

FLUKE®

Biomedical

Victoreen®

960CD-220, 960CD-221 960CD-222 and 960CD-223

Controller Modules

Operators Manual

March 2005

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Section 1

Introduction

1.1 General Description

The 960CD-220 series Controller Modules are the intelligent controlling modules designed for use in Victoreen's 960 Digital Radiation Monitoring System. There are four different modules included in the 960CD-220 series. All are built on the same processed circuit board. Differences include a communications option and the related components installed on the module.

Components

The 960CD-220 Controller Module is a self-contained microcomputer on a single printed circuit board. The module contains the following components.

- Motorola MC6809 microprocessor

- 32K x 8 EPROM

- 24K x 8 static RAM

- Two serial asynchronous communication links with switch selectable baud rates

- Optional RS-232, isolated fiber optics transmit or receive communications

- Memory protection with battery backup static RAM (battery included on the module)

- Buffered 8 bit data bus

- Buffered 16 bit address bus

- 16 Decoded device selects

- 64 Channel identification codes

- 6 Digit, seven-segment display driver

The modules are rated for nuclear safety-related applications. They are assembled using techniques and parts selected for the reliability required in a nuclear application. Any non-Victoreen repairs made to the modules will void their safety-related rating. These modules must be returned to the factory for authorized, qualified (ANSI 45.2.6. 1978, Skill Level II) service.

1.2 Specifications

Dimensions (H x W)	7.5 x 11.5 in (19.1 x 29.2 cm)
Weight	1 lb, 3 oz (0.5 kg)
Operating Temperature	32°F to 122°F (0°C to 50°C)
Relative Humidity	0 to 95% non-condensing
Microprocessor	Motorola MC6809
Data Bus	8 Data Lines – D0-D7
Address Bus	16 Address Lines – A0-A15
Control and Timing	1 MHz clock
R/W	READIWRITE
SHORT 02	Early 02 for WRITE
RESET	Reset
MICRO RESTART	External reset originated by scaler
Display Data	Sa, Sb, Sc, Sd, Se, Sf, Sg
Display Control	DIGIT 1 SELECT DIGIT 2 SELECT DIGIT 3 SELECT DIGIT 4 SELECT DIGIT 5 SELECT DIGIT 6 SELECT
Display Driver	Capable of driving 6 digit, 7-segment display (externally supplied) on 960 front panel.
Mode Select	4 Position keylock switch: Remote Calibrate Test Local
Channel ID	64 Codes, switch selectable
Communication	LOOP 1 and LOOP 2 asynchronous serial ports with watchdog timer Optional RS-232C asynchronous serial port (960CD-221 only) Optional fiber-optic isolator (960CD-222 and 960CD-223 only)
Baud Rate	See Table 4-2
Memory Protect	POWER FAIL input on loss of AC power, prevents loss of RAM data
Power	+5 V @ 1.4 A, +15 V @ 20 mA, -15 V @ 15 mA
Battery	Lithium iodide, 10 year Life

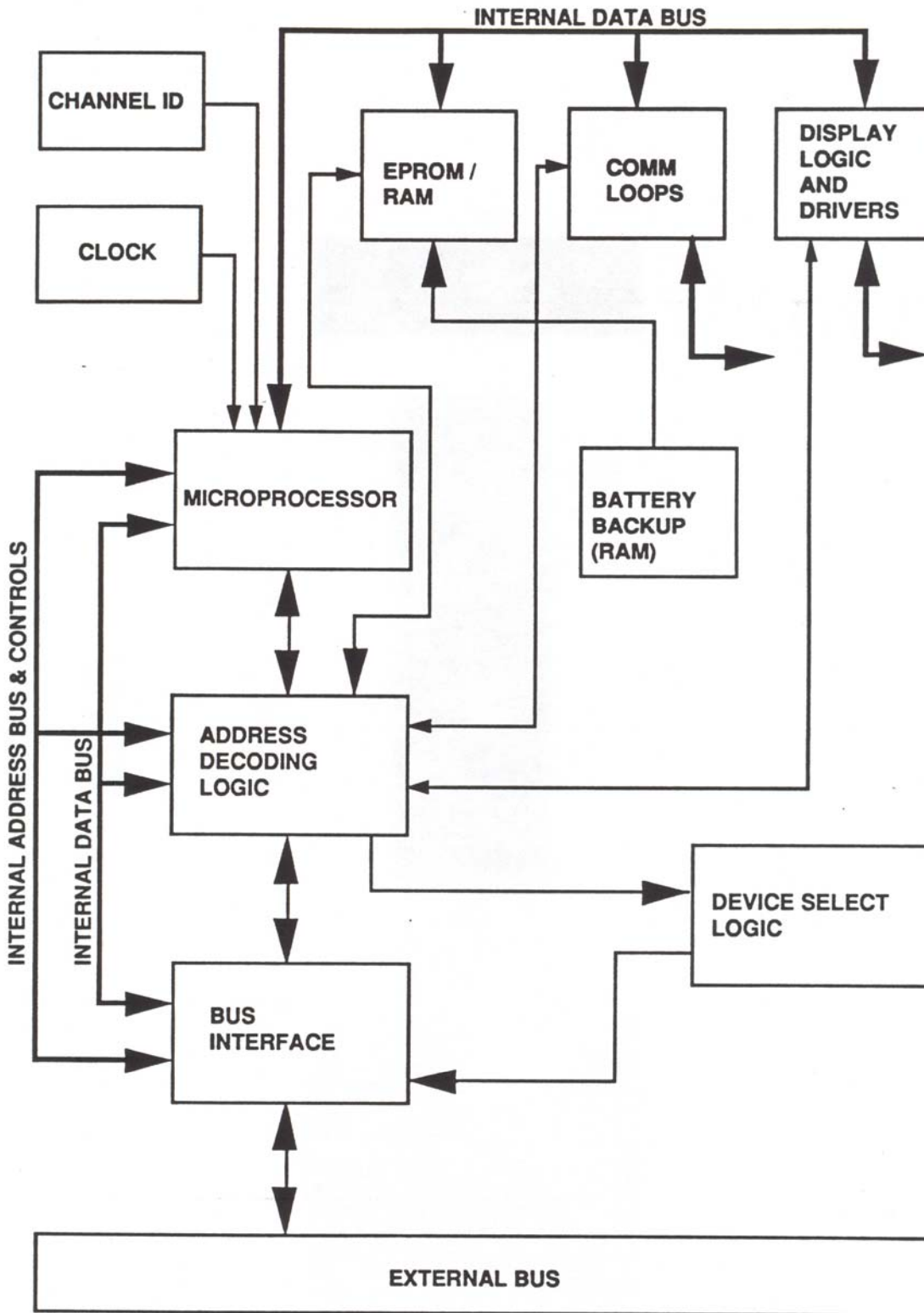


Figure 1-1.960CD-220 Series Controller Block Diagram

1.3 Applications

The 960CD-220 series Controller Modules are compatible with both the 960MB Motherboard and the 961MB Motherboard bus structure. There is total compatibility with all of the 960 data acquisition and input/output modules. The actual operations performed by the specific controller module are dependent more on the firmware employed than with the hardware utilized. Refer to the operation section of the system manual for a total description of the 960 monitor's operation and the types of communications provided for the specific application.

Module functions and applications are discussed in the following paragraphs. Table 1-1 compares the 960CD Modules. Table 1-2 lists communications loop connections to a minicomputer or safety related display. Table 1-3 lists communications loop connections. Figure 1-2 illustrates standard minicomputer communications. Figure 1-3 illustrates fiber optically isolated minicomputer communications with a control room safety-related display. Figure 1-4 illustrates safety related display communications. Figure 1-5 illustrates an RS-232 interface to a Victoreen 977 Series Preamplifier/Electrometer. Figure 1-6 illustrates safety related communications with an RS-232 Interface to a Victoreen 977 Series Preamplifier/Electrometer.

Controller Module 960CD-220

The 960CD-220 Module is supplied with a Motorola 6809 microprocessor, 24K of RAM, 32K of EPROM, and two Victoreen communication loops. Also integral to this module are decoder/drivers for a six-digit panel display. The 960CD-220 Controller Module contains selected components necessary to operate in applications where nuclear safety-related rated equipment is required. The installed components are all rated Class IE quality.

Controller Module 960CD-221

The 960CD-221 Module is supplied with a Motorola 6809 microprocessor, 24K of RAM, 32K of EPROM, two Victoreen communication loops and an RS-232C communications loop. Also integral to this module are decoder/drivers for a six-digit panel display. The module is utilized when an RS-232C communications loop with a 977 series Ion Chamber Detector or a 943-27-31 Current Mode Beta Scintillation Detector is used in the 960 Radiation Monitoring System. The 960CD-221 Controller Module contains selected components necessary to operate in applications where nuclear safety-related rated equipment is required. The installed components are all rated Class IE quality.

Controller Module 960CD-222

The 960CD-222 Module is supplied with a Motorola 6809 microprocessor, 24 K of RAM, 32K of EPROM, two Victoreen communication loops, and a receive only fiber optics link. The module is utilized as a communications isolator in Class 1E radiation monitoring systems. The 960CD-222 Controller Module contains selected components necessary to operate in applications where nuclear safety-related rated equipment is required. The installed components are all rated Class IE quality.

Controller Module 960CD-223

The 960CD-223 Module is supplied with a Motorola 6809 microprocessor, 24K of RAM, 32K of EPROM, a Victoreen communication loop, and a transmit only fiber optics link. Also integral to this module are decoder/drivers for a six-digit panel display. The module is utilized as a communications isolator in the Class 1E section of nuclear safety-related rated radiation monitoring systems. The 960CD-223 Controller Module contains selected components necessary to operate in applications where nuclear safety-related rated equipment is required. The installed components are all rated Class IE quality.

Display Module 960CD-200-15

The 960CD-200-15 Display Module is a six digit, seven-segment display board. The display board receives decoder/driver inputs from a controller module and displays monitor data. The module is designed to interface with all variations of the 960CD Controller Module. It is normally mounted on the front panel of a local control unit. The 960CD-200-15 Display Module contains selected components

necessary to operate in applications where nuclear safety-related rated equipment is required. The installed components are all rated Class IE quality.

Table 1-1. Comparison of 960CD Modules

Model 960CD	RAM	VICO Loops	RS-232	Fiber Optic Loop Receive	Fiber Optic Loop Transmit	All Models
220	24K	2	No	No	Yes	Internal Battery Backup
221	24K	2	Yes	No	No	6809 Microprocessor
222	24K	2	No	Yes	No	Display Driver
223	24K	1	No	No	Yes	and 32KEPROM

Table 1-2. Communication Loop Connections to a Minicomputer or Safety Related Display

Loop #1	960CD-220 J2	960CD-221 J2	960CD-222 J2	960CD-223 J2	Applicable Information
+VL1	1	1	1	1	To minicomputer or safety related display
-VL1	3	3	3	3	
+TX1	9	9	9	9	
-TX1	6	6	6	6	
+RX1	14	14	14	14	
-RX1	10	10	10	10	
Loop #2					
+VL2	8	8	8	N/A	To minicomputer or safety related display
-VL2	5	5	5	N/A	
+TX2	2	2	2	N/A	
-TX2	4	4	4	N/A	
+RX2	11	11	11	N/A	
-RX2	12	12	12	N/A	

Table 1-3. Communication Loop Connections

RS-232	960CD-220 J4	960CD-221 J4	960CD-222 J4	960CD-223 J4	Application Information
GND	-	1	-	-	For use with Victoreen preamp/electrometer
XMIT3	-	2	-	-	
REC3	-	3	-	-	
RTS3	-	4	-	-	
CTS3	-	5	-	-	
XMIT1	-	6	-	-	
GND	-	7	-	-	
CD3	-	8	-	-	
REC1	-	9	-	-	

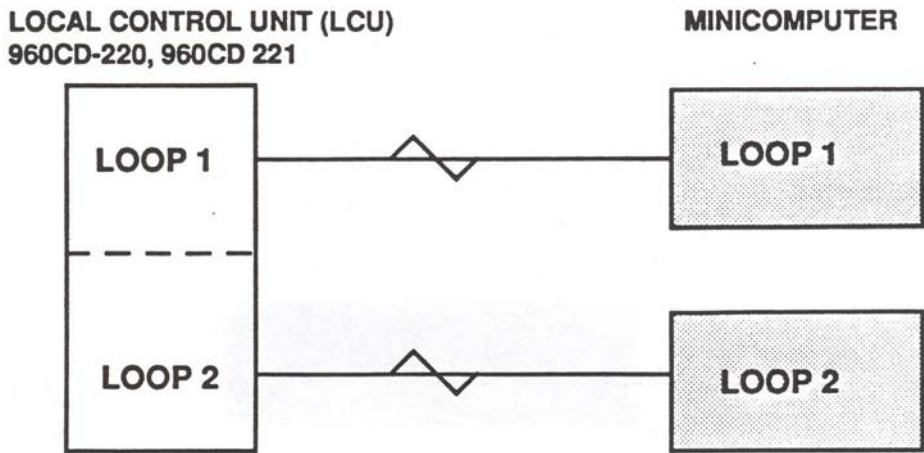


Figure 1-2. Standard Mini-Computer Communications

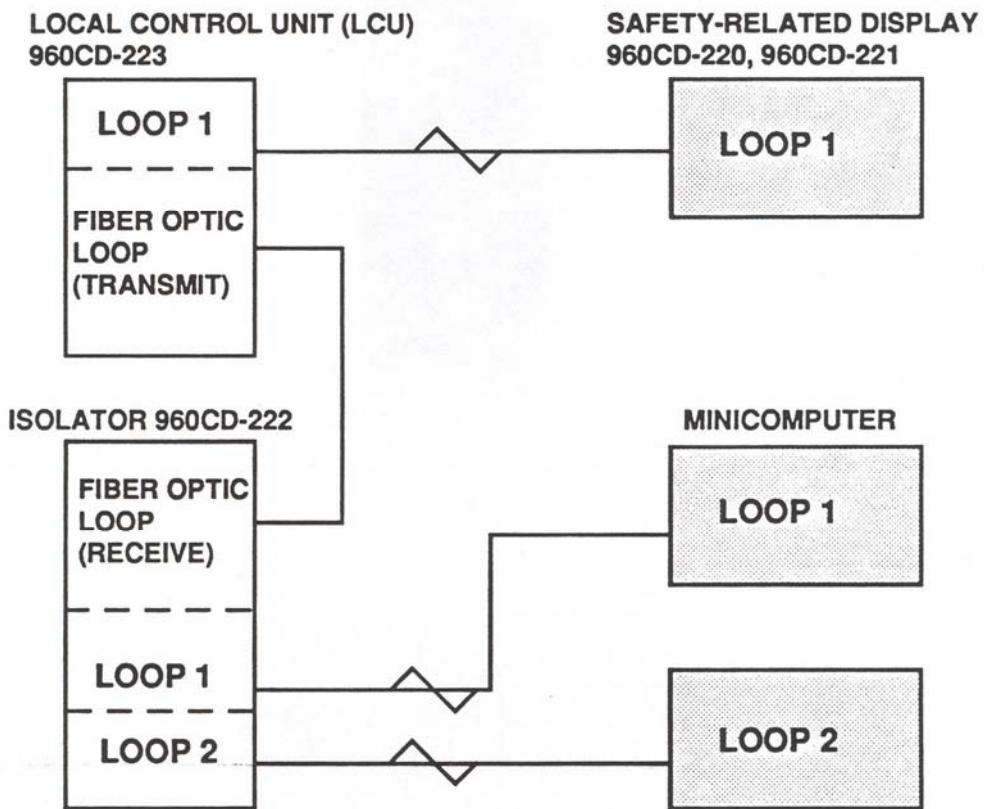


Figure 1-3. Fiber Optically Isolated Mini-Computer Communications with Control Room Safety Related Display

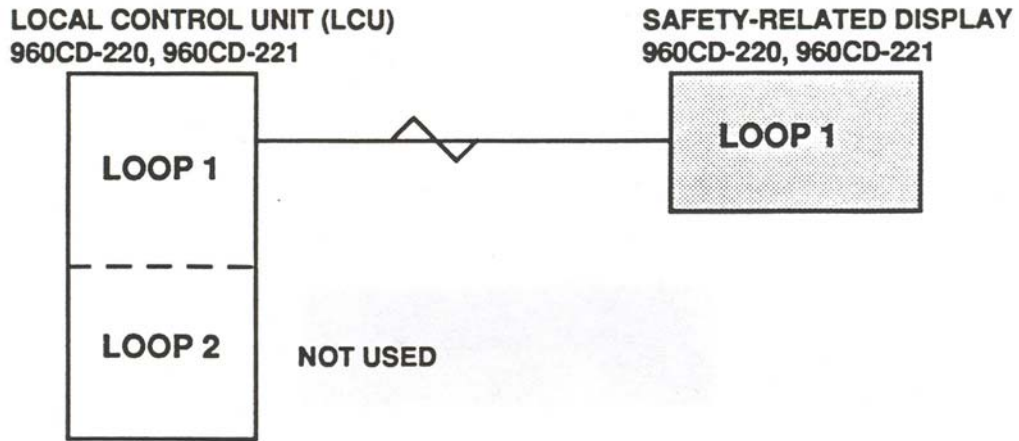


Figure 1-4. Safety Related Display Communications

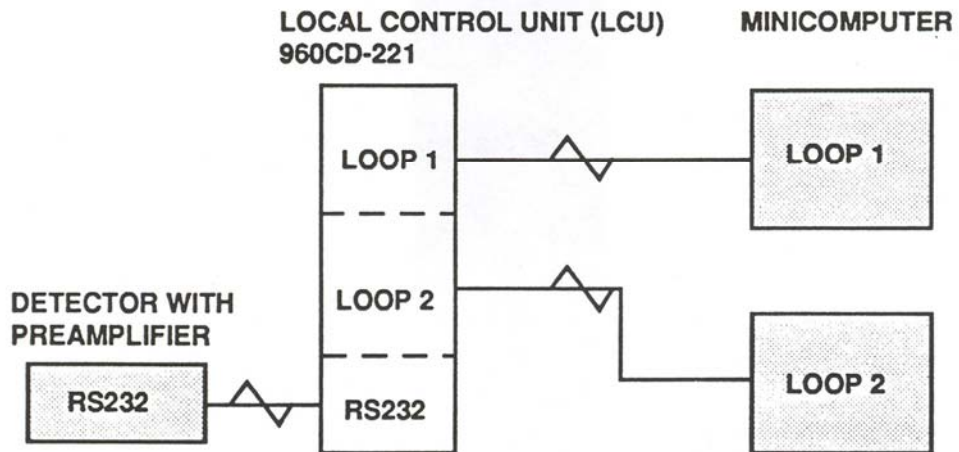


Figure 1-5. RS-232 Interface to Victoreen 977 Series Pre-amplifier/Electrometer

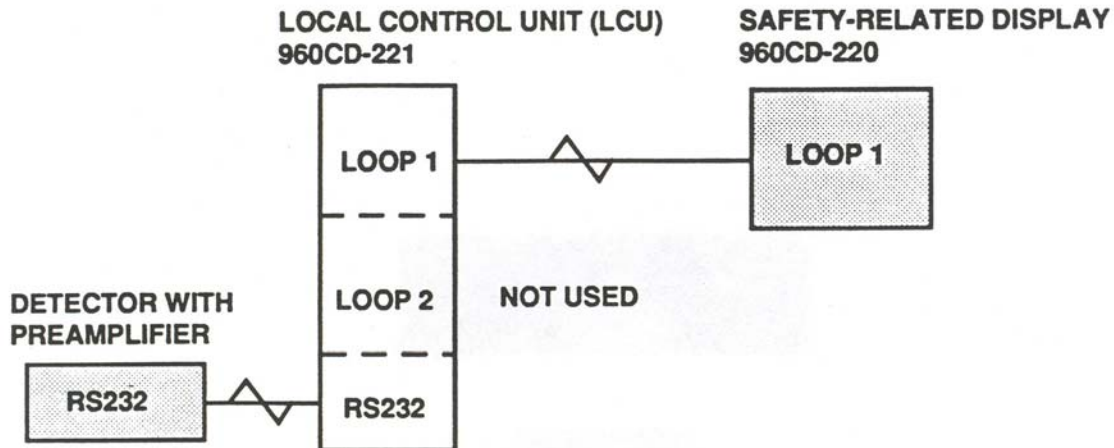


Figure 1-6. Safety Related Display Communications with RS-232 Interface to Victoreen 977 Series Preamplifier/Electrometer

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 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.

1.6 Installation

Controller Module 960CD is supplied as part of a radiation monitoring system or as a replacement part for an existing monitoring system. When the module is shipped as part of a system, it is installed at the factory.

When a module is shipped as a replacement part, verify that jumper addresses and PROMs are in the same configuration as the module that is being replaced. (Refer to Appendix A for jumper placement and connector pin designations.)

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Section 2

Theory of Operation

2.1 Bus Interface Logic

Refer to Drawing 960CD-220-13, sheet 1 in Appendix B. Bus Interface signals are buffered and distributed internally on the module and externally on the data bus. The internal address buffers, Z16 and 27 are permanently enabled. The external address bus is buffered by two bi-directional IC's Z15 and Z28.

Z14 provides internal data bus buffering of D0 to D7. It also inverts the internal data signal. IR/W (internal read/write) controls the direction of data flow. The external data bus is buffered by Z26, an inverting buffer.

2.2 Address Decoding Circuitry

Refer to Drawing 960CD-220-13, Sheet 2 in Appendix B. Z29 is a programmable array logic (PAL) with four sets of inputs; address bits A8 through A15, IR/W, VMA, and SHORT 02. Z29 is programmed as shown in Table 4-1.

Memory consists of Z38, a 32K x 8-bit EPROM, and three 8K x 8 bit static RAMs (Z39, Z40, and Z41).

Table 2-1. Address Decoding Circuitry Programs

Title	Program	Hex Address	Function
DISPID	/A8*A9*/A10*/A11*/A12*/A13*/A14*/A15*VMA	200-2FF	Display or channel ID addressed
ACIA1	A8*A9*/A10*/A11*/A12*/A13*/A14*/A15*VMA	300-3FF	Communications channel 1 addressed
ACIA2	/A8*/A9*A10*/A11*/A12*/A13*/A14*/A15*VMA	400-4FF	Communications channel 2 addressed
ACIA3	A8*/A9*A10*/A11*/A12*/A13*/A14*/A15*VMA	500-5FF	Communications channel 3 addressed
BKSL	/A8*A9*A10*/A11*/A12*/A13*/A14*/A15*VMA* SHORT02*IRW	600-6FF	Bank selected memory addressed
DS	/A9*/A10*/A11*/A12*/A13*/A14*/A15*VMA	000-1 FF	External device address
PROM	/A15*VMA	8000-8FFF	32K PROM in Z38 addressed
RAM3	A13*A14*/A15*VMA	6000-7FFF	Memory in Z41 addressed
RAM 1	A13*/A14*/A15*VMA	2000-3FFF	8K RAM in Z39 addressed
RAM2	A13*A14*/A15*VMA	4000-5FFF	8K RAM in Z40 addressed

Battery backup for RAM memory is provided with a lithium iodide battery. This battery has a useful life expectancy in excess of ten years. However, care should be taken when handling the controller module. If placed on a conductive surface, the battery could be shorted out. The lithium iodide battery, B1, requires no periodic maintenance. It is a primary cell battery that cannot be recharged.

Device selection is accomplished by two IC's, Z36 and Z37. They decode the sixteen-device selects line that select external devices on the 960MB or 961MB Motherboard bus.

2.3 Communication Support

Refer to Drawing 960CD-220-13, Sheet 3 in Appendix B. The controller contains up to three asynchronous serial communications, MC6850 ACIA ports. ACIA Z6, port 1, is normally configured to communicate via a Victoreen communications loop. For test purposes, port 1 can be configured to operate as an RS-232C channel. ACIA Z5, port 2, is also configured to communicate via a Victoreen communications loop. It can be configured to operate as a transmit only fiber optic channel. ACIA Z4, port 3, can be configured to operate as an RS-232C channel.

- Controller Module 960CD-221 utilizes the RS-232C channel.
- Controller Module 960CD-222 utilizes port 3 as a receive only fiber optic channel.
- Controller Module 960CD-223 is the only module which utilizes the transmit only fiber optic channel.

Z22 and Z23 form a time out circuit that ensures that the communication loops are not held in an active state due to a malfunction of the ACIA or its associated circuitry.

PNP transistor Q11 drives the transmit LED in optical coupler Z32. The photosensitive transistor in Z32 receives the optical signal from the LED, and drives the communication loop. This electrically isolates the communication loop from the rest of the controller's electronics. Power for the loop is provided by an external floating 30 VDC potential and is applied between +VL and -VL. In the quiescent state, +TX is pulled to -VL by a resistor tied to -VL. -TX is pulled to +VL by a resistor tied to +VL. When the loop is driven, +TX is pulled to +VL by Q2, -TX is pulled to -VL by Q4. Q2 is driven by Q8 and Q4 is driven by Q6. Transistor Q6 is driven by the output of opto-coupler Z32.

The receive portion of the communication loop is connected via a cable to a transmitter as described above, but it is placed in a location which is remote from the 960CD controller module. The quiescent state of +TX is a negative potential. The quiescent state of -TX is a positive potential. For communication between units, the transmit and receive lines are connected so that +TX of one is connected to the +RX of the other and -TX of one is connected to -RX of the other. Therefore, the quiescent state of the receive circuitry LED RX2 is reverse biased, LED on. The phototransistor of Z13 turns on, pulling the receive data input of the ACIA to a logic 0 level. The +TX2, -TX2, +RX2 and -RX2 of the second Victoreen communication loop circuits, if installed, operate in the same manner.

Controller Module 960CD-223 contains fiber optic transmitter J5B. The transmitter is driven by transistor Q10 instead of a Victoreen loop driver like the one used for port 2. This is a transmit only port that is utilized for nuclear safety-related applications. The fiber optics transmitter is a molded connector assembly housing a transmitting LED that terminates directly in a fiber optic cable assembly.

Controller Module 960CD-222 contains fiber optic receiver J5A. The receiver contains a phototransistor in a molded connector. The connector also contains a comparator that buffers the phototransistor output. In order for the fiber optics receiver to function, jumper W6 must be in the B to C position. Jumper W6 selects either the fiber optics receiver or the RS-232C receiver mode.

Controller Module 960CD-221 contains the RS-232C receiver Z2. Z2 and Z3 enable port 1 and/or port 3's RS-232C port function depending on the position of jumper W6. Jumper W6 must be in the A to B position to select the RS-232C port function.

2.4 Display/Channel ID

Refer to Drawing 960CD-220-13, sheet 4, in Appendix B. A counting circuit, consisting of Z1, Z33, and Z34, provides 100 HZ, 4 HZ, and switchable baud rates. The circuit is used to select a BIT RATE (baud

rate) and to count down the 2.4576 MHz frequency from the crystal circuit to provide the 100 Hz and 4 Hz timing signals used elsewhere in the controller. Table 2-2 lists the baud rates selectable via SW1.

SW3 provide the channel ID selects as shown in Table 2-3. This ID signal is buffered by Z7 and gated onto the data bus at the appropriate time. Z7 also provides an interface to a remote keylock switch that is used to select REMOTE, LOCAL, CALIBRATE, and TEST modes of operation.

LSI device Z8 functions as a driver/decoder. It drives a six digit, seven-segment display and decodes the data to be displayed. Two IC's Z8 and Z9 are the current drivers utilized to drive the display. The display module is normally located on the front panel of the Local Control Unit of the 960 Radiation Monitoring System.

2.5 Switch Settings

Table 2-2 lists the baud rate settings for SW1. Table 2-3 contains channel identification selection information for SW3. Reset switch SW2 is a momentary switch used to reset the controller.

Table 2-2. SW1 Baud Rate Settings

Switch Position				Output
1	2	3	4	
L	L	L	L	Invalid
L	L	L	H	Invalid
L	L	H	L	50 Baud
L	L	H	H	75 Baud
L	H	L	L	134.5 Baud
L	H	L	H	200 Baud
L	H	H	L	600 Baud
L	H	H	H	2400 Baud
H	L	L	L	9600 Baud
H	L	L	H	4800 Baud; Standard Setting
H	L	H	L	1800 Baud
H	L	H	H	1200 Baud
H	H	L	L	2400 Baud
H	H	L	H	300 Baud
H	H	H	L	150 Baud
H	H	H	H	110 Baud

H = Open

L = Closed

Table 2-3. SW3 Channel Identification

Switch Position	Function
1	Non-Functional
2	Non-Functional
3 to 6	Encode the channel ID; position 3 is the least significant bit, position 8 is the most significant bit.

	3 = Binary 1
	4 = Binary 2
	5 = Binary 4
	6 = Binary 8
7	Not Used
8	OFF = Class 1E; ON = Non-Class 1E

Section 3

Maintenance, Calibration and Troubleshooting

3.1 Maintenance

No periodic maintenance is required for the 960CD controller module. However, lithium battery B1 should be checked at least every ten years and replaced if the output voltage is less than 2.2 VDC.

NOTE

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

3.2 Calibration

The 960CD220 – 223 modules do not require any calibration.

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. Refer to Appendix B for drawings.

The 960CD220 - 223 controller 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 Fluke Biomedical at 440.248.9300.

Appendix A Connector Designations

PIN	DESCRIPTION	PIN	DESCRIPTION	PIN	DESCRIPTION	PIN	DESCRIPTION
1	GND	21	MICRO RESTART	41	DSI0C0	61	A6
2	GND	22	BIT RATE	42	DS01E0	62	A7
3	GND	23	R/W	43	GND	63	A8
4	GND	24	02	44	GND	64	A9
5	+5 V	25	IRQ	45	D0	65	A10
6	+5 V	26	SHORT 02	46	D1	66	A11
7	+5 V	27	DS 0000	47	D2	67	A12
8	+5 V	28	DS 0020	48	D3	68	A13
9	+15 V	29	DS 0040	49	D4	69	A14
10	+15 V	30	DS 0060	50	D5	70	A15
11	GND	31	DS 0080	51	D6	71	EXMEM
12	GND	32	DS 00A0	52	D7	72	WATCH DOG
13	-15	33	DS 00C0	53	GND	73	PULSE OUT #1
14	-15	34	DS 00E0	54	GND	74	PULSE OUT #2
15	5 V BAT	35	DS 0100	55	A0	75	PULSE OUT #3
16	5 V BAT	36	DS 0120	56	A1	76	ERROR OUT
17	MEMORY PROTECT	37	DS 0140	57	A2	77	GND

PIN	DESCRIPTION	PIN	DESCRIPTION	PIN	DESCRIPTION	PIN	DESCRIPTION
18	POWER FAIL	38	DS 0160	58	A3	78	GND
19	RESET	39	DS 0180	59	A4	79	GND
20	BNKG	40	DS 01A0	60	A5	80	GND

J2 (Communication) Pin Designations

Pin	Description	Pin	Description
1	+VL1	8	+VL2
2	+TX2	9	+TX1
3	-VL1	10	-RX1
4	-TX2	11	+RX2
5	-VL2	12	-RX2
6	-TX1	13	GND
7	GND	14	+RX1

J3 (Front Panel) Pin Designations

Pin	Description	Pin	Description
1	DIG 5 SEL	15	Sg ±1
2	DPT	16	DIG 1 SEL
3	Sc	17	DIG 2 SEL
4	Sd	18	Sa ± 1
5	DIG 4 SEL	19	Sf ± 1
6	Se	20	Se ± 1
7	Sf	21	-
8	DIG 6 SEL	22	-
9	DIG 3 SEL	23	COMMON
10	-	24	COMMON
11	Sg	25	REMOTE
12	-	26	CALIBRATE
13	Sb	27	TEST
14	Sa	28	-

J4 (RS-232C Port) Pin Designations

Pin	Description
1	GND
2	XMIT3
3	REC3
4	RTS3
5	CTS3
6	XMIT1
7	GND
8	CD3
9	REC1

J5A Pin Designations

Pin	Description
J5A	Fiber Optic Receiver (960CD-222-10 only)

J5b Pin Designations

Pin	Description
J5B	Fiber Optic Transmitter (960CD-223-10 only)

Jumper Placement

Jumper	Placement	Description
W1	A-B	Allows optional memory to be installed external to this module
	B-C	Normal position; all memory contained local to the module.
W2	A-B	Allows bank selected EPROM to be installed in optional memory socket Z41.
	B-C	Normal position; allows RAM to be installed in optional memory socket Z41.
W3	A-B	Allows bank selected EPROM to be installed in optional memory socket Z41.
	B-C	Normal position; allows RAM to be installed in optional memory socket Z41.
W4	A-B	Normal position; allows RAM to be installed in optional memory socket Z41.
	B-C	Allows bank selected EPROM to be installed in optional memory socket Z41.
W5	A-B	Normal position; enables battery to supply RAMs on power down.
	B-C	Disables battery for test purposes.
W6	A-B	Normal position for all models except 960CD-222-10; enables RS-232C receive data to port 3.
	B-C	Normal position for model 960CD-222-10; enables fiber optic receive data to port 3.
W7	A-B	Enables RS-232C receive data to port 1.
	B-C	Normal position; enables VICTOREEN loop, receive data to port 1

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Appendix B Applicable Drawings and Bill of Materials

B.1 Applicable Drawings

<u>Drawing Number</u>	<u>Description</u>
960CD-220-13	Schematic Diagram
960CD-220-10	Controller Module Assembly
960CD-221-10	Controller Module Assembly
960CD-222-10	Controller Module Assembly
960CD-223-10	Controller Module Assembly
960CD-200-15	Display Board Assembly
960CD-200-18	Display Board Schematic

B.2 Applicable Bill of Materials

<u>Document Number</u>	<u>Description</u>
960CD-220-10	Controller Module Assembly
960CD-221-10	Controller Module Assembly
960CD-222-10	Controller Module Assembly
960CD-223-10	Controller Module Assembly
960CD-200-15	Display Board Assembly

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