TYPE N1, O, AND ON CARRIER SYSTEMS
OVERALL CHANNEL LINEUP
CHANNEL NOISE MEASUREMENT

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1. GENERAL

1.01 This section provides procedures for measuring noise and the maintenance requirements for N1, N1-H, O, O-H, ON, and ON-H carrier channel units.

1.02 This section is reissued to add the sequential sampling method of determining channels selected for impulse noise measurement, requirements tables using holding tone with measurements made at the +7 TLP, and miscellaneous other changes. Arrows normally used to indicate changes have been omitted, as this is a general revision. This reissue affects the Equipment Test List.

1.03 The channel should be completely aligned per Section 362-330-50X, 362-020-510, or 362-335-50X before noise measurements are performed, as applicable. All noise measurements are made at the (+7 TLP) voice frequency patch bay (VF PB) when available. If VF PB is not available, the 5M channel unit test stand, DEM OUT or equivalent VF OUT jack may be used. These are out-of-service tests.

1.04 The requirements listed in this section are maximum permissible limits and shall apply unless a more rigid requirement is specified on the carrier layout card.

1.05 C-Messge weighted, 3-kHz weighted, and impulse noise measurements shall be made at initial lineup of the N1, N1-H, O, O-H, ON, or ON-H carrier.
Routine testing intervals are found in the Equipment Test List (ETL) Section 362-001-011.

1.06 N1, N1-H, O, O-H, ON, and ON-H channels used for data circuits require that C-notched noise, nonlinear distortion, and envelope delay tests be made. A new Section 362-305-508 will be issued listing these requirements.

2. FREQUENCY-WEIGHTED NOISE

2.01 Test A contains procedures for measuring C-Message and 3-kHz flat weighted noise on N1, N1-H, O, O-H, ON, and ON-H channel units used for message or data transmission. Requirements are separated according to channel length and equipment used at receiving end (compandor or

VF Amplifier). (See Tables A, B, and C.) Since the compandor furnishes a predictable noise improvement, channel units at the receiving N1, O, or ON-type terminal have a lower noise requirement then VF Amplifier equipped channels.

2.02 The N1, N1-H, O, O-H, ON, or ON-H channel units used for schedule C and D program service have 15-kHz flat weighted and program-weighted noise requirements. Test E contains procedures for measuring these facilities. The requirements for C and D program service are separated according to length of channel. Table C lists C and D program-weighted noise limits. All requirements are based upon the use of compandors at each end of the channel.

3. IMPULSE NOISE

A. Testing Methods

3.01 Impulse noise consists of short duration pulses of unwanted signals which occur in a random pattern in the transmission medium. Impulse noise measurements should be made during the busy times of the day (8:30 to 11:30 am and 1:00 to 4:30 pm) or in case of customer complaint, at the time of day that the trouble was experienced. Since impulse noise is time variable and facility oriented, a sampling technique is used to shorten the testing interval. By the sampling process, relatively short tests (5 minutes) are made on several channels rather than longer tests (15 minutes) on all channels. Using the "sequential sampling" technique, the facilities in a facility group are measured in a predetermined sequence. Table D lists sample sequence schemes which may be used. A decision may be made on a facility group after four or more channels of the group have been tested, to accept, reject, or to proceed with tests of additional facilities (channels). See Table E for objective number values. In cases where the facility group is either very good or very bad, the decision to accept or reject the facility group is approached very rapidly. For example, a facility group of 40 facilities could be accepted if three of the first four facilities tested meet their requirements, or rejected if the first four faciities fail to meet requirements. Only in borderline cases does the number of required measurements approach the total number of facilities

3.02 Impulse noise measurements of small facility groups (less than 5 facilities) require that each facility be tested for 15 minutes. Accept the facility if the counts are 15 or less in the 15-minute test interval. If the counts exceed 15 during the 15-minute test interval, the facility must be rejected and the trouble cleared from the facility. Accept the facility when requirements are met. See paragraph 3.09 for corrective procedures.

3.03 Test B is normally used for facilities having compandors at both ends of the facility or on facilities having a VF Amplifier at the transmit end and a compandor at the receive end. A -13 dBmO, 1004-Hz holding tone is normally applied at the transmit end -16 TLP (-29 dBm) for Test B. A 1004-Hz notched filter (KS-21567,L2 network) is used in the 6-type test set at the receive end +7 TLP to block the holding tone from the test set. If the 1004-Hz filter is not available, one of another frequency may be used if the holding tone at the transmit terminal is adjusted to the substituted filter frequency.

3.04 The holding tone operates the expandor, thereby keeping the expandor at a fixed loss value near its normal operating level. The requirements specified for a fully compandored or one with a compandor at the receive end only account for the fixed expandor loss; therefore, these values are valid only when holding tone is applied to the facility.

3.05 In Test C, the impulse noise on a compandored facility may be measured without the use of holding tone by disabling the receiving terminal compandor circuit. The tube equipped compandor may be disabled by replacing the 408A tube in the V44 socket with a 408A tube which has pins 1, 5, and 6 clipped off; or for HIN equipped compandor, remove the KS-21073, L1 HIN device from socket V44. The impulse noise measurement may be made at the DEMOD OUT, VF OUT, or equivalent jacks. Test B is preferred to Test C, as Test B excludes the expandor circuit, therefore, it does not represent the normal operating facility. The threshold values for Test C have been listed with compensation made for the absence of expandor loss. The counts-per-unit of time using either Test B or C should be comparable.

3.06 Test D contains procedures for measuring impulse noise on N1, N1-H, O, O-H, ON, and ON-H facilities with VF Amplifier equipped channel units at the receiving terminal. Since there is no expandor circuit, impulse noise may be

measured at the VF patch jacks without use of holding tone and its associated filter.

3.07 Although Tests B and C are designed for measuring impulse noise on compandored facilities, the tests may also be used for facilities equipped with receiving VF Amplifiers (noncompandored). Where a facility group is made up of compandored and noncompandored facilities (receiving terminal), it may be less time consuming to use one test method (Test B or C) for all facilities within the facility group.

3.08 Impulse noise measurements are made only on the initial lineup or when an impulse noise problem occurs. Impulse noise measurements are not required for N1, N1-H, O, O-H, ON, or ON-H carrier channels which are used for schedule C and D program service.

3.09 When impulse noise in an NI, N1-H, O, O-H, ON, or ON-H carrier system fails to meet requirements, the noise should be sectionalized using the 7A (J94007A) carrier frequency noise measuring set (CFNMS) per Section 362-401-501, 103-500-100, or equivalent. Systems that contain impulse noise which the plant operations personnel are unable to locate, should be referred to the appropriate engineering department through lines of organization. Troubles which are isolated to power line induction and other areas outside of plant control should be forwarded to engineering for assistance.

B. Test Preparation

3.10 A typical arrangement for measurement of impulse noise on a compandored channel (facility) is shown in Fig. 1. At the far (transmit) end, a -29.0 dBm, 1004-Hz holding tone is applied at the -16 TLP and is transmitted on the channel to hold the near (receive) end expandor at a specific loss. A 6F NMS or 6H impulse counter is connected at the DEM OUT jack of the VF patch bay, or equivalent +7 TLP. The 6-type test set at the receive end is equipped with a C-notched KS-21567, L2 network to block the 1004-Hz holding tone from the measuring set. The network blocks a band about 20 Hz wide which will not affect the impulse noise measurements.

3.11 Message or data N1, N1-H, O, O-H, ON, or ON-H channels should be tested for impulse noise while using holding tone per Test B. Figure 2 lists procedure sequence. Symbols are similar to those used for TOP documents. A diamond-shaped symbol indicates that a decision is to be made; a rectangular-shaped symbol indicates an instruction, and a solid bar is used to indicate end of tests.

3.12 For the purpose of making impulse noise tests, a ***facility group*** is defined as all channels under test between common test points. For example, all channels between two VF patch bay appearances would comprise a facility group. The ***objective number*** is a function of the facility group size and the number of tests necessary to reach a decision. Table E lists objective numbers for various size facility groups.

3.13 Select a systematic sequence of channels to be tested which will provide the greatest cross-section of the channel frequency spectrum. This may be all odd-numbered channels 1, 3, 5, etc., until all odd-numbered channels are tested. The next sequence could be all even-numbered channels of the facility group, or any other sequence is acceptable so long as channels selected represent a cross-section of the entire frequency spectrum. Table D lists examples of test sequence patterns. Testing will end as soon as the cumulative number of passed (Os) channels or failed (1s) channels ***exceed*** the objective number specified in Table E, or when all channels in the facility group have been tested. Reject a facility group only if the number of failed channels (1s) ***exceed*** the objective number. Use an impulse noise test worksheet similar to Fig. 3 and 4 to list the sequential sample of the channels, then as each channel is tested record the results cumulatively in the passed (Os) column or failed (1s) column. Continue tests until the facility group is either accepted or rejected.

4. APPARATUS

4.01 The following sections describe the calibration of the test sets used in this section. The applicable section(s) should be available for reference during testing. Equivalent test apparatus may be used in lieu of those listed.

SECTION	TITLE
103-221-101	J94021A (21A) Transmission Measuring Set (TMS)
103-302-106	KS-19353, List 4 Oscillator

SECTION	TITLE
103-500-100	J94007A (7A) Carrier Frequency Noise Measuring Set (CFNMS)
103-611-101	J94003C (3C) Noise Measuring Set (NMS)
103-620-101	J94006H (6H) or J94006HR (6HR) Impulse Counter*
103-626-100	J94006F (6F) Noise Measuring Set (NMS)*, recommended for impulse noise testing only.

*Earlier vintage 6F NMS, 6H, and 6HR impulse counters were furnished with 497E or 497G networks containing C-notched filters centered at 2750 and 2800 Hz, respectively. If the KS-21567, L2 network (1004 Hz) is not available for impulse noise measurements, the 497E or 497G network may be substituted.

4.02 The monitoring headset should be used with the noise measuring sets as an aid in identifying the noise source. The character of the noise heard in the monitoring receiver is similar to that which would be heard by the subscriber but is not necessarily of the same magnitude.

Note 1: If a monitoring headset is to be used during noise tests, calibration of the noise test set should also be done with the monitor receiver connected.

Note 2: The meter damping switch of the NMS should 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 the type of noise to subscriber is obtained with the damping switch in the DAMP position.

4.03 ***Test A Apparatus:***

1 262B Plug (600 ohm termination)

1 3C NMS, or equivalent, equipped with

1 3P7E Cord and

1 497A Network

4.04 ***Test B Apparatus:***

1 21A TMS equipped with

1 2P14A Cord and

1 3P17A Cord; or

1 KS-19353, List 4 Oscillator equipped with

1 3P7E Cord; or equivalent

1 6F NMS equipped with

1 KS-21567, List 2 Network and

1 3P7E Cord; or

1 6H Impulse Counter equipped with

1 KS-21567, List 2 Network and

1 3P7E Cord; or

1 6HR Impulse Counter equipped with

1 KS-21567, List 2 Network and

1 3P7E Cord; or equivalent

4.05 ***Tests C and D Apparatus:***

1 262B Plug

1 6-Type Test Set per Test B equipped with

1 497G Network or

1 KS-21567, List 2 Network

4.06 ***Test E Apparatus:***

1 262B Plug

1 3C NMS equipped with

1 3P7E Cord and

1 497B Network; or equivalent

5. PROCEDURE

STEP	PROCEDURE

Test A. C-Message Weighted Noise Test

Both Ends

1 Remove the channel from service and lineup according to Section 362-330-50X, 362-335-50X, or 362-020-510, as applicable.

Far (Transmit) End

2 Terminate the channel in 600 ohms by inserting a 262B plug into the MOD IN, VF IN, or equivalent jack in the patch bay or 5M test stand.

Near (Receive) End

3 Calibrate 3-type NMS with the 497A network oriented for C-message weighted measurements. If monitor receiver is to be used with the 3-type NMS during measurements, it must also be connected for this calibration for proper noise measurement values.

4 Set FUNCTION switch of the NMS for 600-ohm terminated measurements; set NORM-DAMP switch to the NORM position.

5 Connect the input of the 3-type NMS to DO, VF OUT, or equivalent +7 TLP in the VF patch bay or channel unit test stand.

6 Measure the noise level.

Requirement: The measured noise level must not exceed the limit shown in Table A. If the noise level exceeds limit shown in Table A, take corrective action to reduce noise to or below listed requirements, then retest.

7 Orient the 497A network for 3-kHz flat weighted measurements and check calibration of the 3-type NMS. If measurements are to be made while using monitor receiver with the NMS, calibrate the NMS under the same condition.

8 Measure the noise level.

Requirement: The measured noise must not exceed the limit shown in Table B for the equipment configuration of the channel. If the noise level exceeds limit per Table B, take necessary corrective action, then retest the facility.

STEP	PROCEDURE

Both Ends

9 If only one direction of transmission has been tested, repeat Steps 2 through 8 for the other direction.

10 Proceed to impulse noise test (Test B, C, or D) if testing a message or a data facility; proceed to Test E if testing a program facility. (Impulse noise test is not required for a program facility.)

Test B. Impulse Noise Test—Holding Tone Method

Test A, C-Message Weighted Noise Tests should be completed before performing Test B. Test B provides the preferred impulse noise test procedures for N, O, and ON-type carrier voice frequency circuits. Total testing time may be reduced by making impulse noise test in both directions of transmission at the same time.

Transmitting (Far) End

1 Adjust the KS-19353, L4 oscillator or oscillator section of 21A TMS for an output level of -29.0 dBm at 1004 Hz for compandored or noncompadored facilities or to match the C-notched network frequency of the receiving end test set. Arrange the KS-19353 oscillator for 600-ohm impedance by setting FUNCTION switch to the 600 position.

2 Connect the OUTPUT jack of the KS-19353 oscillator or the OSC OUT jacks of the 21A TMS to the MOD IN, VF IN, or equivalent -16 TLP jack in the VF patch bay or channel unit test stand.

Receiving (Near) End

3 Set FUNCTION switch of the 6F NMS to TERM 600-900Ω, orient the KS-21567, L2 network (or equivalent) for FLAT measurement, or set DIAL-MEAS switch of the 6H impulse counter to MEAS.

4 Calibrate the 6F NMS per Section 103-626-100 or the 6H impulse counter per Section 103-620-101.

Note: When the KS-21567, L2, 1004-Hz network is used in the 6-type test set, the test set calibration must be done with the network oriented to the FLAT position. Incorrect readings will result from calibration of the 6-type test sets when the KS-21567, L2 network is oriented to the C-NOTCHED position.

5 Orient the KS-21567, L2 network to the C-NOTCHED position in the 6-type test set.

6 Connect the INPUT jack of the 6F NMS or MEAS jack of the 6H impulse counter to the DEMOD OUT, VF OUT, or equivalent +7 TLP jack in the VF patch bay or channel unit test stand.

7 Adjust the threshold of the test set for the minimum level at which counts occur in rapid succession due to the presence of holding tone (not noise).

STEP	PROCEDURE

8 Observe the impulse counter while having the far end change in small increments the holding tone frequency. It may be necessary to increase the threshold setting to obtain counts after the initial far end tone adjustment. Repeat this procedure until the holding tone is tuned to the C-notched network frequency.

Requirement: Minimum counts per unit of time.

9 Adjust the threshold of the 6-type test set per Table F.

10 Perform impulse noise measurements as indicated per Fig. 2. Record noise measurements on worksheet forms similar to Fig. 3 and 4.

Requirements:

Less than 5 circuits: 15 counts or less in 15 minutes per facility (Test all facilities of facility group.)

Five or more circuits: 5 counts or less in 5 minutes per facility (Quantity of facilities per facility group to be tested and the objective number are determined per Table E.)

11 If requirements per Step 10 are not met, reject the facility and proceed to the next facility until the facility group has been accepted or rejected. Repair rejected facilities.

12 If only one direction of transmission has been tested, repeat Steps 1 through 11 for the other direction of transmission.

13 If no further tests are to be made, remove all test equipment.

Test C. Impulse Noise Test—DEM OUT Jack Method

This test is an alternate method of measuring impulse noise on a full compandored or mixed N1, N1-H, O, O-H, ON, or ON-H channel facility. If the channel facility is equipped with a compandor at one end and an intermediate VF Amplifier at the other end (mixed), this test may be performed in both directions of transmission, or Test D may be performed with a VF Amplifier at the receive end. If the facility is equipped with VF Amplifier at each end, this test or Test D shall be performed.

Test A should be completed prior to performing this test.

Both Ends

1 Ensure that the facility is out-of-service.

Transmitting (Far) End

2 If jack appearances are available, use a 262B plug to terminate the channel under test in 600 ohms at the MOD IN, VF IN jacks, or equivalent -16 TLP.

STEP	PROCEDURE

3 If jack appearances are not available, remove the compandor unit or the VF Amplifier from the terminal and reconnect using the 5M channel unit test stand. Plug the 600 ohm 262B termination into the MOD IN, or equivalent VF IN of 5M channel unit test stand.

Receiving (Near) End

4 Calibrate the 6F NMS or 6H impulse counter per Section 103-626-100 or 103-620-101, respectively.

Note: As holding tone is not used in this test method, either the 497D, 497G, or the KS-21567, L2 network may be used. When KS-21567, L2 network is used in the 6-type test set, the test set calibration must be done with the network oriented to the FLAT position. Incorrect readings will result from calibration of the 6-type test sets when the KS-21567, L2 network is oriented to the C-NOTCHED position.

5 Orient the KS-21567, L2 network to the C-NOTCHED position or the 497D and 497G networks to the C-MESSAGE position in the 6-type test set.

6 Connect the INPUT jack of the 6F NMS or MEAS jack of the 6H impulse counter to the DEM OUT, VF OUT, or equivalent +7 TLP jack in the circuit patch bay or channel unit test stand.

7 Adjust the 6-type test set for a threshold of 66 dBrmc.

8 Disable the tube equipped expandor by replacing the 408A tube (V44) with a 408A tube having Pins 1, 5, and 6 clipped off, or a HIN equipped expandor by removing the KS-21073, L1 HIN device from socket V44. (This is required to prevent double termination at the measuring point.)

9 Perform impulse noise measurements similar to the sequence shown in Fig. 2. Record test results on impulse noise test worksheets per Fig. 3 and 4. (Omit Steps 7 and 8 of Fig. 2 for this test method.)

Requirements:

Less than 5 circuits: 15 counts or less in 15 minutes per facility (test all facilities in the facility group.)

Five or more circuits: 5 counts or less in 5 minutes per facility (Quantity of facilities per facility group to be tested and the objective number is determined per Table E.)

10 If the requirements of Step 9 are not met, reject the facility and proceed to the next facility until the facility group has been accepted or rejected. Repair the rejected facilities.

11 If only one direction of transmission has been tested, repeat Steps 1 through 10 for the other direction.

12 If no other tests are to be made, remove all test equipment.

STEP	PROCEDURE

Test D. Impulse Noise Test—Method for VF Amplifier

Test D contains procedures for measuring impulse noise on N1, N1-H, O, O-H, ON, or ON-H facilities equipped with VF Amplifiers. If a facility is equipped with a compandor at one end and an intermediate VF Amplifier at the other end, Test D may be performed at the receiving end with the VF Amplifier.

Test A should be completed prior to performing Test D. Refer to Fig. 2 for testing sequence.

Transmitting (Far) End

1 Terminate the channel in 600 ohms at the MOD IN, VF IN, or equivalent -16 TLP jack in the VF patch bay or channel unit test stand. Use 262B plug or equivalent.

Receiving (Near) End

2 Calibrate the 6F NMS or 6H impulse counter per Section 103-626-100 or 103-620-101, respectively.

Note: As holding tone is not used in Test D, either of the 497D, 497G, or KS-21567, L2 networks may be used in the 6-type test set.

When the KS-21567, L2 network is used in the 6-type test set, calibration must be done with the network oriented to the FLAT position. Incorrect readings will result from calibration of the 6-type test sets when the KS-21567, L2 network is oriented to the C-NOTCHED position.

3 Set FUNCTION switch of the 6F NMS to TERM 600-900 or the DIAL-MEAS switch of the 6H impulse counter to MEAS and orient the 497G (or equivalent) network for C-NOTCHED measurements on the 6F or 6H test set.

4 Set 6F or 6H test set threshold per Table F.

5 Perform impulse noise measurements similar to the sequence listed in Fig. 2.

Requirements:

Less than 5 circuits: 15 or less counts per facility (Test all of the facilities of the facility group.)

Five or more circuits: 5 counts or less in 5 minutes per facility (Quantity of facilities per facility group to be tested and the objective number are determined per Table E.)

6 If the requirements of Step 5 are not met, reject the facility and proceed to the next facility, until the facility group has been accepted or rejected. Repair the rejected facilities.

STEP	PROCEDURE

7 If only one direction of transmission has been tested, test the other direction with the proper test method as determined by the type of equipment at the receive end of the facility as follows:

VF Amplifier unit: Repeat Steps 1 through 6.

Compandor unit: Perform Test B or C.

8 If no further tests are to be made, remove all test equipment.

Test E. Program-Weighted Noise Test

Test E is required for N1, N1-H, O, O-H, ON, and ON-H carrier facilities which are used for C and D program service.

Both Ends

1 Remove the facility from service and line up according to Section 362-330-505, 362-335-50X, 362-110-510, or 362-020-510 for tube or HIN equipped, as applicable.

Transmitting (Far) End

2 Terminate the facility in 600 ohms by inserting a 262B plug into the MOD IN, VF IN, or equivalent -16 TLP jack in the VF patch bay or the channel unit test stand.

Receiving (Near) End

3 Calibrate 3-type NMS with 497B network oriented to 15-KC FLAT weighted measurements per Section 103-611-100 or 103-611-101, as applicable.

4 Set FUNCTION switch of the NMS for 600-ohm terminated measurements and NORM-DAMP switch to NORM position.

5 Connect the INPUT of the NMS to DEM OUT, VF OUT, or equivalent +7 TLP jack in the VF patch bay or channel unit test stand.

6 Measure noise level.

Requirement: The measured noise shall not exceed 61 dBrn for any length facility.

7 If the facility fails to meet requirements, make necessary repairs and retest the facility.

8 Orient the 497B network for PROGRAM weighted measurements and check the calibration of the NMS per Section 103-611-100 or 103-611-101, as applicable.

9 Measure noise level.

Requirement: Per Table C.

STEP	PROCEDURE
10	If the facility fails to meet requirements, make necessary repairs and retest the facility.
	Both Ends
11	If only one direction of transmission has been tested, repeat Steps 2 through 10 for the other direction.
12	If no further tests are to be made, remove all test equipment.

TABLE A

N1, 0, OR ON–TYPE MESSAGE CHANNEL–
3-KHZ FLAT-WEIGHTED NOISE LIMITS

EQUIPMENT CONFIGURATION		NOISE LIMIT dBrnc AT +7 TLP (SEE NOTES 1 & 2)
TRANSMIT END	RECEIVE END	
COMPANDOR OR VF AMPLIFIER	COMPANDOR	42
	VF AMPLIFIER	72

Note 1: Measure at DEMOD OUT, VF OUT, or equivalent Jack.

Note 2: Any length N1, N1-H, 0, 0-H, ON, or ON-H channel used for message or data service.

TABLE B

N1, 0, OR ON–TYPE MESSAGE CHANNEL–
C-MESSAGE-WEIGHTED NOISE LIMITS

EQUIPMENT CONFIGURATION		NOISE LIMITS IN DBRNC AT +7 TLP	
TRANSMIT END	RECEIVE END	0–100 MILES	101–200 MILES
COMPANDOR OR VF AMPLIFIER	COMPANDOR	30	33
	VF AMPLIFIER	60	63

TABLE C

N1, 0, AND ON–TYPE SCHEDULE C AND D PROGRAM
CHANNEL–PROGRAM-WEIGHTED NOISE LIMITS

NOISE LIMIT IN DBRN PROGRAM-WEIGHTED AT +7 TLP			
0–15 MILES	16–50 MILES	51–100 MILES	101–200 MILES
41*	43*	45*	48*

*Values based upon use of compandors at each end of the facility and measurement being made at the DEMOD OUT, VF OUT, or equivalent jack.

TABLE D

EXAMPLES OF SEQUENTIAL SAMPLING OF CHANNELS
FOR IMPULSE NOISE TESTS

TEST NUMBER	ODD CHANNELS THEN EVEN CHANNELS	FIRST CHAN THEN EVERY FOURTH CHAN	FIRST CHAN THEN EVERY TWELTH CHAN	FOURTH CHAN THEN EVERY FOURTH CHAN
1	1	1	1	4
2	3	5	13	8
3	5	9	2	12
4	7	13	14	16
5	9	17	3	20
6	11	21	15	24
7	13	2	4	3
8	15	6	16	7
9	17	10	5	11
10	19	14	17	15
11	21	18	6	19
12	23	22	18	23
13	2	3	7	2
14	4	7	19	6
15	6	11	8	10
16	8	15	20	14
17	10	19	9	18
18	12	23	21	22
19	14	4	10	1
20	16	8	22	5
21	18	12	11	9
22	20	16	23	13
23	22	20	12	17
24	24	24	24	21

Note 1: Select different sequences and starting points for each facility group.
Note 2: In addition to these sequences others may be used as desired.
Note 3: Sequence used will vary depending on facility group size.

TABLE E

OBJECTIVE NUMBERS OF 0s OR 1s
FOR SEQUENTIAL SAMPLING OF FACILITY
GROUPS FOR IMPULSE NOISE TESTS

CUMULATIVE NUMBER OF CHANNELS TESTED	SIZE OF FACILITY GROUP					
	5-12	13-18	19-24	25-30	31-43	44 UP
	OBJECTIVE NUMBERS					
4	3	3	3	3	3	—
5	3	4	4	4	4	5
6	4	4	4	4	4	6
7	4	5	5	5	5	6
8	5	5	5	5	6	7
9	5	6	6	6	6	7
10	6	6	6	6	7	8
11	6	7	7	7	7	9
12	6	7	7	7	8	9
13		7	8	8	8	10
14		8	8	9	9	10
15		8	9	9	9	11
16		9	9	10	10	12
17		9	10	10	10	12
18		9	10	11	11	13
19			10	11	11	13
20			11	12	12	14
21			11	12	13	14
22			12	12	13	15
23			12	13	14	16
24			12	13	14	16
25				14	14	17
26				14	15	17
27				15	15	18
28				15	16	18
29				15	16	19
30				15	17	19
31					17	20
32					18	21
33					18	21
34					19	22
35					19	22
36					20	23
37					20	23
38					20	24
39					21	24
40					21	25
41					21	26
42					21	↓
43					21	
44						
↓						
50						26

TABLE F

N1, 0, AND ON–TYPE FACILITY–IMPULSE NOISE THRESHOLD

EQUIPMENT CONFIGURATION		THRESHOLD IN DBRNC AT +7 TLP
TRANSMIT END	RECEIVE END	ALL MILEAGES (SEE NOTE)
COMPANDOR OR VF AMPLIFIER	COMPANDOR	71
	VF AMPLIFIER	77

Note: Apply -29dBm, 1004-Hz holding tone at the -16 TLP of the transmit terminal. Use an impulse counter equipped with a 1004-Hz network at the receive terminal end.

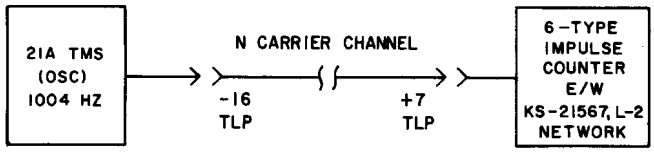
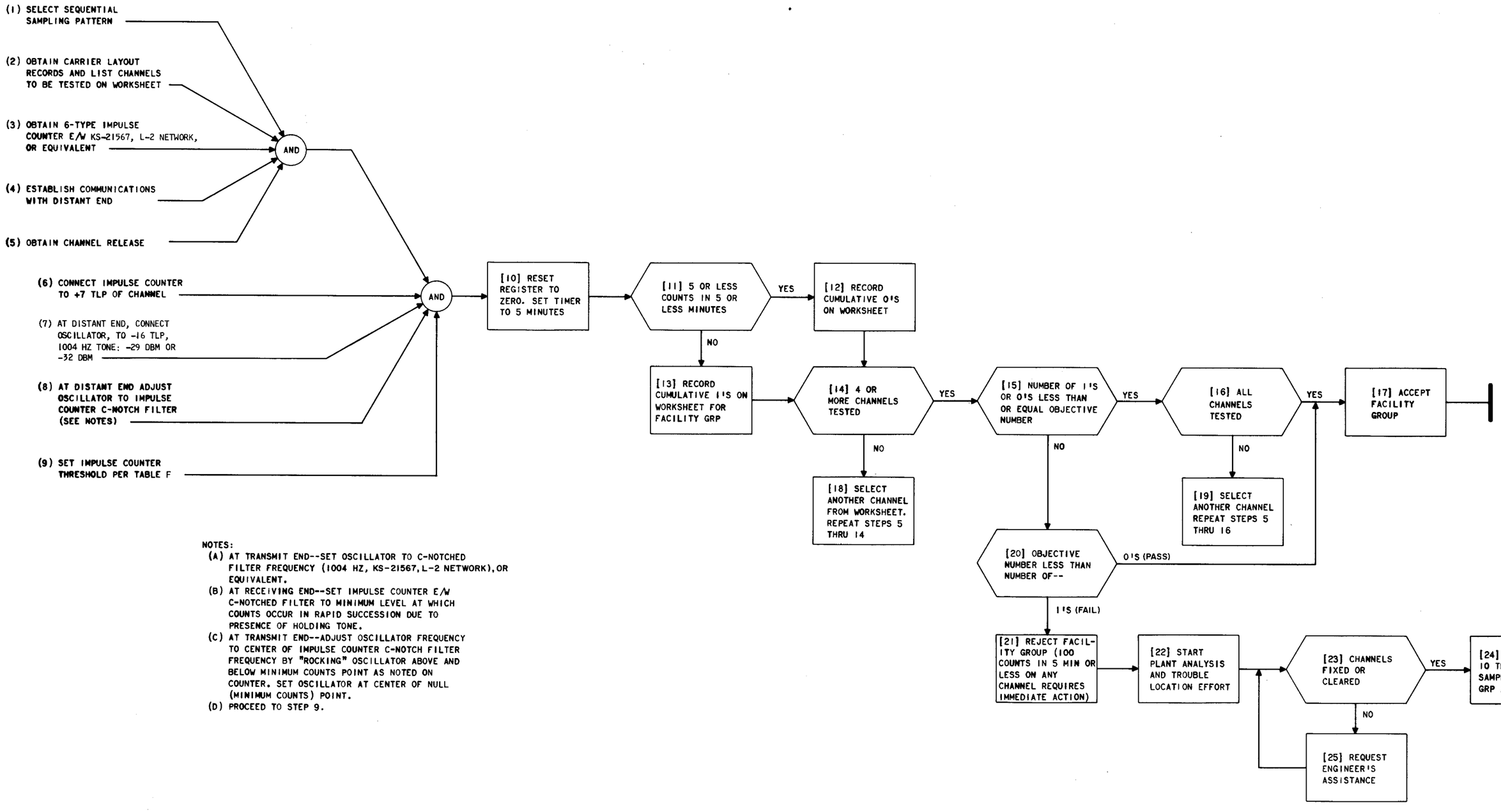


Fig. 1—Typical Arrangement for Measurement of Impulse Noise



NOTES:
(A) AT TRANSMIT END--SET OSCILLATOR TO C-NOTCHED FILTER FREQUENCY (1004 HZ, KS-21567, L-2 NETWORK), OR EQUIVALENT.
(B) AT RECEIVING END--SET IMPULSE COUNTER E/W C-NOTCHED FILTER TO MINIMUM LEVEL AT WHICH COUNTS OCCUR IN RAPID SUCCESSION DUE TO PRESENCE OF HOLDING TONE.
(C) AT TRANSMIT END--ADJUST OSCILLATOR FREQUENCY TO CENTER OF IMPULSE COUNTER C-NOTCH FILTER FREQUENCY BY "ROCKING" OSCILLATOR ABOVE AND BELOW MINIMUM COUNTS POINT AS NOTED ON COUNTER. SET OSCILLATOR AT CENTER OF NULL (MINIMUM COUNTS) POINT.
(D) PROCEED TO STEP 9.

Fig. 2—Sequence of Impulse Noise Test for Facility Groups of Five or More Channels

IMPULSE NOISE TEST
SAMPLE WORKSHEET

FACILITY GROUP FRSN CA 01 - HNFR CA 01 DATE 9-22-75

OFFICE ANYTOWN ACCEPT ☑ REJECT ☐ (SEE NOTE)

SEQUENTIAL SAMPLING PATTERN(S) USED ODD NUMBERED CHANNELS

0's -- EQUAL TO OR LESS THAN COUNTS LIMIT.
1's -- EXCEEDS COUNTS LIMIT.

TEST NO.	COMPANDORED OR NON-COMPANDORED CHANNEL MODEM	TEST LEVEL dBrncO	OBJECTIVE NUMBER PER TABLE E	CUMULATIVE 0's (PASS)	CUMULATIVE 1's (FAIL) (SEE NOTE)
1	COMP	71	-	1	-
2	COMP	71	-	-	1
3	NON-COMP	77	-	2	-
4	NON-COMP	77	3	-	2
5	COMP	71	3	3	-
6	COMP	71	4	4	-
7					
8					
9					
10					
11					
12					
			TOTAL	4	2

NOTE:
ANY CHANNEL HAVING 100 COUNTS IN 5 MINUTES OR LESS MUST BE CLEARED IMMEDIATELY PER PARAGRAPH 3.02.

ACCEPT IF TOTAL IS LESS THAN OBJECTIVE NUMBER

REJECT IF TOTAL EXCEEDS OBJECTIVE NUMBER

ACCEPT IF EQUAL 0'S AND 1'S AFTER MAXIMUM NUMBER OF TESTS

Fig. 3—Impulse Noise Test Worksheet—Typical Twelve Channel Facility Group

IMPULSE NOISE TEST
SAMPLE WORKSHEET

FACILITY GROUP _____ DATE _____

OFFICE _____ ACCEPT ☐ REJECT ☐ (SEE NOTE)

SEQUENTIAL SAMPLING PATTERN(S) USED _____

0's -- EQUAL TO OR LESS THAN COUNTS LIMIT.
1's -- EXCEEDS COUNTS LIMIT.

TEST NO.	COMPANDORED OR NON-COMPANDORED CHANNEL MODEM	TEST LEVEL dBrncO	OBJECTIVE NUMBER PER TABLE E	CUMULATIVE 0's(PASS)	CUMULATIVE 1's(FAIL) (SEE NOTE)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
			TOTAL		

NOTE:
ANY CHANNEL HAVING 100 COUNTS IN 5 MINUTES OR LESS MUST BE CLEARED IMMEDIATELY PER PARAGRAPH 3.02.

ACCEPT IF TOTAL IS LESS THAN OBJECTIVE NUMBER

REJECT IF TOTAL EXCEEDS OBJECTIVE NUMBER

ACCEPT IF EQUAL 0'S AND 1'S AFTER MAXIMUM NUMBER OF TESTS

Fig. 4—Sample Impulse Noise Test Worksheet