ELECTRONIC SWITCHING SYSTEMS
5ESS™
OPERATOR SERVICES POSITION SYSTEM
LINK ADAPTER UNIT

TABLE OF CONTENTS PAGE

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The link adapter unit (LAU) provides a remote alarm section (RAS) and a terminal adapter section (TAS). These two functions are housed in the same shelf for reasons of economics and space. The RAS refers to the six circuit packs which provide the alarm capability. The TAS can house up to fourteen circuit packs with four different applications. The TAS of the LAU can be equipped with TN1087 and TN1523 circuit packs. The TN1087 circuit pack has two microcodes (MC5D109A1 and MC5D118A1). The MC5D109A1 refers to the TN1087 circuit pack used in synchronous terminal adapter (S-TA) and asynchronous terminal adapter (A-TA) applications. The MC5D118A1 is used for asynchronous low speed terminal adapter (ALTA) applications. The TN1523 circuit pack is microcoded MC5D117A1 and refers to the synchronous rate adapter (SRA). Three of the four applications involve protocol conversion between the 5ESS™ Switching System and external data links to an OSPS administrative processor (OAP), directory assistance system/computer (DAS/C) system, and printer for OSPS autoquote service for hotel/motel customers (AQSHM). The fourth application will rate adapt data from the switch to an automated multi-leaf bulletin (AMLB) database with no protocol processing taking place.

2. GENERAL DESCRIPTION OF OPERATION

2.01 The LAU physically interfaces to a remote integrated services line unit (RISLU) via one to sixteen T-interfaces (two for the RAS and 14 for the TAS). If the LAU is equipped with the optional RAS alarm circuitry, it provides status and alarm information to the craft responsible for the remote operator site. The RAS also informs the host 5ESS switching system of alarm conditions affecting the operator site.

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SECTION II - DETAILED DESCRIPTION

1. REMOTE ALARM SECTION

1.01 The RAS of the LAU includes two new circuit packs - the TN1087 terminal adapter (TA) and the TN1089 alarm conversion circuit (ACC). The other circuit pack in the RAS is a TN867 scan applique circuit (SAC), currently used for reporting central office alarms to the 3B20D processor.

1.02 The RAS can be configured as a single T-interface (simplex) or as two T-interfaces (duplex). The duplex interface is recommended for reliability; it can detect and report alarms in the event of any single failure. The single T-interface option is provided for cost savings. In the duplex case, the RAS requires two asynchronous TAs (A-TAs) to provide the alarm functions of the LAU. These two A-TAs are considered part of the RAS, and not part of the TAS. Physically, the A-TAs in the RAS are the same as the A-TAs in the TAS, and can be interchanged. An ACC and an A-TA operate together as a service group. There is no cross coupling to allow ACC0 to communicate with A-TA1, or ACC1 to communicate with A-TA0.

1.03 FS 1. All communication between the switching module processor (SMP) and the LAU are sent over the four T-interface leads of each service group. These leads terminate on the TA. Leads 0TPR and 0TNR are the transmit pair, while 0RPR and 0RNR are the receive pair. These leads carry time-multiplexed data at a bit rate of 192 kbps. Of the 192 kbps, only 16 kbps of data are actually used by the TA and passed on to the ACC. The remaining bits carry framing information, continuity checking bits, and the two unused 64 kbps integrated services digital network (ISDN) B-channels.

1.04 Communication between the ACC and A-TA is done over five signals on the LAU backplane. Information between the A-TA and ACC is carried over TTL level signals as asynchronous characters. Signals 0TTLTXDB and 0TTLRXDB are the transmit and receive data leads, respectively. When the ACC is ready to communicate with the SMP, signal 0TTLCDB is asserted and received by the A-TA. The A-TA detects the signal and brings up its protocol to the SMP. When the A-TA is ready for sending information to the ACC, it asserts lead 0TTLRTSB, which provides a clear-to-send indication to the ACC. Likewise, when the ACC wishes to send information to the A-TA, it asserts its request-to-send lead, which provides signal 0TTLCTSB to the A-TA. This hardware "handshaking" allows either circuit to temporarily stop the other from transmitting.

1.05 Leads TC and RC are the synchronous TAs (S-TAs) receive and transmit clocks. Since TAs in the RAS are in asynchronous mode only, these leads are unused. In addition, leads DTRB, CDB, and GRD are needed for S-TAs. Leads DTRB and CDB are used for modem "handshaking" and are strapped together on the RAS backplane as signal 0DTCD.

1.06 The ACC receives seven twisted pair scan leads from the external alarm status circuit (ASC). These leads, 0ASC(00-06)(N,P), are periodically read by the ACC and typically indicate that some activity has occurred at the alarm status panel (ASP). The ACC also drives 18 pairs of distribute leads to the ASC (0ASD(00-17)(N,P)). These distribute leads control ASC functions, including lighting lamps on the ASP.

1.07 The ACC periodically communicates with the ACC in the mate service group. Signal 0MTXD and 1MTXD are the transmit and receive data leads for ACC0. Signal 0MRTS informs ACC1 that ACC0 is ready to transmit, while signal 1MRTS informs ACC0 that ACC1 is ready to transmit. This bidirectional link

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carries asynchronous characters at 9600 bps.

1.08 The ACC is notified of alarm indications by SAC leads OSC(00-23)(P) and OSC(24-47)(P). Leads OSC(00-23)(P) are from one SAC, while leads OSC(24-47)(P) are from the second SAC. When an alarm state is detected by the SAC, it drives the corresponding lead high. The ACC periodically scans these leads for alarms.

1.09 FS 2. FS 2 shows alarm processing service group 1. Service group 1 operates identically to service group 0, as described previously.

1.10 FS 3. The RAS can monitor up to 48 external alarms. The external alarm circuits provide -48V relay closures, and can be either normally open or normally closed. The SAC provides a common lead for each alarm SC(00-23)CM and SC(24-47)CM. The SAC also supplies normally open leads SC(00-23)NO and SC(24-47)NO, as well as normally closed leads SC(00-23)NC and SC(24-47)NC. The actual connection in the field depends on the type of external alarm circuit. Each alarm circuit receives a twisted triple of wires. Each SAC interfaces with up to 24 alarm circuits, allowing 48 total alarms for the two SACs.

1.11 The SAC indicates the current alarm state for each of the 24 alarms on leads OSC(00-23)P and 1SC(00-23)P. Leads OSC(00-23)P connect to ACCO, while leads 1SC(00-23)P go to ACC1. Similarly, the second SAC provides leads OSC(24-47)P and 1SC(24-47)P to ACCO and ACC1, respectively. Changes in an alarm state are detected by the scanning of these leads by the ACCs.

2. TERMINAL ADAPTER SECTION

2.01 The TAS of the LAU can be equipped with asynchronous and synchronous TA circuit packs. For AQSHM applications, the MC5D118A1 is required for the TAS. The MC5D118A1 is asynchronous and can be optioned for 110 or 300 baud. If signal N1200 is strapped to SYNCRT (GRD), then 300 baud is selected. If N1200 is not strapped, the MC5D118A1 will run at 110 baud. The MC5D118A1 will convert ISDN T-interface to an asynchronous RS-232C interface for AQSHM. The DAS/C, OAP, and RAS applications require MC5D109A1 (TA) circuit packs. The MC5D109A1 can be optioned for 1200/9600 baud asynchronous operation or synchronous operation. The MC5D109A1 will be placed in synchronous mode when signal SYNCN is strapped to SYNCRT. Synchronous MC5D109A1 circuit packs will convert the ISDN T-interface to the BX.25 synchronous protocol used by the DAS/C. If SYNCN is unstrapped, the MC5D109A1 will be in asynchronous mode. In the asynchronous mode, the baud rate is determined by signal N1200. When N1200 is unstrapped, the baud rate is 9600. When N1200 is strapped to SYNCRT, the rate will be 1200 baud. The MC5D109A1 in the asynchronous mode will convert the ISDN T-interface to an asynchronous RS-232C interface for the OAP. The RAS application requires 9600 baud. In addition to housing TA circuit packs, the TAS of the LAU can be equipped with SRA circuit packs. The TAS will require MC5D117A1 circuit packs for AMLB. The MC5D117A1 will rate adapt ISDN T-interface to an RS-232C interface to be used by AMLB.

2.02 FS 4. Seven terminal adapters are shown in FS 4. Each TA interfaces to a bidirectional 4-wire T-interface. Leads (2-8)TPR and (2-8)TNR are transmit pairs, and leads (2-8)RPR and (2-8)RNR are receive pairs. These leads carry time-multiplexed data at a bit rate of 192 kbps. Of the 192 kbps, only 16 kbps of data are actually processed by the TA.

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The remaining bits contain framing information, continuity checking bits, and the two unused 64 kbps ISDN B-channels.

2.03 The data link side of the TA refers to the interface for DAS/C, OAP, or AQSHM. Signals on this interface are RS-232C levels (+12V or -12V). Leads (2-8)TC and (2-8)RC are the synchronous transmit and receive clocks provided for the synchronous terminal adapter. GRD is the RS-232C signal ground. Incoming data is received on (2-8)RXDB; outgoing data is transmitted on (2-8)TXDB.

2.04 Hardware handshaking is supplied for flow control and detection of a failed link. After the TA is powered up and passes diagnostics, it asserts a signal indicating data terminal ready [(2-8)DTRB]. When the TA is ready to transmit, it asserts a request-to-send [(2-8)RTSB]. Similarly, the TA receives a carrier-detect signal [(2-8)CDB] when the TA data link is operational, and a clear-to-send signal [(2-8)CTSB] when the link can transmit and receive data.

2.05 FS 5. FS 5 shows seven more terminal adapters (TAs 9-15) which operate identically to the TAs in FS 4. The only difference between FS 4 and FS 5 is in which power feeder is used.

2.06 FS 6. Seven SRAs are shown in FS 6. Each SRA interfaces with a bidirectional 4-wire T-interface. Leads (0-6)TPR and (0-6)TNR are transmit pairs, and leads (0-6)RPR and (0-6)RNR are receive pairs. These leads carry time-multiplexed data at a bit rate of 192 kbps. Of the 192 kbps, the SRA processes only the B1-channel (64 kbps) data. The remaining bits contain framing information, continuity checking bits, and the two unused channels (B2 and D).

2.07 The data link side of the SRA refers to the interface for AMLB database. Signals on this interface are RS-232C levels (+12V or -12V). Leads (0-6)TC and (0-6)RC are the synchronous transmit and receive clocks provided for the SRA and modem interface. Incoming data is received on (0-6)RXDB; outgoing data is transmitted on (0-6)TXDB. RS-232C signal ground is lead GRD on backplane pin 045. Clocking can be provided by an SRA or by modems. The SRA may be optioned to provide the clock signals from the DTE lead. This cable strapped option connects signal DTE (148) to the RC and TC leads. The clocking option is not needed when modems are used, since they will provide the synchronous clocks.

2.08 Handshaking signals on the RS-232C interface include data terminal ready and carrier detect. After the SRA is powered on and successfully passes diagnostics and initialization, assertion of (0-6)DTRB takes place. Signal lead (0-6)CDB will be checked by the SRA to determine if the SRA modem data link to the AMLB database is operational.

2.09 FS 7. FS 7 shows seven more SRAs (7-13) which operate identically to the SRAs in FS 6. The only difference between FS 6 and FS 7 is in which power feeder is used.

3. POWER DISTRIBUTION

3.01 The LAU receives power via four pairs of feeders. Each pair consists of a -48V feeder and a -48VRTN feeder. The voltage range of the supply must be between -42.75V and -52.50V for correct operation. The RAS section receives power feeder pairs 0 and 1, while the TAS receives pairs 2 and 3.

3.02 FS 6. Power distribution is shown in FS 6. Each SAC receives two -48V power feeders. If one feeder should fail, the SAC will automatically switch to the second feeder. A failure in the RAS would bring down one of the

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service groups; however, the other service group would still be capable of scanning all 48 alarms. The TAS is powered by two pairs of feeders; a power failure here would bring down one-half of the terminal adapters in the TAS (FS 4 or FS 5).

4. OPTIONS

4.01 A basic LAU comes with no equipped circuits. Either the RAS or TAS option, or both, may be ordered.

A. RAS

4.02 Option 1 orders service group 0 of the RAS and the first 24 alarms, while option 2 orders service group 1. Each service group includes one TA, one ACC, and one SAC. Option 3 orders the second group of 24 alarms, bringing the total alarm capability to 48 alarms.

B. TAS

4.03 As previously mentioned, a terminal adapter in the terminal adapter section of the link adapter unit may be synchronous or asynchronous, depending on the SYNCN/SYNCRT cabling. Asynchronous terminal adapters are used for a connection to the OSPS administrative processor (OAP). Administrative terminals and printers are connected to the OAP, not directly to the TA. A typical configuration with administrative capability requires one A-TA for the OAP. Synchronous terminal adapters are used for DAS/C links. These data links, and associated S-TAs, are ordered in pairs to provide redundancy.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Voltage Limits

Nominal	Minimum	Maximum
-48V	-42.75V	-52.50V

2. GLOSSARY

ACC	Alarm Conversion Circuit
ALTA	Asynchronous Low-speed Terminal Adapter
ASC	Alarm Status Circuit
ASD	Alarm Status Display
AQSHM	Autoquote Service for Hotel/Motel
CDB	Carrier Detect Channel B
CTSB	Clear To Send Channel B
DAS/C	Directory Assistance System/Computer
DTCD	Data Terminal Carrier Detect
DTE	Data Timing Element
DTRB	Data Terminal Ready Channel B
ISDN	Integrated Services Digital Network
LAU	Link Adapter Unit
MRTS	Mate Request To Send
MTXD	Mate Transmit Data
N1200	1200/9600 Strap Lead
OAP	OSPS Administrative Processor
OSPS	Operator Services Position System
RAS	Remote Alarm Section
RC	Receive Clock
RISLU	Remote Integrated Services Line Unit
RNR	Receive Negative Rail
RPR	Receive Positive Rail
RTSB	Request To Send Channel B
RXDB	Receive Data Channel B
SAC	Scan Applique Circuit
SC	Scan
SMP	Switching Module Processor
SRA	Synchronous Rate Adapter
SYNCN	Synchronous Strap Lead
SYNCRT	Synchronous Return Lead

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TA	Terminal Adapter
TAS	Terminal Adapter Section
TC	Transmit Clock
TNR	Transmit Negative Rail
TPR	Transmit Positive Rail
TTLCDB	TTL Carrier Detect Channel B
TTLCTSB	TTL Clear To Send Channel B
TTLRTSB	TTL Request To Send Channel B
TTLRXDB	TTL Receive Data Channel B
TTLTXDB	TTL Transmit Data Channel B
TXDB	Transmit Data Channel B

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