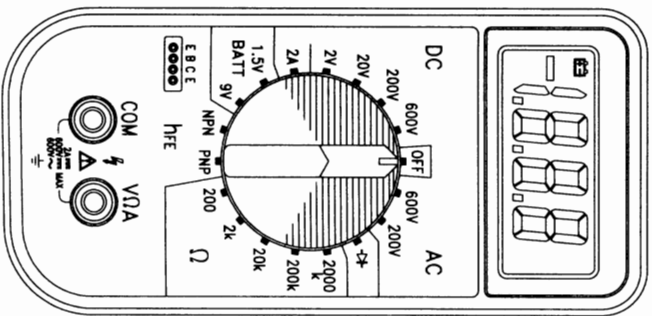


OPERATING INSTRUCTIONS

MODEL 120 DIGITAL MULTIMETER



SAFETY INFORMATION

The following safety information must be observed to insure maximum personal safety during the operation of this meter:

Do not use the meter if the meter or test leads look damaged, or if you suspect that the meter is not operating properly.

Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.

Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.

Use caution when working above 60V dc or 30V ac rms. Such voltages pose a shock hazard.

When Using the probes, keep your fingers behind the finger guards on the probes.

Measuring voltage which exceeds the limits of the multimeter may damage the meter and expose the operator to a shock hazard. Always recognize the meter voltage limits as stated on the front of the meter.

SPECIFICATIONS

Display: 3½ digit liquid crystal display (LCD) with a maximum reading of 1999.

Polarity: Automatic, positive implied, negative polarity indication.

Overrange: (1) or (-1) is displayed.

Zero: Automatic.

Low battery indication: The "⊠" is displayed when the battery voltage drops below the operating level.

Measurement rate: 2.5 times per second, nominal.

Operating environment: 0°C to 50°C at < 70% relative humidity.

Storage temperature: -20°C to 60°C, 0 to 80% R.H. with battery removed from meter.

Accuracy: Stated accuracy at 23°C ± 5°C, < 75% relative humidity.

Power: Single standard 9-volt battery, NEDA 1604, JIS 006P, IEC 6F22.

Battery life: 300 hours typical with carbon-zinc.

Dimensions: 147mm (H) x 70mm (W) x 39mm (D).

Weight: Approx. 7.4 oz (210g) including battery.

Accessories: One pair test leads, One spare fuse, 9V battery (installed) and Operating Instructions.

DC VOLTS

Ranges: 2V, 20V, 200V, 600V

Resolution: 1mV

Accuracy: ±(1.2% rdg + 1dgt)

Input impedance: 1MΩ

Overload protection: 600VDC or AC rms

AC VOLTS (50Hz - 500Hz)

Ranges: 200V, 600V

Resolution: 100mV

Accuracy: ±(2.0% rdg + 4dgt)

Input impedance: 450KΩ

Overload protection: 600VDC or AC rms

DC CURRENT

Range: 2A

Resolution: 1mA

Accuracy: ±(2.5% rdg + 2dgt)

Input protection: 2A / 250V fast blow fuse

RESISTANCE

Ranges: 200Ω, 2KΩ, 20KΩ, 200KΩ, 2000KΩ

Resolution: 100mΩ

Accuracy: ±(1.5% rdg + 3dgt) on 200Ω range

±(1.5% rdg + 1dgt) on 2KΩ to 2000KΩ ranges

Open circuit volts: 0.3Vdc (3.0Vdc on 200Ω range)

Overload protection: 500VDC or AC rms

DIODE TEST

Test current: 1.0mA ± 0.6mA

Accuracy: ±(3.0% rdg + 1dgt)

Open circuit volts: 3.3Vdc typical

Overload protection: 500VDC or AC rms

TRANSISTOR hFE

Ranges: 0 - 1000

Base current: 10 μ A dc approx. (Vce=3.0Vdc)

BATTERY TEST

Ranges: 1.5V, 9V

Resolution: 1mV, 10mV

Accuracy: ±(3.0% rdg + 2dgt)

Loaded current: 150mA typical for 1.5V range

6mA typical for 9V range

OPERATION

Before taking any measurements, read the Safety Information Section. Always examine the instrument for damage, contamination (excessive dirt, grease, etc.) and defects. Examine the test leads for cracked or frayed insulation. If any abnormal conditions exist do not attempt to make any measurements.

Voltage Measurements

1. Connect the red test lead to the "V Ω A" jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the desired Voltage type (AC or DC) and range. If magnitude of voltage is not known, set switch to the highest range and reduce until a satisfactory reading is obtained.
3. Connect the test leads to the device or circuit being measured.
4. For dc, a (-) sign is displayed for negative polarity; positive polarity is implied.

Current Measurements

1. Connect the red test lead to the "V Ω A" jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the 2A DC range.
3. Remove power from the circuit under test and open the normal circuit path where the measurement is to be taken. Connect the meter in series with the circuit.
4. Apply power and read the value from the display.

Resistance Measurements

1. Set the Function/Range switch to the desired resistance range.
2. Remove power from the equipment under test.
3. Connect the red test lead to the "V Ω A" jack and the black test lead to the "COM" jack.
4. Connect the test leads to the points of measurements and read the value from the display.

Diode Tests

1. Connect the red test lead to the "V Ω A" jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the " \rightarrow " position.
3. Turn off power to the circuit under test. External voltage across the components causes invalid readings.
4. Touch probes to the diode. A forward-voltage drop is about 0.6V (typical for a silicon diode).
5. Reverse probes. If the diode is good, "1" is displayed. If the diode is shorted, ".000" or another number is displayed.
6. If the diode is open, "1" is displayed in both directions.

Transistor Gain Measurements

1. Set the Function/Range switch to the desired hFE range (PNP or NPN type transistor).
2. Never apply an external voltage to the hFE sockets. Damage to the meter may result.
3. Plug the transistor directly into the hFE sockets. The sockets are labeled E, B, and C for emitter, base, and collector.
4. Read the transistor hFE (dc gain) directly from the display.

Battery Test

1. Connect the red test lead to the "V Ω A" jack and the black test lead to the "COM" jack.

2. Set the Function/Range switch to the desired 1.5V or 9V battery test range.

3. Connect the test leads to the 1.5Vdc battery under test. Normally, a good 1.5Vdc battery will read above 1.25Vdc. Consult the battery manufacturer for complete battery specifications to determine actual battery life remaining and condition of battery.

MAINTENANCE

WARNING

Remove test leads before changing battery or fuse or performing any servicing.

Battery Replacement

Power is supplied by a 9 volt "transistor" battery. (NEDA 1604, IEC 6F22). The "☒" appears on the LCD display when replacement is needed. To replace the battery, remove the three screws from the back of the meter and lift off the front case. Remove the battery from case bottom.

Fuse Replacement

If no current measurements are possible, check for a blown overload protection fuse. For access to fuse, remove the three screws from the back of the meter and lift off the front case. Replace only with the original type 2A/250V, fast acting fuse.

120 CALIBRATION PROCEDURES

EQUIPMENT REQUIREMENTS

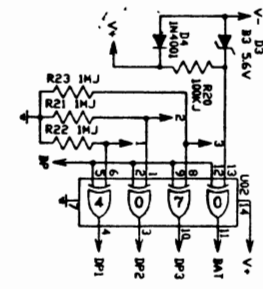
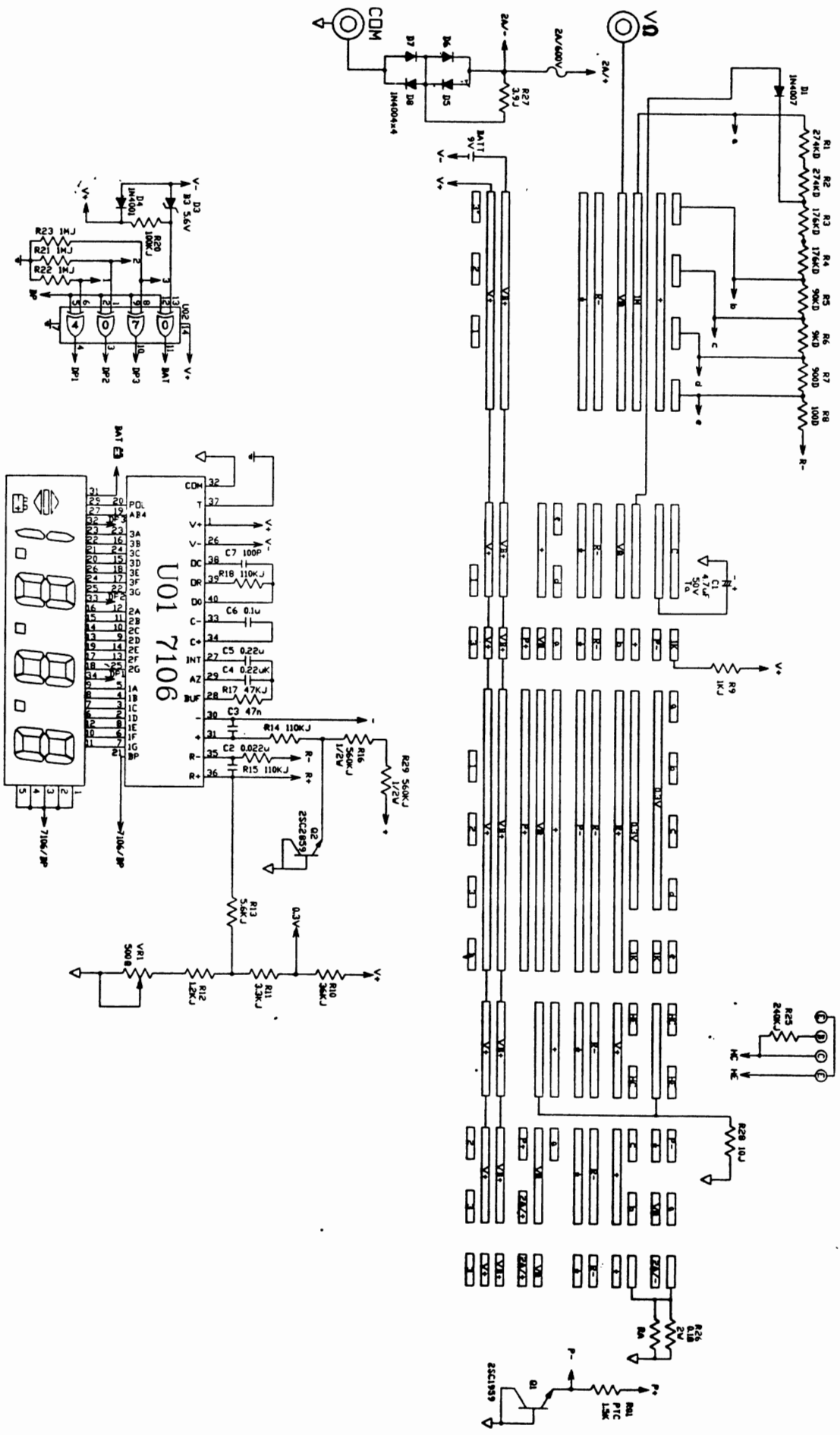
Before removing the 120 from service check that the necessary calibration equipment is available, the equipment requirements listed as following:

DATRON 4700

AUTOCAL MULTIFUNCTION CALIBRATOR

1. Perform calibration at $23 \pm 2^\circ\text{C}$ at relative humidity of $< 70\%$. Allow the meter to stabilize at this temperature for at least 30 minutes prior to performing the calibration procedure.
2. Select the 2 V DC range on the meter. Apply $1.900\text{V} \pm 0.005\%$ (from DATRON 4700) to the V- Ω and the COM input connectors of the meter.
3. Adjust VR1 (VR 500 Ω) as shown to obtain a reading of 1.900 in the digital display.

_____ DCV _____
 _____ ACV _____
 _____ Ω _____
 _____ BATT _____
 _____ A _____
 _____ PNP _____
 _____ NPN _____
 _____ 9V _____
 _____ 15V _____
 _____ 2 _____



C. I. E.		MODEL	NAME	DWG	SHEET	OF	REV	DSCN	DWN	CKD	APPVD	APPVD
		120		120	DATE	82	3	15				
					CHX							