

# Instruction Manual

**MODEL 870**

**mA / mAs Meter**

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mA / mAs Meter**

**INSTRUCTION MANUAL**

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## DESCRIPTION

The ECC Model 870 mA Meter / mAs/ exposure time meter is specifically designed to measure x-ray tube current. The ECC Model 870 is a solid-state, digital instrument designed specifically for service personnel in assessing the performance of radiation generators. This instrument measures and displays mA, mAs and exposure time for each x-ray exposure. The instrument is used for dental x-ray units, radiographic and fluoroscopic x-rays. The operator switches from 2A to 200 mA amp operation simply by switching the switch from left to right.

### **mA / mAs Measurement Overview**

- Connect the leads in series with the ground side of the tube current
- Switch the switch to which range you wish to obtain.
- Take an exposure
- 870 will display and hold mA, mAs, and exposure time reading
- 870 is ready for next reading, no reset is required

When a measurement is being made, the Model 870 has the capability of automatically determining the type of x-ray that is being measured. It is not necessary for the user to program correction factors for different types of x-ray waveforms.

The Model 870 automatically resets at the beginning of each exposure, holding the reading until the next exposure. There is no need to reset the meter before each measurement.

This is a new state of the art instrument with many advanced features. For example, when taking ma / mAs readings, the mA reading is stored and displayed. It is not necessary to have exposure times long enough to display a reading. This minimizes unnecessary exposure to test personnel and minimizes heating as well as wear and tear on the x-ray tube. The Model 870 will display mA, mAs and exposure time for each x-ray exposure further minimizing the number of x-ray exposures.

The most convenient way of using the 870 for mA, mAs and exposure time measurements is to plug leads into front of unit and attach the other end, which is designed to be connected in the ground return line of the high voltage transformer and must be in the actual current path of the x-ray tube. Step back, take the exposure and then observe the reading. Refer to the section on Operation for information on how to obtain the most accurate measurements.

**It is important that the user be thoroughly familiar with the contents of this manual before performing any tests on radiation generating equipment. It is also imperative that the user be thoroughly qualified, and familiar with safety precautions and other practices relating to radiation generators.**

## **GENERAL INSTRUCTIONS**

### **SWITCH SETTINGS**

In order to keep operation easy and straightforward there is only one switch on the unit.

#### **ON / OFF / RANGE switch**

The switch is used to turn on the instrument and switch between the 2 ranges. To first power on as an mA / mAs meter, choose which range you wish to use.

#### **OPERATION mA / mAs Measurements:**

1. Before making any connections to the x-ray generator, **MAKE CERTAIN THAT THE GENERATOR'S POWER TURNED OFF.**
2. Connect the Model 870 mA leads to the x-ray generator under test (see below).
3. Plug leads into front of Model 870.
4. Set the range (200 mA or 2 Amp) by turning the switch.
5. Step back from x-ray and take exposure.
6. Observe the reading.

**CAUTION: Do Not Plug Or Unplug mA Cable While Unit is ON. Line up the pins in the cable and chassis connector before inserting.**

When taking mA or mAs measurements there is no minimum exposure time requirement. For AC x-rays we suggest that the x-ray be at least 2 AC cycles to get a representative sample. This time is 33 mS or .033 second. The instrument will work with shorter x-rays, but may have some inaccuracy because of the startup characteristics. For DC x-rays we suggest that the x-ray be long enough to minimize the initial turn on current change. An x-ray of 40 mS is long enough.

The ECC Model 870 performs a true RMS measurement of the x-ray current, and then converts that value to average current to conform to industry standards. The proprietary circuit samples the current for representative amount of time, and then extrapolates that value for the entire exposure time.

If the instrument is set for 200mA range and any portion of the current reaches 200 mA, the unit will indicate that the reading is Overscale. Turn the unit off and on and set the range for 2 Amp to get the proper reading. This can happen with AC x-rays measuring between 150 and 200 mA as well as DC and multiphase x-rays that have an overshoot.

**Exposure Time Measurements:**

The exposure time will be displayed in milliseconds (ms).

**mA Lead Connection**

The mAs meter was designed to be connected in the ground return line of the high voltage transformer and must be in the actual current path of the x-ray tube. The meter can be connected in series with the rectified tube current (DC Path), via the DC input jacks or it can be connected using the AC input jack in series with the transformer downstream of the rectifier (AC Path). However, all tube current must go through the mAs Meter to have an accurate reading. If an alternate or parallel current pathway of the x-ray generator is present, it could bypass the meter and invalidate the reading. Do not use resistors, varistors, bypass, or distributed capacitors in parallel with the meter. This will affect calibration. Before using the mAs meter, examine the circuit of the x-ray generator and be certain that the mAs meter is connected so that such components will not affect the readings. Varistors, which have limiting voltage above 10V, will probably not affect the reading.

**STATUS MESSAGES****Applies to kVp and mA Measurements**

The alphanumeric display on the Model 870 is capable of displaying messages along with the output readings that give the user additional information. Each message is described below:

Rdy 2A- Unit is ready for a reading in the 2 Amp range. Rdy 200mA- Unit is ready for a reading in 200mA Range

Over Range - Over Range. The x-ray output is too high. Switch to 2 Amp range.

Low Battery - Battery is low. The unit may still be operated for several hours, but accuracy may suffer. Replace the batteries as soon as possible.

**BATTERY REPLACEMENT**

The Model 870 is supplied with one 9V battery. Replace the battery when the "Low Battery" indication shows in the display. Any standard 9V batteries can be used in the 870. We recommend Duracell MN1604 9 Volt Alkaline Battery. To prolong battery life, turn the instrument off when not in use.

To replace the battery, open the battery compartment on the bottom of the case using a small screwdriver or thumbnail. Remove the old batteries, and install the new batteries. Observe the correct polarity of the battery as shown on the bottom of the battery compartment.

## **WARRANTY**

Electronic Control Concepts warrants the Model 870 X-ray mA / mAs / Exposure Time Meter from defects in materials and workmanship for a period of 2 years. There is no warranty on the battery. ECC will replace or repair any Model 870 during the first year after shipment that does not show obvious signs of abuse. Contact the factory as described below.

## **SERVICE INFORMATION**

If a unit should need calibration or service, please contact the factory by phone, fax or Email.

(800)VIP-XRAY or (800)847-9729 Phone  
(513)248-2402 Fax  
[sales@eccxray.com](mailto:sales@eccxray.com)

Ship the unit to:  
**Electronic Control Concepts**  
1160 US Highway 50  
Milford, OH 45150 USA

# SPECIFICATIONS FOR MODEL 870 mA / mAs METER

## RANGE

- 200 mA Full Scale
  - 0.1 mA Resolution (mA or mAs)
  - 10 Ohms Input impedance
  - Measures 5 to 200 mA
- 2A Full Scale
  - 1 mA Resolution (mA or mAs)
  - 1 Ohm Input impedance
- Meter automatically selects AC/DC
- Select range via On / Off Switch

## mA / mAs ACCURACY

- 1% +/- 2% +1 digit

## CONNECTION

- Tip Jacks
- Test leads with two alligator clips

## DISPLAY

- 0.22" (5.5mm) Liquid Crystal
- 2 line, 12 Character Alphanumeric

## CONTROLS/INDICATORS

- ON / OFF / Range Switch
- 24 Character Liquid Crystal Display
- Displays mA, mAs and Exposure time for each exposure.

## POWER

- 9 Volt battery accessible from bottom of case
- Low battery indicator

## BATTERY LIFE

- 100 hours continuous
- Typically over one year of normal use

## WARRANTY

- 2 years from ship date

## PHYSICAL SIZE

- 80 X 147 X 40 mm  
3.15 X 5.8 X 1.6 inches

## WEIGHT

- 250 g, (0.55 lb)

## RECALIBRATION

- Annually

## OPERATING CONDITIONS

- 10° to 40° C
- 50° to 104° F

## ABOUT ECC

Electronic Control Concepts is recognized throughout the world, having sold to over forty countries, as well as military installations. ECC has been in business since 1994, and has become known for quality, reliability, and value.

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