DXC-2

T1/E1 Converter and Timeslot Cross-Connect
Installation and Operation Manual

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For further information contact RAD Data Communications at the address below or contact your local distributor.

RAD data communications
Headquarters
12 Hanechoshet Street
Tel Aviv 69710 Israel
Tel: 972-3-6458181
Fax: 972-3-6498250
E-mail: rad@radmail.rad.co.il

RAD data communications
US East
900 Corporate Drive
Mahwah, NJ 07430 USA
Tel: (201) 529-1100
Fax: (201) 529-5777
E-mail: market@radusa.com

RAD data communications
US West
3631 South Harbor Boulevard
Suite 250
Santa Ana, CA 92704
Tel: (714) 850-0555
Fax: (714) 850-1555

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Always observe standard safety precautions during installation, operation and maintenance of this product. Only a qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this instrument. No adjustment, maintenance or repairs should be performed by either the operator or the user.

Telecommunication Safety

The safety status of each of the ports on the DXC-2 is declared according to EN 41003 and is detailed in the table below:

Ports	**Safety Status**	
Unbalanced E1	SELV	Circuit operating with Safety Extra-Low Voltage
Balanced E1, T1	TNV-1	Circuit whose normal operating voltage is within the limits of SELV, on which overvoltages from Telecommunications Networks *are* possible.

Declaration of Conformity

Manufacturer's Name: RAD Data Communications Ltd.

Manufacturer's Address: 12 Hanechoshet St.
Tel Aviv 69710
Israel

declares that the product:

Product Name: **DXC-2**

Conforms to the following standard(s) or other normative document(s):

EMC:	EN 55022 (1994)	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
	EN 50082-1 (1992)	Electromagnetic compatibility - Generic immunity standards for residential, commercial and light industry.
Safety:	EN 60950 (1992/93)	Safety of information technology equipment, including electrical business equipment.

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC. The product was tested in a typical configuration.

Tel Aviv, October 30th, 1996

Haim Karshen
VP Quality

European Contact: RAD Data Communications GmbH, Lyoner Strasse 14, 60528 Frankfurt am Main, Germany

Conventions

Note	*A note draws attention to a general rule for a procedure, or to exceptions to a rule.*
Caution	A caution warns of possible damage to the equipment if a procedure is not followed correctly.
 ***Warning***	**A warning alerts to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the equipment. If these instructions are not followed exactly, possible bodily injury may occur.**

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Setting the Jumpers and Switches

To reach the internal jumpers and switches of the DXC-2:

1. Disconnect all the cables connected to the DXC-2.
2. Unscrew the large screw fastening the top cover to the rear panel.
3. Remove the top cover.

Refer to Chapter 2, *Jumper and Switch Location and Functions* for more information about setting the jumpers and switches.

Grounding

Connect the protective earth terminals to the protective ground conductors of the (mains) power cord.

Warning

Any interruption of the grounding conductor or disconnecting the protective earth terminal can make the DXC-2 dangerous.
Only use fuses with the required rated current, as marked on the DXC-2 rear panel, for replacement.

AC Power Connector

If the unit is powered from an AC source:

1. Use a 5 feet (1.5 m) standard power cable terminated by a standard 3-prong plug.
2. Check that the ON/OFF switch on the DXC-2 rear panel is set to OFF.
3. Connect the power cable first to the connector on the rear panel, then to the mains outlet.

DC Power Connector

If the unit is powered from a DC source, connect the power cable to the DC power connector.

Link Connectors

Connect each of the link cables to the connector(s) corresponding to the interface in use.

Note

Do not connect to both the balanced and unbalanced connectors of the same interface.

- When using the balanced interfaces, connect to the 15-pin D-type connectors designated LINK A and/or LINK B.
- When using the unbalanced interface, connect to the two BNC connectors designated RX-IN and TX-OUT of the appropriate interfaces.

Supervisory Port Connection

Connect a cable (prepared as specified in Appendix A) between the supervisory port connector and the supervision terminal. If the supervision terminal is connected via modems, use a cross-over cable.

To enable communication with the DXC-2, the supervisory terminal should be set to the same data rate, data word format and parity type as the DXC-2, before you begin operations.

Note *The various user interface cables should be shielded, in order to comply with FCC rules.*

2. Operating the DXC-2

To operate the DXC-2:

1. Turn on the DXC-2 by setting the POWER switch on the rear panel to ON.
2. Check the current operating configuration (refer to *Checking Current Operating Configuration* in Chapter 3).
3. Check for normal operating indications (refer to *Normal Indications* in Chapter 3).
4. Turn off the DXC-2 by setting the POWER switch on the rear panel to OFF.

3. Configuring the DXC-2

To set up the DXC-2 configuration (refer to Chapter 3 for more information on the configuration parameters):

1. Select the system parameters.
2. Select the Link A and Link B.
3. Select the time slot mapping parameters.
4. Select the individual time slot.
5. If you are using a supervision terminal, select the parameters of the supervisory port.

To perform any configuration activity:

1. Bring the cursor under the top row.
2. Scroll to display the desired group of parameters in the top row.
3. When the second row has more than one field, bring the cursor under the parameter name in the second row and scroll to display the desired parameter.
4. Bring the cursor under the parameter value in the second row.
5. Scroll to set the required value for the displayed parameter.
6. Select the new parameter value.
7. Repeat steps 3 through 6 until values are assigned to all parameters in the group.
8. Repeat steps 1 through 7 until values are assigned to all parameters in the desired groups.

Chapter 1

Introduction

This chapter contains:

- An overview and functional description of the DXC-2
- A description of the E1 and T1 operating environments
- A description of typical applications
- Technical specifications of the DXC-2

1.1 Overview

The DXC-2 is a versatile T1/E1 converter and time slot digital cross-connect system. The DXC-2 user-programmable routing allows connecting any incoming 64 kbps time slot to any outgoing 64 kbps time slot. For time slots that carry voice channels, T1-to-E1 conversions can also include the required A-law/μ-law and signaling conversion.

The standard DXC-2 is configured with a T1 interface for link A and an E1 interface for link B. It can also be ordered configured with two T1 interfaces or with two E1 interfaces. Each one of the link interfaces can also optionally be provided with a built-in CSU for the T1 interface or LTU for the E1 interface.

Functional Description

The following is a description of the functions and major operational features of the DXC-2.

T1 Link Interface Characteristics

The DXC-2 T1 link interface is compatible with virtually all carrier-provided T1 services. It supports both the D4 (SF) and the ESF framing formats, and unframed service, in accordance with user's selection. Zero suppression over the line is user-selectable (transparent (AMI) coding, B7ZS, or B8ZS).

The T1 line interface meets the requirements of AT&T TR-62411, ANSI T1.403, and ITU-T Rec. G.703, G.704. Jitter performance complies with the requirements of AT&T TR-62411. The interface has a 100-ohm balanced line interface, terminated in a D-type 15-pin female connector. The nominal transmit level is ±3 V, and the line signal is software-adjustable for line lengths of 0 to 655 feet in accordance with AT&T CB-119. The maximum line attenuation, without CSU, is up to 10 dB; when the integral CSU option is used, the maximum line attenuation is up to 40 dB. For shorter lines, the CSU transmit level can be set to -7.5, -15, or -22.5 dB.

E1 Link Interface Characteristics

The DXC-2 E1 link interface meets the requirements of ITU-T Rec. G.703, G.704 and G.732, and supports both 256N and 256S multiframes (2 or 16 frames per multiframe, respectively), according to user selection. The DXC-2 also supports the CRC-4 option specified in ITU-T Rec. G.704. CRC-4 use is user-selectable.

The DXC-2 E1 link has two line interfaces: a 120-ohm balanced line interface terminated in a D-type 15-pin female connector, and a 75-ohm unbalanced interface terminated in two BNC female coaxial connectors. Line coding is HDB-3. The nominal balanced interface transmit level is ±3 V, and the unbalanced interface transmit level is ±2.37 V. Jitter performance complies with the requirements of ITU-T Rec. G.823.

When the balanced interface is used, the maximum line attenuation, without LTU, is up to 10 dB; when the integral LTU is used, the maximum line attenuation is up to 40 dB.

Timing

The DXC-2 fully reconstructs the output data streams. Multiple clock source selection provides maximum flexibility in system integration:

- The receive clock of each link is always derived from the incoming line signal.
- The transmit clock source, common to both links, is derived from a user-selected timing source:
  - The recovered clock signal of the desired link.
  - An internal crystal oscillator with an accuracy of ±32 ppm.

In addition to a main transmit clock source, the user can specify a fallback source, which is automatically selected in case the main source fails, e.g., because of a red alarm (loss of signal) condition on the link selected as the main source.

Time Slot Routing

The DXC-2 allows the user to program the connection of each individual 64 kbps time slot to any time slot of the other link. Programming can be performed during system operation, without disrupting the service to the users of time slots that are not rerouted. The DXC-2 automatically connects the time slots in both the receive and transmit direction.

The individual time slot routing capability enables the DXC-2 to perform various functions, depending on the types of link interfaces installed on the unit:

- **DXC-2 equipped with one T1 and one E1 link:** the DXC-2 operates as a T1-to-E1 converter, and can also provide digital cross-connect functions. The DXC-2 is designed to support ITU-T Rec. G.802, Annex 2. For this purpose, the DXC-2 inserts the F-bit of the T1 data stream in a separate

time slot. The user can connect this time slot, if desired, to any time slot of the E1 data stream.

The DXC-2 can either transfer the data carried in connected time slots transparently, or perform the A-law/μ-law and signaling conversion required for the transfer of voice channels in compliance with the applicable T1 and E1 (CEPT) standards. The user can specify for each individual time slot whether it is to be handled as a data channel or as a voice channel.

- **DXC-2 equipped with two interfaces of the same type (both E1 or both T1):** the DXC-2 operates primarily as a digital cross-connect system (DCS). When a DXC-2 equipped with two T1 interfaces is used as a DCS, and both links operate with ESF framing, the user can program the DXC-2 to transfer transparently the FDL.

  In addition to the basic DCS function, a DXC-2 equipped with two interfaces of the same type can also be used to modify framing patterns. For example:

  – A DXC-2 equipped with two T1 interfaces can perform conversion between D4 (SF) framing to ESF framing.

  – A DXC-2 equipped with two E1 interfaces can perform conversion between framing per ITU-T Rec. G.704 without CRC-4 to framing with CRC-4.

Statistics Collection

When operating with the ESF frame format, the DXC-2 stores T1 line statistics in compliance with ANSI T1.403-1989 requirements. DXC-2 also provides local statistics support that meets the requirements of AT&T Pub. 54016.

When the CRC-4 format is used, the DXC-2 also collects and stores E1 link statistics in compliance with ITU-T Rec. G.706.

Test and Diagnostics Capabilities

The DXC-2 has comprehensive diagnostics capabilities that include local and remote loopbacks on each link. For T1 links with CSU interfaces, the DXC-2 also supports network line loopback, and network payload loopback.

Maintenance is further enhanced by advanced self-test capabilities, and by an automatically performed power-up self-test that provides circuit-level diagnostics data.

Alarms

The DXC-2 stores alarms detected during its operation in a buffer that can hold up to 100 alarms. During regular operation, the front panel LCD display notifies the local operator whether alarm conditions have been detected. The local operator can then review the contents of the alarm buffer on the front panel display, and can delete old alarms.

In addition to the alarm buffer, the front-panel LED indicators display in real time the status of its links, and an alert when test loops are present in the system.

Control of DXC-2 Operation

The DXC-2 system is designed for unattended operation. The configuration of the DXC-2, that is, a complete collection of operating parameters, is determined by a data base stored in non-volatile memory.

The DXC-2 can be controlled by means of a simple menu, operated by push-buttons located on the front panel.

During set-up, an LCD display guides the operator in the execution of the desired operations. The display provides information concerning the current system configuration and operating mode, and the available values of each programmable parameter. In case of operator errors, the DXC-2 displays a message that explains the error and helps the operator take the correct action.

Remote Supervision and Monitoring

In addition to the front panel control, the DXC-2 also includes an RS-232 supervisory port. The supervisory port allows full control over DXC-2 operation, remote reading of alarm messages, and remote monitoring of DXC-2 operation from a standard ASCII data terminal, using either point-to-point or polling communications.

For polling purposes, each DXC-2 can be assigned an eight-bit address, for a maximum of 255 nodes (the zero address is reserved).

Optionally, a Hayes™ compatible dial-up modem can be connected to the supervisory port, to provide call-in capabilities.

Physical Characteristics

The DXC-2 is a compact unit, intended for installation on desk tops or shelves. Unit height is only 1U (1.75").

An optional rack-mount adapter kit enables the installation of one or two DXC-2 units in a 19" rack.

Power Requirements

The DXC-2 is powered by 115 VAC or 230 VAC, 47 to 63 Hz, in accordance with order, and has very low power consumption. Alternatively, the DXC-2 can be ordered with a -48 VDC power supply.

1.2 Operating Environment

The DXC-2 can operate with both T1 or E1 trunks. This section describes the T1 and E1 environments, and provides the background required for understanding the DXC-2 configuration parameters.

The E1 (CEPT) Environment

The E1 line interface of the DXC-2 complies with all the applicable requirements of ITU-T Rec. G.703, G.704, G.711, G.732, and G.823.

E1 (CEPT) Signal Structure

The E1 line operates at a nominal rate of 2.048 Mbps. The data transferred over the E1 line is organized in frames. Each E1 frame includes 256 bits. The E1 frame format is shown in Figure 1-1.

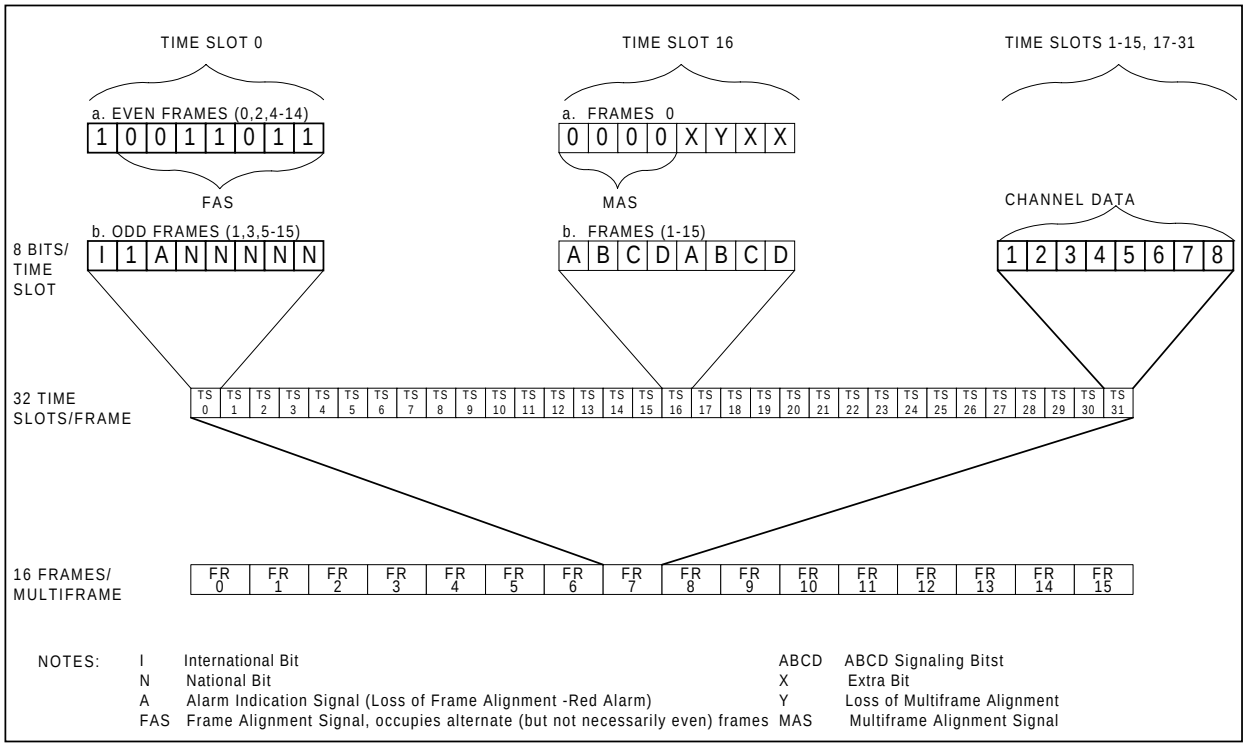


Figure 1-1 E1 (CEPT) Frame Format

The 256 bits consist of 32 time slots of eight bits each, that carry the data payload. The frame repetition rate is 8,000 per second, and therefore the data rate supported by each time slot is 64 kbps. The number of time slots available for user data is maximum 31, because time slot 0 is always used for frame synchronization.

The frames are organized in larger patterns, called multiframes. Two types of multiframes are generally used: G.732N, which includes 2 frames, and G.732S, which includes 16 frames:

- The G.732N multiframe is generally used when time slot 16 is available to the user, or serves for the transmission of end-to-end signaling using common-channel signaling (CCS).
- The G.732S multiframe is generally used when time slot 16 serves for the transmission of end-to-end signaling using channel-associated signaling (CAS). CAS is typically used on links that transfer voice channels.

E1 (CEPT) Line Signal

The basic E1 line signal is coded using the High-Density Bipolar 3 (HDB3) coding rules. The HDB3 coding format is an improvement of the alternate mark inversion (AMI) code.

In the AMI format, “ones” are alternately transmitted as positive and negative pulses, whereas “zeros” are transmitted as a zero voltage level. The AMI format cannot transmit long strings of “zeros”, because such strings do not carry timing information.

The HDB3 coding rules restrict the maximum length of a “zero” string to 3 pulse intervals. Longer strings are encoded at the transmit end to introduce non-zero pulses. To allow the receiving end to detect these artificially-introduced pulses and to enable their removal to restore the original data string, the encoding introduces intentional bipolar violations in the data sequence. The receiving end detects these violations and when they appear to be part of an encoded “zero” string – it removes them. Other bipolar violations are probably due to line errors, and can be counted separately, to obtain information on the quality of the transmission link.

E1 Line Statistics Using CRC-4 Error Detection

The DXC-2 supports the CRC-4 option in accordance with ITU-T Rec. G.704, which allows the evaluation of the quality of transmission over E1 links.

When the CRC-4 option is enabled, frames are arbitrarily grouped in groups of 16 (these groups are called CRC-4 multiframes, but they do not bear any relationship to the 16-frame multiframe organization used with the G.732S super-frame explained above). A CRC-4 multiframe always starts with a frame that carries the frame alignment signal. The CRC-4 multiframe structure is identified by a six-bit ***CRC-4 multiframe alignment signal***, which is multiplexed into bit 1 of time slot 0 of each odd-numbered frame of the multiframe (up to frame 11 of the CRC-4 multiframe). Each CRC-4 multiframe is divided into two submultiframes of 8 frames (2048 bits) each. The detection of errors is achieved by calculating a four-bit checksum on each 2048-bit block (submultiframe). The four checksum bits calculated on a given submultiframe are multiplexed, bit by bit, in bit 1 of time slot 0 of each even-numbered frame of the next submultiframe.

At the receiving end, the checksum is calculated again on each submultiframe and then compared against the original checksum (sent by the transmitting end in the next submultiframe). The results are reported by two bits multiplexed in bit 1 of time slot 0 in frames 13, 15 of the CRC-4 multiframe, respectively. Errors are counted and reported as CRC-4 error statistics.

E1 (CEPT) Line Alarm Conditions

- **Excessive bit error rate.** The bit error rate is measured on the frame alignment signal. The alarm threshold is an error rate higher than 10-3 that persists for 4 to 5 seconds. The alarm condition is canceled when the error rate decreases below 10-4 for 4 to 5 consecutive seconds.
- **Loss of frame alignment** (also called loss of synchronization). This condition is declared when too many errors are detected in the frame alignment signal (FAS), e.g., when 3 or 4 FAS errors are detected in the last 5 frames. Loss of frame alignment is cleared after no FAS errors are

detected in two consecutive frames. The loss of frame alignment is reported by means of the A bit (see Figure 1-1).

- **Alarm indication signal (AIS).** The AIS signal is an unframed "all-ones" signal, and is used to maintain line signal synchronization in case of loss of input signal, e.g., because an alarm condition occurred in the equipment that supplies the line signal. Note that the equipment receiving an AIS signal loses frame synchronization.

64 kbps Channel Characteristics

Time slots 1 through 31 carried by the E1 frame are available to the user (possibly with the above-mentioned exception of time slot 16, when this time slot is used for system purposes). The time slots may be used as transparent data carriers for channelized data (*n×64 kbps*), or for audio (voice) transmission.

A widely used method for voice digitizing is pulse-coded modulation (PCM). To improve transmission quality, a non-linear encoding law is used. ITU-T Rec. G.711 recommends that in E1 systems the non-linear encoding law designated the A-law be used.

The signaling associated with voice channels is multiplexed within time slot 16. This requires the use of G.732S framing when channel-associated signaling (CAS) is required.

The T1 Environment

The T1 line interface of the DXC-2 complies with the applicable requirements of AT&T Pub. 62411, and ITU-T Rec. G.703, G.704, G.711, G.733, and G.824.

T1 Signal Structure

The T1 line operates at a nominal rate of 1.544 Mbps. The data transferred over the T1 line is organized in frames. Each T1 frame includes 193 bits.

The 193 bits consist of 24 time slots of eight bits each, that carry the data payload. An additional time slot, including one bit (the F bit) carries framing and supervision information. As a result, the data rate supported by each payload time slot is 64 kbps. The data rate of the framing slot is 8 kbps.

The T1 frame does not include a dedicated time slot for the transfer of channel signaling. When end-to-end transfer of signaling is necessary, a technique called "robbed-bit signaling" is used. The robbed-bit is the least significant bit (bit 8) of the channel byte, and is actually "robbed" only once in every six frames.

In order to enhance link/system supervision capabilities, the frames are organized in larger patterns, called super-frames. Two types of super-frames are used:

- SF (also called D4), consists of 12 T1 frames.
- Extended SF (ESF), consists of 24 T1 frames.

The SF format provides limited supervision capabilities such as end-to-end reporting of local loss-of-signal (yellow alarm).

The ESF format provides much improved supervision capabilities, and allows better utilization of the 8 kbps framing time slots. The major advantage of the ESF format is that it supports on-line link performance monitoring (by means of a 2 kbps Cyclic Redundancy Check (CRC) channel) and in addition provides a 4 kbps end-to-end supervision and control data link. The T1 frame format is shown in Figure 1-2.

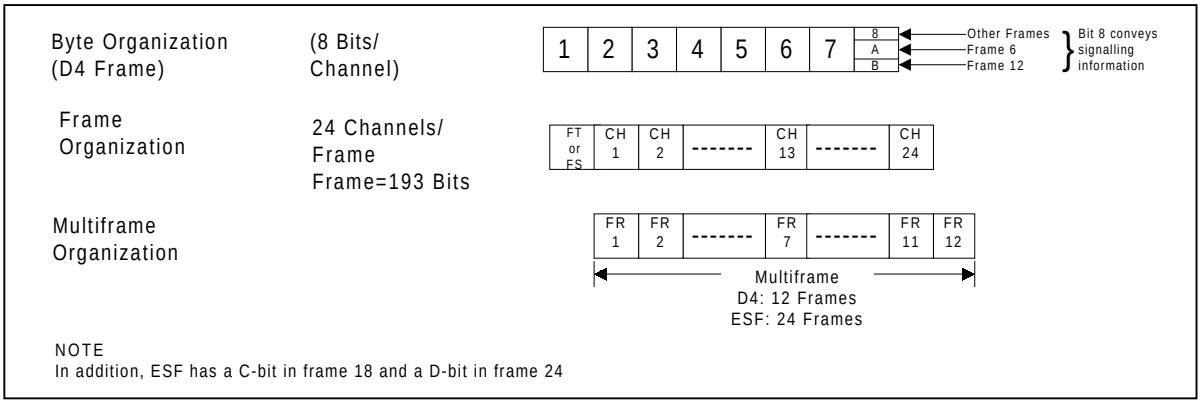


Figure 1-2 T1 Frame Format

The implementation of the multiframing format is based on the use of various F-bit patterns. The F-bit pattern is used to perform three functions:

- Framing Pattern Sequence (FPS), defines frame and multiframe boundaries.
- Facility Data Link (FDL), allows transfer of supervisory data, e.g., alarms, error performance, test loop commands, etc., to be passed through the T1 link.
- Cyclic Redundancy Check (CRC), allows the measurement of the bit error rate and enhances the reliability of the framing algorithm.

The F-bit pattern defines the structure of frames and multiframes. In the D4 (SF) frame format, the F-bit of consecutive frames is alternately interpreted as an Ft bit (terminal framing bit) or Fs bit (frame signaling bit).

- F_t pattern: alternating 0's and 1's, defines the frame boundaries.
- F_s pattern: fixed 001110 pattern, defines the multiframe boundaries, so that one frame may be distinguished from another. In particular, the Fs pattern is needed so that frames 6 and 12 may be identified for the recovery of signaling bits.

In the ESF frame format, the multiframe structure is extended to 24 frames, but the frame and channel structure are the same as in the D4 (SF) format.

T1 Line Signal

The basic T1 line signal is coded using the alternate mark inversion (AMI) rules. In the AMI format, "ones" are alternately transmitted as positive and negative pulses, whereas "zeros" are transmitted as a zero voltage level. The AMI format cannot transmit long strings of "zeros", because such strings do not carry timing information. Therefore, the AMI signal source must generate a signal with guaranteed minimum "ones" density.

The minimum average "ones" density is 1:8, so when a T1 signal is transmitted over an AMI line each frame time slot must include at least one "1" bit. In certain applications, this would effectively reduce the data rate available to the user to only 56 kbps per time slot, and would preclude the provision of clear channel capability (CCC). To circumvent this problem, modified line codes, which perform zero suppression by substituting special codes for long strings of "zeros", are used.

A widely used zero suppression method is B8ZS. The B8ZS zero suppression method provides clear channel capability, and the "ones" density requirement no longer restricts user data characteristics. This means that each T1 frame time slot can support the full 64 kbps.

T1 Alarm Conditions

The basic alarm conditions are the red alarm and the yellow alarm.

- **Red Alarm.** A red alarm is generated when the local unit has lost frame synchronization for more than 2.5 consecutive seconds. Loss of frame synchronization may be caused by F_s or F_t errors, by the reception of an AIS signal, or by the loss of the input signal. In accordance with AT&T TR-62411, a system automatically recovers synchronization when there has been a period of 10 to 20 consecutive seconds free of the loss of sync condition. Since in many system applications this is an overly conservative specification, the DXC-2 allows the user to select a "fast" mode, which reduces the time necessary to declare synchronization to approximately one second free of the loss of sync condition.

- **Yellow Alarm.** A yellow alarm is sent from the remote unit to inform the local unit that a red alarm exists at the remote end.

- **Alarm indication signal (AIS).** The AIS signal is an unframed "all-ones" signal, and is used to maintain line signal synchronization when an alarm condition occurs in the equipment that supplies the line signal.

- **Excessive bit error rate.** The bit error rate is measured on the framing bits. An excessive error rate condition is declared when the bit error rate exceeds 10^{-3}.

64 kbps Channel Characteristics

Time slots 1 thru 24 carried by the T1 frame are available to the user. The time slots may be used as transparent data carriers for fractional T1 data, or for audio (voice) transmission. When voice digitizing is made by PCM,

ITU-T Rec. G.711 recommends that in T1 systems the non-linear encoding law designated the μ-law be used.

To allow transparent transfer of channel signals between E1 trunks and T1 trunks, the DXC-2 allows the user to select on a channel-by-channel basis whether a conversion from A-law to μ-law is to be performed. This selection is made by defining the channel type: voice (with conversion) or data (no conversion).

The selected signaling transfer mode (common channel signaling – CCS, or channel associated signaling – CAS) applies to all the channels. The selection of a signaling transfer mode affects the transfer of the channel bits, a characteristic of importance in applications in which a trunk carries data channels together with voice channels:

- In the CCS mode, the bits are transparently transferred.
- In the CAS (robbed bit signaling) mode, the signaling information overwrites the least significant bit of the channel once in every six frames.

Thus, when signaling must be transferred for data channels, it is necessary to implement the system using CCS (this requires reserving time slot 16 for the transfer of the CCS data).

DXC-2 and ITU-T Rec. G.802

The ITU-T Rec. G.802 recommendation deals with the interworking between networks based on different digital hierarchies and speech encoding laws. Within this framework, the recommendation deals with the transport of a T1 signal within a framed E1 signal, and recommends that the T1 F-bit be transferred end to end.

When the T1 signal is framed, e.g., when it is a multiplexed signal, the DXC-2 uses its 32-bit handling capability to provide a separate user-controlled facility for the transfer of the F bit. For this purpose, the DXC-2 internally handles the F bit in an additional time slot (that requires a total of 25 time slots for carrying the T1 signal over an E1 link). Bit 1 of the time slot carries the F bit of the T1 frame, and the other bits of that time slot are not used. The user can then program the DXC-2 to connect the time slot carrying the F bit to any desired E1 time slot.

Note that when the DXC-2 operates as a T1-to-E1 converter in a system that transports a T1 signal within a framed E1 signal, the FDL can be transferred only when the DXC-2 operates in the ITU-T Rec. G.802 mode: if the G.802 mode is not used, the FDL transferred by the DXC-2 carries local diagnostic data in accordance with the requirements of ANSI T1.403.

1.3 Applications

This section presents typical DXC-2 applications and explains special application considerations.

T1/E1 Converter

The DXC-2 can be used as a programmable T1/E1 converter. A typical configuration is shown in Figure 1-3.

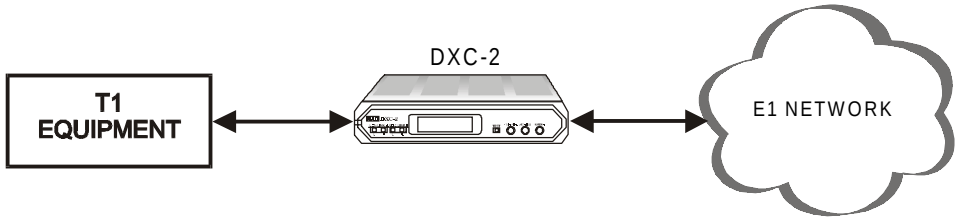


Figure 1-3 Typical T1/E1 Converter Application

In a T1/E1 conversion application, the DXC-2 is equipped with one T1 line interface and one E1 line interface. The conversion services are selected by the user:

- Transparent full-duplex transfer of data from all the T1 time slots to the corresponding E1 time slots, and vice versa, and the addition of the appropriate frame synchronization and housekeeping signals, as specified by the applicable standards. The user can define the channels (time slots) to be transferred from trunk to trunk. The DXC-2 inserts a user-selectable ***idle*** code in empty time slots.

  This service is sufficient for applications in which the equipment that forms the T1 or E1 line signal is a data multiplexer (fractional T1 service or channelized E1 data *(n×64 kbps)*).

- When the equipment that forms the T1 or E1 line signal is a voice multiplexer, the DXC-2 can perform A-law/μ-law conversion in accordance with ITU-T Rec. G.711. The conversion can be performed on all the channels, or on channels individually selected by the user. The selection of the channels for which conversion is to be performed is made by specifying the channel type: voice (with conversion) or data (no conversion).

  In addition to A-law/μ-law conversion, the DXC-2 also performs signaling conversion: the robbed-bit signaling information of the T1 trunk voice channels is converted, in accordance with user's selection, to channel-associated signaling on the E1 trunk, and vice versa. Therefore, if one or more of the channels are defined as voice channels, the E1 framing mode must be G732S.

Transport of T1 Frame over E1 Transmission Facilities

The DXC-2 allows the transport of a T1 frame across E1 transmission facilities. This function can be performed as shown in Figure 1-4.

In this application, it is necessary to transfer the T1 trunk, including the F-bit, transparently without any conversion from end to end, therefore the T1 frames must be processed in accordance with ITU-T Rec. G.802.

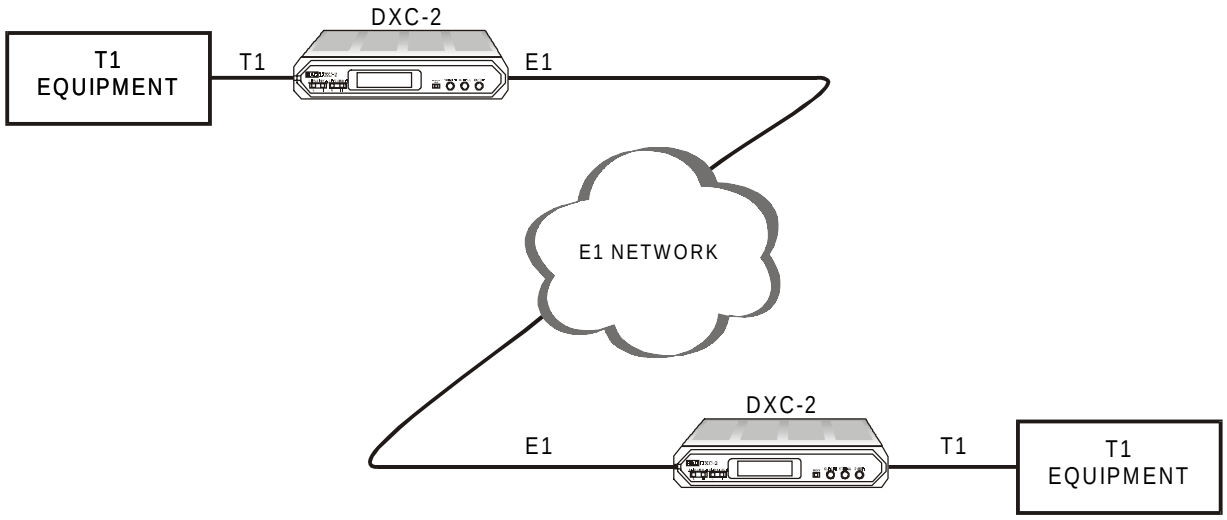


Figure 1-4 Typical T1 Transport Application

Channel Relocation and Digital Cross-Connect Applications

In channel relocation and digital cross-connect system applications, the channels of a T1 and/or E1 trunk are moved from one time slot to another, in accordance with user's programming. These capabilities are available in addition to the other capabilities described in the previous sections.

The channel relocation and digital cross-connect services can be performed between dissimilar trunks, e.g., between E1 and T1 trunks, or between similar links, e.g., between two E1 trunks or between two T1 trunks.

The DXC-2 will also perform, when required, the conversion of the signaling formats (i.e., convert robbed-bit signaling to CEPT channel-associated signaling), and will move the channel signaling information to the appropriate location in the signaling frame, in parallel with the change in channel numbers. The DXC-2 can also perform A-law/μ-law conversion.

Handling of Alarm Conditions

When there is a problem on one of its links, the DXC-2 provides indications of the problem to the other link. Two types of indications are provided: Out-Of-Service (OOS) indications in the individual time slots, and link alarms.

Indications in Individual Time Slots

In many applications it is necessary to signal the equipment connected to one of the DXC-2 links that the other link is out of service. This indication, called Common Group Alarm (CGA), should be provided in each time slot.

However, the appropriate signaling method depends on the application, because the transmission of such indications interferes to some extent with the transmission of the user's data. The DXC-2 provides three CGA indication modes:

NONE — When one of the DXC-2 links is in the Out-Of-Service state, the time slots of the other link carry a user-selectable OOS code. The OOS code can be different from the idle code (the code inserted in time slots not assigned to user traffic or housekeeping purposes). Moreover, two different OOS codes can specified, one for data channels, and another for voice channels. In addition, the signaling bits of the T1 link (designated A, B, C, D in Figure 1-2; for SF framing, only bits A, B are used) also assume the OOS state specified by the user (see below).

The NONE mode is a non-transparent mode, and is often used when the T1 or E1 link carries voice channels, e.g., in PABX applications.

TRANS — Same as for NONE, except the signaling bits are not forced to the OOS state.

This mode is suitable for use in voice and DATAPORT™ applications.

FULL — The DXC-2 does not change the state of the time slots of the other link, nor the state of the signaling bits.

This mode is the fully-transparent mode, and is often used when the link carries channelized or unchannelized data.

The CGA indication mode selected applies to both voice and data time slots.

When the NONE mode is selected (usually for voice channels), the DXC-2 offers four additional user-selectable options. These options determine the states assumed by the A, B signaling bits of the corresponding channels when there is an Out-Of-Service condition:

SPACE (SP) — The A and B signaling bits are forced to the state that corresponds to on-hook (idle) when there is an Out-Of-Service condition.

MARK (MK) — The A and B signaling bits are forced to the state that corresponds to off-hook (busy) when there is an Out-Of-Service condition.

SP_MK — The A and B signaling bits are forced to on-hook state for 2.5 seconds, and then are switched to the off-hook state until the Out-Of-Service condition disappears.

MK_SP — The A and B signaling bits are forced to the off-hook state for 2.5 seconds, and then are switched to the on-hook state until the Out-Of-Service condition disappears.

Link Alarms

The DXC-2 recognizes the following link alarm conditions:

- Local loss of link input signal (red alarm condition).
- Local loss of synchronization to link signal (red alarm condition).

NOTE *The DXC-2 uses elastic buffers having a length of exactly ±1 frame. Therefore, in case of buffer underflow one frame is repeated without loss of frame alignment, and in case of buffer overflow one frame is skipped, also without loss of frame alignment.*

- Local reception of AIS signal (AIS red alarm condition).
- Indication of remote loss of synchronization or remote loss of signal (yellow alarm condition).

NOTE *For convenience, the terms used in this section to identify the various alarm conditions are the terms used for T1 links. The equivalence of the terms is explained in* The E1 (CEPT) Environment *on page 1-4 and* The T1 Environment *on page 1-7*.

Table 1-1 lists the DXC-2 response to the various link alarm conditions.

Table 1-1 DXC-2 Response to Link Alarm Conditions

Condition	Link A				Link B			
	Send Yellow Alarm	**Send AIS**	**Send OOS Code**	**Send Signal OOS Code**	**Send Yellow Alarm**	**Send AIS**	**Send OOS Code**	**Send Signal OOS Code**
Red Alarm A	Yes	No	No	No	No	No	Yes	Yes
Yellow Alarm A	No	No	No	No	No	No	No	No
AIS A	Yes	No	No	No	No	No	Yes	Yes
Red Alarm B	No	No	Yes	Yes	Yes	No	No	No
Yellow Alarm B	No	No	No	No	No	No	No	No
AIS B	No	No	Yes	Yes	Yes	No	No	No

1.4 Technical Specifications

T1 Interface

Applicable Standards	• AT&T TR-62411, ANSI T1.403 • ITU-T Rec. G.703, G.704
Framing	D4 (SF), ESF
Nominal Line Data Rate	1.544 Mbps
Line Code	AMI
Impedance	100Ω, balanced
Zero Suppression	• Transparent (no zero suppression) • B7ZS • B8ZS The desired mode is software-selectable
Signal Levels	
Transmit Levels	
Nominal Level	± 3V ± 10%
Levels with CSU	0 dB, -7.5 dB, -15 dB, -22.5 dB
Levels without CSU	Software-adjustable to be measured at 0 to 655 ft
Line Attenuation	0 to 40 dB with CSU 0 to 10 dB without CSU
Jitter Performance	Per AT&T TR-62411
Connector	15-pin D-type, female

E1 Interface

Applicable Standards	ITU-T Rec. G.703, G.704, G.732
Framing	
With CRC-4	• Time slot 0 multiframe for CRC-4 protection, and 16-frame multiframe managed by means of time slot 16 (G.732S) for use of CAS • Time slot 0 multiframe for CRC-4 protection, and no multiframe (G.732N), intended for use with CCS
Without CRC-4	• 16-frame multiframe managed by means of time slot 16 (G.732S) for use of CAS • No multiframe (G.732N), intended for use with CCS

Nominal Line Data Rate	2.048 Mbps
Line Code	HDB3
Line Impedance	• 120 Ω, balanced • 75 Ω, unbalanced The line impedance is selectable by jumpers
Signal Levels	
Transmit Levels	
Nominal Levels	• Balanced interface: ±3V ±10% • Unbalanced interface: ±2.37V ±10%
Balanced and Unbalanced Line Attenuation	• 0 to 40 dB with LTU • 0 to 10 dB without LTU
Jitter Performance	Per ITU-T Rec. G.823
Connectors	• Balanced interface: 15-pin D-type female connector • Unbalanced interface: two BNC coaxial connectors

General

Time Slot Mapping	Any time slot to any time slot with/without A-law/μ-law and signaling conversion per time slot
Clock Source (System, Link A, Link B)	
Main Source	• Internal oscillator (accuracy: ±32 ppm) • Locked to the receive clock of link A • Locked to the receive clock of link B Main source is software-selectable
Fallback Source	• Locked to the receive clock of link A • Locked to the receive clock of link B Fallback source is software-selectable, independently of the main source.

Elastic Buffer	
Buffer Length	±1 frame
Buffer Underflow	1 frame repeated without frame sync loss
Buffer Overflow	1 frame skipped without frame sync loss
Data Delay	Up to 375 µsec
Unused Time Slot Code	Software-selectable, 00 to FF (hexa)
OOS Time Slot Code	Software-selectable, 00 to FF (hexa), separately for voice and data time slots
Diagnostics	• Local (analog) T1 or E1 loopback • Remote (digital) T1 or E1 loopback • Code-activated network loopback per ANSI T1.403 (T1 interface only)
Statistics	
T1 ESF diagnostics	• Full support of ANSI T1.403 statistics • Local support of AT&T Pub. 54016 statistics • Transparent transfer of the FDL between two T1 ports (software-selectable)
E1 CRC-4 diagnostics	Per ITU-T Rec. G.706
Alarm Response (both directions)	See Table 1-1
Front Panel Controls	
LCD	Two rows of 16 characters
Push-buttons	CURSOR, SCROLL, ENTER
Indicators	• Local sync loss for link A and link B • Remote sync loss for link A and link B • Test active

Supervisory Port

Interface	V.24/RS-232, asynchronous
Connector	9-pin D-type female connector
Data Rate	300, 1200, 2400, 4800 and 9600 bps, with automatic detection of data rate (Autobaud)

Physical Characteristics

Height	4.4 cm/1.7 in (1U)
Width	21.6 cm/8.5 in
Depth	24.0 cm/9.5 in
Weight	1.4 kg/3.1 lb

Power Requirements

- 115 VAC ±10%, 47 to 63 Hz
- 230 VAC ±10%, 47 to 63 Hz
- -48 VDC ±10%, 15 watts

Power source in accordance with order

Environment

Operating Temperature	0 to +50°C (32 to 122°F)
Relative Humidity	Up to 90%, non-condensing

Chapter 2

Installation

This chapter describes:

- What is required at the installation site
- Unpacking the DXC-2
- Configuring the internal jumpers of the DXC-2
- Connecting the DXC-2

2.1 Overview

The DXC-2 is delivered completely assembled. It is designed for installation as a desk-top unit or for mounting in a 19" rack (refer to Appendix B for rack installation instructions).

Mechanical and electrical installation procedures for the DXC-2 are provided in the following sections.

After installing the unit, refer to Chapter 3 for system configuration information and procedures using the front panel controls, or to Chapter 4 for system configuration procedures using an ASCII terminal connected to the DXC-2 supervisory port.

In case a problem is encountered, refer to Chapter 5 for test and diagnostics instructions.

2.2 Site Requirements

This section describes the requirements for the site at which the DXC-2 will be installed.

Power

AC-powered DXC-2 units should be installed within 1.5 m (5 feet) of a grounded AC outlet that is easily accessible and capable of furnishing the nominal supply voltage (115 or 230 VAC, in accordance with your order).

DC-powered DXC-2 units require a -48 VDC power source.

DXC-2 units must be properly grounded. See *Connections* on page 2-8.

Warning

It may be dangerous to operate a DXC-2 unit that is not properly grounded. See *Connections* on page 2-8.

Link Connections

The DXC-2 has one female 15-pin D-type connector for each balanced link interface. Appendix A provides the pin allocation for the D-type connector.

For E1 interfaces, there are two additional BNC connectors for the unbalanced interface. The DXC-2 can optionally be ordered with two E1 interfaces, for a total of four BNC connectors.

The maximum allowable line attenuation between the DXC-2 link port and the network interface depends on the DXC-2 interface:

- Balanced T1 and E1 interfaces. For a link interface without CSU or LTU, the maximum range is 10 dB. For a link interface with CSU or LTU, the maximum range is 40 dB. See *Technical Specifications* in Chapter 1.
- Unbalanced E1 interface. The LTU is usually not required when the unbalanced interface is used. The range complies the requirements of ITU-T Rec. G.703 (up to 10 dB attenuation). With the LTU, the maximum range is 40 dB. See *Technical Specifications* in Chapter 1.

Front and Rear Panel Clearance

Allow at least 90 cm (36 inches) of frontal clearance for operator access. Allow at least 10 cm (4 inches) clearance at the rear of the unit for interface cable connections.

Ambient Requirements

The ambient operating temperature of the DXC-2 should be 32º to 122º F (0º to 50º C), at a relative humidity of up to 90% non-condensing.

2.3 Unpacking the DXC-2

Make a preliminary inspection of the equipment container before unpacking. Report any evidence of damage immediately.

Unpack the DXC-2 as follows:

1. Place its container on a clean flat surface, cut all straps, and open or remove the top.
2. Take the DXC-2 carefully out of the container and place it securely on a clean surface.
3. Inspect the product for damage. Report immediately any damage found.

2.4 DXC-2 Configuration Information

This section provides information on the functions of the internal jumpers to help you select the correct setting for your particular application. It gives you step-by-step instructions for setting these jumpers and lists the default settings for each jumper.

All other configuration actions can be performed from the front panel or from a supervision terminal after the installation is completed. Information and detailed instructions for these operations appear in Chapters 3 and 4, respectively.

Prior to DXC-2 installation, check the positions of its internal jumpers and switches. Change the settings in accordance with the specific requirements of your application if necessary.

Warning

HIGH VOLTAGE!

Disconnect the unit from the power line and from all cables before removing the cover.

Dangerous high voltages are present inside the DXC-2 when it is connected to power and/or to the links.

Do not perform any adjustment, maintenance, or repair on the DXC-2 under voltage with its cover open, except by qualified service personnel who are aware of the hazards involved.

Capacitors inside the DXC-2 may still be charged even after the power has been disconnected.

CAUTION

The DXC-2 contains components sensitive to electrostatic discharge (ESD). To prevent ESD damage, avoid touching the internal components. Touch the DXC-2 frame before moving jumpers.

Opening the DXC-2

To reach the internal jumpers and switches of the DXC-2:

1. Disconnect all cables from the DXC-2.
2. Unscrew the large captive screw that fastens the top cover to the rear panel.
3. Remove the top cover.

Jumper and Switch Location and

The jumpers and switches located on the DXC-2 board are identified in Figure 2-1. Their functions are described below.

Functions

Note *Do not change any jumpers not listed below from their factory preset configuration.*

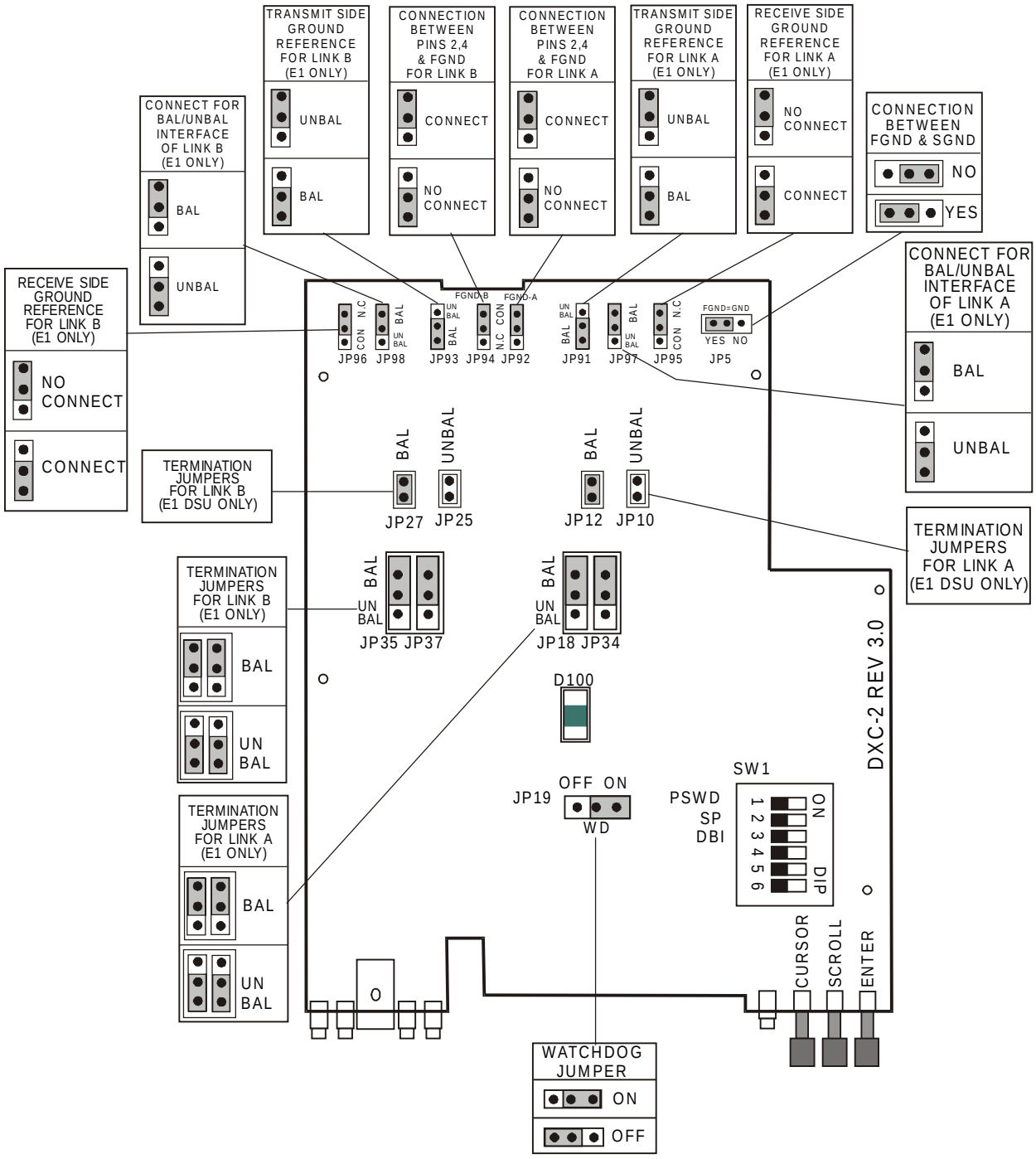


Figure 2-1 DXC-2 Internal Settings

Watchdog Selection, Jumper WD (JP19)

The WD jumper (JP19) is used to disable the internal watchdog function during maintenance. It has two positions:

- ON: watchdog enabled
- OFF: watchdog disabled.

The DXC-2 is shipped with the WD jumper set at ON.

Signal Ground to Frame Ground Connection, Jumper FGND=SGND (JP5)

The jumper JP5 controls the connection between the DXC-2 signal ground and the frame (chassis) ground. It has two positions:

- YES: signal ground is connected to the frame (chassis) ground.
- NO: signal ground is not connected to the frame ground.

The DXC-2 is shipped with the FGND=SGND jumper set at YES (connected).

Warning

In certain locations where permanent excessive high voltages are present on the lines, setting JP5 to NO may render the unit unsafe for connection to unprotected telecommunication networks.

Switch SW1

The DXC-2 is delivered with a fixed set of default parameters (see *Tables 3-3*, *3-4*, and *3-5*) stored in its program EPROM. The user specifies custom parameter values when configuring the DXC-2; these parameter values are stored in the DXC-2 data base in non-volatile memory and are automatically loaded each time the DXC-2 is powered up.

NOTE *If during the power-up self-test the user's configuration is found to be corrupted, the DXC-2 automatically reloads the default parameters from its EPROM.*

Switch SW1 allows the user to control the reloading of the desired group of default parameters. The switch has six sections, but only three of its sections are used, for the following purposes:

- Section 1 — PSWD. This section controls the supervision program password and the DXC-2 address (node number).

  A password, consisting of up to eight alphanumeric characters, can be used to prevent unauthorized personnel from using the DXC-2 supervision program. The DXC-2 is delivered with a default password, **RAD**, but a different password can be configured by the user. Section 1 of SW1 is used to select between the default DXC-2 password (the ON position) and the user-selected password (the OFF position).

The DXC-2 address (node number) is also affected by section 1: with the jumper set at ON, the node number is set to 0.

Use the ON position the first time you operate the DXC-2 to start the configuration process, and to restart with the default password and node address 0 in case the current user password is lost.

The DXC-2 is shipped with section 1 set at OFF.

- Section 2 — SP. This section selects the source of the supervisory port parameters:
  - ON: DXC-2 uses the default parameters stored in its program EPROM. The default values are Autobaud, eight data bits, and no parity.
  - OFF: DXC-2 uses the user-selected parameters.

  Use the ON position the first time you operate the DXC-2 to start the configuration process, and to restart with the default parameters in case the current values are not known and it is not possible to communicate with the DXC-2 through its supervisory port.

  The DXC-2 is shipped with section 2 set at OFF.

- Section 3 — DBI. This section selects the source of the data base configuration parameters:
  - ON: DXC-2 uses the default parameters stored in its program EPROM.
  - OFF: DXC-2 uses the user-selected parameters.

  The DXC-2 is delivered with the data base loaded with the default parameters. You can select this position again to restart with the default parameters in case the current values are not known.

  The DXC-2 is shipped with section 3 set at OFF.

NOTE *User-selected parameter values are not erased by setting one or more switch sections to ON: this action merely causes the DXC-2 to use the default values. However, if the DXC-2 is turned off and then powered up again, the default values replace the user values.*

Termination Selection Jumpers

The jumpers designated BAL/UNBAL are used to select the link interface. There is one group of six jumpers serving link A, and another group of six jumpers serving link B, as follows (see Figure 2-1):

- Link A: Jumpers JP25, JP27, JP35, JP37, JP93, and JP98
- Link B: Jumpers JP10, JP12, JP18, JP34, JP91, and JP97

For each link, all six jumpers must be set to one of the following two positions:

- BAL for operation with the balanced interface.

- UNBAL for operation with the unbalanced interface. This position can be selected only for E1 interfaces.

Note *For each link, all six jumpers must always be set to the same position.*

The DXC-2 is shipped with all jumpers set at BAL.

Receive Side Ground Reference, Jumpers RXG (JP96) and RXG (JP95)

The RXG jumpers are used to control the ground reference of the link receive inputs when the unbalanced interface is used (applicable only to E1 interfaces). There are two jumpers, one for link A (JP95) and the other for link B (JP96).

In accordance with ITU-T recommendations, this jumper is provided for use with the unbalanced interface (the line is normally grounded at the transmit side). However, it may also be used with the balanced interface.

The RXG jumpers have two positions:

- CON: Connected
- N.C.: Not connected.

The DXC-2 is shipped with the jumpers set at N.C.

Connection From Pins 2 and 4 to Frame Ground, Jumpers FGND-A (JP92) and FGND-B (JP94)

The FGND-A (JP92) and FGND-B (JP94) jumpers are used to control connection from pins 2 and 4 to frame (chassis) ground for links A and B, respectively. The two positions of these jumpers are:

- CON: Pins 2 and 4 are connected to frame (chassis) ground.
- N.C.: Pins 2 and 4 are not connected to frame (chassis) ground.

Green LED D100

This LED should light continuously.

Internal Settings Procedure

Refer to Figure 2-1 to identify jumper and switch locations and settings. Change settings as required.

After completing the internal settings, reinstall the top cover of the DXC-2 and fasten it to the rear panel by fully screwing in the large rear panel screw.

2.5 Connections

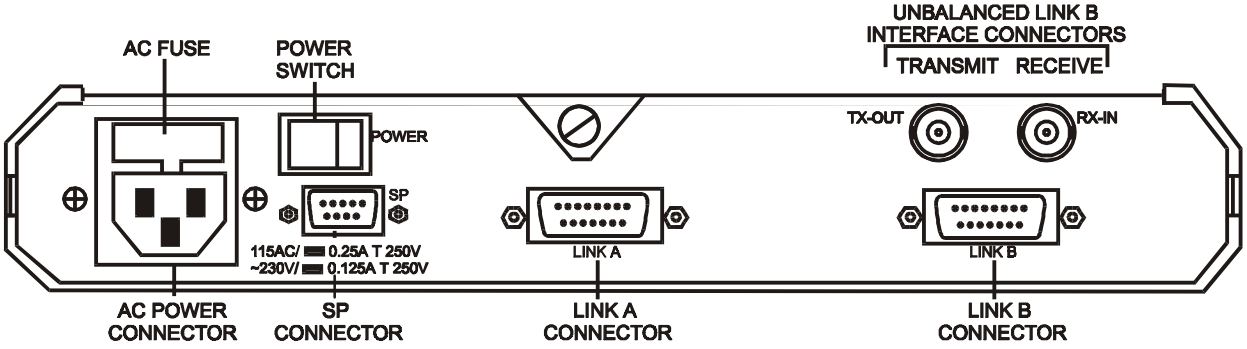
This section describes connections made to the DXC-2.

Connector Location

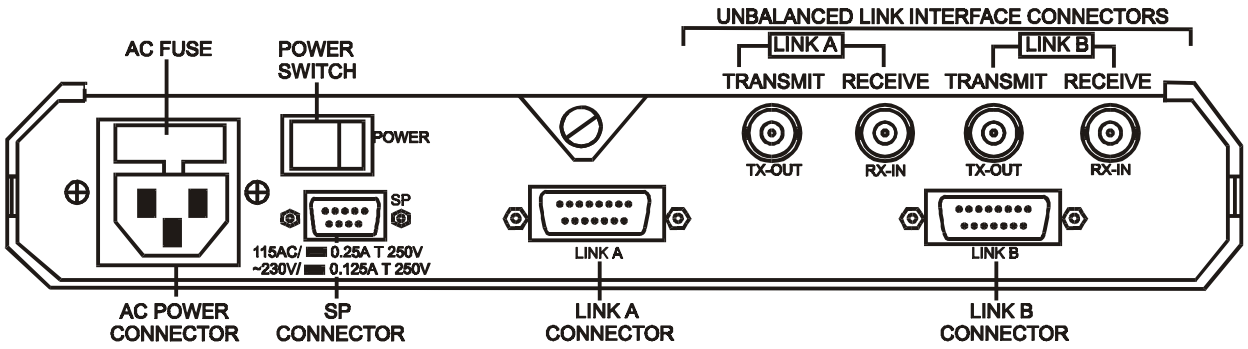
Figure 2-2.*A* shows the rear panel of a standard AC-powered DXC-2 unit and identifies connector locations. The standard DXC-2 has one T1 interface for link A and one E1 interface for link B.

Figure 2-2.*B* shows the rear panel of a DXC-2 unit with two E1 interfaces.

For DC-powered DXC-2 units, a circular three-pin DC power connector is used.



A. Rear Panel of Standard DXC-2 Unit with One T1 and One E1 Interface (AC-Powered)



B. Rear Panel of DXC-2 Unit with Two E1 Interfaces (AC-Powered)

Figure 2-2 Typical DXC-2 Rear Panels

Grounding

The DXC-2 must be properly grounded.

Warning

It is dangerous to operate an improperly grounded DXC-2.

Make sure that the DXC-2 is properly grounded before connecting any other cables and before switching it on.

Insert the power plug only into a properly grounded outlet.

Do not use an extension cord without a ground conductor and grounded plugs.

Do not sever or disconnect the grounding conductors inside or outside the unit.

Warning

For replacement fuses, use only fuses with the required current rating as marked on the DXC-2 rear panel.

Never short-circuit the fuse holders or use repaired fuses.

If it is possible that fuse protection has been impaired, make the unit inoperative and secure it against any unintended operation.

Power Connection

Connect the DXC-2 to its power source as follows:

AC Power Connection

Skip this section if the DXC-2 is powered from a DC source.

AC power should be supplied to the DXC-2 through a 5 feet (1.5m) long standard power cable terminated by a standard 3-prong plug.

1. Check that the ON/OFF switch on the DXC-2 rear panel is set to OFF.
2. Connect the power cable first to the connector on the DXC-2 rear panel, then to the power outlet.

DC Power Connection

Skip this section if the DXC-2 is powered from an AC source.

1. Connect the power cable to the DC power connector.

Link Connections

Connect each of the link cables to the connector(s) corresponding to the interface in use. Do not connect both the balanced and unbalanced connectors of the same interface!

- When using the balanced interfaces, connect to the 15-pin D-type connectors designated LINK A and/or LINK B, respectively.
- When using the unbalanced interface, connect to the two BNC connectors designated RX-IN and TX-OUT of the appropriate interfaces. Pay attention to correct connection of the transmit and receive cables to the TX-OUT and RX-IN connectors.

Supervisory Port Connection

Connect a cable prepared in accordance with Appendix A between the supervisory port connector and the supervision terminal. If the supervision terminal is connected via modems, use a cross-over cable.

To enable communication with the DXC-2, the supervisory terminal should be set to the same data rate, data word format and parity type as the DXC-2 before you start operations.

NOTE *To comply with FCC rules, make sure that the various user interface cables are shielded. The DXC-2 and its data interfaces will work well even if the cables are not shielded, but radio interference may occur.*

Chapter 3

Front-Panel Operating Instructions

In this chapter you will find detailed instructions for operating the DXC-2 from the front panel. The information presented in this chapter includes:

- DXC-2 front panel
- General description of DXC-2 control, display and push-button functions, and menu organization
- DXC-2 configuration parameters
- DXC-2 operating procedures (turn-on, front-panel indications, performance monitoring and turn-off)
- DXC-2 local configuration set-up
- DXC-2 configuration error messages.

Refer to Chapter 4 for instructions on the use of a supervision terminal to remotely control and monitor DXC-2 operation.

3.1 Front Panel Controls and Indicators

Figure 3-1 shows the front panel of the DXC-2.

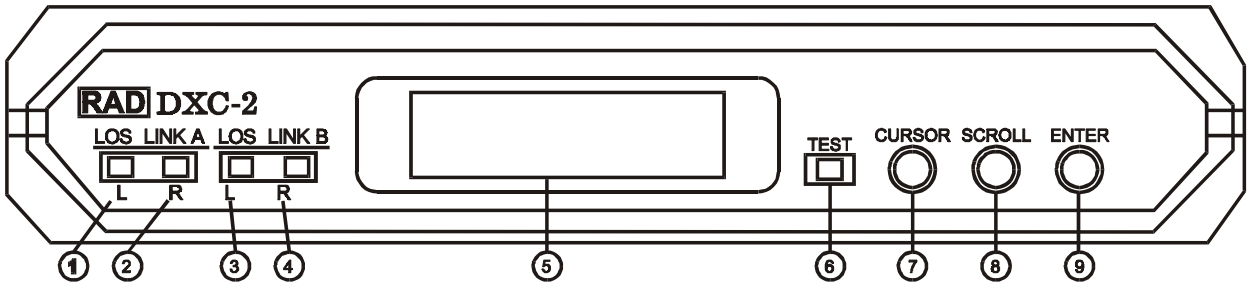


Figure 3-1 DXC-2 Front Panel

Table 3-1 lists the functions of the DXC-2 controls and indicators, located on the DXC-2 front panel. The index numbers in Figure 3-1 correspond to the item numbers in Table 3-1.

Table 3-1 DXC-2 Controls, Connectors and Indicators

Nº	Control or Indicator	Function
1	L LOS LINK A indicator	Indicates local loss of synchronization on link A
2	R LOS LINK A indicator	Indicates remote loss of synchronization on link A
3	L LOS LINK B indicator	Indicates local loss of synchronization on link B
4	R LOS LINK B indicator	Indicates remote loss of synchronization on link B
5	Alphanumeric display	Liquid crystal display (LCD) used to display messages and status information. The display contains 2 lines of 16 characters each
6	TEST indicator	Lights when a test is active
7	CURSOR push-button	Used to move among the information fields
8	SCROLL push-button	Used to scroll among the available options of the displayed functions
9	ENTER push-button	Used to enter the changes made in the DXC-2 operation, and initiate operation under the new set-up

3.2 Control of DXC-2 Operation

DXC-2 operating modes are determined by a set of parameters selected by the user using the DXC-2 front panel push-buttons or a supervision terminal. These parameters are stored in internal memory that is preserved when the power is off.

Once these parameters have been set up, the DXC-2 no longer requires operator attendance.

When it is turned on, the DXC-2 checks the validity of the stored configuration data and reloads it. The DXC-2 is then ready for operation. If the stored configuration data is not valid, the DXC-2 loads the factory preset default configuration from program EPROM.

General Operating Instructions

All operations are performed using an interactive, menu-driven user-friendly interface. The interface is controlled by means of the display and three push-buttons. The DXC-2 guides you in the execution of the required task by means of simple and clear messages. It presents the range of available parameter values and checks your inputs.

Usually, only those parameter values available on your DXC-2 model in the selected operating mode appear as choices. If nevertheless you select a parameter value that conflicts with the current operating mode, the DXC-2 rejects the selection and displays a message that identifies the problem.

Detailed instructions for operating the DXC-2 are in *Operating Instructions* on page 3-12 and *Local Configuration Set-Up Procedure* on page 3-16. *LCD Configuration Error Messages* on page 3-22 contains a list of configuration error messages and their meanings, and presents suggested corrections.

Display Functions

The DXC-2 display has four functions:

- Display of status messages
- Display of diagnostics performance data
- Display of test functions
- Display of configuration parameters.

Status Messages

When the DXC-2 is not being configured and no test is active, its display shows status messages. The alarm buffer can store up to 100 alarms. The status messages appear under the header ALARM BUFFER. The status messages are described in Chapter 5.

Diagnostic Performance Data

The diagnostic data displayed by the DXC-2 includes:

- For the E1 link(s), statistics of Out-Of-Service (OOS) events. When the CRC-4 option is enabled, the DXC-2 can also display an error count.
- For the T1 link(s), the traffic performance parameters gathered by the DXC-2 when operating with ESF framing. The DXC-2 can also display Red Alert alarm statistics when operating with SF (D4) framing.

The diagnostic data appears on the display under the header DIAGNOSTICS. Chapter 5 explains the diagnostics data displayed by the DXC-2.

Test Functions

The test functions include:

- Local (analog) and remote (digital) loopbacks, for rapid isolation of faults.
- For T1 links with CSU interface, network line loopback and network payload loopback, controlled by the network. These loopbacks have the highest priority and will override any other loop request.

The test function messages appear under the header TEST OPTIONS. Chapter 5 describes the available test functions.

Configuration Parameters

The DXC-2 has five groups of configuration parameters:

- System parameters
- Link parameters
- Time slot mapping
- Time slot parameters
- Supervisory port parameters

The configuration parameter groups are detailed in Table 3-2.

Table 3-2 Configuration parameter groups

Display	Description	See...
• SYSTEM PARAMETER	• Display and selection of system parameters: • Master clock source • Fallback clock source • FDL transfer mode • Signaling mode • Signaling inversion mode	*System Configuration Parameters* on page 3-6
LINK PARM	Display and selection of link parameters: • Framing • Use of CRC-4 option • Synchronization time • Link interface function • Signaling OOS indication • OOS code for voice time slots • OOS code for data time slots • CGA indication for voice and data time slots • Idle time slot fill-up code • Zero suppression coding • Transmit signal masking/attenuation	*Link Configuration Parameters* on page 3-7
TS MAP	Display and select the mapping of time slots between the two links	*Time Slot Mapping* on page 3-10
TS PARM	Display and select the type of the individual time slots	*Time Slot Parameters* on page 3-11
• SP PARAMETER	• Display and selection of DXC-2 supervisory port parameters: • Data rate • Number of data bits • Parity • Interface type	*Supervisory Port Configuration Parameters* on page 3-11

In addition to the parameters configured from the front panel, there are parameters controlled only from the supervision terminal. These are presented in Chapter 4.

After configuration, if alarm messages are stored in its ALARM BUFFER, the DXC-2 automatically returns to the display of status messages.

Organization of DXC-2 Display

The DXC-2 display has two lines:

- Upper line. Shows the name of the displayed function, group of configuration parameters, or test option.
- Lower line. The lower line displays:
  - Parameter name and value
  - Status messages
  - Loopback status
  - Error messages
  - Diagnostics messages.

Using the Front-Panel Push-buttons

DXC-2 operation is controlled by means of the display and the three push-buttons designated CURSOR, SCROLL and ENTER. The same control actions are consistently used for all the activities:

CURSOR — Use this push-button to indicate what you want to change. Pressing the CURSOR push-button moves the cursor among the fields in the current display. The cursor is a bar that underlines the selected field.

Some fields list several different items, and then you move the cursor under the desired item.

The item displayed above the cursor can be changed (scrolled) by pressing SCROLL.

SCROLL — Press repeatedly to display the alternatives for the current field/item indicated by the cursor. Holding the push-button depressed causes automatic scrolling of the available alternatives.

ENTER — Press it once to select the value displayed in the field/item indicated by the cursor. If the selected value is valid, it replaces the old value and the change takes effect immediately.

When the alarm buffer is displayed, the ENTER key can be used to reset the following error counters: OOS, BPV, CRC, CUR ES, CUR SES, CUR BES, CUR UAS, CUR LOFC, and CUR CSS.

If you make an incorrect selection, the selection is not accepted. In this case, you see a CONFIG ERROR message with a two-digit code in the second display line. The code indicates what is wrong. *LCD Configuration Error Messages* on page 3-22 explains the codes and what to do to correct the error.

After a short time, the error message disappears and you see again the original display. Now you can correct the error.

3.3 System Configuration Parameters

Table 3-3 lists the available system configuration parameters and their functions. The table also lists the parameter values included in the DXC-2 default configuration.

Table 3-3 System Parameters

Designation	Function	Values
CLK_MASTER	Selects the master timing reference	LNKA - Locked to the recovered receive clock of link A LNKB - Locked to the recovered receive clock of link B INT - Internal oscillator **Default: INT**
CLK_FBACK	Selects the alternate (fallback) timing reference for use in case the master reference fails	NONE- No fallback source is used LNKA - Locked to the recovered receive clock of link A LNKB - Locked to the recovered receive clock of link B **Default: NONE**
FDL_TRANS	Selects the FDL mode. This parameter is displayed only for DXC-2 equipped with two T1 link interfaces	NO - The FDL is not transferred transparently from link to link YES - The FDL is transferred transparently from linkto link. This option can be selected only whenboth links are configured for ESF framing **Default: NO**
SIG_INVERT	Selects the signaling bits inversion mode. This parameter is displayed only for DXC-2 units equipped with one T1 link interface and one E1 link interface	OFF - The signaling bits are transferred fromlink to link without inversion ON - The signaling bits are inverted when transfer-red from link to link **Default: ON**
SIGNAL_MODE		REGULAR - No proprietary MCL_CAS - Special custom proprietary **Default: REGULAR**

3.4 Link Configuration Parameters

Table 3-4 lists the available link configuration parameters and their functions. The table also lists the parameter values included in the DXC-2 default configuration.

Parameter values can be independently selected for each link.

Table 3-4 Link Parameters

Designation	Function	Values
FRAME	Selects the multiframing mode for the selected link. The available options depend on the type of link interface	**For E1 Links:** G732N - Two frames per multiframe. Time slot 16 can be used for user data G732S - 16 frames per multiframe **Default:** G732N **For T1 Links**: SF - 12 frames per multiframe. ESF - 24 frames per multiframe UNFRAME - No frames **Default: ESF**
SYNC	Reduces recovery time for the selected link to return to normal operation after a local loss of synchronization. The available options depend on the type of link interface	**For E1 Links:** ITU-T - Complies with ITU-T Rec. G.732 62411- Similar to the requirements of AT&T TR-62411 (after 10 seconds) FAST- After 1 second **Default: ITU-T** **For T1 Links:** 62411- Complies with AT&T TR-62411(after 10 seconds) FAST- After 1 second **Default: FAST**
CRC-4	Generates check bits (in accordance with the CRC-4 polynomial specified by ITU-T Rec. G.704) for the frames transmitted on the link, and verifies check bits carried by received link frames. This option is displayed only for a link equipped with an E1 interface	NO- CRC-4 option disabled YES- CRC-4 option enabled **Default: NO**

Designation	Function	Values
FUNCTION	Indicates the type of interface installed on the selected link. The value appearing in this field is automatically displayed in accordance with the hardware installed on the selected link, and cannot be changed	**For E1 Links:** LTU- The link interface includes an LTU DSU- The link interface does not include an LTU **For T1 Links:** CSU- The link interface includes a CSU DSU- The link interface does not include a CSU
OOS SIGNAL	When NONE is selected for the CGA parameter (see below), this parameter determines the state of the A and B signaling bits when an Out-Of-Service condition is in effect. **NOTE** "0" - on-hook (idle) state "1" - off-hook (busy) state	SPACE Both A and B signaling bits are forced to "0" when an Out-Of-Service condition is in effect MARK Both A and B signaling bits are forced to "1" when an Out-Of-Service condition is in effect SP_MK The A and B signaling bits are forced to "0" for 2.5 seconds, then switch to the "1" state until the Out-Of-Service condition ends MK_SP The A and B signaling bits are forced to "1" for 2.5 seconds, then switch to the "0" state until the Out-Of-Service condition ends * The E1 link is located opposite the received signaling OOS. **Default: SPACE**
VOICE OOS	When either NONE or TRANS is selected for the CGA parameter (see below), a code is transmitted when an Out-Of-Service condition is in effect. This parameter determines which code is transmitted in those time slots of the selected link that were defined as voice time slots.	The available selections are 00 to FF (hex). **Default: 00**
DATA OOS	When either NONE or TRANS is selected for the CGA parameter (see below), a code is transmitted when an Out-Of-Service condition is in effect. This parameter determines which code is transmitted in those time slots of the selected link that were defined as voice time slots.	The available selections are 00 to FF (hex). **Default: 00**

Designation	Function	Values	
CGA	Selects the method used to signal the CGA state (DXC-2 link out-of-service) to the other end of the selected link.	NONE	When the DXC-2 link is in the Out-Of-Service state, the voice time slots and the data time slots carry the OOS code, and the A and B signaling bits assume the OOS state (see the OOS SIGNAL parameter above). This mode is the non-transparent mode and is often used when the link carries voice channels, e.g., in PABX applications
		TRANS	When the DXC-2 link is in the Out-Of-Service state, the voice time slots and the data time slots carry the OOS code, but the A and B signaling bits are not forced to the OOS state (see the OOS SIGNAL parameter above). Used with voice and DATAPORT applications.
		FULL	The DXC-2 changes neither the state of the voice and data time slots nor the state of the signaling bits when it is in the Out-Of-Service state. This is the fully-transparent mode. It is often used when the link carries channelized or unchannelized data..
		Default: NONE	
I_TS_CODE	Selects the code transmitted to fill idle (unused) time slots in the frames transmitted on the selected link	The available selections are 00 to FF (hex). **Default: 3F**	
CODE	Selects the line coding method used for zero suppression on T1 links. This parameter is displayed only when a T1 link is selected	TRAN-	Transparent (AMI) coding, no processing for zero suppression
		B7ZS-	B7ZS coding
		B8ZS-	B8ZS coding **NOTE -** Clear channel capability is available only with B8ZS coding.
		Default: B8ZS	

Designation	Function	Values
MASK	Controls the link transmit signal characteristics. This parameter is displayed only when a T1 link is selected. The displayed options depend on the link interface hardware (with or without CSU): • When the link does not include a CSU, the transmit signal mask can be selected for compliance either with DSX-1 requirements as specified by AT&T CB-119, or with FCC Rules Part 68. • When the link includes a CSU, the transmit signal attenuation can be selected for compliance with FCC Rules Part 68	**For links without CSU:** 1. DSX-1 operation: The following selections, indicating the line length in feet, are available: Length (ft) — Display 0-133 — 000 - 133-266 — 133 - 266-399 — 266 - 399-533 — 399 - 533-655 — 533 - 2. An additional selection, FCC68, provides compliance with FCC Rules Part 68 Subpart 308 Option A ("Output Pulse Mask"). **Default for links without CSU: 000** **For links with CSU:** 0 — No attenuation 7.5 — Attenuation of 7.5 dB relative to the nominal transmit level 15 — Attenuation of 15 dB relative to the nominal transmit level 22.5 — Attenuation of 22.5 dB relative to the nominal transmit level **Default for links with CSU: 0**

3.5 Time Slot Mapping

The time slot mapping function is used to define the connections ("mapping") between the time slots of link A and link B. Any selection made is bidirectional, i.e., if time slot 3 of link A is connected to time slot 12 of link B, the DXC-2 automatically connects time slot 12 of link B to time slot 3 of link A.

The DXC-2 automatically displays the proper number of time slots for each link, in accordance with the installed link interfaces:

- For T1 links, the range of time slot numbers is 1 through 24, and F. F represents the 25th time slot, which carries the F-bit.
- For E1 links, the range of time slot numbers is 1 through 31.

The default mapping is NC, meaning "not connected".

3.6 Time Slot Parameters

The Time Slot Parameter defines the type of each time slot of link A and link B. Two types are available:

- Voice —The data transferred in a voice time slot is interpreted as a digitized voice signal using the appropriate standards. For example, it may undergo A-law/μ-law conversion if connected between a T1 link and an E1 link.
- Data — The data in a data time slot is transferred transparently.

The DXC-2 automatically displays the proper number of time slots for each link, corresponding to the number of installed link interfaces (1 through 24 for T1 links, and 1 through 31 for E1 links). An ALL selection is also available, meaning that all the time slot of the selected link should be handled in the same way (either voice or data).

3.7 Supervisory Port Configuration Parameters

Table 3-5 lists the available supervisory port configuration parameters and their functions. The table also lists the parameter values included in the DXC-2 default configuration.

In addition to the parameters listed below, the DXC-2 supports additional parameters, which can be modified only via the supervisory port. These parameters are explained in Chapter 4.

Table 3-5 Supervisory Port Parameters

Designation	Function	Values	
SPEED BPS	Selects supervisory port data rate	300, 1200, 2400, 4800, 9600	Supervisory port data rate (bps)
		AUTO	Autobaud operation. The DXC-2 automatically identifies the supervisory port data rate. To enable positive identification, the transmission must start with three consecutive Carriage Returns.
		Default: AUTO	
DATA	Selects the number of data bits in the word format	7 or 8 data bits.	
		Default: 8	

Designation	Function	Values	
PARITY	Controls the use of parity	ODD	Odd parity
		EVEN	Even parity
		NO	Parity disabled (only available with 8 data bits)
		Default: NO	
INTERFACE	Selects supervisory port interface	DCE	The DXC-2 appears as a DCE for the supervision terminal
		DTE	The DXC-2 operates as a DTE, for connection via modem to the supervision terminal
		Default: DCE	

3.8 Operating Instructions

This paragraph explains the following procedures:

- Turning on the DXC-2
- Checking DXC-2 configuration
- Verifying that the DXC-2 is operating normally
- Monitoring DXC-2 performance
- Turning off the DXC-2

Refer to *Local Configuration Set-Up Procedure* on page 3-16 for local configuration set-up instructions.

Turning on the DXC-2

To turn the DXC-2 on, set the rear power switch to ON. The DXC-2 performs a self-test when it is first turned on. Watch the front-panel indications. During the self-test, the DXC-2 displays its software version in the format X.Y:

```
DXC-2 REV: X.Y
SELF TEST
```

After successfully completing the self-test procedure, the DXC-2 will switch to the default display - the ALARM BUFFER.

Note *If the DXC-2 fails the self-test, you will see a description of the fault on the second line. In this case, the DXC-2 must be repaired before it can be used again. Refer to* Chapter 5 *for instructions.*

Note

If the configuration data stored by the DXC-2 is corrupted, the DATABASE CKS ERR alarm message is generated. In this case, reinitialize the data base, and then reenter your custom configuration.

To reinitialize the data base, set section 3 of the internal switch SW1 to ON, turn the DXC-2 on, and then turn it off and return section 3 to OFF (see Chapter 2*). The default values of the configuration parameters are listed in* System Configuration Parameters *on page 3-6 through* Supervisory Port Configuration Parameters *on page 3-11.*

You can verify the DXC-2 configuration as explained below. If the configuration does not require modification, the DXC-2 is ready for operation immediately after the self-test is completed. To change the configuration, refer to ***Local Configuration Set-Up Procedure*** on page 3-16.

Checking Current Operating Configuration

The following procedure should be used to view the current values of the configuration parameters.

For an explanation of the parameters, see ***System Configuration Parameters*** on page 3-6 through ***Supervisory Port Configuration Parameters*** on page 3-11.

NOTE

To prevent accidental change of parameters during the following procedure, be careful not press the ENTER key at any time.

Step	Action	Key	Display
1	Bring the cursor to the top line	CURSOR	
2	Scroll to display SYSTEM PARAMETER on the top line	SCROLL	Second line shows the first system parameter, CLK MASTER, and its current selection
3	Bring the cursor to the first field on the second line	CURSOR	
4	Scroll to see the other system parameters	SCROLL	Each time the SCROLL button is pressed, the second line of the display shows the current value of the next system parameter. Continue until CLK MASTER appears again
5	Bring the cursor to the last field on the top line	CURSOR	
6	Begin displaying the next group of configuration parameters, LINK PARM LNKA (the link parameters of link A)	SCROLL once	The second line of the display shows the first link parameter of link A, FRAME, and its current value
7	Bring the cursor to the first field on the second line	CURSOR	
8	Scroll to see the other link parameters of link A	SCROLL	Each time the SCROLL button is pressed, the second line of the display shows the current value of the next link parameter. Continue until FRAME appears again

9	Bring the cursor to the last field on the top line	CURSOR	
10	Scroll to display LNKB on the top line	SCROLL	The second line shows the first link parameter of link B, FRAME, and its current value
11	Bring the cursor to the first field on the second line	CURSOR	
12	Scroll to see the other link parameters of link B	SCROLL	Each time the SCROLL button is pressed, the second line of the display shows the current value of the next link parameter. Continue until FRAME appears again
13	Bring the cursor to the first field on the top line	CURSOR	
14	Scroll to display TS PARM on the top line	SCROLL	The top line shows TS PARM LNKA, followed by the number of the first link A time slot, 01, or by ALL. ALL means all the time slots of this link are of the same type. The second line shows TYPE, followed by the type of the time slot(s): VOICE or DATA.
15	Bring the cursor to the last field on the top line	CURSOR twice	
16	Scroll to see the types of the other time slots of link A	SCROLL	You will see 01 again after the last user time slot of link A , 24 if it has a T1 interface, or 31if it has an E1 interface.
17	Scroll to display TS MAP on the top line	SCROLL	The top line shows TS MAP LNKA, followed by the number of the first link A time slot, 01. The second line shows CONNECT LNKB, followed by the number of the link B time slot to which link A time slot 01 is connected, or NC (not connected).
18	Bring the cursor under the right-hand field in the top line	CURSOR	
19	Scroll to see the connections of the other time slots	SCROLL	If link A has a T1 interface, after the last user time slot, 24, you will see F (the time slot carrying the F-bit), then 01 again. If link A has an E1 interface, after the last time slot, 31, you will see 01 again.
20	Bring the cursor to the first field on the top line	CURSOR	
21	Repeat steps 1 thru 4 to display the supervisory port parameters - SP PARAMETER	CURSOR, SCROLL	

Normal Indications

The following conditions indicate normal operation of the DXC-2.

Display

The normal message displayed in the top line is ALARM BUFFER. However, if no alarm is stored in the alarm buffer, the DXC-2 will continue displaying the last user-selected display.

In addition, the DXC-2 will automatically abort the current activity and will redisplay this message if no front-panel button is pressed for 1 minute, thereby ensuring that it will not remain in an indeterminate state even if the operator does not complete a configuration activity. This, however, does not apply to the TEST OPTIONS display: if an operator-initiated test loopback is active, the DXC-2 continues displaying the TEST OPTIONS information (see *Chapter 5*).

When the top line shows ALARM BUFFER, the second line displays the following information:

- During normal operation, the second line should show EMPTY (no alarm messages).
- If the alarm buffers contains alarms, you will see SCROLL in the left-hand field of the second line, and CLEAR in the right-hand field.

The alarms can be displayed by bringing the cursor under SCROLL, and then pressing ENTER: you can now scroll between the alarms stored in the alarm buffer. To interpret the alarm messages displayed in the second line, refer to *Table 5-1*. In *Table 5-1*, you will find two types of alarms, designated as ON/OFF and ON:

- A message indicating an ON/OFF alarm is displayed only when the alarm condition is present, and is automatically removed when the condition is cleared (if the alarm is being displayed, it will disappear only when the display is refreshed by scrolling).
- A message indicating an ON alarm persists even after the event that caused the alarm condition is cleared.

If the DXC-2 operates normally, but an alarm message of the ON type is displayed, you can clear the event alarm message from the display by the following procedure:

Step	Action	Key	Display
1	Bring the cursor to the word CLEAR on the second line	CURSOR	
2	Press ENTER to clear the event messages in the alarm buffer	ENTER	If no state alarms are present, the second line should show EMPTY

Normal Front-Panel Indications

During normal operation, all the DXC-2 front-panel indicators, including TEST, should be off.

Fault Indications

If any of the link indicators or the TEST indicator light, data transfer is interrupted.

- The TEST indicator lights when a test is activated. If the test is activated from the local DXC-2, you can see the test type by entering TEST OPTIONS (*Chapter 5*). You can disconnect a local loop as explained in *Chapter 5*.
- The L LOS LINK A or L LOS LINK B indicator lights when a local loss of synchronization occurs on the corresponding link.
- The R LOS LINK A or R LOS LINK B indicator lights when a remote loss of synchronization occurs on the corresponding link.

Monitoring DXC-2 Performance

The DXC-2 continuously measures diagnostics performance data. The diagnostics data is available under DIAGNOSTICS. The measured parameters are explained in *Chapters 4* and *5*.

Turning off the DXC-2

Set the DXC-2 rear power switch to OFF.

3.9 Local Configuration Set-Up Procedure

Before starting any configuration action:

- Review the relevant configuration parameters given in *System Configuration Parameters* on page 3-6 through *Supervisory Port Configuration Parameters* on page 3-11
- Obtain a list of the required parameters from your network subscription data, and/or from your system administrator.

DXC-2 configuration is set-up by a simple four-step procedure:

1. Select the system parameters.
2. Select the link A and link B parameters.
3. Select time slot mapping.
4. Select individual time slot types.

When a supervision terminal will be used to control the DXC-2, also select the parameters of the supervisory port.

The general configuration procedure is explained on the following page. The general procedure is followed by special considerations for each group of parameters.

The DXC-2 presents only those parameters available in the selected mode, therefore it is important to perform the configuration according to the order specified above.

General Configuration Procedure

The following steps are used to perform any configuration activity:

Note *Before starting the configuration procedure, always disconnect all the user-initiated loopbacks (select OFF on TEST OPTIONS)*

Note *Refer to* LCD Configuration Error Messages *on page 3-22 for an explanation of the configuration error messages the DXC-2 displays when you make an error.*

Step	Action	Key	Display
1	Bring the cursor under the top line (if not already there)	CURSOR	
2	Scroll to display the desired group of parameters in the top line **Note** When the desired group of parameters must be independently selected for each link or time slot, the top line includes an additional field (at the rightmost side of the top line): this field is used to select the desired link/time slot number. In this case, use the CURSOR key to bring the cursor to the rightmost field, then SCROLL to show the desired link or time slot number.	SCROLL	Second line shows the first parameter in the selected group and its current value
3	When the second line has more than one field, bring the cursor under the left-hand field (parameter name) in the second line, and then scroll to display the desired parameter in the selected group	CURSOR SCROLL	The second line shows the parameter name and its current value
4	Bring the cursor under the right-hand field (the parameter value) in the second line	CURSOR	
5	Scroll to set the required value for the displayed parameter	SCROLL	The second line shows the available values

6	When the desired parameter value is displayed, select the new parameter value **Note** You must press ENTER after changing parameters of a certain group, e.g., SYSTEM, LINK, etc. If you change parameter values, but return the cursor to the first field and scroll to another group without pressing ENTER, the changes are discarded and you will see the message CONFIGLOST.	ENTER	The cursor returns to the first field in the top line. The second line displays shortly CONFIG ENTER, then returns to the normal display
7	Repeat steps 3 thru 6 until values are assigned to all the parameters in the group	SCROLL	The second line shows the current selection
8	Repeat steps 1 thru 7 until values are assigned to all the parameters in the desired groups	SCROLL	The second line shows the current selection
9	After completing the configuration actions, you can use steps 1, 2 to return to the ALARM BUFFER. If alarm messages are stored in the ALARM BUFFER, ALARM BUFFER will be automatically displayed if no push-button is pressed for one minute.	SCROLL	The top line shows: ALARM BUFFER

Specific Configuration Guidelines

This section presents specific configuration guidelines for the selection of parameter values. You may also wish to refer to *Operating Environment* in *Chapter 1*, that provides a concise description of the DXC-2 operating environment, including explanations for many of the relevant terms.

SYSTEM PARAMETER

See parameter definitions in *System Configuration Parameters* on page 3-6.

CLK MASTER — For connection to carrier lines, select LNK A or LNK B. For a point-to-point application with stand-alone equipment, you can also select INT.

CLK FBACK — Select a source different from that selected as master. To disable switching to the fallback source, select NONE. In this case, the default fallback clock source is the DXC-2 internal clock oscillator.

FDL TRANS — If the DXC-2 is used as a T1 digital cross-connect system operating with ESF framing on both links, select YES to enable transparent transfer of the FDL between the two links.

SIG INVERT — When the DXC-2 has identical links, you should select NO.

If the DXC-2 is used to convert between T1 and E1 links, it may be necessary to select YES, because the representation of on-hook and off-hook states is different.

The required setting must be determined in accordance with the requirements of your specific application.

SIGNAL MODE — This is a special custom parameter. See separate instructions on its use.

LINK PARM

See parameter definitions in *Link Configuration Parameters* on page 3-7.

FRAME — Select the framing mode specified for use in your network.

- For T1 links, select ESF unless the T1 equipment connected to the DXC-2 does not support this mode.
- For E1 links, if time slots carry voice traffic, always use the G732S framing mode.

CRC-4 — Select YES, except when the DXC-2 is connected to transmission equipment that does not support this option.

SYNC

- For E1 links, select ITU-T, unless your application has special requirements.
- For T1 links, select FAST, unless your application requires exact conformance with AT&T TR-62411 requirements.

OOS SIGNAL — When NONE is used for VOICE CGA, select the OOS signaling mode used by the equipment connected to the link.

VOICE OOS — When NONE or TRANS is used for VOICE CGA, select the out-of-service code recommended for use on voice channels in your network.

DATA OOS — When TRANS is used for DATA CGA, select the out-of-service code recommended for use on data channels in your network.

CGA — Select the desired method in accordance with your application:

NONE For a link connected to a PABX or to a data or voice multiplexer.

This is the non-transparent mode.

TRANS Use for voice applications with channel associated signaling (proprietary signaling) and for channelized data applications.

This is the transparent mode.

FULL If the equipment connected to the link requires transparent transmission, e.g., for data transmission applications.

This is the fully transparent mode.

IDLE_CODE — Select the value specified for your network.

CODE — Select the framing mode specified for use in your network.

For point-to-point applications, B8ZS should be used whenever supported by the carrier.

MASK — Select in accordance with the required link operating mode, and the hardware installed on the link interface.

If the link interface does not include a CSU:

- For compliance with DSX-1 specifications per AT&T CB-119 and ANSI T1.102-1987, select the value corresponding to the length of the cable (in feet) connected between the T1 LINK connector and network entry point.
- For compliance with FCC Rules Part 68, select FCC68.

If the link interface includes a CSU, it is necessary to adjust the T1 output transmit level, for reliable operation of the network, and for compliance with FCC Rules Part 68. This adjustment is used to minimize the interference caused by your transmit signal to other users that transmit their signals on other pairs of the same cable. The required setting depends mainly on the length of the cable that connects your DXC-2 to the first repeater down the link. Repeaters are usually located every mile, and therefore, they are designed to optimally handle signals attenuated by one mile length of cable. If your DXC-2 is closer, the repeater would receive your signal at a higher

level. This will not significantly improve the handling of your signal, but will certainly increase the interference coupled from your pair to repeaters that serve other pairs in the cable.

To prevent this, you can select an attenuation value that will bring your signal level closer to the expected repeater signal level. This is achieved by connecting, as required, one, two, or three artificial line sections in series with your T1 transmit signal. Each line section introduces a nominal attenuation of 7.5 dB (equivalent to the attenuation of approximately 1000 feet of cable). Your system administrator or data carrier will tell you what is the proper setting for your DXC-2.

TS MAP

See parameter definitions in *Time Slot Mapping* on page 3-10.

Select the desired connections between the time slots of link A and the time slots of link B:

- To connect between given time slots, specify the number of the link A time slot in the top line, and the number of the corresponding link B time slot in the second line.
- To transfer the F-bit transparently (per ITU-T Rec. G.802), connect the F time slot of link 1 to any desired time slot in the other link.
- To disconnect a time slot, select NC.

It is not necessary to interrupt normal service while making these changes, because the DXC-2 will change only the connections of the selected time slots, without disrupting the traffic through the other time slots.

TS PARM

See parameter definitions in *Time Slot Parameters* on page 3-11. Note that time slots are identified in accordance with the slot numbers of link A.

Select the desired type for each individual time slot by displaying the number of the link A time slot in the top line, and display the desired type (voice or data) in the second line.

- If the time slot must be transferred transparently, select DATA.
- If the time slot carries voice signals, and it is necessary to convert the coding and the signaling format, select VOICE

If all the time slots must be handled in the same way, select ALL to specify the same type for all the time slots.

SP PARAMETERS

See parameter definitions in *Supervisory Port Configuration Parameters* on page 3-11.

SPEED_BPS — Select AUTO whenever feasible. In this case, start the communication with three Carriage Returns, to ensure positive identification of terminal data rate.

NOTE The automatic baud rate recognition procedure must be repeated after the DTR line in the SP connector had been switched to OFF and then ON again.

DATA — Select the required number of data bits (same as on the terminal).

PARITY — Select the required parity (same as on the terminal).

INTERFACE — Select DCE when directly connected to the supervision terminal. Select DTE when connected to a modem.

NOTE *The INTERFACE parameter only changes the direction of the interface control (handshaking) signals, but not the functions of the interface pins. Therefore, when connecting to a modem, it is necessary to use a cross cable.*

3.10 LCD Configuration Error Messages

The DXC-2 detects configuration errors and displays a CONFIG ERROR XY message. The code XY identifies the error. You will find below the list of error messages and instructions that will help you correct the problem.

CONFIG ERROR 1 — You are trying to select the same source as both master and fallback clock source. Check and change as required.

CONFIG ERROR 2 — Conflict in time slot mapping: you are trying to connect an already connected time slot to an additional time slot. Check and change as required.

CONFIG ERROR 3 — Illegal combination of link loopbacks: you are trying to activate simultaneously local and remote loopbacks on the same link, or a network-activated loopback may already be activated. Only one loopback can be connected at a time.

CONFIG ERROR 4 — Illegal combination of link loopbacks that involves a remote link loopback. Check and change as required.

CONFIG ERROR 5 — Illegal combination of link loopbacks that involves a local link loopback. Check and change as required.

CONFIG ERROR 6	You are trying to deactivate a loopback which is not active. Check and change as required.
CONFIG ERROR 7	Illegal performance monitoring request for the current framing mode.
CONFIG ERROR 8	Illegal time slot mapping.
CONFIG ERROR 9	Conflict in time slot type and link framing mode: the VOICE type can be selected on an E1 link only when the framing mode is G732S. Check and change as required.
CONFIG ERROR 10	You are trying to connect a time slot to time slot 16 of an E1 link operating with G732S framing. This is not allowed.
CONFIG ERROR 11	Conflict between the time slot type and the G.802 mode: you are trying to route the F-bit to a time slot defined as a voice time slot. This is not allowed.

Chapter 4

Control of DXC-2 Operation from the Supervisory Port

This chapter provides instructions for the control of the DXC-2 operation from a supervision terminal connected to the DXC-2 supervisory port. The information presented in this chapter includes:

- Description of supervision terminal hardware requirements, communication and handshaking.
- Preparation for use of supervision terminal.
- Description of supervision terminal set of commands and command syntax.
- General operating instructions, including start-up, routine operations, and stopping of remote control.
- Configuration error messages.

4.1 Hardware Requirements

Terminal Characteristics

Any standard ASCII terminal (dumb terminal or personal computer emulating an ASCII terminal) equipped with an RS-232 communication interface can be used to control DXC-2 operation. The software necessary to run the DXC-2 supervision program is contained in the DXC-2.

Communication Requirements

The supervision terminal can be connected either directly to the DXC-2 supervisory port, or through a modem or any other type of full-duplex data link. The DXC-2 supervisory port interface type must be set in accordance with the connection method (see *Supervisory Port Configuration Parameters* in Chapter 3):

- DCE for direct connection
- DTE for connection through a modem or data link (cross cables must then be used at the DXC-2 SP connectors).

The DXC-2 can communicate with the supervision terminal at rates of 300, 1200, 2400, 4800 or 9600 bps. The word format consists of one stop bit and 7 or 8 data bits. Parity can be odd, even or disabled. The communication

interface of the terminal and the DXC-2 must be configured for operation with the same parameters.

The DXC-2 supports two types of modems:

- Dial-up Hayes compatible modems, e.g., the RAD miniature DLM/AT modem. The DXC-2 has only a call-in capability, that is, it can accept external calls, but cannot initiate calls.
- Multidrop modems, e.g. the RAD SRM-6 miniature multidrop modem.

For multidrop operation, each DXC-2 can be assigned a node address in the range of 1 through 255. Assigning address 0 to the DXC-2 means that it will accept and answer any message: this is not permitted in multidrop operation. Address 0 is however recommended for use with both point-to-point and dial-up modes.

Each DXC-2 can be assigned a logical name of up to eight characters. The logical name is sent in each transmission of alarm messages. The name helps the operator to identify the source of messages that are received by the supervision terminal.

The relevant DXC-2 configuration parameters are described in *Supervisory Port Configuration Parameters* in Chapter 3. Instructions for configuring the DXC-2 supervisory port appear in *Local Configuration Set-Up Procedure* in Chapter 3.

Handshaking Protocol

The handshaking between the DXC-2 and the supervision terminal uses the control lines in the DXC-2 SP connector.

The control lines being used in each mode and the direction of the control signals is detailed in the following chart.

Interface Type		DCE	DTE
CONTROL LINE	CTS	Out	Not used
	DCD	Out	Out
	DSR	Out	Out
	DTR	In	In
	RI	Not used	In
	RTS	In	In

Data Terminal Ready (DTR)

The terminal sets the DTR line ON (active) to gain control over the DXC-2 and start a configuration/monitoring session.

When the DTR is ON, the front panel controls are disabled, and the LCD shows: TERMINAL ON LINE.

The DTR line is OFF (inactive) when terminal control is not required. This ends the terminal control connection, and returns the control to the DXC-2 front panel. If password protection is used, the password must be entered again the next time the DTR line is set ON to start a new session.

Request to Send (RTS)

The RTS line is normally ON (active) when the supervision terminal is in session. When the RTS line is OFF (inactive), the DXC-2 interprets any data received from the terminal on the TD line as MARK.

Clear to Send (CTS)

The state of the CTS line is determined by the CTS parameter:

ON The CTS line is always ON (active).

=RTS The CTS line follows the RTS line.

Data Carrier Detect (DCD)

The state of the DCD line depends on the communication address (node number):

- When the node address is 0, the DCD line is always ON (active).
- When a non-zero node address is used, the DCD line becomes ON (active) when data is detected on the RD line, provided the DXC-2 recognizes its own address in the data stream.

To simulate DTE operation, the delay between these events can be set by the user (by means of the DCD-DELAY parameter).

Ring Indication (RI)

The RI line is used only with dial-up modems (INT=DTE). The RI line is normally OFF (inactive), and switches to the ON (active) state when the modem attached to the DXC-2 SP connector detects an incoming call. See also the DSR line.

Data Set Ready (DSR)

- Usually, the DSR line is configured to track the DTR line. In this case, if the supervisory port interface is DTE, the DSR line will be set to ON for 5 seconds when the RI line is ON while the DTR line is OFF.
- If the supervisory port interface is DCE, the DSR line can also be configured to be continuously ON. However, if the DTR line switches to OFF, the DSR line will also switch to OFF for 5 seconds.

In addition, the DXC-2 always sets DSR OFF (inactive) for 5 seconds when the EXIT command is executed, or the disconnect time-out expires.

AUTOBAUD Function

When the AUTOBAUD function is enabled, the DXC-2 can identify the operating data rate of the terminal by analyzing the timing of three consecutive Carriage Return + Line Feed characters (generated by pressing

three times the carriage return key). The detected data rate is then used for the current communication session.

The automatic baud rate identification procedure is performed (or repeated) whenever three consecutive carriage returns are received after one of the following events occurs:

- The DTR line has been switched OFF.
- The EXIT command has been executed.
- The idle disconnect time-out expired because no data has been exchanged with the supervision terminal.

In case one of these events occurred, the DXC-2 assumes that the current communication session has been terminated. Therefore, when the password protection is enabled, the password must be entered again before the supervision terminal can resume communication with the DXC-2.

4.2 Preparation For Use Of Supervision Terminal

DXC-2 Preparations

Internal Settings

See *DXC-2 Configuration Information* in Chapter 2 for detailed information.

Note that in general you must enter a password when you start a control session. If the password is incorrect, the DXC-2 will not respond. This can be corrected by appropriate setting of the PSWD section of SW1. Set the PSWD section of SW1 as follows:

OFF In this position, you can define your own password and node address.

ON Set the switch section to ON to restore the default DXC-2 password (RAD), and change the node address to the default value of 0. The change will be made after you turn the DXC-2 off for a short time, and then turn it back on.

Supervisory Port Configuration

Configure the DXC-2 SP port as required. See *Supervisory Port Configuration Parameters, Operating Instructions* and *Local Configuration Set-Up Procedure* in Chapter 3. If the supervisory port parameters are not correct, the DXC-2 will not respond. This can be corrected by appropriate setting of the SP section of SW1. Set the SP section of SW1 as follows:

OFF In this position, you can define the desired supervisory port parameters.

ON Set the switch section to ON to restore the default supervisory port parameters. The change will be made after you turn the DXC-2 off for a short time, and then turn it back on.

Supervision Terminal

Configure the terminal for the same communication parameters you selected for the DXC-2 SP port.

Connections

Connect the supervision cable (coming directly from the terminal, or from the modem used to connect the terminal) to the SP connector of the DXC-2. See Appendix A for cable wiring information. Turn the supervision terminal on and when applicable, turn on the modems and the other communication equipment used to connect the terminal to the DXC-2.

4.3 DXC-2 Supervision Language

This paragraph presents the DXC-2 supervision language syntax, usage, and set of commands.

Command Language Syntax

- Commands can only be entered when the DXC-2 supervisory port prompt is displayed. The prompt is DXC2>, and it always appears at the beginning of a new line. The cursor appears to the right of the prompt.
- Commands are case-insensitive, e.g. you can type commands in either lower case and/or upper case letters.
- To correct typing errors, backspace by pressing the BACKSPACE key until the error is cleared, and then type again the correct command.
- Use space as a separator between command fields and/or parameters.
- Commands must end with a carriage return <CR>.
- To cancel the current command, press BREAK or type CTRL-C. You will obtain again the DXC-2 prompt.

Command Options

The following general types of options are available with some commands. See details in the command set index, Table 4-1.

Option	Meaning	Example of Usage
/A	All	CLR ALM /A Clears all the alarms stored by the alarm buffer
/C	Clear	DSP ALM /C Displays all the alarms stored by the alarm buffer, and then clears all the alarms in the ON state stored by the alarm buffer
/CA	Clear all	DSP ALM /CA Displays all the alarms stored by the alarm buffer, and then clears all the alarms stored by the alarm buffer

/R	Repeat automatically command execution. Available only when node address is 0	DSP FDL /R Enables you to monitor the FDL statistics collected by the DXC-2 on link A.

Command Protocol

- If AUTOBAUD is on, start any session by pressing the <CR> key three times in sequence. This will ensure identification of terminal data rate.
- When the DXC-2 uses a non-zero node address, it expects an address before responding to the terminal commands. No response will occur until the node number is received and acknowledged by the addressed DXC-2. Acknowledgment is indicated by the echoing of the node address part, i.e. Node<SP>nnn<SP>, where <SP> stands for space.
- The address is in the range of 1 through 255 (0 indicates that the selective addressing function is disabled). The address is a prefix sent in the following format: Node<SP>nnn<SP>.
- When password protection is on, the addressed DXC-2 waits for the password before continuing. After the correct password is received, the DXC-2 sends the working prompt, DXC2>. If password protection is off, this step is omitted and the working prompt appears after the node address conditions are fulfilled.
- After the working prompt is displayed, every character typed on the terminal keyboard is immediately evaluated by the DXC-2 and echoed to the terminal screen. Full duplex communication with the terminal is therefore necessary, to provide on-line feedback to the terminal operator.
- Command evaluation starts only when the <CR> key is pressed.
- In case an error is detected during command evaluation, the command is not executed. Instead, the DXC-2 will send the erroneous command back to the terminal, and you will see BAD COMMAND OR PARAMETER. TYPE H FOR HELP in the next row. The correct command must then be sent again.
- The command is executed only after it is validated.
- Command execution can be interrupted by pressing BREAK or CTRL-C. This will result in the display of the DXC-2 prompt, and a new command can be entered. Use the BREAK key (or CTRL-C) to stop the automatic repetition of commands (/R option).
- If an idle disconnect time-out is specified, the DXC-2 will automatically disconnect the ongoing session if no command is received from the terminal for the specified time-out interval.

Index of Commands

Table 4-1 lists the DXC-2 commands in alphabetical order.

Table 4-1 DXC-2 Command Set Index

Command	Purpose	Options
CLR ALM	Clear the alarms stored in the DXC-2 alarm buffer	/A
CLR LOOP L LINK X CLR LP L LINK X CLR LOOP R LINK X CLR LP R LINK X CLR LOOP LINK X CLR LP LINK X	Clear user-initiated loopbacks. X stands for the link number	
DATE	Set the date for the DXC-2 internal clock	
DEF CON	Define the time slot connections and time slot types	
DEF LINK X	Define the link parameters. X stands for the link number	
DEF NAME	Define the logical name of the DXC-2	
DEF NODE	Define the node number of the DXC-2	
DEF PWD	Define new password	
DEF SP	Define supervisory port parameters	
DEF SYS	Define system parameters	
DSP ALM	Display the contents of the alarm buffer and optionally clear the buffer	/C /CA
DSP CON	Show DXC-2 time slot utilization map (current time slots connections and types)	
DSP FDL X	Display the contents of the last ANSI FDL message received on the specified link. X stands for the link number	/R
DSP HDR TST	Display hardware faults (detected during the power-on self-test, and during normal operation)	
DSP PM X	Display the contents of the performance monitoring registers, and optionally clear these registers. X stands for the link number	/C /CA
DSP ST LINK X	Display status information on the selected link (link interface type and function, and link error events counters), and optionally clear the link error events counters. X stands for the link number	/R /C
DSP ST SYS	Display system status information (node name and number, software and hardware versions, and clock source)	
EXIT	End the current control session	
HELP	Displays a concise index of commands and option switches	
INIT DB	Load the default configuration instead of the user configuration. Table 4-3 lists default parameter values	
INIT F	Reset the codes for clear the screen, cursor right, and cursor home to 0	

Command	Purpose	Options
LOOP L LINK X LP L LINK X LOOP R LINK X LP R LINK X	Activate a specified user-controlled loopback. X stands for the link number	
NODE	Send the node address to the DXC-2; followed by the node address itself	
PASSWORD=	Enter the user password at the start of a new session; followed by the password itself	
F	Select the codes for clear the screen, cursor right, and cursor home	
TIME	Set the time of the DXC-2 internal clock	

4.4 DXC-2 Command Set Description

This section describes the DXC-2 commands. The commands are listed in alphabetical order. The description includes command format, use, and options. The following notational conventions are used below:

[ ] square brackets indicate optional entry/parameter

' ' single quotes delimit user entry

<CR> indicates the pressing of the carriage return key

X identifies the link (A or B)

CLR ALM

Purpose

Clear the alarm buffer.

Format

CLR ALM [/A]

Use

1. To clear only alarms of the ON type stored in the alarm buffer (see Table 5-1):

   CLR ALM<CR>

2. To clear all the alarms stored in the alarm buffer (including ON/OFF alarms):

   CLR ALM /A<CR>

3. You will see the time and date, followed by the DXC-2 prompt.

CLR LOOP

Purpose

Deactivate the specified user-initiated loopback.

Format

CLR LOOP [looptype] [link] or CLR LP [looptype] [link]

Use

1. To deactivate a local (L) or a remote (R) loopback on link A, type:

   CLR LOOP L LINK A<CR> or CLR LP L LINK<CR>

   CLR LOOP R LINK A<CR> or CLR LP R LINK<CR>

2. To deactivate a local (L) or remote (R) loopback on link B, type :

   CLR LOOP L LINK B<CR>

   CLR LOOP R LINK B<CR>

3. To deactivate all the user-initiated loopbacks on both links, type :

   CLR LOOP LINK <CR>

4. You will see the time and date, followed by the DXC-2 prompt.

5. If no user-initiated loopback of the specified type is now activated, you will receive ERROR 6.

DATE

Purpose

Set the date for the DXC-2 internal clock.

Format

DATE

Use

1. Type DATE<CR>

2. The DXC-2 sends the date entry form:

   ```
   Date
   Day = 06
   Month  = 02
   Year = 1994
   ```

3. Bring the cursor to the first field to be changed by pressing <CR>.

4. To change the selected field, press F to increase and B to decrease the displayed values. When done, press <CR> to move to the next field.

5. To end, press <CR> after the YEAR field. The DXC-2 will display the TIME and DATE fields (note that DATE has changed), followed by the DXC-2 prompt.

DEF CON

Purpose

Define the connections of the time slots and their types. See *Time Slot Mapping* and *Time Slot Parameters* in Chapter 3 parameter description and allowable ranges, and *Local Configuration Set-Up Procedure* in Chapter 3 for practical selection recommendations.

Format

DEF CON

Use

1. To display the time slot data form, type:

   DEF CON<CR>

2. You will see the first section of the first page of the time slot data form. A typical display is shown below.

```
LINK  A
TS:      01     02    03    04     05     06     07     08    09     10
TYPE:  VOICE  DATA DATA  VOICE  VOICE  DATA   DATA   DATA VOICE  DATA
```

3. The data form includes the following fields:

   - TS lists the time slots of link A in ascending order (10 time slots per display page). For a T1 link, the time slots are identified as 1 through 24 and F, whereas for an E1 link, the time slots are identified as 1 through 31.

   - TYPE displays the current type of each time slot: VOICE or DATA.

4. To change the type of the time slots displayed on this page, use the following procedure:

   - Bring the cursor to the beginning of the desired field in the TYPE row by pressing the space bar.

   - Select between VOICE and DATA by pressing F or B.

5. To change the destination of the time slots displayed on this page, use the following procedure:

   - Press <CR> to display the second part of the first page. This section includes the row listing the time slot numbers (DES.TS). A typical display is shown below:

LINK A										
TS:	01	02	03	04	05	06	07	08	09	10
TYPE:	VOICE	DATA	DATA	VOICE	VOICE	DATA	DATA	DATA	VOICE	DATA
DES.TS:	01	NC	22	10	15	06	18	08	09	11

- Bring the cursor to the beginning of the desired field in the D. TS row by pressing the space bar.
- Select the desired link B time slot number, or NC (not connected) by pressing F or B.

6. To see the next display page, press <CR> and repeat the procedure given above.
7. After updating the last page of the data form, press <CR> to end. The DXC-2 will display the TIME and DATE fields, followed by the DXC-2 prompt.

DEF LINK

Purpose

Assign values to link parameters. The available parameters and their range of values depend on the link type, E1 or T1. See *Link Configuration Parameters* in Chapter 3 for parameter description and allowable ranges, and *Local Configuration Set-Up Procedure* in Chapter 3 for practical selection recommendations.

Format

DEF LINK

Use

1. To define the parameters of link A, type:

   DEF LINK A<CR> or DEF LINK<CR>

   To define the parameters of link B, type:

   DEF LINK B<CR>
2. The first page of the link parameters data form for the selected link is displayed. Typical displays for E1 and T1 links are shown below.
3. Change the parameter values as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections. When the desired selection is displayed, press the space bar to move to the next field.
4. After the desired parameter values are selected, press <CR> to display the second page of the link parameters data form. Change the parameter values as explained above.

5. After the desired parameter values are selected, press <CR> to end. The DXC-2 will display the TIME and DATE fields, followed by the DXC-2 prompt.

E1 Link Data Form

A typical first page of the link parameters data form for an E1 link is shown below. The form presents the current parameter values as defaults.

FRAME	CRC-4	SYNC
G732N	NO	ITU-T

After pressing <CR>, the second page of the link parameters data form is displayed. A typical second page is shown below.

CGA	IDLE_TS_CODE	OOS_SIG	VOICE_OOS	DATA_OOS
NONE	3F	SPACE	00	00

T1 Link Data Form

A typical first page of the link parameters data form for a T1 link is shown below.

FRAME	CODE	MASK	SYNC
ESF	B8ZS	000	FAST

A typical second page of the link parameters data form for a T1 link is shown below.

CGA	IDLE_TS_CODE	OOS_SIG	VOICE_OOS	DATA_OOS
NONE	3F	SPACE	00	00

DEF NAME

Purpose

Define the node name (up to eight alphanumeric characters).

Format

DEF NAME

Use

1. To define the DXC-2 node name, type:

   DEF NAME<CR>

2. The DXC-2 displays the node name entry form:

```
ENTER NODE NAME (MAX 8 CHARACTERS) =
CURRENT NODE NAME = 'name'
```

   where 'name' is the node name the DXC-2 is currently assigned.

3. Type the desired name, and then press <CR>. The DXC-2 will display the TIME and DATE fields, followed by the DXC-2 prompt.

NOTE *Before entering a node name, make sure that section 1, PSWD, of the DXC-2 internal switch SW1 is not set to ON, because in such a case the default name (blank) is enforced.*

DEF NODE

Purpose

Define the node number, or address, of the DXC-2. The allowed range is 0 to 255.

Format

DEF NODE

Use

1. To define the DXC-2 node number, type:

   DEF NODE<CR>

2. The DXC-2 displays the node entry form:

   NODE (0 to 255) = 0

3. Type the desired number in the range of 0 to 255, and then press <CR>. The DXC-2 will display the TIME and DATE fields, followed by the DXC-2 prompt.

NOTE *Before entering a node number, make sure that section 1, PSWD, of the DXC-2 internal switch SW1 is not set to ON, because in such a case the default number (0) is enforced.*

DEF PWD

Purpose

Define a new user password for the DXC-2. The password must have 4 to 8 characters.

Format

PWD

Use

1. Type

   DEF PWD<CR>

2. The password entry screen appears, e.g.:

```
NEW PASSWORD (4 to 8 CHARS) =
CURRENT PASSWORD = 'password'
```

   where 'password' is the current password.

3. Type the required password. Carefully check that the specified password has been indeed typed in, and then press <CR>. The DXC-2 will display the TIME and DATE fields, followed by the DXC-2 prompt.

NOTE

Before entering a new password, make sure that section 1, PSWD, of the DXC-2 internal switch SW1 is not set to ON, because in such a case the default password (RAD) is enforced.

DEF SP

Purpose

Assign values to supervisory port parameters. See *Supervisory Port Configuration Parameters* in Chapter 3 for parameter description and allowable ranges, and *Local Configuration Set-Up Procedure* in Chapter 3 for practical selection recommendations.

Format

DEF SP

Use

1. Type

   DEF SP<CR>

2. The first page of the supervisory port parameters data form is displayed. A typical form is shown below. The form presents the current parameter values as defaults.

SPEED	DATA	PARITY	INTERFACE	CTS	DCD_DEL	DSR
AUTO	7	EVEN	DCE	=RTS	0_MSEC	=DTR

3. Change the parameter values as follows:

   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections.
   - When the desired selection is displayed, press the space bar to move to the next field.

4. When done, press <CR> to display the next page of supervisory port parameters. A typical form is shown below.

POP_ALM	PWD	LOG_OFF
NO	YES	10_min

5. Repeat the procedure given in step 3 above to select new parameter values.

NOTE

In addition to the parameters listed in Supervisory Port Configuration Parameters *in Chapter 3, the following parameters can be programmed only from the terminal:*

PWD	*Password protection: select YES or NO*	
LOG_OFF	*Idle disconnect time:*	
	NO	*automatic session disconnection disabled.*
	10_MIN	*automatic disconnection after ten minutes if no input data is received by the DXC-2.*
CTS	*ON*	*The CTS line is always ON (active).*
	=RTS	*The CTS line follows the RTS line.*
DCD_DELAY	*With DXC-2 supervisory port defined as DTE, indicates delay (in msec) between DCD=ON and the sending of data. Values: 0, 10, 50, 100, 200, 300 msec. If you select a non-zero value when the INTERFACE is programmed as DCE, you receive ERROR 11 (conflict in interface and DCD_DELAY parameters).*	
POP_ALM	*Controls the automatic display of alarms in the terminal:*	
	YES	*The terminal automatically displays every 10 minutes the alarm status (or whenever an alarm changes state to ON)*
	NO	*The automatic display feature is disabled*
DSR	*ON*	*The DSR line is continuously on. It will switch to OFF for five seconds after the DTR line is switched OFF. If you select DSR=ON when INTERFACE=DTE, you will receive ERROR12.*
	DTR	*The DSR line tracks the DTR line. When INTERFACE=DTE, the DSR line will switch to ON for five seconds when the RI line is ON while the DTR line is OFF.*

6. After the desired parameter values are selected, press <CR> to end. The DXC-2 will display the TIME and DATE fields, followed by the DXC-2 prompt.

DEF SYS

Purpose

Assign values to system parameters. See *System Configuration Parameters* in Chapter 3 for parameter description and allowable ranges, and *Local Configuration Set-Up Procedure* in Chapter 3 for practical selection recommendations.

Format

DEF SYS

Use

1. Type

   DEF SYS<CR>

2. The system parameters data form is displayed. A typical form is shown below. The form presents the current parameter values as defaults.

CLK_MASTER	CLK_FBACK	FDL_TRANS	SIG_INVRT_MODE	SIGNAL_MODE
INT	NONE	NO	ON	REGULAR

NOTE *The SIG_INVRT_MODE field is relevant only when the DXC-2 is equipped with different link interfaces.*

3. Change the parameter values as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections.
   - When the desired selection is displayed, press the space bar to move to the next field.
4. After the desired parameter values are selected, press <CR> to end. The DXC-2 will display the TIME and DATE fields, followed by the DXC-2 prompt.

DSP ALM

Purpose

Display the contents of the alarm buffer. This buffer can contain up to 100 alarms.

Format

DSP ALM [Option]

Use

1. To display the complete contents of the buffer, type:

   DSP ALM<CR>

2. To display the complete buffer contents and then clear the type-ON alarms, type:

   DSP ALM /C<CR>

3. To display the complete buffer and then clear all the stored alarms, type:

   DSP ALM /CA<CR>

Display Format

The contents of the alarm buffer are displayed as a table with four columns: the alarm record number, the alarm number and alarm syntax (description), alarm status and time of occurrence. Each block of alarms received from a DXC-2 is preceded by a header. The header lists the assigned node name and the node number of the DXC-2 unit which sent the alarm block, and thus it serves as an easily-identified separator between alarms transmitted by different DXC-2 units.

Table 4-2 lists all the alarm messages that can be displayed by the terminal. L stands for the LNK: identification, A or B.

Table 4-2 Supervision Terminal Alarm Messages

Alarm No.	Alarm Syntax	Meaning	Status	Time
01	SIGNAL LOSS, LNK:X	Loss of input signal on link X	[ON]	hh:mm:ss
02	BPV ERROR, LNK:X	A bipolar violation error has been detected on link X	[ON]	hh:mm:ss
03	DRIVER FAIL, LNK:X	A hardware failure has been detected in the line driver serving link X	[ON] [OFF]	hh:mm:ss
04	FRAME SLIP, LNK:X	A frame slip occurred on link X	[ON]	hh:mm:ss
05	NETWORK LLB, LNK:X	A network-activated line loopback is currently activated on link X (only for T1 links)	[ON] [OFF]	hh:mm:ss
06	NETWORK PLB, LNK:X	A network-activated payload loopback is currently activated on link X (only for T1 links)	[ON] [OFF]	hh:mm:ss
07	EXCESSIVE BPV, LNK:X	The rate of bipolar violation errors on link X is too high (only for T1 links)	[ON] [OFF]	hh:mm:ss
08	REMOTE MF ALARM, LNK:X	The remote unit connected to the other end of link X reports loss of multiframe alignment (only for E1 links)	[ON] [OFF]	hh:mm:ss
09	LOCAL MF ALARM, LNK:X	Local loss of multiframe alignment on link X (only for E1 links)	[ON] [OFF]	hh:mm:ss
10	CRC-4 ERROR, LNK:X	Bit errors have been detected by CRC-4 checking on link X (only for E1 links)	[ON]	hh:mm:ss
11	EXCESSIVE ERR RATIO, LNK:X	Excessive bit error rate (higher than 10-3) on link X (only for E1 links)	[ON] [OFF]	hh:mm:ss
12	AIS OCCURRED, LNK:X	AIS is being detected on link X	[ON] [OFF]	hh:mm:ss
13	AIS RED ALARM, LNK:X	AIS and loss of frame alignment on link X (only for T1 links)	[ON] [OFF]	hh:mm:ss
	AIS SYNC LOSS, LNK:X	AIS and loss of frame alignment on link X (only for E1 links)	[ON] [OFF]	hh:mm:ss

Alarm No.	Alarm Syntax	Meaning	Status	Time
14	RED ALARM, LNK:X	Local loss of frame alignment on link X (only for T1 links)	[ON] [OFF]	hh:mm:ss
	LOCAL SYNC LOSS, LNK:X	Local loss of frame alignment on link X (only for E1 links)	[ON] [OFF]	hh:mm:ss
15	DB CHECKSUM ERROR	The data base currently stored in the non-volatile memory of DXC-2 is corrupted. Message can appear only upon power-up	[ON]	hh:mm:ss
16	Reserved for future use			
17	ALARM BUFFER OVERFLOW	The DXC-2 alarm buffer is full, and new alarms overwrite the older alarms	[ON] [OFF]	hh:mm:ss
18	CLOCK WAS CHANGED TO FALLBACK	The main clock source of the DXC-2 failed, and the DXC-2 switched to the clock source selected as fallback	[ON]	hh:mm:ss
19	CLOCK WAS CHANGED TO INTERNAL	The current clock source of the DXC-2 failed, and the DXC-2 switched to the internal oscillator	[ON]	hh:mm:ss
20	SELF TEST ERROR	A fault has been detected during the power-up self-test	[ON]	hh:mm:ss
21	HARDWARE FAILURE	A hardware fault has been detected	[ON]	hh:mm:ss
22	Reserved for future use			
23	Reserved for future use			
24	PSWRD SWITCH IS ON	Section 1, PSWD, of switch SW1 is set to ON	[ON]	hh:mm:ss
25	SP-PAR SWITCH IS ON	Section 2,SP-PAR, of switch SW1 is set to ON	[ON]	hh:mm:ss
26	DB-INIT SWITCH IS ON	Section 1,DBI, of switch SW1 is set to ON	[ON]	hh:mm:ss
27	REAL TIME CLOCK BATTERY FAILURE	The battery powering the DXC-2 internal real-time clock while DXC-2 is not powered has failed	[ON]	hh:mm:ss
28	YELLOW ALARM, LNK:X	The remote unit connected to the other end of link X reports loss of frame alignment (only for T1 links)	[ON] [OFF]	hh:mm:ss
	REMOTE SYNC LOSS, LNK:X	The remote unit connected to the other end of link X reports loss of frame alignment (only for E1 links)	[ON] [OFF]	hh:mm:ss

DSP CON

Purpose

Display the connections of the time slots and their types. See *Time Slot Mapping* and *Time Slot Parameters* in Chapter 3 for parameter description and allowable ranges.

Format

DSP CON

Use

1. To display the time slot data form, type:

   DSP CON<CR>

2. You will see the first page of the time slot data form. A typical display is shown below.

```
TIME SLOT MAPPING OF LINK A

TS:     01      02      03      04      05      06      07      08      09      10
TYPE: VOICE DATA DATA VOICE VOICE DATA DATA DATA VOICE DATA
DES.TS:01     NC     22      10      15      06      18      08      09      11
```

3. The data form includes the following fields:

   - TS lists the time slots of link A in ascending order (10 time slots per display page). For a T1 link, the time slots are identified as 1 through 24 and F, whereas for an E1 link, the time slots are identified as 1 through 31.
   - TYPE displays the current type of each time slot: VOICE or DATA.
   - DES.TS displays the current destination time slot (on link B).

4. After viewing the first page, press <CR> to display the next page.
5. After pressing <CR> on the last page, the DXC-2 displays the TIME and DATE fields, followed by the DXC-2 prompt.

DSP FDL

Purpose

Display the contents of the last FDL message received by the DXC-2 via the selected link. This option is available on T1 links with ESF framing.

Format

DSP FDL X [Option]

Use

1. To see the last FDL message received on link A, type:

   DSP FDL A<CR>orDSP FDL<CR>

   To monitor continuously the FDL messages received on link A, type:

   DSP FDL A /R<CR>orDSP FDL /R<CR>

   Each new message received on link A will then be automatically displayed. To stop the monitoring, press the BREAK key (or CTRL+C).

2. To see the last FDL message received on link B, type:

   DSP FDL B<CR>

   To monitor continuously the FDL messages received on link B, type:

   DSP FDL B /R<CR>

   Each new message received on link B will then be automatically displayed. To stop the monitoring, press the BREAK key (or CTRL+C).

3. If the current framing mode is SF (D4) or if the link type is E1, you will receive ERROR 15 (illegal command for current link mode).

Display Format

A typical FDL message display is shown below:

SAPI	=14	C/R=[0],[1]	EA = [0],[1]	
TEI	= 00		EA = [0],[1]	
CONTROL	=HH			
REPORT	=HH HH HH HH HH HH HH HH			
INTERPRETATION	T	T-1	T-2	T-3
CRC ERR	=1	1<N≤5	10<N≤100	N≥320
SE EVENT	=N1	0	0	0
FE EVENT	=0	N≥1	0	0
LV EVENT	=0	0	N≥0	0
SL EVENT	=N1	0	0	0
LOOPBACK	=YES	NO	NO	NO
RESERVED	=00	00	00	00

COUNTER	=00	01	10	11
FCS	=GOOD			
T	=hh:mm:ss			

The fields included in the message are listed below line by line, from top to bottom:

SAPI	Service Access Point Identifier
C/R	Command/Response: C/R = 1 Command C/R = 0 Response
EA	Extended address
TEI	Terminal Endpoint Identifier
CONTROL	Two bytes (00 through FF)
REPORT	Eight bytes that carry the message contents (see interpretation below)
FCS	Two bytes, carry the Frame Check Sequence of the message
INTERPRETATION T, T-1, T-2, T-3:	Interpretation of current message contents (T) and of the three previous messages
CRC ERR	Number of CRC errors, specified in seven ranges: none, 1, 1-5, 5-10, 10-100, 100-319, and 320 or more
SE EVENT	Severely-errored framing event (0, 1 or more)
FE EVENT	Frame synchronization bit error event (0, 1 or more)
LV EVENT	Line code violation event (0, 1 or more)
SL EVENT	Controlled slip event (0, 1 or more)
LOOPBACK	Loopback on information bits (YES or NO)
COUNTER	One-second report module-4 counter
FCS	Indicates whether the message FCS is GOOD or NOT (in the latter case, the message probably contains an error)
T	Message time stamp, i.e., the time the message has been received at the supervision terminal (hours: minutes: seconds)

DSP HDR TST

Purpose

Display the results of the last hardware test (made during power-on self-test and during regular operation).

Format

DSP HDR TST

Use

1. Type

   DSP HDR TST<CR>

   to display the hardware test report.

Display Format

The display has one field that shows NO ERROR if everything checks good, or lists the detected problem:

- DATABASE 1 CHKSUM ERROR
- I/O EXPANDER ERROR
- COUNTER ERROR

DSP PM

Purpose

Display the contents of the performance monitoring registers specified by AT&T Pub. 54016. This option is available on T1 links with ESF framing, or on E1 links with the CRC-4 function enabled.

For an explanation of the performance monitoring registers, refer to *Performance Diagnostics Data* in Chapter 5.

Format

DSP PM X [Option]

Use

1. To display the performance monitoring registers of link A, type:

   DSP PM A<CR> or DSP PM<CR>

   To display the performance monitoring registers of link A, and clear only the event register of link A, type:

   DSP PM A /C<CR>

To display the performance monitoring registers of link A, clear all the performance monitoring registers of link A, and restart the count intervals, type

DSP PM A /CA<CR>

2. To display the performance monitoring registers of link B, type:

   DSP PM B<CR> or DSP PM<CR>

   To display the performance monitoring registers of link B, and clear only the event register of link B, type:

   DSP PM B /C<CR>

   To display the performance monitoring registers of link B, clear all the performance monitoring registers of link B, and restart the count intervals, type

   DSP PM B /CA<CR>

3. In case the current framing mode is SF (D4) or if the information is requested for an E1 link with the CRC-4 function disabled, you will receive ERROR 13 (illegal command for current link mode).

Display Format

The performance monitoring registers displayed for a T1 link with ESF framing are listed in the following order:

```
ESF ERROR EVENTS      =     [0] ..... [65535]
CURRENT ES            =     [0] ..... [900]
CURRENT UAS           =     [0] ..... [900]
CURRENT SES           =     [0] ..... [900]
CURRENT BES           =     [0] ..... [900]
CURRENT LOFC          =     [0] ..... [255]
CURRENT CSS           =     [0] ..... [255]
CURRENT TIMER         =     [0] ..... [900]

INTERVAL mm ES=nnn UAS=nnn BES=nnn SES=nnn LOFC=nnn CS=nnn

24 HOUR ES            =     [0] ..... [65535]
24 HOUR UAS           =     [0] ..... [65535]
24 HOUR SES           =     [0] ..... [65535]
24 HOUR BES           =     [0] ..... [65535]
24 HOUR LOFC          =     [0] ..... [255]
24 HOUR CSS           =     [0] ..... [255]
LAST 24 DEGRADE MIN   =     [0] ..... [1440]
24 HOUR INTERVAL      =     [0] ..... [96]
```

The numbers in brackets indicate the range of values for each register.

In case the link is an E1 link with CRC-4 enabled, the performance monitoring registers are displayed in a similar format, except the ESF ERROR EVENTS line is replaced with the following two lines:

CRC ERROR EVENTS = [0] ..... [1000]

CRC AVG ERR EVENTS = [0] ..... [1000]

DSP ST LINK

Purpose

Display status information on a selected link, and optionally clear the event registers.

The information displayed depends on the link type, E1 or T1.

Format

DSP ST LINK X [Option]

Use

1. To display the current status information for link A, type:

   DSP ST LINK A<CR> or DSP ST LINK<CR>

   To display status information for link A, and then clear all the event registers of link A, type

   DSP ST LINK A /C<CR> or DSP ST LINK /C<CR>

   To monitor continuously the status information of link A, type:

   DSP ST LINK A /R<CR> or DSP ST LINK /R<CR>

   The display will be automatically updated. To stop the monitoring, press BREAK (or CTRL+C).

2. To display status information for link B, type:

   DSP ST LINK B<CR> or DSP ST LINK<CR>

   To display status information for link B, and then clear all the event registers of link B, type

   DSP ST LINKB /C<CR>

   To monitor continuously the status information of link B, type:

   DSPST LINK B /R<CR>

   The display will be automatically updated. To stop the monitoring, press BREAK (or CTRL+C).

Display Format

A typical link status display for an E1 link is shown below. X stands for the link identification, A or B.

```
STATUS OF LINK X
TYPE              = E1
FUNCTION          = LTU
ALARM             = L.SYNC LOSS     R.SYNC LOSS
                    NO              NO
LOOPS             = LOCAL           REMOTE
                    NO              NO
OOS COUNT         = 0
BPV LAST MINUT    = 0
BPV WORST MINUT= 1
```

A typical link status display for a T1 link is shown below.

```
STATUS OF LINK X
TYPE              = T1
FUNCTION          = CSU
ALARM             = RED             YELLOW
                    NO              NO
LOOPS             = LOCAL           REMOTE    PLB       LLB
                    NO              NO        NO        NO
OOS COUNT         = 0
BPV LAST MINUT    = 0
BPV WORST MINUT= 1
```

The fields included in the status information display are listed below:

TYPE	Displays the type of the selected link, E1 or T1
FUNCTION	Displays the type of interface hardware installed the selected link: LTU or DSU for an E1 link; CSU or DSU for a T1 link
ALARM	Indicates the status of the link alarms. The listed alarms depend on the link type
OOS COUNT	Displays the number of red alarm (respectively loss of frame alignment) events detected since the last time the counters were cleared
BPV LAST MINUT	Displays the number of BPV events detected in the worst minute
BPV WORST MINUT	Displays the number of BPV events detected during the worst minute since the last time the counters were cleared

NOTE *BPV counts are available only when operating on an E1 link with CRC-4 disabled, or on a T1 link with SF (D4) framing.*

DSP ST SYS

Purpose

Display system status information, and optionally clear the status registers.

Format

DSP ST SYS[option]

Use

To view the current system status, type:

DSP ST SYS <CR>

Display Format

A typical status information display is shown below.

```
NODE          = 0
NAME          = 'DXC-2 name'
NODAL CLOCK   = INT
SOFTWARE REV  = X.Y
HARDWARE REV  = X.Y
```

The system status fields are described below (from top to bottom)

NODE	The node number of the DXC-2
NAME	The node name of the DXC-2
NODAL CLOCK	Indicates the source for the DXC-2 clock: INT, LNKA, LNKB (see *System Configuration Parameters* in Chapter 3).
SOFTWARE REV	DXC-2 software version
HARDWARE REV	DXC-2 hardware version

EXIT

Purpose

End the current session and return control to the DXC-2 front panel.

Format

EXIT

Use

Type:
EXIT<CR>

F

Purpose

Define the codes used to be sent to the supervision terminal to perform the following terminal control functions:

- Clear screen
- Move cursor to screen home position
- Move cursor to the right by one position.

The codes used by typical terminals are listed in the following chart:

Function	Terminal Type				
	TV920	VT52	VT100	Freedom 100/110	Freedom 220
Clear Screen	1B2A0000	N/A	1B5B324A	1B2A0000	1B5B324A
Cursor Home	1E000000	1B480000	1B5B4800	1E000000	1B5B4800
Cursor Right	0C000000	1B430000	1B5B3143	0C000000	1B5B0143

Format

F

Use

1. To display the current codes, type:

   F<CR>

2. The terminal function entry screen is displayed. The screen includes three separate lines, displayed one after the other. A typical screen, showing all the three lines, is shown below:

   ```
   CLEAR SCREEN=hhhhhhhh (clear screen code)
   CURSOR HOME=hhhhhhhh (cursor home code)
   CURSOR RIGHT=hhhhhhhh (cursor right code)
   ```

   where h indicates hexadecimal digits.

3. To change a code, bring the cursor under the first digit of the code to be changed, by pressing <CR>, then enter the appropriate hexadecimal digit.

4. Repeat the procedure until all the necessary digits are changed.

HELP

Purpose

Display an index of the supervisory port commands and the options available for each command.

Format & Use

H<CR>

You will see the first HELP page. Press any key to see the next page.

INIT DB

Purpose

Load a specified set of default parameters values instead of the user configuration (Table 4-3).

Format

INIT DB

Use

1. Type INIT DB<CR>
2. The DXC-2 will display the TIME and DATE fields followed by the DXC-2 prompt.

Table 4-3 DXC-2 Default Configuration Used with Supervision Terminal

Parameter Type	Parameter Designation	Default Value
General	PASSWORD	RAD
	NODE (node number)	0
	CLEAR SCREEN	0
	CURSOR HOME	0
	CURSOR RIGHT	0
System	CLK_MASTER	INT
	CLK_FBACK	NONE
	TRANS_FDL	NO
	SIG_INVERT	ON
E1 Link	FRAME	G732N
	SYNC	ITU-T
	CRC-4	NO
	OOS SIGNAL	N/A
	VOICE OOS	00
	DATA OOS	00
	CGA	NONE
	IDLE_TS_CODE	3F

Parameter Type	Parameter Designation	Default Value
T1 Link	FRAME	ESF
	SYNC	FAST
	OOS SIGNAL	SPACE
	VOICE OOS	00
	DATA OOS	00
	CGA	NONE
	IDLE_TS_CODE	3F
	CODE	B8ZS
	MASK	000
Time Slot Mapping	All the time slots	NC
Time Slot Type	All the time slots	DATA
SP (Supervisory Port)	SPEED	AUTO
	DATA	8
	PARITY	NONE
	INTERFACE	DCE
	PWD	NO
	LOG_OFF	NO
	CTS	=RTS
	DSR	ON
	DCD_DELAY	O_MSEC
	POP_ALM	NO

INIT F

Purpose

Resets the codes used to clear the terminal screen, to move the cursor to the right, and to return the cursor to the home position to 0.

Format & Use

INIT F<CR>

LOOP

Purpose

Activate a user-controlled loopback (see *Performance Diagnostics Data* in Chapter 5 for loopback description).

Format

LOOP [looptype] [link] or LP [looptype] [link]

Use

1. To activate a local (L) or remote (R) loopback on link A, type:

   LOOP L LINK A<CR> or LP L LINK<CR>

   LOOP R LINK A<CR> or LP R LINK<CR>

2. To activate a local (L) or remote (R) loopback on link B, type :

   LOOP L LINK B<CR>

   LOOP R LINK B<CR>

3. You will see the time and date, followed by the DXC-2 prompt.

At any time, you can activate only one loopback. If you try to activate a second loopback of the same type, you will see ERROR 03 (illegal link loop combination). You must deactivate the other loopback before you can activate the new one.

NODE

Purpose

Select one DXC-2 for establishing a control session.

Format

NODE 'node number'

Use

1. To connect to the desired DXC-2, type:

   NODE 'node number'<CR>

   where 'node number' is the three-digit node number, in the range of 1 through 255.

2. When the addressed DXC-2 is on-line, it will echo the complete NODE<SP>nnn<SP> string. After you see the echo, type the desired command.

PASSWORD

Purpose

Enter the password when prompted to type the password upon the start of a control session.

Format

PWD<SP>'password'

Use

1. When you see the prompt PASSWORD>type:

   'password'<CR>

   where 'password' is the string of four to eight alphanumeric characters that has been defined by the user (or the default, RAD, as appropriate).

2. The DXC-2 sends the current time and date, and then the prompt DXC2> is displayed on the next line.

TIME

Purpose

Set the time for the DXC-2 internal clock.

Format

TIME

Use

1. Type

   TIME<CR>

2. The DXC-2 sends the time entry form:

   ```
   Time
   Hour = 12
   Minute = 25
   Second = 16
   ```

3. Bring the cursor to the first field to be changed by pressing <CR>.

4. Set the time about one minute beyond the current time, and then press <CR> at the correct instant. The DXC-2 will display the TIME and DATE fields (note that TIME has changed), followed by the DXC-2 prompt.

4.5 Supervision Terminal Operating Instructions

Before using the supervision terminal, make sure the preparations listed in *Preparation For Use Of Supervision Terminal* on page 4-4 were completed and all the relevant equipment has been turned on.

Starting a Session - Single DXC-2

When the terminal is used to control a single DXC-2, always assign node address 0 to the DXC-2. Use the following start-up sequence to connect to a DXC-2 that has been assigned node number 0.

1. If you use the AUTO (Autobaud) mode, press the <CR> key three times. This allows the DXC-2 to identify the terminal data rate.

2. Assuming that the DXC-2 successfully identified the data rate of the supervision terminal, you will be notified if the DXC-2 failed the power-up self-test:

   - If you see DXC-2 SELFTEST FAILED, the DXC-2 must be repaired before you can continue using it.

   - If DXC-2 successfully passed the power-up self-test (DXC-2 SELFTEST OK) , it is ready for use.

3. By now, the DXC-2 prompt should already be displayed on the terminal screen, after the ON-LINE announcement. If you see

   PASSWORD>

   this indicates that password protection is enabled. In this case, type the password:

   'password'<CR>

   where 'password' stands for the current password (four to eight characters). For each password character typed by you, the terminal displays an asterisk *. Type the default password, RAD, after turning the power ON, and verifying that SW1 Section 1 is in the ON position. If your password is accepted, you will see the prompt DXC2>.

4. The DXC-2 is now in session, under your control:

   - On your terminal, you will see the prompt:

     DXC2>

   - On the DXC-2 front panel, you will see the message:

TERMINAL ON LINE

   The front panel controls are disabled as long as the DXC-2 is under remote control.

NOTE

While the supervision terminal is in session with the DXC-2, the DXC-2 local operator can regain control by disconnecting the cable from the DXC-2 SP connector, or by sending the EXIT command from the supervision terminal. The DXC-2 will automatically return to front panel control if no commands are received for a certain period of time (controlled by the LOG_OFF parameter). This time-out can however be disabled.

Starting a Session - Multiple DXC-2

When one terminal is used to control several DXC-2 connected via modems, non-zero node addresses are assigned to each DXC-2. The node addresses, in the range of 1 through 255 are assigned during the first session, by means of the command DEF NODE. Use the following procedure to establish a session with a specific DXC-2.

IMPORTANT

If you are using a multidrop configuration, do not assign address 0 to any of the DXC-2 connected to a given terminal. Make sure the interface type is set as DTE, and select the appropriate DCD_DEL parameter.

1. Press the <CR> key three times.
2. Type NODE, space, the desired DXC-2 node address and another space, and then type the desired command and press <CR>. For example, with node address 234, type:

   NODE<SP>234<SP> 'command' <CR>

3. If the addressed DXC-2 does not use password protection, it will immediately execute the command.

4. If the addressed DXC-2 is password protected, you will see the prompt:

   PASSWORD>

   Type again the node address and then the password. For example, for node address 234, type :

   NODE<SP>234<SP>'password'<CR>

5. If the password is correct, the DXC-2 will execute the command. Otherwise, you will see ENTER PASSWORD>.

Control Session

1. During the control session, type the desired commands at the terminal keyboard. You must see the DXC-2 echo character by character. If a bad command appears, backspace to clear the error, and then type again the correct character.

- When you see the correct and complete command in the echo line, press <CR> to execute the command. The DXC-2 will process the command and display the appropriate response. At the end of the command execution, the DXC-2 displays the current time and date, and then provides a new prompt for the next command line.
- If you changed your mind, and want to abort the command, press BREAK or CTRL-C. You will again receive the prompt, so you can enter another command.

NOTE

You can also use BREAK or CTRL+C to stop automatic repetition of commands sent with the /R option.

2. If your command is not correct, the DXC-2 will not execute it, but will echo again the command, with a bad command message in the following line. Type again the correct command.
3. If the terminal screen fills up during the exchange with the DXC-2, you will see the message: HIT ANY KEY TO CONTINUE

After pressing any key except BREAK, the terminal scrolls to the next page.

Ending a Control Session

1. To end the control session, type: EXIT
2. The DXC-2 prompt will disappear. Now you can control the DXC-2 from its front panel.

NOTE

A control session may also be terminated by the DXC-2 if the idle disconnect time-out is enabled, or when the DTR line switches to the inactive (OFF) state.

4.6 Configuration Error Messages

The DXC-2 provides configuration error messages for the supervision terminal user. The configuration messages have the format ERROR, followed by a two-digit code. The DXC-2 will display a short description of the error message after the ERROR code. The error messages are explained below.

ERROR 01 `MASTER AND FALLBACK CLOCKS ARE SAME`

You are trying to select the same source as both master and fallback clock source. Check and change as required.

ERROR 02 `CONFLICT IN TS MAPPING`

Conflict in time slot mapping: you are trying to connect an already connected time slot to an additional time slot. Check and change as required.

ERROR 03 `ILLEGAL LINK LOOP COMBINATION`

Illegal combination of link loopbacks: you are trying to activate simultaneously local and remote loopbacks on the same link, or a network-activated loopback may already be activated. Only one loopback can be connected at a time.

ERROR 04 `ILLEGAL LINK LOOP COMBINATION INVOLVING LINK REMOTE LOOP`

Illegal combination of link loopbacks that involves a remote link loopback. Check and change as required.

ERROR 05 `ILLEGAL LINK LOOP COMBINATION INVOLVING LINK LOCAL LOOP`

Illegal combination of link loopbacks that involves a local link loopback. Check and change as required.

ERROR 06 `LOOP IS NOT ACTIVE`

You are trying to deactivate a loopback which is not active. Check and change as required.

ERROR 08 `ILLEGAL TS MAPPING`

Illegal time slot mapping.

ERROR 09 `CONFLICT IN TS TYPE AND LINK FRAME`

Conflict in time slot type and link framing mode: the VOICE type can be selected on an E1 link only when the framing mode is G732S. Check and change as required.

ERROR 10 `TS 16 IS MAPPED IN G732S FRAME TYPE`

You are trying to connect a time slot to time slot 16 of an E1 link operating with G732S framing. This is not allowed.

ERROR 11 `CONFLICT IN DCD_DEL AND INTERFACE COMBINATION`

You are trying to select a non-zero DCD DELAY after the DXC-2 supervisory port interface has been set as DCE.

ERROR 12 `CONFLICT IN INTERFACE AND DSR PARAMETERS`

You selected DSR=ON after the supervisory port interface has been set to DTE.

ERROR 13 `ILLEGAL COMMAND FOR CURRENT LINK MODE`

You are trying to select a parameter value which is not supported under the current link framing mode. Check and change as required.

ERROR 51 `CONFLICT IN TS TYPE AND G802 MODE`

Conflict between the time slot type and the G.802 mode: you are trying to route the F-bit to a time slot defined as a voice time slot. This is not allowed.

Chapter 5

Diagnostics

This chapter provides diagnostics for the DXC-2. The information presented in this chapter includes:

- A list of status messages and corrective actions for them
- A description of the performance evaluation and monitoring functions provided for T1 links
- A description of the test functions supported by the DXC-2
- A description of the Power-Up Self-Test
- Instructions for troubleshooting the DXC-2.

5.1 Status Indications and Messages

Indicators

DXC-2 status is indicated by the LOS L and R alarm indicators of its two links. Indicator functions are listed in Table 3-1.

Display

The DXC-2 maintains an alarm buffer that can store one alarm event of each type. A maximum of 100 alarms can be displayed on the supervision terminal.

The DXC-2 operator can view the contents of the alarm buffer on the front panel LCD display. The event alarms can be deleted from the buffer when no longer needed. This procedure is explained in *Operating Instructions* in Chapter 3.

Table 5-1 lists the possible alarm messages displayed on the front panel display in alphabetical order. In addition, it lists the actions required to correct the alarm condition (the messages displayed on the supervision terminal have a similar syntax). In these messages, L identifies the link, A or B.

To correct the problem, perform the corrective actions in the given order. If the problem persists, have the DXC-2 checked by the technical support personnel.

Table 5-1 DXC-2 Alarm Buffer Messages

Message	Description	Corrective Actions	Alarm Type
ALARM BUFFER OVERFLOW	More than 100 alarms entries have been written in the alarm buffer since the last clear command	Read the messages. If you are using the front panel, delete all the event alarms by selecting CLEAR. From the supervision terminal, send the CLR ALM command	ON/OFF
AIS OCCURRED: L	Unframed all ones sequence is received in the link data stream	The source of the problem can is located at the remote equipment	ON/OFF
AIS RED ALM: L	Local loss of frame synchronization alarm on the specified link caused by AIS condition (only on T1 links)	The source of the problem can is located at the remote equipment	ON/OFF
AIS SYNC LOSS: L	Local loss of frame synchronization alarm on the specified link caused by AIS condition (only on E1 links)	The source of the problem can is located at the remote equipment	ON/OFF
BPV ERROR: L	Bipolar violations in the link receive signal. Updated once per second	Check the link	ON
CRC-4 ERROR: L	CRC-4 errors detected in the E1 link receive signal. Updated once per second	Check the E1 link	ON
DATABASE CKS ERR	DXC-2 technical failure (internal data base error)	1. Load the default configuration in the place of the current data base (enter the INIT DB command from the supervision terminal) 2. Replace the DXC-2	ON/OFF
DB-INIT SW IS ON	Section 3, DBI, of switch SW1 is set to ON	If it is no longer necessary to enforce the default data base parameter values, change setting to OFF	ON
DRIVER FAILURE: L	DXC-2 technical failure (link line driver)	1. Check the transmit line pair 2. Replace the DXC-2	ON/OFF
EXCESSIVE BPV: L	The rate of bipolar violations in the link receive signal exceeds $1x10^{-6}$ during a measurement interval of 1000 seconds	Problem in network facilities	ON/OFF
EXC ERR RAT: L	The bit error rate of the link receive signal exceeds $1x10^{-3}$	Problem in network facilities	ON/OFF

Message	Description	Corrective Actions	Alarm Type
FALLBACK CLK USE	The DXC-2 switched to the fallback clock source, because the master clock source failed	Check the link providing the master clock source. The DXC-2 replaces a recovered link clock when the corresponding link loses frame synchronization or its input signal is missing	ON/OFF
FRAME SLIP: L	Frame slips are detected (not displayed during local loss of frame synchronization). Updated once per second	1. Incorrect selection of clock source 2. Problem at far end (unstable clock source) 3. Replace the DXC-2 only if no problem has been detected in steps 1 and 2	ON
HARDWARE FAILURE	DXC-2 technical failure (one of the internal programmable components)	Replace the DXC-2	ON/OFF
INTERNAL CLK USE	The DXC-2 switched to the internal clock source, because both the master and the fallback clock sources failed	Check the link providing the clock source. The DXC-2 replaces a recovered link clock when the corresponding link loses frame synchronization or its input signal is missing	ON/OFF
L MF LOSS: L	Local loss of multiframe synchronization alarm on the specified link (only on E1 links operating with G732S framing)	1. Check cable connections to the link connector. 2. Check line and/or other communication equipment providing the link to the remote DXC-2. Replace the DXC-2	ON/OFF
L SYNC LOSS: L	Local loss of frame synchronization alarm on the specified link (only on E1 links)	3. Check cable connections to the link connector. 4. Check line and/or other communication equipment providing the link to the remote DXC-2. Replace the DXC-2	ON/OFF
NETWORK LLB: L	Line loopback command received from the network (only for T1 links)	Wait until the loopback condition is removed	ON/OFF
NETWORK PLB: L	Payload loopback command received from the network (only for T1 links)	Wait until the loopback condition is removed	ON/OFF
PSWRD SW IS ON	Section 1, PSWD, of switch SW1 is set to ON	If it is no longer necessary to enforce the default password and node number, change setting to OFF	ON

Message	Description	Corrective Actions	Alarm Type
R MF LOSS: L	Remote loss of multiframe synchronization alarm on the specified link (only on E1 links with G732S framing)	Problem at the remote equipment	ON/OFF
R SYNC LOSS: L	Remote loss of frame synchronization alarm on the specified link (only on E1 links)	Problem at the remote equipment	ON/OFF
RED ALARM: L	Local loss of frame synchronization alarm on the specified link (only on T1 links)	1. Check cable connections to the link connector. 2. Check line and/or other communication equipment providing the link to the remote DXC-2. Replace the DXC-2	ON/OFF
RTC BATTERY FAIL	The battery powering the DXC-2 internal real-time clock while DXC-2 is not powered has failed	Have the DXC-2 repaired	ON
SELF TEST ERROR	A problem has been detected during DXC-2 self-test		ON
SIGNAL LOSS: L	Loss of link receive signal	1. Check cable connections to the link connector. 2. Check line and/or other communication equipment providing the link to the remote DXC-2	ON/OFF
SP-PAR SW IS ON	Section 2, SP-PAR, of switch SW1 is set to ON	If it is no longer necessary to enforce the default supervisory port parameters, change setting to OFF	ON
YELLOW ALARM: L	Remote loss of frame synchro-nization alarm on the specified link (only on T1 links)	Problem at the remote equipment	ON/OFF

5.2 Performance Diagnostics Data

Performance Evaluation for T1 Links

This section describes the performance evaluation and monitoring functions provided by the DXC-2 for T1 links. The functions actually available depend on the framing in use, ESF or SF (D4):

- **ESF Framing**: when ESF framing is used, it is possible to monitor end-to-end data transmission performance. With this type of framing (see *Operating Environment* in Chapter 1), the data stream transmitted end-to-end includes supervision and error detection information. The error detection information is derived from the data payload included in each extended super-frame, by performing a cyclic redundancy check (CRC). The resulting CRC checksum is transmitted in addition to the raw data bits. The receiving end recalculates the checksum and compares the results with the received checksum: any difference between the two checksums indicates that one or more bit errors are contained in the current data block (ESF) being evaluated.
- **SF Framing**: the SF-framed signal does not support the capabilities listed above. However, the DXC-2 is capable of gathering the number of out-of-service (OOS) events caused by red alarms when operating with SF (D4) framing, and the number of bipolar violations measured during the last minute.

ANSI T1.403-1989 ESF Statistics

When using ESF framing, the DXC-2 stores T1 line statistics in compliance with the ANSI T1.403-1989 requirements. The statistic data is gathered once per second. The statistics are collected over the last four seconds, and then transmitted via the 4 kbps control and supervision data link (FDL) of the ESF frames. This permits real-time monitoring of data transmission performance. The performance parameters defined for AT&T Pub. 54016 statistics are listed below:

- **Current ESF error events (ERROR EV)**
  An ESF error event is any extended super-frame containing a CRC error and/or OOF event. The number of events is collected in a current ESF error events register.

  NOTE *Register contents can be displayed at any time. When the ESF error events are displayed on the front-panel LCD, the register can be reset by pressing ENTER.*

- **Current seconds (SECS)**
  The number of seconds in the current measurement interval. A measurement interval has 900 seconds (15 minutes).
- **Current errored seconds (ES)**
  An errored second is any second containing one or more CRC error events, or one or more OOF events, or one or more controlled slip events. The data is collected for the current 15-minute interval.

- **Current unavailable seconds (UAS)**
  An unavailable second is any second in which a failed signal state exists. A failed signal state is declared when 10 consecutive severely errored seconds (SES) occur, and is cleared after 10 consecutive seconds of data are processed without a SES.

- **Current severely errored seconds (SES)**
  A SES is a second with 320 or more CRC error events, or one or more OOF events. The data is collected for the current 15-minute interval.

- **Current bursty errored seconds (BES)**
  A BES is a second with 2 to 319 CRC error events. The data is collected for the current 15-minute interval.

- **Current loss of frame counter (LOFC)**
  The loss of frame (LOF) counter counts the loss of frame alignment events. The data is collected for the current 15-minute interval.

- **Current slip second counter (CSS)**
  A CSS is a second with one or more controlled slip events. The data is collected for the current 15-minute interval.

DXC-2 also provides local statistics support that meets the requirements of AT&T Pub. 54016. These are long-term statistics gathered over the long-term interval (96 15-minute intervals, i.e., a total of 24 hours). The additional parameters included in this class are:

- **Long-term errored seconds (ES)**
  The total number of ES in the current 24-hour interval.

- **Long-term fail seconds (UAS)**
  The total number of UAS in the current 24-hour interval.

- **Long-term severely errored seconds (SES)**
  The total number of SES in the current 24-hour interval.

- **Long-term loss of frame counter (LOFC)**
  The total number of LOF events in the current 24-hour interval.

- **Long-term slip second counter (CSS)**
  The total number of CSS in the current 24-hour interval.

- **Long-term (BES)**
  The total number of BES in the current 24-hour interval.

- **Long-term interval**
  The number of valid 15-minute intervals in the previous 24 hour period.

- **Current degraded minutes**
  The total number of degraded minutes in the current 24-hour interval. A degraded minute is a minute in which the bit error rate (BER) exceeded $1x10^{-6}$. This number is updated every minute.

- **Last degraded minutes**
  The total number of degraded minutes in the last 24-hour interval. This number is updated every 24 hours.

SF Statistics

The performance evaluation and monitoring parameters collected by the DXC-2 for SF framing are listed below:

- **Bipolar violations (BPV) count (BPV last minute)**
  The total number of bipolar violations counted in the last minute. This number is updated every minute.

- **Bipolar violations worst count**
  The number of bipolar violations counted in the worst minute since the last resetting of the BPV count. This number is updated every minute.

Performance Evaluation for E1 Links

This section describes the performance evaluation and monitoring functions provided by the DXC-2 for E1 links. The functions actually available depend on the use of the CRC-4 option.

CRC-4 Enabled

With the CRC-4 option enabled, the DXC-2 provided performance data essentially similar to that available on T1 links with ESF framing. The difference is that the error events count is no longer applicable, and instead the following two parameters are provided:

- **Current CRC-4 error events (ERROR CRC)**
  A CRC-4 error event is any multiframe containing a CRC error and/or OOF event. The number of CRC events in the current second is collected in a current CRC error events register.

- **Current average CRC-4 errors (AVG ERR CRC)**
  The average number of CRC events per second. The average is updated every second.

CRC-4 Disabled

With the CRC-4 option disabled, the DXC-2 provided performance data similar to that available on T1 links with SF framing, i.e., BPV last minute and BPV worst minute data.

Summary of Performance Monitoring from the Front Panel

A summary of the performance diagnostics data displayed on the DXC-2 front panel, under DIAGNOSTICS, is given in Table 5-2. The DXC-2 allows the user to reset the performance diagnostics by pressing the ENTER button.

Table 5-2 Summary of Performance Monitoring from the Front Panel

Display	Description	Range
CURR ES	Number of ES measured during the current 15-minute interval. The display is updated every second	0 - 900
CURR UAS	Number of UAS measured during the current 15-minute interval. The display is updated every second	0 - 900
CURR SECS	The time in seconds that expired from the start of the current 15-minute interval. The display is updated every second	0 - 900
CURR SES	Number of SES measured during the current 15-minute interval. The display is updated every second	0 - 900
CURR BES	Number of BES measured during the current 15-minute interval. The display is updated every second	0 - 900
CURR LOFC	Number of loss of frame synchronization events measured during the current 15-minute interval. The display is updated every second	0 - 255
CURR CSS	Number of CSS measured during the current 15-minute interval. The display is updated every second	0 - 255
L.TERM ES	Number of ES measured during the current 24-hour interval. The display is updated every 15 minutes	0 - 900
L.TERM UAS	Number of UAS measured during the current 24-hour interval. The display is updated every 15 minutes	0 - 65535
L.TERM SES	Number of SES measured during the current 24-hour interval. The display is updated every 15 minutes	0 - 65535
L.TERM BES	Number of BES measured during the current 24-hour interval. The display is updated every 15 minutes	0 - 65535
L.TERM LOFC	Number of loss of frame synchronization events measured during the current 24-hour interval. The display is updated every 15 minutes	0 - 255
L.TERM CSS	Number of CSS measured during the current 24-hour interval. The display is updated every 15 minutes	0 - 255
L.TERM INT	The number of 15-minute intervals that expired from the start of the current 24-hour interval. The display is updated every 15 minutes	0 - 96
ERROR EV	The number of ESF error events recorded since the last time the register was cleared. The display is updated every second	0 - 65535
ERROR CRC	The number of CRC error events recorded since the last time the register was cleared. The display is updated every second	0 - 1000
AV ERR CRC	The average number of CRC error events recorded since the last time the register was cleared. The display is updated every second	0 - 1000
BPV COUNT	The total number of BPV errors during the last minute The display is updated every minute	0 - 9999
CUR DEG MIN	Number of degraded minutes measured during the last 24 hours. The display is updated every minute	0 - 1440

Display	Description	Range
BPV WORST	The number of BPV errors measured during the worst minute. The display is updated every minute	0 - 9999
LST DEG MIN	Last 24-hour count of degraded minutes. The display is updated every 24 hours	0 - 1440

Displaying the Performance Data on the Front Panel

Use the following procedure to display the performance diagnostics data on the DXC-2 front-panel LCD:

Step	Action	Key	Display
1	Bring the cursor under the left-hand field of the top row (if not already there)	CURSOR	
2	Scroll to display DIAGNOSTICS in the top row	SCROLL	The right-hand field of the top row indicates LNKA, meaning that the displayed diagnostics data pertains to link A. Second row shows the first performance item for link A, and its current value. The displayed item depends on the link type and framing mode
3	Bring the cursor under the left-hand field in the second row	CURSOR	
4	Scroll to see the other statistics	SCROLL	After each SCROLL pressing, the second row shows the current value of the next item. Continue until the first item appears again.
5	Bring the cursor under the right-hand field of the top row (if not already there)	CURSOR	
6	Scroll to display LNKB	SCROLL	Second row shows the first performance item for link B, and its current value. The displayed item depends on the link type and framing mode
7	Repeat steps 3, 4 above to see the other statistics of link B	SCROLL	After each SCROLL pressing, the second row shows the current value of the next item. Continue until the first item appears again.

Resetting the Performance Data Registers

The registers storing diagnostics data can be reset. To reset a register, bring the register to display and press ENTER. To ensure that the collected data remains meaningful and correlated after a specific register is reset, the DXC-2 will automatically perform the following actions:

- Since the data collected on a given link for the current interval and for the current 24-hour interval is correlated, pressing ENTER while any of the following CURR or L.TERM data items is displayed clears all the

performance diagnostics registers, not only that appearing on the display: ES, UAS, SES, BES, LOFC, CSS, and the registers for CURR SECS, CURR DEG MIN, LST DEG MIN, and L.TERM INT.

- In case the ERROR CRC register of a given link is reset, the AVG ERR CRC register of that link is also reset, and vice versa.
- In case the BPV COUNT register of a given link is reset, the BPV WORST register of that link is also reset, and vice versa.

The only register that can be reset independently of the other registers is the ERROR EV register (available for T1 links using ESF framing).

Displaying the Performance Data on a Supervision Terminal

The performance data can be displayed on the supervision terminal by means of the DSP PM command, as explained in Chapter 4. By adding the /CA switch to the command, you can reset all the performance diagnostics registers.

5.3 Test Functions

User-Controlled Loopback Functions

The DXC-2 supports two types of user-controlled loopbacks, local (analog) loopbacks and remote (digital) loopbacks. The user-controlled test functions are accessed from the TEST OPTIONS menu. The available loopback functions are described in the following paragraphs. The loopbacks are identified by the designation displayed by the DXC-2.

LOCAL LOOP

When activated on a given link, the local loopback returns the signal received from the other link, after passing through all the DXC-2 circuits. The local loop is obtained by connecting the link transmit signal to the input of the receive path. The test signal is provided by the DTE connected to the other end of the link, that must receive its own transmission. During the loopback, the local DXC-2 sends an unframed all-ones signal to the link. Figure 5-1 shows a typical analog loop on link B. This test fully checks local DXC-2 operation, and the connections to the DTE of the other link.

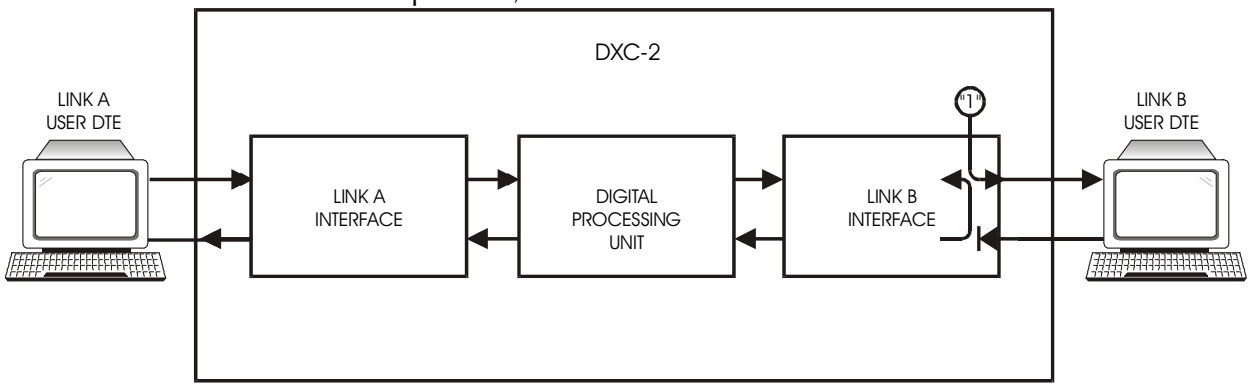


Figure 5-1 LOCAL LOOP Loopback (on Link B)

REMOTE LOOP

When activated on a given link, the remote loopback returns the received signal toward the remote user DTE connected to the same link. The remote loopback is performed by connecting the link receive signal, after regeneration, to the input of the transmit path. The test signal is provided by the user DTE connected to the remote end of the link, that must receive its own transmission. Figure 5-2 shows a typical digital loopback. For comparison with Figure 5-1, the loopback is also shown on link B. This test fully checks the data link, including the cables connecting the DXC-2 to the link, the transmission plant connecting the user DTE to the DXC-2, and the corresponding link interface of the DXC-2.

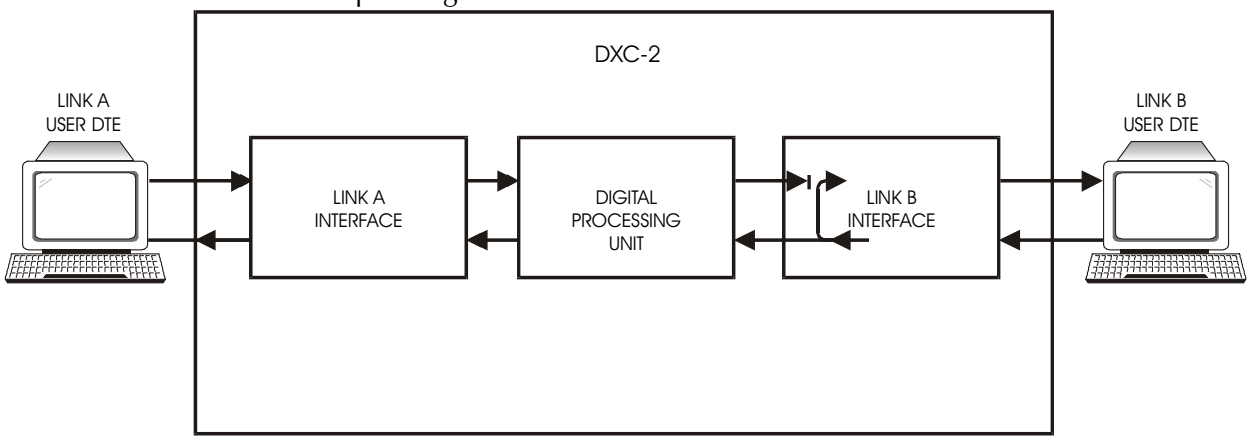


Figure 5-2 REMOTE LOOP Loopback (on Link B)

TEST OPTIONS Operating Instructions

Before starting the execution of a test, note that in general you should activate only one loopback at a time. However, the DXC-2 will allow you to activate a remote loopback on one link, and a local loopback on the other link.

To activate or deactivate a loopback, use the following procedure:

Step	Action	Key	Display
1	Bring the cursor under the left-hand field in the top row (if not already there)	CURSOR	
2	Scroll to display TEST OPTIONS in the top row	SCROLL	The right-hand field of the top row indicates LNKA, meaning that the displayed loopback state pertains to link A. Second row shows the current state of the local loop for link A, e.g., OFF
3	To change the link, bring the cursor under the right-hand field in the top row, and scroll to display LNKB	CURSOR, SCROLL	The right-hand field of the top row indicates LNKB, meaning that the displayed loopback state pertains to link B. Second row shows the current state of the local loop for link B, e.g., OFF

4	After the desired link is selected, bring the cursor under the left-hand field in the second row, and scroll to display the desired type of loopback, LOCAL LOOP or REMOTE LOOP	CURSOR, SCROLL	Second row shows the current state of the selected loopback, OFF or ON
5	To change the state of the displayed loopback, bring the cursor under the right-hand field in the second row, and scroll until you see the desired loopback state	CURSOR, SCROLL	Second row shows the new state of the selected loopback, ON or OFF
6	Press ENTER to activate the displayed test		The TEST indicator turns on if the loopback is activated, or turns off if no loopback is activated

Network-Controlled T1 Loopback Functions

When equipped with T1 line interfaces, the DXC-2 supports two types of network-controlled loopbacks, network latching loopback and network payload loopback.

The available network-controlled loopback functions are described in the following paragraphs. The loopbacks are identified by the designation displayed by the DXC-2.

Network LLB

The latching network line loopback is connected upon the reception of the appropriate code from the network. The loopback connections are shown in Figure 5-3.

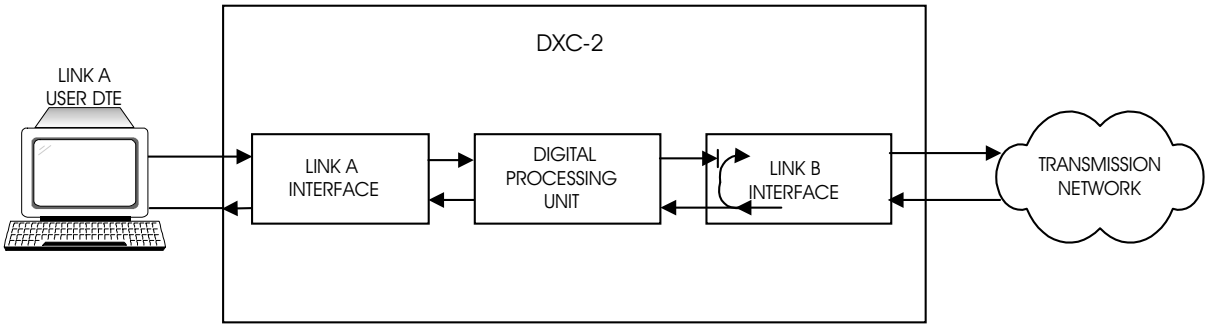


Figure 5-3 Latching Network Line Loopback

The activation/deactivation code depends on the main link framing mode:

SF (D4) — The network line loopback is activated when the DXC-2 detects the continuous transmission of the repeating sequence 10000..... for at least 5 seconds, and is deactivated by the transmission of the sequence 100..... for at least 5 seconds.

ESF — The network line loopback is activated when the DXC-2 detects the pattern 00001110 11111111 on the FDL, and is disconnected by the reception of the pattern

00111000 11111111 (rightmost bit transmitted first). Alternately, the network line loopback is also activated by the pattern listed above for SF (D4) framing.

The latching network line loopback has priority over all the user-controlled loopbacks, therefore, when a network loopback command is received, the user-controlled loopbacks are disconnected; they are automatically reconnected upon the reception of the network loopback disconnection command.

While the network line loopback is connected, the DXC-2 displays NETWORK LLB.

Network PLB

The latching network payload loopback is connected upon the reception of the appropriate code from the network. Loopback connections are shown in Figure 5-4.

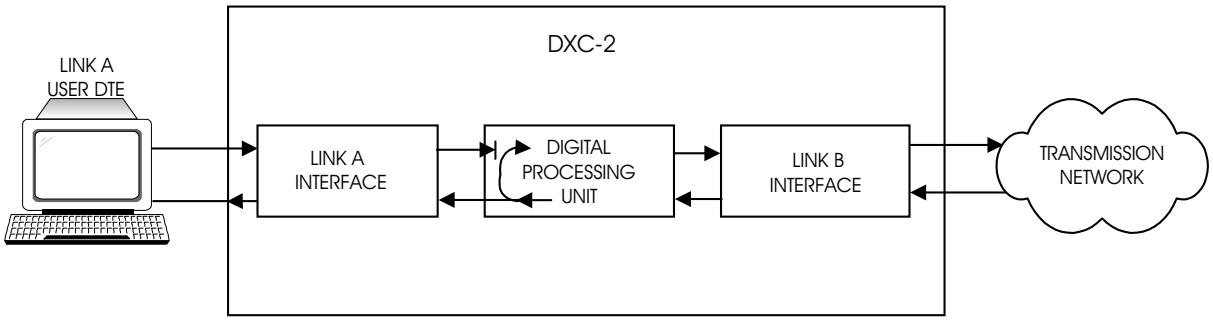


Figure 5-4 Latching Network Payload Loopback

The loopback can only be connected when ESF main link framing is used. The connection is performed by means of commands transmitted through the FDL link:

- The network payload loopback is activated when the DXC-2 detects the pattern 00010100 11111111 on the FDL.
- The network payload loopback is disconnected by the reception of the pattern 00110010 11111111 (rightmost bit transmitted first).

The latching network payload loopback has priority over all the user-controlled loopbacks. Therefore, when a network loopback command is received, the user-controlled loopbacks are disconnected; they are automatically reconnected upon the reception of the network loopback disconnection command.

While the network line loopback is connected, the DXC-2 displays NETWORK PLB.

5.4 Power-Up Self-Test

The DXC-2 performs a power-up self-test upon turn-on. The self-test sequence, described in *Operating Instructions* in Chapter 3, tests the critical circuit functions and the display.

In case of failure, the DXC-2 displays an alarm message in the second row.

5.5 Troubleshooting Instructions

In case a problem occurs, check the displayed alarm messages and refer to *Status Indications and Messages* on page 5-1 and Table 5-1 for their interpretation. If trouble cannot be corrected by performing the actions listed in Table 5-1, use Table 5-2: identify the trouble symptoms and perform the actions listed under Corrective Measures in the order given in Table 5-3, until the problem is corrected.

Table 5-3 Troubleshooting Chart

N°	Trouble Symptoms	Probable Cause	Corrective Measures
1	The DXC-2 is dead	1. No power	1. Check that both ends of the power cable are properly connected 2. If the DXC-2 is powered from DC, check the polarity of the power connections
		2. Blown fuse	Disconnect power cable from both ends and replace the fuse with another fuse of proper rating.
		3. Defective DXC-2	Replace the DXC-2.
2	Local DXC-2 reports local link sync loss	1. External problem	Activate the local loopback on the link. Check that the previously lit LOS L indicator turns OFF. If the indicator turns OFF, the problem is external.
		2. Defective DXC-2	Perform power-up self-test and replace the DXC-2 if defective.

Appendix A

INTERFACE SPECIFICATIONS

This appendix describes the specifications for the DXC-2 interfaces. The information presented in this chapter includes:

- Link Connectors
- RS-232 (V.24) Supervisory Port Connector
- -48 VDC Connector.

A.1 Link Connectors

The link physical interface is a 15-pin D-type female connector.

Table A-1 LINK Connectors, Pin Allocation

Pin	Designation	Direction	Function
1	TD(T)	From DXC-2	Transmit data (tip)
2	FG	↔	Frame ground
3	RD(T)	To DXC-2	Receive data (tip)
4	FG	↔	Frame ground
5 to 8	-	N/A	Not connected
9	TD(R)	From DXC-2	Transmit data (ring)
10	-	N/A	Not connected
11	RD(R)	To DXC-2	Receive data (ring)
12 to 15	-	N/A	Not connected

A.2 RS-232 (V.24) Supervisory Port Connector

The DXC-2 supervisory port has a standard RS-232 interface. The physical interface is a 9-pin D-type female connector.

Table A-2 Supervisory Port Interface Signals (ITU-T V.24/EIA RS-232 Interface)

Pin	Line	Notes	Connected to Terminal	Connected to Dial-Out Modem
1	Data Carrier Detect (DCD)	From DXC-2	8	4
2	Receive Data (RD)	From DXC-2	3	2
3	Transmit Data (TD)	To DXC-2	2	3
4	Data Terminal Ready (DTR)	To DXC-2	20	6
5	Signal Ground (SIG)	Common reference and DC power supply ground. Can be isolated from chassis ground (AA) (strap-selectable)	7	7
6	Data Set Ready	From DXC-2	6	20
7	Request to Send (RTS)	To DXC-2	4	8
8	Clear to Send (CTS)	From DXC-2	5	-
9	Ring Indicator (RI)	To DXC-2	-	22

A.3 -48 VDC Connector

The -48 VDC connector is a three-pin circular connector, wired in accordance with Table A-3.

Table A-3 -48 VDC Connector Wiring

Pin	Function
1	Ground
2	Chassis Ground (Frame)
3	-48VDC

Appendix B

Installation of Unit in 19" Rack

B.1 Installation

General

The height of the unit is 1U (1.75"), while the width of the unit is slightly less than half the available mounting width. To install either a single unit, or two units side by side, in a 19" rack, use the **RM-1/NEW** rack mounting kit.

Warning

Disconnect the power before installing the unit.

Installation of a Single Unit

Rack mounting components for installing a single unit include one short bracket and one long bracket. Each bracket is fastened to the side walls of the unit by two screws which are inserted into the two front holes on the side wall (The unit is supplied with nuts already in place on the inner side wall). Note that the short bracket fastens to the left side of the unit, and the long bracket to the right side of the unit (*see Figure B-1*).

Once the brackets are fastened to the side walls, the unit is ready for installation in the 19" rack. Place the unit in the rack and fasten the brackets to the side rails of the rack using two screws on each side (not included in the kit).

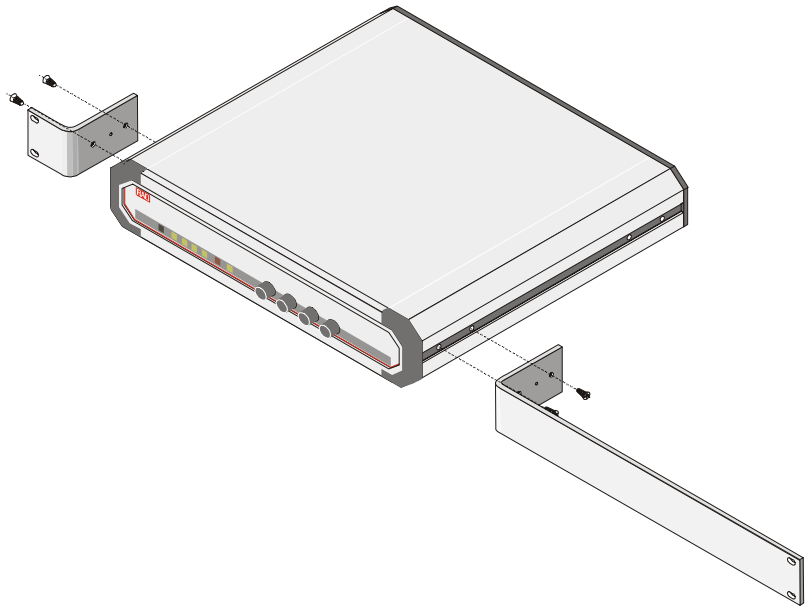


Figure B-1 Installation of a Single Unit

Installation of Two Units

Rack mounting components for installing two units include: two long side rails (one for each unit) which slide one into the other, fastening the two units together; two short side brackets (one for each unit) which hold the two units in the 19" rack (see *Figure B-2*).

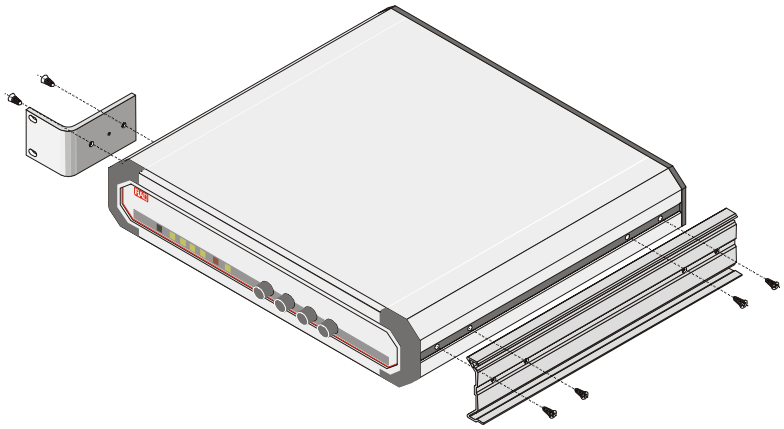


Figure B-2 Installation of Two Units

To install two units, follow these instructions:

1. Fasten one long side rail to each unit (right side to one unit, left side to the other unit) using the four screws supplied. The side rails must be attached in opposing fashion, the narrow flange of the first rail opposite the wide flange of the second rail.
2. Attach one short bracket opposite the side rail on each unit using the 4 screws supplied.
3. Slide the side rail of one unit into the side rail of the other unit, fastening the two units together (*see Figure B-3*).
4. Secure the supplied plastic caps to the ends of the rails, to prevent the units moving and to protect the rail ends.
5. The assembled units can now be fastened to the side rails of the 19" rack by means of four screws to each side (not included in the kit).

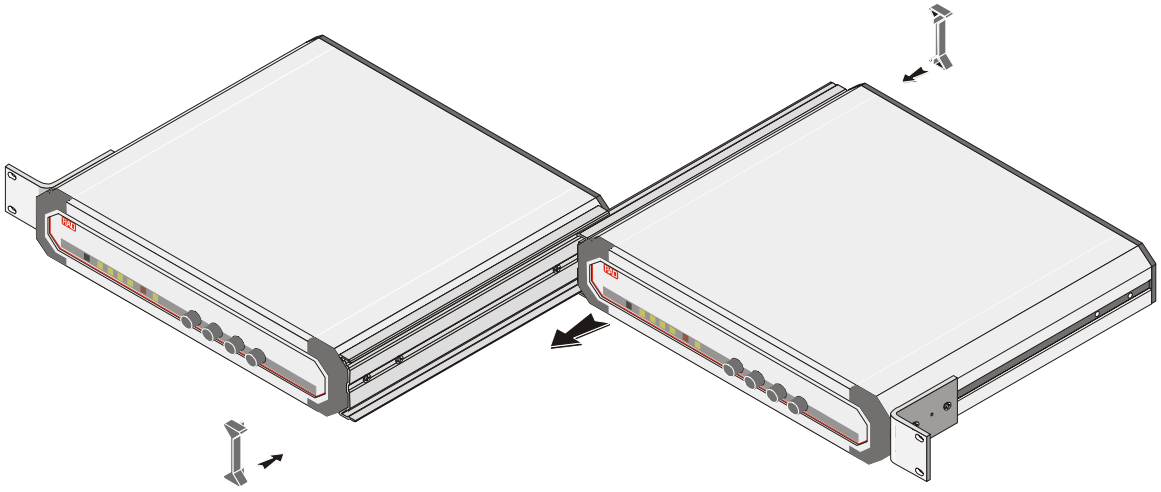


Figure B-3 Fastening Two Units Together