HALF GROUPBAND DATA SYSTEMS
2-POINT PRIVATE LINE
NOISE MEASUREMENTS

CONTENTS PAGE

1. GENERAL

1.01 This section describes characteristics of transmission noise and provides procedures for making noise measurements on a half groupband data channel carrying signals of the Data Set 303-type. These measurements are made on the 2-point private line circuit when directed by the circuit control office.

1.02 A typical half groupband service as supplied to the wideband customer may consist of one low-speed data channel, one voice-frequency (vf) coordination channel, and five vf channels. This arrangement, if used, will require that periodic noise measurement tests be made on the vf channels including the coordinating channel. These measurement tests are made by following the procedures of Section 310-300-500 and using the 3A Noise Measuring Set described in Section 103-611-100.

1.03 Three characteristics of noise are measured in half-group service as follows:

(a) ***Single Frequency:*** One-way and/or end-to-end measurements of noise (rms), in each direction, at selected frequencies in the groupband. Measurements are made between Wideband Service Bays (WSBs) or between a WSB and a wideband data station. The frequencies are selected by tuning the measuring instrument (frequency selective voltmeter) through the band and observing maximum readings.

(b) ***Gaussian:*** One-way and/or end-to-end measurements of noise (rms), in each direction, in the groupband slot. Measurements are between WSBs or between a WSB and a wideband data station.

(c) ***Impulse:*** One-way and/or end-to-end counts of noise impulses above an established threshold and within a specified time in the groupband slot. This measurement is also made between WSBs or between a WSB and a wideband data station.

1.04 The gain-frequency objectives given in Section 314-608-501 must be met before the noise measurements described in this section are made.

Apparatus

1.05 The following list of apparatus is required at the WSB from which a looped circuit measurement is made. This apparatus may also be needed and used at each WSB or wideband data station involved in one-way measurements.

1—Frequency Selective Voltmeter with input of 135 ohms, capable of measuring noise on an rms basis at selected frequencies from 2 to 350 kHz. A typical meter meeting these specifications is the KS-15538 L5A Carrier Frequency Voltmeter and is the type used in this section.

1—6G Wideband Noise Measuring Set equipped with a 10-50 kc weighting network

1—135-Ohm Termination (310 Plug)

1—135-Ohm Resistor, unattached

1—2W42A Test Cord

1—3P7B Patch Cord

Preparation

1.06 Noise measurements are made only on an out-of-service basis. The wideband circuit will not normally be removed from service except for routine maintenance or unless a trouble report has been received from the customer.

1.07 Prior to making the noise measurements, the test sets to be used should be calibrated in accordance with procedures in sections covering the test sets. The 6G Wideband Noise Measuring Set (6G NMS) is calibrated using procedures outlined in Section 103-627-100. The calibration of the KS-15538 L5A Carrier Frequency Voltmeter (CF VM), described in Section 103-400-106, is performed after the test set is connected to the circuit being tested.

1.08 Noise measurements are made at the test jacks provided in the WSB, except for one-way measurements between a WSB and a wideband data station. In the case of one-way tests, measurements are made at the Data Auxiliary Set (DAS) 806B line jacks at a wideband data station.

1.09 One-way measurements in each direction should be made for line-up purposes or to determine which direction of a circuit is at fault. For trouble location on a wideband subscriber line (2-point private line), a looped-line measurement should be made first to determine whether one-way measurements between the WSB and the wideband data station will be required. It should be noted that measurement of different characteristics of noise is affected in different ways when looped-circuit measurements are made. Gaussian noise generated within the facilities tends to be additive and, since the equipment used in a looped-circuit measurement is doubled, the measured level could be as much as 3 dB higher than the one-way objective. Noise impulses are difficult to interpret on a looped circuit, but generally, the impulse count at a given threshold should double. Single-frequency tones on a looped circuit may be additive or may tend to cancel out, depending on the phase relationship of the tones. The phase relationship will vary slowly, resulting in an indication which varies from maximum (in-phase condition) to minimum (out-of-phase condition). The readings resulting from a looped measurement are sometimes difficult to interpret, but generally, if a looped facility meets its one-way objectives, it is probably satisfactory.

2. NOISE MEASUREMENTS

2.01 Designations of WSB testing jacks are not standardized. For this reason, a theoretical east-west wideband channel is used for describing test procedures, and arbitrary jack designations are assigned. The illustrations used in this section identify the equivalent jacks in the WSB at a particular location.

A. Requirements

2.02 Noise requirements are based on impairments expected in a wideband data channel. For a 2-point private line, allocations of noise objectives are made to trunk and line sections which might be combined into an overall wideband channel.

2.03 Objectives for trunk and line sections are given at the end of each test procedure. These objectives also appear in Table A of Section 314-608-300. When making looped-circuit measurements, refer to 1.09. If an objective cannot be met, a request for engineering assistance should be made.

2.04 Procedures for obtaining test access to wideband data channels are described in Section 314-602-100.

Caution: Before connecting a measuring set to make any kind of measurement, make certain that the transmitting end of the circuit has been terminated. This must be done to prevent possible damage to the measuring instrument. In addition, use a low meter sensitivity (high voltmeter range) until all connections and control settings are made. Then, increase the sensitivity (lower voltmeter range) until a readable meter deflection is obtained.

B. Single-Frequency Noise Measurements

2.05 The testing arrangements for making one-way and looped-circuit measurements of

single-frequency interference tones are shown in Fig. 1.

Note: When making measurements on balanced circuits, the voltmeter INPUT terminal connecting link should be disconnected from the ground terminal.

STEP	PROCEDURE
1	This test is performed on a 2-point private line system. It is necessary, therefore, to obtain release of the wideband data channel from the customer.
	At Transmitting End
2	Insert a 135-ohm termination (equipped with a 310 plug) in the appropriate transmitting jack indicated below. Refer to Fig. 1.
	(1) One-way measurement, DAS to WSB: TRANSMITTING LINE WB jack in DAS 806B( ).
	(1A) One-way measurement, WSB to DAS: XMT W jack in WSB.
	(2) Looped-line measurement from WSB: XMT W jack in WSB.
	(3) Looped-trunk measurement from WSB: XMT E jack in WSB.
	(4) One-way measurement, WSB (far) to WSB (near): XMT W jack in WSB at distant end.
	(4A) One-way measurement, WSB (near) to WSB (far): XMT E jack in WSB at near end.
3	For a one-way measurement, proceed to Step 4. For a looped-line measurement, perform the procedure for looping the line at the DAS 806B( ); refer to Section 593-800-500. For a looped-trunk measurement, have the trunk looped with a patching cord at the distant end WSB.
	At Receiving End
4	Set the controls of the KS-15538 L5A CFVM as follows: ATTENUATOR to -20 FUNCTION to 135Ω SELECTOR to INPUT FINE control to minimum (counterclockwise)
4a	Connect 135-ohm resistor across input jacks of KS-15538 L5A CFVM.
5	Connect the INPUT terminals of the voltmeter to the appropriate jack listed below. The connections correspond to the measurements listed in Step 2. Use a 2W42A test cord.

STEP	PROCEDURE
	(1) One-way measurement, DAS to WSB: REC W jack in WSB. (1A) One-way measurement, WSB to DAS: RECEIVING LINE WB jack in DAS 806B( ). (2) Looped-line measurement from WSB: REC W jack in WSB. (3) Looped-trunk measurement from WSB: REC E jack in WSB. (4) One-way measurement, WSB (far) to WSB (near): REC E jack in WSB at near end. (4A) One-way measurement, WSB (near) to WSB (far): REC W jack in WSB at distant end.
6	Calibrate the voltmeter.
7	Turn the voltmeter MAIN TUNING control ***slowly*** through the frequency range of 28 through 44 kHz. Observe and record any frequency settings at which the meter reading approaches or exceeds -10 dBm at DAS or -20 dBm at WSB when testing a station line or interexchange facility (2-point private line). Use the FINE tuning control to obtain maximum deflections. The level of any tone measured is the algebraic sum of the ATTENUATOR setting and the DBM meter reading. ***Note:*** Interfering signals are not necessarily of constant amplitude. It is recommended that more than one frequency run be made. If the wideband circuit being tested contains LMX equipment with an LWM-3 wideband modem, pay particular attention to the region about 34 kHz (96 kHz in the 60- to 108-kHz groupband). If the LMX equipment includes an LWM-4 wideband modem, check the region around 42 kHz (68 kHz in the 60-108 kHz groupband).
8	If the measurement made was one-way, switch testing locations and make a measurement in the opposite direction. ***Objective:*** Interexchange Facility—(-30 dBm or less) Each Station Line—(-30 dBm or less)
9	If a looped circuit measurement was made, refer to 1.09. Record the results on the transmission form in Section 314-608-300.
10	Remove the test equipment and looping arrangement, if used. If no further types of noise tests are to be made, return the wideband data channel to the customer.

C. Gaussian Noise Measurements

2.06 The testing arrangements for making one-way and looped-circuit measurements of Gaussian noise are shown in Fig. 2. This test procedure should only be made if the single-frequency noise objectives are met as given in Step 8 of 2.05.

STEP	PROCEDURE
1	This test is performed on a 2-point private line system. It is necessary therefore, to obtain release of the wideband channel from the customer.
	At Transmitting End
2	Insert a 135-ohm termination (equipped with 310 plug) into the transmitting jack as indicated below. Refer to Fig. 2.
	(1) One-way measurement, DAS to WSB: TRANSMITTING LINE WB jack in DAS 806B( ).
	(1A) One-way measurement, WSB to DAS: XMT W jack in WSB.
	(2) Looped-line measurement from WSB: XMT W jack in WSB.
	(3) Looped-trunk measurement from WSB: XMT E jack in WSB.
	(4) One-way measurement, WSB (far) to WSB (near): XMT W jack in WSB at distant end.
	(4A) One-way measurement, WSB (near) to WSB (far): XMT E jack in WSB at near end.
3	For a one-way measurement, proceed to Step 4. For a looped-line measurement, perform the procedure for looping the line at the DAS 806B( ); refer to Section 593-800-500. For a looped-trunk measurement, have the trunk looped with a patching cord at the distant end WSB.
	At Receiving End
4	Set the controls of the 6G Wideband Noise Measuring Set as follows: TIMER MINUTES to HOLD DBRN DIAL to 50 (network trunk, interexchange facility), 35 (wideband subscriber line, station line) FUNCTION to ON LINE WTG to 10-50 KC
5	Patch the 310 input jack of the 6G NMS to the receiving jack listed below. The connections correspond to the measurements listed in Step 2. Use a 3P7B patching cord.
	(1) One-way measurement, DAS to WSB: REC W jack in WSB.
	(1A) One-way measurement, WSB to DAS: RECEIVING LINE WB jack in the DAS 806B( ).
	(2) Looped-line measurement from WSB: REC W jack in WSB.
	(3) Looped-trunk measurement from WSB: REC E jack in WSB.

STEP	PROCEDURE
	(4) One-way measurement, WSB (far) to WSB (near): REC E jack in WSB at near end. (4A) One-way measurement, WSB (near) to WSB (far): REC W jack in WSB at distant end.
6	The measured level is the sum of the DBRN DIAL setting and the meter reading. If necessary, readjust the DBRN DIAL setting to obtain a meter reading in the upper two-thirds of the meter.
7	If a one-way measurement was made, switch testing locations and make a measurement in the opposite direction. ***Objective:*** Interexchange Facility—(61 dBrn or less) Each Station Line—(51 dBrn or less) ***Note:*** If the requirement for Gaussian noise is exceeded by more than 6 dB, remove the trunk or line immediately for trouble investigation. If the requirement is exceeded, but by 6 dB or less, repeat the measurement three times at 1-hour intervals. If more than one of the three subsequent measurements exceed the requirement, remove the trunk or line for trouble investigation.
8	If a looped measurement was made, refer to 1.09. Record results on the Transmission Measurements Form in Section 314-608-300.
9	Remove the test equipment and looping arrangement, if used. If no further types of noise tests are to be made, return the wideband data channel to the customer.

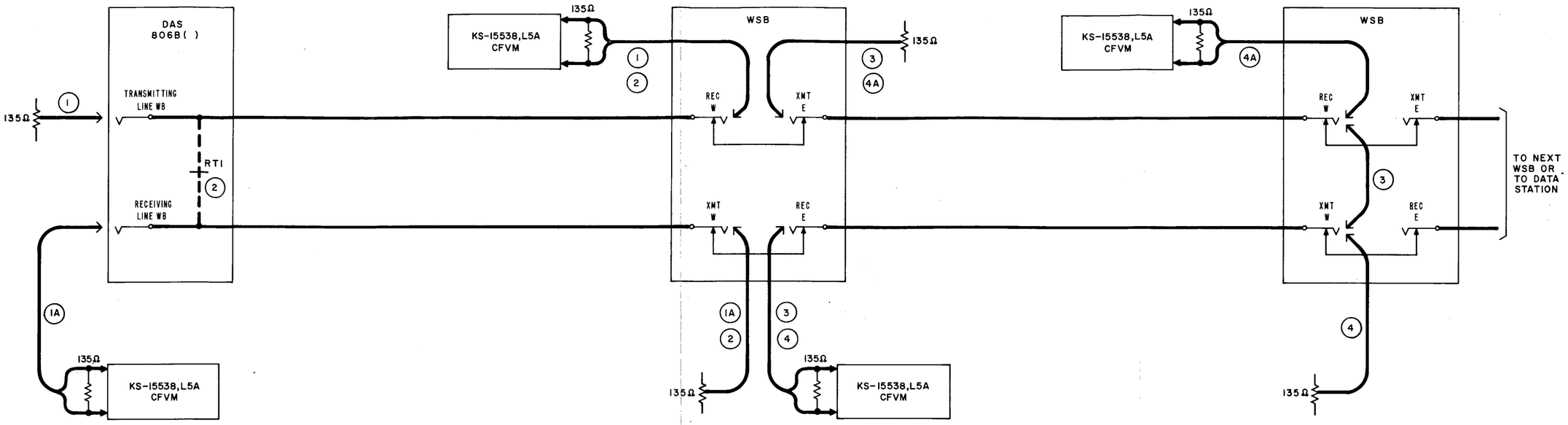
D. Impulse Noise Counts

2.07 The testing arrangements for making one-way and looped-circuit counts of noise impulses are shown in Fig. 2. Impulse count is taken at a reference setting of 85 dBrn at the DAS. The reference setting is 75 dBrn at the WSB.

STEP	PROCEDURE
1	This test is performed on a 2-point private line system. It is necessary, therefore, to obtain release of the wideband data channel from the customer. ***At Transmitting End***
2	Insert a 135-ohm termination (equipped with 310 plug) into the transmitting jack as indicated below. Refer to Fig. 2. (1) One-way measurement, DAS to WSB: TRANSMITTING LINE WB jack in DAS 806B( ).

STEP	PROCEDURE
	(1A) One-way measurement, WSB to DAS: XMT W jack in WSB. (2) Looped-line measurement from WSB: XMT W jack in WSB. (3) Looped-trunk measurement from WSB: XMT E jack in WSB. (4) One-way measurement, WSB (far) to WSB (near): XMT W jack in WSB at distant end. (4A) One-way measurement, WSB (near) to WSB (far): XMT E jack in WSB at near end.
3	For a one-way measurement, proceed to Step 4. For a looped-line measurement, perform the procedure for looping the line at the DAS 806B( ); refer to Section 593-800-500. For a looped-trunk measurement, have the trunk looped with a patching cord at the distant-end WSB.
	At Receiving End
4	Set the controls of the 6G NMS as follows: WTG to 10-50 KC DBRN DIAL to 85 if at DAS—DBRN DIAL to 75 if at WSB FUNCTION to ON LINE TIMER MINUTES to OFF
5	Patch the 310 input jack of the 6G NMS to the receiving jack listed below. The connections correspond to the measurements listed in Step 2. Refer to Fig. 2. Use a 3P7B patching cord. (1) One-way measurement, DAS to WSB: REC W jack in WSB. (1A) One-way measurement, WSB to DAS: RECEIVING LINE WB jack in DAS 806B( ). (2) Looped-line measurement from WSB: REC W jack in WSB. (3) Looped-trunk measurement from WSB: REC E jack in WSB. (4) One-way measurement, WSB (far) to WSB (near): REC E jack in WSB at near end. (4A) One-way measurement, WSB (near) to WSB (far): REC W jack in WSB at distant end.
6	If required, pull the measuring set RESET control to return the register to zero (000).

STEP	PROCEDURE
7	Move the TIMER MINUTES control to 30 and allow the timing circuit to time out after 30 minutes. When setting the timing control, move the pointer about 5 minutes ***above*** the desired setting, then move ***downward*** to the desired setting. The register indicates the number of noise impulses (above the 85 or 75 dBrn threshold) counted during the test interval. ***Note:*** When it is necessary to repeat the test, return the TIMER MINUTES control to OFF, reset the register to zero, and return the TIMER MINUTES control to the proper setting for the test interval.
8	If a one-way measurement was made, switch testing locations and make a measurement in the opposite direction. ***Objective:*** Interexchange Facility—(15 counts/30 min) Each Station Line—(110 counts/30 min)
9	If a looped-circuit measurement was made, refer to 1.09. Record the results on the transmission form in Section 314-608-300.
10	Remove the test equipment and looping arrangement, if used. If no further types of noise tests are to be made, return the wideband data channel to the customer.



(1) ONE-WAY MEASUREMENT, DAS TO WSB

(1A) ONE-WAY MEASUREMENT, WSB TO DAS

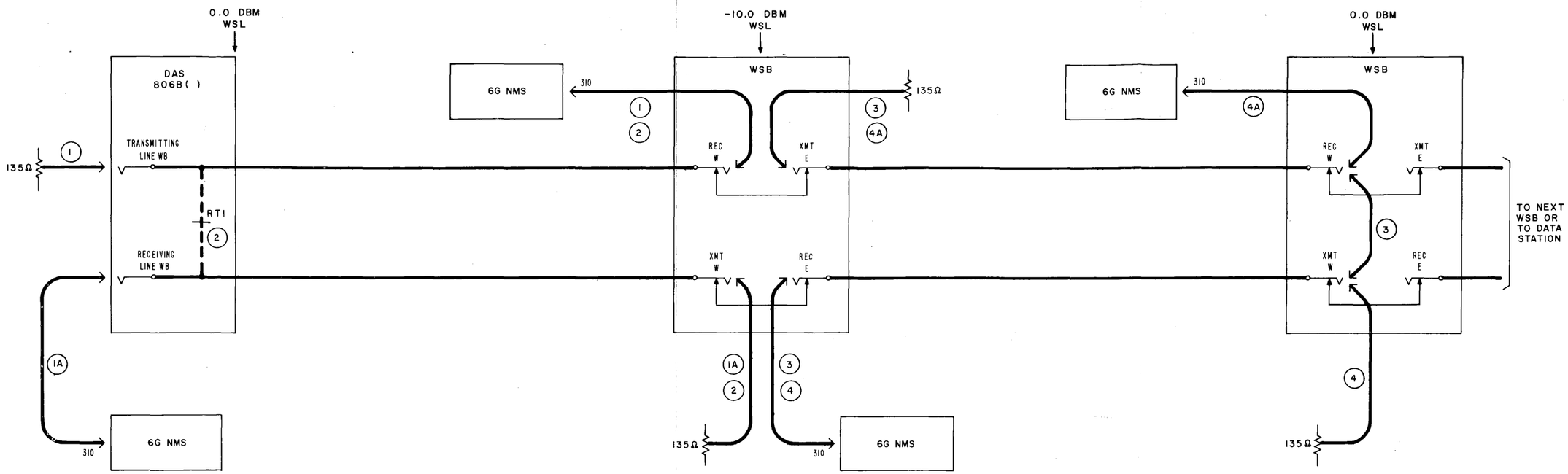
(2) LOOPED-LINE MEASUREMENT FROM WSB

(3) LOOPED-TRUNK MEASUREMENT FROM WSB

(4) ONE-WAY MEASUREMENT, WSB (FAR END) TO WSB (NEAR END)

(4A) ONE-WAY MEASUREMENT, WSB (NEAR END) TO WSB (FAR END)

Fig. 1—Selective Frequency Noise Measurements, Half Groupband Data Circuit



(1) ONE-WAY MEASUREMENT, DAS TO WSB

(1A) ONE-WAY MEASUREMENT, WSB TO DAS

(2) LOOPED-LINE MEASUREMENT FROM WSB

(3) LOOPED-TRUNK MEASUREMENT FROM WSB

(4) ONE-WAY MEASUREMENT, WSB (FAR END) TO WSB (NEAR END)

(4A) ONE-WAY MEASUREMENT, WSB (NEAR END) TO WSB (FAR END)

Fig. 2—Gaussian Noise Measurements and Noise Impulse Counts, Half Groupband Data Circuit