5ESS® SWITCHING EQUIPMENT
COMMUNICATIONS MODULE MODEL 2
DOUBLE DUAL FABRIC
CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Replace two 70A fuses with 70F fuses.

D. Description of Changes

D.1 Replace two 70A, 1-1/3 AMP (white) TMSU2 optic fuses, located in the fuse filter units at positions 70-3B and 70-10B, with 70F, 1/4 AMP (purple) fuses.

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DEPT 55614-CWR-CEJ

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COMMUNICATIONS MODULE MODEL 2
DOUBLE DUAL FABRIC
CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Change NCT link fiber and associated Transmitter/Receiver paddle boards to cost-reduced versions.

D. Description of Changes

D.1 Rerate the 1A Transceiver (982 FH) paddle board LA, for additions and maintenance only, and replace it with the 982 TT.

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5ESS™ SWITCHING EQUIPMENT
COMMUNICATIONS MODULE, MODEL 2
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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The communication module, model 2 (CM2) consists of a time-shared space division switch: The time multiplexed switch unit, model 2 (TMSU2) and the message switch (MSG), which transfers control messages between the administrative module (AM) and the switch modules (SMs) or between SMs themselves.

2. GENERAL DESCRIPTION OF OPERATION

2.01 The TMSU2 provides physical paths for the digital signal carrying data and control between the SMs and the AM. The TMSU2 connects to the SMs by means of the NCT (fiber-optic) links. It connects to the MSG via a copper (twisted-pair) link. The MSG link terminates on the foundation link interface (FLI) board. SM links terminate on either the FLI or one of the quad link interface (QLI) boards. The QLI provides synchronization and formatting before the data is

multiplexed at the shelf utility board (SUB) and placed on the emitter coupled logic bus (EBUS). The EBUS distributes clock and data signals to/from all switch units in the TMSU2.

Data received from the EBUS is switched through the fabric board multiplexers and routed back to the appropriate link interface (LI) board. The LI checks the data for errors and sends it out to a receiving SM via the NCT links. Major functions of the TMSU2 are described in the next paragraphs.

2.02 The communication module control unit (CMCU) consists of the time multiplexed switch controller (TMC), dual message interface (DMI), and network clock (NCLK). The NCLK provides the TMS with an 8 KHz reference clock. The TMS clock board generates and distributes a 65.536 MHz clock to all circuit packs in the TMS. The TMS2 controller coordinates and implements external interfaces, internal TMS communication, and overall maintenance activity. The TMS2 controller uses a 68000 microprocessor to interface to the AM via the foundation peripheral controller (FPC) in the MSG. The TMS2 controller receives control messages from the MSG, translates them into fabric memory address and data, routes the message to the appropriate fabric control (FC) board via the control interface chip (CIC) and the EBUS. The TMS2 controller also provides error reporting, error filtering, and execution of diagnostic messages sent by the AM.

2.03 The EBUS is a cabling scheme to distribute data, clock, and control internally throughout the CM2 using a medium (the EBUS) with high quality transmission characteristics.

The EBUS consists of multilayer backplanes connected in series by coaxial ribbon cable. This arrangement provides more flexibility than a cable because circuit packs can be plugged into the EBUS and directly access the signals it carries through backplane pins.

2.04 The MSG transfers control messages between the AM and an SM, or between SMs. Control messages are passed through the TMS to the SMs over NCT links. The following functions are provided by the MSG:

(a) Duplicated control message data links for the SMs.

(b) Control message time slot routing between the AM and an SM or between two SMs.

(c) Office synchronization to other switching (even in the event of hardware failures).

(d) Control and diagnostic access of the CMCU.

(e) Power alarming and control from the AM.

2.05 The message switch peripheral unit, model 3 (MSPU3) is a part of the CM2 for the 5ESS™ Switching System multi-module office. The minimum configuration for a simplex CM2 includes one message switch control unit, model 2 (MSCU2), one CMCU, one TMS2 and one MSPU3 to support up to 32 SMs. The CM2 can accommodate additional MSPU3s to support up to 192 SMs.

SECTION II - DETAILED DESCRIPTION

1. TIME MULTIPLEXED SWITCH UNIT MODEL 2

CONTROL FUNCTION

1.01 The TMS is controlled by the TMC circuit pack located in the CMCU. Control information is sent to the TMS

via the EBUS. This control information is used to set up the interconnection of time slots on the NCT links.

CLOCK FUNCTION

1.02 The TMS connects to the NCLK of the CMCU. This provides the means by which the TMS can synchronize 5ESS Switching equipment with other switching systems. This NCLK reference is also used to provide clock synchronization within an office via the NCT links.

DATA FUNCTION

1.03 At each SM, in the time slot interchangers (TSI), the output from lines and trunks is converted into 16-bit channels (time slots). These bits are used for signaling control, parity, and voice or data. The time slots are switched through the TSI and time multiplexed into NCT links to the TMS.

The TMS provides digital paths for switched voice or data connections. The TMS also provides paths for control messages from the MSG to the SMs.

2. COMMUNICATION MODULE CONTROL UNIT

DUAL MESSAGE INTERFACE

2.01 The DMI provides a control and diagnostic access link (CDAL) from either FPC to the DMI, the network clock, model 2 (NCLK2), and the TMC. This CDAL link enables the AM to control and diagnose the DMI, NCLK, and TMS. The DMI also provides a metallic link into the TMS fabric. This link is a bi-directional link that transfers the control time slot messages from/to the MSG to/from the SMs.

NETWORK CLOCK, MODEL 2

2.02 The NCLK2 provides timing and synchronization signals to the 5ESS™ Switch network. The NCLK2 features high-stability operation, multiple references, analog references, and 30-channel digital references. The NCLK2 is a duplex circuit, that is, it is fully duplicated in each CMCU with some signals cross-couple between the major and minor sides.

TMS CONTROLLER

2.03 The main purpose of the TMC is to provide timing, control, and to receive and transmit data to the TMSU2. The TMC consists of five circuit packs: TN884 (controller), UN183 or UN321 (TMS2 interface), TN881 (clock interface), TN882 (control interface bus), UN310 (transmit data).

The TN884, UN183 (UN321 for signal fabric growth bay) and TN882 provide the control interface and environment necessary for the TMS2 firmware to execute call processing. These boards also handle maintenance orders from the central processor (CP) and TMS2 internal operations (error reporting, (re)initialization).

The clock interface pack (TN881) provides transmit clock signals and sync pulses to the fabric control (KBN2) packs on the TMSU2. It also provides receive clock signals to the UN182 SUB on the TMSU2.

The transmit data pack (UN310) transmits data time slots between the UN182 SUB board and KBN1 fabric board.

The CMCU is only provided in the two basic cabinets (5 & 6). Unit 0 is located in cabinet 5 and unit 1 in cabinet 6. In the "growth cabinets," the EBUS is used to provide the metallic path for the CMCU to communicate to every TMSU2.

3. EMITTER COUPLED LOGIC BUS UNIT

3.01 The EBUS provides interconnections that are broken down into three major areas: data, clock, and control.

DATA

3.02 The UN182 SUB puts 65Mb/s data onto the EBUS, which distributes the data to the appropriate KBN1 fabric boards.

CLOCK

3.03 The TN881 clock interface provides 65MHz clock and 8KHz sync to the SUB, fabric boards, and KBN2 FC boards via the EBUS.

CONTROL

3.04 The UN183 TMS interface board puts 32MHz control data and address on the EBUS for distribution to the SUB. Return 32MHz control and address data are returned from the SUB over the EBUS to the UN183. Mux control from the UN183 is distributed via the EBUS to the SUB. Errors from the TMSU2 are distributed via the EBUS from the UN182 SUB to the UN182 TMS interface board.

4. MESSAGE SWITCH CONTROL UNIT

4.01 The MSCU2 controls the message transfers between the AM, and as many as 16 communities, each consisting of one-to-four peripheral controllers (PCs). A PC can be a module message processor (MMP), an FPC, or a pump peripheral controller (PPC). The community with the FPC and PPC is limited to two PCs and is contained within the MSCU2. Message transfers are accomplished via a bit-slice processor called the peripheral interface controller, model 2 (PIC2). The functions of the MSCU2 are as follows:

(a) Performs the serial-to-parallel conversion of data received from the AM, and the parallel-to-serial conversion of data transmitted to the AM via the duplex dual serial bus selector (DDSBS).

(b) Provides a bus interface controller (BIC) to interface the 16-bit PIC2 to the 32-bit DDSBS.

(c) Provides one to four input/output microprocessor interfaces (IOMIs) to interface the PIC2 to the MMPs, FPC, and PPC.

(d) Provides control over the BIC and IOMIs to transfer data between MMPs or between the AM and MMPs.

(e) Provides control over the BIC and IOMIs to transfer data between the AM and the FPC or PPC.

(f) Performs self-diagnostics resident in the pumpable microcontrol store (PMCS).

(g) Provides control and diagnostic access for the DMI, the NCLK, and the TMS2 via the FPC.

(h) Provides a PPC for loading the SM with data at a high rate (192k bytes/sec).

(i) Provides both manual and AM control of the MSCU2 from an in-service/out-of-service point of view.

5. MESSAGE SWITCH PERIPHERAL UNIT

5.01 The MSPU3 provides two communities; each community able to house up to four 2-board MMPs. The MMPs are the communication processors that provide for the interchange of messages with SMs using the BX.25 protocol. Each MMP is equipped to handle communications with up to eight SMs.

5.02 The characteristics of the MSPU3 are:

(a) The MSPU3 can accommodate two communities of four 2-board MMPs.

(b) Each MMP supports up to eight fixed time slot channels. When equipped with four 2-board MMPs, there are 32 time slot channels per community. Each time slot in a community is allocated to a different SM.

(c) The MSPU3 interfaces to the CMCU by the message interface bus (MIB).

(d) The MSPU3 interfaces to the MSCU2 by the IOMI bus.

(e) Each MMP community of the MSPU3 may consist of one control and display (C&D) pack, a power converter, and up to four 2-board MMPs.

6. POWER ACCESS AND CONTROL

6.01 The power access and control provides the MSG cabinet with power, alarming, and control.

6.02 The -48V feed and return is connected to the cabinet where it is filtered and fused. Individual units connect to the fuse panel to provide voltage to their power converters. The power converters change the -48V to their proper circuit pack voltage and ground.

6.03 Control and alarming of the power converters is provided by individual C&D circuit packs. The C&D circuit provides both manual and 3B control of the power converters. The 3B monitors the C&D for fuse alarms, power alarms, and requests for out-of-service.

6.04 CM-2 side 0 is power from the A bus, and CM-2 side 1 is powered from the B bus. Therefore, the CM-2 could tolerate a bus failure and still process messages.

7. FAN UNIT

7.01 The fan unit provides forced air cooling to the cabinets and consists of six self-contained cooling subunits. Fan subunits E, F, G are located in the front of the CM2 cabinets and fan subunits A, B, C are located in the rear of the cabinets. Each of the six subunits contains a fan, a power converter and connection to an alarm circuit pack (233A) which is common to all six fan subunits.

7.02 The six cooling subunits are fixed assigned to fuses in the fuse/filter panel located in the top of the cabinet. A power converter on the subunit converts the -48V dc to +5V dc to drive the fan. The fans are turned on when the fuses are inserted into the fuse/filter panel.

7.03 A 233A circuit pack, mounted on the rear of the unit, monitors the subunits for a slow fan or power converter failure and generates a message printout at the maintenance TTY and a major alarm. The alarm circuitry also lights the red LEDs (A,B,C,E,F,G) located on the rear of the fan unit, and a fan alarm lamp located at the top of the cabinet. The "Alarm Button" located near the LED is required to reset the visual alarm.

SECTION III - REFERENCE DATA

1. UNITS

1.01 See the individual unit and circuit pack CDs listed below.

TMSU2	SD-5D061-01
CMCU	SD-5D060-01
EBUS	SD-5D085-01
MSCU2	SD-5D077-01
MSPU3	SD-5D078-01
6-FAN UNIT	SD-5D081-01
FUSE FILTER UNIT	SD-5D084-01

2. WORKING LIMITS

2.01 Voltages

1. -42.75 to -52.5 volts (nominal -48 volts).

2.02 Ambient Temperature

1. 0 to 70 degrees Celsius (maximum air temperature at frame outlet).

2. 0 to 50 degrees Celsius (aisle ambient, fan inlet).

3. GLOSSARY

AM	-	Administrative module
BIC	-	Bus interface controller
C&D	-	Control and display
CDAL	-	Control and diagnostic access link
CIC	-	Control interface chip
CM2	-	Communication module, model 2
CMCU	-	Communication module control unit
CP	-	Central processor
DDSBS	-	Duplex dual serial bus selector
DMI	-	Dual message interface
DSCH	-	Dual serial channel
EBUS	-	Emitter coupled logic bus
FAB	-	Fabric
FC	-	Fabric control
FLI	-	Foundation link interface
FPC	-	Foundation peripheral controller
IOMI	-	Input/output micro-processor interface
IOP	-	Input/output processor
KHz	-	Kilohertz
LI	-	Link interface
MHz	-	Megahertz
MIB	-	Message interface bus
MMP	-	Module message processor
MSCU2	-	Message switch control unit, model 2
MSG	-	Message switch
MSPU3	-	Message switch peripheral unit, model 3
NCLK	-	Network clock
NCLK2	-	Network clock, model 2
PC	-	Peripheral controller
PIC2	-	Peripheral interface controller, model 2
PMCS	-	Pumpable microcontrol store
PPC	-	Pump peripheral controller
QLI	-	Quad link interface
SM	-	Switch module
SUB	-	Shelf utility board
TMC	-	Time multiplexed switch controller
TMS2	-	Time multiplexed switch, model 2
TMSU2	-	Time multiplexed switch unit, model 2
TSI	-	Time slot interchangers

4. CONNECTING CIRCUITS

4.01 Circuits that are directly connected to the CM2 are as follows:

SMs, RSMs, and TRMs -- SD-5D118-03 (connected to the TMSU2 via NCT links.)

AM -- SD-4C122-01 (connected to the MSG.)

DC Power Distribution -- SD-5D005-01

Dual Serial Channel (DSCH) -- SD-4C099-01

Input/Output Processor (IOP) -- SD-4C099-01.

SECTION IV - REASONS FOR REISSUE

D. Description of Changes

D.1 Add detailed description information, working limits, and reference data.

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