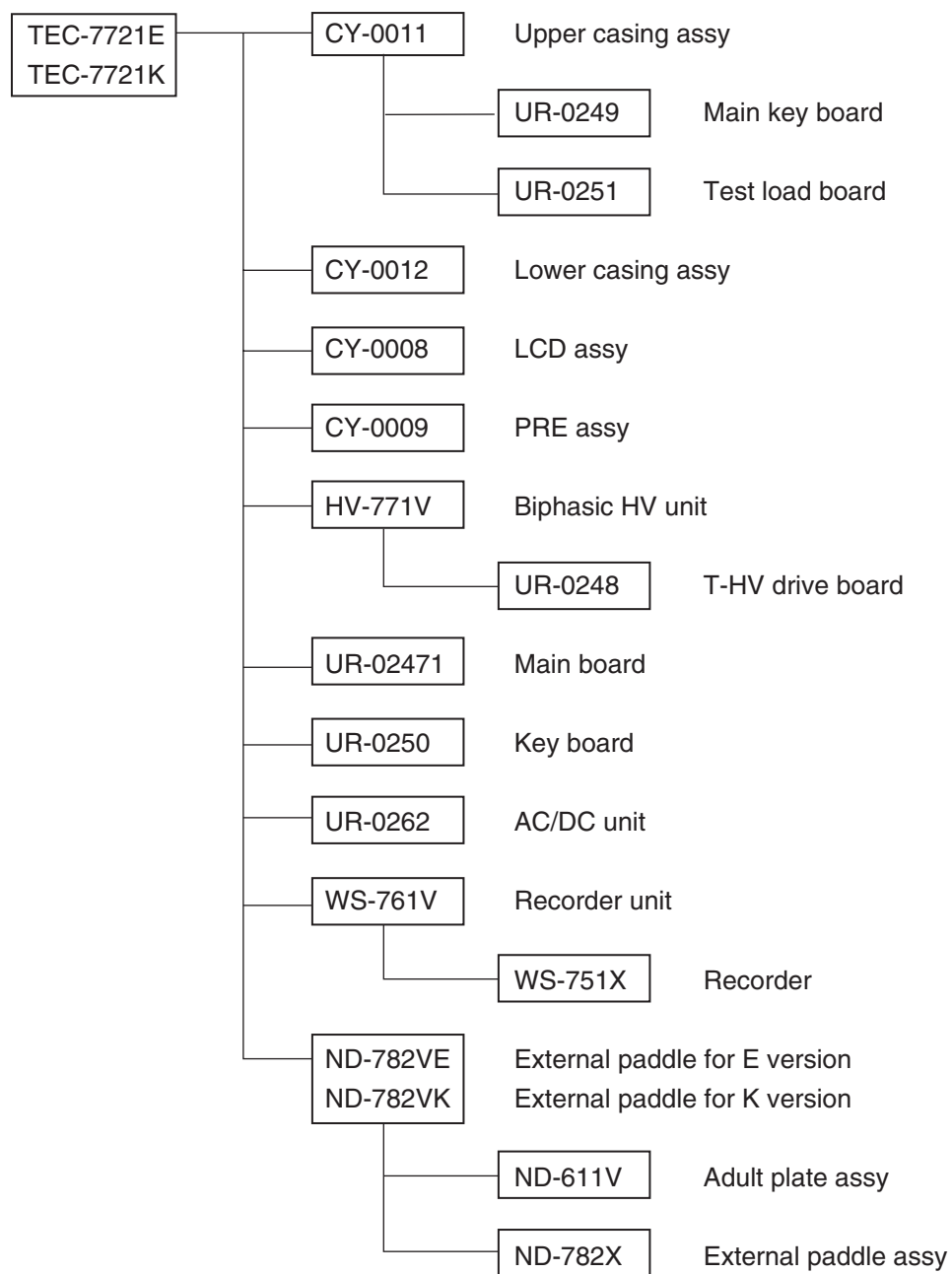
## Composition

### Standard Components



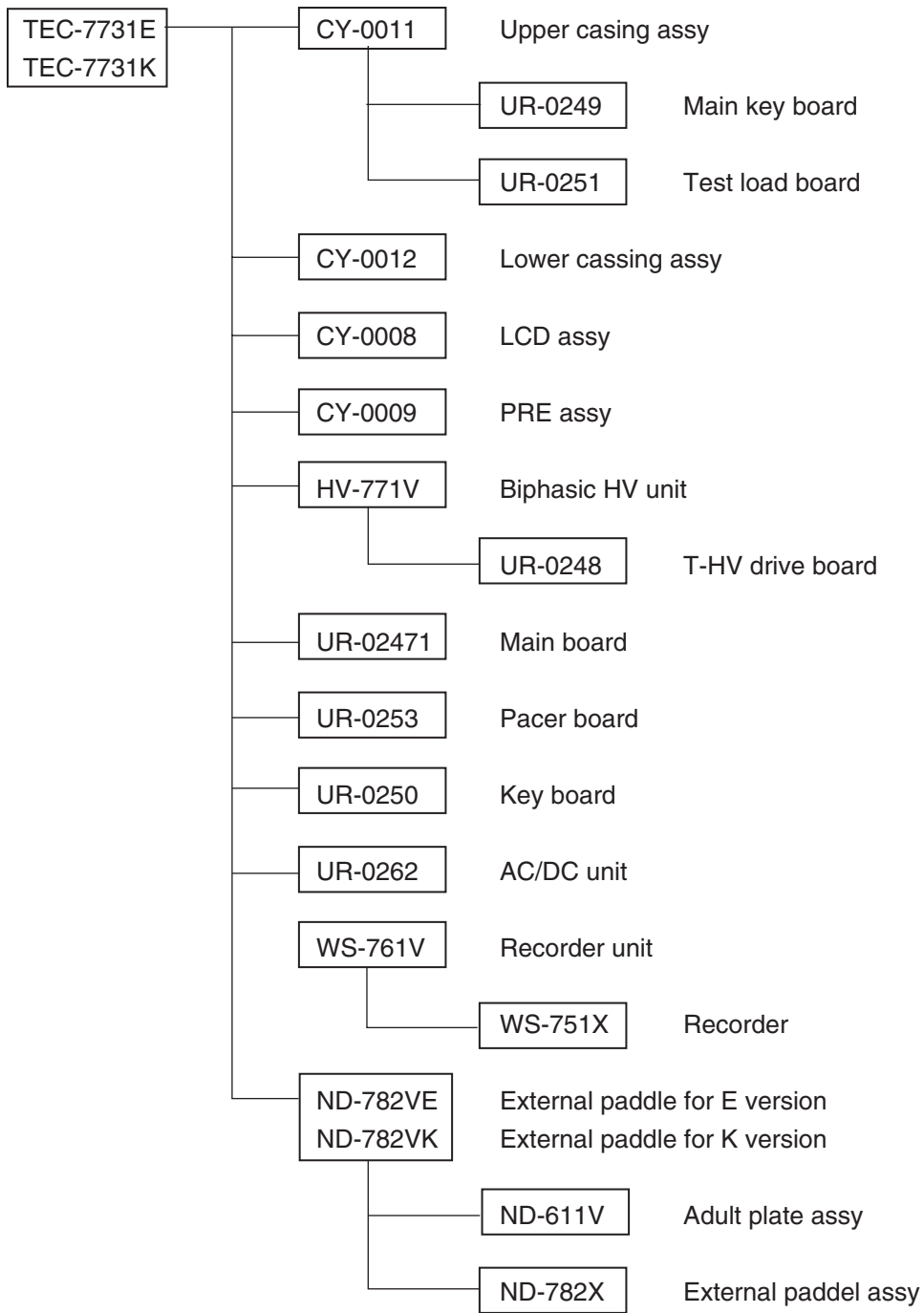
1. GENERAL







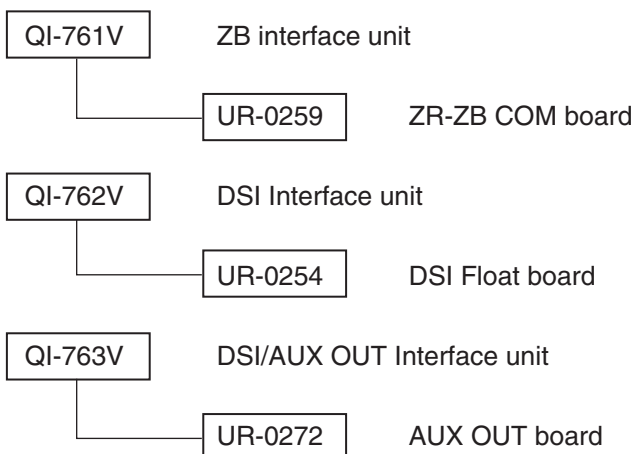
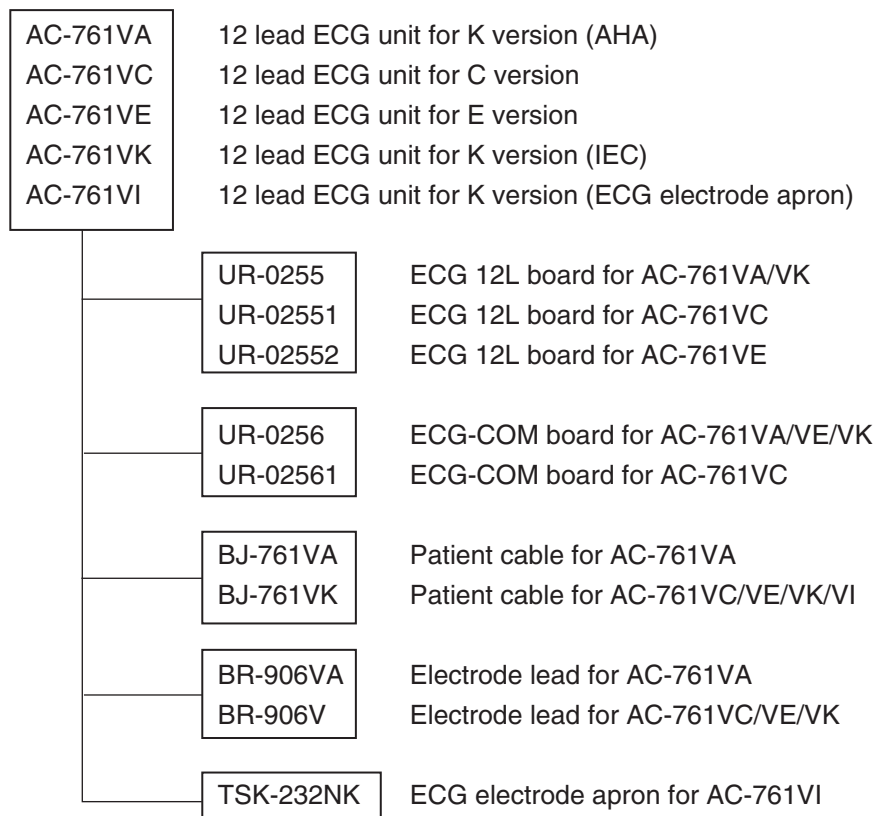
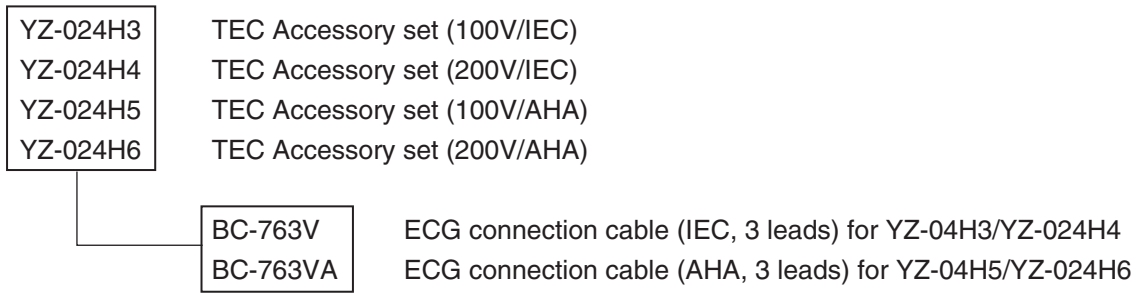
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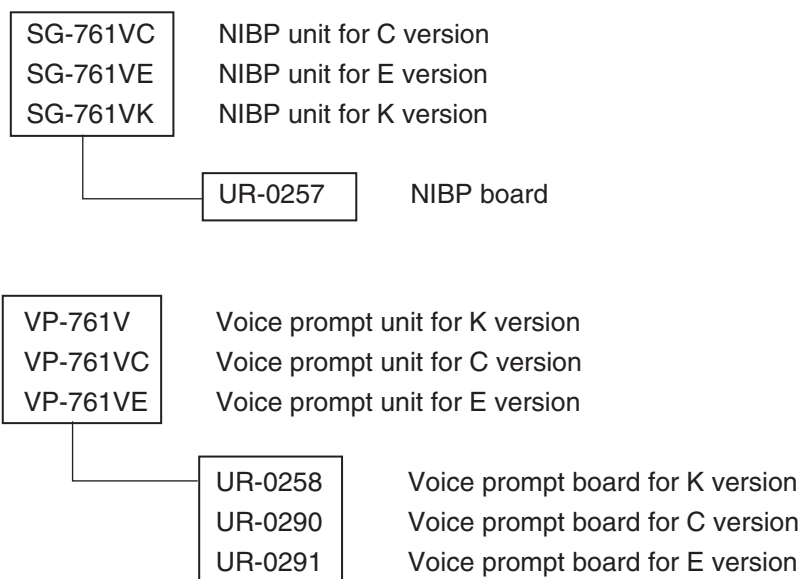


**Options**

JC-761V	External ECG cable
JC-762V	Connection cable
JC-763V	Connection cable
ND-612V	Pediatric electrode, 44 mm $\phi$
ND-762V	Internal paddle electrode, 25 mm $\phi$
ND-763V	Internal paddle electrode, 35 mm $\phi$
ND-764V	Internal paddle electrode, 45 mm $\phi$
ND-765V	Internal paddle electrode, 55 mm $\phi$
ND-766V	Internal paddle electrode, 65 mm $\phi$
ND-767V	Internal paddle electrode, 75 mm $\phi$
BC-763V	ECG connection cable (IEC, 3 leads)
BC-763VA	ECG connection cable (AHA, 3 leads)
BC-765V	ECG connection cable (IEC, 5 leads)
BC-765VA	ECG connection cable (AHA, 5 leads)
JC-755V	Pad adapter
JC-765V	Pad adapter
KD-022A	Cart
DI-001A	Cart tray assembly
YZ-024H9	Battery pack, NKB-301V
YZ-025H0	Paste holder kiy

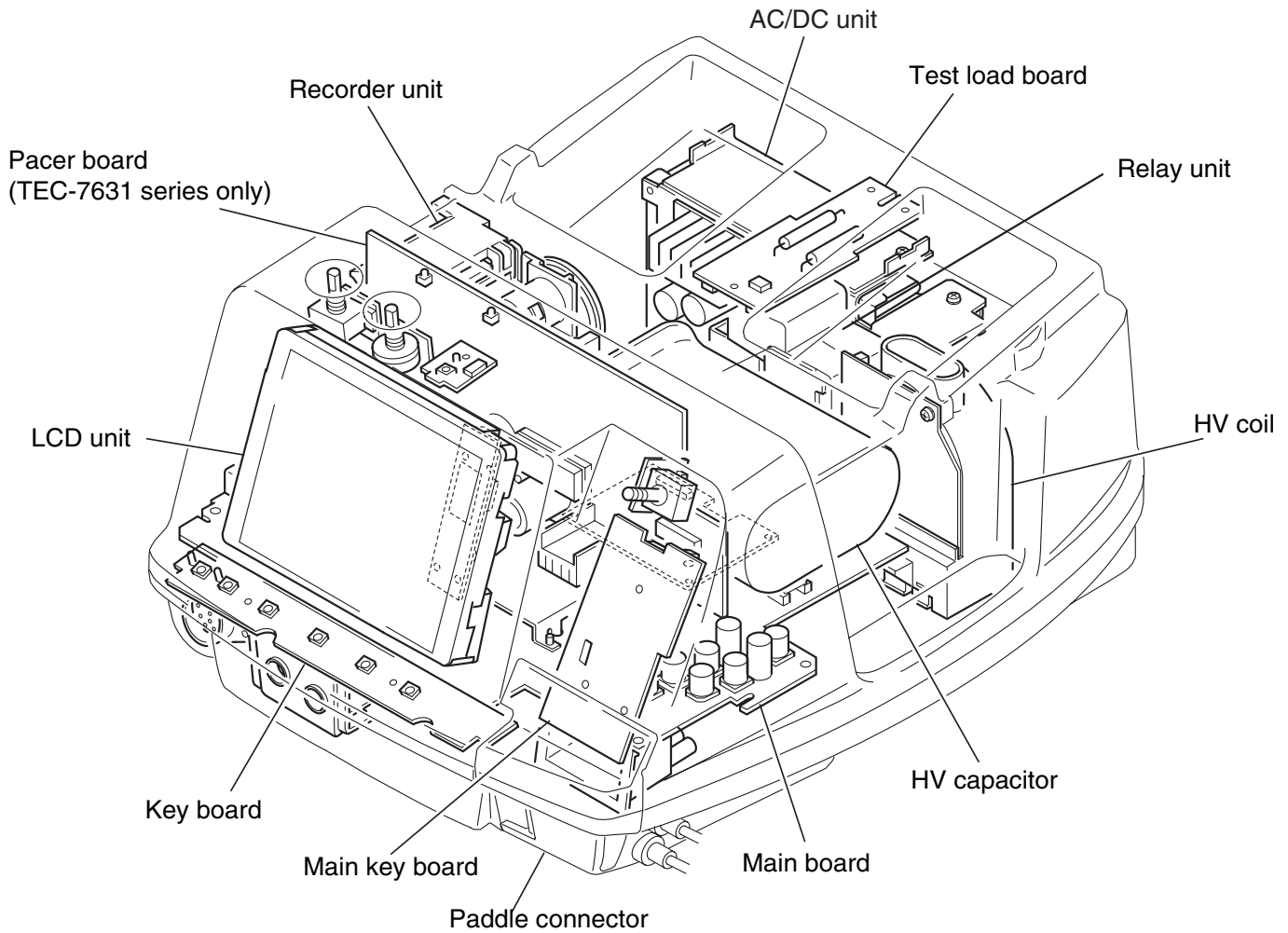
1. GENERAL

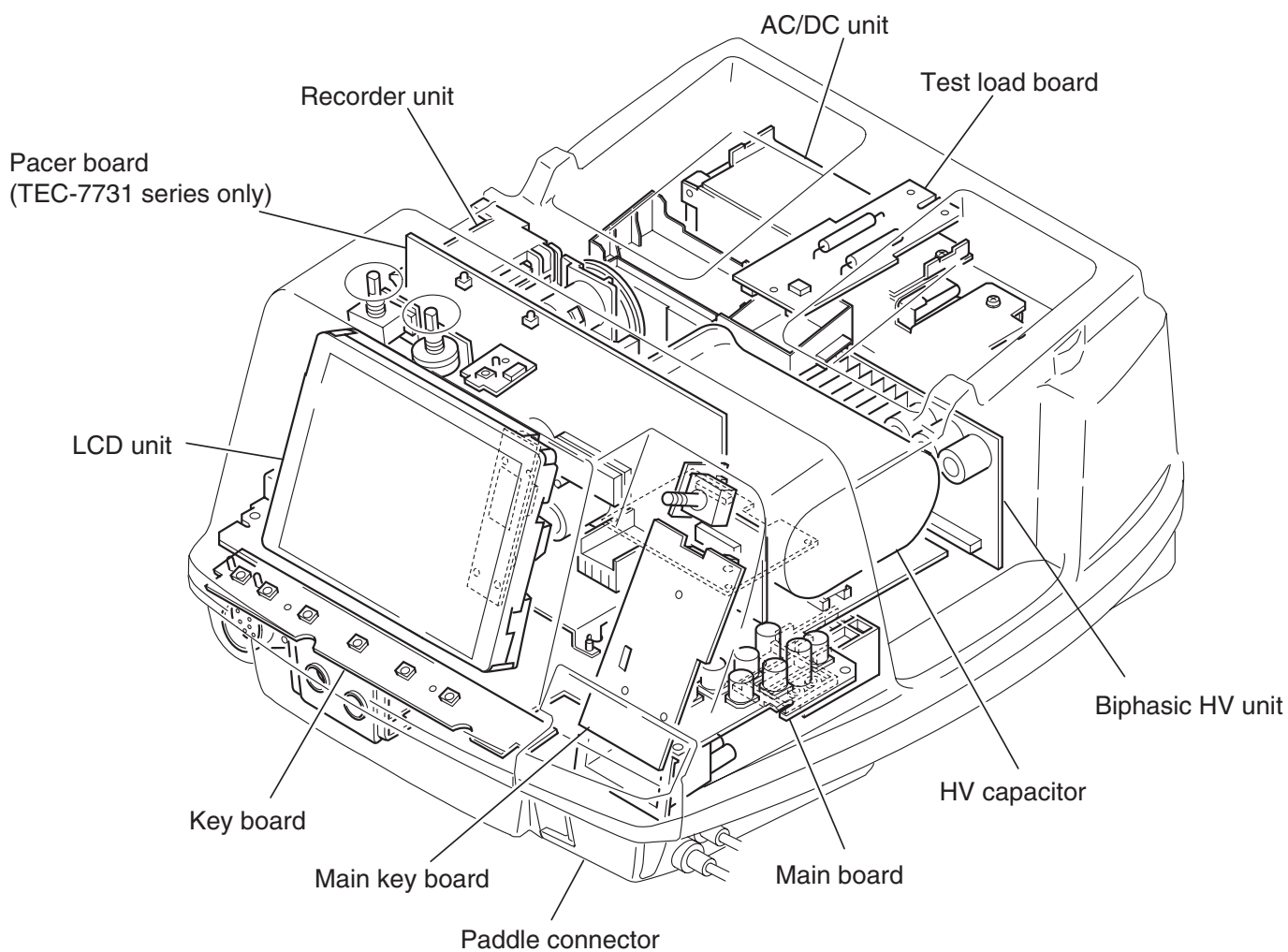




## Board/Unit Location

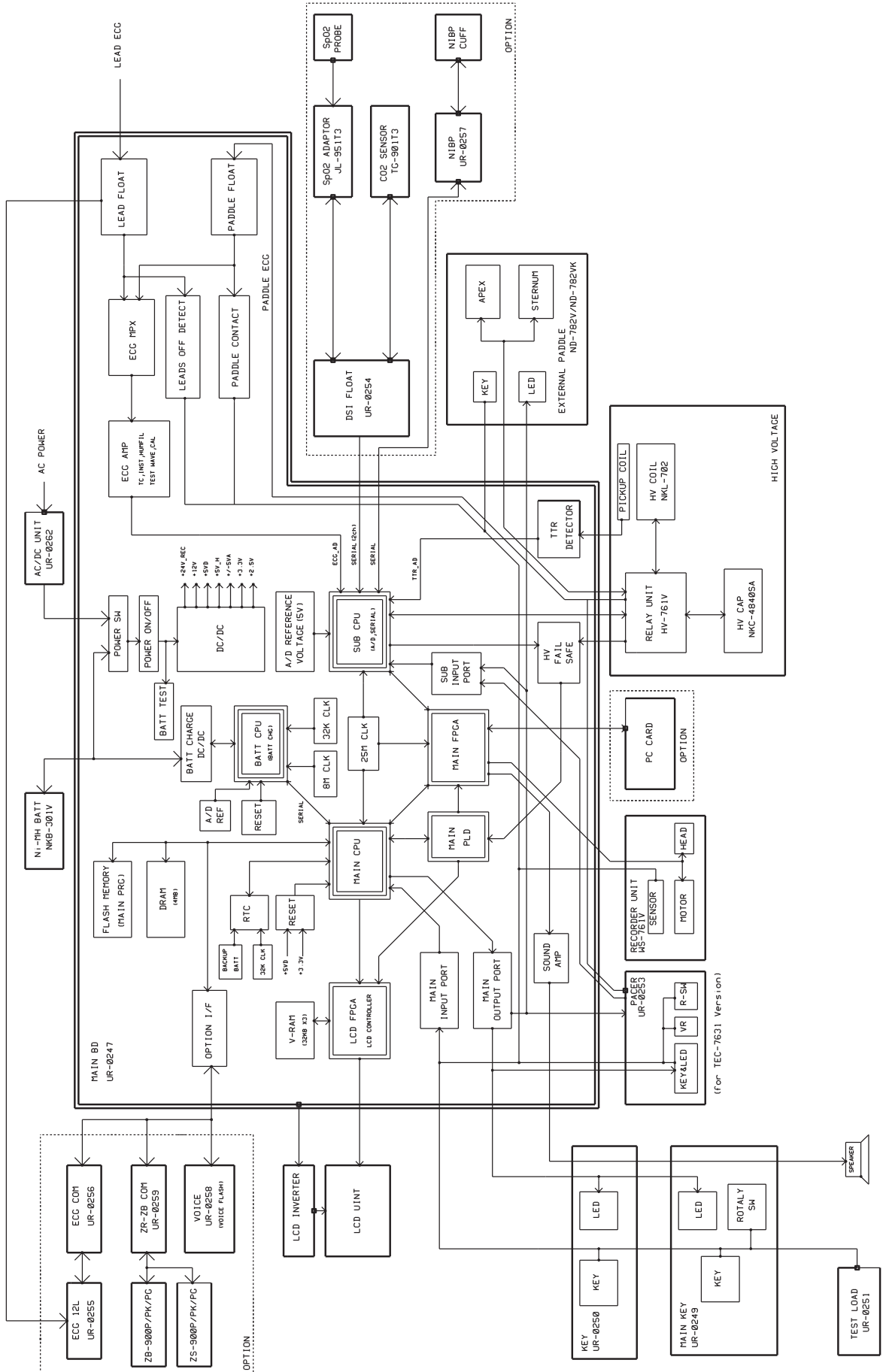
### TEC-7600 Series Defibrillator



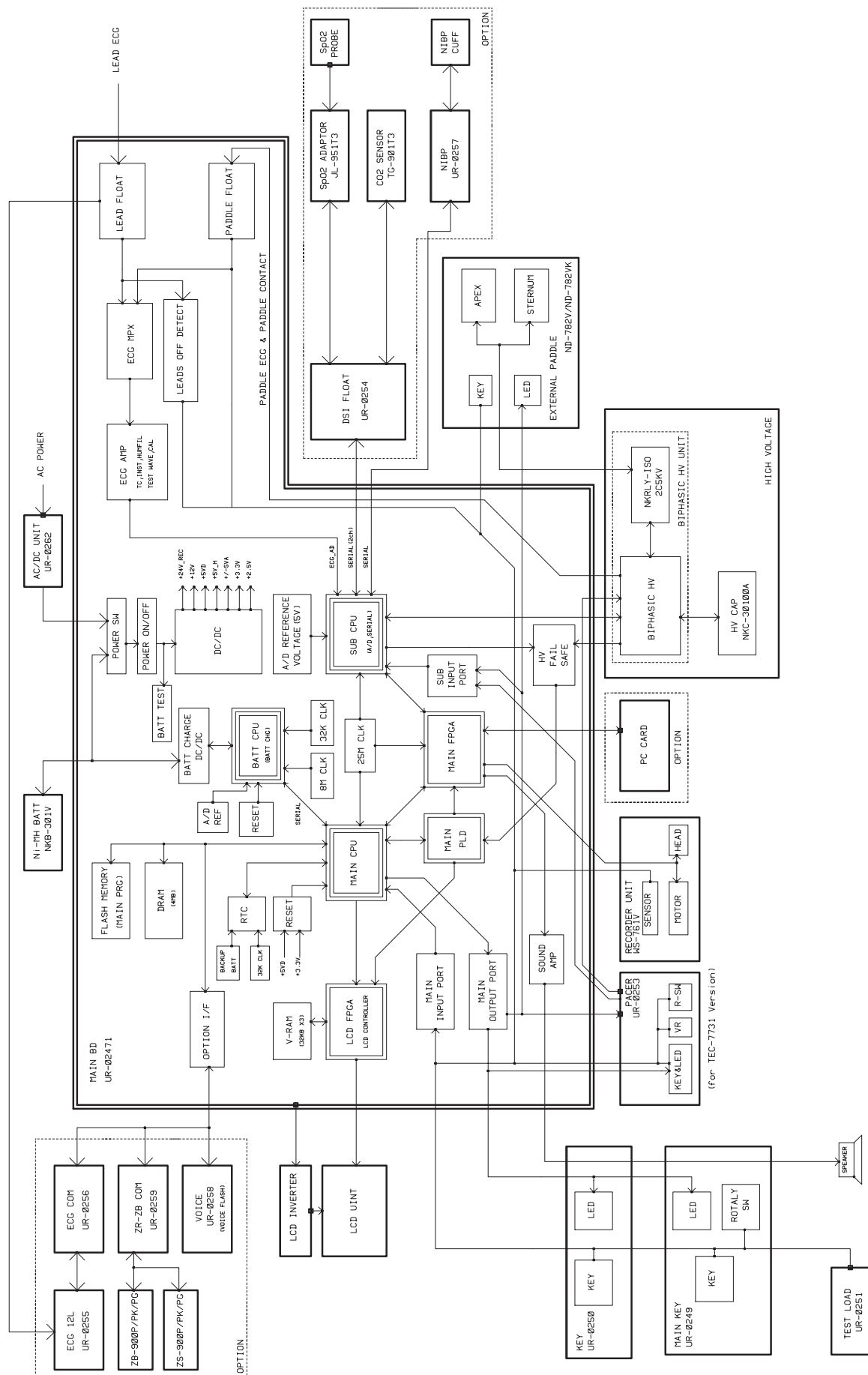
**TEC-7700 Series Defibrillator**

# Block Diagram

## TEC-7600 Series Defibrillator



# TEC-7700 Series Defibrillator





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# *Section 2 Troubleshooting*

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## How to Troubleshoot

Use this section to locate, identify and solve a problem in the instrument or an error message displayed on the screen. The troubleshooting tables in this section are divided into general problems and displayed error messages.

1. Determine which troubleshooting table to use. Also refer to “Messages and Troubleshooting” in Section 10 of the Operator’s manual.
2. In the “Error Code”, “Message” or “Problem” column, 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.)
5. If none of the actions solve the problem, contact your Nihon Kohden distributor or representative.

### NOTE

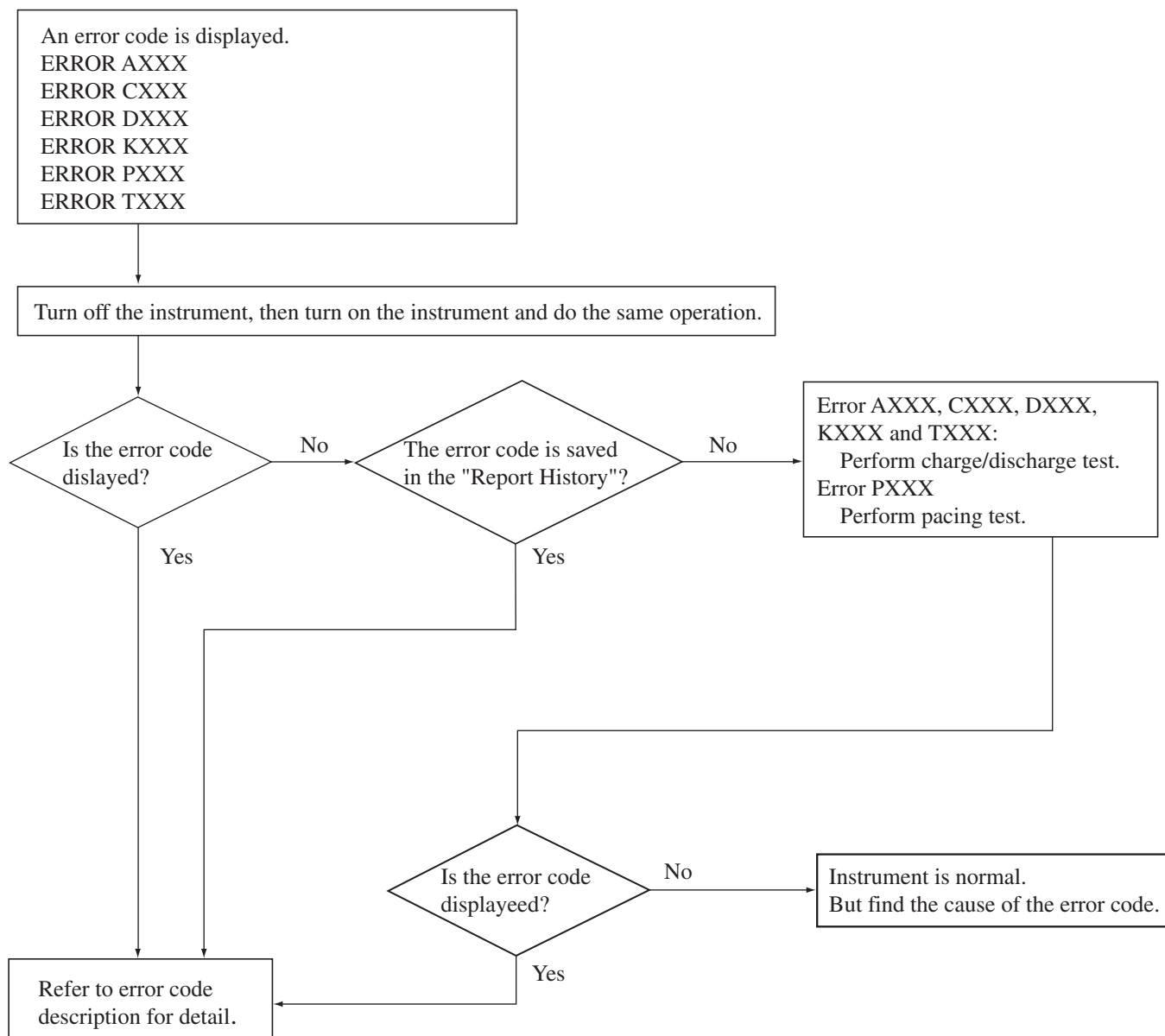
**Before contacting your NK distributor or representative for technical support, please complete a copy of the Maintenance Check Sheet (the original copy is provided at the end of the Section 4 “Maintenance”), and if possible, provide additional detailed information on the problem. Send the complete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

## Error Code

The instrument 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, call up the System Setup screen and print the REPORT HISTORY. Refer to the Operator's Manual 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 instrument before performing the action recommended in the troubleshooting tables in this section. This is because a loose cable connection can cause the instrument to display the error code.



## Defibrillation

TEC-7621/7631 series

Error Code	Meaning	Possible Cause	Action
A501	During standby mode, the HV capacitor has more than 1 J energy more than one continuous second.	Faulty relay unit.	Discharge HV capacitor and replace the relay unit.
A512	When charging is started, the HV capacitor energy did not reach 1 J within 2 seconds.	Faulty relay unit.	Replace the relay unit.
		Faulty HV capacitor.	Replace the HV capacitor
A513	The energy is not reached to the selected energy within the specified time.	Faulty relay unit.	Replace the relay unit.
		Faulty HV capacitor.	Replace the HV capacitor
A524	After charging, the capacitor energy falls the specified value for each energy.	Faulty relay unit.	Replace the relay unit.
		Faulty HV capacitor.	Replace the HV capacitor
A527	After charging, the capacitor energy is about 15% above the selected energy.	Faulty relay unit.	Replace the relay unit.
A529	After charging, the actual charged energy is different from the selected energy.	Faulty relay unit.	Replace the relay unit.
		Faulty main board.	Replace the main board.
		Faulty HV capacitor.	Replace the HV capacitor.
A556	Internal discharge takes more than 20 seconds to complete.	Faulty relay unit.	Replace the relay unit.
		Faulty main board.	Replace the main board.
A566	HV capacitor's voltage did not reach its target value 20 seconds after adjusted internal discharge.	Faulty relay unit.	Replace the relay unit.
A585	The voltage of the HV capacitor exceeds its specified voltage.	Faulty relay unit.	Replace the relay unit.
		Faulty main board.	Replace the main 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 relay unit.	Replace the relay unit.
		Faulty main board.	Replace the main board.

## 2. TROUBLESHOOTING

TEC-7721/7731 series

Error Code	Meaning	Possible Cause	Action
A501	During standby mode, the HV capacitor has more than 1 J energy more than one continuous second.	Faulty biphasic HV unit.	Discharge HV capacitor and replace the biphasic HV unit.
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 HV capacitor.	Replace the HV capacitor
A513	The energy is not reached to the selected energy within the specified time.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty HV capacitor.	Replace the HV capacitor
A524	After charging, the capacitor energy falls the specified value for each energy.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty HV capacitor.	Replace the HV capacitor
A527	After charging, the capacitor energy is about 15% above the selected energy.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
A529	After charging, the actual charged energy is different from the selected energy.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
A551	An IGBT of the switch 1 on the biphasic HV unit does not operate.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty main board.	Replace the main board.
A552	Two or more IGBTs of the switch 1 on the biphasic HV unit does not operate.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty main board.	Replace the main board.
A556	Internal discharge takes more than 20 seconds to complete.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty main board.	Replace the main 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.
A581	An IGBT of the switch 2 on the biphasic HV unit does not operate.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty main board.	Replace the main board.
A582	Two or more IGBTs of the switch 2 on the biphasic HV unit does not operate.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty main board.	Replace the main board.
A583	An IGBT of the switch 3 on the biphasic HV unit does not operate.	Faulty biphasic HV unit..	Replace the biphasic HV unit.
		Faulty main board.	Replace the main board.
A584	Two or more IGBTs of the switch 3 on the biphasic HV unit does not operate.	Faulty biphasic HV unit..	Replace the biphasic HV unit.
		Faulty main board.	Replace the main board.
A585	The voltage of the HV capacitor exceeds its specified voltage.	Faulty biphasic HV unit.	Replace the biphasic HV unit.
		Faulty main board.	Replace the main 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 main board.	Replace the main board.
A597	When discharging, the second phase pulse is not output.	Faulty biphasic HV unit..	Replace the biphasic HV unit.
		Faulty main board.	Replace the main board.

## Operation Panel

### NOTE

- When the power is power is on, the following key switch is pressed and held for more than 10 seconds, the error code of each key is displayed.
- If the key was not pressed and held, check each key function with the System Maintenance screen. Refer to Section 4 “System Maintenance Screen - Check Hardware Screen - Check Key Screen”.

Error Code	Meaning	Possible Cause	Action
K501	The ECG lead key error is detected.	Faulty key board.	Replace the key board.
		Faulty main board.	Replace the main board.
K502	The ECG sensitivity key error is detected.	Faulty key board.	Replace the key board.
		Faulty main board.	Replace the main board.
K503	The ECG silence alarm key error is detected.	Faulty key board.	Replace the key board.
		Faulty main board.	Replace the main board.
K504	The alarm setting key error is detected.	Faulty key board.	Replace the key board.
		Faulty main board.	Replace the main board.
K505	The record key error is detected.	Faulty key board.	Replace the key board.
		Faulty main board.	Replace the main board.
K506	The event key error is detected.	Faulty key board.	Replace the key board.
		Faulty main board.	Replace the main board.
K507	The SYSNC button error (front panel) is detected.	Faulty main key board.	Replace the main key board.
		Faulty main board.	Replace the main board.
K508	The CHARGE button error (front panel) is detected.	Faulty main key board.	Replace the main key board.
		Faulty main board.	Replace the main board.
K509	The right DISCHARGE button error (front panel) is detected.	Faulty main key board.	Replace the main key board.
		Faulty main board.	Replace the main board.
K510	The left DISCHARGE button error (front panel) is detected.	Faulty main key board.	Replace the main key board.
		Faulty main board.	Replace the main board.
K511	The CHARGE button error (apex external paddle) is detected.	Faulty external paddles.	Replace the external paddles.
		Faulty main board.	Replace the main board.
K512	The DISCHARGE button error (apex external paddle) is detected.	Faulty external paddles.	Replace the external paddles.
		Faulty main board.	Replace the main board.
K513	The DISCHARGE button error (sternum external paddle) is detected.	Faulty external paddles.	Replace the external paddles.
		Faulty main board.	Replace the main board.
K515	When the NIBP unit is connected, the NIBP START/STOP key error is detected.	Faulty NIBP unit.	Replace the NIBP unit.
K516	The PACING START/STOP key error is detected.	Faulty pacer board.	Replace the pacer board.
		Faulty main board.	Replace the main board.



**Communication**

<b>Error Code</b>	<b>Meaning</b>	<b>Possible Cause</b>	<b>Action</b>
C501	When the CO2 sensor kit is connected, CO2 data is not received.	Faulty CO2 sensor kit.	Replace the CO2 sensor kit.
		Faulty DSI interface board.	Replace the DSI interface board.
		Faulty DSI/AUX OUT interface board.	Replace the DSI/AUX OUT interface board.
		Faulty main board.	Replace the main board.
C502	When the SpO2 adapter is connected, SpO2 data is not received.	Faulty SpO2 adapter.	Replace the SpO2 adapter.
		Faulty DSI interface board.	Replace the DSI interface board.
		Faulty DSI/AUX OUT interface board.	Replace the DSI/AUX OUT interface board.
		Faulty main board.	Replace the main board.
C503	When the NIBP unit is connected, the communication between the NIBP unit and sub-CPU is not performed correctly.	Faulty NIBP unit.	Replace the NIBP unit.
		Faulty main board.	Replace the main board.
C504	When the ZB interface unit and transmitter are connected, the communication between the transmitter and main-CPU is not performed correctly.	Faulty ZB interface unit.	Replace the ZB interface unit.
		Faulty transmitter.	Replace the transmitter.
		Faulty main board.	Replace the main board.
C505	The battery CPU does not transfer the battery data to the main CPU for more than 10 seconds.	Faulty main board.	Replace the main board.
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 main board.	Replace the main board.
C508	When the 12 lead ECG unit is connected, the communication between the 12 lead ECG unit and main-CPU is not performed correctly.	Faulty ECG 12L board.	Replace the ECG 12L board.
		Faulty ECG-COM board.	Replace the ECG-COM board.
		Faulty main board.	Replace the main board.
C511	The sub CPU does not update the data in the DPRAM for one second.	Faulty main board.	Replace the main board.

## Data Error

Error Code	Meaning	Possible Cause	Action
D501	Data in the DRAM or flash memory is not read out correctly (summation error).	Faulty DRAM or flash memory.	Replace the main 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.	Delete the report data in the System Setup screen.
		Faulty main board.	Replace the main 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 System Setup screen.
		Faulty main board.	Replace the main board.

## Pacing (TEC-7631/7731 Series Only)

Error Code	Meaning	Possible Cause	Action
P501	Pacing output rate does not match the selected rate.	Faulty pacer board.	Replace the pacer board.
		Faulty main board.	Replace the main 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 main board.	Replace the main board.
P503	Current intensity of the pacing output pulse is larger than the selected value.	Faulty pacer board.	Replace the pacer board.
		Faulty main board.	Replace the main board.
P504	Current intensity of the pacing output pulse is smaller than the selected value.	Faulty pacer board.	Replace the pacer board.
		Faulty main board.	Replace the main board.
P505	Pacing output that is not requested by the CPU is detected.	Faulty pacer board.	Replace the pacer board.
		Faulty main board.	Replace the main board.
P506	Pacing output voltage exceeds the upper limit.	Faulty pacer board.	Replace the pacer board.
		Faulty main board.	Replace the main board.
P507	Reference voltage exceeds the specified value.	Faulty pacer board.	Replace the pacer board.
		Faulty main board.	Replace the main board.
P511	Error was detected in the short-mode of the transistor.	Faulty pacer board.	Replace the pacer board.

**12 Lead ECG Measurement**

<b>Error Code</b>	<b>Meaning</b>	<b>Possible Cause</b>	<b>Action</b>
T501	Serial communication error between the input CPU and host CPU on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T502	Command communication error between the input CPU and host CPU on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T503	Data from the input CPU on the ECG 12L board is out of range.	Faulty ECG 12L board.	Replace the ECG 12L board.
T507	Timer error of the host CPU on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T511	Bus error of the host CPU on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T512	Address error of the host CPU on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T513	Invalid command error of the host CPU on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T514	Division error of the host CPU on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T516	Check sum error of the EEPROM on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.
T517	Write error of the flash memory on the ECG 12L board.	The power is turned off during shutdown.	Turn the power off after the system shutdowns correctly.
		Faulty ECG 12L board.	Replace the ECG 12L board.
T522	Time out of the 12 lead ECG analysis.	Faulty ECG 12L board.	Turn the power off, then retry the 12 lead ECG analysis. If the error code appears again, replace the ECG 12L board.
T523	The sensitivity and time constant data differ between the EEPROM and flash memory on the ECG 12L board.	Faulty ECG 12L board.	Replace the ECG 12L board.

## Message

### Instrument and SpO<sub>2</sub>/CO<sub>2</sub> Measurement

Message	Meaning	Possible Cause	Action
Battery charge timed out	During battery test The battery was not fully charged 5 hours after battery charging started.	Faulty battery pack.	Replace the battery pack.
		Faulty main board.	Replace the main board.
Battery charging error	During battery test An error occurred in battery charging	Faulty battery pack.	Replace the battery pack.
		Faulty main board.	Replace the main board.
Battery discharge timed out	During battery test The voltage did not decrease to the specified level 4 hours after battery discharging started.	Faulty battery pack.	Replace the battery pack.
		Faulty main board.	Replace the main board.
Capacitor test fail	Capacitor test failed.	Faulty HV capacitor.	Replace the HV capacitor.
CO <sub>2</sub> module not working	CO <sub>2</sub> module is faulty.	Faulty CO <sub>2</sub> sensor kit.	Replace the CO <sub>2</sub> sensor kit.
		Faulty the QI-762V DSI Interface Unit or QI-763V DSI/AUX OUT Interface Unit.	Replace the DSI Interface Unit or DSI/AUX OUT Interface Unit.
CO <sub>2</sub> module disconnected	CO <sub>2</sub> cable is disconnected from the instrument.	CO <sub>2</sub> cable is disconnected from the QI-762V DSI Interface Unit or QI-763V DSI/AUX OUT Interface Unit.	Press the Silence alarm key to turn off the message. If the message still appears, the DSI interface unit or DSI/AUX interface unit is faulty. Replace the DSI interface unit or DSI/AUX interface unit.
		Faulty DSI interface unit or DSI/AUX OUT interface unit	
ERROR AXXX	Faulty HV	---	Turn off the instrument, then turn on and do the same operation. If the message still appears, refer to the table for each error code.
ERROR CXXX	Communication error		
ERROR DXXX	Faulty ROM/RAM		
ERROR KXXX	Faulty keys		
ERROR PXXX	Faulty pacing unit		
ERROR TXXX	Faulty 12 lead ECG unit		
FET error	The circuit to measure remaining battery charge is faulty.	Faulty main board.	Replace the main board.
High voltage monitor error	Faulty high voltage monitor circuit.	Faulty relay unit, biphasic HV unit or main board.	Turn off the instrument, then turn on and do the same operation. If the message still appears, the relay unit, biphasic HV unit or main board is faulty. Replace the relay unit, biphasic HV unit or main board.

## 2. TROUBLESHOOTING

Message	Meaning	Possible Cause	Action
Overheating	The high voltage charge circuit heats up.	The instrument discharged too frequently	Turn off the instrument and leave the instrument for 10 minutes, then turn on.
		Faulty relay unit, biphasic HV unit or main board.	Turn off the instrument and leave the instrument for 10 minutes, then turn on. If the message appears, the relay unit, biphasic HV unit or main board is faulty. Replace the relay unit, biphasic HV unit or main board.
Power abnormality	Input power voltage is too high.	Not specified battery is used.	Only use the NKB-301V battery.
Relay drive error	Faulty relay drive circuit	Faulty relay unit or biphasic HV unit.	Replace the relay unit or biphasic HV unit.
		Faulty main board.	Replace main board.
Replace battery	Battery test result is 0 to 49%. The instrument judged that the battery should be replaced with a new one.	Faulty battery pack.	Replace the battery.
SpO2 module not working	SpO2 module is faulty.	Faulty the SpO2 adapter.	Replace the SpO2 adapter.
		Faulty the QI-762V DSI Interface Unit or QI-763V DSI/AUX OUT Interface Unit.	Replace the DSI Interface Unit or DSI/AUX OUT Interface Unit.
SpO2 module disconnected	SpO2 cable is disconnected from the instrument.	SpO2 cable is disconnected from the QI-762V DSI Interface Unit or QI-763V DSI/AUX OUT Interface Unit.	Press the Silence alarm key to turn off the message. If the message still appears, the DSI interface unit or DSI/AUX interface unit is faulty. Replace the DSI interface unit or DSI/AUX interface unit.
		Faulty DSI interface unit or DSI/AUX OUT interface unit.	

## NIBP Measurement

Message	Possible Cause	Action
NIBP air hose disconnected	The air hose is disconnected from the NIBP socket.	Connect the air hose properly. When NIBP monitoring is not necessary, press the SILENCE ALARM key to silence the alarm. The NIBP display can be cleared.
	The air hose is damaged.	Replace the air hose with a new one.
	Faulty NIBP unit.	Replace the NIBP unit.
NIBP air leak	The cuff pressure does not change after inflation even after a certain period of time.	Connect the cuff to the air hose properly. Connect the air hose to the socket properly.
	The cuff or air hose is damaged.	Replace the cuff or air hose with a new one.
	Faulty NIBP unit.	Replace the NIBP unit.
NIBP cuff occlusion	The cuff pressure does not decrease after measurement has completed.	Check that the air hose is not bent or squeezed.
	Faulty NIBP unit.	Replace the NIBP unit.
Cuff pressure abnormal	Excessive pressure was applied by the cuff.	When measuring an adult, ask the patient not to move too much.
	Faulty NIBP unit.	Replace the NIBP unit.
NIBP module not working	Faulty NIBP unit.	Replace the NIBP unit.
NIBP measurement time out	The measuring time exceeded the specified time due to arrhythmia or noise.	If the cause is arrhythmia, measure by invasive blood pressure measurement. Remove the cause if due to noise.
	Faulty NIBP unit.	Replace the NIBP unit.

## 12 Lead ECG Measurement

Message	Possible cause	Action
Check XX electrode	The displayed is detached. (XX: electrode name)	Check the electrode attachment of the indicated position.
	Faulty electrode lead or patient cable.	Replace the electrode lead or patient cable.
Check chest electrode	Two or more chest electrodes are detached.	Check the chest electrode attachment.
	Faulty electrode lead or patient cable.	Replace the electrode lead or patient cable.
	A 5 lead electrode is used.	Use the specified electrode lead and patient cable.
Check limb electrode	Two or more limb electrodes from the R(RA), L(LA) or F(LL) electrode are detached.	Check the limb electrode attachment.
	The RF electrode is detached.	
	No electrode is attached to the patient.	
	Faulty electrode lead or patient cable.	Replace the electrode lead or patient cable.
	A 3 lead electrode is used.	Use the specified electrode lead and patient cable.
Not enough free memory	There is no space to save new ECG data file in the memory card.	Replace the memory card with a new one.
Insert memory card	A memory card is not inserted.	Insert the memory card into the memory card slot.
Check memory card	An unspecified memory card is inserted.	Insert the specified memory card.
	Faulty memory card.	Replace the memory card.

## Troubleshooting

### 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 Energy/Mode select control to OFF position and disconnect the power cord.
No operation when the instrument is turned on.	The power cord is disconnected.	Firmly connect the power cord to the AC outlet and the defibrillator.
	The battery is not installed.	Install the specified battery.
	Faulty battery	Replace the battery with a new one (NKB-301V).
	Remaining battery charge is low.	Charge the battery.
	Faulty main key board.	Replace the main key board.
	Faulty main board.	Replace the main board.
Screen is dim. Waveform and characters are not seen.	Faulty LCD inverter board.	Replace the LCD inverter board.
	Faulty LCD unit.	Replace the LCD unit.
	Faulty main board.	Replace the main board.
The printed data is JAN/01/80.	The backup battery is almost discharged.	Replace the main board. (Under normal use condition, the backup battery lifetime is about 6 years.)
The report data are not saved.	On the Setup screen, the report data were deleted.	Deleted data cannot be recovered.
	When the power is turned off, the AC power cord is disconnected while the "Shutdown" message is displayed.	Do not disconnect the AC power cord while the "Shutdown" message is displayed.
	Faulty main board.	Replace the main board.
All settings set in the Setup screen and System Setup screen return to the default settings.	When the power is turned off, the AC power cord is disconnected while the "Shutdown" message is displayed.	Do not disconnect the AC power cord while the "Shutdown" message is displayed.
	Faulty main board.	Replace the main board.

<b>Problem</b>	<b>Possible Cause</b>	<b>Action</b>
When the battery is installed, the instrument suddenly changes to battery operation.	Power voltage changed.	Check that the AC power cord is connected to the instrument. If the trouble is not solved, the AC/DC unit or AC power cord faulty. Replace the AC/DC unit or AC power cord.
When the battery is not installed, the instrument power suddenly drops.		
The date and time printed on the recording paper is incorrect.	---	Set the date and time on the Date/Volume screen. Refer to Section 3 of the Operator's manual
	The backup battery for the clock is discharged.	Replace the backup battery.
	Faulty main board.	Replace the main board.

## Defibrillation

<b>Problem</b>	<b>Possible Cause</b>	<b>Action</b>
The defibrillator self-discharges the energy during charging.	In battery operation, the battery is almost discharged.	Operate the defibrillator on AC power and recharge the battery. The battery is automatically charged when the defibrillator is connected to AC power.
	Faulty high voltage unit. (Error code appears on the screen.)	When an error code appears on the screen, refer to the Defibrillation table in the Error Code section.
Cannot switch to synchronized mode.	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 screen.	On the Paddle Setup screen, set the "sync by paddle lead" to ON.
	Faulty main key board.	Replace the main key board.
	Faulty main board.	Replace the main board.
"0 J" is printed on the defibrillation report recording.	TTR is 15 $\Omega$ or less	Check that the paddles do not touch each other.
	TTR is 255 $\Omega$ or more.	Press the paddles on the patient firmly.



## Monitoring

### ECG

Problem	Possible Cause	Action
Dotted lines appear instead of the ECG waveforms.	An ECG electrode is detached.	Remove the cause of the trouble. If the trouble is not solved, the main board is fault. Replace the main board.
	An electrode lead is disconnected from the electrode.	
	The ECG connection cable is disconnected from the defibrillator.	
	An electrode lead is faulty.	
	Faulty main board.	
No sync sound	Faulty main board.	Replace the main board.
No alarm is generated	The SILENCE ALARMS key is pressed.	Press the SILENCE ALARMS key again.
	On the Setup screen, alarm is set to OFF.	On the Setup screen, set the upper/lower limit of each vital alarm.
	Faulty main board.	Replace the main board.
No sound	Faulty speaker or speaker cable.	Replace the speaker
	Faulty main board.	Replace the main board.

### SpO<sub>2</sub>

Problem	Possible Cause	Action
SpO <sub>2</sub> value is not displayed on the screen.	The SpO <sub>2</sub> adapter cable is disconnected from the SpO <sub>2</sub> /CO <sub>2</sub> connector.	Connect the SpO <sub>2</sub> adapter to the SpO <sub>2</sub> /CO <sub>2</sub> connector.
	The SpO <sub>2</sub> probe is disconnected from the SpO <sub>2</sub> adapter.	Firmly connect the probe to the SpO <sub>2</sub> adapter.
	Cable discontinuity in SpO <sub>2</sub> adapter or probe	Replace the SpO <sub>2</sub> adapter or probe.
	SpO <sub>2</sub> probe attachment to the patient is loose.	Firmly attach the probe to the patient.
Dotted lines appear instead of the pulse waveforms.	Faulty SpO <sub>2</sub> probe.	Replace the SpO <sub>2</sub> probe.
	Faulty SpO <sub>2</sub> adapter.	Replace the SpO <sub>2</sub> adapter.
	Faulty QI-762V DSI Interface Unit.	Replace the DSI interface unit.
	Faulty QI-763V DSI/AUX OUT Interface Unit.	Replace the DSI/AUX OUT interface unit.
Deformed or damaged SpO <sub>2</sub> probe	Probe was disinfected in a way other than the specified way.	Replace the probe with a new one. Use the specified disinfecting method.
	SpO <sub>2</sub> probe is repeatedly used.	Replace the probe with a new one when its lifetime is over.

CO<sub>2</sub>

<b>Problem</b>	<b>Possible Cause</b>	<b>Action</b>
The measured value is not displayed on the screen.	The CO <sub>2</sub> sensor kit cable is disconnected from the SpO <sub>2</sub> /CO <sub>2</sub> connector.	Connect the CO <sub>2</sub> sensor kit cable to the SpO <sub>2</sub> / CO <sub>2</sub> connector.
	CO <sub>2</sub> gas is in the inspiration.	With the CO <sub>2</sub> sensor kit, measurements are based on the assumption of no CO <sub>2</sub> 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 red LED on the CO <sub>2</sub> adapter blinks.	CO <sub>2</sub> sensor or CO <sub>2</sub> adapter is faulty.	Replace the CO <sub>2</sub> sensor or CO <sub>2</sub> 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.

## 2. TROUBLESHOOTING

### NIBP

<b>Trouble</b>	<b>Possible Cause</b>	<b>Action</b>
The displayed cuff type is not correct.	The air hose is not connected to the cuff socket firmly.	Connect the air hose to the socket firmly.
Cuff inflation pressure is less than 10 mmHg.	The air hose is not connected to the cuff socket properly.	Connect the air hose to the socket properly.
	The cuff is not wrapped around the arm or is wrapped too loosely.	Wrap the cuff around the upper arm.
The cuff does not inflate when the NIBP START/STOP key is pressed.	The air hose is not connected to the cuff socket.	Connect the air hose to the socket firmly.
	The cuff hose or air hose may be folded or squeezed.	Check the cuff hose and air hose.
Abnormal measurement results are displayed.	The cuff size is not correct.	Select the cuff which fits the patient's limb circumference.
	The cuff is not wrapped around the arm correctly.	Wrap the cuff around the upper arm, not too tightly or too loosely.
	NIBP data is not correct because of body movement.	Prevent the patient from moving during measurement.
	The cuff is touched during measurement.	Do not touch the cuff during measurement.
	The cuff is not wrapped at the correct position.	Wrap the cuff at the correct position.
The cuff is suddenly deflated during inflation.	The NIBP START/STOP key is pressed during inflation.	—————
	The energy charging for defibrillation is started.	From the start of charging to discharging, the NIBP measurement cannot be preformed.
	In battery operation, the battery is almost discharged.	Replace the battery or switch to AC operation.
	The air hose is disconnected from the NIBP socket (The NIBP air hose disconnected" message is displayed).	Connect the air hose properly. When NIBP monitoring is not necessary, press the SILENCE ALARM key to silence the alarm. The NIBP display can be cleared
Auto measurement does not start even when the time interval has passed.	The time interval for the NIBP auto measurement is changed.	Check the time interval.
	The measurement is stopped by the safety circuit (The "NIBP safety circuit operating" message is displayed).	Wait for 40 seconds before remeasurement (This measurement is canceled).
	The cuff inflation pressure is deflated enough or during NIBP measurement stop interval (2 or 30 seconds).	The measurement automatically starts after the stop interval.
	The previous measurement is not complete.	This measurement is canceled.
The cuff suddenly inflates.	The measurement mode is set to auto mode.	Check the time interval.
Cannot connect cuff to the air hose.	Unspecified cuff is used.	Use a cuff specified by Nihon Kohden.

If none of the actions solve the problem, replace the NIBP unit.

<b>Problem</b>	<b>Possible Cause</b>	<b>Action</b>
Cannot measure NIBP.	Noise which disables calculation of the blood pressure has interfered.	Remove the cause. Do not touch the cuff during measurement.
	The pulse wave is unstable due to arrhythmia.	Ask the patient not to move too much and perform invasive blood pressure measurement as required.
	The air hose is bent or squeezed.	Remove the cause.
	The cuff has worn out.	Use a new cuff.
Blood congestion occurs.	Measuring over a long period of time at intervals less than 2.5 minutes.	Increase the measuring interval.
		Do not measure NIBP over a long time.
Thrombus occurs.	Measuring a sickle anemia patient.	Do not perform NIBP measurement on a sickle anemia patient.
Buzzing sounds when the NIBP START/STOP key is pressed and NIBP cannot be measured.	The NIBP START/STOP key is pressed before the cuff inflation pressure has deflated enough or during NIBP measurement stop interval (2 or 30 seconds).	Wait for the NIBP measurement stop interval to elapse before remeasurement.
	The energy charging for defibrillation is started.	Form the start of charging to discharging, the NIBP measurement cannot be preformed.
	In battery operation, the battery is almost discharged.	Replace the battery or switch to AC operation.
	The measurement is stopped by the safety circuit (The "NIBP safety circuit operating" message is displayed).	Wait for 40 seconds before remeasurement.
	The air hose is disconnected from the NIBP socket (The NIBP air hose disconnected" message is displayed).	Connect the air hose properly. When NIBP monitoring is not necessary, press the SILENCE ALARM key to silence the alarm. The NIBP display can be cleared
The size of the measurement data on the screen is small.	The size of the measurement data changes to small 10 seconds after the last measurement.	—————

## Recording

Problem	Possible Cause	Action
Printing is blurred. Dots are missing.	The specified recording paper is not used.	Use the specified recording paper.
	The thermal head is dirty.	Clean the thermal head with the head cleaning pen. If the trouble not solved. The recorder unit is faulty. Replace the recorder unit.
There is no printing.	The recording paper is not loaded.	Load new recording paper.
	Recording unit 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 key board.	If the lamp does not light when you press the record key, check the key function and recorder with the System Maintenance screen. If the recorder check is passed, the key board is faulty. Replace the key board.
	Faulty recorder. Faulty main board.	If the lamp lights when you press the record key, check the recorder in the System Maintenance screen.
Printing is light.	The recording unit temperature is too hot.	Cool the instrument down in a cooler place. If the trouble is not solved, the recorder unit or main board is faulty. Replace the recorder unit or main board.

## Battery

Problem	Possible Cause	Action
The battery charging lamp is blinking.	The instrument is too hot.	Bring the instrument to a cool place. When the battery temperature decreases, charging resumes.
After starting battery charging, the charging stops. (neither battery charging lamp nor battery charge complete lamp lights.)	Faulty battery	Replace the battery with a new one.
	Charging circuit is not working.	Replace the main board.

**Pacing (TEC-7631/7731 Series Only)**

<b>Problem</b>	<b>Possible Cause</b>	<b>Action</b>
Although the PULSE lamp is lit, pacing pulse does not appear on the ECG.	Faulty pacer board.	Replace the pacer board.
	Faulty main board.	Replace the main board.
Although the START/STOP lamp is lit, pacing does not start.	Pacing energy is set to 0 mA.	Set the appropriate pacing energy with the PACING OUTPUT control.
	In DEMAND mode, selected pacing rate is faster 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 main board.	Replace the main board.

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# Section 3 *Disassembly*

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The procedures in this section explain how to remove, replace and install major components in the **TEC-7621/7631 series defibrillator** (for TEC-7721/7731 series defibrillator, see the next section).

## Before You Begin

### Warnings, Cautions and Notes

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#### WARNING

- The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, HV inductor, relay unit, paddle socket or paddles) of the instrument.
- Removal and replacement of any components in the instrument should only be done by qualified service personnel.
- To avoid the possibility of injury to yourself or damage to the instrument, do not install or remove any component while the power is on. When disassembling, make sure that the instrument is off, the AC power cord is disconnected from the instrument and the battery pack is removed from the defibrillator.

There are several high voltage units inside the instrument: LCD backlight, high voltage capacitor, pacing DC/DC converter and switching regulator.

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#### CAUTIONS

- To avoid accidental discharge of static electricity which could damage the components of the instrument, use a grounded wrist strap when installing or removing any component of the instrument.
  - Fuses on the main board and AC/DC unit cut off the power when an abnormality occurs in the instrument. Eliminate the malfunction before replacing the fuse. Use the correct fuse only.
  - Use only parts recommended by Nihon Kohden to assure maximum performance from your instrument.
- 
- 

#### NOTE

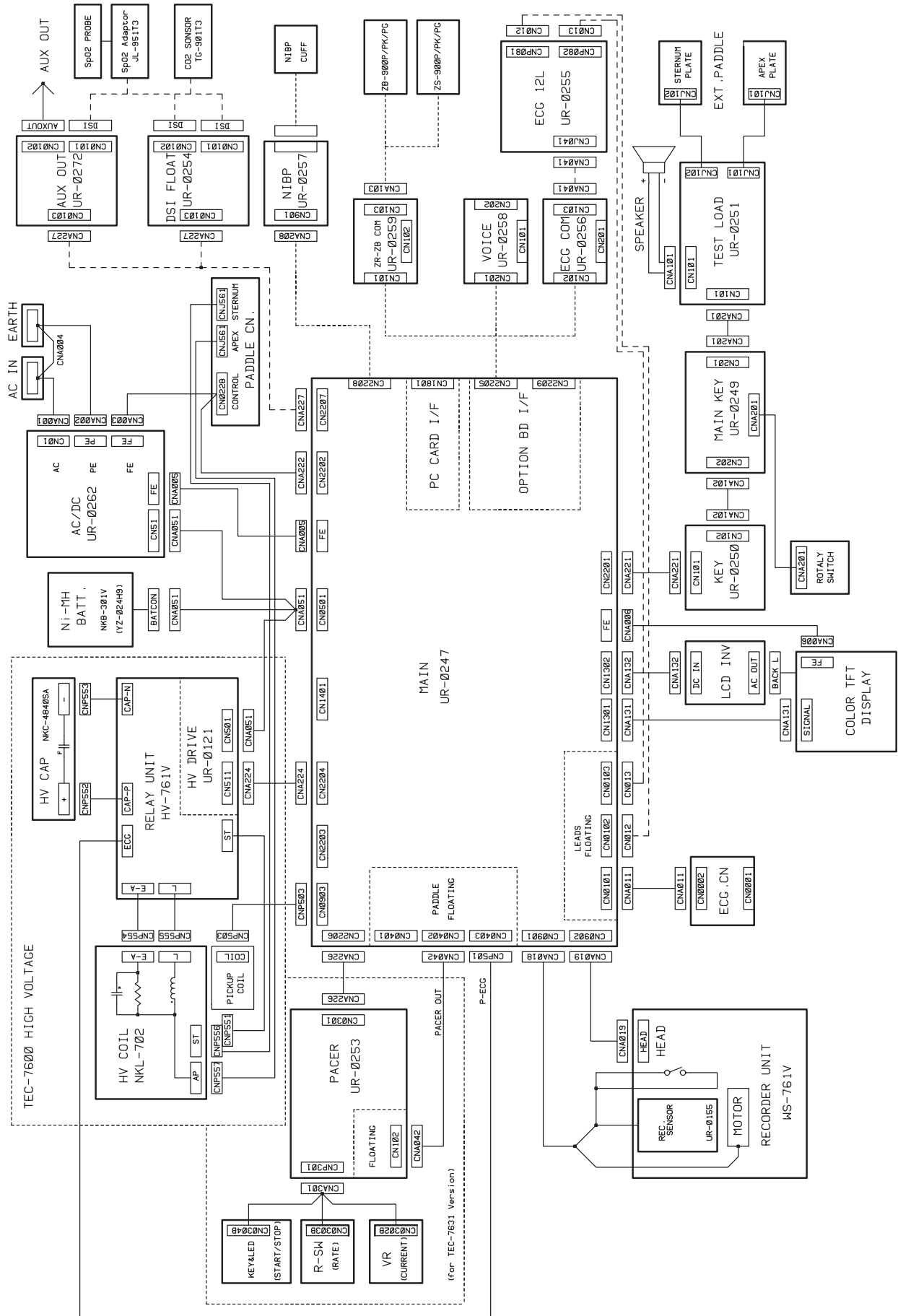
When the main board is replaced with a new one, do the following adjustment. Refer to "System Maintenance Screen - Adjust AD Screen".

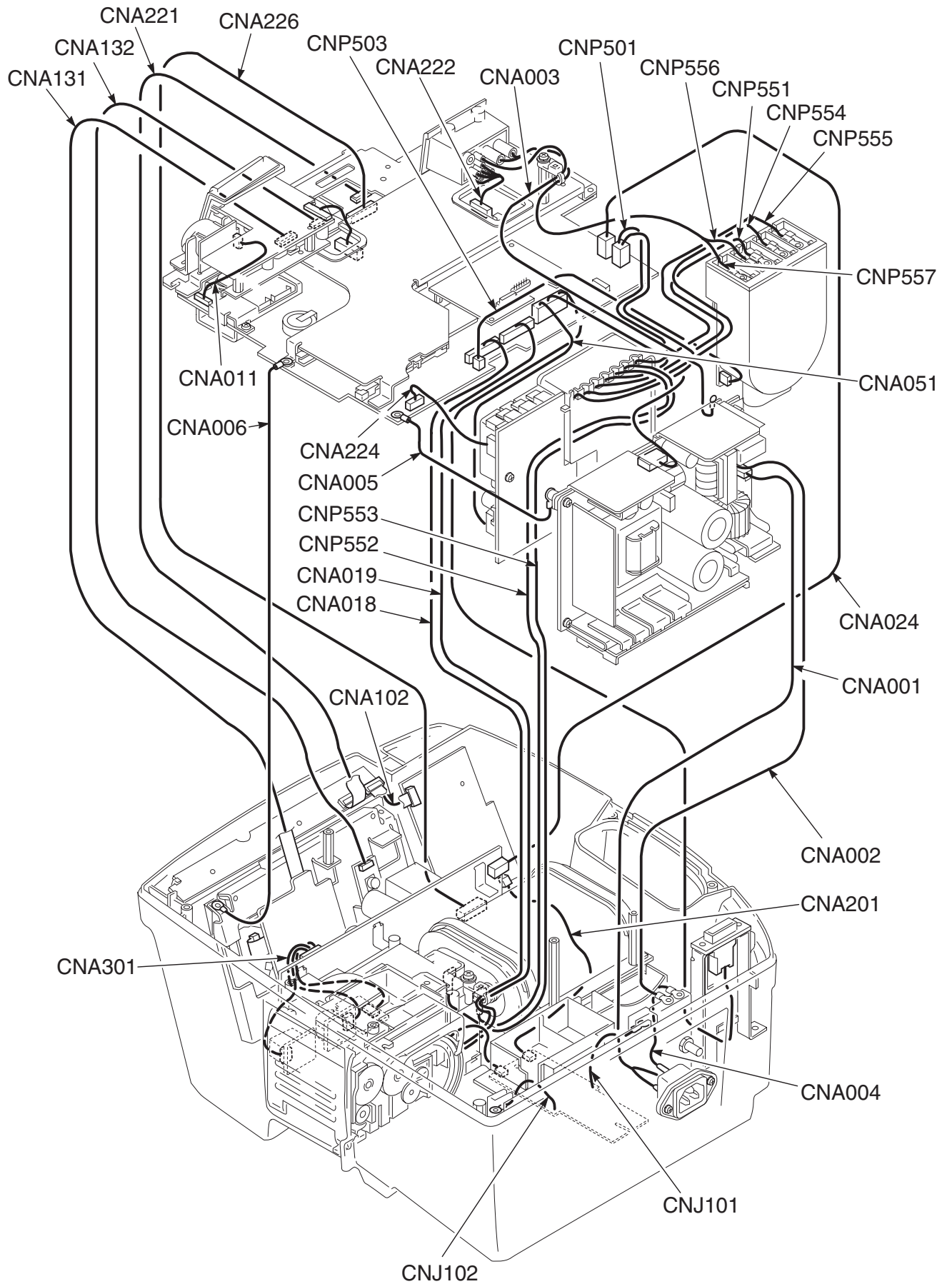
- ECG sensitivity and offset
- Charge energy, delivered energy, TTR
- Battery charging setting

### Required Tools

- Anti-static bench mat
- Wrist ground strap
- Phillips screwdriver (insulated type, for M3 and M4 screws)
- Hex socket driver (for 3 mm spacer bolt and nut)
- Allen wrench
- Tweezers
- Short bar

# Connection Diagram (TEC-7621/7631 Series)

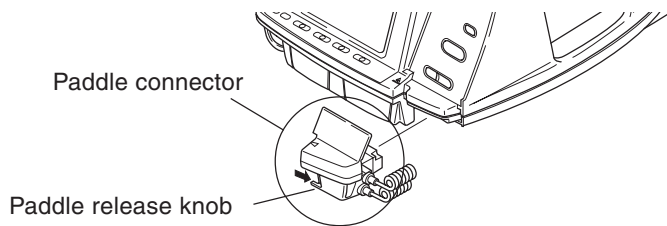




TEC-7631 with QI-762V (option)

## Removing the Lower Casing

### Removing the Paddles



1. Make sure that the power of the instrument is turned off.
2. Disconnect the AC power cord from the AC outlet and defibrillator.
3. Remove the paddles. To remove the paddles, press and hold the paddle release knob on the paddle connector and pull the paddle connector toward you.

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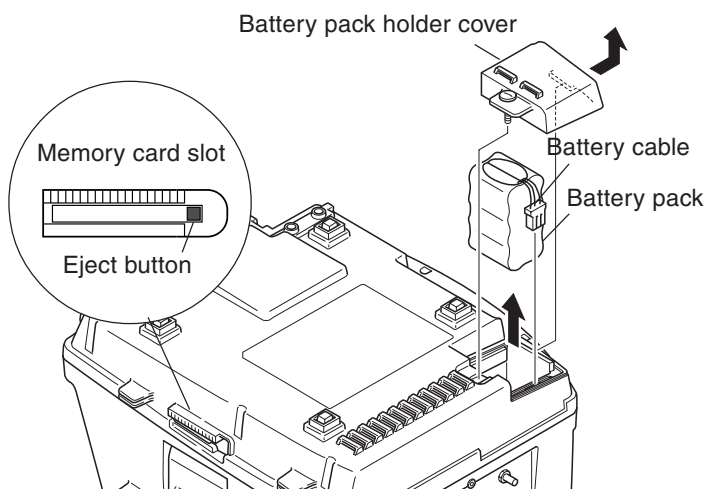
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### CAUTION

**When removing the paddle do not pull anywhere other than the paddle connector. Otherwise, the paddle connector or paddle cable may be damaged.**

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4. Remove the memory card if it is inserted.

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### CAUTION

**Make sure that the card eject button is depressed. Otherwise, the button may be damaged when removing the lower casing and the memory card slot becomes unusable.**

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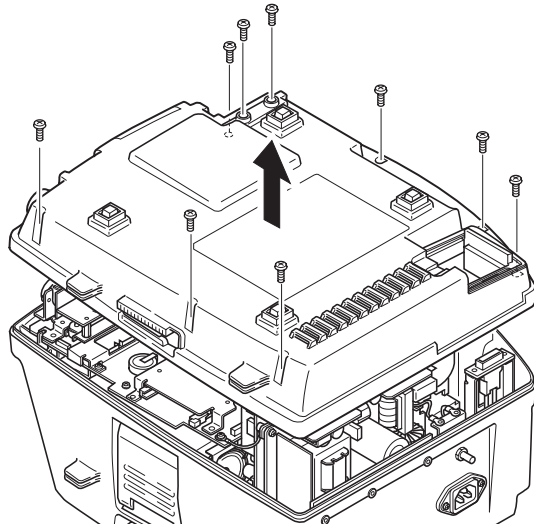
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### Removing the Battery Pack

1. Unscrew the battery holder cover screw and remove the battery pack holder cover.
2. Remove the battery cable and pull out the battery pack.

## Removing the Lower Casing

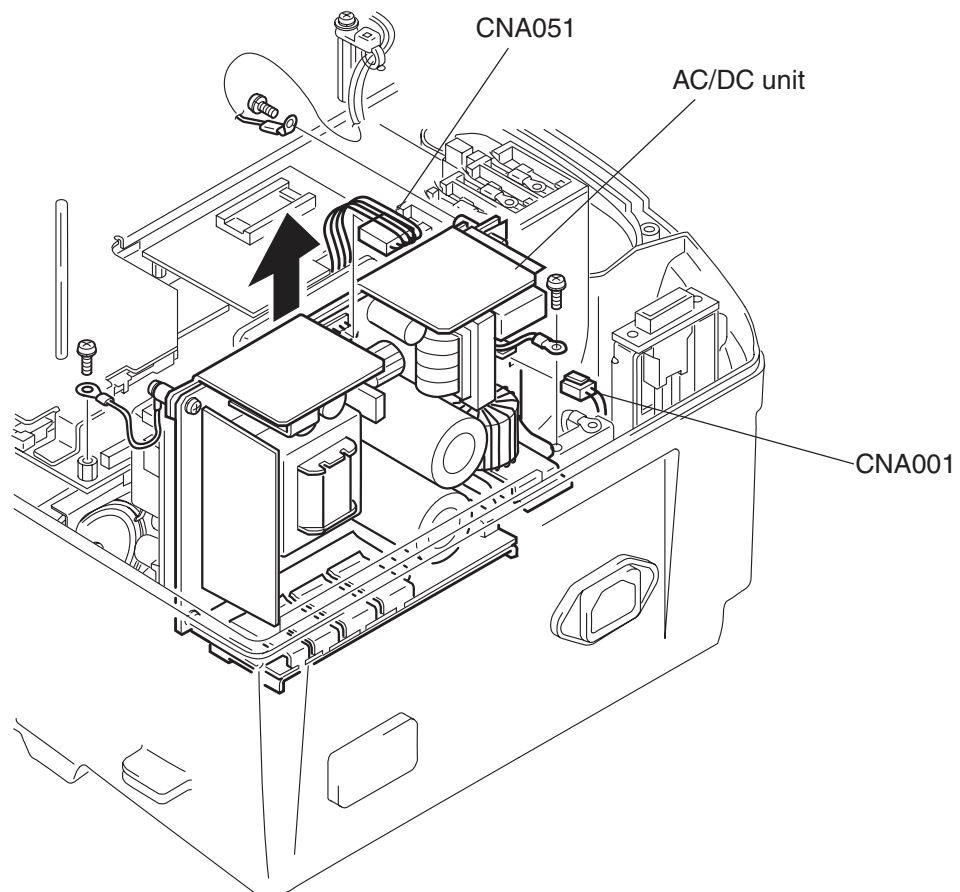
Remove the nine M4×10 binding head screws with washer and remove the lower casing.





## Removing the AC/DC Unit

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the three M3 screws with spring washers to remove the three ground leads.
3. Disconnect the CNA051 cable (to main unit, battery pack and relay unit) from the AC/DC unit:
4. Pull up the AC/DC unit.
5. Disconnect the CNA001 cable from the AC inlet.



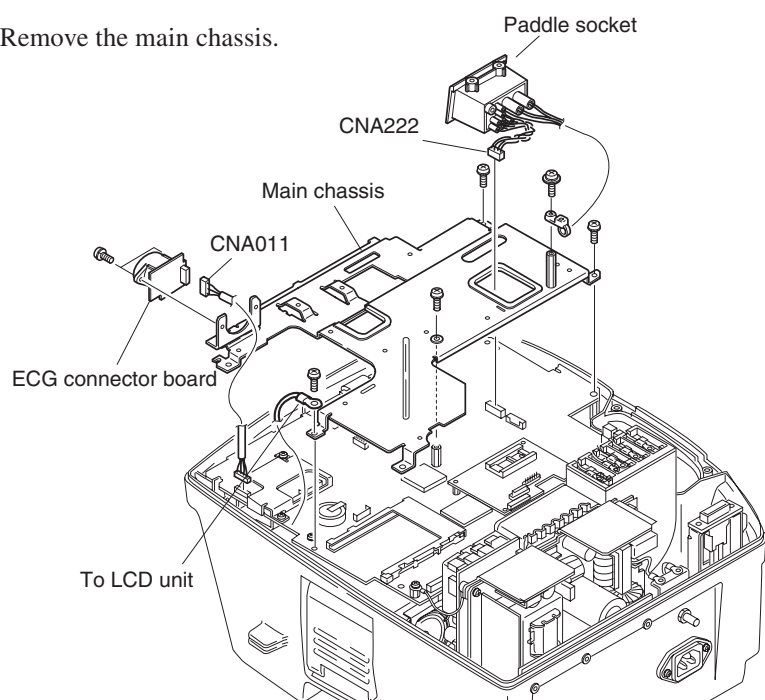
## Removing the Main Board

### Removing the Main Chassis

#### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, HV inductor, relay unit, paddle socket or paddles) of the instrument.

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the M3 pan screw with spring washer which secures the paddled socket cables to the main chassis and remove the paddle socket.
3. Remove the CNA222 cable which connects the paddle socket and main board from the main board.
4. Remove the M3 pan screw with spring washer which secures the ECG connector board to the main chassis and remove the ECG connector board.
5. Remove the CNA011 cable which is connected to the ECG connector board.
6. Remove the four M3 pan screws with spring washers which secure the main chassis to the main board.
7. If the optional QI-762V DSI Interface Board or QI-763V DSI/AUX OUT Interface Board is installed, disconnect the CNA227 cable which connects the interface board and the main board from the interface board.
8. Remove the main chassis.

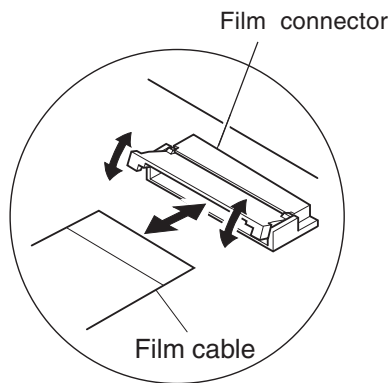


## Removing the Main Board

When the main chassis is removed, you can remove the main board.

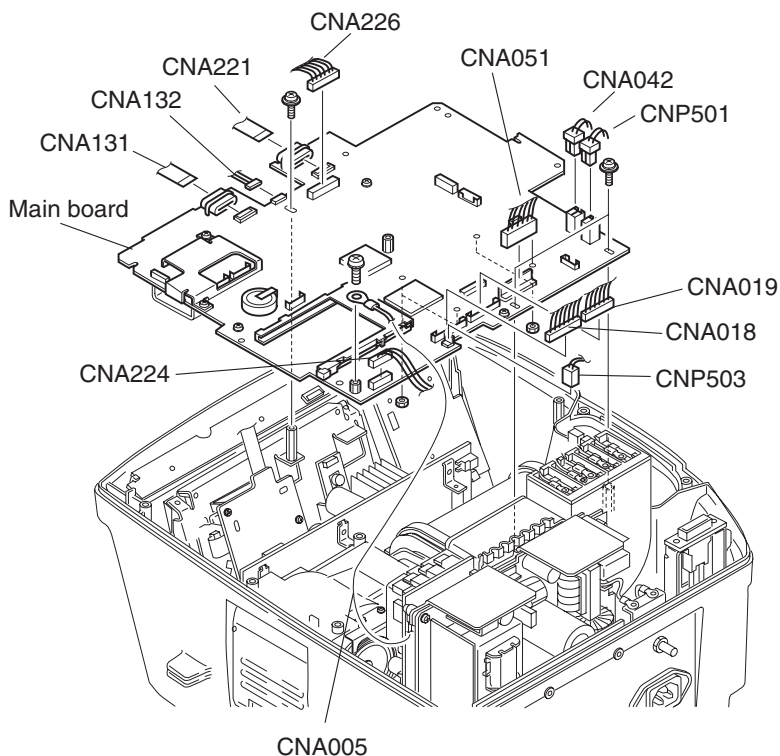
1. Disconnect the following cables:

- CNA131 film cable: Connects to the LCD unit.
- CNA132 cable: Connects to the LCD inverter board.
- CNA221 film cable: Connects to the key board.
- CNA226 cable: Connects to the pacer board (TEC-7631 series only).
- CNA042 cable: Connects to the pacer board (TEC-7631 series only).
- CNP501 cable: Connects to the relay unit.
- CNA051 cable: Connects to the relay unit, battery pack and AC/DC unit.
- CNA019 cable: Connects to the recorder unit.
- CNA018 cable: Connects to the recorder unit.
- CNP503 cable: Connects to the pickup coil in the HV inductor.
- CNA224 cable: Connects to the relay unit



To remove the film cable from the film cable connector, gently release the lock of the film cable connector with a small flat blade driver and your finger as shown in the expanded illustration. Be careful because the film cable connector is easily damaged.

2. Remove the two M3 pan screws, spacer and CNA005 ground lead (connected to the AC/DC unit).
3. Remove the main board.

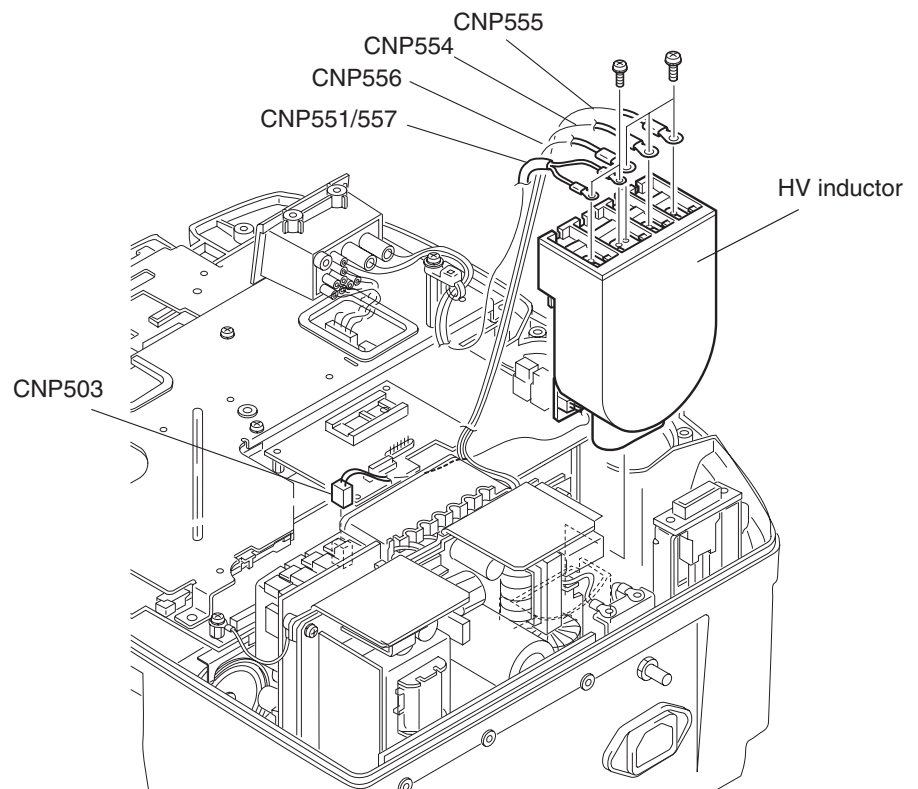
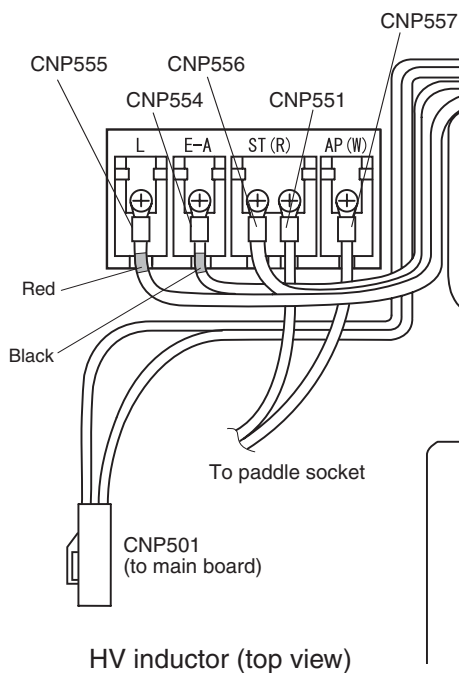


## Removing the HV Inductor

### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, HV inductor, relay unit, paddle socket or paddles) of the instrument.

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the five wires (CNP551, CNP554, CNP555, CNP556 and CNP557 wire) from the HV inductor.
3. Pull out the HV inductor.
4. Remove the CNP503 cable which connects the pickup coil and main board from the pickup coil.



## Removing the HV Capacitor and Relay Unit

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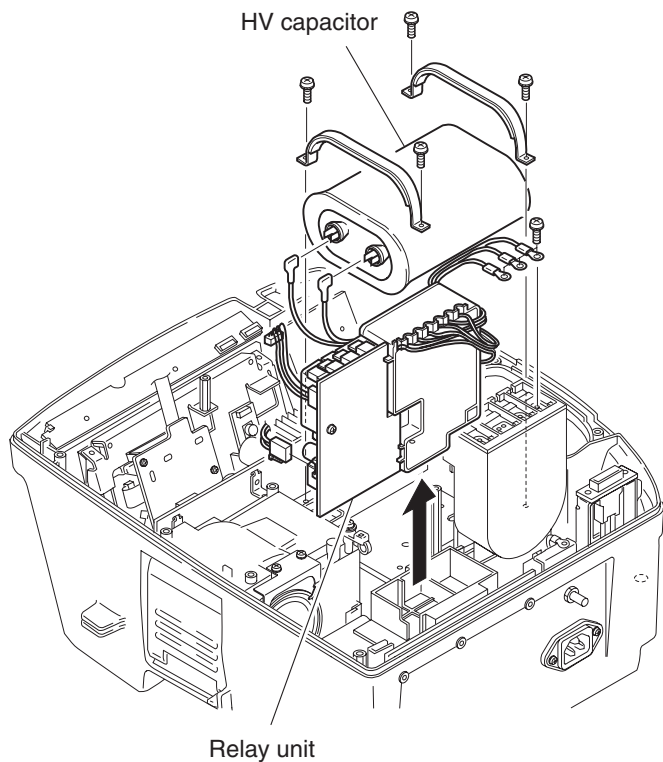
### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, HV inductor, relay unit, paddle socket or paddles) of the instrument.

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1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Make short-circuit the two HV capacitor terminals with the short bar which is connected to the ground terminal on the wall with the ground lead.
5. Remove the four M3 pan screws with spring washers which secure the HV capacitor to the lower casing and remove the two HV capacitor fixing brackets.
6. Remove the cap of the CNP552 and CNP553 wires from the HV capacitor.
7. Remove the HV capacitor.
8. Remove the three wires (CNP555, CNP554 and CNP556 wire) which connect the HV inductor and relay unit from the HV inductor.
9. Pull out the relay unit.



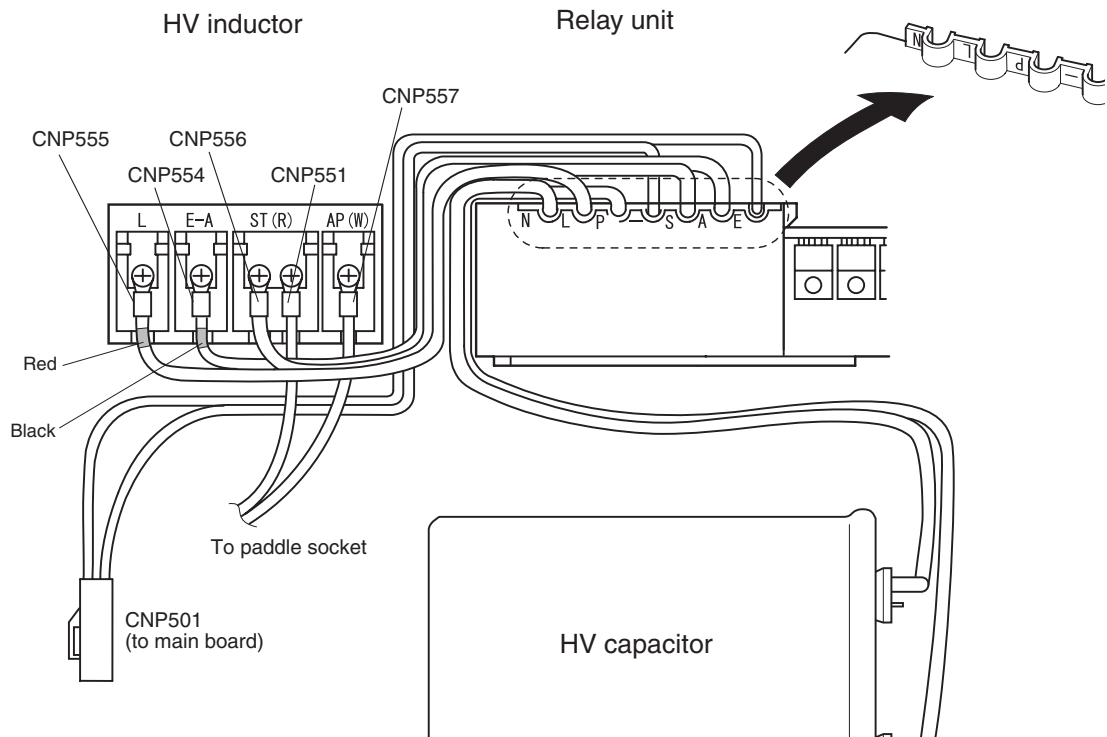
### Cable Connections of the High voltage Unit

### NOTE

After replacing the HV capacitor or relay unit, always check the following:

- TTR value
- Delivered energy
- Charge time

Refer to “System Maintenance Screen” in Section 5.



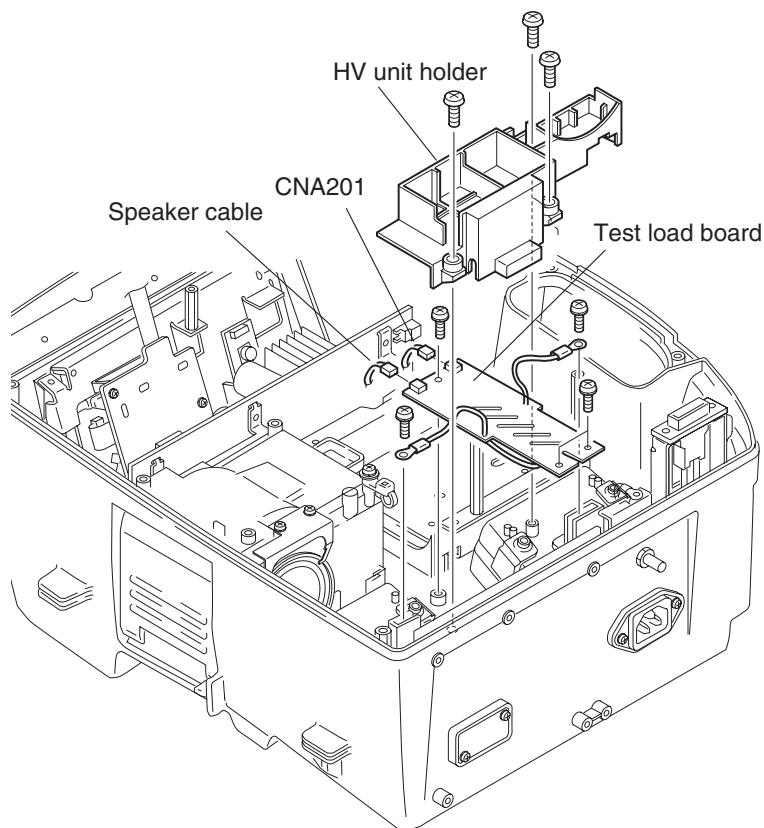
## Removing the Test Load Board

### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, HV inductor, relay unit, paddle socket or paddles) of the instrument.

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Remove the HV inductor. Refer to “Removing the HV Inductor”.
5. Remove the HV capacitor and relay unit. Refer to “Removing the HV Capacitor and Relay Unit”.

6. Remove the three M3 pan screws with spring washer and remove the HV unit holder.
7. Disconnect the CNA201 cable (to main board) and speaker cable from the test load board.
8. Remove the two M3 pan screws with washers and spring washers on the test electrode plate.
9. Remove the two M3 pan screws with washer and spring washers and remove the test load board.

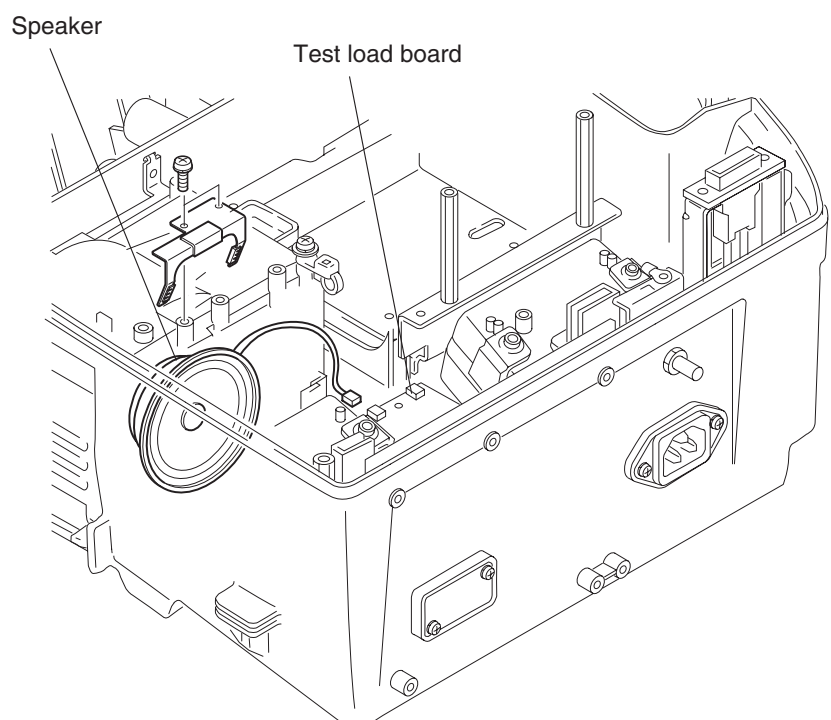


## Removing the Speaker

### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, HV inductor, relay unit, paddle socket or paddles) of the instrument.

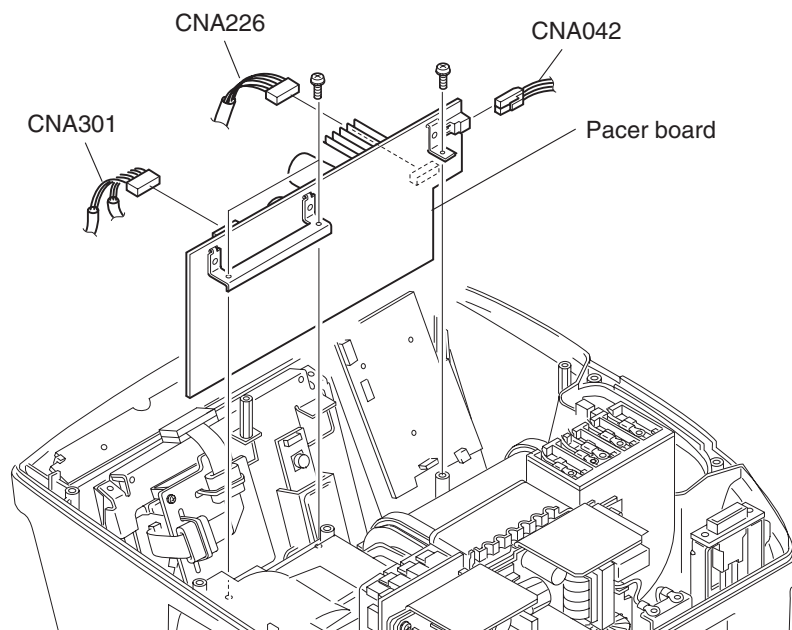
1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Remove the HV inductor. Refer to “Removing the HV Inductor”.
5. Remove the HV capacitor and relay unit. Refer to “Removing the HV Capacitor and Relay Unit”.
6. Remove the M3 pan screw with spring washer.
8. Remove the speaker cable from the test load board and remove the speaker.





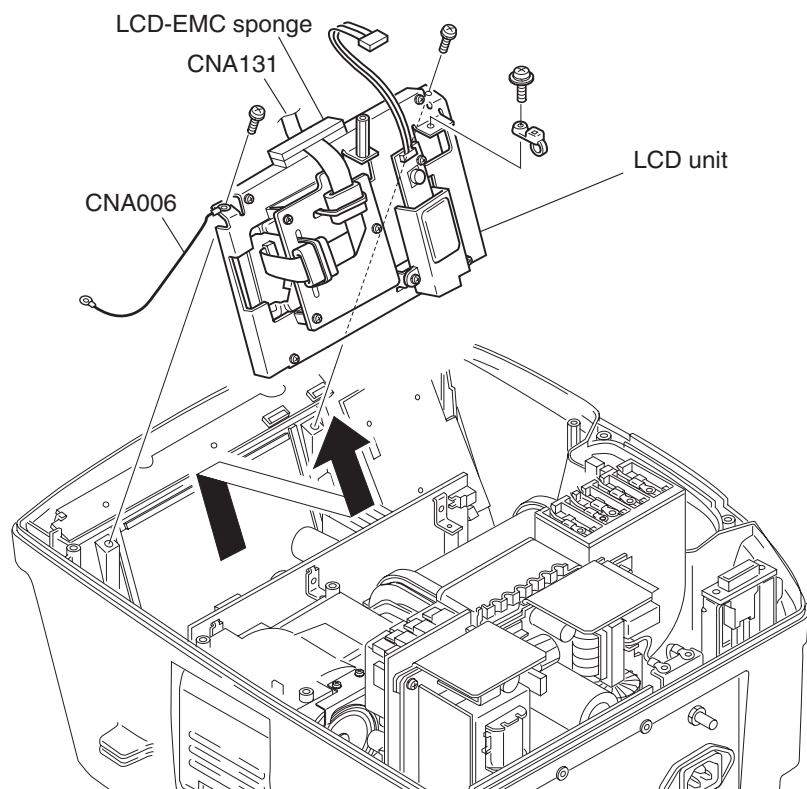
## Removing the Pacer Board (TEC-7631 Series Only)

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the main chassis and main board. Refer to “Removing the Main Board”.
3. Disconnect the following cables from the pacer board:
  - CNA301 cable: Connects to the PACING OUTPUT control and PACING RATE control.
  - CNA226 cable: Connects to the main board.
  - CNA042 cable: Connects to the main board.
4. Remove the three M3 pan screws with spring washers and remove the pacer board.



## Removing the LCD Unit

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the main chassis and main board. Refer to “Removing the Main Board”.
3. Remove the two M3 pan screws with spring washers and remove the LCD unit.

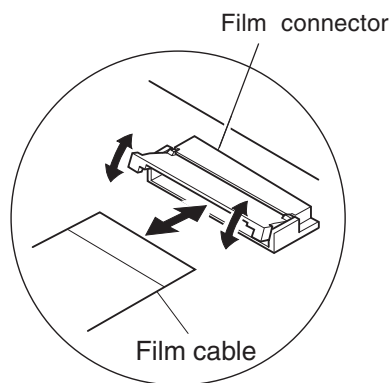


### NOTE

When assembling, pass the CNA131 film cable between the LCD-EMC sponges.

## Removing the Main Key Board and Key Board

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the main chassis and main board. Refer to “Removing the Main Board”.
3. Disconnect the following cables:
  - Rotary switch cable.
  - CNA201 cable: Connects to the test load.
  - CNA102 film cable: Connects to the main key board and key board.

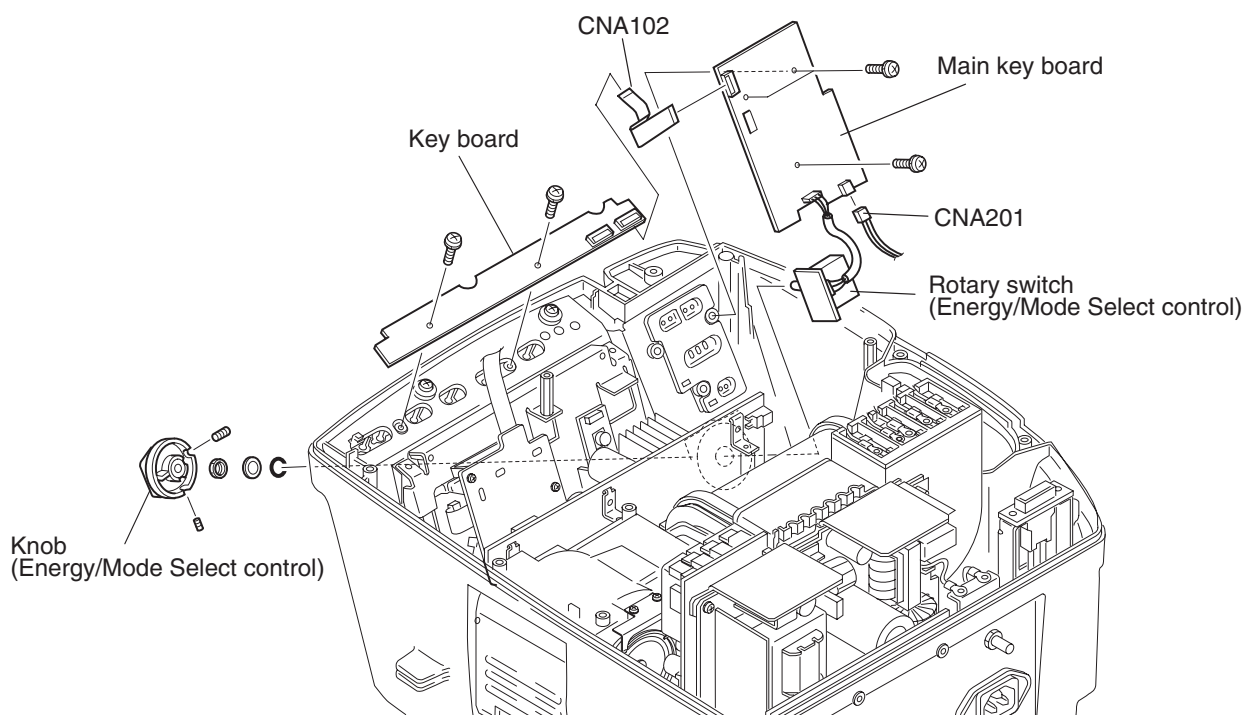


To remove the film cable from the film cable connector, gently release the lock of the film cable connector with a small flat blade driver and your finger as shown in the expanded illustration. Be careful because the film cable connector is easily damaged.

4. Remove the three M3 pan screws with washers and spring washers and remove the main key board.
5. Remove the two M3 pan screws with washers and spring washers and remove the key board.

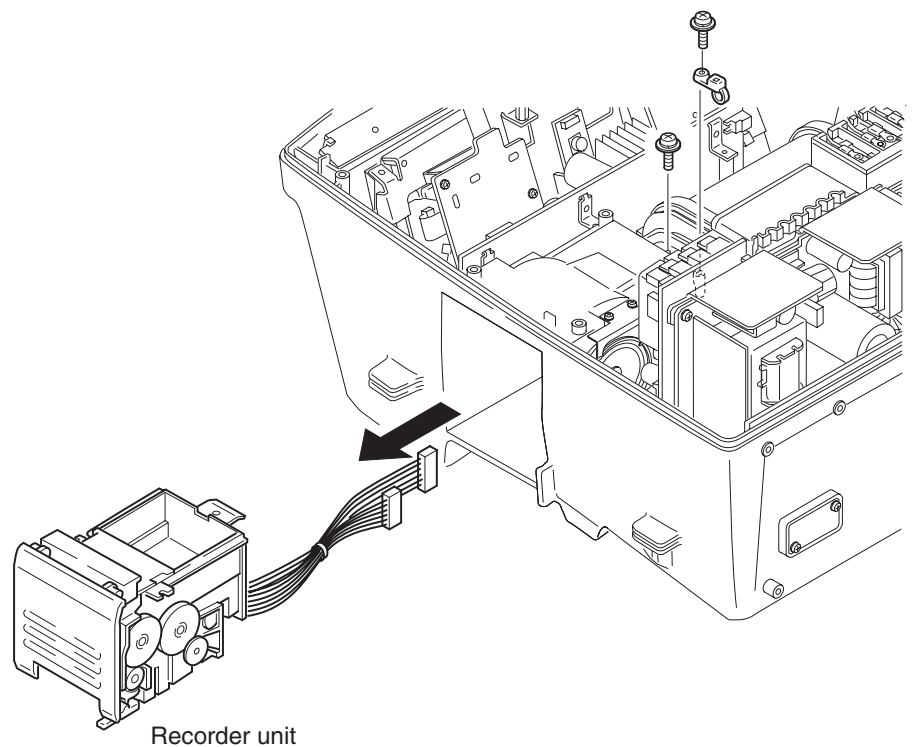
To remove the Energy/Mode Select control knob on the front panel.

- 1) Remove the two allen screws on the Energy/Mode Select control knob.
- 2) Remove the knob, nut, washer and O ring from the rotary switch.



## Removing the Recorder Unit

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the main chassis and main board. Refer to “Removing the Main Board”.
3. Remove the two M3 pan screws with spring washers and pull out the recorder unit.



## Removing the Paddle Locks

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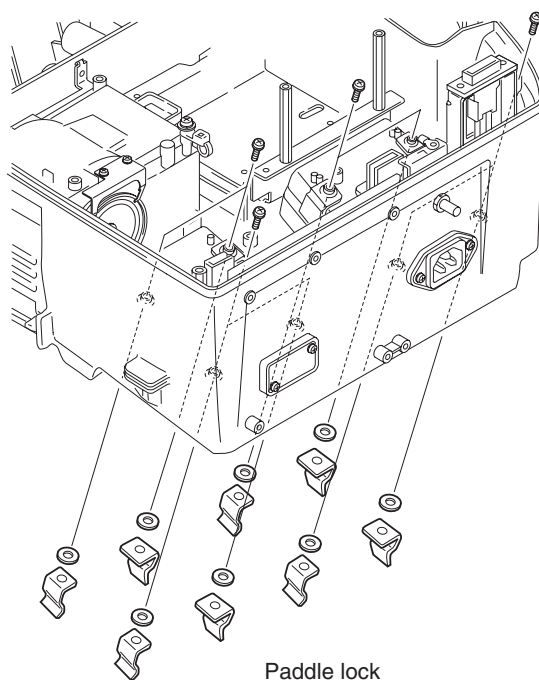
### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, HV inductor, relay unit, paddle socket or paddles) of the instrument.

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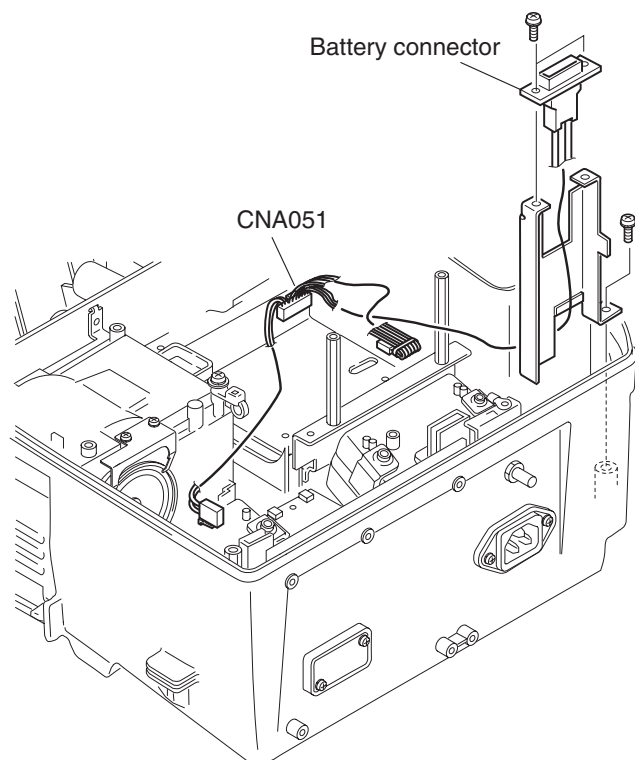
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1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Remove the HV inductor. Refer to “Removing the HV Inductor”.
5. Remove the HV capacitor and relay unit. Refer to “Removing the HV Capacitor and Relay Unit”.
6. Remove the test load board. Refer to “Removing the Test Load Board”.
7. Remove the M3 pan screws with spring washer and remove the paddle lock.



## Removing the Battery Connector

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Disconnect the CNA051 cable from the main board and relay unit .
4. Remove the M3 pan screws with spring washer and remove the battery connector.



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# *Disassembly - TEC-7721/7731 Series*

Before You Begin .....	3.2.1
Warnings, Cautions and Notes .....	3.2.1
Required Tools .....	3.2.1
How to Troubleshoot .....	3.2.1
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Removing the Battery Pack .....	3.2.4
Removing the Lower Casing .....	3.2.4
Removing the Paddles .....	3.2.4
Removing the Lower Casing .....	3.2.5
Removing the AC/DC Unit .....	3.2.6
Removing the Main Board .....	3.2.7
Removing the Main Chassis .....	3.2.7
Removing the Main Board and Terminal Bracket .....	3.2.9
Removing the HV Capacitor and Biphasic HV Unit .....	3.2.10
Removing the Test Load Board .....	3.2.11
Removing the Speaker .....	3.2.12
Removing the Pacer Board (TEC-7731 Series Only) .....	3.2.13
Removing the LCD Unit .....	3.2.14
Removing the Main Key Board and Key Board .....	3.2.15
Removing the Recorder Unit .....	3.2.16
Removing the Paddle Locks .....	3.2.17
Removing the Battery Connector .....	3.2.18



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The procedures in this section explain how to remove, replace and install major components in the **TEC-7721/7731 series defibrillator** (for TEC-7621/7631 series defibrillator, see the previous section).

## Before You Begin

### Warnings, Cautions and Notes

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#### WARNING

- The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, biphasic HV unit, terminal bracket, paddle socket or paddles) of the instrument.
- Removal and replacement of any components in the instrument should only be done by qualified service personnel.
- To avoid the possibility of injury to yourself or damage to the instrument, do not install or remove any component while the power is on. When disassembling, make sure that the instrument is off, the AC power cord is disconnected from the instrument and the battery pack is removed from the defibrillator.

There are several high voltage units inside the instrument: LCD backlight, high voltage capacitor, pacing DC/DC converter and switching regulator.

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#### CAUTIONS

- To avoid accidental discharge of static electricity which could damage the components of the instrument, use a grounded wrist strap when installing or removing any component of the instrument.
  - Fuses on the main board and AC/DC unit cut off the power when an abnormality occurs in the instrument. Eliminate the malfunction before replacing the fuse. Use the correct fuse only.
  - Use only parts recommended by Nihon Kohden to assure maximum performance from your instrument.
- 
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#### NOTE

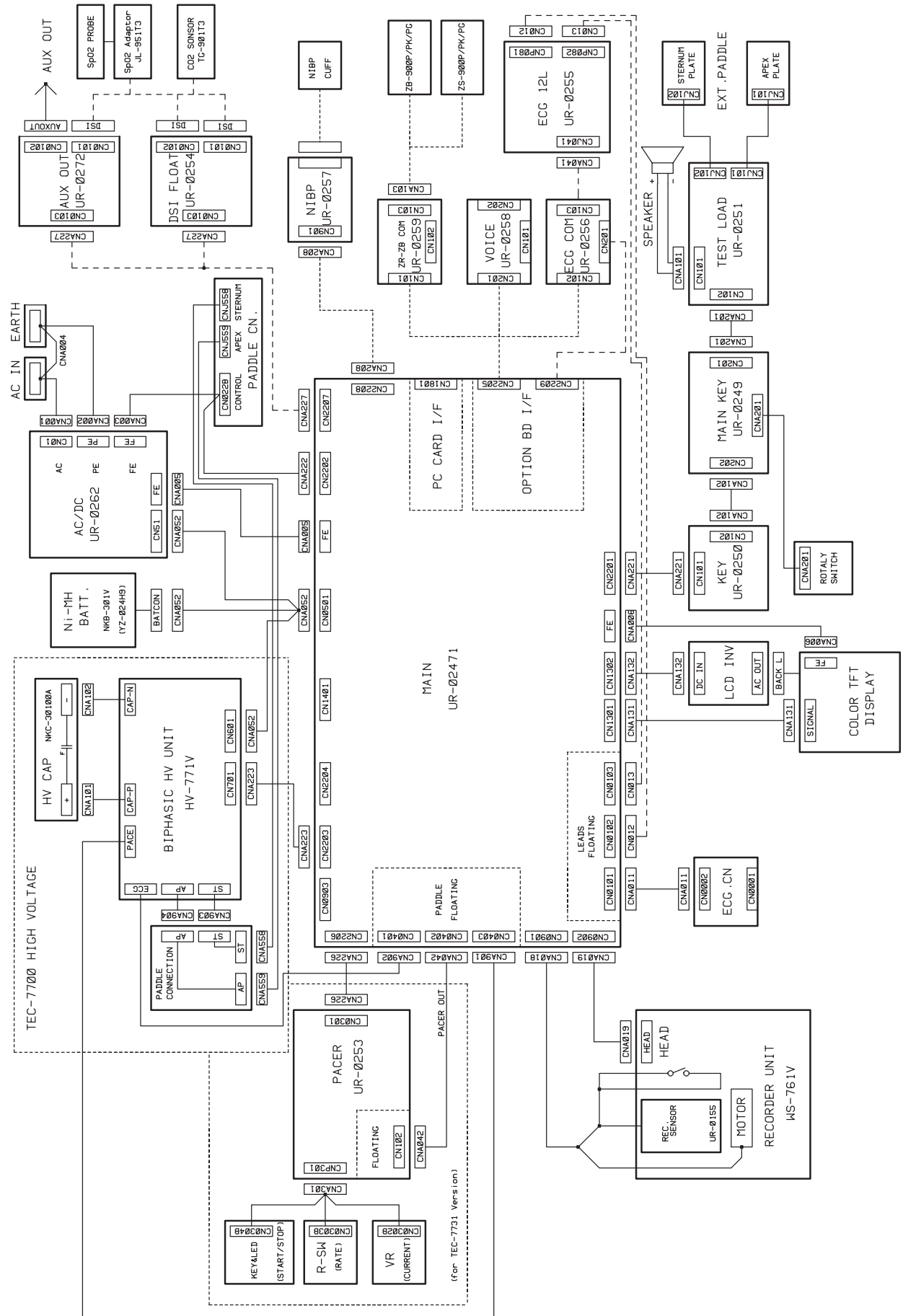
When the main board is replaced with a new one, do the following adjustment. Refer to “System Maintenance Screen - Adjust AD Screen”.

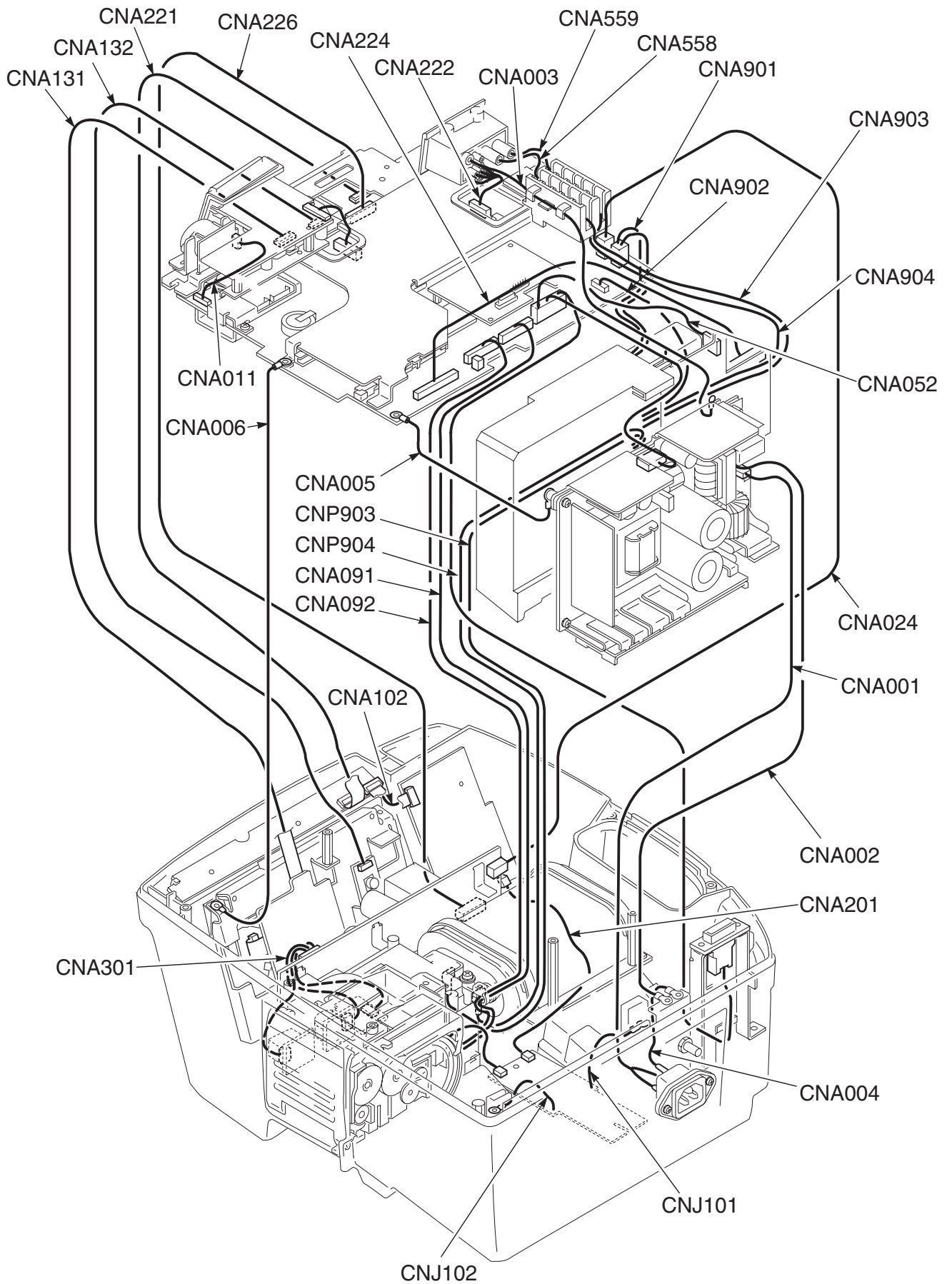
- ECG sensitivity and offset
- Charge energy, delivered energy, TTR
- Battery charging setting

### Required Tools

- Anti-static bench mat
- Wrist ground strap
- Phillips screwdriver (insulated type, for M3 and M4 screws)
- Hex socket driver (for 3 mm spacer bolt and nut)
- Allen wrench
- Tweezers
- Short bar

# Connection Diagram (TEC-7721/7731 Series Defibrillator)

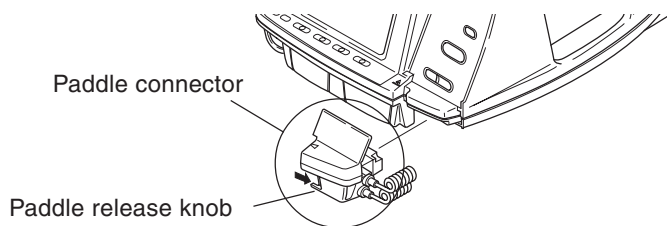




TEC-7731 with QI-762V (option)

## Removing the Lower Casing

### Removing the Paddles



1. Make sure that the power of the instrument is turned off.
2. Disconnect the AC power cord from the AC outlet and defibrillator.
3. Remove the paddles. To remove the paddles, press and hold the paddle release knob on the paddle connector and pull the paddle connector toward you.

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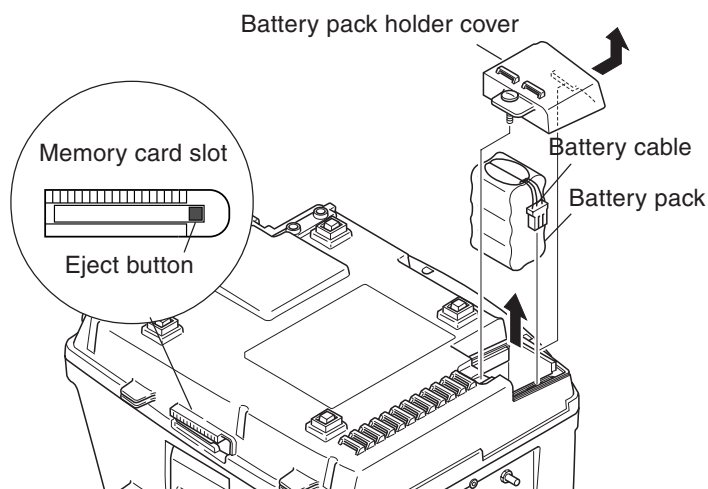
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#### CAUTION

**When removing the paddle do not pull anywhere other than the paddle connector. Otherwise, the paddle connector or paddle cable may be damaged.**

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4. Remove the memory card if it is inserted.

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#### CAUTION

**Make sure that the card eject button is depressed. Otherwise, the button may be damaged when removing the lower casing and the memory card slot becomes unusable.**

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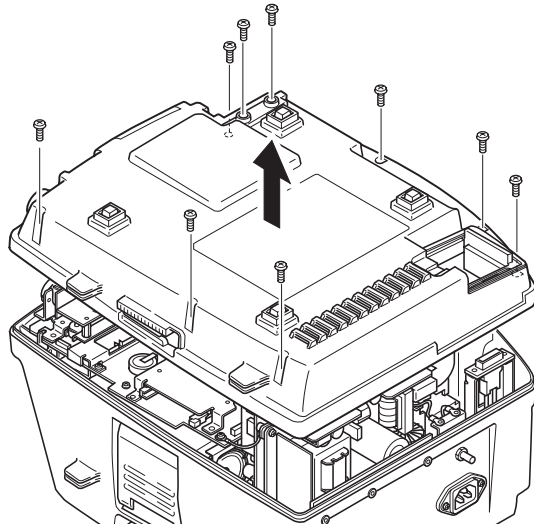
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### Removing the Battery Pack

1. Unscrew the battery holder cover screw and remove the battery pack holder cover.
2. Remove the battery cable and pull out the battery pack.

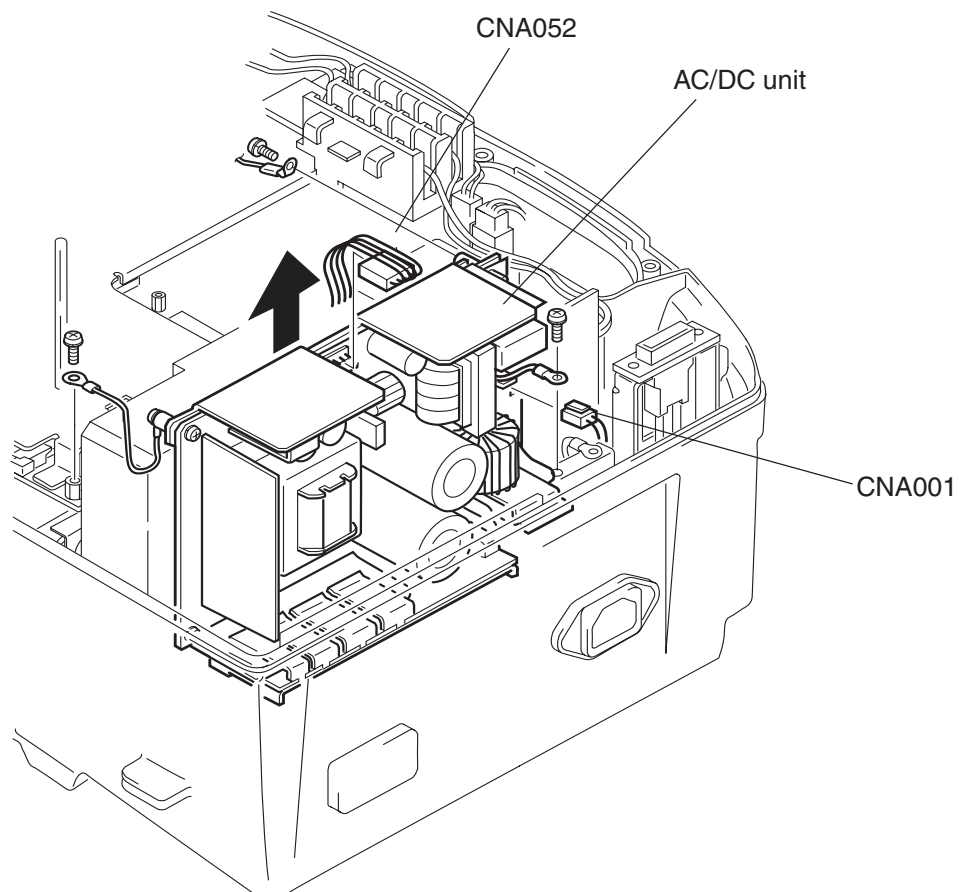
## Removing the Lower Casing

Remove the nine M4×10 binding head screws with washer and remove the lower casing.



## Removing the AC/DC Unit

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the three M3 screws with spring washers to remove the three ground leads.
3. Disconnect the CNA052 cable (to main unit, battery pack and biphasic HV unit) from the AC/DC unit:
4. Pull up the AC/DC unit.
5. Disconnect the CNA001 cable from the AC inlet.



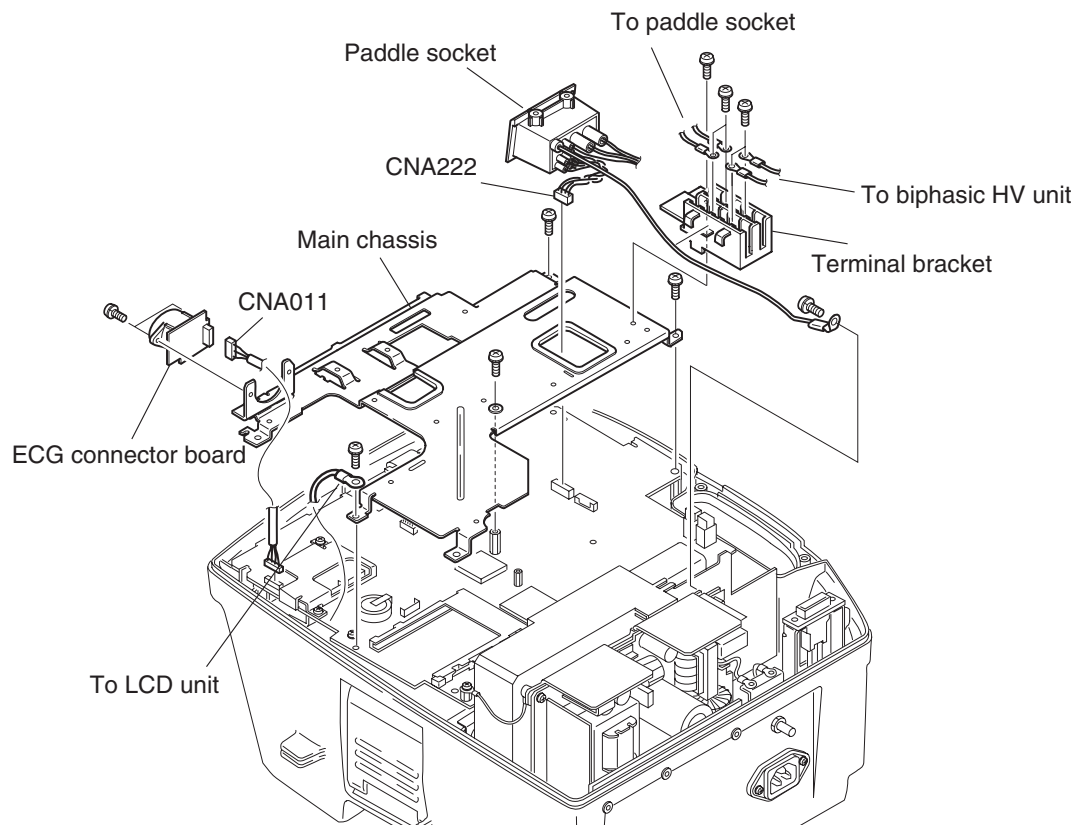
## Removing the Main Board

### Removing the Main Chassis

#### WARNING

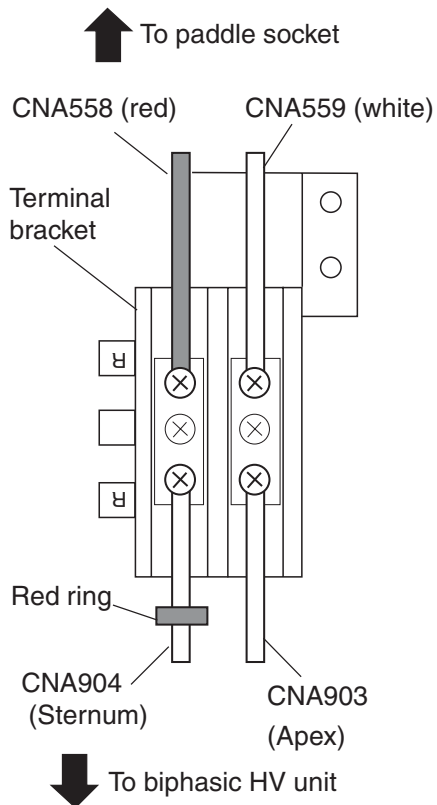
The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, biphasic HV unit, terminal bracket, paddle socket or paddles) of the instrument.

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the M3 pan screw with spring washer which secures the paddled socket cables to the main chassis and remove the paddle socket.
3. Remove the CNA222 cable which connects the paddle socket and main board from the main board.





### 3. DISASSEMBLY - TEC-7721/7731 SERIES



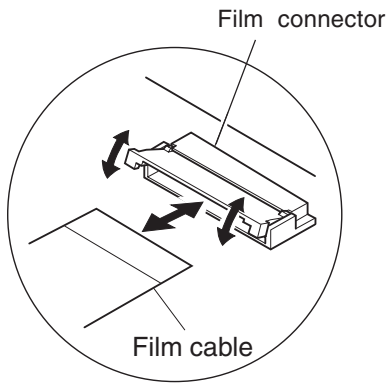
4. Remove the M3 pan screw with spring washer which secures the ECG connector board to the main chassis and remove the ECG connector board.
5. Remove the CNA011 cable which is connected to the ECG connector board.
6. Remove the two wires (CNA558 and CNA559 wire) from the paddle socket and the two wires (CNA903 and CAP904 wire) from the biphasic HV unit.
7. Remove the two M3 pan screws with spring washers which secure the terminal bracket to the main chassis.
8. Remove the four M3 pan screws with spring washers which secure the main chassis to the main board.
9. If the optional QI-762V DSI Interface Board or QI-763V DSI/AUX OUT Interface Board is installed, disconnect the CNA227 cable which connects the interface board and the main board from the interface board.
10. Remove the main chassis.

## Removing the Main Board and Terminal Bracket

When the main chassis is removed, you can remove the main board.

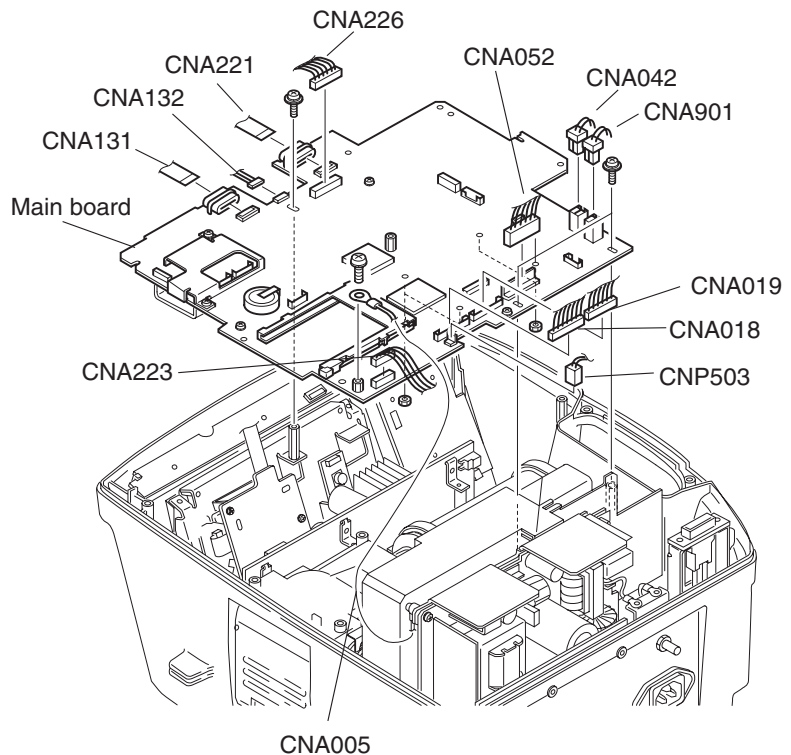
### 1. Disconnect the following cables:

- CNA131 film cable: Connects to the LCD unit.
- CNA132 cable: Connects to the LCD inverter board.
- CNA221 film cable: Connects to the key board.
- CNA226 cable: Connects to the pacer board (TEC-7731 series only).
- CNA042 cable: Connects to the pacer board (TEC-7731 series only).
- CNA901 cable: Connects to the biphasic HV unit.
- CNA052 cable: Connects to the biphasic HV unit, battery pack and AC/DC unit.
- CNA019 cable: Connects to the recorder unit.
- CNA018 cable: Connects to the recorder unit.
- CNP503 cable: Connects to the pickup coil in the HV inductor.
- CNA223 cable: Connects to the biphasic HV unit



To remove the film cable from the film cable connector, gently release the lock of the film cable connector with a small flat blade driver and your finger as shown in the expanded illustration. Be careful because the film cable connector is easily damaged.

2. Remove the two M3 pan screws, spacer and CNA005 ground lead (connected to the AC/DC unit).
3. Remove the main board.

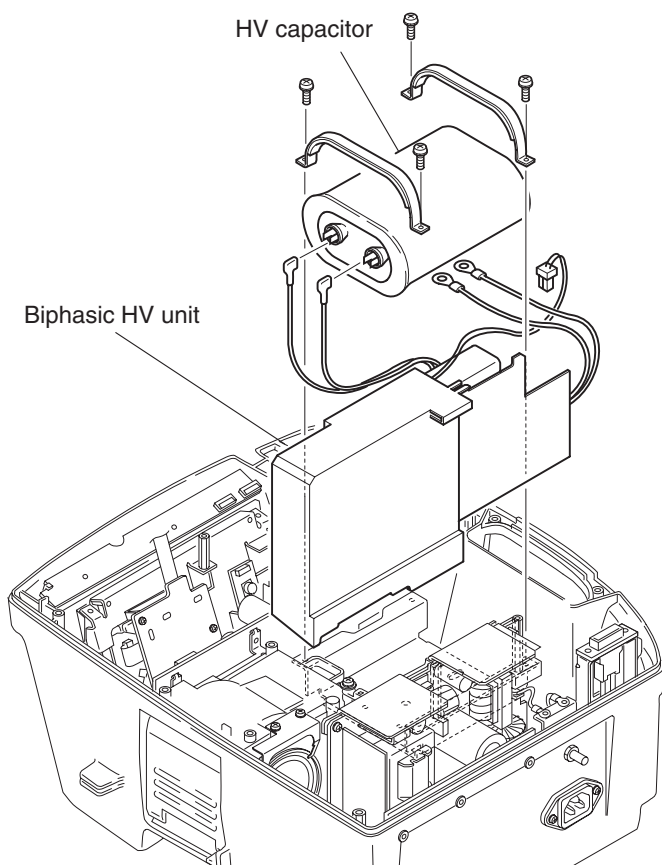


## Removing the HV Capacitor and Biphasic HV Unit

### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, biphasic HV unit, terminal bracket, paddle socket or paddles) of the instrument.

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Make short-circuit the two HV capacitor terminals with the short bar which is connected to the ground terminal on the wall with the ground lead.
5. Remove the four M3 pan screws with spring washers which secure the HV capacitor to the lower casing and remove the two HV capacitor fixing brackets.
6. Remove the cap of the CNA101 and CNA102 wires from the HV capacitor.
7. Remove the HV capacitor.
8. Pull out the biphasic HV unit.



### NOTE

After replacing the HV capacitor or biphasic HV unit, always check the following:

- TTR value
- Delivered energy
- Charge time

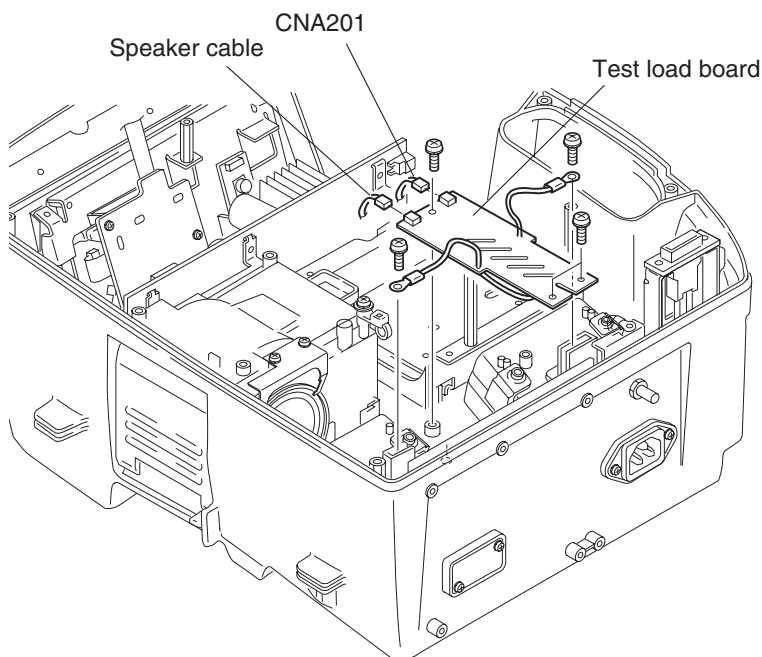
Refer to “System Maintenance Screen” in Section 5.

## Removing the Test Load Board

### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, biphasic HV unit, terminal bracket, paddle socket or paddles) of the instrument.

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Remove the HV capacitor and biphasic HV unit. Refer to “Removing the HV Capacitor and Biphasic HV Unit”.



5. Disconnect the CNA201 cable (to main board) and speaker cable from the test load board.
6. Remove the two M3 pan screws with washers and spring washers on the test electrode plate.
7. Remove the two M3 pan screws with washer and spring washers and remove the test load board.

## Removing the Speaker

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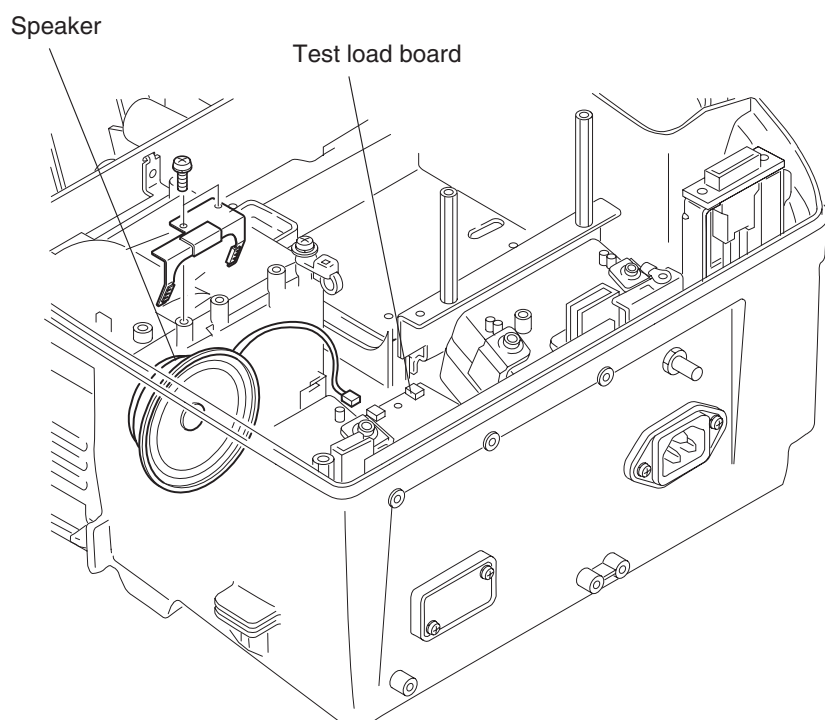
### WARNING

**The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, biphasic HV unit, terminal bracket, paddle socket or paddles) of the instrument.**

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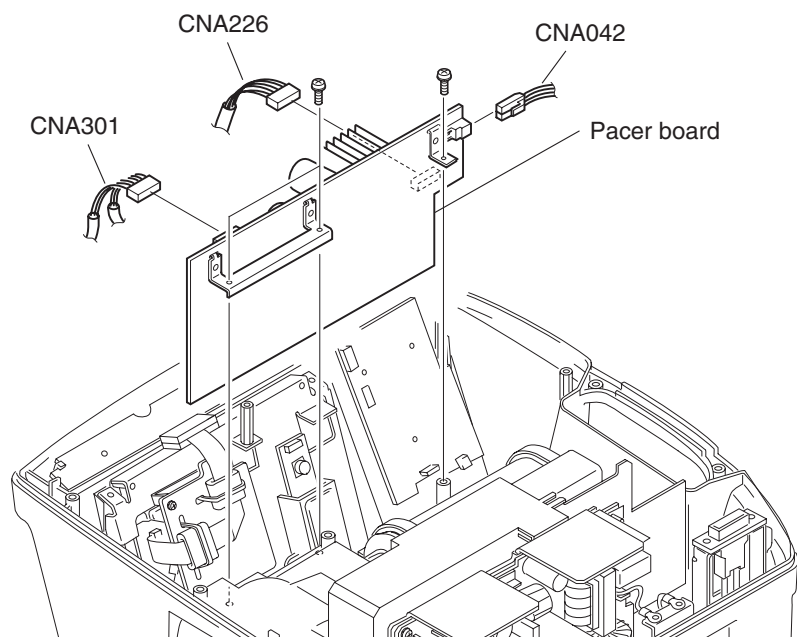
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1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Remove the HV capacitor and biphasic HV unit. Refer to “Removing the HV Capacitor and Biphasic HV Unit”.
5. Remove the M3 pan screw with spring washer.
68. Remove the speaker cable from the test load board and remove the speaker.



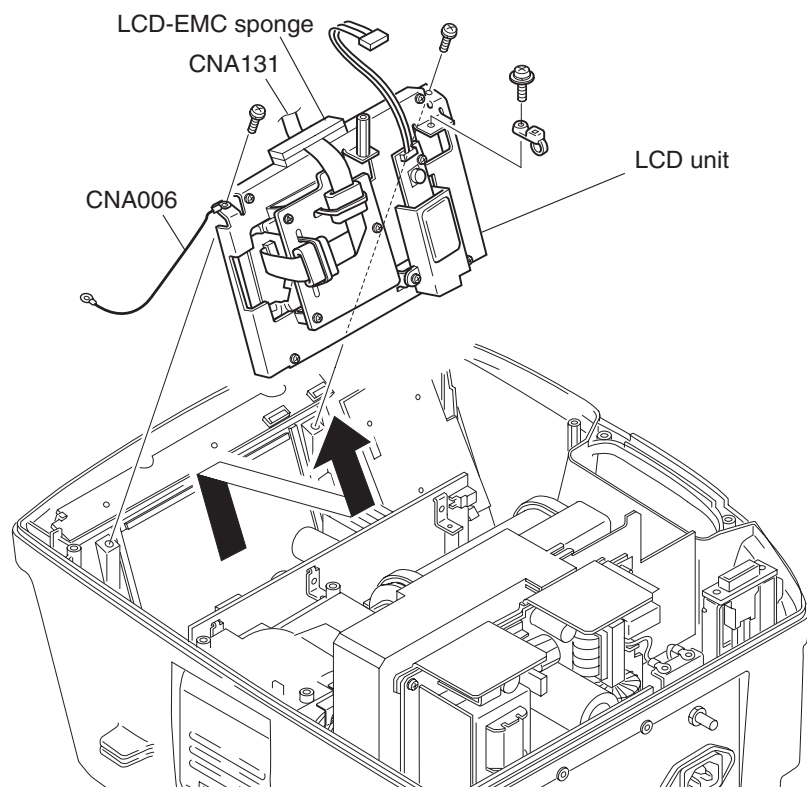
## Removing the Pacer Board (TEC-7731 Series Only)

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the main chassis and main board. Refer to “Removing the Main Board”.
3. Disconnect the following cables from the pacer board:
  - CNA301 cable: Connects to the PACING OUTPUT control and PACING RATE control.
  - CNA226 cable: Connects to the main board.
  - CNA042 cable: Connects to the main board.
4. Remove the three M3 pan screws with spring washers and remove the pacer board.



## Removing the LCD Unit

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the main chassis and main board. Refer to “Removing the Main Board”.
3. Remove the two M3 pan screws with spring washers and remove the LCD unit.

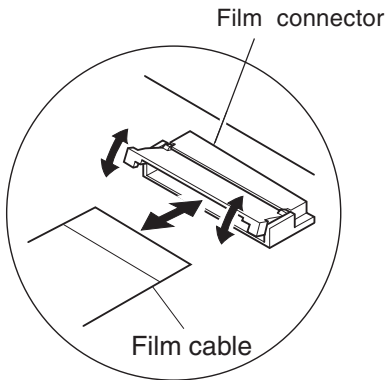


### NOTE

When assembling, pass the CNA131 film cable between the LCD-EMC sponges.

## Removing the Main Key Board and Key Board

1. Remove the battery pack, memory card and lower casing. Refer to "Removing the Lower Casing".
2. Remove the main chassis and main board. Refer to "Removing the Main Board".



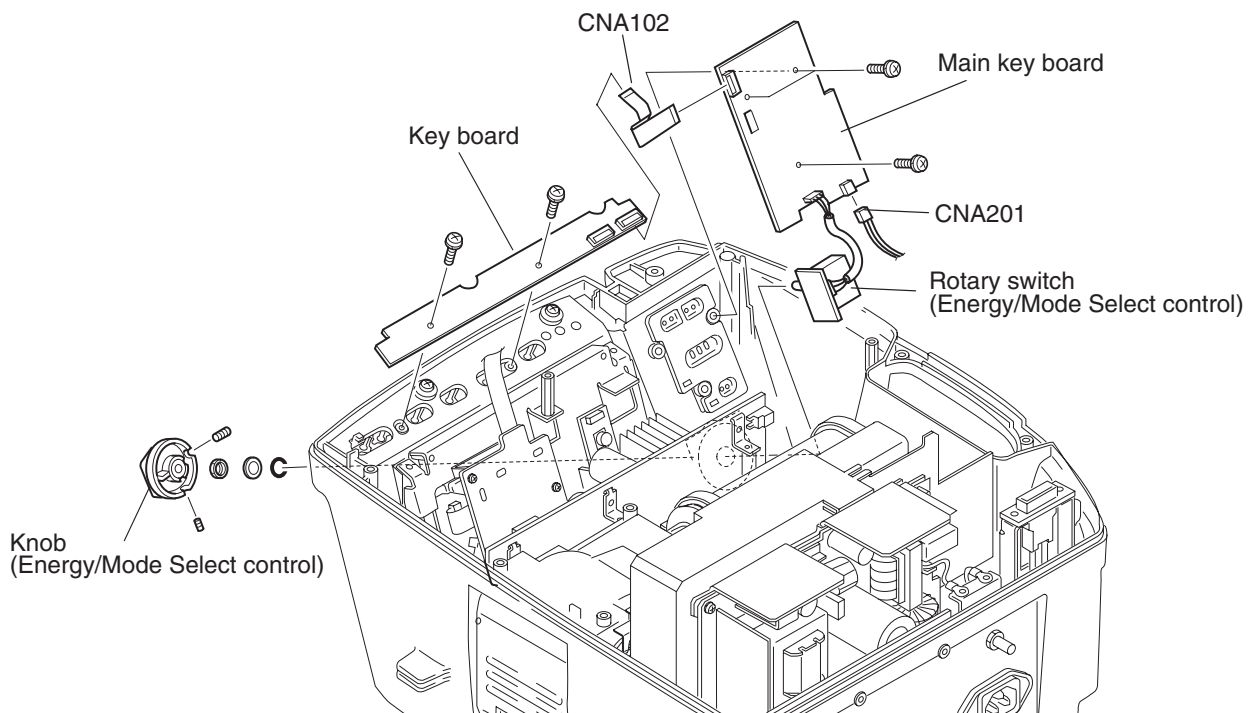
3. Disconnect the following cables:
  - Rotary switch cable.
  - CNA201 cable: Connects to the test load.
  - CNA102 film cable: Connects to the main key board and key board.

To remove the film cable from the film cable connector, gently release the lock of the film cable connector with a small flat blade driver and your finger as shown in the expanded illustration. Be careful because the film cable connector is easily damaged.

4. Remove the three M3 pan screws with washers and spring washers and remove the main key board.
5. Remove the two M3 pan screws with washers and spring washers and remove the key board.

To remove the Energy/Mode Select control knob on the front panel.

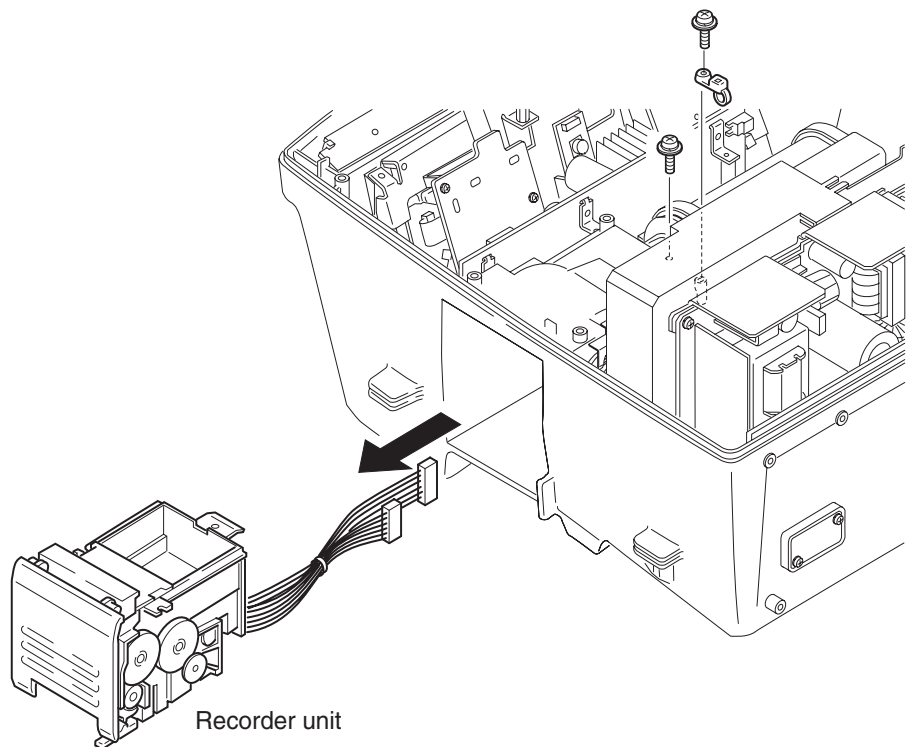
- 1) Remove the two allen screws on the Energy/Mode Select control knob.
- 2) Remove the knob, nut, washer and O ring from the rotary switch.





## Removing the Recorder Unit

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the main chassis and main board. Refer to “Removing the Main Board”.
3. Remove the two M3 pan screws with spring washers and pull out the recorder unit.



## Removing the Paddle Locks

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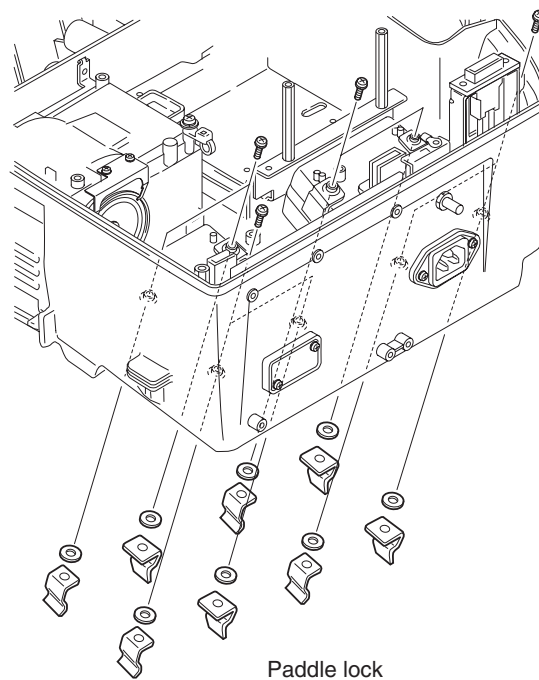
### WARNING

The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component (HV capacitor, biphasic HV unit, terminal bracket, paddle socket or paddles) of the instrument.

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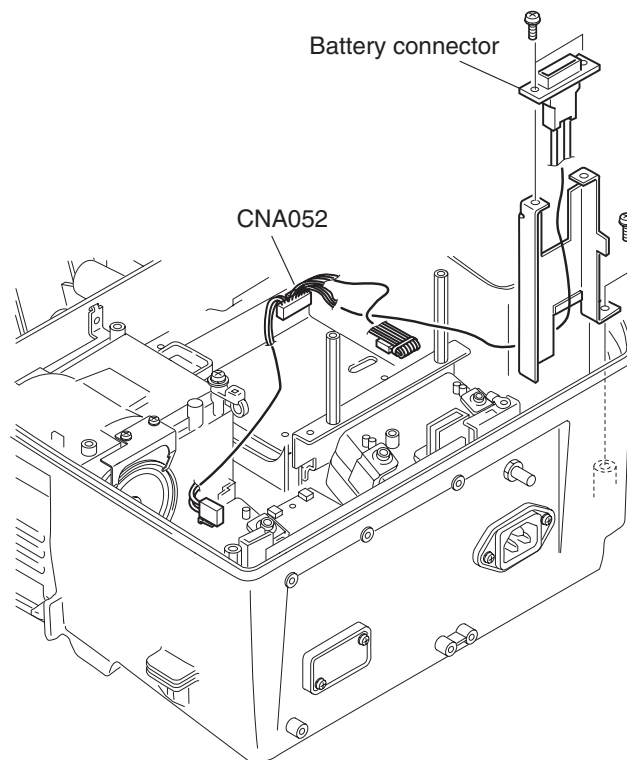
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1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Remove the main chassis and main board. Refer to “Removing the Main Board”.
4. Remove the test load board. Refer to “Removing the Test Load Board”.
5. Remove the M3 pan screws with spring washer and remove the paddle lock.



## Removing the Battery Connector

1. Remove the battery pack, memory card and lower casing. Refer to “Removing the Lower Casing”.
2. Remove the AC/DC unit. Refer to “Removing the AC/DC Unit”.
3. Disconnect the CNA052 cable from the main board and biphasic HV unit .
4. Remove the M3 pan screws with spring washer and remove the battery connector.



# *Disassembly - Installing the Optional Unit*

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Installation Procedure .....	3.3.2
Installing the VP-761V/VC/VE Voice Prompt Board .....	3.3.3
Operation Check .....	3.3.3
Installing the QI-762V DSI Interface Board or QI-763V DSI/AUX OUT Interface Board .....	3.3.4
Operation Check .....	3.3.4
Installing the AC-761VA/VC/VE/VK/VI 12 Lead ECG Unit .....	3.3.5
Operation Check .....	3.3.6
Installing the SG-761VC/VE/VK NIBP Unit .....	3.3.6
Operation Check .....	3.3.7
Installing the QI-761V ZB Interface Unit .....	3.3.8
Operation Check .....	3.3.10

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## General

The procedures in this section explain how to install the optional units in the defibrillator when the main board is replaced. For operation check, refer to the operator's manual for each optional unit.

### NOTE

**The following optional units do not operate depending on the software versions. Before installing the optional unit into a defibrillator, check the software version with the System Setup - 6. System information screen (Refer to "System Setup Screen" in Section 3 of the operator's manual). If the software version is not compatible with the optional unit, contact your NK distributor or representative to upgrade the software.**

- AC-761VA/VC/VE/VK/VI 12 Lead ECG Unit
- SG-761VC/VE/VK NIBP Unit
- QI-761V ZB Interface Unit

### Compatible software

	TEC-7600 series	TEC-7700 series
12 lead ECG unit	MAIN 02-03 or later	MAIN 01-06 or later
NIBP unit	MAIN 02-XX or later	All
ZB interface unit	MAIN 02-XX or later	

## Installation Procedure

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### WARNING

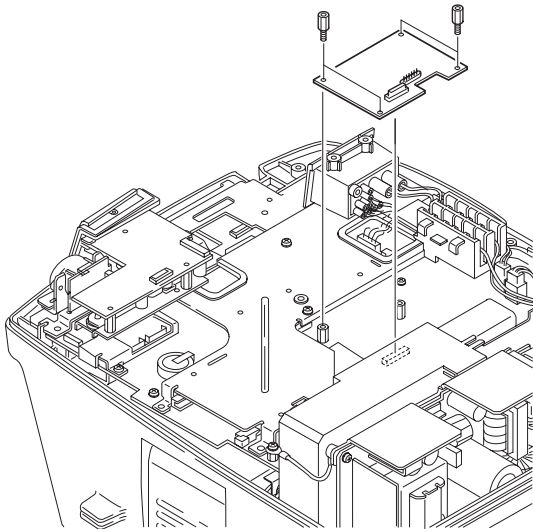
- The HV capacitor can store lethal amounts of energy. Be sure to discharge this capacitor before touching any high voltage component  
TEC-7600: HV capacitor, HV inductor, relay unit, paddle socket or paddles  
TEC-7700: HV capacitor, biphasic HV unit, terminal bracket, paddle socket or paddles) of the instrument.
  - Removal and replacement of any components in the instrument should only be done by qualified service personnel.
  - To avoid the possibility of injury to yourself or damage to the instrument, do not install or remove any component while the power is on. When disassembling, make sure that the instrument is off, the AC power cord is disconnected from the instrument and the battery pack is removed from the defibrillator.  
There are several high voltage units inside the instrument:  
LCD backlight, high voltage capacitor, pacing DC/DC converter and switching regulator.
- 
- 

### CAUTIONS

- To avoid accidental discharge of static electricity which could damage the components of the instrument, use a grounded wrist strap when installing or removing any component of the instrument.
  - Fuses on the main board and AC/DC unit cut off the power when an abnormality occurs in the instrument. Eliminate the malfunction before replacing the fuse. Use the correct fuse only.
  - Use only parts recommended by Nihon Kohden to assure maximum performance from your instrument.
- 
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## Installing the VP-761V/VC/VE Voice Prompt Board

Attach the voice prompt board to the main board and secure the voice prompt board with the four spacer bolts.



### Operation Check

For the defibrillator operation, refer to the TEC-7600 or TEC7700 Operator's manual.

1. Connect the AC power cord to the defibrillator and connect the other end of the AC power cord to the AC outlet.
2. Call up the System Maintenance screen.
  - 1) While pressing and holding the alarm setting key, turn the Energy/Mode Select control to "SETUP". The System Setup Menu screen appears.
  - 2) While pressing the alarm setting key, press the following keys one by one:  
ECG lead key → Silence alarm key → ECG sensitivity key.  
The System Maintenance screen appears. Refer to "System Maintenance Screen" in Section 4.
3. Select "Check Hardware".
4. Select "Check Voice".
5. Press the AUTO button. The check screen appears and the defibrillator automatically selects the message and outputs the voice prompt.
6. Check that the defibrillator outputs the voice prompt correctly according to the selected message. If not, check that the voice prompt board is correctly installed.
7. Turn off the power of the defibrillator.



### 3. DISASSEMBLY - INSTALLING THE OPTIONAL UNIT

#### Installing the QI-762V DSI Interface Board or QI-763V DSI/AUX OUT Interface Board

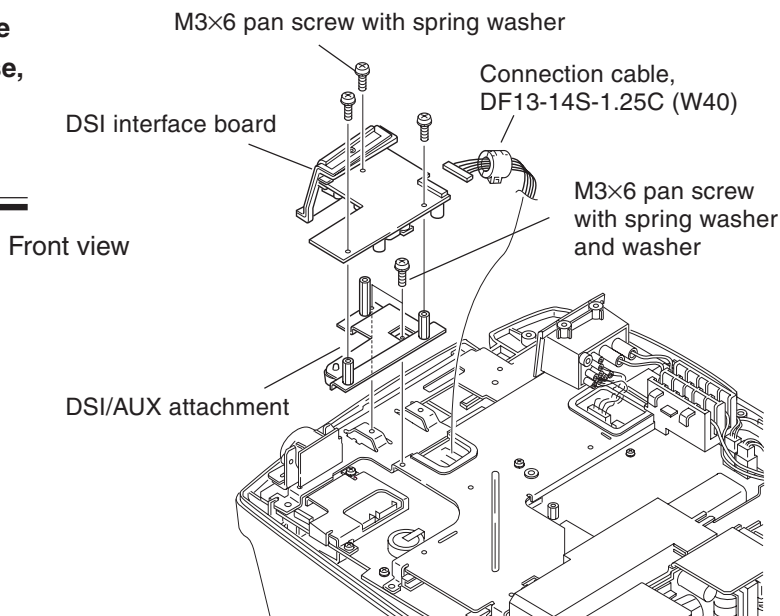
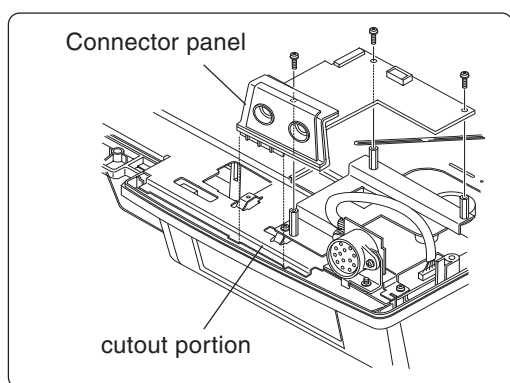
1. Attach the DSI/AUX attachment to the main chassis and secure the DSI/AUX attachment with the two M3 pan screws with spring washers.
2. Attach the DSI inference board or DSI/AUX OUT interface board to the DSI/AUX attachment and secure the interface board with three M3 pan screws with spring washers.
3. Connect the CNA227 cable to the main board and interface board.

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#### CAUTION

Align the connector panel of the DSI interface board to the cutout portion of the upper casing of the defibrillator. Otherwise, the connector panel or upper casing may be damaged.

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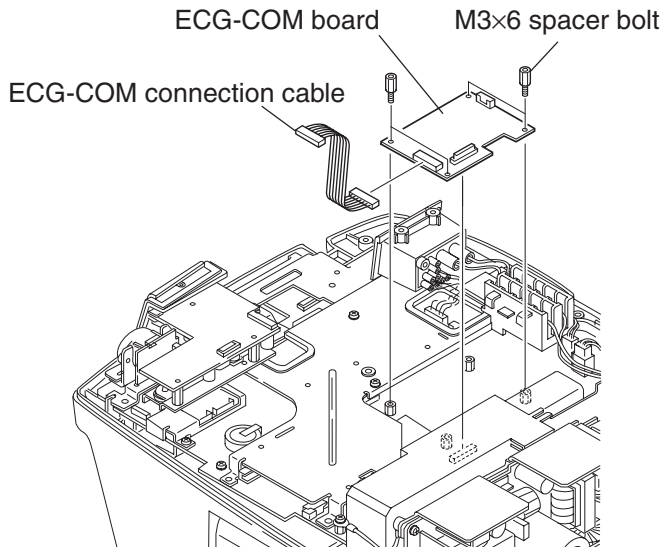


#### Operation Check

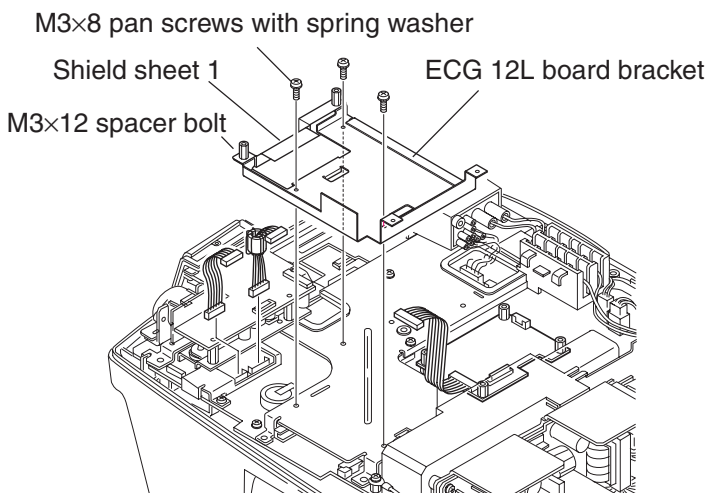
For the defibrillator operation, refer to the TEC-7600 or TEC-7700 Operator's manual.

1. Connect the AC power cord to the defibrillator and connect the other end of the AC power cord to the AC outlet.
2. Turn on the power of the defibrillator.
3. Check that no error message is displayed.
4. Connect the TG-901T3 CO<sub>2</sub> Sensor Kit or JL-951T3 SpO<sub>2</sub> Adaptor to the connector on the DSI Interface Unit.
5. Check that "CO<sub>2</sub>" or "SpO<sub>2</sub>" is displayed on the screen (the waveforms and measurement data are displayed in dotted line).  
For the CO<sub>2</sub> and SpO<sub>2</sub> measurement, refer to the Operator's manual of the TG-901T3 CO<sub>2</sub> Sensor Kit and JL-951T3 SpO<sub>2</sub> Adaptor.  
If not, check that the DSI interface board is correctly installed.
6. Turn off the power of the defibrillator.

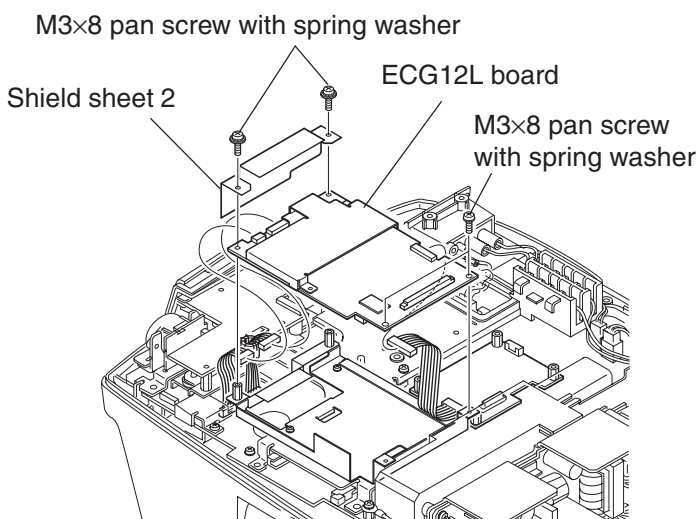
## Installing the AC-761VA/VC/VE/VK/VI 12 Lead ECG Unit



1. Attach the ECG-COM board to the main chassis and secure the ECG-COM board with the four M3x6 spacer bolts. If the another board has been installed, remove it. After attaching the ECG-COM board, attach another board. The ECG-COM board must be installed first.
2. Connect the ECG-COM connection cable to the ECG-COM board.



3. Attach the ECG 12L board bracket to the main chassis and secure the ECG 12L board bracket with the three M3x8 pan screws with spring washers.
4. Connect the two connection cables to the main board.
  - Connection cable (6 pin): CN0103
  - Connection cable (12 pin): CN0102



5. Attach the ECG 12L board and shield sheet 2 to the main chassis and secure them with the 4 screws.
6. Connect the connection cable (6 pin), connection cable (12 pin) and ECG-COM connection cable to the ECG 12L board.

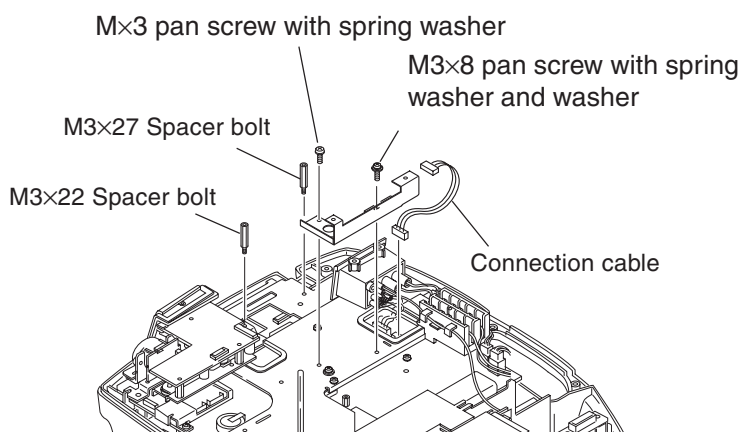
### 3. DISASSEMBLY - INSTALLING THE OPTIONAL UNIT

#### Operation Check

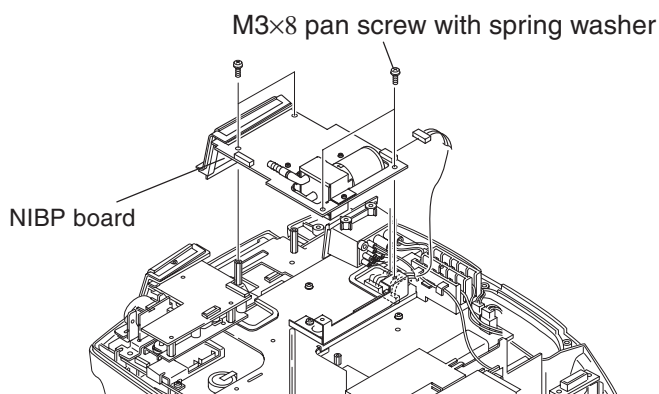
For the 12 lead ECG waveform measurement, refer to the AC-761VA/VC/VE/VK/VI 12 Lead ECG Unit Operator's manual.

1. Turn the Energy/Mode Select control to the 12 LEAD ECG position. The 12 lead ECG measurement screen is displayed. When the patient cable is not connected to the patient, the waveform for each lead is displayed with dotted lines
2. Check the following.
  - No error message appears on the screen.
  - The ECG waveform is not frozen.
  - The system does not restart.If any one of above malfunction occurs, check that ECG 12L board and ECG-COM board are correctly installed.
3. Turn off the power of the defibrillator.

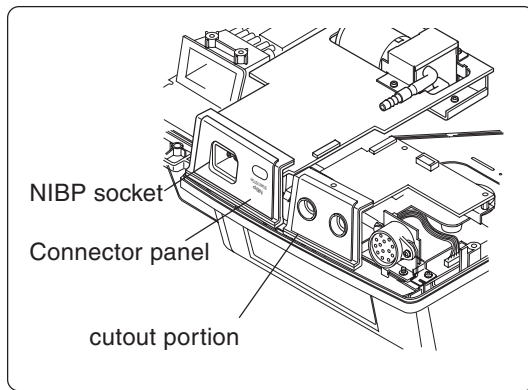
#### Installing the SG-761VC/VE/VK NIBP Unit



1. Connect the connection cable to the CN2208 connector on the main board.
2. Attach the two spacer bolts (M3x22 and M3x27) to the main chassis.
3. Attach the NIBP board bracket to the main chassis and secure the NIBP bracket with the M3x8 pan screw with the spring washer and M3x8 pan screw with the spring washer and washer.



4. Attach the NIBP board to the main chassis and secure the NIBP board with four M3x8 pan screws with the spring washers.
5. Connect the connection cable to the NIBP unit.



Front view

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**CAUTION**

Align the connector panel of the NIBP board to the cutout portion of the upper casing of the defibrillator. Otherwise, the connector panel or upper casing may be damaged.

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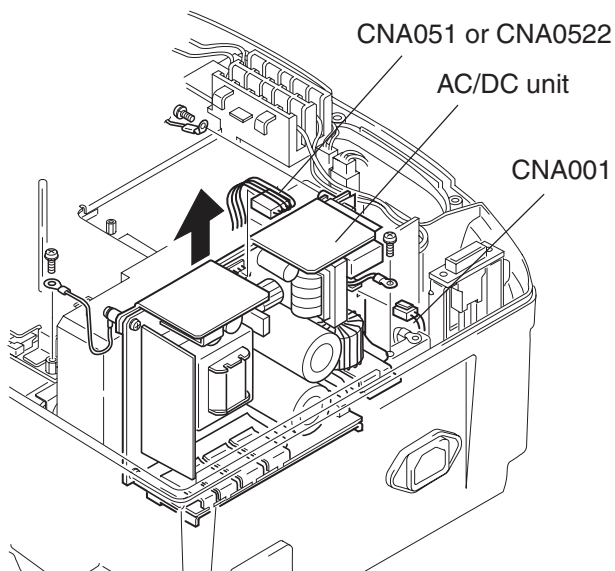
**Operation Check**

For the NIBP measurement, refer to the SG-761VC/VE/VK NIBP unit Operator's manual.

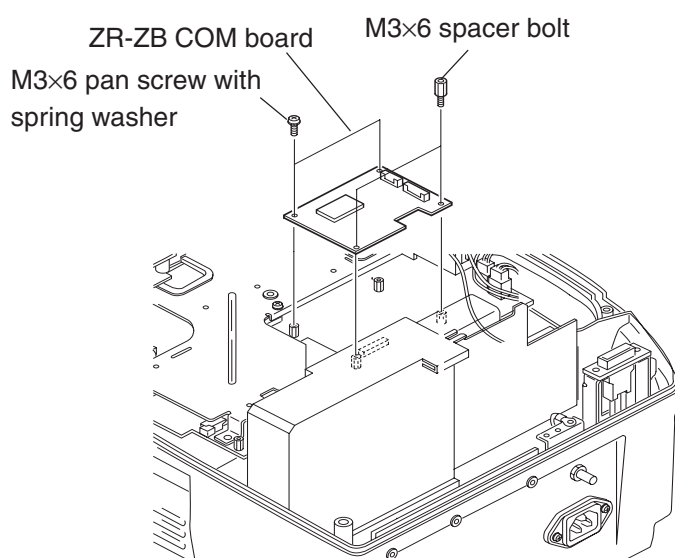
1. Connect the AC power cord to the defibrillator and connect the other end of the AC power cord to the AC outlet.
2. Connect the air hose to the NIBP socket on the NIBP unit.
3. Turn the Energy/Mode Select control to MONITOR position.
4. Check that the NIBP display appears on the screen. If it does not appear, check that the NIBP board is correctly installed.
7. Turn off the power of the defibrillator.

### 3. DISASSEMBLY - INSTALLING THE OPTIONAL UNIT

#### Installing the QI-761V ZB Interface Unit

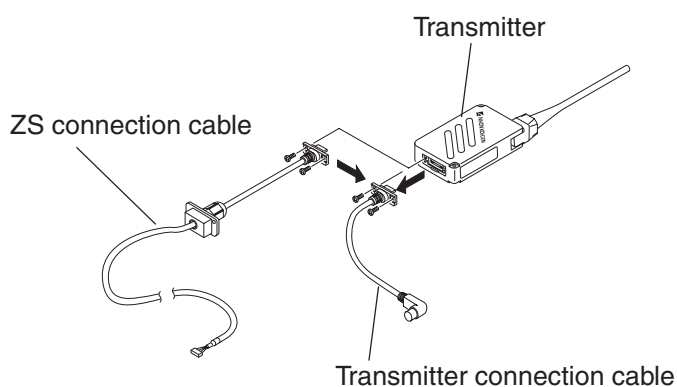


1. Remove the AC/DC unit.
  - 1) Remove the three M3 screws with spring washers to remove the three ground leads.
  - 2) Disconnect the cable (CNA051: TEC-7600, CNA052: TEC-7700) from the AC/DC unit.
  - 3) Pull up the AC/DC unit.
  - 4) Disconnect the CNA001 cable from the AC inlet.



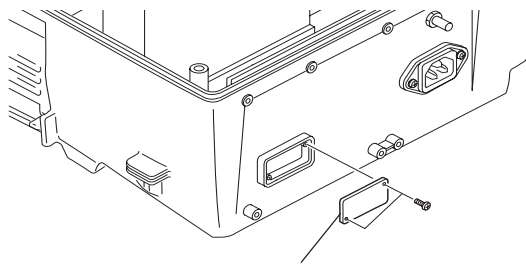
2. Attach the ZR-ZB COM board.

Attach the ZR-ZB COM board to the main chassis and secure the ZR-ZB COM board with the two M3x6 pan screws with spring washers and two M3x6 spacer bolts. If another board has been installed, you can attach the ZR-ZB COM board on the spacers of the previously installed board. The ZB interface board must be installed last.

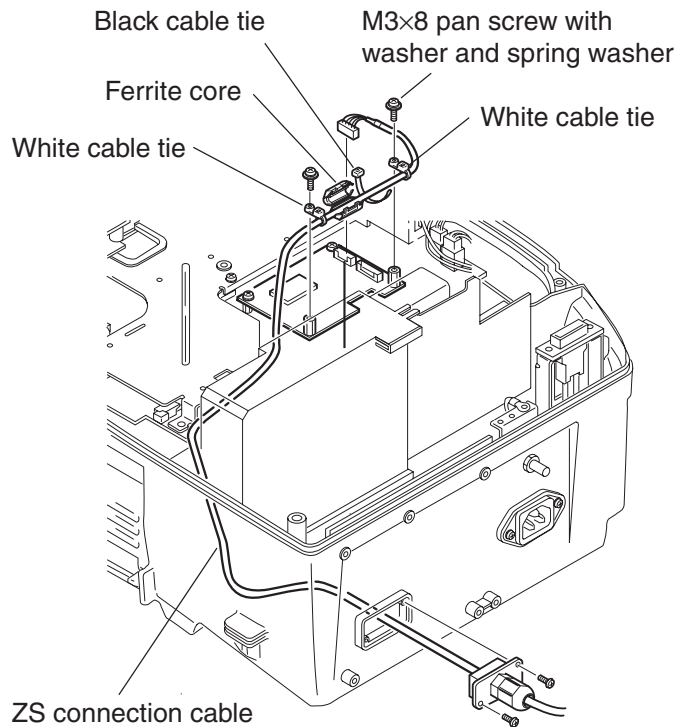


3. Connect the ZS connection cable.
  - 1) Remove the two M3 pan screws with spring washers and remove the transmitter cable from the transmitter.
  - 2) Connect the ZS connection cable to the transmitter and secure the ZS connection cable with the two M3 pan screws with spring washers.

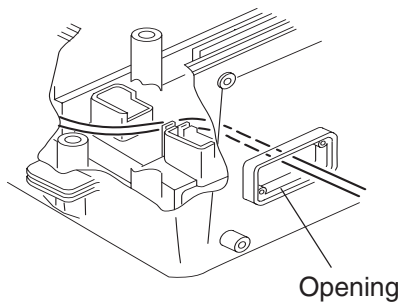
### 3 DISASSEMBLY - INSTALLING THE OPTIONAL UNIT



optional unit connector cover



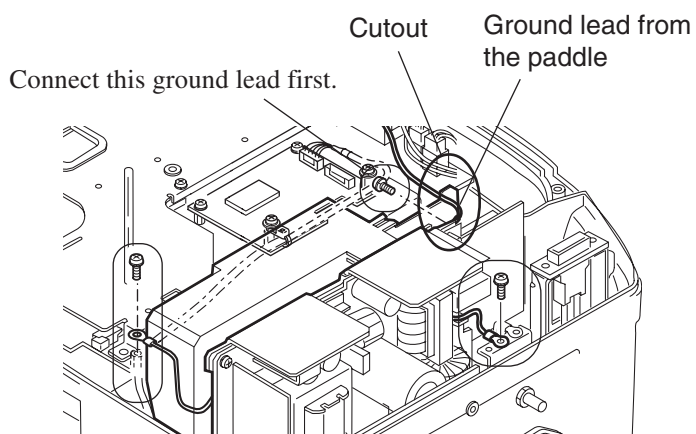
ZS connection cable



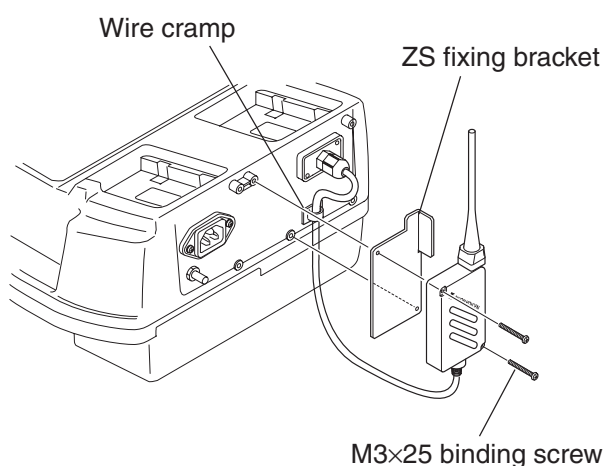
Opening

- 3) Remove the two M3 pan screws with spring washers and remove the optional unit connector cover.
- 4) Pass the ZS connection cable through the opening and connect the ZS connection cable to the ZR-ZB COM board.
- 5) Attach the two white cable ties, black cable tie and ferrite core to the ZS connection cable. Attach the one white cable tie and black tie beside the ferrite core so that the ferrite core is not moved.
- 6) Run the ZS connection cable between the two bosses on the upper casing so that the ZS connection cable is not damaged by the AC/DC unit.
- 7) Attach the optional unit connector cover and secure it with the two M3 pan screws with spring washers.
- 8) Attach the ZS connection cable to the space bolts with the two M3x8 pan screws with spring washers and washers.

### 3. DISASSEMBLY - INSTALLING THE OPTIONAL UNIT



4. Attach the AC /DC unit.
  - Before attaching the AC/DC unit to the upper casing, connect the three ground leads.
  - Run the ground lead from the paddle through the cutout the HV unit or biphasic HV unit so the ground lead is not damaged by the lower casing.



5. Attach the lower casing.
6. Attach the ZB interface unit.
  - 1) Attach the wire cramp to the rear panel of the defibrillator and secure the ZS connection cable with the wire cramp.
  - 2) Attach the ZS fixing bracket and transmitter to the rear panel and secure them with the two M3`25 binding head screws.

#### Operation Check

1. Connect the AC power cord to the defibrillator and connect the other end of the AC power cord to the AC outlet.
2. Turn the Energy/Mode Select control to the MONITOR position.
3. Check that the LED on the transmitter lights in green.
4. Turn the Energy/Mode Select control to the OFF position.
5. Turn the Energy/Mode Select control to the SETUP position while pressing and holding the Silence alarms key.
6. Select "Configuration" with the Item key and press the OK key. The System Setup - Configuration screen appears.
7. Select "TEST lead" with the Item ↓ or Item ↑ key.
8. Select "ON" with the Select key.
9. Turn the Energy/Mode Select control to the MONITOR position.
10. Select "TEST" with the ECG lead key.
11. Set the channel of the central monitor to the channel of the transmitter.



# Section 4 Maintenance

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## General

Check the following items to keep the instrument in optimal condition. You can check each function and adjust the settings of the instrument in the System Maintenance screen. The maintenance check sheet is provided at the end of this section. Use this sheet to check the instrument after any component is replaced.

### Daily Checks

Check the following items every day. Refer to “Basic Checks” in Section 2 of the Operator’s manual).

- Discharge check
- Battery check
- Recorder check
- Alarm check
- Voice check (when the optional VP-761V/VC/VE Voice Prompt Unit is installed)

### Monthly Checks

Check the following items once a month. Refer to “Periodic Check” in Section 10 of the Operator’s manual)

- External paddles
- Energy discharge Test
- Checking energy charge (TEC-7600 series: 360 J, TEC-7700 series: 270 J) and disarm (Charge and internal discharge)
- Battery test (Check the battery appearance every 6 months.)
- HV capacitor test
- Recorder test
- Date and time adjustment

### NOTE

- **Make sure that the date and time printed on the recording paper is correct. The date and time on the recording paper are important parts of the medical record.**
- **When the main board is replaced with a new one, do the following adjustment. Refer to “System Maintenance Screen - Adjust AD Screen”.**
  - **ECG sensitivity and offset**
  - **Charge energy, delivered energy, TTR**
  - **Battery charging setting**

## System Maintenance Screen

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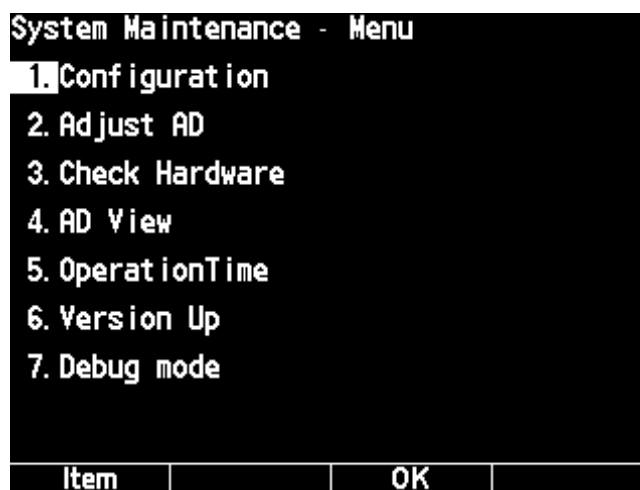
### CAUTIONS

- **The instrument cannot perform ECG monitoring and defibrillation when the System Maintenance screen is displayed. You have to turn the power off and then on to perform ECG monitoring and defibrillation.**
  - **Before changing or adjusting a setting in the System Maintenance screen, write down or print out all settings. The settings for defibrillation, ECG waveform acquisition and battery are adjusted in the factory for each instrument. If different settings are used, the instrument may malfunction.**
  - **You must perform the “Flash Save” procedure in the System Maintenance - Configuration screen after any setting in the System Maintenance screen is changed or adjusted. The new setting or adjustment is not applied and saved until the “Flash Save” procedure is performed. Otherwise, the “D511” error code appears every time the power is turned on.**
- 
- 

When an error is detected when the instrument is in the System Maintenance screen mode, the error code is displayed on the upper right corner of this screen.

### Calling Up the System Maintenance Screen

1. Connect the AC power cord to the defibrillator and connect the other end of the AC power cord to the AC outlet.
2. While pressing and holding the Silence alarms key, turn the Energy/Mode Select control to the “SETUP” position. The System Setup - Menu screen appears.
3. Release the Silence alarms key.
4. While pressing the alarm setting key, press the following keys on the front panel one by one:  
ECG lead key → Silence alarms key → ECG sensitivity key.  
The System Maintenance - Menu screen appears.
5. Release the alarm setting key.



The function keys at the bottom of the screen change according to the selected screen.

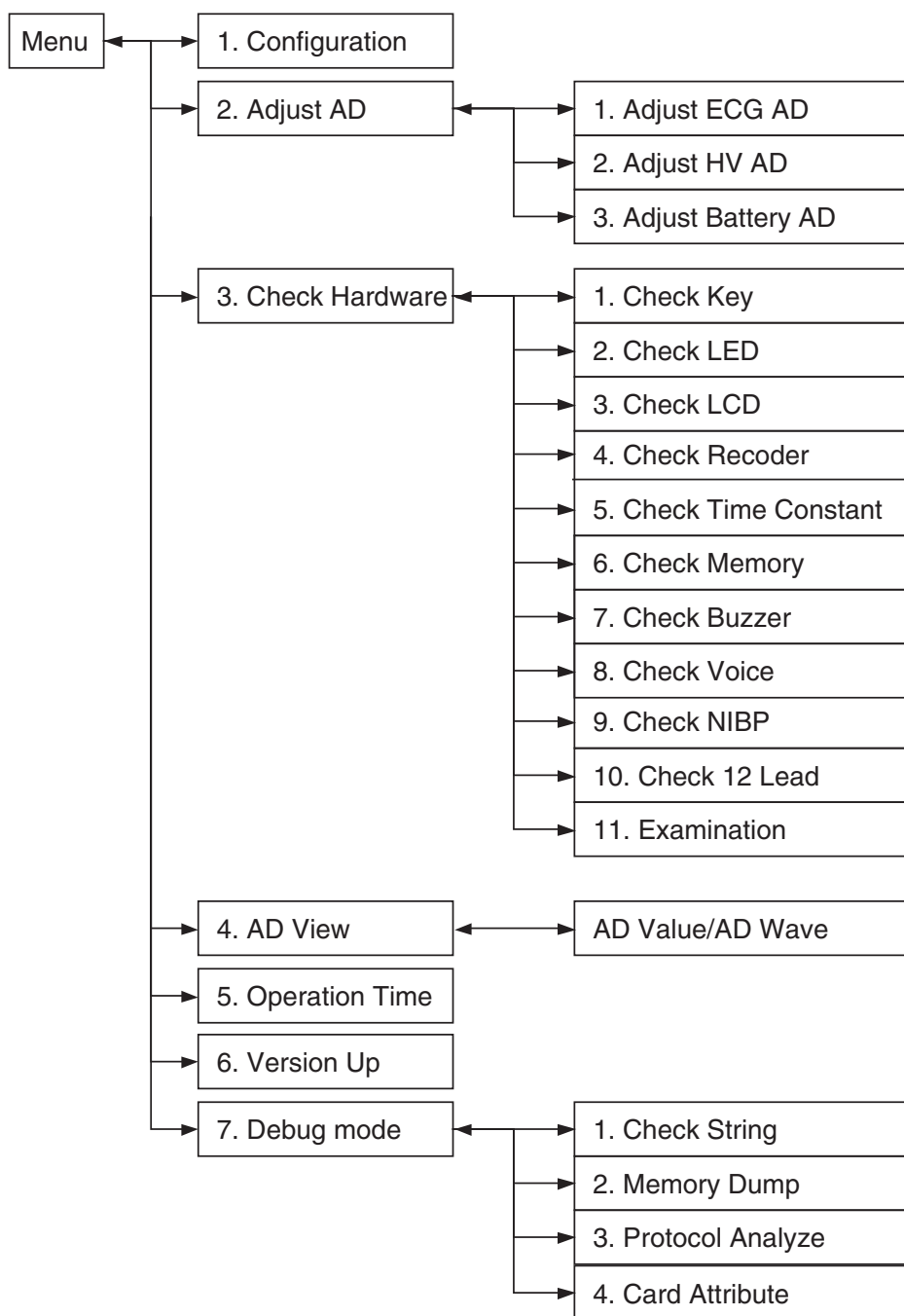
- To call up the sub-screen for each item.
  - 1) Press the Item key to select the item. The cursor moves to the next item.
  - 2) When the item is selected, press the OK key. The menu screen of the selected item appears.
- To exit the System Maintenance Screen, turn the power off by turning the Energy/Mode control to the “OFF” position. When any setting in the System Maintenance screen is changed or adjusted, perform the “Flash Save” procedure.

## About the Menu Items

There are seven items in the System Maintenance - Menu screen.

	Screen	Settings
1	Configuration	Changes the settings in the following items: Language, Telemetry, Alarm Off Message, Battery Insert Message, 12Lead Option, Pacing Option, Freeze Function, Charge Time Clear, Default Setting, Flash Save, Digital filter
2	Adjust AD	Changes the A/D values for ECG waveform acquisition, HV unit, and battery charge.
3	Check Hardware	Checks the operation of the key switches, LEDs, recorder, memories, sounds, etc
4	AD View	Checks the A/D values that the main CPU currently receives.
5	Operation Time	Displays the count of internal and external discharges and operation time.
6	Version Up	You can update the system program and data
7	Debug mode	Displays the characters used in this instrument and checks the flash memory.

**System Maintenance Screen Flowchart**



## Default Settings

The factory default settings are underlined.

Screen	Item	Setting
Configuration	Language	Selects the language or country. Selection list: <u>English</u> , Japanese, American, Chinese, Spanish, French, German, Italian, Norwegian, Finnish, Other 1 to 5
	Telemetry(ZR)	Select "Export". Selection list: <u>Export</u> (Other than Domes channel) Domes (Channel A1000 to A6000)
	Alarm Off Message	Select "On" to display a message when any of the vital alarm settings is set to off. Selection list: <u>On</u> , Off
	Battery Insert Message	Select "On" to display a message when the battery is not in the instrument. Selection list: <u>On</u> , Off
	12 Lead Option	Select "On" when using the optional 12 lead module. This option is only available for the TEC-7721/7731 series defibrillator. Selection list: On, <u>Off</u>
	Pacing Option	On: For the TEC-7631/7731 series defibrillators. Off: For the TEC-7621/7721 series defibrillators.
	Freeze Function	Select "On" to enable the freeze function. The ECG second trace can be frozen when the Alarm setting key is pressed. Selection list: On, <u>Off</u>
	Charge Times Clear	Deletes the count of internal and external discharges. Selection list: <u>Off</u> , Exec
	Default Setting	Select "Exec" to return all settings (including the AD adjustment settings, alarm settings) to the factory default settings. Before doing this operation, write down the necessary settings for each item. Selection list: <u>Off</u> , Exec
	Flash Save	Select "Exec" to save the current settings in the System Maintenance screen in the flash ROM. Selection list: <u>Off</u> , Exec
	Digital filter	Select "On" to enable the digital filter for ECG. This function is available only when "AC hum filter" in the Setup screen is set to "ON" Selection list: <u>On</u> , Off
Adjust AD → Adjust ECG AD	Gain	Adjusts the A/D value for the ECG sensitivity. Setting range: 0 to 31 in of 1
	Offset	Adjusts the A/D value for the ECG offset at gain $\times 1/2$ , $\times 1$ , $\times 2$ and $\times 4$ . Setting range: 0 to 50 in of 1
Adjust AD → Adjust HV AD	CHARGE AD	Adjusts the A/D value to measure the charged energy in the HV capacitor. Setting range: -25 to +25 in of 1
	TTR AD	Adjusts the A/D value to measure the TTR (transthoracic resistance). Setting range: -25 to +25 in of 1
	DELIVERED ENERGY	Adjusts the /AD value to measure the delivered energy from the HV capacitor. Setting range: -25 to +25 in of 1
Adjust AD → Adjust Battery AD	BATTERY VOLTAGE	Adjusts the A/D value of the voltage that is applied to the battery. Setting range: -25 to +25 in of 1
	BATTERY CURRENT	Adjusts the A/D value of the current that applied to the battery. Setting range: -25 to +25 in of 1

## 4. MAINTENANCE

The default setting of the following items may differ depending on the instrument:  
Adjust ECG A/D, CHARGE AD, TTR AD, DELIVERED ENERGY, BATTERY VOLTAGE, BATTERY CURRENT.

Language	Sync mode after CV	Date format
English, French, German, Italian Spanish, Other	Def (defibrillation)	MMM/DD/YYYY
Chinese, Japanese	Def (defibrillation)	YYYY/MM/DD
American	Sync (cardioversion)	MMM/DD/YYYY

“Language” sets the language which is used in the instrument. The default setting of “Sync mode after CV” (the mode after cardioversion) and “Date format” in the System Setup screen changes according to the selected language.

The default language setting of the instrument is set at the factory for the country where the instrument is exported to.

### Flash Save Procedure

Do the following procedure when change or adjust any setting in the System Maintenance screen.

1. In the System Maintenance - Menu screen, select “1. Configuration” with the Item key and press the OK button. The System Maintenance - Configuration screen appears.
2. Select “10. Flash Save” with the Item key.
3. Press the ← key. The setting changes from “off” to “Exec” and the function keys change as follow:



4. Press the OK key to perform the selected item.

To cancel it, press the Cancel key.

To return to the System Maintenance - Menu screen, press the Exit key.

## Configuration Screen

You can set the several default settings for the instrument.

System Maintenance Configuration			
1.	Language		English
2.	Telemetry( ZR)		Export
3.	Alarm Off Message		On
4.	Battery Insert Message		On
5.	12Lead Option		Off
6.	Pacing Option		Off
7.	Freeze Function		Off
8.	Charge Times Clear		Off
9.	Default Setting		Off
10.	Flash Save		Off
11.	Digital Filter		Off
	Item	←	→
			Exit

To select a setting for “1. Language” to “7. Freeze Function”:

1. Press the Item key to select the item. The cursor moves to the next item.
2. Select the setting with the ← key and → key.  
The setting changes as follow:

Item	Setting
Language:	English ↔ Japanese ↔ American ↔ Chinese ↔ Spanish ↔ French ↔ German ↔ Italian ↔ Norwegian ↔ Finnish ↔ Other 1 to 5
Telemetry(ZR):	Export ↔ Domes
Alarm Off Message:	On ↔ Off
Battery Insert Message	On ↔ Off
12Lead Option:	On ↔ Off
Pacing Option:	On ↔ Off
Freeze Function:	On ↔ Off
Digital filter:	On ↔ Off

To perform an item from “8. Charge Time Clear” to “10. Flash Save”

1. Press the Item key to select the item. The cursor moves to the next item.
2. Press the → key. The setting changes from “off” to “Exec” and function key changes as follow:

OK		Cancel	
----	--	--------	--

3. Press the OK key to perform the selected item.  
To cancel it, press the Cancel key.

To return to the System Maintenance - Menu screen, press the Exit key.



To print the information displayed on the System Maintenance screen, press and hold the record key on the front panel, until the recorder starts to print the information.



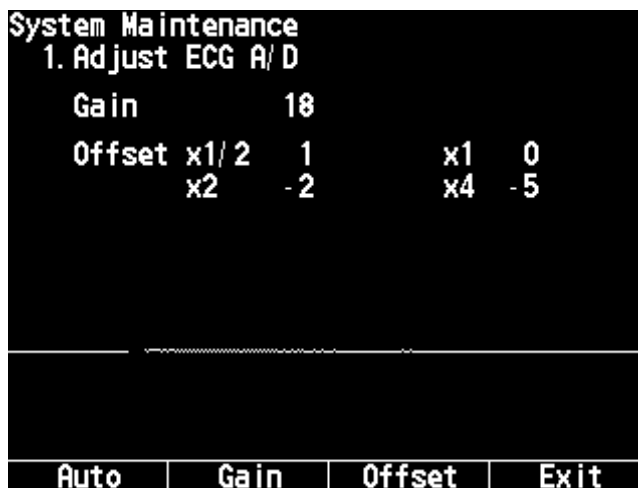
### Adjust AD Screen

You can adjust the ECG sensitivity, charge and delivered energy, TTR and battery charging settings by changing the A/D value for each item. To call up a sub-screen, select the item with the Item key and OK key.



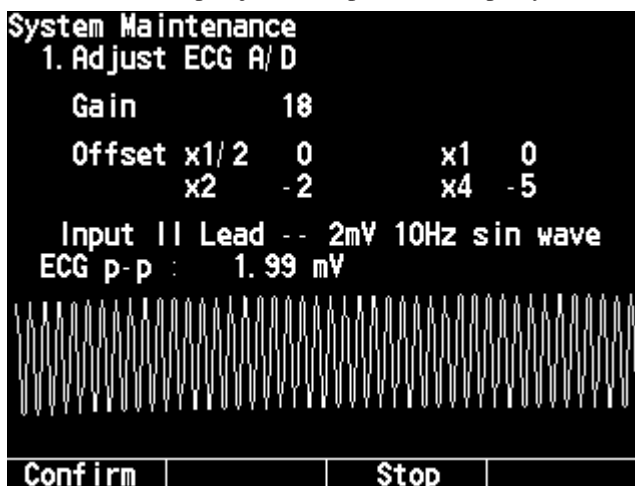
#### Adjust ECG/AD Screen

You can adjust the A/D value for the ECG offset and ECG sensitivity with the automatic adjustment mode or manual adjustment mode



Automatic adjustment mode:

1. Apply a 2 mVp-p, 10 Hz sine wave between lead R (RA) and L (LA).
2. Press the Auto button. The ECG sensitivity is automatically adjusted. The new A/D value is temporarily saved in memory and displayed in the upper right corner of the screen. To stop adjustment, press the Stop key.



3. Press the Confirm key. The ECG offset is automatically adjusted. The new A/D value is temporarily saved in memory and displayed in the upper right corner of the screen. To stop adjustment, press the Stop key.

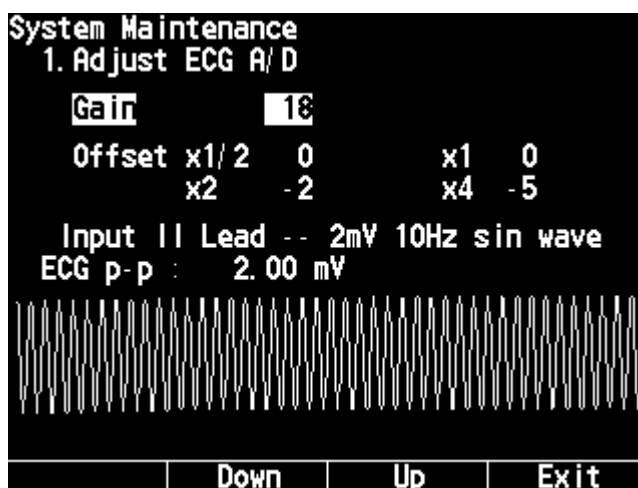
To return to the System Maintenance - Adjust AD screen, press the Exit key.

Manual adjustment mode:

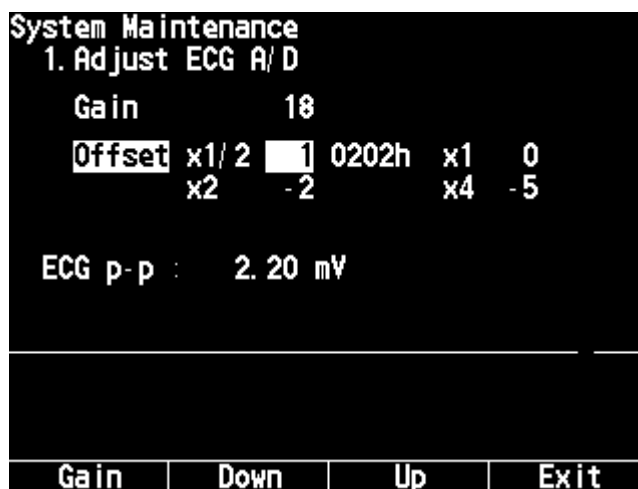
Adjust the base line or amplitude of the sine wave on the screen or paper to 2 cm with the Down and Up key. You can print the ECG AD screen during adjustment by pressing the record key (To stop recording press the record key again). The new A/D value is temporarily saved in memory and displayed in the upper right corner of the screen.



1. Adjust ECG sensitivity.
  - 1) Apply a 2 mVp-p, 10 Hz sine wave between lead R (RA) and L (LA).
  - 2) Press the Offset key.
  - 3) Adjust the base line with the Down and Up key.



2. Adjust ECG Offset
  - 1) Press the Offset key.
  - 2) Adjust the base line with the Down and Up key.



To return to the System Maintenance - Adjust AD screen, press the Exit key.

**Adjust HV AD Screen**

You can adjust the settings for delivered energy, TTR and charged energy.

TEC-7621/7631 Series  
Defibrillator

System Maintenance			
2. Adjust HV AD			
SELECT 300J			0J
1.	2. CHARGE AD		0
	3. TTR AD	0ohm	0
	4. DELIVERED ENERGY	0J	0
			0. 00s
Item			Menu

**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, HV inductor, relay 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 for TEC-7600 series defibrillator:

Nihon Kohden AX-102V or Dynatec Impulse 3000

(The checker must be checked for accuracy and performance every year by its manufacturer or approved electrical safety organization.)

**Procedure**

- 1 Check and adjust the charged energy.
  - 1) When the Adjust HV AD screen is selected, the “SELECT 300J” message appears on the screen. Place the external paddles on the electrode plate of the delivery checker.
  - 2) Turn the Energy/Mode Select control on the front panel to 300 J. The “PUSH CHARGE KEY” message appears and the selected energy is displayed beside the message.
  - 3) Press the CHARGE button on the APEX external paddle. The charged energy is displayed in the upper right corner of the screen and the elapsed time from starting charging is displayed in the lower right corner of the screen.

- 4) When the energy charging is complete, the “PUSH DISCHARGE KEY” message appears. Press both DISCHARGE buttons on the external paddles.
- 5) Check the delivered energy displayed on the delivery checker. If the delivered energy is not 300 J, continue the adjustment procedure.
- 6) Select “2. CHARGE AD” with the Item key. The function keys change as follow.



- 7) Press the ↑ or ↓ key to change the energy that will be charged in the capacitor at the 300 J setting. The new CHARGE AD value is displayed beside “2. CHARGE AD” (Setting range: -25 to +25, The default setting is 0).
  - 8) Repeat steps 2 to 7 until the delivered energy displayed on the delivery checker is as close as possible to 300 J.
  - 9) Turn the Energy/Mode Select control to the “DISARM” position.
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” is as close as possible to 50 W.
    - 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 close as possible to 300 J.
  3. Save each AD value to the flash memory.
    - 1) Press the Menu key. The System Maintenance - Adjust AD screen appears.
    - 2) Press the Exit key. The System Maintenance - Menu screen appears.
    - 3) Select “1. Configuration” with the Item key and press the OK button.
    - 4) Select “10. Flash Save” with the Item key and press the ← key. The setting changes from “off” to “Exec”.
    - 5) Press the OK button.

To cancel saving, press the Cancel key.

- 4) Exit the System Maintenance screen.

TEC-7721/7731 Series  
Defibrillator

System Maintenance		
2. Adjust HV AD		0J
SELECT 200J		0J
1.		
2. CHARGE AD		- 2
3. TTR AD	0ohm	2
4. DELIVERED ENERGY	0J	- 2
		0. 00s
Item		Menu

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### 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, biphasic HV unit.

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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 for TEC-7700 series defibrillator:

TEC-7700: Nihon Kohden AX-102V or Dynatec Impulse 4000

(The checker must be checked for accuracy and performance every year by its manufacturer or approved electrical safety organization.)

#### Procedure

1. Check and adjust the charged energy.
  - 1) When the Adjust HV AD screen is selected, the “SELECT 200J” message appears on the screen. Place the external paddles on the electrode plate of the delivery checker.
  - 2) Turn the Energy/Mode Select control on the front panel to 200J. The “PUSH CHARGE KEY” message appears and the selected energy is displayed beside the message.
  - 3) Press the CHARGE button on the APEX external paddle. The charged energy is displayed in the upper right corner of the screen and the elapsed time from starting charging is displayed in the lower right corner of the screen.

- 4) When the energy charging is complete, the “PUSH DISCHARGE KEY” message appears. Press both DISCHARGE buttons on the external paddles.
- 5) Check the delivered energy displayed on the delivery checker. If the delivered energy is not 200 J, continue the adjustment procedure.
- 6) Select “2. CHARGE AD” with the Item key. The function keys change as follow.



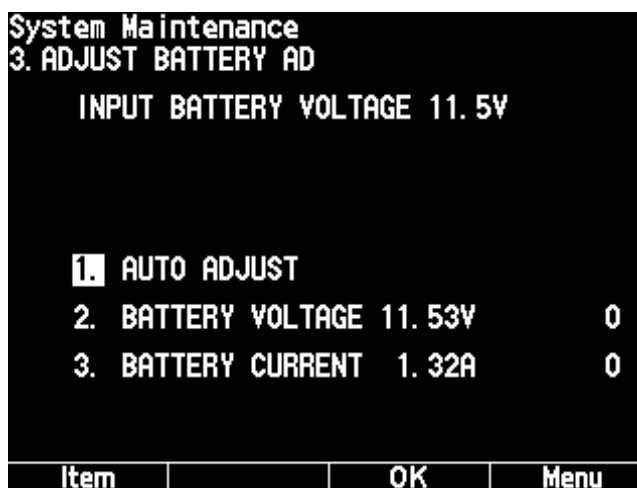
- 7) Press the ↑ or ↓ key to change the energy that will be charged in the capacitor at the 200 J setting. The new CHARGE AD value is displayed beside “2. CHARGE AD” (Setting range: -25 to +25, The default setting is 0).
  - 8) Repeat steps 2 to 7 until the delivered energy displayed on the delivery checker is as close as possible to 200 J.
  - 9) Turn the Energy/Mode Select control to the “DISARM” position.
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” is as close as possible to 50 W.
    - 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 close as possible to 200 J.
3. Save each AD value to the flash memory.
    - 1) Press the Menu key. The System Maintenance - Adjust AD screen appears.
    - 2) Press the Exit key. The System Maintenance - Menu screen appears.
    - 3) Select “1. Configuration” with the Item key and press the OK button.
    - 4) Select “10. Flash Save” with the Item key and press the ← key. The setting changes from “off” to “Exec”.
    - 5) Press the OK button.

To cancel saving, press the Cancel key.

4. Exit the System Maintenance screen.

**Adjust Battery AD Screen**

Adjusts the AD values of the voltage and current that are applied to the battery pack.



1. Remove the battery pack from the instrument. Make sure that the power is turned off and the AC power cord is disconnected from the instrument and AC outlet before removing the battery.
2. Call up the System Maintenance - Adjust Battery AD screen.
3. Apply 11.5 V from a power supply (Red wire: +, Black wire: GND).
4. Automatic adjustment mode:  
Select "1. AUTO ADJUST" with the Item key and press the OK key. The AD values of the voltage and current that are applied to the battery pack are automatically adjusted. The new A/D value are temporarily saved in a memory and displayed beside "2. BATTERY VOLTAGE 11.50 V" and "3. BATTERY CURRENT 0.90 A".

Manual adjustment mode:

- 1) Select "2. BATTERY VOLTAGE XX.XX V" with the Item key. The function keys change as follows.



- 2) Adjust the AD value with the ↑ or ↓ key so that the "XX.XX" display becomes 11.50 V.
- 3) Select "3. BATTERY CURRENT X.XX A" with the Item key and press the OK key.
- 4) Adjust the AD value with the ↑ or ↓ key so that the "X.XX" display becomes 0.90 A.

To return to the System Maintenance - Adjust AD screen, press the Exit key.

## Check Hardware Screen

You can check the function of each hardware in the instrument.

System Maintenance			
Check Hardware			
1.	Check Key		
2.	Check LED		
3.	Check LCD		
4.	Check Recorder		
5.	Check Time Constant		
6.	Check Memory		
7.	Check Buzzer		
8.	Check Voice		
9.	Check NIBP		
10.	Check 12Lead		
11.	Examination		
Item		OK	Exit

- To call up a sub-screen, select the item with the Item key and OK key.
- To return to the System Maintenance - Check Hardware screen, press the Exit key (alarm setting key).
- To return to the System Maintenance - Menu screen, press the Exit key.

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### CAUTION

Do not open the “9. Check NIBP” and “11. Examination” screens. These check items are factory use only. If any setting is changed, this may cause malfunction.

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## Check Key Screen

You can check the function of the rotary switches, keys, paddle, etc. in this screen. This screen displays the status of rotary switches, keys, paddle, etc. by highlighting the part names or displaying the status.

System Maintenance			
Check Key			
Pacing Rate	100	Pacing Start	200
Record Event		Card Exist	
Out Of Paper		Panel Charge	
No Battery	AC	Sync	
		Dis L R	
		Paddle Charge	
DSI 1		Dis L R	
NIBP		No Connect	
Leads	Sens	Suspend	Alarm

To return to the System Maintenance - Check Hardware screen, press the Alarm key (alarm setting key).



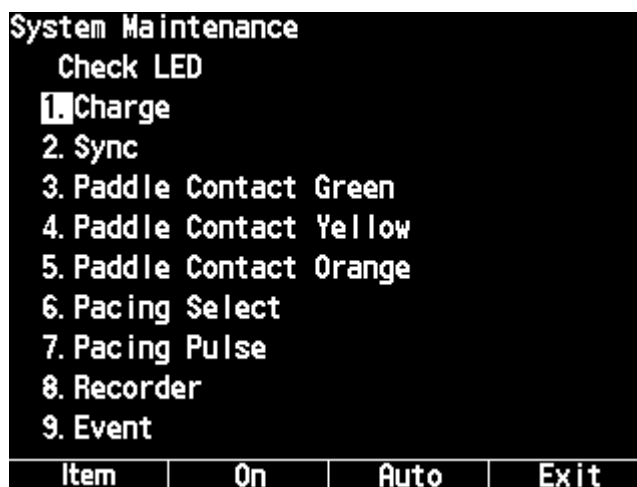
## 4. MAINTENANCE

Check items in the Check Key screen

Part Name	Description
Pacing Rate	Shows the status of the PACING RATE control on the top panel (TEC-7631/7731 series only).
Pacing Start	Highlights when the START/STOP key on the top panel is pressed (TEC-7631/7731 series only).
SetUp	Shows the status of the Energy/Mode Select control.
Record	Highlights when the record key is pressed.
Event	Highlights when the event key is pressed.
Card exist or No Card	Shows whether a memory card is inserted into the memory card slot.
Paper Exit or Out of Paper	Shows whether the recording paper is set or not.
Battery or No Battery	Shows whether the battery pack is installed or not.
AC	AC: Displayed when the AC power cord is connected to the instrument DC: Displayed when the AC power cord is not connected to the instrument.
Panel Charge	Highlights when the CHARGE key on the front panel is pressed.
Panel Sync	Highlights when the SYNC key on the front panel is pressed.
Panel Dis L	Highlights when the left DISCHARGE key on the front panel is pressed.
Panel Dis R	Highlights when the right DISCHARGE key on the front panel is pressed.
Paddle Charge	Highlights when the CHARGE key on the apex external paddle is pressed.
Panel Dis L	Highlights when the left DISCHARGE key on the sternum external panel is pressed.
Panel Dis R	Highlights when the right DISCHARGE key on the sternum external paddle is pressed.
External	Shows the type of the connected paddle. Displays "No Connect" when no paddle is connected.
DSI 1, DSI 2 or DSI 1 2	DSI 1, DSI 2: Displayed when SpO2 adapter or CO2 sensor kit is connected to the left or right SpO2/CO2 connector. DSI 1 2: Displayed when SpO2 adapter and CO2 sensor kit are connected to the SpO2/CO2 connectors.
NIBP	Displayed when the NIBP unit is installed.
Leads	Highlights when the ECG lead key is pressed.
Sens	Highlights when the ECG sensitivity key is pressed.
Suspend	Highlights when the Silence alarms key is pressed.
Alarm	Highlights when the alarms setting key is pressed, then the System Maintenance - Check Hardware screen is displayed.

### Check LED Screen

You can check the LED function on the instrument. The LED lights when the item is selected and On key is pressed. When “Auto” is selected, all LEDs are checked and lit one by one.



### 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 button is pressed, the screen is displayed in green.

Every time you press the ECG lead key, the screen color changes as follow:  
green → blue → white → pink → orange → black → green

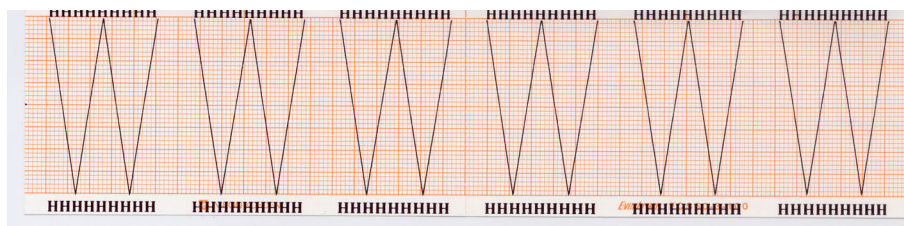
To return to the System Maintenance - Check Hardware screen, press the alarm setting key.

### Check Recorder Screen

You can check the recorder. When “4. Check Recorder” on the System Maintenance - Check Hardware screen is selected and the OK button is pressed, the recorder prints test patterns. After all test patterns are printed, the System Maintenance - Check Hardware screen is displayed.

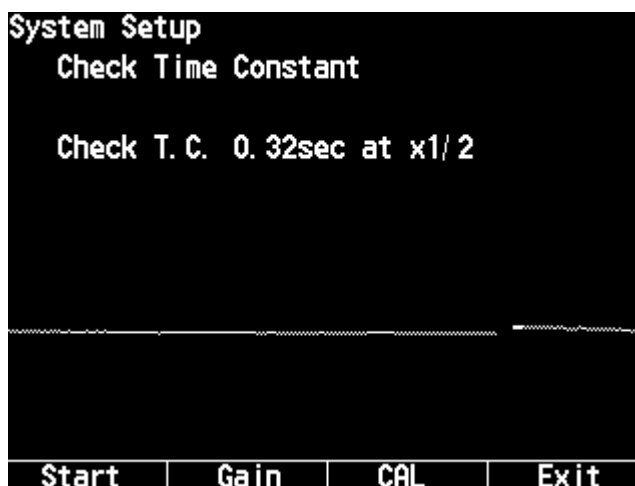
#### NOTE

This check uses 2.1 m of recording paper.



**Check Time Constant Screen**

You can check the time constant of the ECG amplifier.



Automatic check mode:

When the Start key is pressed, the instrument checks the time constant 0.32 and 3.2 by changing the sensitivity 1, 2, 4 and 1/2. The check result is automatically printed on the paper.



To stop checking, press the Stop key

Manual check mode:

You can check the time constant by printing the calibration waveforms on the paper.

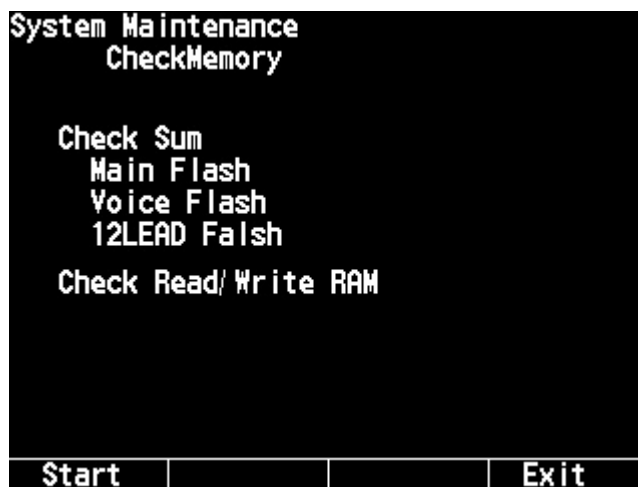
- To apply the calibration waveforms, press the CAL key.
- To change the time constant and sensitivity, press the Gain key. Every time you press the Gain key, the time constant and sensitivity change as follows:
  - time constant: 0.32 s, sensitivity: 1/2 →
  - time constant: 0.32 s, sensitivity: 1 →
  - time constant: 0.32 s, sensitivity: 2 →
  - time constant: 0.32 s, sensitivity: 4 →
  - time constant: 3.2 s, sensitivity: 1/2
  - time constant: 3.2 s, sensitivity: 1 →
  - time constant: 3.2 s, sensitivity: 2 →
  - time constant: 3.2 s, sensitivity: 4 →



- To print the check result, press the record key on the front panel.

### Check Memory Screen

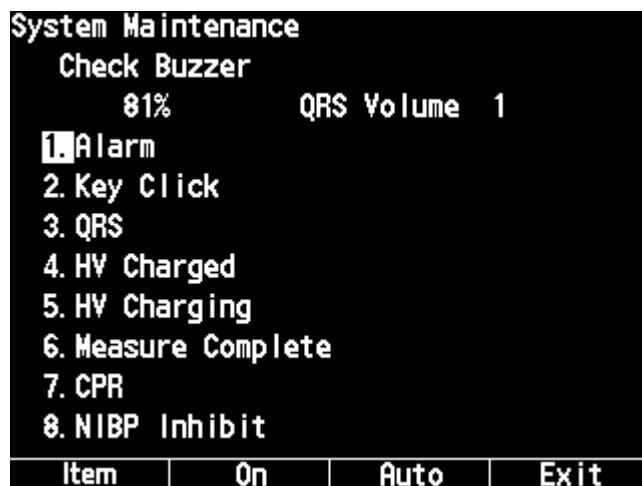
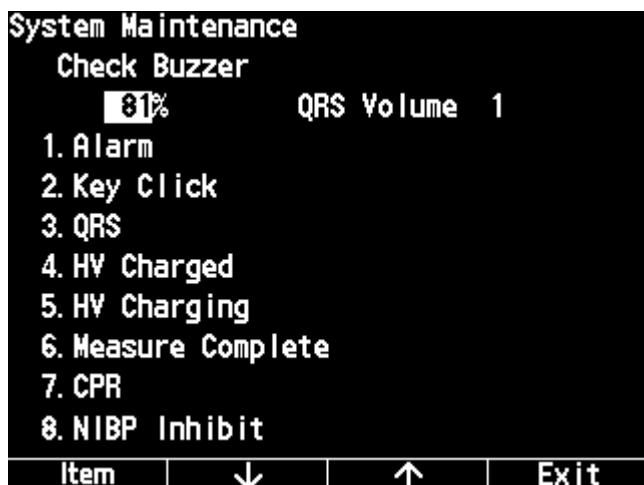
When the Start key is pressed, the instrument checks the flash memory and DRAM. During checking, the checked capacity (%) is displayed.



- To start checking, press the Start key.
- To stop checking, press the Stop key.

### Check Buzzer Screen

You can check the sound generated by the instrument. When the VP-761V Voice Prompt Unit is installed, the voice prompt can be checked in the Check Voice screen.



Automatic check mode

The sound for each item is generated for 1 second, item by item.

To start checking, select “1: Alarm” with the Item key and press the Auto key. In “3: QRS”, the pitch of the QRS sound is automatically changed from 81% to 100%, then returned to 81% .

#### NOTE

When “3. QRS”, “7. CPR” and/or “8. NIBP Inhibit” is selected and the “On” key is repeatedly pressed, each sound may be not heard. This is because each sound does not continue for 1 second.

Manual check mode

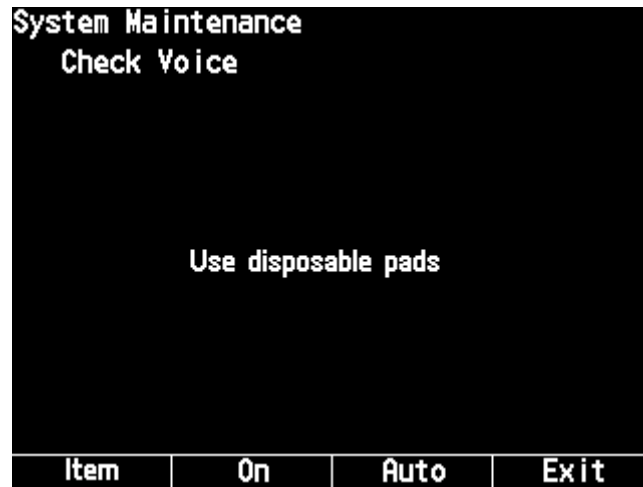
Select the sound with the Item key and press the On key. The sound for each item is generated for 1 second.

QRS Volume:

You can change the pitch and volume of the QRS sound with the ↓ or ↑ key.

### Check Voice Screen

When the optional VP-761V/VC/VE Voice Prompt Unit is installed, the voice prompt can be checked in this screen.



You can manually check the voice prompt by selecting the voice prompt with the Item key, then pressing the On key. When the Auto key is pressed, all voice prompts are checked one by one.

List of voice prompts:

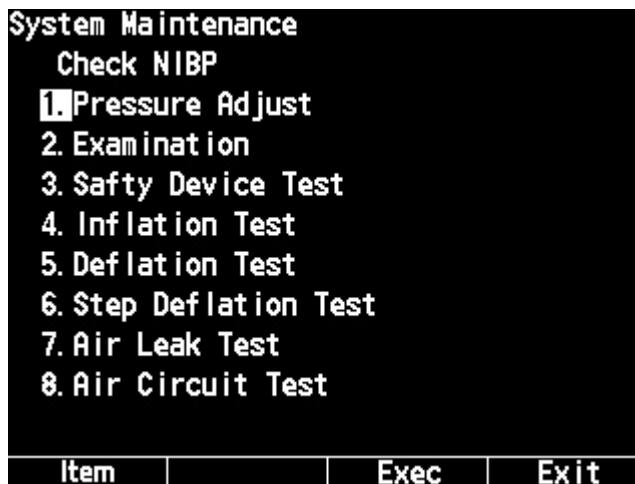
- Use disposable paddle
- Connect paddle
- SYNC
- Check disposable pads
- Press CHARGE/AED button
- If no pulse, press CHARGE/AED button
- Check patient
- Stand clear and press DISCHARGE buttons
- Defibrillation not necessary. Check ECG.
- If no pulse, start CPR
- Check pulse
- Stand clear
- Defibrillation necessary. Check ECG.

### Check NIBP Screen

You can check the optional NIBP unit function. The instrument checks the two pressure sensors, safety operation, pump, valves, air leakage and air block in the NIBP unit.

#### NOTE

**Make sure there is no pressure applied on the cuff connector before starting checking. The instrument considers the pressure of the cuff connector as 0 mmHg at the start of the check.**



#### Check items:

- Pressure Adjust: Not used.
- Examination: Checks the pressure sensors and safety circuit.
- Safety Device Test: Checks the safety circuit operation (pressure limiter and pressure continuous time).
- Inflation Test: Checks the time it takes for the inflation pressure to reach the specified pressure.  
For the Adult cuff: Checks the inflation speed with 700 mL dummy cuff.  
For the neonate cuff: Checks the inflation speed with 72 mL dummy cuff.
- Deflation Test: Not used.
- Step Deflation Test: Checks the valve operation.
- Air leak Test: Checks that the inflation pressure is held for the specified time.
- Air Circuit Test: Checks that there is no air block.

#### To perform the check items, prepare the following tools:

- Hand bulb pump
- Mercury manometer
- Y-branch connector (The Y-branch connector connects one tube of the dummy cuff to the hand bulb pump and manometer.)
- 700 mL dummy cuff YS-077P1 (A 700 ml dummy cuff is a solid container that withstands high pressure. The inner volume of this container must be 700 ml.)
- 250 mL dummy cuff YS-077P2
- 72 mL dummy cuff 6443-000022B
- Two 3.5 m air hoses (YN-901P for adult/child and YN-921P for neonate)

**Examination Screen - Checking the Pressure Sensors and Safety Circuit**

On the Examination screen, you can display the accuracy of the normal pressure sensor and safety pressure sensor. The accuracy of each sensor changes with the measuring pressure. The following table shows the acceptable accuracy range of the two pressure sensors at different pressure ranges.

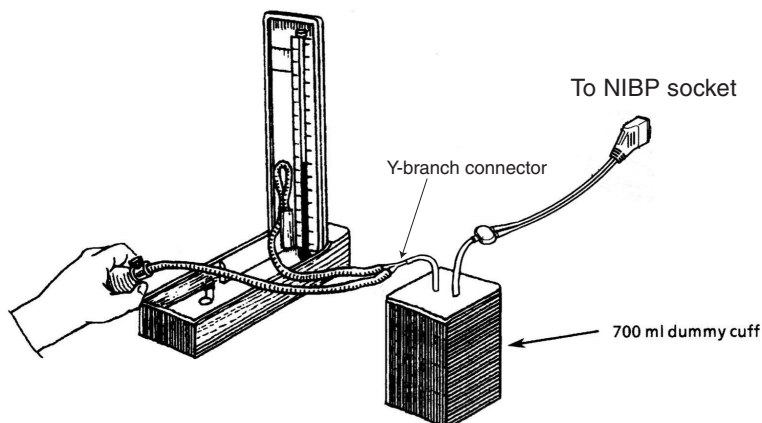
- Acceptable accuracy range of the normal pressure sensor

<u>Pressure Range</u>	<u>Acceptable Accuracy Range</u>
0 to 200 mmHg	±3 mmHg
201 to 300 mmHg	±4 mmHg

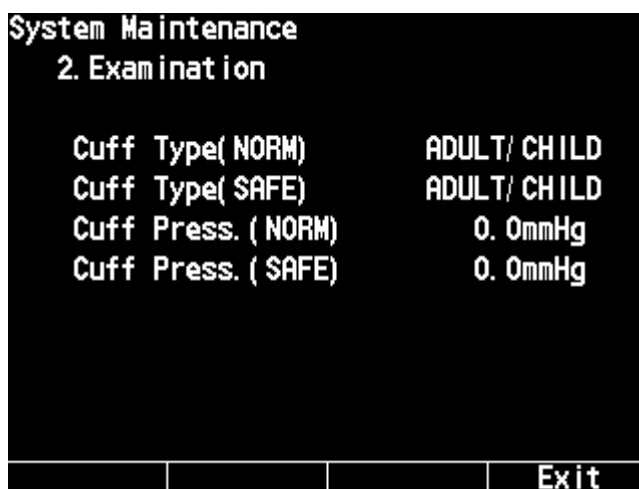
- Acceptable accuracy range of the safety pressure sensor

<u>Pressure Range</u>	<u>Acceptable Accuracy Range</u>
0 to 15 mmHg	-2 mmHg to +3 mmHg
16 to 200 mmHg	±8 mmHg
201 to 300 mmHg	±12 mmHg

1. Connect the manometer and hand bulb pump to the dummy cuff using the Y-branch connector. Connect the dummy cuff to the instrument with the air hose.



2. On the Check NIBP screen, select “2. Examination” with the Item key and press the Exec key. The Check NIBP - 2. Examination screen appears.



3. Immediately start pumping the hand bulb pump.
4. Stop pumping the hand bulb pump when the pressure reading displayed on the Examination screen comes within one of the above mentioned pressure ranges (0 to 300 mmHg at NORM or 0 to 15 mmHg, 16 to 200 mmHg or 201 to 300 mmHg at SAFE).
5. Compare the pressure reading displayed on the Examination screen with the pressure reading on the manometer and check that the difference between the two pressure readings is within the acceptable accuracy range.
6. Repeat steps 3 and 5 for a reading in the other pressure range.

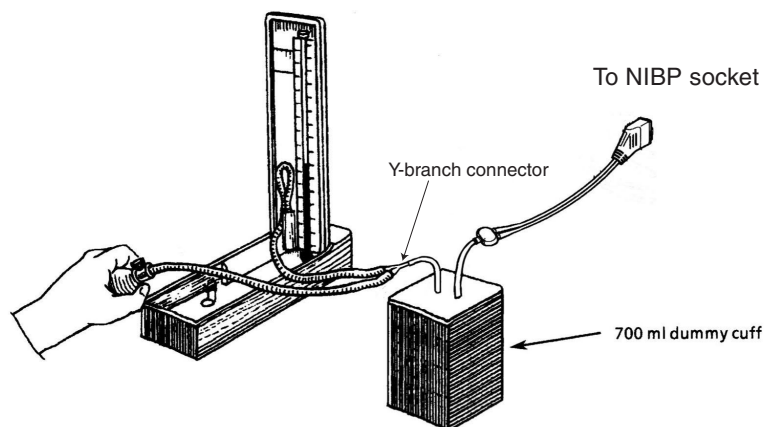
If the accuracy of the pressure sensor for any of the two pressure ranges is out of the acceptable accuracy range, replace the NIBP board.

#### **Safety Device Test Screen - Checking the Pressure Limiter and Pressure Continuous Time**

This screen has the following two check items.

##### Checking the Pressure Limiter

1. Connect the manometer and hand bulb pump to the 700 mL or 72 mL dummy cuff using a Y-branch connector. Connect the dummy cuff to the instrument with the 3.5 m long adult or neonatal air hose. The adult air hose must be used with the 700 mL dummy cuff and the neonatal air hose must be used with the 72 mL dummy cuff.



2. On the Check NIBP screen, select “3. Safety Device Test” with the Item key and press the Exec key. The Check NIBP - 3. Safety Device Test screen appears.



System Maintenance	
<b>3. Safty Device Test</b>	
<b>Over Pressure</b>	
Cuff Type( NORM)	ADULT/ CHILD
Cuff Type( SAFE)	ADULT/ CHILD
Cuff Press. ( NORM)	0. 0mmHg
Safty Device Action	0. 0mmHg
Safty Device Action	0. 0S
Safty Device Status	INACTIVE
	<b>Start</b>
	<b>Exit</b>

3. Press the Start key to start checking.
4. Immediately increase the pressure inside the dummy cuff and manometer with the hand bulb pump until the pressure reaches 300 mmHg (for adult) or 150 mmHg (for neonate).
5. After the specified pressure is reached, slowly increase the pressure with the hand bulb pump.
6. Check that the pressure is released within the range of 300 to 330 mmHg (for adult) or 150 to 165 mmHg (for neonate) and check that "Safety Device Status" changes from "INACTIVE" to "ACTIVE". The overpressure is released by the safety valve.

#### Checking the Pressure Continuous Time

1. Connect the manometer and hand bulb pump to the 700 mL dummy cuff using a Y-branch connector. Connect the dummy cuff to the instrument with the 3.5 m long adult or neonatal air hose. The adult air hose must be used with the 700 mL dummy cuff.
2. On the Check NIBP screen, select "3. Safety Device Test" with the Item key and press the Exec key. The Check NIBP - 2. Safety Device Test screen appears.
3. Press the Start key to start checking.
4. Immediately increase the pressure inside the dummy cuff and manometer with the hand bulb pump until the pressure reaches 300 mmHg (for adult) or 150mmHg (for neonate).
5. After the specified pressure is reached, stop pumping the hand bulb pump.
6. Check that the pressure is released within 15 seconds. The pressure is released by the time limiter and safety valve.

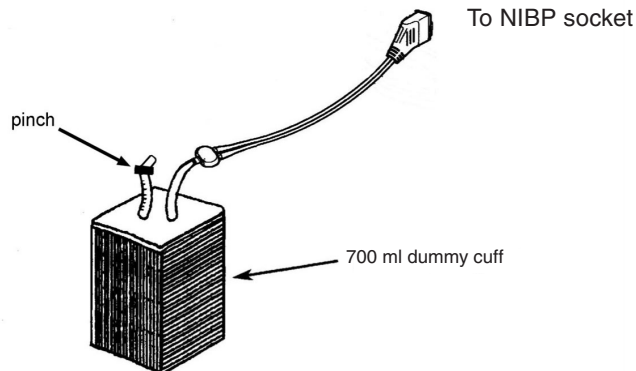
If the above mentioned checks show an error, replace the NIBP board.

### Inflation Test Screen - Checking the Inflation Speed

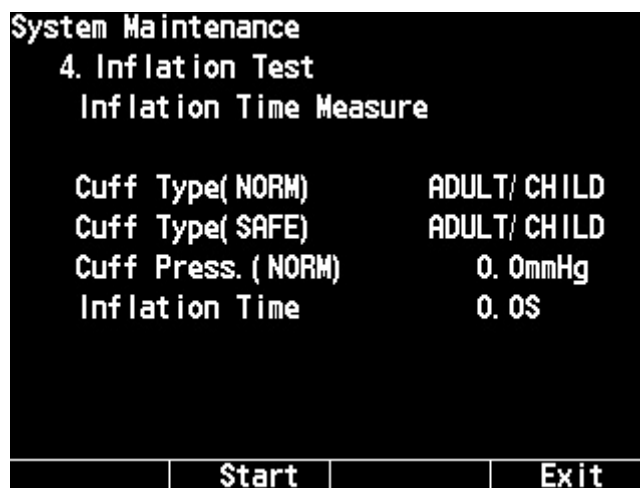
This screen has the following two check items.

#### Checking the Inflation Speed When Using the Adult Cuff

1. Connect the 700 mL dummy cuff to the instrument with the 3.5 m long adult/child air hose.



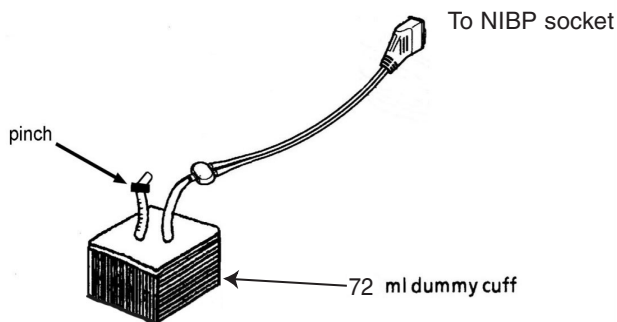
2. On the Check NIBP screen, select "4. Inflation Test" with the Item key and press the Exec key. The Check NIBP - 4. Inflation Test screen appears.



3. Press the Start key to start checking. The instrument increases the pressure On the dummy cuff to 200 mmHg.
4. Check that it takes 7 seconds or less to change from zero pressure to 200 mmHg. If it takes more than 7 seconds, the NIBP board is faulty. Replace the NIBP board.

Checking the Inflation Speed When Using the Neonate Cuff

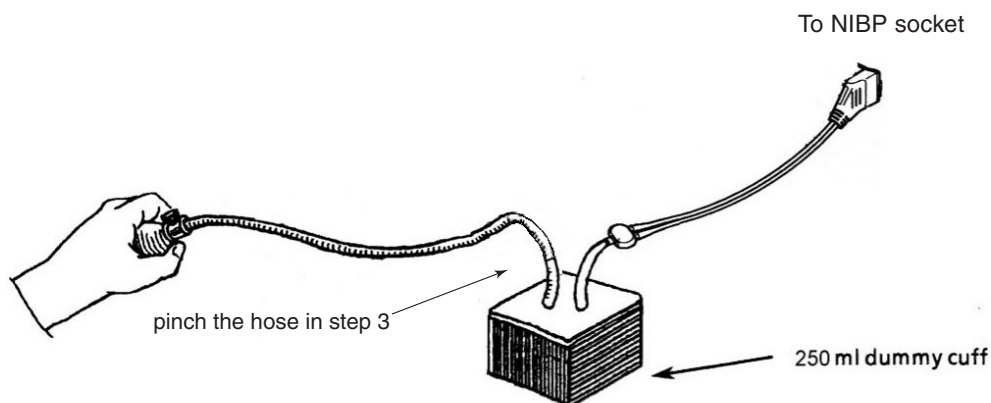
1. Connect the 72 mL dummy cuff to the instrument with the 3.5 m long neonatal air hose.



2. On the Check NIBP screen, select “4. Inflation Test” with the Item key and press the Exec key. The Check NIBP - 4. Inflation Test screen appears.
3. Press the Start key to start checking. The instrument increases the pressure in the dummy cuff to 200 mmHg.
4. Check that it takes 5 seconds or less to change from zero pressure to 200 mmHg. If it takes more than 5 seconds, the NIBP board is faulty. Replace the NIBP board.

**Air Leak Test Screen - Checking the Pressure Hold**

1. Connect the 250 mL dummy cuff and hand bulb pump to the instrument with the 3.5 m long adult/child air hose.



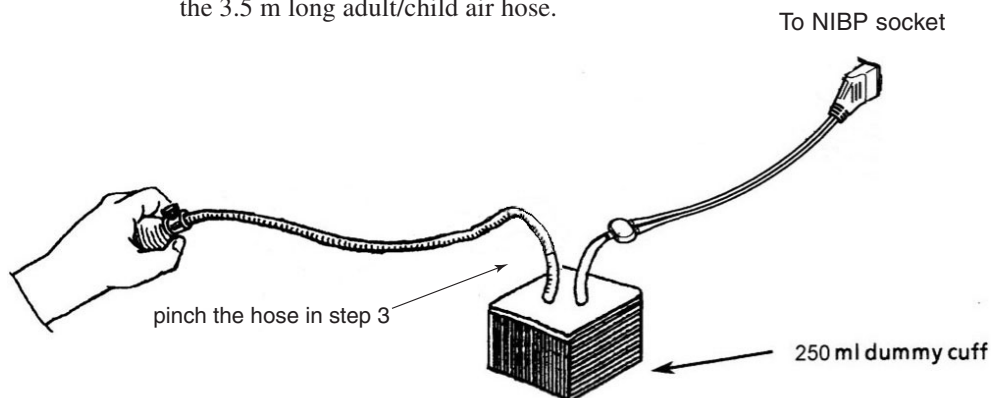
2. On the Check NIBP screen, select “7. Air Leak Test” with the Item key and press the Exec key. The Check NIBP - 7. Air Leak Test screen appears and “Pressure Hold Test” is highlighted.

System Maintenance		
7. Air Leak		
Pressure Hold Test		
Air Leak Test(Normal)		
Air Leak Test(Automatic)		
Cuff Type(NORM)	ADULT/ CHILD	
Cuff Type(SAFE)	ADULT/ CHILD	
Cuff Press. (NORM)	0.0mmHg	
Elapsed Time	0.0S	
Air Leak	0.0mmHg	
Item	Start	Exit

3. Immediately increase the pressure inside the dummy cuff with the hand bulb pump to about 250 mmHg and pinch the hose of the hand bulb pump.
4. When the pressure becomes stable, press the Start key to measure the pressure. The Start key changes to the Stop key. The pressure difference between 10 and 20 seconds after the Start key is pressed is displayed in the "Air Leak" column.
5. Check that the "Air Leak" pressure is within 5 mmHg. If it is more than 5 mmHg, the NIBP board or pneumatic component such as pump, valve or tube is faulty.

**Step Deflation Screen - Checking Valves 1 and 2****Checking Valve 1 at the High Pressure**

1. Connect the 250 mL dummy cuff and hand bulb pump to the instrument with the 3.5 m long adult/child air hose.



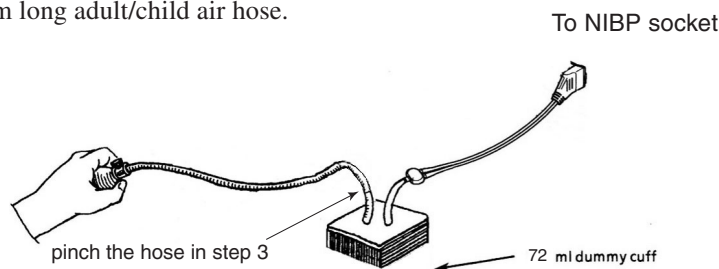
2. On the Check NIBP screen, select “6. Step Deflation Test” with the Item key and press the Exec key. The Check NIBP - 6. Step Deflation Test screen appears.

System Maintenance		
6. Step Deflation Test		
Valve 1 Open( 50ms)		
Valve 2 Open( 50ms)		
Valve 1 Open( 120ms)		
Valve 2 Open( 100ms)		
Cuff Type( NORM)	ADULT/ CHILD	
Cuff Type( SAFE)	ADULT/ CHILD	
Cuff Press. ( NORM)	0. 0mmHg	
Deflation Press.	0. 0mmHg	
Item	Start	Exit

3. Select “Valve 1 Open (50ms) with the Item key.
4. Immediately increase the pressure inside the dummy cuff with the hand bulb pump to about 250 mmHg and pinch the hose of the hand bulb pump.
5. When the pressure becomes stable, press the Start key to measure the pressure. The valve 1 opens and the Start key changes to the Stop key. The pressure difference between when the valve 1 opens and 50 milliseconds later is displayed in the “Deflation Press.” column.
6. Check that the “Deflation Press.” pressure is within the range of 7 to 23 mmHg. If the pressure difference is out of range, the NIBP board or pneumatic component such as pump, valve or tube is faulty.

Checking Valve 2 at the High Pressure

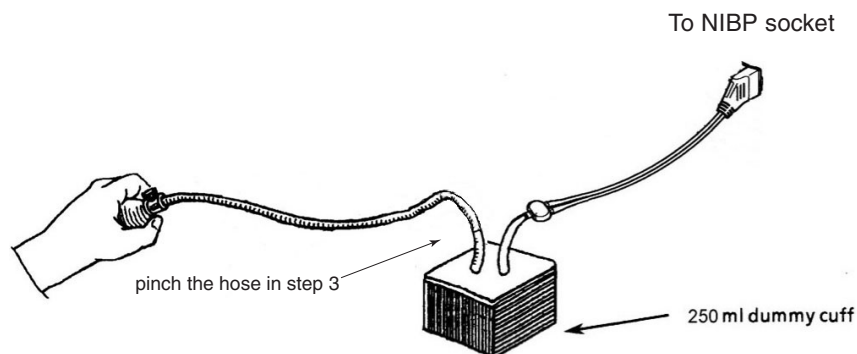
1. Connect the 72 mL dummy cuff and hand bulb pump to the instrument with the 3.5 m long adult/child air hose.



2. Select "Valve 2 Open (50ms)" with the Item key.
3. Immediately increase the pressure inside the dummy cuff with the hand bulb pump to about 250 mmHg and pinch the hose of the hand bulb pump.
4. When the pressure becomes stable, press the Start key to measure the pressure. The valve 2 opens and the Start key changes to the Stop key. The pressure difference between when the valve 2 opens and 50 milliseconds later is displayed in the "Deflation Press." column.
5. Check that the "Deflation Press." pressure is within the range of 5 to 15 mmHg. If the pressure difference is out of range, the NIBP board or pneumatic component such as pump, valve or tube is faulty.

Checking Valve 1 at the Low Pressure

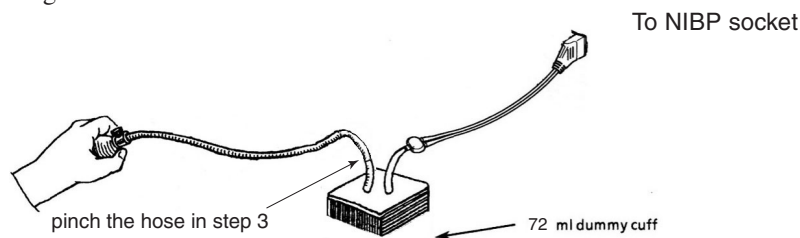
1. Connect the 250 mL dummy cuff and hand bulb pump to the instrument with the 3.5 m long adult/child air hose.



2. Select "Valve 1 Open (120ms)" with the Item key.
3. Immediately increase the pressure inside the dummy cuff with the hand bulb pump to about 20 mmHg and pinch the hose of the hand bulb pump.
4. When the pressure becomes stable, press the Start key to measure the pressure. The valve 1 opens and the Start key changes to the Stop key. The pressure difference between when the valve 1 opens and 120 milliseconds later is displayed in the "Deflation Press." column.
5. Check that the "Deflation Press." pressures is within the range of 2 to 8 mmHg. If the pressure difference is out of range, the NIBP board or pneumatic component such as pump, valve or tube is faulty.

Checking Valve 2 at the Low Pressure

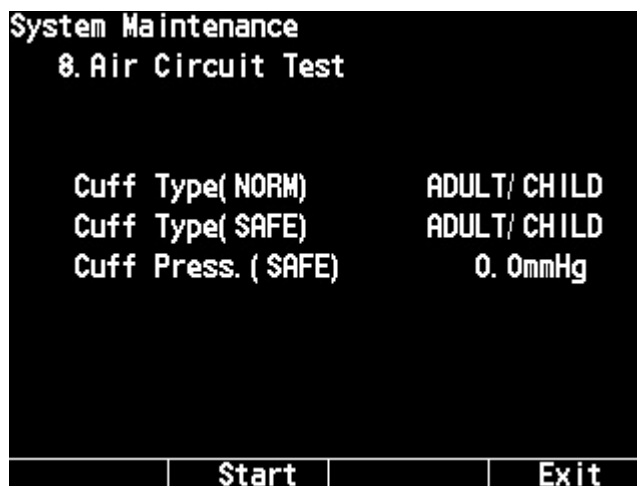
1. Connect the 72 mL dummy cuff and hand bulb pump to the instrument with the 3.5 m long adult/child air hose.



2. Select "Valve 2 Open (100ms) with the Item key.
3. Immediately increase the pressure inside the dummy cuff with the hand bulb pump to about 20 mmHg and pinch the hose of the hand bulb pump.
4. When the pressure becomes stable, press the Start key to measure the pressure. The valve 2 opens and the Start key changes to the Stop key. The pressure difference between when the valve 2 opens and 100 milliseconds later is displayed in the "Deflation Press." column.
5. Check that the "Deflation Press." pressures is within the range of 2 to 8 mmHg. If the pressure difference is out of range, the NIBP board or pneumatic component such as pump, valve or tube is faulty.

**Air Circuit Test Screen -**

1. Disconnect any air hose from the NIBP socket on the instrument.
2. On the Check NIBP screen, select "8. Air Circuit Test" with the Item key and press the Exec key. The Check NIBP - 8. Air Circuit Test screen appears.

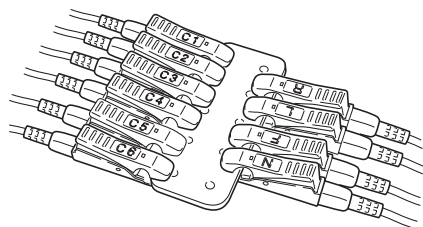
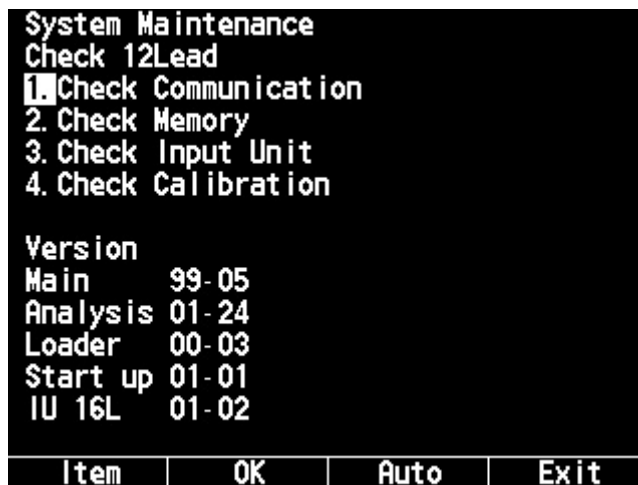


3. Press the Start key to start checking. The pump works.
4. Check that the pressure displayed in the "Cuff Press. (SAFE) column does not exceed 40 mmHg after about 5 seconds.

If the pressure exceeds 40 mmHg, the pneumatic component such as pump, valve or tube is faulty.

**Check 12 Lead Screen**

You can check the optional 12 lead ECG unit function automatically and manually. When "Auto" is selected, all items are checked one by one.



Input check jig

Check items:

Check communication: Check the communication between the defibrillator and 12 lead ECG unit.

Check memory: Checks the memory on the 12 lead ECG unit.

Check Input Unit: Check the input circuit on the 12 lead ECG unit. To check this item, connect the tip of the electrode lead to the input check jig (12 lead ECG unit standard accessory).

Check Calibration: Checks the amplifiers on the 12 lead ECG unit.

Automatic checking mode:

Press the Auto key. All items are checked one by one.

Manual checking mode:

Select the item with the Item key and press the OK key.



#### 4. MAINTENANCE

### A/D View Screen

This screen displays each AD value that the main CPU currently receives. You can display the A/D wave screen for each AD value by selecting the item with the Item key, then pressing the Exec key.

System Maintenance			
A/D View			
1. Ecg	15	0x01f5	
2. Polarization		0x01f8	
3. Charge	0	0x0000	
4. Battery voltage	0	0x0382	
5. Battery temperature		0x016f	
6. Recorder temperature		0x01ea	
7. Pacing current		0x0000	
8. Field strength		0x0267	
9. Battery current	0	0x03ff	
Item		Exec	Exit



System Maintenance			
A/D View			
10. Pacing current setting		0x0024	
11. Discharge 1		0x7fff	
12. Discharge 2		0x7fff	
13. Relay drive error		0x00e1	
14. Monitor error		0x0000	
15. Reference voltage		0x0203	
16. TTR		0x0000	
17. HV temperature		0x0265	
Item		Exec	Exit

AD Wave screen

To return to the A/D View screen, press the Exit key.

To return to the System Maintenance - Menu screen, press the Exit key.

### Operation Time Screen

This screen displays the count of internal and external discharges and operation time.

System Maintenance			
OperationTime			
Discharge Times			
2- 200J	20		
300- 360J	60		
Operation Time	11h33m		
			Menu

TEC-7621/7631 Series

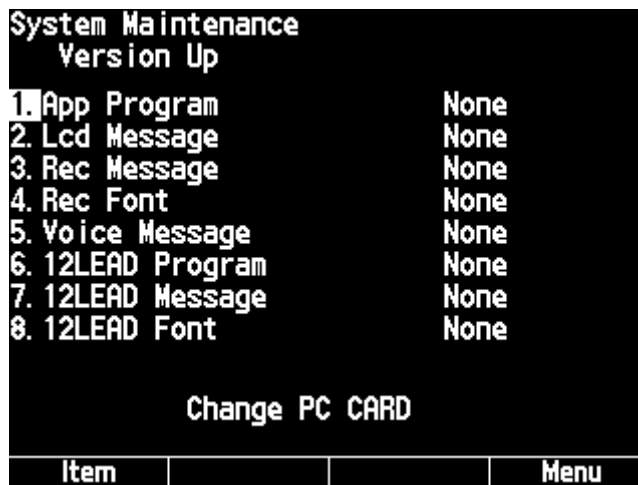
System Mainten OperationTime			
Discharge Times			
2- 150J	375		
200- 270J	129		
Operation Time	38h11m		
			Menu

TEC-7721/7731 Series

To return to the System Maintenance - Menu screen, press the Menu key.

### Version Up Screen

This screen is used to update programs and data for the instrument with a version up card. When a version up card is inserted into the memory card slot, the program versions of the instrument and version up card are displayed in the upper right corner of the screen. Depending of the contents of the version up card, "No" is displayed for items that are not updated.

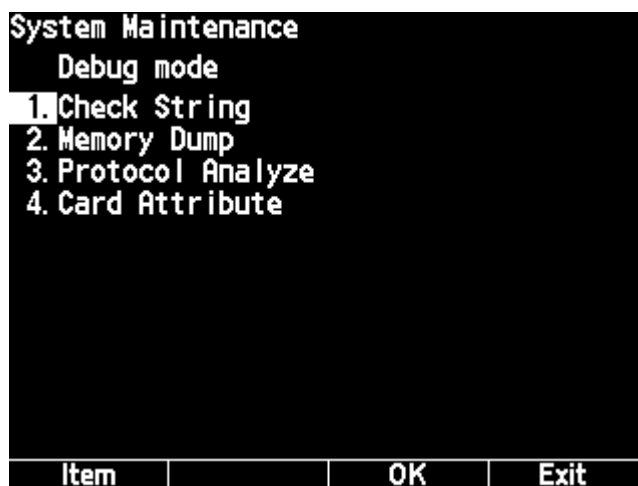


Program version and message

Card type	Version	Message	Function key
Program card	Instrument < Version up card	Versionup	Start
	Instrument > Version up card	Versiondown	Confirm
Data card	-----	Versionup	Start

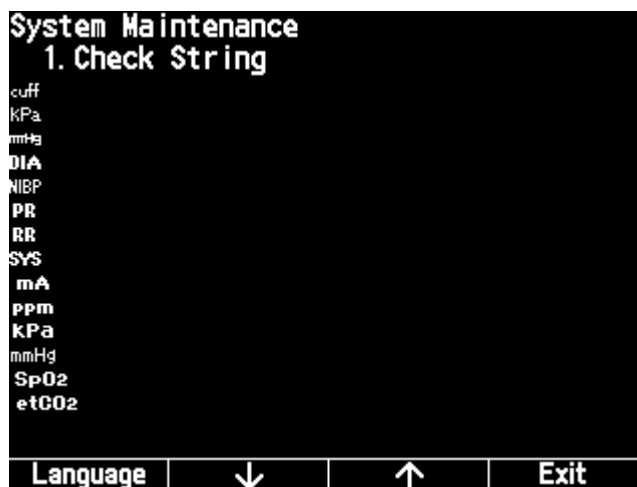
To return to the System Maintenance - Menu screen, press the Menu key.

### Debug Mode Screen



### Check String Screen

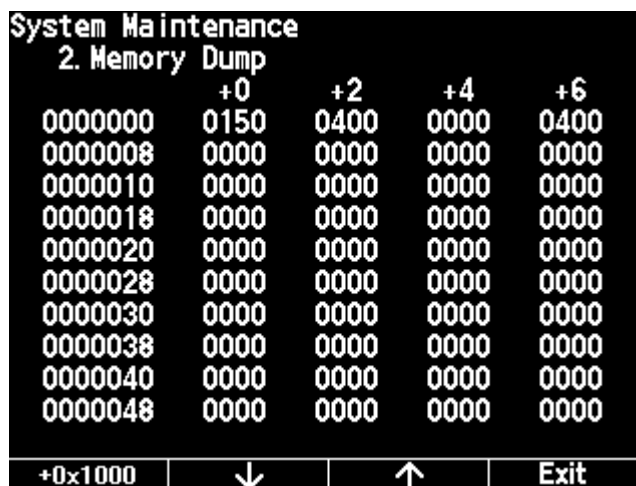
This screen is used to check the characters used in the instrument. You can display the language which is selected in “Language” (System Maintenance - Configuration screen) by pressing the Language key.



- To scroll the characters, use the ↓ or ↑ key.
- To return to the System Maintenance - Debug Mode screen, press the Exit key.

### Memory Dump Screen

This screen is used to check the flash memory. The address and data can be displayed.



- To display the next 1000H, press the +0x1000 key
- To display the previous or next 50H, use the ↓ or ↑ key.
- To return to the System Maintenance - Debug Mode screen, press the Exit key.

**Protocol Analysis Screen**

This screen is used to check the communication between the main CPU and sub CPU. The address and data can be displayed.

- To display the previous or next 50H, use the ↓ or ↑ key.
- To return to the System Maintenance - Debug Mode screen, press the Exit key.

System Maintenance				
3. Protocol Analyze				
	+0	+2	+4	+6
140000	0000	0000	00B4	0006
140008	0000	0000	0000	0000
140010	0000	0000	0032	0000
140018	0000	0064	0000	0000
140020	0000	0000	0000	0000
140028	0000	0000	0000	0000
140030	0000	0000	0000	0000
140038	0000	0000	0000	0000
140040	0000	00FF	00FF	0001
140048	0510	0103	0000	0000
	↓	↑	Exit	

**Card Attribute Screen**

This is not available for this instrument.

## Periodic Replacement Schedule

To maintain the performance of the instrument, the following parts must be periodically replaced by qualified service personnel.

<b>Battery Pack, YZ-024H9</b>	<b>Every year</b>
<b>Pad Adapter, JC-755V</b>	<b>Every two years</b>
<b>Pad Adapter, JC-705V</b>	<b>Every two years</b>

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### CAUTION

**Before disposing of the battery, check with your local solid waste officials for recycling options or proper disposal.**

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### Reference

Fuses on the main board

<u>Part No.</u>	<u>Code No.</u>	<u>Description</u>
F0501	606168	4 A
F0502	392406	121°C
F0504	606117	15 A
F1801	607648	1 A

# Maintenance Check Sheet

## Maintenance Check Sheet

1/2

Date: \_\_\_\_\_

Customer: \_\_\_\_\_

Customer Address: \_\_\_\_\_

Service Personnel: \_\_\_\_\_ Service Company: \_\_\_\_\_

Instrument Name: \_\_\_\_\_ Instrument Model: \_\_\_\_\_

Instrument Serial Number: \_\_\_\_\_ Hardware Revision: \_\_\_\_\_

Software Revision: \_\_\_\_\_

<b>Overview</b>	Outside of instrument is clean.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	No loose screws.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	No physical damage, no bent parts and no contact with liquid.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Operation panel is not torn or broken.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	All keys, buttons and controls are undamaged.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Power cord, cables and pins of the paddle connector are not frayed and are correctly connected to the instrument.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
<b>Accessories</b>	Paddles, pads and cables prepared.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Enough recording paper.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Sterilized internal paddle electrode prepared, if necessary.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Enough disposable pads, if necessary.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Enough contact gel (GELAID).	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Enough disposable electrodes.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
<b>Installation</b>	Instrument is installed in the proper location.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Specified 3-prong power cord and ground lead are used.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Battery is in the instrument.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Recording paper is loaded.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Options are correctly installed in the instrument.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
<b>Power on</b>	There is no fire, smoke or smell.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	There is no electrical shock when touching the instrument.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Instrument is not abnormally hot.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Instrument does not affect surrounding equipment.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	AC lamp lights when the AC power is supplied.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Battery charge lamp lights when the AC power is supplied.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
<b>Basic operation</b>	The screen display is correct. (brightness, no distortion)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Lamp indication is correct.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	All keys, buttons and control operate properly.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	All settings are correct.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	The battery is fully charged.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	Alarm functions properly.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	There is no error message or abnormal operation.	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

## Maintenance Check Sheet

2/2

### Defibrillation function

Synchronized cardioversion and defibrillation function is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Output energy value is proper.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Time to charge a selected energy is proper.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Charged energy can be changed to another value.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
The defibrillator properly disarms.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Energy discharge test is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Continuity of the paddles and paddle cables is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>

### Monitoring

ECG waveform display is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
The continuity of the ECG connection cable is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Heart rate display is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
QRS sync mark is displayed and heart rate sync sound generates.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
ECG lead and sensitivity can be changed properly.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Alarms setting and alarm function is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Sound volume can be changed properly.	Yes <input type="checkbox"/>	No <input type="checkbox"/>

### Recorder

Paper is fed correctly (no wandering or jam).	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Waveforms and letters are clearly recorded.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Time printed on the recording paper is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>

### Pacing (TEC-7631/7731 series only)

Pacing pulse rate and intensity can be set properly.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
The continuity of the pad adaptor cable is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
FIXED and DEMAND mode function is correct.	Yes <input type="checkbox"/>	No <input type="checkbox"/>

# *Section 5 Replaceable Parts List*

TEC-7621/7631 Series Defibrillator .....	5.2
TEC-7721/7731 Series Defibrillator .....	5.6
KD-022A Cart .....	5.10



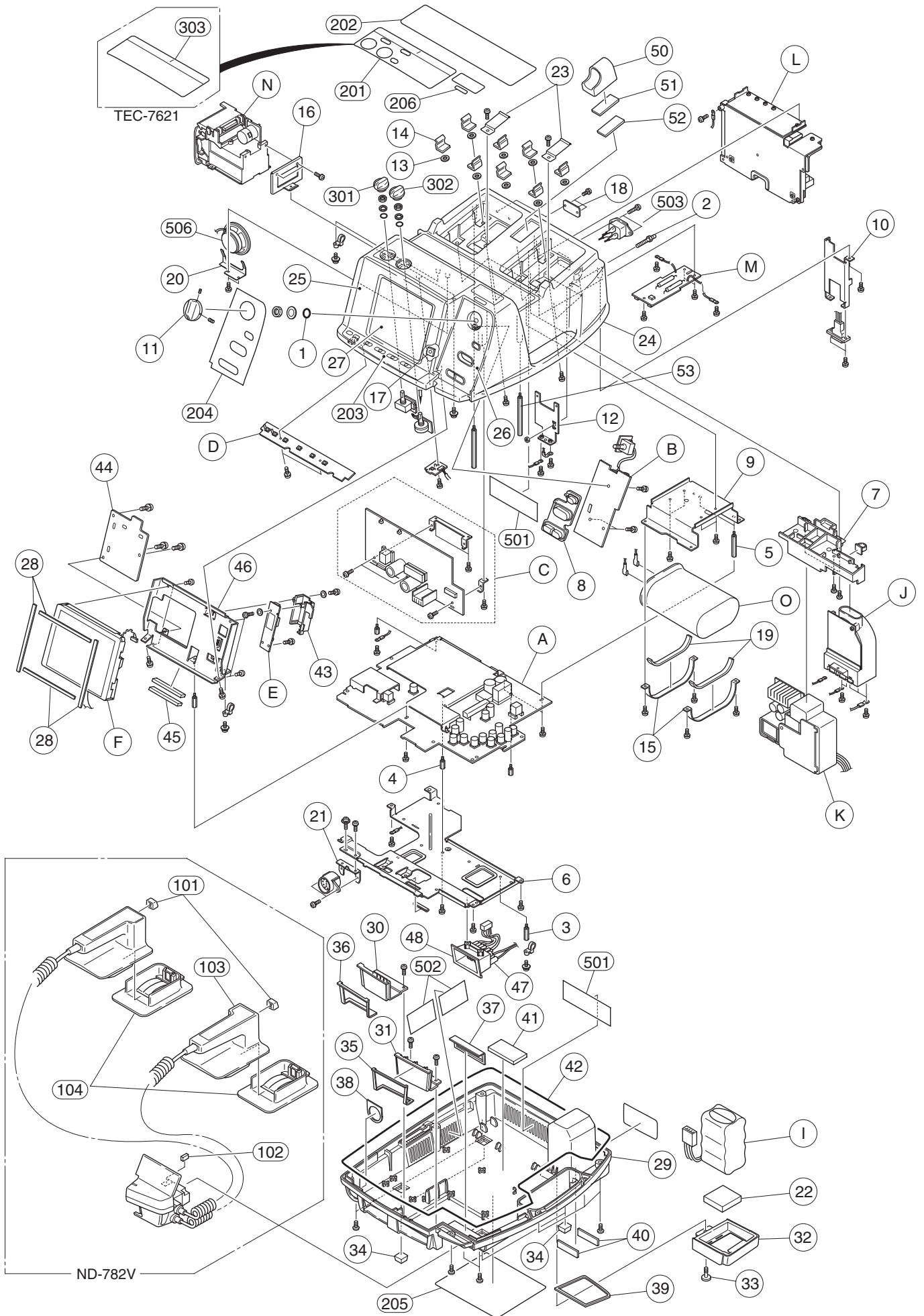
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When ordering parts or accessories from your nearest Nihon Kohden Corporation distributor, please quote the NK code number and part name which are listed in this service manual, and the name or model of the unit in which the required part is located. This will help us to promptly attend to your needs. Always use Nihon Kohden parts and accessories to assure maximum performance from your instrument.

## TEC-7621/7631 Series Defibrillator

Index	Code No.	Q'ty	Description
1	107546	1	O ring, H-2401 (P-9)
2	6144-005993A	1	Ground terminal for C version
	551734	1	Ground terminal for K/E version
3	619582	2	Spacer bolt, BSB-322
4	619564	1	Spacer bolt, BSB-312
5	619608	2	Spacer bolt, BSB-365
6	6111-006519B	1	Main chassis
7	6112-015249C	1	HV unit holder
8	6113-017637D	1	Rubber switch (defibrillation)
9	6113-041468B	1	HV capacitor holder
10	6113-041495D	1	Battery bracket
11	6113-041521C	1	Energy/Mode Select control knob
12	6113-044278A	1	AC/DC unit bracket
13	6114-035802A	8	Paddle lock gasket
14	6114-069677A	8	Paddle lock spring K-718
15	6114-118241B	2	HV capacitor bracket
16	6114-118277B	1	Recorder unit bracket
17	6114-118312C	2	LCD sponge (2)
18	6114-118321B	1	ZR blank panel
19	6114-118357C	2	HV capacitor sponge
20	6114-118366B	1	Speaker bracket
21	6114-122343A	1	ECG connector board bracket
22	6114-123431B	1	Battery sponge 1
23	6114-124377A	2	Test electrode plate
24	6141-000888B	1	Upper casing
25	6143-011747C	1	Front panel assy
26	6144-011139B	1	Operation panel assy
27	6114-118268C	1	LCD filter
28	6114-125402A	4	LCD gasket
29	6111-006546C	1	Lower casing
30	6113-041548C	1	Blank panel (DSI)
31	6113-041557C	1	Blank panel (NIBP)
32	6113-041566C	1	Battery pack holder cover
33	6114-060436	1	Battery pack holder cover screw
34	6114-093614	4	Rubber foot
35	6114-118107B	1	Blank panel gasket (NIBP)
36	6114-118116B	1	SpO <sub>2</sub> gasket
37	6114-118134C	1	Paddle socket gasket
38	6114-118143C	1	ECG connector gasket
39	6114-118295B	1	Battery pack holder cover gasket
40	6114-123449A	2	Battery sponge 2

# 5. REPLACEABLE PARTS LIST



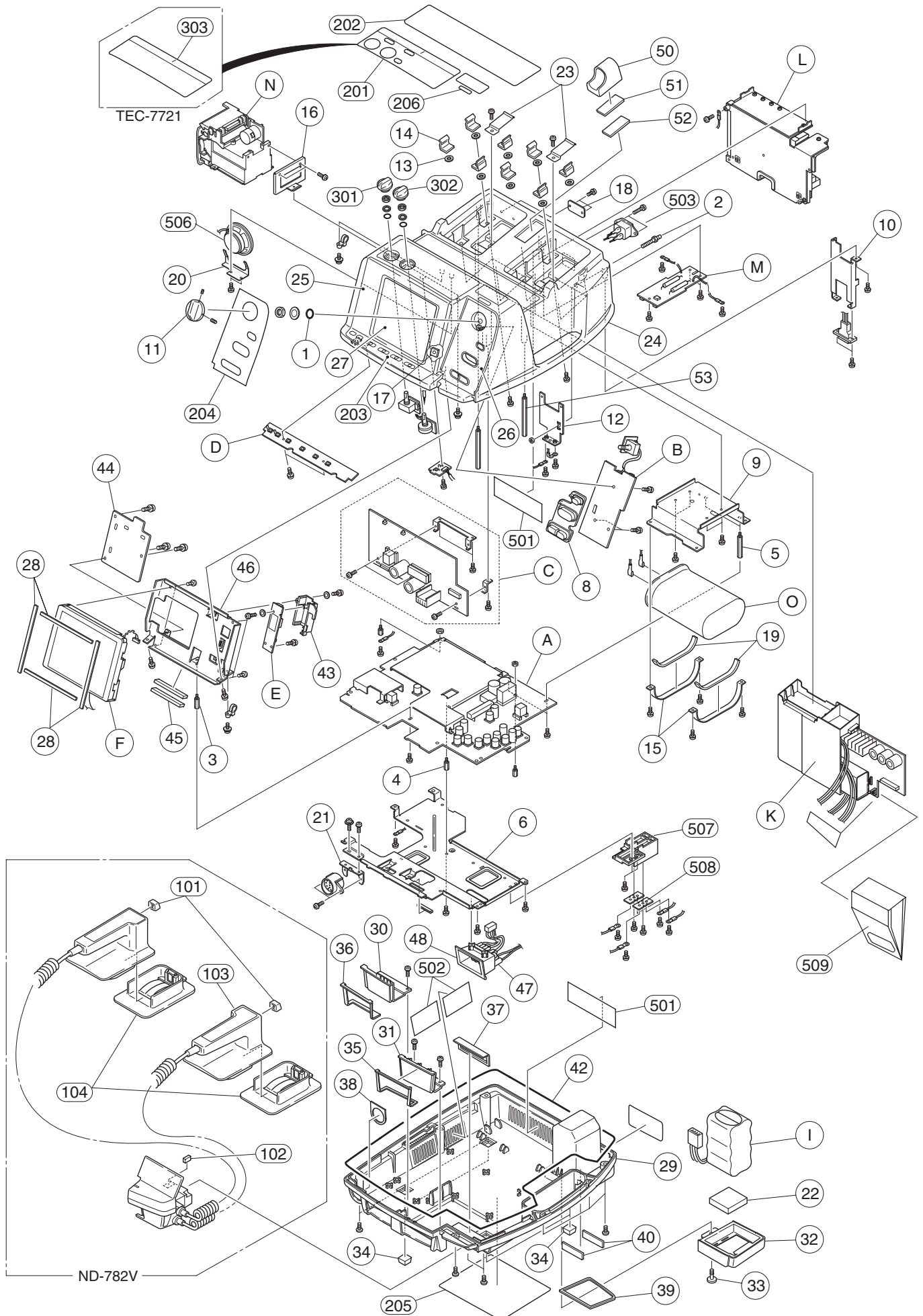
## 5. REPLACEABLE PARTS LIST

Index	Code No.	Q'ty	Description
41	6114-123467A	1	HV capacitor sponge
42	6114-125581A	1	Lower casing gasket
43	6113-041584C	1	Inverter board cover
44	6114-125616A	1	EMC plate
45	6114-125652B	1	LCD-EMC sponge
46	6143-011943B	1	LCD chassis assy
47	6113-002466	1	Socket insulator
48	6113-041512C	1	Paddle socket
50	6113-011607C	1	Paste holder
51	6114-053373A	1	Velcro fastener (upper)
52	6114-053382A	1	Velcro fastener (lower)
53	619591	1	Spacer bolt, BSB-356
101	6114-123948	2	DISCHARGE button (K-719)
102	6114-124493A	1	Paddle connector sponge
103	6114-124207	1	CHARGE button (K-719)
104	ND-611V	2	Adult plate assy
201	6123-015077	1	Pacing panel for C version
	6123-014345A	1	Pacing panel for E version
	6123-013444C	1	Pacing panel for K version
202	6123-015041	1	Instruction panel for C version
	6123-014185A	1	Instruction panel for E version
	6123-013417C	1	Instruction panel for K version
203	6123-013025C	1	Monitoring panel
204	6123-015068	1	Operation panel for TEC-7621C
	6123-015086	1	Operation panel for TEC-7631C
	6123-014265	1	Operation panel fot TEC-7621E
	6123-014309	1	Operation panel for TEC-7631E
	6123-014113	1	Operation panel for TEC-7621K
	6123-014122	1	Operation panel for TEC-7631K
205	6123-015032	1	Operation panel (battery) for C version
	6123-014381A	1	Operation panel (battery) for E version
	6123-013435D	1	Operation panel (battery) for K version
206	6124-037586	1	Model label for TEC-7621C
	6124-037603	1	Model label for TEC-7631C
	6124-037595	1	Model label for TEC-7621E
	6124-037612	1	Model label for TEC-7631E
	6124-034829A	1	Model label for TEC-7631K
	6124-034847A	1	Model label for TEC-7631K

<b>Index</b>	<b>Code No.</b>	<b>Q'ty</b>	<b>Description</b>
301	6113-020401C	1	PACING RATE control knob
302	6113-020393B	1	PACING OUTPUT control knob
303	6123-015059	1	Caution label for C version
	6123-014229A	1	Caution label for E version
	6123-014015	1	Caution label for K version
304	032813	1	PACING RATE control rotary switch
305	458381A	1	PACING OUTPUT control volume
306	619501	1	Energy/Mode Select control rotary switch
501	6114-118161C	1	Dripproof sheet 2
502	6114-124546B	2	Dripproof sheet 1
503	313626	1	AC inlet
505	622079	1	ECG Connector board
506	630195	1	Speaker, C065K12A0000
A	UR-0247	1	Main board
B	UR-0249	1	Main key board
C	UR-0253	1	Pacer board (TEC-7631 series only)
D	UR-0250	1	Key board
E	618298A	1	Inverter board (included in CY-0008 LCD assy)
F	618306A	1	LCD unit (included in CY-0008 LCD assy)
I	YZ-024H9	1	Battery pack, NKB-301V
J	NKL-702	1	HV inductor
K	HV-761V	1	Relay unit
L	UR-0262	1	AC-DC unit
M	UR-0251	1	Test Load board
N	WS-761V	1	Recorder unit
O	NKC-4840SA	1	HV capacitor

## TEC-7721/7731 Series Defibrillator

Index	Code No.	Q'ty	Description
1	107546	1	O ring, H-2401 (P-9)
2	551734	1	Ground terminal
3	619582	1	Spacer bolt, BSB-322
4	619564	1	Spacer bolt, BSB-312
5	619608	2	Spacer bolt, BSB-365
6	6111-006519B	1	Main chassis
8	6113-017637D	1	Rubber switch (defibrillation)
9	6113-041468B	1	HV capacitor holder
10	6113-041495D	1	Battery bracket
11	6113-041521C	1	Energy/Mode Select control knob
12	6113-044278A	1	AC/DC unit bracket
13	6114-035802A	8	Paddle lock gasket
14	6114-069677A	8	Paddle lock spring K-718
15	6114-118241B	2	HV capacitor bracket
16	6114-118277B	1	Recorder unit bracket
17	6114-118312C	2	LCD sponge (2)
18	6114-118321B	1	ZR blank panel
19	6114-118357C	2	HV capacitor sponge
20	6114-118366B	1	Speaker bracket
21	6114-122343A	1	ECG connector board bracket
22	6114-123431B	1	Battery sponge 1
23	6114-124377A	2	Test electrode plate
24	6141-000888B	1	Upper casing
25	6143-011747C	1	Front panel assy
26	6144-011139B	1	Operation panel assy
27	6114-118268C	1	LCD filter
28	6114-125402A	4	LCD gasket
29	6111-006546C	1	Lower casing
30	6113-041548C	1	Blank panel (DSI)
31	6113-041557C	1	Blank panel (NIBP)
32	6113-041566C	1	Battery pack holder cover
33	6114-060436	1	Battery pack holder cover screw
34	6114-093614	4	Rubber foot
35	6114-118107B	1	Blank panel gasket (NIBP)
36	6114-118116B	1	SpO <sub>2</sub> gasket
37	6114-118134C	1	Paddle socket gasket
38	6114-118143C	1	ECG connector gasket
39	6114-118295B	1	Battery pack holder cover gasket
40	6114-123449A	2	Battery sponge 2
42	6114-125581A	1	Lower casing gasket
43	6113-041584C	1	Inverter board cover





## 5. REPLACEABLE PARTS LIST

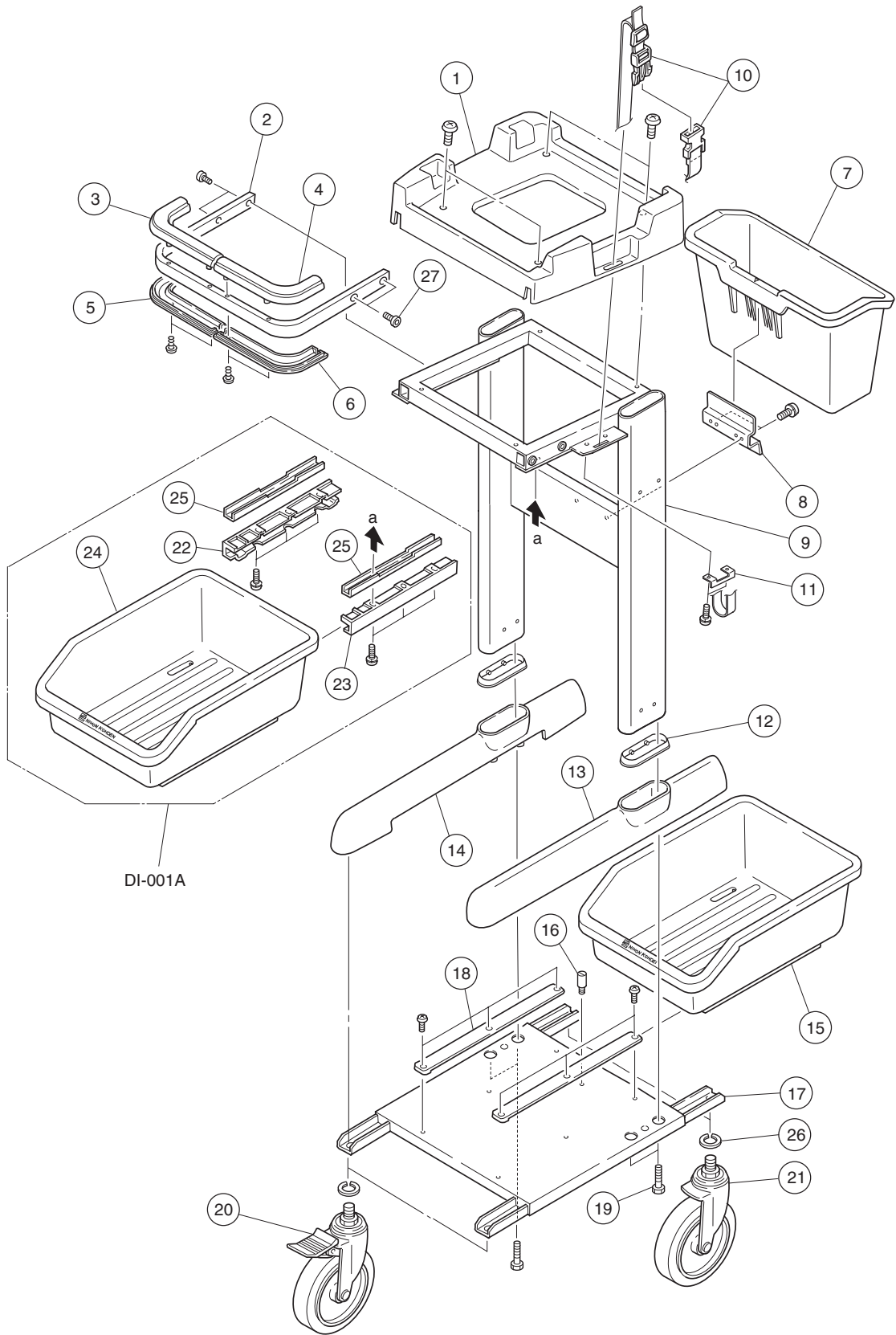
Index	Code No.	Q'ty	Description
44	6114-125616A	1	EMC plate
45	6114-125652B	1	LCD-EMC sponge
46	6143-011943B	1	LCD chassis assy
47	6113-002466	1	Socket insulator
48	6113-041512C	1	Paddle socket
50	6113-011607C	1	Paste holder
51	6114-053373A	1	Velcro fastener (upper)
52	6114-053382A	1	Velcro fastener (lower)
53	619591	1	Spacer bolt, BSB-356
101	6114-123948	2	DISCHARGE button (K-719)
102	6114-124493A	1	Paddle connector sponge
103	6114-124207	1	CHARGE button (K-719)
104	ND-611V	2	Adult plate assy
201	6123-014345A	1	Pacing panel for E version
	6123-013444C	1	Pacing panel for K version
202	6123-014185A	1	Instruction panel for E version
	6123-013417C	1	Instruction panel for K version
203	6123-013025C	1	Monitoring panel
204	6123-014773	1	Operation panel for TEC-7721E
	6123-014719	1	Operation panel for TEC-7721K
	6123-014782	1	Operation panel for TEC-7731E
	6123-014728	1	Operation panel for TEC-7731K
205	6123-014381A	1	Operation panel (battery) for E version
	6123-013435D	1	Operation panel (battery) for K version
206	6124-039414	1	Model label for TEC-7721E
	6124-037033	1	Model label for TEC-7721K
	6124-039405	1	Model label for TEC-7731E
	6124-037042	1	Model label for TEC-7731K
301	6113-020401C	1	PACING RATE control knob
302	6113-020393B	1	PACING OUTPUT control knob
303	6123-014229A	1	Caution label for E version
	6123-014015	1	Caution label for K version
304	032813	1	PACING RATE control rotary switch
305	458381A	1	PACING OUTPUT control volume
306	619501	1	Energy/Mode Select control rotary switch
501	6114-118161C	1	Drip-proof sheet 2
502	6114-124546B	2	Drip-proof sheet 1
503	313626	1	AC inlet

<b>Index</b>	<b>Code No.</b>	<b>Q'ty</b>	<b>Description</b>
A	UR-02471	1	Main board
B	UR-0249	1	Main key board
C	UR-0253	1	Pacer board (TEC-7731 series only)
D	UR-0250	1	Key board
E	618298A	1	Inverter board (included in CY-0008 LCD assy)
F	618306A	1	LCD unit (included in CY-0008 LCD assy)
I	YZ-024H9	1	Battery pack, NKB-301V
K	HV-771V	1	Biphasic HV unit
L	UR-0262	1	AC-DC unit
M	UR-0251	1	Test Load board
N	WS-761V	1	Recorder unit
O	640317	1	HV capacitor, NKC-30100A
505	622079	1	ECG Connector board
506	630195	1	Speaker, C065K12A0000
507	6113-047275	1	Terminal bracket
508	6114-129835	2	Terminal
509	6113-047319	1	HV film protector

## 5. REPLACEABLE PARTS LIST

### KD-022A Cart

Index	Code No.	Q'ty	Description
1	6111-006867C	1	Top plate
2	6112-007507H	1	Handle 350A
3	6113-138213	1	Handle grip L1
4	6113-038231	1	Handle grip R1
5	6113-038222	1	Handle grip L2
6	6113-038249	1	Handle grip R2
7	6112-006606B	1	Basket
8	6114-059901D	1	Basket holder
9	6141+000879	1	Frame assy 350-840K-A
10	6114-123146A	1	Belt
11	6114-123182	1	Belt holder
12	6114-110579	2	Base cover
13	6112-007311B	1	Base R
14	6112-007302B	1	Base L
15	6112-006598D	1	Tray 1
16	2219-015105	1	Fixing screw
17	6112-006562I	1	Base plate 350
18	6113-019234B	2	Guide rail
19	6114-057271B	4	Screw 1
20	6143-011159A	2	Caster NKC-150S (F)
21	6143-011141A	2	Caster NKC-150 (F)
22	6113-018716D	1	Slide rail L
23	6113-011679D	1	Slide rail R
24	6112-006598D	1	Tray 1
25	6113-023416A	2	Slide rail holder





**NIHON KOHDEN CORPORATION**

1-31-4 Nishiochiai, Shinjuku-ku  
Tokyo 161-8560, Japan  
Phone +81 (3) 5996-8036  
Fax +81 (3) 5996-8100

**上海维修站**  
上海市徐汇区南丹路 169 号 新旺大厦 3008 室  
电话：021-6469-9016 传真：021-6486-7218

**北京维修站**  
北京市南礼士路甲 3 号 海通大厦 601 室  
电话：010-6804-9531 传真：010-6804-7366

**广州维修站**  
广州市环市东路 371~375 号 世贸中心南塔 2516 室  
电话：020-8777-9108 传真：020-8778-1882

**沈阳维修站**  
沈阳市和平区太原北街 20 号  
电话：024-2340-2565 传真：024-2383-2557

**成都维修站**  
成都市一环路西二段 25 号 华立大厦 420 室  
电话：028-773-6236 传真：028-773-6236

**NIHON KOHDEN AMERICA, INC.**  
90 Icon Street, Foothill Ranch, CA 92610, USA  
Phone +1 (949) 580-1555  
Fax +1 (949) 580-1550

**EC REP** European Representative  
**NIHON KOHDEN EUROPE GmbH**  
Raiffeisenstraße 10  
D-61191 Rosbach, Germany  
Phone +49 (6003) 8270  
Fax +49 (6003) 827599

**NIHON KOHDEN ITALIA S.r.l.**  
Via San Tomaso 78  
24121 Bergamo, Italy  
Phone +39 35-219543  
Fax +39 35-232546

**NIHON KOHDEN IBERICA S.L.**  
C/ Ulises 75A, 28043 Madrid, Spain  
Phone +34 917-161080  
Fax +34 913-004676

**NIHON KOHDEN SINGAPORE PTE LTD**  
70 Shenton Way, #14-05 Marina House  
Singapore 079118  
Phone +65 6224-6700  
Fax +65 6224-6216

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 distributor concerning this instrument, mention these two pieces of information for quick and accurate service.

Model \_\_\_\_\_

Serial number \_\_\_\_\_

Your Distributor