

**TRUNK, LINE, AND SERVICE CIRCUITS**  
**DESCRIPTION**  
**NO. 3 ELECTRONIC SWITCHING SYSTEM**

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## 1. GENERAL

**1.01** This section describes in general terms the auxiliary line, trunk, and service circuits in the No. 3 Electronic Switching System (ESS).

**1.02** This section is being reissued for the following reasons:

- Include information on D4 channel unit direct interfacing
- Loop start noise immunity line FB407 is manufacture discontinued
- Test circuit descriptions are omitted and are included in Section 233-121-116.

Revision arrows are used to emphasize significant changes.

**1.03** The trunks and service circuits have the following common characteristics:

- (a) They complete and supervise paths through the outside facilities. (Junctors supervise paths through the office.)
- (b) They receive information from peripheral decoders (PDs) via peripheral pulse distributors (PPDs) and transmit information to the control unit via the various scan points (ferrod sensors) associated with the circuits.
- (c) They are switched to various states by a PD. The PD operates and/or releases relays which put the trunks into various electrical states

to enable them to perform specific predetermined functions.

**1.04** The relationship of the various circuits to the switching network is shown in Fig. 1. Trunk, service, and line circuits appear on one side of the network with junctor circuits between the second and third stages. The junctor circuits are used in *all* connections through the office.

**1.05** Auxiliary line circuits interface between the customer and the system for distributing and sleeve lead functions.

**1.06** The universal trunk circuit types (Table A) originate or terminate transmission facilities to or from other offices. They also serve as a means for receiving or transmitting the various supervisory signals (Fig. 2). A universal trunk unit is shown mounted on the network frame (Fig. 3).

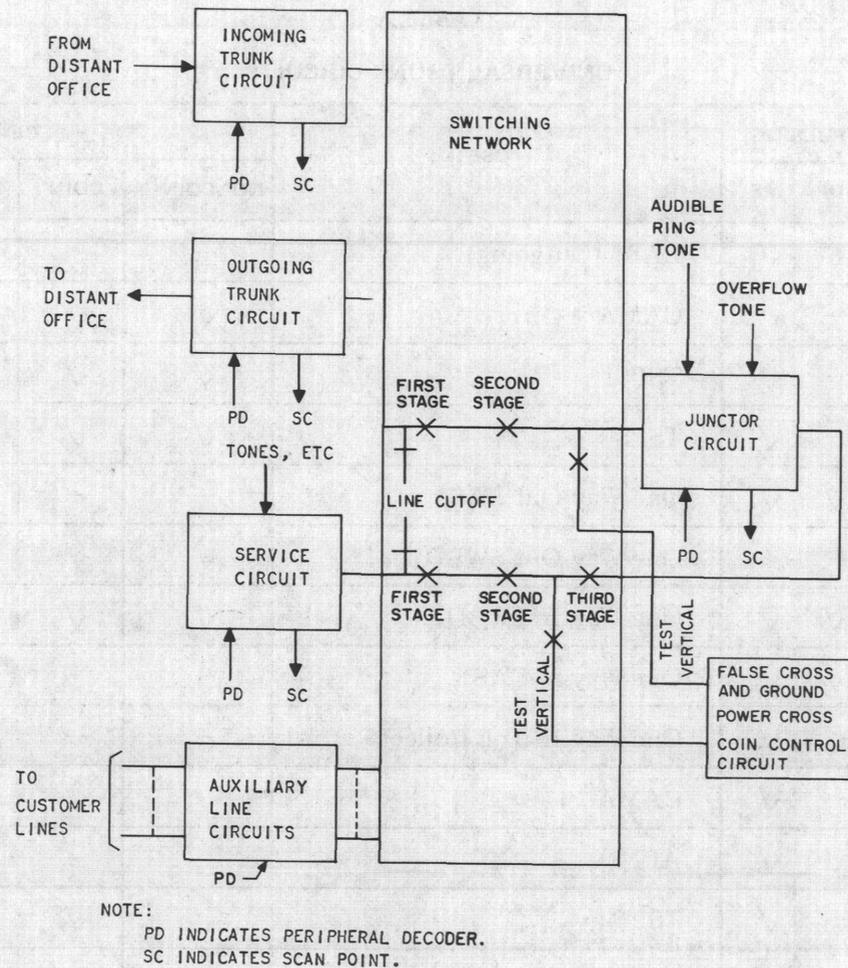
**1.07** Service circuits are special-use circuits switched in and out during call processing to provide various tones, to receive or detect outpulsing digits, to provide ringing current, etc. They perform functions which can be handled more economically by a few circuits than by providing additional equipment in each trunk or line. Table B indicates the various categories of service circuits and the basic call processing level in which the circuits are accessed.

**1.08** Three additional types of circuits, the scan, distribute, and E- and M-applique circuits, are used in the No. 3 ESS. These are special-purpose circuits which normally serve as interface circuits between the equipment of the No. 3 ESS and other non-ESS equipment. The scan and distribute applique circuits (see paragraph 3.102) are mounted in the miscellaneous frame and the E- and M-applique circuits are mounted on the toll frame.

**1.09** The autoconnect facility used in the No. 3 ESS provides a means for establishing dial-up connections to handle remote TTY functions. This minimizes the need for using trunks to perform remote TTY functions. The TTY line circuit (FB518), was designed with the TTY as its only user.

## 2. PHYSICAL DESCRIPTION

**2.01** The auxiliary line, trunk, and service circuits are provided on circuit packs except for the



**Fig. 1—Relationship of Auxiliary Line Circuits, Junctor Circuits, Trunk Circuits, and Service Circuits to Switching Network**

noise immunity line (circuit packs and relays mounted on plates), and the applique circuits (plate mounted relays). Each pack is arranged for plug-in installation in apparatus mountings on a specific frame.

**2.02** The frames which house the trunk and service circuits are as follows:

- (a) Network frame (Fig. 3)
- (b) Control frame (Fig. 4)
- (c) Miscellaneous frame (Fig. 5).

**2.03** The auxiliary line circuits are located on toll equipment frames and the miscellaneous frames.

### 3. FUNCTIONAL DESCRIPTION

#### AUXILIARY LINE CIRCUITS

**3.01** The following auxiliary line circuits are available in a No. 3 ESS installation:

- (a) **Dial-Tone-First Coin Line:** This circuit provides positive battery (+48 volts) feed polarity when needed during dial-tone-first operation for coin telephone lines. Tip and ring from the circuit can be switched to +48 volts and ground. Supervision is repeated to the system via tip and ring to the junctor. A single relay cuts in the supervisory elements and repeater circuitry. Each FB428 contains two line circuits.

TABLE A  
UNIVERSAL TRUNK CIRCUITS

TRUNK CIRCUIT TYPE	PULSING		USE	CLASS		
	DP	MF		NONCOIN	COIN	COIN-NONCOIN
Outgoing Reverse Battery High-Low (FB399)	✓	✓	EAS* (Outgoing)	—	—	—
	—	✓	CAMA	✓	✓	—
	—	✓	TSP	✓	✓	—
	—	✓	TSPS	✓	✓	✓
	✓	✓	One-Way Out EAS*	—	—	—
	—	—	One-Way Out SWBD	✓	✓	✓
	✓	✓	One-Way In SWBD	✓	✓	✓
	✓	✓	One-Way in EAS*	—	—	—
	✓	✓	One-Way In Toll Collect	—	—	—
E- & M-Lead (FB382 Type Two Interface)  (FB391 Type Three Interface)	—	✓	CAMA	✓	✓	—
	✓	✓	AIS	—	—	—
	—	✓	TSP	✓	✓	—
	—	✓	TSPS	✓	✓	✓
	—	—	Regular and Trouble Intercept	—	—	—
	✓	✓	One-Way Out EAS*	—	—	—
	—	—	One-Way Out SWBD	✓	✓	✓
	✓	✓	One-Way In SWBD	✓	✓	✓
	✓	✓	One-Way In EAS*	—	—	—
	✓	✓	One-Way In Toll Collect	—	—	—
	✓	✓	2-Way SWBD	✓	✓	✓
	✓	✓	2-Way EAS*	—	—	—
Incoming Reverse Battery Wink (FB371)	✓	✓	EAS* (Incoming)	—	—	—
	✓	✓	Outgoing SWBD	✓	✓	✓
	✓	✓	Incoming SWBD	✓	✓	✓

TABLE A (Contd)

## UNIVERSAL TRUNK CIRCUITS

TRUNK CIRCUIT TYPE	PULSING		USE	CLASS		
	DP	MF		NONCOIN	COIN	COIN-NONCOIN
Incoming Reverse Battery (Delay Dial) (FB370)	—	✓	Toll Connect From 4A or 4M Crossbar	—	—	—
Incoming Reverse Battery Immediate Start (FB371)	✓	—	EAS* (Incoming)	—	—	—
Tandem Reverse Battery (FB371 or FB399)	✓	✓	EAS* (One-Way)	—	—	—
E- & M-Lead Tandem (FB382 or FB391)	✓	✓	Regular and Trouble Intercept	—	—	—
	✓	✓	AIS	—	—	—
	✓	✓	One-Way EAS*	—	—	—
	✓	✓	2-Way EAS*	—	—	—

\* EAS includes crossbar tandem and all local offices except panel.

(b) **Loop Start Noise Immunity Line:**

◆The loop start noise immunity line (FB407) has been manufacture discontinued. Longitudinal chokes, neutralizing transformers, and/or mutual drainage reactors are placed on the line to provide noise immunity.◆

(c) **Ground Start Noise Immunity Line:**

This type of circuit is used for coin-first lines and lines from a PBX system. It employs two state relays, one of which is specifically for maintenance. This circuit (SD-3H208-01) reduces problems of false service requests due to high longitudinal noise. A current requirement of 5.5 milliamperes at 60 Hz is necessary on the ground start line to warrant use of noise immunity line circuit.

(d) **Emergency Manual Line Circuit:** This circuit provides manual service to certain customers when a service-affecting failure exists; eg, when both control units are out of service. See References for additional information.

(e) **Public Emergency Reporting Line**

**Circuit:** This circuit terminates up to ten different calls simultaneously to a public emergency line and rings the station(s) on this line. In this application, the incoming loop trunk is used as a line circuit. See References for additional information.

(f) **Group Alerting Line Circuit:** This circuit provides a means of alerting a special

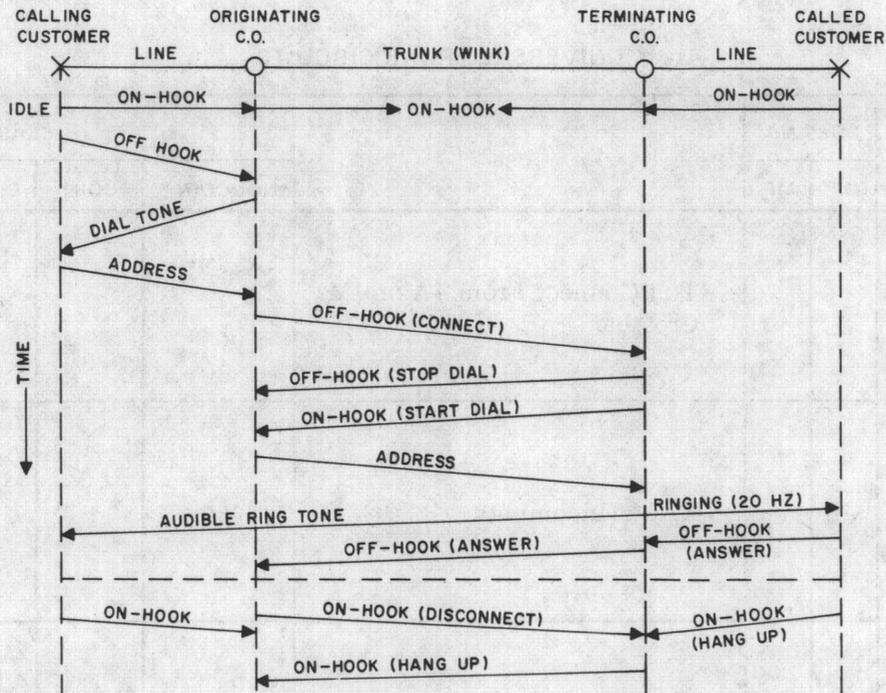


Fig. 2—Sequence of Supervisory Signals on a Typical Telephone Connection

group of customers over regular message telephone lines, independent of the switching network.

(g) **Emergency Line Circuit:** This circuit allows operators to complete direct emergency calls, independent of the switching system.

**3.02** Circuits described in paragraphs 3.01 (a) through (c) are located on the miscellaneous frames, and circuits described in paragraphs 3.01 (d) through (g) are located on toll equipment frames and not ESS equipment frames.

#### UNIVERSAL TRUNK CIRCUITS SD-3H220-01

**3.03** The universal trunk circuits are provided with one scan point and a maximum of three distributor points per circuit. These circuits provide the following types of trunks:

- Incoming Reverse Battery Delay Dial Trunk
- Incoming Reverse Battery Wink or Immediate Start (Bylink) Trunk
- Two-Way E- and M-Lead Trunk

(d) Outgoing Reverse Battery High-Low Trunk.

#### A. Incoming Reverse Battery Delay Dial Trunk

**3.04** This circuit terminates incoming transmission facilities from a 4A or 4M crossbar which uses MF signaling and provides the transmission, supervision, and control elements necessary for processing incoming calls. Off-hook represents an idle condition.

**3.05** The 3A Central Control (3A CC) connects an MF receiver to this trunk circuit via the switching network. A specific check of this connection is made, and the circuit is placed in a state which provides the capability for the receiver to be connected directly to the incoming transmission facility.

**3.06** Supervision is maintained by the receiver during digit reception. The trunk circuit provides supervision after the digits have been received. The receiver is released, and the trunk circuit is switched to another state.

**3.07** Audible ringing is returned to the calling party by the junctor (when the called line

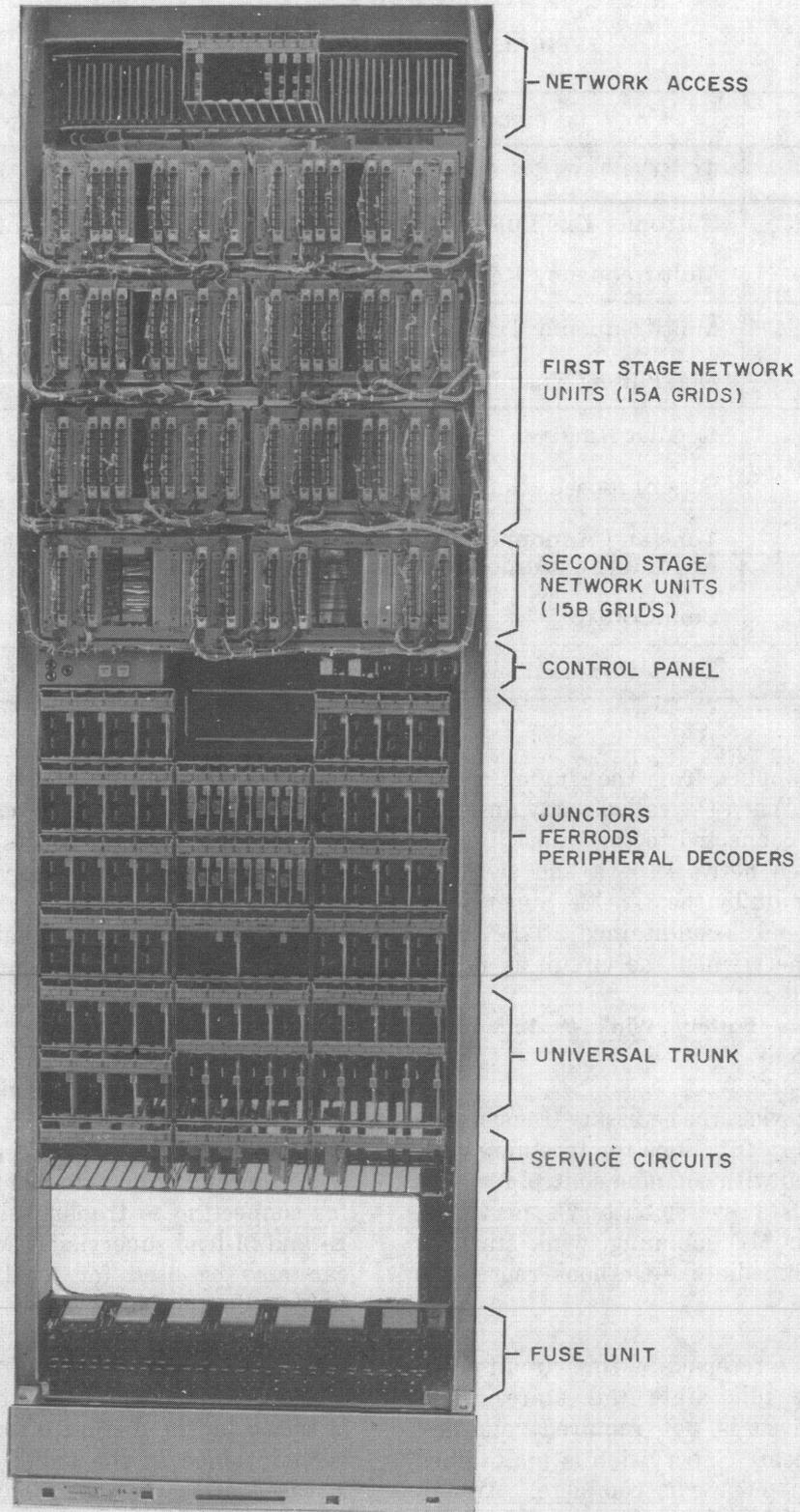


Fig. 3—Network Frame

TABLE B  
TYPICAL NO. 3 ESS SERVICE CIRCUITS

CATEGORY	CIRCUIT TITLE	BASIC CALL PROCESSING LEVEL
Receiving	TOUCH-TONE® Calling Detector Customer Dial Pulse Receiver Multifrequency Receiver	Interrupt
Transmitting	Multifrequency Transmitter Dial Pulse Transmitter	Interrupt
Ringing, Tone, and Control	Regular Ringing Superimposed Ringing Tone and Announcement Remote Recording of Announcement Coin Control	Base
Conference	3-Way Conference Circuit	Base

is idle). Ringing is applied from the ringing circuit to the called party. When the called party answers, the trunk circuit is connected to the called line via a previously reserved network path and switched to the appropriate state by the 3A CC. Supervision toward the distant end is maintained at the trunk circuit until disconnect when the circuit is idled.

#### B. Incoming Reverse Battery Wink or Immediate Start (Bylink) Trunk

**3.08** This circuit provides the necessary transmission and supervisory functions for incoming calls from offices arranged with common control features or step-by-step. It uses reverse battery supervision, dial pulsing (DP) or MF signaling, wink start, or bylink operation (immediate). On-hook represents an idle condition.

**3.09** Dial pulses are received by this circuit while it is in the idle state (all state relays released) (DP receiver is not required) and are repeated to the system. Supervision is maintained at this circuit when pulsing is complete. An MF receiver is connected via the system to this trunk for MF calls.

**3.10** This circuit is switched to a specific state by the 3A CC when the call is locally

terminating and the called line is idle. Audible ringing is provided to the calling customer by the junctor and ringing alerts the called customer. The called line is connected via a switching network path to this circuit upon answering. Supervision of the calling party is maintained at the trunk circuit until disconnect when the circuit is idled.

#### C. Two-Way E- and M-Lead Trunk

**3.11** This circuit (Fig. 6) provides the necessary incoming or outgoing trunk circuit functions for connecting to transmission facilities which use E- and M-lead supervision, MF, or DP. This circuit can also be used for local completion and local tandem in the No. 3 ESS.

**3.12 Incoming Calls—MF:** An MF receiver is connected to this circuit when the trunk is seized by the distant office. Supervision always is maintained at the trunk circuit; the receiver is released after the digits have been received.

**3.13 Incoming Calls—DP:** No receiver is associated with the circuit. The dial pulses are detected by the trunk circuit and collected by the control unit via the scanner.

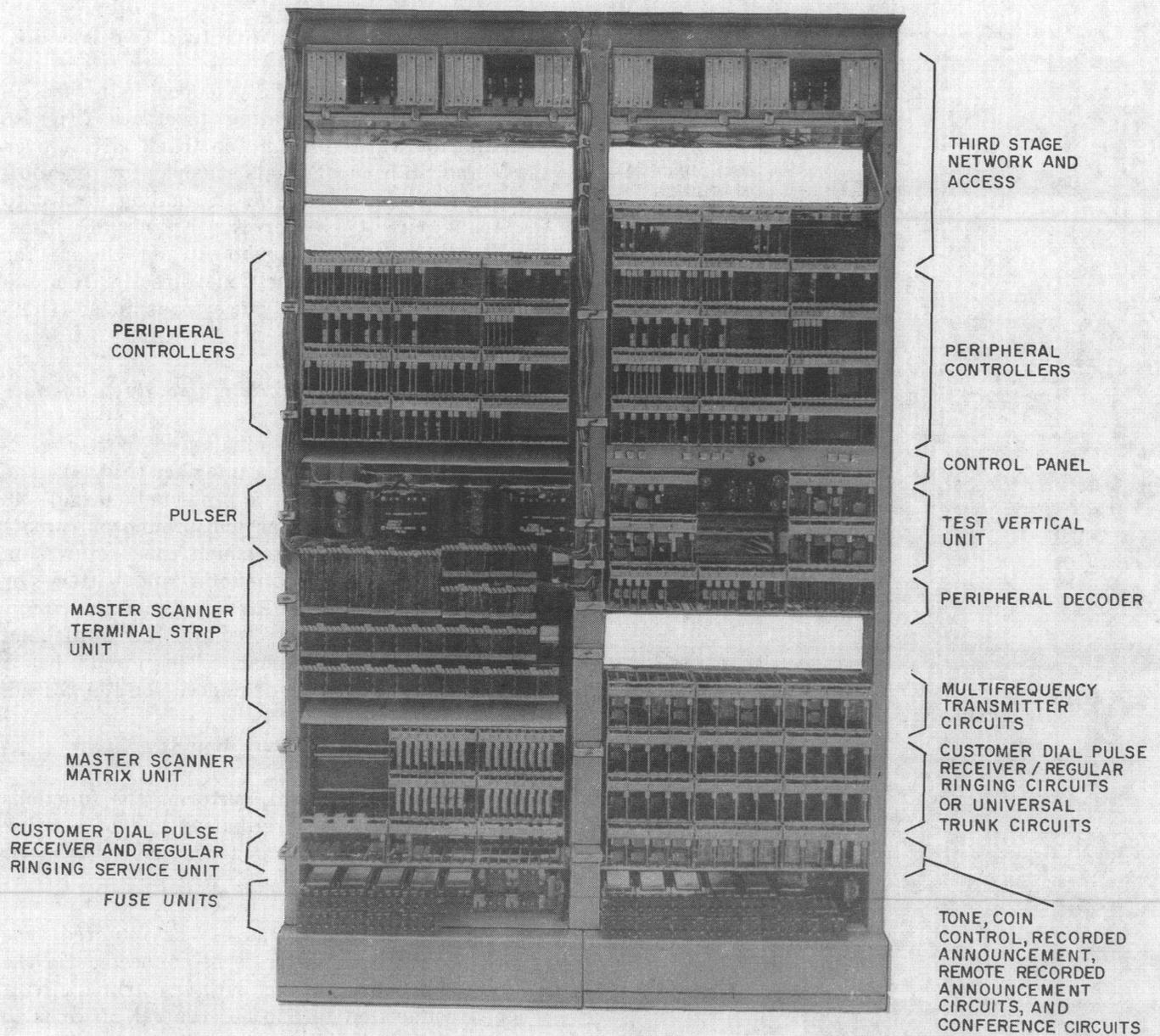


Fig. 4—Control Frame

**3.14** For locally terminating calls, the appropriate tone is returned via the network to the calling party, depending upon the state of the called line. If the line is idle, ringing is applied via the network to the called line, and audible ringing is returned by the junctor to the trunk. Upon answer, the line is connected to the trunk.

**3.15 Outgoing Calls—MF:** An MF transmitter is connected to this circuit via the network. The digits are outpulsed under supervision of this trunk circuit after a check of the switching network path has been made. The transmitter is released,

and the calling line is connected to the circuit after the digits are outpulsed.

**3.16 Outgoing Calls—DP:** The dial pulses are transmitted from the trunk circuit under control of the control unit with supervision maintained at the trunk circuit. The transmitter is released, and the calling line is connected to this circuit after the digits are outpulsed.

**3.17** Line supervision and talking battery are provided via the junctor for the local calling customer. Supervision of the distant office is

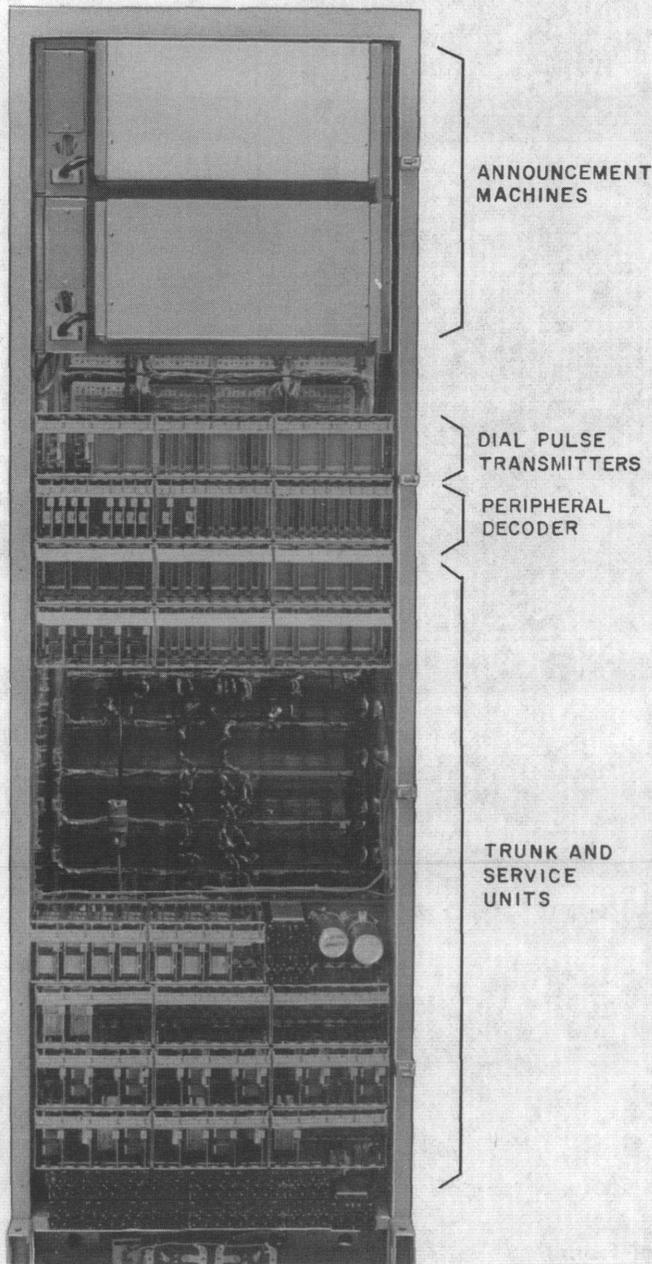


Fig. 5—Typical Miscellaneous Frame

maintained by the trunk circuit. Upon disconnect, this circuit is idled.

**3.18 E- and M-Tandem:** Three configurations of signaling are provided with the E- and M-tandem trunk. These are E- and M- to E- and M-; E- and M- to loop; and loop to E- and M-.

**3.19** The trunk conditions are shown in Fig. 7.

### Two-Way E- and M-Trunk With Type Two Interface

**3.20** This circuit is a fully looped four wire E- and M-lead signaling interface (Fig. 8). Signaling outward is from the trunk circuit over the M and SB leads. Signals are open for *on-hook* and a closure for *off-hook*. Signaling inward to the trunk circuit is over the E and SG leads. Signals are open for *on-hook* and closure for *off-hook*. Outpulsing is done directly from the trunk rather than a dial pulse transmitter (DPT) via the trunk.

### Two-Way E- and M-Trunk With Type Three Interface

**3.21** This circuit is an unbalanced four wire E- and M-lead signaling interface (Fig. 9). The signaling circuit supplies a protected (surge) -48 volt battery on the SB lead and ground on the SG lead to the trunk circuit, which then returns on the M lead ground for *on-hook* and battery for *off-hook* signals. Signaling into the trunk circuit is on the E lead by an open for *on-hook* and ground for *off-hook* signals. This circuit has a balanced M lead but is unbalanced for the E lead.

### D. Outgoing Reverse Battery High-Low Trunk

**3.22** The outgoing trunk performs the functions required at the originating end of a trunk loop to complete a call to a customer served by another central office.

**3.23** The control unit causes the required type of digit transmitter to be connected via the switching network to the outgoing trunk circuit when a connection to another central office is to be set up. The trunk circuit and the junctor are placed in a bypass state, thereby connecting the digit transmitter directly to the outgoing transmission facility. While in this state, various integrity checks are made by placing the trunk circuit in a specific state which provides the capability for the network to be checked for proper operation.

**3.24** When all integrity checks are passed and outpulsing is finished, the trunk circuit is again placed in a state where talking battery and supervision are at the junctor circuit for the calling customer and at the trunk circuit for the called customer.

**3.25** During outpulsing, supervision is maintained at the trunk if MF is used and at the

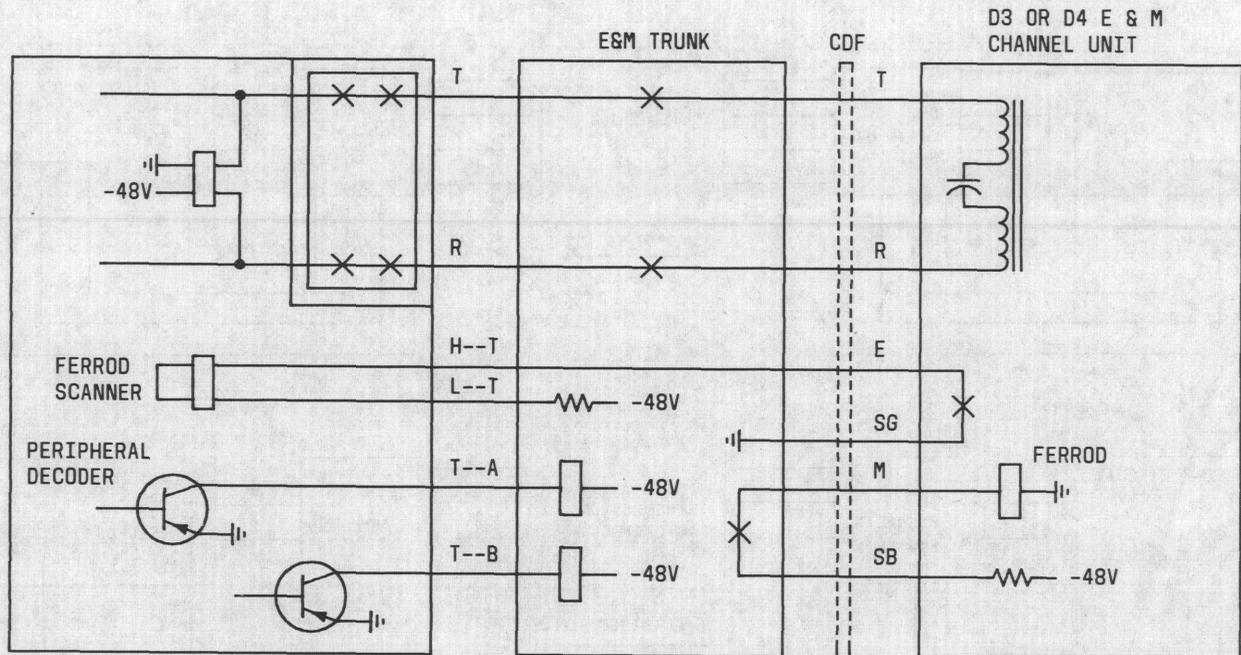


Fig. 6—E- and M-Trunk Circuit

transmitter if dial pulse is used. After the digits are outpulsed, supervision of the distant office is transferred to the trunk and the digit transmitter is released. The trunk then recognizes answers, provides a transmission path for talking, and recognizes a distant end disconnect. When disconnect occurs, the circuit is returned to an idle state by the control unit.

**3.26** The outgoing reverse battery high-low trunk provides for a remote "make busy" from the incoming office. When the trunk is idle, a high resistance (100,000 ohms) is provided; thereby, not restricting incoming trunk relays.

#### DIRECT INTERFACE

**3.27** The direct interface feature permits direct control of T-carrier D4 channel units without the use of E- and M-trunk circuits. The modified D4 channel unit (SD-3C328-01) performs both trunk circuit and channel unit functions.

**3.28** The direct interface arrangement (Fig. 10) passes the same information between the switching system and the carrier as in the conventional arrangement.

#### LOCAL TEST DESK TRUNK CIRCUIT SD-3H520-01

**3.29** This circuit (maximum of two) is located on the test frame and provides a means for establishing a test path from a local test desk (LTD), No. 14 or No. 16, or a 3A local test cabinet to a customer line through a No. 3 ESS central office. This trunk circuit is capable of receiving additional testing signals over additional leads from the local test desk. The additional leads are sleeve and ground leads.

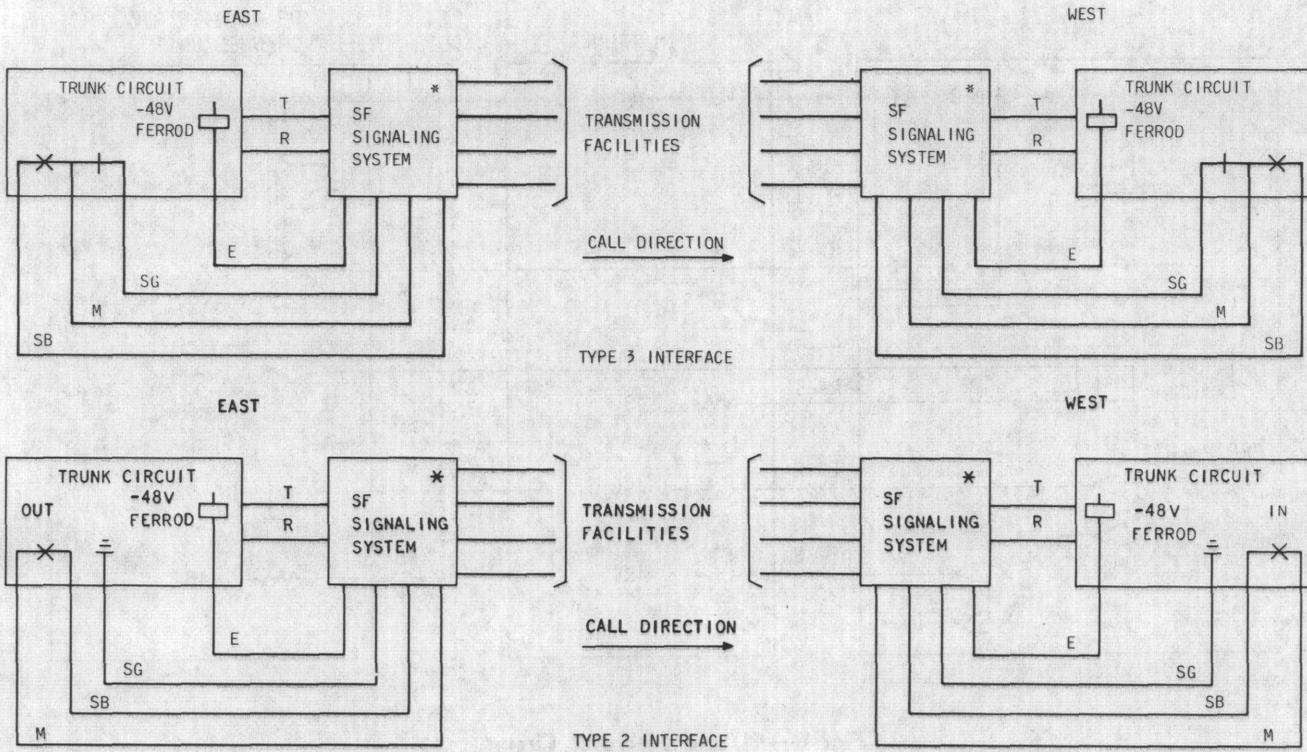
**3.30** This trunk circuit is placed in a state which directly connects an MF digit receiver to the incoming trunk circuit. Supervision of the trunk is maintained at the receiver during pulsing. Following pulsing, the trunk circuit state is again switched, supervision is maintained at the trunk circuit, and the receiver is released.

**2.31** The controller sets up a connection to the called line and switches the trunk circuit to a state that provides for testing capabilities. Upon disconnect, the trunk circuit is idled.

#### JUNCTOR CIRCUIT SD-3H200-01

**3.32** The junctor circuit is used in all connections through the office. It is present in every

SECTION 233-121-115



TRUNK CONDITION	SIGNAL (EAST TO WEST)	SIGNAL (WEST TO EAST)	CONDITION AT EAST		EAST TO WEST SF TONE	CONDITION AT WEST		WEST TO EAST SF TONE
			FERROD	M LEADS		FERROD	M LEADS	
IDLE	ON-HOOK	ON-HOOK	UNSATURATE	OPEN	ON	UNSATURATE	OPEN	ON
SEIZURE	<u>OFF-HOOK</u>	ON-HOOK	UNSATURATE	<u>CLOSED</u>	<u>OFF</u>	<u>SATURATE</u>	OPEN	ON
ANSWER	OFF-HOOK	<u>OFF-HOOK</u>	<u>SATURATE</u>	CLOSED	OFF	SATURATE	<u>CLOSED</u>	<u>OFF</u>
DISCONNECT (EAST)	<u>ON-HOOK</u>	OFF-HOOK	SATURATE	<u>OPEN</u>	<u>ON</u>	<u>UNSATURATE</u>	CLOSED	OFF
DISCONNECT (WEST)	OFF-HOOK	<u>ON-HOOK</u>	<u>UNSATURATE</u>	<u>CLOSED</u>	OFF	SATURATE	<u>OPEN</u>	<u>ON</u>
IDLE (BOTH ENDS DISCONNECT)	ON-HOOK	ON-HOOK	UNSATURATE	OPEN	ON	UNSATURATE	OPEN	ON

NOTE:  
 — DENOTES CHANGE FROM PREVIOUS CONDITION  
 \* F TYPE SIGNALING UNIT OR EQUIVALENT ALSO COMPATIBLE WITH OTHER SIGNALING SYSTEMS

Fig. 7—E- and M-Trunk Circuit Diagram

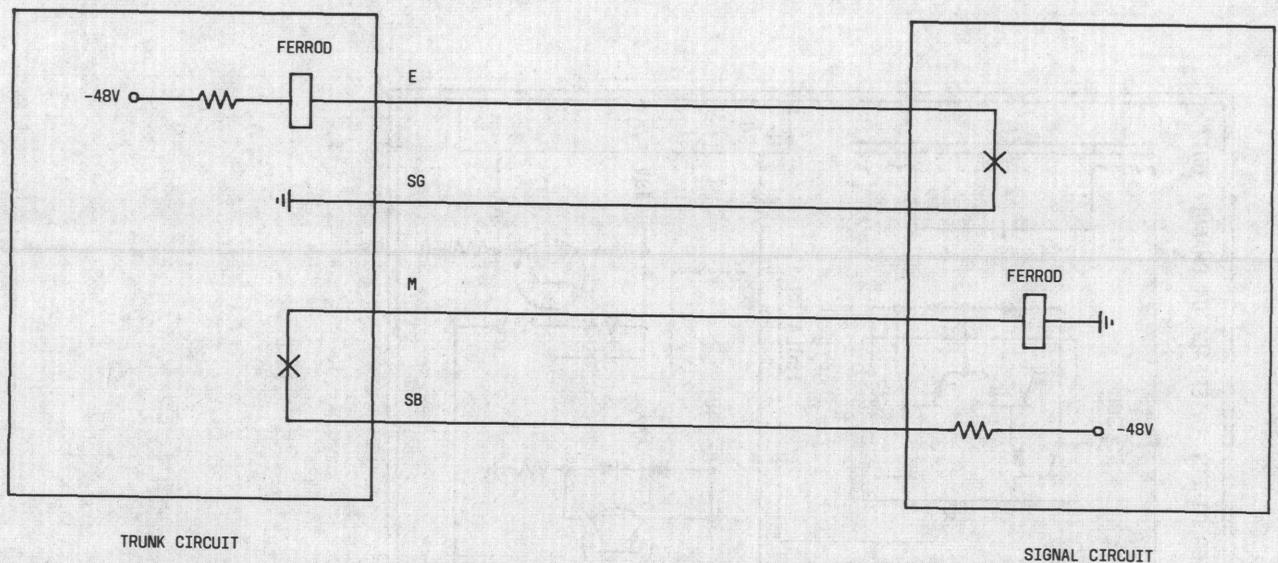


Fig. 8—FB382 E- and M-Type Two Interface

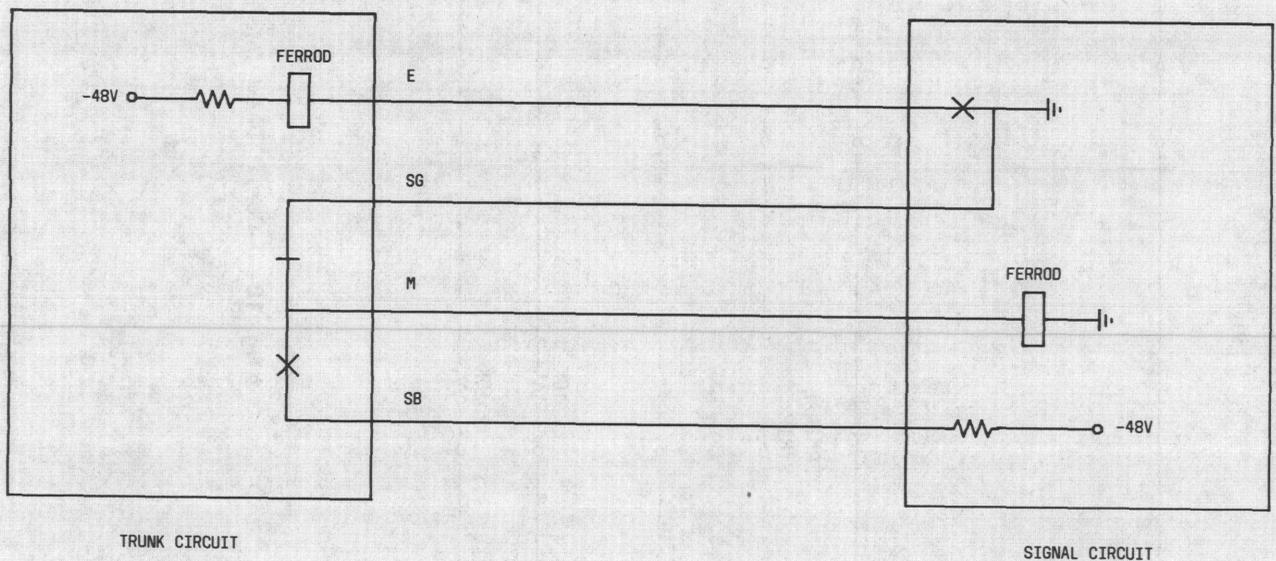


Fig. 9—FB391 E- and M-Type Three Interface

switched path, thereby providing a large number of functions. The circuit has the following states.

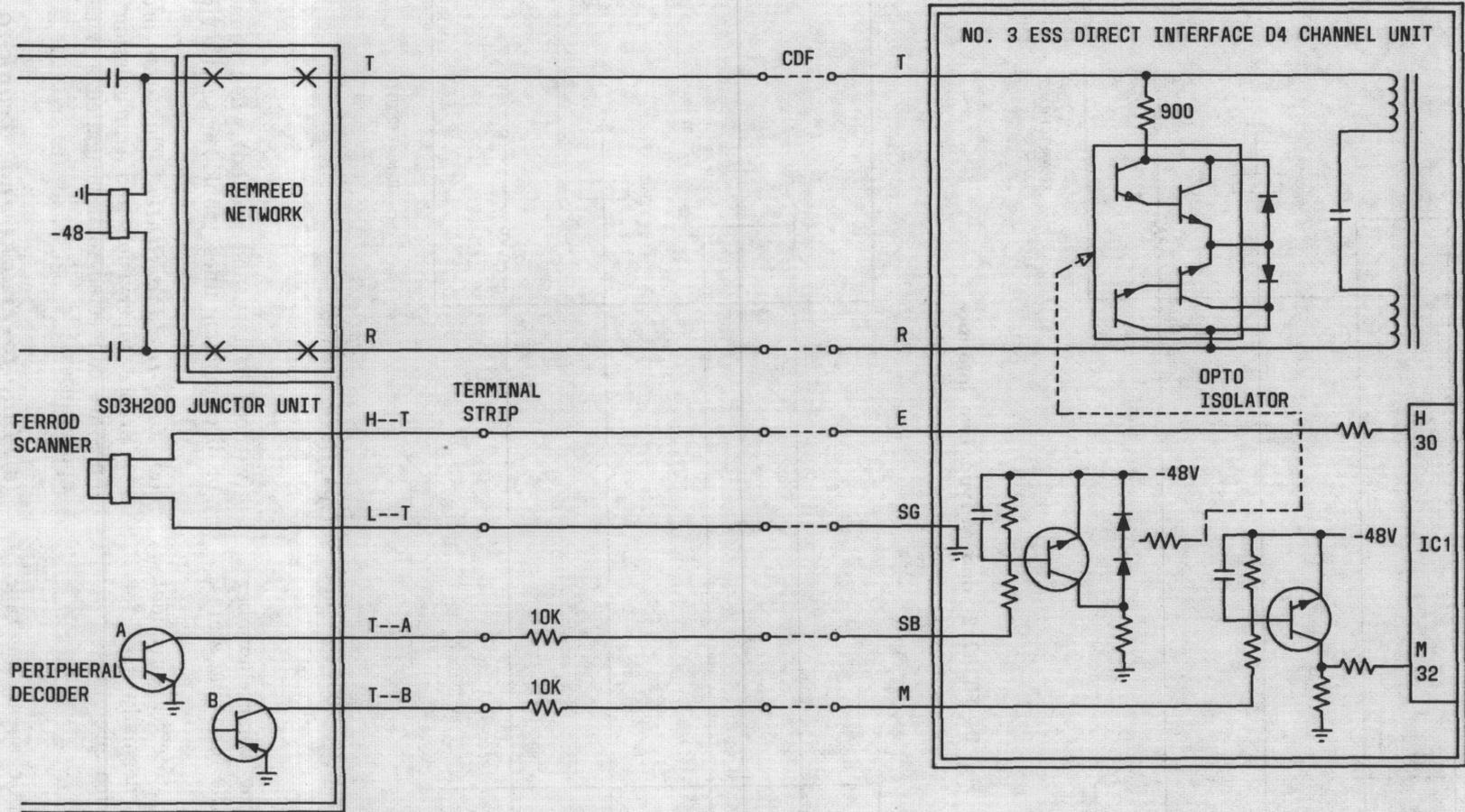
(a) **Bypass State:** This state is equivalent to a wire-type junctor, normally used for switched connections to service circuits.

(b) **Open State:** This state opens the talk path to allow the network to switch dry

(without battery and ground) when connecting or disconnecting lines, trunks, or service circuits.

(c) **Line-to-Line State:** This state provides proper supervision and transmission when lines are connected to both (called and calling) appearances.

(d) **Line-to-Trunk and Trunk-to-Line States (Two States):** These states



◆ Fig. 10—T-Carrier Direct Interface ◆

provide proper supervision and transmission when a trunk is connected to a line.

(e) **Audible Ring State:** This state applies audible ring to the calling customer while the system is waiting for the called party to answer (tone and supervision available at either port, but not both).

(f) **Overflow (Reorder) Tone State:** This state returns overflow tone in the event that all the network paths, trunks, or service circuits are busy (tone and supervision available at either port, but not both).

**3.33** The junctor must also supply talking battery to the local customer, sense call status signals (supervision), and limit high current surges in the transmission path in all states except bypass and open. The current surge limiting is necessary to protect the network contacts.

#### ORIGINATING CALL

**3.34** When a junctor circuit is selected to complete the connection between terminals, the junctor is set to the bypass state by the control unit. (It is initially open while the first part of the path is set.) After network integrity tests (FCG and PC) have been successfully completed, the system switches the circuit to the open state. The network path to the customer dial pulse receiver (CDPR) is completed, and supervision is transferred from the line to the CDPR via the junctor which is placed in the bypass state.

**3.35** A maximum of three separate juncctors is used to process a typical call as described below.

**3.36 Intraoffice Calls:** The previously connected junctor is switched to the open state, the network is configured, and the CDPR is disconnected. If the called party's line is found to be idle, a second junctor is placed in the bypass state to provide a path from the ringing circuit to the called line. (Depending on path chosen, this may be the same junctor used in the line-to-CDPR connection.) A third junctor is placed in the audible state until answer. The network is reconfigured to the third junctor which is placed in the line-to-line state, providing supervision and talking battery during the talking interval.

**3.37 Outgoing Calls:** The same preceding process is used in connecting to the CDPR. A digit transmitter (DP or MF) is connected to the trunk through a second junctor in the bypass state. (Depending on path chosen, this may be the same junctor used in the line-to-CDPR connection.) Ringing is applied in the distant office, and audible ring is returned from the distant office after ringing begins. A third junctor in a line-to-trunk state provides a talking path from the calling customer to the outgoing trunk circuit when the outpulsing is completed.

**3.38 Incoming MF Calls:** An MF receiver is assigned to the trunk to detect MF tones. A junctor in the bypass state connects the trunk to an MF receiver. A second junctor is connected to provide ringing to the called party when all MF tones have been received, and a third junctor is connected to provide audible ring to the calling party. When ringing is tripped, the third junctor is placed in a trunk-to-line state to serve as the talking connection when an answer occurs. The trunk is then placed in a talk change state.

**3.39 Incoming DP Calls:** Digits are detected at the incoming trunk circuit and passed to the control unit where the two juncctors needed to complete the call are determined. One junctor provides audible ring to the calling party in the audible ring state; the second connects ringing to the called party.

#### SERVICE CIRCUITS

**3.40** Eleven service circuit types are required for the features provided by the No. 3 ESS. These circuits are divided as follows:

- (a) Digit receiving circuits
  - (1) Customer dial pulse receiver (CDPR)
  - (2) TOUCH-TONE receiver (detector) circuit
  - (3) Multifrequency receiver
- (b) Digit transmitting circuits
  - (1) Dial pulse transmitter (DPT)
  - (2) Multifrequency transmitter
- (c) Ringing, tone, and control circuits

- (1) Regular ringing
  - (2) Superimposed ringing
  - (3) Tone and announcement
  - (4) Coin control
  - (5) Remote recording of announcement.
- (d) Conference circuits.

**A. Digit Receiving Circuits**

**3.41** Digit information can be received either from local customers or from other central offices. The different digit receiving circuits used in each case, because of differences in signaling methods, are described in the following paragraphs.

**Customer Dial Pulse Receiver Circuit SD-3H410-01**

**3.42** This circuit receives dial pulses generated by customer subsets or private business exchanges (PBXs) and passes the information on to the control unit. These circuits are mounted on the network and control frames.

**3.43** TOUCH-TONE signals are received via the TOUCH-TONE calling detector circuit which shares the same tip-ring appearance as the CDPR.

**3.44** Dial tone and battery reversal are provided as a start-dial signal and removed as required for both dial pulse and TOUCH-TONE customers. A party test is provided to identify the party of a 2-party line that is originating a call. A coin-in-the-slot test is provided for coin lines, and a toll diversion signal (reverse battery) is provided for use with PBXs to screen unauthorized calls.

**3.45** When a subscriber goes off-hook, the control unit connects the subscriber line to an idle CDPR via a network path. Dial tone is then returned to the customer for a start-dial signal.

**3.46** Dial tone is disconnected when the first pulse of the first digit has been sent. If dial pulses are being sent, they will be sensed by the DP detector circuit. The control unit determines the digits that are being dialed. The CDPR receives all the digits from the subscriber. The CDPR is then disconnected from the subscriber loop. The calling subscriber is connected via a network path

and appropriate trunk (if required) to the called subscriber, as determined by the dialed digits.

**3.47** A party test is performed before dial tone and again after the digits are received to determine the party that is originating the call if the call is from a 2-party line.

**3.48** If the call is from a dial-tone-first coin line, a coin-present test is made for charge calls.

**3.49** A toll diversion signal can be sent from the CDPR to the PBX trunk circuit. The signal directs the call to the PBX attendant if the toll call is not authorized.

**TOUCH-TONE Receiver (Detector) Circuit SD-3H401-01**

**3.50** This circuit is used to receive TOUCH-TONE signals from a customer telephone set also, to recognize that frequencies are present, and convert the signaling frequencies to data suitable for detection by the scanner. This circuit is mounted on the miscellaneous frame(s).

**3.51** The circuit offers a high degree of protection against false operation by voice frequency components contained in speech or noise picked up by the telephone transmitter.

**3.52** TOUCH-TONE signaling uses two groups of frequencies, low and high, in the speech band with each group consisting of four frequencies. The low band frequencies are 697 Hz, 770 Hz, 852 Hz, and 941 Hz; the high-band frequencies are 1209 Hz, 1336 Hz, 1477 Hz, and 1633 Hz. A valid signal consists of two frequencies, one from each of the two bands.

**3.53** This circuit is bridged across tip and ring of a CDPR circuit and presents a high impedance to prevent interference with dial pulsing. A circuit in the TOUCH-TONE detector prevents noise outside the audio band from affecting detection operation.

**3.54** The TOUCH-TONE detector first separates and then amplifies and limits the signals derived from the two frequencies. These ac signals are rectified and converted to signals suitable for operating ferroids within the circuit. To be recognized, a signal must be present for a minimum time period to prevent momentary noise and speech signals from simulating digits. A timer is started

upon detection of output and is not released for an additional timed interval to prevent double registration of the same digit and to give the system software time to see the output.

#### **Multifrequency Receiver Circuit SD-3H402-01**

**3.55** This circuit receives MF signals from operator key sets or senders in distant offices, recognizes frequencies present, and converts the received frequencies into signals suitable for detection by the scanner. This circuit is mounted on the miscellaneous frame(s).

**3.56** The MF signaling uses one group of the following frequencies in the speech band: 700 Hz, 900 Hz, 1100 Hz, 1300 Hz, 1500 Hz, and 1700 Hz. A valid signal consists of exactly 2 of these frequencies (2-out-of-6 code) with 15 valid combinations of which 10 are used as digits to identify called customer directory numbers and the remaining 5 special function numbers.

**3.57** An MF receiver is connected to the incoming trunk circuit via a junctor when the distant office sends addresses by MF signaling. The frequencies are converted to signals which will activate ferros in the scanner.

**3.58** A signal must be present for a minimum period of time before it is recognized to prevent momentary noise from simulating digits. A timer sequence is started to determine if a valid signal is at the frequency detector outputs.

#### **B. Digit Transmitting Circuits**

**3.59** Digit transmission between central office is accomplished by the dial pulse transmitter circuit [mounted on miscellaneous frame(s)] and the multifrequency transmitter circuit (mounted on control and miscellaneous frames).

#### **Dial Pulse Transmitter (DPT) Circuit SD-3H403-01**

**3.60** This circuit provides a means for the system to transmit dial pulse information to another office and to a PBX. The circuit is arranged to recognize start and stop pulsing signals and to transmit battery and ground pulses.

**3.61** The system causes this circuit to be connected via the network and a junctor circuit to an idle outgoing trunk on a call to an outgoing trunk.

A seizure signal is recognized by the distant end when the state of the junctor is switched. The results of checks made by the dial pulse transmitter notify the system of a start pulsing signal (no signal for step-by-step; on-hook—off-hook—on-hook for common control).

**3.62** On a call to a 2-way trunk (E and M only), the trunk circuit is directed to forward the seizure. Wink start pulsing signals are recognized by the E- and M-trunk circuit.

**3.63** The system times an interval before transmitting dial pulses to allow the transients on the line (resulting from the tip-ring reversals) to diminish after receiving the start pulsing signal. The release-operate sequence of a relay within the circuit constitutes a dial pulse. An off-hook indication from the distant office is a stop-dial signal; return to on-hook is a go signal.

**3.64** Supervision is maintained at the E- and M-trunk after the necessary digits have been transmitted. The connection between the transmission facility (via the DPT and the network path) and the junctor is disconnected, and the DPT is idled.

#### **Multifrequency Transmitter Circuit SD-3H404-01**

**3.65** This circuit generates signals in the MF code. Such signals are used to transmit the directory number of the called customer. This can also be used to transmit the directory number of the calling customer for automatic number identification (ANI) operation. In addition, the circuit checks the continuity of loop trunks and observes battery-reversal start pulsing signals.

**3.66** The same six frequencies used in the MF receiver are used in the MF transmitter.

**3.67** The transmitter is first connected to the trunk circuit. The states of the junctor are switched, connecting the network path from the trunk through the bypassed junctor to the MF transmitter. The control unit causes a seizure signal which is either (1) a loop trunk, whereby the MF transmitter provides a loop for the distant office or (2) an E- and M-trunk, whereby the loop is provided from the trunk. This is to be sent to the distant office from the transmitter.

**3.68** Continuity of the path to the distant office and polarity of battery from a loop trunk

can be detected by the MF transmitter circuit. One reversal will be detected when the distant office attaches its receiver; a second reversal, usually interpreted as the start pulsing signal, will be detected when the receiver is ready to receive digits.

**3.69** The transmission of the MF signals involves the operation of two of six relays for each digit sent. When the two relays for any particular digit have been selected, a check is made to insure that two out of six relays have been operated.

#### C. Ringing, Tone, and Coin Control Circuits SD-3H411-01

**3.70** The remaining service circuits used in the No. 3 ESS are as follows:

- (a) Regular ringing circuit (mounted on control 0 and network frames)
- (b) Superimposed ringing circuit (mounted on miscellaneous frames)
- (c) Tone and recorded announcement circuit (mounted on control and miscellaneous frames)
- (d) Coin control circuit (mounted on control 0 frame)
- (e) Remote recording of announcement (mounted on miscellaneous or control 0 or control 1 frame).

#### Regular Ringing Circuit SD-3H410-01

**3.71** This circuit provides ringing for single-party, 2-party, PBX, coin, 8-party coded, and 4-party semiselect stations. Continuous ringing is applied to the circuit, and interruptions are provided at the circuit under control of the control unit.

**3.72** The circuit is connected to the customer loop via a normal network path with the junctor placed in a bypass state. The circuit tests for a low resistance to ground or a low bridging resistance from tip to ring (pretrip condition) under control of the control unit. If no such condition is detected, ringing is applied.

**3.73** Ringing current flow to the customer line is detected and checked immediately. This early detection, of ac continuity failure, allows the

system to attempt a second trial on the call if an ac continuity failure is encountered.

**3.74** The circuit provides a means of testing for a pretrip condition prior to ringing and of making an ac continuity test during ringing. This pretrip condition prevents ringing a loop which would immediately trip ringing and possibly cause false charging.

**3.75** The ac continuity test checks the path between the ringing supply and the customer telephone. Two trials can be made. If a failure is encountered on a second trial ringing connection, the connection is allowed to remain and will be abandoned or will time out.

**3.76** Ringing is automatically tripped upon customer answer (to inhibit the customer actually hearing the ringing signal) and the control unit is informed of the answer condition. The control unit tears down the connection to this circuit, idles the circuit, and establishes the necessary talking path.

#### Superimposed Ringing Circuit SD-3H406-01

**3.77** The circuit provides ringing for calls to polarized ringer lines associated with 4-party full select and 8-party semiselect customers. Similar checks as in the regular ringing circuit are made.

#### Coin Control Circuit

**3.78** This circuit is connected to a coin line via the switching network to test for the presence of coins or to collect or return coins.

**3.79** To test for the presence of coins, a 48-volt potential is applied through the ferrod. Positive voltage is used for the overtime deposit test; negative voltage is used for the initial deposit test. A ferrod saturation occurs in either case if a coin is present. This information is passed to the control unit via a scan point.

**3.80** A 130-volt potential through a ferrod sensor to the line tip conductor allows the collection (positive) or return (negative) of coins. (The reverse may be used as a local office program option for all prepay coin stations.) The ferrod sensor detects the flow of current and notifies the processor of the presence of a coin. Operation (coin collection

or return) is successfully completed when current stops flowing.

**3.81** The integrity of the network connection between the circuit and the coin line is verified.

**3.82** Drain states follow the control functions of the circuit to discharge line capacity, charged as a result of the control function. Also, this precedes a coin presence test.

#### **Tone or Recorded Announcement Circuit**

**3.83** This circuit connects a tone from the tone plant to a terminal on the network circuit. The circuit is also used as an interface to the recorded announcement circuit.

**3.84** This circuit is used to connect a tone or announcement to a line or trunk whenever needed. It is connected to a customer via the junctor (in one of its predetermined states) by the system.

**3.85** *Local Customer:* The tone circuit provides a loop continuity check to the junctor circuit. The tone or recorded announcement circuit relay connects the recorded announcement to the calling party via the network and junctor circuit. The tone or recorded announcement circuit removes power from the 7A announcement machine when a disconnect signal is detected by the system, thus stopping playback of the recorded announcement.

**3.86** *Local Line Connection:* When a call has been placed into the system from a local line, the status of the called line is checked. When the status indicates that a tone or recorded announcement should be returned to the calling line, a junctor is selected to connect the calling line to a tone or recorded announcement circuit. Once the network path has been established, the junctor is placed in the line-to-line state. This action supplies battery and supervision through the network to the calling line and the tone or recorded announcement circuit. A continuity check is made between the junctor and the tone or recorded announcement circuit. When the recorded announcement circuit is selected, power is applied to the announcement machine to start playback of a recorded announcement (as long as power is applied). A scan point is provided with each to signify the end of a recorded message for nonbarga-in

operation. The junctor (in the line-to-line state) completes the connection from the tone or recorded announcement circuit to the calling line. When the calling line disconnects, the junctor is placed in the open state. This removes the tone or recorded announcement from the circuit.

**3.87** *Trunk Connection:* The loop continuity check, tone circuit operation, and disconnect procedures are the same for a trunk connection as for a local line connection except that supervision of the distant end is accomplished at the trunk circuit.

#### **Remote Recording of Announcement**

**3.88** Under extreme overload, the No. 3 ESS has the capability of switching in an announcement instead of the overflow tone. When provided, the announcement machine is mounted in a miscellaneous frame. There are three types of announcement machines available for use in the No. 3 ESS. These are: 7A, 12A, and 13A recorded announcement systems. The announcement machine is connected to the customer via the tone or recorded announcement circuit (SD-3H411-01).

**3.89** The 7A recorded announcement system (SD-95283-01) recording medium is a magnetic drum capable of a maximum announcement length of 120 seconds. The 7A system has one channel per machine.

**3.90** The 12A recorded announcement system (SD-2G435-01) recording medium is a 1/4-inch continuous loop magnetic tape with a maximum announcement length of 12 seconds. The 12A system has the capability of four channels per machine. A channel is added by the additions of a circuit pack in the 12A and the addition of a trunk circuit.

**3.91** The 13A recorded announcement system (SD-97753-01) recording medium is digitized voice stored in a magnetic bubble memory. The system is capable of a maximum combination of eight 3- through 12-second and 3- through 24-second messages.

**3.92** Either remote or local recordings can be made with the 7A or 13A announcement machines. Recordings for the 12A machine must be ordered from Western Electric Co. and cannot be made locally or remotely.

**3.93** The overload announcement recording on the 7A or 13A announcement machine can be changed at the No. 3 ESS office from a remote location. This is accomplished by establishing a talking path between the No. 3 ESS office and the remote location; the remote recording circuit is used in conjunction with the automatic call-back feature. (The automatic call-back feature originates a call to a predetermined number whenever a call is terminated to a special number in the No. 3 ESS office.) Upon receipt of the incoming call, the No. 3 ESS returns a signal to the originating caller to go on-hook and wait for a return call. The No. 3 ESS then originates a call back to a fixed number at the remote location; this establishes the talking path to the 7A or 13A announcement machine through the remote recording circuit.

**3.94** The 7A or 13A announcement machine is placed into the playback cycle, and the overload announcement transfer at the junctor is canceled. This allows the remote end to hear the recording and determine if a previous recording may be reused. If the recording can be reused, the remote end goes on-hook within 30 seconds of the end of the recording and all connecting circuits are idled. A ferrod on the remote recording circuit indicates the end of the recording. A TTY command is initiated, placing the recording into service. If the recording is to be changed, the remote end remains off-hook; and 30 seconds after the end of the recording, the 7A or 13A announcement machine is placed into the **record** cycle (by the remote recording circuit controlled by the control unit). The previous recording is erased while simultaneously giving overflow tone to the remote end (remote end off-hook). After erasure of the recording, the overflow tone is removed, indicating to the remote end to start recording, and the junctor is activated. A recording of up to slightly less than 2 minutes duration on the 7A or less than 24 seconds on the 13A machine can be made. Upon completion of recording, the remote end goes on-hook, thereby disconnecting and idling all connecting circuits.

**3.95** The quality of the newly recorded announcement can be checked by initiating the automatic call-back feature. If the quality is good, a TTY message places it into service.

#### D. Conference Circuits SD-3H411-01

**3.96** This custom calling package enables a subscriber to talk with two parties at the

same time. This service is provided by performing two modifications. First, software is added to control the service. Secondly, a conference circuit is used to join three lines whereby the transmission quality between any two parties is as good as a simple 2-way connection.

**3.97** The 3-way conference circuit has no relays, scan points, PD points, nor power and ground in the usual sense. Control and power is delivered by one of the three junctors connected to the circuit. The entire circuit will reside on an FB427 circuit pack.

**3.98** Power for the conference circuit is obtained from a junctor. Software can control the conference circuit by switching the state of the junctor. Placing the junctor in the line state, facing the conference circuit, turns power on. A transition to the trunk state removes power. No additional fusing is required. If junctor 0 (Fig. 11) indicates a failure to meet continuity on the circuit side, it means a failure in the electronics has occurred. This is a self-checking feature each time the conference circuit is used.

**3.99** Junctor 1 and Junctor 2 have continuity at all times provided by two shunt resistors. The signal loss due to these shunts, by adding a third line, is compensated for by gain circuitry in the conference circuit electronics. The three junctors are given the appearance of three plain old telephone service (POTS) lines with continuity satisfied on all ports.

**3.100** To add a third party, the 3-way subscriber must flash the switch hook. This action causes the 2-way connection to be broken while the flashing subscriber receives dial tone. The 3-way subscriber then proceeds to dial the third party in the normal manner. A talk path is established between the subscriber and a third party. A second flash from the subscriber brings all three customers together at the conference circuit. It is possible for more than one customer to have the conference feature. Two or more conference circuits can be interconnected resulting in a four or more party connection. If another subscriber in the already existing conference activates the service by flashing the switch hook, the system will treat this condition as an on-hook. An on-hook powers down the conference circuit. The party that flashed is removed and acquires another conference circuit as previously described. The two parties left on the original conference

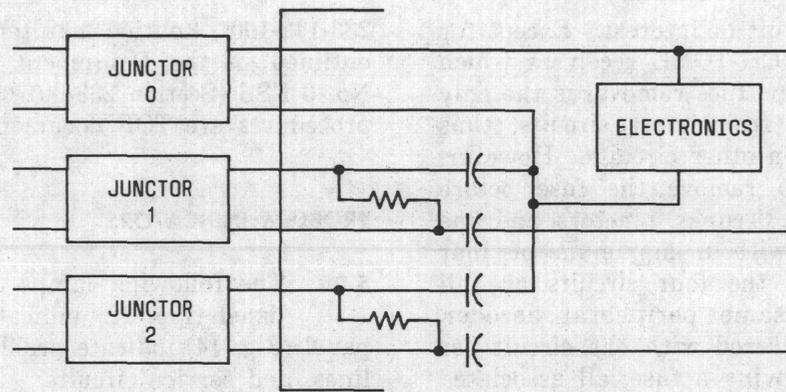


Fig. 11—3-Way Conference Circuit

circuit can still talk to each other, but transmission quality will not be as good as a POTS connection. As soon as all parties are together at the conference circuit, power is restored and transmission quality is returned.

**3.101** When a customer goes on-hook, the gain in the conference circuit automatically switches to a lower level. The lower level condition lasts for a very brief delay. During this brief delay, the system has time to interrogate the junctor to see if a party did go on-hook. An on-hook indication from any of three juncctors prompts software to switch junctor 0 to trunk state. The system may generate a brief delay and not find an on-hook condition. All parties will then hear a loud click followed by a soft brief thump. The customers may notice a loss of signal strength and an increase in echo between the click and thump.

#### APPLIQUE CIRCUITS

**3.102** The three applique circuits of the No. 3 ESS are as follows.

- (a) **Scanner Applique SD-1A210-01:** The remote master scanner applique circuit provides the capability for the scanner to receive information from various non-ESS equipment; eg, high-water sump.
- (b) **Distributor Applique SD-3H911-01:** This circuit provides the capability for the peripheral decoder on one frame to control relays in another frame (with the intent of operating message registers at a PBX on customer premises, ie, operating relays outside the office). These

relays provide contact closures for functions such as sleeve lead interface, PBX message register, service observing, etc.

#### (c) **E- and M-Applique SD-99774-01:**

This circuit provides the capability for the E- and M-trunk facility or carrier to be compatible (if compatibility does not already exist) with the No. 3 ESS E- and M-trunk. The E- and M-trunk facility has only two leads; the switching system requires four leads for minimizing noise in the switching environment. This applique provides the required conversion.

#### 4. POWER

**4.01** Power requirements for each type of circuit are provided by the frame on which each circuit is mounted except for ringing voltages,  $\pm 130$  volts, +48 volts, and +24 volts, which are provided by the miscellaneous power frame. Also, the battery boost converter that provides variable voltage (1 to 13 volts direct current) to boost the talk battery is located on the network frame.

**4.02** Power (110-volt 60-Hz) for all but one of the 7A announcement machines is supplied by a commercial power outlet. Protected ac power (110-volt 60-Hz) is supplied to one of the 7A announcement machines by the ac inverter in the test frame. When the overload announcement capability is provided in an office, the announcement is recorded on the 7A powered from the ac inverter.

**4.03** Power can be removed from trunks, service circuits, juncctors, and line circuits by manually removing the fuse pair (talk and signal) associated

with the particular circuit of interest. Except for MF receivers and TOUCH-TONE receivers which have a POWER OFF key, fuse removal is the only way to remove power from these circuits, thus minimizing the effect on other circuits. However, it is not necessary to remove the fuse before removing a circuit pack. Trunks, junctors, and line circuits are powered with a maximum of four circuits per fuse pair; the four circuits are all associated with the same peripheral decoder. Service circuits are powered with one circuit per fuse pair. Before removing a fuse, all associated circuits must be removed from service via a TTY input message. Fuse failures in these circuits are indicated via scan points.

## 5. MAINTENANCE

### TROUBLE DETECTION

**5.01** Trunks are checked for operation by connected circuits and variable trunk selection during call processing. Trouble treatment consists of sectionalization where possible, error analysis if sectionalization is not possible, automatic maintenance busy, and the maintenance of a trunk-out-of-service list. Manual tests are available using the test circuits accessed via the trunk and line test panel.

**5.02** Operation checks and variable circuit selections are made on the service circuits during all processing. Trouble treatment consists of the disposition of receiver and transmitter time-outs, MF receiver/transmitter 2-out-of-6 failures, automatic maintenance busy, and service circuit out-of-service list updates.

**5.03** Specific tests performed by the various test circuits may be accessed from the local test desk or the trunk and line panel within the No. 3 ESS office.

**5.04** The dial-tone-first (DTF) coin line circuit does not have a maintenance state associated with it although problems can be detected by working with a junctor and software. The DTF line is verified during call processing. The loop and ground start noise immunity lines (NILs) have one state relay per circuit which is used for maintenance. The NILs are tested on a per-call basis.

**5.05** Routine maintenance procedures are included in Task Oriented Practices (TOP) document

233-142-100. Routine maintenance is performed as outlined in the Equipment Test List (ETL) for No. 3 ESS (Section 233-001-011). Trouble clearing procedures are TOP document 233-143-100.

### PROBLEM INDICATORS

**5.06** The following lamps on the system status panel (Fig. 12) indicate problems involving panel (Fig. 14) indicate problems involving trunks, lines, and service circuits.

(a) **SVC LIM (Service Circuits Limited):** Number of service circuits taken out of service has reached an unacceptable limit.

(b) **TRK LIM (Trunks Limited):** Number of trunks taken out of service has reached an unacceptable limit.

**5.07** The trunks and service circuits that have been removed automatically from service by the system are indicated by a teletypewriter message as they are removed. An out-of-service list is maintained and may be requested manually via the teletypewriter.

**5.07** Specific maintenance procedures will be outlined in the Task Oriented Practices (TOP) documents for the No. 3 ESS.

## 6. REFERENCES

**6.01** The following Bell System Practices are germane to this section.

SECTION	TITLE
233-000-003	No. 3 ESS General Description
233-120-100	No. 3 ESS Switching Network Description and Theory of Operation
233-121-100	No. 3 ESS Scanner Description and Theory of Operation
233-130-100	No. 3 ESS Power Equipment Description
233-135-100	No. 3 ESS Test Equipment Description

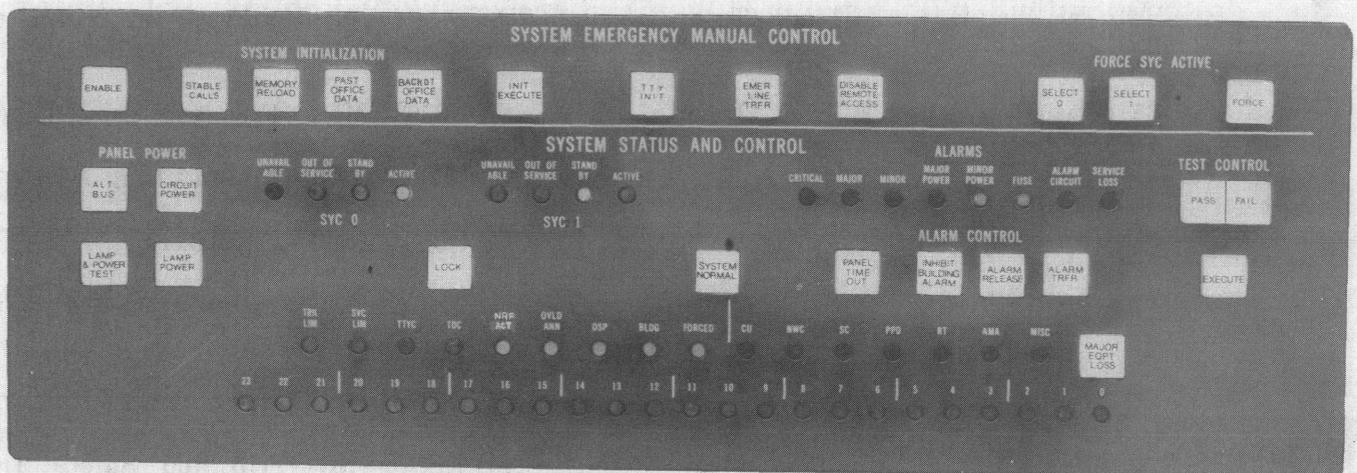


Fig. 12—System Status Panel

233-135-105	No. 3 ESS Trunk and Line Test Panel Description and Theory of Operation	SD/CD-47753-01—13A Announcement System Circuit
233-140-100	No. 3 ESS Office Maintenance Description	SD-3B011-01—Service Observing Signal Converter Circuit
233-143-100	No. 3 ESS TOP Trouble Clearing Document	SD-3B012-01—Service Observing Console Circuit
233-150-100	No. 3 ESS Software General Description	SD-3H200-01—Juncture and Juncture Control Circuit
233-151-135	Threeway Calling	SD/CD-3H205-01—Dial Tone First Coin Line Circuit
254-300-180	No. 3 ESS System Status Panel Description and Theory of Operation	CPS-FB428—Dial Tone First Coin Line Circuit
254-300-190	Teletypewriter and Teletypewriter Controller Description and Theory of Operation	SD/CD-3H208-01—Noise Immunity Line Circuit
		CPS-FB407—Loop Start Line
		CPS-FB408—Ground Start Line
		SD/CD-3H220-01—Universal Trunk Circuit
		CPS-FB361—Two-Way E- and M-Lead Trunk Circuit (Manufacture Discontinued, Replaced by FB382)
		CPS-FB370—Incoming Reverse Battery Trunk Circuit (Delay Dial)
		CPS-FB371—Incoming Reverse Battery Trunk Circuit (Wink or Immediate)
	SD/CD-1A156-01—Emergency Manual Line Circuit	
	SD/CD-26435-C1—12A Announcement System Circuit	

**6.02** The following list of documents contains schematic diagrams, circuit descriptions, and circuit pack schematics regarding trunk, line, and service circuits.

SD/CD-1A156-01—Emergency Manual Line Circuit

SD/CD-26435-C1—12A Announcement System Circuit

CPS-FB382 Two-Way E- and M-Trunk (Type Two Interface)

CPS-FB391 Two-Way E- and M-Trunk (Type Three Interface)

CPS-FB399—Outgoing Reverse Battery High-Low Trunk Circuit

SD/CD-3H401-01—TOUCH-TONE Calling Detector

CPS-A118—TTR—Input Amplifier

CPS-A120—TTR—TT Limiter and Resistor

CPS-A121—TTR—697- and 770-Hz Detectors

CPS-A122—TTR—852- and 941-Hz Detectors

CPS-A123—TTR—1209- and 1336-Hz Detectors

CPS-A124—TTR—1447- and 1633-Hz Detectors

CPS-A946—TTR—Signal Present Timer

CPS-A1025—TTR—Scanner Driver

SD/CD-3H402-01—Multifrequency Receiver Circuit

CPS-A152—MFR—MF Channel Detectors

CPS-A260—MFR—Vario Losser and Guard Filters

CPS-A263—MFR—Guard Filters

CPS-A264—MFR—700-, 900-, 1100-Hz Channel Filters

CPS-A265—MFR—1300-, 1500-, 1700-Hz Channel Filters

CPS-A266—MFR—Signal Present Timer

CPS-A1024—MFR—Scanner Driver

SD/CD-3H403-01—Dial Pulse Transmitter Circuit

CPS-FB403—Dial Pulse Transmitter Circuit

SD/CD-3H404-01—Multifrequency Transmitter Circuit

CPS-FB362—MFT—Frequency Select Relays

CPS-FB363—MFT—Tip and Ring

CPS-FB364—MFT—Oscillators

SD/CD-3H406-01—Superimposed Ringing Circuit

CPS-FB375—SR—Ringing Control

CPS-FB376—SR—Trip and Safety Trip Detectors

SD/CD-3H410-01—Customer Dial Pulse Receiver and Regular Ringing Circuit

CPS-FB358—Regular Ringing Circuit

CPS-FB367—Customer Dial Pulse Receiver Circuit

SD/CD-3H411-01—Coin Control, Tone and Announcement, and Remote Recording of Announcement Circuit and Conference Circuit

CPS-FB383—Tone and Announcement Circuit

CPS-FB423—Coin Control Circuit

CPS-FB426—Remote Recording of Announcement Circuit

CPS-FB427—Conference Circuit

SD/CD-3H520-01—Peripheral Test Circuit

CPS-FB500—Continuity and Polarity Test Circuit

CPS-FB501—DPR Test—Tip and Ring

CPS-FB502—DPR Test—Pulse Control

CPS-FB504—Transmission Test Termination Circuit

CPS-FB505—MW and Transmission Environment Test Circuit, Port 0

CPS-FB506—MW and XMISSION ENV Test,  
Port 1

CPS-FB507—MW and XMISSION ENV Test,  
Pads A

CPS-FB508—MW and XMISSION ENV Test,  
Pads B

CPS-FB509—MW and XMISSION ENV Test,  
Oscillator

CPS-FB510—Loop Environment Test Circuit

CPS-FB511—Trunk and Line Test Panel  
(TLTP) Transmission Control Circuit

CPS-FB512—Distribute Points (TLTP)

CPS-FB513—Voltmeter Control Circuit (TLTP)

CPS-FB514—Ringing and Flash CNT (TLTP)

CPS-FB515—Electrical Lock (TLTP)

CPS-FB516—TPD—Amplifier

CPS-FB517—TPD—Timer

CPS-FB519—Incoming Local Test Desk  
Trunk Circuit

CPS-FB521—STA Ringer Test—Tip and Ring

CPS-FB522—STA Ringer Test—Dial Pulse  
Detector and Scanner Driver

CPS-FB523—LIT—Power Supply

CPS-FB524—LIT—Comparator

CPS-FB525—LIT—Line Switching

CPS-FB526—TTR Test—D-Sine Converter

CPS-FB527—TTR Test—Output Stage

CPS-FB528—TTR Test—Power Supply

CPS-FB529—TTR Test—Divide Counter

CPS-FB420—Test Vertical False Cross and  
Ground Test Circuit

CPS-FB422—Test Vertical Power Cross Test  
Circuit

SD/CD-26164-01—Public Emergency Reporting  
Line Circuit

SD/CD-3H912—No. 3 ESS Assignment Rules  
and Trunk Compatibility Tables.

## 7. GLOSSARY

**7.01** A glossary of terms is provided to aid in the understanding of definitive words used in this section.

**Control Unit (CU)**—The combination of 3A Central Control, main store, power, store buses, and the system status and control panel.

**Junctor Circuit (JC)**—A circuit associated with the switching network which provides a path for a call through the network. It has several states which break talking current and provide supervision, audible ring tone, and overflow tone.

**Line**—A connection to a network terminal that is not classified as a trunk or service circuit. Usually a pair of wires that serves to connect a customer telephone to a terminal on the network.

**Local (End) Office**—Normally classified as the office in which local subscribers terminate.

**Network (NW)**—The fabric consisting of network links and switches to provide a 2-wire metallic talking path between any two network terminals. Remreed switches are used in No. 3 ESS.

**Peripheral Decoder (PD)**—A circuit containing 12 flip-flops used for controlling up to four groups of three relays. It accepts a serial bipolar pulse stream to load one group of three flip-flops. Its main application is for controlling the state relays in trunks, service circuits, and junctors. Two PDs are mounted together on one replaceable circuit board and are referred to as a peripheral decoder group (PDG).

**Peripheral Pulse Distributor (PPD)**—That part of system control which receives orders from the control unit (via the frame input/output controller) and sends bipolar pulses to peripheral decoders. A system control may contain up to two duplicated peripheral pulse distributors.

**Scanner**—The scanner is controlled by the 3A Central Control (3A CC). It is used to detect the off-hook or on-hook status of a customer line, to check the status of talking paths, to monitor certain test points in various frames, and to scan other miscellaneous points for which information is desired.

**Service Circuit**—A circuit which connects to a network terminal and provides one of several specialized functions such as digit reception and transmission, alerting, coin control, and testing. A service circuit communicates with the system control via scan points and peripheral decoders.

◆**Service Observing**—Monitoring a line or trunk to determine service quality.◆

**Teletypewriter Controller (TTYC)**—The interface between the 3A Central Control and one

to four teletypewriter ports comprising a TTY communication channel.

**Trunk**—The circuits and transmission facility which connect a network terminal of one office to a network terminal of another office. A trunk circuit communicates with the system control via scan points and peripheral decoders. In direction of control, trunks are classified as incoming, outgoing, or 2-way. Trunks may also be classified by method of supervision (loop reverse battery, E- and M-leads, etc). Some special trunks terminate on switchboards and test circuits.

**Trunk and Line Test Panel (TLTP)**—A manual test facility for performing various transmission and operational tests on trunks, service circuits, lines, and junctors.