5ESS® SWITCHING EQUIPMENT
SWITCHING MODULE CONTROL CABINET
MODEL 2
CIRCUIT

CHANGES

B. Changes in Apparatus

Added the following options: YF, YG, YH, YJ, YL, and YM. Added the following apparatus figures: 8, 9 and 10.

D. Description of Changes

These changes introduce the following options:

Option YF, provides a bi-directional fan unit for shared switching module (SM) application.

Option YG, provides a digital line trunk unit, model 2 (DLTU2) unit for shared SM application.

Option YH, provides communication module unit (CM2C) shelf side 0 with a bottom 6 fan unit.

Option YJ, provides CM2C shelf side 1 with a bottom 6 fan unit.

Option YL, provides CM2C shelf side 0 with a bi-directional fan unit.

Option YM, provides CM2C shelf side 1 with a bi-directional fan unit.

F. Changes in CD Sections

Added the following description to section 2 under "Fan Unit:"

FAN UNIT SD-5D168-01

Equivalent to the bottom 6 fan unit, it only requires different shelf positions for installation.

Added the following descriptions to section 2.01, "CONNECTING CIRCUITS" under peripheral units:

— CM2C (Communication Module Unit)
SD-5D513-01

— DLTU2 (Digital Line Trunk Unit Model 2)
SD-5D205-01

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MODEL 2
CIRCUIT

CHANGES

B. Changes in Apparatus

None.

D. Description of Changes

Added a bracket to provide -48 volts tap for the alarm status unit (ASU) when an FJ modular fuse/filter unit is installed.

F. Changes in CD Sections

None.

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MODEL 2
CIRCUIT

CHANGES

B. Changes in Apparatus

Added apparatus figure 7.

D. Description of Changes

FJ fuse/filter units, equivalent to either AU2 or BT1, added to the switching module control (SMC) cabinet.

F. Changes in CD Sections

Added the following descriptions to section 2, "Fuse/Filter Unit:"

FUSE/FILTER UNIT SD-5D190-01 Modular Fuse/Filter Unit.

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MODEL 2
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CHANGES

B. CHANGES IN APPARATUS

B.1 Options "ZH" and "ZI" added to App. FIG. 1.
App. FIG. 6 for the ASU2 added.

D. DESCRIPTION OF CHANGES

D.1 Option "ZH", which provides the red and yellow LEDs that mount in sockets in the Bezel, is replaced with option "ZI", which provides the 300A cabinet fan/fuse indicator circuit which connects to the alarm circuits through a connectorized cable. Provides RTB information for the ASU2, which is electrically similar to an ASU. The ASU2 is physically different from the ASU. The ASU2 provides CI keys, RSM alarms, and scan and distribute points for the SM.

F. CHANGES IN CD SECTIONS

F.1 Add a section in I2.xx describing the ASU2 and its interfaces.

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5ESS® SWITCHING EQUIPMENT SWITCHING MODULE CONTROL CABINET, MODEL 2 CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added option "ZF" and "ZG" to App. Figure 1.

D. Description of Changes

D.01 This change is being introduced to reduce the number of cable groups required for the SM fuse alarms. Option "ZG" provides cable groups of ED5D688-15 to replace option "ZF," cable groups of ED5D503-15, on all new SMs.

F. Changes in CD Sections

F.01 None.

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CIRCUIT

B. Changes in Apparatus

B.1 Added J5D003BN-2 to Apparatus Figure 1.

D. Description of Change

D.1 In the SMC2 Cabinet, 6-FAN UNIT J5D993BN-1, will be replaced by J5D003BN-2.

F. Changes in CD Sections

F.1 None.

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CIRCUIT

B. CHANGES IN APPARATUS

B.01 Apparatus Figure Two provides all the variations of the reconfigured SMC2 cabinet. Options E, D and B provide a rewired version of the two feeder Fuse/Filter unit 5D-5D053-01. Options A, ZA, and ZB provide a more standard version of SD-5D053-01. Options ZC, ZD, and ZE provide the four feeder Fuse/Filter unit SD-5D087-01. Option F, of Apparatus Figure 1, will now be the standard cabinet configuration.

D. DESCRIPTION OF CHANGE

D.01 The purpose of this change is to allow expanded equipage of peripheral units in the SMC2 cabinet. Previously each shelf of the MCTU2 and half of the six-fan unit were powered from a separate FFU, now both shelves of MCTU2 and all six fans may be powered from a single FFU, (options E, D, and B). In this case, both the "A" bus and "B" bus are brought into a single FFU which has been modified to equally separate both -48V power and the fuse alarm groups. Options D and B are modified versions of option E for the use in a single bay SM applications.

D.02 Options A, ZA, and ZB are provided to power peripheral units which would require up to sixteen fuse positions from a single feeder. In option A, both feeders of the SD 5D053-01 FFU are powered from the "A" bus. In option ZA, both feeders are powered the "B" bus. In option ZB, one feeder is powered from the "A" bus and one from the "B" bus.

D.03 Options ZC, ZD, and ZE are provided to power peripheral units which have higher power requirements, but need fewer fuses per feeder. Option ZC provides a SD-5D087-01 FFU with all four feeders on the "A" bus. In option ZD, all four feeders are on the "B" bus. In option "ZE" two feeders are powered from the "A" bus and two from the "B" bus.

D.04 When any of the options of apparatus figure two are specified, the TEL & TTY jacks will be equipped on the FFU that is mounted on the right side of the cabinet (front view). The TEL & TTY circuitry was moved in order to provide a second FFU alarm circuit board (ED-5D521-30,G1) in options E, D, and B.

D.05 When option E, D, or B is equipped, the fuse alarm "MULT" cabling for both bus 0 and bus 1 will originate and end at that FFU. The second FFU in the SMC2 Cabinet will be tied into the proper fuse alarm mult for which it is powered.

F. CHANGES IN CD SECTIONS

F.01 Add references about reconfigured Fuse/Filter units to Section I 2.02, Section II 1.12, 1.16, 1.17, 1.20, 1.23, Section III 1.03.

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SWITCHING MODULE CONTROL CABINET
MODEL 2
CIRCUIT

CHANGES

B. CHANGES IN APPARATUS

B.1 Added option "G" to apparatus Figure 3 and 4. Option "G" will allow ODL50 fiber optic transducers (982TR and 982TS) to be used in the cabinet.

D. DESCRIPTION OF CHANGES

D.1 This change allows ODL50 fiber optic transducers to be used in place of ODL40 fiber optic transducers when the cabinet is used in a Local Switching Module, Host Switching Module or a Remote Switching Module.

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5ESS™ SWITCHING EQUIPMENT

SWITCHING MODULE CONTROL CABINET, MODEL 2 CIRCUIT

TABLE OF CONTENTS PAGE

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The switching module control cabinet, model 2 (SMC2) provides fusing and cooling for the module controller and time slot interchanger unit, model 2 (MCTU2) and any equipped peripheral units[1] within the cabinet. The MCTU2 has been redesigned to improve performance, and this is the sole reason for introducing the SMC2.

2. GENERAL DESCRIPTION OF OPERATION

2.01 The SMC2 houses the MCTU2, the fuse/filter unit (FFU) and the six-fan unit.

The MCTU2 provides the following equipment/functions in the SMC2:

- A switch module processor (SMP) to provide the intelligence for call-processing.
- A time-slot interchanger and signal processor (TSI/SP) to

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1. Global digital service unit, metallic service unit, digital line and trunk unit, line unit, trunk unit, packet switch unit, integrated services line unit, etc.

perform time-division switching and related functions.

- A data interface (DI) to provide an interface to peripheral units for pulse code modulation (PCM) data.
- A control interface (CI) to provide an interface between the SMP and peripheral units.
- A packet interface (PI) to provide an interface for implementing intergrated services digital network (ISDN) capabilities.
- A dual link interface (DLI) to provide an interface between the communication module, model 2 (CM2) and the SMC2 via optical fibers called network control and timing (NCT) links.
- A local digital service unit (LDSU) to provide digital signal processing capabilities.

2.02 The six-fan unit provides air flow for maintaining correct operating temperatures for all equipment within the SMC2. Six separate fans are used in the six-fan unit. Only five are required to provide sufficient airflow, thereby ensuring that correct operating temperature can be maintained should a single fan failure occur. Circuitry to detect and report a fan failure to the MCTU2 is provided via a scan point from the unit. A fan failure alarm can be retired manually, or by software control, using a distribute point to the six-fan unit.

2.03 The FFU provides fusing for all equipped units in the SMC2, as well as an electrical alarm signal and a visual indicator whenever any fuse blows. To ensure that the alarm circuitry is functioning, the FFU provides an alarm test capability.

SECTION II - DETAILED DESCRIPTION

MCTU2 - SD-5D151-01

The MCTU2 has nine subfunctions:

(1) Switch module processor (SMP).

(2) Dual link interface (DLI).

(3) Time slot interchanger (TSI).

(4) Signal processor (SP).

(5) Data interface (DI).

(6) Control interface (CI).

(7) Packet interface (PI).

(8) Local digital service unit (LDSU).

(9) Power control (PWRCTRL).

1.01 The SMP provides the operating environment for software and interfaces to the TSI subunits. The SMP can operate in the active, standby, or out-of-service (OOS) mode. In the active state, the SMP performs call processing, executes code, and controls the DLIs and interface units. In the standby state, the SMP does not execute code but allows the active processor access to its internal buses. In the OOS state, the SMP is able to execute code but cannot access the DLIs. In the normal operating mode of the SMP, one processor is active, and the other processor is standby. An "active" SMP means that its "A" flip-flop is set, and it is executing code. Circuitry is provided to ensure that neither a standby nor OOS processor can access a DLI. Under normal (no faults) operating conditions, the active processor keeps all data areas in the standby controller up to date so that the standby processor can, at any time, be made active. Should a fault occur in the active processor, the standby processor will be made active, and the active processor made OOS.

1.02 The DLI provides the interface to NCT links. It recovers timing information from these links to provide timing for the MCTU2. The DLI contains the transmit and receive circuitry needed to interface to the optical links. It also provides the SMP an interface to the message time slot (MTS) on each NCT link. Because the DLI is in the same failure group as the time multiplexed switch (TMS) in the CM2, cross-coupling is necessary for all connections between the DLIs and the duplex MCTU2. The DLI selects one of two NCT links connected to it or to the mate DLI as a reference timing source. Under SMP control, the TSI selects one of the two DLIs as a clock source and distributes this clock to the rest of the MCTU2.

1.03 The TSI is the time division switch, and it contains two 512 x 512 time-slot interchangers: one for data from the TMS to peripheral units, and one for data from peripheral units to the TMS. The two 512 x 512 switches are connected such that timeslots may be looped, thereby providing the capability to connect peripheral timeslots to other peripheral timeslots for intramodule calls. The TSI also provides a data port to the LDSU.

1.04 The SP performs the hit timing and processing on signaling and control bits (A-G) from peripheral timeslots. It provides the SMP access to these bits and provides a first in/first out (FI/FO) type queue to report state changes of these bits. It also allows the SMP to source these bits to peripheral units.

1.05 The DI provides the data interface to peripheral units. It reformats time-slot information and does a 2:1 concentration on peripheral timeslots. Two DIs are connected to the TSI, each providing the TSI with 256 timeslots per frame. Each DI provides 16 peripheral interface data buses (PIDBs) for connection to peripheral units.

1.06 The CI provides the interface between the SMP and the various peripheral units for control information through peripheral interface control buses (PICBs). Each CI provides 23 PICB connections. The MCTU2 may be equipped with two CIs (per side) to provide a total of 46 PICBs.

1.07 The PI provides the Interface to the packet switch unit (PSU). The PI and associated PSU are used in an SM for the integrated services digital network (ISDN). The PI and PSU provide a centralized high bandwidth interface to support packetized data and signaling messages. By centralizing packet processing in the PSU, efficient signaling, maintenance, and administrative interfaces are maintained, and the distributed architecture of the 5ESS® Switch is enhanced.

1.08 The LDSU is responsible for creating and transmitting call-progress tones, multifrequency signals, tone-dialing signals, and common channel interoffice signaling continuity check tones. It also does dial-pulse collection, tone-decoding and detection of multifrequency signals. To provide reliable operation, the LDSU comprises .wo service groups that share the load, so that a single fault can, at most, reduce the LDSU capacity by 50 percent. The LDSU uses AT&T-T digital signal processing chips for its required services.

1.09 The PWRCTRL provides the SMP, CI, DI, TSI, SP and PI a common +5-volt power supply in the MCTU2.

SIX-FAN UNIT - SD-5D081-01

The six-fan unit provides the following functions:

- Maintains airflow through the SMC2 by providing six fans.
- Provides a fan-failure detection for any one of six fans through a "fan-failure" scan point and a red light-emitting diode (LED) located in rear of the unit.
- Provides a "clear-fan failure" distribute point, used to clear a "fan-failure" alarm through software.
- Provides a reset button, located in the rear of the unit, to clear a "fan-failure" alarm manually.

1.10 The six-fan unit provides air flow for maintaining correct operating temperatures for all equipment within the SMC2 by providing six fans and a fan alarm board. Only five are required to provide sufficient airflow, thereby ensuring that correct operating temperature can be maintained should a single fan failure occur.

1.11 Within the six-fan unit, the 233A fan alarm board is used to detect and report fan failures. This requires detecting a fan failure and activating corresponding visual displays on the rear of the six-fan unit (red LED) and on the SMC2 bezel (yellow LED). A fan failure will also activate a scan point used by SMP software to detect the fan failure. The 233A alarm board provides a reset capability for retiring a fan failure alarm. This is accomplished by momentarily removing power to the alarm detection circuitry; activation is by a switch, located on the alarm board or through an SMP software controllable distribute point. Each fan of the six-fan unit is powered by a separate -48V feeder, while the 233A alarm board obtains its power from two of the six fans.

FUSE/FILTER UNIT - SD-5D053-01

1.12 Two fuse/filter units (FFUs) are used in the SMC2. Each FFU is connected to two 20A, -48V feeders from the power distributing cabinet. One FFU is connected to a "0" feeder bus; the other to the "1" feeder bus.

1.13 The SMC2 uses FFUs (J5D003AU-2) equipped with list 6 to provide an extra high current (>5A) fuse block in addition to the standard low-current (<5A) fuse block. Therefore, each FFU provides eight high-current load fuses and 24 low-current load fuses. With the use of two FFUs in the SMC2, a total of 16 high-current and 48 low-current load fuses are available.

1.14 When a fuse blows, fuse alarms are generated by sending a -48V signal to the FFU plug-in circuit pack (ED-5D521-30,G1) where they are combined to light a red LED in the FFU and a red LED on the SMC2 bezel, and to send an electrical signal to the SMP indicating the fuse alarm.

INTERFACES

EXTERNAL INTERFACES

MCTU2 External Interfaces

The MCTU2 external interfaces are:

- DLI control and display interface.
- Revertive pulsing interface.
- Peripheral interface data bus.
- Peripheral interface control bus.
- Packet switch unit interface.
- DLI-TRCU interface.
- Fiber optic MCT link interface.

1.15 A complete description of the above MCTU2 external interfaces can be found in CD-5D151-01.

FFU Power Interface

1.16 The power input to the cabinet is -48V, with the return lead isolated from cabinet ground. Each FFU has two circuits that are fed from a 20-amp fuse in the power distributing cabinet. One FFU is connected to the "0" feeder bus; the other to the "1" feeder bus.

FFU alarm/TEL/TTY Interface

1.17 A small terminal strip is provided on the FFU for pluggable connectors for fuse alarms, and also for the TEL, SP, TTY A, and TTY B functions. This terminal strip has pairs of terminals made common in its printed wiring pattern, such that two connectors plugged into it, side-by-side, will have identical signals present. These carry alarm and jack signals to/from line and trunk peripheral (LTP) cabinets of the SM.

INTERNAL INTERFACES

MCTSI Fuse Alarm Interface

1.18 The module controller and time slot interchanger (MCTSI) fuse alarm interface consists of signals between the SMP core support 1 (CS1) circuit pack and the FFU. The interface is used to monitor blown fuses. When an MCTSI 70-type indicator fuse is blown, the fuse connects -48 volts to this signal, which is used to light a red alarm LED on the FFU, on the cabinet bezel, and on the CS1 circuit pack. The mate SMP monitors this alarm scan point and will take appropriate recovery actions if it becomes active. The SMP can test continuity of the MCTSI fuse alarm circuitry and its connection to the FFU through a combination of three distribute points.

DLI Fuse Alarm Interface

1.19 The DLI fuse alarm interface consists of signals between the DLI alarm circuitry, FFU and CS1 circuit pack of the SMP. The interface is used to monitor blown fuses. When a DLI, 70-type indicator fuse is blown, the fuse connects -48 volts to a signal used to light a red alarm LED on the FFU, the cabinet bezel, and on the DLI circuit pack. The DLI alarm circuitry informs the SMP of the fuse alarm through two scan points. The SMP monitors the scan points and will take appropriate recovery actions if they become active. The SMP can test continuity of the DLI fuse alarm circuitry and its connection to the FFU through a combination of three distribute points.

Peripheral Fuse Alarm Interface

1.20 The peripheral fuse alarm interface consists of signals between the FFU and the CS1 circuit pack. The interface is used to monitor blown fuses in peripheral units. When a peripheral 70-type indicator fuse is blown, the fuse connects -48 volts to this signal used to light a red alarm LED on the FFU, the cabinet bezel. The SMP monitors the Z scan point and will take appropriate recovery actions if it becomes active. The SMP can test continuity of the peripheral connection to the FFU through a combination of three distribute points.

Six-Fan Unit Scan and Distribute Interface

1.21 A fan failure is reported to the SMP through a scan point from the six-fan unit to the CS1 circuit pack. When a fan fails, a scan lead becomes active and is used to light a red LED on the six-fan unit and a yellow alarm LED on the cabinet bezel. The SMP monitors this scan point and will take appropriate recovery actions if the scan point becomes active. A fan alarm can be retired by SMP software using a distribute point or manually by a push button located on the rear of the six-fan unit.

Unit Power Interface

1.22 All power for the MCTU2 and six-fan unit is connected to the FFU through a -48V feed and a -48V return (ground potential).

FFU Alarm Strapping

1.23 Each FFU provides four fuse alarm groups. Two of the fuse alarm groups are wired together for the SMC2 application. The remaining three SMC2 fuse alarm groups are:

1. MCTSI - Alarm group includes the SMP, CI, DI, TSI/SP and PI functions of the MCTU2.

2. DLI - Alarm group includes the DLI function of the MCTU2 and, optionally, one of the following units:

   - Transmission rate converter unit (TRCU) if the SMC2 is used in an optically remote switching module (ORM).

   - Facilities interface unit (FIU) if the SMC2 is used in a remote switching module (RSM).

3. Peripheral - Alarm group includes the LDSU function of the MCTU2, the six-fan unit, and any other peripheral units equipped within the SMC2.

Craft Intervention Interface

1.24 This interface is used when the SMC2 is used in a remote switching module (RSM) environment to provide interconnections between the SMP and the multi-module RSM (MMRSM) alarm and status unit (ED-5D586-01).

The MMRSM alarm and status unit is located in the SMC2 bezel and allows the following operations of the SMP:

- Force either side of the SMP active.

- Monitor the status of communication between the RSM and the host SM by indicating the state of the links between them.

- Monitor the status of the SMP by indicating the current state of sanity in each processor.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

Voltages

1.01 The SMC2 will function correctly at a nominal voltage of -48 volts, +4.5 or -6.25 volts.

Ambient Temperature

1.02 The SMC2 will function correctly at an ambient temperature of 0 to 70 degrees Centigrade at the circuit packs and 0 to 50 degrees Centigrade in office aisle.

Equipment Growth

With the basic SMC2 equipage, the cabinet contains three shelves (six-fan unit, MCTU2 shelf 0 and shelf 1). Four additional peripheral shelves may be equipped in the SMC2.

1.03 With the FFU fuse alarm groups divided into three groups (MCTSI, DLI and Peripheral) only eight high-current and 16 low-current load fuses are available from the FFU for SMC2 peripheral unit growth. Two of the 16 low-current load fuses are reserved for LDSU growth in the MCTU2.

2. FUNCTIONAL DESIGNATIONS

2.01 The function of this unit is described in Section 1 of this Circuit Description.

CONNECTING CIRCUITS

- Line and trunk peripheral cabinet - SD5D119-01
- Power distribution cabinet - SD82619-02
- Time multiplexed switch unit - SD-5D043-01
- Time multiplexed switch unit 2 - SD-5D061-01
- Multi module RSM alarm and status unit - SD-5D586-10
- Peripheral Units:
  - Line unit - SD-5D051-01
  - Line unit 2 -SD5D032-01
  - Line unit 3 -SD-5D180-01
  - Trunk unit - SD-5D300-01
  - Digital carrier line unit - SD-5D203-01, DS-5D202-01
  - Integrated services line unit - SD-5D091-01
  - Packet switch unit - SD-5D074-01
  - Digital line and trunk unit - SD-5D201-01
  - Digital line and trunk unit export - SD-5X204-01
  - Metallic service unit - SD-5D033-01
  - Modular metallic service unit - SD-5D015-01
  - Digital service unit - SD-5D035-01
  - Digital service unit 2 - SD-5D092-01
  - Digital service unit export - SD-5X201-01
  - Remote clock unit - SD-5D075-01
  - Facilities interface unit - SD-5D401-01
  - Transmission rate converter unit - SD-5D086-01
  - Switching transmission facilities unit - SD-5D167-01
  - Directly connected test unit - SD-2P077-01
  - Echo canceler #5 signaling unit - SD-5X213-01

REFERENCES

2.02 Supplementary information is contained in the following documents:

- Six-Pan Unit, Circuit Description - CD-5D081-01
- Module Controller and Time Slot Interchange Unit Model 2, Circuit Description - CD-5D151-01
- Fuse/Filter Unit, Circuit Description - CD-5D053-01

ACRONYMS

CI	control interface
CM2	communication module, model 2
CS1	core support 1 circuit pack
DI	data interface
DLI	dual link interface
DMA	direct memory access
DSC	digital service circuit
FFU	fuse/filter unit
FI/FO	first in/first out
FIU	facility interface unit
ISDN	intergrated services digital network
LDSU	local digital service unit
LED	light-emitting diode
LTP	line and trunk peripheral cabinet
MCTSI	module controller and time slot interchanger
MCTU2	module controller time slot interchange unit, model 2
MMRSM	multi module remote switching module
MTS	message time slot
NCT	network control and timing
OOS	out of service
ORM	optically remote switching module
PCM	pulse code modulation
PICB	peripheral interface control bus
PIDB	peripheral interface data bus
PI	packet interface
PSU	packet switch unit
PWRCTRL	power control
RSM	remote switching module
SM	switching module
SMC2	switching module control cabinet, model 2
SMP	switching module processor
SP	signal processor
TMS	time multiplexed switch
TRCU	transmission rate converter unit
TSI	time slot interchanger
TSI/SP	time slot interchanger and signal processor

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