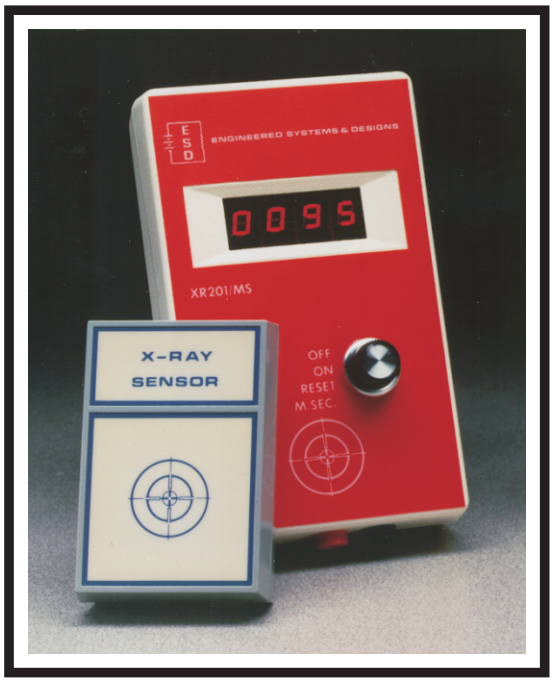
Model XR-201/MS X-Ray Timer

The Model **XR-201/MS** Solid-State 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/MS 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: 4 "AA" Nickel Cadmium rechargeable
Readout: 0.3 inch LED 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
Low Battery Indicator: The four decimal points on the LED's will display at 4.85 volts

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
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: 0.3 inch LED
Power: 6 volts maximum, 4.85 volts minimum
4 "AA" Nickel Cadmium rechargeable batteries
Low Battery Indicator: The four decimal points of the LED's will come on at 4.85 volts
Size: 6.25 x 3.5 x 2 inches
AC Input Jack: 125 volts AC maximum, 55 volts AC minimum

Introduction

The XR-201/MS 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 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, ON, RESET**, 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 **"ON"** position is used for counting pulses from half-wave or full-wave x-ray sources and AC line pulses.

The **"RESET"** position zeros the LED display. The display should be zeroed before each exposure.

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 using either **a** or **b** below::
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 - Model XR-201/MS has a low battery indicator. The decimal points of the LED display will light up when the batteries need recharging. Do not delay in recharging the batteries when indicated by the decimal points. If the batteries are allowed to get too low, the decimal points will get too dim to see.

NOTE: If the XR-201/MS unit is used with very low batteries, inaccurate counting will occur.

Recharging Procedures - To charge the batteries, remove the battery cover and locate the AC jack. Plug in the AC adapter provided. **NOTE: Switch must be in the OFF position in order to charge the batteries.** Allow the batteries to charge 14 to 16 hours.

DO NOT OPERATE UNIT WHILE
BATTERIES ARE BEING CHARGED

Operation

For use on dental and medical x-ray equipment with half-wave and full-wave rectification - To operate Model XR-201/MS, first turn the control switch to "RESET". This zeros the display and internal counters. Next, turn the control switch to "ON". 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/MS, 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/MS counter has been provided.

The counter has an internal clock which runs at 1,000 Hz., +/- .2 Hz. When the instrument senses the presence of x-rays, it closes a gate and connects the clock to the display. 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 milliseonds to the exposure time set on the x-ray machine. Make any necessary adjustments to the timing mechanism 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/MS - The XR-201/MS 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 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/MS counter with AC counting, first plug the leads into the instrument. Turn the instrument control knob to “RESET” and then to “ON”. 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. If your results are not what you expected, see **"External Adjustment to Trip Point for XR201" on page three.**

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 7 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

Engineered Systems & Designs May 23, 2001

External Adjustment to AC Trip Point for XR201

The XR201 series of pulse counters have a set of jacks which enables a technician to apply up to 125 VAC. The instrument, through the jacks, will count ac pulses. We set the trip point at 55 VAC and this has been satisfactory for timing preheat cycles. Over time, various manufacturers have changed their voltage levels during the preheat cycle. In order to allow the XR201 counters to function properly with various trip levels, we have developed a simple procedure to adjust the trip level.

1. Determine the minimum voltage level produced by the x-ray machine during the preheat cycle.
2. Look at the chart below and determine a resistor for the voltage level indicated.
3. Place that resistor in series with the positive (red) lead. Plug the Red lead in to the red jack and the black lead in to the black jack.
4. Attach the Black lead to ground and the Red lead to the correct terminal for measuring preheat. The counter will now count at the new voltage level.

OHMS	INPUT VOLTS WHICH MAKES XR201 COUNT AT OHMS	
30,000*	30.0 VAC	
120,000*	40.0 VAC	
200,000*	50.0 VAC	
290,000	60.0 VAC	
380,000	70.0 VAC	
430,000*	75.9 VAC	
470,000*	80.0 VAC	
500,000	83.5 VAC	1 Meg parallel 1 Meg = 500,000 ohms
510,000*	85.0 VAC	
550,000	90.0 VAC	

* These are standard resistor values.

Example: To set the trip voltage to 85 VAC on the XR201, place a 510K resistor in series with the red lead. Note! this data is based on a sine wave.

Engineered Systems & Designs
119A Sandy Drive
Newark, DE 19713
302-456-0446

Operating Instructions fo the Remote Sensor

The Remote Sensor will operate with the Model XR201/MS Pulse Counter once the XR201/MS has been fitted with a stereo, 3.5 mm socket. The Remote Sensor is an option and not part of the standard XR201 instrument. The Remote Sensor will count pulses or time length of exposure on three phaser AC and DC operated generators.

OPERATION

Insert the stereo plug of the Remote Sensor in to the stereo jack on the XR201/MS Pulse Counter. Place the Remote Sensor under the head of the generator to be timed. Turn-on the XR201/MS to the operating mode needed: Pulse counting (ON position) or Millisecond Timing position, and make an exposure while holding the XR201/MS in your hand at the control panel.

The Remote Sensor derives its power for operation from the XR201/MS. Thus there are no batteries to change and the Remote Sensor has been permanently sealed.