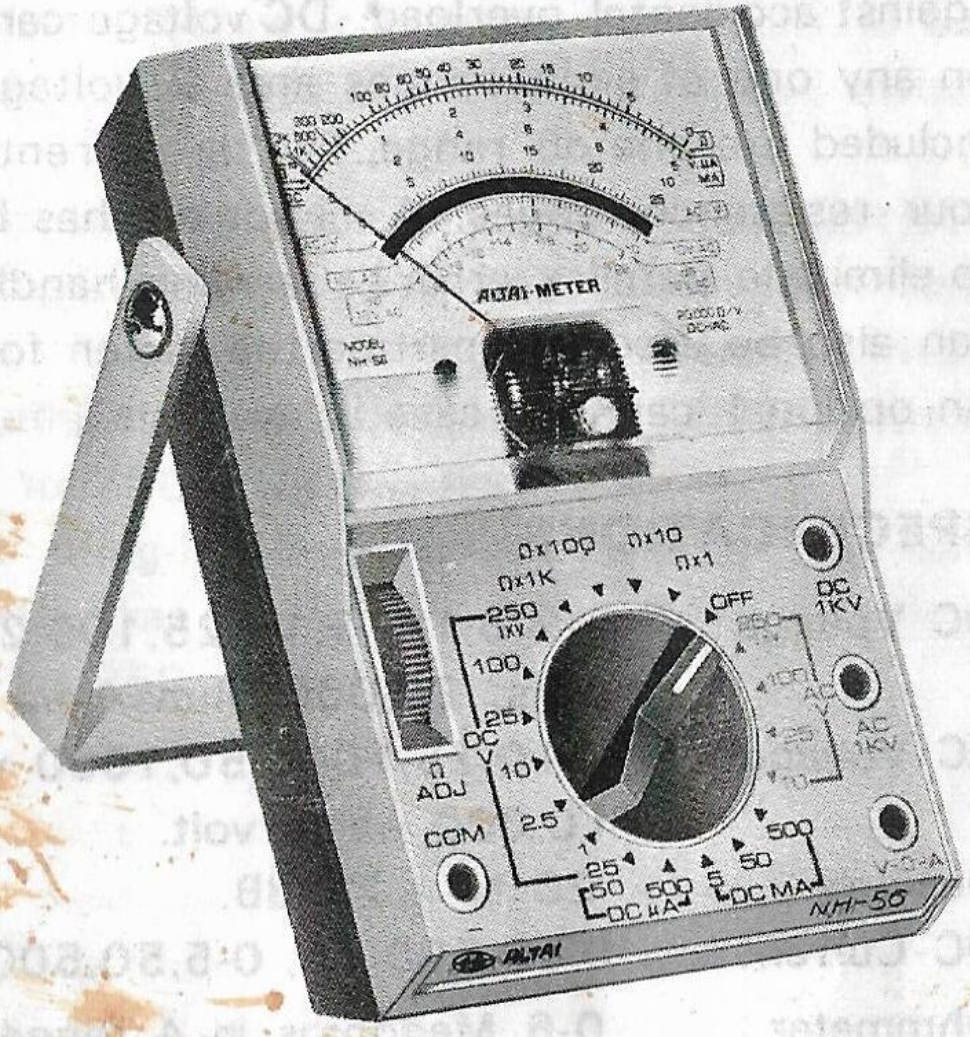
instruction manual

VOM-MULTITESTER
20,000 ohms/volts dc
model NH-56



ALTAI

DESCRIPTION

Ideal for use where measurements must not disturb the circuit being tested, the ALTAI NH-56 features high 20,000ohms/volt dc and 10,000ohms/volt ac sensitivities on all ranges. Special circuitry protects the meter movement against accidental overload. DC voltage can be measured on any one of eight ranges and ac voltage on five. Also included are one dB range, five dc current ranges and four resistance ranges. A mirror arc has been included to eliminate parallax errors. Carrying handle on the case can also be used to position the meter for easy reading. An optional carrying case is available.

SPECIFICATIONS

DC Voltage :	0-2.5,1,2.5,10,25,100,250,1000 volts. 20,000 ohms/volt.
AC Voltage :	0-10,25,100,250,1000 volts. 10,000 ohms/volt.
Decibels :	-20 to +22 dB.
DC Current :	0-50,500 uA, 0-5,50,500 mA.
Ohmmeter :	0-6 Megohms in 4 ranges.
Size :	5-1/4" X3-1/2 X1-1/2"
Weight :	1 lb. (including battery)

CONTROLS AND JACK SOCKETS

RANGE switch : Use to select factor to be measured and range. Ω ADJUST control : Use to set pointer 0 (extreme right of meter scales) on uppermost ohm -meter scale, when test leads are touching.

Mechanical adjust : Screw on meter movement to set pointer to zero when leads are touching RANGE switch at DCV.

COM-jack : Plug-in connection for black, negative, test lead.

V-Ω-A jack : Plug-in connection for red, positive test lead.

DC 1KV jack : Plug-in connection for red test lead when measuring dc to 1,000 volts. RANGE switch must be set to 250 DCV position.

AC 1KV jack : Plug-in connection for red test lead when measuring ac to 1,000 volts. RANGE switch must be set to 250 ACV position.

Operating Procedure

PRELIMINARY ADJUSTMENTS

1. Check the mechanical adjust screw setting as follows :
   a. Set the RANGE switch to 1 DCV.
   b. Connect one test lead to the other.
   c. Note if the meter pointer indicates exactly 0 at the extreme left end of the black scales.
   d. If it does not read 0, turn the screw on the meter move – ment slowly until the proper 0 reading is realized.
2. Check the battery as follows :
   a. Connect one test lead to the other.
   b. Set the RANGE switch to Ω×1.
   c. Turn the Ω ADJ control until you find the position where the meter pointer indicates the full scale 0 on the Ω scale. If this abjustment cannot be made, replace the battery.
   (See MAINTENANCE.)

OPERATING SUGGESTIONS

1. Set the RANGE switch to the proper voltage or current range before making measurements. Never apply more voltage or current than the amount noted on the front panel in each switch position. When in

doubt as to the voltage or current present in a circuit, start with the highest range in each case. If the voltage or current is measurable on a lower range, select the lowest range switch position which will provide you with a reading without causing the meter pointer to deflect off scale.

2. Do not check resistance when voltage or current is present in the circuit.
3. Discharge a capacitor before measuring it.
4. Avoid placing the tester in a place where severe vibration is encountered. Do not store it in extremely hot or humid locations.
5. Remove the battery before storing the tester. Also rotate the RANGE switch from time to time to clean the contacts.
6. To extend the life of the battery, never leave the tester in an OHMS setting when you are not measuring resistance.
7. For all measurements, plug the black test lead into the COM-jack. Plug the red test lead into the V-Ω-A jack except when measuring from 250 to 1000 volts.
8. You can see a reflection of the meter pointer in the mirror arc. To avoid parallax errors in your readings, look straight down onto the meter scale. You are

doing this properly if the mirror image of the pointer is covered by the actual meter pointer, so that you do not see its reflection in the mirror arc.

DC VOLTAGE MEASUREMENTS

Select the required dc voltage range or use the procedure in "1" above under OPERATING SUGGESTIONS. Connect the test leads across the circuit whose voltage is to be measured. Observe polarity. Read dc voltage on the appropriate scale.

DC CURRENT MEASUREMENTS

Select the required dc current range or use the procedure in "1" above under OPERATING SUGGESTIONS. Connect the test leads in series with the circuit to be measured. Observe polarity. Read dc current on the appropriate scale.

Should the ranges provided not be sufficient to measure current in your circuit, the DCV ranges of your HM-102 may be utilized. Measure the voltage across a resistor in the circuit through which the current flows. If this is not possible, add a small resistor in series with the circuit.

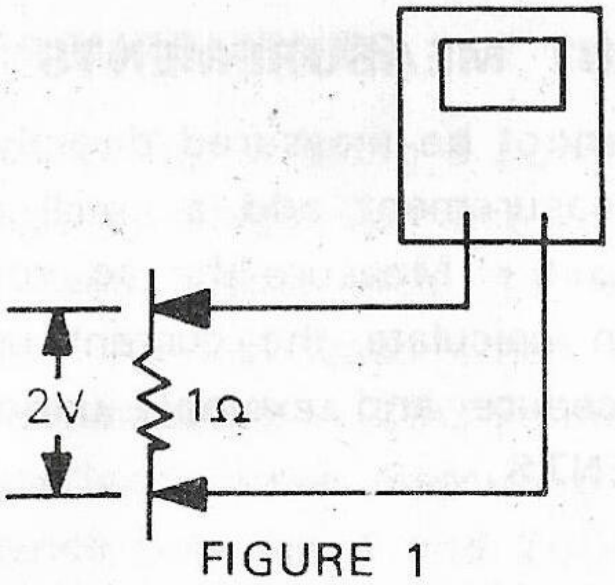


FIGURE 1

The added resistor, if used, must be small enough so as not to upset the circuit. Measure the voltage across this resistor, then calculate the current using Ohm's Law. See the example in Figure 1. Here, it is assumed that 2 volts is across a 1-ohm resistor. The current through the resistor is:

$$I = \frac{E}{R} = \frac{2}{1} = 2 \text{Amps}$$

AC VOLTAGE MEASUREMENTS

Select the required red ACV range or use the procedure in "1" above under OPERATING SUGGESTIONS. Connect the test leads across the voltage to be measured. Leads may be connected in either direction. Read ac voltage on the appropriate scale.

AC CURRENT MEASUREMENTS

Ac current cannot be measured directly. If you need an ac current measurement, add a small resistor in series with the circuit. Measure the ac voltage across this resistor, then calculate the current using Ohm's Law. See the procedure and example under DC CURRENT MEASUREMENTS.

RESISTANCE (OHMS) MEASUREMENTS

Set the RANGE switch to an OHMS range. Connect one test lead to the other and set the Ω ADJ. control for full scale deflection. Separate the test leads and connect them across the resistor to be measured. Read the resistance on the Ω scale. Use the appropriate multiplier as required for the different resistance ranges.

DB RATIO MEASUREMENTS

The ratio of two ac voltages can be expressed in terms of dB. A stand rd has been adopted which establishes one reference voltage as the 0 dB level. It is 0.774 volt rms. This assumes that 1 milliwatt is developed across an impedance of 600 ohms.

When using the 10-volt ac range, read the red dB scale.

INDUCTANCE MEASUREMENTS

Wire the circuit shown in Fig. 2 using a power transformer and variable ac supply voltage. Connect an 11 kohms resistor across the leads. (Note: The 11 kohms resistor is used across the test leads when measuring inductance and high capacitance. A 280 kohms resistor is used across the test leads when measuring low capacitance.) Any inductance between 4 and 2000 henrys can be measured.

NOTE: Adjust voltage with variac before measuring capacitance or inductance. Transformer voltage and shunt resistor requirements are discussed in the text. Do not change variac voltage after setting has been made.

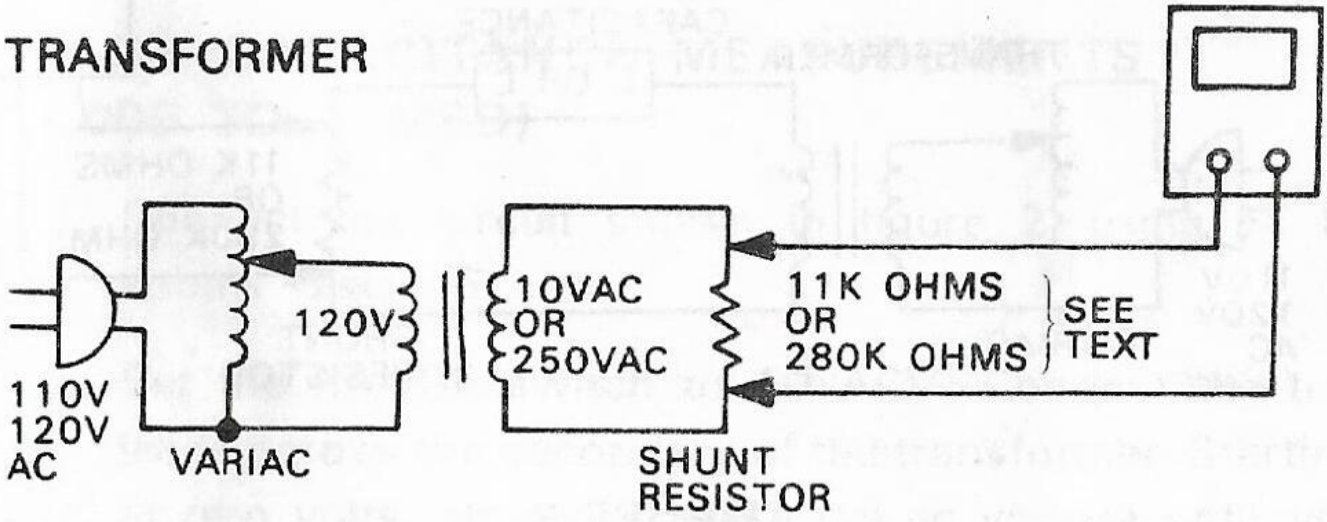


FIGURE 2

1. Set the RANGE switch to 10 ACV. Connect the test leads across the secondary of the transformer, as shown in Figure 2. Starting at zero volts, slowly increase the ac voltage until you read 10 volts.

2. Connect the unknown inductor (drawn as a rectangular box marked L OR C) as shown in Figure 3. Note the voltage on the 10-volt scale. Use TABLE 1 to determine the inductance in the circuit from the voltage read on the meter. You can interpolate between values if the actual voltage read on the meter is not indicated on the table.

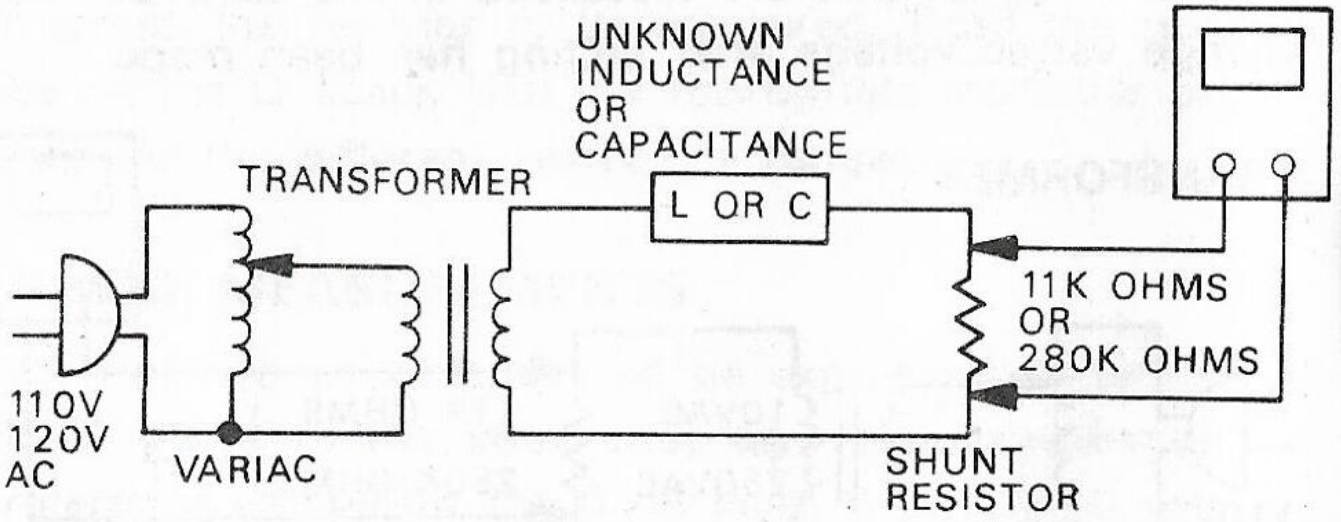


FIGURE 3

Circuit to measure inductance or capacitance.

TABLE 1. VOLTAGE TO INDUCTANCE CONVERSION
(4 HENRYS TO 2000 HENRYS)

RMS VOLTS	INDUCTANCE(H)	RMS VOLTS	INDUCTANCE(H)
9.88	4	3.14	80
9.83	5	2.81	90
9.75	6	2.56	100
9.67	7	2.16	120
9.57	8	1.86	140
9.47	9	1.63	160
9.35	10	1.45	180
7.99	20	1.31	200
6.63	30	0.88	300
5.52	40	0.64	400
4.67	50	0.53	500
4.04	60	0.27	1000
3.52	70	0.13	2000

HIGH CAPACITANCE MEASUREMENTS (.005 TO 1 MFD)

1. Connect the circuit shown in figure 2, using an 11 kohms resisistor.

2. Set the RANGE switch to 10 ACV. Connect the test leads across the secondary of the transformer. Starting at zero volts, slowly increase the ac voltage until you read 10 volts.

3. Connect the capacitor (drawn as a rectangular box marked L OR C) as shown in Figure 3. Note the voltage on the 10-volt scale. Use TABLE 2 to determine the capacitance in the circuit from the voltage read on the meter.

LOW CAPACITACE MEASUREMENTS (100 TO 50,000 PF)

1. Connect the circuit shown in Figure 2, using a 280,000 ohms resistor.
2. Set the RANGE switch to 250 ACV. Connect the test leads across the secondary of the transformer. Starting at zero volts, slowly increase the ac voltage until you read 250 volts.
3. Connect the capacitor (drawn as a rectangular box marked L OR C) as shown in Figure 3. Note the voltage on the 250-volt scale. Use TABLE 3 to determine the capacitance in the circuit from the voltage read on the meter.

TABLE 2. VOLTAGE TO CAPACITANCE CONVERSION (.005 MFD TO 1 MFD)

RMS VOLTS	CAPACITANCE(mfd)	RMS VOLTS	CAPACITANCE(mfd)
.19	.005	4.67	14
.32	.009	5.15	.16
.38	.01	5.61	.18
.73	.02	6.01	.2
1.1.1	.03	6.86	.25
1.49	.04	7.49	.3
1.85	.05	8.34	.4
2.21	.06	8.83	.5
2.55	.07	9.14	.6
2.87	.08	9.35	.7
3.20	.09	9.50	.8
3.52	.1	9.58	.9
4.12	.12	9.67	1

TABLE 3. VOLTAGE TO CAPACITANCE CONVERSION (.0001 MFD TO .03 MFD)(100 PFD-50,000 PFD)

RMS VOLTS	CAPACITANCE(pF)	RMS VOLTS	CAPACITANCE(pF)
2.25	100	59	2600
4.5	200	64	2800
6.75	300	68	3000
9.25	400	78	3500
11.8	500	88	4000
14	600	97.5	4500
16	700	106	5000
18.1	800	112	5500
21	900	124	6000
23.3	1000	130	6500
27.7	1200	137	7000
32.7	1400	151	8000
37	1600	161	9000
42	1800	172	10K
46.2	2000	221	20K
51	2200	236	30K
55	2400	245	50K

Maintenance

Test the battery as described above in PRELIMINARY ADJUSTMENTS. If the battery must be replaced, remove the screw in the rear cover of the case, and lift the back off the front section. Note the orientation of the cell in its compactment. Replace the battery. The positive (+) end should be at the end so indicated in the case. Be sure that the contacts at each end of the comparment make good contact with the metallic hattery terminal at its positive end and the metallic portion of the battery case at its negative end.

Carefully replace the back onto the front of the case. Retighten the screw. Do not tighten excessively. or you will strip the threads in the case.

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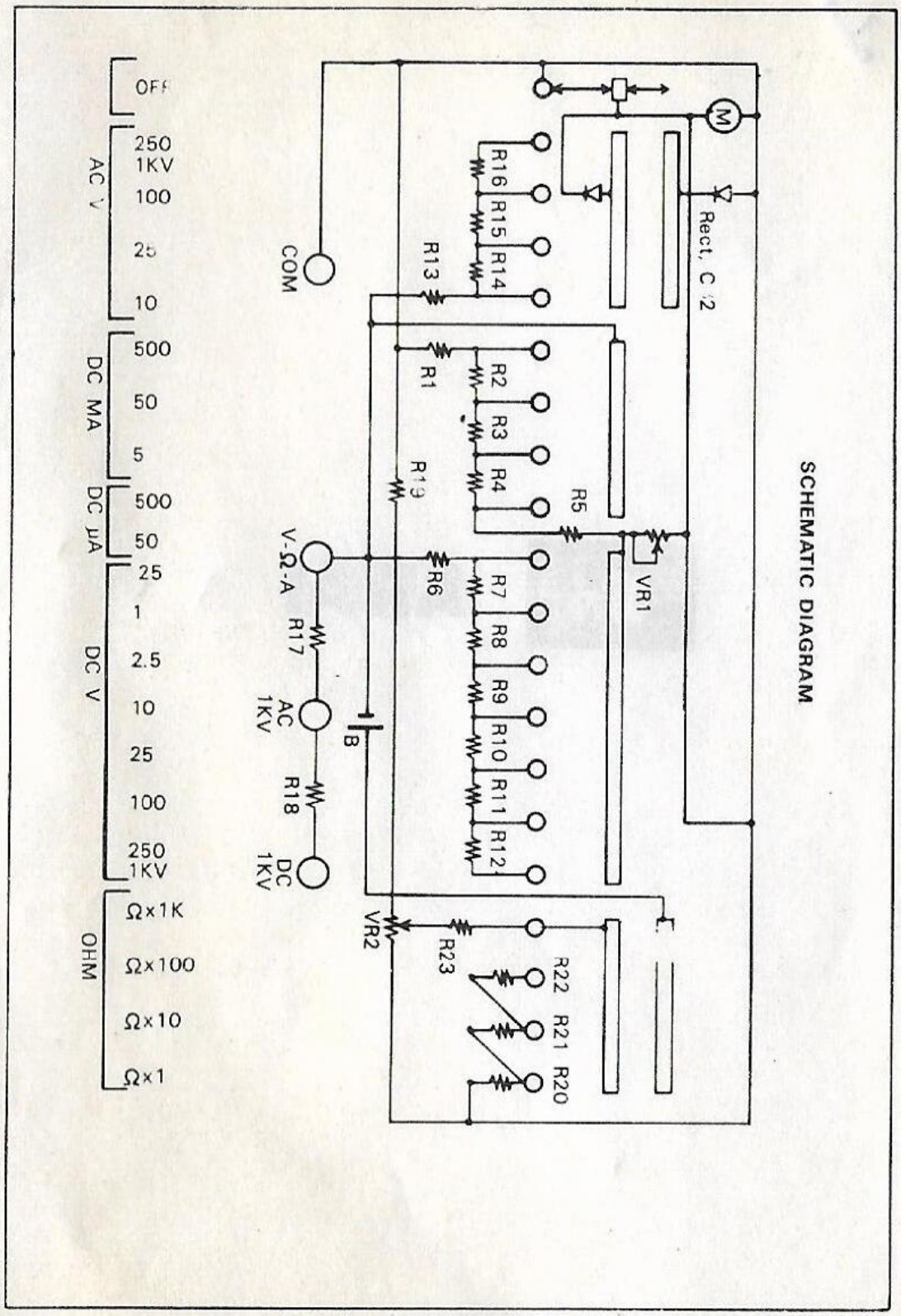
SCHEMATIC DIAGRAM
OFF
AC V
250 1KV
100
25
10
DC MA
500
50
5
DC μA
500
50
25
DC V
1
2.5
10
25
100
250 1KV
OHM
Ω×1K
Ω×100
Ω×10
Ω×1
COM
V-Ω-A
AC 1KV
DC 1KV
B
Rect. C 2
M
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
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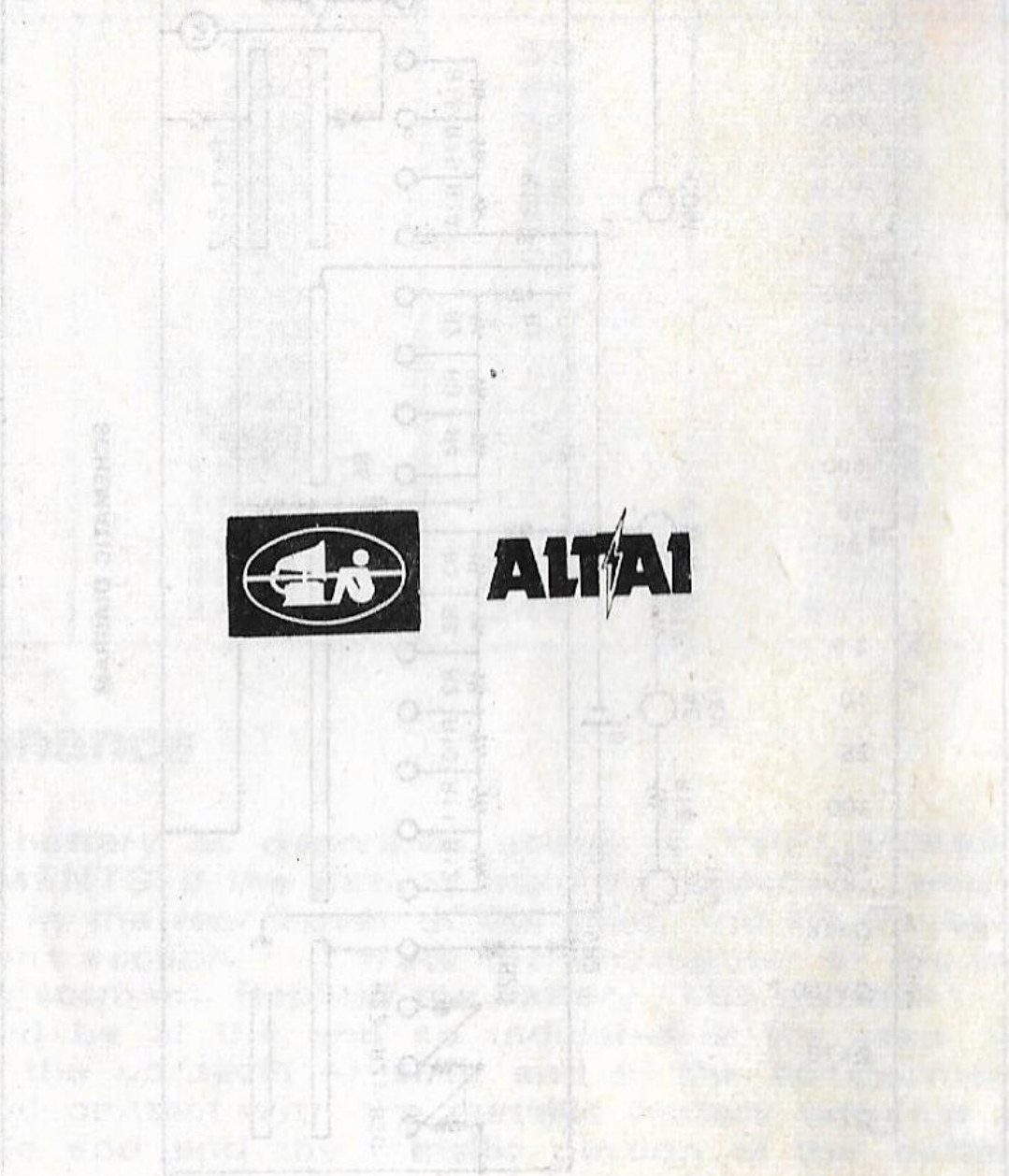
R22
R23
VR1
VR2

R/W
B/Y



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