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AHG13, S2 BRITE AND AHG19 KTTE CHANNEL UNITS FOR ISDN AND DIGITAL BUSINESS SERVICE APPLICATIONS INSTALLATION AND TESTING D4 CHANNEL BANK OR *SLC*® 96 CARRIER SYSTEM TERMINAL DIGITAL TRANSMISSION SYSTEMS

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BRITE AND KTTE CHANNEL UNITS FOR ISDN AND DBS APPLICATIONS INSTALLATION AND TESTING

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INTRODUCTION

This document contains installation and testing procedures for the AHG13, Series 2 BRITE (basic rate interface transmission extension) and the AHG19 KTTE channel units. It also describes the BRITE and KTTE channel units applications. Both channel units can be used in D4 channel banks and/or *SLC* 96 carrier system terminals.

This document is reissued to include the KTTE channel unit and updated information. This is a general revision; revision arrows are not used.

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

This document is intended for the technician as an aid to set the BRITE and/or KTTE channel unit(s) options, to install the unit(s), to perform acceptance tests or verify certain requirements of the ISDN (Integrated Services Digital Network) or DBS (Digital Business Service) circuit, and to locate and clear trouble at the BRITE or KTTE channel unit level.

This document consists of six parts (excluding the Introduction): BRITE and KTTE channel unit applications, ISDN and DBS service prerequisites, transmission equipment preparation, BRITE and KTTE channel unit installation, testing procedures, and a list of references. References are made to other documents to be used when applicable.

BRITE AND KTTE CHANNEL UNITS APPLICATIONS

BRITE CHANNEL UNIT APPLICATIONS

The BRITE channel unit is used to transport ISDN (Integrated Services Digital Network) services to remote customers of the *5ESS* switch. It is used in an ISDN circuit between a *5ESS* switch and equipment at a remote customer location. The equipment at the customer location is an NT1 (network termination 1). There is no limit to the number of BRITE channel units that can be used between a *5ESS* switch and NT1 equipment. However, the 946A test set which is used to test the BRITE and/or KTTE channel units limits the number of channel units to four for testing purposes. Figure 1 shows three typical BRITE channel unit applications that provide remote customers with ISDN basic rate service.

Other configurations may use other types of transmission equipment, such as SLIM (subscriber loop interface module) which is used in the circuit just before the *SLC* 96 carrier remote terminal and NT1.

The BRITE channel unit can also be used in digital data transmission applications to provide a digital "pipe" service. Although this document contains information pertinent to ISDN and DBS applications, it can be used in most digital pipe applications for installing and testing the BRITE channel units.

KTTE CHANNEL UNIT APPLICATIONS

The KTTE channel unit is used to transport DBS (Digital Business Service) to remote customers of a *5ESS* switch. See Figure 2 for three typical applications. DBS is provided to customers using digital business set(s). The KTTE channel unit is used in a DBS circuit between a *5ESS* switch and digital business set. However, it cannot be used to provide tandem functions in a tandem office. If tandem functions are needed, the BRITE channel unit can be used to provide the tandem functions as shown in Figure 2C. The KTTE channel unit can also be used in an ISDN circuit that uses only B+D channel service between the *5ESS* switch and NT1 equipment.

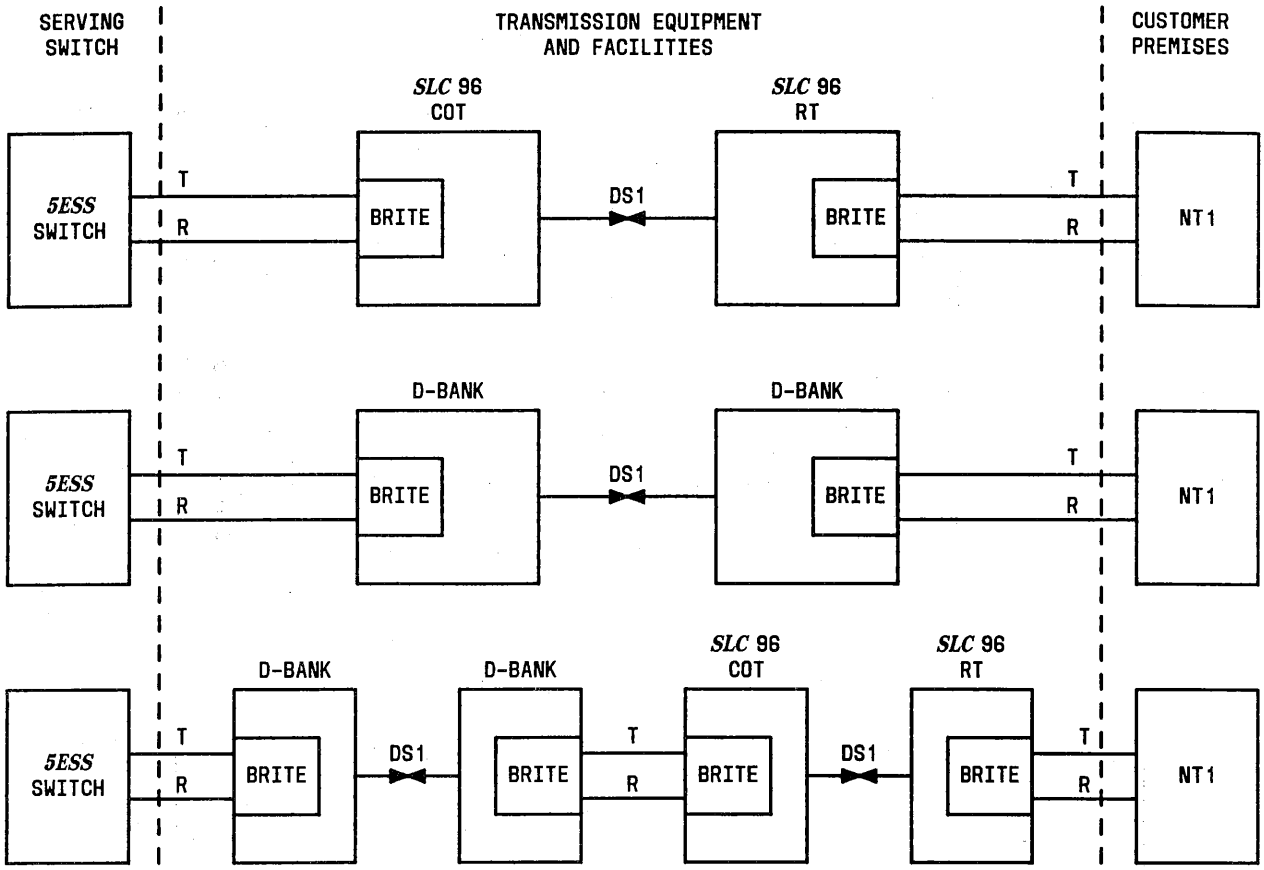
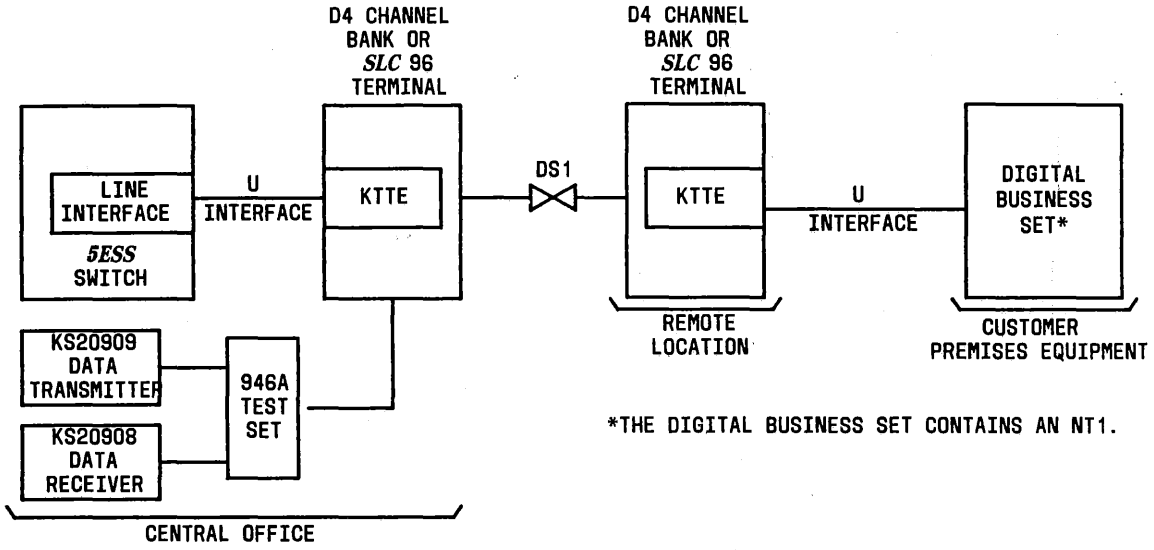
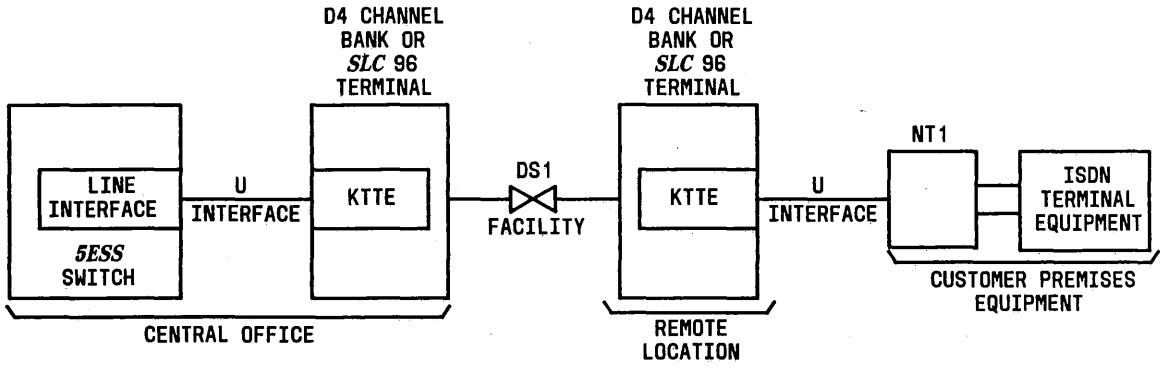


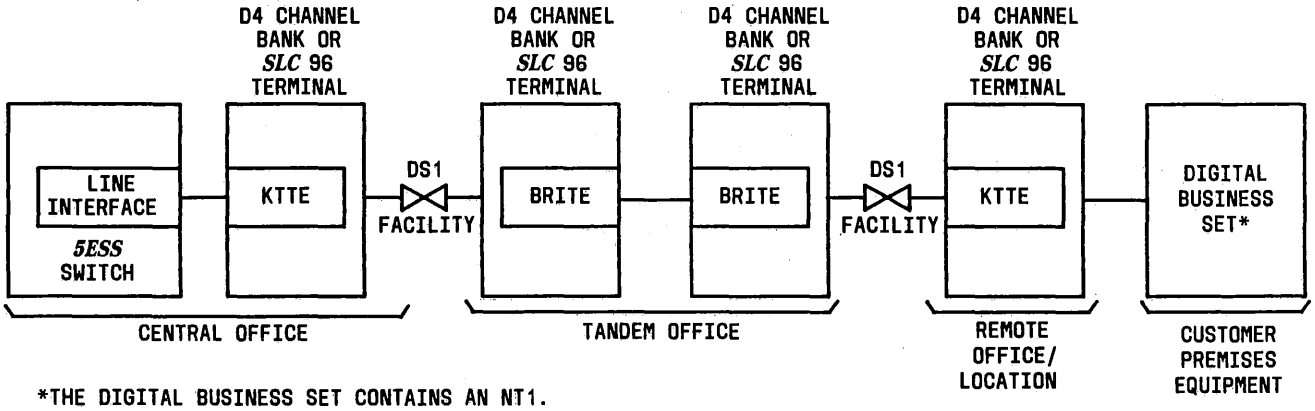
Figure 1. AHG13, S2 BRITE Channel Unit Applications



(A) DIGITAL BUSINESS SERVICE APPLICATION



(B) ISDN (B+D CHANNEL SERVICE ONLY) APPLICATION



*THE DIGITAL BUSINESS SET CONTAINS AN NT1.

(C) DIGITAL BUSINESS SERVICE APPLICATION USING INTERMEDIATE TANDEM BRITE CHANNEL UNITS

Figure 2. AHG19 KTTE Channel Unit Applications

ISDN AND DBS SERVICE PREREQUISITES

OVERVIEW

Before a BRITE or KTTE channel unit can be used to provide ISDN or DBS, several prerequisites must be met. The prerequisites are divided into three areas: the serving switch, transmission equipment, and customer-premises equipment.

AT THE SERVING SWITCH

ISDN or DBS service prerequisites at the serving switch are as follows:

- An ISLU (integrated services line unit) card or RISU (remote integrated services line unit) card must be installed in the switch and be available for service.
- Tip and ring cable from the switch must be connected at the distribution frame where the D4 channel bank or *SLC 96* carrier terminal tip and ring cable terminates.
- The proper switch translations for the line must be administered. The switch translations are made using the proper *5ESS* switch generic software release (5E4 or later) translations data and the *5ESS* Switch Translations Guide (TG-5).
- The B-channel assignments (voice or data) must be made according to the engineering work order, facilities work order, circuit/service order, WORD (Work Order Record and Details) document, or other type of document that specifies the service.
- **A common timing source must be used by the switch and transmission equipment so that synchronization will exist throughout the ISDN or DBS circuit.** Composite clock (64 kHz) must be used to time the transmission equipment. A suggested timing and synchronization method used in a typical application is shown in Figure 3. Other methods may be used to obtain a common timing source.

As shown in Figure 3, the *5ESS* switch receives the clock source from the DS1 facility. The DS1 output is taken to the DSX terminating field where the SDEs (synchronization distribution expanders) in Office A and Office B extract timing from the DS1 facility and then generate the composite clock. The SDEs distribute the 64-kHz composite clock to the D4 channel banks or *SLC* 96 carrier central office terminals in both offices. The remote channel bank is usually loop timed but it can be externally timed to the same composite clock if it is available at the remote location. A *SLC* 96 carrier remote terminal is always loop timed.

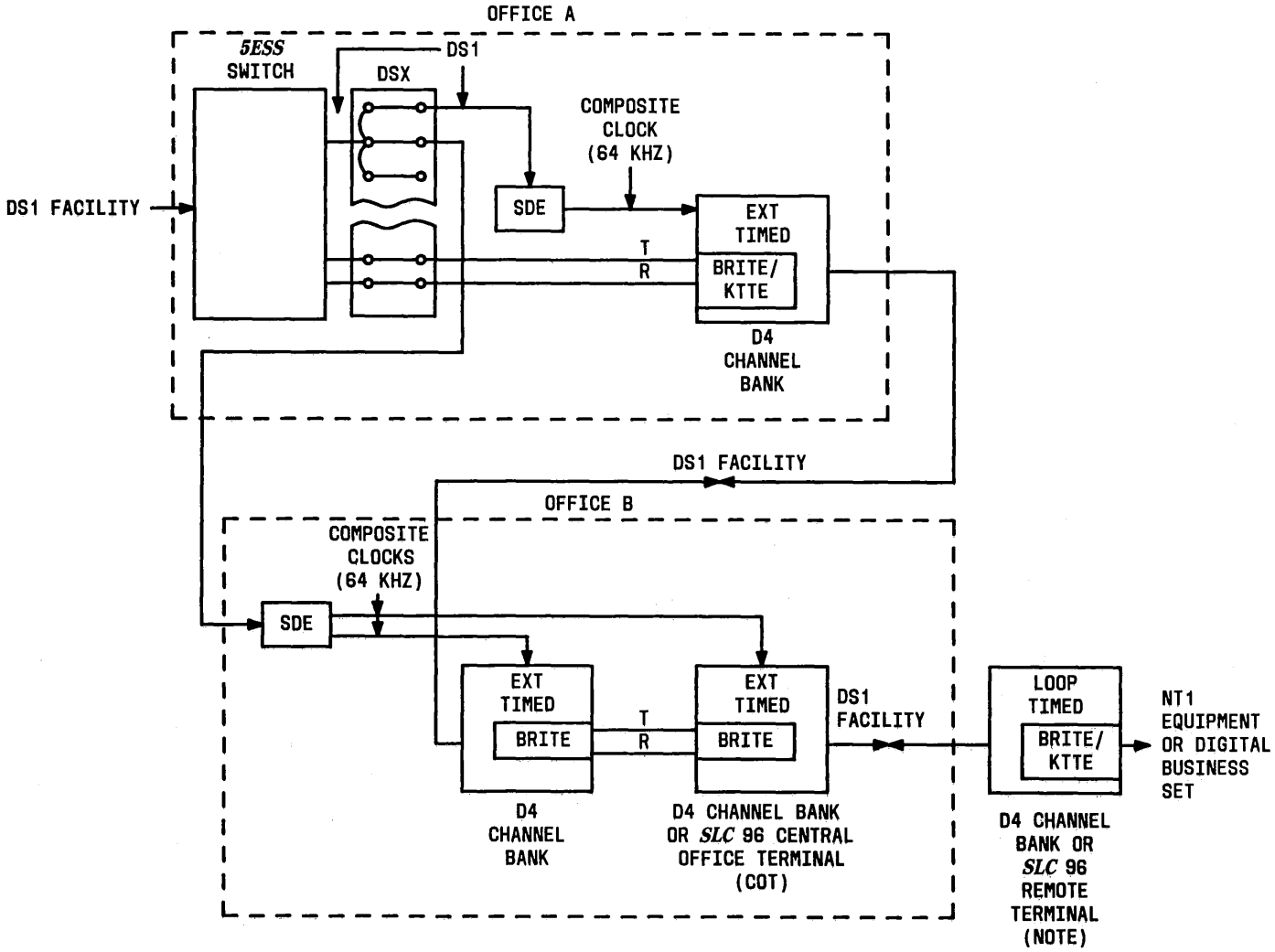
AT THE TRANSMISSION EQUIPMENT

The transmission equipment provides connectivity between the *5ESS* switch and the NT1 equipment or digital business set and transports the ISDN or DBS to remote customers of the switch.

The requirements for the transmission equipment to transport the services are as follows:

- The tip and ring cable from the transmission equipment must be connected to the appropriate distribution frame or cross-connect blocks. (Connection to *5ESS* switch must exist.)
- Transmission path continuity must exist from the switch to the NT1 equipment or digital business set.
- D4 channel bank(s) and/or *SLC* 96 carrier terminal(s) **must be properly timed and synchronized** using the same clock source that provides timing to the *5ESS* switch.

- A BRITE or KTTE channel unit must be properly optioned and installed into the D4 channel bank or *SLC* 96 carrier terminal for each ISDN or DBS circuit.
- The B channels and D channel must be properly assigned according to the engineering work order, facilities work order, circuit/service order, WORD document, or other type of document that specifies the service.
- Proper counting sequence and time-slot alignment for the channel assignment must exist. For 2B+D service, the first B channel is carried by the first time slot. The D channel is carried by the second time slot. The second B channel is carried by the third time slot. For B+D service, the B channel is carried by the first time slot and the D channel by the second time slot.



SDE = SYNCHRONIZATION DISTRIBUTION EXPANDER

NOTE: THE D4 CHANNEL BANK CAN BE EXTERNALLY TIMED TO THE COMPOSITE CLOCK FROM THE SDE IF THE CLOCK IS AVAILABLE AT THE REMOTE LOCATION. A *SLC* 96 REMOTE TERMINAL HAS TO BE LOOP TIMED (SSU TIMING OPTION SET TO INTERNAL).

Figure 3. Suggested Methods of Timing and Synchronization for ISDN/DBS Circuits

If a DACS (Digital Access Cross-Connect System) is in the ISDN or DBS circuit, time slot placement is very important for the B and D channels. The order in which the time slots enter the DACS must be the same when leaving the DACS.

Service and Power Consumption Restrictions and Limitations

There are restrictions and limitations to consider when equipping a D4 channel bank or *SLC* 96 carrier terminal with BRITE or KTTE channel units and when mixing BRITE or KTTE and other types of channel units in the same D4 channel bank or *SLC* 96 carrier terminal. These restrictions and limitations are based on the type of service used and power consumption. The following guidelines concerning service and power consumption may be used to determine channel unit placement using BRITE and KTTE channel units with or without other types of channel units.

Service restrictions and limitations are as follows:

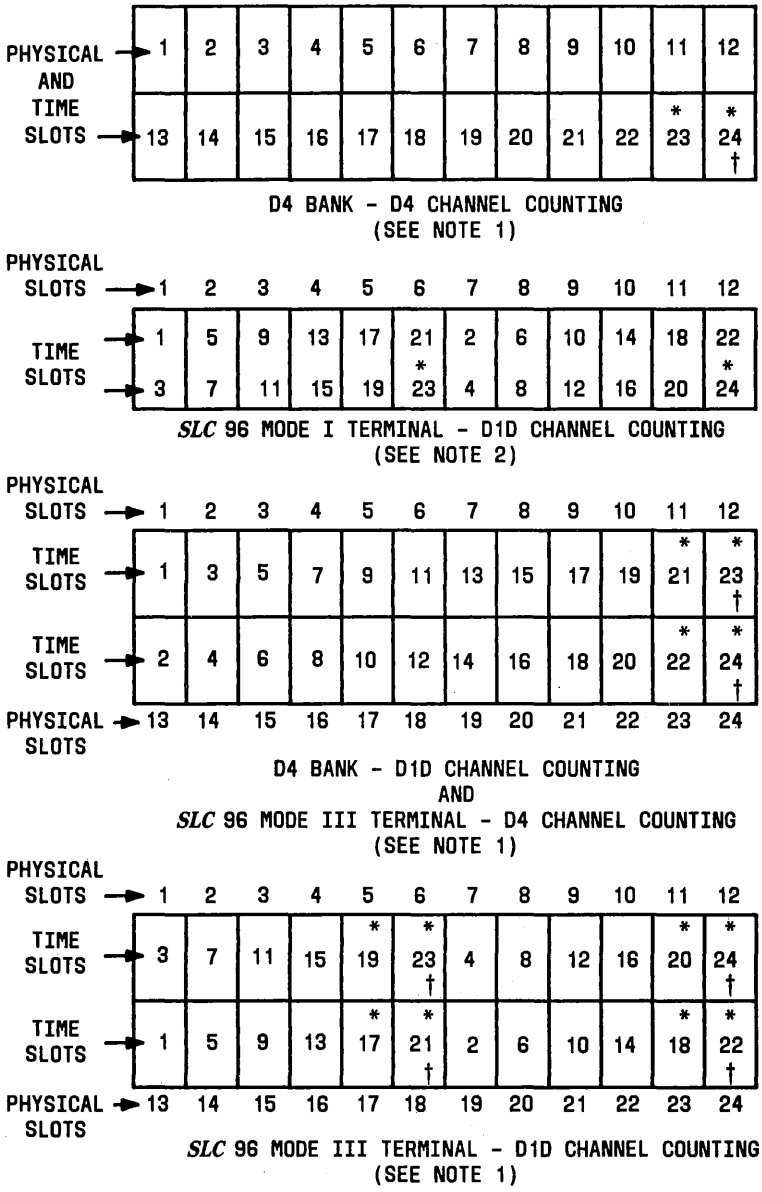
- B+D service requires two time slots per BRITE or KTTE channel unit. 2B+D service requires three time slots per BRITE channel unit.
- Neither BRITE nor KTTE channel units should be mixed with program channel units in the same D4 channel bank or *SLC* 96 carrier terminal.
- BRITE channel units can be used in ISDN and DBS circuits to provide tandem functions as shown in Figures 1 and 2. However, KTTE channel units cannot be used to provide tandem functions in a circuit.

See Figure 4 for physical channel and time slot deployment restrictions in a D4 channel bank or a *SLC* 96 carrier terminal using BRITE channel units. See Figure 5 for the same type of restrictions using KTTE channel units. Table A lists physical channel slots that cannot contain BRITE or KTTE channel units for each type of channel service provided.

In ISDN circuits that include a SLIM before the *SLC* 96 carrier remote terminal, the physical channel slot designation strips on the remote terminal requires restenciling. The order of the channel slot numbers depends upon the type of channel counting used. Refer to AT&T 363-203-100 to properly restencil the physical channel slots.

Power consumption restrictions and limitations are as follows:

- BRITE or KTTE channel units should not be mixed with J98726DB-1 L1, L2, or L3 dataport OCUs (office channel units) in the same D4 channel bank or *SLC* 96 carrier terminal.
- Each BRITE or KTTE channel unit requires 1.5 watts of power from the PU (power unit) or PCU (power converter unit) and 0.3 watts drawn from the –48 volt source.
- Restrictions for the PUs or PCUs used in D4 channel banks and *SLC* 96 carrier terminals are as follows.
  - 325A PU (60 watts) provides a total of 44 watts of power to the channel slots in the D4 channel bank. The maximum number of BRITE channel units that can be used in the D4 channel bank is not dependent upon available power. The maximum number is dependent upon the type of channel service provided. For example, if a D4 channel bank is to have the maximum number of BRITE channel units (disregarding the type of service), the number is 29 (44 watts divided by 1.5 watts = 29). However, since B+D service requires 2 time slots and 2B+D service requires 3 time slots, the maximum numbers are 24 and 16 per bank, respectively, or 12 and 8 per digroup, respectively. The KTTE channel unit provides B+D channel service; therefore 24, is the maximum number allowed per bank or 12 per digroup.



NOTES:

1. IF 2B+D CHANNEL SERVICE IS USED, THE TWO ADJACENT PHYSICAL SLOTS (NOT TIME SLOTS) TO THE RIGHT OF THE SLOT OCCUPIED BY THE BRITE CHANNEL UNIT MUST BE VACANT. IF B+D OR 2B CHANNEL SERVICE IS USED, THE NEXT ADJACENT PHYSICAL SLOT TO THE RIGHT OF THE SLOT OCCUPIED BY THE BRITE CHANNEL UNIT MUST BE VACANT.
2. IF 2B+D CHANNEL SERVICE IS USED, THREE TIME SLOTS ARE REQUIRED AND IF THE D1D COUNTING STARTS WITH THE SECOND TIME SLOT IN THE PHYSICAL SLOT OCCUPIED BY THE BRITE CHANNEL UNIT, THE NEXT ADJACENT PHYSICAL SLOT TO THE RIGHT MUST BE VACANT. B+D OR 2B CHANNEL SERVICE REQUIRES TWO TIME SLOTS.

* A CHANNEL UNIT WITH 2B+D SERVICE CANNOT OCCUPY THIS SLOT.
† A CHANNEL UNIT WITH B+D SERVICE CANNOT OCCUPY THIS SLOT.

Figure 4. Channel Slot Deployment Restrictions for BRITE Channel Units

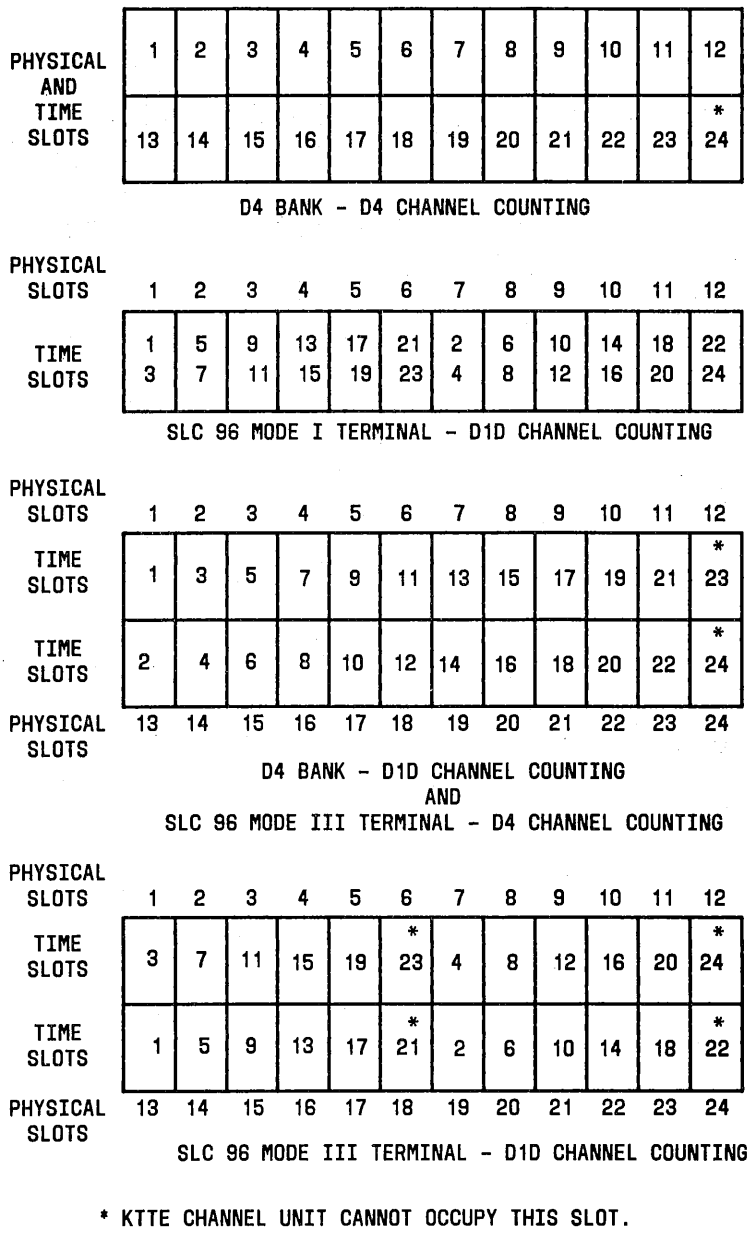


Figure 5. Channel Slot Deployment Restrictions for KTTE Channel Units

— J87380C PCU (40 watts) provides a total of 24 watts of power to the channel slots in the D4 channel bank. Therefore, 24 watts can power a maximum number of 16 BRITE or KTTE channel units with no other types of channel units installed. However, the maximum number of channel units that can be used in the D4 channel bank is also dependent upon the type of channel service used.

TABLE A

CHANNEL SLOT RESTRICTIONS FOR BRITE OR KTTE CHANNEL UNITS

TYPE OF CHANNEL SERVICE BEING PROVIDED	CHANNEL UNIT SLOTS THAT CANNOT CONTAIN BRITE OR KTTE UNITS			
	D4 BANK WITH D4 COUNTING	D4 BANK WITH D1D COUNTING OR *SLC* 96 BANK-MODE 3 WITH D4 COUNTING	*SLC* 96 BANK-MODE 3 WITH D1D COUNTING	*SLC* 96 BANK-MODE 1 WITH D1D COUNTING
B (Digital Pipe)	None	None	None	None
2B (Digital Pipe)	24	12, 24	6, 12, 18, 24	†
B+D *	24	12, 24	6, 12, 18, 24	†
2B+D‡	23, 24	11, 12, 23, 24	5, 6, 11, 12, 17, 18, 23, 24	6, 12 **

* For 2B or B+D service, the next adjacent physical channel slot to the right of the BRITE or KTTE channel unit must be vacant except in the case of a *SLC* 96 terminal operating in Mode 1 with D1D counting.

† A BRITE or KTTE channel unit cannot occupy physical channel slots 6 and 12 if time slot counting starts with the second time slot in these channel slots.

‡ For 2B+D service, the next two adjacent physical channel slots to the right of the BRITE channel unit must be vacant except in the case of a *SLC* 96 carrier terminal operating in Mode 1 with D1D counting.

** A BRITE channel unit cannot occupy a physical channel slot if another BRITE channel unit to the left of the physical channel slot uses both time slots assigned to it (e.g., physical channel slot 4 can not be used if a BRITE channel unit installed in physical channel slot 3 uses time slots 11, 13, and 15 for 2B+D channel service).

— WP74 PU (60 watts) provides a total of 44 watts of power to the channel slots in the *SLC* 96 carrier terminal. Two WP74 PUs are used to power the *SLC* 96 carrier terminal (one per two shelves). Therefore, there are no power restrictions for the BRITE or KTTE channel units. The maximum number of BRITE or KTTE channel units that can be used in the *SLC* 96 carrier terminal is dependent upon the type of channel service provided and operating mode used. See Figure 4 or Figure 5 and Table A to determine the maximum number of BRITE or KTTE channel units that can be used.

— 295A PU (40 watts) provides a total of 24 watts of power to the channel slots in the *SLC* 96 carrier terminal. Two 295A PUs are used to power the *SLC* 96 carrier terminal (one per two shelves). This allows a maximum number of 8 BRITE or 8 KTTE channel units per shelf or 32 channel units per *SLC* 96 carrier terminal. However, the maximum number of BRITE or KTTE channel units that can be used is also dependent upon the type of service and operating mode used. See Figure 4 or Figure 5 and Table A to determine the maximum number of BRITE or KTTE channel units that can be used if power limitations are of no concern.

- All the message, special service, and later vintage dataport channel units require from 0.5 to 1.5 watts of power each. One exception is the J98726DP-1, L1 DSU II V.35 dataport which requires 2.4 watts of power. Therefore, when equipping either the D4 channel bank or *SLC* 96 carrier terminal with a mixture of BRITE or KTTE channel units and other types of channel units, the total power drain should not exceed the power capacity of 44 watts for each 325A PU or WP74 PU and 24 watts for each J87380C PCU or 295A PU.
- For heat requirements in the D4 channel bank or *SLC* 96 carrier terminal the 1.5 watts drawn from the power unit plus 0.3 watts drawn from the –48-volt source (a total of 1.8 watts) must be considered in the calculations.
- Schematic diagram (SD-3C304-02) lists the current drain by voltage for each channel unit for the D4 channel bank and most of the channel units used in the *SLC* 96 carrier terminal. SD-97770-01/02 lists current drains of other channel units used in the *SLC* 96 carrier terminal. These schematic diagrams can be used to calculate power consumption for most of the channel units and thus determine the maximum wattage required for a given mixture of BRITE or KTTE channel units and other type channel units.

CUSTOMER-PREMISES EQUIPMENT

At the customer premises, NT1 equipment must connect to the tip and ring cable from the transmission equipment for ISDN services. The NT1 equipment provides the 2-wire to 4-wire interface for the ISDN terminals. Some ISDN terminals provide the NT1 functions internally, thereby, eliminating the need for a stand-alone NT1.

For DBS, the ISDN 6504 or ISDN 6508 digital business set is used to provide voice-only services through the U-interface. The digital business set connects to the D6AP-87 mounting cord from the U-interface wall jack which connects to the tip and ring cable from the transmission equipment.

In ISDN and DBS configurations, **loop qualification** must meet certain specifications. Loop qualification insures that the loop loss of the entire cable facility between the final D4 channel bank or *SLC* 96 carrier terminal in the circuit and the NT1 or digital business set is within the maximum specified range. The recommended maximum limit for the 2-wire loop is 32 dB of loss at 80 kHz. See Figure 6. In cases where loop configurations exceed the range limit by a small amount, it is sometimes possible to rearrange the loop plant to reduce the loss. The removal of bridged taps or the use of coarse gauge cable as an alternate along the same route may help to qualify the loop.

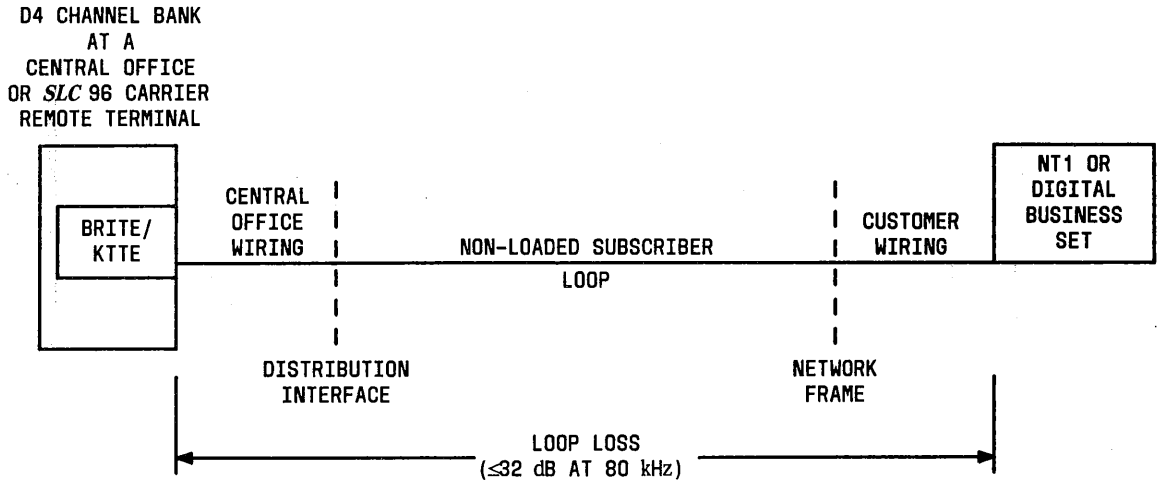


Figure 6. ISDN Loop Range Limit

Two procedures for loop qualification have been established. One is based on actual loop insertion loss measurements. The other is based on calculations using cable records.

If loop qualification is based on an insertion loss measurement, then the measurement should be made over the complete facility between the location of the D4 channel bank or *SLC* 96 carrier terminal and the location of the NT1 equipment or digital business set. The insertion loss measurement should be made at 80 kHz with either a 135-ohm or a 120-ohm termination. The loop qualifies if the result of this measurement is less than or equal to 32 dB.

If loop qualification is performed using calculations based on cable records, then the following procedure is recommended:

STEP	PROCEDURE

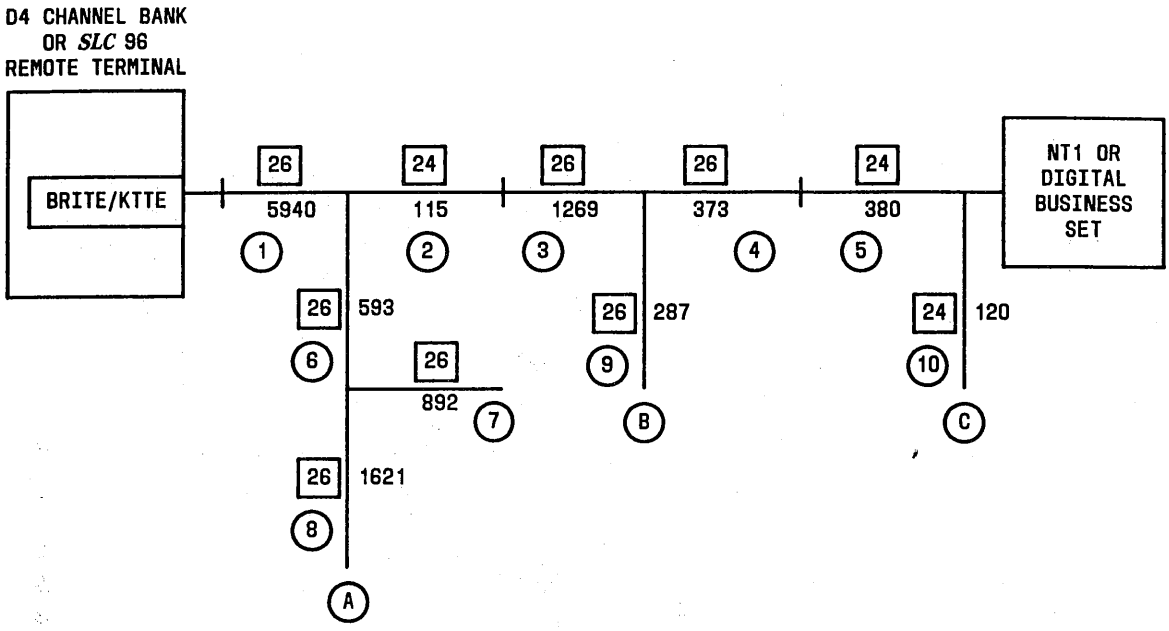
1. Multiply the length of each cable section (in feet) in the cable facility (between the D4 channel bank or *SLC* 96 carrier terminal and the NT1 equipment or digital business set) by an appropriate dB loss constant (see Table B). This will give the dB loss per section. Figure 7 shows an example of dB loss calculations. Table B lists constants for PIC cable at 68° F. The dB loss constants may be different for other types of cable and should be used in those cases.
2. Add the calculated dB loss of each section together. If there are no bridged taps in the loop, go to Step 4 as this is the total dB loss of the loop. If there bridged taps, continue with Step 3.
3. If the number and length of any bridged taps are known, multiply the length of a bridged tap by 0.002 dB per foot and add this amount (up to a maximum of 4 dB per bridged tap) to obtain a total loss. If the total length of all bridged taps is known, multiply the total length of the bridged taps on the loop by 0.002 dB per foot and add this amount to obtain the total loss.
4. If total dB loss from Step 2 or Step 3 is less than or equal to 32 dB, the loop meets the requirements. If it is more than 32 dB, the loop does not meet the requirements. Therefore, the loss should be reduced by rearranging the loop plant, removing bridged taps, using cable with less loss constants, or using other means to reduce the loss.

TABLE B

PIC CABLE CONSTANTS* FOR CALCULATING LOOP QUALIFICATION

CABLE GAUGE	dB LOSS PER FOOT AT 80 KHZ
19	0.0010
22	0.0015
24	0.0022
26	0.0032

* Applicable to outside plant cable.



NOTE:

1. For this example, each of the cable segments is identified by a circled number. Each of the level 1 bridged taps is identified by a circled letter. The gauge of each section is identified by the number in the box. The remaining numbers are the lengths of each section in feet. The "adjusted 80 kHz loss" is computed as follows:

LOSS CONTRIBUTION OF IN LINE CABLE SECTIONS:

26 gauge	①	5940 ft.	
	③	1269 ft.	
	④	+ 373 ft.	
		7582 ft. X .0032 db per ft.	= 24.26 db
24 gauge	②	115 ft.	
	⑤	+ 380 ft.	
		495 ft. X .0022 db per ft.	= 1.09 db

LOSS CONTRIBUTION OF BRIDGED TAPS:

Ⓐ	⑥	593 ft.	
	⑦	892 ft.	
	⑧	+1621 ft.	
		3106 ft. X .002 db per ft. = 6.21 db > 4.00 db maximum	
Ⓑ	⑨	287 ft. X .002 db per ft.	= 0.57 db
Ⓒ	⑩	120 ft. X .002 db per ft.	= 0.24 db
		Total adjusted 80 kHz loss	= 30.16 db

Figure 7. Example of a Loop Qualification Calculation

For more information about ISDN and DBS customer-premises equipment and loop qualification, refer to ISDN Customer Premises Planning Guide -- AT&T 533-700-100 and *5ESS* switch ISDN Basic Rate Interface Specification -- AT&T 5D5-900-301.

TRANSMISSION EQUIPMENT PREPARATION

OVERVIEW

This part contains general information for preparing the D4 channel bank or *SLC* 96 carrier terminal for ISDN or DBS.

D4 CHANNEL BANK PREPARATION

Before ISDN or DBS is provided, a service work order (circuit, service, or engineering work order), WORD (Work Order Record and Details) document, or a similar document is prepared by the appropriate organization. One of the items that the order document will specify is the proper timing source to be used and which digroup will be used as the timing reference. An OIU (office interface unit) -2, OIU-4, or OIU-4A must be installed in the D4 channel bank.

> ***Caution: Digital service will be interrupted in a D4 channel bank if the OIU plug-in has to be removed for replacement or to change the timing option.***

The D4 channel bank must be externally timed or loop timed to a common timing source. Figure 3 shows a suggested method for timing the D4 channel bank to provide synchronization.

For loop timing, the **LT** option is selected on the OIU-2 or OIU-4 plug-in by positioning the white plugs in the front window on the faceplate. One plug must be installed in the **LT** position and another plug installed for the applicable referenced digroup (**A DGP** or **B DGP** position). With the OIU-4A, loop timing and the digroup reference are selected by turning the faceplate rotary switch to the **LT A/LT B** position.

External timing of the D4 channel bank requires the timing leads to be connected to the terminal strip **TS8** at the top right rear of the D4 channel bank. The timing leads must connect to terminal pins **9** and **10** and the shield to terminal pin **14** per CAD 27, SD-3C304-02. After the timing leads have been connected, the OIU-2, OIU-4, or OIU-4A must be optioned for **EXT** timing.

SLC 96 CARRIER SYSTEM TERMINAL PREPARATION

An engineering work order or other similar document must be initiated to establish proper timing for the ISDN or DBS circuit. For *SLC* 96 carrier terminals, an SSU (special service unit) and a TRU (transmission receive unit) must be installed. The SSU should be a WP2C, Series 5 and must be optioned for external timing in a COT (central office terminal) and optioned for looped (internal) timing in an RT (remote terminal). The TRU must be a WM1D, Series 2 or later vintage.

> ***Caution: Digital service will be interrupted in a SLC 96 carrier terminal if the SSU plug-in has to be removed for replacement or to change the timing option.***

Procedures to select the *SLC* 96 carrier terminal for internal/external timing options are contained in the DLPs (Detailed Level Procedures) of AT&T 363-202-400 for central office terminals and 363-202-401 for remote terminals.

BRITE AND KTTE CHANNEL UNIT INSTALLATION AND VERIFICATION TESTS

OVERVIEW

This part contains the procedures to verify continuity of connections between the *5ESS* switch and transmission equipment, to install the BRITE and/or the KTTE channel units, and to verify that the circuit is properly synchronized. Procedure 1 is a suggested method to verify that the *5ESS* switch translations have been accomplished and that metallic continuity exists between the switch and the D4 channel bank or *SLC* 96 carrier central office terminal. Procedure 2 contains BRITE and KTTE channel unit option setting information and installation procedures. Procedure 3 contains steps to verify proper synchronization between the first D4 channel bank or *SLC* 96 carrier central office terminal and the *5ESS* switch. Procedure 4 is a suggested method to verify the continuity of the ISDN circuit from the final (far end) D4 channel bank or *SLC* 96 carrier remote terminal to the *5ESS* switch. Procedure 5 contains steps to test the complete ISDN circuit to insure proper operation.

PROCEDURE 1 -- VERIFY CONTINUITY BETWEEN FIRST D4 CHANNEL BANK OR *SLC* 96 CARRIER TERMINAL AND *5ESS*® SWITCH AND VERIFY THAT SWITCH TRANSLATIONS HAVE BEEN PERFORMED

Application: This procedure contains a suggested method to verify continuity of the connections between the first D4 channel bank or *SLC* 96 carrier terminal and the *5ESS* switch. It also contains the steps to verify that the line and ISDN terminal translations have been performed at the switch.

Apparatus Required:

- ITE 6601 test set (COMCODE 200155109) or the following apparatus:
  - — 1 -- 353A power unit
  - — 1 -- NT1 unit
  - — 1 -- ISDN terminal
  - — 1 -- Modified telephone cord approximately 12 feet long or long enough to reach the top shelf of a bay. The tip and ring leads must be terminated at one end to tip and ring on a 310 plug and terminated at the other end to tip (pin 4) and ring (pin 3) on a 6-pin modular telephone plug. See Figure 8.
  - — 1 -- D8W-87 cord
  - — 1 -- D6AP-87 cord.
- 1 -- Channel unit extender - J98726MF (for D4 channel bank only), J1C141MF (for *SLC* 96 carrier terminal only), or J98726MP (for either one). The J98726MP is recommended.

STEP	PROCEDURE

1. At the D4 channel bank or *SLC* 96 carrier terminal, remove the BRITE or KTTE channel unit (if present) and install the channel unit extender into the channel slot. (On the J98726MP channel unit extender, set the **D4/SLC** 96 carrier switch to the appropriate position). See Figure 8.

PROCEDURE 1 -- VERIFY CONTINUITY BETWEEN FIRST D4 CHANNEL BANK OR *SLC* 96 CARRIER TERMINAL AND *5ESS* SWITCH AND VERIFY THAT SWITCH TRANSLATIONS HAVE BEEN PERFORMED (Contd)

STEP	PROCEDURE

2. Are you using the ITE 6601 test set?

   No -- Continue with Step 3.

   Yes -- Go to Step 6.

3. Connect apparatus as shown in Figure 8.
4. Insert the 310 plug on the modified telephone cord into the **DROP T/R** jack on the channel unit extender.
5. Insert the 6-pin modular telephone plug on the modified telephone cord into the **TO LINE** jack on the 353A power unit (see Figure 8). Go to Step 7.
6. Connect the ITE 6601 test set tip and ring to the **DROP T/R** jack on the channel unit extender and connect the power unit to 115V ac outlet.
7. Go off-hook at the ISDN terminal (telephone). Do you hear dial tone?

   Yes -- Continue with Step 8.

   No -- Stop. The circuit is not working. The problem can be due to a lack of continuity between the *5ESS* switch and the D4 channel bank or *SLC* 96 carrier terminal or a lack of line translations at the *5ESS* switch.

8. Dial the *5ESS* switch test number. Do you hear a special tone?

   No -- Stop. The *5ESS* switch translations have not been performed.

   Yes -- Disconnect apparatus or ITE 6601 test set and remove the channel unit extender. Reinstall a BRITE or KTTE channel unit, if applicable.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

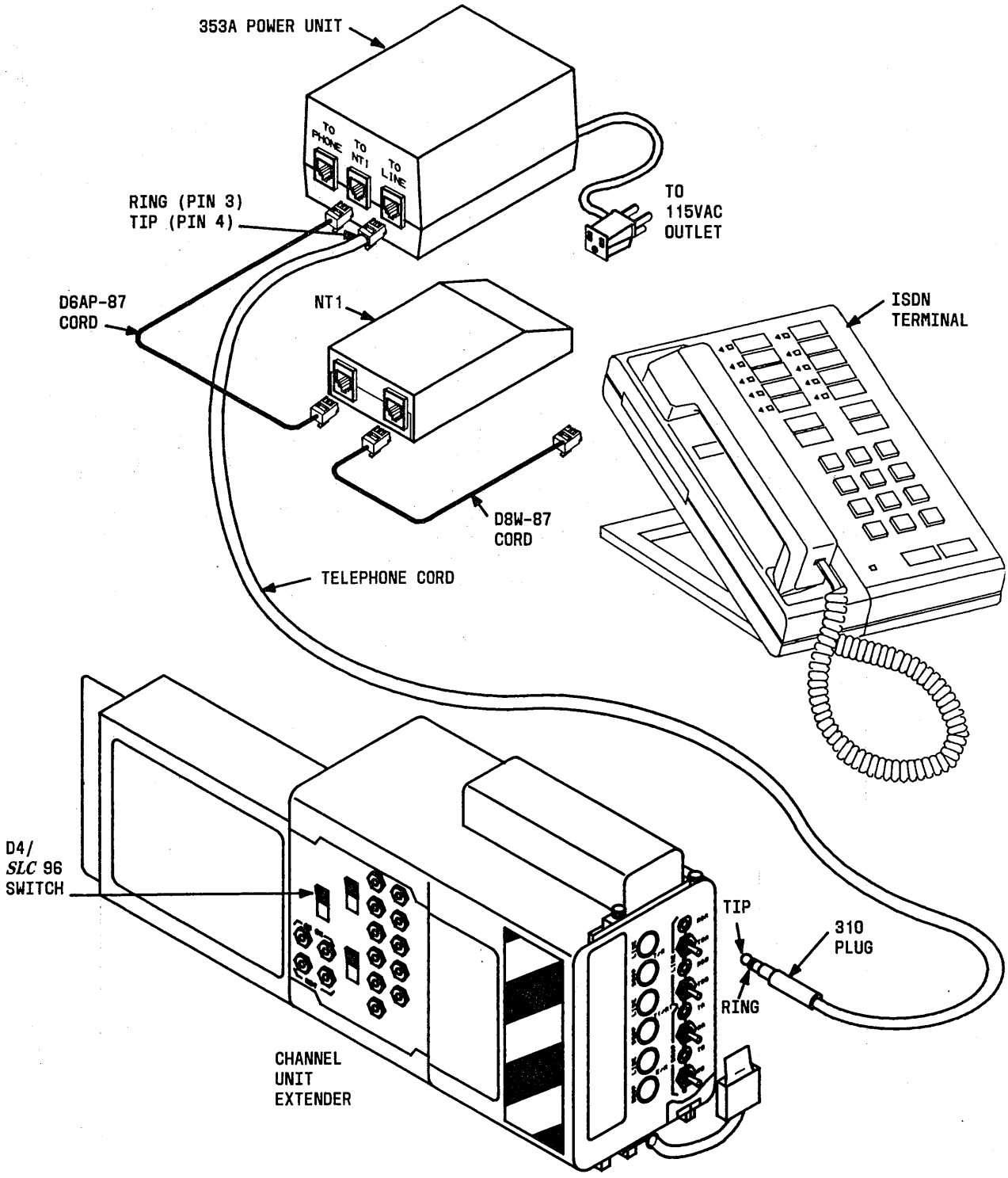


Figure 8. Apparatus Connections to Verify Continuity Between *5ESS* Switch and D4 Channel Bank or *SLC* 96 Carrier Terminal

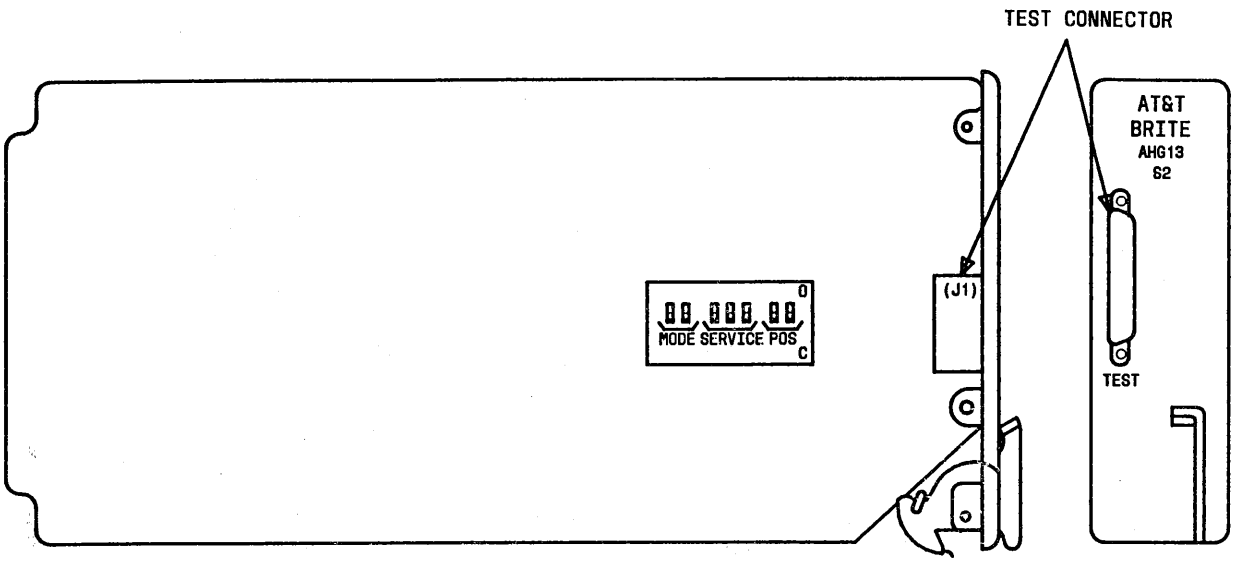
PROCEDURE 2 -- SET BRITE OR KTTE CHANNEL UNIT OPTIONS AND INSTALL THE CHANNEL UNIT

Application: This procedure is used to set the options and install the BRITE or KTTE channel unit. These steps are to be performed at either the D4 channel bank or *SLC* 96 carrier terminal.

STEP	PROCEDURE

1. Obtain an AHG13, Series 2 BRITE channel unit for each ISDN service or AHG19 KTTE channel unit for each DBS specified in the circuit/service order, WORD document, or similar document. **Note that a KTTE channel unit can be used to provide ISDN service if the service is B+D only.**
2. Locate the option switch on the component side of the channel unit. Refer to Figure 9 for the BRITE channel or to Figure 10 for the KTTE channel unit.
3. If a BRITE channel unit is to be installed, set the rocker sections (1 through 7) for **MODE, SERVICE,** and **POS** as listed in TABLES C, D, and E. If a KTTE channel unit is to be installed, set the rocker sections (**A** and **B**) to closed (**C**) or open (**O**) for counting/mode and position as listed in Tables F and G.
4. Install the BRITE or KTTE channel unit into the channel slot as specified on the circuit/service order, WORD document, or similar document.
5. If blank cards are available, install the blank card(s) into any vacant slots that carry (2B+D) or (B+D) service. This is a safety precaution to prevent inadvertent installation of channel units into these particular channel slots. As an example, if channel slot 1 has a BRITE channel unit installed with 2B+D service, place blank cards into channel slots 2 and 3.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.



D4	D1D COUNT		CC	MODE
	D4 COUNT		CO	
SLC 96	MODE I	1,4,7,10	CC	
		2,5,8,11	OO	
	MODE III	D1D CNT	OC	
		D4 CNT	CC	
DGTL PIPE	56	2B	OCC	SERVICE
	64		OCO	
	56	B	COC	
	64		COO	
	IDSN	2B+D	OOC	
		B+D	OOO	
		D	CCO	
	TDM OFC	SINK	CO	POS
		SOURCE	CC	
	5ESS	SINK	OO	
	NT1	SOURCE	OC	

NOTE: THE DECAL IS LOCATED ON THE BACK SIDE OF THE FACEPLATE

Figure 9. AHG13 BRITE Channel Unit Option Switch Location

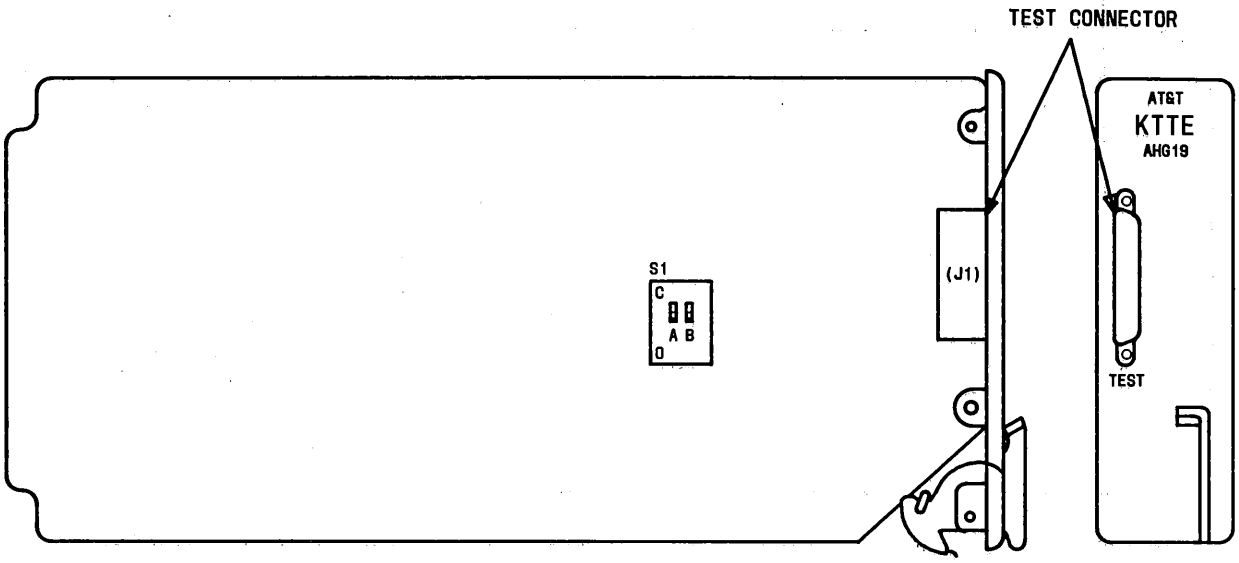


Figure 10. AHG19 KTTE Channel Unit Option Switch Location

TABLE C
MODE OPTIONS FOR BRITE CHANNEL UNIT

BANK OR TERMINAL	COUNTING AND MODE	MODE SWITCHES (NOTE)	
		1	2
D4	D4 Counting	C	O
D4	D1D Counting	C	C
SLC 96	D1D Mode 1	C *	C *
SLC 96	D1D Mode 1	O †	O †
SLC 96	D4 Mode 3	C	C
SLC 96	D1D Mode 3	O	C

Note: C = Closed; O = Open.

* These switch settings are for a channel unit that requires time slot counting to begin with the first of the two time slots assigned to a physical slot.

† These switch settings are for a channel unit that requires time slot counting to begin with the second of the two time slots assigned to a physical slot. This is the case when the first time slot is already taken by another channel unit to the left.

TABLE D
SERVICE OPTIONS FOR BRITE CHANNEL UNIT

SERVICE	CHANNELS	RATE	SERVICE SWITCHES (NOTE)		
			3	4	5
ISDN	2B+D	-	O	O	C
ISDN	B+D	-	O	O	O
Digital Pipe	2B	56 kb/s	O	C	C
Digital Pipe	2B	64 kb/s*	O	C	O
Digital Pipe	B	56 kb/s	C	O	C
Digital Pipe	B	64 kb/s*	C	O	O

Note: C = Closed; O = Open.

* D4 channel bank or *SLC* 96 carrier terminal should be configured with B8ZS capability.

TABLE E
BRITE CIRCUIT POSITION (SINK OR SOURCE)

BRITE POSITION IN CIRCUIT	POS SWITCHES (NOTE)	
	6	7
Adjacent to *5ESS* Switch (Sink)	O	O
Adjacent to NT1 (Source)	O	C
Tandem Office (Sink) *	C	O
Tandem Office (Source) *	C	C

Note: C = Closed; O = Open.

* Use the **Sink** setting for a tandem BRITE which is closer to the *5ESS* switch than to the NT1. Use the **Source** setting for a tandem BRITE which is closer to the NT1 than to the *5ESS* switch.

TABLE F
COUNTING/MODE OPTIONS FOR KTTE CHANNEL UNIT

SYSTEM	MODE/COUNTING	SWITCH A (NOTE)
D4	D4 Counting	O
D4	D1D Counting	C
SLC 96	Mode 1 - D1D Counting	C
SLC 96	Mode 3 - D4 Counting	C

Note: C = Closed; O = Open.

TABLE G
KTTE CIRCUIT POSITION (SINK OR SOURCE)

KTTE POSITION	SWITCH B (NOTE)
Adjacent to *5ESS* Switch (Sink)	O
Adjacent to NT1 (Source)	C

Note: C = Closed; O = Open.

PROCEDURE 3 -- VERIFY PROPER SYNCHRONIZATION BETWEEN FIRST D4 CHANNEL BANK OR *SLC* 96 CARRIER TERMINAL AND *5ESS* SWITCH

Application: This procedure is used to verify proper synchronization between the first D4 channel bank or *SLC* 96 carrier central office terminal in the circuit and the *5ESS* switch. It should be performed after Procedures 1 and 2 have been performed at the first D4 channel bank or *SLC* 96 carrier terminal.

Apparatus Required:

946A test set

STEP	PROCEDURE

1. Insert the 946A test set into an available channel slot.
2. Connect the ribbon cable connector to the BRITE or KTTE channel unit faceplate test connector.

PROCEDURE 3 -- VERIFY PROPER SYNCHRONIZATION BETWEEN FIRST D4 CHANNEL BANK OR *SLC* 96 CARRIER TERMINAL AND *5ESS* SWITCH (Contd)

STEP	PROCEDURE

3. At the 946A test set (see Figure 11), perform the following steps:
   a. Set the **2B+D** switch to the **BRI** position.
   b. Set the **ADDR** switch to the **1** position.
   c. Set the **T/R** switch to the **R** position (receive only).
   d. Set the **B1/B2** switch to either position (does not matter).
   e. Set the **LP/CR** switch to the **CR** position (carrier).
   f. Press the **ACT** button.
4. At the *5ESS* switch trunk/line work station, perform an external loopback test to run for 15 minutes. Results with no errors occurring during the 15 minutes is a good indication that the circuit is properly synchronized.
5. Are there any error indications from the loopback test?

   Yes -- At the **D4 channel bank**, verify that the OIU plug-in is properly optioned for external timing and that the external clock leads are connected to terminal strip **TS8** located at the right top on the rear side of the channel bank. The leads should be connected to **terminal pins 9 and 10** per CAD 27 in SD-3C304-02. Replace the OIU plug-in if it is suspected of causing trouble.

   At a ***SLC* 96 carrier terminal**, verify that the SSU plug-in is properly optioned for external timing (for a central office terminal) or internal (for a remote terminal) and that the backplane is properly wired per AT&T 363-202-400. Replace the SSU plug-in if it is suspect of causing trouble.

   Verify that the *5ESS* switch has the same source of timing as that of the transmission equipment.

   No -- **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

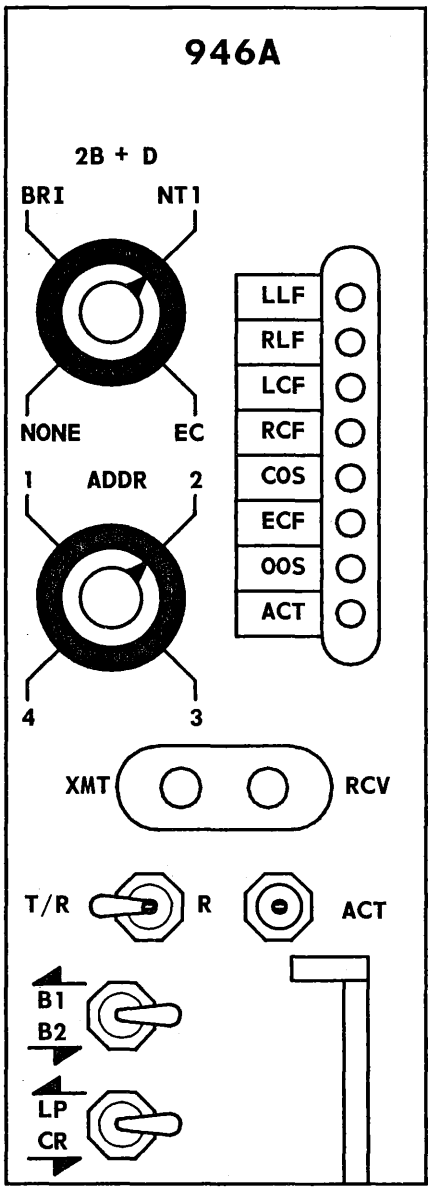


Figure 11. 946A Test Set Faceplate

PROCEDURE 4 -- VERIFY ISDN OR DBS CIRCUIT CONTINUITY FROM FAR END D4 CHANNEL BANK OR *SLC* 96 CARRIER REMOTE TERMINAL TO *5ESS* SWITCH

Application: This procedure contains a suggested method of verifying continuity of connections between the final (far end) D4 channel bank or *SLC* 96 carrier terminal and the *5ESS* switch. Before this procedure is performed, Procedure 1 should be performed to verify that the *5ESS* switch translations have been administered. Procedure 2 should be performed at all D4 channel banks or *SLC* 96 carrier terminals in the ISDN or DBS circuit. Synchronization should be verified (Procedure 3) at the first D4 channel bank or *SLC* 96 carrier terminal.

Apparatus:

- ITE 6601 test set (COMCODE 200155109) or the following apparatus:
  - — 1 -- 353A power unit
  - — 1 -- NT1 unit
  - — 1 -- ISDN terminal
  - — 1 -- Modified telephone cord approximately 12 feet long or long enough to reach the top shelf of a bay. The tip and ring leads must be terminated at one end to tip and ring of a 310 plug and terminated at the other end to tip (pin 4) and ring (pin 3) of a 6-pin modular telephone plug. See Figure 8.
  - — 1 -- D8W-87 cord
  - — 1 -- D6AP-87 cord.
- 1 -- Channel unit extender - J98726MF (for D4 channel bank only), J1C141MF (for *SLC* 96 carrier terminal only), or J98726MP (for either one). The J98726MP is recommended.

STEP	PROCEDURE

1. At the D4 channel bank or *SLC* 96 carrier terminal, remove the BRITE or KTTE channel unit and install the channel unit extender into the channel slot. (On the J98726MP channel unit extender (preferred), set the **D4/SLC** 96 carrier switch to the appropriate position.) See Figure 8.
2. Install the BRITE or KTTE channel unit into the channel unit extender.
3. Are you using the ITE 6601 test set?

   No -- Continue with Step 4.

   Yes -- Go to Step 7.

4. Connect apparatus as shown in Figure 8.
5. Insert the 310 plug on the modified telephone cord into the **LINE T/R** jack on the channel unit extender.
6. Insert the 6-pin modular telephone plug on the modified telephone cord into the **TO LINE** jack on the 353A power unit (see Figure 8). Go to Step 8.

PROCEDURE 4 -- VERIFY ISDN OR DBS CIRCUIT CONTINUITY FROM FAR END D4 CHANNEL BANK OR *SLC* 96 CARRIER REMOTE TERMINAL TO *5ESS* SWITCH (Contd)

STEP	PROCEDURE

7. Connect the ITE 6601 test set tip and ring to the **LINE T/R** jack on the channel unit extender and connect the power unit to 115V ac outlet.
8. Go off-hook at the ISDN terminal (telephone). Do you hear dial tone?

   Yes -- Continue with Step 9.

   No -- Stop. The circuit is not working. All appropriate connections must be made.
9. Dial the *5ESS* switch test number. Do you hear a special tone?

   No -- Stop. The *5ESS* switch translations are not correct.

   Yes -- Disconnect apparatus or test set and remove the channel unit extender.
10. Install the BRITE or KTTE channel unit into the channel slot.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

PROCEDURE 5 -- TEST ISDN OR DBS CIRCUIT FOR OPERATION

Application: This procedure contains a suggested method of testing the ISDN or DBS circuit in both directions to verify that the circuit is operational and error-free. An average error rate of 10^{-6} or better indicates a good circuit. This procedure should be performed after Procedures 1, 2, 3, and 4 have been performed, loop qualification has been done, and NT1 equipment has been installed and connected at the customer-premises. If NT1 equipment is not available at the customer-premises, connect an NT1 or an ITE 6601 test set to the tip and ring cables at the cross-connect field. If the circuit does not perform properly, further testing is required. Procedures 6, 7, and 8 can be used to test the BRITE or KTTE channel units in the circuit.

STEP	PROCEDURE

1. At the *5ESS* switch, have a technician perform NT1 loopback tests toward the far end on the B1 and B2 (if used) channels. Each loopback test should last for at least 15 minutes to obtain an average error rate.
2. Make an ISDN or DBS call through the *5ESS* switch to an ISDN terminal or a DBS telephone located on the customer-premises.
3. Did the call complete?

   Yes -- Continue with Step 4.

   No -- Repeat Step 2 several times. If the call does not complete every time, further tests must be performed to isolate trouble. See Trouble Clearing in this manual.
4. Make an ISDN or DBS call through the *5ESS* switch from an ISDN terminal or a DBS telephone at the customer premises.
5. Did the call complete?

   No -- Repeat Step 4 several times. If the call does not complete every time, further tests must be performed to isolate trouble. See Trouble Clearing in this manual.

   Yes -- **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

TROUBLE CLEARING

OVERVIEW

This part contains maintenance information for the BRITE or KTTE channel units in ISDN or DBS circuits. It also contains Procedures 6, 7, and 8 for performing loopback tests in an ISDN or DBS circuit. The loopback tests can be used as installation aids or for trouble isolation.

MAINTENANCE -- GENERAL INFORMATION

In most cases, maintenance on BRITE or KTTE channel units is performed as a reaction to a customer trouble report. Presently when a customer reports a trouble, the proper organization will dispatch a technician to resolve the trouble. Later, when BRITE or KTTE channel unit maintenance capabilities are added to the *5ESS* switch and to LMOS (Loop Maintenance Operation System), an ISDN or DBS customer can dial 611 to report trouble. Maintenance can then be performed from an ARSB (Automated Repair Service Bureau).

The first step in the maintenance of an ISDN or DBS circuit is to determine the location of the trouble. There are three locations in which the trouble can occur: (a) switch equipment, (b) transmission equipment, and/or (c) customer-premises equipment.

If a problem is diagnosed to be in either the switch or customer-premises equipment, a regular course of action is taken. That is, the SCC (Switching Control Center) will make arrangements to fix problems in the serving switch. For customer premises-equipment troubles, the customer will be informed about the problem so that corrective action can be taken.

If the trouble is diagnosed to be in the transmission equipment, then further tests must be run to isolate the trouble.

For testing and trouble isolation, the BRITE or KTTE channel units provide two different loopbacks. One loopback is activated by codes from the carrier side and the other is activated by codes from the customer side. Figure 12 shows the loopbacks for a BRITE channel unit. The loopbacks for a KTTE channel unit are almost identical except that the loopbacks are B+D rather than 2B+D. These loopbacks are as follows:

- 2B+D or B+D channels loop back toward the customer (drop side or loop interface)
- 2B+D or B+D channels loop back toward the carrier (carrier interface).

The loopbacks can be activated using the 946A test set. See Figure 11.

946A Test Set

The 946A test set (Figure 11) tests BRITE or KTTE channel unit(s) at the D4 channel bank or *SLC* 96 carrier terminal. When the test set is connected to the channel unit, the test set enables maintenance personnel to do the following:

- To check the condition of the remote access loops
- To activate loopback tests
- To insert pseudorandom data patterns into the customers data channels.

The test set can be installed into a vacant channel slot without interfering with service. The test set should make contact with the backplane so that it will have the same ground potential as the D4 channel bank or *SLC* 96 carrier terminal. One end of a cable plugs into a jack on the test set and the other end plugs into a jack on the channel unit faceplate.

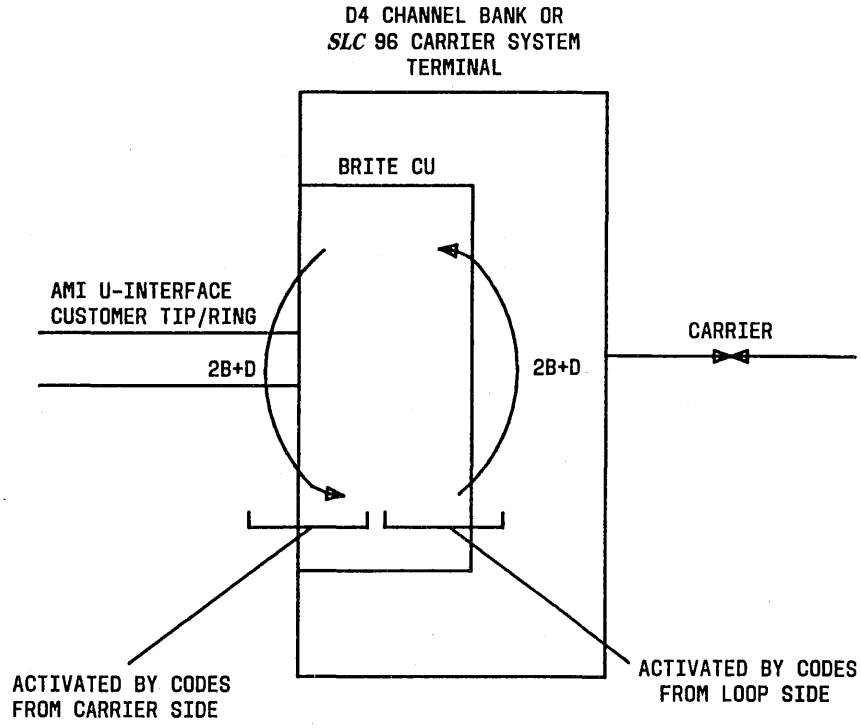


Figure 12. BRITE Channel Unit 2B+D Channel Loopback

The main function of the 946A test set is to establish a loopback connection in the immediate channel unit or in another channel unit in the circuit. Up to four channel units can be tested using the test set. The test set contains test and status lamps and provides jack access for connecting the existing KS-20908 and KS-20909 receiver and transmitter data test sets.

The switches and lamps on the 946A test set (Figure 11) are described below.

2B+D Switch: The four positions on this switch are as follows:

- **NONE** - In this position the test set performs circuit monitoring but no test loops are established.
- **BRI** - In this position a loopback is initiated in a BRITE or KTTE channel unit. The specific channel unit is determined by the setting of the **LP - CR** switch and **ADDR** switch.
- **EC** - In this position the test set initiates a test on the EC (echo canceling) hybrid circuit in a BRITE or KTTE channel unit depending on the **ADDR** switch position.
- **NT1** - In this position the test set initiates a code to activate a loopback at the NT1 on the customer premises.

ADDR Switch: This switch selects the address of the applicable BRITE or KTTE channel unit in the circuit for test. Position **1** selects the channel unit that is connected to the 946A test set. Positions **2, 3,** and **4** select the next channel unit (respectively) in the circuit in the direction specified by the **LP - CR** switch.

XMT - RCV Jack: The **XMT** jack provides access for the KS-20909 transmitter data test set. The **RCV** jack provides access for the KS-20908 receiver data test set.

T/R - R Switch: The **T/R** position allows transmit and/or receive testing on the B channel(s). The **R** position allows receive testing only. The B channel being tested (B1 or B2) depends on the position of the **B1 - B2** switch.

ACT Switch: After the test set is connected to the channel unit, this momentary pushbutton type switch activates the test set and lights the **ACT** lamp. Service is interrupted when the test set is activated.

B1 - B2 Switch: This switch allows transmission testing on the selected channel (B1 or B2). This switch should always be in the **B1** position to test KTTE channel units.

LP - CR Switch: This 2-position switch either sends the loopback code toward the loop side designated by **LP** and an arrow or sends loopback code toward the carrier side designated by **CR** and an arrow.

TABLE H lists and describes the lamps of the 946A test set.

Using the 946A Test Set

The 946A test set is used to help isolate trouble in an ISDN or DBS circuit. To use the test set proficiently, one must analyze the circuit from one end to the other and know the meaning of the lamp indications.

An example of an ISDN circuit with tandem offices between the *5ESS* and the network termination 1 (NT1) is shown in Figure 13. In Figure 13, a 946A test set is connected to the BRITE channel unit in the D4 channel bank at the serving office. The serving office provides the most efficient location to test the circuit. Also, a KS-20908 receiver data test set and a KS-20909 transmitter data test set are connected to the 946A test set. Each D4 channel bank in the remote access line is equipped with a BRITE channel unit and is numbered to correspond to the **ADDR** switch numbers on the 946A test set.

Once a customer reports trouble in the circuit, a technician determines what equipment is in the access line. The technician checks for failure lamp indication(s) on the 946A test set and determines if there is loop, carrier, or possibly intermittent trouble. Intermittent trouble will require further testing.

TABLE H

946A TEST SET LAMPS

LAMPS	LIGHTED ?	REASON
All Lamps	No	BRITE or KTTE channel unit and circuit are working properly.
LLF (Local Loop Failure)	Yes	Indicates that the BRITE or KTTE channel unit connected to the 946A test set has lost framing on the customer side.
RLF (Remote Loop Failure)	Yes	Indicates that the far end BRITE or KTTE channel unit has lost framing on the customer side.
LCF (Local Channel Failure)	Yes	Indicates that N-channel framing is lost on the carrier which could be caused by a channel unit or carrier failure.
RCF (Remote Channel Failure)	Yes	Indicates that N-channel framing is lost on the tandem carrier which could be caused by a BRITE channel unit or carrier failure.
COS (Carrier Out of Service)	Yes	Indicates a loss of framing in the entire carrier. This is a failure of the DS1 facility. The COS lamp takes precedence over the LCF lamp.
ECF (Echo Canceler Failure)	Yes	Indicates that the echo canceler test is active on the channel unit hybrid circuit. Normally the lamp is extinguished after 2 seconds. If it is not, either the tested BRITE or KTTE channel unit is not functioning properly or the loopback was performed at a BRITE channel unit that has a 4-wire reflective loopback.
OOS (Out of Service)	Yes	Indicates that the *5ESS* switch has placed the circuit out-of-service.
ACT (Active)	Yes	Indicates that the 946A test set is activated by the **ACT** switch. The lamp is extinguished upon the next activation of the **ACT** switch.

Lighted lamps on the 946A test set which indicate trouble depend upon the BRITE or KTTE channel unit position to which the test set is connected. As an example, a BRITE channel unit that detects trouble (bad framing) at the loop interface sends an LLF (local loop failure) message to the test interface and an RLF (remote loop failure) message to the carrier interface. The LLF message causes the LLF lamp to light on the connected 946A test set. If there are other test sets connected to other BRITE channel units on the carrier side, the RLF message causes the RLF lamp(s) to light on these test set(s). Similarly, a BRITE channel unit that detects bad framing at the carrier interface sends an LCF (local channel failure) message to the test interface and an RCF (remote channel failure) message toward the loop interface. These failure messages cause the LCF lamp on a test set connected to the failed BRITE channel unit to light and cause the RCF lamp on a test set connected to a BRITE unit on the loop side of the failed unit to light.

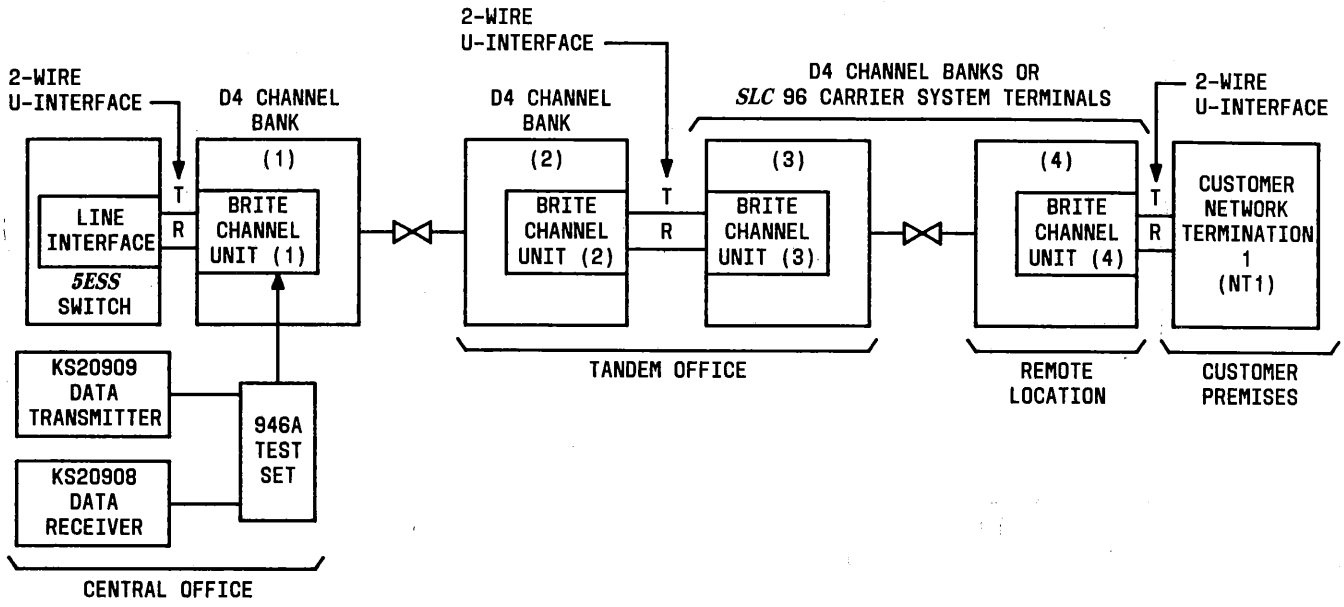


Figure 13. Example of an ISDN Circuit With Tandem D4 Channel Banks

The D4 channel bank and the *SLC* 96 carrier terminal use a framing pattern to monitor the integrity of the entire DS1 facility. A failure of the DS1 facility causes the BRITE or the KTTE channel unit to send a COS (carrier-out-of-service) message to the test- set interface (to the 946A test set if connected) and to the customer. An LCF message is also sent to the test-set interface because the individual channel units in the circuit become out-of-frame. These simultaneous messages cause the COS and LCF lamps on connected test sets to light. In this case the LCF lamp indication should be ignored and attention be given to carrier trouble.

Further loopback tests can be performed with the 946A test set to verify lamp indications. However, there are limitations on some testing. As an example, the echo canceler loopback test will not pass on the number 3 position BRITE channel unit (Figure 13) since there is 4-wire reflective loopback from the carrier side. The echo canceler loopback test provides valid test results only from 2-wire reflective loopbacks. There are some cases where the loopback test passes but the channel unit can be defective. Such cases can be a result of intermittent trouble. Also, a loopback can be transmitted toward the carrier side of the number 1 BRITE channel unit and provide a pass indication. However, the number 1 BRITE channel unit can be defective.

PROCEDURE 6 -- ECHO CANCELER LOOPBACK TEST

Application: This procedure is used to perform the echo canceler test for the BRITE or KTTE channel unit(s). The only apparatus required to perform this loopback test is the 946A test set. It is recommended that this test be performed on all the BRITE or KTTE channel units in the circuit except for the BRITE channel unit described in the note below.

> ***Note:*** If tandem BRITE channel units are used in the circuit, the second tandem unit (number 3 unit in Figure 13) will not pass the echo canceler test since the reflective loopback is from the 4-wire carrier side.

STEP	PROCEDURE

1. Install the 946A test set into a vacant slot close to the channel unit to which it is to be connected. Verify that it makes connection to the backplane.
2. Connect the ribbon cable connector on the 946A test set to the connector on the faceplate of the channel unit.
3. At the 946A test set (see Figure 11), set the **2B+D** switch to **EC** position.
4. Set the **ADDR** switch to the number representing the channel unit in the circuit to be tested.
5. Set the **LP - CR** switch to **LP** position for number 1 channel unit or to **CR** position for number 2 or 4 channel units. Note that the echo canceler test can only be performed on channel units with 2-wire reflective loopback toward the test set.
6. Press the **ACT** button. The ECF lamp lights for about 2 seconds and is extinguished if the echo canceler circuit is working properly. If the circuit is not working properly, the lamp remains lighted.
7. Press the **ACT** button to end the test. Repeat this test on remaining BRITE or KTTE channel units in the circuit.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

PROCEDURE 7 -- NETWORK TERMINATING 1 (NT1) LOOPBACK TEST

Application: This procedure is used to perform a loopback at the NT1 equipment and test the circuit from the BRITE or KTTE channel unit out to the NT1 equipment and back to the channel unit.

Note: For DBS applications, the NT1 function is contained within the digital business set.

Apparatus Required:

- 946A test set
- KS-20908 receiver data test set and cords
- KS-20909 transmitter data test set and cords
- ED-3C792 - D3/D4-to-DDS interface test unit with cable assembly (COMCODE 842725111) for connecting to the clock source in the OIU or SSU **(The "clock box" and cable assembly are not required for D4 channel banks equipped with an OIU-4A).**

STEP	PROCEDURE

1. Install the 946A test set into a vacant slot close to the channel unit to which it is to be connected. Verify that it makes connection to the backplane.
2. Connect the ribbon cable connector on the 946A test set to the connector on the faceplate of the channel unit.
3. Is the D4 channel bank or *SLC* 96 carrier terminal equipped with an OIU-2, OIU-4, OIU-4A, or SSU?

   OIU-4A -- Continue with Step 4.

   OIU-2, OIU-4, or SSU -- Go to Step 5.
4. Using the appropriate clock cords located under the top cover of each KS-20908 and KS-20909 data test set, connect the cords to the OIU-4A faceplate as follows:
   a. Connect the transmitter test set clock cord to the **TRMTR** connector.
   b. Connect the receiver test set clock to the **REC** connector. Go to Step 7.
5. Connect the ED-3C792 (D3/D4-to-DDS interface test unit) to the OIU or SSU, using cable assembly (COMCODE 842725111). One end of the cable connects to the 9-pin connector on the faceplate of the OIU or SSU and the other end connects to the **TO CH BK** connector on the ED-3C792 unit.
6. Using the appropriate clock cords located under the top cover of each KS-20908 and KS-20909 data test set, connect the cords to the D3/D4 to DDS interface test set as follows:
   a. Connect the transmitter test set clock cord to the **TRMTR** connector.
   b. Connect the receiver test set clock cord to the **REC** connector.

PROCEDURE 7 -- NETWORK TERMINATING 1 (NT1) LOOPBACK TEST (Contd)

STEP	PROCEDURE

7. Using the signal cords (terminated with miniature phone jacks) located under the top cover of each KS-20908 and KS-20909 data test set, connect the cords to the 946A test set as follows:
   a. Connect the **X** cord to the **XMT** faceplate connector.
   b. Connect the **REC** cord to the **RCV** faceplate connector.
8. Connect the power cord located under the top cover of each KS-20908 and KS-209909 data test set to a 115V ac outlet.
9. At the KS-20908 data test set (see Figure 14), perform the following:
   a. Set the **INPUT** switch to **LOGIC - NEAR** position.
   b. Set the **DATA RATE** switch to **56** position.
   c. Set the **COUNTER MODE** switch to **COUNT** position.
   d. Set the **SUBRATE CHANNEL or CHANNEL** switch to any position.

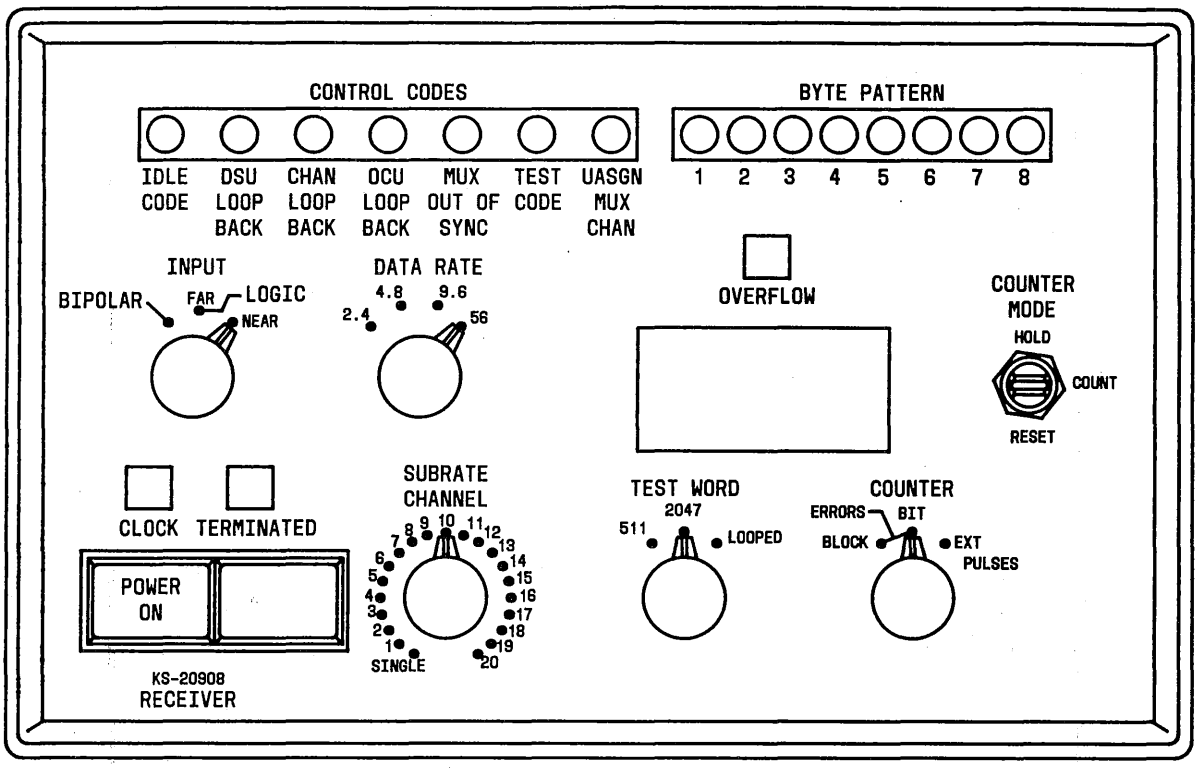


Figure 14. KS-20908 Receiver Data Test Set

PROCEDURE 7 -- NETWORK TERMINATING 1 (NT1) LOOPBACK TEST (Contd)

STEP	PROCEDURE

e. Set the **TEST WORD** switch to **2047** position.

f. Set the **COUNTER** switch to **ERRORS - BIT** position.

g. Press the **POWER** or **POWER ON** switch.

h. Verify that the **CLOCK** lamp lights.

10. At the KS-20909 data test set (see Figure 15), perform the following:

a. Set the **MODE** switch to **REPEAT** position.

b. Set the **FUNCTION** switch to **2047** position.

c. Set the **DATA RATE** switch to **56** position.

d. Set the **OUTPUT** switch to **LOGIC - NEAR** position.

e. Press the **POWER** or **POWER ON** switch.

f. Verify that the **CLOCK** lamp lights.

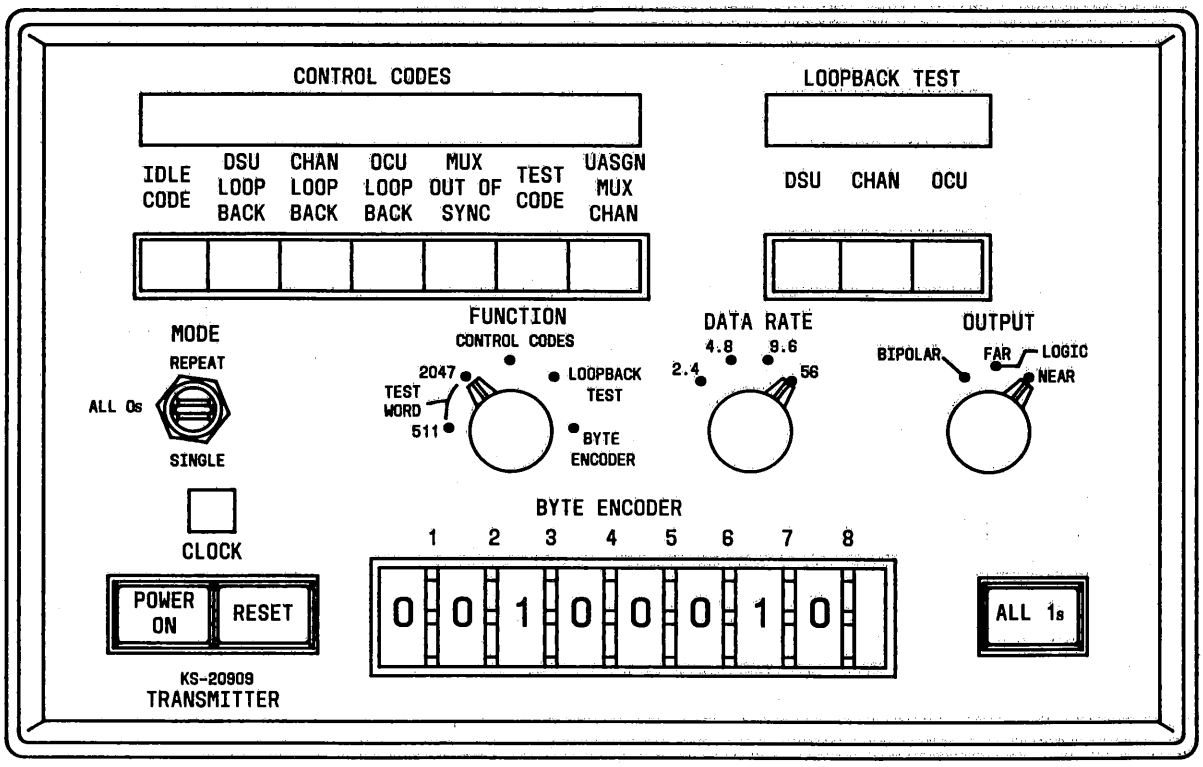


Figure 15. KS-20909 Transmitter Data Test Set

PROCEDURE 7 -- NETWORK TERMINATING 1 (NT1) LOOPBACK TEST (Contd)

STEP	PROCEDURE

11. At the 946A test set (see Figure 11), perform the following:
    a. Set the **2B+D** switch to the **NT1** position.
    b. Set the **ADDR** switch to any position (does not matter for this test).
    c. Set the **T/R - R** switch to the **T/R** position.
    d. Set the **LP - CR** switch to the **CR** position.
    e. Set the **B1 - B2** switch to the **B1** position.
    f. Press the **ACT** button.
12. Reset the KS-20908 receiver and KS-20909 transmitter data test sets as follows:
    a. Set the **COUNTER MODE** switch on the receiver data test set to the **RESET** position.
    b. Press the **RESET** button on the transmitter data test set.
13. Observe the display on the KS-20908 receiver data test set. Zero readings indicate no errors. Zero readings for 5 minutes result in an error rate better than 10^{-6}. An error rate of this quality is sufficient for data transmission.
14. If a KTTE channel unit or a BRITE with B+D service was tested, go to Step 15. If a BRITE channel unit with 2B+D service was tested, set the **B1 - B2** switch to the **B2** position and repeat Steps 11f, 12, and 13. When the test is completed, continue with Step 15.
15. Press the **ACT** button on the 946A test set to terminate the loopback test.
16. Remove all test connections.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

PROCEDURE 8 -- BRITE (BRI) LOOPBACK TEST

Application: This procedure is used to perform the BRITE loopback test for each BRITE (or KTTE) channel unit in the circuit.

Apparatus required:

- 946A test set
- KS-20908 receiver data test set and cords
- KS-20909 transmitter data test set and cords
- ED-3C792 - D3/D4-to-DDS interface test unit ("clock box") with cable assembly (COMCODE 842725111) for connecting to the clock source in the OIU or SSU. **(The "clock box" and cable assembly are not required for D4 channel banks equipped with an OIU-4A.)**

STEP	PROCEDURE

1. Install the 946A test set into a vacant slot close to the channel unit to which it is to be connected. Verify that it makes connection to the backplane.
2. Connect the ribbon cable connector on the 946A test set to the connector on the faceplate of the channel unit.
3. Is the D4 channel bank or *SLC* 96 carrier terminal equipped with an OIU-2, OIU-4, OIU-4A, or SSU?

   OIU-4A -- Continue with Step 4.

   OIU-2, OIU-4, or SSU -- Go to Step 5.
4. Using the appropriate clock cords located under the top cover of each KS-20908 and KS-20909 data test set, connect the cords to the OIU-4A faceplate as follows:
   a. Connect the transmitter test set clock cord to the **TRMTR** connector.
   b. Connect the receiver test set clock to the **REC** connector. Go to Step 7.
5. Connect the ED-3C792 (D3/D4-to-DDS interface test unit), to the OIU or SSU, using cable assembly (COMCODE 842725111). One end of the cable connects to the 9-pin connector on the faceplate of the OIU or SSU and the other end connects to the **TO CH BK** connector on the ED-3C792 unit.
6. Using the appropriate clock cords located under the top cover of each KS-20908 and KS-20909 data test set, connect the cords to the D3/D4 to DDS interface test set as follows:
   a. Connect the transmitter test set clock cord to the **TRMTR** connector.
   b. Connect the receiver test set clock cord to the **REC** connector.

PROCEDURE 8-- BRITE (BRI) LOOPBACK TEST (Contd)

STEP	PROCEDURE

7. Using the signal cords (terminated with miniature phone jacks) located under the top cover of each KS-20908 and KS-20909 data test set, connect the cords to the 946A test set as follows:
    a. Connect the **X** cord to the **XMT** faceplate connector.
    b. Connect the **REC** cord to the **RCV** faceplate connector.
8. Connect the power cord located under the top cover of each KS-20908 and KS-209909 data test set to a 115V ac outlet.
9. At the KS-20908 data test set (see Figure 14), perform the following:
    a. Set the **INPUT** switch to **LOGIC - NEAR** position.
    b. Set the **DATA RATE** switch to **56** position.
    c. Set the **COUNTER MODE** switch to **COUNT** position.
    d. Set the **SUBRATE CHANNEL or CHANNEL** switch to any position.
    e. Set the **TEST WORD** switch to **2047** position.
    f. Set the **COUNTER** switch to **ERROR - BIT** position.
    g. Press the **POWER** or **POWER ON** switch.
    h. Verify that the **CLOCK** lamp lights.
10. At the KS-20909 data test set (see Figure 15), perform the following:
    a. Set the **MODE** switch to **REPEAT** position.
    b. Set the **FUNCTION** switch to **2047** position.
    c. Set the **DATA RATE** switch to **56** position.
    d. Set the **OUTPUT** switch to **LOGIC - NEAR** position.
    e. Press the **POWER** or **POWER ON** switch.
    f. Verify that the **CLOCK** lamp lights.
11. At the 946A test set (see Figure 11), perform the following:
    a. Set the **2B+D** switch to the **BRI** position.
    b. Set the **ADDR** switch to the number representing the position of the BRITE or KTTE channel unit in the circuit.
    c. Set the **LP - CR** switch to either **LP** or **CR** position for BRITE or KTTE channel unit number 1 or to **CR** position for other channel units in the circuit.
    d. Press the **ACT** button.

PROCEDURE 8-- BRITE (BRI) LOOPBACK TEST (Contd)

STEP	PROCEDURE

12. Reset the KS-20908 receiver and KS-20909 transmitter data test sets as follows:
    a. Set the **COUNTER MODE** switch on the receiver data test set to the **RESET** position.
    b. Press the **RESET** button on the transmitter data test set.
13. Observe the displays on the data test sets. Zero readings indicate no errors. Zero reading for 5 minutes result in an error rate better than 10^{-6}. An error rate of this quality is sufficient for data transmission. Go to Step 15 if all channel units have been tested.
14. If the BRITE or KTTE channel unit being tested is in the number 1 position, set the **LP - CR** switch on the 946A test set to the opposite direction and repeat Steps 12 and 13. If BRITE tandem channel units are to be tested, repeat Steps 11b, 11c, 11d, 12, and 13.
15. Press the **ACT** button on the 946A test set to terminate the test.
16. Remove all test connections.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

REFERENCES

OVERVIEW

The following publications contain description and maintenance information on the D4 channel bank and the *SLC* 96 carrier system terminals.

PRACTICE	TITLE
363-202-100	*SLC* 96 Carrier System - General Description
363-202-400	*SLC* 96 Central Office Terminal - Pair Gain System
363-202-401	*SLC* 96 Subscriber Loop Carrier System - Remote Terminal
363-202-500	*SLC* 96 Carrier System Maintenance Loop Terminal System
363-203-100	SLIM (Subscriber Loop Interface Module) - General Description
365-170-000	D4 Channel Bank - (TOP)
365-170-100	D4 Channel Bank - Description
365-005-089	AHG13, SERIES 2 BRITE Channel Unit Data Sheet
365-005-099	AHG19 KTTE Channel Unit Data Sheet
TG5	*5ESS* Switch Translations Guide
5D5-900-301	ISDN Basic Rate Interface Specifications
533-700-100	*5ESS* Switch ISDN Customer Premises Planning Guide

DRAWING	TITLE
SD-3C304-02	D4 Channel Bank - Application Schematic
SD-97770-01/02	*SLC* 96 Carrier System Terminal - Schematic Diagram