

Model XR-201/MSB X-Ray Timer

The Model **XR-201/MSB** Microcontroller X-ray Timer is a versatile instrument used to determine the length of exposure produced by x-ray generators. Because of its simplicity, an operator can perform an accurate and reliable timing check in less than 15 seconds. Just aim the beam at the target symbol on The Model XR-201/MSB and make an exposure. It's that easy!

This easy-to-use meter also:

- * **Counts** the number of x-ray pulses produced by half-wave and full-wave rectified x-ray machines at a rate of 60 to 120 pulses per second respectively.
- * **Times** the length of exposure in milliseconds where a pulsing source of x-ray does not exist such as found in three phase AC medical x-ray machines, capacitive discharge x-ray machines and DC-operated dental x-ray machines.
- * **Counts** the number of AC line pulses (up to 125V AC) via the input jacks located on the side of the meter.



Specifications

Accuracy: Half-Wave and Full-Wave, +/- 1 count
Three-Phase AC and DC, +/- 1%

Sensitivity: Counts at 50 KVP and 5 MA

Range: 9,999 Milliseconds

Batteries: 1 "9 Volt Lithium Battery" rechargeable

Readout: 0.25 inch LCD display

Size: 6.00 x 3.50 x 1.5 inches (15.3 x 9 x 3.7 cm)

Weight: 2 lb. (1 kilogram)

AC Input Jack: 125 Volts AC Maximum
55 Volts AC Minimum

Remote Sensor

The optional Remote Sensor allows a service technician to make repeated tests of an x-ray generator without leaving the control panel. Simply reset the pulse counter to zero and shoot again. The results will be conveniently displayed on the instrument, held in the technician's hand at the control panel, alleviating unnecessary trips between the control panel and the exposure site. The sensor comes with a twenty foot cable, but longer lengths can be ordered.



Engineered Systems & Designs, Inc.

3 South Tatnall Street
Wilmington, DE 19801 USA

302-456-0446 ph
302-456-0441 fx
esd@esdinc.com
www.esdinc.com

Model XR-201/MS-B X-Ray Pulse Counter

Specifications

Accuracy: Half Wave and Full Wave, +/- 1 count
Three-Phase AC and DC, +/- 1%, +/- 1 count
Sensitivity: Will count accurately with a minimum setting
of 50 KVP and 5 MA
Range: 9,999 milliseconds or pulses
Display: 0.25 inch LCD
Power: 1 "9 Volt Lithium Battery" rechargeable
Size: 6.25 x 3.5 x 2 inches
AC Input Jack: 125 volts AC maximum, 55 volts AC
minimum

Introduction

The XR-201/MSB is a versatile instrument used to determine the length of exposure produced by x-ray generators. It can be used in the following manner:

- To count the number of x-ray pulses produced by half-wave and full-wave rectified x-ray machines. It will count at the rate of 60 or 120 pulses per second respectively.
- To time the length of exposure in milliseconds where a pulsing source of x-ray does not exist such as is found in three-phase AC medical x-ray machines, capacitive discharge x-ray machines, and DC-operated dental x-ray machines.
- To count the number of AC line pulses (125V AC) via the input jacks located on the side of the counter. Used for pre-heat cycle timing.

The Model XR-201/MS-B pulse counter replaces the Spinning Top technique, synchronous motor device such as the Wisconsin Timing Cassette and mechanical impulse counter which are all used to determine length of exposure.

Because of its simplicity, an operator can perform an accurate and reliable timing check with the counter in less than 15 seconds.

General Instructions

Control Knob - The four positions of the control knob are: **OFF**, **PULSE**, **RESET (Bat Chk)**, and **M.SEC.**

The "**OFF**" position is self-explanatory, but do remember to turn the instrument off when not in use. Failure to do so will result in a premature depletion of battery life.

The "**PULSE**" position is used for counting pulses from half-wave or full-wave x-ray sources and AC line pulses.

The "**RESET (Bat Chk)**" position zeros the LCD display. The display should be zeroed before each exposure. While in the RESET position, the battery voltage is displayed.

The "**M.SEC.**" position is used to time length of exposure for non-pulsing x-ray sources such as three-phase AC and DC operated machines.

Positioning - The counter should be positioned as close as possible to the x-ray source. If the machine being tested has the ability to collimate its beam, it should be done with the target symbol of the counter at the center of focus.

Please Note! Some x-ray machines leak low level radiation during the pre-heat cycle. The XR201 will pick-up this radiation (which should not be present). If you find that your test results are not close to what is expected, you can neutralize the pre-heat radiation leakage by doing the following:

- a. Increase the distance from the x-ray source to the XR201 by 18 inches.
- b. Place an aluminum filter over the target symbol on the XR201.

Recharging Batteries - Use the 9 volt DC wall adapter to recharge the battery. It will take about 10 hours for a full recharge. A fully charge battery should provide 10 hours of operation. The instrument can be used while recharging. The lithium battery is considered dead when it reaches 7.2 volts.

Operation

For use on dental and medical x-ray equipment with half-wave and full-wave rectification - To operate Model XR-201/MSB, first turn the control switch to "RESET". This zeros the display and internal counters. Next, turn the control switch to "PULSE". The instrument is now ready to perform a timing function. Place the instrument in front of the x-ray source with the cone of the x-ray machine aimed at the target symbol on the panel of the counter. For best performance, the counter should be within one to two inches of the cone of the x-ray machine.

Set the time, on the x-ray machine to be tested, to the desired length of exposure. Trigger the exposure switch and compare the reading on the counter to the time set on the timer. For example, a timer on a half-wave rectified machine set at 1/10 second should produce a reading of six pulses and a timer set at one second will give sixty pulses. A full-wave rectified machine would produce twelve and one hundred twenty pulses respectively. If the reading on the counter does not agree with the time set on the timer, adjust the timer so it agrees with the counter and re-test the x-ray machine.

The XR-201/MS counter will count pulses on a machine which is set as low as 5 MA and 50 KVP. On lower settings, the distance between the instrument and the x-ray source may become critical and should be kept to a minimum.

Millisecond timing with the XR-201/MSB, for use with DC and three-phase AC operated heads - Because the x-ray beam does not pulse when a tube is excited by either DC or three-phase AC potential, the millisecond (M.SEC.) function on the XR-201/MSB counter has been provided.

The counter has a microprocessor which runs at 16 Megahertz. When the instrument senses the presence of x-rays, the microprocessor starts an internal timer and records the length of the exposure. The experienced exposure time is displayed in units of 1/1,000 of a second (milliseconds). For example, a 1/10 second exposure would produce a reading of 100 milliseconds.

First, reset the display to zero by turning the control knob to "RESET". Then turn the control knob to "M.SEC." Make an exposure and compare the reading in milliseconds to the exposure time set on the x-ray machine. Make any necessary adjustments to the timing mechanism on the x-ray machine and repeat the above steps until the exposure time agrees with the time displayed on the counter.

NOTE!!! Keep the distance between the x-ray source and the counter to a minimum. Collimate the beam, aimed at the target on the counter, to as small a size as possible.

AC Counting and XR-201/MSB - The XR-201/MSB will accept AC line pulse from 55 to 125 volts AC. A set of test leads is provided with the instrument. This set of leads plugs into the red and black jacks located on the side of the counter. With an AC voltage between 55 and 125 volts present, the instrument will count the 60 Hz. pulses in the same manner as would a mechanical pulse counter. The AC jacks are optically isolated from the XR201/MSB's dc circuit.

The AC counting feature enables service technicians to perform timing functions on preheat and delay periods, etc. Also, timing functions can be performed on x-ray machines that have moving heads via proper connection to AC voltages inside the control panel.

CAUTION - AC VOLTAGE CAN KILL!!!

When working near AC voltages, use extreme caution and safety procedures. To use the XR-201/MSB counter with AC counting, first plug the leads into the instrument. Turn the instrument control knob to "RESET" and then to "PULSE". Now hook-up the leads to the proper pins or test points in the control panel of the x-ray machine. Make your exposure and compare results as previously mentioned.

Calibration and Repair

We recommend the counter be returned for calibration every 12 months. This schedule is what is customarily followed in most fields of instrumentation. Where laws control installation and repair of equipment, it is wise to maintain your test instrument in order to avoid potential fines for noncompliance.

In the event a problem arises with your counter, return the instrument to the address below, stating as clearly as possible your problems. We will make every effort to keep your instrument for as short a period as possible, usually not more than 3-4 days.

Please include a brief explanation of why the meter is returned, your name and telephone number. A street address is needed for UPS return delivery.



Engineered Systems & Designs, Inc.
3 South Tatnall Street
Wilmington, DE 19801 USA
phone: 302-456-0446
fax: 302-456-0441
email: esd@esdinc.com
web: www.esdinc.com