PERMANENT SIGNAL HOLDING AND CONCENTRATING ARRANGEMENTS

GENERAL DESCRIPTIVE INFORMATION

PANEL SYSTEM, AND NO. 1 AND NO. 5 CROSSBAR SYSTEMS

CONTENTS

1. INTRODUCTION

1.01 This section describes the permanent signal holding and concentrating arrangements available in No. 1 and No. 5 crossbar offices and in panel offices.

1.02 Prompt handling of permanent signals is important from two aspects: (1) common central office equipment is seized and held by permanent signals for relatively long times, thereby reducing the call-carrying capacity, and (2) all customer stations on a line with a permanent signal condition are out of service until the condition is relieved.

1.03 The principal source of permanent signals is failure to hang up by customers. However, a ground on the ring side or a cross between the two sides of a customer line will cause a permanent signal condition.

1.04 When a permanent signal trunk is seized and brings in a signal to an operator she normally proceeds as follows:

(a) She challenges to see if anyone requires assistance or if the call is of an emergency nature.

(b) If no response is received, she listens on the circuit for line trouble noise or room noise as a preliminary indication of line trouble or a receiver-off-hook condition.

(c) If she hears room noise or no noise, she tries to attract the customer's attention by ringing or applying the howler tone. The howler, however, should never be applied on PBX trunks or lines from key equipments.

(d) She passes the trouble to the plant deskman if the customer fails to restore the receiver. The deskman may repeat the tests and make others, and if required, dispatch a repairman to the trouble location.

1.05 There are three general arrangements for handling permanent signals in crossbar and panel offices:

(a) By an operator in a distant building.

(b) By an operator in the same building.

(c) By the plant forces at the central office maintenance center.

1.06 Before the introduction of the concentrating arrangement as shown in Fig. 1, permanent signal trunks were terminated in the same building as the dial equipment, thus requiring that an operator or plant attendant be available in that building. By concentrating permanent signals (and certain other traffic functions) so that the work can be centralized, more efficiency is achieved.

2. CONNECTING EQUIPMENT

2.01 Permanent signal trunks are connected to out-trunk locations on office link frames and trunk link frames of crossbar offices and district frames of panel offices.

2.02 At the terminating end the trunks are connected to one of three types of equipment, depending on which method is used as itemized in 1.05:

(a) To the permanent signal holding and concentrating trunk described hereinafter.

(b) To permanent signal holding trunks terminated at an operator position in the same building.

(c) To permanent signal holding trunks in the test frames at the maintenance center.

2.03 Permanent signal trunks are also connected with the central office maintenance center test frames, and such interrupter circuits, alarm circuits, timing circuits, coin supervisory circuits, and tone supply circuits as are necessary for their proper functioning.

2.04 As the arrangements indicated in 2.02 (b) and (c) above have been available

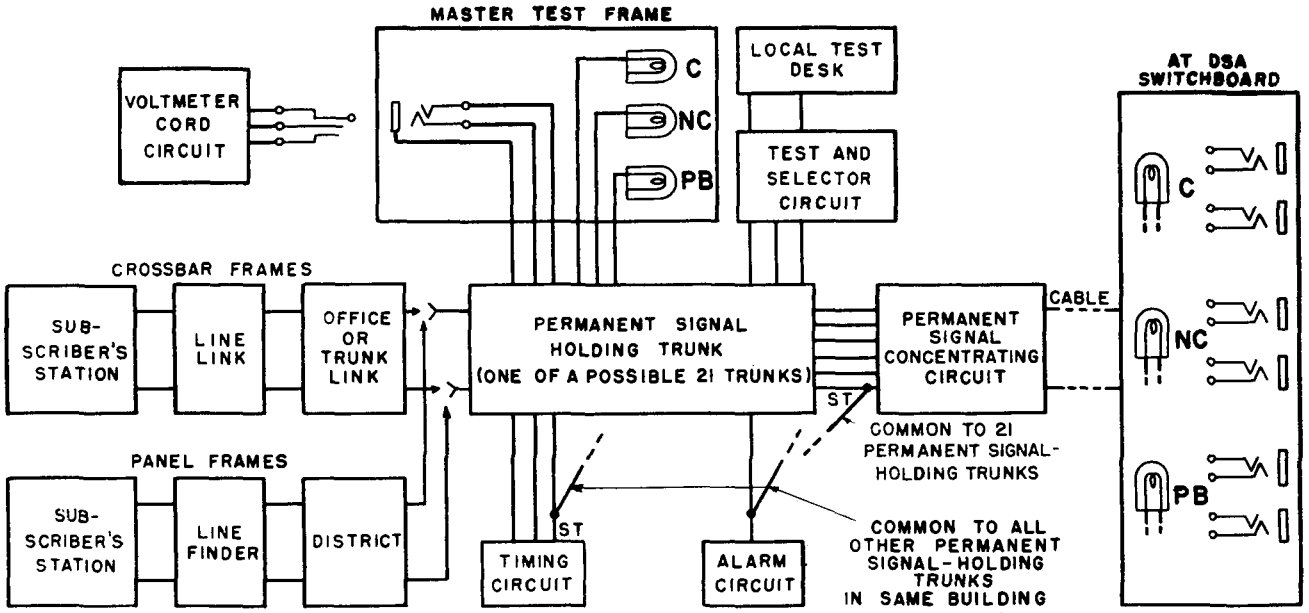

FIG. 1 - BLOCK DIAGRAM OF COMPONENTS

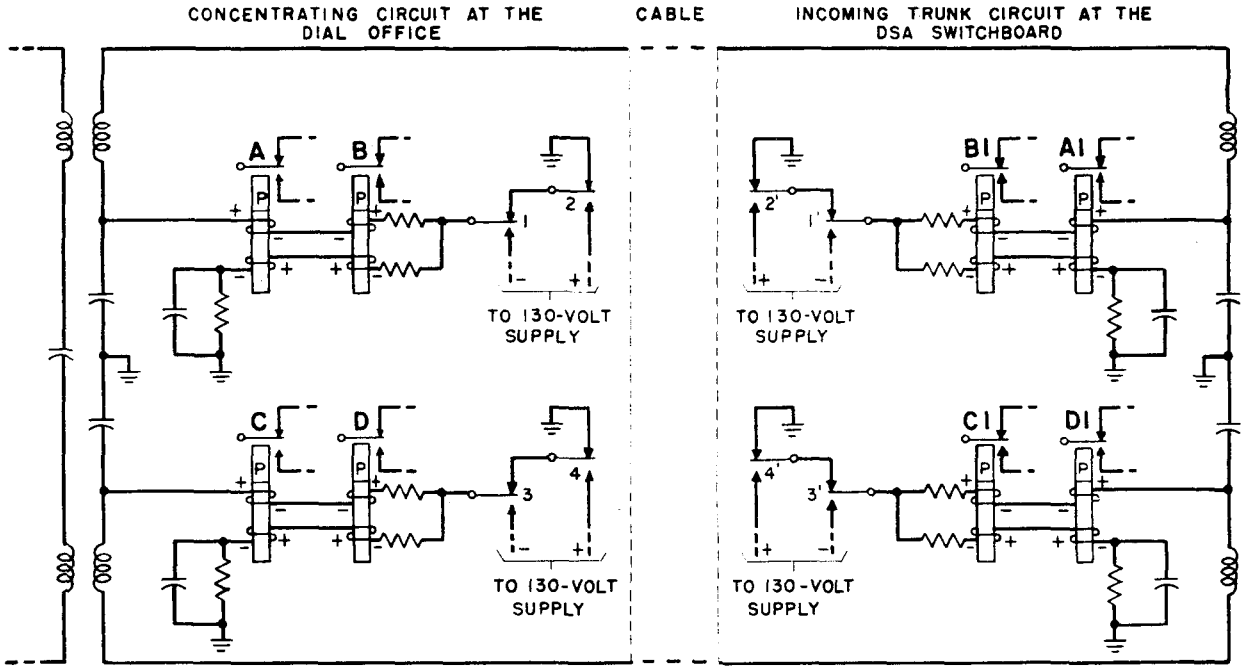

FIG. 2 - SCHEMATIC OF SIGNALING PRINCIPLES

for some time, the discussion here will be limited to arrangement 2.02 (a).

Note: No. 5 crossbar uses the concentrating arrangement for both local and centralized DSA board operation.

3. EQUIPMENT ELEMENTS

3.01 The equipment at the originating end consists of one rotary-type selector or link per concentrating circuit and a number of relays plus the necessary wiring, terminal strips, jacks, lamps, and keys. This equipment is all rack-mounted.

3.02 One pair of wires is required to connect the concentrating circuit to the equipment at the DSA board end.

3.03 At the terminating end, the equipment consists of a number of relays, terminal strips, jacks, lamps, and wiring. This equipment, when used with a cord circuit at the special service operator's position, enables the operator to take the necessary action in attempting to clear the permanent signal condition.

3.04 The arrangements necessary to derive simultaneous talking and signaling paths over the pair between the concentrating and terminating equipment are included in the equipment at both ends.

3.05 Equipment is also provided at the central office maintenance center and the plant test center to enable action to be taken by the plant employees on cases that cannot be cleared by the DSA operator.

4. PRINCIPAL FUNCTIONAL FEATURES OF CIRCUITS

4.01 The principal functional features of circuits are:

(a) To provide a trunk termination to which the customer line with permanent signal may be connected and thereby clear the sender or register for further traffic.

(b) To indicate to the special service operator and sender make-busy frame attendant the type of line with the permanent signal: that is, PBX, coin, or noncoin.

(c) To make available to 21, or less, permanent signal holding trunks the one circuit by which they may have access to the special service operator.

(d) To permit the special service operator to apply ringing current to the line connected to the trunk, and apply howler tone. See 1.04 (c).

(e) To permit the DSA operator to talk on the line and complete emergency calls over this circuit.

(f) To apply a tone to the connected line so that it may be readily identified.

(g) To prevent the plant attendant and the special service operator from interfering with each other by locking one out while the other is testing.

(h) To permit the DSA operator to collect or refund coins over this circuit.

(i) To release all circuits if the permanent signal condition is removed from the line, that is, customer hangs up or a trouble condition is cleared.

5. METHOD OF OPERATION

5.01 The block diagram in Fig. 1 shows the principal components and their interconnections. The permanent signal trunks appear on crossbar trunk or office link frames and panel district frames. When a line with a permanent signal is connected to an idle PS trunk as a result of a subscriber sender or register timing out without receiving dial pulses, a signal is passed to the trunk to indicate whether the line serves a coin station, a PBX trunk (or key equipment), or a line that does not fall into either of the above types. This signal is furnished by the marker in No. 5 crossbar and by the trunk location in No. 1 crossbar. In panel offices the differentiation is obtained by segregating subscriber lines, and it will usually be impracticable to exclude every PBX line from those served by a PS holding trunk so as to establish a noncoin, non-PBX class. As a consequence, the usual indications from panel offices will be "coin" and "PBX." The signal causes the display of this class designation at the master test frame and the DSA board. Immediately upon seizure, the PS trunk is extended to the maintenance center, where the trunk number and class of calling party are indicated by one of three steady lamps; the trunk is extended to a test selector bank and circuit, where it is available to the local test desk; also the trunk is extended to the selector or link in the concentrating circuit. If the selector is not busy with another call it is actuated to hunt for and connect to this line. After the selector finds this line, the circuit is cut through to the special service operator at the distant point. At the same time the class-of-service lamp is lighted in front of the operator. The holding trunk also places a high tone on the ring conductor to make the line readily identifiable.

5.02 This concentrating circuit may serve as many as 21 lines and connect them one after the other over a single trunk to a DSA operator for test, thus making efficient use of conductors between the offices. Since the DSA board will usually be in an office a considerable distance

from the originating equipment, the effectiveness of the howler and ringing tones would be much reduced by the attenuation of the trunk pair. Also, howler tones in trunk cables tend to crosstalk into and interfere with other services. Therefore, the circuit is arranged to apply these tones and other tests at the office of origin under control of the special operator.

5.03 Upon receiving a class lamp indication the operator plugs into the associated jack. If she hears no sounds and is unable to get a reply, she proceeds with specified tests. If the permanent signal disappears during one of these tests - indicating that the customer has hung up - the operator's lamp goes out, and she takes down her cord. All connections are then dropped, and the customer line is restored to service.

5.04 If the operator is unable to cause the line to be restored to service, she may notify the local test desk forces, who can connect to the PS trunk by means of their test selector circuit. If exact line identification is required, the maintenance center must be so notified; otherwise, the PS trunk can be identified by the test desk forces in conjunction with the DSA operator.

5.05 If the operator takes no action, the steady lamp at the maintenance center is changed to a rapid-flashing lamp at the end of 15 to 45 minutes. If the switchman or test deskman has seized the trunk in the interim, then the lamp in the central office maintenance center flashes at a slow rate, at the end of the 15- to 45-minute interval.

5.06 To permit the concentrating circuit to indicate to the special service operator the type of line involved, and also to receive the results obtained from the tests that the operator applies, it must be possible to pass six different signals from the concentrating circuit to the DSA board. To permit the operator there to control the application of the various tests at the concentrating circuit, it must be possible to pass seven different signals from the DSA board to the concentrating circuit. Since only one pair is used between these two points for each concentrating circuit, a special signaling circuit is used. This is shown in simplified form in Fig. 2. This circuit permits as many as eight d-c signals to be sent in each direction without interfering with each other or with voice transmission over the pair. The "full duplex" principle is employed, using polar relays with balanced windings and networks, which enables signals transmitted in opposite directions to be mutually independent. The various signals are formed by combinations of ground and positive or negative 130-volt battery on either the tip or ring or both.

5.07 The purpose of placing the high tone on the ring conductor is to indicate that this line is connected to a permanent signal trunk, should an operator or maintenance man connect to this line on a "no test" basis. The high tone is removed while the DSA operator is making her tests and whenever this trunk is being tested from the central office maintenance center.

5.08 During a cable failure the number of lines with permanent signals may exceed the number of PS trunks, and the excess lines will be connected to overflow trunks. In the No. 5 crossbar office, when any line with a permanent signal is connected to an overflow trunk, the trunk is arranged to impress a high tone on the ring conductor and contribute a signal to an integrating circuit which will operate an alarm when a specified number of overflow trunks are held by lines with permanent signals. In No. 1 crossbar, when all the PS trunks are busy, subsequent permanent signals will cause the district junctors to be left "high and dry" with no crosspoints closed on the district link frame. No alarm indication is given by the concentrating equipment.

5.09 When this PS holding circuit is used in No. 5 crossbar offices equipped for coin operation, the PS trunks are arranged to control the coin.