2AB AUXILIARY TRANSMISSION TEST SET
(J94002AB)

CONTENTS PAGE

1. GENERAL

1.01 This section describes the J94002AB auxiliary transmission test set designed to match the impedance of 600-ohm transmission measuring equipment to 900-ohm trunks. This set permits more accurate transmission loss measurements at 900-ohm offices. The auxiliary set makes it unnecessary to modify existing 600-ohm testing equipment for 900-ohm impedance. It can be used to make over-all trunk transmission and terminal balance tests.

1.02 The 2AB set includes a dc holding bridge to facilitate transmission tests on 2-wire and 4-wire trunks. The set provides the same dialing and jack arrangements as the 12-type transmission measuring set and has general application in any location where transmission tests are made. Testing procedures for using this set are provided in other practices.

1.03 The principal features of the set are illustrated in Fig. 1. The portable set has optional arrangements for 19-inch or 23-inch

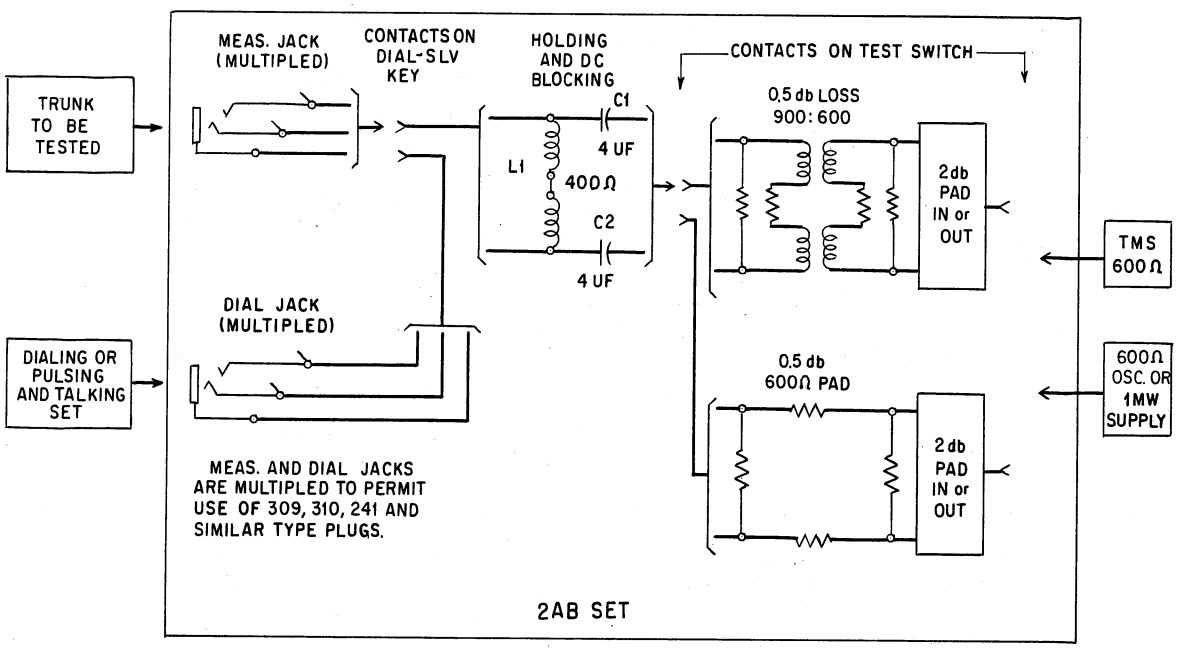

Fig. 1 – Simplified Schematic

mounting in the space of three mounting plates, or 5-1/4 inches. The conversion from portable form to panel mounting does not require modification of the unit.

1.04 The functions of the 2AB set are:

(a) To connect dialing equipment to trunks.

(b) To hold the seizure on trunks equipped for tip and ring supervision.

(c) To transfer to externally connected sending or receiving transmission testing equipment.

(d) To provide impedance transformation from 600 to 900 ohms.

(e) To block dc from the test equipment.

(f) To provide a 2 db pad for via net loss (VNL) testing.

(g) To provide a 600- or 900-ohm termination.

1.05 The set provides for proper impedance matching between 600- or 900-ohm trunks and may be used with all 600-ohm sending and receiving devices. In both cases the set introduces a loss of approximately 0.5 db which is substantially flat with frequency over the voice range. An oscillator calibrating feature provides connections for checking the oscillator output power against the TMS in use. The holding circuit dc resistance is 400 ohms ±5 per cent and does not change with the operation of the TEST switch.

2. DESCRIPTION OF CIRCUIT AND EQUIPMENT

2.01 The principal circuit features of the set are shown in schematic form in Fig. 1. Switching details are shown in Figs. 2 and 3. The trunk to be tested is patched to a MEAS jack of the 2AB set. The set includes a multipled arrangement of jacks to permit a choice among the usually available types of patch cords and plugs. Multipled DIAL jacks are also provided for dialing, monitoring and talking arrangements. These are also useful in making preparations for tests requiring an attendant at a distant office.

2.02 The test set controls are illustrated in Fig. 4. The oscillator and measuring sets are connected to the OSC and TMS binding posts or jacks with test leads or patch cords.

2.03 The three-position key DIAL-SLV, and five-step rotary TEST switch establish the test conditions. The PAD key switches a 2 db pad IN or OUT of the OSC or TMS circuit for either the 600:600- or 900:600-ohm circuits. This feature is used when sending or receiving at VNL (via net loss) offices.

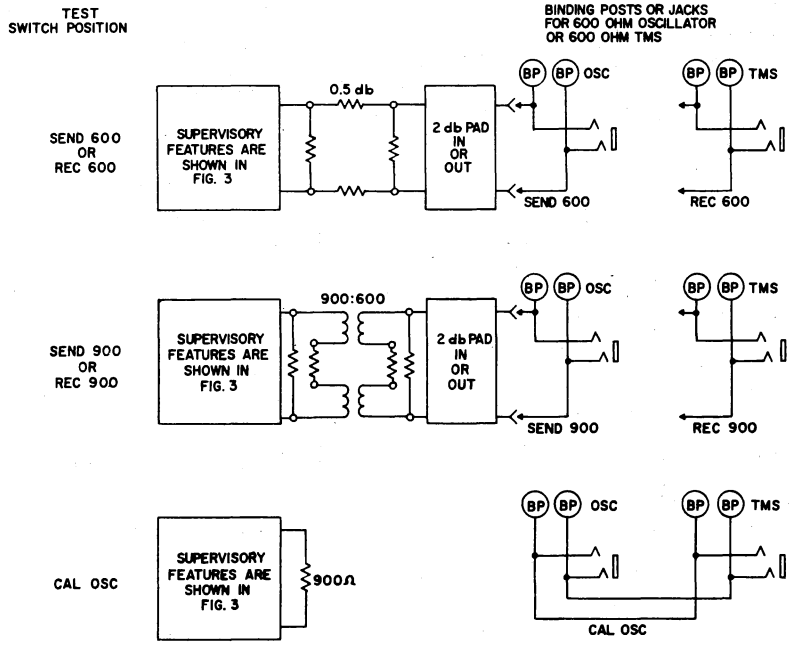

Fig. 2 – Test Terminations

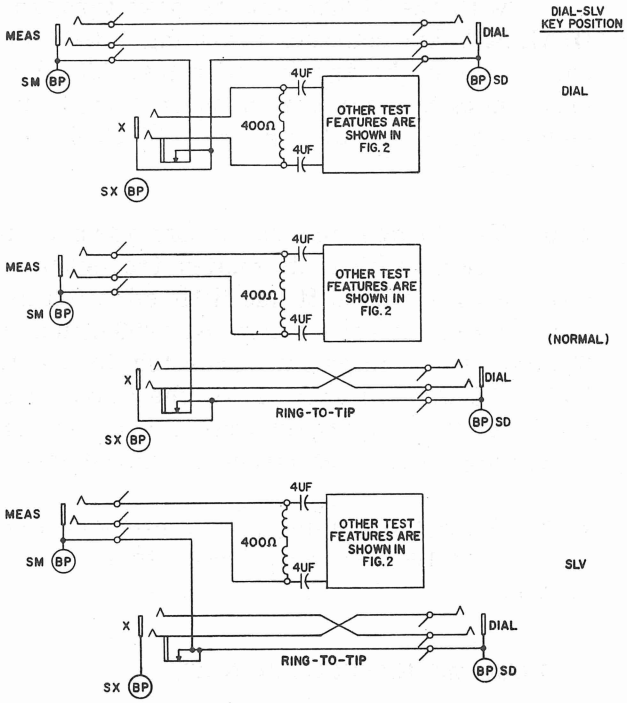

Fig. 3 – Supervisory Arrangements

2.04 The 2AB set will hold a trunk connected to a MEAS jack and provide a 900-ohm terminating impedance when the TEST switch is operated to CAL-OSC. Other TEST switch positions will hold a trunk and provide 600-ohm or 900-ohm terminating impedances with a 600-ohm plug or 600-ohm test equipment connected to the OSC or TMS jacks or binding posts as follows:

Terminating Impedance Provided	TEST Switch Position	600-ohm Test Equipment or 600-ohm Plug Connected to
600Ω	SEND-600Ω	OSC jack or BP
900Ω	SEND-900Ω	OSC " " "
900Ω	REC -900Ω	TMS " " "
600Ω	REC -600Ω	TMS " " "

2.05 Multipled jacks are provided for dialing and measuring connections between the set and the various types of switchboards, testboards, PBXs, selector switches, etc. Jacks are designated for 309, 310 and 241 plugs. A 349-type jack is included for connection to a hand test set in a step-by-step office. The jacks desig-

Length-11 inches ; Width-5 inches ; Height-7 inches ; Weight-11 pounds.

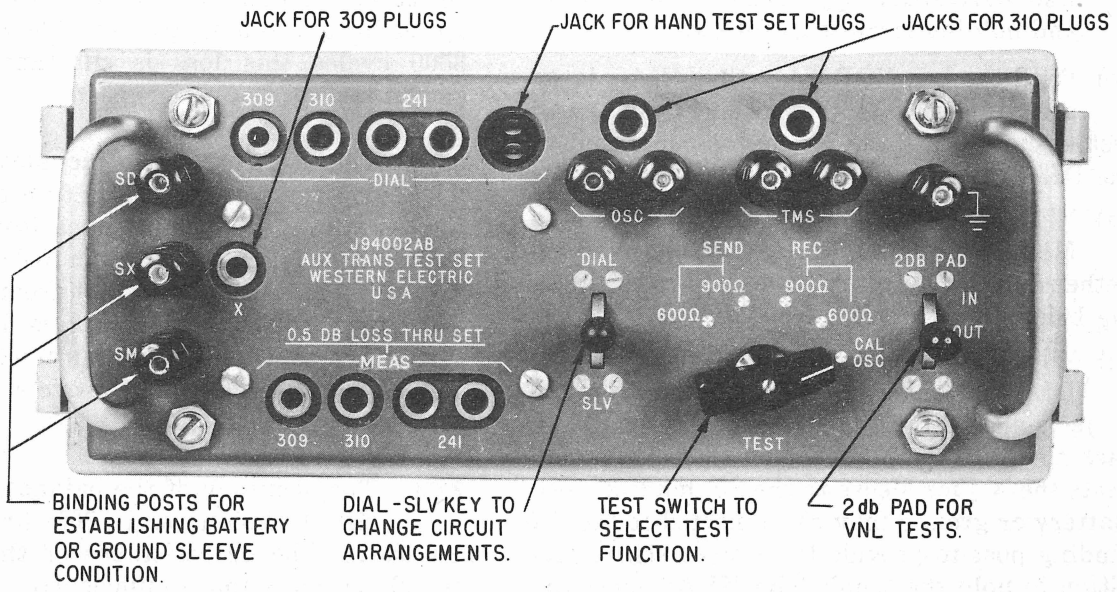

Fig. 4 – 2AB Auxiliary Transmission Test Set — Face View

nated MEAS connect the 2AB set to the trunk under test. The jacks designated DIAL connect a handset or other dialing test set to the trunk under test for establishing or controlling connections and for talking from the test position. The DIAL and MEAS jacks are connected together by operating the DIAL-SLV key to DIAL.

2.06 The X jack circuit is designed for 309-type plugs and is used at a PBX when 1000-cycle test power is supplied from a central office for measuring. PBX cord circuits may be measured in both trunk-to-extension and extension-to-extension conditions. In addition, the X jack circuit will hold the trunk supplying the test power. The tip and ring of the X jack are reversed with respect to the DIAL and MEAS jacks. If the PBX trunk circuit does not require the operation of a sleeve circuit relay to connect the trunk through to the central office, this arrangement will extend ground from the tip of the cord under test to the ring side of the trunk, thereby holding the connection to the test power when the SLV key is operated to SLV.

2.07 The sleeve circuit binding posts connect external battery or ground to the trunk under test. The SM and SD binding posts are in the MEAS and DIAL sleeve circuits, respectively, and are connected together through an auxiliary contact on the X jack.

2.08 The DIAL-SLV key arranges the dialing and holding circuits as follows:

(a) With the key NORMAL, the MEAS jacks are connected to the holding bridge and test circuit, while the X jack is connected to the DIAL jacks.

(b) With the key in the DIAL position, the MEAS and DIAL jacks are connected together and the X jack is connected to the holding bridge.

(c) With the key in the SLV position, the DIAL jack sleeve is disconnected from the X jack sleeve. This also connects the DIAL jack sleeve to the MEAS jack sleeve, and connects the X jack sleeve to the SX binding post. Battery or ground may be connected to the SX binding post to provide the proper sleeve condition to hold the trunk. The MEAS jacks are connected to the holding bridge and test circuit.

2.09 The holding bridge (L1) is associated with the MEAS and X jacks through the DIAL-SLV key contacts, providing a 400-ohm dc path to hold the trunk under test. The bridge also limits the current in the external circuit under test. The 4 uf capacitors block dc to the test sets.

2.10 The bridge and capacitors form a filter circuit which attenuates frequencies below the voice range. It has little effect on measurements in the voice range. At 1000 cycles with 600-ohm test equipment connected to the OSC and TMS terminals or jacks, the impedance of the 2AB set is approximately 600 or 900 ohms depending on the test circuit arrangements.

2.11 A ground binding post is provided to connect the test set chassis to an external ground.

3. TRANSMISSION PERFORMANCE

3.01 The 0.5 db loss introduced by the test set is uniform in both directions of transmission through the set when tests are made at 600 or 900 ohms. The 900-ohm path is obtained with a 1.5:1 impedance transformer of low loss (about 0.3 db). The coil is built out to 0.5 $\pm$ 0.03 db in steps of 0.05 db by means of strapping resistors. The deviation in impedance of the 2AB set from 900 ohms is less than 5% when terminated by a 600-ohm test set. Between 200 and 3500 cycles this loss is substantially flat as shown in Fig. 5.

3.02 The 600-ohm path includes a balanced 600-ohm pad of 0.50 $\pm$0.03 db. The holding circuit and blocking capacitor loss under these conditions is less than 0.05 db at 1000 cycles. The increase in loss at frequencies below 500 cycles, as shown in Fig. 6, is due largely to the 4 uf capacitors rather than the inductor. The suppression at 120- and 180-cycle power induction frequencies is small.

3.03 The accuracy of the balanced 2 db pad in the 600-ohm and 900-ohm circuit is $\pm$0.05 db. The dc resistance of the inductor is 400 ohms $\pm$5% and is sufficiently low to provide a suitable holding circuit for moderately long trunks.

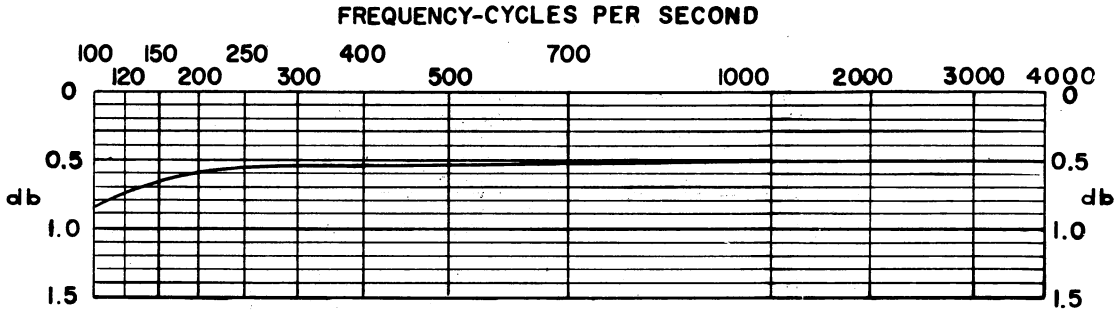

Fig. 5 – Typical 900-ohm Frequency Response

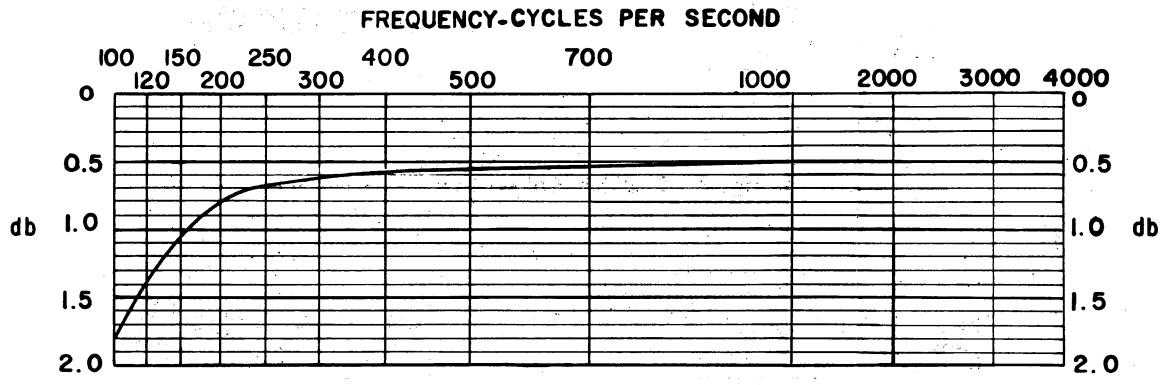

Fig. 6 – Typical 600-ohm Frequency Response

4. ASSOCIATED TEST APPARATUS

4.01 Test apparatus for use with the 2AB set is indicated below.

(a) 1 MW Test Power or 600-ohm Oscillator.

(b) 600-ohm Transmission Measuring Set.

(c) Dialing, Monitoring and Talking Equipment.

(d) Patch Cords, Test Leads, etc.

5. CALIBRATION

5.01 The accuracy of the associated test equipment should be periodically checked to insure proper operation. Figs. 7 and 8 illustrate 2 methods for calibrating the 2AB set and associated test equipment. The method illustrated by Fig. 7 is preferred since it more accurately compensates for the 2AB set loss. Both methods eliminate the need for correcting transmission measurements for the 0.5 db loss of the 2AB set.

6. TESTING

6.01 The 2AB set should be used when making over-all transmission tests on 900-ohm trunks with 600-ohm test equipment. Measurements will be improved as a result of the matching of test equipment to trunk and equipment impedances.

6.02 The 2AB set provides a convenient means for seizing a trunk and dialing up a 900-ohm 2 uf termination for terminal balance tests. In some offices it may be necessary to place the termination on a trunk manually if it is not provided on a test line. After the seized trunk is terminated, the DIAL-SLV key is operated to NORMAL so that return loss measurements can

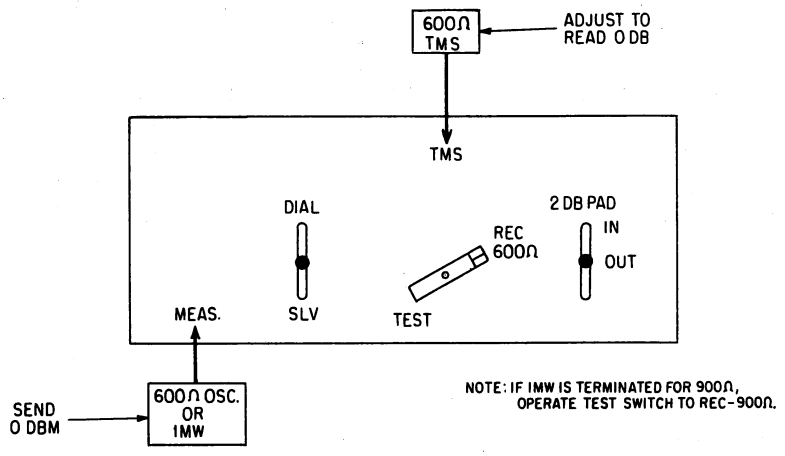

Fig. 7 – 2AB Set Calibration

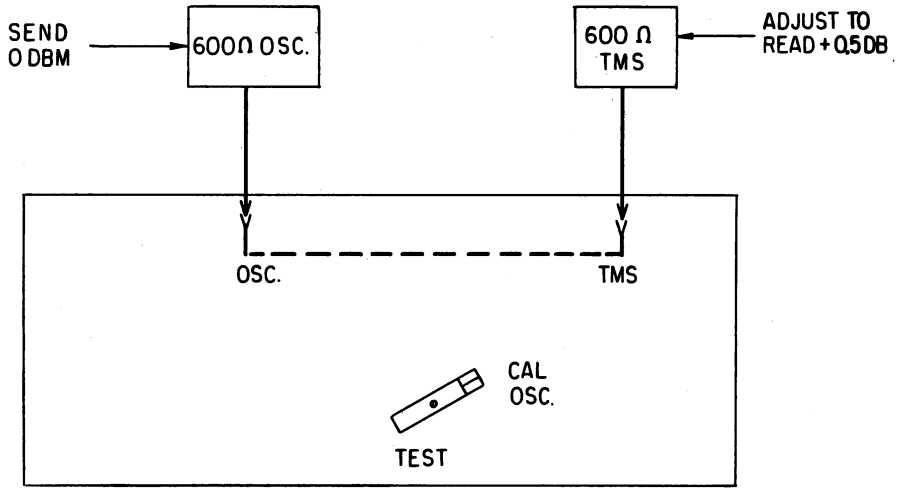

Fig. 8 – 2AB Set Calibration

be made with an external hybrid connected to the OSC or TMS jacks.

7. MAINTENANCE

7.01 The transmission features of the 2AB set requiring periodic checks are: the terminating impedances, the 0.5 db through loss of the set and the 2 db pads.

8. DRAWING REFERENCE

8.01 SD-95253-01 (not attached) is the detailed circuit for the 2AB set.