AHG8, S2 LIU-3ESF LINE INTERFACE UNIT
EXTENDED SUPERFRAME FORMAT (ESF) DATA SHEET
D4 CHANNEL BANK

DESCRIPTION

The LIU-3ESF line interface unit contains the clock and transmit-receive converters needed to interface the D4 channel bank to two bidirectional DS1 facilities. The LIU-3ESF unit provides optional extended superframe (ESF) or D4 superframe (SF) framing formats and optional bipolar eight zero substitution (B8ZS) or zero code suppression (ZCS) codes. ZCS is the standard D4 zero suppression technique used with the alternate mark inversion (AMI) line code. The unit is used in D4 Mode 3 operation only. Figures 1 and 2 show the LIU-3ESF circuit board and the faceplate.

This data sheet is reissued to provide information about the Series 2 version of the LIU-3ESF unit. Revision arrows are used to identify significant changes.

Application Note: Unrestricted fill 64 kb/s applications (excluding voice but including voice-band data) are not supported. Each digroup of the D4 channel bank will accommodate a maximum number of DS0 signals with each bit 2 equal to 0 from DS1 signal sources as follows:

- 23 when the D4 bank is equipped with a J98726AC-2 alarm control unit (ACU)
- 15 when it is equipped with a J98726AC-1 ACU.

D4 SF

The superframe format is the standard D4 format. It uses the 8-kb/s 193rd bit position of each frame to identify the beginning of a frame and identify a frame that contains signaling information. It contains 12 frames and uses the 6th and 12th frames to contain signaling information.

ESF

The ESF extends the D4 superframe structure from 12 frames to 24 frames and uses the 6th, 12th, 18th, and 24th frames to contain signaling information. The 193rd bit position is divided into 2 kb/s for main frame and robbed-bit signaling synchronization, 2 kb/s for transmission of a (cyclic redundancy check-6 (CRC-6) code, and 4 kb/s for a data link. The 4-kb/s data link is used by the LIU-3ESF unit only to convey out-of-band ESF yellow alarm information. ESF also provides real-time and in-service maintenance capability through the CRC-6 code without interrupting the data being transmitted. At the remote terminal digital signal cross-connect (DSX) maintenance access point, test equipment can monitor received CRC-6 information and display the system error performance.

AMI

Alternate mark inversion is the standard line code which uses alternate logic one pulses with alternating polarities. Bipolar violations are not permitted. AMI is selected when the ZCS option is selected on the LIU-3ESF unit. ZCS substitutes a 1 for the 7th bit of an eight zero byte. It is used for voice and voiceband data transmission and satisfies the ones density requirements of the DS1 line. The ZCS code does not allow 64-kb/s clear channel data transmission.

B8ZS

B8ZS is a line coding technique used to support 64-kb/s clear channel transmission over DS1 facilities. In the transmit direction, the B8ZS encoder substitutes the code 000V10V1 for each consecutive string of eight zeros. The V represents a bipolar violation. In the receive direction, the B8ZS decoder converts the incoming code 000V10V1 back to eight zeros.

Equalization

This LIU-3ESF unit provides equalization for the transmit signal from digroups A and B to the DS1 cross-connect (DSX-1). Required equalization is selected by setting the appropriate positions on switch **S1**. ED-3C656-( ) G7 strap cards (zero loss) are required in the equalizer slots of the trunk processing unit (TPU) common unit. Refer to the **OPTIONS** section to set the LIU-3ESF equalizers.

FEATURES

LIU-3ESF unit features are as follows:

- Optional ESF or D4 superframe format.
- Optional B8ZS line code to support 64-kb/s clear channel capability or AMI with D4 standard ZCS code.
- Integrated equalizers for digroups A and B for bipolar signals transmitted to the DSX-1 line cross-connect frame. This eliminates the need to order application specific equalizer cards for the D4 TPU circuit pack [two ED-3C656-( ) G7 strap cards are shipped with the LIU-3ESF].
- Independent loopback capability on a digroup basis toward the DS1 line and/or toward the D4 channel bank.
- Options selectable on a per DS1 line basis.

OPTIONS

Faceplate options (Figure 2) are provided by pairs of pin jacks and recessed switches, one pair for each D4 digroup. The top pin jack and switch are for digroup B and the bottom pair are for digroup A.

- **ESF/D4:** The ESF position provides extended superframe format. The D4 position provides the standard SF format.
- **B8ZS/ZCS:** The B8ZS position provides B8ZS line code to support 64-kb/s clear channel transmission. The ZCS position provides AMI with zero code suppression code. Clear channel 64-kb/s transmission is prohibited when the ZCS option is set.
- **LP2/OFF:** The LP2 position provides a loopback toward the DS1 line. The OFF position removes the loopback.
- **LP3/OFF:** The LP3 position provides a loopback toward the D4 channel bank. ***However, it is recommended that a pin plug inserted into LP-A be used to provide this loopback. Always set the LP3 switch to the OFF position.***

Equalizer options are set by switch S1 located on the circuit board (Figure 1). Switch sections 1, 2, and 3 provide equalizer settings for digroup A. Sections 4, 5, and 6 provide equalizer settings for digroup B. Refer to Table A for the S1 switch equalizer settings for digroups A and B.

When replacing an LIU-3 with an LIU-3ESF, the application specific TPU equalizer cards must be replaced with the ED-3C656-( ) G7 strap cards. Equalizer settings made on switch **S1** of the LIU-3ESF must correspond to the replaced application specific equalizer cards. Use Table B to determine the corresponding equalizer settings.

REFERENCES

The following publications contain description, engineering, and maintenance information on the D4 channel bank circuit packs:

PRACTICE	TITLE
365-170-000	D4 Channel Bank - (TOP)
365-170-100	D4 Channel Bank - Description
365-170-101	D4 Channel Bank - General Channel Unit Description
801-505-155	D4 Channel Bank Equipment - for Use With Digital Transmission Systems - Equipment Design Requirements - Common Systems
855-351-103	D1, D2, D3, and D4 Digital Channel Banks and D5 Digital Terminal System - Application Engineering - Carrier Engineering
855-351-105	D4 Channel Bank - Channel Units - Application Engineering.

SCHEMATIC	TITLE
CPS-AHG8	LIU-3ESF Line Interface Unit Schematic.

DRAWING	TITLE
SD-3C304-02	D4 Channel Bank - Application Schematic

PRECAUTIONS

The **LIU-3ESF** unit contains devices that are subject to damage or decreased reliability from static discharges. When handling either unit, proper antistatic measures should be taken, such as wearing grounding bracelets and handling by the faceplate only.

REGIONAL TECHNICAL ASSISTANCE

Technical assistance for the D4 channel bank can be obtained by calling the Regional Technical Assistance Center at **1-800-225-RTAC**. This telephone number is staffed 24 hours per day.

WARRANTY

The terms and conditions of sale will include a five year warranty.

ISSUING ORGANIZATION

Published by
The AT&T Documentation Management Organization

TABLE A

EQUALIZER SETTINGS FOR LIU-3ESF

CABLE TYPE AND DISTANCE TO CROSS-CONNECT (FEET)		SWITCH S1 POSITIONS (NOTE)	
CABLE TYPE		DIGROUP A	DIGROUP B
750/1249	ABAM/TYPE 600	1 2 3	4 5 6
0 to 90	0 to 133	O O O	O O O
90 to 180	133 to 267	O O C	O O C
180 to 270	267 to 400	O C O	O C O
270 to 360	400 to 533	O C C	O C C
360 to 450	533 to 655	C O O	C O O

Note: O = Switch open (depressed toward OPEN)
C = Switch closed (depressed toward switch number)

TABLE B

EQUALIZER SETTINGS FOR REPLACED TPU EQUALIZER CARDS

EQUALIZER CARD TO BE REPLACED	CORRESPONDING SWITCH S1 POSITIONS (NOTE)	
EQUALIZER	DIGROUP A	DIGROUP B
	1 2 3	4 5 6
ED-3C655-( ) G1 or G6	O O O	O O O
ED-3C655-( ) G2 or G8	O O C	O O C
ED-3C655-( ) G3	O C O	O C O
ED-3C655-( ) G4	O C C	O C C
ED-3C655-( ) G5	C O O	C O O

Note: O = Switch open (depressed toward OPEN)
C = Switch closed (depressed toward switch number)

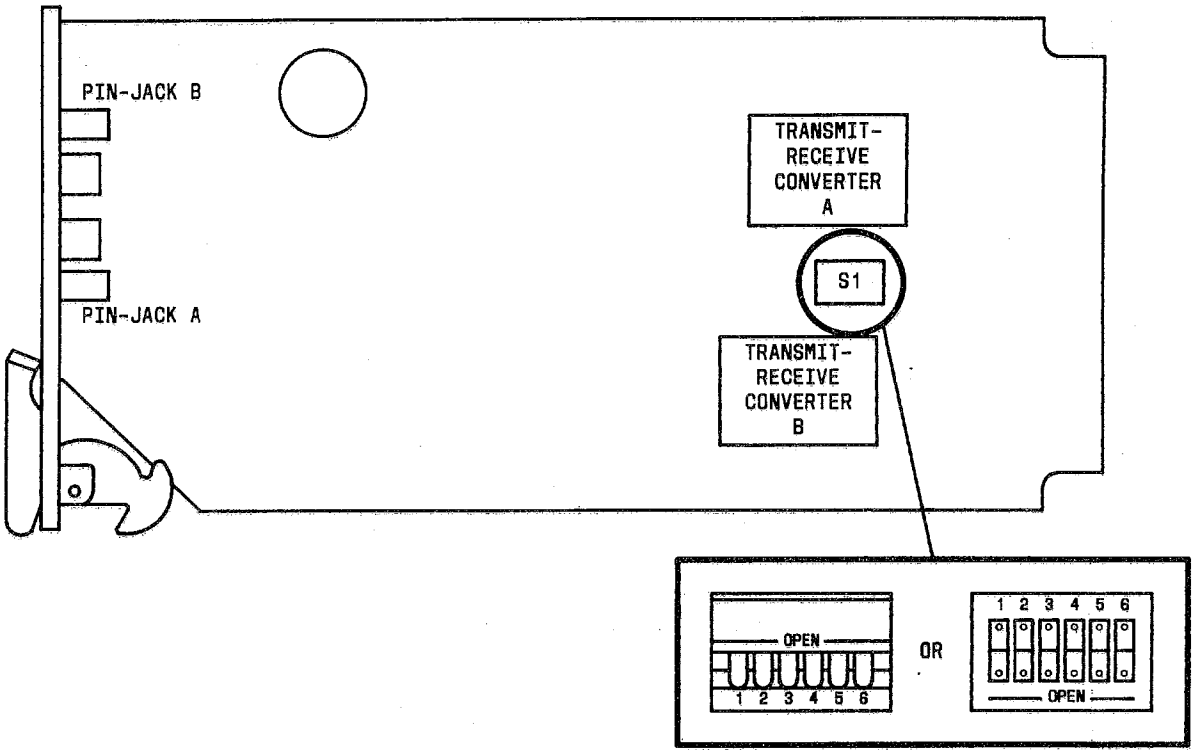

Figure 1—LIU-3ESF Circuit Board

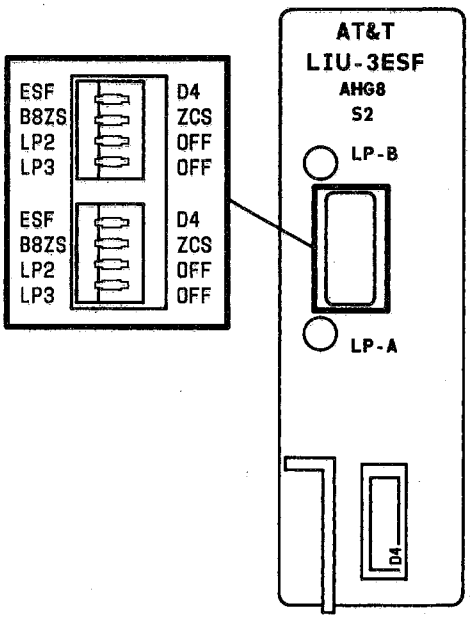

Figure 2—♦ LIU-3ESF Faceplate ♦