TYPE N2 CARRIER TELEPHONE SYSTEM
OVERALL SYSTEM
CHANNEL NOISE MEASUREMENT

The design of the N2 carrier telephone system requires that a certain maximum allowable noise level not be exceeded. The noise measurements in this section apply to message channels, Schedules C and D program channels, and noncompandored channels equipped with voice-frequency amplifier units. These noise measurements should be performed on a completely aligned channel after the net gain adjustment has been made. If patch jacks are available, these tests should be made with the transmitting terminal and receiving terminal compandor units or voice-frequency amplifier units in place in the terminals. If no patch jacks are available, these tests may be made with the units in an N2 terminal test stand.

The channel noise requirements in this section are based upon systems engineered according to present transmission objectives. If a noise objective is provided on the circuit layout card, the measured noise should not exceed that objective. If no noise objective is provided on the circuit layout card, the measured noise should not exceed the requirements in this section.

The Transmission Engineering Department should be consulted in all cases where measured noise exceeds the noise objective.

The characteristics of some types of noise are such that if the C-message weighted objectives given in this section or on the circuit layout card are met, the noise will not be disturbing to most telephone users. However, the noise characteristics may be such as to degrade the performance of the N2 carrier system. The 3-kc flat weighted noise requirements for the message channel have been established to ensure that the performance of the carrier channel is not being degraded. Impulse noise requirements in this section are based upon objectives set for various switched data systems and are not necessarily a function of circuit length. It may be desirable to measure the impulse noise not only during a busy hour but also during a light traffic period when the channels of the carrier system are loaded with idle 2600-cps signaling tones.

This section is reissued to revise previous message circuit noise requirements, to add requirements for Schedules C and D program channels and noncompandored channels equipped with voice-frequency amplifier units, and to provide a channel impulse noise measurement. Because of the general revision, marginal arrows usually used to denote changes have been omitted.

The purpose of these tests is to measure the interfering effects of noise on an N2 channel using the 3A noise measuring set and the 6A impulse counter.

APPARATUS:

J94003A Noise Measuring Set (3A NMS) with Appropriate Weighting Networks

J94006A (6A) Impulse Counter

APPARATUS: (Cont)

J99272W or J99272AH N2 Terminal Test Stand

3P15 Cord

3P17 Cord

P2DS Cord

262B Plug (600 Ohms)

STEP	PROCEDURE
	A. Preparation for Testing
	Observe the following notes and perform the following preparatory steps (1 through 11) only if Test B, C, or D is to be performed. When conducting impulse noise measurements (Test E) no preparatory procedures are required.
	Note 1: The monitoring headset should be used as an aid in identifying noise. However, the quality heard is not comparable to that heard by subscribers.
	Note 2: The meter damping switch (just above FUNCTION switch) on the 3A NMS should ordinarily be in the NORM position for greater accuracy. When measuring rapidly fluctuating noise (static, dial-office noise, etc.), a better estimate of the disturbing effect of this type of noise to subscribers is obtained with the damping switch in the DAMP position.
	Note 3: Noise limits are specified in two length categories for the various types of channels. The noise limits specified apply to any length within a given category.
1	Remove the channel from service.
	At Transmitting Terminal
2	If jack appearances are available, use a 262B plug to terminate the channel under test in 600 ohms at the MOD IN or equivalent VF IN jacks.
3	If no jack appearances are available, remove the compandor unit or the VF amplifier unit from the terminal and reconnect using an N2 terminal test stand. Plug the 262B plug (600-ohm termination) into the COMP IN jack on the J99272W test stand or the VF IN jack on the J99272AH test stand.
	At Receiving Terminal
4	If jack appearances are available, use a 3P17 cord to connect the IN jacks of the 3A NMS to the DEM OUT or equivalent VF OUT jacks in the jack field or patch bay.
5	If jack appearances are not available, remove the compandor unit or VF amplifier unit from the channel under test and reconnect using an N2 terminal test stand. Use a 3P17 cord to connect the IN jacks of the 3A NMS to the EXP OUT jack of the J99272W test stand or VF OUT jack of the J99272AH test stand.

STEP	PROCEDURE
6	Set the FUNCTION switch on the 3A NMS to OFF and check that the meter zero is properly adjusted so that the needle is on the base line.
7	Insert the proper weighting network into the 3A NMS as follows: message channels or channels equipped with VF amplifiers — C-message network; Schedules C and D channels — program weighting network.
8	Set the DBRN switch to 85.
9	Set the FUNCTION switch to BAT. If the meter fails to read in the scale area marked BAT, set the FUNCTION switch to OFF and replace the battery.
10	Set the FUNCTION switch to CAL. Adjust the CAL control for a meter reading on the red line of the scale. Use a screwdriver through the panel hole for this adjustment. *Note:* If the readings are made with the monitoring headset in the 3A NMS, the calibration of the instrument should be made under the same condition.
11	Set the FUNCTION switch to the 600-ohm position. **B. Method for Making Noise Measurements on Message Channels Equipped With Compandor Units at Both Ends** *Note:* These noise measurements are made at the +7 db transmission level point.
12	Check that the C-message weighting network is in the 3A NMS.
13	Adjust the DBRN switch in a counterclockwise direction until a meter reading between the +5 and +10 points on the scale is obtained. *Note:* The measured noise level is the meter reading ***plus*** the DBRN switch setting. The units of the 3A NMS are given in decibels referred to reference noise power (dbrn). ***Requirement:*** The measured noise level (C-message) shall not exceed the value on the circuit layout card or, if none is shown, shall not exceed: SYSTEM LENGTH (MILES) — NOISE LIMITS (DBRNC) 0 to 100 — 30 More than 100 — 33
14	Insert the 3-kc flat weighting network into the 3A NMS.
15	Repeat Step 13. ***Requirement:*** The measured noise level (3KC FLAT) shall not exceed 42 dbrn for any length system.
16	Restore channel to service.

STEP	PROCEDURE
	C. Method for Making Noise Measurements on Channels Equipped With VF Amplifiers at One or Both Ends of the Channel
	Note: These noise measurements are made at the +7 db transmission level point.
12	Check that the C-message weighting network is in the 3A NMS.
13	Adjust the DBRN switch in a counterclockwise direction until a meter reading between the +5 and +10 points on the scale is obtained. *Note:* The measured noise level is the meter reading ***plus*** the DBRN switch setting. The units of the 3A NMS are given in decibels referred to reference noise power (dbrn). ***Requirement:*** • For channels with compandor unit at transmitting terminal and VF amplifier unit at receiving terminal (measuring end), the measured noise level (C-message) shall not exceed the circuit layout card value or, if none is shown, shall not exceed: SYSTEM LENGTH (MILES) — THROUGH-CHANNEL SERVICE LINE-UP NOISE LIMITS (DBRNC) 0 to 100 — 60 More than 100 — 63 • For channels with VF amplifier unit at transmitting terminal and compandor unit at receiving terminal (measuring end), the measured noise level (C-message) shall not exceed the circuit layout card value or, if none is shown, shall not exceed: SYSTEM LENGTH (MILES) — NOISE LIMITS (DBRNC) 0 to 100 — 30 More than 100 — 33 • For channels with VF amplifier units (using the data adjustment) at both terminals, the measured noise level (C-message) shall not exceed the requirement for the particular type of circuit assigned to the channel or, if this is not known, shall not exceed: SYSTEM LENGTH (MILES) — DATA SERVICE LINE-UP NOISE LIMITS (DBRNC) 0 to 100 — 56 More than 100 — 59
14	Insert the 3-kc flat weighting network into the 3A NMS.

STEP	PROCEDURE
15	Adjust the DBRN switch in a counterclockwise direction until a meter reading between the +5 and +10 points of the scale is obtained. ***Note:*** The measured noise level is the meter reading ***plus*** the DBRN switch setting. The units of the 3A NMS are given in decibels referred to reference noise power (dbrn). ***Requirement:*** • For channels with compandor unit at the transmitting terminal and VF amplifier units at the receiving terminal (measuring end), the measured noise level (3 KC FLAT) shall not exceed 72 dbrn for any length system. • For channels with VF amplifier units at the transmitting terminal and compandor units at the receiving terminal (measuring end) using through-channel service line-up adjustment of VF amplifier units, the measured noise level (3 KC FLAT) shall not exceed 42 dbrn for any length system. • For channels with VF amplifier units (using data service line-up adjustment) at both terminals, the measured noise level (3 KC FLAT) shall not exceed 68 dbrn for any length system.
16	Restore channel to service.
	D. Method for Making Noise Measurements on Schedules C and D Program Channels
	Note: These noise measurements are made at the +7 db transmission level point.
12	Check that the program weighting network is in the 3A NMS.
13	Adjust the DBRN switch in a counterclockwise direction until a meter reading between the +5 and +10 points on the scale is obtained. ***Note:*** The measured noise level is the meter reading ***plus*** the DBRN switch setting. The units of the 3A NMS are given in decibels referred to reference noise power (dbrn). ***Requirement:*** The measured noise level, unless otherwise specified on the circuit lay-out card, shall not exceed: SYSTEM LENGTH (MILES) — NOISE LIMITS (DBRN PROG) 0 to 100 — 36 More than 100 — 39
14	Insert 15-kc flat weighting network into the 3A NMS.
15	Repeat Step 13. ***Requirement:*** The measured noise level (15KC FLAT) shall not exceed 42 dbrn for any length system.

STEP	PROCEDURE
16	Restore channel to service.
	E. Impulse Noise Measurement
1	Remove the channel from service.
	At Transmitting Terminal
2	If jack appearances are available, use a 262B plug to terminate the channel under test in 600 ohms at the MOD IN or equivalent VF IN jacks.
3	If jack appearances are not available, remove the compandor unit or the VF amplifier from the terminal and reconnect using an N2 terminal test stand. Plug the 600-ohm, 262B termination into the COMP IN jack on the J99272W test stand or VF IN jack on the J99272AH test stand.
	At Receiving Terminal
4	Calibrate the 6A impulse counter in accordance with Section 103-620-100.
5	Turn the weighting switch (S1) to VOICE BAND.
6	Remove the receiving-end compandor unit of VF amplifier unit or the channel under test.
7	Use a P2DS cord to connect the IN jacks of the 6A impulse counter to the DO-DG jacks of the modem unit of the channel under test.
8	Set the REF LEV DBRN switches (S2 and S3) to 63 dbrn. Rotate TIMER knob to 30 to set the counter in operation. ***Requirement:*** The number of counts on the 6A impulse counter shall not exceed 90 in a 30-minute period.
9	If the requirement of Step 8 is not met, adjust the REF LEV DBRN switches until the count approximates the requirement. Record the switch setting.
10	Restore channel to service.