Service Circuit System (SCS) Application
4ESS™ Switch

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1. Overview

1.01 This practice describes the *4ESS*™ switch application of the Service Circuit System (SCS). The following subjects are included:

- Physical description
- Office connections.

1.02 This practice is being reissued to add information on Phase 2 of the optional Automatic Speech Recognition (ASR) feature.

1.03 This practice does not contain admonishments.

1.04 Lucent Technologies welcomes your comments on this practice. Your comments will aid us in improving the quality and usefulness of our documentation. Please use the Feedback Form provided in the back of this practice or call the Lucent Technologies Documentation Comment Hot-Line Service [1-8888-LT INFO6 (584-6366)].

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

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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 Abbreviations and acronyms are defined at the end of this practice.

1.09 This practice was developed by Lucent Technologies Network Systems Toll Switching, Voice & Signaling (TSVS) Information Development.

2. General

Purpose of the Service Circuit System

2.01 The SCS is a family of equipment cabinets that provides announcement and digit collection capabilities for the *4ESS* switch. SCS configurations include both software and firmware.

2.02 The SCS provides the following functions for telephone network services:

- Playing of recorded announcements that contain instructions or prompts to callers.
- Collection of various information by receiving touch-tone dialed signals.
- With the optional ASR feature, collection of various information by receiving spoken responses. Two different ASR versions are provided: ASR Phase 1 and ASR Phase 2. Differences between the two ASR versions can be found in 234-100-130AC, *SCS Description*.

2.03 The SCS incorporates the functions previously listed into the *4ESS* switch by harnessing the connection capabilities of *4ESS* switch call processing logic. This means the *4ESS* switch can play announcements to both the caller and called party. It can also collect information from

both the caller and called party.

2.04 With the SCS, critical buses and data links are duplicated. Also, critical circuit packs as well as the Hard Disk Units (HDUs) which store SCS announcements are duplicated.

2.05 With the optional ASR feature, information collection capabilities are greatly improved and become more flexible by providing recognition of spoken responses such as digits (1, 2, 3, etc.) and simple words ("zero," "yes," "no," etc.). ASR also reduces expenses by decreasing required attendant services for customers that do not have touch-tone capability.

Equipment Configuration

2.06 Initially, each SCS consists of two or three cabinet types: the Service Circuit Controller (SCC) cabinet (J4A024A-1), the SCU cabinet (J4A024B-1), and (optionally) the Custom Data Services Cabinet-I (CDSC-I) cabinet (J4A024C-1) or Custom Data Services Cabinet-II (CDSC-II) cabinet (J4A024D-1). A *4ESS* switch office can support up to eight SCS complexes. One SCC can support up to 16 SCUs. An SCU can support up to five Custom Data Service Unit-Is (CDSU-Is) or two Custom Data Service Unit-IIs (CDSU-IIs).

3. Physical Description

General

3.01 The equipment cabinets used for each SCS are 6 feet high, 2 feet 6 inches wide, and 24 inches deep. The equipment cabinets are the shielded type with double doors hinged at the edges of the cabinet. The units mounted in each SCC and SCU cabinet contain *FASTECH** circuit packs and backplanes. Integrated circuits of the dual in-line package variety and discrete components are both used in the circuit packs. Most power units are mounted in the same unit in which they are used and are adjacent to the circuit pack group served. Each circuit pack and power unit is labeled on designation strips to indicate its identity and boundaries. For concrete slab applications only, a 1-foot tall, 30-inch wide, and 24-inch deep cable cabinet is mounted on top of each cabinet. 234-100-130AC, *SCS Description*, provides detailed descriptions of SCS equipment.

* Registered trademark of Berg Electronics, Inc.

The SCC Cabinet (J4A024A-1)

3.02 The SCC cabinet is the basic cabinet required in each SCS. The basic cabinet is equipped with each of the following units:

- One Fuse and Filter Unit (J5D003FJ-1)
- One Optical Cross-Connect Panel (J4A024AD-1)
- One SCC Unit 1 (J4A024AA-1)
- One SCU 0 (J4A024AB-1)
- One Fan Unit (J5D003FH-1)
- Two Hard Disk Units (J4A024AC-1).

The SCU Cabinet (J4A024B-1)

3.03 The SCU cabinet is equipped with each of the following units:

- One Fuse and Filter Unit (J5D003FJ-1)
- Up to four SCUs (J4A024AB-1)
- One Fan Unit (J5D003FH-1)
- Up to two Hard Disk Units (four pairs of hard disk circuit packs; one pair for each SCU) (J4A024AC-1).

The Custom Data Services Cabinet-I (CDSC-I) (J4A024C-1)

3.04 The CDSC-I is connected to an SCU to perform special signal processing functions. The cabinet contains up to five Custom Data

Services Units (CDSU-Is). Each CDSU-I performs speech recognition for 24 channels. The CDSC-I is equipped with each of the following units:

- One Fuse and Filter Panel (J5D003FJ-1)
- Up to five CDSU-Is (J4A024CA-1)
- One Smart Hub (not in every CDSC-I; only one required for each set of eight CDSC-Is).

The Custom Data Services Cabinet-II (CDSC-II) (J4A024D-1)

3.05 The CDSC-II is connected to an SCU to perform special signal processing functions. The cabinet contains up to four Custom Data Services Units (CDSU-IIs). Each CDSU-II performs speech recognition for 60 channels. The CDSC-II is equipped with each of the following units:

- One Fuse and Filter Panel (J5D003FJ-1)
- Up to four CDSU-IIs (J4A024DA-1)
- One Smart Hub (not in every CDSC-II; only one required for each set of four CDSC-IIs).

The SCC Unit (J4A024AA-1)

3.06 The SCC is a two-shelf unit consisting of two identical or duplexed controllers, each occupying a single shelf of the cabinet. The two controllers are stacked vertically with a common backplane.

3.07 The SCC has the following six circuit pack types:

- Peripheral Unit Driver/Receiver (PUDR) (UN349)
- Peripheral Unit Bus Interface (PUBI) (UN350)
- Executive Processor (UN351 or UN591)
- Global Random Access Memory (RAM) (UN352)
- Extended Bus Interface (EBI) (KCN3)
- Backplane Transceiver Logic (BTL) Bus Terminator (UN357).

3.08 The SCC has the following three power controller types:

- Integrated Power Controller (TN1671)
- Power Control Circuit (TN1984)
- Power Converter (410AA).

The SCU (J4A024AB-1)

3.09 Each SCU is a single unit with one shelf of circuit packs. Each SCU has the following 12 circuit pack types:

- DS-120 Exchange and Interface (TN1588)
- Multifaceted Signal Processor (TN1589)
- Enhanced Peripheral Interface Controller (TN1976)
- Microstore (TN1977) or (TN9001)
- SCSI Host Adapter (TN1978)
- Voice Processor (TN1979)
- Voice Processor Interface Controller (TN1980)
- Buffer Control (TN1981)
- Buffer Fabric (TN1982)
- Table RAM (TN1983) or (TN9002)
- Extended Bus and Local Area Network (LAN) Interface (KCN4)
- Multifunctional Interface Processor (TN4001).

3.10 The SCU has the following two power controller types:

- Power Control (TN1984)
- Power Converter (410AA).

The CDSU-I (J4A024CA-1)

3.11 Each CDSU-I is a single unit occupying one shelf of the CDSC-I. Each CDSU-I consists of the following:

- One 486 Processor Card (WP-92304L301 CAT 1012) manufactured by Diversified Technology Inc.
- One Hard Disk Drive (WP-92304L304)
- One Ethernet LAN Interface Card (WP-92304L306)
- One Super Video Graphics Adapter (SVGA) Card (WP-92304L304)
- One Small Computer System Interface (SCSI) Card (WP-92304L307)
- Twelve AYC50 Speech Processing Cards
- Two T1 Interface Cards (WP-92304L302)
- One Control Module
- One Power Module
- Three Fans.

The CDSU-II (J4A024DA-1)

3.12 Each CDSU-II is a single unit occupying one shelf of the CDSC-II. Each CDSU-II consists of the following:

- One *Pentium** Extended Industry Standard Architecture (EISA)/Peripheral Controller Interface (PCI) Processor Board
- One Hard Disk Drive
- One Ethernet LAN Interface Board
- One PCI SVGA Video Board
- One PCI SCSI Interface Board
- Five BYC51 Speech Processing Cards
- One AYC52 T1 Interface Card
- One AYC53 Echo Cancellation Card
- One Control Module
- One Power Module
- Three fans.

* Registered trademark of Intel Corporation.

Hard Disk Unit (J4A024AC-1)

3.13 The SCU's announcements and operating system are stored in the HDU. Each HDU is comprised of two matched Hard Disk (HD) pairs and two power controllers. Each HDU takes up one shelf in the SCC and/or SCU cabinet. The SCC and SCU cabinets can each be equipped with up to two HDUs (two matched pairs of hard disk circuit packs). In the SCU cabinet, one pair of hard disk circuit packs is associated with each SCU. In the SCC cabinet, all four pairs of hard disk circuit packs are associated with SCU 0. The hard disk circuit packs available are the TN1672 (420 MB), the TN1972 (2 GB), the TN4000 (4 GB), and the TN9000 (9 GB). The UN356 circuit pack supplies +12 V and +5 V to drive one pair of disk circuit packs.

Floor Plan Arrangements

3.14 Each *4ESS* switch office should be able to support eight SCS complexes.

3.15 A *4ESS* switch office is required to have two adjacent vacant building bays. Each bay should be 400 square feet and capable of supporting 140 pounds per square foot. These adjacent bays will be capable of housing two Power Distribution Frames (PDFs), eight duplex SCCs, and all the associated SCUs and disk drives.

3.16 The adjacent building bays must be within one floor of the *4ESS* switch ground window, within 700 cable feet of the extended polling Peripheral Unit Bus Branch (PUBB), and within 1000 cable feet of the breakage Time Slot Interchange (TSI) frame. The "within 700 cable

feet of the PUBB" requirement only applies if the SCS complex is a single entity on that PUBB (for more entities, the distance is shorter). Additionally, the maximum distance from any SCU to the Announcement Administrative Processor (AAP) is 607 cable feet. For distances greater than 607 cable feet, a repeater is required.

3.17 If the ASR feature is provided, floor space is also required for the CDSCs. One CDSC-I is required for each SCU that has the ASR Phase 1 option. One CDSC-II is required for each two SCUs that have the ASR Phase 2 option. The CDSC must be within 415 cable feet of the associated SCU.

3.18 Specifications for the SCC cabinet, SCU cabinet, and CDSC are provided in Table A.

Table A. Cabinet Specifications

Specification	SCC Cabinet	SCU Cabinet	CDSC-I	CDSC-II
Height	6 ft.	6 ft.	6 ft.	6 ft.
Depth	2 ft.	2 ft.	2 ft.	2 ft.
Width	2 ft. 6 in.	2 ft. 6 in.	2 ft. 6 in.	2 ft. 6 in.
Front Clearance	2 ft. 6 in.	2 ft. 6 in.	2 ft. 6 in.	2 ft. 6 in.
Rear Clearance	2 ft.	2 ft.	2 ft.	2 ft.
Weight	700 lbs.	750 lbs.	575 lbs.	500 lbs.
Power Consumption	2183 watts	2138 watts	2275 watts	2400 watts

4. Office Connections

SCC to 1B Processor

4.01 The SCC communicates with the Central Controller (CC) via the Peripheral Unit Bus (PUB), which is shared with many other *4ESS* switch peripherals. The PUB is fully duplicated and has 24 data bits from the CC to the SCC, and 24 data bits from the SCC to CC. There are also some dedicated control and response bits for specialized polling of peripherals by the CC, fault recovery, and error detection, for a total of 64 transmit bits and 32 reply bits. A maximum of eight SCCs can be connected to a *4ESS* switch PUB.

4.02 To allow polling of the SCC's buffers, **the SCCs must be placed on a PUBB with the extended buffer polling option**. The extended buffer polling option expands the CC's buffer polling capabilities on a specific PUBB. Replies to the extended buffer polling on the SCCs are on bits 8 through 15 of the Peripheral Unit Reply Bus (PURB). Additional information on extended buffer polling and its requirements can be found in 234-110-010, *Peripheral Unit Bus System, Description, 4ESS Switch*.

4.03 The PUB connects to the rear of both SCC circuits per ED-4A286-31, G1 and ED-4A286-31, G2. PUB0 connects at mounting plate 045 and PUB1 connects at mounting plate 053. They connect at horizontal locations 144, 152, 160, and 168 of both controllers. These are the locations of the UN349 PUB Driver/Receiver circuit packs in the Interface to Peripheral Unit Bus (IPUB) section of each SCC.

SCU to *4ESS* Switch

4.04 Each SCU has a bidirectional DS-120 link to the *4ESS* switch. Each link consists of a pair of coaxial cables. Digital data representing announcements and Dual Tone Multifrequency (DTMF) tones are sent serially on the DS-120 links, with 120 voice terminations and 8 maintenance channels per link. The TN1588 DS-120 exchange and interface circuit pack connects the links coming from the *4ESS* switch network and the SCU's local time slot bus. A description of the TN1588 can be found in 234-100-130AC, *Service Circuit System Description*.

4.05 A pair of coaxial cables carry the bi-directional DS-120 link from the *4ESS* switch network to paddle board connectors on the SCU backplane directly behind the DS-120 circuit pack (position 032). The coaxial cables terminate at the

4ESS switch network on breakage TSI frames.

SCU and CDSU to AAP

4.06 Announcement administration for the SCU is provided by an AAP. The AAP communicates with SCUs over a dedicated LAN. If the ASR feature is used, this same LAN is connected to the CDSUs via a Smart Hub (see Figures 1 and 2). This network consists of the following:

- The SCU/AAP interface circuitry resident in the SCUs' KCN4 Extended Bus and LAN Interface (EBLI) circuit pack
- The LAN coaxial cables that daisy-chain the SCUs together
- The LAN coaxial cables between the AAP and the SCUs, and the Ethernet transceiver subassemblies
- The LAN coaxial cable between the AAP and the Smart Hub
- The Ethernet controller boards in the AAP
- The Smart Hub in the CDSC.

SCU to CDSU-I

4.07 Two DS1 links connect the SCU to each CDSU-I (half of each link is used for ASR and the other half of each link is used for echo cancellation). The DS1 connection on the SCU side is made at the SCU's TN4001 Multifunctional Interface Processor (MIP) circuit pack.

4.08 An Ethernet LAN connection is provided between the SCU and the CDSU-Is as a control link. This LAN is connected to the lowest-numbered CDSU-I and then daisy-chained to each of the other CDSU-Is within the CDSC-I. This same LAN is also connected to the Smart Hub from the highest-numbered CDSU-I. This LAN network (see Figure 1) consists of the following:

- The LAN interface circuitry resident in the SCUs' TN4001 MIP circuit pack
- The LAN interface circuitry resident in the CDSU-Is' Ethernet LAN Interface Card
- The LAN coaxial cables that daisy-chain the CDSU-Is together
- The LAN coaxial cable between the SCU and the lowest-numbered CDSU-I sub-assemblies
- The LAN coaxial cable between the highest-numbered CDSU-I and the Smart Hub.

SCU to CDSU-II

4.09 Five DS1 links connect each CDSU-II to an SCU (half of each link is used for ASR and the other half of each link is used for echo cancellation). The DS1 connection on the SCU side is made at the SCU's TN4001 Multifunctional Interface Processor (MIP) circuit pack.

4.10 An Ethernet LAN connection is provided between the SCU and the CDSU-IIs as a control link. This LAN is connected to the lowest-numbered CDSU-II and then daisy-chained to the other CDSU-II within the CDSC-II. This same LAN is also connected to the Smart Hub from the highest-numbered CDSU-II. This LAN network (see Figure 2) consists of the following:

- The LAN interface circuitry resident in the SCUs' TN4001 MIP circuit pack
- The LAN interface circuitry resident in the CDSU-IIs' Ethernet LAN Interface Card
- The LAN coaxial cables that daisy-chain the CDSU-IIs together
- The LAN coaxial cable between the SCU and the lowest-numbered CDSU-II sub-assemblies
- The LAN coaxial cable between the highest-numbered CDSU-II and the Smart Hub.

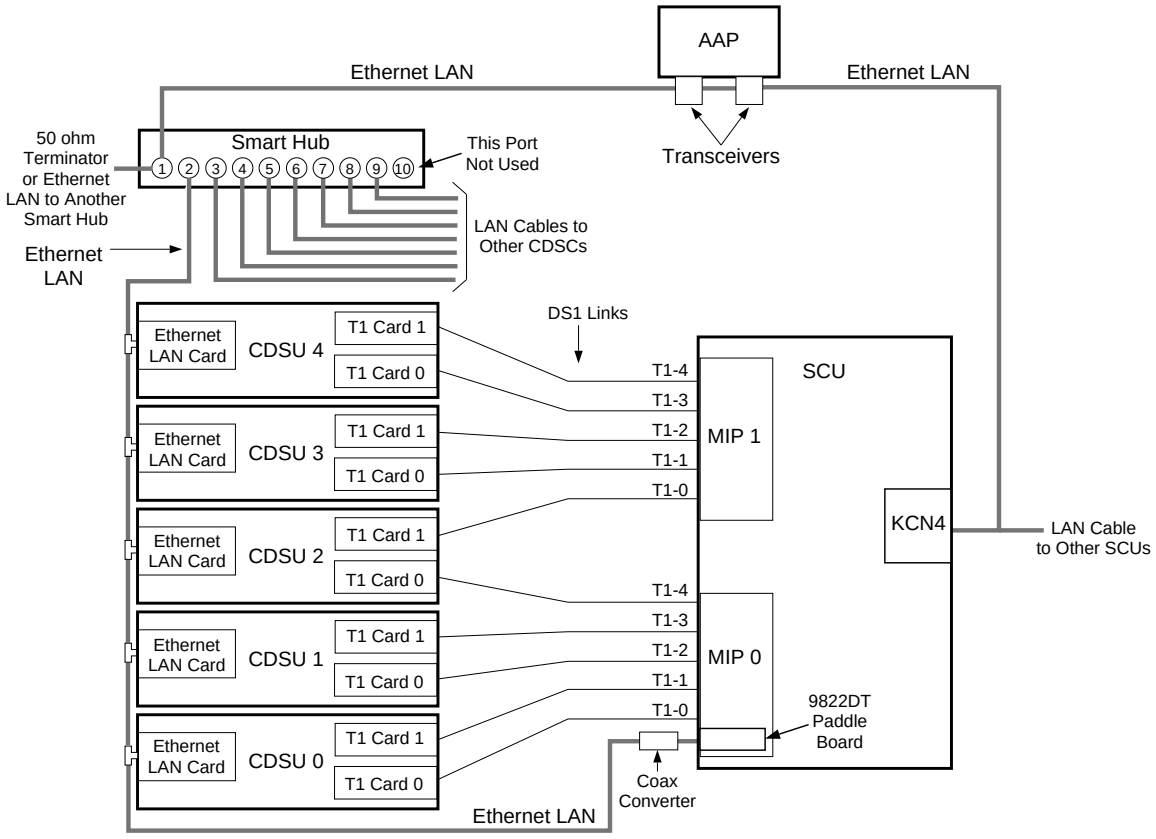

Figure 1. SCU/CDSU-I/AAP Connections

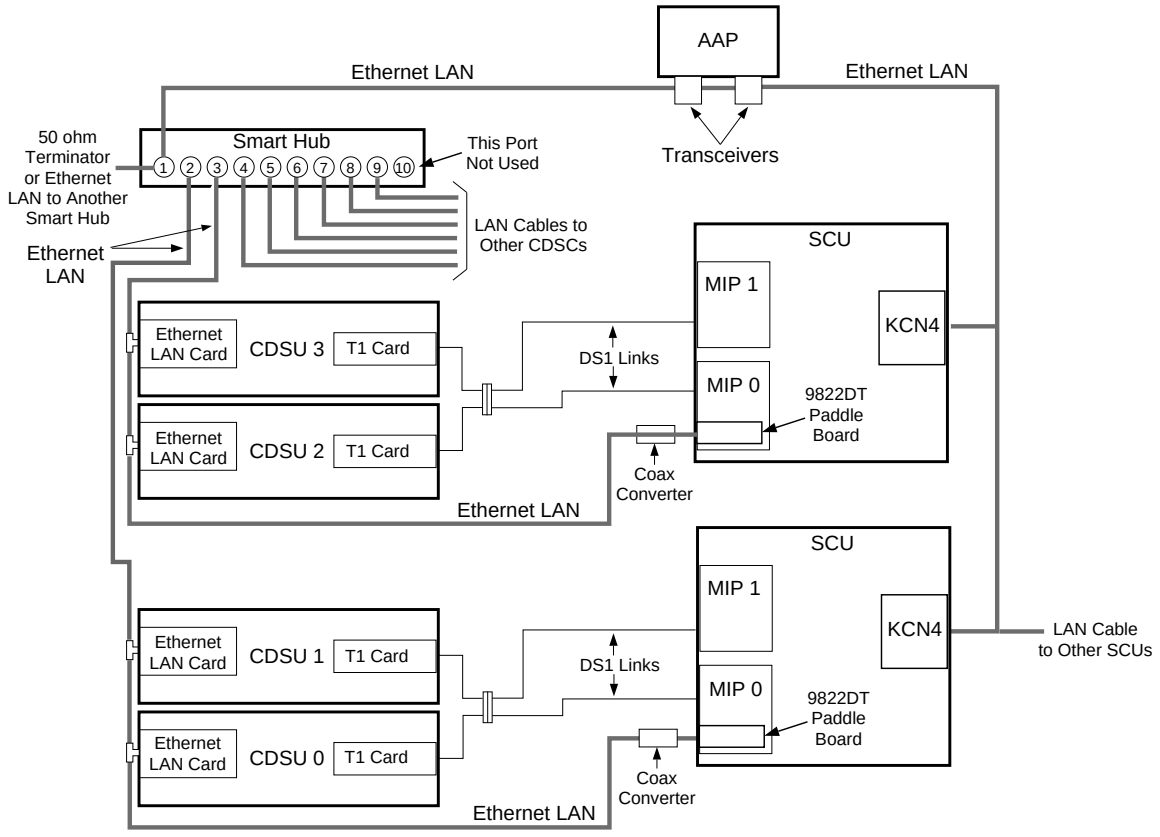

Figure 2. SCU/CDSU-II/AAP Connections

Alarm Reporting

A. SCS Alarms

4.11 Alarms for the SCS are reported via scan leads tied to the *4ESS* switch. Each of the TN1984 and TN1671 power control circuit packs report individual alarm status through a dedicated set of scan leads. A major alarm is activated at the cabinet if a power fault or fan failure occurs. This alarm is reported to the *4ESS* switch alarm grid.

B. CDSU-I Alarms

4.12 CDSU-I fuse alarms, power failures and component failures, including fan alarms, are not reported to the office alarm grid but are reported to the 1B processor via an SCU interject message sent on the LAN. This interject causes the SCU/CDSU-I to be removed from service and an SCU/CDSU-I diagnostic to be initiated. Diagnostic phases then detect and report the CDSU-I failure via the appropriate output message. To aid maintenance personnel in identifying the specific CDSC-I that has failed, labels are attached to the SCUs and CDSC-Is to cross-reference their physical locations in the office. Also, diagnostic software provides the floor identification code of the CDSC-I when a fault has been detected.

C. CDSU-II Alarms

4.13 For major and minor alarms, the CDSU-II software will send error report messages along with the appropriate alarm level [interject or Base Level Maintenance (BLM)] to the MIP via the LAN. This interject causes the SCU/CDSU-II to be removed from service and an SCU/CDSU-II diagnostic to be initiated. Diagnostic phases then detect and report the CDSU-II failure via the appropriate output message. To aid maintenance personnel in identifying the specific CDSC-II that has failed, labels are attached to the SCUs and CDSC-IIs to cross-reference their physical locations in the office. Also, diagnostic software provides the floor identification code of the CDSC-II when a fault has been detected.

4.14 In addition to the interjects and Broadcast Warning Messages (BWMs) that may be generated, office alarms may also be triggered. One relay for major office alarms is provided in the CDSU-II via scan point connections.

4.15 In addition to the system fans, each BYC51 has three processor fans (one per Power PC chip). These fans are not alarmed, but each Power PC chip has a thermal sensor which will report overheating of the chip. This error is reported to the SCU as an interject via the LAN.

Power Distribution

4.16 The majority of the SCS units share a common power design that provides the following major features:

- Power is derived from –48 V using *FASTECH* power unit circuit packs.
- Power units are automatically shut down for fault protection.
- Each unit (or functional unit group) has an individual power switch and control circuit pack.
- Each unit power control circuit communicates power status to the *4ESS* switch processor.
- Each unit power control circuit provides clamping outputs to protect the SCS common buses during unit fault and power cycling intervals.
- Indicators are provided to help localize any detected power fault.

4.17 Each SCC cabinet requires six –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.

4.18 Each of the SCU cabinets require four –48 V power feeders from the power distribution frame. The power feeders to each frame are connected to a fuse panel via a filter unit located at the top of the frame. The –48 V is then distributed to the various DC-to-DC power converter units within the frame via alarm-type fuses in the fuse panel.

4.19 Each CDSC requires one –48 V power feeder from the power distribution frame for each CDSU in the cabinet. These power feeders must be from the same power bus (A or B) that is connected to the associated SCU. If the CDSC-II is used, feeders from both A and B power buses may be required if the two SCUs connected to the CDSC-II use different power buses. The power feeders to each frame are connected to a fuse panel via a filter unit located at the top of the frame. The –48 V is then distributed to the various DC-to-DC power converter units within the frame via alarm-type fuses in the fuse panel. Also, a 120 V AC outlet is required in each CDSC with a Smart HUB, to provide power for the Smart Hub.

Abbreviations and Acronyms

5.01 The following defines the abbreviations and acronyms used in this practice.

AAP	Announcement Administrative Processor
ASR	Automatic Speech Recognition
BLM	Base Level Maintenance
BWM	Broadcast Warning Message
BTL	Backplane Transceiver Logic
CDSC	Custom Data Services Cabinet
CDSU	Custom Data Services Unit
CC	Central Controller
DTMF	Dual Tone Multi Frequency
EBI	Extended Bus Interface
EBLI	Extended Bus and LAN Interface
EISA	Enhanced Industry Standard Architecture
HD	Hard Disk
HDU	Hard Disk Unit
MIP	Multifunctional Interface Processor
IPUB	Interface to Peripheral Unit Bus
LAN	Local Area Network
PCI	Peripheral Component Interface
PDF	Power Distribution Frame
PUB	Peripheral Unit Bus
PUBB	Peripheral Unit Bus Branch
PUBI	Peripheral Unit Bus Interface
PUDR	Peripheral Unit Bus Driver/Receiver
PURB	Peripheral Unit Reply Bus
RAM	Random Access Memory
SCC	Service Circuit Controller
SCS	Service Circuit System
SCSI	Small Computer System Interface
SCU	Service Circuit Unit
SVGA	Super Video Graphics Adapter
TSI	Time Slot Interchange

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Document Title: SERVICE CIRCUIT SYSTEM APPLICATION *4ESS*™ SWITCH

Document No.: 234-100-210AC Issue 4 Date: November 1997

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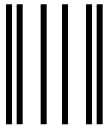

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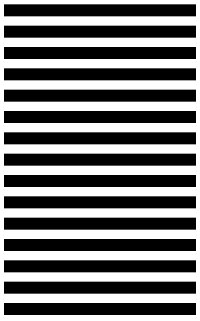

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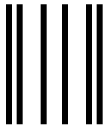

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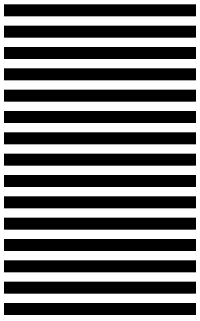

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