Instruction Manual 21-80J

for the use of

Battery Megger® Testers

Catalog Numbers 210800, 210801, 210802

Biddle Instruments

BLUE BELL, PA. 19422

SAFETY IN THE USE OF ELECTRICAL EQUIPMENT

It should be understood that any use of electricity inherently involves some degree of safety hazard.

• Safety is the responsibility of the user •

• La Seguridad es el cargo del operador •

While every effort is made by responsible manufacturers to reduce the hazard, it still rests with the user to play his part in ensuring his own safety.

The best way to achieve this is: —

★ Understand the equipment you are proposing to use and its ratings.

★ Understand the application to which the equipment is to be put.

★ Ensure that all reasonable safety procedures are followed.

★ Take no chances, nor short cuts, in safety procedures.

See also the notes on safety for this particular instrument in the paragraph headed 'WARNING' on page 10.

CONTENTS

Illustrations

INTRODUCTION

Catalog Numbers 210800, 210801 and 210802 are hand-held insulation testers incorporating resistance and continuity ranges. The 210800 can also indicate ac voltage up to 500 V.

The 210800 and 210801 test insulation at 500 V dc (nominal); the 210802 tests insulation at 250 V dc (nominal).

Each tester has a 50 μA moving coil meter with a black scale plate, white calibrations and a red pointer. The test leads connect to fully shrouded terminal socket at the top of the case, and wrap around the case through the slotted carrying handle when not in use. Test prods or alligator clips may be used and storage slots are provided in the case moulding for them. The insulation, resistance or continuity functions are selected by a single switch and a test is initiated by pressing the TEST push-button. The condition of the internal battery can also be checked. The 210800 acts as a voltmeter with the switch in any position other than the blank position and the TEST push-button not pressed. Therefore an immediate indication can be given of whether a circuit is energized or not as soon as the test leads are connected. Capacitive circuits are automatically discharged after insulation tests.

The case is fitted with a fold-away support stand and non-slip rubber feet.

Each of these instruments can be supplied with a rubber outer casing for extra protection in rough working conditions.

The instructions given in this book are common to all the testers except where stated.

APPLICATIONS

These insulation testers are intended for installation and maintenance work on domestic and industrial wiring systems, transformers, motor windings, electrical appliances etc.

Circuit and continuity measurements may be made; the 210800 will also measure ac voltage up to 500 V.

ACCESSORIES

SUPPLIED WITH THE INSTRUMENT

A test lead set including prods and clips, an Instruction Manual, and Cat. No. 210835 Carrying Case.

RECEIVING INSTRUCTIONS

When your Biddle instrument arrives, check the equipment received against the packing list to ensure that all materials are present. Notify Biddle Instruments, Blue Bell, Pa. of any shortage of materials.

Examine the instrument for damage received in transit. If any damage is discovered, file a claim with the carrier at once and notify Biddle Instruments or its nearest authorized sales representative, giving a detailed description of the damage observed.

This instrument has been thoroughly tested and inspected to meet rigid inspection specifications before being shipped. It is ready for use. To confirm that the tester is in good operating condition, see the "OPERATION" Section.

SPECIFICATIONS

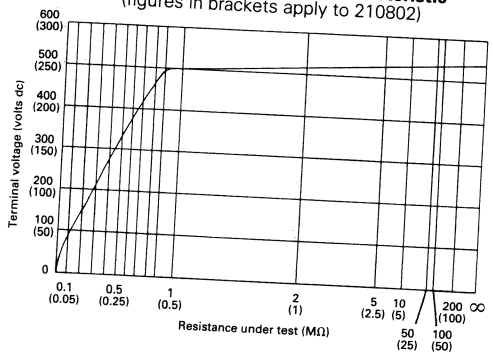
Catalog No.		**210800**	**210801**	**210802**
Insulation Test Voltage		500 V dc	500 V dc	250 V dc
Ranges	Insulation resistance	0 — 200 MΩ	0 — 200 MΩ	0 — 100 MΩ
	Resistance (i)	—	0 — 1 MΩ	0 — 500 kΩ
	(ii)	0 — 200 Ω	0 — 200 Ω	0 — 200 Ω
	Continuity	0 — 2 Ω	0 — 2 Ω	0 — 2 Ω
	Voltage	0 — 500 V ac	—	—
Terminal Voltage dc (nominal on o/c)				
	Insulation resistance range	<600 V (500 V ± 10% at 1 MΩ)	<600 V (500 V ± 10% at 1 MΩ)	<300 V (250 V ± 10% at 500 kΩ)
	Resistance ranges (i)	—	11 V	5.5 V
	(ii)	450 mV	450 mV	450 mV
	Continuity range	450 mV	450 mV	450 mV
Terminal Current (nominal on s/c)				
	Insulation resistance range	750 μA	750 μA	750 μA
	Resistance range (i)	—	170 μA	170 μA
	(ii)	9 mA	9 mA	9 mA
	Continuity range	9 mA	9 mA	9 mA
All Models: —				
Accuracy (at 20°C)		± 2.5% of scale length (± 0.075" Outer Scale, ± 0.050" Inner Scale) except 2 Ω continuity range which is ± 5% of scale length.		

SPECIFICATIONS

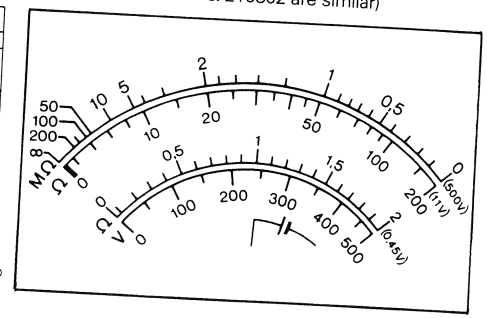
Movement		50 μA f.s.d.
Discharge		Automatic discharge of capacitive circuits via a 470 kΩ ± 10% resistor when 'TEST' push-button is released following an insulation test.
Temperature Range		Operation −5°C to +40°C
Temperature Coefficient		±0.1%°C
Humidity	Operation	90% R.H. max. at 20°C 80% R.H. max. at 35°C
	Storage	95% R.H. max. at 35°C
Fuse		500mA 250 V ceramic fuse type F, 20x5 mm.
Power Supply		Single 9 V battery IEC 6-F22 type e.g. Eveready 216 (NEDA 1604) Current consumption 55 mA max. on insulation range — 210800 and 210801 17 mA max. on insulation range — 210802 22 mA max. on resistance and continuity ranges.
Dimensions		8¼" x 3¾" x 2½" approx. (209 x 95 x 57 mm).
Weight		1 lb. 1 oz. approx. (.485 kg)

SPECIFICATIONS

Typical Terminal Voltage Characteristic
(figures in brackets apply to 210802)



Typical Cat. No. 210800 Scale
(210801 & 210802 are similar)



WARNING

1. The circuit under test **must** be de-energized before insulation, resistance or continuity tests are made.
   Switch the circuit off and check that it is so by making a voltage test. 210800 will automatically indicate any ac voltage present as soon as the test leads are connected.
2. 210800 tester must only be used to measure ac voltages. Take care when the voltage is greater than 50V.
3. Where capacitive circuits have been tested allow a suitable time to elapse before disconnecting the test leads in order for the circuit to discharge.
4. Instruments used in dusty environments should be stripped and cleaned periodically.
5. Do not leave the meter exposed to direct heat from the sun for long periods.
6. Do not use the instrument or any accessories for any purposes not described in this manual.
7. The Tester and the sample to which it is connected are a source of high-voltage electrical energy and all persons making or assisting in the tests must use all practical safety precautions to prevent contact with energized parts of the test equipment and related circuits.
8. Persons actually engaged in the test must stand clear of all parts of the complete high-voltage circuit unless the set is de-energized and all parts of the test circuit are grounded.

PRELIMINARY PROCEDURE

(a) Fitting a battery or fuse
Remove the battery and fuse compartment cover from the rear of the case by releasing the cross-head screw in the center and levering upwards. The battery and fuse compartment will be exposed. Observe the correct polarity as shown on the holder when replacing the battery. Replace the cover

(b) Checking battery condition
Set the selector switch to ⊣⊢ and press the 'TEST' push-button. The meter pointer should

deflect to within the 'battery check' arc on the scale (⊣⊢).

Note: It is advisable to remove the battery if the tester is not to be used for any length of time. Never leave discharged batteries in the tester because of the possibility of damage by leaking electrolyte.

(c) Setting the meter mechanical zero
With the tester horizontal set the meter pointer to zero (∞ on insulation range) if necessary, using the mechanical adjuster located centrally on the front panel.

(d) Connecting and checking the test leads
Connect the red and black test leads, terminated with the appropriate prods, or clips, to the '+' and '−' terminal sockets respectively.
Inspect the test leads to see that they have good, unbroken insulation. Connect the test lead prods or clips together and set the selector switch to '2Ω'. Press the 'TEST' push-button and check that the meter reads 0. If a high resistance reading is obtained or one greater than full scale, check the connections. If the reading is still high suspect that the test leads may be at fault or that the fuse has ruptured.

Note:— The fuse is located in clips in the battery and fuse compartment at the rear of the case.

INSULATION TESTS

The red test lead is connected to earth, frame of the equipment or cable sheath etc. and the black test lead is connected to the circuit under test or cable core.

With the selector switch set to '200 MΩ' ('100 MΩ' on the 210802), and the 'TEST' push-button pressed, the insulation resistance can be read from the top meter scale.

Capacitive circuits automatically discharge through the tester when the 'TEST' push-button is released. Therefore, wait a few moments before disconnecting the test leads to allow this to happen. The suggested time to allow for discharge of capacitance is 5 seconds per microfarad. The 210800 will automatically monitor the discharge on its voltage range, thus showing when it is safe to remove the test leads.

OPERATION

RESISTANCE AND CONTINUITY TESTS

The test leads are connected across the circuit under test and the selector switch set to the required resistance or continuity range.

When the 'TEST' push-button is pressed the resistance is indicated on the appropriate meter scale. There is a separate scale for each range so the readings are direct.

Release the push-button and remove the test leads.

Note:-if an insulation test is followed immediately by a resistance test on the '2Ω' range, wait one minute for the circuit to settle and the pointer to regain zero.

AC VOLTAGE MEASUREMENTS (210800 only)

The voltage range is automatically selected when the switch is in any position (other than the blank position) and the 'TEST' push-button **not** pressed. Connect the test leads across the circuit under test and switch the circuit on. The tester will indicate if the circuit is energized, and the level of the voltage present (up to 500 V ac) will be shown on the inner scale.

USING THE INSULATION TESTER

DESIRABILITY OF INSULATION TESTING

The safety of electrical installations and apparatus depends on the condition of the insulation. It is essential that this is thoroughly checked when new equipment is installed, while being subjected to a voltage high enough to break through any mechanical flaws arising from manufacture or installation.

It is also desirable, in order to avoid interruptions or breakdowns, that tests on the condition of the installation and equipment are made from time to time to ensure that deterioration is not occurring because of the accumulation of dirt or moisture, or caused by mechanical factors of wear or breakage.

In every case the insulation resistance can be measured very simply by using the Megger Tester.

PREVENTIVE MAINTENANCE

It is good practice to make regular tests of the insulation resistance of all larger machinery and thus detect any incipient faults. When the tests are entered in the logbook a considerable variation between test results will be noted.

It is important to test under similar conditions each time and to note the current weather status.

Damp weather — or damp conditions of use or storage — can cause large reductions in insulation resistance. Drying out by heat or by running for a period, should give a more consistent and appropriate insulation resistance value.

A counter effect to that above occurs because the insulation resistance of the varnishes used in the construction of machine windings becomes lower when hot than when cold. Thus for constant comparisons the temperature of the machine under test should also be noted.

The best plan is regularly to make the time for testing a machine as soon as possible after it has been shut down. The insulation resistance is then likely to be at it lowest operational value. This then would become the figure which would show any continuing mechanical depreciation or potential insulation breakdown.

USING THE INSULATION TESTER

If the machine stands idle in humid conditions a worse picture might well apply but this would normally be assumed to be safe during the running up to temperature, provided that the resistance at working temperature remained unchanged.

TESTING MOTORS AND GENERATORS

1. Disconnect the equipment from the supply by opening the main switch and removing the main fuses.
2. Join together BOTH terminals on the motor side of the double pole main switch.
3. With a contactor operated starter where all the lines to the motor are disconnected at 'off' it is necessary to make tests to earth on both the incoming and outgoing terminals of the starter.
4. Connect the red test lead to earth using the frame of the motor.
5. Using the black test lead measure the resistance of each part of the circuit in the usual way. If the value is unsatisfactory then separate tests in starter, motor and cables must be carried out to locate the defect.
6. If the motor itself is suspect, disconnect its supply cables and with one lead connected to the frame carry out the following tests:
7. Test with the armature and field windings connected together.
8. Test with the brushes lifted from contact with the commutator.
9. Test on the armature only, section by section.
10. If all resistances are low the fault can usually be remedied by complete and careful cleaning of the machine. Equipment that has been in service for a period can accumulate metallic, or other conducting, dust especially when mixed with oil from bearings etc. The leakage paths from such deposits are eliminated by thorough cleaning.

CIRCUIT DESCRIPTION

INSULATION TEST RANGES (200 MΩ or 100 MΩ)
An inverter provides a stable 500 V test voltage in the case of the 200 MΩ instruments (210800 and 210801) and 250 V in the case of the 210802. The circuit is arranged so that the pointer gives a slight 'kick' before settling back to a steady reading. This is noticeable only above about 100 MΩ and is included to show that the instrument is functioning correctly when measuring resistances corresponding to small deflections of the pointer. A 470 kΩ resistor is connected automatically between the positive and negative test terminals on releasing the 'TEST' button, to allow for capacitive circuits to discharge.

VOLTAGE RANGE (210800 only)
On any marked position — except the blank one separating the continuity ranges from the insulation resistance (high voltage) range — with the 'TEST' button **not** pressed, the instrument acts as a voltmeter, reading 0 — 500 V ac.

CONTINUITY RANGES (2 Ω and 200 Ω)
The nominal test voltage on these ranges is 450 mV. Overload protection is provided by a 500 mA 250 V ceramic fuse type F. Changing the fuse will have no effect on the calibration of the ranges.

RESISTANCE RANGES (1 MΩ and 500 kΩ)
The nominal test voltage is 11 V in the case of the 1 MΩ range (210801) and 5,5 V in the case of the 500 kΩ range (210802). Protection against overload is provided by a positive temperature coefficient (PTC) thermistor, and by the fuse.

BATTERY CHECK
In the battery check position the instrument functions as a voltmeter of approx. 12 V f.s.d. (6 V mid-scale). The battery is rejected if its voltage is less than 6 V. During this test the battery is drawing approx. 50 mA, so the 'TEST' button should not be pressed longer than necessary to make the check.

In order for any servicing and maintenance work to be carried out on the tester it must be opened up. NOTE: THIS WILL AUTOMATICALLY INVALIDATE ANY WARRANTY COVERING THE INSTRUMENT. It is recommended that this type of work be carried out by a qualified instrument technician only.

OPENING THE TESTER

The tester should not be connected to any external circuit and the test leads should be removed. All parts should be stored carefully ready for re-assembly.

1) Lay the tester face down on the work bench.
2) Remove the test prods or clips from their storage slots.
3) Remove the battery and fuse compartment cover plate. Release the cross-head screw in the center and then lift up and towards the top of the tester until the cover is completely free. Do not lose the spare fuse which is attached to the inside of the cover.

   Note: — The tester stand is not fixed in place once the cover has been removed. Be careful that it is not lost.

4) Remove the battery.
5) Release the four cross-head screws, one in each corner of the rear cover.
6) Lift the rear cover assembly vertically off the tester.
7) The printed circuit board and components are now exposed so that test measurements and settings can be made.

REMOVING THE PRINTED CIRCUIT BOARD

If it is necessary to unsolder components, service the selector switch or push-button or remove the movement, it is necessary to take out the printed circuit board.

1) Unclip the red and black wires connecting the meter to the board, at the board end.
2) The push-button prevents the board from being lifted straight out. Therefore hold the front cover assembly in one hand and grip the push-button S2 with the other. Pull firmly until the button is released from the switch, (take care that it is not lost), then continue to lift until the selector switch mechanism separates from its knob.
3) The removal of the selector switch arms from the

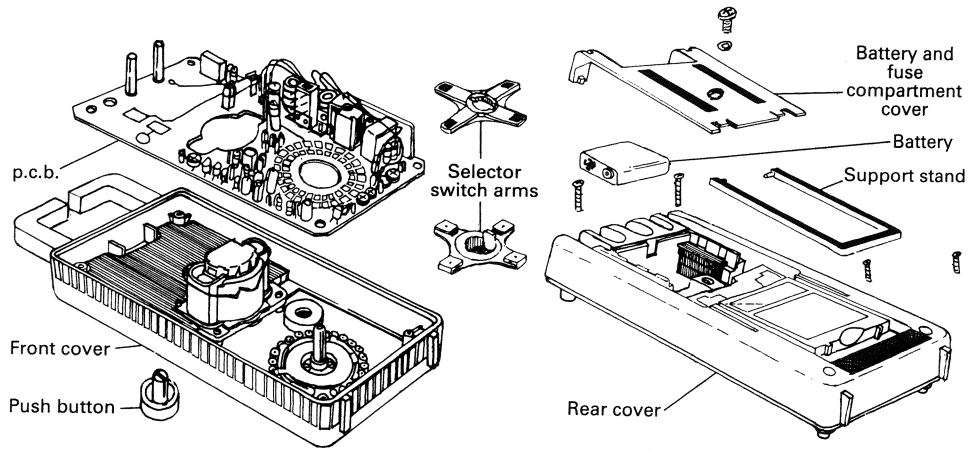


Fig. 1: The tester disassembled

board should not normally be necessary. However, to achieve this, hold the rear switch arm moulding still and rotate the front one until they spring apart. (The two sections are identical and interchangeable).

Note: — The contacts are retained and will not drop out. To replace the selector switch arms, position them on either side of the board and line up the nub on one with the recess on the other. Push together and turn counter clockwise until locked.

RE-ASSEMBLY

The tester is re-assembled by performing the operations in the reverse order.

When replacing the p.c.b. in the front cover assembly, ensure that the slots in the selector switch mouldings line up with the 'keys' on the knob spiggot.

Ensure that the parts are properly in place before securing the screws. The battery must be fitted properly, therefore observe the correct polarity as indicated in the battery compartment.

CALIBRATION

Refer to the circuit diagram and to fig. 2 to find the positions of the adjustment potentiometers.

There is no adjustment of the battery check function nor of the 210800 ac voltage range.

Open up the tester as described above in 'Opening the tester' and connect a 9 V battery (IEC 6-F22 type) to the circuit. This may be done using short leads with alligator clips, for convenience. The positive being connected to the leg of R18 and the negative to the pin from which an orange lead connects to the push-button switch.

Setting the 2 Ω range

1) Connect the test leads to the instrument terminals and to a known 2 Ω ± 2% resistor.
2) Press the push-button and adjust R7 to give a full scale reading on the meter.
3) Connect the test leads to a known 0.5 Ω ± 2% resistor.
4) Press the push-button and adjust R19 to give a reading of 0.5 Ω on the '2 Ω scale'.

5) Because the adjustments of R7 and R19 are interactive the setting procedure must be repeated as necessary until the required accuracy is obtained.

Note: — It is necessary to ensure a good connection between the test lead clips and the resistor terminals in order to keep contact resistance as low as possible.

Setting the 200 Ω range

1) Connect the test leads to a known 50 Ω ± 1% resistor.
2) Press the push-button and adjust R8 to give a reading of 50 Ω on the '200 Ω scale'.

Setting the 1 MΩ range (210801) **or 500 kΩ range** (210802)

1) Connect the test leads to a known 100 kΩ ± 1% resistor for 210801 or 50 kΩ ± 1% resistor for 210802.
2) Press the push-button and adjust R28 to give a reading of 0,1 MΩ or 50 kΩ on the '1 MΩ scale' or '500 kΩ scale' as appropriate.

Setting the insulation resistance range

(200 MΩ range 210800 and 210801. 100 MΩ range 210802)

1) Connect the test lead clips together and adjust R15 to give a zero reading on the '200 MΩ scale', or '100 MΩ scale' as appropriate.
2) Connect the test leads to a known 2 MΩ ± 1% resistor for 210800 and 210801 or 1 MΩ ± 1% resistor for 210802.

Note: — These resistors must be able to withstand the voltage applied to them, see the terminal voltage characteristics given in the Specification section.

3) Press the push-button and adjust R26 to give the correct reading 2 MΩ or 1 MΩ as appropriate on the insulation resistance scale (i.e. '200 MΩ scale' or '100 MΩ scale').
4) Connect the test leads to a known 500 kΩ ± 1% resistor for 210800 and 210801 or 250 kΩ ± 1% resistor for 210802.

Note: — These resistors must also be able to withstand the voltage applied to them.

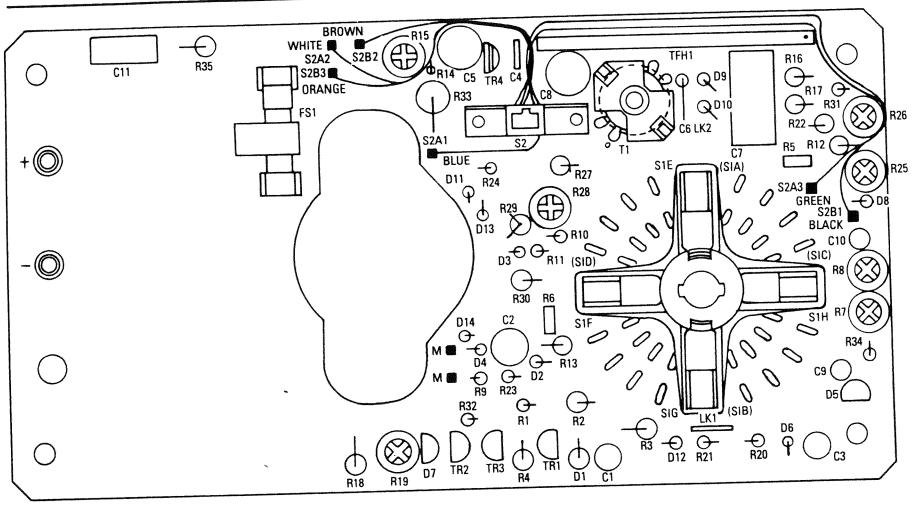


Fig. 2: The printed circuit board

Notes referring to fig. 2 page 20: —
R24 — on 210800 only
R27 — on 210801 and 210802 only
R28 — on 210801 and 210802 only
R29 — on 210801 and 210802 only
R30 — on 210801 and 210802 only
C6 — on 210800 and 210801 only
(replaced by link LK2 on 210802)
D9 — on 210800 and 210801 only
D11 — on 210800 only
D13 — on 210800 only
D14 — on 210801 and 210802 only
LK1 — on 210801 and 210802 only

5) Press the push-button and adjust R25 to give the correct reading 0,5 MΩ or 0,25 MΩ as appropriate on the insulation resistance scale, (i.e. '200 MΩ scale' or '100 MΩ scale').
6) Because the adjustments of R15, R25 and R26 are interactive the setting procedure must be repeated as necessary until the required accuracy is obtained.

Having set all the potentiometers the calibration of all the scale points may be checked against the specification using appropriate value resistors or resistance boxes. Following the setting up and calibration checks, the potentiometers should be locked in place using a suitable varnish, and the tester re-assembled.

CLEANING THE MULTIMETER

A mild solution of detergent in water is recommended for cleaning the instrument case. Wipe the exterior surface with a moistened cloth taking particular care not to scratch the display cover.

CARE OF THE BATTERY

If the tester is not in regular use, the condition of the battery should be checked periodically. Preferably the battery should be removed and stored separately, to avoid possible damage by leaking electrolyte.

WARRANTY AND REPAIRS

WARRANTY

All products supplied by Biddle Instruments are warranted against all defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair will be shipped Prepaid and Insured. The warranty does not include batteries, lamps or tubes, where the original manufacturer's warranty shall apply. WE MAKE NO OTHER WARRANTY.

The warranty is void in the event of abuse or failure by the customer to perform specified maintenance as indicated in the manual.

REPAIRS

Biddle Instruments maintains a complete instrument repair service. Should this instrument ever require repairs, we recommend that it be returned to the factory for repair by our instrument specialists. When returning instruments for repairs, either in or out of warranty, they should be shipped Prepaid and Insured, and marked for the attention of the Instrument Service Manager.

PARTS LIST

(Components are common to all instruments except where stated)

R1	Resistor	82Ω ±2%	½W	
R2	Resistor	330Ω ±5%	2½W	
R3	Resistor	47Ω ±5%	2½W	
R4	Resistor	22,1kΩ ±1%	¼W	
R5	Posistor	10kΩ		
R6	Posistor	10kΩ		
R7	Potentiometer	100Ω ±20%	½W	
R8	Potentiometer	10kΩ ±20%	½W	
R9	Resistor	1kΩ ±1%	¼W	
R10	Resistor	221kΩ ±1%	¼W	
R11	Resistor	121Ω ±1%	¼W	21800 and 21801
		221Ω ±1%	¼W	21802
R12	Resistor	5,62kΩ	¼W	
R13	Resistor	10kΩ ±10%	½W	
R14	Resistor	2,74kΩ ±1%	¼W	
R15	Potentiometer	1kΩ ±20%	½W	
R16	Resistor	18MΩ ±5%	½W	210800 and 210801
		9,1MΩ ±5%	½W	210802
R17	Resistor	20MΩ ±5%	½W	210800 and 210801
		10MΩ ±5%	½W	210802
R18	Resistor	3,32kΩ ±1%	¼W	
R19	Potentiometer	1MΩ ±20%	½W	
R20	Resistor	15kΩ ±1%	¼W	
R21	Resistor	240kΩ ±1%	½W	
R22	Resistor	10kΩ ±10%	½W	
R23	Resistor	39,2kΩ ±1%	¼W	
R24	Resistor	4,53MΩ ±1%	½W	210800 only
R25	Potentiometer	50kΩ ±20%	½W	
R26	Potentiometer	1MΩ ±20%	½W	
R27	Resistor	3,9MΩ ±5%	½W	210801 only
		1,8MΩ ±5%	½W	210802 only
R28	Potentiometer	1MΩ ±20%	½W	210801 and 210802 only

PARTS LIST

R29	Resistor	200kΩ ± 5%	1W 210801 only
		100kΩ ± 5%	1W 210802 only
R30	Resistor	200kΩ ± 5%	1W 210801 only
		100kΩ ± 5%	1W 210802 only
R31		100kΩ ± 1%	¼W
R32	Resistor	47,5kΩ ± 1%	¼W
R33	Resistor	470kΩ ± 10%	1W
R34	Resistor	301Ω ± 1%	¼W
R35	Resistor	100kΩ ± 20%	½W
C1	Capacitor	10µF 35V	electrolytic
C2	Capacitor	100µF ± 20%	6.3V
C3	Capacitor	10µF 35V	electrolytic
C4	Capacitor	330pF ± 2%	63V
C5	Capacitor	47µF 25V	electrolytic
C6	Capacitor	0,0047µF 630V	210800 and 210801
		link LK2	210802
C7	Capacitor	0,068µF 630V	
C8	Capacitor	100µF 16V	electrolytic
C9	Capacitor	22µF 16V	tantalum
C10	Capacitor	4,7µF 25V	tantalum
C11	Capacitor	0,015µF 630V	
D1	Zenner diode	BZV48C4V7	
D2	Zenner diode	BZX79C15	
D3	Diode	1N4148	
D4	Diode	1N4148	
D5	Band gap diode	ICL8069DCZR	
D6	Diode	1N4148	
D7	Band gap diode	ICL8069DCZR	
D8	Zener diode	BZX79C30	
D9	Diode	BA158	210800 & 210801 only
D10	Diode	BA158	
D11	Diode	1N4148	210800 only
D12	Diode	1N4148	
D13	Diode	1N4148	210800 only
D14	Diode	1N4148	210801 & 210802 only

PARTS LIST

TR1	Transistor	BC214
TR2	Transistor	BC214
TR3	Transistor	BC214
TR4	Transistor	VN10KM
TFH1	Thick film hybrid	part no. 10394-1
T1	Transformer assembly	part no. 10394-2
FS1	Fuse	500mA ceramic
SW2	Switch assembly	part no. 10394-3
LK1	Wire link	part no. 10394-4 210801 and 210802 only
LK2	Wire link	part no. 10394-4 210802 only (replaces C6)

RECOMMENDED SPARES LIST

		part no.
Front cover assembly		10394-5
Rear cover assembly		10394-6
Switch assembly		10394-3
Printed circuit board assembly	210800	10394-7
	210801	10394-8
	210802	10394-9
Movement	210800	10394-10
	210801	10394-11
	210802	10394-12
Transformer bobbin		10394-13

Fig. 3: Circuit Diagram for Cat. Nos. 210800, 210801, 210802