SUNRISE TELECOM

SunSet ISDN

User's Manual

SS428

Version 3.00

Sunrise Telecom . . . . . a step ahead

SUNRISE TELECOM
INCORPORATED

DECLARATION OF CONFORMITY

SUNRISE TELECOM
for
SunSet ISDN

Manufacturer
Sunrise Telecom
22 Great Oaks Boulevard
San Jose, CA 95119
USA

Statement of Conformity
Based on test results using appropriate standards, the product is in conformity with Electromagnetic Compatability Directive 89/336/ EEC

Sample Tests
Standards used:

C.I.S.P.R. 22 (1993-12);
EN50081-1992, EN55022
Electromagnetic Compatability;
Generic Immunity Standard
EN 50082-1 (1992)
IEC 801-2, IEC 801-3, IEC 801-4

The tests have been performed in a typical configuration.

The conformity is indicated by the symbol
CE i.e., "Conformité eurpoéenne"

SunSet ISDN Version 3.00
Table of Contents

dialer

Optional HardWare features give you even more diagnostic testing capability:

- Dual ISDN T1 Primary Rate Interfaces
- Dual ISDN E1 Primary Rate Interfaces
- Phantom Power source to provide power to one TE Device connected to the SunSet ISDN

The SunSet ISDN is designed to help anyone who maintains or works with ISDN BRI or PRI circuits. Its broad range of capabilities, combined with its convenient hand-held size, make it the favorite of technicians in the central office, outside plant, and corporate communications center. The set helps diagnose ISDN problems quickly, whether the circuit is in-service or out-of-service. In-service D-Channel Monitoring saves time for the skilled ISDN technician and also enables a broader range of people to perform ISDN testing.

The SunSet ISDN is useful anywhere an ISDN circuit is found. At the corporate communications center it can verify the performance of the telco-provided switch or monitor D-Channel messages if you suspect something is wrong with the signalling of the circuit. It can also be used to "turn up" ISDN circuits, allowing you to place both a voice call and a data call to verify that the circuit is working properly.

This manual is designed to provide you with all the information you will need concerning your SunSet ISDN. For further information, or if you encounter problems, please contact Sunrise Telecom Customer Service or Technical Support for assistance:

Customer Service
Sunrise Telecom Inc.
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Chapter 1
ISDN Technology Overview

Section 1 Introduction

ISDN (Integrated Services Digital Network) was conceived to provide digital services to end users using regular phone lines. ISDN targets both the residential as well as the business customer. Two configurations were designed: 2B+D for BRI (Basic Rate Interface), and either 23B+D or 30B+D for high speed PRI (Primary Rate Interface). Each B channel has 64 kbps available for voice or data transport. The D channel is used for signalling and data communication; its capacities for BRI and PRI are 16 kbps and 64 kbps respectively.

Using ISDN, users can transport data at a higher rate in addition to utilizing a variety of new services such as Group IV FAX and personal digitalized video communication.

Section 2 ISDN Network Architecture

ISDN provides complete digital capabilities. In accordance with Figure 2.A, an ISDN user can access the following services using an ISDN TE (Terminal Equipment):

- Packet-switched data
- Circuit-switched data
- Circuit-switched voice
- Common Channel Signalling (SS7)
- User-to-user signalling

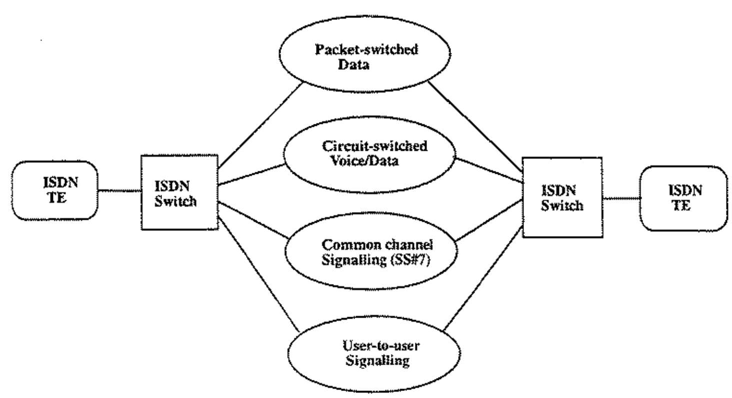


Figure 2.A
ISDN Architecture

Section 3 ISDN Protocol

3.1 B & D Channels

The D channel provides the signalling for all of the B channel connections; therefore, the ISDN protocol is mainly concerned with the first 3 layers of the D channel signalling. However, there are occasions in which the B channel is connected to a packetized network, and can provide its own signalling.

The signalling at the Data Link layer is called LAP-B (Link Access Protocol Balanced) or LAP-D (Link Access Protocol on the D-Channel), respectively.

Application	End-to-end user signalling					
Presentation						
Session						
Transport						
Network	Call control I.451	X.25 Packet level	(Further study)			X.25 Packet level
Data Link	LAP-D (I.441)					X.25 LAP-B
Physical	Layer 1 (I.430, I.431)					
	Signal	Packet	Telemetry	Circuit switching	Leased circuit	Packet switching
	D Channel			B Channel		

Figure 3.A
ISDN Protocl Architecture

Referring to Figure 3A, here are the different layers of the protocol:

Layer 1 (I.430, I.431)

The ISDN physical layer functions are:

- Encoding of digital data for transmission across the interface
- Full-duplex transmission of B-channel data
- Full-duplex transmission of D-channel data
- Multiplexing of channels to form basic or primary access transmission structure

- Activation and deactivation of the physical circuit
- Power feeding from network termination to the terminal
- Terminal identification
- Faulty terminal isolation
- D-channel contention access; this is needed when there is a multipoint configuration for basic rate access.

Layer 2 LAP-D (I.441, Q.921)

The purpose of LAP-D is to convey user information between layer 3 entities across ISDN using the D-channel. The LAP-D service will support:

- Multiple terminals at the user-network installation
- Multiple layer 3 entities

The LAP-D standard provides two forms of service to LAP-D users: unacknowledged and acknowledged information transfer services. Their characteristics are described as follows:

- *Unacknowledged operation:*

Layer 3 information is transferred in unnumbered frames. Error detection is used to discard damaged frames, but there is no error control or flow control.

- *Acknowledged operation:*

Layer 3 information is transferred in frames that include sequence numbers and that are acknowledged. Error control and flow control procedures are included in the protocol. This type is also referred to in the standard as multiple-frame operation.

These two types of operations may coexist on a single D channel. With the acknowledged operation, it is possible to simultaneously support multiple logical LAP-D connections. This is analogous to the ability in X.25 level 3 to support multiple virtual circuits.

Layer 3 (I.450, I.451, Q.931)

The layer 3 interface defines the D-channel call control signalling. It specifies the procedures for establishing connections on the B channels that share the same interface to ISDN as the D channel. It also provides user-to-user control signalling over the D channel.

As mentioned before, packet switching signalling is also available using X.25 layer 3 protocol. This is the same for using B channel packet switching service. Layer 3 provides higher layer information for supporting various ISDN functions.

Two basic types of user terminals are supported by ISDN: functional and stimulus. Functional terminals are considered to be intelligent devices and can employ the full range of Q.931 messages and parameters for call control. All signalling information is sent in a single control message (en bloc sending). Stimulus terminals are devices with a rudimentary signalling capability. A simple digital telephone is an example of a stimulus terminal.

3.2 Synchronization & Encoding

To know how to interpret an electrical signal, synchronization is necessary. Required for synchronization is a method of timing by which the signal is sampled, and that a pattern designating the beginning of a frame is recognizable. Commonly, an "idle" pattern is continually sent when a line is idle, which allows the line to be sampled for synchronization. Another pattern will alert the receiver when data is now being transmitted.

Electrical signals must also keep in balance, working with the voltage variations which carry signal information. Encoding systems have been devised to allow enough variations to keep sampling precise. A system common with BRI is called 2B1Q. It is used at the U interface. Every two bits are encoded by one of four voltage levels, which allows more bandwidth to be used at greater speed.

Section 4 ISDN Messages and Their Functionalities

The message structure is shown in Figure 4.A There is an 8 bit flag on each end of a frame. Sixteen bits are used as the frame check sequence.

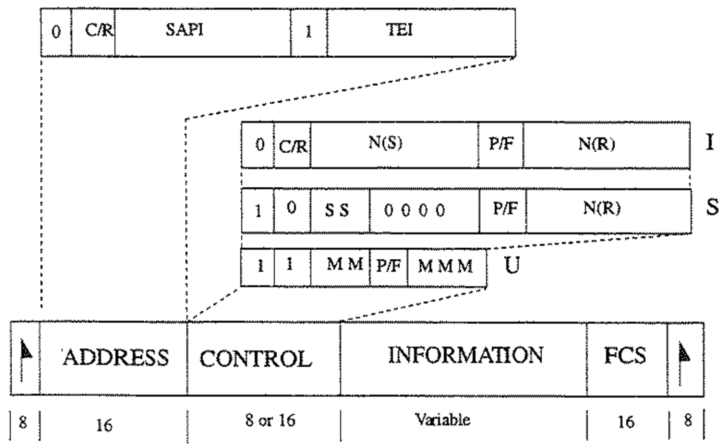


Figure 4.A
ISDN Frame Structure

4.1 Address Field

Address is composed of the TEI (Terminal Endpoint Identifier) and SAPI (Service Access Point Identifier). The Address Field is shown in Figure 4.1.A.

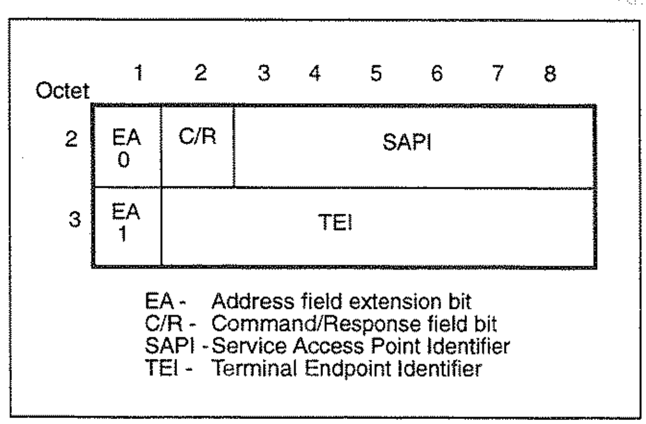


Figure 4.1.A
LAPD address Field

- The TEI identifies the user device. A TEI may be assigned automatically, or in a fixed manner, by the switch. Fixed TEIs are used in PRI, or in BRI point-to-point configurations. Automatic TEIs are generally used with multipoint BRI terminals.

- A SAPI determines the function of the datalink; it identifies a layer 3 user of LAP-D, and thus corresponds to a layer 3 protocol entity within a user device. Four values have been assigned:

0: used for call control procedures for managing B channel circuits

16 : reserved for packet-mode communication on the D channel using X.25 level 3

63: used for the exchange of layer 2 management information.

1: is for packet-mode communication using I.451. This could be used for user-user signalling.

- The combination of TEI and SAPI is referred to as DLCI (Data Link Connection Identifier). At any one time, LAP-D may maintain multiple logical connections, each with a unique DLCI.

4.2 Control Fields

LAP-D defines three types of frames, each with a different control field format. Information transfer frames (I-frames) carry the data to be transmitted for the user. Additionally, flow and error control data, using the go-back-N ARQ (Automatic Repeat Request) mechanism, are piggybacked on an information frame. Supervisory frames (S-frames) provide the ARQ mechanism when piggybacking is not used. Unnumbered frames (U-frames) provide supplemental link control functions and are also used to support unacknowledged operation. The Control Field identifies the type of frame being transmitted.

All of the control field formats contain the poll/final bit (P/F). In command frames, it is referred to as the P bit, and is set to 1 to solicit (poll) a response frame from the peer LAP-D entity. In response frames, it is referred to as the F bit, and is set to 1 to indicate the response frame transmitted as a result of a soliciting command.

Additionally, the control field contains the Received frame number [N(R)] and Sent frame number [N (S)] fields, which keep track of the variables determining the sequence numbers of the I-frames.

The SABME (set asynchronous balanced mode extended) is a command used to set the multiple frame acknowledged mode. The initiator of this command receives a Unnumbered acknowledgment (UA) response.

Section 5 SPIDs for North America

The SPID causes the most difficulty for the tester when configuring to test or troubleshoot an ISDN BRI. The SPID, Service Profile IDentifier, is an identifier that is used to configure each of the two channels on the ISDN circuit. They do not correspond to a specific B Channel, as in B1 for SPID 1 and B2 for SPID 2. They correspond to the first and second telephone numbers which are associated to the ISDN BRI circuit. If you do not have the correct SPIDs for the ISDN BRI which you are testing, you will not be able to place or receive calls. This section will help you decipher not only the meaning of the SPID, but how each switch type typically sets up the SPIDs on the ISDN BRI circuits which they provide. Each switch type and each protocol use a different configuration for their SPIDs.

For each switch type, there are two different protocols which can be used. There is a Custom Protocol for each switch type, and a National ISDN protocol, which is developed by Bellcore. The Custom Protocol is proprietary to each of the switches, meaning each switch can only use its own Custom Protocol. The National ISDN protocol is developed by Bellcore, a national standards organization, in order to unify the protocol used for ISDN BRI on all switches. So you will see this National ISDN protocol used on all North American switch types, including AT&T, Northern Telecom, and Siemens (the three most common). Bellcore continues to improve and enhance the National ISDN standard, and releases new versions of this protocol which are numbered in the order in which they are released. The first release is called National ISDN 1, the second is National ISDN 2, followed by National ISDN 3.

5.1 SPID Definitions

SPID stands for Service Profile IDentifier. It is an identifier used to not only configure the ISDN BRI circuit to be used, but to protect it from being used by others. It can be used almost like a password protection for users of ISDN BRI, because without it the ISDN BRI circuit can not be used.

In order to try and standardize on a similar SPID configuration for all switches, the SPID has been made into a combination of either the 7 or 10 digit telephone number, with a combination of ones and zeroes before and after the number. Each switch type typically uses its own combination of ones and zeroes before and after the telephone number. As the SPID is configured in the translations in the switch, the person who configures the SPID in the switch can set it up to be the same for all of the switches in order to create unity for all SPIDs used in an area.

5.2 AT&T Custom Switch Type

The AT&T Custom protocol is the ISDN BRI protocol which AT&T has developed to use only on their switches. For an AT&T switch type which is using the Custom Protocol, there are two different Line Types which can be used, either Point-to-Point, P-to-P, or Point-to-Multipoint, P-to-MP. Each of these Line Ty pes have completely different SPID configurations.

5.2.1 Point-to-Point Line Type

In a P-to-P configuration, where the NT is connected to only one TE, no SPID is required. You do not have to enter in a SPID to place and receive calls. There is only one telephone number associated with an ISDN BRI / P-to-P Line Type, so you do not have to configure for a second one. The one telephone number for the ISDN BRI circuit is configured during the normal setup when first plugging into the circuit. Once set up properly, an ISDN BRI with a P-to-P Line Type works like a hunt group. If B1 is busy, then the call will be automatically routed to B2, and vice versa.

5.2.2 Point-to-Multipoint Line Type

In a P-to-MP configuration, where the NT is connected to more than one TE, there are two SPIDs associated with the circuit. In order to place and receive calls on both B Channels simultaneously, you need to configure both SPIDs. If you want to place or receive one call, then you only need to configure one SPID. The SPID will typically look like this: 0XXXXXXX01, where XXXXXXX is the 7 digit phone number of the circuit. There will be a 0 at the beginning and a 01 at the end. This is the typical setup for an AT&T switch using the Custom Protocol with a P-to-MP Line Type.

Section 6 BRI Call Appearance & EKTS

Electronic Key Telephone Set (EKTS) phones have the capacity to feature a variety of ISDN services, including Flexible Call Offering, which allows a terminal to handle several calls in various stages (such as one call on hold, another coming in, one talking) at the same time. These usages are programmed by the switch, but must also be programmed onto the individual keys of a given telephone set, so that communication is possible. The terminal (EKTS) is expected to have a button and light to provide information, such as which line is active and which is on hold, to the end-user about each call. This is called the Call Appearance (CAP).

Basic Key-System features are the ability for an individual EKTS phone to have more than one directory number (often a main number, and a secondary shared number), and to have several call appearances for each number. A common application is for several sets to share a directory number, which allows for more than one CAP to deal with calls using only one directory number.

Additionally, call appearances may be shared with other EKTS phones in the key-system (such as other phones within a company). Call conferencing is also possible, called bridging; e.g. one person is talking with a second, and a third person, who shares a call appearance with the first, may join in. The fourth features is hold retrieval- any terminal in a Key-system group may pick up an on-hold call (as long as a B Channel is available). Special features, such as intercom and bridging restriction, exist with Expanded Key-System. Each CAP is assigned a numeric value within the EKTS, and so may be tested by changing the call appearance value in the SunSet.

A related National ISDN option is Call Appearance Call Handling (CACH). This is the procedure by which a switch decides how a call should be routed. If a call comes into a specific CAP, all EKTS phones with that CAP will light/ring. When one terminal is picked up, it sends an acknowledgment to the switch, which stops the ringing on the associated sets. Associated CAP's may also pick up the call.

Section 7 BRI Interfaces

The CCITT has defined "functional groupings" of ISDN technologies:

LT: Link Termination; the point at which an ISDN circuit terminates at the exchange office

NT1: Network Termination 1; physical interface between the customer's equipment and the carrier's network

NT2: Network Termination 2; logical interface between the customer premises and the carrier's network

NT: Combined NT1 and NT2

TA: Terminal Adaptor; device which allows non-ISDN equipment to connect with the ISDN line

TE: Terminal Equipment; may be any voice, data, or other ISDN terminal

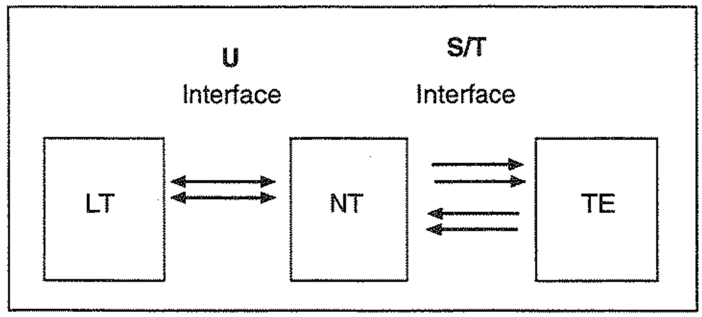


Figure 7.A
Groupings & Interfaces

The ISDN interfaces (where testing is done) are:

U: the two-wire connection between the NT1 and the LT. It uses a special compressed transmission format called 2B1Q.

T: connects NT1 and NT2; a 4-wire interface using bipolar transmission. Not required in an NT.

S: connects NT (or NT2) with TE or TA

Note: S and T interfaces are often grouped as S/T, as the signal and data formats used are the same.

Chapter 2
Initial Setup

Section 1 Unpacking Procedure

Use the following procedure for unpacking and testing your new SunSet:

1) Remove the packing list from the shipping container.

2) Remove the SunSet and accessories from the shipping container.

3) Inspect all parts and immediately report any damage to the carrier and to Sunrise Telecom.

4) Verify that all parts specified on the packing list were received.

5) Complete the Warranty Registration Card and return it immediately to Sunrise Telecom.

   NOTE: Sunrise Telecom must receive your Warranty Registration Card in order to provide you with updated SunWare releases.

6) Ensure that the SunWare cartridges are fully seated in their slots. Refer to figures 1.A and 1.B. Figure 1.A illustrates where to place the cartridge. Figure 1.B shows the cartridge fully installed; the top of the cartridge is pushed flush with the top of the ejector button.

   - There are two slots for SunWare cartridges on the back of the set towards the top. These are PCMCIA card slots which carry all of the software for the set, as well as the buffer space for storing messages.
   - The first card is used to carry the actual software of the test set.
   - The second card is just a blank card as of now, but in the future it will be used as a memory buffer to store protocol messages.
   - The cartridges are field upgradeable, and allow you to swap in a new card in the field.

- To order new SunWare options, or upgrade to a new version of software, we simply program a new SunWare cartridge for you, ship it to you, and you can swap out the old card, put in the new card, and send the old card back in a prepaid envelope which we also provide. This allows you , the user, to never have a day in the field without your SunSet ISDN.

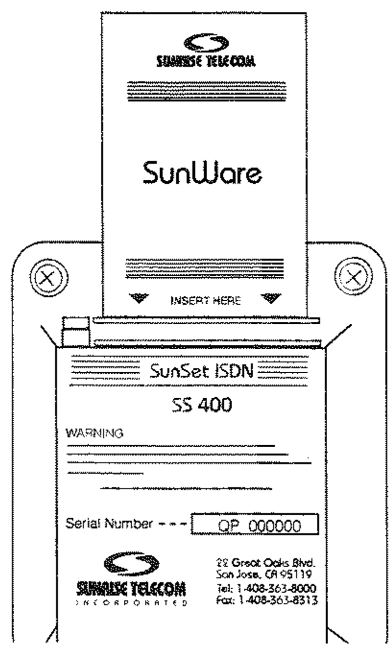


Figure 1.A
Cartridge Installation

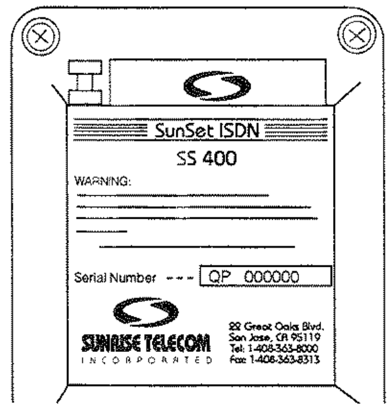


Figure 1.B
Cartridge Installed

7) Plug the AC Battery Charger into an AC wall outlet and connect it to the SunSet.

NOTE: The SunSet ISDN uses a Ni-MH battery. Use only the 100-240 VAC AC Adapter supplied with the test set..

8) Switch the set on and verify that it passes the SELF TEST. If the test set does not turn on immediately, it may need to charge for up to 5 minutes before it can run.

9) Charge the unit for at least three hours before its first use. Or, leave the AC Battery Charger plugged in while operating the test set.

10) Put the test set and accessories into the soft carrying case (if ordered).

NOTE: Each SunWare cartridge is mated to a single SunSet. If your SunSet does not start properly, verify that the Serial Number printed on the SunWare cartridge matches the Serial Number on the back of your SunSet.

When ordering SunWare upgrades, be sure to specify the Serial Number of the SunSet into which the new cartridge will be installed.

Section 2 Replacing the Battery Pack

1) Push down on the battery cover on the back panel, in the direction indicated by the arrow, to remove the battery cover (refer to Figure 2.A Replacing the Battery Pack).

2) Pull the SS140 NimH battery pack off its velcro backing, and out of the set.

3) Unclip the battery pack, as indicated on Figure 2.A.

4) Clip in your new battery pack, replace it against the velcro inside the unit, and slide the battery cover back on, hooking the cover clips into the provided slots.

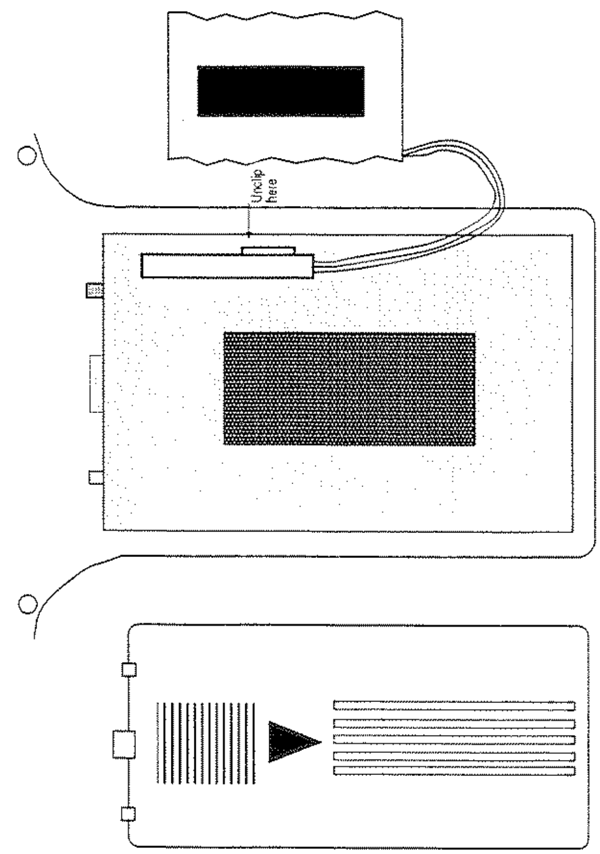
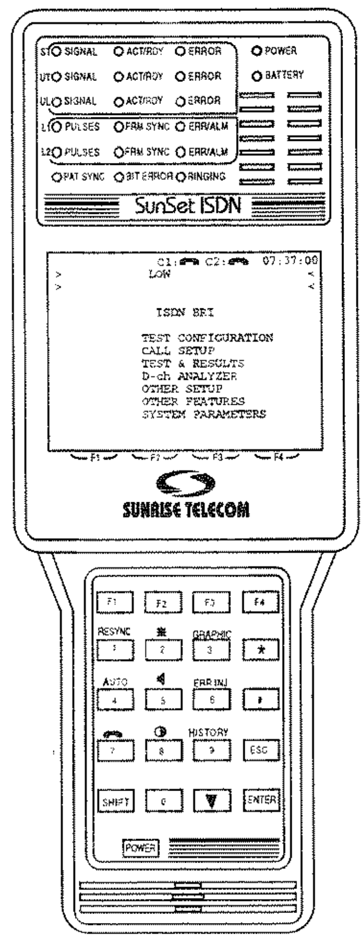


Figure 2.A
Replacing the Battery Pack

Chapter 3
Product Description

This section is dedicated to the general features of the test set. It explains the physical features of the set: the LEDs, keypad functions, and connector panels. The front view of the SunSet ISDN is shown below.



Note: Most SunSet ISDN sets will look like the test set shown above. However, some older units may have a different keypad version. For these, the white numbers are placed above the keys and the yellow labels below. The functionality does not differ between the two styles of keypads.

Section 1 Front View Description

1.1 LED Indicators

The LEDs (Light Emitting Diodes) show the status of the received signal and the circuit itself. The LEDs are organized in three sections:

- BRI: ST, UT, UL
- PRI: L1, L2
- Common LEDs: PAT SYNC, BIT ERROR, RINGING

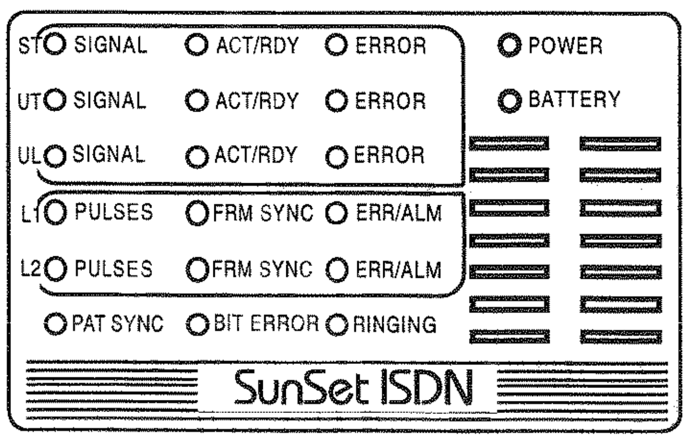


Figure 1.1.A
SunSet ISDN LEDs

Essentially, there are two pairs of states for each LED:

1) Color follows the simple concept: green is good; red is bad. For example, the SIGNAL LED will light green when a valid signal is found at the particular interface. Alternately, it will light red when a valid signal is not detected (but is expected due to configuration).

2) LEDs may be blinking or solid. A solid light reflects the current condition. A blinking light indicates a *history* condition, where errors existed in the past, but are no longer present. For example, a solid red ERRORS LED shows that the test set is detecting errors. A blinking red ERRORS LED indicates that

errors were detected in the past.

- Use the HISTORY key (press SHIFT, then HISTORY) to clear these blinking lights. Pressing HISTORY will not affect your measurements.
- A blinking green ACT/RDY light does not indicate a history condition. Refer to the next section for further details on this light.

1.1.1 BRI LED Indicators

The top group of LEDs are used for ISDN BRI testing. These LEDs show the status of the signal received at each BRI connector located at the right side panel of the test set:

ST: S/T connector
UT: U-NT connector
UL: U-LT connector

Each group of LEDs will be activated according to your configuration choices. For example, if you have selected BRI, TE-S/T Mode, then the ST lights will be activated and the UL and UT lights will be turned off.

SIGNAL

SIGNAL indicates the presence or absence of a valid signal at the particular interface.

- solid green: valid signal
- solid red: signal loss

ACT/RDY

ACT/RDY displays the status of the three states appearing during a normal turn up of an ISDN BRI circuit : Sync, Active, and Ready. These three states are represented as follows:

- Flashing green: indicates Layer 1 is established. This occurs when the test set has performed the proper handshaking with the ISDN network element This handshaking is otherwise known as Synch and Active.
- Solid green: indicates Layer 2 has been properly turned up. ID Request, ID Assigned, SABME, and UA messages have all properly passed between the SunSet and the network element.

- Solid red: the handshaking has not yet taken place, and calls cannot be placed or received.

ERROR
- Solid red: indicates the SunSet is detecting errors on the particular port
- Flashing red: indicates a history error condition. Errors were received in the past, but are no longer present. Pressing the SHIFT and HISTORY keys will clear these lights.

In most scenarios you will look for a green SIGNAL LED, and a solid green ACT/RDY LED, before you can place or receive any calls on a BRI circuit.

1.1.2 PRI LED Indicators

The second group of LEDs are used for ISDN PRI testing. These LEDs refer to the signals received on the PRI ports located on the left side panel of the test set.
- L1- the signal received on the Line 1 Rx jack
- L2- the signal received on the Line 2 Rx jack

The Line 1 lights will be activated for all PRI applications. Line 2's LEDs will be activated only when you have selected PRIMON Mode or a 46B+2D/47B+D configuration.

PULSES
- Green: indicates a valid 2.048 Mbps E1 or 1.544Mbps T1 signal on the Rx jack.
- Red: indicates signal loss.

FRM SYNC
- Green: indicates that the SunSet has achieved frame synchronization.
- Red: indicates a loss of frame synchronization or a framing mismatch.

ERR/ALM
- Solid Red: indicates an error or alarm is detected, such as AIS.
- Blinking Red: indicates a history error or alarm condition. Errors or alarms were received in the past, but are no

longer present. Pressing the SHIFT and HISTORY key will clear these lights.

1.1.3 Common LED Indicators

The third group of LEDs are common to both ISDN BRI and PRI testing.

PAT SYNC

This light will be activated only when you have a data call connected and are running a BER test in the TEST & RESULTS screen.

- Solid green: shows that the SunSet has achieved pattern synchronization during a data call.
- Solid red: shows that the SunSet has *not* achieved pattern synchronization during a data call.

BIT ERROR

- Solid red: indicates that the SunSet detects bit errors.
- Blinking red: indicates a history bit error.

RINGING

- Solid green: indicates an incoming call.

POWER

- Green: indicates the test set is powered on.

BATTERY

- Green: indicates that the AC Adapter/Charger is connected to the test set.
- Red: indicates the battery is low, and the set needs to be plugged into AC as soon as possible. The set will typically last about 3-5 minutes when the BATTERY LED is red.

1.2 Keypad

Most SunSet keys perform two distinct operations. The black label on the key indicates the functions which will be performed when the key is pressed by itself. The orange label above the keys shows which function will be performed if the SHIFT key is first pressed, and the SHIFT indicator is displayed in the upper left-hand corner of the screen. If the keys are not behaving as expected, check the status of the SHIFT function.

Refer to Figure 1.2.A

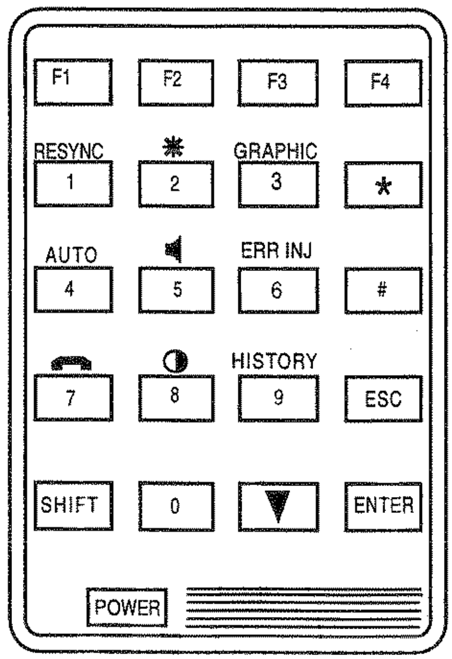


Figure 1.2.A
SunSet ISDN Keypad

Note: Most SunSet ISDN sets will look like the test set shown above. However, some older units may show the white numbers above the keys and the yellow labels below. The functionality does not differ between the two styles of keypads.

1.2.1 Black Labels (on the keys)

F1, F2, F3, and F4

These function keys are used to select choices F1 through F4, which appear at the bottom of the LCD screen. For example, in Figure 1.2.B, "MODE" is highlighted. The various MODEs are shown at the bottom of the LCD screen above each of the four Function keys: TE-S/T (F1), LT-S/T (F2), ST-MON (F3). The "more" (F4) key displays more F-key options.

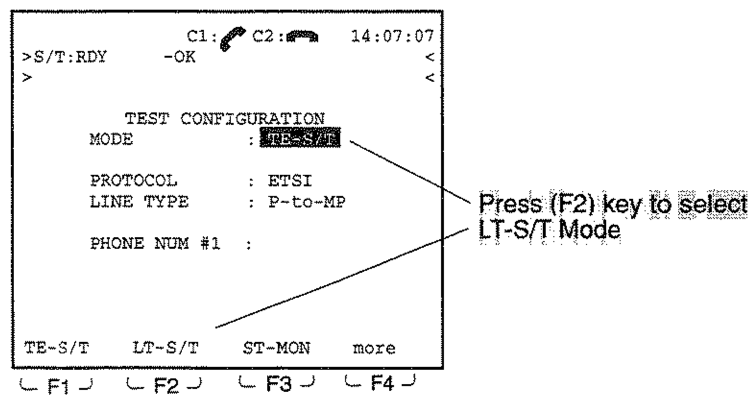


Figure 1.2.B
F-Key Operations

Note the following:

1) In most instances, when the desired F-key is pressed, the cursor will advance to the next display line automatically.
2) The options appearing at the bottom of the screen are associated with a particular set-up parameter within that screen. As you change the position of the cursor within that screen, the F-key options available to you will also change.
3) If more than four F-key options are available, a "more" option will appear in the (F4) position. Pressing this key will show the other F-key options.

0,1,2,3,4,5,6,7,8,9, #,

The number, pound, and star keys are used to enter telephone numbers and labels.

▼

The down arrow key is used to scroll through menus.

ESC

Press Escape to exit out of any menu to the previous menu.

ENTER

Press this key to move into the highlighted menu choice

POWER
Press this key to power the set on or off.

1.2.2 Orange Labels

SHIFT
The SHIFT key enables the second function of each of the keys; the second function label is displayed in yellow.

- The SHIFT key should not be pressed simultaneously with another key. It should be pressed, then released. A SHIFT indicator will then appear in reverse video in the top left corner of the screen. Any other key may now be pressed, and the SunSet will perform the function indicated by the orange label. The SHIFT key will automatically release.
- Remember to press the SHIFT key each time you want to use a orange-label key function.

GRAPHIC
The graphic key draws a picture of the current circuit configuration. A sample BRI screen is shown in Figure 1.2.C.

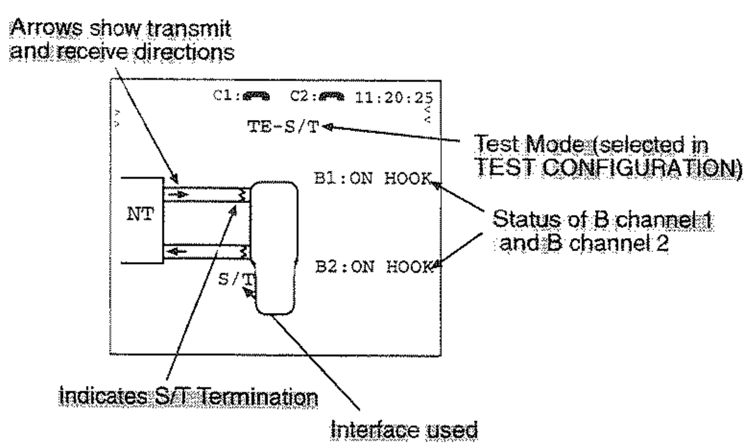


Figure 1.2.C
Graphic screen, BRI

Figure 1.2.D provides a sample E1 PRI Graphic screen.

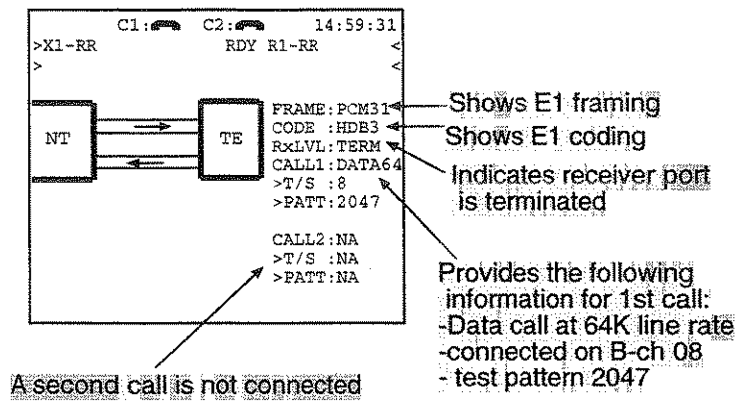


Figure 1.2.D
Graphic Screen, PRI

The PRI screen shows both NT and TE devices. The SunSet ISDN is represented by either the TE or NT box. This is determined by the Mode selection in TEST CONFIGURATION. In the graphic display, the text appears closest to whichever equipment type the SunSet is emulating. In Figure 1.2.D, the SunSet is TE.

RESYNC
Press RESYNC to resynchronize on a test pattern.

✱
This key turns the backlight on and off.

AUTO
Press to auto configure the test set to the received framing and test pattern.

Press this key to change the speaker volume. You will enter a Volume Control screen, as shown in Figure 1.2.E, featuring a bar graph of the volume level. Press the DOWN (F1), and UP (F2) keys to change the volume. Press EXIT (F4) to return to your previous screen.

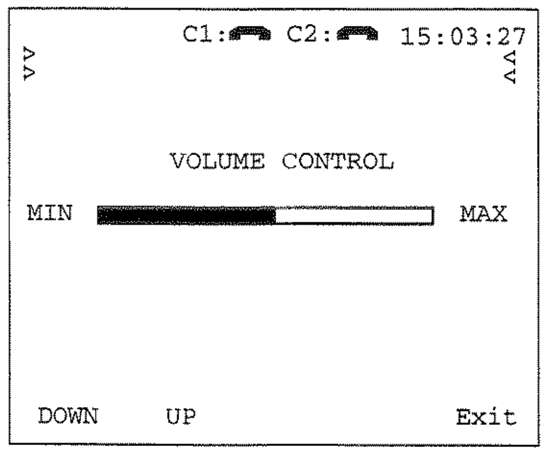


Figure 1.2.E
Volume Control screen

ERR INJ

The ERRor INJect key is used to inject errors onto the transmit signal. Errors will be injected according to the settings in OTHER FEATURES, ERROR INJECTION.

The contrast key is used to change the contrast of the LCD screen. You will enter a CONTRAST CONTROL screen, as shown in Figure 1.2.F, featuring a bar graph. To make the screen brighter, press the <- (F1) key. To make the screen darker, press the -> (F2) key. Press Exit (F4) to return to your previous screen.

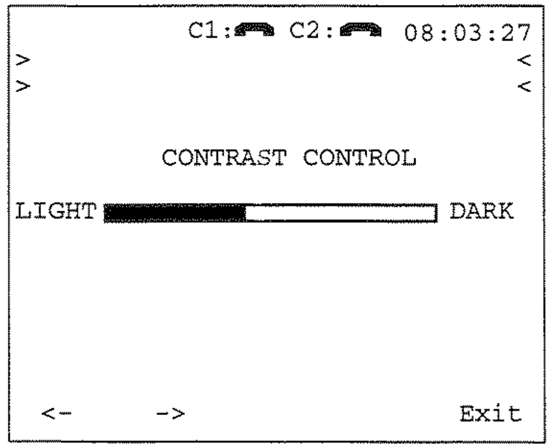


Figure 1.2.F
Contrast Control screen

HISTORY
The HISTORY key is used to clear blinking history LEDs. Blinking LEDs indicate a history condition, where an error or alarm condition occurred in the past, but is no longer present. Pressing the HISTORY key will not clear the test and results.

This key displays the CALL CONTROL screen. This screen provides the status of both B channels for BRI or the two possible B- channel calls for PRI. You can access this screen from any menu. In it, you can disconnect a call, change the call type, or switch between the set's speaker and handset. Figure 1.2.G shows the BRI Call Control screen.

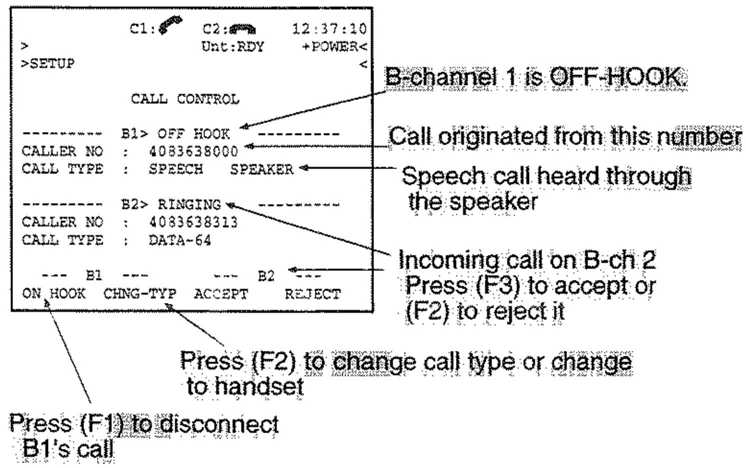


Figure 1.2.G
Call Control Screen, BRI

Figure 1.2.H shows the PRI Call Control screen.

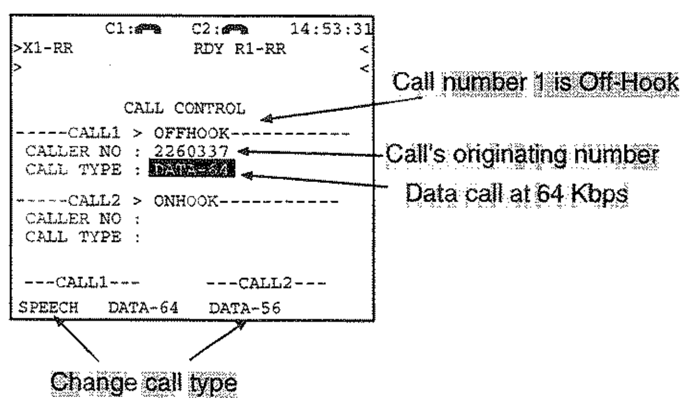


Figure 1.2.H
PRI Call Control Screen

Section 2 Connector Panels

The SunSet ISDN contains three connector panels.

1) The right side has all the BRI connectors.
2) The left side contains the PRI connectors.
3) The top panel on the set contains the serial port and power connector.

2.1 BRI Connector Panel

The Basic Rate Interface panel is located on the right side of the test set. It has four connectors reading from left to right: U-LT, U-NT, S/T, and HANDSET. Refer to Figure 2.1.A.

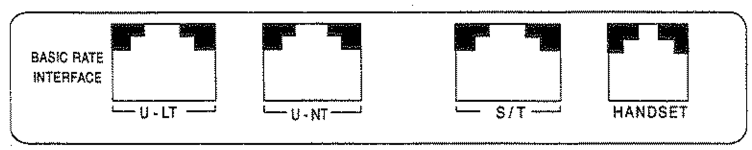


Figure 2.1.A
BRI Side Connector Panel

- **U-LT** should be used when facing the customer at the U Interface. The set should be connected to an NT1 or a combined TE/NT1. The LT-U and U-RPTR Modes both use the U-LT connector.
- **U-NT** should be used when facing the switch at the U Interface. The NT1, TE/NT1-U. and U-RPTR Modes use the U-NT connector.
- Both the U-LT and U-NT connectors are used in the U Repeater mode; the U-LT would be facing the NT1, and the U-NT would be facing the switch.
- The **S/T** connector is used for plugging into the S/T Interface of the NT1 when emulating a TE. It also should be used when emulating an ISDN switch to provide the S/T interface to a TE device.
- The **HANDSET** port is used to plug in the optional handset, which allows you to talk/listen on a second call. This handset can be used with both BRI and PRI testing.

2.2 PRI Connector Panel

The PRI Interface panel contains the transmit and receive jacks for either 2.048 Mbps E1 (SS402) or 1.544Mbps T1 (SS401). Refer to Section 2.2.1 for the E1 interface and 2.2.2 for the T1 interface.

2.2. 1 E1 Interface (SS402)

Figure 2.2.A shows the E1 PRI Interface. Line 1 contains a transmitter and receiver; Line 2 is a receiver only for bi-directional monitoring. For each line, you have the option of using either a 75Ω BNC connector or a 120Ω RJ45 connector.

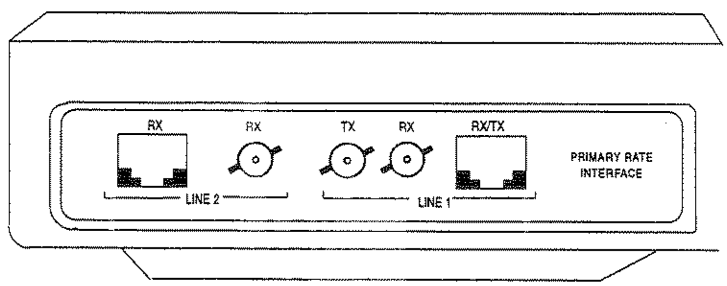


Figure 2.2.A
PRI E1 Interface Panel (SS402)

2.2. 1 T1 Interface (SS401)

Figure 2.2.B shows the T1 PRI Interface. For T1, there are two transmitters and receivers. Line 1 should be used to place a 23B+D data/voice call; Line 1 and Line 2 together should be used to place a 47B+D or 46B+2D data/voice call. You should use both Line 1 and Line 2 receivers for bi-directional monitoring. For each line, you have the option of using either a 100Ω bantam connector or a 100Ω RJ45 connector.

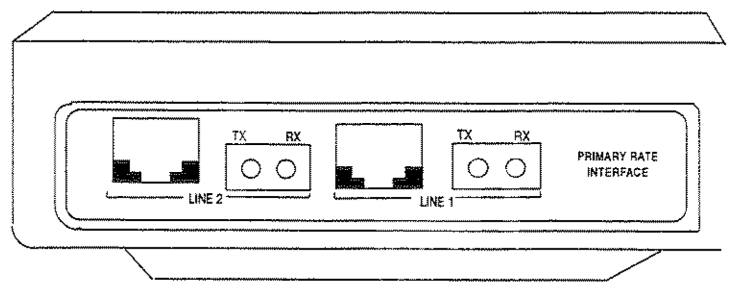


Figure 2.2.B
PRI T1 Interface Panel (SS401)

2.3 Top Panel of the Test Set

The top connector contains the serial port and the 15VDC port for the AC adapter/charger. Refer to Figure 2.3.A.

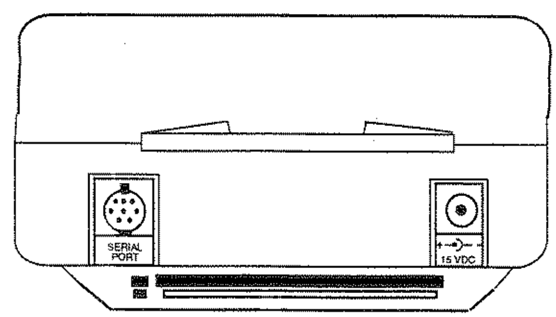


Figure 2.3.A
SunSet ISDN Top View

- **Serial port**: Used to connect a printer for outputting results from your buffer to a thermal printer. It also may be used for the Remote Control function, which allows you to dial into the set remotely through a modem, and control the test set via any kind of VT100 Terminal Emulation software.

- The **15 VDC** port is used to plug in the AC adapter/ charger. Sunrise Telecom provides the SS138 AC charger (100-

240 VAC). The ouptut is 15 VDC @2A; the input is 100-240 VAC.

- **CAUTION: Do not use any charger other than the SunSet charger (SS138) provided to you with the test set. Other chargers may cause damage to the SunSet and void your warranty.**

2.4 RJ48 Connector Pin Assignments

Here are the pin-outs for the BRI S/T and U Interfaces.

ST Interface

Pin Number	NT Signal	TE Signal	Polarity
3	XMT	RCV	+
4	RCV	XMT	+
5	RCV	XMT	-
6	XMT	RCV	-
7	PS2	PS2	-
8	PS2	PS2	+

U Interface

Pin Number	Signal	Notes
1	Battery Status	Optional battery status
2	Battery Status	Optional battery status
3	No Connection	Reserved for future use
4	Signal	Tip or ring of pair to & from the network interface
5	Signal	Tip or ring of pair to & from the network interface
6	No Connection	Reserved for future use
7	Powering	Optional powering
8	Powering	Optional powering

The PRI pin assignments differ for NT or TE Modes.

- For TE Mode, 1 & 2 are Rx; 4 & 5 are Tx
- For NT Mode, 1 & 2 are Tx; 4 & 5 are Rx

Section 3 SunSet ISDN Status Indicator

The SunSet ISDN Status Indicator is located at the top portion of the screen. It gives a status of the circuit you are testing. Section 3.1 describes the indicators seen in BRI testing; Section 3.2 shows the PRI indicators.

In addition to the status indicators, the time of day (in hr/min/sec) is shown in the top right corner. This may be changed in System Parameters, Date/Time.

3.1 BRI Testing Status Indicators

These handset symbols tell you the status of Call 1 and Call 2. A horizontal handset means the call is on-hook. A handset at a forty-five degree angle indicates a call is off-hook.

Sealing Current is displayed on the top right side- There are three status indicators for sealing current:

- NOPWR- indicates there is no sealing current on the line, or you are not plugged into the circuit.
- +PWR- indicates that you have sealing current with a positive polarity.
- -PWR- indicates that you have sealing current with a negative polarity.

The Unt Interface status is displayed in the middle- There are two possibilities for the Unt status:

- Unt:Act- means you have an active U circuit. At this point, the UT ACT/RDY LED will be blinking green.
- Unt:Rdy- means your Layer 2 has been configured properly, and the set is ready for Layer 3 setup messages. The UT ACT/RDY LED will light solid green.

The ST Interface status appears on the left side- There are two possibilities for the S/T status:

- S/t:Act- means you have an active S/T Interface; Layer 1 is up. At this point, the ST ACT/RDY LED will be blinking green.
- Unt:Rdy- means your Layer 2 has been configured properly, and the set is ready for Layer 3 setup messages. The UT ACT/RDY LED will light solid green.

The indicator INT40 appears in the middle -

- INT40 indicates that the SunSet ISDN is generating 40V power onto the circuit. In NT1 Mode, power can be supplied on the S/T interface to power a TE device. IN LT-U or U-RPTR Modes, power can be supplied on the U-LT port to provide power to a mid-span repeater. You can configure your power in OTHER SETUP.

3.2 PRI Status Indications

The PRI Status Indicators are also found on the top two lines of the screen. The first line pertains to Line 1; the second to Line 2, when applicable. The left side of each, labelled X, contains the transmit Layer 2 or Layer 3 message. The right side, represented by R, shows the received Layer 2 or Layer 3 message. The middle of the line gives the D-channel status. There are two possible conditions:

RDY- Ready, The D-channel is ready to place/receive calls

OOS-Out Of Service, Layer 2 has not been established yet; the D channel is not ready to handle calls.

Chapter 4
BRI Menus

Section 1 BRI Menu Tree

The SunSet ISDN is a menu-driven unit. The following Menu Tree shows the organization of the BRI menus. To select a menu, use the arrow keys to highlight that menu choice. Then press the ENTER key. Refer to Chapter 6 PRI for the PRI Menu Tree.

- ISDN MAIN MENU
- ISDN-BRI
  - TEST CONFIGURATION
  - CALL SETUP/EOC CONTROL
  - BERT & RESULTS
  - D-CH ANALYZER
    - VIEW TRACER
    - VIEW/PRINT BUFFER
    - FILTER SETUP
  - OTHER SETUP
  - OTHER FEATURES
    - ERROR INJECTION
    - VIEW TEST RECORD
    - U M4/EOC ACCESS
    - SUPPLEMENTARY SERVICES
    - AUTO SERVICE SCAN
    - LOAD SAMPLES
    - U 40KHZ MEASUREMENT
  - SYSTEM PARAMETERS
    - TEST PARAMETERS
    - REPORT CONFIG
    - ANSWER CONFIG
    - SERIAL/PRINTER PORT
    - DATE/TIME
    - ERASE NV RAM
    - VERSION/OPTION
    - SYSTEM PROFILE

- LEASED LINE-BRI
  - TEST CONFIGURATION
  - BERT & RESULTS
  - OTHER SETUP
  - OTHER FEATURES
    - ERROR INJECTION

- VIEW TEST RECORD
- U M4/EOC ACCESS
- SUPPLEMENTARY SERVICES
- AUTO SERVICE SCAN
- LOAD SAMPLES
- U 40kHz MEASUREMENT

SYSTEM PARAMETERS

- TEST PARAMETERS
- REPORT CONFIG
- ANSWER CONFIG
- SERIAL/PRINTER PORT
- DATE/TIME
- ERASE NV RAM
- VERSION/OPTION
- SYSTEM PROFILE

The following sections within this chapter provide a detailed explanation of each menu.

Section 2 Test Configuration

Before plugging the SunSet ISDN into the ISDN BRI circuit, you must first properly configure the TEST CONFIGURATION. Follow this procedure:

1) From the MAIN MENU, use the down arrow key to scroll to ISDN - BRI. Press the ENTER key.

2) Scroll to the TEST CONFIGURATION item. Press ENTER . Refer to Figure 2.A.

```
                C1:   C2:     14:07:02
>                                     <
>                                     <

           ISDN - BRI

          TEST CONFIGURATION
          CALL SETUP
          BERT & RESULTS
          D-ch ANALYZER
          OTHER SETUP
          OTHER PARAMETERS
          SYSTEM PARAMETERS
```

Figure 2.A
ISDN BRI Menu

Figure 2.B provides the Test Configuration screen.

```
                C1:   C2:     14:07:07
>S/T:RDY  +PS1 +PS2                   <
>                                     <

        TEST CONFIGURATION
     MODE           : TE-S/T

     PROTOCOL       : 5ESS
     LINE TYPE      : P-to-MP
     SPID #1        : 0136380000
     SPID #2        : 0136383130
     PHONE NUM #1   :
     PHONE NUM #2   :

TE-S/T                     ST-MON    more
```

Figure 2.B
BRI Test Configuration Screen

The following configuration items are contained in this screen:

1) MODE

F-Key Options: TE/NT1-U (F1), NT1 (F2), LT-U (more, F1), U-RPTR (more, F2), TE-S/T (more, more, F1), LT-S/T (more, more, F2), ST-MON (more, more F3)

- The MODE choice corresponds to where you will be plugging into the ISDN BRI circuit and to which connectors you will be using.
- In order to avoid configuration mistakes, press the SHIFT and GRAPHIC keys to check your setup.
- In any mode where you may place calls, two handset icons will appear at the top of the screen, indicating the status of the two calls. A horizontal handset means the call is on-hook, an angled handset means the call is off-hook.

TE/NT1-U (F1)

In this mode, the SunSet ISDN is emulating a combined NT1 and TE. It is plugging in at the U Interface. You may place and receive calls, perform basic measurements, as well as store and decode all D-channel protocol messages. Figure 2.C shows the SunSet ISDN in TE/NT1-U Mode.

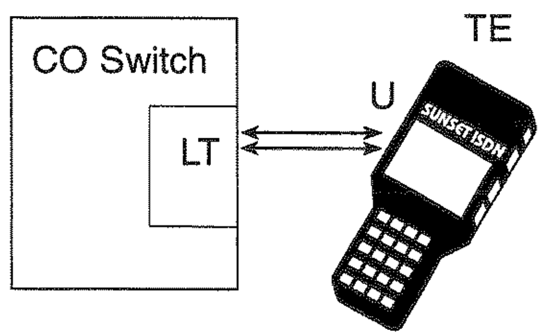


Figure 2.C
TE/NT1-U Mode

NT1 (F2)

This mode allows the SunSet ISDN to emulate an NT1 device by converting the U into the S/T Interface. In NT1 Mode, the SunSet provides the 2-wire U Interface to 4-wire S/T Interface exchange between the ISDN switch (LT) and the TE. You may perform in-service monitoring of the D-channel protocol messages in both directions simultaneously and store these in the buffer. With the external power source option *(SS403)*, you can provide 40 VDC to power the TE device. The SunSet ISDN also responds to *eoc* loopback commands from the ISDN switch. Figure 2.D shows the SunSet ISDN in NT1 Mode.

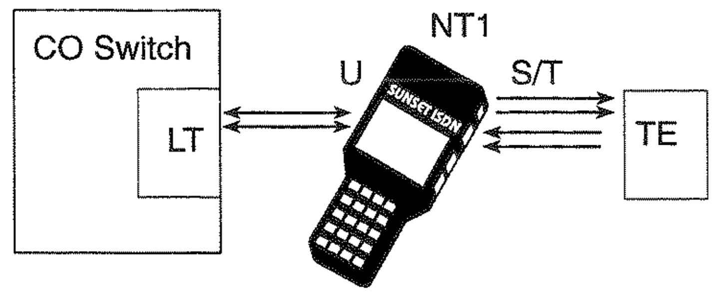


Figure 2.D
NT1 Mode

LT-U (more, F1)

In LT-U Mode, the SunSet ISDN is simulating an ISDN switch (LT) at the U Interface. You may send *eoc* commands to control the NT1. You can also send a loop command to the NT1, send a test pattern, and perform a BERT test. With the external power source option ***(SS403)***, you can insert power along the span to power the NT1 or mid-span U-repeater. Figure 2.E shows the SunSet ISDN in LT-U Mode.

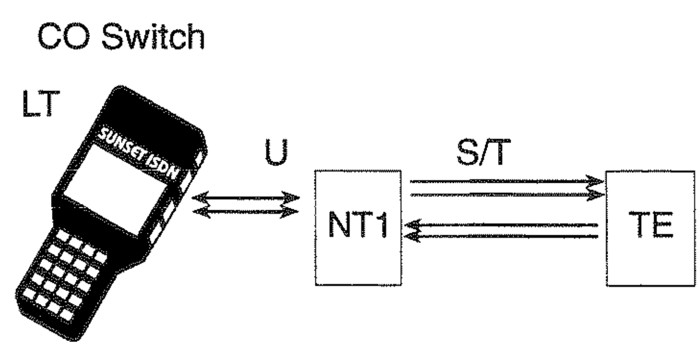


Figure 2.E LT-U Mode

U-RPTR (more, F2)

In this mode, the SunSet ISDN is simulating a U Loop Repeater and a U Loop analyzer. You can perform in-service monitoring over the U Interface in a THRU mode, and store and decode all D-channel protocol messages. You can also perform in-service D-channel CRC and Block error checking (NEBE and FEBE) in both directions to determine where an error source is occurring on the U loop. With the external power source option ***(SS403)***, you can insert power along the span to power the NT1 or a mid-span U-repeater. Figure 2.F shows the SunSet ISDN in U-Repeater Mode.

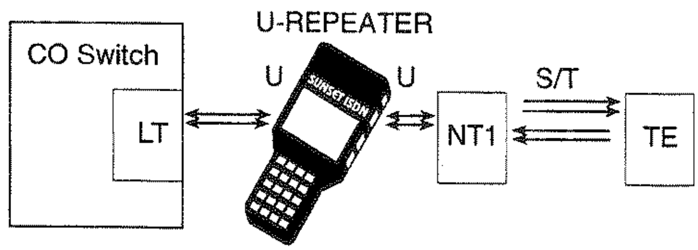


Figure 2.F
U-Repeater Mode

TE-S/T (more, more,F1)

In this mode, the SunSet ISDN is emulating a Terminal Equipment, TE, at the S/T Interface. You may place and receive calls, perform basic measurements, as well as store and decode all D-channel protocol messages. Figure 2.G shows the SunSet ISDN in TE-S/T Mode.

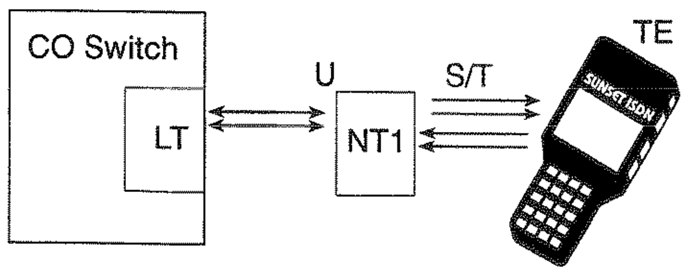


Figure 2.G TE-S/T Mode

ST-MON (more, more, F3)

In this mode, the SunSet ISDN is monitoring at the S/T Interface. The SunSet provides a high impedance bridge onto the S/T interface to monitor D-channel messages in both directions. Figure 2.H shows the SunSet ISDN in ST-MON Mode.

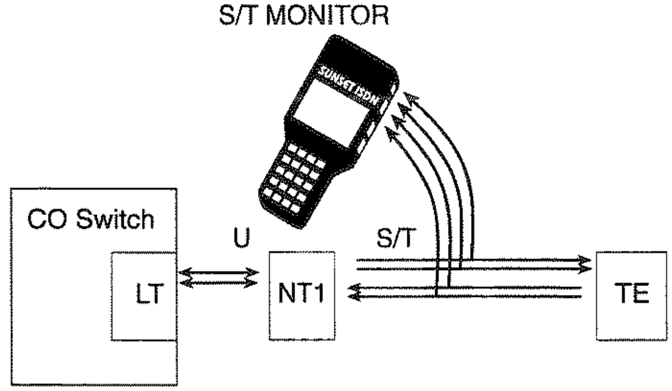


Figure 2.H
ST-MON Mode

LT-S/T (more, more, F2)

•This Test Mode is only available for the ETSI and NTT protocols.

In this mode, the SunSet ISDN is emulating a combined Line Termination ISDN switch (LT) and a Network Termination 1 (NT1). It is providing the S/T Interface to a TE. You will be able to place and receive calls, perform basic measurements, as well as store and decode all D-channel protocol messages. With the External Power Source option (SS403), you can provide 40 VDC to power the TE device. Figure 2.I shows the SunSet ISDN in LT-S/T Mode.

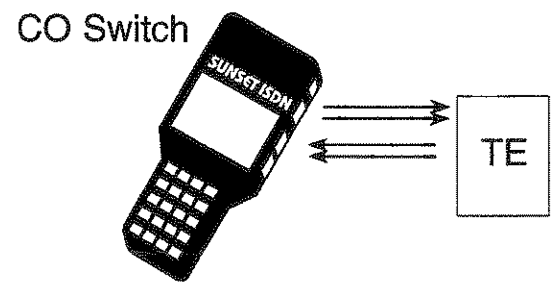


Figure 2.1
LT-S/T Mode

2) PROTOCOL

F-Key Options: 5ESS (F1), ETSI (F2), NTT (F3), DMSF (more, F1), NAT'L (more, F2), AUSSIE (more, F3)

NOTE: The F-keys available will depend on the options ordered. A typical U.S. setup will include 5ESS, DMSF, and NAT'L. A typical European setup will include ETSI.

- 5ESS is the AT&T Custom switch protocol
- ETSI designates European ISDN BRI standard
- NTT designates Japanese ISDN BRI standard
- DMSF is the NTI (Northern Telecom) custom standard. It applies to the DMS-100 switch. F is for DMS - Functional.
- NAT'L is the North American national standard. It can apply to either AT&T or Northern Telecom national switches.
- AUSSIE designates the Australian national standard

3) LINE TYPE

F-Key Options: P-to-P (F1), P-to-MP (F2)

In a Point-to-Point (P-to-P) configuration, there can be only one device on the line. In Point-to-Multipoint (P-to-MP), sometimes referred to as just Multipoint, there may be multiple devices on the line.

- In North America, the Line Type is governed by the Switch Type and Protocol of the ISDN BRI circuit. The Line Type will always be P-to-MP (Point-to-Multipoint), unless the ISDN BRI circuit has 5ESS PROTOCOL, where the LINE

TYPE can be either P-to-P or P-to-MP.
- Outside the U.S, the Line Type may be either P-to-P or P-to-MP.

4) SPIDs

- SPIDs are used in North American protocols
- SPID stands for Service Profile IDentifier
- A P-to-P LINE TYPE configuration, since there is only one TE, does not require a SPID
- The SPID is typically the 7 or 10 digit (Area Code + 7 digits) phone number of the circuit, plus a series of 1s and 0s before and after it.
- All lines with a P-to-MP LINE TYPE use two SPIDs which associate two separate lines with the ISDN BRI circuit.

To enter your SPIDs, use the following procedure:

a. Place the cursor on SPID#1.
b. Use the keypad numbers to enter your digits for the first SPID.
c. Press the down arrow key to move the cursor down to SPID#2.
d. Use the keypad numbers to enter your digits for the second SPID.
e. If you should make a mistake while entering the numbers, use the
<- (F2) and -> (F3) keys to delete them.
f. To send your SPIDs, press SEND (F1).
   - The SPIDs will also be sent automatically if they are entered in before connecting to the circuit, or when you press the Down Arrow key.

5) PHONE NUMbers

This is the number(s) of the ISDN line which you are plugging into. This number shows up as the Caller Number for all calls which you place, as well as the Called Number to match for an incoming call.

To enter Phone Numbers, use the following procedure:

a. Place the cursor on PHONE NUM #1 or #2, by pressing the down arrow key from SPID#2.

b. Use the keypad numbers to enter the digits.

c. If you should make a mistake while entering the numbers, use the <- (F2) and -> (F3) keys to delete them.

Note: The PHONE NUMbers, derived from the SPIDS, will be entered automatically, when you enter the SPIDS. You may use these derived numbers, or enter them manually, as above.

When you have completed your TEST CONFIGURATION, press the ENTER key to return to the BRI Menu.

Section 3 Call Setup

Use this screen to place calls. Before placing a call, you should make sure your Test Configuration settings are correct for your application. You must select Test Mode TE-S/T, LT-S/T, or TE/NT1-U to place a call. Refer to Figure 3.A.

```
              C1:    C2:     18:50:21
>S/T:ACT   +PS1 +PS2                <
>                                   <

            CALL SETUP

       CALL TYPE    : DATA-56
       B CHANNEL    : AUTO
       TEST PATTERN: 2047
       DIAL NUMBER :
       14159030108
       ■
SPEECH   DATA-64   DATA-56   more
```

Figure 3.A
Call Setup Screen

To configure the call setup portion, review the following:

1) CALL TYPE

F-Key Options: SPEECH (F1), DATA-64 (F2), DATA-56 (F3), 3.1K (more, F1), HLC (more, F2), SELFBER (more, F3)

This item determines what kind of call you are going to place. Specify the CALL TYPE by pressing the corresponding F-Key.

- Press (F1) to place a voice call.
- Press DATA-64 (F2) to place a data call at 64 Kbps data rate.
- Press DATA-56 (F3) to place a data call at 56 Kbps data rate.
- Press 3.1K (more, F1) to place a 3.1K audio call.
- HLC (more, F2) places an Higher Level Capability call. This call type is not available for AT&T's 5ESS protocol. Upon choosing HLC, the HLC menu screen appears displaying all the possible HLC call types. Refer to Figure 3.B.

```
            C1:     C2:        09:16:51
>                                     <
>                                     <

                 HLC

                TELE3.1K
                TELE_64K
                FAX_2/3
                FAX_G4
                MIXMODE
                PROCFORM
                VIDEOTX
                OSI
```

Figure 3.B HLC menu

Use the cursor to highlight the desired call type:

TELE3.1K, for a TELEphony 3.1K audio voice call
TELE_64K for a TELEphony 64Kbps voice call
FAX_2/3, for a fax G2/G3 call
FAX_G4, for a fax G4 all
MIXMODE, for a MIXmode call
PROCFORM, for a Processable Form call
VIDEOTX, for a video text call
OSI, for an OSI call

Then, press ENTER to return to the CALLSETUP screen.

- Press SELFBER (more, F3) to place a Data-64 call to yourself, auto answer it, loop it, then enter BERT & RESULTS, and perform a BERT. If the call does not connect properly, you will see a "SELFBER TEST FAILED" message.

2) B CHANNEL

F-Key Options: AUTO (F1), B1 (F2), B2 (F3)

This determines which B channel you will use for the call.

- For AUTO (F1), the test set automatically selects the first available B channel.
- Choose B1 (F2) to place your call on B channel 1.
- Press B2 (F3) to use B channel 2.

3) TEST PATTERN

The test pattern displayed here will be transmitted on the B channel during data calls. This pattern can be changed before or during a call.

- Highlight the desired test pattern. Move the cursor using the UP (F2), <- (F3) and -> (F4) keys. Refer to Figure 3.C.
- The SunSet will immediately begin transmitting the highlighted pattern, if a data call is in place.

```
                                  15:03:27
>                                        <
>                                        <
         TEST  PATTERN

63       127      511      2047
2e15     2e20     1111     0000
1010     USER1    USER2    USER3

USER3:



 EDIT        UP        <-         ->
```

Figure 3.C
Test Pattern screen

Here are the standard test patterns which may be transmitted:

63: 63 is the 63-bit code, also known as 2e6-1.

127: 127 is the 127-bit code, also known as 2e7-1.

511: 511 is the 511-bit code, which conforms to the ITU V.52 technical standard. This pattern is also known as 2e9-1.

2047: 2047 is the 2047-bit code, also known as 2e11-1.

2e15: 2e15 is the 2e15-1 pseudo random bit sequence. This signal is formed from a 15-stage shift register and is not zero-constrained. This pattern contains up to 14 zeroes in a row In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

2e20: 2e20 is the 2e20-1 pseudo random bit sequence. This signal is formed from a 20-stage shift register and is not zero-constrained. In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

1111: The all 1s pattern is used for stress testing circuits.

1010: 1010 is the alternating ones and zeroes pattern.

0000: 0000 is the all zeroes pattern.

In addition to these standard patterns, you may define and send three different 16-bit test patterns.

To create a User pattern:

a. Cursor to USER1, 2, or 3.
b. Press EDIT (F1). The cursor will move to the EDIT line.
c. Enter up to 16 digits (1s and 0s). You will see your pattern appear. Use the <- (F3), and -> (F4) keys to move within the pattern as necessary.
d. Press ENTER to set the pattern. The cursor will return to your chosen USER number.
e. To edit the entered pattern, repeat the process.

3) DIAL NUMBER

The screen will prompt you to enter the Dial Number. This is the number that you intend to dial to place your call. The number may be entered directly from the keypad.

You may also store and use ten numbers in the Speed Dial Menu. To enter a speed dial number use the following procedure:

Entering a Speed Dial Number

1. Move the cursor down to DIAL NUMBER. Press SPEED (F3).
2. A screen, as shown in Figure 3.D appears.

```
            C1:      C2:       19:12:59
>X1-RR                RDY R1-RR        <
>                                      <
               SPEED DIAL
      1. 14159030108
      2. 7770434
      3. 3638000
      4. 19146318512
      5.
      6.
      7.
      8.
      9.
      10.
   SELECT    <-         ->
```

Figure 3.D
Speed Dial Menu

3. Use the down arrow key to move cursor to an empty line.
4. Enter the numbers from the keypad.

Selecting a Speed Dial Number

1. Move the cursor down to DIAL NUMBER. Press SPEED (F3).
2. A screen, as shown in Figure 3.D appears.
3. Use the down arrow key to move the cursor to the desired number.
4. When your number is highlighted, press SELECT (F3), or ENTER. This will automatically return you to the Call Setup screen and enter your number in the DIAL NUMBER line.

North American Dialing

When you have entered all the necessary Call Setup information, press CALL1HK (F1) or CALL2HK (F2), depending on which SPID you want to use. If Call 1 is on-hook, pressing CALL1HK (F1) places it off-hook and the C1 handset at the top of the screen lifts to a 45° angle. See Figure 3.E.

- With En_Bloc dialing, the call is sent when you press a Call Hook key.
- For Overlap dialing, you will hear dial tone after you press the Call Hook key, and a DIAL (F4) key will appear. Press DIAL to send the call.
- You can change the dialing method in OTHER SETUP/DIAL METHOD.

```
              C1:    C2:         18:50:21
>S/T:RDY       +PS1                      <
>                                        <

                CALL SETUP

        CALL TYPE    : SPEECH
        B CHANNEL    : AUTO
        TEST PATTERN: 2047
        DIAL NUMBER :
        14159030108

 CALL1HK     CALL2HK    SPEED     <-
```

Figure 3.E
North American dialing screen

International dialing does not require SPIDs, and so the dialing method differs. Without SPIDs, press CALL (F1) to place your call. Refer to Figure 3.F.

```
           C1:    C2:          09:50:21
>S/T:RDY      +PS1                     <
>                                      <

           CALL SETUP

        CALL TYPE    : SPEECH
        B CHANNEL    : AUTO
        TEST PATTERN: 2047
        DIAL NUMBER :
        14083638000

CALL                   SPEED         <-
```

Figure 3.F
International dialing screen

3.1 EOC Control

If you have selected LT-U as your Test Mode, you will be presented with the EOC CONTROL menu, rather than CALL SETUP when you return to the MAIN MENU. In this screen, you may view and control the *eoc* bits of the D-channel overhead. The *eoc* (Embedded Operations Channel) is a 2 kbps section of overhead on the ISDN Basic Rate signal. It carries special commands to U-BRiTE cards, mid-span repeaters, or NT1s. See Figure 3.1.A.

```
                                  11:20:25
>                                        <
>                                        <

              EOC CONTROL

   ADDRESS       : 7    (GLOBAL)
   COMMAND       : RET TO NORMAL
   EOC BITS      : 111111111111
 ------------------------------------
   RX ADDRESS    : 0    (NT1)
   RX COMMAND    : HOLD STATE
   RX EOC BITS   : 000100000000

SEND    REQ_CRC    NOTI_CRC    more
```

Figure 3.1.A
EOC Control

The top three lines of this screen pertain to your transmitted commands. The bottom three lines display the received command.

1) ADDRESS
Options: 0-7

- The eoc address is contained in the first three bits, and designates which device will receive the eoc command.
- Press the NEXT (F1) and PREVious (F2) keys to make your selection.
  0 = NT1
  1-6 = Mid-span U-repeaters or U-BRITE card
  7 = Global (the command will be performed by the first device to receive it)
- Note that the first three bits of EOC BITS change.

2) COMMAND
F-key Options: SEND (F1), NORMAL (F2), LOOP2B+D (F3), LOOPB1 (more, F2), LOOPB2 (more, F3), REQ_CRC (more,F2), NOTI_CRC (more, F3), HOLD STA (more,F2)

- Select the remote command you wish to perform. Then press SEND (F1) to begin transmitting that command.

NORMAL : This RETURN TO NORMAL message is to loop down a device, and to return it to the idle condition. It is also the idle condition which is constantly being sent on the *eoc* channel.

LOOP2B+D: This command loops the whole data stream of both B channels and the D channel

LOOPB1 or LOOPB2 : This loops the specified B channel data stream. The test pattern will be sent on the single specified B channel, and looped back for BERT testing.

CORR_CRC: The REQUEST CORRUPTED CRC messages tells the addressed device to send CRC errors toward the network. You may use this command to check CRC error detection at the U interface.

NOTI_CRC: NOTIFY CORRUPTED CRC tells the addressed device that the network will be sending CRCs toward the customer equipment. You may use this command to check CRC error detection at the U interface.

HOLD STA: The HOLD STATE message tells the addressed device to hold its current state.

Note: After performing any command, and running your test, you must perform a RETurn TO NORMAL (NORMAL, F2) command. This returns the device to the idle condition.

3) EOC BITS

As you make your selection in either the ADDRESS or COMMAND fields above, the EOC BITS will change accordingly. However, if desired, you may also manually enter in the *eoc* bits

- Enter the 0s and 1s from the keypad
- Use the <- (F3) and -> (F4) keys to cursor within the line
- Press SEND (F1) to send the *eoc* command .

The bottom three lines display the received *eoc* command. The definitions of each field are identical to those for the transmitted bits. Please refer to the previous page for more details.

Section 4 BERT & Results

The BERT & RESULTS item allows you to test the physical signal, as well as perform a BERT test on a data call. On the U Interface, you can read both Near and Far End Block Errors. On the S/T Interface, you can see any BPVs or frame errors. You will also be able to measure any D-channel CRC errors at both the U and S/T Interfaces.

When you have a voice call connected or are monitoring the ISDN BRI line, you will have one page of results which shows BPVs, Frame Errors, and Near/Far End Block Errors, depending at which interface you are testing. When you have placed/received a data call, a logical results screen and a summary page are also available.

4.1 General

Measurements may have a count number displayed on the left hand side, and the corresponding rate or percentage displayed on the right hand side of the same line. For example, in Figure 4.1.A, BIT appears on the left and Bit Error Rate on the right.

```
                       C1:   C2:        12:37:10
>                          Unt:RDY      +POWER<
>CONNECT                                      <

        RESULTS - LOGICAL
  ET - 000:01:23    RT -   CONTINU
  RCV- 2047         XMT- 2047
  BIT - 0           BER  - 0.0e-07
  ES  - 0           %ES  - 00.000
  SES - 0           %SES - 00.000
  EFS - 83          %EFS - 100
  AS  - 83          %AS  - 100
  UAS - 0           %UAS - 00.000
  DGRM- 0           %DGRM- 0

 PAGE-UP    PAGE-DN    STOP    ERR INJ
```

Figure 4.1.A
BERT & RESULTS Screen

A key concept for the measurement result screens is availability. A circuit is available for use only when the bit error rate is low enough that the signal can get through and be understood. A circuit is said to be unavailable at the beginning of 10 consecutive severely errored seconds. Errors, errored seconds, and severely errored seconds are not recorded when the circuit is unavailable. Once a circuit is unavailable, it becomes available only after 10 consecutive seconds without severe errors.

The BERT & RESULTS screens contain the following F-keys:

PAGE-UP (F1), PAGE-DN (F2) : When a data call is connected, there will be three pages of results. These keys allow you to view each of the available pages.

STOP/START (F3): Pressing STOP causes the SunSet to stop the test. Pressing START restarts the measurement process from within this menu.

ERR INJ (F4): Allows you to directly inject an error. The ERR INJ key still functions as usual; press the SHIFT key, then the ERR INJ key. The type of errors to be injected can be set at the OTHER FEATURES/ ERROR INJECTION line.

4.2 Line Signal Screen

The Line Signal screen provides your physical measurements. This screen will be present at all times when there is an active signal. The results for the U-NT, U-LT, and S/T interfaces will be displayed as applicable. Refer to Figure 4.2.A.

```
                                  11:20:25
>S/T:ACT INT40   Unt:ACT   -POWER <
>                                 <

      RESULTS- LINE SIGNAL

  D-CH MESG CRC ERROR     - 0
  S/T BPV                 - 0
  S/T FRAME ERROR         - 0
  U NT NEBE               - 0
  U NT FEBE               - 0
  U LT NEBE               - 0
  U LT FEBE               - 0

                      STOP     ERR INJ
```

Figure 4.2.A
Line Signal Results

Following are the BERT & Results definitions shown in this screen:

D-CH MESG CRC: This is the number of D-channel messages containing CRC errors since the beginning of the test.

S/T BPV: This is the number of BiPolar Violations which have been detected on the S/T interface since the beginning of the test.

(S/T) Frame Error: This is the number of errored S/T framing bits.

(U NT or U LT) FEBE: This is the number of Far End Block Errors since the beginning of the test. A FEBE indicates CRC errors were detected at the far end.

(U NT or U LT) NEBE: This is the number of Near End Block Errors since the beginning of the test,. A NEBE is reported when a CRC error is detected incoming with respect to that interface connector.

4.3 Logical Results Screen

The RESULTS-LOGICAL screen reports all the parameters that are measured from a known test pattern. This screen will be available only if you have a data call connected. Refer to Figure 4.3.A

```
                  C1:    C2:       12:37:10
>                     Unt:RDY     +POWER<
>CONNECT                                <

        RESULTS - LOGICAL
  ET - 000:01:23    RT -  CONTINU
  RCV- 2047         XMT- 2047
  BIT - 0           BER  - 0.0e-07
  ES  - 0           %ES  - 00.000
  SES - 0           %SES - 00.000
  EFS - 83          %EFS - 100
  AS  - 83          %AS  - 100
  UAS - 0           %UAS - 00.000
  DGRM- 0           %DGRM- 0

 PAGE-UP    PAGE-DN    STOP    ERR INJ
```

Figure 4.3.A
Logical Results screen

The following information is displayed on this screen:

ET (Elapsed Time): Elapsed Time is the time that has passed since the test was started or restarted.

RT (Remaining Time): Remaining Time is the time that remains until the end of testing. The factory default condition is that the test runs continuously until the user stops it. For this reason, CONTINU is displayed in the RT field to denote a continuous test. In SYSTEM PARAMETERS, TEST PARAMETERS, you may select a CONTINUous or TIMED test, and enter a length for a timed test. In this case, the remaining time will count down to zero during the measurement.

RCV
This displays the received test pattern.

XMT
This displays the transmitted test pattern. This pattern may be changed in the CALL SETUP screen.

BIT
This is the number of bit errors that have occurred since the beginning of the test. Bit errors are not counted during unavailable time.

BER
The Bit Error Rate is the total number of bit errors divided by the total number of bits during available time since the beginning of the test.

ES
This is the number of Errored Seconds that have occurred since the beginning of the test. An errored second is any second with at least one BPV, bit error, FEBE, or CRC-4 error. An errored second is not counted during an Unavailable Second.

%ES
This is the percentage of errored seconds that have occurred since the beginning of the test.

SES
This is the count of Severely Errored Seconds since the beginning of the test. A severely errored second has an error rate of 10-3 or higher. Severely errored seconds are not counted during unavailable time.

%SES

This is the percentage of seconds since the beginning of the test that are Severely Errored Seconds.

EFS

This is the number of bit Error Free Seconds since the beginning of the test.

%EFS

This is the percentage of Error Free Seconds since the beginning of the test. A Error Free Second is a second in which the signal is properly synchronized and no errors or defects occur.

AS

This is the count of Available Seconds that have occurred since the beginning of the test.

%AS

This is the percentage of Available Seconds since the beginning of the test.

UAS

This is the count of UnAvailable Seconds that have occurred since the beginning of the test. Unavailable time begins at the onset of 10 consecutive severely errored seconds. The displayed value of unavailable seconds updates after the tenth consecutive severely errored second occurs. Unavailable time also begins at a loss of signal, pattern synch, or frame.

%UAS

This is the percentage of UnAvailable Seconds since the beginning of the test.

DGRM:

This is the count of DeGRaded Minutes since the beginning of the test. A Degraded Minute occurs when there is a 10^{-6} bit error rate during 60 available, non-severely bit errored seconds. Errors during bit unavailable or severely bit errored seconds are not counted while the 60 available, non-severely bit errored seconds are being accumulated.

%DGRM:
This is the percentage of summary degraded minutes since the beginning of the test.

Section 5 D-Channel Analyzer

Use this feature to trace the D-channel protocol messages. You can print these messages and store approximately 400 in the buffer. The messages are displayed in hexadecimal format, as well as a decoded version, which breaks down messages into an easy-to-read format. Refer to Figure 5.A for The D-ch Analyzer menu.

```
                                        11:01:33
                      Unt: RDY      +PWR <
>                                          <
>
           D-ch ANALYZER

           VIEW TRACER
           VIEW/PRINT BUFFER
           FILTER SETUP
```

Figure 5.A
D-Channel Analyzer menu

5.1 View Tracer

View Tracer allows you to view the live presentation of D-channel protocol messages as they are received on the S/T or U interfaces. These messages can be displayed in either hexadecimal or decoded format. Figure 5.1.A provides a sample tracer screen.

Note: You must be in a monitor mode, either ST-MON, NT1, or U-RPTR, to enter the View Tracer screen. You can select one of these modes in the Test Configuration screen.

```
                                        22:09:18
>Ult: Act          Unt:ACT          +POWER<
>INFORMATION                               <


  U  TE->NT  C/R:C  P/F:0  #014
  97-04-25    22:07:26.886
  SAPI : 000        TEI : 080
  L2 MSGTYPE : I
  NS : 012      NR : 006
  L3 MSGTYPE : INFORMATION
  CALLREFL : 01  CALLREFV : 081


                          HEX     PAUSE
```

Figure 5.1.A
Start Tracer Screen

The following F-Keys are available in this screen:

HEX/DECODE (F3) to determine the display format for the messages. HEX displays the message in hexadecimal format. DECODE decodes the message as the Layer 3 message type.

PAUSE (F4) to pause the live presentation of messages. This allows you to view each message individually. After pausing, two new F-key choices appear: PREV (F1) and NEXT (F2). Use these keys to scroll through the captured messages.

RESUME (F4) to resume the live presentation of messages.

Figure 5.1.A shows a decoded message. The following information is provided in this screen:

- U or ST: Reports the interface where the message was captured.

- TE->NT: This shows the direction of the message. Here the message was sent from the TE (Terminal Equipment).

- C/R: C/R displays the Command/Response field bit, which identifies a frame as either a command or response. Figure 5.1.A's message is a command.

- P/F: This is the Poll/Final bit. In command frames, it is the P-bit; in response frames, it is the F-bit. When the P-bit is set to 1, it demands a response (F-bit set to 1). The F-bit is then set to 1 to indicate that this frame is a response from a poll command. Messages with P-bit 0 do not require a response and may be sent consecutively without responses.

- Date and Time: The second line displays the date and time (with a resolution of 1 millisecond) when this message was received.

- SAPI: The Service Access Point Identifier identifies the point where layer 2 services are provided to a Layer 3 entity. Currently, there are four assigned SAPI values:
  - 0 Call Control Procedures (normal voice/data call set-ups)
  - 1 Packet Mode using Q.931 Call Procedures (B-ch packet calls)
  - 16 Packet communication conforming to X.25 Level 3 procedures (D- ch packet calls)
  - 63 Layer 2 management procedures

- TEI: The Terminal Endpoint Identifier identifies the terminal at the end of the connection. TEI values may be in the range of 0 to 127. The values are grouped as follows:

0-63	Fixed TEI assignment
64-126	Automatic TEI assignment
127	Group TEI for broadcast data link connection

- L2 MESGTYPE: This displays the Layer 2 message type. In Figure 5.1.A, this message is I, Information. The Layer 2 messages are:

I - information
RR - receive ready
SABME - set asynchronous balanced mode, extended
DISC - disconnect
XID - exchange identification

RNR - receive not ready
REJ - reject
DM - disconnect mode
UI - unnumbered information
FRMR - frame reject
UA - unnumbered acknowledgment

- NS: Sequence Number (sent) identifies the information frame being sent. The NS is a seven-bit field, allowing for values 0 to 127. NS identifies each transmitted Layer 3 frame to ensure that it is received correctly.

- NR: Sequence Number (received) identifies the number of the next information frame expected. Therefore, it indicates that this data-link layer entity has correctly received all Layer 3 frames numbered up to and including N(R)-1.

- L3 MSGTYPE: This displays the Layer 3 message types. Layer 3 messages are associated with Call Control. The Layer 3 messages are shown below:

Call Establishment
- Alerting
- Call Proceeding
- Progress
- Setup
- Setup Acknowledge
- Connect Acknowledge

Miscellaneous
- Segment
- Facility
- Register
- Notify
- Status Enquiry
- Congestion Control
- Information
- Status

Call Information Phase
- User Information
- Suspend Reject
- Resume Reject
- Hold
- Suspend
- Hold Acknowledge
- Suspend Acknowledge
- Resume Acknowledge
- Retrieve
- Retrieve Acknowldege
- Retrieve Reject

Call Clearing
- Disconnect
- Restart
- Release
- Restart Acknowledge
- Release Complete

•CALLREFL: This is the Call Reference Length. It specifies the number of octets in the Call Reference value. The Call Ref Value can be either one or two octets long.

•CALLREFV: This is the Call Reference Value. Each call has an associated Call Reference Value, which is assigned in the CALL SETUP message.

5.2 View/Print Buffer

This feature allows you to view and print specific data captured by the SunSet. The VIEW/ PRINT BUFFER screen is displayed in Figure 5.2.A.

```
                                    20:25:13
>                                          <
>                                          <

          VIEW/PRINT BUFFER

           TOTAL MSG : 312

           FROM MSG  : 1
           TO MSG    : 312


CLR-ALL   PRINT    VIEW
```

Figure 5.2.A
View/Print Buffer

Three function keys are available in this screen:

CLR-ALL (F1): This option is the first step in erasing the contents of the buffer. After pressing (F1), you will be asked to press ENTER to continue the process. This second step provides security against accidentally erasing the buffer contents.

PRINT (F2): This option will print the contents of the buffer to the serial port, according to the FROM/TO settings.

VIEW (F3): VIEW shows the contents of the buffer, as specified by the FROM MSG and TO MSG settings. Use the following procedure to determine these settings:

1) Make sure the cursor is on the FROM MSG line.
2) Enter the number of the message you wish to begin viewing from, using the number keys. This will be the first message displayed.
3) Cursor down to TO MSG.
4) Enter the number from the keypad. This will be the last message displayed.

When you have selected the message numbers, press VIEW (F3) to begin viewing the messages. Figure 5.2.B shows a sample message.

```
          C1:   C2:      06:08:23
                          NO PWR<
                                <

 U  TE<-NT  C/R:C  P/F:0  #015
 97-04-25    22:07:26.886
 SAPI : 000        TEI : 078
 L2 MSGTYPE : I
 NS : 003     NR : 002
 L3 MSGTYPE : DISCONNECT
 CALLREFL : 01  CALLREFV : 116



UP      DOWN      HEX     InfoElem
```

Figure 5.2.B
Disconnect Message

Section 5.1 defines each of the fields presented in this screen. If the message contains an Information Element, the InfoElem (F4) key appears. Pressing this key brings up the Information Element screen. Refer to Figure 5.2.C.

```
                                    16:53:17
>X1-RR               RDY R1-RR             <
>                                          <

CAUSE - 08h
  CODING STANDARD:0h
    ITU-TS-standard
  LOCATION:2h
    Public NT serve local user
  CAUSE CLASS:1h
    Normal event
  CAUSE VALUE:10h
    16 Normal call clearing


        PAGE-DN                 RETURN
```

Figure 5.2.C
Information Element

Figure 5.2.C shows a sample cause information element. A cause value provides diagnostic information, the reason a certain message was generated. The Cause info element contains three main fields: Location, Class, and Value. All three fields are decoded in this screen . You may refer to the appendix for a list of all the Cause Values, as defined in ITU Q.931.

5.3 Filter Setup

In this screen, select which D-channel messages you want to capture and analyze.

- Press L2_ONLY to capture layer 2 messages only
- Press L3_ONLY to capture only layer 3 messages
- Press ALL (F3) to capture both layer 2 and layer 3 messages

Section 6 Other Setup

The Other Setup menu allows you to configure several parameters associated with various BRI applications. Figure 6.A displays the Other Setup screen.

```
                              15:03:27
>                                     <
>                                     <
            OTHER SETUP

DIAL METHOD          : EN_BLOC
S/T TERMINATION      : ON
40 V POWER           : OFF
LAYER 2 TEI          : AUTO
CALL APPEARANCE      : 001




 OVERLAP EN_BLOC
```

Figure 6.A
Other Setup screen

You may make the following selections:

1) DIAL METHOD
F-Key Options: OVERLAP (F1), EN_BLOC (F2)

- Overlap sends a SETUP message without a CALLED NUMBER and then sends one digit at a time as part of an INFORMATION message on the D-channel.
- En_Bloc sends the entire number in the SETUP message when the call is placed.

2) S/T TERMINATION
F-Key Options: ON (F1), OFF (F2)

This item determines if the S/T port is terminated. S/T Termination applies to TE-S/T and LT-S/T Modes. When ON, it terminates the line with 100Ω. If it is off, it puts High Impedance, 1000Ω.

3) 40 V POWER
F-Key Options: OFF (F1), S/T (F2), Ult (F3)

This item determines whether the SunSet ISDN will generate 40V power onto the circuit.

- When OFF (F1), the SunSet does not generate 40V power.
- Press S/T (F2) to place the 40V power on the S/T port on PS1 and PS2. This can be turned on in a LT-S/T Mode to provide power to a TE device.
- Press Ult (F3) to put the 40V power on the U-LT port. This can be turned on in LT-U or U-RPTR Modes to provide power down the U interface.

4) LAYER 2 TEI
F-Key Options: AUTO (F1), INC+1 (F2), DEC-1 (F3), 1/10 (F4)

You may manually select a Terminal Endpoint Identifier, or have the set AUTO configure one during turn-up. The TEI number identifies the terminal to which the message is intended.

Press AUTO (F1) to have the SunSet automatically identify the Layer 2 TEI. In AUTO, the SunSet sends an Identity Request message with TEI:127 and Action Indicator:127. The switch responds with an Identity Assigned with TEI:127 and Action Indicator from 64-126. Then, the SunSet transmits a SABME with a TEI of the same value as the received Action Indicator.

You may also manually enter the TEI value in the range of 0 to 127. To enter the TEI manually, use the F-Keys, INC+1 (F2), DEC-1 (F3), 1/10 (F4). The (F4) key determines the increase/decrease factor. In this case, the SunSet will send an Identity Request message with TEI:127 and Action Indicator of whatever value you entered here for the TEI. The switch responds with an Identity Assigned with a TEI:127 and Action Indicator with your transmitted value. The SunSet then sends a SABME with the TEI set to the Action Indicator's value (which is the same value as you entered for the TEI value). If the switch does not like the entered TEI value, it will respond with an Identity Denied message, instead of Identity Assigned.

5) CALL APPEARANCE

F-Key Options: NONE (F1), INC+1 or 10 (F2), DEC-1 or 10 (F3), 1/10 (F4)

- Press INC+1 to increment the call appearance by 1
- Press DEC-1 to decrement the call appearance by 1
- Press 1/10 to determine the increase/decrease factor (1 or 10)
- Note: Call Appearance does not apply to ETSI or AUSSIE protocols.

The call appearance (CAP) value is used on ISDN BRI lines which are configured with CACH (Call Appearance Call Handling), and/or EKTS (Electronic Key Telephone Systems). The CAP is used to determine a button number on a key telephone. This value is used for both placing a call to test the number of CAPs a line may have, and receiving a call, to test for a particular directory number, which can be associated with a specific button. Please see Chapter 1 **Technology Overview**, for additional information.

Section 7 Other Features

See Figure 7.A for the OTHER FEATURES menu screen.

```
          C1:   C2:       12:34:18
>                                <
>                                <

          OTHER FEATURES

         ERROR INJECTION
         VIEW TEST RECORD
         U M4/EOC ACCESS
         SUPPLEMENTARY SERVICES
         AUTO SERVICE SCAN
         LOAD SAMPLES
         U 40kHz MEASUREMENT
```

Figure 7.A
Other Features Menu

7.1 Error Injection

Error Injection determines what type of errors will be transmitted when you inject an error, either through pressing the SHIFT, then ERRINJ keys, or the ERRINJ F-key in BERT & RESULTS. Refer to Figure 7.1.A.

```
                          12:48:32
>                                <
>                                <
           ERROR INJECTION

  BIT ERROR              : SINGLE
  D-CH MSG CRC ERROR     : OFF
  U NT CRC ERROR         : OFF
  U LT CRC ERROR         : OFF




 ON      OFF
```

Figure 7.1.A
Error Injection screen

You can configure the following error types:

1) BIT ERROR
F-Key Options: OFF (F1), SINGLE (F2), RATE (F3)

- When OFF (F1), the SunSet will not transmit bit errors when the ERR INJ key is pressed.
- Pressing SINGLE (F2) configures the set to send one error at a time when the ERR INJ key is pressed.
- Choose RATE (F3) to have the test set send errors at a specified rate.
- Upon pressing the ERR INJ at rate, an ERR indicator appears at the top of the screen. Pressing the ERR INJ key again will turn off the rate injection. Select the error rate as follows:

a. Enter the desired multiplier value from the keypad.
b. The cursor automatically jumps to the exponent value. Enter the number from the keypad.

2) D-CH MSG CRC ERROR
F-Key Options: ON (F1), OFF (F2)

- Press ON (F1) to have the test set to inject one D-channel CRC error when the ERR INJ key is pressed.
- When OFF (F2), the SunSet does not inject D-channel CRC errors when the ERR INJ key is pressed.

Note: The following two errors are only available to set when you are in a U mode.

3) U NT CRC ERROR
F-Key Options: ON (F1), OFF (F2)

- Press ON (F1) to have the test set inject one U NT CRC error on the U-NT connector when the ERR INJ key is pressed.
- When OFF (F2), the SunSet does not inject D-channel UNT CRC errors on the U-NT connector when the ERR INJ key is pressed.

4) U LT CRC ERROR
F-Key Options: ON (F1), OFF (F2)

- Press ON (F1) to have the test set inject CRC errors on the U-LT connector when the ERR INJ key is pressed
- When OFF (F2), the SunSet does not inject D-channel ULT CRC errors on the U-LT connector when the ERR INJ key is pressed.

7.2 View Test Record

In View Test Record, you may view all the events and results stored in the SunSet ISDN. Each event or result includes a date and time stamp for when it occurred. The screen gives you an option to view or print all the stored data or only a select number. Refer to Figure 7.2.A.

```
        C1:     C2:        15:03:27
>                                 <
>                                 <
        VIEW TEST RECORDS
        TOTAL EVENT -42
        TOTAL RESULT-21

        EVENT RECORD
         VIEW FROM:1
         VIEW TO   :42
        RESULT RECORD
         VIEW FROM:1
         VIEW TO   :21

      press ENTER to VIEW
 ALL     NONE     CLR-ALL    PRINT
```

Figure 7.2.A
View Test Record screen

The top two rows display the total number of results and events stored in memory. Events and results are defined as follows:

- *Event-* An event is a received error or alarm condition, the stopping or starting of a test, pattern loss, or signal loss. To store events, you must turn on PRINT EVENT in SYSTEM PARAMETERS, REPORT CONFIG.
- *Result-* Result refers to all errors/measurements taken in the BERT & RESULTS screen.

1) EVENT RECORD

First, select the events you wish to view. Press ALL (F1) to view all stored events. Press NONE (F2) to view no events. If you wish to view only a select number of events, follow this procedure:

a. Enter the VIEW FROM number; this will be the first event displayed.
b. Cursor down to VIEW TO.
c. Enter the VIEW TO number; this will be the last event displayed.

2) RESULT RECORD

Select the results you wish to view. Press ALL (F1) to view all stored results. Press NONE (F2) to view no results. If you wish to view only a select number of results, follow this procedure:

a. Enter the VIEW FROM number; this will be the first result displayed.
b. Cursor down to VIEW TO.
c. Enter the VIEW TO number; this will be the last result displayed.

After you have set configured your VIEW FROM/ VIEW TO settings, press the ENTER key to begin viewing.

You also have two other F-Key options:

CLR-ALL (F3) to clear all events/results stored in memory
PRINT (F4) to print the events/results

The events will be shown first. Press the NEXT (F1) key to view all the pages of events. After you have scrolled through all the specified events, the results are shown. Since each result may contain more than one page of data, you have four F-key options:

- Use PAGE-UP (F3) or PAGE-DN (F4) to view the different pages of the same result.
- Use NEXT (F1) or PREV (F2) to bring up the different results.
- Note the record number above each result.

7.3 U M4/*eoc* Access

In this screen, you may view or control the M4 and eoc bits of the D-channel overhead. M4 bits are maintenance bits. The eoc (Embedded Operations Channel) is a 2 kbps section of the DSL. They carry special commands to U-BRiTE cards, mid-span U-repeaters, or NT1s. When the set is in LT-U Mode, you may control these bits. When in LT-U, U-RPTR, TE/NT1-U, or NT1, you may view these bits.

Refer to Figure 7.3.A.

```
                                11:20:25
>                  Unt:RDY     -POWER<
>                                      <
         U M4/EOC ACCESS

NET-> NT      M4  - 011111111
_ACT *DEA *SCO *UOA *AIB
NT-> NET      M4  - 011111111
_ACT *PS1 *PS2 *NTM *CS0 *SAI
NET-> NT      EOC - 000101010000
    OPERATE 2B+D LOOPBACK
NT-> NET      EOC - 000000000000
    HOLD STATE

LOOP2B+D    more    SEND      <-
```

Figure 7.3.A
U M4/EOC Access screen

- The M4 bits are displayed first; the eoc bits are shown below.
- Note the NET -- >NT displays the switch (Network) to NT1 direction, on the left side of the screen
- Below that, view the NT -- >NET, which displays the NT1 (customer) to switch direction.

7.3.1 Remote Commands

When in LT-U Mode, you may perform one of the following Remote commands. Press the more (F2) key to cause the F1 key to scroll until it reaches the command you wish to initiate. Press F1. Next, press SEND (F3) to send the digits. Use the <- (F4) key to move within digits, so you may change them.

LOOP2B+D: Loops the whole data stream of both B channels and the D channel

LOOPB1 or LOOPB2 : Loops the specified B channel data stream. The test pattern will be sent on the single specified B channel, and looped back for BERT testing.

CORR_CRC: The REQUEST CORRUPTED CRC messages tells the addressed device to send CRC errors toward the network. Use to check CRC error detection at the U interface.

NOTI_CRC: NOTIFY CORRUPTED CRC tells the addressed device that the network will be sending CRCs toward the customer equipment. Use to check CRC error detection at the U interface.

NORMAL : This RETURN TO NORMAL message is to loop down a device, and to return it to the idle condition. It is also the idle condition which is constantly being sent on the *eoc* channel.

HOLD STA: The HOLD STATE message tells the addressed device to stay in its current state; to hold its state.

Note: The commands all default to the address of 000 for the NT1

7.3.2 *eoc* Addresses

The eoc address is contained in the first three bits. The address bits designate which device will receive your *eoc* command. The set defaults to the NT1 setting of 000. There are three destination devices:

- NT1: 000- This is the default setting.
- U-Repeater: 001-110 (binary). This corresponds to 1-6 in decimal. These addresses are used for both Mid-Span repeaters and U-BRiTE cards. U-BRiTE cards are used to carry ISDN BRI over a digital facility.
- Global: 111. The command will be performed by the first device to see the command.

Make sure you have selected your remote command first, since choosing a new remote command sends the address back to its default (000) state.

To enter your own address and command:

a) Place the cursor on the first eoc digit.
b) Use the number keys to enter the digits (0s and 1s), and the <- (F4) arrow key to cursor within the line.
c) Press Send (F4) to send the command and address

Note: After performing any command, and running your test, you must perform a NORMAL, Return to Normal, command. This returns the device to the idle condition.

7.3.3 M4 Maintenance Bits

The M4 Maintenance bits are an 8-bit field sent in both directions on an ISDN BRI span. Refer back to Figure 7.3.A for a sample screen depicting the M4 bits. The top four lines of this screen display the M4 information; the first two pertain to the network to customer direction, and the next two pertain to the customer to network. For each, the top line shows the direction and the actual 8 bits. The next line provides a decoding of those bits.

The decoding works as follows:

_ indicates that this bit is set for 0

* indicates that this bit is set for 1

The purpose of each bit is provided below:

ACT
This is the Activation, or "start-up bit." It is set to 1 during the start up sequence to communicate readiness for Layer 2 communication.

DEA
This is the Deactivation, or "turn-off bit." It is set to 0 by the LT to indicate its intention to take down Layer 1.

SCO
This bit is set to 1 by the LT to notify the NT1 that the LT will deactivate the loop between calls.

UOA
This is bit is U-Interface Only Activation. This is set to 1 to indicate to the NT1 to activate the S/T Interface. It is set for) to tell the NT1 to deactivate the S/T Interface.

AIB

AIB stands for Alarm Indication Bit. It is set to 1 to indicate good framing and timing from the NT1. It is set to 0 to indicate a loss of signal of frame synchronization from the NT1 to LT.

PS1, PS2

These are Power status 1 and 2. They are used to indicate the NT1's power status. These are coded as follows:

11= All Normal Power (both primary and secondary sources are intact).
10+ Secondary power out
01= Primary power out
00= Both primary and secondary are out

NTM

NTM stands for NT1 in Test Mode. When set to 0, it indicates that the NT1 is in a customer initiated test mode and may not be able to respond to messages or eoc commands.

CSO

This bit is Cold Start Only. It is set to 1 to indicate that the NT1 has a Cold Start Only transceiver.

SAI

SAI stands for S/T Interface Activation Indicator. It is set to 1 to indicate the S/T Interface is active. It is set to 0 to indicate no activity.

7.4 Supplementary Services

The Supplementary Services feature allows you to verify which supplementary services are installed in your BRI network. This menu applies mainly to ETSI applications.

These tests generally involve three steps:

1) Setting the parameters to test in the Supplementary Service menu.
2) Placing either a self-call (for CLIP/CLIR, MSN, Sub Address) or an end-to-end call (for AOC and Terminal Portability). You can place the call in the Supplementary Services CALL SETUP screen.

3) Checking the particular supplementary service status in the CALL STATUS screen.

Refer to Figure 7.4.A.

```
                                          23:15:55
>            Unt:RDY              -POWER<
>                                        <

         SUPPLEMENTARY SERVICES

              CALL SETUP
              AOC
              CLIP/CLIR
              MSN
              SUB ADDRESS
              TERMINAL PORTABILITY
              CALL STATUS
```

Figure 7.4.A
Supplementary Services

The following subsections describe each of the supplementary services screens.

7.4.1 Call Setup

For your convenience, a call setup screen is included in the supplementary services menu. This screen is identical to CALL SETUP found in the BRI menu. After setting your particular supplementary service parameters, enter this screen and place your call.

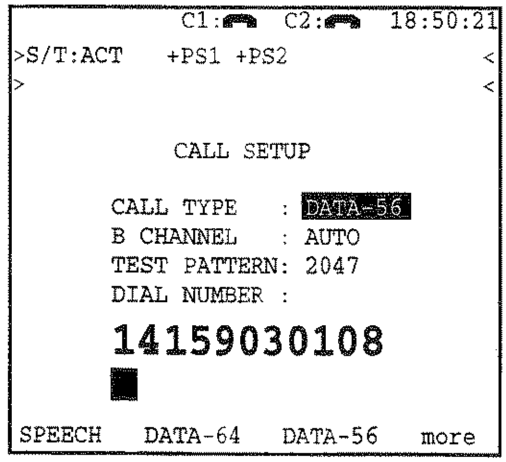


Figure 7.4.B
Supplementary Services Call Setup Screen

Note: AOC and Terminal Portability services require end-to-end calls; CLIP/CLR, MSN, and Sub Address pertain to self calls.

To configure the call setup portion, review the following:

1) CALL TYPE
F-Key Options: SPEECH (F1), DATA-64 (F2), DATA-56 (F3), 3.1K (more, F1), HLC (more, F2)

This item determines what kind of call you are going to place. Specify the CALL TYPE by pressing the corresponding F-Key.

- Press (F1) to place a voice call.
- Press DATA-64 (F2) to place a data call at 64 Kbps data rate.
- Press DATA-56 (F3) to place a data call at 56 Kbps data rate. At 56 Kbps, a 1 is placed in the 1st bit of an 8-bit byte.
- Press HLC (more, F2) to place an Higher Level Capability call
- Press 3.1K (more,F1) to place a lower rate voice call.

2) B Channel
F-Key Options: AUTO (F1), B1 (F2), B2 (F3)

- Select AUTO (F1) to automatically select the first available B Channel
- Select B1 (F2) for B Channel 1
- Select B2 for B Channel 2

Note: We recommend you select AUTO, so the test set can always go to the available channel

3) DIAL NUMBER

The screen will prompt you to enter the Dial Number. This is the number that you intend to dial to place your call.

- The number may be entered directly from the keypad.
- When you have completed these settings, press CALL (F4) to place your call.

Note: HOLD applies to a connected call that has been placed on hold. You may place a call on hold by pressing the HOLD (F1) key.

7.4.2 AOC

This feature allows you to test the supplementary service AOC, Advice of Charge. This test should be carried out in an end-to-end mode. Refer to Figure 7.4.C.

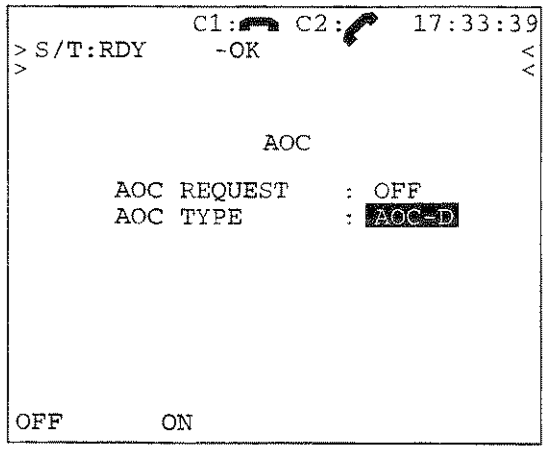


Figure 7.4.C
AOC Screen

1) AOC REQUEST
F-Key Options: OFF (F1), ON (F2)

- OFF (F1) disables the charging mode.
- ON (F2) enables the charging mode. The particular charging request specified below will be sent in your outgoing setup messages.

2) AOC TYPE
F-Key Options: AOC-D

- For AOC-D (Advice of Charge- Duration), the charge invocation is made during the call and on a per-call basis.

To test AOC, perform the following:

1) In the AOC screen, set AOC REQUEST to ON (F2).
2) Escape to the Supplementary Services menu and enter CALL SETUP.
3) Place an end-to-end call. You may refer to Section 7.1 for more details on each of the call settings.
4) Once the call is connected, escape to the Supplementary Services menu and enter CALL STATUS. Refer to Figure

7.4.D.

```
          C1:    C2:       18:48:23
> S/T:RDY     -OK                  <
>                                  <

          CALL  STATUS

      AOC UNITS         : 12
      CALLING PARTY NUMBER
       3638000
      PRESENT IND      :PRESENT
      SCREENING INFO  :



PAGE-UP   PAGE-DN
```

Figure 7.4.D
AOC Call Status Screen

- The first line of the Call Status screen shows the AOC units incrementing while the call is connected.
- One unit is added every 10 seconds.
- You may then convert these units to currency according to your switch and protocol.

7.4.3 CLIP/CLIR

The primary function of this menu feature is to see if the CLIR/ CLIP feature is in the switch. The Calling Line Identification Presentation/Restriction feature can be optional in some ISDN networks; this test allows you to check if it has been activated in your network.

This menu allows you to change the status of your Presentation Indicator bit for your outgoing calls. The Presentation Indicator shows the intention of the calling user to present/restrict the Calling Party Number to the called user. It is included as an info element (optional octet 3a) in the SETUP message.

- You may choose to present or restrict the CLI in the setup messages of your outgoing calls. Refer to Figure 7.4.E.

```
              C1:     C2:     08:11:31
> S/T:RDY     -OK                    <
>                                    <

            CLIP/CLIR

  MY PHONE NUMBER
   8675309
  PRESENTATION IND    : ALLOW




ALLOW     RESTRICT
```

Figure 7.4.E
CLIP/CLIR Screen

1) MY PHONE NUMBER

My Phone Number is the user-specified Calling Line Number. This is the number you may either present or restrict to the called party. Enter your number from the keypad. If you make a mistake, use the <- (F2) and -> (F3) keys to delete the unwanted digits. You will be allowed to enter up to 22 digits.

2) PRESENTATION IND
F-Key Options: ALLOW (F1), RESTRICT (F2)

The Presentation Indicator, included as an info element in the SETUP message, is 2 bits long and is coded as follows (ETS 300 102-1):

00 Presentation allowed
01 Presentation restricted
10 Number not available due to interworking
11 Reserved for future use

- For ALLOW (F1), the SunSet sends the bits 00 for the presentation Indicator. The switch will pass the CLI on. If you make a self- call, verify that the CALLING PARTY

NUMBER appears in the CALL STATUS screen.

- RESTRICT (F2) restricts the presentation of the CLI in outgoing setup messages. It sends 01 for the Presentation Indicator (Presentation Restricted). If you make a self- call, verify that The CALLING PARTY NUMBER does not appear in the CALL STATUS screen.

You may use the CLIP/CLIR function with either a self-call or end-to-end application. The CALL STATUS screen (located in the Supplementary Services menu) will give you the results of your CLIP/CLIR test. The following steps provide a sample procedure for checking the CLIR feature of a switch with a self-call.

CLIR test with a self-call:

1) From the BRI MAIN MENU, enter TEST CONFIGURATION. Configure this menu as follows:
   MODE: TE-S/T
   PROTOCOL: ETSI
   LINE TYPE: P-to-MP

2) Plug into the circuit under test at the S/T interface.
3) Escape to the BRI MAIN MENU. Enter OTHER FEATURES, SUPPLEMENTARY SERVICES, CLIP/CLIR.
4) Configure this screen for:
   MY PHONE NUMBER: your phone number
   PRESENTATION IND: RESTRICT
5) Escape to the Supplementary Service menu, enter CALL SETUP. Enter in your number as the DIAL NUMBER. Press CALL (F4).
6) Accept this incoming call.
7) Escape back to the Supplementary Services menu and enter CALL STATUS. Verify that NONE is displayed for the CALLING PARTY NUMBER and that the PRESENT IND shows RESTRICT. You have just verified the CLIR feature of your switch.

7.4.4 MSN

This menu feature is an auto test for your MSN numbers. A line will have a primary Directory Number; Multiple Subscriber Numbers may be ordered. With this test you can check to see if you have other directory numbers associated with the line.

Refer to Figure 7.4.F.

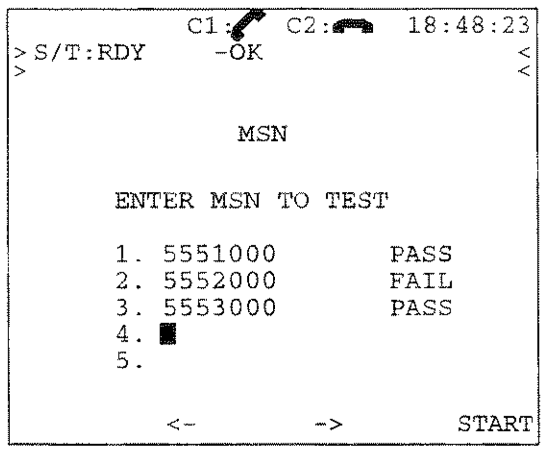


Figure 7.4.F
MSN Screen

- You may enter up to five numbers to test, directly from the keypad, cursoring between numbers.
- Use the <- (F2) and -> (F3) to cursor within a line.

When you have finished entering all your numbers, press START (F1) to begin your test. The SunSet ISDN performs this test by sending SETUP messages to itself containing each of the selected numbers. It checks to see which SETUPs were accepted and which rejected. It records its results as follows:

- PASS: This Directory number is associated with your line.
- FAIL: This Directory number is not associated with your line.

7.4.5 Sub Address

This screen allows you to receive only those calls containing a particular sub address. Refer to Figure 7.4.G.

```
              C1:    C2:       14:53:31
>                                      <
>                                      <

              SUB ADDRESS

    TYPE OF SUBADDR        : NSAP
    CALLED PARTY SUBADDR   : ON
    5001

      MY SUB ADDRESS 1     : OFF

      MY SUB ADDRESS 2     : OFF

NSAP        USER
```

Figure 7.4.G
Sub Address Screen

1) TYPE OF SUBADDR
F-Key Options: NSAP (F1), USER (F2)

- Press NSAP to select the Network Service Access Point subaddress
- Select USER to use a subaddress defined by a user (no standards applied)

2) CALLED PARTY SUBADDR
F-Key Options: OFF (F1), ON (F2)

- When OFF (F1), the SunSet does not send a subaddress.
- Select ON (F2) to send the called party's subaddress. After selecting ON, follow the next steps:
  a. Press the down cursor one time.
  b. Enter the numbers directly from the keypad. For example, to send 0x50 and 0x01, enter 5001.

Note the following:
  a. For NSAP, the first two digits are the AFI.
  b. To identify a terminal on the NSAP S/T interface, use 0x50 for the AFI, and the next two digits should be the terminal number. For example, for terminal 2, send

5002.

3) MY SUB ADDRESS 1
F-Key Options: OFF (F1), ON (F2)

- Select OFF (F1) to accept calls from all subaddresses; this is the standard choice.
- When you choose ON (F2), the SunSet compares the received subaddress with this subaddress. To enter a subaddress:
  a. Press the down cursor one time
  b. Enter the numbers directly from the keypad

4) MY SUB ADDRESS 2
F-Key Options: OFF (F1), ON (F2)

- Select OFF (F1) to accept calls from all subaddresses; this is the standard choice.
- When you choose ON (F2), the SunSet compares the received subaddress with this subaddress. To enter a subaddress:
  a. Press the down cursor one time.
  b. Enter the numbers directly from the keypad.

7.4.6 Terminal Portability

The Terminal Portability feature allows you to suspend a call and disconnect from the circuit. You may then reconnect anywhere on the S/T bus and resume the call. Figure 7.4.H shows the Terminal Portability screen.

```
               C1:   C2:       11:23:41
> S/T:RDY      -OK                     <
>                                      <

        TERMINAL PORTABILITY

       CALL IDENTITY : 99█




SUSPEND   RESUME                    <-
```

Figure 7.4.H
Terminal Portability

1) CALL IDENTITY
Options: up to 8 digits

The Call Identity is an Info Element which identifies the suspended call. The TE which tries to resume the call must have the same CALL IDENTITY. The network also guarantees that another call with the same CALL IDENTITY may not be suspended until the first is resumed.

- Enter the desired digits from the keypad.
- While a call is in place, press SUSPEND (F1) to suspend your call. The SunSet ISDN sends a SUSPEND message to the network. The network then responds with a SUSPEND ACKNOWLEDGE indicating a successful completion of the suspension. If the call cannot be suspended, the network will send a SUSPEND REJECT message.
- After receiving a SUSPEND ACKNOWLEDGE, you may disconnect from the circuit without disconnecting the call in place.
- When you are ready to resume your call, replug the SunSet anywhere on the ST bus and press RESUME (F2). The SunSet sends a RESUME message to request the network to resume a suspended call. The network may respond with either a RESUME ACKNOWLEDGE (successful) or

RESUME REJECT (failure).

Note: Terminal Portability supports only voice calls.

Using Terminal Portability

1) Enter ISDN-BRI, TEST CONFIGURATION.
2) Enter ISDN-BRI, OTHER FEATURES, SUPPLEMENTARY SERVICES, CALL SETUP.
3) Configure the Call setup screen as follows:
   CALL TYPE: **SPEECH** Terminal Portability works only with voice calls.
   B CHANNEL: AUTO (or you may manually select your B channel)
   DIAL NUMBER: Use the number keys to enter the number you wish to call.
4) Press CALL (F4) to place your call.
5) Escape back to the Supplementary Services menu and enter TERMINAL PORTABILITY.
6) Enter a CALL IDENTITY number.
7) Press SUSPEND (F1).
   - Verify that you receive a SUSPEND ACKNOWLEDGE message. It will be displayed on the top left of the screen.
8) You may now disconnect the SunSet ISDN.
9) Reconnect the SunSet. Make sure that you are using the same CALL IDENTITY.
10) Press RESUME (F2).
11) When you are finished, you may disconnect your call by pressing the SHIFT and CALL CONTROL keys, and then ON-HOOK (F1).

7.4.7 Call Status

When your call is connected, the Call Status screen reports any applicable supplementary services information. The exact information displayed depends upon the requests made in your call setup. Refer to Figure 7.4.I and J.

```
        C1:   C2:       18:48:23
> S/T:ACT  +PS1 +PS2           <
>                              <

          CALL STATUS

      AOC UNITS       : 12
      CALLING PARTY NUMBER
       3638000
      PRESENT IND     :PRESENT
      SCREENING INFO :



PAGE-UP   PAGE-DN
```

Figure 7.4.I
Call Status Screen

```
          C1:  C2:      18:49:12
> S/T:RDY     +PS1             <
>                              <

          CALL STATUS

   CALL HOLD          : NONE
   CALL SUSPEND       : NONE
   INCOMING SUBBADDR :





PAGE-UP   PAGE-DN
```

Figure 7.4.J
Call Status Screen, Page 2

Use the PAGE-UP and PAGE-DN F-keys to view both pages of data. The following information is provided on these pages:

1) AOC UNITS
The Advice of Charge Units increment by one every ten seconds to provide the billing information for your call. You may then convert these units to currency according to your switch and protocol. The AOC Units will count up if you turned on the AOC REQUEST in the AOC screen.

2) CALLING PARTY NUMBER
This if the number of the calling party. It may be either user or switch provided. If you request ALLOW in the CLIP/CLIR screen and make a self- call, verify that The CALLING PARTY NUMBER appears here. If you request RESTRICT, make sure this item shows NONE.

3) PRESENT INDICATOR
The Presentation Indicator will show either ALLOW or RESTRICT depending on how the incoming setup message has been configured. This field represents the calling party's wishes to display or not display their calling party number. If you request ALLOW in the CLIP/CLIR screen and make a self- call, verify that ALLOW appears here. If you request RESTRICT, make sure RESTRICT appears.

4) SCREENING INFO
Screening Info provides information on the source of the Calling Party Number displayed above:

- U PASS: The number is User-provided, screened by the network and passed.
- NETWORK: The number is Network-provided.
- N/A: ScreeningInfo is not applicable, since there is no Calling Party Number.

5) CALL HOLD
This will show either HOLD or NONE. HOLD applies to a connected call that has been placed on hold. You may place a call on hold by pressing the HOLD (F1) key in the CALL SETUP screen.

6) CALL SUSPEND

- SUSPEND: The connected call has been suspended. You may suspend a call in the Terminal Portability screen.
- NONE: The connected call is not suspended.

7.5 Auto Service Scan

- Applies generally to ETSI applications
- Scan local and distant ends of the line for functionality
- Scanning starts when you select a function key, or press Enter
- See Figure 7.5.A

```
                                      12:02:34
>                                            <
>                                            <
              AUTO SERVICE SCAN

         SCAN MODE:      LOCAL
         DISTANT PHONE NUMBER




LOCAL    DISTANT                         START
```

Figure 7.5.A
Auto Service Scan screen

Configure the following:

1) SCAN MODE
F-Key Options: LOCAL (F1), DISTANT (F2)

- Press LOCAL (F1) to scan your end of the line for the ability to place the various kinds of calls.

- Press DISTANT (F2) to scan the far end of the line for its ability to receive various kinds of calls.

2) DISTANT PHONE NUMBER

When performing a Distant scan, you must enter in the Distant phone number, using the numeric keys.

Next, press START (F4) to begin scanning. View the scan results, as shown in Figure 7.5.B.

```
                              07:59:16
>                                    <
>                                    <
         AUTO SERVICE SCAN

   ✓  SPEECH          - FAX 2/3
   ✓  DATA 64K        - FAX G4
   x  DATA 56K        - MIXMODE
   -> 3.1K            - PROCFORM
   -  TELE3.1K        - VIDEOTEX
   -  TELE64K         - OSI



                                STOP
```

Figure 7.5.B
Scan Checklist

- An arrow (->) next to the call type means that particular type is in progress.
- A Check mark next to a call type means that type has passed
- An x means that the call type was not found.
- A dash (-) indicates that the call type has not been scanned yet.

7.6 Load Samples

Load Samples loads 18 sample messages into the VIEW/ PRINT BUFFER. These messages will automatically clear and replace all messages currently stored in the storage buffer. After receiving the "Load samples will erase buffer" message, press ENTER to continue, or ESCAPE to leave the screen without loading the samples.

These messages are a sample of a simple turn-up, call setup and disconnect, which are helpful to any user who is unfamiliar with ISDN protocols. The particular messages loaded will relate to your Mode selected in Test Configuration.

7.7 U 40kHz Measurement

This menu feature allows you to transmit a 40kHz tone, as well as perform a level measurement. This application can only be used back to back between two SunSet ISDNs. See Figure 7.7.A.

```
             C1:      C2:      11:49:12
>                                     <
>                                     <

          U 40kHz MEASURMENT

    U LT SENDING 40kHz TONE

    U NT RECEIVING
    TONE LEVEL          -35.73dB
```

Figure 7.7.A
U 40kHz Measurement screen

Upon entering this screen, the SunSet begins transmitting a 40 kHz tone on the U-LT interface. If you have purchased the U Interface 40kHz measurement option, SW407, you will be able to perform a level measurement.

Section 8 System Parameters

From this menu, you may enter various screens where you are allowed to customize system parameters. See Figure 8.A.

```
                        15:03:27
>                              <
>                              <
          SYSTEM PARAMETERS

          TEST PARAMETERS
          REPORT CONFIG
          ANSWER CONFIG
          SERIAL/PRINTER PORT
          DATE/TIME
          ERASE NV RAM
          VERSION/OPTION
          SYSTEM PROFILE
```

Figure 8.A
System Parameters menu

8.1 Test Parameters

The Test Parameters screen allows you to adjust several parameters related to test and measurements. Refer to Figure 8.1.A.

```
          C1:      C2:      15:03:27
>                  UNT:RDY     +POWER <
>                                     <
          TEST PARAMETERS

 CONVERSION LAW       : u-LAW
 BEEPER               : ON
 MEAS DURATION        : CONTINU
 PASS/FAIL THRESHOLD: 1E-7
 P15  STANDARD        : ITU
 P20  STANDARD        : ITU
 BERT SPEAKER         : ON


u-Law    A-Law
```

Figure 8.1.A
Test Parameters screen

You may set these parameters:

1) CONVERSION LAW
F-Key Options: u-Law (F1), A-Law (F2)

This is the algorithm used for encoding the VF signal to 64Kbps and decoding the 64Kbps to a Voice Frequency. A-Law is used in Europe; U-Law is used in the U.S., Canada, and Japan. The Conversion Law will automatically default according to the chosen protocol.

- Press the appropriate F-key for the standard used for speech encoding.

2) BEEPER
F-Key Options: ON (F1), OFF (F2)

BEEPER determines whether the test set's ringer will sound or not sound. When ON (F1) is selected, the SunSet will ring when a call comes in.

3) MEAS DURATION
F-Key Options: TIMED (F1), CONTINU (F2)

A CONTINUous Test (F2) will run indefinitely until you press the RESTART key, or until you escape from the BERT & RESULTS screen.

A TIMED (F1) measurement will stop automatically when the specified amount of time has elapsed. This option is useful for making measurements of a specified length; 15 minute and 1 hour tests are commonly used in the industry. When a timed test is in progress, the Remaining Time (RT) counter in the BERT & Results screen shows how much time is left before the end of the test.

- If you choose TIMED, enter a number between 000:01 min to 999 hr: 59 min.
- Use the <- (F3) and -> (F4) keys to cursor within the line.

4) PASS/FAIL THRESHOLD

Options: 1E-7 to 1E-10

- Use the F-Keys, UP (F1) and DOWN (F2), to select the Pass/Fail threshold. When the error rate on the received signal exceeds this selected threshold rate, a Fail message will be reported in the BERT & RESULTS screen.

5) P15 Standard

F-Key Options ITU (F1), JAPAN (F2)

Determine which standard will apply for the pattern 2e15.

6) P20 Standard

F-Key Options ITU (F1), JAPAN (F2)

Determine which standard will apply for the pattern 2e20.

7) BERT SPEAKER

F-Key Options ON (F1), OFF (F2)

The BERT Speaker determines if the speaker will be on or off when placing a data call.

- If ON (F1), you will hear the data through the speaker, until you enter the BERT & RESULTS screen; at which point the speaker will turn off

8.2 Report Config

Use this screen to set different ways the SunSet ISDN will print/save its results.

1) PRINT EVENT
F-Key Options: ON (F1), OFF (F2)

- When ON (F1), the SunSet will print every time an event occurs. An event is an error or alarm condition. It will also store these events in View Test Record.
- When OFF (F2), the SunSet will not print at every event.

2) PRINT RESULT
F-Key Options: TIMED (F1), LAST (F2)

- Press TIMED to have test results printed and saved to the buffer at a specified interval. After selecting TIMED, enter the desired period (from 1-99 minutes).
- In LAST Mode, test results are printed only at the end of a timed test or a continuous test that has ended from pressing the STOP F-key in the BERT & RESULTS screen.

8.3 Answer Config

Use this screen to determine how the SunSet ISDN will answer an incoming call.

1) AUTO ANSWER
F-Key Options: ON (F1), OFF (F2)

- When ON (F1), the SunSet will automatically answer any incoming call.

2) ANSWER TYPE
F-Key Options: NORMAL (F1), LOOP (F2)

- Press NORMAL to have the test set answer an incoming call, and terminate it.
- Press LOOP for the SunSet to answer a call and loop it.

8.4 SERIAL/PRINTER PORT

The Serial/Printer Port screen allows you to configure several serial port characteristics. Figure 8.4.A shows the test set's factory default serial port settings.

```
                                   04:32:19
>X1-RR               RDY R1-RR            <
>                                         <

       SERIAL/PRINTER PORT

     BAUD RATE             : [9600]
     PARITY                : NONE
     STOP BIT              : 1-BIT
     BIT/CHAR              : 8-BIT
     CR/LF                 : CR+LF



 1200     2400     9600      19.2K
```

Figure 8.4.A
Serial/Printer Port Screen

The factory default settings work with the printer supplied by the factory. However, you can alter these settings in case you want to use the SunSet with another printer.

You are free to use this information to attempt to set the SunSet up with another printer. However, Sunrise Telecom does not warrant the operation of the test set with any printer other than the one supplied by Sunrise Telecom.

1) BAUD RATE

F-Key Options: 1200 (F1), 2400 (F2), 9600 (F3), 19.2K (F4)

Note: the rates 1200 and 2400 will not support remote control features.

- These settings determine the rate at which the SunSet transmits data (characters) to the printer
- This setting must match the setting on your printer; otherwise random characters will appear on your print-out

2) PARITY
F-Key Options: NONE (F1), EVEN (F2), ODD (F3)

- This setting must match with the configuration of your printer

Parity is a method of checking the accuracy of transmitted or stored data. It defines whether the sum, the total number of ones, of all bits is odd or even. An extra bit, known as a parity bit, is added to the data as an accuracy check. This bit will be set to either 0 or 1 depending on what value is needed to pass the parity test. For example, if there is Odd Parity and the data is 10101010, the parity bit must be set to 1 in order to pass. The receiving element checks the parity bit and indicates an error if the total number of ones does not add up to the correct total.

In Odd Parity (F3), the total number of ones (including the added parity bit) is odd. In even parity (F2), the total number of ones (including the added parity bit) is even. None (F1), the factory default setting, signifies no parity checking.

3) STOP BIT
F-Key Options: 1-BIT (F1), 2-BIT (F2)

In asynchronous transmission, the stop bit is the last transmitted character which permits the receiver to come into an idle condition before accepting another character. This can be set to either 1-BIT (F1) or 2-BIT (F2).

- This setting must match with the configuration of your printer. Normally this is configured as 1-BIT

4) BIT/CHAR
F-Key Options: 7-BIT (F1), 8-BIT (F2)

BITS/CHAR determines the number of bits per character. This setting must match with the configuration of your printer. Normally this is configured as 8-BIT.

- Press (F1) to select 7 bits per character
- Press (F2) to select 8 bits per character.

5) CR/LF INSRT

F-Key Options: CR (F1), CR+LF (F2)

This setting must be opposite to the configuration of your printer. For example, if the SunSet is CR+LF, then your printer should be CR.

- Press CR (F1) to select carriage return.
- Press CR+LF (F2) for carriage return and line feed. In carriage return and line feed, an extra line space is inserted after every line.

8.5 Date/Time

- Set the current date and time
- See Figure 8.5.A
- Use the <- (F2) and -> (F3) keys to cursor within a line

```
          C1:     C2:       15:03:27
>                                  <
>                                  <
            DATE/TIME
DATE  (YY/MM/DD)      : 97-03-13
TIME  (HH/MM/SS)      : 16:02:38




               <-        ->
```

Figure 8.5.A
Date/Time screen

1) DATE

Set the current date

- Use the number keys to enter the date, in the Year-Month-Day format

2) TIME

Set the current time

- Use the number keys to enter the time, in the Hour-Minute-Second format

8.6 Erase NV RAM

- Erase NV (Non Volatile) RAM erases all the user-storable information entered into the test set, and sets all parameters back to factory defaults
- This operation should always be performed when inserting a new SunWare cartridge
- This operation can also be tried as a last resort if the set is not performing properly. If this is the case, you should initiate Erase NV RAM, only after attempting to correct the problem by:

  1) Making sure that the test set is properly configured for the application being attempted.
  2) Turning the power switch off and on.

WARNING
Performing the NV RAM ERASE operation will erase all the user-storable information the user has entered into the test set. All user transmit patterns, telephone numbers, and system profiles will be erased.

Use the following procedure to perform ERASE NV RAM :

1) From the BRI main menu, enter the SYSTEM PARAMETERS menu, then enter the ERASE NV RAM menu item.

2) Press ENTER again after the warning message is displayed. A WORKING message will be displayed.

3) When the test set is finished with the operation, turn the power off for 5 seconds, then turn the power back on.

8.7 Version/Option

This screen displays the SunWare version, serial number, and options installed in your SunSet ISDN. Figure 8.7.A depicts a sample Version/Option screen.

```
                                   22:09:42
>                                  NO PWR<
>                                        <
Version 3.00
S/N:   000962
OPTION :
A: BRI S/T enable
B: BRI U   enable
C1:SS401   - T1 PRI enable
D: SS403   - Phantom Power
E: SW400   - LT eoc Control
F: SW401   - Remote control
H: SW403   - BRI protocol
I: SW404   - PRI protocol

PAGE-UP    PAGE-DN
```

Figure 8.7.A
Version/ Option Screen

Note: The serial number displayed in the screen should agree with the serial number written on the cartridge as well as the serial number written on the back of the set.

8.8 System Profiles

This feature allows you to store common configuration setups as system profiles. These profiles can save you time when configuring your set for applications, as they can be conveniently recalled at any time. You may store ten profiles in the test set. The following menu items are stored in these profiles:

Test Configuration, Call Setup, Other Setup, Error Injection, Test Parameters, Report Config, Answer Config, and Serial/Printer Port.

To enter a new system profile:

1) Have the test set configured how you wish to have it stored.

2) From the BRI MAIN MENU, select SYSTEM PARAMETERS, SYSTEM PROFILES.
3) Select the STORE (F1) key.
4) Enter the Label you wish to give the profile. This is how it will be stored in the System Profiles menu.
   a. press TOGGLE (F1) to toggle to the alphabet grid (letter A on the alphabet grid begins flashing).
   b. cursor to the desired letter and press the SELECT (F2) key.
   c. repeat this until your label is complete.
   d. choose toggle (F1) to leave the alphabet grid (letter stops flashing).

   • Use the <- (F3) and -> (F4) keys to move the cursor within a line.
5) Press ENTER to store the SYSTEM PROFILE.

To invoke a stored system profile:
1) Enter the SYSTEM PROFILES menu.
2) Cursor down to the desired system profile.
3) Press the ENTER key. The test set will immediately reconfigure itself to your selected system profile.

To delete a system profile:
1) Enter the SYSTEM PROFILES menu.
2) Cursor down to the desired system profile.
3) Press the DELETE (F2) key. The selected system profile will be deleted.

Section 9 Leased Line - BRI

The Leased Line-BRI feature provides physical layer testing at the S/T interface. You may run a BER test, or monitor the signal for errors.

9.1 Leased Line - BRI Test Set Configuration

Before plugging the SunSet ISDN into the S/T Interface, you must first properly configure the TEST CONFIGURATION. Refer to Figure 9.1.A.

```
                                            14:07:07
>S/T:ACT  +PS1 +PS2                                <
>                                                  <

          TEST CONFIGURATION
      MODE              : TE-LOOP
      BERT CHANNEL      : B1
      TEST PATTERN      : 2047






TE-144K     NT-144K     TE-LOOP    NT-LOOP
```

Figure 9.1.A
Leased Line - BRI Config screen

1. MODE
Options: TE-144K (F1), NT-144K (F2), TE-LOOP (F3), NT-LOOP (F4)

- Select TE-144K (F1) to have the test set emulate a TE and generate a test pattern to run a BERT
- Select NT-144K (F2) to have the test set emulate a NT and generate a test pattern to run a BERT
- Select TE-LOOP (F3) for the test set to emulate a TE, and loopback received data
- Select NT-LOOP (F4) for the test set to emulate a NT, and loopback received data

2. BERT CHANNEL
Options: B1 (F1), B2 (F2), D (F3), B1+B2 (more, F1), 2B+D (more, F3)

Select which B and/or D channels you want to test

3. TEST PATTERN
F-Key Option: SELECT (F1)

The test pattern displayed here will be transmitted on the B channel during data calls. This pattern can be changed before or during a call.

- To choose your test pattern, highlight it. Move the cursor using the UP (F2), <- (F3) and -> (F4) keys. Refer to Figure 9.1.B.
- The SunSet will immediately begin transmitting the highlighted pattern, if a data call is in place.

```
                           15:03:27
>                                 <
>                                 <

        TEST  PATTERN

63      127      511      2047
2e15    2e20     1111     0000
1010    USER1    USER2    USER3

USER3:



 EDIT        UP        <-        ->
```

Figure 9.1.B
Leased Line - BRI Test Pattern screen

Here are the standard test patterns which may be transmitted:

63: 63 is the 63-bit code, also known as 2e6-1.

127: 127 is the 127-bit code, also known as 2e7-1.

511: 511 is the 511-bit code, which conforms to the ITU V.52 technical standard. This pattern is also known as 2e9-1.

2047: 2047 is the 2047-bit code. This pattern is also known as 2e11-1.

2e15: 2e15 is the 2e15-1 pseudo random bit sequence. This signal is formed from a 15-stage shift register and is not zero-constrained. This pattern contains up to 14 zeroes in a row In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

2e20: 2e20 is the 2e20-1 pseudo random bit sequence. This signal is formed from a 20-stage shift register and is not zero-constrained. In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

1111: The all 1s pattern is used for stress testing circuits.

1010: 1010 is the alternating ones and zeroes pattern.

0000: 0000 is the all zeroes pattern. lect whether this pattern will conform to the ITU or Japanese technical standard.

In addition to these standard patterns, you may define and send three different 16-bit user-programmed test patterns.

To create a User pattern:

a. Cursor to USER1, 2, or 3
b. Press EDIT (F1). The cursor will move to the EDIT line
c. Enter up to 16 digits (1s and 0s). You will see your pattern appear. Use the <- (F3), and -> (F4) keys to move within the pattern as necessary.
d. Press ENTER to set the pattern. The cursor will return to your chosen USER number
e. To edit the entered pattern, repeat the process

9.2 Leased Line - BRI BERT & Results

The BERT & RESULTS item provides all the necessary results for your physical layer testing. It also provides your logical measurements for a BER Test. On the U interface, you can read both Near and Far End Block Errors.

Measurements may have a count number displayed on the left hand side, and the corresponding rate or percentage displayed on the right hand side of the same line. For example, in Figure 9.2.A, BIT appears on the left and BER (Bit Error Rate) on the right.

A key concept for the measurement result screens is availability. A circuit is available for use only when the bit error rate is low enough that the signal can get through and be understood. A circuit is said to be unavailable at the beginning of 10 consecutive severely errored seconds. Errors, errored seconds, and severely errored seconds are not recorded when the circuit is unavailable. Once a circuit is unavailable, it becomes available only after 10 consecutive seconds without severe errors.

The BERT & RESULTS screens contain the following F-keys:

PAGE-UP (F1), PAGE-DN (F2) : When a data call is connected, there will be three pages of results. These keys allow you to view each of the available BERT & RESULTS pages.

STOP/START (F3): Pressing STOP causes the SunSet to stop the test. Pressing START restarts the measurement process from within this menu.

ERR INJ (F4) allows you to directly inject an error. The ERR INJ key still functions as usual; press the SHIFT key, then the ERR INJ key.

The type of errors to be injected can be set at the OTHER FEATURES/ ERROR INJECTION line.

9.2.1 Leased Line - BRI Results - Logical Screen

The Logical screen reports the parameters measured from a known test pattern. See Figure 9.2.A

```
                                      12:37:10
>                                            <
> S/T:ACT   +PS1   +PS2                      <

        RESULTS - LOGICAL

  ET - 000:01:23     RT -  CONTINU
  RCV- 2047          XMT- 2047
  BIT - 0            BER  - 0.0e-07
  ES  - 0            %ES  - 00.000
  SES - 0            %SES - 00.000
  EFS - 83           %EFS - 100
  AS  - 83           %AS  - 100
  UAS - 0            %UAS - 00.000
  DGRM- 0            %DGRM- 0
PAGE-UP    PAGE-DN    STOP    ERR INJ
```

Figure 9.2.A Leased Line - BRI Results - Logical screen

The following information is displayed on this screen:

ET (Elapsed Time): Elapsed Time is the time that has passed since the test was started or restarted.

RT (Remaining Time): Remaining Time is the time that remains until the end of testing. The factory default condition is that the test runs continuously until the user stops it. For this reason, CONTINU is displayed in the RT field to denote a continuous test. I n SYSTEM PARAMETERS, TEST PARAMETERS, you may select a CONTINUous or TIMED test, and enter a length for a timed test. In this case, the remaining time will count down to zero during the measurement.

RCV: This displays the received test pattern.

XMT: This displays the transmitted test pattern. This pattern may be changed in the Test Configuration screen.

BIT: This is the number of bit errors that have occurred since the beginning of the test. Bit errors are not counted during unavailable time.

BER: The Bit Error Rate is the total number of bit errors divided by the total number of bits during available time since the beginning of the test.

ES: This is the number of Errored Seconds that have occurred since the beginning of the test. An errored second is any second with at least one BPV, bit error, FEBE, or CRC-4 error. An errored second is not counted during an Unavailable Second.

%ES: This is the percentage of errored seconds that have occurred since the beginning of the test.

SES: This is the count of Severely Errored Seconds since the beginning of the test. A severely errored second has an error rate of 10-3 or higher. Severely errored seconds are not counted during unavailable time.

%SES: This is the percentage of seconds since the beginning of the test that are Severely Errored Seconds.

EFS: This is the number of bit Error Free Seconds since the beginning of the test.

%EFS: This is the percentage of Error Free Seconds since the beginning of the test. A summary Error Free Second is a second in which the signal is properly synchronized and no errors or defects occur.

AS: This is the count of Available Seconds that have occurred since the beginning of the test.

%AS: This is the percentage of Available Seconds since the beginning of the test.

UAS: This is the count of UnAvailable Seconds that have occurred since the beginning of the test. Unavailable time begins at the onset of 10 consecutive severely errored seconds. The displayed value of unavailable seconds updates after the tenth consecutive severely errored second occurs. Unavailable time also begins at a loss of signal, pattern synch, or frame.

%UAS: This is the percentage of summary UnAvailable Seconds since the beginning of the test.

DGRM: This is the count of DeGRaded Minutes since the beginning of the test. A Degraded Minute occurs when there is a 10^{-6} bit error rate during 60 available, non-severely bit errored seconds. Errors during bit unavailable or severely bit errored seconds are not counted while the 60 available, non-severely bit errored seconds are being accumulated.

%DGRM: This is the percentage of summary DeGRaded Minutes since the beginning of the test.

9.2.2 Leased Line - BRI Line Signal Screen

The Line Signal screen provides your physical measurements. The results for the U-NT, U-LT, and S/T interfaces will be displayed as applicable. Refer to Figure 9.2.B.

```
                                11:20:25
>S/T:ACT INT40   Unt:ACT   -POWER <
>                                  <

       RESULTS- LINE SIGNAL

  D-CH MESG CRC ERROR     - 0
  S/T BPV                 - 0
  S/T FRAME ERROR         - 0
  U NT NEBE               - 0
  U NT FEBE               - 0
  U LT NEBE               - 0
  U LT FEBE               - 0

                  STOP     ERR INJ
```

Figure 9.2.B Line Signal screen

Following are the BERT & RESULTS definitions shown in this screen:

D-ch MESG CRC: This is the number of D-channel CRC errors that have occurred since the beginning of the test.

S/T BPV: This is the number of BiPolar Violations which have occurred since the beginning of the test.
(S/T) Frame Error: This is the number of errored S/T framing bits.

(U NT or U LT) FEBE: This is the number of Far End Block Errors since the beginning of the test. A FEBE indicates a CRC error on the 2B+D block of data was detected at the far endin your transmitted signal.

(U NT or U LT) NEBE: This is the number of Near End Block Errors since the beginning of the test. A NEBE indicates a CRC error has been detected in the received signal.

9.3 Other Setup

For a description of the features in this menu, please see Section 6 **Other Setup.**

9.4 Other Features

For an explanation of these items, please see Section 7 **Other Features.**

9.5 System Parameters

For an explanation of this menu, please see section 8 **System Parameters.**

Chapter 5
BRI Applications

Section 1 Placing BRI Calls

1.1 Placing a Voice Call

(for N.American protocols: 5ESS, DMSF, NAT'L)

1) From the MAIN MENU, enter ISDN-BRI.

2) Enter TEST CONFIGURATION and configure these settings as follows:

MODE: TE/NTI-U or TE-S/T
PROTOCOL: 5ESS, DMSF, NAT'L (according to circuit)
LINE TYPE: P-to-P or P-to-MP (according to circuit)

3) Next, connect the SunSet ISDN to the circuit. If you are in TE/NT1-U Mode, use the U-NT RJ-48. If you are TE-S/T, use the S/T RJ-48 port. Check the Graphic screen for verification.

4) Check for a +/- POWER reading in the top right corner of the screen. This indicates you have Sealing Current

If you are in TE-S/T Mode, you will see the status of PS1 and PS2 power sources in the top left of the screen.

5) Wait 10-15 seconds for the link to initialize. The SIGNAL LED should light solid green, and the ACT/RDY LED will blink. The Status indication area on the top line of the screen will read Unt:ACT for TE/NT1-U or S/T:ACT for TE-S/T Mode.

6) Look for a Received Message (typically Information or Network) on the second line of the display to indicate that the TEI is assigned.

7) Now, configure the rest of your Test Configuration screen:

SPID #1: set per circuit, then press SEND (F1)
SPID #2: set per circuit, then press SEND (F1)
PHONE NUM #1: this will be auto-configured from your above SPID entry, or you may enter it manually.
PHONE NUM #2: this will be auto-configured from your above

SPID entry, or you may enter it manually.

Note: 5ESS P-to-P does not require SPIDS. There will only be a PHON NUM#1 for the 7 digit number of the circuit.

8) Look for a SPID#1 (or #2) OK message at the top of the screen upon pressing the SEND (F1) key. If one SPID is valid, the ACT/RDY LED will turn solid green, and the status indication area will change from Unt:ACT to Unt:RDY for the U Interface or from S/T:ACT to ACT:RDY on the S/T Interface.

9) Press the ESCAPE key. Cursor to CALL SETUP; press ENTER. Set up as follows:

CALL TYPE: SPEECH
B CHANNEL: AUTO, B1, B2
TEST PATTERN: 2047
DIAL NUMBER: 14083638000 (The number you wish to call)

10) Scroll down to DIAL NUMBER. You will see the F-keys, CALL1HK (F1) and CALL2HK (F2). If you press CALL1HK (F1), you will place your call on SPID#1. If you press CALL2HK (F2), you will place your call on SPID#2.

11) After pressing a CALLHK key, you will hear dial tone and see the message DIAL TONE ON at the top of the screen.

12) Press DIAL (F4) to dial your number.

13) When the call is connected, you will see a CONNECT message at the top left of the screen. You may now talk/listen through the set's microphone and speaker. Alternately, you may use a handset. To do so:

a. Connect a handset to the HANDSET port located on the right connector panel.
b. Press the SHIFT, then Call Control key (represented by a handset).
c. Press CHG-TYP (F2)
d. Use the right arrow (F4) key to move the cursor to SPEAKER.
e. Press HANDSET (F2) to activate the handset.

14) If you need to BERT (Bit Error Rate Test) the voice call, you may change to a data call while still connected:

a. Enter the Call Control screen again.
b. Press CHG-TYP (F2).
c. Press DATA-56 (F3) to change your call to a data call.
d. Press ESCAPE. This will automatically bring you to the BERT & RESULTS screen. Press the PAGE-DN key to see the Logical Results page.
e. The SunSet ISDN will transmit the test pattern selected in the Test Configuration screen. If you need to change this pattern, you may return to Test Configuration.

15) To hang-up the call, return to the BRI Menu. Scroll to Call Setup and press ENTER. Press the same CALLHK key again. For example, if you placed your call using CALL1HK, press CALL1HK to disconnect that call.

1.2 Placing a Data Call
(for N. American protocols: DMSF, 5ESS, NAT'L)

1) From the MAIN MENU, enter ISDN-BRI.

2) Enter TEST CONFIGURATION and configure these settings as follows:

MODE: TE/NTI-U or TE-S/T
PROTOCOL: 5ESS, DMSF, NAT'L (according to circuit)
LINE TYPE: P-to-P or P-to-MP (according to circuit)

3) Next, connect the SunSet ISDN to the circuit. If you are in TE/NT1-U Mode, use the U-NT RJ-48. If you are TE-S/T, use the S/T RJ-48 port. Check the Graphic screen for verification.

4) Check for a +/- POWER reading in the top right corner of the screen. This indicates you have Sealing Current

If you are in TE-S/T Mode, you will see the status of PS1 and PS2 power sources in the top left of the screen.

5) Wait 10-15 seconds for the link to initialize. The SIGNAL LED should light solid green, and the ACT/RDY LED will blink. The Status indication area on the top line of the screen will read Unt:ACT for TE/NT1-U or S/T:ACT for TE-S/T Mode.

6) Look for a Received Message (typically Information or Network) on the second line of the display to indicate that the TEI is assigned.

7) Now, configure the rest of your Test Configuration screen:

SPID #1: set per circuit, then press SEND (F1)
SPID #2: set per circuit, then press SEND (F1)
PHONE NUM #1: this will be auto-configured from your above SPID entry, or you may enter it manually.
PHONE NUM #2: this will be auto-configured from your above SPID entry, or you may enter it manually.

Note: 5ESS P-to-P does not require SPIDS. There will only be a PHON NUM #1 for the 7 digit number of the circuit.

8) Look for a SPID#1 (or #2) OK message at the top of the screen upon pressing the SEND (F1) key. If one SPID is valid, the ACT/RDY LED will turn solid green, and the status indication area will change from Unt:ACT to Unt: RDY for the U Interface or from S/T:ACT to S/T:RDY on the S/T Interface.

9) Press the ESCAPE key. Cursor to CALL SETUP; press ENTER. Set up as follows:

CALL TYPE: DATA-64 or DATA-56
B CHANNEL: AUTO, B1, B2
TEST PATTERN: 2047 (or press SELECT F1 to change the test pattern)
DIAL NUMBER: 14083638000 (The number you wish to call)

10) Scroll down to DIAL NUMBER. You will see the F-keys, CALL1HK (F1) and CALL2HK (F2). If you press CALL1HK (F1), you will place your call on SPID#1. If you press CALL2HK (F2), you will place your call on SPID#2.

11) After pressing a CALLHK key, you may hear dial tone and see the message DIAL TONE ON at the top of the screen.

12) Press DIAL (F4) to dial your number.

13) When the call is connected, you will see a CONNECT message at the top left of the screen. You may or may not hear the data through the set's speaker. This depends on your BERT SPEAKER setting in the Test Parameters screen. It also depends on the version of software; if you have the DTMF dialing capability in your software, you will not be able to hear data. To check or change this setting:

   a. Escape to the BRI Menu. Enter SYSTEM PARAMETERS.
   b. Enter Test Parameters. The setting in this screen is called BERT SPEAKER.
   c. When BERT Speaker is ON, you will hear data through the speaker until you enter BERT & RESULTS. Then the speaker will be turned off.
   d. When BERT Speaker is OFF, you will never hear data through the speaker.

14) To run a BER Test (Bit Error Rate Test) on your data call, escape back to the BRI Menu and enter BERT & RESULTS.

15) Press the PAGE-DN key to see the Logical Results page as shown in Figure 1.2.A.

```
              C1:   C2:        12:37:10
>                   Unt:RDY     +POWER<
>CONNECT                              <

        RESULTS - LOGICAL
  ET - 000:01:23    RT -  CONTINU
  RCV- 2047         XMT- 2047
  BIT - 0           BER  - 0.0e-07
  ES  - 0           %ES  - 00.000
  SES - 0           %SES - 00.000
  EFS - 83          %EFS - 100
  AS  - 83          %AS  - 100
  UAS - 0           %UAS - 00.000
  DGRM- 0           %DGRM- 0

 PAGE-UP   PAGE-DN    STOP    ERR INJ
```

Figure 1.2.A
BERT & RESULTS Logical Screen

Verify that the PAT SYNC LED is solid green. If not, you will need to establish pattern synchronization before running a BER Test: try entering Test Configuration and changing the Test Pattern. If you are running an end-to-end data call, both ends must be transmitting the same test pattern. If you have a loopback in place, inject errors (by pressing the ERR INJ (F4) key) and verify that they return to you.

All abbreviations are described in Chapter 4, Section 4.3. You may read your bit error count at BIT and the rate at BER. ET stands for Elapsed Time; this is the amount of time that has elapsed since you entered BERT & RESULTS and began running the test.

16) To change your data rate of the call, press the SHIFT, then Call Control key (represented by a handset). Press CHG-TYP (F2). The cursor is now on DATA-56 (or 64 depending on what rate you chose). Press the F-key corresponding to the different data rate.

17) To disconnect the call, escape back to the Main Menu. Enter Call Setup. Press the corresponding CALLHK key. For

example, if you placed your call using CALL1HK, press CALL1HK again to disconnect this call.

1.3 Placing a Voice Call (for ETSI)

1) From the MAIN MENU, enter ISDN-BRI.

2) Enter TEST CONFIGURATION and configure these settings as follows:

MODE: TE/NTI-U or TE-S/T
PROTOCOL: ETSI
LINE TYPE: P-to-P or P-to-MP (according to circuit)
PHONE NUM #1: Use the keypad digits to enter the number of the ISDN line

3) Next, connect the SunSet ISDN to the circuit. If you are in TE/NT1-U Mode, use the U-NT RJ-48. If you are TE-S/T, use the S/T RJ-48 port. Check the Graphic screen for verification.

4) Check for a +/- POWER reading in the top right corner of the screen. This indicates you have Sealing Current

If you are in TE-S/T Mode, you will see the status of PS1 and PS2 power sources in the top left of the screen.

5) Wait 10-15 seconds for the link to initialize. The SIGNAL LED should light solid green, and the ACT/RDY LED will blink. The Status indication area on the top line of the screen will read Unt:ACT for TE/NT1-U or S/T:ACT for TE-S/T Mode.

6) Look for a Received Message (typically Information or Network) on the second line of the display to indicate that the TEI is assigned.

7) Press the ENTER key; this will bring you directly to the CALL SETUP screen. Configure as follows:

CALL TYPE: SPEECH
B CHANNEL: AUTO, B1, B2

TEST PATTERN: 2047
DIAL NUMBER: 14083638000 (The number you wish to call)

8) Press CALL (F1) to place your call.

9) When the call is connected, you will see a CONNECT message at the top of the screen. You may now talk/listen through the set's microphone and speaker. Alternatively, you may use a handset. To do so:

a. Connect a handset to the HANDSET port located on the right connector panel.
b. Press the SHIFT, then Call Control screen (represented by a handset).
c. Press CHG-TYP (F2)
d. Use the right arrow F-key to move the cursor to SPEAKER.
e. Press HANDSET (F2) to activate the handset.

10) If you need to BERT (Bit Error Rate Test) the voice call, you may change to a data call while still connected:

a. Enter the Call Control screen again.
b. Press CHG-TYP (F2).
c. Press the DATA-64 F-key to change your call to a data call.
d. Press ESCAPE. This will automatically bring you to the BERT & RESULTS screen. Press the PAGE-DN key to see the Logical Results page.
e. The SunSet ISDN will transmit the test pattern selected in the Test Configuration screen. If you need to change this pattern, you may return to Test Configuration.

11) To hang-up the call, return to the Call Control Screen. Press ON-HOOK (F1).

1.4 Placing 2 Simultaneous Calls

You may place two calls with the SunSet ISDN. However, you may not have two data calls connected at the same time (depending on which software version you have). Follow this procedure to place a voice and then a data call. This application uses North American protocols as a basis; if you are using ETSI, please disregard any reference to SPIDS.

1) From the MAIN MENU, enter ISDN-BRI.

2) Enter TEST CONFIGURATION and configure these settings as follows:

MODE: TE/NTI-U, TE-S/T
PROTOCOL: 5ESS, DMSF, NAT'L (according to circuit)
LINE TYPE: P-to-P or P-to-MP (according to circuit)

3) Next, connect the SunSet ISDN to the circuit. If you are in TE/NT1-U Mode, use the U-NT RJ-48. If you are TE-S/T, use the S/T RJ-48 port. Check the Graphic screen for verification.

4) Check for a +/- POWER reading in the top right corner of the screen. This indicates you have Sealing Current

If you are in TE-S/T Mode, you will see the status of PS1 and PS2 power sources in the top left of the screen.

5) Wait 10-15 seconds for the link to initialize. The SIGNAL LED should light solid green, and the ACT/RDY LED will blink. The Status indication area on the top line of the screen will read Unt:ACT for TE/NT1-U or S/T:ACT for TE-S/T Mode.

6) Look for a Received Message (typically Information or Network) on the second line of the display to indicate that the TEI is assigned.

7) Now, configure the rest of your Test Configuration screen:

SPID #1: set per circuit, then press SEND (F1)
SPID #2: set per circuit, then press SEND (F1)
PHONE NUM #1: this will be auto-configured from your above SPID entry, or you may enter it manually.
PHONE NUM #2: this will be auto-configured from your above SPID entry, or you may enter it manually.

Note: 5ESS P-to-P does not require SPIDS. There will only be a PHON NUM#1 for the 7 digit number of the circuit.

8) Look for a SPID#1 (or #2) OK message at the top of the screen upon pressing the SEND (F1) key. If one SPID is valid, the ACT/RDY LED will turn solid green, and the status indication area will change from Unt:ACT to Unt: RDY for the U Interface or from S/T:ACT to S/T:RDY for the S/T Interface.

9) Press the ENTER key; this will bring you directly to the CALL SETUP screen. Configure as follows:

CALL TYPE: SPEECH
B CHANNEL: AUTO, B1, B2
TEST PATTERN: 2047
DIAL NUMBER: 14083638000 (The number you wish to call)

10) Scroll down to DIAL NUMBER. You will see the F-keys, CALL1HK (F1) and CALL2HK (F2). If you press CALL1HK (F1), you will place your call on SPID#1. If you press CALL2HK (F2), you will place your call on SPID#2.

11) After pressing a CALLHK key, you will hear dial tone and see the message DIAL TONE ON at the top of the screen.

12) Press DIAL (F4) to dial your number.

13) When the call is connected, you will see a CONNECT message at the top lef tof the screen. You may now talk/listen through the set's microphone and speaker. Alternately, you may use a handset. To do so:

a. Connect a handset to the HANDSET port located on the right connector panel.
b. Press the SHIFT, then Call Control screen (represented by a handset).
c. Press CHG-TYP (F2).
d. Use the right arrow F-key to move the cursor to SPEAKER.
e. Press HANDSET (F2) to activate the handset.

14) To place a data call, return to the BRI menu and enter Call Setup. You will need to use the other SPID and B-channel for this call. Configure this screen as follows:

CALL TYPE: DATA-56 or DATA-64

B CHANNEL: AUTO will automatically select the other B-channel. Or, if you manually enter a B channel; make sure it is not the one used for the first call.
TEST PATTERN: 2047 (or press SELECT F1 to change it)
DIAL NUMBER: Enter the number you wish to call

15) Press the other CALLHK F-key. If you used CALL 1HK for your voice call, now press CALL2HK.

16) After pressing a CALLHK key, you may hear dial tone and see the message DIAL TONE ON at the top of the screen.

17) Press DIAL (F4) to dial your number.

18) When the call is connected, you will see a CONNECT message at the top left of the screen. You may or may not hear the data through the set's speaker. This depends on your BERT SPEAKER setting in the Test Parameters screen. It also depends on the version of software; if you have the DTMF dialing capability in your software, you will not be able to hear data.

19) To run a BER Test (Bit Error Rate Test) on your data call, escape back to the BRI Menu and enter BERT & RESULTS.

20) To hang-up the calls, return to the BRI Menu. Scroll to Call Setup and press ENTER. Press CALLHK to disconnect the data and/or voice call.

1.5 Placing a SELF BER Call

SELF BER automatically places a self data-64 call, answers it, loops it back, and runs a BER test. The Called phone number is based on the PHONE NUMBER #2 in the Test Configuration screen. For ETSI, NTT, or P-to-P 5ESS, there is only PHONE NUMBER #1, which will be the number called when running the SELF BER test.

Follow this procedure:

1) From the MAIN MENU, enter ISDN-BRI.

2) Enter TEST CONFIGURATION and configure these settings as follows:

MODE: TE/NTI-U or TE-S/T
PROTOCOL: according to circuit
LINE TYPE: P-to-P or P-to-MP (according to circuit)

3) Next, connect the SunSet ISDN to the circuit. If you are in TE/NT1-U Mode, use the U-NT RJ-48. If you are TE-S/T, use the S/T RJ-48 port. Check the Graphic screen for verification.

4) If you are using TE/NT1-U, you should see a +/- POWER reading in the top right corner of the screen. This indicates you have Sealing Current.

If you are in TE-S/T Mode, you will see the status of PS1 and PS2 power sources in the top left of the screen.

5) Wait 10-15 seconds for the link to initialize. The SIGNAL LED should light solid green, and the ACT/RDY LED will blink. The Status indication area on the top line of the screen will read Unt:ACT for TE/NT1-U or S/T:ACT for TE-S/T Mode.

6) Look for a Received Message (typically Information or Network) on the second line of the display to indicate that the TEI

7) Now, configure the rest of your Test Configuration screen:

SPID #1: set per circuit, then press SEND (F1), if applicable
SPID #2: set per circuit, then press SEND (F1), if applicable
PHONE NUM #1: this will be auto-configured from your above SPID entry, or you may enter it manually.
PHONE NUM #2: this will be auto-configured from your above SPID entry, or you may enter it manually.

Note: 5ESS P-to-P or ETSI does not require SPIDS. There will only be a PHONE NUM #1 for the 7 digit number of the circuit.

8) Look for a SPID#1 (or #2) OK message at the top of the screen upon pressing the SEND (F1) key. If one SPID is valid, the

ACT/RDY LED will turn solid green, and the status indication area will change from Unt:ACT to Unt:RDY or from S/T:ACT to S/T:RDY.

9) Press the ENTER key; this will bring you directly to the CALL SETUP screen. Select CALL TYPE: SELFBER.

10) The SELF BERT CALL screen appears. You will be prompted to enter a dial prefix. This is necessary when calling from a Centrex circuit, or any circuit that requires a number (i.e. 9) to access an outside line. In North America, it may be required to dial an area code when placing a DATA-64 call; this can be entered as 1xxx in the dial Prefix. Enter any prefix from the keypad.

11) Press START (F1) to begin the test. The message "CALL IN PROGRESS, PLEASE WAIT" appears. If the call fails, the message will read "SELF BERT CALL FAILED."

12) If the call succeeds, you will automatically enter the BERT & RESULTS screen to run your BER test. Press the PAGE-DN key to see the Logical Results. You may read your bit error count at BIT and the rate at BER. ET stands for Elapsed Time; this is the amount of time that has elapsed since you entered BERT & RESULTS and began running the test.

13) Inject errors by pressing the ERR INJ (F4) key and verify that they return to you.

14) Press the Escape key to return to the Call Setup screen. Press CALL1HK to disconnect the call. If you are using ETSI or NTT protocol, you will need to press the shift, then Call Control key (represented by a handset). Then press ON-HOOK (F1).

Section 2 Other BRI Applications

2.1 Monitoring on the U-Interface (U-RPTR Mode)

Since the SunSet ISDN has 2 U-interface ports, you may perform in-service monitoring on the U-interface. Because of the

2 wire hybrid on the U interface, the signal cannot be monitored with a high impedance connection. The signal must be interrupted, then after inserting the SunSet ISDN, the signal wil bel terminated and regenerated. So the SunSet ISDN will be using 2 connectors, one facing the ISDN Switch, and the other facing the Customer's Equipment. Follow this application to monitor the signal (Layer 1), as well as the D-channel messages:

1) From the MAIN MENU, enter ISDN-BRI.

2) Enter TEST CONFIGURATION and configure these settings as follows:

MODE: U-RPTR
PROTOCOL: according to circuit

3) Next, connect the SunSet ISDN to the circuit via the U-NT and U-LT ports. Connect the U-NT port on the SunSet to the U interface facing the LT (ISDN Switch). Connect the U-LT port of the SunSet to the U-interface facing the customer equipment (typically an NT1 device). Check the Graphic screen for verification.

4) Wait 20-25 seconds for the link to initialize on both sides. The SIGNAL LEDs should light solid green, and the ACT/RDY LEDs will blink on both the UT LEDs and the UL LEDs. The Status indication area on the top line of the screen will read Unt:ACT and Ult:ACT. If there is Sealing Current, then there will be an indication of +/- POWER in the top right corner of the Status Indication Area.

5) To check the Layer 1 status for errors, press ESC, then scroll down to BERT & RESULTS and press ENTER. You will see the following error measurements: D-Channel Message CRC Errors, U NT NEBEs and FEBEs, and U LT NEBEs and FEBEs. NEBE stands for Near End Block Error and FEBE stands for Far End Block Error. A NEBE is reported when a CRC error on the 2B+D block of data has been received by the SunSet. A FEBE is reported when a CRC error on the 2B+D block of data of our transmitted signal is received by either the LT (ISDN Switch) or the Customer Equipment (typically an NT1), and in return, they would generate a FEBE to notify the far end (the

SunSet ISDN) of their received CRC error.

6) To monitor the D-Channel Messages, press ESC, and scroll to the D-CH ANALYZER, and press ENTER. You have three menu settings to choose from:

1) VIEW TRACER, to see a live trace of D-Channel Messages,

2) VIEW/PRINT BUFFER, to see the stored D-Channel Messages which have been saved in the buffer. You will be able to store approximately 400 messages in the buffer. The D-Channel messages will automatically be stored as soon as the link is established. You can also print the D-Channel Messages out via the serial port on the top of the test set.

3) FILTER SETUP, to set up a pre-filter of either LAYER 2 ONLY, LAYER 3 ONLY, or ALL messages.

7) To view the M4 Channel bits or the EOC bits, press ESC, then enter the OTHER FEATURES, U M4/EOC ACCESS screen. This screen shows the M4 bits at the top 4 lines of the screen. The top 2 lines show the M4 binary data and meaning of the bits being sent from the LT (ISDN Switch) to the Customer Equipment (typically an NT1). The next 2 lines show the Customer Equipment to the LT direction. The bottom 4 lines show the EOC bits. The top 2 lines show the EOC binary data and command being sent from the LT to the Customer Equipment. The bottom 2 lines show the Customer Equipment to the LT direction.

8) To disconnect the SunSet ISDN from the circuit, simply unplug the connectors from the test set, and reconnect the Customer Equipment to the circuit.

2.2 Looping NT1 and mid-span repeaters in LT-U Mode

Use this procedure to loopback an NT1 device, mid-span repeater, or U-BRITE card utilizing the *eoc* bits. The *eoc* (embedded operations channel) is a 2 Kbps section of the DSL that carries commands to NTI and mid-span U-Repeaters. When the SunSet ISDN is in LT-U Mode; it may control these bits.

Figure 2.2.A shows the SunSet ISDN in relation to your BRI circuit.

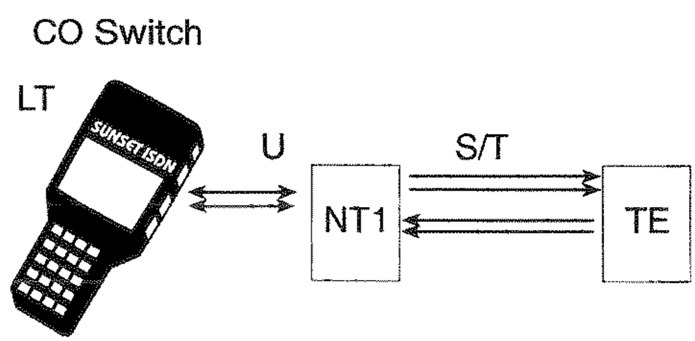


Figure 2.2.A
SunSet ISDN in LT-U Mode

1) From the ISDN BRI Menu, enter TEST CONFIGURATION. Configure as follows:

MODE: LT-U
TEST PATTERN: 2047

Note: You may change the test pattern before or after you have performed the loopback

Press ENTER after configuring.

2) Connect the SunSet ISDN to the line

- Plug the an RJ-48 cord into the U-LT connector on the right side of the set. Check the Graphic key for verification.
- You may need to use the RJ-48 to two alligator clips to connect to the U interface facing the customer equipment. You may clip to either wire.

3) If there is a U-Repeater on the line, you will need to provide power to it (Skip this step if there is no U-Repeater). This can be done with our External Power Supply, or it may be done with the Internal Phantom Power Source depending on the Power Board you have in your test set. To use the Internal Power Source:

a. From the BRI menu, enter the OTHER SETUP

b) Scroll to 40V POWER
c) Select Ult (F3)
d) Press ESCAPE

4) Check the UL LEDS. Verify that you have a solid green SIGNAL LED and a flashing ACT/RDY LED.

5) At the top of the screen in the status area, look for an indication on the left side of Ult:ACT and INT 40V (if you are using the Internal Power Source). This tells you have an ACTIVE circuit and are providing an INTERNAL 40V from the test set.

6) Enter the EOC CONTROL screen, setup as follows:
ADDRESS: (The address of the device which you want to loopback)
COMMAND: (The command which you want to perform)
EOC BITS: (The Binary Data of the Address and Command which you have selected)

Use NEXT (F1) and PREV (F2) to scroll through the ADDRESS choices. Refer to Figure 4.B for the definitions of each address. Use the F2 and F3 keys to select the COMMAND, and the more (F4) key to scroll through the different COMMANDS available. The definitions for each COMMAND are:

LOOP2B+D: Loops the whole data stream of both B channels and the D channel. Your test pattern will be sent on the full 2B+D, and looped back for BERT testing.

LOOPB1 or LOOPB2: Loops the specified B channel data stream. The test pattern will be sent on the single specified B channel, and looped back for BERT testing.

CORR_CRC: The REQUEST CORRUPTED CRC message tells the addressed device to send CRC errors toward the network. Use to check CRC error detection on the U interface.

NOTI_CRC: NOTIFY CORRUPTED CRC tells the addressed device that the network will be sending CRC errors toward the customer equipment. Use to check CRC error detection on the U interface.

NORMAL: This RETURN TO NORMAL message is used to loop down a device, and to return it to the idle condition. It is also the idle condition which is constantly being sent on the *eoc* channel.

HOLD STA: The HOLD STATE message tells the addressed device to stay in its current state; to hold its state.

The bottom 3 lines of the EOC CONTROL screen show the Received ADDRESS, COMMAND, and EOC BITS. These can be used to determine if a COMMAND has been initiated successfully.

7) To loopback a device for a BERT, choose the proper ADDRESS corresponding to the device you want to loopback, and choose the COMMAND as either LOOP2B+D, LOOP B1 or LOOP B2. To send the COMMAND after you have selected it, press SEND (F1) to transmit it. Watch the received *eoc* bits below to see the response to the COMMAND. You should see the same sent ADDRESS, COMMAND, and EOC BITS received at the bottom of the screen by the test set as well. This is an indication that your COMMAND has been initiated by the particular device.

8) After your loopback has been completed, you can run your BERT. Press ESC, then scroll to the BERT & RESULTS screen and press ENTER. The BER Test will begin automatically. Verify that your PAT SYNC LED is solid green. You can inject an error to verify your loopback is in place by pressing the ERR INJ (F4) key.

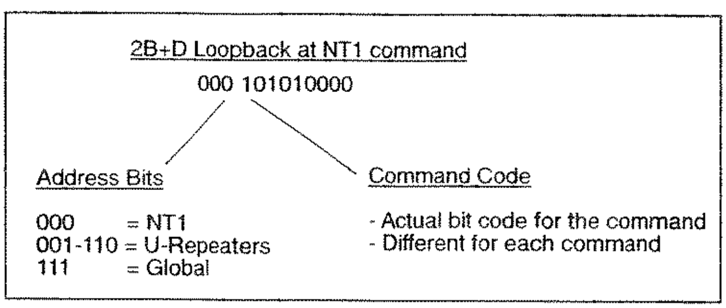


Figure 4.B
Address and Command Bits

9) If you wish to perform a command on a different device, you will need to change the ADDRESS. But after performing any command, and running your test, you must then send a RET TO NORMAL, Return to Normal, command to that device. This returns the device to the idle condition. Make sure the ADDRESS still matches, change the COMMAND to RET TO NORMAL, and press the SEND (F1) key. The change the ADDRESS to another device which you want to loopback, select the COMMAND, and press SEND (F1).

10) When you are finsihed with your testing, you can simply unplug the test set from the line.

2.3 Auto Service Scan

This feature scans the bearer services available on the circuit. Follow this procedure to check if your circuit is provisioned for speech, data, 3.1K, or HLC call types. This procedure is based on North American protocols. If you are using ETSI, disregard any reference to SPIDs; if there is any confusion about placing a call, refer to Section 1.3 (Placing a Voice Call- ETSI).

1) From the MAIN MENU, enter ISDN-BRI.

2) Enter TEST CONFIGURATION and configure these settings as follows:

   MODE: TE/NTI-U or TE-S/T
   PROTOCOL: according to circuit
   LINE TYPE: P-to-P or P-to-MP (according to circuit)

3) Next, connect the SunSet ISDN to the circuit. If you are in TE/NT1-U Mode, use the U-NT RJ-48. If you are TE-S/T, use the S/T RJ-48 port. Check the Graphic screen for verification.

4) If you are using TE/NT1-U, you should see a +/- POWER reading in the top right corner of the screen. This indicates you have Sealing Current.

   If you are in TE-S/T Mode, you will see the status of PS1 and PS2 power sources in the top left of the screen.

5) Wait 10-15 seconds for the link to initialize. The SIGNAL LED should light solid green, and the ACT/RDY LED will blink. The Status indication area on the top line of the screen will read Unt:ACT for TE/NT1-U or S/T:ACT for TE-S/T Mode.

6) Look for a Received Message (typically Information or Network) on the second line of the display to indicate that the TEI is assigned.

7) Now, configure the rest of your Test Configuration screen:

SPID #1: set per circuit, then press SEND (F1), if applicable
SPID #2: set per circuit, then press SEND (F1), if applicable
PHONE NUM #1: this will be auto-configured from your above SPID entry, or you may enter it manually.
PHONE NUM #2: this will be auto-configured from your above SPID entry, or you may enter it manually.

Note: 5ESS P-to-P does not require SPIDS. There will only be a PHON NUM #1 for the 7 digit number of the circuit.

8) Look for a SPID#1 (or #2) OK message at the top of the screen upon pressing the SEND (F1) key. If one SPID is valid, the ACT/RDY LED will turn solid green, and the status indication area will change from Unt:ACT to Unt:RDY for the U Interface or from S/T:ACT to S/T:RDY for the S/T interface. The ready status indicates that layer 2 is established and you are ready to place calls.

9) Press the Escape key to return to the BRI Menu. Enter Other Features, Auto Service Scan. Configure the screen as follows:

SCAN MODE: LOCAL (to scan the services on your circuit) or DISTANT (to scan the services of a different circuit)
SPID NUMBER: SPID1, SPID2 (if applicable)
DISTANT PHONE NUMBER (if Scan Mode=Distant): This will be the phone number of the Distant circuit to be scanned.

8) Press the START (F4) key to begin the test.

9) The Auto Service Scan results screen appears, showing the status of each bearer service.

"->" : the particular call type is currently being scanned
"V" : the call type is a valid, available bearer service
"X" : the bearer service is not available

10) If testing North America, it is necessary to repeat this test for SPID1 and SPID2 because each SPID can be configured to have different Bearer Services available to it.

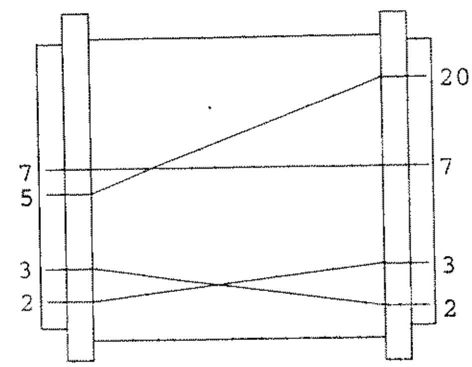
Section 3 General Applications

3.1 Printing from the SunSet ISDN

The test set may be ordered with an optional High Capacity Thermal Printer (SS118). This printer operates by an 8-bit serial RS-232C method, and uses thermal paper (i.e., it has no ink cartridge or ribbon which needs to be replaced). Many other serial printers are available to the user; however, not all of these printers will operate correctly with the SunSet. In addition to the printer which may be ordered with the test set, the TTC PR40A printer will work, although it requires an optional Null Modem Adapter (SS122).

You are free to use this information to attempt to set up the test set with another printer. However, Sunrise Telecom does not warrant the operation of the test set with any printer other than the one supplied by Sunrise Telecom.

If you wish to connect to a mode or other brand of printer, you may find the SS122 Null Modem Adaptor useful. Refer to Figure 3.1.A.



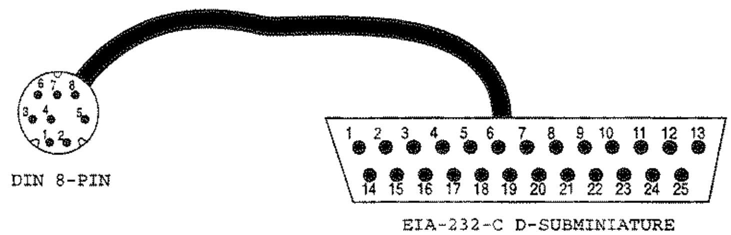
------ PIN-TO-PIN CONNECTIONS -----

DB-25 FEMALE PIN#	DESCRIPTION	DB-25 MALE PIN#	DESCRIPTION
7	SG	7	SG
5	CTS	20	DTR
3	RD	2	TD
2	TD	3	RD

Figure 3.1.A
Null Modem Adaptor

To begin printing, follow this procedure:

1) Connect the Sunrise Telecom DIN-8 to RS232C Printer Cable (SS115) to the SunSet ISDN. Figure 3.1.B displays the cable pin assignments of the RS232C Printer Cable.



------ PIN-TO-PIN CONNECTIONS -----

DIN 8-PIN PIN#	DESCRIPTION	EIA-232-C D-SUB PIN#	DESCRIPTION
2	DSR	6	DSR
3	TX	2	TXD
4	RX	3	RXD
5	GND	7	GND
6	CTS	5	CTS
7	RTS	4	RTS
8	DTR	20	DTR

Figure 3.1.B
Printer Cable Pin Assignments

2) If you are using a Sunrise Telecom printer, skip this step.
   a) Otherwise, you may need to connect the Sunrise Telecom Null Modem Adapter (SS122) to the free end of the Printer Cable.
   b) Note that the Adapter is labeled for the "Test Set Cord" end and the "Printer, Terminal" end.

3) Confirm that the SunSet's serial port settings match those of your printer.
   a) The switches to configure your printer's serial port and print characteristics are usually located on the back or bottom of the printer.
   b) If you are using the Sunrise Telecom thermal printer, refer to Figure 3.1.C for the correct switch settings.

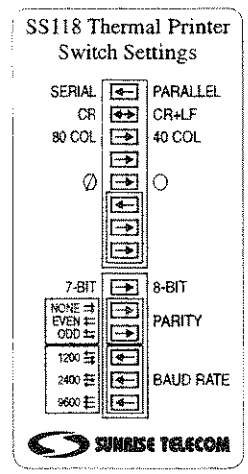


Figure 3.1.D
Printer Switch Settings

The test set's factory default serial port settings are:

BAUD RATE: 9600
PARITY: NONE
STOP BIT: 1-BIT
BITS/CHAR: 8-BIT
CR/LF INSRT: CR+LF

If you need to reconfigure the SunSet's serial port settings to match the settings of your printer, use the following procedure:

a) From the MAIN MENU, select the SYSTEM PARAMETERS item.
b) Select the SERIAL/PRINTER PORT item.
c) Use the Down Arrow key to access the BAUD RATE setting. Four selections are available:1200 (F1), 2400 (F2), and 9600 (F3), 19.2K (F4).
   - These settings determine the rate at which the SunSet transmits data (characters) to the printer.
   - This setting must match the setting on your printer; otherwise random characters will appear on your print-out.
d) Access the PARITY setting. Three options are available here:

NONE (F3), EVEN (F1), and ODD (F2). This setting must match with the configuration of your printer.

e) Access the STOP BIT setting. Two options are available: 1-BIT (F1) and 2-BIT (F2). This setting must match with the configuration of your printer. Normally this is configured as 1-BIT.

f) Access the BITS/CHAR setting. Two options are available: 7-BIT (F1) and 8-BIT (F2). This setting must match with the configuration of your printer. Normally this is configured as 8-BIT.

g) Access the CR/LF INSRT setting. Two options are available: CR+LF for a carriage return and a line feed, or CR for a carriage return only. This setting must be opposite to the configuration of your printer.

4) Set up printer's printing instructions in SYSTEM PARAMETERS, REPORT CONFIG.

PRINT RESULT

TIMED: Choose TIMED (F1) if you would like to have the printer print out results at a regular interval during a MEASUREMENT RESULTS.
- The default time is 1 minute
- You may enter any interval between 1 minute and 9999 minutes.
- To change the interval, enter the desired numbers from the keypad.

LAST: Choose LAST (F2) if you would like the printer to print out a result only at the conclusion of a test.

PRINT EVENT

ON: Choose ON (F1) if you would like the printer to print out a result every time an error or alarm condition is reported.

OFF: Choose OFF (F2) if you do not want the printer to print out a result every time an error or alarm condition is reported.
- Note that each result can only be printed once. The printer buffer is then emptied.

5) Confirm that the DIP switch settings (or other switch settings) on your printer correspond to those of the SunSet's serial port above.
- If you have changed the DIP switch settings, switch the

printer off and then on before continuing.

6) Ensure that the printer is powered up and "on-line".

7) Ensure that the SunSet is not displaying its GRAPHIC screen. This

3.2 Using the Remote Control option

The SunSet ISDN comes with an optional remote control feature. Controlling the test set through the remote control is similar to controlling the test set directly. The remote control allows a remote user, and a local user, to use the test set together at the same time. The simultaneous use can help a team collaborate to fix a problem quickly. Figure 3.2.A shows a typical setup.

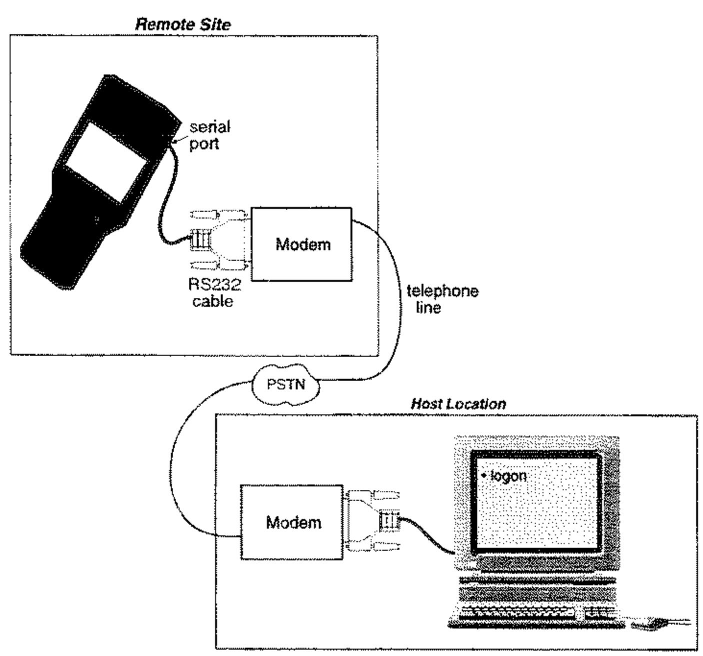


Figure 3.2.A
Typical Remote Control Setup via modems

Refer to Figure 3.1.A. for a diagram of the pin-to-pin assignments of the DIN to EIA-232-C cable supplied by Sunrise Telecom. Refer to Figure 3.1.B for the pin-to-pin assignments of the Sunrise Telecom Null Modem Adapter.

You may need a break-out box, null modem, patch-box and other RS-232C communications tools if you wish to set up your own serial communications. Here are some helpful hints.

1) The test set is configured as a DTE.
2) You will need a modified null modem cable if you wish to connect directly to a terminal.
3) It often is successful if pin 20 (DTR) of the modem or terminal is connected to pin 5 (CTS) of the test set DB25 connector.
4) Pin 5 of the test set DB25 connector must show green on a breakout box in order for the test set to print.

To begin remote operation, follow this procedure:

1) Connect the Sunrise Telecom DIN-8 to RS232C Printer Cable (SS115) to the SunSet ISDN's serial port.

2) If you are plugging directly into a terminal, connect the Sunrise Telecom Null Modem Adapter (SS122) to the free end of the Printer Cable. Note that the Adapter is labeled for the "Test Set Cord" end and the "Printer, Terminal" end. Make sure the end with the "Test Set Cord" is connected to the RS232C end of the printer cable.

   a) Connect the Null Modem Adapter to a "gender changer". Normally this will be a female-to-female conversion.

   b) Connect the gender changer to the cable which connects to your computer or terminal.

   c) Skip steps 3,4,6,7

3) Connect the printer cable's RS232 end to a modem. A 9600 baud error-correcting modem is highly recommended. You may need a breakout box, appropriate tools, and training to make sure the test set is appropriately connected to the modem the first time you set it up.

4) If not already connected to an analog phone line, plug the modem into the telephone network (usually done with an RJ-11 cable).

5) Confirm that the test set's serial port settings correspond to those of your communications software or terminal. The test set's factory default settings are:

BAUD RATE: 9600
PARITY: NONE
STOP BIT: 1-BIT
BITS/CHAR: 8-BIT

If you need to reconfigure the test set's serial port settings, use the following procedure:

a) From the MAIN MENU, select SYSTEM PARAMETERS.

b) Select the GENERAL CONFIG item.

c) Use the Down Arrow key to access the BAUD RATE setting. Four selections are available: 1200 (F1), 2400 (F2), 9600 (F3) and 19.2K (F4). These settings determine the rate at which the test set transmits data (characters) to the computer or terminal. This setting must match the setting on your computer or terminal, otherwise random characters will appear on your remote screen.

d) Access the PARITY setting. Three options are available here: NONE (F1), EVEN (F2), and ODD (F3). This setting must match with the configuration of your remote control.

e) Access the STOP BIT setting. Two options are available: 1-BIT (F1) and 2-BIT (F2). This setting must match with the configuration of your remote control. Normally this is configured as 1-BIT.

f) Access the BITS/CHAR setting. Two options are available: 7-BIT (F1) and 8-BIT (F2). This setting must match with the configuration of your remote control.

Normally this is configured as 8-BIT.

6) Set up a terminal to dial up the far modem and commence communications. Any terminal or personal computer with VT100 terminal emulation software should work.

7) Call up the far modem with your terminal.

8) Once communication has been established with the far modem, log on to the SunSet ISDN by typing in:

    logon

You do not need to press the return key after typing the letters. The test set will automatically repaint the screen with the main menu and other information. If you make a mistake while typing logon, just type it again.

9) Use the SunSet ISDN just like you would use it locally. The same menus will be presented to you. The key options are listed under the Status Panel heading. The letter presented in bold is the key you push to initiate the command. The cursor commands are: **U**p, do**W**n, lef**T** and **R**ight. In addition, you may find that the arrow keys on your computer/terminal will work.

Refre**S**h repaints the screen, which is useful if the screen appearance becomes skewed.

Quit functions as the ESCAPE key.

Other key functions are **I**nj err, **H**istory, and res**Y**nch.

Pressing the Return key on your computer/terminal is the same as pressing the ENTER key on your test set.

F-key functions are provided by the - (F1), = (F2), [(F3), and] (F4) keys.

When you wish to enter letters or numbers in a setup screen, instead of using the SHIFT key and the orange test set key labels, just type in the numbers or letters directly from your computer/terminal keyboard.

10) When you are finished with the SunSet ISDN, type in:

    logoff

11) Then terminate the phone connection by hanging up your

near-end modem.

Note that you can use a variety of asynchronous communications in addition to modems over the public switched telephone network. Direct local connection, dedicated line, and packet are other communication alternatives.

Chapter 6
PRI Analysis

Section 1 PRI Analysis Menu Tree

Enter ISDN-PRI from the Main menu to perform PRI testing. The following Menu Tree outlines the organization of the PRI menus. Refer to Chapter 4 BRI for the BRI Menu Tree.

- ISDN MAIN MENU
- ISDN-PRI
  - TEST CONFIGURATION
  - PRI INTERFACE
  - CALL SETUP
  - BERT & RESULTS
  - D-ch ANALYZER
    - VIEW TRACER
    - VIEW/PRINT BUFFER
    - FILTER SETUP
  - OTHER SETUP
  - OTHER FEATURES
    - ERROR INJECTION
    - VIEW TEST RECORD
    - LOAD SAMPLES
    - BULK CALL
    - SEQUENTIAL CALL
  - SYSTEM PARAMETERS
    - TEST PARAMETERS
    - REPORT CONFIG
    - ANSWER CONFIG
    - SERIAL/PRINTER PORT
    - DATE/TIME
    - ERASE NV RAM
    - VERSION/OPTION
    - SYSTEM PROFILE

- LEASED LINE-PRI
  - TEST CONFIGURATION
  - PRI INTERFACE
  - BERT & RESULTS
  - OTHER SETUP
  - OTHER FEATURES
    - ERROR INJECTION
    - VIEW TEST RECORD

LOAD SAMPLES
BULK CALL
SEQUENTIAL CALL
SYSTEM PARAMETERS
TEST PARAMETERS
REPORT CONFIG
ANSWER CONFIG
SERIAL/PRINTER PORT
DATE/TIME
ERASE NV RAM
VERSION/OPTION
SYSTEM PROFILE

Section 2 Test Configuration

The Test Configuration menu sets up the SunSet ISDN for your particular application. Before plugging the SunSet ISDN into the ISDN PRI circuit, you must first properly configure the TEST CONFIGURATION. Refer to Figure 2.A.

```
                              18:39:43
>X1-RR              RDY R1-RR        <
>                                    <

         TEST CONFIGURATION

       MODE              : TE
       PROTOCOL          : NTI
       TEST PATTERN      : 2047

       MY PHONE NUMBER
       3638000

AT&T        NTI        NI-2       more
```

Figure 2.A
PRI Test Configuration

Test Configuration contains the following settings:

1) MODE

F-Key Options: TE (F1), NT (F2), PRIMON (F3)

This item configures the emulation mode for the test set:

- Choose TE, terminal equipment, to emulate customer equip ment.
- Choose NT, network terminal, to emulate an ISDN switch.
- Choose PRIMON (F3) for monitoring only. In this mode, you will connect both receivers to the circuit.

Figure 2.B displays the difference between NT and TE modes.

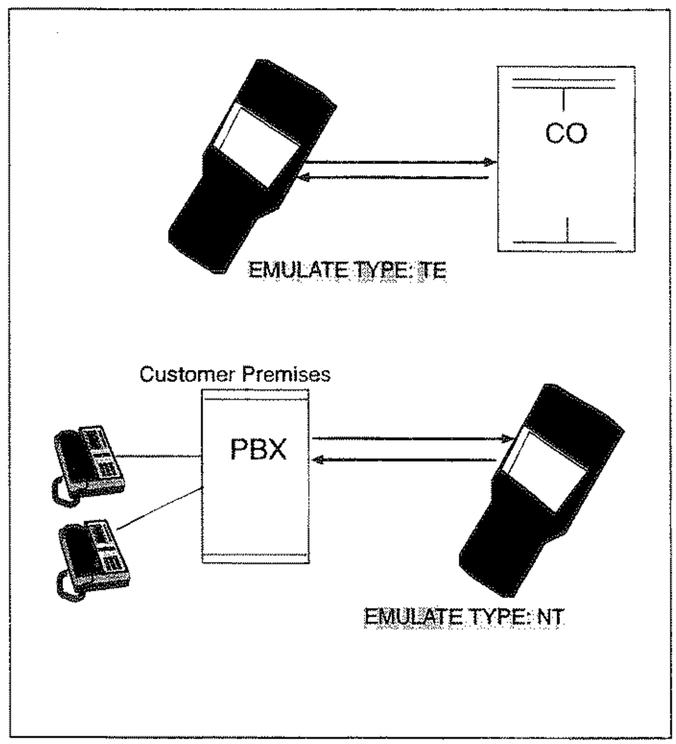


Figure 2.B
TE & NT Modes

2) PROTOCOL

F-Key Options: AT&T (F1), NTI (F2), NI-2 (F3), ETSI (more, F1), NTT (more, F2), AUSSIE (more, F3)

The PROTOCOL setting indicates which PRI protocol standard you intend to use for testing. Six choices are available:

- AT&T (F1) refers to AT&T's custom 5ESS switch
- NTI (F2) refers to Northern Telecom's DMS-100 switch.
- NI-2 (F3), National ISDN-2, is a Bellcore standard.
- ETSI (more, F1) designates a European standard.
- NTT (more, F2) designates a Japanese standard.
- AUSSIE (more, F3) is the Australian national standard

3) TEST PATTERN
F-Key Option: SELECT (F1)

The test pattern displayed here will be transmitted on the B channels during data calls. This pattern can be changed before or during a call.

- To choose your test pattern, press SELECT (F1). Refer to Figure 2.C.

```
                              15:03:27
>                                    <
>                                    <
          TEST  PATTERN
63        127       511       2047
2e15      2e20      1111      0000
1010      USER1     USER2     USER3
USER3:



EDIT        UP          <-         ->
```

Figure 2.C
Test Pattern screen

- Use the UP (F2) and arrow keys (F3 and F4) to move the cursor to the desired pattern. The SunSet will immediately begin transmitting the highlighted pattern.

Here are the standard test patterns which may be transmitted:

63: 63 is the 63-bit code, also known as 2e6-1.

127: 127 is the 127-bit code, also known as 2e7-1.

511: 511 is the 511-bit code, which conforms to the ITU V.52 technical standard. This pattern is also known as 2e9-1.

2047: 2047 is the 2047-bit code. This pattern is also known as 2e11-1.

2e15: 2e15 is the 2e15-1 pseudo random bit sequence. This signal is formed from a 15-stage shift register and is not zero-constrained. This pattern contains up to 14 zeroes in a row In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

2e20: 2e20 is the 2e20-1 pseudo random bit sequence. This signal is formed from a 20-stage shift register and is not zero-constrained. In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

1111: The all 1s pattern is used for stress testing circuits.

1010: 1010 is the alternating ones and zeroes pattern.

0000: 0000 is the all zeroes pattern.

In addition to these standard patterns, you also may define and send three user patterns by following this procedure:

a) Cursor to USER1, 2, or 3.
b) Press EDIT (F1). The cursor will move to the EDIT line.
c) Enter up to *16 digits* in binary format (1s and 0s).
d) Press ENTER to set the pattern. The cursor will return to your chosen USER number
e) To edit the entered pattern, simply repeat the process.

4) MY PHONE NUMBER

- This is the number of the ISDN line you are using. You may enter up to 23 digits.
- This number shows up as the Caller Number for all calls which you place.

NOTE: To enter in numbers or digits:
a) Enter the numbers from the keypad.
c) If you make a mistake when dialing in a number, use the arrow keys (F2 and F3) to scroll to your mistake, and enter the correct number(s).

When you are finished configuring these settings, press the ENTER key to return to the ISDN - PRI menu.

Section 3 PRI Interface

The PRI Interface screen configures the line interface. These settings all refer to the physical layer. Before plugging in, you want to make sure that these settings are properly configured for your circuit. If your SunSet has option SS401, Dual T1 Interface, refer to Section 3.1. For option, SS402, Dual E1 Interface, refer to Section 3.2.

3.1 T1 PRI Interface (for SS401)

This screen configures the physical T1 layer. Refer to Figure 3.1.A.

```
                                         18:50:21
>X1-RR                  RDY R1-RR               <
>                                               <

               PRI  INTERFACE
           TEST MODE: 23B+D
           FRAMING   : ESF
           CODING    : B8ZS
           RxLVL-1   : TERM
           XMTCLK    : RCVCLK
           TxLBO     : 0dB



 INTERN    RCVCLK
```

Figure 3.1.A
T1 PRI Interface (for SS401)

1) TEST MODE
F-Key Options: 23B+D (F1), 46B+2D (F2), 47B+D (F3)
Note: If you have selected PRIMON as your Mode in Test Configuration, this Test Mode will be PRIMON and you will not be given any options.

- 23B+D uses only one T1 line; there are 23 B-channels and one D-channel.
- 46B+2D uses both T1 lines; there are 46 B-channels and 2 D-channels. In this case, one D-channel is active, while the other one is in a stand-by mode to take over if the first should go out-of-service.
- 47B+D uses both T1 lines. There are 47 B-channels and only one D-channel. In this case, there is no backup D-channel.

Note: When you select either 46B+2D or 47B+D, you will be using both Line 1 and Line 2. You will have to plug both lines into the circuit. Therefore, you will have to set the receiver level and LBO setting for Line 1 and 2.

2) FRAMING
F-key Options: ESF (F1), SF (F2)

- Select SF-D4 (F2) for Super Frame, where 12 frames are grouped together. For SF framing, all 12 framing bits are used for frame position; SF framing does not have a data link or CRC error detection.

- ESF (F1) refers to Extended Super Frame; 24 frames are grouped together. In ESF framing, only 6 framing bits are used to establish frame position. Another 6 are used for CRC-6 (Cyclic Redundancy Check Code 6) and 12 are used for the ESF Facility Data Link (FDL).
- If the framing of a particular circuit is unknown, you may use the AUTO key to detect and automatically synchronize on the received framing. After pressing the AUTO key the SunSet ISDN will be configured for whichever framing type is found on its received signal.

3) CODING

F-key Options: B8ZS (F1), AMI (F2)

- AMI (Alternate Mark Inversion) requires the terminal transmitting data to have at least a 12.5% average 1's density and a maximum of 15 consecutive zeroes.
- B8ZS (Bipolar 8-Zero Substitution) uses a bipolar violation substitution which guarantees the 12.5% average with a maximum number of 7 consecutive zeroes. B8ZS coding is preferred, because it reduces transmission problems caused in AMI.

4) RxLVL 1 (2)

F-key Options: TERM (F1), BRIDGE (F2), DSXMON (F3)
Note: for 46B+2D or 47B+D, you must set RxLVL-1 for line 1 and RxLVL-2 for Line 2.

- RxLVL-1 configures the LINE1 1.544 Mbps receiver.
- This setting lets the SunSet electrically decode a 1.544 Mbps signal under a wide range of resistive or cable losses.
- This setting also determines which electrical load will be placed on the circuit by the SunSet. There is no effect on the transmitter. In a 1.544 Mbps circuit, there must always be exactly one receiver that applies the low impedance (100 ohm) termination. There should never be two or more receivers applying a low impedance termination.

WARNING: IF YOU ARE UNCERTAIN, CHOOSE BRIDGE. THIS WILL PROTECT THE 1.544 Mbps SIGNAL.

TERM (F1)

The TERM mode is used when you will both send and receive a T1 signal. It requires that the circuit be disrupted for testing.

The received signal is terminated by the test set. The received signal is not obtained through a MONITOR jack. The received signal can have up to 36 dB of cable transmission loss (this is a different kind of loss than the 20 dB of resistive loss provided by a DSX MON jack).

Note that if you plug into a DSX MON jack in the TERM mode, the BPV LED will probably come on. Use the DSXMON mode instead.

DSXMON (F3)

The DSXMON access mode is used when a monitor measurement will be made. The signal is provided from the MON jack of a DSX, DS1 plug-in card, CSU, or NI. The DSX has isolated the MON signal from the live signal with a high impedance circuit. The transmitter is turned on and is sending the selected test pattern.

This mode is useful, since the DSX monitor jack protects the live signal from any possible disruptions caused by the testing process. It allows the technician to observe an in-service line.

If DSXMON mode is selected when a 3V signal is received, then the red BPV LED will be lit. This often happens if DSX MON is selected when the test set is plugged into an OUT jack. In this case, TERM should be selected instead of DSXMON. In some cases, it may not be clear if the mon jack provides a bridged access or a 20 dB isolated monitor access. In this case, you should try BRIDGE first to see if this works and then try DSXMON if it doesn't.

BRIDGE (F2)

The BRIDGE monitor is similar to the DSXMON monitor. However, in BRIDGE, the test set taps into a live, in-service, terminated DS1 signal with up to 36 dB cable loss. The test set applies isolation resistors to protect the circuit from a hit. Be sure to select BRIDGE before clipping onto the live circuit. This will put the isolation resistors in place and ensure that the test set does not place a hit on the circuit.

If you use BRIDGE mode on a DSXMON jack, there will be a total of 40 dB resistive isolation and the test set will likely report loss of signal. In some cases, it may not be clear if the monitor jack being used provides a bridged access or a 20 dB isolation monitor access. In this case, you should try BRIDGE first to see if this works and then try DSXMON if it doesn't.

5) XMT CLOCK
F-key Options: INTERN (F1), RCVCLK (F2)

XMT CLOCK determines the timing source for your transmit signal.

- INTERN (F1) uses the test set's internal timing as its clock source. You should use INTERN when you want to emulate a piece of network equipment (NT).
- RCVCLK (F2) uses the timing signal received on Line 1. Use RCVCLK if you are plugging into a switch or other synchronous element, which requires the test set to be synchronized to the network. Pick RCVCLK if you selected either TE or PRIMON in TEST CONFIGURATION.

6) LBO 1(2)
F-key Options: 0dB (F1), -7.5dB (F2), -15dB (F3), -22.5dB (F4)
Note: for 46B+2D or 47B+D, you must set the LBO 1 for Line 1 and LBO 2 for Line 2.

- LBO 1 stands for Line Build Out for Line 1. Line Build Out is used to stress test a line by attenuating the dB to a certain level.

3.2 E1 PRI Interface (for SS402)

This screen configures the physical E1 layer. Refer to Figure 3.2.A.

```
                                    18:35:22
>X1-RR               RDY R1-RR             <
>                                          <

          LINE INTERFACE

         MODE        : MONITOR
         FRAMING     : PCM31
         CRC-4       : YES
         CODING      : HDB3
         XMT CLOCK   : RCVCLK




 PCM31     PCM30     UNFRM
```

Figure 3.2.A
E1 PRI Interface (SS402)

1) MODE
F-Key Options: TERM (F1), MONITOR (F2), BRIDGE (F3)

You must specify the Line Interface MODE for your testing. TERM is the most common mode used for out-of-service testing. BRIDGE or MONITOR are commonly used for testing live circuits.

TERM (F1)

The TERM mode is used when you wish to send and receive an E1 signal. The test set terminates the received signal with a low impedance termination, and requires that the circuit be disrupted for testing. A 75 ohm termination is used for BNC and 1.6/5.6 mm connectors. A 120 ohm termination is used for BR2 and Bantam connectors.

MONITOR (F2)

The MONITOR (protected monitoring point) mode is used for monitoring. The signal is provided from the MON jack of an E1 network element. The network element has isolated the MON signal from the live signal with high impedance resistors. The test set has an Automatic Gain Control (AGC) circuit to compensate for the resistive loss from -15 dB to -30 dB. If the signal source is not a resistively attenuated MON output signal, the AGC will not operate properly, and as a result, CODE ERR and/or other problem indicators will be shown on the test set.

The MONITOR mode is useful because it protects the live signal from possible disruptions caused by the testing process. It allows the technician to observe the line while the circuit is carrying customer traffic.

BRIDGE (F3)

The BRIDGE mode is similar to the MONITOR mode. However, in the BRIDGE mode, the test set applies high impedance isolation resistors to the circuit under test. This isolation circuitry will protect the signal from any possible disruption.

If a connection is made from the MON jack of a network element to the test set, and if the BRIDGE access mode is being used, this may result in two isolation circuits on the signal. In this case, the test set will likely report a loss of signal and be unable to perform any measurements.

2) FRAMING

F-key Options: PCM31 (F1), PCM30 (F2), UNFRM (F3)

- For PRI testing, select PCM31 framing.
- Choosing PCM30 (F2) means that the SunSet will synchronize on both Frame Alignment Signal (FAS)and Multiframe Alignment Signal (MFAS).
- Choosing PCM31 (F1) means that the set will synchronize only on FAS; it will disregard the Multiframe Alignment Signal.
- UNFRM (F3) specifies an unframed signal.
- If the framing on the received signal does not match your framing type selected here, the FRM SYNC LED on the SunSet will light red.

3) CRC-4

F-Key Options: YES (F1), NO (F2)

- YES (F1) allows the SunSet to measure CRC-4 errors on the incoming signal and also transmit CRC-4 bits on the outgoing signal. CRC-4 works only with PCM30 and PCM31 framing.

4) CODING

F-key Options: AMI (F1),HDB3 (F2)

- Choose AMI (F1) for Alternate Mark Inversion. AMI coding is not commonly used in 2.048Mbps transmission, because synchronization loss occurs during long strings of data zeroes.
- HDB3 (F2) was adopted to eliminate the loss of synchronization with AMI. In HDB3, a string of 4 consecutive zeroes is replaced with a substitute string of pulses containing an intentional Bipolar Violation.

5) XMT CLOCK

F-key Options: INTERN (F1), RCVCLK (F2)

XMT CLOCK determines the timing source for your transmit signal:

- INTERN (F1) uses the test set's internal timing as its clock source. You should use INTERN when you want to emulate a piece of network equipment (NT).
- RCVCLK (F2) uses the timing signal received on Line 1. Use RCVCLK if you are plugging into a switch or other synchronous element, which requires the test set to be synchronized to the network. Pick RCVCLK if you selected either TE or PRIMON in TEST CONFIGURATION.

When you have finished configuring your PRI Interface, press the ENTER key to return to the ISDN- PRI menu.

Section 4 Call Setup

Use this screen to place a voice or data call. Before placing a call you should make sure that your TEST CONFIGURATION settings are correct for your application. Refer to Figure 4.A.

```
                                   01:32:21
>X1-RR              RDY R1-RR             <
>                                         <

          CALL SETUP

       CALL TYPE    : DATA-64
       B CHANNEL    : 14

       DIAL NUMBER :
       14159030108

CALL                  SPEED          <-
```

Figure 4.A
Call Setup Screen

To configure the call setup portion, review the following:

1) CALL TYPE
F-Key Options: SPEECH (F1), DATA-56 (F2), DATA-64 (F3), Nx64K (F4)
Note: for ETSI, AUSSIE, or NTT protocols, you will not have a DATA-56 option.

This item determines what kind of call you are going to place. Specify the CALL TYPE by pressing the corresponding F-Key.

- Press (F1) to place a voice call.
- Press (F2) to place a data call at 56 Kbps data rate. At 56 Kbps, a 1 is placed in each timeslot.
- Press DATA-64 (F3) to place a data call at 64 Kbps data rate.
- Nx64 (F4) pertains to the multirate ISDN PRI with 64K for each channel. For a Nx64 call on a T1 line, refer to Figure 4.B and the following text.

```
                                      01:40:56
>X1-RR                   RDY R1-RR           <
>                                            <

          SELECT TIME SLOT

     01 02 03 04 05 06 07 08
     09 10 11 12 13 14 15 16
     17 18 19 20 21 22 23






SEL-ALL  SELECT   UN-SEL  CLR-ALL
```

Figure 4.B
Nx64K Select Time Slot Screen (T1)

- Use the SELECT (F2) and UN-SEL (F3) keys to choose the timeslots you wish to send data on. These may be contiguous or non-contiguous channels. Any selected timeslots will be highlighted. For example, if you wish to select channels 1 and 4, you need to press SELECT (F2) on 01, UN-SEL (F3) on 02 and 03, and SELECT on 04.
- SEL-ALL (F1) selects all 23 timeslots.
- CLR-ALL (F4) clears any selected timeslots.
- After you have selected your timeslots, press the ENTER key to return to the Call Setup screen.

When placing a Nx64K call on a E1 line, you may choose your timeslots from 1 to 31, except for the D- channel,which is ordinarily timeslot 16. The method for selecting timeslots is identical to the steps outlined above. Refer to Figure 4.C.

```
                                01:43:41
>X1-RR             RDY R1-RR           <
>                                      <
          SELECT TIME SLOT

  01   02   03   04   05   06   07   08
  09   10   11   12   13   14   15
  17   18   19   20   21   22   23   24
  25   26   27   28   29   30   31



 SEL-ALL  SELECT    UN-SEL  CLR-ALL
```

Figure 4.C
Select Timeslot (E1)

2) B CHANNEL
Options: 1-24 (T1) or 1-31 (E1)

- Specify the B channel onto which you will place the call.
- Use the INCrease +1 (F1) or DECrease-1 (F2) keys to change the channel number.
- You will not be able to select whichever channel was selected as the D channel in the OTHER SETUP screen. This is normally channel 24 in North America (T1) and channel 16 for ETSI (E1).

3) B CHNL LINE
F-Key Options: LINE 1 (F1), LINE 2 (F2)

If you have selected either 46B+2D or 47B+D in the PRI INTERFACE screen, you must pick which T1 line to use for your call. This setting determines whether the B channel used for the call is from Line 1 or Line 2. Press (F1) for Line 1 or (F2) for Line 2.

4) DIAL NUMBER
The screen will prompt you to enter the Dial Number. This is the number that you intend to dial to place your call.

- The number may be entered directly from the keypad.
- Use the <- (F4) key to backspace within the line

You may also store and use ten numbers in the Speed Dial Menu. To enter a speed dial number use the following procedure:

Entering a Speed Dial Number

1. Move the cursor down to DIAL NUMBER.
2. Press SPEED (F3). A screen, as shown in Figure 4.D appears.

```
                                    01:42:26
>X1-RR                RDY R1-RR            <
>                                          <
                SPEED DIAL
      1. 14159030108
      2. 7770434
      3. 3638000
      4. █
      5.
      6.
      7.
      8.
      9.
      10.
SELECT    <-         ->
```

Figure 4.D
Speed Dial Menu

3. Use the down arrow key to move cursor to an empty line.
4. Enter the numbers from the keypad.

Selecting a Speed Dial Number

1. Move the cursor down to DIAL NUMBER.
2. Press SPEED (F3). A screen, as shown in Figure 4.D appears.
3. Use the down arrow key to move the cursor to the desired number.
4. When your number is highlighted, press SELECT (F3). This will automatically return you to the Call Setup screen and enter that number in the DIAL NUMBER line.

When you have entered all the necessary Call Setup information, press CALL (F1) to place your call.

Section 5 BERT & Results

The BERT & Results item allows you to test the physical signal, as well as perform a BER test on a data call. When you have a voice call connected or are monitoring the line, you will have one page of results, which is a summary screen on the signal. When you have a data call connected, a logical results screen is also available.

5.1 General

Measurements may have a count number displayed on the left hand side, and the corresponding rate or percentage displayed on the right hand side of the same line. For example, in Figure 5.1.A, BIT appears on the left and Bit Error Rate on the right.

```
                                   11:54:41
>X1-RR              RDY R1-RR             <
>                                         <

        RESULTS - LOGICAL
 ET - 000:12:43  RT - CONTINU
 RCV- 2047       XMT- 2047
 BIT - 4         BER  - 0.0e-09
 ES  - 2         %ES  - 00.262
 SES - 0         %SES - 00.000
 EFS - 761       %EFS - 99.738
 AS  - 763       %AS  - 100
 UAS - 0         %UAS - 00.000
 DGRM- 1         %DGRM-08.333

PAGE-UP     PAGE-DN    STOP   ERR INJ
```

Figure 5.1.A
BERT & Results screen

A key concept for the measurement result screens is availability. A circuit is available for use only when the bit error rate is low enough that the signal can get through and be understood.

A circuit is said to be unavailable at the beginning of 10 consecutive severely errored seconds. Errors, errored seconds, and severely errored seconds are not accumulated when the circuit is unavailable. Therefore, if you start continuously injecting errors to the test set at a $2x10^{-3}$ error rate, you will see increasing bit errors, errored seconds, and severely errored seconds for the first 9 seconds. Then, at the tenth second, all the counts will suddenly decrease back to the values they had before the error injection was started, and the unavailable counter will suddenly increase by 10.

Once a circuit is unavailable, it becomes available only after 10 consecutive seconds without severe errors. To continue the previous example, if you turn the severe error injection off, and then insert 1 or 2 errors during the next 5 seconds, you will observe that the unavailable second counter continues to increase for the first 9 seconds while the error counter does not change. Then at the tenth second, the unavailable second counter suddenly decreases by 10 and the error counter increases by the 1 or 2 errors that you inserted.

You may wish to practice this for yourself so that you will not be confused while taking actual measurements.

Measurement Screens have the following F-keys:

PAGE-UP (F1), PAGE-DN (F2) : If a data call is connected, you will have three pages of results. These keys allows you to view each of the pages available to you.

STOP/START (F3): Pressing STOP causes the SunSet to stop the test. Pressing START restarts the measurement process from within this menu.

ERR INJ (F4): This key allows you to inject errors directly from the measurement screen. You may also press the SHIFT and ERR INJ keys.

In addition, to the actual measurement data, the following information is displayed in the upper portion of the measurement screens:

CURRENT TIME: The current time of day is displayed in the upper right-hand corner of the screen.

ET (Elapsed Time): Elapsed Time is the time that has passed since the test was started or restarted.

RT (Remaining Time): Remaining Time is the time that remains until the end of testing. The factory default condition is that the test runs continuously until the user stops it. For this reason, CONTINU is displayed in the RT field to denote a continuous test. However, in SYSTEM PARAMETERS, TEST PARAMETERS, you may specify the amount of test time (MEAS DURATION). In this case, the remaining time will count down to zero during the measurement.

5.2 T1 PRI Analysis (for SS401)

5.2.1 Signal Summary Screen

The Summary Screen provides the significant measurement results about the T1 signal. It contains measurement data related to specific types of impairments, like bipolar violations or framing bit errors. It also reports overall service performance measures such as errored seconds and percent error free seconds. Figure 5.2.A provides a summary screen for T1 (SS401).

```
                                 11:49:03
>                                       <
>                                       <
 RESULTS - SUMMARY
 ET- 000:08:50      RT- CONTINU
 FRM-ESF    COD-B8ZS    CNFG-TERM

 BPV :0              RATE :0.0e-09
 FBE :0              RATE :0.0e-07
 CRC :0              RATE :0.0e-06
 ES  :0              SES  :0
 UAS :0              %EFS :100
 FREQ:1544000        +LVL :3.01 V

PAGE-UP    PAGE-DN    STOP   ERR INJ
```

Figure 5.2.A
Summary Screen (T1)

The definitons for each of the abbreviations seen in this summary screen are as follows:

BPV

This is a count of the number of BiPolar Violations that have occurred since the beginning of the test.

Usage: This measurement detects problems with the line that the set is attached to. The problem is a local one, because any multiplexers, radio or fiber transmission links, switches, digital cross-connects, or other line-terminating devices will strip bipolar violations as the signal passes through it. Bipolar violations only pass through copper and regenerative repeaters. This measurement is also useful where the framing or data being transmitted is unknown. Finally, many telephone companies use a given number of BPV counts as the maximum acceptable for a span.

BPV RATE

This is the average Bipolar Violation error Rate since the beginning of the test.

Usage: The rate is sometimes used instead of a count when the measurement is conducted for a longer period. 10^{-3} is a typical maintenance limit for voice transmission and 10^{-6} is a common acceptance limit for voice transmission. Many data customers require 10^{-9} or better.

CRC

This is a count of the number of CRC-6 errors that have occurred since the beginning of the test. This measurement is reported as N/A when the test set is not synchronized on a received ESF signal.

Usage: This measurement is a valuable complement to the BPV measurement. BPVs identify errored in-service transmission in the local part of the T1 path, and CRCs identify errored in-service transmission on the entire path from the origination point to the test set. If the number of BPV errors is about the same or a little bit less than the CRC errors, then you have a problem on the local span. However, if there are no BPV errors but many CRC errors, then your problem is on the other side of multiplexers or other line-terminating equipment.

Note that for an in-service test, both CRCs and BPVs only give information about errors on the incoming signal directions but do not give information about errors on the outgoing signals. To fully test the line with these measurements, you must take it out of service and operate a loopback at the far end.

CRC RATE

This is the average CRC error rate since the beginning of the test.

ES

This is a count of the number of Errored Seconds that have occurred since the beginning of the test. An errored second is any second with at least one BPV, FBE, or CRC-6 error. An errored second is not counted during an unavailable second.

Usage: errored seconds are a key tariff parameter for T1 services. Acceptance limits are often given for a number of errored seconds in a 5 minute, 15 minute, or 24-hour period. 7 errored seconds in 5 minutes and 20 errored seconds in 15 minutes are common acceptance limits, and 60 errored seconds in 5 minutes is a common immediate action limit. Some organizations accept no errors on a turn-up test.

The measurement is attractive because it takes out the effects of burstiness on service performance and because it measures the quality of service as the user actually sees it.

%EFS

This is a count of percentage of Error Free Seconds since the beginning of the test. An error free second has no errors at all.

Usage: This parameter is most often used for T1 services. Data customers typically expect this number to be anywhere from 95% to 99.5% or higher. %EFS and %AS are probably the two most significant parameters in gauging the quality of T1 service delivered to the end user.

FBE

This is a count of the number of Framing Bit Errors that have occurred since the beginning of the test. This measurement is reported as N/A when the test set is not synchronized on a known framing pattern within the received signal.

Usage: This measurement is often used for in-service testing on SF-D4 circuits where the customer is transmitting an unknown data stream. The advantage of the measurement is that the framing stays intact as it passes through various network elements (fractional T1 circuits excepted), hence it depicts the overall transmission quality from the far end of the circuit to the test set. One problem with the measurement is that it only measures one out of every 193 bits, and so gives only a sampling of the true transmission performance. The other problem with the monitor measurement is that it can't measure the quality of transmission on the outgoing directions from the test set to the end of the circuit. It can only measure the quality on the two incoming directions of transmission.

FBE RATE

This is the average Frame Bit Error Rate since the beginning of the test.

SES

This is a count of the number of Severely Errored Seconds that have occurred since the beginning of the test. A severely errored second is a second with a 10^{-3} error rate, where error rate is measured off of bit errors, BPV errors, framing bit errors, and CRC-6 errors. An out of frame error will also generate a severely errored second. A severely errored second is not counted during an unavailable second.

Usage: This measurement is sometimes used in combination with errored seconds to describe overall in-service transmission performance.

UAS

This is a count of all the UnAvailable Seconds since the beginning of the test. Note that a T1 service is not available during an UAS.

An unavailable second is any second with a loss of signal, loss of frame, loss of pattern, or alarm indication signal. Unavailable seconds are also counted at the onset of 10 consecutive severely errored seconds. Once an unavailable second has been declared, the following seconds continue to be counted as unavailable until the service is declared to be available again. Service becomes available at the onset of 10 consecutive available non-severely errored seconds.

Usage: Unavailable seconds are usually not permitted in any number in a 15 minute or 1-hour test. Telephone companies typically guarantee something like 3 hours maximum outage time per year on a T1 service.

FREQ
FREQuency is the frequency of the signal as measured against the frequency of the reference clock. The set's internal clock is used to measure frequency when just one signal is plugged in. When both Rx jacks have signals plugged in, one of the signals is used as the frequency reference of the other. The INTERN reference clock of the set has stratum 3 accuracy.

+LVL: Positive LeVeL is the level of positive pulses received by the test set.

5.2.2 Signal Summary Screen

The Logical screen reports all the parameters that are measured from a known test pattern. This screen will be available only if you have placed or received a data call. Refer to Figure 5.2.A.

```
                                   11:54:41
>X1-RR                RDY R1-RR           <
>                                         <

       RESULTS - LOGICAL
 ET - 000:12:43  RT - CONTINU
 RCV- 2047       XMT- 2047
 BIT  - 4        BER  - 0.0e-09
 ES   - 2        %ES  - 00.262
 SES  - 0        %SES - 00.000
 EFS  - 761      %EFS - 99.738
 AS   - 763      %AS  - 100
 UAS  - 0        %UAS - 00.000
 DGRM- 1         %DGRM-08.333

PAGE-UP    PAGE-DN   STOP   ERR INJ
```

Figure 5.2.A
Logical Results Screen

The following information is provided in this screen:

RCV- The received test pattern is shown here.

XMT - The transmitted test pattern is shown here.

BIT
This is a count of the BIT errors since the beginning of the test.

BER
This is the Bit Error Rate since the beginning of the test.

BIT ES
This is a count of the bit Errored Seconds that have occurred since the beginning of the test. A bit errored second is a second with at least 1 bit error. Bit errored seconds are not counted during bit unavailable seconds.

BIT %ES
This is the percentage of BIT Errored Seconds that have occurred since the beginning of the test.

BIT SES
This is a count of the bit Severely Errored Seconds that have occurred since the beginning of the test. A bit severely errored second is a second with at least 1,544 bit errors (10^{-3} error rate). Bit severely errored seconds are not counted during bit unavailable seconds.

BIT %SES
This is the percentage of the bit Severely Errored Seconds that have occurred since the beginning of the test.

BIT EFS
This is a count of the bit Error Free Seconds since the beginning of the test.

BIT %EFS
This is the percentage of the bit Error Free Seconds that have occurred since the beginning of the test.

BIT AS
This is a count of the bit Available Seconds since the beginning of the test. A bit AS can be error-free, errored, or severely-errored; it cannot be unavailable.

BIT %AS
This is the percentage of bit Available Seconds since the begin-

ning of the test.

BIT UAS
This is a count of the bit UnAvailable Seconds since the beginning of the test. A bit unavailable second is a second during which the test pattern has lost synchronization. Bit unavailable seconds are also counted at the onset of 10 consecutive bit severely errored seconds. Bit unavailable seconds continue to be counted until the onset of 10 bit non-severely errored seconds.

BIT %UAS
This is the percentage of bit UnAvailable Seconds since the beginning of the test.

BIT DGRM
This is a count of the bit DeGRaded Minutes that have occurred since the beginning of the test. A bit degraded minute is 60 non-severely errored seconds during which there is a total of at least 92 errors

BIT %DGRM
This is the percentage of bit degraded minutes since the beginning of the test.

5.3 E1 Primary Rate Results (for SS402)

5.3.1 Signal Summary Screen

The Summary Screen provides the significant measurement results about the E1 signal. It contains measurement data related to specific types of impairments, like code errors or framing bit errors. It also reports overall service performance measures such as errored seconds and percent error free seconds. Figure 5.3.A provides a summary screen for E1 (SS402).

```
                                   11:49:03
>X1-RR              RDY R1-RR           <
>                                       <
  RESULTS - SUMMARY
  ET- 000:05:27       RT- CONTINU
  FRM-PCM31    COD-AMI    CNFG-TERM

  BPV :0              RATE :0.0e-09
  FBE :0              RATE :0.0e-07
  CRC :0              RATE :0.0e-06
  ES  :0              SES  :0
  UAS :0              %EFS :100
  FREQ:2048000        +LVL :2.30 V

 PAGE-UP    PAGE-DN    STOP
```

Figure 5.3.A
E1 Summary Screen (SS402)

BPV
This is a count of the number of line Code Errors (Bipolar Violations that violate the coding rules) that have occurred since the beginning of the test. In HDB3 coding, a Code Error is a bipolar violation that is not part of a valid HDB3 substitution.

BPV RATE
This is the average BiPolar Violation error rate since the beginning of the test.

CRC
This is a count of the number of CRC-4 block errors that have occurred since the beginning of the test. This measurement is reported as N/A when the SunSet is not synchronized on a received CRC-4 check sequence.

CRC RATE
This is the average CRC-4 block error rate since the beginning of the test. This measurement is reported as N/A when the SunSet is not synchronized on a received FAS or MFAS signal.

FBE
This is a count of the number of Frame bit Errors that have occurred since the beginning of the test. This measurement is

reported as N/A when the SunSet has not synchronized on a known framing pattern within the received signal.

ES
This is a count of the number of Errored Seconds that have occurred since the beginning of the test. An errored second is any second with at least one BPV, FBE, or CRC-4 error. An errored second is not counted during an Unavailable Second.

%EFS
This is the percentage of summary Error Free Seconds since the beginning of the test. A summary Error Free Second is a second in which the signal is properly synchronized and no errors or defects occur.

SES
This is the count of summary Severely Errored Seconds since the beginning of the test. A severely errored second has an error rate of 10-3 or higher. Severely errored seconds are not counted during unavailable time.

UAS
This is the count of UnAvailable Seconds that have occurred since the beginning of the test. Unavailable time begins at the onset of 10 consecutive severely errored seconds. The displayed value of unavailable seconds updates after the tenth consecutive severely errored second occurs. Unavailable time also begins at a loss of signal or loss of frame.

FREQ
FREQuency is the frequency of the signal as measured against the frequency of the reference clock. The set's internal clock is used to measure frequency when just one signal is plugged in. When both Rx jacks have signals plugged in, one of the signals is used as the frequency reference of the other. The INTERN reference clock of the set has stratum 3 accuracy.

+LVL
Positive LeVeL is the level of positive pulses being received by the SunSet.

5.3.2 E1 Logical Results

The Logical screen reports all the parameters that are measured from a known test pattern. This screen will be available only if you have placed or received a data call. Refer to Figure 5.3.A.

```
                                  11:54:41
>X1-RR                 RDY R1-RR         <
>                                        <

       RESULTS - LOGICAL
 ET - 000:12:43   RT - CONTINU
 RCV- 2047        XMT- 2047
 BIT - 4          BER  - 0.0e-09
 ES  - 2          %ES  - 00.262
 SES - 0          %SES - 00.000
 EFS - 761        %EFS - 99.738
 AS  - 763        %AS  - 100
 UAS - 0          %UAS - 00.000
 DGRM- 1          %DGRM-08.333

PAGE-UP    PAGE-DN    STOP  ERR INJ
```

Figure 5.3.A
Logical Results Screen

The following information is provided in this screen:

RCV- The received test pattern is shown here.

XMT - The transmitted test pattern is shown here.

BIT
This is a count of the BIT errors since the beginning of the test.

BER
This is the Bit Error Rate since the beginning of the test.

BIT ES
This is a count of the bit Errored Seconds that have occurred since the beginning of the test. A bit errored second is a second with at least 1 bit error. Bit errored seconds are not counted during bit unavailable seconds.

BIT %ES
This is the percentage of BIT Errored Seconds that have occurred since the beginning of the test.

BIT SES
This is a count of the bit Severely Errored Seconds that have occurred since the beginning of the test. A bit severely errored second is a second with at least 1,544 bit errors (10^{-3} error rate). Bit severely errored seconds are not counted during bit unavailable seconds.

BIT %SES
This is the percentage of the bit Severely Errored Seconds that have occurred since the beginning of the test.

BIT EFS
This is a count of the bit Error Free Seconds since the beginning of the test.

BIT %EFS
This is the percentage of the bit Error Free Seconds that have occurred since the beginning of the test.

BIT AS
This is a count of the bit Available Seconds since the beginning of the test. A bit AS can be error-free, errored, or severely-errored; it cannot be unavailable.

BIT %AS
This is the percentage of bit Available Seconds since the begin ning of the test.

BIT UAS
This is a count of the bit UnAvailable Seconds since the beginning of the test. A bit unavailable second is a second during which the test pattern has lost synchronization. Bit unavailable seconds are also counted at the onset of 10 consecutive bit severely errored seconds. Bit unavailable seconds continue to be counted until the onset of 10 bit non-severely errored seconds.

BIT %UAS
This is the percentage of bit UnAvailable Seconds since the

beginning of the test.

BIT DGRM
This is a count of the bit DeGRaded Minutes that have occurred since the beginning of the test. A bit degraded minute is 60 non-severely errored seconds during which there is a total of at least 92 errors

BIT %DGRM
This is the percentage of bit degraded minutes since the beginning of the test.

Section 6 D-Channel Analyzer

Use this feature to trace the D-channel protocol messages. You can print these messages and store up to 400 in the buffer. The messages are displayed in hexadecimal format, as well as a decoded version with up to Layer 3 decoding. Refer to Figure 6.A for the D-ch Analyzer menu.

```
                                        11:01:33
>                                              <
>                                              <
              D-ch ANALYZER

              VIEW TRACER
              VIEW/PRINT BUFFER
              FILTER SETUP
```

Figure 6.A
D-Channel Analyzer menu

6.1 View Tracer

View Tracer allows you to view the live presentation of D-channel protocol messages as they are received on Line 1 & 2 Rx. These messages can be displayed in either hexadecimal or decoded format.

Note: You must be in a monitor mode to enter this menu item. In the TEST CONFIGURATION screen, select MODE: PRIMON.
1) From the ISDN - PRI MAIN MENU, enter D-ch ANALYZER
2) Enter VIEW TRACER
3) The screen will now show the live messages as they appear on Line 1 and Line 2. Figure 6.1.A shows a sample message.

```
                                 11:02:21
>                                       <
>                                       <


L2  <-NT     C/R:C  P/F:1  #426
97-04-25       14:45:26.886
SAPI : 000          TEI : 000
L2 MSGTYPE : RR
NS : XXX      NR : 009




                          HEX     PAUSE
```

Figure 6.1.A
Sample View Tracer Message

The following F-Keys are available in this screen:

PAUSE (F4) to pause the live presentation of messages. This allows you to view each message individually. After pausing, two new F-key choices appear: PREV (F1) and NEXT (F2). Use these keys to scroll through the captured messages.

RESUME (F4) to resume the live presentation of messages.

HEX/DECODE (F3) to determine the display format for the messages. HEX displays the message in hexadecimal format. DECODE decodes the message as the Layer 3 message type.

Figure 6.1.A shows a decoded message. The following information is provided in this screen:

- L2: This shows which line the message was received on. In Figure 6.1.A, the message was received on Line 2.

- <-NT: This shows the direction of the message. Here the message was sent from the NT (Network Terminal).

- C/R: C/R displays the Command/Response field bit, which identifies a frame as either a command or response. Figure 6.1.A's message is a command.

- P/F: This is the Poll/Final bit. In command frames, it is the P-bit; in response frames, it is the F-bit. When the P-bit is set to 1, it demands a response (F-bit set to 1). The F-bit is then set to 1 to indicate that this frame is a response from a poll command. Messages with P-bit 0 do not require a response and may be sent consecutively without responses.

- Date and Time: The second line displays the date and time (with a resolution of 1 millisecond) when this message was received.

- SAPI: The Service Access Point Identifier identifies the point where layer 2 services are provided to a Layer 3 entity. Currently, there are four assigned SAPI values:
  - 0 Call Control Procedures (normal voice/data call setup)
  - 1 Packet Mode using Q.931 Call Procedures (B-channel Packet calls)
  - 16 Packet communication conforming to X.25 Level 3 procedures (D-channel packet calls)
  - 63 Layer 2 management procedures

- TEI: The Terminal Endpoint Identifier identifies the terminal at the end of the connection. TEI values may be in the range of 0 to 127. The values are grouped as follows:

0-63	Fixed TEI assignment
64-126	Automatic TEI assignment
127	Group TEI for broadcast data link connection

- L2 MESGTYPE: This displays the Layer 2 message type. In Figure 6.1.A, this message is RR, Receive Ready. The Layer 2 messages are:

DISC	Disconnect Command
DM	Disconnect Mode
FRMR	Frame Reject Response
REJ	Reject
RNR	Receive not Ready
RR	Receive Ready
SABME	Set Asynchronous Balanced Mode Extended
UA	Unnumbered Acknowledgment

- NS: Sequence Number (sent) identifies the information frame being sent. The NS is a seven-bit field, allowing for values 0 to 127. NS identifies each transmitted Layer 3 frame to ensure that it is received correctly.

- NR: Sequence Number (received) identifies the number of the next information frame expected. Therefore, it indicates that this data-link layer entity has correctly received all Layer 3 frames numbered up to and including N(R)-1.

6.2 View/Print Buffer

This feature allows you to view and print specific data captured by the SunSet. The VIEW/ PRINT screen is displayed in Figure 6.2.A.

```
                                    20:25:13
>                       R1-RR              <
>                       R2-RR              <

           VIEW/PRINT BUFFER

            TOTAL MSG : 412

            FROM MSG  : 1
            TO MSG    : 412



CLR-ALL    PRINT    VIEW
```

Figure 6.2.A
View/Print Buffer

Three function keys are available in this screen:

CLR-ALL (F1): This option is the first step in erasing the contents of the buffer. After pressing (F1), you will be asked to press ENTER to continue the process. This second step provides security against accidentally erasing the buffer contents.

PRINT (F2): This option will print the contents of the buffer.

VIEW (F3): VIEW shows the contents of the buffer, as specified by the FROM MSG and TO MSG settings. Use the following procedure to determine these settings:

1) Make sure the cursor is on the FROM MSG line.
2) Enter the number from the keypad. This will be the first message displayed.
3) Cursor down to TO MSG.
4) Enter the number from the keypad. This will be the last message displayed.

When you have selected the message numbers, press VIEW (F3) to begin viewing the messages. Figure 6.2.B shows a sample message.

```
                                16:51:11
>X1-RR              RDY R1-RR          <
>                                      <


   L2 TE<-NT  C/R:C  P/F:0 #015
   97-04-18  16:42:58.885
   SAPI : 000       TEI : 078
   L2 MSGTYPE : I
   NS : 003         NR : 002
   L3 MSGTYPE : DISCONNECT
   CALLREFL : 01  CALLREFV :116



UP      DOWN        HEX      InfoElem
```

Figure 6.2.B
View Message

The layer 2 Information (i.e L2MSGTYPE, SAPI) has already been covered in Section 6.1. Layer 3 Information is also provided in the View Buffer screen. These are:

- L3 MSGTYPE: This displays the Layer 3 message type. In Figure 6.2.B, the message is Disconnect.

- CALLREFL: This is the Call Reference Length. It states the number of octets used for the Call Reference Value.

- CALLREFV: This displays the Call Reference Value. Each call has a particular call reference value; all message associated with this call contain the same value.

If the message contains anInformation Element, the InfoElem (F4) key appears. Pressing this key brings up the Information Element screen. Refer to Figure 6.2.C.

```
                                   16:53:17
>X1-RR              RDY R1-RR             <
>                                         <

CAUSE - 08h
  CODING STANDARD:0h
    ITU-TS-standard
  LOCATION:2h
    Public NT serve local user
  CAUSE CLASS:1h
    Normal event
  CAUSE VALUE:10h
    16 Normal call clearing

        PAGE-DN                 RETURN
```

Figure 6.2.C
Information Element Screen

Figure 6.2.C shows a sample cause information element. This provides diagnostic information, the reason a certain message was generated. The Cause info element contains three main fields: Location, Class, and Value. All three fields are decoded in this screen . You may refer to the appendix for a list of all the Cause Values, as defined in ITU Q.931.

6.3 Filter Setup

In this screen, select which D-channel messages you want to capture and analyze.

- Press L2_ONLY to capture only layer 2 messages
- Press L3_ONLY to capture only layer 3 messages
- Press ALL (F3) to capture both layer 2 and layer 3 messages

Section 7 Other Setup

The Other Setup menu allows you to configure several parameters associated with various PRI applications. Figure 7.A displays the Other Setup screen.

```
                                    17:54:36
>X1-RR                RDY R1-RR            <
>                                          <

               OTHER SETUP

       LINE 1 D chnl : 24
       L2 Bkup D chnl: 24
       L1 INTRFACE ID: 0
       L2 INTRFACE ID: 0
       LAYER 2 TEI   : 0
       NSF CODE      : NONE
       NSF TYPE      : SERVICE

INC+10   INC+1    DEC-10    DEC-1
```

Figure 7.A
Other Setup Screen

1) Line 1 D chnl
Options: 1-24 (T1), 1-32 (E1)

This specifies the Line 1 D channel. Use the F-Keys, INC+1 (F1) or DEC-1 (F2), to select a D Channel from 1 to 24. Channel 24 is normally used in North America, Channel 16 for ETSI.

2) L2Bkup D chnl
Options: 1-24

Use the F-Keys, INC+1 (F1) or DEC-1 (F2), to select a Backup D Channel from 1 to 24. This specifies the backup D channel for Line 2 for 46B+2D. In 46B + 2D, one D channel is active at a time; the other channel is in standby mode and can become active if the first one should go out of service. This pertains to North American protocols.

The Line 2 channel changes as you change the Line 1 D channel. If you want the Line 2 D channel to be different, cursor down to it and change it manually.

3) L1 INTRFACE ID
Options: 0-127

- Use the F-Keys, INC+10 (F1), INC+1 (F2), DEC-10 (F3), DEC-1 (F4), to select your interface ID for Line 1.

4) L2 INTRFACE ID
Options: 0-127

- Use the F-Keys, INC+10 (F1), INC+1 (F2), DEC-10 (F3), DEC-1 (F4), to select your interface ID for Line 2.

5) Layer 2 TEI
Options: 0-127

- Use the F-Keys, INC+1 (F2), DEC-1 (F3), 1/10 (F4), to select the Terminal Endpoint Identifier.
- The (F4) key sets the increment/decrement value at 0 or 10.
- The TEI number identifies the terminal to which the message is intended.

The values are grouped as follows:

0-63	Fixed TEI assignment
64-126	Automatic assignment
127	Group TEI for broadcast data link connection

Note: A value of 0 is normally used.

6) NSF CODE
F-Key Options: NONE (F1), NEXT (F2), table (F3)

- If you are using either AT&T, NI-2, or NTI protocols, you may specify the NSF CODE (Network Specific Facilities) using the NONE (F1) or NEXT (F2) keys.
- If you wish to enter a NSF CODE, it can be in the range from 0 to 31. This code specifies which network facilities are being invoked. Normally, for the TE mode, NSF is set to NONE, and for the NT mode, NSF is set to 2.
- Also, you may wish to view NSF options as specified by either AT&T Custom or National ISDN-2 by pressing the table (F3) key. This table gives the NSF CODE for certain options.

7) NSF TYPE
F-Key Options: SERVICE (F1), FEATURE (F2), table (F3)

- If you are using either AT&T, NI-2, or NTI protocols, you may specify the NSF type; this can either be FEATURE (F2) or SERVICE (F1).
- You may wish to view the NSF Type options as specified by either AT&T Custom or National ISDN-2 by pressing the table (F3) key. This table gives the NSF TYPE and NSF CODE for certain options. In this table, FEATURE is designated by "f," SERVICE by "s."

Section 8 Other Features

8.1 Error Injection

In this screen, you may configure the type of errors, as well as the number, to be sent when you press the ERR INJ key. Refer to Figure 8.1.A.

```
                                      22:09:18
>X1-UA                     RDY R1-SABME      <
>                                            <

              ERROR INJECTION

             TYPE  : LOG+BPV

             MODE  : BURST

            COUNT  : 1


 BPV      LOGIC        LOG+BPV        FBE
```

Figure 8.1.A
Error Injection Screen

1) TYPE
F-Key Options: BPV (F1), LOGIC (F2), LOG+BPV (F3), FBE (F4)

- You may inject bipolar violations (F1), logic/bit errors (F2), bipolar violations and bit errors together (F3), or frame bit errors (F4).

2) MODE
F-key Options: BURST (F1), RATE (F2)

- For BURST (F1), a specified number of errors are inserted at once when the ERRINJ key is pressed.
- For RATE (F2), the errors are inserted at a specified rate. When you inject errors at a rate mode, an ERR message is displayed at the top of the screen. To stop injecting errors at a rate, press the ERRINJ key again and verify that the error indicator no longer appears on the screen.

The third item will vary depending upon the Mode selected above. For Rate Mode, this line will be RATE; for Burst Mode, this line will be COUNT. See below.

3) COUNT
Options: 1 to 9999
Note: You will be able to insert only 1 Frame Bit Error.

For BURST MODE, choose the COUNT of errors to be inserted. Enter any number between 1 and 9999. The errors will be inserted in approximately 1 second or less, and will cause from 1 to 3 errored seconds.

4) RATE
Options: 1e-3 to 9e-9

For RATE MODE, choose the error RATE number and exponent. The errors will then be inserted at a continuous rate as specified in this entry.

To start error injection, simply press the ERR INJ key. The test set will insert errors as you have specified. If the error injection is set to RATE mode, an ERINJ indicator will be displayed on the screen.

Programming a burst of 10 errors
Here is a sample procedure for programming a burst of 10 Logic errors.

1) In the OTHER FEATURES menu, move the cursor to ERROR INJECTION and press ENTER.

2) At TYPE, choose LOGIC (F2).

3) The cursor automatically moves down to MODE selection. Press BURST (F1) key.

4) The cursor automatically moves down to COUNT.

5) Press the 1 key followed by 0 key. The COUNT should show 10.

6) Press ENTER; you have just programmed the set to inject 10 CODE errors each time you press the ERRINJ key.

Programming a 1e-06 bit error rate

Use this procedure to program a 1e-06 bit error rate:

1) In the OTHER FEATURES menu, move the cursor to ERROR INJECTION and press ENTER.

2) At TYPE, select LOGIC (F2).

3) The cursor automatically moves down to MODE selection. Choose RATE (F2).

4) The cursor automatically moves down to RATE. Your key pad allows you to enter the numeric number.

5) Press the '1' key once. The multiplier position is showing '1'. The cursor will automatically jump to the exponent position.

6) Press the '6' key once. A '6' is entered.

7) Press ENTER. You have just programmed the set to inject Bit errors at 1x10-6 rate each time you press the ERRINJ key or F-key.

8.2 VIEW TEST RECORD

This screen lets you view the results and events stored in the

SunSet. Figure 8.2.A displays the VIEW TEST RECORD screen.

```
                              15:03:27
>                                     <
>                                     <
          VIEW TEST RECORDS
          TOTAL EVENT -0
          TOTAL RESULT-21

          EVENT RECORD
           VIEW FROM:0
           VIEW TO  :0
          RESULT RECORD
           VIEW FROM:1
           VIEW TO  :21

       press ENTER to VIEW
 ALL     NONE     CLR-ALL    PRINT
```

Figure 8.2.A
View Test Record

The top two rows display the total number of results and events stored in memory. Events and results are defined as follows:

- *Event-* An event is a received error or alarm condition. To store events, you must turn on PRINT EVENT in SYSTEM PARAMETERS, REPORT CONFIG.
- *Result-* Result refers to all errors/measurements taken in the BERT & RESULTS screen.

1) EVENT RECORD

First, select the events you wish to view. Press ALL (F1) to view all stored events. Press NONE (F2) to view no events. If you wish to view only a select number of events, follow this procedure:

a. Enter the VIEW FROM number; this will be the first event displayed.
b. Cursor down to VIEW TO.
c. Enter the VIEW TO number; this will be the last event displayed.

2) RESULT RECORD

Select the results you wish to view.

- Press ALL (F1) to view all stored results.
- Press NONE (F2) to view no results.
- If you wish to view only a select number of results, follow this procedure:
  a. Enter the VIEW FROM number; this will be the first result displayed.
  b. Cursor down to VIEW TO.
  c. Enter the VIEW TO number; this will be the last result displayed.

After you have configured your VIEW FROM/ VIEW TO settings, press the ENTER key to begin viewing. You also have two other F-Key options:

- CLR-ALL (F3) to clear all events/results stored in memory
- PRINT (F4) to print the events/results

The events will be shown first. Press the NEXT (F1) and PREVious (F2) keys to view all the pages of events. After you have scrolled through all the specified events, the results are shown. Since each result may contain more than one page of data, you have four F-key options:

- Use PAGE-UP (F3) or PAGE-DN (F4) to view the different pages of the same result.
- Use NEXT (F1) or PREV (F2) to scroll to the next or previous result record. Note the record number above each result.

8.3 Load Samples

Load Samples loads 18 sample messages into the VIEW/ PRINT BUFFER. These messages will automatically clear and replace all messages currently stored in the storage buffer. After receiving the "Load samples will erase buffer" message, press ENTER to continue, or ESCAPE to leave the screen without loading the samples.

These messages are a sample of a simple turn-up, call setup and disconnect, which are helpful to any user who is unfamiliar with ISDN protocols.

8.4 Bulk Call

The Bulk Call feature is an automated test that stresses the PRI circuit to see how much traffic it can handle. The SunSet ISDN places a number of calls (maximum 99,999) at a maximum rate of 180 calls per minute.

Figure 8.4.A displays the setup screen.

```
                                      08:27:39
>X1-RR                  RDY R1-RR            <
>                                            <

               BULK CALL

  CALL TIMES(1-99999)       : 180
  SELF CALL                 : OFF
  CALL RATE (1-180/min)     : 60
  DIAL NUMBER :
       3638000



 <-        ->                     CALL
```

Figure 8.4.A
Bulk Call Screen

The following items can be configured for your bulk call test;

1) CALL TIMES
Options: 1-99,999

This line determines the number of calls the SunSet will generate during the test. The maximum number is 99,999. You may enter the number directly from the keypad. Use the arrow F-keys to edit your entry as needed.

2) SELF CALL
F-Key Options: OFF (F1), ON (F2)

- Select ON (F2) to place a self call during the test. In this case, the SunSet will call the CALLER NUMBER entered in the Test Configuration screen.

- Select OFF (F2) if you do not wish to place a self. In this case, the SunSet will call the number entered as DIAL NUMBER below.

3) CALL RATE

Options: 1-180 calls per minute

This specifies the call rate , the number of calls generated per minute. For example, in Figure 8.4.A, the number of calls is 180 and the call rate is 60. This means that 60 calls will be setup and released per minute, and the test will run for three minutes.

4) DIAL NUMBER

If you are not placing a self call, this will be the number called. You may enter the numbers directly from the keypad, using the arrow F-keys to edit your entry.

When you have finished configuring these items, press CALL (F4) to begin the test. A bulk call testing screen appears showing you the status of all B channels. Refer to Figure 8.4.B.

```
                                          17:54:36
>X1-RR                 RDY R1-RR                 <
>                                                <
          BULK CALL TESTING

  1       2  V    3 V     4       5
  6  V    7  V    8       9       10
  11      12 V    13      14 V    15
  16 V    17      18      19      20
  21      22      23
        ACTIVE CALLS     : 7
        CALLS COMPLETED  : 16
        TOTAL CALLS      : 25

RESULT
```

Figure 8.4.B
Bulk Call Testing Screen

You may view the live activity on all B channels simultaneously. The "V" indicates a valid call on that particular B channel. The bottom provides a running count of the status of your calls:

Active Calls: This is the number of calls that are currently connected.

Completed Calls: This is the number of calls which have been successfully completed and released.

Total Calls: This is the number of Call Setup messages which have been generated.

You may press the RESULT (F1) key for more information on your test. Refer to Figure 8.4.C.

```
>X1-RR              RDY R1-RR        <
>                                    <
         BULK CALL RESULT

  ORIGINATING CALLS    : 180
  TERMINATING CALLS    : 0
  COMPLETED CALLS      : 24

  DISC CAUSE VALUE:
  16 Normal Call Clearing

    24

         PAGE-DN              RETURN
```

Figure 8.4.C
Bulk Call Result

The result screen gives you the results of your finished test:

Originating Calls: The number of call setup messages generated by the SunSet ISDN.

Terminating Calls: The number of call setup messages received by the SunSet ISDN.

Completed Calls: The number of calls which were successfully connected and released.

Disc Cause Value: The disconnect cause values for each call are displayed and decoded. The number of calls disconnected with that cause value is provided below.

In Figure 8.4.B, the SunSet attempted 180 calls, as was specified in CALL NUMBER. Of those 180 calls, only 24 were connected and released. These all bear a Disc Cause value 16, Normal Call Clearing. Press the PAGE-DN (F2) key to find out what happened to the other attempted calls. Refer to Figure 8.4.D.

```
>X1-RR              RDY R1-RR        <
>                                    <

  17 User Busy

   156

  CHANNEL USED:
  1 - 1      2 - 2     3 - 1
  4 - 2      5 - 2     6 - 2
  7 - 1      8 - 2     9 - 1
  10- 1      11- 1     12- 1
  13- 2      14- 0     15- 0
  16- 2      17- 0     18- 0
PAGE-UP  PAGE-DN            RETURN
```

Figure 8.4.D
Bulk Call Result

The next screen shows us that 156 calls were released with a cause value of 17, designating user busy. This screen also shows the number of completed calls for each B-channel. Press the PAGE-DN (F2) to view the results on the last B-channels. Refer to Figure 8.4.E.

4) DIAL NUMBER

If you are not placing a self call, this will be the number called. You may enter the numbers directly from the keypad, using the arrow F-keys to edit your entry.

When you have finished configuring these items, press CALL (F4) to begin the sequential call test. A sequential call results screen appears showing you the status of each B channel. Refer to Figure 8.5.B.

```
                                  15:20:32
>X1-RR              RDY R1-RR            <
>                                        <
               SEQUENTIAL CALL

   1  PASS      2  PASS      3  PASS
   4  PASS      5  PASS      6  FAIL
   7  PASS      8  PASS      9  PASS
   10PASS       11PASS       12PASS
   13PASS       14ACTIVE     15
   16           17           18
   19           20           21
   22           23           24  D

 STOP
```

Figure 8.5.B
Sequential Call Results

All 23 B channels are shown on this screen (note that channel 24 is marked as the D-channel). Each channel may display one of the following status messages:

- PASS: A call has been successfully connected and released.
- FAIL: A call was attempted on the channel, but was not successful.
- ACTIVE: The call is still in progress for this channel.
- A blank indicates that a call has not yet been attempted for that channel.

Section 9 System Parameters

From this menu, you may enter various screens where you are allowed to customize system parameters. All the System Parameters menus and options are identical to the Basic Rate system parameters. Please refer to Chapter 4, Section 8 for more details or definitions on any of these settings.

Section 10 Leased Line - PRI

The Leased Line-PRI feature provides physical layer testing at the E1 or T1 interface (or fractional E1/T1 interface). You may run a BER test on the line, or monitor the signal for errors. If your SunSet has option SS401, Dual T1 Interface, you will perform your testing on the T1 line. For option SS402, Dual E1 Interface, you will test the E1 line Both are covered in this section.

10.1 Leased Line - PRI Test Set Configuration

Before plugging the SunSet ISDN into the E1 or T1 line, you must first properly configure the TEST CONFIGURATION. Refer to Figure 10.1.A.

1) MODE
Options: TE (F1), NT (F2)

- Select TE (F1) to emulate TE, Terminal Equipment.
- Select NT (F2) to emulate NT, Network Terminal.

2) BERT RATE (for T1, SS401)
Options: Nx64k (F1), Nx56k (F2), 1.544M (F3)

- Choose 1.544M (F3) for full-rate T1 testing.
- Choose Nx64K (F1) for fractional T1 testing where the fractional circuit is any number of 64 kbps channels within the DS1.
- Choose Nx56K (F3) where the fractional circuit is any number of 56 kbps channels within the DS1. In this case, the test set will transmit a 1 in the eighth (least significant) bit of each fractional T1 channel.

If you have selected either Nx56K or Nx64K, the Select Time Slot appears. Refer to Figure 10.1.B.

```
                                22:09:18
>                                      <
>                                      <

          SELECT TIME SLOT

      01 02 03 04 05 06 07 08
      09 10 11 12 13 14 15 16
      17 18 19 20 21 22 23 24





SEL-ALL  SELECT   UN-SEL  CLR-ALL
```

Figure 10.1.B
Select Time Slot Screen

Select which timeslots you wish to use for your test.
- Use the SELECT (F2) and UN-SEL (F3) keys to choose your timeslots. Any selected timeslots will be highlighted.

- Use CLR-ALL (F4) to clear all selected timeslots.
- SEL-ALL (F1) selects all 24 timeslots.
- After you have selected your timeslots, press the ENTER key to return to the Test Configuration screen.

3) BERT RATE (for E1, SS402)
Options: 2048K (F1), Nx64K (F2)

- Choose 2048K (F1) for full-rate E1 testing.
- Choose Nx64K (F1) for fractional E1 testing where the fractional circuit is any number of 64 kbps channels within the E1 signal. If you select (F2), a SELECT TIME SLOT screen will appear as shown in Figure 10.1.B. However, you may select any number of channels from 1 to 31 for your testing.

4) TEST PATTERN
F-Key Option: SELECT (F1)

The test pattern displayed here will be transmitted on the full E1 or T1 signal, or on the selected timeslots if you are performing a fractional test.

- To choose your test pattern, press SELECT (F1). Refer to Figure 10.1.C.

```
                                    15:03:27
>                                          <
>                                          <
          TEST  PATTERN
63        127       511       2047
2e15      2e20      1111      0000
1010      USER1     USER2     USER3
USER3:



EDIT        UP        <-          ->
```

Figure 10.1.C
Test Pattern screen

- Use the UP (F2) and arrow keys (F3 and F4) to move the cursor to the desired pattern. The SunSet will immediately begin transmitting the highlighted pattern.

Here are the standard test patterns which may be transmitted:

63: 63 is the 63-bit code, also known as 2e6-1.

127: 127 is the 127-bit code, also known as 2e7-1.

511: 511 is the 511-bit code, which conforms to the ITU V.52 technical standard. This pattern is also known as 2e9-1.

2047: 2047 is the 2047-bit code. This pattern is also known as 2e11-1.

2e15: 2e15 is the 2e15-1 pseudo random bit sequence. This signal is formed from a 15-stage shift register and is not zero-constrained. This pattern contains up to 14 zeroes in a row In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

2e20: 2e20 is the 2e20-1 pseudo random bit sequence. This signal is formed from a 20-stage shift register and is not zero-constrained. In SYSTEM PARAMETERS, TEST PARAMETERS, you may select whether this pattern will conform to the ITU or Japanese technical standard.

1111: The all 1s pattern is used for stress testing circuits.

1010: 1010 is the alternating ones and zeroes pattern.

0000: 0000 is the all zeroes pattern.

In addition to the provided standard patterns, you also may define and send three user patterns by following this procedure:

a) Cursor to USER1, 2, or 3.
b) Press EDIT (F1). The cursor will move to the EDIT line.
c) Enter up to *16 digits* in binary format (1s and 0s).
d) Press ENTER to set the pattern. The cursor will return to your chosen USER number

e) To edit the entered pattern, simply repeat the process.

Press the ENTER key to return to the Leased Line- PRI menu.

10.2 PRI INTERFACE

The PRI Interface screen configures the line interface. Before plugging in, you want to make sure that these settings are properly configured for your circuit. If your SunSet has option SS401, Dual T1 Interface, refer to Section 10.2.1. For option, SS402, Dual E1 Interface, refer to Secton 10.2.2.

10.2.1 T1 PRI Interface (for SS401)

This screen configures the physical T1 layer. Refer to Figure 10.2.A.

```
                                      18:50:21
>                                            <
>                                            <

             PRI  INTERFACE

          FRAMING   :  ESF
          CODING    :  B8ZS
          RxLVL-1   :  TERM
          XMTCLK    :  RCVCLK
          TxLBO-1   :  0dB



INTERN   RCVCLK
```

Figure 10.2.A
Leased Line - PRI Interface

1) FRAMING
F-key Options: ESF (F1), SF (F2), UNFRM (F3)

- Select SF (F2) Super Frame. SF framing does not have a data link or CRC error detection.

- ESF (F1) refers to Extended Super Frame. in ESF, 6 framing bits are used for CRC-6 (Cyclic Redundancy Check Code 6) and 12 are used for the ESF Facility Data Link (FDL).
- Select UNFRM for an unframed T1 signal.

2) CODING

F-key Options: B8ZS (F1), AMI (F2)

- AMI (Alternate Mark Inversion) requires the terminal transmitting data to have at least a 12.5% average 1's density and a maximum of 15 consecutive zeroes.
- B8ZS (Bipolar 8-Zero Substitution) uses a bipolar violation substitution which guarantees the 12.5% average with a maximum number of 7 consecutive zeroes. B8ZS coding is preferred, because it reduces transmission problems caused in AMI.

3) RxLVL 1

F-key Options: TERM (F1), BRIDGE (F2), DSXMON (F3)

- RxLVL-1 configures the LINE1 1.544 Mbps receiver.
- This setting lets the SunSet electrically decode a 1.544 Mbps signal under a wide range of resistive or cable losses.
- This setting also determines which electrical load will be placed on the circuit by the SunSet. There is no effect on the transmitter. In a 1.544 Mbps circuit, there must always be exactly one receiver that applies the low impedance (100 ohm) termination. There should never be two or more receivers applying a low impedance termination.

WARNING
IF YOU ARE UNCERTAIN, CHOOSE BRIDGE. THIS WILL PROTECT THE 1.544 Mbps SIGNAL.

TERM (F1)

The TERM mode is used when you will both send and receive a T1 signal. It requires that the circuit be disrupted for testing.

The received signal is terminated by the test set. The received signal is not obtained through a MONITOR jack. The received signal can have up to 36 dB of cable transmission loss (this is a different kind of loss than the 20 dB of resistive loss provided by a DSX MON jack).

Note that if you plug into a DSX MON jack in the TERM mode, the BPV LED will probably come on. Use the DSXMON mode instead.

DSXMON (F3)

The DSXMON access mode is used when a monitor measurement will be made. The signal is provided from the MON jack of a DSX, DS1 plug-in card, CSU, or NI. The DSX has isolated the MON signal from the live signal with a high impedance circuit. The transmitter is turned on and is sending the selected test pattern.

This mode is useful, since the DSX monitor jack protects the live signal from any possible disruptions caused by the testing process. It allows the technician to observe the line and check for problems, while the customer is actually using it.

If DSXMON mode is selected when a 3V signal is received, then the red BPV LED will be lit. This often happens if DSX MON is selected when the test set is plugged into an OUT jack. In this case, TERM should be selected instead of DSXMON. In some cases, it may not be clear if the mon jack provides a bridged access or a 20 dB isolated monitor access. In this case, you should try BRIDGE first to see if this works and then try DSXMON if it doesn't.

BRIDGE (F2)

The BRIDGE monitor is similar to the DSXMON monitor. However, in BRIDGE, the test set taps into a live, in-service, terminated DS1 signal with up to 36 dB cable loss. The test set applies isolation resistors to protect the circuit from a hit. Be sure to select BRIDGE before clipping onto the live circuit. This will put the isolation resistors in place and ensure that the test set does not place a hit on the circuit.

If you use BRIDGE mode on a DSXMON jack, there will be a total of 40 dB resistive isolation and the test set will likely report loss of signal. In some cases, it may not be clear if the monitor jack being used provides a bridged access or a 20 dB isolation monitor access. In this case, you should try BRIDGE first to see if this works and then try DSXMON if it doesn't.

4) XMT CLOCK

F-key Options: INTERN (F1), RCVCLK (F2)

XMT CLOCK determines the timing source for your transmit signal.

- INTERN (F1) uses the test set's internal timing as its clock source. You should use INTERN when you want to emulate a piece of network equipment (NT).
- RCVCLK (F2) uses the timing signal received on Line 1. Use RCVCLK if you are plugging into a switch or other synchronous element, which requires the test set to be synchronized to the network.

5) LB0-1

F-key Options: 0dB (F1), -7.5dB (F2), -15dB (F3), -22.5dB (F4)

- LBO 1 stands for Line Build Out for Line 1. Line Build Out is used to stress test a line by attenuating the dB to a certain level.

When you have finished configuring your PRI Interface, press ENTER to return to the LEASED LINE - PRI menu.

10.2.2 E1 PRI Interface (for SS402)

This screen configures the physical E1 layer. Refer to Figure 10.2.B.

```
                              18:35:22
>                                    <
>                                    <
        LINE INTERFACE

       MODE         : MONITOR
       FRAMING      : PCM31
       CRC-4        : YES
       CODING       : HDB3
       XMT CLOCK    : RCVCLK




PCM31    PCM30    UNFRM
```

Figure 10.2.B
E1 PRI Interface (SS402)

1) MODE

F-Key Options: TERM (F1), BRIDGE (F2), MONITOR (F3)

You must specify the Line Interface MODE for your testing. TERM is the most common mode used for out-of-service testing. BRIDGE or MONITOR are commonly used for testing live circuits.

TERM (F1)

The TERM mode is used when you wish to send and receive an E1 signal. The test set terminates the received signal with a low impedance termination, and requires that the circuit be disrupted for testing. A 75 ohm termination is used for BNC and 1.6/5.6 mm connectors. A 120 ohm termination is used for BR2 and Bantam connectors.

MONITOR (F3)

The MONITOR (protected monitoring point) mode is used for monitoring. The signal is provided from the MON jack of an E1 network element. The network element has isolated the MON signal from the live signal with high impedance resistors. The test set has an Automatic Gain Control (AGC) circuit to compensate for the resistive loss from -15 dB to -30 dB. If the signal source is not a resistively attenuated MON output signal, the AGC will not operate properly, and as a result, CODE ERR and/or other problem indicators will be shown on the test set.

The MONITOR mode is useful because it protects the live signal from possible disruptions caused by the testing process. It allows the technician to observe the line while the circuit is carrying customer traffic. Note that there is generally no need to plug into the TX jack of the test set while in this mode, and there is no need to specify a test pattern to be transmitted. However, the transmitter in the test set is continually sending the selected test pattern, framing, coding, and CRC for the rare occasion that it will be needed.

BRIDGE (F2)

The BRIDGE mode is similar to the MONITOR mode. However, in the BRIDGE mode, the test set applies high impedance isolation resistors to the circuit under test. This isolation circuitry will protect the signal from any possible disruption.

If a connection is made from the MON jack of a network element to the test set, and if the BRIDGE access mode is being used, this may result in two isolation circuits on the signal. In this case, the test set will likely report a loss of signal and be unable to perform any measurements.

2) FRAMING

F-key Options: PCM31 (F1), PCM30 (F2), UNFRM (F3)

- Choosing PCM30 (F2) means that the SunSet will synchronize on both Frame Alignment Signal (FAS)and Multiframe Alignment Signal (MFAS).
- Choosing PCM31 (F1) means that the set will synchronize only on FAS; it will disregard the Multiframe Alignment Signal.
- UNFRM (F3) specifies an unframed signal.
- If the framing on the received signal does not match your framing type selected here, the FRM SYNC LED on the SunSet will light red.

3) CRC-4

F-Key Options: YES (F1), NO (F2)

- YES (F1) allows the SunSet to measure CRC-4 errors on the incoming signal and also transmit CRC-4 bits on the outgoing signal. CRC-4 works only with PCM30 and PCM31 framing.

4) CODING
F-key Options: AMI (F1),HDB3 (F2)

- Choose AMI (F1) for Alternate Mark Inversion. AMI coding is not commonly used in 2.048Mbps transmission, because synchronization loss occurs during long strings of data zeroes.
- HDB3 (F2) was adopted to eliminate the loss of synchronization with AMI. In HDB3, a string of 4 consecutive zeroes is replaced with a substitute string of pulses containing an intentional Bipolar Violation.

5) XMT CLOCK
F-key Options: INTERN (F1), RCVCLK (F2)

XMT CLOCK determines the timing source for your transmit signal:

- INTERN (F1) uses the test set's internal timing as its clock source. You should use INTERN when you want to emulate a piece of network equipment (NT).
- RCVCLK (F2) uses the timing signal received on Line 1. Use RCVCLK if you are plugging into a switch or other synchronous element, which requires the test set to be synchronized to the network.

10.3 Leased Line - PRI BERT & Results

The BERT & RESULTS menu choice provides all the necessary results for your physical layer testing. It gives all the measurements of your E1 or T1 signal. You also may perform a BER test and view all associated logical results.

These screens are similar to the BERT & RESULTS screens found in the normal PRI menu. Please refer to Section 5 of this chapter for sample screens and definitions.

10.4 Other Setup

For a description of the features in this menu, please see Section 7 Other Setup.

10.5 Other Features

For an explanation of these items, please see Section 8 Other Features.

10.6 System Parameters

For an explanation of this menu, please see Section 9 System Parameters.

Chapter 7
PRI Applications

The PRI Applications chapter is divided into two sections:

Section 1: contains all applications for SS401, Dual T1 PRI Interface. These applications should be used when testing a 1.544 Mbps T1 PRI circuit.
Section 2: contains all applications for SS402, Dual E1 PRI Interface. These applications should be used when testing a 2.048 Mbps E1 PRI circuit.

Section 1 T1 PRI Applications (for SS401)

1.1 Placing a PRI 23B + D Voice Call

This outlines the procedure for placing an ISDN PRI voice call.

1) Verify that the span is not in service. This application will disrupt service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: TE
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: 2047; this field pertains only to a data call.
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER. Configure the screen settings for:
TEST MODE: 23B+D
FRAMING: as specified by your circuit, but normally this is set for ESF.
CODING: as specified by your circuit, but normally this is

set for B8ZS.

RXLVL-1: TERM

XMT CLK: RCVCLK

Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 1.1.A. The Line 1 Tx jack should connect to the DSX IN jack. The Line 1 Rx jack should connect to the DSX OUT jack.

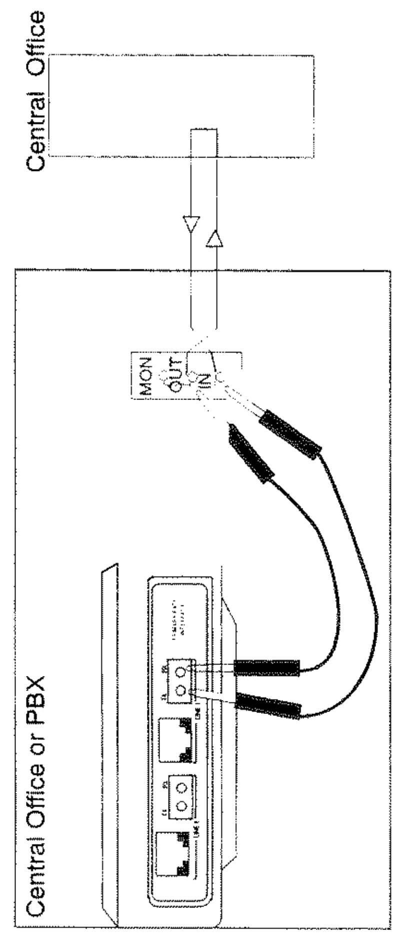


Figure 1.1.A
ISDN Call Setup- TE Mode

7) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

8) Enter CALL SETUP. Select the following in this screen:

CALL TYPE: SPEECH (F1)
B CHANNEL: This is the B channel you plan to use to place your call. Use the (F1) and (F2) keys to scroll through your 23 channels.

9) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

10) Before placing your call, check the Layer 2 messages displayed at the top of the screen. The R1 should show RR (Receive Ready). The RDY message should also be present; this indicates that Layer 2 has been established and the set is ready to handle calls.

11) Press CALL (F1) to place your call.

12) The call will be connected through the speaker and microphone built into the test set. You could also talk/listen through a handset. Connect a handset to the HANDSET jack located on the right side of the set. Follow this procedure:
   a. Press the SHIFT, then Call Control key (represented by a handset).
   b. Press CHG-TYP (F2).
   c. Press the arrow key (F4) to move the cursor to SPEAKER.
   d. Press HANDSET (F2).

13) You may change your call type while the call is in place. Follow these steps:
   a. Press the SHIFT, then Call Control key (represented by a handset).
   b. Press CHG-TYP (F2).
   c. The cursor is now at SPEECH. You may choose DATA-64 (F2), DATA-56 (F3), or Nx64 (F4) to change your voice call to a data call.

14) To disconnect the call, press the SHIFT and Call Control keys, then press ON-HOOK (F1).

1.2 Placing a PRI Data Call

This outlines the procedure for placing an ISDN data call at a 56K or 64K rate. You can perform a data call two ways:

A. Point-to-Point: The SunSet ISDN calls another piece of test equipment (which is also TE). Both test sets must be transmitting the same pattern.

B. Loopback: The SunSet ISDN calls a loopback device, which loops back the transmitted test pattern. This method does not require any setup at the far-end.

1) Verify that the span is not in service. This application will disrupt service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: TE
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: select which test pattern you wish to transmit for your data call. Press SELECT (F1) key; use the down arrow and F-keys to select the desired pattern. After the right pattern is highlighted, press the ENTER key to return to the Test Configuration screen.
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER Configure the screen settings for:

TEST MODE: 23B+D
FRAMING: as specified by your circuit, but normally this is set for ESF.
CODING: as specified by your circuit, but normally this is set for B8ZS.
RXLVL-1: TERM
XMT CLK: RCVCLK
Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 1.2.A.

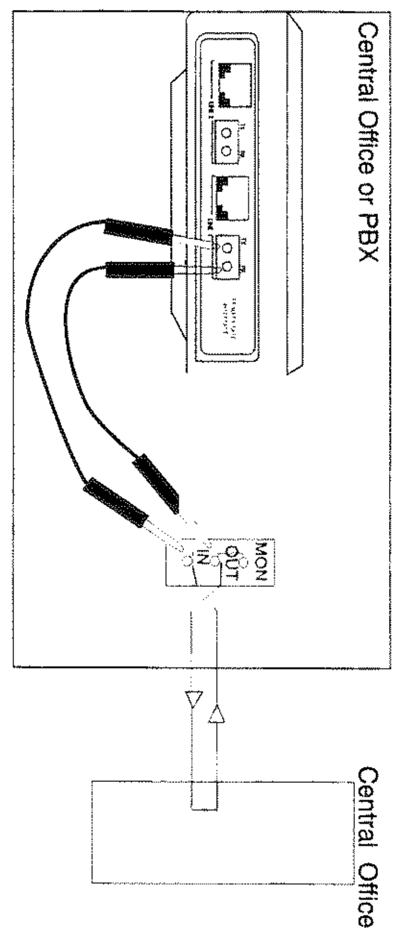


Figure 1.2.A
ISDN Call Setup- TE Mode

7) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the SHIFT, then HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

8) Enter CALL SETUP. Select the following in this screen:

CALL TYPE: DATA-56 (F2), DATA-64 (F3)
B CHANNEL: This is the B channel you plan to use to place your call. Use the (F1) and (F2) keys to scroll through the 23 channels.

9) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

10) Before placing your call, check the Layer 2 messages displayed at the top of the screen. The R1 should show RR (Receive Ready). The RDY message should also be present; this indicates that Layer 2 has been established and the set is ready to handle calls.

11) Press CALL (F1) to place your call.

12) To perform a BER test on the data call, escape to the ISDN-PRI menu. Cursor down to BERT & RESULTS; press ENTER. The first BERT & RESULTS screen gives a summary of the elapsed time (the time since you first entered this screen) and the error count during that time.

- Press PAGE-DN (F2) to view the results on your T1 line.
- Press PAGE-DN (F2) again to view the Logical results page. Here you can view any received bit errors. Refer to Figure 1.2.B. Refer to Chapter 6, Section 5 for definitions and descriptions of the measurement terms seen in these screens.
- If you have a loopback in place, you may want to inject errors with the ERR INJ key and verify that they return back to you.

```
                              11:54:41
>X1-RR              RDY R1-RR        <
>                                    <

       RESULTS - LOGICAL
 ET - 000:12:43   RT - CONTINU
 RCV- 2047        XMT- 2047
 BIT - 4          BER  - 0.0e-09
 ES  - 2          %ES  - 00.262
 SES - 0          %SES - 00.000
 EFS - 761        %EFS - 99.738
 AS  - 763        %AS  - 100
 UAS - 0          %UAS - 00.000
 DGRM- 1          %DGRM-08.333

PAGE-UP    PAGE-DN   STOP  ERR INJ
```

Figure 1.2.B
Logical Results screen

13) You may change the test pattern while the call is in place. From the ISDN-PRI menu, enter TEST CONFIGURATION. Cursor down to Test pattern. Press SELECT (F1) and use the arrow keys to select the desired pattern. After the right pattern is highlighted, press the ENTER key to return to the Test Configuration screen.

14) To disconnect the call, press the SHIFT and Call Control keys, then press ON-HOOK (F1).

1.3 ISDN PRI Monitoring from DSX MON jacks

This procedure illustrates monitoring an ISDN line from both directions. This application requires a DSX monitor access point.

1) This test may be performed while the PRI line is in-service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:
- MODE: PRIMON
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: N/A (monitoring only)
- MY PHONE NUMBER: N/A (monitoring only)

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER Configure the screen settings for:

TEST MODE: PRIMON (You won't be able to change this).
FRAMING: as specified by your circuit
CODING: as specified by your circuit
RxLVL-1: DSXMON
RxLVL-2: DSXMON

6) Connect the Line 1 and Line 2 Rx jacks to the DSX Monitor jacks, as shown in Figure 1.3.A. You may perform this test anywhere you have access to the T1 circuit, i.e. central office, customer premises, span.

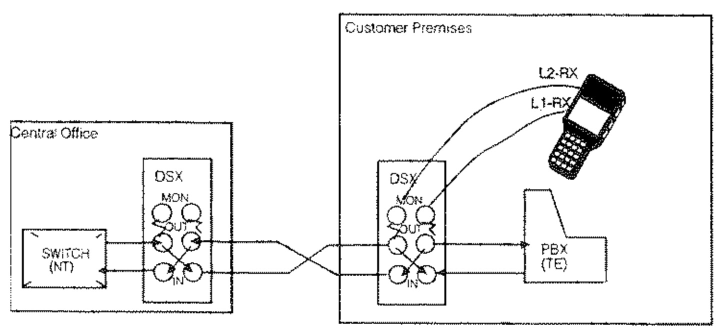


Figure 1.3.A
Monitoring a PRI line

Note: Figure 1.3.A shows the SunSet connected to DSX monitor jacks. If you do not have a monitor access point, which is providing 20 dB isolation, you will need to select RxLVL-1 & 2 : BRIDGE.

7) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing the Framing type in PRI INTERFACE.

8) From the ISDN-PRI menu, enter BERT & RESULTS to monitor the physical layer. This screen will indicate if you have a problem with the T1 signal. 'NO ERRORS' means the T1 signal is good. Escape back to the ISDN-PRI menu.

9) Enter D-ch ANALYZER, VIEW TRACER. You should now see a live presentation of messages received on both Line 1 and Line 2. The first line of each message gives you the received line, as well as the direction of each message. Press PAUSE (F4) to pause the messages. Use the HEX/DECODE (F3) key to display the messages in either hexadecimal or decoded format.

10) Escape and enter into the VIEW/PRINT BUFFER screen. At the initial screen, you may choose to view or print all the messages, or a certain number of messages. To view a select number, make sure that the cursor is on the VIEW FROM line. Enter the number of the first message you wish to see. Cursor down to VIEW TO, and enter in the message number where you will stop viewing. When your settings are correct, press VIEW (F3).

11) When you have finished monitoring, disconnect your test set from the circuit and turn the set off.

1.4 Emulate an ISDN Network Terminal or PBX

This procedure illustrates how the SunSet ISDN can replace an NT or PBX.

1) Verify that the span is not in service. This ISDN call will disrupt service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: NT
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: 2047- If you plan to place a data call, select your transmit test pattern. Press SELECT (F1) and use the down arrow and F- keys to select the desired pattern. After the right pattern is highlighted, press the ENTER key to return to the Test Configuration screen.
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER Configure the screen settings for:

TEST MODE: 23B+D
FRAMING: as specified by your design
CODING: as specified by your design
RXLVL-1: TERM
XMT CLK: INTERN
Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 1.4.A. Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

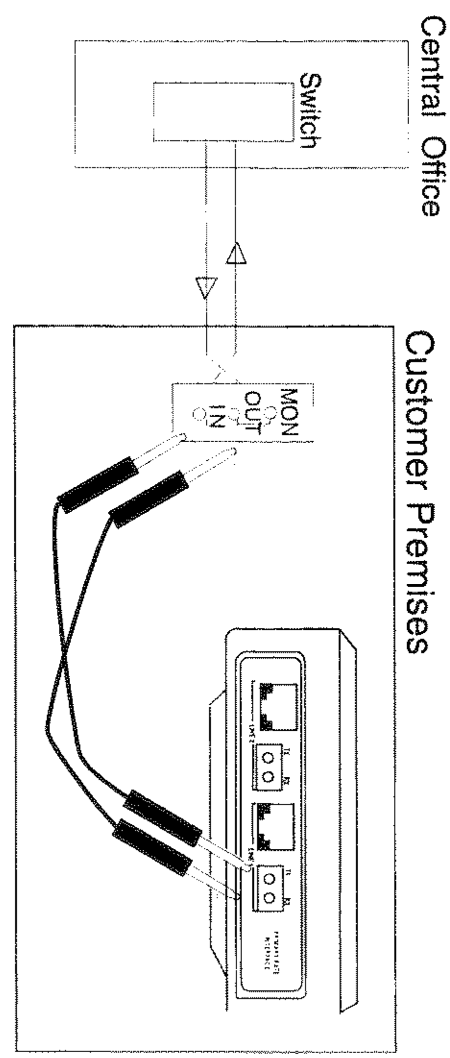


Figure 1.4.A
NT Emulation

7) When emulating an NT, you may place a call. Follow the same call setup procedures outlined in Section 2.1, Placing a Voice

call TE mode. You also may handle call setup messages sent from a TE device. When there is an incoming call, the SunSet will ring and the Call Control screen will be displayed. The call Control screen will show an incoming call with the Caller # (if provided). You will be given the option to accept or reject this call.

1.5 Placing 2 Simultaneous B-Channel Calls

This procedure illustrates placing two simultaneous B-Channel calls.

1) Verify that the span is not in service. This ISDN call will disrupt service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: TE
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: 2047- If you plan to place a data call, select your transmit test pattern. Press SELECT (F1) and use the down arrow and F-keys to select the desired pattern. After the right pattern is highlighted, press the ENTER key to return to the Test Configuration screen.
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER. Configure the screen settings for:
TEST MODE: 23B+D
FRAMING: as specified by your design

CODING: as specified by your design
RXLVL-1: TERM
XMT CLK: RCVCLK
Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 1.5.A.

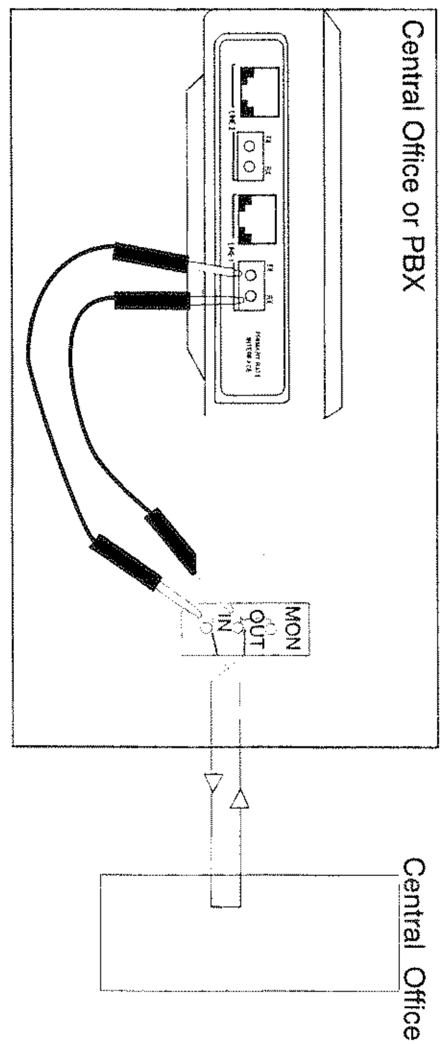


Figure 1.5.A
Placing a Call- TE Mode

7) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

8) Enter CALL SETUP. Select the following in this screen:

CALL TYPE: SPEECH (F1)
B CHANNEL: This is the B channel you plan to use to place your call. Use the (F1) and (F2) keys to scroll through your 23 channels.

9) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

10) Before placing your call, check the Layer 2 messages displayed at the top of the screen. The R1 should show RR (Receive Ready). The RDY message should also be present; this indicates that Layer 2 has been established and the set is ready to handle calls.

11) Press CALL (F4) to place your call.

12) The call will be connected through the speaker and microphone built into the test set. You could also talk/listen through a handset. Connect a handset to the HANDSET jack located on the right side of the set. Follow this procedure:
a. Press the SHIFT and Call Control keys.
b. Press CHG-TYP (F2).
c. Press the right arrow key to move the cursor to SPEAKER.
d. Press HANDSET (F2).

13) Press the SHIFT and Call Control keys again to return to the Call Setup screen. Change your Call Type to either DATA-56 (F2), DATA-64 (F3), or Nx64 (F4). Notice that your B-channel has automatically changed to the next channel. This is to prevent you from trying to make 2 calls on the same B-channel. If you want to select a different B-channel, use the (F1) and (F2) keys to scroll through the 22 channels.

Note: You may place two voice calls or one voice and one data. You may not place two data calls.

14) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

14) Press CALL (F4) to place your call.

15) Press the SHIFT and Call Control key again. Figure 1.5.B provides a sample screen.

```
              C1:   C2:     14:53:31
>X1-RR            RDY R1-RR         <
>                                   <

           CALL CONTROL
-----CALL1 > OFFHOOK-----------
 CALLER NO : 2260337
 CALL TYPE : SPEECH    HANDSET
-----CALL2 > OFFHOOK-----------
 CALLER NO : 2260337
 CALL TYPE : DATA-64

 ---CALL1---           ---CALL2---
ON HOOK  CHG_TYP  ON HOOK   CHG_TYP
```

Figure 1.5.B
Call Control Screen

16) You may change the call types of either call, but you may have only one data call in place at a time. To change a call type, press either (F2) for Call 1 or (F4) for Call 2.

17) To disconnect your calls, press ON HOOK (F1) for Call 1 and ON HOOK (F3) for Call 2.

1.6 Monitoring a PRI Circuit with a Y-Adapter

This application outlines how to monitor both directions of a PRI circuit using a Y-adapter (SS433).

1) This test may be performed while the PRI line is in-service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:
- MODE: PRIMON
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: N/A (monitoring only)
- MY PHONE NUMBER: N/A (monitoring only)

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER Configure the screen settings for:

TEST MODE: PRIMON (You won't be able to change this).
FRAMING: as specified by your circuit
CODING: as specified by your circuit
RxLVL-1: BRIDGE
RxLVL-2: BRIDGE

6) Connect a Y-adapter (SS433) to either the PBX or NT. The Y-adapter works as a splitter; it splits the T1 signal into two connections. One connector should be used for the connection between the PBX and NT (this is the live T1 circuit which you will monitor). The other connector should be used as a bridge access point for the SunSet ISDN. Figue 1.6.A shows a diagram where the Y-adapter is placed at the NT.

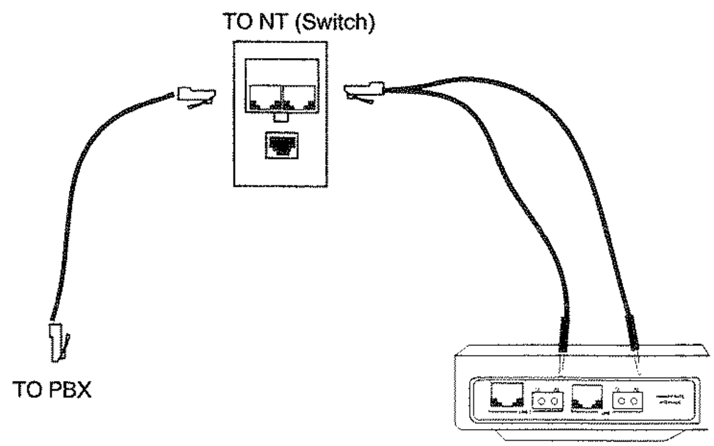


Figure 1.6.A
Plugging the Y-adapter to the Switch

According to this diagram, connect the Y-adapter to the RJ-48 port at the NT. Connect, via RJ48 to RJ48 in Figure 1.6.A, the NT to the PBX. With the other Y-adapter port, connect an RJ-48 to bantam cable, and place the two batam jacks into the two PRI receivers of the SunSet ISDN.

Figure 1.6.B provides an example wher e the Y-Adapter is placed at the PBX.

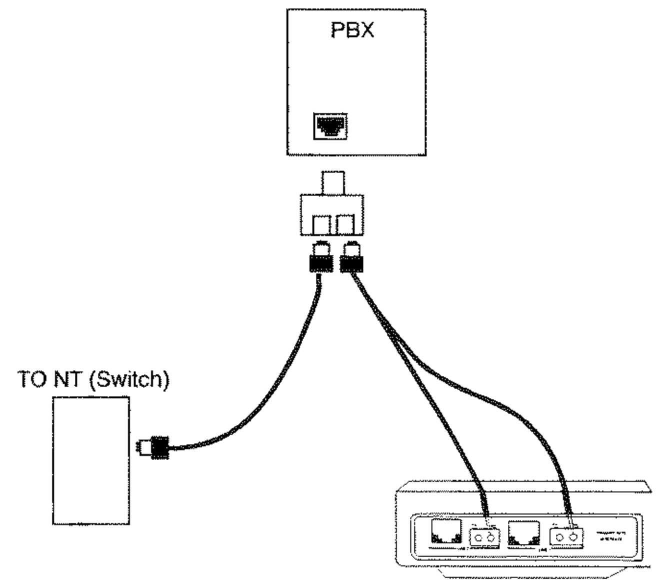


Figure 1.6.B
Plugging the Y-adapter to the PBX

According to this diagram, connect the Y-adapter to the RJ-48 port at the PBX. Connect, via RJ48 to RJ48 , the PBX to the NT. With the other Y-adapter port, connect an RJ-48 to bantam cable, and place the two batam jacks into the two PRI receivers of the SunSet ISDN.

7) Once connected to the circuit, verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing the Framing type in PRI INTERFACE.

8) From the ISDN-PRI menu, enter BERT & RESULTS to monitor the physical layer. This screen will indicate if you have a problem with the T1 signal. 'NO ERRORS' means the T1 signal is good. Escape back to the ISDN-PRI menu.

9) Enter D-ch ANALYZER, VIEW TRACER. You should now see a

live presentation of messages received on both Line 1 and Line 2. The first line of each message gives you the received line, as well as the direction of each message. Press PAUSE (F4) to pause the messages. Use the HEX/DECODE (F3) key to display the messages in either hexadecimal or decoded format.

10) Escape and enter into the VIEW/PRINT BUFFER screen. At the initial screen, you may choose to view or print all the messages, or a certain number of messages. To view a select number, make sure that the cursor is on the VIEW FROM line. Enter the number of the first message you wish to see. Cursor down to VIEW TO, and enter in the message number where you will stop viewing. When your settings are correct, press VIEW (F3).

11) When you have finished monitoring, disconnect your test set from the circuit and turn the set off.

1.7 Running a Sequential Call Test

Sequential Call is an automated PRI turn-up test. In the Sequential Call test, the SunSet ISDN places a call on each B-channel sequentially, and displays which B channels had successful or failed calls.

1) Power on the test set.

2) From the Main Menu, enter ISDN-PRI.

3) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: TE
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: 2047; this field pertains only to a data call.
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

4) Cursor down to PRI INTERFACE; press ENTER. Configure the screen settings for:
   TEST MODE: 23B+D
   FRAMING: as specified by your circuit, but normally this is set for ESF.
   CODING: as specified by your circuit, but normally this is set for B8ZS.
   RXLVL-1: TERM
   XMT CLK: RCVCLK
   Tx LBO -1: 0 dB

5) Connect the test set to the circuit using the Line 1 Tx/Rx bantams or the Line 1 RJ-48 jack. You may refer to Figure 1.1.A if necessary.

6) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

7) From the PRI menu, enter Other Features, Sequential Call. Configure the sequential call settings as follows:

   HOLD TIME(S): 3 (this will keep each call up for 3 seconds before releasing; you may enter in any value from 0 to 9999 seconds)
   SELF CALL: On or Off, depending if you want to call another number or your own. In this case, the SunSet will call the CALLER NUMBER entered in the Test Configuration screen. When OFF, the SunSet will call the number entered as DIAL NUMBER below.
   CALL TYPE: VOICE, DATA-56, or DATA-64
   DIAL NUMBER: Enter the number you wish to call. When Self Call is on, this number should match the Caller # in Test Configuration.

8) When these settings have been entered properly and you are ready to run the test, scroll down to Dial Number. Press CALL (F4).

9) A sequential call results screen appears showing you the status of each B channel. The 23 B-channels are shown on the screen. Note that channel 24 is the D channel; no call will be attempted on it.

The results are as follows:

- ". " : The SunSet is dialing on this channel.
- "PASS": A call has been successfully connected and released.
- "FAIL": A call was attempted on the channel, but was not successful.
- "ACTIVE": The call is currently connected for this channel.
- A blank indicates that a call has not yet been attempted for that channel.

10) Press STOP (F1) to stop the test; press START (F1) to resume testing. To quit the test, press STOP, then escape from the screen.

1.8 Using the Bulk Call Test

The Bulk Call feature is an automated test that stresses the PRI circuit to see how much traffic it can handle.

1) From the ISDN-PRI menu screen, enter TEST CONFIGURATION. Set up the screen as follows:

MODE: TE
PROTOCOL: AT&T, NTI, NI-2 (set per circuit)
TEST PATTERN: 2047 (or press SELECT F1 to change pattern)
MY PHONE NUMBER: enter the number of the line you are calling from

Press ENTER to return to the ISDN-PRI menu.

2) Cursor to PRI INTERFACE, and press ENTER. Configure the screen as follows:

FRAMING: ESF
CODING: B8ZS
RxLVL-1: TERM
XMTCLK: RCVCLK
Tx LBO-1: 0 dB

3) Connect the SunSet ISDN to the circuit via the Line 1 bantams or the Line 1 RJ-48 port. You may refer to Figure 1.1.A if necessary.

3) From the ISDN PRI menu, enter OTHER FEATURES, BULK CALL. Set up as follows:

CALL TIMES: 23 (this sets the SunSet to place 23 calls; you may enter any number from 1 to 9999).
SELF CALL: OFF or ON, depending if you wish to call another number or yourself. When On, the SunSet will call the CALLER NUMBER entered in the Test Configuration screen. When Off, the SunSet will call the number entered as DIAL NUMBER below.
CALL RATE: 180 (this sets the rate at 180 calls per minute). Note that when placing a self call, the maximum call rate is 90.
CALL TYPE: SPEECH, DATA-56, or DATA-64
DIAL NUMBER: Enter the number you wish to dial. If placing a self call, make sure that this number matches the Caller Number in Test Configuration.

4) When you have finished configuring these items and are ready to begin the test, scroll down to DIAL NUMBER. Press CALL (F4) to begin the test.

5) A Bulk Call Testing screen appears showing you the status of all B channels. You may view the live activity on all B channels simultaneously:
The "V" indicates that B channel is active.
A blank means that B channel is idle.

6) The bottom of this screen provides a running count of the status of your test.

Active Calls: This is the number of calls that are currently connected.

Calls Completed: This is the number of calls which have been successfully completed and released.

Total Calls: This is the number of Call Setup messages which have been generated.

7) Press the RESULT (F1) key for more information on your test.

Note: You will need to press the PAGE-DN (F2) key to read all the result information.

Originating Calls: The number of call setup messages generated by the SunSet ISDN.

Terminating Calls: The number of call setup messages received by the SunSet ISDN.

Completed Calls: The number of calls which were successfully connected and released.

Disc Cause Value: The disconnect cause values for each call are displayed and decoded. The number of calls disconnected with that cause value is provided below.

Start Time: The time of the start of the test.

End Time: The time at test completion.

Section 2 E1 PRI applications (for SS402)

2.1 Placing a Voice Call

This outlines the procedure for placing an ISDN voice call.

1) Verify that the span is not in service. This application will disrupt service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: TE
- PROTOCOL: ETSI or determined by the switch you're using.
- TEST PATTERN: 2047- This field pertains only to a data call.

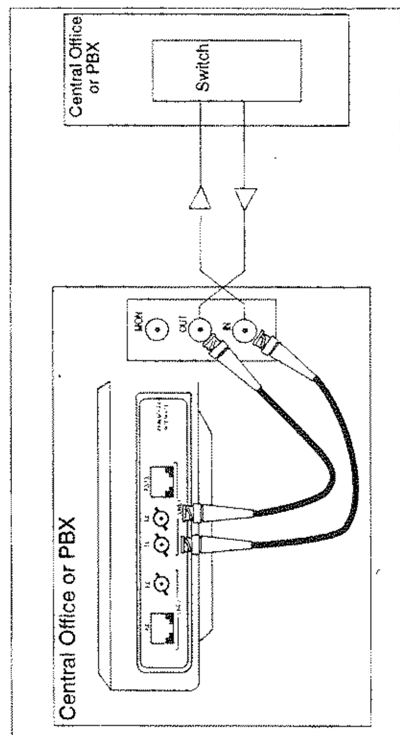
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER. Configure the screen settings for:

FRAMING: as specified by your design
CODING: as specified by your design
RXLVL-1: TERM
XMT CLK: RCVCLK
Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 2.1.A.



7) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

8) Enter CALL SETUP. Select the following in this screen:

CALL TYPE: SPEECH (F1)

B CHANNEL: This is the B channel you plan to use to place your call. Use the (F1) and (F2) keys to scroll through your B channels.

9) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

10) Before placing your call, check the Layer 2 messages displayed at the top of the screen. The R1 should show RR (Receive Ready). The RDY message should also be present; this indicates that Layer 2 has been established and the set is ready to handle calls.

11) Press CALL (F4) to place your call.

12) The call will be connected through the speaker and microphone built into the test set. You could also talk/listen through a handset. Connect a handset to the HANDSET jack located on the right side of the set. Follow this procedure:
   a. Press the Call Control key (represented by a handset).
   b. Press CHG-TYP (F2).
   c. Press the arrow (F4) key to move the cursor to SPEAKER.
   d. Press HANDSET (F2).

13) You may change your call type while the call is in place. Follow these steps:
   a. Press the Call Control key (represented by a handset).
   b. Press CHG-TYP (F2).
   c. The cursor is now at SPEECH. You may choose DATA-64 (F2) to change your voice call to a data call.

14) To disconnect the call, press the Call Control key (represented by a handset) and then press ON-HOOK (F1).

2.2 Placing a PRI Data Call

This outlines the procedure for placing an ISDN data call at a 64K rate. You can perform a data call two ways:
   A. Point-to-Point: call another piece of test equipment (which is also TE). Make sure that both test sets are transmitting the same pattern.
   B. Loopback- call a loopback device, which will loop your transmitted test pattern back to you. Calling a loopback device is quicker and less labor intensive.

1) Verify that the span is not in service. This application will disrupt service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: TE
- PROTOCOL: ETSI or determined by the switch you're using.
- TEST PATTERN: select which test pattern you wish to transmit for your data call. Press SELECT (F1) and use the down arrow and F-keys to select the desired pattern. After the right pattern is highlighted, press the ENTER key to return to the Test Configuration screen.
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER Configure the screen settings for:

FRAMING: as specified by your design
CODING: as specified by your design
RXLVL-1: TERM
XMT CLK: RCVCLK
Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 2.2.A.

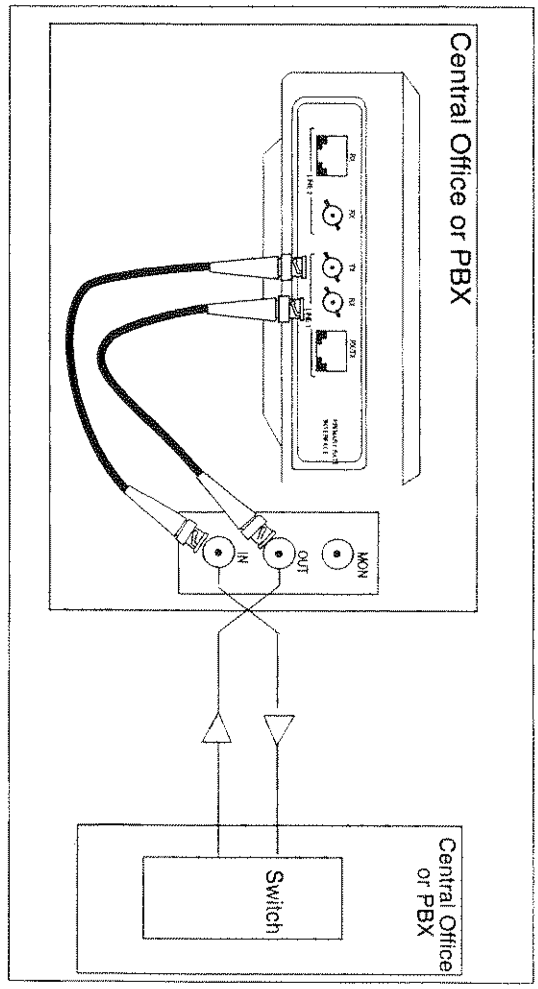


Figure 2.2.A
Placing a Call- TE Mode

7) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

8) Enter CALL SETUP. Select the following in this screen:

CALL TYPE: DATA-64 (F2)
B CHANNEL: This is the B channel you plan to use to place your call. Use the (F1) and (F2) keys to scroll through the B channels.

9) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

10) Before placing your call, check the Layer 2 messages displayed at the top of the screen. The R1 should show RR (Receive Ready). The RDY message should also be present; this indicates that Layer 2 has been established and the set is ready to handle calls.

11) Press CALL (F4) to place your call.

12) To perform a BERT test on the data call, escape to the ISDN-PRI menu. Cursor down to TEST & RESULTS; press ENTER. The first TEST & RESULTS screen gives a summary of the elapsed time (the time since you first entered this screen) and the error count during that time.

- Press PAGE-DN (F2) to view the results on your T1 line.
- Press PAGE-DN (F2) again to view the Logical results page. Here you can view any received bit errors. If you have a loopback in place, you may want to inject errors with the ERR INJ key and verify that they return back to you. Figure 2.2.B displays a sample BERT screen. Refer to Chapter 6, Section 5 for definitions and descriptions of the measurement terms seen in these screens.

```
                              11:54:41
>X1-RR               RDY R1-RR        <
>                                     <

       RESULTS - LOGICAL
 ET - 000:12:43  RT - CONTINU
 RCV- 2047       XMT- 2047
 BIT - 4         BER  - 0.0e-09
 ES  - 2         %ES  - 00.262
 SES - 0         %SES - 00.000
 EFS - 761       %EFS - 99.738
 AS  - 763       %AS  - 100
 UAS - 0         %UAS - 00.000
 DGRM- 1         %DGRM-08.333

PAGE-UP    PAGE-DN   STOP
```

Figure 2.2.B
Logical Results screen

13) You may change the test pattern while the call is in place. From the ISDN-PRI menu, enter TEST CONFIGURATION. Cursor down to Test pattern. Press SELECT (F1) and use the arrow F-keys to select the desired pattern. After the right pattern is highlighted, press the ENTER key to return to the Test Configuration screen.

14) To disconnect the call, press the SHIFT, then Call Control key (represented by a handset) and then press ON-HOOK (F1).

2.3 ISDN PRI Monitoring

This procedure illustrates monitoring an ISDN line from both directions.

1) This test may be performed while the PRI line is in-service.

2) Switch on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: PRIMON
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: N/A (monitoring only)
- MY PHONE NUMBER: N/A (monitoring only)

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER Configure the screen settings for:
   TEST MODE: PRIMON (You won't be able to change this).
   FRAMING: as specified by your design
   CODING: as specified by your design
   RxLVL-1: DSXMON
   RxLVL-2: DSXMON

6) Connect the Line 1 and Line 2 Rx jacks to Monitor jacks, as shown in Figure 2.3.A. You may perform this test anywhere you have access to the T1 circuit, i.e. central office, customer premises, span.

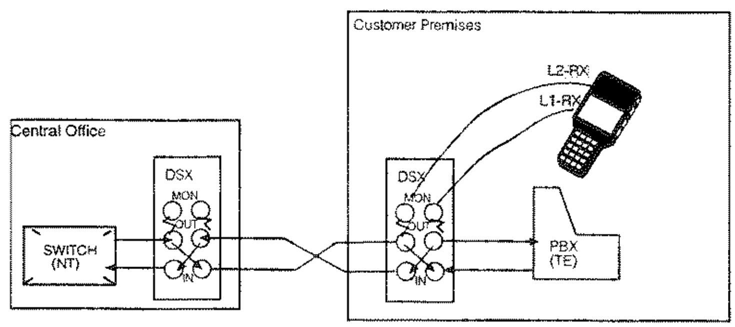


Figure 2.3.A
Monitoring a PRI line

Note: Figure 2.3.A shows connecting to monitor jacks. If you do not have a monitor access point, you will need to select RxLVL-1 & 2 : BRIDGE.

10) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press

the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI Interface.

11) Enter D-ch ANALYZER, VIEW TRACER. You should now see a live presentation of messages received on both Line 1 and Line 2. The first line of each message gives you the received line, as well as the direction of each message. Press PAUSE (F4) to pause the messages. Use the HEX/DECODE (F3) key to display the messages in either hexadecimal or decoded format.

12) Escape and enter into the VIEW/PRINT BUFFER screen. At the initial screen, you may choose to view or print all the messages, or a certain number of messages. To view a select number, make sure that the cursor is on the VIEW FROM line. When your settings are correct, press VIEW (F3).

13) When you have finished monitoring, disconnect your test set from the circuit and turn the set off.

2.4 Emulate an ISDN Network Terminal or PBX

This procedure illustrates how the SunSet ISDN can replace an NT or PBX.

1) Verify that the span is not in service. This ISDN call will disrupt service.

2) Power on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: NT
- PROTOCOL: ETSI or determined by the switch you're using.
- TEST PATTERN: 2047- If you plan to place a data call, select your transmit test pattern. Press SELECT (F1) and use the

down arrow and F-keys to select the desired pattern. After the right pattern is highlighted, press the ENTER key to return to the Test Configuration screen.

- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER Configure the screen settings for:

FRAMING: as specified by your design
CODING: as specified by your design
RXLVL-1: TERM
XMT CLK: INTERN
Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 2.4.A. Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI Interface.

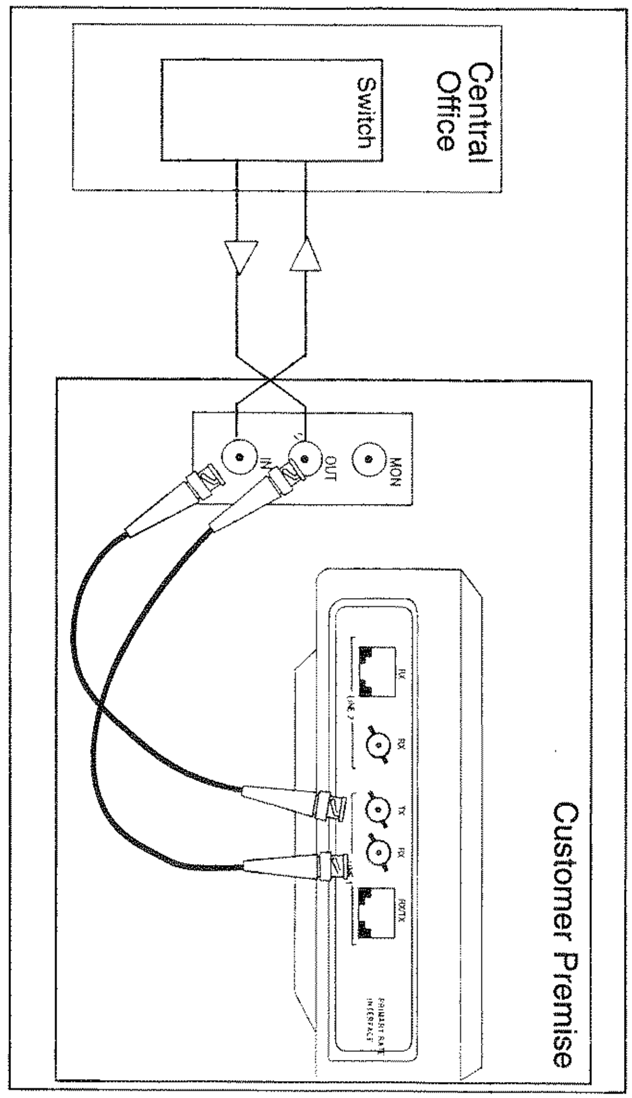


Figure 2.4.A
NT Emulation

7) When emulating an NT, you may place a call. Follow the same call setup procedures outlined in Section 2.1, Placing a Voice call TE mode. You also may handle call setup messages sent from a TE device. When there is an incoming call, the SunSet will ring and the Call Control screen will be displayed. The call Control screen will show an incoming call with the Caller # (if provided). You will be given the option to accept or reject this call.

Section 2.5 Placing 2 Simultaneous B-Channel Calls

This procedure illustrates placing two simultaneous B-Channel calls.

1) Verify that the span is not in service. This ISDN call will disrupt service.

2) Switch on the test set.

3) From the Main Menu, enter ISDN-PRI.

4) Enter TEST CONFIGURATION. Set up this screen as follows:

- MODE: TE
- PROTOCOL: determined by the switch you're using.
- TEST PATTERN: 2047- This field pertains only to a data call.
- MY PHONE NUMBER: This is the number of the ISDN line you are using. It will show up as the Caller Number for any calls you place. Enter the numbers directly from the keypad using the number keys. You may use the arrow F-keys (F2 and F3) to edit the number if necessary.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

5) Cursor down to PRI INTERFACE; press ENTER. Configure the screen settings for:

FRAMING: as specified by your design
CODING: as specified by your design

RXLVL-1: TERM
XMT CLK: RCVCLK
Tx LBO -1: 0 dB

6) Connect the test set to the circuit as shown in Figure 2.5.A. Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI Interface.

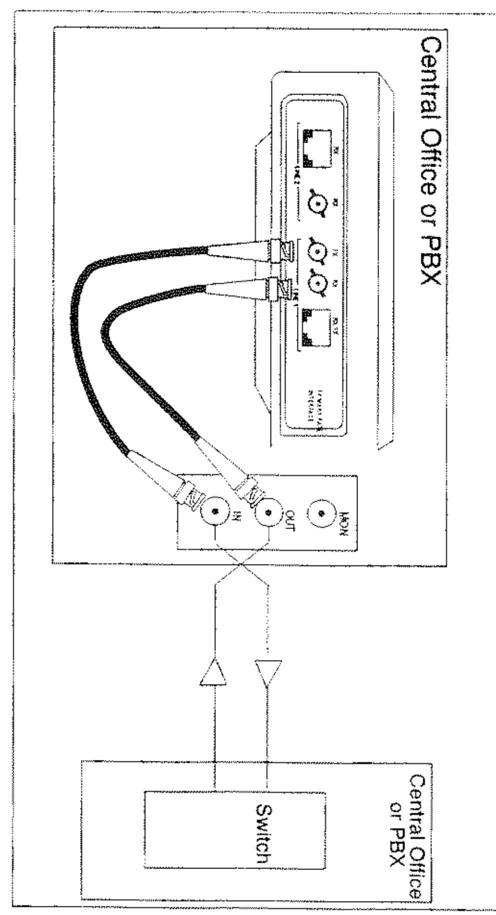


Figure 2.5.A
Connecting the SunSet- TE Mode

7) Enter CALL SETUP. Select the following in this screen:

CALL TYPE: SPEECH (F1)
B CHANNEL: This is the B channel you plan to use to place your call. Use the (F1) and (F2) keys to scroll through your 30 channels.

8) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

9) Before placing your call, check the Layer 2 messages displayed at the top of the screen. The R1 should show RR (Receive Ready). The RDY message should also be present; this indicates that Layer 2 has been established and the set is ready to handle calls.

10) Press CALL (F4) to place your call.

11) The call will be connected through the speaker and microphone built into the test set. You could also talk/listen through a handset. Connect a handset to the HANDSET jack located on the right side of the set. Follow this procedure:
   a. Press the SHIFT, then Call Control key (represented by a handset).
   b. Press CHG-TYP (F2).
   c. Press the arrow (F4) key to move the cursor to SPEAKER.
   d. Press HANDSET (F2).

12) Press the Call Control key again to return to the Call Setup screen. Change your Call Type to DATA-64 (F2). Notice that your B-channel has automatically changed to the next channel. This is to prevent you from trying to make 2 calls on the same B-channel. If you want to select a different B-channel, use the (F1) and (F2) keys to scroll through the 30 channels.

13) Press the down arrow key to DIAL NUMBER. Enter the number you wish to call.

14) Press CALL (F4) to place your call.

15) Press the Call Control key again. Figure 2.5.B provides a sample screen.

```
                                  14:53:31
>X1-RR               RDY R1-RR           <
>                                        <

             CALL CONTROL
-----CALL1 > OFFHOOK-----------
 CALLER NO : 2260337
 CALL TYPE : SPEECH   HANDSET
-----CALL2 > OFFHOOK-----------
 CALLER NO : 2260337
 CALL TYPE : DATA-64

 ---CALL1---           ---CALL2---
ON HOOK  CHG_TYP  ON HOOK   CHG_TYP
```

Figure 2.5.B
Call Control Screen

15) You may change the call types of either call, but you may have only one data call in place at a time. To change a call type, press either (F2) for Call 1 or (F4) for Call 2.

16) To disconnect your calls, press ON HOOK (F1) for Call 1 and ON HOOK (F3) for Call 2.

2.6 Running a Sequential Call Test

Sequential Call is an automated PRI turn-up test. In the Sequential Call test, the SunSet ISDN places a call on each B-channel sequentially, and displays which B channels had successful or failed calls.

1) Power on the test set.

2) From the Main Menu, enter ISDN-PRI.

3) Enter TEST CONFIGURATION. Set up this screen as follows
   - MODE: TE
   - PROTOCOL: ETSI (or per circuit)
   - TEST PATTERN: 2047 (or press SELECT to change the

pattern)

- MY PHONE NUMBER: This is the number of the ISDN line you are using. If you will be placing self calls during the test, be sure to enter in your phone number.

When you have finished your Test Configuration, press ENTER to return to the ISDN-PRI Menu.

4) Cursor down to PRI INTERFACE; press ENTER. Configure the screen settings for:

MODE: TERM
FRAMING: PCM31
CRC-4: per circuit
CODING: HDB3 or per circuit
XMT CLK: RCVCLK

5) Connect the test set to the circuit using the Line 1 Tx/Rx bantams or the Line 1 RJ-48 jack. You may refer to Figure 2.1.A if necessary.

6) Verify that you have green LEDs for L1 PULSES and FRM SYNC. Flashing red lights indicate a history condition. Press the HISTORY key to acknowledge these blinking lights and turn them off. If you have a solid red LED for FRM SYNC, try changing your Framing type in PRI INTERFACE.

7) From the PRI menu, enter Other Features, Sequential Call. Configure the sequential call settings as follows:

HOLD TIME(S): 3 (this will keep each call up for 3 seconds before releasing; you may enter in any value from 0 to 9999 seconds)

SELF CALL: On or Off, depending if you want to call another number or your own. In this case, the SunSet will call the CALLER NUMBER entered in the Test Configuration screen. When OFF, the SunSet will call the number entered as DIAL NUMBER below.

CALL TYPE: VOICE or DATA-64

DIAL NUMBER: Enter the number you wish to call. When Self Call is on, this number should match the Caller # in Test Configuration.

8) When these settings have been entered properly and you are ready to run the test, scroll down to Dial Number. Press CALL (F4).

9) A sequential call results screen appears showing you the status of each B channel. The 30 B-channels are shown on the screen. Note that channel 16 is the D channel; no call will be attempted on it.

The results are as follows:

- ". " : The SunSet is dialing on this channel.
- "PASS": A call has been successfully connected and released.
- "FAIL": A call was attempted on the channel, but was not successful.
- "ACTIVE": The call is currently connected for this channel.
- A blank indicates that a call has not yet been attempted for that channel.

10) Press STOP (F1) to stop the test; press START (F1) to resume testing. To quit the test, press STOP, then escape from the screen.

Chapter 8
X.25 - BRI

Section 1 X.25 Technology Overview

An X.25 network transfers data via packet switching. Packet switching allows remote devices to communicate across a high-speed digital link without purchasing individual leased lines. Networks route data packets between end users based on addressing within each packet. It is a lower cost, higher-speed method of transferring data for users.

1.1 X.25 Network

The X.25 Packet Switching Network (PSN) contains the following equipment:

- **PSE**, Packet Switching Exchange, is a switching node and forwards packets around the network.
- **DCE**, Data Communication Equipment, is a port into the network; it provides the interface to the user.
- **DTE**, Data Terminal Equipment, is the user's equipment. It is the source and destination of data. The DTE/DCE interface is also known as the user/host interface.

The X.25 protocol refers specifically to the DTE/DCE interface. It is used for packet generation and transmission between the DTE and DCE. The PSEs and DCEs interconnect to form a transmission path for the packets. Figure 1.1.A shows an X.25 network.

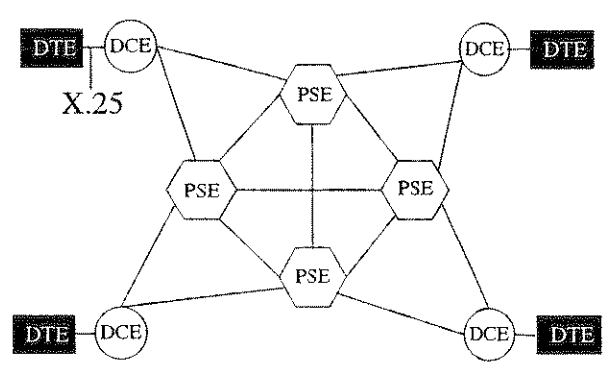


Figure 1.1.A
X.25 Network

1.2 Virtual Circuits

Packets are transmitted from one DTE to another DTE through the network between a source and a destination address. The logical association between the source and destination is known as a **virtual circuit**. It is termed virtual, because there is no physical connection between the two endpoints; it is based solely on the logical association between source and destination addresses.

X.25 distinguishes two types of virtual circuits:

1. **PVC**- Permanent Virtual Circuit: The logical connection between 2 DTEs is permanently established by the PSN. Data can always be sent without any call setup or clearing procedures. This is similar to a leased line in that the connection is always present.

2. **SVC**- Switched Virtual Circuit: The logical connection between 2 DTEs for a SVC is temporary. It is established only for the length of the call: the connection is established, data is transferred, the connection is released. An SVC must go through call setup procedure to establish its temporary circuit.

One DTE may have multiple virtual circuits established with other DTEs. An example is shown in Figure 1.2.A.

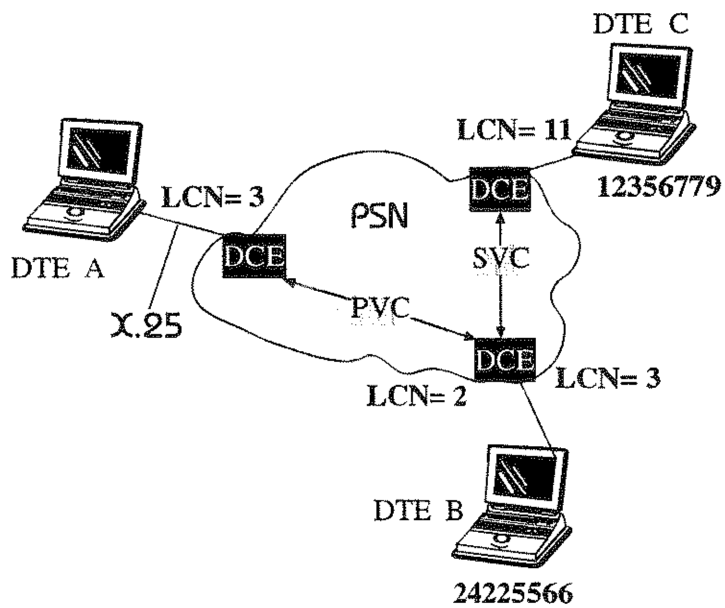


Figure 1.2.A
Virtual Circuits

In Figure 1.2.A, DTE B has established virtual circuits with both DTE A and DTE C:

- DTE B - DTE A: this connection is a PVC set through LCN=2 at DTE B and through LCN=3 at DTE A. When this LCN is chosen, they are free to send data.
- DTE B - DTE C: an SVC is established between DTE B and DTE C through LCN=3 at DTE B and LCN=11 at DTE C. A unique global number (i.e. 24225566 and 12356779) identifies DTE B and DTE C.

The Logical Channel Identifier (LCI) is encoded in every packet (except Restart and Error indicator) to identify the virtual circuit used by the local and remote DTE. The network uses the LCIs to associate the host and destination DTE.

1.3 Basic Packet Procedures

This section describes the basic packet procedures for exchanging data packets via virtual circuits. The procedures are divided into three phases:

1. Call Setup Phase
2. Data Transfer Phase
3. Call Clearing Phase

SVC calls use all three phases; since PVCs have a permanent logical connection, they use only the Data Transfer Phase. Figure 1.3.A shows these three phases.

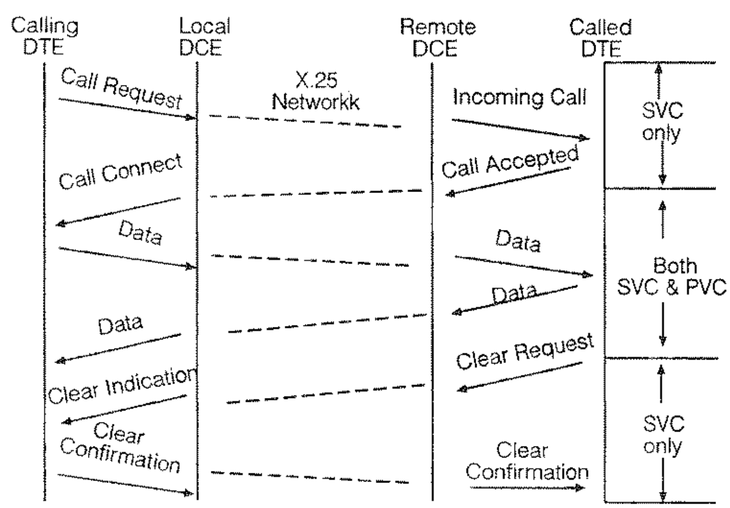


Figure 1.3.A
Basic Packet Exchange Procedure

1. Call Setup Phase

In this phase, the local DTE initiates the establishment of a virtual circuit by sending a Call Request packet to the local DTE. The packet will include the LCI value and Called DTE number. The PSN will pass the packet to the remote DCE where the packet will be seen to the Called DTE as an Incoming Call packet. If the Called DTE accepts the call, it will respond by sending a Call Accepted packet which the DTE receives as a Call Connect message. At this point, the Call Setup Phase is completed and the SVC enters the Data Transfer Phase.

2. Data Transfer Phase

In this phase, the two DTEs associated with the virtual circuit exchange data packets. The maximum length of the user data field (packet size) is set by the network at subscription time. If the user messages are longer than the maximum packet size, this message will be split into several packets. The M bit (more data bit) is set to "1" in all of these packets except for the last one.

Each data packet transmitted contains a send sequence number P(S) to detect loss or duplication of packets and a P(R) to indicate acknowledgment of the number of data packets received. These flow control sequence numbers are incremented modulo 8 or 128, and they are unique for each virtual circuit identified by the LCI value.

3. Call Clearing Phase

This phase is relevant only to SVC calls. The procedure for call clearing can be initiated by either the calling or called DTE. The DTE that initiates the call clearing will send a Clear Request packet. The remote DTE will receive that packet as a Clear Indication packet and will respond with a Clear Confirmation packet. Once the Clear Confirmation packet is received by the local DTE, the call clearing procedure is complete and the used LCI becomes available for another call establishment procedure.

1.4 X.25 Packets

At Level 3, the packet is placed inside the information field of a LAP-D Information frame. There are fifteen different packet types, most of which are concerned with initiating, maintaining, and clearing the DTE-DCE call. Refer to Figure 1.4.A.

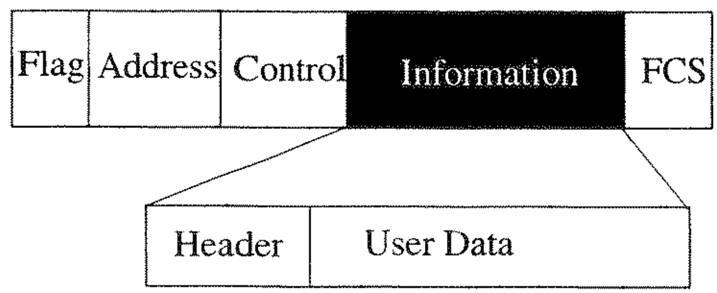


Figure 1.4.A
Frame Structure

As shown in Figure 1.4.A, each packet consists of a packet header and a user data field. The user data field is included only in DATA packet types. For all other packet types (non-DATA), the header comprises the whole packet. Three bytes are assigned for the header; the user data can be a maximum of 128 bytes.

The three bytes of the header are defined as follows:
1) General Format Identifier (GFI)
2) Logical Channel Identifier (LCI)
3) Packet Type Identifier (PTI)

GFI (General Format Identifier)

Octet 1 of the packet header contains the General Format Identifier (GFI). This four-bit field indicates the general format the rest of the header will follow. See Figure 1.4.B.

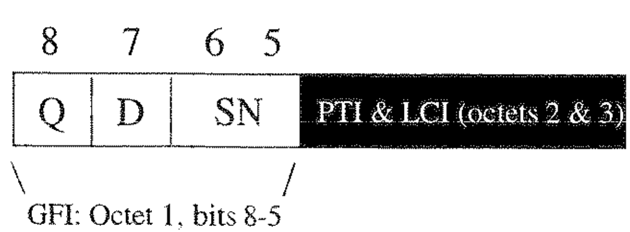


Figure 1.4.B
GFI Indicator Bits

The GFI bits are defined as follows:

- Q (Qualifier) bit qualifies the data in the packet. The Q bits used when the DTE is connected to a PAD (Packet Assembler/Disassembler). The Q bit indicates the packet is a PAD control packet rather than the typical user data.

- D (Delivery) bit allows the local DTE to specify when it wants end-to-end acknowledgment of the receipt of a data packet from the remote DTE, rather than receiving only the acknowledgment from its local DCE. When set to 1, the user indicates that acknowledgment of the packet is required by the remote DTE. When set to 0, the acknowledgment is issued by the local DCE. Refer to Figure 1.4.C.

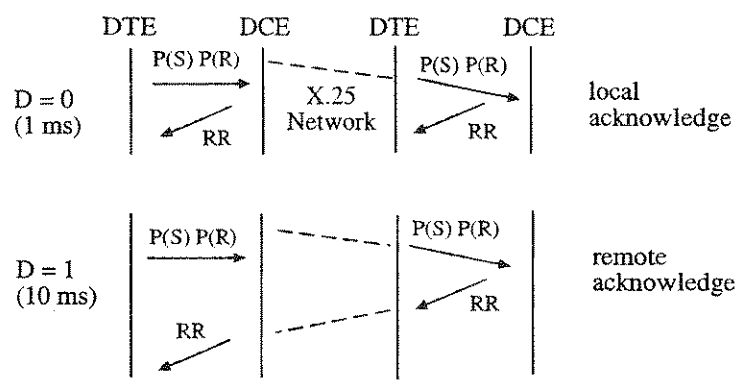


Figure 1.4.C
D Bits

- SN (Sequence Number) bits provide the packet sequence numbering information. Most switching networks support only Modulo 8, which numbers packets between 0 and 7. Modulo 128 allows numbers between 0 and 127.

LCI (Logical Channel Identifier)

The LCI (Logical Channel Identifier) identifies the virtual circuit in use between a local and a remote DTE. It is included in every packet type, except restart and error reporting. It is divided into two four bit subfields: the Logical Channel Group Number (LCGN) and the Logical Channel Number (LCN).

PTI (Packet Type Identifier)

Octet three in the packet header is the Packet Type Identifier. It is used to identify the type of packet being transmitted. This field also includes the send and receive sequence numbering, with the P(S) and P(R) bits.

The twenty-eight packet types are divided into seven groups based on function. The groups and packets are:

Call setup group: Used to set up a SVC call:
 Call Request, Incoming call, Call Accepted, Call Connected
Supervisory group: Used to bring a VC to an idle state:
 Clear Request, Clear Indication, Reset Request, Reset Indication, Restart Request, Restart Indication
Confirmation group: Used to acknowledge reception of a Clear, Reset, Restart or Interrupt Request:
 DTE/DCE Clear Confirmation, DTE/DCE Reset Confirmation, DTE/DCE Restart Confirmation, DTE/DCE Interrupt Confirmation.
Data group: Used to carry the user's data:
 DTE/DCE Data packet
Flow Control group: used to control the transfer of data packets between a DTE and a DCE:
 DTE/DCE RR, DTE/DCE RNR, DTE REJ
Diagnostic group: Used to issue fault diagnostics:
 The single packet type in this group is called a Diagnostic packet. It is sent only by the DCE.
Interrupt: Used in data transfer by the local DTE when an immediate response is required:
 DTE/ Interrupt

Figure 1.4.D displays the different PTI fields for each packet type.

Octet 3 PTI field bits 8 7 6 5 4 3 2 1	Packet Format Groups	Packet Types DTE -> DCE	DCE->DTE
0 0 0 0 1 0 1 1	Call Setup	Call Request	Incoming Call
0 0 0 0 1 1 1 1		Call Accepted	Call Connected
0 0 0 1 0 0 1 1	Supervisory	Clear Request	Clear Indication
0 0 0 1 1 0 1 1		Reset Request	Reset Indication
1 1 1 1 1 0 1 1		Restart Request	Restart Indication
0 0 0 1 0 1 1 1	Confirmation	DTE Clear Confirm	DCE Clear Confirm
0 0 1 0 0 1 1 1		DTE Interrupt Conf.	DCE Interrup Conf.
0 0 0 1 1 1 1 1		DTE Reset Confirm	DCE Reset Confirm
1 1 1 1 1 1 1 1		DTE Restart Conf.	DCE Restart Conf.
R R R 0 0 0 0 1	Flow Control	DTE RR	DCE RR
R R R 0 0 1 0 1		DTE RNR	DCE RNR
R R R 0 1 0 0 1		DTE REJ	——
0 0 1 0 0 0 1 1	Interrupt	DTE Interrupt	DCE Interrupt
1 1 1 1 0 0 0 1	Diagnostic	——	Diagnostic
S S S M R R R 0	Data	DTE Data	DCE Data

Figure 1.4.D
Packet Types

Section 2 X.25 Menu Operations

The SunSet ISDN is a menu-driven unit. The following Menu Tree shows the organization of the BRI - X.25 menus. To select a menu, use the arrow key to highlight that menu choice. Then press the ENTER key.

ISDN MAIN MENU
ISDN-BRI X.25
- TEST CONFIGURATION
- CALL SETUP
- CALL STATUS
- PROTOCOL ANALYSIS
  - VIEW TRACER
  - VIEW/PRINT BUFFER
  - FILTER SETUP
- OTHER SETUP
- SYSTEM PARAMETERS
  - TEST PARAMETERS

REPORT CONFIG
ANSWER CONFIG
SERIAL/PRINTER PORT
DATE/TIME
ERASE NV RAM
VERSION/OPTION
SYSTEM PROFILE

2.1 X.25 Test Configuration

The Test Configuration screen sets up the SunSet for X.25 packet testing. The exact settings provided will depend on your Protocol, Line Type, and TEI settings; therefore your screen display may not be identical to the two sample screens shown in Figure 2.1.A and 2.1.B. Figure 2.1.A refers to a 5ESS, point-to-multipoint circuit; Figure 2.1.B to an ETSI point-to-multipoint circuit.

```
                                12:59:34
>>                                    <<
         TEST CONFIGURATION
        MODE             : DTE-U

        PROTOCOL         : 5ESS
        LINE TYPE        : P-to-MP
        SPID #1          : 0122222220

        X.25 PHONE #     : 2222222
        AREA CODE        : 408



DTE-S/T   DTE-U
```

Figure 2.1.A
Test Configuration (5ESS, P-to-MP)

```
                                    01:12:21
>                                          <
>                                          <
          TEST CONFIGURATION
        MODE           : DTE-U

        PROTOCOL       : ETSI
        LINE TYPE      : P-to-MP


        PHONE NUM #1   :




DTE-S/T    DTE-U
```

Figure 2.1.B
Test Configuration (ETSI, P-to-MP)

1) MODE
F-Key Options: DTE-S/T (F1), DTE-U (F2)

The SunSet ISDN emulates DTE, Data Terminal Equipment. A DTE is the customer's equipment; it is the source and destination of the data.

- Select DTE-S/T (F1) to connect at the 4-wire S/T interface.
- Select DTE-U (F2) to plug in at the 2-wire U interface.

2) PROTOCOL
F-Key Options: 5ESS (F1), ETSI (F2), NTT (F3), DMSF (more, F1), NAT'L (more, F2), AUSSIE (more, F3)

- 5ESS is the AT&T Custom protocol
- ETSI designates the European ISDN BRI protocol
- NTT designates a Japanese ISDN BRI protocol
- DMSF is the NT1 (Northern Telecom) custom protocol. It applies to the DMS switch, and stands for DMS - Functional.
- NAT'L is the North American National ISDN protocol. It can apply to an AT&T, Northen Telecom, or any other switch

running the National protocol.
- AUSSIE is the Australian national protocol.

3) LINE TYPE

F-Key Options: P-to-P (F1), P-to-MP (F2)

In a Point-to-Point (P-to-P) configuration, only one TE device is allowed access to the ISDN circuit. In Point-to-Multipoint (P-to-MP), multiple TE devices can be connected to the ISDN circuit.

- In North America, the Line Type is governed by the Switch Type and Protocol of the ISDN BRI circuit. The Line Type will always be P-to-MP (Point-to-Multipoint), unless the ISDN BRI circuit has 5ESS PROTOCOL, where the LINE TYPE can be either P-to-P or P-to-MP.
- Outside of North America, the Line Type may be either P-to-P or P-to-MP.

4) SPID

- A SPID applies only to P-to-MP North American circuits.
- SPID stands for Service Profile IDentifier.
- The SPID is typically the 7 or 10 digit (Area Code + 7 digits) phone number of the circuit, plus a series of 1s and 0s before and after it.

To enter your SPIDs, use the following procedure:

a. Place the cursor on SPID#1.
b. Use the keypad numbers to enter your digits
c. If you should make a mistake while entering the numbers, use the <- (F2) and -> (F3) keys to delete them.
d. To manually send your SPIDs, press SEND (F1). They will be sent automatically if you press the Down Arrow key, or if they are configured before plugging the unit into the circuit.

Note: For DMSF and NATNL-2 protocols, a P-to-MP circuit may not use SPIDs, if the switch is set for fixed TEI values. In fixed TEI conditions, a specific TEI is assigned forX.25 packet. This value is asigned for in the translation of the switch and can only be used for packet testing. You may configure your TEI value for the Sunset ISDN in the Other Setup menu.

5) X.25 PHONE #

This is the number of the X.25 line you are using. This number shows up as the Caller Number for all calls which you place. You may enter up to 14 digits from the keypad.

5) AREA CODE

For the North American protocols (DMSF, NAT'L, 5ESS), you will need to enter the area code of the X.25 line you are using. You may enter the three digits from the keypad.

When you have finished entering your Test Configuration settings, press the ENTER key to bring up the Call Setup screen.

2.2 Call Setup

This screen enables you to place a call and send data . There are two types of virtual circuits in a X.25 network: switched (SVC) and permanent (PVC). An SVC requires a call setup; a PVC does not. For this reason, the Call Setup screen for an SVC call contains settings related to call setup and clearing, while the PVC screen does not. Figure 2.2.A shows the Call Setup screen for a SVC call; 2.2.B shows a PVC call.

```
                                         01:32:16
>                      Unt: RDY     -POWER <
> INFORMATION                              <

                 CALL SETUP
   LCN (1-16)           : 1
   CALL TYPE            : SVC
   CUG (0-9999)         : NONE
   RPOA (0-9999)        : NONE
   REVERSE CHARGE       : OFF
   CALL USER DATA       :
      1234567890123456
   DIAL NUMBER          :
      4083638000

 PVC
```

Figure 2.2.A
Call Setup Screen (SVC)

```
                                         01:32:16
>                            Unt: RDY    -POWER <
> INFORMATION                                   <

                 CALL SETUP
    LCN (1-16)          : 1
    CALL TYPE           : PVC








 SVC
```

Figure 2.2.B
Call Setup (PVC)

1) LCN (1-16)
Options: 1-16

The Logical Channel Number (LCN) identifies the channel which you will use to setup your virtual circuit. You may enter a LCN from 1 to 16.

- Enter the number (1 to 16) directly from the keypad.

2) CALL TYPE
F-Key Options: SVC (F1) or PVC (F1)

There are two types of virtual circuits for an X.25 network: switched and permanent.

- A PVC (F2) identifies a permanent virtual circuit between 2 DTEs. This logical path is always available for data transfer without a call setup.
- A SVC (F1) requires a call setup (like a telephone call) between the calling and called DTEs. The connection is established which creates the virtual circuit, data is transferred, then the connection, as well as the virtual circuit, is released.

The following setup items pertain to an SVC:

3) CUG (0-9999)
F-Key Options: NONE (F1), NUMBER (F2), <- (F4)

Enter a number to include the SunSet ISDN in a particular CUG. The Closed User Group creates a private network which restricts communication between members and nonmembers. By entering a number in this line, you will be able to place a call to another member within the specified CUG.

- Press NUMBER (F2), then enter the number (0 to 9999) directly from the keypad. Use the <- (F4) key to backspace.
- Press NONE (F1) to leave this entry blank.

4) RPOA (0-9999)
F-Key Options: NONE (F1), NUMBER (F2), <- (F4)

Specify a RPOA (Recognized Private Operating Agency) network through which your D-channel packet calls will be routed.

- Press NUMBER (F2), then enter the number (0 to 9999) directly from the keypad. Use the <- (F4) key to backspace.
- Press NONE (F1) to leave this entry blank.

5) REVERSE CHARGE
F-Key Options: OFF (F1), ON (F2)

This field determines whether the SunSet ISDN requests reverse charging for its outgoing D-ch packet calls.

- This is similar to a collect call, where the billing will be assigned to the receiver of the call.
- Select ON (F2) to have the set reverse charges for all outgoing calls.
- Select OFF (F1) to have normal charges assigned.

6) DIAL NO

- This is the number you intend to dial.
- Enter the number (up to 22 digits) from the keypad. You can press the <- (F4) key to backspace.

When the cursor is on the DIAL NUMBER line for SVC or CALL TYPE for PVC, the following F-Keys are available. These F-Keys vary depending on your CALL TYPE.

F-Keys for SVCs are:

RESTART (F1): RESTART clears all SVCs and resets all PVCs held by the SunSet. This affects all logical channels. RESTART wipes out all SVC calls. All incoming and outgoing data for that DTE will be erased.

RESET (F2): RESET sends a Reset Request Packet. This resets the packet sequence count (the sent, P(S) and received P(R)) back to 0.

CALL (more,F1): CALL places your call. The SunSet ISDN sends a Call Request packet to establish connection. This is only for SVC calls, you must first establish connection and then send data.

CLEAR (more,F2): CLEAR sends a CLEAR REQUEST packet to disconnect a call. This disconnects the SVC call identified in the selected LCN. CLEAR applies only to SVCs, since the logical connection between DTEs on a PVC is permanent.

SND MSG (more, F1): SND MSG sends your actual data packet. The SunSet ISDN transmits two different data packets: "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG" and "SUN-RISE TELECOM, A STEP AHEAD!" The transmitted data packet alternates each time you press SEND.

SND PH# (more, F2): SND PH# sends your phone number. It sends the area code (if required) and number as configured in the Test Configuration screen. This may be used when calling through a PAD (Packet Assembler-Disassembler) that requires a Caller ID to return your call.

<- (F4): use the <- (arrow) key to backspace.

The F-Keys available for PVC are:

SVC (F1): This key changes the Call Type on the particular LCN to an SVC.

RESET (F2): RESET sends a Reset Request Packet. This resets the packet sequence count (the sent, P(S), and receive, P(R)) back to 0.

SEND (F3): SEND sends your actual data packet. Since the logical connection for a PVC is permanent, no call setup is required. The SunSet ISDN transmits two different data packets: "The quick brown fox jumps over the lazy dog" and "Sunrise Telecom, a step ahead!" The transmitted data packet alternates each time you press SEND.

RESTART (F4): RESTART clears all SVCs and resets all PVCs held by the SunSet ISDN. This affects all logical channels . RESTART wipes out all SVC calls. All incoming and outgoing data for that DTE will be erased.

2.3 Call Status

The Call Status screen shows the status of any connected LCNs. The SunSet ISDN can maintain up to 16 simultaneous calls. Refer to Figure 2.3.A.

```
                                    12:45:12
> INFORMATION          Unt:ACT    -POWER<

       CALL STATUS MONITOR

    LCN 1     : SVC
    L3 STATE  : DATA TRANSFER
    ADDRESS   :

    LCN 2     : SVC
    L3 STATE  : DATA TRANSFER
    ADDRESS   : 3638000


PREV      NEXT
```

Figure 2.3.A
Call Status Monitor Screen

This screen shows each of the Logical Channel Numbers that are connected. Use the PREV (F1) and NEXT (F2) keys to view the other connected LCNs. For each connection, the following information is displayed:

- LCN: shows the LCN number and the call type.
- L3 State: shows the Layer 3 state for that LCN.
- Address: shows the called number.

2.4 Protocol Analysis

Use this feature to view the D-channel protocol messages. You may choose to exclusively capture only Layer 2 or Layer 3 messages. You can print these messages and store up to 400 in the buffer. The messages are displayed in hexadecimal format, as well as a decoded version in plain English. Refer to Figure 2.4.A for the Protocol Analysis menu.

```
>X1-RR              RDY R1-RR        <
>                                    <
  19- 0      20- 0     21- 2
  22- 0      23- 1     24- D

  START TIME: 7:22:18
  END TIME  : 7:23:31




PAGE-UP                          RETURN
```

Figure 8.4.E
Bulk Call Result

This screen provides the number of calls completed on B-channels 19-23. It also gives the start and stop time for your test. You may press the Return (F4) key to return to the first page of results.

8.5 Sequential Call

Sequential Call is another automated stress test. In the Sequential Call test, the SunSet ISDN places a call on each B-channel sequentially. The setup screen is shown in Figure 8.5.A.

```
                                15:07:03
>X1-RR              RDY R1-RR          <
>                                      <
          SEQUENTIAL CALL

  HOLD TIME(S)          : 10
  SELF CALL             : OFF
  CALL TYPE             : VOICE
  DIAL NUMBER :
    3638000




 <-       ->                       CALL
```

Figure 8.5.A
Sequential Call

You may configure the following setup items for your test:

1) HOLD TIME
Options: 1 to 9999 seconds

Hold Time determines how long the SunSet will hold each call before releasing. You may choose from 1 to 9999 seconds.

2) SELF CALL
F-Key Options: OFF (F1), ON (F2)

- Select ON (F2) to place a self call during the test. In this case, the SunSet will call the CALLER NUMBER entered in the Test Configuration screen.
- Select OFF (F2) if you do not wish to place a self. In this case, the SunSet will call the number entered as DIAL NUMBER below.

3) CALL TYPE
F-Key Options: VOICE (F1), DATA-64 (F2)

- Select VOICE (F1) to place voice calls during the test.
- Select DATA-64 (F2) to place data calls at a 64Kbps rate.

```
                              11:01:33
>              Unt: RDY    +POWER<
>                                  <

          PROTOCOL ANALYSIS

          VIEW TRACER
          VIEW/PRINT BUFFER
          FILTER SETUP
```

Figure 2.4.A
Protocol Analysis menu

2.4.1 View Tracer

View Tracer is not available for X.25. It is available only in Monitor modes.

2.4.2 View/Print Buffer

This feature allows you to view and print specific data captured by the SunSet ISDN. The VIEW/ PRINT BUFFER screen is displayed in Figure 2.4.B.

```
                          20:25:13
>                                <
>                                <

      VIEW/PRINT BUFFER

       TOTAL MSG : 312

       FROM MSG  : 1
       TO MSG    : 312



CLR-ALL   PRINT    VIEW
```

Figure 2.4.B
View/Print Buffer

Three function keys are available in this screen:

CLR-ALL (F1): This option is the first step in erasing the contents of the buffer. After pressing (F1), you will be asked to press ENTER to continue the process. This second step provides security against accidentally erasing the buffer contents.

PRINT (F2): This option will print the contents of the buffer to the serial port. The messages printed will be limited to those selected at the FROM MSG and TO MSG settings.

VIEW (F3): VIEW shows the contents of the buffer, as specified by the FROM MSG and TO MSG settings. Use the following procedure to specify these settings:

1) Make sure the cursor is on the FROM MSG line.
2) Enter the number from the keypad. This will be the first message displayed.
3) Cursor down to TO MSG and enter the number from the keypad. This will be the last message displayed.

When you have selected the message numbers, press VIEW (F3) to begin viewing the messages. Figure 2.4.C shows a sample message.

```
                                 12:45:12
>>                                     <<

   ST TE->NT    C/R:C      #23
   97-07-24    15:05:28.568
   SAPI : 016      TEI : 066
   L2 MSGTYPE :

   L3 MSGTYPE : CALL REQ

UP    DOWN      HEX        InfoElem
```

Figure 2.4.C
Call Request Message

Use the UP (F1) and DOWN (F2) keys to scroll through the messages. Refer to Figure 2.4.D for another message.

```
                                 01:23:41
>>                                     <<

   ST TE->NT    C/R:C      #029
   97-07-24    15:05:34.134
   SAPI : 016      TEI : 066
   L2 MSGTYPE :

   L3 MSGTYPE : DTE DATA

  UP     DOWN     HEX     InfoElem
```

Figure 2.4.D
DTE Data Message

The following information is displayed in this screen:

- TE->NT: This shows the direction of the message. Here the message was sent from the TE (Terminal Equipment) to the NT (Network Termination).

- C/R: C/R displays the Command/Response field bit, which identifies a frame as either a command or response.

- Date and Time: The second line displays the date and time (with a resolution of 1 millisecond) when this message was received (or sent).

- SAPI: The Service Access Point Identifier identifies the point where layer 2 services are provided to a Layer 3 entity. Currently, there are four assigned SAPI values:

  0 Call Control Procedures
  1 Packet Mode using Q.931 Call Procedures
  16 Packet communication conforming to X.25 Level 3 procedures
  63 Layer 2 management procedures

  - X.25 D-channel packets use a SAPI of 16

- TEI: The Terminal Endpoint Identifier identifies the terminal at the end of the connection. TEI values may be in the range of 0 to 127. The values are grouped as follows:

0-63	Fixed TEI assignment
64-126	Automatic TEI assignment
127	Group TEI for broadcast data link connection

- L2 MSGTYPE: This displays the Layer 2 message type. For X.25 Packets, the Layer 2 messages are I (Information) frames. Pressing HEX (F3) will display the Layer 2 message type.

- L3 MSGTYPE: This displays the Layer 3 message type. Section 1 of this chapter shows all the possible PTI fields (message types).

Since Figure 2.4.D's message type is DTE DATA, we can press the InfoElem (F4) to show the user's data. This screen is shown below in Figure 2.4.E.

```
                                   01:23:41
>                                         <
>                                         <

 P(S)   : 00h
 P(R)   : 00h
 M bit  : 00h
 USER DATA :
   SUNRISE TELECOM A step ahe-
  ad!




                                     RETURN
```

Figure 2.4.E
DTE Data Info

The following information is displayed in this screen:

- P(S): Packet Sequence Number (sent) identifies the information packet being sent. P(S) increments each transmitted frame to ensure that it is received correctly.

- P(R): Packet Sequence Number (received) identifies the P(S) value of the next expected Information frame. It indicates that the DTE has correctly received all packets numbered up to this P(R) value, minus one (P(R)-1).

P(S) and P(R) operate similarly to the frame sequencing of Layer 2 for all of ISDN using the N(S) and N(R) values. These values are also included with packet messages. They are relevant for only one virtual circuit, meaning each virtual circuit will have its own P(R) and P(S) values.

- M bit: "more data" bit. A DTE may send all of its data in a single packet, but it more than likely will need to send several contiguous packets of data. Since the packet length is a fixed value (typically 128K long), the user's information will have to be sent in more than one packet, if the information is longer than this fixed packet length. The DTE ensures that this information remains in a logical stream by setting the M-bit to 1 when data overflows into the next packet. The M-bit is set as follows:

1: when data overflows into the next data packet.
0: when this is the final data packet, or when there is only a single packet of data.

- USER DATA: This contains the actual data being sent within the packet.

2.4.3 Filter Setup

This screen enables you to filter Layer 2 and Layer 3 messages. When you begin tracing, you will exclusively capture only those messages associated with that layer. Refer to Figure 2.4.F.

```
                                        01:28:47
>                      Unt:RDY      +POWER <
>                                          <

                FILTER SETUP

   FILTER   :  L2_ONLY





L2_ONLY   L3_ONLY    ALL
```

Figure 2.4.F Filter Setup Screen

Select the filter:

1) FILTER
F-Key Options: L2_ONLY (F1), L3_ONLY (F2), ALL (F3)

- L2_ONLY captures only Layer 2 messages
- L3_ONLY captures only Layer 3 messages
- ALL (F3) has the SunSet capture both Layer 2 and 3

messages

- If you want to capture both Layer 2 and Layer 3 messages, make sure that the setting is ALL
- Until changed, these selections will apply to all your tracing.

2.5 Other Setup

```
                                         17:25:14
>                                               <
>                                               <
                   OTHER SETUP

  REL TIMER IDLE (MIN)   : 15
  S/T TERMINATION        : ON
  40V POWER              : OFF
  LAYER 2 TEI            : AUTO
  AUTO ANSWER MODE       : ON
  ECHO MODE              : ON



INC+1    DEC-1
```

Figure 2.5.A
Other Setup

1) REL TIMER IDLE (MIN)
F-key Options: INC+1 (F1), DEC-1 (F2)
Options: 1-30

The Release Timer idle determines the amount of time elapsed before an idle call will be automatically released.

- Use the INC+1 and DEC-1 keys to set the timer
- When the specified time has expired, all idle PVCs (where there is not data transfer) will be released.

2) S/T TERMINATION
F-Key Options: ON (F1), OFF (F2)

- S/T Termination ON (F1)places a 100Ω termination

- S/T Termination OFF (F2) places a high impedance 1000Ω bridge.

3) 40 V POWER

F-Key Options: OFF (F1), S/T (F2), Ult (F3)

This item determines whether the SunSet ISDN will generate 40V power onto the circuit. This item does not apply to the X.25 - BRI settings.

4) LAYER 2 TEI

F-Key Options: AUTO (F1), INC+1 (F2), DEC-1 (F3), 1/10 (F4)

You may manually select a Terminal Endpoint Identifier, or have the set AUTO configure one during turn-up. The TEI number identifies the terminal on the end of the circuit.

- Press AUTO (F1) to have the SunSet automatically identify the Layer 2 TEI. In AUTO, the SunSet sends an Identity Request message with TEI:127 and Action Indicator:127. The switch responds with an Identity Assigned with TEI:127 and Action Indicator from 64-126. Then, the SunSet transmits a SABME with a TEI of the same value as the received Action Indicator.
- You may also manually enter the TEI value in the range of 0 to 127. To enter the TEI manually, use the F-Keys, INC+1 (F2), DEC-1 (F3), 1/10 (F4). The (F4) key determines the increase/decrease factor. In this case, the SunSet ISDN will send an Identity Request message with TEI:127 and Action Indicator of whatever value you entered here for the TEI. The switch responds with an Identity Assigned with a TEI:127 and Action Indicator with your transmitted value. The SunSet then sends a SABME with the TEI set to the Action Indicator's value (which is the same value as you entered for the TEI value). If the switch does not like the entered TEI value, it will respond with an Identity Denied message, instead of Identity Assigned.

5) AUTO ANSWER MODE

The Answer Mode is permanently set to ON for X.25 applications.

6) ECHO MODE

F-Key Options: ON (F1), OFF (F2)

- The Echo feature is used for call placement.
- When ON, the SunSet ISDN sends back the data packets it receives.

2.6 System Parameters

Please refer to Chapter 4, Section 8- BRI System Parameters. The menu settings and options are identical.

Section 3 X.25 Applications

3.1 Placing a SVC call

This application provides an outline for placing an SVC (switched virtual circuit) packet call:

1. Establish connection
2. Send data packet.

1) From the Main Menu, enter X.25 - BRI.

2) Enter TEST CONFIGURATION

a) Configure the set as follows:

Mode: DTE-U

PROTOCOL: 5ESS, DMSF, NAT'L (set per circuit)

LINE TYPE: P-to-P or P-to-MP (set per circuit; P-to-P only for 5ESS)

SPID#1: ONLY needed for AT&T 5ESS switch, enter the SPID from the keypad, then press SEND (F1)

X.25 PHONE #: Set this number to the X.25 phone number which should be part of the Circuit Order Configuration. Enter this number from the keypad. If you have entered a SPID above, the number will be auto-configured for you.

AREA CODE: Set to your local area code.

Press the ENTER key when your settings are complete.

3) Connect to the circuit via the U-NT connector.

4) From the X.25-BRI menu, enter the CALL SETUP screen.
   Configure your call:
   LCN: 1 (or set to the LCN you wish to test)
   CALL TYPE: SVC
   CUG: NONE (or set per circuit)
   RPOA: NONE (or set per circuit)
   REVERSE CHARGE: NO (or set per circuit)
   CALL USER DATA: Enter up to 16 digits to be placed in the CALL USER DATA field in the Call Request packet.
   DIAL NUMBER: Enter the number you want to dial, from the keypad.

5) Look for a Restart Confirmed message in the Status Indication area at the top of the screen. If it is not there, press the RESTART F-Key. For a SVC call, place the cursor on Dial Number and press RESTART (F1). Upon pressing RESTART, the Status Indication area shows "Sending Restart Request..." This should then be followed by a Restart Confirmed message. If not, there may be a translation problem.

6) Place the cursor on Dial Number (verify that the correct number has been entered). Press the more (F3) key until you see CALL (F1). Press Call. You should see the message "Out Call Connected...LCN=1" at the top of the screen. Note that the LCN value depends on the LCN you selected.

7) Next, send a data package. Press more (F3), then SND MSG (F1). You will see "Send Data Successful" at the top of the screen display. The SunSet ISDN sends two different messages:
   "the quick brown fox jumps over the lazy dog 0123456789"
   "sunrise telecom a step ahead"

   These messages alternate each time the SND MSG (F1) key is pressed. If you have a loopback in place at the far end, you will see Rcv Data [the quick brown.." or Rcv Data [sunrise telecom..].

8) To send your phone number as a data packet, push SND PH# (F2). The SunSet ISDN sends a data packet with 1 + area code + X.25 phone number (as entered in the Test Configuration screen.

9) To hang up the call, press more (F3), then CLEAR (F2). The top of the screen displays "Clear Confirmed."

3.2 Placing a PVC Call

A Permanent Virtual Circuit has a logical path which is always available for data transfer without a call setup. The major difference between the PVC and SVC application, is that the PVC application does not require placing a call, only sending the data.

1) From the Main Menu, enter X.25 - BRI.

2) Enter TEST CONFIGURATION
   a) Configure the set as follows:

   Mode: DTE-U
   PROTOCOL: 5ESS, DMSF, NAT'L (set per circuit)
   LINE TYPE: P-to-P or P-to-MP (set per circuit; P-to-P only for 5ESS)
   SPID#1: ONLY needed for AT&T 5ESS switch, enter the SPID from the keypad, then press SEND (F1)
   X.25 PHONE #: Set this number to the X.25 phone number which should be part of the Circuit Order Configuration. Enter this number from the keypad. If you have entered a SPID above, the number will be auto-configured for you.
   AREA CODE: Set to your local area code.

   Press the ENTER key when your settings are complete.

3) Connect to the circuit.

4) From the X.25-BRI menu, enter the CALL SETUP screen.

   Configure your call:
   LCN: 1 (or set to the LCN you wish to test)
   CALL TYPE: PVC

5) Look for a Restart Confirmed message in the Status Indication area at the top of the screen. If it is not there, press the

RESTART (F4) Key. Upon pressing RESTART, the Status Indication area shows "Sending Restart Request..." This should then be followed by a Restart Confirmed message. If not, there may be a translation problem.

6) Next, send a data package. Press SEND (F3). You will see "Send Data Successful" at the top of the screen display. The SunSet ISDN sends two different messages:
"the quick brown fox jumps over the lazy dog 0123456789"
"sunrise telecom a step ahead"

These messages alternate each time the SEND (F3) key is pressed. If you have a loopback in place at the far end, you will see Rcv Data [the quick brown..] or Rcv Data [sunrise telecom..].

7) To hang up the call, press more (F3), then CLEAR (F2). The top of the screen displays "Clear Confirmed."

Chapter 9
Product Specs & Configs

1.0 Specifications

CONNECTORS

BRI interface (Basic Rate Interface)
S/T : RJ45 / ISO 8877
U-NT : RJ45 / ISO 8877
U-LT : RJ45 / ISO 8877
Handset interface: RJ11
PRI interface (Primary Rate Interface / option)
2.048 Mbps (E1) : BNC @ 75Ω, RJ45 @ 120Ω
Line 1 Tx, Rx; Line 2 Rx
1.544 Mbps (T1) : Bantam, RJ45 @ 100Ω
Line 1 Tx, Rx; Line 2 Tx, Rx
Serial port: 8-DIN, RS232C (V.24), DTE
DC Charger Input, 15 VDC

BRI INTERFACE

S/T Interface
Conforms to ITU I.430
Receiver impedances: 100Ω, >1000Ω switchable

U INTERFACE

2B1Q, Conforms to ANSI T1.601

PRI INTERFACE

2.048 Mbps:
Terminate: 75Ω/120Ω, ALBO range +6 to -41 dB
Monitor : 75Ω/120Ω, AGC range -18 to -30 dB, resistive
Bridge > 2000Ω, ALBO range +6 to -41 dB
1.544 Mbps:
Terminate: 100Ω, ALBO range +6 to -36 dBdsx
Monitor: 100Ω, AGC range -15 to -30 dBdsx, resistive
Bridge > 2000Ω, ALBO range +6 to -36 dBdsx

STATUS/ALARM INDICATORS

Power and low battery charging LED indicators
18 dual-color (RED, GREEN) LED indicators
Current status and alarm history
BRI interface
S/T - Signal, Active/Ready, Error
U-NT - Signal, Active/Ready, Error
U-LT - Signal, Active/Ready, Error
PRI interface
Line 1 - Pulses, Frame Sync, Error/Alarm

Line 2 - Pulses, Frame Sync, Error/Alarm
Test Pattern
Pattern Sync, Bit Error

BRI CALL SET UP (GENERAL)
Speech, Data, 3.1K, HLC
Automatic or manual answer, loop or terminate
Dial method: Overlap, En-bloc
Dial out from one B channel to another B channel
Any combination of sent or received calls on B1 and B2, data or voice
Higher Layer Compatibility call set up
Telephony, FAX G2/3, FAX G4, MIX Mode, OSI Mode, Videotex
Automatic available service scan & qualification
Standard protocols - AT&T, Nortel, NI-1
Optional protocols - ETSI, NTT
Standard and optional protocols based on Q.921, Q.931
Point-to-point and point-to-multipoint modes

BRI OPERATION MODES OVERVIEW
Emulation and protocol trace
TE/NT-U, TE-S/T, NT1, LT-U, LT-S/T, U-Repeater
Monitor and protocol trace
U-Repeater
S/T - Monitor

PRI CALL EMULATION
Standard protocols: AT&T, Nortel, NI-2
Optional protocols: ETSI, NTT, 1TR6, DPNSS, DASS-2
Standard and optional protocols based on Q.921, Q.931

PRI FACILITY TESTING
Loop Up/Down: CSU or NIU, in-band or datalink, per ANSI T1.403, ANSI T1.408
Pre-service T1/E1 BERT Test: facility monitored during PRI call setup and PRI protocol monitoring modes

PROTOCOL ANALYSIS
D channel Layer 2, Layer 3 protocol analysis to bit level
X.25 protocol analysis on D or B channel (option)
Programmable trace filters
NVRAM trace buffer
Remote trace dumping
Remote D-channel drop out to the serial port
Detailed trace printing via serial printer

All messages logged during emulation, call setup and in-service monitor modes

TEST PATTERN GENERATOR

Pseudorandom:
511 bit, Conforms to ITU V.52
2047 bit, Conforms to ITU O.151, O.152
63, 2^{23}-1, 2^{20}-1, 2^{15}-1, QRS
Other patterns:
All ones, All zeros, Alternate 1/0, programmable 16 bits, 3-in-24, 1-in-8

ERROR INJECTION

Single or programmable rate logical error injection
BRI : Forced CRC Inversion, Bit Error
PRI : BPV/Code Violation, Frame Error, CRC Error

MEASUREMENTS

Bit Error (BRI & PRI):
Error count, error rate, pattern sync loss seconds
ITU G.821 Analysis: ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS, AS, %AS, DGRM
BRI:
U/2B1Q: NEBE errors, NEBE errored seconds, FEBE errors, FEBE errored seconds, Sealing Current, D-channel CRC
S/T: Code errors, Code errored seconds, Frame errors, Frame errored seconds, Power Source Detect (PS1, PS2), BERT on B1, B2, D, or 2B+D
PRI:
BPV/Code violations, frame errors, CRC errors
ITU G.821 Analysis: ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS, AS, %AS, DGRM, Signal Level
BERT on Nx64K, Nx56K. Time slot programmable
Physical layer level, frequency
Programmable measurement time: 1 to 99 minutes or continuous
Test results buffer: saves measurement results with time stamp and circuit information in NVRAM

SPEAKER PHONE CAPABILITY

Built-in microphone & speaker with volume control
Hands-free operation
Audio ringer
Companding: A Law / u Law, selectable

VF MEASUREMENTS

DTMF dialer
PCM coded, A Law / u Law selectable
Simultaneous send/receive tone within a B channel
Sends/measures tone from 50 Hz to 3950 Hz, +3 dBm to -60 dBm

HANDSET INTERFACE

Drop/Insert VF tones from a handset to any B-channel (A / u Law selectable)
Used for one call during simultaneous voice calls on B1 and B2

2.0 Configurations

Here are the various items which may be ordered with the SunSet ISDN. The following ISDN Packages give you everything you need in one conveneient order number. However, if you prefer, you may order most items separately.

Model	Name and Description
SS400A	SunSet ISDN Includes BRI test set chassis, S/T Interface, one Interface, NT1 emulation, Universal 100-240 VAC Battery Charger with IEC Connector (SS138) and North American Power Cord (SS431), SunWare cartridges, Battery Pack, User's Manual, and 3 protocols (AT&T, NTI and National ISDN 1). Additional protocols may also be purchased as SunWare Options.

HARDWARE OPTIONS

SS401	Dual T1 Primary Rate Interfaces
SS402	Dual E1 Primary Rate Interfaces
SS403	Phantom Power Source Internal powering device for U or S/T Inter face: 40 VDC @ 100 mA.

Note: SS401 and SS402 are mutually exclusive

SUNWARE OPTIONS

SW401	Remote Control Includes Null Modem Adapter (SS122A)
SW403	Basic Rate Interface D-Channel Monitor, Decode and Protocol Analysis
SW404	Primary Rate Interface D-Channel Monitor, Decode and Protocol Analysis (Requires SS401 or SS402)
SW405	U Repeater and LT *eoc* Control
SW406	VF Frequency/Level Send and Receive and DTMF dialer

Basic Rate Protocol Options

SW440	ETSI protocol (Europe)
SW441	NTT protocol (Japan)

Primary Rate Protocol Options

SW451	NTT T1 protocol (Requires SS401)
SW452	ETSI T1 protocol (Requires SS401)
SW460	1TR6 E1 protocol (Requires SS402)
SW461	DASS-2/DPNSS E1 protocols (Requires SS402)
SW462	ETSI E1 protocol (Requires SS402)
SW2502	2 Mb SunWare Replacement Cartridge

ACCESSORIES

SS101	Carrying Case
SS104B	Cigarette Lighter Battery Charger
SS106	Cable, Single Bantam to Single Bantam, 6'
SS107	Cable, Dual Bantam to Dual Bantam, 6'
SS108	Cable, Single Bantam to Single 310, 6'
SS109	Cable, Single Bantam to Probe Clip, 6'
SS112	Cable, Dual Bantam to RJ-48 8-position Modular Plug,6'
SS115B	DIN-8 to DB-9 Printer Cable
SS117A	Printer Paper, 5 rolls, for SS118B/C
SS118B	High Capacity Thermal Printer Includes cable (SS115B) and 110 VAC charger
SS118C	High Capacity Thermal Printer As SS118B but with 220 VAC charger
SS122A	Null Modem Adapter
SS138	SunSet AC Charger, 100 - 240 VAC AC Adapter, output 15 VDC @ 2A, input 100 -

	240VAC
SS140	9-Cell NimH Battery Pack, 10.8 VDC, 1.8 Ahr
SS400AW	SunSet ISDN 3-Year Extended Warranty
SS423	Cable, RJ-48 (m) 8-pin Modular Plug to RJ-48 (m) 8-pin Modular Plug, 6'
SS424	Cable, RJ48 (m) 8-pin Modular Plug to 2 Probe Clips, 6' (for U Interface)
SS425	Cable, RJ48 (m) 8-pin Modular Plug to 4 Probe Clips, 6' (for S/T Interface)
SS427	Handset
SS428	SunSet ISDN User's Manual
SS429	2 pin Euro-style Power Cord
SS431	3-prong Power Cord
SS432	Cable, RJ-48 (m) 8-pin Modular Plug to RJ-11 (m) 6-pin Modular Plug, 6'
SS433	RJ-48 8-pin Modular Plug Y-Adapter

Chapter 10
Troubleshooting & Customer Service

Section 1 Troubleshooting

Occasionally, your SunSet ISDN may not operate as expected.

Here is a general troubleshooting procedure:

1) Check the manual for instructions on how to perform the desired procedure

2. Verify the Test Configuration is set up properly

3) Check that the cords are properly connected into the right jacks

4) Make sure the SHIFT status is the one you want

5) If the set still does not behave properly, try turning the power off, then on.

6) If this does not solve the problem, to an NV RAM erase, in the SYSTEM PARAMETERS menu.
Note: This will erase all user programmed information.

Here are some helpful suggestions for specific problems which might occur:

Problem: Keys do not work properly.
Suggestion:

1) Verify shift status by pressing and releasing the SHIFT-lock key. Press and release the SHIFT-lock key until the SHIFT status indicator in the upper left hand side of the screen achieves the desired condition.
2) Do not press SHIFT-lock key simultaneously with another key.
3) Press the key again. The set may not have registered it the first time.

Problem: Test set will not power up properly.
Suggestion:

1) Make sure the battery is charged or the charger is plugged in.
2) Make sure the SunWare cartridge is inserted firmly and seated correctly.

Problem: SunSet shows Security Violation when switched on.

Suggestion:

1) Make sure the serial number of the SunWare cartridge matches the serial number of the SunSet.

Problem: Set performs improperly.

Suggestion:

1) Try switching the set off, then switching it on again.
2) Try the ERASE NV RAM. menu option. NOTE: this will erase all user-programmed information and history buffers within the SunSet. When the ERASE NV RAM has completed, switch off the SunSet for 5 seconds, then switch it on.

Problem: Measurements are not working properly (Loss of Signal, no Pattern Synch).

Suggestion:

1) Verify signal settings in the TEST CONFIGURATION menu.
2) Verify that all jacks are connected properly, according to the circuit graphic.
3) Ensure that OUT is plugged to IN and vice-versa.
4) Twist the plugs inside of the jacks and ensure that all plugs are inserted fully.

Problem: Test Patterns will not synch.

Suggestions:

1) Press AUTO to force the SunSet to resynchronize on the Pattern, Framing type, and line Coding type.
2) Verify that desired pattern is being sent in the TEST PATTERN menu.

Problem: Test patterns will not synch with another test set.

Suggestions:

1) Enter the TEST PATTERN screen to examine the pattern being received.

If you are still having difficulty, contact your distributor directly or contact Sunrise Telecom at Tel: 1 408 363 8000 or Fax: 1 408 363 8313.

Section 2 Customer Service

Sunrise Telecom Customer Service is available from 7:30 AM to 5:00 PM Pacific Standard Time (California, U.S.A.).

Customer Service performs the following functions:

- Answers customer questions over the phone on such topics as product operation and repair
- Repairs malfunctioning SunSets promptly
- Provides information about product upgrades

The warranty period covering the SunSet ISDN is 1 year from the date of shipment. A Return Merchandise Authorization (RMA) Number is required before any product may be shipped to Sunrise Telecom for repair. Out-of-warranty repairs require both an RMA and a Purchase Order before the unit is returned. All repairs are warranted for 90 days.

Please contact Customer Service if you need additional assistance:

Customer Service
Sunrise Telecom Inc.
22 Great Oaks Blvd.
San Jose, CA 95119
U.S.A.

Phone: 1 408 363 8000
(24 hrs tech support) 1 800 701 5208
Fax: 1 408 363 8313
Internet: http://www.sunrisetelecom.com
Email: support@sunrisetelecom.com

Abbreviations

A

A-law - International voice-encoding system
ACT/RDY - Active/Ready
AFI - Authority and Format Identifier
AMI - Alternate Mark Inversion
AOC- Advice of Charge
AS - Available Second

B

B Channel - Bearer Channel; carries user information
Basic Rate - ISDN type typically used for subscribers; consists of two B channels and one D channel; 144Kbps bidirectional
BERT - bit error rate testing
BRI - Basic Rate Interface

C

CACH - Call Appearance Call Handling
CAP - Call Appearance
CCS - Common Channel Signalling
CLI - Calling Line Identification
CLIP - Calling LIne Identification Presentation
CLIR - Calling LIne Identifcation Restriction
CO - Central Office
config - configuration
CPNI - Calling Party Number Identification
C/R - Command/Response (bit)
CRC - Cyclic Redundancy Check
CUG - Closed User Group

D

D Channel - Demand Channel; carries signalling information
DCE- Data Circuit Eqipment
DDS - Dataphone Digital Service
DM - Disconnect Mode
DS0 - Digital Signal level 0 = 64 Kbps
DTE - Data Terminal Equipment

DS1 - Digital Signal level 1 = 1.544 Mbps
DSL - Digital Subscriber Line

E

EKTS - Electronic Key Telephone System
eoc - Embedded Operations Channel; 2 Kbps section of DSL
ESF - Extended SuperFrame

F

FEBE - Far End Block Error
FRM SYNCH - Frame Sychronization
Full Duplex - Simultaneous two-way communication

H

H Channel - High speed bearer channel
Half Duplex - One direction of communication at a time
HLC - Higher Level Capability
HOLDSCRN - hold screen
Hz - Hertz

I

INTERN - Internal
ICHD - ISDN Call HolD
ISDN - Integrated Services Digital Network
ISUP - ISDN User Part
ITU - International Telecomunications Union

K

Kbps - KiloBits Per Second

L

LAPD - Link Access Protocol, Balanced
LCI - Logical Channel Identifier
LCN - Logical Channel Number
LED - Light Emitting Diode
LT - Line Termination
LVL - Level

M

M-4 - D-channel overhead Maintenance bits
Mbps - MegaBits Per Second
meas - measurement
μ-law - mu-law; voice companding law

MON - Monitor

N

NE - Network Element
NOPWR - No power
NSAP - Network Service Access Point
NT - Network Termination
NTE - Network Terminating Equipment
NV RAM - Non Volatile Random Access Memory

O

OSI - Open Systems Interconnect

P

P/F - Poll/Final (bit)
PP-EOC - Point to Point Embedded Operations Channel
PPSN - Public Packet Switched Network
P-to-MP - Poin to Multipoint
P-to-P - Point to Point
PRA - Primary Rate Access
PREVIUS - previous
PRI - Primary Rate Interface
PRN SCRN - Print Screen
PRNT - Print
PSN - Packet Switching Network
PS1- PowerSource 1
PS2 - PowerSource 2
PTI - Packet Type Identifier
PVC - Permanent Virtual Circuit

R

RCV - Receive
RDY - Ready
REJ - Reject
RNR - Receive Not Ready
RPOA - Recognized Provate Operating Agency
RR - Receive Ready
RTD - Remote Digital Terminal
RT - Remaining Time
Rx - Receive

S

SABM - Set Asynchronous Balanced Mode

SABME - Set Asynchronous Balanced Mode Extended
SAP - Service Access Point
SAPI - Service Access Point Identifier
SCCP - Signalling Connection Control Part
SDLC - Synchronous Data Link Control
SCRN - Screen
SES - Severly Errored Second
SPID - Service Profile IDentifier
SS - SunSet
SVC - Swtiched Virtual Circuit
SW - SunWare

T

TA - Terminal Adaptor
TEI - Terminal Endpoint Identifier
TERM - terminated
TEI - Terminal Endpoint Identifier
TSP - Terminal Service Profile
Tx - Transmit

U

U interface - reference point netween NT1 and the network; first point on customer premesis
UA - Unnumbered Acknowledgement
UAS - Unavailable Second
UI - Unit Interval or Unnumbered Information
USID - User Service IDentifier
uS - microsecond

V

VC - Virtual Circuit
VF - Voice Frequency

Annex
Q.931 Cause Values

Class: Normal Event

No.	Cause Value Class 765	Value 4321	Definition
1	000	0001	Unallocated (unassigned) number
2	000	0010	No route to specified transit network
3	000	0011	No route to destination
6	000	0110	Channel Unacceptable
16	000	0110	Normal call clearing
17	001	0000	User Busy
18	001	0010	No user responding
19	001	0011	No answer from user (user alerted)
21	001	0101	Call rejected
22	001	0110	Number changed
27	001	1011	Destination out of order
28	001	1100	Invalid number format (address incomplete)
29	001	1101	Facility rejected
30	001	1110	Response to *STATUS ENQUIRY*
31	001	1111	Normal, unspecified

Class: Resource Unavailable

No.	Cause Value Class 765	Value 4321	Definition
34	010	0010	No circuit/channel available
41	010	1001	Temporary failure
42	010	1010	Switching equipment congestion
43	010	1011	Access information discarded
44	010	1100	Requested circuit not available
47	010	1111	Resources unavailable, unspecified

Class: Service or Option not Available

No.	Cause Value Class	Cause Value Value	Definition
	765	4321	
50	011	0010	Requested facility not subscribed
54	011	0110	Incoming calls barred
57	011	1001	Bearer capability not authorized
58	011	1010	Bearer capability not presently available
63	011	1111	Service or option not available, unspecified

Class: Service or Option not Implemented

No.	Cause Value Class	Cause Value Value	Definition
	765	4321	
65	100	0001	Bearer capability not implemented
66	100	0010	Channel type not implemented
70	100	0110	Only restricted digital information bearer capability is available
79	100	1111	Service or option not implemented, unspecified

Class: Invalid Message

No.	Cause Value Class	Cause Value Value	Definition
	765	4321	
81	101	0001	Invalid call reference value
82	101	0010	Identified channel does not exist
88	101	1000	Incompatible destination
90	101	1010	Destination address missing, and direct call not subscribed
95	101	1111	Inavalid message, unspecified

Class: Protocol Error

No.	Cause Value Class Value 765 4321	Definition
96	110 0000	Mandatory information element is missing
97	110 0001	Message type non-existent or not implemented
99	110 0011	Information element non-existent or not implemented
100	110 0100	Invalid information element contents
101	110 0101	Message incompatible with call state
102	110 0110	Recovery on timer expiry
111	110 1111	Protocol error, unspecified

Class: Interworking Class

No.	Cause Value Class Value 765 4321	Definition
127	111 1111	Interworking, unspecified

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Symbols/ Numbers

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SunSet ISDN Supplement 3.20 No. America

This supplement will introduce you to the SunWare features added since version 3.0 of the manual. The new features include a second memory card, new calling abilities such as bonding, selfbert and dualbert, as well as additional filtering capabilities and an autoscan for supplementary service in the ETSI protocol. The section and page number from the manual corresponding to each figure will be listed in parenthesis..

1.0 Product Description

1.1 Memory Card

The second PMCIA card slot on the back of the SunSet ISDN may now be filled with an optional memory card. The cards are available in 256K (SW2510) and 1 Mbyte (SW2515) sizes. On bootup, and also upon entering the PROTOCOL ANALYSIS menu, the SunSet will scan itself for a second memory card. If it finds one, you will see a "2nd Memory Card Detected" message. The card will be used to store all D-channel messages. If a second memory card is not detected, the unit will use its internal memory to store the messages, and presents an "Internal Memory Used" message on bootup. Do not insert or remove the card while the unit is operating.

To insert the card, refer to Figures 1.A and 1.B in Chapter 2 of the User's Manual. Switch off the test set. Insert the memory card into the second (outer) slot. Ensure that it is seated firmly. The ejector button will pop up, and, when the card is inserted properly, be at the same height as the card. You can now switch the set back on.

Section 2 BRI Changes

2.1 Auto Key Functions

Various automated tests have been added to the SunWare. They are accessed in the BRI mode by pressing the SHIFT key followed by the AUTO key (see page 3–9). Some tests are also accessible from the menus they are specific to. The AUTO SERVICE SCAN function is available with this key in any but the ETSI or AUSSIE modes.

SPID Detection

In the TEST CONFIGURATION screen, at a SPID line, using National protocol, press SHIFT, then AUTO. You will enter an AUTOMATED TESTS screen. You have two ways of figuring out the SPIDs.

1) AUTO SPID DETECT

Auto SPID is only supported in National 3 protocol.Press ENTER at this line and you will enter the following screen:

```
          C1:   C2:  14:09:29
>             Unt:RDY   +POWER<
>SETUP                        <
      AUTO SPID DETECT


 SPID #1     :
 PHONE NUM #1  :

 SPID #2     :
 PHONE NUM #2  :
                          START
```

Figure 1 Auto Spid Detect, Start

a) Press START. The unit will query the switch for the valid SPID. You will see a PLEASE WAIT TEST IN PROGRESS message. The unit will report TEST FAILED if the SPIDs are not found. Otherwise, the SPIDs will be presented at the proper line, along with the corresponding phone number. See Figure 2.

```
          C1:  C2:        14:09:29
>               Unt:RDY   +POWER<
>SETUP                           <
          AUTO SPID DETECT
 TEST COMPLETED
 SPID #1   : 40836389970101
 PHONE NUM #1 :3638997
 SPID #2   : 40836383130101
 PHONE NUM #2 : 3638313
```

Figure 2 Auto Spid Detect, Finished

2) Guess SPID

This function can be used when you have a phone number for the line, but not the SPID. It is available for all protocols.

a) Enter the phone number(s) at the PHONE NUM #1/2 lines, then press START.

b) Use the arrow (F2 and F3) keys if you need to edit the phone numbers.

The unit will try SPIDs until it arrives at the correct one(s), which it will then present in the SPID #1/2 lines. See the following figure:

```
          C1:   C2:        14:09:29
>                 Unt:RDY   +POWER<
>INFORMATION                       <
          GUESS SPID
 PLEASE WAIT TEST IN PROGRESS
 PHONE NUM #1  :  4083602298
 PHONE NUM #2  :  4083602227
-----------------------------------
 SPID #1   :  40836022980101
 SPID #2   :
                               STOP
```

Figure 3 Guess SPID, In Progress

- When the SPID was successful, it will show next to the SPID line, with a SPID #1 (2) OK message.
- If no SPID is found, FAILED will show next to the SPID line.

3) AUTO SERVICE SCAN

This is a short cut to the feature in the OTHER FEATURES menu (4-57). Its functionality has not changed.

2.2 Call Setup

SunWare version 3.20 has added three new call types to the BRI Call Setup screen (see 4–11). To access these call types:

1) Enter ISDN-BRI, CALL SETUP (TE-S/T and TE/NT1-U Modes)
2) With the cursor on CALL TYPE, press more (F4). The screen should appear as below.

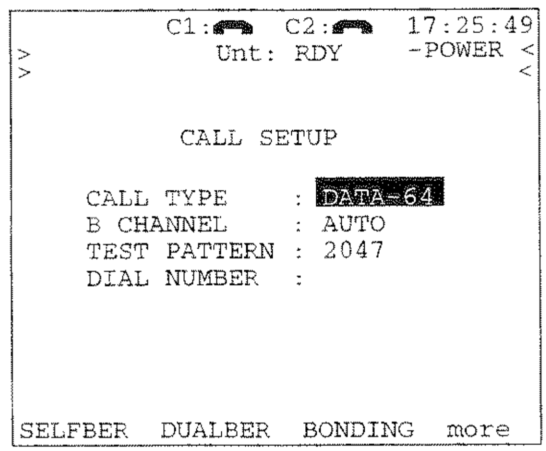

Figure 4 Additional Call Types

These new call types are used as follows:

- SELFBER (F1): The SunSet ISDN automatically sets up a self Data-64K data call, answers and loops back the call, then runs a BER test.
- DUALBER (F2): This feature automatically sets up two Data-64K calls, and runs two independent BER tests on B1 and B2.
- BONDING (F3): Here the SunSet ISDN automatically places two Data-64K calls and runs a BER test at the full 128K rate. It also reports the round trip delay (in ms) for each B-channel, the interchannel delay (in ms), and the phase shift (in bits) between the two B-channels.

2.2.1 Placing a SELFBER Call

To place a Data-64 call:

1) Configure your TEST CONFIGURATION:

MODE: TE-S/T (for S/T Interface) or TE/NT1-U (for U Interface)
PROTOCOL & LINE TYPE: As required
SPID #1, SPID #2: If applicable
PHONE NUM #1, #2: This is your own phone number. If you are using a point-to-multipoint circuit which requires SPIDs,

you will need to enter in two numbers- corresponding to each SPID. Make sure this number is set properly before continuing, as this is the number used for the SELFBER test.

2) Connect to the circuit. You may press the GRAPHIC key to determine which connector to use.
a) Look at the status indication area at the top of the LCD screen, and verify the Interface status
b) The ACT/RDY LED will blink to indicate an active circuit, then go solid green when you are ready to place a call

3) From Test Configuration, press ENTER. This should bring up the Call Setup screen. Change the Test Pattern or B channel, if necessary. The SELF BERT test uses both channels during the test; however, a BERT measurement is performed only on the channel selected here.

4) Then cursor to Call Type and select SELF BER (more, F1). This brings up the SELF BERT screen, as seen in Figure 5.

```
            C1:     C2:      17:26:03
>                 Unt: RDY   -POWER <
>                                   <

          SELF BERT CALL

   ENTER DIAL PREFIX
   PRESS START TO CONTINUE

   9



START     <-
```

Figure 5 Self Bert Call Screen

The SunSet ISDN will place a call to your number as entered in Test Configuration. If you need to, add a prefix to this number (for example, if you are using a centrex circuit, or some PBXs, you would need to add "9"); type in the numbers as required.

Press START (F1) to begin the SELFBER test.

5) If the call is connected successfully, the SunSet automatically shows a BERT screen. You also will see the C1 and C2 symbols in the "Off-Hook" position, as well as a CONNECT message in the Status bar.

If the call does not connect successfully, the screen will read "SELFBER CALL FAILED." You may look at the status line for a RELEASE COMP message with the associated cause value for why the call did not go through.

6) The BERT screen appears in Figure 6. Note that only one B-channel shows an error count, because the other B channel just has a loopback placed on it. This B-channel is the one selected in the Call Setup screen (or the available channel selected by the switch if you chose AUTO). You are essentially BERTing both B-channels at the same time.

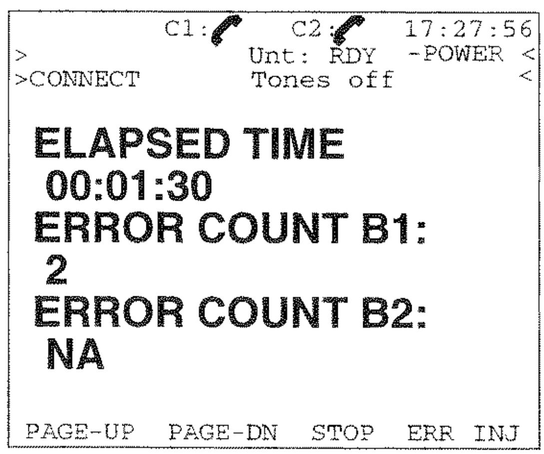

Figure 6 Self Bert Results

- The first page provides a summary on your SELF BERT test.
- Elapsed time equals the amount of time since the BERT started.
- The error count is given for your selected B channel.
- Press the PAGE-DN (F2) key to view the physical measurements and a detailed logical results page.

7) Enter the Call Control screen, and press ON-HOOK (for either

B1 or B2) to disconnect your call and stop the test.

2.2.2 Placing a DUALBER Call

1) Configure your TEST CONFIGURATION:

MODE: TE-S/T (for S/T Interface) or TE/NT1-U (for U Interface)
PROTOCOL & LINE TYPE: As required
SPID #1, SPID #2: If applicable
PHONE NUM #1, #2 : This is your own phone number. If you are using a point-to-multipoint circuit with SPIDs, you will need to enter in two numbers- corresponding to each SPID.

Note that you need to call a loopback data call number or have another SunSet ISDN in auto answer loopback mode.

2) Connect to the circuit. You may press the GRAPHIC key to determine which connector to use.
a) Look at the status indication area at the top of the LCD screen, and verify the Interface status
b) The ACT/RDY LED will blink to indicate an active circuit, then go solid green when you are ready to place a call

3) In order to test bonding, your circuit needs to have data compatibility for both SPID 1 and SPID 2. If you are uncertain about the service supported on your SPIDs, you can run an Auto Service Scan. Enter Other Features, Auto Service Scan. Run a Local scan for both SPID1 and SPID2 and verify that DATA 64K passes for both SPIDs.

4) From Test Configuration, press ENTER. This should bring up the Call Setup screen.
a) Change the Test Pattern, if necessary.
b) Cursor to Call Type and select DUAL BER (more, F2). This brings up the DUALBER Call Setup screen as seen in Figure 7.

```
          C1:     C2:       13:04:15
>               Unt: RDY   -POWER <
>                                 <

          DUAL BERT TEST

   ENTER DIAL NUMBER B1:
   93638000
   ENTER DIAL NUMBER B2:
   93602103█

     PRESS START TO CONTINUE

START    <-          ->      SPEED
```

Figure 7 Dual BERT Test Screen

c) Enter the number you wish to call for B Channel 1; enter another number to use for B channel 2. To achieve pattern synchronization, you need to call a loopback data call number or have another SunSet ISDN in auto answer looopback mode in order to

d) When you have completed entering these numbers, press START (F1) to begin the test.

5) If both calls connect successfully, the SunSet automatically shows a BERT screen. You also will see the C1 and C2 symbols in the "Off-Hook" position, as well as a CONNECT message in the Status bar.

If either call does not connect successfully, the screen will read "DUAL BERT TEST FAILED" on the bottom line. You may look at the status line for a RELEASE COMP message with the associated cause value for why the call did not go through.

6) The BERT screen appears in Figure 8.

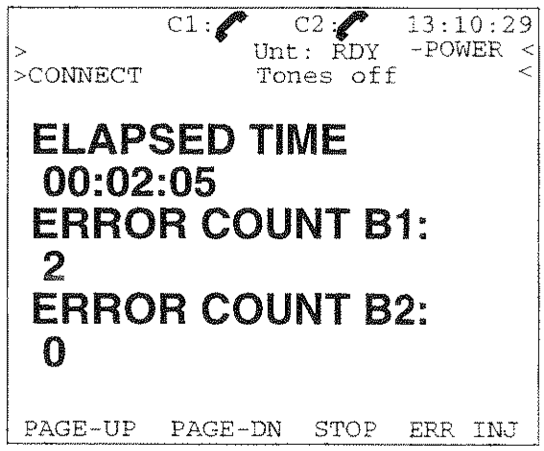

Figure 8 Dual Bert Test Results

- The first page provides a summary on your DUAL BERT test.
- Elapsed time equals the amount of time since the BERT started.
- An error count is given for both B channels.
- An independent BER test is run on both B1 and B2 simultaneously.
- Press the PAGE-DN (F2) key to view the physical measurements and a detailed logical results page for B1 and B2.

7) Enter the Call Control screen, and press ON-HOOK (for B1 and B2) to disconnect your calls and stop the test.

2.2.3 Performing a Bonding Test

1) Configure your TEST CONFIGURATION:
   MODE: TE-S/T (for S/T Interface) or TE/NT1-U (for U Interface)
   PROTOCOL & LINE TYPE: As required
   SPID #1, SPID #2: If applicable
   PHONE NUM #1, #2: This is your own phone number. If you are using a point-to-multipoint circuit with SPIDs, you will need to enter in two numbers- corresponding to each SPID.

2) Connect to the circuit. You may press the GRAPHIC key to

determine which connector to use.

a) Look at the status indication area at the top of the LCD screen, and verify the Interface status

b) The ACT/RDY LED will blink to indicate an active circuit, then go solid green when you are ready to place a call

3) In order to test bonding, your circuit needs to have data compatibility for both SPID 1 and SPID 2. If you are uncertain about the services supported on your SPIDs, you can run an Auto Service Scan. Enter Other Features, Auto Service Scan. Run a Local scan for both SPID1 and SPID2 and verify that DATA 64K passes for both SPIDs.

Note that to achieve pattern synchronization you need to call a loopback data call number or have another SunSet ISDN in auto answer looopback mode.

4) From Test Configuration, press ENTER. This should bring up the Call Setup screen.

a) Change the Test Pattern, if necessary.

b) Cursor to Call Type and select BONDING (more, F1). This brings up the Bonding Test Setup screen as seen in Figure 9.

```
           C1:    C2:     14:12:30
>               Unt: RDY  -POWER <
>                                <

          BONDING TEST

  ENTER DIAL NUMBER B1:
  93638000
  ENTER DIAL NUMBER B2:
  93638001█

    PRESS START TO CONTINUE

START   <-          ->       SPEED
```

Figure 9 Bonding Test Screen

DIAL NUMBERS for B1 and B2:

1) If you calling ISDN equipment at the far end, you may use the

same number for B1 and B2. Enter the number for B1.

a) Cursor down to B2; the SunSet ISDN automatically enters B1's number for B2.

2) If you are calling a Terminal Adaptor, you need to enter numbers for both SPIDs. Enter the number for B1. Cursor down to B2 and manually change B2's entry to match the number associated with SPID 2.

3) When you have finished entering the numbers, press START (F1) to begin the test. When both calls have connected, the C1 and C2 handsets are in the "Off-Hook" position and a CONNECT message is displayed on the status line. The Summary Results page will automatically appear, as in Figure 10.

Note: If either call fails to connect, the message "BONDING TEST FAILS" appears at the bottom of the screen. Check the status line for a Release Complete message and the cause value to learn why the call did not connect.

If the first call connects and the second call fails, the first call remains connected. To run the test again, go to Call Control, press ON-HK, then Escape back to Call Setup. Then you may retry the bonding test.

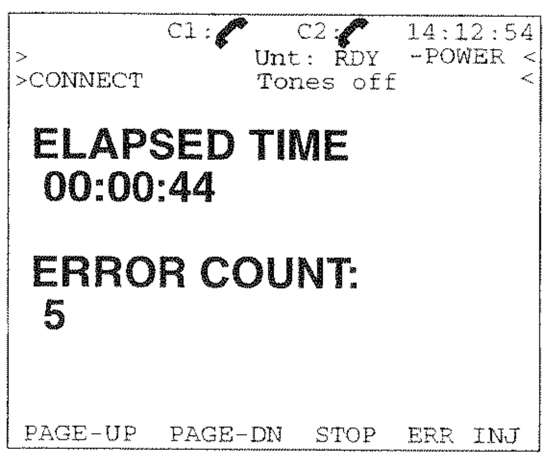

Figure 10 Bonding Result Screen

The summary screen provides two results:

- ELAPSED TIME: This records the amount of time since the BERT started.
- ERROR COUNT: This counts the number of errors detected on the full bonded 128K.

Press the Page-Dn key to view the Signal results, a detailed Logical Results (for 128K), and a B Channel Delay page. The B Channel Delay screen is shown in Figure 11.

```
            C1:        C2:       14:13:46
>                  Unt: RDY   -POWER <
>CONNECT           Tones off         <


           B CHANNEL DELAY

     B1 ROUNDTRIP       : 13750µs
     B2 ROUNDTRIP       : 13500µs

     DELAY B1 vs B2     : -250µs

     PHASE SHIFT        : 16 BITS

 PAGE-UP  PAGE-DN   STOP   ERR INJ
```

Figure 11   B Channel Delay

The following information is displayed in this screen:

- B1 ROUNDTRIP: This is the roundtrip delay for the call on B1 in microseconds.
- B2 ROUNDTRIP: This is the roundtrip delay for the call on B2 in microseconds.
- DELAY B1 vs. B2: This is the difference in time between the delay on B1 and B2.
- PHASE SHIFT: This is the difference in bits between the calls on B1 and B2.

The difference in time and bits is directly related. There are 64,000 bits per second. In Figure 11, 16/ 64,000= .00025 seconds or 250 µs

In general, a Terminal Adapter can support up to 500 milliseconds (or 500,000 µs) of one-way delay between the two channels. Note that the SunSet ISDN provides this measurement as a round-trip figure. You might want to check with your Terminal Adaptor vendor to determine the exact amount of delay your TA can tolerate.

2.2.4 Bulk Call

The Bulk Call feature is an load generation test that stresses the BRI circuit to see how much traffic it can handle.

1) From the ISDN - BRI menu screen, enter TEST CONFIGURATION.

a) Set up the screen as follows:

MODE: TE/NT1-U
PROTOCOL: as required
LINE TYPE: as required
SPID #1: set per circuit, then arrow down
SPID #2: set per circuit, then arrow down
PHONE NUM #1 will appear automatically, or enter yourself
PHONE NUM #2: will appear automatically, or enter yourself

b) Escape back to the ISDN BRI menu.

2) Enter OTHER FEATURES/BULK CALL. See Figure 12.

```
              C1:  C2:    08:27:39
>                                <
>                                <
              BULK CALL
  NUM OF CALLS (1-9999): 180
  SELF CALL             : OFF
  CALL RATE (1-100/min): 60
  CALL TYPE             :DATA-64
  DIAL NUMBER :
       3638000



 <-        ->       SPEED      CALL
```

Figure 12 BRI Bulk Call

a) Configure the screen as follows:

NUM OF CALLS: Determine the number of calls the SunSet will generate during the test. The maximum number is 9,999.

- You may enter the number directly from the keypad. Use the arrow F-keys to edit your entry as needed.

SELF CALL: Determine if the SunSet will place a self call.

- Select ON (F1) to place a self call during the test. In this case, the SunSet will call the PHONE NUM #1 entered in the Test Configuration screen. Note that if ON is selected, the CALL RATE will then be a maximum of 90.
- Select OFF (F2) if you do not wish to place a self call. In this case, the SunSet will call the number entered as DIAL NUMBER below.

CALL RATE: Specify the call rate, from 1-100 per minute. For example, in Figure 12, the number of calls is 180 and the call rate is 60. This means that 60 calls will be setup and released per minute, and the test will run for three minutes.

- You may enter the number directly from the keypad. Use the arrow F-keys to edit your entry as needed.

CALL TYPE: Press F1 to place a SPEECH call. Press F2 to place a DATA-64 call, or F3 for DATA-56.

DIAL NUMBER: If you are not placing a self call, this will be the number called. You may enter the numbers directly from the keypad, using the arrow F-keys to edit your entry.

4) When you have finished configuring these items, press CALL (F4) to begin the test.
   - A Bulk Call Testing screen appears showing you the status of the calls. Refer to Figure 13.

```
            C1    C2    01:16:54
>            Unt:RDY      POWER<
>                              <

        BULK CALL TESTING

     ACTIVE CALLS    : 1
     CALLS COMPLETED: 0
     TOTAL CALLS     : 2




RESULT                      STOP
```

Figure 13 Bulk Call Testing

ACTIVE CALLS: This is the number of calls that are currently connected.

CALLS COMPLETED: This is the number of calls which have been successfully completed.

TOTAL CALLS: This is the number of calls both placed and received. Note that on a self call, this number will be double the number of calls you set up, and in a point-to-point test, this will be only the number of calls you place, as you are not receiving any.

5) Press the RESULT (F1) key for more information on your test. Refer to Figure 14.

```
                C1    C2    01:16:54
>               Unt:RDY     POWER<
>                                <
        BULK CALL RESULT

   ORIGINATING CALLS   : 100

   TERMINATING CALLS   : 0
   COMPLETED CALLS     : 24

   DISC CAUSE VALUE:24
   16 Normal Call Clearing
   CHANNELS USED:

         PAGE-DN  PRINT  RETURN
```

Figure 14 Bulk Call Results, pg. 1

The result screen gives you the results of your finished test:

ORIGINATING CALLS: The number of call setup messages generated by the SunSet ISDN.

TERMINATING CALLS: The number of call setup messages received by the SunSet ISDN.

COMPLETED CALLS: The number of calls which were successfully connected and released.

DISC CAUSE VALUE: The disconnect cause values for each call are displayed and decoded. The number of calls disconnected with that cause value is provided below.

In the sample screen, Figure 14, 24 calls had a disconnect cause value of 16, which is normal call clearing.

a) Press the PAGE-DN (F2) key to see more results.

```
                C1:  C2:   01:17:38
>               Unt:ACT       -PWR <
>                                  <
 B1: 0       B2: 100

 START TIME: 98:10:02   7:22:18
 END TIME  : 98:10:02   7:23:31




PAGE-UP            PRINT     RETURN
```

Figure 15 Bulk Call Results, pg. 2

2.3 Protocol Analysis

The D-ch Analysis menu (4–25 to 4-31) has been replaced by a more extensive Protocol Analysis menu. Please see Section 3.2 in this supplement for a description of the new features.

2.4 Other Features

2.4.1 Auto Service Scan

This function (4-57) has an additional choice of SPID to scan for. See Figure 16 and the following procedure:

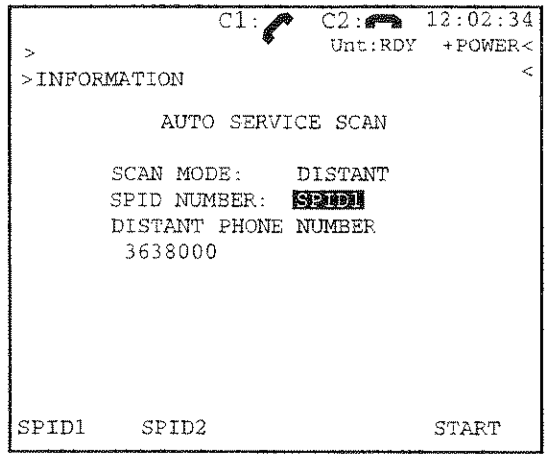

Figure 16 Auto Service Scan

1) Select your scan mode (Local or Distant) as described on 4-57/58.

2) SPID NUMBER
Options: SPID1 (F1), SPID2 (F2)
Determine which SPID to check for bearer services.

3) Continue with the procedure as outlined on 4-58.

2.4.2 40 kHz Loss Measurement

The following provides a step-by-step procedure for measuring the loss on a 40 kHz tone (4-59). This application uses two SunSet ISDNs: one generates the 40 kHz tone at +13.6 dBm; the other measures the 40 kHz tone.

Use the following procedure to generate and measure a 40 kHz tone:

To Generate a Tone:

1) Enter ISDN-BRI, Test Configuration.

2) Connect the SunSet ISDN to the 2-wire U-interface. You will

most likely need to use an RJ-48 to alligator cable to clip directly onto the 2 wires. Connect the RJ-48 to the SunSet's U-LT Interface.

3) Enter the U 40 kHz MEASUREMENT line in the OTHER FEATURES menu. As the screen shows, the set is now sending a 40 kHz tone at +13.6 dBm on the U -LT port as per ANSI Recommendation T1.601and ETR 80 ETSI. As soon as you enter this screen, you are transmitting a 40 kHz tone.

To Measure a 40 kHz tone:

1) Enter ISDN-BRI, Test Configuration.

2) Connect the SunSet ISDN to the 2-wire U-interface. You will most likely need to use an RJ-48 to alligator cable to clip directly onto the 2 wires. Connect the RJ-48 to the SunSet's U-NT port.

3) Escape back to the BRI menu. Cursor down to OTHER FEATURES. Press ENTER and enter U 40 kHz Measurement. The U NT Receiving loss measurements reports the dB of attenuation, assuming the tone is generated at +13.6 dBm. Refer to Figure 17.

```
          C1:      C2:      11:49:12
>                                  <
>                                  <

      U 40kHz MEASURMENT

   U LT SENDING 40kHz TONE

   U NT RECEIVING
   TONE LEVEL          -35.73dB
```

Figure 17 U 40 kHz Measurement

- The bottom line shows the dB loss
- The maximum allowed loss, according to ANSI T1.601, is 42dB to quality a copper pair to be able to support 2B1Q U interface transmission.

Technology Note: 40 kHz Tones

A loss measurement at 40 kHz must be performed to determine if a copper pair can support ISDN BRI services.

The U interface has a rate of 160 Kbit/s (2 B-channels at 64 Kbit/s each, 1 D-channel at 16 Kbit/s,and overhead bits, which include M4, eoc commands, CRC, and Frame Alignment, at 16 Kbit/s).

This interfaces uses 2B1Q encoding (2 binary, 1 quatenary) that sends 2 bits per symbol. See Figure 18A for an example of 2B1Q.

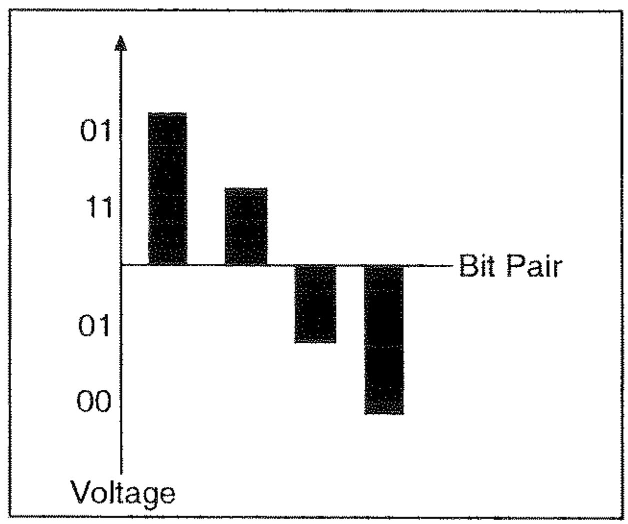

Figure 18A 2B1Q Encoding

As each symbol is sending 2 bits, the overall rate is 80 Ksymbols/s, or 80 Khz bandwidth. The highest bandwidth reached by this transmission occurs when a maximum positive symbol is sent simultaneously with the maximum negative symbol (see Figure 18B). In this case, we have a psuedo-sinewave signal that has a frequency of 40 Khz. (80 Khz per symbol -> 40 Khz for a full cycle.)

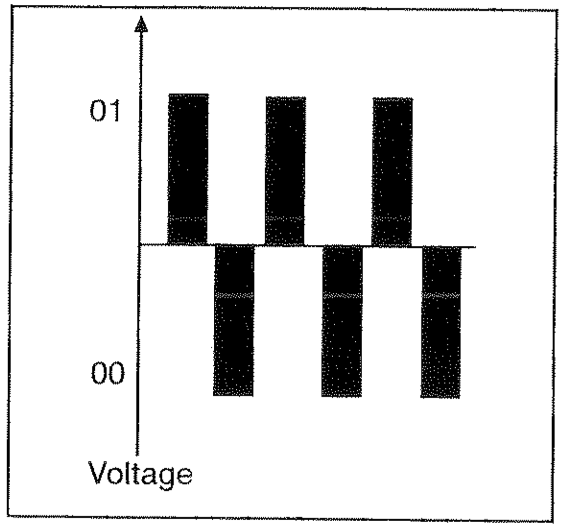

Figure 18B 2B1Q Maximum Bandwidth

Due to the fact that on a copper wire circuit the amplitude steadily decreases as function of the frequency, and that in the function of the U interface the maximum frequency transmitted is 40 Khz, if the 40 Khz test passes, the line will carry the 2B1Q encoding and the U interface traffic with no problem.

3.0 Changes Common to BRI and PRI

3.1 SUPP SERVICE SCAN

In ETSI protocol, a Supplementary Services Scan is available in the OTHER FEATURES menu for both PRI and BRI. See Figure 19. This features scans a line to determine which of a variety of supplementary services are available on it.

```
            C1:      C2:      14:09:29
>                  Unt:RDY   +POWER<
>                                   <
  SUPPLEMENTARY SERVICE SCAN

 ENTER ONE MSN NUMBER TO TEST
 PRESS START TO CONTINUE
 █




 START    NONE            <-
```

Figure 19 Supplementary Services Scan, Start

1) Use the numeric keys to enter a Multiple Subscriber Address (MSN) at the indicated line. This is the number you want to test for services. If you don't have a number, or don't want to test the MSN service, please skip the setting.

2) Press START. You will see the following screen:

```
            C1:      C2:      14:09:29
>                  Unt:RDY   +POWER<
>                                   <
  SUPPLEMENTARY SERVICE SCAN

 - CLIP      - CLIR      - CFU
 - COLP      - COLR      x CFB
 V SUB       V MSN       X CFNR
 X DDI       - CH        - UUS
 - TP        - AOC-D     - MCID
 - AOC-E     - AOC-S

 PLEASE WAIT TEST IN PROGRESS
                    PRINT    STOP
```

Figure 20 Supplementary Services Scan, In Progress

a) When the test is finished, you will see a TEST COMPLETED message. Here is a list of the services:

CLIP: Calling Line Identification Presentation - presents the Calling Party Number to the called user.

CLIR: Calling Line Identification Restriction - prevents the Calling Party Number from showing to the called user.

CFU: Call Forwarding Unconditional - diverts a received call to a specified different number.

COLP: Connected Line Identification Presentation - the answering party's number is conveyed to the calling party.

COLR: Connected Line Identification Restriction - allows the called subscriber to stop COLP from operating.

CFB: Call Forwarding Busy - Calls are forwarded to a specified number only when the subscriber (called party) 's number is busy.

SUB: Sub Address- a digit is added to an incoming call to specify an extension.

MSN: Multiple Subscriber Number - multiple full numbers are assigned to one BRI line.

CFNR: Call Forwarding No Reply - Calls are forwarded to a specified number only when the subscriber (called party) does not pick up the line in a specified amount of time..

DDI: Direct Dialing In - adds a number of telephone number to a circuit which can be used to dial that BRI (common use is a company number with individual 4 or 4 digit extension numbers that can be dialed)

CH: Call Hold - the user may interrupt a call, then reestablish it later. Interruption frees the associated B-channel.

UUS: User to User Signalling - allows a user to send an Information message in the Setup, Alerting, or Connect message on the D-channel, without connecting the call; the message shows on the ISDN phone display.

TP: Terminal Portability; the ability to suspend and reconnect a call; for example, to move a phone from one plug to another.

AOC-D/E/S: Advice of Charge - Determines what charging invocations are available; Duration, End , Start (charged per a certain amount of time at the beginning of the call)

MCID: Malicious Call Identification - the called party, on a per call basis, requests the caller to transmit their phone number, the number they are calling, and the date and time of the call.

3.2 Protocol Analysis

The PROTOCOL ANALYSIS menu replaces the previous D-CHANNEL ANALYZER menu (4–25 and 5-31). It incorporates the previous features, and adds new ones. It also reminds you if a memory card is present, and, if so, its size. See Figure 21 for the menu screen.

```
                              14:09:37
>Ult:ACT         Unt:ACT   +POWER<
>INFORMATION                       <

       PROTOCOL ANALYSIS

       TRACER PARAMETERS
       FILTER SETUP
       VIEW TRACER
       VIEW/PRINT BUFFER

  1MB Memory Card Being Used
       for D-ch Buffer
```

Figure 21 Protocol Analysis Screen

3.2.1 Tracer Parameters

The first new item is the TRACER PARAMETERS.

```
                          14:09:39
>Ult:ACT       Unt:ACT   +POWER<
>RELEASE                        <

       TRACER PARAMETERS

  X.25 B-Ch PKT TRACE : OFF




   B1        B2              OFF
```

Figure 22 Tracer Parameters Screen

X.25 B-CH PKT TRACE
Options: B1 (F1), B2 (F2), OFF (F4)

Decide whether to trace X.25 messages on the specified B-channel.

- Select B1 (F1) or B2 (F2) to trace only that specific B channel.
- Select OFF and no X.25 messages will be traced.

Note that this applies only to BRI.

3.2.2 Filter Setup

This menu (6-37) also contains additional configurable items. See Figure 23.

```
                               03:33:55
>Ult:ACT          Unt:ACT +POWER<
>RELEASE                          <

          FILTER SETUP

 FILTER TYPE: NONE
 LAYER       : NA
 CALLING #   : NA
 CALLED #    : NA



 PRE     POST     NONE    V/P BUFF
```

Figure 23 Filter Setup

Note: Select V/P BUFF (F4) and you will be taken to the View/Print Buffer screen. In that screen, press FILTER (F4) to return to the FILTER SETUP screen.

1) Filter Type

Options: PRE (F1), POST (F2), NONE (F3)

Determine what kind of filtering to use.

- Select PRE (F1) and the set will only capture the selected messages as they are received.
- Select POST (F2) and the set will filter messages after all messages are received.
- Select NONE (F3) and no messages will be filtered; all messages will be captured.

When you have selected a Pre of Post filter, arrow down to the next line.

2) LAYER

Options: L2_ONLY (F1), L3_ONLY (F2), NONE (F3)

Select which B and D-channel messages you want to capture and analyze.

- Press L2_ONLY to capture only layer 2 messages
- Press L3_ONLY to capture only layer 3 messages.

• Press NONE to remove any filtering setting.

3) CALLING

• Enter a number here if you want to capture only messages from a particular calling number.

4) CALLED

• Enter a number here if you want to capture only messages to a particular called number.

3.2.3 VIEW TRACER and VIEW/PRINT BUFFER

The functionality of these features has not changed in usage. (See pages 6–30 to 6–37 for these PRI sections, 4-29 to 4-31 for BRI). There has been an addition of information to the tracer screens. The second line of the message now reports if the message is a D- or B- channel message. See the Figure 24 for a sample screen.

```
                                14:09:39
>Ult:ACT              Unt:ACT +POWER<
>INFORMATION                          <

 U TE->NT  C/R:C  P/F:0 #00255
 98-04-24 09:55:23.237  B1-CH
 SAPI : 001        TEI : 078
 L2 MSGTYPE : I
 NS : 011          NR : 012
 L3 MSGTYPE : CALL REQ



UP      DOWN     HEX   InfoElem
```

Figure 24 Buffer Screen w/B-ch Information

4.0 PRI Screen Changes

4.1 Test Configuration

One item has been added to the PRI Test Configuration (6-2). See Figure 25 for reference.

```
                                       12:37:10
>X1-          OOS    R1-                      <
>X2-                 R2-                      <
       TEST CONFIGURATION

       MODE                 : TE
       PROTOCOL             : AT&T
       TEST PATTERN         : 2047
       LINE TYPE            : T123BD
       MY PHONE NUMBER
        3638000


   T123Bd  T146B2D  T147BD
```

Figure 25 PRI Test Configuration Screen

Line Type

Select the B+D configuration of the PRI line.
Options: T123BD (F1), T146B2D (F2), T147BD (F3)

- Select F1 to choose one T1 line; there are 23 B channels and one D channel
- Select F2 to choose both T1 lines; there are 46 B channels and two D channels.
- Select F3 to choose both T1 lines; there are 47 B channels and one D channel.

4.2 Test Patterns Screen

The Test Pattern has two additional patterns (6-4). See Figure 26. Here are the definitions:

```
                         15:03:27
>                               <
>                               <
        TEST PATTERN
63      127     511     2047
2e15    2e20    1111    0000
1010    3-24    QRS     USER1
USER2   USER3

USER1:


 EDIT     UP      <-      ->
```

Figure 26 Test Patterns Screen

- 3-24: The industry-standard 3 in 24 pattern is used for stress testing AMI lines. The pattern is frame aligned ("f" is the framing bit) as shown in its binary form: f 0100 0100 0000 0000 0000 0100
- QRS: QRS is the industry-standard Quasi Random Signal. This signal is formed from a 20-stage shift register and is zero-constrained for a maximum of 14 consecutive zeroes. When transmitted in a framed signal, up to 15 consecutive zeroes will occur, in accordance with AMI minimum density requirements.

4.3 PRI Interface

The only change in this screen, as shown in Figure 27, is the deletion of the TEST MODE line. This configuration is now done at the LINE TYPE in the Test Configuration screen.

```
                              18:50:21
>X1-RR            RDY R1-RR          <
>                                    <

           PRI INTERFACE
        FRAMING   : ESF
        CODING    : B8ZS
        RxLVL-1   : TERM
        XMTCLK    : RCVCLK
        TxLBO-1   : 0dB



 INTERN   RCVCLK
```

Figure 27 T1 PRI Interface

4.4 BERT & Results

The BERT & RESULTS screen (6-18) has been expanded. See Figure 28.

```
                              10:12:30
>X1-RR              RDY R1-RR        <
>                                    <
           RESULTS SUMMARY
ET-  000:04:48      RT- CONTINU
FRM-ESF COD-B8ZS RxLVL-TERM

 BPV :0              RATE :0.0e-09
 FBE :0              RATE :0.03-06
 CRC :0              RATE :0.0e-06
 ES  :0              SES  :0
 UAS :0              %EFS :100
 FREQ:1544000        +LVL :2.96 V


 PAGE-UP  PAGE-DN  STOP  ERR INJ
```

Figure 28 PRI Results Screen

Results are available for Line 1 and Line 2, depending on your

Mode. If you are in 46B+D, you will have a RESULTS SUMMARY -LINE 1 page, and a RESULTS SUMMARY-LINE 2 page. Use the F-keys to page through all of the results.

4.5 Other Features/ Backup D-ch Test

It is now possible to check on both D channels of a 46B+2D line. This is an out-of-service test. Follow this procedure:

1) Enter TEST CONFIGURATION, and set up the set as follows:
MODE: TE
PROTOCOL: AT&T, NT1, or NI-2
TEST PATTERN: 2047
LINE TYPE: T146B2D
MY PHONE NUMBER: as required

2) Enter the PRI INTERFACE, and configure the set as follows:
FRAMING: ESF
CODING: B8ZS
RxLVL-1/2: TERM
XMTCLK: L1-Rx
LBO-1/2: 0 db, or as required

3) Connect to the circuit as shown in Figure 29.
a) Press the HISTORY key to clear the blinking lights.

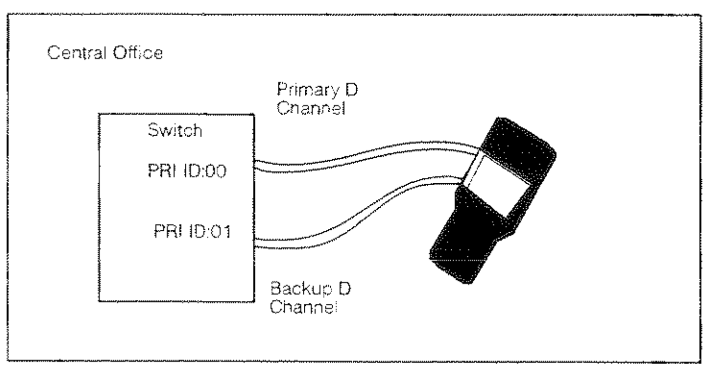

Figure 29 Backup D Channel – Plugging In

b) Escape out to the Main Menu.

4) Enter OTHER FEATURES.
a) Enter BACKUP D-CH TEST. See Figure 30.

```
                                      00:15:33
>X1-RR               RDY R1-RR               <
>X2-RR               RDY R2-RR               <
         BACKUP D-CH TEST

 LINE 1:
    D-CHANNEL NO : 24
    INTERFACE ID : 0
     In service
 LINE 2:
    D-CHANNEL NO : 24
    INTERFACE ID : 1
     Stand By

DROP-L1 DROP-L2
```

Figure 30 Backup D-ch Test

- The D-channels will appear in the screen as they are configured in the OTHER SETUP menu.
- You should see active messages on the top of the screen, and have green L1 and L2 PULSES and FRM SYNC LEDs.

5) In order to test the backup D-channel functionality of the line, press DROP-L1 (F1) to manually drop Line 1. The dropped line's F-key will now display EST-L1, and the corresponding message will be 'Manual Out-of-Service.' Line 2 will now read 'In Service' if it is backing up properly.
a) To reestablish Line 1, press EST-L1. It will display 'Stand By,' then change to 'In-Service.'

6) You may now place calls by the normal methods, if desired.

7) The test is finished.

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