GROUPBAND DATA SYSTEMS (RESTORED POLAR) SWITCHED NETWORK AND 2-POINT PRIVATE LINE NOISE MEASUREMENTS

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1. GENERAL

1.01 This section describes procedures for making noise measurements on groupband data channels carrying the line signals of the 303-type data set. These channels may either be part of a switched network or may be 2-point private lines. The model network, described in Section 314-609-110, is used in this section as an example of a switched network.

1.02 Noise measurements are made on a 2-point private line when directed by the circuit control office. For a switched network, the measurements are directed by the network control office when intertoll facilities are involved or by the area control office when the measurements are confined to the area served by the area control office.

1.03 Three characteristics of noise are measured as follows:

*A. **Single Frequency:*** Looped circuit and/or one-way, rms measurements of noise at selected frequencies in the band measured between wideband service bays or between a wideband service bay and a wideband data station. The frequencies are selected by tuning the measuring instrument through the band and observing maximum readings.

*B. **Gaussian:*** Looped circuit and/or one-way, measurements of rms noise in the band of frequencies measured between wideband service bays or between a wideband service bay and a wideband data station.

*C. **Impulse:*** Looped circuit and/or one-way counts of noise impulses above an established threshold and within a predetermined time in the band of frequencies measured between wideband service bays or between a wideband service bay and a wideband data station.

1.04 The gain-frequency requirements given in Section 314-609-310 must be met before the noise measurements described in this section are made.

Apparatus

1.05 The apparatus listed below is required at the wideband service bay from which a looped circuit measurement is made and at each wideband service bay or wideband data station involved in one-way measurements.

1—Frequency Selective Voltmeter with 135-ohm input, capable of measuring noise on an rms basis at selected frequencies from 2 to 50 kHz. (The KS-15538 L5A carrier frequency voltmeter is used in this section.)

1—6G Wideband Noise Measuring Set, equipped with 10-50 KC Weighting Network

1—135-Ohm Termination (310 Plug)

1—2W42A Test Cord

1—3P7B Patch Cord

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Preparation

1.06 Noise measurements are made only on an out-of-service basis. Except for routine maintenance, the wideband data circuit will not normally be removed from service unless a trouble report has been made as a result of a customer complaint.

1.07 Before the noise measurements are made, the test sets to be used should be calibrated in accordance with procedures described in sections covering the sets. The calibration procedure for the 6G wideband noise measuring set (6G NMS) is given in Section 103-627-100. The calibration of the KS-15538 L5A carrier frequency voltmeter (CFVM), described in Section 103-400-106, is accomplished after the test set is connected to the circuit being tested.

1.08 Noise measurements are made at the test jacks provided in the wideband service bay (WSB), except when one-way measurements are required between a WSB and a wideband data station. In this case, measurements are also 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 wideband subscriber lines (switched network) or station lines (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 are 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 requirement. 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 requirements, it is probably satisfactory.

2. NOISE MEASUREMENTS

2.01 Since the designations of WSB testing jacks are not standardized, a theoretical east-west wideband data channel is used for describing test procedures and arbitrary jack designations are assigned. The illustrations contained in this section can be used to identify 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 which, in a switched network, could contain two intertoll trunks three wideband switches, and two wideband subscriber lines each of which might contain a section using N carrier facilities. For a 2-point private line, the station lines are equivalent to the switched network wideband subscriber lines and the total interexchange facilities are equivalent to the two network trunks and three wideband switches. Allocations of noise requirements are made to trunk and line sections which might be combined into an overall wideband data channel.

2.03 Requirements for trunk and line sections are given in Section 314-609-310, Table A (switched network) and Table B (2-point private line). When making looped-circuit measurements, refer to 1.09. If any requirement cannot be met, a request for engineering assistance should be made.

B. Test Access to Wideband Channels

2.04 Procedures for obtaining test access to wideband data channels are described in Section 314-609-510.

> ***Caution: Before connecting a measuring set to make any kind of noise measurement, make sure that the transmitting end of the circuit has been terminated. This must be done to prevent possible damage to the measuring set. Use a low meter sensitivity until all connections and control settings are made. Then, increase the sensitivity until an appropriate meter defection is obtained.***

C. 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: The voltmeter INPUT terminal connecting link should be disconnected from the ground terminal to make measurements on balanced circuits.

STEP	PROCEDURE
1	If test is to be performed on a 2-point private line or on a wideband subscriber line in a switched network, obtain release of the wideband channel from the customer. In addition, if the test is performed on a switched network, make the wideband channel busy at a master test frame or test board.
	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 carrier frequency voltmeter as follows: ATTENUATOR to -20 FUNCTION to 135Ω SELECTOR to INPUT FINE control to minimum (counterclockwise)

STEP	PROCEDURE
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. (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 2 through 50 kHz. Observe and record any frequency settings at which the meter reading approaches or exceeds -10 dBm when testing a wideband subscriber line (switched network), or a station line or interexchange facility (2-point private line). If a network trunk is being tested (switched network), observe and record any frequency setting at which the noise level approaches or exceeds -16 dBm. 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, pay particular attention to the region about 30 and 2 kHz (96 and 68 kHz in the LMX 60- to 108-kHz band).
8	If a one-way measurement was made, switch testing locations and make a measurement in the opposite direction.
9	Refer to Section 314-609-310, Table A (switched network) or Table B (2-point private line) for requirements. If a looped-circuit measurement was made, refer to 1.09. Record the results on the transmission form in Section 314-609-310.
10	Remove the test equipment and looping arrangement, if used. Return the wideband data channel to the customer. Release the make-busy condition, if used.

D. Gaussian Noise Measurements

2.06 The testing arrangements for making one-way and looped-circuit measurements of Gaussian noise are shown in Fig. 2.

STEP	PROCEDURE
1	If test is to be performed on a 2-point private line or on a wideband subscriber line in a switched network, obtain release of the wideband channel from the customer. In addition, if the test is performed on a switched network, make the wideband channel busy at a master test frame or testboard.
	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( ).

STEP	PROCEDURE
	(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	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.
8	Refer to Section 314-609-310, Table A (switched network) or Table B (2-point private line) for requirements. If a looped-circuit measurement was made, refer to 1.09. Record results on the transmission Measurements Form in Section 314-609-310.
9	Remove test equipment and looping arrangement, if used. Return the wideband data channel to the customer. Release the make-busy condition, if used.

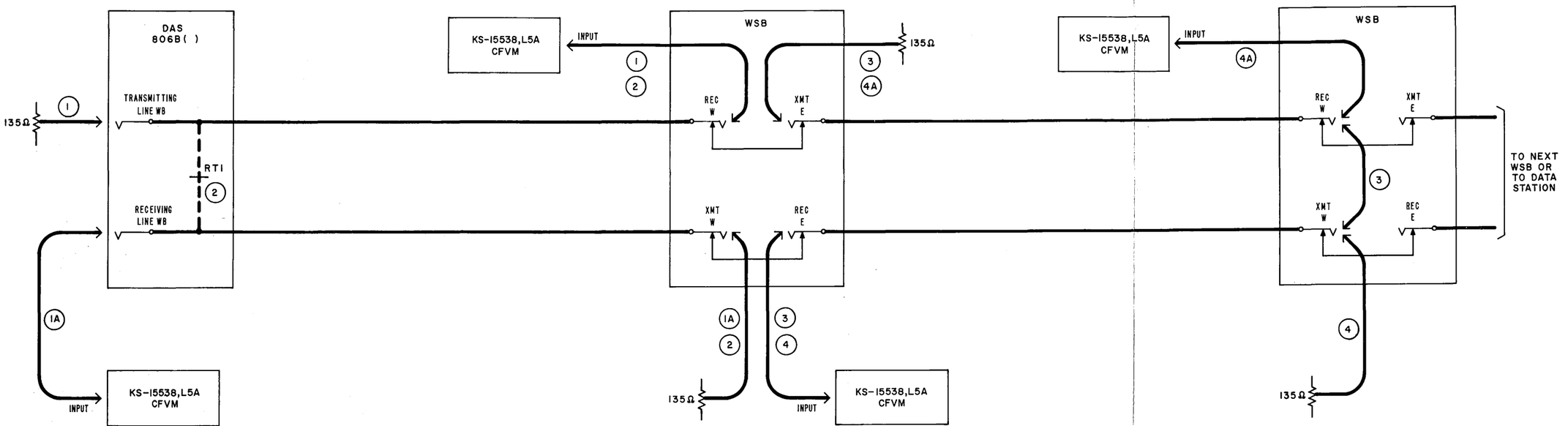
E. Impulse Noise Counts

2.07 The testing arrangements for making one-way and looped-circuit counts of noise impulses are shown in Fig. 2.

STEP	PROCEDURE
1	If test is to be performed on a 2-point private line or on a wideband subscriber line in a switched network, obtain release of the wideband channel from the customer. In addition, if the test is performed on a switched network, make the wideband channel busy at a master test frame or testboard. ***At Transmitting End***
2	Insert a 135-ohm termination (equipped with 310 plug) into the transmitting jack as indicated below. Refer to Fig. 2.

STEP	PROCEDURE
	(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 NMS as follows: WTG to 10-50 KC DBRN DIAL to 85 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 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.
9	Refer to Section 314-609-310, Table A (switched network) or Table B (2-point private line) for requirements. If a looped-circuit measurement was made, refer to 1.09. Record results on the Transmission Measurements Form in Section 314-609-310.
10	Remove test equipment and looping arrangement, if used. Return the wideband circuit to the customer. Release the make-busy condition, if used.



(1) ONE-WAY MEASUREMENT, DAS TO WSB

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

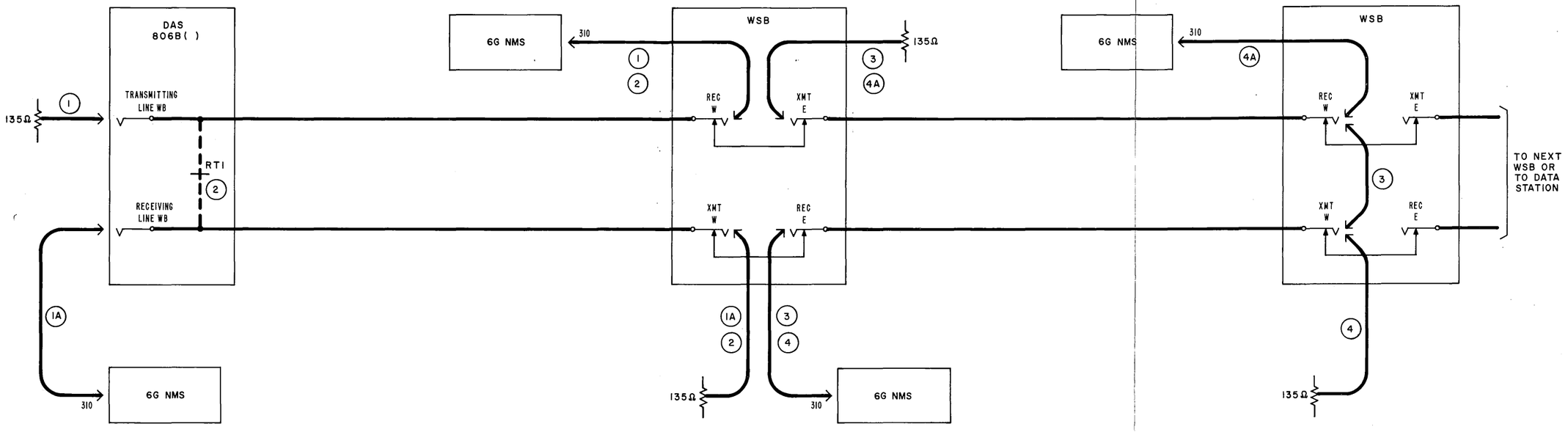
(2) LOOPED-LINE MEASUREMENT FROM WSB

(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, 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, Groupband Data Circuit