SIGNALING LINKS

DESCRIPTION

COMMON CHANNEL SIGNALING SYSTEMS

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Figures

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1. GENERAL

A. Introduction

1.01 This AT&T Practice provides a physical and functional description of analog and digital SLKs (signaling links) used in a CCS (common channel signaling) network.

1.02 This AT&T Practice is a general revision, and as such, no revision arrows have been used to denote changes.

B. Definition

1.03 Signaling links are the paths within a CCS network used for the reliable transfer of

switching and control signals between central processor controlled nodes on the CCS network. Figure 1 provides a high level perspective of a CCS signaling link.

1.04 Signaling links connect an STP (signal transfer point) central processor to other nodes on a CCS network. An STP office can be a 2STP (No.2 signal transfer point) or 2ASTP (No. 2A signal transfer point). A node on a CCS network is defined as any central processor controlled office with access to the CCS network via signaling links.

1.05 A CCS network supports two categories of SLKs. These SLKs are categorized as analog and digital. The 2STPs and 2ASTPs support both analog and digital SLKs.

1.06 Analog SLKs operate at a signaling rate of either 2400 bps (bits per second) or 4800 bps. All analog SLKs utilize CCIS6 signaling protocol. The CCIS6 signaling protocol is based on CCITT (International Telegraph and Telephone Consultative Committee) Signaling System No. 6.

1.07 Digital SLKs operate at a signaling rate of 56 kbps (kilobits-per-second) and utilize CCS7 signaling protocol. The CCS7 signaling protocol is based on CCITT Signaling System No. 7.

C. CCS Network Structure

1.08 A CCS network may consist of several nodes which are interconnected by different types of SLKs. The following is a description of each type SLK that may be used.

(a) ***A-Links (Access Signaling Links):*** The A-links connect STPs to nodes which provide signaling access to a CCS network from a toll network. Both analog and digital A-links may be used with 2STPs and 2ASTPs.

(b) ***B-Links (Bridge Signaling Links):*** The B-links connect STPs in one region to STPs in other regions. Digital B-links are used with 2STPs and 2ASTPs.

(c) ***C-Links (Cross Signaling Links):*** The C-links connect the control STP to the mate STP of the same region. Digital C-links are used with 2STPs and 2ASTPs.

1.09 Each mated SLK normally accommodates a load of approximately one-half of its maximum load capacity. This arrangement allows each mated SLK to serve its normal load and the load of its mate should the mate SLK fail.

1.10 Generally, an analog 2400-bps SLK provides one-half the signaling capacity of an analog 4800-bps SLK. A digital 56-kbps SLK provides more than thirteen (13) times the signaling capacity of an analog 2400-bps SLK and more than six and one-half (6 and 1/2) times the signaling capacity of an analog 4800-bps SLK.

2. ANALOG SIGNALING LINKS

2.01 Analog SLKs operate at a 2400-bps or 4800-bps rate and use CCIS6 signaling protocol for transporting signaling messages within a CCS network. Figure 2 is a high level diagram of the analog SLK arrangement. An analog SLK is comprised of a

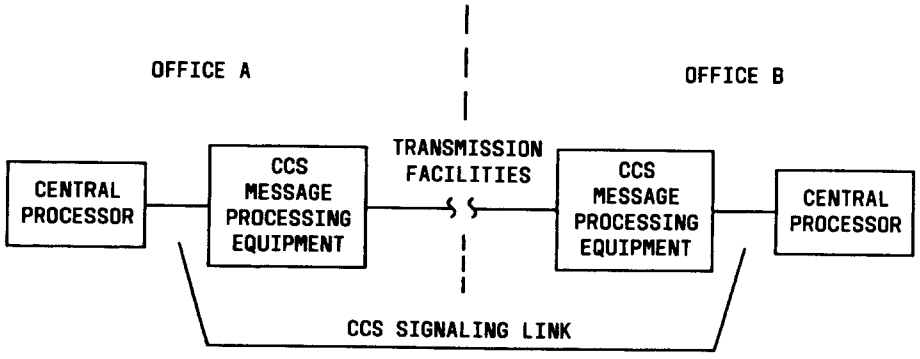


Fig. 1—CCS Signaling Link

VFL (voice frequency link), a data link, and two link nodes (or one link node and the functional equivalent at the far-end office).

2.02 Analog A-links are equipped with mated VFLs for reliability. The VFLs are designated VFL-A and VFL-B. One VFL is active while its mate VFL is standby.

A. Physical Description

2.03 Figure 3 shows a simplified block diagram of the STP hardware arrangement for analog signaling links. An analog SLK is comprised of an LN (link node), not including the RI (ring interface) circuit (UN122 and UN123 CPs), an AFA (analog facility access) circuit, analog transmission facilities, and the functionally equivalent equipment at the far-end office. An LN consists of an RI circuit (UN122 and UN123 CPs), an NP (node processor) (TN913 or TN922CP), and an LI (link interface) (TN916 CP). The AFA circuit includes a data set (2024A or 2048A) and VFLA (voice frequency link access) circuit (TN919 CP).

B. Functional Operation

2.04 The LN portion of an SLK is attached to the dual "ring" buses of an STP via the RI. The RI, which is not considered part of the SLK but is defined as part of the LN, is located on the ring and provides for the transfer of digital information between the "ring" buses and the SLK. The RI inserts messages onto the "ring" buses upon command from the NP, extracts messages from the "ring" buses when appropriate, performs message error checks, and other maintenance functions. The RI also controls ring reconfiguration that permits faulty nodes to be isolated. The RI is located on two CPs, UN122 (RI"0") and UN123 (RI"1").

2.05 The NP provides message handling, control functions, some routing functions for the LN, and ring reconfiguration functions for ring continuity. The NP performs CCIS6 and CCS7 link level 3 protocol as well as transferring messages between the RI and LI circuitry. Signaling messages are transferred between the RI circuit and the LI circuit via the NP bus. The NP is contained on a TN913 or TN922 CP. The TN913 and TN922 CPs differ in the amount of data memory supplied. The TN913 CP has 128K bytes of RAM (random access memory), and the TN922 CP has 512K bytes of RAM.

2.06 The LI, contained on a TN916 CP, serves as an interface between the NP bus and data set. This interface converts TTL-type signals from the NP to RS-422/RS-423 signals that can interface with the data set and converts RS-422/RS-423 signals from the data set to TTL-type signals for use by the NP.

2.07 The AT&T Practices 256-210-101 and 256-220-101 contain a detailed description of an LN in a 2STP and 2ASTP, respectively.

2.08 The AFA circuit consists of a 2024A or 2048A data set. A 2024A data set is used in 2400-bps

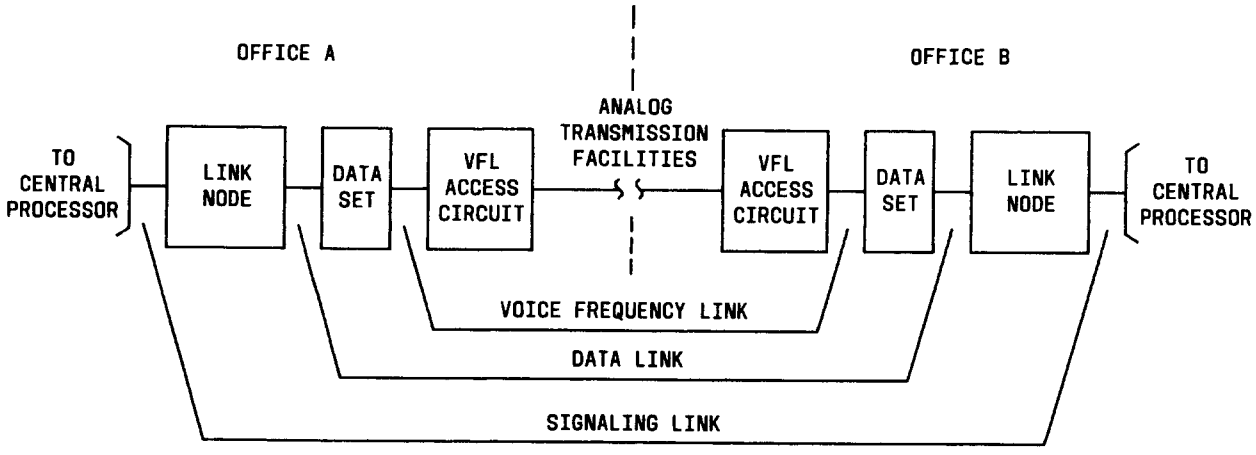


Fig. 2—Analog Signaling Link

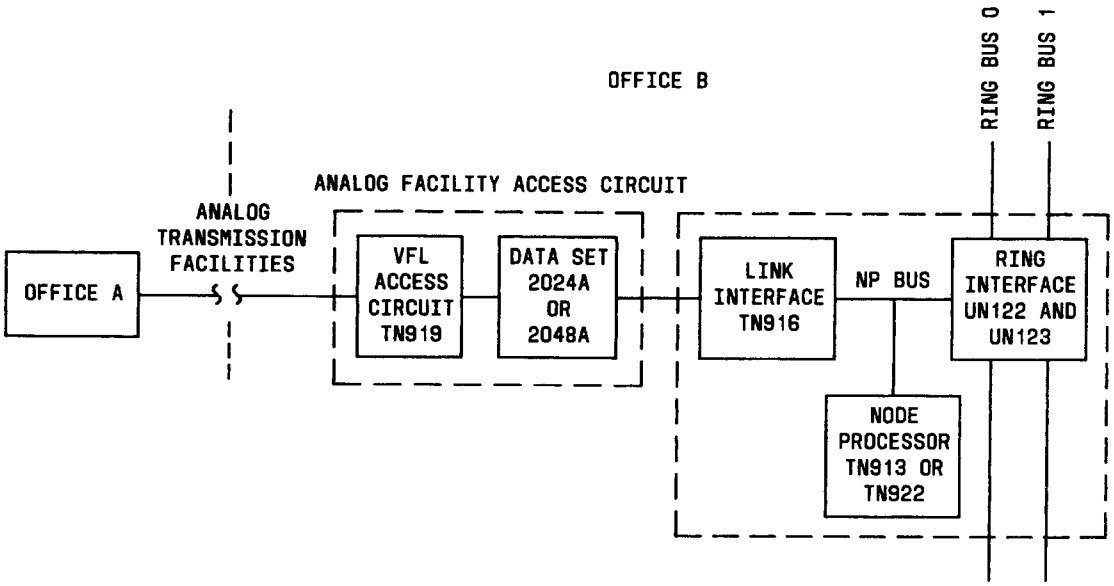


Fig. 3—Analog Signaling Link and STP Interface

analog SLKs, and a 2048A data set is used in 4800-bps analog SLKs. Both the 2024A and 2048A data sets are synchronous, serial, binary transmitter-receivers operating over 4-wire 3002-type facilities. The data sets use an EIA (Electronic Industries Association) RS-449 customer interface connector. The data sets convert incoming analog data signals to RS-422/RS-423 signals that can be used by the LI and convert outgoing digital data to an analog format for use by the analog facilities.

2.09 The AFA circuit also consists of a VFLA circuit. The VFLA circuit provides a selective access from an analog data set (2024A or 2048A) to a 4-wire VFL. Additionally, the VFLA circuit provides, under control of the central processor, loopbacks for automated testing and switched access to the maintenance center arrangement. The VFLA circuit is contained on a TN919 CP.

2.10 The AT&T Practice 256-210-102 contains a detailed description of the AFA circuit.

3. DIGITAL SIGNALING LINKS

A. Physical Description

3.01 Figure 4 is a simplified block diagram of the 56-kbps digital SLK arrangement. A 56-kbps digital SLK is comprised of an LN, not including the RI circuit (UN122 and UN123 CPs), and a DFA (digital facility access) circuit positioned at each end of the digital transmission facilities.

3.02 An LN consists of an RI circuit (UN122 and UN123 CPs), an NP (TN913 or TN922 CP), and an LI (TN916 CP). The RI circuit contained on UN122 and UN123 CPs is not considered part of the actual SLK.

3.03 A DFA circuit is comprised of one of the following arrangements:

(1) A 500B DSU (digital service unit), 550A CSU (channel service unit), and a DSA (digital service adapter) (TF5 CP)

(2) A *DATATEL* DCP 3180B data service unit and a signal level converter (TF9 CP)

(3) A *DATAPHONE* Z2556A data service unit and a DSA (digital service adapter) (TF5 CP).

B. Functional Operation

Link Node Circuit

3.04 Figure 5 shows the relationship of the LN circuitry to the STP "ring" architecture and the digital facility access circuit. The LN portion of a dig-

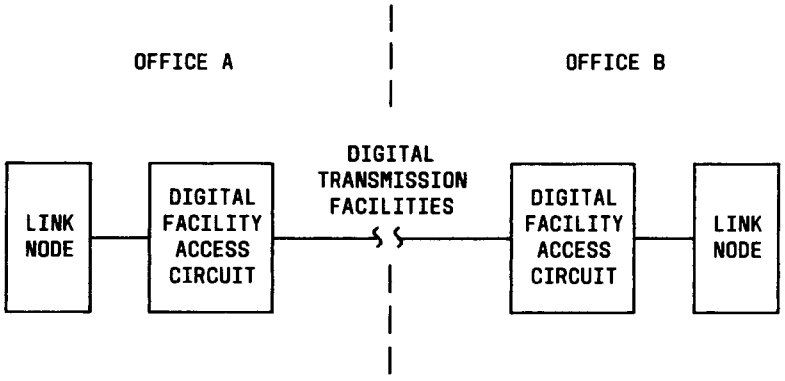


Fig. 4—56-Kbps Digital Signaling Link

ital SLK is attached to the dual "ring" buses of an STP via the RI. The RI, which is not considered part of an SLK but is defined as part of the LN, is located on the ring and provides for the transfer of digital information between the "ring" buses and the SLK. The RI inserts messages onto the "ring" buses upon command from the NP, extracts messages from the "ring" buses when appropriate, performs message error checks, and performs other maintenance functions. The RI also controls ring reconfiguration that permits faulty nodes to be isolated. The RI is located on two CPs, UN122 (RI"0") and UN123 (RI"1").

3.05 The NP provides message handling, control functions, some routing functions for the LN, and ring reconfiguration functions for ring continuity. The NP performs CCIS6 and CCS7 link level 3 protocol as well as transferring messages between the RI and LI circuitry. Signaling messages are transferred between the RI circuit and the LI circuit via the NP bus. An NP is contained on a TN913 or

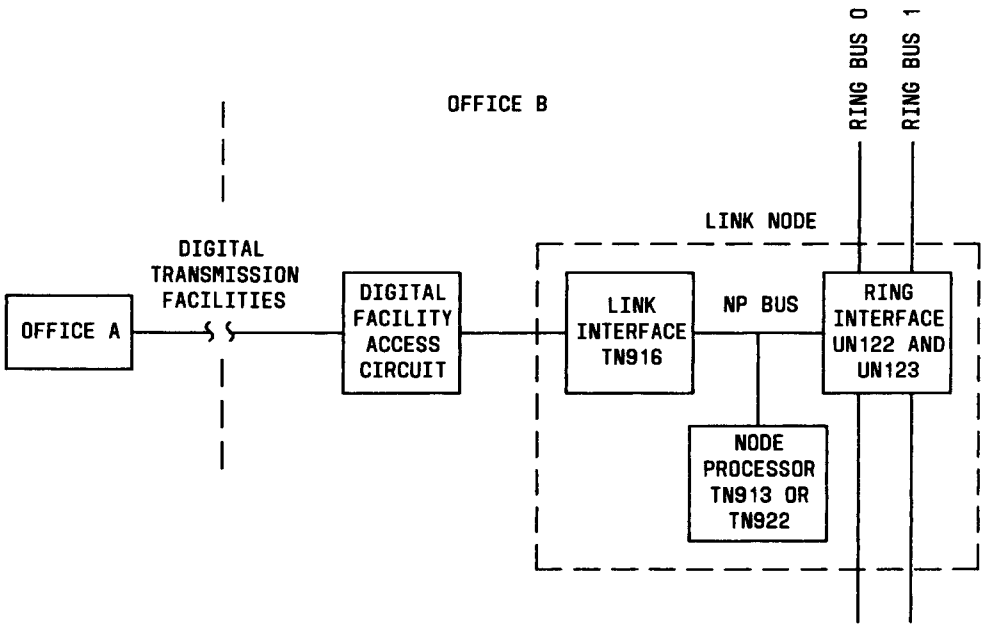


Fig. 5—Link Node Block Diagram

TN922 CP. The TN913 and TN922 CPs differ in the amount of data memory supplied. The TN913 CP has 128K bytes of RAM (random access memory), and the TN922 CP has 512K bytes of RAM.

3.06 The LI, contained on the TN916 CP, serves as an interface between the NP bus and data set. This interface converts TTL-type signals from the NP to RS-422/RS-423 signals that can interface with the data set and converts RS-422/RS-423 signals from the data set to TTL-type signals for use by the NP.

3.07 The AT&T Practices 256-210-101 and 256-220-101 contain a detailed description of an LN for a 2STP and 2ASTP, respectively.

Digital Facility Access Circuit (500B DSU/550A CSU)

3.08 Figure 6 is a simplified block diagram of a digital facility access circuit containing a 500B digital service unit, 550A channel service unit, and a DSA (digital service adapter) (TF5 CP). All signals transmitted to or received from the digital transmission facility pass through the DSA. The DSA provides signal level translation between the LI circuit and the DSU. The LI circuit uses RS-422/RS-423 signals and the 500B DSU uses RS-232/V.35 signals. The DSA also provides an external loopback (toward the ring) at the DSU. This external loopback is controlled by the central processor via a relay on the DSA.

3.09 The DSU provides access from the LN to the synchronous digital transmission facilities via the DSA and the CSU (for digital SLKs greater than 9 miles in length). The DSU receives serial data in RS-449 format and transmits a baseband, bipolar signal whose frequency corresponds to the transmitted data rate.

3.10 If the DSU is used to access a nonsynchronous digital transmission facility (a short haul metallic SLK less than 1000 feet), a 112A circuit module is installed in the 500B DSU, at one end of the digital SLK only, to provide synchronization. When the 500B DSU is modified for short haul access, it is designated a 502B DSU. A digital SLK 1000 feet or less in length is shown in Fig. 7. The 500/502B DSU pair is used as part of digital SLKs between colocated offices.

3.11 The 500/502B DSU pair is also used as part of digital SLKs that are from 1000 feet to 9 miles in length (repeaters are required every three miles) as shown in Fig. 8. The 500B-L1/5 version of the 500B DSU is used in the 56-kbps SLK application.

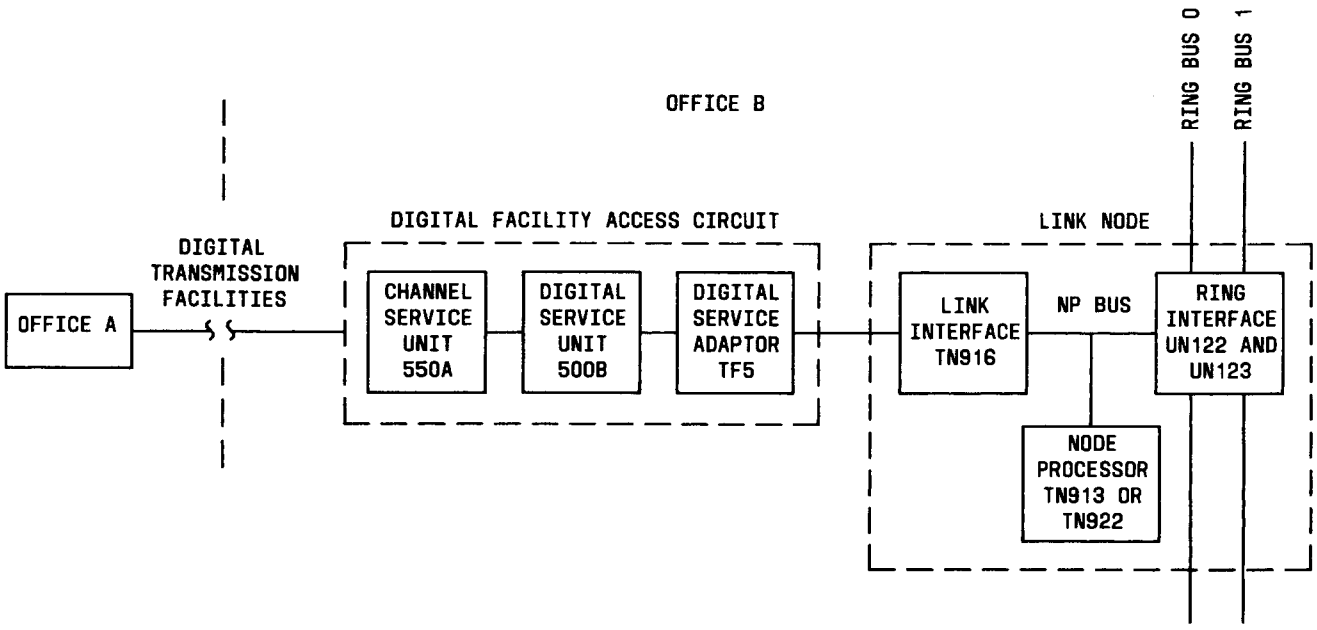


Fig. 6—Digital Facility Access Circuit (500B DSU/550A CSU)

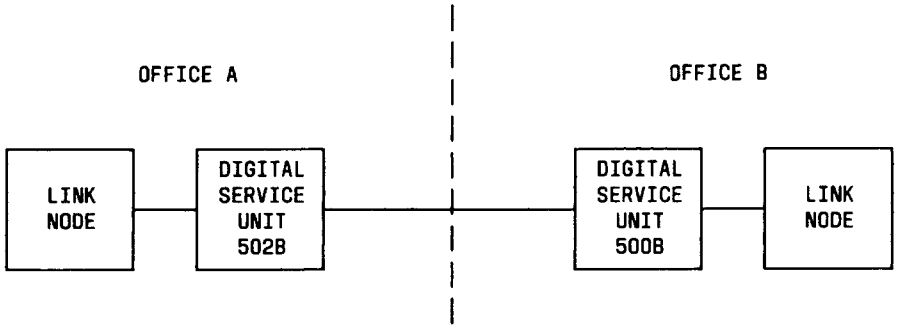
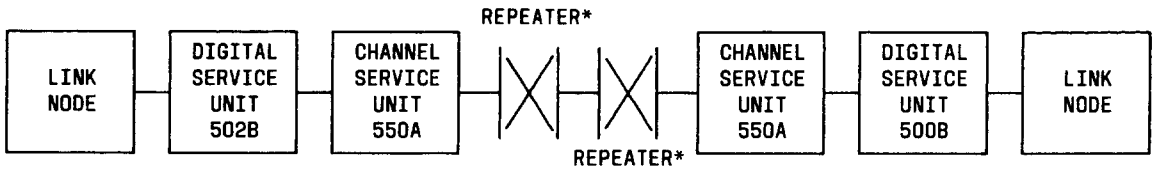


Fig. 7—Digital Signaling Link (1000 Feet o- Less)



* A REPEATER IS REQUIRED EVERY THREE MILES

Fig. 8—Digital Signaling Link (1000 Feet to 9 Miles)

3.12 The CSU is used with synchronous digital transmission facilities and is primarily intended for full-duplex SLK applications (digital SLKs greater than 9 miles in length) as shown in Fig. 6. The CSU is also used as part of digital SLKs that are from 1000 feet to 9 miles in length as shown in Fig. 8. The CSUs are not used with short haul metallic SLKs (less than 1000 feet) to colocated offices. (The 500B digital service units must be used at both ends of the signaling link.) The CSU provides equalization and loop capabilities for maintenance of digital transmission facilities. For 56-kbps digital SLK applications, the 550A-L1/5 version of the 550A CSU is used.

3.13 The AT&T Practice 256-210-103 contains a detailed description of the digital facility access frame and the units which reside on that frame.

Digital Facility Access Circuit (*DATATEL* DCP 3180B Data Service Unit)

3.14 Figure 9 shows a simplified block diagram of a digital facility access circuit containing a DCP 3180B data service unit and a signal level converter (TF9 CP). A signal level converter is associated with a DCP 3180B data service unit to provide access from a link node to the digital transmission facility. The signal level converter provides signal level translation between the RS-422/RS-423 interface presented by a link node and the V.35/RS-232C interface used by a DCP 3180B data service unit.

3.15 A DCP 3180B data service unit is associated with a signal level converter to provide access from a link node to the digital transmission facility. Each data service unit contains customer interfaces and provides signal processing functions. A pair of transmit and receive leads connect a DCP 3180B data service unit with the digital transmission facility. Data is exchanged in a bipolar format. The data service unit converts bipolar data signals from the digital transmission facility to data signals conforming to the CCITT (International Telegraph and Telephone Consultative Committee) specification V.35. The data service unit transmits V.35 clock and data signals and control signals conforming to EIA (Electronic Industries Association) standard RS-232C to a signal level converter. The DCP 3180B data service unit also has a self-test and loopback capability.

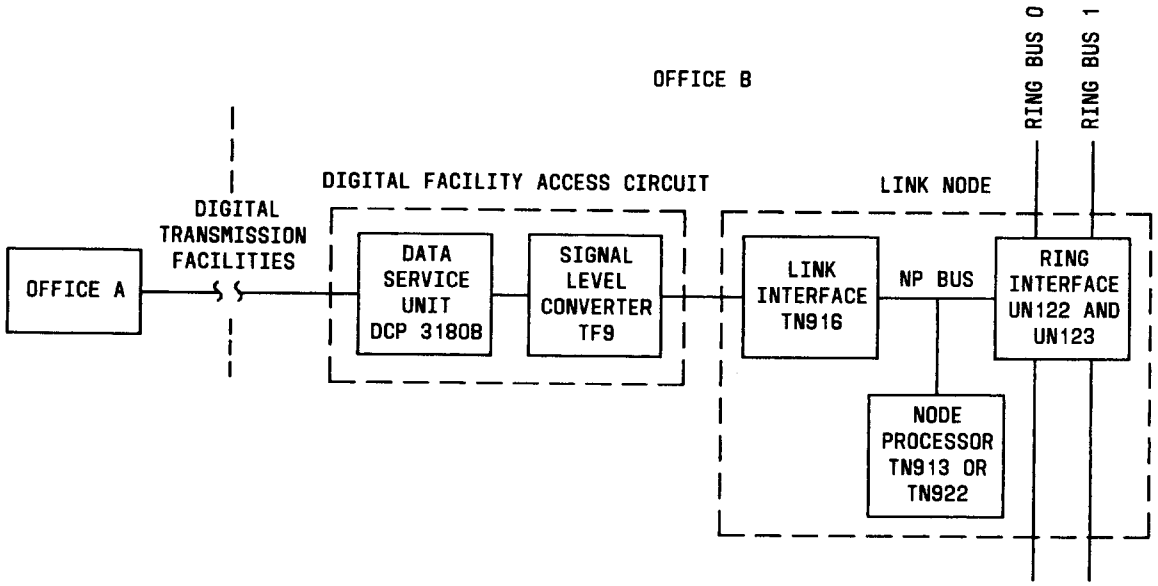


Fig. 9—Digital Facility Access Circuit (DCP 3180B Data Service Unit)

3.16 The AT&T Practice 256-220-103 contains a detailed description of the digital facility access cabinet and the units which reside on that cabinet.

Digital Facility Access Circuit (*DATAPHONE* Z2556A Data Service Unit)

3.17 Figure 10 is a simplified block diagram of a digital facility access circuit containing a Z2556A data service unit and a DSA (digital service adapter). A DSA is housed on a TF5 circuit pack and is associated with a Z2556A data service unit to provide access from a link node to the digital transmission facility. A DSA provides signal level translation between the RS-449 interface presented by a link node and the V.35/RS-232C interface used by a Z2556A data service unit. A DSA also provides a central processor-controlled external loopback capability on the line side. The loopback is controlled by the central processor via a relay on the DSA.

3.18 A Z2556A data service unit is associated with a DSA to provide access from a link node to the digital transmission facility. A Z2556A data service unit contains customer interfaces and provides signal processing functions and test capabilities. A pair of transmit and receive leads connect a Z2556A data service unit with the digital transmission facility via a DSA. Data is exchanged in a modified bipolar format. The Z2556A data service unit converts bipolar data signals from the digital transmission facility to data signals conforming to the CCITT specification V.35. The Z2556A data service unit transmits V.35 clock and data signals and control signals conforming to EIA standard RS-232C to a DSA. The Z2556A data service unit also has self-test and loopback capabilities.

4. GLOSSARY

4.01 Following is a list of the most commonly used acronyms and abbreviations relating to SLKs.

AFA	analog facility access
A-link	access signaling link
B-link	bridge signaling link
bps	bits per second
CCIS6	Message format conforming to domestic version of CCITT signaling system No. 6
CCITT	International Telegraph and Telephone Consultative Committee
CCS	common channel signaling

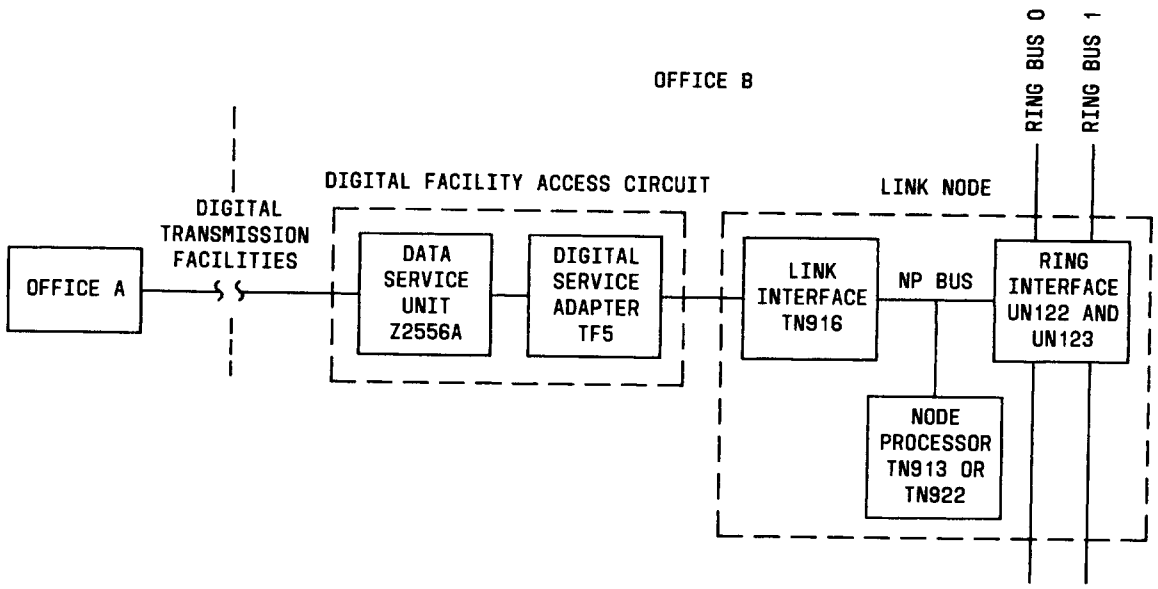


Fig. 10—Digital Facility Access Circuit (Z2556A Data Service Unit)

CCSS	Common Channel Signaling System	LN	link node
CCS7	Message format conforming to domestic version of CCITT signaling system No. 7	NCP	network control point
		NP	node processor
C-link	cross signaling link	RAM	random access memory
CP	circuit pack	RI	ring interface
CSU	channel service unit	SLK	signaling link
DFA	digital facility access	SO	switching office
DSA	digital service adaptor	STP	signal transfer point
DSU	digital service unit	VFL	voice frequency link
EIA	Electronic Industries Association	VFLA	voice frequency link access
kbps	kilobits per second	2ASTP	No. 2A signal transfer point
LI	link interface	2STP	No. 2 signal transfer point