

LCR BRIDGE

LCR-3000A

Operation

Manual

Description, technical datas and operation

The unit is a fully transistorized AC-bridge, which allows accurate measurement of resistances, capacities, inductances and turns ratios of transformers. Because battery operated the bridge is small and handy and has high mechanical and electrical stability. Besides the actual bridge circuit a 1KHz generator and a three-stage test-amplifier is inserted.

Specification

6 Range Respectively

Resistance Ranges	: 0.1 ohm to 11.1Mohm 0.1 ohm to 10 ohm $\pm 2\%$ +0.1ohm 10 ohm to 5 Mohm $\pm 1\%$ 5Mohm to 11.1 Mohm $\pm 5\%$
Inductance Range	: $1\mu\text{H}$ to 111H $1\mu\text{H}$ to $100\mu\text{H}$ $\pm 5\%$ $\pm 1\mu\text{H}$ 1mH to 111H $\pm 2\%$
Capacity Range	: 10pF to $1110\mu\text{F}$ 10pF to 1nF $\pm 2\%$ $\pm 1\text{pF}$ 1nF to $111\mu\text{F}$ $+1\%$ -1.5% $111\mu\text{F}$ – $1110\mu\text{F}$ $\pm 5\%$

Turns Ratio : 1:1/10000:11100
± 1.5%

Battery : 9V

2. Operating instructions

Measurements of resistance

1. The functions selector switch SELECTOR must be in Position R.
2. If the resistance value is roughly known, then the range selector switch RANGE can be switched to the respective range.
3. Now the resistor is connected with the two connections.
4. The knob OFF/SENS switches ON/OFF and regulates the test amplifier. By turning right away from OFF the device is switched on and by turning the knob carefully right the swing on the dial is brought to about half value. At the beginning of a measurement this adjusting is quite cviticall because of the big amplifying reserve capacity of the amplifies.
5. Now the left decimal scale is turned left or right to a position where the meter shows the smallest deflection.
6. Now the middle decimal scale is turned accordingly. It is possible that the swing on the dial is so low now, that it is difficult to find out the smallest meter deflection. In this case the meter is brought to the middle of the scale by turning the SENS-knob more to the right.

7. Now with the right decimal scale the smallest meter deflection is sought. At this the SENS-knob has to be turned nearly to tally to the right. The minimum of meter deflection is not necessarily the zero position on the meter, normally it is half to one hairline above the zero/position of the meter.
8. For example a resistance of 125Ω can be tested as follows: Left decimal scale shows smallest meter deflection on 1, middle decimal scale on 2, right scale shows smallest deflection on 5. The range selector switch is on $10-1.11k\Omega$.

ATTENTION: If the range selector switch is on the position $100\Omega-111k\Omega$ and the 3 decimal scales show the following 3 figures at minimum meter deflection:

left10
 Middle.....5
 right7

than the resistance value is $105.7k\Omega$.

The correct determination of the adjusted value is made easy by using the following help:

The top figure on the respectively adjusted range shows the one-digit, i.e. how much the value of each figure on the right decimal knob then are ten times higher, that means they are the decimal-digits, on the left are the hundred-digits.

If like in our example the range selector switch is on $100\Omega-111K\Omega$, than each figure on the right decimal knob means 100Ω . Because it is on 7, so the value is $700\Omega = 0.7k\Omega$. The next

digit figure is 10 times as much, hence $5 \times 1000\Omega = 5k\Omega$. The left digit shows 10 hence has to be multiplied by 10000 = $100000\Omega = 100k\Omega$. This sum is then $100 + 5 + 0.7k\Omega = 105.7k\Omega$. Another example: decimal places from left to right are on 0, 3 and 6. Range selector switch is on $1\Omega-1.1k\Omega$.

Smallest place hence	$6 \times 1\Omega = 6\Omega$
Middle place	$3 \times 10\Omega = 30\Omega$
Right place	0
Total value	$30 + 6 = 36\Omega$.

If the value of the resistor is unknown, than should be proceeded as follows: All three decimal scales are first meter tuned into a middle position on 5, and the deflection is tuned by the SENS —knob to a middle position. If now with the left decimal knob the minimum position os traced than it is possible that it is only found either on 0 or 10. Than the range selector switch has to be brought into another position. If it is found inside the range, the other knobs have to be operated accordingly.

ATTENTION! The Q-regulators are not in use while measuring resistance.

Measurements of capacity

1. The function selector switch is put on position C.
2. The concentrical Q-regulator are brought on position 0. When measuring electrolytic capacitor the deflection of the méter can be slow because to the loss resistance of the

capacitor. The minimum indication can be improved by carefully turning on the Q-regulators and at the right combination of the decimal regulators and the Q-regulators a clear minimum is found (like in resistance measurement) with a SENS-knob turned on up to three quarters or more. This position is corresponding to the right value. The bigger Q-regulator positioned directly on the front plate, is for rough tuning, the 10 times smaller one is for fine tuning. After the minimum deflection is found, the loss resistance of the electrolytic capacitor can be read on the inner Kohm-scale. The position of the rough tuning knob shows the values in KOHM, the fine tuning knob shows the values in tenths of KOHM. Example: Big knob on 2, small knob on 4, then the loss resistance is $2\text{KOHM} + 0.4\text{KOHM} = 2.4\text{KOHM}$. Except the particularity of high capacities with the Q-regulatory are measured like resistors, they are connected with the connections X as well and are found by the position of the range selector switch and the decimal scales. Example: range selector switch on $1000\text{PF} - 1.11\text{MF}$, decimal scale from left to right: 4 7 6. Smallest unit is here $1000\text{PF} = 1\mu\text{F}$. Value hence is $6 \times 1\mu\text{F} + 7 \times 10\mu\text{F} + 4 \times 100\mu\text{F} = 476\mu\text{F} = 0.476\text{MF}$.

Measurements of inductance:

1. The function selector switch is switched to position L.
2. The range selector switch is switched on an estimated position, if the range is not right, no minimum will be found on the left decimal scale.

3. *Now the coil that has to be tested is connected with the X connections.*
4. The two Q-regulators first are on a middle position.
5. Now the meter deflection is tuned to a middle position by the sensitivity regulator, which is first quite critical because of the high amplification in the test amplifies.
6. Now the left decimal scale is switched stepwise from 1–10. On each step a minimum position has to be tried with the Q-(rough) regulator.

Even if a minimum deflection is found, it still has to be tested whether there is a lowest minimum or not by switching to the next lowest resp highest decimal position and by tuning the Q-regulator. If this is not the case, then with the same procedure and always newly tuned Q-regulators the minimum is traced for the middle and right decimal scale.

By approaching the final position more and more the sensitivity regulator is tuned also on more and more, and at the end of the measurement it is on a position between three quarters and very right.

Attention: To avoid spurious measurement please watch that the traced minimum cannot be improved in other positions of the decimal scales and the Q-regulator only by tuning in to the absolute minimum the measurement is right.

Turns ratios:

1. Switch the function selector switch to position T.
2. Put the range selector switch to an estimated position.
3. The Q-regulators are not functioning in this position.
4. Now one connection of the primary winding and one of the secondary winding respectively are connected together with the middle (red) terminal. The remaining connection of the primary winding is connected with the lowest (black) terminal, the remaining secondary winding connection with the upper (back) terminal.
5. The measuring is proceeded like in measurements of resistance.

ATTENTION: The smaller one of the two windings has to be connected with the terminals N1, the bigger one with the terminals N2. In the ratio between N1 and N2, the winding connected with N1 = 1. If a minimum is not found despite changing of the range selector switch, then the primary and secondary windings have to be connected in exchanged positions, because in this case not the smaller one of the both was connected with N1.

ATTENTION: Don't forget to switch off the device after use by turning the SENS-knob totally to the left. The earphone socket right of the Q-regulators allows to check the test sound and the minimum finding acoustically.