NOISE ENGINEERING
CONTROL OF
CENTRAL OFFICE NOISE
GENERAL ENGINEERING CONSIDERATIONS

CONTENTS PAGE

1. GENERAL

1.01 This section discusses the general engineering considerations involved in the control of central office noise. The primary concern is C-message weighted noise as measured with a 3-type noise measuring set or equivalent.

1.02 Methods of reducing noise in toll office equipment are discussed in Section 870-700-102. All other sections in this series are concerned with noise problems in local offices.

2. CENTRAL OFFICE NOISE CHARACTERISTICS

2.01 The noise objective for subscriber lines is established at 20 dBrnc as measured at the station terminals. Noise generated in the serving central office should be low enough so that it has little or no effect on the noise levels measured at the station terminals. In order to keep the central office noise at a low level, the central office equipment must be properly engineered and adequately maintained.

2.02 There are three basic sources of noise in central office equipment that contribute noise to a connection. These are (a) battery supply noise, (b) noise due to equipment unbalance, and (c) cross-office noise. Battery supplies contribute noise to a connection through the office when the supplies are in trouble, or when the filters are defective, inadequate, or missing. Battery supply troubles effectively raise the average noise level measured on cross-office connections.

2.03 Noise due to equipment unbalance occurs when the unbalanced equipment is connected to a plant facility which has longitudinal noise present. The equipment unbalance affects only the lines connected, but the noise may be objectionable on any connection involving those lines.

2.04 Cross-office noise is the net sum of all noise sources on a connection between any two line appearances. Since the outside plant facilities are disconnected for such a measurement, the measured cross-office noise is not influenced by equipment unbalance, but it is influenced by excessive battery noise. Other potential sources of noise are step-by-step selectors, crossbar switches, panel multiple banks and brushes, panel sequence switches, panel commutators, rotary selectors, and relay contacts. When such contact pairs are allowed to become pitted, corroded, dirty, or when the contact pressure becomes excessively light due to contact wear or maladjustment, they tend to introduce series unbalance into the transmission path and may also behave as a microphone to reproduce vibration and mechanical noise from the surrounding structure. The series unbalance introduced into the transmission path increases its susceptibility to noise from other central office noise sources. Negative impedance repeaters, tone generators, ringing equipment, power supplies, and relay contacts opening and closing reactive loads all can produce interfering tones and other noise that can

enter the cross-office transmission path via either, or both, magnetic and electrostatic inductive couplings. The resultant noise levels in the disturbed circuits may, at times, rise to objectionable levels.

2.05 Panel dial equipment includes many sliding contacts in the commutators and sequence switches. Unlike relays, where the make or break tends to be quick and clean, sliding contacts make and break relatively slowly. Insulating materials which bridge the open sliding contacts tend to foul. This, coupled with the slow make and break characteristic, tends to produce extended arcing at contacts. Insufficient contact pressure on the panel multiple brush fingers tends to allow generation of microphonic noise. The fairly large inductances in the sequence switch and vertical drive clutch magnets may generate large current and voltage transients. Further, the balance of the earlier supervisory relays and talking battery supply components was not good. Finally, a large majority of the contacts in panel offices, particularly in the transmission path, are of metals that tend to corrode. All of these conditions contribute to the poor noise performance of the panel switching system. Also, panel systems utilize revertive pulsing for transferring called number information from originating to terminating equipment. This, too, may contribute to the cross-office noise in panel and No. 1 crossbar offices.

3. CONTROL OF CENTRAL OFFICE NOISE

A. Battery Supply Noise

3.01 Battery supply noise is controlled through adequate design of the battery supply plant and adequate maintenance. Excessive noise may occur if decentralized filters are not supplied where appropriate or if the office requirements exceed the capacity of the centralized filter. It may also occur if the battery plant or filters are defective.

3.02 When central office noise levels are excessive, the first step in its control is to ensure good design and performance of the battery supply system. Further details on the engineering aspects and noise limits are described in Section 870-700-500. Techniques for measurement of battery supply noise are provided in Section 331-701-501.

B. Noise Due to Equipment Unbalance

3.03 Noise due to equipment unbalance is controlled largely by proper equipment engineering. It is necessary to provide well balanced supervisory relays and associated equipment. The AB63 series of BSPs provides further information on the control of noise due to equipment unbalance.

C. Cross-Office Noise

3.04 Cross-office noise is controlled largely through adequate equipment maintenance. The nature of the noise sources is such that excessive noise occurs on random connections rather than on all connections. When the random occurrences become too frequent, they may seriously affect the grade of service experienced by users.

3.05 Cross-office noise troubles can be identified by sampling measurements. The results can be used to direct corrective maintenance programs. Section 870-700-501 provides further information on cross-office noise requirements, methods of measurement, and control. The 331-7 layer of Plant Series BSPs provides detailed methods of cross-office noise measurement.