

FLUKE®

Biomedical

Nuclear Associates 07-451

X-Ray Output Detector

Operators Manual

**Fluke Biomedical
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Section 1

General Information

1.1 Introduction

The X-Ray Output Detector offers a unique means of calibrating and trouble-shooting both diagnostic and therapeutic x-ray generators. When used with a storage or camera oscilloscope, the system displays the intensity-time relationship of an x-ray beam. The detector is simply placed in the x-ray beam, and the output cable is connected to the oscilloscope input. The resulting wave-shape patterns may be utilized to calibrate and/or diagnose malfunctions in the x-ray generator.

The detector supplies a 100-200 mV peak signal at standard diagnostic conditions (80 kVp, 100 mA). This high output permits the simple interpretation of oscilloscope displays. Since the detector has a rise time of about 1 μ /sec, no alternation of the true x-ray output pulse shape is introduced. This solid-state detector requires no power input.

1.2 Theory

The detector utilizes silicon diodes that have very high sensitive volume and very low mass encapsulation. The characteristics of diode detectors, when used with x-rays, are similar to that of a silicon diode detector when used for light. When such a detector is used as a current generator with very low input impedance to the measurement device, the output is linear with the input x-ray intensity. However, if the detector is operated into a very high impedance such as an oscilloscope, which is commonly 10 megohms, the output will be logarithmic. When operated in this voltage mode, the actual detector rise time as measured on the oscilloscope will depend on the cable capacity. As short a cable as possible should be used with as low a capacity as possible. It is suggested that RG-58u cable be used.

When the unit is used with an oscilloscope, the output is logarithmically compressed. The interpretation of this trace, nevertheless, is not altered for such difficulties as contactor problems, timer calibration, loading, arcing or rectifier malfunction, all of which are interpreted in the same way as with a linear output.

The Model 07-451 is connected so that it will produce a negative voltage output by negative current on the center conductor of the cable.

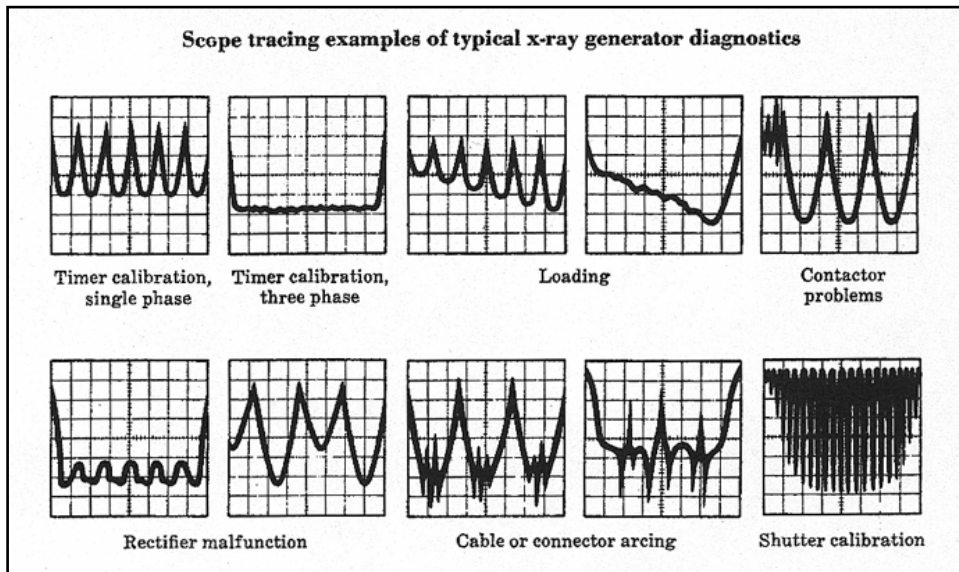


Figure 1-1

1.3 Operation

1. Using a suitable oscilloscope (memory or standard type, 10 mV/div vertical deflection, and with a sufficient sweep generator and camera adaptor), connect the detector to the input of the scope with a BNC-BNC cable.
2. Place the 07-451 Detector as close as possible to the x-ray tube target or teletherapy head, with the middle of the “product name” label toward the source of radiation.
3. Set the scope controls so that an incoming signal will trigger the sweep (vertical deflection typically 25 mV/div, sweep optional).
4. Expose the detector (for example, 80 kVp, 100 mA, 0.1 sec) and record the displayed waveform with the Polaroid camera system. If a memory scope is used, record the waveform in the storage mode.
5. The film or stored record indicates the time the source of radiation was “on” and the radiation output vs. time (single phase, 3 phase, continuous potential, etc). This allows the user to check the machine’s timer and the output quality of the radiation source by interpreting the information rendered.

NOTE

Make sure that the oscilloscope time base is calibrated. An uncalibrated time base will cause inaccurate timer measurements.

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