

PRELIMINARY

**Bell System Voice Communications
TECHNICAL REFERENCE**

**Voice
Connecting
Arrangement**

DCT

**Interface
Specification**

June 1971

ENGINEERING DIRECTOR - CUSTOMER TELEPHONE SYSTEMS



NOTICE

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TECHNICAL REFERENCE
VOICE CONNECTING ARRANGEMENT DCT

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PRELIMINARY

VOICE CONNECTING ARRANGEMENT DCT

1. GENERAL

1.1 Introduction

F.C.C. Tariffs and corresponding intrastate tariffs filed by the Bell System provide for the direct electrical connection of customer-provided voice transmitting and receiving terminal equipment and communications systems to Bell System telecommunications network. The tariffs also provide for the indirect (acoustic or inductive) connection of such equipment or systems. Both methods require compliance with network protection criteria given in the tariffs.

Direct electrical connection is made through a voice connecting arrangement and associated network control signaling unit furnished, installed, and maintained by the Telephone Company.

1.2 Application

Voice Connecting Arrangement DCT (see Figure 1) provides access from a station on a Bell System dial private branch exchange (PBX) to customer-provided dictation equipment via a dial access code (e.g., dial "7"). The circuit is intended for use on calls from dial PBX extension stations (including off-premises) that are either directly connected to the PBX in which the circuit is installed, or connected to such PBX over dial tie lines from another PBX of the same customer. No provision is made for connections between Voice Connecting Arrangement DCT and the long distance message telecommunications network.

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1.3 Ordering and Identification

The connection service described in this Technical Reference is identified by the Bell System as Voice Connecting Arrangement DCT which provides basic service from rotary dial telephones. Operation with PBX TOUCH-TONE® stations requires additional equipment for which there may be a charge. One arrangement should be ordered for each dictation machine which is to be connected. The order must include the customer's selection of the desired Operational Features (Table A) and the required Playback Feature Group (Table B). The local Telephone Company business office or Marketing representative will provide information regarding availability and rates for this service.

2. DESCRIPTION

2.1 Functions

The major functions of this arrangement are:

- (a) To protect Telephone Company personnel and facilities from hazardous voltages which may be applied to the circuit.
- (b) To provide longitudinal isolation.
- (c) To provide voice-only transmission to and from the customer-provided equipment.
- (d) To limit abnormally high voice and supervisory tone levels to the PBX.
- (e) To provide exclusive access from rotary dial or TOUCH-TONE® (optional) PBX stations.

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- (f) To provide control signals for use of the customer-provided equipment.
- (g) To provide a means of calling in the dictation equipment attendant for assistance (Telephone Company provided telephone).

2.2 Service Features and Options

2.21 TOUCH-TONE Capability

Voice Connecting Arrangements DCT provides rotary dial basic service. (capability for operation with PBX TOUCH-TONE stations must be ordered as a separate feature, otherwise only rotary dial capability is provided.

2.22 Operational and Playback Feature Selection

The arrangement is designed to work with a variety of customer-provided dictation machines which require different operational and playback features. Table A should be used to select the Operational Features and Table B should be used to select one of the four Playback Features according to the dictation machine requirements. The associated letters and group number must be included when the arrangement is ordered from the Telephone Company by the customer. Details concerning these features are given in Section 3.

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TABLE A

OPERATIONAL FEATURES

OPERATIONAL DESCRIPTION		FEATURE
Start-Stop of Dictation Machine Controlled By (choose one)	Dial (1)	A
	Voice	B
Machine Attendant Playback Control Key	Yes	C
Playback Reduced By Dialing 2 (choose one)	Yes	D
	No	E
When Dictation Machine Becomes Unavailable to Record (choose one)	Circuit is Made Busy and Attendant is Signaled	F
	Circuit is Made Busy	G

TABLE B

PLAYBACK FEATURES

PLAYBACK DESCRIPTION	PROVIDED	FEATURE GROUP (choose one)
Machine provides playback signal Dial "3" extends playback Dial "1" ends playback	No No Yes	1
Machine provides playback signal Dial "3" extends playback Dial "1" ends playback	Yes Yes No	2
Machine provides playback signal Dial "3" extends playback Dial "1" ends playback	Yes No Yes	3
Machine provides playback signal Dial "3" extends playback Dial "1" ends playback	Yes Yes Yes	4

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2.3 Physical Description

Voice Connecting Arrangement DCT consists of equipment mounted on 2-inch by 23-inch mounting plates. These mounting plates may be relay rack mounted in or near the PBX switching equipment or housed in apparatus mounting boxes with covers near the dictation machines. In addition, a Telephone Company-provided telephone set may be located near the dictation machine. This telephone set, usually a multibutton set, is referred to as the dictation machine attendant telephone set.

When the Telephone Company switching equipment is not located on the customer's premises, an ac voltage source of 117 \pm 12 volts at 60 \pm .1 Hz, fused for 15 amperes and not under control of a switch must be provided by the customer to accommodate a Telephone Company-provided rectifier equipped with a U-blade ground plug. The current drain is approximately 2 amperes per connecting arrangement.

2.4 Interface Leads

Twenty-two interface leads per circuit are normally provided from Voice Connecting Arrangement DCT for customer use. Technical information pertaining to these leads is discussed in Section 4. The leads and functions are as follows:

<u>LEAD DESIGNATION</u>	<u>FUNCTION</u>
TT, TR	2-way voice transmission.
S1, S2	Closure to customer-provided equipment when trunk is seized.
SS1, SS2	Closure to customer-provided equipment for start and open for stop.

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C1, C2 C3, C4	Closure to customer-provided equipment for correction.
PB1, PB2, PB3, PB4,	Provides control signals to customer-provided equipment for playback sequences.
PB5, C	Closure from customer-provided equipment for end of playback.
E1, E2 E3, E4	Provides control signals to customer-provided equipment for end-of-message sequences.
B, G	Closure from customer-provided equipment to indicate ready for use.

Leads from the arrangement will be terminated on a Telephone Company-provided interface connecting block conveniently located to permit testing, maintenance, trouble isolation, and ease of connection to the customer-provided equipment. The customer must provide and install the conductors and make the necessary connections of his equipment to the circuit at this block.

A typical interface connecting block is shown in Fig. 2. This "quick connect" connecting block uses tin-plated spring clip terminal strips which accommodate polyethylene or polyvinyl chloride insulated (8 mils maximum thickness) conductors of No. 20 through 24 AWG. A Reliable Electric R714B Tool or equivalent is used to press the insulated wire down in to the slot. The spring pressure of the clip cuts away the insulation and makes the electrical connection. The Telephone Company will provide strapping wires between the second and third terminals of the block to interconnect the leads. The straps should be removed by the customer's representative when it is necessary to test

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toward the customer-provided equipment and then replaced to restore the circuit to service. (The type of block and the order of lead terminations may vary for older versions of the trunk in the field.)

The customer-provided equipment must be located so that the maximum external loop resistance, including contact resistance, across the B and G leads or the PB5 and C leads measured at the block shall not exceed 250 ohms. However, it is recommended that the intervening distance be minimized to reduce exposure to crosstalk and noise.

3. OPERATION

3.1 Simplified Description

Voice Connecting Arrangement DCT is seized when the PBX station user (dictator) dials the assigned trunk access code (e.g., dial "7"). If the customer-provided dictation machine is dial controlled (Operational Feature A), a continuous audible ringing or dial tone is returned by the arrangement to the dictator indicating that the dictation machine has been seized. With voice control (Operational Feature B) the customer-provided equipment must provide the tone. If circuit seizure is unsuccessful, a busy tone is returned by the PBX indicating an all-trunks-busy condition.

With dial control, the dictator dials digit (1) to start the dictation machine and then records by speaking into the telephone transmitter. The dictation machine may be stopped at any time by again dialing digit (1). When the dictation machine is stopped, dial tone from the circuit is returned to the dictator. Starting and stopping the dictation machine by dialing digit (1) may be repeated as many times as desired.

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With voice controlled dictation machines, the customer-provided equipment detects the presence of speech to start the recording and the absence of speech to stop the recording.

The dictator may initiate a correction by dialing the digit (2). This places a correction mark in the dictation machine and a momentary burst of dial tone is returned by the circuit to the dictator as an acknowledgment tone.

The dictator may initiate playback of a portion of the previously recorded message by dialing the digit (3). A playback option (Playback Feature Groups 2 or 4) is available whereby the digit (3) may be dialed repeatedly to extend the length of playback. Digit (1) must be dialed to end playback (Playback Feature Group 1) or may be dialed to cancel playback (Playback Feature Group 3 or 4) after which the arrangement returns to the dictation condition. With Playback Feature Groups 2, 3 or 4, the dictation machine automatically stops at the end of playback but the digit (1) must be dialed to restore the arrangement to the dictate condition.

When the dictator has completed dictation, digit (4) is dialed to indicate end of dictation. Dial tone or audible ringing is returned by the circuit to the dictator indicating an end of dictation mark has been made at the machine when the dictation machine is dial controlled.

If the dictator needs assistance from the attendant at the dictation equipment, digit (0) is dialed. The attendant telephone set located near the dictation equipment rings and audible ringing tone is returned to the dictator. When the attendant answers, ringing is tripped and audible ringing tone is removed. Conversation between the

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dictator and attendant is not recorded as the machine is stopped by digit (0). The attendant will assist the dictator and may initiate playback by operating the optional playback key (Feature C) located at the attendant position. If the attendant does not answer, the dictator may stop the ringing of the attendant telephone by dialing digit (1). The digits dialed or keyed by the dictator and functions performed at the dictation machine are summarized in Table C.

If any digits other than (1), (2), (3), or (4) are inadvertently dialed the attendant will be called in. If the 11th or 12th buttons (* or #) on a 12-button TOUCH-TONE telephone set are inadvertently operated, the trunk will ignore these signals.

TABLE C

CONTROL FUNCTIONS

DIGIT DIALED	DIAL CONTROLLED MACHINE	VOICE CONTROLLED MACHINE
1	<ul style="list-style-type: none"> - Start-Stop - Stop ringing of attendant telephone set when attendant does not answer. - End of playback or cancel remainder of playback. 	<ul style="list-style-type: none"> - Cancel remainder of playback. - Stop ringing of attendant telephone set when attendant does not answer.
2	<ul style="list-style-type: none"> - Correction 	<ul style="list-style-type: none"> - Correction - Reduces extended playback.
3	<ul style="list-style-type: none"> - Playback 	<ul style="list-style-type: none"> - Playback
4	<ul style="list-style-type: none"> - End of dictation 	<ul style="list-style-type: none"> - End of dictation
0	<ul style="list-style-type: none"> - Dictation machine attendant 	<ul style="list-style-type: none"> - Dictation machine attendant

When the arrangement is used with a dial PBX equipped with a cord switchboard, the PBX station access is protected by a privacy feature.

When the switchboard attendant plugs into the station jack which is associated with the telephone using this arrangement, the dictation machine is automatically stopped. Audible ringing tone is returned to the dictator as an indication that recording has been interrupted.

3.2 Dial Controlled Dictation Machine (Operational Feature A)

3.21 Idle Condition

When the dictation machine is available for use (idle condition), a customer-provided contact closure between the B and G leads operates a supervisory relay in Voice Connecting Arrangement DCT which removes a busy condition toward the PBX (see Fig. 3). When these leads are opened, the circuit is made busy. In addition, under Operational Feature F, an open will cause the dictation machine attendant's telephone set to be rung.

3.22 Seizure

When Voice Connecting Arrangement DCT is seized by a PBX station dialing the assigned circuit access or service code (e.g., dial "7"), a 600-ohm termination is removed from the TT and TR leads and the dictation machine is connected to the transmission path of the arrangement. The arrangement is now unavailable to other users or to the switchboard attendant. The S1 and S2 leads are closed and with Playback Feature Groups 2, 3 or 4, ground is provided by the dictation machine over the PB5 lead for end-of-playback control. A "ready" tone consisting of continuous audible ringing of dial tone (according to type of PBX) is returned to the calling station.

3.23 Control Functions

To perform the desired control functions the dictator must dial the digits listed in Table C. At the beginning of dialing the circuit operates to open the transmission path and terminate the TT and TR leads in 600 ohms toward the dictation machine to minimize recording of dial pulses or tone signals. "Ready" tone is removed toward the dictator. At the end of dialing, the 600-ohm termination is removed and the TT and TR leads are closed to the dictation machine.

Start or Stop

When the first start-stop digit (1) is dialed, when the arrangement is in the "ready" or stop condition, the SS1 and SS2 leads are closed and the arrangement is put in the dictate or start condition. The next time the digit (1) is dialed for stop the SS1 and SS2 leads will be opened and dial tone or ringing will be returned to the dictator as a ready signal.

Correction

When the correction digit (2) is dialed, the arrangement operates momentarily for a minimum of 200 milliseconds and a maximum of 500 milliseconds to (a) close the C1 and C2 leads, (b) close the C3 and C4 leads, (c) open the SS1 and SS2 leads, and (d) to apply a burst of dial tone or ringing to the dictator as an acknowledgment. The arrangement then returns to the dictate condition.

Playback

When the playback digit (3) is dialed, the arrangement performs the following sequential operations:

- (a) Feature Group 1 - Opens the SS1 and SS2 leads and closes the PB1 and the PB2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads and closes the PB4 lead to the SS1 lead.

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- (b) Feature Group 2 - Closes the PB1 and PB2 leads and within 150 milliseconds opens the SS1 and SS2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads; closes the PB4 lead to the SS1 lead; and locks in the playback mode over the C and PB5 leads under control of the dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1 and PB2 leads each time for minimum of 200 milliseconds in order to allow the dictation machine to extend playback time.
- (c) Feature Group 3 - Opens the SS1 and SS2 leads and closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads; closes the PB4 and SS1 leads; and locks in the playback mode over the C and PB5 leads under control of the dictation machine.
- (d) Feature Group 4 - Closes the PB1 and PB2 leads and within 150 milliseconds opens the SS1 and SS2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads; closes the PB4 to the SS1 lead; and locks the playback in mode over the C and PB5 leads under control of the dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1 and PB2 leads each time for a minimum of 200 milliseconds in order to allow the dictation machine to extend playback time.

End of Playback or Cancel Remainder of Playback

The digit (1) may be dialed at the end of playback or to cancel playback, according to the playback feature group provided:

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- (a) Feature Group 1 - Since the dictation machine does not indicate that playback is in progress with this feature group, it is necessary for the dictator to dial (1) to end the playback. This action closes the SS1 and SS2 leads; opens the PB1 and PB3 leads; opens the PB4 and SS1 leads; and returns the arrangement to the dictate condition.
- (b) Feature Group 2 - At the end of playback, the dictation machine shall automatically remove ground from the C lead for a minimum of 25 milliseconds. As a result, the arrangement opens the PB1 and PB3 leads; opens the PB4 and SS1 leads; and sends a "ready" tone to the dictator. Digit (1) must be dialed to restore the arrangement to the dictate condition which is indicated by a closure on the SS1 and SS2 leads.
- (c) Feature Group 3 and 4 - The dictator may cancel playback by dialing digit (1). In this case, the arrangement closes the SS1 and SS2 leads, opens the PB1 and PB3 leads; opens the PB4 and SS1 leads; and returns the arrangement to the dictate condition. Alternately, at the normal end of playback, the dictation machine shall automatically removed ground from the C lead for a minimum of 25 milliseconds. In this case the arrangement opens the PB1 and PB3 leads; opens the PB4 and SS1 leads; and sends a "ready" tone to the dictator. The digit (1) must be dialed again to provide a closure on the SS1 and SS2 leads to restore the arrangement to the dictate condition.

End of Dictation

At the end of dictation, digit (4) is dialed. At the beginning of the dialing, the arrangement opens the SS1 and SS2 leads; opens the E3 and E4 leads; and closes the E1 and E2 leads. At the end of dialing the arrangement closes the E3 and E4 leads; opens the E1 and E2 leads; and sends the "ready" tone to the dictator indicating that the dictator should now hang-up (see Paragraph 3.25).

3.24 Attendant AssistanceAssistance Before Playback

When the dictator dials the digit (0) the arrangement operates to terminate the TT and TR leads in 600 ohms, opens the SS1 and SS2 leads and rings the attendant station. When the attendant answers, the arrangement connects the dictator and attendant and disconnects the TT and TR leads from the dictation machine.

Assistance During Playback

If the dictator dials the attendant after playback has been initiated, the arrangement operates as above (Assistance Before Playback) with the exception that the TT and TR leads are reconnected to the dictation machine so that both the dictator and attendant may hear the playback. Any playback in progress is cancelled by the arrangement as described for Playback Feature Groups 1 and 3.

Attendant Controlled Playback (Operational Feature C)

If playback is desired while attendant and dictator are connected, the attendant momentarily operates the optional playback key. With the arrangement in this manual playback condition, the TT and TR leads are cut through to connect the dictator and attendant to the dictation machine and the arrangement functions as described in Paragraph 3.23 (Playback).

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The attendant may cancel playback in progress with Feature Groups 1 and 3 by momentarily operating the optional playback key which causes the circuit to close the SS1 and SS2 leads; open the PB1 and PB3 leads; open the PB4 and SS1 leads; and terminates the TT and TR leads in 600 ohms. The dictator must dial (1) to resume dictation.

Attendant Does Not Answer

If the access digit (0) is dialed and the attendant does not answer, the dictator may stop ringing of the attendant line by dialing a digit (1) during the silent interval of the ringing signal. This causes a closure on the TT and TR leads to connect the dictator to the transmission path; disconnects the attendant; and closes the SS1 and SS2 leads, restoring the arrangement to the dictate condition.

3.25 Disconnect

Dictator Only

When the dictator hangs up, the PB5 lead opens; the TT and TR leads are connected to 600 ohms toward the dictation machine; the E1 and E2 leads close momentarily (200 milliseconds minimum); the E3 and E4 leads open momentarily (200 milliseconds minimum); the S1 and S2 leads open; the SS1 and SS2 leads open; and the arrangement is released toward the PBX.

Dictator Connected to Attendant

When the attendant hangs up after a call for assistance, the dictator is disconnected from the attendant line and reconnected to the transmission path, the 600-ohm termination is removed from the TT and TR leads; and the TT and TR leads are reconnected to the dictation machine; the SS1 and SS2 leads are opened; and "ready" tone is sent to the dictator.

If the dictator disconnects first, the procedure is the same as above (Dictator Only) except that the circuit is not released until the attendant hangs up.

3.3 Voice Controlled Dictation Machine (Operational Feature B)

3.31 Idle Condition

When the dictation machine is in the idle condition, a customer-provided contact closure between the B and G leads operates a supervisory relay in Voice Connecting Arrangement DCT which removes a busy condition toward the PBX (Fig. 3). When these leads are opened, the circuit is made busy. In addition, under Operational Feature F, an open will cause the dictation machine attendant's telephone set to be rung.

3.32 Seizure

When Voice Connecting Arrangement DCT is seized by a PBX station dialing the assigned circuit access or service code (e.g., dial "7"), a 600-ohm termination is removed from the TT and TR leads and the dictation machine is connected to the transmission path of the arrangement. The arrangement is now unavailable to other users or to the switchboard attendant. The S1 and S2 leads are closed and with Playback Feature Groups 2, 3 or 4, ground is provided by the dictation machine over the PB5 lead for end-of-playback control. Any "ready" tone or "talk-down" that is required shall be provided by the customer-provided equipment on the TT and TR leads. A 1400 Hz tone is recommended.

3.33 Control Functions

To perform the desired control functions the dictator must dial the digits listed in Table C. At the beginning of dialing the arrangement operates to open the transmission path and terminate the TT and TR leads in 600 ohms toward the dictation machine to minimize recording of dial pulses or tone signals. The customer-provided "ready" tone shall be removed toward the dictator. At the end of dialing the 600-ohm termination is removed and the TT and TR leads are closed to the dictating machine.

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Start or Stop

The start and stop of the dictation machine shall be controlled by a voice-operated circuitry in the customer-provided equipment.

Correction

When the correction digit (2) is dialed, the arrangement operates momentarily for a minimum of 200 milliseconds and a maximum of 500 milliseconds to (a) close the C1 and C2 leads, (b) close C3 and C4 leads, (c) to open the SS1 and SS2 leads, and (d) to apply a burst of dial tone to the dictator as an acknowledgement. The arrangement then returns to the dictate condition by the application of the customer-provided "talk-down" tone on the TT and TR leads.

Playback

When the playback digit (3) is dialed, the arrangement performs the following sequential operations :

- (a) Feature Group 1 - Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads and closes the PB4 lead to the SS1 lead.
- (b) Feature Group 2 - Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads; closes the PB4 lead to the SS1 lead; and locks in the playback mode over the C and PB5 leads under control of the dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1 and PB2 leads each time for a minimum of 200 milliseconds in order to allow the dictation machine to extend playback time.

- (c) Feature Group 3 - Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads; closes the PB4 and SS1 leads; and locks in the playback mode over the C and PB5 leads under control of the dictation machine.
- (d) Feature Group 4 - Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the arrangement closes the PB1 and PB3 leads before opening the PB1 and PB2 leads; closes the PB4 to the SS1 lead; and locks in the playback mode over the C and PB5 leads under control of the dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1 and PB2 leads each time for a minimum of 200 milliseconds in order to allow the dictation machine to extend playback time.

End of Playback or Cancel Remainder of Playback

The digit (1) may be dialed at the end of playback or to cancel playback, according to the playback feature group provided:

- (a) Feature Group 1 - Since the dictation machine does not indicate that playback is in progress within feature group, it is necessary for the dictator to dial (1) to end the playback. This action opens the PB1 and PB3 leads; and opens the PB4 and SS1 leads. The arrangement returns to the dictate condition as indicated by the return of customer-provided "talk-down" tone to the dictator.

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- (b) Feature Group 2 - At the end of playback, the dictation machine shall automatically remove ground from the C lead for a minimum of 25 milliseconds. As a result, the arrangement returns to the dictate condition which shall be indicated by the return of customer-provided "talk-down" tone to the dictator.
- (c) Feature Groups 3 and 4 - The dictator may cancel playback by dialing the digit (1). Alternately, at the normal end of playback, the dictation machine shall automatically remove ground from the C lead for a minimum of 25 milliseconds. In either case, the circuit opens the PB1 and PB3 leads, and opens the PB4 and SS1 leads. The arrangement returns to the dictate condition which shall be indicated by the return of customer-provided "talk-down" tone to the dictator.

End of Dictation

At the end of dictation, digit (4) is dialed. At the beginning of dialing, the arrangement opens the E3 and E4 leads and closes the E1 and E2 leads. At the end of dialing the arrangement closes the E3 and E4 leads; opens the E1 and E2 leads and returns to the dictate condition which shall be indicated by a return of customer-provided "talk-down" tone to the dictator.

3.34 Attendant Assistance

Assistance Before Playback

When the dictator dials the digit (0), the arrangement operates to terminate leads TT and TR in 600 ohms and rings the attendant station. When the attendant answers, the arrangement connects the dictator and attendant and disconnects the TT and TR leads from the dictation machine.

Assistance During Playback

If the dictator dials the attendant after playback has been initiated the arrangement as above (Assistance Before Playback) with the exception that the TT and TR leads are reconnected to the dictation machine so that both the dictator and the attendant may hear the playback. Any playback in progress is cancelled by the arrangement as described for Playback Feature Groups 1 and 3.

Attendant Controlled Playback (Operational Feature C)

If playback is desired while attendant and dictator are connected, the attendant momentarily operates the optional playback key. With the arrangement in manual playback, the TT and TR leads are cut through to connect the dictator and attendant to the dictation machine and the arrangement functions as described in Paragraph 3.33 (Playback).

The attendant may cancel playback with Feature Groups 1 or 3 by momentarily operating the optional playback key which causes the arrangement to function as described in Paragraph 3.33 (End of Playback or Cancel Remainder of Playback).

Attendant Does Not Answer

If the access digit (0) is dialed and the attendant does not answer the dictator may stop ringing of the attendant line by dialing (1) during the silent interval of the ringing signal. This causes a closure on the TT and TR leads which connects the dictator to the transmission path; disconnects the attendant; and restores the arrangement to the dictate condition.

3.35 Disconnect

Dictator Only

When the dictator hangs up, the PB5 leads opens; the TT and TR leads are terminated in 600 ohms toward the dictation machine; the E1 and E2 leads close momentarily (200 milliseconds minimum); the E3 and E4 leads open momentarily (200 milliseconds minimum); the S1 and S2 leads open; and the arrangement is released toward the PBX.

Dictator Connected to Attendant

When the attendant hangs up after a call for assistance, the dictator is disconnected from the attendant line and reconnected to the transmission path; the 600-ohm termination is removed from the TT and TR leads; and the TT and TR leads are reconnected to the dictation machine. The arrangement returns to the dictate condition which shall be indicated by a return of customer-provided "talk-down" tone to the dictator.

If the dictator disconnects first, the procedure is the same as above (Director Only) except that the arrangement is not released until the attendant hangs up.

4. SPECIAL DESIGN CONSIDERATIONS

4.1 Transmission Path

4.1.1 Insertion Loss

The insertion loss of Voice Connecting Arrangement DCT is 1 dB over the voice connecting frequency range of 300 Hz to 3000 Hz. No voice signal amplification is provided.

4.12 Impedance

The arrangement provides about a one-to-one impedance transformation. For design purposes, the input impedance of this arrangement should be considered to be 600 ohms therefore, the impedance of the customer-provided equipment should be 600 ohms for optimum voice signal power transfer across the interface.

4.13 Bandwith

The nominal voice frequency bandwidth of the connection between the PBX extension station and the customer-provided equipment extends from about 300 to about 3000 Hz. In general, an end-to-end connection may be expected to have a loss characteristic which increases at both ends of the band. Voice Connecting Arrangement DCT does not limit this bandwidth.

4.14 Voice Signal Power Level

The maximum available power from the customer-provided 600-ohm source for both playback and talk down tone when averaged over any 3-second interval and measured on the TT and TR leads at the interface connecting block should not exceed -12 dbm. This limit has been set so that the level at the PBX which includes the loss of the connecting arrangement is compatible with the -13 dBm level set for private line services at the PBX in order to prevent excessive noise and crosstalk from interfering with these services as stated in the tariffs.

Using measuring Method A (see Paragraph 4.15), in almost all cases, the speech power, averaged over any 3-second interval, will not exceed -12 dBm if the maximum meter swing does not exceed 81 dBm. With the

additional damping of measuring Method B, the power averaged over any 3-second interval will not exceed -12 dBm if the maximum meter swing does not exceed 79 dBrn.

4.15 Measuring Maximum Available Inband Power

The measuring methods described below are satisfactory for estimating the maximum power averaged over a 3-second interval to determine that the inband criteria specified in Paragraph 4.14 is being met.

Method A

Operate the customer-provided equipment into a 600 ohm load, (this assumes that the customer-provided equipment has a 600 ohm source impedance), bridged by a Hewlett-Packard Transmission and Noise Measuring Set - Model 3555B, or a Western Electric 3-Type Noise Measuring Set, or the equivalent.* To insure a proper measurement technique, the control settings on these meters should be as shown below.

<u>Western Electric 3-Type Noise Measuring Set</u>		<u>Hewlett-Packard Transmission and Noise Measuring Set Model 3555B</u>	
<u>Control</u>	<u>Setting</u>	<u>Control</u>	<u>Setting</u>
FUNCTION (Switch)	BRDG	INPUT (Switch)	NOISE/BRDG
NORM/DAMP (Switch)	DAMP	FUNCTION (Pushbutton)	VF/Nm-600 BAL
WTG (Plug-in Network)	3Kc FLAT	Noise WTG (Switch)	3 kHz FLAT
		NORM/DAMP (Switch)	DAMP

*These meters do not have a 3-second averaging time, but when used on speech, they give a reliable estimate of a 3-second average. The use of meters with shorter time constants, such as VU meters or standard voltmeters, is not recommended.

Method B

The accuracy of Method A can be somewhat improved by increasing the size of the damping capacitance in the Western Electric 3-Type Noise Meter by 150 microfarads. To do this, connect the negative lead of a 150 microfarad capacitor to either terminal of the NORM/DAMP switch and connect the positive lead to ground. This allows the meter to more nearly approximate a 3-second averaging meter. (NOTE: This modification does not necessarily hold for the Model 3555B or noise meters other than the Western Electric 3-Type.)

4.16 Signal Power Distribution

A PBX tie line tandem network may incorporate tone signaling devices that are used for tandem network control functions. These devices, which are connected at all times to the telephone circuit, are designed to be sensitive to a single frequency tone at 2600 Hz. They are, however, relatively insensitive to energy at this frequency if sufficient energy is present at the same time at other frequencies in the voiceband.

In order to prevent the interruption or disconnection of a call, or interference with network control signaling, it is necessary that the signal applied by the customer-provided equipment to the voice connecting arrangement at no time have energy solely in the 2450 to 2750 Hz band. If signal power is in the 2450 to 2750 Hz band, it must not exceed the power present at the same time in the 800 to 2450 Hz band.

4.17 Out-of-Band Signal Power Limits

To protect other services, it is necessary that the signal which is applied by the customer-provided equipment to the Telephone Company interface, located on the customer's premises, meet the following limits:

- (a) The power in the band from 3995 Hz to 4005 Hz shall not exceed 30 dB below one milliwatt.
- (b) The power in the band from 4000 Hz to 10,000 Hz shall not exceed 16 dB below one milliwatt.
- (c) The power in the band from 10,000 Hz to 25,000 Hz shall not exceed 24 dB below one milliwatt.
- (d) The power in the band from 25,000 Hz to 40,000 Hz shall not exceed 36 dB below one milliwatt.
- (e) The power in the band above 40,000 Hz shall not exceed 50 dB below one milliwatt.

4.18 Signal Limiting

The voice signal limiter is incorporated in the transmission path to protect the network from abnormally high signal levels. This has no effect on normal signal or tone levels. This limiter does not abrogate the customer responsibility to meet the network protection criteria as prescribed in the tariffs and in Section 4.14 of this Technical Reference.

4.2 DC Signaling Paths

4.21 General Description

The equipment provided by the Telephone Company consists of an arrangement of relays and other components designed to translate pulses received from a PBX extension telephone into control signals for the customer-provided equipment. The control signals consist of open and closed circuit conditions for application to particular control leads of the dictation machine (Fig 3).

4.22 Seizure Path

The S1 and S2 leads provide a contact closure to the dictation machine when the arrangement is seized on an incoming call. The open circuit resistance is greater than 100,000 ohms and the closed circuit resistance is less than 5 ohms at the interface. The customer equipment load on the S1 and S2 leads shall not exceed .35 ampere peak. The customer's equipment shall provide appropriate contact protection.

4.23 Start-Stop Path

The SS1 and SS2 leads provide a contact closure to the dictation machine to start or stop recording when digit (1) is dialed. The open circuit resistance is greater than 100,000 ohms and the closed circuit resistance is less than 5 ohms at the interface. The customer equipment load on the SS1 and SS2 leads shall not exceed .35 ampere peak. The customer's equipment shall provide appropriate contact protection.

4.24 Correction Path

The C1 and C2 leads and the C3 and C4 leads provide contact closures to the dictation machine during the correction sequence when digit (2) is dialed. The open circuit resistance is greater than 100,000 ohms and the closed circuit resistance is less than 5 ohms at the interface. The customer's equipment load on these leads shall not exceed .35 ampere peak. The customer's equipment shall provide appropriate contact protection.

4.25 Playback Path

The PB1 and PB2 leads, the PB1 and PB3 leads, and PB4 and the SS1 leads provide contact closures (depending on the playback features selected) to the dictation machine during the playback sequence when digit (3) is dialed. The open circuit resistance is greater than 100,000 ohms and the closed circuit resistance is less than 5 ohms at the interface. The customer's equipment load on these leads shall not exceed .35 ampere peak. The customer's equipment shall provide appropriate contact protection.

4.26 End-of-Playback Path Optional

The C and PB5 leads are used by the customer-provided equipment (Playback Feature Groups 2, 3, or 4) to signal end of playback. An open condition of at least 25 milliseconds from the customer between the PB5 and C leads will initiate the end-of-playback sequence and restore the trunk to the ready condition awaiting the next signal from the dictator. A closure should be maintained at all other times.

The C lead has a maximum potential of 52 volts (nominal 48 volts) dc through a 3200 ohm inductive load. The external loop resistance, including contact resistance, across the C and PB5 leads measured at the

interface connecting block shall not exceed 250 ohms when indicating a closure. When indicating an open, the resistance should be greater than 50,000 ohms.

4.27 End-of-Dictation Path

The E1 and E2 leads provide a momentary open at the E3 and E4 leads and a momentary contact closure to the dictation machine to indicate end of dictation when digit (4) is dialed. The open circuit resistance is greater than 100,000 ohms and the closed circuit resistance is less than 5 ohms at the interface. The customer's equipment load on these leads shall not exceed .35 ampere peak. The customer's equipment shall provide appropriate contact protection.

4.28 Ready-for-Use Path

The B and G leads provide a means for the dictation machine to indicate that it is ready to record. If an open condition is maintained by the customer's equipment across the B and G leads, the arrangement will test busy to incoming calls. This feature may be used by the customer to prevent seizing the recorder, for example, when the recording media is being changed. In addition, with Operational Feature F, an open on this path will ring the dictation machine attendant's telephone set.

The B lead has a maximum potential of 52 volts (nominal 48 volts) dc through 2450 ohms inductive load. The G lead is grounded at the arrangement but cannot be used by the customer to ground his equipment.

The external loop resistance, including contact resistance, across the B and G leads measured at the interface connecting block shall not exceed 250 ohms when indicating a closure. When indicating an open, the resistance should be greater than 50,000 ohms.

4.3 Grounding

Voice Connecting Arrangement DCT is provided with a common signal ground (a metallic cold water pipe or other approved ground) which is bonded to the electric power ground and telephone protector ground, where present. Although the G lead is used to supply ground for the trunk control relays, it is not permitted to derive the main ground for the customer's equipment through this lead. It is expected that the customer-provided equipment will be grounded in accordance with applicable electrical codes such as the National Electrical Code (NEC).

5. GENERAL DESIGN CONSIDERATIONS

5.1 Foreign and Surge Voltage Protection

Where telephone lines are exposed to foreign voltages by direct contact or induction (e.g., powerline crosses or lightning), protective devices are installed at the Central Office and on the customer's premises that will provide a path to ground for foreign voltages that exceed about 600 volts peak. Since the customer's equipment is connected to the telephone line through the Recorded Telephone Dictation Trunk Circuit, the customer's equipment is protected from metallic longitudinal surges.

The customer is responsible for providing protection, internal to his equipment and facilities, against foreign and hazardous voltages from his equipment and facilities being applied to the circuit.

5.2 Voltage Limitations

When it is necessary for the customer to apply an operational voltage to the control leads of the circuit, certain limitations shall be observed. These limitations are for the purpose of providing adequate protection to personnel and plant facilities, and unless otherwise specified in Section 4 of this Technical Reference, any steady-state voltage applied by the customer-provided equipment to conductors connected to the circuit shall not exceed the following:

	<u>dc</u>	<u>ac (RMS)</u>
Maximum voltage, any conductor to ground	135	50
Maximum voltage, conductor to conductor	(135 270*	(50 100*

The power supplies and wiring methods used in the customer-provided equipment should meet the provisions of applicable electrical codes, such as the National Electrical Code (NEC), Article 725, for Class 2 remote control and signal circuits.

5.3 Tie Line Network Characteristics

Transmission engineering information for tie trunks is described in Transmission Engineering Technical Reference, "Private Line Interconnection - Voice Application" (PUB 43201) available as described in Appendix C.

*Permitted only if voltage source is center-tapped to ground.

6. SERVICE AND MAINTENANCE CONSIDERATIONS

6.1 Responsibility of the Customer

The tariffs permitting connection of customer-provided terminal equipment or communications systems state that where telecommunications service is available under these tariffs for use in connection with terminal equipment or communications systems, provided by a customer, the operating characteristics of such equipment or systems shall be such as not to interfere with any of the services offered by the Telephone Company. Such use is subject to the further provisions that the equipment or systems provided by a customer does not endanger the safety of Telephone Company employees or the public; damage, require change in or alteration of, the equipment or systems or other facilities of the Telephone Company, interfere with the proper functioning of such equipment or systems or facilities impair the operation of the telecommunications system of facilities or otherwise injure the public in its use of the Telephone Company's services. Upon notice from the Telephone Company that the equipment or system provided by a customer is causing or is likely to cause such hazard or interference, the customer shall take such steps or make such change as shall be necessary to remove or prevent such hazard or interference.

6.2 Responsibility of the Telephone Company

The tariffs permitting connection of customer-provided terminal equipment or communications systems state that the Telephone Company shall not be responsible for the installation, operation or maintenance of any

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customer-provided terminal equipment or communications systems. Long distance message telecommunications service is not represented as adapted to the use of customer-provided equipment or systems and where such equipment or systems are connected to Telephone Company facilities the responsibility of the Telephone Company shall be limited to the furnishing of facilities, including the protective connecting arrangements and network control signaling units, suitable for long distance telecommunications service and to the maintenance and operation of such facilities in a manner proper for such telecommunication services. Subject to this responsibility the Telephone Company shall not be responsible for (i) the through transmission of signals generated by the customer-provided equipment or systems or for the quality of, or defects in, such transmission, (ii) the reception of signals by customer-provided equipment or systems or (iii) address signaling where such signaling is performed by customer-provided tone-type signaling equipment.

The Telephone Company shall not be responsible to the customer if changes in minimum network protection criteria contained in the tariffs (and in this Technical Reference) or in any of the facilities, operations or procedures of the Telephone Company render any customer-provided facilities obsolete or require modification or alteration of such equipment or systems or otherwise affect its use of performance.

6.3 Trouble Reporting Procedure

When trouble is experienced with this service, the customer should perform the necessary testing at the interface to sectionalize the difficulty, i.e., determine whether the service impairment is located in the customer-provided equipment or in the equipment provided by the Telephone Company. If the tests indicate that the trouble is in the Telephone Company-provided equipment, it should be promptly reported to the Telephone Company. Trouble reports should be called into the listed "Repair Service" number which can be found in the front of the telephone directory. The repair attendant should be given:

- (a) Customer's name
- (b) Customer's address
- (c) Listed telephone number
- (d) Description of the trouble
- (e) Customer's contact for additional information

If a Telephone Company service call results in the location of the trouble in the customer-provided equipment, the customer is liable to be charged for the service call.

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APPENDIX A

GLOSSARY

COMMUNICATIONS SYSTEM - denotes channels and other facilities which are capable, when not connected to the Long Distance Message Telecommunications Service, of communications between customer-provided terminal equipment or Telephone Company stations.

CONNECTING ARRANGEMENT - equipment provided by the Telephone Company to accomplish the direct electrical connection of customer-provided equipment and the telecommunications network.

CUSTOMER - the term "Customer" denotes the person, firm or corporation which orders service and is responsible for the payment of charges and compliance with Telephone Company regulations.

INTERFACE CONNECTING BLOCK - the Telephone Company-provided connecting point to which the customer brings and connects the leads of his equipment and to which the Telephone Company brings and connects leads from the voice connecting arrangement.

TELECOMMUNICATIONS NETWORK - the Bell System voice switching equipment, associated interconnecting facilities, and station equipment which provide Long Distance Message Telecommunication Service or private line service.

TELEPHONE COMPANY - denotes the American Telephone and Telegraph Company, the Long Lines Department, its concurring carriers, and its connecting carriers, either individually or collectively.

VOICE CONNECTING ARRANGEMENT - a protective connecting arrangement designed to transmit speech signals as contrasted to one designed to transmit data signals.

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APPENDIX B

REFERENCES

Some references describing various transmission characteristics of the telecommunications network are listed below:

- (a) Bell System Transmission Engineering Technical Reference, "Private Line Interconnection - Voice Applications - June 1970" PUB 43201.
- (b) Bodle, D. W., and Gresh, P. A., "Lightning Surges in Paired Telephone Cable Facilities," BSTJ, Vol. 40, No. 2 (March 1961), p. 547.
- *(c) "Principles of Electricity Applied to Telephone and Telegraph Work" by American Telephone and Telegraph Company, New York, New York.
- *(d) "Switching Systems," by American Telephone and Telegraph Company, New York, New York.
- (e) "Notes on Transmission Engineering," by United States Independent Telephone Association, Washington, D. C.
- *(f) "Transmission Systems for Communications," by Bell Telephone Laboratories, Inc.

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APPENDIX C

WHERE TO OBTAIN REFERENCE MATERIAL

1. Bell System Technical References

These references may be purchased by writing to:

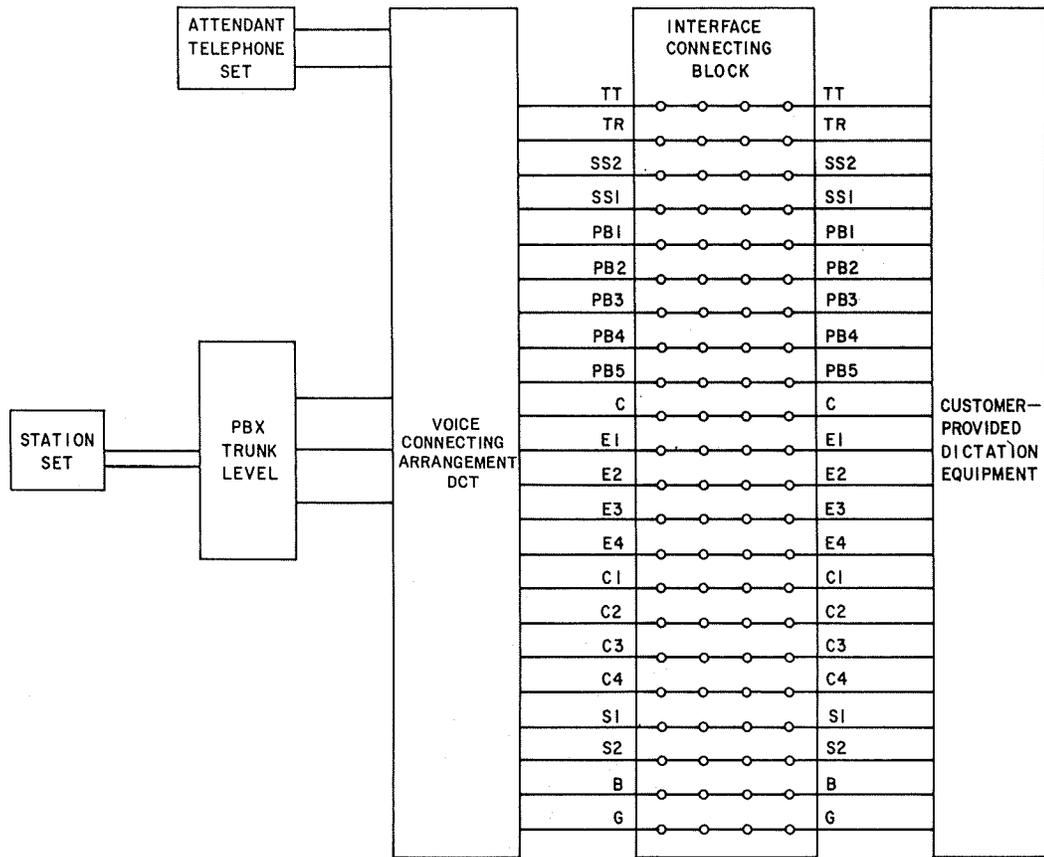
Western Electric Company, Inc.
Commercial Relations
P.O. Box 1579
Newark, New Jersey 07102

2. Bell System Technical Journals (BSTJ)

These journals may be purchased by writing to:

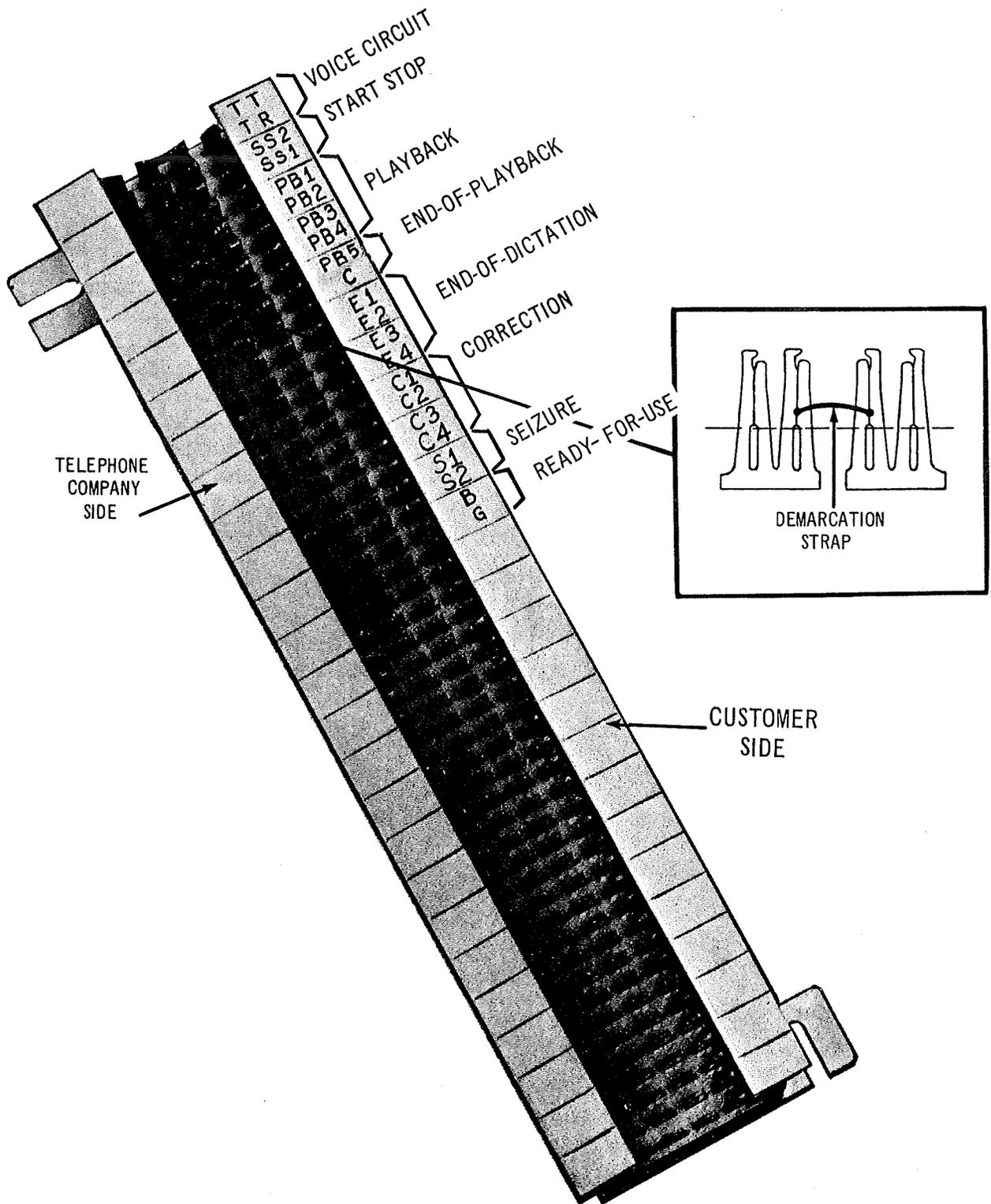
Mr. F. J. Schwetje
Bell Telephone
Mountain Avenue, Room 3C115
Murray Hill, New Jersey 07974

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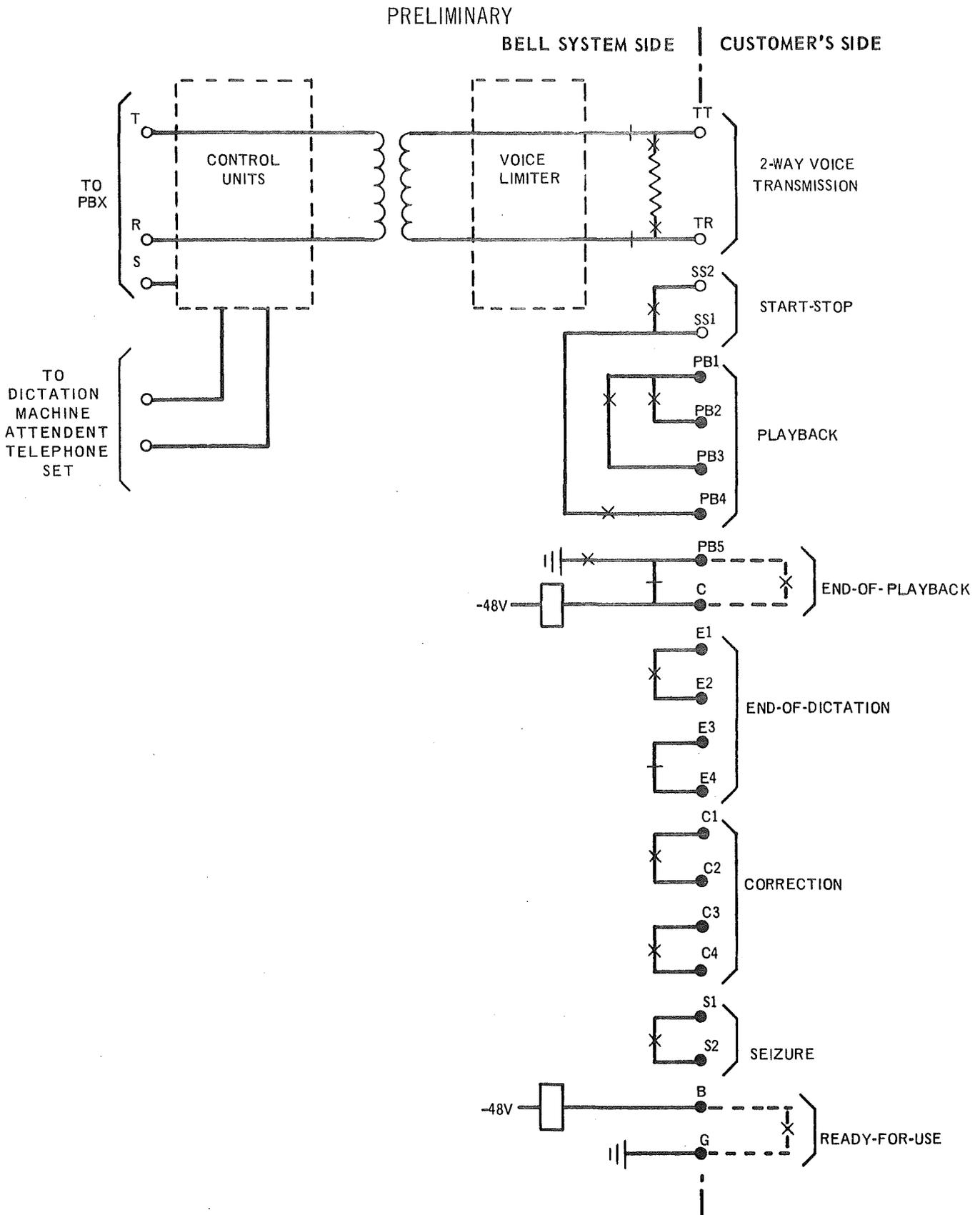


BLOCK DIAGRAM - VOICE CONNECTING ARRANGEMENT DCT
FIG. 1

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TYPICAL INTERFACE CONNECTING BLOCK
FIG. 2



SIMPLIFIED SCHEMATIC - VOICE CONNECTING ARRANGEMENT DCT
FIG. 3

