N3 CARRIER TELEPHONE SYSTEM
OVERALL SYSTEM
CHANNEL NOISE MEASUREMENT

The design of the N3 Carrier Telephone System requires that a certain maximum allowable noise level not be exceeded. The noise measurements in this section apply to message channels and Schedules C and D program channels, whether the channels are transmitted solely over an N carrier system or transmitted over an N carrier system in conjunction with an L broadband carrier system via N3-L junctions. The measurements also apply to 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.

The channel noise requirements in this section are based upon systems engineered to present transmission objectives. Noise objectives should be provided on the carrier layout card and the measured noise should not exceed that objective. The Transmission Engineering Department should be consulted in all cases where measured noise exceeds these noise objectives. Typical noise performance values are given in this section. If no values are entered on the carrier layout card, and the typical values given in this section are exceeded the Transmission Engineering Department should be consulted.

The characteristics of some types of noise are such that if the C-message weighted objectives in this section or on the carrier 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 N3 carrier system. For this reason, noise measurements in this section include both C-message and 3-kHz flat readings. If C-message requirements are not met, it is particularly important to make a flat weighting measurement to detect any interference which may affect expandor operation of compandored channels.

Note: A flat noise measurement requires the use of a J94003( ) noise measuring set and ***cannot*** be made on the J64043A noise measuring system. A J64043A noise measuring system has a built-in message weighting characteristic which cannot be varied. The J64043A system should only be used for an approximate evaluation of message noise.

The impulse noise requirements in this section are based upon objectives set for various switched data systems and are not necessarily a function of length. This test is not only a measure of the impulse noise of an N3 carrier system or a combined N3 and L system, but also a measure of N3 load-handling capacity. For this reason, it may be desirable to measure the impulse noise not only during the busy hour but also during a light traffic period when the channels of the carrier system are loaded with the idle 2600-Hz signaling tones.

This section is reissued to add requirements for Schedules C and D program channels, noncompandored channels equipped with voice-frequency amplifier units, and channels transmitted over an L carrier system via N3-L junctions. 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 N3 channel, using a 3 type noise measuring set and a 6 type impulse counter.

APPARATUS:

1 — J94003 A, B, or C type Noise Measuring Set (NMS)

1 — J94006( ) type Impulse Counter

1 — 262B 600-Ohm Plug (to terminate voice-frequency input)

1 — 3P17 Cord

1 — P2DS Cord

STEP	PROCEDURE
	Note 1: Observe Notes 2, 3, and 4 and perform Part A Steps 1 through 9 if Test B, C, or D is to be performed. When conducting impulse noise measurements (Test E), no preparatory procedures are required. *Note 2:* The monitoring headset should be used as an aid in identifying noise. The character of the noise heard in the monitoring receiver is similar to that which would be heard by a subscriber but is not necessarily the same in magnitude. *Note 3:* The meter damping switch (just above the FUNCTION switch) on the 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 4:* Noise limits are specified in length categories for the various types of channels. The noise limits specified apply to any length within a given category. **A. Initial Preparation**
1	Remove the channel from service.
2	At the transmitting terminal, terminate the channel under test in 600 ohms at the MOD IN or equivalent VF IN jacks.
3	At the receiving terminal, connect the IN jacks of the NMS to the DEM OUT or equivalent VF OUT jacks in the jack field or patch bay, using a 3P17 cord.
4	Set the FUNCTION switch of the noise measuring set to OFF and see that the meter zero is properly adjusted so that the needle is on the base line.

STEP	PROCEDURE
5	Insert the proper weighting network into the NMS as follows: • Message channels or channels equipped with VF amplifiers — C-message network • Schedules C and D channels — program weighting network
6	Set the DBRN switch to 85.
7	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.
8	Set the FUNCTION switch to CAL. Adjust the CAL control for a meter reading in the red section of the scale. Use a screwdriver through the panel hole for this adjustment. ***Note:*** When readings are made with the monitoring headset plugged into the NMS, the calibration of the instrument must be made under the same condition.
9	Set the FUNCTION switch to the 600-ohm position (3A or 3B NMS) or to $N_M \frac{600}{900}$ (3C NMS)
	B. Method for Making Noise Measurements on N3 or Combined N3-L Message Channels with Compandor Units at Both Ends
	Note: These noise measurements are made at the +7 dB transmission level point (TLP).
1	Check that the C-message weighting network is in the NMS.
2	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 NMS are given in decibels referred to reference noise power (dBrn). ***Requirement:*** The measured noise level (C-message) at this +7 dB TLP shall not exceed the value on the carrier layout card or, if none is shown, shall not exceed:

N3 SYSTEM — NOISE LIMITS IN DBRNC	
SYSTEM LENGTH IN MILES	DBRNC
0 to 50	25
51 to 100	27
101 to 200	30

STEP	PROCEDURE

N3-L SYSTEMS — NOISE LIMITS IN DBRNC								
L FACILITY LENGTH IN MILES / TOTAL N3 FACILITY LENGTH IN MILES*	UP TO 50	51 TO 100	101 TO 200	201 TO 400	401 TO 1000	1001 TO 1500	1501 TO 2500	2501 TO 4000
0 to 50	26	27	27	28	29	30	32	33
51 to 100	28	28	29	29	30	31	32	34
101 to 200	31	31	31	31	32	33	34	35
201 to 400	34	34	34	34	34	35	35	36

*The N3 system length may be at one end of the total connection or distributed between the two ends.

3 Insert the 3 KC FLAT weighting network into the NMS.

4 Repeat Step 2.

Requirement: The measured noise level (3 KC FLAT) at +7 dB TLP shall not exceed 42 dBrn for any length of system.

5 Restore the channel to service by removing all test connections at both terminals.

C. Method for Making Noise Measurements on N3 Channels Equipped with VF Amplifiers at One or Both Ends of the Channel

Note 1: These noise measurements are made at the +7 dB TLP.

Note 2: N3 levels required for data and message signals are identical.

1 Insert the C-message weighting network in the NMS.

2 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 NMS are given in decibels referred to reference noise power (dBrn).

Requirement:

- For channels with a compandor unit at the transmitting terminal and a VF amplifier unit at the receiving terminal (measuring end), the measured noise level (C-message) shall not exceed the carrier layout card value or, if none is shown, shall not exceed:

SYSTEM LENGTH (MILES)	THROUGH-CHANNEL SERVICE LINE-UP NOISE LIMITS (DBRNC)
0 to 50	55
51 to 100	57
More than 100	60

<table>
<tr><th>STEP</th><th>PROCEDURE</th></tr>
<tr><td>2
(Cont)</td><td>
• For channels with a VF amplifier unit at the transmitting terminal and a compandor unit at the receiving terminal (measuring end), the measured noise level (C-message) shall not exceed the carrier layout card value or, if none is shown, shall not exceed:
<table>
<tr><th>SYSTEM LENGTH (MILES)</th><th>NOISE LIMITS (DBRNC)</th></tr>
<tr><td>0 to 50</td><td>25</td></tr>
<tr><td>51 to 100</td><td>27</td></tr>
<tr><td>More than 100</td><td>30</td></tr>
</table>
• For channels with VF amplifier units 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:
<table>
<tr><th>SYSTEM LENGTH (MILES)</th><th>DATA SERVICE LINE-UP NOISE LIMITS (DBRNC)</th></tr>
<tr><td>0 to 50</td><td>55</td></tr>
<tr><td>51 to 100</td><td>57</td></tr>
<tr><td>More than 100</td><td>60</td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Insert the 3-KC FLAT weighting network into the NMS.</td></tr>
<tr><td>4</td><td>Repeat Step 2.

Requirement:

• For channels with a compandor unit at the transmitting terminal and a VF amplifier unit at the receiving terminal (measuring end), the measured noise level (3 KC FLAT) shall not exceed 72 dBrn for any length of system.

• For channels with a VF amplifier unit at the transmitting terminal and a compandor unit 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 of system.

• For channels with VF amplifier units at both terminals, the measured noise level (3 KC FLAT) shall not exceed 72 dBrn for any length of system.</td></tr>
<tr><td>5</td><td>Restore channel to service by removing all test connections at both terminals.</td></tr>
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STEP	PROCEDURE
	D. Method for Making Noise Measurements on N3 or Combined N-3L Schedules C and D Program Channels
	Note: These measurements are made at the +7 dB TLP.
1	Insert the program weighting network in the NMS.
2	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 NMS are given in decibels referred to reference noise power (dBrn).
	Requirement: The measured noise level (program weighting) at this +7 dB TLP, unless otherwise specified on the carrier layout card, shall not exceed:

N3 SYSTEM — NOISE LIMITS IN DBRN (PROG. WGT)	
SYSTEM LENGTH IN MILES	DBRN
0 to 50	31
51 to 100	33
101 to 200	36

N3-L SYSTEMS — NOISE LIMITS IN DBRNC (PROG. WGT)								
L FACILITY LENGTH IN MILES / TOTAL N3 FACILITY LENGTH IN MILES*	UP TO 50	51 TO 100	101 TO 200	201 TO 400	401 TO 1000	1001 TO 1500	1501 TO 2500	2501 TO 4000
0 to 50	32	33	33	34	35	36	38	39
51 to 100	34	34	35	35	36	37	38	40
101 to 200	37	37	37	37	38	39	40	41
201 to 400	40	40	40	40	40	41	41	42

*The N3 system length may be at one end of the total connection or distributed between the two ends.

3	Insert the 15 KC FLAT weighting network into the NMS.
4	Repeat Step 2.
	Requirement: The measured noise level (15 KC FLAT) shall not exceed 42 dBrn for any length of system.
5	Restore the channel to service by removing all test connections at both terminals.

STEP	PROCEDURE
	E. Impulse Noise Measurement
1	Remove the channel from service.
2	At the transmitting terminal, use a 262B plug to terminate the channel under test in 600 ohms at the MOD IN or equivalent VF IN jacks.
3	Calibrate the 6-type impulse counter in accordance with Section 103-620-100.
4	Turn the weighting switch (S1) to VOICE BAND.
5	Remove the receiving-end compandor unit or VF amplifier unit of the channel under test.
6	Use a P2DS cord to connect the IN jacks of the 6-type impulse counter to the DEM OUT and DEM GRD jacks of the modem unit of the channel under test.
7	Adjust 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 6-type impulse counter shall not exceed 90 in a 30-minute period.
8	If the requirement of Step 7 is not met, adjust the REF LEV DBRN switches until the count approximates the requirement. Record the switch setting.
9	Return the compandor unit to the terminal.
10	Remove all test connections at both terminals.