

THE LINE CONCENTRATOR-IDENTIFIER SYSTEM  
FOR TELEPHONE SECRETARIAL SERVICE

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1. GENERAL

A. Introduction

1.01 This section describes the application of the line concentrator-identifier principal to telephone secretarial service. This system permits telephone-answering bureaus to serve subscribers without using an individual pair of wires for each line from the central office to the bureau.

B. Field of Use

1.02 The purpose of telephone secretarial service is to answer calls to subscribers such as business concerns, doctors, and other professional people. When the line of a subscriber to this service is called, a lamp at the answering bureau lights. The attendant may answer all such calls or only those occurring at certain times, as instructed by the bureau subscriber. In some cases, the attendant is instructed to answer calls only on the third or fourth ring, thus allowing time for the subscriber to answer personally if he so wishes. There is no uniform method for handling calls answered by the bureau attendant. Incoming calls to each subscriber's line are handled according to that subscriber's specific instructions.

1.03 Without the concentrator-identifier system, an individual pair of wires per line must be provided between the central office and the bureau. These bureaus are usually located as near as possible to the central office so that the economies of minimum mileage charges may be realized. The cost of providing individual pairs has generally made it impractical for a bureau to serve subscribers in distant central office areas. To avoid this cost, many bureau managements operate several

small bureaus in different central office areas. However, greater economy may be achieved by reducing the number of pairs required between the office and the answering bureau. This is accomplished by the concentrator-identifier system.

1.04 This system is intended for use when the bureau and the subscribers are located in different central office areas. However, it may be employed within a central office area if its use can be economically justified.

C. Principal Features

1.05 This system consists essentially of two units interconnected by a minimum number of trunks. The "concentrator" or originating equipment, located at the central office, concentrates a large number of lines over a few trunks to the bureau. The "identifier" or terminating equipment, located at the answering bureau, indicates to the attendant which of the lines is being rung.

1.06 Subscriber lines served by this system are answered in the same manner as those with individual pairs to the bureau. The system is so arranged that all incoming calls are indicated by the lighting of switchboard line lamps even when all trunks are busy. In this way, the attendant is informed of all waiting calls so that she may answer them at her discretion. The equipment is arranged to prevent the attendant from dialing out on a line. It also prevents monitoring on a subscriber's conversation since the attendant can connect to the line only during the ringing interval.

1.07 The basic concentrator-identifier system is arranged to serve 40 subscriber lines. These may be either one- or two-party lines, including those rung with positive superimposed ringing. Additional lines may be added in multiples of ten up to a maximum of 100 lines. Two talking trunks must be provided between the concentrating equipment at the central office and the identifying equipment at the answering bureau. More trunks may be provided up to a maximum of four to handle increased volumes of traffic.

2. EQUIPMENT ELEMENTS

A. Central Office Equipment

2.01 The concentrator-identifier system operates in any type of dial or manual central office having a battery

within the limits of 43 to 53 volts. It has been approved for use with ringing power plants within the following voltage limits:

<u>20 cycle</u>	<u>dc component</u>	<u>silent</u>
80-88	37-50	45-75

Where 65 to 75 volt silent interval battery is used, the ringing machine must be equipped with drainage resistances. The central office equipment, as shown in Fig. 1, is arranged to mount on one standard 23-inch relay rack bay 11 feet 6 inches high.

2.02 Each line to be served by the answering bureau is cross-connected to the originating equipment by a pair of wires at the main distributing frame. This pair terminates in an individual auxiliary line circuit which operates when ringing is applied to the line. For identification purposes, each line connected to the concentrator-identifier system is assigned an arbitrary 2-digit code from 00 to 99.

2.03 The major elements of the originating equipment are shown in Fig. 2. The units identifier, consisting of ten relays corresponding to the units digits (0 to 9), operates to indicate to the system the units digit of the called line. The tens identifier connector, consisting essentially of two crossbar verticals, receives information from the auxiliary line circuit and the units identifier and passes this to the tens identifier. This circuit, consisting essentially of ten relays corresponding to the tens digits (0 to 9), indicates to the system the tens digit of the called line.

2.04 The two controllers operate alternately to pulse the line number code forward to the answering bureau one digit at a time. This code, as outlined in Table A, consists of positive and negative pulses of 130 volts.

Table A

Digit	First Pulse	Second Pulse	Third Pulse
0	-		
1	-	-	+
2	-	-	-
3	-	+	-
4	-	+	+
5	+		
6	+	-	+
7	+	-	-
8	+	+	-
9	+	+	+

The controller connector provides means of transferring from one controller to the other on successive calls.

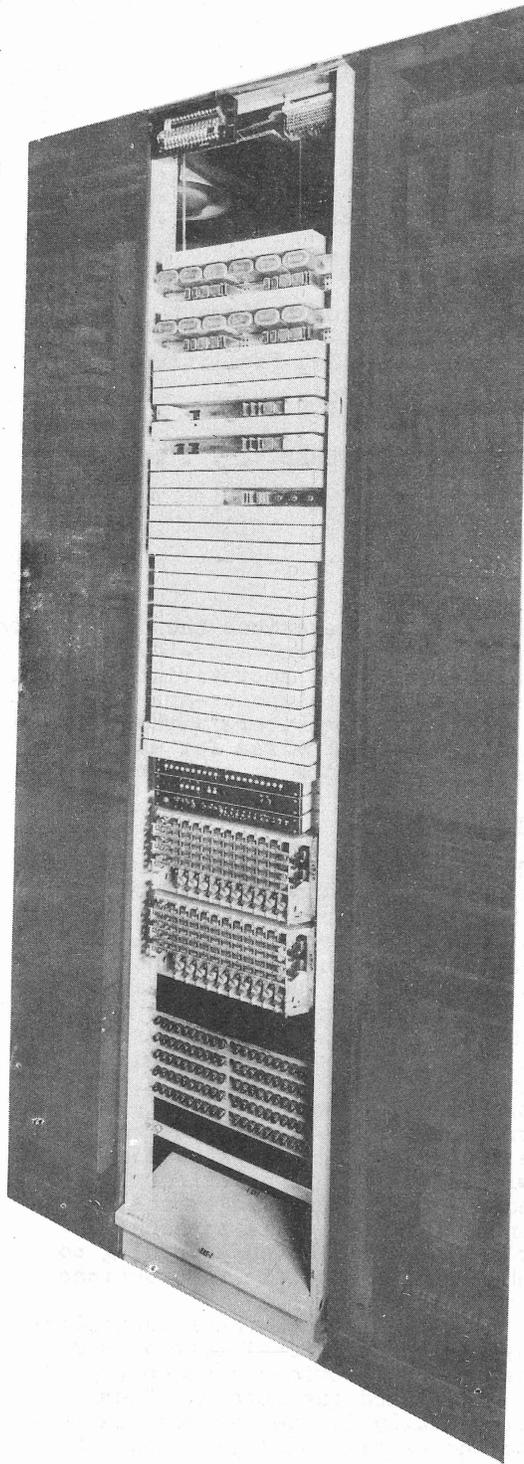
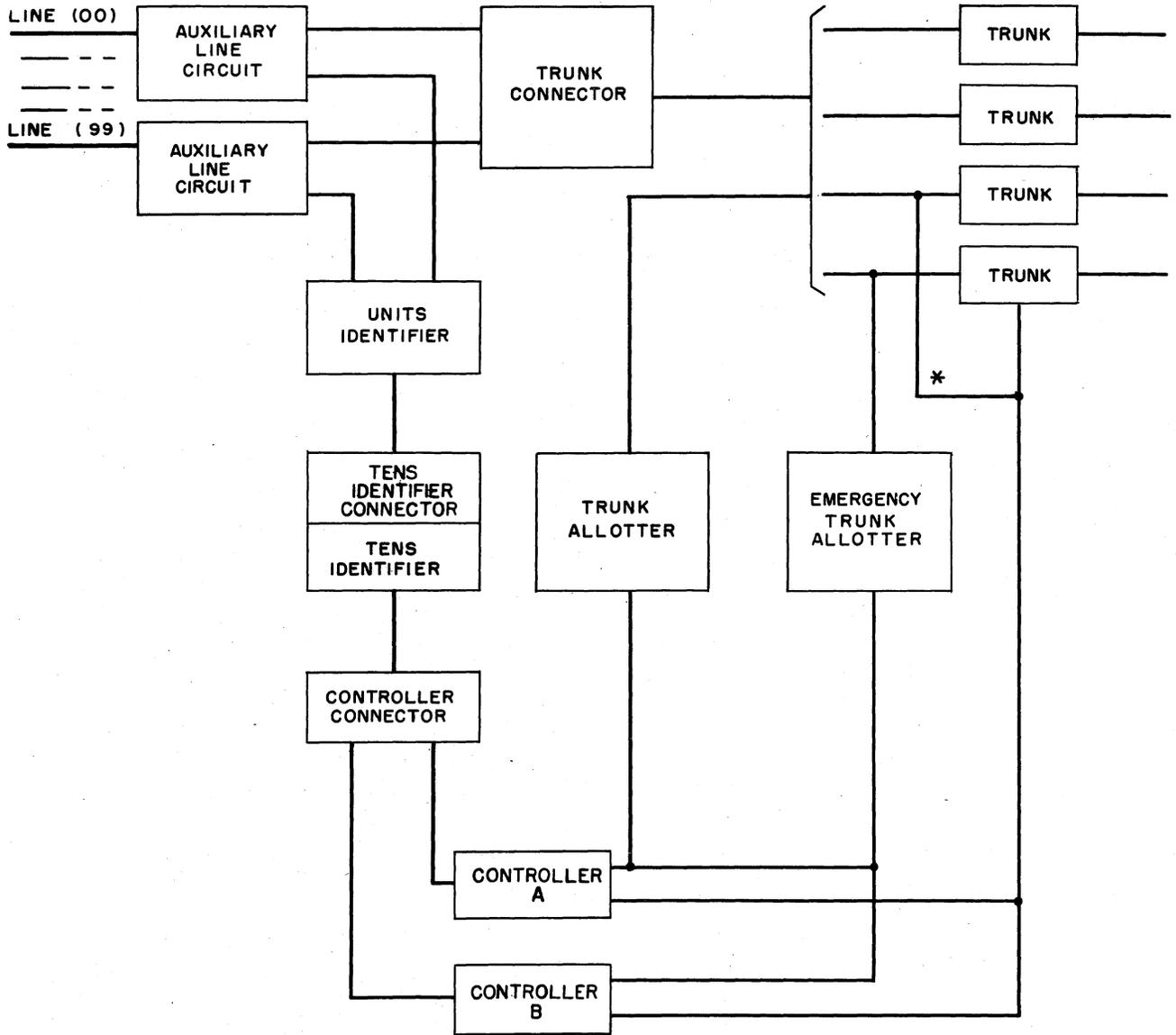


Fig. 1 - Concentrator - Identifier - Originating Equipment



\* EMERGENCY PULSING PATH

Fig. 2 - Concentrator - Identifier - Central Office End

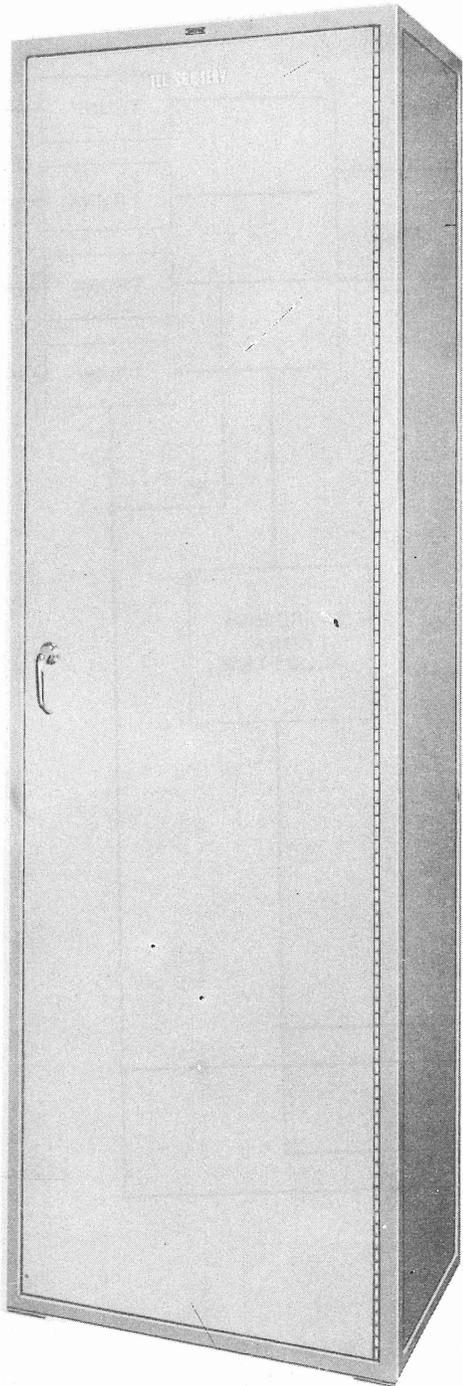


Fig. 3 - Concentrator - Identifier - Terminating Equipment Cabinet

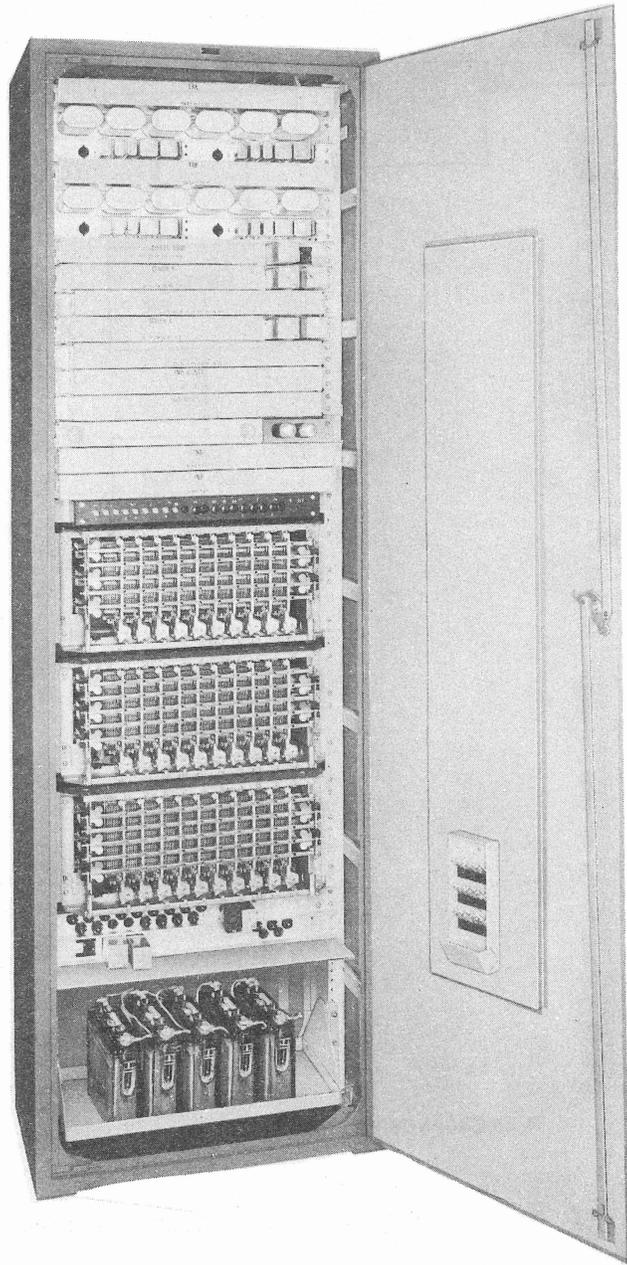


Fig. 4 - Concentrator - Identifier - Terminating Equipment - Cabinet Door Open

2.05 Two trunk allotters are provided to seize an idle trunk to the answering bureau. One allotter has access to all talking trunks. The other, which is used only in case of emergency, has access to only one trunk.

2.06 A trunk connector, consisting of four crossbar verticals per trunk, is provided to complete the connection from the subscriber line through the allotted trunk to the answering bureau.

2.07 A start circuit, not shown on Fig. 2, is provided to coordinate the functions of the various concentrating and identifying circuits. This unit provides for lighting progress lamps and sounding alarms to facilitate locating troubles.

#### B. Bureau Equipment

2.08 The secretarial-bureau equipment is mounted in one floor-supported cabinet-type frame, as shown in Fig. 3. The bureau equipment, with the cabinet door open, is shown in Fig. 4. One talking path per line is provided to connect this equipment to jacks and lamps in the secretarial-answering switchboard. If a 10-cell battery is not available at the bureau, one is provided in the bottom of the cabinet.

2.09 The major elements of the terminating equipment are shown in Fig. 5. Like the corresponding central office unit, the controller connector provides means of transferring from one controller to the other on successive calls. The controllers receive pulses from the originating equipment and pass this information to the indicating equipment.

2.10 The indicating equipment consists of two controllers, an allotter, four indicators, and an indicator connector. The controllers operate alternately to record the arbitrary digits and energize the indicator allotter. This circuit seizes an idle indicator. The operation of an indicator lights the proper switchboard lamp through the indicator connector crossbar switches.

2.11 A trunk connector is provided at the bureau to connect a trunk incoming from the central office to the associated jack in the switchboard.

#### C. Interconnecting Facilities

2.12 Composite-type trunk facilities are used to connect the originating equipment to the terminating equipment. Two, three, or four talking trunks may be provided, depending upon the volume of traffic.

2.13 These same trunks are used for signaling. The called line number is

pulsed over the ring of one trunk and receipt of this information is verified over the ring of a second trunk. A single signaling channel is employed for supervision for each talking path. In case of failure of either the identification or verification channel, both these functions are transferred to the tip and ring of an additional pair. In four-trunk installations, this pair is one of the four talking trunks. However, in two- or three-trunk installations, an additional signaling path must be provided for emergency conditions.

2.14 No facilities are provided to allow the subscriber to switch his line to the bureau by operating a key at the station.

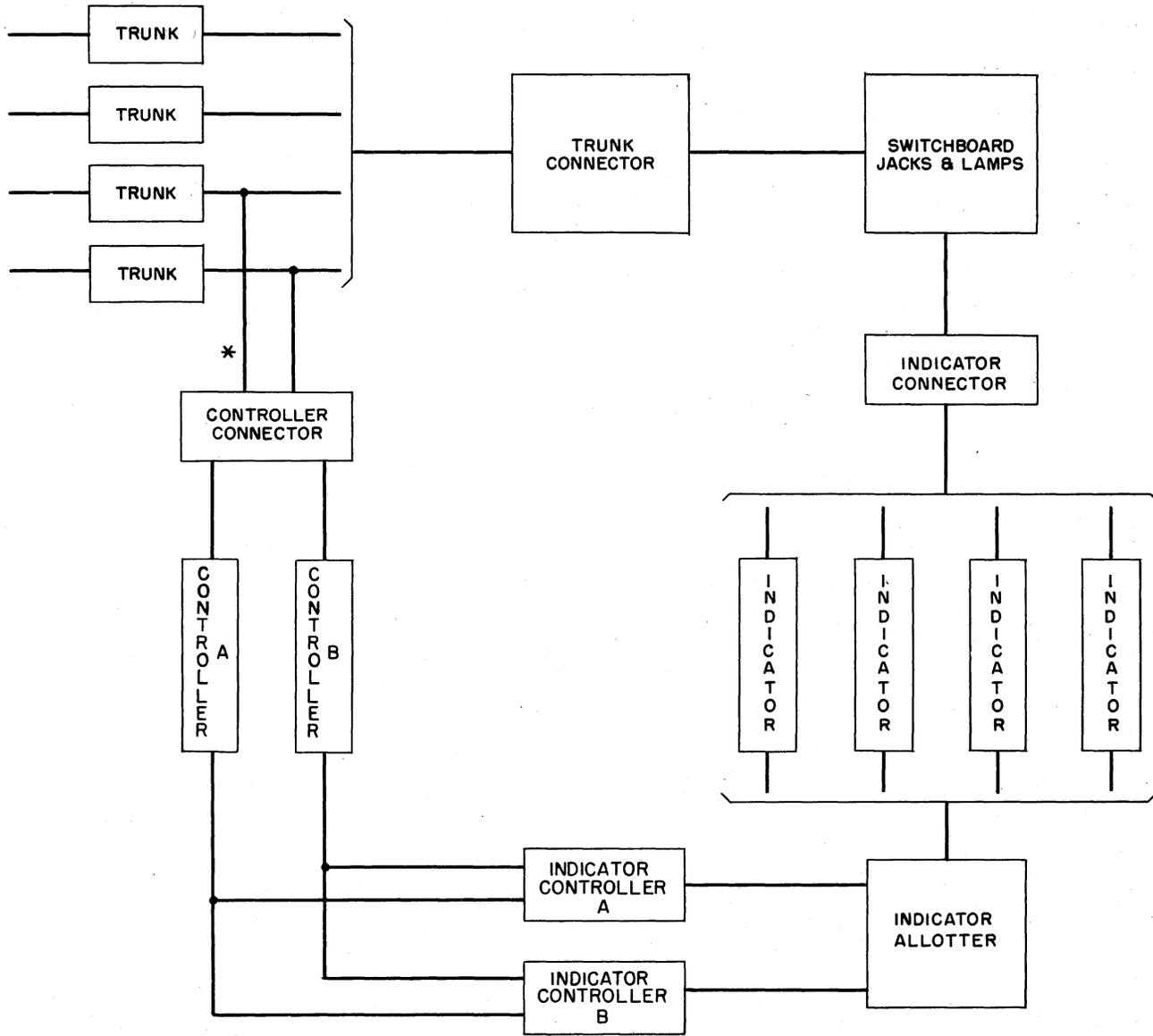
#### 3. METHOD OF OPERATION

3.01 The concentrator-identifier system operates only during the ringing interval of a call incoming to one of the associated subscriber lines. This operation may be traced on the diagrams shown in Figs. 2 and 5. When a call is received on such a line, the ringing causes the auxiliary line circuit to operate. This action energizes the units and tens identifier circuits to identify the arbitrary 2-digit number of the line being called. These circuits then connect to the common controller circuit which pulses the identified line number forward over the ring side of one of the composite trunks to the answering-bureau controller circuit. This circuit activates the line indicator circuit which lights the proper lamp on the switchboard. Receipt of this information is verified over the ring conductor of a second trunk circuit.

3.02 Simultaneously, the controller at the central office causes the trunk allotter to seize an idle talking trunk. If available, the path is closed through by the trunk connectors at each end of the trunk for the duration of the ringing interval. If the call is not answered during this time, the equipment returns to normal until the next "on" period of ringing.

3.03 The arrangement for displaying lamps is independent of talking path availability. Therefore, when all trunks are busy, the equipment continues to light line lamps associated with other incoming calls. As many as 12 calls may be indicated during a single ringing cycle (6 seconds). This is more than ample for any foreseen maximum traffic load. However, the system is so arranged that, during periods of abnormal load, all calls will be indicated once before any are repeated.

3.04 This nonlocked-in method of indicating incoming calls permits the attendant's choice of specific line answering and response only after a given number of rings, as may be previously requested by the subscriber.



\* EMERGENCY PULSING PATH

Fig. 5 - Concentrator - Identifier - Answering Bureau End

3.05 The system is arranged to permit "holding" a connection while answering another call. This is limited, of course, by the number of trunks available.

3.06 If the attendant plugs an answering cord into the jack while the associated lamp is lighted, she will be immediately connected with the calling party. Should she plug into this jack during the time when the line lamp is dark, the talking connection will be completed during the next ringing interval.

#### 4. MAINTENANCE FEATURES

4.01 All of the concentrator-identifier equipment is arranged for testing

with standard portable test sets and other facilities.

4.02 The failure of any of the central office equipment or interconnecting facilities brings in the regular central office alarm. A visual and audible fuse alarm is provided at the bureau. This alarm may be extended to a central office.

4.03 Certain common equipment is provided in duplicate to be used on alternate calls. Such practice minimizes the chance of service failure.

4.04 Progress lamps which lock in under call block conditions are provided at the originating equipment frame to assist the maintenance forces in the location of the trouble.