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DST 2000

User Guide

For 2 Mbit/s System

GNI **Nettest**

P/N 96102456R5

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Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

WARNING!

The test set described in this manual complies with the CE marking requirements only if approved signal cables are used with the instrument. GN Nettest cannot guarantee that the use of other cables will not impair the CE compliance of the test setup.

For approved cable types please contact your nearest GN Nettest representative.

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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1.1 Introduction to the DST 2000

Welcome to the DST 2000. Your Data Services Tester is a powerful tool, designed to assist you in the installation and maintenance of data services provided by the various carriers.

The basic DST 2000, with comprehensive Layer 1 (2 Mbit/s) tests, can be enhanced by adding other application options (e.g. Frame Relay) to broaden its capabilities. The unit can monitor and emulate layers 1-2-3 of the network services up to 2 megabits per second.

Access to the service to be tested is made convenient via a number of integrated interfaces. These interfaces allow testing at the 4 wire (2 Mbit/s) as well as from a user selected data interface.

A comprehensive Remote Operation option provides for the use of the DST 2000 in unattended, dark, sites.

Major Features:

- Monitor and emulate services up to 2 Mbit/s
- Ease of Use - facilitated by the large LCD display
- LEDs to monitor the "life signs" of the service for Layers 1-3
- Access to the 2 Mbit/s facilities via 3-pole balanced connectors, DA 15 or BNC connectors
- Integral data interfaces (V.35, V.24, EIA 449, EIA 530, X.21)
- Real Time Clock (RTC)
- Ability to automatically record (AUTOSAVE) statistical information as well as errors and significant events (EVENTLOG) with time stamps.
- Real time ALERT messages
- Printer support
- Bit Error Rate tests and result interpretation according to CCITT G.821 specifications
- Full Drop and Insert capability with two receivers and two transmitters
- Ability to drop n x 56/64 kb/s channels to a selected integral data interface
- Ability to drop a DS0 to an integral analog VF interface to allow analog tests to be performed by an external analog test set (i.e. TIMS)

- Monitor or “Talk through” on PCM encoded voice channels
- CSU/DSU emulation capability
- Ability to accept application options, such as Frame Relay

2 Mbit/s Feature

2 Mbit/s Monitor feature allows extensive real-time troubleshooting and performance analysis of your 2 Mbit/s network. You can monitor 2 Mbit/s data channels as well as voice channels without interfering with the customer's use of the 2 Mbit/s service.

The BERT (Bit Error Rate Test) feature lets you perform single time slot, fractional rate, or full 2 Mbit/s BERT as well as BER tests on data interfaces such as V.24, V.35, etc.

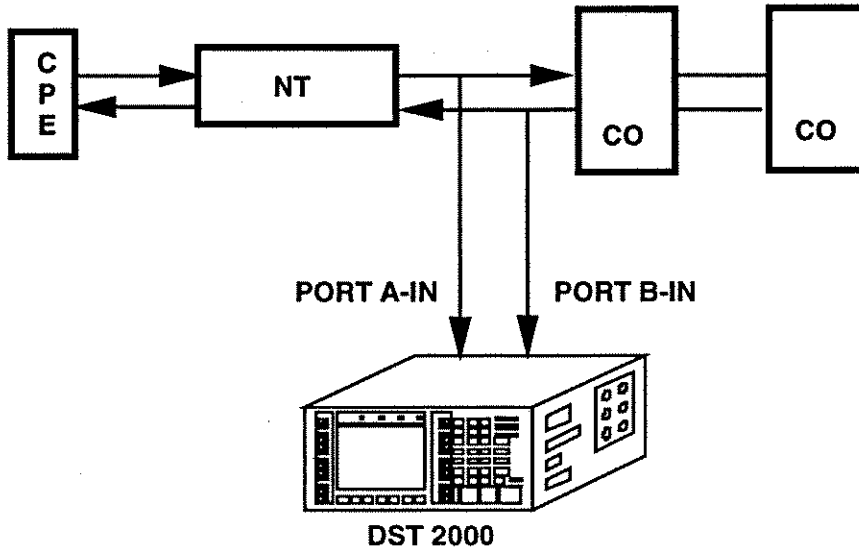
The “Tests Using Data Interface” application lets you monitor or perform emulation using one or more time slots in a 2 Mbit/s pipe via one of the DST 2000 data interfaces.

The “Analog and Voice Test” lets you monitor or emulate a voice time slot and lets you perform TIMS testing or tone insertion from an external analog test set.

The Review Log File utility lets you review statistic results that have been saved to memory.

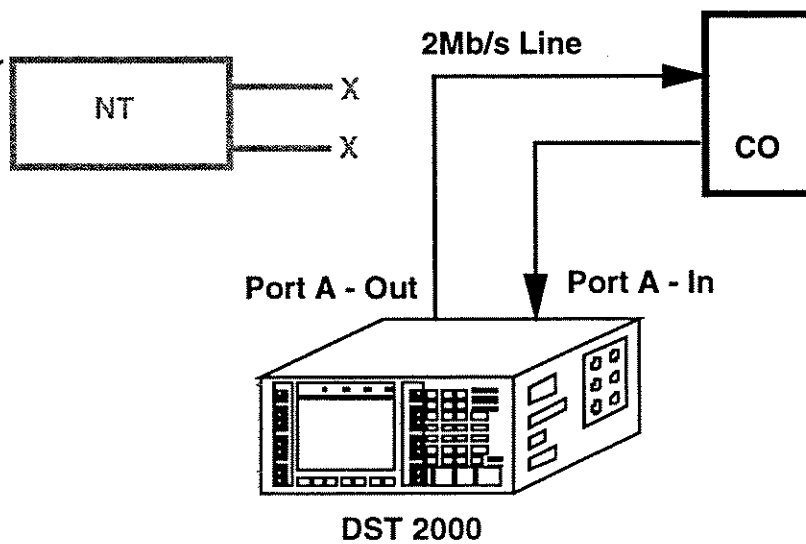
1.2 Typical Connections

Non-Intrusive Monitor Test

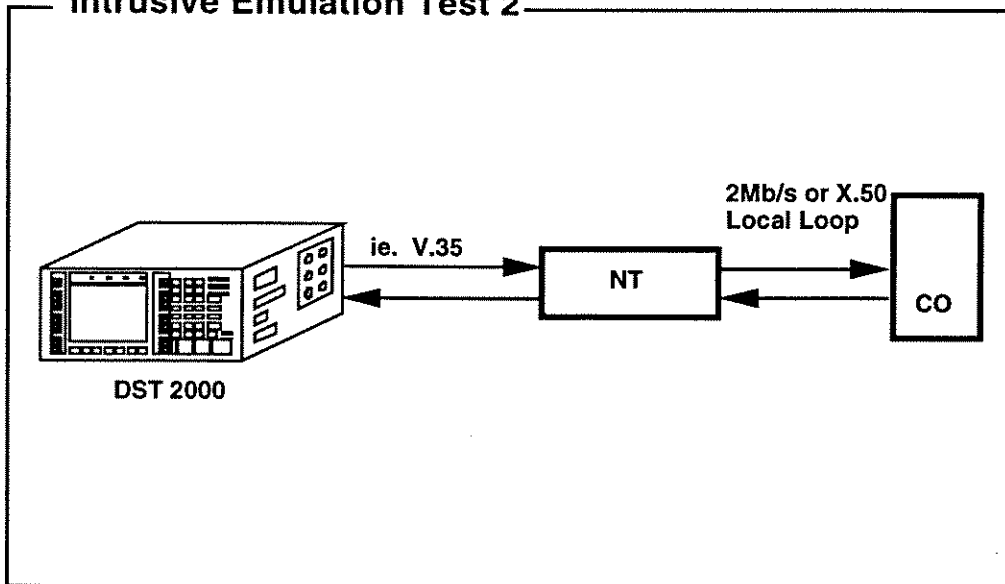


For high impedance monitoring, set IMPEDANCE to BRIDGE.

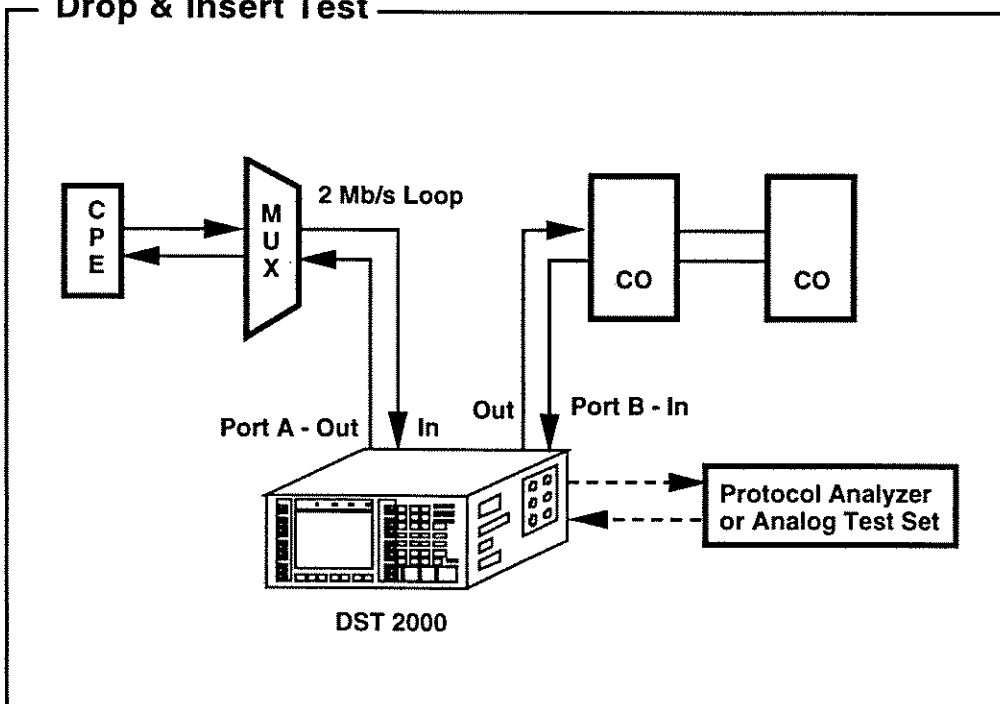
Intrusive Emulation Test 1



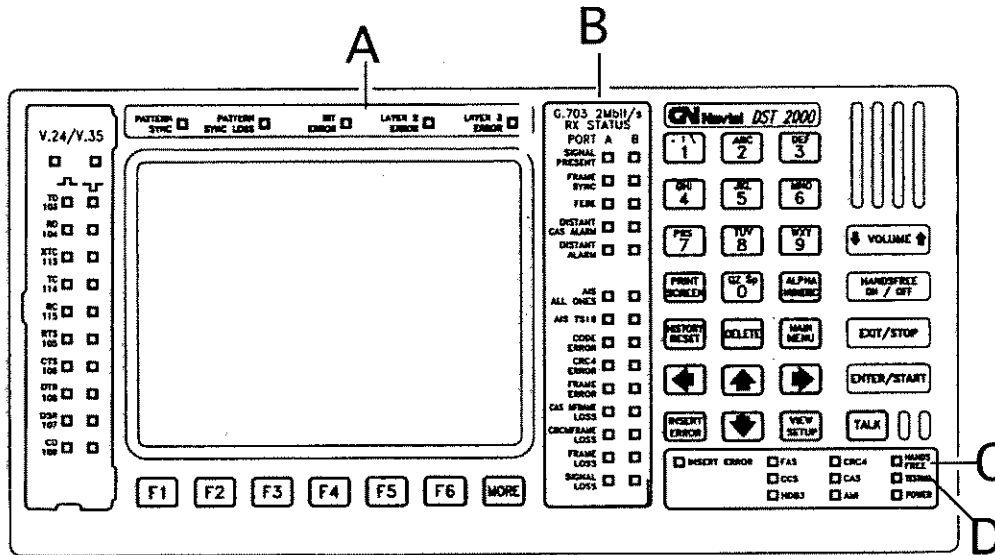
Intrusive Emulation Test 2



Drop & Insert Test



1.3 The Front Panel



- A Indicates Layer 2 and Layer 3 related problems.
- B G.703 2 Mbit/s RX STATUS LEDs monitor received signal performance in test situations where both directions are observed (i.e. monitoring and Drop & Insert tests). See Section 1.7 for detailed descriptions.
- C HANDS FREE LED. If blinking, indicates “Hands Free” operation with microphone disabled. (Default condition for voice tests.) To activate microphone, press **TALK** key.
- D TESTING LED. Indicates when test is in progress or if test is started/ stopped remotely from a PC using the Remote Option.

Note: Error history is indicated by blinking of appropriate LEDs. Error history can be reset with the **HISTORY RESET** key.

PRINT SCREEN

Prints the screen displayed to a printer connected to the DST 2000. However, if the AUTOSAVE function was set to direct saved files to the printer, the **PRINT SCREEN** will be disabled by the system.

ALPHA NUMERIC

Used, in conjunction with the ARROW keys to enter alpha characters. After **ALPHA NUMERIC** is pressed, the word ALPHA is displayed in the bottom right of the screen indicating that the keyboard is set to "alpha mode". All numeric entries will still operate as before, but now you can also enter any of the alpha characters indicated on the keys. This is accomplished by pressing the CURSOR keys (left, up or right), indicating the position of the alpha character desired on the key (left, center or right respectively) and the appropriate key on the keyboard. The "down" cursor key toggles the case of the alpha characters.

Example: To enter the file name "TEST1", press:
ALPHA NUMERIC; {left arrow, 8}= T; {up arrow, 3}= E;
{right arrow, 7}= S; {left arrow, 8=T}; 1=1.

INSERT ERROR

Used to insert bit errors while running BER tests. The number of errors inserted is set within the BER test.

VIEW SETUP

Displays a summary of the setup parameters while the test is running.

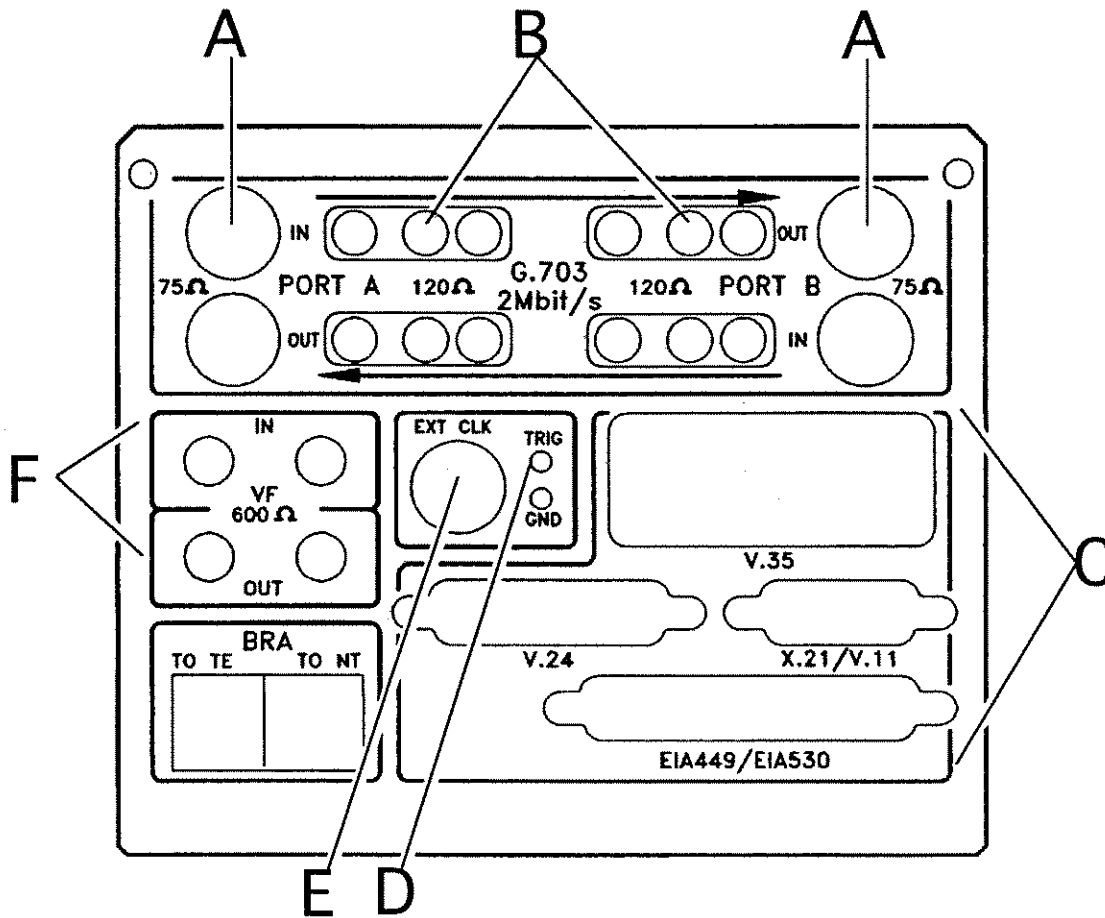
HANDSFREE ON/OFF

Toggling this key allows switching voice input/output between the built in speaker/microphone (hands free = ON) and an electret handset connected at the left side of the unit (hands free = OFF).

TALK

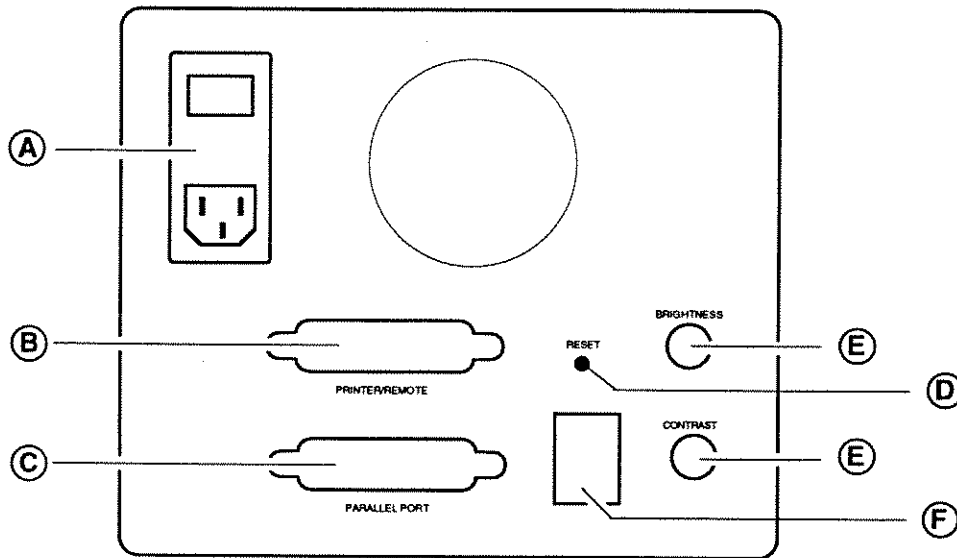
Activates the built in microphone. Pressing it a second time will mute the microphone. The HANDSFREE LED will start flashing indicating the muted condition.

1.4 Right Side Panel



- A BNC connectors for 75 ohm coaxial cables.
- B Siemens connectors for 120 ohm balanced cable.
- C Data Interfaces.
- D Reserved for future use.
- E BNC connector for external clock source input. Requires TTL-level signal.
Warning! Signal levels larger than TTL can damage input.
- F Banana VF jacks to interface with external analog/TIMS equipment. Use these jacks in "Analog and Voice Tests" when TEST TYPE = ANALOG.

1.5 Left Side Panel



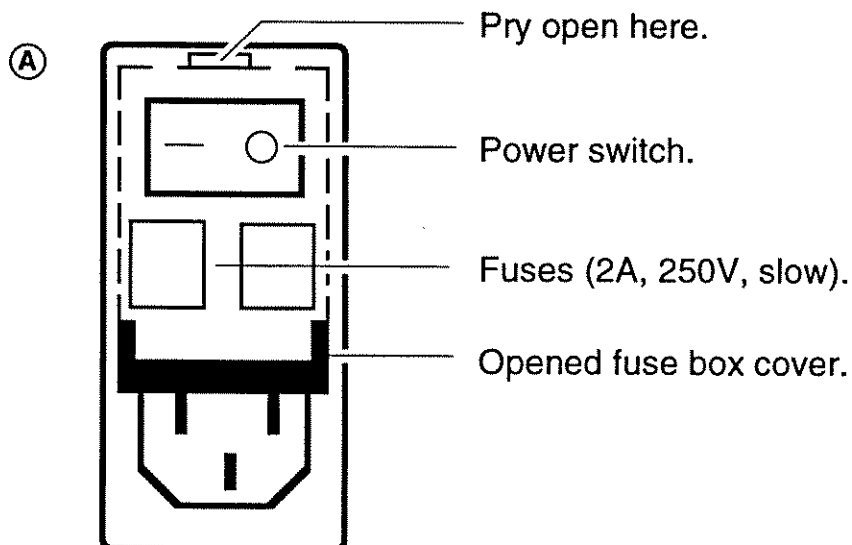
(A) Power switch, power connector, and 2 covered fuses.

Note: See diagram of fuses below.

(B) Printer / remote connector. (C) Parallel port (reserved for future use)

(D) Reset button. (E) Brightness & contrast controls.

(F) Handset connector



1.6 Replacing the Battery

The DST 2000 has one main battery and one backup battery. The batteries provide power to volatile memory so that information such as configuration files, stored test results, user defined patterns, and loop codes remains intact even though external power is shut off. The batteries also provide backup power for the real time clock.

The main (brick shaped) battery is affixed to the top rear of the frame. It is attached by a cable to a plug on the upper portion of the Memory Card. The expected life of the main battery is several years, although this may vary depending on use of the DST 2000. When the voltage drops below 2 volts, the DST 2000 will display a warning at power up time. If this occurs, replace the main battery as soon as possible.

The backup battery (small, coin shaped) is located on the memory card, which is the second card in from the front of the unit. This battery provides backup power when the main battery is being replaced.

At least one battery must stay connected at all times to ensure that data is not lost from volatile memory.

Although the DST 2000 will remain operational without sufficient battery power, its operation MAY be reduced to real time measurements only. Low battery power will cause the unit to lose its ability to recall setups or store results in volatile memory, and operation of the real time clock may stop.

Use the following replacement batteries:

Main (brick shaped) battery: 3.6V high energy, lithium battery TADIRAN TL-5242 / W or equivalent

Back-up (coin shaped) battery: 3V lithium battery PANASONIC BR 2325 or equivalent

For Flash ROM Host:
(Refer to Figure 1-A on page 1-13) 3V lithium battery PANASONIC UL 2320 or equivalent

<p>WARNING! Follow local regulations regarding the disposal of old batteries.</p>
--

1.7 Installing New System or E1 ICs

You can have your authorized GN Navtel representative do the installation, or you can do the installation yourself by following the instructions below. If you do the installation yourself, take all appropriate precaution against static electrical discharge. To install option ICs, refer to the manual that comes with the option.

Introduction: Installing the System or E1 application involves removing existing ICs from the memory card and inserting new ICs in their place.

1. Remove all power from the DST 2000.
2. Remove the 2 screws from top rear of unit.
3. Lift off top plate.
4. Pull out the connector from connector plug on top of Memory Card. The Memory Card is in second slot from the front of the unit.
5. Slide Memory Card out of unit by lifting the ejectors on both ends of card.
6. Refer to Figure 1 or Figure 1-A (depending on which card is being used), and the following chart.

System	U16	U17
E1	U18	U19

7. If you are installing a new system, remove the ICs from sockets U16 and U17.

If you are installing a new E1 application, remove the ICs from sockets U18 and U19.

Note: To remove an IC, use a 32-pin extraction tool (AMP 821980-1 or equivalent).

8. Unpack the new ICs.

Note: Do not touch the IC pins because you could damage them.

9. If you are installing a new System, insert SYS-U16 into socket U16, and insert SYS-U17 into socket U17.

If you are installing a new E1 application, insert E1-U18 into socket U18, and insert E1-U19 into socket U19.

10. Reinstall Memory card.

11. Re-attach connector to connector plug.

12. Reposition top plate and secure with screws.

Figure 1 - Memory Card Using ROM ICs

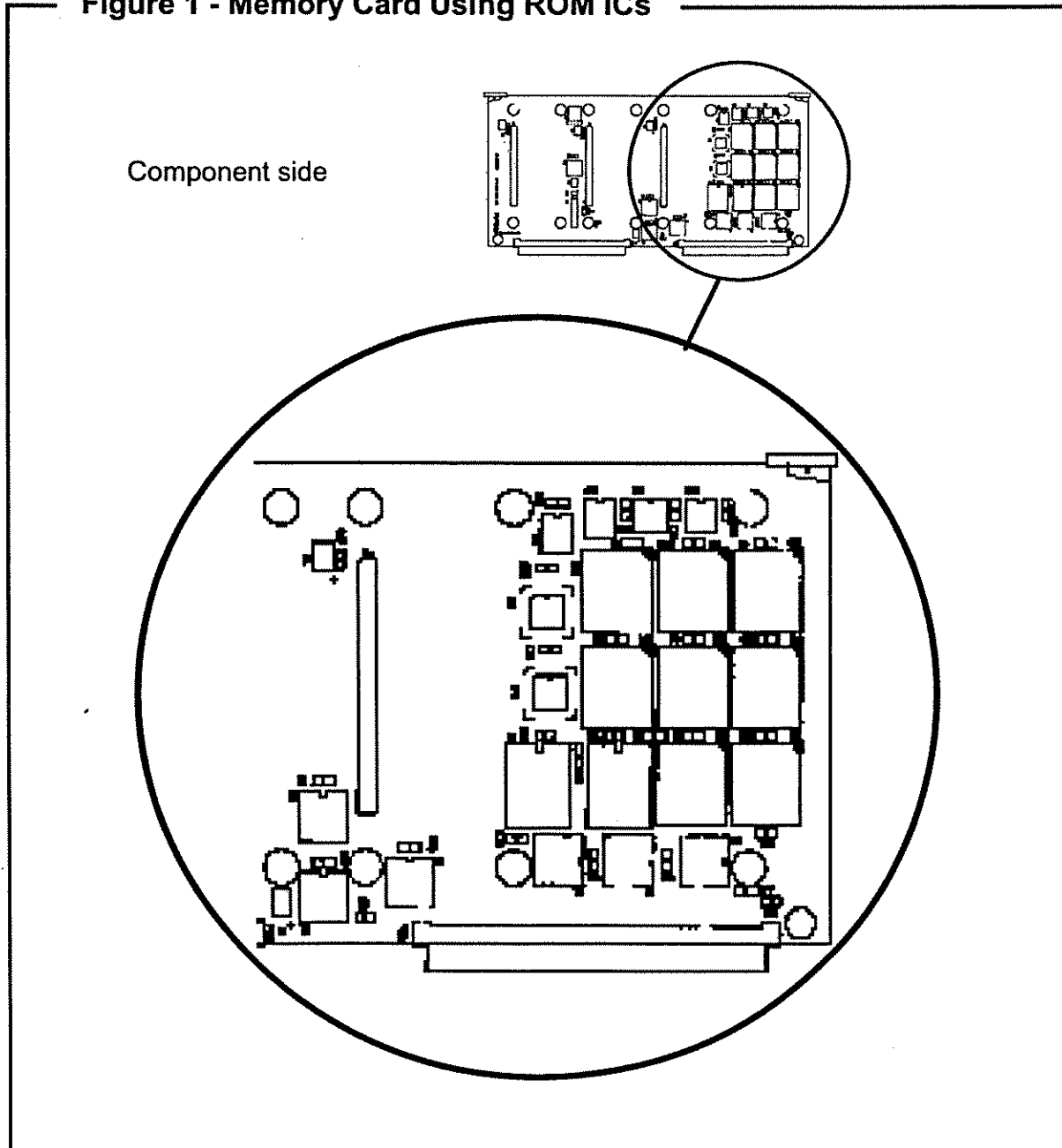
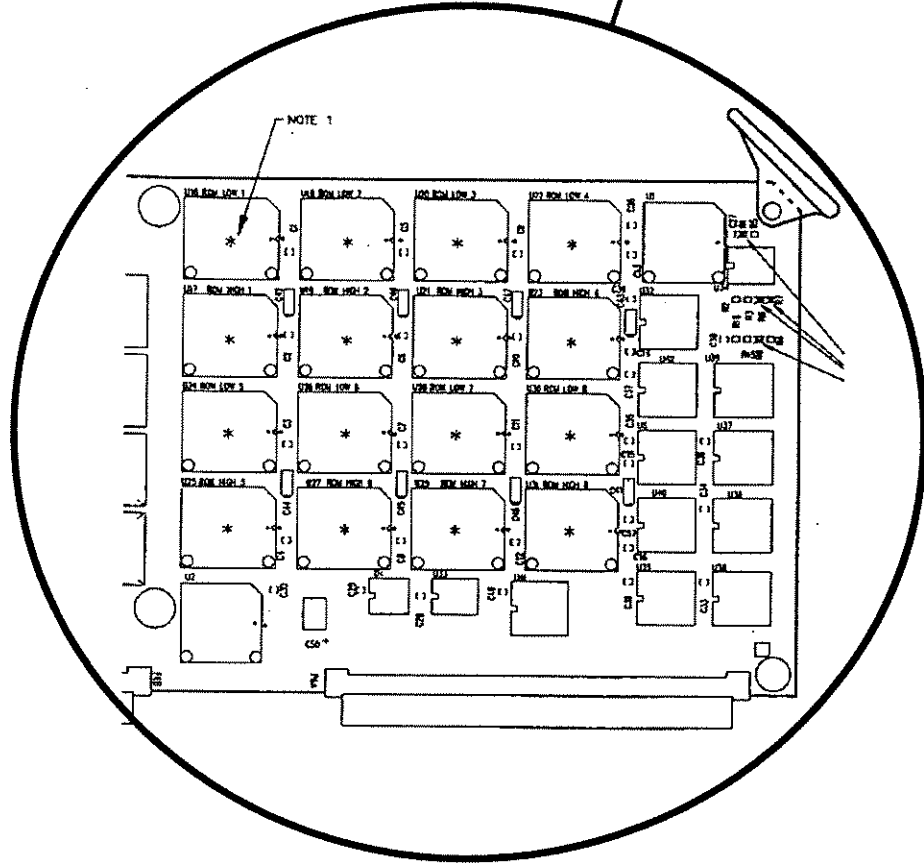
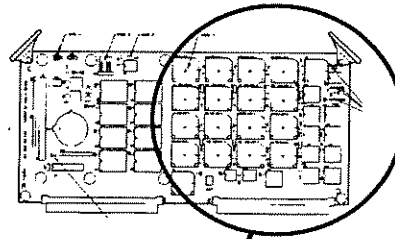


Figure 1-A - Memory Card Using Flash ROM ICs

Component side



1.8 DST 2000 Main Menu

```
GN Nettest
Data Services Tester 2000

MAIN MENU

1 G.703 2Mb (E1) MONITOR & EMULATION
2 BERT (FAS FRMD, 2Mb UNFRMD, DATA I/F)
3 FRAME RELAY MONITOR & EMULATION TESTS
4 USER MESSAGE & TEXT EDITOR
5 FILE UTILITIES
6 SYSTEM CONFIGURATION

Select by number, or position
highlight bar and press <ENTER>
```

Sections 2 to 6
Section 3
Section 7

Options such as Frame Relay are listed here.

Note: If you have more than one option installed, the order in which they appear here is determined by the locations of their ICs on the memory card. The option with ICs in positions U20 and U21 will appear first in the menu. See the installation instructions in the manual that comes with your option.

1.9 Alarms and RX Status Indicators

Alarm messages are displayed in the top right hand corner of the DST 2000 screen. Received signal performance is indicated by the "G.703 2 Mbit/s RX STATUS" LEDs on the DST 2000 front panel.

Alarms

- SIG LOSS** Signal loss. The number of consecutive 0s received equals or exceeds the loss of signal threshold, "LOS THRES," as defined in Setup Menu. The alarm could also be triggered if the received signal level is too low.
- < 300mV** The received signal is less than 300mV peak-to-peak, resulting in signal loss condition.
- AIS** Alarm indicator signal, or all ones. The intermediate equipment transmits this alarm due to improperly received signal at the other end.
- NO FRAME** Loss of frame synchronization on received signal.
- CRC4 MFL** Loss of the CRC4 multiframe alignment signal.
- CAS MFL** Loss of the CAS multiframe alignment signal.
- TS16 AIS** Data on time slot 16 are all ones.
- DISTANT** An alarm condition signalled by the distant/remote equipment.
- DIST CAS** An alarm signalled by the distant/remote equipment indicating it has lost the CAS multiframe alignment signal.

G.703 2 Mbit/s RX Status LEDs

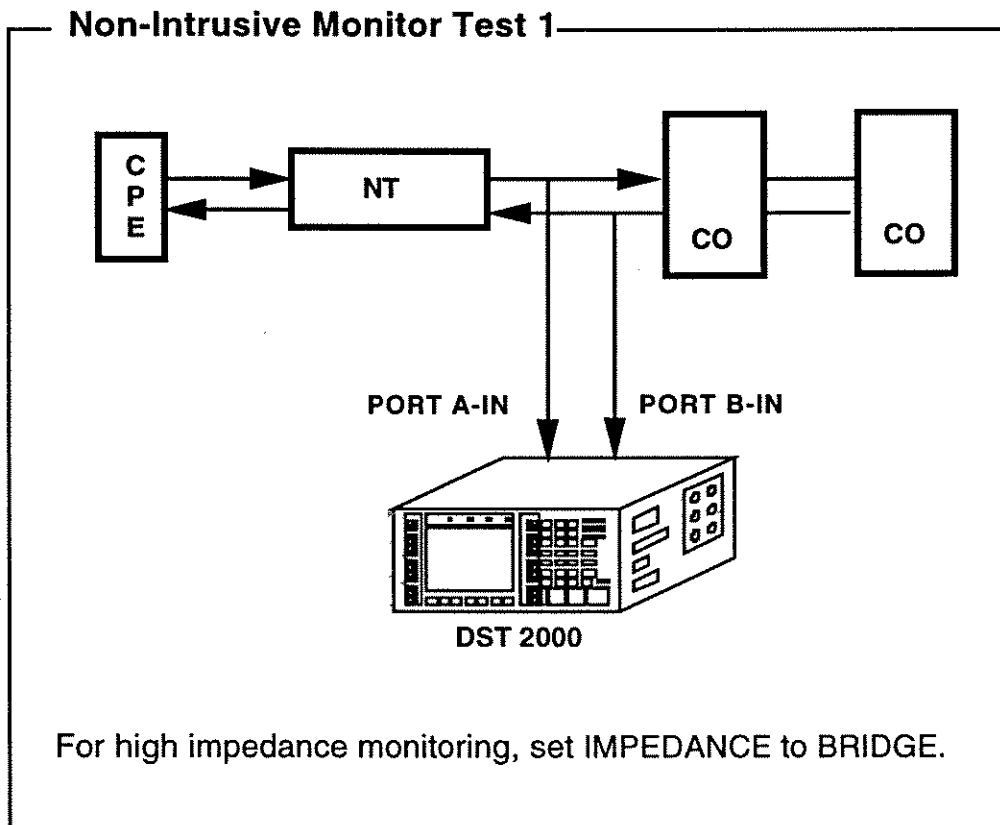
- SIGNAL PRESENT** A valid signal is detected.
- FRAME SYNC** Indicates frame synchronization has been achieved (for FRAMED modes).
- FEBE** The far end equipment has reported an error in the last multiframe.

DISTANT CAS ALARM	An alarm signalled by the distant/remote equipment indicating it has lost the CAS multiframe alignment signal.
DISTANT ALARM	An alarm condition signalled by the distant/remote equipment.
AIS ALL ONES	Alarm indicator signal, or all ones. The intermediate equipment transmits this alarm due to improperly received signal at the other end.
AIS TS 16	Data on time slot 16 are all ones.
CODE ERROR	A bipolar violation error which is not part of HDB3 coding.
CRC4 ERROR	Cyclic redundancy code is incorrect.
FRAME ERROR	Error in framing byte (i.e. time slot 0).
CAS MFRAME LOSS	Loss of the CAS multiframe alignment signal.
CRC4 MFRAME LOSS	Loss of the CRC4 multiframe alignment signal.
FRAME LOSS	Loss of frame synchronization.
SIGNAL LOSS	Signal loss. The number of consecutive 0s received equals or exceeds the loss of signal threshold, "LOS THRES," as defined in Setup Menu. The alarm could also be triggered if the received signal level is too low.

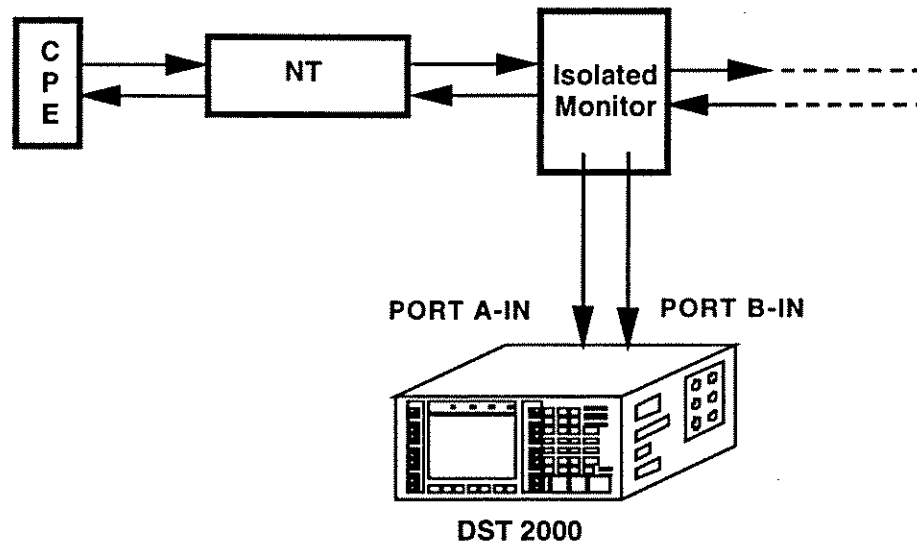
2 Mbit/s Monitor & Autoconfigure (Layer 1)

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2.1 Typical Connections



Non-Intrusive Monitor Test 2



When monitoring data from an isolated monitor jack, set IMPEDANCE to ISOL MON.

2.2 Configuring the 2 Mbit/s Monitor Test

Before you can run a Monitor test that will gather statistics about your 2 Mbit/s signal, you must set up the Monitor & Autoconfigure menu.

1. At the DST 2000 Main Menu, select G.703 2 Mb (E1) MONITOR & EMULATION. The following menu appears:

```
G.703 2Mb (E1) MAIN MENU
(R1.00 Jan 1994)

1 MONITOR & AUTOCONFIGURE (LAYER 1)
2 BERT (FAS FRMD, 2Mb UNFRMD, DATA I/F)
3 TESTS USING DATA INTERFACES
4 ANALOG & VOICE TESTS
5 REVIEW LOG FILE

Select by number, or position
highlight bar and press <ENTER>
```

2. Select MONITOR & AUTOCONFIGURE (LAYER 1). The following screen appears:

```
E1 MONITOR & AUTOCONFIGURE
SETUP
AUTOCONFG: NO          CLOCK REF: B-IN
SOURCE: LINE          VOICE: LISTEN
FRAMING: FAS          TIME SLT: 31
CRC-4: OFF           TO: A-IN
TS16 SIG: NONE       CODE: A-LAW
CODING: HDB3
IMPEDANCE: BRIDGE
LINE: 120 OHMS
LOS THRES: 32 0s
```

- SETUP** Allows test configuration to be loaded or saved.
- LOAD** Loads a setup from a file. A pop-up window appears so you can choose from a list of previously saved files.
 - SAVE** Saves the current test configuration to file. You are prompted for a file name.
 - AUTO LOG** See Section 2.4.
- AUTOCONFG** Either the software automatically selects proper parameters for the FRM FMT and CODING fields or you select parameters for the FRM FMT and CODING fields in addition to the other fields.
- NO** You select parameters.
 - YES** Enables the Autoconfiguration function.
- Note: Line coding will be configured to HDB3 if an HDB3 coding signature is detected during autoconfiguration. In rare situations, coding errors on the network could simulate an HDB3 signature where a true HDB3 does not exist.
- SOURCE** (Available only if AUTOCONFG is set to NO.) Source of data to be captured or reviewed.
- LINE** Collect statistics based on the performance of the line.
 - STATS FILE** Displays statistics from a previously saved file.
 - REV STATS** Displays most recently collected statistics. If you exit to the E1 Menu, all statistics will be lost.
- FRAMING** (Available only if AUTOCONFG is set to NO.) The framing format used to subdivide the data stream into smaller groups or frames.
- FAS** Frame Alignment Signalling format.
 - UNFRAMED** Traffic on the line is not framed.
- CRC-4** (Available only if FRAMING is set to FAS.) 4-bit Cyclic Redundancy Check multiframe structure. CRC-4 resides in time slot 0
- TS16 SIG** (Available only if FRAMING is set to FAS.) Type of signalling used in time slot 16.
- NONE** Treat as regular time slot,
 - CAS** Channel Associated Signalling,
 - CCS** Common Channel Signalling.
- CODING** Defines how Mark and Space will be shown on the line.
- HDB3** An HDB3 code will be substituted for any occurrence of 4 consecutive zeroes in the line. This has the effect of

reducing the number of zeroes on the line. HDB3 codes are different from regular data because they contain a bipolar violation.

AMI Alternate Mark Inversion is used as the coding scheme on the line. Opposite polarities will be used to indicate subsequent Marks.

IMPEDANCE Input impedance of the DST 2000.

ISOL-MON Choose ISOL-MON if you are connected to protected or isolated monitor jacks. See Non-Intrusive Monitor Test 2 in Section 2.1.

BRIDGE Causes the impedance looking into the receivers of the DST 2000 to be high so the presence of the instrument on the line will not affect the service. See Non-Intrusive Monitor Test 1 in Section 2.1.

LINE Select the matching cable impedance. 75 ohms for 75 ohm coaxial cable with BNC connector, or 120 ohms for 120 ohm balanced cable with Siemens connector.

CLOCK REF Selects the reference clock for clock slip calculation. Clock slips are calculated as bit slips.

B-IN Use the B-IN signal frequency as the reference clock frequency.

EXTERNAL Use the clock source BNC input connector (labelled EXT CLK) as the reference clock frequency.

NONE Clock slips are not calculated.

VOICE (Not available if AUTOCNFG is set to YES or if FRAMING is set to UNFRAMED.) Designates a time slot as a voice channel for the purpose of audible monitoring. You choose either NO or LISTEN. If you choose LISTEN, additional fields appear:

TIME SLT You key in the number of the time slot that is to be monitored. Can be 1 to 31.

TO A-IN Listens to the voice time slot on Port A-IN.

B-IN Listens to the voice time slot on Port B-IN.

BOTH Listens to the voice time slots on both A-IN and B-IN ports.

CODE A-LAW Companding of voice digitizing is done according to the European CCITT A-LAW definition.

U-LAW Companding of voice digitizing is done according to the North American μ -LAW definition.

Note: The DST 2000 will default to "hands free" operation. A blinking "HANDS FREE" LED indicates that "hands free" operation is selected. An unlit "HANDS FREE" LED indicates that the RJ-13 connector is selected for use in voice monitoring.

LOS THRES Loss of signal threshold. Lets user define the maximum allowable number of consecutive zero bits in data stream. A signal loss condition is declared when this threshold is reached or exceeded.

2.3 Running the 2 Mbit/s Monitor Test

The 2 Mbit/s Monitor test gathers statistics about the 2 Mbit/s signal.

1. Be sure you have configured the Monitor & Autoconfigure menu as section 2.2 describes.
2. To run the Monitor test, press the **ENTER/START** key. The following statistics are displayed if no data is connected.

```

E1 MON  START:15:48:57 1A-IN  SIG LOSS
RUNNING  B-IN  SIG LOSS
E1 STATS  A-IN
CODE ERRS  0
CODE ERT  0.000e+00
FRAMES  0.000e+00  SIG LOSS  1
FRAME ERR  0
FRAME ERT  0.000e+00  SIG LOSS SECS  27
CAS FRMS  0  CODE ERR SECS  0
CRC4 FRMS  0  FRM LOSS SECS  0
CRC4 ERR  0  CAS MFL SECS  0
CRC4 ERT  0.000e+00  CRC4 MFL SECS  0
FEBES  0  ERR'D SECS  0
AIS  0  SEVERR'D SECS  0
FRM LOSS  0  %ERRFREE SECS  100
CRC4 MFL  0  UNAVAIL TM  0:00:27
CAS MFL  0  AVAIL TIME  0:00:00
AIS TS16  0  ELAPSED TM  0:00:27
E-IN  SIGNAL  NFAS  EVENT  CLEAR
STATS  BITS  ON  LOG  STATS
  
```

CODE ERRS	A bipolar violation which is not part of HDB3 coding.
CODE ERT	Code Error Rate = Code Errors÷bits received.
FRAMES	Number of 256-bit CEPT frames received.
FRAME ERR	Number of frames whose FAS or non-FAS byte is in error
FRAME ERT	Frame error rate. FRAME ERT = FRAME ERR ÷ Number of frames.
CAS FRMS	Number of CAS multiframes (16 frames) received.
CRC4 FRMS	Number of CRC-4 multiframes (16 frames) received.
CRC4 ERR	Number of CRC-4 errors received.
CRC4 ERT	CRC-4 Error Rate = CRC4 errors ÷ (CRC frames x 2).
FEBES	Number of Far End Block Errors received.
AIS	Alarm Indicator Signal (or all ones unframed) is a signal transmitted by the intermediate equipment indicating it has received an improper signal from the other end.

FRM LOSS	Loss of frame synchronization. This condition is reported when 3 consecutive FAS+non-FAS pairs are received in error.
CRC4 MFL	CRC-4 Multi Frame Loss. This condition is caused by a loss of the CRC-4 frame alignment signal.
CAS MFL	CAS Multi Frame Loss. This condition is caused by a loss of the CAS frame alignment signal.
AIS TS16	Alarm Indicator Signal on Time Slot 16. This signal (all ones) is transmitted by the intermediate equipment on time slot 16 when it has received improper signalling on time slot 16 from the other end.
CLK SLIPS	Total difference in bits between the clock on Port A-IN and the reference clock as indicated in the CLOCK REF field in the setup screen. With no phase shift between the clocks, CLK SLIPS would read zero. If the A-IN clock is faster than the reference, clock slips increment. If the A-IN clock is slower than the reference, clock slips decrement. CLK SLIPS has an accuracy of ± 1 .
SIG LOSS	The number of consecutive 0 bits received has equalled or exceeded the Loss Of Signal Threshold (LOS THRESH) as defined in the G.703 (2 Mbit/s) setup menu.
SIG LOSS SECS	Total number of seconds in which signal loss condition is in effect.
CODE ERR SECS	A second containing 1 or more code errors.
FRM LOSS SECS	A second containing 1 or more frame loss conditions.
CAS MFL SECS	A second containing 1 or more CAS Multi Frame Loss conditions.
CRC4 MFL SECS	A second containing 1 or more CRC-4 Multi Frame Loss conditions.
ERR'D SECS	Errored Seconds is a second which contains: <ul style="list-style-type: none"> • 1 or more frame errors and/or • 1 or more CRC-4 errors and/or • 1 or more frame loss, CAS multi frame loss, CRC-4 multiframe loss or signal loss conditions.
SEV ERR'D SECS	Severely Errored Second (SES) is a second which contains: <ul style="list-style-type: none"> • 64 or more frame errors and/or • 817 or more CRC-4 errors and/or • 1 or more frame loss, CAS multiframe loss, CRC-4 multiframe loss, or signal loss conditions.
%ERR FREE SECS	Percentage of error free seconds = (available time – errored seconds) ÷ available time x 100%.

- UNAVAIL TM** Unavailable time is the time during which a failed signal state is in effect. A failed signal state is declared after 10 consecutive SESs and is cleared after 10 consecutive non-SESs.
- AVAIL TIME** Available time is the time during which a failed signal state is NOT in effect. A failed signal state is declared after 10 consecutive SESs and is cleared after 10 consecutive non-SESs.
- ELAPSED TM** Length of time since you last pressed **ENTER/START** or the **CLEAR STATS** softkey to start the test.
- Note: Elapsed tm = Unavail tm + Avail time.

2.4 Auto Log (Auto Save & Event Log)

This feature, available through the SETUP field, saves statistics screens that you specify to either printer or memory. It also *time stamps* and records major events as they occur. You can save up to 250 statistic screens to memory without adding any expansion RAM. **Note:** Recording too many statistical screens too often can easily fill up memory. Should this occur, the DST 2000 will stop saving statistic screens, record the event, and continue testing.

AUTOSAVE & EVENT LOG			
STATS:	SELECT	EVENTS:	SELECT
PRINTER:	NO	PRINTER:	NO
SAVE:	YES	SAVE:	YES
FILE:	STATS---	FILE:	EVENTLOG
TRIGGER:	INTERVAL		
HOURS:	0_	ALERT USER	
MINUTES:	10	ON EVENT:	YES
SECONDS:	0_	TIME:	5_

STATS Specifies which application-specific statistics are sent to memory or printer.

SAVE ALL All.

SELECT You select which application-specific statistics from a pop-up window.

NONE Disables automatic recording of statistics.

PRINTER (Not available if STATS is set to NONE.) Indicates if application-specific statistics will be sent to the printer. YES or NO. Either SAVE or PRINTER must be set to YES for AUTO LOG to be enabled.

SAVE (Not available if STATS is set to NONE.) Indicates if application-specific statistics will be saved to battery backed-up SRAM. If you select YES, you are prompted for a file name. Either SAVE or PRINTER must be set to YES for AUTOLOG to be enabled.

Note: Files with duplicate names will be overwritten when the test is started. If you entered alpha characters, you will have to press the **ALPHA NUMERIC** key before you can move to another field.

TRIGGER (Not available if STATS is set to NONE.) Specifies under what conditions the selected application-specific statistics will be sent to the printer or saved to memory.

INTERVAL You specify the time period after which the selected statistics will be recorded. Must be greater than 0.
EVENT Each time a particular event occurs, only selected statistical screens that display a statistical count of the event are recorded. This reduces memory use.
INT & EVENT Both INTERVAL and EVENT.

EVENTS Specifies which application specific events get logged.

LOG ALL All.

SELECT You select which application-specific events.

NONE Disables the EVENTS function.

Note: We recommend that you run all tests with EVENTS enabled because valuable information will be recorded with times of occurrence.

If you enable the event log, the first 256 events will be recorded in the event log buffer. What happens next depends on whether you enable SAVE and whether there is enough room in memory. To view memory-saved events, first select REVIEW LOG FILE from the T1 MAIN MENU and then select the file in memory containing the events (EVENTLOG.TXT by default).

Be aware of the following messages:

EVENT LOG WRAP & SAVED TO FILE SAVE is enabled and 256 events have been logged. The event log has wrapped around and previous events have been saved in memory.

MEMORY FULL (FILE SAVE HALTED) SAVE is enabled but events will no longer be saved to memory because memory is full.

EVENT LOG WRAP & MEMORY FULL SAVE is enabled, the event log is full but it will wrap around and continue logging events. From this point on events will not be saved to memory because memory is full.

BUFFER FULL (EVENT LOG HALTED) SAVE is not enabled and the event log is full. Events will not be saved to memory.

PRINTER (Not available if EVENTS is set to NONE.) Indicates if application-specific events will be sent to the printer.

SAVE (Not available if EVENTS is set to NONE.) Indicates if application-specific events will be saved to memory. If you select YES, you are prompted for a file name.

Note: Files with duplicate names will be overwritten when the test is started. If you entered alpha characters, you will have to press the **ALPHA NUMERIC** key before you can move to another field.

ALERT USER

ON EVENT Whether or not to display a pop-up window indicating that an event has occurred. If you select YES, you are prompted to define the desired duration of the ALERT displays.

Note: Usually a 5-second duration is satisfactory. When dealing with a very troublesome line, the frequent appearance of the ALERT windows might become undesirable. In this case, disable the function. Checking the Eventlog screen will provide all necessary data.

2.5 Softkey and Hardkey Features of 2 Mbit/s Monitor Test

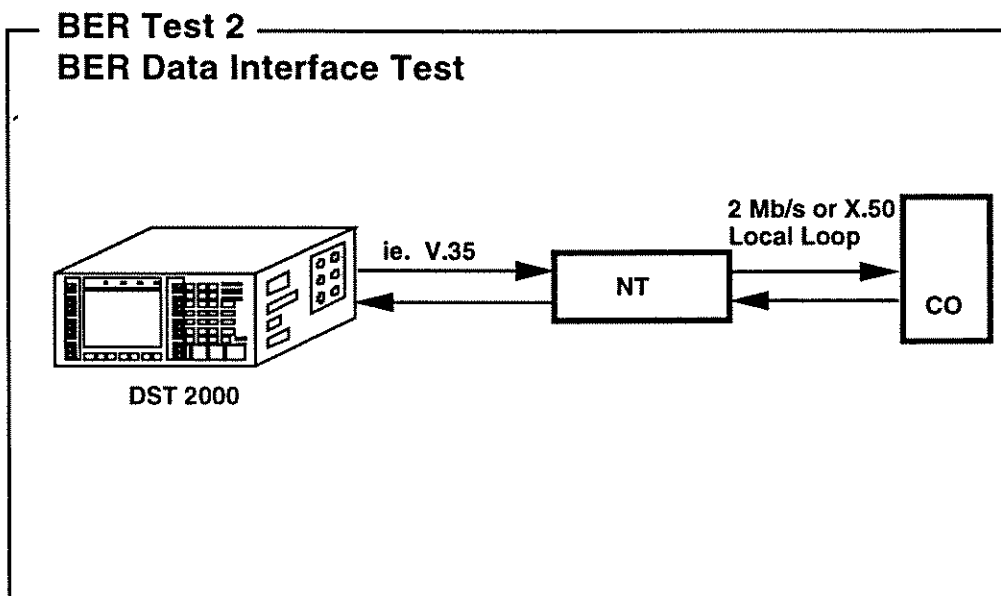
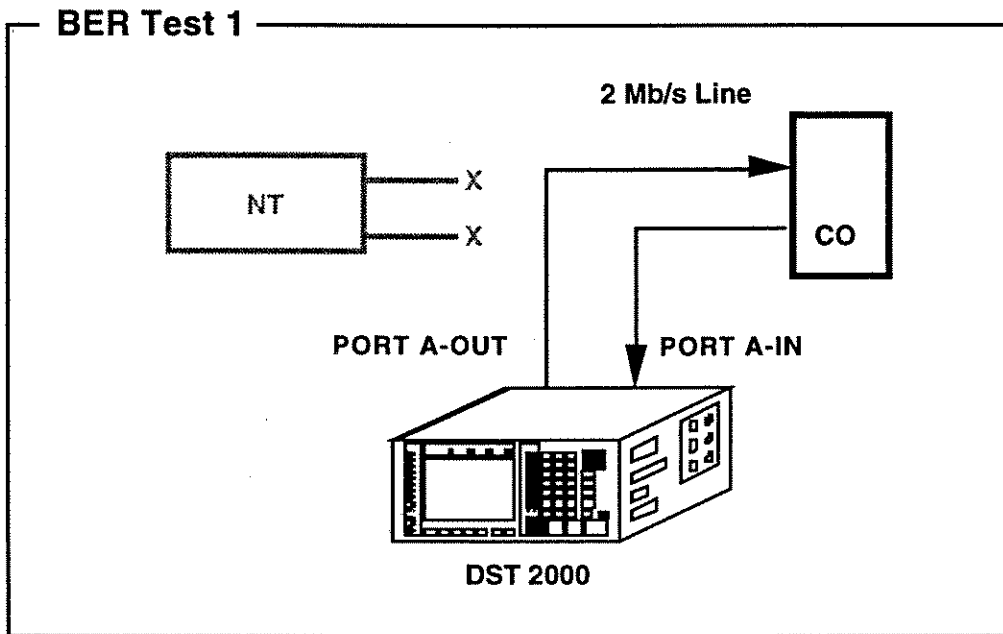
- To toggle between the statistics for the A-IN and B-IN ports, press the **A-IN STATS** and **B-IN STATS** softkeys.
- To toggle between the basic statistics (BPV ERT, FRAME ERT, CRC ERT, and %ERR FREE SECS) and all of the statistics, press the **BASIC STATS** and **ALL STATS** softkeys.
- To save the statistics to a file after you halt the test, press the **SAVE STATS** softkey. You will be prompted for a file name.
- To display the signalling bits, press the **SIGNL BITS** softkey. This screen is available only when TS16Sig is set to CAS. This screen will be accessible only at run-time.
- To display a list of the selected events which occurred during the test, press the **EVENT LOG** softkey.
- To reset the statistics to zero, press the **CLEAR STATS**, followed by the **YES** softkey.
- The **NFAS ON** and **NFAS OFF** softkeys are used to toggle the header display to show real-time snap shots of the non-FAS bytes, and the normal run-time header. These keys are available only at run-time.
- Press the **VIEW SETUP** hardkey to display a summary of the test configuration, without halting the test.
- Press the **HANDSFREE ON/OFF** hardkey if you wish to toggle between the built-in speaker (handsfree mode) and the handset. This key will be active only when VOICE is set to LISTEN during the run-time. The Handsfree LED will indicate one of the following modes:
 - OFF The voice signal is directed to the handset port.
 - Flashing Handsfree mode. The voice signal is directed to the speaker. The **VOLUME UP/DOWN** hardkey can be used to adjust the speaker volume to the desired level.
- Press the **HISTORY RESET** hardkey to reset all the receive (RX) status LEDs.

Section 3

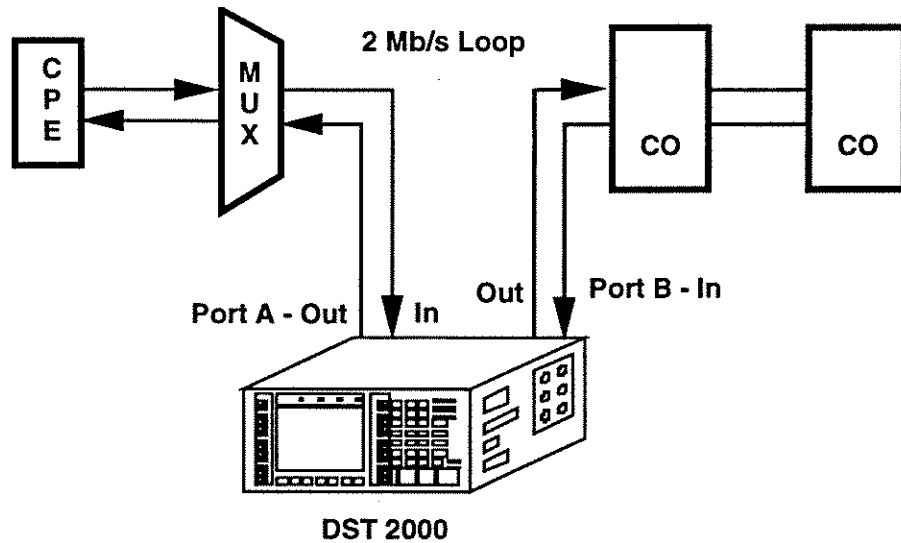
**BERT
FAS FRMD,
2 Mbit/s UNFRMD,
Up to 2 Mbit/s DATA I/F**

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3.1 Typical Connections



BER Test 3 Drop & Insert Configuration



This configuration allows the isolation of a problem on segments to the "left" or "right" of the DST 2000 point of insertion. The ability to insert BERT patterns in either the A-OUT or B-OUT direction enables the DST 2000 to trouble shoot both directions of the line without any time-consuming physical connections. "Good" time slots which are not selected in the Drop and Insert Test will remain unaffected.

3.2 Setting Up a BERT

The BER tests can be run either from the DST 2000 Main Menu or from the G.703 2 Mbit/s (E1) Main Menu. The test procedures are the same in either case.

1. At the DST 2000 Main Menu, select G.703 2 Mv (E1) MONITOR & EMULATION. The following menu is displayed:

```
G.703 2Mb (E1) MAIN MENU
(R1.00 Jan 1994)

1 MONITOR & AUTOCONFIGURE (LAYER 1)
2 BERT (FAS FRMD, 2Mb UNFRMD, DATA I/F)
3 TESTS USING DATA INTERFACES
4 ANALOG & VOICE TESTS
5 REVIEW LOG FILE

Select by number, or position
highlight bar and press <ENTER>
```

2. Select BERT (FAS FRMD, 2 Mbit/s UNFRMD, DATA I/F). The following screen appears:

```
BERT
SETUP
SOURCE: LINE          CLOCK REF: NONE
LINE TYPE: FAS CHNL  TX ON:  A-OUT
CONFIG:  TERMINAL
CRC-4:   ON           BLK SIZE: 10E3
TS16 SIG: CAS        DURATION: CONT
CODING:  HDB3
NFAS SA: ALL 0'S

IMPEDANCE: TERMINATE  LOS THRES: 32 0s
LINE:      75 OHMS
CLK A-OUT: INTERNAL   OUT TM SL: SINGLE
                                TIME SLT: 1_
                                IN  TM SL: SAME

PATTERN:  511
INVERTED: NO
```


SETUP Allows you to load setups from a file, save current setups, access the Auto Log setup menu, or access the Circuit Analysis Setup menu.

- LOAD** Loads setups from a file. A pop-up window appears so you can choose the desired file.
- SAVE** Saves the current setups to a file. You are prompted for a file name.
- AUTO LOG** See Section 2.4.
- CIRCUIT ANALYSIS** Lets you specify thresholds by which the results of the test can be evaluated.

```
BERT CIRCUIT ANALYSIS
ANALYSIS: ON
REF LABEL:GN NAUTEL_
ANALYSIS DEFINITION:
          % ERROR FREE SECS THRESHOLD
EXCELLENT:100.00 %
GOOD:      99.00_ %
POOR:      98.00_ %
UNACCP TBL:LESS THAN POOR
```

ANALYSIS Lets you enable or disable circuit analysis. If you enable the analysis, you can select threshold levels which will be associated with excellent, good, and poor levels.

SOURCE The line tested or data to be reviewed.

- LINE** Perform BERT.
- STATS FILE** Review previously saved statistic file.
- REV STATS** Review most currently run statistics.

LINE TYPE Indicates the type of live data line.

- FAS CHNL** Channelized Facility.
- 2Mb UNFRMD** Unframed line operating at 2 Mbit/s.
- DATA INTFC** Performs BERT on other data interfaces. See BER Test 2 in Section 3.1.

Note: For DATA INTFC clocking options, see Appendix.

MODE (Available only if LINE TYPE is set to DATA INTFC.) The emulation mode. Either DTE or DCE.

TYPE (Available only if LINE TYPE is set to DATA INTFC.) Type of data interface. One of: V.24, V.35, EIA 449, EIA 530, X.21.

TX CLOCK (Available only if LINE TYPE is set to DATA INTFC.)
RX CLOCK Specifies the transmit (TX) or receive (RX) clock source. For a detailed explanation of the various clocking configurations, see the Appendix.

INTERFACE Use appropriate interface clock.

INTERNAL Use internal clock, and set the clock rate at the SPEED: field. Value entered must be a multiple of 56 or 64. Maximum allowable value is 2048. Units are in Kbps.

EXTERNAL Use clock frequency from the BNC input connector labelled EXT CLK.

The clock rate limits are listed in the table below.

Interface Type	Lower Limit	Upper Limit
V.24	1200 bps	19.2 Kbps
V.35, EIA 449, EIA 530, X.21	1200 bps	2.048 Mbps

INV CLK (Available only if LINE TYPE is set to DATA INTFC.) Lets you invert the clock and trigger on the opposite clock edge.

NONE No clock inversion.

IN Invert the receive clock.

OUT Invert the transmit clock.

BOTH Invert both receive and transmit clocks.

CONFIG Selects the type of emulation configuration.

DROP&INSRT Drop and Insert. This mode enables the DST 2000 to drop specified time slots and insert a BERT pattern onto the 2 Mbit/s facility without disrupting other time slots. See BER Test 3 in Section 3.1.

TERMINAL Configure the DST 2000 to emulate a terminal. See BER Test 1 in Section 3.1.

CRC-4 Available only if FRAMING is set to FAS. 4-bit Cyclic Redundancy Check multiframe structure. CRC-4 coding resides in TS0 of the multiframe structure.

OFF CRC-4 signalling is disabled.

ON CRC-4 signalling is enabled.

- TS16 SIG** Available only if FRAMING is set to FAS. Selects the type of signalling used in time slot 16.
- NONE Treat as regular time slot.
 - CAS Channel Associated signalling.
 - CCS Common Channel Signalling.
- CODING** Defines how Mark and Space will be shown on the line.
- HDB3 An HDB3 code will be substituted for any occurrence of 4 consecutive zeroes in the line. This has the effect of reducing the number of zeroes on the line. HDB3 codes are different from regular data because they contain a bipolar violation.
 - AMI Alternate Mark Inversion is used as the coding scheme on the line. Opposite polarities will be used to indicate subsequent Marks.
- NFAS SA** Allows user to set the SA bits in the non-FAS bytes.
- ALL 0'S Available only if CONFIG is set to TERMINAL. All SA bits in the non-FAS bytes are cleared to 0.
 - BYPASS Available only if CONFIG is set to DROP&INSRT. SA bits received on the input will be allowed to pass to the output unchanged.
 - USER A pop-up window lets you set or clear any SA bit in the non-FAS bytes.
- IMPEDANCE** Sets the input impedance of the DST 2000.
- ISOL-MON When monitoring at an isolated monitor jack, use this setting to verify the matching pattern (e.g. ALT1-0, 511, 2e15-1, QRSS, etc.) is received correctly.
 - BRIDGE When monitoring at a normal jack (i.e. not an isolated monitor jack), use bridge impedance to verify that the matching pattern is received correctly.
 - TERMNATE Use this when you need to transmit onto the G.703 (2 Mbit/s) facility. See BER Test 1 and BER Test 3 in Section 3.1.
- LINE** Select the matching cable impedance, 75 Ohms for the 75 Ohm coaxial cable, 120 Ohms for the 120 Ohm shielded twisted pair, balanced cable.

- CLK A-OUT** Specifies the source of the A-OUT clock. Not user-selectable if CONFIG is set to DROP&INSRT.
- LOOP Recovered clock from received signal on Port A-IN.
 - EXTERNAL External signal present on EXT CLK connector.
 - INTERNAL Test sets internal clock.
- CLK B-OUT** (Available only if CONFIG is set to DROP&INSRT.) Specifies the source of the B-OUT clock. Set to LOOP.
- FALL BK** (Available only if CLOCKS A-OUT is set to LOOP.) Lets you specify the fall back (backup) clock should the loop clock become disabled due to received signal loss.
- PATTERN** Specifies the pattern for the BER test. One of: 511, 2047, 4095, 2e15-1, 2e20-1, 2e20 CCITT (CCITT V.57), 2e23-1, ALT 1-0, MARK (all ones), SPACE (all zeroes), 1:7, 2 IN 8, QRSS, 16BIT USER.
- Note: For 16BIT USER you key in a binary pattern up to 16 bits. The entry is 1's and 0's. Any number other than a 1 or 0 will automatically be converted to a 1. The LSB (right-most bit) is transmitted first.
- CLOCK REF** Selects the reference clock for clock slip calculation. Clock slips are calculated as bit slips.
- B-IN Use the B-IN signal frequency as the reference clock frequency.
 - EXTERNAL Use the clock source BNC input connector (labelled EXT CLK) as the reference clock frequency.
 - NONE Clock slips are not calculated.
- TX ON** Selectable only if CONFIG is set to DROP&INSERT. Selects the data transmission port.
- A-OUT Data is transmitted on port A-OUT and received on port A-IN.
 - B-OUT Data is transmitted on port B-OUT and received on port B-IN.
- BLK SIZE** Selects the size of the block used for the test. One of: 10e3 (1,000 bits), 10e4 (10,000 bits), 10e5 (100,000 bits), 10e6 (1 million bits), 10e7 (10 million bits), 10e8 (100 million bits), 10e9 (1,000 million bits).
- DURATION** Selects the length of the test. One of: CONT (continuously), 1 MIN, 5 MIN, 15 MIN, 1 HOUR, 12 HOUR, 24 HOUR, 10 BLKS, 100 BLKS, 1000

BLKS, 10e4 BLKS (10,000 blocks), 10e5 BLKS (100,000 blocks), 10e6 BLKS (1 million blocks).

LOS THRES Loss of signal threshold. Lets user define the maximum allowable number of consecutive zero bits in data stream. A signal loss condition is declared when this threshold is reached or exceeded.

OUT TM SL Selects transmit time slots.

SINGLE Selects a single time slot (64 Kbps) to perform the BER test. You specify the number of the time slot (between 1 and 31) to transmit the BERT pattern on.

MULTIPLE Used when running BERT on multiple (up to a maximum of 31) time slots. "Y" indicates a time slot is selected. The **[SET ALL]** softkey selects all available time slots to perform a full 1.984 Mbit/s framed BERT. The **[CLR ALL]** softkey clears all time slots. The **[SET]** and **[CLR]** softkeys are used to set or clear individual time slots. When you finish selecting, press **[DONE]**.

Note: For multiple time slot selection, you must choose the same number of time slots for IN and OUT, although the time slots can be different.

IN TM SL Selects receive time slots.

SAME Selects the receive time slots to be the same as the transmit time slots.

SINGLE You specify the number of the time slot (between 1 and 31) to receive the BERT pattern on.

MULTIPLE Used when running BERT on multiple (up to a maximum of 31) time slots. "Y" indicates a time slot is selected. The **[SET ALL]** softkey selects all available time slots to perform a full 1.984 Mbit/s framed BERT. The **[CLR ALL]** softkey clears all time slots. The **[SET]** and **[CLR]** softkeys are used to set or clear individual time slots. When you finish selecting, press **[DONE]**.

Note: For multiple time slot selection, you must choose the same number of time slots for IN and OUT, although the time slots can be different.

3.3 Running a BERT

After you enter the configuration parameters for the test, as described in Section 3.2, press the **ENTER/START** key. The following statistical results screen is displayed.

```
BERT START:15:00:33 01/19/94
RUNNING

          6.821 STATISTICS

BITS RX  2.044e+08 SYNC LOSS SECS      0
BIT ERRS          0 ERRORED SECS      0
BER        0.000e+00 SEV ERR SECS     0
                    %ERR FREE SECS 100.00
BLKS RX    204353 UNAVAIL TIME  0:00:00
BLK ERRS    0 AVAIL TIME    0:01:43
SYNC LOSS   0 DEGRADED MINS  0
PAT SLIPS   0 ELAPSED TIME  0:01:43

CIRCUIT ANALYSIS: EXCELLENT
LOW SAMPLE

REFERENCE STANDARD: GN NAVTEL
DSO BASIC LVR 1 EVENT ERR CLEAR
STATS MON LOG RATE STATS
```

This screen is automatically displayed when you press the **ENTER/START** key at the BERT setup menu. To return to this BERT statistic screen from another screen, press the **BERT STATS** softkey.

- BITS RX** Number of bits received by the DST 2000 while in synchronization with the signal.
- BIT ERRS** Number of incorrect received bits.
- BER** Bits in error divided by bits received in floating point notation.
- BLKS RX** Number of blocks of data received by the DST 2000 while in synchronization.
- BLK ERRS** Total number of blocks containing at least one bit error while in synchronization.
- SYNC LOSS** A sync loss is defined as 250 bit errors in any 1000-bit block of data.

PAT SLIPS	<p>A total count of pattern slips seen while the DST 2000 has been running. A pattern slip is counted when the receive pattern has slipped by one or more bits. Pattern slips could indicate timing problems on the network.</p> <p><u>Note:</u> Pattern slips are not counted if you choose any of the following patterns for the test: ALT1-0, MARK, SPACE, 1:7, 2 in 8, 16 BIT USER.</p>
SYNC LOSS SECS	Total seconds elapsed while out of sync. Note that a sync loss second can occur if the DST 2000 goes out of and back into sync in the same second.
ERRORED SECS	Total available time in which one or more bit errors are detected.
SEV ERR SECS	Severely errored seconds. Total of 1-second intervals in which the BER is worse than $1 \times 10e-3$, or sync loss or signal loss occurred.
%ERR FREE SECS	$\text{Error free seconds} = \frac{(\text{Available time} - \text{Errored seconds})}{\text{Available time}} \times 100\%$
UNAVAIL TIME	Time duration with at least 10 consecutive seconds with a BER worse than $1 \times 10e-3$ (or sync loss seconds or signal loss seconds). A transition from available time to unavailable time occurs if 10 consecutive seconds having a BER worse than $1 \times 10e-3$ elapse.
AVAIL TIME	Time duration with at least 10 consecutive seconds with a BER equal or better than $1 \times 10e-3$. A transition from unavailable time to available time occurs if there is an occurrence of 10 consecutive seconds having a BER better than or equal to $1 \times 10e-3$ without synchronization losses.
DEGRADED MINS	Number of 1-minute intervals which have an average bit error rate worse than $1 \times 10e-6$. A one minute interval is defined as removing unavailable seconds and severely errored seconds from the total time and then consecutively grouping the remaining seconds into blocks of 60.
ELAPSED TIME	<p>Length of time since you last pressed ENTER/START or the CLEAR STATS softkey to start the test.</p> <p>Note: ELAPSED TIME = UNAVAIL TIME + AVAIL TIME</p>

3.4 Layer 1 Statistics

The Layer 1 Statistics screen displays statistics about your 2 Mbit/s signal. To display this screen press the **LYR 1 MON** softkey.

```

BERT      START:11:28:34 11/11/93
RUNNING
E1 STATS                                     A-IN
CODE ERRS                                     0
CODE ERT  0.000e+00
FRAMES    3.200e+05 SIG LOSS                 0
FRAME ERR                                     0
FRAME ERT 0.000e+00 SIG LOSS SECS           0
CAS FRMS   19999 CODE ERR SECS              0
CRC4 FRMS  19999 FRM LOSS SECS              0
CRC4 ERR   0 CAS MFL SECS                   0
CRC4 ERT  0.000e+00 CRC4 MFL SECS           0
FEBES      0 ERR'D SECS                     0
AIS         0 SEVERR'D SECS                  0
FRM LOSS   0 %ERRFREE SECS                  100
CRC4 MFL   0 UNAVAIL TM 0:00:00
CAS MFL    0 AVAIL TIME 0:00:40
AIS TS16   0 ELAPSED TM 0:00:40
SIGNL NFAS BERT EVENT ERR CLEAR
BITS  DN  STATS LOG  RATE  STATS
  
```

- CODE ERRS** A bipolar violation which is not part of HDB3 coding.
- CODE ERT** Code Error Rate = Code Errors÷bits received.
- FRAMES** Number of 256-bit CEPT frames received.
- FRAME ERR** Number of frames whose FAS or non-FAS byte is in error
- FRAME ERT** Frame error rate. FRAME ERT = FRAME ERR ÷ Number of frames.
- CAS FRMS** Number of CAS multiframes (16 frames) received.
- CRC4 FRMS** Number of CRC-4 multiframes (16 frames) received.
- CRC4 ERR** Number of CRC-4 errors received.
- CRC4 ERT** CRC-4 Error Rate = CRC4 errors ÷ (CRC frames x 2).
- FEBES** Number of Far End Block Errors received.
- AIS** Alarm Indicator Signal (or all ones unframed) is a signal transmitted by the intermediate equipment

	indicating it has received an improper signal from the other end.
FRM LOSS	Loss of frame synchronization. This condition is reported when 3 consecutive FAS+non-FAS pairs are received in error.
CRC4 MFL	CRC-4 Multi Frame Loss. This condition is caused by a loss of the CRC-4 frame alignment signal.
CAS MFL	CAS Multi Frame Loss. This condition is caused by a loss of the CAS frame alignment signal.
AIS TS16	Alarm Indicator Signal on Time Slot 16. This signal (all ones) is transmitted by the intermediate equipment on time slot 16 when it has received improper signalling on time slot 16 from the other end.
CLK SLIPS	Total difference in bits between the clock on Port A-IN and the reference clock as indicated in the CLOCK REF field in the setup screen. With no phase shift between the clocks, CLK SLIPS would read zero. If the A-IN clock is faster than the reference, clock slips increment. If the A-IN clock is slower than the reference, clock slips decrement. CLK SLIPS has an accuracy of ± 1 .
SIG LOSS	The number of consecutive 0 bits received has equalled or exceeded the Loss Of Signal Threshold (LOS THRESH) as defined in the G.703 (2 Mbit/s) setup menu.
SIG LOSS SECS	Total number of seconds in which signal loss condition is in effect.
CODE ERR SECS	A second containing 1 or more code errors.
FRM LOSS SECS	A second containing 1 or more frame loss conditions.
CAS MFL SECS	A second containing 1 or more CAS Multi Frame Loss conditions.
CRC4 MFL SECS	A second containing 1 or more CRC-4 Multi Frame Loss conditions.
ERR'D SECS	Errored Seconds is a second which contains: <ul style="list-style-type: none"> • 1 or more frame errors and/or • 1 or more CRC-4 errors and/or • 1 or more frame loss, CAS multi frame loss, CRC-4 multiframe loss or signal loss conditions.
SEV ERR'D SECS	Severely Errored Second (SES) is a second which contains: <ul style="list-style-type: none"> • 64 or more frame errors and/or • 817 or more CRC-4 errors and/or • 1 or more frame loss, CAS multiframe loss, CRC-4 multiframe loss, or signal loss conditions.
%ERR FREE SECS	Percentage of error free seconds = (available time – errored seconds) ÷ available time x 100%.

- UNAVAIL TM** Unavailable time is the time during which a failed signal state is in effect. A failed signal state is declared after 10 consecutive SESs and is cleared after 10 consecutive non-SESs.
- AVAIL TIME** Available time is the time during which a failed signal state is NOT in effect. A failed signal state is declared after 10 consecutive SESs and is cleared after 10 consecutive non-SESs.
- ELAPSED TM** Length of time since you last pressed **ENTER/START** or the **CLEAR STATS** softkey to start the test.
- Note: Elapsed tm = Unavail tm + Avail time.

3.5 Softkey and Hardkey Features of BERT

- To insert a single bit error in the BER test, press the **ERR RATE** softkey and select “single Error” from the pop-up window. Then a single bit error is inserted every time **INSERT ERROR** is pressed.
- To specify an automatic error rate between 10e-3 (1÷1,000) and 10e-9 (1÷100,000,000) to be inserted in the pattern, press the **ERR RATE** softkey. To insert the error, press the **INSERT ERROR** key. To stop the insertion, press the **INSERT ERROR** key again.
- Press the **LYR 1 MON** softkey to access the layer 1 statistics. Please refer to Sub-Section “2.3 Running the 2 Mbit/s Monitor Test” for a description of the layer statistics, and to Sub-Section “2.5 Run/Halt Time Features of the 2 Mbit/s Monitor Test” for the features available in the Layer 1 Monitor screen.

Note: In BERT TERMINAL mode, only the A-IN statistics will be available. In DROP&INSRT mode, both A-IN and B-IN statistics will be available. The **LYR 1 MON** softkey will not be available when running Data Interface BERT. Also, **HANDSFREE ON/OFF**, **TALK**, and **VOLUME UP/DOWN** hardkeys are not valid in BERT.

- To view a summary of the BERT or G.703 (2 Mbit/s) setups, press the **VIEW SETUP** hardkey. If the BERT Setup Summary is displayed, the **LYR 1 SETUP** softkey lets you view the layer 1 setups. If the Layer 1 Setup Summary is displayed, the **BERT SETUP** softkey lets you access the BERT Setup Summary screen. To return to the BERT G.821 results display at any time, press the **BERT STATS** softkey.

Note: The **LYR 1 SETUP** softkey is not available when running Data interface BERT.

- To change configuration to single time slot BERT when running a test on multiple time slots, press the **DS0** softkey. A pop-up window appears to let you select the DS0 time slot. Once you select the time slot, press the **RUN DS0** softkey to suspend the current BERT and initiate the DS0 BERT. If you decide not to run the DS0 BERT after you have pressed the **DS0** softkey, press the **CANCEL DS0** softkey to remove the pop-up window and continue the BER Test without interruption.
- To change back to the original G.703 (2 Mbit/s) BERT once the DS0 BERT is running, press the **E1/FE1** softkey.
- Press the **HISTORY RESET** hardkey to reset all the receive (RX) status LEDs.

- The **BASIC STATS** and **ALL STATS** softkeys let you toggle between displaying a basic set of statistics (BIT ERRS, BER, BLK ERRS and % ERR FREE SECS) and displaying all the BERT statistics.

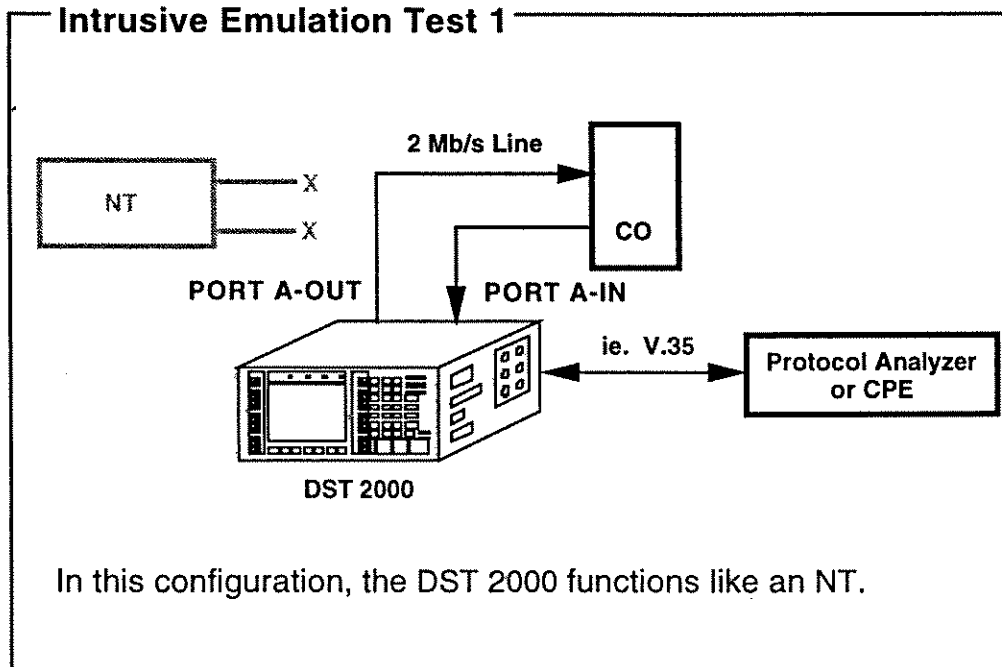
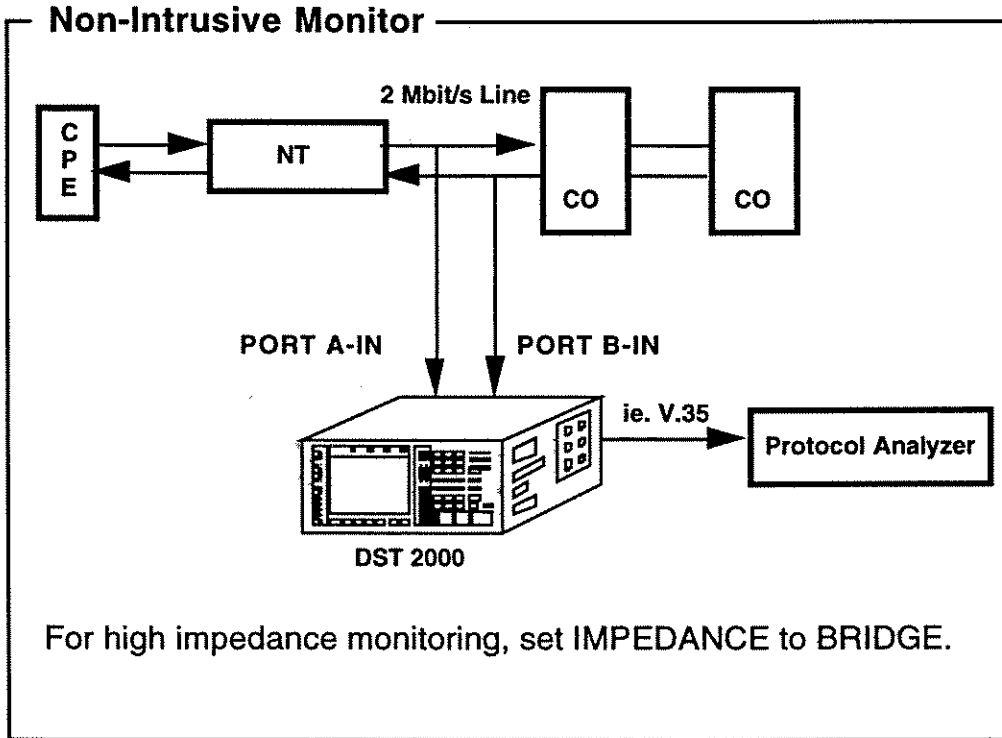
Note: A similar pair of softkeys are present in the Layer 1 Monitor Statistic screen, which toggles to basic and all statistic displays for layer 1.

Tests Using Data Interfaces

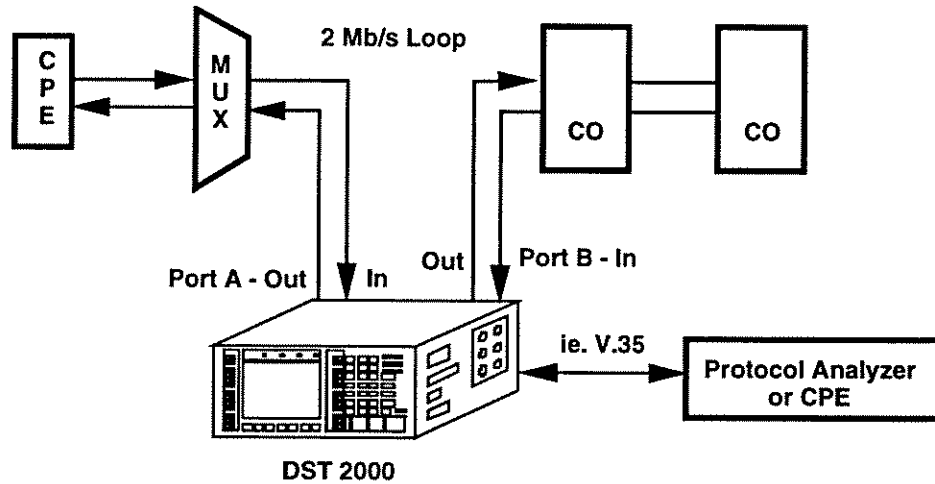
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4.1 Typical Connections

The following configurations can be used to test data services at full or fractional G.703 (2 Mbit/s) rates using the data interfaces on the DST 2000.



Intrusive Emulation Test 2 Drop & Insert Configuration



This configuration allows data to be transmitted and received in either direction to/from the point of insertion of the DST 2000 to/from any device connected to a selected data interface at n X64 kbit/s transmission rate, up to 1.984 Mbit/s (framed) on selected time slots.

4.2 Configuring the Data Interface Setup Menu

1. At the DST 2000 Main Menu, select G.703 2 Mb (E1) MONITOR & EMULATION. The following menu is displayed:

```
G.703 2Mb (E1) MAIN MENU
(R1.00 Jan 1994)

1 MONITOR & AUTOCONFIGURE (LAYER 1)
2 BERT (FAS FRMD, 2Mb UNFRMD, DATA I/F)
3 TESTS USING DATA INTERFACES
4 ANALOG & VOICE TESTS
5 REVIEW LOG FILE

Select by number, or position
highlight bar and press <ENTER>
```

2. Select TESTS USING DATA INTERFACES. The following screen appears:

```
E1 DATA INTERFACE SETUP
SETUP
SOURCE: LINE          CLOCK REF: NONE
CONFIG: TERMINAL     TX ON: A-OUT
INTF MODE: DCE EM
INTF TYPE: V.35
FRAMING: FAS
CRC-4: ON
TS16 SIG: CAS
CODING: HDB3
NFAS SA: ALL 0'S

IMPEDANCE: TERMINATE  LOS THRES: 10 0s
LINE: 75 OHMS        OUT TM SL: MULTIPLE
CLK A-OUT: INTERNAL  IN  TM SL: SAME
```


- SETUP** Allows you to load setups from a file, save current setups, access the Auto Log setup menu, or access the Circuit Analysis Setup menu.
- LOAD** Loads setup from a file. A pop-up window appears so you can choose the desired file.
 - SAVE** Saves the current setups to a file. You are prompted for a file name.
 - AUTO LOG** See Section 2.4.
- SOURCE** Select the line to be tested or data to be reviewed.
- LINE** Displays statistical data based on performance of the line.
 - STATS FILE** Displays statistics from a previously saved file.
 - REV STATS** Displays most currently run statistics.
- CONFIG** Select the type of test to be run.
- MONITOR** Data time slots will be extracted from transmit and receive lines and both will be sent out to the data interface. See Non-Intrusive Monitor in Section 4.1.
 - DROP&INSRT** Drop and insert. See Intrusive Emulation Test 2 in Section 4.1.
 - TERMINAL** The DST 2000 will emulate a CSU/DSU. See Intrusive Emulation Test 1 in Section 4.1.
- INTF MODE** Preset to MONITOR if CONFIG has been set to MONITOR. Preset to DCE EM (DCE emulation) if CONFIG has been set to DROP&INSERT or TERMINAL.
- INTF TYPE** Select the data interface to be used, either V.24, V.35, EIA 449, EIA 530, or X.21.
- FRAMING** The framing format.
- FAS** Frame alignment signal is forced.
- CRC-4** Cyclic Redundancy Code.
- TS16 SIG** Indicate the time slot 16 signal.
- NONE** No time slot 16 signalling.
 - CAS** Channel Associated Signalling.
 - CCS** Common Channel Signalling.
- CODING** Indicate how Mark and Space will be shown on the G.703 line.

- HDB3** Reduces the number of consecutive zeroes on the line by substituting any occurrence of 4 consecutive zeroes with an HDB3 code. HDB3 codes are different from regular data on the line because they contain a bipolar violation.
- AMI** Alternate Mark Inversion is used as the coding scheme on the line. Opposite polarities will be used to indicate subsequent Marks.
- NFAS SA** Indicates the state of the non frame alignment signal bits.
- ALL 0's** All SA bits will be cleared to 0. Available only if CONFIG is set to TERMINAL.
- BYPASS** SA bits received on the input will be allowed to pass to the output unchanged. Available only if CONFIG is set to DROP&INSRT.
- USER** A pop-up window lets you set or clear any SA bit.
- IMPEDANCE** Input impedance of the DST 2000.
- ISOL-MON** Choose ISOL-MON if you are connected to protected or isolated monitor jacks.
- BRIDGE** Causes the impedance looking into the receivers of the DST 2000 to be high so the presence of the instrument on the line will not affect the service. See Non-Intrusive Monitor in Section 4.1.
- TERMNATE** Choose TERMINATE when performing an intrusive emulation test. See emulation diagrams in Section 4.1.
- LINE** Select matching cable impedance.
- 75 OHMS** For 75 ohm coaxial cable with BNC connector.
- 120 OHMS** For 120 ohm balanced cable with Siemens connector.
- FALL BACK CLOCK** Lets you specify the fall back (backup) clock that will be used should the loop clock become disabled due to received signal loss.
- CLOCK REF** Indicates how Clock Slips are to be calculated. Clock Slips are calculated by subtracting the reference clock frequency from the A-IN receive signal frequency.
- B-IN** Use the B-IN signal frequency as the reference clock frequency.
- EXTERNAL** Use the clock source BNC input connector (labelled EXT CLK) as the reference clock frequency.
- NONE** Clock slips are not calculated.

TX ON Indicate how data is to be transmitted. Available only if CONFIG is set to DROP&INSRT.

A-OUT Data is inserted on line A-OUT.

B-OUT Data is inserted on line B-OUT.

LOS THRES Loss of signal Threshold. Lets user define the maximum allowable number of consecutive zero bits in data stream. A signal loss condition is declared when this threshold is reached or exceeded.

OUT TM SL Select transmit time slots.

SINGLE Selects a single time slot (64 Kbps) to perform the BER test. You specify the number of the time slot (between 1 and 31) to transmit the BERT pattern on.

MULTIPLE Used when running BERT on multiple (up to a maximum of 31) time slots. "Y" indicates a time slot is selected. The **SET ALL** softkey selects all time slots to perform a full 1.984 Mbit/s framed BERT. The **CLR ALL** softkey clears all time slots. The **SET** and **CLR** softkeys are used to set or clear individual time slots. When you finish selecting, press **DONE**.

Note: For multiple time slot selection, you must choose the same number of time slots for IN and OUT, although the time slots can be different.

IN TM SL Select receive time slots.

SAME Selects the receive time slots to be the same as the transmit time slots.

SINGLE You specify the number of the time slot (between 1 and 31) on which to receive the BERT pattern.

MULTIPLE Used when running BERT on multiple (up to a maximum of 31) time slots. "Y" indicates a time slot is selected. The **SET ALL** softkey selects all time slots to perform a full 1.984 Mbit/s BERT. The **CLR ALL** softkey clears all time slots. The **SET** and **CLR** softkeys are used to set or clear individual time slots. When you finish selecting, press **DONE**.

Note: For multiple time slot selection, you must choose the same number of time slots for IN and OUT, although the time slots can be different.

4.3 Running the Data Interface Test

1. Be sure you have configured the DATA INTERFACE SETUP menu as Section 4.2 describes.
2. To run the test, press the **ENTER/START** key. The following statistics are displayed:

```
E1 DIFC START:15:32:57 11/11/93
RUNNING
E1 STATS A-IN
CODE ERRS 0
CODE ERT 0.000e+00
FRAMES 7.040e+05 SIG LOSS 0
FRAME ERR 0
FRAME ERT 0.000e+00 SIG LOSS SECS 0
CAS FRMS 44000 CODE ERR SECS 0
CRC4 FRMS 44000 FRM LOSS SECS 0
CRC4 ERR 0 CAS MFL SECS 0
CRC4 ERT 0.000e+00 CRC4 MFL SECS 0
FEBES 0 ERR'D SECS 0
AIS 0 SEUERR'D SECS 0
FRM LOSS 0 %ERRFREE SECS 100
CRC4 MFL 0 UNAVAIL TM 0:00:00
CAS MFL 0 AVAIL TIME 0:01:28
AIS TS16 0 ELAPSED TM 0:01:28
SIGNAL NFAS EVENT CLEAR
BITS ON LOG [ ] [ ] STATS 0
```

CODE ERRS	A bipolar violation which is not part of HDB3 coding.
CODE ERT	Code Error Rate = Code Errors÷bits received.
FRAMES	Number of 256-bit CEPT frames received.
FRAME ERR	Number of frames whose FAS or non-FAS byte is in error
FRAME ERT	Frame error rate. FRAME ERT = FRAME ERR ÷ Number of frames.
CAS FRMS	Number of CAS multiframes (16 frames) received.
CRC4 FRMS	Number of CRC-4 multiframes (16 frames) received.
CRC4 ERR	Number of CRC-4 errors received.
CRC4 ERT	CRC-4 Error Rate = CRC4 errors ÷ (CRC frames x 2).
FEBES	Number of Far End Block Errors received.
AIS	Alarm Indicator Signal (or all ones unframed) is a signal

	transmitted by the intermediate equipment indicating it has received an improper signal from the other end.
FRM LOSS	Loss of frame synchronization. This condition is reported when 3 consecutive FAS+non-FAS pairs are received in error.
CRC4 MFL	CRC-4 Multi Frame Loss. This condition is caused by a loss of the CRC-4 frame alignment signal.
CAS MFL	CAS Multi Frame Loss. This condition is caused by a loss of the CAS frame alignment signal.
AIS TS16	Alarm Indicator Signal on Time Slot 16. This signal (all ones) is transmitted by the intermediate equipment on time slot 16 when it has received improper signalling on time slot 16 from the other end.
SIG LOSS	The number of consecutive 0 bits received has equalled or exceeded the Loss Of Signal Threshold (LOS THRESH) as defined in the G.703 (2 Mbit/s) setup menu.
SIG LOSS SECS	Total number of seconds in which signal loss condition is in effect.
CODE ERR SECS	A second containing 1 or more code errors.
FRM LOSS SECS	A second containing 1 or more frame loss conditions.
CAS MFL SECS	A second containing 1 or more CAS Multi Frame Loss conditions.
CRC4 MFL SECS	A second containing 1 or more CRC-4 Multi Frame Loss conditions.
ERR'D SECS	Errored Seconds is a second which contains: <ul style="list-style-type: none"> • 1 or more frame errors and/or • 1 or more CRC-4 errors and/or • 1 or more frame loss, CAS multi frame loss, CRC-4 multiframe loss or signal loss conditions.
SEV ERR'D SECS	Severely Errored Second (SES) is a second which contains: <ul style="list-style-type: none"> • 64 or more frame errors and/or • 817 or more CRC-4 errors and/or • 1 or more frame loss, CAS multiframe loss, CRC-4 multiframe loss, or signal loss conditions.
%ERR FREE SECS	Percentage of error free seconds = (available time – errored seconds) ÷ available time x 100%.
UNAVAIL TM	Unavailable time is the time during which a failed signal state is in effect. A failed signal state is declared after 10 consecutive SESs and is cleared after 10 consecutive non-SESs.
AVAIL TIME	Available time is the time during which a failed signal state is NOT in effect. A failed signal state is declared after 10 consecutive SESs and is cleared after 10 consecutive non-SESs.

ELAPSED TM Length of time since you last pressed **ENTER/START** or the **CLEAR STATS** softkey to start the test.

Note: Elapsed tm = Unavail tm + Avail time.

4.4 Softkey and Hardkey Features of the Data Interface Test

- To toggle between the basic statistics (BPV ERT, FRAME ERT, CRC ERT, and %ERR FREE SECS) and all of the statistics, press the **BASIC STATS** and **ALL STATS** softkeys.
- To save the statistics to a file after you halt the test, press the **SAVE STATS** softkey. You will be prompted for a file name.
- To display a list of the selected events which occurred during the test, press the **EVENT LOG** softkey.
- When running in Monitor or Drop & Insert mode, you will be able to toggle between the statistics collected from the A-IN and B-IN ports by pressing the **A-IN STATS** and **B-IN STATS** softkeys respectively.
- To display the signalling bits, press the **SIGNL BITS** softkey. This screen will only be accessible at run-time when TS 16 SIG is set to CAS.
- To reset the statistics to zero, press the **CLEAR STATS**, followed by the **YES** softkey.
- Press the **VIEW SETUP** hardkey to display a summary of the test configuration, without halting the test.
- Press the **HISTORY RESET** hardkey to reset all the receive (RX) status LEDs.
- The **NFAS ON** and **NFAS OFF** softkeys are used to toggle the header display to slow real-time snapshots of the non-FAS bytes and the normal run-time header. These keys are only available at run-time.

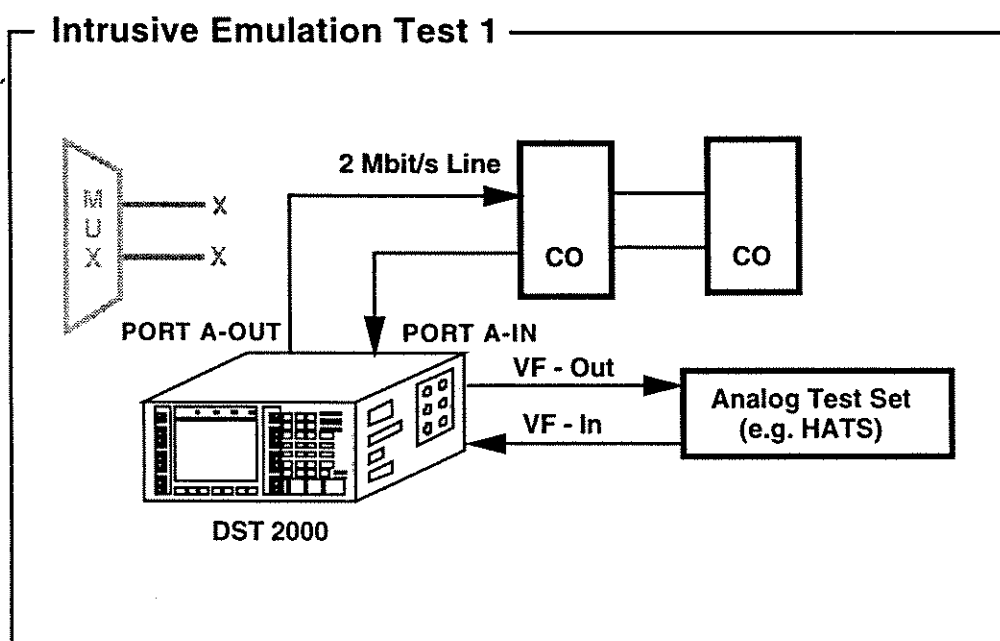
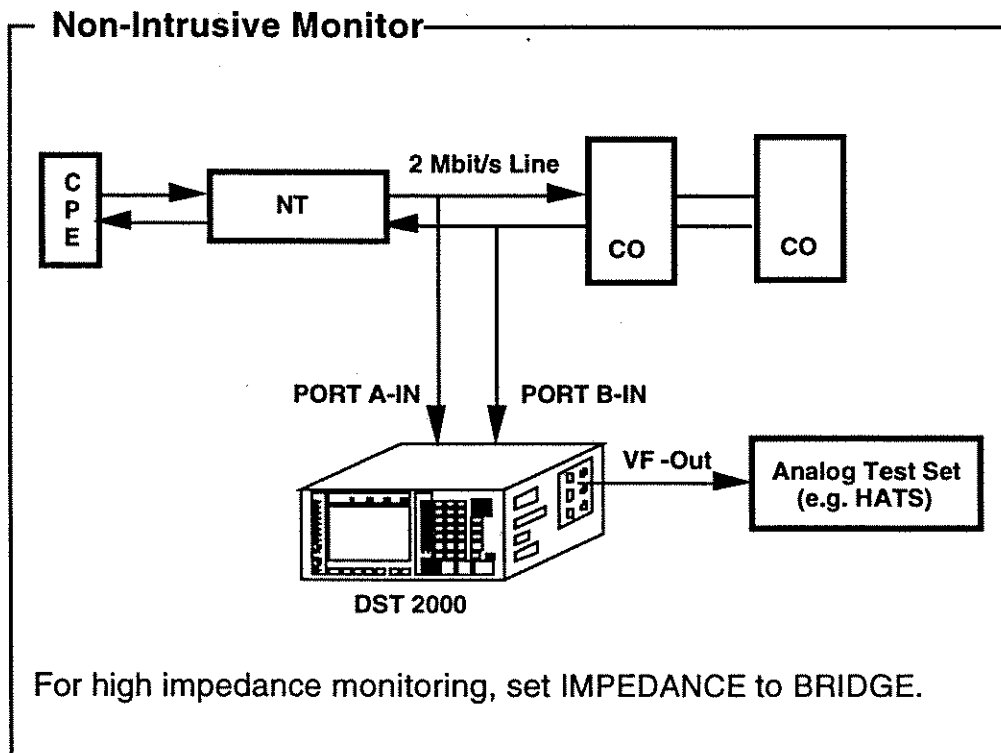


Analog and Voice Tests

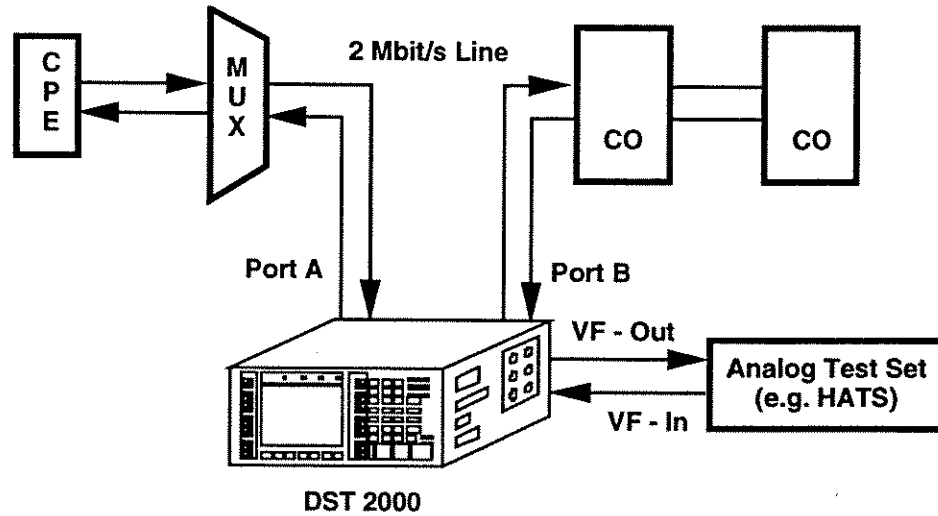
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5.1 Typical Connections

The two configurations below allow testing of analog time slots with external analog test sets, or talking/listening to PCM-encoded voice.



Intrusive Emulation Test 2 Drop & Insert Configuration



This configuration allows testing of analog time slots with external analog test sets or talking/listening to PCM-encoded voice.

Note: The internal analog/digital conversion process of the DST 2000 uses the complete DS0 time slot and does not implement robbed bit signalling. Therefore, signalling bits might be seen to toggle in the DS0 time slot used for analog testing.

5.2 Configuring the Analog and Voice Test

1. At the DST 2000 Main Menu, select G.703 2 Mb (E1) MONITOR & EMULATION. The following menu is displayed:

```
G.703 2Mb (E1) MAIN MENU
(R1.00 Jan 1994)

1 MONITOR & AUTOCONFIGURE (LAYER 1)
2 BERT (FAS FRMD, 2Mb UNFRMD, DATA I/F)
3 TESTS USING DATA INTERFACES
4 ANALOG & VOICE TESTS
5 REVIEW LOG FILE

Select by number, or position
highlight bar and press <ENTER>
```

2. Select ANALOG & VOICE TESTS. The following screen appears:

```
E1 ANALOG & VOICE TEST
SETUP
SOURCE: LINE          CLOCK REF: NONE
CONFIG: TERMINAL
MODE: EMULATION      TEST TYPE: ANALOG
FRAMING: FAS         TIME SLT: 1_
CRC-4: ON           TO: A-OUT
TS16 SIG: CCS       CODE: A-LAW
CODING: HDB3
NFAS SA: ALL 0'S
IMPEDANCE: ISOL-MON
LINE: 120 OHMS
CLOCKS          LOS THRES: 10 0s
A-OUT: INTERNAL
```

- SETUP** Allows test configuration to be loaded or saved.
- LOAD** Loads a setup from file. A pop-up window appears so you can choose from a list of previously saved files.
 - SAVE** Saves the current configuration to file. You are prompted for a file name.
 - AUTO LOG** See Section 2.4.
- SOURCE** Source of data to reviewed.
- LINE** Displays statistical data based on the performance of the line.
 - STATS FILE** Displays statistics from a previously saved file.
 - REV STATS** Displays most currently run statistics.
- CONFIG** Indicates type of test.
- MONITOR** Monitors voice or analog parameters. See Non-Intrusive Monitor in Section 5.1.
 - DROP&INSRT** Drop and insert voice or transmission impairments via TIMS. See Drop & In sert Test in Section 5.1.
 - TERMINAL** Voice or transmission impairments via TIMS. The DST 2000 will emulate an NT. See Intrusive Emulation Test in Section 5.1.
- MODE** (Not available if CONFIG set to MONITOR.) Set to EMULATION. Not user-selectable.
- FRAMING** The framing format.
- FAS** Frame alignment signal is forced.
- CRC-4** 4-bit Cyclic Redundancy Check multiframe structure. CRC-4 resides in time slot 0. Choose either OFF or ON.
- TS16 SIG** Selects the type of signalling used in time slot 16.
- NONE** No time slot 16 signalling. Treat as a regular time slot.
 - CAS** Channel Associated Signalling.
 - CCS** Common Channel Signalling.
- CODING** Defines how Mark and Space will be shown on the line.
- HDB3** An HDB3 code will be substituted for any occurrence of 4 consecutive zeroes in the line. This has the effect of reducing the number of zeroes on the line. HDB3 codes

are different from regular data because they contain a bipolar violation.

AMI Alternate Mark Inversion is used as the coding scheme on the line. Opposite polarities will be used to indicate subsequent Marks.

IMPEDANCE Sets the input impedance of the DST 2000.

ISOL-MON Use this setting when monitoring at an isolated monitor (DSX) jack.

BRIDGE When monitoring at a normal jack (i.e. not an isolated monitor jack), use bridge impedance. This high receiver impedance allows the DST 2000 to be on the line without affecting the service. See Non-Intrusive Monitor in Section 5.1.

TERMNATE Use this when you need to transmit onto the G.703 (2Mbit/s) facility. See Intrusive Emulation Test diagrams in Section 5.1.

LINE Select matching cable impedance.

75 OHM For 75 ohm coaxial cable with BNC connector.

120 OHM For 120 ohm balanced cable with Siemens connector.

FALL BACK CLOCK Lets you specify the fall back (backup) clock that will be used should the loop clock become disabled due to received signal loss.

CLOCK REF Indicates how Clock Slips are to be calculated. Clock Slips are calculated by subtracting the reference clock frequency from the A-IN receive signal frequency.

B-IN Use the B-IN signal frequency as the reference clock frequency.

EXTERNAL Use the clock source BNC input connector (labelled EXT CLK) as the reference clock frequency.

NONE Clock slips are not calculated.

TEST TYPE Select one of the two tests below.

VOICE Test voice data transmission on a single time slot via the built-in microphone/speaker (hands free mode) or via the hand set.

ANALOG Perform analog measurement tests by connecting an external analog test set (e.g. HATS) to the VF in/out ports.

- TIME SLT** You key in the number of the time slot to be monitored or emulated. 1 to 31.
- TO** Port to be used for time slot specified in TIME SLT. Testing mode is indicated by the CONFIG setting.
- For MONITOR mode, selections available are A-IN, A-OUT or BOTH.
- For DROP&INSRT mode, selections are A-OUT or B-OUT.
- For TERMINAL mode, selection is fixed at A-OUT.
- CODE** A-LAW Companding of voice data on the line is done according to A-LAW definition.
- U-LAW Companding of voice data on the line is done according to μ -LAW definition.
- LOS THRES** Loss of signal threshold. Lets user define the maximum allowable number of consecutive zero bits in data stream. A signal loss condition is declared when this threshold is reached or exceeded.

5.3 Running the Analog and Voice Test

1. Be sure you have configured the ANALOG & VOICE TEST menu as Section 5.2 describes.
2. To run the test, press the **ENTER/START** key. The statistics below are displayed.
3. Once you have started the test, you can listen to the voice time slot on the handset supplied with the option. Plug the handset into the RJ-11 connector on the right-hand side of the test set.

```
E1 ANLG START:16:18:28 11/11/93
RUNNING
E1 STATS A-IN
CODE ERRS          0
CODE ERT  0.000e+00
FRAMES      9.040e+05 SIG LOSS          0
FRAME ERR      0
FRAME ERT  0.000e+00 SIG LOSS SECS      0
                                CODE ERR SECS      0
CRC4 FRMS       56500 FRM LOSS SECS      0
CRC4 ERR        0
CRC4 ERT  0.000e+00 CRC4 MFL SECS        0
FEBES           0 ERR'D SECS             0
AIS              0 SEVERR'D SECS         0
FRM LOSS         0 %ERRFREE SECS        100
CRC4 MFL         0 UNAVAIL TM  0:00:00
                                AVAIL TIME  0:01:53
                                ELAPSED TM  0:01:53
NFAS  EVENT  [ ]  [ ]  [ ]  CLEAR
DN    LOG    [ ]  [ ]  [ ]  STATS
```

CODE ERRS	A bipolar violation which is not part of HDB3 coding.
CODE ERT	Code Error Rate = Code Errors/bits received.
FRAMES	Number of 256-bit CEPT frames received.
FRAME ERR	Number of frames whose FAS or non-FAS byte is in error
FRAME ERT	Frame error rate. FRAME ERT = FRAME ERR / Number of frames.
CAS FRMS	Number of CAS multiframes (16 frames) received.
CRC4 FRMS	Number of CRC-4 multiframes (16 frames) received.
CRC4 ERR	Number of CRC-4 errors received.
CRC4 ERT	CRC-4 Error Rate = CRC4 errors / (CRC frames x 2).
FEBES	Number of Far End Block Errors received.

AIS	Alarm Indicator Signal (or all ones unframed) is a signal transmitted by the intermediate equipment indicating it has received an improper signal from the other end.
FRM LOSS	Loss of frame synchronization. This condition is reported when 3 consecutive FAS/non-FAS pairs are received in error.
CRC4 MFL	CRC-4 Multi Frame Loss. This condition is caused by a loss of the CRC-4 frame alignment signal.
SIG LOSS	The number of consecutive 0 bits received has equalled or exceeded the Loss Of Signal Threshold (LOS THRESH) as defined in the G.703 (2Mbit/s) setup menu.
SIG LOSS SECS	Total number of seconds in which signal loss condition is in effect.
CODE ERR SECS	A second containing 1 or more code errors.
FRM LOSS SECS	A second containing 1 or more frame loss conditions.
CRC4 MFL SECS	A second containing 1 or more CRC-4 Multi Frame Loss conditions.
ERR'D SECS	Errored Seconds is a second which contains: <ul style="list-style-type: none"> • 1 or more frame errors and/or • 1 or more CRC-4 errors and/or • 1 or more frame loss, CAS multi frame loss, CRC-4 multiframe loss or signal loss conditions.
SEV ERR'D SECS	Severely Errored Second (SES) is a second which contains: <ul style="list-style-type: none"> • 64 or more frame errors and/or • 817 or more CRC-4 errors and/or • 1 or more frame loss, CAS multiframe loss, CRC-4 multiframe loss, or signal loss conditions.
%ERR FREE SECS	Percentage of error free seconds = (available time – errored seconds) / available time x 100%.
UNAVAIL TM	Unavailable time is the time during which a failed signal state is in effect. A failed signal state is declared after 10 consecutive SESS and is cleared after 10 consecutive non-SESS.
AVAIL TIME	Available time is the time during which a failed signal state is NOT in effect. A failed signal state is declared after 10 consecutive SESS and is cleared after 10 consecutive non-SESS.
ELAPSED TM	Length of time since you last pressed ENTER/START or the CLEAR STATS softkey to start the test. Note: Elapsed tm = Unavail tm + Avail time.

5.4 Softkey and Hardkey Features of the Analog and Voice Test

- To toggle between the statistics for the A-IN and B-IN ports, press the **A-IN STATS** and **B-IN STATS** softkeys.
- To toggle between the basic statistics (BPV ERT, FRAME ERT, CRC ERT, and %ERR FREE SECS) and all of the statistics, press the **BASIC STATS** and **ALL STATS** softkeys.
- To save the statistics to a file after you halt the test, press the **SAVE STATS** softkey. You will be prompted for a file name.
- To display the signalling bits, press the **SIGNL BITS** softkey. This screen is available only when TS16Sig is set to CAS. This screen will be accessible only at run-time.
- To display a list of the selected events which occurred during the test, press the **EVENT LOG** softkey.
- To reset the statistics to zero, press the **CLEAR STATS**, followed by the **YES** softkey.
- Press the **VIEW SETUP** hardkey to display a summary of the test configuration, without halting the test.
- Press the **HANDSFREE ON/OFF** hardkey if you wish to toggle between the built-in speaker (handsfree mode) and the handset. This key will be active only when TEST TYPE = VOICE. The Handsfree LED will indicate one of the following modes:
 - OFF The voice signal is directed to the handset port.
 - FLASHING Handsfree mode with microphone disabled. The voice signal is directed to the speaker. The **VOLUME UP/DOWN** hardkey can be used to adjust the speaker volume to the desired level.
 - ON Handsfree mode with microphone enabled. Voice signal will be directed to and from the speaker and microphone respectively. Press the **TALK** hardkey to toggle between the Flashing and On modes.
- The **NFAS ON** and **NFAS OFF** softkeys are used to toggle the header display to show real-time snap shots of the non-FAS bytes, and the normal run-time header. These keys are available only at run-time.
- Press the **HISTORY RESET** hardkey to reset all the receive (Rx) status LEDs.

Utilities

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6.1 Review Log File

This utility is used to examine Statistic or Event Log files that were saved by the AUTO LOG feature available in all test applications.

To use this utility, select REVIEW LOG FILE from the G.703 2Mb (E1) MAIN MENU.

- SCROLL DOWN** Scrolls towards the end of the file as long as you press the softkey.
- SCROLL UP** Scrolls towards the beginning of the file as long as you press the softkey.
- PAGE DOWN** Displays the next screen of data.
- PAGE UP** Displays the previous screen of data.
- SRCH FWD** Searches from the current cursor position to the end of the file for the string of data you enter. A pop-up window lets you enter the string. To move the cursor, press the Left Arrow and Right Arrow keys. To delete a character, press **DELETE**.
- SRCH BWD** Searches from the current cursor position to the beginning of the file for the string of data you enter. A pop-up window lets you enter the string. To move the cursor, press the Left Arrow and Right Arrow keys. To delete a character, press **DELETE**.
- TOP OF FILE** Positions the cursor at the beginning of the file.
- BOT OF FILE** Positions the cursor at the end of the file.
- SCROLL LEFT** Scrolls the screen leftward as long as you press the softkey.
- SCROLL RIGHT** Scrolls the screen rightward as long as you press the softkey.
- SRCH AGAIN** Repeats the search for the last string of data you entered.
- LOAD FILE** Lets you select a file to be displayed.

6.2 User Message & Text Editor

The Editor lets you create or browse through user and ASCII text messages. User messages created using the Editor can be used as transmission data in a BERT application.

1. Select USER MESSAGE & TEXT EDITOR from the DST 2000 MAIN MENU.
2. Select a code.
3. Using the following softkey descriptions, enter the text of a message; load a message from file, or save the message to a file:

FIND Search forward from the cursor's position to the end of the user message.

-FIND Search backward from the cursor's position to the start of the user message.

DON'T CARE Insert a "Don't Care" character, displayed on screen as \bar{X} .

MASK Insert a custom-made bitmask character. A pop-up window lets you enter any combination of 1's, 0's, and Don't Care bits.

FLAG Insert a flag character.

LOAD Load the contents of a previously saved USR file.

SAVE Save the user message currently displayed to a file. You are prompted for a file name.

NEW Clear the screen and start a new user message.



System Utilities

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7.1 System Configuration

To display this screen, select SYSTEM CONFIGURATION from the DST 2000 Main Menu. All setups made from the System Configuration menu will be saved in battery backed-up memory.

SYSTEM CONFIGURATION	
ITEM	VERSION
SYSTEM SOFTWARE:	
OPERATING SYSTEM:	R1.2
DATA LINK CONTROLLER (DLC):	R1.2
SYSTEM HARDWARE:	
MAIN PROCESSING CONTROLLER (MPC):	0
DATA LINK CONTROLLER (DLC):	1
T1/E1 & BRA:	0
E1 I/O:	3
UNIVERSAL INTERFACE:	0
(U35 EIA232 EIA449/530 X21)	
PORT SETUP	TIME SETUP
MISC SETUP	REMOTE SETUP
SOFTW RELS	SYS MEM

7.2 Port & Printer Setup

To display this screen, press the **PORT SETUP** softkey at the System Configuration menu (Section 7.1).

PORT & PRINTER SETUP	
PORT PARAMETERS	PRINTER PARAMETERS
SPEED: 9600	#LINE: 60_
STOPB: 1	WIDTH: 80
LEVEL: 8	FORM: % hex
PARITY: NONE	NEWLINE: % hex
FLOW CTL: NONE	INIT SEQ=:_____ hex
INTERFACE: DTE	PRINTER TYPE: TEXT

Note: DO NOT USE this screen to configure remote operation. See Section 7.5.

7.3 Real Time Clock Setup

To display this screen, press the **TIME SETUP** softkey at the System Configuration menu (Section 7.1).

```
REAL TIME CLOCK SETUP 10:58:00
11/12/93
DISPLAY: ON

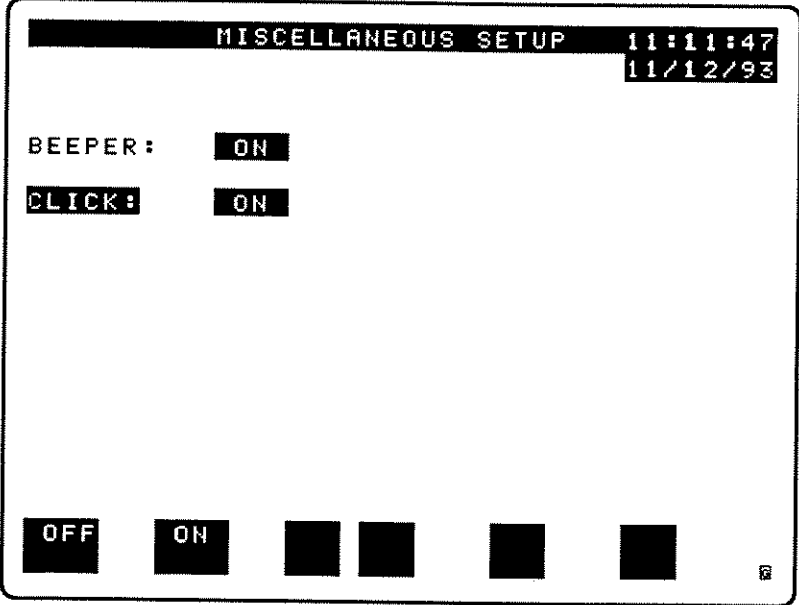
TIME SETTING          DATE SETTING
HOUR:      10          MONTH:    11
MINUTE:    56          DAY:      12
SECOND:    27          YEAR:     93

Use cursor keys to select item to be
modified. Press <ENTER> to set
time and date or <EXIT> to quit.

OFF  ON  [ ]  [ ]  [ ]  [ ]
```

7.4 Miscellaneous Setup

To display this screen, press the **MISC SETUP** softkey at the System Configuration menu (Section 7.1).



7.5 Remote Setup

The remote option is comprised of the DST 2000 firmware and the PC software. This section describes the DST 2000 firmware only. For a complete description of the remote function, see the manual that is supplied with the option.

1. At the DST 2000 Main Menu, select SYSTEM CONFIGURATION.
2. Press the **REMOTE SETUP** softkey. The following screen appears.

```
REMOTE OPERATION SETUP 11:28:31
                          11/12/93
OPERATION:ENABLE
CONNECT:  DIR LINK

SPEED:    9600
STOPB:    1
LEVEL:    8
PARITY:   NONE
INTERFACE:QTE

PASSWORD:  -----

Press <ENTER> to accept new parameters
```

3. Set the OPERATION field to ENABLE.
4. Choose one of the following options for CONNECT:

- DIR MODEM** There is a direct link between the modem on the PC side to the modem on the DST 2000 side. There is no need to dial a particular site number from the PC. Both modems must be Hayes compatible. If you choose Dir Modem, the USER DEFINED MODEM STRING field appears. Not a commonly used configuration.
- DIAL MODEM** The link between the modem on the PC side to the modem on the DST 2000 side is via a switched telephone network. Both modems must be Hayes compatible. If you choose Dial Modem, the USER DEFINED MODEM STRING field appears.
- DIR LINK** There is a direct link via an intermediate private line modem or a cable between the PC and the DST 2000. Set INTERFACE to a setting appropriate for the intermediate circuit.

5. Set the SPEED field for the specific end-to-end connection between your PC and the DST 2000.
6. Set the STOPB field to 1 (stop bit).
7. Set the LEVEL field to 8 (data bits per character) or to a setting needed by the intermediate network.
8. Set the PARITY field to NONE or to a setting needed by the intermediate network.
9. If the DST 2000 is connected to a modem (DCE), set the INTERFACE field to DTE.
If the DST 2000 is directly connected to the PC (DTE), set the INTERFACE field to DCE.
10. If you wish, enter a password in the PASSWORD field. You can enter up to 12 alphanumeric characters. The software distinguishes between upper and lower case.
The password you enter here must match the password on the PC side or no connection will be made. If you do not specify a password here, no password check will be done before communication regardless of what password is set on the PC.
11. If the CONNECT field is set to either DIR MODEM or DIAL MODEM, the USER DEFINED MODEM STRING field is displayed. In this field you can enter a character string that will be used for modem initialization. The character string you enter will be prefixed with the Hayes-compatible ATZ and suffixed with the Hayes-compatible command VI. If you do not enter a character string, the command ATZVI will be used alone to initialize the modem.
12. When you have completed setting the remote options, press the **ENTER/START** key.

7.6 Software Configuration

To display this screen, press the **SOFTW RELS** softkey at the System Configuration menu (Section 7.1).

SOFTWARE RELEASES	
SOFTWARE	VERSION
1 G.703 2Mb (E1) MONITOR & EMULAT	R1.0
2 BERT (FAS FRMD, 2Mb UNFRMD, DAT	R1.0
3 FRAME RELAY MONITOR & EMULATION	R1.1
4 USER MESSAGE & TEXT EDITOR	R1.2
5 FILE UTILITIES	R1.2

7.7 System Memory

To display this screen, press the **[SYS MEM]** softkey at the System Configuration menu (Section 7.1).

SYSTEM MEMORY		12:02:15
		11/12/93
TYPE	LOCATION	SIZE
STORAGE RAM	0	224K
APPLICATION ROM	2	1M
APPLICATION ROM	4	1M

7.8 File Utility and Transfer

This utility treats the DST 2000 memory as a disk (RAM disk). Files can be copied, deleted, printed, or transferred via the serial port. System and application files, designated by the letter "r" in the attributes (ATT) column, cannot be erased.

To display this screen, select FILE UTILITIES from the DST 2000 Main Menu.

```
FILE UTILITY: INTERNAL MEMORY
Total Free Space: 200192
Max File Size: 200192
FILES 39 ATT DATE TIME SIZE
BERT .APP 2r 12/31/93 12:48 3193
E1 .APP 2r 12/31/93 12:47 3171
FRAMERLY .APP 4r 12/02/93 11:03 214899
DSTDLC .BIN 4r 12/06/93 17:29 75776
FRDLC .BIN 4r 12/02/93 17:02 24576
SHELL .EXE 4r 08/30/93 15:08 9295
AUTOSAVE .OVL 4r 09/20/93 18:23 54365
BERTPRW .OVL 2r 12/20/93 09:57 77592
BROWSER .OVL 4r 07/12/93 17:14 87132
COMMJOB .OVL 4r 09/15/93 16:16 27808
E1 .OVL 2r 12/31/93 12:50 116078
E1_ANLG .OVL 2r 12/21/93 16:51 65483
E1_BERT .OVL 2r 12/30/93 14:50 133171
E1_CRD .OVL 2r 12/30/93 16:13 110594
COPY [ ] FORMAT FILE [ ] PORT
STORAG KFER [ ] SETUP
```

You can use File Utilities to send and receive any file. The DST 2000 uses the popular, error-free, XMODEM file transfer protocol. This lets you transfer files to or from a wide range of large and small computer systems (including most types of personal computers) through modems, a null modem cable, or other data connection. File transfer also facilitates file exchange (i.e. setup files) between two DST 2000s.

XMODEM (also called Christensen protocol) is a self-correcting asynchronous file transfer protocol. Using X MODEM, you can transfer a file over a very noisy telephone line via modems. It may take a long time, but if two computers are using XMODEM, the file is almost guaranteed to copy from one machine to the other perfectly. XMODEM breaks the file into 128 character pieces called records. Each record is checked individually and re-transmitted if not perfectly received at the other end.

1. From the DST 200 Main Menu, select File Utilities. The File Utility: Internal Memory screen will display.
2. Press the **PORT SETUP** softkey and choose the field values that match the computer to which the DST 2000 is connected.
3. Establish the data connection to the DST 2000.
4. Tell the other party (or computer) that you want to send or receive a file. XMODEM protocol *must* be used.
5. Press the **SEND FILE** softkey or the **RECEIVE** softkey.
6. *If you are sending*, use the up and down arrow keys to highlight the file you want to send, and press the **ENTER/START** hardkey.

If you are receiving, type a name for the incoming file as you want it to be saved on your disk. Make sure there is a disk in the drive and press the **ENTER/START** hardkey.

The file transfer begins. If you want to stop the file transfer before it ends, press the **CANCEL** softkey. Depending on the host computer, it may take a few moments for the transfer to stop, and you may see some garbled data and some sort of message from the host confirming that the transfer was stopped before it was completed.

7.9 User Message & Text Editor

This utility lets you create user files. User files share battery backed-up memory with Setup and result (statistical and Event log) files. If user files are numerous or long, less memory will be available for Setup and results files.

1. Select USER MESSAGE & TEXT EDITOR from the DST 2000 Main Menu.
2. Using the following softkey descriptions, enter the text of a message, load a message from file, or save the message to a file:
 - FIND** Search forward from the cursor's position to the end of the user message.
 - FIND** Search backward from the cursor's position to the start of the user message.
 - DON'T CARE** Insert a "Don't Care" character, displayed on screen as \bar{X} .
 - MASK** Insert a custom-made bitmask character. A pop-up window lets you enter any combination of 1's, 0's, and Don't Care bits.
 - FLAG** Insert a flag character.
 - LOAD** Load the contents of a previously saved USR file.
 - SAVE** Save the user message currently displayed to a file. You are prompted for a file name.
 - NEW** Clear the screen and start a new user message.

Data Interface Clocking Configurations

A.1	Introduction.....	A-2
A.2	Clocking options for DTE Emulation.....	A-4
A.3	Clocking options for DCE Emulation	A-7

A.1 Introduction

Figure 1 depicts the typical operation of standard clocking on data interfaces with distinctly different transmit and receive clocks.

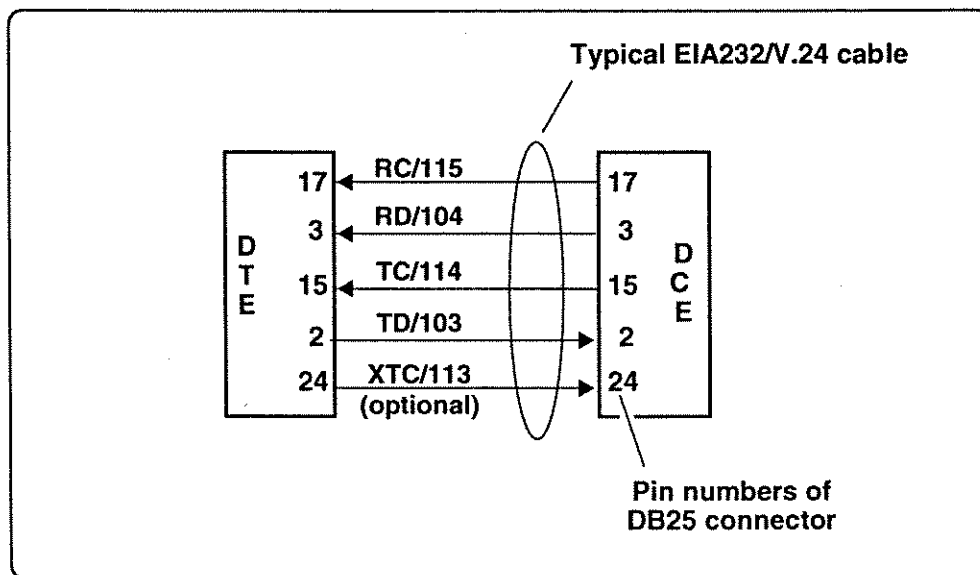


Figure 1. The BASIC data interface configuration.

The direction of the arrows indicate the source and destination of the clock signals. In the world of high speed, synchronous transmission, the transmit and the receive clocks (TC and RC) are most often provided by the data set or DCE. This creates contra-directional signalling between the transmit data (TD) and the transmit clock (TC). This contra-directional signalling can create timing problems on high speed circuits (56 kb/s and above).

The DST 2000 was developed to allow various clock configurations to help the user to resolve these problems. The following diagrams will describe how the DST 2000 will function to handle the various clocking needs of the user.

All diagrams in this document refer to signal the names of the EIA232 or V.24 interface because it is the most well known. However, all information presented here regarding the way clocking can be used, are correct for the V.35, EIA449/530 (V.36) interfaces as well.

Note: The X.21 data interface has only one clock signal, which is used for timing data travelling in both directions on the interface. Therefore, the clocking options described herein are not applicable to the X.21 interface.

The figures in this section show the data and timing circuits on the data interface. To simplify the diagrams, the other interface signals are omitted. Their proper operation is assumed, otherwise they are not relevant to this topic.

A.2 Clocking options for DTE Emulation

When configuring the DST 2000 for DTE emulation the RX Clock, used for sampling the received data (RD) could be either DCE provided (RC), Internal or External. The TX Clock is always XTC. The TX Clock source can be either "Interface" (TC from the DCE), "Internal" or "External". Figures 2, 3 and 4 depict each of these configurations.

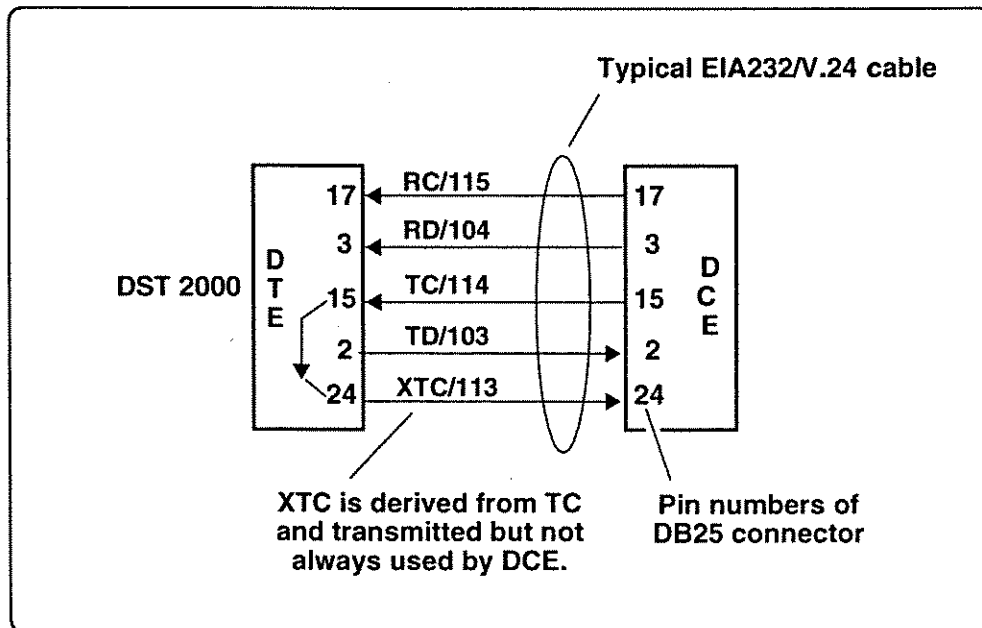


Figure 2. DTE Emulation, Option 1

TX Clock Source: "Interface" (Co-directional TD and XTC)

RX Clock Source: "Interface" (RC from DCE)

In this mode, clocking is provided by the DCE via the interface used for the test. The DST 2000 will transmit the receiver derived clock (XTC), to be used by the DCE to sample the transmitted data (TD). Depending on the DCE it may or may not use the XTC. At transmission speeds (>56/64 kb/s), it is recommended, if possible, to configure the DCE to use this DTE generated clock (XTC).

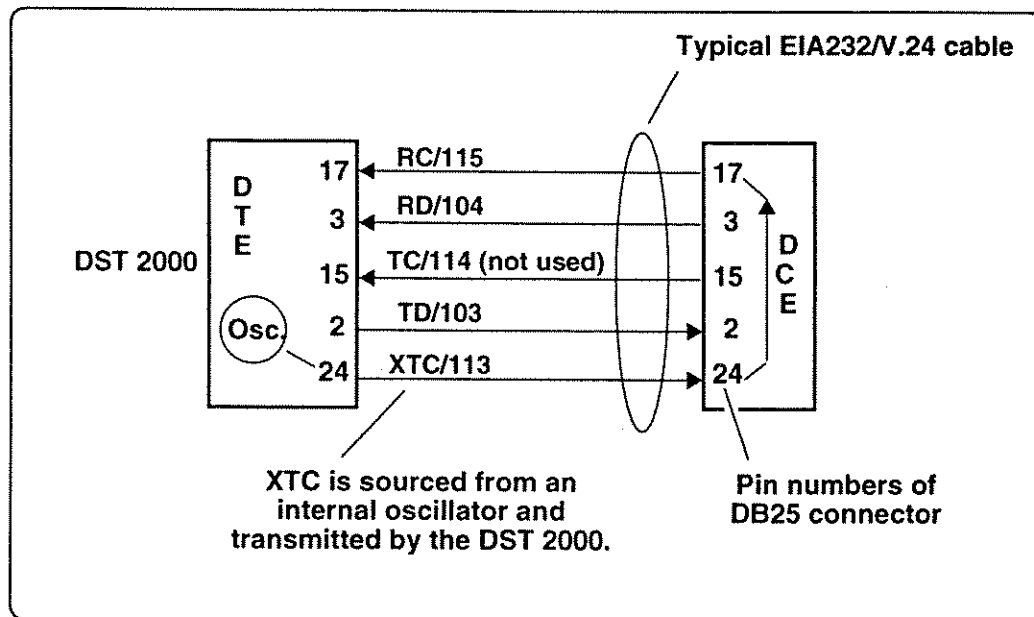


Figure 3. DTE Emulation, Option 2

TX Clock Source: "Internal" (Co-directional TD and XTC)

RX Clock Source: "Internal" or "Interface" (RC from DCE)

In this mode the XTC is provided by the INTERNAL oscillator of the DST 2000. (The DCE may or may not use the XTC for deriving RC.)

The RX clock source is either the same INTERNAL oscillator which is used for the XTC, or provided by the DCE (RC) via the data INTERFACE used for testing. (User selectable)

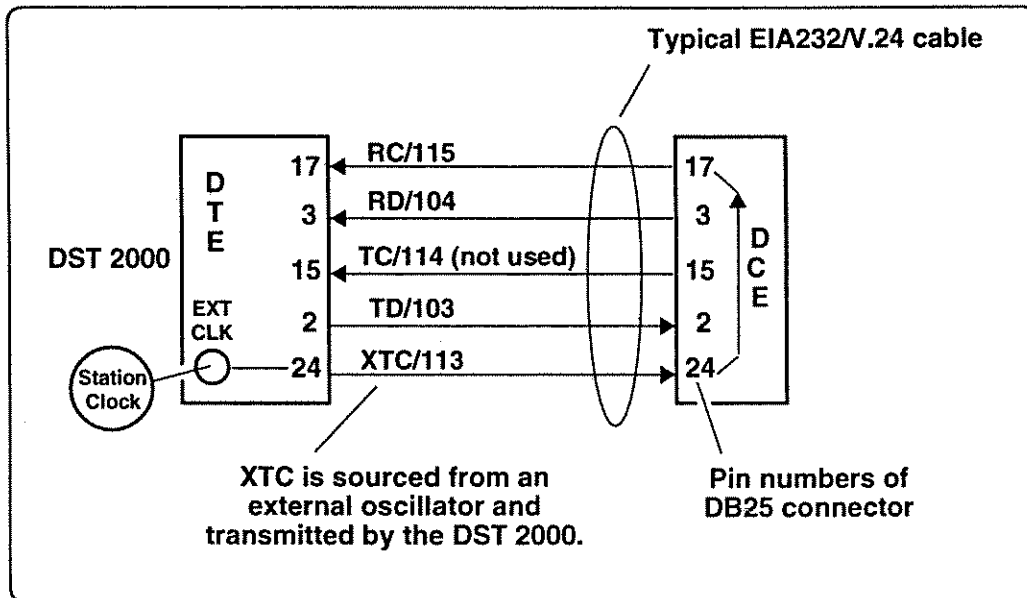


Figure 4. DTE Emulation, Option 3

TX Clock Source: "External" (Co-directional TD and XTC)
 RX Clock Source: "External" or "Interface" (RC from DCE)

In this mode XTC is provided by the DST 2000 based on an EXTERNAL clock source (i.e. station clock). This clock is provided via the BNC connector labelled "EXT CLK" on the connector panel of the DST 2000.

Note: This input requires a TTL level signal.

The RX clock is either derived from the EXTERNAL clock or it can be provided by the DCE (RC) on the data INTERFACE used for the test. (User selectable)

A.3 Clocking options for DCE Emulation

When configuring the DST 2000 for DCE emulation the sources of both the TX and the RX clocks are user selectable. From the DCEs perspective the TX Clocks are always TC and RC and the RX Clock is XTC. Figures 5 - 9 show the various configurations supported by the DST 2000.

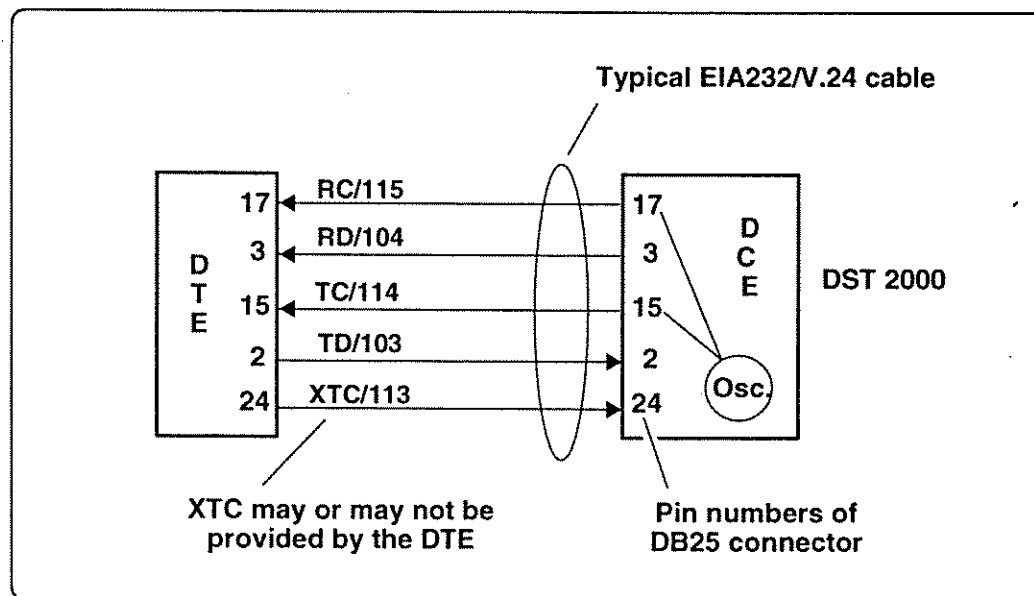


Figure 5. DCE Emulation, Option 1

Clock Sources: TX Clock: "Internal"

RX Clock: "Internal" (Contra-directional TD and TC)

Even if available, the XTC is not used by the DST 2000 (DCE). This is the most common mode of DCE emulation. Typical for the RS232 (V.24) interface. Both RC and TC are provided by the internal oscillator of the DCE. Hence the TD and the TC are travelling contra-directionally between the DTE and the DCE.

Note: In this configuration the DST 2000 will use the INTERNAL clock, to sample the received data from the DTE (TD).

The use of contra-directional clocks on high speed circuits (>56/64 kb/s) can cause timing problems. This is because the TC can become delayed travelling from the source (DCE) to the DTE. The DTE uses this clock to "clock out" the TD towards the DCE. Travelling to the DCE the TD gets delayed again. By the time the TD arrives to the DCE it can be sufficiently out of phase with the internal clock of the DCE to make it difficult for the DCE to "clock in" the TD accurately.

Note: The XTC may or may not be provided by the DTE. If XTC is not provided, it is not possible to set up the configuration on figure 6 below. Hence, clocking problems due to time delays may not be easily proven by the DST 2000.

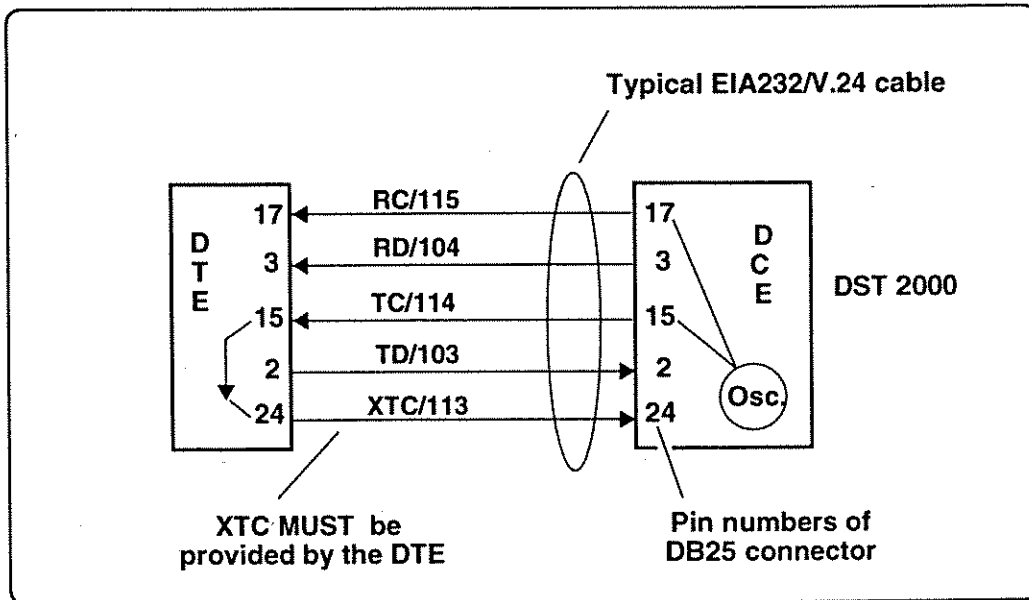


Figure 6. DCE Emulation, Option 2

Clock Sources: TX Clock: "Internal"
 RX Clock: "Interface" (Co-directional TD and XTC)
 The XTC is used by the DST 2000 (DCE)

This test setup is very similar to figure 5. It can be used to prove and resolve propagation delay caused timing problems, due to contra-directionally travelling TC and TD. Note that both RC and TC are provided by the INTERNAL clock of the DST 2000 emulating the DCE. However the DTE derives its transmit clock from the TC and transmits it as XTC co-directionally with the TD. The TD and XTC (travelling from DTE to DCE) are delayed evenly and arrive in phase to the DCE.

Note: In this configuration the DST 2000 will use the XTC, arriving via the data INTERFACE, to sample the received data from the DTE (TD).

Since co-directional clocking often solves propagation delay caused timing problems on high speed circuits (>56/64 kb/s), this is a very useful configuration to test this possibility. It is most suitable for tests via the V.35 or EIA449/530 (V.36) interfaces.

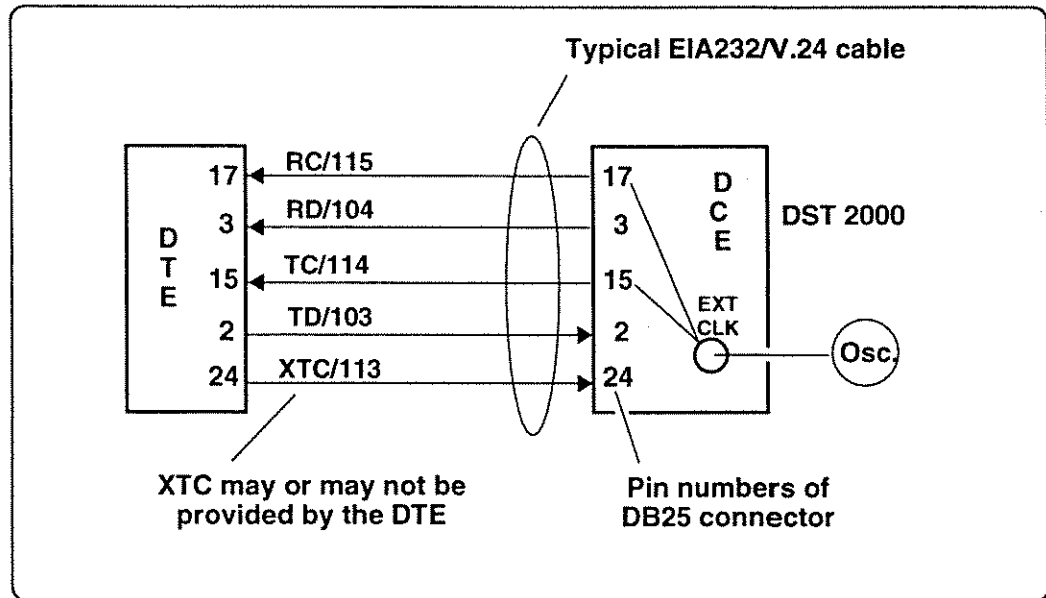


Figure 7. DCE Emulation, Option 3

Clock Sources: TX Clock: "External"

RX Clock: "External" (Contra-directional TD and TC)

The XTC is not used by the DST 2000 (DCE)

In this configuration the clock source is external to the DST 2000 emulating a DCE to sample the received data from the DTE (TD). Observe that the TD and TC are contra-directional.

Note: In this configuration the DST 2000 will use the EXTERNAL clock, to sample the received data from the DTE (TD).

Warning! Potential trouble at high speeds.

Observe that the XTC may or may not be provided by the DTE. XTC is not used by the DST 2000, the DCE, even if it is provided by the DTE. If XTC is not provided, it is not possible to set up the configuration in figure 8 below.

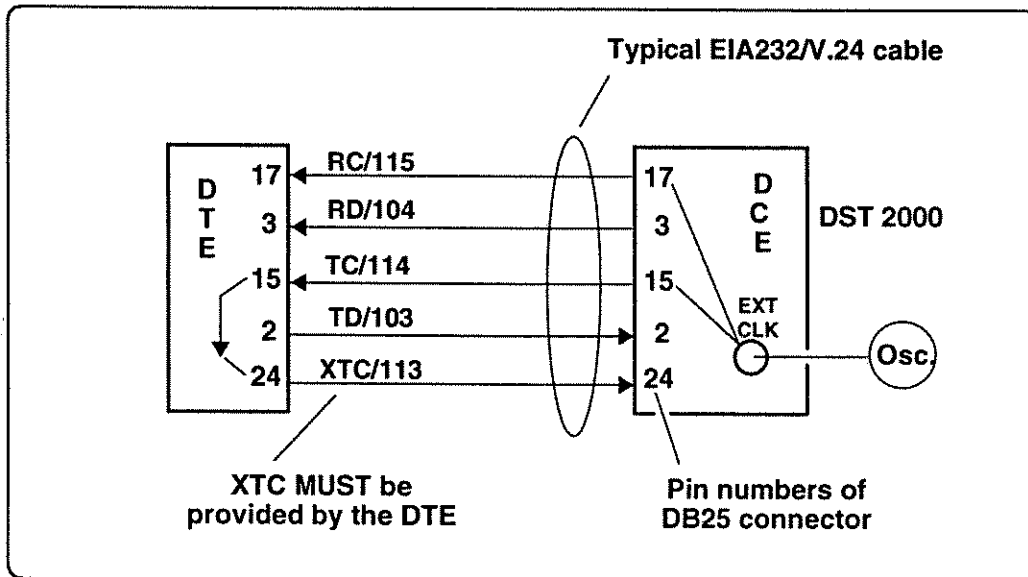


Figure 8. DCE Emulation, Option 4

Clock Sources: TX Clock: "External"

RX Clock: "Interface" (Co-directional TD and XTC)

The XTC is used by the DST 2000 (DCE)

This configuration is similar to the one on figure 6. In this configuration both the RC and the TC are provided by an EXTERNAL source to the DST 2000, which is emulating the DCE. However, the DTE derives its transmit clock from the TC and transmits it as XTC co-directionally with the TD.

Note: The DST 2000 (DCE) will use the XTC, arriving via the data INTERFACE used, to "clock in" the data received from the DTE (TD).

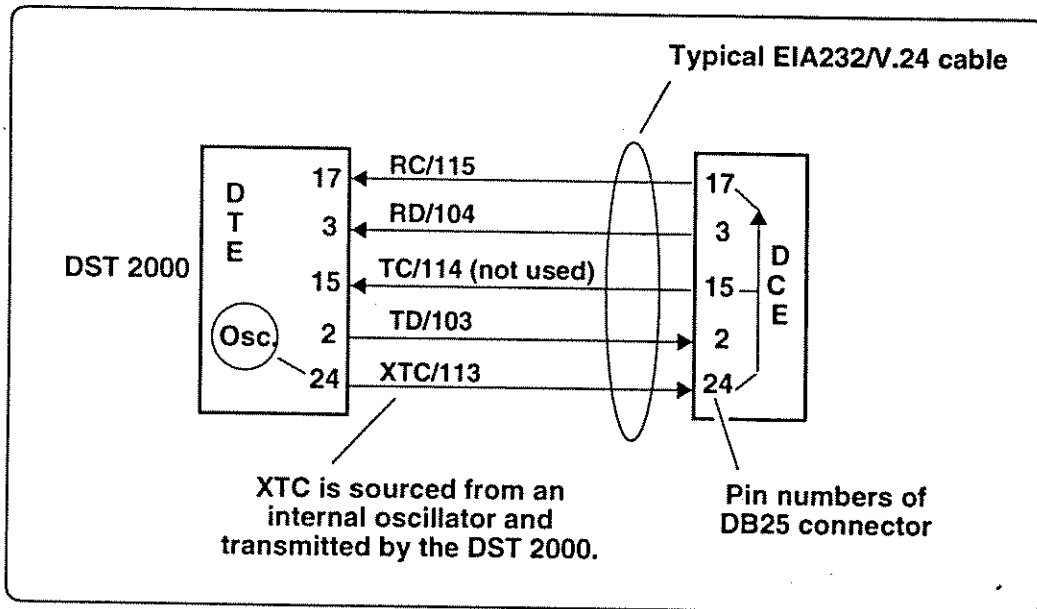


Figure 9. DCE Emulation, Option 5

Clock Sources: TX Clock: "Interface"
 RX Clock: "Interface" (Co-directional TD and XTC)
 The XTC is used by the DST 2000 (DCE)

Clocking is provided by the DTE via the data INTERFACE used for the test.

Note: The DST 2000 will use the XTC to sample the incoming TD as well as for "clocking out" the data it transmits towards the DTE (RD). Observe that both the TD & XTC as well as the RD & RC are co-directional.

This configuration, while not commonly used for synchronous data transmission, is suitable for high speed transmission.

Appendix B.

DST 2000 Interface Specifications and Pin Assignments

V.24 (EIA-232) Interface

Receivers

Maximum Data Rate:	256	Kb/s
Input Voltage (maximum):	±30	V
Positive Threshold (maximum):	2.8	V
Negative Threshold (minimum):	0.5	V
Unterminated Input Impedance (typical):	18	KΩ
Terminated Input Impedance (typical):	4.3	KΩ
Capacitance (maximum):	<2500	pF

Drivers

Maximum Data Rate:	128	Kb/s
Min ± Voltage into 3KΩ:	±10	V
Maximum Slew Rate:	30	V/μS
Maximum Short Circuit Current:	15	mA

Pin Assignments:

As per EIA-232-D (ISO 2110-1980). The following circuits are implemented:

<u>PIN</u>	<u>CIRCUIT NAME</u>	<u>EIA</u>	<u>ITU</u>
1	Shield (connected to chassis)		
2	Transmitted Data	TD	103
3	Received Data	RD	104
4	Request to Send	RTS	105
5	Clear to Send	CTS	106
6	Data Set Ready	DSR	107
7	Signal Ground		102
8	Data Carrier Detect	DCD	109
15	Transmit Clock (DCE)	TC	114
17	Receive Clock	RC	115
20	Data Terminal Ready	DTR	108
21	Signal Quality *	SQ	110
22	Ring Indicator *	RI	125
24	Transmit Clock (DTE)	XTC	113

(All other pins are not connected)

* SQ and RI do not have LED indicators but can be driven or monitored.

EIA-449/EIA-530 Interface

Receivers

Maximum Data Rate:	>2048	Kb/s
Differential Input Voltage (maximum):	±12	V
Non-Differential Input Voltage (maximum):	+10/-7	V
Differential Input Threshold:	±0.3	Volts
Unterminated Input Impedance (typical):	3.5	KΩ
Terminated Input Impedance (typical):	120	Ω

Drivers

Maximum Data Rate:	>2048	Kb/s
Minimum Differential Voltage into 100Ω:	3.0	V
Maximum Differential Voltage open:	6.0	V
DC Offset:	<3.0	V
Rise-Time (typical):	8.0	ns
Maximum Short Circuit Current:	<150	mA

Pin Assignments:

As per EIA-449 (ISO 4902-1980). The following circuits are implemented:

PIN	CIRCUIT NAME	EIA	ITU
1	Shield (connected to chassis)		
4	Send Data (A)	SD	103
5	Send Timing (A)	ST	114
6	Receive Data (A)	RD	104
7	Request to Send (A)	RS	105
8	Receive Timing (A)	RT	115
9	Clear to Send (A)	CS	106
11	Data Mode (A)	DM	107
12	Terminal Ready (A)	TR	108
13	Receiver Ready (A)	RR	109
15	Calling Indicator*	CI	125
17	Terminal Timing (A)	TT	113
19	Signal Ground	SG	102
20	DTE Common Return		102(a)
22	Send Data (B)	SD	103
23	Send Timing (B)	ST	114
24	Receive Data (B)	RD	104
25	Request to Send (B)	RS	105
26	Receive Timing (B)	RT	115
27	Clear to Send (B)	CS	106
29	Data Mode (B)	DM	107
30	Terminal Ready (B)	TR	108
31	Receiver Ready (B)	RR	109
33	Signal Quality *	SQ	110
35	Terminal Timing (B)	TT	113
37	DCE Common Return		102(b)

* SQ and CI are single ended and do not have LED indicators but can be driven or monitored.

EIA-449/EIA-530 Interface Conversion

The electrical characteristics of the transmitters and the receivers of the EIA-530 interface are equivalent to those of the EIA-449 interface. For this reason a simple, passive cable converter (GN Nettek P/N 59-102545A) can be used to connect the EIA-449 interface of the DST 2000 to an EIA-530 interface. The wiring of the converter module is shown on the table below.

Converter Module Pin Assignments:

EIA-530 Interface 25 pin connector		EIA-449 Interface 37 pin connector	
PIN		PIN	CIRCUIT NAME
1	GND	1	Shield (connected to chassis)
2	103	4	Send Data (A) (SD)
3	104	6	Receive Data (A) (RD)
4	105	7	Request to Send (A) (RS)
5	106	9	Clear to Send (A) (CS)
6	107	11	Data Mode (A) (DM)
7	102	19	Signal Ground (SG)
8	109	13	Receiver Ready (A) (RR)
9	115	8	Receive Timing (A) (RT)
10	109	31	Receiver Ready (B) (RR)
11	113	17	Terminal Timing (A) (TT)
12			Not Connected
13	106	27	Clear to Send (B) (CS)
14	103	22	Send Data (B) (SD)
15	114	23	Send Timing (B) (ST)
16	104	24	Receive Data (B) (RD)
17	115	26	Receive Timing (B) (RT)
18			Not Connected
19	105	25	Request to Send (B) (RS)
20	108	12	Terminal Ready (A) (TR)
21			Not Connected
22	107	29	Data Mode (B) (DM)
23	108	30	Terminal Ready (B) (TR)
24	113	35	Terminal Timing (B) (TT)
25			Not Connected

X.21/V.11 Interface

This interface is standard on the 2.048 Mbit/s, E1 models. T1 (1.544 Mbit/s) models can be connected to an X.21/V.11 interface by using a 15 pin to 37 pin conversion cable attached to the EIA-449 connector of the DST 2000. The wiring of the conversion module is shown below.

Receivers

The electrical characteristics of the receivers are the same as the receiver specifications for the EIA-449 interface (see previous page).

Drivers

The electrical characteristics of the drivers are the same as the driver specifications for the EIA-449 interface (see previous page).

Pin Assignments:

As per EIA-422 (ISO 4903).

The following circuits are implemented:

X.21/V11 Interface			EIA-449 Interface		
15 pin connector			37 pin connector		
PIN	ITU NAME		PIN	CIRCUIT NAME	
1	GND	-----	1	Shield (connected to chassis)	
2	TA	-----	4	Send Data (A)	(SD)
3	CA	-----	7	Request to Send (A)	(RS)
4	RA	-----	6	Receive Data (A)	(RD)
5	IA	-----	13	Receiver Ready (A)	(RR)
6	SA	-----	8	Receive Timing (A)	(RT)
7	BA			Not Connected	
8	GND	-----	19	Signal Ground	(SG)
9	TB	-----	22	Send Data (B)	(SD)
10	CB	-----	25	Request To Send (B)	(RS)
11	RB	-----	24	Receive Data (B)	(RD)
12	IB	-----	31	Receiver Ready (B)	(RR)
13	SB	-----	25	Request to Send (B)	(RS)
14				Not Used	
15		---- 4K7 Ω RES -----	37	DCE Common Return	

Note: BYTE clock is not supported.

V.35 Interface

Receivers

Maximum Data Rate:	>2048	Kb/s
Differential Input Threshold:	±0.05	V _{Peak}
Unterminated Input Impedance (typical):	3.5	KΩ
Terminated Input Impedance (typical):	160	Ω
Resistance between shorted terminals & ground:	150±15	Ω

Drivers

Maximum Data Rate:	>2048	Kb/s
Terminal to Terminal Voltage:	±0.55	V _{Peak}
Rise-Time (maximum):	20	ns
Source Impedance:	100±10	Ω
Resistance between shorted terminals & ground:	150±10	Ω
DC offset:	<0.3	V

V.28 Drivers and Receivers

See EIA-232 Specifications.

Pin Assignments:

As per ISO 2593-1984. The following circuits are implemented:

PIN	CIRCUIT NAME	EIA	ITU
A	Shield (connected to chassis)		
B	Signal Ground		102
C	Request to Send	RS	105
D	Clear to Send	CS	106
E	Data Set Ready	DSR	107
F	Receive Line Signal Detector	RLSD	109
H	Data Terminal Ready	DTR	108
J	Ring Indicator	RI	125
P	Send Data (A)	SD	103
R	Receive Data (A)	RD	104
S	Send Data (B)	SD	103
T	Receive Data (B)	RD	104
U	Serial Clock Transmit External (A)	SCTE	113
V	Serial Clock Receive (A)	SCR	115
W	Serial Clock Transmit External (B)	SCTE	113
X	Serial Clock Receive (B)	SCR	115
Y	Serial Clock Transmit (A)	SCT	114
AA	Serial Clock Transmit (B)	SCT	114

(All other pins are not connected)

E1 Interface

Key Parameters

Sensitivity of Receivers

- 20 dB from 3V peak to peak @ 120 Ω
- 30 dB patch bay compensation

Terminating Impedance

- Terminate - 120 Ω balanced or 75 Ω unbalanced
- Monitor - high impedance Bridge mode
- Isolated Monitor mode

Clock Slip Measurement:

- Difference between PORT A receive and PORT B receive or
- PORT A receive and External clock
- Resolution: 1 bit

Access to E1 systems

The DST 2000 can be connected to 2.084 Mb/s E1 carrier systems through the 120 ohm, balanced interface using the three prong banana (Siemens) connectors or via the 75 ohm, unbalanced interface using the BNC connectors.

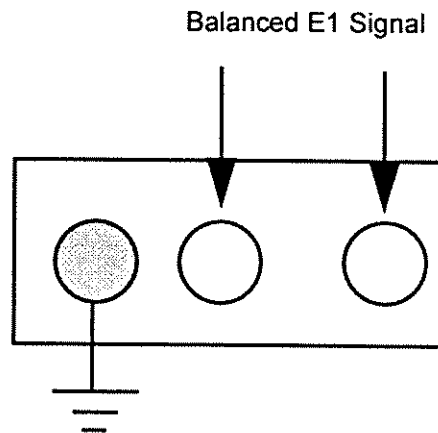


Figure 1. Pin assignment of the 120 ohm, 3 prong Siemens connector