OPERATOR'S MANUAL

TRANSMITTER

ZS-910PA

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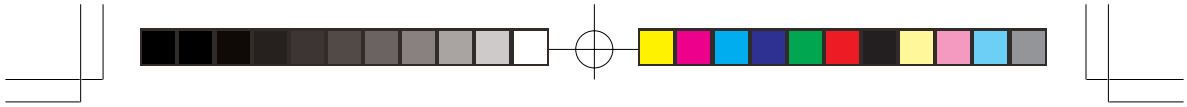
0614-008543

NIHON KOHDEN



TRANSMITTER

ZS-910PA

0614-008543

Model: ZS-910PA

Manual code no.: 0614-008543

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This manual is organized.	1	2	3	4	5
I can find the information I want.	1	2	3	4	5
The information is accurate.	1	2	3	4	5
I can understand the instructions.	1	2	3	4	5
The illustrations are appropriate and helpful.	1	2	3	4	5
The manual length is appropriate.	1	2	3	4	5

Comments:

Thank you for your cooperation. We appreciate it very much.

Name:
Occupation/Position:
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cutting line

Contents

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.**

10. **When the instrument is used with a defibrillator, make sure that the instrument is protected against defibrillator discharge. If not, remove patient cables and/or transducers from the instrument to avoid possible damage.**

WARRANTY POLICY

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

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

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

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

This warranty does not apply to products that have been modified, disassembled, reinstalled or repaired without Nihon Kohden approval or which have been subjected to neglect or accident, damage due to accident,

fire, lightning, vandalism, water or other casualty, improper installation or application, or on which the original identification marks have been removed.

In the USA and Canada other warranty policies may apply.

CAUTION

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

Equipment Authorization Requirement

Operation of this equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service.

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. **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.

3. **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.

Conventions Used in this Manual and Instrument

Warnings, Cautions and Notes

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

WARNING

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

CAUTION

A caution alerts the user to possible injury or problems with the instrument associated with its use or misuse such as instrument malfunction, instrument failure, damage to the instrument, or damage to other property.

NOTE

A note provides specific information, in the form of recommendations, prerequirements, 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
	Power ON
	Power Off
	Defibrillation proof type CF applied part
	DC
	Attention, consult operator’s manual
	Nurse call
	Battery Position

Introduction

The ZS-910PA transmits ECG from a patient to a Nihon Kohden monitor. The transmitter can change channels when connected to the QI-901PK channel writer. Read the operator's manual for the monitor together with this manual before operation.

CAUTION

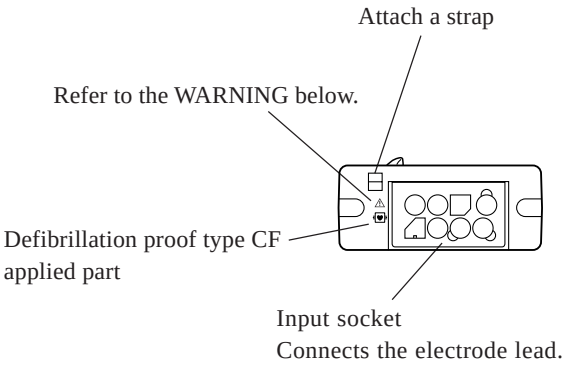
- **Do not use the same channel for different patients. Otherwise, two patients' data will be lost due to mutual modulation interference, or another patient's data may appear on the receiving monitor screen.**
- **Do not use transmitters of adjacent channels in a hospital. Otherwise, radio waves from one transmitter affects the receiver of the adjacent channel's transmitter and there may be interference.**

NOTE

- **To prevent interference between channels, assign a channel administrator in the hospital and only he or she should manage channel assignment.**
- **Use Nihon Kohden parts and accessories to assure maximum performance from your instrument.**
- **It is recommended to use a diversity antenna system on the receiving monitor for stable signal reception. Otherwise, spike noise from transient fading of electric field strength (for example, people moving) may interfere with the transmitter signal and may be mistaken as an arrhythmia on the receiving monitor.**

Panel Description

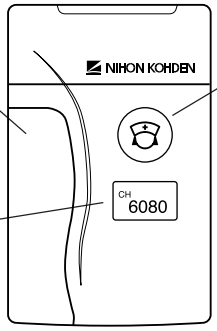
Top Panel



WARNING

- **Before performing defibrillation, check that the electrode leads attached to the patient are properly connected to the transmitter. Touching the metal parts of disconnected leads and probes causes serious electrical shock or injury by discharged energy.**
- **When performing defibrillation, all persons must keep clear of the bed and must not touch the patient, any equipment connected to the patient or the metal parts of leads connected to the patient. Failure to follow this warning may result in serious electrical burn, shock or other injury.**

Front Panel



Battery case

Channel number label: Indicates the channel number of the transmitter. Attach the accessory channel number label to the panel of the monitor.

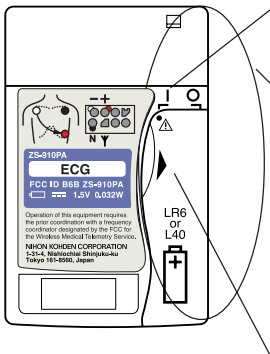
CALL key: When this key is pressed, a “peep” sounds at the transmitter, and a “CALL” message appears on the monitor. Depending on the settings on the monitor, an ECG waveform is recorded when this key is pressed.

CAUTION

Only use your finger to press the CALL key. Do not press the key with a sharp object. Otherwise the key may be broken.

Rear Panel

<ZS-910PA>



Refer to the CAUTION below.

Battery case/Power switch
Contains a battery.
Opening/closing the battery case cover turns the instrument power off/on.
The cover opens out in two steps.
Open to one step (◯ position):
Turns the power off. The battery cannot come out.
Open to two steps:
The battery can be replaced.
Cover closed (| position):
Turns on the power

Tab for opening and closing the battery case cover

CAUTION

Battery replacement must be performed by medical staff. When replacing the battery of the transmitter currently used for a patient, disconnect electrode leads from the transmitter before replacing the battery or do not touch the patient during replacement.

Important Safety Information

General

WARNING

- **Never use this instrument in the presence of any flammable anesthetic gas or high concentration oxygen atmosphere. Failure to follow this warning may cause explosion or fire.**
- **Never use this instrument in a high-pressure oxygen medical care tank. Failure to follow this warning may cause explosion or fire.**
- **Do not take this transmitter into the MRI test room. This transmitter is not designed to be used during MRI tests.**
- **Before performing defibrillation, check that the electrode leads attached to the patient are properly connected to the transmitter. Touching the metal parts of disconnected leads causes serious electrical shock or injury by discharged energy.**
- **When performing defibrillation, all persons must keep clear of the bed and must not touch the patient, any equipment connected to the patient or the metal parts of leads connected to the patient. Failure to follow this warning may result in serious electrical burn, shock or other injury.**
- **Before performing defibrillation, remove all electrodes and gel from the chest of the patient. If the defibrillator touches electrodes or gel, the discharged energy may burn the patient's skin.**
- **When using this instrument with an ESU, refer to the instruction manual for the ESU. Before measurement, check that the return plate is correctly attached to the patient and check that the instrument operates correctly when using with the ESU. If the return plate is not attached correctly, it may burn the patient's skin where the electrodes are attached.**

CAUTION

- **Attach a strap to the transmitter to prevent it from falling.**
- **Turn off the power of cellular telephones, small wireless devices and other devices which produce strong electromagnetic interference around a patient (except for PHS telephones allowed by the hospital administrator). Otherwise, radio waves from devices such as cellular telephones or small wireless devices may be mistaken as respiration waves and the displayed data may be incorrect.**
- **Do not use the same channel for different patients. Otherwise, two patients' data will be lost due to mutual modulation interference, or another patient's data may appear on the receiving monitor screen.**
- **Do not use transmitters of adjacent channels in a hospital. Otherwise, radio waves from one transmitter affect the receiver of the adjacent channel's transmitter and there may be interference.**

Battery

WARNING

- **Do not dispose of the battery in fire, or it may explode.**
- **Do not disassemble the battery. The contents of the battery are harmful and the battery may catch fire.**
- **Never short-circuit the + and – terminals. The battery may overheat and catch fire.**
- **Take care that the patient does not swallow batteries.**

CAUTION

Battery replacement must be performed by medical staff. When replacing the battery of the transmitter currently used for a patient, disconnect electrode leads from the transmitter before replacing the battery or do not touch the patient during replacement.

For Patients With an Implantable Pacemaker

WARNING

Interaction Between Minute Ventilation Rate-Adaptive Pacemakers and Cardiac monitoring and Diagnostic Equipment
The bioelectric impedance measurement sensor of a minute ventilation rate-adaptive implantable pacemaker may be affected by the transmitter which is connected to the same patient. If this occurs, the pacemaker may pace at its maximum rate and the transmitter may give incorrect data to the monitor. If this occurs, disconnect the electrode leads from the patient or change the setting on the pacemaker by referring to the pacemaker's manual. For more details, contact your pacemaker distributor or Nihon Kohden distributor.

Output Signal

CAUTION

Do not use the output signal from the receiving monitor as the synchronization signal for other equipment such as IABP, MRI, echocardiography or defibrillation because there may be time delay between the monitor and the other equipment caused by waveform transmission delay and spike noise may interfere on the output signal and be mistaken as a trigger.

Electrodes and Electrode Leads

CAUTION

- **Use Nihon Kohden specified electrodes and electrode leads. With electrodes and electrode leads other than specified ones, the message indicating checking electrodes appears and monitoring may stop.**
- **Do not reuse disposable products.**
- **Do not shake or swing the transmitter holding the leads/cables connected to the transmitter. The transmitter may come off and injure a person or damage surrounding instruments.**
- **When the message indicating checking electrodes is displayed on the receiving monitor, check electrodes and electrode leads and remove the cause.**
  While the message is displayed, there is no ECG monitoring and no alarms.

Maintenance

WARNING

If detergents or dirty liquid get on the transmitter, clean it and dry it completely before use. If a wet transmitter is used, the patient or anyone in contact with the transmitter may receive an electric shock.

CAUTION

Do not disassemble the transmitter when performing maintenance and inspection. Do not repair the transmitter. When there is any problem with the transmitter after maintenance and inspection, contact your Nihon Kohden distributor.

Preparation

Installing (Replacing) a Battery

Use one AA type alkaline dry cell battery. Manganese dry cell battery, NiCd rechargeable battery or NiMH battery can also be used.

With a new alkaline battery, the ZS-910PA transmitter can continuously measure ECG for approximately 5 days.

CAUTION

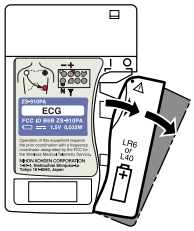
Battery replacement must be performed by medical staff. When replacing the battery of the transmitter currently used for a patient, disconnect electrode leads from the transmitter before replacing the battery or do not touch the patient during replacement.

NOTE

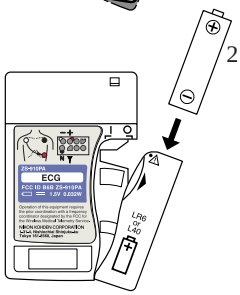
- **Tell the patient not to open or close the battery case cover.**
- **Insert the battery with the correct polarity (+ and –).**

If electrode leads are attached to the patient and a person replacing the battery touches the patient during battery replacement, patient leakage current over the amount allowed for the defibrillation proof type CF applied part may flow.

Procedure



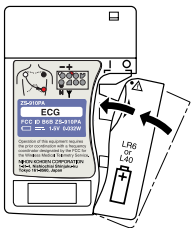
1. Open the battery case cover by pulling the tab until it clicks twice and until the cover stops. The cover opens two steps.
   When replacing the battery, take out the old battery.



2. Insert one alkaline dry cell battery (LR6) into the battery case observing the correct polarity.

NOTE

Do not use the transmitter if the battery case cover is lost.



3. Close the cover. Confirm that there is a “peep” sound for about one second.

Situations Requiring Battery Replacement

Replace the batteries when any of the following occurs:

- With the power ON, the transmitter generates a constant alarm (continuous high-pitched sound).
- The receiving monitor displays the battery replacement message on the screen.
- The transmitter does not generate a “peep” sound when the power is turned on (when the battery case cover is closed).

WARNING and CAUTION for Battery Handling

WARNING

- **Do not dispose of the battery in fire, or it may explode.**
- **Do not disassemble the battery. The contents of the battery are harmful and the battery may catch fire.**
- **Never short-circuit the + and – terminals. The battery may overheat and catch fire.**
- **Take care that the patient does not swallow batteries.**

CAUTION

When the transmitter is not in use, remove the battery or turn the power OFF. With the power ON, battery power is consumed even if measurement is not performed.
Especially, when NiCd or NiMH batteries remain in the transmitter when the transmitter is not in use, the battery may become unusable from overdischarge and leak liquid which will damage the transmitter.

NOTE

- **Remove the battery before disposing of the transmitter.**
- **The capacity of manganese, NiCd and NiMH batteries is less than that of alkaline batteries and the battery lifetime is shorter.**

Type	Lifetime
Manganese	About 1/2 of alkaline batteries
NiCd	About 1/3 of alkaline batteries (when fully charged)
NiMH	About 1/2 of alkaline batteries (when fully charged)

- **When using rechargeable NiCd batteries or NiMH batteries, shallow charging/discharging shortens battery capacity. For details, refer to the battery operator's manual.**

Attaching a Strap to the Transmitter

CAUTION

Attach a strap to the transmitter to prevent the transmitter from falling.

NOTE

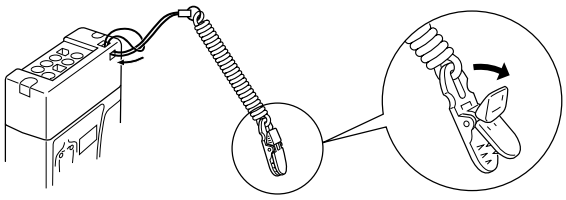
Do not attach the clip to hard objects such as thick cloth or a zipper. It will break the clip.

Attach a strap to the transmitter and fasten the clip to the patient clothes's or bed sheets.

NOTE

- **If the transmitter falls off, it may become damaged.**
- **If the transmitter falls on the patient foot, it will injure the patient.**
- **When the transmitter falls into water or a toilet, clean and disinfect the transmitter.**

To open the clip, firmly pull out the tab in the direction of the arrow.



Turning the Transmitter On/Off

The transmitter power is turned on or off by closing or opening the battery case cover.

Turning on the power

To turn on the power, close the battery case cover. After about a one second "peep" sound, the power is turned on and transmission starts.

Turning off the power

There are two ways of turning off the power.

Normal power off

1. Open the battery case cover until it clicks twice and until the cover stops.
2. Take out the battery and close the cover. When not using the transmitter, remove the battery and store the transmitter.

Temporary power off

Open the battery case cover until it clicks once. At this position, the battery does not fall out if the transmitter is upside down.

Check Items Before Use

Before turning on the transmitter power switch, check the following to confirm that the transmitter can be used in normal and safe condition.

Appearance

- There are no damaged or dirty points on the outside of the transmitter and the CALL key.
- The battery case cover is not lost.
- The transmitter is completely dry.
- The electrode lead is not broken.
- There are no damaged or dirty points on the disposable electrodes.

Battery

- The battery polarity is correct.
- The battery case spring is firmly fixed and the battery is not loose.

Channel Setting

- The transmitter channel corresponds to that of the receiving monitor.
- No other transmitter in the surrounding area has the same channel.

Check Items After the Power On

After turning on the power, check the following.

Power on

- There are no broken points on the battery case cover.
- The transmitter generates about a one second “peep” sound.
- The transmitter does not generate a continuous high-pitched sound.
- The transmitter does not produce excessive heat.
- The transmitter does not interfere with the operation of medical instruments used near it.

Basic Operation

- The “signal loss” message is not displayed on the monitor when the transmitter is inside the receiving range of the monitor.
- A “peep” sounds at the transmitter and a “CALL” message appears at the receiving monitor when the CALL key is pressed and the transmitter is inside the receiving range of the monitor.
- The battery replacement message is not displayed on the monitor.

Monitoring

WARNING

- **Interaction Between Minute Ventilation Rate-Adaptive Pacemakers and Cardiac monitoring and Diagnostic Equipment**
  The bioelectric impedance measurement sensor of a minute ventilation rate-adaptive implantable pacemaker may be affected by the transmitter which is connected to the same patient. If this occurs, the pacemaker may pace at its maximum rate and the transmitter may give incorrect data to the monitor. If this occurs, disconnect the electrode leads from the patient or change the setting on the pacemaker by referring to the pacemaker's manual. For more details, contact your pacemaker distributor or Nihon Kohden distributor.
- **When using this instrument with an ESU, refer to the instruction manual for the ESU. Before measurement, check that the return plate is correctly attached to the patient and check that the instrument operates correctly when using with the ESU. If the return plate is not attached correctly, it may burn the patient's skin where the electrodes are attached.**

CAUTION

Turn off the power of cellular telephones, small wireless devices and other devices which produce strong electromagnetic interference around a patient (except for PHS telephones allowed by the hospital administrator). Otherwise, radio waves from devices such as cellular telephones or small wireless devices may be mistaken as respiration waves and the displayed data may be incorrect.

NOTE

- **Noise overlaps when the transmitter is used with the ESU, but it does not cause instrument trouble.**
- **If an electric blanket is used and incorrect heart rate is displayed on the receiving monitor, turn off the pacing pulse detection on the monitor.**

ECG Monitoring

This transmitter sends the ECG waveform detected between the R/RA electrode and F/LL electrode to the monitor. The monitor displays the ECG waveform and measures heart rate, etc.
Refer to the operator's manual of the monitor for details.

Measurement Procedure

1. Select the type of electrode lead and disposable electrode according to the purpose.
2. Connect the electrode lead to the transmitter.
3. Connect disposable electrodes to the electrode lead and attach electrodes to the patient.

After steps 1 to 3 are finished, monitoring automatically starts.

Selecting Electrode Lead and Disposable Electrode

CAUTION

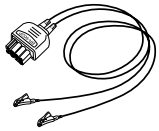
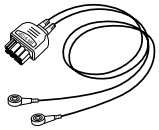
Use Nihon Kohden specified electrodes and electrode leads. With electrodes and electrode leads other than specified ones, the message indicating checking electrodes appears and monitoring may stop.

Option

Disposable electrode

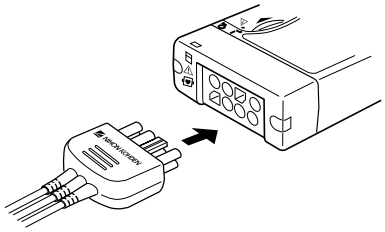
Vitrode

Electrode lead

BR-913PA	BR-903PA	BR-902PA	BR-912PA
			
3 electrodes snap type	3 electrodes, clip type	2 electodes, clip type	2 electrodes, snap type

Connecting the Electrode Lead to the Transmitter

Connect the electrode lead to the input socket on the transmitter.



CAUTION

- **Do not shake or swing the transmitter holding the leads/cables connected to the transmitter. The transmitter may come off and injure a person or damage surrounding instruments.**
- **Hold the connector of the electrode lead when connecting/ disconnecting the electrode lead. If you disconnect the electrode lead holding the lead, it damages the electrode lead.**

Selecting the Electrode Position

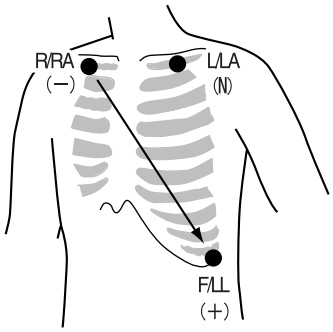
Follow the physician's instructions for electrode placement when available. For ECG monitoring, electrodes are attached only on the chest to allow patient movement and obtain continuous stable ECG. Following leads are examples. When also monitoring respiration, refer to "Electrode Position for Respiration Monitoring".

NOTE

The optimum electrode positions for ECG measurement of a patient are not always optimum for respiration measurement of the patient. Select positions suitable for both ECG and respiration measurements, or positions which have priority for one measurement.

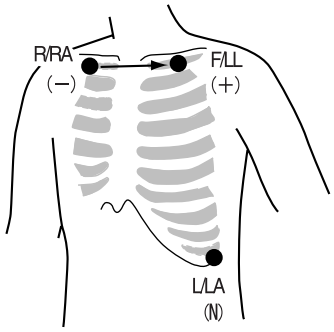
Three Electrodes

- Lead MII, which is similar to standard lead II, used when ECG measurement has priority

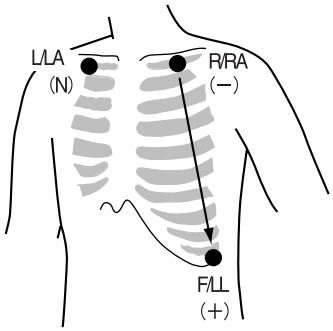


Electrode Position	Symbol		Lead Color	
	AHA	IEC	AHA	IEC
Left infraclavicular fossa	LA	L	Black	Yellow
Right infraclavicular fossa	RA	R	White	Red
Below lowest rib on the left anterior axillary line	LL	F	Red	Green

- Lead MI, which is similar to standard lead I
  Change F/LL and L/LA of the lead MII.



- Lead MIII, which is similar to standard lead III.
  Change R/RA and L/LA of the lead MII.

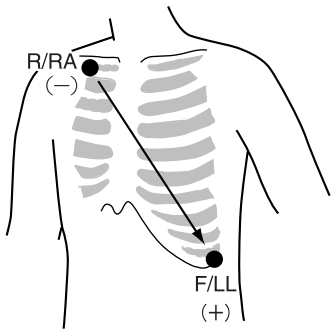


If the electrode position shown above is not available due to chest surgery, attach the electrodes to the root of the limbs or below the clavicles for stable ECG monitoring.

Two electrodes

With the optional BR-912P and BR-902P electrode leads, measurement with two electrodes is available. The L/LA electrode is not used.
This is effective for a neonate or a patient whose body area is small and difficult to attach three electrodes.

(ex.) Lead MII, which is similar to standard lead II



Electrode Position	Symbol		Lead Color	
	AHA	IEC	AHA	IEC
Right infraclavicular fossa	RA	R	White	Red
Below lowest rib on the left anterior axillary line	LL	F	Red	Green

Difference between measurement with two electrodes and three electrodes
Measurement with two electrodes is less stable than measurement with three electrodes because of hum overlapping and body movement. Pay sufficient attention to this point. If ECG of necessary quality cannot be obtained, measure with three electrodes.

Connecting the Electrode Lead and Disposable Electrodes

Prepare the patient skin

Shave off excessive body hair.

To reduce skin impedance, clean the electrode site with cream or with a gauze moistened with alcohol. Thoroughly dry the skin with a clean cotton pad.

NOTE

- **For a patient with frequent body movement, rub the sites with Skinpure skin preparation gel. However, do not use Skinpure skin preparation gel for sensitive skin.**
- **Do not place electrodes on a wound or on an inflamed, wrinkled or uneven skin surface.**

Attaching Electrodes to the Patient

CAUTION

Do not reuse disposable products.

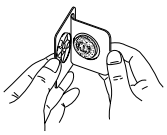
NOTE

- **To maintain good contact between the electrode and skin, check that the paste of the disposable electrode is not dry.**
- **When contact between the disposable electrode and skin becomes poor, replace electrodes with new ones immediately. Otherwise, contact impedance between the skin and the electrode increases and the correct ECG cannot be obtained.**

Refer to the electrode operator's manual for details.

(ex. Attaching Vitrode C disposable electrode)

1. Connect the electrode lead to the electrode.

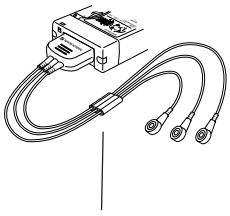


2. Carefully remove the backing paper from the electrode. Avoid touching the adhesive surface.

3. Place the electrode on the previously cleaned skin. Pay attention to the electrode lead color and symbol.

4. Fasten the electrode lead wire with surgical tape with an extra length of wire between the tape and the electrode. This lessens the movement of electrode leads by body movement and helps stable monitoring.

Using Electrode Lead Tube (Option)

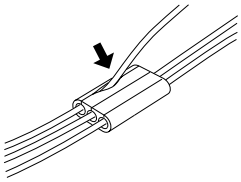


electrode lead tube

The electrode lead tube can prevent the electrode leads from getting tangled during monitoring.

During monitoring, slide the tube toward the transmitter. When not using the transmitter, slide the tube toward the lead clips or snaps.

If the tube comes off the electrode leads easily, bind the tube with tape to firmly attach it to the electrode leads.



Set one electrode lead into one opening of the tube.

Detection and Display of Measurement Condition

Checking Electrodes

The message indicating checking electrodes is displayed on the screen of the monitor when:

- An electrode is detached from skin.
- An electrode lead is disconnected.
- Polarization voltage between an electrode and skin is excessively high.

In these cases, check the cause and if necessary, replace electrodes with new ones.

CAUTION

When the message indicating checking electrodes is displayed on the receiving monitor, check electrodes and electrode leads and remove the cause.
While the message is being displayed, there is no ECG monitoring and no alarms.

NOTE

When the L/LA electrode is detached from the skin or L/LA electrode lead is disconnected, the message indicating checking electrodes does not appear on the receiving monitor. If hum overlaps or waveform is unstable for body movement, check the L/LA electrode and electrode lead condition.

Condition List by Sound

Sound	Cause	Countermeasure
Single “peep” sound	The CALL key is pressed. The sound lasts while the key is pressed.	---
Continuous “peep” sound	Battery is completely discharged.	Replace the battery with a new one. To stop the sound, turn off the power.
One second “peep” sound	The power is turned on.	---

Changing the Transmitter Channel

The transmitter channel can be changed when the transmitter is connected to the QI-901PK channel writer. Refer to the operator’s manual of the QI-901PK channel writer for details.

WARNING

The following action must be taken to properly receive the transmitter signal of the correct patient on the receiving monitor. Otherwise, there may be signal loss or signals may mix. This causes a serious accident, such as monitoring a different patient.

- **Assign a channel administrator in the hospital and only he or she should manage channel assignment on his or her responsibility.**
- **The channel administrator must manage the channels in the facility so that there is no signal interference.**
- **When the transmitter channel is changed, the channel administrator must check that the channel on the receiving monitor is also changed and that the signal is properly received.**
- **The channel administrator must replace the channel number label on the transmitter with the new one after changing the channel.**

Troubleshooting

If the problem still remains after checking the following, contact your Nihon Kohden distributor.

Problem	Cause	Countermeasure
The power cannot be turned on.	Batteries are not installed correctly. The battery polarity is wrong.	Install the batteries correctly.
	Batteries are completely discharged.	Replace the batteries with new ones.
Nothing is displayed on the monitor after turning the transmitter power on.	The channel of the transmitter and monitor does not match.	Set the correct channel on the monitor.
Signal receiving condition is poor.	Electrode lead is not connected to the transmitter.	Connect the electrode lead to the transmitter.
	Another transmitter of the same channel is used nearby.	Turn the transmitter power off. If the monitor still receives a signal, there is a high probability that another transmitter of the same channel is used nearby. Follow the instruction of your channel administrator and use another transmitter of a different channel.
	Signals are mixing.	Follow the instruction of your channel administrator and use another transmitter of a different channel.
	Transmitter radio wave is temporarily cut by people and objects moving.	It is recommended to use a diversity antenna system.
	The transmitter is broken.	Contact your Nihon Kohden distributor.

Problem	Cause	Countermeasure
ECG baseline is thick. (Hum is overlapping)	The gel on the electrode is dried out.	Replace the electrode with a new one.
	The gel on the electrode is coming off.	
	Electric blanket is used.	Cover the blanket with a shield cover.
	Hum filter is set to OFF on the monitor	Set the filter to ON.
The heart rate of a patient using an electric blanket is incorrect on the receiving monitor.	The pacing pulse detection is ON on the monitor.	Turn off the pacing pulse detection
The transmitter is dropped in water or a toilet	---	Clean and disinfect the transmitter. Refer to “Cleaning and Disinfection” in this manual. Use the strap to prevent falling.

Check After Use

To use the instrument in safe and optimum condition, perform inspection after use.

CAUTION

Do not disassemble the transmitter when performing maintenance and inspection. Do not repair the transmitter. When there is any problem with the transmitter after maintenance and inspection, contact your Nihon Kohden distributor.

Storage

- ECG electrode leads are cleaned and disinfected.
- When the transmitter gets wet, liquid is wiped off and the transmitter is thoroughly dried.
- There are enough consumables, such as disposable electrodes.
- The power is turned off.
- The batteries are removed from the transmitter when it will not be used for a long time.
- Dead batteries are disposed of properly.

Lifetime and Disposal

Disposing of Used Batteries

Replacement

When the battery replacement message is displayed on the receiving monitor, the battery are running out.
Replace the battery with a new one. When using a rechargeable battery, recharge it.

Disposal

NOTE

Remove the battery before disposing of the transmitter.

Before disposing of batteries, check with your local solid waste officials for details in your area for proper disposal. It may be illegal to dispose of these batteries in the municipal waste stream.

Disposing of Disposable Electrodes

Lifetime

Replace the disposable electrodes with new ones 48 hours after the start of usage. Otherwise, the gel on the electrode gets dry and adhesive property decreases. This increases skin electrode contact impedance and causes incorrect measurement.
Replace the electrodes with new ones even before 48 hours if the contact between skin and electrode becomes poor.

Disposal

Follow your local laws for disposing of medical waste.

Cleaning, Disinfection and Sterilization

Transmitter and Electrode Lead

WARNING

If detergents or dirty liquid get on the transmitter, clean it and dry it completely before use. If a wet transmitter is used, the patient or anyone in contact with the transmitter may receive an electric shock.

CAUTION

- **Before cleaning or disinfecting the transmitter, remove the battery.**
- **The transmitter cannot be sterilized.**

Cleaning

Wipe the transmitter and electrode leads with a soft cloth moistened with disinfecting alcohol or neutral detergent diluted with water. If the surface is very dirty, wash with running water. After cleaning, dry them completely.

Disinfection

CAUTION

- **Do not immerse the electrode lead connector in liquid.**
- **Do not disinfect with hypochlorous acid.**
- **Use the recommended concentration.**

Wipe the outside surface of the transmitter and electrode lead with a non-abrasive cloth moistened with any of the disinfectants listed on the next page. Use the recommended concentration.

Disinfectant	Concentration (%)
Glutaraldehyde solution	2.0
Hydrochloric alkyl diaminoethylglycine	0.5
Benzalkonium chloride	0.2
Benzethonium chloride solution	0.2
Chlorohexidine gluconate solution	0.5

Specifications

ECG measurement

Channels:	1
Input range:	±5mV or more
DC offset:	±500mV or more
Input impedance:	5 MΩ or more (5Hz)
Pacing pulse detection:	ANSI/AAMI EC13 Based upon pacemaker pulse rejection capability

Transmitter

FCC regulation:	FCC part 95 Subpart-H Wireless Medical Telemetry Service (WMTS)
Field strength limits:	<200 mV/m(at 3 m)
Undesired emission:	below 960 MHz: 200µV/m (at 3 m) above 960 MHz: 500µV/m (at 3 m)
Antenna:	ECG electrode lead
Transmission channel:	indicated on the transmitter
Transmission frequency range:	608.0125 to 613.9875 MHz
Channel spacing:	25kHz (12.5 kHz when interleave)
Type of emission:	F1D
Occupied bandwidth:	<8.5 kHz
Effective radiated power:	1.0 mW (conducted)

Safety standards

Safety standard:	CSA C22.2 No.601-1 M90 (1994) IEC 60601-1 (1988) IEC 60601-1 Amendment1 (1991) IEC 60601-1 Amendment2 (1995) IEC 60601-1-2 (1993) IEC 60601-2-27 (1994)

According to the type of protection against electrical shock:	INTERNALLY POWERED EQUIPMENT
According to the degree of protection against electrical shock:	DEFIBRILLATION-PROOF TYPE CF APPLIED PART
According to the degree of protection against harmful ingress of water:	Ordinary equipment
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
According to the mode of operation:	CONTINUOUS OPERATION

Water resistance

Water does not get inside the transmitter except for the battery case when immersed in water up to 30 cm deep for 3 minutes.

Power requirements

Battery type:	One AA type alkaline dry cell battery recommended, One manganese dry cell battery, One NiCd rechargeable battery, One NiMH battery	
Battery lifetime:	ZS-910PA (with an alkaline battery)	approximately 5 days

Environment

Operating environment

Operating temperature:	5 to 40°C, 41 to 104°F
Operating humidity:	30 to 85% (non-condensing)
Operating atmospheric pressure:	70 to 106 kPa
Operating voltage:	0.9V to 1.6V

Storage environment

Storage temperature:	–20 to 65°C, –4 to 149°F
Storage humidity:	15 to 95% (non-condensing)
Storage atmospheric pressure:	70 to 106 kPa

Dimension and Weight

Dimension:	54 W × 85 H × 22 D (mm)
Weight:	about 85 g (without battery)

Standard Accessories

Attach the channel number label to the monitor, too.

No	Name	Model	Q'ty	Supply code
1	strap	---	1	Y233

Options

CAUTION

Use only Nihon Kohden electrodes and electrode leads. Otherwise, the message indicating checking electrodes appears and monitoring may stop.

Name	Application	Model	Q'ty	Supply code
Electrode lead	3 electrodes, snap type, lead length 80 cm	BR-913P	1	K910A
	3 electrodes, clip type, lead length 80 cm	BR-903P	1	K911
	2 electrodes, clip type, lead length 80 cm	BR-902P	1	K907A
	2 electrodes, snap type, lead length 80 cm	BR-912P	1	K908A
Electrode lead tube		---	1	K120
Vitrode, disposable electrode	General	Bs-150	1 box (30 × 5 package)	G201
		C-150	1 box (30 × 5 package)	G204
		D-90	1 box (3 × 30 package)	G217
		F-150M	1 box (3 × 50 package)	G210D
		G-600	1 box (30 × 20 package)	G221
		J-150	1 box (30 × 5 package)	G250
	Neonate Premature baby	F-150S	1 box (3 × 50 package)	G210C