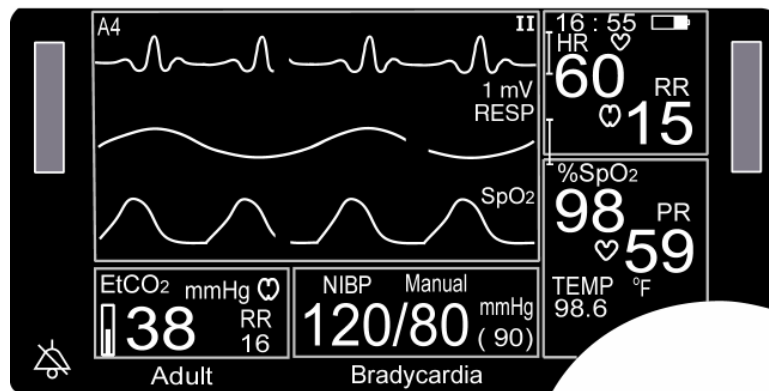
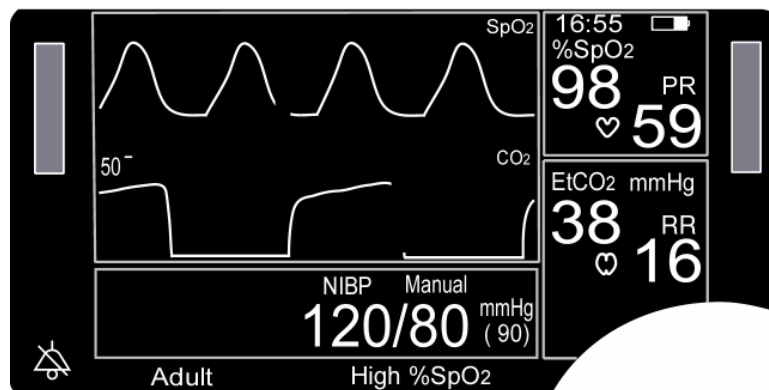

CAS 750

Multi-Parameter Monitor



750E



750C

Service Manual

THE CAS 750 MULTI-PARAMETER MONITOR

IMPORTANT:

This manual addresses all parameters of the CAS 750 Multi-Parameter Monitor. You may have purchased a model that does not have all the parameters referred to in the manual.

THIS MANUAL REMAINS SUITABLE FOR USE!

WARNING:

The CAS 750 Monitor is to be operated by qualified personnel only. Before use, carefully read this manual, including accessory directions for use, all precautionary information, and specifications. The user must check that the equipment functions safely and see that it is in proper working condition before being used.

HOW TO CONTACT US

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1. INTRODUCTION

INTRODUCTION

The CAS 750 Monitor is a multi parameter monitor. The CAS 750E Monitor when fully configured, can monitor Heart Rate, Respiration, Blood Pressure, Oxygen Saturation, Carbon Dioxide and Temperature. The CAS 750C Monitor when fully configured, can monitor Oxygen Saturation, Carbon Dioxide and Blood Pressure.

Heart Rate is measured by placing electrodes on either side of the chest that detect electrical changes produced by the heart. The same electrodes for heart rate detection are used to detect respiration through a process called impedance pneumography. Non-invasive blood pressure is measured using the oscillometric technique determining systolic, diastolic and mean arterial pressure. The pulse oximeter function continuously monitors and displays values for functional arterial hemoglobin saturation and a pulse rate. Capnography continuously monitors and displays the concentration of exhaled carbon dioxide (CO₂). Temperature is obtained using a temperature thermistor probe that can be applied to sites such as esophageal, rectal or skin.

BRIEF DEVICE DESCRIPTION

The CAS 750 Monitor is compact, lightweight and portable, allowing it to be easily carried and used in a variety of clinical settings. The monitor is powered by AC Line Power, +12 VDC or by a Nickel Metal Hydride (NiMH) rechargeable battery pack. The internal battery pack charges when the monitor is plugged into a power source (AC Line Power or +12 VDC). The CAS 750 Monitor can be set to operate in one of nine (9) different languages: English, German, French, Italian, Spanish, Dutch, Swedish, Portuguese or Norwegian. The monitor's message window areas can display various patient alarm and system alarm messages. These messages direct the user to check conditions such as the battery state, air leaks and measurement problems. The monitor's display window also displays the operational mode of the monitor (Adult or Neonate).

The ECG parameter is intended for three-lead or five-lead ECG monitoring.

The Respiration (RESP) parameter is intended to measure changes in electrical impedance caused by chest shape changes associated with inspiration and expiration.

The Non-Invasive Blood Pressure (NIBP) parameter automatically inflates an occluding cuff and, using the oscillometric measurement technique, determines systolic and diastolic pressure and mean arterial pressure. Measurement results along with operator prompts and error messages are displayed on the front panel. The frequency of NIBP determination can be selected by the operator in varied times between one and ninety minutes. The auto and manual operating modes cover a variety of clinical uses.

The Pulse Oximeter parameter (%SpO₂) determines arterial oxyhemoglobin saturation by measuring the absorption of red and infrared light passing through the tissue. Changes in absorption caused by pulsations of blood in the vascular bed are used to determine arterial saturation and pulse rate. The oximeter requires no routine calibration or maintenance. Oxygen saturation and pulse rate numeric values are available for display. When selected as a waveform parameter, a pulsatile waveform is also available for display. When selected on the display as a numeric parameter, on each detected pulse, a bar graph gives the user a pulse-by-pulse visual indication of waveform signal quality. An audio “beep” can be enabled that is generated each time the SpO₂ module detects a pulse.

NOTE:

The bar graph is not proportional to the pulse volume.

The Capnography parameter is a noninvasive method for continuously measuring the amount of CO₂ during every breath, the amount of CO₂ present at the end of exhalation (EtCO₂) and during inhalation (FiCO₂) and the Respiratory Rate (RR). These parameters are useful to assess a patient's ventilatory status. End Tidal and respiratory rate numeric values are available for display. When selected as a waveform parameter, a CO₂ waveform is also available for display. When selected on the display as a numeric parameter, on each exhaled breath, a visual indicator provides a breath-by-breath indication of the patient's breathing.

The Temperature parameter (TEMP) is intended to measure temperature using an attachable probe. The temperature value displayed can be viewed in either Fahrenheit or Celsius.

PATIENT ENVIRONMENT

The CAS 750 Monitor has been tested with specific parts of the “system” used within the Patient Environment. Figure 1, defines the Patient Environment.

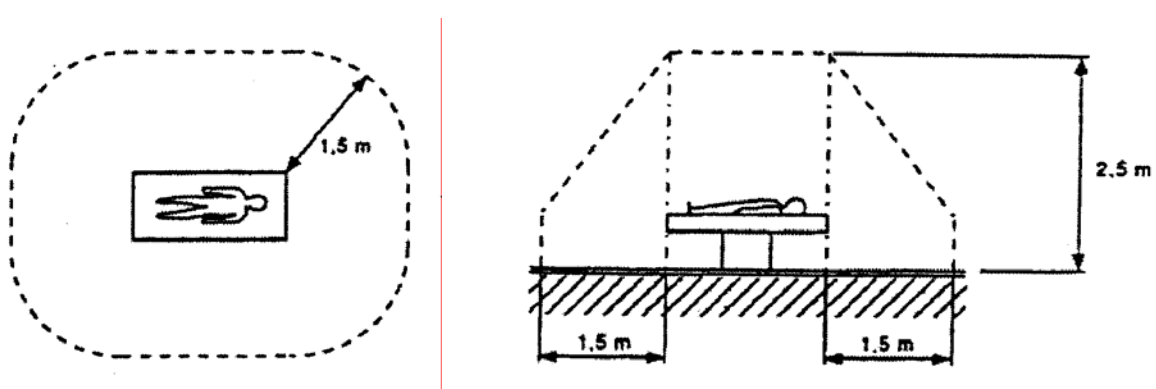


Figure 1: Patient Environment

The parts of the CAS 750 Monitor “system” that can be used in the Patient Environment are defined as;

The CAS 750 Monitor
Appropriate Accessories, listed in the ACCESSORIES section of this User’s Manual
Line Cord
Citizen CMP-10 Mobile Printer
RS232 Interconnect Cable (supplied with printer)
AC Adapter / Charger, Model TRC-09-1100-M from Group West or equivalent (supplied with printer)

Table 1: **Parts of the System**

MANUAL INFORMATION

REVISION HISTORY

Each page of this manual has the document part number and revision letter at the bottom of the page. The revision letter identifies the document’s update level. The revision history of this document is summarized below.

Revision History		
Revision	Date	Comments
00	12/2005	Initial Release

MANUAL OVERVIEW

This manual contains information for diagnosing and servicing the CAS 750 Monitor to board level without the necessity of electrical schematics. Only qualified service personnel should service this product.

It is the user’s responsibility to ensure that the product is properly maintained and that the monitor is in safe and proper operating condition before being put into use.

Before servicing the CAS 750 Monitor, read the appropriate User’s Manual carefully.

CAS Medical Systems, Inc. believes the information herein is complete and accurate, but accepts no liability for errors, omissions, or misrepresentations.

INTENDED AUDIENCE

This manual is intended for service representatives and technical personnel who maintain, troubleshoot, or repair this equipment.

DEFINITION OF TERMS

In this manual, "WARNING", "CAUTION", "IMPORTANT" and "NOTE" mean the following:

WARNING:

Directions that warn of conditions that put the patient or caregiver at risk.

CAUTION:

Directions that help you avoid damaging your monitor or losing data.

IMPORTANT:

Directions you should be particularly aware of; something not readily apparent.

NOTE:

Directions that make it easier to use your monitor.

RELATED DOCUMENTS

To perform test and troubleshooting procedures, you must know how to operate the monitor. Refer to the CAS 750E Monitor User's Manual (CAS p/n 21-02-0184) or the CAS 750C Monitor User's Manual (CAS p/n 21-02-0193).

MONITOR CONFIGURATIONS

Model Number	Description
CAS 750E-1	ECG, Respiration and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750EM-1	ECG, Respiration and Temperature, 12VDC Power input with Battery, Mount included
CAS 750E-2MS	ECG, Respiration and Temperature and Masimo SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750EM-2MS	ECG, Respiration and Temperature and Masimo SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 750E-2NL	ECG, Respiration and Temperature and Nellcor SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750EM-2NL	ECG, Respiration and Temperature and Nellcor SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 750E-3MS	ECG, Respiration and Temperature, MAXNIBP®, Masimo SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750EM-3MS	ECG, Respiration and Temperature, MAXNIBP®, Masimo SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 750E-3NL	ECG, Respiration and Temperature, MAXNIBP®, Nellcor SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750EM-3NL	ECG, Respiration and Temperature, MAXNIBP®, Nellcor SpO ₂ , 12VDC Power input with Battery, Mount included
CAS750E-3MSC	ECG, Respiration and Temperature, Masimo SpO ₂ , Oridion CO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS750EM-3MSC	ECG, Respiration and Temperature, Masimo SpO ₂ , Oridion CO ₂ , 12VDC Power input with Battery, Mount included
CAS750E-3NLC	ECG, Respiration and Temperature, Nellcor SpO ₂ , Oridion CO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS750EM-3NLC	ECG, Respiration and Temperature, Nellcor SpO ₂ , Oridion CO ₂ , 12VDC Power input with Battery, Mount included
CAS750E-4MS	ECG, Respiration and Temperature, MAXNIBP®, Masimo SpO ₂ , Oridion CO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS750EM-4MS	ECG, Respiration and Temperature, MAXNIBP®, Masimo SpO ₂ , Oridion CO ₂ , 12VDC Power input with Battery, Mount included
CAS750E-4NL	ECG, Respiration and Temperature, MAXNIBP®, Nellcor SpO ₂ , Oridion CO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS750EM-4NL	ECG, Respiration and Temperature, MAXNIBP®, Nellcor SpO ₂ , Oridion CO ₂ , 12VDC Power input with Battery, Mount included

Table 2: **750E Monitor Configurations**

Model Number	Description
CAS 750C-2MS	Oridion CO ₂ , and Masimo SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750CM-2MS	Oridion CO ₂ , and Masimo SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 750C-2NL	Oridion CO ₂ , and Nellcor SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750M-2NL	Oridion CO ₂ , and Nellcor SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 750C-3MS	Oridion CO ₂ , MAXNIBP®, Masimo SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750CM-3MS	Oridion CO ₂ , MAXNIBP®, Masimo SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 750C-3NL	Oridion CO ₂ , MAXNIBP®, Nellcor SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 750CM-3NL	Oridion CO ₂ , MAXNIBP®, Nellcor SpO ₂ , 12VDC Power input with Battery, Mount included

Table 3: **750C Monitor Configurations**

2. SERVICE POLICY

WARRANTY POLICY

CAS Medical Systems, Inc. warrants the monitor, when new, to be free from defects in material and workmanship and to perform in accordance with manufacturer's specifications for a period of two (2) years from the date of original purchase from CAS or its authorized distributors or agents except as noted below.

The same warranty conditions are made for a period of one (1) year with respect to printers and battery and ninety (90) days on non-disposable accessories and certain components consisting of reusable SpO₂ sensors, reusable temperature probes and other accessories provided by CAS as part of the original purchase. CAS warrants blood pressure cuffs and disposable or single-patient-use products for out-of-box failure only. Where the accessory is not a CAS manufactured product, the manufacturers own warranty conditions apply.

CAS reserves the right to perform warranty service operations in its own factory, at an authorized repair facility, or at the customers' site.

Our obligation under this warranty is limited to repairing or, at our option, replacing any defective parts or our equipment, without charge, if such defects occur in normal service and with prompt notification.

Damage to any part through misuse, neglect, or accident, or by affixing any accessories or attachments other than CAS, Masimo[®], Nellcor[®], Oridion[®] and YSI[®] manufactured accessories or attachments, is not covered by this warranty.

ACCESSORIES, BATTERIES, CUFFS, AND CERTAIN COMPONENTS

In all cases, policy applies from date of purchase from CAS or its authorized distributors or agents.

Batteries:	(1) Year
Chargers:	(1) Year (not including power cord: see other accessories)
CO ₂ Accessories:	Out-of-box failure only for Oridion Sample Lines
Cuffs (all):	Out-of-box failure only
Patient Cable:	(90) Days
Print Heads:	Out-of-box failure only
SpO ₂ Sensors:	(90) Days for Masimo and Nellcor SpO ₂ Sensors
Temp Probes:	(120) Days for YSI probes
Other Accessories:	Out-of-box failure only
Certain Components:	(1) Year - Printer mechanism, but not including Thermal Print Heads

THERE ARE NO WARRANTIES, WHICH EXTEND BEYOND THOSE EXPRESSLY DESCRIBED IN THIS AGREEMENT AND THE COMPANY MAKES NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

EXTENDED WARRANTY PROGRAM

CAS Medical Systems offers an Extended Warranty Program for the CAS 750 Monitor.

A one (1) year Extended Warranty, on the monitor, is available at either the time of purchase or within two (2) years of the purchase date.

Contact CAS Medical Systems' Customer Service Department for more information.

RETURNING THE MONITOR FOR REPAIR

Before returning a product for repair you must obtain authorization from CAS Medical Systems. An RGA (Return Goods Authorization) number will be given to you by our Service Department. Be sure to note this number on the outside of your shipping box. Returns without an RGA number will not be accepted for delivery.

NOTE:

Save the original shipping container and it's inside packing material should the monitor need to be returned for service.

Refer to the section *How To Contact Us*, found in the front of this manual, for important telephone numbers, fax numbers and email addresses.

3. SAFETY MEASURES AND WARNINGS

WARNING:

Do not use this instrument for any purpose other than specified in this manual. Doing so will invalidate the monitor's warranty.

The Model 750 Monitor is defibrillator proof. It may remain attached to the patient during defibrillation, but the readings may be inaccurate during use and less than ten (10) seconds thereafter.

Do not connect more than one patient to the monitor. Do not connect more than one monitor to a patient.

Do not plug the monitor into an outlet controlled by a wall switch.

Before each use, verify that the alarm limits are appropriate for the patient being monitored.

The position of subject, physiological condition, and other factors affect the readings.

Blood pressure and pulse can fluctuate greatly between measurements; the monitor cannot alert the user to changes in vital signs occurring between measurement cycles.

Occasionally, electrical signals at the heart do not produce a peripheral pulse. If a patient's beat-to-beat pulse amplitude varies significantly (for example, pulsus alternans, atrial fibrillation, rapid-cycling artificial ventilator), blood pressure and pulse rate readings can be erratic and an alternate measuring method should be used for confirmation.

Where the integrity of the external protective conductor in the installation or its arrangement is in doubt, EQUIPMENT shall be operated from its INTERNAL ELECTRICAL POWER SOURCE.

Isolation of product from mains can only be achieved by removal of external power cord.

Do not, under any circumstances, perform any testing or maintenance on the monitor or power cord while the unit is being used to monitor a patient. Unplug the power cord before cleaning or servicing the monitor. The operator should not perform any servicing except as specifically stated in this manual.

Do not touch part of non-medical electrical equipment in the patient environment after removal of covers, connectors etc... without the use of a tool which operate at voltages not exceeding 25 VAC or 60 VDC and the patient at the same time.

Do not use a frayed or damaged power supply cord, or any accessory if you notice any sign of damage. Contact CAS Medical Systems for assistance.

Equipment not suitable for use in the presence of FLAMMABLE ANESTHETICS.

Equipment is not intended to be used in Oxygen Enriched Atmospheres.

WARNING:

Do not gas sterilize or autoclave the monitor.

Do not use the monitor in the presence of Magnetic Resonance Imaging (MRI) equipment.

Do not apply the blood pressure cuff on an extremity being used for an intravenous infusion.

Do not place liquids on top of the monitor. Do not immerse the monitor or power cord in water or any liquid. If unit is accidentally wetted it should be thoroughly dried. The rear cover can be removed by a qualified service technician to verify absence of water.

A pulse oximeter should be considered an early warning device. As a trend toward patient deoxygenation is indicated, blood samples should be analyzed by a laboratory co-oximeter to completely understand the patient's condition.

Accurate oxygen saturation measurements cannot be obtained when the oximeter is not measuring the pulse properly. If the SpO₂ waveform, perfusion bar graph or the Pulse Rate display be erratic or inaccurate, first examine the patient for any sign of distress and only then re-examine sensor placement.

When monitoring CO₂ with non-flammable anesthetics (halothane, enflurane, isoflurane, sevoflurane and desflurane), connect the gas outlet from the monitor to a scavenger system.

CO₂ readings and respiratory rate readings can be affected by certain ambient environmental conditions and certain patient conditions.

ACCURACY – If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by alternate means and then check the CAS 750 Monitor for proper functioning.

APPLICATION – This monitor is not designed for direct cardiac connection.

CABLES – Route all cables away from patient's throat to avoid possible strangulation.

CONDUCTIVE CONNECTIONS – Avoid making any conductive connections to applied parts (patient connection), which is likely to degrade safety.

CONDUCTIVE PARTS – Ensure that the conductive parts of the lead electrodes and associated connectors do not contact other conductive parts including earth.

CONNECTIONS – The correct way to connect a patient to the monitor is plug the electrode leads into the patient cable which in turn connects to the monitor. The monitor is connected to the wall socket by the power cord. Do not plug the electrode leads into the power cord, a wall socket, or an extension cord.

DEFIBRILLATION – Do not come in contact with patients during defibrillation. Serious injury or death could result.

WARNING:

DISPOSAL – Dispose of the packaging material, observing the applicable waste control regulations.

PACEMAKER PATIENTS – Rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. Keep pacemaker patients under close surveillance.

PACEMAKER SPIKE – When Pacemaker Detection is enabled; an artificial pacemaker spike is displayed in place of the actual pacemaker spike. All pacemaker spikes appear uniform. Do not diagnostically interpret pacemaker spike size and shape.

SITE REQUIREMENTS – For safety reasons, all connectors for patient cables and sensor leads are designed to prevent inadvertent disconnection, should someone pull on them. Do not route cables in a way that they may present a stumbling hazard. For devices installed above the patient, adequate precautions must be taken to prevent them from dropping on the patient.

CAUTION:

Before each use, make sure that the monitor default alarm settings are appropriate for the specific patient being monitored.

Pressing the front panel keyswitch with a sharp or pointed instrument may permanently damage the keyswitch. Press the keyswitch using only your finger.

Even though the ECG patient circuit is electrically isolated, it has not been designed for direct application on a patient's heart.

Do not operate the monitor unless it has been properly calibrated. Inaccurate blood pressure readings may result. A calibration check is recommended once every year. A pneumatic check is recommended once every six (6) months.

As with any non-invasive oscillometric blood pressure monitor, the accuracy of the measurements obtained may be adversely affected by the presence of agents that alter the patient's cardiovascular system.

Do not alter the monitor's air hose. CAS Medical Systems cannot ensure proper monitor performance if the tubing is altered. Modification of the air hose will void the warranty. Avoid compression or restriction of pressure tubes.

A NIBP monitor does not operate effectively if a patient is having seizure activity, convulsions or tremors or is connected to a heart/lung machine.

In shock conditions, the low amplitude of the blood pressure waveform may make it difficult for the monitor to accurately determine the systolic and diastolic pressures.

When a patient is experiencing arrhythmias during a NIBP measurement, the accuracy of the pulse determination may be affected or the time needed to complete a measurement may be extended. The monitor will not make a determination beyond 120 seconds.

CAUTION:

If the cuff is applied on a limb being used for oxygen saturation monitoring %SpO₂ results will be altered during each blood pressure measurement due to the occlusion of blood flow.

Inspect the monitor, air hose and sensors for any damage prior to operation. If any damage is noted, the monitor should not be used until it has been serviced. The monitor should be repaired only by personnel authorized to do so by CAS Medical Systems, Inc.

Use only CAS Medical Systems approved accessories and sensors to preserve the integrity, accuracy and the electromagnetic compatibility of the monitor.

Use only CAS approved ECG cables to ensure proper defibrillation protection.

Consult a physician for interpretation of blood pressure measurements.

The oximeter is factory calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin.

Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin may affect the accuracy of the measurement.

Cardiogreen and other intravascular dyes, depending on the concentration, may affect the accuracy of the oximeter measurement.

Some sensors may not be appropriate for a particular patient. If at least ten (10) seconds of one bar pulses cannot be observed for a given sensor, change sensor location or sensor type until this condition is achieved.

If the monitor fails to respond, do not use it until the situation has been corrected by qualified personnel.

ACCIDENTAL SPILLS – In the event that fluids are accidentally spilled on the monitor, take the monitor out of operation and inspect for damage.

BATTERY POWER – If the monitor will not be used or not connected to AC line power for a period over six (6) months, remove the battery.

ELECTRICAL SHOCK – To reduce the risk of electrical shock, do not remove the back cover. Refer all servicing to qualified personnel.

ELECTROCAUTERY PRECAUTIONS – To prevent unwanted skin burns, apply electrocautery electrodes as far as possible from all other electrodes, a distance of at least 15 cm/6 in. is recommended.

ELECTROMAGNETIC COMPATIBILITY (EMC) – The equipment needs special precautions regarding EMC. Be aware that strong electromagnetic fields may interfere with monitor operation. Interference prevents the clear reception of signals by the monitor. If the hospital is close to a strong transmitter such as TV, AM, or FM radio, police or fire stations, a HAM radio operator, an airport, or cellular phone, their signals could be picked up as signals by the monitor.

ELECTROSURGERY – Measurements may be affected in the presence of strong electromagnetic sources such as electro surgery equipment.

CAUTION:

GROUNDING – Do not defeat the three-wire grounding feature of the power cord by means of adaptors, plug modifications, or other methods. Do not use extension cords of any type. Do not connect the monitor to an electrical outlet controlled by a wall switch or dimmer.

INTERFACING OTHER EQUIPMENT – Monitoring equipment must be interfaced with other types of medical equipment by qualified biomedical engineering personnel. Be certain to consult manufacturers' specifications to maintain safe operation.

LEAKAGE CURRENT TEST – The interconnection of auxiliary equipment with this device may increase the total leakage current. When interfacing with other equipment, a test for leakage current must be performed by a qualified biomedical engineering personnel before using with patients. Serious injury or death could result if the leakage current exceeds applicable standards. The use of accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include: use of the accessory in the patient vicinity; and evidence that the safety certification of the accessory has been performed in accordance with the appropriate IEC 601.1 and/or IEC 601.1.1 harmonized national standard.

STACKING – Where monitor is used adjacent to or stacked with other equipment, the monitor should be observed to verify normal operation in the configuration in which it will be used.

GENERAL NOTES:

There are no known risks with common disposal of equipment or accessories; however, the disposing of accessories should follow in accordance with local hospital policies. The user should ensure these policies do not conflict with any local, state or federal guidelines.

The monitor is suitable for use in the presence of electro surgery.

The monitor is suitable to be connected to public AC mains power.

The CAS 750 Monitor is not "Category AP or APG Equipment".

The CAS 750 Monitor is for "Continuous Operation".

The CAS 750 Monitor with ECG/Respiration applied parts is "Type CF Defibrillation Proof".

The CAS 750 Monitor applied parts are "Type BF Defibrillation Proof".

The CAS 750 Monitor provides "DRIP-PROOF" level of protection from ingress to moisture. Do not expose the CAS 750 Monitor to extreme moisture levels such as direct exposure to rain. Exposure to extreme moisture levels may cause incorrect or inaccurate performance, or device failure during or after exposure.

When using "snap" leadwires, attach leadwires to electrodes first then apply electrodes to the patient. This prevents the gel from spreading and becoming ineffective as you attach the snaps to the electrodes.

AUTOMATIC SAFETY FEATURES

The monitor has been designed to promote patient safety. The maximum amount of time allowed to complete a blood pressure measurement is 120 seconds in adult mode and 90 seconds in neonate mode. If the measurement has not been completed within that time, the cuff is deflated automatically and a message is displayed indicating the problem.

To prevent exposure of the extremity to an inordinately high pressure, the cuff is deflated automatically when the pressure in the system is greater than 290 mmHg in the adult mode or 145 mmHg in the neonatal mode.

The cuffs used by the CAS 750 Monitor are designed without transducers for patient safety. The transducers used for NIBP measurement are located inside the monitor on the NIBP board and are isolated from the patient.

In the event of a microprocessor failure, the cuff will be deflated automatically within ten (10) seconds.

All equipment parts are protected against the effects of the discharge of a defibrillator. No separate actions are required when using this equipment with a defibrillator.

Should the AC or DC power be interrupted coming into the monitor, the monitor automatically runs off battery power. An indication of this would be a change in color of the Battery Power Visual Indicator LED from Green to either Orange or Red.

Whenever the power is disconnected from the monitor and the monitor is not allowed to shut down in an orderly fashion, the monitor, when re-powered alerts the user. Refer to Page 61, USER MESSAGES for more information.

CAUTION:

Regardless of these safety features, always be sure to check that there are no signs of prolonged impairment of patient circulation and that the monitor is functioning properly.

4. DECLARATION OF CONFORMITY


Manufacturers Declaration of Conformity Electronic Emissions and Immunity

The CAS 750 Monitor is intended for use in the electromagnetic environment specified below. The customer or the user of the CAS 750 Monitor should assure it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment
RF emissions – CISPR 11	Group 1	The CAS 750 Monitor uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions – CISPR 11	Class B	The CAS 750 Monitor is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations / flicker emissions	Complies	

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+/-6 kV contact +/-8 kV air	+/-6 kV contact +/-8 kV air	Floors should be wood concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	+/-2 kV for power supply lines +/-1 kV for input/output lines	+/-2 kV for power supply lines +/-1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	+/-1 kV differential mode +/-2 kV common mode	+/-1 kV differential mode +/-2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage Dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. < 5% U_T (> 95% dip in U_T) for 5 seconds.	< 5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. < 5% U_T (> 95% dip in U_T) for 5 seconds.	Mains power quality should be that of a typical commercial or hospital environment. If user of the CAS 750 Monitor requires continued operation during power mains interruptions, it is recommended that the CAS 750 Monitor be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE: U_T is the A.C. mains voltage prior to application of the test level.

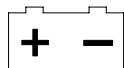
Guidance and Manufacturer’s Declaration – Electromagnetic Immunity			
The CAS 750 Monitor is intended for use in the electromagnetic environment specified below. The customer or the user of the CAS 750 Monitor should insure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the CAS 750 Monitor, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance: $d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz Where P is the maximum output power rating of the transmitter in watts according to the transmitter manufacturer and d is the recommended separation distance in meters. 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: 
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is effected by absorption and reflection from structures, objects and people.			
^a Field strengths from fixed transmitters, such as base stations for radio (cellular / cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the CAS 750 Monitor is used exceeds the applicable RF compliance level above, the CAS 750 Monitor should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the CAS 750 Monitor.			
^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 CAS 750 Monitor			
The CAS 750 Monitor is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the CAS 750 Monitor can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the CAS 750 Monitor as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter (Watts)	Separation distance according to frequency of transmitter (Meters)		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters operating at a maximum output power not listed above, the recommended separation distance d in meters 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 according to the transmitter manufacturer. NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

5. SYMBOLS

The following is a summary of all symbols used on the monitor and accessories. Symbols may occur on the product or on its packaging.

Front Panel Symbols



A tri-colored LED used to indicate the status of the monitors power source.



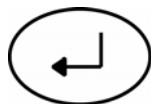
POWER (ON/STANDBY) Pushbutton



ALARMS (SILENCE/RESET) Pushbutton



NIBP (Start, Stop, Menu) Pushbutton



RETURN (Freeze, Print, Main screen) Pushbutton



PARAMETERS Pushbutton

SYMBOLS (CONT.)

LIMITS (Alarm Limits) Pushbutton



HISTORY Pushbutton



VOLUME (Audio/Visual) Pushbutton



ARROW UP Pushbutton



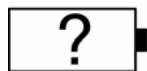
ARROW DOWN Pushbutton

Screen Indicators

Heart Beat Indicator
Flashes once for every detected heartbeat.



Respiration Breath Indicator
Flashes once for every detected breath.



Battery Charge Level Indicator

SYMBOLS (CONT.)

A Yellow LED visual indicator used along with the SILENCE/RESET pushbutton to display the status of the Audio Alarm Silence.



A vertical bar graph display of signal strength is displayed along side the numerics for CO₂ and SpO₂ ;

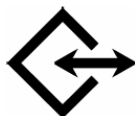
- When the parameter is not selected as a waveform being displayed.
- When one of the sub menus is being displayed (i.e. Parameters menu, Alarm Limits menu)

Symbols near Accessory Connections

Indicates protection against the effects of the discharge of a cardiac defibrillator. Patient connections are Type CF, isolated for direct cardiac application, and protected against defibrillation.



Indicates protection against the effects of the discharge of a cardiac defibrillator. Patient connections are Type BF and protected against defibrillation.



Two-way Communication Port
RS232 Interface Connector

ECG/RESP

ECG/Respiration Input Connector

SpO₂

Pulse Oximeter Probe Input Connector

SYMBOLS (CONT.)

MicroStream™ CO₂ Input Connector



CO₂ Scavenger Exhaust Port



NIBP Hose and Cuff Connector

TEMP

Temperature Probe Input Connector

Symbols on Monitor or Printer



CAUTION: Before using, read instructions included.



Potential Equalization Post

IPX1

Protection against ingress of water.



The CE Mark and Notified Body Registration Number signifies the device has met all essential requirements of European Medical Device Directive 93/42/EEC.



Indicates this monitor is subject to the Waste Electrical and Electronic Equipment Directive in the European Union.

SYMBOLS (CONT.)

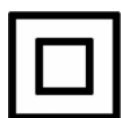
Alternating Current



Symbol used on the rear panel of the CAS 750CM and 750EM, to indicate the polarity of the DC power input.



Direct Current



Monitor Classification of Electrical Insulation
Class II device (if applicable)

The CAS 750 Monitor is normally a Class I device.

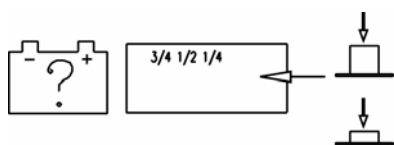
The CAS 750 Monitor becomes a Class II device when it is mounted and connected to a DC power source (750CM and 750EM).



Recycling suggested (see General Notes).



WARNING: Before removing, read instructions in Printer Manual



Located on the Smart Pack batteries, a set of four (4) LEDs used to indicate the approximate amount of charge remaining in the battery pack.

SYMBOLS (CONT.)

Symbols on Packaging



Symbol used to indicate where Relative Humidity information concerning storage and transport can be located.



Symbol used to indicate the minimum and maximum storage and transport Temperatures.

6. MONITOR CONTROLS

FRONT PANEL

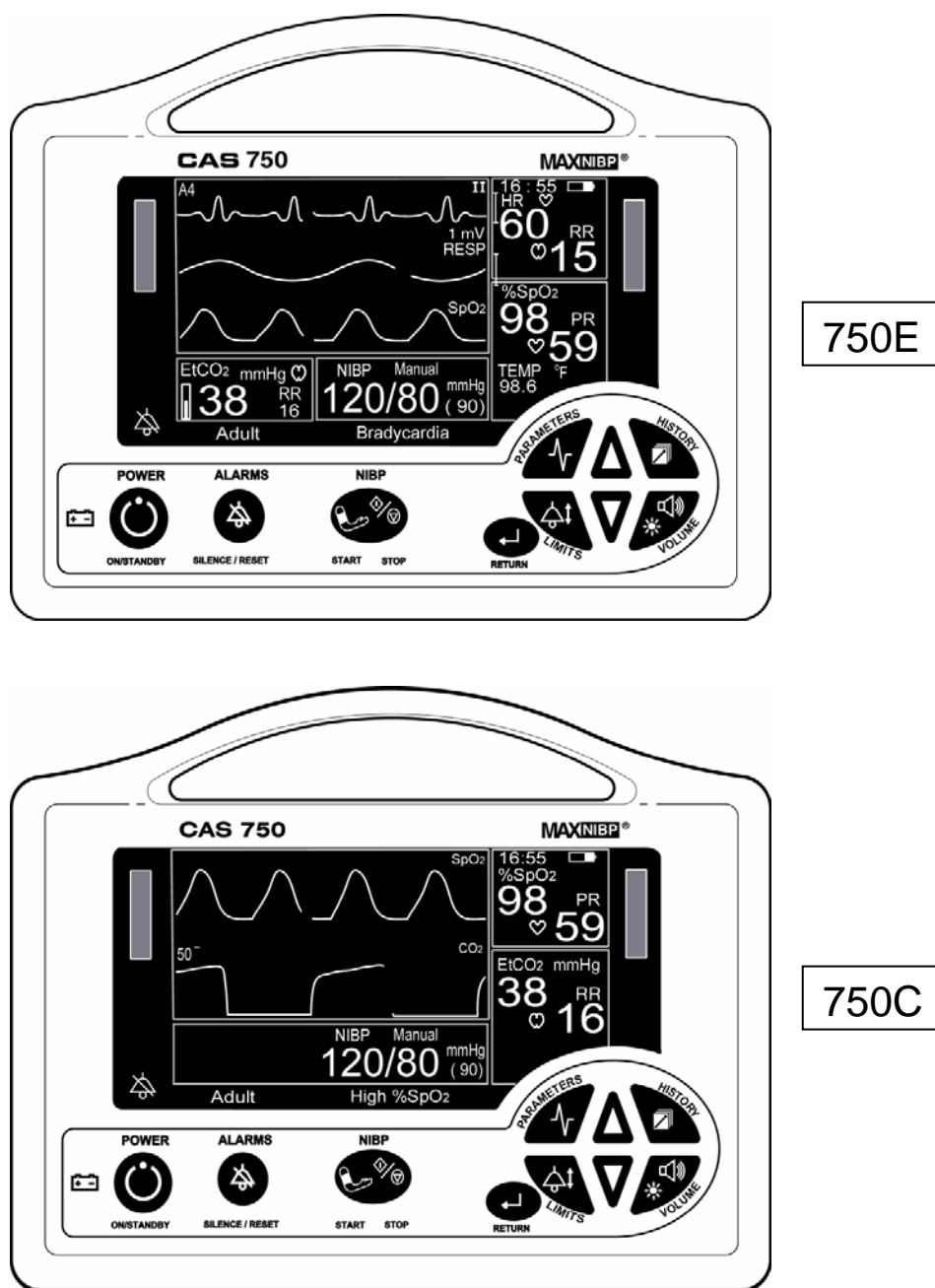


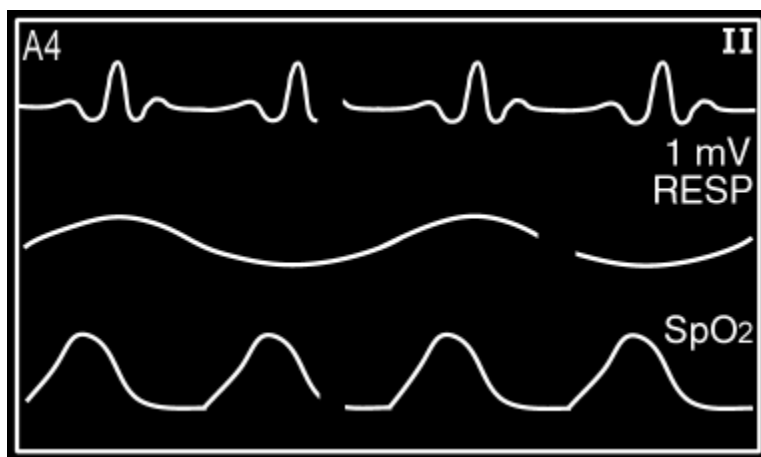
Figure 2: Front Panel Views

DISPLAY AREAS

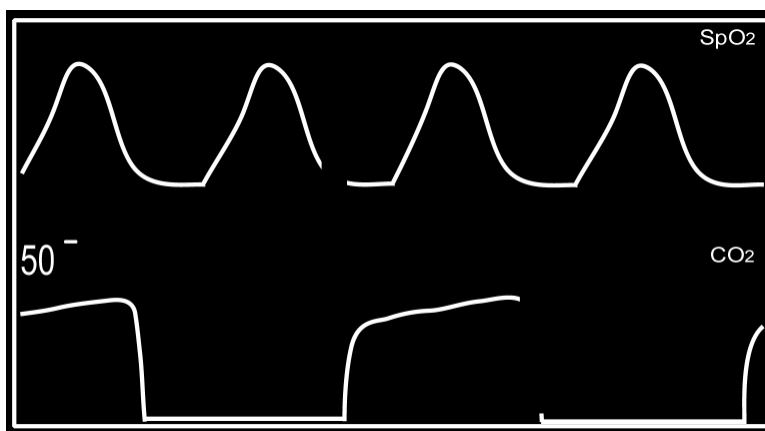
The Main display area of the CAS 750E Monitor can be broken down into seven (7) sections of information. The Main display area of the CAS 750C Monitor can be broken down into six (6) sections.

They are:

MAIN DISPLAY AREA



750E



750C

Figure 3: Main Display Areas

During normal operation, this section (Refer to Figure 3 on the previous page) displays the traces that have been selected in the PARAMETERS menu. In the CAS 750E Monitor up to three (3) traces can be selected. Since the CAS 750C Monitor is capable of monitoring two (2) waveform parameters, the position of Trace 1 and 2 is not user selectable. Only the trace speed is selectable.

The names of the traces are also displayed to better identify them. The traces are displayed in an erase bar format.

When the CAS 750 Monitor contains ECG as a parameter, an ECG waveform trace is automatically selected as Trace #1. Included with the ECG trace is the ECG Gain selection and the value for the ECG size marker.

This section is also used to display, when selected, the Alarm Limits, Audio/Visual, History, Parameters, Service and Setup menus.

TIME, BATTERY AND NUMERICS

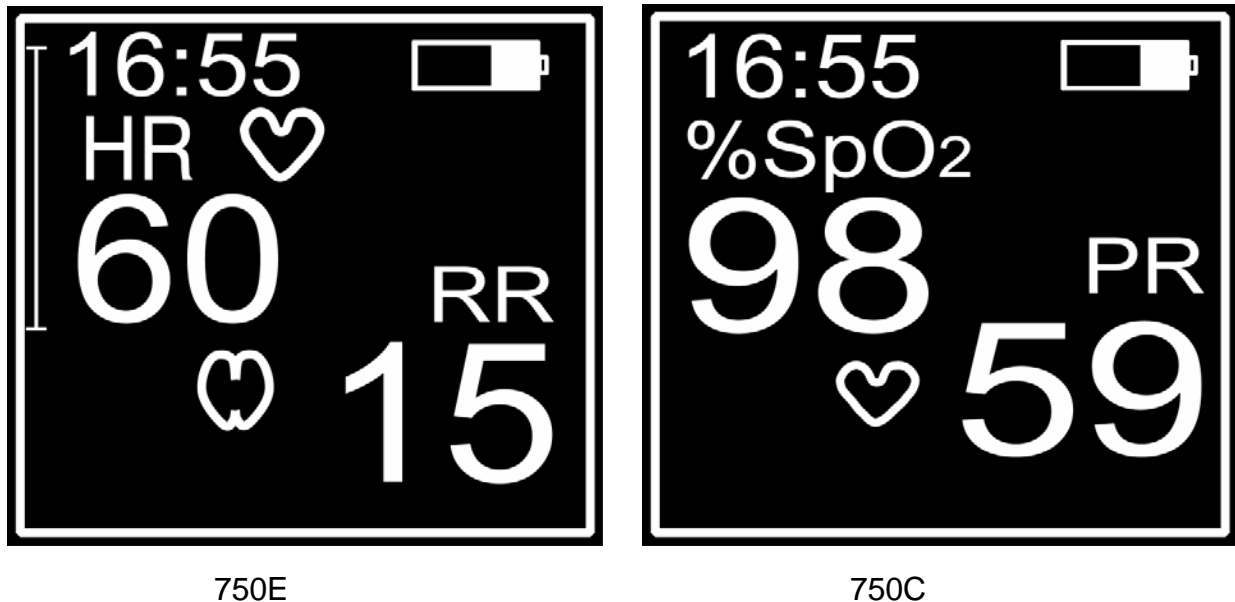


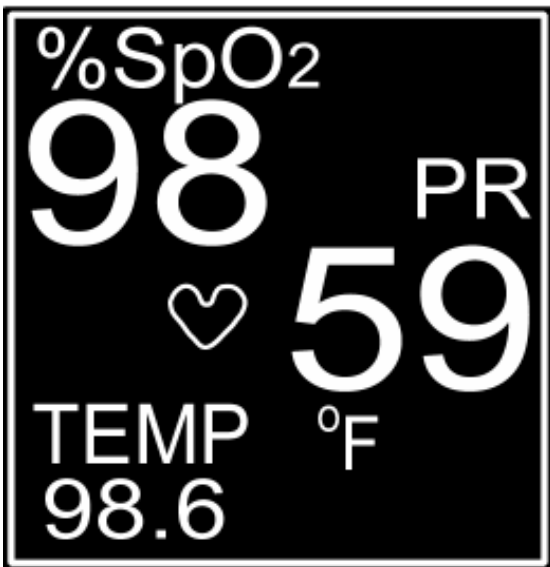
Figure 4: Time, Battery Status and Numerics

This section contains the current monitor time and Battery Charge Status icon. This section also contains waveform names, numeric values and flashing visual icons.

When the CAS 750 Monitor contains ECG and Respiration as parameters, size markers are drawn for both the ECG and Respiration waveforms being displayed. The value for the size marker for ECG is displayed in the waveform area. The size marker for Respiration represents a breath of 1 Ohm.

NOTE:

If no battery is installed, the Battery icon will not be displayed.

NUMERICS AND TEMPERATURE

750E



750C

Figure 5: **Numerics and Temperature**

This section displays the numeric information for the remaining waveform selected as well as the Temperature value.

EtCO₂ NUMERICS

750E

Figure 6: **EtCO₂ Numeric**

This section displays the numeric information for EtCO₂. When CO₂ is not displayed as a waveform, a vertical bar graph of relative signal strength is also displayed.

NIBP NUMERICS

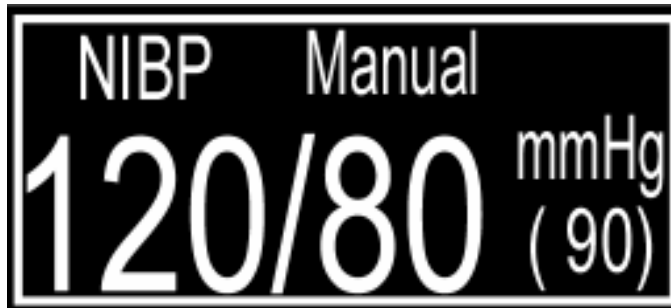


Figure 7: **NIBP Numerics**

This section displays the operating mode for NIBP (Automatic or Manual) and the numeric information for the last NIBP reading taken. The information supplied is in the format Systolic/Diastolic and (MAP) mmHg values or Systolic/Diastolic mmHg and Pulse Rate ♡. The selection between (MAP) or Pulse Rate ♡ can be made in the NIBP menu.

PATIENT ALARM MESSAGE WINDOW

The text section directly below the bottom trace and to the right, in Figure 2, displays any patient related alarm messages: example Bradycardia, Tachycardia.

EQUIPMENT MESSAGE WINDOW

The text section directly below the bottom trace and to the left, in Figure 2, displays the monitor's current operating mode (Adult or Neonate) as well as other equipment type alarm messages. Also displayed, when selected, will be the current status of the Audio Alarm Silence (2 Minute or Permanent).

DISPLAY VISUAL INDICATORS



Two (2) light bar visual indicators. One on the left side of the monitor and one on the right side of the monitor are used for alarm indications.

The Yellow light bar, on the left side, is lit indicating an equipment alarm.

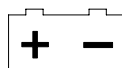
The Red light bar, on the right side, is lit to indicate a patient alarm.



A Yellow LED visual indicator used along with the SILENCE/RESET pushbutton to display the status of the Audio Alarm Silence. Refer to Page 41, AUDIO ALARM SILENCE (SILENCE/RESET Pushbutton) for more information.

The status of the LED is:

- “ON” continuously = 2 Minute Audio disable
- Flash one second “ON”/one second “OFF” = Permanent Audio disable



A tri-colored LED visual indicator used to display the status of the power source and battery condition.

The status of the LED is:

- GREEN = Monitor is connected to a main power source
- ORANGE = In Use on Battery
- RED = Battery Low or Dead Battery

FRONT PANEL CONTROLS

Below are the keyswitch panels used on the various models of the CAS 750.

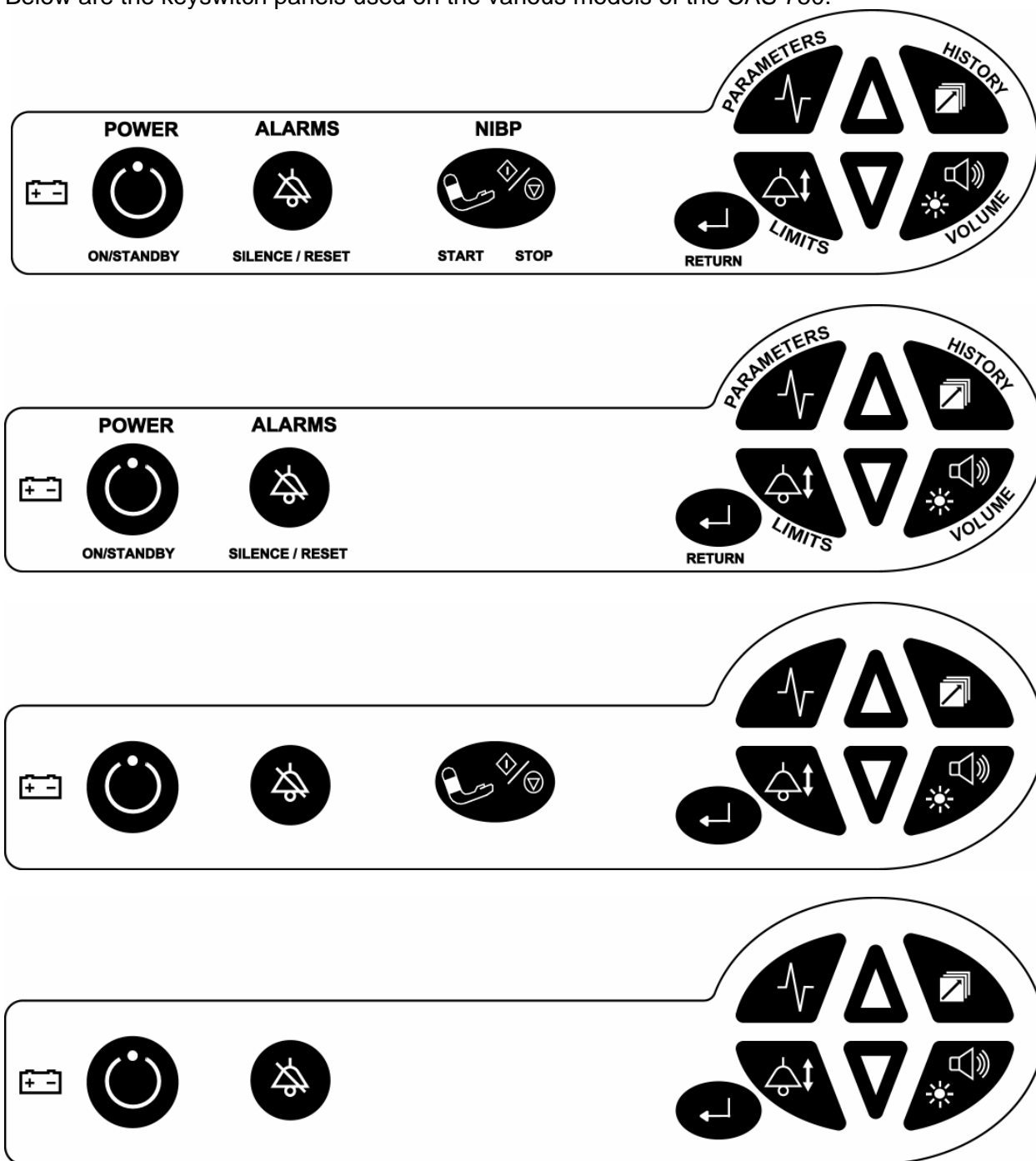


Figure 8: Front Panel Controls

**POWER:**

- On: Turns on the monitor's display.
- Standby: Switches monitor to standby mode when pressed for 2 seconds.

**ALARMS:**

- Reset: When depressed during an active patient alarm, silences the audio portion of that alarm for fifteen (15) seconds.
- Silence: When depressed during an active equipment alarm, the alarm condition shall be acknowledged along with the audio and visual shall be removed.

Used to enable and disable the 2 Minute or Permanent Audio Alarms Silence feature.

Refer to Page 41, AUDIO ALARM SILENCE (SILENCE/RESET Pushbutton) for more information.

**NIBP:**

- Start:** Initiates a NIBP measurement.
- Stop:** Terminates any active NIBP measurement and immediately deflates the cuff.
- Menu:** Activates the NIBP menu when pressed and held for 2 seconds.

**RETURN:**

- Main Screen:** Returns to the Main screen when pressed while any other screen or menu is being displayed.
- Freeze:** Freezes all traces when pressed while the Main screen is active. Press again to un-freeze. Traces will un-freeze automatically after 60 seconds.
- Print:** Activates a print of the actual screen content (Traces, Trend or Alarm History) when key is pressed for 2 seconds.

**PARAMETERS:**

Activates the Parameters menu, which provides an overview of parameters and screen layout settings and gives access to change these settings.

**LIMITS:**

Activates the Alarm Limits menu, which provides an overview of all actual limit settings and gives access to change, save and restore alarm limits.

**HISTORY:**

Activates the Trend History and the Alarm History screen. Gives access to erase History data.

**VOLUME:**

Activates the Audio/Visual menu that allows configure the audio and visual signals the monitor can generate.

**ARROW UP:**

Moves cursor upward or scrolls through menu options, press and hold for quicker advance.
Sets patient mode to Adult when pressed and hold while the monitor is being turned on.

**ARROW DOWN:**

Moves cursor downward or scrolls through menu options, press and hold for quicker advance.
Sets patient mode to Neonate when pressed and hold while the monitor is being turned on.

NEXT

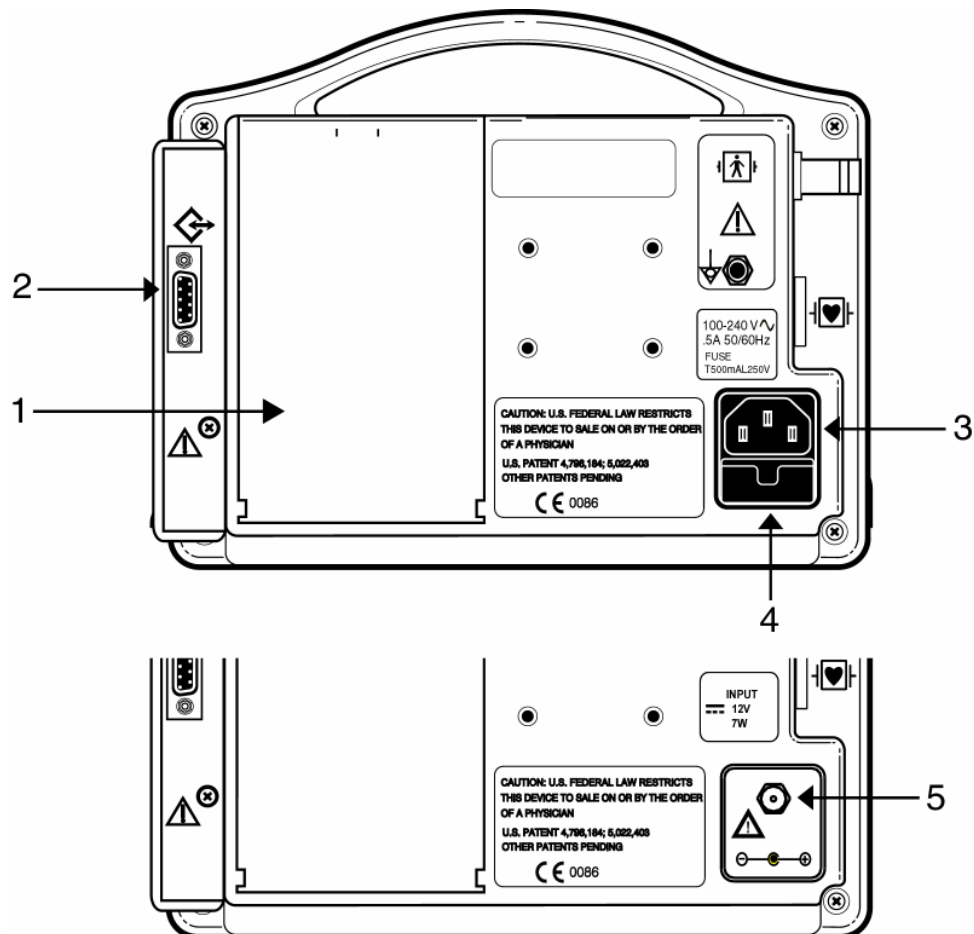
In the menus: The **HISTORY** and **AUDIO/VISUAL** pushbutton keys have been programmed to allow the user to advance horizontally to the ***next*** parameter.

PREVIOUS

In the menus: The **PARAMETERS** and **ALARM LIMITS** pushbutton keys have been programmed to allow the user to advance horizontally backwards to the ***previous*** parameter.

INFRARED (Ir) DATA PORT

An Infrared (Ir) output port, located on the bottom panel of the monitor's front cover, is available to print Waveforms, History and Alarm data to the optional external printer or other data collection device(s). Maximum distance is approximately three (3) Feet, direct line of sight operation.

REAR PANEL**Figure 9: Rear Views of Monitors**

(M-Version shown below)

1. Battery Compartment.
2. External Device Interface (RS232)
3. Receptacle for the AC power cord
4. Fuse Compartment
5. Receptacle for the 12 VDC cable

BATTERY COMPARTMENT

The CAS 750 Monitor is equipped with a 7.2 Volt, 3700 mAh battery pack. The monitor will operate on a completely charged battery for 3 to 5 hours depending on its configuration and the use of the NIBP function.

EXTERNAL DEVICE INTERFACING

The CAS 750 Monitor comes equipped with a combined DB9 RS232 output and Nurse Call interface. The RS232 output may be used to interface to the Citizen CMP-10 Mobile Printer or another serial printing device.

Refer to Section 8, EXTERNAL DEVICE INTERFACING for more information.

AC / DC CONNECTION

Receptacle for the AC power cord when the CAS 750 Monitor is purchased with an AC Line Power option and built-in battery.

When the CAS 750 Monitor is purchased as an EMS monitor equipped with a Swivel Mount (750EM or 750CM), the ambulance DC power cord is attached here.

FUSE COMPARTMENT

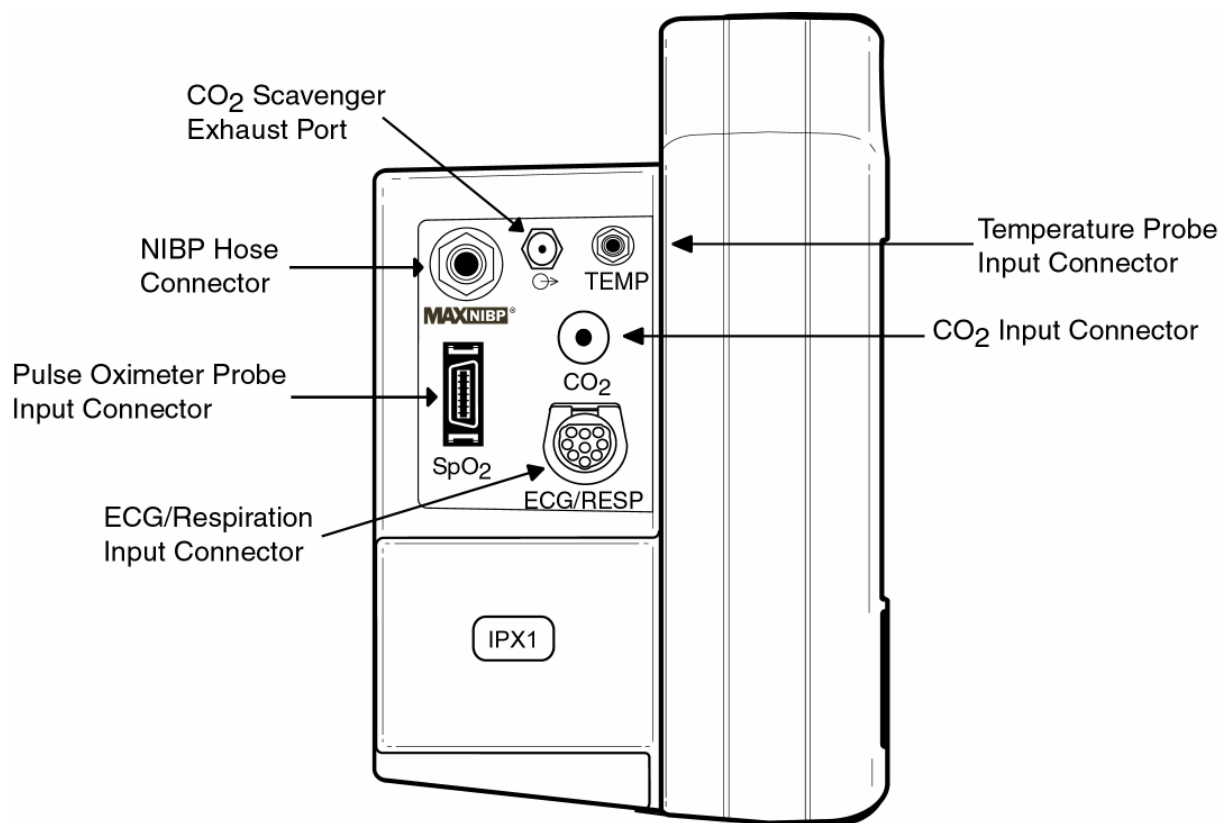
When the CAS 750 Monitor is purchased for AC Line power, the power input receptacle incorporates dual fuses located in the hot and neutral lines.

EQUIPOTENTIALITY GROUND POST

This terminal can be used to provide an auxiliary ground for the monitor.

NOTE:

The serial number label is located on the bottom of the monitor.

LEFT SIDE VIEWFigure 10: **Left Side Panel View****MAXNIBP®****CUFF HOSE CONNECTION**

(if equipped)

The inflation hose is connected to the monitor where the MAXNIBP logo is located. The hose must be connected to the cuff prior to use.

NOTE:

An optional six (6) foot inflation hose is available when monitoring in the Neonate mode. Refer to Section 14, SPARE PARTS for part number information.

TEMP CONNECTOR

(if equipped)

Connect the temperature adapter and sensor cable in this receptacle for Temperature monitoring.

CO₂ SENSOR CONNECTOR

(if equipped)

The CO₂ consumable is connected to the monitor where the Microstream® logo is imprinted onto the CO₂ connector's protective cover is located.

SpO₂ SENSOR CONNECTOR

(if equipped)

Connect the sensor cable in this receptacle for SpO₂ monitoring.

ECG/RESP CONNECTOR

(if equipped)

The ECG/RESP connector is mechanically keyed to accept only CAS Medical Systems' 3-Lead or 5-Lead patient cable. Connect either the 3-Lead or 5-Lead Patient Cable in this receptacle for ECG and Respiration monitoring.

CO₂ SCAVENGER EXHAUST PORT

(if equipped)

To the left of the TEMP connector is the CO₂ Scavenger Exhaust Port. The exhaust port is an output intended only for connection to gas collection equipment such as gas scavenger devices.

WARNING:

Do not connect sample line or patient input to the exhaust port.

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7. MONITOR CONFIGURATION

SETUP MENU

WARNING:

Do not enter the Setup menu while the monitor is connected to a patient. The patient is not being monitored while in the menu.

The monitor's Setup menu allows the user to tailor the CAS 750 Monitor. Once entered, the user can:

- Select the Operating Language
- Select the Patient Mode
- Make selections for Audio Alarms Silence
- Set the Date
- Set the Time
- Set Daylight Saving Time Options
- Make selection for Pacemaker Detection (750E only)
- Make selection for CVA Filter (750E only)
- Set the SpO₂ Alarm Delay Time
- Select the EtCO₂ Units
- Select the Temperature Units (750E only)
- Select the Trace Background

ENTERING THE SETUP MENU

To enter the monitor's Setup menu, depress and hold the LIMITS



and VOLUME



pushbutton keys while the monitor is being turned "ON" .


<u>Setup</u>	
Language	English
Patient	Adult
Audio Silence	2 Minute
Date	19-Nov-04
Time	08:26
DST	OFF
Pacer Detect	OFF
CVA Filter	OFF
O ₂ Alarm Delay	10 Sec
EtCO ₂ Units	mmHg
TEMP Units	°F
Background	Dark

Figure 11: **Setup Menu**

NOTE:

While in the Setup menu, if no pushbutton is depressed within 60 seconds, the monitor will automatically save all changes made, exit the Setup menu and return to the Main display screen.


EXIT THE SETUP MENU

When you have completed configuring the monitor, press the RETURN  pushbutton to exit and lock in your selection(s). The monitor exits the Setup menu and returns to the Main display screen.

SELECTING THE LANGUAGE

The CAS 750 Monitor can operate in one (1) of nine (9) languages: English, German, French, Italian, Spanish, Dutch, Swedish, Portuguese or Norwegian.

To configure the monitor's operating Language, follow the following procedure:


- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU. The monitor will automatically highlight the Language parameter.
- 2) Press one of the NEXT programmed pushbutton keys until the cursor displays the current language being used.
- 3) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 4) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column. At this time the new language selection shall take effect.
- 5) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

SELECTING THE PATIENT MODE

The CAS 750 Monitor can be used on patients from Neonates to Adults.

To configure the monitor's Patient mode, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter Patient is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the current patient mode being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection. The front panel display will illuminate with the patient mode selected (Adult = Adult / Pediatric; Neonate = Neonate).
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.

- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

NOTE:


Switching modes from Adult to Neonate or Neonate to Adult, shall recall the last stored values for patient alarm limits.

AUDIO ALARM SILENCE (SILENCE/RESET Pushbutton)

The CAS 750 Monitor's SILENCE/RESET pushbutton can be configured to have the audio associated with patient alarms set to one of these selections. The selections are:

- 2 Minute (Default)
- Permanent

To configure the monitor's Audio Alarm Silence, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter Audio Silence is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the audio mode currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbuttons to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

2 MINUTE AUDIO ALARM SILENCE

When the monitor is configured for the 2 Minute Audio Alarm Silence setting, use the SILENCE/RESET pushbutton to "enable or disable" audio alarms for a two (2) minute period. The SILENCE visual bell indicator, located on the front panel of the monitor will be illuminated constantly and the message "2 Minute" will be displayed in the Equipment Message Window section of the display as a reminder when enabled. At the end of two (2) minutes, the monitor will automatically exit the 2 Minute Audio Alarm Silence period and return to normal operation.

During a 2 Minute Audio Alarm Silence period, if an alarm (patient or equipment) occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced for the remainder of the two-minutes and only a visual indicator is provided.

PERMANENT AUDIO ALARM SILENCE


When the monitor is configured to the Permanent Audio Alarm Silence setting, use the SILENCE/RESET pushbutton to “enable or disable” audio alarms. The SILENCE visual bell indicator, located on the front panel of the monitor will flash at a rate of one (1) second “ON” and one (1) second “OFF” and the message “Permanent” is displayed in the Equipment Message Window section of the display as a reminder when enabled.

During a Permanent Audio Alarm Silence period, if an alarm (patient or equipment) occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced and only a visual indicator is provided.

SETTING THE DATE

The CAS 750 Monitor's Date value is set at the factory.

To configure the monitor's Date, follow the following procedure:


- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter Date is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the day parameter currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the NEXT programmed pushbutton keys until the cursor displays the month parameter currently being used. Month of the Year (Jan, Feb, etc.).
- 6) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 7) Follow steps 5 and 6 to set the year parameter. Last 2 digits of the year (2004 is displayed as 04).
- 8) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 9) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

SETTING THE TIME

The CAS 750 Monitor's Time value is set for Eastern Time and is set at the factory.

To configure the monitor's Time, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter Time is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the hour parameter currently being used. Hour of the Day (0 – 23).

- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the NEXT programmed pushbutton keys until the cursor displays the minute parameter currently being used. Minute of the Hour (0 – 59).
- 6) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 7) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 8) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

NOTE:

Altering the Date and Time will affect the History readings, but not erase them.

DAYLIGHT SAVING TIME OPTION

The CAS 750 Monitor can be configured to automatically respond to time changes associated with Daylight Saving Time. The monitor can be configured to one of five Daylight Saving Time Option settings. They are:

- OFF Daylight Saving Time is “OFF”. The user is responsible for changing the time if needed. This is the default setting for the CAS 750 Monitor.
- N AMERICA Daylight Saving Time “North America”. Use this setting and the monitor will automatically *add* one (1) hour the first Sunday in April at 2 a.m. and *subtract* (1) hour the last Sunday in October at 2 a.m.
- EU 01:00 Daylight Saving Time “European Union”.
EU 02:00
EU 03:00


In the European Union, Daylight Saving Time begins and ends at 1 a.m. Universal Time (Greenwich Mean Time). It starts the last Sunday in March, and ends the last Sunday in October. In the EU, all time zones change at the same moment.

Select EU 01:00 if the monitor will be located in Ireland, Portugal or the United Kingdom. Select EU 03:00 for Finland. EU 02:00 can be used for all remaining countries within the European Union.

NOTE:

Enabling Daylight Saving Time will affect the History readings, but not erase them.


To configure the monitor's Daylight Savings Time setting, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter DST is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the parameter currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

PACEMAKER DETECTION

The CAS 750E Monitor can be configured to automatically detect and not count the presence of a pacemaker pulse. The default value used by the Model 750E Monitor is OFF.


To change the monitor's Pacemaker Detection capability, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter Pacer Detect is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the parameter value currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

CVA FILTER

The CAS 750E Monitor can be configured to automatically filter out cardiogenic artifact from the respiration signal. The default value used by the Model 750E Monitor is OFF.


To change the monitor's CVA Filter selection, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter CVA Filter is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the parameter value currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

SET THE SpO₂ ALARM DELAY

The delay time until an alarm is generated for %SpO₂ and Pulse Rate can be configured to be either zero (0) seconds (no delay) or ten (10) seconds. The default value used by the Model 750 Monitor is ten (10) seconds.

To change the monitor's SpO₂ Alarm Delay Time, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter O₂ Alarm Delay is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the parameter currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

NOTE:

When the monitor incorporates Masimo SpO₂, the delay time for both %SpO₂ and Pulse Rate are set here.


NOTE:

When the monitor incorporates Nellcor SpO₂, the delay time for Pulse Rate is set here and the delay time for %SpO₂ is set using the SatSeconds setting.

END TIDAL CO₂ UNITS

The CAS 750 Monitor can display End Tidal readings in either the mmHg, kPa or % scales.


To configure the monitor's End Tidal CO₂ setting, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter EtCO₂ Units is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the parameter currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

SELECTING THE TEMPERATURE UNITS

The CAS 750E Monitor can display Temperature readings in either the Celsius (°C) or Fahrenheit (°F) scales.


To configure the monitor's Temperature setting, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter TEMP Units is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the parameter currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the ARROW DOWN pushbutton to continue to the next parameter or press the RETURN  pushbutton to exit to the Main display screen.

TRACE BACKGROUND

The background area surrounding the monitor's waveforms can be displayed either as: a black background with white traces (Dark) or a white background with black traces (Light).

To configure the monitor's Trace Background setting, follow the following procedure:

- 1) First enter the monitor's Setup menu. Refer to Page 39, SETUP MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter Background is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys until the cursor displays the parameter currently being used.
- 4) Press either the ARROW UP or ARROW DOWN pushbutton to make a selection.
- 5) Press one of the PREVIOUS programmed pushbutton keys to return back to the parameter selections column.
- 6) Press the RETURN  pushbutton to exit to the Main display screen.

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8. EXTERNAL DEVICE INTERFACING

OVERVIEW

The CAS 750 Monitor is capable of interfacing to an external Serial printer or have the ability to interface to a Nurse Call System using the DB9 RS232 connector. Both connections are made through the DB9 connector located on the rear panel of the monitor.

WARNING:

The CAS 750 Monitor has been tested with the Citizen CMP-10 Mobile printer to comply with IEC 60601-1-1 and is the only printer that is recommended to be used with the monitor. If another printer is to be used, the user must read the Caution on Page 13 under LEAKAGE CURRENT TEST and follow the guidance given.

RS232

The CAS 750 Monitor uses the DB9 connector to interface to the Citizen CMP-10 Mobile printer using the cable supplied with the printer. The connector information provided in this section is made available to allow the user the ability to print the monitor's History data, Alarm History data and Waveform data to an external serial printer. Refer to Figure 12 and Table 4 for connection information. Refer to Section 15, SPECIFICATIONS for Serial Interface information.

NURSE CALL INTERFACE

The CAS 750 Monitor provides an isolated relay switch closure output connection between two (2) of the pins on the DB9 RS232 output connector. The output is compatible with most Nurse Call Systems in that there is no polarity to the connection.

When properly connected, the Nurse Call Interface activates the Nurse Call System each time an alarm is activated on the monitor. The delay time for the Nurse Call Interface to activate is less than 0.5 seconds.

The Nurse Call System's relay contacts are rated at 120 VAC at 0.3A; or 30 VDC at 1.0 A.

The Nurse Call Option is available as a normally open (closed on alarm) or normally closed (open on alarm) depending upon how it is wired.

For normally open (N.O.) applications, the Nurse Call system needs to be connected to pins 1 and 9 of the RS232 connector. For normally closed (N.C.) applications, the Nurse Call system needs to be connected to pins 6 and 9. Refer to Figure 12 and Table 4 for connection information.

WARNING:

The connection to the Nurse Call Interface should only be installed by a qualified service personnel.

WARNING:

The interconnection of auxiliary equipment to the Nurse Call Interface may increase the total leakage current. The user must read the Caution on Page 13 under LEAKAGE CURRENT TEST and follow the guidance given.

NOTE:

Even though the Nurse Call Interface allows remote alarm indication, it does not replace appropriate bedside surveillance by trained clinicians.

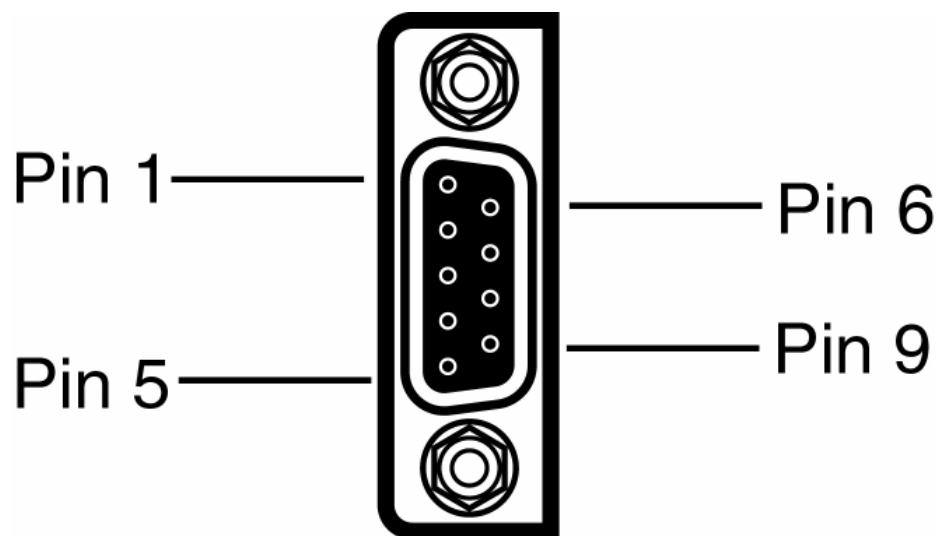


Figure 12: DB9 Male Connector Pin Layout

Pin Number	Signal Description
1	Nurse Call (N.O.)
2	Serial Receive In
3	Serial Transmit Out
4	No Connection
5	Isolated Ground
6	Nurse Call (N.C.)
7	No Connection
8	No Connection
9	Nurse Call (common)

Table 4: DB9 Pin Out

9. ROUTINE MAINTENANCE

CLEANING

CLEANING OVERVIEW

WARNING:

Do not, under any circumstances, perform any testing or maintenance on the monitor while the monitor is being used to monitor a patient. The monitor must be turned off. Unplug the monitor from the AC power source and remove the internal battery.

CAUTION:

Do not open the monitor to clean or repair it. Contact CAS Medical System for service needs.

CAUTION:

Disconnect all accessories from the monitor before cleaning. Do not immerse any part of the electrical connector of the cable or accessories in the cleaning or disinfection solution at any time. Do not use an abrasive cloth or cleaner on the accessories.

Immersing the patient cable or leadwires in any liquid may result in moisture entering. This may cause internal damage and reduce the product life. Alcohol and organic solvents may cause stiffness and brittleness.

THE MONITOR

On a daily basis, examine the monitor's case for any damages and check the AC power cord for bent or broken prongs, cracks or fraying. Neither the monitor nor the power cord should be used if damaged. If any damage is noted, contact the appropriate service personnel.

CAUTION:

Do not spray or pour any water or cleaning solution directly onto the monitor.

As needed, clean the monitor using a soft cloth dampened with a mild dishwashing detergent solution and gently rub the soiled area until clean. Use a clean soft cloth to dry the monitor. Do not use abrasive cleaners on the monitor. Do not use either isopropyl alcohol or solvent to clean the monitor. Use of these cleaners can cause damage to the monitors' surface. Do not immerse the monitor or power cord in the cleaning solution.

When necessary, the monitor surfaces may be disinfected using a soft cloth saturated with a 10% (1:10) solution of chlorine bleach in tap water. When all of the surfaces have been disinfected, wipe the entire surface of the monitor using a soft cloth dampened with fresh water to remove any trace amounts of residue and/or fumes.

NOTE:

Thoroughly wipe off any excess cleaning solutions. Care should be taken to prevent water or cleaning solution to run into connector openings or crevices.

THE DISPLAY

CAUTION:

Use care when cleaning the display. Scratches may occur.

Occasionally, as needed, clean the display window using a soft, lint-free cloth sprayed with an alcohol free glass cleaner. Do not use either isopropyl alcohol or solvent to clean the display. Use of these cleaners can cause damage to the display. The use of paper towels is not recommended as it may scratch the surface.

PATIENT CABLE AND LEADWIRES

Prior to each patient use, inspect the patient cable and leadwires for damage. As necessary, clean the patient cable and leadwires using a soft cloth dampened with a germicidal solution.

CUFFS

Prior to each patient use, inspect the blood pressure cuff and its hose for damage.

TUFF-CUFF® REUSABLE CUFFS

As necessary, clean the blood pressure cuff using a soft cloth dampened with a 70% Isopropyl Alcohol solution.

NOTE:

CAS does not recommend submersion of the cuff. Liquid should not be permitted to enter the cuff bladder because instrument damage may occur. The cuff should be allowed to thoroughly dry before use.

PEDISPHYG® CUFFS

CAS is aware that, in certain situations, the cuff may become soiled during its use. In these situations a water-based detergent is suitable for wiping the cuff.

As necessary, the preferred method for cleaning the Pedisphyg Cuff is to wipe it down with a damp, soapy cloth. A damp, detergent-free cloth should then be used to rinse the cuff.

NOTE:

CAS does not recommend submersion of the cuff. Liquid should not be permitted to enter the cuff bladder because instrument damage may occur. The cuff should be allowed to thoroughly dry before use.

PNEUMATIC TUBING

Prior to each patient use, inspect the NIBP Inflation Hose for proper connection, cracks and kinks. As necessary, clean the pneumatic tubing using a soft cloth dampened with a germicidal solution.

CO₂ CONSUMABLES

Microstream CO₂ consumables are designed for single patient use and are not to be reprocessed. Do not attempt to disinfect or flush the FilterLine as the monitor can be damaged.

Refer to the manufacturer's instructions enclosed with each sensor for more information.

PRINTER

When the printer becomes dirty, wipe with a soft dry cloth. For extreme dirt buildup, soak a cloth with mild detergent, wring well and wipe. Dry by wiping with a soft dry cloth.

CAUTION:

Before cleaning the printer, disconnect the AC adapter from the printer.
Do not use volatile chemicals such as thinner, benzene, etc.
Never wet the inside of the printer mechanism.

Refer to the printer User's Manual for more information.

SpO₂ SENSORS

(Reusable)

As necessary, the sensor may be surface cleaned by wiping it with a 70% isopropyl alcohol pad. Allow the sensor to dry prior to placement on a patient.

CAUTION:

Do not soak or immerse the sensor or its cable in any liquid solution. Do not attempt to sterilize.

Refer to the Directions For Use pamphlet enclosed with each sensor for more information.

TEMPERATURE PROBES

(Reusable)

As necessary, the probes should be cleaned with a mild detergent and water to remove excess bioburden. When necessary, the probes may be disinfected using a soft cloth saturated with a 10% (1:10) solution of chlorine bleach in tap water or 70% isopropyl alcohol. When all of the surfaces have been disinfected, wipe the entire surface of the monitor using a soft cloth dampened with fresh water to remove any trace amounts of residue and/or fumes.

PNEUMATIC PRESSURE CHECK

A check of the monitor's pneumatic pressure system should be performed every six (6) months.

SAFETY CHECKS

The following Safety Checks should be performed at least every twelve (12) months by a qualified service technician.

- Inspect the equipment for mechanical and functional damage.

SYSTEM CHECKS

The following System Checks should be performed at least every twelve (12) months by a qualified service technician.

- Alarm and Beep Volumes
- CO₂ Calibration Check
- NIBP Pressure Checks
- NIBP Overpressure Check
- +12 Volt Power Supply Check
- ECG/Respiration Simulator Check
- Temperature Calibration Check
- SpO₂ Simulator Check
- NIBP Simulator Check
- Chassis Leakage

The following Electrical Safety Check should be performed any time the case is opened or patient isolation is in question.

- Hypot

BATTERY

CAS Medical Systems recommends replacing the monitor's battery every two (2) years.

When the CAS 750 Monitor is going to be stored for two (2) months or more, remove the battery prior to storage. To remove the battery, refer to Page 91, REPLACING THE MONITOR BATTERY.

If the CAS 750 Monitor has been stored for more than thirty (30) days, charge the battery as described on Page 74, BATTERY CHARGE. A fully discharged battery requires five (5) hours to receive a full charge. The battery is being charged whenever the monitor is connected to a power source (AC Line Power or +12 VDC).

10. TROUBLESHOOTING

SYSTEM TROUBLESHOOTING

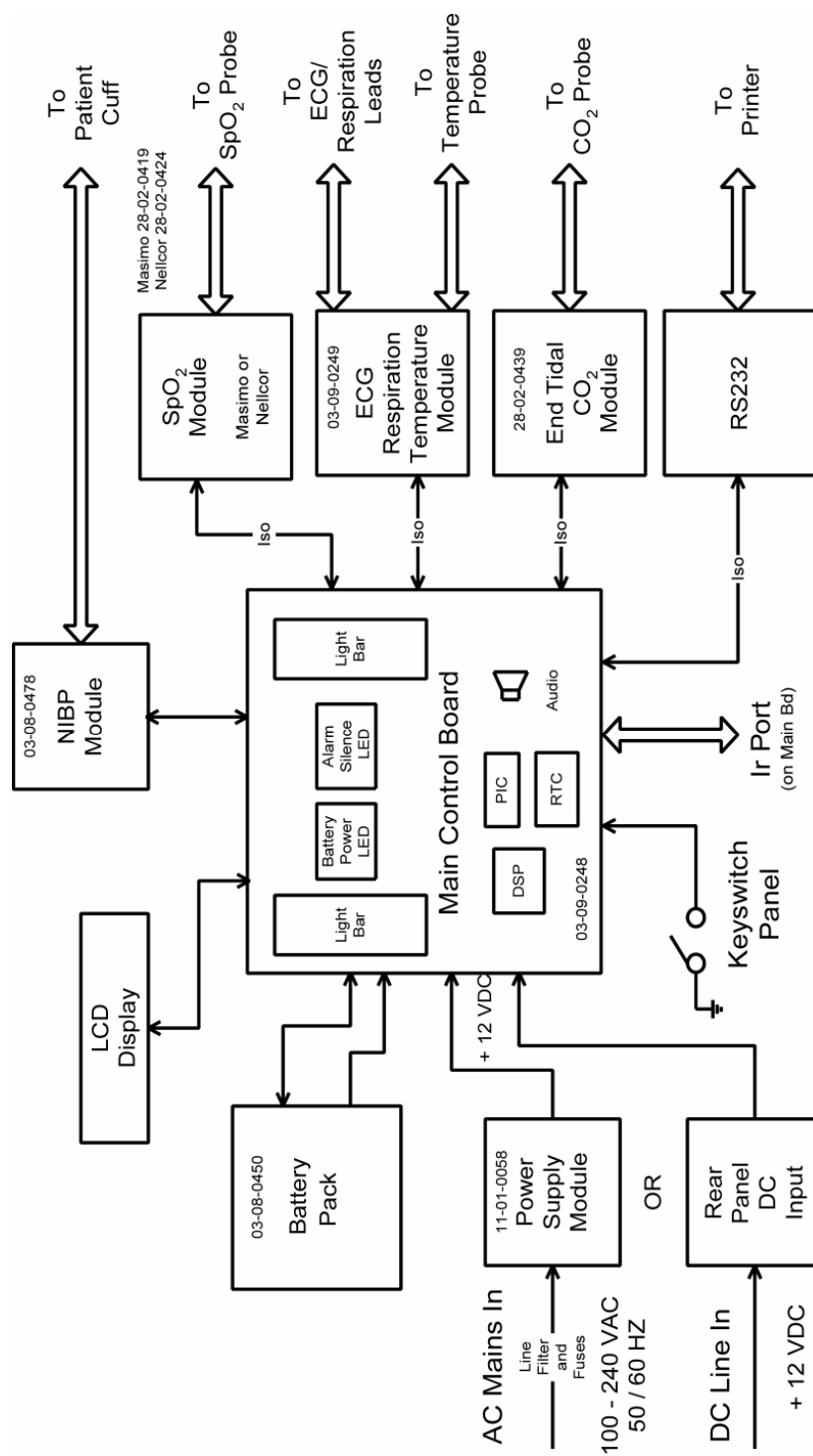


Figure 13: Overall Block Diagram

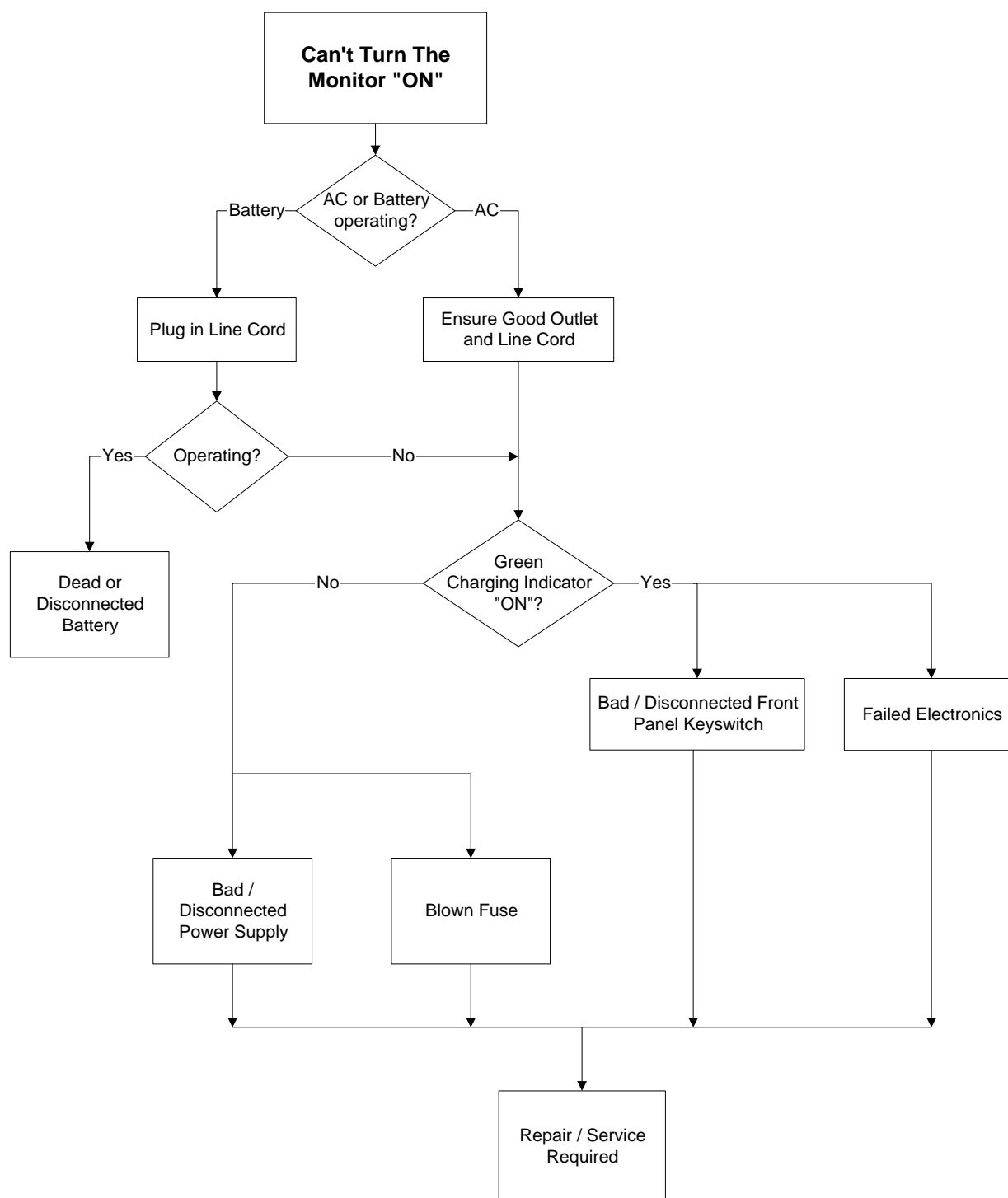


Figure 14: No Monitor Power

THEORY OF OPERATION

The CAS 750 Monitor's Main Control Board provides the following functions for the operation of the monitor.

- Power Supplies
- Battery Charger
- Supervisor Microcontroller (Microchip PIC 16F73)
 1. Indicator LEDs
 2. Power ON/OFF and Reset to Digital Signal Processor Controller
 3. Monitor ON/OFF
 4. Communication with Digital Signal Processor Controller
 5. Monitor Battery Charger and Battery conditions
- Digital Signal Processor Controller (Motorola DSP 56F827)
 1. ECG/Respiration/Temperature Monitoring
 2. SpO₂ Monitoring
 3. CO₂ Monitoring
 4. Blood Pressure Monitoring
 5. LCD Display
 6. Keypad Monitoring
 7. Indicator LEDs and Displays
 8. Real-Time Clock
 9. Alarms
 10. IrDA Communications
 11. Communications Interface

POWER SUPPLIES

The input to the 750 Main Control Board comes from either the DC input (J1) or the Battery Input (J2). A Control chip (U7) is responsible for selecting the monitor's main power source. The DC input always takes priority over the Battery.

Battery	7.2 Volts @ 4.0 Ahr (TP13 to TP19)
DC	12 Volts @ 45 Watts (TP12 to TP15)

There are several supplies that are generated for internal use.

+Vpic TP10 The power supply for the Microchip PIC16F73 (U6), the Supervisor of the CAS 750 Main Control Board.

The DC input or the Battery input, if there is no DC present, goes into a voltage regulator (U5) to supply the +3.3 volts.

+5V TP1 Power supply voltage for the main Analog and Digital circuitry.

The DC input or the Battery input, if there is no DC present, goes into a switching regulator (U1) to supply +5 volts. The regulator is turned on and off by the Microcontroller (U6).

+3.3V TP3 Chip I/O supply voltage for the DSP Controller (U17).

The +5 volts output of the switching regulator (U1) goes into a voltage regulator (U2) to supply the +3.3 volts.

+2.5V TP4 Core operating voltage for the DSP Controller (U17).

The +5 volts output of the switching regulator (U1) goes into a voltage regulator (U3) to supply the +2.5 volts.

+5V_ISO2 TP33 Isolated power supply for the SpO₂ circuit.

The +5 volts output of the switching regulator (U1) goes into a dc-dc converter (U25) to supply +7 volts. The converter provides an isolation voltage of 2.5KV. The dc-dc converter is turned on and off by the DSP controller (U17 pin 91) and transistor (Q12). The output of the converter feeds a +5 volt regulator (U24) that provides the isolated voltage for the SpO₂ board.

+5VCRG TP14 Power supply for the Battery Charger.

The DC input goes into a voltage regulator (U8) to supply the +5 volts.

+VND TP5 Power supply for the Blood Pressure board.

The DC input or the Battery input, if there is no DC present, goes into a voltage regulator (U4) to supply the +6 volts. The voltage regulator is turned on and off by the DSP controller (U17) and transistors (Q1 and Q2).

-15V TP32 Power supply for the LCD contrast control.

The monitor's +5 volts feed a voltage regulator (U11) to supply the -15 volts.

BATTERY CHARGER

The battery charging is controlled by U9.

SUPERVISOR MICROCONTROLLER

The Microchip PIC16F73 (U6) is the supervisor of the Main Control Board. The controller has 4K of program flash, 192 bytes of data memory and operates from an external 153.6KHz crystal. The Microcontroller has 22 I/O's, 3 timers, 2 PWM/capture/compare modules, UART, SPI, and five (5) 8bit analog-to-digital channels.

LED Indicators

LED1 is the power/low battery/dead battery indicator that is controlled by an output port of the Microcontroller (U6).

Power Smart Module

The Power Smart Module option comes into the Main Control Board at J2 (pins 2 and 3). The Power Smart Module is read by the Supervisor (U6 pins 25 and 26) then sent to the DSP (U17) thru the SPI port.

Power ON/OFF and Reset to Digital Signal Processor Controller

The On/Standby keyswitch comes into the Main Control Board at keypad connector J3. It is read as an input pin to the Supervisor (U6 pin 21).

The Supervisor has an output pin (U6 pin 7) that controls the reset to the DSP (U17).

Monitor ON/OFF (+5V ENABLE)

The monitor turning on and off is control by an output pin of the Supervisor (U6 pin 11) and associated components Q3 and Q4.

Communication with Digital Signal Processor Controller

The Supervisor (U6) has two-way communication to the DSP (U17) using a dedicated SPI line.

Monitor Battery Charger and Battery Conditions

The DC input and Battery inputs are read by two analog to digital converter of the Supervisor (U6 pins 2 and 3). The results of these signals are used to control the Low and Dead Battery conditions of the monitor and the status of the front panel Power / Charging LED (LED 1).

Two output lines from the Battery Charger Control chip (U9) are read by the Supervisor (U6 pins 23 and 24). The information from these pins informs the Supervisor the status of the charging condition (fast charge, trickle charge or hold off). All of the information is sent from the Supervisor to the DSP (U17) thru the SPI port.

DIGITAL SIGNAL PROCESSOR CONTROLLER

The Motorola DSP56F827, is Digital Signal Processor (DSP U17) and is the Main Controller of the CAS 750 Monitor. The controller has 64K of program flash, 4K of data flash, 1K program ram, 4K of data ram and operates off an external 4 MHz crystal. The DSP features are PLL, 2 SPI ports, TOD, watchdog timer, quad timer, 16 dedicated I/O, 48 shared I/O, 64 muxed I/O, interrupt controller, 8 programmable chip selects and 32 external bus signals.

ECG Monitoring

The ECG/Respiration/Temperature Module is an option that is plugged into J12 of the Main Control Board. The Module is read by the DSP (U17) thru the serial port (TXD1 and RXD1) and is supplied with power +5 volts from (U1).

SpO₂ Monitoring

The SpO₂ Module is an option that is plugged into the Main Control Board; J9 for Nellcor and J10 for Masimo. The isolated power supply for the SpO₂ Module circuit (+5V_ISO2) is controlled by an output pin of the DSP (U17 pin 91). The Module is read by the DSP (U17) thru the serial port (TXD2 and RXD2) and associated components (U28, Q13, Q14, ISO1 and ISO2). The power is turned off when the SpO₂ option is not installed.

CO₂ Monitoring

The CO₂ Module is an option that is plugged into J15 of the Main Control Board. The Module is read by the Serial Control (U13) thru the serial port (TXD1 and RXD1) and RS232 IC (U27). Power is supplied with the +5 volts from (U1).

Blood Pressure Monitoring

The Blood Pressure Module is an option that is plugged into J13 of the Main Control Board. The power (+VND) for the Blood Pressure Module is controlled by an output pin of the DSP (U17 pin 93). The Blood Pressure Module is read by the Serial Control (U13) thru the serial port (TXD3 and RXD3).

LCD Display

The LCD display connects to the Main Control board at J5. Power for the display is derived from a LCD Inverter that provides 1200 VAC at J6. The contrast control for the display is controlled by a digital pot and amplifier (U12 and U30) and power supply (U11).

Keypad Monitoring

The keypad comes into the Main Control Board at J3. There are nine (9) keys are read as inputs by the DSP (U17 pins 94, 116 - 124). The keys are normally high and active low when the switch is depressed.

LED Indicators and Light Bars

The Equipment alarm light bar, Patient alarm light bar and Silence indicator LEDs connect to the Main Control board at J4 and are controlled by a LED driver IC (U10).

Real-Time Clock

The real-time clock (U18) is controlled by the DSP (U17) thru the SPI port. The part has its own battery and internal crystal. The battery can be replaced separately when needed.

Alarms

The alarms circuit has an audio attenuator (U20), an amplifier (U21) and a speaker (LS1). The sound is controlled by the DSP (U17).

IrDA Communications

The IrDA infrared LED (U22) is driven by IrDA Control (U23). The chip is controlled by the DSP (U17) thru the serial port (TXD0).

Communications Interface

The Communications Module connects into the Main Control Board on J14. The serial port is controlled by the DSP (U17) thru the serial port (TXD0 and RXD0).

USER MESSAGES

WARNING:

The Model 750 Monitors are equipped with non-latching equipment alarm(s). As soon as the monitored parameter(s) return within the adjusted limits, the alarm is silenced and reset automatically without any operator interaction.

The CAS 750 Monitor displays a variety of messages to aid the user in monitor operation. If a troubleshooting message is displayed during a measurement, follow the actions listed to correct the situation.

If the monitor does not turn on, or exhibits a flashing display and failure to operate, the battery is most likely below the Dead Battery point. Connect the monitor to a power source (AC Line Power or +12 VDC) and allow it to charge for five (5) hours.

NOTE:

Refer to the Tables starting on Page 66, MONITOR MESSAGES for a listing of messages that may be displayed on the Main display screen.

If the monitor is in need of repair, it must be referred to the appropriate service personnel. Service performed by unauthorized personnel could be detrimental to the monitor and will void the warranty. For service, contact your dealer or CAS Medical Systems, Inc.

ECG/RESPIRATION USER MESSAGES

(available if ECG/Respiration are installed)

If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by an alternate method.

If one of the leadwires should become disconnected from the patient, the waveform trace(s) will become blank, the message "Leads OFF" will be displayed in the waveform section of the display, the Heart Rate and Respiration Rate numeric displays will show dashes "- - -", the Equipment Alarm LEDs will flash and three (3) audio "beeps" are heard every twenty-five (25) seconds for as long as the condition continues.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms and the message "Leads OFF" remains on the display.

If the ECG/Respiration Module located inside the CAS 750 Monitor should fail, the message "ECG Error" or "ECG Module" is displayed. The Heart Rate and Respiration Rate numeric displays will show dashes "- - -", the Equipment Alarm LEDs will also flash and three (3) audio "beeps" are heard every twenty-five (25) seconds.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms, but the message “ECG Error” or “ECG Module” remains on the display.

Should the above problems persist, contact your dealer or CAS Medical Systems, Inc.

SpO₂ USER MESSAGES

(available if SpO₂ is installed)

If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by an alternate method.

NOTE:

The SpO₂ probe must be kept as motionless as possible to make a proper determination. Use the SpO₂ waveform display to determine if a strong rhythmic pulse signal is present.

When no oximeter probe is attached to the monitor, the %SpO₂ and Pulse Rate numeric displays will show dashes “- -”, and the signal strength window will be blank.

NOTE:

If SpO₂ is selected as a waveform parameter, no signal strength window is displayed.

When the probe is connected to the monitor, but is off of the patient, the %SpO₂ and Pulse Rate numeric displays will show dashes “- -”. The message “SpO₂ Probe OFF” is displayed, the Equipment Alarm LEDs are flashing and three (3) audio “beeps” are heard every twenty-five (25) seconds.

NOTE:

If SpO₂ is selected as a waveform parameter, the message appears in the waveform section of the display. If SpO₂ is selected as a numeric parameter, the message appears in the equipment message window section of the display.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms, but the message “SpO₂ Probe OFF” remains on the display.

If the message “Chk SpO₂ Probe” should appear, verify that the probe being used is the correct one for the monitor's SpO₂ configuration (Masimo, Nellcor) or that the probe is not defective. The message “Chk SpO₂ Probe” is displayed, the Equipment Alarm LEDs are flashing and three (3) audio “beeps” are heard every twenty-five (25) seconds.

NOTE:

If SpO₂ is selected as a waveform parameter, the message appears in the waveform section of the display. If SpO₂ is selected as a numeric parameter, the message appears in the equipment message window section of the display.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms, but the message “Chk SpO₂ Probe” remains on the display.

Remove the defective probe and replace it with a working probe.

If the SpO₂ Module located inside the CAS 750 Monitor should fail, the message “SpO₂ Error” or “SpO₂ Module” is displayed. The %SpO₂ and Pulse Rate numeric displays will show dashes “- - -”, the Equipment Alarm LEDs are flashing and three (3) audio “beeps” are heard every twenty-five (25) seconds.

NOTE:

If SpO₂ is selected as a waveform parameter, the message appears in the waveform section of the display. If SpO₂ is selected as a numeric parameter, the message appears in the equipment message window section of the display.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms, but the message “SpO₂ Error” or “SpO₂ Module” remains on the display.

Should any of the above problems persist, contact your dealer or CAS Medical Systems, Inc.

CO₂ USER MESSAGES

(available if CO₂ is installed)

If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by an alternate method.

When the message “High FiCO₂” appears, the CO₂ base line level has shifted above the default level set in the CAS 750 Monitor. The message “High FiCO₂” is displayed, the Patient Alarm LEDs are flashing and three (3) audio “beeps” followed by two (2) audio “beeps” are heard every ten (10) seconds.

NOTE:

If CO₂ is selected as a waveform parameter, the message appears in the waveform section of the display. If CO₂ is selected as a numeric parameter, the message appears in the equipment message window section of the display.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms, but the message "High FiCO₂" remains on the display.

If the CO₂ Module located inside the CAS 750 Monitor should fail, the message "CO₂ Error" or "CO₂ Module" is displayed. The EtCO₂ and Respiration Rate numeric displays will show dashes "- - -", the Equipment Alarm LEDs are flashing and three (3) audio "beeps" are heard every twenty-five (25) seconds.

NOTE:

If CO₂ is selected as a waveform parameter, the message appears in the waveform section of the display. If CO₂ is selected as a numeric parameter, the message appears in the equipment message window section of the display.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms, but the message "CO₂ Error" or "CO₂ Module" remains on the display.

Should the above problems persist, contact your dealer or CAS Medical Systems, Inc.

When the message "Cal CO₂" appears, the CO₂ Hours to Calibration value, displayed in the monitor's SERVICE menu, equals zero (0). The message "Cal CO₂" is displayed in the Equipment Message area of the display and will alternate with the monitor's current operating mode. No other audible or visual alarm indications will be made. The CO₂ module will continue to function normally. This is an indicator that it is time to Calibrate the module.

Refer to Page 78, CO₂ CALIBRATION CHECK for more information.

When the message "Service CO₂" appears, the CO₂ Hours to Service value, displayed in the monitor's SERVICE menu, equals zero (0). The message "Service CO₂" is displayed in the Equipment Message area of the display and will alternate with the monitor's current operating mode. No other audible or visual alarm indications will be made. The CO₂ module will continue to function normally. This is an indicator that it is time to Service the module.

Contact your dealer or CAS Medical Systems, Inc.

NIBP USER MESSAGES

(available if NIBP is installed)

If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by an alternate method.

If the NIBP Module located inside the CAS 750 Monitor should fail, the message "NIBP Error" or "NIBP Module" is displayed. The NIBP and MAP numeric displays will show dashes "- - -", the Equipment Alarm LEDs are flashing and three (3) audio "beeps" are heard every twenty-five (25) seconds.

To acknowledge the alarm, depress the SILENCE/RESET pushbutton.

The monitor silences the audible and visual alarms, but the message "NIBP Error" or "NIBP Module" remains on the display.

Should the above problems persist, contact your dealer or CAS Medical Systems, Inc.

MONITOR MESSAGES**MONITOR**

MONITOR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Clock Battery"	The monitor's internal clock battery is almost discharged.	Contact CAS Medical Systems to have the monitor serviced.
"Dead Battery"	The battery is fully discharged.	Recharge the battery for at least 5 hours.
"Low Battery"	The battery is almost discharged.	At least 30 minutes of operation is available from when the message first appears. Recharge the battery as soon as possible.
"System Error"	An electronic failure has occurred within the monitors' Main Board.	Contact CAS Medical Systems to have the monitor serviced.
"Power Failure"	Power was disconnected from the monitor.	Depress the SILENCE/RESET pushbutton to clear the message. OR Turn the monitor Off, then back On to clear the message.
"Set Clock"	The monitor's clock needs to be set.	The monitor's time and date values are incorrect. Refer to Page 42, for information to set the Time and Date. The monitor's internal clock battery needs to be replaced. Contact CAS Medical Systems.

Table 5: **Monitor Messages**

MONITOR MESSAGES (cont.)**CO₂**

MONITOR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Blocked Line"	The CO ₂ module has attempted to purge the line with no success.	Disconnect the consumable. Check the consumable tube for kinks and/or blockages. Replace the consumable.
"Cal CO ₂ "	The CO ₂ module's calibration timer has reached zero hours.	Perform a CO ₂ calibration check. Refer to Page 78, CO ₂ CALIBRATION CHECK
"Chk CO ₂ Flow"	The CO ₂ module has detected a blockage in the exhaust port.	Check the exhaust port and tubing for kinks and/or blockages.
"Clearing Line"	The CO ₂ module has detected an occlusion in its input and is attempting to purge the line.	Check the consumable tube for kinks and/or blockages.
"CO ₂ Error"	A communication failure has occurred with the monitors' CO ₂ Board.	Turn the monitor Off; disconnect the AC Line cord and battery. Reconnect the battery and AC Line cord, turn the monitor On. If the message still appears, contact CAS Medical Systems to have the monitor serviced.
"CO ₂ Module"	An electronic failure has occurred within the monitors' CO ₂ Board.	Contact CAS Medical Systems to have the monitor serviced.
"CO ₂ OFF"	The monitor is no longer receiving a patient signal from the CO ₂ consumable.	The consumable is no longer connected to the monitor.
"Service CO ₂ "	The CO ₂ module's service timer has reached zero hours.	The monitor will continue to function. Contact CAS Medical Systems to arrange for service.

Table 6: **CO₂ Monitor Messages**

MONITOR MESSAGES (cont.)**ECG/RESPIRATION**

MONITOR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"ECG Error"	A communication failure has occurred with the monitors' ECG Board.	Turn the monitor Off; disconnect the AC Line cord and battery. Reconnect the battery and AC Line cord, turn the monitor On. If the message still appears, contact CAS Medical Systems to have the monitor serviced.
"ECG Module"	An electronic failure has occurred within the monitors' ECG Board.	Contact CAS Medical Systems to have the monitor serviced.
"Leads OFF"	The leadwires may be disconnected. The patient cable may be disconnected. The leadwires or patient cable may be broken. The electrodes may be old.	Check the leadwires at the electrode end and at the patient cable to be sure they are connected securely. Check the patient cable jack on the monitor to be sure it is plugged in securely. Replace the leadwires or patient cable. Replace the electrodes.

Table 7: **ECG/Respiration Monitor Messages**

MONITOR MESSAGES (cont.)**NIBP**

MONITOR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Air Leak"	Air leak in cuff/hose/monitor pneumatic system.	Check that the cuff/hose/monitor connection is secure. Check cuff for leaks. DO NOT use a known leaky cuff.
"Appl Error"	Neonate cuff is detected in Adult Mode.	Check cuff. Replace cuff or change operating mode
"Flow Error"	Stable cuff pressure cannot be maintained by the NIBP pneumatic system.	Check the external tube for kinks. Perform a Pneumatic Check as detailed in the Maintenance section of this manual. Replace cuff.
"Loose Cuff"	Cuff applied too loosely.	Check cuff for proper fit on patient.
"Motion"	There was too much extremity motion for the monitor to accurately complete the NIBP measurement in 120 seconds.	Measurements can be obtained when there is limited extremity movement, but the measurement time may be extended. Measurement time is limited to 120 seconds. Restrain patient extremity motion.
"NIBP Cal"	Pressure calibration data corrupted within NIBP module.	Pressure module needs recalibration. Contact CAS Medical Systems to have the monitor serviced.
"NIBP Error"	A communication failure has occurred within the monitors' NIBP module.	Turn the monitor Off; disconnect the AC Line cord and battery. Reconnect the battery and AC Line cord, turn the monitor On. If the message still appears, contact CAS Medical Systems to have the monitor serviced.
"NIBP Module"	The NIBP Module installed is not compatible with the monitor.	Contact CAS Medical Systems to have the monitor serviced.

Table 8: **NIBP Monitor Messages**

MONITOR MESSAGES (cont.)**NIBP (cont.)**

ERROR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Over Press"	Cuff pressure exceeded 290 mmHg in the Adult mode or 145 mmHg in the Neonate mode.	<p>Very rapid squeezing of the cuff can cause this error.</p> <p>Repeat the measurement.</p> <p>If this message repeatedly occurs during normal use, the monitor must be serviced.</p>
"Range Error"	The systolic reading exceeds the measurement range of 255 mmHg in the Adult mode or 135 mmHg in the Neonate mode.	<p>Repeat measurement.</p> <p>If the message is displayed again, use another method to measure the patient's blood pressure.</p>
"Signal Sat"	Motion pulses too strong.	<p>Limit patient activity; the arm must be still and/or relaxed.</p> <p>Repeat measurement.</p>
"Time Out"	The monitor was unable to complete a measurement within 120 seconds in the Adult mode or 90 seconds in the Neonate mode.	<p>An extremely long measurement can be due to a loose cuff, high blood pressure, or monitor re-pumps.</p> <p>Try measurement again. Try higher initial pressure.</p> <p>If message consistently reappears try using another means to obtain patient's blood pressure.</p>
"Weak Signal"	The monitor did not detect any pulses during a NIBP measurement.	<p>Check the fit of the cuff.</p> <p>Repeat measurement.</p>

Table 8: **NIBP Monitor Messages**

MONITOR MESSAGES (cont.)**SpO₂**

MONITOR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Chk SpO ₂ Probe" (Masimo)	<p>The monitor is questioning the quality of the signal being received by the SpO₂ sensor.</p> <p>The sensor is receiving too much ambient light.</p>	<p>Verify that the sensor is being used according to the manufacturer's recommendations.</p> <p>Verify that the sensor emitter and detector are parallel to and directly opposing each other.</p>
"Low Perfusion" (Masimo)	The perfusion level being received by the SpO ₂ sensor is low.	<p>Determine if an extreme change in the patient's physiology and blood flow at the monitoring site occurred (e.g. an inflated blood pressure cuff, a squeezing motion).</p> <p>Try to warm the patient or sensor site.</p> <p>Move sensor to a site with better perfusion.</p>
"Low Signal IQ" (Masimo)	The quality of the signal level being received by the SpO ₂ sensor is in question.	<p>Ensure proper sensor type and application.</p> <p>Verify that the sensor emitter and detector are parallel to and directly opposing each other.</p> <p>Clean or replace the sensor.</p>
"No SpO ₂ Probe"	The monitor is not detecting the SpO ₂ probe.	The probe was disconnected from either the Interface Cable or from the monitor.
"Pulse Search"	The monitor is searching for a Pulse signal.	<p>Normal at power-up as the monitor searches for a pulse.</p> <p>The probe position may have changed.</p> <p>Check the probe site.</p>
"Probe Error"	The SpO ₂ probe being used is not the correct one for the monitor's configuration.	Verify the probe being used is the correct probe.

Table 9: **SpO₂ Monitor Messages**

MONITOR MESSAGES (cont.)**SpO₂ (cont.)**

MONITOR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"SpO ₂ Error"	A communications failure has occurred with the monitors' SpO ₂ module.	Turn the monitor Off; disconnect the AC Line cord and battery. Reconnect the battery and AC Line cord, turn the monitor On. If the message still appears, contact CAS Medical Systems to have the monitor serviced.
"SpO ₂ Module"	An electronic failure has occurred within the monitors' SpO ₂ module.	Contact CAS Medical Systems to have the monitor serviced.
"SpO ₂ Probe OFF"	The monitor is no longer receiving a patient signal from the SpO ₂ probe.	The probe is no longer in contact with the patient. Check the probe site.

Table 9: **SpO₂ Monitor Messages**

11. MAINTENANCE PROCEDURES

INTRODUCTION

This section discusses the tests used to verify performance following repairs or during routine maintenance. All tests can be performed without removing the CAS 750 Monitor's cover.

If the CAS 750 Monitor fails to perform as specified in any test, repairs must be made to correct the problem before the monitor is returned to the user.

EQUIPMENT REQUIRED

To test the CO₂

- Gas Calibration Kit

To test the ECG/Respiration

- ECG/Respiration Simulator

To test the NIBP

- P9 Calibration Kit
- Mercury Manometer
- NIBP Simulator
- 500 mL Pressure Cylinder (CAS p/n 01-02-0248)

To test the SpO₂

- SpO₂ Finger Sensor Simulator

To test the Temperature

- Temperature Test Jack (Refer to Page 84, TEMPERATURE CALIBRATION CHECK for more information)

To perform Electrical Safety

- Electrical Safety Analyzer
- Hypot Tester

Data Sheet

This procedure uses a Data Sheet as the record for verifying monitor performance. Once the procedure is completed, CAS recommends the Data Sheet be kept with the respective monitor's Device History Record should verification of monitor performance be questioned.

The *DATA SHEET* can be found on Page 89.

BATTERY CHARGE

Perform the following procedure to fully charge the battery.

- 1) Turn the monitor's power "OFF" and connect it to a power source (AC Line or +12 VDC).
- 2) Verify, the Battery Power Visual Indicator is lit Green and the Battery Charge Status visual icon is displayed on the Main Display screen.
- 3) Charge the battery for at least five (5) hours.

TURNING THE MONITOR "ON"

Press the ON/STANDBY pushbutton on the front panel to turn the monitor's display "ON".

Each time the monitor is turned "ON", a three (3) second electronic Power On Self-Test (POST) is conducted to ensure that its internal circuits are functioning properly.

NOTE:

The user should use the Power On Self Test as a verification tool that the audio and all front panel visual indicators are functioning properly.

Upon applying power to the monitor, verify the following:

- The monitor produces three (3) audio beeps from its internal speaker.
- The two (2) light bars and the Alarm Silence Visual Indicator are turned "ON" twice for one-half second and cycled one after the other.
- The monitor displays for three (3) seconds the current monitor configuration setup.

The configuration setup consists of the monitor's Model number and a description of its power source (750E/750EM or 750C/750CM), an Installed Parameter Code (1, 2, 3 or 4), a two (2) or three (3) character module configuration code and the version of its main software.

As an example, upon power-up the CAS 750 Monitor displays: 750E-3MSC.

- The first set of characters indicates the Model number and the source of its power supply (750E = Internal/AC Line Power or 750EM = DC power connection).
- The second character (3) describes how many parameters are installed in the monitor. The CAS 750E monitor is configured with ECG as its main base parameter. The 750C monitor is configured with CO₂ as its base parameter. The monitor in our example is configured for ECG, SpO₂ and CO₂,
Installed Parameter Codes include;
 - (1) = ECG; (2) = ECG and SpO₂; (3) = ECG, SpO₂ and NIBP or ECG, SpO₂ and CO₂; (4) = ECG, SpO₂, NIBP and CO₂

NOTE:

Respiration and Temperature are automatically included with ECG.

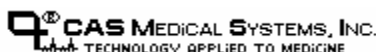
- The third set of characters (MSC) describes the type of module(s) installed. The monitor in our example is configured for Masimo Pulse Oximeter and Oridion CO₂.

Configuration Codes are;

- MS = Masimo; NL = Nellcor; C = Oridion

NOTE:

If the printer was powered "ON" during the monitor's power-up sequence, the CAS Medical Systems logo is printed.



Once the Power On Self-Test is completed, the monitor's Main display screen is ready for use.


VERIFYING THE TIME

Perform the following procedure to verify the time is set correctly.

- Once the monitor has completed its Power On Self Test, the monitor continuously displays the time, in 24 Hr. format in the upper right hand corner of the Main display.
- Should the time being displayed not be correct, refer to Page 42, SETTING THE TIME.

VOLUME CHECKS**ALARM VOLUME**

Perform the following procedure to verify the audio range for the Alarm Volume.

- Depress the VOLUME pushbutton  on the front panel. The "Alarm Volume" menu selection is highlighted.
- Press one of the NEXT programmed pushbutton keys and select the Alarm Volume adjustment.
- Depress the ARROW UP and ARROW DOWN pushbuttons and verify the Alarm Volume can be adjusted to one of five volume levels.
- Set the volume level as desired.



NOTE:

The Alarm Volume level cannot be set to "OFF".

- Press the RETURN pushbutton  when completed.

BEEP VOLUME

Perform the following procedure to verify the audio range for the Beep Volume.

- 1) Depress the VOLUME pushbutton  on the front panel.
- 2) Use the ARROW DOWN pushbutton and highlight "Beep Volume".
- 3) Press one of the NEXT programmed pushbutton keys and select the Beep Volume adjustment.
- 4) Depress the ARROW UP and ARROW DOWN pushbuttons and verify the Beep Volume can be adjusted to one of five volume levels and OFF.
- 5) Set the volume level as desired.
- 6) Press the RETURN pushbutton  when completed.

SERVICE MENU TESTS

WARNING:

Do not enter the Service menu while the monitor is connected to a patient. The patient is not being monitored while in the menu.

Perform the following procedures to verify the following system operations of the monitor.

NOTE:




The monitor must be in the Service menu in order to perform the following functions.

- Perform CO₂ System Checks ⁽¹⁾
 - Perform a CO₂ Calibration Check
- Perform NIBP System Checks ⁽²⁾
 - Manometer Mode
 - Overpressure Test
 - Pneumatic Leak Test (Plug Tube)
- Verify the monitor's operating power supply voltage level
- Review the monitor's operating and internal modules software levels

(1) The CO₂ module is optional, in the case when it is not installed, no text message is shown.

(2) The NIBP module is optional, in the case when it is not installed, no text message is shown.

ENTERING THE SERVICE MENU

To enter the monitor's Service menu, depress and hold the PARAMETERS  and HISTORY  pushbutton keys while the monitor is being turned "ON" .


<u>Service</u>	
IrDA Test	OFF
EtCO ₂ Check	OFF
EtCO ₂ Cal	OFF
EtCO ₂ Cal Date	06-Feb-04
EtCO ₂ S/N	00234
Service EtCO ₂	xxxxx Hours
Cal EtCO ₂	xxxx Hours
Manometer Mode	OFF
Pneumatic Test	OFF
PIC Voltage	xx.xx v

Figure 15: Service Menu

NOTE:

While in the Service menu, if no pushbutton is depressed within 15 minutes, the monitor will automatically exit the Service menu and return to the Main display screen.

EXIT THE SERVICE MENU

When you have completed testing the monitor, press the RETURN  pushbutton to exit and return to the Main display screen.

CO₂ CALIBRATION CHECK(available if CO₂ is installed)**CAUTION:**

Do not perform a CO₂ Calibration Check from the monitor's measuring mode. This mode corrects the CO₂ value for BTPS (Body, Temperature, Pressure, Saturation), which assumes that alveolar gases are saturated with water vapor. The Calibration Check mode disables this correction.

CAUTION:

The Calibration Check must be performed with a manufacturer authorized Calibration Kit containing (5% CO₂, 21% O₂, Balance N₂) gas, tubing adapter and a calibration filter line. A manufacturer approved Calibration Kit can be purchased from Scott Medical (P/N 0304653ORFBD).

NOTE:

The Calibration Check should be performed only after the CO₂ module has been operating for at least twenty (20) minutes in a normal operating mode and connected to a FilterLine.

NOTE:

Prior to performing the Calibration Check, verify that the FilterLine supplied with the kit is firmly attached to the monitor.

To perform a CO₂ Calibration Check, follow the following procedure:

- 1) First enter the monitor's Service menu. Refer to Page 76, SERVICE MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter "EtCO₂ Check" is highlighted.
- 3) Press one of the NEXT programmed pushbutton keys to select "OFF".
- 4) Press the ARROW UP pushbutton to select "AUTO ZERO" which begins the Calibration Check.


NOTE:

While the monitor is in the AUTO ZERO mode, connect the FilterLine to the calibration gas.

- 5) When the message "Open 5% Gas" appears, depress and hold open for fifteen (15) seconds the gas valve until the reading stabilizes.
- 6) Verify the reading on the display to be "5.0% +/- 0.3" vol%.

NOTE:

Calibration is not required if the measured value is the same as the concentration of the calibration gas +/- 0.3%. The concentration of the calibration gas used is 5% (CO₂); the measured value should be between 4.7% to 5.3%, therefore, calibration is not required.

- 7) Press one of the PREVIOUS programmed pushbutton keys to return to the "CO₂ Check" menu selection and end the Calibration Check.
- 8) When you have completed, press the RETURN  pushbutton to exit and return to the Main display screen.

Should the monitor fail the EtCO₂ CHECK, it is recommended a EtCO₂ Calibration be performed or the monitor be returned to CAS Medical Systems for service.

CO₂ CALIBRATION

(available if CO₂ is installed)

NOTE:

Perform the Calibration after performing the Calibration Check.

CAUTION:


The Calibration must be performed with a manufacturer authorized Calibration Kit containing (5% CO₂, 21% O₂, Balance N₂) gas, tubing adapter and a calibration filter line. A manufacturer approved Calibration Kit can be purchased from Scott Medical (P/N 0304653ORFBD).

To perform a CO₂ Calibration, follow the following procedure:

- 1) Connect the FilterLine from the Calibration Kit to the monitor.
- 2) First enter the monitor's Service menu. Refer to Page 76, SERVICE MENU.
- 3) Press the ARROW DOWN pushbutton until the parameter "EtCO₂ Cal" is highlighted.
- 4) Press one of the NEXT programmed pushbutton keys to select "OFF".
- 5) Press the ARROW UP pushbutton to select "Connect Gas".
- 6) The highlighted section should read "Open 5% Gas".
- 7) When the message "Open 5% Gas" appears, depress and hold the gas valve until the message "Remove Gas" is displayed.
- 8) The highlighted section should read "Passed" and two (2) audible beeps should be heard when the calibration is completed.
- 9) Verify the "EtCO₂ CAL Date" has been updated to reflect the monitor's date.

NOTE:

The starting hours for Calibration are initially 1200 hours, and then 4000 after that. This timer is automatically reset to 4000 hours during the Calibration process as long as it has been more than 720 hours from the last calibration. If less than 720 hours, the timer does not reset.

- 10) Press one of the PREVIOUS programmed pushbutton keys to return to the "EtCO₂ Cal" menu selection and end the Calibration.
- 11) Disconnect the FilterLine from the unit.
- 12) When you have completed, press the RETURN  pushbutton to exit and return to the Main display screen.

NOTE:

Should the monitor fail the EtCO₂ Calibration, it is recommended the procedure be repeated. Prior to repeating the Calibration procedure, carefully check all connections.

Should the monitor continue not to pass the Calibration procedure, the monitor should be returned to CAS Medical Systems for service.

NIBP CALIBRATION CHECK

(available if NIBP is installed)

Verify the calibration of the monitor once (1) per year.

A Calibration Kit, (product #P9) is included with the monitor. The kit contains a T-connector with a male and a female luer fitting (for a Calibration Check) and a male luer plug (to be used for the Pneumatic Test).

The monitor must be in the Adult mode and be in the Service menu in order to perform the following pressure checks:

- Manometer Mode
- Overpressure Test
- Pneumatic Test

Equipment required to perform the pressure checks:

- Assembled P9 Calibration Kit
- Mercury manometer whose accuracy meets the AAMI/ANSI Standard for Non-Automated Sphygmomanometers, 2002.

WARNING:

Do not place the monitor in the Service menu when a cuff is attached to a patient.

MANOMETER PRESSURE CHECK

- 1) Assemble the Calibration Kit according to the diagram provided in the P9 kit.
- 2) Remove the manometer tubing from the inflation bulb. Connect the open ended tubing of the T-connector to the inflation bulb.
- 3) Connect the female luer fitting to the inflation tube leading to the manometer.
- 4) Connect the male luer fitting to the manometer tubing.
- 5) First enter the monitor's Service menu. Refer to Page 76, SERVICE MENU.
- 6) Press the ARROW DOWN pushbutton until the parameter Manometer Mode is highlighted.

- 7) Press one of the NEXT programmed pushbutton keys to select and start the test.
- 8) The Message Window will switch from displaying "OFF" to "0 mmHg".
- 9) Use the manometer inflation bulb to slowly inflate the system pausing for 30 seconds at the following points and verify calibration according to the following table:

0 mmHg +/- 1 mmHg
50 mmHg +/- 4 mmHg
100 mmHg +/- 4 mmHg
150 mmHg +/- 4 mmHg
200 mmHg +/- 5 mmHg

NOTE:

If the monitor does not display the test pressure for the 30-second period, deflate to zero and verify the proper assembly of the calibration set-up. Re-inflate the system. If the monitor again fails to hold the pressure, it is recommended the monitor be returned to CAS Medical Systems for service.

OVERPRESSURE

- 1) While still in the Manometer Mode Test, inflate the pressure slowly until 290 mmHg +/- 10 mmHg is reached. The monitor's NIBP display should stop updating and the message "Over Press" will be displayed in the Message Window.
- 2) Press the SILENCE/RESET pushbutton to exit the Overpressure Test. The monitor returns to the Manometer Mode selection.
- 3) Press either the ARROW UP or ARROW DOWN pushbutton key to continue.

If the monitor does not meet the above specifications, it is recommended the monitor be returned to CAS Medical Systems for service.

PNEUMATIC PRESSURE CHECKS

Check the monitor's pneumatic system for air leakage every six (6) months.

PLUG TUBE

- 1) Obtain the male luer plug found in the Calibration Kit (product #P9) supplied with the monitor.
- 2) Place this plug into the cuff connector at the end of the monitor inflation hose and twist one-quarter turn. The plug must fit securely into the connector for this test to be performed properly.
- 3) First enter the monitor's Service menu. Refer to Page 76, SERVICE MENU.
- 4) Press the ARROW DOWN pushbutton until the parameter Pneumatic Test is highlighted.
- 5) Press one of the NEXT programmed pushbutton keys to select and start the test.
- 6) The monitor will inflate to approximately 180 mmHg and attempt to hold this pressure. The pressure value will be displayed in the Pneumatic Test section of the Service menu. This test takes about fifteen (15) seconds.
- 7) At the completion of a successful Pressure Check, the Message Window will display "Passed" and the monitor will beep two (2) times.
- 8) Press one of the PREVIOUS programmed pushbutton keys to exit and return to the Pneumatic Test selection.
- 9) If the monitor fails the Pressure Check, the Message Window will display "Failed" and the monitor will beep three (3) times.
- 10) Press one of the PREVIOUS programmed pushbutton keys to exit and return to the Pneumatic Test selection.
- 11) Due to the volume differences of the hoses offered with the CAS 750 Monitor, the monitor may incorrectly fail the Plug Tube check. Should the monitor fail the Plug Tube Pressure Check, obtain a 500 ml Pressure Cylinder and follow the 500 ml Pressure Check.

500 ml PRESSURE CHECK

- 1) Obtain a fixed volume 500 ml Pressure Cylinder (CAS p/n 01-02-0248).
- 2) Place the end of the monitor's inflation hose securely onto the luer fitting at the top of the pressure cylinder. The hose must fit securely onto the connector for this test to be performed properly.
- 3) First enter the monitor's Service menu. Refer to Page 76, SERVICE MENU.
- 4) Press the ARROW DOWN pushbutton until the parameter Pneumatic Test is highlighted.
- 5) Press one of the NEXT programmed pushbutton keys to select and start the test.
- 6) The monitor will inflate to approximately 160 mmHg and attempt to hold this pressure. The pressure value will be displayed in the Pneumatic Test section of the Service menu. This test takes about fifteen (15) seconds.
- 7) At the completion of a successful Pressure Check, the Message Window will display "Passed" and the monitor will beep two (2) times.
- 8) Press one of the PREVIOUS programmed pushbutton keys to exit and return to the Pneumatic Test selection.
- 9) If the monitor fails the Pressure Check, the Message Window will display "Failed" and the monitor will beep three (3) times.
- 10) Press one of the PREVIOUS programmed pushbutton keys to exit and return to the Pneumatic Test selection.

Should the monitor fail the 500 ml Pressure Check, it is recommended the monitor be returned to CAS Medical Systems for service.

+12 VOLT POWER SUPPLY CHECK

Perform the following procedure to verify the proper DC input voltage to the Main Controller Board.

NOTE:

The monitor must be connected to the AC Line power source to view this voltage level.

- 1) First enter the monitor's Service menu. Refer to Page 76, SERVICE MENU.
- 2) Press the ARROW DOWN pushbutton until the parameter "PIC Voltage" is highlighted.
- 3) Verify the value on the display to be 12.00 +/- 0.50 V.

NOTE:

The information provided is read only. No changes can be made.

- 4) When you have completed, press the RETURN  pushbutton to exit and return to the Main display screen.

ECG/RESPIRATION CALIBRATION CHECK

(750E)

- 1) Connect the CAS 750E Monitor to a ECG/Respiration simulator.
- 2) Set the simulator for the following;

ECG ECG rate of 120 BPM ECG amplitude 1 mV	Respiration Respiration Rate of 60 BrPM Base Impedance of 500 Ohms Respiration Impedance of 1.0 Ohm
---	---
- 3) Verify the HR reading, displayed on the monitor's front panel, to be within +/- 2 BPM and the Respiration Rate to be within +/- 3 BrPM.

TEMPERATURE CALIBRATION CHECK

(750E)

To perform a Temperature Calibration Check, a Temperature Test Jack is required. This Test Jack can be manufactured by your biomedical department. Refer to Figure 16.

The Temperature Test can be performed, at any time.

CAUTION:

Do not perform a Temperature Test while the CAS 750 Monitor is monitoring a patient.

To perform a Temperature Test, follow the following procedure;

- 1) If installed, remove the temperature probe connector completely from the TEMP connector.
- 2) Insert the Temperature Test Jack into the TEMP connector.
- 3) The TEMP display value should read 37.0 +/-0.1 °C or 98.6 +/-0.1°F.

NOTE:

The monitor will display the Temperature Test Jack value using the current temperature units selected.

- 4) Once completed, remove the Temperature Test Jack from the TEMP connector.

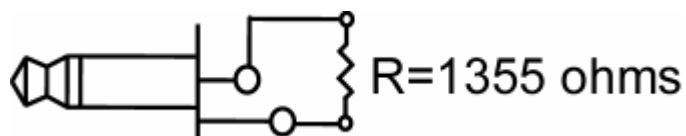


Figure 16: **Temperature Test Jack**

SpO₂ CALIBRATION CHECK

The oximeter is factory calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin. No user calibration is required.

SpO₂ SIMULATOR CHECK

- 1) Connect the CAS 750 Monitor to a SpO₂ Simulator of the appropriate type.
- 2) Set the simulator to a SpO₂ value of 98% and a Pulse Rate of 60 BPM.
- 3) Verify the %SpO₂ reading, displayed on the monitor's front panel, to be within +/- 2% digits and the Pulse Rate to be within +/- 3 BPM.

NIBP SIMULATOR CHECK

- 1) Connect the CAS 750 Monitor to a NIBP Simulator.
- 2) Set the simulator to a pressure value of 120/80, 40 BPM, 100% gain.
- 3) Press the START pushbutton and allow the monitor to take the NIBP measurement.
- 4) Take a total of four (4) NIBP readings. Disregard the first and average the remaining together.
- 5) Verify the NIBP values, displayed on the monitor's front panel, to be within +/- 5 mmHg and the Pulse Rate to be within +/-2% or +/-2 BPM, whichever is greater.

SOFTWARE VERSIONS

The CAS 750 Monitor displays the current software revision of its operating system and that of the internal modules being used inside. The software versions are displayed in the following order:

<u>Versions</u>	
DSP Software	x.xx
Lang FLASH	x.xx
BOOT	x.xx
PIC	x.xx
CAS ECG/RESP ⁽¹⁾	x.xx
Masimo SpO ₂ ⁽²⁾	x.xx
Oridion EtCO ₂ ⁽³⁾	x.xx
CAS ND ⁽⁴⁾	x.xx
Unit S/N	xxxxxxxx

Table 10: **Software Versions**

To view the software Versions menu, follow the following procedure:

- 1) First enter the monitor's Service menu. Refer to Page 76, SERVICE MENU.
- 2) Depress and hold the HISTORY pushbutton for two (2) seconds to display the Versions menu.

NOTE:

The information provided in the Versions menu is read only. No changes can be made.

- 3) When you have completed, press the RETURN  pushbutton to exit and return to the Main display screen.

(1) The ECG/Respiration/Temperature module is optional, in the case when it is not installed, no text message is shown.

(2) The SpO₂ module is optional, in the case when it is not installed, no text message is shown. Installed SpO₂ technology may be either Masimo SpO₂ or Nellcor SpO₂.

(3) The CO₂ module is optional, in the case when it is not installed, no text message is shown.

(4) The NIBP module is optional, in the case when it is not installed, no text message is shown.

ELECTRICAL SAFETY CHECKS

WARNING:

Do not touch the monitor when performing these tests.

LEAKAGE

- 1) Disconnect all accessories from the monitor.
- 2) Plug the AC power cord from the CAS 750 Monitor into the Electrical Safety Analyzer.
- 3) Turn the CAS 750 Monitor "ON".
- 4) Perform a Leakage Check per manufacturers instructions. Verify the monitor's leakage to be *less* than 100 micro-amps.

HYPOT (Monitor)

NOTE:

CAS Medical Systems recommends a Hypot Electrical Safety Checks be performed each time the monitor's case is opened or patient isolation is in question.

WARNING:

Do not touch the monitor when performing this test.

- 1) Disconnect all accessories from the monitor.
- 2) Plug the AC power cord from the CAS 750 Monitor into the Hypot Tester.

WARNING:

Do not turn the monitor "ON" during a hypot test.

- 3) Perform a Hypot Test, per manufacturers instructions for **one (1) minute**, at 2.5 KV.
- 4) Verify that there was no arching observed.

HYPOT (SpO₂)

WARNING:

Do not touch the monitor when performing this test.

- 1) Connect the appropriate SpO₂ probe and/or cable to the monitor.
- 2) Plug the AC power cord from the CAS 750 Monitor into the Hypot Tester.
- 3) Connect a lead wire from the Ground terminal of the Hypot tester to the SpO₂ probe.

WARNING:

Do not turn the monitor "ON" during a hypot test.

- 4) Perform a Hypot Test, per manufacturers instructions for **one (1) second**, at 1.8 KV.
- 5) Verify that there was no arching observed.

Disconnect the monitor from the test equipment.

This concludes the testing to the CAS 750 Monitor.

DATA SHEET

Date: _____

Tested By: _____

**CAS 750 Monitor
Data Sheet**

Dealer / Hospital:

Monitor Type: _____

Address: _____

Monitor Serial Number: _____

City: _____

State: _____ Zip: _____

Battery Charge

Verify, the Battery Power Visual Indicator is lit Green and the Battery Charge Status visual icon is displayed.

Pass () Fail ()

Turning the CAS 750 Monitor “ON”

Monitor displays Configuration for three (3) second.

Pass () Fail ()

Monitor produces three (3) audio beeps.

Pass () Fail ()

Monitor illuminates Light Bars and Alarm Silence LED.

Pass () Fail ()

Displaying the Time

Verify, the monitor's Time is set correctly.

Pass () Fail ()

Alarm Volume

Verify, the Alarm Volume can be adjusted to one of five levels.

Pass () Fail ()

Beep Volume

Verify, the Beep Volume can be adjusted to one of five levels.

Pass () Fail ()

CO₂ Calibration Check

Monitor displays correct CO₂ value.

Pass () Fail ()

CO₂ Calibration

Verify, the correct CO₂ values have updated.

Pass () Fail ()

System Pressure

Deflate system pressure to 0 mmHg.

Pass () Fail ()

Inflate system pressure to 50 mmHg.

Pass () Fail ()

Inflate system pressure to 100 mmHg.

Pass () Fail ()

Inflate system pressure to 150 mmHg.

Pass () Fail ()

Inflate system pressure to 200 mmHg.

Pass () Fail ()

Over Pressure

Verify, the Message Window displays “Over Pres”.

Pass () Fail ()

Pneumatic Pressure Tests

Plug Tube Test

Pass () Fail ()

500 mL Pressure Check

Pass () Fail ()

+12 Volt Power Supply Check

Verify, the voltage reading to be 12 +/- 0.50.

Pass () Fail ()

ECG/Respiration Calibration Check

Monitor displays correct ECG and Respiration values.

Pass () Fail ()

Temperature Calibration Check

Monitor displays correct Temperature value.

Pass () Fail ()

Oximetry Simulator Check

Monitor displays correct SpO₂ values.

Pass () Fail ()

NIBP Simulator Check

Monitor displays correct NIBP values.

Pass () Fail ()

Leakage

Verify, the monitor's leakage to be less than 100 micro-amps.

Pass () Fail ()

Hypot

Monitor, verify, no arching was observed.

Pass () Fail ()

SpO₂, verify, no arching was observed.

Pass () Fail ()

12. SERVICE PROCEDURES

INTRODUCTION

CAUTION:

Removal of the "Warranty Void If Removed" sticker voids any warranty the monitor may have. Refer service only to technicians trained by CAS Medical Systems Inc.

This section discusses the replacement of major assemblies found inside the CAS 750 Monitor.

WARNING:

Before attempting to open or disassemble the CAS 750 Monitor, disconnect the power cord from the monitor and remove the battery.

CAUTION:

Observe ESD (electrostatic discharge) precautions when working within the unit.

TOOLS REQUIRED

- Small, Phillips head screwdriver
- Medium, Phillips head screwdriver
- Flat blade, screwdriver
- Household scissors
- Torque screwdriver
- Wire Cutters
- Adhesive, Loctite 425
- Adhesive, RTV, GE 162 (Electronic Grade)
- Small Size Tie Wrap
- 91% Isopropyl Alcohol

REPLACING THE MONITOR BATTERY

A part number for the battery can be found in the Accessories section of this manual or on the label located on the inside panel of the battery pack. When the battery fails to hold a charge it will need to be replaced.

CAS Medical Systems recommends the battery be changed every two (2) years.

REMOVING THE BATTERY

- 1) Turn the monitor "OFF" and disconnect the power cord.
- 2) Push down on the battery latch to unlock the battery door from the rear panel of the monitor.
- 3) Carefully remove the battery pack from the rear panel of the monitor. Refer to Figure 17.

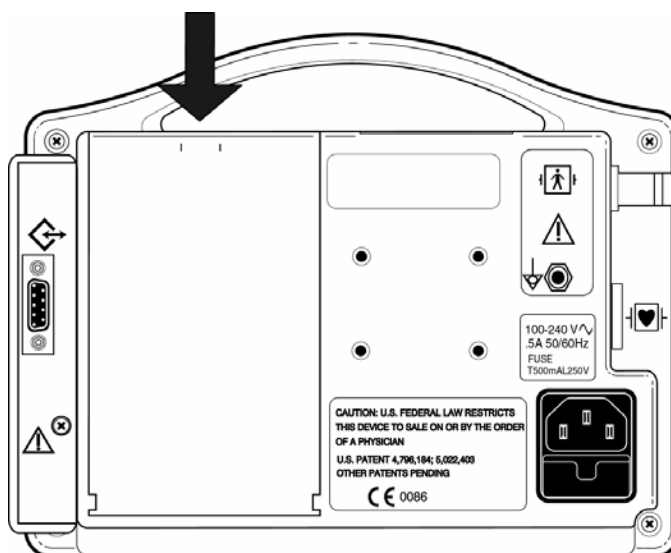


Figure 17: Removing the Monitor Battery Pack

INSTALLING THE BATTERY

- 1) Align the Battery Pack guides with the bottom of the monitor.
- 2) Slowly close the battery door to ensure the connector in the monitor and the connector on the battery pack mate together.
- 3) Lock the battery door closed.

NOTE:

When the battery pack is re-inserted, the monitor will automatically turn "ON".

WARNING:

Do not disassemble the battery pack or batteries. The batteries contain electrolytes, which can cause injury to eyes, skin and clothing.

WARNING:

Use of unapproved batteries will invalidate the product's warranty and may result in serious safety consequences for the patient and user.

NOTE:

This product contains a rechargeable battery that is recyclable. Under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local authorities for instructions on recycling options in your area.

CHANGING THE FUSES**OUTSIDE FUSES**

The CAS 750 Monitor uses a dual fuse power input receptacle to protect the input of the power supply. The receptacle incorporates fuses in the hot and neutral AC input lines that are user serviceable.

The two (2) fuses for the CAS 750 Monitor are each rated at 250V, 500mA, 5 x 20 mm, Slow Blow. Refer to Section 14, SPARE PARTS for part number information.

CAUTION:

For continued protection against fire hazard, replace only with identically rated fuses.

A fuse may need to be replaced if the monitor is plugged into an electrical outlet but the Battery Power Visual Indicator is not illuminated the color Green.

WARNING:

Before changing the fuse, unplug the power cord.

The fuse holder is incorporated into the power input receptacle and located under the power cord input connector.

To replace fuses:

- 1) Turn the monitor "OFF" and disconnect the power cord.
- 2) Depress down on the locking tab, which holds the fuse holder in the power input receptacle.
- 3) While holding down on the tab, pull the fuse holder out.
- 4) Remove the fuses.
- 5) Place new fuses directly into the fuse holder.
- 6) Insert the fuse holder into the power input receptacle. There should be an audible "click" when it is secure.

INSIDE FUSE

The CAS 750 Monitor uses a single fuse located inside the monitor on the Main Controller Board to protect the +12 volt input power supply.

The one (1) fuse for the CAS 750 Monitor is rated at 125VAC, 5.00A, Slo-Blo. Refer to Section 14, SPARE PARTS for part number information.

CAUTION:

For continued protection against fire hazard, replace only with identically rated fuses.

A fuse may need to be replaced if the monitor is plugged into an electrical outlet but the Battery Power Visual Indicator is not illuminated the color Green.

WARNING:

Before changing the fuse, disconnect the monitor from its power source and remove the battery.

To replace the fuse:

- 1) Turn the monitor "OFF" and disconnect it from its power source.
- 2) Complete the steps in sections *Prior to Disassembly* and *Monitor Disassembly* (below).
- 3) Remove and replace the defective fuse from the Main Controller Board.
- 4) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

MAIN MONITOR SERVICE PROCEDURES

PRIOR TO DISASSEMBLY

- 1) Turn the CAS 750 Monitor "OFF" by pressing the front panel POWER pushbutton.
- 2) Disconnect the monitor from the AC or DC power source.
- 3) Remove the battery from the monitor.

MONITOR DISASSEMBLY

- 1) Complete the steps in *Prior to Disassembly*.
- 2) Set the CAS 750 Monitor face down onto a soft surface being careful not to scratch the front display.
- 3) Remove the one (1) screw that secures the RS-232 Communications Module to the monitor's rear case. Remove the Module and place it to the side.
- 4) Remove the four (4) corner screws that secure the two case halves together.
- 5) Separate the monitor's front and rear cases, being careful not to stress the internal wire harnesses.
- 6) Disconnect the NIBP hose and cable connector harnesses between the front and rear cases.

NOTE:

For monitors with CO₂ installed, do not remove at this time the cable assemblies from the side input panel or the CO₂ board as they can be easily damaged.

- 7) Place the Rear panel assembly down next to the Front panel assembly.

MONITOR ASSEMBLY

- 1) Connect the Power Supply harness assembly to J1 on the Main Control board.
- 2) Connect the ECG board harness assembly to J12 on the Main Control board.
- 3) Connect the Battery harness assembly to J2 on the Main Control board.
- 4) Connect the NIBP hose and cable harnesses from the side input panel.
- 5) Place the Rear Case assembly onto the Front Case assembly being careful of all wire harnesses and hoses.
- 6) Secure the two case halves together using the four (4) screws previously removed.
- 7) Re-install the Communications Module and secure it to the monitor's rear case using the Loctite adhesive and the one (1) screw previously removed. Apply a small amount of the adhesive to the threads of the screw and torque to 30 in.-oz.
- 8) Perform a complete System Check as described in the section *MAINTENANCE PROCEDURES*.

REPLACING THE POWER SUPPLY BOARD

The Power Supply board is part of the Rear Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Disconnect the two (2) harness assemblies from the Power Supply board.
- 3) Remove the four (4) screws that secure the board to the rear case.
- 4) Remove the board.

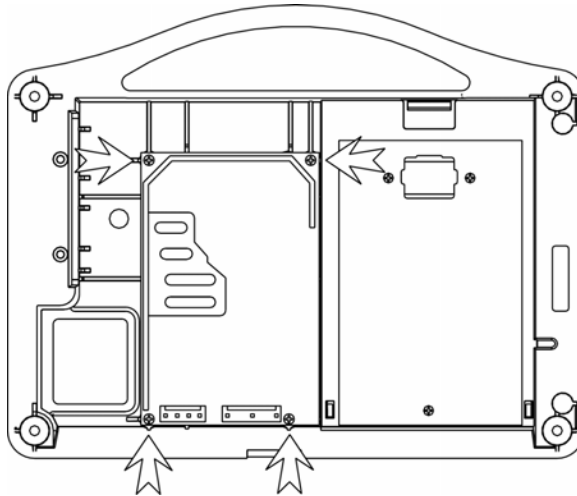


Figure 18: Replacing the Power Supply Board

Installation

- 1) Install the Power Supply board into the rear case so that the connectors on the Power Supply Board are at the bottom of the monitor's rear case.
- 2) Secure the board using the hardware previously removed.
- 3) Re-connect the wire harness from the AC input receptacle.
- 4) Re-connect the wire harness that will be connected to the J1 connector on the Main Control board.
- 5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE ECG/RESP/TEMPERATURE BOARD

The ECG/Respiration/Temperature Board is part of the Rear Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Disconnect the two (2) harness assemblies from the board.
- 3) Remove the three (3) screws that secure the board to the rear case.
- 4) Remove the board.
- 5) Remove the battery cable assembly from the board.
- 6) Remove the Main Control board interconnect cable assembly.

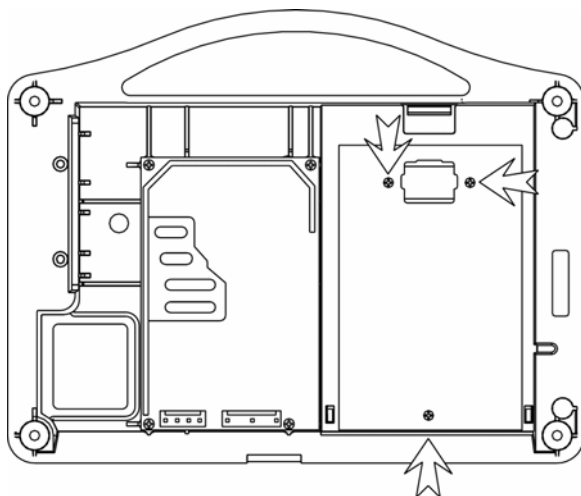


Figure 19: Replacing the ECG/Respiration/Temperature Board

Installation

- 1) Install the battery cable assembly onto the board.
- 2) Re-connect the Main Control board interconnect cable assembly.
- 3) Install the board into the rear case.
- 4) Secure the board using the hardware previously removed.
- 5) Re-connect the wire harnesses.
- 6) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE NIBP BOARD

The NIBP board is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Remove the four (4) screws used to secure the NIBP board to the Main Control board standoffs.
- 3) Separate the NIBP board from the J13 connector located on the Main Control board.

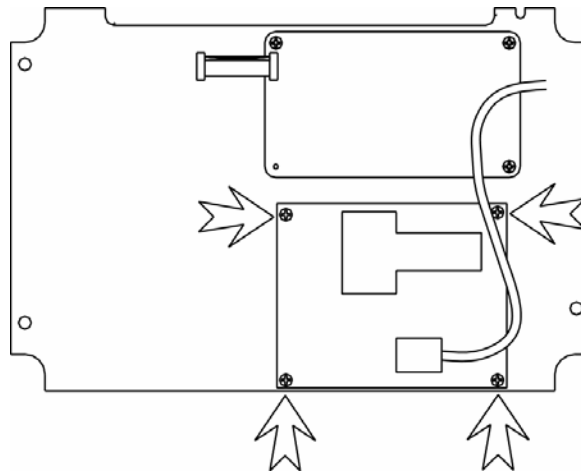


Figure 20: **Replacing the NIBP Board**

Installation

- 1) Align the female connector on the NIBP board with the J13 connector on the Main Control board. Gently push the NIBP Module onto the connector pins.
- 2) Secure the board to the standoffs using the Loctite adhesive and the hardware previously removed. Apply a small amount of the adhesive to the threads of the screws and torque to 30 in.-oz.
- 3) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE SpO₂ BOARD

The SpO₂ board is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Disconnect the cable assembly from the SpO₂ board to the Main Control board.
- 3) Remove the three (3) screws used to secure the SpO₂ board to the Main Control board standoffs. Remove the board.

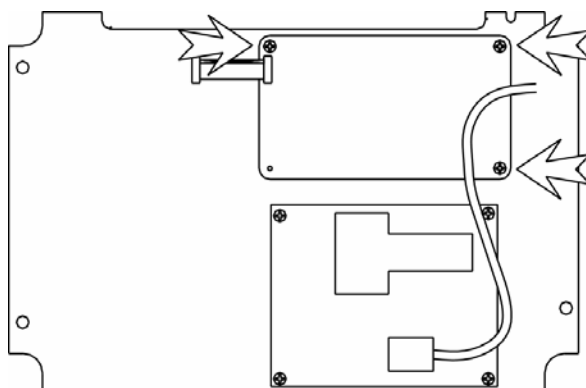


Figure 21: Replacing the SpO₂ Board

Installation

- 1) Place the SpO₂ board onto the standoffs located on the Main Control board. Secure the board to the standoffs using the Loctite adhesive and the hardware previously removed. Apply a small amount of the adhesive to the threads of the screws and torque to 30 in.-oz.
- 2) Connect the harness assembly from the SpO₂ board to the Main Control board.
- 3) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE CO₂ BOARD

The CO₂ board is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Disconnect the cable assembly from the CO₂ board to the Main Control board.
- 3) Cut the tie wrap that secures the CO₂ input receptacle to the side input panel.
- 4) Carefully twist the CO₂ input receptacle and remove it from the side input panel.
- 5) Disconnect the CO₂ exhaust tube from the side input panel.
- 6) Remove the four (4) screws used to secure the CO₂ board to the Main Control board standoffs. Remove the board, input connector and exhaust tube as one piece.

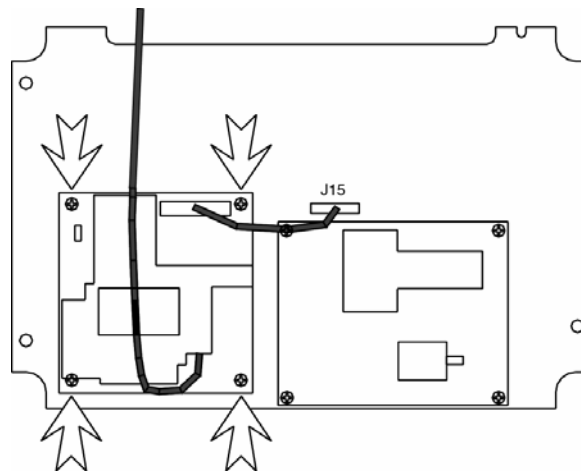


Figure 22: Replacing the CO₂ Board

Installation

- 1) Place the CO₂ board onto the standoffs located on the Main Control board. Secure the board to the standoffs using the Loctite adhesive and the hardware previously removed. Apply a small amount of the adhesive to the threads of the screws and torque to 30 in.-oz.
- 2) Connect the harness assembly from the Main Control board.
- 3) Connect the exhaust tube to the side input panel.
- 4) Re-install and secure with a tie wrap the CO₂ input receptacle to the side input panel.
- 5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE MAIN CONTROL BOARD

The Main Control board is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly and Monitor Disassembly*.
- 2) Remove the NIBP board.
- 3) Remove the SpO₂ board and its cable assembly.
- 4) Remove the CO₂ board and its cable assembly. Carefully place the board inside the rear case.
- 5) Remove the four (4) screws used to secure the Main Control board and LCD assembly to the Case Extension and Case Front.
- 6) Fold the Main Control board and LCD assembly out from the Case Extension and remove the ribbon cable from the J3 Front Panel Keyswitch connector. Remove the assembly. Refer to Figure 23.

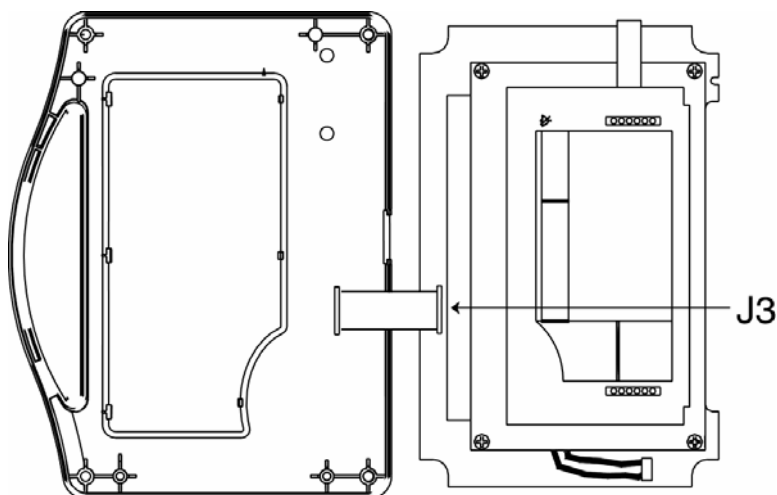


Figure 23: Replacing the Main Control Board

- 7) Remove the ribbon cable from the J4 connector and the cable assembly from the J6 connector.
- 8) Remove the four (4) screws used to secure the LCD assembly to the Main Control board. Separate the LCD assembly from the J5 connector located on the Main Control board. Remove the board.

Installation

- 1) Align the male pins on the LCD assembly with the J5 connector on the Main Control board. Gently push the LCD assembly into the connector pins and onto the standoffs.
- 2) Secure the LCD assembly to the Main Control board using the hardware previously removed.
- 3) Reconnect J4 ribbon cable and J6 cable assembly.
- 4) Install the ribbon cable, from the front panel Keyswitch, into the J3 connector.
- 5) Fold the Main Control board assembly over onto the Case Extension.

NOTE:

Ensure the Display and LCD windows are free of dust and scratches before assembly.

NOTE:

Be careful not to crimp the ribbon cable between the PC Board and the Case Extension.

- 6) Secure the board to the standoffs with the hardware previously removed.
- 7) Re-install the option boards previously removed.
- 8) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE FRONT PANEL KEYSWITCH

The Front Panel Keyswitch is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Complete the steps in *Replacing the Main Control Board* to remove the Main Control board and LCD assembly from the monitor.
- 3) Remove the Case Extension and IrDA window from the Case Front.
- 4) Using the flat blade screwdriver, loosen the keyswitch from the Case Front by pushing on the keyswitch from the inside of the Case Front in the location where the ribbon cable is located.
- 5) Pry the defective keyswitch loose from the Case Front.
- 6) Clean the keyswitch recess surface area of all remaining adhesive with 91% Isopropyl Alcohol.

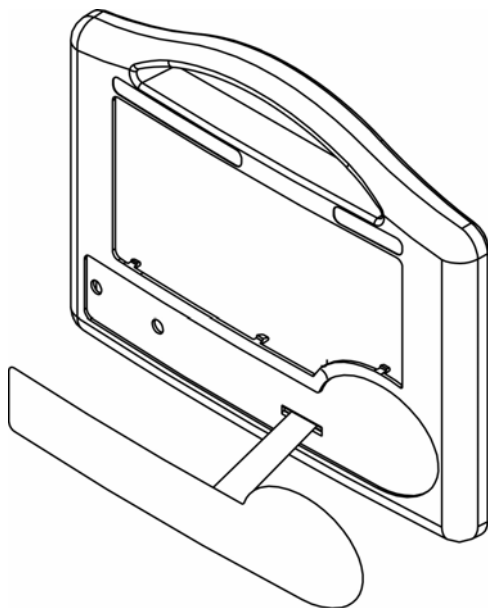


Figure 24: Replacing the Front Panel Membrane Keyswitch

Installation

- 1) Remove the liner from the rear of the keyswitch.
- 2) Feed the ribbon cable through the slot on the Case Front and carefully position the keyswitch into the recess on the Case Front. Apply even pressure across the face of the keyswitch to secure it in place.

NOTE:

Use extreme caution when handling and positioning the membrane keyswitch. Do not bend, crease or pinch the keyswitch or the tail connector. Do not remove and reapply the keyswitch.

- 3) Using a pair of household scissors cut back the shield tail flush to the front panel.
- 4) Reinstall the IrDA window and Case Extension.
- 5) Plug the ribbon cable connector into the J3 connector on the Main Control board.
- 6) Finish assembling the monitor by following the steps in the Installation section of *Replacing The Main Control Board*.

MODULE SERVICE PROCEDURE

REPLACING THE RS232/NURSE CALL INTERFACE BOARD

Removal

- 1) Complete the steps in *Prior to Disassembly*.
- 2) Remove the one (1) screw that secures the Communications Module to the monitor's rear case. Remove the Communications Module.
- 3) Remove the three (3) screws that secure the RS232/Nurse Call Interface board to the module case.

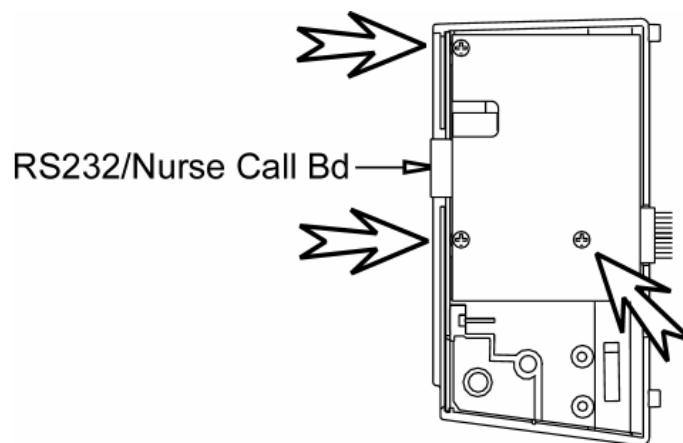


Figure 25: Replacing the RS232/Nurse Call Interface Board

Installation

- 1) Install the RS232/Nurse Call Interface board into the module case and secure it with the three (3) screws previously removed.
- 2) Re-install the Communications Module and secure it to the monitor's rear case using the Loctite adhesive and the one (1) screw previously removed. Apply a small amount of the adhesive to the threads of the screw and torque to 32 in.-oz.
- 3) Perform a complete System Check as described in the section *MAINTENANCE PROCEDURES*.

13. SCHEMATICS

ECG/RESPIRATION/TEMPERATURE BOARD

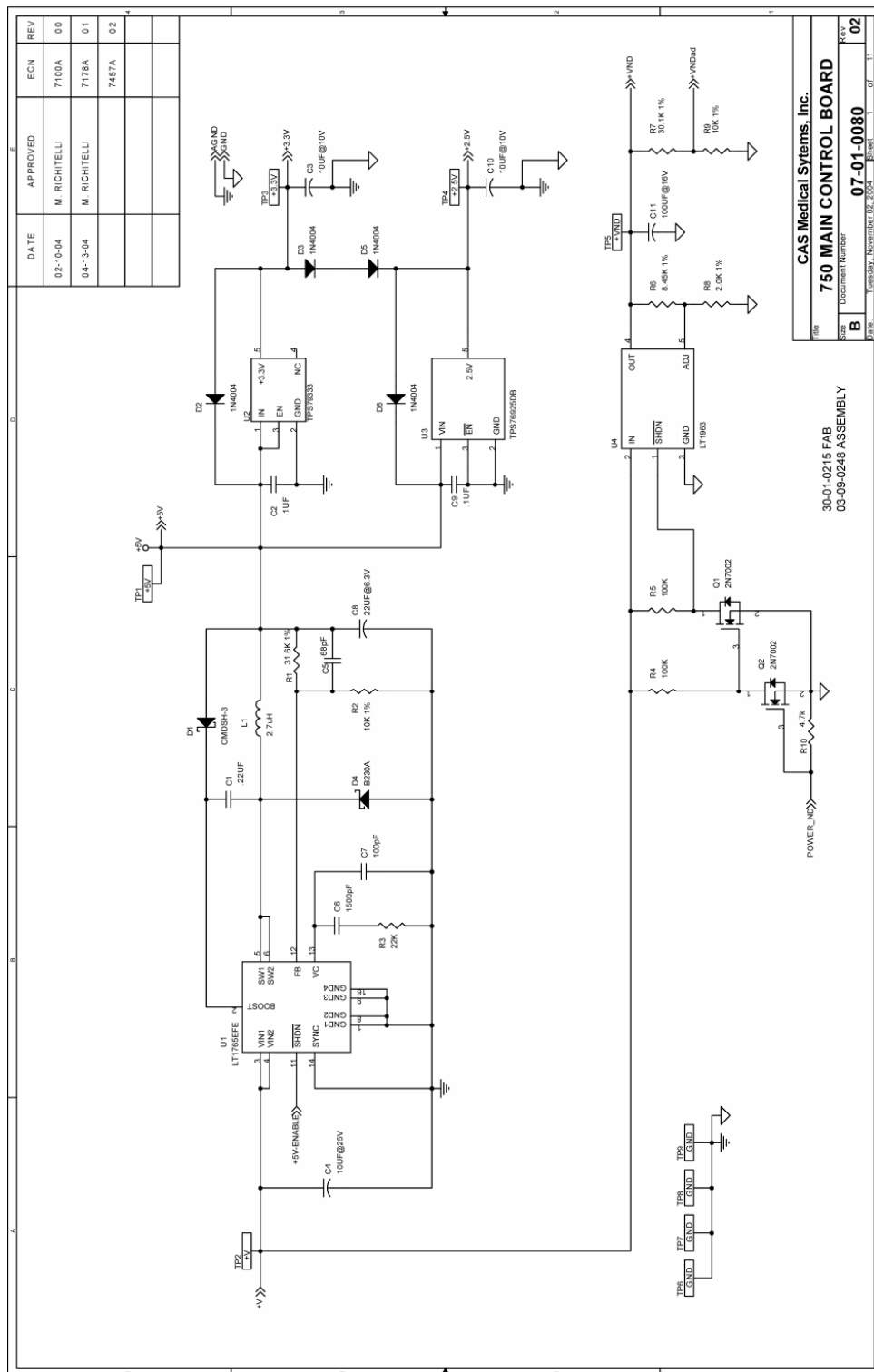
The ECG/Respiration/Temperature Board used in the CAS 750 Monitor is not user serviceable. No schematic diagram is provided.

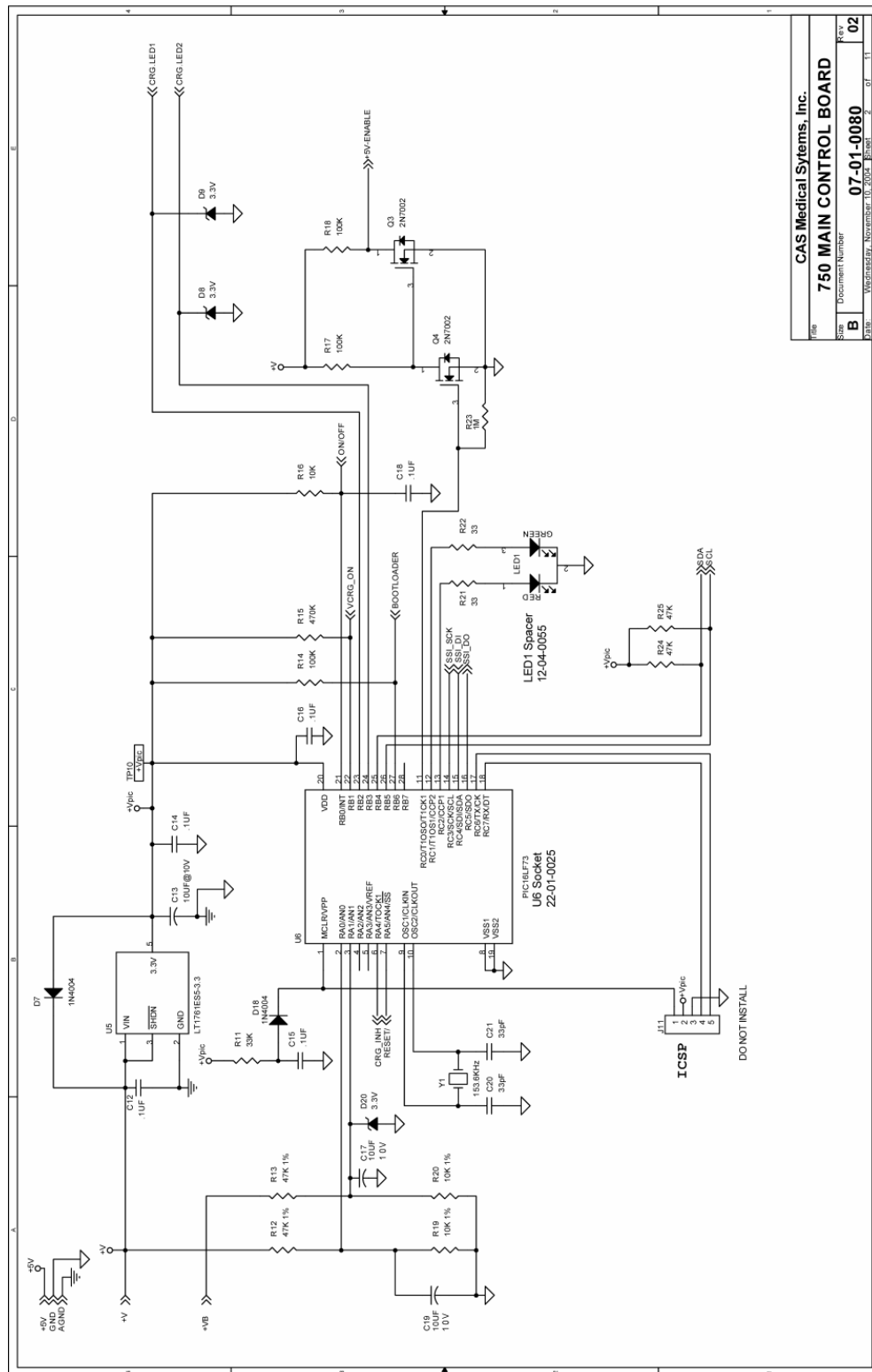
NIBP BOARD

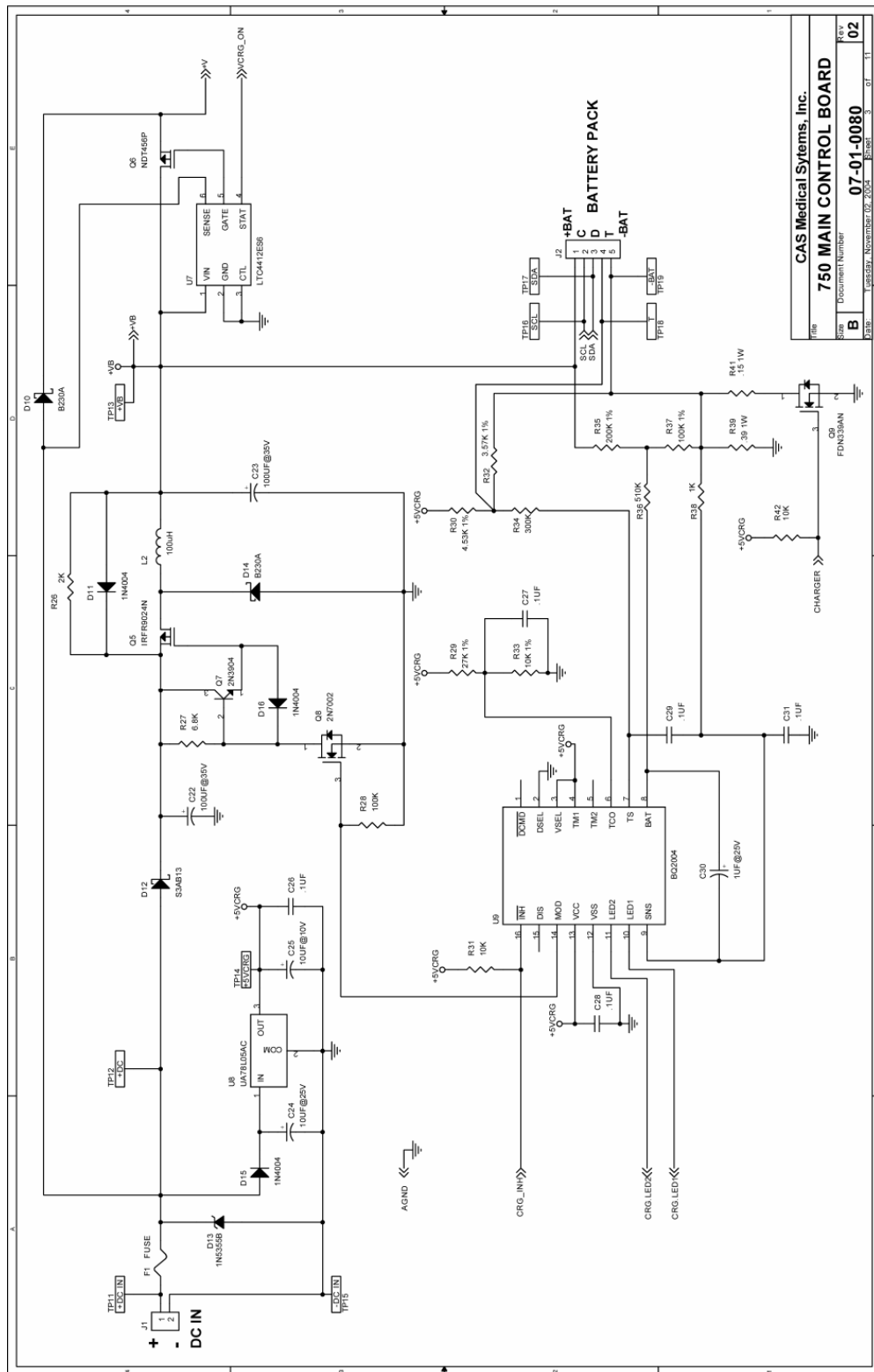
The NIBP Board used in the CAS 750 Monitor is not user serviceable. No schematic diagram is provided.

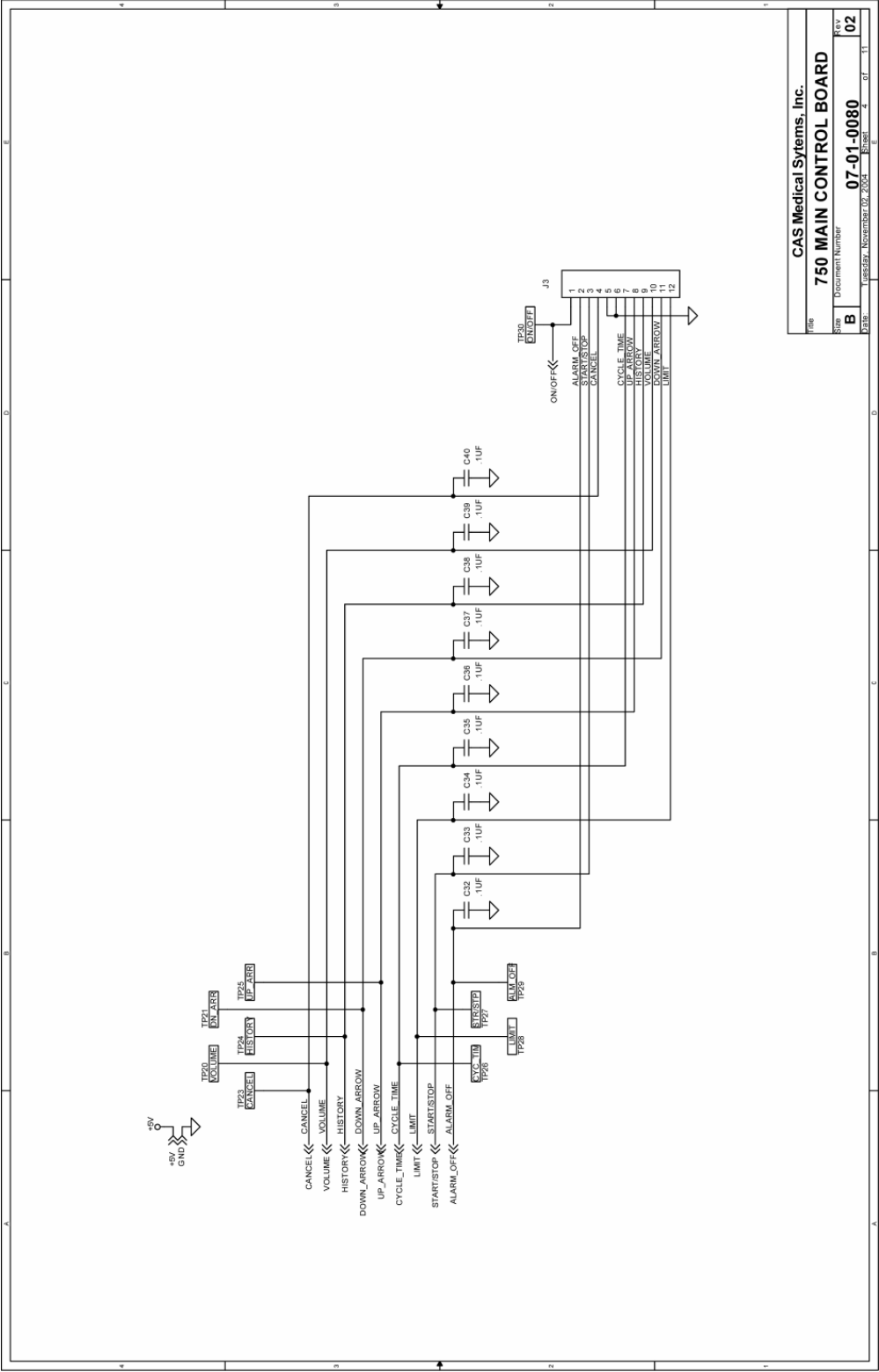
MAIN CONTROL BOARD

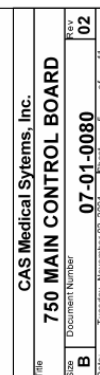
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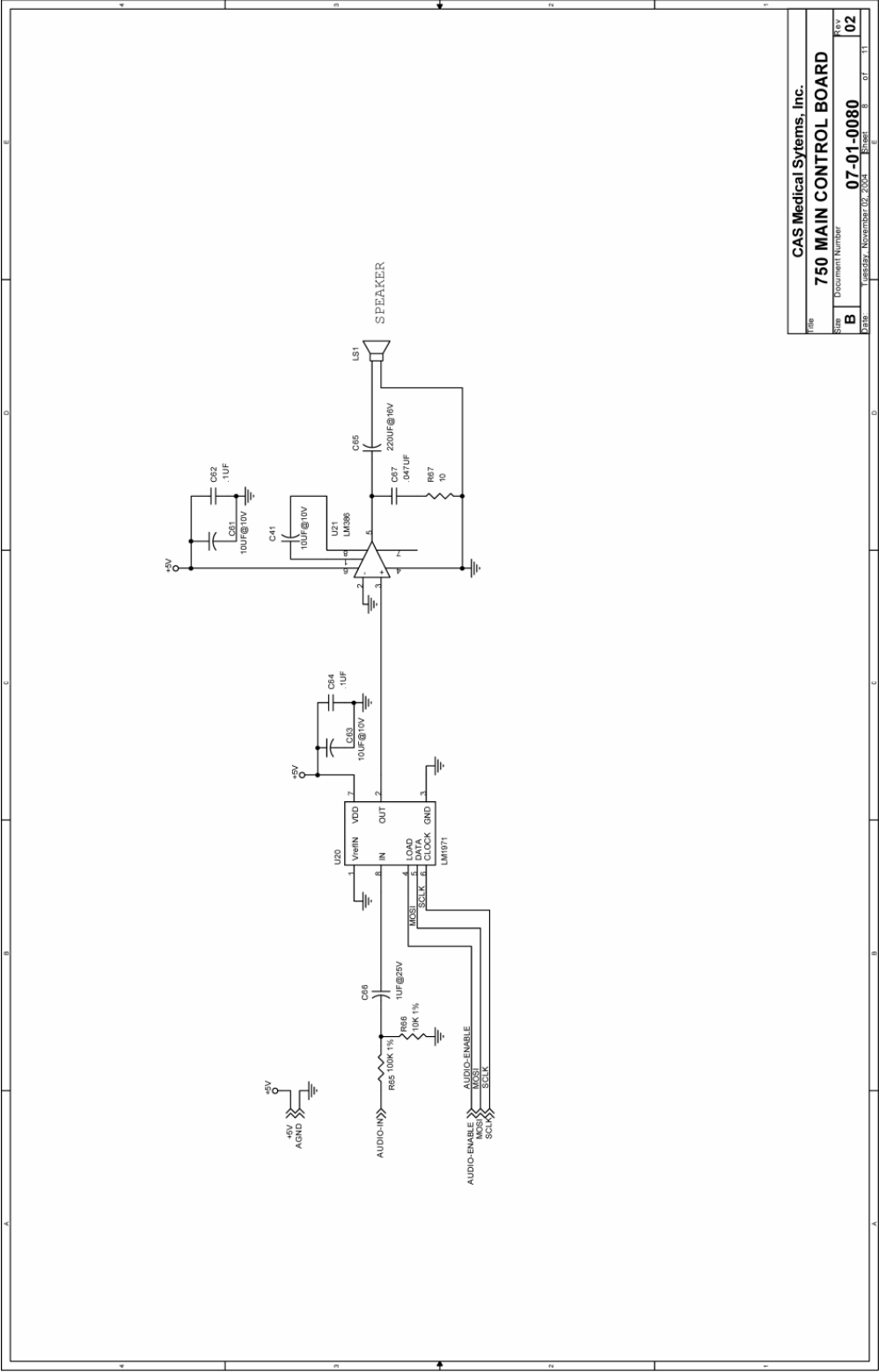


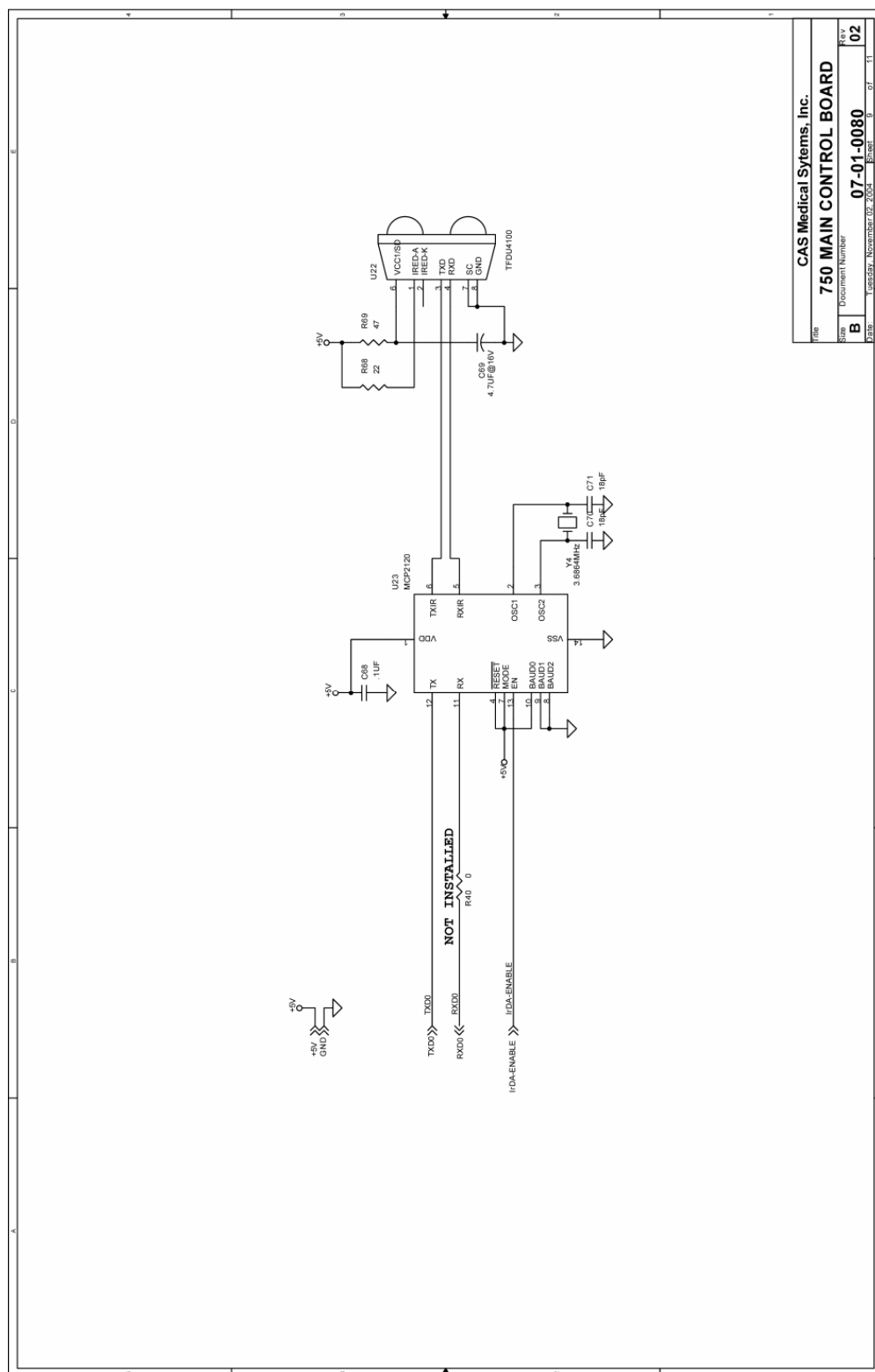


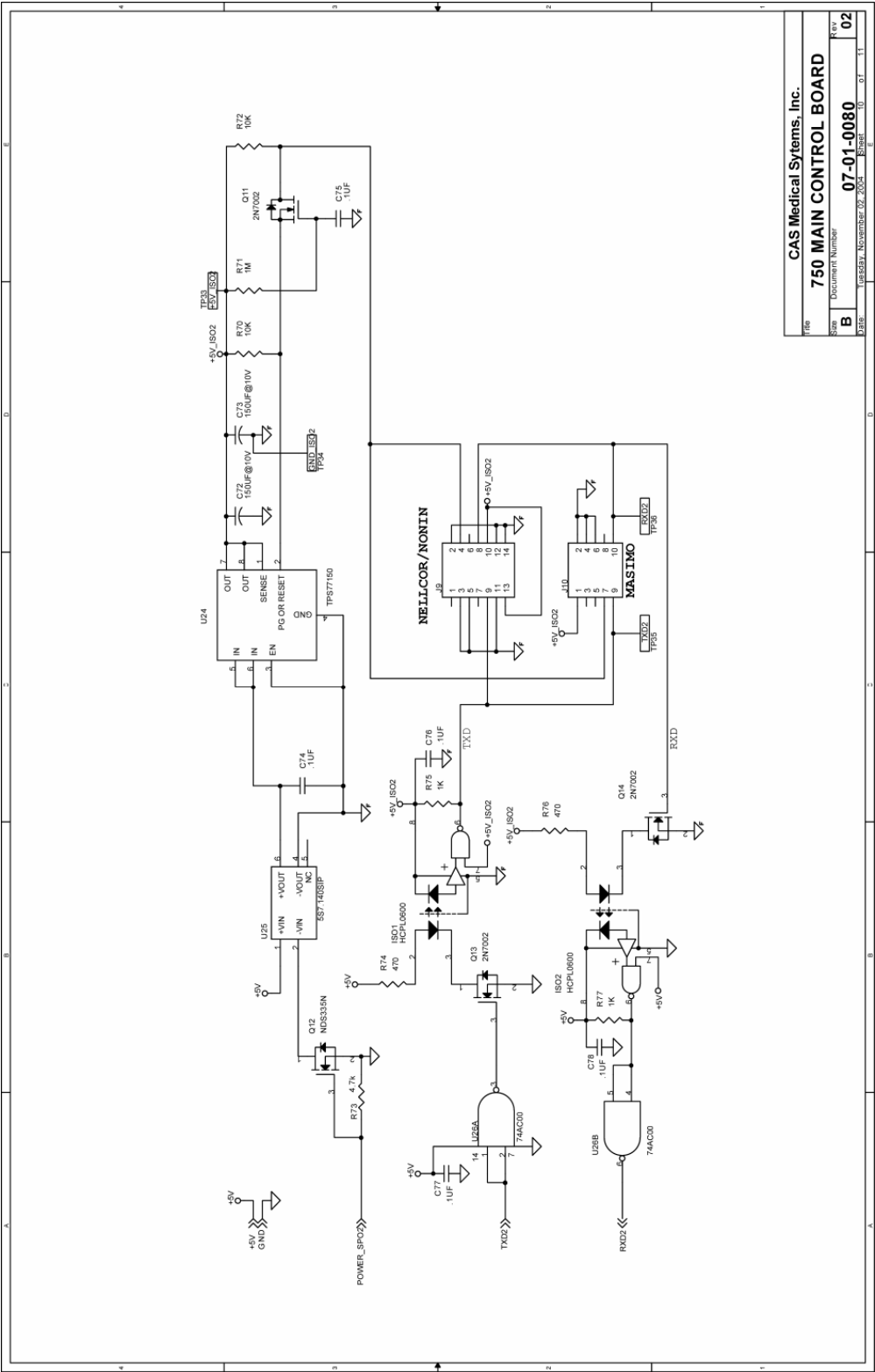




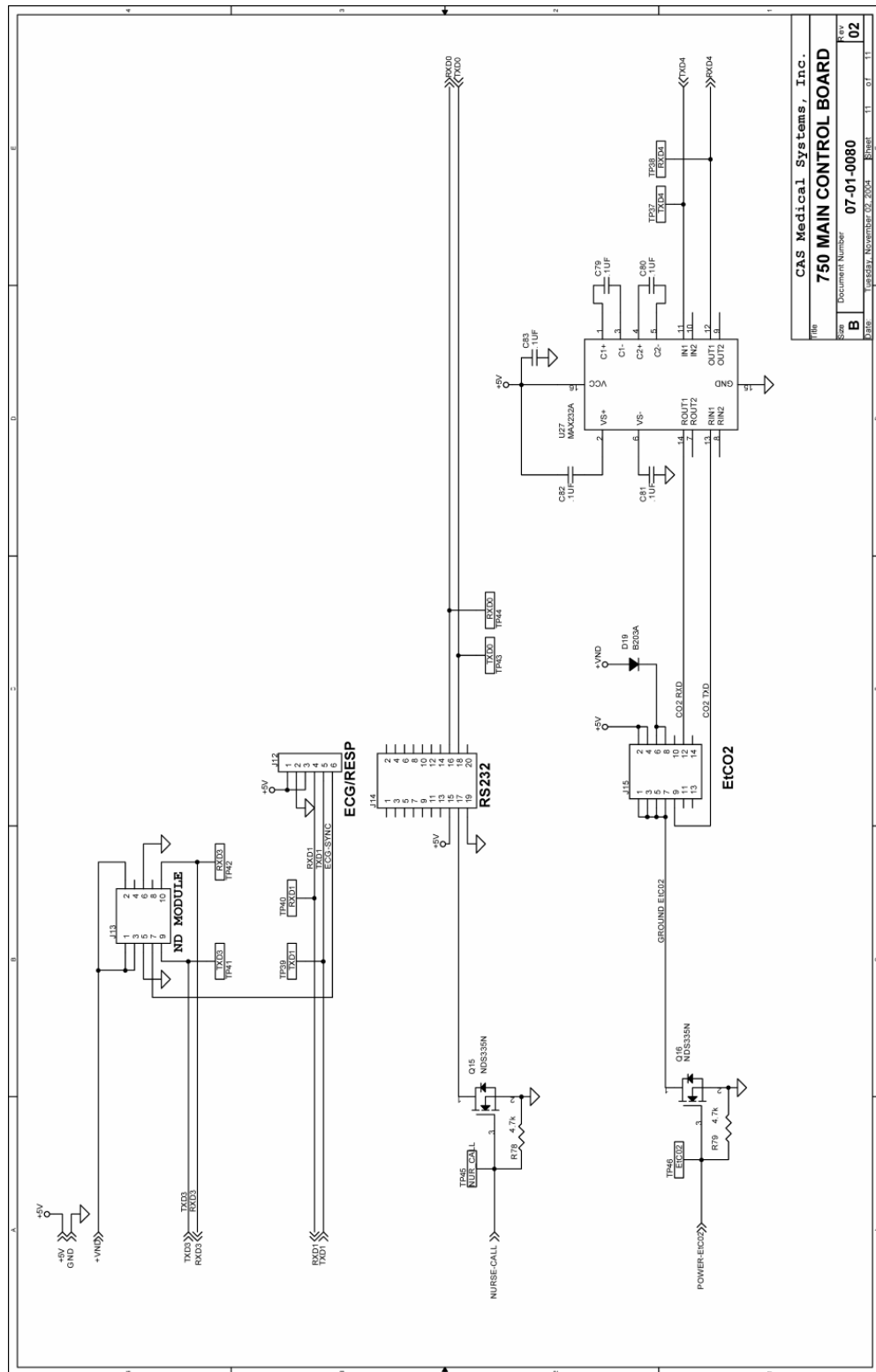


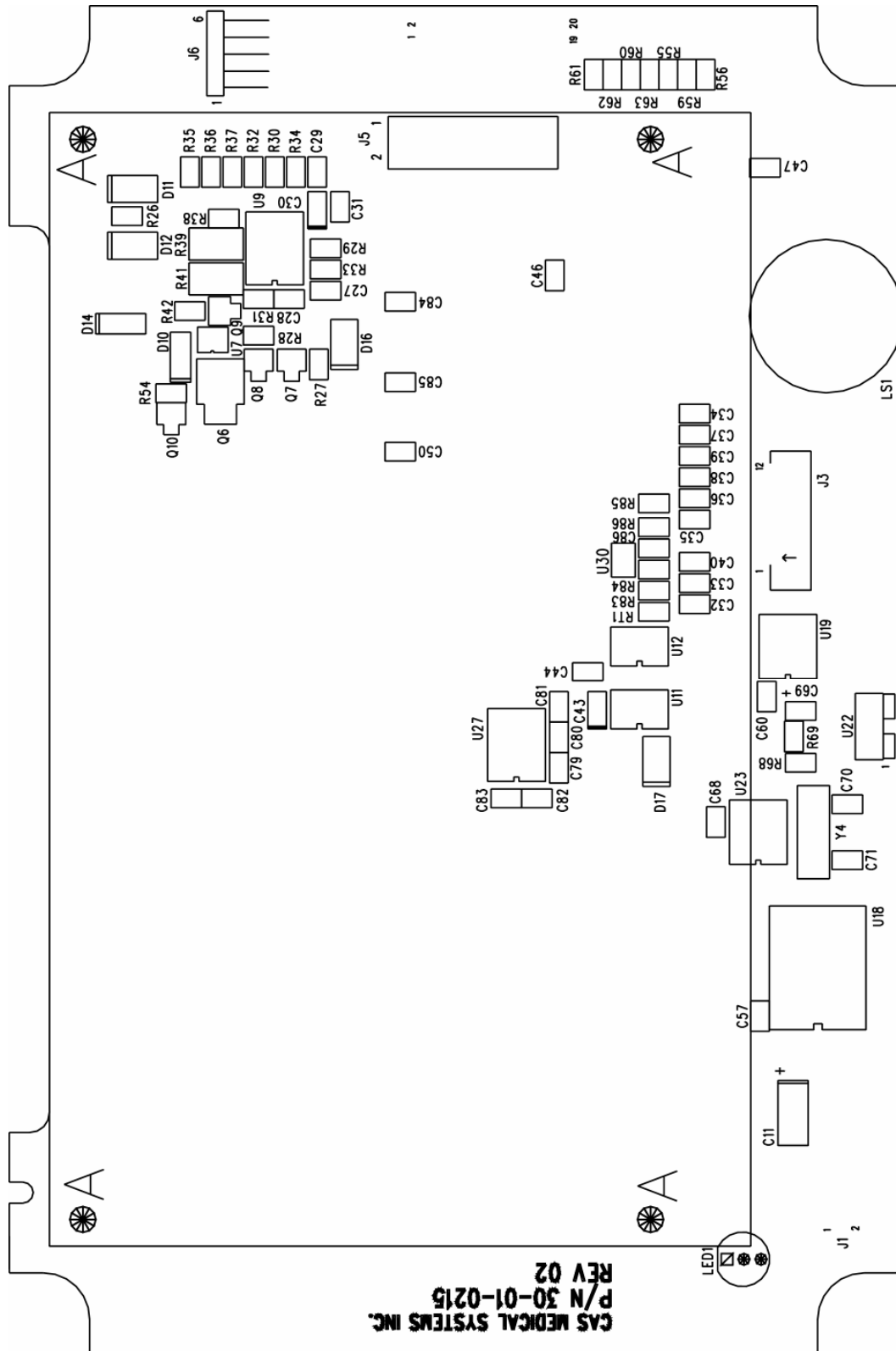


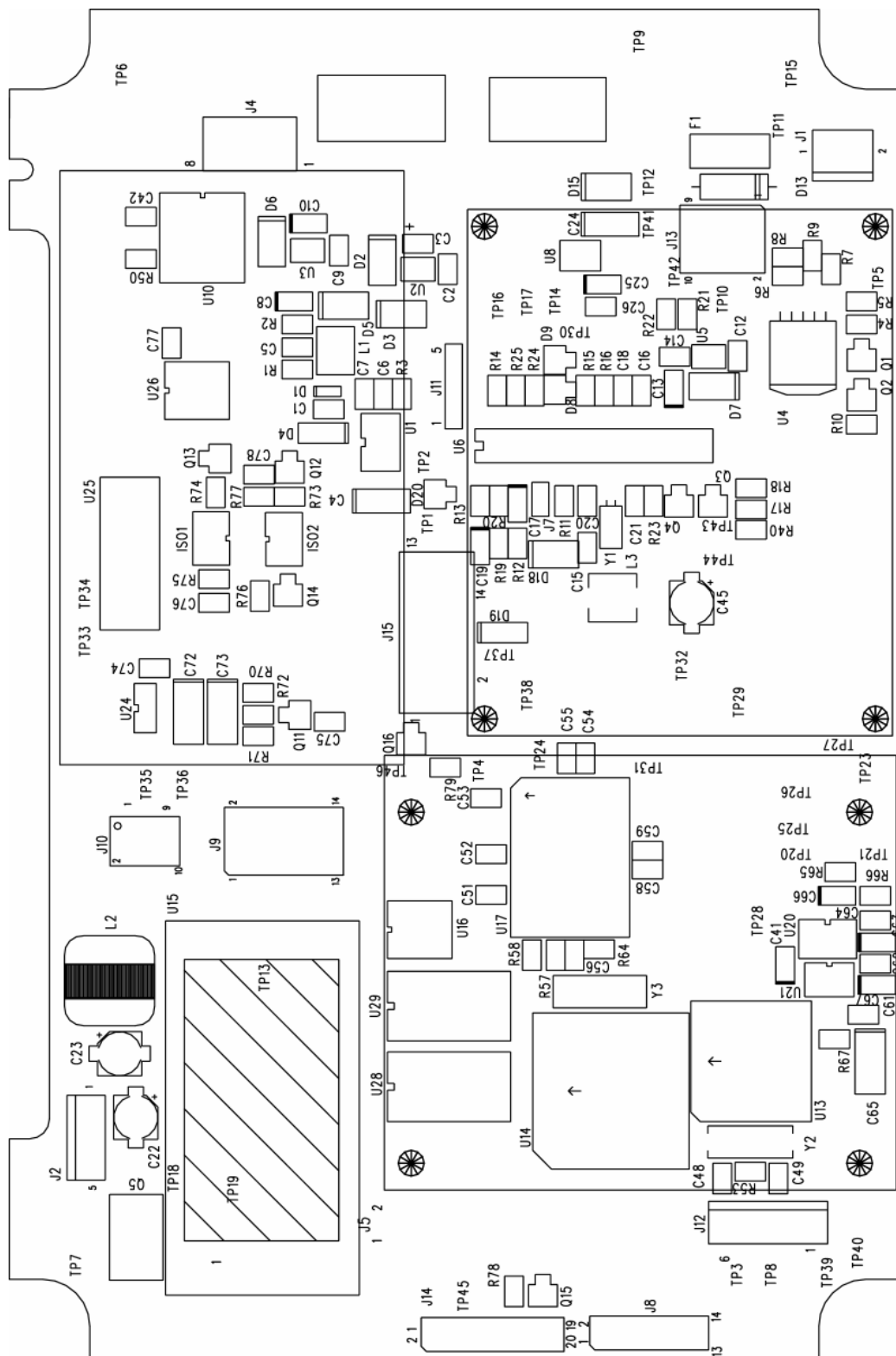




File	CAS Medical Sytems, Inc.
Doc	750 MAIN CONTROL BOARD
Rev	02
Doc Number	07-01-0080
Rev	02
Date	11/25/2004
By	11/25/2004

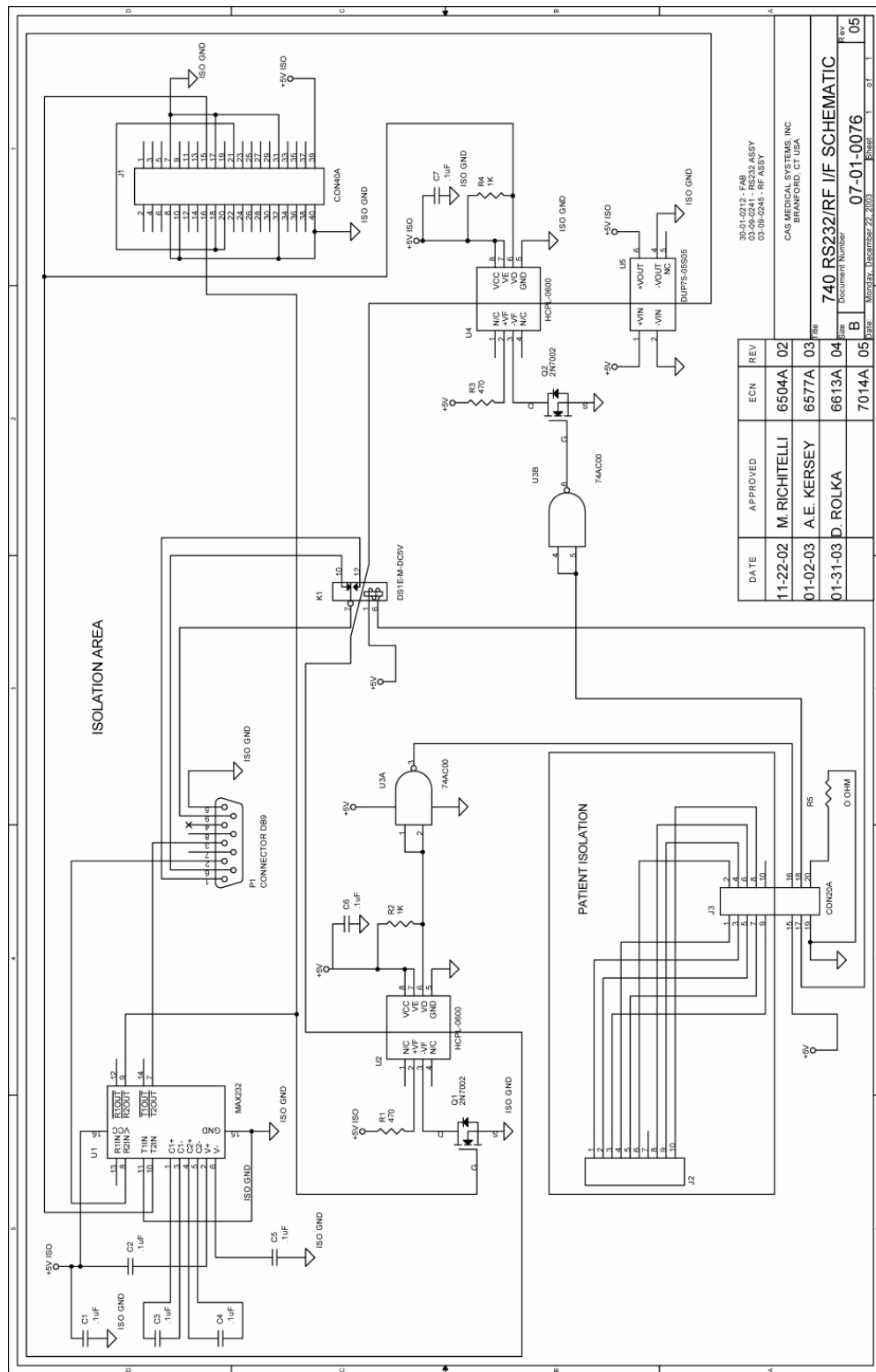


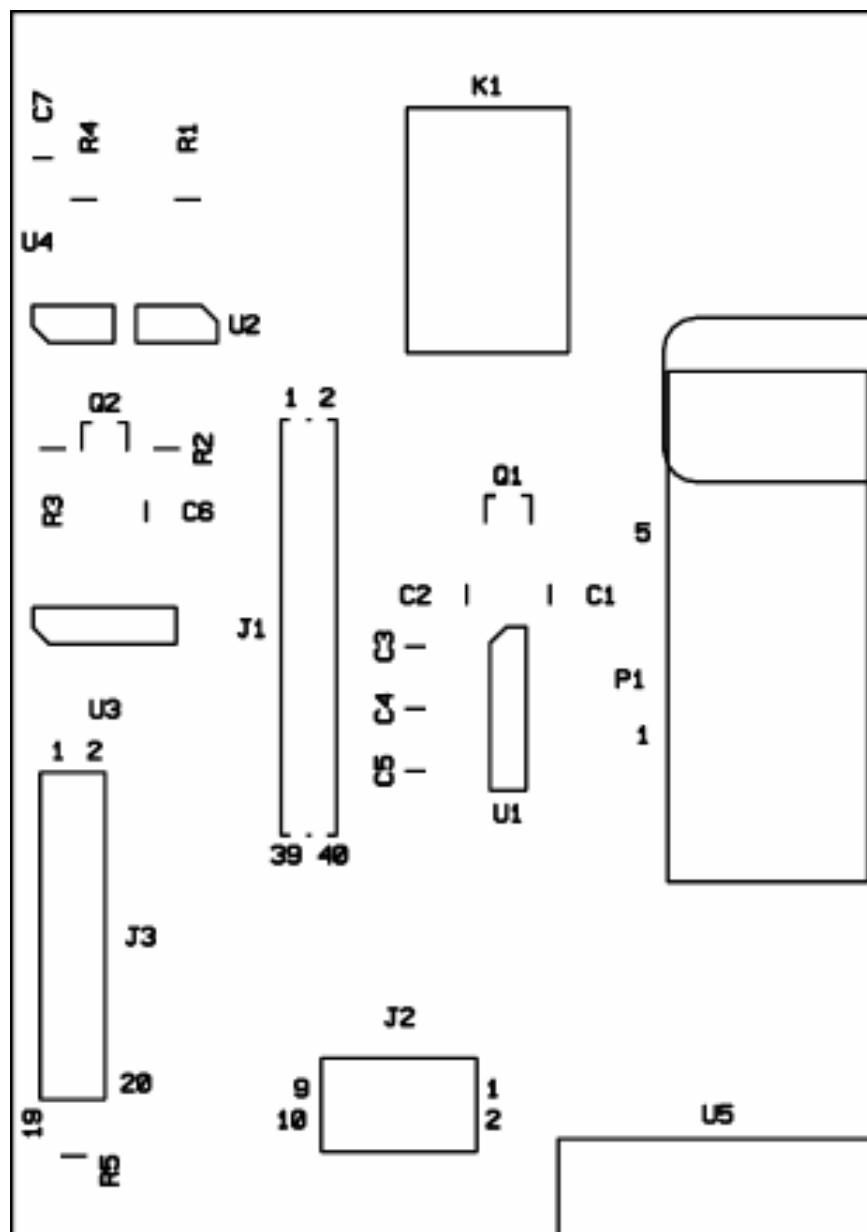




RS232 BOARD

Page 1 of 2





PROPRIETARY BOARDS

Due to the proprietary nature of the Power Supply Board from Condor, the SpO₂ Boards from Masimo and Nellcor, and the CO₂ Board from Oridion, the schematics, board layouts and bill of materials could not be placed into this service manual.

Contact Condor, Masimo, Nellcor and Oridion directly for this information.



14. SPARE PARTS

PRINTED CIRCUIT BOARDS

<u>Part Number</u>	<u>Description</u>
03-09-0249	ECG/Respiration/Temperature Board
03-09-0248	Main Control Board
28-02-0419	Masimo SpO ₂ Board
03-08-0478	ND+ NIBP Board
28-02-0424	Nellcor SpO ₂ Board
28-02-0439	Oridion CO ₂ Board
11-01-0058	Power Supply Board
03-09-0241	RS232 Interface Board

SWITCHES/CONTROLS/CONNECTORS

<u>Part Number</u>	<u>Description</u>
21-06-0020	Membrane Keypad Panel with NIBP
21-06-0021	Membrane Keypad Panel without NIBP
21-06-0033	Membrane Keypad Panel with Text and NIBP
21-06-0034	Membrane Keypad Panel with Text, without NIBP
27-03-0094	NIBP Input Connector
22-01-0292	Power Entry Module

CABLES

<u>Part Number</u>	<u>Description</u>
18-02-0241	Main Control Board to Battery Harness Assembly
18-02-0233	DC Input Cable, 750CM and 750EM
18-02-0231	ECG/Respiration Input Cable Assembly
18-02-0243	ECG Board to Main Control Board Cable Assembly
18-02-0225	Masimo SpO ₂ Input Cable
18-02-0223	Masimo Board to Main Control Board Cable Assembly
18-02-0224	Nellcor SpO ₂ Input Cable
18-02-0226	Nellcor Board to Main Control Board Cable Assembly
18-02-0234	Oridion Board to Main Control Board Cable Assembly
18-02-0240	Power Supply to Main Control Board Harness
18-02-0232	Temperature Input Cable Assembly

MISC PARTS

<u>Part Number</u>	<u>Description</u>
01-02-0248	NIBP Pressure Cylinder, 500 mL
23-01-0118	Battery Harness Plate, 750C
29-01-0307	Case Extension
29-01-0303	Case Front with Window
29-01-0295	Case, Rear
29-01-0301	Case, RS232 Module
21-06-0026	Color Window, 2 Parameter
21-06-0027	Color Window, 3 Parameter
21-06-0028	Color Window, 4 Parameter
21-06-0024	Display Window Overlay
29-01-0305	EtCO ₂ Protective Door
28-02-0422	Foot Pad
09-01-0002	Fuse, 5x20mm, SLO-BLO, 500 mA
09-01-0030	Fuse Block with 5A, SLO-BLO, SM
28-02-0433	Gasket, RS232 Module
29-01-0304	IrDA Window
21-01-1529	Label Set
24-01-0017	LCD with Backlight
29-01-0306	Patient Connector Panel

15. SPECIFICATIONS

ECG (OPTIONAL)

Characteristic	Specification
Input:	3 or 5 leads
Selectable Leads:	I, II, III, aVL, aVR, aVF, V
Gain:	X1, X2, X4, X8, Auto
Display Sweep Speeds:	12.5, 25, 50 mm/Sec
QRS Tone Volume:	User-selectable: 5 settings, Off
Frequency Response:	0.5 to 40 Hz
Sensitivity Adjustment:	Automatic
Minimum Signal:	Neonate mode: 0.20 mV peak-to-peak Pediatric/Adult mode: 0.20 mV peak-to-peak
Common Mode Rejection:	>90dB
Loose Lead Threshold:	2.0 to 2.5 K ohms
Pacemaker Spike Rejection:	Meets AAMI Standards

HEART RATE

Characteristic	Specification
Asystole Detection:	4 seconds
Alarms:	User-selectable: low heart rate and high heart rate
Alarm Delay Time:	5 seconds
Numeric Resolution:	1 BPM
Accuracy:	+/- 3 BPM or +/- 3%, whichever is greater
Numeric Range:	Neonate mode: 0, 15 - 350 BPM averaged, 1 second update Pediatric/Adult mode: 0, 15 - 300 BPM averaged, 1 second update

RESPIRATION (OPTIONAL)

Characteristic	Specification
Detection Technique:	Impedance Pneumography
Sensing Electrodes:	LA-RA
Bandwidth:	0.05 to 2.5 Hz
Sweep Speed:	3, 6.25, 12.5 mm/Sec
Sense Frequency:	63 kHz
Sensitivity Adjustment:	Automatic
Trigger Level:	Minimum trigger at 0.20 ohm.
Numeric Range:	Neonate mode: 0 (No RESP), 12 - 150 BrPM averaged, 1 second update Pediatric/Adult mode: 0 (No RESP), 6 - 150 BrPM averaged, 1 second update
Accuracy:	0 to 122 BrPM +/- 1 BrPM 123 to 150 BrPM +/- 2 BrPM
Numeric Resolution:	1 BrPM
Alarms:	User-selectable: low and high respiration rate; NO RESP
Base Impedance Range:	Neonate mode: 0 to 2.5 K ohms at 50 kHz Pediatric/Adult mode: 0 to 3.5 K ohms at 50 kHz

NIBP (OPTIONAL)

Characteristic	Specification
Technique:	Oscillometric (MAXNIBP® Technology) Microprocessor software eliminates most ambient noise and motion artifact.
Patient Range:	Neonate – Adult
Blood Pressure Range	Neonate Adult
Systolic:	30 – 135 mmHg 30 – 255 mmHg
Diastolic:	15 – 110 mmHg 15 – 220 mmHg
MAP:	20 – 125 mmHg 20 – 235 mmHg
Pulse Rate Range:	40 – 240 BPM 30 – 240 BPM
Accuracy	
Blood Pressure:	+/-5 mmHg with a standard deviation no greater than 8 mmHg (See Standards)
Pulse Rate:	+/-2% or +/-2 BPM, whichever is greater

OXIMETRY (OPTIONS)

Characteristic	Specification																				
Masimo SET®																					
Type:	Functional Oxygen Saturation																				
SpO ₂ % Range:	0 - 100%																				
SpO ₂ Accuracy:	<table> <tr> <th>Sensor</th><th>Accuracy</th></tr> <tr> <td>DC-195</td><td>70 - 100%, +/-2 digits (1 S.D.)</td></tr> <tr> <td>LNOP® Adt</td><td></td></tr> <tr> <td>LNOP Adt Long</td><td></td></tr> <tr> <td>LNOP DCI</td><td></td></tr> <tr> <td>LNOP DCSC</td><td></td></tr> <tr> <td>LNOP DC1P</td><td></td></tr> <tr> <td>LNOP DC150</td><td></td></tr> <tr> <td>LNOP Ear</td><td></td></tr> <tr> <td>LNOP Pdt</td><td></td></tr> </table>	Sensor	Accuracy	DC-195	70 - 100%, +/-2 digits (1 S.D.)	LNOP® Adt		LNOP Adt Long		LNOP DCI		LNOP DCSC		LNOP DC1P		LNOP DC150		LNOP Ear		LNOP Pdt	
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	<table> <tr> <th>Sensor</th><th>Accuracy</th></tr> <tr> <td>LNOP Neo</td><td>70 - 100%, +/-3 digits (1 S.D.)</td></tr> <tr> <td>LNOP Neo PT</td><td></td></tr> <tr> <td>LNOP NeoPT-L</td><td></td></tr> <tr> <td>LNOP Neo-L</td><td></td></tr> <tr> <td>LNOP Inf-L</td><td></td></tr> </table>	Sensor	Accuracy	LNOP Neo	70 - 100%, +/-3 digits (1 S.D.)	LNOP Neo PT		LNOP NeoPT-L		LNOP Neo-L		LNOP Inf-L									
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LNOP Neo PT																					
LNOP NeoPT-L																					
LNOP Neo-L																					
LNOP Inf-L																					
Measurement Wavelengths:	Red 660 Nanometers																				
	Infrared 905 Nanometers																				
Power:	Maximum radiant power at 50 mA pulsed is 0.79mW																				
Pulse Rate Range:	25 - 240 BPM																				
Pulse Rate Accuracy:	+/-3 BPM																				
Numerics:	Updated every one (1) second.																				

Characteristic	Specification														
Nellcor® OxiMax®															
Type:	Functional Oxygen Saturation														
SpO ₂ % Range:	1 - 100%														
SpO ₂ Accuracy:	<table> <tr> <th>Sensor</th><th>Accuracy</th></tr> <tr> <td>MAX-A</td><td>70 - 100%, +/-2 digits (1 S.D.)</td></tr> <tr> <td>MAX-AL</td><td></td></tr> <tr> <td>MAX-N</td><td></td></tr> <tr> <td>MAX-P</td><td></td></tr> <tr> <td>MAX-I</td><td></td></tr> <tr> <td>MAX-FAST</td><td></td></tr> </table>	Sensor	Accuracy	MAX-A	70 - 100%, +/-2 digits (1 S.D.)	MAX-AL		MAX-N		MAX-P		MAX-I		MAX-FAST	
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MAX-FAST															
	<table> <tr> <th>Sensor</th><th>Accuracy</th></tr> <tr> <td>OxiCliq A</td><td>70 - 100%, +/-2.5 digits (1 S.D.)</td></tr> <tr> <td>OxiCliq I</td><td></td></tr> <tr> <td>OxiCliq N</td><td></td></tr> <tr> <td>OxiCliq P</td><td></td></tr> </table>	Sensor	Accuracy	OxiCliq A	70 - 100%, +/-2.5 digits (1 S.D.)	OxiCliq I		OxiCliq N		OxiCliq P					
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OxiCliq N															
OxiCliq P															
	<table> <tr> <th>Sensor</th><th>Accuracy</th></tr> <tr> <td>DS-100A</td><td>70 - 100%, +/-3 digits (1 S.D.)</td></tr> <tr> <td>D-YS</td><td></td></tr> <tr> <td>OXI-A/N</td><td></td></tr> <tr> <td>OXI-P/I</td><td></td></tr> </table>	Sensor	Accuracy	DS-100A	70 - 100%, +/-3 digits (1 S.D.)	D-YS		OXI-A/N		OXI-P/I					
Sensor	Accuracy														
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OXI-A/N															
OXI-P/I															
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Sensor	Accuracy														
D-YS	70 - 100%, +/-3.5 digits (1 S.D.)														
D-YSE															
D-YSPD															
	<table> <tr> <th>Sensor</th><th>Accuracy</th></tr> <tr> <td>MAX-R</td><td>80 - 100%, +/-3.5 digits (1 S.D.)</td></tr> </table>	Sensor	Accuracy	MAX-R	80 - 100%, +/-3.5 digits (1 S.D.)										
Sensor	Accuracy														
MAX-R	80 - 100%, +/-3.5 digits (1 S.D.)														
Measurement Wavelengths:	Red 660 Nanometers														
	Infrared 890 Nanometers														
Power:	Not exceeding 15 mW														
Pulse Rate Range:	20 - 240 BPM														
Pulse Rate Accuracy:	+/-3 digits														
Numerics:	Updated every one (1) second.														

CAPNOGRAPHY (OPTIONAL)

Characteristic	Specification
Oridion MicroStream®	
Units:	mmHg, % or kPa
Sampling Rate:	50 ml/min. +/- 7.5 ml/min.
CO ₂ Range:	0 – 99 mmHg (0 – 13.2 kPa and 0 – 13.0 vol% at sea level)
Accuracy:	0 – 38 mmHg +/- 2 mmHg 39 – 99 mmHg +/- 5% of reading +0.08% for every 1 mmHg (above 38 mmHg). Equivalent values for kPa and vol%
	Respiration Rate: 0 – 150 breaths/min.
Resolution:	1 mmHg, 0.1 % or 0.1 kPa
Warm-up Time:	30 seconds (typical)
Frequency Response:	EtCO ₂ accuracy is maintained up to 80 breaths/min. (For maintaining accuracy for respiration rate over 60 bpm, use the neonatal mode.) From 81 to 150 bpm accuracy is +/-12%, if the EtCO ₂ is higher than 18.8 mmHg in neonatal mode.
System Response Time:	2.9 seconds typical, (includes the delay time and the rise time)
Rise Time:	Adult and Neonate: 190 msec max.
Delay Time:	2.7 seconds typical.
Ambient Pressure:	Compensated internally – automatic

TEMPERATURE (OPTIONAL)

Characteristic	Specification
Input:	YSI® 400 compatible
Temperature Range:	29 to 42 °C (84.2 to 107.6 °F)
Accuracy:	+/-0.1°C (+/-0.2°F)
Resolution:	0.1°C or 0.1°F

PATIENT ALARMS

Characteristic	Specification
Adjustable Alarms: (High & Low)	Heart Rate, %SpO ₂ , Pulse Rate, EtCO ₂ , Respiration Rate, Systolic, Diastolic, No Respiration
Fixed Alarms:	Asystole, FiCO ₂
Alarm History:	25 most recent alarms
Indicators:	Audible, Yellow Equipment Alarm LED's, Red Patient Alarm LED's, and Message Window

750E

Patient Parameter	Neonatal Limit Range		Adult Limit Range	
	Low	High	Low	High
Heart Rate	25 – 235 BPM	25 – 235 BPM	25 – 235 BPM	25 – 235 BPM
Respiration Rate	5 – 145 BrPM	5 – 145 BrPM	5 – 145 BrPM	5 – 145 BrPM
SYS	35 – 130 mmHg	35 – 130 mmHg	35 – 250 mmHg	35 – 250 mmHg
DIA	20 – 105 mmHg	20 – 105 mmHg	20 – 215 mmHg	20 – 215 mmHg
End Tidal CO ₂	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa
No Respiration	5 to 30 Sec	5 to 30 Sec	5 to 30 Sec	5 to 30 Sec
%SpO ₂	70 – 95 %	80 – 99 %	70 – 95 %	80 – 99 %
SpO ₂ Pulse	25 – 235 BPM	25 – 235 BPM	25 – 235 BPM	25 – 235 BPM

750C

Patient Parameter	Neonatal Limit Range		Adult Limit Range	
	Low	High	Low	High
End Tidal CO ₂	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa	1 to 99 mmHg .1 to 13.2 % .1 to 13.2 kPa
Respiration Rate	5 – 145 BrPM	5 – 145 BrPM	5 – 145 BrPM	5 – 145 BrPM
No Respiration	5 to 30 Sec	5 to 30 Sec	5 to 30 Sec	5 to 30 Sec
SYS	35 – 130 mmHg	35 – 130 mmHg	35 – 250 mmHg	35 – 250 mmHg
DIA	20 – 105 mmHg	20 – 105 mmHg	20 – 215 mmHg	20 – 215 mmHg
%SpO ₂	70 – 95 %	80 – 99 %	70 – 95 %	80 – 99 %
SpO ₂ Pulse	25 – 235 BPM	25 – 235 BPM	25 – 235 BPM	25 – 235 BPM

NOTE:

Each alarm limit may also be selected "OFF" individually or as a whole.
 Low Limits cannot be set above the associated High Limit.
 High Limits cannot be set lower than the associated Low Limit.

CONTROL PANEL

Characteristic	Specification
Display:	LCD display of measurement results, instructions, troubleshooting messages, waveforms and signal strength bar.
Parameters Displayed:	Systolic Pressure, Diastolic Pressure and Mean Arterial Pressure (MAP) or Systolic Pressure, Diastolic Pressure and Pulse Rate
	Heart Rate
	Respiration Rate
	%SpO ₂
	Pulse Rate
	EtCO ₂ (mmHg, kPa, %) user selectable
	Temperature (in Fahrenheit or Celsius)

OPERATING MODES

Characteristic	Specification
Patient:	Neonate or Adult
ECG:	Continuous Monitoring
Respiration:	Impedance Pneumography
NIBP:	Manual, STAT or Automatic (at preset intervals)
History:	Trend: Review of previous measurements Alarm: Review of previous alarms
%SpO ₂ :	Continuous Monitoring
CO ₂	Continuous Monitoring
Temperature:	Continuous Monitoring

POWER

Characteristic	Specification
Source:	External AC power or internal battery
AC Power:	100 - 240 VAC, 50/60 Hz, 0.5A; Fuse Rating – T500mAL250V (two provided)
DC Power (EMS Option):	+12 VDC; 7W; Fuse Rating – Littelfuse Type 154, Slo-Blo, 5.0A, 125VAC or approved equivalent (one provided)
Battery:	Nickel Metal Hydride (NiMH) battery pack (user removable)
	Charge Time: 3 - 5 hours
	Operating Time: 3 hours (minimum)
Chassis Leakage Current:	100 microamp (maximum)

FEATURES

Characteristic	Specification
Self Test:	System self test is performed each time power is turned on.
Auto Zero:	Zero pressure reference is automatically established after every reading.
Inflation:	Initial inflation to 150 mmHg (Adult) or 100 mmHg (Neonatal) or user selectable. (100, 120, 140, 160, 180, 200) - Adult ; (60, 80, 100, 120) - Neonatal. Subsequent inflation to approximately 30 mmHg greater than previous Systolic pressure.
Deflation:	Automatic
Max Measurement Time:	Limited to 120 seconds (Adult), 90 seconds (Neonate)

SAFETY LIMITS

Characteristic	Specification
Automatic Cuff Deflation:	If cuff pressure exceeds 290 mmHg (Adult); 145 mmHg (Neonate) If measurement time exceeds 120 seconds (Adult), 90 seconds (Neonate) If safety timer detects microprocessor failure

OPERATING ENVIRONMENT

Characteristic	Specification
Operating Temperature:	0°C to 50°C (32°F to 122°F)
Humidity:	15 to 95%, non-condensing
Altitude:	10,000 to -1,000 ft (690 – 1050 hPa)

Monitors may not meet performance specifications if stored or used outside temperature and humidity ranges. When moving the monitor from a storage location, wait at least one-hour prior to use to allow the monitor to adjust to room temperature.

STORAGE/TRANSPORT ENVIRONMENT

Characteristic	Specification
Storage / Transport Temperature:	-20°C to 65°C (-4°F to 149°F)
Humidity:	15 to 95%, non-condensing
Altitude:	10,000 to -1,000 ft (690 – 1050 hPa)

PHYSICAL DIMENSIONS & WEIGHT

Characteristic	Specification
Base Unit	
H x W x D:	6.75 in x 8.5 in x 4.0 in (17 cm x 21.5 cm x 10.2 cm)
Weight:	4.4 lbs approx. (2.0 kg)

SERIAL INTERFACE

Characteristic	Specification
Interface:	Bi-directional serial communication
Speed:	9600 for Printer 115200 for CAS Serial Protocol
Signal Level:	RS232C
Data Length:	8 bits
Start Bit:	1 bit
Stop Bit:	1 bit
Parity:	None

NURSE CALL INTERFACE

Characteristic	Specification
Relay contacts:	Floating, one opening and one closing contacts
Max. Switch Power:	0.3 A at 120 VAC or 1.0 A at 30 VDC
Max. Delay	Less than 0.5 seconds

OPTIONAL ACCESSORIES

Infrared Printer
 Swiveled Hard Mount (for ambulance applications)
 Roll Stand and Basket
 Protective Carrying Case

STANDARDS

Accuracy complies with that given in American National Standard for Electronic or Automated Sphygmomanometers, ANSI/AAMI SP10, 2002. Adult blood pressure measurements determined with this device are equivalent to those obtained by an auscultatory blood pressure measurement device and neonatal ones are equivalent to those obtained by an intra-arterial blood pressure device, within the limits prescribed by the American National Standard for Electronic or Automated Sphygmomanometers. The 4th Korotkoff sound was used to determine Diastolic pressure. Study findings are available.

Units comply with the following requirements:

- ANSI/AAMI SP-10: 2002

- EN 60601-1

- EN 60601-1-2

- EN 60601-2-27

- EN 60601-2-30

- EN 60601-20-49

- EN 864

- EN 865

- UL Classified - UL 60601-1, CAN/CSA C22.2 No.601.1. If so marked

- CE marking according to Directive 93/42/EEC. If so marked

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Possession or purchase of this device does not convey any express or implied license to use the device with replacement parts which would, alone, or in combination with this device, fall within the scope of one or more of the patents relating to this device.

Nellcor® and *OxiMax*® are registered trademarks of Nellcor Puritan Bennett, Inc.

Microstream® and FilterLine® are registered trademarks of Oridion Medical 1987 LTD.

MAXNIBP®, Tuff-Cuff® and Pedisphyg® are registered trademarks of CAS Medical Systems, Inc.

Safe-Cuff™ is a trademark of CAS Medical Systems, Inc.

YSI® is a registered trademark of Yellow Springs Instrument Company



is a registered trademark of CAS Medical Systems, Inc.
All units covered by U.S. patent 4,796,184 and 5,022,403. Other patents pending.

Monitors are  if so marked.