ESCORT Prism™ Patient Monitor Service Manual

Model
20401
20403

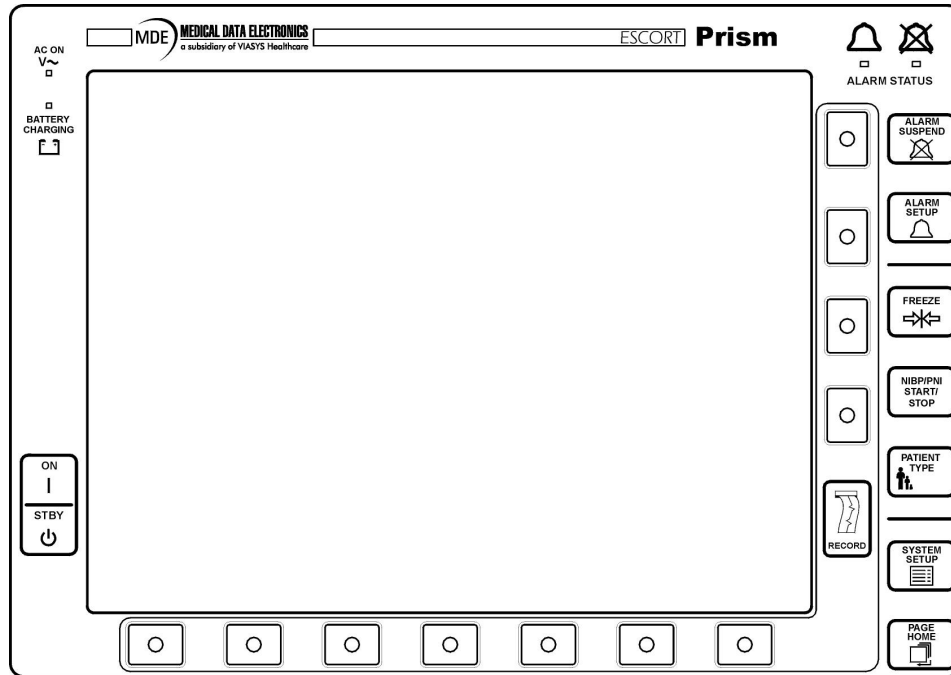*Prism*

MDE **MEDICAL DATA ELECTRONICS**
a subsidiary of VIASYS Healthcare

ESCORT Prism™
Patient Monitor
Service Manual

Model 20401
Model 20403

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a subsidiary of VIASYS Healthcare

CE 0543

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PATENT INFORMATION

MDE US Patents: 4,757,520; 4,922,918

Nellcor US Patents: 4,621,643; 4,830,014; 4,700,708; 4,770,179; 4,869,254; 4,685,464; 4,802,486

Masimo US Patents: 5,482,036; 5,490,505; 5,632,272; 5,685,299; 5,758,644; 5,769,785; 6,002,952; 6,036,642; 6,067,462; 6,206,830; 6,157,850; 6,002,962

CERTIFICATIONS

The PRISM has received the following certifications:

CSA601.1, IEC 601-1-2, UL2601-1, CE/MDD, FCC Part 90.217 (UHF), FCC Part 15 (Spread Spectrum), ETS 300328

WARRANTY

The *PRISM* monitor is warranted against defects in materials and workmanship for a period of twelve (12) months from the date of shipment to the original purchaser. Batteries, cables, cuffs, and sensors are warranted ninety (90) days from date of shipment. Warranty is valid only to the original buyer. Defective equipment should be returned freight prepaid to Medical Data Electronics. Equipment returned with defective parts and assemblies will be either repaired or replaced. This warranty is not applicable if repair has been attempted, if the instrument has been damaged due to operation outside the environmental and power specifications for the product, or due to improper handling or use.

If any fault develops, notify MDE Technical Support giving full details of the difficulty, and include the model and serial number of the device. Upon receipt of the shipping instructions, forward the device prepaid and repairs will be made at the factory.

The foregoing warranty is in lieu of all other warranties expressed or implied, including but not limited to any implied warranty or merchantability, fitness or adequacy for any particular purpose or use. Medical Data Electronics shall not be liable for any incidental or consequential damages.

NOTICE

TECHNICAL SERVICE

If you experience any problems with this product or would like more information about related equipment, please call one of the telephone numbers listed below. You can also send an email to the email address listed below. Medical Data Electronics is dedicated to providing accurate and timely responses to all of our customer's requests.

Technical Service	(818) 768-6411
MDE FAX Line	(818) 768-2899
Email	technicalsupport@emailmde.com

Written requests for information should be addressed to:

Medical Data Electronics
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Arleta, CA 91331-4330

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Chapter 1

Introduction

General Description

The *PRISM* is a patient monitor capable of keeping track of several parameters simultaneously, including dual vector ECG, Respiration, SpO_2, Noninvasive Blood Pressure, one to three Invasive Blood Pressures, 2 Temperatures, Mainstream/Sidestream $ETCO_2$ and Cardiac Output. The *PRISM* features many modular components that are interchangeable with other *ESCORT II 100* and *300* Series modular monitors.

The *PRISM* monitor is factory equipped with a color Liquid Crystal Display (LCD) screen, or an electroluminescent (EL) display screen that is capable of displaying as many as five waveform traces simultaneously. Both of these display types accurately reproduce physiological waveform abnormalities, providing the detail needed to make clinical decisions.

The *PRISM* monitor may be operated with AC, battery, or external DC power. Battery operation is provided by two modular batteries, with operating time ranging from 1.25 to 2.25 hours, depending upon configuration.

The *PRISM* can monitor adult, pediatric, and neonatal patients. The appropriate monitoring mode for each patient, ADULT, PED, or NEO, is selectable. Changing from one mode to another automatically changes all appropriate algorithms, alarm limits, and any applicable parameter defaults.

The *PRISM* monitor minimizes the number of function keys you see at any one time. Some keys, fixed function keys, are labeled on the front panel and always retain the same function. Other keys, softkeys, are not labeled and vary in function according to the labels displayed adjacent to them on the monitor's screen. There are eleven softkeys, seven located at the bottom of the front panel, and four located on the right side of the front panel. For more information on the monitor keys and their functions, see Chapter 2, **"Controls & Indicators"**.

Factory defaults have been established and installed for all system and physiological monitoring issues (i.e., alarm settings, default ECG lead, etc.). These values may be easily reconfigured to meet your specific needs.

This service manual provides readily available documentation to troubleshoot, repair, and maintain the *PRISM* monitor. It outlines functional block diagrams, board layouts, and schematic diagrams. Also included are performance check and preventive maintenance sections in Chapter 9 to keep your *PRISM* monitor(s) working efficiently and reliably for many years to come.

Safety Considerations

Read the following sections before using or servicing the *PRISM* monitor. These warnings and symbols are presented to both increase patient safety and prevent damage to the monitor.

Warnings

Read this service manual in its entirety prior to attempting any service or repair.

ONLY qualified technicians possessing specific experience and expertise in the servicing of biomedical equipment should attempt servicing the *PRISM* monitor.

HIGH VOLTAGES are present within the *PRISM* monitor. Use caution when servicing.

Always use an ESD (Electro-Static Discharge) grounding wrist or ankle strap that is properly grounded. Always perform service in an ESD safe environment.

The *PRISM* is intended only as an adjunct in patient assessment. It cannot replace skilled nursing care and proper surveillance. Keep high-risk patients under close surveillance.

Carefully read the operator's manual, all directions for use of monitor accessories, and all precautionary information before attempting clinical use of the *PRISM*.

When operating the *PRISM* from an AC power source, the wall receptacle must be a three-wire, grounded, hospital grade outlet. Use only *PRISM's* original hospital grade AC power plug and cord, or an equivalent hospital grade plug and cord. If in doubt about the integrity of the grounding of the main supply connection, the unit must be operated by battery power.

DO NOT plug unit into multiple outlet power strip to avoid summation of leakage currents.

Explosion hazard. Do not use the *PRISM* in the presence of flammable anesthetics.

In the event of an adverse patient condition, the audio alarm will not sound if it has been temporarily silenced or disabled.

For pacemaker patients, the HR may continue to count the pacemaker artifact during cardiac arrest or other arrhythmias. Keep pacemaker patients under close surveillance.

Do not under any circumstance use replacement parts and connect devices that are not approved by Medical Data Electronics.

Do not use in ambient temperatures above 40° C or below 5° C. Storage and transport specifications are: Temperature = -10° C to 40° C, Humidity = 0% to 90%, Pressure = 500 to 1060hpa.

For protection against fire, replace fuses only with those of the same type and rating.

The alarms for some parameters are factory set to default to the OFF setting. This may not be consistent with the policies of your institution or the type of patients being monitored by the *PRISM* monitors.

Symbols

The following cautionary symbols appear on the *PRISM* monitor. Familiarize yourself with these symbols and their meaning before using the monitor.

Type CF Defibrillation Protected Equipment: Isolated patient connections comply with the allowable leakage current limits for direct cardiac application and are protected against the effects of defibrillation.

Type CF Applied Part: Isolated Patient connections comply with the allowable leakage current limits for direct cardiac application.

Attention: Consult accompanying documents.

Replace Fuses as Marked: For protection against fire, replace only with fuses of the same type and rating.

Caution: Electric shock hazard. Do not remove cover. Refer servicing to qualified service personnel.

Alternating Current: 100-240V @ 50/60 Hz.

Equipotential Connection: When external DC power is used, the equipotential connection must be used as a protective ground terminal.
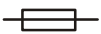
Fuse: Voltage and current ratings appear adjacent to symbol.

The CE symbol indicates that the device conforms to the Medical Device Directive.

Controls and Indicators

Front Panel

A summary of the **PRISM** front panel keys and indicators is provided in the figure below and on the following pages. Fixed functions keys, softkeys, and indicators are each discussed individually.
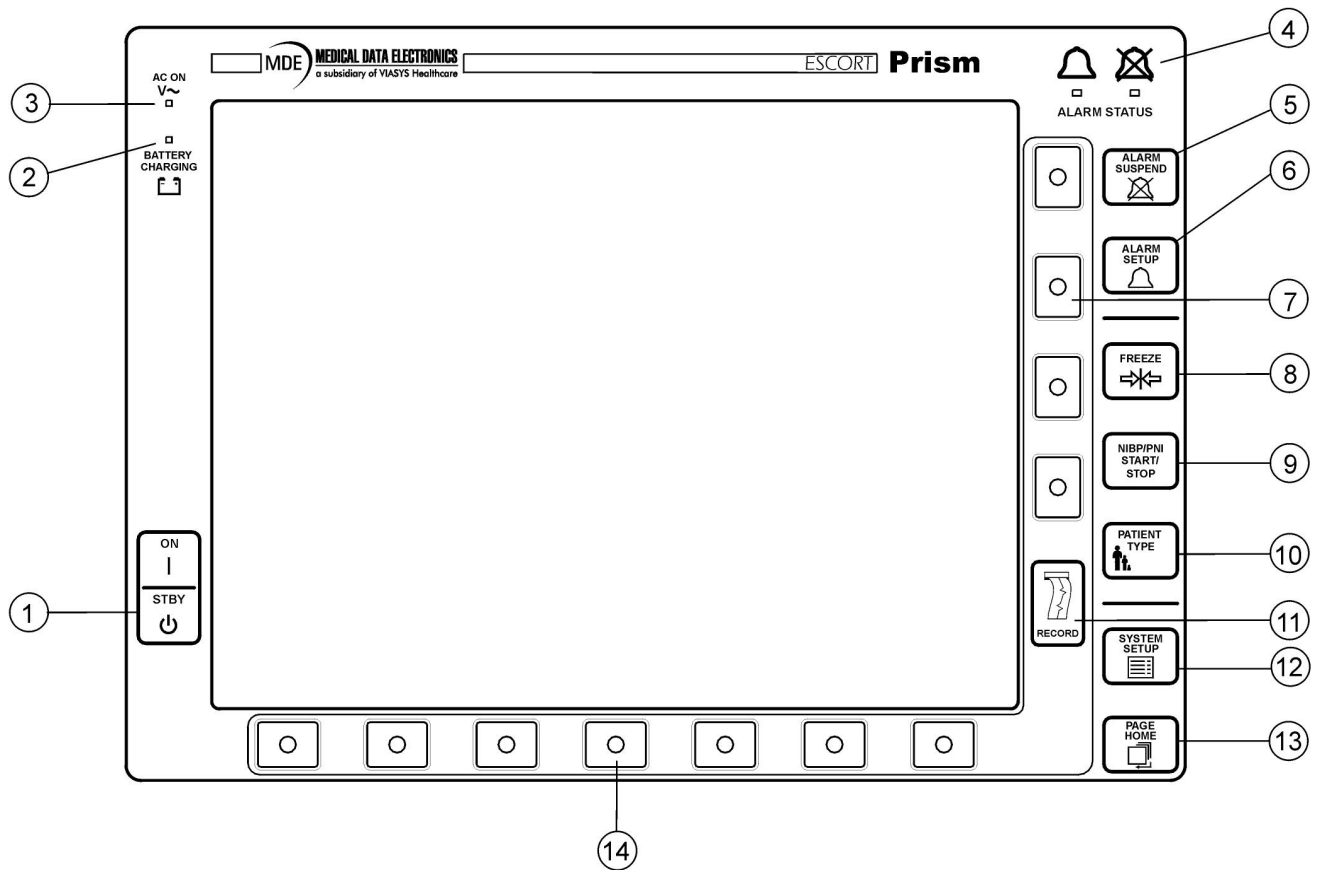
Figure 2-1. *PRISM Front Panel Detail*

1. Monitor On/Standby Keys

2. Battery Charging Indicator

3. AC Power Indicator

4. Alarm Indicator Lights

❑ When flashing, one or more parameters are alarming

❑ When lit, one or more alarms are suspended, OR all alarms are turned off

5. Alarm Suspend Key (180 seconds)

6. Alarm Setup Key

7. Softkeys for Parameters in Waveform Display Zone

8. Freeze/Unfreeze All Waveform Traces

9. NIBP Start/Stop Key

10. Patient Type Selection Key (Adult, Ped, Neo)

11. Start/Stop Manual Recordings

12. Display System Setup Menu

13. Return to Home Page

14. Seven Parameter/System Softkeys

Fixed Function Keys (USA and International)

The *PRISM* includes the following nine (9) fixed functions keys: **ON/STBY, ALARM SUSPEND, ALARM SETUP, FREEZE, NIBP START/STOP, PATIENT TYPE, SYSTEM SETUP, PAGE HOME,** and **RECORD**. Each of these keys, as the name implies (or symbol for International), is fixed and performs its intended function regardless of the monitoring scenario. A brief description of each is provided below.
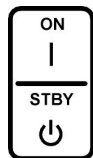
ON/STBY

Turns the display on and initializes the *PRISM* when **ON** is pressed. When the *PRISM* is turned on, you will hear two beeps. The *PRISM* is returned to standby status by pressing **STBY**. When in **STBY**, the batteries continue to be charged if the *PRISM* is connected to AC power, but no monitoring or storing of data occurs.

ALARM SUSPEND

Temporarily suspends alarm tones. The factory defaults for alarm suspend intervals are 180 seconds in adult mode, 90 seconds in pediatric mode, and 60 seconds in neonatal mode. If an alarm limit is violated, pressing **ALARM SUSPEND** will silence the alarm tone. Pressing the key again before the suspend time period has elapsed will reactivate the audible alarm tones if the alarm condition still exists. While alarms are suspended, the following message will appear on the *PRISM* screen:

ALARM SUSPEND *XXX*

The *XXX* will be replaced with the number of seconds remaining until the alarm suspend condition is removed.

ALARM SETUP

Displays the alarm status for all vital sign parameters. Alarm **ON/OFF** status, alarm priority level, high and low limits, and recording type for each active parameter are displayed.

A bell… … next to the listed parameter indicates that one or more alarms for that parameter is **ON**. An X is displayed when all alarms for the associated parameter are **OFF**.

FREEZE

Freezes all displayed waveforms for evaluation purposes. Pressing FREEZE again releases waveforms.

> **NOTE: Waveforms cannot be frozen during recording. Initiating a recording will also release the frozen waveforms.**

NIBP START/STOP

Pressing the **NIBP START/STOP** key immediately initiates an inflation and measurement. You can also press the NIBP softkey to access the setup keys for setting automatic measurement intervals.

PATIENT TYPE

The **PATIENT TYPE** key is used to select or display the current patient type. The selections are **ADULT, PED,** and **NEO**.

SYSTEM SETUP

SYSTEM SETUP is used to change the monitoring conditions that your *PRISM* monitor is currently set up for.

PAGE HOME

Returns the *PRISM* display to the **HOME PAGE** screen (i.e., the screen normally displayed during patient monitoring).

RECORD

Initiates a 16-second recording of any one or two parameter waveforms. To stop a recording in process, press **RECORD** prior to completion of a manual or alarm recording. To specify the parameters to be recorded, press the softkey(s) of the desired parameter(s) within two seconds after pressing the **RECORD** key. If no parameters are selected after pressing record, a 16-second strip of ECG waveform will be recorded.

> **NOTE: Active waveforms (i.e., parameters currently being monitored) do not need to be displayed in order to acquire a recorded waveform.**

Parameter Softkeys

The *PRISM* monitor is equipped with eleven (11) softkeys. Softkey operation changes depending upon the monitoring mode, parameter, or configuration options being accessed. Four parameter softkeys are located to the right of the display screen. Seven parameter/system softkeys are located below the display screen.
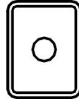
WAVEFORM SOFTKEYS

These four softkeys, located on the right side of the front panel, provide access to the function keys of the parameters displayed in the waveform display zone. ECG is always assigned to the top waveform trace, and as many as three additional parameters, when available (i.e., installed), can be assigned to trace 2, 3, 4, or 5 depending upon options.

SYSTEM SOFTKEYS

The function of these seven softkeys, located directly below the display screen, depends on the label or function key displayed directly above the softkey. In the **HOME PAGE** state, parameter labels and associated numeric values may be displayed directly above one or more of the softkeys. To access the function keys for any of these parameters, press the softkey under the parameter label and a page of function keys that relates specifically to that parameter will be displayed.

Indicators

The *PRISM* includes up to four indicators, which illuminate to notify the operator of a specific activity or situation. These indicators notify the operator of AC power, battery charging, and alarm status.

AC ON
V∼

AC ON INDICATOR

The green AC ON LED (Light Emitting Diode) illuminates when the *PRISM* is connected to AC power.

BATTERY
CHARGING

BATTERY CHARGING INDICATOR

The yellow CHARGING LED illuminates when the *PRISM's* batteries are charging. The CHARGING LED will not be illuminated when the batteries are fully charged, or when the monitor is not connected to AC power.

ALARM INDICATORS

□ When flashing, one or more parameters are alarming.

□ When lit, one or more alarms are suspended, OR all alarms are turned off.

Display Screen

The following is a brief description of the information and format presented on the **PRISM** display screen.
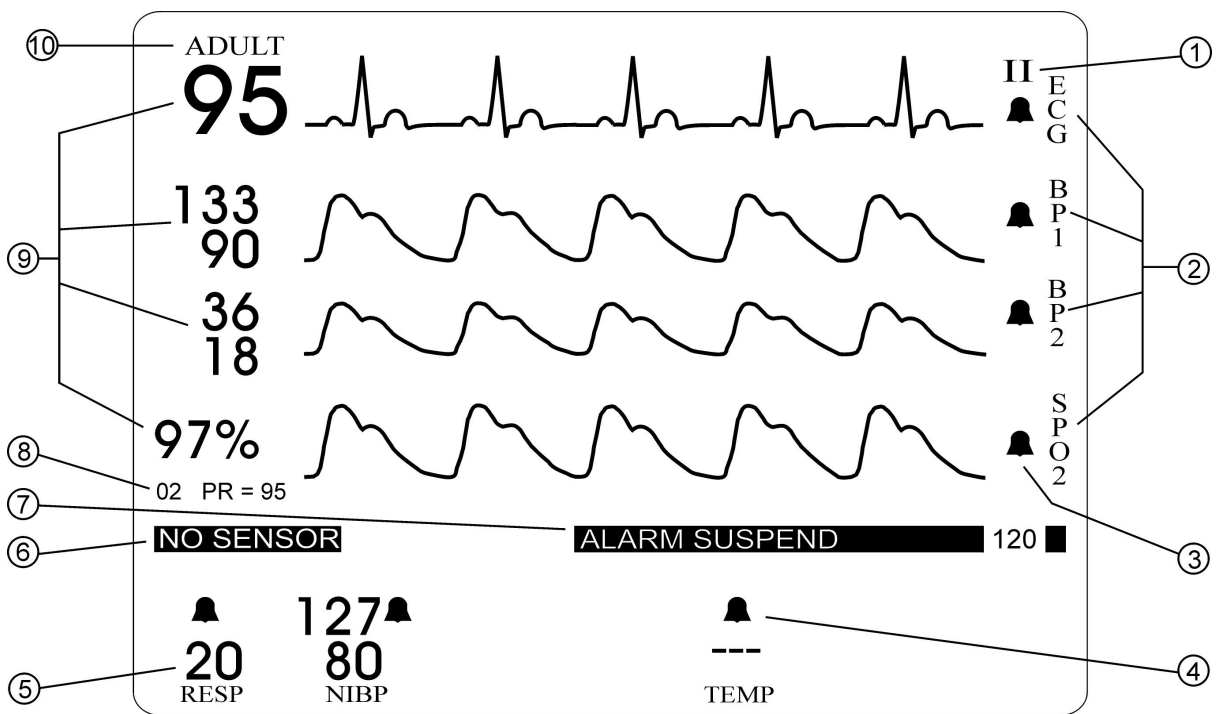
Figure 2-2. *PRISM Display Screen*

1. ECG Lead in Use

2. Softkey Labels for Parameters Displayed in the Waveform Display Zone (WDZ)

3. Alarm Status for Parameters in the Waveform Display Zone

4. Alarm Status for Parameters in the Numeric Only Display Zone

5. Numeric-Only Display Zone

6. Message Area for Parameters in the Numeric Only Display Zone

7. System Message Area

8. Message Area for Parameters in the Waveform Display Zone

9. Waveform Display Zone with Associated Numerics

10. Current Monitoring Mode (Patient Type selected)

ECG Lead in Use

Indicates the ECG lead displayed in the top trace of the WDZ. Choices include lead I, II, III, or V LD (and depending on hardware and software, choices may include aVF, aVL, or aVR) (for "chest lead" in a 5-lead configuration). If heart rate is being derived from SpO2 or Invasive Blood Pressure, *PULSE* is displayed.

Softkey Labels for Parameters Displayed in the Waveform Display Zone (WDZ)

The labels displayed adjacent to the parameter softkeys specify the parameters displayed in the WDZ.

Alarm Status for Parameters in the Waveform Display Zone

Each bell displayed in the WDZ indicates the alarm **ON/OFF** status for the parameter adjacent to it.

If a solid bell is displayed, one or more alarm for the associated parameter is **ON**.

If the bell is displayed with an X through it, the alarms for the associated parameter are **OFF**.

Alarm Status for Parameters in the NODZ

Each bell displayed in the Numeric-Only Display Zone indicates the alarm **ON/OFF** status for the parameter listed below it.

If a solid bell is displayed, one or more alarm for the associated parameter is **ON**.

If the bell is displayed with an X through it, the alarms for the associated parameter are **OFF**.

Numeric-Only Display Zone (NODZ)

The parameter labels displayed above the softkeys at the bottom of the front panel specify the parameters associated with each softkey. The numeric data associated with the parameters are displayed above the parameter labels in the Numeric-Only Display Zone.

> ✓ **NOTE: In the HOME PAGE state, the parameter labels and numeric data are displayed directly above the softkeys. When a parameter or system setup page is displayed above the softkeys, the Numeric-Only parameter labels and associated data are displayed slightly above the setup page.**

Message Area for Parameters in the NODZ

Messages concerning parameters in the NODZ will be displayed in a reverse-video box on the left side of the screen, just above the NODZ. Message display is temporarily obscured when a parameter or system setup page is displayed. In the **HOME PAGE** state, the message continues to be displayed as long as the message condition exists.

System Message Area

A message that is not specific to a single parameter, such as **"ALARMS SUSPENDED 180"**, is displayed in a reverse-video box, just below the WDZ. Message display is temporarily obscured when a parameter or system setup page is displayed. In the **HOME PAGE** state, the message continues to be displayed as long as the message condition exists.

Message Area for Parameters in the WDZ

Messages concerning parameters displayed in the WDZ will be displayed in a video box below the numeric data for the corresponding waveform parameters. The message is displayed as long as the message condition exists.

Waveform Display Zone with Associated Numerics

The Waveform Display Zone displays waveform traces and associated numeric data for as many as four different parameters. The top waveform trace is reserved for the ECG waveform; however, you can assign different parameters to the other three waveform traces.

Current Monitoring Mode (Patient Type selected)

The current monitoring mode is displayed at the top of the screen — **ADULT, PED,** or **NEO**. The monitoring mode can be changed through the system function key **ADULT/PED/NEO**.

Side Panel

Figure 2-3 displays the right side of the *PRISM* monitor. The Multiparameter Module, the ISP Port, and the Multichannel Recorder Module may each be accessed from this side of the monitor.
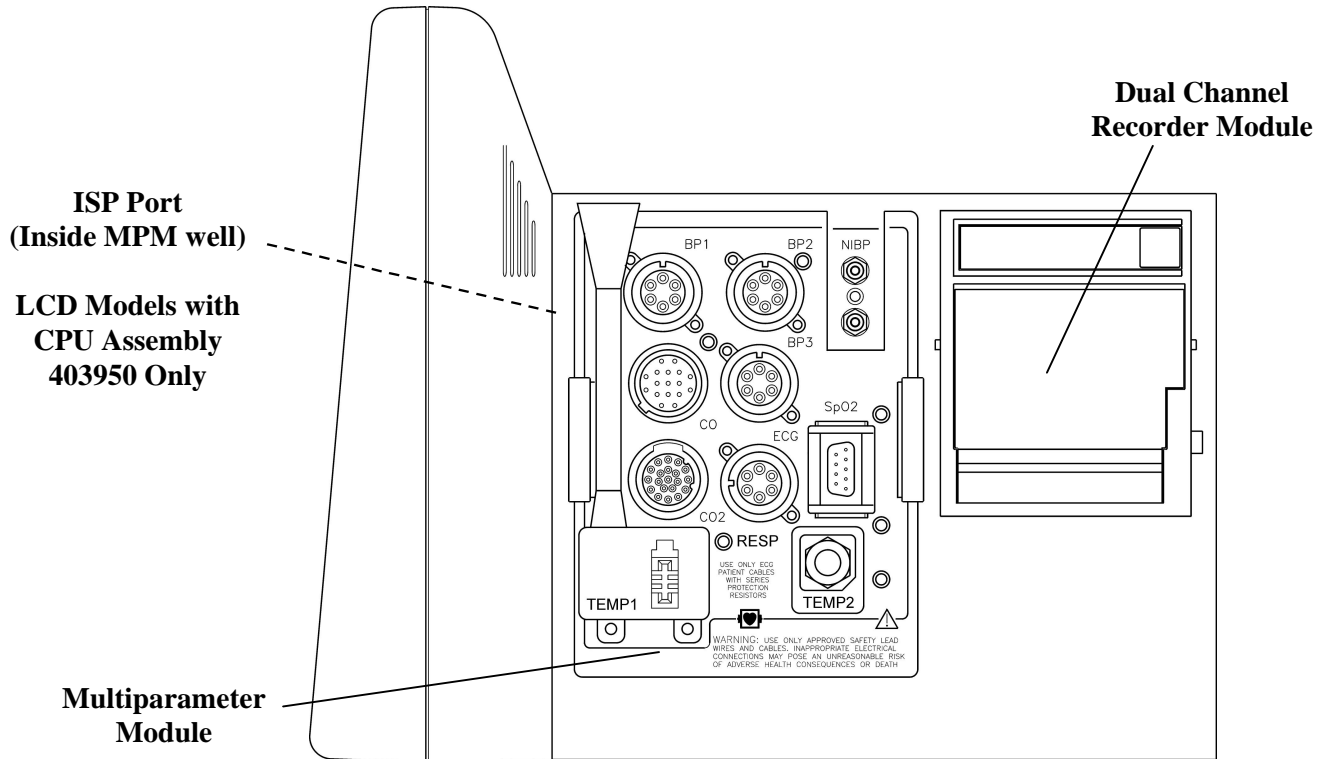
Figure 2-3. *PRISM Right Side Panel*

Multiparameter Module

The module in Figure 2-3 is configured for several parameters; your Multiparameter Module may be configured for fewer parameters. This module may be interchanged with any *PRISM* monitor.

Dual Channel Recorder Module (Option)

The Recorder module provides manual and alarm recordings of any one or two waveforms simultaneously.

Serial Interface (ISP Port)

This port is located inside the MPM well and is used to upload and download software data from external sources. Only Prism LCD models 20403 with CPU Board assembly 403950 has ISP capability. *Refer to Chapter 8 (Mechanical) for illustrations showing the location of the ISP Port*.

Rear Panel

Figure 2-4 presents the *PRISM* rear panel. Brief descriptions are provided for the areas indicated.
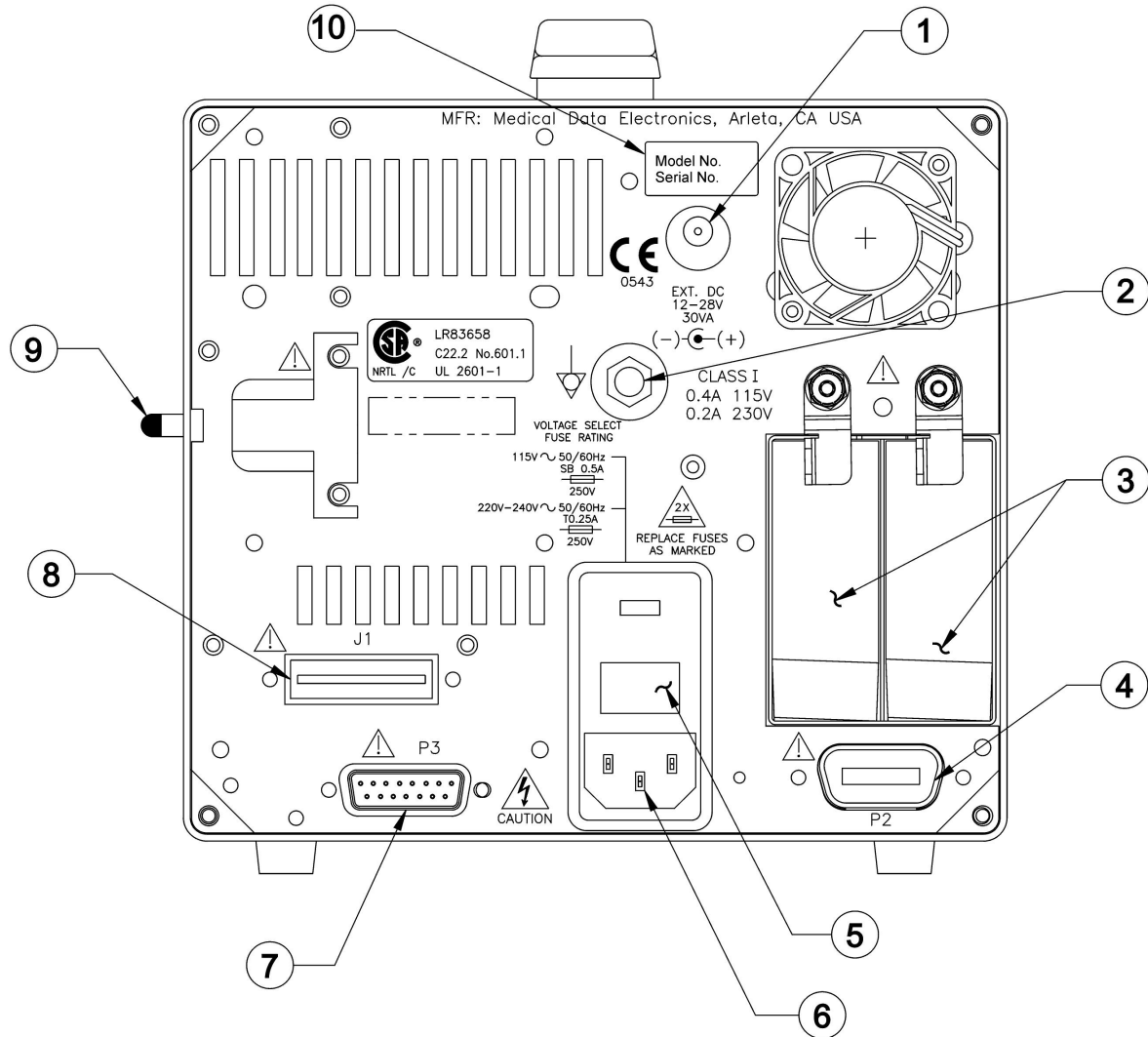
Figure 2-4. *PRISM Rear Panel*

1. External DC Input Connector (optional)

2. Equipotential Connector (optional)

3. Batteries

4. Defibrillator/ Pacer Interface

5. Fuse Holder/Voltage Selector

6. AC Power Cord Input Connector

7. Auxiliary Output Connector

8. Add-On Module Interface (J1 Connector)

9. Recorder Release Lever

10. Model and Serial Number Label

External DC Input (12 - 28V) Connector

Allows an external DC power source to be connected for extended use during transport where AC power is not available. Batteries are not charged with external DC power.

Equipotential Connector

Provides grounding for the monitor when the monitor is used with other medical equipment. It must be used as a protective ground terminal when the monitor is operated with external DC power.

Batteries

These two slots contain modular batteries which provide power in transport situations or when AC power is not available.

Defibrillator/Pacer Interface

Provides connection and communication between the *PRISM* monitor and the ESCORT Defibrillator/Pacer.

Fuse Holder/Voltage Selector and Fuse Replacement

The fuse holder contains the fuses and the voltage selector for the monitor. Open the door of this holder to replace fuses or to configure the voltage selection block — 115 VAC or 230 VAC. The present voltage setting can be read through the small rectangular window on the door of the holder. It is recommended that qualified technical service personnel replace fuses or change the voltage selection when necessary.

⚠️   **WARNING: For protection against fire, replace the fuses only with those of the same type and rating.**

The *PRISM* requires two identical slow blow 0.5A fuses for 115 VAC operation, or two slow blow 0.25A fuses for 220 VAC operation. Ensure that the AC power cord has been disconnected before replacing fuses. Carefully open the door of the fuse holder with a short 1/8" flat screwdriver. Replace the blown or defective fuse with one of the same type and rating. Noting orientation, gently slide the fuse holder back until it locks snugly into its original place. After the fuse replacement, connect the AC power cord to the *PRISM*. The unit is now ready for operation.

AC Power Cord Input Connector and Optional Power Cord Mounting Bracket

Allows connection of the AC power cord to the monitor. In addition, the AC power cord must be plugged into an AC source before the monitor can operate on AC power and before the batteries can be charged.

For permanent connection, the MDE power cord bracket should be installed. See Figure 2-5 for instructions on installing the power cord mounting bracket.
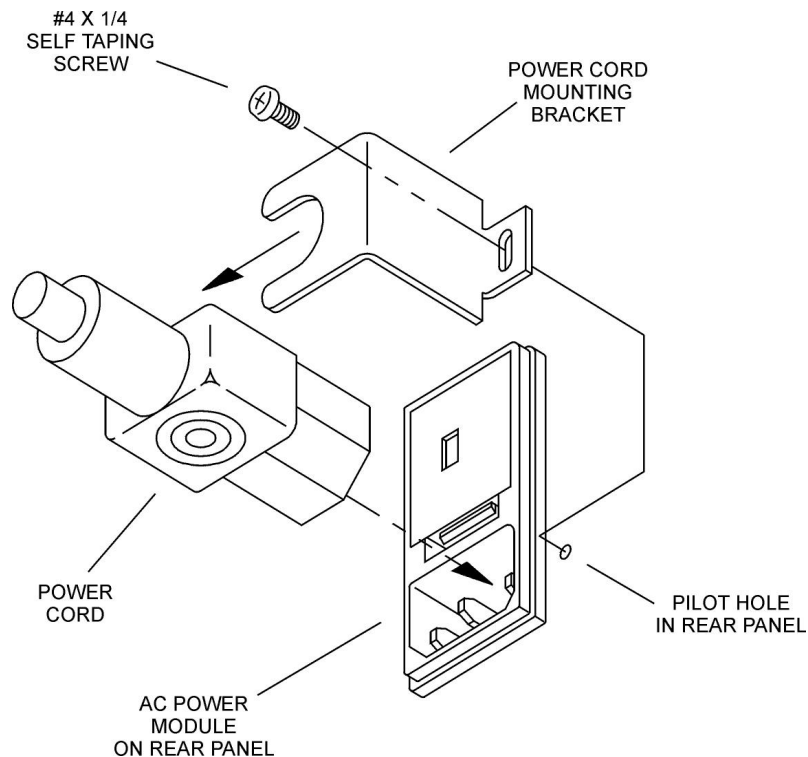
Figure 2-5. *AC Power Cord Bracket Installation*

Auxiliary Output Connector

Provides analog waveform or alarm relay closure interface signals from the *PRISM* to other clinical instruments.

⚠ **WARNING: When connecting the *PRISM* to any other instrument, verify proper operation before clinical use. Refer to the other instrument's operation manual for complete instructions.**

Add-On Module Interface

If a transceiver module is connected here, wireless communications between the monitor and an MDE Central Station can be established.

If a telemetry receiver module is connected, communication between the monitor and an ambulatory transmitter can be established.

If a CIS module is connected, communication to a hospital information system computer can be established, or RS232 communications can be established.

Chapter 3

Power Sources

Power Module

WARNING: Always locate the *PRISM* and its power cord away from any electrosurgery equipment and its power cord and cables.

There are three options for providing power to the *PRISM* monitor: **AC**, **Battery**, and **External DC** power. These options and their requirements are described below.

AC Power

WARNING: When operating the *PRISM* from an AC power source, the wall receptacle must be a three-wire, grounded, hospital grade outlet. Use only *PRISM*'s original hospital grade AC power plug and cord, or an equivalent hospital grade plug and cord. If in doubt about the integrity of the grounding of the main supply connection, the unit must be operated by battery power.

If the *PRISM* monitor is operated by AC power alone, make sure the following requirements are met:

1. The fuses and voltage selected in the fuse holder on the rear panel must be appropriate for the line power to which the monitor is connected — 115 VAC or 230 VAC (the present voltage setting can be read through the small rectangular window on the fuse holder door).

2. The *PRISM* monitor power cord is connected to both the monitor and AC power source.

NOTE: For permanent connection, the MDE power cord bracket should be installed.

If the preceding requirements are met, the AC ON LED should be illuminated. If the preceding requirements are met and the LED is not illuminated, qualified service personnel should inspect the monitor and connection.

Battery Power

Power to the *PRISM* monitor may be supplied by utilizing a modular battery or batteries. The battery or batteries transform the *PRISM* into a fully functional, portable monitor available for use in various transport situations.

The batteries utilized in the *PRISM* monitor are 12 VDC sealed lead-acid type rated at 2.0 AH. Fully charged batteries should measure approximately 13.0 to 13.5 Volts DC with an open load.

The *PRISM* will indicate battery status on screen as **BATTERY HI, MID, LOW** or **VERY LOW**. Battery status may be viewed from the **TEST** page when **SW STAT INFO** is selected and the monitor is running on battery power.

Battery charging circuitry is located on the Power Supply Board. See Chapter 4, "Power Supply Board" for details.

> **NOTE: Never discharge the batteries completely. To ensure long battery life, always recharge batteries immediately after use. An optional battery charger (MDE Part Number: E2700-12) is recommended. Batteries should be replaced every two (2) years regardless of test results. Used batteries should be recycled or disposed of properly in accordance with local regulations.**

> **NOTE: Refer to the operator's manual for instructions on removing and replacing the modular batteries.**

The *PRISM* accommodates up to two (2) rechargeable sealed lead-acid batteries (MDE Part Number E2700-37M).

The following guidelines apply when operating the *PRISM* with battery power:

- Operating time with two fully charged batteries is 1.25 to 2.25 hours, depending upon monitor configuration.

- Use of the monitor's recorder will shorten operating time 5 minutes for every minute the recorder runs.

- The batteries will automatically recharge if the monitor's AC power cord is connected to AC power source. The front panel AC ON LED will illuminate when the monitor is connected to AC power source. The front panel CHARGING LED will illuminate when the batteries are charging and will be OFF when the batteries are about 90% charged.

> **NOTE: Neither the AC ON nor the CHARGING LED will be illuminated when the monitor operates on battery power alone.**

- *PRISM* charges fully depleted batteries to a 90% charge in approximately 5 hours when the monitor is connected to an AC power source and is in STBY mode.

- Batteries can be externally charged with *PRISM's* optional external Multiple Battery Charger (E2700-12). The Multiple Battery Charger can fully charge as many as three fully depleted batteries within three hours.

- When you turn the monitor **ON** and it is powered by batteries alone, the *PRISM* displays one of the battery level messages listed in Table 3-1. The message will be displayed for thirty (30) seconds on the system message line.

> **NOTE: Battery cycle life (operating time) is dependent on battery usage and maintenance. To maximize battery cycle life, do the following:**

1. Operate the *PRISM* monitor with AC power whenever possible.

2. Always charge the batteries when the *PRISM* is not being used.

3. Immediately charge the batteries if the level reads **LOW** or **VERY LOW**.

4. Replace batteries after two years of use.

Table 3-1. *Battery Power Levels*

MESSAGE	BATTERY LEVEL
MONITOR BAT HI	> 60% Charge
MONITOR BAT MID	20-60% Charge
MONITOR BAT LOW	< 20% Charge
BATTERY VERY LOW (Intermittent Alarm Tone Sounds)	Approximately 10 minutes of battery life remains

External DC Power

An auxiliary connector (center pin positive) labeled **DC IN 12-28V, 30VA** is located on the rear panel of the *PRISM*. This allows connection to an external DC power source when AC power is not available. The external DC power source will not charge the internal batteries, however the batteries will maintain their charge while the monitor is being operated in this mode.

> **WARNING: When using an external DC power source, the equipotential connector must be used as a protective ground terminal.**

Turning on the Monitor

Perform the following steps to turn on the monitor:

1. Make sure you have chosen your power source (AC, Battery, or External DC), and have followed the guidelines and requirements in the appropriate section.

2. Press the **ON** key on the *PRISM*'s front panel. You should see the *PRISM* display screen and hear two beeps.

> **NOTE: The first time the monitor is turned ON, after delivery from the factory, or whenever ALL default settings are set back to factory, a message will be displayed on the monitor screen indicating that all defaults are set to factory. To remove the display of the message, press the ALARM SETUP key.**

Power Supply Board

Overview

Power Supply Board

The Power Supply Board provides the flexibility to operate the unit via three inputs: AC (alternating current), external DC, or battery. The Power Supply Board will charge batteries with AC supply only. Voltages created by the Power Supply Board are used throughout the *PRISM*. Fan control, battery level-detect, and low voltage shutdown circuitry are also contained on the Power Supply Board.

Inputs

The Power Supply Board utilizes any one of three inputs. These inputs are 18-22VAC from the AC supply at J7, external DC source (12 – 28VDC, 30VA) at J6, and battery input (10-13VDC) at J8. When the power supply is input by the AC supply, the **AC ON** led will be illuminated on the front panel. Input from the CPU board is PS_SYNC. This is a 250 kHz signal for noise reduction throughout the *PRISM*. Inputs from the front panel membrane **ON/STBY** key will enable the control relay to turn the system **ON** or **OFF**.

Voltage Creation

Voltage creation starts when the operator touches the **"ON"** key on the front panel. This latches the control relay on the power supply and powers the input of the pulse width modulator (PWM). The PWM will enable the power mosfets into switching V+ through the primary of the transformer. Output voltages are then filtered and rectified before being transferred to the CPU board.

Battery Charging

All battery charge functions are controlled on the Power Supply Board. The batteries are charged from the input AC source. The battery charging is controlled by a programmable microcontroller. Maximum charge current is 400 milliamperes. When the unit is charging above 50 mA, the battery charging LED will be illuminated on the front panel. A floating charge current of 50 mA occurs when the battery is approximately 90% charged. Charge times will be approximately 5 hours to 90% charge when in Standby mode.

Battery Level

The microcontroller on board the power supply detects and reports the battery level to the CPU board. The signals to the CPU board are BAT_CON0 and BAT_CON1. Refer to Table 4-1 for battery voltage indicator levels. The battery level will be displayed for 30 seconds when initially operating on battery power. After 30 seconds, the battery level status can be viewed on the **TEST / STAT INFO SW** page (Find and press the **TEST** softkey, then press the **STAT INFO SW** softkey).

Table 4-1. *Battery Conditions*

BAT_CON0	BAT_CON1	Battery Condition
1	1	High
0	1	Mid
1	0	Low
0	0	Very Low

Fan Control

The *PRISM* controls the internal temperature with a temperature sensor and fan. When the internal temperature reaches 115° F, the temperature switch closes and enables the fan to rotate. The fan control circuitry resides on the Power Supply Board. The fan is located on the rear panel.

Shutdown Circuitry

There are two methods of shutting down the *PRISM*. The first method is when the operator presses the **STBY** key on the front panel. When this is performed, the control relay enables a ground reference to the PWM's soft start input. This will cease the voltage creation and turn off the power supply. The second method is low voltage shutdown. When the VBATT signal drops below approximately 8.3VDC, a comparitor circuit will pull the soft start input to the PWM low, and force the power supply off.
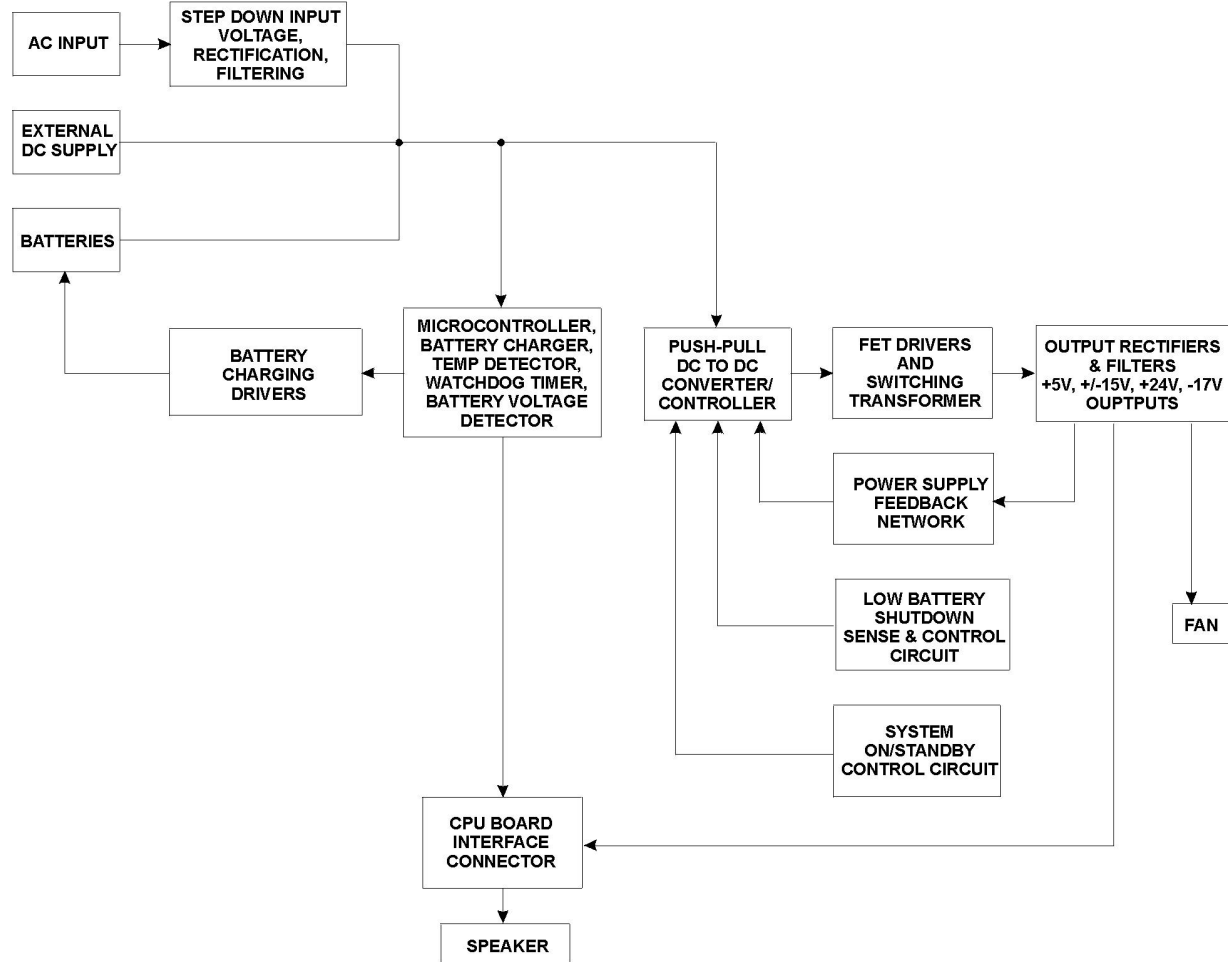
Figure 4-1. *PRISM Power Supply Block Diagram*
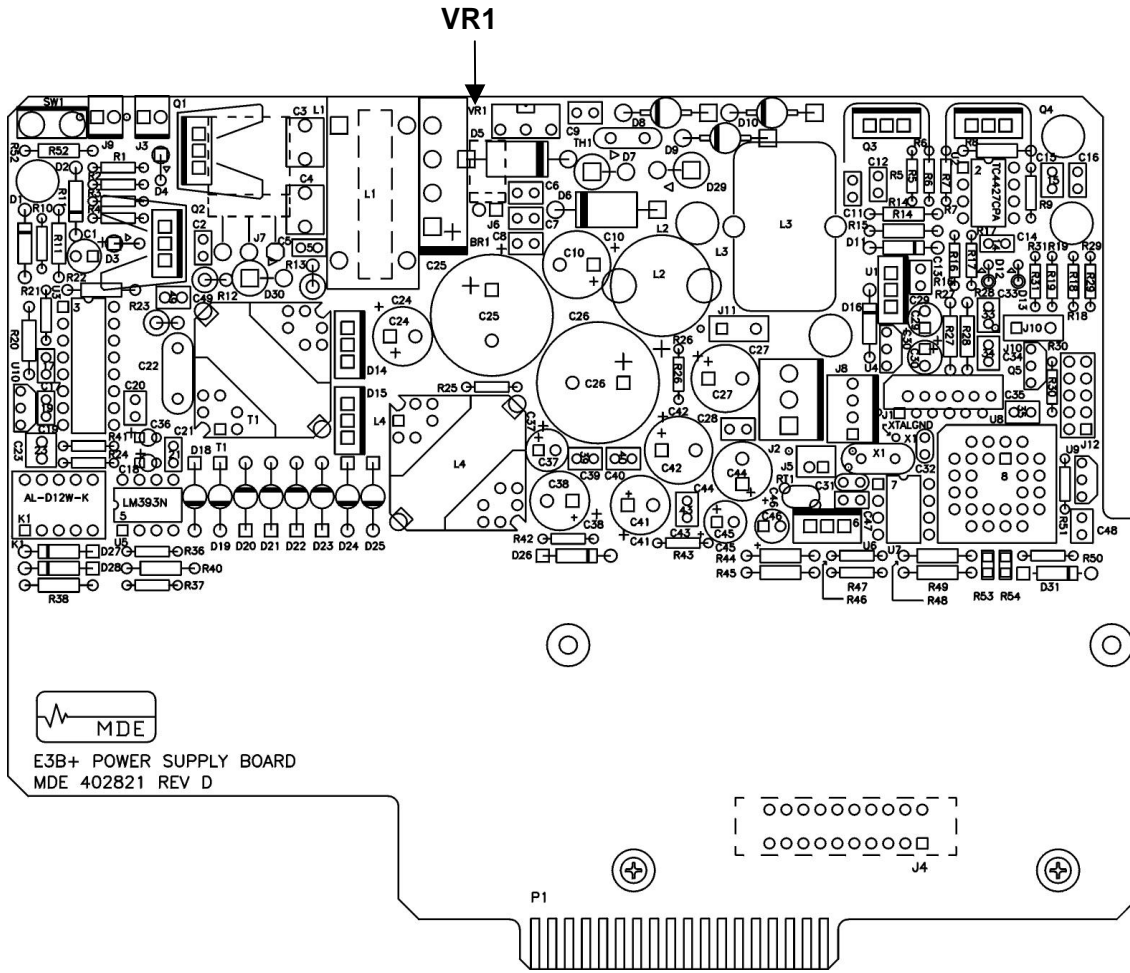
Figure 4-2. *PRISM Power Supply Board*

Table 4-2. *Power Supply Board Adjustment*

Adjustments	
VR1	Model 20300 contrast adjustment
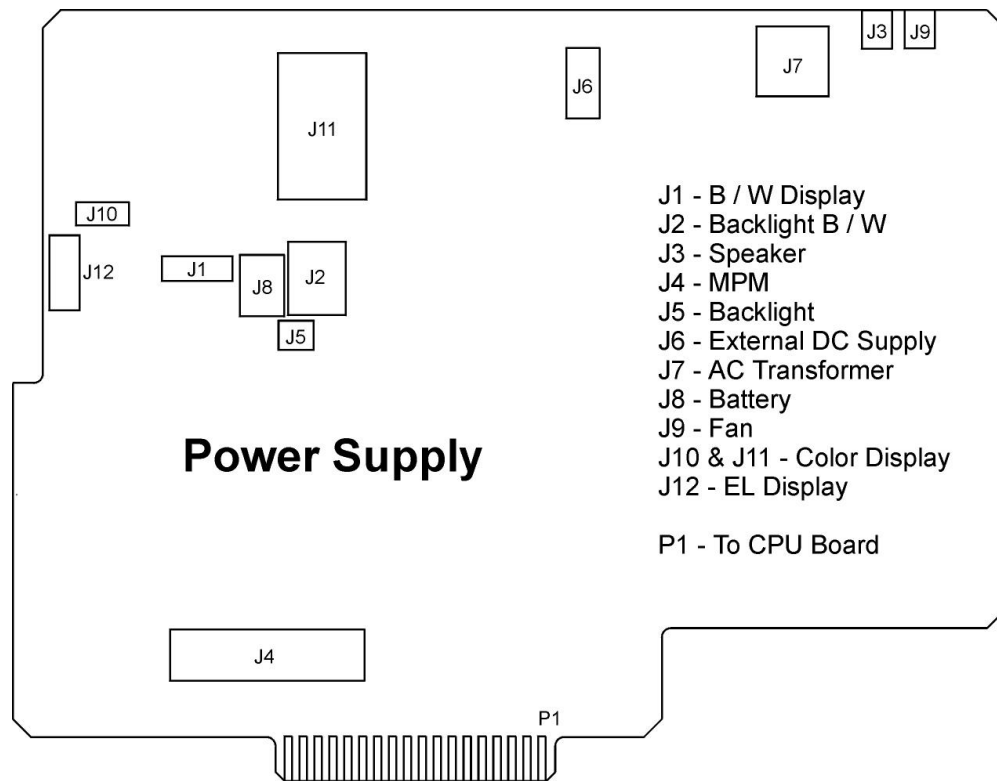
Figure 4-3. *Connector Identification of PRISM Power Supply Board*

Figure 4-4. *Power Test Points*

Prism Membrane "ON" bypass P2 on Video Controller Board (with CPU Board 403023 only)

P2

A

B

1

2 3
4
5 6
7
8 9
10 11
12 13

1
2 3
4
5 6
7
8 9
10 11
12 13

Momentarily short these two pins to turn the system "ON"

Edge of Controller Board
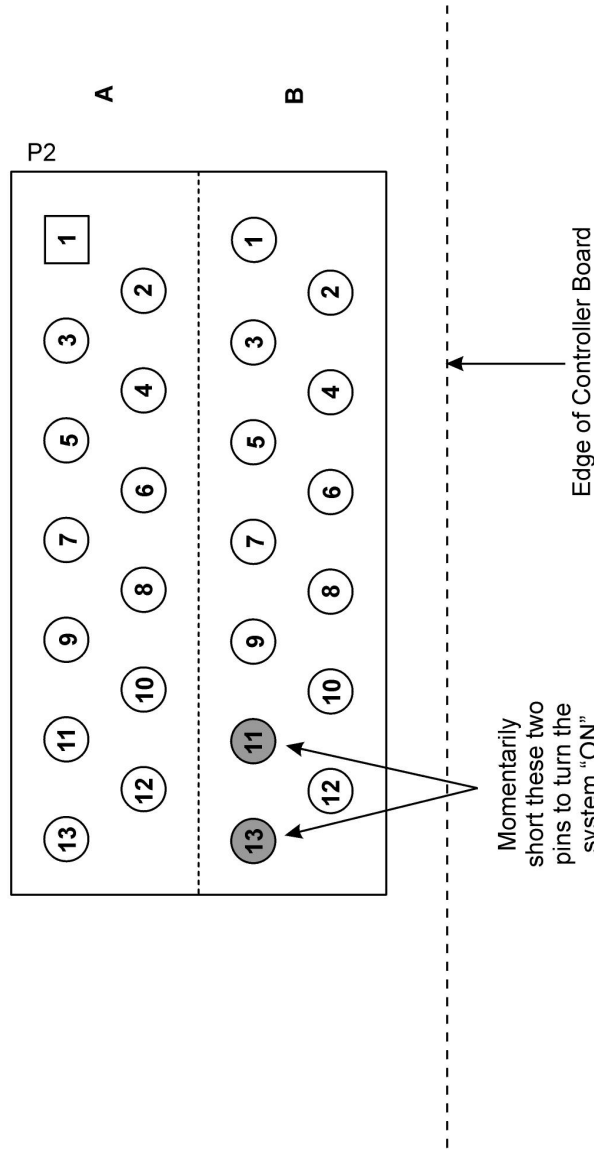
NOTE: Membrane "ON" bypass for Prisms with CPU Board 403950 can be located at J2 on the CPU Board (refer to 403950 Schematics for pin locations)

Figure 4-5. *Membrane "ON" Bypass*

CPU Board & Video Configurations

Overview

The CPU board controls many functions including video display, alarm processing, tone generation, recorder interface, I/O connections, clock functions, reset control, and keypad calculations. The Central Processing Unit (CPU) used is a type Z8S180. Configuration is retained in RAM for the Z8S180 CPU via a backup battery. If the backup battery fails, all power up settings will be set to factory defaults. The main processor communicates to the parameter processors via serial bus communications (DBUS). Add on modules also communicate through the DBUS to the main processor. Communications for each parameter and add on module can be verified on the TEST page. The software version of the main CPU and parameters are listed on the TEST page.

Display

The **PRISM** uses either a multi-color LCD or monochrome EL 10.4 inch display. A power inverter board is used on the LCD models to illuminate the backlight. Each display connects to the appropriate interface board (see NOTE below) located in the bezel assembly.

> **NOTE: All EL display models use an interface board, a video controller board, and CPU board P/N 403023. LCD display models prior to June 2001 also use an interface board, a video controller board, and CPU board P/N 403023. LCD display models after June 2001 use CPU board P/N 403950 without an interface and video controller board. This chapter discusses LCD displays with both earlier and later CPU configurations.**

Bezel/Membrane

All membrane calculations are handled on the CPU board. The **PRISM** uses a 4 x 5 matrix to determine which key was pressed. Please refer to Figure 5-4 when trouble shooting the membrane.

The membrane connects to the interface board on all EL displays and older LCD displays using CPU board P/N 403023. The membranes on newer LCD display type monitors connect directly to J20 on the CPU board (CPU board P/N 403950).

Figure 5-1. *Diagram of PRISM CPU Board Assembly # 403023*
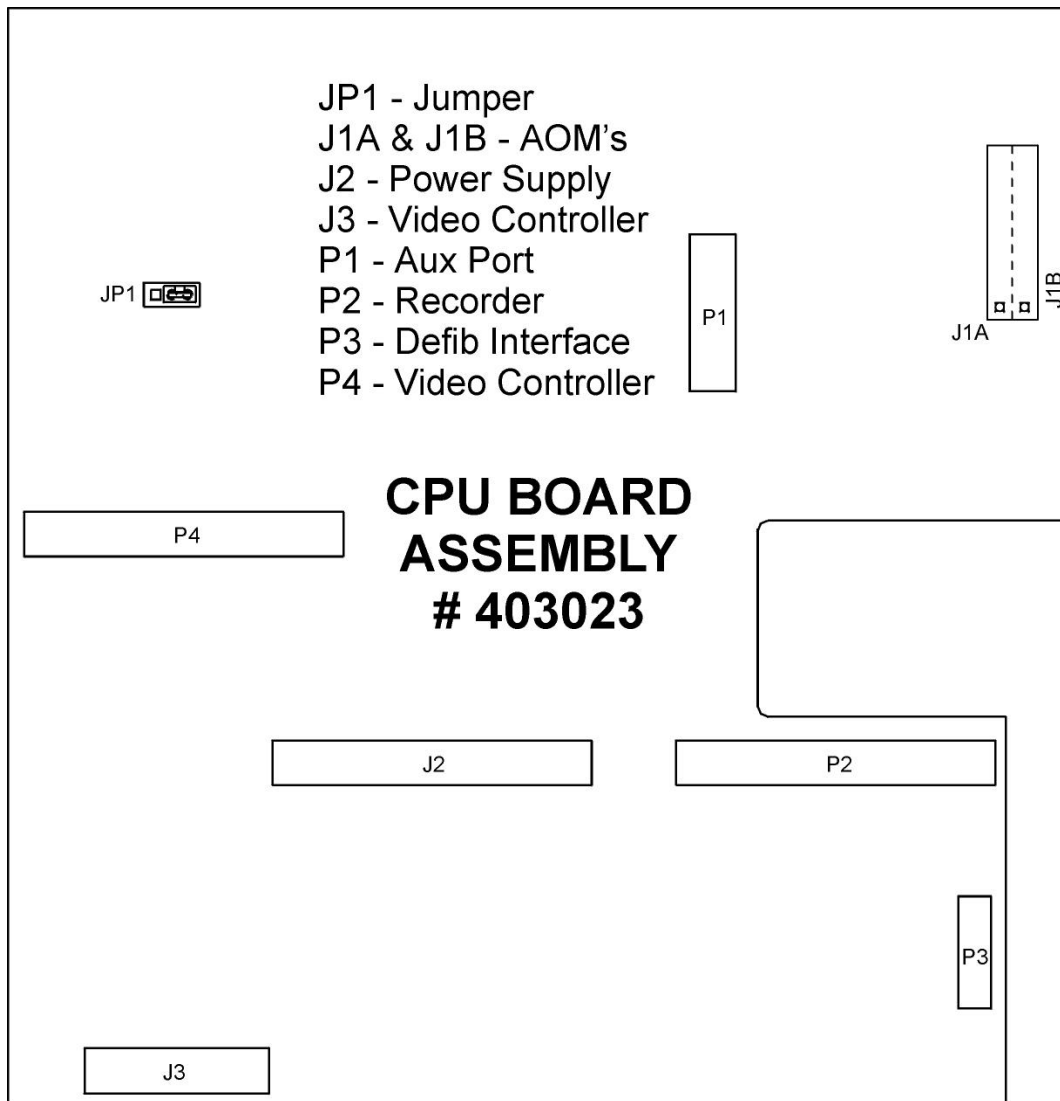
Figure 5-2. *Connector Identification for PRISM CPU Board Assembly # 403023*
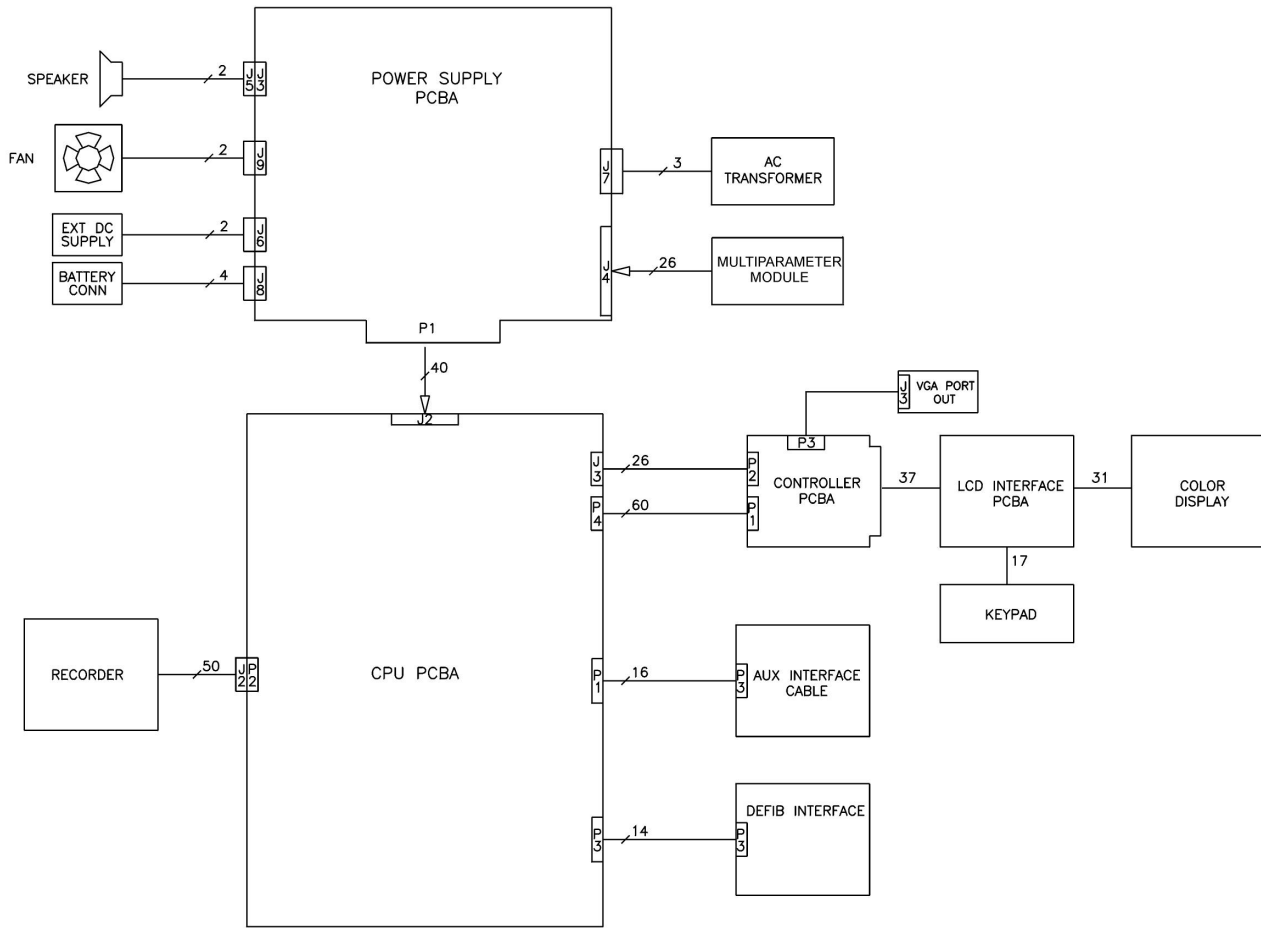
Figure 5-3. *System Interconnect for CPU Board Assembly # 403023*
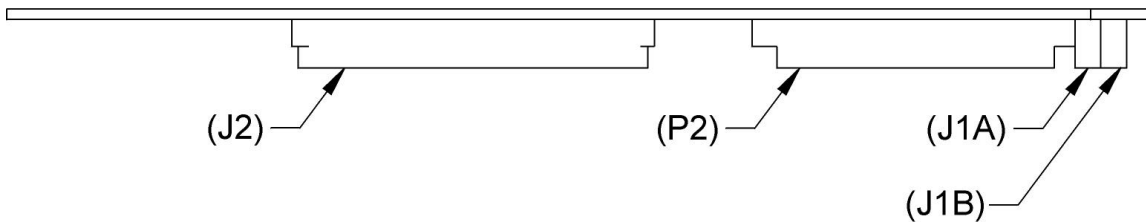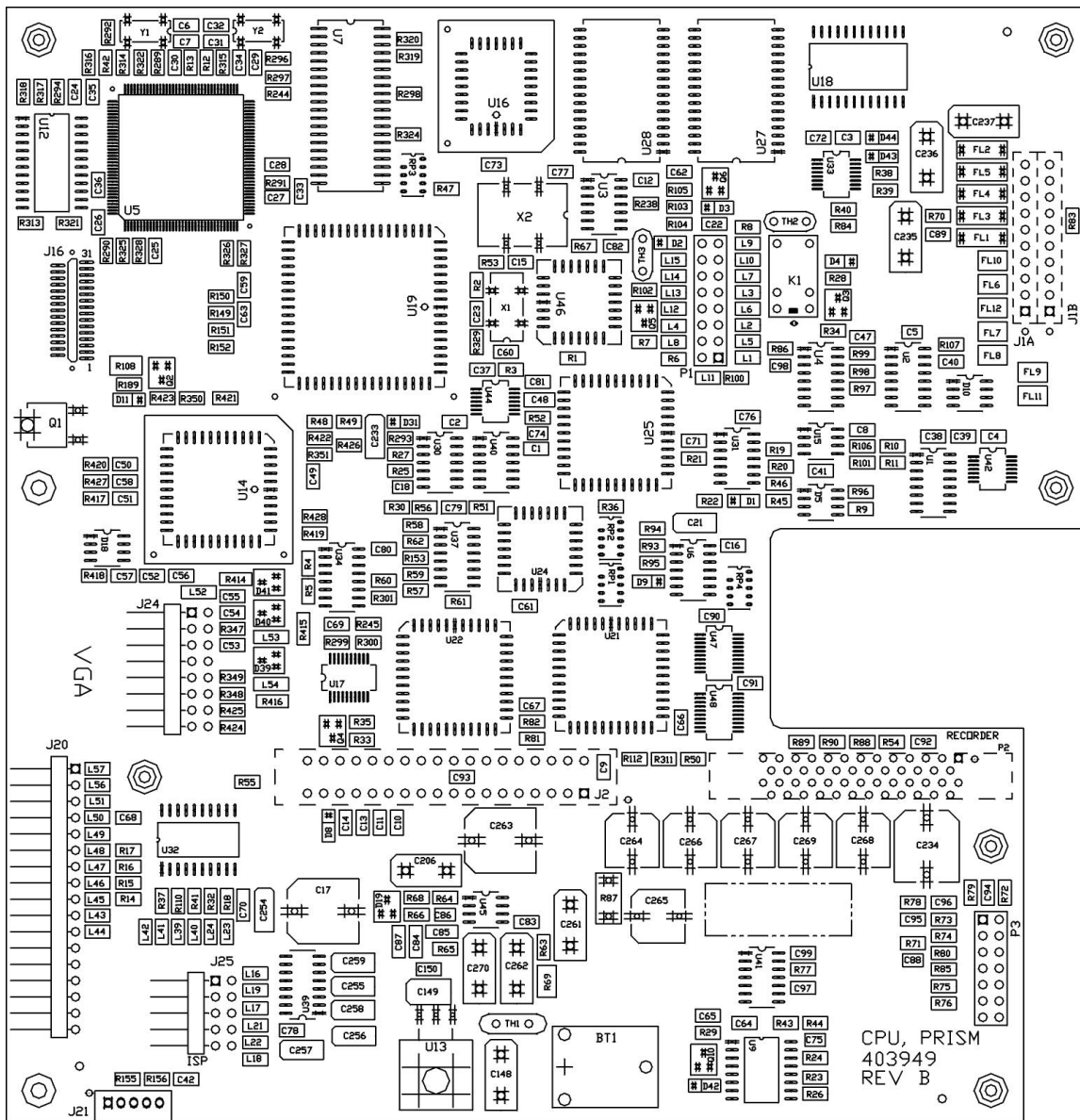
Figure 5-4. *Diagram of PRISM CPU Board Assembly # 403950*

J1A & J1B - AOM's
J2 - Power Supply
J16 - LCD
J20 - Membrane
J21 - Inverter
J24 - VGA Out
J25 - ISP
P1 - Aux Port
P2 - Recorder
P3 - Defib Interface

J16

P1

J1A   J1B

**CPU BOARD
ASSEMBLY
403950**

J24

VGA

J2

RECORDER

P2

J20

J25

ISP

P3

J21

(J2)   (P2)   (J1A)

(J1B)
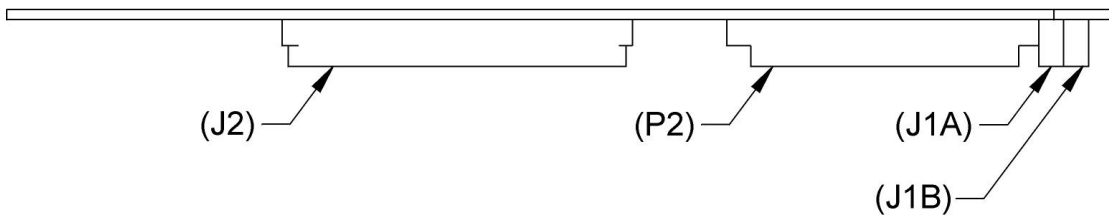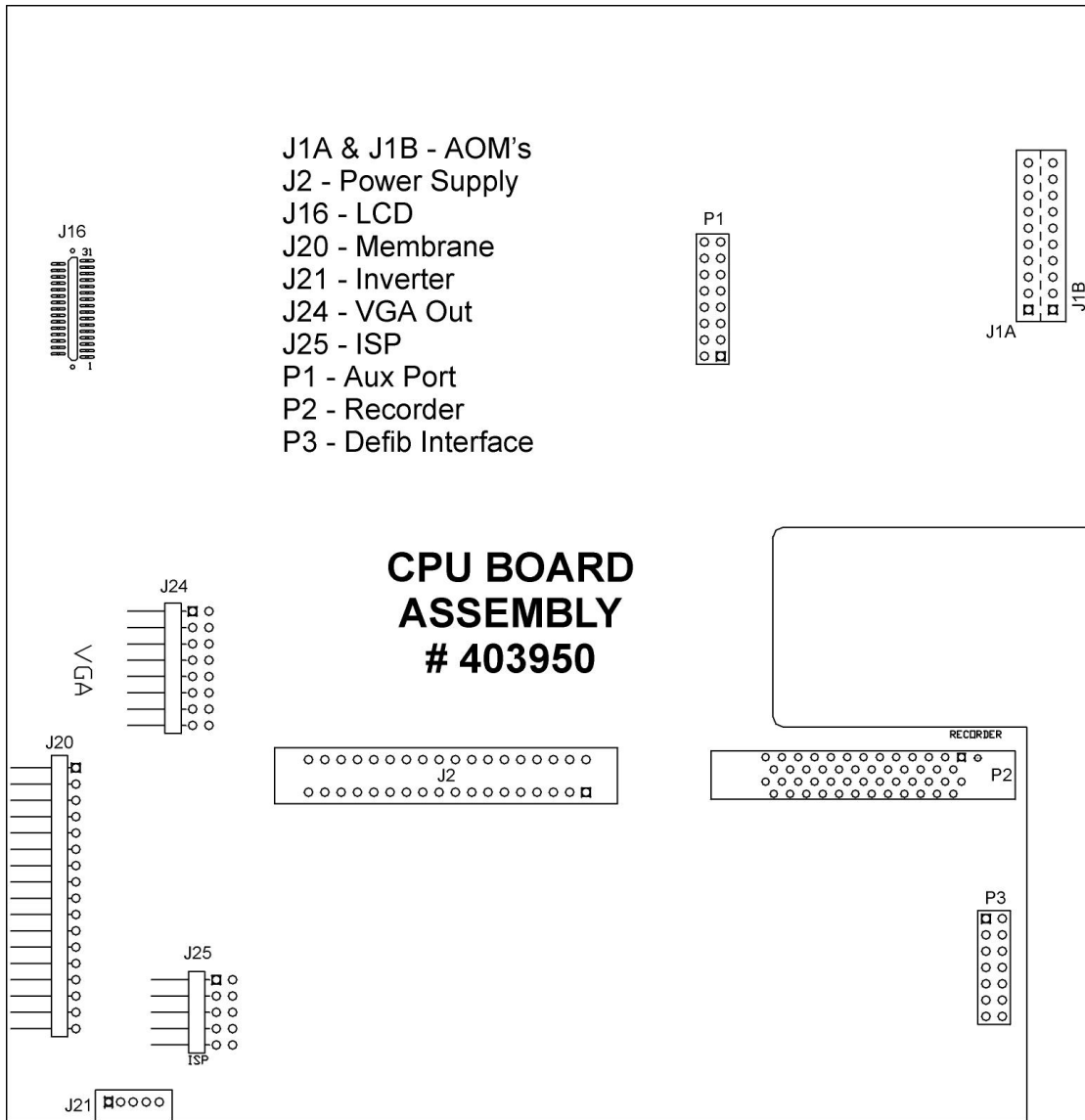
Figure 5-5. *Connector Identification for PRISM CPU Board Assembly # 403950*
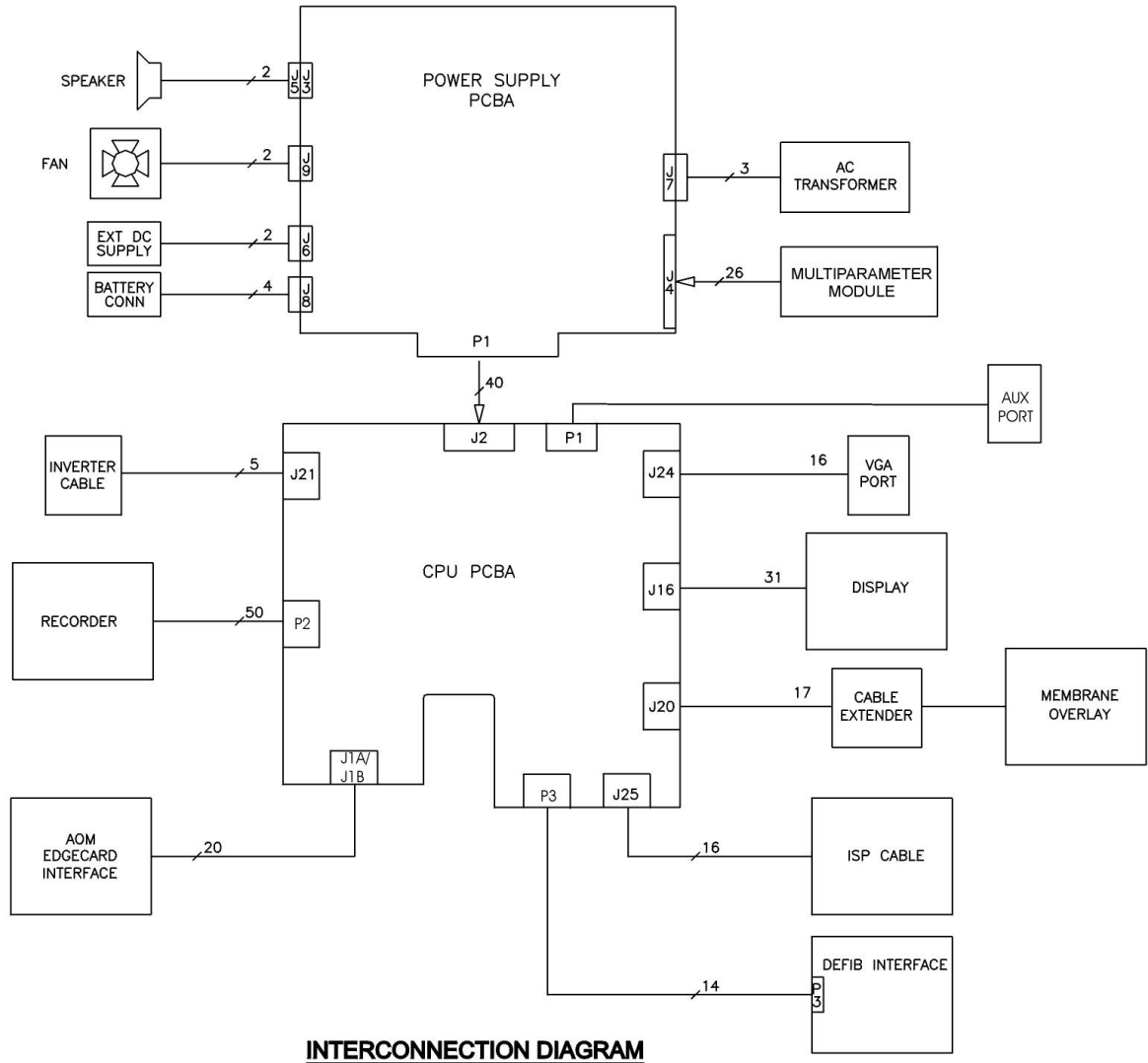
Figure 5-6. *System Interconnect for CPU Board Assembly # 403950*
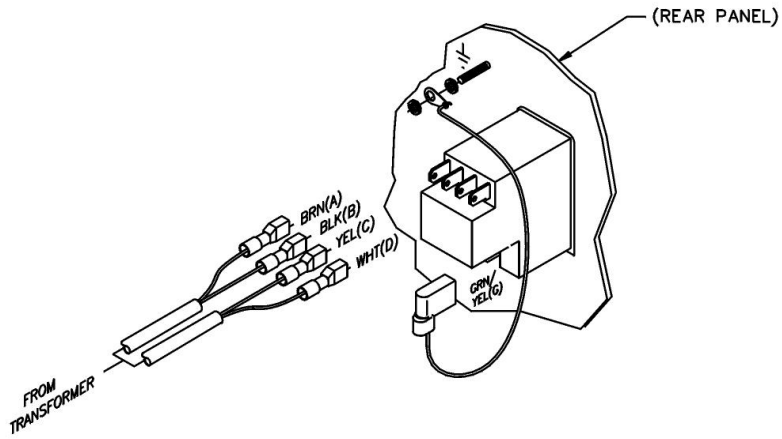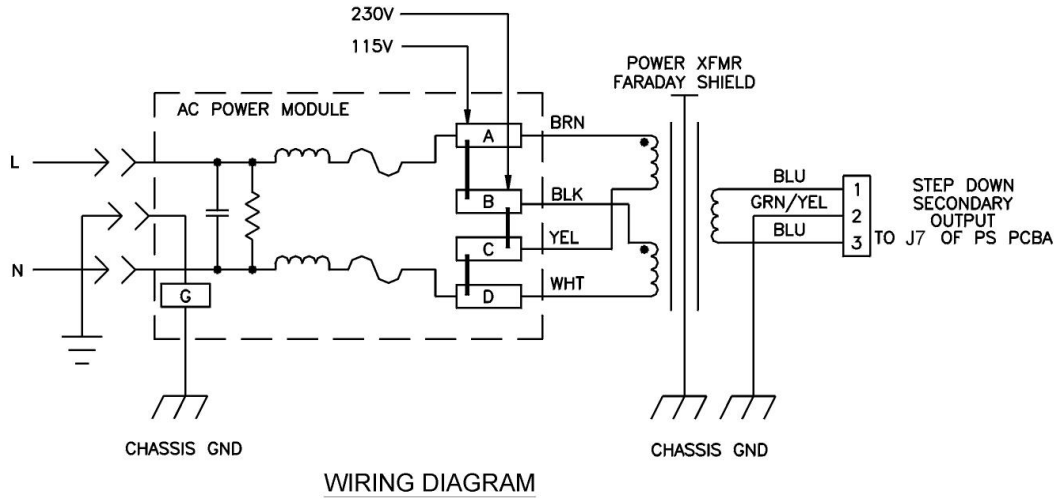
WIRING DIAGRAM

Figure 5-7. *Power Module Wiring Diagram*

PRISM
MEMBRANE
SCHEMATIC

X - TABLE

Y - TABLE

	6	7	8	9
13	ALARM SUSPEND	SYSTEM SETUP	SK7	FREEZE
14	WF1	WF2	WF4	WF3
15		ALARM SETUP	SK2	SK3
16	PATIENT TYPE	NIBP START/STOP	SK1	RECORD
17	PAGE HOME	SK4	SK5	SK6

MATRIX
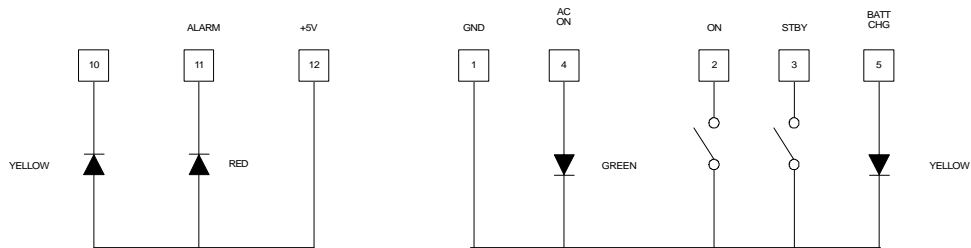
SCHEMATIC

Figure 5-8. *PRISM Membrane Schematic*

High Level Outputs

The *PRISM* allows programming and control of three output ports (PORT1, PORT2, and PORT3). These signals originate from the CPU board connector, P1, and are routed to the rear panel connector, P3. See Table 5-1 for pin designations. Each port may deliver any of three signal outputs. The signal can be a waveform output, an alarm-triggered output, or a record-triggered output. The signals can be sent to Nurse Call Panels, Remote Slave monitors, or various recording devices. Interfacing with many of these devices may require the use of the High Level Interface Module (HLIM), P/N E2900-33. Contact MDE Technical Support for ordering information.

The *PRISM* may also be connected to an external defibrillator. When [RING], the external QRS sync signal, goes high, it turns on Q1, which will pull the defibrillator flag signal, [DFIBFLG2], low. The [QRSOUT] signal, if present, can be monitored at P3-11. The analog ground is on P3-15, while the digital ground is on P3-14. The [SLEEVE] voltage level is tied to analog ground through R9. The [TIP], which is the ECG high level output signal, is connected to [HI_LEVEL] through R8.

Each port can be defined by accessing the CONFIG page using the *PRISM's* softkeys. Scaling factors, DC offsets, and coupling for each of the parameters are listed in Table 5-2. In addition, Table 5-3 outlines the types of signal outputs for which each port can be programmed.

> ☑ **NOTE: The outputs will be clipped if the displayed waveform is clipped.**

Nurse Call System and Alarm Panel

The *PRISM* monitor provides a single-pole/double-throw relay that can be used to interface to a nurse call system or alarm panel. When the monitor is not in alarm, the relay pole, ALARM_NO (Normally Open) will be in the open position and ALARM_NC (Normally Closed) will be in the closed position.

If an alarm is activated, the relay contacts toggle at different rates. For high limit alarms, it is on for 300 milliseconds and off for 300 milliseconds. For low limit alarms, it is on for 600 milliseconds and off for 600 milliseconds. By applying a voltage to either ALARM_NC or ALARM_NO, an alarm panel or nurse call system can be connected to ALARM_O. The maximum voltage that can be applied to ALARM_NC or ALARM_NO is 12 VDC, and the maximum current should be limited to 0.5A.

Table 5-1. *Auxiliary Output Connector—Pin Designations*

SIGNAL NAME	AUX. OUTPUT CONNECTOR	SIGNAL NAME	AUX. OUTPUT CONNECTOR
ALRM_0	1	RING	8
PORT1	2	+5V	9 (limited to .5A)
ALRM_NC	3	TIP/HI_LEVEL	10
PORT2	4	QRSOUT	11
ALRM_NO	5	DIGITAL GND	14
PORT3	6	ANALOG GND	15

Table 5-2. *Parameter Scaling Factors, DC Offsets, and Coupling*

PARAMETER	SCALE	DC OFFSET	COUPLING
ECG	1V = 1mV	2.5V	DC
BP (PULSE)	1V = 100 mmHg	1.6V	DC
BP (SCALE)	1V = 100 mmHg	0V	DC
RESP	1V = 1 ohm	2.5V	DC
SPO2	4V = 100%	0V	DC
CO2	1V = 10.1 mmHg	0.2V	DC
TEMP	1V = 10° C	0V	DC
HR	1V = 51 BPM	0V	DC

Table 5-3. *Programmable Outputs*

OUTPUT	PARAMETER	DEFINITION
WF1	AUTO	Any trace displayed in waveform area 1 is output.
WF2	AUTO	Any trace displayed in waveform area 2 is output.
WF3	AUTO	Any trace displayed in waveform area 3 is output.
WF4	AUTO	Any trace displayed in waveform area 4 is output.
WF	ECG	The ECG waveform is output.
	BP1	The BP1 waveform is output.
	BP2	The BP2 waveform is output.
	BP3	The BP3 waveform is output.
	CO2	The CO2 waveform is output.
	PLETH	The SPO2 pleth waveform is output.
	RESP	The Respiration waveform is output.
	HR	The heart rate numeric is output.
	SPO2	The SPO2 percentage numeric is output.
	T1	The TEMP1 Temperature numeric is output.
	T2	The TEMP2 Temperature numeric is output.
ALARM	ANY	Enables on any alarm.
	FLASH	Enables alternating ON/OFF (flashing) on any alarm.
	ECG	Enables on any ECG alarm.
	BP1	Enables on any BP1 alarm.
	BP2	Enables on any BP2 alarm.
	BP3	Enables on any BP3 alarm.
	CO2	Enables on any CO2 alarm.
	NIBP	Enables on any NIBP alarm.
	SPO2	Enables on any SPO2 alarm.
	RESP	Enables on any Respiration alarm.
	T1	Enables on any TEMP1 Temperature alarm.
	T2	Enables on any TEMP2 Temperature alarm.
KEY	REC	Enables when the RECORD key is pressed.

Video Configurations

The Prism can display information formatted for an El display (model 20401) or an LCD display (model 20403). Display formatting is performed on the video controller board for all 20401 models, and older 20403 models equipped with the 403023 CPU board. Display formatting on 20403 models equipped with CPU board 403950, is performed on the CPU board.

On models equipped with CPU board 403023, there are four (4) boards for the two models; two (2) boards per model. All four boards format the unit's display information. Two of the four boards format VGA outputs for each model. Each model has it's own interface board for routing signals to and from the display and membrane to the video controller and CPU board. The video controller board resides on top of the CPU board and also connects to the corresponding interface board.

On 20403 models equipped with CPU board 403950, these functions are performed on the CPU board.

EL Video Controller (Model 20401 with CPU Board 403023)

This controller has two microprocessors for EL, VGA control, and EL timing. Membrane signals are routed through this board from the interface board to the CPU board. Display signals are buffered on this board to protect the input signals. The power control circuit enables the display buffers. Two (2) or three (3) connectors are located on this board depending on whether the VGA option is installed. Connector P4 attaches to the interface board located in the front housing assembly. Connector P1 attaches to the CPU board. Connector P3 (VGA Option) attaches to the VGA cable connecting the 15 pin D-connector located at the rear of the bezel assembly.

LCD Video Controller (Model 20403 with CPU Board 403023)

This controller has one microprocessor for LCD and VGA control. Membrane signals are routed through this board from the interface board to the CPU board. A power control circuit buffers the input voltage and will enable the display buffers. Two (2) or three (3) connectors are located on this board depending on whether the VGA option is installed. Connector P4 attaches to the interface board located in the front housing assembly. Connector P1 attaches to the CPU board. Connector P3 (VGA Option) attaches to the VGA cable connecting the 15 pin D-connector located at the rear of the bezel assembly.

LCD Interface Board (Model 20403 with CPU Board 403023)

The LCD interface board has four primary functions. These are to buffer and filter the display signals. Secondly, it routes the membrane signals. Thirdly, it sends voltages to the power inverter board. The fourth function is to set the view angle to six o'clock. There are four (4) connectors located on this board. J2 connects to the membrane. J1 connects to the video cable attaching to the display. J4 attaches to the video controller board. J3 connects to the power inverter cable attaching to the power inverter.

EL Interface Board (Model 20401 with CPU Board 403023)

The El interface board has three primary functions. These are to buffer and filter the display signals. Secondly, it routes the membrane signals. And thirdly, it sends power to the display. There are three (3) connectors located on this board. J2 connects to the membrane. J1 connects to the video cable attaching to the display. J3 attaches to the video controller board.

Power Inverter Board (Model 20403)

There are three types of power inverters. Two are for the Sharp display and the other is for the NEC display. The display manufacturer is printed at the back of the display. Please contact MDE Technical Support for the correct power inverter. The power inverter drives the back illumination for the display. Input voltage to the power inverter is from the interface board on models equipped with CPU board 403023, and directly from the CPU board on models equipped with CPU board 403950. Two output connectors attach directly to the display for illuminating the top and bottom half of the display.

WARNING: The Inverter output is 1500 VRMS.

Chapter 6

Multiparameter Module

Overview

The **PRISM** Model 20001 Multiparameter Module (MPM) houses all installed parameter boards, and provides easy accessibility to each. A fully loaded MPM can accommodate ECG, Respiration, SPO_2, three (3) Invasive Blood Pressures, Noninvasive Blood Pressure, Temperature, Mainstream/Sidestream $ETCO_2$, and Cardiac Output.

The MPM is easily removed by grasping the two tabs on either side of the MPM and squeezing inward while pulling the MPM straight out of the **PRISM** monitor. The parameter boards are then accessible by removing the four Phillips screws securing the MPM cover plate and removing the cover plate.
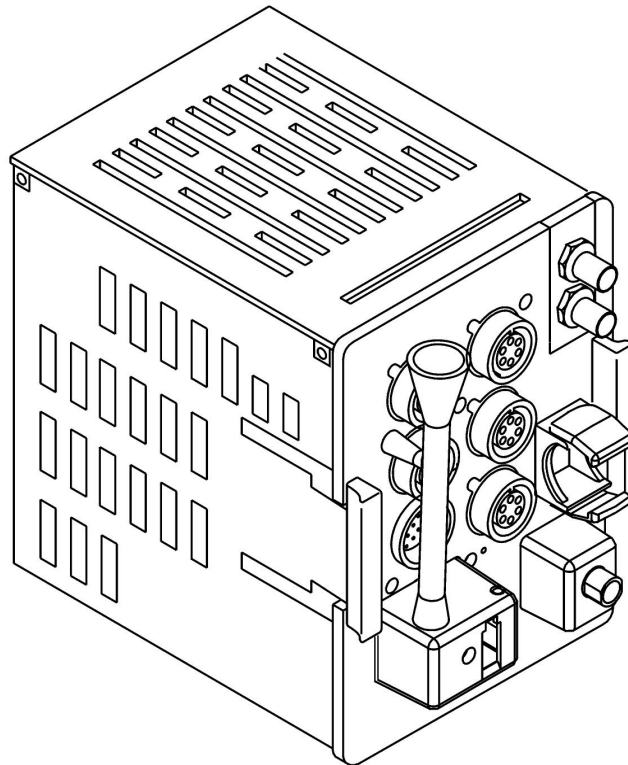
Figure 6-1. *Multiparameter Module (MPM)*

Connector Plate Assembly

The Connector Plate Assembly includes the MPM Connector Board, connectors to support all purchased parameter options, and the connector plate itself. The MPM Connector Plate may also be configured for use with Hewlett-Packard Merlin type connectors (ECG and IBP only).
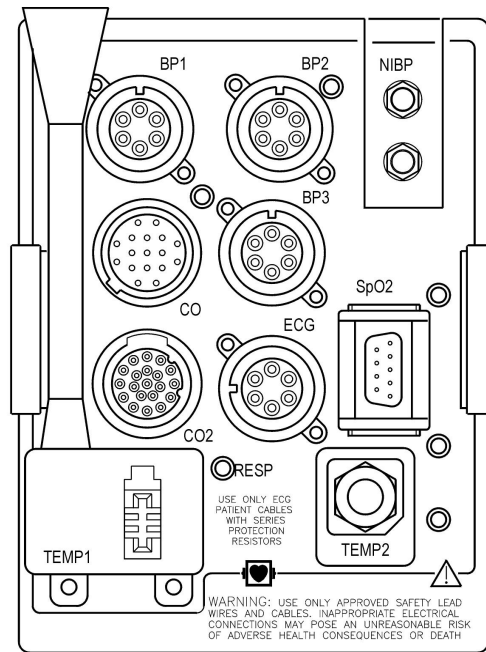
Figure 6-2. *MPM Connector Plate Assembly*
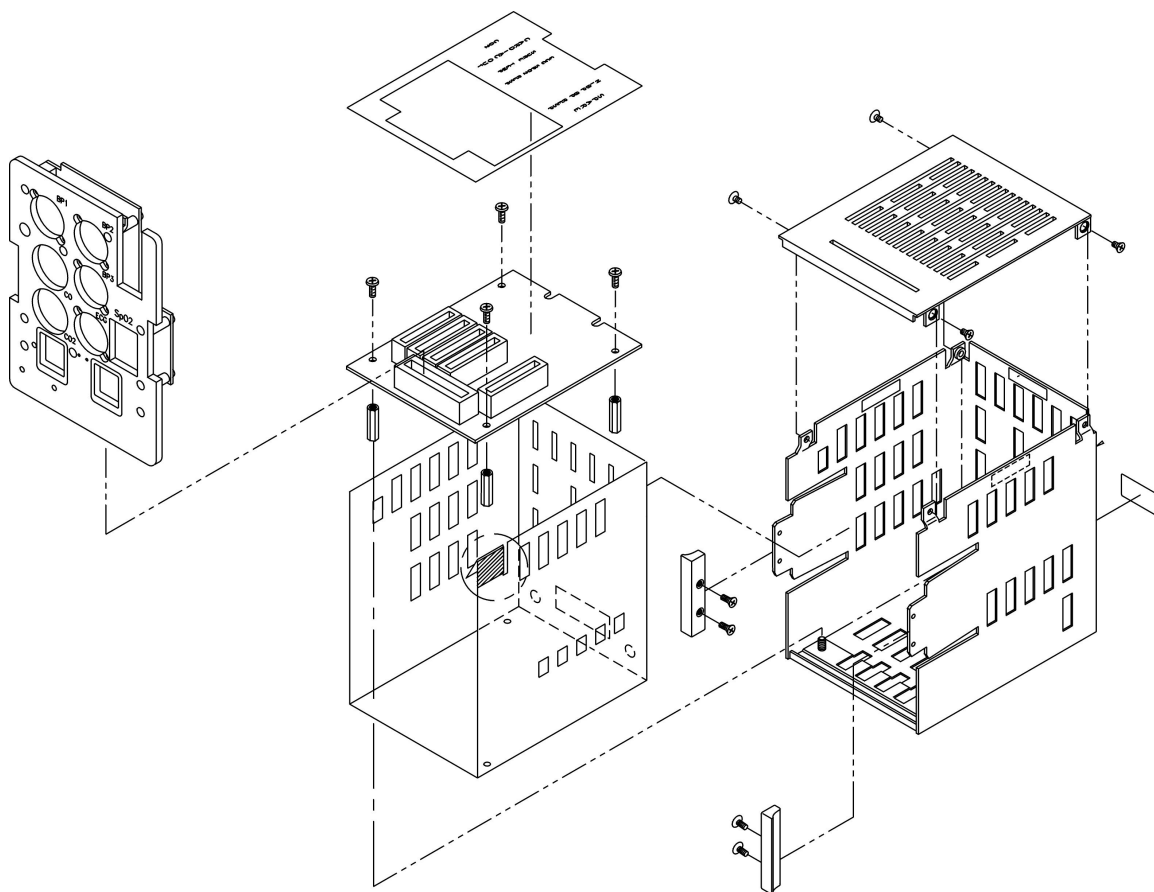
Figure 6-3. *MPM Housing Assembly*

MPM Connector Board

The MPM Connector Board acts as an interface between patient cable connections and the *PRISM* monitor. All signals are routed from the various input connectors to the cardedge connector P1 which, connects to the MPM ISO Power Supply.

ECG inputs are protected by surge arrestors against possible external potentials of up to 80 VAC. DS1 connects between each surge arrestor and the isolation barrier, providing a discharge path. DS1 is also used to complete protection to the IBP and Temperature inputs. Diodes provide protection against an external potential of 24 VAC for IBP Channel 1, Channel 2, and Temperature inputs. Inductors are use throughout the board to suppress EMI.
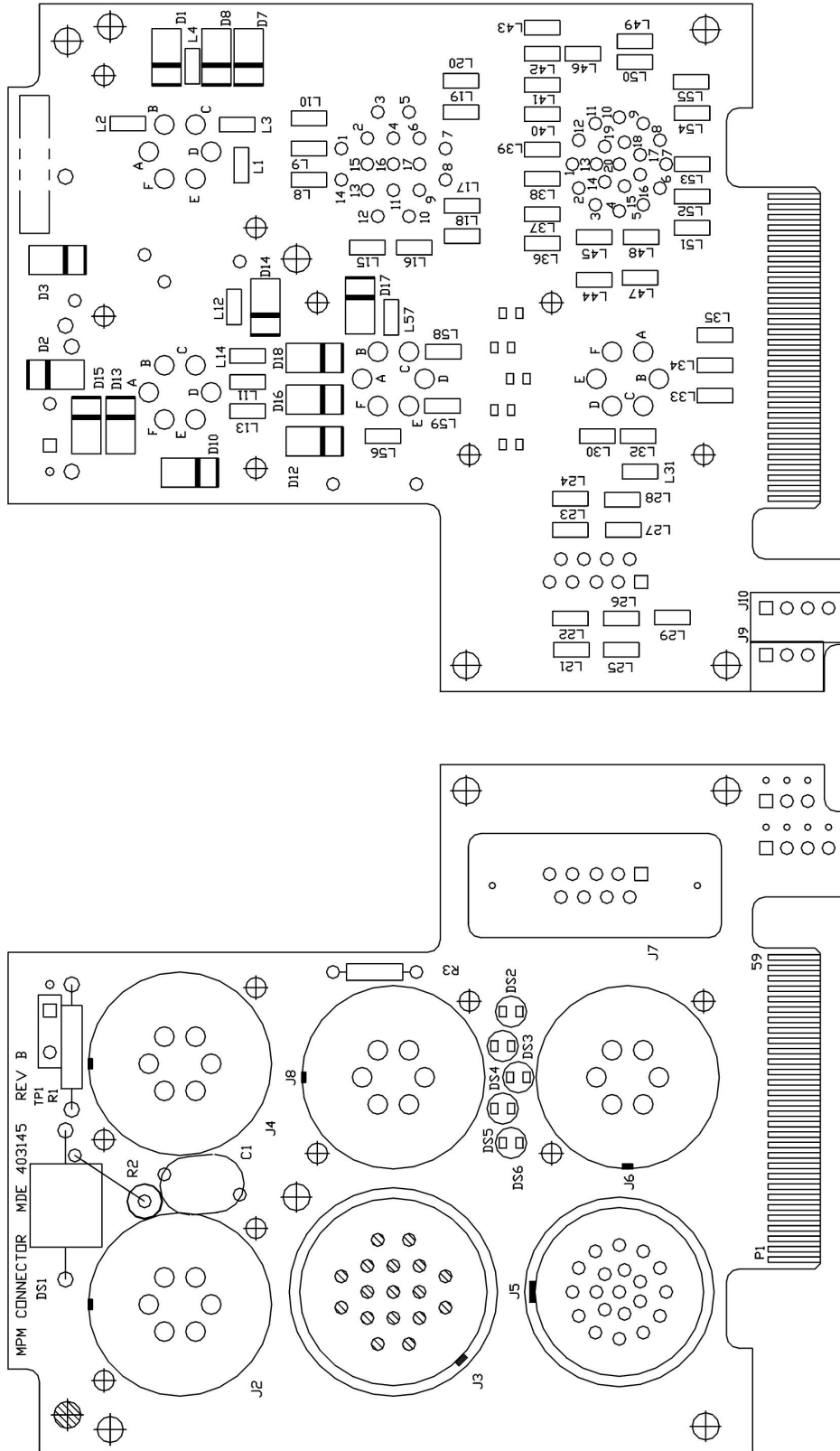
Figure 6-4. *MPM Connector Board Layout*

ISO Power Supply Board

The ISO Power Supply Board performs three (3) major functions. These functions are: (1) Isolates control signals for serial communications with the bedside. (2) Creates isolated operational voltages. (3) Routes patient signals from the connector plate assembly to the individual parameter locations. The potentiometer VR1 on the ISO Power Supply reduces EMI between the isolated and non-isolated grounds.

All control signals are isolated through opto-isolators. These provide an isolation boundary of 7.5kVDC. The signals isolated are CPU RX, CPU TX, TIMETICK, and RESET. These signals are routed to all of the parameter connectors.

Isolated operational voltages are created from the input voltages of V+ and +15V. V+ is switched through the isolating transformer to create +15VISO, -15VISO, and +5VISO. The pulse width modulator is synced with the PS SYNC (250 kHz) signal from the main CPU. The +5VISO signal is fed back to the pulse width modulator to vary the duty cycle to maintain constant voltages.

TO J4 OF POWER SUPPLY PCBA

P1

ISO POWER SUPPLY PCBA
(TOP VIEW)

PARAMETER BOARDS

CO2
CARDIAC OUT
SURETEMP
ECG / SPO2 / RESP
NIBP / BP / TEMP

J8   J7   J6   J5   J2   J1

CO2

CARDIAC OUT

SURE TEMP

ECG / SPO2 / RESP

NIBP / BP / TEMP

SPARE

MPM CONNECTOR

J10

ECG
J6

TEMP2
J10

CO2
J5

P1

TEMP1
J9

SPO2
J7

CARDIAC OUT
J3

BP3
J8

BP1
J2

BP2
J4

MPM CONNECTOR PCBA
(BACK VIEW)
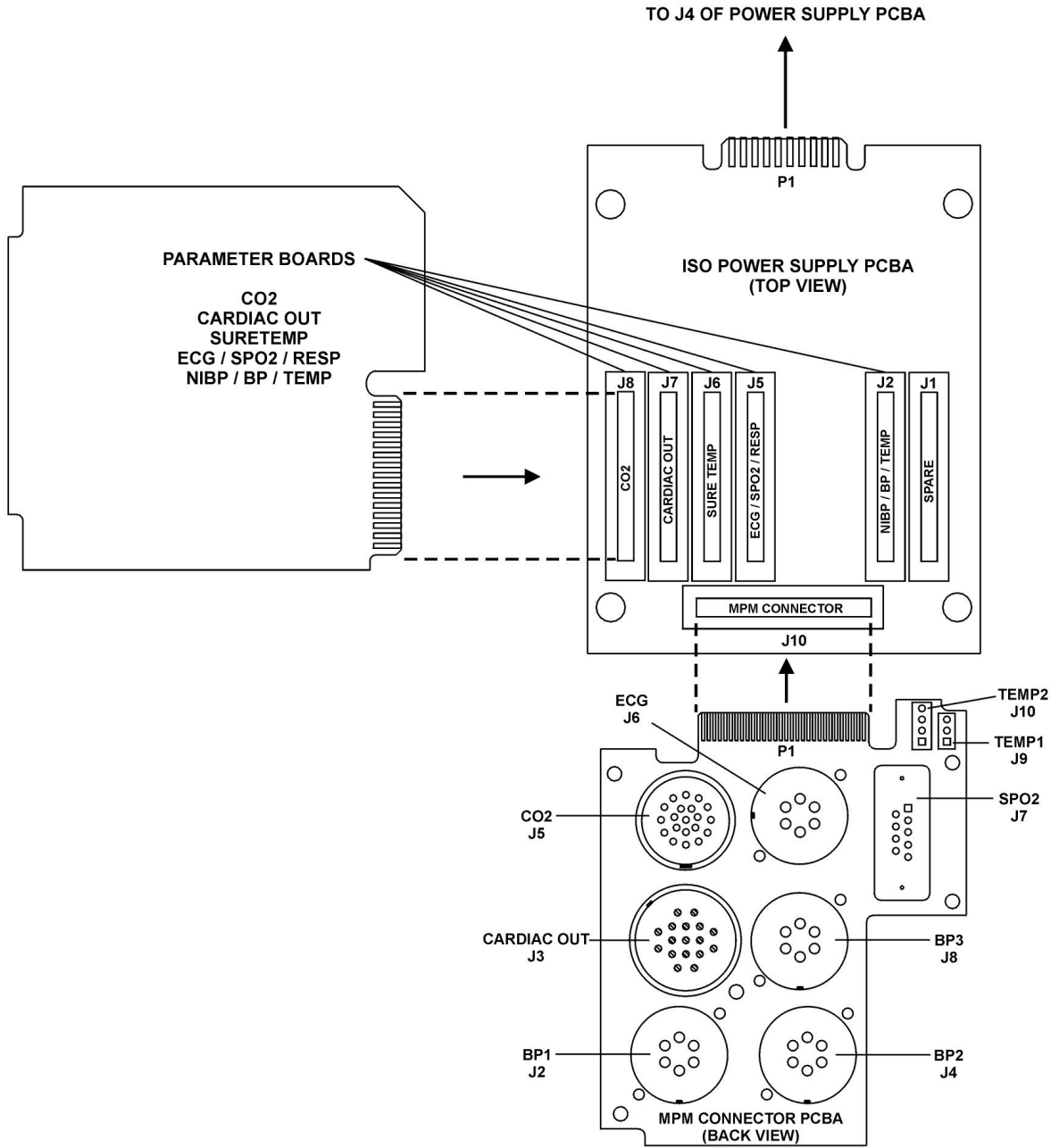
Figure 6-5. *Isolation Power Supply Board & Connections*
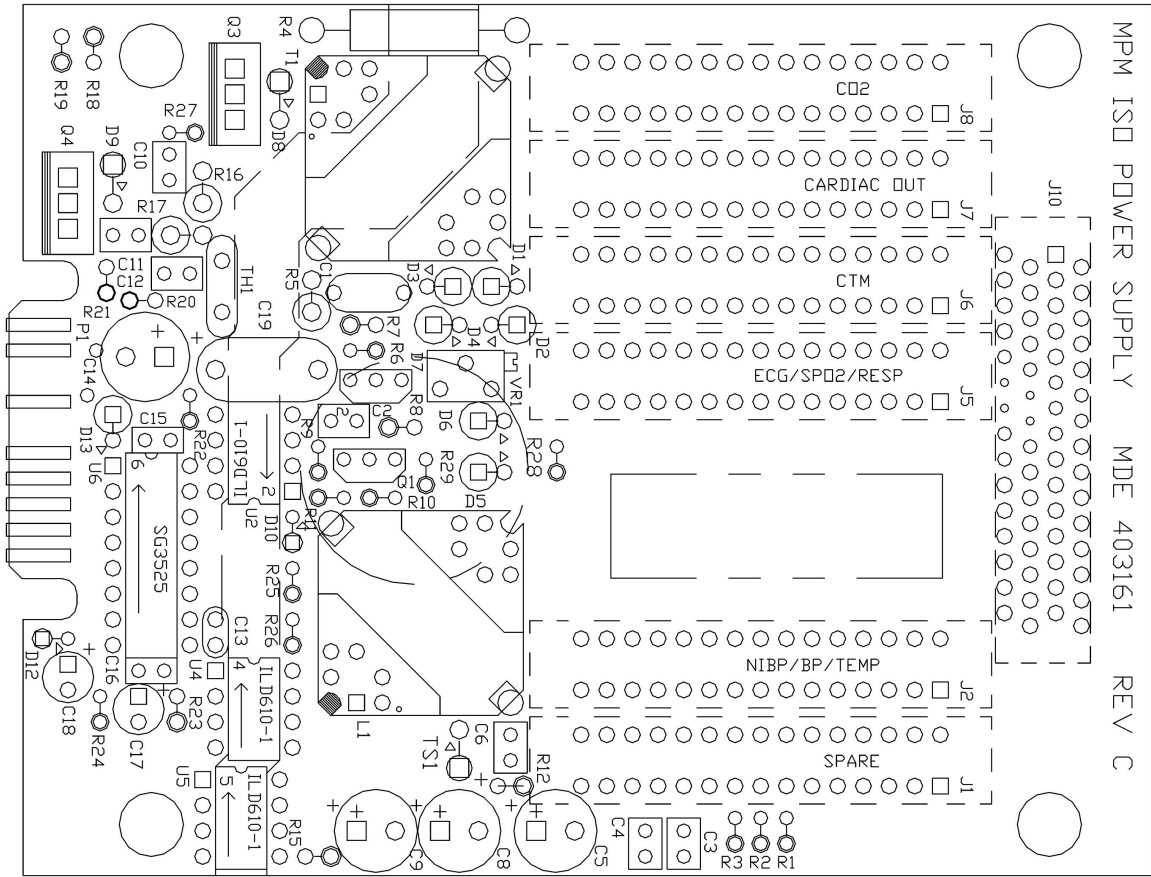
Figure 6-6. *Isolation Power Supply Board Circuit Side*

ISO Power Supply Board
Test Points
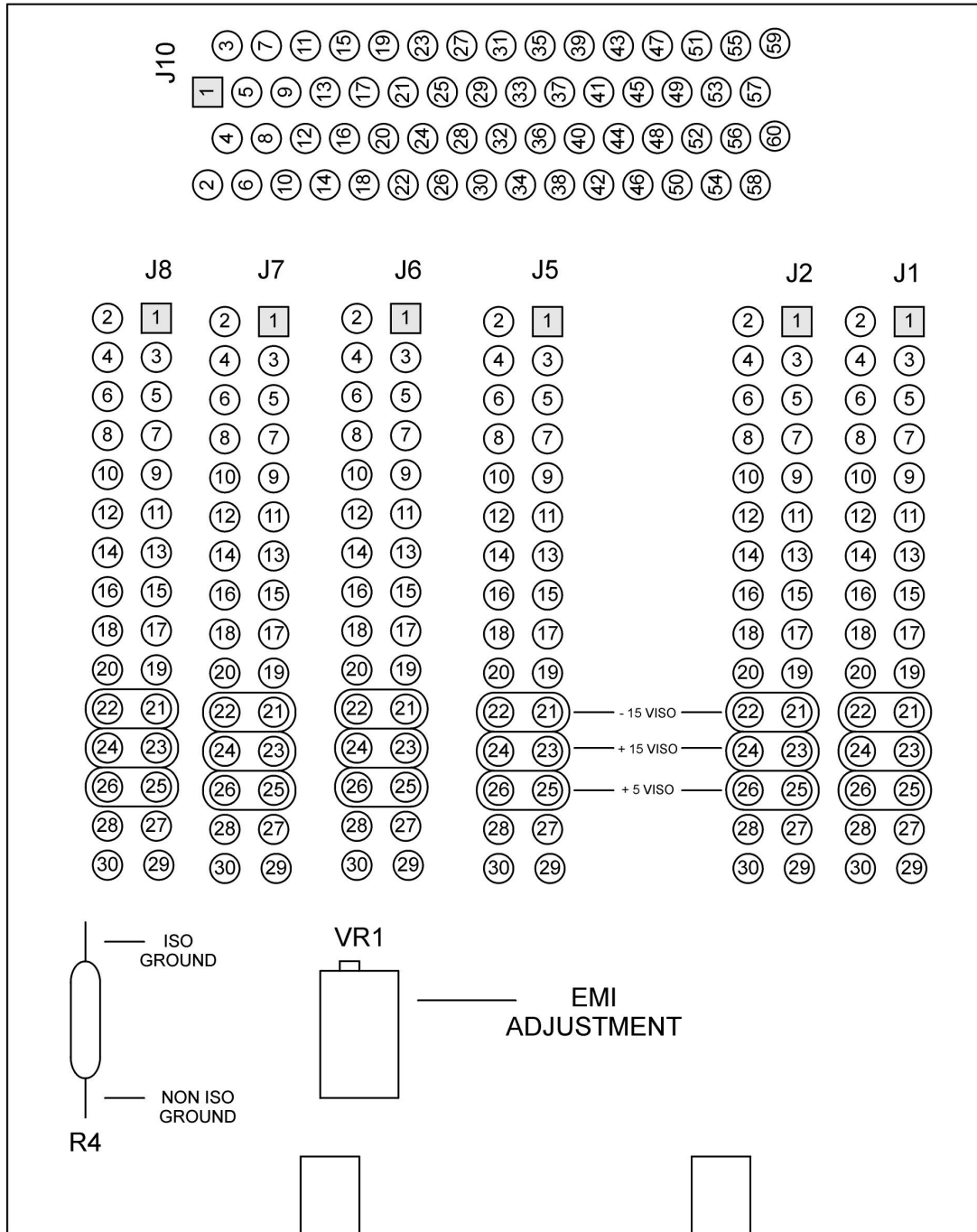
Figure 6-7. *ISO Power Supply Board Test Points*

ECG/SpO$_2$/RESP Boards

The *PRISM* provides monitoring capability of ECG, Respiration, and SpO$_2$ while inhabiting a single slot inside the MPM. The board will include ECG as a minimum, with optional Respiration and SpO$_2$ when purchased.

ECG signals are developed on the ECG/SpO$_2$/Resp main board. The signals are then converted to digital format. The digital information is then sent to the *PRISM's* main CPU Board.

Respiration is also available on the ECG/SpO$_2$/Resp main board with the addition of the necessary respiration components and applicable software.

Pulse Oximetry (SpO$_2$) monitoring is available with the Nellcor or Masimo SpO$_2$ module. This board connects directly to the main ECG/SpO$_2$/Resp board via the onboard connectors.

ECG circuitry performs many functions. These include Lead Select, Common Mode Rejection, Pacer Pulse Detect, Lead Fail, Filtering, and Amplification. Most of these functions can be controlled via the operator in the ECG SETUP menu.

Respiration circuitry resides on the ECG board. The respiration signal is derived from the impedance pneumography technique. Respiration uses the LA and RA leads from the ECG cable for signal processing. If ETCO$_2$ is in use, the respiration will switch to the CO$_2$ information for respiration processing. Respiration is optional and can be configured into the unit.

All SPO$_2$ functions are processed on the Nellcor or Masimo modules. Once processed by these modules, information is transmitted via serial communications to the ECG board. SPO$_2$ is optional and can be configured into the unit.

Figure 6-8. *ECG/Resp Main Board Layout—Nellcor*
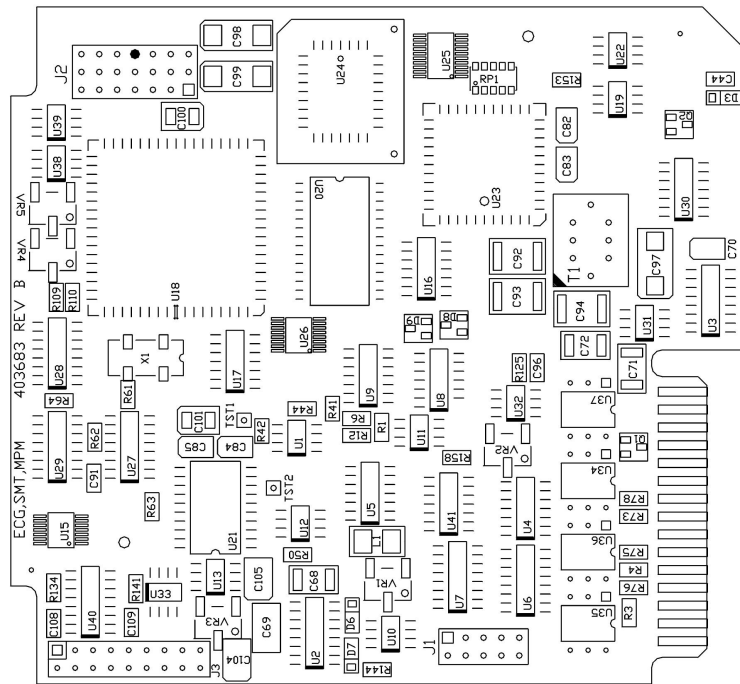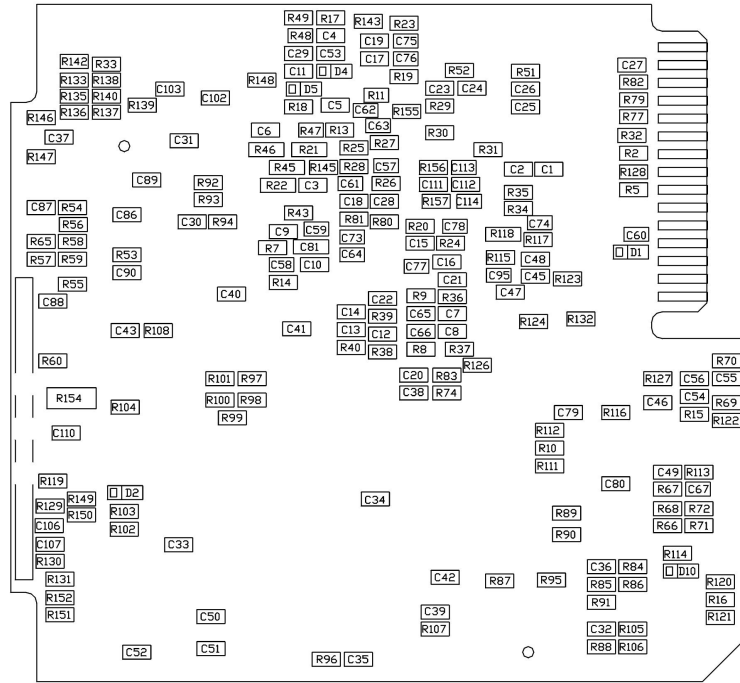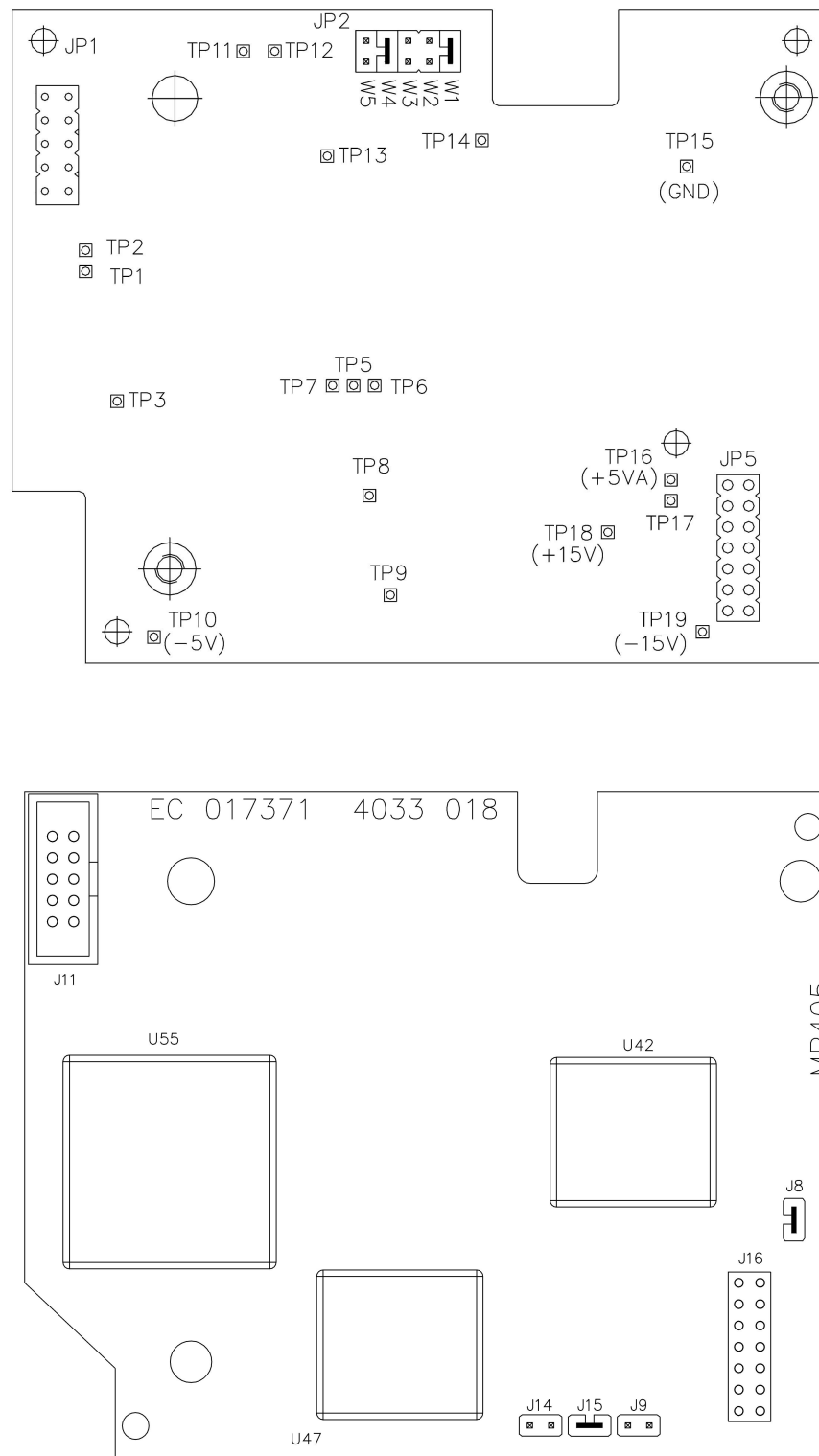
Figure 6-9. *Nellcor MP204 (Top) and Nellcor MP405 (Bottom) SpO₂ Board Layouts*
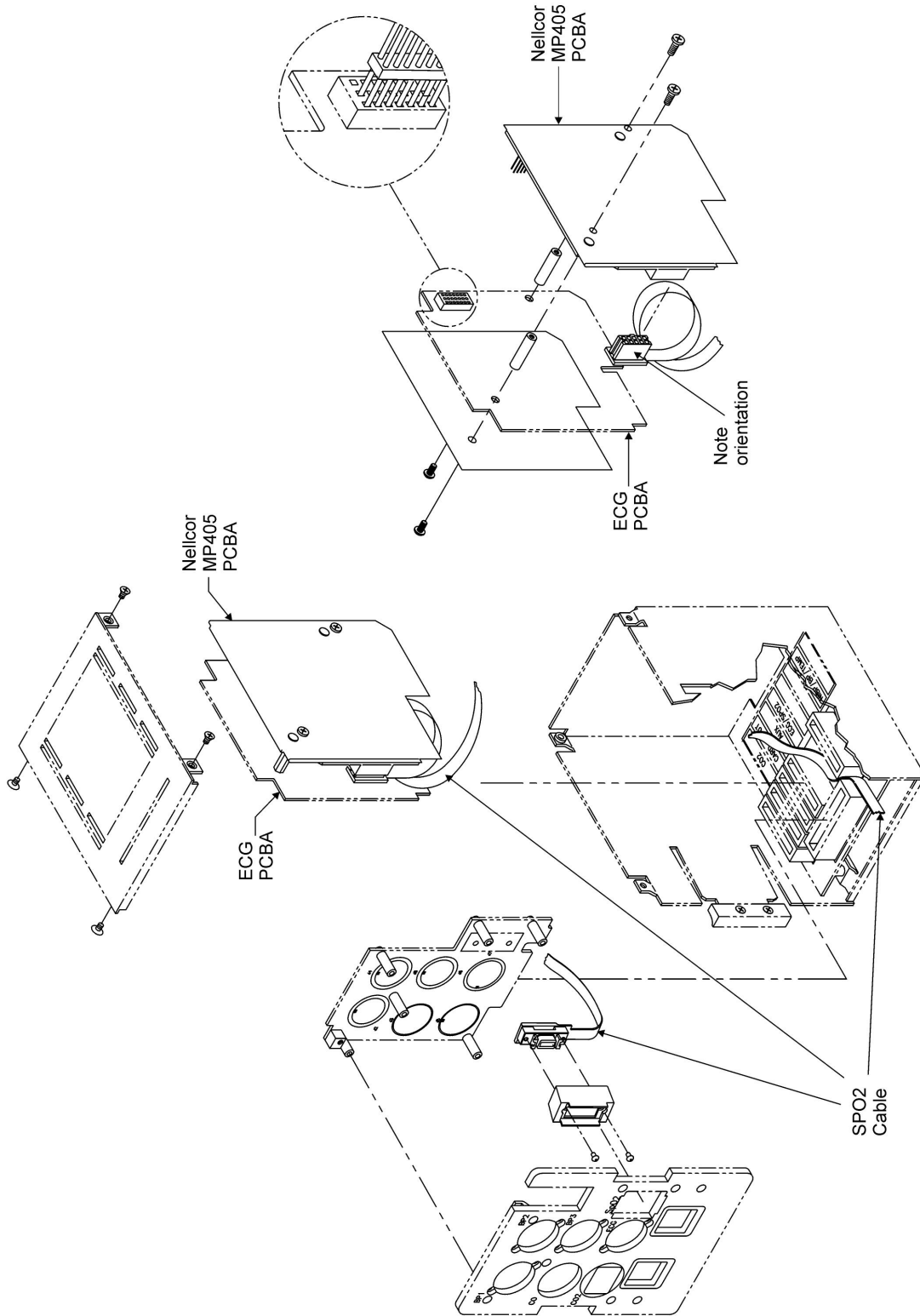
Figure 6-10. *Nellcor MP405 SpO$_2$ Cable Routing*

Figure 6-11. *ECG/Resp Main Board Layout—Masimo*
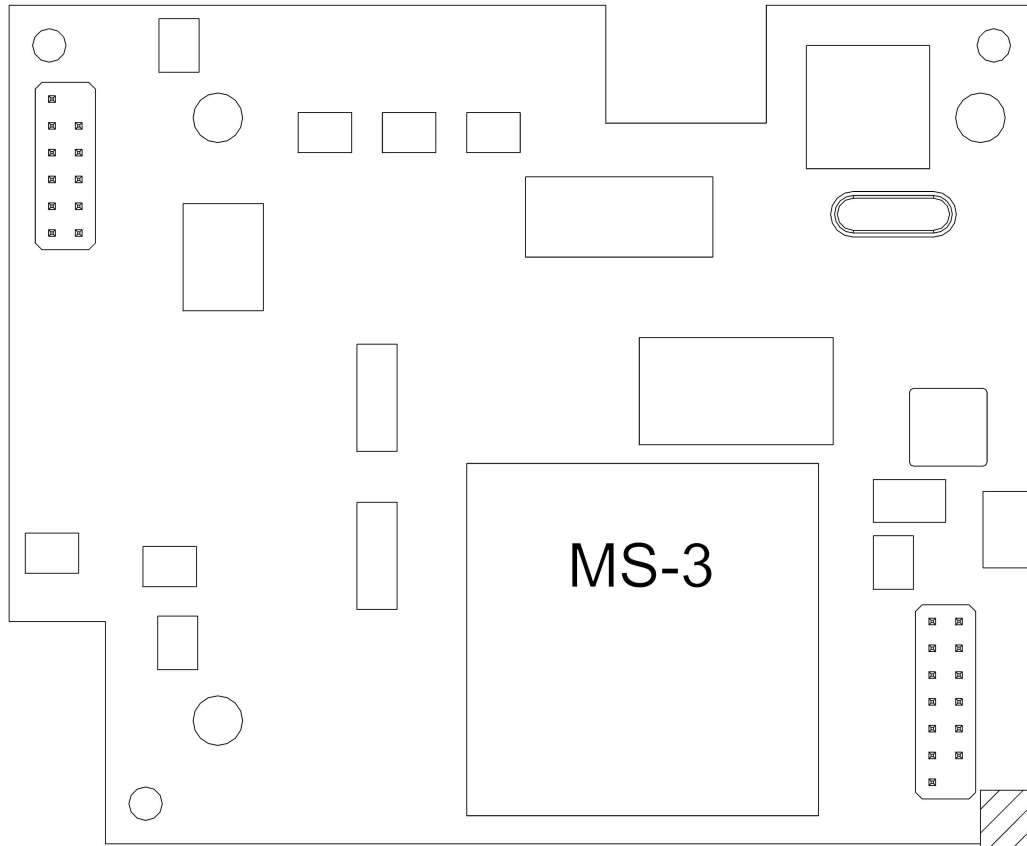
Figure 6-12. *Masimo SpO$_2$ Board Layout*

NIBP/BP/TEMP Board

The NIBP/BP/TEMP Board provides monitoring capability of up to three parameters in eleven different configurations. Available parameters include monitoring of one, two, or three Invasive Blood Pressures (IBP), Temperature (TEMP), and Noninvasive Blood Pressure (NIBP).

Invasive Blood Pressure monitoring is compatible with all **5 µV/V/mmHg** type external pressure transducers. Temperature monitoring utilizes YSI-400 and YSI-700 autosensing circuitry, and is compatible with either type of probe, and also provides predictive temp. Noninvasive Blood Pressure monitoring is accomplished using a traditional dual-lumen hose and cuff.

The NIBP/BP/TEMP Board is comprised of five main sections IBP, TEMP, NIBP, NIBP Pneumatics, and Digital Processing.
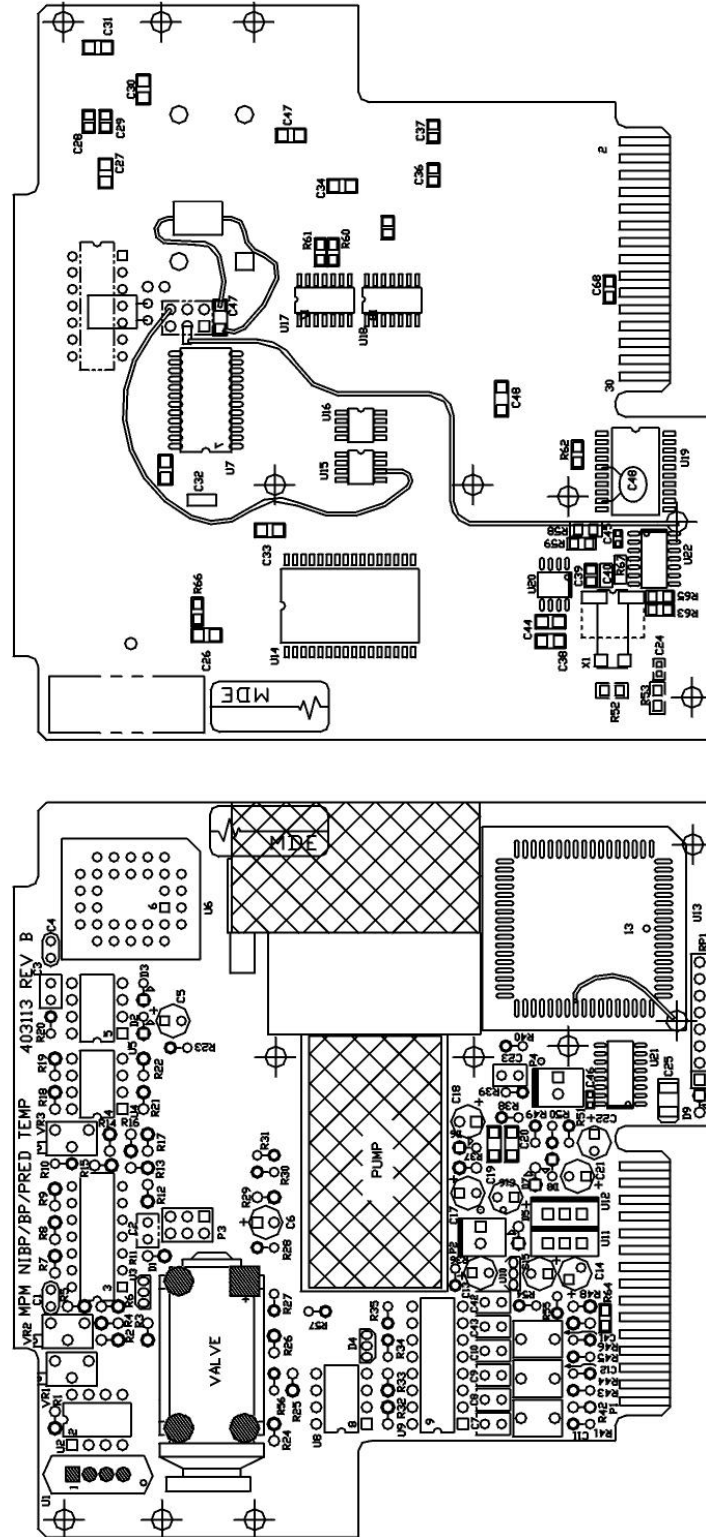
Figure 6-13. *NIBP/BP/TEMP Board Layout*

PUMP ASSEMBLY

PNEUMATICS ASSEMBLY

PRESSURE SENSOR (SEE DETAIL A)

MANIFOLD

NIBP HOSE CONNECTORS (Threaded Type)

VALVE

PIN 1

DETAIL - A-

SILICONE TUBING & CHECK VALVE

MOUNTING PLATE
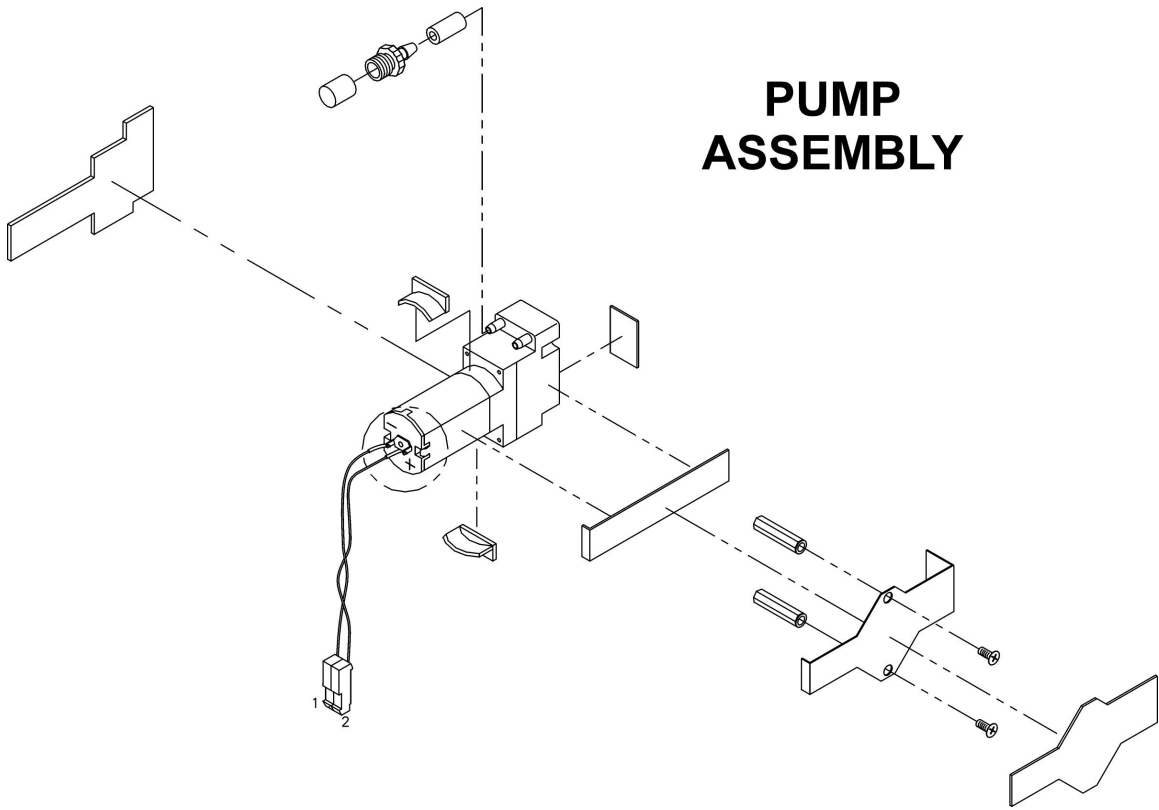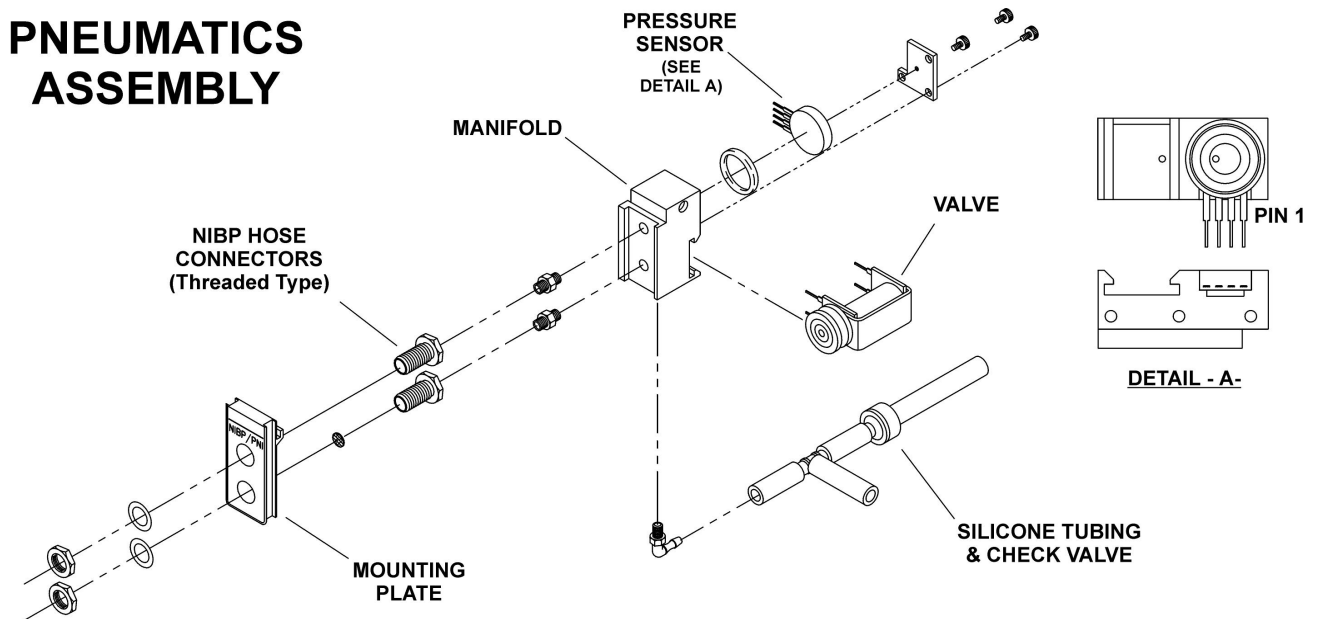
Figure 6-14. *NIBP Pneumatics*
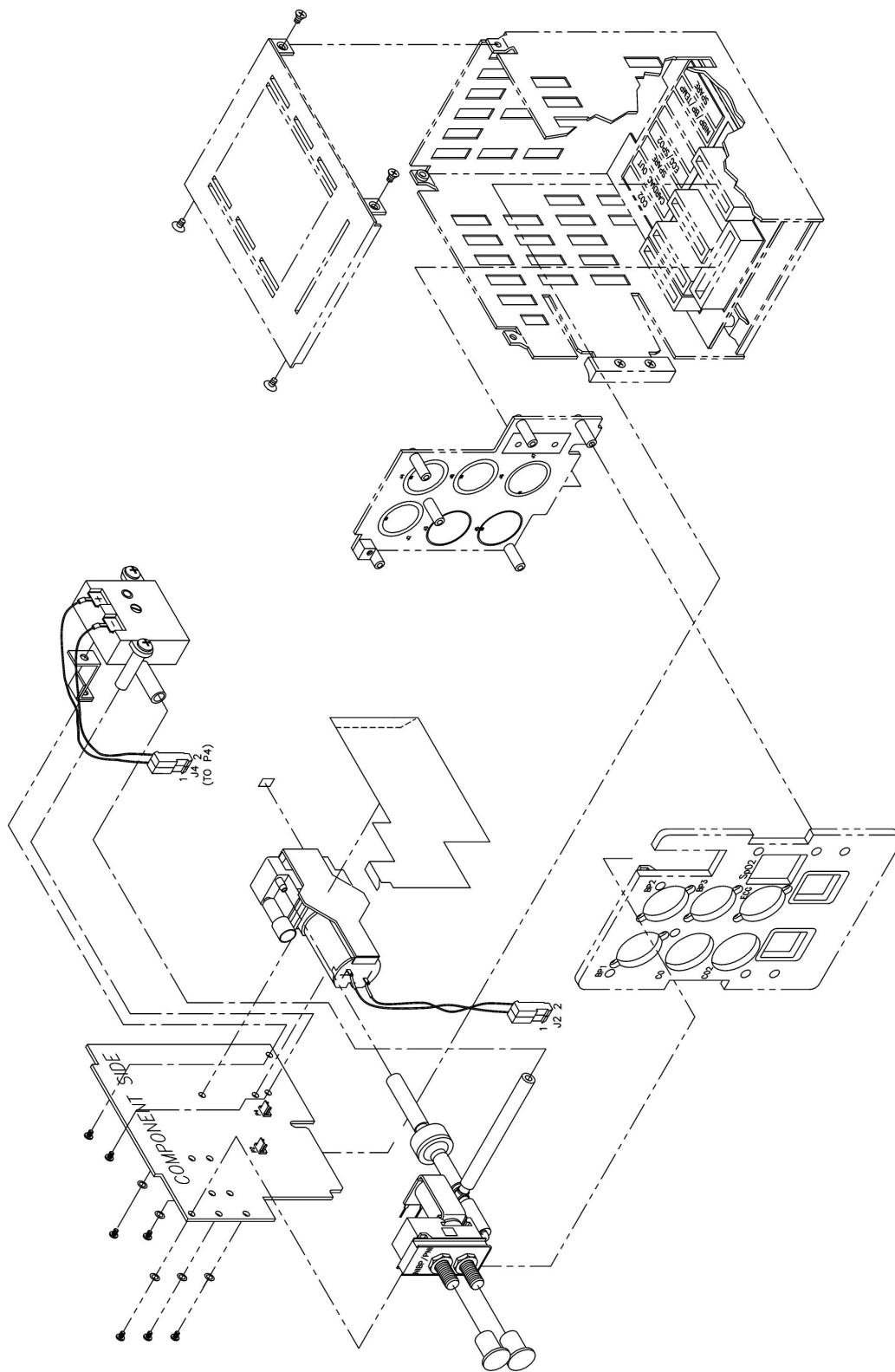
Figure 6-15. *NIBP/BP/TEMP Board with NIBP Pneumatics (Exploded View)*

SureTemp Board

SureTemp is achieved through a proprietary algorithm which calculates (predicts) a temperature reading before reaching a thermal steady state. There are two modes for the SureTemp parameter; normal (predictive) and monitor modes. Temperatures may be taken in the oral, rectal, and axillary locations. The time it takes to predict an Oral temperature is 4 seconds. Rectal temperatures take about 15 seconds for a final reading. Oral temperatures are taken utilizing a patient's sublingual pocket.
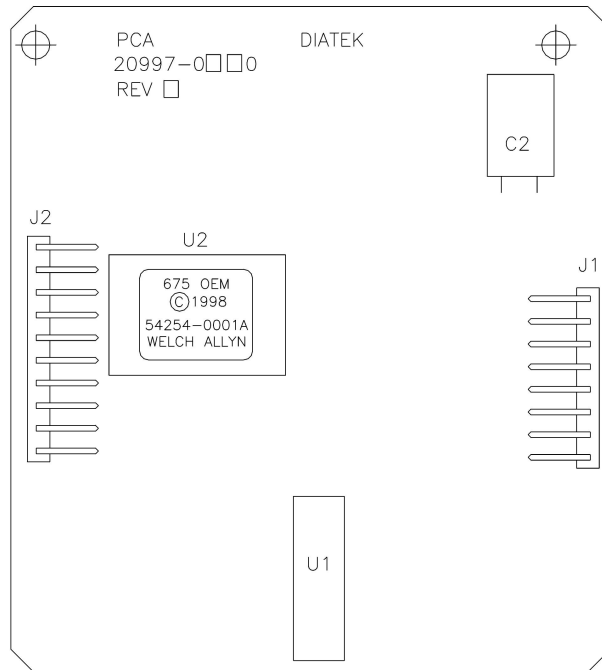
Figure 6-16. *SureTemp PCBA (675 OEM)*
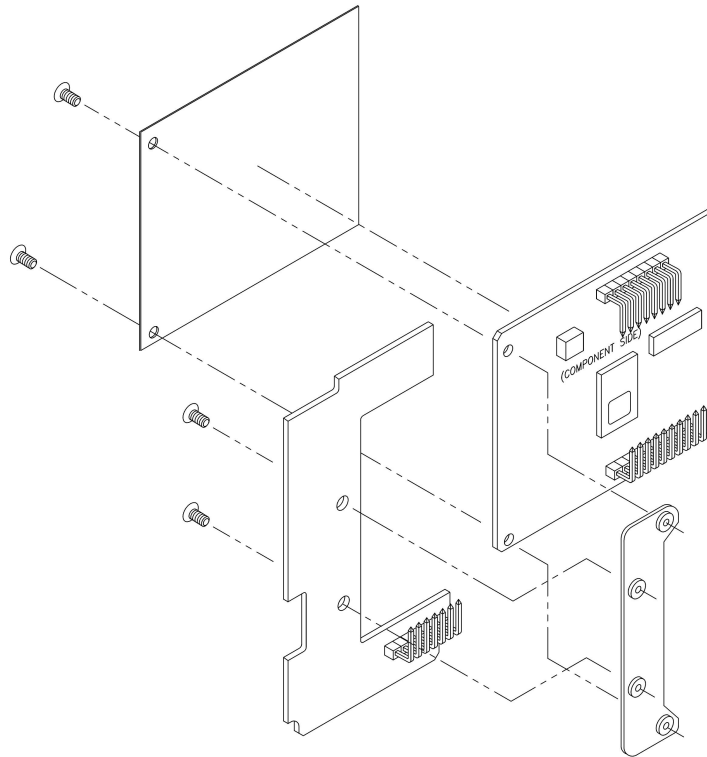
Figure 6-17. *SureTemp Board & Mounting Support Exploded View (675 OEM)*
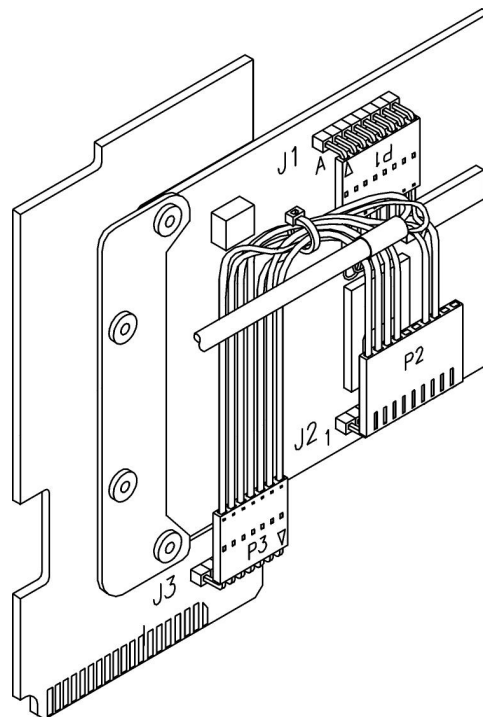
Figure 6-18. *SureTemp Board & Mounting Support Assembly (675 OEM)*
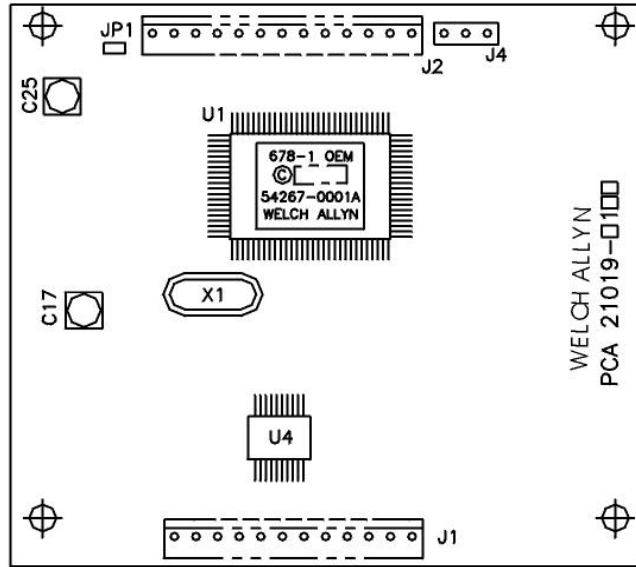
Figure 6-19. *SureTemp PCBA (678 OEM)*
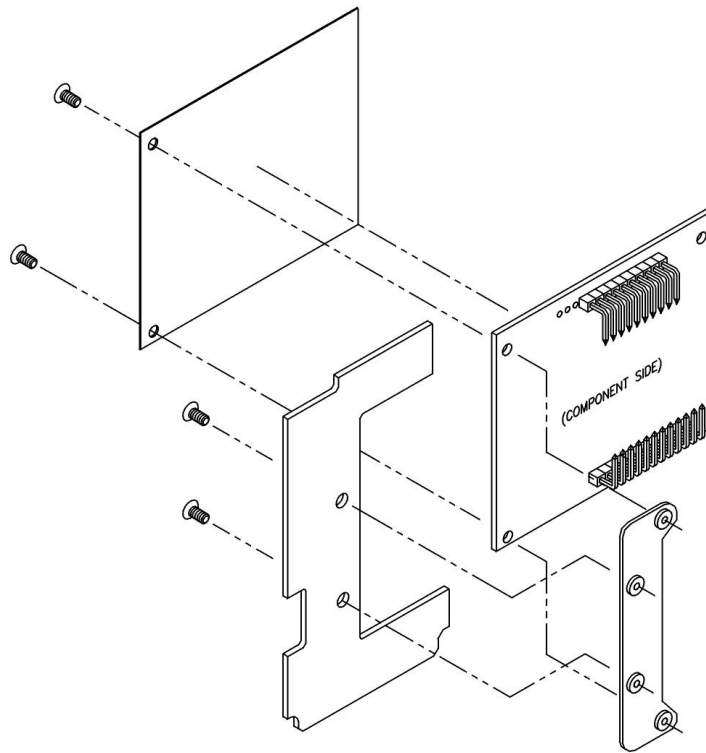
Figure 6-20. *SureTemp Board & Mounting Support Exploded View (678 OEM)*
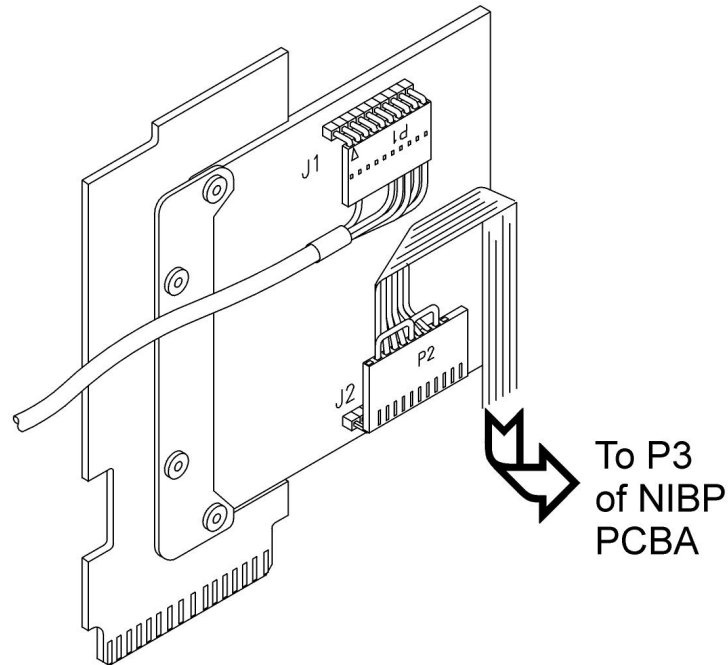
Figure 6-21. *SureTemp Board & Mounting Support Assembly (678 OEM)*
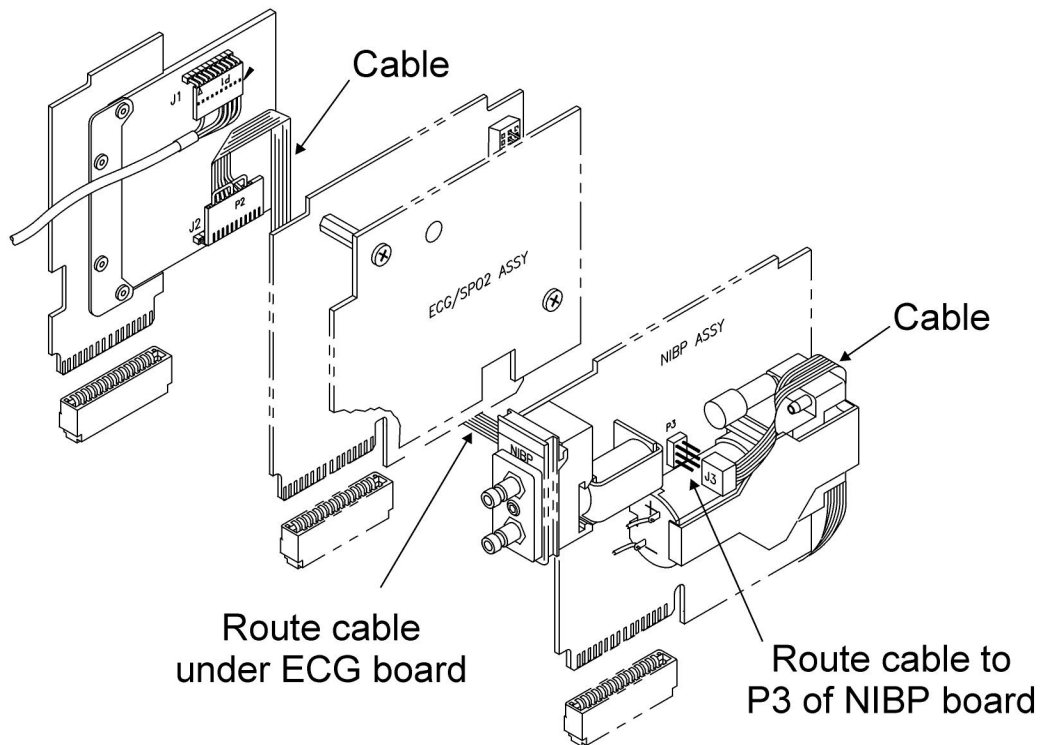
Figure 6-22. *SureTemp Cable Routing (678 OEM)*

CO$_2$ & CO$_2$ Processor Boards

The **PRISM** CO$_2$ system is comprised of three major components, as listed below.

- Optical Bench (CO$_2$ Sensor)

- CO$_2$ Main Board

- CO$_2$ Processor Board

The Optical Bench, or CO$_2$ sensor, is the interface between the patient and the **PRISM** bedside monitor, and is placed in the patient airway. The CO$_2$ Board processes the ETCO$_2$ information received from the Optical Bench while also providing sensor heat-up and control. The CO$_2$ Processor Board is the digital interface between the CO$_2$ board and the **PRISM's** main CPU board.

If the **PRISM** is equipped with both the CO$_2$ and Cardiac Output option, then the entire CO$_2$ Processor capability is embedded in the Cardiac Output Board with minor modifications.

WARNING: Great care must be exercised in handling the CO$_2$ sensor. There are no serviceable parts inside the sensor. If the sensor malfunctions, contact MDE Technical Support.

WARNING: DO NOT immerse, gas sterilize, or autoclave the CO$_2$ sensor. Doing so will cause damage to the sensor, which is NOT COVERED by the product warranty.
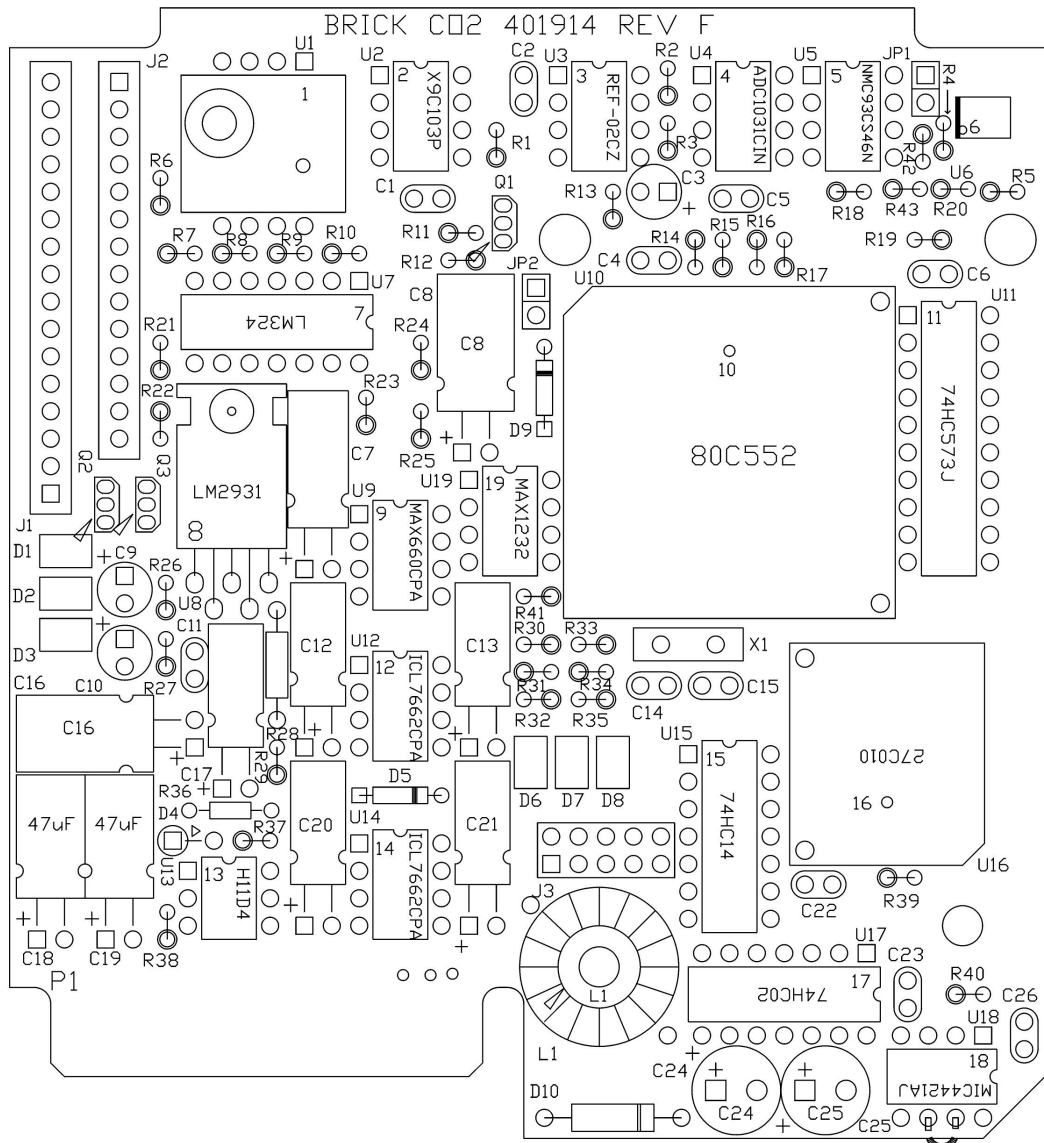
Figure 6-23. *CO2 Board Layout*
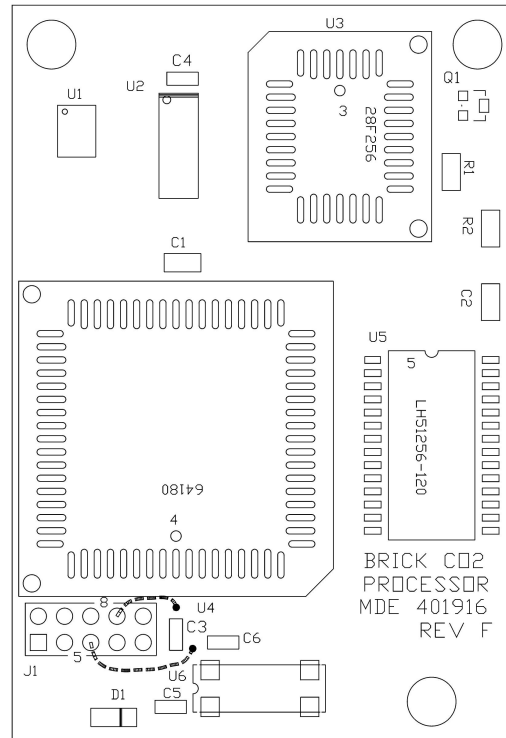
Figure 6-24. *CO2 Processor Board Layout*

Cardiac Output Board

The *PRISM* Cardiac Output system consists of a bifurcated Cardiac Output (CO) cable and the Cardiac Output board. The bifurcated CO cable is comprised of two individual cables — one with a blue connector which connects to the thermistor on the catheter to take blood temperatures, the other with a four-pin female plug which connects to an open bath temperature probe or an injectate flow through probe. The Cardiac Output board includes sensitive amplifiers, an analog-to-digital converter, digital signal processing, and voltage regulators.

The process of performing Cardiac Output measurements starts with a certain amount of injectate with a known temperature. The injectate is diluted with an unknown amount of blood inside the right ventricle of the heart. Temperatures are continuously monitored. Cardiac output, right ejection fraction (REF), stroke volume (SV), end systolic volume (ESV) and end diastolic volume (EDV) are calculated using algorithms stored inside the EPROM. The EPROM stores the calibration coefficients for each channel. Each board has a different set of coefficients. The resistance changes on the probes are converted to voltage values with the analog amplifiers in each one of the three channels. The amplified signals are digitized by an analog-to-digital converter. The software will take these voltage values and process them through algorithms to calculate the temperature values first, and then the CO and REF values.
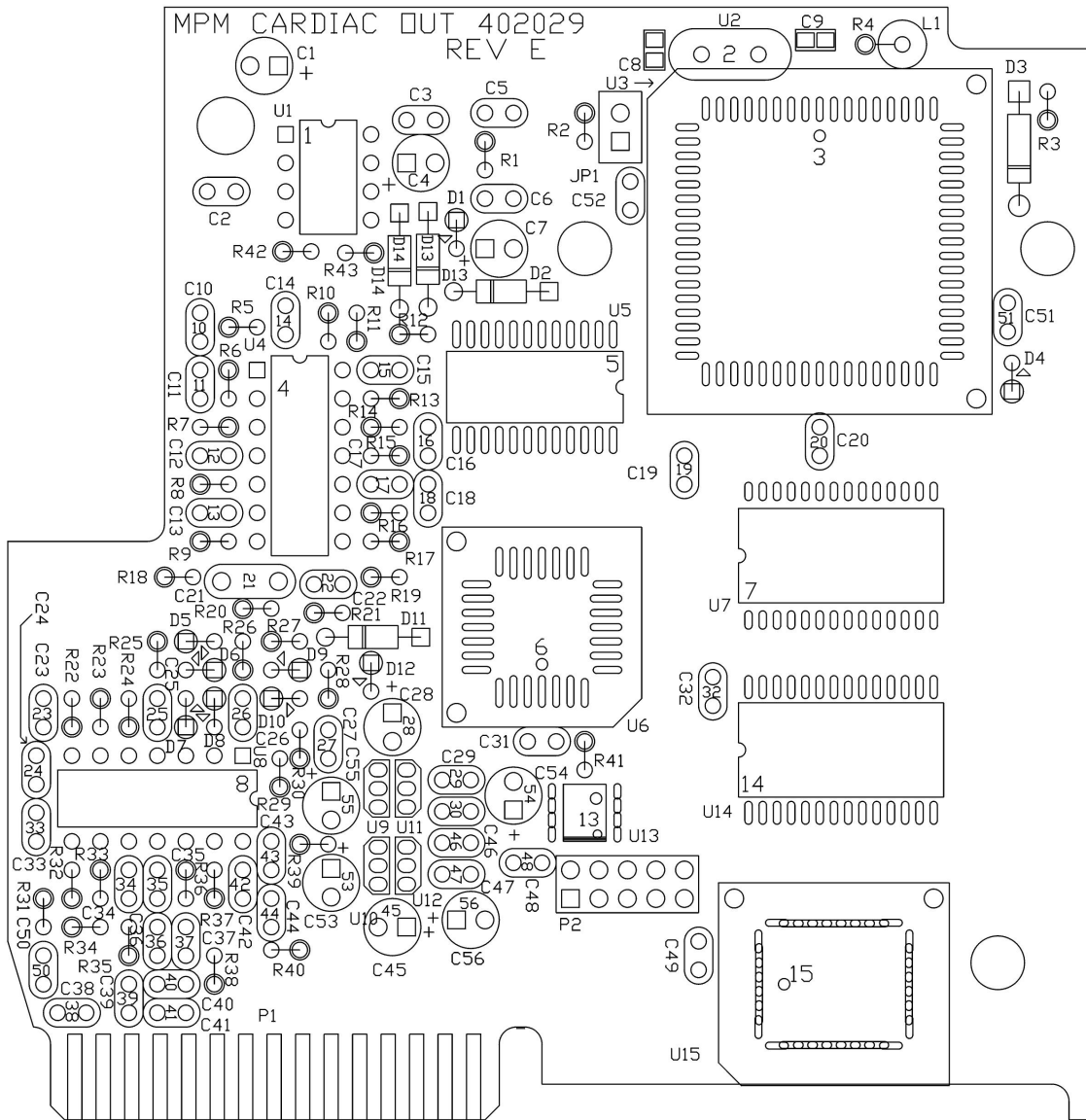
Figure 6-25. *Cardiac Output Board Layout*

Chapter 7

Non-Parameter Options

Recorder (Option 20002)

PRISM monitors may be equipped with an optional thermal recorder, see Figure 7-1. All alphanumeric and waveform data displayed on the monitor's screen may be sent to the recorder for printing.

If the recorder option is not included, a non-recorder configuration is installed to fill the recorder cavity in the *PRISM* monitor. The non-recorder configuration is shown in Figure 7-2.

PRISM monitors that do not include the Thermal Recorder option may be easily upgraded by replacing the non-recorder configuration with a Thermal Recorder.
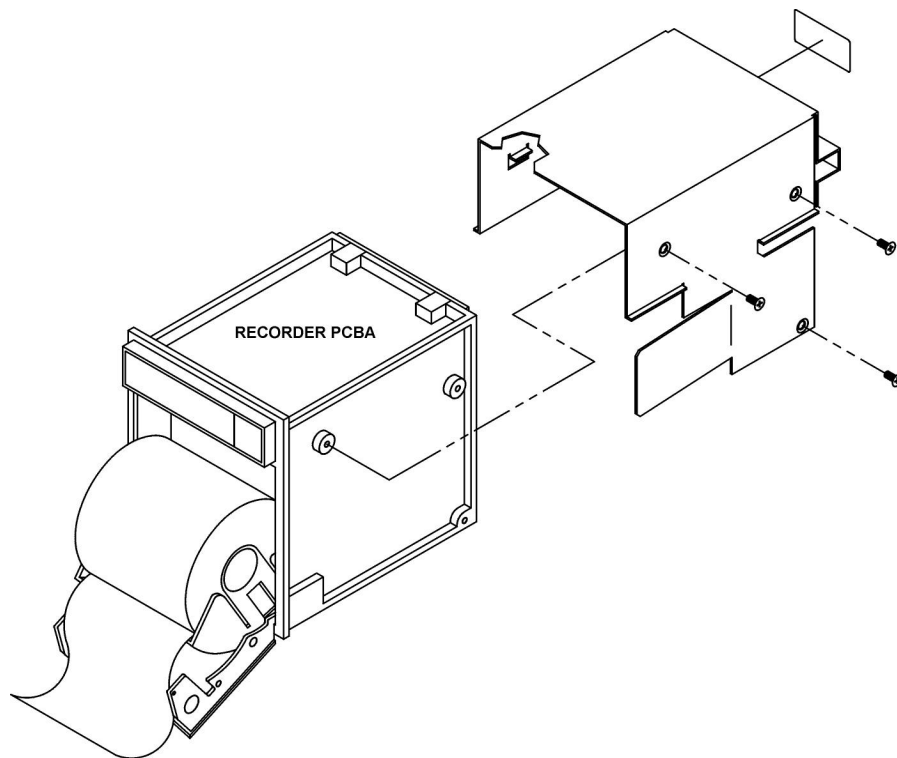
RECORDER PCBA

Figure 7-1. *Thermal Recorder Option*
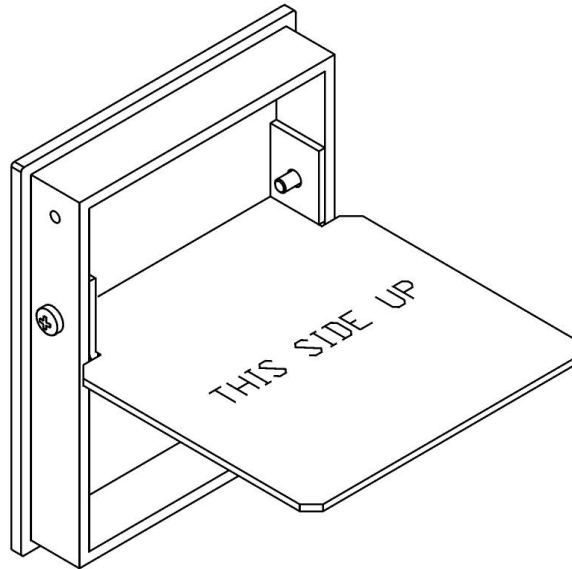
Recorder Blank

Figure 7-2. *Non-Recorder Assembly*

✓ **NOTE: Refer to the operator's manual for instructions on removing and replacing the Recorder Module, and for instructions on changing the recorder paper.**

VGA Output (OPT53)

The optional **VGA OUTPUT** port allows for an external VGA monitor to be connected. The same information that is displayed on the *PRISM* monitor will display on the external VGA monitor.

Power Isolation Transformer

To AC Power
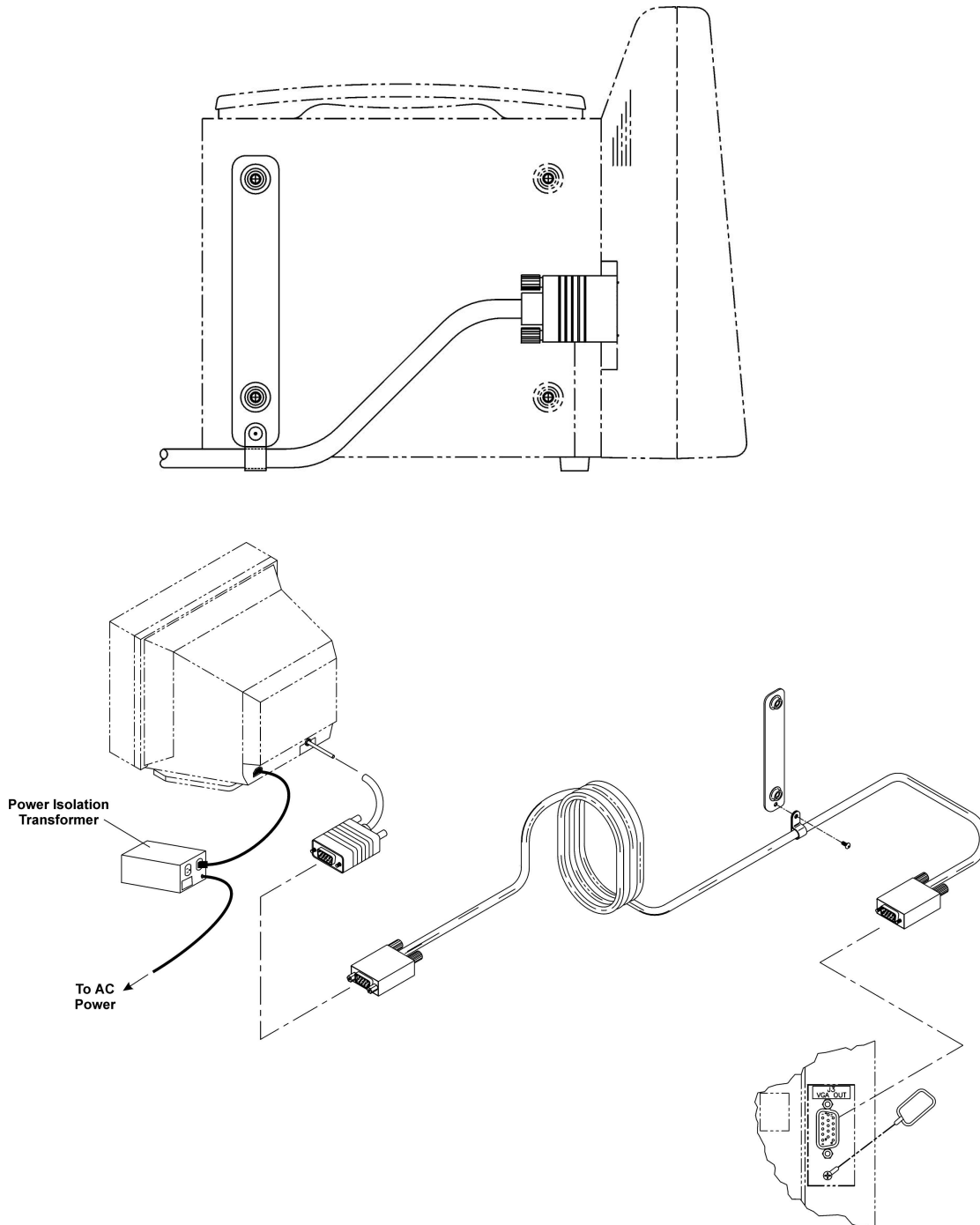
Figure 7-3. *PRISM with VGA Option*

Chapter 8

Mechanical

Overview

This chapter provides the information necessary to disassemble the *PRISM* monitor.

⬦
WARNING: High voltages may be present! REMOVE ALL POWER FROM THE AC MAINS, EXTERNAL DC SUPPLIES, AND REMOVE BATTERIES. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY. Use caution when handling electrical parts and assemblies as injury could occur. Technicians should wear a grounding wrist or ankle strap to increase personal safety and to avoid possible damage to the monitor. Read all disassembly instructions prior to performing any removal of parts.

Tools Required

- 7/64 inch Hex Ball Driver

- Phillips Screwdriver(s)

- 1/4 inch Hex Driver

- Needlenose Pliers – small

- Flat Bladed Screwdriver(s)

Disassembly

Main Housing (Skin Assembly) Removal

1. Remove 5 rear screws.

2. Remove any side screws next to the MPM housing.

3. Remove or loosen 2 screws securing the recorder release tab.

4. Slide the main housing (skin assembly) backward.

Power Supply Removal

1. Remove the main housing (skin assembly).

2. Remove 2 side screws securing the power supply to the middle bulkhead.

3. Remove the rear top screw securing the power supply

4. Disconnect the AC, speaker, fan, battery and Ext. DC connectors from the power supply.

5. Remove the power supply.

Bezel Removal

1. Remove the three bottom screws for the bezel.

2. Carefully lift off the bezel and membrane assembly (the membrane cable will be attached to the interface board).

3. Remove the four screws behind the EMI tape on the display.

4. Disconnect the two connectors from the inverter board.

5. Disconnect the display cable.

6. Remove the display.

7. Disconnect the membrane cable from the interface board (CPU 403023) or interface cable (CPU 403905).

Inverter Board Removal

1. Remove the bezel as described earlier in **"Bezel Removal"**.

2. Disconnect the inverter connector.

3. Remove the two screws securing the inverter bracket.

4. Remove the inverter board with bracket.

5. Remove the two screws securing the inverter.

6. Remove the inverter board from the bracket.

7. Remove the cable from the board.

Interface Board Removal

1. Remove the bezel as described earlier in **"Bezel Removal"**.

2. Disconnect the cable for the inverter.

3. Remove the four screws securing the interface board.

4. *Carefully* remove the interface board, which is attached to the video controller board.

Video Controller Board Removal

1. Remove the interface board as described earlier in **"Interface Board Removal"**.

2. Remove the main housing (skin assembly) as described earlier in **"Main Housing (Skin Assembly) Removal"**.

3. Remove the five screws securing the video controller board.

4. *Carefully* remove the board from the CPU board.

5. Disconnect the video cable if necessary.

CPU Removal

1. Remove the video controller board as described earlier in **"Video Controller Board Removal"** (units with video controller boards only).

2. Remove the power supply board as described earlier in **"Power Supply Removal"**.

3. Remove the five screws securing the CPU board.

4. Remove all cable connectors.

5. *Carefully* remove the board.
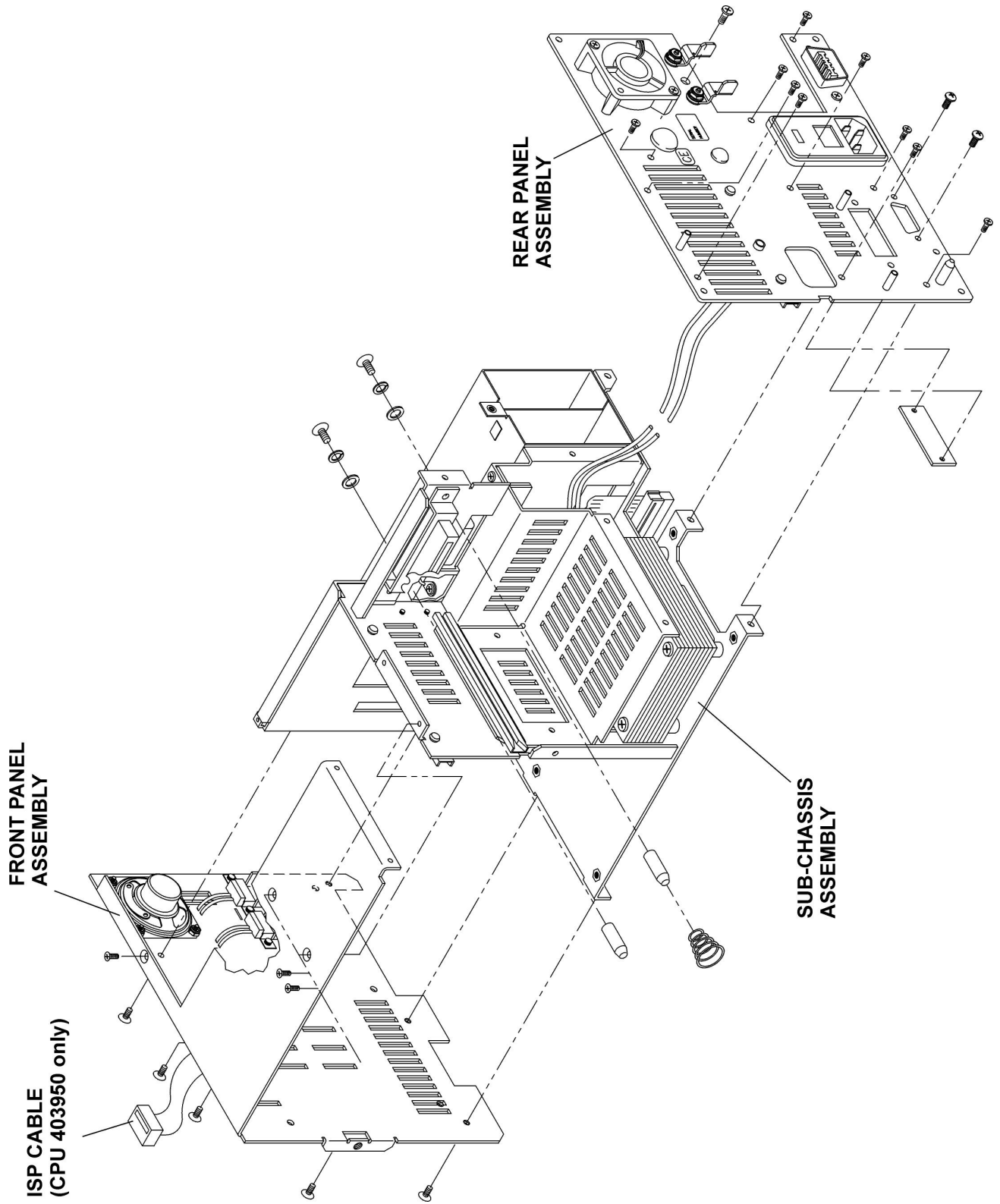
Figure 8-1. *PRISM Chassis Assembly #1*

J7 From
Transformer

J3 From
Speaker

J9 From
Fan

J6 From
Ext DC
Jack Cable

J8 From
Battery
Connector

POWER
SUPPLY
BOARD

ISP CABLE
(CPU 403950 ONLY)

P3 From Defib
Interface Cable

CPU
BOARD
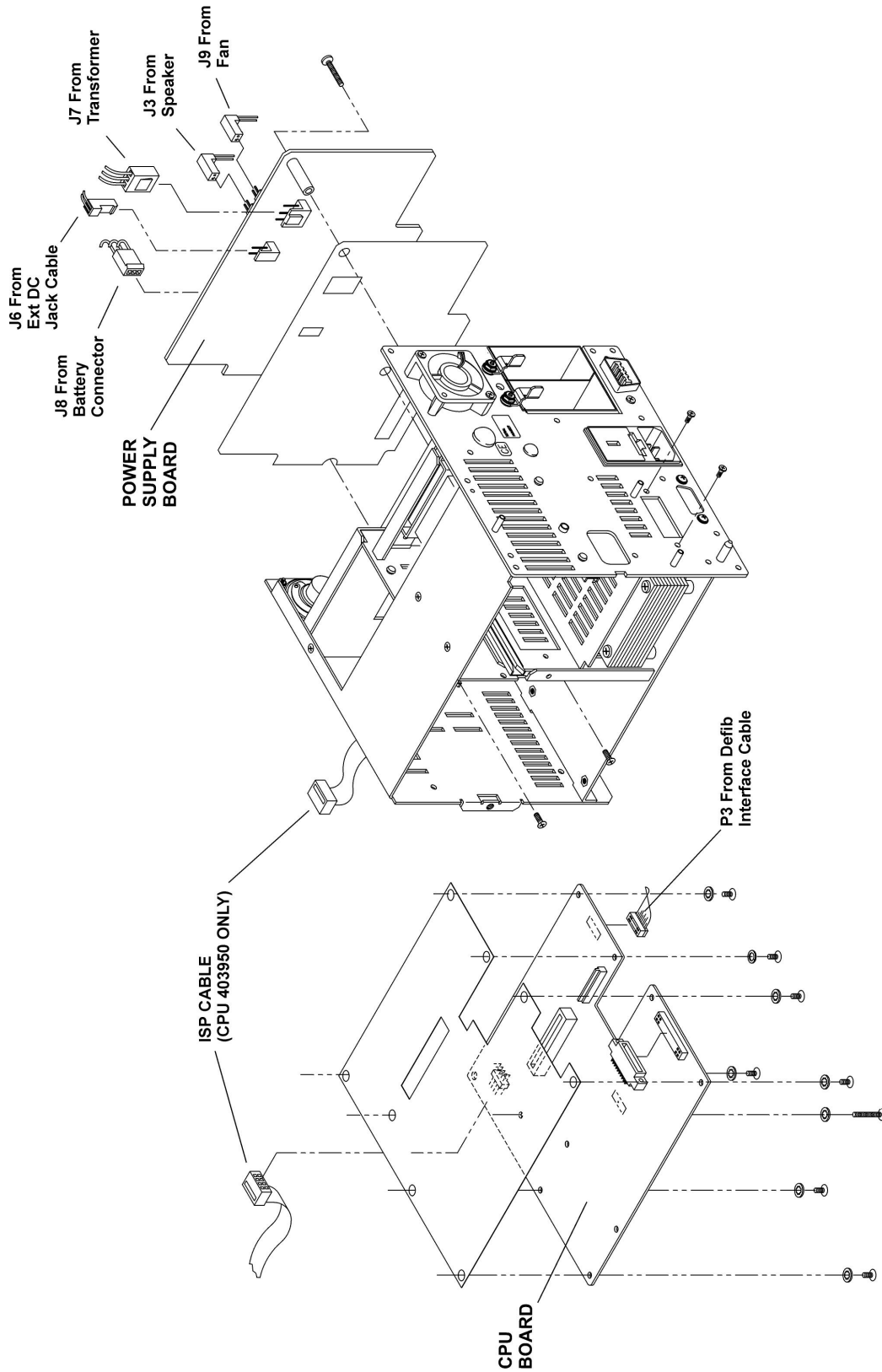
Figure 8-2. *PRISM Chassis Assembly #2*

ISP CONNECTOR &
PORT LOCATION
(CPU 403950 ONLY)

FRONT PANEL
ASSEMBLY

REAR BEZEL
MOLDED

NOTE:
ACCESS TO
THE ISP PORT
IS INSIDE THE
MPM WELL
(with MPM removed)
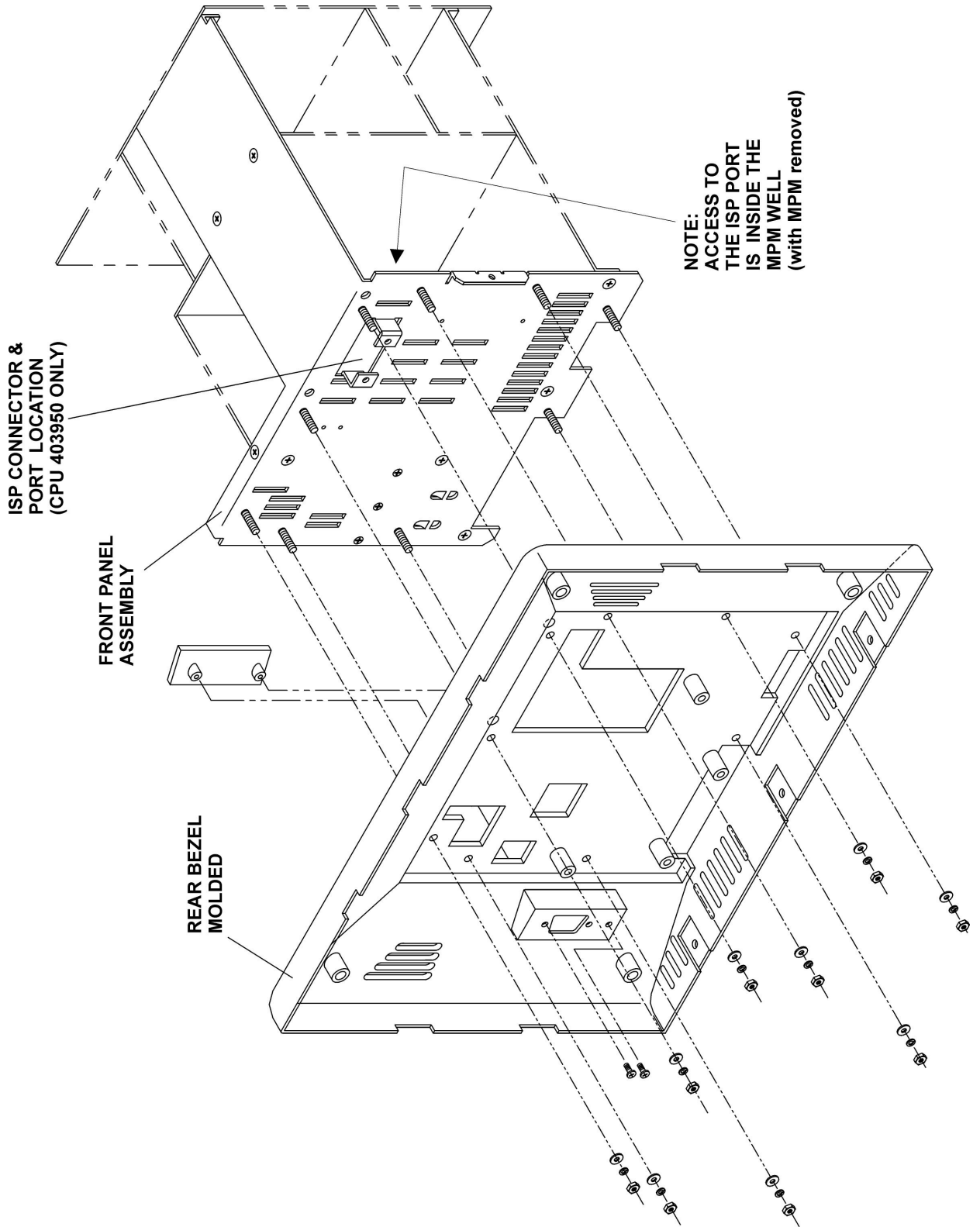
Figure 8-3. *PRISM Chassis Assembly #3*
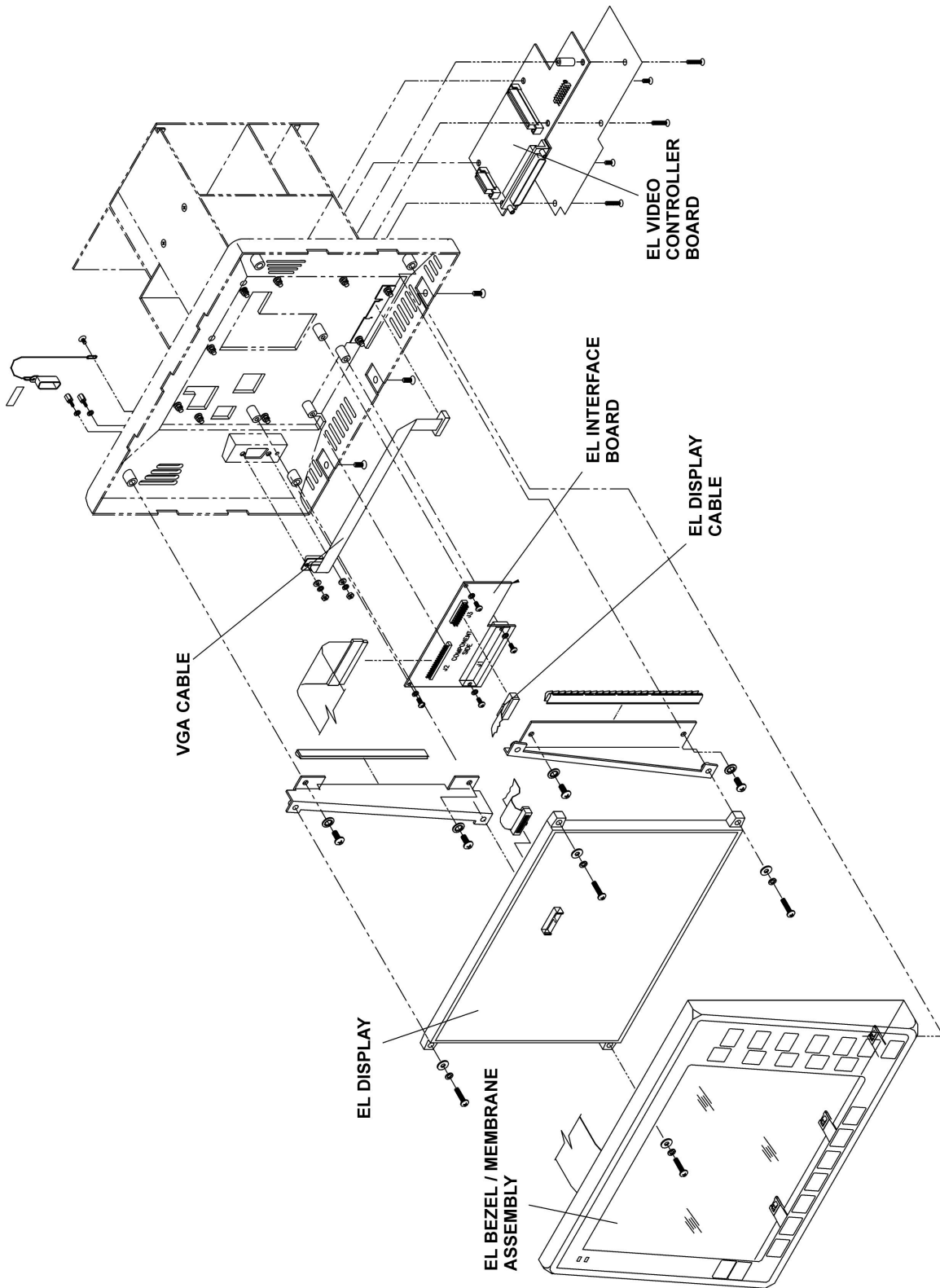
Figure 8-4. *PRISM EL Display Assembly (CPU Board 403023 ONLY)*

LCD VIDEO
CONTROLLER
BOARD

LCD INTERFACE
BOARD

LCD DISPLAY
CABLE

VGA CABLE

POWER
INVERTER
BOARD

LCD DISPLAY
(Sharp)

LCD BEZEL / MEMBRANE
ASSEMBLY
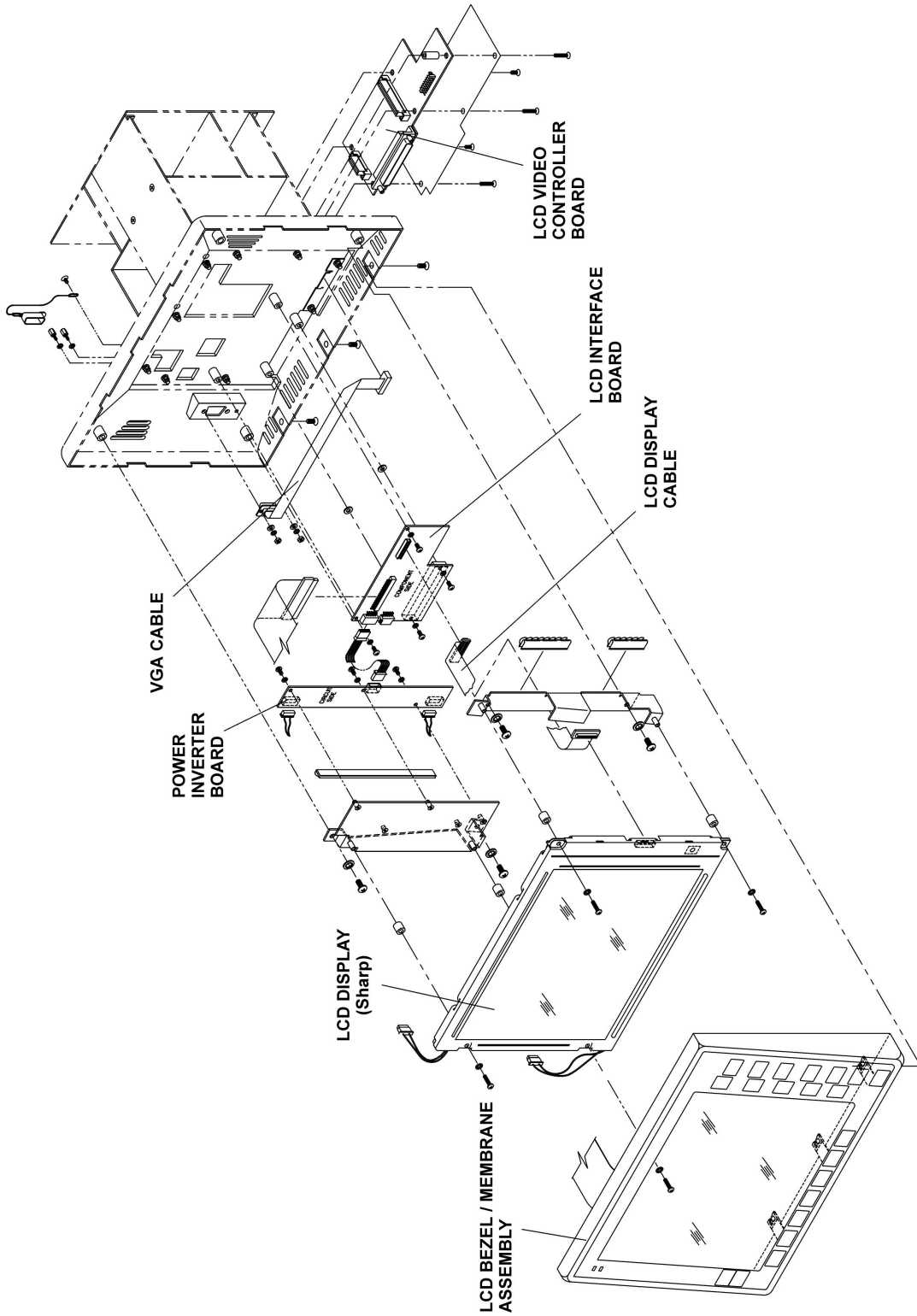
Figure 8-5. *PRISM Color Display Assembly (CPU Board 403023 ONLY)*
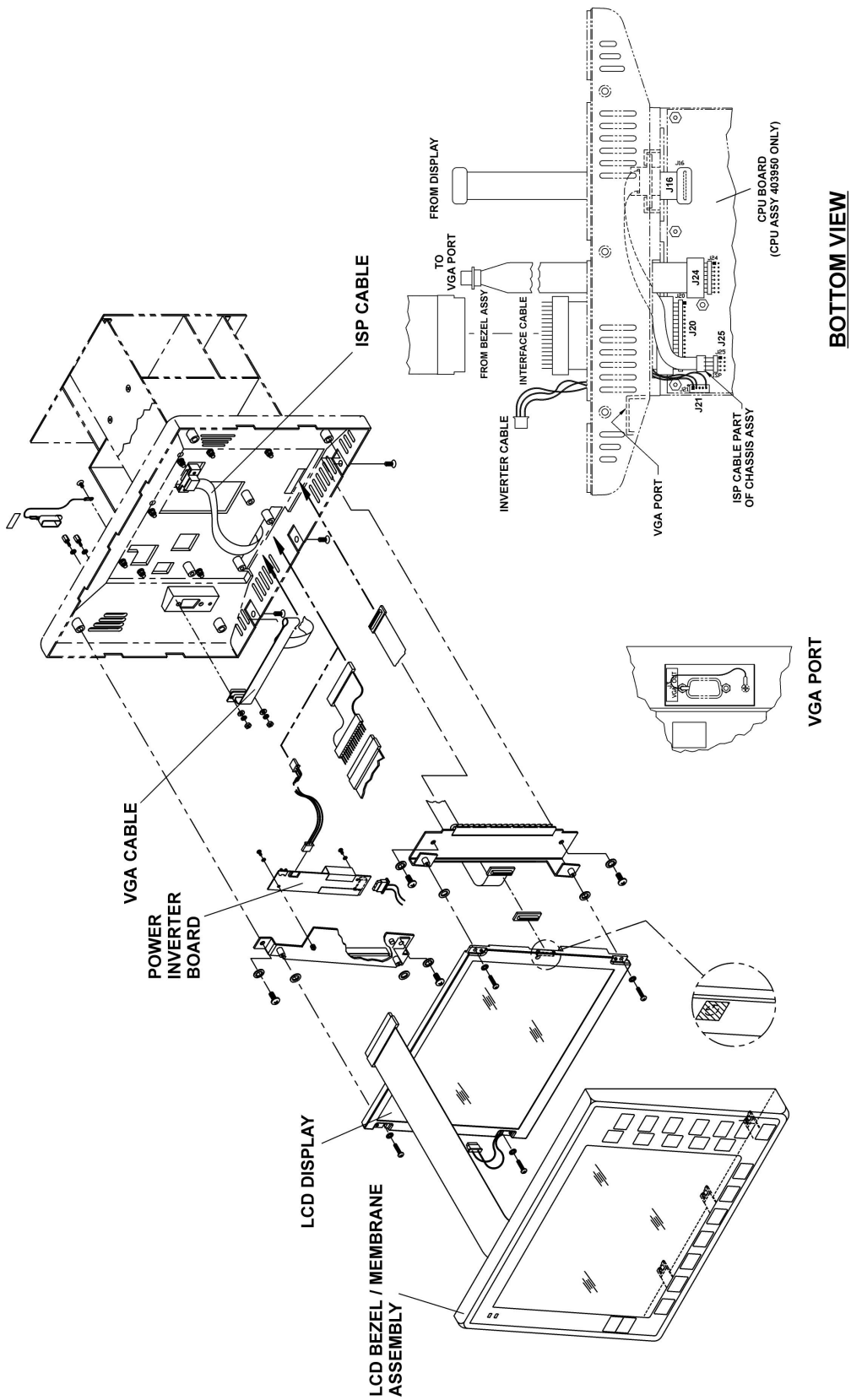
Figure 8-6. *PRISM Color Display Assembly (NEC Display & CPU Board 403950)*

ISP CABLE

FROM DISPLAY

TO
VGA PORT

FROM BEZEL ASSY

INTERFACE CABLE

J16

J24

J20

J20

J25

J21

CPU BOARD
(CPU ASSY 403950 ONLY)

INVERTER CABLE

VGA PORT

ISP CABLE PART
OF CHASSIS ASSY

BOTTOM VIEW

VGA CABLE

POWER
INVERTER
BOARD

LCD DISPLAY

LCD BEZEL / MEMBRANE
ASSEMBLY

VGA OUT

VGA PORT
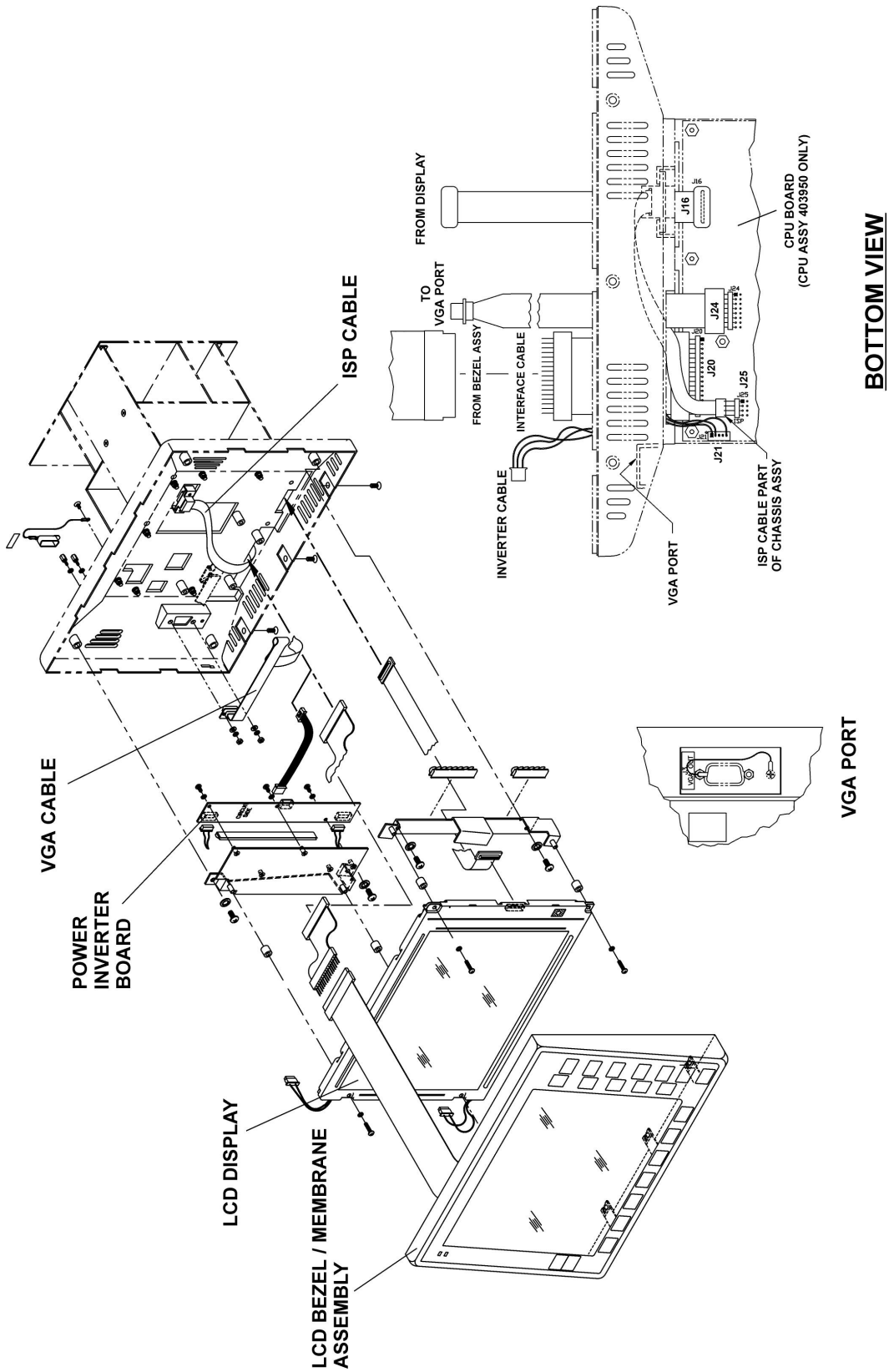
Figure 8-7. *PRISM Color Display Assembly (Sharp Display & CPU Board 403950)*
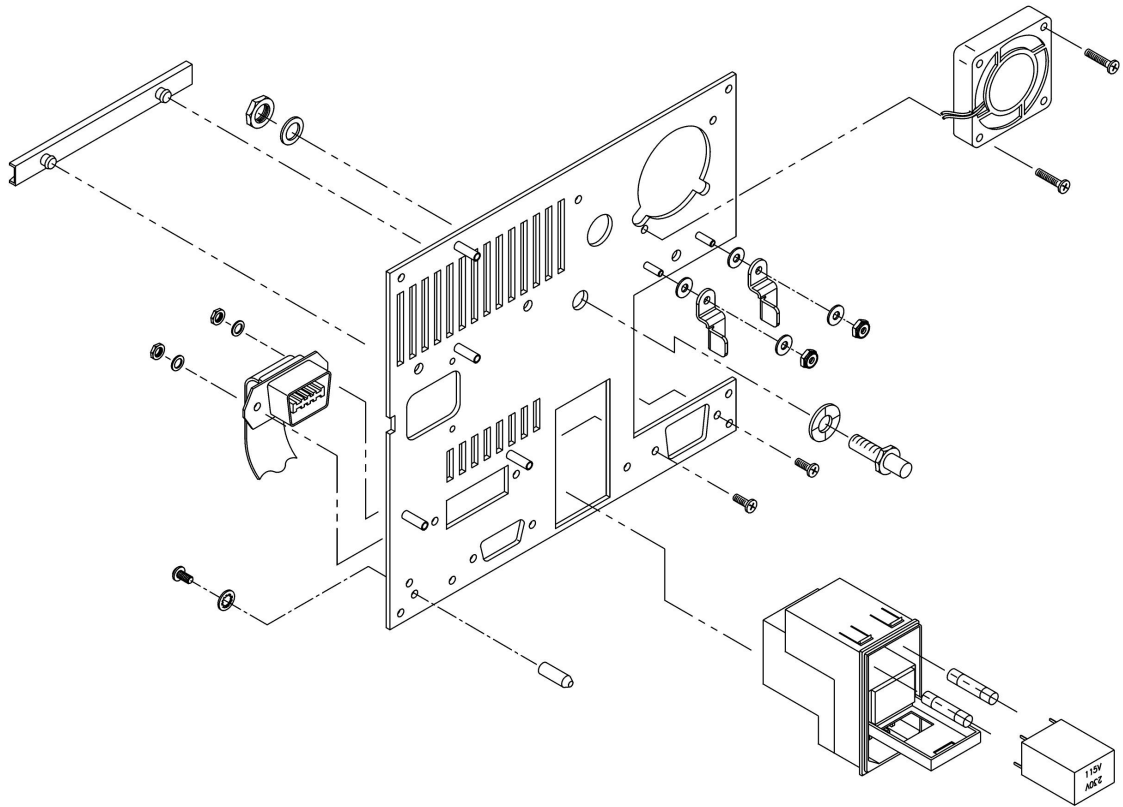
Figure 8-8. *PRISM Rear Panel Assembly*

Chapter 9

Performance Check

Overview

MDE recommends a yearly performance check to verify all functions on the *PRISM* monitor. Perform only the tests necessary for the options and parameters installed in your monitor. A checklist is included at the back of this section which may be photocopied and completed each time the performance check is done. At the conclusion of the performance check, turn power **OFF** and back **ON** again. Verify that all default settings return.

The following equipment (or equivalent) is necessary to do the performance tests. Refer to the manufacturer's operating procedures for detailed information. All test equipment used should be in good working condition and calibrated, if necessary.

- MDE Datasim 6000, 6100 Patient Simulator or similar
- Resistive 3-lead and 5-lead ECG cables and leads
- Two (2)blood pressure cables
- IEC-601 Continuity Tester
- Variac/current box 110VAC
- Variac/current box 220VAC
- DC power supply with 3.5 mm connector, 20VDC/3A
- NELLCOR finger probe and cable
- MASIMO finger probe and cable
- NIBP cuff and hose
- Fogg Temperature Simulator TP400/700
- Fogg BP Simulator BP-600
- Stopwatch
- Digital Manometer (EDI or equivalent)
- Biotek 505 Electrical Safety Tester or similar with printer and interface cable
- Barometer
- DMM, 3 1/2 digit or better
- VGA monitor
- Module Extender Cable (MDE p/n 402000)
- MPM Extender Cable (MDE p/n 401999)

Begin with a thorough visual inspection of the unit. Inspect the power cord for cracks or exposed conductors. Replace power cord, if defective.

Safety Tests

⬦ **WARNING: Disconnect the AC power cord, remove all batteries (if installed), and disconnect all cables connected to the *PRISM* before performing the safety test.**

Chassis Ground Test

1. Connect the AC plug of the IEC-601 Continuity Tester to the AC input of the *PRISM* monitor.

2. Touch test probe to ground post (if present), or to any non-anodized post or screw on back of monitor.

3. Activate the tester and verify that the green **PASS LED** is illuminated.

Current Leakage Test

1. Power-up the Biotek 505 instrument and the printer.

2. Connect the printer to the Biotek and verify it is ON-LINE.

3. Connect the power cable of the Biotek to the monitor.

4. Connect the RED test lead jack to the ground post (if present), or to any non-anodized post or screw on back of monitor.

5. Connect the ECG leads from the Biotek to the monitor.

6. Press the PROGRAM key on the Biotek until the display indicates Pro2.

7. Verify the following LEDs are lit to indicate corresponding tests are enabled: "ohm", "μA" "V" "ECG Leak", "Rev Pol", Open Gnd", "Print", and "Program" LED blinking.

8. Turn ON the monitor.

9. Toggle the ON/STBY key while testing.

10. At the end of the test check the printout. Verify the Ground Wire Resistance does not exceed 0.1 ohm, current consumption is between 0.1 and 0.6A, "Chassis Leakage" current is less than 100μA, and the "Patient Lead Leakage" current in the "isolation mode" is less than 20μA at 120VAC, and 50 μA at 230VAC.

Mainframe Check

Keypad Function Check

1. Verify all membrane keys respond when pressed.

2. Violate an Alarm limit to cause Alarm to activate and verify the **"ALARM"** LED lights.

3. Press the **"Alarm Suspend"** key and verify the "Alarm Suspend" LED lights.

Mainframe Software

1. Press the **PAGE HOME** function key.

2. Press the **SYSTEM SETUP** function key.

3. Press the **MORE** softkey twice.

4. Press the **TEST** softkey to display the parameter communication status codes on the screen.

   Each parameter listed is followed by a communications code and its software version. Communication status codes are as follows:

   OK - No faults detected; normal operating state

   I - Parameter is INHIBITED by user configuration in monitor (parameter selection; i.e., RESP vs. RESPCO2, indicating that only one source of respiration may be active at a given time, e.g., Respiration via impedance pneumography vs. Respiration via $ETCO_2$)

   D - Parameter is DISABLED by user configuration in monitor (PRAM AVAIL field in power-up defaults)

   V - Version (protocol revision) mismatch between parameter and monitor; contact MDE Technical Support

   # - Any numeric codes displayed for COMM status should be relayed to MDE Technical Support for further direction

Date and Time Check

1. Press the **PAGE HOME** function key.

2. Press the **SYSTEM SETUP** function key.

3. Press the **MORE** softkey twice.

4. Press the **TEST** softkey.

5. Press the **STAT INFO** softkey to highlight **SW**.

6. Check the monitor for correct date and time.

7. Make changes as necessary. Refer to the operator's manual to change the date and time.

Line Frequency Check

1. While the monitor is set to the **STAT INFO SW** page, verify that the AC line frequency is 60 ± 0.05 Hz. For 50 Hz systems, verify that the AC line frequency is 50 ± 0.05 Hz.

VGA Output Check (If Applicable)

1. Connect a VGA monitor to the 15 pin D-sub connector of the monitor.

2. Verify the *PRISM* monitor display. Verify the VGA monitor text and graphics displayed are normal.

System AC Current Check

1. Remove the batteries from the monitor.

2. Plug the power cord of the monitor into a variac.

3. Set the variac at 115 VAC. Ensure that the current meter reads less than 500 mA.

4. Reinstall the batteries of the monitor when complete.

External DC Operation (If applicable)

1. Remove the AC power source from the monitor.

2. Remove the batteries, if present.

3. Set an external DC power supply (rated at a minimum of 45 VA) to 20 ± 8 VDC.

4. Connect the DC output to the external DC connector at the back of the monitor using the 3.5 mm connector (center pin positive). Verify that the monitor operates normally.

Battery Operation Test

☑ **NOTE: Never discharge the batteries completely. To ensure long battery life, always recharge batteries immediately after use. Batteries should be replaced every two (2) years regardless of test results. Used batteries should be recycled or disposed of properly.**

☑ **NOTE: Battery test should be performed on recently charged batteries.**

1. Remove the AC power cord from the monitor and verify the monitor remains on with normal operation.

2. Ensure that both the **AC ON** and **BATTERY CHARGING** LEDs are off.

3. Reconnect the AC power cord to the monitor.

4. Verify the **AC ON** LED is on with AC power

ECG Tests

☑ **NOTE: When using a patient simulator, the tolerance factor of the simulator must be considered in determining if the monitor is within tolerance.**

Lead Fail Test

1. Connect a 5-lead ECG cable to a calibrated patient simulator.

2. Connect the ECG cable to the ECG connector of the monitor.

3. Ensure that the monitor is set to 5-lead mode.

4. Verify the **CHK LEADS** message appears below the ECG trace within 10 seconds when any patient lead is disconnected (LL, LA, RA, RL, and C).

5. Verify the **CHK LEADS** message appears below the RESP trace (if applicable) when LA or RA lead is disconnected.

6. Verify that when any patient lead is disconnected and reconnected, the baseline returns to normal within two (2) seconds.

ECG Lead Position Check

1. Connect a 5-lead ECG cable to a calibrated patient simulator.

2. Connect the ECG cable to the ECG connector of the monitor.

3. Press the **PAGE HOME** function key.

4. Press the softkey adjacent to the **ECG** label.

5. Press the **LEAD SEL** softkey.

6. Press the **LEAD** softkey to highlight the **5** mode.

7. Press the **MORE** softkey twice.

8. Press the **MM/S** softkey to set the sweep speed to 25 mm/sec.

9. Verify that an acceptable ECG waveform is displayed in all lead positions.

ECG Alarm Function Check

1. Press the **PAGE HOME** function key.

2. Press the softkey adjacent to the **ECG** label.

3. Turn on ECG alarms using the **ALARM ON/OFF** softkey.

4. Set the ECG output of the patient simulator higher than the high alarm limit.

5. Verify that the alarm tone sounds.

6. Set the patient simulator ECG output lower than the low alarm limit.

7. Verify that the alarm tone sounds.

8. If the monitor is equipped with a recorder, observe alarm recording when the alarm record is enabled.

9. Verify that the red ALARM LED is flashing.

Pacer Flag and Artifact Check

1. Set simulator to output a paced waveform.

2. Press the **PAGE HOME** function key.

3. Press the softkey adjacent to the **ECG** label.

4. Set the **PACE ON/OFF** softkey to **ON**.

5. Verify that the pace spikes are replaced with uniform pacer flags and that the heart rate indicated on the monitor returns to the simulator rate.

Verify No ECG Count in Asystole Mode

1. Set simulator to ASYSTOLE Mode.

2. Verify the ECG count goes to 00.

3. Verify the monitor is in 5-lead mode, select lead I.

4. Set ECG trace size to maximum.

5. Verify ECG count remains at 00 for at least 10 seconds.

6. Set ECG to standard trace size.

7. Return monitor to lead II.

8. Set simulator to NSR.

9. Check **QRS TONE:** Press **TONE** softkey and listen for beep corresponding to each R-wave.

ECG Calibration Check

> ✓ **NOTE: Disconnect all parameter cables (except the ECG cable) during this test. Ensure that ECG is set to monitor Lead II.**

Units with Recorders

1. Connect an ECG 1mV calibrated signal to the monitor's ECG input connector.

2. Set the monitor for a single trace mode in the **RECORDER SETUP** menu.

3. Turn **OFF** the Recorder Delay in the **RECORDER SETUP** menu.

4. Press the **RECORD** key.

5. Press the softkey adjacent to the **ECG** label.

6. Press the **SIZE** softkey.

7. Press the **CAL** softkey.

8. Verify that the R-wave amplitude is 1mV peak-to-peak from the isoelectric line to the R-wave peak $\pm$ 0.1 mV.

9. Verify the Cal pulse is 1mV peak-to-peak.

Units without Recorders

1. Perform Steps 1 and 2, and 5-7 as described above.

2. Ensure that the calibration pulse generated on the screen and the ECG amplitude are within 15% measuring the peak-to-peak from the isoelectric line to the R-wave peak.

Respiration Tests

Apnea Alarm Check

1. Set the simulator to produce an apnea greater than 10 seconds.

2. While in the **RESPIRATION SETUP** menu of the monitor, set alarms **ON**.

3. Set the **APNEA DELAY** to 10 seconds.

4. Ensure that the alarm sounds after the delay indicated.

5. Verify that the front panel ALARM LED flashes while the alarm is in progress.

6. Return the simulator respiration rate to 15 or 20 BPM.

High/Low Alarm Function Check

1. Turn on RESP alarms using the **ALARM ON/OFF** softkey.

2. Set the RESP output of the patient simulator higher than the high alarm limit.

3. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

4. Set the patient simulator RESP output lower than the low alarm limit.

5. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

SpO$_2$ Tests

Finger Sensor Check (Nellcor & Masimo)

1. Connect the appropriate Finger Sensor.

2. Verify **SEARCH** message.

3. Insert an index finger into the sensor. Place LED over fingernail.

4. Verify that the SpO$_2$ waveform and saturation reading appear on the screen after a few seconds.

5. Disconnect Finger Sensor.

6. Verify **NO SENSOR** message flashes on the screen.

High/Low Alarm Function Check

1. With the finger sensor connected to the monitor, insert an index finger into the sensor.

2. Turn on SpO$_2$ alarms by using the **ALARM ON/OFF** softkey.

3. Set the alarm limits outside of values.

4. Verify that the alarm tone sounds while the front panel ALARM LED is flashing.

5. Set the SpO$_2$ alarms to **OFF** by using the **ALARM ON/OFF** softkey.

NIBP Tests

Inflation Time and Maximum Pressure Check

1. Connect a digital manometer to the bottom NIBP fitting.

2. Press the **PAGE HOME** function key.

3. Press the **SYSTEM SETUP** function key.

4. Press the **MORE** softkey twice.

5. Press the **TEST** softkey.

6. Cycle the **NIBP TEST** softkey until **ADJ** mode is highlighted.

7. Press **PAGE HOME**, followed by pressing the softkey adjacent to the **NIBP** label.

8. Simultaneously, start a stopwatch and press the **START** softkey.

9. Stop the watch when the manometer reads 200mmHg. The time must be equal to or less than 15 seconds.

10. Once the pump shuts off, note the reading on the manometer. The pressure shall be between 270 and 330.

Overpressure Detection Check

1. Verify that the monitor is configured in **ADULT** mode in the **SYSTEM SETUP** menu.

2. Connect the manometer using a 'Y' adapter and reservoir bottle to both bulkhead connectors on the monitor.

3. Press **PAGE HOME**, followed by pressing the softkey adjacent to the **NIBP** label.

4. Wait until the pump stops and then continue to pump the system using the manometer's inflation bulb.

5. Verify that the overpressure switch activates and vents the system between 255 and 280 mmHg.

6. Press the **STOP** softkey, and bleed off any additional air from the system.

7. Configure the monitor to **NEO** mode in the **SYSTEM SETUP** menu and return to the **NIBP** menu.

8. Press the **START** softkey.

9. Wait until the pump stops and then continue to pump the system using the manometer's inflation bulb.

10. Ensure that the overpressure switch activates and vents the system between 155 and 170 mmHg.

11. Press the **STOP** softkey, and bleed off any additional air from the system.

12. Switch monitor back to **ADULT** mode.

Leak Test Procedure

If a leak is suspected, take the following steps:

1. Attach an adult hose and cuff to monitor. Wrap cuff around a mandrel.

2. Press the **PAGE HOME** function key.

3. Press the **SYSTEM SETUP** function key.

4. Press the **MORE** softkey twice.

5. Press the **TEST** softkey.

6. Press the **NIBP TEST** softkey once to highlight **LEAK**.

7. Press the **PAGE HOME** key.

8. Press the **NIBP** softkey to display the first **NIBP SETUP** menu.

9. Press the **START** softkey. The following message is displayed:

   LEAK TEST

10. The *PRISM* will then automatically check for a leak. If no leak is detected, a **NO LEAK** message is displayed. If a leak is detected, a **LEAK** message is displayed, and should be repaired by qualified service personnel.

Calibration Check Procedure

Calibration of the monitor should be checked at least once a year, or when there is doubt about the validity of the pressure readings. The test procedure is designed to confirm the accuracy of the monitor as well as to diagnose pneumatic leaks.

To perform a calibration check, follow these steps:

1. Connect a manometer, reservoir, and pump bulb to the top NIBP fitting.

2. Press the **PAGE HOME** function key.

3. Press the **SYSTEM SETUP** function key.

4. Press the **MORE** softkey twice.

5. Press the **TEST** softkey.

6. Press the **NIBP TEST** softkey three times, until **ADJ** is highlighted.

7. Press the **PAGE HOME** key.

8. Verify **CUFF = 00** on the screen.

9. Pump the system using the manometer's inflation bulb until 240 mmHg is shown on the manometer.

10. Verify the unit is displaying 240 mmHg ± 2 mmHg (If not within limits, Adjust VR1 on the NIBP board until the pressure is within specified limits).

Temperature Tests

YSI Temperature Check

1. Press the **PAGE HOME** function key.

2. Press the softkey below the **TMP 1** label.

> **NOTE: If your PRISM is equipped with SureTemp, it will occupy the TMP1 position. There are no user performance tests for SureTemp.**

3. Check for no temperature indication (dashed lines on the screen).

4. Connect the temperature simulator to the **TEMP 1** input of the monitor.

5. Set the simulator to 25° C.

6. Check that the temperature on monitor reads within 0.2° for both YSI 400 and YSI 700 type probes.

7. Repeat the above for 37° C and 40° C.

8. Repeat the above steps for **TMP 2** (if applicable).

High/Low Alarm Function Check

1. Turn on the **TMP 1** alarms by using the **ALARM ON/OFF** softkey.

2. Set the temperature simulator output higher than the high alarm limit.

3. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

4. Set the temperature simulator output lower than the low alarm limit.

5. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

6. Repeat the above steps for **TMP 2** (if applicable).

IBP Tests

ZERO Check

1. Configure an available trace for BP1.

2. Press the **PAGE HOME** function key.

3. Press the softkey adjacent to the **BP1** label.

4. Plug the waveform simulator into the monitor's BP1 connector.

5. Ensure that a flashing **ZERO BP1** message appears.

6. Set the simulator to zero pressure.

7. Press the **ZERO BP1** softkey.

8. Ensure that the flashing **ZERO BP1** message disappears.

9. Repeat the above procedures for **BP2** and **BP3** if installed.

Waveform Check

1. Set the simulator to output dynamic pressure (e.g., 120/80).

2. Verify that a standard invasive blood pressure waveform is present.

3. Repeat the above procedures for **BP2** and **BP3** if installed.

High/Low Alarm Function Check

1. Turn on BP1 alarms by using the **ALARM ON/OFF** softkey.

2. Set the patient simulator BP1 output higher than the high alarm limit.

3. Verify that the alarm tone sounds while the front panel ALARM LED is flashing.

4. Set the patient simulator BP1 output lower than the low alarm limit.

5. Verify that the alarm tone sounds while the front panel ALARM LED is flashing.

6. Repeat all IBP tests for **BP2** and **BP3** (if installed).

End Tidal CO_2 Tests

Test Setup

1. Plug in the **ECG** cable, enable **RESP** and **CO_2** on traces 2 and 3 respectively.

2. Press the **CO_2** Softkey and verify **"NO SENSOR"** message appears on **CO_2** trace.

3. Verify **RESP (ECG RESP)** rate is equal to DataSim rate.

CO_2 Power-Up Sequence Check

1. Plug in the **CO_2** sensor.

2. The **"WARM UP"** message should be present. When the sensor completes the **"WARM UP"** process, the message is removed from display.

Verify CO_2 Operation

1. Breathe into sensor.

2. A squared pulse should be seen on the **CO_2** trace. The **RESP (CO2 RESP)** count should equal your breath rate, and the **CO_2** value should be between 35 and 60mm.

Verify Apnea Operation

1. Enable **CO_2** alarm and stop breathing into the sensor.

2. The **APNEA** alarm should sound after the **APNEA** delay time preset under **RESP**.

Check Barometric Pressure Calibration

1. Check that barometric pressure displayed on the **SW STAT** page is no more than ±7mmHg from the actual pressure.

High/Low Alarm Function Check

1. Turn on **CO_2** alarm softkey

2. Set alarm limits outside of displayed values.

3. Confirm alarm sounds and the front panel **"ALARM" LED** is flashing.

Cycle Test

1. Turn off the **CO_2** with the softkey and verify the **RESP (ECG RESP)** count returns to the DataSim rate.

2. Turn on the **CO_2** parameter with the softkey.

Unplug the Sensor

1. Unplug the CO_2 sensor and verify the **"NO SENSOR"** message appears.

Cardiac Output (CO) Tests

✓ **NOTE: To perform the following Cardiac Output tests, precision resistance (1%) must be applied to the reference designation pins on the *PRISM's* CO connector, as indicated for each test.**

Table 9-1. *CO Connector Pin Designations*

PIN DESIGNATION	SIGNAL
1	BAB
2	THB
3	BAC
7	THD
8	THA
10	BAA
14	FL
4,5,6,11,12,13,15,16,&17	SHLD_CO

Blood Temperature (Tb) Tolerance Check

1. Configure Trace 3 for CO.

2. Press the **PAGE HOME** function key.

3. Press the softkey adjacent to the **CO** label.

4. Using Table 9-2 as a guide, set the resistance values across THA and THB and across THB and THD, as indicated.

5. Observe that for each setup, the blood temperature (Tb) displayed on the *PRISM's* screen is within tolerance.

Table 9-2. *Cardiac Output Calibration Values for Blood Temperatures*

RESISTANCE ACROSS THA-THB	RESISTANCE ACROSS THB-THD	BLOOD TEMPERATURE
9.76 kohms	30.484 kohms	$17.0 \pm 0.1°$ C
9.76 kohms	14.000 kohms	$37.0 \pm 0.1°$ C
9.76 kohms	11.304 kohms	$43.0 \pm 0.1°$ C

Flow Through (Ti) Tolerance Check

1. Configure Trace 3 for CO.

2. Press the **PAGE HOME** function key.

3. Press the softkey adjacent to the **CO** label.

4. Using Table 9-3 as a guide, set the resistance values across BAB and FL, as indicated (see Table 9-1 for correct pin designation).

5. Observe that for each setup, the flow through temperature (Ti) displayed on the *PRISM's* screen is within tolerance.

Table 9-3. *Cardiac Output Calibration Values for Flow Through Temperatures*

RESISTANCE ACROSS BAB-FL	FLOW THROUGH TEMPERATURE
84.510 kohms	$5.0 \pm 0.1°$ C
78.850 kohms	$10.0 \pm 0.1°$ C
62.760 kohms	$25.0 \pm 0.1°$ C

Bath Tolerance Check (Ti)

1. Configure Trace 3 for CO.

2. Press the **PAGE HOME** function key.

3. Press the softkey adjacent to the **CO** label.

4. Using Table 9-4 as a guide, set the resistance values across BAA and BAC and across BAB and BAC, as indicated (see Table 9-1 for correct pin designation).

5. Observe that for each setup, the bath temperature (Ti) displayed on the *PRISM's* screen is within tolerance.

Table 9-4. *Cardiac Output Calibration Values for Bath Temperatures*

RESISTANCE ACROSS BAA-BAC	RESISTANCE ACROSS BAB-BAC	BATH TEMPERATURE
94.980 kohms	19.500 kohms	$0.0 \pm 0.1°$ C
58.750 kohms	11.940 kohms	$10.0 \pm 0.1°$ C
30.000 kohms	6.000 kohms	$25.5 \pm 0.1°$ C

PERFORMANCE CHECKLIST

MODEL: _____ **TECHNICIAN:** _____
SERIAL NUMBER: _____ **DATE:** _____

SAFETY TESTS

Chassis Ground Test ....OK_____
Current Leakage Test ....OK_____

MAINFRAME CHECK

Keypad Function Check...OK_____
Mainframe Software ....OK_____
Date and Time Check..OK_____
Line Frequency Check ....OK_____
VGA Output Check (If Applicable)...OK_____
System AC Current Check..OK_____
External DC Operation ....OK_____
Battery Operation Test..OK_____

ECG TESTS

Lead Fail Tests...OK_____
ECG Lead Position Check ....OK_____
ECG Alarm Function Check ....OK_____
Pacer Flag and Artifact Check ....OK_____
Verify No ECG Count in Asystole Mode ....OK_____
ECG Calibration Check ....OK_____

RESPIRATION TESTS

Apnea Alarm Check..OK_____
High/Low Alarm Function Check ....OK_____

SpO_2 TESTS

Finger Sensor Check (Nellcor & Masimo) ....OK_____
High/Low Alarm Function Check ....OK_____

NIBP TESTS

Inflation Time and Maximum Pressure Check ....OK_____
Overpressure Detection Check...OK_____
Leak Test Procedure..OK_____
Calibration Check Procedure ....OK_____

TEMPERATURE TESTS

YSI Temperature Check...OK_____

High/Low Alarm Function Check ....OK_____

IBP TESTS

ZERO Check..OK_____

Waveform Check ....OK_____

High/Low Alarm Function Check..OK_____

END TIDAL CO_2 TESTS

Test Setup..OK_____

CO_2 Power-Up Sequence Check ....OK_____

Verify CO_2 Operation ....OK_____

Verify Apnea Operation...OK_____

Check Barometric Pressure Calibration...OK_____

High/Low Alarm Function Check..OK_____

Cycle Test ....OK_____

Unplug the Sensor...OK_____

CARDIAC OUTPUT TESTS

Blood Temperature (Tb) Tolerance Check ....OK_____

Flow Through (Ti) Tolerance Check ....OK_____

Bath Tolerance Check (Ti)...OK_____

Chapter 10

Care and Cleaning

Guidelines for Cleaning the Monitor

WARNING: To avoid electric shock, unplug the AC power cord before cleaning.

CAUTION: Do not immerse the instrument, its switches, cables, connectors or accessories in liquids. Do not use caustic or abrasive cleaners that will damage the housing.

Use the following guidelines and considerations when cleaning the *PRISM* monitor:

- Clean the monitor, cuffs, and hoses as required per hospital procedures. Only use a lint free, nonabrasive cloth that has been slightly dampened with mild detergent.

- Avoid harsh cleaning solutions that may harm plastic surfaces.

- Do not immerse monitor, cuffs, or hoses in liquids.

- Do not clean with isopropyl alcohol or other solvents that may harm plastics.

- Do not spray or pour liquids directly onto the monitor or its accessories.

- Do not allow any liquid to come into contact with the power connector, fuse holder, or switches.

- Do not allow any liquids to penetrate connectors or the monitor chassis.

Repacking and Shipping the Monitor

Use the following guidelines if you need to ship the *PRISM* monitor for repair or relocation.

> **CAUTION: Failure to follow the guidelines below may result in damage or loss. Equipment damaged due to improper packaging is not covered in the monitor's warranty, nor is the loss of equipment due to improper or inadequate shipping procedures.**

- The equipment must be packed carefully, ideally using the original shipping carton with foam packing material.

- If the original carton is not available, use a similar carton. Place the equipment in a plastic bag or air bubble cushioning material. Fill the bottom of the carton with approximately five (5) centimeters of polystyrene packing material. Place the equipment on the layer of packing material, and then fill all the remaining space in the carton with packing material.

- Seal the carton adequately.

- If shipping to Medical Data Electronics for repair, a Return Material Authorization number (RMA#) must be obtained. To obtain an RMA number, call MDE Technical Support at one of the telephone numbers listed at the front of this manual. It is necessary to have the model and serial number of the equipment at hand along with a detailed description of the reason(s) why it needs to be returned to the factory.

PRISM Add-on Modules

Introduction

There are three add-on modules that can be shared by all **PRISM** monitors.

- The **Transceiver Module** – provides two-way wireless communication to the ESCORT-Link or ESCORT Vision Central Station, and serves as a repeater for the wireless network.

- The **Telemetry Receiver Module** – allows for bedside monitoring of telemetry patients.

- The **CIS Communication Module** – provides serial and Ethernet TCP/IP interface to HIS/CIS systems for automated charting.
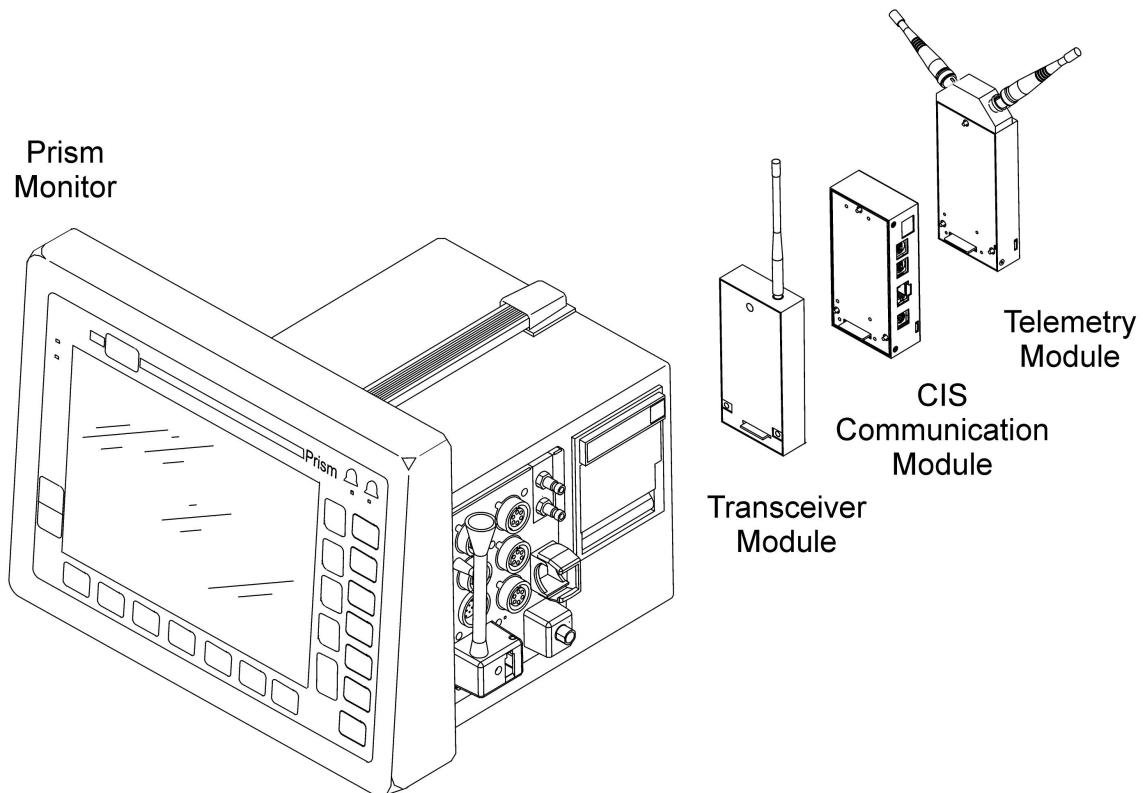
Figure 11-1. *PRISM Add-on Modules*

Transceiver Module

 WARNING: The monitor power should be OFF and the power cord should be disconnected from its AC source when you attach or remove a Transceiver Module. Do not open the module. Refer all servicing to qualified technical personnel.

Attaching the Transceiver Module to the *PRISM* Monitor

1. Turn the monitor power **OFF** by pressing the **STBY** key and **disconnect from AC power source**. Proceed with the following steps after the monitor power has been turned off for approximately twenty (20) seconds.

2. Plug the transceiver into the J1 connector on the back of the monitor, making sure to line up the three screws on the transceiver with the three screw holes on the back of the monitor. Refer to the **"Rear Panel"** section of Chapter 2 for the location of this connector.

3. Use a flat head screwdriver or 3/16"-hex nut driver to turn each of the three screws until the transceiver is attached snugly to the back of the monitor.

4. Ensure that the transceiver antenna is screwed into place on the top of the transceiver.

5. Connect the *PRISM* monitor to an AC power source.

6. Turn the monitor power on by pressing the **ON** key.

7. The green LED on the transceiver indicates the transceiver's communication status.

   - **ON** - If the LED is ON (except for a momentary flicker approximately every 20 seconds), the transceiver has established a communication link.

   - **OFF** - If the LED is OFF, there is currently no communication to or from the transceiver.

   - **Flashing** - If the LED is flashing, the transceiver is attempting to communicate information, but no steady communication link with a central station has been established.

Setting Up Transceiver Communications

Each transceiver has a unique ID code (a four-digit alphanumeric code) which is assigned at the factory. There are fourteen channels through which the transceiver can send and receive data. The transceiver ID and the channel in use must be recognized by both the monitor and central station with which it is communicating.

The following steps ensure the monitor recognizes the transceiver information. See the ESCORT-LINK E3200B Central Station Operator's Manual, or the ESCORT Vision Central Station Reference Manual for information on setting up communications.

Step 1: Verify/Set the Transceiver Channel

To optimize communication between *PRISM* bedside monitors and the central station, a few network configuration issues should be considered. These considerations include assigning the proper operating channel and mode of the monitor's transceiver:

- If the *PRISM* is going to communicate alternately with two or more central stations, it should be in **AUTO** mode. This mode allows the *PRISM's* transceiver to constantly be in a search mode of all fourteen operating channels until it locks in on a central station's channel to which it is currently assigned. Thus, changes in the monitor's central station assignments only require user configuration changes at the central station.

- If you know the *PRISM* will always be communicating with a specific central station, the transceiver should be assigned to the central station's current operating channel. See the ESCORT-LINK E3200B Central Station Operator's Manual or the ESCORT Vision Central Station Reference Manual for information on setting up the communication channel at the central station.

The following steps describe how to verify and/or change your monitor's frequency mode:

1. Press the **PAGE HOME** function key.

2. Press the **SYSTEM SETUP** function key.

3. Press the **MORE** softkey twice.

4. Press the **CONF** softkey.

5. Press the **YES** softkey when prompted **"ARE YOU SURE?"**

6. Press the **SETUP** softkey.

7. Press the **YES** softkey when prompted **"ARE YOU SURE?"**

   The following **CONFIGURATION SETUP** menu will be displayed:

	PORT1 WF2 AUTO	PORT2 WF2 AUTO	PORT3 WF1 AUTO			MORE

8. Press the **MORE** softkey to display the following **CONFIGURATION SETUP** menu:

	BAND AUTO 1				PWR UP DFLTS	

9. Press the **BAND** softkey to choose channels 1 - 14 or AUTO.

10. Press **PAGE HOME** to return to the main monitoring screen. Changes will take effect *without* the need to cycle the monitor on and off.

11. Allow additional time (up to approximately two minutes) to establish communications if the *PRISM* has been set to **AUTO**.

Step 2: Verify the Transceiver Communication Status

Perform the following steps to verify acceptable communications:

1. Press the **SYSTEM SETUP** function key.

2. Press the **MORE** softkey twice.

3. Press the **TEST** softkey.

4. Press the **STAT INFO** (Status Information) softkey twice. **NET** should be displayed.

	STAT INFO NET	CHECK COMM VER	CHECK PROM VER	NIBP REC START	NIBP TEST OFF	

The following four items will appear on the *PRISM* monitor under **NETWORK STATUS** at the top of the screen:

- **RF TRANSPONDER:** The four-digit alphanumeric number on the far right of this line is the transceiver ID number. It identifies the transceiver connected to the monitor. If you have not installed a transceiver on the monitor or its connection with the monitor is not adequate, this line will read **"NO RF TRANSPONDER"**.

- **CENTRAL TRANSPONDER:** The four-digit alphanumeric number on the far right of this line is the central station's transceiver ID number. It identifies the transceiver connected to the central station with which the monitor is currently communicating. If the monitor's frequency mode is set to **AUTO** and its transceiver is searching for a central station, but has not yet established communication, or if the monitor's transceiver ID is not associated with any central station, this line will read **"NO LINK TO CENTRAL"**.

- **FREQ:** The number to the right of **FREQ** is the current monitor frequency, or operating channel. If the monitor is in **AUTO** mode, this number may change as various channels are checked; otherwise the number should not change.

- **HOPS:** The number to the right of **HOPS** indicates the number of transceivers/ repeaters this monitor's transceiver is sending data to in order to reach the central station.

NOTE: HOPS will not appear if the monitor is in AUTO mode and communications are not established with a central station.

NOTE: The *STATUS MESSAGE* area of the screen presents additional information for use by technical personnel.

Removing the Transceiver Module

1. Turn the monitor power **OFF** by pressing the **STBY** key and **disconnect from AC power source**. Allow the monitor power to be **OFF** for approximately twenty (20) seconds before proceeding with these steps.

2. Use a flat head screwdriver or 3/16"-hex nut driver to turn each of the three screws on the transceiver until the transceiver is unscrewed from the back of the monitor.

3. Unplug the transceiver from the connector on the back of the monitor.

Telemetry Module

WARNING: The monitor power should be OFF and the power cord should be disconnected from its AC source when you attach or remove a Transceiver Module. Do not open the module. Refer all servicing to qualified technical personnel.

Attaching the Telemetry Module to the PRISM Monitor

1. Turn the monitor power **OFF** by pressing the **STBY** key and **disconnect from AC power source**. Proceed with the following steps after the monitor power has been turned off for approximately twenty (20) seconds.

2. Plug the telemetry module into the J1 connector on the back of the monitor, making sure to line up the three screws on the module with the three screw holes on the back of the monitor. Refer to the **"Rear Panel"** section of Chapter 2 for the location of this connector.

   Depending on the monitor's configuration, the telemetry module may be connected directly to the rear panel of the *PRISM* monitor or to other *add-on modules* (for example, a transceiver module).

3. Use a flat head screwdriver or 3/16"-hex nut driver to turn each of the three screws until the telemetry module is attached snugly to the back of the monitor/add-on module.

4. Ensure that the two telemetry antennae are BNC-mounted into place at approximately 45 degrees to the vertical, on top of the telemetry module.

5. Connect the *PRISM* monitor to an AC power source.

6. Turn the monitor power on by pressing the **ON** key.

Setting Up Telemetry Communications

The telemetry module can receive ECG signals from any one of approximately 200 different remote transmitters. Each remote telemetry transmitter is assigned a unique ID number at the factory. The transmitter ID must be recognized by the telemetry module in order to display the patient's ECG waveform on the monitor's screen. The following procedure is used to setup telemetry communications with the *PRISM* monitor.

Configuration

Four different types of transmitters are available for use with the *PRISM* monitor. MDE's analog transmitters (MDE model number E12000LR), MDE's digital transmitter (MDE model number 20013), Hewlett-Packard's analog transmitters (HP model number 78100A), and MDE's ESCORT Guardian telemetry transmitter (MDE model number 20601, 20602, or 20603) can all send data to the *PRISM* monitor. Each of these transmitters has different capabilities. The following table presents the features of each transmitter type.

Transmitter Type	Screen Text	Pacer Detect	Remote Record	Low Battery	Check Leads	3-LEAD/- 5-LEAD	SP0$_2$ Capability
MDE Digital UHF	MDD	Yes	Yes	Yes	Yes	Both	No
MDE Analog UHF	MDE	Yes	Yes	Yes	Yes	3-lead	No
HP Analog UHF	HP	No	No	No	No	3-lead	No
MDE Guardian UHF	GTM	Yes	Yes	Yes	Yes	Both	Yes

NOTE: Synchronization with an external defibrillator is not possible when an MDE Digital Transmitter is used as the source for the ECG waveform.

To access these channels, perform the following steps:

1. Press the **PAGE HOME** function key.

2. Press the **SYSTEM SETUP** function key.

3. Press the **MORE** softkey twice.

4. Press the **CONF** softkey.

5. Press the **YES** softkey when prompted **"ARE YOU SURE?"**

6. Press the **SETUP** softkey.

7. Press the **YES** softkey when prompted **"ARE YOU SURE?"**

   The following **CONFIGURATION SETUP** menu will be displayed:

	PORT1 WF2 AUTO	PORT2 WF2 AUTO	PORT3 WF1 AUTO	STOPS		MORE

8. Press the **STOPS** softkey. The following menu appears:

	MFG ↑↑		CHAN ↑↑	CHAN ↓↓	STOP CLR SET	MORE

9. Press the **MFG** ↑↑ softkey to select the desired transmitter type, as described in the beginning of this section. Press the **CHAN** ↑↑ softkey to select higher channel numbers or the **CHAN** ↓↓ softkey to select the lower channel numbers. Press the **STOP** softkey to select **CLR** or **SET** channel.

> ✓ **NOTE: To clear all stops stored in memory, press the MORE function key, and then press the CLEAR ALL STOPS softkey. When prompted "ARE YOU SURE?", press the YES softkey. Pressing the EDIT STOPS softkey will revert to the previous telemetry setup page.**

	CLEAR ALL STOPS	EDIT STOPS				

Verify/Set the Telemetry Channel

> ✓ **NOTE: The "telemetry-monitored" patient must be adequately prepared for proper telemetry function. Hospital personnel have the option of using either 3-lead or 5-lead monitoring depending on the type of transmitter used. In either case, proper lead attachment must be achieved with correct ECG electrodes. After the patient has been prepared, the transmitter is strapped onto the body of the patient using a transmitter pouch.**

The following steps describe how to verify and/or change the monitor's frequency mode:

1. Press the **PAGE HOME** function key.

2. Press the softkey adjacent to the **ECG** label.

3. Press the **MORE** softkey twice to display the following menu:

					MODE CABLE TLM	

4. Press the **MODE** softkey to select **TLM** (Telemetry). The following **ECG SETUP** menu is displayed:

			TLM ID ↑ ↑	TLM ID ↓ ↓	MODE CABLE TLM	

5. Press the **TLM ID ↑ ↑** or **TLM ID ↓ ↓** softkeys to select the transmitter ID of the patient.

   Allow a couple of seconds for each channel to settle. The ECG waveform of the patient being monitored will appear on the display together with a calculated heart rate.

   The channel ID of the transmitter is displayed in the upper area of the monitor's screen, just below the **ADULT/NEO/PED** mode indication. If the receiver loses communication with the transmitter, a **"SIGNAL"** message will be displayed.

⚠ **WARNING: Telemetry ID and lead selection on the monitor must be identical to that of the remote transmitter. Incorrect settings may cause the *PRISM* to display ECG information from a different patient that is assigned to another telemetry ID number.**

✓ **NOTE: The *PRISM* monitor will display a squelch, or triangular, waveform when excessive signal noise is present. This waveform is displayed in lieu of a noisy ECG waveform, which could cause unnecessary alarms.**

✓ **NOTE: The *PRISM* monitor can default to CABLE (standard ECG cable with electrodes), TELM (telemetry), or LAST via system setup. See Chapter 12, "System Defaults & Messages," for details. If LAST is selected, the *PRISM* will power-up to either CABLE or TELM depending on what was last used as an ECG source.**

Recording the Telemetry ECG Waveform

A push button is provided at the top of the patient's transmitter.

1. To record the ECG output waveform, press the push button. A pulse is sent to the telemetry module to initiate a 16-second remote recording. The time, date, transmitter ID, ECG waveform, and additional information will be printed on the recording strip.

Remote recording must first be enabled at the *PRISM* monitor from the **RECORDER SETUP** menu. To access the **RECORDER SETUP** menu, perform the following steps:

1. Press the **PAGE HOME** function key.

2. Press the **SYSTEM SETUP** function key.

3. Press the **MORE** softkey once to display the following menu:

ADULT PED NEO	VOL	DISP CRG	REC SETUP	TIMER	CLOCK	MORE

4. Press the **REC SETUP** softkey to display the following menu:

	REC ON OFF	DELAY ON OFF	TRACE SNGL DUAL	MARK EVENT	RREC ON OFF	MORE

5. Press the **RREC** (Remote Record) softkey to select **ON**. Telemetry recording will now be activated.

> **NOTE: The factory default for the remote record feature is set to OFF. The default may be configured to power up in the ON status. See Chapter 12, "System Defaults & Messages," for details on changing the power up defaults.**

CIS Communication Module

WARNING: The monitor power should be OFF and the power cord should be disconnected from its AC source when you attach or remove the CIS Communication Module. Do not open the module. Refer all servicing to qualified technical personnel.

Attaching the CIS Communication Module to the PRISM Monitor

1. Turn the monitor power **OFF** by pressing the **STBY** key and **disconnect from AC power source**. Proceed with the following steps after the monitor power has been turned off for approximately twenty (20) seconds.

2. Plug the CIS module into the J1 connector on the back of the monitor, making sure to line up the three screws on the CIS module with the three screw holes on the back of the monitor. Refer to the **"Rear Panel"** section of Chapter 2 for the location of this connector.

   Depending on the monitor's configuration, the CIS module may be connected directly to the rear panel of the *PRISM* monitor or to other *add-on modules* (for example, a transceiver or telemetry module).

3. Use a flat head screwdriver or 3/16"-hex nut driver to turn each of the three screws until the CIS module is attached snugly to the back of the monitor/add-on module.

4. Connect the *PRISM* monitor to an AC power source.

5. Turn the monitor power on by pressing the **ON** key.

Setting Up CIS Communication Module Operation

For complete information on configuring and operating the CIS interface module, refer to the **Clinical Information System (CIS) Communication Module Operator's Manual** and the **Clinical Information System (CIS) Communication Module Configuration Instructions**, or contact MDE Technical Support at (818) 768-6411.

Chapter 12

System Defaults & Messages

Default Settings

When the *PRISM* monitor is powered on for the first time, it will be in the Neonatal mode, and all parameters will be set to their factory defaults.

Each parameter has defaults for adult, pediatric, and neonatal modes (ADULT, PED, NEO). All parameter and system defaults can be user-configured. Tables 12-1 through 12-14 can be copied so that you can record your own system defaults for Adult, Ped, and Neo should you desire to change from the factory defaults. Configuring your own defaults is discussed in the section, **"Changing Parameter and System Defaults"** later in this chapter.

Table 12-1. *System Setup Default Record*

SYSTEM SETUP	ADULT	PED	NEO	DESCRIPTION
FACTORY DEFAULTS				To restore all settings to factory defaults
PWR DN MEMORY				Selected time for saving VSC settings
ALRM VOLUME				Alarm tone volume setting (1-8)
ALM VOL MIN				Sets minimum allowable alarm tone volume setting (1-8)
TONE VOLUME				Key tone setting
TRACE 2				Waveform or feature for second trace
TRACE 3				Waveform or feature for third trace
TRACE 4				Waveform or feature for fourth trace
HR SOURCE				Heart rate source, ECG, SPO2, BP's
ALM SUSPND				Alarm suspend time
PRAM LABELS				To blank parameters when off
CLOCK DISPLY				Time displayed on screen
CABLE / TELM				ECG mode - telemetry or cable
REMOTE RECD				Telemetry recording
ALARM FLASH				Flashing alarm LED
LANGUAGE				Sets language (English, French, German, Spanish, Swedish, or Italian)
LINE FREQ				50Hz or 60Hz input line frequency
PATIENT TYPE				Adult, Ped, or Neo
ALARM CNTRL				Enables or disables alarm ON/OFF function

Table 12-2. *Recorder Default Record*

RECORDER SETUP	ADULT	PED	NEO	DESCRIPTION
RECD DELAY				Four second delay
ALRM RECDNG				Alarm recording enable/disable
DUAL RECDNG				Dual trace recording
REMOTE RECD				Telemetry recording
FULL DISCL				Wavelog option

Table 12-3. *Vital Signs Chart Default Record*

VITAL SIGNS CHART	ADULT	PED	NEO	DESCRIPTION
STORE AUTO				Auto stores at selected intervals
STORE NIBP				Storing NIBP values
STORE TMP				Storing Temperature values
STORE CO				Storing Cardiac Output values
VALID TIME				Displayed time for NIBP, Suretemp, and CO
STORE ALARM				Storing alarm violations
STR ECG ALM				Storing ECG alarm violations
STR SPO2 ALM				Storing SPO2 alarm violations
STR RESP ALM				Storing Respiration alarm violations
STR CO2 ALM				Storing CO2 alarm violations
STR BP ALM				Storing IBP alarm violations
STR NIBP ALM				Storing NIBP alarm violations
STR TMP ALM				Storing temperature alarm violations

Table 12-4. *ECG Setup Default Record*

ECG SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables ECG alarms
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the ECG alarms until reset
HIGH LIMIT				High alarm limit setting
LOW LIMIT				Low alarm limit setting
RCD ON ALARM				Record when ECG alarm enabled
FILTER				ECG filter enable
SIZE VCTR 1				3 lead select size
SIZE VCTR 2				5 lead select size
SWEEP SPEED				Waveform speed
PACE DETECT				Pacer detection enable
LEAD SELECT				Lead select I, II, III, or V
5 LEAD				5 lead mode enable
QRS TONE				QRS detect tone
WAVEFORM ON				ECG waveform enable
PRAM COLOR				Sets on-screen color of parameter

Table 12-5. *Respiration Setup Default Record*

RESPIRATION SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables respiration alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the Respiration alarms until reset
HIGH LIMIT				High alarm limit setting
LOW LIMIT				Low alarm limit setting
PRAM AVAIL				Respiration enable or disable
PRAM ON/OFF				Respiration standby
RCD ON ALARM				Record when Resp alarm enabled
RESP SIZE				Respiration waveform size
SWEEP SPEED				Respiration waveform speed
APNEA DELAY				Time delay for apnea alarm
APNEA ALM LVL				Sets alarm priority level (1, 2, or 3)
CVA				Artifact detection
TONE				Respiration Rate tone
CRG SCALES				OXYCRG scales enable
PRAM COLOR				Sets on-screen color of parameter

Table 12-6. *SPO2 Setup Default Record*

SPO2 SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables SPO2 alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
ALARM DELAY				Delay time for alarm
LATCH ALARMS				Latches the SPO2 alarm until reset
ALARM TONE				Tone during alarm
HIGH LIMIT				High alarm limit setting
LOW LIMIT				Low alarm limit setting
PRAM AVAIL				SPO2 enable or disable
PRAM ON / OFF				SPO2 standby
RCD ON ALARM				Record when SPO2 alarm enabled
TONE				Tone enable for SPO2
TONE RANGE				SPO2 tone frequency range
MODE				SPO2 averaging time
C-LOCK				ECG synchronization
WAVEFORM ON				SPO2 waveform enable
PRAM COLOR				Sets on-screen color of parameter

Table 12-7. *BP1 Setup Default Record*

BP1 SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables BP1 alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the BP1 alarm until reset
SYS HI LIMIT				Systolic high alarm limit setting
SYS LO LIMIT				Systolic low alarm limit setting
DIA HI LIMIT				Diastolic high alarm limit setting
DIA LO LIMIT				Diastolic low alarm limit setting
MN HI LIMIT				Mean high alarm limit setting
MN LO LIMIT				Mean low alarm limit setting
PRAM AVAIL				BP1 enable or disable
PRAM ON / OFF				BP1 standby
RCD ON ALARM				Record when BP1 alarm enabled
SIZE				BP1 waveform size
SCALE				BP1 scale enable
DISPD VALUES				BP1 numeric display format
SITE				BP1 catheter site
PRAM COLOR				Sets on-screen color of parameter

Table 12-8. *BP2 Setup Default Record*

BP2 SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables BP2 alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the BP2 alarm until reset
SYS HI LIMIT				Systolic high alarm limit setting
SYS LO LIMIT				Systolic low alarm limit setting
DIA HI LIMIT				Diastolic high alarm limit setting
DIA LO LIMIT				Diastolic low alarm limit setting
MN HI LIMIT				Mean high alarm limit setting
MN LO LIMIT				Mean low alarm limit setting
PRAM AVAIL				BP2 enable or disable
PRAM ON / OFF				BP2 standby
RCD ON ALARM				Record when BP2 alarm enabled
SIZE				BP2 waveform size
SCALE				BP2 scale enable
DISPD VALUES				BP2 numeric display format
SITE				BP2 catheter site
PRAM COLOR				Sets on-screen color of parameter

Table 12-9. *BP3 Setup Default Record*

BP3 SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables BP3 alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the BP3 alarm until reset
SYS HI LIMIT				Systolic high alarm limit setting
SYS LO LIMIT				Systolic low alarm limit setting
DIA HI LIMIT				Diastolic high alarm limit setting
DIA LO LIMIT				Diastolic low alarm limit setting
MN HI LIMIT				Mean high alarm limit setting
MN LO LIMIT				Mean low alarm limit setting
PRAM AVAIL				BP3 enable or disable
PRAM ON / OFF				BP3 standby
RCD ON ALARM				Record when BP3 alarm enabled
SIZE				BP3 waveform size
SCALE				BP3 scale enable
DISPD VALUES				BP3 numeric display format
SITE				BP3 catheter site
PRAM COLOR				Sets on-screen color of parameter

Table 12-10. *NIBP Setup Default Record*

NIBP SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables NIBP alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the NIBP alarm until reset
SYS HI LIMIT				Systolic high alarm limit setting
SYS LO LIMIT				Systolic low alarm limit setting
DIA HI LIMIT				Diastolic high alarm limit setting
DIA LO LIMIT				Diastolic low alarm limit setting
MN HI LIMIT				Mean high alarm limit setting
MN LO LIMIT				Mean low alarm limit setting
PRAM AVAIL				NIBP enable or disable
PRAM ON/OFF				NIBP standby
RCD ON ALARM				Record when NIBP alarm enabled
AUTO				Automatic mode enable
INTERVAL				Automatic reading interval
1ST INFLATE				First inflation pressure
TABLE DSPLY				Enables NIBP table display
DISPD VALUES				NIBP numeric displ.y format
TONE				Enables end value tone
SITE				NIBP cuff site
PRAM COLOR				Sets on-screen color of parameter

Table 12-11. *CO2 Setup Default Record*

CO2 SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables CO2 alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the CO2 alarm until reset
HIGH LIMIT				High alarm limit setting
LOW LIMIT				Low alarm limit setting
ICO2 LIMIT				Inspired CO2 alarm limit setting
PRAM AVAIL				CO2 enable or disable
PRAM ON/OFF				CO2 standby
RCD ON ALARM				Record when CO2 alarm enabled
SCALE				CO2 waveform scale size
UNITS				Measurement units % or mmHg
O2 COMPNSAT				O2 compensation enable
N2O COMPNSAT				N2O compensation enable
PRAM COLOR				Sets on-screen color of parameter

Table 12-12. *CO Setup Default Record*

CO SETUP	ADULT	PED	NEO	DESCRIPTION
PRAM AVAIL				Cardiac output enable or disable
CONSTANT				Adjusts computational constant for catheter and injectate volume
PRAM ON/OFF				Cardiac output standby
REF ON/OFF				Right ejection fraction measurement enable
DISP TIMEOUT				Displayed time for CO measurement
UNITS				Inches/pounds or centimeters/kilograms
PRAM COLOR				Sets on-screen color of parameter

Table 12-13. *Temp1 Setup Default Record*

TEMP1 SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enables Temp1 alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the Temp1 alarm until reset
UNITS				Celsius or Fahrenheit
HIGH LIMIT				High alarm limit setting
LOW LIMIT				Low alarm limit setting
PRAM AVAIL				Temp1 enable or disable
PRAM ON/OFF				Temp1 standby
TONE				Measurement update tone enable
PRAM COLOR				Sets on-screen color of parameter

Table 12-14. *Temp2 Setup Default Record*

TEMP2 SETUP	ADULT	PED	NEO	DESCRIPTION
ALARMS				Enable Temp2 alarm
ALARM LEVEL				Sets alarm priority level (1, 2, or 3)
LATCH ALARMS				Latches the Temp2 alarm until reset
HIGH LIMIT				High alarm limit setting
LOW LIMIT				Low alarm limit setting
PRAM AVAIL				Temp2 enable or disable
PRAM ON/OFF				Temp2 standby
PRAM COLOR				Sets on-screen color of parameter

Changing the Parameter and System Defaults

The *PRISM* monitor allows you to tailor the parameter and system default settings to suit your specific monitoring needs. It is important to recognize that changes made to these functions determine the status of those functions upon every subsequent power-up. As a result, default settings should not be changed unless the setting will be desired on a regular basis.

Perform the following steps to access the **CONFIGURATION SETUP** menus and screens:

1. Press the **PAGE HOME** function key.

2. Press the **SYSTEM SETUP** function key.

3. Press the **MORE** softkey twice.

4. Press the **CONF** softkey.

5. Press the **YES** softkey when prompted **"ARE YOU SURE?"**

6. Press the **SETUP** softkey.

7. Press the **YES** softkey when prompted **"ARE YOU SURE?"**

8. Press the **MORE** softkey to display the following **CONFIGURATION SETUP** menu:

	BAND **AUTO** 1				PWR UP DFLTS	

9. Press the **PWR UP DFLTS** softkey to display the following **CONFIGURATION SETUP** menu:

DFLTS FOR **ADULT**	NEXT ↓ ↓	NEXT ↑ ↑	SRCE **CONF**	VALUE ↑ ↑	NEXT PRAM	PREV PRAM

This menu contains function keys, which can be used to modify the factory defaults to a user-defined configuration. Each of the available softkeys are explained in the following paragraphs.

- Use the **DFLTS** softkey to set the defaults for **ADULT, PED,** or **NEO**.

- Use the **NEXT** ↓ ↓ and **NEXT** ↑ ↑ softkeys to move vertically through the list of default functions listed on the monitor until you have highlighted the function you want to change.

- The **SRCE** (Source) softkey toggles between **FACT** (Factory) and **CONF** (user-configured) values for each default function. Pressing the **VALUE** ↑ ↑ softkey for any function which, currently has a factory setting, will automatically change the **SRCE** key from **FACT** to **CONF**. The **SRCE** softkey is especially useful for returning any functions currently with a user-configured value back to the factory default; simply press the **SRCE** softkey to toggle the **SRCE** label to **FACT**, and the configured default value will return to the factory default setting.

- Use the **VALUE** ↑ ↑ softkey to change the setting of the highlighted parameter function. The **VALUE** ↑ ↑ softkey toggles between two possible settings, such as **ON/OFF**, or adjusts a numeric value. Once a numeric value reaches its maximum value, the setting rolls over to start at the minimum level.

> ✔ **NOTE: The display of the configuration pages will timeout and return you to HOME PAGE state if you do not use a function key within a three minute interval. If you have completed your default changes and want to return to HOME PAGE state, press the PAGE HOME key. All changes will take affect upon return to HOME PAGE.**

System and Parameter Messages

System and parameter messages remind, prompt, or warn you about the current condition of the monitor or its parameters. These messages are displayed in reverse video and may flash on and off to get your attention.

System Messages

The system messages, explained in Table 12-15, are displayed in a reverse-video box, just below the WDZ. They apply to conditions of the monitor that are not specific to any one parameter. See the **"System Message Area"** section in Chapter 2 for more information.

Table 12-15. *System Messages*

SYSTEM MESSAGE	MEANING
RECORDER PAPER	The recorder is out of paper, or the paper is not installed correctly
REC DISABLE FREEZE	You are trying to freeze waveforms while recording is in progress. You can only freeze waveforms when they are not being recorded.
REC IN CONT RUN MODE	Indicates that you have pressed and held the RECORD key so that the recorder will run continuously. Press RECORD again to end continuous recording.
FREZ RELEASE FREZ	Waveforms are currently frozen. To release the frozen waveforms, you must press either the FREEZE or the RECORD key.
LINK RECORD SENT	A record has been sent to the Central Station because the recorder at PRISM monitor is either not present or out of paper.
ALARM SUSPEND XXX	You have pressed the ALARM SUSPEND key, disabling all alarm tones for the number of seconds (XXX) displayed. To enable alarm tones before the suspend time has expired, press the ALARM SUSPEND key again. The ALARM SUSPEND function is also enabled at power-up.

Battery Messages

When the *PRISM* is operating on battery power, one of the following messages will be temporarily displayed on the system message line when the monitor is turned **ON**. Battery messages may also be viewed within the **SYSTEM SETUP/TEST** menu. See the section, **"Battery Check"** in Chapter 9 for details.

Table 12-16. *Battery Messages*

MESSAGE	BATTERY LEVEL
MONITOR BAT HI	> 60% Charge
MONITOR BAT MID	20-60% Charge
MONITOR BAT LOW	< 20% Charge
BATTERY VERY LOW (Intermittent Alarm Tone Sounds)	Approximately 10 minutes of battery life remains

Parameter Messages

The following tables explain messages that are parameter specific. Messages concerning parameters displayed in the WDZ will be displayed in a video box below the numeric data for the corresponding waveform parameters. The message is displayed as long as the message condition exists. All messages that apply to parameters in the numeric-only zone are displayed in the numeric display area. See Chapter 2 for details.

Table 12-17. *ECG/Respiration Messages*

ECG/RESP MESSAGE	MEANING
CVA	Cardiovascular artifact (CVA) coincidence has been detected on respiration. Respiration will reject coincident respiration while the message is displayed. At least 8 out of 10 coincident respirations are required to initiate and maintain the CVA message.
APNEA	The apnea alarm limits have been exceeded.
APN ALM OFF	Respiration alarms are ON, but apnea alarm is OFF.
CHK LEADS	One or more electrodes or lead wires may be dry or loose. In addition to the message, the ECG waveform and respiration waveform, if it is displayed, become dotted lines.

Table 12-18. *SpO$_2$ Messages*

SPO2 MESSAGE	MEANING
SPO2 SRCH (Nellcor only)	The monitor cannot locate the patient's pulse. The patient's perfusion may be too poor to detect an acceptable pulse. Confirm proper application of the sensor; make sure the ECG parameter is available for C-LOCK synchronization; try another sensor site; or try the OXISENSOR II R-15 sensor.
NO C-LOCK (Nellcor only)	Indicates loss of synchronization between the ECG and SPO2 pulse waveform. Take steps to eliminate ECG artifact, or if the R-wave amplitude is less than 4 mm, increase the ECG waveform size by using the ECG SIZE softkey
NO SENSOR	The SPO2 parameter is ON, but the sensor and/or sensor cable is/are not connected to the monitor.
SPO2 CAL	The monitor is performing automatic self-calibration. The calibration range is 50 to 100%.

Table 12-19. *Invasive Blood Pressure (BP1/BP2/BP3) Messages*

BP1/BP2/BP3 MESSAGE	MEANING
NO XDUCER	The pressure transducer is not connected to the monitor.
ZERO BP1 ZERO BP2 ZERO BP3	Message flashes until the pressure channel is zeroed as a reminder that pressures must be zeroed prior to use.
NO ZERO: PULSE DETECT	Displayed over the BP SETUP page to indicate that either a pulse or electrical noise was detected, which precluded zeroing the transducer. Confirm that the transducer is vented to air before pressing the ZERO key.
ZERO OUT OF RANGE	Displayed over the BP SETUP page to indicate that a transducer's offset exceeds the zero range (±100 mmHg) of the monitor. Confirm that the transducer is vented to the air and attempt to zero again.

Table 12-20. *Noninvasive Blood Pressure (NIBP) Messages*

NIBP MESSAGE	MEANING
ET = MM:SS	Indicates elapsed time (ET) since last NIBP measurement.
AET = MM:SS	Indicates elapsed time since last NIBP measurement while auto timer is on.
AUTO	Monitor is in NIBP AUTO mode.
CUFF = XXX	Displays as the cuff inflates and deflates, giving the pressure in mmHg.
LOW OSCIL	Oscillation amplitudes are too low to obtain measurement.
ARTIFACT	Excessive artifact precluded measurement within a 145-second timeout.
MAX 2 LOW	Cuff inflation was too low to take a reading. May indicate either incorrect operating mode (ADULT, PED, NEO) or a need to increase the initial inflation.
CHECK CUF	40-second timeout exceeded for inflation to at least 20 mmHg.

Table 12-21. *ETCO$_2$ Messages*

ETCO$_2$ MESSAGE	MEANING
NO SENSOR	The MediCO2 module has detected that NO FilterLine is currently connected. This message will remain displayed until a FilterLine is connected or another CO2 status message is displayed.
WARM UP	This message is displayed for approximately 5-10 seconds after the installation of the FilterLine, or after power-up with the FilterLine already installed.
FILT OCCL	The MediCO2 module has detected an airway blockage. If blockage remains for more than 30 seconds, the MediCO2 module will go into standby mode and this message will remain displayed until FilterLine is disconnected.
CO2 ERROR	This message will be displayed if the CO/CO2 firmware has not received valid data from the MediCO2 module for more than 30 seconds.
ICO2	This message will be displayed when the <u>INSPIRED CO2</u> value has exceeded the alarm limit set in the CO2 Setup page in deep configuration or in the Alarm Limits page under the CO2 Parameter menu.

Table 12-22. *SureTemp Messages*

SURETEMP MESSAGE	MEANING
T1 INITIAL	This message display for a few moments as the probe warms up.
T1 WAIT	This message displays momentarily when the probe is removed from the well.
T1 READY	This message means it is time to insert the probe (orally or rectally).
T1 FINAL	This message displays when the final temperature is reached.
T1 POSITN	If a "t1 POSITN" error displays during the reading, reposition the probe, and initiate a new measurement.
T1 MONITOR	Displays when taking a patient's axillary temperature.

Table 12-23. *Cardiac Output (CO) Messages*

CO MESSAGE	MEANING
NO CATH	No catheter connected to the monitor.
NO PROBE	No temperature probe (bath or injectate) connected to the monitor.
∧ ∧ RANGE ∧ ∧	Signal over range.
∨ ∨ RANGE ∨ ∨	Signal under range.
<< RANGE >>	Cardiac output out of range.
BASELINE	Noisy baseline detected.
IRG CURVE	Irregular curve detected.
PEAKS	Multiple curve peaks detected.
INJ LATE	Delayed injection detected.
DRIFT	Excessive thermal drift detected.
SHORT CUR	Short thermodilution curve detected.
LONG CURV	Long thermodilution curve detected.
WARM H2O	Warm H2O for injectate or bath detected.
NO ECG	No ECG signal detected by the monitor.
<<EF HR>>	REF HR out of range.
IRG ECG	Irregular rhythm.
<<CO EF>>	REF out of range.
FAST DROP	Fast drop curve.
EF EARLY	Premature beat.
EF LATE	Delayed beat.
<<BOLUS>>	REF post bolus out of range.
RUNS FULL	Maximum number of runs performed.
DELETED	Measurement run deleted.

Chapter 13

Troubleshooting

Overview

MDE provides 24-hour technical support and should be contacted if a problem persists after consulting the following troubleshooting guidelines. An MDE Technical Support Specialist will be able to provide additional help in determining system problems, and, if necessary, supplying shipping instructions should the equipment need to be returned to the factory. All returned equipment must be issued a Return Material Authorization Number (RMA #) prior to shipment. An RMA number may be obtained from MDE Technical Support.

To contact MDE Technical Support, call: (818) 768-6411.

General Solutions

Problem	Possible Causes	Action/Solution
Monitor does not turn on.	AC power may not be connected.	Verify that AC ON light is on.
Parameter labels display, but without alarm status or data.	Parameter sensor or cable is not connected to monitor.	Connect appropriate sensor or cable to the monitor.
Parameter does not display label or data.	Parameter is "not available" in power-up defaults.	Contact service personnel to change power-up status.
Parameter does not display label or data.	Parameter sensor or cable is not connected to monitor.	Connect appropriate sensor or cable to the monitor.

ECG Solutions

Problem	Possible Causes	Action/Solution
CHK LEADS message.	Electrodes may not be conductive enough to provide signal.	Confirm electrode placement and skin preparation and adhesion.
	The LEAD SEL softkey may be set incorrectly (3-lead or 5-lead).	Verify that LEAD SEL is set for correct lead configuration.
	ECG patient leads and/or cable are not connected.	Confirm connections at lead block and at the monitor.
CHK LEADS message is displayed with ECG waveform.	Lead I, II, or III is being monitored with 5-lead cable installed and selected. One or more leads that are not used for ECG waveform is disconnected (e.g. Lead II is being monitored and LA is disconnected.	Confirm electrode placement and skin preparation, confirm leads are connected at lead block, and make sure cable is connected to monitor. If possible, use a 3-lead cable when monitoring Leads I, II, or III.
Displayed heart rate is too low.	Insufficient R-wave amplitude.	Use ECG SIZE to increase waveform size.
		Select an ECG vector that provides an R-wave amplitude at least twice that of the T and P-wave.
Displayed heart rate is too high.	The amplitude of the ECG waveform is too high.	Use the ECG SIZE function to decrease waveform size.

Respiration Solutions

Problem	Possible Causes	Action/Solution
Erratic Respiration rate and waveform.	Poor electrode placement or conductivity.	Confirm proper electrode placement and adhesion.
Respiration rate displayed is less than actual rate.	Respiration waveform amplitude is too low.	Use RESP SIZE function to increase waveform amplitude.
Respiration rate displayed is higher than actual rate.	Cardiovascular artifact (CVA) is interfering with signal.	Reposition the LA electrode to reduce CVA.

SpO$_2$ Solutions with Nellcor

Problem	Possible Causes	Action/Solution
Pleth waveform does not track pulse; SPO2 SRCH is displayed, or oxygen saturation does not display.	Sensor is not applied correctly.	Check sensor application.
	Sensor or cable is damaged.	Verify red light on sensor illuminates. Replace cable if needed.
	Patient's perfusion is too poor for oximeter to detect a pulse.	Try another sensor site.
	Excessive patient motion.	Reduce patient motion or set response mode to SLOW.
NO C-LOCK message displays.	Poor patient perfusion.	Try another sensor site.
	ECG electrode or lead is loose.	Check all ECG connections.
NO SENSOR is displayed.	Sensor not connected.	Check sensor connections.
	Damaged Sensor or cable.	Verify red light on sensor illuminates. Replace cable if necessary.
	Unknown sensor connected.	Replace with Nellcor sensor.
LOW SIG is displayed.	Sensor off patient.	Place sensor on patient.
ARTIFACT is displayed.	Excessive patient motion.	Reduce patient motion.
O2 WTR ER	Indicates an older version of main software and **SLOW** mode is selected.	Select either **NORM** or **FAST** mode. Contact MDE if **SLOW** mode is required.

SpO$_2$ Solutions with Masimo

Problem	Possible Causes	Action/Solution
Pleth waveform does not track pulse; SPO2 SRCH is displayed, or oxygen saturation does not display.	Sensor is not applied correctly.	Check sensor application.
	Sensor or cable is damaged.	Verify red light on sensor illuminates. Replace cable if needed.
	Patient's perfusion is too poor for oximeter to detect a pulse.	Try another sensor site.
	Excessive patient motion.	Reduce patient motion.
	Environmental interference.	Move away from light or noise source.
NO SENSOR is displayed.	Sensor is not connected.	Check sensor connections.
	Sensor or cable is damaged.	Verify red light on sensor illuminates. Replace cable if necessary.
	Unknown sensor connected.	Replace with Masimo sensor.

		Contact MDE Technical Support.
All other messages.		

SureTemp Solutions

Problem	*Possible Causes*	*Action/Solution*
T1 Position message.	Incorrect probe placement.	Check location of probe to ensure monitor is set for position used. For example, axillary, oral, or rectal.
Unit never displays T1 Ready.	Probe switch failure.	Check/Replace probe switch.
	Probe not attached properly.	Reattach probe properly.
	Probe never inserted into well.	Insert the probe into the well.
	Defective probe.	Replace the probe.
Unit constantly displays T1 initial.	Defective probe.	Check/Replace the probe.
Suspected inaccurate reading.	Incorrect probe covers.	Ensure Welch Allyn probe covers are used.
	T1 not ready.	Ready message not displayed before attempted temperature.
	Technique.	Ensure good clinical technique. For example, sublingual pocket w/oral reading.
T1 Error message.	Defective probe.	Check/Replace the probe.

Invasive Blood Pressure Solutions

Problem	Possible Causes	Action/Solution
Will not zero - ZERO OUT OF RANGE displays.	Faulty transducer or transducer is not zeroed.	Try new transducer or rezero current one.
Will not zero - NO ZERO: PULSE DETECT displays.	The Prism monitor has detected a pulse.	Open the stopcock on transducer to air and rezero.
Pressure values are lower than expected.	Dampened waveform from bubbles in the line.	Flush the line.
	Transducer was repositioned after zeroing was completed.	Rezero the transducer.
Pressure values are higher than expected.	Excessive tubing length is causing resonance.	If possible, reduce length of tubing and rezero transducer.

Noninvasive Blood Pressure Solutions

Problem	Possible Causes	Action/Solution
CHECK CUFF message displays.	Poor connection to monitor or cuff.	Verify that NIBP assembly is connected to the monitor.
	Cuff or hose assembly is leaking.	Check cuff and hose for leaks.
	Cuff is loose on the patient.	Make sure cuff is correct size and snug on patient.
ARTIFACT message displays.	Too much patient movement.	If possible, reduce patient movement and retake reading.
LOW OSCIL message displays.	Pulse detected is too low due to improper placement or tightness of cuff.	Make sure cuff is positioned correctly and snug on patient.
NIBP pump turns on and off during inflation.	Monitor is set to PED or NEO mode.	If monitoring an adult patient, switch to ADULT mode, otherwise this behavior is acceptable.
Inaccurate NIBP readings.	Improper cuff placement.	Ensure proper cuff placement.
MAX 2 LOW message displays.	Monitor did not obtain valid systolic reading.	Retry reading. Note: subsequent inflations are 25 mmHg higher.

Mainstream ETCO$_2$ Solutions

Problem	Possible Causes	Action/Solution
NO SENSOR message displays.	Sensor is not connected.	Confirm proper sensor connection.
LOW SIGNAL message displays.	Airway adapter obstructed.	Check airway adapter for obstruction. Use another airway adapter.
OCCLUSION message displays.	Particulate matter is obstructing airway.	Check airway adapter for obstruction. Use another airway adapter.
BAD SENSOR message displays.	Sensor is not functioning properly.	Try sensor with different monitor. If problem persists, replace sensor.
CO2 ERROR message displays.	Hardware problem with ETCO$_2$.	Contact MDE Technical Support.
WARM UP message displays.	Sensor has not warmed to 42°C.	Allow sensor to warm up prior to ETCO$_2$ monitoring.

Sidestream ETCO$_2$ Solutions

Problem	Possible Causes	Action/Solution
NO SENSOR message displays.	Pump is not operative.	Try sensor with another Prism monitor. If problem persists, replace sensor.
NO FILTER message displays.	No watertrap filter.	Insert watertrap filter into sidestream module.
FILT OCCU message displays.	Filter has been obstructed.	Replace watertrap filter.
EXH OCCLU message displays.	Exhaust has been obstructed.	Clear exhaust of any obstruction.
LOW SIGNAL or OCCLUSION message displays.	Watertrap flow restricted or pump is inoperative.	Check tubing for kinks or blockage. Replace tubing if necessary. Replace watertrap if message persists.
	Exhaust/scavenger port flow impaired.	Move objects away from exhaust port or check scavenger tubing.
BAD SENSOR message displays.	Sensor is not functioning properly.	If possible, try sensor with another Prism monitor. If problem persists, replace sensor.

PUMP ERR message displays.	Hardware error.	Contact MDE Technical Support.
5V FAULT message displays.	Hardware error.	Contact MDE Technical Support.
CO2 COMM message displays.	Hardware error.	Contact MDE Technical Support.
CO2 ERROR message displays.	Hardware error.	Contact MDE Technical Support.
WARM UP message displays.	Sensor has not finished warming up to 42° C.	Allow sensor to warm up prior to commencing with $ETCO_2$ monitoring.

Recorder Solutions

Problem	*Possible Causes*	*Action/Solution*
Paper jams.	Improper paper or an obstruction in paper exit area.	Confirm proper paper is installed (blank thermal paper, 50 mm wide roll up to 2 in. in diameter). Remove paper and clear paper path. Reinstall paper and retry.
No recording prints on paper.	Paper is not installed properly.	Ensure that paper is properly installed. Confirm correct paper is being used.

Battery Solutions

Problem	*Possible Causes*	*Action/Solution*
Battery cycle time is less than expected.	Batteries are not adequately charged. A battery is installed incorrectly. Battery is old or damaged.	Contact service personnel or MDE Technical Support.
Batteries will not charge and Battery Charging indicator is OFF.	AC power is not connected properly.	Confirm that front panel AC ON indicator is on. Ensure that the Prism is connected to AC power.
Unit will not run on batteries.	Batteries are not adequately charged. A battery is installed incorrectly. Battery is old or damaged.	Replace the battery or batteries.

Defibrillator/Pacer Solutions

Problem	*Possible Causes*	*Action/Solution*
Defibrillator will not charge (beeps intermittently) when CHARGE key is pressed.	Defibrillator cable is either disconnected or defective.	Ensure that defibrillator cable is properly connected to the defibrillator behind the Prism monitor. If problem persists, replace defibrillator cable.
Defibrillator beeps intermittently when attempting to charge the internal paddles.	Internal paddle cable is either disconnected or defective.	Ensure that internal paddle cable is properly connected to defibrillator behind the Prism monitor. If problem persists, replace internal paddle cable.
	Energy selected exceeds 50 joules.	Ensure that energy selected is not more than 50 joules (max. setting for internal paddles).
Patient's skin burns during pacing.	Improper electrode to skin adhesion or use of dry or otherwise defective electrodes.	Ensure that disposable defibrillator/ pace electrodes are not outdated.
		Replace electrodes that are dry or defective.
	Pacing current may be set too high.	If possible, reduce pacing current.
Insufficient ECG waveform during defibrillation or pacing.	Incorrect ECG electrode placement.	Apply standard 3-lead ECG cable with proper electrodes to obtain ECG waveform.
	Defibrillator ECG source is set to PADDLES.	Set defibrillator ECG source to LEADS with ECG SOURCE key. Then connect a standard 3-lead ECG cable with proper electrodes.
	Patient and/or paddle motion.	If possible, reduce patient and/or paddle motion.
Discomfort or pain during pacing.	Excessive pacing current.	If possible, reduce pacing current. If high pacing current is warranted for capture, sedation with analgesic may be required.
Unable to obtain ventricular capture.	External pacer is either not in DEMAND mode or the pace rate is too low.	Ensure that pacer is set to DEMAND mode and pace rate is higher than that of the patient. Also ensure that sufficient pacing current is being delivered to patient.

Appendix A

Specifications

PARAMETER SPECIFICATIONS

PHYSICAL
    Size: 9.3 x 11.8 x 10.2 in./23.6 x 30.0 x 25.9 cm (HWD)
    Weight: 12.35 lb/5.6 kg (includes MPM with ECG, NIBP, SPO2, Temp)
    Weight with 2 Batteries: add 2.9 lb/1.3 kg

DISPLAY
    Type: Color Active Matrix TFT LCD
    Size: 10.4 in./26.4 cm diagonal
    Resolution: 640 x 480 pixels
    Number of Traces: 4 (standard) or 5 optional
    Trace Length: 5 seconds

POWER
    Modular Batteries: 2 – each 12V; 2.0 AH Rechargeable Sealed Lead Acid
    Battery Capacity with 2 batteries: – 1.25 to 2.25 hrs, depending on configuration
    Battery Charge Time: 5hrs to 90% with unit in standby
    Battery Level Indicator: Screen messages and audio tones
    Ac Main: 115/230VAC selectable, 48 to 62 Hz autosensing
    External DC In: 12 to 28VDC, 3A max
    Power: 27 W

ENVIRONMENTAL
    Operating Temp: 5 to 40° C
    Relative Humidity: 0 to 90% noncondensing
    See shipping carton for storage and transport specifications

INPUT/OUTPUT OPTIONS AVAILABLE
    Analog Out, Recorder Out, Alarm Relay Closure, HR, SpO_2 Out, Defibrillator Sync, DB-15 VGA Out

ECG
    Range: 10 to 300 BPM
    Accuracy: ±2% or ±2 BPM
    Sweep Speed: 12.5, 25 mm/sec selectable
    High Limit Range: 50 to 250 BPM in 5 BPM steps
    Low Limit Range: 20 to 150 BPM in 5 BPM steps
    Bandwidth: 0.5 to 40 Hz (monitor); 0.05 to 100 Hz (diagnostic)
    Leads: 3 lead: I, II or III selectable;
    5 Lead/Dual Vector: I, II, III, or V selectable
    Sensitivity: 0.25 to 3 mV/cm selectable (12 levels)
    Pacer Rejection: 0.1 to 2 msec; 2 to 700 mV
    Heart Rate Source: ECG, IBP, SpO_2, Pleth

Defib Tolerance: 400 joules with 50 ohm series lead impedance
Connector: Std 6 pins MS
Isolation: Full electrical isolation

RESPIRATION

Range: 4 to 200 BPM
Accuracy: ±2% or ±2 BPM
Lead: RA to LA
Display Sensitivity: 0.25 to 3 ohm/cm selectable
Minimum Detection Sensitivity: 0.1 to 1.2 ohm depending on display setting
High Limit Range: 5 to 150
Low Limit Range: 5 to 50
Apnea Delay: 10, 15, 20, 30, 40
Sweep Speed: 1.56, 6.25, 12.5, 25 mm/sec selectable
Respiration Rate Source: ETCO2 or ECG Leads
CVA Rejection: Rejects most cardiovascular coincidence

STANDARD TEMPERATURE

Channels: 1 or 2
Range: 20 to 50° C (68 to 122° F)
Accuracy: ±0.1° C
Probe: YSI 700 or 400, autosensing
Connector: 1/4 inch (0.6 cm) stereo phone jack

SURETEMP® TEMPERATURE

Measurement Range: 28.9 to 42.2 ° C (84.0 to 108.0 ° F)
Accuracy: ±0.1 ° C (±0.2 ° F)
Response Time: Oral - approx. 4 sec., Rectal - approx. 15 sec., Axillary - continuous
Cord Length: 9 ft. or 16 ft.

NIBP

Measurement Method: Oscillometric
Measurement Range: Systolic: 30 to 275 mmHg ADULT, 30 to 175 mmHg PED/NEO;
    Diastolic: 20 to 240 mmHg ADULT, 20 to 130 mmHg PED/NEO
Pulse Rate: 30 to 250 BPM
Measurement Time: 40 seconds typical
Modes: Manual - initiated via START key; Automatic - STAT, 1, 2, 3, 4, 5, 10, 15, 30, 45
    minutes, 1, 2, 3, 4 hrs
1st Cuff Inflation: ADULT: 90 to 220 mmHg; PED/NEO: 60 to 150 mmHg selectable
Subsequent Inflations: Systolic +30 mmHg
Alarms: SYS, DIAS, MEAN selectable in 5 mmHg steps
System Accuracy: ±5 mmHg mean error, ±8 mmHg SD
Cuff Sizes: Thigh, Large Adult, Adult, Child, Infant, Neo sizes 1, 2, 3, 4

SpO$_2$ (Nellcor MP204)

Display: % SpO$_2$, Plethysmographic Waveform or Pulse Amplitude Bar
Range: 1 to 100%
Accuracy: ADULT: 70 to 100% ±2 digits; 50 to 69% ±3 digits; NEO: 70 to 94% ±3 digits
Pulse Rate Range: 20 to 250 BPM
Pulse Rate Accuracy: ±3 BPM
High Limit Range: 70 to 100%

Low Limit Range: 50 to 99%
Sensors: Neonatal through Adult (NELLCOR)
Pulse Tone: Pitch varies with SpO_2 value
ECG Sync: NELLCOR C-LOCK

SpO_2 (Nellcor MP405)

Display: % SpO_2, Plethysmographic Waveform or Pulse Amplitude Bar
Range: 0 to 100%
Accuracy: ADULT: 0 to 69% unspecified; 70 to 100% ±2 digits; NEO: 0 to 69%
 unspecified; 70 to 100% ±3 digits
Pulse Rate Range: 20 to 250 BPM
Pulse Rate Accuracy: ±3 BPM
High Limit Range: 70 to 100%
Low Limit Range: 50 to 99%
Sensors: Neonatal through Adult (NELLCOR)
Pulse Tone: Pitch varies with SpO_2 value
ECG Sync: NELLCOR C-LOCK

SpO_2 (Masimo SET)

Display: % SpO_2, Plethysmographic Waveform or Pulse Amplitude Bar
Range: 1 to 100%
Accuracy:
  During NO Motion Conditions:
    Saturation (% SpO_2):
      ADULT, PED: 70 to 100% ±2 digits
      NEO: 70 to 100% ±3 digits
    Pulse Rate: 25 to 240 bpm ±3 digits (Adult, Ped, and Neo)
  During Motion Conditions:
    Saturation (% SpO_2):
      ADULT, PED: 70 to 100% ±3 digits
      NEO: 70 to 100% ±3 digits
    Pulse Rate: 25 to 240 bpm ±5 digits (Adult, Ped, and Neo)
  Low Perfusion Performance:
    >0.02% Pulse Amplitude   Saturation (%SpO_2)±2 digits and %Transmission > 5%
    Pulse Rate (bpm)±3 digits
High Limit Range: 70 to 100%
Low Limit Range: 50 to 99%
Sensors: Neonatal through Adult (Masimo)
Pulse Tone: Pitch varies with SpO_2 value

INVASIVE PRESSURE

Channels: 1, 2, or 3
Range: -40 to 300 mmHg
Accuracy: ±1% or ±1 mmHg
Parameter Display: SYS, DIAS, and MEAN selectable
Pressure Labels: ART, PA, CVP, ICP, RA, LAP, FEM, UA, UV, PRES
Alarm Limit Range: 5 to 250 mmHg
Display Scale: 15, 30, 60, 120, 180, 240 mmHg selectable
Input Connector: Std 6 pin MS, 5 uV/V/mmHg

CARDIAC OUTPUT/HEMODYNAMIC CALCULATIONS

CO Range: 0.1 to 19.99 liters/minute

CO Repeatability: ±2% or 0.2 liters/minute from mean value, whichever is greater, as measured by electronically generated standard flow curves

REF Range: 1% to 85%

Blood Temperature Range: 17.5 to 43° C

Blood Temperature Accuracy: ±0.5° C from 17.5 to 31° C, ±0.3° C from 31 to 43° C

Injectate Temperature Range: 0 to 27° C

Injectate Temperature Accuracy: ±0.3° C from 0 to 25° C, ±0.5° C from 25.5 to 27° C

Hemodynamic Calculations Provided: CI, SV, SVI, SVR, SVRI, PVR, PVRI, LVSW, LVSWI, RVSW, RVSWI, REF, PAWP,BSA

Catheters & Accessories: Baxter-Edwards compatible

ETCO$_2$

Type: NDIR single beam, ratiometric

Sensor Size: Mainstream: 0.78 x 1.036 x 1.003 inches/1.98 x 2.63 x 2.55 cm (LWD); Sidestream: 6.3 x 3.15 x 2.17 Inches/ 160 x 80 x 55 cm (LWD)

Sensor Weight: Mainstream: <10 g, without cable; Sidestream: 1.5 lbs (0.68 kg) with cable

Airway Adapter Dead Space: Mainstream < 6cc (std), 0.6 cc NEO

Altitude/Barometric Pressure Compensation: Automatic

Warm Up: 45 seconds typical

Range: 0 to 99 mmHg

Accuracy: ±2 mmHg or ±5% of reading below 77 mmHg, ±10% above 77 mmHg

Sweep Speed: 1.56, 6.25, 12.5, 25 mm/sec selectable

Display Scale: 50, 75, 100 mmHg

Alarm Limit Range: 5 to 100 mmHg

High Limit Inspired CO$_2$: 4 to 12 mmHg, selectable

Sampling Flow Rate: Sidestream: 150 cc/min

Response Time: Mainstream: <60 msec max, 30 msec typical; Sidestream: <100 msec max

Calibration: None required; annual check recommended

O$_2$ and N$_2$O Compensation: Independently selectable

THERMAL RECORDER

Channels: Any 1 or 2 waveforms, user selectable

Resolution: 8 dots/mm vertical, 32 dots/mm horizontal

Paper: 40 mm grid; 50 mm width

Sweep Speed: 6.25, 12.5, 25 mm/sec; 1 mm/sec Trend

Manual Record Duration: 16 seconds, 12 seconds memory

Annotation: Time, date, parameter values, scales, source, speed

Weight: 1.15 lb (0.52 kg) with full roll of paper

AutoNet TRANSCEIVER MODULE
Indicator: Green light indicates comm. Status
Frequency: Spread spectrum 902 to 928 MHz or 2.4 GHz
Transmission: Bidirectional with seamless auto-retry
Weight: 0.55 lb (0.25 kg)

TELEMETRY RECEIVER MODULE
Frequency Range: UHF 450 to 470 MHz (20012/20012V)
Frequency Range: UHF 608 to 614 MHz (20012V-M6)
Sensitivity: 1 uV typical
Available Transmitters: MDE models 1200LR, 20013, ESCORT Guardian models
20601,20602, 20603
Weight: 0.85 lb (0.39 kg)

CIS COMMUNICATION MODULE
Size: 13.5 x 6.6 x 3.4 cm (HWD)
Weight: 0.50 kg
Network Interface: IEEE 802.3 10 BaseT Ethernet RJ45
Serial Interface: 2 shielded EIA/TIA RS232 (9-pin mini-DIN) ports, 1 shielded EIA/TIA
    RS 485 IEEE 1073.4.1 MIB compliant) port
Keyboard Interface: PS/2 Compatible (6-pin mini-DIN)
Interface Software: TCP/IP and HL7 – other protocols/data formats available at additional
    cost
Ancillary Devices: driver software required for each different device type at additional cost

Appendix B

Supplies, Accessories, & Options

The supplies, accessories, and options listed in this section can be ordered by calling Medical Data Electronics at the following telephone number:

(818) 768-6411

To make the order of the process smoother, note the part or option/model number of the item(s) you are ordering, and be prepared to give the number to MDE personnel.

Part Number	Accessory Starter Kits
E100001	Adult Accessory Kit – Nellcor – Consists of: 5-Lead ECG cable, 5-Lead Snap Leadwires, Adult NIBP Hose & Cuff, Nellcor 8 foot SPO2 extension cable, Oxisensors
E100002	Adult Accessory Kit – Masimo – Consists of: 5-Lead ECG cable, 5-Lead Snap Leadwires, Adult NIBP Hose & Cuff, Masimo 8 foot SPO2 extension cable, Masimo Sensor Kit
E100003	Pediatric Accessory Kit – Nellcor – Consists of: 3-Lead ECG cable, 3-Lead Pinchclip Leadwires, NIBP Hose, Pediatric Cuff, Nellcor 8 foot SPO2 extension cable, Oxisensors
E100004	Pediatric Accessory Kit – Masimo – Consists of: 3-Lead ECG cable, 3-Lead Pinchclip Leadwires, NIBP Hose, Pediatric Cuff, Masimo 8 foot SPO2 extension cable, Masimo Sensor Kit
E100005	Neonatal Accessory Kit – Nellcor – Consists of: 3-Lead ECG cable, Neonatal NIBP Hose, Nellcor SPO2 extension cable, Oxisensors
E100006	Neonatal Accessory Kit – Masimo – Consists of: 3-Lead ECG cable, Neonatal NIBP Hose, Masimo 8 foot SPO2 extension cable, Masimo Sensor Kit
E100007	Defib / Pacer Accessory Kit – Adult – Includes adult defib electrode set, 3-Lead Fixed ECG cable, Pace output cable, gel, and (1) battery
E100008	Defib Pacer Rolling Stand Kit – Includes GCX Rolling Stand, Basket, Fixed mounting Plate, and Rolling Stand Counterweight

Part Number	Battery Accessories
E2700-37M	Modular Battery Medical Grade – ESCORT II, Prism

Part Number	Defibrillator / Pacer Accessories / Supplies
E2700-03	GCX Defib Slide Mount Adapter Plate – Allows monitor equipped with Defib base to attach to a GCX wall mount or rolling stand
E2700-80A	Defib/Pacer Tester (One recommended with each Defibrillator purchase)
E2900-07	ESCORT II, Prism, Prism SE, Defib 3-Lead Cable (fixed)
384000-0161	Pediatric Defib/Pace Electrodes (1 set)
384000-0160	Adult Defib/Pace Electrodes (1 set)
384000-0162	Defib Gel (1 tube)
E2700-64	Adult Disposable Defib/Pace Electrodes (box of 10)
E2700-65	Pediatric Disposable Defib/Pace Electrodes (box of 10)
E2700-66	"Hands Off" Defib/Pace Adapter Cable
E2700-69	Defib Internal Paddles Cable Only – Order internal paddles separately
E2700-70	Defib Internal Paddles – Adult (8.9 cm) – requires E2700-69
E2700-72	Defib Internal Paddles – Pediatric (3.8 cm) – requires E2700-69
E2700-73	Pace Output Cable
E2700-83	Signal Electrode Gel (box of 12 tubes)
E2700-89	Multi-function Defib/Pace Adapter – Order if defib and pace both have Hands Off
E2900-54	External Pediatric Slide-On Paddle Set
E2900-52	External Adult Paddles/Cable

Part Number	ECG Accessories – U.S.A
E2900-01	3-Lead ECG Safety Cable
401603	24 inch 3-Lead Snap Safety Leadwires (1 set)
401503	24 inch 3-Lead Neo Safety Pinchclip Leadwires (1 set)
E2900-02	5-Lead ECG Safety Cable
401604	24 inch 5-Lead Snap Safety Leadwires (1 set)
401504	24 inch 5-Lead Neo Safety Pinchclip Leadwires (1 set)
E2700-24	24 inch HP 3-Lead ECG Safety Cable
E2700-25	24 inch HP 5-Lead ECG Safety Cable
E2700-46	24 inch HP 3-Lead Safety Pinchclip Leadwires for E2700-24
E2700-47	24 inch HP 5-Lead Safety Pinchclip Leadwires for E2700-25
E2700-43	24 inch HP 3-Lead Shielded Snap Leadwires
E2700-62	24 inch 3-Lead Neonatal Safety Pinchclip Leadwires (5 sets)
E2700-75	24 inch 5-Lead Neonatal Safety Pinchclip Leadwires (5 sets)
E2700-77	24 inch 5-Lead Safety Snap Leadwires (10 sets)
E2700-78	24 inch 3-Lead Safety Snap Leadwires (10 sets) U.S.A
E2700-27	24 inch ECG Electrode Set – For Veterinarian use
E2700-17S	5-Lead ECG Safety Cable Assembly USA 25 Feet

Part Number	ECG Accessories – CE Approved
E2900-04	5-Lead ECG Safety Cable (Red, Yellow, Green, Black, White)
E2900-03	3-Lead ECG Safety Cable (Red, Yellow, Green)
E2700-60	24 inch 3-Lead Safety Snap Leadwires (Red, Yellow, Green) (10 sets)
401505	24 inch 3-Lead Safety Pinchclip Leadwires (1 set)
401506	24 inch 5-Lead Safety Pinchclip Leadwires (1 set)
E2700-76	24 inch 5-Lead Neonatal Safety Pinchclip Leadwires (5 sets)
E2700-61	24 inch 5-Lead Safety Snap Leadwires (Red, Yellow, Green, Black, White) (10 sets)
E2700-63	24 inch 3-Lead Neonatal Safety Pinchclip Leadwires (5 sets)

Part Number	ECG ESIS Accessories
E2800-30	ESIS Patient Cable 5-Lead USA
E2800-31	ESIS Patient Cable 5-Lead CE
E2800-33	ESIS Leadwire Set 3-Lead 36 inch Snap USA
E2800-34	ESIS Leadwire Set 5-Lead 36 inch Snap CE
E2800-32	ESIS Leadwire Set 5-Lead 36 inch Snap USA

Part Number	ETCO2 Accessories / Supplies (Prism Only)
20020	Mainstream Sensor – (for intubated use only) – For use with MPM OPT36, must use with Airway adapter E2900-20, or E2900-21
20021	Sidestream Sensor – (for some intubated and all non-intubated patients) – For use with MPM OPT36, must use with Watertrap E2900-26.
E2900-20	ETCO2 Airway Adapter – Standard (box of 10, single use)
E2900-21	ETCO2 Airway Adapter – Neonatal (box of 10, single use)
E2900-26	Watertrap – (box of 24)
E2900-38	ETCO2 Nasal Cannula – Adult (box of 10, single use)
E2900-39	ETCO2 Nasal Cannula – Pediatric (box of 10, single use)

Part Number	NIBP Accessories / Supplies – Quick Disconnect Type Fittings
E2910-01	NIBP CUFF Thigh – CE
E2910-02	NIBP CUFF Large Adult – CE
E2910-03	NIBP CUFF Adult – CE
E2910-10	NIBP Cuff Small Adult – CE
E2910-04	NIBP CUFF Child – CE
E2910-05	NIBP CUFF Infant – CE
E2910-06	Neo Size 1 – Box of 10
E2910-07	Neo Size 2 – Box of 10
E2910-08	Neo Size 3 – Box of 10
E2910-09	Neo Size 4 – Box of 10
E2810-06	Adult NIBP Hose
E2810-11	Neonatal NIBP Hose
E2810-12	SE to EII NIBP CUFF ADAPTER
E2810-13	EII to SE NIBP CUFF ADAPTER Screw fitting to Quick Disconnect

Part Number	NIBP Accessories / Supplies – Screw Type Fittings
E2800-06	Adult / Pediatric Hose Assembly (12 foot)
E2800-11	Neonatal Hose Assembly (8 foot)
E2810-12	SE to EII NIBP CUFF ADAPTER (Quick disconnect to screw fitting)
E2810-13	EII to SE NIBP CUFF ADAPTER (Screw fitting to Quick Disconnect)
E2910-06	Neo Size 1 – Box of 10
E2910-07	Neo Size 2 – Box of 10
E2910-08	Neo Size 3 – Box of 10
E2910-09	Neo Size 4 – Box of 10
E2910-12	NIBP Cuff Infant – Screw Fittings
E2910-13	NIBP Cuff Child – Screw Fittings
E2910-14	NIBP Cuff Small Adult – Screw Fittings
E2910-15	NIBP Cuff Adult – Screw Fittings
E2910-16	NIBP Cuff Large Adult – Screw Fittings
E2910-17	NIBP Cuff Thigh – Screw Fittings
404016	NIBP Board Exchange Kit, MPM (Prism Only)
404018	NIBP Factory Conversion Kit, MPM (Prism Only)
403958	Hose Conversion Kit

Part Number	IBP Accessories / Supplies
E2800-23	IBP Disposable Transducer Kit (use with E2800-22)
E2800-21	IBP Disposable Monitoring Kit P23XL (use with E2800-20 – box of 5)
E2800-22	IBP Interface Cable (use with E2800-23, E2800-24, or E2800-20)
E2800-24	IBP Disposable Transducer Kit (use with E2800-22)
E2800-20	IBP Reusable Transducer P23XL (use with E2800-21 – requires E2800-22)

Part Number	Cardiac Output Accessories / Supplies
E2900-43	Injectate Flow-Through Temp Probe
E2900-42	Cardiac Output Injectate Bath Probe
E2900-41	Cardiac Output Injectate Patient Cable

Part Number	Mounting Accessories
401609	GCX Plate Interface Kit
E2700-34	Wall Mount less Wall Channel
E2700-10	Wall Mount with Wall Channel
E2700-91	6 inch Wall Mount Utility Basket with SureTemp holder
E2700-11	Rolling Stand
E2700-90	6 inch Rolling Stand Utility Basket with SureTemp holder

Part Number	SPO2 Accessories / Supplies – Masimo
E2810-50	Adult Masimo SpO_2 Clip Sensor-Reusable - Single
E2810-51	Adult Masimo SpO_2 Disposable Adhesive Sensors (20)
E2810-52	Pediatric Masimo SpO_2 Disposable Adhesive Sensors (20)
E2810-53	Neonatal Masimo SpO_2 Disposable Adhesive Sensors (20)
E2810-54	Neonatal Masimo SpO_2 Preterm Disposable Adhesive Sensors (20)
E2810-55	Neonatal Masimo SpO_2 Adhesive Sample pack
E2810-56	Adult/Pediatric Masimo SpO_2 Adhesive Sample pack
E2810-57	SpO_2 Masimo Replacement Tape 100 (pk) (For use with E2810-53)
E2810-58	SpO_2 Masimo Replacement Posey Wrap (12 pk) (For use with E2810-54)
E2810-59	SpO_2 Extension Cable-4 foot Masimo
E2810-60	SpO_2 Extension Cable-8 foot Masimo
E2810-61	SpO_2 Extension Cable-12 foot Masimo

Part Number	SPO2 Accessories / Supplies – Nellcor
E2800-50	Nellcor Durasensor – Reusable
E2800-63	SpO_2 Sensor Extension Cable (8 Foot)

Part Number	SureTemp Accessories / Supplies
E2900-55	SureTemp Oral Probe
E2900-56	SureTemp Rectal Probe
E2900-57	SureTemp Probe Covers – Disposable (Box of 500)
E2900-58	SureTemp Probe Covers Snap on Holder for Monitor
E2900-62	SureTemp Probe Covers – Disposable (Box of 1000)

Part Number	Non-SureTemp Accessories / Supplies
E2700-40	YSI Esophageal / Rectal Temp Probe
E2700-41	YSI Standard Skin Temp Probe

Part Number	Remote Displays
E3202-05	17 inch Color Remote Display
E3202-08	18 inch Color Remote Display – Flat Panel
E3202-06	21 inch Color Remote Display
E2900-91	17 inch Remote Display Wall Mount
E2900-90	17 inch Remote Display Ceiling Mount
E2900-98	18 inch Flat Panel Remote Display Wall Mount
E2900-95	21 inch Remote Display Wall Mount
E2900-94	21 inch Remote Display Ceiling Mount

Part Number	Video Cable
E2800-SC25	25 Foot Standard Cable
E2800-SC50	50 Foot Standard Cable
E2800-PC50	50 Foot Plenum Cable

Part Number	Remote Display Power Isolation
E2900-49	Power Isolation Transformer 150VA floor mount, single outlet 110 volts
E2900-50	Power Isolation Transformer 150VA wall mount, single outlet 110 volts

Part Number	Miscellaneous Accessories/ Supplies
E2700-32	Recorder Paper (box of 10 rolls)
E2700-54	Recorder Paper (case of 100 rolls)
E2700-14	Monitor Accessory Pouch – Snaps to side of monitor
E2900-51	Cable Strap – Snaps to monitor for cable management when monitor is not in use
E2900-30	Power Cord Clamp
E2900-31	Nurse Call Interface Cable (unterminated)
E2900-33	High Level Interface Cable
E2700-87	Power Cord USA – Replacement
E2700-88	Power Cord Unterminated

Part Number	Educational Material
E9040-62	ESCORT Prism Service Manual
E9040-63	ESCORT Prism SE Service Manual
E9040-55	Service Manual CD ROM
E9030-31	ESCORT Prism & Prism SE Operator's Manual
E9030-33R	ESCORT Prism & Prism SE Reference Manual
E9030-36	Reference Manual CD ROM
E9040-54	ESCORT Prism & Prism SE Quick Reference Guide

Part Number	Options (Prism Only)
OPT25	BEDRAIL HANDLE – Need 9040-60 upgrade on older units
OPT37	CRG and OXYCRGS – Provides CRG (Cardiorespirogram) to standard MPM equipped with ECG/Resp. Provides OXYCRG (Oxycardiorespirogram) when and SpO2 option is purchased.
OPT53A	VGA Output for Prism model 20401 Only – Permits all Prism waveforms and numeric data to be displayed on any standard VGA display. The remote display may require an Isolation Transformer depending upon its location. Remote Display, Isolation Transformer can be purchased from a commercial source or MDE.
OPT53B	VGA Output for Prism model 20403 Only – Permits all Prism waveforms and numeric data to be displayed on any standard VGA display. The remote display may require an Isolation Transformer depending upon its location. Remote Display, Isolation Transformer can be purchased from a commercial source or MDE.
OPT70	ADD 5TH TRACE
OPT103	External DC Jack – Prism – Includes Grounding Plug
OPT104	Prism Aux I/F Option
20002	Dual Channel Recorder Module – Diagnostic quality, thermal array
20002CVR	Modular Recorder Housing Cover
20202	Defibrillator / Pacer
OPT21	Defibrillator Slide Mount– 20401, 20403 only.
500256	Defibrillator Skin (Prism Housing) – Required when adding a defibrillator to an existing Prism monitor
E2900-40A	UHF Tlm RF/Transceiver antenna Adapter for defib – Required when defib monitor is equipped with a bedside telemetry receiver AND a central station receiver
E2900-40B	Spectrum RF/Transceiver antenna Adapter for defib – Required when defib monitor is equipped with a central station receiver
20001-M	**MULTIPARAMETER MODULE – M** **MPM for use with Masimo SpO2 or when no SpO2 is ordered. Includes single or dual lead ECG and Respiration.**
20001-N	**MULTIPARAMETER MODULE – N** **MPM for use with Nellcor SpO2. Includes single or dual lead ECG and Respiration.**
20001CVR	MULTIPARAMETER MODULE Housing Cover Plate
OPT101-N	MPM Standard Connectors with Nellcor SpO2
OPT101-M	MPM Standard Connectors with Masimo SpO2 or no SpO2
OPT101-N	ECG Board Nellcor SpO2
OPT101-M	ECG Board Masimo or no SpO2
OPT28	NON-INVASIVE BLOOD PRESSURE
OPT30-M	MASIMO SpO2

OPT30-N	NELLCOR SpO2 – Includes pkg of 3 disposable Oxisensors
OPT31	(1) INVASIVE BLOOD PRESSURE
OPT31I	(1) INVASIVE BLOOD PRESSURE CE
OPT31M	(1) INVASIVE BLOOD PRESSURE HP
OPT33	(2) INVASIVE BLOOD PRESSURES
OPT33I	(2) INVASIVE BLOOD PRESSURE CE
OPT33M	(2) INVASIVE BLOOD PRESSURE HP
OPT48	(3) INVASIVE BLOOD PRESSURES
OPT48I	(3) INVASIVE BLOOD PRESSURES CE
OPT48M	(3) INVASIVE BLOOD PRESSURES HP
OPT35	Standard Temperature – does not include SureTemp
OPT36	ETCO2 – PRYON – Requires Model 20020 or 20021 sensors, purchased separately
OPT38-M	HP MERLIN CONNECTORS – ECG & IBP only. For MPM's equipped with Masimo SpO2 or no SpO2
OPT38-N	HP MERLIN CONNECTORS – ECG & IBP only. For MPM's equipped with Nellcor SPO2
OPT39	CARDIAC OUTPUT / REF – Available in MPM's for ESCORT II 20101 & 20300 monitors ONLY. Requires purchase of (2) or (3) Invasive Blood Pressures.
OPT72	CARDIAC OUTPUT WITH HEMODYNAMIC CALCULATION – Available in MPM's for PRISM 20401 & 20403 monitors ONLY. Requires purchase of (2) or (3) Invasive Blood Pressures.
OPT50	ADD SECOND STANDARD TEMPERATURE – When first temp is a standard temp
OPT50S	ADD SECOND STANDARD TEMPERATURE – When first temp is a SureTemp
OPT54	SURETEMP ELECTRONIC THERMOMETER – Provides episodic measurements of patient temperature, oral, axillary, rectal
OPT54I	SURETEMP ELECTRONIC THERMOMETER CE – Provides episodic measurements of patient temperature, oral, axillary, rectal

Part Number	Wireless Communication Modules
20011V	VISION TRANSCEIVER MODULE – (900 MHz BAND) Spread Spectrum communication with Vision central station. Requires (1) per monitor.
20011	ESCORT-LINK TRANSCEIVER MODULE – (900 MHz BAND) Spread Spectrum communication with existing E3200B central stations. Requires (1) per monitor.
20019V	VISION TRANSCEIVER MODULE – (2.4 GHz BAND) Spread Spectrum communication with Vision central station in the 2.4 GHz BAND. Requires (1) per monitor.
20019VS	VISION TRANSCEIVER MODULE – (2.4 GHz BAND) – SP – Spread Spectrum communication with Vision central station in the 2.4 GHz BAND. Requires (1) per monitor. **(FOR USE IN FRANCE)**

Part Number	Guardian Receivers – Bedside
20012V	TELEMETRY BEDSIDE RECEIVER MODULE – (450-470 MHz). For bedside monitor to receive Guardian telemetry transmitter signal. Requires Guardian transmitter. One required for each transmitter to be monitored.
20012VDP	TELEMETRY BEDSIDE RECEIVER MODULE – (450-470 MHz). For bedside equipped with Defib/Pacer to receive Guardian transmitter signal. Requires Guardian transmitter. One required for each transmitter to be monitored.
20012V-M6	TELEMETRY BEDSIDE RECEIVER MODULE – (608-614 MHz). For bedside monitor to receive Guardian telemetry transmitter signal. Requires Guardian transmitter. One required for each transmitter to be monitored.

Part Number	CIS Communication Modules – Bedside
20030-MT1	Meditech CIS Communication Module
20030-HB1	HBOC CIS Communication Module
20030-CN1	Cerner CIS Communication Module
20030-EC1	Eclipsys CIS Communication Module
20030-RS232	RS232 Communication Module
E9040-26	MDE Engineering CIS Software Support

Appendix C

Schematics

This chapter contains the necessary *PRISM* monitor schematics. The schematics in this chapter are:

- E3B+ CPU Schematic (sheets 1 & 2 of 3) #402820

- Prism CPU Schematic (sheets 1-7 of 8) #403950

- E3B+ Power Supply Schematic (sheet 1 of 2) #402822

- E3B Plus 10.4 Color Interface Schematic (sheet 1 of 2) #402912

- E3B Plus VGA Video Controller Schematic (sheet 1 of 2) #402914

- E3B Plus 10.4 VGA EL Video Controller Schematic (sheet 1 of 2) #402923

- E3B Plus 10.4 EL VGA Interface Schematic (sheet 1 of 2) #402925

- MPM Connector Schematic (sheet 1 of 2) #403146

- MPM ISO Power Supply Schematic (sheet 1 of 2) #403162

- ECG, SMT, MPM Schematic (sheets 1-3 of 4) #403684

- MPM NIBP/BP/PT TEMP Schematic (sheets 1 & 2 of 3) #402954

- MPM CO2 Schematic (sheet 1 of 2) #401915

- MPM CO2 Processor Schematic (sheet 1 of 2) #401917

- MPM Cardiac Output Schematic (sheet 1 of 2) #402030

E3B+ CPU
SCHEMATIC

Medical Data Electronics		

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE
IN OHMS, 1/8W, 5%
ALL CAPACITOR VALUES ARE
IN MICROFARADS, 20%

APPROVALS	DATE
DRAWN	LF	04-05-96
CHECKED		
APPROVED		

SCALE	SIZE	DRAWING NO.	REV
NONE	B	402820	L

FILE NAME: 2820IL.SCH   PCB REV: E   SHEET 1 OF 3
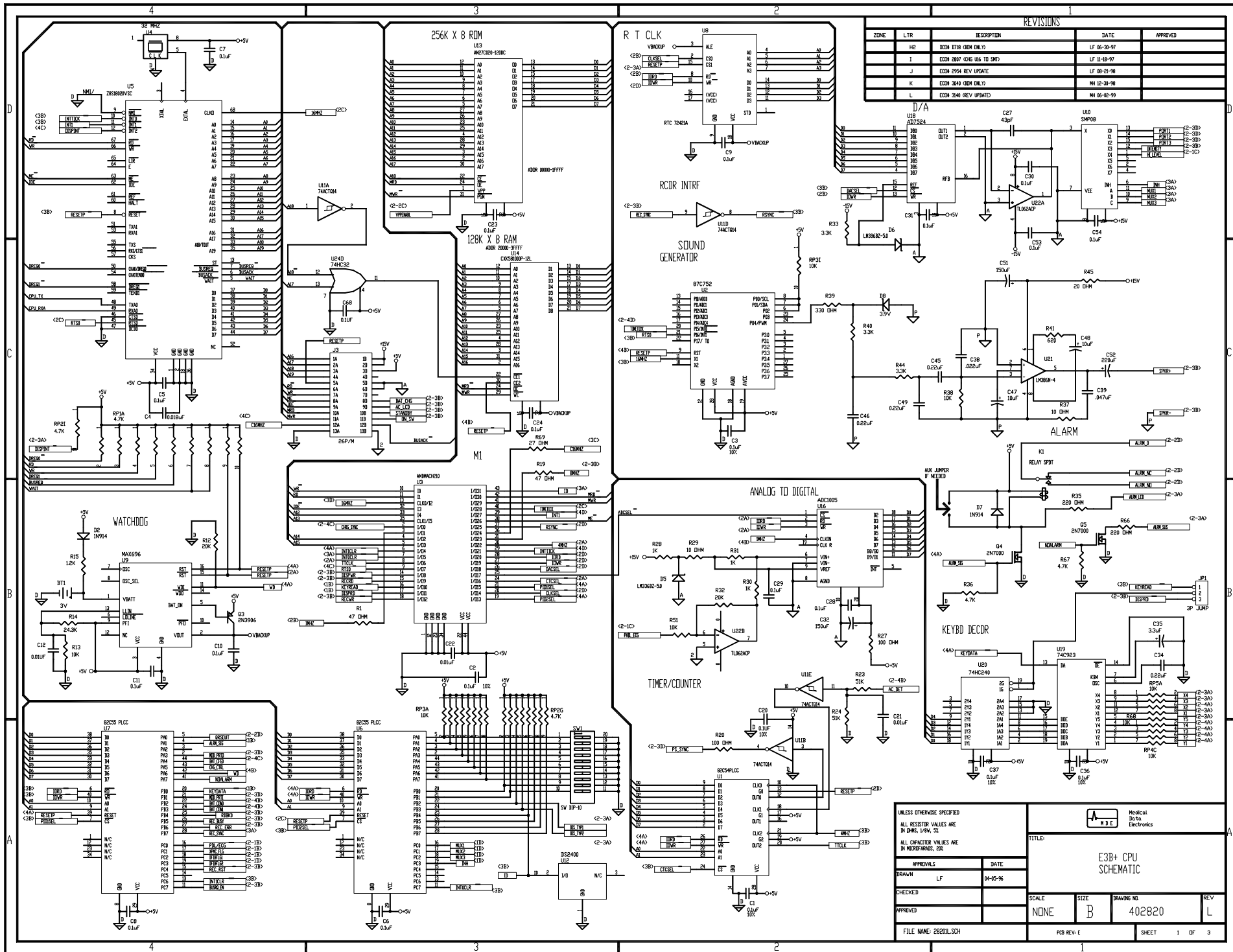
REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
H2		ECON D718 (ROM ONLY)	LF 06-30-97	
	I	ECON 2807 (CHG U16 TO SMT)	LF 11-18-97	
	J	ECON 2954 REV UPDATE	LF 08-21-98	
	K	ECON 3040 (ROM ONLY)	MH 12-30-98	
	L	ECON 3040 (REV UPDATE)	MH 06-02-99	

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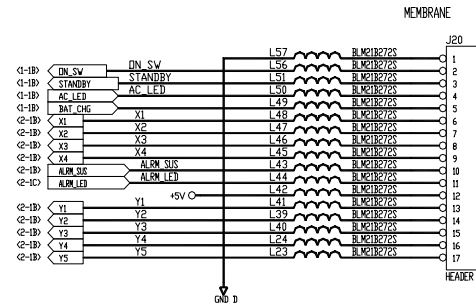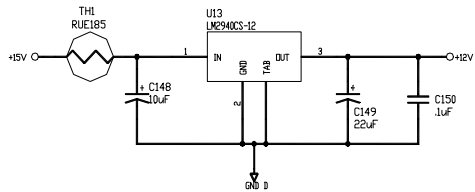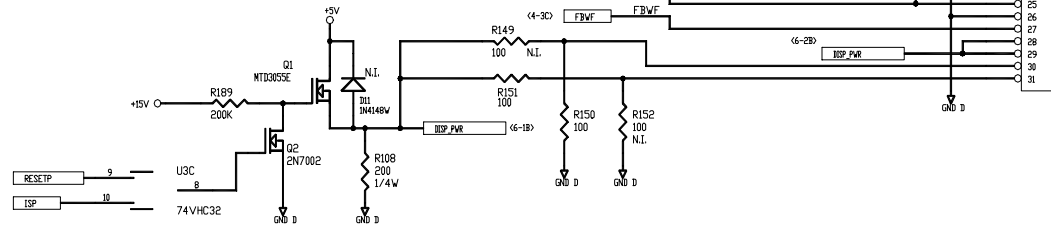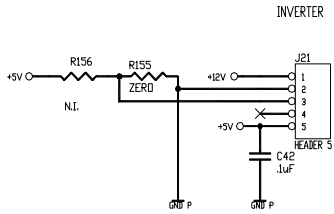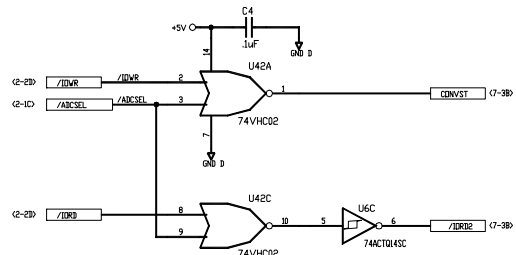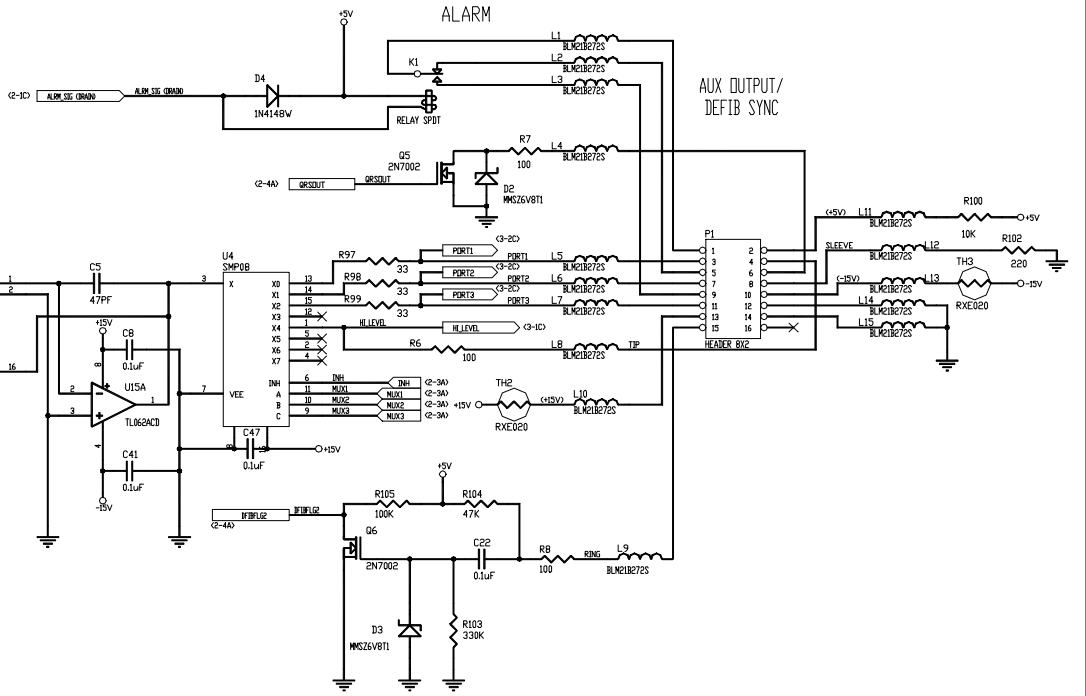
REVISIONS
SEE SHEET 1

AUX OUTPUT/
DEFIB SYNC

BACK PANEL
MODULES

DEFIB
INTERF

POWER
SUPPLY
BOARD

RECORDER

TO VIDEO CONTROLLER

LAST USED
C70 D10 FL12 J3 K1 P4 Q5 R69 RP7 SW1 TH2 TS1 U24 BT1

UNUSED PARTS
C17

PARTS FLOWN

UNUSED LABELS

UNLESS OTHERWISE SPECIFIED		Medical Data Electronics
ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 5%		TITLE:
ALL CAPACITOR VALUES ARE IN MICROFARADS, 20%		E3B+ CPU
APPROVALS	DATE	SCHEMATIC
DRAWN LF	04-05-96	
CHECKED		
APPROVED		

SCALE NONE	SIZE B	DRAWING NO. 402820	REV L
FILE NAME: 28202L.SCH		PCB REV: E	SHEET 2 OF 3

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	RELEASE PER ECO 3419	MH 11-10-00	
B	REVISED PER ECO 3459	MH 02-16-01	
C	REVISED PER ECO 3467	MH 03-01-01	
D	REVISED PER ECO 3510	MH 05-31-01	

POWER SUPPLY CONNECTOR

RCDR INTRF
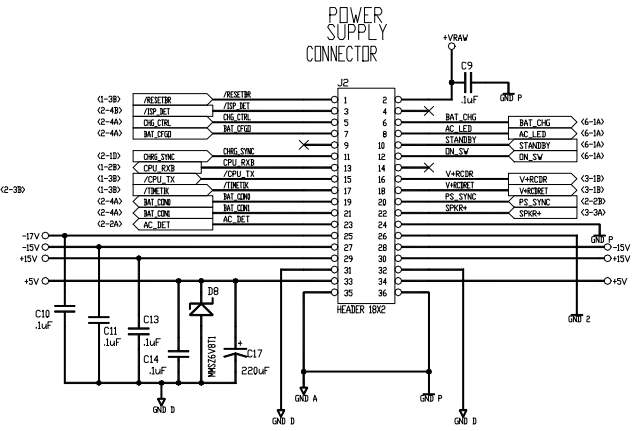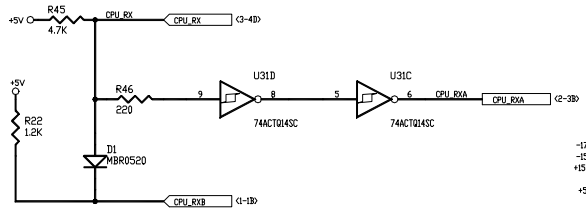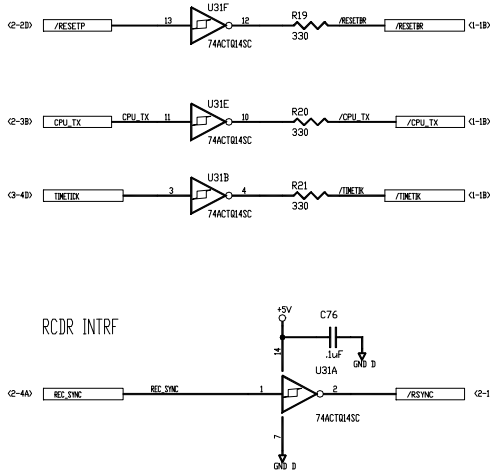
UNUSED LABELS

C19, C20, C43-46, C100-147, C151-205, C207-232,
C238-253, C260,   D6, D7, D12-17, D20-30, D32-38,
J3-15, J17-19, J22, J23, L20, L25-38, L55,
Q7-Q9, R31, R91, R92, R109, R111, R113-148,
R154, R157-188, R190-237, R239-243, R246-288, R295,
R302-310, R312, R323, R330-346, R352-413,
U8, U10, U11, U20, U23, U26, U29, U35, U36, U38, U43

LAST USED

BT1, C270, D44, FL12, J25, K1, L57,
P3, Q10, Q42B, RP4, TH3, U48, X2, Y2

NON INSTALLED

C15, C23, C37, D11, U14, R52, R53
R149, R152, R156, R244, R298, R316, X2

		UNLESS OTHERWISE SPECIFIED:	APPROVALS	DATE		Medical Data Electronics
		ALL RESISTOR VALUES ARE IN OHMS, 1/16W, 5%	DRAWN MIKE HOV.	07-10-00	TITLE	CPU, PRISM SCHEMATIC
		ALL CAPACITOR VALUES ARE IN MICROFARADS, 20%	CHECKED BOB GAUSMAN	11-21-00		
		ARTWORK/FAB 403949	APPROVED ROY CARR	11-21-00	SIZE B	DRAWING NO. 403950 / REV D
		ASSY/BOM 403950	OTHER			
SHEET NO.	FILE NAME	REFERENCE DRAWINGS	FILE NAME PSCON.SCH	SIZE B	SCALE NONE	PCB REV: B / SHEET 1 OF 8

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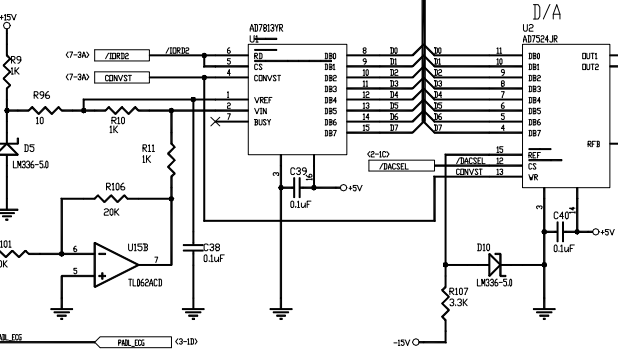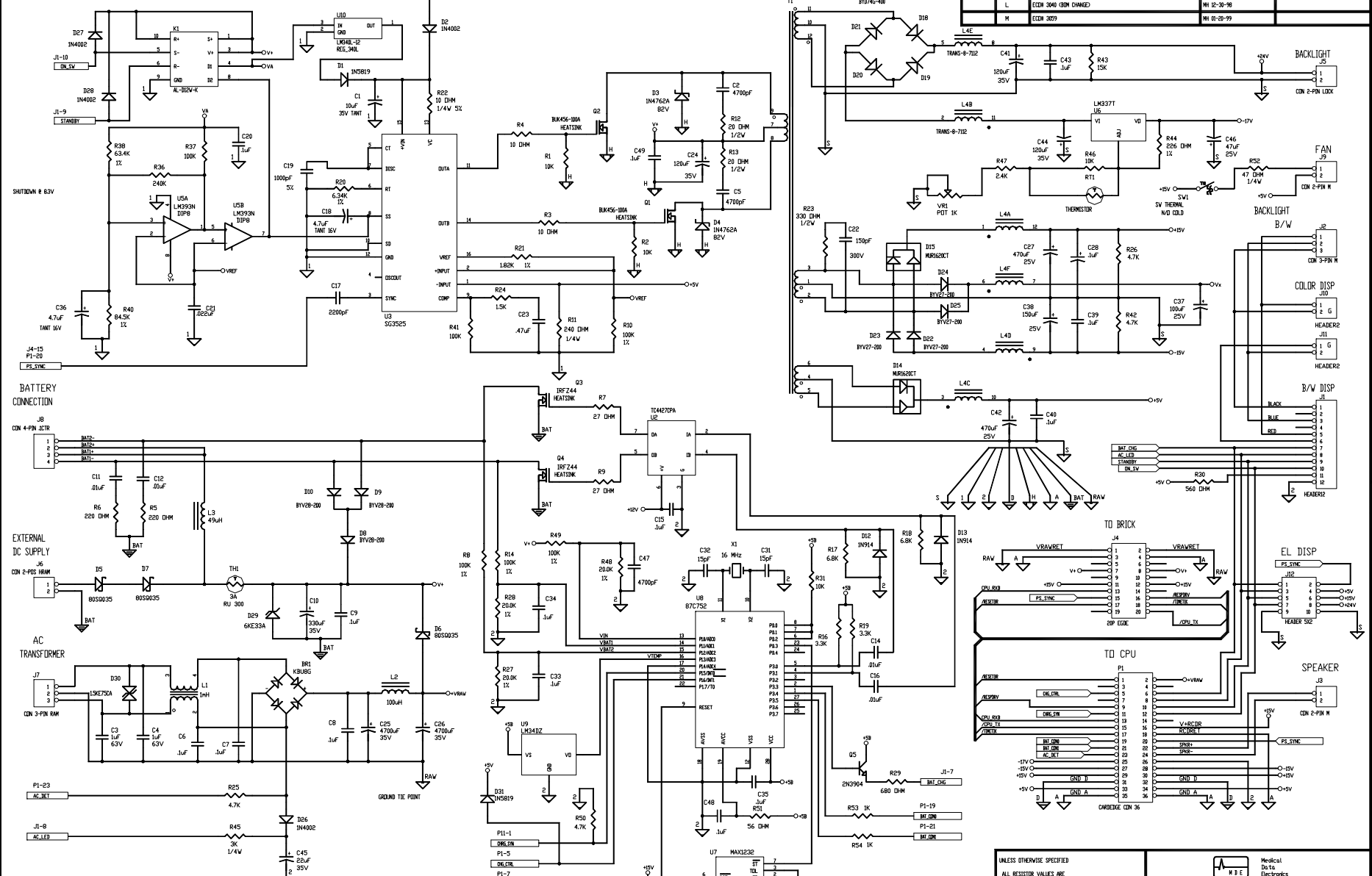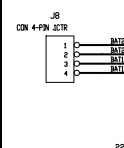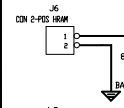
REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
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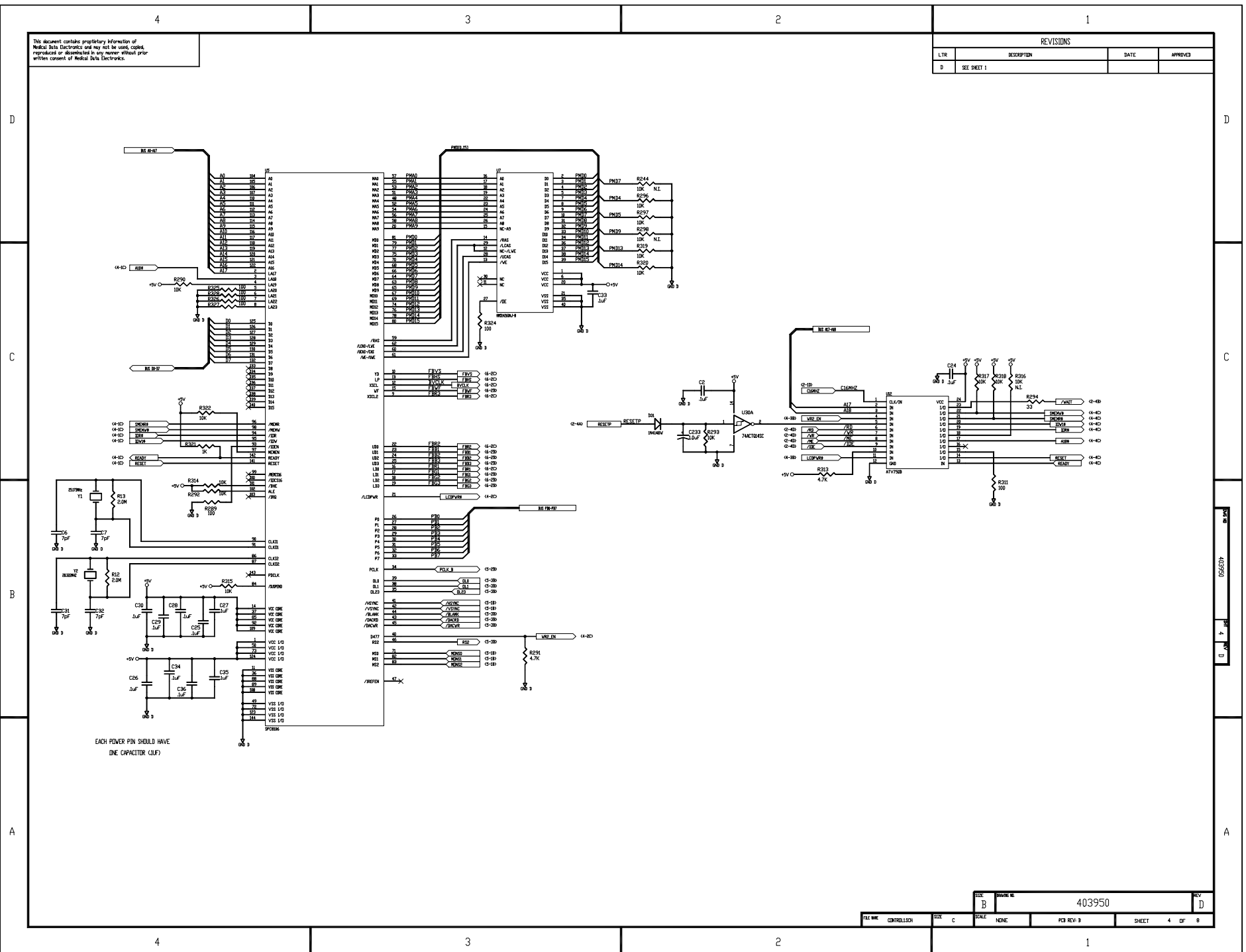
EACH POWER PIN SHOULD HAVE
ONE CAPACITOR (.1UF)

SIZE B	DRAWING NO	403950	REV D

| FILE NAME CONTROL1.SCH | SIZE C | SCALE NONE | PCB REV: D | SHEET 4 OF 8 |

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
D	SEE SHEET 1		

VGA OUT

BUS D0-D7

BUS PB0-PB7

U14

D0 8	D0	P0	32	PB0
D1 9	D1	P1	33	PB1
D2 10	D2	P2	34	PB2
D3 11	D3	P3	35	PB3
D4 12	D4	P4	36	PB4
D5 13	D5	P5	37	PB5
D6 14	D6	P6	38	PB6
D7 15	D7	P7	39	PB7

+5V

R350 10K   R351 10K

<4-3B> /DACRD   R422 33 6 /RD
<4-3B> /DACWR   R423 33 16 /WR

PCLK 40   R419 33   PCLK_B   PCLK_B <4-3B>

A0   A0   17 RS0   RED 25
A1   A1   18 RS1   GREEN 26
<4-3B> RS2   R420 33 19 RS2   BLUE 27

L52 BLMB0A02
L53 BLMB0A02
L54 BLMB0A02

<4-3B> /BLANK   /BLANK R426 100 5 /SYNC
                R421 33 7 /BLANK
                R427 100 23 SETUP
                         24 /SENSE
<4-3B> DL0   DL0   R428 100 2 MODE

C52 .1uF   +5V
C57 .01uF

COMP 29
NC 30
R418 1K

R414 150 1%   R415 150 1%   R416 150 1%

D41 BAV99   D40 BAV99   D39 BAV99 +5V
GND D   +5V   GND D

<4-3B> DL1   DL1   41 DL0
<4-3B> DL23 DL23 42 DL1
                   43 DL2
                   44 DL3

VREF 31

C56 .1uF

+5V   4 AVCC
      20 AVCC
      21 AVCC
      22 AVCC

C50 .1uF   C49 .1uF   C51 .1uF   C58 .1uF

RSET 28   R417 182 1%   D18 LM385M

      3 GND
      24 GND

BT481A
N.I.

GND D   GND D   GND D   GND D

EACH POWER PIN SHOULD HAVE
ONE CAPACITOR (.1uF)

C55 47pF   C54 47pF   C53 47pF
GND D

+5V
R349 10K   R348 10K   R347 10K

R424 33
R425 33

<4-3B> MONS2   MONS2
<4-3B> MONS0   MONS0
<4-3B> MONS1   MONS1
<4-3B> /HSYNC /HSYNC
<4-3B> /VSYNC /VSYNC

J24
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
VGA

GND D

| SIZE B | DRAWING NO. | 403950 | REV D |

| FILE NAME CONTROL2.SCH | SIZE B | SCALE NONE | PCB REV: B | SHEET 5 OF 8 |

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
D	SEE SHEET 1		

C

LCD
J16

INVERTER

R156 R155 +12V
+5V
N.I. ZERO

J21
1
2
3
4
5
HEADER 5
+5V

C42
.1uF

GND P   GND P

(4-3C) BVCLK — BVCLK
(4-3C) FBHS — FBHS
(4-3C) FBVS — FBVS
(4-3C) FBR1 — FBR1

(4-3C) FBR2 — FBR2
(4-3C) FBR3 — FBR3
(4-3C) FBG1 — FBG1
(4-3C) FBG2 — FBG2

(4-3C) FBG3 — FBG3
(4-3C) FBB1 — FBB1
(4-3C) FBB2 — FBB2
(4-3C) FBB3 — FBB3

+5V

Q1
MTD3055E
N.I.
DI1
1N4148W

R149
100 N.I.

(4-3C) FBWF — FBWF

(6-2B) DISP_PVR

B

+15V R189 200K

Q2
2N7002

R151
100

DISP_PVR (6-1B)

R150
100

R152
100
N.I.

R108
200
1/4W

RESETP 9
U3C
8
ISP 10
74VHC32

GND D   GND D   GND D   GND D

GND D

MEMBRANE
J20

TH1
RUE185

U13
LM2940CS-12

+15V
1 IN OUT 3 +12V
GND TAB
2
+ C148
.10uF
+
C149
22uF
C150
.1uF

GND D

(1-1B) ON_SW — ON_SW L57 BLM21B272S 1
(1-1B) STANDBY — STANDBY L56 BLM21B272S 2
(1-1B) AC_LED — AC_LED L51 BLM21B272S 3
(1-1B) BAT_CHG — L50 BLM21B272S 4
(2-1B) X1 — X1 L49 BLM21B272S 5
(2-1B) X2 — X2 L48 BLM21B272S 6
(2-1B) X3 — X3 L47 BLM21B272S 7
(2-1B) X4 — X4 L46 BLM21B272S 8
(2-1B) ALRM_SUS — ALRM_SUS L45 BLM21B272S 9
(2-1C) ALRM_LED — ALRM_LED L43 BLM21B272S 10
L44 BLM21B272S 11
L42 BLM21B272S 12
+5V L41 BLM21B272S 13
(2-1B) Y1 — Y1 L39 BLM21B272S 14
(2-1B) Y2 — Y2 L40 BLM21B272S 15
(2-1B) Y3 — Y3 L24 BLM21B272S 16
(2-1B) Y4 — Y4 L23 BLM21B272S 17
(2-1B) Y5 — Y5
HEADER 17

GND D

A

SIZE B	DRAWING NO. 403950	REV. D

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
D	SEE SHEET 1		

ALARM

AUX OUTPUT/
DEFIB SYNC

ANALOG TO DIGITAL

D/A

SIZE B	DRAWING NO. 403950	REV D
FILE NAME AUXOUT.SCH	SIZE B	SCALE NONE	PCB REV: B	SHEET 7 OF 8

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	K	ECON 2958 (REV UPDATE ONLY)	LF 08-31-98	
	L	ECON 3040 (BOM CHANGE)	MH 12-30-98	
	M	ECON 3059	MH 01-20-99	

BACKLIGHT
J5
CON 2-PIN LOCK
+24V

FAN
J9
CON 2-PIN M

BACKLIGHT
B/W
J2
CON 3-PIN M

COLOR DISP
J10
HEADER2

J11
HEADER2

B/W DISP
J1
BLACK
BLUE
RED

HEADER12

TO BRICK
J4
VRAWRET
RAW
V+
PS_SYNC
REG90V
/CPU_TX
28P EDGE

EL DISP
J12
HEADER 5X2
PS_SYNC
+5V
+15V
+24V

TO CPU
P1
CARTRIDGE CON 36

SPEAKER
J3
CON 2-PIN M

BATTERY CONNECTION
J8
CON 4-PIN ACTR
BAT-
BAT2-
BAT1+
BAT1-

EXTERNAL DC SUPPLY
J6
CON 2-POS HRAM

AC TRANSFORMER
J7
CON 3-PIN RAM

SHUTDOWN @ 8.3V

U3 SG3525
U2 TC4427CPA
U8 87C752
U9 LM34DZ
U7 MAX1232
U1 7812CT
U4 78L05
U10 LM340L-12 REG_340L
U5A LM393N DIP8
U5B LM393N DIP8
U6 LM337T
K1 AL-D12V-K
T1
BR1 KBU8G
X1 16 MHz

GROUND TIE POINT

LAST USED
U10 R54 D31 Q5 K1
L4 C49 VR1 J12 BR1
RT1 SW1 T1 TH1 X1
P1
PARTS FLOWN

UNUSED COMPONENTS
R32-R35 R39 D17

UNUSED LABELS

REFERENCE DRAWINGS
ASSY/BOM   402822
ARTWORK/FAB   402821

	Medical Data Electronics	

TITLE:
E3B+ POWER SUPPLY
SCHEMATIC

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 5%
ALL CAPACITOR VALUES ARE IN MICROFARADS, 20%

APPROVALS	DATE
DRAWN LF	12-28-95
CHECKED	
APPROVED	

FILE NAME: 402822M.SCH
PCB REV: D

SCALE NONE
SIZE B
DRAWING NO. 402822
REV M
SHEET 1 OF 2

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	D	ECO 2588 (ADD, R41,42 & J5)	MH 01-21-97	
	E	ECO# 2636 (REVISION UPDATE)	LF 04-03-97	
	E1	DCO 709 (CLARIFY FOR SUBCONTRACTING)	RT 04-21-97	
	F	ECO# 2707 (BOM ONLY)	LF 07-09-97	
	G	ECO# 2903 (MEDH ONLY)	LF 05-13-98	
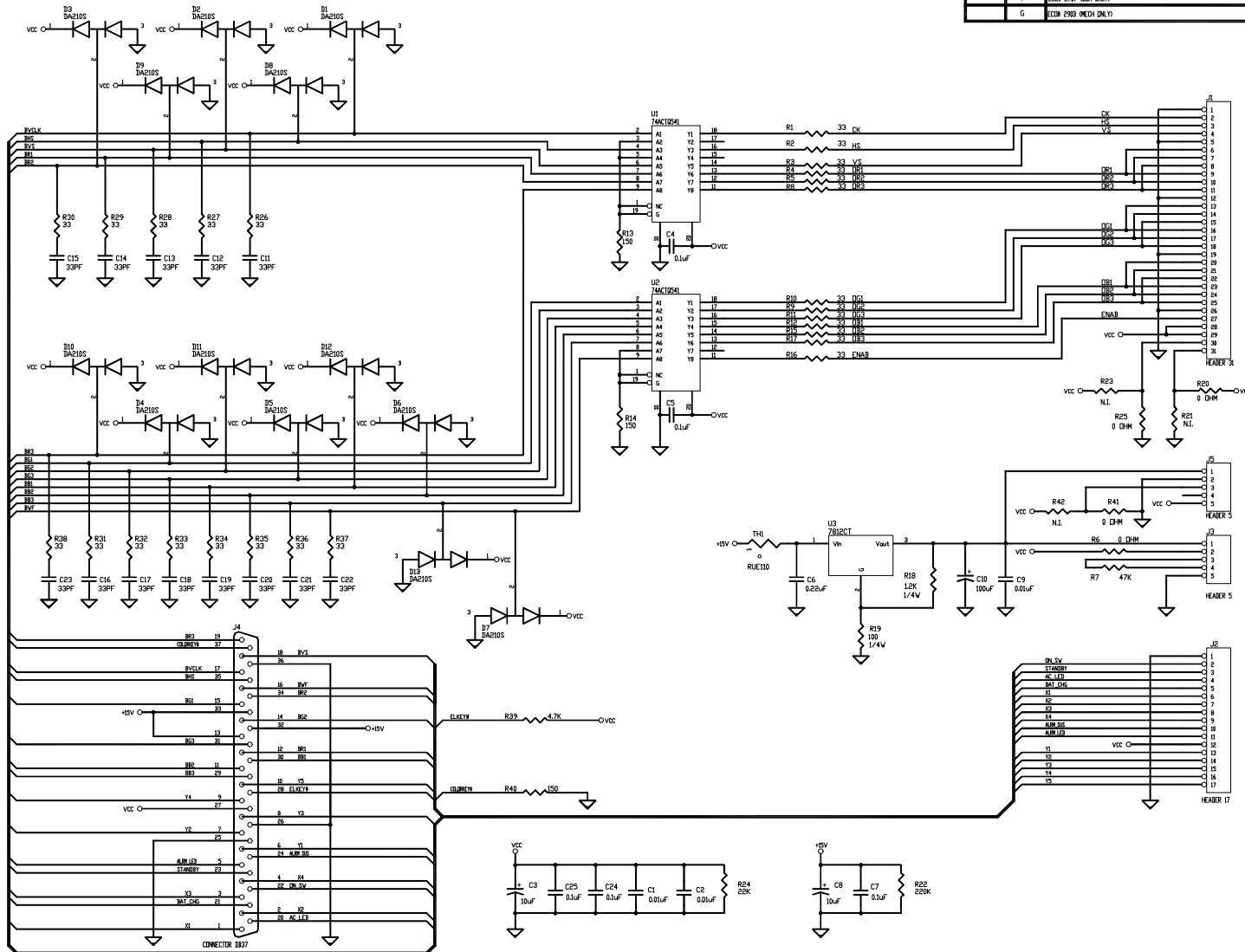
LAST USED
C25 D13 J5 R42
U3 TH1

UNUSED COMPONENTS

UNUSED LABELS
R21,23,42,44

PARTS FLOWN

REFERENCE DRAWINGS
ASSY/BOM   402912
ARTWORK/FAB   402911

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE
IN OHMS, 1/8W, 5%

ALL CAPACITOR VALUES ARE
IN MICROFARADS, 20%

Medical
Data
Electronics

TITLE:
E3B PLUS
10.4 COLOR INTERFACE
SCHEMATIC

APPROVALS		DATE
DRAWN	MH	04-24-96
CHECKED	RDY CARR	10-25-96
APPROVED	RDY CARR	10-25-96

SCALE	SIZE	DRAWING NO.	REV
NONE	B	402912	G

FILE NAME: 402912G.SCH

PCB REV: C

SHEET 1 OF 2

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by-pass capacitors (1/power pin)

LAST USED
C58, D7, L17,
P4, Q4, R72,
U7, Y2,

UNUSED COMPONENTS

PARTS FLOWN

UNUSED LABELS

REFERENCE DRAWINGS

ASSY/BOM   402914

ARTWORK/FAB   402913

Note: Each power pin of the Randac should have one of these .1uF capacitors next to it.

UNLESS OTHERWISE SPECIFIED

ALL RESISTOR VALUES ARE
IN OHMS, 1/8W, 5%

ALL CAPACITOR VALUES ARE
IN MICROFARADS, 20%

APPROVALS		DATE
DRAWN	MH	03-19-96
CHECKED		
APPROVED		

Medical Data Electronics

TITLE:
E3B PLUS
VGA VIDEO CONTROLLER
SCHEMATIC

SCALE	SIZE	DRAWING NO.	REV
NONE	C	402914	H

FILE NAME: 402914H.SCH

PCB REV: C

SHEET 1 OF 2

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	RELEASE PER ECON 2424	09-30-96	
B	ECON 2534 (BOM CHG)	12-02-96	
C	ECON 2563	RT 02-07-97	
C1	BCO 702 (MECH CHG ONLY)	RT 03-06-97	

LAST USED   UNUSED COMPONENTS   PARTS FLOWN   UNUSED LABELS   REFERENCE DRAWINGS

C62, D7, L17,
P4, Q4, R86,
U10, Y4,

ASSY/BOM   402923
ARTWORK/FAB   402922

by-pass capacitors (1/power pin)

Note: Each power pin of the Ramdac should have one
of these 1uf capacitors next to it.

		Medical Data Electronics

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE
IN OHMS, 1/8W, 5%.
ALL CAPACITOR VALUES ARE
IN MICROFARADS, 20%

TITLE: E3B PLUS
10.4 VGA EL VIDEO CONTROLLER
SCHEMATIC

APPROVALS		DATE
DRAWN	MH	07-09-96
CHECKED		
APPROVED		

SCALE	SIZE	DRAWING NO.	REV
NONE	C	402923	C1

FILE NAME: 402923C1SCH   PCB REV: A   SHEET 1 OF 2

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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELESE PER ECON 2424	MH 09-30-96	
	B	ECON 2534 (BOM CHG)	MH 12-02-96	
	C	ECO 2563	RT 02-07-97	
	C1	DCO 709 (CLARIFY FOR SUBCONTRACTING)	RT 04-21-97	
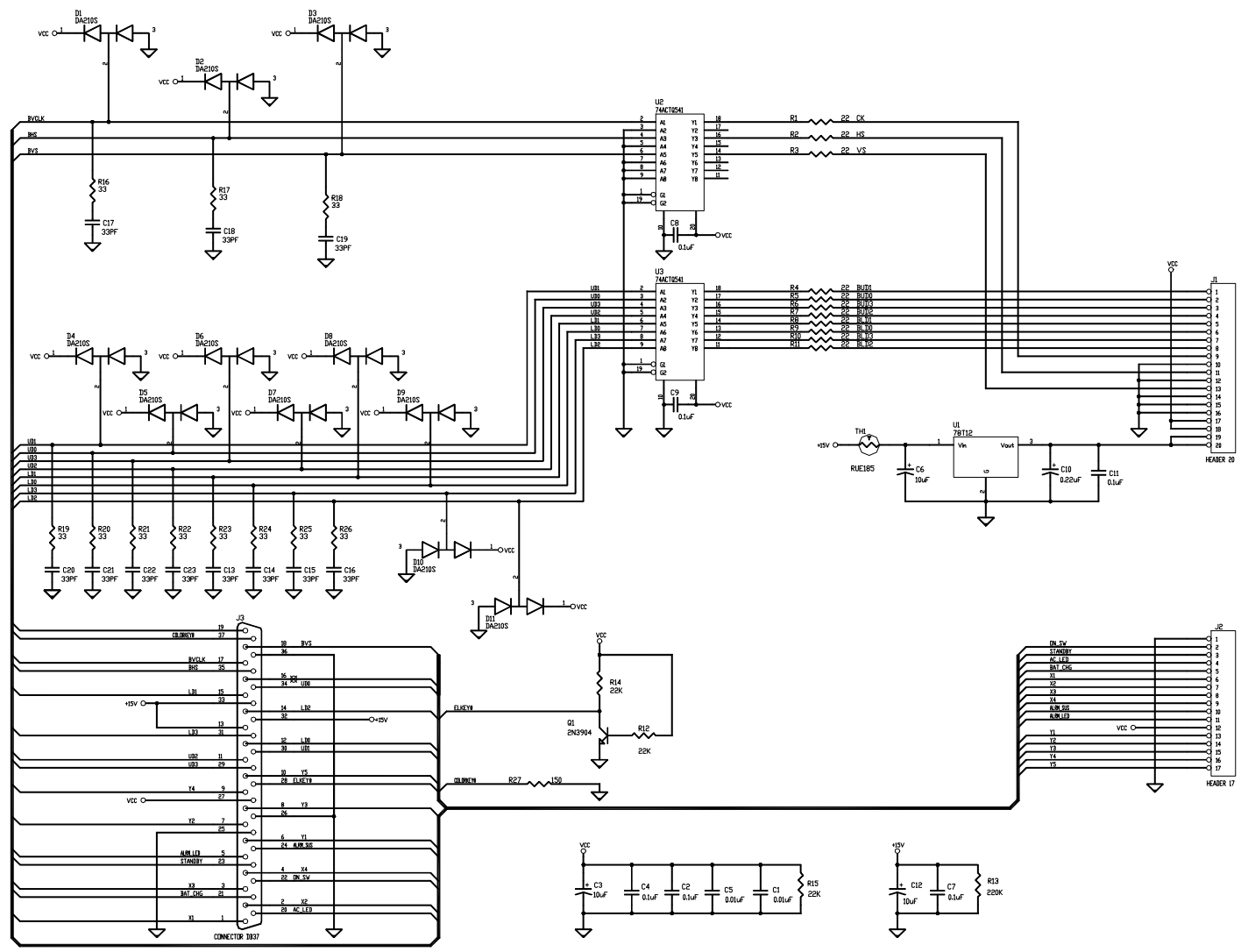
LAST USED
R27 C23 D11 Q1
U3 J3 TH1

UNUSED COMPONENTS

UNUSED LABELS

PARTS FLOWN

REFERENCE DRAWINGS
ASSY/BOM   402925
ARTWORK/FAB   402924

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 5%
ALL CAPACITOR VALUES ARE IN MICROFARADS, 20%

Medical Data Electronics

TITLE:
E3B PLUS
10.4 EL VGA INTERFACE
SCHEMATIC

APPROVALS	DATE
DRAWN MH	06-05-96
CHECKED	
APPROVED	

SCALE: NONE   SIZE: B   DRAWING NO: 402925   REV: C1

FILE NAME: 402925C1SCH   PCB REV: A   SHEET 1 OF 2

MPM CONNECTOR SCHEMATIC — Medical Data Electronics, Drawing No. 403146, Rev E, Sheet 1 of 2.

This is a full-page engineering schematic diagram.

Title block:
- Medical Data Electronics (MDE)
- TITLE: MPM ISO POWER SUPPLY, CTM SCHEMATIC
- DRAWN: L. FRIEND 11-04-96
- CHECKED: R. CARR 97-2-18
- APPROVED: R. CARR 97-2-18
- FILE NAME: 403162J.SCH
- SIZE: B
- DRAWING NO: 403162
- REV: J
- PCB REV: C
- SHEET 1 OF 2
- UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%, ALL CAPACITOR VALUES ARE IN MICROFARADS, 20%
- SCALE: NONE

REVISIONS table:
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	E	ECON 2786 (REV UPDATE ONLY)	LF 10-24-97	
	F	ECON 2815 (MECH UPDATE)	RT 12-29-97	
	G	ECON 2930 (MECH ONLY)	LF 08-17-98	
	H	ECON 2963 (REV UPDATE ONLY)	LF 09-02-98	
	I	ECON 3099 (REV UPDATE ONLY)	MH 07-07-99	
	J	REVISED PER ECO 3304	MH 04-10-00	

REFERENCE DRAWINGS:
- ASSY/BOM 403162
- ARTWORK/FAB 403161

LAST USED: C29 D13 J10 L1 P1 Q4 R29 T1 TH1 TS1 U6 VR1

UNUSED LABELS: C7, TB1, J3, J4, J9, Q2, D13, R14, U1, U3

PARTS FLOWN

ECG, SMT, MPM SCHEMATIC — Medical Data Electronics, Drawing No. 403684, Rev. G

SP02 INTERFACE

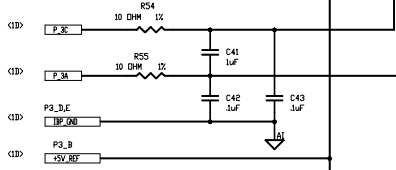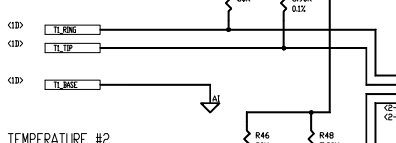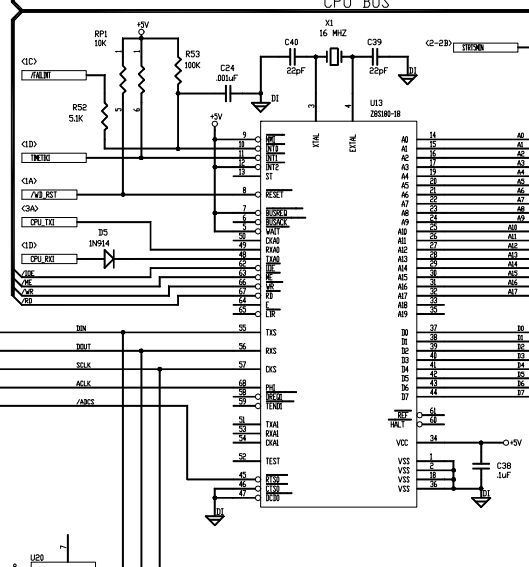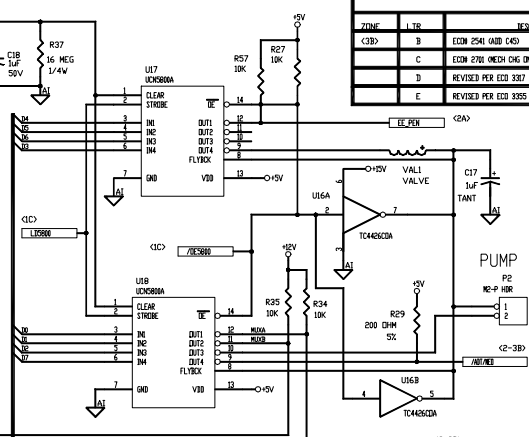BLOOD PRESSURE #1

BLOOD PRESSURE #2
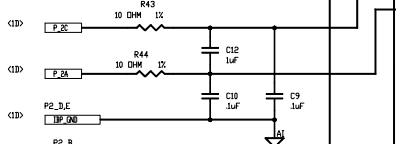
BLOOD PRESSURE #3

TEMPERATURE #1

TEMPERATURE #2

DIVIDER FOR
CALIBRATION
IBP CAL.

PUMP

PAL DECODER

CPU BUS

FLASH EEPROM
00000-1FFFF

RAM
20000-3FFFF

WATCHDOG

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
<3B>	B	ECON 2541 (ADD C45)	MH 12-09-96	
	C	ECON 2701 (MECH CHG ONLY)	RT 08-05-97	
	D	REVISED PER ECO 3317	MH 04-11-00	
	E	REVISED PER ECO 3355	MH 06-27-00	

REFERENCE DRAWINGS

ASSY/BOM   402954

ARTWORK/FAB   402953

UNLESS OTHERWISE SPECIFIED

ALL RESISTOR VALUES ARE
IN OHMS, 1/8W, 5%

ALL CAPACITOR VALUES ARE
IN MICROFARADS, 20%

APPROVALS		DATE
DRAWN	LF	6-14-96
CHECKED	RDY CARR	08-05-96
APPROVED	RDY CARR	08-05-96

Medical
Data
Electronics

TITLE:
MPM
NIBP/BP/TEMP
SCHEMATIC

SCALE	SIZE	DRAWING NO.	REV
NONE	B	402954	E

FILE NAME: 2954IE.SCH

PCB REV: A   SHEET 1 OF 3

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		

TRANSDUCER PRESSURE

U1 MPX2052D
XCIT
OUT-
OUT+
GND

+5V_REF

C31 .1uF
C29 15pF
C28 15pF

BP XDCR-
BP XDCR+

R1 150 OHM 1%
VR1 100 OHM
NIBP GAIN

+12V
C27 .1uF

U2 ADG20BN
R G 1
R E F
R G

VA

C30 .1uF
-12V

R11 5.36K 1%
-12V

D1
LM385BX-L2

REGULATORS

7812CT U11
VI VO
GND

MC7805 U12
VI VO
GND

+12V

+5V
C15 47uF 25V
C13 10uF TANT
-15V

C16 10uF TANT
C14 10uF TANT

U10 LM79L12ACZ
VI VO
GND

+5V_REF
C21 1uF TANT
-12V

<1-1C> /DAC_LD

U4 DAC8043GP
IOUT   -LD
RFB   SD_IN
        CLK
GND   VREF
        VDD

R21 475K 1%

+5V_REF

DIN <1-2B>
SCLK <1-2A>

R16 4.99K 1%
+12V

C1 15pF

U3D LPC660AIN

R40 1K
NIBPHI <1-3B>

R22 10K 1%
IOUT

R19 10K 1%

R18 300K
VR3 10K
+12V
-12V
NIBP OFFSET

R9 10K 1%

U3C LPC660AIN

R10 510 OHM
NIBPLO <1-3B>

<1-3B> PORT1

FAIL_OP <1-1C>

C6 10uF TANT

R12 1.82K 1%

<1-1C> /NBTRIG

+5V_REF

R17 1K 1%
R15 10K 1%
R31 10K

R30 510K

ININSN <1-1C>

U3B LPC660AIN

+5V
C5 .22uF

D3 1N914

R20 22M

R28 510K

U5 ICM7242IPA
RC   DIV2
TRIG
RESET   DIV128
TB
GND

R13 649 OHM 1%
R14 12.4K 1%
+5V

C2
+5V_REF

C3 .1uF

U3A LPC660AIN

C4 100pF

D2 1N914

TIME_OUT <1-1C>

R8 100K 1%

R7 40.2K 1%

LAST USED
C45 D9   P2
R58 RP1 U20
VR3 X1

UNUSED PARTS

+5V
RP1 10K

UNUSED LABELS

PARTS FLOWN

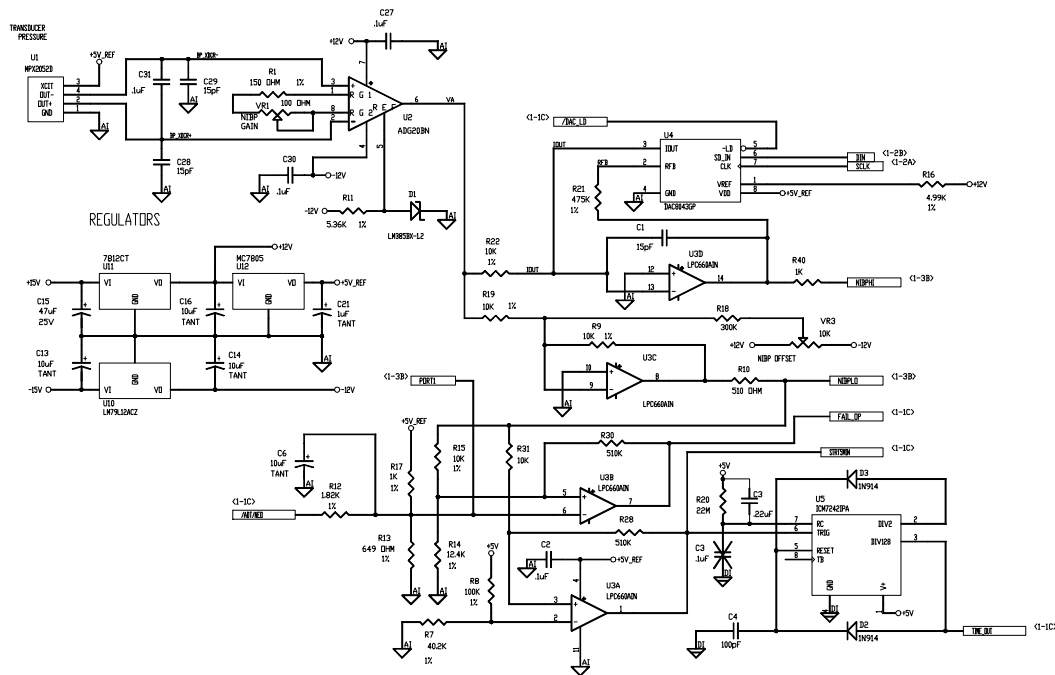REFERENCE DRAWINGS

ASSY/BOM   402954

ARTWORK/FAB   402953

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 5%
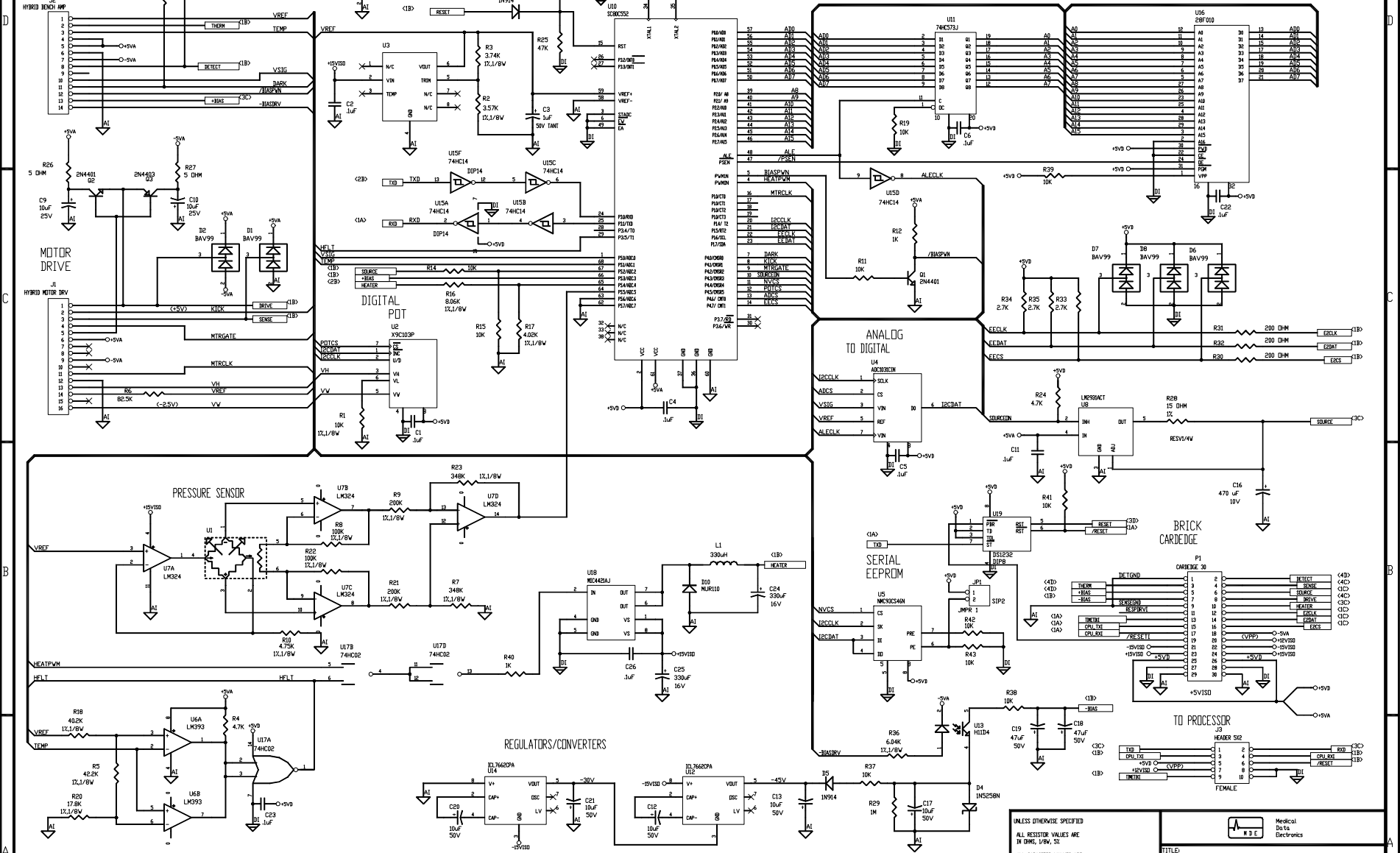ALL CAPACITOR VALUES ARE IN MICROFARADS, 20%

APPROVALS	DATE
DRAWN LF	06-14-96
CHECKED	
APPROVED	

Medical Data Electronics

TITLE: MPM NIBP/BP/TEMP SCHEMATIC

SCALE NONE | SIZE B | DRAWING NO 402954 | REV E

FILE NAME: 29542E.SCH | PCB REV: A | SHEET 2 OF 3

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	PCB UPDATE
	S	ECO 2719	RT 07-31-97	
	T	ECO 2897 (USE AMP SOCKET)	LF 05-06-98	
	U	ECO 3261	MH 12-01-99	

BENCH AMP

J2
HYBRID BENCH AMP

MOTOR DRIVE

J1
HYBRID MOTOR DRV

PRESSURE SENSOR

DIGITAL POT

ANALOG TO DIGITAL

SERIAL EEPROM

BRICK CARDEDGE

P1
CARDEDGE 30

TO PROCESSOR

HEADER 5X2
FEMALE

REGULATORS/CONVERTERS

LAST USED
U19 C26 R43 D10
J3   L1   Q3   X1

UNUSED PARTS

U17C
74HC02

U15E
74HC14

PARTS FLOWN

UNUSED LABELS

REFERENCE DRAWINGS

ASSY/BOM   401915
ARTWORK/FAB   401914

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 5%
ALL CAPACITOR VALUES ARE IN MICROFARADS, 20C

Medical Data Electronics

TITLE:
MPM CO2 SCHEMATIC

APPROVALS	DATE
DRAWN MH	03-13-95
CHECKED	
APPROVED	

SCALE: NONE   SIZE: B   DRAWING NO. 401915   REV U

FILE NAME: 401915U.SCH   PCB REV: F   SHEET 1 OF 2

BRICK CO2 PROCESSOR SCHEMATIC — Drawing No. 401917, Rev N, Sheet 1 of 2

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	PCB UPDATE
	J	ECON 2691 (ADD REWORK)	LF 06-25-97	
	J1	DCO D724 (MECH CHANGE ONLY)	LF 08-28-97	
	K	ECO 2808	LF 11-28-97	
	L	ECO 2897 (USE AMP SOCKET)	LF 05-06-98	
	M	ECON 2917 (ENLARGE CONN HOLES)	LF 06-29-98	
	N	ECON 2938 (ADD REWORK- REV F ONLY)	RT 07-31-98	

HD64180 MPU
128K EPROM (FLASH)
TO CO2
32K SRAM
MEMORY DECODE
LAST USED
C6 R2 U6 Q1
J1 D1

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	P	ECO# 2691 (ADD REWORK)	LF 06-25-97	
	Q	ECO 2793 (REV UPDATE ONLY)	LF 11-03-97	
	R	ECO 2897 (USE AMP SOCKET)	LF 05-06-98	

Z8S180 MPU

128K EPROM (FLASH)
U15
AM27C010

32K SRAM
U7
CXK58257P-200

EEPROM 8K X 8BIT
U14
HN58C65

REGULATORS

U12 LM78L08ACZ
U10 LM78L05ACZ
U11 LM79L05ACZ
U9 LM79L12ACZ
U1 LT1021CCN8-5

U6 GAL6001

TO CO2
P2 HEADER 5X2

BRICK CARDEDGE
P1 CARDEDGE 30
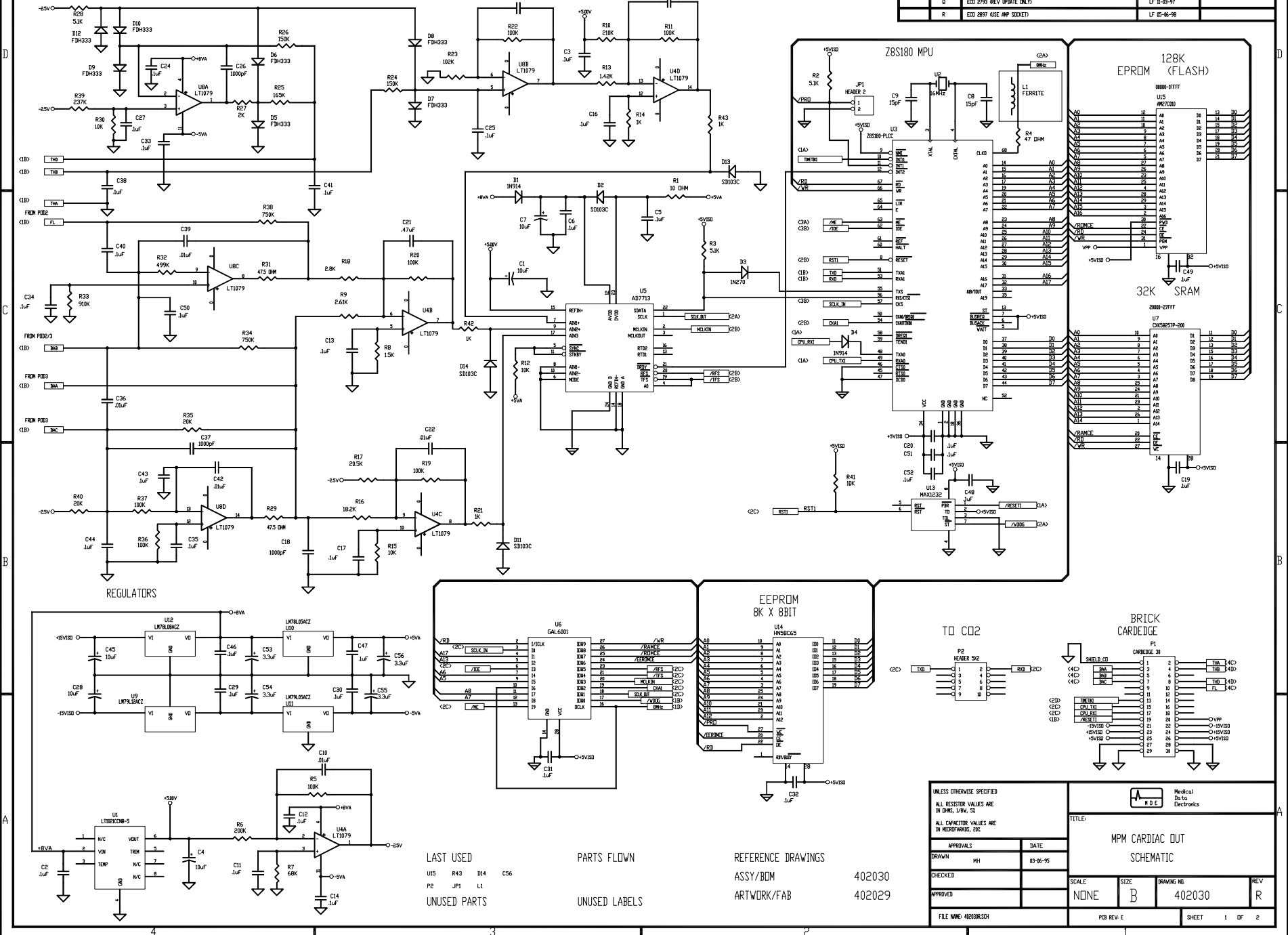
LAST USED
U15 R43 D14 C56
P2 JP1 L1
UNUSED PARTS

PARTS FLOWN

UNUSED LABELS

REFERENCE DRAWINGS
ASSY/BOM   402030
ARTWORK/FAB   402029

UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE
IN OHMS, 1/8W, 5%
ALL CAPACITOR VALUES ARE
IN MICROFARADS, 20%

Medical Data Electronics

TITLE:
MPM CARDIAC OUT
SCHEMATIC

APPROVALS	DATE
DRAWN MH	03-06-95
CHECKED	
APPROVED	

SCALE: NONE   SIZE: B   DRAWING NO. 402030   REV R

FILE NAME: 402030R.SCH

PCB REV: E   SHEET 1 OF 2