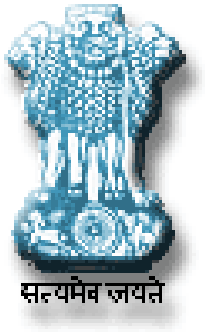

Government of India - Ministry of Railways

RESEARCH DESIGN& STANDARDS ORGANISATION

Manak Nagar, Lucknow-226011

INDIAN RAILWAY
STANDARD SPECIFICATION
for
DOUBLE LINE BLOCK INSTRUMENT

SPECIFICATION NO. IRS: S IRS:S 22/2016

Version 1.0

SIGNAL DIRECTORATE
RESERCH DESIGN & STANDARD ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR
LUCKNOW -- 226011

DOCUMENT DATA SHEET		
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Authors: See Document Control Sheet **Signed by:** **Name: Hari Om Kushwaha** **Designation: Director/ Signal**		
Approved By: **Name: Shri Sandeep Mathur** **Designation: Executive Director/Signal** **RDSO, Lucknow**		
Abstract This document specifies the requirement of Double Line Block Instrument suitable for Indian Railways.		

DOCUMENT CONTROL SHEET

Designation	Organization	Function	Level
Director/Signal	RDSO	Member	Prepare
ED/Signal	RDSO	-	Approval

AMENDMENTS

Sl. No.	Specification Number	Version	Amendment	Amendment Details	Effective Date
1.	IRS:S 22/1991	--	--	--	1992
2.	IRS:S 22/2016	Version 1.0	--	Cl. 0.2, 2(e), 7.21, 8.2, 8.4, 8.6, 8.7, 9.2.5, 9.2.6, 9.2.7, 9.2.12(b), 13.1 and Annexure 'B' Modified. Appendix 'A', Annexure 'A', 'B' and 'C' renamed.	28.04.2016

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INDIAN RAILWAY STANDARD SPECIFICATION
For
DOUBLE LINE BLOCK INSTRUMENT
(TENTATIVE)

Serial No. S: 22-2016

0. FOREWARD

0.1 This specification is issued under a fixed serial No. 22-91. The final number indicates the year of original adoption as standard.

ADOPTED 1991, REVISED, 2016

0.2 This specification requires reference to the following specifications:-

IRS:S 23-89	Indian Railway Standard Specification for Electrical signalling and interlocking equipment.
IRS:S 10-78	Indian Railway Standard Specification for Mechanical Signalling and Interlocking Equipment.
IRS:S 31-80	Indian Railway Standard Specification for DC Polarised relay, 3-Position (Tentative).
IR:9000	Indian Railway Standard Specification for Basic climatic and mechanical durability tests for electronic components.
RDSO/SPN/191 /2005	Specification for DTMF Based Electronic Block Bell & Block Telephone Equipment.

0.3 This specification is intended mainly to cover the technical provisions and the provisions relating to the general requirements of the equipment and supply of material and does not include all the necessary provisions of the contract.

1. SCOPE

1.1 This specification covers the general requirements of double line block instrument to IRS design for use on Indian Railways in Electrified and Non-electrified sections.

1.2 Special requirements for controlling out lying sidings in block section, emergency release contact assembly, counter bracket, veeder counter etc. shall be provided in the instrument, when required by the purchaser.

1.3 This specification does not cover the requirements of all the associated devices used in conjunction with the block instrument for its working.

2. SYSTEM COMPOSITION :

The following components shall be provided within the Block instrument:

(a) Needle type visual indication (upper and lower) both indicating "Train on Line", "Line Closed" and "Line Clear" on segments coloured red, white and green respectively
(b) A Commutator;
(c) A Bell Plunger;
(d) A block bell;
(e) A H.M.T. set with induction coil and condenser or Block Telephone as per RDSO/SPN/191 (Latest) or Similar and
(f) 3-position polarised relay when required by the purchaser.

2.1 The block handle shall be provided with electro-mechanical locking device with forced dropping arrangement which shall lock the handle after it is turned from "Line Clear" to "Train On Line".

3. INDICATIONS:

3.1 The instrument shall be provided with two sets of needle type visual indicators, one for 'UP direction movement' and the other for 'Down direction movement'.

3.2 The top set of indicator shall normally indicate the state of block section for trains proceeding from the station, and the bottom set of indicator shall normally indicate the state of block section for trains approaching station where the block instrument is situated.

3.3 Each set of visual indicator shall give the following indications :

3.3.1 The "Line Closed" indication shall appear when there is no train in the block section, and permission has not been given for any train to enter it. (Needle vertical on white segment).

3.3.2 The "Line Clear" indication shall appear when permission has been given or received for a train to enter the block section (Needle deflected right on green segment).

3.3.3 The "Train On Line" indication shall appear when the block section is occupied by a train, or in case of any other obstruction (Needle deflected left on Red segment).

3.4 The above positions (Para 3.3.1 to 3.3.3) shall be achieved through mechanically operated block handle. The "Upright position" of the handle indicator shall show "Line Closed", about 20^{o} towards left shall show "TOL" and 20^{o} towards right shall show "Line Clear" positions.

3.5 "Train On Line" shall be white letters on red background, "Line Closed" shall be black letters on white background and "Line Clear" shall be white letters on green background.

3.6 Any other additional indication as specified by the purchaser may also be provided.

4. CONTROLS:

4.1 The instrument shall be such that:

4.1.1 The station Master has to go through one or more definite operations of the block handle in addition to the working of Bell Plunger before he can normalise the block instrument for closing the block section after the operation of block handle to "Line Clear" and "TOL" position.

4.1.2 The last stop signal cannot be taken 'OFF' unless the instrument at the block station in advance has been operated showing 'Line Clear' indication in the bottom indicator, and the instrument at the block station asking for ‘Line Clear’ showing ‘Line Clear’ indication in its top indicator.

4.1.3 The instrument provides means for exchange of bell codes by the operation of a single stroke bell.

4.1.4 The last stop signal of the block station shall be replaced to ‘On’ automatically by the entry of the train into the block section and shall be maintained in that position until whole of the train has cleared the block section and the instrument has been put back to ‘Line Closed’ position, and fresh "Line Clear" has been granted by the station in advance.

4.1.5 Block-handle of the block instrument at the receiving end can be turned from 'TOL' to ‘Line Closed’ position only after whole of the train has arrived, the block clearance track has been occupied and subsequently cleared by the train and the reception signals have been put back to ‘ON’.

5. CANCELLATION OF LINE CLEAR:

5.1 Provision shall be made for cancellation of ‘Line Clear’ already granted and such cancellation shall be recorded.

5.2 It shall be possible to cancel the 'Line Clear' already granted only if the train has not entered the block section.

5.3 The initiation of the cancellation procedure shall immediately replace the last stop signal to 'ON', if it had already been taken 'OFF'.

5.4 Arrangement shall be made to prevent the operation of block handle for cancellation of ‘Line Clear’ when the Station Master's key is out.

6. ELECTRICAL CIRCUITS:

6.1 The instrument and the electrical circuit shall be so designed that all requirements of safety of train working are fully complied with.

6.2 All equipments in external circuits shall be provided with cross protection and shall be immuned to false operation by stray currents.

6.3 The electrical circuitry of the block instrument shall be such that the internal circuits are electrically isolated from all external circuits including signal control circuits and the line circuits.

6.4 The circuit arrangement of the instrument with the accessories shall be such that any failure of the equipment is on the safe side and does not go un-noticed.

6.5 DC Polarised, 3-position relay, shall be used for block working. This relay shall comply all requirements as laid down in IRS: S 31 (Latest).

7. GENERAL REQUIREMENTS:

7.1 The block instrument shall be compact and robust in construction fit to withstand rough handling.

7.2 The block instrument shall comply with the requirements as specified in IRS Drawing No. SA 22781 and relevant IRS Drawings for components or any other approved drawings for the double line block instrument supplied by the purchaser.

7.3 It shall have facility for easy maintenance, removal or replacement of any independent component or sub-assembly and shall not disturb the adjoining components or sub-assembly.

7.4 There shall not be any opening on the exterior of' the instrument which will permit irregular access to its interior permitting irregular operation and or interference to its working parts.

7.5 All indication labels, needle indicators and other accessories shall be so fixed on the front side of the instrument as to prevent their unauthorized removal from outside.

7.6 A locking device to lock the instrument in any condition shall be provided to enable the Station Master to prevent unauthorized manipulation of the instrument, during this absence.

7.7 SM's key, when out, shall lock the block handle in any, of the three positions i.e. ‘Line Clear’ , ‘Line Closed’ and ‘TOL’.

7.8 Facility shall be, provided for locking and sealing the cover giving access to the interior of instrument.

7.9 Two block instruments provided in the same room must be fitted with gongs of' distinctive tones to distinguish between the bell codes received at a station from adjoining stations. One gong may conform to IRS drawing No. S 22912 and the other to S 22912A.

7.10 Proper alignment of' all the components in the assembled unit shall conform to the requirements as in IRS: S 10 (Latest).

7.11 Electrical contacts and springs shall conform to the requirements as specified in Clause 9 of IRS :S23 (Pt. II).

7.12 All terminals shall be provided with washers and wiring inside the block instrument shall conform to Clause Nos. 11 & 12 respectively of IRS:S 23 (Part-II Latest). The wiring shall follow a colour code to Indian Standard specification unless otherwise specified.

7.13 A telephone instrument of an approved type shall be provided for each instrument on the left hand side. The case of the telephone instrument shall be metallic or unbreakable synthetic material to an approved specification.

7.14 Name plates provided on front side of the block instrument with ‘UP LINE TO’ and ‘DOWN LINE FROM’ shall have sufficient space for painting or engraving the Name of the station. A separate label/plate for painting or engraving the name of station at which the instrument is used shall also be provided preferably just above the needle indicator dial.

7.15 Wiring diagram should be pasted on inside of the side wall of the cover in each instrument.

7.16 The drawer lock to Clause 7.6 shall be such that the key can not be extracted in unlocked position and be supplied with female/male keys.

7.17 Telephone headset leads shall be of suitable length for connections to the terminals provided for connecting the condenser, induction coil and earth etc.

7.18 The instrument shall be tropicalised so as to comply with the requirements as in Clause 9.2.7.

7.19 The instrument shall comply with all additional requirements as may be specified by the purchaser when the block instrument is required to be used in electrified sections.

7.20 Any component of the block instrument not withstanding the requirements of this specification shall comply with the specified requirements as may be approved by the Purchaser or his nominee.

7.21 It shall be ensured that the values of contact pressure is maintained as mentioned in Annexure 'C'.

8. OPERATING REQUIREMENTS:

8.1 The instrument shall be suitable to work on 12V DC or 24V DC as specified by the Purchaser and shall work satisfactorily with a variation of ±20% of rated voltage and draw as low as current as possible.

8.2 Electrical parameters of needle indicator coil 'TOP' and 'BOTTOM', lock magnet (door lock) coil and bell unit coil shall conform to the values as indicated in the relevant IRS drawings (See Annexure 'C').

8.3 Resistance of the coil in Para 8.2 shall not vary from that specified in relevant IRS Drawings by more than ±5% at 20°C.

8.4 The bell relay shall be similar to "telephone type relay No. DJR 1001-A2-ZR and shall have resistance of 500 ohms" or shall be similar to "O/E/N signal relay part No. O/E/N 46-12-2CE ".

8.5 Induction coil and core for telephone shall conform to the size 25mm dia X 25 mm X 100 mm long similar to ITD Specification or to any other specification approved by the purchaser or his nominee.

8.6 Hand micro telephone without dial shall be similar to ITI type as mentioned in Part (U) of IRS drawing SA-22781 or Block Telephone as per RDSO/SPN/191 or Similar shall be used.

8.7 Resistance of primary and secondary windings of the induction coil shall be 1 ohm and 30 ohms respectively when measured at 20^{o}C (See Annexure 'C').

8.8 All coils shall generally conform to all the requirements as in sub-clause 8.1 to 8.12 of IRS: S 23 as far applicable.

9. INSPECTION AND TESTING:

9.1 Inspection and testing of the block instrument shall be carried out to ensure that all the requirements of this specification and all other relevant specifications and IRS drawings mentioned by the purchaser are complied with.

9.2 Type test

9.2.1 The following shall constitute type tests.

9.2.2 Visual inspection of the block instrument and its components shall be carried out as per relevant IRS drawings and specifications and be ensured that these are of excellent order.

9.2.3 All the insulating components used in the instrument shall withstand satisfactorily 50 Hz AC test voltage of 2 KV applied for one minute.

9.2.4 The insulation resistance of individual components excluding electronic component, if any shall not be less than 10 Mega ohms when measured with 500 V DC under the normal conditions. This test shall be carried out immediately after high voltage test as in Clause 9.2.3.

9.2.5 Performance test on a pair of block instruments connected on a bench shall be carried out to ensure that they comply with the operational requirements as in Annexure 'A'.

9.2.6 Electrical parameters of vital components of block instrument shall comply the values as shown in Annexure 'C'.

9.2.7 The climatic severity test on the block instrument shall be carried out in accordance with IS:9000 as per sequence and severity indicated below:-

S. No.	**Test**	**Degree of severity**	**Duration**	**Reference**
1.	Cold test	0^{o}C	Hot & cold test to be repeated alternatively for 3 cycles with 3 hours duration in each cycle.	IS:9000 Pt. XIV-Sec. I
2.	Dry heat test	55^{o}C		
3.	Damp heat test	40^{o}C 95%	Accelerated RH 7 cycles	IS:9000 Pt. V-Sec. I.

Note:- After completion of damp heat cycle test & standard 24 hours recovery period, the instrument shall withstand 2KV H.V. test as per Clause 9.2.3 above, the I.R. values measured (Cl. 9.2.4) shall not be less than 10 mega ohms

9.2.8 In case it is not possible to subject the complete equipment to climatic test, the following essential components shall be subjected to climatic test as per Cl. 9.2.7

i) Needle Indicator coil 'TOP' & 'BOTTOM';
ii) Bell coil;
iii) Lock magnet coil;
iv) Induction coil;
v) Commutator arrangement &
vi) Bell contact assembly

Note:- After climatic test of these components as per Cl. 9.2.7 these will be re-assembled and the block instrument shall be subjected to HV & IR tests as per 9.2.3 and 9.2.4 and performance test as per Cl. 9.2.5 above.

9.2.9 The manufacturer shall submit to the purchaser or his nominee two prototype samples of the equipment and supply labour and appliance for their testing, if required, free of cost for type approval.

9.2.10 A type approval certificate may be issued to the manufacturer if the sample passes all the prescribed tests necessary for type approval. Type approval certificate shall normally be valid for three years from the date of issue. Type approval certificate once issued shall not be valid if a change in the design, construction materials used or manufacturing process is made subsequently unless this change has the approval of the purchaser or his nominee.

9.2.11 If agreed to by the purchaser or his nominee, the manufacturer can furnish the test certificate from an approved test laboratory, giving the results of chemical analysis and other tests carried out on the equipment and/or components/materials to prove their conformity to the requirements of this specification.

9.2.12 **50 Hz AC Immunity test**:- The performance of the block instrument shall not be affected and no failure of instrument or its components shall occur on application of :

(a) Abrupt 50 Hz AC voltage of 430 Volts for a period of 300 milli-seconds.

(b) Steady state 50 Hz AC voltage of 150V RMS for this purpose, circuit arrangement shall be as shown in Annexure 'D'.

9.2.13 **Life Test**:- The instrument shall be operated for 10,000 times at the interval of 5 minutes. No part of the instrument shall show any sign of wear, erratic behaviour or failure:-

9.3 **Routine Test**:-

9.3.1 The following shall constitute the routine tests:

(a) Performance test (Clause 9.2.5)
(b) Applied H.V. test (Clause 9.2.3).
(c) Insulation Resistance Test (Clause 9.2.4).

9.4 Acceptance Test:-

9.4.1 The following shall constitute the acceptance tests:

(a) Visual inspection 100% (Clause 9.2.2)
(b) Applied H.V. Test 20% (Clause 9.2.3)
(c) Insulation Resistance test 100% (C1.9.2.4)
(d) Performance test 100% (Clause 9.2.5)

10. MANUFACTURER:

10.1 The manufacturer shall ensure that in addition to all the provisions of this specification, the requirements of other specification referred to in this specification as far as they are applicable and such of the specifications referred to in relevant IRS drawings are fully complied with.

10.2 The Manufacturer shall also ensure that material composition and surface finish of all components are in accordance with relevant IRS drawings supplied by the purchaser and Spec. IRS:S 10 & IRS:S 23.

10.3 Workmanship, limits and fittings, insulating materials, electro-magnetic Coils, electrical contacts and springs, magnetic materials, terminal with washers, wiring rejection, marking and identification, packing and warranty shall be in accordance with the requirements of relevant clauses of IRS:S 23 (Part-I to III).

11. MARKING AND IDENTIFICATION:

11.1 Wherever possible an engraved nameplate giving manufacturer's name, the IRS No. if any and serial No. and year of manufacture shall be attached on the outside of the apparatus in a conspicuous position.

11.2 When the size of the part permits all metal parts shall have the letters IRS (where applicable) and the part number shown on the drawing stamped or cast thereon, in letters and figures of suitable size. Cast or malleable iron parts or nylon, phenolic and other moulded parts shall have in addition to the above, the manufacturer's name or initial of trademark, moulded stamped or engraved thereon when the size of the part permits.

12. PACKING:

12.1. Equipment shall be so packed as to permit convenient handling and to protect against loss or damage during, transit and storage.

13. WARRANTY:

13.1 The contractor shall warrant the material covered by this specification, to be free from defects in design, material and workmanship under ordinary use and service, his obligation under warranty being limited to replace free of cost those parts which shall be found defective after delivery to the purchaser.

14. IMPORTANT NOTICE:

14.1 In the event of any requirement, information or specification applicable to any apparatus or equipment being omitted from this general specification, the manufacturer shall at once obtain from the purchaser or his nominee, required information, specification or drawing that may be necessary before proceeding with the manufacturer.

ANNEXURE 'A'

METHOD OF OPERATION FOR DOUBLE LINE BLOCK INSTRUMENTS BOTH STATIONS (SENDING AND RECEIVING) ARE ASSUMED TO BE EQUIPPED WITH MULTIPLE ASPECT COLOUR LIGHT SIGNALS).

Dispatching train from Station 'A' to Station 'B'

Block Section assumed to be clear. All concerned signals and levers normal, Block instrument showing "Line Closed"

S. No.	Station 'A' (Sending)	S. No.	Station 'B' (Receiving)
1.	Sends "Call Attention" code of Bell Signals to 'B'.	2.	Acknowledge the same.
3.	Sends "Attend Telephone" signal.	4.	Acknowledges and both stations attend telephone.
5.	Calls out station name.	6.	Calls out his station name.
7.	Asks "Is Line Clear" on telephone, giving number and description of train.	8.	Grants 'Line Clear' and gives a private no. (in case he is prepared to receive the train).
9.	Sends "Is Line Clear" signal to 'B'.	10.	Acknowledges "Is Line Clear" signal by an exact repetition and on the last beat, turn the commutator of his block instrument to the right, indicating "Line Clear".
11.	Seeing that his upper needle now points to "Line C1ear" position, lowers departure signals for the train to start.		
12.	Sends "Call Attention" signals to 'B' when the train starts.	13.	Acknowledges "Call Attention" signal.
14.	Sends "Train Entering Section" signal to 'B'.	15.	Acknowledges "Train Entering Section" signal by an exact repetition and on the last beat turns the commutator of his block instrument to the left indicating "Train on Line".
16.	Returns departure signal to 'ON' when the train has passed the last stop signal.	17.	Sends "Call Attention Signal" to Station 'A'.
18.	Acknowledges "Call Attention" signal.	19.	On Complete arrival of train, after conditions for 'Closing Line' are fulfilled, sends "Train out of Section" signal to Station 'A' and on the last beat turns the commutator to 'Line Closed'.
20.	Acknowledges "Train out of section" signal by an exact repetition.		

Note: The procedure for sending a train from Station 'B' to Station 'A' will be similar to the above.

Cancellation of line clear before the train enters the block section

1.	Replace 'Last Stop' signal at 'ON' position if already taken 'OFF' and puts back the slide to normal.		
2.	Sends call attention signal to receiving station through Bell Code.	3.	Acknowledges Bell Code Signal.
4.	Intimates on telephone for cancellation of 'Line Clear'.	5.	Gives consent on telephone. Turn handle to "Line Closed Position".
6.	Top indicator of block instrument assumes 'Line Closed' position.	7.	Bottom indicator of block instrument goes to 'Line Closed Position'.

ANNEXURE-B

A. INFORMATION TO BE SUPPLIED BY PURCHASER

1. Special requirements for control of outline sidings etc., if any, (Clause 1.2.).
2. Whether three position polarised relay to be provided, within the instrument [Clause 2(f)].
3. Any other additional indications required (Clause 3.6).
4. Any other drawings or specifications to be complied with by the manufacturer (Clause 7.1).
5. Specification of wiring inside the block instrument, if any (Clause 7.15).
6. Additional requirements for using the instrument in AC electrified traction area (Clause 7.19).
7. Rated voltage of the instrument 24V or 12V DC (Clause 8.1).
8. Type of telephone instrument to be used (Cl. 8.6)

B. INFORMATION TO BE SUPPLIED BY THE TENDERER

1. Complete technical Pamphlet giving information about the instrument with sketches, operational details etc.
2. Complete electrical characteristics of the instrument.
3. List of deviations from the requirements of the specification/drawings supplied by the Purchaser.
4. Specification for the special components, relays etc., used in the instrument along with operating characteristics.

ANNEXURE 'C'

1. Coil Resistance (Refer Cl. 8.2 & 8.7):

Sl. No.	Item/Parameter		Specified Value at 20°C in ohm
1.	Top Needle		140 ohm
2.	Bottom Needle		140 ohm
3.	Door Lock Coil		14.5 ohm
4.	Bell Coil		29 ohm
5.	Induction Coil, Primary and Secondary		1ohm and 30 ohm
6.	Bell Relay	Telephone type relay No. DJR 1001-A2-ZR	500 ohm
		O/E/N signal relay part No. O/E/N 46-12-2CE	960 ohm

2. Operating Parameters:

Sl. No.	Item/Parameter		Specified Operating Current/Voltage
1.	Top Needle		Min – 10.5mA and Nor – 14 mA
2.	Bottom Needle		Min – 10.5mA and Nor – 14 mA
3.	Door Lock Coil		Min – 200mA and Nor – 250mA
4.	Bell Coil		Min – 100mA and Nor – 125mA
5.	Bell Relay	Telephone type relay No. DJR 1001-A2-ZR	7.5Volt. (Min.)
		O/E/N signal relay part No. O/E/N 46-12-2CE	9.6Volt. (Min.)

3. High Voltage and IR Test (Refer Cl. 9.2.3 & 9.2.4):

Sl. No.	Item/Parameter	Specified Value
1.	AC HV test on 2KV	Withstand satisfactorily
2.	Insulation resistance test with 500V megger	Min. 10 M.ohm

4. Contact Pressure (Refer Cl. 7.21):

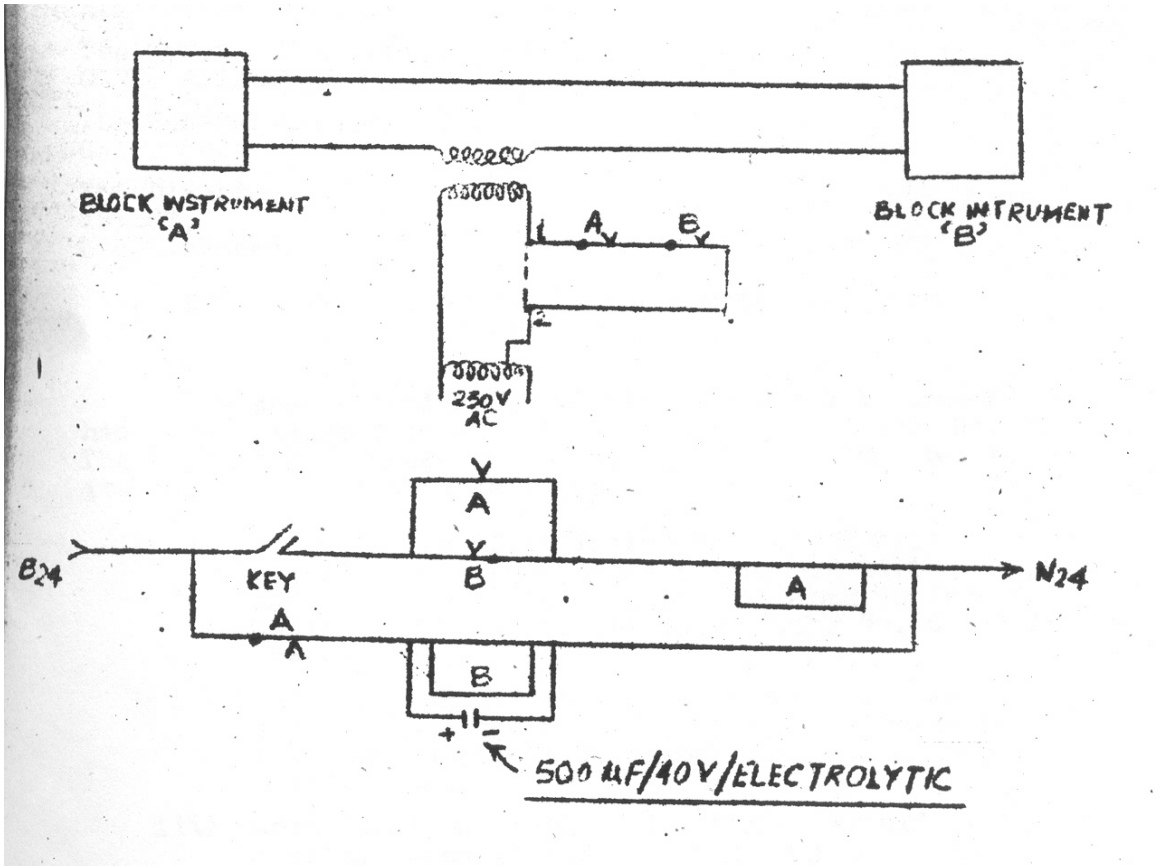
Sl. No.	Item/Parameter	Specified Value
1.	Commutator Contact Segment	200 gram. (Min.)

5. Test of Block Telephone:

Sl. No.	Item/Parameter	Specified Value
1.	The speech quality of Block Telephone shall be distinct & clear.	Satisfactorily

ANNEXURE 'D'

A CIRCUIT SHOWING PAIR OF DOUBLE LINE BLOCK INSTRUMENT INTER CONNECTED BY MEANS OF AN ARTIFICIAL LINE WITH METTALIC RETURN



Note: 1. Abrupt 430V AC for 300 ms to be applied through secondary winding of the transformer in 'LINE CLOSED', 'LINE CLEAR' and 'TOL' position of the block instrument.

2. For gradual application of 150V AC points 1 & 2 shorted.