

INTEGRATED LOW BIT RATE VOICE (ILBRV) DATA SHEET D4 CHANNEL BANK

DESCRIPTION

Integrated Low Bit Rate Voice (ILBRV) is a D4 channel bank capability that allows transmission of up to 48 channels over one standard DS1 facility. This is accomplished by a technique, called "bit compression", a CCITT standard ADPCM (adaptive differential pulse code modulation) algorithm. This bit compression reduces a 64 kb/s channel to a 32 kb/s channel, thereby doubling the channel carrying capacity of a DS1 facility for voice and voiceband data channels. The 32 kb/s channels carry sufficient information for excellent voice and voiceband data (2.4 or 4.8 kb/s) transmission. ILBRV can also combine compressed and noncompressed (full-rate) channels for transmission over a DS1 facility. Full-rate channels are required for dataports, program channels, and 9.6 kb/s voiceband data.

ILBRV is provided by two new D4 channel bank common circuit packs (Figure 1). The circuit packs are:

- AHG6 CP LBRV Low Bit Rate Voice Unit
- AHG7 LIU-7 Line Interface Unit.

These circuit packs may also be used to provide the ILBRV capability in the Digital Carrier Terminal (DCT).

Configuration of D4 Channel Bank

The D4 channel bank configured with ILBRV operates in a mode that is different from the conventional modes. However, it operates in a mode similar to Mode 1. The ILBRV DS1 signal is interfaced to the DS1 facility only through the A digroup signal path. The B digroup output DS1 signal path is not used. In other words, the D4 digroups A and B are multiplexed onto the A

digroup DS1 signal path.

The following is a list of the D4 common circuit packs required and their locations:

- AHG6 CP LBRV circuit pack in the SU slot.
- AHG7 LIU-7 circuit pack in the LIU slot.
- J98726AD TPU circuit pack in the TPU slot with one ED3C656-30-G7 equalizer card in digroup A equalizer slot. The digroup B equalizer slot should be vacant.
- J98726AA List 2 or later TU circuit pack in TU slot of both A and B digroups.
- J98726AC ACU circuit pack in the ACU slot of digroup A. **The ACU slot of digroup B must be vacant.**
- J98726AB RU circuit pack in RU slot of both A and B digroups.
- J98726AK PDU circuit pack in the PDU slot.
- J87380C PCU or 325A PU circuit pack in the PCU slot.
- Office Interface Unit circuit pack in OIU slot if required for loop timing or for data transmission. If loop timing is used, it is recommended that loop timing be set for the A digroup.

LIU-7 Circuit Pack

The LIU-7 circuit pack is a two-board combination that converts between the format required by the DS1 facility and the ILBRV format of the D4 channel bank. The LIU-7 faceplate (Figure 1) contains 4 switches to select framing format and line coding format and to allow loopback testing. The faceplate also contains loopback test jack, LP-

A. The switch positions and test jack are defined as follows:

- **D4** - D4 framing format consists of a fixed 12-bit framing pattern which is repeated continuously. At the transmit end, one framing bit is inserted into each succeeding 193rd bit-position of the DS1 signal. A 24-channel block plus the 193rd framing bit makes up a frame. The 12 framing bits in 12 frames make up the standard D4 framing pattern. The receiving end uses the framing pattern for synchronizing to the end of one 24-channel block (frame) and the beginning of the next and to identify which channels contain embedded signaling information.
- **ESF (Extended Superframe Format)** - ESF extends the capabilities of the present DS1 signal by providing in-service performance monitoring capability, a 4 kb/s data link channel, and 16-state robbed-bit signaling. This is accomplished by dividing the 8 kb/s (193rd bit position) pattern previously used for mainframe and robbed-bit signaling synchronization. The 193rd bit position is divided into 2 kb/s for mainframe and robbed-bit signaling synchronization, 2 kb/s for a cyclic redundancy check (CRC-6) which provides transmission performance information, and 4 kb/s for a data link to transmit maintenance, supervisory signaling, and other network related information.
- **ZCS (Zero Code Suppression)** - ZCS is the standard D4 line coding format which substitutes a 1 for the 7th bit (second least significant) of an eight zero byte or word at the transmitting end. However, the 1 is not removed at the receiving end. ZCS is used for voice and voiceband data transmission and satisfies the "ones density requirement" of the DS1 facility. ZCS format is not suitable for 64 kb/s clear channel data transmission.
- **B8ZS (Bipolar 8 Zero Substitution)** - B8ZS is a line coding format that allows 64 kb/s clear channel data transmission over a DS1 facility. This format meets the "ones density requirement" of DS1 facility. In the transmit direction the B8ZS encoder substitutes the code 000V10V1 for each consecutive string of eight zeros. The Vs represent bipolar violations. In the receive direction, the B8ZS decoder converts the incoming 000V10V1 code back to eight zeros.
- **LP2/OFF** - This switch provides maintenance looping capability toward the DS1 facility. Loopback is removed when the switch is set to the **OFF** position.
- **LP3/OFF** - This switch provides maintenance looping capability back to the D4 channel bank while the LIU-7 continues to transmit the DS1 signal to the far-end equipment that terminates the line facility. The loopback occurs at the DS1 interface on the LIU-7 back to the LBRV. If an LP3 loopback is activated, the far-end equipment will not detect the loopback since the LIU-7 will continue to transmit valid DS1 signals. Therefore, the far-end equipment will not go into a **RED** alarm. *It is recommended to leave the LP3 in the OFF position and use the LP-A jack to activate a loopback to the D4 channel bank.*
- **LP-A** - This jack provides loopback toward the D4 channel bank when a pin plug is inserted. An all 1's alarm indicating signal (AIS) code is transmitted to the far-end equipment that terminates the line facility when this loopback is active. The AIS code causes the far-end equipment to go into **RED** alarm when the pin plug is inserted into the jack.
- **S1 (Equalizer)** - The S1 switch provides equalizer settings on positions 1, 2, and 3. See Figure 2. S1 is located on the main circuit board just behind the "sub" board of the two-board combination. The sub board, held on to the main board by four screws, should be removed to set the switch positions. However, it is possible to reach the switch positions from the rear of the circuit boards by using a plastic "orange stick" or an equivalent tool and carefully go between the two boards to set the switch positions. Although S1 has three other switch positions (4, 5, and 6), they are not used for ILBRV application.

LBRV Circuit Pack

The LBRV circuit pack compresses the 64 kb/s signals into 32 kb/s signals. It provides either of two signaling modes, bundle or robbed-bit. Selection of the signaling mode is provided through a printed wiring board mounted switch (**BU/RB**). Figure 3 shows the switch on the component side of the circuit pack. The switch set to the up (**BU**) position provides bundle signaling; set to the down (**RB**) position provides robbed-bit signaling. The

faceplate (Figure 1) contains template select switches for selecting compressed or full-rate channel configurations.

Templates for full-rate channel or channel compression selections are provided by rotary type and rocker type switches on the faceplate of the LBRV circuit pack (Figure 1). There are 4 rotary type template select switches each labeled with hexadecimal notations (0 through F). One of 16 possible templates can be selected from each switch. The applicable rotary switch is turned until the arrow points to the hexadecimal position that represents the desired D4 channel bank configuration as selected from Table A for bundle signaling or from Table B for robbed-bit signaling. Associated with each of the 4 rotary template select switches is one rocker of a 4-place rocker switch. The top rocker (# 1) of the switch is associated with the top rotary switch (**1B THRU 12B**), and the next rocker down (# 2) is associated with the next rotary switch (**13B THRU 24B**), etc. When the rocker is set toward the position labeled "OPEN", the first 16 templates (0-15) are selected. When the rocker is set toward the position labeled with numbers (**1 2 3 4**), templates 16 through 31 are selected.

The template select switch settings are read and stored by the LBRV unit continuously unless a pin-plug is inserted into the **TEMP SELECT** jack on the faceplate. When the pin plug is inserted, the LBRV unit uses the last stored setting to maintain service. Template select switches may be changed when the pin-plug is in place without interrupting service. The AHG6 LBRV circuit pack reads and stores the new switch settings when the pin-plug is removed from the jack.

In an existing ILBRV configuration in which there are LBRV units at each end of the circuit, coordination of effort by both installers is needed to keep disruption of service to a minimum. When channel configurations are to be changed (by setting the appropriate temp select switch), both pin-plugs should be inserted and removed at approximately the same time. By inserting and removing the pin-plugs at the same time, disruption of those channels with changes is kept to a minimum. The channels with no changes remain in service without being affected since the LBRV unit uses the last stored setting.

Bundle Signaling

Bundle signaling removes the signaling bits (on-hook, off-hook, and ringing) from each channel and places them in a separate channel called a delta channel. This allows up to 44 channels for service and 4 channels for signaling. The delta signaling channels (12 and 24 of each digroup) are used for the following:

- Per channel signaling (on-hook, off-hook, and ringing)
- Bundle maintenance
- Bundle framing
- Bundle CRC-6 bits.

Note: The D4 channel slots 12 and 24 should be vacant for bundle signaling. Channel unit cards in these slots are **NOT** functional in the ILBRV mode.

In the bundle signaling mode, each bundle is independent of the other bundles and can be networked using DACS (Digital Access and Cross-Connect System). When channels are compressed in the bundle signaling mode, the bundles are formed by formatting 44 of the 48 channels into four 11-channel bundles. One channel (delta channel) carries signaling for the other 11 channels. When full-rate (non-compressed) channels are required, two compressed channel time slots are used for each full-rate channel.

Robbed-Bit Signaling

Robbed-bit signaling replaces a channel data bit with a signaling bit once every six frames. This signaling format makes available all 48 channels for service. Refer to the **CIRCUIT ENGINEERING AND OPTIONS** for more information on bundle and robbed-bit signaling, restrictions, and optioning.

APPLICATIONS AND FEATURES

ILBRV can be used in the following applications to increase capacity on the DS1 facility:

- Customer to network access for cases in which the capacity of the leased DS1 facility is to be doubled
- Private customer networks for cases in which analog voice-frequency channels exceed 24
- Facility expansion applications such as in cellular radio, digital radio, and satellite systems

- Facility relief for increased call traffic such as during holidays and in resort areas.

Figure 4 shows several configurations in which ILBRV can be used.

The following features are included with ILBRV:

- Selection of either bundle or robbed-bit signaling format
- Selection of either extended superframe format (ESF) or standard (D4) framing format
- Selection of either B8ZS or standard D4 ZCS line coding format
- Independent manual loopback capability toward either the DS1 facility or the D4 channel bank
- Selection of compressed or noncompressed channels on a per-channel basis
- End-to-end compatibility with BCM32000X and BCM32000 SOLITAIRE
- Compatible with DACS using bundle signaling format
- Capable of being retrofitted into existing D4 channel banks simply by installing the applicable circuit packs
- Capable of passing full-rate (64 kb/s) channels
- Capable of combining full-rate channels with compressed voice and voiceband data channels.

CIRCUIT ENGINEERING AND OPTIONS

Bundle Signaling Considerations and Restrictions

The following is a list of considerations and restrictions for bundle signaling:

- It meets CCITT G.721 (Geneva, 1986) standard.
- It is required when channels are networked with DACS.
- It reduces the maximum number of channels used for service from 48 to 44.
- If full-rate channels are to be passed, two subrate channel time slots must be used for each full-rate channel.
- Channels to be compressed and/or to be passed must be specified through applicable template selection on the LBRV circuit pack.

- Template options allow the user to specify which full-rate and subrate channels are to have signaling and which are not.
- The allowable maximum number of full-rate channels is 6 per bundle. However, in a configuration in which the A digroup shelf is equipped with out-of-service dataport circuit packs, the total number of out-of-service dataports should not exceed 7 for both bundles. More than 7 such dataports may cause a false bank yellow alarm to occur and may prevent normal clearing of the alarm. No such limitation applies to the B digroup.
- Bundle signaling is recommended for use with tandemed channels.
- An additional layer of alarms is added for bundle signaling format. However, three wires must be added to the backplane.

Note: Before connecting the office alarm wires, it is recommended that the -48ABS fuse be removed from its holder at the Power Distribution Unit (PDU).

The alarm wires that should be connected from one pin to another pin (see Figure 5) are as follows:

- A wire from J34 (SU) pin 22 to J35 (ACU) pin 35 (ACO lead)
- A wire from J34 (SU) pin 20 to J35 (ACU) pin 17 (ALM lead)
- A wire from J34 (SU) pin 19 to J26 (OIU) pin 19 (-48ABS lead).

After the wires are connected to their respective backplane pins, the -48ABS fuse should be placed back into its holder.

Bundle Signaling Templates

Each digroup can be configured in one of 32 combinations (templates) of compressed and full-rate (noncompressed) channels in the bundle signaling format. A channel can be configured with or without signaling. Table A shows all switch settings and corresponding channel configurations. Table A also shows the corresponding template numbers for the BCM32000X and BCM32000 SOLITAIRE.

Template 0 specifies that all the channels that comprise a given bundle will be compressed. Templates 1 through 5 allow for 1 to 5 full-rate

channels without channel associated signaling in a bundle. With template 6 selected, the entire bundle is used for full-rate channels without channel associated signaling.

Note: Template 6 should be used when a bundle is empty (not equipped with any channel units) to avoid transmission of erroneous signaling and alarm information.

Templates 1 through 6 can accommodate full-rate applications such as 9.6 kb/s voiceband data, 64 kb/s voice, subrate digital data, 56 kb/s digital data with/without error correction, and 5, 7.5, and 15 kHz program transmission, and Basic Rate Interface Transmission Extension (BRITE) Integrated Services Digital Network (ISDN) channel unit data.

Templates 7 through 9 accommodate full-rate channel units which may require two adjacent channel slots because of power consumption and/or heat dissipation. These templates are not intended for use in applications that use 56 kb/s data with error correction which require two adjacent active full-rate channel slots as in templates 2, 4, or 6.

Templates 10 through 24 allow for various combinations of compressed channels and full-rate channels with or without channel associated signaling.

Template 25 is used for full-rate channels without signaling in any channel throughout the bundle.

Templates 26 through 31 allow for bundles comprised entirely of channels without signaling in various combinations of compressed and full-rate operation.

Robbed-Bit Signaling Format Considerations and Restrictions

The following is a list of considerations and restrictions for the robbed-bit signaling format:

- It is a per-channel signaling technique in which no separate signaling channels exist.
- If full-rate channels are to be passed, two subrate channel time slots must be used for each full-rate channel.
- The allowable maximum number of full-rate channels is 6 per shelf. However, as with bundle signaling, no more than 7 out-of-service dataports should be installed in the A digroup. The B digroup does not have this limitation.
- All 48 channels may be used for service.
- Eleven templates are provided that allow a mix of full-rate and compressed channels.
- Robbed-bit signaling format is not compatible with DACS.
- Robbed-bit signaling is not recommended for use with tandemed channels.

Robbed-Bit Signaling Templates

In the robbed-bit signaling format one of 11 templates can be configured for each digroup. Table B shows all switch settings and corresponding channel configurations. Table B shows also the corresponding template numbers for the BCM32000X and BCM32000 SOLITAIRE. Note however, that for a given number and positioning of full-rate channel units, one ILBRV template number is used, regardless of whether or not the full-rate channels have channel associated signaling.

The robbed-bit signaling format templates are similar to bundle signaling format templates 0 through 9 and 25. Channels 12 and 24 of each digroup are used for transmission since they are not needed for signaling information.

Setting Options On The LIU-7

Before installing the LIU-7 into its slot, remove the "sub" board from the main board and set the S1 equalizer switch positions 1, 2, and 3 to the proper positions as selected from the chart in Figure 2. Insert the LIU-7 into its slot and set the following faceplate switch options:

- (1) **ESF/D4** - Set switch to the **ESF** position to provide extended super frame line format; set switch to the **D4** position to provide standard D4 framing format.
- (2) **B8ZS/ZCS** - Set switch to the **B8ZS** position to provide 64 kb/s clear channel transmission; set switch to the **ZCS** position to provide the D4 standard line format **without** 64 kb/s clear channel transmission.
- (3) **LP2/OFF** - For service, set switch to **OFF** position.
- (4) **LP3/OFF** - For service, set switch to **OFF** position.

Setting Options On The LBRV Unit

For service, set the following options on the **LBRV** circuit pack:

- (1) **BU/RB** Switch - Before installing the **LBRV** circuit pack, set to **BU** for bundle signaling or to **RB** for robbed-bit signaling (Figure 3).

Note: The signaling format must be consistent throughout the **ILBRV** circuit.

- (2) **TEMP SELECT** Jack - Before turning the template select rotary switches, insert pin-plug into jack to prevent interrupting the service.

Note: If this **ILBRV** circuit has two **LBRV** units (one on each end) and if the circuit is in service, both pin-plugs should be inserted approximately at the same time to prevent interruption of service on those channels to be changed. This requires coordination of effort between both installers.

- (3) Rotary Switch - Set rotary switch to template as selected from Table A or Table B consistent with the **D4** channel bank configuration.

- (4) Rocker Switch - Select appropriate rocker switch and set to **OPEN** for templates 0 - 15 or set to a number (1 2 3 4) for templates 16 - 31.

- (5) **TEMP SELECT** Jack - Remove the pin-plug from the jack. If there are two **LBRV** units in the circuit and if the circuit is in service, both pin-plugs should be removed as close to the same time as possible.

ILBRV Configuration Example

As an example, a **D4** channel bank is to be equipped for **ILBRV**. The top shelf is equipped with circuit packs for voice-only applications. All 12 channels are to be compressed with robbed-bit signaling. **D4** framing format and **ZCS** line coding will be used.

Since this **D4** channel bank will require some circuit packs to be removed, the bank will be out of service until the task is completed. The first task is to prepare the existing **D4** channel bank. This is done by removing circuit packs from the **SU**, **ACU** (**B** digroup), and **LIU** slots and verifying the following:

- **TPU** is in place with one equalizer card (**ED3C656-30-G7**) for **A** digroup and the **B** digroup equalizer card is removed.

- **TUs** (**J98726AA** List 2 or later) are in slots for both **A** and **B** digroups.
- **ACU** is in slot for **A** digroup.
- **RUs** are in slots for both **A** and **B** digroups.
- **OIU** is set for desired timing (if loop timing is desired, it should be set for **A** digroup).

The next task is to set the **BU/RB** switch on the **LBRV** to the **RB** position (robbed-bit signaling) and then install the **LBRV** unit into the **SU** slot. The pin-plug is inserted into the **TEMP SELECT** jack on the faceplate. Rotary switch **1B THRU 12B** (top shelf) is turned to **0** to compress all 12 channels. Rocker switch 1 is set toward **OPEN** to select templates 0 - 15.

The **S1** equalizer settings are made on the **LIU-7** unit and is then installed into the **LIU** slot. The **ESF/D4** switch is set to **D4**, the **B8ZS/ZCS** switch is set to **ZCS**, and the **LP2** and **LP3** switches are set to **OFF**.

The pin-plug is then removed from the **TEMP SELECT** jack on the **LBRV** unit to complete the configuration. If another **D4** channel bank is on the other end, it will require configuring in the same manner. In this case it is recommended to leave the pin-plugs (one at each end) in place until both **D4** channel banks are ready to be put back into service.

MAINTENANCE

The lamps on the **LBRV** faceplate are functional only in the bundle signaling format and will not light in the robbed-bit signaling format.

Bundle alarms on the **LBRV** circuit pack operate office audible and visual alarms if the three optional alarm wires are connected to the backplane as shown in Figure 5. With this configuration when a bundle alarm is present but with no bank alarm, depressing the **ACO** button on the Alarm Control Unit (**ACU**) extinguishes the office alarms and lights the green **ACO** lamp on the **LBRV** faceplate. The **ACO** lamp on the **ACU** does not light when an **LBRV** office alarm is deactivated by the **ACO** button. When a bundle or bank alarm has been deactivated by the **ACO** button, then a new bank or bundle alarm will extinguish the **ACO** lamp on the **LBRV** unit and reactivate the office alarms. When both bank and bundle alarms are present, the bank alarm takes precedence. In this case,

depressing the **ACO** button lights only the **ACO** lamp on the **ACU** faceplate.

A yellow and a red lamp mounted on the **LBRV** faceplate is associated with each 12-channel bundle. The red lamp (red alarm) lights when the receive bundle frame alignment is lost. The presence of a red bundle alarm causes the **LBRV** unit to transmit a signal to the far-end **LBRV** unit which lights the corresponding yellow lamp (yellow alarm). As with all bank alarms, trunk processing takes place at both ends, but only on a per-bundle basis. The trunk processing units' (**TPD-A** and **TPD-B**) lamps do not light in this case. Trunk processing is performed and an idle channel code is transmitted on all channels in the bundle with signaling (compressed or full-rate channels). If a bundle yellow alarm is followed by a bundle red alarm, the yellow lamp will not extinguish until the red lamp extinguishes.

When bank red or yellow alarm lamps are lighted, the corresponding color bundle alarm lamps light and will remain lighted until the bank alarms clear.

Two switches, **LP2** and **LP3**, on the **LIU-7** faceplate provide maintenance looping capability. However, it is recommended that **LP3** not be used but **LP-A** be used instead to provide loopback. **LP2** provides loopback toward the **DS1** facility and **LP-A** provides loopback toward the **D4** channel bank.

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

855-351-103	Systems 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-AHG6	LBRV Circuit Pack Schematic
CPS-AHG7	LIU-7 Circuit Pack Schematic

DRAWING

TITLE

SD-3C304-02	D4 Channel Bank - Application Schematic
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PRECAUTIONS

The **AHG6** **LBRV** and **AHG7** **LIU-7** units contain devices that are subject to damage or decreased reliability from electrostatic discharges. When handling this unit, proper antistatic measures should be taken. Refer to AT&T Practice 365-170-100 for detailed information about the handling of the **D4** channel bank circuit packs.

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. TEMPLATES FOR BUNDLE SIGNALING FORMAT

TEM- PLATE NO. •	ROT SW POS	ROCK SW POS †	CHANNEL NUMBER AND CONFIGURATION											
			1 13	2 14	3 15	4 16	5 17	6 18	7 19	8 20	9 21	10 22	11 23	12 24
0 (0)	0		32s	32s	32s	32s	32s	32s	32s	32s	32s	32s	32s	Δ
1 (1)	1		64n	-	32s	32s	Δ							
2 (3)	2		64n	64n	-	-	32s	32s	32s	32s	32s	32s	32s	Δ
3 (6)	3		64n	64n	64n	-	-	-	32s	32s	32s	32s	32s	Δ
4 (10)	4		64n	64n	64n	64n	-	-	-	-	32s	32s	32s	Δ
5 (15)	5	O	64n	64n	64n	64n	64n	-	-	-	-	-	32s	Δ
6 (21)	6	P	64n	64n	64n	64n	64n	64n	-	-	-	-	-	-
7 (30)	7	E	64n	-	64n	-	32s	32s	32s	32s	32s	32s	32s	Δ
8 (31)	8	N	64n	-	64n	-	64n	-	32s	32s	32s	32s	32s	Δ
9 (32)	9		64n	-	64n	-	64n	-	64n	-	32s	32s	32s	Δ
10 (2)	A		64s	-	32s	32s	Δ							
11 (4)	B		64n	64s	-	-	32s	32s	32s	32s	32s	32s	32s	Δ
12 (5)	C		64s	64s	-	-	32s	32s	32s	32s	32s	32s	32s	Δ
13 (7)	D		64n	64n	64s	-	-	-	32s	32s	32s	32s	32s	Δ
14 (8)	E		64n	64s	64s	-	-	-	32s	32s	32s	32s	32s	Δ
15 (9)	F		64s	64s	64s	-	-	-	32s	32s	32s	32s	32s	Δ
16 (11)	0		64n	64n	64n	64s	-	-	-	-	32s	32s	32s	Δ
17 (12)	1		64n	64n	64s	64s	-	-	-	-	32s	32s	32s	Δ
18 (13)	2		64n	64s	64s	64s	-	-	-	-	32s	32s	32s	Δ
19 (14)	3		64s	64s	64s	64s	-	-	-	-	32s	32s	32s	Δ
20 (16)	4		64n	64n	64n	64n	64s	-	-	-	-	-	32s	Δ
21 (17)	5	N	64n	64n	64n	64s	64s	-	-	-	-	-	32s	Δ
22 (18)	6	U	64n	64n	64s	64s	64s	-	-	-	-	-	32s	Δ
23 (19)	7	M	64n	64s	64s	64s	64s	-	-	-	-	-	32s	Δ
24 (20)	8	B	64s	64s	64s	64s	64s	-	-	-	-	-	32s	Δ
25 (22)	9	E	-	-	-	-	-	-	64n	64n	64n	64n	64n	64n
26 (24)	A	R	-	32n	32n	64n								
27 (25)	B		64n	-	-	32n	32n	64n						
28 (23)	C		32n	32n	32n	32n	32n	32n	32n	32n	32n	32n	32n	32n
29 (33)	D		64n	-	32n	32n	32n							
30 (34)	E		64n	64n	-	-	32n	32n	32n	32n	32n	32n	32n	32n
31 (35)	F		64n	64n	64n	-	-	-	32n	32n	32n	32n	32n	32n

* The template numbers in parenthesis represent the corresponding template numbers for the BCM3200X and BCM32000 SOLITAIRE.

† OPEN = Applicable rocker switch is set toward position marked "OPEN"; NUMBER = Applicable rocker switch is set toward position marked with a number (1, 2, 3, 4). The setting of Rocker Switch 1 combines with the setting of the top Rotary Switch (1B THRU 12B); the setting of Rocker Switch 2 combines with the setting of the second Rotary Switch (13B THRU 24B), etc., to provide the appropriate channel configuration.

Δ = Delta channel used for signaling (not for service).

- = Channel unavailable for service or signaling.

s/n = Channel with signaling (s) or with no signaling (n).

TABLE B. TEMPLATES FOR ROBBED-BIT SIGNALING FORMAT

TEM- PLATE NO. •	ROT SW POS	ROCK SW POS †	CHANNEL NUMBER AND CONFIGURATION											
			1 13	2 14	3 15	4 16	5 17	6 18	7 19	8 20	9 21	10 22	11 23	12 24
0 (0)	0	OPEN	32s	32s	32s	32s	32s	32s	32s	32s	32s	32s	32s	32s
1 (1)	1	OPEN	64n	-	32s	32s	32s							
1 (2)	1	OPEN	64s	-	32s	32s	32s							
2 (3)	2	OPEN	64n	64n	-	-	32s	32s	32s	32s	32s	32s	32s	32s
2 (4)	2	OPEN	64n	64s	-	-	32s	32s	32s	32s	32s	32s	32s	32s
2 (5)	2	OPEN	64s	64s	-	-	32s	32s	32s	32s	32s	32s	32s	32s
2 (6)	2	OPEN	64s	64n	-	-	32s	32s	32s	32s	32s	32s	32s	32s
3 (7)	3	OPEN	64n	64n	64n	-	-	-	32s	32s	32s	32s	32s	32s
3 (8)	3	OPEN	64n	64n	64s	-	-	-	32s	32s	32s	32s	32s	32s
3 (9)	3	OPEN	64n	64s	64s	-	-	-	32s	32s	32s	32s	32s	32s
3 (10)	3	OPEN	64s	64s	64s	-	-	-	32s	32s	32s	32s	32s	32s
4 (11)	4	OPEN	64n	64n	64n	64n	-	-	-	-	32s	32s	32s	32s
4 (12)	4	OPEN	64n	64n	64n	64s	-	-	-	-	32s	32s	32s	32s
4 (13)	4	OPEN	64n	64n	64s	64s	-	-	-	-	32s	32s	32s	32s
4 (14)	4	OPEN	64n	64s	64s	64s	-	-	-	-	32s	32s	32s	32s
4 (15)	4	OPEN	64s	64s	64s	64s	-	-	-	-	32s	32s	32s	32s
5 (16)	5	OPEN	64n	64n	64n	64n	64n	-	-	-	-	-	32s	32s
5 (17)	5	OPEN	64n	64n	64n	64n	64s	-	-	-	-	-	32s	32s
5 (18)	5	OPEN	64n	64n	64n	64s	64s	-	-	-	-	-	32s	32s
5 (19)	5	OPEN	64n	64n	64s	64s	64s	-	-	-	-	-	32s	32s
5 (20)	5	OPEN	64n	64s	64s	64s	64s	-	-	-	-	-	32s	32s
5 (21)	5	OPEN	64s	64s	64s	64s	64s	-	-	-	-	-	32s	32s
6 (22)	6	OPEN	64n	64n	64n	64n	64n	64n	-	-	-	-	-	-
6 (23)	6	OPEN	64s	64s	64s	64s	64s	64s	-	-	-	-	-	-
6 (24)	6	OPEN	64n	64n	64s	64s	64s	64s	-	-	-	-	-	-
6 (25)	6	OPEN	64n	64s	64s	64s	64s	64s	-	-	-	-	-	-
6 (26)	6	OPEN	64n	64n	64n	64n	64s	64s	-	-	-	-	-	-
6 (27)	6	OPEN	64s	64s	64n	64n	64n	64n	-	-	-	-	-	-

* The template numbers in parenthesis represent the corresponding template numbers for the BCM3200X and BCM32000 SOLITAIRE.

† OPEN = Applicable rocker switch is set toward position marked "OPEN". The setting of Rocker Switch 1 combines with the setting of the top Rotary Switch (1B THRU 12B); the setting of Rocker Switch 2 combines with the setting of the second Rotary Switch (13B THRU 24B), etc., to provide the appropriate channel configuration.

- = Channel unavailable for service.

s = Channel with signaling.

n = Channel with no signaling.

TABLE B. TEMPLATES FOR ROBBED-BIT SIGNALING FORMAT (Contd)

TEM- PLATE NO. •	ROT SW POS	ROCK SW POS †	CHANNEL NUMBER AND CONFIGURATION											
			1	2	3	4	5	6	7	8	9	10	11	12
			13	14	15	16	17	18	19	20	21	22	23	24
7 (28)	7	OPEN	64n	-	64n	-	32s							
7 (29)	7	OPEN	64s	-	64s	-	32s							
7 (30)	7	OPEN	64s	-	64n	-	32s							
7 (31)	7	OPEN	64n	-	64s	-	32s							
8 (32)	8	OPEN	64n	-	64n	-	64n	-	32s	32s	32s	32s	32s	32s
8 (33)	8	OPEN	64s	-	64s	-	64s	-	32s	32s	32s	32s	32s	32s
8 (34)	8	OPEN	64n	-	64s	-	64s	-	32s	32s	32s	32s	32s	32s
8 (35)	8	OPEN	64n	-	64n	-	64s	-	32s	32s	32s	32s	32s	32s
9 (36)	9	OPEN	64n	-	64n	-	64n	-	64n	-	32s	32s	32s	32s
9 (37)	9	OPEN	64s	-	64s	-	64s	-	64s	-	32s	32s	32s	32s
9 (38)	9	OPEN	64n	-	64n	-	64n	-	64s	-	32s	32s	32s	32s
9 (39)	9	OPEN	64n	-	64s	-	64s	-	64s	-	32s	32s	32s	32s
9 (40)	9	OPEN	64n	-	64n	-	64s	-	64s	-	32s	32s	32s	32s
25 (41)	9	NUM	-	-	-	-	-	-	64n	64n	64n	64n	64n	64n
25 (42)	9	NUM	-	-	-	-	-	-	64s	64s	64s	64s	64s	64s
25 (43)	9	NUM	-	-	-	-	-	-	64n	64n	64n	64s	64s	64s
25 (44)	9	NUM	-	-	-	-	-	-	64s	64s	64n	64n	64n	64n

* The template numbers in parenthesis represent the corresponding template numbers for the BCM32000X and BCM32000 SOLITAIRE.

† OPEN = Applicable rocker switch is set toward position marked "OPEN"; NUM = Applicable rocker switch is set toward position marked with a number (1, 2, 3, 4). The setting of Rocker Switch 1 combines with the setting of the top Rotary Switch (1B THRU 12B); the setting of Rocker Switch 2 combines with the setting of the second Rotary Switch (13B THRU 24B), etc., to provide the appropriate channel configuration.

- = Channel unavailable for service.

s = Channel with signaling.

n = Channel with no signaling.

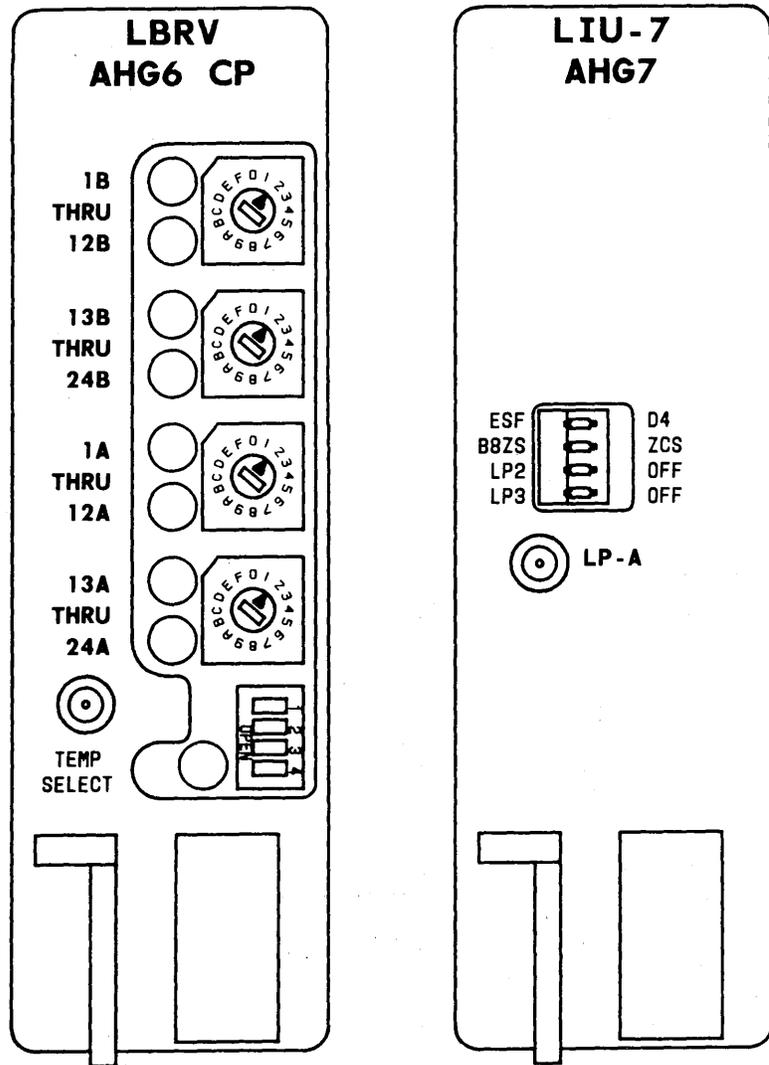
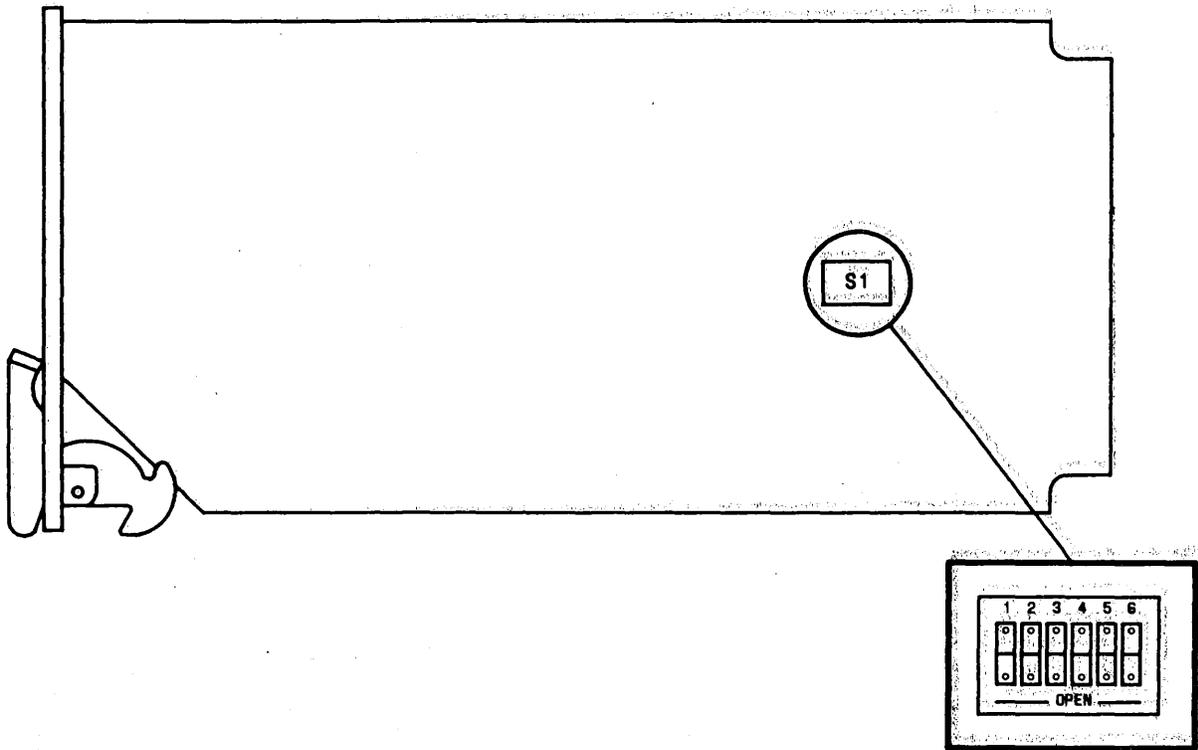


Figure 1. AHG6 LBRV and AHG7 LIU-7 Faceplates



S1 EQUALIZER SETTINGS				
CABLE TYPE AND CABLE DISTANCE TO CROSS-CONNECT FIELD (FEET)		SWITCH 1 (S1) POSITIONS (NOTE)		
750/1249	ABAM	1	2	3
0 TO 90	0 TO 133	0	0	0
90 TO 180	133 TO 267	0	0	C
180 TO 270	267 TO 400	0	C	0
270 TO 360	400 TO 533	0	C	C
360 TO 450	533 TO 655	C	0	0

NOTE: 0 - SWITCH OPEN (DEPRESSED TOWARD OPEN)
 C - SWITCH CLOSED (DEPRESSED TOWARD NUMBER)

Figure 2. S1 Equalizer Switch Location On LIU-7 and Equalizer Settings

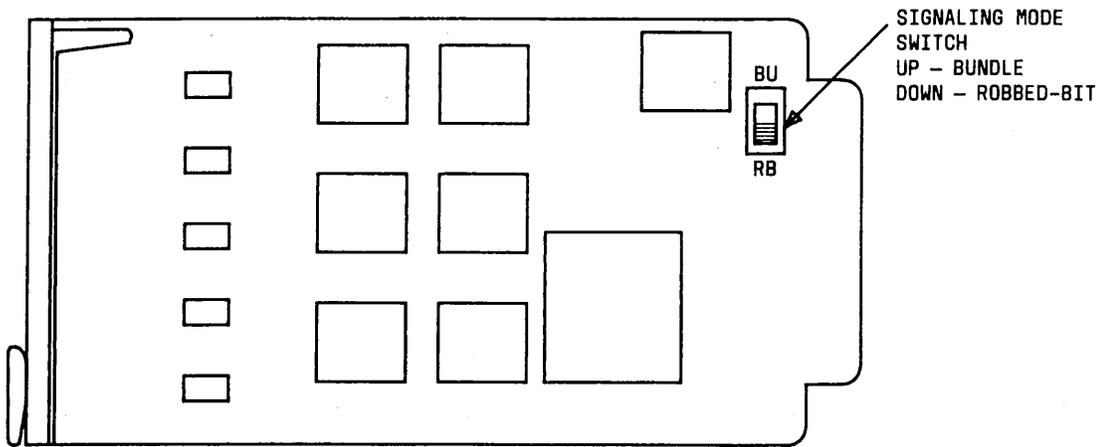


Figure 3. LBRV Circuit Pack Component Layout

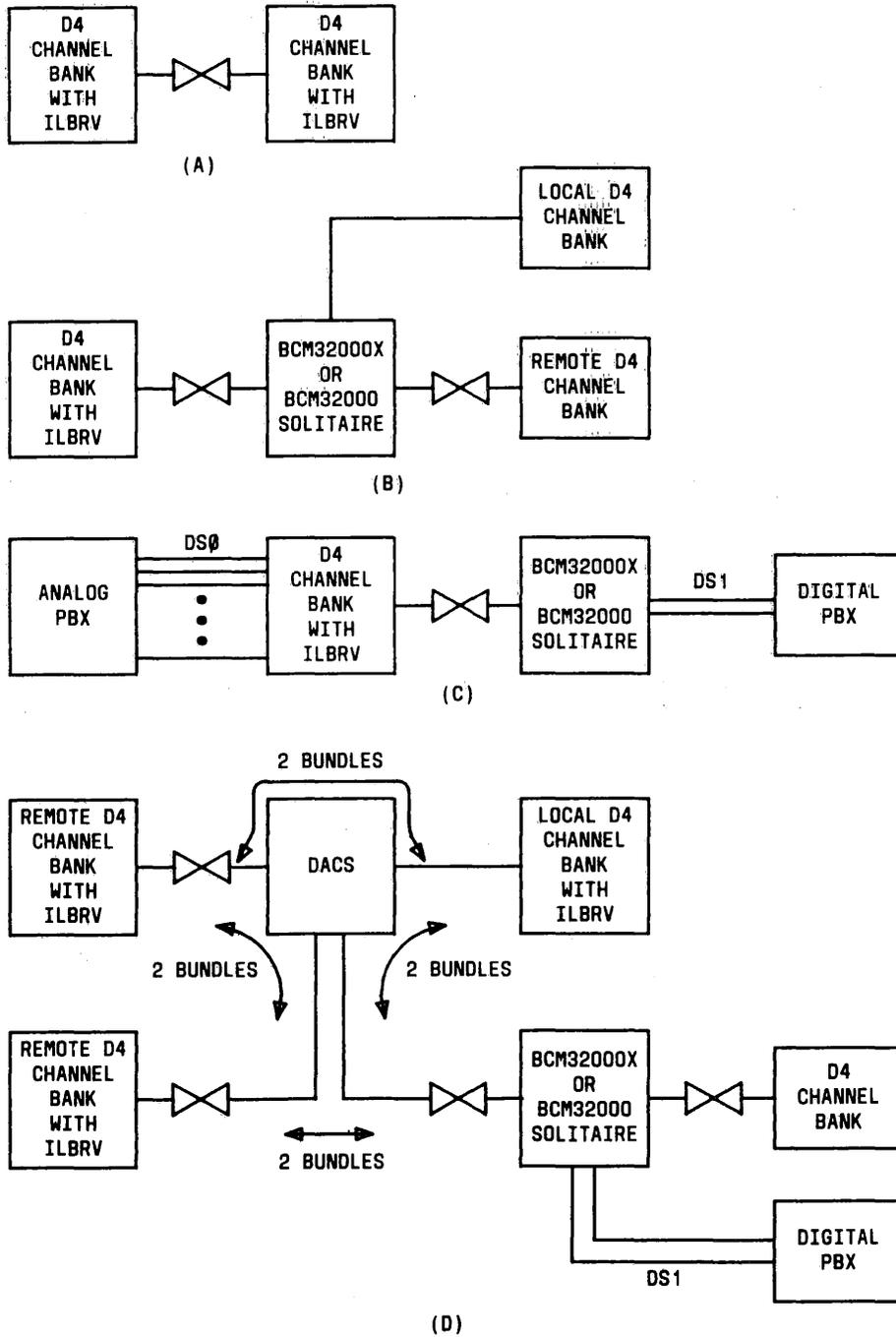


Figure 4. Typical ILBRV Configurations

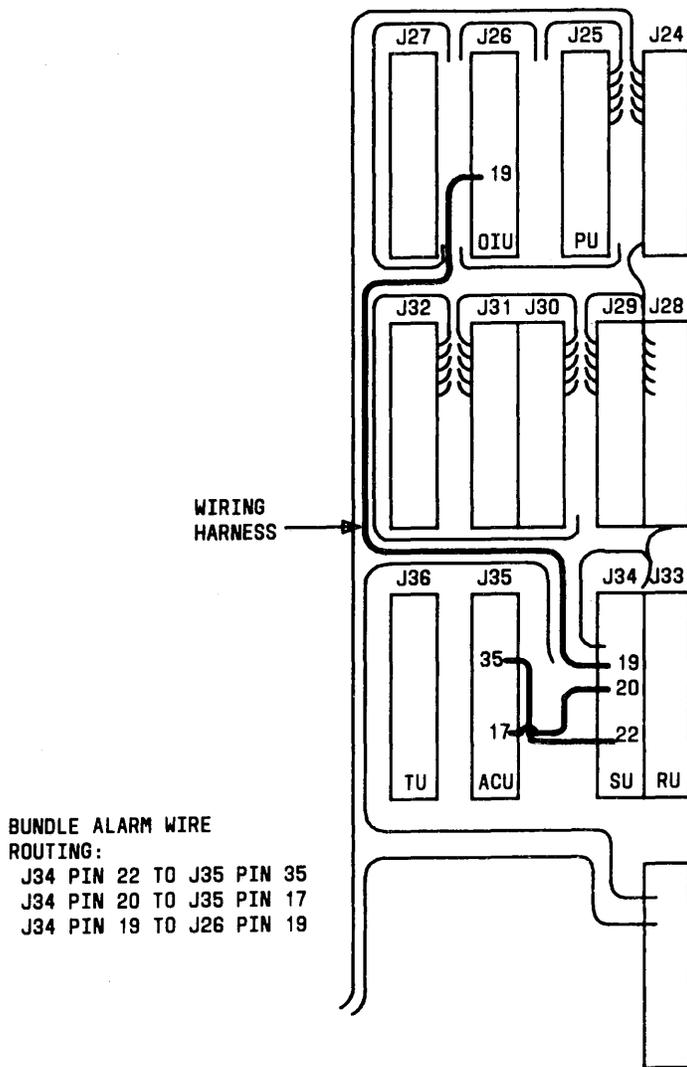


Figure 5. Rear View (Backplane) - Bundle Alarm Wire Connections