

**NOISE ENGINEERING**  
**TRACING VOICE-FREQUENCY NOISE FIELDS**  
**BY EXPLORING COIL METHOD**

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**1. GENERAL**

**1.01** This section is reissued to renumber it into the nine digit numbered Plant Series. In addition, references to noise measuring equipment have been changed to indicate the 3-type noise measuring set (NMS), manufacture discontinued apparatus codes have been replaced with currently available types, and Table 1 and related references have been deleted. Because of the extensive revision, the marginal arrows usually used to indicate changes have been omitted.

**1.02** This section describes a method of tracing voice-frequency noise producing magnetic fields by means of an exploring coil and noise measuring set. These procedures provide a useful tool for locating wiring and apparatus that induce noise by means of the magnetic fields they produce into nearby circuits.

**1.03** Frequently, a fixed separation has been specified between the repeaters and amplifier equipments and the disturbing sources such as charge and discharge lead buses, batteries, etc., in order to minimize the effects of magnetic fields upon this equipment. Such separations are not always effective in controlling induced noise. Rearrangements of apparatus; new, changed or relocated wiring; increased loads on power equipment; and other causes may induce noise into formerly quiet circuits.

**1.04** The method discussed in this section employs one of several possible coils, more or less

readily available, for the search coil. Since it is virtually impossible to calibrate such a coil, all the NMS readings in this section will be considered relative to an initial reading made in the vicinity of the disturbed apparatus or in the vicinity of conductors connected to the disturbed apparatus or circuits.

**2. TESTING APPARATUS REQUIRED**

**2.01** A 3-type noise measuring set and one of several possible inductors or coils are required for these tests. The 1940-ohm or 1570-ohm hold magnet coil of a 325AE, AF, AG, AH or similar crossbar switch makes a very good exploring coil. The sensitivity of these coils is good when the 3-type NMS FUNCTION switch is set to BRDG. Also, the voltage output does not depend on the position of the coil in the field of interest to the same degree as it does with other coils. Lower resistance hold magnets seem considerably less effective.

**2.02** The 47-B inductor has been used as an exploring coil. Other coils and inductors might also serve as exploring coils. However, some will be better than others, depending on their construction, core material and shape, number of turns in the winding, and outer shielding or the lack of it. A hundred or so turns of 26-gauge wire on a ferrite core with 1/4 to 1/2 square inch cross section or more makes a fairly sensitive exploring coil. A few trials of different possible exploring coils connected to the NMS will indicate which ones will be most effective in a given situation.

**2.03** Both of the leads between the exploring coil and the NMS should be kept tightly twisted and as short as possible. This will minimize the chance that the leads might pick up extraneous noise that could obscure the output of the exploring coil.

**3. TROUBLE LOCATING PROCEDURE**

**3.01** The relative noise field intensity in the near vicinity of a pair of conductors or a piece of apparatus may help locate a significant disturber. One method for checking relative field intensity is as follows:

- (a) Connect the input of the 3-type (or equivalent) noise measuring set to the disturbed pair or apparatus. Set FUNCTION switch to either BRDG, 600, or 900 as appropriate. Where the circuit is out of service and measurement is at a testboard, the 600 or 900 position should be used as a termination. At other points where the circuit cannot be broken, or when the circuit cannot be removed from service, BRDG must be used.
- (b) Plug in the monitor receiver supplied with the NMS and listen to the character of the noise. Note any distinguishing characteristics that will identify the same noise when heard later.
- (c) Disconnect the NMS from the disturbed circuit and connect the exploring coil.
- (d) Set FUNCTION switch to 600, 900, or BRDG to provide the best sensitivity.
- (e) Hold the exploring coil near the suspected disturbed pair or apparatus. Change the position of the coil until the NMS indicates a maximum.

(f) Again listen carefully to the receiver of the NMS. Note whether the noise characteristics observed in step (b) are still present. If so, record the reading of the NMS and proceed to step (g). If not, proceed to step (h).

(g) Move the exploring coil in the direction of nearby apparatus or conductors that might be the source of the disturbing noise field. Stop the motion of the exploring coil frequently to check that it is oriented to keep the NMS at maximum indication. Continuously listen to be sure that the noise of interest is the one being observed. Note whether the meter reading is increasing or decreasing. An increase should indicate that the exploring coil is approaching the disturbing conductors or apparatus.

(h) If the field in the immediate vicinity of the first suspected disturbed point in the circuit or apparatus does not correspond in characteristics with the noise first observed on the disturbed circuit, move the exploring coil back along the route taken by the conductors being checked, or along the low-level input conductors to amplifiers or repeaters, checking for the noise characteristics of interest. When these are again observed, continue to move the exploring coil to maximize the NMS indication. When the maximum has been found, return to (g) to locate the source of the disturbance. In many situations, the NMS must be moved along with the exploring coil.