



Trusted
radiation
protection.

940-7 Duct Monitor

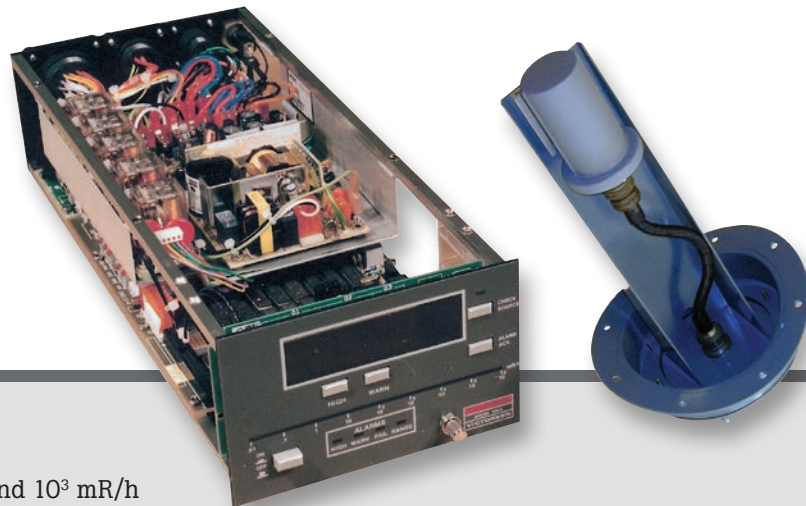
The 940-7 Duct Monitor is a single-channel Geiger-Mueller (GM) area radiation monitoring system capable of operating over the range of 10^{-2} to 10^3 mR/h. The system monitors gamma radiation over a 5-decade range and provides indication when the radiation level decreases below a fail threshold, exceeds a warn set point, exceeds a high set point or exceeds an over-range set point. The overrange feature provides two significant benefits. First, it prevents the system from displaying an on-scale, but inaccurate, reading should the detector become saturated. Second, it lessens the risk of damaging the detector by disabling it during an over-range condition. Relay outputs are available to activate alarm annunciators. Analog outputs are available for trend display on a strip-chart recorder or computer. In addition, the

monitoring system has an integral isotopic check source to verify operational integrity. The duct-monitoring system consists of an 897A series GM detector with integral preamplifier and a 956A Universal Digital Ratemeter (UDR). The detector is bolted to a mounting flange that matches the contour of the exhaust duct.

The 940-7 Duct Monitoring system can be used with any size or shaped duct. Since the detectors are mounted directly in the duct, there is no need for an expensive or high maintenance

off-line type of monitoring system. These monitors can be used in a single channel configuration or grouped together as part of a multi-channel monitoring system.

The 956A-201 UDR, when connected to an 897A series GM detector, comprises a monitoring system that operates over a five-decade range. The UDR provides control and annunciation functions for the system, and will display readings in the range of 10^{-2} to 10^5 mR/h. Standard features for the



Key features

- Range: 5 decades between 10^{-2} and 10^3 mR/h
- Energy response: 15 % from 80 keV to 1.5 MeV
- No external power needed at detector location
- Preamplifier integral with detector
- Ratemeter may be remotely located up to 1700 feet
- Single cable between ratemeter and detector
- 8 μCi ^{137}Cs check source
- Life expectancy: up to 10^5 rads
- Replaces high maintenance off-line monitoring system
- Class IE qualified
- NRC approved



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ratemeter consist of a three-digit display of the radiation value and a multicolored bargraph, which covers the entire range. The bargraph changes color in the event of an alarm condition (green for normal, amber for warning, and red for high). Front-panel alarm indicators and rear-panel relay output contacts for alarm annunciation are also included. Front-panel pushbuttons are provided to apply power, display alarm limit set points, acknowledge alarms and activate the check source. Analog outputs of 0 to 10 V dc (1) and 4 mA to 20 mA (2) are provided for recording and computer monitoring. The outputs may also drive a remote meter or a local (i.e. near the detector) indicator. All electronics required to interface with the 897A series detector are included within the 956A UDR, including a high-voltage power supply, low-voltage dc power supply and the hardware/software required for UDR operation. The system also includes an overrange indicator to preclude the possibility of an erroneous down scale reading when the radiation field is beyond the range of the detector.

The 897A series detectors use a thin walled GM tube to detect ionizing radiation. Each 897A series detector has a GM tube, a check source, and a preamplifier. The check source is a low-level radioactive source actuated by a + 15 V dc meter movement. The preamplifier provides the pulse conditioning and cable driving capability necessary to drive a 956A UDR. All 897A series detectors are functionally identical. They differ only

in housing material, tube type, and range. The 897A series detectors operate in the voltage range between 500 V dc to 650 V dc. The 897A series detector is designed to operate with the 956A UDR or with other readouts. Each detector measures a five-decade range. Three measurement ranges are available: low, medium, and high. The low range covers 10^{-2} to 10^3 mR/h, the medium covers 10^{-1} to 10^4 mR/h, and the high covers 10^0 to 10^5 mR/h. The 897A series detector may also be used with the 960 Digital Radiation Monitoring System (DRMS) equipment or the 856 Analog Readout.

Technical specifications

Main display

3 digits with backlighted radiation units display and floating decimal point. Three digits plus exponent for data entry/display Bargraph display (dynamic range) 3 segments per decade, 10^{-2} to 10^5 mR/h (24 segments), tricolor, indicating channel status

Alarm indicators

HIGH (red LED), WARN (amber LED), FAIL (red LED), and RANGE (red LED)

Pushbuttons

Set points:

- HIGH, High Alarm limit
- WARN, Warn Alarm limit

Check source: Activates radioactive check source and associated green LED indicator. Momentary non-latching pushbutton operation

Alarm acknowledgment: Causes alarm indicators to go to a steady on state after acknowledgment

Power ON/OFF: Alternate action pushbutton for ac power to unit

Relay outputs (failsafe operation)

- High alarm: One set. DPDT rated 5 A @ 120 V ac (one set 120 V ac powered for use with optional remote alarm)
- Warn alarm: Two sets. DPDT rated 5 A @ 120 V ac
- Fail alarm: Two sets. DPDT rated 5 A @ 120 V ac
- Contact rating for all relays is 5 A @ 28 V dc

Detector

Dimensions

7.12 long in x 3 in \varnothing (18.1 cm x 7.6 cm)

Weight

1 lb (0.45 kg)

Housing material

Aluminum: 897A-210

Fill gas

Neon/argon/halogen: 897A-210

Wall thickness (bare tube)

32 to 40 mg/cm²: 897A-210

Mounting

Duct mounting

Mating connectors

897A-2x0

- 92-7005-17A, 12 pin female
- 92-7005-12A, bushing
- 92-7005-9A, clamp

Field cable

50-100 or equivalent with two coaxial conductors, two twisted pairs, and overall shield

Maximum external pressure
30 psig

Environmental

- Storage temperature:
10°F to 122 °F (-23 °C to 50 °C)
- Operating temperature:
10°F to 122 °F (-23 °C to 50 °C)
- Relative humidity:
0 to 95 %, non-condensing

Operating voltage
500 V dc to 650 V dc
(supplied by UDR)

Plateau length
100 V dc to 150 V dc

Plateau slope
0.1 %/V: 897A-210

Dead time (approx.)
45 microseconds: 897A-210

Measurable radiation
10-2 to 103 mR/h: 897A-210

Detector element life
Exceeds 1000 hours at full-scale

Typical energy dependence
± 15 % from 80 keV to 1.5 MeV

Detector accuracy
± 20% of actual dose for 137Cs

Radiation detected
Gamma rays and x-rays

Preamplifier

Input impedance
> 100 k-ohms

Output impedance
50 ohms

Output pulse polarity
Positive

Output signal (50 ohm)
+ 5 V dc square wave

Low voltage
+ 15 V dc (optional + 10 V dc is
jumper selectable)

Power requirements
+ 15 V dc @ 20 mA

Maximum field cable length
1700 ft (518 m)

Electronics life expectancy
Approximately 105 rads

Discriminator level
Adjustable from 0 to + 2 V dc
(nominal value = 0.5 V dc)

Anti-jam level
Adjustable from 0 to + 3 V dc

Anti-jam oscillator frequency
Approximately 50 kHz

**Analog and digital monitor
configuration**
Divide by 2, square wave output

**Optional monitor
configuration**
Raw pulse output
(jumper selectable)

Ordering information

Model

940-7: Duct Monitor

Standard accessories

897A Series: GM Detector

956A Series: Universal Digital
Rateometer

Optional accessories

948-1: Rack Chassis



6045 Cochran Road
Cleveland, OH 44139-3303 U.S.A.

For more information, please contact us at:

Phone: 440-542-3628
Email: Sales@Victoreen.com
Web access: www.victoreen.com

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