FLUKE®
Biomedical

Off-Line Sampler Model 940-513, 11cc Volume

Installation and Operation Manual

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Fluke Biomedical
Radiation Management Services

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Section 1
General Information

1.1 Product Description

This manual outlines the procedures required for installation, operation and maintenance of the Model 940-515 Off-Line Sampler. The Model 940-513 is an off-line, single channel sampler suitable for monitoring accident range radioactive gases. The sampler is only used with the Model 943-27-31 Current Mode Beta Scintillation Detector and radioactive check source part number 841A-123-50. The Model 943-27-31 detector and 841A-123-50 check source are described in separate manuals. Refer to Figure 1-1 for a general view of the sampler and Appendix A for assembly and dimensional drawings.

The sampler consists of a weldment, a detector end cap and a Gas chamber end cap. The sampler weldment provides three (3) inches of 4 pi lead shielding around a sensitive volume and provides inlet/outlet connections to the ample volume. Tube stubs with a ¼ inch OD are provided for connecting the sample volume to other sampling system components (e.g. a vacuum pump, inlet filters, isolation valves, etc.).

The detector end cap provides a means to remove and install the detector and to shield the rear of the detector from ambient background radiation.

The Gas chamber cap provides access to the sample volume for cleaning and shields the sample volume from ambient background radiation. The Gas chamber cap also houses the solenoid assembly used to position a radioactive check source in view of the beta sensitive scintillation detector. The radioactive check source available is a 100 microCurie Strontium 90 source capsule.

The Gas chamber plug is attached to the Gas chamber cap. The Gas chamber plug provides a pressure tight seal (10 psig) for the sample volume and provided access to the sample volume for cleaning or decontamination.

1.2 Specifications:

The following technical specifications apply to the Model 940-513 Sampler:

Dimensions (H x W x L):	11.5 x 11.5 x 21 inches (29.2 x 29.2 x 53.3 cm)
Weight:	Approximately 500 lbs (227 kg)
Shielding:	4 pi, 3 in Lead
Inlet Diameter:	¼ inch O.D. Stn Stl tubing
Outlet Diameter:	¼ inch O.D. Stn Stl tubing
Effective Chamber Volume:	Approximately 11cc
Pressure Limit:	10 psig
High Voltage Cable:	Detector High Voltage cable exits the detector cap assembly for termination at the detector preamplifier
Signal Voltage Cable:	Detector Signal Voltage cable exits the detector cap assembly for termination at the detector preamplifier
Check Source:	A 100 microCurie, Sr-90 source and rotary solenoid are located in the Gas chamber cap. Entry for the solenoid control wiring is provided via a ½ in NPT threaded port in the gas chamber cap.

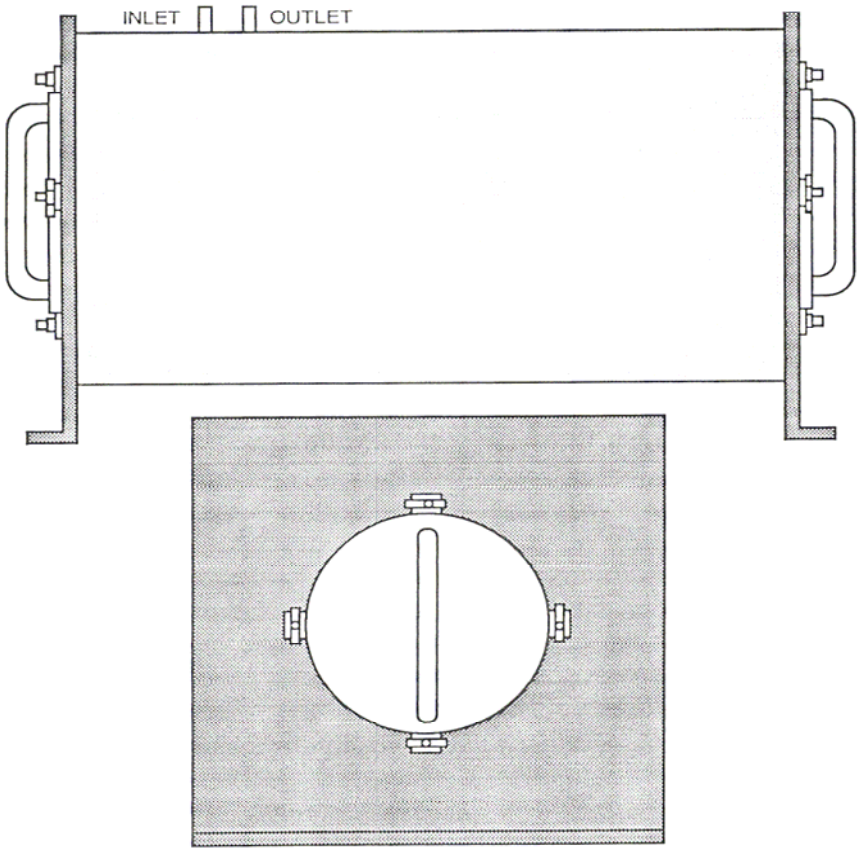
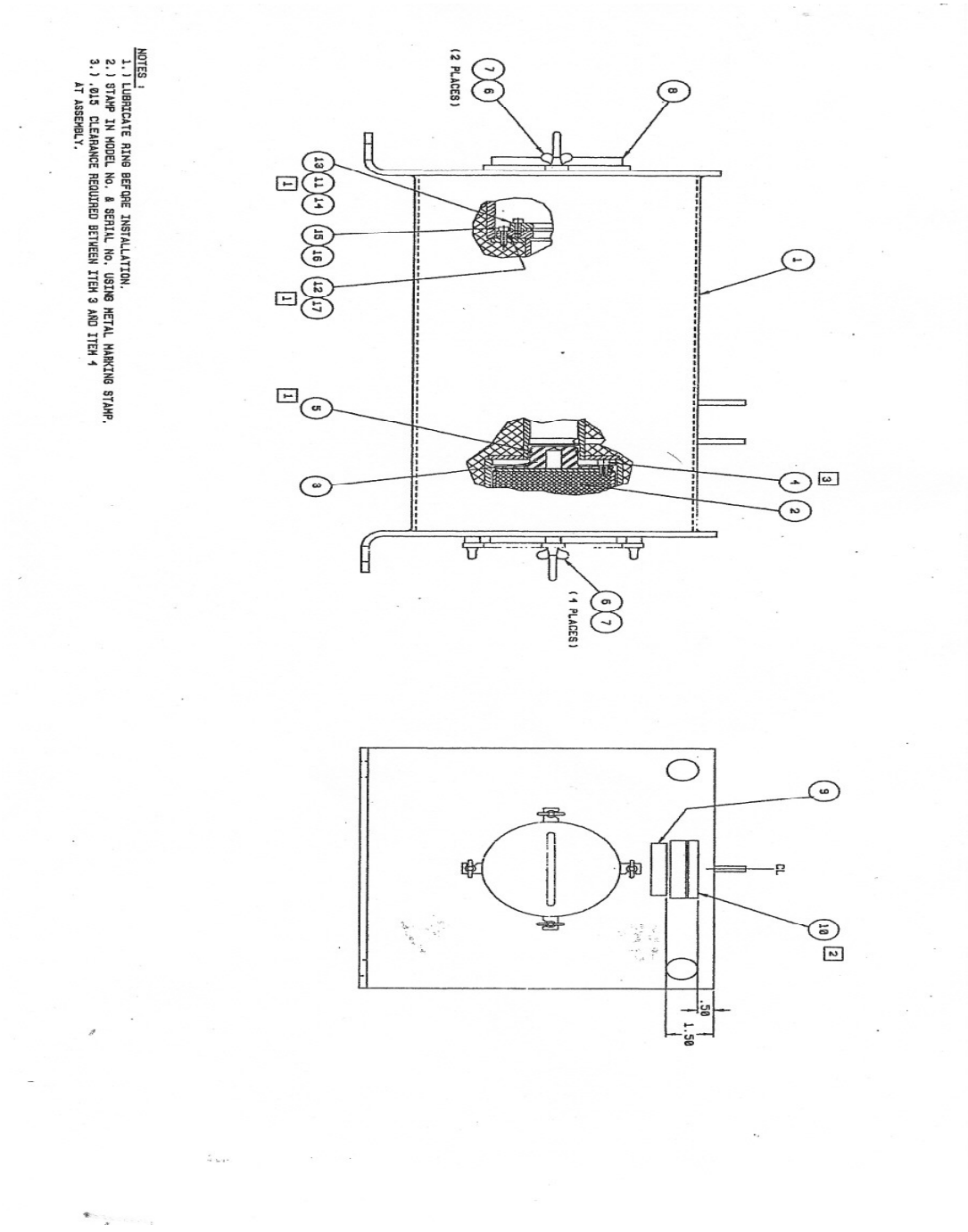


Figure 1-1. Model 940-513 General View (not to scale)


NOTES :
1.) LUBRICATE RING BEFORE INSTALLATION.
2.) STAMP IN MODEL No. & SERIAL No. USING METAL MARKING STAMP.
3.) .015 CLEARANCE REQUIRED BETWEEN ITEM 3 AND ITEM 4 AT ASSEMBLY.
(2 PLACES)
(1 PLACES)
.50
1.50

1.3 Features and Benefits

The Model 940-513 Series Sampler, provides the following features:

- Measurement of accident range noble gasses
- Integral Sr-90 Check Source
- Quad-lobed O-ring sealed detector
- O-ring sealed sample chamber

The design of the Model 1060AM-NM3-XX Controller provides the following User benefits:

- 4 pi shielded sample volume
- 3 inches of lead shielding
- Removable end caps for cleaning
- Rotary Check Source mechanism to minimize background contribution

1.4 Safety Precautions and Terms

The Model 940-513 sampler includes a rotary solenoid inside of the Gas Chamber cap, and voltages up to 125 VDC may be present when the solenoid is actuated. Turn OFF the AC power on the associated Local Control unit prior to removing the Gas Chamber Cap.

CAUTION

Model 940-513 sampler also includes a 100 microCurie Sr-90 radioactive source located within the Gas Chamber Cap. The local plant Health Physist should be consulted prior to removing the Gas Chamber cap.

CAUTION

The Model 940-513 is an accident noble gas monitor, and radioactive gasses may be present within the sample volume. The local plant Health Physist should be consulted prior to removing the Gas Chamber cap or Detector End cap to access the sample volume.

1.5 Product Handling and Storage

1.5.1 Receiving Inspection:

Upon receipt of the unit:

Inspect the carton(s) and contents for damage. If damage is evident, file a claim with the carrier and notify the FLUKE Biomedical Radiation Management Services Customer Service Department.

FLUKE Biomedical
Radiation Management Services
6045 Cochran Rd.
Cleveland, Ohio 44139
Phone: 440.248.9300, Fax: 440.542.3682

Remove the contents from the packing material.

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 the FLUKE Biomedical, Radiation Management Services Customer Service Department.

1.5.2 Storage:

Instruments storage 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.

Instruments storage must comply with the following:

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

Requirements for proper storage must be documented and written procedures or instructions must be established.

In the event of fire, post-fire evaluation must be in accordance with ANSI N45.2.2 (1972), Section 6.4.3.

Removal of items from storage must be in accordance with ANSI N45.2.2 (1972), Sections 6.5 and 6.6.

1.6 Accessories

Optional accessories available for the Model 940-513 include the following:

Detector: Model 943-27-31 Current Mode Beta Scintillation Detector

Recommended Spare Parts are identified in Section 5.4. Replacement parts are identified in the Product Bill of Materials provided in Appendix B.

1.7 Customer Service/Technical Assistance

For Technical Assistance with this product, contact FLUKE Biomedical Radiation Management Services Customer Service Department. At the following address:

FLUKE Biomedical
Radiation Management Services
6045 Cochran Rd.
Cleveland, Ohio 44139
Phone: 440.248.9300
Fax: 440.542.3682

1.8 Manual Addenda

Manual Addenda sheets are provided separately with the equipment at the time of shipment.

Section 2
Theory of Operation

2.1 Functional Description

The Model 940-513 is an off-line, single channel sampler suitable for monitoring accident range radioactive gases. The sampler is only used with the Model 943-27-31 Current Mode Beta Scintillation Detector and radioactive check source part number 841A-123-50. The Model 943-27-31 detector and 841A-123-50 check source are described in separate manuals. Refer to Figure 1-1 for a general view of the sampler and Appendix A for assembly and dimensional drawings.

Once the detector is inserted into the sampler and calibrated, operation is automatic. Refer to the Instruction Manual for the Model 943-27-31 Detector for calibration information.

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Section 3
Installation and Set-up

3.1 Installation

The following materials are needed to remove or install the Model 943-27-31 detector into the Model 940-513 Sampler:

1, 943-27-31 detector to be installed

Detector mounting hardware:

1, P/N 943-27-47, Detector Mounting Flange

1, P/N 46-103, Quad lobed seal (Detector mounting flange to Adapter flange)

O-Ring Lubricant, Dow Corning #55, or equivalent

6, P/N 5-1026, 10-32x0.5 Socket head cap screws, Stn Stl

1, P/N 943-27-48, Adaptor Flange

1. P/N 46-104, Quad lobed seal (Adapter flange to sampler body)

6, P/N 5-994, 10-24x0.75 Socket head cap screws, Stn Stl

6, P/N 5-795, #10 split washes, Stn Stl

1, 5/32 Hex head bit or T-handle tool

1, Dial Caliper with depth gage, 6 inch

1, Marking pen or pencil

3.1.1 Mounting

WARNING

Due to the potential for high activity radioactive gasses in or around the vicinity of the detector, protective Clothing should be worn while installing or removing the detector,

Proper installation of the Model 943-27-31 Detector requires inserting the detector into the sample volume until it stops against the Gas Chamber plug, inside the sampler. Once the detector has been fully inserted, the detector is then withdrawn a distance of 0.25 inches. This will replicate the installation method used during the sampler's primary isotopic calibration, and the efficiency documented in the primary isotopic calibration report 958.350. The following procedure is recommended to obtain the required 0.25 inch detector withdrawal distance.

3.1.1.1 Turn OFF the high voltage power supply for the detector by turning the controlling Local Control Unit power OFF.

3.1.1.2 Remove the two (2) Thumb Screws and flat washers retaining the P/N 841A-123-16 Detector Plug and remove the plug. Retain the parts removed for future re-installation.

3.1.1.3 Loosen the six (6), 10-32 x 0.5 in detector flange mounting screws that provide a pressure retaining seal between the detector and the detector mounting flange.

NOTE:
The potential exists for radioactive gas to be present within the sample volume. It is recommended that this procedure be reviewed by the local plant Health Physist

3.1.1.4 Gently push the detector forward, until the detector end cap stops against the internal Gas Chamber Cap. The Gas Chamber Cap, P/N 940-513-11, is located on the opposite end of the sampler, inside of the sampler and attached to the P/N 841A-123-5 Filter Plug and Solenoid assembly, and defines the outer edge of the sample volume.

3.1.1.5 Tighten the six (6) detector flange mounting screws that were loosened in above.

3.1.1.6 Loosen and remove the six (6), 10-24 x 0.75 in socket head cap screws that retain the adapter flange to the sampler body. Carefully remove the detector and mounting flange assembly.

3.1.1.7 With the detector and mounting flanges removed, draw a line on the detector body, adjacent to the detector mounting flange, on the side of the detector mounting flange facing the connector end of the detector. This will indicate the position of the detector when fully inserted.

3.1.1.8 Loosen the six (6), 10-32 x 0.5 in detector flange mounting screws, the screws that retain the detector to the detector mounting flange.

3.1.1.9 If the detector has not been replaced for over 18 months, the detector mounting flange should be removed, and the 46-103 Quad lobed seal should be inspected for wear or damage. If the seal is worn, it should be replaced at this time. When replacing the seal, the new seal should be lubricated with O-ring lubricant, Dow Corning #55, or equivalent, and the detector mounting flange loosely re-installed

3.1.1.10 With the detector mounting flange mounting screws loosened, slide the detector mounting flange forward, toward the sensitive end of the detector, until the distance between the mark applied above and the detector mounting flange is 0.25 inches. Re-tighten the six (6) detector mounting screws to lock the detector and mounting flange assembly in position (i.e.with the detector withdrawn 0.25 inches from the Gas Chamber cap, when re-installed, providing a sensitive volume of approximately 11cc's).

3.1.1.11 Using the caliper, recheck the distance between the line marked on the detector body, the fully inserted position, and the detector mounting flange. This distance must be 0.25 inches to ensure the efficiency obtained in the primary isotopic calibration will be realized in operation.

3.1.1.12 If the detector has not been replaced for over 18 months, the 46-104 Quad lobed seal that seals the adaptor mounting flange to the sampler body should be removed and inspected for wear or damage. If the seal is worn, it should be replaced at this time. When replacing the seal, the new seal should be lubricated with pneumatic grease, Dow Corning #55, or equivalent, and the Quad lobed seal re-installed

3.1.1.13 Carefully re-insert the detector assembly into the sampler body.

3.1.1.14 Install and tighten the six (6), 10-24 x 0.75 in socket head cap screws and split lock washers that retain the detector assembly to the sampler body.

3.1.1.15 Again, using the caliper, measure the distance from the cable end of the detector to the rear face of the detector mounting flange. Record this distance on the Data Sheet provided. This dimension may be used in the future to verify the installed detector position.

3.1.1.16 Re-install the P/N 841A-123-16 Detector Cap, the two (2) Thumb screws and the two (2) flat washers. This completes the detector withdrawal adjustment and detector installation.

3.1.1.17 To complete the re-installation, the system should be pressure tested prior to returning the unit to service. The maximum system pressure is 10 psig.

3.1.1.18 This will complete the installation

3.1.2 Electrical Interface

The electrical interface with the Model 940-513 Sampler includes connecting the associated Model 943-27-31 detector High Voltage and Signal coaxial cables to their associated preamplifier junction box and interconnecting the P/N 841A-123-50 Rotary Check source assembly control wiring to its associated Local Control Unit. Refer to the system level drawings supplied with the sampler for specific interconnecting wiring requirements

3.1.3 Setup

Other than the detector installation described above, there are no Setup requirements associated with the Model 940-513 Sampler. Refer to the associated Local Control Unit for Detector and Check Source operation.

3.2 Operator Interface Functions

There are no operator interface functions associated with the Model 940-513 Sampler. Refer to the associated Local Control Unit for Detector and Check Source operation.

3.3 Accessories

Optional accessories available for the Model 940-513 include the following:

Detector: Model 943-27-31 Current Mode Beta Scintillation Detector

3.4 Preoperational Checks

Prior to operating the unit, the sampler should be subjected to a pressure test at a maximum value of 10 psig.

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Section 4
Maintenance and Calibration

4.1 Maintenance

The Model 940-513 Sampler is designed to operate for extended periods of time with no scheduled maintenance required. However, periodic inspections may be performed to verify system integrity has not degraded. This would include the integrity of the cable connectors and the tightness of the mounting hardware. Dust and dirt may be removed by wiping the surface of the sampler with a damp cloth.

NOTE

If a maintenance question arises, please contact the FLUKE Biomedical Radiation Management Services Customer Service Department at (440) 248-9300 for assistance.

4.2 Calibration

The Model 940-513 Sampler is designed for use with the Model 943-27-31 Detector. Refer to the Model 943-27-31 Instruction Manual for detector calibration instructions.

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Section 5
Troubleshooting

5.1 Troubleshooting

The Model 940-513 is designed to maintain a positive pressure of 10 psig. Troubleshooting for the Model 940-513 include locating pressure leaks, if any, and operation of the check source solenoid.

Troubleshooting procedures for the detector may be found in the Model 943-27-31 Detector Instruction Manual.

Other that a pressure leak or a detector fault, the operation of the check source solenoid is the only other component that may require troubleshooting. If the detector is operating properly, and there is no check source response, the check source hold-in module, located in the associated Local Control Unit or local Junction Box, may have failed, or the rotary solenoid may have failed. Using the applicable system level wiring diagrams, first verify the applicable supply voltage is available. If the supply voltage is available to the rotary solenoid, the solenoid may have failed, or a component within the assemble may have loosened, obstructing its movement. The Gas Chamber plug will then need to be removed to repair/replace the rotary solenoid mechanism.

CAUTION

A 100 microCurie Sr-90 Source Capsule is mounted to the rotary solenoid. Contact the local plant Health Physist prior to opening the check source assembly and handling the check source.

With the power to the associated Local Control Unit turned OFF, the Gas Chamber Cap may be removed from the sampler. The Gas Chamber plug may then be removed, exposing the check source solenoid mechanism. Being careful to not handle the Sr-90 source, movement of the rotary solenoid may be checked. If the movement operates freely, the solenoid may need to be replaced. Refer to the drawings in Attachment A for additional information.

5.2 Start-up Test

Prior to start-up, the integrity of the sampler should be verified. The operation of the detector check source should be performed to verify detector operation.

5.3 Periodic Manual Test

Periodically, the pressure integrity of the sampler should be verified. This should be performed whenever the detector is removed and re-installed. The operation of the detector check source should be performed periodically, to verify detector operation.

5.4 Recommended Spare Parts

User serviceable parts in the Model 940-513 are limited to the detector o-rings and the check source solenoid listed below:

P/N:	**Description**:
46-14	O-ring, Gas Chamber Cap
46-103	O-ring, Quad lobed Seal, Detector Mounting Flange to detector
46-104	O-ring, Quad lobed Seal, Adaptor Disc to Sampler Weldment
S96240091	Rotary Solenoid

Replacement parts FLUKE Biomedical, Radiation Management Services.

5.5 Return Authorization

In the event it becomes necessary to return the unit for repair, contact the FLUKE Biomedical Radiation Management Services Customer Service Department to obtain a Return Authorization number. The return Authorization will assist us in tracking the receipt, repair and return of the device. To assist with the repair process, the following information will be requested by our Customer Service Department:

- Model Number
- Serial Number
- Approximate Shipping Date
- Statement of the malfunction

Our Customer Service Department may be contacted at the following address:

FLUKE Biomedical
Radiation Management Services
6045 Cochran Rd.
Cleveland, Ohio 44139
Phone: 440.248.9300,
Fax: 440.542.3682

Appendix A
Applicable Drawings

A1 Applicable Drawings

Drawing No.	Description
940-513-GEL	General Arrangement/Installation Drawing
940-513-5	Main Assembly
841A-123-50	Check Source Plug Assembly

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Appendix B
Bill of Materials

B1 Bill of Materials

Part Number	Description
940-513-5	Main Assembly
841A-123-50	Check Source Plug Assembly

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Appendix C
Supplemental Data (Customer Specific)

C1 Supplemental Data (Customer Specific)

Appendix E contains all technical information pertaining to a specific 1060AM-NM3-XX part number or modification. The 940-513 is designed for use with the Model 943-27-31 Detector. Refer to the document listed below for further information on the operation of the Model 943-27-31 Detector with the 940-513 Accident Range Sampler.

Document Number	Description
943-27-31	Users Manual
	(For Reference Only, Not Provided)

NOTE

These manuals are not included in this document. To obtain a copy of this manual, please contact the Fluke Biomedical, Radiation Management Services Customer Service Department at 440.248.9300 for assistance.

Fluke Biomedical
Radiation Management Services

6045 Cochran Road
Cleveland, Ohio 44139
440.498.2564