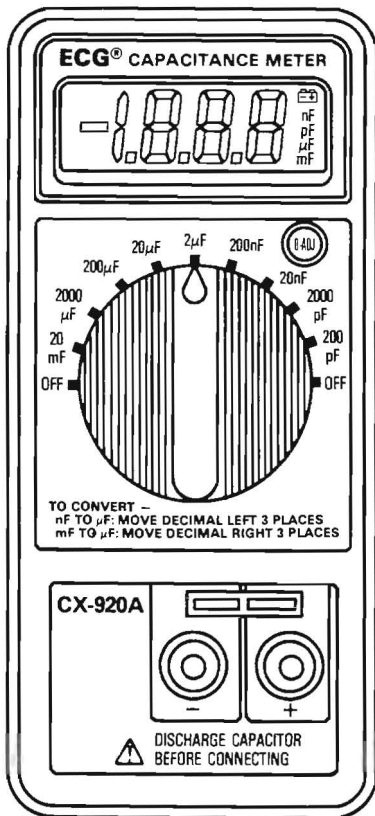


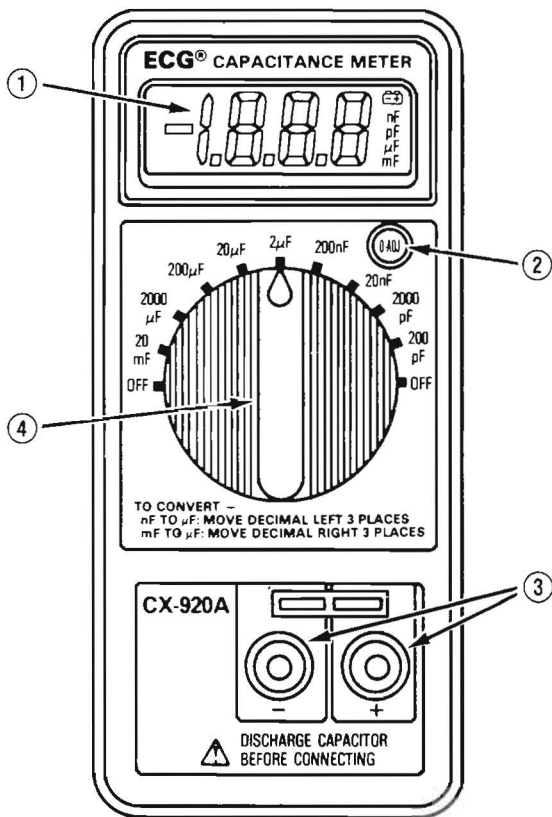
# ECG<sup>®</sup>

## Digital Capacitance Meter

### Model CX-920A



- 20,000  $\mu\text{F}$  Measurement Capability
- 0.5% Basic Accuracy
- 3½ Digit LCD, 0.55" H
- Zero Adjustment



## Operating Features

1. **Display:** 3 1/2 digit LCD (1999), 0.55" H, decimal point, range, over-range and low battery indicators.
2. **Zero Capacitance Adjust Knob:** Use to adjust to zero, approx.  $\pm 20$  pF (200 pF, 2000 pF and 20 nF ranges only).
3. **"+", "-" Input Connectors and Jacks:** Polarized for polarized capacitors.
4. **Range Select Switch:** Rotary switch for selecting ranges (9 ranges from 200 pF to 20 mF [20,000  $\mu$ F]).

The CX-920A Digital Capacitance Meter displays readings on a 3 1/2 digit LCD. The 9 ranges give precision readings from 0.1 pF to 20 mF (20,000  $\mu$ F). These ranges cover virtually all the capacitors used in electronic engineering labs, production, service shops and schools. This meter can be used to check tolerances, sort values, select precision values, measure unmarked capacitors, select matched sets plus measure cable, switch or PCB layout capacitances. Battery operation, light weight and compactness makes the CX-920A a truly portable instrument.

## Model CX-920A Specifications

### General

**Display:** 3 1/2 digit LCD, 0.55" H with polarity

**Overrange Indication:** A "1" with the 3 least significant digits blanked.

**Operating Environment:** 0°C to 50°C (below 70% relative humidity).

**Storage Environment:** -20°C to 60°C battery removed and below 80% relative humidity.

**Temperature Coefficient:** 0.1 x specified accuracy per °C, which is only applicable for the temperature range of <18°C or >28°C.

**Power:** 9V alkaline or carbon-zinc battery (NEDA 1604).

**Battery Life:** 150 hours typical with carbon-zinc cells.

**Battery Indicator:** Display indicates when battery is below operating voltage.

**Dimensions, Weight:** 151 mm long x 70 mm wide x 38 mm thick (6" x 2.8" x 1.5"), 200 g (7 oz.).

### Capacitance:

| Range                  | Resolution | Accuracy                         |
|------------------------|------------|----------------------------------|
| 200 pF                 | 0.1 pF     | $\pm 0.5\%$ of rdg + 1D + 0.5 pF |
| 2000 pF                | 1 pF       | $\pm 0.5\%$ of rdg + 1D          |
| 20 nF (.02 $\mu$ F)    | 10 pF      | $\pm 0.5\%$ of rdg + 1D          |
| 200 nF (.2 $\mu$ F)    | 100 pF     | $\pm 0.5\%$ of rdg + 1D          |
| 2 $\mu$ F              | 1 nF       | $\pm 0.5\%$ of rdg + 1D          |
| 20 $\mu$ F             | 10 nF      | $\pm 0.5\%$ of rdg + 1D          |
| 200 $\mu$ F            | 100 nF     | $\pm 0.5\%$ of rdg + 1D          |
| 2000 $\mu$ F           | 1 $\mu$ F  | $\pm 2\%$ of rdg + 1D            |
| 20 mF (20,000 $\mu$ F) | 10 $\mu$ F | $\pm 4\%$ of rdg + 1D            |

## NOTE

pF = pico Farad ( $10^{-12}$  Farads)  
nF = nano Farad ( $10^{-9}$  Farads)  
 $\mu$ F = micro Farad ( $10^{-6}$  Farads)  
mF = milli Farad ( $10^{-3}$  Farads)

Accuracy is based on an operating temperature of 23°C (73°F) at relative humidity up to 75%.

**Test Voltage:** >3.5 volts peak maximum, “+” input terminal voltage is always higher than “-” input terminal.

**Overload Protection:** The meter is protected against damage from charged capacitors (greater than 50 VDC) by a 100 mA/250 V, fast blow fuse.

**Zero Capacitance Adjustment Range:** Approx.  $\pm 20$  pF.

These specifications are subject to change at any time and no obligation is assumed as to future manufacture of the product herein described nor adherence to this data in case of such future manufacture.

## Meter Safety

1. Observe polarity when connecting polarized capacitors.
2. Fully discharge any capacitor.
3. Never apply voltage to the test connectors, serious damage may result.
4. Do not short the test leads together. This will cause a large power drain on the battery and will show an overrange on all ranges.

## Capacitance Measurement

1. Insert any test leads or fixtures and rotate range selector to a range on the capacitance scale higher than the expected capacitance to be measured.
2. If the 200 pF, 2000 pF or 20 nF range has been selected and the display does not read zero, use the zero adjust knob to bring the reading to zero. The adjustment is limited to approximately  $\pm 20$  pF.
3. Connect the alligator clips to the capacitor leads or insert capacitor leads into the capacitor test sockets.
4. Read the display value on the LCD. If display shows “1”, it indicates an overrange measurement. If the display indicates one or more leading zero's, shift to the next lower range scale to improve the resolution of the measurement.

## Measurement Considerations

1. If the capacitance value is unknown, start with the 200 pF range and rotate selector switch to successive higher ranges until the overrange indication disappears and a reading is obtained.

3. Very low capacitances should be measured by using extremely short leads in order to avoid introducing any stray capacitances.
4. When using the optional test leads, remember that the leads introduce a measurable capacitance.
5. Capacitors, especially electrolytics, often have wide tolerances. The measured value may be greater than the value marked on the capacitor. However, values are seldom drastically below the rated value.
6. The existence of a leaky capacitor may be detected if the value changes significantly as the ranges are changed.

## Large Unknown Capacitance Test Method

To test a large unknown capacitance of more than 20,000  $\mu\text{F}$ , use the following procedure:

1. Select a capacitor with a known value (over 10,000  $\mu\text{F}$  and as close to 20,000  $\mu\text{F}$  as possible), this value becomes  $C_k$ .
2. Place the unknown capacitor ( $C_x$ ) in series with the known value capacitor (see Figure 1).
3. Measure the capacitance of this series combination. The measured value becomes  $C_s$ .
4. The unknown capacitor's value can now be calculated by using the following formula:

$$C_x = \frac{C_k \times C_s}{C_k - C_s}$$

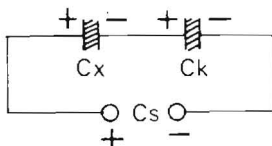


Figure 1

## Useful Conversions

| pF        | nF        | $\mu\text{F}$ | mF | Farad |
|-----------|-----------|---------------|----|-------|
| 1,000     | 1.0       | 0.001         |    |       |
| 10,000    | 10.0      | 0.01          |    |       |
| 100,000   | 100.0     | 0.1           |    |       |
| 1,000,000 | 1000.0    | 1.0           |    |       |
|           | 10,000    | 10.0          |    |       |
|           | 100,000   | 100.0         |    |       |
|           | 1,000,000 | 1000.0        |    | 0.001 |
|           |           | 10,000        | 10 | 0.01  |

## **Calibration Procedure**

1. Set the meter to the 200 pF range and adjust the zero capacitance knob until the display reads zero.
2. Connect a standard capacitor whose value is near a full scale reading on one of the higher ranges, and is known to have within  $\pm 0.1\%$  accuracy.
3. Select the appropriate range scale.
4. Adjust R40 for display reading equal to the known standard capacitance.

## **Battery Replacement**

### **CAUTION**

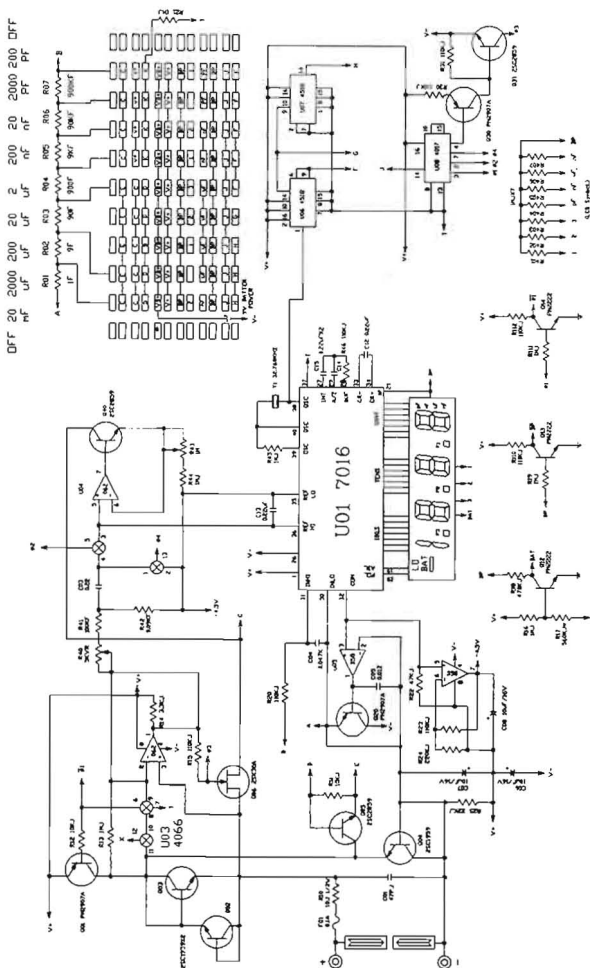
**BEFORE ATTEMPTING BATTERY REMOVAL OR REPLACEMENT, DISCONNECT TEST LEADS FROM ANY ENERGIZED CIRCUITS TO AVOID SHOCK HAZARD.**

1. Remove the two (2) screws in the rear cover of the case, and lift the back off from the front section.
2. Replace battery with a 9 V battery and be sure to observe polarity.
3. Carefully replace the rear cover and replace the two (2) screws.

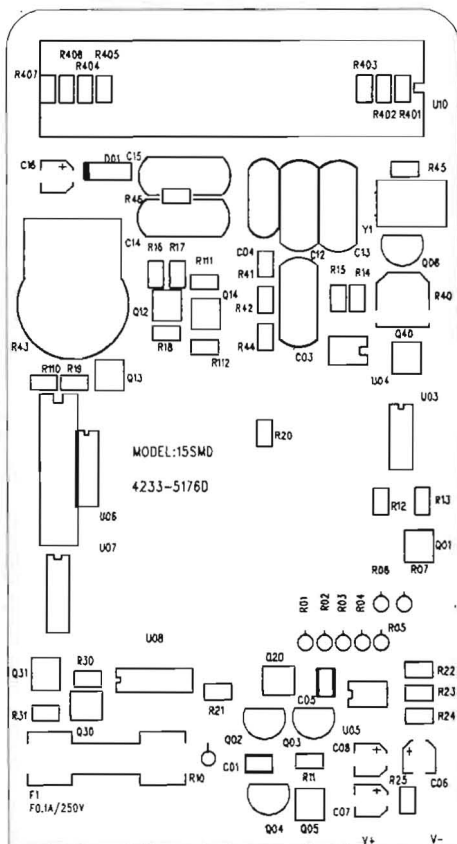
## **Fuse Replacement**

1. Remove the two (2) screws in the rear cover of the case, and lift the back off from the front section.
2. Replace blown fuse with a new 100 mA/250 V, fast blow fuse. To prevent fire or damage to meter, do not use a fuse which has a higher rated value than specified.

# CX-920A Schematic Diagram



# CX-920A Component Layout



## Limited Warranty

NTE Electronic, Inc. warrants to the original consumer purchaser that this product ("UNIT") shall be free from any defect in material and workmanship for a period of (1) year from the date of purchase. If a defect covered by this warranty occurs during this warranty period, you should return the unit to NTE Electronic, Inc., freight prepaid, (CAREFULLY PACKED TO AVOID TRANSIT DAMAGE), together with your dated proof-of-purchase and a description of the defect to:

NTE Electronics, Inc.  
44 Farrand Street  
Bloomfield, NJ 07003  
ATTN: Warranty Department

THIS WARRANTY DOES NOT COVER batteries or fuses, damage or malfunction resulting from improper handling, accident, misuse, abuse, damage while in transit for repairs, repairs by unauthorized person or agency or any other reason not due to defect in material or workmanship.

NTE Electronic, Inc.'s liability is limited, in its sole discretion, to the repair or replacement of the UNIT with a new or reconditioned model of equivalent quality. In the event of replacement with a new or reconditioned model, the replacement will continue the warranty period of the original UNIT.

IN NO EVENT WILL NET ELECTRONIC, INC. OR ITS AGENTS BE LIABLE FOR ANY INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES NOR FOR ANY AMOUNT IN EXCESS OF THE CURRENT PRICE OF THE DEFECTIVE ITEM. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED.

This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

NTE Electronics, Inc.  
44 Farrand Street  
Bloomfield, NJ 07003  
ATTN: Warranty Department

ET-2268-1  
Printed in Taiwan

---

**NTE**

**ELECTRONICS, INC.**

44 Farrand Street, Bloomfield, NJ 07003