Mortara

www.mortara.com

REF 9515-164-50-ENG Rev D1

X12+

AMBULATORY TRANSMITTER

USER MANUAL

Manufactured by Mortara Instrument, Inc., Milwaukee, Wisconsin U.S.A.

CE 0459

CAUTION: *Federal law restricts this device to sale by or on the order of a physician.*

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NOTICES

Manufacturer's Responsibility

Mortara Instrument, Inc. is responsible for the effects on safety and performance only if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out only by persons authorized by Mortara Instrument, Inc.
- The device is used in accordance with the instructions for use.

Responsibility of the Customer

The user of this device is responsible for ensuring the implementation of a satisfactory maintenance schedule. Failure to do so may cause undue failure and possible health hazards.

Equipment Identification

Mortara Instrument, Inc. equipment is identified by a serial and reference number on the back of the device. Care should be taken so that these numbers are not defaced.

Copyright and Trademark Notices

Other Important Information

The information in this document is subject to change without notice.

Mortara Instrument, Inc. makes no warranty of any kind with regard to this material including, but not limited to, implied warranties of merchantability and fitness for a particular purpose. Mortara Instrument, Inc. assumes no responsibility for any errors or omissions that may appear in this document. Mortara Instrument, Inc. makes no commitment to update or to keep current the information contained in this document.

WARRANTY INFORMATION

Your Mortara Warranty

MORTARA INSTRUMENT, INC. (hereafter referred to as "Mortara") warrants that components within Mortara products (hereafter referred to as "Product/s") will be free from defects in workmanship and materials for the number of years specified on documentation accompanying the product, or previously agreed to by the purchaser and Mortara, or if not otherwise noted, for a period of twelve (12) months from the date of shipment.

Consumable, disposable or single use products such as, but not limited to, PAPER or ELECTRODES are warranted to be free from defects in workmanship and materials for a period of 90 days from the date of shipment or the date of first use, whichever is sooner.

Reusable product such as, but not limited to, BATTERIES, BLOOD PRESSURE CUFFS, BLOOD PRESSURE HOSES, TRANSDUCER CABLES, Y-CABLES, PATIENT CABLES, LEAD WIRES, MAGNETIC STORAGE MEDIUMS, CARRY CASES or MOUNTS, are warranted to be free from defects in workmanship and materials for a period of 90 days. This warranty does not apply to damage to the Product/s caused by any or all of the following circumstances or conditions:

a) Freight damage;

b) Parts and/or accessories of the Product/s not obtained from or approved by Mortara;

c) Misapplication, misuse, abuse, and/or failure to follow the Product/s instruction sheets and/or information guides;

d) Accident; a disaster affecting the Product/s;

e) Alterations and/or modifications to the Product/s not authorized by Mortara;

f) Other events outside of Mortara's reasonable control or not arising under normal operating conditions.

THE REMEDY UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT WITHOUT CHARGE FOR LABOR OR MATERIALS, OR ANY PRODUCT/S FOUND UPON EXAMINATION BY MORTARA TO HAVE BEEN DEFECTIVE. This remedy shall be conditioned upon receipt of notice by Mortara of any alleged defects promptly after discovery thereof within the warranty period. Mortara's obligations under the foregoing warranty will further be conditioned upon the assumption by the purchaser of the Product/s (i) of all carrier charges with respect to any Product/s returned to Mortara's principal place or any other place as specifically designated by Mortara or an authorized distributor or representative of Mortara, and (ii) all risk of loss in transit. It is expressly agreed that the liability of Mortara is limited and that Mortara does not function as an insurer. A purchaser of a Product/s, by its acceptance and purchase thereof, acknowledges and agrees that Mortara is not liable for loss, harm, or damage due directly or indirectly to an occurrence or consequence therefrom relating to the Product/s. If Mortara should be found liable to anyone under any theory (except the expressed warranty set forth herein) for loss, harm, or damage, the liability of Mortara shall be limited to the lesser of the actual loss, harm, or damage, or the original purchase price of the Product/s when sold.

EXCEPT AS SET FORTH HEREIN WITH RESPECT TO REIMBURSEMENT OF LABOR CHARGES, A PURCHASER'S SOLE EXCLUSIVE REMEDY AGAINST MORTARA FOR CLAIMS RELATING TO THE PRODUCT/S FOR ANY AND ALL LOSSES AND DAMAGES RESULTING FROM ANY CAUSE SHALL BE THE REPAIR OR REPLACEMENT OF DEFECTIVE PRODUCT/S TO THE EXTENT THAT THE DEFECT IS NOTICED AND MORTARA IS NOTIFIED WITHIN THE WARRANTY PERIOD. IN NO EVENT, INCLUDING THE CLAIM FOR NEGLIGENCE, SHALL MORTARA BE LIABLE FOR INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES, OR FOR ANY OTHER LOSS, DAMAGE, OR EXPENSE OF ANY KIND, INCLUDING LOSS OF PROFITS, WHETHER UNDER TORT, NEGLIGENCE OR STRICT LIABILITY THEORIES OF LAW, OR OTHERWISE. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

USER SAFETY INFORMATION

Warning: Means there is the possibility of personal injury to you or others.

Caution: Means there is the possibility of damage to the device.

Note: Provides information to further assist in the use of the device.

Warning(s)

- This manual gives important information about the use and safety of this device. Deviating from operating procedures, misuse or misapplication of the device, or ignoring specifications and recommendations could result in increased risk of harm to users, patients and bystanders, or damage to the device.
- Device transmits data reflecting a patient's physiological condition to a properly equipped receiving device that when reviewed by a trained physician or clinician, can be useful in determining a diagnosis; however, the data should not be used as a sole means for determining a patient's diagnosis.
- Users are expected to be licensed clinical professionals knowledgeable about medical procedures and patient care, and adequately trained in the use of this device. Before attempting to use this device for clinical application, the operator must read and understand the contents of the user manual and other accompanying documents. Inadequate knowledge or training could result in increased risk of harm to users, patients and bystanders, or damage to the device. Contact Mortara service for additional training options.
- To maintain designed operator and patient safety, peripheral equipment and accessories used that can come in direct patient contact must be in compliance with UL 60601-1, IEC 60601-1 and IEC 60601-2-25. Only use parts and accessories supplied with the device and available through Mortara Instrument, Inc.
- Patient cables intended for use with the device include series resistance (9 Kohm minimum) in each lead for defibrillation protection. Patient cables should be checked for cracks or breakage prior to use.
- Conductive parts of the patient cable, electrodes, and associated connections of type CF applied parts, including the neutral conductor of the patient cable and electrodes, should not come into contact with other conductive parts including earth ground.
- ECG electrodes could cause skin irritation; patients should be examined for signs of irritation or inflammation.
- To avoid the possibility of serious injury or death during patient defibrillation, do not come into contact with device or patient cables. Additionally, proper placement of defibrillator paddles in relation to the electrodes is required to minimize harm to the patient.
- Defibrillation protection is guaranteed only if the original patient cable is used. Any modification of this device may alter defibrillator protection.
- This device was designed to use the electrodes specified in this manual. Proper clinical procedure must be employed to prep the electrode sites and to monitor the patient for excessive skin irritation, inflammation, or other adverse reactions.

- To avoid potential for spread of disease or infection, single-use disposable components (e.g., electrodes) must not be reused. To maintain safety and effectiveness, electrodes must not be used beyond their expiration date.
- FCC Warning (Part 15.21): Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the device.
- A possible explosion hazard exists. Do not use the device in the presence of a flammable anesthetic mixture.
- The device has not been designed for use with high-frequency (HF) surgical equipment and does not provide a protective means against hazards to the patient.
- The quality of the signal produced by the device may be adversely affected by the use of other medical equipment, including but not limited to defibrillators and ultrasound machines.
- There is no known safety hazard if other equipment, such as pacemakers or other stimulators, is used simultaneously with the device; however, disturbance to the signal may occur.
- Operations may be affected in the presence of strong electromagnetic sources such as electrosurgery equipment.
- The battery operated device transmits data reflecting a patient's physiological condition to a receiving device. During operation failure, data transmission and LCD information will cease to occur. In mission critical conditions, it is advisable to have a backup device available.
- There is a potential pinch hazard when applying the battery compartment cover to the device that could result in minor injury. Care should be taken to avoid entrapment of fingers when performing this operation.
- The device is restricted to use on one patient at a time.
- The performance of the device may be compromised by excessive motion.
- Use only recommended battery cells. Use of other cells may present a risk of fire or explosion.

Caution(s)

- To prevent possible damage to the keypad, do not use sharp or hard objects to depress keys, only use fingertips.
- Do not attempt to clean the device or patient cables by submersing into a liquid, autoclaving, or steam cleaning as this may damage equipment or reduce its usable life. Use of unspecified cleaning/disinfecting agents, failure to follow recommended procedures, or contact with unspecified materials could result in increased risk of harm to users, patients and bystanders, or damage to the device. Do not sterilize the device or patient cables with Ethylene Oxide (EtO) gas.
- The device and patient cable should be cleaned between each use. Inspect cable and connections for damage or excessive wear prior to each use. Replace cable if damage or excessive wear is noted.
- Do not pull or stretch patient cables as this could result in mechanical and/or electrical failures. Patient cables should be stored after forming them into a loose loop.
- The device will only work with receiving devices that are equipped with the appropriate option.
- No user-serviceable parts are inside. Damaged or suspected inoperative equipment must be immediately removed from use and must be checked/repaired by qualified service personnel prior to continued use.
- This device is not recommended for use in the presence of imaging equipment such as Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) devices, etc.
- The following equipment may cause interference with the RF channel: microwave ovens, diathermy units with LANs (spread spectrum), amateur radios, and government radar.
- When necessary, dispose of the device, its components and accessories (e.g., batteries, cables, electrodes), and/or packing materials in accordance with local regulations.
- Wipe the exterior surface of the device and patient cables with a sterilizing disinfectant and then dry with a clean cloth.
- AA batteries are known to leak their contents when stored in unused equipment. Remove battery from device when not used for an extended period of time.
- •To prevent possible damage to the device during transport and storage (while in original packaging) the following environmental conditions must be adhered to:

  Ambient Temperature Range: -20°C to 65°C (-4°F to 149°F)
  Relative Humidity Range: 5% to 95% (non-condensing)
  Atmosphere Pressure: 700 hPa to 1060 hPa

- Allow the device to stabilize within its intended operating environment for a minimum of two hours prior to use. The allowable operating environment is as follows:

  Ambient Temperature Range: 0°C to 45°C (32°F to 113°F)
  Relative Humidity Range: 5% to 95% (non-condensing)
  Atmosphere Pressure: 700 hPa to 1060 hPa

FCC Compliance Statement

In the United States use of this device is regulated by the Federal Communications Commission (FCC). The device with its antenna complies with FCC's RF exposure limits for general population/uncontrolled exposure.

FCC Warning (Part 15.21): Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the device.

X12+ (600) FCC ID: HJR-X12-600-15
X12+ (2500) FCC ID: HJR-X12P-2500
X12+ (915) FCC ID: HJR-X12P-915

These devices comply with Part 15 of the FCC rules. Operation is subject to the following conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

- The X12+ (600) must be used solely on the premises of healthcare facilities (see Part 15, section 15.242a).

- A healthcare facility operating the X12+ (600) must coordinate with the directors of existing nearby TV stations and radio astronomy observatories to ensure compatible use. Minimum separation distances from such facilities may apply. It may be necessary to obtain written authorization from such facilities prior to installation and use of the X12+ (Part 15, section 15.242d,e).

Industry Canada Compliance Statement

These devices comply with RSS-210 of the Industry Canada rules. Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

X12+ (915) IC: 3758-X12P915

The term "**IC:**" before the certification/registration number only signifies that the Industry Canada technical specifications were met.

X12+ (600) Certification Number: 3758A - 104616

This telemetry device is only permitted for installation in hospitals and healthcare facilities. Devices shall not be operated in mobile vehicles (even ambulances and other vehicles associated with healthcare facilities). The installer/user of this device shall ensure that it is at least 80 km from the Penticton radio astronomy station (British Columbia latitude: 49° 19' 12" N, longitude: 118° 59' 56" W). For medical telemetry systems not meeting this 80 km separation (e.g., the Okinagan valley, British Columbia), the installer/user must coordinate with and obtain the written concurrence of the Director of the Penticton radio astronomy station before the equipment can be installed or operated. The Penticton contact is Tel: 250-493-2277/Fax: 250-493-7767.

Note(s)

- Proper patient preparation is important to proper application of ECG electrodes and operation of the device.
- If electrode is not properly connected to the patient, or one or more of the patient cable lead wires is damaged, display will indicate a lead fault for the lead(s) where the condition is present.
- For additional instructions and warnings, refer to the user manual of the receiving monitoring device.
- As defined by IEC 60601-1 and IEC 60601-2-25, the device is classified as follows:
  - Class I equipment or internally powered
  - Type CF defibrillation-proof applied parts
  - Ordinary equipment
  - Equipment not suitable for use in the presence of a flammable anesthetic mixture
  - Continuous operation
- The device will automatically turn off (blank screen) if the batteries have been severely discharged.
- The device is UL classified:

Medical Equipment
WITH RESPECT TO ELECTRIC SHOCK, FIRE, AND MECHANICAL HAZARDS ONLY, IN ACCORDANCE WITH UL 60601-1, CAN/CSA C22.2 No. 601.1, IEC60601-1 AND IEC60601-2-25.

EQUIPMENT SYMBOLS AND MARKINGS

Symbol Delineation

Attention, consult accompanying documents

Defibrillator-proof, Type CF input

Battery

Indicates compliance to applicable European Union directives

Do not dispose as unsorted municipal waste. Per European Union Directive 2002/96, requires separate handling for waste disposal according to national requirements

GENERAL CARE

Precautions

- Turn off the device before inspecting or cleaning.
- Do not immerse the device in water.
- Do not use organic solvents, ammonia-based solutions, or abrasive cleaning agents which may damage equipment surfaces.

Inspection

Inspect your equipment daily prior to operation. If you notice anything that requires repair, contact an authorized service person to make the repairs.

- Verify that all cables and connectors are securely seated.
- Check the case for any visible damage.
- Inspect cables and connectors for any visible damage.
- Inspect buttons and controls for proper function and appearance.

Cleaning and Disinfection

Refer to section 3 for proper cleaning and disinfection procedures.

Sterilization

EtO sterilization is not recommended but may be required for cables and lead wires. Frequent sterilization will reduce the useful life of cables and lead wires. If required, sterilize with ethylene oxide gas (EtO) at a maximum temperature of 50°C/122°F. After EtO sterilization, follow the recommendations from the sterilizer manufacturer for required aeration.

Cautions

Improper cleaning products and processes can damage the device, produce brittle lead wires and cables, corrode the metal, and void the warranty. Use care and proper procedure whenever cleaning or maintaining the device.

ELECTROMAGNETIC COMPATIBILITY (EMC)

Electromagnetic compatibility with surrounding devices should be assessed when using the device.

An electronic device can either generate or receive electromagnetic interference. Testing for electromagnetic compatibility (EMC) has been performed on the device according to the international standard for EMC for medical devices (IEC 60601-1-2). This IEC standard has been adopted in Europe as the European Norm (EN 60601-1-2).

The device should not be used adjacent to, or stacked on top of other equipment. If the device must be used adjacent to or stacked on top of other equipment, verify that the device operates in an acceptable manner in the configuration in which it will be used.

Fixed, portable, and mobile radio frequency communications equipment can affect the performance of medical equipment. See appropriate EMC table for recommended separation distances between the radio equipment and the device.

The use of accessories and cables other than those specified by Mortara Instrument may result in increased emissions or decreased immunity of the device.

Guidance and Manufacturer's Declaration: Electromagnetic Emissions

The equipment is intended for use in the electromagnetic environment specified in the table below. The customer or the user of the equipment should ensure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment: Guidance
RF Emissions CISPR 11	Group 2	The equipment must emit electromagnetic energy in order to perform its intended function. Nearby electronic equipment may be affected.
RF Emissions CISPR 11	Class B	The equipment is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Not Applicable	
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Not Applicable	

Guidance and Manufacturer's Declaration: Electromagnetic Immunity

The equipment is intended for use in the electromagnetic environment specified in the table below. The customer or the user of the equipment should ensure that it is used in such an environment.

Emissions Test	Compliance	Compliance Level	Electromagnetic Environment: Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	+/- 6 kV contact +/- 8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	+/- 2 kV for power supply lines +/- 1 kV for input/output lines	Not Applicable	
Surge IEC 61000-4-5	+/- 1 kV differential mode +/- 2 kV common mode	Not Applicable	
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles	Not Applicable	
Power frequency (50/60 Hz) magnetic field	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE: *UT is the AC Mains voltage prior to application of the test level.*

Guidance and Manufacturer's Declaration: Electromagnetic Immunity

The equipment is intended for use in the electromagnetic environment specified in the table below. The customer or the user of the equipment should ensure that it is used in such an environment.

<table>
<tr><th>Emissions Test</th><th>IEC 60601 Test Level</th><th>Compliance Level</th><th>Electromagnetic Environment: Guidance</th></tr>
<tr><td>Conducted RF
IEC 61000-4-6</td><td>3 Vrms
150 kHz to
80 MHz</td><td>3 Vrms
150 kHz to
80 MHz</td><td rowspan="2">Portable and mobile RF communications equipment should be used no closer to any part of the equipment, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

Recommended separation distance

$d = \left[\frac{3.5}{3Vrms}\right]\sqrt{P}$

$d = \left[\frac{3.5}{3V/m}\right]\sqrt{P}$ 80 MHz to 800 MHz

$d = \left[\frac{7}{3V/m}\right]\sqrt{P}$ 800 MHz to 2.5 GHz

Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b].

Interference may occur in the vicinity of equipment marked with the following symbol:

  </td></tr>
<tr><td>Radiated RF
IEC 61000-4-3</td><td>3 V/m
80 MHz to
2.5 GHz</td><td>3 V/m
80 MHz to
2.5 GHz</td></tr>
</table>

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

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

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the Equipment

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

Rated Maximum Output Power of Transmitter W	Separation Distance According to Frequency of Transmitter (m)	
	150 KHz to 800 MHz	800 MHz to 2.5 GHz
	$d = 1.2\sqrt{P}$	$d = 2.3\sqrt{P}$
0.01	0.1 m	0.2 m
0.1	0.4 m	0.7 m
1	1.2 m	2.3 m
10	4.0 m	7.0 m
100	12.0 m	23.0 m

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: *At 800 MHz, the separation distance for the higher frequency range applies.*

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

TABLE OF CONTENTS

INTRODUCTION SECTION 1

OPERATION SECTION 2

MAINTENANCE SECTION 3

MESSAGES AND INFORMATION APPENDIX A

CHANNEL ASSIGNMENTS APPENDIX B

TRANSLATIONS APPENDIX C

INTRODUCTION

Manual Purpose

The X12+™ digital ambulatory transmitter user manual explains how to:

- Acquire and transmit 12-lead ECG signals to a receiving device
- Setup device configurations

> ***NOTE:*** *This manual may contain screen shots. Any screen shots are provided for reference only and are not intended to convey actual operating techniques. Consult the actual screen in the host language for specific wording.*

Audience

This manual is written for clinical professionals who are expected to have a working knowledge of medical procedures and terminology as required for monitoring cardiac patients.

Indications for Use

- The device is indicated for use in a clinical setting by a physician, or by trained personnel who are acting on the orders of a licensed physician. It is not intended as a sole means of diagnosis.
- The device is indicated for use to acquire and output electrocardiographic data obtained during physiologic stress exercise testing.
- Indicated for use as a radiofrequency physiological signal transmitter, receiving and delivering real-time acquisition and RF transmission of simultaneous 12-lead ECG data while allowing the patient to be ambulatory.
- The device is indicated for use on adult populations, typically symptomatic.
- The device is not intended to be used as a vital signs physiological monitor.

System Description

The X12+ represents state-of-the-art wireless electrocardiographic technology. It provides a means to acquire and transmit 12-lead cardiac signals without direct connection to an electrocardiograph. Design innovations implemented in the X12+ achieve real-time acquisition and RF transmission of simultaneous 12-lead ECG data with diagnostic quality to a Mortara receiver module while allowing the patient to be ambulatory.

In addition, by using a very high monitoring frequency to transmit cardiac signals, the diagnostic bandwidth of the signals is maintained.

The X12+ affords the patient complete freedom of movement. Unlimited range can also be obtained with the addition of Mortara's antenna network box(s).

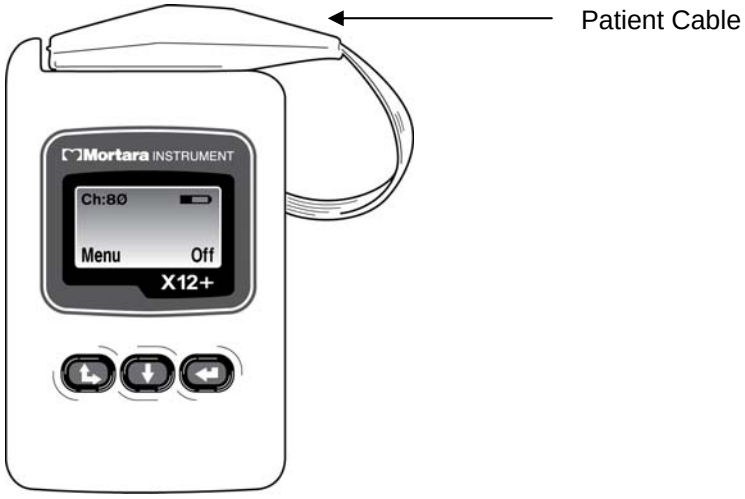
The X12+ uses a single AA alkaline battery.

The following equipment is necessary to use the X12+:

- One AA battery, 1.5V
- Mortara receiver module with antennas
- Patient cable
- Antenna network

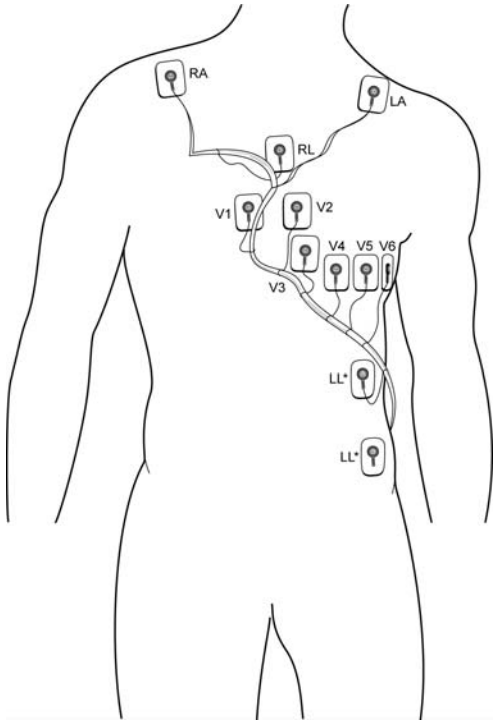
X12+ with Patient Cable

Figure 1-1, Front View



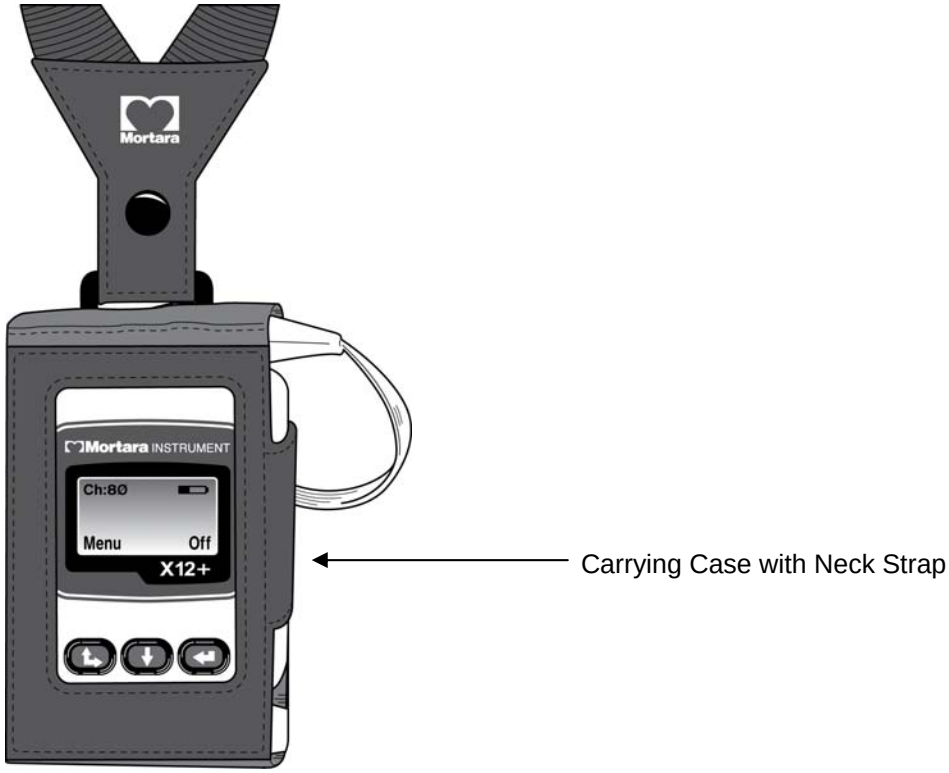
LeadForm Patient Cable

Figure 1-2



X12+ in Carrying Pouch

Figure 1-3



Part Numbers

Description	Part Numbers
X12+ TRANSMITTER	X12PLUS-XXX-XXXXX
X12+ BATTERY DOOR	8346-003-50
CARRY CASE & BELT ASSEMBLY H12+/X12+	8485-020-50
PAT CBL 10WIRE LEADFORM AHA SNAP	9293-017-50
PAT CBL 10WIRE IEC SNAP CINCH	9293-017-51
PAT CBL 5WIRE AHA BANANA DO	9293-025-50
PAT CBL 5WIRE IEC BANANA DO	9293-025-51
PAT CBL 10WIRE LEADFORM XL AHA SNAP	9293-026-50
PAT CBL 10WIRE LEADFORM XL AHA SNAP	9293-026-51
HOOKUP KIT MONITORING 10E SINGLE	9294-009-50
SHORT FORM INSTR CARD X12+ (xxx = language)	9503-164-01-xxx
X12+ USER MANUALS	9515-164-50-CD

To order additional supplies, contact a Mortara Instrument customer service representative.

Specifications

Feature	Specifications
Instrument Type	12-lead ECG digital transmitter
Input Channels	Continuous 12-lead signal acquisition and transmission
ECG Leads Transmitted	I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5 and V6
Frequency Range*	608.48 MHz to 631.52 MHz or 904.76 MHz to 925.16 MHz or 2400.96 MHz to 2482.56 MHz
Special Functions	Lead impedance check, ECG display, lead fail, battery notification, multi-purpose call; 10-wire, 5-wire, and 4-wire options
Defibrillator Protection	Complies with AAMI standards and IEC 60601-2-25
Number of Channels	256 user selectable
Function Keys	Up/right, down, and enter keys for on/off and menu navigation; call button during transmission
Device Classification	Type CF, battery operated
Weight	4 oz. (125 g) without battery
Dimensions	2.5 x 3.5 x .98” (64 x 91 x 25 mm)
Battery	1 AA alkaline, 24-hour typical life

**Operating frequency range is dependent on the X12+ part number.*

OPERATION

Read Instructions before Operating this Device

The user is cautioned that any changes or modifications not expressly approved by Mortara Instrument, Inc. could void the user's authority to operate this device.

This device complies with part 15 of the FCC rules. Operation is subject to the following conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

- The X12+ must be used solely on the premises of healthcare facilities (see Part 15, section 15.242a).
- A healthcare facility operating the X12+ must coordinate with the directors of existing nearby TV stations and radio astronomy observatories to ensure compatible use. Minimum separation distances from such facilities may apply. It may be necessary to obtain written authorization from such facilities prior to installation and use of the X12+ (Part 15, section 15.242d,e).

Operating frequency ranges are 608.48 to 631.52 MHz, 904.76 to 925.16 MHz, or 2400.96 to 2482.56 MHz.

FCC ID: HJR-X12-600-15 FCC ID: HJR-X12P-915 FCC ID: HJR-X12P-2500

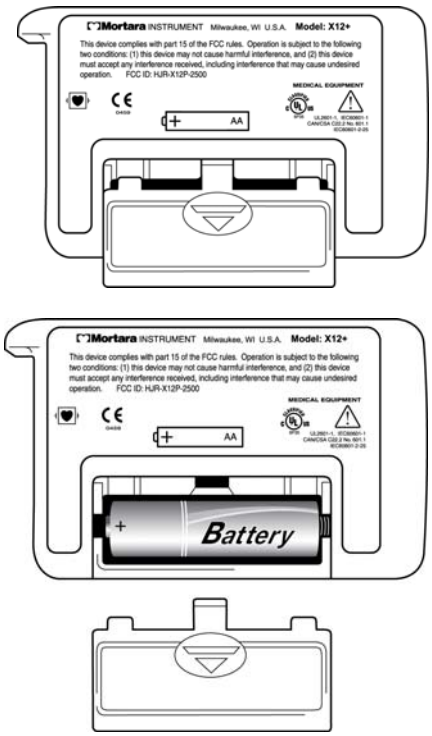
This device is defibrillator protected in compliance with AAMI standards and IEC 60601-2-25.

Battery Installation

The battery compartment is accessible via the battery door.

1. Position the X12+ with its back facing you to open the battery door.
2. Press down on the battery door arrow symbol and slide the battery door out.
3. Insert one AA alkaline battery into the battery compartment. Align the positive (+) and negative (-) indicators of the battery with the designators in the battery compartment.
4. To close the battery door, replace the battery door on the X12+ and slide the door in until it snaps into place.

NOTES: *AA alkaline batteries are recommended. The typical life of one AA alkaline battery is 30 hours.*



Turning the X12+ On

The X12+ will power up as soon as a battery with a minimum of 1.0 volts has been inserted into the battery compartment. If the X12+ was turned off after its last use, the user has two options to power the X12+ on:

1. Remove and re-insert the AA alkaline battery, or
2. Press **Up/Right**

The X12+ will power up and display the main LCD menu within three seconds.

Turning the X12+ Off

The user has two options to power the X12+ off:

1. Remove the battery, or
2. Press and hold **Enter** for a period of three seconds
    a. A prompt will appear in the LCD display
    b. Press **Up/Right** to highlight Yes
    c. Press **Enter** to select

NOTE: *The user has three seconds to select yes or no or the prompt menu will be replaced by the main menu.*

LCD Display Battery Voltage Indicator

The X12+ is powered with a single AA alkaline battery that requires a minimum of 1.0 volts to operate.

When the battery contains sufficient voltage, the LCD main menu will display a picture representing the current battery voltage in increments of 100%, 75%, 50%, 25%, or 0%. If a battery with unknown voltage is inserted and the LCD menu does not appear, insert a new battery.

100% 75% 50% 25% Low Battery

An option to display the actual battery voltage is also available in the configuration menu and will be explained later in this section.

NOTE: *If battery voltage is below 1.0 volts, the X12+ will not power on. Insert a new AA alkaline battery to continue operation.*

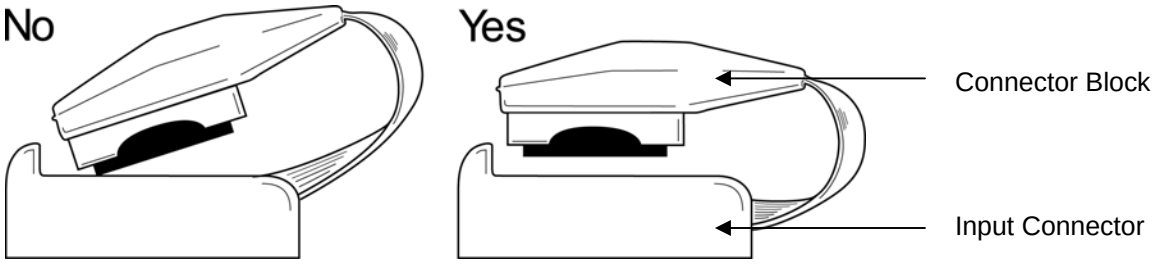
When the battery indicator shows a voltage of 25%, the battery should be discarded and a new battery should be inserted.

Attaching the Patient Cable

The LeadForm patient cable consists of a connector block, a main cable, and lead wires connected to the main cable. Each lead wire terminates in a snap connector. The lead wires are positioned on the main cable to follow the contour of the torso.

Insert the connector block into the input connector on the top of the X12+.

NOTE: *Be careful to insert the connector block parallel to the input connector.*



Patient ECG Hookup

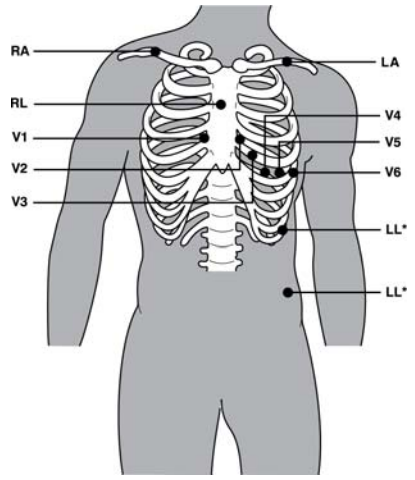
Skin Preparation

Skin preparation is important to perform before electrode attachment to help ensure good signal quality when transmitting patient data. Poor skin-electrode contact may cause noise or artifact which can affect the analysis of the ECG data. Low amplitude signals may also be the result of poor skin-electrode contact.

To prepare the skin

1. Identify the electrode sites on the torso by referring to *Positioning the Electrodes for 10-wire Hookup*.
2. Remove any hair from the electrode sites using a razor.
3. Wipe oils from the electrode sites with an alcohol prep pad.
4. Remove any dead skin from the electrode sites with an abrasive pad. Two to three moderate rubs at each site should be sufficient.

Positioning the Electrodes for 10-wire (12-lead) Hookup



Limb Electrodes

AAMI	IEC	Placement
RA	**R**	Right clavicle as shown
LA	**L**	Left clavicle as shown
RL	**N**	Reference or ground lead, placed to maximize patient comfort
LL	**F**	Lower left side of body, as close to hip as possible, on the iliac crest (original Mason-Likar position) or lowest rib on the left side of chest (modified Mason-Likar position)

Precordial Electrode

AAMI	IEC	Placement
V1	**C1**	Fourth intercostal space at the right sternal border
V2	**C2**	Fourth intercostal space at the left sternal border
V3	**C3**	Midway between V2 and V4
V4	**C4**	Fifth intercostal space at the left midclavicular line
V5	**C5**	Anterior axillary line on same horizontal level as V4
V6	**C6**	Mid-axillary line on the same horizontal level as V4 and V5

***NOTE AND CAUTION**: Placement of the Left Leg (LL)* electrode in the original Mason-Likar position increases the similarity of the acquired ECG with a standard 12-lead ECG and is therefore recommended; however, clothing may interfere with this position and increase the amount of artifact. The modified position may decrease the sensitivity of inferior ECG leads and cause axis shift with respect to the standard 12-lead ECG. Accurate skin preparation and suitable clothing are the most important factors in excessive artifact prevention.*

***NOTE**: The Right Leg (RL) electrode may be positioned in any location least subject to motion artifact according to clinician preference and specific test requirements.*

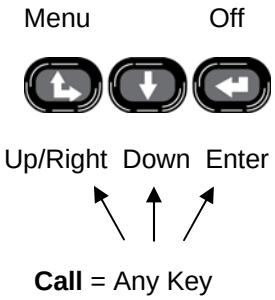
When the electrode sites have been identified and prepped, remove the clear electrode covering and apply an electrode to each of the sites. Secure each electrode by exerting slight pressure around the outer edge and inner ring of the electrode.

To connect the lead wires, begin with connecting the LL lead wire (Red – labeled LL or F) to the LL electrode. Connect the next lead wire on the cable to the next electrode. Continue connecting the snap connectors to the electrodes as positioned on the main cable.

> ***NOTE:*** *QRS morphology may be slightly different from a standard 12-lead ECG due to torso located limb electrode placement.*

Using the Keypad

The keypad is located on the front, lower portion of the X12+. Three keys are available for navigating through the LCD menu screens, for powering the X12+ on/off, and for sending calls during transmission: **Up/Right**, **Down**, and **Enter**.



Main Menu

The X12+ main LCD menu displays the following information.

- Ch:XX = Transmission channel
- Battery Symbol = 100%, 75%, 50%, or 25% battery charge
- Menu = Label over the Up/Right key for access to menu options
- Off = label over the Enter key to power the X12+ off
- RL, RA, LL, LA, V1, V2, V3, V4, V5, and/or V6 = Leads in fail
- CALL = a call signal has been transmitted

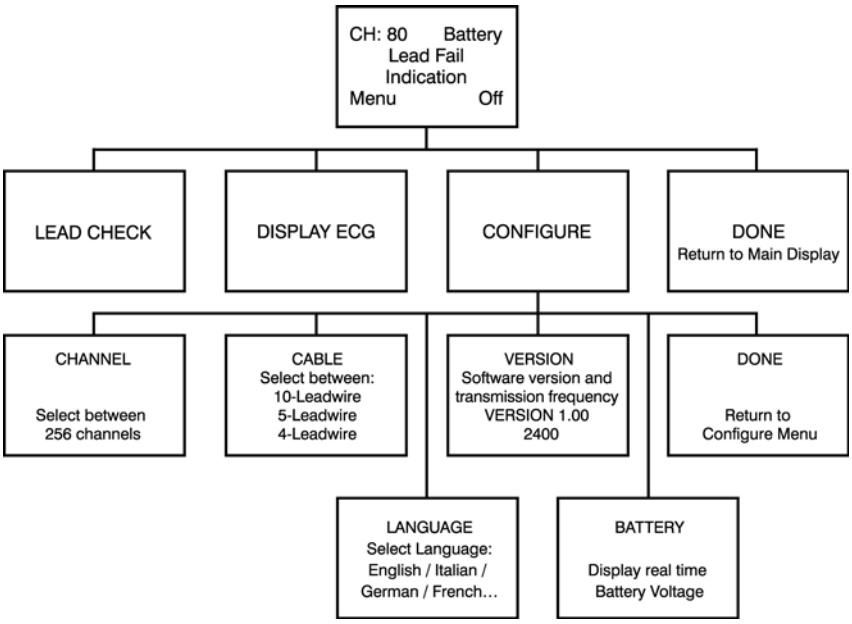
To send a CALL signal, press any one of the three keypad keys. A CALL indicator will appear on the LCD display to notify the user that a call signal has been transmitted.

Top Level Menu Options

To select menu options, press and hold **Up/Right** for approximately three seconds. Use **Up/Right** and **Down** to scroll and **Enter** to select. The top level menu includes:

- LEAD CHECK
- DISPLAY ECG
- CONFIGURE
- DONE

An operational flowchart of menu options depicts the flow of functionality using the three keys.



Lead Check

LEAD CHECK, DISPLAY ECG, and CONFIGURE are performed prior to starting a new patient.

LEAD CHECK, DISPLAY ECG, and DONE are typically selected prior to each new session.

Checking Impedances

LEAD CHECK is the first option displayed on the LCD screen after patient hookup and is a valuable tool for verifying and optimizing signal quality before starting a patient session.

From the main menu, use **Down** or **Up/Right** to scroll to LEAD CHECK. Press **Enter** to select.

A graph depicting the impedance measured at the right arm (RA), left arm (LA), left leg (LL), and V1 through V6 electrodes is displayed from left to right in vertical columns on the screen. The higher the bar, the better the skin-to-electrode contact.

For good quality transmissions, the bars should be at least 4 bars high. A full-bar graph (6 bars) means optimal high quality and good electrode contact. A low-bar graph means poor quality and high electrode impedance. Skin preparation should be checked for improvement and, if necessary, the electrode(s) should be replaced.

Once acceptable impedance levels are verified, press any of the three keys to return to the top level menu.

Displaying ECG Leads

DISPLAY ECG is used to visually inspect leads I, II, III, V1, V2, V3, V4, V5, and V6 before starting a transmission session. Check the signal quality and lead amplitude for each lead.

From the main menu, use **Down** or **Up/Right** to scroll to DISPLAY ECG. Press **Enter** to select.

Lead I is the first lead displayed on the screen. Use **Down** or **Up/Right** to scroll from lead to lead.

After visual verification of all leads, press **Enter** to return to the top level menu.

Use **Down** or **Up/Right** to scroll to Exit. Press **Enter** to return to the main menu.

Configuring the X12+

CONFIGURE is used to set the channel number, the number of patient cable lead wires, and the language defaults. This menu is also used to display the software version number and current battery voltage. Settings are typically set before the initial patient session and do not need to be set on a per patient basis.

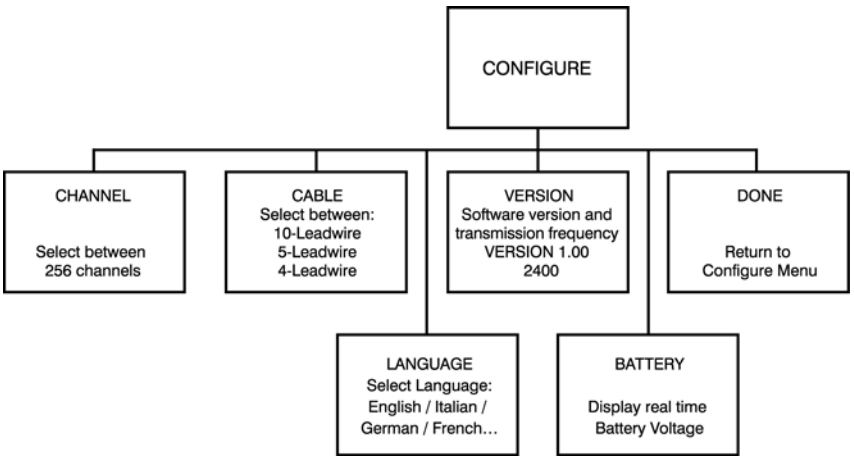
From the main menu, use **Down** or **Up/Right** to scroll to CONFIGURE. Press **Enter** to select.

The CONFIGURE menu includes:

- CHANNEL
- CABLE
- LANGUAGE
- VERSION
- BATTERY
- DONE

Use **Down** or **Up/Right** to scroll through the CONFIGURE menu options. Press **Enter** when the desired option is displayed. Select DONE and press **Enter** to return to the top level menu. Scroll to DONE and press **Enter** to return to the main menu.

The operational flowchart of CONFIGURE menu options depicts the flow of functionality using the three keys.



Setting the Transmission Channel Number

The X12+ transmits the patient's cardiac signals to the electrocardiograph using a specific channel number. CHANNEL is used to enter the optimal transmission channel number before starting a patient session. The user may choose from any of 256 channels. If ECG signal loss occurs, the transmission channel can be changed.

From the main menu, use **Down** or **Up/Right** to scroll to CHANNEL. Press **Enter** to select.

To enter the channel number, move the cursor to the right or left alphanumeric character field by pressing **Up/Right**. To move the cursor one letter or digit at a time, press **Down**. When the cursor reaches the end of the characters it will wrap to the beginning.

When finished, press **Enter** to exit the CHANNEL menu.

> ***NOTE:*** *When entering the channel number, the down arrow key is used to change the characters. The cursor cannot be moved in the up direction.*

Setting the Number of Patient Cable Lead Wires

CABLE is used to set the number of lead wires for the patient cable.

From the CONFIGURE menu, use **Down** or **Up/Right** to scroll to CABLE. Press **Enter** to select. The CABLE menu includes:

- 4 lead wire
- 5 lead wire
- 10 lead wire

Use **Down** or **Up/Right** to scroll to the desired option and press **Enter**. When finished, press **Enter** to exit the CABLE menu.

> ***NOTE:*** *When a 4-wire or 5-wire cable is selected, only the limb leads (and a V label with the 5-wire cable) will appear in* LEAD CHECK, DISPLAY ECG, *and lead fail messages.*

Setting Language

LANGUAGE is used to select the language displayed in the main menu and all sub-menu options.

From the CONFIGURE menu, use **Down** or **Up/Right** to scroll to LANGUAGE. Press **Enter** to select. When finished, press **Enter** to exit the LANGUAGE menu.

Viewing Software Version Number

VERSION displays the current software version installed in the X12+.

From the CONFIGURE menu, use **Down** or **Up/Right** to scroll to VERSION. Press **Enter** to select and view the current software. When finished, press **Enter** to exit the VERSION menu.

Viewing Battery Voltage

BATTERY displays the voltage of the battery currently installed in the X12+.

From the CONFIGURE menu, use **Down** or **Up/Right** to scroll to BATTERY. Press **Enter** to select and view the current battery voltage. When finished, press **Enter** to exit the BATTERY menu.

Starting a Patient Transmission Session

1. Hookup the patient.
2. Ensure that there is an AA alkaline battery in the battery compartment (see note below).
3. Press **Up/Right** to turn the X12+ on (if not already powered on by battery insertion).
4. Use LEAD CHECK to check the electrode-to skin-impedances and verify patient hookup quality as explained in this section.
5. Use DISPLAY ECG to verify the amplitude and signal quality of each ECG lead as explained in this section.
6. Exit and return to the main menu.

> ***NOTE:*** *If battery voltage is below 1.0 volts, the X12+ will not power on. Insert a new AA alkaline battery to continue operation.*

During normal operation, Ch: xx (channel number) and battery indicator are continuously displayed on the LCD.

If the battery is removed during a transmission session, the X12+ stops transmitting. A battery must be inserted to continue operation.

> ***NOTE:*** *If a lead fail condition occurs during operation, the appropriate lead fail indicator(s) is displayed in the center of the LCD display.*
>
> *Refer to Appendix A, Messages and Information for information on lead fail messages.*

Sending (Optional) Call Signals

During the patient data transmission session, the patient may be instructed to transmit call signals from the X12+ to a receiving device for monitoring purposes.

To send a call signal, press any one of the three keys on the X12+. The CALL message is displayed in the main menu on the LCD to inform the user that a call was sent.

Ending a Transmission Session

At the end of the patient session, the X12+ can be turned off.

MAINTENANCE

Cleaning the X12+ and Accessories

1. Remove cables and disconnect power source from device before cleaning.

2. Wash the carry case by hand with fabric detergent and then air dry. Do not machine dry the case.

3. For general cleaning, use a soft, lint-free cloth lightly moistened with a mild soap and water solution. Wipe and air dry.
    - Do use clean, lint-free cloth
    - Don't use alcohol or solvents
    - Don't use abrasive cleaners or materials

4. For disinfecting, wipe exterior with a soft, lint-free cloth using a solution of Sodium Hypochlorite (10% household bleach and water solution) minimum 1:500 dilution (minimum 100 ppm free chlorine) and maximum 1:10 dilution as recommended by the APIC Guidelines for Selection and Use of Disinfectants.

5. Use caution with excess liquid as contact with metal parts may cause corrosion.

6. Do not immerse cable ends or lead wires; immersion can cause metal corrosion.

7. Do not use excessive drying techniques such as forced heat.

> ***WARNING**: Prevent liquid from penetrating the device and do not attempt to clean/disinfect the device or patient cables by submerging into a liquid, autoclaving, or steam cleaning. Never expose cables to strong ultra-violet radiation. Do not sterilize the device or ECG cable with Ethylene Oxide (EtO) gas.*

Periodic Maintenance

Check the X12+ and the ECG cable before each use to ensure they are not damaged or broken.

1. Patient Cable Maintenance:
    - Check patient cables for cracks or breakage prior to use
    - Clean the cable with a germicidal solution that does not contain alcohol
    - Alcohol will cause hardening and can introduce cracks
    - Don't use tape on the patient cable; tape residue will cause hardening and can introduce cracks
    - Patient cables should be stored by looping them loosely. Don't pull or stretch the cables; don't wrap cables tightly
    - Replace patient cables periodically (depending on use and care)
2. Exterior Visual Inspection:
    - Check connectors for loose, bent, or corroded contact points
    - Inspect covers for warping, surface damage, or missing hardware
    - Check for any other form of damage

Disposal of Waste Materials

The X12+ needs one alkaline battery and disposable monitoring electrodes. Disposal must be in accordance with the following procedures:

Battery: applicable disposal or recycling standards

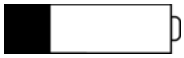
Electrodes: normal waste

MESSAGES AND INFORMATION

APPENDIX A

The following table describes messages that are displayed on the X12+ during patient hookup and transmission.

Table of Messages

Message	Solution
	Battery power is low. Replace existing battery with a fully charged battery.
	Battery power is at 25%.
	Battery power is at 50%.
	Battery power is at 75%.
	Battery power is at 100% (fully charged).
CALL	A call signal has been transmitted.
CH:XX	The transmission channel that has been set for this unit.
MENU	Label over the Up/Right arrow key that indicates access to menu options
OFF	Label over the Enter key that indicates powering the unit off.
'RA'	RA fail. Check if the lead wire is off or the electrode needs to be replaced.
'RL'	RL fail. Check if the lead wire is off or the electrode needs to be replaced.
'LA'	LA fail. Check if the lead wire is off or the electrode needs to be replaced.
'LL'	LL fail. Check if the lead wire is off or the electrode needs to be replaced.
A combination of 'RA/…/LL'	More than one limb lead fail or all leads fail. Check the lead wires and electrodes.
'V1'	V1 fail. Check if the lead wire is off or the electrode needs to be replaced.
'V2'	V2 fail. Check if the lead wire is off or the electrode needs to be replaced.
'V3'	V3 fail. Check if the lead wire is off or the electrode needs to be replaced.
'V4'	V4 fail. Check if the lead wire is off or the electrode needs to be replaced.
'V5'	V5 fail. Check if the lead wire is off or the electrode needs to be replaced.
'V6'	V6 fail. Check if the lead wire is off or the electrode needs to be replaced.
A combination of 'V1, V2, V3, V4, V5, V6'	More than one chest lead fail. Check the lead wires and electrodes.

The following system information log is provided for your convenience. You need this information if your system needs servicing. Be sure to update the information log when you add options or your system has been serviced.

Record the model and serial number of all components, dates of removal and/or replacement, and the name of the vendor from whom the component was purchased and/or installed.

In addition to having records of this information, the system information provides a warranty record of when your system was placed in service.

System Information Log

Manufacturer:

Mortara Instrument, Inc.
7865 N. 86th St.
Milwaukee, WI 53224

Telephone Numbers:

Domestic: 800-231-7437
European: +39-51-6650-701

Sales Department: 800-231-7437
Service Department: 888-MORTARA

Product Information:

Name of Unit/Product: _____

Date of Purchase: ___/___/_____

Purchased Unit From: _____

Serial Number: _____

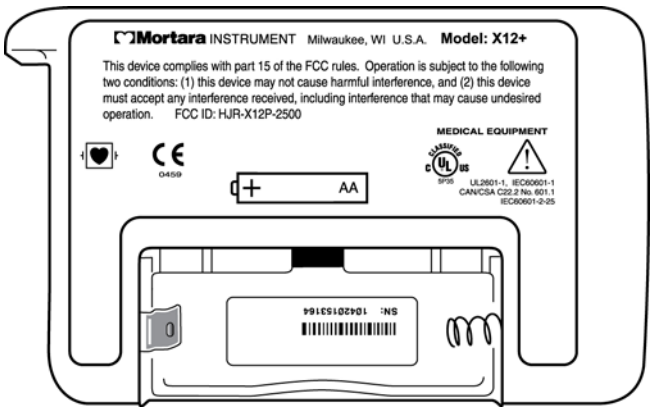
Software Version: _____

Serial and Part Number Location

For questions and service information, have serial number and part number available when calling.

The serial number (SN) and part number (REF) are found under the battery, in the battery compartment on the backside of the unit similar to the one pictured below.

Figure A



CHANNEL ASSIGNMENTS

X12+600 Channel Assignments

Includes reference to UHF TV channel occupying the same frequency range.

CH#	TV3 MHz	CH#	TV38 MHz	CH#	TV39 MHz	CH#	TV40 MHz
00	608.48	40	614.48	80	620.48	C0	626.48
01	608.56	41	614.56	81	620.56	C1	626.56
02	608.64	42	614.64	82	620.64	C2	626.64
03	608.72	43	614.72	83	620.72	C3	626.72
04	608.8	44	614.8	84	620.8	C4	626.8
05	608.88	45	614.88	85	620.88	C5	626.88
06	608.96	46	614.96	86	620.96	C6	626.96
07	609.04	47	615.04	87	621.04	C7	627.04
08	609.12	48	615.12	88	621.12	C8	627.12
09	609.2	49	615.2	89	621.2	C9	627.2
0A	609.28	4A	615.28	8A	621.28	CA	627.28
0B	609.36	4B	615.36	8B	621.36	CB	627.36
0C	609.44	4C	615.44	8C	621.44	CC	627.44
0D	609.52	4D	615.52	8D	621.52	CD	627.52
0E	609.6	4E	615.6	8E	621.6	CE	627.6
0F	609.68	4F	615.68	8F	621.68	CF	627.68
10	609.76	50	615.76	90	621.76	D0	627.76
11	609.84	51	615.84	91	621.84	D1	627.84
12	609.92	52	615.92	92	621.92	D2	627.92
13	610	53	616	93	622	D3	628
14	610.08	54	616.08	94	622.08	D4	628.08
15	610.16	55	616.16	95	622.16	D5	628.16
16	610.24	56	616.24	96	622.24	D6	628.24
17	610.32	57	616.32	97	622.32	D7	628.32
18	610.4	58	616.4	98	622.4	D8	628.4
19	610.48	59	616.48	99	622.48	D9	628.48
1A	610.56	5A	616.56	9A	622.56	DA	628.56
1B	610.64	5B	616.64	9B	622.64	DB	628.64
1C	610.72	5C	616.72	9C	622.72	DC	628.72
1D	610.8	5D	616.8	9D	622.8	DD	628.8
1E	610.88	5E	616.88	9E	622.88	DE	628.88
1F	610.96	5F	616.96	9F	622.96	DF	628.96
20	611.04	60	617.04	A0	623.04	E0	629.04
21	611.12	61	617.12	A1	623.12	E1	629.12
22	611.2	62	617.2	A2	623.2	E2	629.2
23	611.28	63	617.28	A3	623.28	E3	629.28
24	611.36	64	617.36	A4	623.36	E4	629.36
25	611.44	65	617.44	A5	623.44	E5	629.44
26	611.52	66	617.52	A6	623.52	E6	629.52
27	611.6	67	617.6	A7	623.6	E7	629.6
28	611.68	68	617.68	A8	623.68	E8	629.68
29	611.76	69	617.76	A9	623.76	E9	629.76
2A	611.84	6A	617.84	AA	623.84	EA	629.84
2B	611.92	6B	617.92	AB	623.92	EB	629.92
2C	612	6C	618	AC	624	EC	630
2D	612.08	6D	618.08	AD	624.08	ED	630.08
2E	612.16	6E	618.16	AE	624.16	EE	630.16
2F	612.24	6F	618.24	AF	624.24	EF	630.24
30	612.32	70	618.32	B0	624.32	F0	630.32
31	612.4	71	618.4	B1	624.4	F1	630.4
32	612.48	72	618.48	B2	624.48	F2	630.48
33	612.56	73	618.56	B3	624.56	F3	630.56
34	612.64	74	618.64	B4	624.64	F4	630.64
35	612.72	75	618.72	B5	624.72	F5	630.72
36	612.8	76	618.8	B6	624.8	F6	630.8
37	612.88	77	618.88	B7	624.88	F7	630.88

CH#	TV3 MHz	CH#	TV38 MHz	CH#	TV39 MHz	CH#	TV40 MHz
38	612.96	78	618.96	B8	624.96	F8	630.96
39	613.04	79	619.04	B9	625.04	F9	631.04
3A	613.12	7A	619.12	BA	625.12	FA	631.12
3B	613.2	7B	619.2	BB	625.2	FB	631.2
3C	613.28	7C	619.28	BC	625.28	FC	631.28
3D	613.36	7D	619.36	BD	625.36	FD	631.36
3E	613.44	7E	619.44	BE	625.44	FE	631.44
3F	613.52	7F	619.52	BF	625.52	FF	631.52

X12+2500 Channel Assignments

CH#	MHz	CH#	MHz	CH#	MHz	CH#	MHz
00	2400.96	40	2421.44	80	2441.92	C0	2462.4
01	2401.28	41	2421.76	81	2442.24	C1	2462.72
02	2401.6	42	2422.08	82	2442.56	C2	2463.04
03	2401.92	43	2422.4	83	2442.88	C3	2463.36
04	2402.24	44	2422.72	84	2443.2	C4	2463.68
05	2402.56	45	2423.04	85	2443.52	C5	2464
06	2402.88	46	2423.36	86	2443.84	C6	2464.32
07	2403.2	47	2423.68	87	2444.16	C7	2464.64
08	2403.52	48	2424	88	2444.48	C8	2464.96
09	2403.84	49	2424.32	89	2444.8	C9	2465.28
0A	2404.16	4A	2424.64	8A	2445.12	CA	2465.6
0B	2404.48	4B	2424.96	8B	2445.44	CB	2465.92
0C	2404.8	4C	2425.28	8C	2445.76	CC	2466.24
0D	2405.12	4D	2425.6	8D	2446.08	CD	2466.56
0E	2405.44	4E	2425.92	8E	2446.4	CE	2466.88
0F	2405.76	4F	2426.24	8F	2446.72	CF	2467.2
10	2406.08	50	2426.56	90	2447.04	D0	2467.52
11	2406.4	51	2426.88	91	2447.36	D1	2467.84
12	2406.72	52	2427.2	92	2447.68	D2	2468.16
13	2407.04	53	2427.52	93	2448	D3	2468.48
14	2407.36	54	2427.84	94	2448.32	D4	2468.8
15	2407.68	55	2428.16	95	2448.64	D5	2469.12
16	2408	56	2428.48	96	2448.96	D6	2469.44
17	2408.32	57	2428.8	97	2449.28	D7	2469.76
18	2408.64	58	2429.12	98	2449.6	D8	2470.08
19	2408.96	59	2429.44	99	2449.92	D9	2470.4
1A	2409.28	5A	2429.76	9A	2450.24	DA	2470.72
1B	2409.6	5B	2430.08	9B	2450.56	DB	2471.04
1C	2409.92	5C	2430.4	9C	2450.88	DC	2471.36
1D	2410.24	5D	2430.72	9D	2451.2	DD	2471.68
1E	2410.56	5E	2431.04	9E	2451.52	DE	2472
1F	2410.88	5F	2431.36	9F	2451.84	DF	2472.32
20	2411.2	60	2431.68	A0	2452.16	E0	2472.64
21	2411.52	61	2432	A1	2452.48	E1	2472.96
22	2411.84	62	2432.32	A2	2452.8	E2	2473.28
23	2412.16	63	2432.64	A3	2453.12	E3	2473.6
24	2412.48	64	2432.96	A4	2453.44	E4	2473.92
25	2412.8	65	2433.28	A5	2453.76	E5	2474.24
26	2413.12	66	2433.6	A6	2454.08	E6	2474.56
27	2413.44	67	2433.92	A7	2454.4	E7	2474.88
28	2413.76	68	2434.24	A8	2454.72	E8	2475.2
29	2414.08	69	2434.56	A9	2455.04	E9	2475.52
2A	2414.4	6A	2434.88	AA	2455.36	EA	2475.84
2B	2414.72	6B	2435.2	AB	2455.68	EB	2476.16
2C	2415.04	6C	2435.52	AC	2456	EC	2476.48
2D	2415.36	6D	2435.84	AD	2456.32	ED	2476.8

CH#	MHz	CH#	MHz	CH#	MHz	CH#	MHz
2E	2415.68	6E	2436.16	AE	2456.64	EE	2477.12
2F	2416	6F	2436.48	AF	2456.96	EF	2477.44
30	2416.32	70	2436.8	B0	2457.28	F0	2477.76
31	2416.64	71	2437.12	B1	2457.6	F1	2478.08
32	2416.96	72	2437.44	B2	2457.92	F2	2478.4
33	2417.28	73	2437.76	B3	2458.24	F3	2478.72
34	2417.6	74	2438.08	B4	2458.56	F4	2479.04
35	2417.92	75	2438.4	B5	2458.88	F5	2479.36
36	2418.24	76	2438.72	B6	2459.2	F6	2479.68
37	2418.56	77	2439.04	B7	2459.52	F7	2480
38	2418.88	78	2439.36	B8	2459.84	F8	2480.32
39	2419.2	79	2439.68	B9	2460.16	F9	2480.64
3A	2419.52	7A	2440	BA	2460.48	FA	2480.96
3B	2419.84	7B	2440.32	BB	2460.8	FB	2481.28
3C	2420.16	7C	2440.64	BC	2461.12	FC	2481.6
3D	2420.48	7D	2440.96	BD	2461.44	FD	2481.92
3E	2420.8	7E	2441.28	BE	2461.76	FE	2482.24
3F	2421.12	7F	2441.6	BF	2462.08	FF	2482.56

X12+915 Channel Assignments

CH#	MHz	CH#	MHz	CH#	MHz	CH#	MHz
00	904.76	40	909.88	80	915	C0	920.12
01	904.84	41	909.96	81	915.08	C1	920.2
02	904.92	42	910.04	82	915.16	C2	920.28
03	905	43	910.12	83	915.24	C3	920.36
04	905.08	44	910.2	84	915.32	C4	920.44
05	905.16	45	910.28	85	915.4	C5	920.52
06	905.24	46	910.36	86	915.48	C6	920.6
07	905.32	47	910.44	87	915.56	C7	920.68
08	905.4	48	910.52	88	915.64	C8	920.76
09	905.48	49	910.6	89	915.72	C9	920.84
0A	905.56	4A	910.68	8A	915.8	CA	920.92
0B	905.64	4B	910.76	8B	915.88	CB	921
0C	905.72	4C	910.84	8C	915.96	CC	921.08
0D	905.8	4D	910.92	8D	916.04	CD	921.16
0E	905.88	4E	911	8E	916.12	CE	921.24
0F	905.96	4F	911.08	8F	916.2	CF	921.32
10	906.04	50	911.16	90	916.28	D0	921.4
11	906.12	51	911.24	91	916.36	D1	921.48
12	906.2	52	911.32	92	916.44	D2	921.56
13	906.28	53	911.4	93	916.52	D3	921.64
14	906.36	54	911.48	94	916.6	D4	921.72
15	906.44	55	911.56	95	916.68	D5	921.8
16	906.52	56	911.64	96	916.76	D6	921.88
17	906.6	57	911.72	97	916.84	D7	921.96
18	906.68	58	911.8	98	916.92	D8	922.04
19	906.76	59	911.88	99	917	D9	922.12
1A	906.84	5A	911.96	9A	917.08	DA	922.2
1B	906.92	5B	912.04	9B	917.16	DB	922.28
1C	907	5C	912.12	9C	917.24	DC	922.36
1D	907.08	5D	912.2	9D	917.32	DD	922.44
1E	907.16	5E	912.28	9E	917.4	DE	922.52
1F	907.24	5F	912.36	9F	917.48	DF	922.6
20	907.32	60	912.44	A0	917.56	E0	922.68
21	907.4	61	912.52	A1	917.64	E1	922.76
22	907.48	62	912.6	A2	917.72	E2	922.84
23	907.56	63	912.68	A3	917.8	E3	922.92
24	907.64	64	912.76	A4	917.88	E4	923
25	907.72	65	912.84	A5	917.96	E5	923.08
26	907.8	66	912.92	A6	918.04	E6	923.16

CH#	MHz	CH#	MHz	CH#	MHz	CH#	MHz
27	907.88	67	913	A7	918.12	E7	923.24
28	907.96	68	913.08	A8	918.2	E8	923.32
29	908.04	69	913.16	A9	918.28	E9	923.4
2A	908.12	6A	913.24	AA	918.36	EA	923.48
2B	908.2	6B	913.32	AB	918.44	EB	923.56
2C	908.28	6C	913.4	AC	918.52	EC	923.64
2D	908.36	6D	913.48	AD	918.6	ED	923.72
2E	908.44	6E	913.56	AE	918.68	EE	923.8
2F	908.52	6F	913.64	AF	918.76	EF	923.88
30	908.6	70	913.72	B0	918.84	F0	923.96
31	908.68	71	913.8	B1	918.92	F1	924.04
32	908.76	72	913.88	B2	919	F2	924.12
33	908.84	73	913.96	B3	919.08	F3	924.2
34	908.92	74	914.04	B4	919.16	F4	924.28
35	909	75	914.12	B5	919.24	F5	924.36
36	909.08	76	914.2	B6	919.32	F6	924.44
37	909.16	77	914.28	B7	919.4	F7	924.52
38	909.24	78	914.36	B8	919.48	F8	924.6
39	909.32	79	914.44	B9	919.56	F9	924.68
3A	909.4	7A	914.52	BA	919.64	FA	924.76
3B	909.48	7B	914.6	BB	919.72	FB	924.84
3C	909.56	7C	914.68	BC	919.8	FC	924.92
3D	909.64	7D	914.76	BD	919.88	FD	925
3E	909.72	7E	914.84	BE	919.96	FE	925.08
3F	909.8	7F	914.92	BF	920.04	FF	925.16

TRANSLATIONS

Table of Translations

English	Italian ITALIANO	Spanish ESPAÑOL	German DEUTSCH	Dutch HOLLAND
CH:	CH:	C:	KAN:	CH:
Menu	Menu	Menu	Menu	Menu
CALL	CHIAMA	LLAMAR	RUF	OPROEP
Off	Off	Off	Aus	Uit
POWER OFF?	SPEGNERE?	¿APAGAR?	AUSSCHALTEN?	SPANNING UIT?
NO	NO	NO	NEIN	NEE
YES	SI’	SI	JA	JA
LEAD CHECK	DERIVAZIONI	TEST ELECT	ABL.TEST	AFL. TEST
DISPLAY ECG	MOSTRA ECG	MOSTRAR ECG	EKG-ANZEIGE	TOON ECG
CONFIGURE	CONFIGURA	CONFIGURAR	EINSTELLUNG	CONFIGUREER
CHANNEL	CANALE	CANAL	KANAL	KANAAL
CABLE	CAVO	CABLE	KABEL	KABEL
4-Leadwire	4 Elettrodi	4 Electrodos	4-Elektroden	4 Electroden
5-Leadwire	5 Elettrodi	5 Electrodos	5-Elektroden	5 Electroden
10-Leadwire	10 Elettrodi	10 Electrodos	10-Elektroden	10 Electroden
VERSION	VERSIONE	VERSION	VERSION	VERSIE
BATTERY	BATTERIA	BATERIA	BATTERIE	BATTERIJ
Battery Voltage	Livello Batteria	Voltaje Bateria	Batterie-Spannung	Batterij spanning
DONE	FINE	OK	FERTIG	KLAAR
LANGUAGE	LINGUA	IDIOMA	SPRACHE	TAAL

English	French FRANÇAIS	Polish POLSKI	Portuguese PORTUGUES
CH:	CH:	KAN:	CANAL:
Menu	Menu	Menu	Menu
CALL	APPEL	Dzwonek	Chamar
Off	Off	Wyłącz	Off
POWER OFF?	ETEINDRE?	Wyłączyć zasilanie?	Desligar?
NO	NON	NIE	NÃO
YES	OUI	TAK	SIM
LEAD CHECK	DÉRIVATIONS	ELEKTRODY	DERIVAÇÕES
DISPLAY ECG	AFFICH. ECG	EKG	MOSTRAR ECG
CONFIGURE	CONFIGURER	USTAWIENIA	CONFIGURAR
CHANNEL	CANAL	KANAŁ	CANAL
CABLE	CÀBLE	KABEL	CABO
4-Leadwire	4 Électrodes	4-ŻYŁOWY	4-eléctrodos
5-Leadwire	5 Électrodes	5-ŻYŁOWY	5-eléctrodos
10-Leadwire	10 Électrodes	10-ŻYŁOWY	10-eléctrodos
VERSION	VERSION	WERSJA	VERSÃO
BATTERY	BATTERIE	BATERIA	BATERIA
Battery Voltage	Capacité Batt.	Napięcie baterii	Voltagem Bateria
DONE	FIN	GOTOWE	OK
LANGUAGE	LANGUAGE	JĘZYK	IDIOMA