10-TYPE DATA LINE CONCENTRATOR SYSTEM (DLCS)

DESCRIPTION

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1. GENERAL

1.01 This section describes the functional operation of the 10-type Data Line Concentrator Systems, hereafter referred to as DLCS. It covers both the single access system which uses the 10A Data Line Concentrator (Fig. 1) and the dual access system which uses the 10B Data Line Concentrator (Fig. 2).

1.02 This section is reissued to include information pertaining to the dual access DLCS which uses the 10B Data Line Concentrator and to remove all references to the acronym DATREX. Since this reissue is a general revision, change arrows have been omitted.

1.03 The purpose of the DLCS is to provide private line (PL) communications for multiaccess computer systems.

1.04 The nuclei of the DLCS are the 10A and 10B Data Line Concentrators which provide the nonblocking switching function for the connection of the lines to the trunks. They may be arranged to accomodate up to 128 lines and 32 trunks.

1.05 The 10A and 10B Data Line Concentrators are designed to serve half-duplex (HDX) and full-duplex (FDX) Data Set 109-type stations located within 1600 ohms (line resistance limitation) of the multiple arrangement data set, concentrator end trunk 1A Data Station, or trunk side DATA-PHONE interconnection arrangement (dual access only). These are the "local station" arrangements. The line resistance limitation for HDX stations may be extended to 2100 ohms where necessary, with only a slight degradation in the service.

Note: The concentrator inserts approximately 400 ohms resistance into the circuit, thereby making the total loop resistance of the above 2000 and 2500 ohms, respectively.

1.06 The DLCS can be arranged to serve stations located outside the Data Set 109-type line resistance limitations ("remote station" arrangements) by use of the following arrangements.

(a) 1A Data Station

(b) PL interconnection arrangement

(c) Line side DATA-PHONE interconnection arrangement.

1.07 DLCS which utilize only one concentrator can be arranged to serve up to 128 local and/or remote stations. This number may be increased by using a second concentrator connected in tandem with the first concentrator. When tandem concentrators are used, the 1A Data Station System will be used to provide the interconcentrator trunks.

1.08 The 1A Data Station may also be used to provide remote data terminals access to a concentrator and concentrator trunks access to a remote computer. It is capable of serving up to 4 lines or trunks over 2-wire facilities or 8 lines or trunks over 4-wire facilities. For this reason it is advised that the DLCS always employ 4-wire facilities.

Single Access DLCS (10A Data Line Concentrator)

1.09 There are two arrangements which may be used to provide concentrator trunks for the single access DLCS. The arrangement used is dependent on whether the concentrator is "local or remote." When the concentrator is locally located, the Data Set 109D- or E-type multiple data set arrangement will be used to provide the trunking from the concentrator to the computer port via dc facilities. When the concentrator is remotely located, the 1A Data Station will be used over conditioned 3002 voice grade facilities.

Dual Access DLCS (10B Data Line Concentrator)

1.10 There are three arrangements which may be used to provide concentrator trunks for the dual access DLCS. The arrangement used is dependent on whether the concentrator is "local", the concentrator is "remote", or access to the direct distance dialing (DDD) network is desired. The arrangements for locally and remotely located dual access concentrators are the same as those for the single access concentrators (see 1.09). However, when access to the DDD network is desired, the trunk side DATA-PHONE interconnection arrangement will provide the trunks.

2. PHYSICAL DESCRIPTION

2.01 The block diagrams in Fig. 1 and 2 show the basic arrangements used in the DLCS which use the 10A Data Line Concentrator and 10B Data Line Concentrator, respectively. For a physical description of the components that make up a DLCS, refer to the following Bell System Practices (BSPs).

SECTION	TITLE
591-811-100	10A Data Line Concentrator —Description
591-811-101	10B Data Line Concentrator —Description
591-031-101	Data Set 109C-Type Used in 10-Type Data Line Concentrator System (DLCS)—Description
591-035-101	Data Set 109F-Type Used in 10-Type Data Line Concentrator System (DLCS)—Description
591-023-110	Data Set 108A- or C-Type Single Private Line Station Using Data Auxiliary Set 820D-L1A in the 10-Type Data Line Concentrator System (DLCS)—Description
591-813-100	1A Data Station Multichannel Arrangement—Description and Operation
591-814-100	113-Type Data Station—Description and Operation
591-811-102	Private Line Interconnection Arrangement for Line Side of 10-Type Data Line Concentrator System (DLCS)—Description
591-811-103	DATA-PHONE Interconnection Arrangement for Line Side of 10-Type Data Line Concentrator System (DLCS)—Description
591-811-104	DATA-PHONE Interconnection Arrangement for Trunk Side of 10B Data Line Concentrator System (DLCS)—Description
591-029-101	Data Set 109D-Type Multiple Data Set Arrangement Using 28A1 Data Mounting and 27A1 Data Unit—Description
591-036-101	Data Set 109E-Type Multiple Data Set Arrangement Using 28A1 Data Mounting and 27A1 Data Unit—Description

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The following restrictions must be observed in the DLCS:

(a) ***No more than two concentrators may be connected in tandem with each other.***

(b) ***No two 1A Data Station links may be connected directly in series (back-to-back) with each other.***

(c) ***No station may be connected to the computer via more than three 1A Data Station links.***

(d) ***No DATA-PHONE stations may be served by a tandem concentrator.***

(e) ***No DATA-PHONE station may be connected to the computer via more than one 1A Data Station link.***

(f) ***Only local stations arranged for dual access may be connected to both trunk groups in the dual access DLCS. All other type stations will always be connected to one trunk group.***

3. FUNCTIONAL DESCRIPTION

A. General

3.01 This part describes the functional operation of the DLCS when used with the following:

(a) Single access local stations (Fig. 3)

(b) Dual access local stations (Fig. 4)

(c) Remote PL stations (Fig. 5)

(d) Remote DATA-PHONE stations (Fig. 6)

(e) Remote data terminals which access a concentrator via a 1A Data Station link (Fig. 7)

(f) Remote stations which access the computer via tandem concentrators (Fig. 8).

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3.02 Figures 3 through 8 are provided with tables which show the supervisory signaling used in the system when:

(a) The system is idle.

(b) A station is turned on (requests service).

(c) A line is connected to a trunk.

(d) A station originates a disconnect.

(e) The computer originates a disconnect.

3.03 When a station places a call, the request for service is detected by the concentrator. In the dual access DLCS, the concentrator also recognizes the trunk group requested at this time. If there is a trunk available in the group requested, the concentrator will connect the line requesting service to that trunk. The multiple arrangement data set, computer end 1A Data Station, or DATA-PHONE interconnection arrangement (dual access only) will signal the port or central office (dual access only) that a line has been connected. The computer or central office should then send an answer-back character or dial tone, respectively, to the station.

3.04 If a trunk is not available when the concentrator detects the service request, it will generate and send toward the station a camp-on signal. This can be recognized at a teletypewriter (TTY) station by the fact that the station receiver will select a delete character and, if the optional 6041H key is provided, the CAMP-ON lamp on the 6041H key will flash approximately every three seconds. At customer-provided terminal (CPT) stations equipped with Data Set 109H, the CAMP-ON lamp on the data set will flicker. If a CPT station is equipped with a Data Auxiliary Set (DAS) 820D-type, the optional 6041H key may be provided in which case the CAMP-ON lamp on it will flash. At other CPT stations there may not be any visual or audible indication of receipt of the camp-on signal.

3.05 In the DLCS, a call is always connected in the line-to-trunk direction. There are no means provided for connection of one line to another or in the trunk-to-line direction. Once a line is connected to a trunk, the ***concentrator*** is transparent

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to data signals transmitted in either direction as long as the dc supervisory signal levels of the 109-type Data Set are met.

B. Single Access Local Stations (Fig. 3)

3.06 Single access local stations are designated as those that are within the Data Set 109-type line resistance limitations (or dc signaling range) of the trunk side data set (see 1.05). They are comprised of either a model 33- or 35-type TTY equipped with a Data Set 109C- (HDX) or 109F- (FDX) type or a CPT equipped with a Data Set 109H-type.

Station Idle State

3.07 In the idle state the station data set applies zero volts to the line and no current flows between the station and the concentrator. The concentrator recognizes the zero volts condition as the station idle state.

Computer Port Idle State

3.08 When the computer has a port that is ready to exchange data (idle), the data terminal ready (CD) lead for that port is turned on. This informs the multiple arrangement data set or computer end 1A Data Station that the port is idle.

Trunk Idle State (Local Concentrator Trunk Arrangement)

3.09 The on condition of the port CD lead causes the multiple data set arrangement to apply 4 volts to the trunk side of the concentrator. As long as a line is not connected to the trunk, no current will flow between the multiple arrangement data set and the concentrator. The concentrator recognizes the 4 volts/no-current condition as the trunk idle state. In addition, the no-current condition causes the multiple arrangement data set to turn off the data set ready (CC) lead, thereby indicating to the port that no line is connected to the trunk.

Trunk Idle State (Remote Concentrator Trunk Arrangement)

3.10 The on condition of the port CD lead causes the computer 1A Data Station to send the marking frequency (fm) toward the trunk 1A Data Station. This is recognized as a port idle state and 4 volts is applied to the trunk side of the concentrator. As long as the line is not connected to the trunk, no current will flow between the trunk 1A Data Station and the concentrator. The concentrator recognizes the 4 volts/no-current condition as the trunk idle state. In addition, the no-current condition causes the trunk 1A Data Station to send the center frequency (fc) toward the computer 1A Data Station. The computer 1A Data Station detects the fc signal and turns off the CC lead to the computer, thereby indicating to the port that no line is connected to the trunk.

Port Not Ready (Local Concentrator Arrangement)

3.11 When a computer port is not ready to receive, the CD lead will be turned off. This will cause the multiple data set arrangement to remove the 4 volts from the trunk. The concentrator recognizes this as the port-not-ready state and will not attempt to connect any line to this trunk.

Port Not Ready (Remote Concentrator Arrangement)

3.12 When a computer port is not ready to receive, the CD lead will be turned off. This causes the computer 1A Data Station to send fc toward the trunk 1A Data Station. Receipt of fc causes the trunk 1A Data Station to remove the 4 volts from the trunk. The concentrator recognizes this as the port-not-ready state and will not attempt to connect any line to this trunk.

Call Origination

3.13 A call is originated from a single access local station by operating the LINE 1 button.

> ***Note:*** A CPT station equipped with a Data Set 109H-type can be optionally (CD lead control option) arranged to originate a call when the CPT is turned on.

This causes the station to apply 4 volts to the line and current flows between the concentrator and the station. The concentrator detects the presence of voltage on the loop, recognizes it as a request for service, and, provided a trunk is available (3.09 or 3.10), connects the line to a trunk as described in 3.15 or 3.16. When the single access local station

is used in a dual access system (10B Data Line Concentrator), it can be connected so that it can access either trunk group. However, the call will always be connected to the same trunk group.

3.14 If there are no trunks available, the concentrator will generate and send a camp-on signal toward the station. The concentrator will continue to send the camp-on signal toward the station until the station removes the request for service, or a trunk becomes available. As soon as a trunk becomes available, it will be connected to the camped-on line and the camp-on signal will be removed.

Trunk Connection (Local Concentrator Trunk Arrangement)

3.15 When the concentrator connects a line to a trunk serving a computer via dc facilities, current will flow between the station and the multiple data set 109-type arrangement. This causes the port data set to turn on the CC lead, thereby indicating to the port that it is connected to a line. The computer should now send an answer-back character toward the station as an indication that the connection is complete and ready for data exchange.

Trunk Connection (Remote Concentrator Trunk Arrangement)

3.16 When the concentrator connects a line to a trunk serving a computer via a 1A Data Station, current will flow between the station and the trunk 1A Data Station. This causes the trunk 1A Data Station to send fm toward the computer 1A Data Station. Receipt of fm causes the computer 1A Data Station to turn on the CC lead, thereby indicating to the port that it is connected to a line. The computer should now send an answer-back character toward the station as an indication that the connection is complete and ready for data exchange.

Station Originated Disconnect

3.17 A station originated (TTY or CPT equipped with Data Set 109H) disconnect is initiated by operating the OFF button on the TTY or Data Set 109H, respectively. At other CPT stations, this could be an interface lead function. This places the station in the idle mode (see 3.07),

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thereby removing the 4 volts from the line and causing the loop current to drop to zero. The concentrator detects the loss of current and recognizes it as a request for disconnect.

Trunk Disconnect (Local Concentrator Trunk Arrangement)

3.18 When the concentrator detects the loss of loop current, it disconnects the line from the trunk. In addition, the loss of loop current will cause the port data set to turn off the CC lead, thereby indicating to the port that it is no longer connected to a line. Both the port and trunk now assume the idle state (see 3.08 and 3.09, respectively).

Trunk Disconnect (Remote Concentrator Trunk Arrangement)

3.19 When the concentrator detects the loss of loop current, it disconnects the line from the trunk. In addition, the loss of loop current causes the trunk 1A Data Station to send fc toward the computer. Receipt of fc causes the computer 1A Data Station to turn off the CC lead, thereby indicating to the port that it is no longer connected to a line. Both the port and trunk now assume the idle state (see 3.08 and 3.10, respectively).

Port Originated Disconnect (Local Concentrator Trunk Arrangement)

3.20 The computer may initiate a disconnect by turning off the port CD lead. This causes the port data set to remove the 4 volts from the trunk making the loop current drop to zero. The concentrator will now disconnect the line from the trunk as described in 3.18.

3.21 Since the station is still connected (turned on), the request for service is present at the line side of the concentrator. The concentrator is arranged to ignore the presence of any request for service on this line until the station initiates a disconnect (turned off) and a new service request is initiated.

Port Originated Disconnect (Remote Concentrator Trunk Arrangement)

3.22 The computer may initiate a disconnect by turning off the port CD lead. This causes

the computer 1A Data Station to send fc. Reception of fc causes the trunk 1A Data Station to remove the 4 volts from the trunk. This causes the loop current to drop to zero. The concentrator will now disconnect the line from the trunk as described in 3.19.

3.23 Since the station is still connected (turned on), the request for service is still present at the concentrator. The concentrator is arranged to ignore the presence of any request for service on this line until the station initiates a disconnect (turned off) and a new service request is initiated.

End of Transmission (EOT) Character Disconnect

3.24 Provided the station is equipped with the EOT disconnect option, a disconnect may be initiated by the transmission of an EOT character from either the computer or station. Detection of the EOT character will cause the station to remove the 4 volts from the line, causing the loop current to drop to zero. The concentrator will detect the loss of loop current, recognize it as a request for disconnect, and disconnect the trunk as described in 3.18 or 3.19. In this case, a TTY station must be returned to idle (turned off) before a new service request may be initiated.

C. Dual Access Local Stations (Fig. 4)

3.25 The dual access local station is subject to the same line resistance limitations and is comprised of the same equipment as the single access local station (3.06). However, in this case, a LINE 1 and LINE 2 button are provided.

Station Idle, Computer-Port Idle, Trunk Idle (Local or Remote Concentrator Arrangements), and Port-Not-Ready States

3.26 In the idle state, the dual access local station, as well as the computer ports and trunks for local and remote concentrator arrangements, function in the same manner as described in 3.07 through 3.12 for single access local stations.

DATA-PHONE INTERCONNECTION ARRANGEMENT (Trunk Side) Idle State

3.27 In the idle state, the CO is disconnected from the DATA-PHONE interconnection arrangement which in turn applies 4 volts to the trunk. As long as a line is not connected to the trunk, there will be no current flow in the loop. The concentrator recognizes the 4 volts/no-current condition as the trunk idle state.

Dual Access Call Origination

3.28 A call is originated from a dual access station by operating either of two buttons. If the call is to be directed to trunk group A, the LINE 1 button is operated. This causes the station to apply 4 volts to the line and current flows between the concentrator and the station. If the call is to be directed to trunk group B, the LINE 2 button is operated. This causes the station to apply 4 volts to the line in the ***opposite*** polarity of that which is applied by the LINE 1 button. In either case, current will flow between the concentrator and the station. The concentrator detects the presence of voltage on the loop, recognizes it as a request for service, determines (from the polarity) which trunk group is being requested, and, provided a trunk in the group requested is available (3.09, 3.10, or 3.27), connects the line to the idle trunk as described in 3.15, 3.16, or 3.30.

3.29 If there are no trunks available in the group requested, the concentrator will generate and send toward the station the camp-on signal as described in 3.14.

Trunk Connection (Trunk Side DATA-PHONE Interconnection Arrangement)

3.30 When the concentrator connects a line to a DATA-PHONE trunk, current flows between the station and the DATA-PHONE interconnection arrangement. This causes the interconnection arrangement to signal the CO that a line is connected to the trunk. The CO then returns dial tone. Upon receipt of the dial tone, the station attendant may dial into the DDD network.

Station Originated Disconnect

3.31 A station originated disconnect of a dual access local station is initiated and functions in the same manner as for a single access local station (3.17).

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Trunk Disconnect (Local or Remote Concentrator Trunk Arrangements)

3.32 The trunks for local or remote concentrator arrangements disconnect from dual access local stations in the same manner as for the single access local station (3.18 or 3.19).

Trunk Disconnect (Trunk Side DATA-PHONE Interconnection Arrangement)

3.33 When the concentrator detects the loss of loop current, it disconnects the line from the trunk. In addition, the loss of loop current causes the DATA-PHONE interconnection arrangement (trunk side) to disconnect from the CO and remove the 4 volts from the trunk for a predetermined period of time. This ensures that the trunk disconnect sequence is completed before the trunk can be selected for another service request. At the end of this interval, the DATA-PHONE interconnection arrangement again assumes the idle mode (3.27).

Called DATA-PHONE Station Originated Disconnect (Trunk Side DATA-PHONE Interconnection Arrangement)

3.34 A trunk originated disconnect is initiated when the called station disconnects from the DDD network. The DATA-PHONE interconnection arrangement detects the loss of carrier from the far end, disconnects from the CO, and removes the 4 volts from the trunk for a predetermined period of time. This allows the disconnect sequence to be completed before the trunk can be selected for another service request. The concentrator detects the loss of current, recognizes it as a request for disconnect, and disconnects the line from the trunk.

3.35 Since the station is still turned on, the request for service is still present at the concentrator. The concentrator is arranged to ignore the presence of a service request from this line until the station is turned off and a new service request is initiated. After the predetermined period of time has elapsed, the DATA-PHONE interconnection arrangement reapplies the 4 volts to the trunk, thereby restoring the trunk to the idle mode (3.27).

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Port Originated Disconnect (Local or Remote Concentrator Trunk Arrangements)

3.36 A port originated disconnect of a dual access local station functions in the same manner as described in 3.20 and 3.21 (local concentrator trunk arrangement) or 3.22 and 3.23 (remote concentrator trunk arrangement).

EOT Character Disconnect

3.37 The EOT character disconnect of a dual access local station is subject to the same restrictions and functions in the same manner as described in 3.24 (single access local station).

D. Remote Private Line Stations (Fig. 5)

3.38 Remote PL stations are those that are located outside the Data Set 109-type line resistance limitations (beyond the dc signaling range) of the multiple arrangement data set, trunk side 1A Data Station, or trunk side DATA-PHONE interconnection arrangement (dual access only). The remote PL station does not have dual access capabilities and therefore, it can be wired to connect to trunk group A or trunk group B if this trunk group is ***not*** arranged for DDD access. These stations will fall into one of two categories.

(a) ***Short haul stations***—These stations utilize PL voiceband channels as their transmission facility.

(b) ***Long haul stations***—These stations utilize PL telegraph channels as their transmission facility.

3.39 The remote PL stations are comprised of:

(a) A model 33- or 35-type TTY equipped with one of the following:

(1) Data Set 109C-type (long haul HDX)

(2) Data Set 109F-type (long haul FDX)

(3) Data Auxiliary Set (DAS) 820D-L1A, AR430 circuit pack, and a Data Set 108A-(long haul) or 108C-(short haul) type.

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(b) A CPT equipped with one of the following:

(1) Data Set 109H-type (long haul HDX or FDX)

(2) DAS 820D-L1, AR430 circuit pack, and a data set 108A-(long haul) or 108C-(short haul) type.

3.40 When the DLCS is used to serve a remote PL station, the PL interconnection arrangement is required at the concentrator to provide the dc supervision needed for the concentrator. In addition, the hubs serving long haul stations must be arranged to send space toward the concentrator and mark toward the station when a carrier failure occurs.

Station Idle State

3.41 In the idle state, the Data Set 108-type station sends the steady spacing frequency (fs) toward the concentrator. In the case of a Data Set 109-type station, no current flows in the station loop and the hub sends the steady space to the concentrator. The PL interconnection arrangement detects the spacing signal, opens the concentrator line, and no current flows between the PL interconnection arrangement and the concentrator. The concentrator recognizes the no-current condition as the station idle state.

Computer Port Idle, Trunk Idle, and Port-Not-Ready States

3.42 The computer ports and trunks utilized by a concentrator which is serving remote PL stations function in the same manner as those for concentrators serving local stations (see 3.08 through 3.12).

Call Origination

3.43 A call is originated from a remote PL station by operating a button on the station terminal equipment (TTY station) or data set (CPT station).

Note: In addition, stations equipped with DAS 820D-type or Data Set 109H-type can be optionally arranged (CD lead control option) to originate a call when the terminal equipment is turned on.

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This causes the Data Set 108-type station to transmit a steady marking frequency (fm) toward the concentrator. In the case of the Data Set 109-type station, current now flows between the station and the hub causing the hub to send a steady marking signal toward the concentrator. The PL interconnection arrangement detects the marking signal and places 4 volts across the line. Current now flows between the PL interconnection arrangement and the concentrator. The concentrator detects the presence of voltage on the loop, recognizes it as a request for service, and, provided a trunk is available (3.09 or 3.10), connects the line to a trunk as described in 3.15 or 3.16. If there are no trunks available, the concentrator generates the camp-on signal and sends it toward the station as described in 3.14.

Station Originated Disconnect

3.44 A station originated disconnect is initiated by operating a button on the station terminal equipment (TTY station) or data set (CPT station). This places the station in the idle state (see 3.20), thereby causing the station (or hub) to send a steady spacing signal toward the concentrator. The PL interconnection arrangement detects the spacing signal and removes the 4 volts from the concentrator line. This causes the loop current to drop to zero. The concentrator detects the no-current condition and recognizes it as a request for disconnect. The trunk then disconnects as described in 3.18 or 3.19.

Port Originated Disconnect (Local or Remote Concentrator Trunk Arrangement)

3.45 The computer may originate the disconnect of a remote PL station in the same manner as described in 3.20 and 3.21 (local concentrator trunk arrangements) or 3.22 and 3.23 (remote concentrator trunk arrangements).

EOT Disconnect

3.46 As for the local station, a remote PL station equipped with the EOT disconnect option may be disconnected by the transmission of an EOT character from either the station or the computer. Detection of the EOT by the station terminal equipment causes the station (or hub) to send a steady spacing signal toward the concentrator. The PL interconnection arrangement detects the

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spacing signal and removes the 4 volts from the line, thereby causing the loop current to drop to zero. The concentrator detects the no-loop current condition and disconnects the line from the trunk as described in 3.18 or 3.19.

E. Remote DATA-PHONE Stations (Fig. 6)

3.47 Remote DATA-PHONE stations are those stations which access the concentrator via the direct distance dialing (DDD) network. The remote DATA-PHONE station does not have dual access capabilities and, therefore, it will always be connected to trunk group A. The remote DATA-PHONE station is comprised of a station terminal equipped with a DATA-PHONE data set. When the DLCS is used to serve a DATA-PHONE station, the DATA-PHONE interconnection arrangement is required at the concentrator to provide the dc supervisory signaling needed for the concentrator. In addition, a DATA-PHONE station connection to a computer must be limited to only one stage of concentration and one 1A Data Station link.

Station Idle State

3.48 In the idle state, the DATA-PHONE station and DATA-PHONE interconnection arrangement are disconnected from the DDD network. The DATA-PHONE interconnection arrangement opens the concentrator line and no current flows between the interconnection arrangement and the concentrator. The concentrator recognizes the no-loop current condition as the station idle state.

Computer Port Idle, Trunk Idle, and Port-Not-Ready States

3.49 The computer ports and trunks utilized by a concentrator which is serving DATA-PHONE stations function in the same manner as those for concentrators serving local stations (see 3.08 through 3.12).

Call Origination

3.50 A call is originated from a DATA-PHONE station by dialing the discrete number of a DDD line associated with the concentrator. The DATA-PHONE interconnection arrangement automatically answers the call in the data mode and then places 4 volts across the concentrator line. Current now flows between the concentrator and the DATA-PHONE interconnection arrangement. The concentrator detects the loop current condition and, provided a trunk is available (3.09 or 3.10), connects the line to a trunk as described in 3.15 or 3.16. If there are no trunks available, the concentrator generates the camp-on signal and sends it toward the station as described in 3.14. The camp-on signal will not affect the DATA-PHONE connection, which will remain established while the station is awaiting availability of a part. However, the attendant at the DATA-PHONE station can, if desired, initiate a disconnect while receiving the camp-on signal.

Station Originated Disconnect

3.51 A station originated disconnect is initiated by returning the DATA-PHONE station to the idle state. This causes the station to disconnect from the DDD network. The DATA-PHONE interconnection arrangement detects the loss of carrier, disconnects from the DDD network, and removes the 4 volts from the concentrator line. This causes the loop current to drop to zero. The concentrator detects the no-current condition and recognizes it as a request for disconnect. The concentrator then disconnects the trunk from the line as described in 3.18 or 3.19.

Port Originated Disconnect (Local or Remote Concentrator Trunk Arrangement)

3.52 The computer originates the disconnect of a remote DATA-PHONE station in the same manner as described in 3.20 (local concentrator trunk arrangement) or 3.22 (remote concentrator trunk arrangement). In this case, the loss of loop current is detected by the DATA-PHONE interconnection arrangement which will disconnect from the DDD network. The remote DATA-PHONE station will detect the loss of carrier, disconnect itself from the DDD network, and assume the idle state. A new call may now be placed from the station in the normal manner.

EOT Disconnect

3.53 When a remote DATA-PHONE station is equipped with the EOT disconnect option, it may be disconnected by the transmission of an EOT character from either the station or the

computer. Detection of the EOT by the station terminal equipment causes the station to disconnect in the same manner as described in 3.51 for station originated disconnects.

F. Remote Data Terminals Which Access a Concentrator via a 1A Data Station Link (Fig. 7)

3.54 Remote data terminals which utilize a 1A Data Station link to access a concentrator are comprised of a model 33-type TTY, 35-type TTY, or CPT equipped with a logic package. The logic package allows the TTY or CPT to present voltage signals that conform to the Electronics Industries Association (EIA) Standard RS-232-B to the terminal 1A Data Station. There is no data set of any kind required at the terminal equipment location. However, the terminal equipment must be located within 50 feet of the terminal 1A Data Station.

Terminal Idle State

3.55 When the station is in the idle state, the CD lead to the terminal 1A Data Station is in the off condition. With the CD lead off, the terminal 1A Data Station will transmit the center frequency (fc) toward the concentrator. Detection of the fc causes the concentrator line side 1A Data Station to open the concentrator line, thereby stopping the current flow between the concentrator line side 1A Data Station and the concentrator. The concentrator recognizes the no-loop current condition as the terminal idle state.

Computer Port Idle, Trunk Idle, and Port-Not-Ready States

3.56 The computer ports and trunks utilized by a concentrator serving data terminals which access a concentrator via a 1A Data Station link, function in the same manner as described in 3.08 through 3.12.

Call Origination

3.57 A call is originated from a data terminal which accesses a concentrator via a 1A Data Station link by turning on the data terminal. This turns on the CD lead of the terminal 1A Data Station, thereby causing it to send the marking frequency (fm) toward the concentrator. The concentrator line side 1A Data Station detects the fm signal and applies 4 volts across the concentrator line. Current now flows between the concentrator line side 1A Data Station and the concentrator. The concentrator recognizes the loop current condition as a request for service, and, provided a trunk is available (3.09 or 3.10), connects the line to a trunk as described in 3.15 or 3.16. In addition, the loop current condition causes the concentrator line side 1A Data Station to send fm toward the terminal. Detection of the fm causes the terminal 1A Data Station to turn on the CC lead.

3.58 If there are no trunks available, the concentrator generates the camp-on signal and sends it toward the terminal as described in 3.04 and 3.14.

Data Terminal Originated Disconnect

3.59 A terminal originated disconnect is initiated by turning off the data terminal. This turns off the CD lead which in turn causes the terminal 1A Data Station to send fc toward the concentrator. Detection of the fc causes the concentrator line side 1A Data Station to remove the 4 volts from the concentrator line. With the 4 volts removed from the line, the loop current drops to zero. The concentrator detects the no-current condition, recognizes it as a request for disconnect, and then disconnects the line from the trunk as described in 3.18 or 3.19. In addition, the concentrator line side 1A Data Station also detects the no-current condition of the loop and sends fc toward the terminal. The terminal 1A Data Station detects the fc and turns off the CC lead. This indicates to the data terminal that it is no longer connected to the line.

Port Originated Disconnect (Local or Remote Concentrator Trunk Arrangement)

3.60 The computer originates the disconnect of a data terminal which accesses a concentrator via a 1A Data Station link in the same manner as described in 3.20 and 3.21 (local concentrator trunk arrangement) or 3.22 and 3.23 (remote concentrator trunk arrangement).

SECTION TITLE

EOT Disconnect

3.61 When the data terminal TTY or CPT is equipped with the EOT disconnect option, it may be disconnected by the transmission of an EOT from either the terminal or computer. Detection of the EOT by the TTY or CPT causes the data terminal to disconnect in the same manner as for the data terminal originated disconnect described in 3.59.

G. Remote Data Stations Which Access the Computer via Tandem Concentrators (Fig. 8)

3.62 At installations where two concentrators are connected in tandem, the 1A Data Station will be used to provide the interconcentrator trunks. The interconcentrator trunk 1A Data Stations should be physically located adjacent to their respective concentrators.

3.63 The tandem concentrator may be used to serve remote PL stations, and/or remote data terminals which access the tandem concentrator via a 1A Data Station link, and/or stations which appear to the tandem concentrator as local stations. In no case can the tandem concentrator be used to serve a remote DATA-PHONE station or another tandem concentrator. The tandem concentrator may be either a 10A or 10B Data Line Concentrator. When a primary 10B concentrator is used in tandem with another 10B concentrator, the interconcentrator trunks do not have dual access capabilities. Therefore, the primary concentrator will always connect calls received from the tandem concentrator to one trunk group.

Station(s) Idle

3.64 In the idle state, remote stations which access a tandem concentrator function in the same manner as described in 3.07 (single or dual access local stations), 3.42 (remote PL stations), and 3.55 (remote data terminals which access the concentrator via a 1A Data Station link).

Interconcentrator Trunk (1A Data Stations) Idle State

3.65 In the idle state, both 1A Data Stations in the interconcentrator trunk link send fc. The primary concentrator line side 1A Data Station is arranged to squelch its output to the primary concentrator on receipt of fc, thereby making the interconcentrator trunk appear idle to the primary concentrator. The tandem concentrator trunk side 1A Data Station is equipped to squelch its output to the tandem concentrator for a specific time interval upon receipt of fc. This is to insure that the stations are disconnected from the tandem concentrator when the computer originates a disconnect. After the specific time interval elapses, the tandem concentrator trunk side 1A Data Station applies 4 volts to the trunk of the tandem concentrator. Since there is no line connected, there will be no current flow between the tandem concentrator and the tandem concentrator trunk side 1A Data Station. The tandem concentrator recognizes the 4 volt/no-current condition as the trunk idle state.

Computer Port Idle, Computer Trunk Idle, and Port-Not-Ready States

3.66 The computer ports and trunks in the tandem concentrator arrangement function in the same manner as described in 3.08 through 3.12.

Call Origination

3.67 A call is originated at stations in a tandem concentrator arrangement in the same manner as described in 3.13 (single access local stations), 3.28 (dual access local stations), 3.43 (remote PL stations), and 3.57 (remote data terminals which access the computer via a 1A Data Station link). When the tandem concentrator detects the service request, it connects the station line to the interconcentrator trunk (if one is idle) and current flows between the tandem concentrator trunk side 1A Data Station and the data station. If all interconcentrator trunks are busy, the tandem concentrator will generate and send the camp-on signal toward the station. When the line is connected, the tandem concentrator trunk side 1A Data Station will send fm toward the primary concentrator. Reception of fm unsquelches the output of the primary concentrator line side 1A Data Station which applies 4 volts to the line side of the primary concentrator. Current now flows between the primary concentrator and the primary concentrator line side 1A Data Station which starts sending fm toward the tandem concentrator trunk side 1A Data Station.

SECTION TITLE

Trunk Connection (Local and Remote Concentrator Trunk Arrangements)

3.68 When the primary concentrator recognizes the service request from the tandem concentrator trunk side 1A Data Station, it will connect the interconcentrator trunk to a computer trunk in the same manner as described in 3.15 (local concentrator trunk arrangement) or 3.16 (remote concentrator trunk arrangement).

Station Originated Disconnect

3.69 A station originated disconnect is initiated in the same manner as described in 3.17 (single access or dual access local stations), 3.44 (remote PL stations), and 3.59 (remote data terminals which access the computer via a 1A Data Station link). When the tandem concentrator detects the request for disconnect, it opens the loop between the station and the tandem concentrator trunk side 1A Data Station. This 1A Data Station now sends fc toward the primary concentrator. Detection of fc squelches the output of the primary concentrator line side 1A Data Station which removes the 4 volts from the line side of the primary concentrator and current ceases to flow in the trunk loop. The primary concentrator recognizes this as a request for disconnect and disconnects the trunk in the same manner as described in 3.18 (local concentrator trunk arrangement) or 3.19 (remote concentrator trunk arrangement). In addition, the loss of loop current causes the primary concentrator line side 1A Data Station to send fc toward the tandem concentrator trunk side 1A Data Station. Detection of fc initiates the timed squelch feature of the tandem concentrator trunk side 1A Data Station which removes the 4 volts from the trunk of the tandem concentrator for the specific preset time interval. This is recognized by the tandem concentrator as the interconcentrator trunk busy state and allows the rest of the disconnect sequence to be completed without this interconcentrator trunk being selected again. When the timed squelch period expires, the tandem concentrator trunk side 1A Data Station again applies 4 volts to the trunk of the tandem concentrator and the system is in the idle state.

Port Originated Disconnect

3.70 The computer may originate a disconnect in the same manner as described in 3.20 (local concentrator trunk arrangement) and 3.22 (remote concentrator trunk arrangement). When the primary concentrator disconnects the interconcentrator trunk from the computer trunk, the loop current drops to zero causing the primary concentrator line side 1A Data Station to send fc toward the tandem concentrator trunk side 1A Data Station. Detection of the fc squelches the output of the tandem concentrator trunk side 1A Data Station which removes the 4 volts from the trunk of the tandem concentrator for a specific time interval. This causes the tandem concentrator loop current to drop to zero and the tandem concentrator trunk side 1A Data Station will now send fc toward the primary concentrator. The interconcentrator trunk to computer trunk disconnect is now complete.

3.71 The loss of loop current in the tandem concentrator loop causes the tandem concentrator to disconnect the line from the interconcentrator trunk. When the timed squelch interval expires, the tandem concentrator trunk side will again apply 4 volts to the trunk of the tandem concentrator to indicate that the interconcentrator trunk is idle.

3.72 Since the station terminal equipment is still turned on, the request for service is still present at the line side of the tandem concentrator. The tandem concentrator is arranged to ignore any request for service on this line until the station is turned off and a new call is originated.

EOT Disconnect

3.73 If the station terminal equipment is provided with the EOT disconnect option, detection of an EOT character will turn off the station. The call will then be disconnected in the same manner as when the station is turned off manually (3.69).

4. REFERENCES

4.01 The following Bell System Practices (BSPs) pertain to the DLCS system.

SECTION	TITLE
591-811-100	10A Data Line Concentrator (DLCS)— Description
591-811-101	10B Data Line Concentrator (DLCS)—Description

SECTION	TITLE
591-YYY-1ZZ	Data Set 109H-Type Used in 10-Type Data Line Concentrator System (DLCS)
591-023-110	Data Set 108A- or C-Type Single Private Line Station Using Data Auxiliary Set 820D-L1A in the 10-Type Data Line Concentrator System (DLCS)—Description
591-813-100	1A Data Station Multichannel Arrangement—Description and Operation
591-811-102	Private Line Interconnection Arrangement for Line Side of 10-Type Data Line Concentrator (DLCS)—Description
591-811-103	DATA-PHONE Interconnection Arrangement for Line Side of 10-Type Data Line Concentrator (DLCS)—Description
591-029-101	Data Set 109D-Type Multiple Data Set Arrangement Using 28A1 Data Mounting and 27A1 Data Unit—Description
591-811-104	DATA-PHONE Interconnection Arrangement for Trunk Side of 10-Type Data Line Concentrator (DLCS)—Description
591-035-101	Data Set 109F-Type Used in 10-Type Data Line Concentrator System (DLCS)—Description
591-031-101	Data Set 109C-Type Used in 10-Type Data Line Concentrator System (DLCS)—Description
591-036-101	Data Set 109E-Type Multiple Data Set Arrangement Using 28A1 Data Mounting and 27A1 Data Unit—Description
591-814-100	113-Type Data Station—Description and Operation

SECTION	TITLE
4.02	The following circuit description (CD) and schematic drawing (SD) pertain to the various units of the DLCS.
	(a) 10A Data Line Concentrator—
SD & CD-73055-01	Data Systems—No. 10A Data Concentrator and 803E1 Data Auxiliary Set
	(b) 10B Data Line Concentrator—
SD- & CD-1D212-01	Data Systems Station—No. 10B Data Line Concentrator
	(c) PL Interconnection Arrangement—
SD- & CD-1D200-01	Data System—Private Line/ DLCS Interconnection Circuit (Line Side)
	(d) DATA-PHONE Interconnection Arrangement—
SD- & CD-1D197-01	Data Systems Station—DDD Incoming Circuit for the DLCS Concentrator
SD- & CD-1D201-01	Data Systems Station—DDD Outgoing Circuit for the DLCS Concentrator.
	(e) Remote PL Stations—
SD- & CD-3D031-01	Data Systems Station—Data Auxiliary Sets 820D- and 820E-Type
SD- & CD-3D024-01	Data Systems Station—Data Set 108A-Type
SD- & CD-3D032-01	Data Systems Station—Data Set 108C-Type
SD- & CD-1D164-01	Data Sytems Station—Data Set 109C-Type
SD- & CD-1D199-01	Data Systems Station—Data Set 109F-Type
SD- & CD-1D220-01	Data Systems Station—Data Set 109H-Type

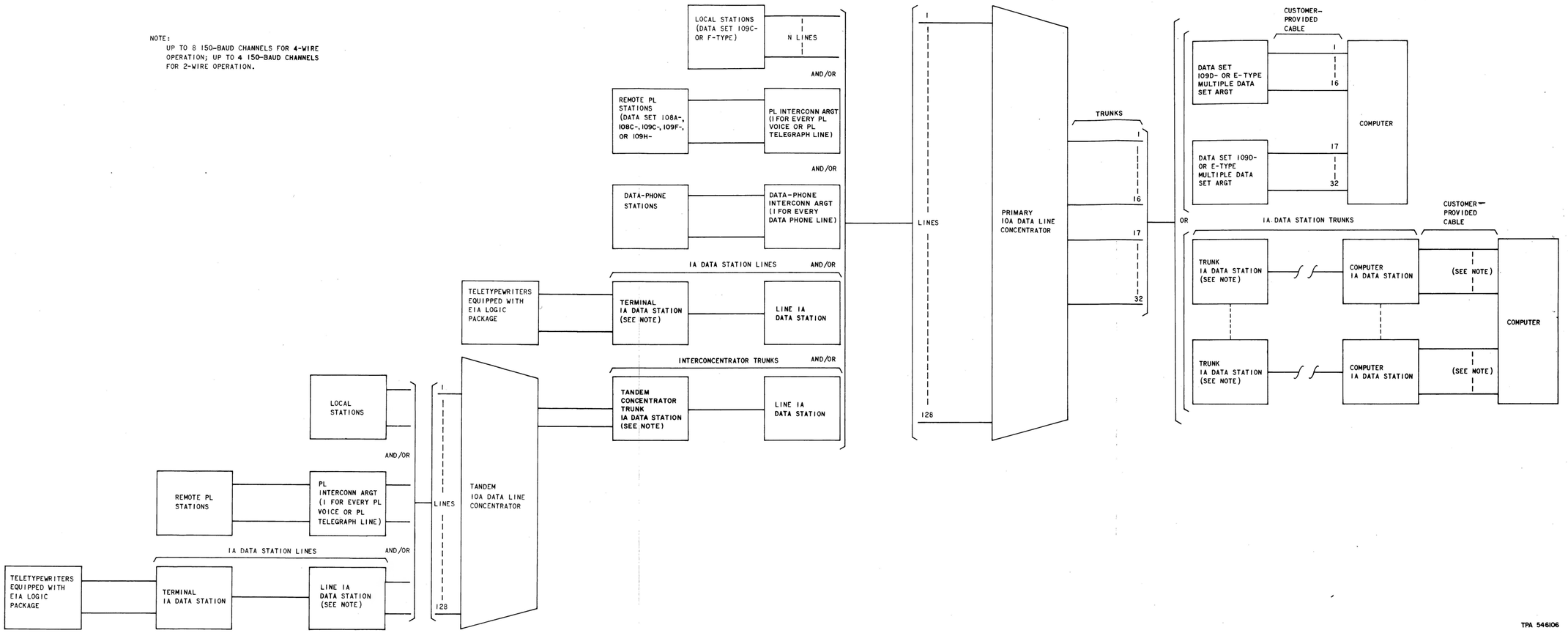


Fig. 1—Typical Arrangement of DLCS Using 10A Data Line Concentrator

NOTES:
1. UP TO 8 150-BAUD CHANNELS FOR 4-WIRE OPERATION; UP TO 4 150-BAUD CHANNELS FOR 2-WIRE OPERATION.
2. MAY GO TO DATA SET 109D- OR E-TYPE MULTIPLE DATA SET ARRANGEMENT, 1A DATA STATION, INTERCONCENTRATOR TRUNK 1A DATA STATION, OR TRUNK DATA-PHONE INTERCONNECTION ARRANGEMENT WHEN TANDEM CONCENTRATOR IS A 10B DATA LINE CONCENTRATOR.
3. 10B DATA LINE CONCENTRATOR ONLY.

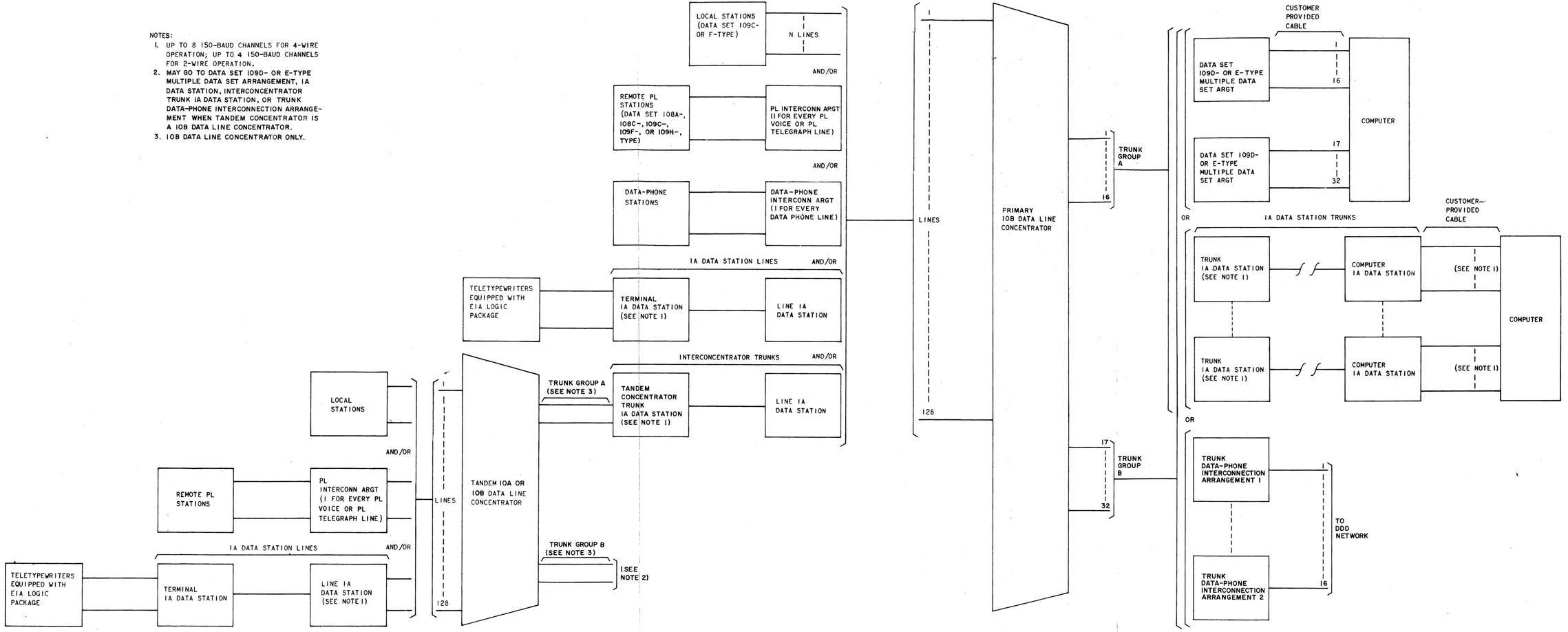


Fig. 2—Typical Arrangement of DLCS Using 10B Data Line Concentrator

* IOB DATA LINE CONCENTRATOR ONLY.

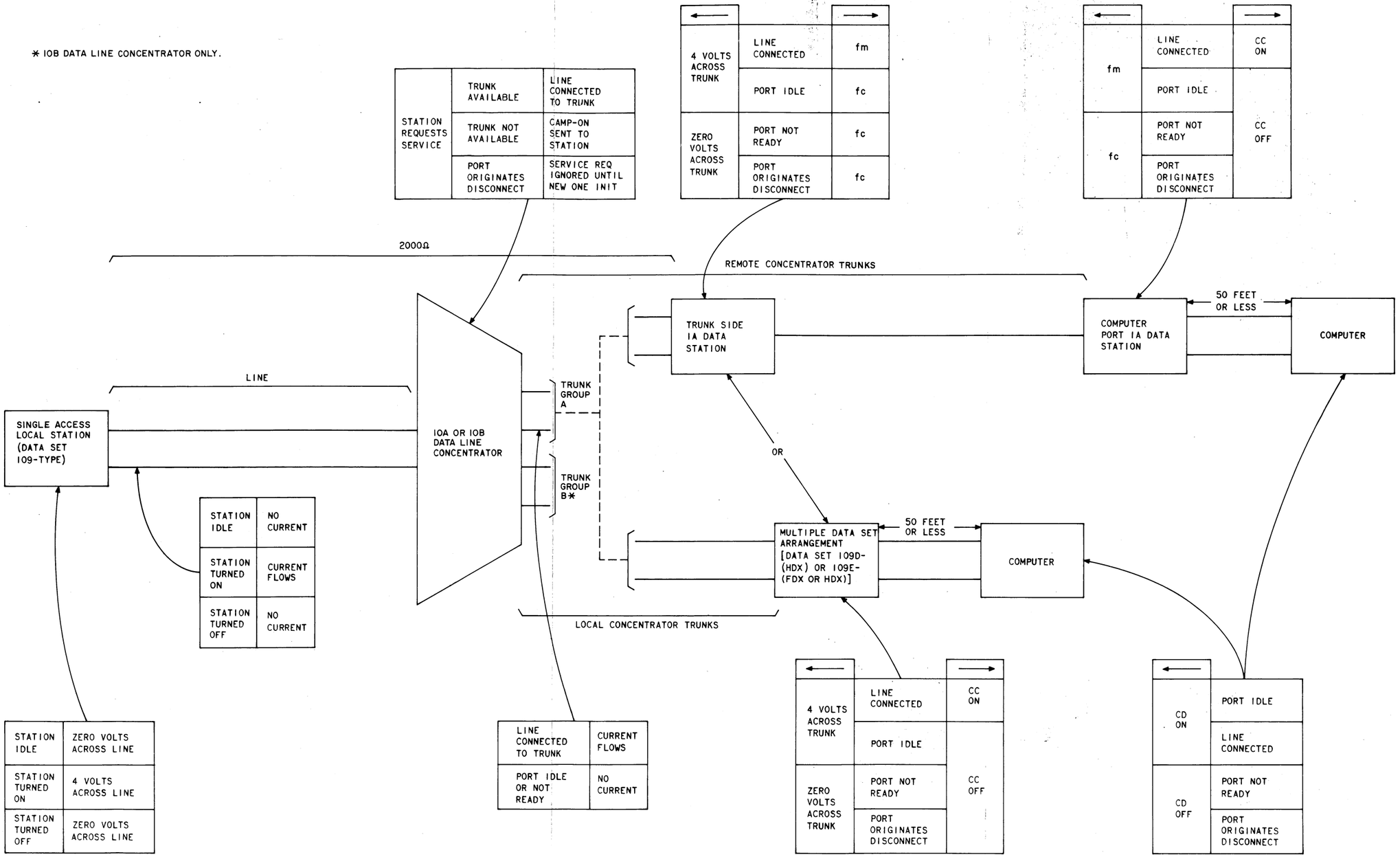


Fig. 3—Block Diagram of DLCS Single Access Local Station Service Arrangement (10A- or 10B-Type Data Line Concentrator)

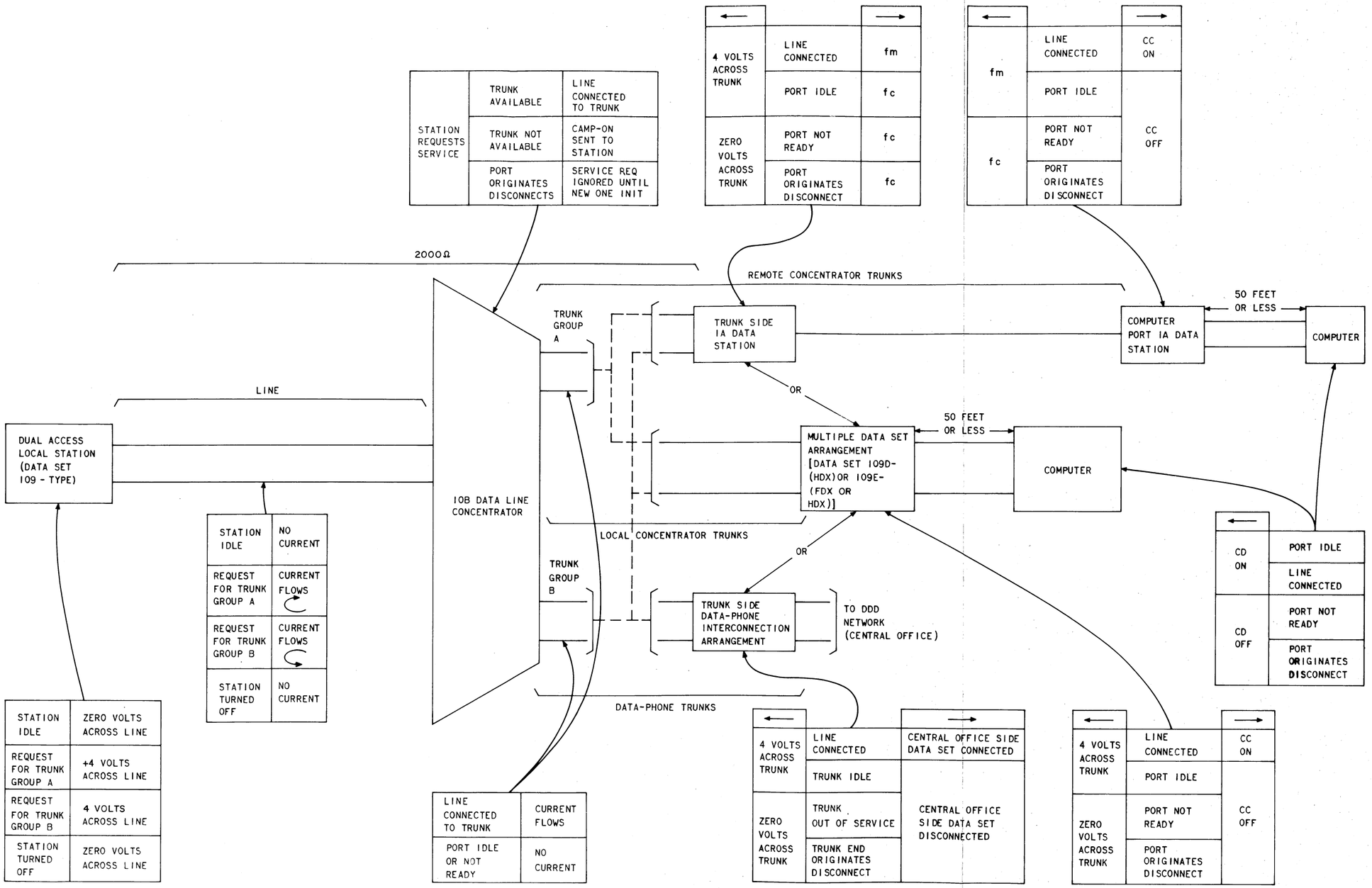
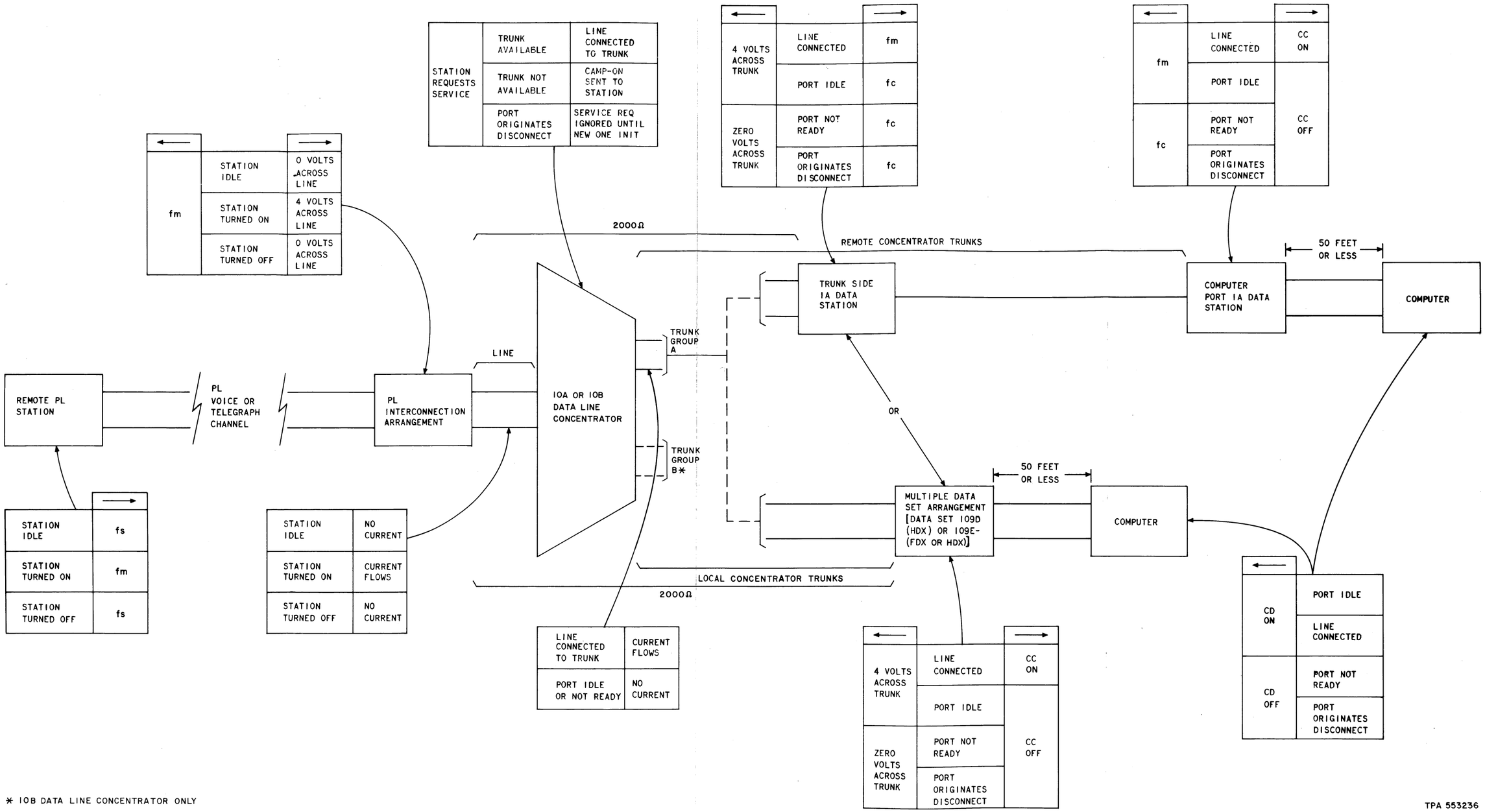


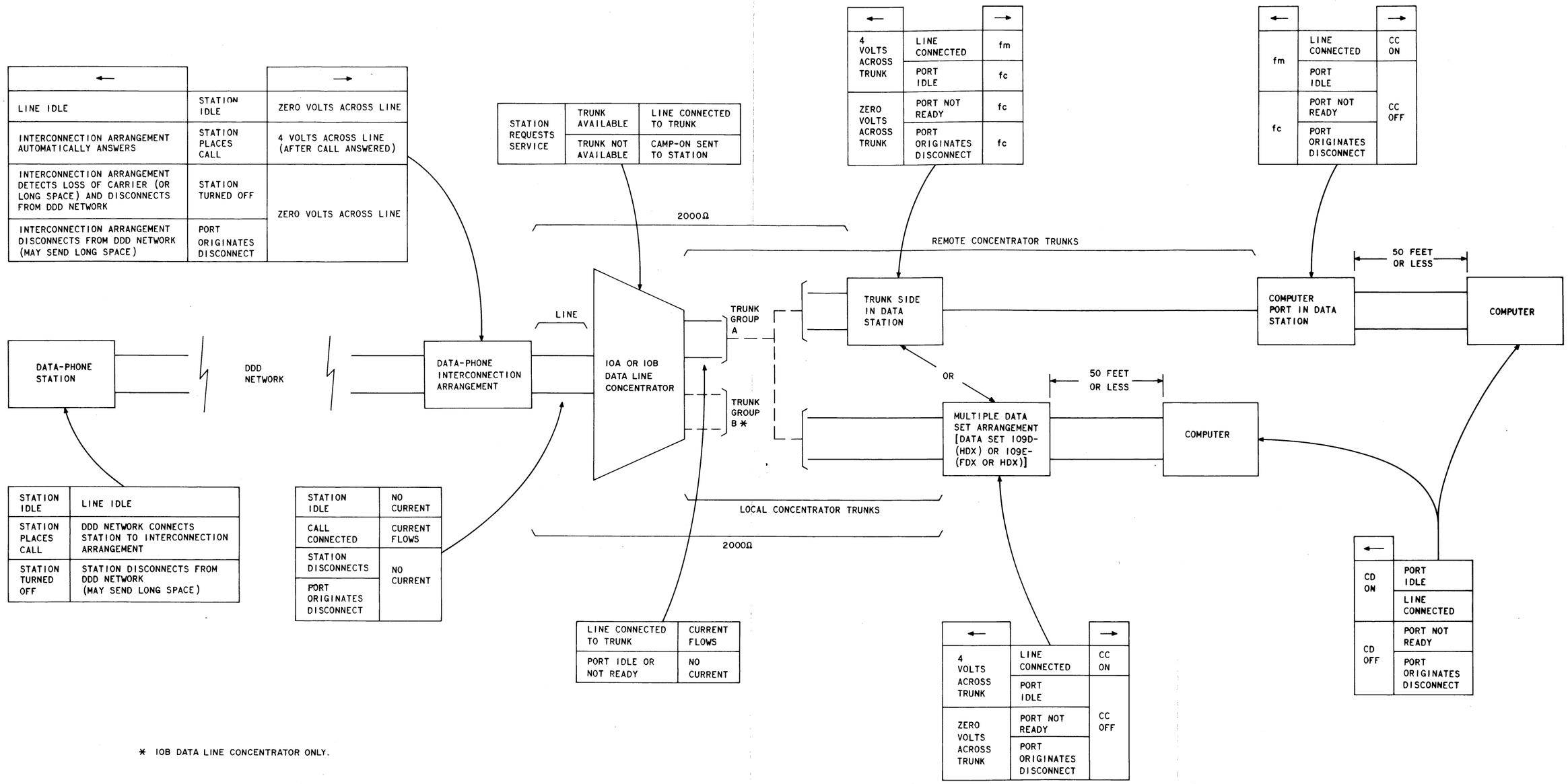
Fig. 4—Block Diagram of DLCS Dual Access Local Station Service Arrangement (10B Data Line Concentrator)



* 10B DATA LINE CONCENTRATOR ONLY

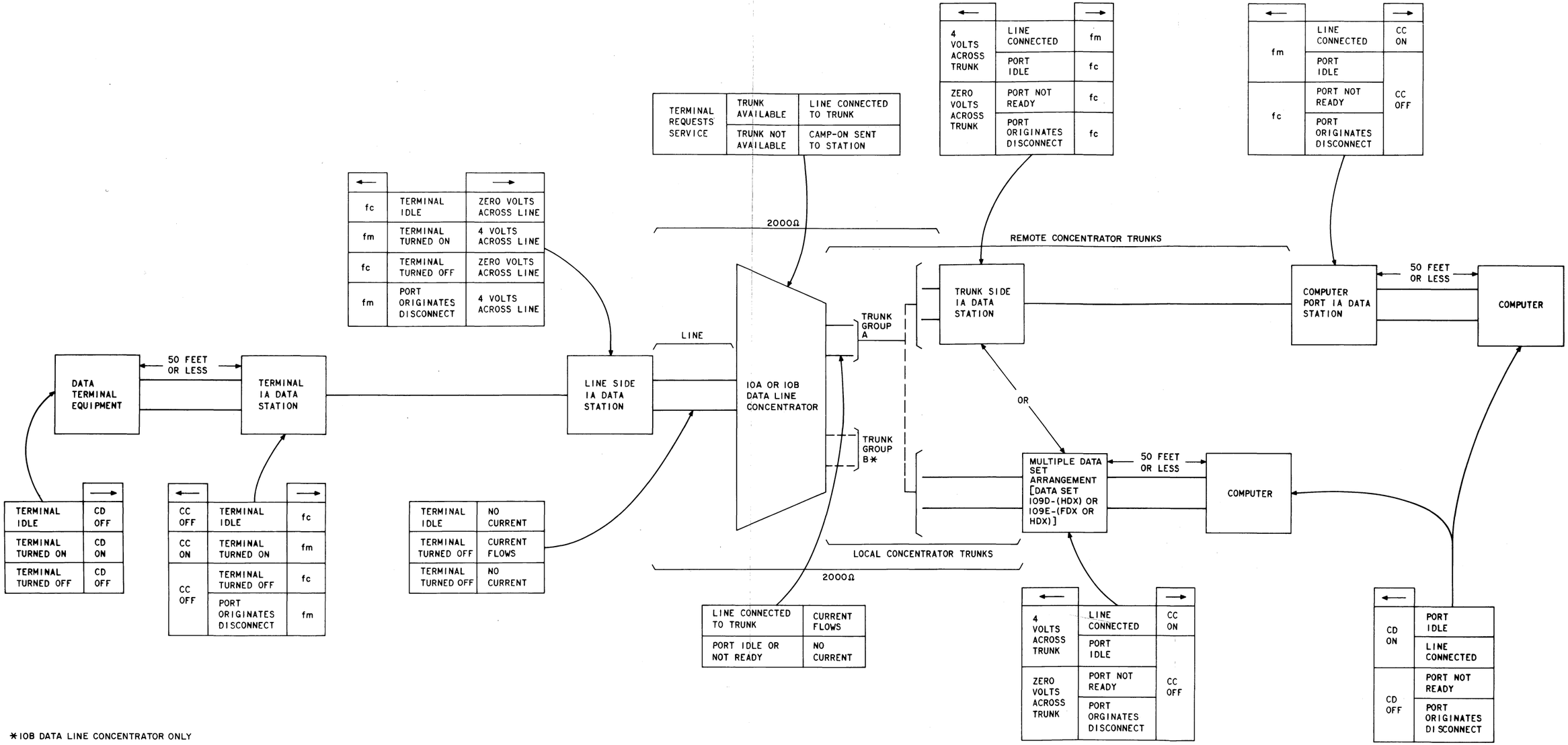
TPA 553236

Fig. 5—Block Diagram of DLCS Remote PL Station Service Arrangement (10A- or 10B-Type Data Line Concentrator)



* 10B DATA LINE CONCENTRATOR ONLY.

Fig. 6—Block Diagram of DLCS Remote DATA-PHONE Station Service Arrangement (10A- or 10B-Type Data Line Concentrator)



*10B DATA LINE CONCENTRATOR ONLY

Fig. 7—Block Diagram of DLCS Service Arrangement for Remote Data Terminals Which Access the Concentrator via a 1A Data Station Link (10A- or 10B-Type Data Line Concentrator)

* 10B DATA LINE CONCENTRATOR ONLY.

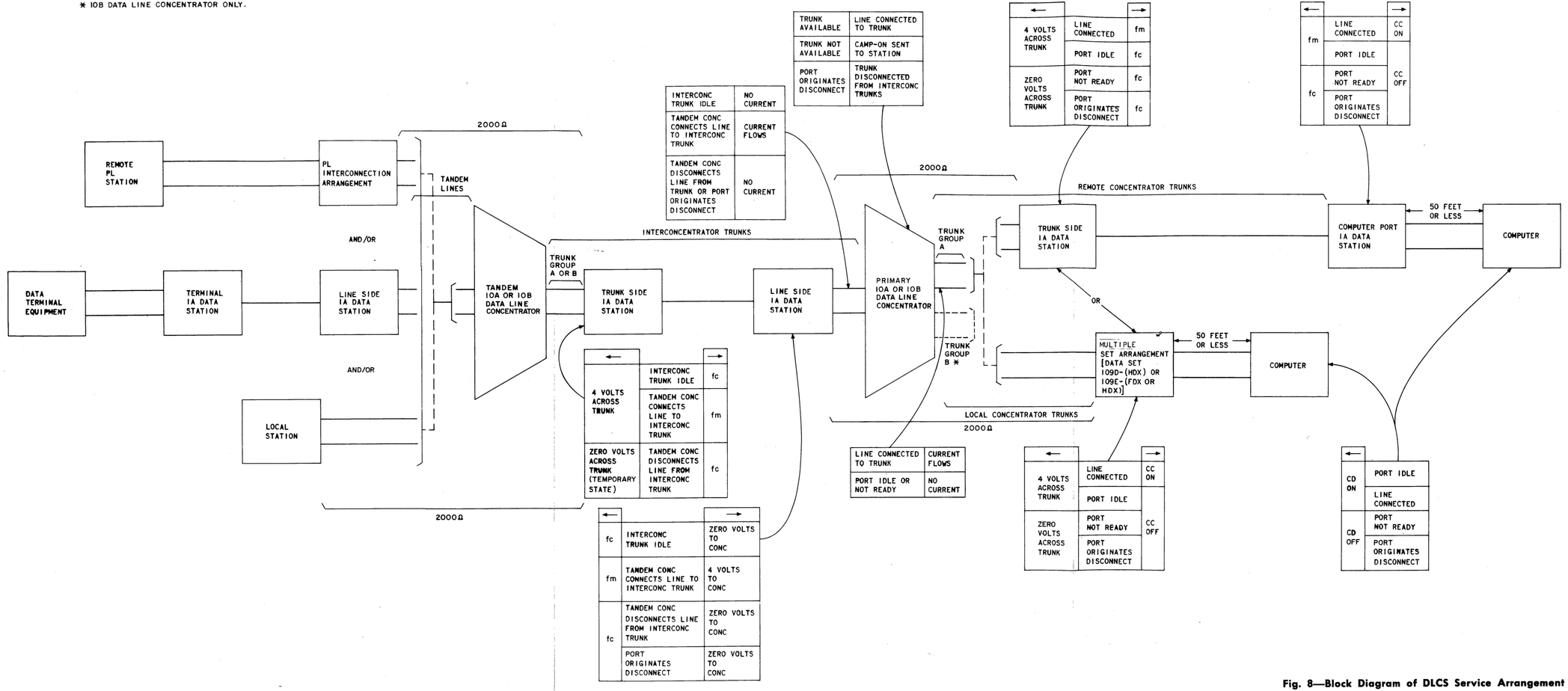


Fig. 8—Block Diagram of DLCS Service Arrangement for Remote Stations Which Access the Computer via Tandem Concentrators (10A-Type Data Line Concentrator)