Network Services Complex (NSCX)
Application
4ESS™ Switch

Contents   Page

Figures

1. Overview

1.01   This practice describes the 4ESS™switch application of the Network Services Complex (NSCX). The following subjects are included:

- Equipment configurations

- Physical description

- Office connections

1.02   This practice is being reissued to:

- Incorporate the new 2 GByte Hard Disk Unit information.

- Incorporate information on the new Automatic Speech Recognition (ASR) feature.

1.03   This practice does not contain admonishments.

1.04   AT&T welcomes your comments on this practice. Your comments will aid us in improving the quality and usefulness of AT&T documentation. Please use the Feedback Form provided in this practice or call the AT&T Documentation Comment Hot-Line Service (1-800-334-0404 or (919)727-6681 in North Carolina).

1.05   Additional copies of this practice, associated appendixes, and all referenced practices may be ordered from the AT&T Customer Information Center as follows:

- Call 1-800-432-6600
    or

- Complete Form INDI-80.80 and mail to:

AT&T Customer Information Center
Attention: Order Entry Department
2855 N. Franklin Road
P. O. Box 19901
Indianapolis, IN 46219-1999

1.06   Every effort was made to ensure that the information in this practice was complete and accurate at the time of printing. However, information is subject to change.

1.07   This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the installation manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

1.08   Part 5 lists the abbreviations and acronyms with applicable terms used in this practice.

1.09   This practice is issued by:

AT&T Customer Information Development and Business Translations Organization
2400 Reynolda Road
Winston-Salem, NC 27106-4696

2. General

Purpose of the Network Services Complex

2.01 The NSCX is designed to support voice-only or voice and analog graphics teleconferencing, or Direct Services Dialing Capability (DSDC). There are three hardware configurations designed to support these services. Each of these configurations includes common software and firmware that implement common NSCX functions. The NSCX generic program for each type of NSCX consists of the common software combined with the appropriate feature software.

2.02 Each NSCX provides automated caller (customer or operator) interactive capabilities for telephone network services. These interactive capabilities consist of:

- Playing recorded announcements to callers that contain instructions or prompts

- Receiving touch-tone signals from callers that correspond to a chosen service option or a telephone number.

- Collecting single digit (1-9) spoken words from callers that correspond to a chosen service option or a telephone number.

2.03 In addition to the interactive capabilities, the teleconferencing NSCX provides voice conferencing between two or more physically remote locations over the toll and local telephone networks. For voice only teleconferencing, the NSCX is equipped with two digital audio bridges. Each audio bridge combines and distributes the Pulse Code Modulated (PCM) voice samples of speakers on a conference to other participants of the conference.

Equipment Configurations

2.04 Each NSCX consists of several frames. The number of frames vary depending on the type of NSCX. The quantity of frames for each type of NSCX is shown in the following paragraphs.

2.05 Voice-Only Teleconferencing NSCX:

- One network services frame (J4A017A-1)

- One moving head disk frame (J1C131B-1)

- One audio bridge frame (J4A017B-1, List 1 and 2) equipped with two audio bridge units and one tone receiver unit.

2.06 Voice and Analog Graphics Teleconferencing NSCX:

- One network services frame (J4A017A-1)

- One moving head disk frame (J1C131B-1)

- One audio bridge frame (J4A017B-1, List 1 and 2) equipped with two audio bridge units and one tone receiver unit.

2.07 Direct Services Dialing Capability NSCX DSD8 or later without ASR:

- One network services frame (J4A017G-1)

- One disk and tone receiver frame (J4A017H-1).

2.08 Direct Services Dialing Capability NSCX DSD8 or later with ASR:

- One network services frame (J4A017G-1)

- One disk and tone receiver frame (J4A017H-1).

- One Automatic Speech Recognition (ASR) cabinet (J4A017R-1)

3. Physical Description

General

3.01 All of the hardware for the NSCX except for the ASR is contained in equipment frames. The ASR hardware is contained in a cabinet. The equipment frames utilized for each NSCX are 7-feet high, 2-feet 2-inches wide, and 18-inches deep. All of the units mounted in each frame contain FASTECH® circuit packs arranged according to function. Horizontal equipment locations are specified in increments of 1/8-inch. Integrated circuits of the dual in-line package variety and discrete components are both utilized in the circuit packs. Most power units are mounted in the same unit in which they are used and adjacent to the circuit pack group served. Each circuit pack and power unit is labeled on designation strips to indicate its identity and boundaries. AT&T 256-041-100, *Network Services Complex J4A017 Description* provides detailed descriptions of NSCX frame equipment.

3.02 The ASR cabinet is 6 feet tall, 34 inches wide, and 19-1/8 inches deep. The ASR Unit contains slots for AT* computer type circuit packs. The ASR unit also contains a power supply, a power switch, and three fans.

Network Services Frame J4A017A-1

3.03 The network services frame J4A017A-1 is the basic frame required in each type NSCX except NSCX using DSD7 and later. It is equipped with one each of the following units:

- Processor and N-link terminal unit J4A017AA-l

- Time slot interchange unit J4A017AB-1

_____

* AT is a registered trademark of International Business Machines Corp.

- Maintenance interface unit J4A017AC-1

- Data storage unit J4A017AD-1

- Disk connector unit J4A017AE-1

- Tone receiver unit J4A017AF-1 or J4A017AF-40

- Fuse panel J4A017AG-1

- Filter unit J1A053AA-1, List 100.

➡ **NOTE:**
Network services frames in a system that has been upgraded to DSD7 or later may be equipped with a J4A017AL-1 Processor & N-Link Unit and a J4A017AM-1 Data Storage Controller Unit.

Moving Head Disk Frame J1C131B-1

3.04 The moving head disk frame J1C131B-1 is required for each NSCX except DSD7 and later generic programs. This frame provides disk data storage for recorded announcements and general data storage for the network services frame. The moving head disk frame is equipped as follows:

- Disk file inverter ED-4C172-30

- Inverter control unit J1C131AA-1

- Moving head disk drive KS-22072, L1 or L2.

Audio Bridge Frame (J4A017B-1)

3.05 The audio bridge frame is required in teleconferencing NSCXs.

3.06 In a voice-only or voice and analog graphics teleconferencing NSCX, the audio bridge frame (Lists 1 and 2) is equipped with:

- Two audio bridge units (J4A017BA-1)
- One tone receiver unit (J4A017AF-1 or J4A017AF-40).
- Fuse panel (J4A017BB-1, L1, L2)
- Filter unit (J1A053AA-1, L100).

Direct Services Dialing Frame J4A017D-1

3.07 The direct services dialing frame J4A017D-1 is used in a DSDC type NSCX except DSD7 and later. The network services frame provides facilities for 24 direct services dialing trunks. When more than a 24-trunk capacity is required, the direct services dialing frame is used. When it is equipped per List 1, it provides facilities for 24 more trunks, for a 48-trunk total capacity. When the direct services dialing frame is equipped per Lists 1 and 2, it provides facilities for 48 more trunks, for a 72-trunk total capacity. The direct services dialing frame is equipped as follows:

LIST 1

- One Tone Receiver (TR) unit J4A017AF-1 or J4A017AF-40
- One disk connector unit J4A017AE-1
- One Data Storage Unit (DSU) J4A017AD-1
- One fuse panel unit J4A017DA-1
- One filter unit J1A053AA-1, L100

LISTS 1 AND 2

- Two Tone Receiver (TR) units J4A017AF-1 or J4A017AF-40
- Two disk connector units J4A017AE-1
- Two Data Storage Units (DSU) J4A017AD-1
- Two fuse panel units J4A017DA-1
- One filter unit J1A053AA-1, L100.

Network Services Frame J4A017G-1

3.08 The network services frame J4A017G-1 is the basic frame needed for the DSD7 NSCX. It is equipped with one of each of the following listed units:

- Processor and N-link Terminal (PROC) unit J4A017AL-1
- Time Slot Interchange (TSI) unit J4A017AB-1
- Maintenance interface unit J4A017AC-1
- Data Storage Controller (DSC) unit J4A017AM-1
- Tone Receiver (TR) unit J4A017AF-1 or J4A017AF-40
- Fuse panel J4A017GA-1
- Filter unit J1A053AA-1, List 100.

Disk and Tone Receiver (DTR) Frame J4A017H-1

3.09 The DTR frame J4A017H-1 is used for DSDC type NSCXs using DSD8 generic or later. The NSCX frame (J4A017G-1) uses 24 direct services dialing trunks. When more than 24-trunks are required, additional units must be provided in the DTR frame. This frame also provides hard disk storage and a floppy disk unit which are required for all DSD8 NSCXs. The DTR frame can be equipped with the following listed items:

- 0, 1, or 2 Tone Receiver (TR) units J4A017AF-1 or J4A017AF-40
- One floppy disk unit J4A017HC-1
- One Hard Disk Unit J4A024AC-1
- Fan Unit J5D003FH-1
- Fuse panel J4A017HA
- Filter unit J1A053AA-1, List 100.

The 24 trunk DSD8 will be equipped with the following units:

- One floppy disk
- One pair of hard disks.

For the 48 trunk DSD8 the following will be added:

- One Tone Receiver

For the 72 trunk DSD8 the following will be added:

- Two Tone Receivers

Automatic Speech Recognition (ASR) Cabinet (J4A017R-1)

3.10 The ASR cabinet contains the ASR Units that interpret the spoken digits and translate them for the NSCX. There are three ASR Units in each cabinet. The ASR cabinet consists of the following subunits:

- Three ASR Interface Unit (J4A017PC-2)
- Three ASR Units (J4A017RB-1)
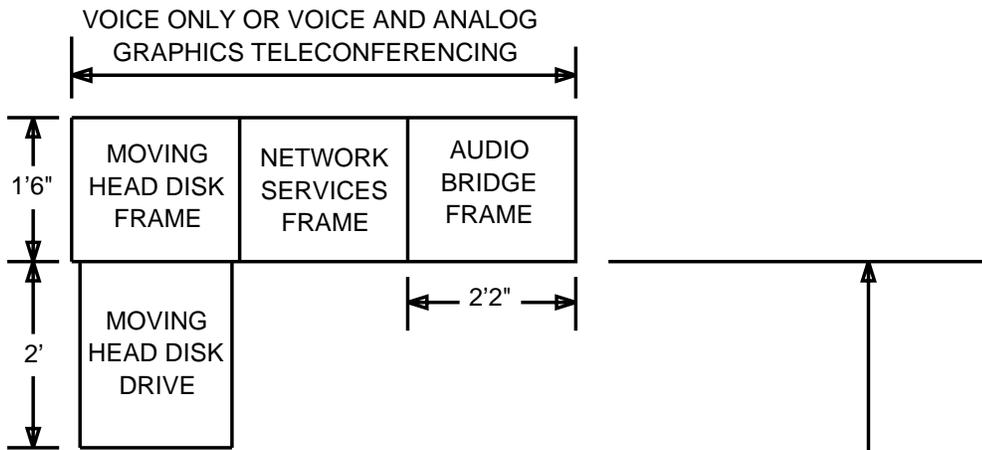- One Fuse and Filter Unit (J4A017RA-1).

Floor Plan Arrangements

3.11 The frame lineup and floor plan arrangements for the three types of NSCXs are shown in Figure 1. All NSCX equipment frames are 7 feet high, 26 inches wide, and 18 inches deep. The ASR cabinet is 6 feet tall, 34 inches wide, and 19-1/8 inches deep.

3.12 The moving head disk drive, located in the base of the moving head disk frame, extends 2 feet into the maintenance aisle. Moving head disk frames cannot be located directly across the maintenance aisle from each other or on a diagonal across from each other in offices using the standard 4-foot, 6-inch maintenance aisle. (The maintenance aisle must be 5 feet, 6 inches to allow diagonal placement and 6 feet, 6 inches to allow placement directly across the aisle.)

A. TELECONFERENCING NETWORK SERVICES COMPLEXES (NSC) NSTC7 OR LATER GENERIC

VOICE ONLY OR VOICE AND ANALOG
GRAPHICS TELECONFERENCING

MOVING HEAD DISK FRAME	NETWORK SERVICES FRAME	AUDIO BRIDGE FRAME

1'6"

2'2"

MOVING HEAD DISK DRIVE

2'

B. DSDC NSC DSD8 OR LATER GENERIC

24, 48, OR 72 TRUNK

NETWORK SERVICES FRAME	DISK DTR FRAME	ASR CABINET (IF PROVIDED)

2'2"

3'

2'6"

4'6" MAINTENANCE AISLE

4'6" MAINTENANCE AISLE (NOTE)

Note:

1. To locate Moving Head Disk Drives diagonally across from each other, the aisle must be 5'6" wide. To locate them directly across from each other, the aisle must be 6'6" wide.
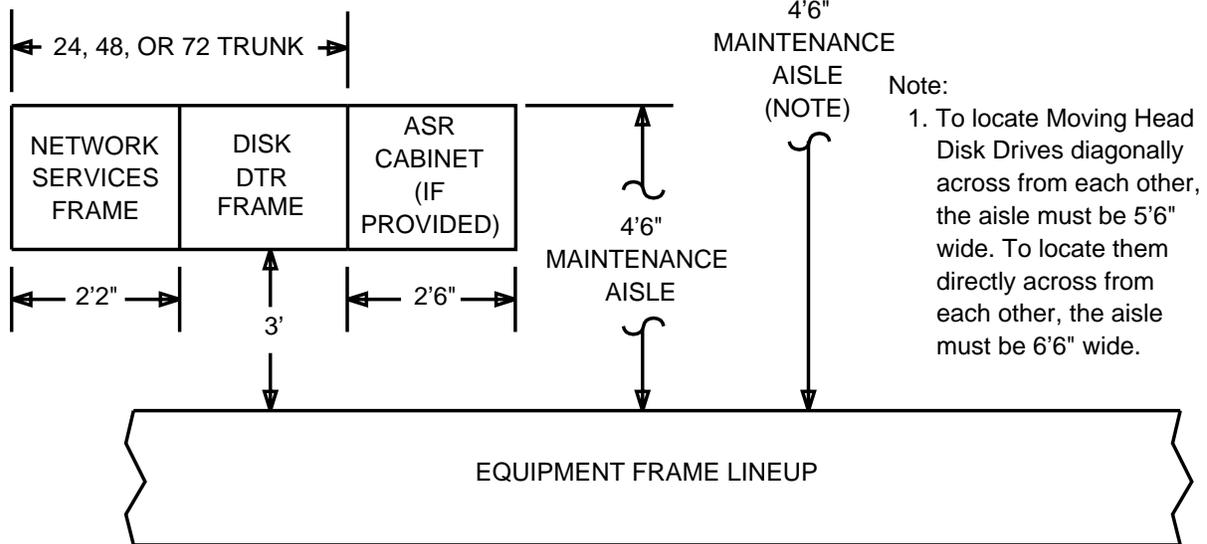
EQUIPMENT FRAME LINEUP

Figure 1. Network Services Complex Floor Plan Arrangements

4. Office Connections

General

4.01 Network Service Complexes must be supported by a host-stored program controlled switching system with access to the Common Channel Interoffice Signaling (CCIS) system. The 4ESS switch equipped with the 4E7 or later version of the generic program is used to support the first deployment of NSCXs. The number of NSCXs which may be engineered for a 4ESS switch office is limited to 14 for each assigned routing data block. A maximum of 14 trunk subgroups can be assigned to each routing data block. Since each NSCX consists of simplex hardware, two or more NSCXs are normally provided in an office for each type of NSCX service required. The 4E8 or later version generic program supports maintenance TTY port connections from up to 20 teleconferencing NSCXs and up to 8 DSDC NSCXs to the Attached Processor System (APS).

4.02 Each NSCX interfaces with the 4ESS switch office as shown in Figure 2. This diagram also identifies the AT&T Practices which describe the interfacing equipment. NSCX connections to 4ESS switch office equipment consist of the following:

- Two intraoffice N-links for exchanging signaling information and other call-related data with the 4ESS switch

- One to five intraoffice T1 lines (24 to 120 digital trunks) to connect callers voice and data to the NSCX

- NSCX major, minor, and office-dependent alarms

- Maintenance TTY links

- -48V power distribution.

N-Link Connections

4.03 The two NSCX N-links (Figure 2) must be terminated on separate CCIS terminal group frames to provide communications between the 1A Processor and the NSCX. The two N-links are connected via terminal strips in the 4ESS switch multifrequency frame to terminal strips in the J4A017AC-1 maintenance interface unit located in the J4A017A-1 or J4A017G-1 network services frame. Maintenance jacks on the maintenance interface unit provide access to the two N-links. These jacks are used to establish the proper transmission levels over the N-links as specified in the application schematic drawing SD-4A124- 01 or SD-4A124-02. Adjustable attenuators are provided for this purpose on the TN640 voice frequency link access circuit pack located in the network services frame processor and N-link terminal unit (J4A017AA-1 or J4A017AL-1). The maintenance interface unit also contains two 201D-L1B data sets (modems) used to interface the two N-links with the NSCX.
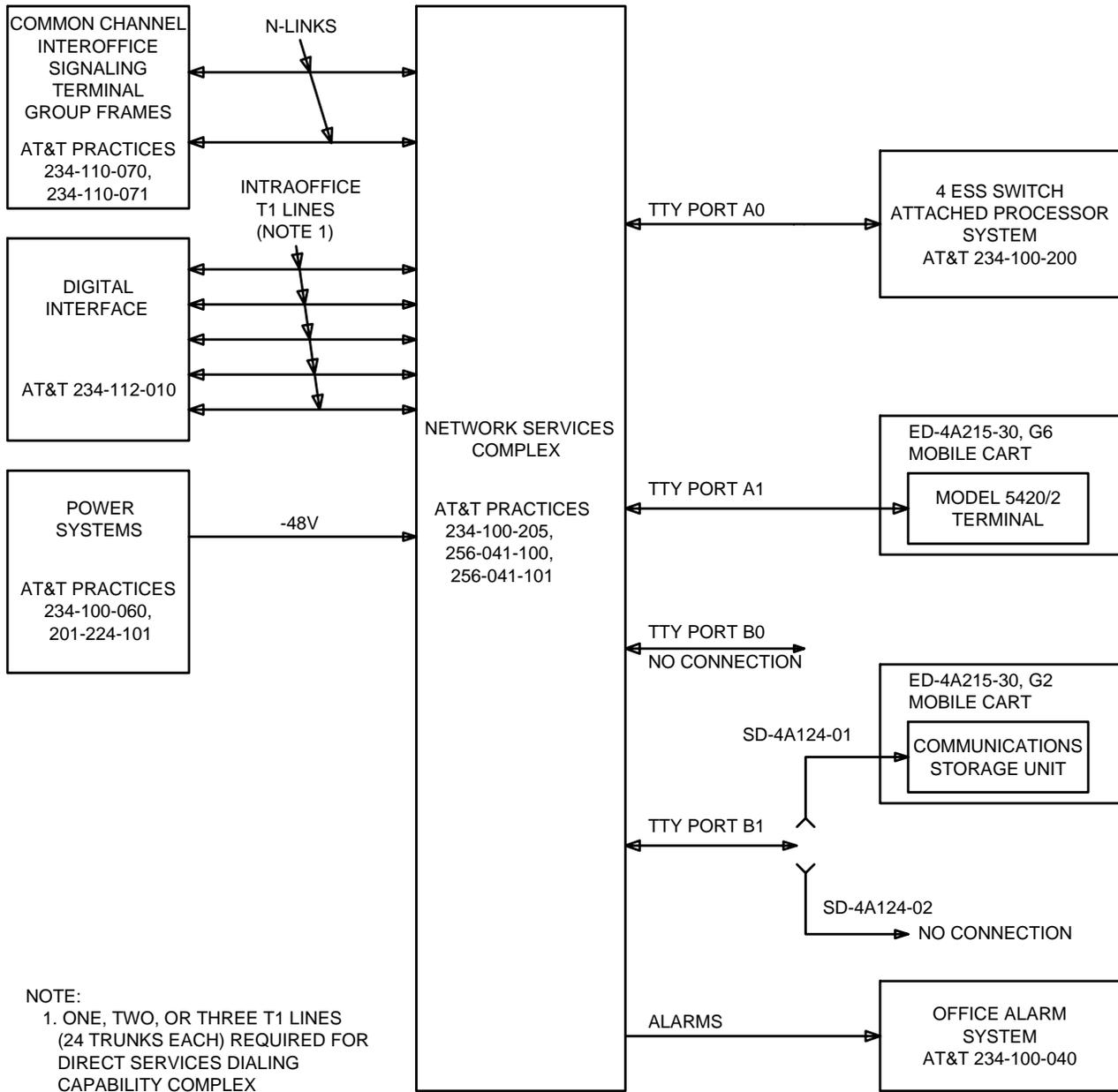
COMMON CHANNEL INTEROFFICE SIGNALING TERMINAL GROUP FRAMES

AT&T PRACTICES 234-110-070, 234-110-071

N-LINKS

INTRAOFFICE T1 LINES (NOTE 1)

DIGITAL INTERFACE

AT&T 234-112-010

POWER SYSTEMS

AT&T PRACTICES 234-100-060, 201-224-101

-48V

NETWORK SERVICES COMPLEX

AT&T PRACTICES 234-100-205, 256-041-100, 256-041-101

TTY PORT A0

4 ESS SWITCH ATTACHED PROCESSOR SYSTEM AT&T 234-100-200

TTY PORT A1

ED-4A215-30, G6 MOBILE CART

MODEL 5420/2 TERMINAL

TTY PORT B0
NO CONNECTION

ED-4A215-30, G2 MOBILE CART

SD-4A124-01

COMMUNICATIONS STORAGE UNIT

TTY PORT B1

SD-4A124-02
NO CONNECTION

ALARMS

OFFICE ALARM SYSTEM AT&T 234-100-040

NOTE:
  1. ONE, TWO, OR THREE T1 LINES (24 TRUNKS EACH) REQUIRED FOR DIRECT SERVICES DIALING CAPABILITY COMPLEX

Figure 2. Network Services Complex Functional Interface Diagram

Intraoffice T1 Line Connections

4.04 Each NSCX is interfaced to the 4ESS switch by intraoffice T1 lines terminated on Digital Interface Frames (DIF) via a Digital Cross-Connect Frame (DSX-1). Each T1 line provides 24 two-way digital trunks (DS1 format). Each teleconferencing NSCX requires five T1 lines (120 digital trunks). Each DSDC NSCX requires one, two, or three T1 lines (24, 48, or 72 digital trunks). The five T1 line terminations from each teleconferencing NSCX must be spread over several (as many as five) digital interface units. The T1 lines from each of several DSDC NSCXs should be terminated on different DIFs. The T1 line terminations from a DSDC NSCX with several T1 lines must be spread over several digital interface units. A terminal strip in the network services frame maintenance interface unit provides T1 line terminations for the NSCX.

4.05 The network services frame time slot interchange unit (J4A017AB-1) interfaces the T1 lines to the NSCX. This unit can be equipped with TN674, TN675, or TN676 circuit packs to interface a maximum of five T1 lines. The TN674, TN675, or TN676 equipment locations for the five T1 lines are as follows:

- First T1 line - equipment location 04-082
- Second T1 line - equipment location 04-090
- Third T1 line - equipment location 04-098
- Fourth T1 line - equipment location 04-106
- Fifth T1 line - equipment location 04-114.

4.06 The TN674, TN675, and TN676 circuit packs are designed to interface different T1 line cable lengths to the DSX-1 digital cross-connect frame. The time slot interchange unit list options are:

- List 2 (TN674) - 0 to 220 feet
- List 3 (TN675) - 220 to 440 feet
- List 4 (TN676) - 440 to 655 feet.

Office Alarm Connections

4.07 The alarm outputs from each NSCX are connected to the 4ESS switch office alarm system (miscellaneous frame A or B). NSCX alarm outputs consist of one major alarm, one minor alarm, and one office-dependent alarm. Terminal strips on the network services frame maintenance interface unit provide the NSCX alarm interface to the 4ESS switch office alarm system. The office-dependent alarm output from each NSCX must be processed by the 4ESS switch office data assembler to output a report message to the Maintenance Operations Center keyboard/display terminal. The report message identifies the office-dependent alarm number, NSCX number, and the office floor number.

Maintenance TTY Port Connections

4.08 The primary control and display facility for the NSCX is provided by two TTY ports (A and B). Two RS-232C-type connectors are provided on the network services frame maintenance interface unit for each TTY port. The two connectors for each port (labeled A0, A1, and B0, B1) are controlled by an associated switch (552A key). The A switch transfers transmit control (only) between the two associated connectors (A0 and A1). Output data may be simultaneously monitored via both connectors A0 and A1. The B switch transfers both the transmit and receive port functions between connectors B0 and B1.

4.09 The TTY ports from each NSCX are connected to office equipment as shown in Figure 3. Offices equipped with the 4E8 or later version generic program use the 3B computer input/output processor growth unit to interface TTY port A0 from all NSCXs. This arrangement interfaces all NSCXs in the office to the APS local maintenance position terminal and with remote maintenance facilities that include the Remote Work Center (RWC). This arrangement accommodates up to 24 teleconferencing NSCXs and up to 8 DSDC NSCXs.

4.10   Network Services Complex TTY ports A1
and B1 may be connected to an ED-4A215-
30 mobile cart. At least one mobile cart is required
for each office. The mobile cart is equipped with a
model 5420/2 terminal or a Advanced Interactive
Maintenance System (AIMS) terminal and a
communications storage unit used for loading and
updating NSCX software The NSCX using DSD7 or
later will use the floppy disk in the DTR frame for
updating NSCX software. A model 5310 or 572
printer may be used (optional) with the mobile cart
connected to port A1.
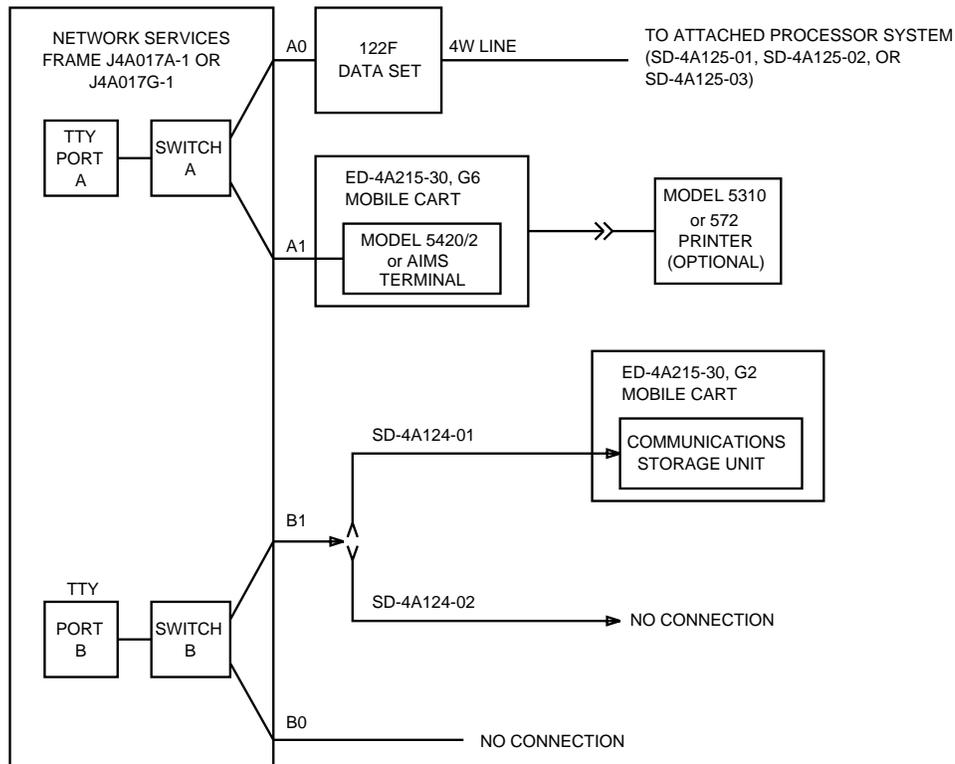
Figure 3. Network Services Complex Maintenance Port Connections

Power Distribution

4.11   Each NSCX frame requires one or two −48 V power feeders from a J86334B-1 or J86334C-1 power distribution frame. The J86334B-1 power distribution frame is required for use with −48 V battery plants. The J86334C-1 power distribution frame is required for use with +140 V to −48 V converter plants.

4.12   The following rules must be followed in the assignment of NSCXs to power distribution frames:

- Each power distribution frame distributes −48 V power from two primary buses (A and B). The even numbered NSCXs must be powered from the A bus and the odd numbered NSCXs must be powered from the B bus.

- A maximum of eight NSCXs (four on each bus) may be powered from each power distribution frame.

- When DSDC 48 or DSDC 72 complexes are provided, the quantity of eight complexes are reduced by one for each additional disk.

- No more than two NSCXs of the same type or one-half the NSCXs of that type, whichever is less, may be powered from a single bus (A or B) of any power distribution frame.

- The assignment of NSCXs for the same type of service should be spread (as much as possible) over all of the power distribution frames.

4.13   The moving head disk drive requires a 48 V DC feeder per disk (50 amp fuse). This provides power to a 48 V DC/208 V AC disk file inverter. The 208 V AC output in turn furnishes power to the disk drive motor.

4.14   Each of the other NSCX frames requires two −48 V power feeders from the power distribution frame. The audio bridge frame requires only one feeder when configured for voice and data teleconferencing service. The ASR cabinet requires two −48 V DC feeders from the power distribution frame.

Abbreviations and Acronyms

This part defines the abbreviations and acronyms used in this practice.

AIMS	Advanced Interactive Maintenance System
APS	Attached Processor System
ASR	Automatic Speech Recognition
CCIS	Common Channel Interoffice Signaling
CSDC	Circuit Switched Digital Capability
DDD	Direct Distance Dialing
DIF	Digital Interface Frame
DSC	Data Storage Controller
DSDC	Direct Services Dialing Capability
DSX-1	Digital Cross-Connect Frame
DTR	Disk and Tone Receiver Frame
NSCX	Network Services Complex
PCM	Pulse Code Modulated
RWC	Remote Work Center
TR	Tone Receiver

How Are We Doing?

Document Title: Network Services Complex (NSCX) Application 4ESS™ Switch

Document No.: AT&T 234-100-205   Issue 5   Date: May 1993

AT&T welcomes your feedback on this document. Your comments can be of great value in helping us improve our documentation.

1. Please rate the effectiveness of this document in the following areas:

	Excellent	Good	Fair	Poor	Not Applicable
Ease of Use					///////////////////
Clarity					///////////////////
Completeness					///////////////////
Accuracy					///////////////////
Organization					///////////////////
Appearance					///////////////////
Examples					
Illustrations					
Overall Satisfaction					///////////////////

2. Please check the ways you feel we could improve this document:

☐ Improve the overview/introduction   ☐ Make it more concise/brief
☐ Improve the table of contents   ☐ Add more step-by-step procedures/tutorials
☐ Improve the organization   ☐ Add more troubleshooting information
☐ Include more figures   ☐ Make it less technical
☐ Add more examples   ☐ Add more/better quick reference aids
☐ Add more detail   ☐ Improve the index

Please provide details for the suggested improvement._____
_____

3. What did you like most about this document?
_____

_____

4. Feel free to write any comments below or on an attached sheet.
_____

_____

_____

_____

If we may contact you concerning your comments, please complete the following:

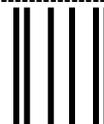Name: _____ Telephone Number: (____)_____
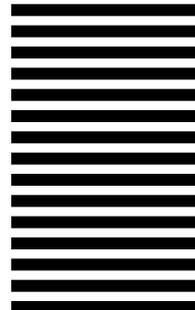
Company/Organization: _____ Date: _____

Address: _____

When you have completed this form, please fold, tape, and return to address on back
or Fax to: 919-727-3148.

AT&T

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 1999 GREENSBORO, N.C.

POSTAGE WILL BE PAID BY ADDRESSEE

DOCUMENTATION SERVICES
2400 Reynolda Road
Winston-Salem, NC 27199-2029

How Are We Doing?

Document Title: Network Services Complex (NSCX) Application 4ESS™ Switch

Document No.: AT&T 234-100-205   Issue 5   Date: May 1993

AT&T welcomes your feedback on this document. Your comments can be of great value in helping us improve our documentation.

1. Please rate the effectiveness of this document in the following areas:

	Excellent	Good	Fair	Poor	Not Applicable
Ease of Use					//////////////////////
Clarity					//////////////////////
Completeness					//////////////////////
Accuracy					//////////////////////
Organization					//////////////////////
Appearance					//////////////////////
Examples					
Illustrations					
Overall Satisfaction					//////////////////////

2. Please check the ways you feel we could improve this document:

☐ Improve the overview/introduction   ☐ Make it more concise/brief
☐ Improve the table of contents   ☐ Add more step-by-step procedures/tutorials
☐ Improve the organization   ☐ Add more troubleshooting information
☐ Include more figures   ☐ Make it less technical
☐ Add more examples   ☐ Add more/better quick reference aids
☐ Add more detail   ☐ Improve the index

 Please provide details for the suggested improvement._____
_____

3. What did you like most about this document?
_____

_____

4. Feel free to write any comments below or on an attached sheet.
_____

_____

_____

_____

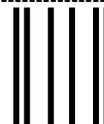If we may contact you concerning your comments, please complete the following:

Name: _____ Telephone Number: (_____)_____
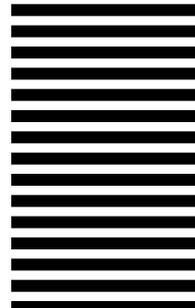
Company/Organization: _____ Date: _____

Address: _____

When you have completed this form, please fold, tape, and return to address on back
or Fax to: 919-727-3148.

AT&T

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1999 GREENSBORO, N.C.

POSTAGE WILL BE PAID BY ADDRESSEE

DOCUMENTATION SERVICES
2400 Reynolda Road
Winston-Salem, NC 27199-2029