

SPECIFICATION FOR DIGITAL CAPACITANCE UNBALANCE TEST SET.

0. FOREWORD

TC-48-90

0.1 This specification is issued under the fixed serial No. The final number indicates the year of original adoption as standard.

ADOPTED

0.2 This specification requires reference to the following: Indian Railway Standard (IRS) and the Indian Standard (IS) Specifications.

IRS:S-23: Electrical Signalling and interlocking equipment.

IS: 6756-1972: Technical documentation to be supplied with electronic measuring equipment.

1. SCOPE

1.1 Digital capacitance unbalance test set:

Used for the measurement of cross talk coupling and ground coupling in the voice frequency range for carrying out and checking capacitive and transposition balancing of line circuits of quaded telecommunication cables.

1.2 This specification covers the electrical characteristic and essential technical requirements of capacitance unbalance measuring set.

2.0 TERMINOLOGY:

2.1 For the purpose of this specification the terminology given in IRS: S-23 shall be applied.

2.2 The terms referred to in this specification but not covered in IRS:S-23 are defined below:-

2.2.1 The cross-talk coupling

- K1 - The capacitance unbalance of a side circuit of a quad with respect to the other side circuit of the same quad.
- K2 - The capacitance unbalance of phantom circuit with respect to side circuit 1 of a quad.
- K3 - The capacitance unbalance of phantom circuit with respect to side circuit 2 of a quad.
- K9 - The capacitance unbalance of side circuit 1 of quad 1 with respect to side circuit 1 of quad 2.
- K10- The capacitance unbalance of side circuit 1 of quad 1 with respect to side circuit 2 of quad 2.
- K11- The capacitance unbalance of side circuit 2 of quad 1 with respect to side circuit 1 of quad 2.
- K12- The capacitance unbalance of side circuit 2 of quad 1 with respect to side circuit 2 of quad 2 where quad 1 and quad 2 are adjacent quads.

Note: For schematic sketch of cross talk coupling refer Annexure 'A'.

2.2.2 Ground Coupling

- e1- Capacitance unbalance of side circuit 1 with respect to cable sheath (earth).
- e2- Capacitance unbalance of side circuit 2 with respect to cable sheath (earth)

3.0 GENERAL REQUIREMENTS:

- 3.1 The capacitance unbalance measuring test set shall be capable of measuring capacitance unbalance between individual voice circuits and ground coupling.
- 3.2 The test set shall have built in oscillator and amplifier detector.
- 3.3 The test set incorporating the state of art of digital technology shall have facilities to digitally display the measured values.
- 3.4 The test set shall be robust in construction to withstand the conditions of extensive field applications from place to place. It shall be portable, equipped with compact and durable carrying case.
- 3.5 The set is intended for use in tropical climate condition. The manufacturer to guarantee the satisfactory performance to the test set under the following conditions:-
 - Operating temp. 0°C to + 55°C
 - Storage temp. -10°C to 60°C
 - Humidity: Upto 95%RH at 40°C.
- 3.6 Unless otherwise specified, all exposed metal parts shall be plated, painted or otherwise protected against corrosion in accordance with clause 13 of IRS:S-23.
- 3.7 The manufacture shall be in accordance with good engineering practice. The general requirement of workmanship limits, fits and rejection shall be in accordance with IRS:S-23 to the extent applicable.
- 3.8 Three copies of detailed instructions manuals covering the requirements of clause 4 of IS:6756 shall be supplied by the manufacturer alongwith each test set.
- 3.9 Complete details of principle of operation, circuit diagrams for maintenance and repairs of the measuring instrument as well as recommended list of spare parts for 3 years shall be furnished.
- 3.10 The test set shall be supplied with -
 - Input Jacks.
 - Shielded test leads. Lead balancing for coupling and for effective capacitances shall be suitably incorporated.

- 3.11 Quad to quad switching units for selecting K9 to K12 shall be incorporated inside the equipment.
- 3.12 Provision shall be there for lead balancing at position, K1, K2, K3, e1 and e2.

4.0 ELECTRICAL PARAMETERS

4.1 The capacitance unbalance measuring test set shall be capable of measuring at least the following measuring mode.

a) Capacitance unbalance/coupling within a quad:
= K1, K2, K3.

b) Ground couplings within a quad: e1, e2.

c) Capacitance unbalance/coupling between adjacent quads:
= K9 to K12

4.2 The measuring frequency shall be 800Hz or 1kHz.
(Preferably both may be available for selection by either an internal or external switch).

4.3 The test set shall be capable of measuring the capacitance unbalance in the range $\geq 0 \pm 9990$ pf.

4.4 The accuracy of measurement of capacitance unbalance shall be \pm (2% of measured value + 2 pf)

4.4.1 The measurement of the unbalance for any cross talk coupling/ground coupling shall be conducted at

a) 12 V DC, 12 VDC + 20%, 12 VDC - 10%

and b) 230v AC, 230v AC + 10%, 230v AC-20%.

Average mean of the observed readings shall determine the accuracy. The same shall be repeated for all cross talk couplings and ground couplings as indicated in clauses 2.2.1 and 2.2.2 respectively.

4.5 Indications: To be 3 digit display with sign and units.

4.6 Measuring time: Better than 0.5 sec.

4.7 Power Supply

4.7.1 The capacitance unbalance measuring test set shall be suitable for working from external battery of 12 volts with a variation of + 20% and - 10% and also from 230 volts, 50 Hz commercial power supply with a variation of -20% and + 10%.

4.7.2 It shall be equipped with rechargeable nickel cadmium battery suitable for minimum 8 hours continuous operation.

4.7.3 The battery check switch shall be provided for checking the voltage before measurement. The range of the battery voltage within which the equipment functions in the specified accuracy shall be marked in a calibrated scale.

4.7.4 Suitable arrangement shall be provided to protect the equipment against the reversal of the polarity of the battery.

5. TESTS

5.1 Each equipment offered shall be subjected to the following tests.

5.2 Visual inspection.

5.2.1 This test shall be carried out as per relevant sub-clause of 14.2 of IRS:S-23 and clause 3 of the specification.

5.3 Electrical characteristic.

5.3.1 All electrical characteristic as stipulated in clause 4 of this specification shall be checked.

6.0 MARKING:

6.1 The following shall be suitably marked on each instrument.

- (a) Name of the instrument.
- (b) Manufacturer's name/trade mark/serial number, year of manufacture.
- (c) IRS Specification number
- (d) Any other marking considered necessary by the manufacturer.

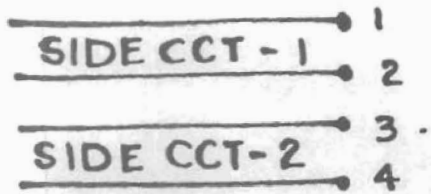
7.0 PACKING:

7.1 The capacitance unbalance measuring test set shall be so packed as to permit convenient handling and to protect against loss or damage during the transit and storage.

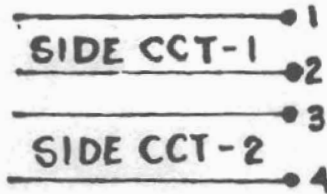
CROSSTALK COUPLING WITHIN SAME QUAD

CROSSTALK COUPLING WITHIN ADJACENT QUAD

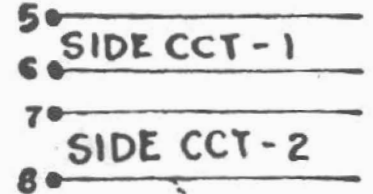
Qd'x



Qd'x'

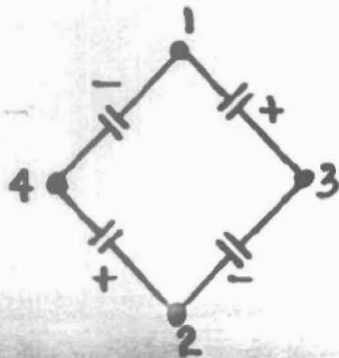


Qd'x'+1

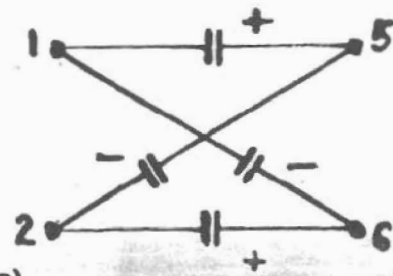


MODE

MO

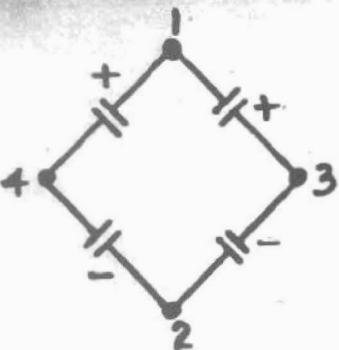


K 1

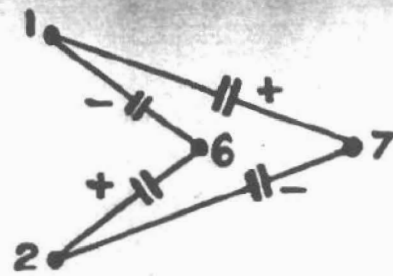


K 9

$(15+26)-(16+25)$

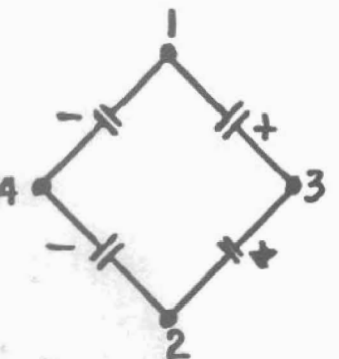


K 2

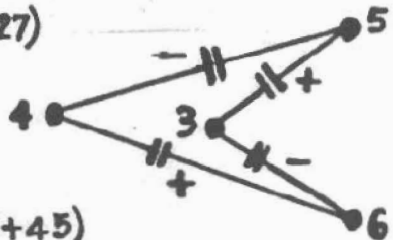


K 10

$(17+28)-(18+27)$

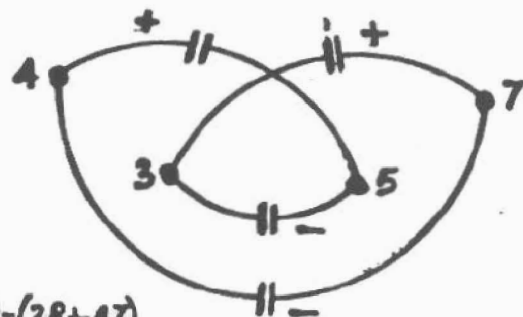


K 3



K 11

$(35+46)-(36+45)$



K 12

$(37+48)-(38+47)$

SCHEMATIC SKETCH FOR CROSSTALK COUPLING