



Operation Manual

ECG250V ECG for Veterinary

Mediaid Inc.

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 **NOTE** : This device is not intended for home use.

 **WARNING** : This device is not intended for treatment.

Using This Label Guide

 **WARNING** 

A **WARNING** label advises certain actions or situations that could result in personal injury or death.

 **NOTE** 

A **NOTE** label advises actions or situations that could damage equipment, produce

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1 Safety Guidance

1.1 Safety Information

The design of ECG250V complies with international standard IEC 60601-1, Medical Electrical Equipment: General Requirements for Safety and IEC 60601-2-25, Particular Requirements for the Safety of Electrocardiographs. The classification of this equipment is Class I, type CF, which means a higher degree of protection against electric shock. The equipment is not explosion-proof or water-proof. Do not use it in the presence of flammable anesthetics.

The equipment is designed for continuous operation.

Safety classification as listed below, Table 1-1.

1) Anti-electric-shock type:	Class I with internal power supply
2) Anti-electric-shock degree:	CF
3) Degree of protection against harmful ingress of water:	Ordinary equipment (Sealed equipment without liquid proof)
4) Disinfection/sterilization method:	Refer to the Operation Manual for details
5) Degree of safety of application in the presence of flammable gas:	Equipment not suitable for use in the presence of flammable gas
6) Working Mode:	Continuous operation
7) EMC:	Group I, Class B

Table 1-1 Safety Classification

1.1.1 Environment Requirements

Environment requirements of ECG250V for transportation, storage and working conditions is listed as below, Table 1-2.

	Transportation	Storage	Working
Temperature	-20 ~+55	-10 ~+40	+5 ~+40
Relative Humidity	25%~95%	25%~85%	25%~85%
Atmosphere Pressure	70kPa~106kPa	70kPa~106kPa	70kPa~106kPa

Table 1-2 Environment Requirements

Be sure that the operation environment is clean, and the ECG is kept away from corrosive, high humidity, high temperature or direct sunshine. Avoid shaking during operating and do not move the equipment when it is powered on.

1.1.2 Power Supply

1) AC Power Supply

Rated voltage: 100V-240V

Rated frequency: 50Hz/60Hz

Rated power: 30VA

2) DC Power Supply

Rated output voltage: 12V

Rated output current: 2A

3) Built-in Rechargeable Battery

Rated voltage: 12V

Rated capacity: 1500mAh

4) Fuse: T250mA/ 250V Ø5×20/ T500mA/ 125V Ø5×20

1.2 Warnings and Notes

In order to use the ECG safely and effectively and to avoid possible dangers caused by improper operations, please read through the Operation Manual and get familiar with all functions of the equipment and proper operation procedures before use.

Please pay special attention to the following warnings and note information.

1.2.1 Safety Warnings

WARNING

- ◆ This equipment is provided for the use of qualified physicians or personnel professionally trained. The operator is supposed to be familiar with the contents of this Operation Manual before operation.
- ◆ Only qualified service engineer can install this equipment. And only service engineer authorized by Mediaid can open the shell case of the ECG.
- ◆ Only qualified installation or service engineer can change the power switch setting (110V-240V) according to the local power supply.
- ◆ The results given by the equipment should be examined with respect to the overall clinical condition of the animal. It can not substitute regular checking.

WARNING

- ◆ **EXPLOSION HAZARD**-Do not use the equipment in the presence of flammable anesthetic mixture with oxygen or other flammable agents.
- ◆ **SHOCK HAZARD**-The power receptacle must be a hospital grade grounded outlet. Never try to adapt the three-prong plug to fit a two-slot outlet.
- ◆ If the integrity of external protective conductor in installation or arrangement is in doubt, this equipment should be operated from the built-in rechargeable battery.
- ◆ Do not use this equipment in the presence of high static electricity or high voltage equipment which may generate sparks.
- ◆ This equipment is not designed for internal use and direct cardiac application.

WARNING

- ◆ Only Animal cable and other accessories supplied by Mediaid can be used. Otherwise the performance or electric shock protection cannot be guaranteed.
- ◆ Use Animal cable appointed by the manufacturer only. Otherwise electrocution of the animal or damage to the ECG may occur.
- ◆ Be sure that all electrodes have been connected to the animal properly before operation.
- ◆ Be sure that the conductive parts of the electrodes and associated connectors, including neutral electrode, not be in contact with earth or any other conducting objects.
- ◆ In order to avoid burns, please keep the electrode far away from the radio knife while using electrosurgical equipment simultaneously.

⚠WARNING⚠:

- ◆ Auxiliary equipment connected to the analog and digital interfaces must be certified according to IEC standards (e.g. IEC 950 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore all configurations shall comply with the valid version of IEC 60601-1-1. If in doubt, consult our technical service department or your local distributor.
- ◆ The summation of leakage current should never exceed leakage current limits while several other units are used at the same time.
- ◆ The potential equalization conductor can be connected to other equipment when necessary. Make sure the equipment is connected with potential equalization bus bar of the electrical installation.

1.2.2 Battery Care Warnings

⚠WARNING⚠:

- ◆ Improper operation may cause the battery to be hot, ignite or explode, and may lead to the declination of battery's capacity. It is necessary to read the Operation Manual carefully and pay attention to warning messages.
- ◆ Opening the battery cover, disassembling or replacing battery should be done according to the Operation Manual, and only battery of same model and specification provided by manufacturer should be used.
- ◆ Danger of explosion -- Do not reverse the anode and cathode when connecting the battery.
- ◆ Do not use battery around fire or place over 60 °C. Do not heat or splash the battery. Do not throw it into fire or water.
- ◆ With leakage or foul smell, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and see a doctor immediately.
- ◆ When the battery's useful life is over or any abnormal phenomenon is found from the battery, stop using it and contact the manufacturer or local distributor for disposal or dispose the battery according to local regulations.

1.2.3 General Notes

ⓘNOTEⓘ:

- ◆ Avoid liquid splash and excessive temperature. Temperature must be kept between 5 °C to 40 °C while working, between -20 °C to 55 °C during transportation, and between -10 °C to 40 °C during storage.
- ◆ Do not use the ECG in dusty environment with poor ventilation or in the presence of corrosive.
- ◆ Be sure that there is no intense electromagnetic interference source around the equipment, such as radio transmitter or mobile phone etc. Attention: Large medical electrical equipment such as

electrosurgical equipment, radiological equipment and magnetic resonance imaging equipment etc. are likely to bring electromagnetic interference.

!NOTE!:

- ◆ Check the main unit and its accessories carefully before operating the ECG. Replacement should be taken if there is any evident defectiveness or aging symptom which may impair the safety or performance.
- ◆ Fuses must only be replaced with the same type and rating as the original.
- ◆ The equipment and reusable accessories can be sent back to the manufacturer for recycling or proper disposal after their useful lives.

1.2.4 Cleaning & Disinfection Notes

!NOTE!:

- ◆ Turn off the power and unplug the power cord from the outlet before cleaning and disinfection. Prevent the detergent from seeping into the equipment.
- ◆ Do not immerse the unit or Animal cable into liquid under any circumstances.
- ◆ Do not clean the unit and accessories with abrasive fabric and avoid scratching the electrodes.
- ◆ Any remainder of detergent should be removed from the unit and Animal cable after cleaning.
- ◆ Do not use chloric disinfectant such as chloride and sodium hypochlorite etc.
- ◆ Do not use high temperature, autoclaving or radiation sterilization processes.

2 Introduction

ECG250V is digital physiological function measurement equipment which records the heart waveform during electro-biological movement. It provides sufficient information on the analysis of arrhythmia and cardiovascular disease, helps to know the pathological disorder caused by some drugs, electrolyte, or unbalance of PH value. It is important equipment for cardiac disease examination, and its compact size makes it suitable for use while visiting animals at farms.

Standard Configuration: main unit and accessories, including Animal cable, electrodes, adapter of animal electrode and thermo-sensitive print paper, etc.

2.1 Function Features

Unless otherwise specified, ECG250V has the following features:

Light in weight, compact in size

Touch key for easy operation

Three kinds of operation modes: Automatic, Manual and Analysis

Standard lead mode or Cabrera lead mode available

Alarm information for lead-off, lack of paper and no battery

Built-in ECG simulator

Built-in rechargeable battery with high capacity

Thermal dot-matrix printer for high-resolution printout

Automatic adjustment of baseline for optimal recording

Standard RS232 communication interface

Optional USB interface

Optional wireless communication interface for sending ECG to PC and setting up ECG Database via ECG Workstation Software

Display of ECG waveforms on LCD

Built-in Help Function: electrode positioning, ECG basic knowledge, etc.

Besides ID, sex, age, name, height, weight, blood pressure and hospital name can also be edited

Case Storage function: 15 cases can be saved in the machine or as much as 150 cases in an SD card. Saved ECG waveforms can be cine-looped, printed out or transferred to PC

2.2 List of Symbols

	External output
	External input
	Equipment or part of CF type
	Attention – general warning
	Equipotentiality
	Power Supply
	On (Power Supply)
	Off (Power Supply)
	Contrast adjustment
	Battery recharging indicator

Table 2-1 List of Symbols

3 General Information

3.1 Front Panel

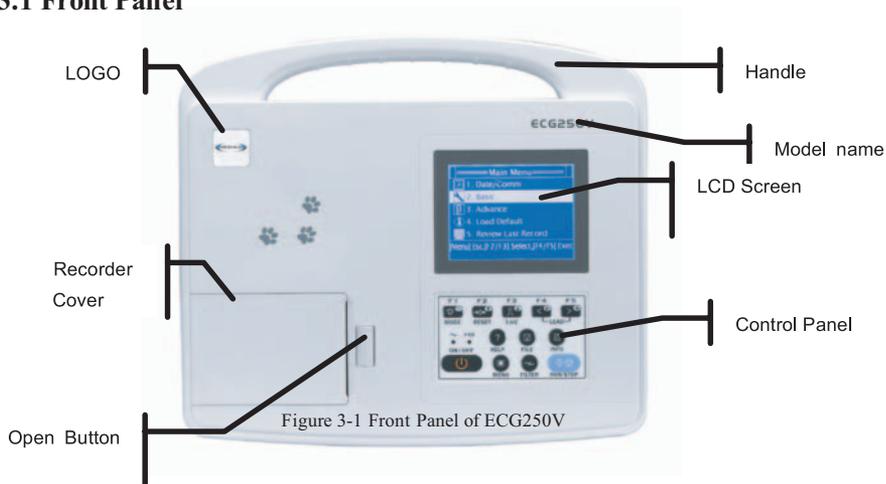


Figure 3-1 Front Panel of ECG250V

3.1.1 Product Information:

1) LOGO



2) Model Series

ECG250V

3) Classification Symbol



Equipment of CF type

4) Open Button

Push this button to open the recorder cover. See Chapter 4.2 for details.

3.1.2 LCD Display

3.8 inch 320X240 monochrome graphic LCD for ECG250V.

3.1.3 LCD Screen of ECG250V

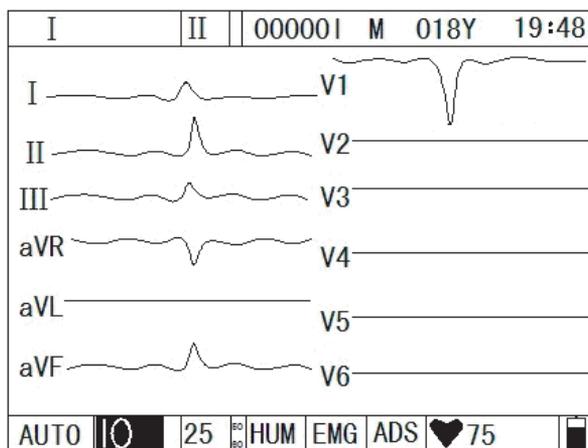


Figure 3-2 LCD Display of ECG250V

Normally, the contents displayed on the LCD screen include (from left to right):

Top Row:

Current lead (I, II, III, aVR, aVL, aVF, V1)

Rhythm lead (selectable from I to aVf, V1)

Animal ID

Sex (Male/Female/Empty)

Age

Current time

Bottom Row:

Operation mode (AUTO, MAN and ANA)

Sensitivity (5mm/mV, 10mm/mV, 20mm/mV, 2.5mm/mV, Auto)

Paper speed (6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s)

HUM Filter (AC ON, AC OFF)

EMG Filter (EMG OFF, EMG 25Hz, EMG 35Hz)

ADS Filter

Heart rate ♥ (Actual heart rate)

Battery capacity (Only when the built-in battery is used)

3.1.4 Control Panel and Keys



Figure 3-3 Control Panel of ECG250V

1) Indicator Lamps

- ⤿ Power supply indicator lamp: when power supply is used, the lamp is on.
- ➔⤿ Battery recharging indicator lamp: when the battery is recharging, this lamp flashes.

2) MODE/F1



Press this key to select operation mode between AUTO, MAN, and ANA. The switching order of leads is listed in Table 3-1.

Mode		Switching Order (from left to right)						
AUTO	AUTO (Standard)				aVR	aVL	aVF	V1
	AUTO (Cabrera)	aVL		aVR		aVF		V1
MAN		In this mode, you need to press Lead (F4/F5) Key to change the lead. For the lead switching order, refer to that of AUTO (Standard) or AUTO (Cabrera/European) above, which can be set in the Basic submenu. The Test mode is used for manufacturer to test the print head and the paper shift.						
ANA		After around 1 minute of auto-sampling, the compressed waveform of lead and its R-R histogram will be printed out.						

Table 3-1 Switching order of Leads

Under INFO menu, it is an auxiliary key. Press F1 plus F4/F5 to change every 10 items to be input.

3) RESET/F2

Press RUN/STOP to start recording, then press RESET to reset signal lead. After that, the corresponding wave is a line. The locked lead will unlock itself after 0.4 second.

It is also a direction key upward.

4) 1mV/F3

Under MAN mode, press this key to record a 1mV calibration pulse at any time while recording.

It is also a direction key downward.

5) LEAD/F4, F5 (Lead Switch Keys)

Under MAN mode, press the keys to switch the lead group.

They're also direction keys leftward or rightward.

6) RUN/STOP

Start or stop recording.

7) ON/OFF

Turn on or off the ECG. When the ECG is connected to power, turn on the power switch first.

8) MENU

Press this key to enter menu settings.

9) FILTER

Switch among No Filter, EMG, HUM, or ADS filters. The filter status can be seen on the LCD.

10) HELP

Press this key to read helpful information such as electrode positioning, ECG basic knowledge, etc. Press this key again to return to main menu

11) FILE

Press this key to enter case saving menu to save the animal's ECG information. Press again to return to main menu.

12) INFO

Press this key to input animal ID, name, sex, age, height, weight, blood pressure and hospital name as Table 3-2. The current item to be edited is "Sex". Press again to return to main menu. See Table 3-2 for the order of characters to be input.

See Chapter 5.2 for how to input the information.

ID	Animal's ID(six digits)	Height (cm)	Animal's Height(three digits)
Name	Animal's Name(eight characters)	Weight (kg)	Animal's Weight(three digits)
Age	Animal's Age(three digits)	B.P. (KPa)	Animal's Blood Pressure(three digits)
Sex	Animal's Sex (male/female/empty)	Hospital	Animal's Hospital(sixteen digits)

Table 3-2 Items Editable in ECG250V

NOTE:

F2, F3, F4, F5 only work in the menu screen. Press F2/F3 to select up/down; press F4/F5 to confirm. Press F1+F4/F5 to change up/down every ten characters. See below example on how to input patient name.

Press INFO to enter information management menu, then press F2/F3 to highlight Name. Press MENU one or more times to choose one line Character you need. Press F4/F5 to input patient's name. Characters that can be input are listed as Table 3-3. Other items such as patient ID, sex, height, etc can be input the same way. Press INFO again to return to upper menu.

A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	blank	+	/	—
a	b	c	d	e	f	g	h	i	j
k	l	m	n	o	p	q	r	s	t
u	v	w	x	y	z	\	^	?	—

Table 3-3 Order of Character to Be Input

3.2 Power Supply and Switch

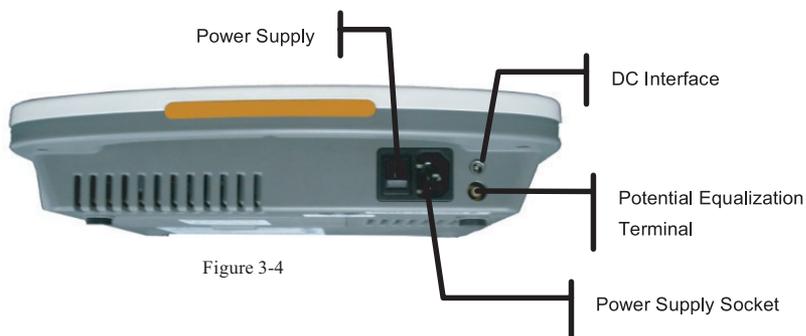


Figure 3-4

1) AC Power Switch

| : Power on

○ : Power off

2) AC Power Socket

The equipment is well grounded when connected to a 3-phase power supply.

3) Potential Equalization Terminal/Equipotentiality



NOTE: When used with other medical equipment, connect the equipotentiality of the ECG to the grounding ends of the equipment with the grounding cable provided, to protect animals from any possible electric shock caused by other equipment.

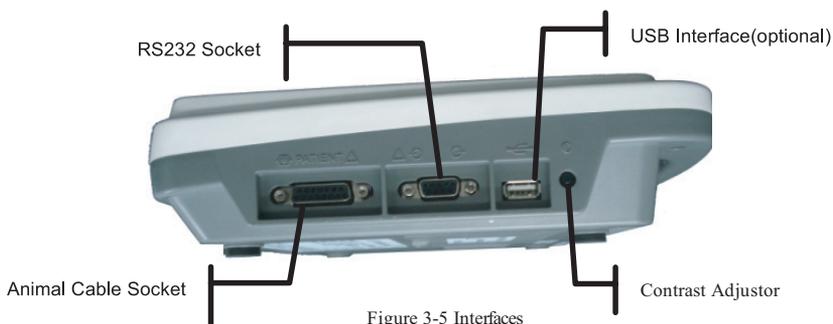
NOTE: Connect one end of the grounding cable to the equipotentiality of the equipment and the other end to the ground to enhance reliability of grounding. Do not use pipe or similar item as a grounding cable; otherwise, the grounding cannot work and the animal has the potential risk of electric shock.

4) DC Interface Power Socket

The equipment can be powered by external DC power source. When choosing DC power source, be sure that the output voltage and current meet the equipment requirement and the interface matches. Car DC power source and the like can be used.

WARNING: Be sure that the safety specification of the DC power source meets the requirement of valid version of IEC 60601-1.

3.3 Animal Cable Socket and Signal Interface



⚠️ WARNING ⚠️:

Auxiliary equipment connected to the analog and digital interfaces must be certified according to IEC standards (e.g. IEC60950 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore all configurations shall comply with the valid version of IEC 60601-1-1. Therefore anybody who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC 60601-1-1. If in doubt, consult our technical service department or your local distributor.

The summation of leakage current should never exceed leakage current limits while several other units are used at the same time.

1) Animal Cable Socket

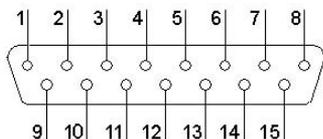


Figure 3-6 Animal Cable Socket



: Applied part of type CF



Attention – see accompanying document

Definition of corresponding pins:

Pin	Signal	Pin	Signal	Pin	Signal
1	NC	6	SH	11	F (input)
2	NC	7	NC	12	V(input)
3	NC	8	NC	13	NC
4	NC	9	R (input)	14	RF
5	NC	10	L (input)	15	NC

Table 3-4 Animal Cable Definition of Pins

2) RS232 Socket

⚠WARNING⚠: The dielectric strength of RS232 interface is AC 1500V, therefore the maximum DC voltage applied on the interface can not exceed +12V.

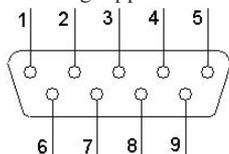


Figure 3-7 RS232 Socket

Definition of corresponding pins:

Pin	Signal	Pin	Signal	Pin	Signal
1	EXT/OUT	4	NC	7	NC
2	RxD (input)	5	GND	8	NC
3	TxD (output)	6	NC	9	EXT/IN

Table 3-5 RS232 Definition of Pins

3) USB Interface (optional)

After Mediaid ECG Workstation Software is installed in PC, data collected by the ECG can be transferred to PC via USB interface for management. Please refer to Mediaid ECG Workstation Software Operation Manual for more information on ECG data management.

4) Contrast Adjustor/Potentiometer (See Figure 3-8)

Use the screw-driver enclosed to adjust the contrast of the LCD.

3.4 Bottom Panel

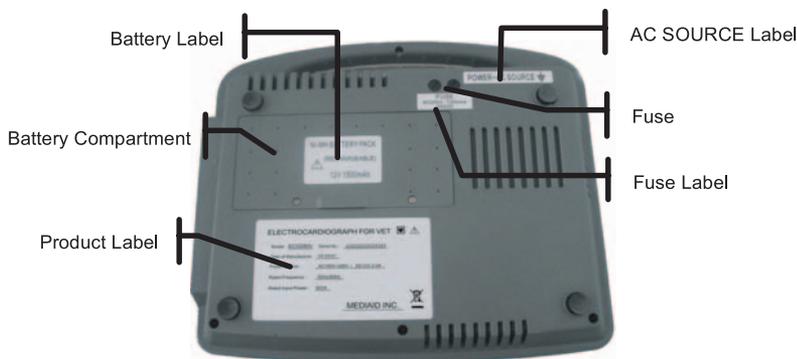


Figure 3-8 Bottom Panel

1) Battery Compartment



Figure 3-9 Battery Compartment Label

The battery label indicates the rated voltage and rated capacity of rechargeable Ni-MH battery pack. Rated voltage: 12V, Rated capacity: 1500mAh.

⚠️WARNING⚠️:

Improper operation may cause the battery to be hot, ignite or explode, and it may lead to the decrease of battery's capacity. Therefore, it is necessary to read the Operation Manual carefully and pay attention to warning messages.

⚠️WARNING⚠️:

When leakage or foul smell found, stop using the battery immediately. If the leakage liquid gets to your skin or cloth, cleanse it with clean water at once. If the leakage liquid gets into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.

⚠WARNING⚠:

Opening the battery cover, disassembling or replacing battery should be done according to the operation manual, and only battery of same model and specification provided by manufacturer should be used.

2) Fuse

There are two same fuses installed on the bottom of the main unit. The specification is showed on the fuse label:

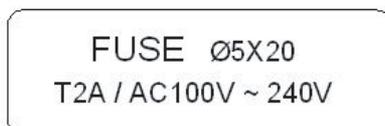


Figure 3-10 Fuse Label (T2A 125V Ø5×20)

⚠WARNING⚠: Fuse must only be replaced with the same type and rating as the original one (T2A 250V Ø5×20).

3) Product Label

Product Label information includes product model, S/N, manufacture date, register No., manufacturer name.

4 Operation Preparations

⚠WARNING⚠: Check the main unit and its accessories carefully before operating the ECG. Replacement should be taken if there is any evident defectiveness or aging symptom which may impair the safety or performance. Make sure that the equipment is in proper working condition.

4.1 Power Supply

⚠WARNING⚠: To avoid any possible electric shock, please connect the ECG with AC power by a three-phase power cable. Don't open the ECG while it is powered on.

⚠WARNING⚠: If the integrity of external protective conductor in installation or arrangement is in doubt, the equipment should be operated from the built-in rechargeable battery.

Mediaid ECG can be powered by AC power, DC power or built-in rechargeable Ni-MH battery pack.

1) Power Supply

The main connection socket is on the top of the unit. If power supply is used, connect the power cord to the socket first, and then connect the plug of the cord to the hospital grade outlet.

Rated voltage: 100V-240V

Rated frequency: 50Hz/60Hz

Rated input power: 30VA

Make sure the power supply meets the above requirements before power is turned on. Then press the power switch to power on the unit. The power supply indicator lamp (⌚) will be lit as well as the battery recharging indicator (➔□).

If the built-in rechargeable battery is weak when power supply is used, it will recharge automatically at the same time. Both the power supply indicator lamp (⌚) and the battery recharging indicator lamp (➔□) will be lit.

2) Built-in Rechargeable Battery

The built-in rechargeable battery pack may not be fully charged because of the consumption during storage and transport. In this case please recharge the battery first. Replace the battery when the battery has been recharged over 500 times.

⚠NOTE⚠: The battery is put into the battery compartment without connecting to the battery socket at factory. After receiving the machine, if built-in rechargeable battery is to be used, connect the battery to the socket first.

ⓘ NOTEⓘ: Please refer to the Section 7.4.1 for how to recharge the battery. During recharging the battery, the electrocardiograph can be powered by power supply at the same time.

3) External DC Power Supply

Make sure the DC power supply meets the requirements as below:

Rated output voltage: 12V;

Rated output current: 2A;

Output terminal plug matches equipment DC socket

- 4) Potential equalization conductor of the unit should be connected to the potential equalization bus bar of the electrical installation when necessary.

4.2 Loading Recording Paper

Rolled or folded thermosensitive paper of 50mm width is used as ECG recording paper. If the paper is unloaded or used up, there will be an out of paper symbol on the screen reminding the user to install or replace paper.

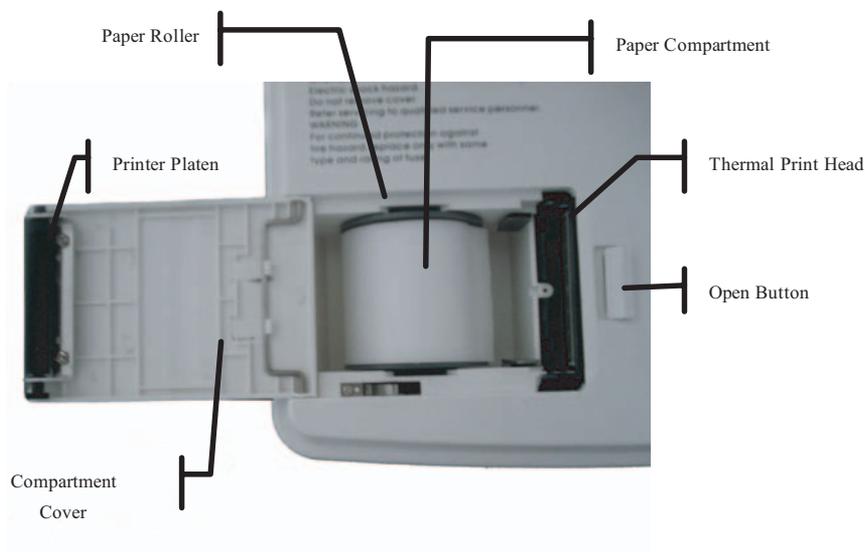


Figure 4-1 Paper Compartment

Loading Procedures of Rolled Paper:

- 1) Push gently the button on the right of the paper compartment to the left to pop up the cover;
- 2) Take out the paper rollers, remove remaining paper if necessary. Insert the rollers into the new paper and put the rollers and paper back to the paper compartment. Be sure that the paper is installed with the paper's grid side facing downward.
- 3) Pull about 2cm of the paper out, and close the cover gently.

Loading Procedures of Folded Paper:

⚠**NOTE**⚠: Rollers are not required when using folded paper.

- 1) Push gently the button on the right of the paper compartment to the left to pop up the cover;
- 2) Load the paper in the paper compartment. Be sure that the paper is installed with the paper's grid side facing downward.
- 3) Pull about 2cm of the paper out, and close the cover gently.

4.3 Animal Cable Connection

Animal cable includes two parts, main cable and lead wires with associated electrode connectors. The electrode connectors can be distinguished from the color and identifier on them.



Figure 4-2 Animal Cable

Connect Main Cable: Plug the connector of main cable into the Animal cable socket on the right side of the unit. Secure the knobs on sides of the socket.

⚠ WARNING ⚠:

- ◆ Precautions must be observed when using high frequency devices. Use the special high frequency Mediaid Animal cable to avoid possible signal interference during ECG acquisition.

4.4 Electrodes Connection

⚠ WARNING ⚠:

- ◆ Please make sure that all electrodes are properly connected to the animal.
- ◆ Be sure that the conductive parts of electrodes and associated connectors, including neutral electrode, do not contact with earth or any other conducting objects.

Veterinary electrode adapter is required for Veterinary ECG; the end with clip is for connection to the animal, and the end with connector is for connection to Animal cable, illustrated as below

figure 4-3. The contacting resistance between the animal and the electrode will affect the quality of ECG waveform greatly. In order to get a high-quality ECG waveform, the skin/electrode resistance must be minimized while connecting electrodes.

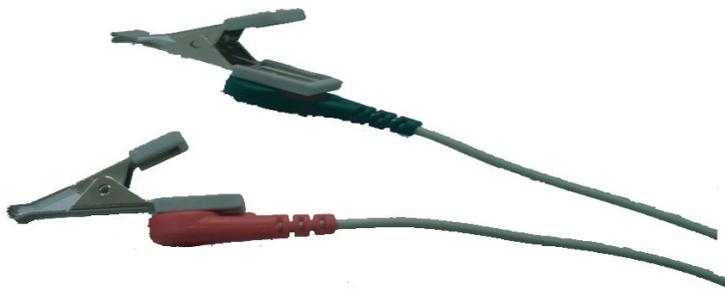


Figure 4-3 Veterinary Electrode Adapter

The identifier and color code of electrodes used comply with IEC requirements. In order to avoid incorrect connections, the electrode identifier and color code are specified in Table 4-1. The equivalent code of American standard is given too.

Electrode	International Standard		American Standard	
	Identifier	Color Code	Identifier	Color Code
Front Right Leg	R	Red	RA	White
Front Left Leg	L	Yellow	LA	Black
Back Right Leg	N	Black	RL	Green
Back left Leg	F	Green	LL	Red
Common/explore	C	White	V	Brown

Table 4-1 Electrode Identifier and Color Code, International & American Standard

Electrode connection:

Attach four limb electrodes to soft muscular, not bony, areas at the limb joints using the following steps (see Figure 4-4).

1. Clean the skin with cotton moistened with alcohol to remove oil.
2. Connect the patient cable to the electrodes.
3. Apply a small amount of 70% alcohol or electrode gel on the surfaces of the electrodes.
4. Clip the cleaned electrode site with the electrode.

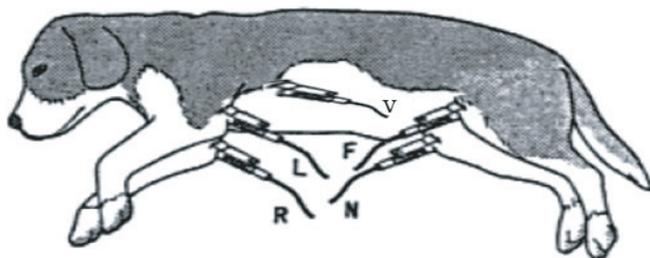


Figure 4-4

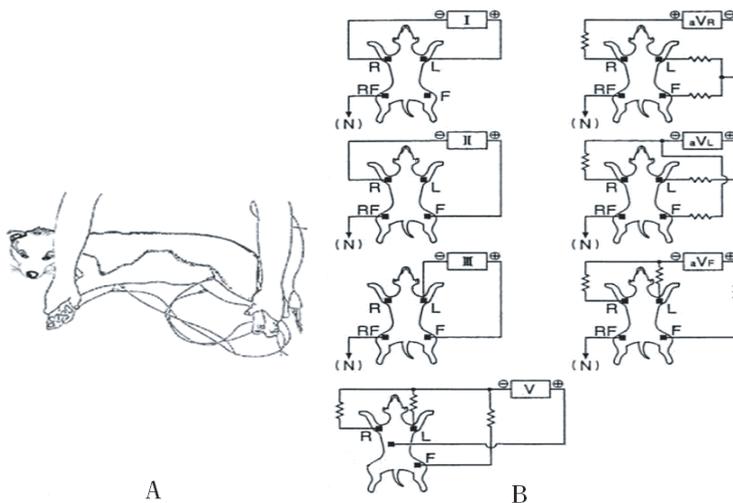


Figure 4-5

1. **Connection of Electrode:**

Connect the electrode to front right leg (**R/Red**), front left leg (**L/yellow**), back left leg (**F/green**) and back right leg (**N/black**), illustrated as below Figure 4-5(B) and Figure 4-6.

ⓘ:NOTEⓘ: For a 7 lead system, four limb leads can be applied (**R, L, N and F**) with the exploring lead (brown) used for diagnostic purposes as needed. Otherwise, for a 6 lead system, the exploring lead may be connected to **N**. The screen of ECG may show leads off, this does not affect the test results.

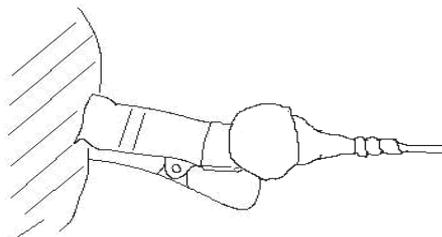


Figure 4-6

Please apply some alcohol to the clip skin for optimal connection.

4.4.1 PROBLEM SOLVING WITH CATS

Unlike humans and most dogs, the cardiac axis is not aligned top right to bottom left in cats. The heart has a tendency to lay more centrally with its apex more ventral than the atria, i.e., the heart points downward towards the ground when the animal stands.

This gives rise to one of the common problems with monitoring cats, finding the strongest signal to present to the **R** and **F** electrodes.

The best signal is derived top/bottom axis i.e. Lead II in humans, with **R** looking at the top of the heart and **F** at the bottom. In cats, as stated, the axis may not lie across the body. (See figure 4-7).

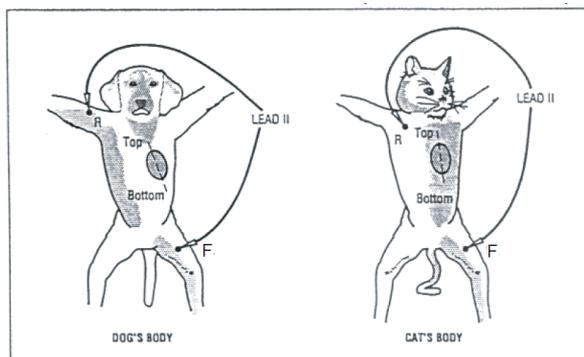


Figure 4-7

As lead II may not align with the cat's axis, the signal is small and sometimes cancels. Therefore, by moving **R** more centrally onto the cat's body above the top, and **F** onto the cat's body below the bottom of the heart, a much larger signal will be obtained.

The plane in which the cat's heart lies within its body may also vary.

The "top" of the heart may be more dorsal and the "bottom" more ventral. In this case, we would refer to the base/apex axis (see figure 4-8) and the following instructions should be followed.

1. Move **F** to the left apex of the heart.
2. Move **R** to the V10 position (over the dorsal spinous process of the seventh thoracic vertebra) and **F** to the V4 position (sixth left intercostal space at the costochondral junction). It will be necessary to annotate the printouts, if any, with actual configurations used to avoid later confusion.



Figure 4-8

4.5 Inspection before Startup

In order to avoid safety hazards and get good ECG record, the following inspection procedures are recommended before turning on the ECG and beginning operation.

1) Environment:

- ◆ Check and make sure that there is no electromagnetic interference source around the equipment, especially large medical electrical equipment such as electrosurgical equipment, radiological equipment and magnetic resonance imaging equipment etc. Switch off these devices when necessary.
- ◆ Keep the examination room warm to avoid muscle action voltages in ECG signal caused by cold.

2) Power Supply:

- ◆ If electrical power is used, please check whether the power cord has been connected to the ECG and it is properly grounded.
- ◆ Recharge the battery first before use when the battery capacity is low.

3) Grounding:

Check whether the grounding cable is properly connected.

4) Animal Cable:

- ◆ Check whether the Animal cable has been connected to the ECG firmly, and keep it far away from the power cord.

5) Electrodes:

- ◆ Check whether all electrodes have been connected to lead wires of Animal cable correctly according to the identifier and color.
- ◆ Be sure that all electrodes have been connected to the animal correctly.
- ◆ Ensure that the electrodes haven't contacted with each other.

6) Recorder Paper:

- ◆ Ensure that there is enough recorder paper loaded correctly.
- ◆ Make sure the case of the recorder has been secured.

7) Animal:

- ◆ The animal should not contact conducting objects such as earth, and metal part of bed etc.
- ◆ Ensure the animal is warm and relaxed, and is breathing calmly.

 **WARNING** : The ECG is provided for the use of qualified physicians or personnel professionally trained. The operator is supposed to be familiar with the contents of this Operation Manual before use.

5 Operation Instructions

5.1 Startup

- ◆ When power supply is applied, press the power switch, and the power supply indicator (⌚) is lit. Press **ON/OFF** key on the control panel to turn on the ECG. Equipment information Name, manufacturer and version No. etc., will be displayed on LCD screen after self-test. Then the ECG is ready for examination and recording.

When only the power supply is applied, the power supply indicator lamp (⌚) will be lit as well as the battery recharging indicator (→□). If the built-in rechargeable battery is weak when power supply is used, it will recharge automatically at the same time. The power supply indicator lamp (⌚) will be lit and the battery recharging indicator lamp (→□) will flash. The indicator lamp will stop flashing and become normal lit when the battery is full.

- ◆ When external DC power supply is applied, both two indicator lamps will be normal lit. Press **ON/OFF** key on the control panel to turn on the ECG. Equipment. Information such as name, manufacturer and version No. etc., will be displayed on LCD screen after self-test. Then the ECG is ready for examination and recording.
- ◆ When using built-in rechargeable Ni-MH battery, press **ON/OFF** key on the control panel directly to turn on the ECG. The power supply indicator and the battery indicator will not be lit. Equipment information such as name, manufacturer and version No. etc., will be displayed on LCD screen after self-test. Then the ECG is ready for examination and recording. When the battery symbol becomes “□”, it means the battery is low, and the ECG will automatically turn off in 1 minute. In this case, use power supply to continue operation and recharge the battery as soon as possible.

5.2 AUTO Mode

Under Auto Mode, the leads switch calibrates automatically while recording, and the 1mV calibration mark is printed on the thermal-sensitive paper. Recording time of each lead can be preset in “Auto Rec. Length (Sec.)” in Basic Menu.

Operation Procedure:

Press **MODE** key to choose AUTO, which will be displayed in the lower left corner of the LCD screen, then press “**RUN/STOP**” to print a complete ECG record. There is a Beep sound after printing a group of waveform. During printing, the operator can press “**RUN/STOP**” key to stop recording any time. Press “**RUN/STOP**” again to continue printing. Animal ID number will change automatically accordingly. If the ID number needs to be unchanged, the operator should adjust animal ID before continuing recording.

NOTE: Whether under AUTO or MAN mode, recording mode can not be changed during recording. Stop recording before choosing recording mode.

5.3 Manual Mode

Under MAN Mode, operator can choose which lead group needs to be recorded and determine the record length.

Operation procedure:

Press **MODE** key to choose MAN mode

Press **LEAD** Left or Right arrow key to select 3 leads to be recorded;

Press **RUN/STOP** to start recording;

1mV key can be pressed to print out 1mV mark while recording;

Press **RUN/STOP** key to stop recording;

Press **RUN/STOP** during recording to stop recording at any time;

Animal ID will be changed automatically if the recording is interrupted. If the ID number needs to be unchanged, the operator should adjust animal ID before continuing recording.

5.4 Analysis Mode

Under ANA Mode, press the **RUN/STOP** key. The ECG will sample for around 1 minute. To print out the compressed waveform of Lead II, including analysis content and R-R histogram, press F1. Operator cannot operate the ECG during printing.

5.5 ECG Data Management

Press **FILE** key to enter ECG Data Management interface. Animal data can be saved, deleted or cine-looped. Press F2 or F3 to move the cursor up/down, or press F1 plus F2/F3 to move the cursor every 10 lines.

5.5.1 ECG Case Storage

Record an ECG waveform of 10-16 seconds, then press **FILE**, move the cursor to choose a file name and press F5 to save the data, as shown in Figure 5-1.

ECG Files			000/014
0000.	000093	2007-12-12	13:55
0001.	000094	2007-12-12	13:59
0002.	000095	2007-12-12	14:00
0003			
0004			
0005			
0006			
0007			
0008			
0009			

[F1]+[F2/F3]: Select [F4/F5/Run]: Replav/Save/Delete

Figure 5-1 ECG Case Storage

5.5.2 ECG Case Recall and Copy

Move the cursor to the file name and press F4 to recall ECG data, as shown in Figure 5-2.

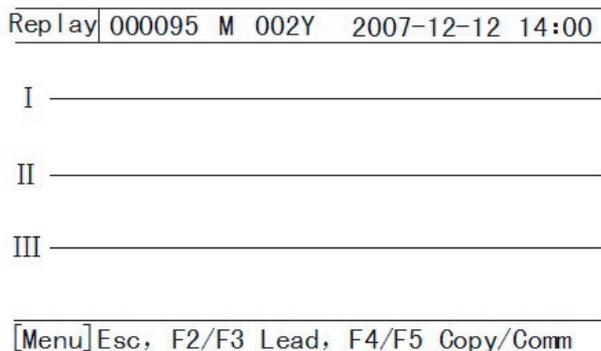


Figure 5-2 ECG Case Recall

Press F2 or F3 to choose the lead, press F4 to copy the ECG case as shown below.

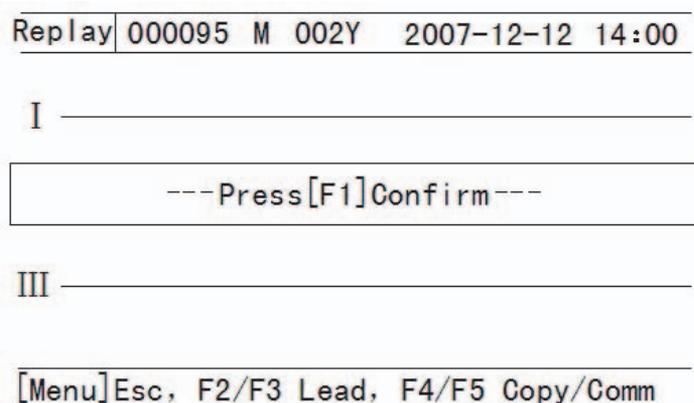


Figure 5-3 ECG Case Copy

Press F1 to print out this ECG waveform.

5.5.3 ECG Case Delete

Press **FILE** key to enter ECG Data Management interface, press F2 or F3 to choose a file, then press **RUN/STOP**. The machine will remind the operator “___ Waiting, press F1 to confirm”.

Press F1 to delete this file.

5.5.4 ECG Case Transferring to PC

Connect the ECG and PC through RS232 interface, start Mediaid ECG Workstation Software in PC and choose “RS232” to start transferring ECG data to PC.

If USB communication function is available, you can start communication via USB interface. Connect the ECG and PC via USB cable, start Mediaid ECG Workstation Software, and select “USB” in the software to start communication.

For details, please refer to ECG Workstation Software Operation Manual.

5.6 ECG Help Information

Press “HELP” key to enter HELP Menu. The operator will read such information as electrode positioning, basic ECG knowledge, etc. Press F2/F3 key to move the cursor. Press “HELP” to return to upper menu.

5.7 Operation Menu

5.7.1 Enter and Exit Menu

Press MENU to open MENU interface as shown in Figure 5-4. There are 5 sub-menus in MENU.

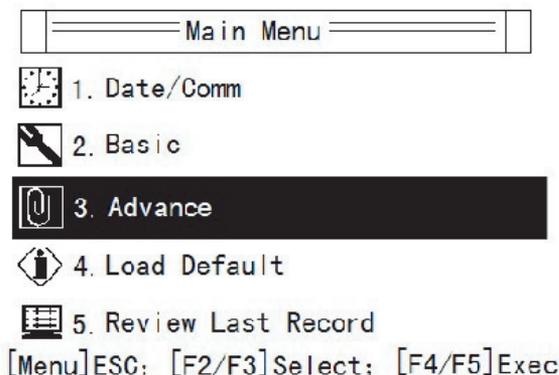


Figure 5-4 Main Menu

5.7.2 Move Cursor among Sub-menus

Press F2 or F3 to move the cursor among the sub-menus.

5.7.3 Change Parameter

Press F4 or F5 to change parameter as required.

5.8 Menu Settings

5.8.1 Date/Comm

There are 8 items under Date/Comm interface as shown in Figure 5-5.

Date/Comm	
1. Local Date	2007-12-11
2. Local Time	15: 51: 57
3. Date Format	Y-M-D
4. Wireless Addr	170-187-018-052
5. LAN Local IP	
6. LAN Remote IP	
7. LAN Mask	
8. LAN Gate IP	

[Menu] Esc, [F2/F3] Select, [F4/F5] Change

Figure 5-5 Date/Comm Settings

1. Local date: Set current date. It will be recorded on the recording paper.
2. Local time: Set current date and time. It will be recorded on the recording paper.
3. Date format: year-month-date or date-month-year.
4. Wireless address code.
5. LAN local IP: option.

6. LAN remote IP: option.

7. LAN mask: option.

8. LAN gate IP: option.

5.8.2 Basic Settings

There are 10 basic settings as shown below.

No.	Parameter	Options
1	Sensitivity (mm/mV)	10,20, <u>AUTO</u> , 2.5,5mm/V
2	Speed (mm/s)	<u>25</u> , 50, 6.25, 12.5mm/s
3	Man. Mode	<u>1ch</u> , 1ch+
4	Auto. Mode	1ch, <u>1ch+</u>
5	Rhythm Lead	I, <u>II</u> , III, aVR, aVL, Avf, V1
6	Auto Rec. Length (Sec.)	<u>12</u> , 24, 36, 60s
7	Lead Mode	<u>Standard</u> , Cabrera
8	AC Filter Frequency	<u>50Hz</u> , 60Hz
9	EMG Filter Frequency	<u>35Hz</u> , 25Hz
10	Report Print Mode	Param, Par+Ana, None

Table 5-1 Basic Settings

Underlined items are default settings.

Sensitivity: adjustable 5 levels: Auto, x2.5mV, 5mm/mV, 10mm/mV, 20mm/mV. Under MAN Mode, press "Sensitivity" to choose the appropriate sensitivity to achieve optimal ECG record according to the signal range. "Auto" means the sensitivity will be adjusted automatically. If the signal range changes greatly, you can choose "Auto" mode.

Record speed: 6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s.

5mm/s or 50mm/s is generally selected in clinical use. 6.25mm/s and 12.5mm/s are for test purpose or special acquisition and ECG recall.

MAN Mode: switch between ch and ch+ modes.

1ch: print one single waveform;

1ch+: print one waveform and one rhythm lead waveform.

Auto mode: switch between ch and ch+ modes.

1ch: print one single waveform;

1ch+: print one waveform and one rhythm lead waveform.

Rhythm lead: can be any of the 7.

Auto Rec. length: recording time of 7-lead ECG waveform under Auto Mode

Lead mode:

Lead Mode	
Standard	I, II, III, aVR, aVL, aVF, V1
Cabrera	aVL, I, aVR, II, aVF, III, V1

Table 5-2 Lead Mode

AC Filter Freq.: 50Hz or 60Hz accordingly to local AC power frequency.

EMG Filter Freq.: 25Hz or 35Hz

Report Print Mode: If select “Param”, besides ECG waveform, the report includes ECG voltage range, axis, and interphase of each waveform. If select “Para+Ana”, besides ECG waveform and measurement data, auto analysis is generated in the report. If select “None”, only ECG waveform is printed.

5.8.3: Advanced Settings

There are 10 items to be set as shown below. Choose “Yes” or “No” to activate or deactivate the functions.

No.	Parameter	Options
1	Pen Heater	Yes, <u>No</u>
2	QRS Beeper	Yes, <u>No</u>
3	Lead-off Beeper	<u>Yes</u> , No
4	Auto LCD BackLight	<u>Yes</u> , No
5	Enable Ext. Input	<u>Yes</u> , No
6	ADS Filter	<u>Yes</u> , No
7	Auto Position	<u>Yes</u> , No
8	ECG Simulator	Yes, <u>No</u>
9	Local Language	<u>Yes</u> , No
10	View 12 Lead ECG	<u>Yes</u> , No

Table 5-3 Advanced Settings

Pen Heater: to print thick waveforms on the thermal-sensitive paper.

QRS Beeper: when R wave is detected, the ECG will give a short Beep sound. During recording,

regular short Beep sounds can be heard. Lead-off Beeper: During use, if an electrode falls off from animal body or cable loosens from equipment, Beep sounds and corresponding indication on the screen will be generated to alarm lead-off.

Auto LCD Backlight: When there is no operation within one minute, the machine will turn off LCD backlight automatically to save battery capacity.

Enable Ext. Input: RS232 interface is preset in standard configuration. Through this interface, external ECG signals can be input into the ECG, internal ECG signals can be transferred to PC.

ADS Filter: Anti Drift System to make sure ECG data is on the baseline.

Auto Position: Automatic adjustment of baseline for optimal recording

ECG Simulator: Demonstration of ECG waveform

Local Language: The default local language is English.

View ECG: Choose “Yes” to display 12-lead ECG wave (12-lead display on the LCD at the same time. For this machine, it can print 7 lead wave(I, II, III, aVR, aVL, aVF, V) on the printing paper, V2-V6 is no longer showed).

5.8.4 Return to Default Settings

The default setting for AC frequency can be 50Hz or 60Hz. Please choose accordingly as per local power frequency and press F1 to confirm.

NOTE: AC filter frequency should comply with local power frequency. Otherwise, anti-interference effect will be seriously impacted.

5.8.5 Review Last Waveform

Choose “Review Last Record” to cine-loop, copy or transfer the last recorded waveform to PC.

5.9 ECG Printout



Figure 5-6 ECG Printout (1)



Figure 5-7 ECG Printout (2)

Printout (1), contains heart rate, sensitivity, filters applied, 1mV mark, lead, ECG waveform, and recording speed.

Printout (2), contains patient information, print date and time, software version and measurement.

5.10 Turning Off the ECG

The ECG can't be turned off under sub-menu. Turn off the ECG only when it is under main menu.

When built-in battery pack is used, press **ON/OFF** key directly to turn off the ECG after finishing ECG record. When there is no operation within 1 minute, the LCD backlight will turn off automatically, no operation within 3 minutes; the ECG will turn off automatically.

When using power supply, press **ON/OFF** key after finishing ECG recording and then switch off the power supply by pressing the switch on the left side of the ECG. Remove the power cable plug for long-term no use.

When external DC power supply is used, press **ON/OFF** key after finishing ECG recording and then remove the DC power cable plug.

NOTE: When switching off the ECG, please operate it according to the sequence above strictly. Otherwise there will be some abnormal characters displayed in the screen next time when the ECG is turned on.

6 Alarm Information

Alarm information will be displayed on the LCD screen when there is something wrong. Alarm information provided by the ECG and corresponding cause is listed in Table 6-1.

Alarm Information	Causes
LEAD/OFF	Electrodes fall off from the animal or the Animal cable falls off from the ECG.
	Character inside the black background is displayed in white, indicating that electrodes fall off from the animal or the Animal cable falls off from the ECG.
	Record paper has not been loaded or it has been used out.
HI	The heart rate is over 215BPM.
LOW	The heart rate is below 30BPM.
	No battery.
	Low battery

Table 6-1 Alarm Information and Causes

7 Cleaning, Care and Maintenance

7.1 Cleaning

NOTE: Turn off the ECG and unplug the AC power supply cable and Animal cable before cleaning and disinfection.

7.1.1 Cleaning the Main Unit and Animal Cable

The surface of the main unit and Animal cable can be wiped with a clean soft cloth damped in soapy water or non-caustic neutral detergent. After that, remove detergent remainder with a clean dry cloth.

7.1.2 Cleaning the Electrodes

Remove the remainder gel from the electrodes with a clean soft cloth first. Take off the clip from Electrode Connectors. Clean them in warm water and be sure there is no remainder gel. Dry the electrodes with a clean dry cloth or air dry naturally.

7.1.3 Cleaning the Print Head

A dirty and soiled thermal print head can deteriorate the record definition. Clean the print head at least once a month regularly.

Open the recorder casing and remove the paper. Wipe the print head gently with a clean soft cloth damped in 75% alcohol. For stubborn stains, soak it with a little alcohol first and wipe off with a clean soft cloth. After air dried, load the recording paper and shut the casing of the recorder.

NOTE:

- ◆ Prevent the detergent from seeping into the main unit while cleaning. Do not immerse the ECG or Animal cable into liquid under any circumstances.
- ◆ Do not clean the unit and accessories with abrasive fabric and avoid scratching the electrodes.
- ◆ Be sure no cleanser remains on the unit, Animal cable or electrodes.

7.2 Disinfection

To avoid permanent damage to the ECG, disinfection can be performed only when it has been considered as necessary according to your hospital's regulations.

Before disinfection, clean the equipment first. Then wipe the surface of the ECG and Animal cable with hospital standard disinfectant.

⚠NOTE⚠:

Do not use chloric disinfectant such as chloride and sodium hypochlorite etc.

7.3 Sterilization

To avoid permanent damage to the ECG, sterilization can be performed only when it has been considered as necessary according to your hospital's regulations. The equipment should be cleaned before sterilization.

⚠NOTE⚠: Sterilization, if required, can not be done with high temperature, autoclaving or radiation.

⚠NOTE⚠: Mediaid will not bear the responsibility for the effectiveness of infectious diseases control measure by using the disinfectant or sterilization process. It would be better to consult epidemic experts for advices.

7.4 Care and Maintenance

7.4.1 Recharge and Replacement of Battery

1) Capacity Identification

Current capacity of the rechargeable battery can be identified according to the battery symbol in the screen.

2) Recharge

Mediaid ECG is equipped with recharge control circuit together with built-in rechargeable Ni-MH battery. When connected with the power supply, the battery will recharge

automatically. Then the battery recharge indicator lamp (→□) will flicker and the power supply indicator lamp (∩) will be lit. When the capacity of battery is full, the battery recharge indicator lamp (→□) will be lit all the time.

Because of the capacity consumption during storage and transport, the capacity of battery is not full while using the first time. Battery recharge should be considered before first usage.

3) Replacement

⚠**NOTE**⚠: The battery is put into the battery compartment without connecting to the battery socket at factory. After receiving the ECG machine, if built-in rechargeable battery is to be used, connect the battery to the socket first. See Figure 7-1 for installation:



Figure 7-1 Battery Installation

1. Open the battery compartment cover with the screw-driver attached;
2. Insert the battery into the battery pack, properly connect;
3. Close the battery cover.

When the useful life of battery is over, or foul smell and leakage has been found, please contact the manufacturer or local distributor for replacement of battery.

⚠WARNING⚠:

- ◆ Inappropriate operation may lead battery to be hot, ignite, explode, be damaged or have capacity fade. Before using the rechargeable Ni-MH battery, read the Operation Manual carefully.
- ◆ Only the battery of same model and specification provided by manufacturer should be used.
- ◆ Danger of explosion -- Do not reverse the anode and cathode when connecting the battery.
- ◆ When the battery's useful life is over, contact the manufacturer or local distributor for disposal, or dispose the battery according to local regulations.

7.4.2 Recording Paper

⚠NOTE⚠: Recording paper provided by manufacturer should be used. Other paper may shorten thermal print head's life. The deteriorated print head may lead to illegible ECG record and block the advance of paper etc.

Storage Requirements:

- ◆ Record paper should be stored in dry, dark and cool area, avoiding excessive temperature, humidity and sunshine.
- ◆ Do not put the paper under fluorescence for long time.
- ◆ Be sure that there is no polyvinyl chloride or other chemicals in the storage environment, which will lead to color change of the paper.
- ◆ Do not overlap the recorded paper for long time. Otherwise the recorded ECG data may trans-print on each other.

7.4.3 Main Unit, Animal Cable & Electrodes

1) Main Unit

- ◆ Avoid excessive temperature, sunshine, humidity or dirt.
- ◆ Put on the dustproof coat after use and prevent from shaking violently when moving it to another place.

- ◆ Prevent any liquid from seeping into the ECG, as it will affect the safety and performance of the ECG.

2) Animal Cable

- ◆ Integrity of Animal cable, including main cable and lead wires, should be checked regularly. Be sure that it is conductible.
- ◆ Do not drag or twist the Animal cable with excessive stress while using. Hold the connector plugs instead of the cable when connecting or disconnecting the Animal cable.
- ◆ Align the Animal cable to avoid twisting, knotting or crooking in closed angle while using.
- ◆ Store the lead wires in bigger wheel to prevent people from stumbling.
- ◆ Once damage or aging of the Animal cable has been found, replace it with a new one immediately.

3) Electrodes

- ◆ Electrodes must be cleansed after use and be sure there is no remainder gel on them.
- ◆ Keep electrodes from sunshine and excessive temperature.
- ◆ After long-term use, the surface of electrodes will be oxidized because of erosion and other causes. In this case, electrodes should be replaced to achieve high-quality ECG.

⚠**NOTE**⚠: The ECG and reusable accessories can be sent back to the manufacturer for recycling or proper disposal after their useful lives.

8 Common Troubleshooting and Solutions

1) Some Leads without Waveform Printout

Possible reason: Normally the ECG needs some seconds to detect the Animal cable while it is connected with the animal.

Solution: repeat operation.

2) Vertical Broken Track of Printed Waveform

Possible reason: This may be caused by dirt on the printer head.

Solution: clean the printer head.

If the problem still exist, there may be damage of the printer head. Please contact our service department or appointed maintenance center.

3) ON/OFF Failure to Start the ECG

Possible reason: Fuses burnt

Solution: Unscrew the fuse holder and install the fuses with the enclosed crew-driver.

⚠Warning⚠: AC power cable must be removed from AC power source when replacing the fuse to avoid any possible electric shock.

4) ON/OFF Failure to turn off the ECG

Possible reason: menu or Sub-menu not exited

Solution: exit the menu

5) AC Interference (as shown in Figure 8-1)



Figure 8-1

Possible reason:

- Equipment is not properly grounded;
- Electrode or Animal cable is not correctly connected;

- There is not enough cream applied;
- Animal bed is not properly grounded;
- Animal touches metal part of the animal bed;
- Somebody is touching the animal;
- There is powerful equipment operating nearby;
- AC power frequency

Solution:

- Ground the equipment properly;
- Connect the electrode and Animal cable correctly;
- Apply enough cream;
- Ground the animal bed properly;

- Don't let the animal touch the metal part of the animal bed;
- Don't touch the animal;
- Wait till the powerful equipment stops;
- Reset AC frequency accordingly to local AC frequency

If interference still exist, please apply HUM filter. The waveform will be weakened a little.

6) EMG Interference (as shown in Figure 8-2)



Figure 8-2

Possible reason

- The room is uncomfortable;
- The animal is nervous;
- The animal is not quiet;
- The electrodes are tightly attached

Solution:

- Move to a comfortable room;
- Let the animal relax;
- Don't talk with the animal during operating;
- Change the electrode if it is too tight;

If interference still exist, please apply EMG filter. The waveform will be weakened a little.

9 Service Warranty

1) Workmanship and Raw Material

The warranty period for the main unit is 18 months and, 6 months for the accessories from the date of shipment.

Mediaid warrants there's no defect in raw material and workmanship. During warranty period, Mediaid will repair or replace the defective part free of charge if the defect has been confirmed as raw material or workmanship defect.

2) Software or Firmware

For the software or firmware installed, Mediaid will replace them free of charge if the defect has been confirmed as raw material or workmanship defect within 18 months from the date of shipment. But Mediaid can not warrant it will not interrupt the use of the ECG.

⚠NOTE⚠: All services must be completed by engineers authorized by Mediaid or its authorized distributor.

3) Exemption of Warranty

The charges of freight and others are excluded under warranty.

The warranty is void in the case of

- ◆ Assembly, extensions, readjustments of any parts;
- ◆ Modification and repair by unauthorized personnel;
- ◆ Subsequent damage caused by improper use or maintenance;
- ◆ Replacement or removal of serial number label and manufacturer label.

10 Accessories

⚠ WARNING ⚠: Only Animal cable and other accessories supplied by the manufacturer can be used. Otherwise the performance and electric shock protection cannot be guaranteed.



No.	Accessory	Quantity
1	Power cord	1
2	Animal cable	1
3	electrodes	5
4	Paper roller	2
5	Thermo-sensitive paper	1

Table 10-1 Accessories List

Appendix I Technical Specifications

Safety Standards	Council Directive 84/539/EEC	Electro medical equipment used in veterinary medicine
	IEC60601-1	Medical electrical equipment - Part 1: General requirements for safety
	IEC 60601-2-25	Medical electrical equipment - Part 2-25: Particular requirements for the safety of electrocardiographs
	EN 60601-1-4	Medical electrical equipment - Part 1-4: General requirements for safety - Collateral standard: Programmable electrical medical systems

Classification	Anti-electric-shock type	Class I with internal power supply
	Anti-electric-shock degree	Type CF
	Degree of protection against harmful ingress of water	Ordinary equipment (Sealed equipment without liquid proof)
	Degree of safety of application in the presence of flammable gas	Equipment not suitable for use in the presence of flammable gas
	Working Mode	Continuous operation
	EMC	Group I, ClassB

Dimensions	295mm×260mm×60mm
Net Weight	2.3kgs
Display	3.8 inch 320×240 monochrome LCD Screen

Environment		Transport	Storage	Working
	Temperature	-20 ~+55	-10 ~+40	+5 ~+40

	Relative Humidity	25%~95%	25%~85%	25%~85%
	Atmospheric Pressure	70kPa ~106kPa	70kPa ~106kPa	70kPa ~106kPa

Power Supply	Mains Supply	Rated voltage :220V/110V $\pm 10\%$
		Rated frequency :50/60Hz
		Rated input power :30VA
	External DC power supply	Rated output voltage:12V
		Rated output current:2A
	Built-in rechargeable Battery Pack	Rated voltage : 12V
		Discharge cut-off voltage $\geq 11V$
		Rated capacity : 1500mAh
		Charge mode: Constant current/voltage
		Charge current (standard) < 0.2C5A(300mA)
		Charge voltage (standard) : (14.5 \pm 0.1V)
		Cycle life ≥ 300 times
	Fuse	T2A 250V $\varnothing 5 \times 20$

Recorder	Record Mode	Thermal dot-matrix printer
	Recording Paper	Rolled or folded thermo-sensitive paper
	Paper Width	50mm
	Recording Width	48mm
	Paper Speed	6.25, 12.5, 25, 50mm/s ($\pm 3\%$)
	Accuracy	$\pm 5\%$ (X axis, Y axis)

HR Recognition	Technique	Peak-peak detection
	HR Range	30BPM~215BPM
	Accuracy	± 1 BPM

ECG Unit	Leads	7 standard leads, lead change manually/automatically
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	Acquisition Mode	7 lead acquisition simultaneously
	Input Circuit	Floating
	A/D switch	12 bit
	Time Constant	$\geq 3.2s$
	Frequency Response	0.05Hz ~ 150Hz
	Sensitivity	Auto, 2.5 , 5, 10, 20 (mm/mV) $\pm 5\%$
	Input Impedance	$> 50M \Omega$ (10Hz)
	Input Circuit Current	$\leq 50nA$
	Input Voltage Range	$\pm 5 mV_{pp}$
	Calibration Voltage	$1mV \pm 2\%$
	Depolarization Voltage	$\pm 500mV$
	Noise	$< 15 \mu V_{p-p}$
	Filter	EMG Filter: 25/35Hz
		ADS Filter: Yes/No
		HUM Filter: Yes/No
	CMRR	$\geq 100dB$
Animal Leakage Current:		$< 10 \mu A$ (a.c.)
Dielectric Strength:		4000V rms

External Input/Output (Optional)	Input (Single ended)	Input impedance $\geq 100k \Omega$; Sensitivity $10mm/V \pm 5\%$;
	Output (Single ended)	Output impedance $\leq 100 \Omega$; Sensitivity $1V/mV \pm 5\%$;
Communication Interface	RS232 serial port/USB(optional)	



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