

## NOISE MEASUREMENTS ON TWO-WIRE SUBSCRIBER LOOPS METHODS AND REQUIREMENTS — AT STATIONS

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### 1. GENERAL

- 1.01 This section describes the method of making noise measurements on two-wire subscriber loops at stations. It is reissued to include the 3C NMS and to provide added information on measurements at coin stations.
- 1.02 Fig. 1 is a schematic of the apparatus arrangements and connections.
- 1.03 It should be noted that a check is made of the 1000-Hz loss of subscriber loops in conjunction with the noise measurements. This measurement can be made with the 3-type Noise Measuring Set (NMS), which is adequate for the purposes of this section.
- 1.04 The 3A and 3B NMS are not equipped with means for holding the connection. When using the 3A or 3B NMS provide an external Holding Coil Assembly as shown in Fig. 1. The 3C NMS includes a holding coil, so for this set the 274L inductor shown in Fig. 1 is not required.
- 1.05 Form E-4948 (4-63) is suitable as a data sheet or Fig. 2 may be reproduced locally and the lower part used for these tests.

### 2. TEST APPARATUS, DATA SHEETS, AND REFERENCES

Description	Notes
3-type Noise Measuring Set (or equivalent) e/w 497A Network	Section 103-611-100
Monitoring Headphone	Included with 3-type NMS
2W24A Cord or Equivalent	For Testing with 3-type NMS
274L Inductor e/w G.R. 274MB Plug, or Equivalent	Holding Coil for Connecting to IN Binding Posts of 3A NMS. Not Required for 3C NMS
Station Set or 1011-type Handset	For Dialing and/or Holding
75-Ohm Resistor	For Use at Noisy Tip-Party Locations

Description	Notes
Form E-4948 (4-63) or Data Sheet (Fig. 2)	LOOP CHECK TICKET or Fig. 2 Reproduced Locally
Section 010-250-001	Crediting Charges on Test Calls
Sections of Bell System Practices Relating to Station Sets, Coin Stations, and Trouble Clearing Procedures	

### 3. TEST PROCEDURES

#### (A) General

**3.01** The loops are measured to a 1000-Hz, 900-ohm test line circuit and to a 900-ohm balance test line circuit at the serving central office. The test lines are reached by dialing the telephone numbers assigned to them.

**3.02** The subscriber should not be charged for test calls made from his premises. Test lines at the central office may or may not be equipped with "NO CHARGE" service. If "NO CHARGE" service is not provided, proper charging and crediting is assured by the following procedures:

#### *Measured Rate Lines*

If subscriber has a measured rate line, normal procedures should be followed to credit the subscriber's account as outlined in Section 010-250-001.

#### *Tip-Party Identification Ground*

At subscriber locations using tip-party identification ground, connection to central office test lines should be established by dialing with the station set.

#### Γ *Prepay Coin Telephone Locations*

Noise at prepay coin telephone locations tends to be higher than if a standard subscriber set were connected to the same loop. This is because the coin ground provides an unbalanced path for "longitudinal" noise current. This condition cannot be simulated, but depends on the entire circuitry of the coin station. When the upper housing is removed to gain access to the line for connecting the noise measuring set, the signal transmitters and electromagnet are also removed. This completely unbalances the coin subset as a termination. Continuity must be restored between the backplate and upper housing assemblies before proceeding with noise tests.

Γ Proceed as follows:

- (1) Remove the upper housing or open the front door of the panel.
- (2) Restore continuity between the upper housing apparatus and the backplate:
  - (a) Use a D6W3 or similar cord for sets equipped with transfer springs. Connect the spade terminals of a color coded conductor under the binding head screws of mating contact spring and spur contact.
  - (b) Use a P10B patch cord for 236G and similar prepay coin sets.
  - (c) Use a P11C test cord for 1A1, 235, 1235 and similar prepay coin sets.
- (3) Manually close the coin relay ground path to obtain dial tone. Keep the ground closed throughout noise measurement to retain normal operating conditions.

#### *Key Equipment Locations*

When making measurements at a subscriber's premises where key equipment such as 1A1 is involved, measurements should be made at the key equipment location. Depending on the type of station set associated with the key equipment, a SHORT must be placed across either the "B" and "H" leads or the "A" and "A1" leads. Since there are many types of key equipment in service, it may be necessary to investigate the circuitry to ensure that the connection is held when the station set is placed ON-HOOK or the 1011-type handset connection is removed during measurements. ***After measurements are completed, the SHORT must be removed.***

#### (B) Setup, Calibration, and Reading the Noise Measuring Set

**3.03** Set up the apparatus and make connections at the connector block, protector, or cable terminal — whichever is the most convenient. Unless otherwise noted, the subscriber's

station set is left undisturbed and must be ON-HOOK for the duration of the measurements.

- (a) Calibrate NMS as described in Section 103-611-100 (3A or 3B) or 103-611-101 (3C).
- (b) Set DBRN switch to 85 to provide protection for the meter.
- (c) Set FUNCTION switch on a 3A or 3B NMS to  $N_M-900$  or on a 3C to  $N_M\frac{600}{900}$  or  $N_M\frac{600}{900}$  HOLD, as required.
- (d) Set DAMP switch to NORM.
- (e) Insert 497A Weighting Network for C-MESSAGE.
- (f) Connect GRD terminal of NMS to station ground or other suitable ground.

**Caution:** Do not ground to cable sheath, since noise currents may be flowing in the sheath. If a water pipe ground or a connection to the station protector ground is not convenient, a driven ground rod may be provided.

- (g) Plug Monitoring Headphone into MON jack of NMS.

**3.04** Since noise readings generally vary over a range of several dB, the following procedure is recommended when observing meter of the NMS to establish a reading: Observe meter 10 to 30 seconds to establish the point at which needle appears "most of the time" (time-average) — disregarding highest occasional peaks.

**3.05** During measurements, listen to the noise on the loop with monitoring headphone and note character of noise in descriptive terms, such as:

Crosstalk  
Tone  
Teletype or Data Impulses  
Hum  
Static  
Frying  
Hissing  
Singing

### (C) 1000-Hz Check Measurement

**3.06** Trouble on subscriber loops may affect noise without making the circuit inoperable. Noise measurements under such trouble conditions might be very inaccurate. Excessive 1000 cycle loss will often indicate loop troubles that would affect noise. Proceed with the 1000 Hz check measurement as follows:

- (a) Prepare to measure in accordance with Parts (A) and (B).
- (b) Dial up the 1000-Hz, 900-ohm test line at the central office, using station set or 1011-type handset as connected in Fig. 1.
- (c) Connect NMS as indicated in Fig. 1, with holding coil in place.
- (d) If station set was used place it in ON-HOOK condition. If 1011-type handset was used, disconnect it. With monitoring headphone of NMS, check to make sure 1000-Hz tone is heard and that connection has not been lost.
- (e) Adjust DBRN switch to obtain a reading between +2 and +9 on the scale of the meter.
- (f) Record the 1000-Hz check measurement — total of meter reading plus DBRN switch setting — as described in Part 5.
- (g) Check results against Part 4 for action to be taken.
- (h) To release connection, remove holding coil.

**Note:** At prepay coin locations, also open the ground path of the ground relay. At key equipment locations, also remove the SHORT installed in accordance with 3.02.

### (D) Noise-Metallic Measurement

#### 3.07 Preliminary Steps

- (a) Prepare to measure in accordance with Parts (A), (B), and (C).

#### 3.08 At Locations Other Than Those Using Tip-Party Identification Ground:

- (b) The FUNCTION switch remains on  $N_M-900$  (3A or 3B) or  $N_M\frac{600}{900}$  (3C).

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- (c) Dial up 900-ohm balance test line at the central office, using station set or 1011-type handset as connected in Fig. 1. (Additional instructions are given in 3.02.)
- (d) Connect NMS as indicated in Fig. 1 with the holding coil in place.

### 3.09 At Locations Using Tip-Party Identification Ground:

- (b) Set FUNCTION switch to  $N_M$ -BRDG.
- (c) Dial up 900-ohm balance test line at the central office, using station set as connected in Fig. 1.
- (d) Proceed as follows:
  - (1) Hold connection by leaving Station Set OFF-HOOK.
  - (2) Connect NMS as indicated in Fig. 1 with FUNCTION switch remaining in BRDG position.
  - (3) Do not connect holding coil.
  - (4) Use either (5) or (6) as follows to eliminate background noise.
  - (5) Cup hand tightly over transmitter of station set.
  - (6) At locations where cupped hand over transmitter appears not to completely eliminate background noise, or if requirements of Part 4 are not met, remove transmitter unit from station set and terminate exposed contacts with a 75-ohm resistor. At exceptionally noisy locations, the receiver of the station set may also pick up background noise. In this case, cup hand tightly over receiver.

### 3.10 At All Locations:

- (e) Adjust DBRN switch to obtain a reading between +2 and +9 on the scale of the meter.
- (f) Record CHARACTER OF NOISE and the C-MESSAGE METALLIC noise measurement — total of meter reading plus DBRN switch setting — as described in 3.04, 3.05, and Part 5. Noise readings should be recorded to nearest dB.

**Note:** Because the OFF-HOOK station set presents an impedance different from 900 ohms, OFF-HOOK tip-party bridging measurements are not comparable to ON-HOOK

measurements made at other than tip-party locations. The error introduced is negligible for the purposes of this section.

- (g) Check results against Part 4 for ACTION to be initiated.
- (h) If noise-to-ground measurements are not required, proceed to Item (i) of Part (E).

### (E) Noise-to-Ground Measurement

**Note:** Noise-to-ground measurements are made to provide additional data which may help in clearing trouble where metallic noise exceeds the requirements.

- (a) Set DBRN switch to 85.
- (b) Set FUNCTION switch of NMS to  $N_G$ .
- (c) Adjust DBRN switch to obtain a reading between +2 and +9 on the scale of the meter.
- (d) Record the C-MESSAGE NOISE-TO-GROUND measurement — total of meter reading plus DBRN switch setting — as described in 3.04, 3.05, and Part 5. Noise readings should be recorded to nearest dB.
- (e) Set DBRN switch to 85.
- (f) Reverse 497A Weighting Network of NMS to 3KC FLAT position.
- (g) Adjust DBRN switch to obtain a reading between +2 and +9 on the scale of the meter.
- (h) Record the 3KC FLAT NOISE-TO-GROUND measurement — total of meter reading plus DBRN switch setting — as described in 3.04, 3.05, and Part 5. Noise readings should be recorded to nearest dB.
- (i) Release connection by removing Holding Coil except as follows:
  - (1) At locations using tip-party identification ground, it is only necessary to replace the 75-ohm resistor, if used, with the station set transmitter unit and to place station set ON-HOOK.
  - (2) At prepay coin locations, also remove temporary cords, open coin relay ground path and replace coin box upper housing or close the front door of the panel.
  - (3) At key equipment locations, also remove the SHORT installed in accordance with 3.02.

**4. REQUIREMENTS**

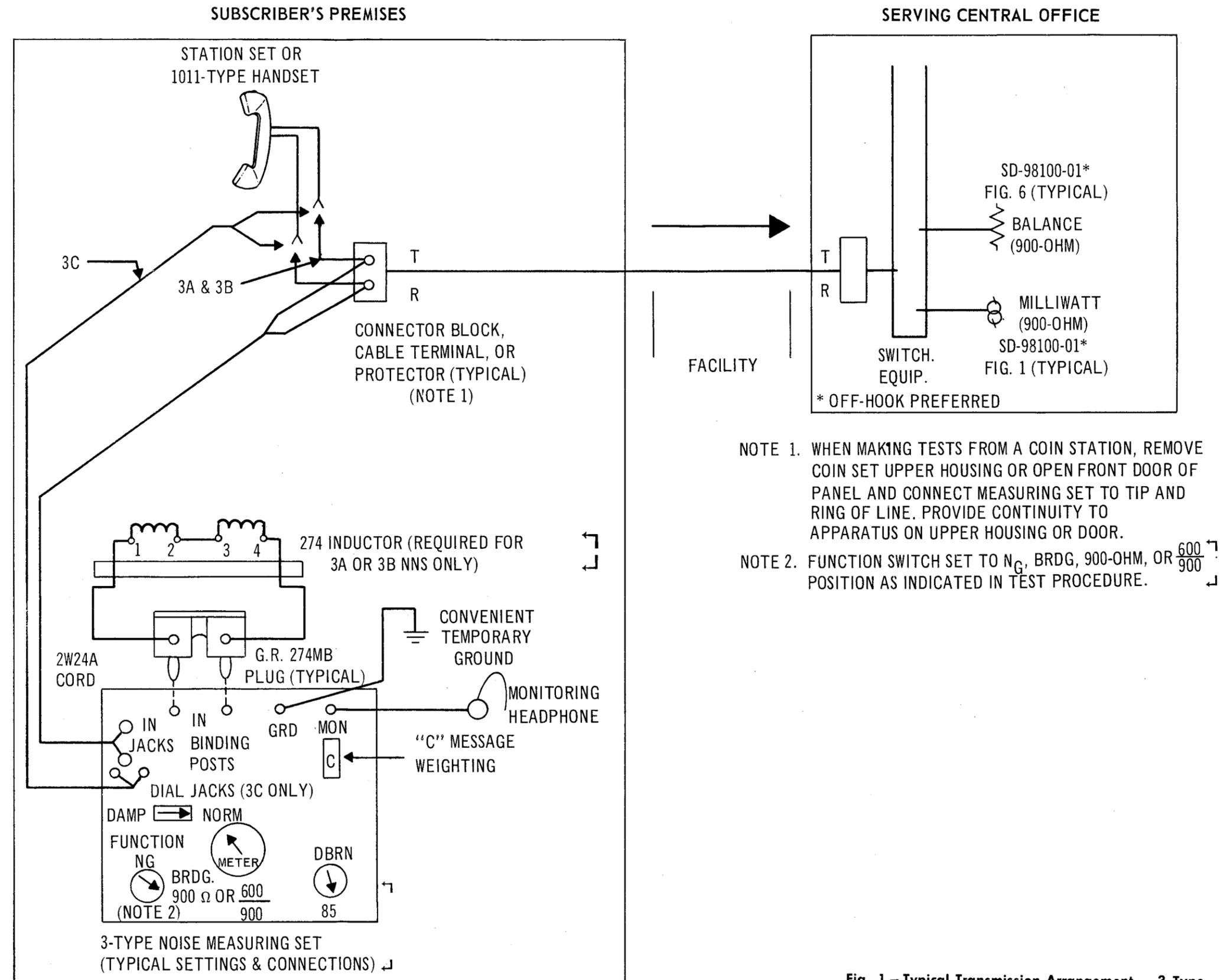
TEST	NMS READING dBm	ACTION TO BE TAKEN
1000-Hz Check	80 to 90	OK — Proceed with noise measurement.
	Less Than 80 or Greater Than 90	Not OK — Do not proceed with noise measurement. Follow usual trouble locating procedures or refer to supervisor immediately for trouble clearing action to be initiated. If trouble cleared, proceed with noise measurement.
	20 or Less 21 to 30	OK Check for possible trouble and proceed with noise-to-ground measurement. Refer to supervisor for review.
Noise-Metallic	Greater Than 30	Not OK — Follow usual trouble locating procedures or refer to supervisor immediately for trouble clearing action to be initiated. Proceed with noise-to-ground measurement.

**5. REPORTS**

**5.01** The "Special Transmission Measurements" portion of Form E-4948 (4-63) may be used to record the results of noise tests. However, for the purposes of this section, this part of the form has been revised and expanded as

shown in Fig. 2, entitled "3-Type Noise Measurements on Subscriber Loops." Fig. 2 may be reproduced locally as required.

**5.02** The results of measurements should be forwarded through lines of organization for analysis and appropriate action.



- NOTE 1. WHEN MAKING TESTS FROM A COIN STATION, REMOVE COIN SET UPPER HOUSING OR OPEN FRONT DOOR OF PANEL AND CONNECT MEASURING SET TO TIP AND RING OF LINE. PROVIDE CONTINUITY TO APPARATUS ON UPPER HOUSING OR DOOR.
- NOTE 2. FUNCTION SWITCH SET TO NG, BRDG, 900-OHM, OR  $\frac{600}{900}$  POSITION AS INDICATED IN TEST PROCEDURE.

Fig. 1 - Typical Transmission Arrangement - 3-Type Noise Measurements on 2-Wire Subscriber Loops

3-TYPE NOISE MEASUREMENTS ON SUBSCRIBER LOOPS			
Cable No. _____	Pair No. _____	B.P. _____	
Terminal Loc. _____			
Telephone No. _____	Panel & Jack or Dial Equiv. _____		
Customer Name _____			
Address _____		Zone Code _____	
Class of Service _____ Type of Station Set _____			
Noise Measurement at Central Office			
Test Location _____			
3-Type NMS Reading	Initial	Final	
To ON-Hook Station	_____ dbrnc	_____ dbrnc	
To OFF-Hook Station	_____ dbrnc	_____ dbrnc	
Character of noise			
Crosstalk <input type="checkbox"/>	Tone <input type="checkbox"/>	Static <input type="checkbox"/>	Hissing <input type="checkbox"/>
Impulses <input type="checkbox"/>	Hum <input type="checkbox"/>	Frying <input type="checkbox"/>	Singing <input type="checkbox"/>
Corrective Action Initiated _____			
Date _____ Time _____ Measured by _____			
Noise Measurement at Station			
Test Location _____			
3-Type NMS Reading	Initial	Final	
1000-Cycle Check	_____ dbrn	_____ dbrn	
Noise Metallic	_____ dbrnc	_____ dbrnc	
Noise-to-Ground			
C-Message Weighting	_____ dbrnc	_____ dbrnc	
3KC Flat Weighting	_____ dbrn	3KC _____ dbrn	3KC _____ dbrn
Character of noise			
Crosstalk <input type="checkbox"/>	Tone <input type="checkbox"/>	Static <input type="checkbox"/>	Hissing <input type="checkbox"/>
Impulses <input type="checkbox"/>	Hum <input type="checkbox"/>	Frying <input type="checkbox"/>	Singing <input type="checkbox"/>
Corrective Action Initiated _____			
Date _____ Time _____ Measured by _____			

Fig. 2