FLUKE ®

Biomedical

05-443/05-444

Digital Wall Mount-Area Monitor

Users Manual

Warranty and Product Support

Fluke Biomedical warrants this instrument against defects in materials and workmanship for one year from the date of original purchase OR two years if at the end of your first year you send the instrument to a Fluke Biomedical service center for calibration. You will be charged our customary fee for such calibration. During the warranty period, we will repair or at our option replace, at no charge, a product that proves to be defective, provided you return the product, shipping prepaid, to Fluke Biomedical. This warranty covers the original purchaser only and is not transferable. The warranty does not apply if the product has been damaged by accident or misuse or has been serviced or modified by anyone other than an authorized Fluke Biomedical service facility. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

This warranty covers only serialized products and their accessory items that bear a distinct serial number tag. Recalibration of instruments is not covered under the warranty.

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Follow standard receiving practices upon receipt of the instrument. Check the shipping carton for damage. If damage is found, stop unpacking the instrument. Notify the carrier and ask for an agent to be present while the instrument is unpacked. There are no special unpacking instructions, but be careful not to damage the instrument when unpacking it. Inspect the instrument for physical damage such as bent or broken parts, dents, or scratches.

Technical Support

For application support or answers to technical questions, either email techservices@flukebiomedical.com or call 1-800-850-4608 or 1-440-248-9300. In Europe, email techsupport.emea@flukebiomedical.com or call +31-40-2675314.

Claims

Our routine method of shipment is via common carrier, FOB origin. Upon delivery, if physical damage is found, retain all packing materials in their original condition and contact the carrier immediately to file a claim. If the instrument is delivered in good physical condition but does not operate within specifications, or if there are any other problems not caused by shipping damage, please contact Fluke Biomedical or your local sales representative.

Returns and Repairs

Return Procedure

All items being returned (including all warranty-claim shipments) must be sent freight-prepaid to our factory location. When you return an instrument to Fluke Biomedical, we recommend using United Parcel Service, Federal Express, or Air Parcel Post. We also recommend that you insure your shipment for its actual replacement cost. Fluke Biomedical will not be responsible for lost shipments or instruments that are received in damaged condition due to improper packaging or handling.

Use the original carton and packaging material for shipment. If they are not available, we recommend the following guide for repackaging:

- Use a double–walled carton of sufficient strength for the weight being shipped.
- Use heavy paper or cardboard to protect all instrument surfaces. Use nonabrasive material around all projecting parts.
- Use at least four inches of tightly packed, industry-approved, shock-absorbent material around the instrument.

Returns for partial refund/credit:

Every product returned for refund/credit must be accompanied by a Return Material Authorization (RMA) number, obtained from our Order Entry Group at 1-440-498-2560.

Repair and calibration:

To find the nearest service center, go to www.flukebiomedical.com/service or

In the U.S.A.:
Cleveland Calibration Lab
Tel: 1-800-850-4608 x2564
Email: globalcal@flukebiomedical.com

Everett Calibration Lab
Tel: 1-888-99 FLUKE (1-888-993-5853)
Email: service.status@fluke.com

In Europe, Middle East, and Africa:
Eindhoven Calibration Lab
Tel: +31-40-2675300
Email: ServiceDesk@fluke.com

In Asia:
Everett Calibration Lab
Tel: +425-446-6945
Email: service.international@fluke.com

To ensure the accuracy of the Product is maintained at a high level, Fluke Biomedical recommends the product be calibrated at least once every 12 months. Calibration must be done by qualified personnel. Contact your local Fluke Biomedical representative for calibration.

Certification

This instrument was thoroughly tested and inspected. It was found to meet Fluke Biomedical's manufacturing specifications when it was shipped from the factory. Calibration measurements are traceable to the National Institute of Standards and Technology (NIST). Devices for which there are no NIST calibration standards are measured against in-house performance standards using accepted test procedures.

WARNING

Unauthorized user modifications or application beyond the published specifications may result in electrical shock hazards or improper operation. Fluke Biomedical will not be responsible for any injuries sustained due to unauthorized equipment modifications.

Restrictions and Liabilities

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Manufacturing Location

The 05-443/05-444 is manufactured for Fluke Biomedical, 6920 Seaway Blvd., Everett, WA, U.S.A.

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Introduction

Models 05-443 or 05-443-2200 and 05-444 Primalert® Digital Wall-Mount Area Monitors (the Product) are designed for visibility and ease of use. Featuring a wall-mount chassis, the Product utilizes a four-digit LED display that is readable from 9.1 m (30 feet) away. Backlit indicators warn of low-radiation alarm (yellow), high-radiation alarm (red), instrument failure (red), and low battery (yellow). A green status light is a positive indication of instrument operation.

Parameters are protected under a calibration cover. Calibration is easily accomplished by moving the **CAL** dipswitch to the right, and using the pushbuttons to increment or decrement the calibration constant, dead time correction, and alarm point parameters. Parameters are stored in non-volatile memory (retained even with power disconnected).

A five-decade logarithmic analog output is provided. A battery backup provides 48 hours of additional use after the primary power is removed.

Systems included in this manual are:

- Model 05-443 and 05-443-2200 with an internal LND 71210 detector

- Model 05-444 with an internal LND 71412 detector

Figure shows the Product.

Figure 1. Front Panel

huk01.eps

Safety Information

A **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

⚠⚠**Warning**

To prevent possible electrical shock, fire, or personal injury:

- **Read all safety information before you use the Product.**

- **Carefully read all instructions.**

- **Do not use the Product around explosive gas, vapor, or in damp or wet environments.**

- **Use the Product only as specified, or the protection supplied by the Product can be compromised.**

- **Use this Product indoors only.**

- **Use only the mains power cord and connector approved for the voltage and plug configuration in your country and rated for the Product.**

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- **Replace the mains power cord if the insulation is damaged or if the insulation shows signs of wear.**

- **Make sure the ground conductor in the mains power cord is connected to a protective earth ground. Disruption of the protective earth could put voltage on the chassis that could cause death.**

- **Do not put the Product where access to the mains power cord is blocked.**

- **Do not operate the Product with covers removed or the case open. Hazardous voltage exposure is possible.**

- **Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.**

- **Have an approved technician repair the Product.**

- **Use only specified replacement parts.**

- **Do not use the Product if it is damaged.**

- **Disable the Product if it is damaged.**

- **Use only specified replacement fuses.**

- **For continued protection against the risk of fire, replace only with fuse of the specified type and current rating.**

- **The operator or responsible body is cautioned that the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by Fluke Biomedical**

- **Only certified technician or calibration personnel should replace battery.**

- **Do not touch the circuit board in the calibration window due to potential for electric shock.**

- **Do not touch the center pin of the detector connector unless the unit has been turned off and power has been removed or at least 1 minute.**

- **To prevent contact with internal hazardous live parts that are accessible using a tool: turn off the Product and disconnect the power cord. Allow the Product to sit for 1 minute before accessing internal components.**

Symbols

Table 1 shows the symbols used in this manual or on the Product.

Table 1. Symbols

Symbol	Description
⚠	Risk of Danger. Important information. See Manual.
⚠	Hazardous voltage. Risk of electric shock.
∼	AC (Alternating Current)
⏚	Protective conductor terminal
CE	Conforms to European Union directives
🗑	This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.

General Specifications

Detectors .... Internal G-M detectors
Display .... 4-digit LED display with 2 cm (0.8 in.) character height
Display Range .... 000.0 to 9999
Display Units .... Can be made to display in: µR/hr, mR/hr, R/hr, µSv/h, mSv/h, Sv/h, µrem/hr, mrem/hr, rem/hr, cpm, cps, and others
Linearity .... Readings within 10 % of true value with detector connected
Operating Range:
    05-443 and 05-443-2200 .... 1 µSv/h to 10 mSv/h (0.1 mR/hr to 1 R/hr)
    05-444 .... 0.01 mSv/h to 100 mSv/h (1 mR/hr to 10 R/hr)
Response .... Typically 3 seconds from 10 % to 90 % of final reading
Status (green light) .... Indicates the instrument is functioning properly
Low Alarm .... Indicated by a yellow light and slow beep (1 per second) audible tone (can be set at any point from 0.0 to 9999)
High Alarm .... Indicated by a red light and a fast beep (4 per second) audible tone (can be set at any point from 0.0 to 9999)

Note

Audible indicators can be configured as a single beep by dipswitch if desired. Audio intensity is controlled by rotating the baffle on the audio device.

DET Fail .... Indicated by a red light and an audible tone greater than 68 dB at 2 m (6.1 ft) for conditions of detector overload, no count from detector or instrument failure
Low Bat .... Indicated by a yellow light, beginning when 2 hours of battery life remain
Connector .... Series "C" (others available)
Calibration Controls .... Accessible from the front of instrument (protective cover provided)

High Voltage .... Adjustable from 200 volts to 2500 volts

Dead Time .... Adjustable to compensate for dead time of the detector and electronics (can be read on the display)

Overload .... A display reading of -OL- and audible fail alarm indicate detector saturation. It is normally set to initiate just above the highest range of the detector.

Over-range .... A display reading of ″----″ and activated low and high alarms indicate that the radiation field being measured has exceeded the counting range of the instrument (or when dead time correction accounts for more than 75 % of the displayed reading).

Data Output .... A 9-pin connector with female sockets provides 5-decade log output, RS-232 output, signal ground connection, FAIL and HIGH ALARM signals (current sink), and direct connection to battery and ground

RS-232 Output .... A 2-second dump for computer data logging

Remote (optional) .... 05-446 Remote unit

Power .... 95 V ac to 135 V ac , (178 V ac to 240 V ac available), 50/60 Hz single phase (less than 100 mA) 6 volt sealed lead acid rechargeable backup battery (built-in)

Battery Life .... Typically 48 hours in non-alarm condition; 12 hours in alarm condition

Battery Charger .... Battery is continuously trickle charged when the instrument is connected to line power and turned on

Construction .... Aluminum housing with ivory powder-coat finish

Temperature range (Normal use) .... - 20 °C to 50 °C (-4 °F to 122 °F). May be certified for operation from -40 °C (-40 °F)

Maximum relative humidity .... Less than 95% (non-condensing)

Size (H x W x D) .... 18.7 cm x 24.6 cm x 6.4 cm (7.4 in x 9.7 in x 2.5 in)

Weight .... 2.36 kg (5.2 lb)

Indoor use only

Maximum altitude .... 5000 m (120 V nominal), 2000m (220 V nominal)

Safety .... IEC 61010-1, Overvoltage category II, Pollution degree 2.

Electromagnetic Compatibility (EMC) .... IEC 61326-1 (Basic EM environment); CISPR 11, Group 1, Class A

Group 1 equipment: group 1 has intentionally generated and/or use conductively coupled radio-frequency energy which is necessary for the internal functioning of the equipment itself.

Class A equipment is equipment suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. Caution - There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted and radiated disturbances.

USA (FCC) .... 47 CFR 15 subpart B, this product is considered an exempt device per clause 15.103

Korea (KCC) .... Class A Equipment (Industrial Broadcasting & Communication Equipment)

This product meets requirements for industrial (Class A) electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.

Driver Option Specification

Power Required.. 7.5 V dc at 100 mA; minimum V_{in}= 5.5 V and maximum V_{in}= 15 V

Terminating Resistor .... 250 Ω

Model 05-450 Recorder Output Connections (9-pin D-sub connector)

    Pin 5 is SIG, current output (was voltage output)

    Pin 6 is LGND, Isolated Loop Return or Loop Ground

Board Header Pinout

    P1-1) .... Loop GND (Isolated)

    P1-2) .... 4 mV to 20 mV current output (Isolated)

    P2-1) .... +7.5 V dc , RAWDC from main circuit board (LMI PN: 5396-160)
                           (May range from +5.5 V dc to 15 V dc)

    P2-2) .... GND

    P2-3) .... RCDR voltage in or analog input (0 V dc -1.25 V dc)

Getting Started

⚠⚠Warning

To prevent possible electrical shock, fire, or personal injury do not put the Product where access to the mains power cord is blocked.

The Product is designed for ease of use. This section of the manual is designed to help the first-time user get started. Initial power-up and basic features of the instrument will be discussed in this section. Other sections of the manual provide more detailed information.

Power Up

Plug the power cord into a suitable wall (Mains) outlet.

Note

The instrument will normally be wired internally for 120 V ac. If requested, the Product may be wired for 220 V ac. Check the label next to the ac input receptacle to verify the required input voltage.

If the RS-232 feature is used, plug in a suitably wired 9-pin connector cable. See the section *9-Pin Data Connector*, for pin assignment. Turn power ON with the left side panel switch. Do not turn power OFF unless the unit is to be removed from service.

Figure shows the left side-panel.

Use only with a 250V fuse

INPUT:120 VAC 50/60 HZ 250W
LINE FUSE: 2 EACH LITTEL FUSE F1A, L250V
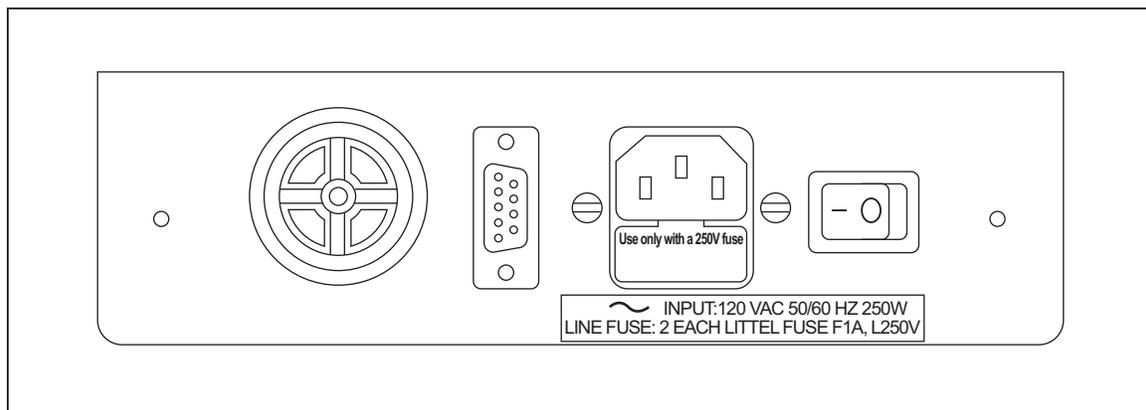
Figure 2. Left Side-Panel

Read and then remove the sticker (see Figure) from the instrument calibration cover. Checking and setting of the alarm point(s) is discussed in detail below and in the sections *Setting Alarm-Points* and *Calibration Controls* in this manual.

Please set the alarm point(s) on this insturment to conform to your requirements. The factory-set alarm points may be incorrect for your use.

Refer to the instrument manual for more information on setting alarm points.

FAILURE TO RESET THE ALARM POINT(S) MAY RESULT IN EXCESSIVE ALARMS OR LACK OF SENSITIVITY.
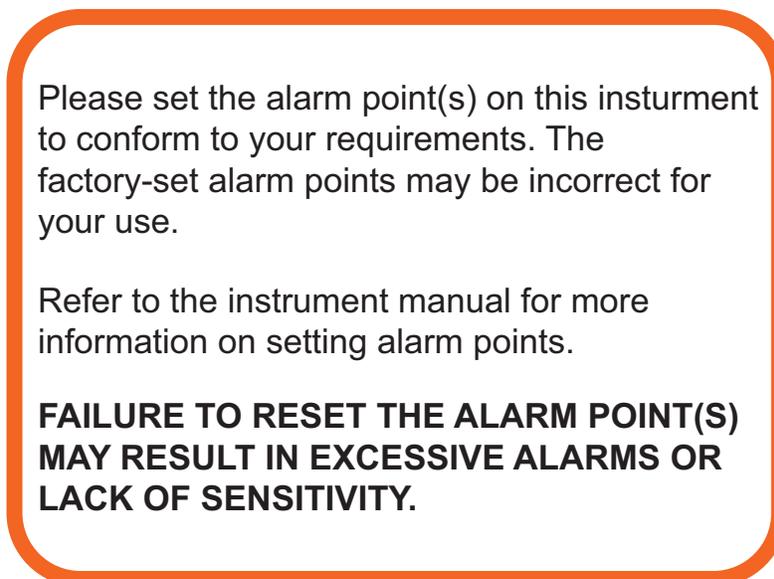
huk02.eps

Figure 3. Alarm Point Notice

Initial power-up (by way of the power switch on the left side panel) will momentarily activate the internal front-panel lights, sound the audio, and display "8888" on the 4-digit LED display. The firmware version number (39665Nyy) is then displayed as "396" and "65yy" (where yy represents the current version number).

When the instrument has finished measuring background, it will display the current radiation reading and begin checking for an alarm condition.

Radiation Units

The Product may be calibrated for almost any desired radiation units of measure. Common units of measure include mR/hr, µR/hr, R/hr, mSv/h, µSv/h, cps, cpm, and kcpm. In each case, the unit of measure is indicated underneath the four-digit display. Throughout the rest of this manual, the notation <units> will be used as a substitute.

Checking Parameters

Check the low alarm point setting by pressing the **LOW ALARM** button. The low alarm point will be displayed as long as the button is pressed. The low alarm point is in units of <units>. The low alarm point can be set from 0.1 <units> to 9999 <units>.

Check the high alarm point setting by pressing the **HIGH ALARM** button. The high alarm point will be displayed as long as the button is pressed. The highalarm point is in units of <units>. The high alarm point can be set from 0.1 <units> to 9999 <units>.

Check the calibration constant by pressing the **CAL CONST** button. The calibration constant will be displayed as long as the button is pressed. The calibration constant is in units of cpm (counts per minute) per <units>*. The calibration constant can be set from 0.1 cpm/<units> to 9999 cpm/<units>.

Check the detector dead time correction by pressing down on the **DEAD TIME** button. The dead time correction will be displayed as long as the button is pressed. The dead time correction is in units of microseconds*. The dead time correction can be set from 0.1 microseconds to 9999 microseconds.

Setting Alarm-Points

The LOW ALARM and HIGH ALARM points can only be changed while the instrument is in calibration mode. Switch the top dipswitch **CAL MODE** (behind the calibration cover) to the right to place the instrument into calibration mode.

Changing alarm points is done by holding down the corresponding parameter key and pressing the up or down arrow buttons. Alarm points can be set in the range of 0.1 to 9999. When an alarm point is changed, the instrument will sound an audible beep to confirm the saving of the parameter, and will then return to displaying the current radiation level.

Note

*Once the alarm point(s) is set, it is important to remember to switch the **CAL MODE** switch back to the left. This action protects the parameters from inadvertent changes.*

Operational Check (Optional)

The operational check is an important assurance that the radiation detector and electronics are working correctly.

Note

The manufacturer of this instrument suggests that an operational check be performed on a regular basis. Local procedures may supersede this suggestion.

For an operational check, use a radiation check source (not included, but available). When not being used, store the check source in a secure area.

Note

Most check sources present very minimal risks and are therefore unlicensed (Exempt Quantity Sources reference: 10 CFR 30.71 Schedule B). The radioactive element is sealed (permanently bonded or fixed inside a capsule) so you need not wash your hands after handling. Radiation exposure while handling this source is very minimal with no identified long or short term risks. Although the amount of radiation given off by exempt sources is so low that it presents no significant hazard, they should be handled with care and respect. Time, distance, and shielding are the best ways to control exposure.

1. Taking the source in hand, place it so that it is located on or near the center (same location each time) of the detector. (For internal detector models, a metal plate on the bottom of the chassis identifies the location of the internal detector.) Hold it there for approximately 5 seconds or until the reading stabilizes. Take note of the displayed level of radiation.

2. Verify that the reading is within 20 % of the last reading obtained. Remove the source from the detector.

3. If an alarm is activated, ensure that all visual and audible devices (if applicable) work correctly.

Operator Controls and Setup

Calibration Controls

Remove the calibration cover to expose the calibration controls.

⚠⚠Warning

To prevent possible electrical shock, fire, or personal injury:

- **To prevent contact with internal hazardous live parts that are accessible using a tool: turn off the Product and disconnect the power cord. Allow the Product to sit for 1 minute before accessing internal components.**

- **Do not touch the circuit board in the calibration window due to potential for electric shock.**

The calibration controls include the up/down buttons, five calibration potentiometers, and the option dipswitch (detailed in the following subsection). The five potentiometers are detailed below:

- **ANALOG**: Used to adjust the logarithmic analog voltage output. Adjusted in calibration mode to the full-scale voltage reading or adjusted to a known point at some given reading.

- **HV**: Used to set the high voltage required for detector operation. Adjustable from 0 V dc to 2500 V dc. The high voltage required will depend on the type of detector used. Internal GM detectors typically require 550 V dc. Be sure to check the high voltage with a high impedance (1000-Mohm impedance) voltmeter only. A high-voltage checkpoint is located next to the HV potentiometer.

- **DISC**: Internal discriminator used to set negative pulse threshold for counting pulses from the detector. Pad allows direct measurement of threshold voltage. Utilize a Ludlum Model 500 Pulser or equivalent to inject pulses of the desired threshold size. The pulse height threshold is adjustable from 2.0 mV dc to 100 mV dc.

- **BAT CHARGE**: Used to set the backup battery trickle charging voltage. It is set to 6.9 V dc while the battery is disconnected.

- **OVERLOAD**: Used to set the detector current overload point. When excessive radiation causes the detector to overload, this set point will cause the **FAIL** light to engage, and the display will be forced to **-OL-.**

Dipswitch (under calibration cover)

When the calibration cover is removed, a four-pole dipswitch is accessible that can activate or deactivate options. These four options are: **CAL MODE**, **LATCH ALARM**, **RANGE**, and **SINGLE BEEP**.

- **Dipswitch 1**: Switching the top **CAL MODE** switch to the right places the instrument into calibration mode. Parameters can only be changed while the instrument is in calibration mode. Calibration mode also changes the analog output to full-scale so that the full-scale voltage may be set by the **ANALOG** potentiometer. Calibration mode also slows the response time of the display and increases the accuracy. If the display seems too erratic, leaving this switch in the calibration mode during operation will help. Moving the **CAL MODE** switch back to the left locks the parameters and disables any further changes.

- **Dipswitch 2:** The second switch, **LATCH ALARM**, changes the high alarm to a latching alarm. This switch does not affect the low alarm, which is always non-latching. When switched to the left, the high alarm is non-latching; the alarm automatically turns off when the radiation level drops below the alarm point. When switched to the right, the high alarm light and audio signals are latched until either the **LOW ALARM** or **HIGH ALARM** button is pressed.

- **Dipswitch 3:** The third switch, **RANGE**, selects the range of the instrument. To select the 0.1 <units> -999.9 <units> range, switch the **RANGE** switch to the left. To select the 1 <units> -9999 <units> range, switch the **RANGE** switch to the right.

- **Dipswitch 4:** Switching the fourth switch to the right places the instrument into **SINGLE-BEEP** mode. This option limits the audio output to a single half-second beep on LOW ALARM and HIGH ALARM. DET FAIL audio output (steady tone) is not limited.

RS-232 Output

With the **CAL MODE** dipswitch in the left position, the Product dumps RS-232 data onto pin 4 of the 9-pin connector every 2 seconds.

An example program which shows how an IBM compatible PC can be used to collect the data follows:

```
Demonstration Program
'Model 05-443 and 05-444 RS232 communication program written for QuickBasic
'This program causes the computer screen to display the data being dumped
from the Model 05-443 and 05-444.
'Needs the following cable:
'              Model 05-443/444      PC (9-pin)      PC (25-pin)
'              pin 4 TXD             pin 2           pin 3
'              pin 2 GND             pin 5           pin 7
'Cable connector has male pins on Model 05-443 and 05-444 side
'Cable connector has female pins on PC side
                'open up communications with serial port #1
                'at 2400 bps (baud), no parity, 8 data bits, 1 stop bit
                'no handshaking, buffer size of 8k
OPEN "COM1: 2400,n,8,1,bin,CS0,DS0,CD0,RB0" FOR INPUT AS #1
                'open up filename• for output
CLS             'clear the screen
LOCATE 1
PRINT           'Press Esc key to stop reading data.
COM(1) ON       'enable coml trapping
ON COM(1) GOSUB Getcomport    'if something comes in coml, then get it
WHILE (1)       'loop until Esc key is hit

comment•= INKEY•

IF comment• = CHR• (27) THEN GOTO endloop
WEND
endloop:
COM (1) OFF
CLOSE#1         'CLOSE COM port.
END
Getcomport:
WHILE LOC(1) <>0
   ComportInput•=INPUT•(1,#1)    'bring in data from serial port
PRINT ComPortInput•;            'pint data to screen
WEND
RETURN
```

The RS-232 data includes the current radiation readings and the current condition of the status lights. The data is presented in the following format:

```
BYTE1         0                    x
BYTE2         x                    x
BYTE3         x       OR           x
BYTE4         x                    x
BYTE5         .                    .
BYTE6         x                    0
BYTE7         Audio Status         =1=on
BYTE8         High Alarm Status    =1=on
BYTE9         Low Alarm Status     =1=on
BYTE10        Over Range Status    =1=on
BYTE11        Monitor Status       =1=on
BYTE12        Error Code
BYTE13        Carriage Return (ODH)
BYTE14        Line Feed (0AH)
```

9-Pin Data Connector (Female Sockets)

The 9-pin connector provides output signals from the instrument and input voltage to the instrument. The pin assignments are:

pin1-   +BATTERY

pin2-   GND IN

pin3-   FAIL_L

pin4-   RS232 DUMP

pin5-   ANALOG OUT

pin6-   NA

pin7-   HIGH ALARM_L

pin8-   EXT RESET_L

pin9-   +5VDC OUT

The FAIL and HIGH ALARM digital signal outputs are open drain 2N7002 outputs, able to sink about 50 mA each.

Internal Detector Setups

Model 05-443 and Model 05-443-2200

Typical response and set points for the Product with internal energy-compensated LND 71210 G-M detector is as follows:

- Operating Voltage: 550 V dc

- Threshold: 100 mV dc

- Calibration Constant: 1000 cpm/mR/hr

- Dead Time Correction: 30 µsec to 150 µsec

- Linear Range with DTC: 0.1 mR/hr to 1 R/hr

Typical Checkpoints:

1 mR/hr

4 mR/hr

8 mR/hr   - calibration constant set point

40 mR/hr

80 mR/hr

400 mR/hr

800 mR/hr   - dead time correction set point

1000 mR/hr

Model 05-444

Typical response and set points for the Product with internal energy-compensated LND 71412 G-M detector is as follows:

- Operating Voltage: 550 V dc
- Threshold: 100 mV dc
- Calibration Constant: 150 cpm/mR/hr
- Dead Time Correction: 30 μsec to 150 μsec
- Linear Range with DTC: 1 mR/hr to 8 R/hr

Typical Checkpoints:

    4 mR/hr

    8 mR/hr

    40 mR/hr   - calibration constant set point

    80 mR/hr

    400 mR/hr

    800 mR/hr

    4,000 mR/hr   - dead time correction set point

    8,000 mR/hr

Common Options and Modifications

Time and Date Stamp Option

Description

When an alarm or failure occurs, the Product will print the current reading, date, time, and either ALARM or FAIL to the RS-232 port. The instrument will print once every 30 seconds as long as the alarm or fail condition is present.

Setup

You will need the following: the Product, a 1220 40-column printer, and a cable (LMI PN: 8303-674)

The printer should be configured at 2400 bps (baud), no parity, 8 data bits, 1 stop bit, and no handshaking. See printer manual for proper setup instructions.

Date and Time

Check the month and day (MMDD) by pressing the **LOW ALARM** and **HIGH ALARM** buttons simultaneously. The month and day will be displayed as long as those buttons are pressed. The month and day can be set from 0101 to 1231.

Check the year (YYYY) by pressing the **LOW ALARM** and **CAL CONST** buttons simultaneously. The year will be displayed as long as those buttons are pressed. The year can be adjusted from 0000 to 9999.

Check the hours and minutes (HHMM) by pressing the **LOW ALARM** and **DEAD TIME** buttons simultaneously. The hours and minutes will be displayed as long as those buttons are pressed. The hours and minutes can be adjusted from 0000 to 2359.

RS232 Data Format

The data will be sent to the RS-232 port as:

```
Byte 1       0     x        Byte 18      Space (20H)
Byte 2       x     x        Byte 19      H
Byte 3       x  OR  x       Byte 20      H
Byte 4       x     x        Byte 21      :
Byte 5       .     .        Byte 22      M
Byte 6       x     0        Byte 23      M
Byte 7       Space (20H)    Byte 24      :
Byte 8       Space (20H)    Byte 25      S
Byte 9       Space (20H)    Byte 26      S
Byte 10      M             Byte 27      Space (20H)
Byte 11      M             Byte 28      A      Space
Byte 12      /             Byte 29      L      F
Byte 13      D             Byte 30      A  OR  A
Byte 14      D             Byte 31      R      I
Byte 15      /             Byte 32      M      L
Byte 16      Y             Byte 33      Carriage Return (0DH)
Byte 17      Y             Byte 34      Line Feed (0AH)
```

Example output:

```
0642.1   04/21/95 16:56:24 ALARM
0000.0   04/21/95 08:32:16 FAIL
```

Modifications to the Product for Optimum Performance

The Product main board (LMI PN: 5396-160) has these modifications:

- U531 changes from an LM358 to an OPA2343UA; LMI PN: 06-6582

- C531 changes from 10 μF tantalum to 0.047 μF "poly film" (Polypropylene sulfide), LMI PN: 04-5729

- R432 changes from 100 k to 1 mg, LMI PN: 12-7844

Calibration

High Voltage

The high voltage is adjustable from 0 V dc to 2500 V dc using the **HV** potentiometer located under the calibration cover. The high voltage required will depend on the type of detector used. Internal G-M detectors usually require 550 V dc. Ensure that the high voltage is checked only with a high impedance (≥1000 megohm) voltmeter. A high-voltage checkpoint is located next to the **HV** potentiometer.

⚠⚠Warning

To prevent possible electrical shock, fire, or personal injury, do not touch the circuit board in the calibration window.

Calibration Parameters

The calibration parameters, LOW ALARM, HIGH ALARM, CAL CONST, and DEAD TIME can only be changed while in calibration mode. Switch the top dipswitch **CAL MODE** to the right to switch into calibration mode. Changing any parameter is done by holding down the parameter key and pressing the up or down arrow buttons. Any parameter can be set in the range of 0.1 to 9999. If a parameter is changed, the instrument will beep to confirm the saving of the parameter, and then return to displaying the current radiation level.

The calibration constant (CAL CONST) is set when the detector is exposed to a "low" radiation field. A "low" radiation field in this case is defined as a field where dead time losses do not exceed 5 %. The calibration constant is usually given for a certain detector. Once the calibration constant is set and checked at a low radiation field, the dead time correction can be set.

The dead time correction (DEAD TIME) is set when the detector is exposed to a "high" radiation field. A "high" radiation field in this case is defined as a field where dead time losses exceed 30 %. The dead time correction will elevate the ratemeter reading to account for counts arriving at the detector during the detector's dead time. G-M tubes typically have long dead times from 50 microseconds to150 microseconds.

Note

Once parameters are set, it is important to remember to switch the ***CAL MODE*** *switch back to the left. This action protects the parameters from inadvertent changes.*

Analog Output

The analog output is a five-decade logarithmic voltage-out. The maximum voltage-out while under primary power is 6 volts. The maximum voltage out while under battery backup power is 4.5 volts. The five decades are:

- 0.1 <units> to 1.0 <units>*
- 1 <units> to 10 <units>*
- 10 <units> to 100 <units>*
- 100 <units> to 1000 <units>*
- 1000 <units> to 10000 <units>*

When the **CAL MODE** dip switch is switched to the right, the analog output goes to full scale. The analog output goes to full scale during a DET FAIL condition.

Discriminator

The **DISC** potentiometer located under the calibration cover is used to set the threshold for pulses coming from the detector. The desired pulse threshold depends on the type of detector used. It is adjustable from 2.0 mV dc to 100 mV dc.

Battery Charge

The potentiometer labeled **BAT**, located under the calibration cover, is used to set the backup battery trickle-charge voltage. This is typically set to 6.9 V dc with the battery disconnected.

Maintenance

⚠⚠Warning

To prevent possible electrical shock, fire, or personal injury:

- **Do not operate the Product with covers removed or the case open. Hazardous voltage exposure is possible.**

- **Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.**

- **Have an approved technician repair the Product.**

- **Use only specified replacement parts.**

- **Do not touch the center pin of the detector connector unless the unit has been turned off and power has been removed for at least 1 minute.**

- **Only certified technician or calibration personnel should replace battery.**

Cleaning Instructions and Precautions

The Product may be cleaned externally with a damp cloth using only water as the wetting agent. Do not immerse the instrument in any liquid. Observe the following precautions when cleaning:

1. Turn the instrument OFF and disconnect the instrument power cord.

2. Allow the instrument to sit for 1 minute before cleaning.

Replacement of Mains Fuse

Fuses should be changed by a maintenance technician approved by the manufacturer only.

⚠⚠Warning

For continued protection against the risk of fire, replace only with fuse of the specified type and current rating.

Recycling

The manufacturer of this instrument supports the recycling of the electronics products it produces for the purpose of protecting the environment and to comply with all regional, national, and international agencies that promote economically and environmentally sustainable recycling systems. To this end, the manufacturer strives to supply the consumer of its goods with information regarding reuse and recycling of the many different types of materials used in its products. With many different agencies, public and private, involved in this pursuit it becomes evident that a myriad of methods can be used in the process of recycling. Therefore, the manufacturer does not suggest one particular method over another, but simply desires to inform its consumers of the range of recyclable materials present in its products, so that the user will have flexibility in following all local and federal laws.

The following types of recyclable materials are present in manufacturer's electronics products, and should be recycled separately. The list is not all-inclusive, nor does it suggest that all materials are present in each piece of equipment:

- Batteries   Glass   Aluminum and Stainless Steel
- Circuit Boards   Plastics   Liquid Crystal Display (LCD)

Products, which have been placed on the market after August 13, 2005, have been labeled with a symbol recognized internationally as the "crossed-out wheelie bin." This notifies the consumer that the product is not to be mixed with unsorted municipal waste when discarding; each material must be separated. The symbol will be placed near the AC receptacle, except for portable equipment where it will be placed on the battery lid.

The symbol appears as such:

Installation Template

A template for installing the Product is shown on the next page.

Drawing to actual size may be used as template.

Use #6 screws

0 in.

1.648 in.

3 in.

6.000 in.

Anchors must be able to hold
12 pounds per screw, and must be appropriate
for wall construction.

0 in.
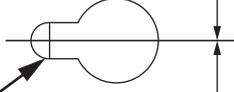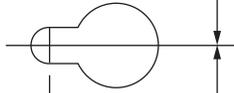
1.648 in.

2.679 in.

3 in. Minimum clearance