

COMMON SYSTEMS  
 VOICE FREQUENCY TRANSMISSION  
 CONSOLIDATED DUAL F-SIGNALING AND  
 OPTIONAL MAINTENANCE  
 CONNECTOR CIRCUIT  
 WITH 4W VF PATCH JACKS

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<u>1. PURPOSE OF CIRCUIT . . . . .</u>	1	1.01 This circuit provides hard-wired interconnections between certain 4-wire VF office terminal equipment units, which occur electrically between carrier channel banks and the switching machine in toll switching centers. Access to a Switched Maintenance Access System (SMAS) is provided on an optional basis.
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<u>1. BASIC CIRCUIT - F- SIGNALING UNIT . . . . .</u>	2	2.02 Provision is made for the insertion of an echo suppressor or equalizer into the circuit between the signal transmitter/receiver and the pads of the converter circuit.
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1.05 The drawing provides manual access with test jacks and monitoring jacks.

1.06 A carrier group conditioning circuit is furnished to provide a direct transmission path between the trunk and carrier facility under normal conditions and to isolate the carrier group in case of trouble. Carrier alarm is provided by a carrier group alarm control circuit.

2.07 The circuit also provides common equipment required for operation of a maximum of 48 of the basic circuits (two maintenance bus groups). This includes a battery and fuse alarm panel, 48- to 24-volt converters, an oscillator and load transfer panel, an oscillator transfer alarm, an optional VF patch jack panel, and an optional jack, key, and lamp circuit.

2.08 Equipment for two groups of 24 circuits, each with maintenance connectors, patch jack panel, and required common equipment, can be mounted on one 11-foot 6-inch by 23-inch bay.

2.09 Equipment for two groups of 24 circuits each, without maintenance connectors, with jack, key, and lamp panel and required common equipment, can be mounted on one 11-foot 6-inch by 23-inch bay or on one 9-foot by 23-inch bay. Equipment for one group of 24 circuits, without maintenance connector, with jack, key, and lamp panel and required common equipment, can be mounted on one 7-foot by 23-inch bay.

## SECTION II - DETAILED DESCRIPTION

### 1. BASIC CIRCUIT - F- SIGNALING UNIT

1.01 The basic circuit is covered in FS 1. It provides the dual signaling unit with pads, an optional maintenance connector with manual access, an optional E-lead repeater, optional VF patch jacks or jack, key, and lamp circuit, and an optional gain-adjust potentiometer for use with A5 channel banks.

1.02 The dual F- signaling unit consists of an FU( ) 2600-Hz converter circuit and an auxiliary F signaling unit. The converter circuit is used as an interface between the 4-wire transmission facility (patch jacks or the maintenance connector may intervene) and the auxiliary signaling unit. It provides receiving and transmitting signal conversion functions. It includes P pads, which are adjustable by means of slide switches on the front face of the unit. Optional access is provided at the circuit point between the pads and the converter transmission paths for the external connection of echo suppressors or equalizers. If external units will not be required, the access points are strapped through. A more detailed description of the converter unit is provided on the drawing shown in Table A. The AUX signaling unit is used as an interface between the FU( ) converter and the trunk or line switching equipment or the terminal equipment. The various units are listed in Table A; more detailed description of any unit is provided on the appropriate drawing listed in Table A.

TABLE A

Code	Functional Description	General Application	SD No
FU( )	2600-Hz SIG Converter	Required With all Auxiliary Units	1C-226-01
FAA	900-ohm, 2-Wire E&M Lead	2-Way Trunk, 2-Wire Switching	1C-227-01
FBA	4-Wire E&M Lead	2-Way Trunk, 4-Wire Switching DP or MF	1C-227-01
FCA	Loop Reverse-Battery Originating	1-Way Trunk 2 Wire - 900-ohm DP or MF	1C-228-01
FDA	Loop Reverse-Battery Terminating	1-Way Trunk 2 Wire - 900-ohm non-SXS DP or MF	1C-229-01
FDB	Loop Reverse-Battery Terminating	1-Way Trunk 2 Wire - 900-ohms Into SXS DP	1C-229-01
FLA	Special Access End	Loop or Ground Start 2 Wire - 900 Ohms	1C-231-01
FM		Through Circuit	1C-296-01
FPA	Special Access CO End	Loop or Ground Start 4-Wire Extension	1C-231-01
FRA	Special Access Station End	Loop or Ground Start 4-Wire Extension	1C-230-01
FSA	Special Access Station End	Loop or Ground Start 2 Wire - 900 Ohms	1C-230-01

1.03 The E&M signaling leads from the trunk switching equipment are attached to the connector for the plug-in AUX unit. Four additional terminals on the connector are provided for connecting the E&M leads to and from the maintenance connector if one is required. If a maintenance connector is not used, the terminals are strapped on the AUX connector. Any AUX unit may be plugged into an AUX connector. The SB (SIG BATT) lead from the trunk switching equipment supplies battery for the M lead through a 500-ohm resistor. The Z strap provides ground to the signal timer of the signaling unit if the EG or SG (SIG GRD) lead is not furnished by the trunk. The SB and SG leads are furnished only when looped signaling leads are required.

1.04 Transmitting and signaling leads from 23 additional F-type signaling units are connected to the same maintenance connector unit. These 24 associated circuits are called a maintenance bus group.

1.05 If a signaling unit should fail, it can be removed and replaced by another unit. If doubt exists as to whether the unit or the connecting circuit is at fault, the test extender circuit,

SD-1C241-02, can be used to examine the input and output ports and the control leads.

## 2. BASIC CIRCUIT MAINTENANCE CONNECTOR (OPTIONAL)

2.01 Transmission leads from each signaling converter unit of a maintenance bus group are brought to the associated maintenance connector, if provided. If a circuit is not being accessed, its leads are brought out through unoperated relays of the maintenance connector to the VF patch jack, channel bank, etc. If maintenance access is used, the leads from any signaling unit (one at a time) in the group may be switched in the connector to the concentrator (not part of this circuit) or may be split in the connector (becoming TL, TD, RL, RD, etc) and connected to the manual access circuit, if provided. This permits testing toward the line or toward the drop side of the of the circuit.

2.02 Each pair of E&M signaling leads from the 24 AUX signaling units is brought to the maintenance connector. If access is used, the E&M leads are split towards the line and the drop and are connected to the

concentrator and to the manual access circuit, if provided.

2.03 In addition, certain control leads from the matrix control circuit of each maintenance connector are brought to the concentrator.

2.04 Another group of leads from the matrix control circuit of the maintenance connector will be multiplied to similar leads from other maintenance connectors on the same bay and will be brought to the Maintenance Concentrator and Control Circuit (not part of this drawing) when the latter circuit is installed.

2.05 The access control circuit of the maintenance connector provides ground through its matrix relays to the carrier group conditioning circuit if provided (not part of this drawing).

2.06 The maintenance connector is provided with leads to the alarm circuit.

2.07 If a maintenance connector is not provided, transmission leads from the signaling converter circuit are connected either directly to VF patch jacks or to a patching, monitoring, and miscellaneous jack, key, and lamp circuit.

### 3. BASIC CIRCUIT - MANUAL ACCESS

3.01 The manual access circuit is used only if the maintenance connector is used. It provides access through one set of test jacks to two associated maintenance connectors. The matrix control leads from the two maintenance connectors are brought separately to the manual access circuit. The split transmission and signaling leads from the two maintenance connectors are multiplied together and are brought as one set of leads to the test jacks of the manual access panel. The split drop leads (TD, RD, T1D, and R1D) are multiplied to one or more sets of monitoring jacks provided on the VF patch panel.

### 4. BASIC CIRCUIT - CARRIER GROUP CONDITIONING CIRCUIT

4.01 Each AUX unit except FBA has a carrier group alarm release and make-busy feature triggered by a ground from a failed carrier (SA lead in FS 4). The carrier group conditioning circuit (CGC) of FS 1 is an added feature. It allows momentary but repeated carrier failure transmitted on the SA lead to be held for checking. It allows a simulated carrier failure to be dialed into either of two or four 12-circuit groups and released from a remote test position or to be keyed in and released from a test panel in the equipment aisle.

4.02 The CGC provides connections to the carrier group alarm control circuit for up to four 12-circuit groups.

4.03 The CGC provides loop closure on the 9A and GAR leads as required in a No. 1 ESS office.

### 5. BASIC CIRCUIT - VF PATCH JACKS AND GAIN ADJUST POTENTIOMETER

5.01 The VF patch jacks provided with option (1) or (-1) of this circuit are expected to be used, one pair per VF circuit, on a decentralized basis. This means that they will not be mounted on a centralized VF patch bay but will be more intimately associated with the remainder of the circuit items on a consolidated bay. However, the circuit allows them to be used in either way.

5.02 The patching, monitoring, and miscellaneous jack, key, and lamp circuit of option T is provided particularly for those circuits which are not furnished with the SMAS maintenance connector.

5.03 The gain-adjust potentiometer is provided as an option and is required, one per VF circuit, with the A5 channel bank.

### 6. BASIC CIRCUIT - E- LEAD REPEATER

6.01 The E- lead repeater is used only in conjunction with the optional maintenance connector; however, it is not always required with the maintenance connector. It is designed to allow testing from a remote testing position without surpassing the limits of resistance on the E- lead.

6.02 One E- lead repeater is supplied per each 24-circuit group. Within the repeater, the Y strapping option allows the E- lead repeater function to be supplied or omitted in any one or more of the 24 associated circuits.

### 7. OSCILLATOR AND TRANSFER CIRCUIT WITH ALARM AND ACO

7.01 Two oscillator circuits (SD-1C224-01) are furnished to provide 2600-Hz tone to the F signaling units on an odd and even basis. Each oscillator has two outputs. For connection to the oscillator outputs, the group of 24 VF circuits is handled as two oscillator groups. The first 12 circuits are the first group; the second 12 circuits are the second group. The first ODD OSC output supplies tone to the odd-numbered circuits (1, 3, 5, 7, 9, 11) in the first group of 12; the second ODD OSC output supplies tone to the even-numbered circuits (2, 4, 6, 8, 10, 12) in the first group of 12. The first EVEN OSC output supplies tone to the odd-numbered circuits (13, 15, 17, 19, 21, 23) in the second group of 12; the second EVEN OSC output supplies tone to the even-numbered circuits (14, 16, 18, 20, 22, 24) in the second group of 12. When a second group of 24 VF circuits is provided, the circuits are designated as a first group (24-36) and a second group (37-48) and are connected to the oscillator outputs in the manner described above.

7.02 A failure in the ODD or EVEN oscillator causes the associated

transfer circuit to operate and transfers the affected load to the functioning oscillator.

7.03 A transfer alarm external to the circuit of SD-1C224-01 has been added in FS 2. Lead X is supplied with 48 volts from the fuse circuit of FS 3. The transfer alarm relays TRA (for ODD oscillator) and TRB (for EVEN oscillator) are normally held operated through lead K. Failure of the ODD or EVEN oscillator releases the associated TRA or TRB relay, putting voltage on lead Y and operating the minor fuse alarm relay MN. Failure of both the ODD and EVEN oscillators releases both the TRA and TRB relays, putting voltage on lead Z and operating the major fuse alarm relay MJ.

7.04 Operating the ACO key cuts off the visual and audible alarms and lights the ACO lamp.

## 8. CARRIER GROUP ALARM CONTROL CIRCUIT

8.01 This circuit (CGAC), in the event of a carrier failure indication, activates all of the trunk processing functions which are provided in the associated AUX signaling units. These functions include trunk release and make-busy, delayed make-busy, sleeve lead wink, and alarm override.

8.02 The FYG lead receives a ground from a failed carrier on the SA lead (shown in FS 1). This becomes control information for up to 12 AUX signaling units in an associated group. The signaling units provide the proper trunk conditioning.

8.03 The CGAC circuit also contains an alarm cut-off lamp and key to permit disabling of the failure processing features subsequent to patching of signaling and drop equipment to another transmission facility during an alarm condition. Provision is made for connecting a remotely located cut-off key and lamp.

8.04 The ground on the SA lead also is furnished to the carrier conditioning circuit of FS 1 as covered in 4.01.

8.05 Leads GA and GAR provide a loop closure for a No. 1 ESS office when the carrier group conditioning circuit of FS 1 is not provided.

## 9. BATTERY FUSE AND ALARM CIRCUIT

9.01 The unfiltered office battery supplies -48 volts to certain portions of the circuit. The P( ) fuses supply -48 volt to -24 volt regulated converters per FS 6 (not provided by this circuit) and to the power failure alarm circuits of FS 7. R fuses supply -48 volts to the E- lead repeaters of FS 1. All of the above fuses are connected to the major alarm.

9.02 Fuse ALM supplies -48 volts to one or two converter fuse circuits. Fuse ALM also supplies -48 volts to the transfer alarm circuit through lead X. Fuse CGA supplies -48 volts to the carrier group alarm control circuit. All of the above fuses are connected to the minor alarm.

9.03 Filtered office battery is also furnished. The TB( ) fuses supply filtered -48 volts to the AUX signaling units and to the R( ) lead, limiting resistors in groups of six per the table of Note 206 on the drawing. Fuses CG1, M( ), and N supply -48 volts to the carrier group conditioning circuits, maintenance connector circuits, and manual access circuits, respectively. All of the above fuses are connected to the minor alarm.

9.04 The major and minor alarms provide both audible and visual alarms.

9.05 Isolating diodes are supplied to prevent voltages from being fed through the wrong branch of a circuit at a junction point.

## 10. CONVERTER FUSE AND ALARM CIRCUIT

10.01 The -24 volts is supplied from a -48 to -24 volt regulator per FS 7 through S( ) fuses to groups of six (maximum) signaling units. The PF( ) fuses supply -24 volts from the regulated converter to the associated power failure alarm circuit.

10.02 Provision is made in FS 3 for up to two such converter fuse and alarm circuits.

10.03 The first and second converters furnish -24 volts through fuses OSCO and OSCE, respectively, to the ODD and EVEN oscillator and transfer units.

## 11. REGULATED CONVERTER

11.01 The converter of FS 6 is a power supply which efficiently converts the normal voltage of 48-volt power plants to a regulated 24-volt output.

11.02 The unit is a plug-in unit which is not furnished by the present drawing. The required connector is furnished on the shelf.

11.03 The converter is supplied with -48 volts from office battery supply. Two such converters supply regulated 24 volts to two converter fuse and alarm circuits in FS 3, as described in 9.

## 12. TANDEM PATCH JACKS

12.01 Tandem patch jacks TRMT and RCV are provided in FS 5 to be furnished as required.

13. RINGING SUPPLY FUSE CIRCUIT

13.01 RS(1-4) indicator fuses are provided in the ac ringing supply leads. Each RS fuse supplies power to two resistance lamps. Through each of these lamps, power is supplied to up to six AUX signaling units per Table A of Note 206.

13.02 RS(5) supplies ringing power to the MON & TALK CKT associated with the patching, monitoring, and miscellaneous jack, key, and lamp circuit of FS 1.

13.03 Operation of any RS fuse will operate the RF relay, which will operate the SIG ALM lamp and the MN alarm.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 The operating level in the transmitting path is approximately -16 dBm. The recommended operating level in the receiving path is +7 dBm, but the circuit overloads at +16 dBm.

1.02 The ambient temperature shall be between +40 and +125°F. Somewhat inferior performance may be expected outside this temperature range. In no case shall the ambient temperature exceed +135°F.

1.03 Working limits for the signaling unit, oscillator and transfer unit, and regulated converter are as given on the associated SD drawings.

2. FUNCTIONAL DESIGNATIONS

2.01 Units

<u>Designation</u>	<u>Meaning</u>
MAN ACS	Manual Access
MTCE CONN	Maintenance Connector

2.02 Jacks

<u>Designation</u>	<u>Meaning</u>
MON	Monitoring
P TRK	Patching Trunk

2.03 Relays

<u>Designation</u>	<u>Meaning</u>
MJ	Major
MN	Minor
PF( )	Power Failure ( )
TRA	Transfer A

Designation                      Meaning

TRB                                      Transfer B

2.04 Keys

Designation                      Meaning

ACO                                      Alarm Cutoff

3. FUNCTIONS

3.01 Provides F-type single frequency to E&M signaling and other signaling in various offices.

3.02 Provides loss adjustment in both the transmitting and receiving paths through the use of adjustable pads built into the F signaling converter unit.

3.03 Provides for insertion of echo suppressor or equalizer into the circuit, when required.

3.04 Provides switched maintenance access through a maintenance connector when required.

3.05 Provides VF patch jacks on a decentralized basis.

3.06 Provides gain-adjust potentiometers on an optional basis.

3.07 Provides an optional E- lead repeater.

3.08 Provides carrier group conditioning which connects the trunk and carrier facility under normal conditions but isolates the carrier group in case of trouble.

3.09 Provides SHAS access to carrier conditioning function for test purposes.

3.10 Supplies battery for lead M, when required.

3.11 Provides manual access with test jacks, when required.

3.12 Provides monitoring jacks in conjunction with the manual access feature.

3.13 Provides dual 2600-Hz oscillators to supply tone to multiple signaling units. An associated transfer circuit allows the load to be switched from a failed oscillator to the functional oscillator.

3.14 Provides a fuse and alarm circuit which can furnish power to two maintenance connectors (for 48 circuits), two manual access circuits, four carrier group alarm control circuits, two -48 to -24 volt power converters (for 48 signaling units), and 48 M leads, when required.

4. CONNECTING CIRCUITS

- (a) Maintenance Concentrator - SD-99499-01.
- (b) Maintenance Concentrator and Control Circuit - SD-99500-01.
- (c) Miscellaneous Alarm Circuits - SD-96188-01 (Typical).
- (d) A5, N2, and N3 Channel Banks or Other Similar Carrier Facilities.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of meeting the requirements listed in 3. FUNCTIONS and those of the Circuit Requirements Table.

6. ALARM INFORMATION

6.01 Failure of any power converter or a massive short in the M lead circuits operates a major alarm.

6.02 Failure of a carrier group conditioning circuit, a maintenance connector, a manual access circuit, or the external concentrator circuit operates a minor alarm.

6.03 Operation of either a minor or a major alarm provides both a visual and audible office alarm and a local visual alarm.

6.04 Failure of a maintenance connector circuit causes a ground to be provided to the external Maintenance Concentrator and Control Circuit to prevent access by another trunk.

SECTION IV - REASONS FOR REISSUE

CHANGES

B. Changes in Apparatus

<u>B.1</u>	<u>Superseded</u>	<u>Superseded By</u>
	[8] S( ) 1 1/3A fuse, 70A, App. Fig. 14	[8] S( ) 2.0A fuse, 70B, App. Fig. 14
	[8] S( ) 1 1/3A fuse, 70A, App. Fig. 15	[8] S( ) 2.0A fuse, 70B, App. Fig. 15
	[4] S( ) 1 1/3A fuse, 70A, App. Fig. 17	[4] S( ) 2.0A fuse, 70B, App. Fig. 17

D. Description of Changes

D.1 In FS 7 the value of the S( ) fuses is changed to 2.0A to allow 6 FRDs and 6 FUDs to be used on each shelf.

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