TYPE N1, O AND ON CARRIER TELEPHONE SYSTEMS — OVER-ALL CHANNEL LINE-UP TRANSMISSION AND SIGNALING — SIGNALING RECEIVER AND OVER-ALL PULSING TESTS

This section is reissued to include the latest information on the location of the test points in the expandor-signaling subassembly.

The pulses of 3700-cycle tone from the demodulator are fed into the signaling circuit which changes the tone pulses into open or ground conditions on the "E" lead. The presence of tone signifies "on hook" and an open on the "E" lead, the absence of tone signifies "off hook" and a ground on the "E" lead. The S1 jack located on the channel unit provides a means of measuring the presence of 3700-cycle tone at the input of the signaling receiver circuit.

The purpose of this section is to describe the tests and adjustments for aligning the signaling circuit. These should be made only if the transmitting terminal, high-frequency line, and regulator are within requirements.

APPARATUS:

1 — Hewlett-Packard, Model 400C or 400D Vacuum Tube Voltmeter

1 — KS-14510, L1 or L5, Volt-Ohm-Milliammeter, or equivalent (20,000 ohms per volt)

1 — Channel Unit Test Stand (J98705M)

1 — W2DW Cord (used to connect VTVM to test points)

2 — 2B Signaling Test Sets (transmitting and receiving end)

2 — 2P1D Cords (used to connect E jack of 2B test set to E_g jack of channel unit test stand)

1 — P1M Cord with 708529 Cord Tips

1 — 2P4C Cord

2 — 1W13B Cords with P36A918 Cord Tips

1 — P19A Cord (used with Channel Unit Test Stand)

STEP	PROCEDURE
1	The channel must be out of service. At the transmitting terminal connect a 2B signaling test set as follows: **SIG. JACKS AVAILABLE** L jack of 2B test set to channel SIG L jack of patch bay using a 2P4C cord, or equivalent. **SIG. JACKS NOT AVAILABLE** "M" jack of 2B test set to M jack of the channel unit test stand using a 2P1D cord. Operate the TWD L key of 2B test set to "ON HK."

STEP	PROCEDURE
2	At the receiving terminal the channel must be removed from the terminal and connected in the channel unit test stand. The channel unit must be kept in vertical position for these tests. Turn the BRK and SIG potentiometers to midposition.
3	Connect the 400C or 400D VTVM between S1 jack and ground and read the meter in db. ***Requirements:*** ***N Carrier*** −3.4 to +14.6 db ***O and ON Carrier*** −12.0 to +10.0 db ***Note: O and ON Carrier*** — The EXP potentiometer at the input to the expandor normally is set in the maximum clockwise position in the type O carrier circuits. If in unusual cases the received level of the 3700-cycle signaling frequency in channel 1 or 4 is too low to meet the requirements, the R potentiometer may be adjusted to increase the signal level at the S1 jack to meet those requirements, or until the R potentiometer is at a maximum. The EXP potentiometer must then be adjusted to meet the expandor output requirements. This procedure does not improve the signal-to-noise ratio. Except for these rare cases, the EXP potentiometer should be in the extreme clockwise position at all times.
4	Connect the KS-14510 volt-ohmmeter between terminals TP1 and TP2 (+ to TP1), and read the dc voltage. This is a measure of the current through the signaling relay. ***Requirements:*** Line-up 15 ± 0 volt Maintenance 15 ± 1.0 volt Adjust the REL CUR potentiometer to obtain the required value. ***Note:*** If no voltage is obtained the SIG potentiometer may be turned clockwise slightly until a measurement is obtained.
5	Connect the E jack of the 2B signaling test set to the E_G jack of the channel test stand using the 2P1D cord. All keys of 2B test set are normal.
6	Connect the S1 jack to TP3.
7	Turn the SIG potentiometer to extreme counterclockwise and observe the L lamp on the 2B set is extinguished, then turn the SIG potentiometer slowly clockwise until the L lamp on the 2B set just lights.
8	Remove the connection from S1 jack to TP3 and repeat Step 4. If a readjustment is necessary in Step 4 repeat Steps 5 through 8.
	Over-all Pulsing Test and Adjustment Where this test is made on a periodic basis it should be made between patching bays, if provided, with the L jack of the 2B signaling test set connected to SIG L jack associated with the channel.
9	The calibration of the 2B set should be made just prior to the final adjustment and measuring of per cent break. At the ***transmitting terminal*** set up the 2B signaling test set to send 12 pps at 58% break as follows:

STEP	PROCEDURE
	(1) Set all keys to normal, turn SCALE SEL switch to PPS, OG-BG to OG, and ADJ % BK to M. (2) Put dummy plug in P jack and adjust CAL % BK potentiometer to obtain 100% (Black Scale) on meter. Remove plug from P jack. (3) Adjust the ADJ PPS potentiometer for 12 pps. (4) Adjust the ADJ % BK potentiometer for 58% break (Black Scale). (5) Operate PLS key toward LINE.
10	At the ***receiving terminal*** set up the 2B signaling test set to receive and measure the pulses as follows: (1) Set all keys to normal. (2) Put dummy plug in P jack and adjust CAL % BK to obtain 100% (Black Scale) on meter. Remove plug from P jack. (3) Operate MEAS % BK key to LINE. (4) Read the per cent break on the ***Red Scale.*** ***Requirements:*** Line-up 62% break Maintenance 56 to 64% break When the requirements are not met: ***On line-up*** — Adjust BRK potentiometer to obtain 62% break. ***On maintenance*** — ***Do not*** adjust the BRK potentiometer to meet requirements. A complete signaling realignment should be done.
11	After the signaling receiver has been properly aligned in Steps 1 through 10, the condition of capacitors C44 and C62 is checked by the following minimum length of pulse test. At the transmitting terminal set the ADJ % BK switch to S, and the ADJ % BK potentiometer to maximum counterclockwise position. Slowly turn the ADJ % BK potentiometer clockwise until a deflection just starts to appear on the per cent break meter of the 2B test set at the receiving terminal.
12	Restore the PLS key to normal at the transmitting terminal and read the per cent break scale (Black Scale). ***Requirement:*** Minimum of 12% break.
13	Remove all test connections and replace channel unit in terminal mounting.
	After complete line-up, recheck pulsing from the patch bay after the unit has been in terminal at least three hours and has reached its operating temperature. If the requirements in Steps 4, 7, or 10 cannot be met replace tubes V45, V41, and V42, and signaling relay K41, one at a time in that order. If trouble is not cleared replace the expandor-signaling subassembly, and repeat all tests. ***Caution: To remove the K41 relay, use the 603A tool, and eject the relay perpendicularly to its socket, to avoid damaging the relay base.*** If the requirements in Step 12 cannot be met, replace the expandor-signaling subassembly and repeat the tests.

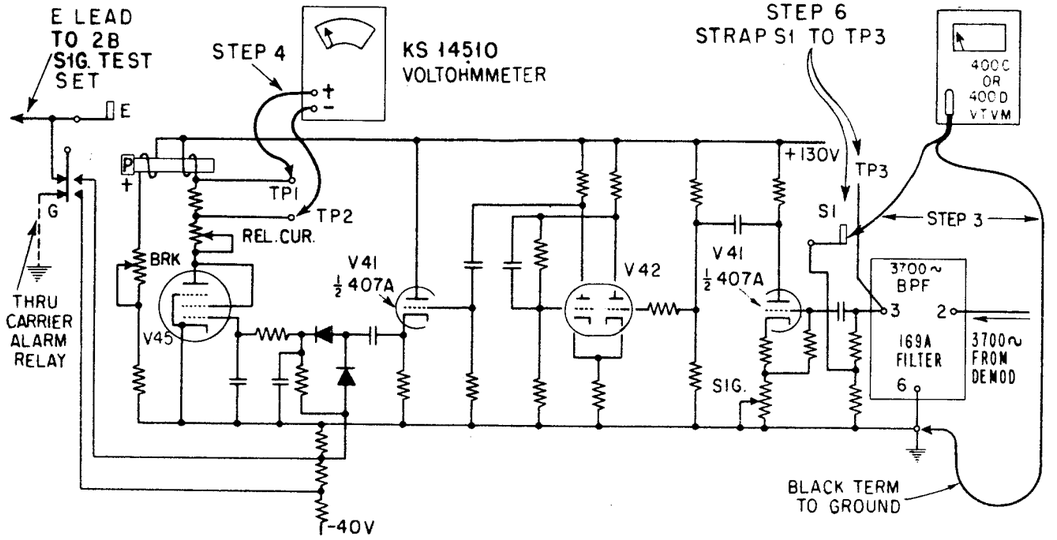

Fig. 1 — Signaling Receiving Circuit

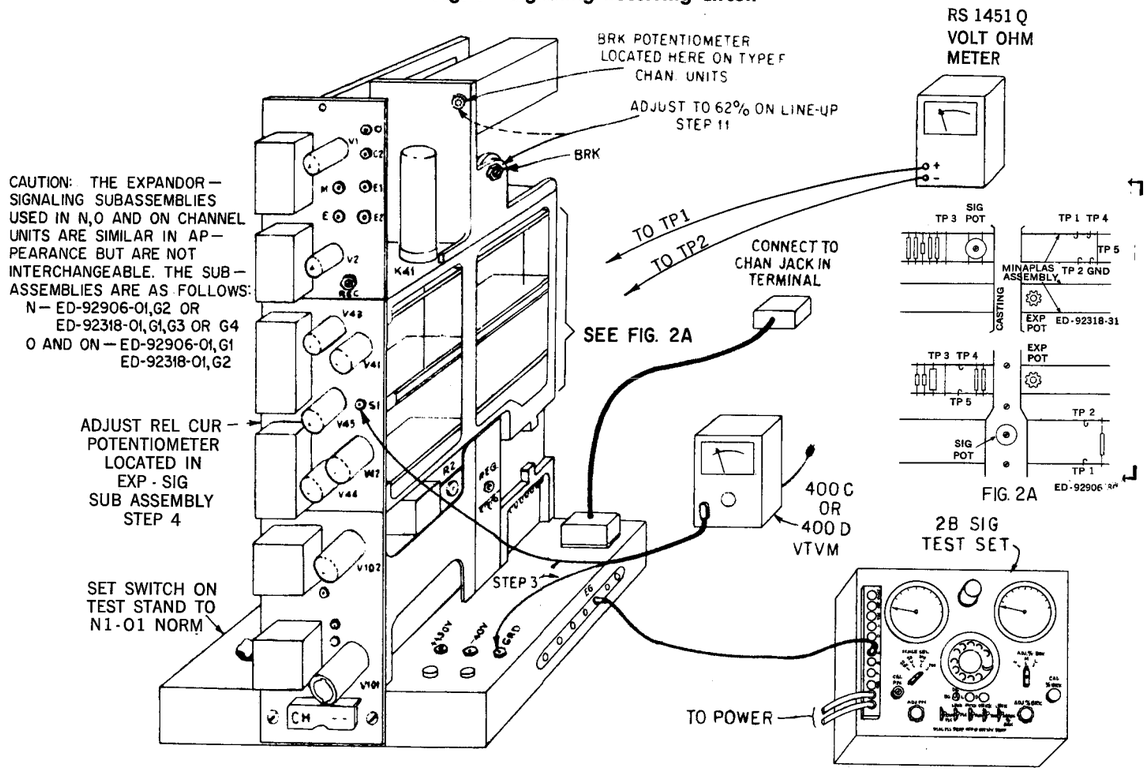

Fig. 2 — Test Set-up at Receiving Terminal