

**FLUKE®**

**Biomedical**

# **Victoreen®**

# **960PS-200 & 960PS-210**

**Power Supply Modules**

## **Operators Manual**

**Fluke Biomedical**  
**Radiation Management Services**

6045 Cochran Road  
Cleveland, Ohio 44139  
440.498.2564

120 Andrews Road  
Hicksville, New York 11801  
516.870.0100

[www.flukebiomedical.com/rms](http://www.flukebiomedical.com/rms)

# Table of Contents

Section 1:	<b>Introduction</b> .....	<b>1-1</b>
1.1	General Description .....	1-1
1.2	Application .....	1-1
1.3	Specifications.....	1-1
1.4	Receiving Inspection and Storage .....	1-2
1.5	Installation.....	1-3
1.6	Procedures, Warnings, and Cautions .....	1-3
Section 2:	<b>Operation</b> .....	<b>2-1</b>
2.1	960PS-200 Power Supply.....	2-1
2.2	Input Filter.....	2-1
2.3	DC to DC Converter.....	2-1
2.4	Voltage Regulation .....	2-1
2.5	960PS-210 Power Supply.....	2-2
Section 3:	<b>Maintenance, Calibration and Troubleshooting</b> .....	<b>3-1</b>
3.1	Maintenance .....	3-1
3.2	Calibration.....	3-1
3.3	Troubleshooting .....	3-1
Appendix A:	<b>Connector Designations</b> .....	<b>A-1</b>
A.1	Connector Designations.....	A-1
Appendix B:	<b>Applicable Drawings and Bill of Materials</b> .....	<b>B-1</b>
B.1	Applicable Drawings .....	B-1
B.2	Bill of Materials .....	B-1

(Blank Page)

# Section 1 Introduction

## 1.1 General Description

The 960PS Power Supply is used to supply power to the modules that are plugged into the 960MB/961MB motherboards.

The power supply is mounted outside of the 960CC Card Cage Module, the wall mounted Local Control Unit enclosure, or control room cabinet. The input AC voltage is soft started to inhibit current surges when powered up. EMI protection is also provided as part of the AC voltage protection. The power supply has remote error sensing and short circuit/overload protection along with input and output over-voltage protection. See Figure 1-1, the Power Supply Functional Block Diagram.

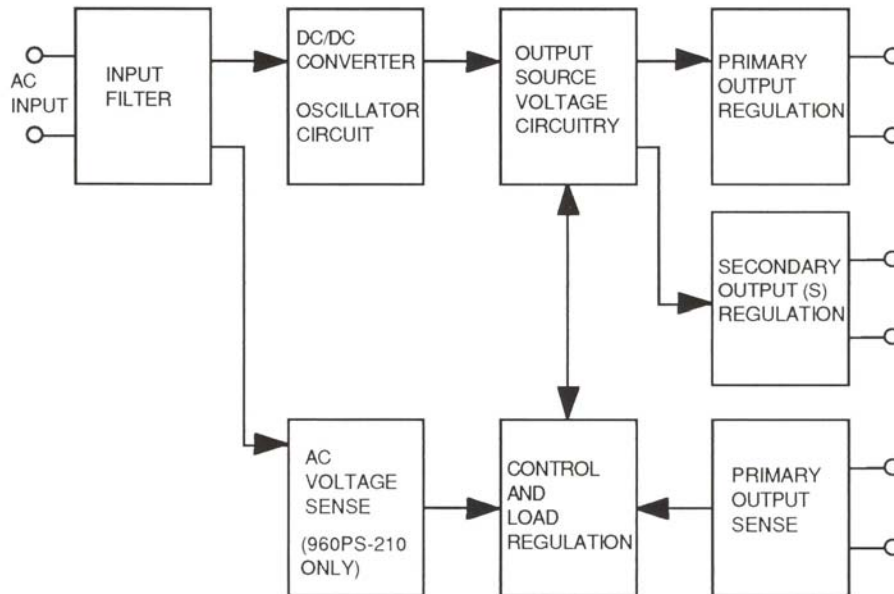
## 1.2 Application

The 960PS-200 & 960PS-210 Power Supply Modules are used in VICTOREEN series area monitors, process monitors, isolators, control rooms, and safety-related display cabinets.

## 1.3 Specifications

General specifications for the power supply are listed below.

	<b><u>960PS-200</u></b>	<b><u>960PS-210</u></b>
<b><i>Dimensions (W x H x D)</i></b>	4.2 x 2.25 x 6.66 in	5.0 x 2.5 x 10.5 in
<b><i>Operating Temperature</i></b>	0° to 50°C, Full Rated	0° to 50°C, Full Rated
<b><i>Relative Humidity</i></b>	95% Non-Condensing	95% Non-Condensing
<b><i>Input Voltage</i></b>	115 VAC ± 15%	90 - 132 VAC/180 - 240 VAC (jumper selectable) 47 - 440 Hz
<b><i>Input Power</i></b>	155 watts	130 watts
<b><i>Efficiency</i></b>	71%	75% Minimum
<b><i>Input Filtering Mode</i></b>	Common Mode	Common Mode and Differential
<b><i>Output Voltages</i></b>	+5 VDC ± 0.2% @ 10 Amps +15 VDC ± 5% @ 2 Amps -15 VDC ± 5% @ 2 Amps	+5 VDC ± 0.2% @ 15 Amps (10% load required for regulation) +15 VDC ± 2% @ 3 Amps -15 VDC ± 2% @ 2 Amps +24 VDC ± 1.5% @ 2 Amps
<b><i>Remote Error Sensing</i></b>	+5 VDC Sense Provided	+5 VDC Sense Provided
<b><i>Fault Protection</i></b>	Short circuit protected by current foldback with automatic recovery	Short circuit protected by current foldback with automatic recovery
<b><i>Line Voltage Monitor</i></b>	Not Provided	Factory Set to 90 VAC



*Figure 1-1. Power Supply Functional Block Diagram*

## 1.4 Receiving Inspection and Storage

### Receiving Inspection

Upon receipt of the unit:

1. Inspect the carton(s) and contents for damage. If damage is evident, file a claim with the carrier and notify Fluke Biomedical, Radiation Management Services at 440.248.9300.
2. Remove the contents from the packing material.
3. Verify that all items listed on the packing list have been received and are in good condition.

**NOTE**

If any of the listed Items are missing or damaged,  
notify Fluke Biomedical.

### Storage

Storage of Victoreen instruments must comply with Level B storage requirements as outlined in ANSI N45.2.2 (1972) Section 6.1.2 (.2). The storage area shall comply with ANSI N45.2.2 (1972) Section 6.2 Storage Area, Paragraphs 6.2.1 through 6.2.5. Housekeeping shall conform to ANSI N45.2.3 (1972).

Level B components shall be stored within a fire resistant, tear resistant, weather tight enclosure, in a well-ventilated building or equivalent.

Storage of Victoreen instruments must comply with the following:

1. Inspection and examination of items in storage must be in accordance with ANSI N45.2.2 (1972) Section 6.4.1.

2. Requirements for proper storage must be documented and written procedures or instructions must be established.
3. In the event of fire, post-fire evaluation must be in accordance with ANSI N45.2.2 (1972), Section 6.4.3.
4. Removal of items from storage must be in accordance with ANSI N45.2.2 (1972), Sections 6.5 and 6.6.

## 1.5 Installation

The 960PS-200 and 960PS-210 Power Supply Modules are supplied as part of a radiation monitoring system (RMS) or as replacement parts for an existing RMS. When the power supplies are shipped as part of a system, they are installed at the factory.

When a module is shipped as a replacement part, verify the integrity of the gasket, heat sink, and seal screw fasteners (when used) prior to installation. Apply P/N 88-10 thermal coat, or equal heat transfer compound between power supply and heat sink to ensure the thermal coupling of the installed power supply. For operation of the 960PS-210 at 220 VAC, verify the location of the internal supply voltage jumper E1. The part number of the required mounting hardware may be found in the system assembly drawing section of the applicable systems manual.

## 1.6 Procedures, Warnings, and Cautions

The equipment described in this manual is intended to be used for the detection and measurement of ionizing radiation. It should be used only by persons who have been trained in the proper interpretation of its readings and the appropriate safety procedures to be followed in the presence of radiation.

Although the equipment described in this manual is designed and manufactured in compliance with all applicable safety standards, certain hazards are inherent in the use of electronic and radiometric equipment.

**WARNINGS** and **CAUTIONS** are presented throughout this document to alert the user to potentially hazardous situations. A **WARNING** is a precautionary message preceding an operation that has the potential to cause personal injury or death. A **CAUTION** is a precautionary message preceding an operation that has the potential to cause permanent damage to the equipment and/or loss of data. Failure to comply with **WARNINGS** and **CAUTIONS** is at the user's own risk and is sufficient cause to terminate the warranty agreement between Fluke Biomedical and the customer.

Adequate warnings are included in this manual and on the product itself to cover hazards that may be encountered in normal use and servicing of this equipment. No other procedures are warranted by Fluke Biomedical. It shall be the owner's or user's responsibility to see to it that the procedures described here are meticulously followed, and especially that **WARNINGS** and **CAUTIONS** are heeded. Failure on the part of the owner or user in any way to follow the prescribed procedures shall absolve Fluke Biomedical and its agents from any resulting liability.

Indicated battery and other operational tests must be performed prior to each use to assure that the instrument is functioning properly. If applicable, failure to conduct periodic performance tests in accordance with ANSI N323-1978 (R1983) Radiation Protection Instrumentation Test and Calibration, paragraphs 4.6 and 5.4, and to keep records thereof in accordance with paragraph 4.5 of the same standard, could result in erroneous readings or potential danger. ANSI N323-1978 becomes, by this reference, a part of this operating procedure.

(Blank page)



## **Section 2**

# **Operation**

### **2.1 960PS-200 Power Supply**

The 960PS-200 supplies three different DC voltage outputs to the 960 modules through the 960MB/961MB motherboard. 115 VAC is connected to terminal strip A3, part of the front panel. The AC line voltage is fed to a bridge rectifier circuit and rectified by diodes CR1, CR2, CR3, and CR4. A thermistor is connected in series with the incoming AC voltage to decrease the effect of "turn-on" in-rush current to the power supply. For all practical purposes this is a soft start device. On some models of the power supply a current limiting resistor is used rather than a thermistor. Refer to schematic drawing 960PS-200-53

### **2.2 Input Filter**

The rectified voltage from the bridge goes to a filter network made up of inductor L1 and a capacitor C1. This filter removes the DC voltage line ripple resulting from the rectification process.

### **2.3 DC to DC Converter**

The voltage is supplied to a DC to DC converter circuit. The converter has an oscillator circuit, with its transformer and transistors, converts the DC voltage to a high frequency AC voltage. Transformer T1 has the oscillator Q1 in the primary and as part of the secondary a feed back winding. The purpose of the feed back winding is maintaining oscillations independent of circuit loading. There are three outputs on T1's secondary that provide the source voltage for the power supply output voltage.

The output from T1 at pin 7 is rectified to DC by CR1 and CR2 and fed through another filter circuit. The output goes to two zener diodes VR1 and VR2. The zener diodes regulate the voltage down to 15 V. The 15 V is supplied to the circuits in the power supply.

### **2.4 Voltage Regulation**

One of the zener diodes, VR2, regulates the voltage that is used in the 5 V and short circuit/overload protection circuit. Operational amplifier AR1 acts as a voltage regulator by comparing the voltage output to a reference 5 volts. The output 5 V is fed to terminal strip A3.

An output is also fed to the -15 V and +15 V circuits. These two circuits function much the same as the +5 V. The only difference is that the +5 V circuit is the primary output circuit and it controls all the other secondary circuits. In addition to this only the +5 V circuit has protection.

## **2.5 960PS-210 Power Supply**

The 960PS-210 Power Supply is similar in operation to the 960PS-200, with the exception that it incorporates an additional 24 VDC output, an input voltage sensing circuit, and a common and differential mode choke. Refer to schematic drawing 960PS-210-53.

## Section 3

# Maintenance, Calibration and Troubleshooting

### 3.1 Maintenance

No periodic maintenance is required for the module. The output voltage levels, however, should be verified periodically.

NOTE

If a maintenance question arises and cannot be resolved by using this manual, please contact Fluke Biomedical at 440.248.9300.

### 3.2 Calibration

There are no user adjustments on the main 960PS-200. Should the output voltage fall outside of the tolerance specified, the unit must be returned to Fluke Biomedical for repair.

Adjustments to the 960PS-210 are limited to the AC Line Monitor Voltage trip point adjustment (R40), mounted on the stand-up circuit board, and the +5 VDC output voltage adjustment (R17). Adjustments to sealed potentiometers; R16 (FREQ.), R27 (CURR.), and R28 (OUP.) should be performed only by factory-trained technicians. Should the output voltage fall outside of the tolerance specified, the unit must be returned to Fluke Biomedical for repair.

### 3.3 Troubleshooting

WARNING

Extreme care must be used when troubleshooting a system that has power applied. All standard troubleshooting precautions apply.

WARNING

Once a problem has been located, remove all power before continuing with the repair.

CAUTION

Personnel performing the following procedure must be familiar with the operation of the monitoring system and the location of each piece of equipment used in the system.

If a problem develops, verify that the voltages at connection point inputs and outputs are present and that all wiring is secure. Ensure fuse F1 is not open for the 960PS-210 Power Supply. Refer to Appendix B for drawings.

The 960PS-200 and 960PS-210 Power Supply Modules must be returned to the factory for service if troubleshooting of the module is necessary.

NOTE

If a problem cannot be resolved by using the drawings in Appendix B while applying the troubleshooting instructions found in this manual, please contact Cardinal Health at 440.248.9300 for assistance.

# Appendix A

## Connector Designations

### A.1 Connector Designations

#### Terminal Designations, 960PS-200

Pin	Description
1	GND
2	AC Line Voltage
3	AC Line Voltage
4	-15 @ 2 A
5	+15 @ 2 A
6	RETURN
7	+5 V Return Sense
8	+5 V@ 10 A
9	+ 5 V SENSE
10	CHASSIS GND

#### Terminal Designations, 960PS-21 0

Pin	Description
1	AC Line Voltage, Neutral
2	AC Line Voltage, Line
3	GND
4	V3, - 15 VDC
5	V2, +15 VDC
6	V4, +24 VDC
7	DC Common
8	DC Common
9	DC Common
10	V1, +5 VDC
11	V1, + 5 VDC

(Blank page)

## **Appendix B**

# **Applicable Drawings and Bill of Materials**

### **B.1 Applicable Drawings**

<u>Drawing Number</u>	<u>Description</u>
960PS-200-50	Power Supply Assembly
960PS-200-53	Schematic Diagram
960PS-210-5	Power Supply Assembly
960PS-210-53	Schematic Diagram

### **B.2 Applicable Bill of Materials**

The 960PS-200 Power Supply is manufactured specifically for Fluke Biomedical by Adtec Power, Inc. and the 960PS-210 Power Supply is manufactured specifically for Fluke Biomedical by Deltron, Inc. These devices are not user serviceable, and sub-component bill of materials is not available. The unit must be returned to Fluke Biomedical for replacement or repair.

**Fluke Biomedical  
Radiation Management Services**

6045 Cochran Road  
Cleveland, Ohio 44139  
440.498.2564

120 Andrews Road  
Hicksville, New York 11801  
516.870.0100

[www.flukebiomedical.com/rms](http://www.flukebiomedical.com/rms)