USER'S GUIDE

T-COM 440B/T-ACE

Digital Communication Test Set

With Options

440B/T-ACE SW 3.5   S/N : _____
equipped with options:

        31   S/N : _____

      52B+   S/N : _____

      52C   S/N : _____

      53A   S/N : _____

Foreword

This User's Manual is complemented by a Service Manual for the 440B/T-ACE. This Service Manual contains information about the operation of the instrument, and its calibration, as well as detailed performance specifications for the instrument and its options.

How To Use This Quick Sheet Binder

This binder contains a series of Quick Sheets that provide step by step instructions for using the 440B with T-ACE enhancements and options. Numbered steps refer to a picture of the 440B front panel and individual screens, to make learning each function very easy.

It is very useful to read through the first four sections: **INTRODUCTION, RECEIVERS, TRANSMITTERS** and **SUMMARY/HISTORY** because they provide core information that will be used for all test configurations.

The Table of Contents provides the list of Tab Titles, and Quick Sheets numbers, with a brief description of what you will find in a given Quick Sheet.

1. Tabs are provided for quickly finding a topic, for example **DS0 MEASUREMENTS**, or **T1 LOOPBACK.**

2. Each section contains one or more Quick Sheets. For example. Tab Title **DS0A/B DATA** contains five Quick Sheets: 5B, 5C, 5D, 5E, and 5F.

3. Each Quick Sheet is numbered on the bottom right hand side of the page, and topic title is on the top of the page.

4. The individual page numbers appear on the top right hand corner of each page for quickly referencing to subsections in long Quick Sheets like DS0 MEASUREMENTS.

5. Some menu FLOW CHARTS are provided in the APPENDICES section to help understand the menu tree hierarchy.

Feel free to call the CXR telcom Technical Assistance Department at (510) 657-8810
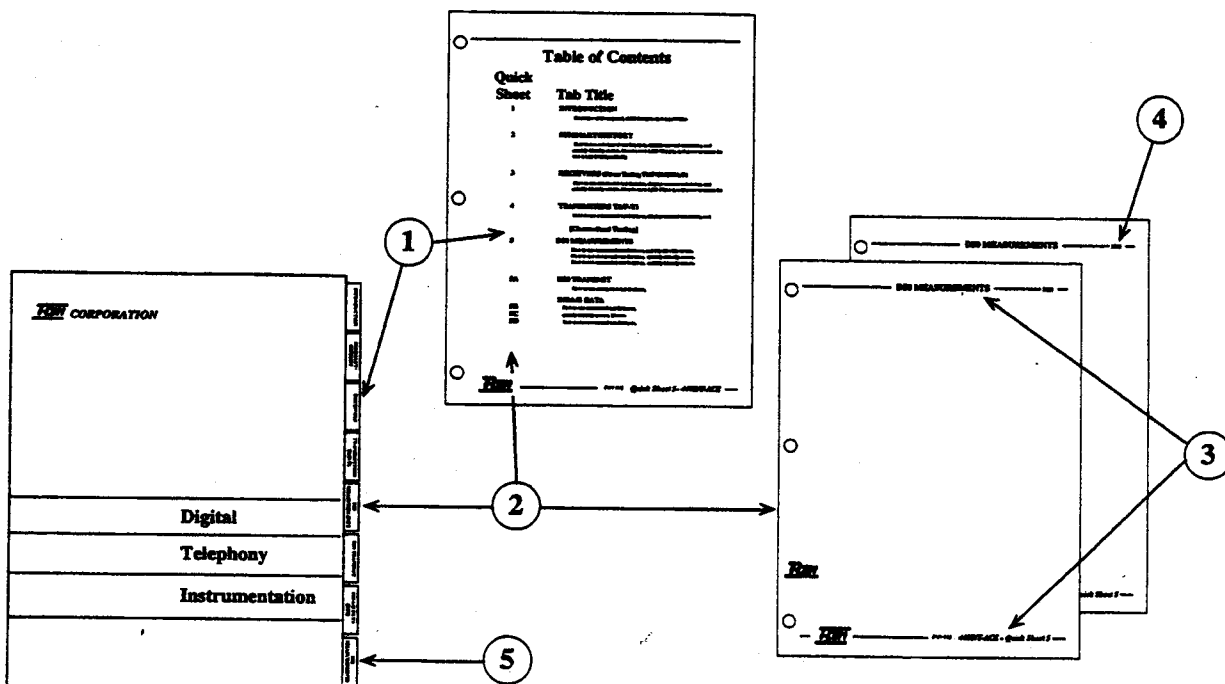
The T-COM 440B/T-ACE is warranted against defects in materials, software design and workmanship for a period of one year from the date of shipment. Under this warranty, T-COM will repair at no charge any product defect or failure not resulting from misuse, negligence, accident or unauthorized repairs or modifications.

T-COM does not assume any liability for consequential damages. We reserve the right to make changes in design and construction of our products at any time without incurring any obligation to alter units previously sold.

This warranty is in lieu of any other warranty expressed or implied except as specifically modified in writing by an officer of T-COM.

Notes:

- With the exception of transportation costs, there is no charge for repair of instruments under warranty.

- Estimates of charges for non-warranty or other service work will always be supplied, if requested, before work begins.

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[Test Set Configuration]

FLOW CHARTS/APPENDICES

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440B/TACE User's Guide
VERSION 6b
SW ver 3.3

Add-On Modules (as optioned)

The 440B is a comprehensive analyzer designed for DS0, DS1, DS3, and STS-1 SONET testing, depending on the options installed. This unit has the flexibility to handle applications as diverse as installing and maintaining T1 High-Cap circuits, SONET systems, Channel Banks, M13 multiplexers, Digital Switches/PBXs, and DS0A/B DDS Data services, to list a few. This Quick Sheet will help familiarize first-time users with the 440B front panel layout, user interface and capabilities. A variety of Quick Sheets have been prepared to cover specific topics.

The 440B supports the following test applications; depending on options installed:

- DS3 & STS-1 SONET Transmit and Receive (BERT and In-Service Monitoring) *Option 52C*
- DS2 (Monitor) *Option 52B+ or 52C*
- DS1C (Monitor) *Option 53A*
- DS1/T1 Transmit and Receive (BERT and In-Service Monitoring) *Base Unit*
- T1 Facilities Data Link Analysis (ESF & SLC-96) *Options 10 & 11*
- Fractional T1 (Contiguous & Non-contiguous BERT and In-Service Monitoring) *Base Unit*
- DDS (DS0/OCU-DP Interface) *Options 12 & 30*

- DS0 Channel Analysis
    a) DATA, DDS, DS0A/B subrate (BERT and monitoring) *Option 12*
    b) Voice, VF (transmit & measurement) *Base Unit*
    c) Signaling (signaling bit & telephone number transmit and display) *Option 06*
    d) Wink (timing measurement and wink generation) *Option 06*

For free Technical Support call T-COM at (408) 523-9900, 8:30-5:30 P.S.T.
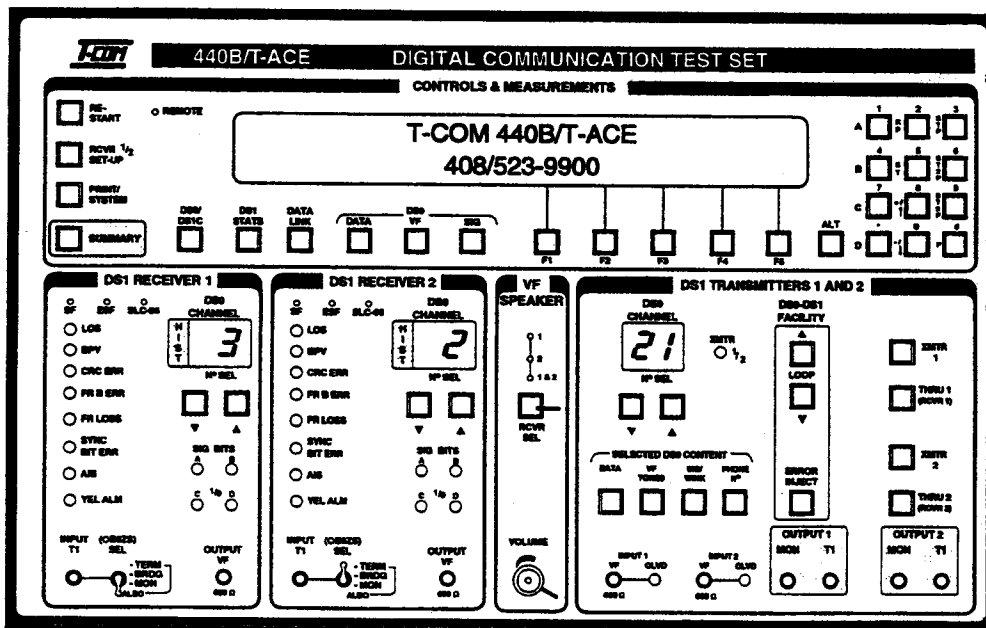
Front Panel Layout

The front panel is divided into five separate sections:

1.) DS1 Receiver 1, with DS0 Channel selection

2.) DS1 Receiver 2, with DS0 Channel selection

3.) Speaker selection and volume control

4.) DS1 Transmitter 1 and 2, with DS0 Channel insert

5.) Controls & Measurements
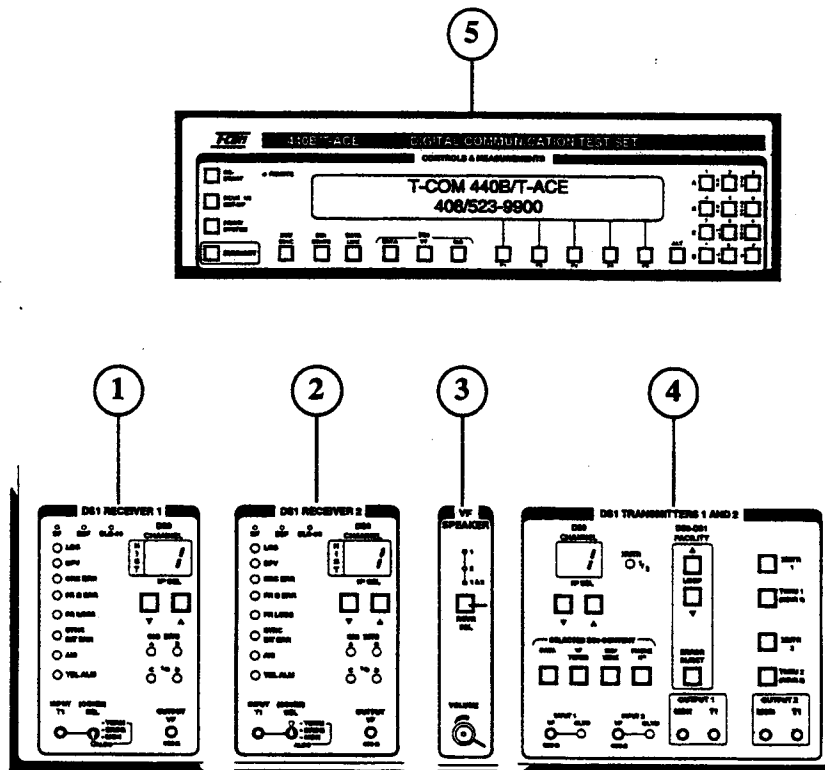
Rear Panel Layout

6.) ON/OFF Switch

7.) Fuse (3/4 Amp)

8.) 9-pin A/B/C/D Signaling Bit Output

9.) RS-232-C Printer Output, miscellaneous logic I/O and Remote Control port

10.) A/B/C/D Signaling Transmit Input jacks

11.) Option 30 Channel Unit interface

12.) Fan Enclosure

13.) AC Power Cord Plug
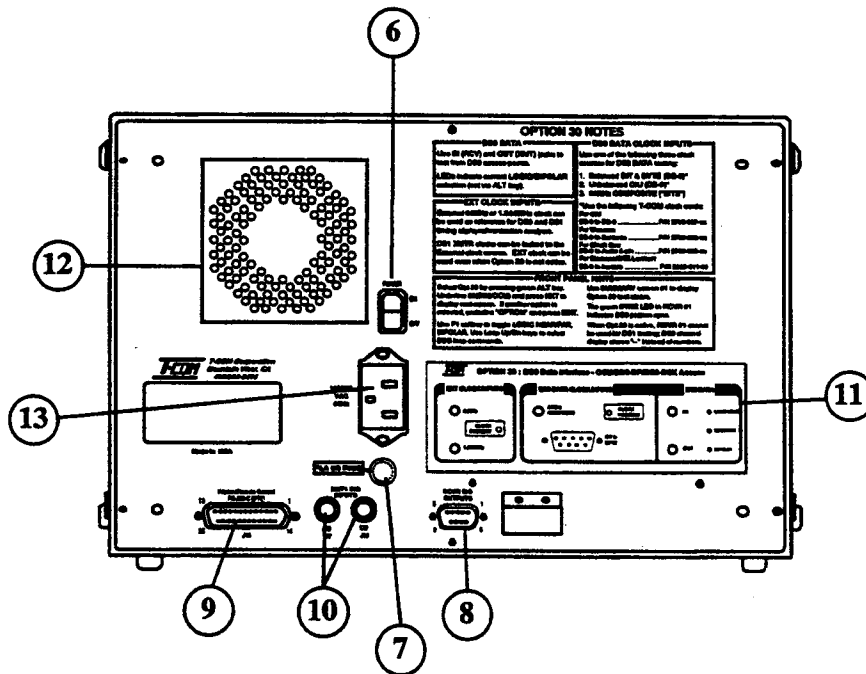
Note: The 440B uses a system of function keys to display screen menus and results. Whenever a key is pressed, it will slowly flash on and off to indicate that it has been chosen. The message displayed will always match the flashing key, so if a screen is unfamiliar, you can refer to the only flashing function key and read the description printed on the front panel.

1. Receivers 1 & 2 provide auto-pattern search, auto-frame, automatic error display, and counting. LEDs provide real-time error status, with history indication (see SUMMARY/HISTORY Quick Sheet). Since the receivers are completely independent, they simultaneously test two separate systems, or both directions of the same circuit.

2. SF/ESF/SLC-96 and B8ZS LEDs provide automatic Frame and Line Code indication.

3. Toggle switches provide setting for Monitor (-20dBDSX), Bridge and Terminate levels. Bridge and Terminate provide Automatic Line Build Out (ALBO).

4. Both DS1 receivers have a DS0 Channel number display identifying the selected channel (1-24). *(4a) A flashing Channel display indicates DS1 and/or DS0 error history for that receiver (Press SUMMARY to see results).* (4b) The four LEDs labeled A/B/C/D display the signaling bit (ON/OFF hook) status for the selected channel.

5. The RESTART key begins a new test by clearing all error counters and LED history indications (flashing DS0 Channel indication). If auto-pattern search is ON, then after each RESTART, both receivers will pattern-search according to their test MODE set-up.

6. The speaker control allows listening to the content of the DS0 Channel in receiver #1, #2, or both simultaneously.
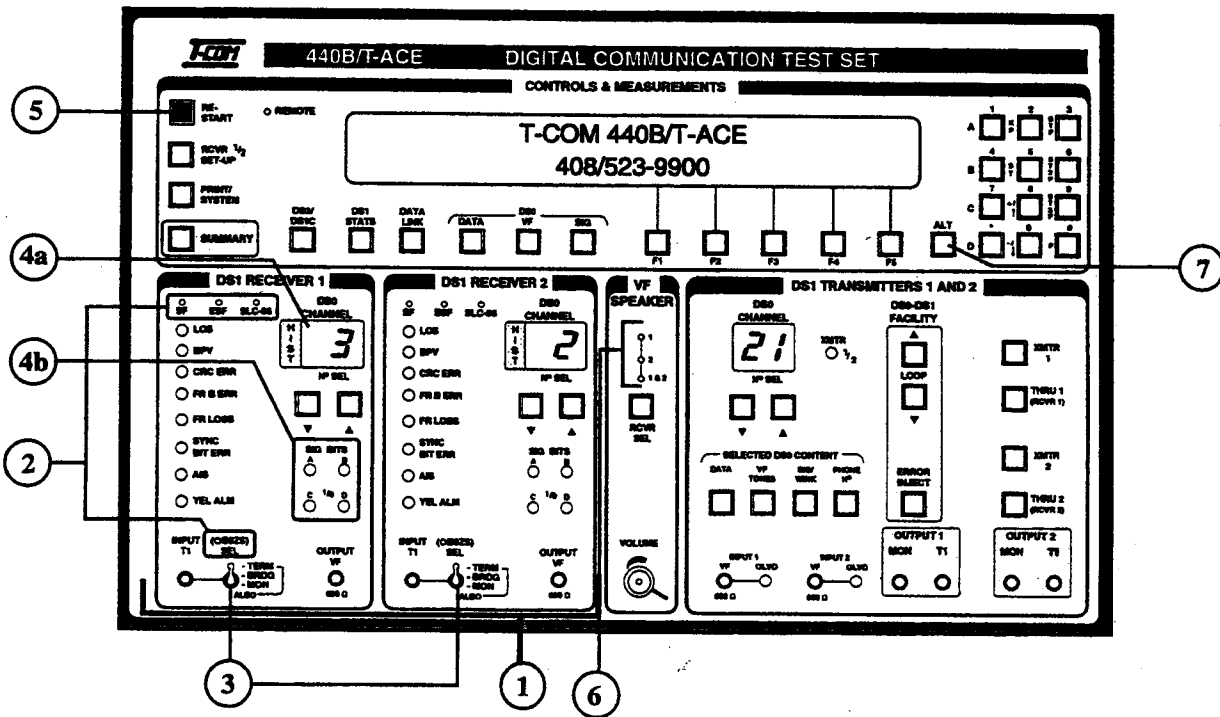
7. Screen messages provide error results, test status, and configurations/SET-UP menus. Choices available on screen are made with the "softkeys" (labeled F1 - F5). Softkeys are used to move an underline using < > (left or right arrows), or pressed to enter a screen choice displayed directly above the softkey. (These keys are called "soft" because their assignment changes according to the screen menu.)

8. SUMMARY provides a quick and easy display of the status and error count for the selected receiver. Both receivers are monitored full-time, but results are displayed one receiver at a time in the SUMMARY screen. (See SUMMARY/HISTORY Quick Sheet.)

9. RCVR SET-Up 1/2 is used to define the pattern search set-up for each receiver. **In almost all cases Receivers should be locked to transmitters.** However, the 440B lets you set-up receivers for T1, Fractional T1 or DS0A/B Data independently of the transmitters.

10. PRINT/SYSTEM provides menus for print commands and system configurations (like AUTO-SEARCH, TEST PROTECTION, etc). (See PRINT/SYSTEM Quick Sheet.)

11. DATA/VF/SIG keys are used to display DS0 Channel measurements for the selected channel in either Receiver 1 or 2. **(These three keys are associated with the receivers, note that the transmitters have matching keys.)** DATA key provides 8-bit word display, DDS test code ID, and DS0A/B error statistics. VF provides Level, Frequency, Noise, and DC offset. SIG provides full 24 channel signaling bit display, telephone number capture and display, and wink timing measurements.

12. DATA LINK displays T1 facilities Data Link messages for ESF (AT&T and ANSI) and SLC-96 formats.

13. DS1 STATS provides the complete array of DS1 Test statistics with RCVR 1 and 2 results simultaneously including: timing slips, level, frequency, errors, G.821 statistics. NOTE: The above two keys are associated with RCVRs 1 & 2.
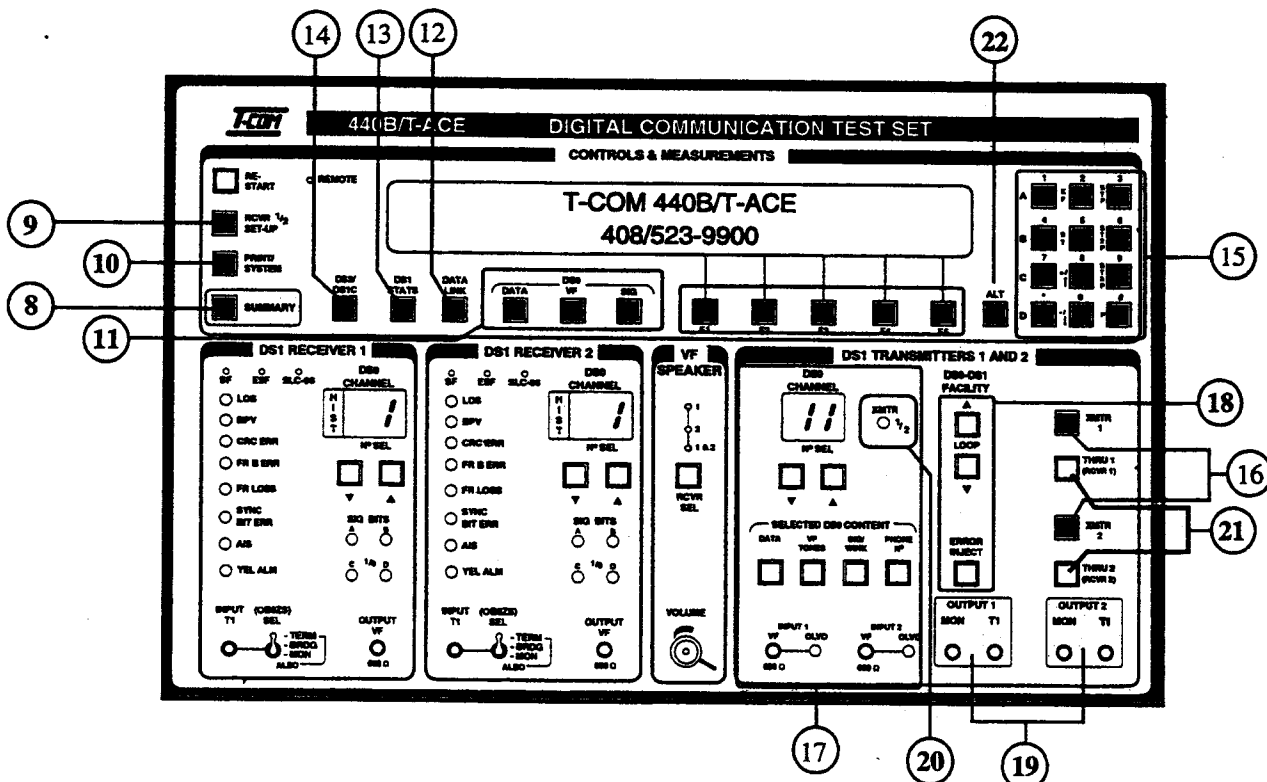
14. DS3/DS1C displays SUMMARY screen and error results/status for either DS3 or DS1C tests, depending on the optional module used.

15. Key Pad is used to enter a variety of numbers and codes (labeled in green, and controlled by the ALT key) like KP, ST, On Hook, Off Hook, etc.

16. The TRANSMITTER 1 AND 2 section controls two independent transmitters that can be configured for T1, Fractional T1, and DS0 Channelized Testing.

    XMTR 1 and XMTR 2 are SET-UP keys that provide menus for formatting each transmitters T1 output (i.e. Patterns, Framing formats, AMI/B8ZS, etc). When either XMTR key is selected, the key will light to indicate that the Transmitter section will follow the selected transmitter. Both Transmitters are always on.

17. The DS0 CHANNEL section provides keys to select an individual DS0 channel, and the content for this channel including DATA, VF Tones, Signaling, Wink and Telephone numbers. External VF INPUT jacks provide auxiliary input access for external VF test equipment.

    In other words, if using a transmitter for channelized testing, use 16 to Set-Up the DS1 signal as channelized, and 17 to format an individual DS0 channel within the DS1/T1 transmitted by the 440B.

18. Loop Up/Down and Error Injection keys provide standard CSU/Network Interface loopback patterns, and error injection. These patterns will automatically follow the Mode selected (i.e. T1, F-T1 or DS0 Channelized). For DS0A/B testing a wide variety of device loops are provided (OCU-DP, DS0-DP, Repeater, etc).

    Pressing the ERROR INJECT key will inject bit errors in to the DS1 or DS0 bit stream depending on the XMTR set-up. Error injection can also be configured for a variety of menu driven errors & alarms, and error injection rates. (See PRINT/SYSTEM Quick Sheet.)

19. Outputs 1 and 2 follow XMTR 1 and 2. They each deliver the DS1 signals defined during DS1 Transmitter and DS0 Channel Set-Up. *The T1 output jack is set at 0 dBDSX, while the MON output is set at -20dBDSX. Note: OUTPUT 1 and 2 are labeled Red and Green to correspond to XMTR1 and XMTR2. Generally the T1 outputs are used.*

20. The XMTR 1/2 LED will be lit Red or Green according to the transmitter currently being Set-Up. *Note: In most cases, this LED will simply follow the XMTR key that is lit. But when both transmitters are set to THRU (Drop-and-Insert), both THRU keys will be lit. In this case, the LED is useful for determining to which transmitter the DS0 Channel content keys apply.*

21. THRU keys will put the 440B in a Drop-and-Insert mode. THRU 1 will pass the content of Receiver 1, allowing for DS0 insert with Transmitter 1. THRU 2 passes the content of Receiver 2, also allowing drop-&-insert.

22. The ALT key is used for selecting key pad letters with green alternates, and for certain VF tone and Wink edits (up and down arrows in the key pad are for on/off hook states, etc). When Option 30 is equipped, the ALT key accesses the set-up menus for this option. Refer to Quick Sheet 5B for details.

GENERAL HINTS

A. It is important to verify the test Set-Up MODE chosen by the receivers and transmitters before performing (BERT) stress testing, because the 440B can test at T1, Fractional T1, and DS0 rates. The SUMMARY screen identifies the receiver SET-UP MODE as either DS1 (T1), F-T1, or DS0. Generally, RCVR Set-Up should be LOCKED to XMTR and test set-up from Transmitter section.

B. If both receivers are being used, the 440B will continue testing and counting errors for both independently, regardless of which screen results are being displayed.

C. A flashing DS0 Channel display indicates a DS1 and/or DS0 error has been detected for that receiver. An audible Beeper can also be turned on to make error identification easy while away from the test set.

D. Pressing the RESTART key will clear all error counters and flashing Channel displays for both receivers. The SUMMARY/HISTORY quick sheet describes how to reset receivers independently.

E. SUMMARY provides a very quick and easy way to display the test mode, stress pattern identification, error count, and elapsed test time on one screen. Because the SUMMARY screen displays one receiver at a time, using the SEL # softkey will toggle between the two receiver SUMMARY screens (this will not affect the tests in progress).

NOTE: When testing DS0A/B, the SUMMARY screen continues counting any DS1/T1 errors. This is a powerful capability for isolating network troubles.

F. Verify that the TERM/BRDG/MON toggle switch selection for receivers matches the signal being tested. (Toggle switches are locking--they must be pulled out in order to change settings.)
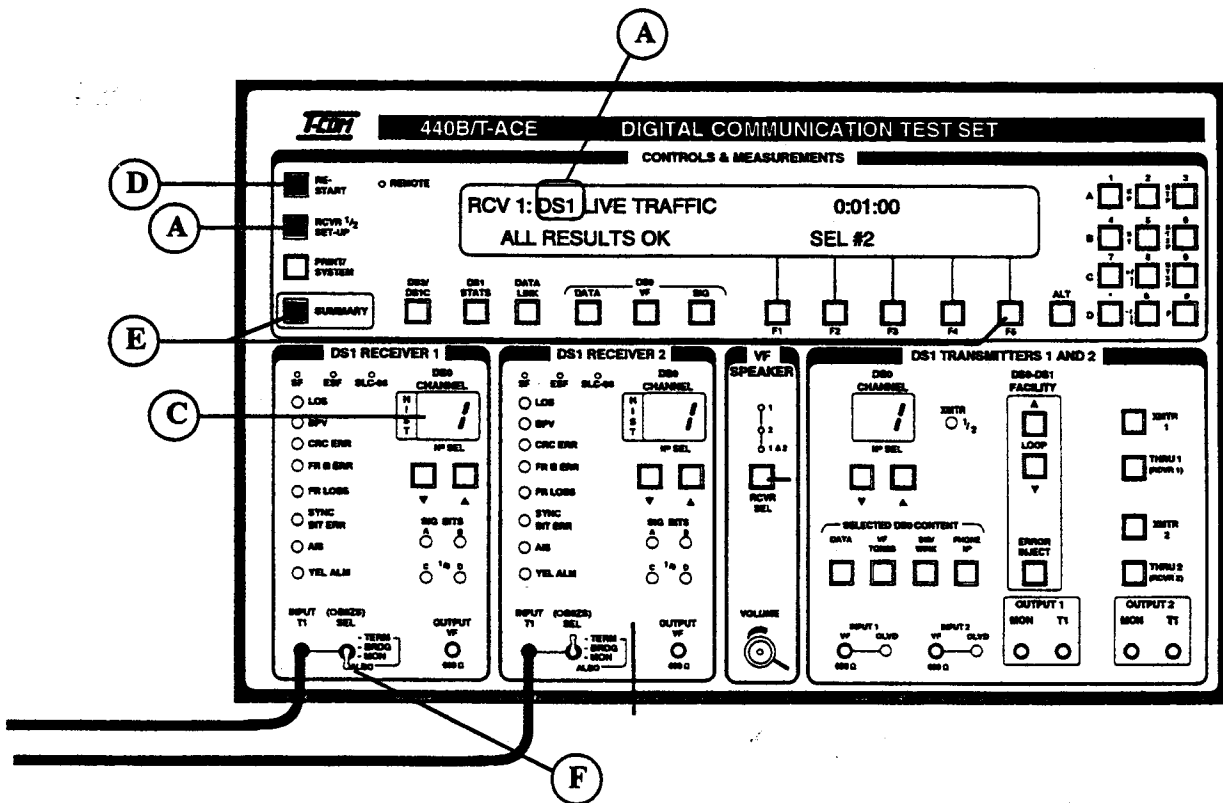
Options Available for the 440B/T-ACE

01 Remote Control

Provides complete remote control for 440B/T-ACE. Ideal for using the unit as a test head at remote offices and digital cross-connects; also ideal for automated testing.

06 MF/DTMF/DP Telephone Number/Wink Capability

Provides the ability to display and send telephone numbers as well as transmit wink, for Digital Switch/PBX emulation.

10 ESF Data Link Analyzer

Provides ESF Data Link analysis and message/alarm transmit capabilities. Automatically displays status and messages in plain English. Supports both ANSI T1.403 and AT&T Pub 54016 formats.

11 SLC-96 Data Link Analyzer

Provides SLC-96 Data Link analysis and message/alarm transmit capabilities. Automatically displays and decodes messages in modes I, II, and III. In mode II provides subscriber On/Off Hook activity and Digital Switch time-slot assignments.

11   SLC-96 Data Link Analyzer

Provides SLC-96 Data Link analysis and message/alarm transmit capabilities. Automatically displays and decodes messages in modes I, II, and III. In mode II provides subscriber On/Off Hook activity and Digital Switch time-slot assignments.

12   DS0A/B DDS Data Testing

Provides full DS0A/B Data Port testing from DS1 access point, for standard transmission types, including Generic DDS, DS0A/B, Advanced Digital Network and Switched 56. Includes full BERT capabilities with complete array of DDS stress patterns including DDS1-DDS6, 2047, 511 and Long Patterns. Also includes Latching & Non-Latching Loop codes as well as complete MJU control functions.

Supports 2.4Kb/s, 4.8, 9.6, 19.2, 38.4, 56 and 64Kb/s rates. Primary/Secondary channels can be tested simultaneously and independently. Also provides important in-service error monitoring capabilities including DS0A Majority vote, DS0B Frame bit error, and Secondary channel analysis.

Switched 56 testing also requires Option 06.

13   Expanded Loopback Codes

Supports Smart Repeater codes for Teltrend, XEL and Westell versions 3150-56/-70. This option is NOT required for standard CSU/NI loopcodes.

14   SS7 Error Analysis

Provides automatic in-service error capture & analysis for two 56/64Kbps links. Errors include CRCs, Length Indicator Errors, NAKs, Retransmits, SS7 Sync Loss, Processor outage/busy, etc. Statistics include % MJUs, LSUs, FISUs, packet counts, etc. Also provides basic SS7 packet transmit/emulation. (This option requires Option 12.)

15   Round Trip Delay Measurement

Provides round trip delay measurements across a T-1/F-T1 circuit in loopback mode. Measures delays in range of one microsecond to two seconds.

Available Options (continued)

16   GUI Interface

Provides a Windows™ browser view of the test set with point and click control, giving you the feel of being right in front of the test set. Works with additional workstation resident software.

30   DS0 Direct Interface

Provides test access to DS0-DP, OCU-DP channel cards for DDS testing. Also provides DS0 clock timing measurements. (This option requires Option 12.)

31   V.35 & RS-232-C Datacom Interfaces

Provides *DTE* interfaces for direct data test access, and *DCE* interfaces for attaching external protocol analyzers. Supports synchronous testing for fifty rates (from 2.4kb/s to 1.536Mb/s). Requires no specialized cables (uses standard/straight cables).

DTE Mode: Allows direct test access into DCE equipment (CSU/DSU, multiplexers...) for monitoring data or stress testing (BERT). Ideal for datacom, ADN/DDS, and SS7 applications.

DCE Mode: Gives external protocol analyzers full duplex monitoring, or drop-&-insert test access to the DS1 bitstream. When combined with the 52B+, allows protocol analyzer test access to DS3 bitstream. Ideal for accessing Frame Relay, ATM, SS7, ISDN, ESF Data Link, or other protocols imbedded in T1/T3 networks.

This option requires Option 12.

52B+ DS3/DS2/DS1 Multiplexer/Demultiplexer

Provides BERT capabilities for DS3 turn-up testing, as well as full, in-service DS3/DS2 error analysis. This add-on module allows the 440B to simultaneously monitor status and capture errors at DS3/DS2/DS1/DS0A/B rates. Also allows insert T1 and DS0 signals into a DS3 bitstream i.e. DS1 Drop-and-Insert. Only one add-on module can be installed.

52C   Dual STS-1 SONET Analyzer

Provides dual independent STS-1/DS3 receivers and an STS-1/DS3 transmitter. Receivers automatically frame to carrier (STS-1 or DS3 with M1-3/C-bit) and automatically determine the imbedded payload structure.

53A   DS1C Monitor and Demultiplexer

Provides DS1C monitor and automatically demultiplexes both di-groups for further DS1 and DS0 channel test and analysis.

The 440B provides a SUMMARY screen for displaying each test's status on one screen. Flashing LEDs indicate HISTORY and/or errors for easy and immediate identification. The SUMMARY and HISTORY features were developed to make the 440B one of the most simple and automatic test sets available. Once the SUMMARY/ HISTORY capabilities are understood, you will find them very useful for quick and easy display of status and test results.

HISTORY

1. A flashing DS0 Channel LED indicates error history for the corresponding receiver.
   The 440B automatically detects and counts errors for both receivers. Pressing the RESTART key clears all error counters. From the moment an error is detected, the 440B immediately forces the DS0 Channel display LEDs into a permanent flashing mode.

2. Pressing RESTART will clear all error counters (both receivers) and clear the flashing HISTORY indication.

   NOTE: Later in this quick sheet we will describe how to clear HISTORY indication for individual receivers without clearing error counters.
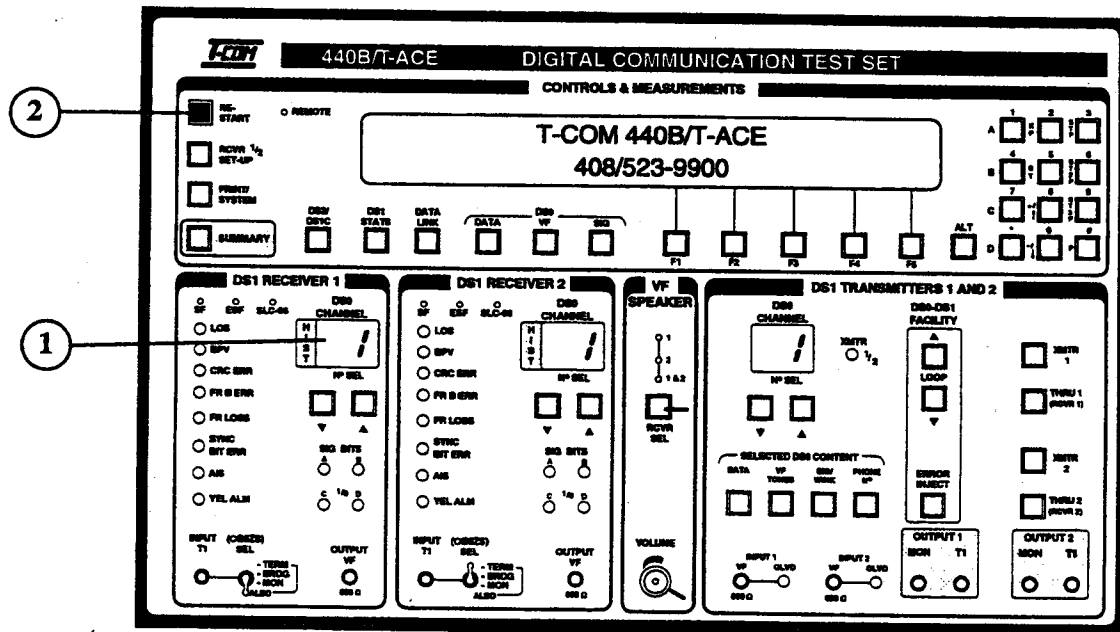
SUMMARY

3. Press SUMMARY key
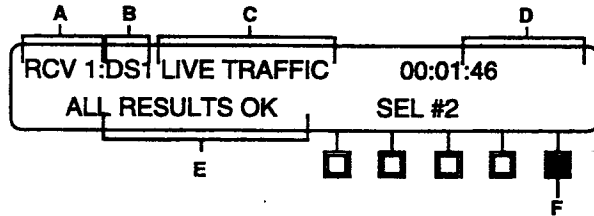
The SUMMARY screen combines several pieces of important test status and error information on a single screen:

A. Which Receiver (RCVR 1 or RCVR 2) results are being displayed.

B. What MODE the Receiver is SET UP to test for (whether DS1/T1, Fractional T1, or DS0 Data).

C. Will identify Pattern Sync or Live Traffic, if no pattern is identified. (See pictured below.)

D. Test Time elapsed since RESTART: 1 minute 45 seconds

E. Which type and how many errors have been counted, if any.
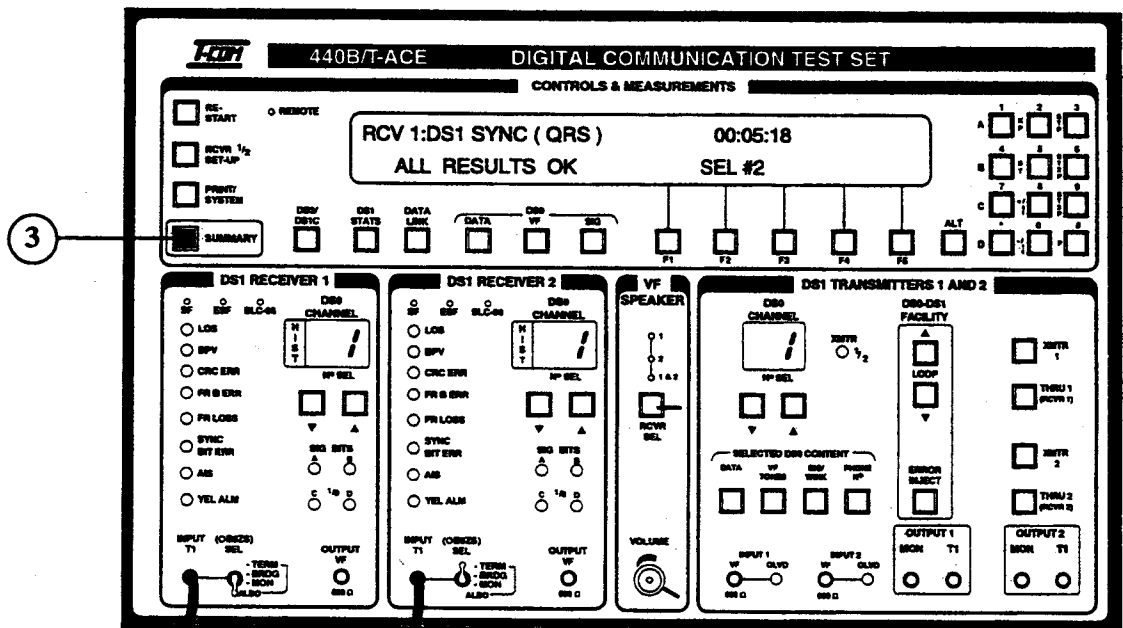
SUMMARY SCREEN RESULTS

If no errors have been detected, the SUMMARY screen reads ALL RESULTS OK. (Therefore, the corresponding DS0 Channel display will not be flashing.)

If errors have been counted, the bottom line will display error type and count.

```
RCV 1:DS1 LIVE TRAFFIC   F   00:01:46
         BPV ERRS:3   NXT   SEL #2
```
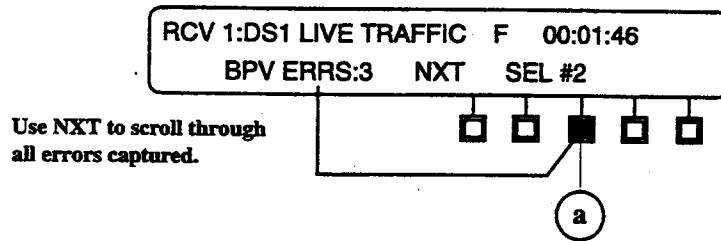
Use NXT to scroll through
all errors captured.

(a)

4. (a) Use the NXT softkey (F3) to scroll through other error counts. Note that the top line does not change.

(b) If a test has been interrupted because the patchcord was unplugged, the SUMMARY screen will flash and F (Frozen) indicating that all error counts/statistics have been frozen. Test time will flash with the exact time the test was interrupted. Plugging the patchcord back in will not continue the test. The test must be started over either by using RESTART or individual receiver RESET described below.

If a receiver is not being used (no patchcord inserted), the SUMMARY screen will indicate RECEIVER PLUG REMOVED. See pictured below.
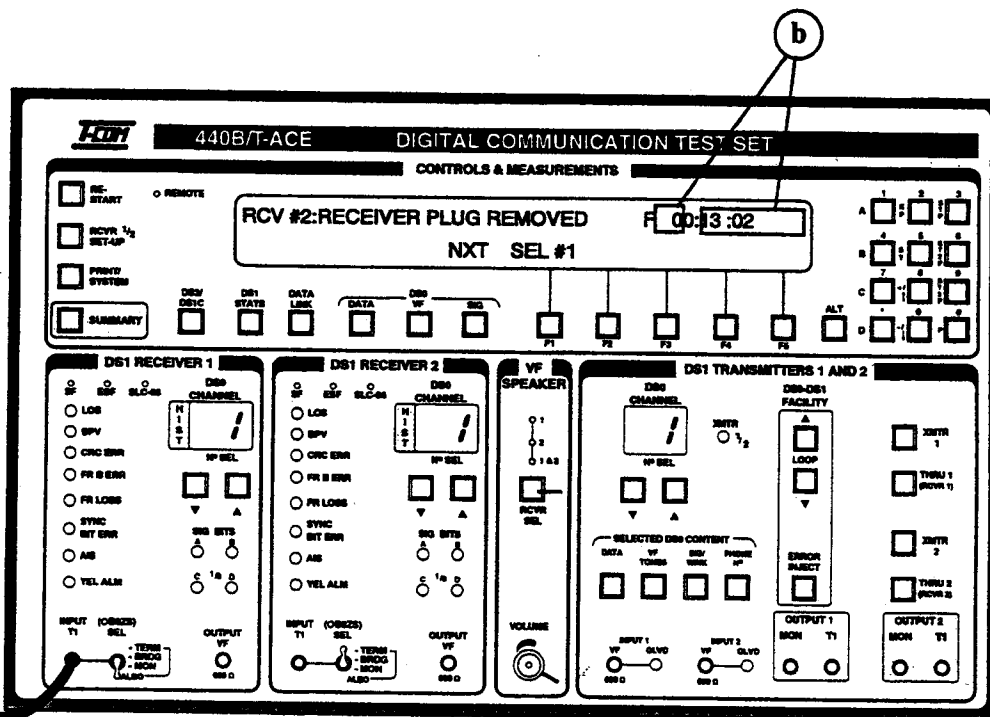
Displaying LED HISTORY

5. Hold SUMMARY key down.

6. LEDs with error history will be lit while SUMMARY key is held depressed.

7. The screen displayed while the SUMMARY key is depressed reads:

```
DISPLAYING HISTORY  CLEAR HIST   RESET
ON RECEIVER LEDS    #1 #2      #1 #2
```
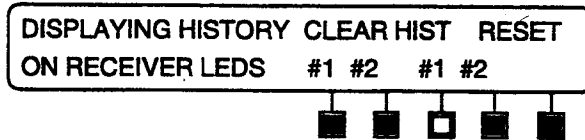
8. Use CLEAR HIST softkeys #1 and #2 (F1, F2) to clear LED history for each receiver. Use RESET #1 and #2 to RESET each receiver.

   NOTE: (a) RESET will clear error counters and LED HISTORY for each receiver, while (b) CLEAR HIST only clears the HISTORY LEDs for each receiver. RESET will also reset each receiver's timer individually.
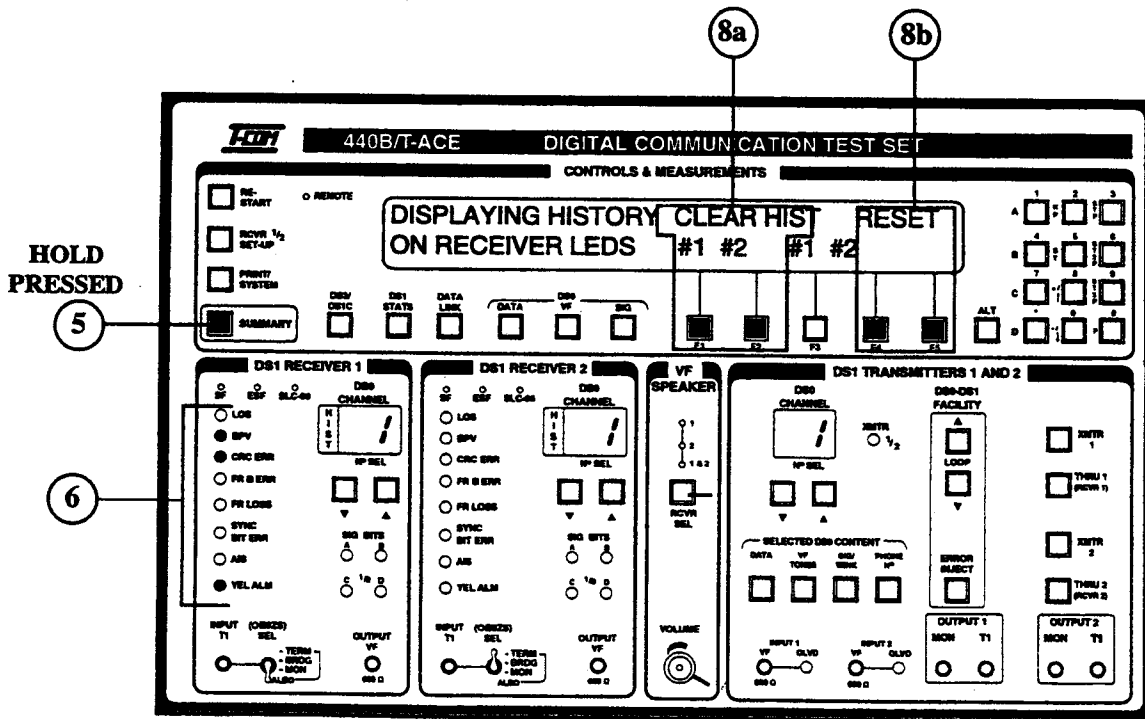
When a patchcord is patched into the T1 inputs, the receivers automatically monitor for DS1/T1 framing, errors and alarms. In addition, each receiver can simultaneously perform a Bit Error Rate (BERT) test using a stress pattern. Receivers can perform stress testing at different rates: T1, Fractional T1, and DS0A/B (2.4Kb/s through 64Kb/s). The Receiver Set-Up determines how each receiver will search for pattern sync. When receivers are set-up for DS0A/B testing the 440B also provides important in-service DS0A/B error monitoring by capturing DS0A majority vote errors, DS0A/B frame loss, DS0B Frame Bit errors, and DS0 secondary channel loss.

NOTE: No matter how a receiver is Set-Up, the 440B always monitors the DS1 rate for framing, errors and alarms. In other words, even when a receiver is performing a Fractional T1, or DS0B 9.6Kb/s BERT test, the test set continuously monitors for all DS1 errors. The SUMMARY screens will, therefore, display and provide HISTORY for all types of DS1 errors regardless of the Receiver Set-Up. This is an important feature for isolating T1 Network problems from DS0 or Fractional T1 equipment failures.

Receivers are configured for auto-frame and auto-pattern sync. When testing slower DDS rates (2.4Kb/s) the auto-pattern search can take up to a minute or so. This is because the 440B checks through a very comprehensive library of all known test patterns. Auto-pattern search can, however, be disabled in the PRINT/SYSTEM Configurations menu. (See PRINT/SYSTEM Configuration Tab section.) When auto-search is off, the receivers only search for the pattern sent by the corresponding transmitter (this speeds up the pattern synchronization process considerably). Auto-frame is always on.
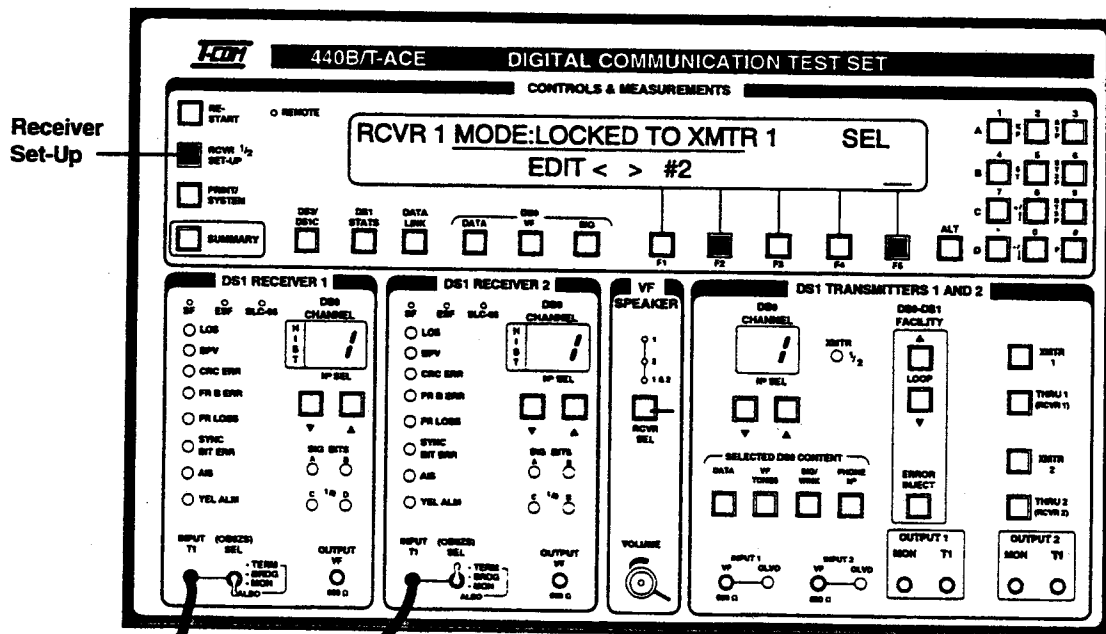
Setting Receiver MODE: Locked To XMTR

Most people find it much easier to Set-Up tests from the transmitters, and simply have the Receivers automatically follow. When "Locked to XMTR" is set, the receiver will follow the transmitter set-up for T1, F-T1 or DS0 data testing.

For typical T1 loopback testing, RCVR 1 will be LOCKED TO XMTR 1 (Figure A), and RCVR 2 LOCKED TO XMTR 2. For DS0 Drop-and-Insert applications (THRU), both receivers may be locked to the same Transmitter. (See Figure B.)

In some cases, it will be useful to Set-Up a receiver independently from the transmitter (for example monitoring a DS0B subchannel, while transmitting into a different subchannel, or Fractional T1 testing).

Figure A: RCVR1 Locked to XMTR1 for T1 Loopback Testing

XMTR1 —— T1 ——>

RCVR1 <—— T1 ——

440B

CSU/NI
in Loopback

------------- = MODE Locked to XMTR1
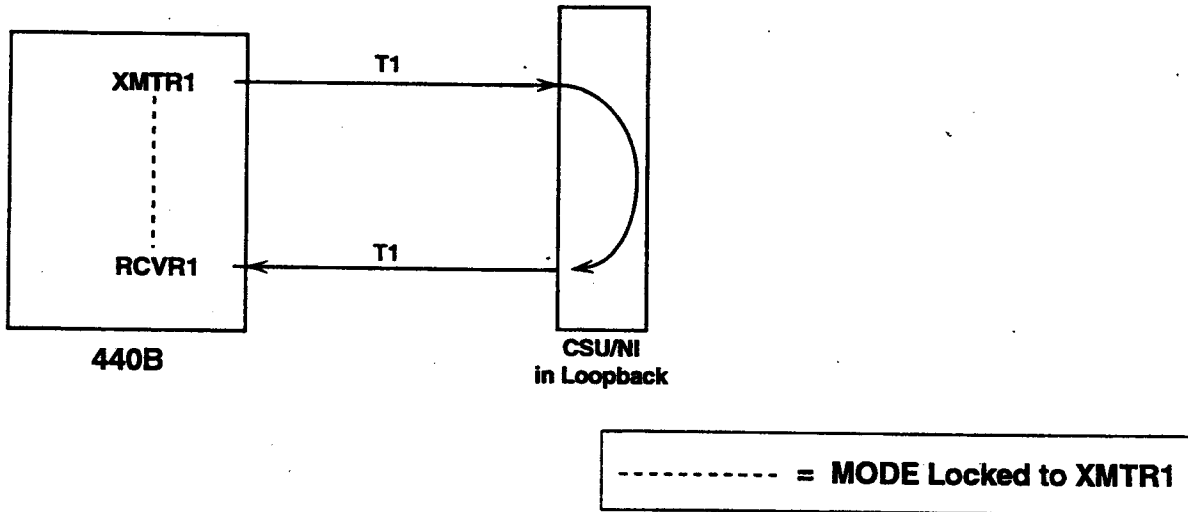
Figure B: RCVR1 & RCVR2 Locked to XMTR1 for Drop-and-Insert Testing

T1 ——>

RCVR1 ——> XMTR1 —— T1 ——>

RCVR2 <—— T1 ——

440B

Digital Switch
or
Channel Bank
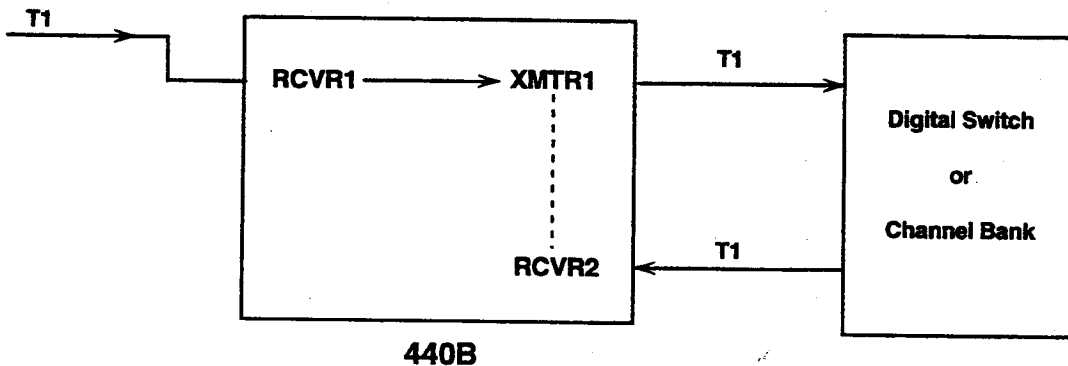
RECEIVER SET-UP

In nearly all cases, it is strongly suggested to lock the receivers to the desired transmitters.

Locking Receivers to Transmitters

1. Press RCVR / SET-UP key to display SET-UP screen. Generally, the Set-Up will display LOCKED TO XMTR.

```
┌─────────────────────────────────────────┐
│ RCVR 1 MODE:LOCKED TO XMTR1       SEL    │
│            EDIT  <  >  #2                 │
└─────────────────────────────────────────┘
```
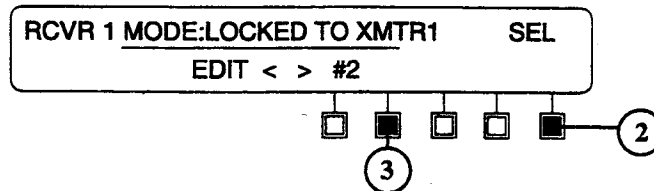
2. Use SEL softkey (F5) to toggle between RCVR 1 or RCVR 2 Set-Up screens.

3. Use the EDIT softkey to change the RCVR Set-Up. Pressing EDIT displays:

```
┌─────────────────────────────────────────┐
│ RCVR 1 MODE: LOCKED TO XMTR1  T1  FT-1   │
│ DS0A  DS0B  SW-56  XMTR #1  <  >  NXT     │
└─────────────────────────────────────────┘
```

4. When LOCKED TO XMTR is underlined, XMTR # is displayed. The F2 softkey can be toggled to select either XMTR #1 or #2. For DS0 Drop-and-Insert, RCVR 2 will typically be Locked to XMTR #1. (See Figure B on previous page.)

5. Press NXT to enter selection and display the opening Set-Up screen:

```
┌─────────────────────────────────────────┐
│ RCVR 1 MODE:LOCKED TO XMTR1      SEL      │
│            EDIT <  >  #2                  │
└─────────────────────────────────────────┘
        □  ■  □  □  ■
```

Setting receivers independently of transmitters

6. Press RCVR Set-Up key to display the opening screen:

```
┌─────────────────────────────────────────┐
│ RCVR 1 MODE:LOCKED TO XMTR1      SEL      │
│            EDIT <  >  #2                  │
└─────────────────────────────────────────┘
        □  ■  □  □  ■──(7)
           (8)
```

7. Use SEL #2 softkey (F5) to toggle between RCVR 1 and RCVR2 set-up screens.

8. Press EDIT to display menu:

```
┌─────────────────────────────────────────┐
│ RCVR 1 MODE:LOCKED TO XMTR  T1  F-T1      │
│  DS0A  DS0B SW-56   XMTR #1_ <  >  #2     │
└─────────────────────────────────────────┘
        □  □  □  □  □
```

Fractional T1

NOTE: When LOCKED TO XMTR, Fractional T1 test can be configured from XMTR and the receiver will automatically match the configuration. Setting up the receiver separately may be useful for troubleshooting esoteric troubles on "non-selected" Idle channels. (See Quick Sheet 4, page 9)

```
┌─────────────────────────────────────────┐
│ RCVR 1 MODE:LOCKED TO XMTR  T1  F-T1      │
│  DS0A  DS0B SW-56   XMTR #1_ <  >  #2     │
└─────────────────────────────────────────┘
        □  □  ■  ■  ■──(9)
```

9. Underline F-T1 and press the NXT softkey to display:

relative channel positions
$1_2 3_4 5_6 7_8 9...$

1 = selected
0 = "Idle"

```
┌─────────────────────────────────────────┐
│ RCVR 1 MODE:F-T1  MAP:¹₀¹₀⁰₀⁰₀⁰₀⁰₀⁰₀ SEL │
│            EDIT <  >  #2                  │
└─────────────────────────────────────────┘
        □  ■  □  □  □
           (10)
```

10. The 1/0 display represents a condensed mapping of the selected Fractional T1 channels currently selected for BERT testing in the receiver. To edit these DS0 channels, underline MAP and press EDIT to display the screen below.

DS0 Channels ——➤   1234.........10.12.................24

```
123456789'₀123456789²₀1234 RCVR 1 FT1 DS0s
```
Channels 1, 3, 5 selected——➤
at 64 Kb/s each
```
10101000000000000000000000 64K  <  >  NXT
```

                                              (11)   (12)

11. Use the < > softkeys and the keypad to enter 1 or 0 for the selected DS0 channels (1-24). Use the F2 softkey to toggle between 64K and 56K.

12. Press NXT to enter the new receiver Set-Up.

```
RCVR 1 MODE:F-T1   MAP:'₀'₀'₀%₀%₀%₀%₀%₀ SEL
            EDIT <   >  #2
```

DS0A/B Data

NOTE: It is much easier to simply LOCK TO XMTR and Set-Up DS0A/B tests from XMTR. However, in some cases it may be useful to search for troubles on subrate channels different from those set in the transmitter, or receive at DS0A while transmitting at DS0B (for equipment qualification).

13. Press RCVR Set-Up key to display opening screen:

```
RCVR 1 MODE:LOCKED TO XMTR1      SEL
            EDIT <   >  #2
```

                              (15)   (14)

14. Use SEL #2 softkey (F5) to toggle between RCVR 1 and RCVR 2 set-up screens.

15. Press EDIT to display menu screen:

```
RCVR 1 MODE:LOCKED TO XMTR1   T1   F-T1
   DS0A  DS0B SW-56   XMTR #1 <  >  NXT
```

            └— * —┘

    * These two selections are shown only if
      Option 12 is installed   (16)

16. Use the < > softkeys to underline DS0B (or DS0A), and press NXT to enter selection and display the new RCVR set-up screen:

```
RCVR 1 MODE:DS0B  RATE:9.6      SEL
        SUBCH:#1 EDIT <  >  #2
```

17. Underline RATE: 9.6 and press EDIT to display the menu for changing rates:

```
RCVR 1 RATE: 2.4  4.8  9.6  19.2
              <  >  NXT
```

18. Use the < > softkeys to underline the desired rate, and press NXT to enter the selection. Pressing NXT displays the opening screen:

```
RCVR 1 MODE: DS0B  RATE:9.6      SEL
        SUBCH:#1 EDIT <  >  #2
```

19. Use the softkey F1 to toggle through subchannels.

```
RCVR 1 MODE:DS0B  RATE:9.6      SEL
        SUBCH:#3 EDIT <  >  #2
```

20. To resume the LOCKED TO XMTR mode, use < > softkeys to underline MODE: DS0B and press EDIT to display menu screen:

```
RCVR 1 MODE: LOCKED TO XMTR  T1  F-T1
  DS0A  DS0B  SW-56  XMTR:#1 <  >  NXT
```

21. Underline LOCKED TO XMTR and select desired XMTR that the receiver is to be locked to with softkey F2. Press NXT to enter selection and display new opening screen:

```
RCVR 1 MODE:LOCKED TO XMTR1      SEL
          EDIT <  >  #2
```

Transmitters 1 and 2 can be Set-Up to perform T1, Fractional T1, or Channelized testing.

Both transmitters are always on , but the front panel function keys only apply to one transmitter at a time. Pressing **XMTR 1** or **XMTR 2 (b)** function key determines which transmitter (and output) is being Set-Up or changed.

In the picture below **XMTR 1** function key is on, therefore, all front panel transmitter keys currently apply to **OUTPUT 1**. The **DATA** function key (a) is on, indicating that a DS0A/B signal is being transmitted into DS0 channel #21. In order to access individual channels, and set up DS0 channel tests (DS0A/B Data, VF tones, Signaling, and Wink), the XMTR Set-Up MODE must be CHANNELIZED.

NOTES:
- The OUTPUT jack labeled **T1** is 0 dBDSX level while the MON output is at -20dBDSX level. Generally, use the **T1** output.

- THRU keys are used for Drop-and-Insert testing. Pressing **THRU 1** automatically passes the Receiver 1 DS1 signal thru Transmitter 1 OUTPUT (THRU 2 passes RCVR 2).

- the LED labeled XMTR 1/2 (c) provides additional confirmation of which transmitter output is being changed. The LED is Red to indicate XMTR 1 and Green to indicate XMTR 2. (The front panel is color coded to provide additional reinforcement)

- Receiver Set-Up (d) should generally be LOCKED TO XMTR

- DS0 related function keys (a) apply only when XMTR MODE is set to CHANNELIZED.

Refer to the XMTR FLOW CHART in Flow Charts/Appendices section for the complete menu hierarchy.
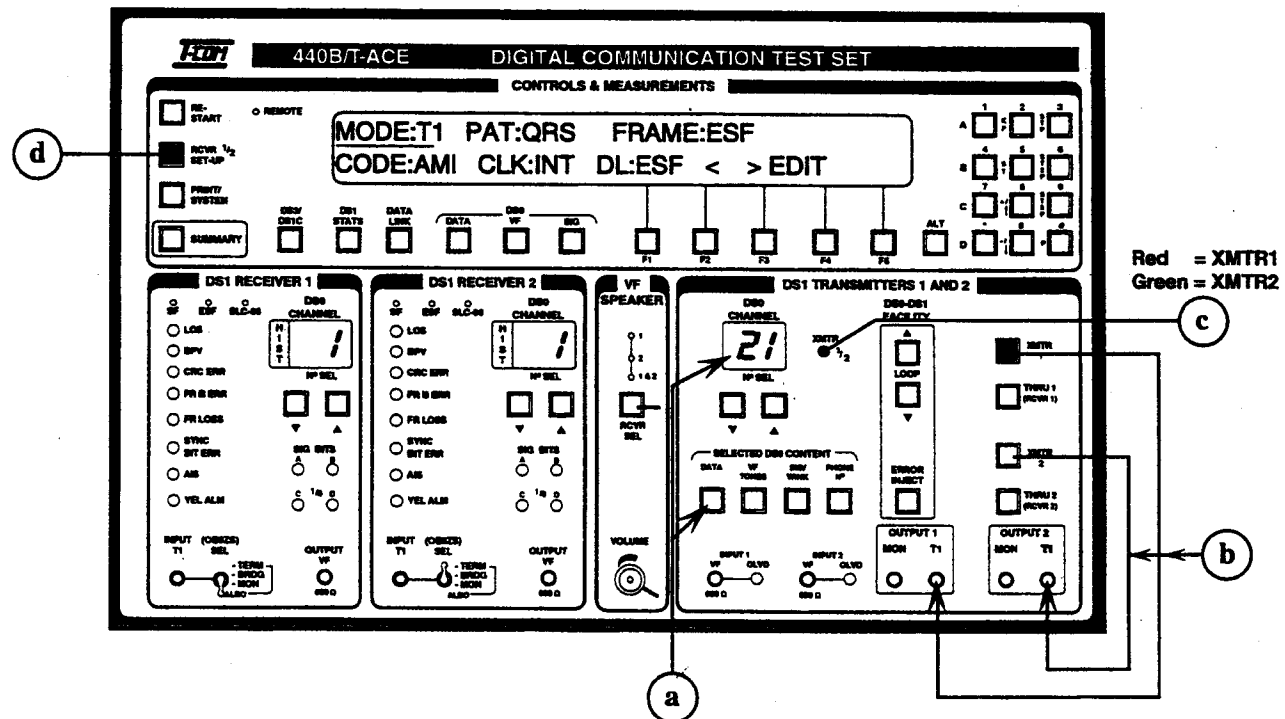
Interpreting Transmitter Set-Up screen:

Press XMTR 1 (or XMTR 2) key to display root menu screen.
(If the screen below is not displayed, press the XMTR key a second time)

example #1

```
Ⓐ          Ⓑ              Ⓒ

MODE:T1  PAT:QRS   FRAME:SF-D3/D4
CODE:AMI  CLK:INT  DL:N/A  <  > EDIT

                   Ⓓ    Ⓔ    Ⓕ      Ⓘ    Ⓙ
```
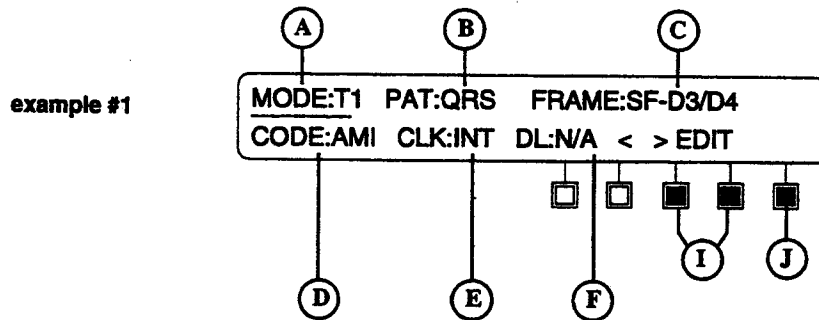
A. Transmitter is Set-Up for T1 testing.
B. Stress pattern (PAT) is set for QRS.
C. Frame type is set for SuperFrame, D3/D4 channel sequencing.
D. Line CODE is set to AMI.
E. Transmitter CLOCK set to internal (INT).
F. Data Link is Not Applicable (N/A) in SF Frame format.

example #2

```
        Ⓖ

MODE:CHAN-TELE/IDLE  FRAME:ESF
CODE:B8ZS  CLK:INT  DL:ESF  <  > EDIT

                         Ⓘ   Ⓙ
                    Ⓗ
```
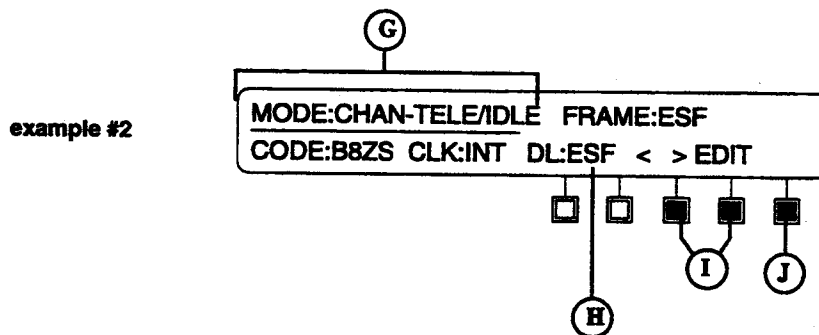
G. Transmitter MODE must be Channelized in order to insert/test individual DS0 channels. CHAN-DATA/IDLE means the current Set-Up is Channelized, with DATA inserted on the selected DS0 Channel, and IDLE on the other 23 channels.

H. T1 Facilities Data Link (DL) is set for Extended Super Frame (ESF). Transmitter can be instructed to send Data Link messages.

Operation:

I. Use < > softkeys to underline parameter.
J. Press EDIT softkey to change setting of the parameter currently underlined.

TRANSMITTER SET-UP

The opening XMTR (transmitter) screen provides a comprehensive look at the current DS1 output. (Refer to the XMTR Flow Chart for a condensed menu-tree)

1. Press the XMTR 1 (or XMTR 2) key to display the root transmitter SET-UP screen below.

    If the above screen is not displayed, press the XMTR 1 key a second time.)

```
MODE:T1  PAT:QRS  FRAME:ESF
CODE:B8ZS  CLK:INT  DL:ESF  <  > EDIT
```
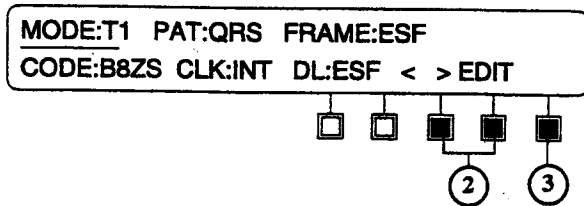
2. Use the < > softkeys (F3 and F4) to underline the parameter to be changed.

3. Use the EDIT softkey (F5) to display the menu choices for the parameter underlined.

4. Press XMTR 1 key to display the root SET-UP screen again.

    Steps 5 - 22 show screens for MODE, PATTERN, LINE CODE, CLOCK SOURCE, and FRAMING.
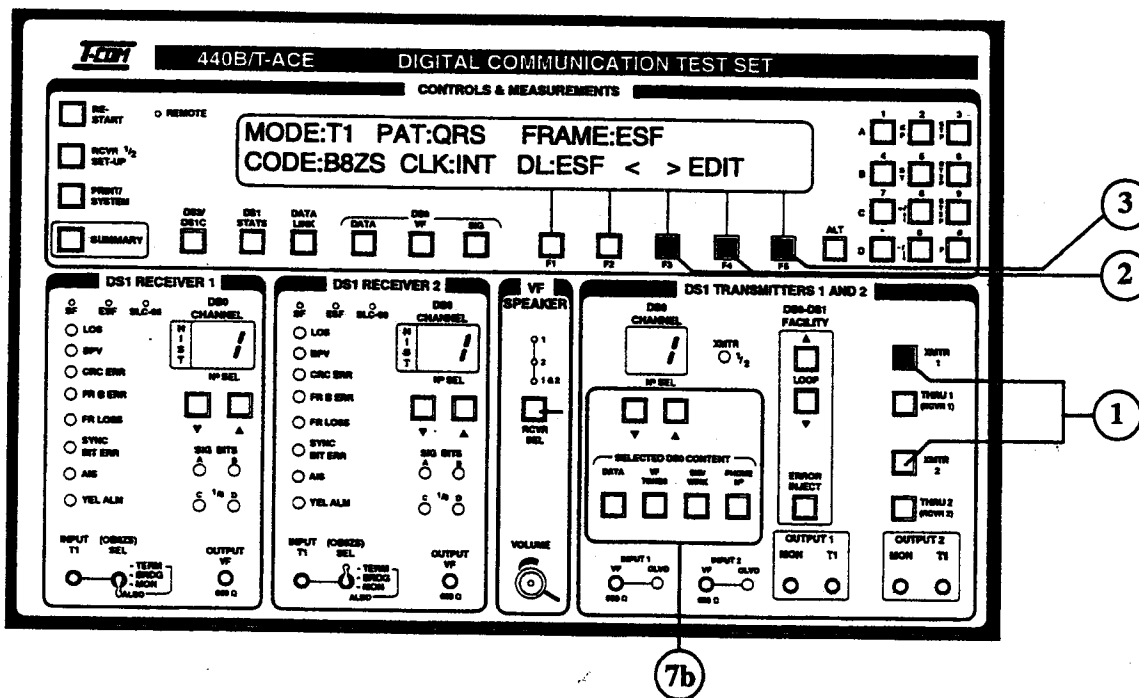
TO CHANGE MODE BETWEEN T1/F-T1/DSO CHANNELIZED

5. Press XMTR 1 (or XMTR 2) to display the root SET-UP screen. (If the screen below does not appear, press the XMTR key a second time.)

```
MODE:T1  PAT:QRS    FRAME:ESF
CODE:B8ZS CLK:INT  DL:ESF  <  > EDIT
```
□ □ ■ ■ ■
⑥
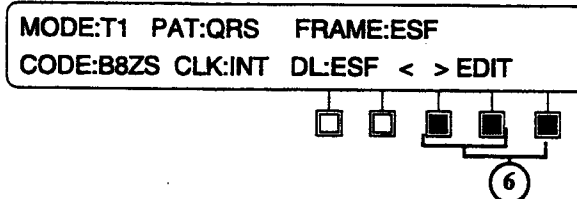
6. Use the < > softkeys (F3, F4) to choose MODE. Press EDIT (F5) softkey to display menu choices:

7. Use the < > softkeys to underline choice.

    a) T1 is for standard T1 stress testing.

    b) Channelized Mode is required for transmitting VF tones, DATA, Phone Numbers and Wink in specific channel using Selected DS0 CONTENT keys and DS0 channel selection (b). The DS1 OUTPUT will be in a Channelized format (24 DS0 Channels). See step 29.

    c) For instructions on F-T1 see Fractional T1 set-up in step 24.

```
        7a         7b        7c
XMT MODE:  T1  CHANNELIZED  F-T1
#1              <  >  NXT
```
□ □ ■ ■ ■—8
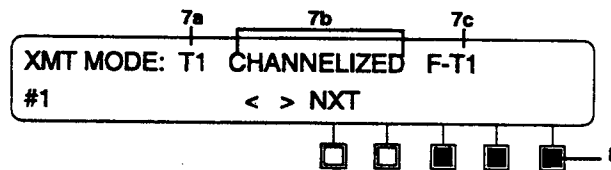
TO CHANGE T1 STRESS PATTERNS (requires setting MODE to T1)

9. Press XMTR 1 (or XMTR 2) to display the root screen. *(If the screen below does not appear, press the XMTR key a second time.)*

10. Use < > softkeys (F3, F4) to choose PATtern (currently QRS in screen below).

```
MODE:T1  PAT:QRS    FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF  <  > EDIT
```
□ □ ■ ■ ■

11. Press the Edit softkey (F5) to display the pattern menu choices:

```
DS1 3/24 1/8 1/1 QRS 55-OCT MINMAX TRIP
#1           UFR FR  <  > NXT
```
□ □ □ □ □
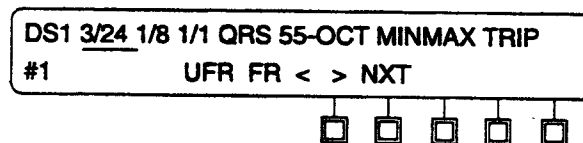
12. Use the < > softkeys (F3 & F4) to underline the pattern choice (for example 3/24) and UFR & FR (F1 & F2) softkeys to make the Unframed/Framed selection.

If the desired pattern is not found on this screen:

13. Use the NXT softkey to scroll through additional pages of pattern choices. The NXT softkey will return the display to the Root SET-UP screen at the end of pattern choices. *Press the XMTR key to return directly to the Root SET-UP screeen and confirm the changes.*

TO CHANGE FRAMING BETWEEN SF/ESF/SLC-96/UNFRAMED

14. Press the XMTR 1 (or XMTR 2) key to display the Root SET-UP screen. *(If the screen below does not appear, press the XMTR key a second time.)*

```
MODE:T1   PAT:3/24   FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF  <  > EDIT
```
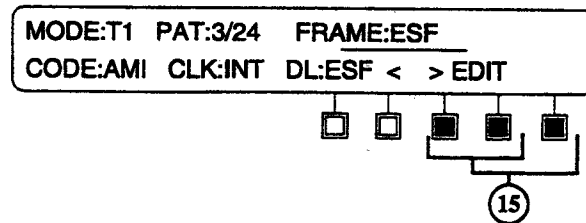
15. Use the < > softkeys (F3 & F4) to underline FRAME:, press EDIT to display menu choices:

```
FRAME TYPE:  UFR  SLC-96  SF  ESF
                  <  > NXT
```
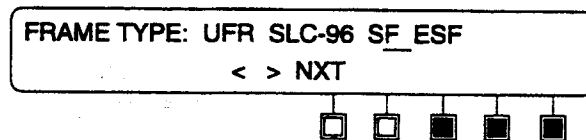
16. Use the < > (F3 & F4) to choose the frame type, for example SF. *Press the NXT softkey or press the XMTR key (14) to return to the Root SETUP screen and confirm the changes.*

TO CHANGE LINE CODE BETWEEN AMI & B8ZS

17. Press the XMTR 1 (or XMTR 2) key to display the Root SET-UP screen. (If the screen below does not appear, press the XMTR key a second time.)

```
MODE:T1   PAT:QRS   FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF  <  > EDIT
```
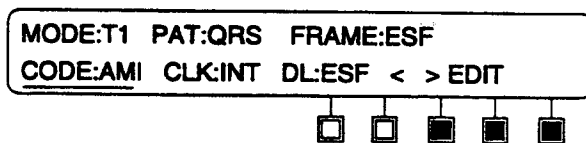
18. Use the < > softkeys (F3 & F4) to underline CODE:, press EDIT to display the menu choices:

```
XMTR LINE CODE
#1          AMI   B8ZS   NXT
```
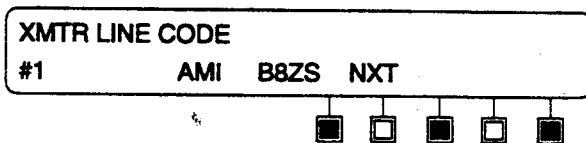
19. Use the < > (F3 & F4) to choose the LINE CODE, for example B8ZS. Press the NXT softkey or press the XMTR key (22) to return to the Root SETUP screen and confirm the changes.

TO CHANGE CLOCK SOURCE BETWEEN RCVR1/RCVR2/INT

20. Press the XMTR 1 (or XMTR 2) key to display the Root SET-UP screen. (If the screen below does not appear, press the XMTR key a second time.)

```
MODE:T1  PAT:3/24   FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF  <  > EDIT
```
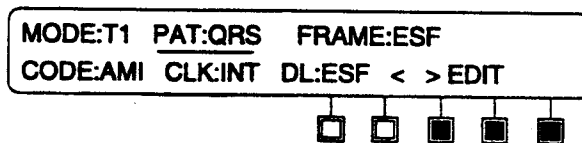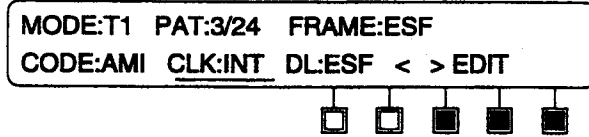
21. a) Use the < > softkeys (F3 & F4) to underline CLK:, press EDIT to display the menu choices:

```
CLOCK SOURCE: RCVR1  RCVR2  INT
                    <  > NXT
```
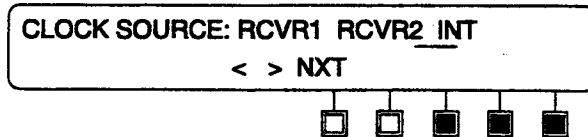
b) Use the < > (F3 & F4) to choose CLOCK SOURCE (generally INTernal). Press the NXT softkey or press the XMTR key (20) to return to the Root SETUP screen and confirm the changes.

Setting Up Fractional T1 testing

It is generally much easier to set up a Fractional T1 test from the transmitters, and verify that the receiver is LOCKED TO XMTR. This will avoid any mistakes in channel "mapping" between the receivers and transmitters.

22. Press the XMTR key to display the opening screen:

```
MODE:T1  PAT:3/24   FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF  <  > EDIT
```

23. Underline MODE and press EDIT to display the menu:

```
MODE: T1  CHANNELIZED  F-T1
#1                  <  > NXT
```
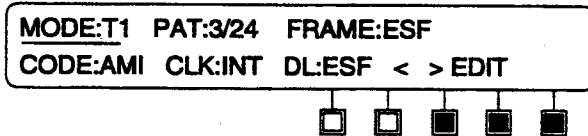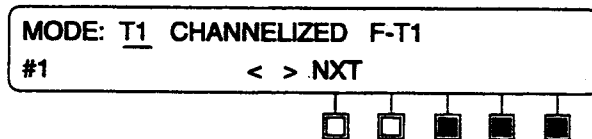
24. Underline F-T1 and press the NXT to display the DS0 channel map. The top numbers represent channels 1-24. A 1 under the channel number indentifies an active selection of this channel as part of the "Fractional T1"

```
(a)—1234567891₀1234567892₀1234 FRACTIONAL
     DS0s
```
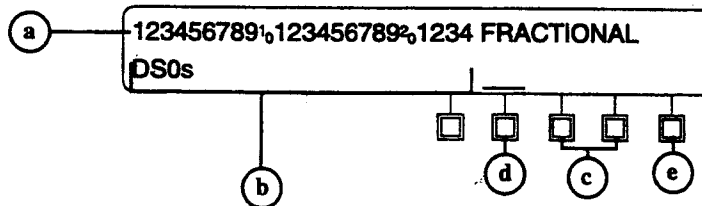
a) The top row represents channels 1-24.

b) A 1 under channels 1,2,3 mean that the Fractional T1 is composed of those three DS0 channels. A 0 represents the IDLE channels.

c) Use the < > and keypad to enter 1 or 0 in the desired channels.

d) Use the softkey F2 to toggle between 64Kb/s or 56Kb/s

e) Press NXT to define the Idle channels content.

25. Use the < > softkeys to underline channel locations, and the keypad to enter 1 or 0 for the desired channels. for example in the screen below, we have selected channels 1, 3, and 5 at 64Kb/s rates (these are non-contiguous)

```
123456789ₒ123456789₂ₒ1234 FRACTIONAL
DS0s
```

☐ ☐ ■ ■ ■
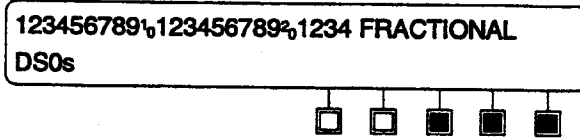
26. Press NXT to display the IDLE channel content screen. Use the < > softkeys and the keypad to enter 1 or 0.

```
FRACTIONAL T1 IDLE DS0 PATTERN
    11111100      <  >  NXT
```

☐ ☐ ■ ■ ■
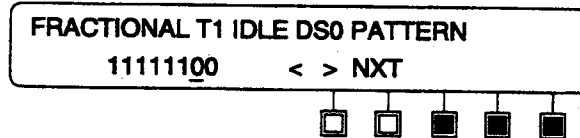
NOTE: The IDLE channel byte programmed above will be entered into each unselected (0) channel in step 25. If the transmitter and receivers are configured for Drop-and-Insert (THRU) the IDLE channels will simply pass thru as uninterrupted live traffic.

27. Press NXT to return to the main XMTR Set-Up screen:

```
MODE:FT1  PAT:3/24    FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF .<  > EDIT
```

☐ ☐ ☐ ☐ ☐
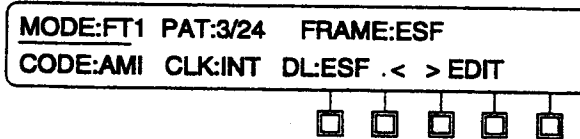
28. The new XMTR Set-Up screen shows that the 511 stress pattern is being transmitted across the F-T1 channels selected in step 25.

Setting Up Channelized Testing

The 440B can test Data, Voice, and signaling in individual DS0 channels. In order to insert into an individual channel, the transmitter MODE must first be channelized. It is sometimes important to set the condition of the remaining 23 DS0 channels. The following steps show how to send either a tone or idle condition in the "other 23" channels.

Pressing the DS0 transmit keys may display the message below. This is a reminder that the XMTR is not set-up for CHANNELIZED pattern format.

```
TRANSMITTER MODE MUST BE
      CHANNELIZED
```

☐ ☐ ☐ ☐ ☐
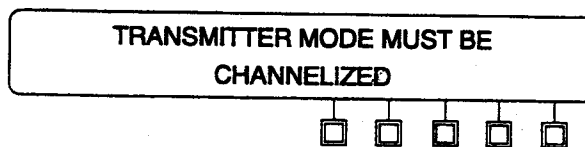
29. Press the XMTR key to display the opening screen:

```
┌─────────────────────────────────────┐
│ MODE:FT1 PAT:511   FRAME:ESF         │
│ CODE:AMI CLK:INT DL:ESF  <  > EDIT   │
└─────────────────────────────────────┘
         □  □  ■  ■  ■
```

30. Underline MODE and press EDIT to display the menu:

```
┌─────────────────────────────────────┐
│ MODE: T1  CHANNELIZED  F-T1          │
│        ─                             │
│ #1              <  > NXT             │
└─────────────────────────────────────┘
         □  □  ■  ■  □
```

31. Use the < > softkeys to underline CHANNELIZED. The bit stream delivered by the XMTR is now channelized, and the individual DS0 transmit keys can be used to insert Data, VF, Signaling, Wink and Phone numbers into the selected DS0 channel. (See Quick Sheet 5A.)

The remaining 23 channels are defined in step 32.

Setting the content of the "other" 23 channels

```
┌─────────────────────────────────────┐
│ MODE: T1  CHANNELIZED  F-T1          │
│           ───────────                │
│ #1              <  > NXT             │
└─────────────────────────────────────┘
         □  □  □  □  ■
```

32. Press NXT to display the screen below:

```
┌─────────────────────────────────────┐
│ XMT OTHER CHs: IDLE 1005Hz/-20dBm0   │
│                ────                  │
│ #1   SIG BITS ABCD: 1111   <  > NXT  │
│                         ─            │
└─────────────────────────────────────┘
         □  □  ■  ■  □
```

33. Use the < > softkeys to choose either IDLE or 1005Hz/-20dBm0 tone. If the 1005Hz/-20dBm0 tone is chosen it will be inserted into each of the "other" 23 channels.

Highlights of Channelized Testing

A) Select the individual DS0 Channel number (1-24) and choose the content (DATA, VF TONES, Signaling/Wink, Phone Numbers).

B) XMTR Set-Up must be Channelized. Select the content of "other" 23 channels (see step 32) if necessary.

C) Pressing the THRU key automatically sets the XMTR in the "Channelized" mode. The "other" 23 channels are passed thru from the Receiver for Drop-and-Insert testing. (See **Drop-and-Insert, Quick Sheet 12.**)

Introduction to DS0 Testing QUICK SHEETS

The 440B supports the installation and maintenance of a wide range of DS0 services and equipment, whether voice or DS0A/B data. It also provides comprehensive digital switch/PBX test capabilities including sending and capturing telephone numbers as well as wink generation and wink timing.

The 440B provides unique in-service error monitoring at DS0A/B rates, as well as stress testing (BERT with patterns). These tests require setting the Receiver Set-Up MODE for the specific type and rate (or preferably, LOCKED TO XMTR) and setting the test up for the corresponding transmitter. When set up to test DS0A/B DATA the unit will capture all errors including DS0B Frame Bit, DS0A Majority Vote errors, Loss of Frame, Loss of Secondary channel as well as all DS1 errors.

Since Receivers 1 and 2 are independent, both can be used for DS0 testing; however, only RCVR2 can measure wink timing. Transmitters 1 and 2 are also independent, and nearly identical with the exception of Wink and Telephone numbers; only Transmitter 1 can be used to generate winks and telephone numbers.

Performing DS0A/B Data error measurements (with stress patterns like 511, the 2047) usually requires setting Receiver SET-UP mode to LOCKED TO XMTR and setting up DS0 test in the transmitter. (NOTE: The receivers can be independently set-up for DS0B 2.4Kb/s testing, for example, but locking to XMTR is easier since the receiver will automatically track with Rate and sub-channel changes.) This Set-Up will provide AUTO-pattern SYNC on the SUMMARY screen, and LED indication of SYNC/Bit Error in the receiver section. Using the transmitters for DS0 testing requires first setting transmitter SET-UP mode to CHANNELIZED.

Because the 440B provides both measurement and transmit of DS0 channel parameters, the Quick Sheets are divided into two corresponding parts.

Part I. Performing DS0 Measurements

Set Up

1. Patch from the 440B Receiver Input T1 jack to the DSX Monitor Jack.

2. Verify that the Input selection toggle switch (labeled SEL) is set appropriately. Incorrect settings may create BPV + Frame Loss LED indication.

3. **NOTE:** If DS0 Data testing (BERT/turn-up testing using stress patterns) is desired, it is necessary that RCVR SET-UP mode be either LOCKED TO XMTR or in a DS0 DATA mode. (*See Receiver Set-Up Quick Sheet.*)

4. Select desired DS0 Channel with keys (labeled with up-down arrows) in receiver being used (for example Channel 1 in Receiver 1).

5. Adjust speaker volume control, and use selection switch (labeled RCVR SEL) to listen to the selected DS0 channel for Receiver 1, Receiver 2 or both 1 & 2.

Operation

6. Press the green RESTART key to clear all counters and flashing HISTORY indications.

7. Press the SUMMARY key to display the status of receiver(s) being monitored:

```
RCV 1:DS1 LIVE TRAFFIC        00:01:45
ALL RESULTS OK                SEL #2
```
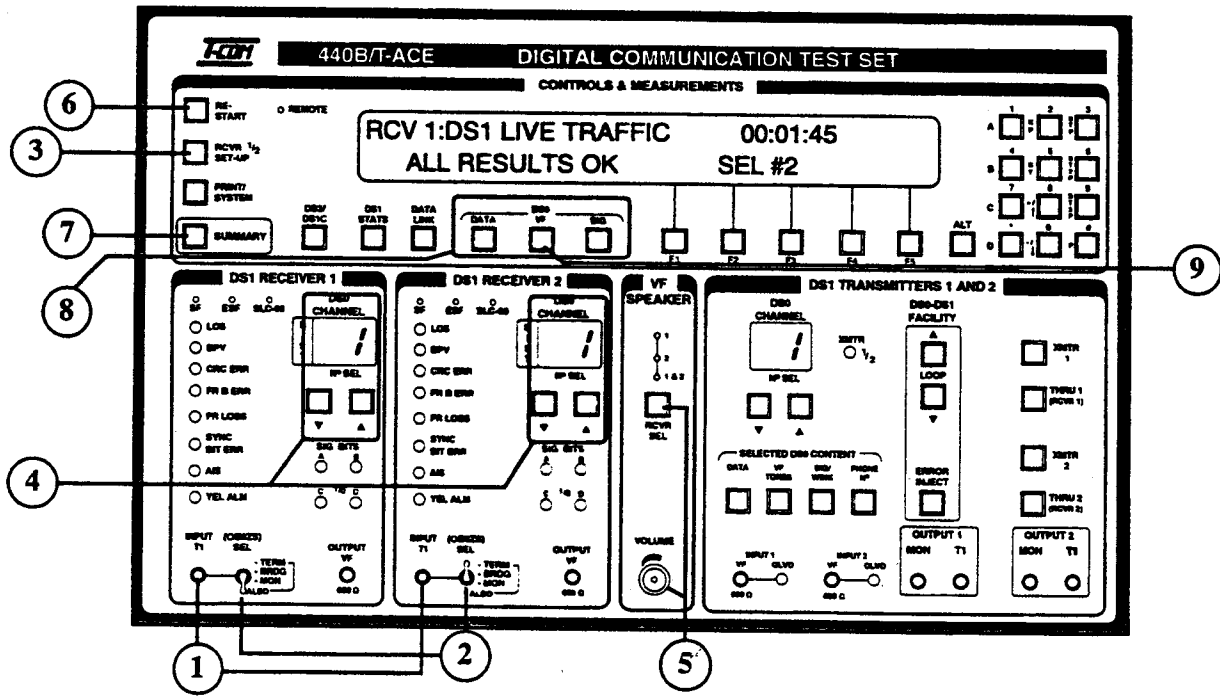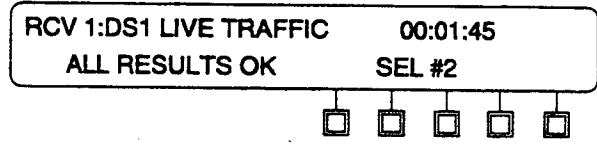
NOTE: If testing DS0 DATA, the SUMMARY screen should display DS0 SYNC or Live Traffic similar to the example below. If it does not, change Receiver Set-Up mode to LOCKED TO XMTR (and set XMTR for appropriate MODE). (VF and Signaling measurements do not require a specific RCVR Set-Up.)

```
┌─────────────────────────────────────────┐
│ RCV 1:DS0 SYNC (PATTERN)      00:01:55   │
│     ALL RESULTS OK          SEL #2       │
└─────────────────────────────────────────┘
       □    □    □    □    □
```
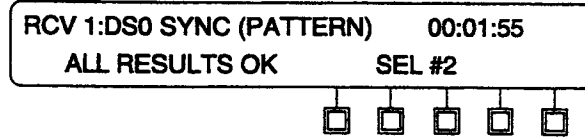
8. Use the DATA, VF, and SIGnaling keys to display DS0 channel measurements. **Steps 9-39 show individual screens for VF, DATA, and SIG keys.**

VF Tests

To Measure Level, Frequency, DC Offset, and Noise

9. Press the VF key (see picture for step 8.) to display the first VF screen below. If this screen does not match, press the VF key a second time.
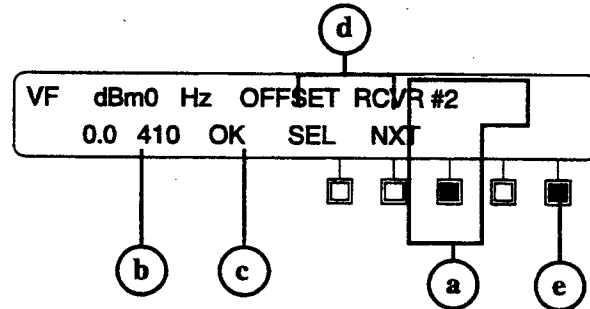
a) Use SEL softkey (F3) to display results for the DS0 channel in Receiver #1 or Receiver #2. (The screen above is displaying RCVR #1 DS0 results.)
b) Level is 0.0 dBm0
c) Frequency is 410 Hz
d) OK means no DC offset is present (>12 units appears if DC offset exists)
e) Use NXT softkey (F5) to scroll through the following three Noise screens. After scrolling through the three noise screens, the first (above) VF screen will return.

```
┌─────────────────────────────────────────┐
│ VF (C-MSG w/1010 Hz NOTCH)  RCVR #1      │
│ NOISE  90.7 dBmC0        SEL    NXT       │
└─────────────────────────────────────────┘
       □    □    ■    □    ■
```

```
┌─────────────────────────────────────────┐
│ VF (C-MSG)              RCVR #1          │
│ NOISE  90.0 dBmC0        SEL    NXT       │
└─────────────────────────────────────────┘
       □    □    ■    □    ■
```

```
┌─────────────────────────────────────────┐
│ VF (FLAT w/35 Hz HP FILTER) RCVR #1      │
│ NOISE  90.7 dBmC0        SEL    NXT       │
└─────────────────────────────────────────┘
       □    □    ■    □    ■
```
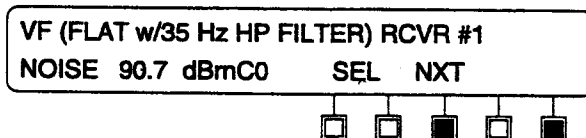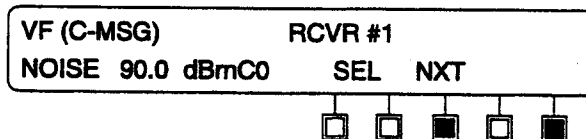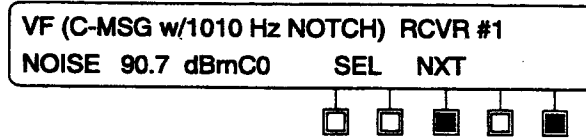
Signaling Analysis
(Telephone No requires Opt 06)
(Trunk scan requires Opt 07)

NOTES:

The 440B can display signaling bit status simultaneously for all 24 channels in both directions. When equipped with Option 06, it can capture telephone numbers (in MF, DTMF, Dial Pulse, or Cut-Thru modes) and measure winks. Since the unit provides dual DS1/DS0 receivers, it is important to verify which receiver's DS0 channel is chosen when capturing phone numbers and winks.

When equipped with Option 07, the 440B/T-ACE has the capability of scanning any number (from 1 to 24) of DS0 channels within a two-way DS1 trunk circuit for the purpose of capturing and viewing call details and downloading reports to a laptop computer or printer for analysis. The call detail reports can include:

- Direction, time, and channel for call origination
- Wink interval and delay
- MF/DTMF/DP telephone numbers
- Direction, time, and channel for call termination
- If answer was received, direction and release time

These reports can be used to analyze false (or early) disconnects, unusual signaling conditions, and toll fraud on two-way E & M Feature Group D trunks.

Since a variety of signaling supervision rules exist, a CNFG (configuration) softkey in the digit capture screen permits customized settings. An EDIT softkey in the call capture menu provides these and some additional customized settings. (Refer to Appendix 5 for details.)

To display signaling status on all 24 channels:

10. Depress DS0 SIG key to display main signaling menu:

```
┌─────────────────────────────────────────┐
│ BITS CALL(MF )  DIGIT  WINK  SS7          │
│          RCVR: #1 CNFG  <  > ENTR         │
└─────────────────────────────────────────┘
        ■   ■   ■   ■   ■
```
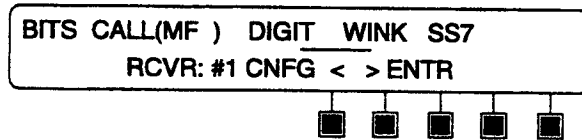
Signaling Bit Display

11. Use the < and > softkeys (F3 and F4) to move the underline to BITS and depress ENTR softkey (F5) to select A & B signaling bits display:
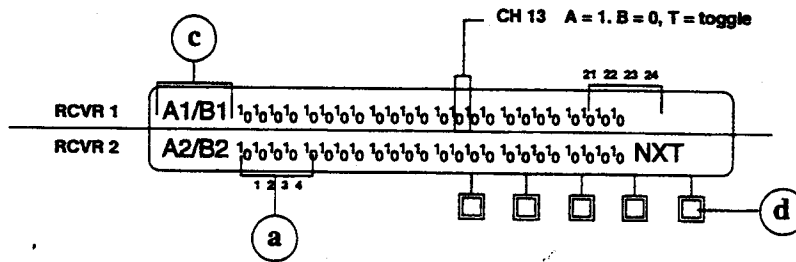
a) Bits are grouped by channels 1-4, 5-9, etc.
b) Each state will match the individual LED state displayed in the receiver DS0 channel section
c) A1/B1 row means A and B signaling bits for RCVR 1
d) If ESF is being monitored, a variety of A/B/C/D bit combinations can be displayed by scrolling with NXT
e) T (Toggle) is used for 9-state SLC-96 signaling

When the DS1 has SF frame type, the signaling bit display matches the screen above, assuming two DS1 circuits are being monitored. When only one DS1 is being monitored, Frame Loss will be displayed for the second unused receiver.

When ESF framing is present, there are four signaling bits per DS0 Channel (A/B/C/D). The screen provides several combinations. For example, A1/B1 means A and B bits for receiver 1, while C2/D2 means C and D bits for receiver #2. If ESF is present, use NXT softkey to scroll through four screen combinations:

| 1) A1/B1 | 2) C1/D1 | 3) A1/B1 | 4) A2/B2 |
| A2/B2 | C2/D2 | C1/D1 | C2/D2 |

NOTES:
This display provides a convenient check of the activity on all 24 trunks simultaneously in both directions. When a trunk is seized, it goes off-hook and this causes a wink in the opposite direction. This is normally followed by answer supervision, which is an off-hook from the same direction as the wink. When the call is completed, a disconnect signal, which is an on-hook, is sent from either end. To release the trunk, normally both parties need to be on-hook again.

To capture telephone numbers:

12. Depress the DS0 SIG key to display screen below, use the < and > softkeys (F3 and F4) to underline DIGIT(MF):

```
┌─────────────────────────────────────┐
│ BITS CALL(MF )  DIGIT  WINK  SS7     │
│      RCVR: #1 CNFG  <  > ENTR        │
└─────────────────────────────────────┘
            ■   ■   ■   ■   ■
```
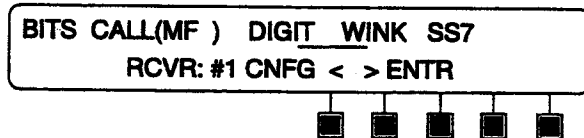
13. Depress the RCVR:# softkey (F1) to select the receiver that will capture the phone numbers.

NOTE: To verify or modify the configuration of the signaling supervision states, see step 39 on page 11/20, Editing Call capture.

14. Depress ENTR softkey (F5). The screen reads:

```
┌─────────────────────────────────────┐
│ DIGIT-CAPTURE TYPE: MF DTMF CUT-THRU │
│ DP                                   │
└─────────────────────────────────────┘
            □   □   ■   ■   ■
```
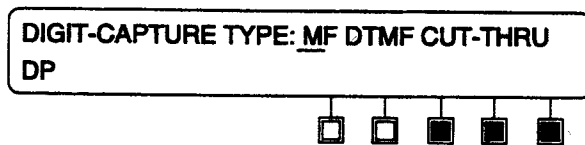
15. Use the < > softkeys (F3 and F4) to move the underline to MF, DTMF, CUT-THRU, or DP (dial pulse) depending on the type of signaling used. (CUT-THRU will capture MF and DTMF digits, if they are separated by an STP symbol.)

16. Depress NXT softkey (F5). The screen reads:

```
┌─────────────────────────────────┐
│ 0000: Ø                         │
│         RCVR#1 MF  CLR PRV NXT   │
└─────────────────────────────────┘
        ■   ■   ■   ■   ■
```
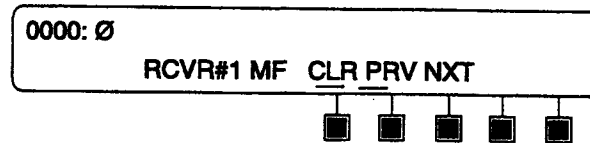
NOTE: This screen displays telephone numbers as they are captured. There is no telephone number currently shown in this screen, only an index number appears. As digits are captured, they will appear across the top line of the screen, after the 0000: index. If more than thirty-five digits are captured, they will roll to the next screen, and can be viewed by using the NXT softkey (F5). To clear all digits from memory, press the CLR softkey (F3). The index number identifies the position of the last digit on the previous screen (i.e. on the following screen, the index number will be 0035: indicating that the next digit displayed is the 36th digit captured. Up to 35 digits can be viewed per screen, and up to 4900 digits and symbols can be captured).

17. Description of telephone number screen:

```
         (e)            (c)
          │              │
┌─────────────────────────────────┐
│ 0000: [2125551212]Ø             │
│         RCVR#1 MF  CLR PRV NXT   │
└─────────────────────────────────┘
        ■   ■   ■   ■   ■
       (a) (b) (f) (g) (d)
```
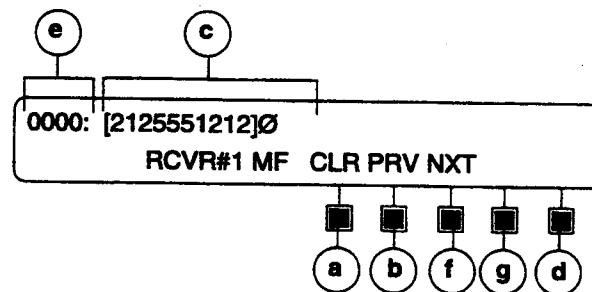
a) Select the receiver to be used for capturing digits (#1 or #2) with the F1 softkey
b) MF indicates the type of digits expected, toggle between DTMF and MF with the F2 softkey
c) The telephone numbers, ON/OFF hook, and KP/ST symbols are captured and displayed automatically.
d) Use NXT to scroll through pages of digits, or
e) Enter a reference index number with the keypad to jump to a specific screen
f) Use CLR softkey to clear/erase all stored digits
g) Use PRV to scroll backwards to previous screens.

Symbol key for Telephone No screens

↓ = On Hook		= = ST2P	
↑ = Off Hook		≡ = ST3P	
[= KP		F = flash (an improper wink)	
] = ST		G = glitch (sporadic A/B state change)	
- = STP			

To scan channels and capture call details (Option 07 Auto-Scan/Call analysis):

18. Press the SIG key to display the main screen below. Use the < > softkeys (F3, F4) to underline CALL (MF) and press GO (F5) to start the auto-scan/call analysis. (GO will become a flashing STOP):

```
┌─────────────────────────────────────┐
│ BITS CALL(MF )  DIGIT  WINK  SS7     │
│ <SCAN:  0>      EDIT VIEW <  > STOP  │
└─────────────────────────────────────┘
         ■    ■    ■    ■    ■
```
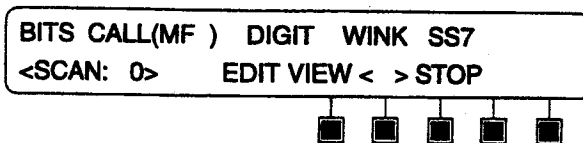
NOTE: To edit Call Capture (use EDIT) refer to step 39 on page 11, Editing Call Capture.

19. As soon a call is captured, <SCAN: 1> indicates 1 call received. To view the call details (while in the process of capturing additional calls) depress the VIEW softkey (F2). A typical screen reads:

```
┌─────────────────────────────────────┐
│ CALL#001: [6509653415]ØT            │
│ (MF )      EXIT PRNT CLR PRV NXT     │
└─────────────────────────────────────┘
         ■    ■    ■    ■    ■
```
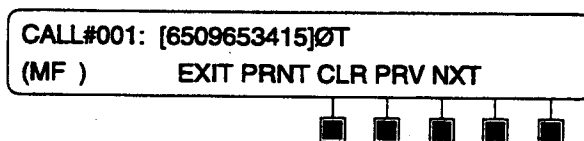
20. Depress the NXT softkey (F5) to display the wink details:

```
┌─────────────────────────────────────┐
│ CALL#001: DELAY   DURATION          │
│ WINK#1    300ms   220ms    PRV NXT  │
└─────────────────────────────────────┘
         □    □    □    ■    ■
```
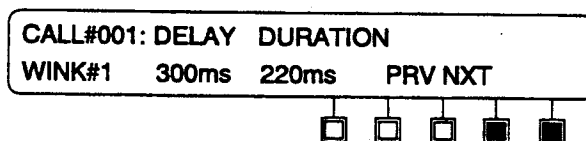
21. Depress the NXT softkey (F5) to display the call origination details:

22. Depress the NXT softkey (F5) to display the call termination details:

Origination   **Termination**

```
┌──────────────────────────────────┐   ┌──────────────────────────────────┐
│ CALL#001: ORIGINATED BY RCVR#1, CH#6 │ │ CALL#001: TERMINATED BY RCVR#1   │
│ OFF-HOOK( ) AT <13:35:56>  PRV NXT │   │ ON-HOOK(Ø) AT <13:39:01>   PRV NXT │
└──────────────────────────────────┘   └──────────────────────────────────┘
      □    □    □    ■    ■                  □    □    □    ■    ■
```
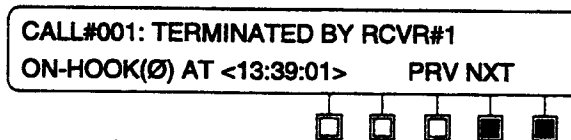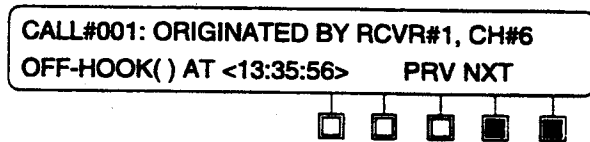
23. Depress the NXT softkey (F5) to display the trunk release details:

```
┌─────────────────────────────────────┐
│ CALL#001: CIRCUIT RELEASED BY RCVR#2 │
│        TIME: 10 secs   PRV NXT      │
└─────────────────────────────────────┘
         □    □    □    ■    ■
```
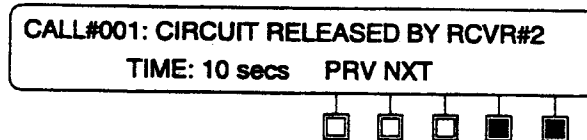
NOTE: Trunk release time is the interval between the call termination and the last on-hook received, which restores the trunk to an idle state. If no answer was received, a "CIRCUIT NOT YET RELEASED" message will be displayed until the Auto-Scan Time-Out period expires, at which time, a "RCVR # NEVER WENT OFF-HOOK" will be displayed.

Wink Timing

Measuring wink timing

Wink timing measurements can only be measured by Receiver #2. Therefore, seizure must be recognized on Receiver #1 (Figure A) or generated by Transmitter #1 when sending telephone numbers (Figure B). The response wink must be captured by Receiver #2.

24. Press the SIG key to display the main menu screen below, as shown in steps 10 and 15. (If this screen is not displayed press SIG a second time.)

```
BITS  CALL(MF )   DIGIT   WINK   SS7
          CNFG  <  > ENTR
```
■ ■ ■ ■ ■
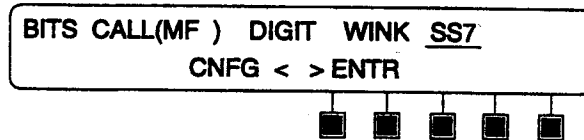
NOTE: To verify the test setup and to configure signaling supervision parameters refer to step 30 on page 10.

26. Press the ENTR softkey (F5) to display the wink measurement screen:

```
WINK DELAY   DURATION (MEAS'D ON RCVR
2)
```
□ □ ■ ■ ■
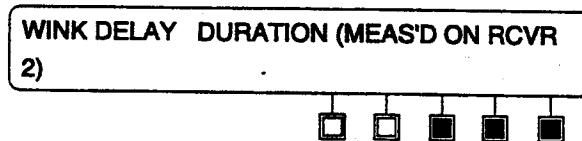
A. Monitoring both T1 directions

RCVR
1   2

direction
with seizure

RCV
wink
from
switch
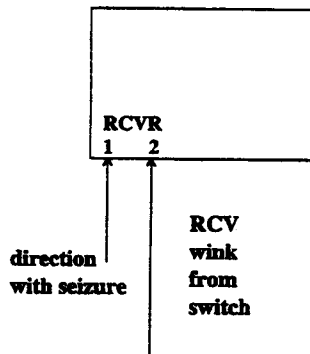
B. Test set generates seizure (XMTR #1)

RCVR   XMTR
#2   #1

wink   seizure

Digital
Switch
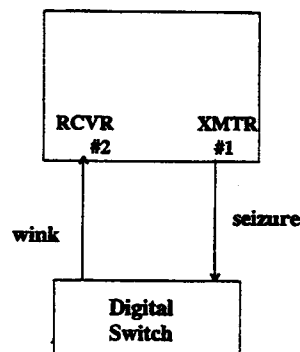
27. Interpreting Wink measurement screen:

```
        a                    e
   ┌──────────────┐  ┌──────────────┐
┌──┴──────────────┴──┴──────────────┴──┐
│ WINK DELAY   DURATION (MEAS'D ON RCVR │
│ 2)                                    │
└───────────────────────────────────────┘
              □  □  ■  ■  ■
                    b  c  d
```
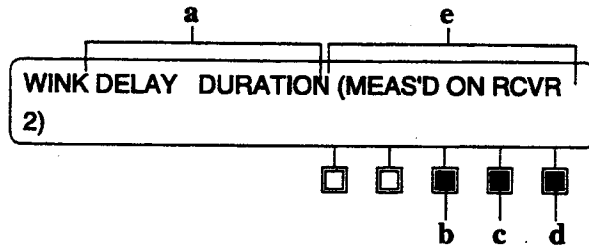
a) Duration and delay are captured and displayed automatically. The Delay (Guard Time) shows 200 ms, while the wink Duration shows 350 ms. (0 ms indicates that the test is set-up and waiting for the wink.)

b) Use NXT to scroll through 2 additional wink results

c) Clear results and begin new test by pressing GO

d) Return to main signaling screen with EXIT

e) Notice the reminder that only Receiver #2 can measure wink, therefore set up patchcords accordingly.

```
┌───────────────────────────────────────┐
│ WINK DELAY   DURATION (MEAS'D ON RCVR  │
│ 2)                                     │
└───────────────────────────────────────┘
              □  □  ■  ■  ■
```
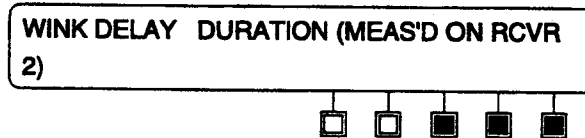
NOTE: Once telephone number capture and wink tests are set-up, the 440B will automatically proceed with measurements even if the screens are not displayed. In other words, after being configured, the unit can capture telephone numbers and measure winks, even while displaying a completely unrelated screen (for example DS1 SUMMARY). Results can be displayed simply by returning to the desired tests.

28. Press NXT to scroll through additional results until the WINK measurement/results screen shown below is displayed. The results captured in the screen below indicate a 350 ms wink duration and a 200 ms delay (guard time).

29. Press GO softkey (F4) to clear previous wink measurements and begin new wink tests.

```
┌───────────────────────────────────────┐
│ WINK DELAY   DURATION (MEAS'D ON RCVR  │
│ 2)                                     │
└───────────────────────────────────────┘
              □  □  ■  ■  ■
```
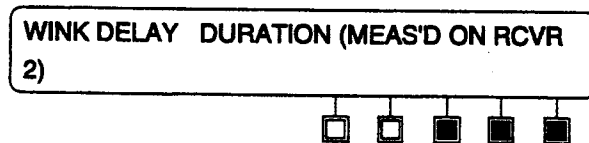
Configuring supervision states for Telephone Number capture and Wink measurement

30. Use the following screens To verify or change signaling or wink supervision states.

31. Press the SIG key to display the root signaling screen. (If this screen is not displayed press SIG a second time) (For location of the SIG key refer to the drawing on page 6/21)

```
BITS  CALL(MF )   DIGIT   WINK   SS7
              CNFG  <  > ENTR
```
☐ ■ ☐ ☐ ☐
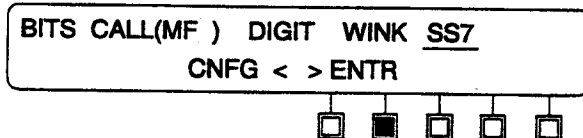
32. A series of configuration screens are provided for customized test settings. Press CNFG to access the following configuration screens.

```
DS0 SIGNALLING FORMAT:
   ROBBED BIT   CLEAR CHAN  <  > NXT
```
☐ ☐ ☐ ☐ ■
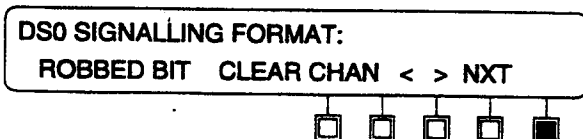
33. When CLEAR CHAN is selected, the 440B ignores the signaling bit states, and therefore does not recognize On/Off Hook states or Flash Hooks and intermittent signaling state changes.

When Robbed Bit is selected, the 440B captures and displays On/Off Hook status, as well as intermittent state changes.

34. In the screen above press NXT to display the on/off hook definition screen shown below. Use < > softkeys and keypad entry (1/0), to select A/B signaling bit transitions for Off Hook (↑) and On Hook (↓).

In the screen below, the ON to OFF hook transition is defined as A=0 to A=1.

```
SWITCH-HOOK  AB   AB
STATES     :0° Ø:1°     <  > NXT
```
☐ ☐ ☐ ☐ ■
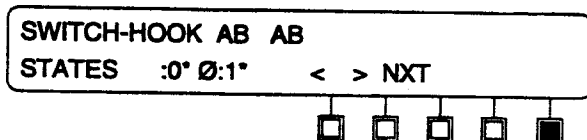
35. The 440B can simultaneously capture telephone numbers and measure wink.

When testing a live system, RCVR #1 must receive the originating seizure, while RCVR #2 receives the wink response and measures wink timing (Figure A).

When using the 440B XMTR #1 to seize the circuit and dial out, RCVR #2 will receive the wink response (Figure B on pg 8) and measure wink timing.

Press NXT

```
SEIZURE ON:  RCVR#1   XMTR#1
(WINK IS MEAURED ON RCVR#2)  <  > NXT
```
☐ ☐ ☐ ☐ ■
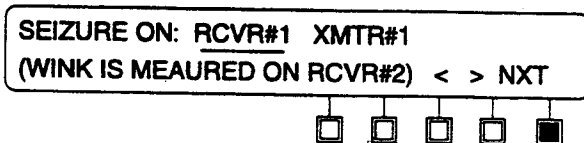
36. Underline your choice in the screen above and press NXT to display the Seizure Code definition screen below. Use the < > softkeys and keypad to enter 0/1 states.

```
┌─────────────────────────────────┐
│ SEIZURE    AB                   │
│ CODE       1*    _  <  > NXT    │
└─────────────────────────────────┘
        □   □   □   □   ■
```

37. Press NXT to display the Wink Code definition screen below. Use the < > softkeys and keypad to enter values.

```
┌─────────────────────────────────┐
│ WINK       AB                   │
│ CODE       1*    _  <  > NXT    │
└─────────────────────────────────┘
        □   □   □   □   ■
```

38. Press NXT to return to the root signaling screen.

```
┌─────────────────────────────────┐
│ BITS CALL(MF ) DIGIT WINK SS7   │
│         CNFG  <  > ENTR         │
└─────────────────────────────────┘
        □   ■   □   □   □
```

Editing Call Capture

39. Press the SIG key to display the root signaling screen and use the < > softkeys (F3,F4) to underline CALL(MF). (If this screen is not displayed press SIG a second time)(For location of the SIG key refer to the drawing on page 6/21)

```
┌─────────────────────────────────┐
│ BITS CALL(DTMF)  DIGIT  WINK SS7│
│         EDIT VIEW <  > GO       │
└─────────────────────────────────┘
        □   ■   □   □   □
```

40. Press EDIT

```
┌────────────────────────────────────────┐
│ 1. DIGIT TYPE: MF DTMF CUT-THRU(C/T) DP │
│              <  > NXT                    │
└────────────────────────────────────────┘
        □   □   ■   ■   ■
```

41. Use the < > softkeys (F3,F4) to underline MF to capture digits on E&M interoffice trunks.

NOTE: This selection allows the capture of MF, DTMF, C/T, or DP calls. C/T consists of MF and DTMF separated by an STP.

42. Press NXT and use the < > softkeys (F3,F4) to move the underline to SELECT to display the channels selected for scanning:

```
┌──────────────────────────────────────────────┐
│ 2. SCAN CHANNELS: SELECT  SINGLE             │
│ 1234567891₀1234567879²₀1234 EDIT <  > NXT    │
└──────────────────────────────────────────────┘
        □   ■   ■   ■   □
```

NOTE: This screen also allows for the selection of single trunk monitoring.

43. Depress the EDIT softkey (F2) to change the channels selected. The screen reads:

```
SELECT CHANNELS:  CH: 01
1111111111111111111111111 ALL  <  >  NXT
```
☐ ☐ ■ ■ ■
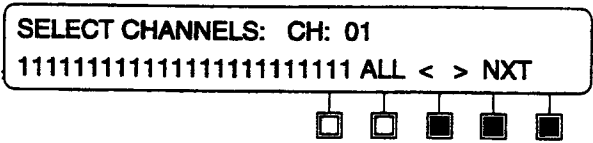
44. Use the < > softkeys (F3,F4) to move the underline to the channel(s) desired. Using the keypad, press 1 to select and 0 to delete a channel.

45. When the channels to be scanned have been selected, press NXT softkey (F5) and use the keypad to set the Auto-Scan Time-Out interval (from 1 to 60 seconds):

```
3. AUTO SCAN TIME-OUT: 15
(ENTER 1-60 W/KEYPAD)        <  > ENTR
```
☐ ☐ ☐ ☐ ■
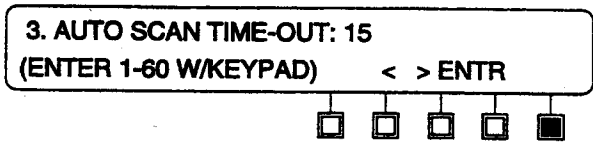
NOTE: This interval sets the amount of time that is spent monitoring a particular channel before moving to the next channel.

46. Press ENTR softkey (F5) and then YES (softkey F1) to select wink measurement and display:

```
4. MEASURE WINKS: YES
(MEASURED ON RCVR#2)  NO YES  <  >  NXT
```
☐ ☐ ☐ ☐ ■
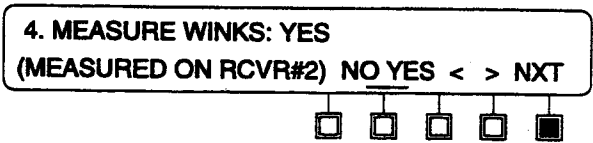
NOTE: Wink is always measured on RCVR#2; verify the correct placement of patch cords so that this is the case.

47. Press the NXT softkey (F5) and then YES softkey (F2) to capture and analyze call disconnect details:

```
5. DISPLAY DISCONNECT ANALYSIS: YES
                NO YES  <  >  NXT
```
☐ ■ ☐ ☐ ■
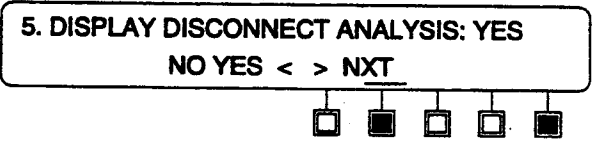
NOTE: This screen allows call details to be captured and reported. The details include:
— Direction, time, and channel for call orgination
— Direction, time, and channel for call termination
— If answer was received, direction and release time

48. Press NXT softkey (F5) and verify that the screen reads as follows, if not change accordingly:

```
6. ON/OFF HOOK  AB   AB
(Ø=ON  =OFF) Ø:0°  :1°  <  >  NXT
```
☐ ☐ ☐ ☐ ■
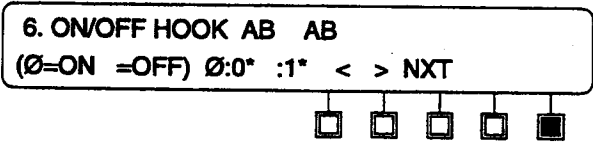
NOTE: This screen allows the off hook condition to be set for either a 1 (normal case) or 0, and vice-versa for the on hook condition. It also allows either the A or B bit to be monitored for on/off hook conditions.

49. Press NXT softkey (F5) and verify that the screen reads as follows, If not change accordingly:

```
┌─────────────────────────────────┐
│ 7. SEIZURE    ABCD              │
│         1***      <  > NXT      │
└─────────────────────────────────┘
        □   □   □   □   ■
```
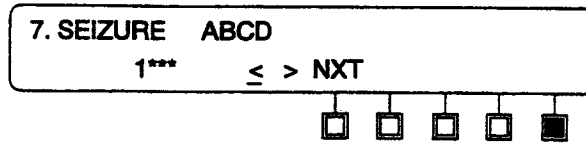
NOTE: This screen allows the seizure condition to be set for a 1 (normal case) or 0. It also allows either the A or B bit to be monitored for the seizure condition.

50. Press NXT softkey (F5) and verify that the screen reads as follows, if not change accordingly:

```
┌─────────────────────────────────┐
│ 8. WINK CODE    ABCD            │
│         1***      <_ > NXT      │
└─────────────────────────────────┘
        □   □   □   □   ■
```
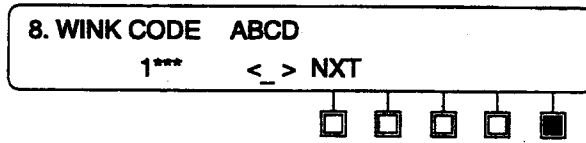
NOTE: This screen allows the wink condition to be set for a 1 (normal case) or a 0. It also allows either the A or B bit to be monitored   for the wink condition.

51. Press NXT to return to the root signal screen.

When equipped with Option 14, the 440B/T-ACE can independently monitor two SS7 channels (56Kb/s or 64Kb/s), non-intrusively, from DS1 monitor jacks. An SS7 circuit can also be tested from a DS3 bitstream when the 440B is equipped with the 52B+ or 52C. An SS7 circuit can also be tested at DS0-DP/OCU-DP access points when the 440B is equipped with Option 30 (DS0 Data access).

SS7 errors automatically trigger the flashing HISTORY indicators, and the message "SS7 Errors Detected" appears in the main SUMMARY screen. Since SS7 monitoring occurs in "background" mode, DS1 and DS3 facility errors will continue to be captured automatically. This allows easy isolation of facility troubles from pure SS7 equipment failures. DS0 VF and signaling measurements can also be made on other channels while an SS7 channel is being monitored.

This option provides individual error counts, as well as packet/traffic statistics including total packet counts by type, and % MSUs, LSSUs, FISUs.

Option 14 also provides limited SS7 packet transmit simulation using the dual transmitters in terminal or DS0 Drop-and-Insert mode. This may be useful to verify receive functions before system/equipment turn-up. (For packet transmit functions, refer to Hint Card 15.)

NOTE: The unit's Split Mode capability allows using one receiver for SS7 testing while using the other for unrelated T1, Fractional T1, or DS0A/B BERT or monitoring.

Set-Up

1. Patch DS1 circuit(s) into Receivers 1 and 2. Set the toggle switches to MON. All error/alarm LEDs should be off.

2. Depress the SIG key and underline SS7:

```
BITS CALL(MF )   DIGIT   WINK   SS7      __
<R1: OFF  R2: OFF>  CNFG VIEW <  >  GO
```
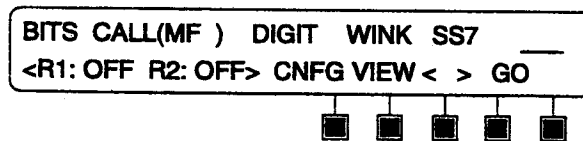
NOTE: SS7 errors will automatically trigger the flashing channel/error indicators, and "SS7 Errors Detected" will appear in the main SUMMARY screen. Therefore, once SS7 is started, it is not necessary to use steps 7-11 to determine errors have occurred.
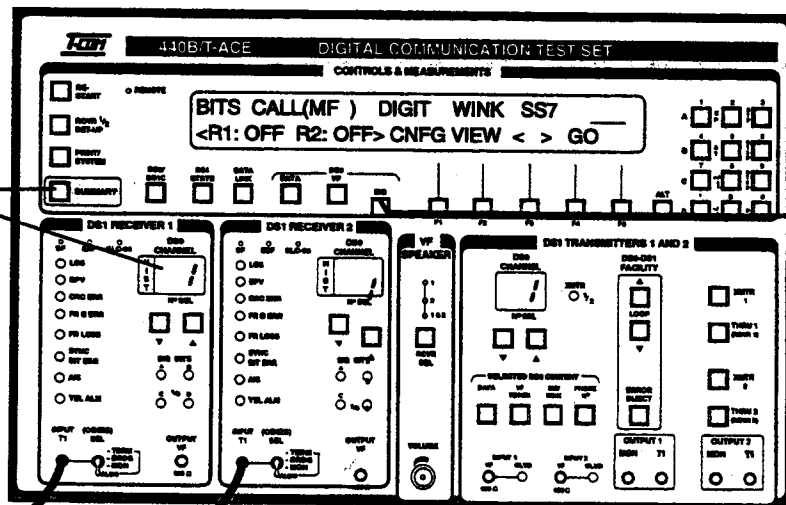
3. Depress the CNFG key (F1) and use the arrow softkeys (F1 thru F4) to select the SS7 channel (#24 in this example) to be monitored by each receiver:
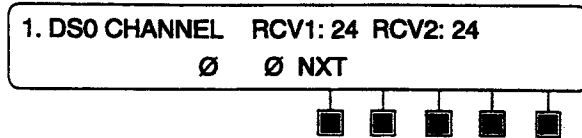
```
┌─────────────────────────────────────────┐
│  1. DS0 CHANNEL   RCV1: 24  RCV2: 24      │
│             Ø      Ø  NXT                 │
└─────────────────────────────────────────┘
         ■    ■    ■    ■    ■
```

NOTE: Between 1 and 24 there is an "OFF" selection which turns off the SS7 monitoring associated with a particular receiver.

4. Depress NXT and depress F1/2 (and F3/4) to select either 56 or 64 kbps operation for the SS7 channel for Receiver 1 (and 2):
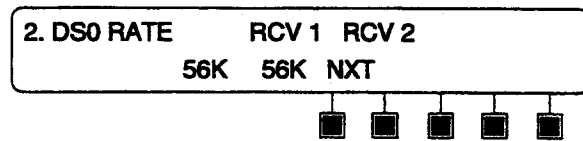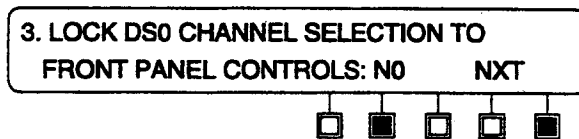
```
┌─────────────────────────────────────────┐
│  2. DS0 RATE        RCV 1  RCV 2          │
│             56K    56K   NXT              │
└─────────────────────────────────────────┘
         ■    ■    ■    ■    ■
```

5. Depress NXT and depress F2 to select either YES or NO:

```
┌─────────────────────────────────────────┐
│  3. LOCK DS0 CHANNEL SELECTION TO         │
│     FRONT PANEL CONTROLS: N0      NXT     │
└─────────────────────────────────────────┘
         □    ■    □    □    ■
```

Note: The above selection (NO) allows the independent operation of the front panel channel selectors, so that they may be used for VF or SIGNALING measurements while SS7 is being monitored in the background on the previously selected channel (#24 in this example). Depress NXT to return to screen #1.

Starting SS7 Monitoring

6. Depress the DS0 SIG key to return to the main menu screen of Step 1 and depress GO to start monitoring the selected SS7 channel(s):

```
┌─────────────────────────────────────────┐
│ BITS  CALL(MF )  DIGIT  WINK  SS7   __    │
│ <R1:CH#24 R2:CH#24> CNFG VIEW <  >  GO    │
└─────────────────────────────────────────┘
         ■    ■    ■    ■    ■
```

Note: If SS7 is not present on the selected channel(s), "N/A" will appear in the screen above instead of CH#24. GO is now a flashing STOP. Depress STOP (F5) to stop monitoring the SS7 channel(s).

7. While monitoring the SS7 channel(s), depress VIEW (F2):

```
┌─────────────────────────────────────────┐
│ RCVR1: SS7 SUMMARY                        │
│ ALL RESULTS OK          RCV2 MORE         │
└─────────────────────────────────────────┘
         □    □    □    ■    ■
```
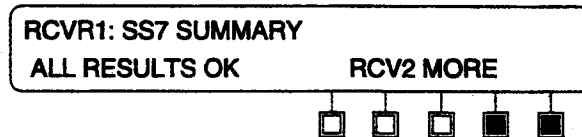
Note: This screen is similar to the DS1 SUMMARY screen, except that only SS7 errors are displayed. Depress F4 to display the RCVR 2 SS7 SUMMARY, if desired. (Use MORE, then ENTR, then NXT to scroll through the different errors.)

(Option 14)

Viewing all error counters and packet statistics.

8. Depress MORE (from screen in step 7):

```
┌─────────────────────────────────────┐
│  ERROR COUNTS  STATISTICS            │
│          EXIT <  > ENTR              │
└─────────────────────────────────────┘
            ☐  ■  ■  ■  ■
```

Note: This screen permits the user to select two display modes:
   a. Error Counts (cumulative SS7 error counts)
   b. Statistics (data packet analysis)

9. With ERROR COUNTS underlined, depress ENTR:

```
┌─────────────────────────────────────┐
│  [ERR COUNTS]    RCVR1   RCVR2       │
│           0       0    NXT           │
└─────────────────────────────────────┘
            ■  ☐  ☐  ■  ■
```

Note: By depressing NXT, the following error counts can be accessed for RCVR 1 and 2:
   a. Cyclic Redundancy Check   **f.** SYNC-LOSS EVENTS
   b. LENGTH Indicator   **g.** Processor/OUTAGE Seconds
   c. Negative Acknowledgments   **h.** Processor/OUTAGE EVENTS
   d. RETRANSMITS   **i.** Processor/BUSY Seconds
   e. SYNC-LOSS Seconds   **j.** Processor/BUSY EVENTS

10. Depress the DS0 SIG key, the VIEW softkey, and the MORE softkey. Move the underline to STATISTICS:

```
┌─────────────────────────────────────┐
│  ERROR COUNTS  STATISTICS            │
│          EXIT <  > ENTR              │
└─────────────────────────────────────┘
            ☐  ■  ■  ■  ■
```

11. Depress ENTR:

```
┌─────────────────────────────────────┐
│  [STATISTICS]   RCVR1   RCVR2        │
│  % MSUs        0.00    0.00   NXT    │
└─────────────────────────────────────┘
            ■  ☐  ☐  ■  ■
```

Note: By depressing NXT, the following statistics can be accessed for RCVR 1 and 2:
   a. % Message Signaling Units
   b. % Link Status Signaling Units
   c. % Fill In Signaling Units
   d. Total Packets (PKTS)
   e. Total Message Signaling Units
   f. Total Link Status Signaling Units
   g. Total Fill In Signaling Uni

37. Press NXT to return to the menu screen:

```
DS0 STATISTICS
            BITS CNT SEC BER
```
☐ ■ ■ ■ ■
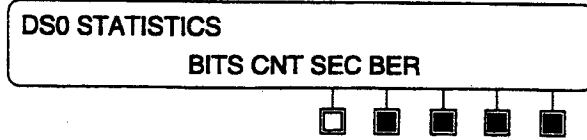
Errored Seconds events

38. Press SEC to display:

SYNC LOSS SECONDS (requires test pattern)

```
RCVR 1       PRI-2047   SEC-LIVE    SEL
SYNC LOSS-SECS  0        N/A    NXT  #2
```
☐ ☐ ☐ ■ ■
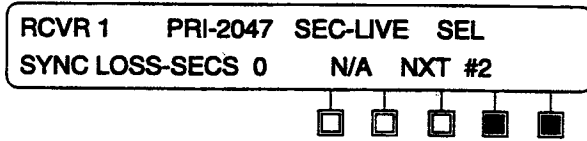
Press NXT to scroll through the following screens:

FRAME LOSS SECONDS

```
RCVR 1       PRI-2047   SEC-LIVE    SEL
FR LOSS-SECS   0         N/A    NXT  #2
```
☐ ☐ ☐ ■ ■

BLOCK ERRORS

```
RCVR 1       PRI-2047   SEC-LIVE    SEL
BLOCK ERRS     0         N/A    NXT  #2
```
☐ ☐ ☐ ■ ■

Press NXT to return to the main menu screen:

```
DS0 STATISTICS
            BITS CNT SEC BER
```
☐ ■ ■ ■ ■
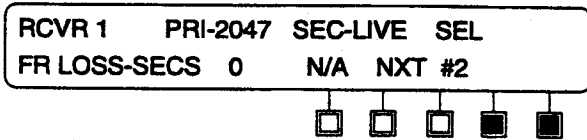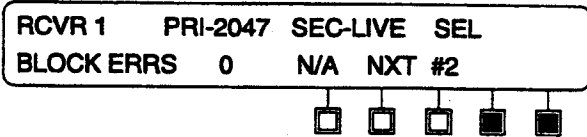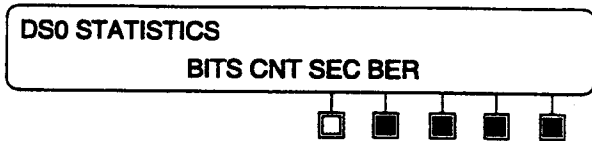
Bit Error Rate Measurements

39. Press BER to display:

Logic Bit Error Rate (requires test pattern)

```
RCVR 1  PRI-2047    SEC-LIVE      SEL
BER      5.2 x 10    N/A     NXT  #2
```
☐ ☐ ☐ ■ ■
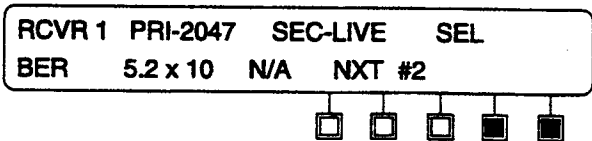
Press NXT to display the following screens:

Majority Vote Bit Error Rate

```
┌─────────────────────────────────────────┐
│         RCVR 1        SEL                 │
│  MAJ VOTE BER   LOW ERROR    NXT  #2      │
└─────────────────────────────────────────┘
             □   □   □   ■   ■
```
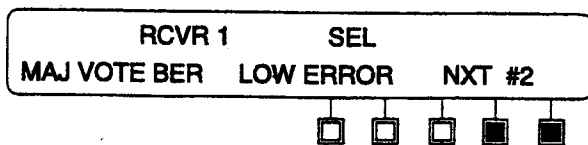
(Use softkey F5 to toggle between RCVR 1 and RCVR 2)

DS0 Frame Bit Error Rate

```
┌─────────────────────────────────────────┐
│         RCVR 1        SEL                 │
│  DS0 FRAME BER   LOW ERROR    NXT  #2     │
└─────────────────────────────────────────┘
             □   □   □   ■   ■
```
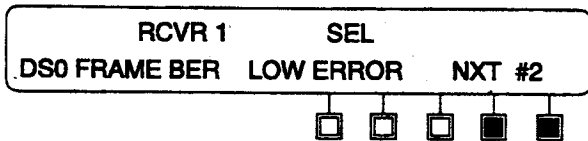
(Use softkey F5 to toggle between RCVR 1 and RCVR 2)

Press NXT to return to the main menu screen:

```
┌─────────────────────────────────────────┐
│  DS0 STATISTICS                           │
│              BITS CNT SEC BER             │
└─────────────────────────────────────────┘
             □   ■   ■   ■   ■
```
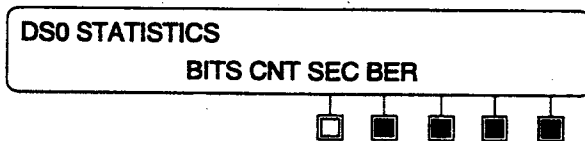
Press BITS to return to the 8 bit word display:

```
┌─────────────────────────────────────────┐
│  RCVR 1 DS0 BITS: 12345678      SEL       │
│  DSU LOOP           _█ NXT #2             │
└─────────────────────────────────────────┘
             □   □   □   □   ■
```
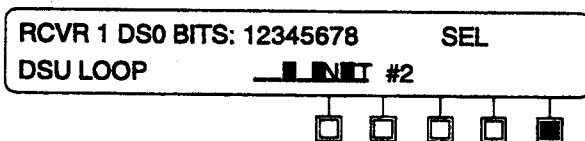
Part II. DS0 Channel Transmit

The 440B can send data, VF tones, telephone numbers, and generate winks into individual DS0 channels. Because the 440B provides two nearly identical transmitters, it should be noted that telephone numbers and winks can only be sent by transmitter #1 (XMTR 1). For this reason, Wink and Phone No. are printed in red to match with XMTR 1 on the front panel.

In order to use the DS0 transmitter keys labeled **DATA, VF TONES, SIG/WINK, and PHONE No**, the transmitter(s) must first be Set-Up in a CHANNELIZED mode (see Transmitter Set-Up Quick Sheets).

The 440B supports out-of-service testing as well as drop-and-insert. Using the transmitter section involves breaking into a DS1/T1 circuit, generally via DSX jacks. Before breaking into a DS1 circuit, T-COM recommends that the circuit first be monitored with the DS1 receivers to verify that there is no customer traffic on the circuit. This will prevent accidentally interrupting customer activity. (For example, using the signaling bit display described on pg 7 of QS5 can quickly show idle/busy status of the trunks.)

It is also important to note that the 440B provides two separate transmitters and therefore there are two sets of transmitter jack outputs (labeled red and green corresponding to XMTR 1 and XMTR 2.) Generally, the jack outputs labeled T1 are used for circuit testing since they provide 0 dBDSX level.

When using the DS0 transmitter function keys (DATA, VF TONES, SIG/WINK, PHONE No), keep in mind that you are controlling either XMTR 1 or XMTR 2, depending on which XMTR key is lit, and the XMTR-LED color.

In the picture below the lit function keys indicate that Transmitter #1 is sending VF Tones into DS0 Channel #21.

DS0 Channel #21
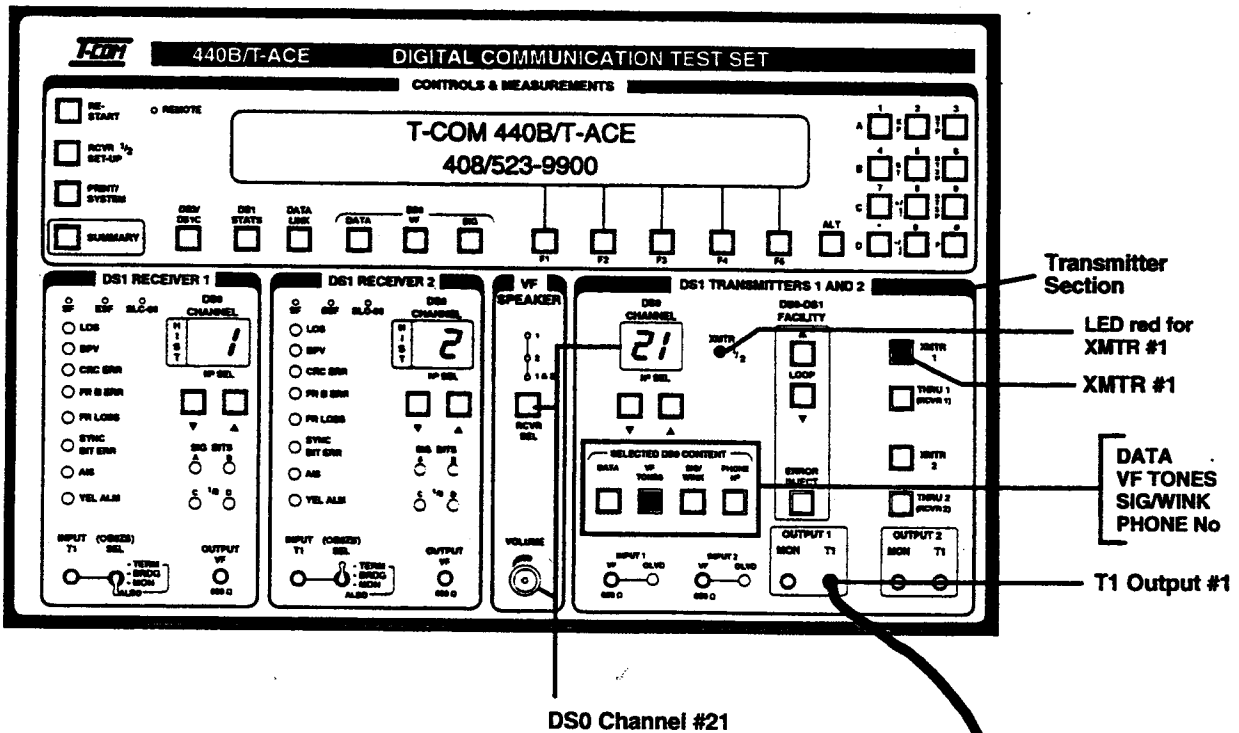
Initial Set-Up

1. Verify whether transmitter 1 or 2 is to be used by checking whether XMTR 1 or XMTR 2 key is lit. (Press the desired XMTR key if it is not lit.)

2. Verify that the patchcord is plugged into the correct jack OUTPUT (notice that Output 1 is used since we are using Transmitter #1). Generally the T1 jack is used.

3. Select the desired DS0 Channel (1 to 24) using either selector keys (labeled ▼ ▲). Selected DS0 content will be sent in this channel.

4. If no number appears in the DS0 Channel read-out, the transmitter is not in a CHANNELIZED mode. Trying to dial to a specific channel or select the DS0 keys labeled **DATA, VF TONES, SIG/WINK, PHONE No.** will cause a reminder screen to display:

```
┌────────────────────────────────────┐
│      TRANSMITTER MODE MUST BE       │
│           CHANNELIZED               │
└────────────────────────────────────┘
        □     □     □     □     □
```
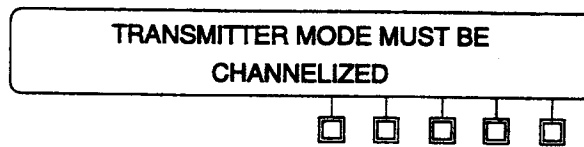
This screen is a reminder that the transmitter mode must first be changed to CHANNELIZED via the DS1 SET-UP key labeled XMTR (see TRANSMITTER SET-UP Quick Sheets).

5. Assuming the transmitter is in a CHANNELIZED mode, use the four function keys in the transmitter's SELECTED DS0 CONTENT section to select desired function.

See individual screens for DATA, VF TONES, SIG/WINK, and PHONE No on the following pages.
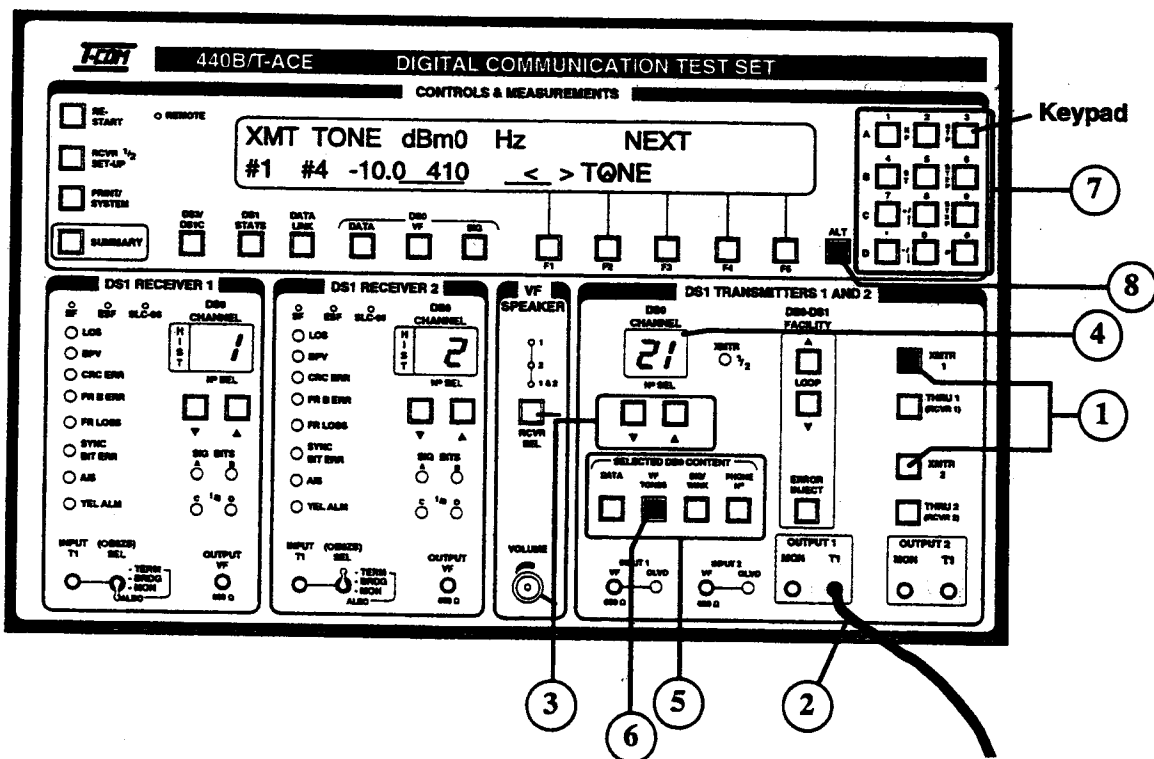
Sending VF tones

The 440B provides 16 factory pre-set tones. All tones can be easily edited, and are automatically saved even when the set is turned off.

Since it is sometimes important to set signaling bit states when sending tones, refer to SIG/WINK section (pg 7) for setting signaling bit status.

6. Press the VF TONES key to display tone screen:

```
XMT  TONE  dBm0  Hz        NEXT
#1   #4   -10.0  410    <  > TONE
```
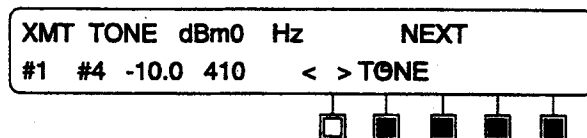
This screen indicates the tone currently being sent in the selected transmitter and its corresponding DS0 channel.

```
  (a)              (b)    (c)
XMT  TONE  dBm0  Hz        NEXT
#1   #4   -10.0  410    <  > TONE

          (d)              (d)
```
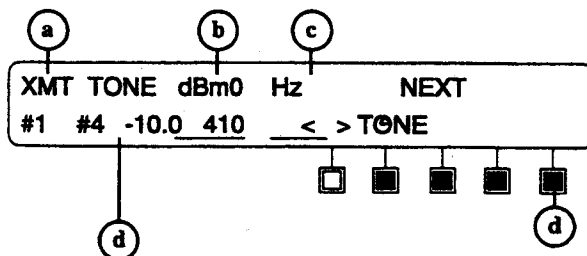
   a) XMT#1 indicates that transmitter #1 is selected
   b) Level is -10.0 dBm0
   c) Frequency is 410 Hz
   d) Use NEXT TONE softkey (F5) to scroll through 16 preset tones.   (TONE #4 is selected in screen)

7. To edit a tone, use the < > softkeys (F3,F4) to move the flashing underline to the digit to be changed, and enter new digits with the keypad. For example in screen below we have changed tone #4 to 1004 Hz at 0.0 dBm0.

```
XMT  TONE  dBm0  Hz        NEXT
#1   #4    0.0  1004    <  > TONE
```
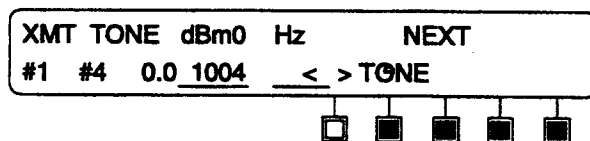
Alternatively, use the < > softkeys to move the blinking underline and use the delta symbol (F2) to scroll quickly through levels and frequencies. Changes are automatically saved (even if the test set is turned off).

8. To reverse the direction of the delta scroll, or the NEXT TONE scroll, press the green ALT key first. This changes NEXT TONE to PREV TONE and changes the direction of the delta scroll. When the ALT key is lit (green) the delta scroll goes "up" on level and "down" on frequency.

This concludes the VF Tones Quick Sheets.

Telephone Numbers (Requires Option 06)

Sending Telephone Numbers (Transmitter #1 only)

A. Direct Dialing from Keypad

9. Press the **PHONE No.** key to display the opening menu screen. If this screen is not displayed, press the key a second time:

```
XMT PHONE   DIRECT   PROGRAMMED
#1  NO.             EDIT  <  > ENTR
```
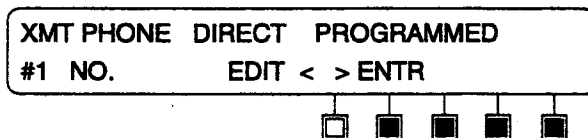
NOTE: EDIT provides screens for verifying and changing telephone number parameters which vary depending on whether MF, DTMF, or Dial Pulse is used. See section Editing Telephone Numbers on page 11/17.

10. Use the < > softkeys (F3, F4) to underline DIRECT.

11. Press ENTER to display the direct dial screen:

```
<>
E&M  -20 dBm0      Ø   DTMF   CLR
```


— *Quick Sheet 5A - 440B/T-ACE*   (ver 3d) ———————
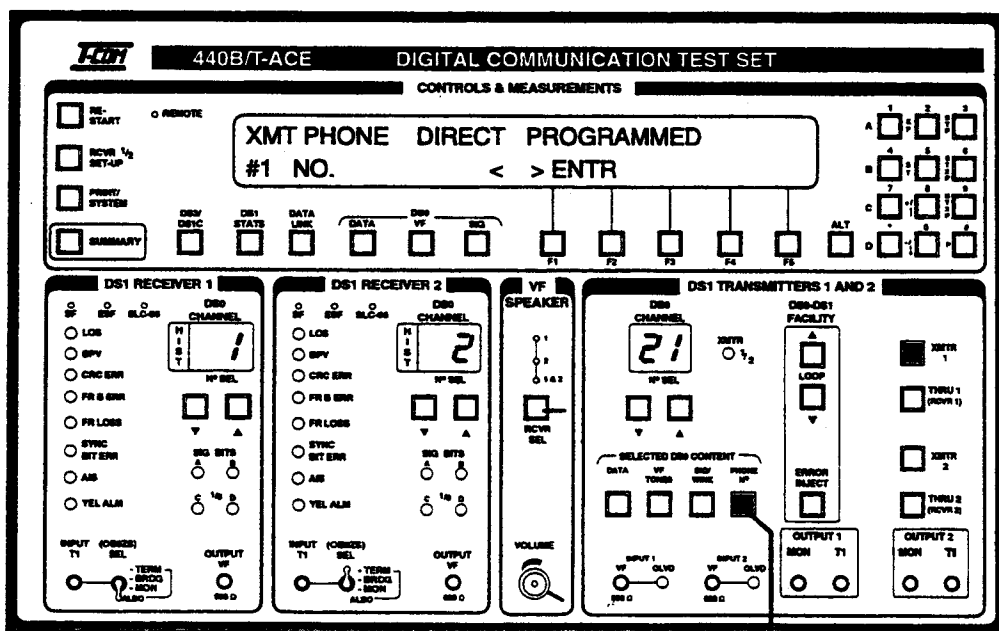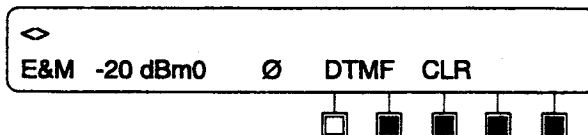
A. Direct Dialing from Keypad (cont.)

Description of the direct dial screen:

```
<>
E&M   -20 dBm0        Ø    DTMF   CLR
```
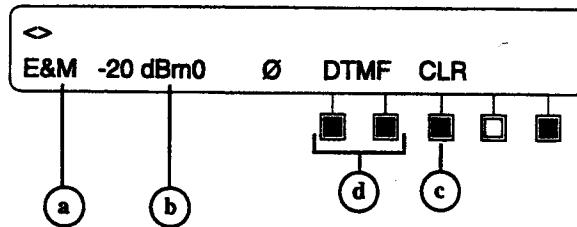
a) E&M signaling is selected
b) Digits will be sent at -20 dBm0 level
c) Use the DTMF/MF/DP softkey to change the digit format.
d) Use the ↓ ↑ softkeys for On/Off Hook

12. Use the ↓ ↑ softkeys (F1, F2) to enter ON/OFF hook status, and use the keypad to enter digits. Digits and ON/OFF hook status are sent immediately when entered, and will appear on screen:

```
< Ø6505551212>
E&M   -20 dBm0        Ø    DTMF   CLR
```
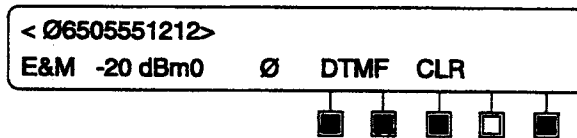
13. Press the CLR softkey (F5) to clear the screen and enter new digits.

14. To exit, or return to the telephone number screen, press the PHONE No. function key (see step 9) on the front panel.

Note: The 440B will only accept new Dial Pulse digit entries when outpulsing of all previously entered digits is complete.

B. Using Pre-Programmable Telephone Sequences

Equal Access, Feature Group D, 800, and interlata testing require sending two or three batches of telephone strings in a row. Pre-programming these sequences into the 16 memory locations is an ideal method of setting up telephone numbers, kick codes, customer ANI, and credit card numbers.

15. Press the PHONE No. function key to display the opening telephone number screen. If this screen does not display, press the key a second time:

```
XMT  PHONE  DIRECT  PROGRAMMED
#1   NO.            <  >ENTR
```
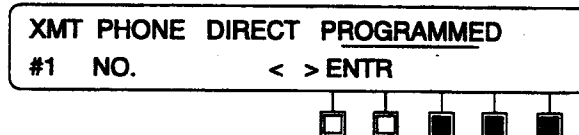
16. Use the < > softkeys to underline PROGRAMMED.

17. Press the ENTR softkey (F5) to access up to 16 pre-programmed telephone number screens:

```
┌─────────────────────────────────────────┐
│ MF  Ø [650®5551212]                      │
│ #1   -20 dBm0 50 ms  Ø    EDIT GO  NXT   │
└─────────────────────────────────────────┘
        ■   ■   ■   ■   ■
```
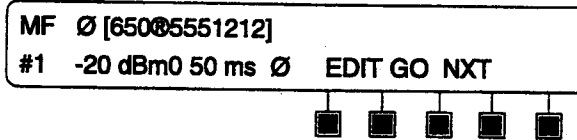
18. Use the NXT softkey to scroll to the desired program (1-16), and press the GO softkey to send digits. An underline will move across the screen to indicate that digits are being transmitted.

   NOTE: EDIT provides menus for changing a variety of parameters, depending on whether the number is MF, DTMF or DP. See APPENDIX TO TELEPHONE NUMBERS for specific EDIT screens.

B. Using Pre-Programmable Telephone Sequences

Description of pre-programmed telephone sequence screen:

```
                        (a)
     ┌─────────────────────────────────────────┐
     │ MF   Ø [650®5551212]                     │
     │ #1   -20 dBm0 50 ms  Ø    EDIT GO  NXT   │
     └─────────────────────────────────────────┘
          │              │     ■  ■  ■  ■  ■
         (b)            (c)       (g)(f)(d)(e)
```
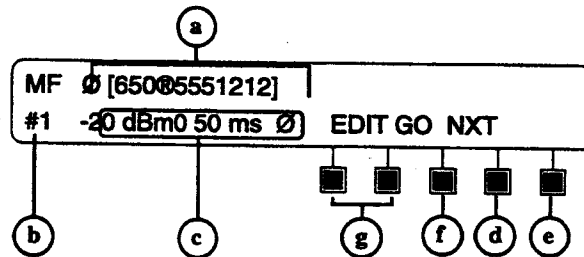
a) MF digits 415 555 1212, with ON/OFF hook KP and ST commands

b) #1 indicates this is number 1 of 16 programmed sequences

c) Digits will be sent at -20 dBm0 level, timed 50ms apart from one another.

d) Press the GO softkey to send numbers.

e) Use NXT to scroll through 16 telephone numbers

f) Use EDIT softkey to edit telephone numbers

h) If a W (wait-for-wink) is entered, the 440B will wait for a wink response before it continues outpulsing

g) Manual On/Off hook control

Symbol Key for Telephone No. screens

↓	= On Hook	=	= ST2P
↑	= Off Hook	≡	= ST3P
[	= KP	W	= Wait-for-wink
]	= ST	↕	= Transition state - FXS/GS
—	= STP	♦	= 1 sec pause

This concludes the Telephone Number Quick Sheets. See Editing Telephone Numbers on page 11.

Signaling and Wink

The Signaling capability allows setting the A/B/C/D signaling bits while sending tones. The wink capability provides for automatic multiple Wink generation for emulating digital switch or PBX operation when setting up a series of telephone calls.

> A. Signaling Bits
> B. Wink Generation - XMTR #1 only (Requires Option 06)

A. Setting Signaling Bits

19. Press SIG/WINK function key to display main menu screen. Note that [AB:11] means signaling states are currently set to A = 1, B = 1:

```
┌─────────────────────────────────────────┐
│ XMT SIG STATES    WINK OR CUT-THRU        │
│ #1  [AB:11]         <  > EDIT             │
└─────────────────────────────────────────┘
           □  □  ■  ■  ■
```
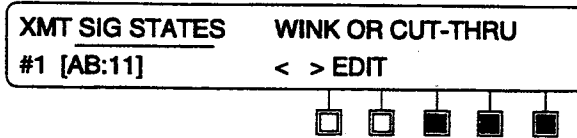
20. Verify that SIG STATES is underlined, and press EDIT to change signaling bit states:

   a) If SF framing is used, verify the screen reads:

```
┌─────────────────────────────────────────┐
│ XMT SIG STATES    A  B  SLC/SF?           │
│ #1                0  0  NO   NXT          │
└─────────────────────────────────────────┘
           ■  ■  ■  □  ■
```
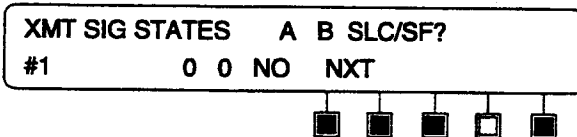
NOTE: The above screen shows that the A and B signaling states are set to 0. When testing Shelves B, C, and D in a SLC-96 system, depress the F3 softkey which changes NO to YES. This permits the selection of the "T" (toggle) state, which is an alternating 0/1 state, normally used for ringing.
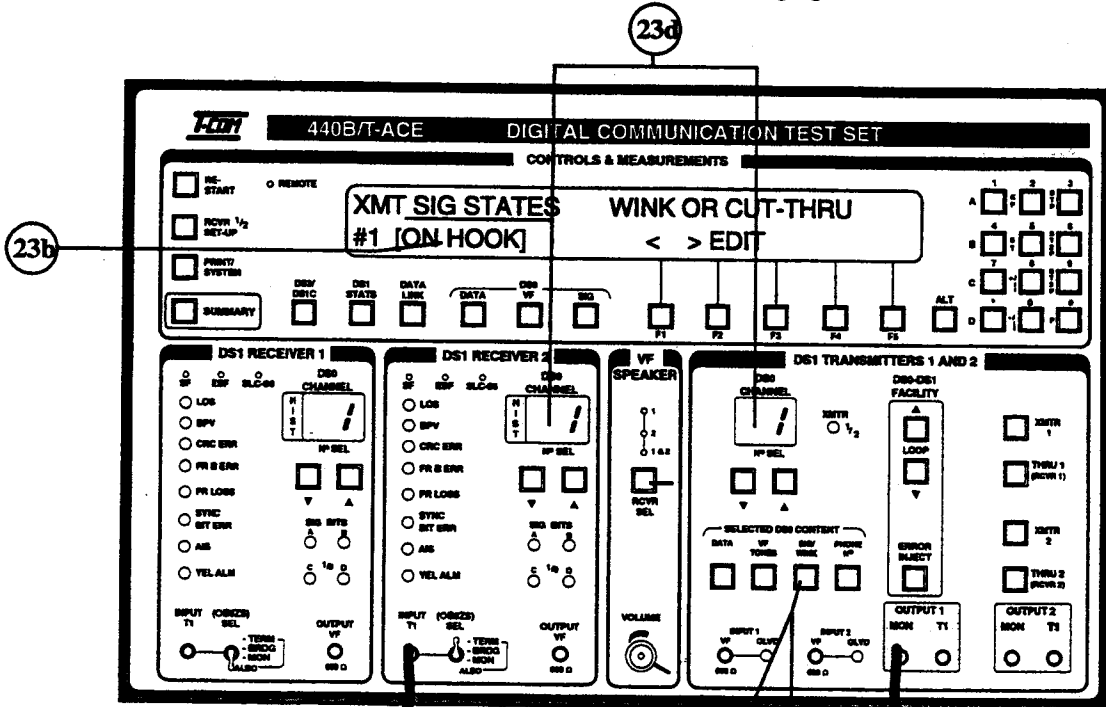
b. If ESF framing is used, verify the screen reads:

```
┌──────────────────────────────────┐
│ XMT SIG STATTES    A  B  C  D     │
│ #1           0  0  0  0 NXT       │
└──────────────────────────────────┘
      ■    ■    ■    ■    ■
```

21. Use the softkeys (F1 through F4) to change states from 0, 1, or T for A/B signaling bits. (Press softkeys repeatedly to run through settings, for example A=1, B=0.

22. Press NXT to return to the main menu screen in step 19. This screen will reflect changed signaling states. Note: C and D signaling bits will only appear for ESF framing. T (toggle) will only appear for SLC-96 framing, and is used for 9-state signaling.

B. Setting automatic Wink generation (Transmitter #1 only; requires Option 06)

The 440B can automatically generate wink responses to incoming seizures, ST, STP, ST2P and ST3P comands, captured by Receiver #2.

23. Press SIG/WINK, a message is displayed as a reminder that only receiver #2 can be used to capture seizures and STs.

```
┌──────────────────────────────────────┐
│ RCVR#2 HAS BEEN SELECTED TO RECEIVE   │
│ SEIZURE - SET PATCH CORDS IF NEEDED   │
└──────────────────────────────────────┘
```

a) Press SIG/WINK if necessary to display the following screen.

```
┌──────────────────────────────────┐
│ XMT SIG STATES    WINK OR CUT-THRU │
│ #1  [ON HOOK]       <  > EDIT      │
└──────────────────────────────────┘
      □    □    □    □    □
```

b) Note that supervision status of RCVR #2, DS0 Channel #1 is displayed in the screen above..

c) Remember that only RCVR #2 can be used to capture seizure/ST's.

d) Verify that the DS0 Channels are the same in the transmitter & the receiver.

To Edit WINK settings

There are three winks to configure. The first wink will respond to the initial off hook seizure. Wink #2 and #3 can be programmed to respond to either the first, second, or third STs ( ]). Each wink can be set with individual delays and durations. Automatic cut-thru winks are generated in response to STP, ST2P, ST3P commands.

24. Press the EDIT softkey to display the edit screen:

```
┌─────────────────────────────────────┐
│ WINK      AB   AB                    │
│ SIG STATES  Ø:00  :11    <  >  NXT   │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

25. Press the NXT to display the wink timing screen:

```
┌─────────────────────────────────────┐
│ WINK   DELAY  DURATION  [10 to 990 ms] │
│ #1     300    200      <  >  NXT     │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

26. Use the < > softkeys and the keypad to enter values, then press the NXT softkey to display the Wink Enable screen:

```
┌─────────────────────────────────────┐
│ WINK   WINK ENABLED / DISABLED       │
│ #2                  <  >  NXT        │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

27. Use the < > softkeys to underline ENABLED or DISABLED to enable or disable the second Wink, then press NXT to display:

```
┌─────────────────────────────────────┐
│ WINK  GENERATE 2nd WINK AFTER        │
│ #2   [ 1st / 2nd ] ST   <  >  NXT    │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

28. Use the < > to underline 1st or 2nd. This will determine when the second Wink is to be sent. Press NXT to display the Wink #2 screen:

```
┌─────────────────────────────────────┐
│ WINK    DELAY  DURATION  [10 to 990 ms] │
│ #2      300    200     <  >  NXT     │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

29. Use the < > softkeys and the Keypad to enter values. Then press NXT to display the Wink #3 screen:

```
┌─────────────────────────────────────┐
│ WINK  WINK ENABLED/DISABLED          │
│ #3                  <  >  NXT        │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

30. Use the < > softkeys to underline enabled or disabled, then press NXT to display:

```
┌─────────────────────────────────────────┐
│ WINK  GENERATE 2nd WINK AFTER            │
│ #3    [ 2nd / 3rd ] ST   <  >  NXT       │
└─────────────────────────────────────────┘
                    □  □  ■  ■  ■
```

31. Use the < > to underline 2nd or 3rd. This will determine when the third Wink is to be sent. Press NXT to display:

```
┌─────────────────────────────────────────┐
│ WINK    DELAY  DURATION [10 to 990 ms]   │
│ #3      300    200      <  >  NXT        │
└─────────────────────────────────────────┘
                    □  □  ■  ■  ■
```

32. Use the < > softkeys and the Keypad to enter values, then press NXT to display the CUT-THRU WINK screen. CUT-THRU WINK will automatically respond to STP, ST2P and ST3P commands.

```
┌─────────────────────────────────────────┐
│ CUT-THRU DELAY  DURATION [10 to 990 ms]  │
│ WINK    300    200      <  >  NXT        │
└─────────────────────────────────────────┘
                    □  □  ■  ■  ■
```

33. Use the < > softkeys and the Keypad to enter values for the CUT-THRU WINK. Then press NXT to return to the main SIG/WINK screen:

```
┌─────────────────────────────────────────┐
│ XMT SIG STATES    WINK OR CUT-THRU       │
│ #1 [ON-HOOK]          <  >  EDIT         │
└─────────────────────────────────────────┘
                    □  □  ■  ■  ■
```

NOTE: *The above screen also displays real-time supervision status of the DS0 being monitored on the receiver chosen (see DS0 Measurements page 5 to select RCVR1 or RCVR2). Currently, the above screen is reading an ON HOOK status. As the telephone call progresses, the screen will display a variety of messages including: - ON HOOK - WINK 1 DELAY - GENERATING WINK 1- WAITING FOR KP- WAITING FOR ST, etc.....*

Editing Telephone Numbers

Sending telephone numbers may require editing certain parameters specific to MF, DTMF, and DP (Dial Pulse). Edit screens will vary depending if MF, DTMF or DP is chosen. This section provides screens for editing telephone number parameters for direct dialing (setting up calls manually), and programmed sequences (storing up to 16 pre-programmed telephone numbers).

A.	Direct Dial	(Begins with Step 1)
B.	Programmed	(Begins with Step 30)

A. EDITS for Direct Dial

1. Press the PHONE No. function key to display the opening screen. Use the < > softkeys to underline DIRECT:

```
┌─────────────────────────────────────┐
│ XMT PHONE   DIRECT  PROGRAMMED       │
│ #1  NO.            EDIT  <  > ENTR    │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

2. Press the EDIT softkey (F2) to display the screen below. Use the < > softkeys to choose MF, DTMF or Dial Pulse (DP):

```
┌─────────────────────────────────────┐
│       MF   DTMF   DP                 │
│                  <  > NXT            │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

If MF is chosen go to step 3.

If DTMF is chosen go to step 6.

If DP is chosen, go to step 12.

If MF is chosen:

3. Press NXT to scroll to the LEVEL parameter screen. Use the < > softkeys and the keypad to enter the level:

```
┌─────────────────────────────────────┐
│ MF    LEVEL (dBm0)  [range 0 to -30] │
│          -20         <  > NXT        │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

4. Press NXT to scroll to the digit timing screen. Use the < > softkeys and the keypad to enter the desired timing values:

```
┌─────────────────────────────────────┐
│ MF   DIGIT  INTERDIGIT   [30-99 ms]  │
│      50 ms    50 ms    <  > NXT      │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

5. Press NXT to scroll to the ON/OFF Hook signaling bit definition screen:

```
┌─────────────────────────────────────┐
│ MF    AB    AB                       │
│      Ø:00   :11      <  > NXT        │
└─────────────────────────────────────┘
              □  □  ■  ■  ■
```

If DTMF is chosen:

6. Press NXT to scroll to the LEVEL parameter screen. Use the < > softkeys and the keypad to enter the desired level:

```
╭─────────────────────────────────────────────╮
│  DTMF   LEVEL (dBm0)  [range 0 to -30]        │
│         -20          <  >  NXT                │
╰─────────────────────────────────────────────╯
```
☐ ☐ ■ ■ ■

7. Press NXT to scroll to the digit timing screen. Use the < > softkeys and the keypad to enter the desired timing values:

```
╭─────────────────────────────────────────────╮
│  DTMF   DIGIT   INTERDIGIT   [30-99 ms]       │
│         50 ms    50 ms    <  >  NXT           │
╰─────────────────────────────────────────────╯
```
☐ ☐ ■ ■ ■

8. Press NXT to scroll to the signaling supervision screen:

```
╭─────────────────────────────────────────────╮
│  DTMF   FX/LS   FX/GS   E&M                    │
│                   EDIT  <  >  NXT             │
╰─────────────────────────────────────────────╯
```
☐ ☐ ■ ■ ■

9. Use the < > softkeys to underline FX/LS (Loop Start), FX/GS (Ground Start), or E&M.

10. Use the EDIT softkey to enter the ON/OFF hook definitions. For example if FX/GS is underlined and EDIT is pressed, the screen below will be displayed. Use the < > softkeys and the keypad to enter 0 or 1.

```
╭─────────────────────────────────────────────╮
│  MF   AB    AB    AB                           │
│       Ø:00   :11   :00   < . >  NXT           │
╰─────────────────────────────────────────────╯
```
This field appears only when FX/GS is selected in the previous screen

☐ ☐ ■ ■ ■

♦ = defines the transition state

11. Press NXT to return to the opening telephone number screen:

```
╭─────────────────────────────────────────────╮
│  XMT PHONE    DIRECT  PROGRAMMED              │
│  #1  NO.           EDIT  <  >  ENTR           │
╰─────────────────────────────────────────────╯
```
☐ ☐ ■ ■ ■

If DP is chosen:

12. Press NXT to scroll to the Make/Break ratio screen. Use the < > softkeys and the keypad to enter the desired ratio:

```
╭─────────────────────────────────────────────╮
│  DP   BREAK      [range 30 to 80%]            │
│       61%           <  >  NXT                 │
╰─────────────────────────────────────────────╯
```
☐ ☐ ■ ■ ■

13. Press NXT to scroll to the dial pulse rate screen. Use the < > softkeys and the keypad to enter the desired rate:

```
┌─────────────────────────────────────┐
│ DP    RATE   [range 8 to 22 pps]     │
│       10 PPS          <  > NXT       │
└─────────────────────────────────────┘
        □  □  ■  ■  ■
```

14. Press NXT to display the interdigit delay screen. Use the < > softkeys and the keypad to enter digits.

```
┌─────────────────────────────────────┐
│ DP   INTERDIGIT DELAY [250-990 ms]   │
│       500 ms       <  > NXT          │
└─────────────────────────────────────┘
        □  □  ■  ■  ■
```

15. Press NXT to display the ON/OFF hook definition screen:

```
┌─────────────────────────────────────┐
│ DP    AB    AB                       │
│      Ø:00   :11      <  > NXT         │
└─────────────────────────────────────┘
        □  □  ■  ■  ■
```

16. Press NXT to return to the opening telephone number screen:

```
┌─────────────────────────────────────┐
│ XMT PHONE   DIRECT  PROGRAMMED       │
│ #1  NO.           EDIT <  > ENTR     │
└─────────────────────────────────────┘
        □  □  ■  ■  ■
```

B. Edit Screens for PROGRAMMED Dialing

There are 16 storage locations for telephone number sequences. All of these pre-programmed numbers can be edited.

17. Press the PHONE No. function key to display the opening screen. Use the < > softkeys to underline PROGRAMMED:

```
┌─────────────────────────────────────┐
│ XMT PHONE  DIRECT   PROGRAMMED       │
│ #1  NO.             <  > ENTR        │
└─────────────────────────────────────┘
        □  □  ■  ■  ■
```

18. Press the ENTER softkey (F5) to display the first (#1) of sixteen pre-programmed telephone number screens:

```
┌─────────────────────────────────────┐
│ MF   Ø [202®5551212]                 │
│ #1   -20 dBm0 50 ms Ø   EDIT GO NXT  │
└─────────────────────────────────────┘
        □  □  □  □  ■
```

19. Use the NXT softkey (F5) to scroll to the telephone number to be changed or edited, for example MF #7:

```
┌─────────────────────────────────────┐
│ MF   Ø [408®12345678]                │
│ #7   -20dBm0  50 ms  Ø   EDIT GO NXT │
└─────────────────────────────────────┘
        □  □  ■  □  □
```

If MF is chosen go to step 20.

If DTMF is chosen go to step 28.

If DP is chosen, go to step 35.

If MF is chosen:

20. Press EDIT to display screen below and underline choice with the < > softkeys, for example MF:

```
No.    MF   DTMF   DP
#7           LAST #   <  >  NXT
```
☐ ☐ ■ ■ ☐

NOTE: The LAST # softkey (F1) will make the current telephone sequence the last in the series. In other words, by pressing LAST # in the screen above, scrolling with NXT will be limited to #1 through #7 (instead of #1 through #16). In order to reinstate each screen (#8 through #16), use the EDIT key shown below. This will let you scroll through edit screens with the NXT softkey until the previously pre-programmed telephone number reappears.

```
No.   End of telephone No. sequence
#7             EDIT   NXT
```
☐ ☐ ■ ☐ ■

21. Use the NXT softkey (F5) to scroll to the Level parameter screen and use the < > and keypad to enter levels.

```
MF    LEVEL (dBm0)  [range 0 to -30]
#7       -20          <  >  NXT
```
☐ ☐ ■ ■ ■

22. Press the NXT softkey to display the digit timing screen below. Use the < > softkeys and the keypad to enter the desired values.

```
MF    DIGIT  INTERDIGIT   [30-99 ms]
#7    50 ms    50 ms      <  >  NXT
```
☐ ☐ ■ ■ ■

23. Press NXT to display the ON/OFF hook definition screen. Use the < > softkeys and the keypad to enter 0 and 1 for the A/B signaling bits:

```
MF    AB    AB
#7   Ø:00   :11        <  >  NXT
```
☐ ☐ ■ ■ ■

24. Press NXT to display the telephone number screen:

```
  MF   0[408@12345678]
          _
  #7        W BLNK < >  NXT
```

25. Use the < > softkeys to move the flashing underline, and the keypad to enter the ST, KP, ON/OFF hook,
    Wait For Wink command, and the digits. (The W softkey will enter a wait-for-wink).

    NOTE: Use the green ALT key next to softkey F5 to enter all alternate symbols written in green on the keypad.
    To enter KP, first press the ALT key (key will light) then press No. 2. ON and OFF hooks are entered
    with ALT and No. 8 respectively. ALT P will enter a one second pause symbol (diamond).
    The W softkey will enter a wait-for-wink command.

26. Use the BLNK (Blank) softkey to erase all digits past the flashing underline. For example, in the screen
    below, 5678 will be changed to 0000 by proceeding as follows:

    a) Moving the underline to the 5, and then

```
  MF   0[408@12345678]
                _
  #7        W BLNK < >  NXT
```

    b) Pressing BLNK to erase 5678:

```
  MF   0 [408@1234]
  #7        W BLNK < >  NXT
```

    c) Using the < > softkeys to move the flashing underline to the right side of 4, and use the keypad to
       enter 0000ST:

```
  MF   0 [408@1234000 0]
  #7        W BLNK < >  NXT
```

```
       DTMF 0  408@12345678
    #7          W BLNK  <    NXT     .
```

33. Press NXT to display the telephone number screen. Use the < softkey and the keypad to enter the telephone number (refer to steps 25-29). The W softkey is used to enter a wait-for-wink command.

```
      DTMF AB    AB    AB
    #7  0:00  11:   00   < . >    NXT
```
↕ = defines the transition state

32. Use the EDIT softkey to enter the ON/OFF hook definitions. For example if FX/GS is underlined and EDIT is pressed, the screen below will be displayed. Use the < . > softkeys and the keypad to enter 0 or 1.

31. Use the < > softkeys to underline FX-LS (Loop Start), FX/GS (Ground Start), or E&M.

```
      DTMF FX-LS  FX/GS   E&M
    #8          EDIT  <  >   NXT
```

30. Press NXT to scroll to the signaling supervision screen:

```
      DTMF DIGIT   INTERDIGIT  [30-99 ms]
    #7  50 ms   50 ms   <  >   NXT
```

29. Press NXT to scroll to the digit timing screen. Use the < > softkeys and the keypad to enter the desired timing values:

```
      DTMF LEVEL (dBm0)  [range 0 to -30]
    #7      -20      <  >   NXT
```
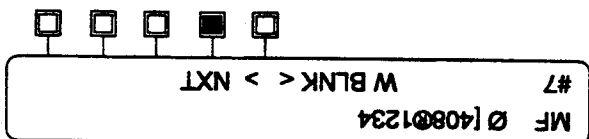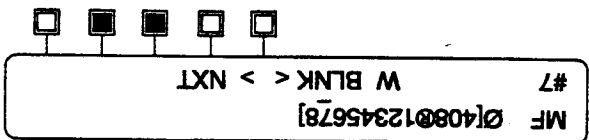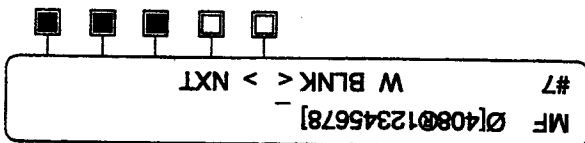
28. Press NXT to scroll to the LEVEL parameter screen. Use the < > softkeys and the keypad to enter the desired level:

If DTMF is chosen: follow steps 17-20, then,

```
      MF  0[408@1234000]
    #7  -20dBm0 50 ms  0 EDIT GO NXT
```

27. If all digits and commands are entered correctly, press NXT to store the sequence into MF #7 (Note that -20 dBm0 50 ms reappears when MF #7 is entered & stored):

34. If all digits and commands are entered correctly, press NXT to store the sequence into DTMF #7:

```
┌─────────────────────────────────────┐
│ DTMF Ø   408®12345678                │
│ #7    -20 dBm0 FX/GS Ø   EDIT GO NXT │
└─────────────────────────────────────┘
        □    □    □    □    □
```

If DP is chosen: follow steps 17-20, then,

35. Press NXT to scroll to the Make/Break ratio screen. Use the < > softkeys and the keypad to enter the desired ratio:

```
┌─────────────────────────────────────┐
│ DP    BREAK      [range 30 to 80%]   │
│ #7    61%            <  > NXT        │
└─────────────────────────────────────┘
        □    □    ■    ■    ■
```

36. Press NXT to scroll to the dial pulse rate screen. Use the < > softkeys and the keypad to enter the desired rate:

```
┌─────────────────────────────────────┐
│ DP    RATE    [range 8 to 22 pps]    │
│ #7    10 PPS         <  > NXT        │
└─────────────────────────────────────┘
        □    □    ■    ■    ■
```

37. Press NXT to display the interdigit delay screen. Use the < > softkeys and the keypad to enter the desired digits.

```
┌─────────────────────────────────────┐
│ DP    INTERDIGIT DELAY  [250-990 ms] │
│ #7       500 ms      <  > NXT        │
└─────────────────────────────────────┘
        □    □    ■    ■    ■
```

38. Press NXT to display the ON/OFF hook definition screen:

```
┌─────────────────────────────────────┐
│ DP    AB    AB                       │
│ #7   Ø:00   :00       <  > NXT       │
└─────────────────────────────────────┘
        □    □    □    □    ■
```

39. Press NXT to display the telephone number screen. Use the < > softkeys and the keypad to enter the desired telephone number (refer to steps 25-29). The W softkey is used to enter a wait-for-wink command.

```
┌─────────────────────────────────────┐
│ DP  Ø 408®12345678                   │
│ #7             W BLNK <  > NXT       │
└─────────────────────────────────────┘
        ■    □    ■    ■    □
```

40. If all digits and commands are entered correctly, press NXT to store the sequence into DP #7:

```
┌─────────────────────────────────────┐
│ DP  Ø 408®12345678                   │
│ #7 B=61%  10 PPS    Ø   EDIT GO NXT  │
└─────────────────────────────────────┘
        □    □    □    □    ■
```

When equipped with Option 12, the 440B/T-ACE supports DS0A/B subrate data testing for both in service and turn up BERT applications. This option provides several unique DS0A/B testing features from the DS1 access point, including simultaneous primary and secondary channel testing, majority vote error capture, and simultaneous DS1 and DS0 error capture. By simultaneously monitoring DS1 and DS0A/B errors, the 440B can quickly help isolate facilities related problems versus equipment troubles. In other words, if the 440B captures DS1 Frame Loss while simultaneously capturing DS0 Sync Loss, then the cause of DS0 circuit drop-outs may be caused by T1 network problems. (If equipped with the 52B+ or the 52C option, the 440B can also simultaneously monitor DS3 errors as well.) **NOTE:** *Refer to Quick Sheet 5, pages 13-18 for information on displaying 8 bit data messages and DS0 error statistics.*

When additionally equipped with Option 30, the 440B/T-ACE provides a direct DS0 interface to a DDS channel unit (DS0-DP or OCU-DP). It also provides DDS timing clock slip display and measurement, by comparing the DDS channel bank clock to the building integrated timing supply outputs, the 8/64 kbps composite clock and T1 station clock.

To fully appreciate the 440B's capabilities, it is important to remember that the set provides two independent transmitters and two independent receivers. The receivers can be locked to the transmitters for loopback or drop and insert applications, or operate independently. For example, Option 30 can transmit a DS0 signal into a DS0-DP channel unit, while Receiver 2 monitors the same signal at the **DSX-1.** (See Figure 1 below.)

Since DDS testing involves interfacing with a variety of network elements, this section is divided into five parts:

1. Generating DS0A/B Test Patterns
2. Loopback Testing (latching and non-latching)
3. MJU Control
4. DS0-DP/OCU-DP Interface
5. DDS Timing Comparison
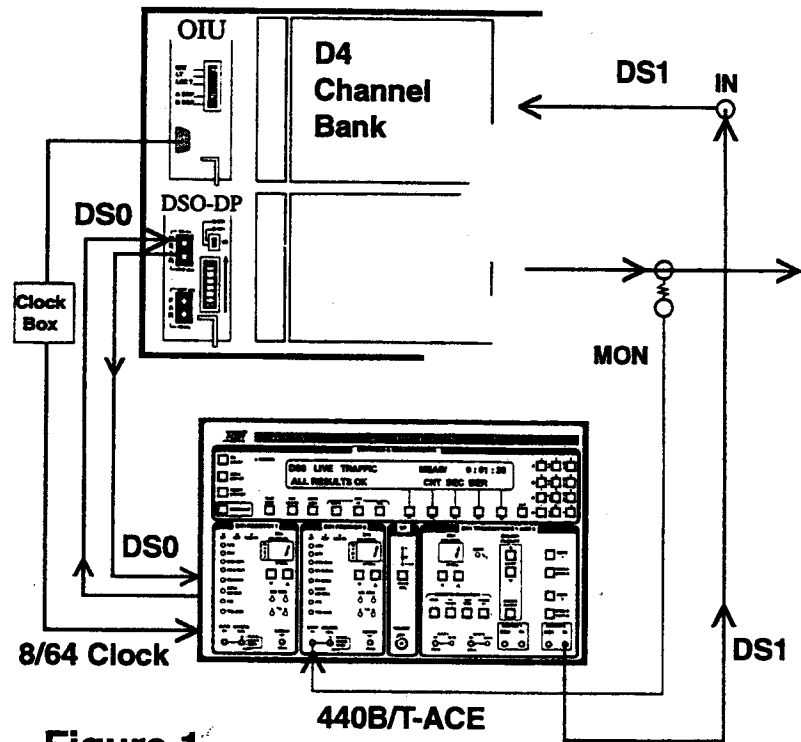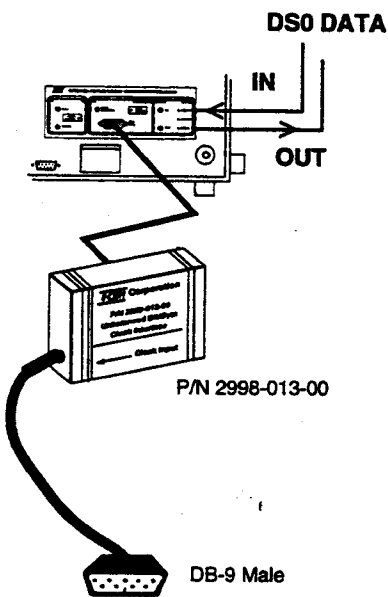
Figure 1

(Requires Option 12)

Generating DS0A/B Test Patterns

Since the 440B provides the ablity to insert DS0A/B data into a specific DS0 channel, in a T1 circuit there are two basic configurations to consider: 1.) Out-of-Service T1 access, and 2.) In-Service, drop-and-insert into a live T1.

In the first case, we will insert data into a specific DS0 channel, and the remaining 23 DS0 channels will be out of service. The 440B provides either IDLE or 1005/-20dBm0 tone for the "other" 23 DS0 channels.

In the second case, we will insert data into a specific DS0 channel, while passing the remaining 23 "in-service" DS0 channels through (THRU) the 440B and back into the DS1/T1 circuit via Output T1 jacks.

If inserting a DS0A/B test pattern into a live DS1 circuit, the 440B must be used in a THRU (drop-and-insert) Set-Up. If inserting the DS0A/B test pattern in to a T1 circuit that is not yet carrying customer traffic, then the remaining 23 DS0 channels can be set to IDLE or 1005Hz/-20dBm0 tone. (See Drop-and-Insert Testing Quick Sheet for more information.)

In either event, the actual DATA menu screen is the same. Only the DS1 Set-Up will differ. The Receiver Set-Up should generally be LOCKED TO XMTR 1 or 2. (LOCKED mode automatically configures the receiver to match the rate, and subrate channel selected in the transmitter.

Transmitter Set-Up

For this example, we will assume that we are inserting data into a T1 that is looped back at the distant end. Although either transmitter or receiver can be used, we will use XMTR1 and RCVR 1. Therefore, as our picture below shows, we are patched into XMTR1 T1 Output, and into RCVR 1 T1 Input. Remember, there are two indications that show which transmitter is being controlled: the LED (Red = XMTR1), and the lit XMTR function key.

DATA content
for selected DS0

Selected DS0
channel

Transmitter 1
is selected

THRU SET-UP
Testing on a
live DS1, other
DS0s pass thru

Quick Sheet 5B - 440B/T-ACE
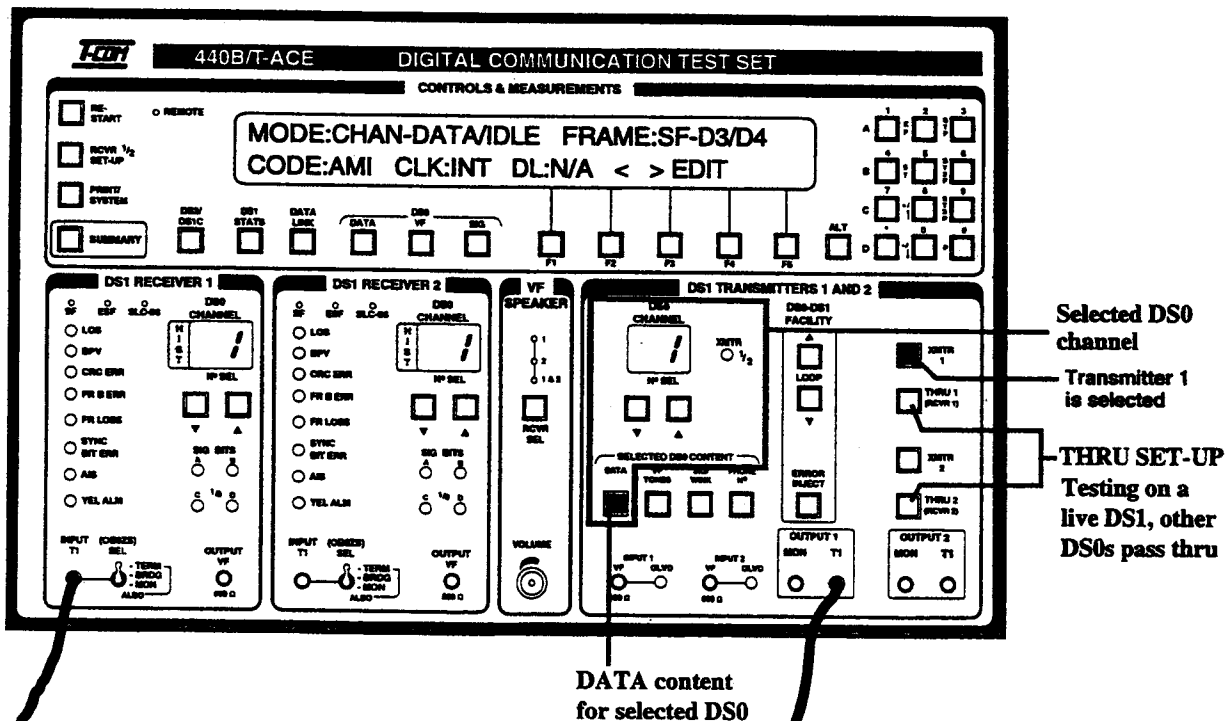
Since we will be testing from a DS1 access point, the XMTR Set-Up key and screen can be used to verify proper DS1 framing, line coding, and status of the remaining 23 DS0 channels.

The DATA Set-Up key and screen is then used to select the data content of the DS0 channel currently selected (Channel 1 in picture below).

Transmitter Set-Up

1. Select transmitter #1 by pressing XMTR1 key. XMTR mode must be CHANNELIZED (press the key twice if the screen below does not display). If MODE does not read CHAN, press EDIT and select CHANNELIZED using the < > (F3, F4) keys. Press XMTR1 to get back to the screen below. Also verify the selections for DS1 Frame, Line Code, and Clock. (See Transmitter Set-Up section.)

```
MODE:CHAN-DATA/IDLE   FRAME:SF-D3/D4
CODE:AMI   CLK:INT   DL:N/A   <   > EDIT
```
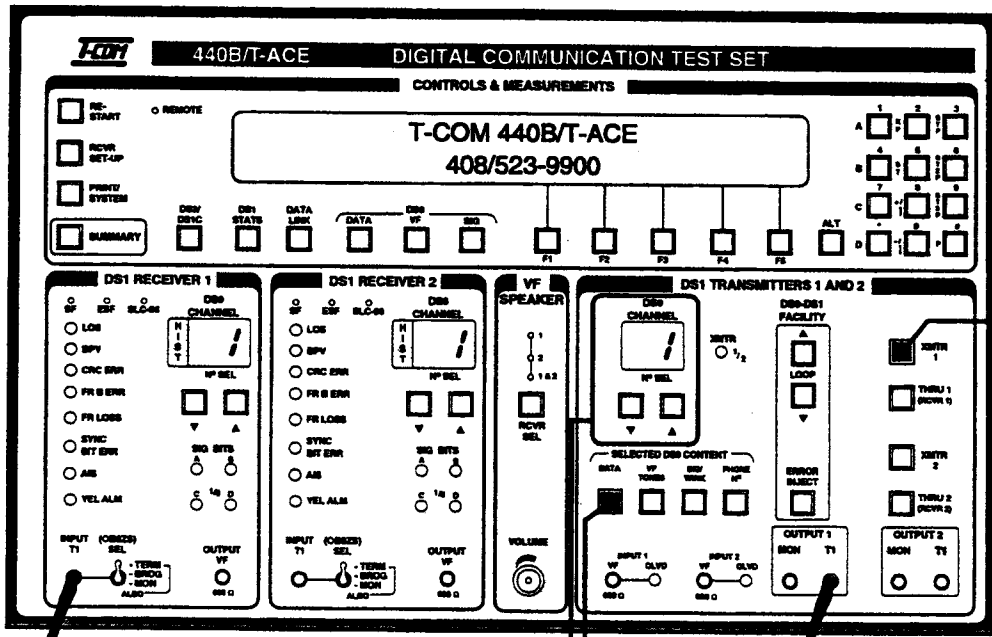
2. Select the desired DS0 channel.

3. Press the DATA key in the transmitter section to display the screen below. (Press the key twice if the opening screen does not appear.)

```
TYPE:DS0A  RATE:9.6  MJU:IDLE   [XMT#1]
PRI:2047   SEC:NONE          <   > EDIT
```
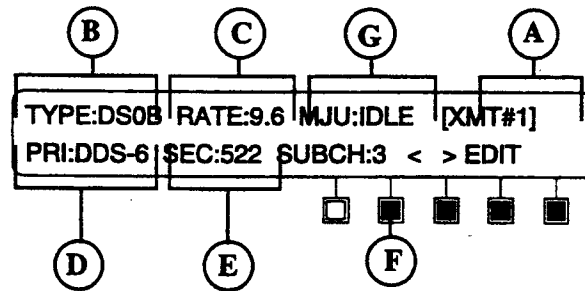
· **NOTE:** Refer to the DS0A/B DATA FLOW CHART in the Flow Charts/Appendices section for menu structure.

(Requires Option 12)

4. The DATA screen is controlled in the same way as the XMTR Set-Up screens. Use the < > softkeys to underline the desired parameter, and press EDIT to choose a new condition. The DATA transmitter screen below indicated that the 440B transmitter #1 is generating a DS0B at a 9.6Kb/s rate. We are inserting into sub-channel #3. The primary channel is carrying a DDS-6 stress pattern, while the secondary channel is carrying a 511 pattern.
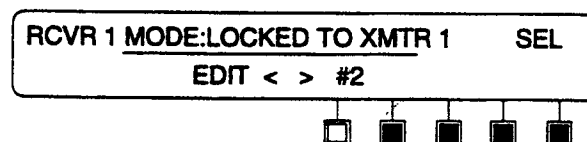
```
     (B)        (C)        (G)        (A)

  ┌ TYPE:DS0B │ RATE:9.6 │ MJU:IDLE │ [XMT#1] ┐
  │ PRI:DDS-6 │ SEC:522  │ SUBCH:3  <  > EDIT │
  └───────────────────────────□ ■ ■ ■ ■──────┘
         (D)        (E)        (F)
```

A. Either XMTR 1 or 2 can be used for DATA testing by first pressing either XMTR 1 or 2 Set-Up key.

B. TYPE can be DS0A, DS0B or SW-56

C. Rates can be changed (DS0B does not have 56 or 64 Kb/s)

D. Primary channel test pattern selected

E. Secondary channel test pattern (to turn off, select NONE)

F. Subrate channel can be toggled with softkeys F1 or F2, (SUBCH does not appear when DS0A is selected). Channel selection is limited by the rate chosen, i.e. when the rate is 2.4Kb/s then up to 20 channels exist, while only 5 channels exist for 9.6Kb/s.

G. MJU status. The status IDLE indicates no MJUs are being controlled. ACTIVE indicates active branch selections, and BLOCKS indicates that branch blocks were left on.

Receiver Set-Up

Receivers can operate independently of transmitters, or they can be locked to either transmitter. Generally, it is much easier to simply LOCK a receiver to a transmitter and perform all testing from the transmitter screens. There are cases, however, when it is desireable to operate a receiver independently of a transmitter (for example, sometimes it is desireable to capture errors in a different subchannel than the subchannel in-use).

For our example, we are using receiver 1, in a LOCKED TO XMTR 1 mode.

5. Verify that receiver 1 is LOCKED TO XMTR 1. Press the RCVR SET-UP key to display the screen below. If the mode is incorrect, press EDIT to change set-up.

```
  ┌ RCVR 1 MODE:LOCKED TO XMTR 1      SEL ┐
  │           EDIT  <  >  #2              │
  └──────────────────□ ■ ■ ■ ■───────────┘
```

— Quick Sheet 5B - 440B/T-ACE (ver 2d) ──────── **T-COM** ──

NOTE: Receivers can be locked to either XMTR 1 or 2. If screen shows an incorrect XMTR selection, or is not locked, press EDIT to display the menu screen below. When LOCKED TO XMTR is underlined, the XMTR #1 appears. Use softkey F2 to toggle between XMTR 1 and XMTR 2. Press NXT to enter the selection.

```
RCVR 1 MODE: LOCKED TO XMTR   T1   F-T1
  DS0A  DS0B  SW-56  XMTR:#1  <  >  NXT
```
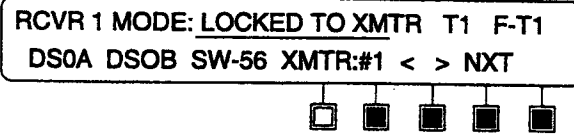
6. Verify that the same DS0 channel is selected in the receiver as is selected in the transmitter (currently Channel #1).

Starting stress test

7. Press the green RESTART key.

8. Press the SUMMARY key to display the RCVR 1 results. After a few seconds of AUTO pattern search, the receiver SUMMARY display should display the screen below.

```
RCV 1:DS0B 9.6 #3 SYNC-DDS-6   00:01:55
  ALL RESULTS OK        SEC SEL #2
```
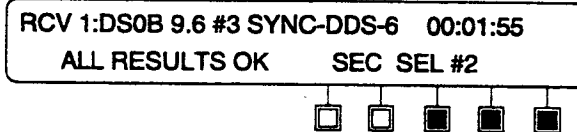
9. Receiver 1 SYNC LED should be green.

10. Any error (DS1 or DS0, Primary/Secondary) will cause the DS0 channel LED to flash.
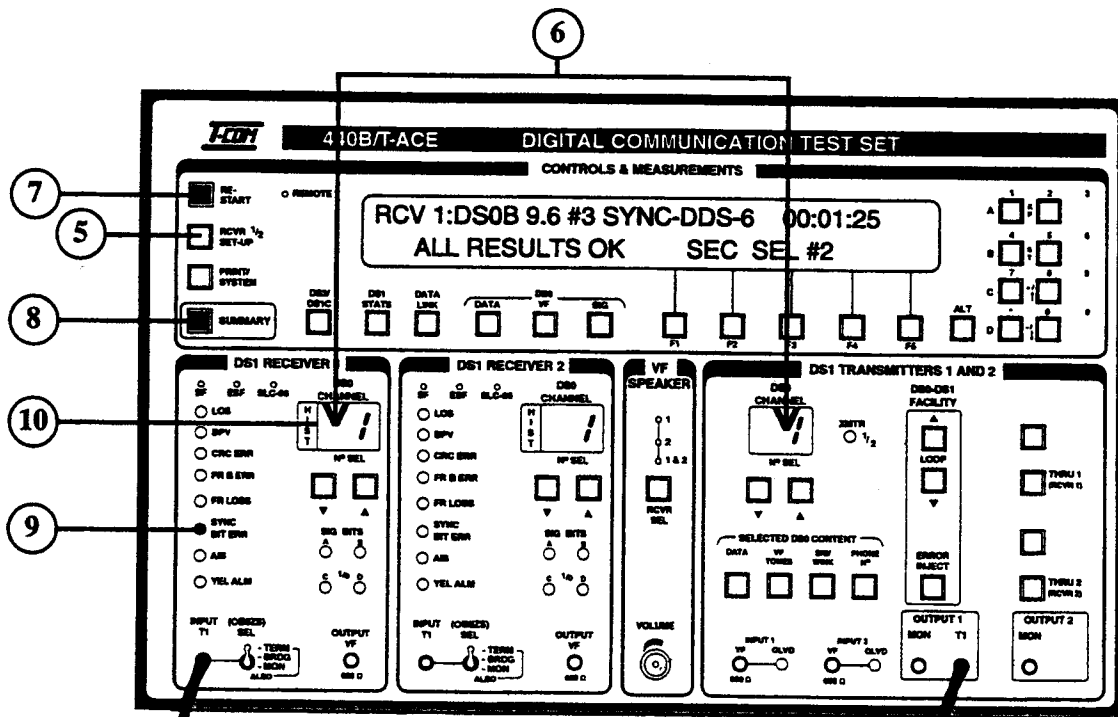
(Requires Option 12)

Interpreting the DS0 SUMMARY Screen

```
         (a)(b)    (c)

  ┌──────────────────────────────────┐
  │ RCV 1:DS0B 9.6 #3 SYNC-DDS-6  00:01:55 │
  │     ALL RESULTS OK      SEC  SEL #2     │
  └──────────────────────────────────┘
              □  □  ■  ■  ■

         (d)            (e)
```
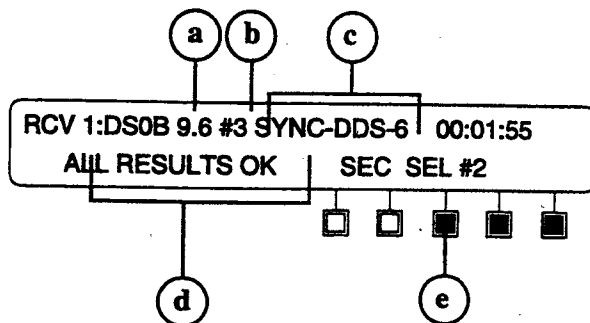
a. The rate is 9.6Kb/s

b. The subchannel #3 is currently being tested

c. The DS0B primary channel is synchronized on the DDS-6 test pattern

d. No errors have occurred at the DS0B primary, secondary, or DS1/T1 level

e. If SEC appears, then the 440B recognizes a secondary channel. Pressing the SEC softkey displays the secondary channel pattern sync. (All errors will still be displayed on the bottom line, regardless if SEC or PRI is displayed.) Below is the secondary SUMMARY screen (note: SEC softkey (F3) becomes PRI):

```
  ┌──────────────────────────────────┐
  │ RCV 1: SEC CHAN SYNC 511      00:01:55 │
  │   ALL RESULTS OK      PRI  SEL #2       │
  └──────────────────────────────────┘
              □  □  ■  ■  ■
```
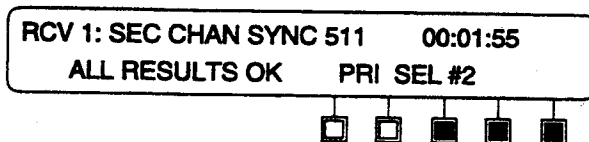
Note: Refer to the DS0 Measurements, Quick Sheet 5 (pgs 18-20) for information on displaying Test Code Messages and DS0 error statistics (% error free seconds, etc)

Loopback

The 440B provides loopback codes for a large variety of DS0 devices, ranging from DS0-DP, OCU, CSU, DSU to repeaters. The unit supports both Latching and Non-latching loopbacks.

When either 440B transmitter is Set-Up for DATA testing, the Loop Up/Down function keys automatically become DS0 related loop function keys.

1. Press the Loop Up key to display the screen below. (Press the key twice if the screen does not match):

```
LOOP DSO DEVICE:DS0-DP#1      [XMT #1]
UP            RESP ON RCVR:#1 EDIT GO
```

2. Select RESPonse on RCVR #1 or #2 with softkey F3. This will determine which receiver is expecting the loopback responses to confirm loop (in our case #1).

3. Press GO to send loop code. The Loop screen will automatically display loop completion or failure.

4. Press EDIT to choose a new Device.

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1. Press the Loop Up key to display the screen below. (Press the key twice if the screen does not match):

```
LOOP DSO DEVICE:DS0-DP#1       [XMT #1]
UP            RESP ON RCVR:#1 EDIT GO
```

2. Select RESPonse on RCVR #1 or #2 with softkey F3. This will determine which receiver is expecting the loopback responses to confirm loop (in our case #1).

3. Press GO to send loop code. The Loop screen will automatically display loop completion or failure.

4. Press EDIT to choose a new Device.

Choosing a new Device

```
┌─────────────────────────────────────────┐
│ LOOP DSO DEVICE:DS0-DP#1      [XMT #1]   │
│ UP           RESP ON RCVR:#1 EDIT GO     │
└─────────────────────────────────────────┘
          □    □    ■    ■    ■
                         ⑤
```
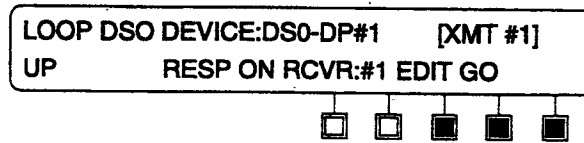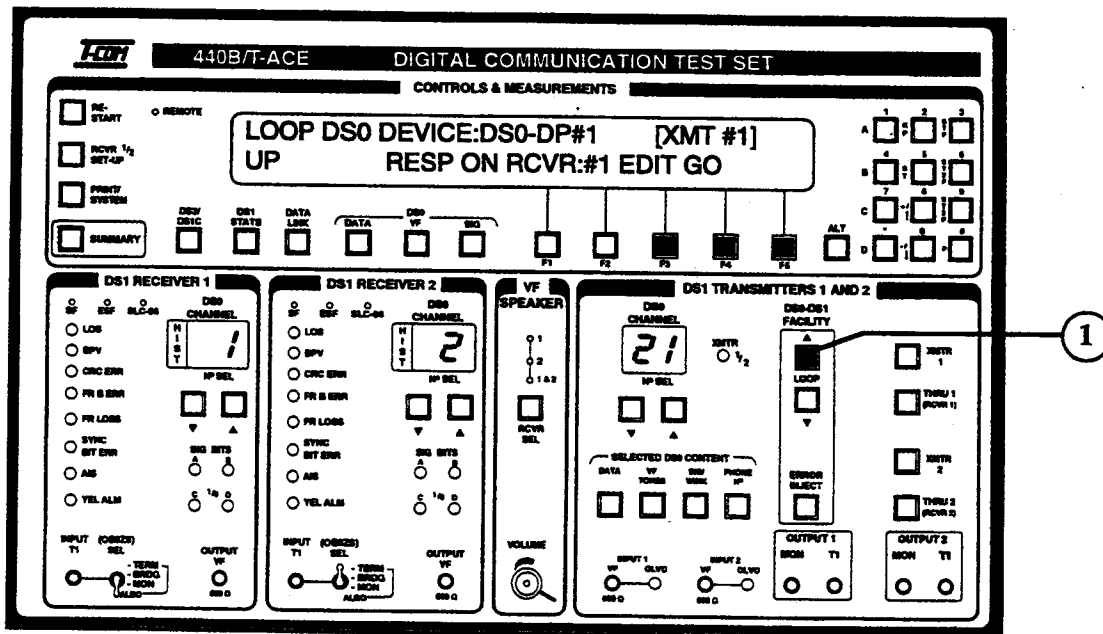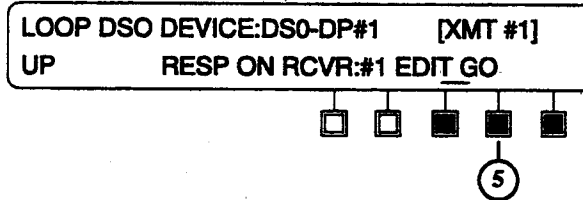
5. Press EDIT (F4) softkey to display the menu screen below:

```
┌─────────────────────────────────────────┐
│ DS0-DP OCU CSU DSU V.54 NIE    [XMT#1]   │
│ HL222 HL96NY RPTR  DS0-DP#1  <  >  NXT   │
└─────────────────────────────────────────┘
          ■    ■    ■    ■    ■
```
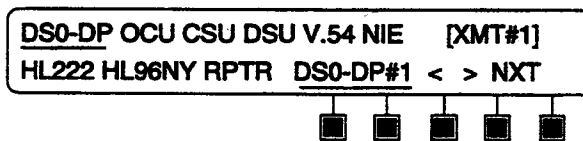
Note: When DS0-DP is underlined, softkey F1 or F2 is used to toggle through #1 to #20.

6. Underline the desired device (for example, OCU). When OCU is underlined, NON-LATCH (interleaved) or LATCHED appears above softkeys F1 and F2.

```
┌─────────────────────────────────────────┐
│ DS0-DP OCU CSU DSU V.54 NIE    [XMT#1]   │
│ HL222 HL96NY RPTR  LATCHED  <  >  NXT    │
└─────────────────────────────────────────┘
          ■    ■    ■    ■    ■
```
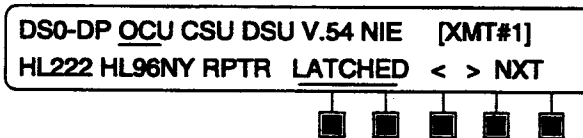
7. Toggle LATCHED or NON-LATCH with softkey F1 or F2. Press NXT to enter the selection and return to the opening Loop screen. Press GO to send the Loop code.

```
┌─────────────────────────────────────────┐
│ LOOP DSO DEVICE:OCU-LATCHED   [XMT #1]   │
│ UP           RESP ON RCVR:#1 EDIT GO     │
└─────────────────────────────────────────┘
          □    □    ■    ■    ■
```
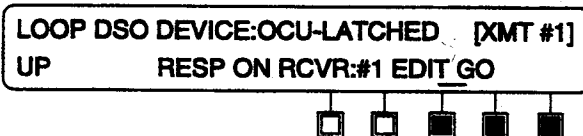
Interpreting Loop Screen Responses

The Loop Up/Down screens provide acknowledgment responses to indicate that a loopback has succeeded or failed. When using NON-LATCHED (interleaved) loopback codes, the screen also provides the current test result, i.e. NO ERRORS or <34> errors, making quick tests very convenient. All errors still appear on the SUMMARY screen.

Responses for Latched Loopbacks

```
LOOP DS0 DEVICE:OCU-LATCHED    [XMT #1]
UP          RESP ON RCVR:#1 EDIT GO
```
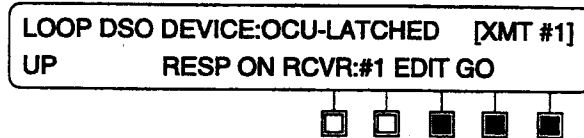
After pressing GO to send the Loop Up code, the first response will be **<AWAITING RESPONSE>**, followed by **<LATCH CONFIRMED>**.

To see the test results, press SUMMARY to display the relevant receiver screen. Remember that any errors detected will automatically cause the receiver DS0 Channel display to begin flashing for the receiver chosen in the screen above (RCVR #1).

NOTE: If <LATCH NOT CONFIRMED> appears, verify that the same DS0 Channel is selected in the Transmitter and Receiver used for the test, and that the transmitter is looking for a response from the correct receiver.

```
LOOP DS0 DEVICE:OCU-LATCHED    [XMT #1]
UP          <LATCH CONFIRMED>    NXT
```
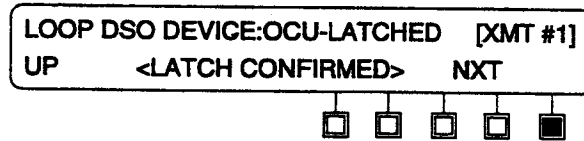
In the response screen above, use NXT to return to main Loop Up screen. Generally, you will press the LOOP Down function key to send the Loop Down code.

The Loop Down screens will also provide responses, including <LATCH REMOVED> if successful or <REMOVAL NOT CONFIRMED> if not successful.
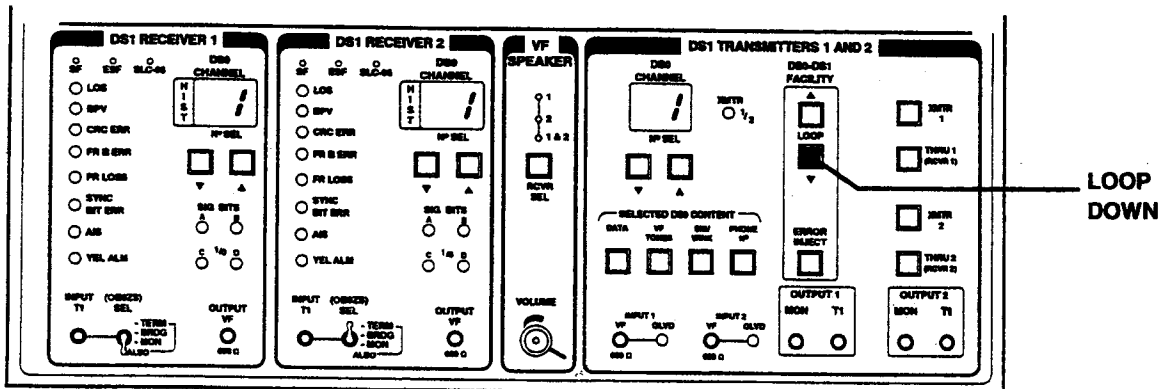
Responses for Non-Latched (interleaved) Loopbacks

When GO is pressed, the unit begins by <WAITING> until the receiver finds the loop code, then begins the <SEARCHING> for pattern sync, and finally will either show <NO ERRORS> or the number of errors accumulated during the test. If loopback is not achieved the message will be <NOT FOUND>.

Press the flashing STOP to quit the test. A loop down command is not used with non-latched loopbacks.

```
LOOP DSO DEVICE:OCU NON-LATCH   [XMT
#1]
```
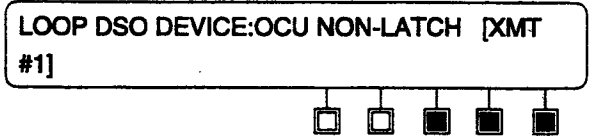
The above errors will also trigger a flashing DS0 Channel indication in the receiver section. The SUMMARY screen will show all errors. Press the RESTART key to clear all error counters.

INJECTING ERRORS

In some cases, it is standard to inject 6 bit errors to re-confirm the loopback.

Pressing the red ERROR INJECT key will inject 6 bit errors in to the DS0 circuit being tested (assuming standard factory setting).

NOTE: The ERROR INJECT key has two SYSTEM settings, a) AUTO and b) MENU. The standard factory default is in the AUTO setting which automatically injects 6 Bit errors when the key is pressed. Refer to ERROR INJECTION quick sheets for information on the MENU error injection capabilities.
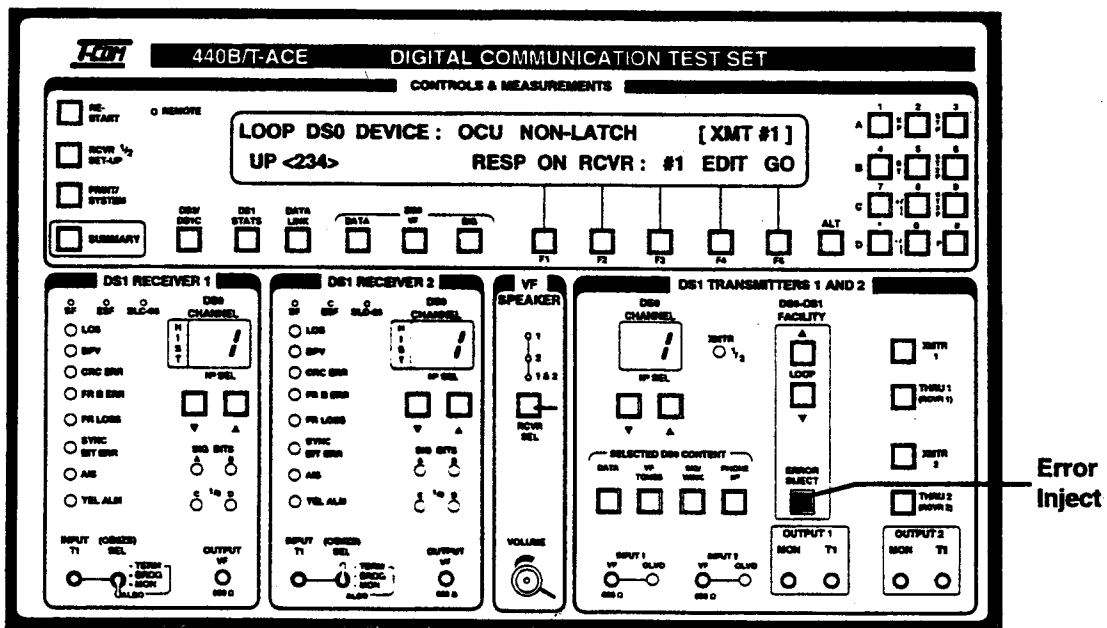
MJU COMMANDS

The 440B provides commands for testing paths via Multi-Junction Units (MJUs). Since MJU control requires verifying responses to commands, it is important to LOCK the appropriate receiver to the transmitter chosen (RCVR 1 and XMTR 1 for example). Also verify that the correct DS0 channels are selected in the RCVR and XMTR.

1. Press the DATA key to display the opening set-up screen below. (If the screen does not appear, press the DATA key a second time):

```
TYPE:DS0A  RATE:9.6  MJU:IDLE   [XMT#1]
PRI:2047  SEC:NONE        <  > EDIT
```
☐ ☐ ■ ■ ■

The screen above shows that the DATA transmitter is currently generating a DS0A at 9.6Kb/s with a 2047 stress pattern selected. MJU controls are not in use (IDLE).

2. Underline MJU:IDLE and press EDIT to display the MJU Response screen. Use the < > softkeys to select the receiver.

```
XMT MJU RESPONSE ON: RCVR 1  RCVR 2
#1              <  > NXT
```
☐ ☐ ■ ■ ■

3. Press NXT in the above screen to display the command screen:

```
MJU:[1] SEL  REL  BLK  MJU-LP  REL-ALL
XMT#1        Br:#1 MAP <  > GO
```
■ ■ ■ ■ ■

INTERPRETING THE MJU COMMAND SCREENS

```
  ①
  |
┌─────────────────────────────────┐
│ MJU:[1] SEL REL BLK MJU-LP REL-ALL │
│ XMT#1     REL-BLK Br:#1 MAP <  >  GO │
└─────────────────────────────────┘
              ■  ■  ■ ■  ■
              │  │  └─┘  │
              ②  ⑤   ③   ④
```
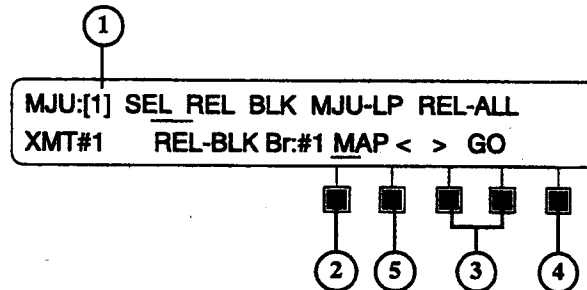
1. The number of the current MJU selected is shown in the flashing brackets: [1].

2. Br: #1 is the Branch selected (1 thru 4). Use F1 softkey to toggle 1-4.

3. Use the < > softkeys to underline the commands:

> SEL = Branch Select
> REL = Release all Branch Selects
> BLK = Branch Block
> MJU LP = MJU Loopback
> REL-ALL = Release All Blocks and Selects
> REL-BLK = Release Branch Block
> PREV = Previous MJU, back-up one MJU
> REBUILD = re-select full MJU path

4. The GO softkey will send the command underlined.

5. MAP provides a graphic display of the MJU path selected and which branches were blocked in each MJU. Selecting MAP will not interrupt the MJU path.

```
┌─────────────────────────────────┐
│ MJU:[1] SEL REL BLK MJU-LP REL-ALL │
│ XMT#1 PREV REBUILD  Br:#1 MAP <  >  GO │
└─────────────────────────────────┘
              ■  ■  ■  ■  ■
```
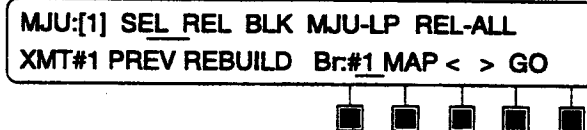
INTERPRETING A MAP
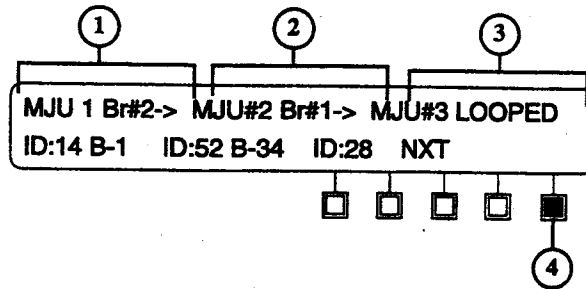
Pressing MAP on the previous MJU command screen displays a MAP as shown above.

1. MJU #1 has Branch #2 selected. The Arrow shows that the path is via Branch #2 to the next MJU (#2) ID: 14 represents the Hub ID for MJU #1. B-1 represents a premanent Block established on Branch #1 of MJU #1.

2. MJU #2 has Branch #1 selected. Branches #3 and #4 are permanently Blocked. (Hub ID is 52 for this MJU).

3. MJU #3 is Looped back.

4. NXT will either display the opening MJU command screen, or display more MJU mappings.

NOTE: The 440B keeps a memory of a single MJU path. Therefore, when a MAP shows an MJU status with no arrows (-->) then all branch selects have been released.

Block diagram of the MAP displayed above:
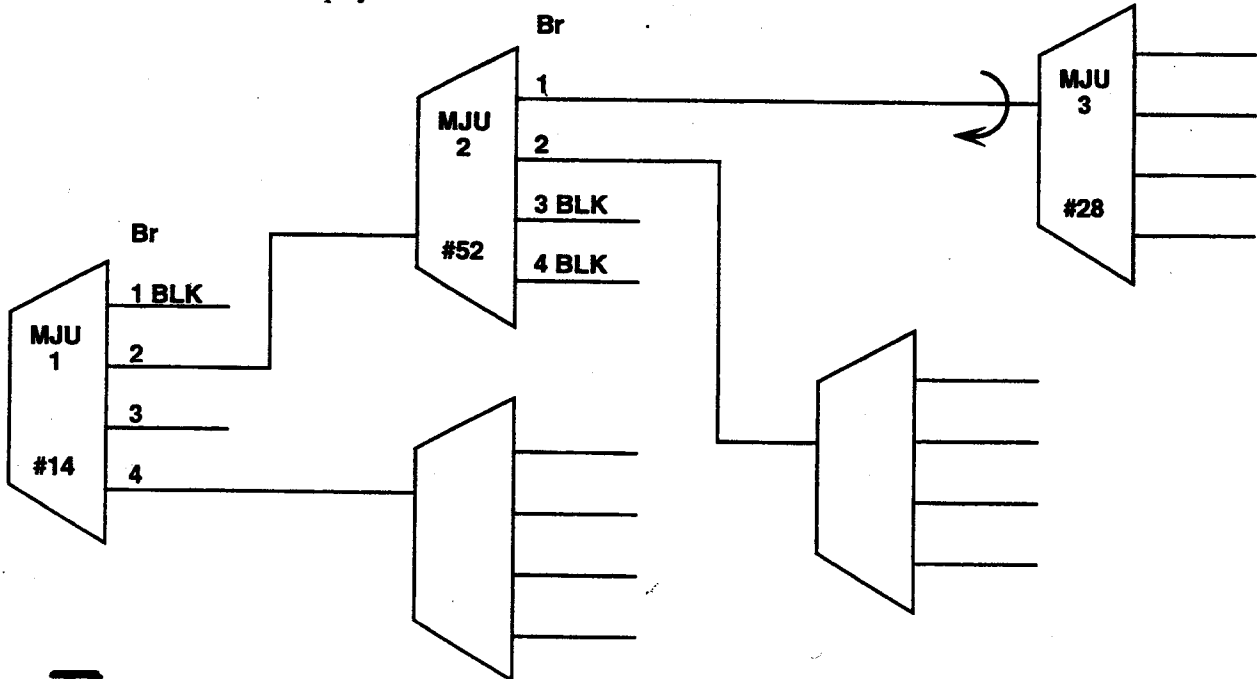
MJU COMMANDS

Miscellaneous Notes

```
┌─────────────────────────────────────────┐
│ MJU:[1] SEL REL BLK MJU-LOOP REL-ALL     │
│ XMT#1          Br:#1 MAP < > GO          │
└─────────────────────────────────────────┘
        □    □    □    □    □
```

Keep in mind that some commands will automatically release all previous branch selects. Therefore, sending certain commands (for example BLK and MJU LOOP DOWN) automatically end with a Release command. After a BLK command is sent, the command screen will show that you have returned to MJU #1.

Certain commands were developed to make MJU control easy. REBUILD is used to rebuild the full MJU path (assuming it was released due to a Block or Release-All command). PREV is used to step back one (1) MJU.

The MAP keeps a single path in memory for easy path rebuilding. But, reselecting a new path, will erase the previous path memory.

Once an MJU path is selected, and an MJU LOOP is established, you can select from the full complement of DS0A/B pattern selections described in the earlier sections. In other words, the MJU path will not be interrupted when selecting the transmitter DATA function key. Remember that the opening DATA menu screen has a variety of parameters, including MJU.

```
┌─────────────────────────────────────────┐
│ TYPE:DS0A  RATE:9.6  MJU:IDLE [XMT#1]    │
│ PRI:2047   SEC:NONE      < > EDIT        │
└─────────────────────────────────────────┘
        □    □    □    □    □
```

Likewise, all Loop Up and Down controls and Error Injection functions are also available.

However, it is important to always check the opening DATA screen to verify the status of MJUs before removing the test set from the circuit (or turning the set off). If opening the DATA screen shows MJU: Active or BLOCKS, then you have left certain branches Selected or Blocked. Return to MJU by underling with the < > softkeys and EDIT accordingly.

DS0-DP/OCU-DP INTERFACE

Option 30 is a rear panel mounted arrangement of jacks, LED's, and connectors.
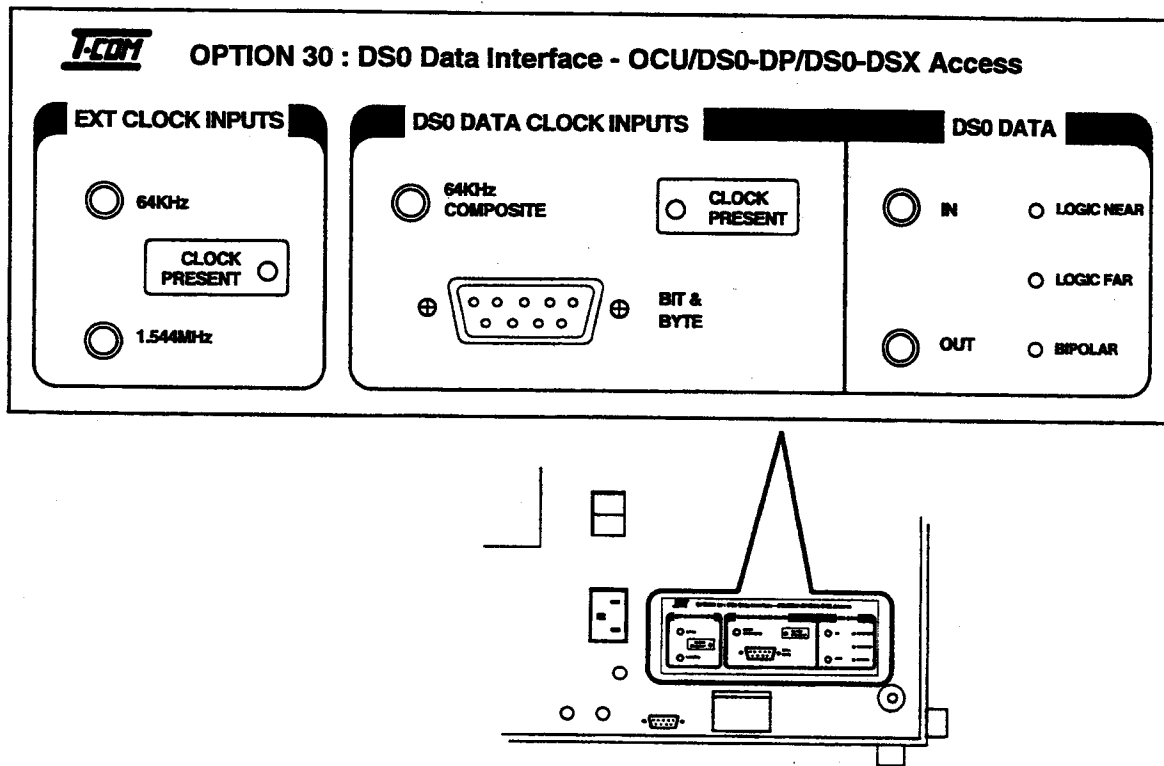
This option provides a direct DS0 interface to a DDS channel unit (DS0-DP or OCU-DP). It also provides DDS timing clock slip display and measurement, by comparing the DDS channel bank clock to the Building Integrated Timing Supply (BITS) outputs: the 8/64 kbps composite clock and the T1 station clock.

Option 30 provides a bantam jack (for connection to the composite clock) or a nine-pin connector (for connection to the bit and byte clocks).

NOTE: When AT&T D4 channel banks are used, they are equipped with a nine-pin connector on the Office Interface Unit (OIU) that provides access to the unbalanced bit and byte clocks. By using a clock interface unit (sometimes called a "clock box"), these unbalanced clocks can be converted to a balanced clocks for connection to Option 30's nine-pin connector labeled "Bit & Byte." GTE Lenkurt/Siemens channel banks integrate clock & data on each individual channel unit (DS0-DP/ OCU-DP). Testing these versions require the T-COM data/clock interface unit (p/n 2889-011-00 When other types of channel banks are used, the composite clock usually appears on wire-wrap pins on the rear of the channel bank shelf, which can be connected to the "64 kHz Composite" bantam jack. This jack can be set for either BRDG or TERM by depressing softkey F1, when Item 12 of the CNFG menu (64K CLOCK INPUT) is on the screen. Refer to Quick Sheet 16 for details.

CLOCK AND DATA PATCHCORD SET-UP FOR TESTING AT THE OCU/DS0-DP

1. **a)** Connect the T-COM clock box (p/n 2700-087) cable to the Option 30's Bit/Byte (DB-9) connector and attach the box directly to the OIU's DB-9 connector or

    b) Connect the T-COM clock box (p/n 2889-013-00) directly to the DB-9 connector on the back of Option 30. Use the bantam to DB-9 cord to connect from the clock (bantam) to the OIU (male DB-9).

2. Patch directly from Option 30's **IN/OUT** data jacks to the desired OCU or DS0-DP.
    Option 30's **OUT** jack is a transmit output; the **IN** jack is the receiver input.

CONFIGURING OPTION 30

3. Press the green **ALT** key on the 440B front panel to select Option 30, by underling **30 (DSO/OCU)**.

4. After underlining **30 (DS0/OCU)**, press **NXT** (F5) or the **ALT** key to display the main Option 30 set-up screen.

5. Use the F1 key to toggle between Logic Far, Logic Near, and Bipolar.

6. Set the primary channel pattern with **PAT** and the secondary channel with **SEC**.

7. Use the **Loop Up/Down** keys to send DDS loop codes (press GO to send), and Error Inject to send bit errors.

8. Use the **DATA** key to access and send MJU codes.

9. Use the **SUMMARY** key to view test status screen.

CLOCK AND DATA PATCHCORD SET-UP FOR TESTING AT THE OCU/DSO-DP

1. Connect the T-COM clock box cable to Option 30's Bit/Byte (DB-9) connector, and patch the box directly to the desired OCU/DS0-DP with a standard Siemens "paddle jack" cable.

2. Patch directly from Option 30's **IN/OUT** data jacks to the clock box.
   Option 30's **OUT** jack is a transmit output; the **IN** jack is the receiver input.

CONFIGURING OPTION 30

3. Press the green **ALT** key on the 440B front panel to select Option 30, by underling **30 (DSO/OCU)**.

4. After underlining **30 (DS0/OCU)**, press **NXT** (F5) or the **ALT** key to display the main Option 30 set-up screen.

5. Use the F1 key to toggle between Logic Far, Logic Near, and Bipolar.

6. Set the primary channel pattern with **PAT** and the secondary channel with **SEC**.

7. Use the **Loop Up/Down** keys to send DDS loop codes (press GO to send), and Error Inject to send bit errors.

8. Use the **DATA** key to access and send MJU codes.

9. Use the **SUMMARY** key to view test status screen.

GTE Lenkurt/Siemens
Channel Bank

(Requires Option 30)

SET UP FOR TESTING A DS0-DP/OCU-DP CHANNEL:

1. Press the green **ALT** key to display the screen below; underline **30 (DS0/OCU)** using the < > softkeys (F3, F4). NOTE: When Option 30 is in operation, Receiver #1 DS0 channel display reads: "- -."

```
┌────────────────────────────────────────┐
│ SELECT OPTION: NONE  31/DTE  31/DCE     │
│        30 (DS0/OCU)  <  >  NXT          │
└────────────────────────────────────────┘
            □   □   ■   ■   ■
```
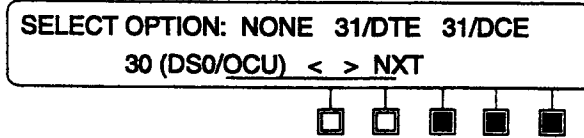
2. Press **NXT** (F5) in screen above to display the main Option 30 set-up screen below:

```
┌────────────────────────────────────────┐
│ OPTION:30  MODE:DS0A/2.4kb   PAT:2²⁰    │
│   SEC:OFF  TYPE:LOGIC-FAR  <  > EDIT    │
└────────────────────────────────────────┘
            ■   □   ■   ■   ■
```

3. In the screen above, use F1 key to toggle TYPE, i.e. Logic-Near, Logic-Far, or Biploar.

4. Use softkeys (F3, F4) in screen above to underline MODE and press the EDIT (F5) softkey to display the rate selection screen. Use the < > (F3, F4) keys to select the rate.

```
┌────────────────────────────────────────┐
│ DS0 RATE(kb/S): 2.4 4.8 9.6 19.2        │
│        38.4 56 64  <  >  NXT            │
└────────────────────────────────────────┘
            □   □   ■   ■   ■
```
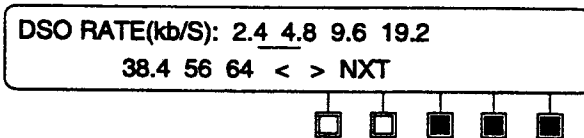

bars indicate that Option 30 is active
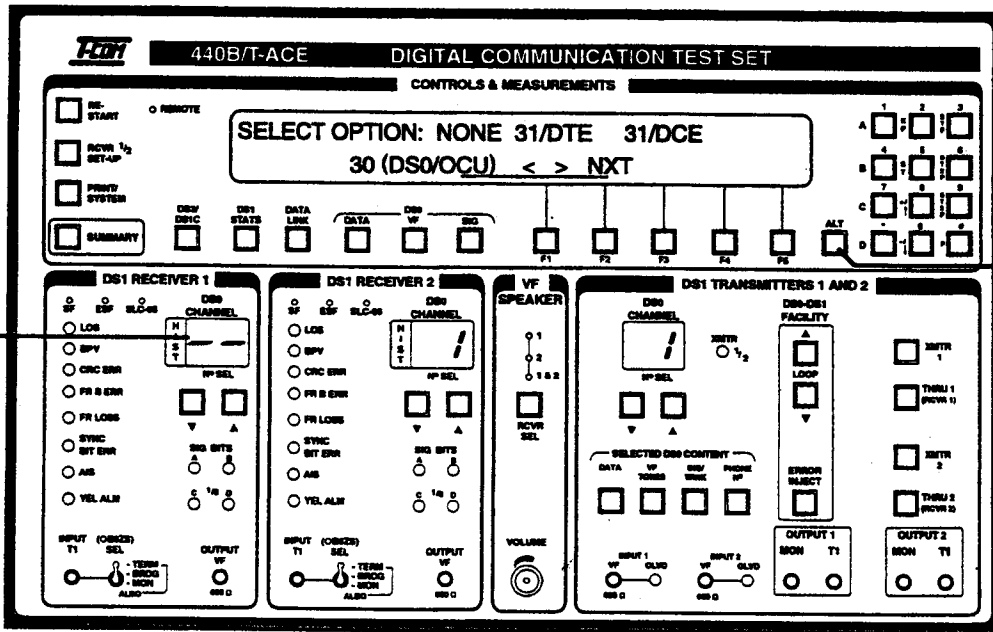
```
DSO RATE(kb/s):  2.4  4.8  9.6  19.2
              38.4  56  64  <  >  NXT
```
☐ ☐ ■ ■ ■

5. After selecting the desired rate, or if you want to use another mode, press the NXT softkey and use the < > softkeys to change MODE, or the NXT softkey to return to the Option 30 screen.

```
MODE/RATE: DS0A  DS0B
        SS7/56K  SS7/64K  <  >  NXT
```
☐ ☐ ■ ■ ■

6. Use the softkeys (F3, F4) in the Option 30 screen to move the underline to PAT and then press the EDIT (F5) softkey.

```
OPTION: 30  MODE:DS0A/2.4kb  PAT:2²⁰
   SEC:OFF   TYPE:LOGIC-FAR  <  > EDIT
```
■ ☐ ■ ■ ■

7. Use the < > softkeys (F3, F4) to select desired pattern. Use the NXT softkey (F5) to move from screen to screen.

```
DSO 63 511 2047 2¹⁵ 2²⁰ 2²³ CODE 0/0
#1   511QR 2047QR          <  >  NXT
```
☐ ☐ ■ ■ ■

8. Use the < > softkeys (F3, F4) to select desired patterns. Use the NXT softkey (F5) to move from screen to screen.

A.
```
DSO DDS-1 DDS-2 DDS-3 DDS-4 DDS-5 DDS-6
#1  DDS-3r PTN5         <  >  NXT
```
☐ ☐ ■ ■ ■

B.
```
DSO CONTROL CODES: ASC  IDLE  MUXOOS
#1     TEST  UN-MUX        <  >  NXT
```
☐ ☐ ■ ■ ■
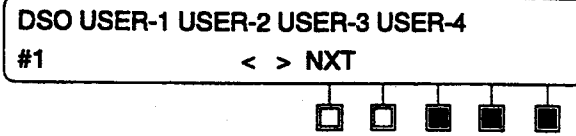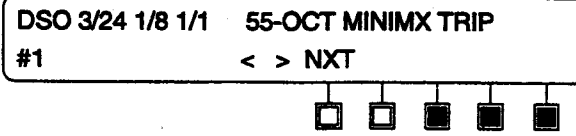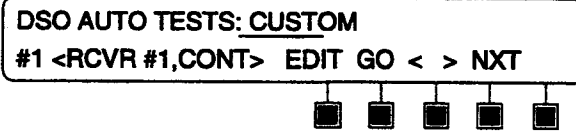
C.

```
DSO USER-1 USER-2 USER-3 USER-4
#1                    <  >  NXT
```

D.

```
DSO 3/24 1/8 1/1    55-OCT MINIMX TRIP
#1                    <  >  NXT
```

E.

```
DSO AUTO TESTS: CUSTOM
#1 <RCVR #1,CONT>  EDIT  GO  <  >  NXT
```

F.

```
OPTION:30  MODE:DS0A/2.4kb  PAT:2²⁰
   SEC:OFF  TYPE:LOGIC-FAR  <  >  EDIT
```
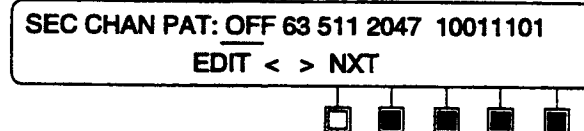
9. If you have a secondary channel you can use the < > softkeys to underline SEC from the Option 30 screen to select the pattern for the secondary channel. Press the NXT softkey (F5) to return to the Option 30 screen.

```
SEC CHAN PAT: OFF 63 511 2047  10011101
            EDIT  <  >  NXT
```

NOTE: Bipolar is usually used for testing at the DS0-DP unit. Logic-Near is used when testing at the OCU-DP toward the drop (customer) side of the circuit. Logic-Far is used for testing at the OCU-DP toward the line (network) side of the circuit.

NOTE: Make sure that the circuit is not carrying live traffic before proceeding with this test.

10. Connect the IN and OUT jacks on Option 30 to the DS0-DP (or OCU-DP) OUT and IN jacks, respectively. The Receiver 1 DS0 CHANNEL display should now read: "- -."
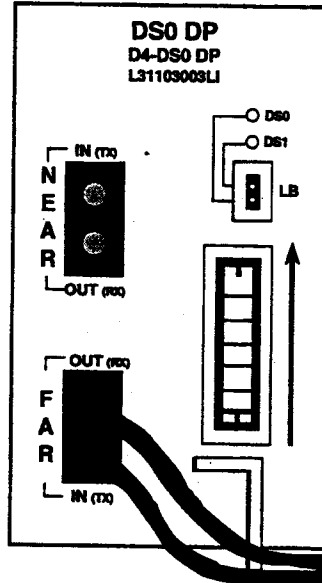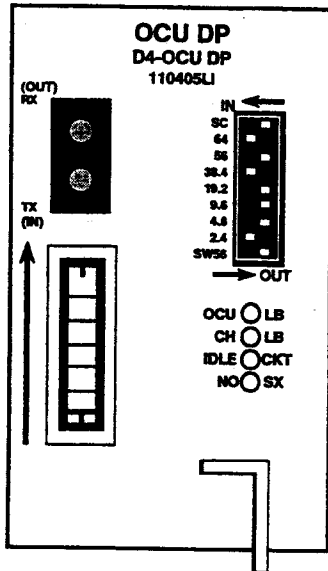
NOTE: If the channel unit is an OCU-DP there will be only one set of jacks. You would have selected Logic-Near or Logic Far in the preceeding step depending on the test direction. With the DS0-DP there are two sets of jecks: Near and Far. Connect to the Near jacks to test toward the drop side of the circuit. Connect to the Far jacks to test toward the DS1 line side of the circuit. Some DS0-DPs have an edge-type printed circuit board test connector. This requires a test adaptor to gain access to the circuit.

Remember: If you are loopback testing, sending a LOOP UP signal toward the line side loops the DS0-DP; whereas, sending LOOP UP signal toward the drop side actually loops the next DS0-DP in the chain.

11. By pressing the SUMMARY key you may check the set-up or test results. A screen like the following should appear:


```
OPT 30:DS0A 9.6 SYNC       0:01:02

   ALL RESULTS OK          SEL #2
```
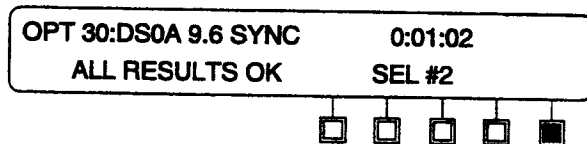
(Requires Option 30)

LOOPING UP A DS0-DP:

1. Depress the **DS0 FACILITY LOOP UP** key. The screen reads:

```
LOOP DSO DEVICE: DSO-DP#1      [XMT#1]
UP        RESP ON RCVR:#1 EDIT  GO
```

2. Select **RESP**onse on RCVR #1 (if not already selected) with softkey F3.

3. Use softkeys F1 and F2 to select the DS0-DP number that you wish to loop. (F1 and F2 are "hidden" UP/DN function keys.)

4. Depress the **GO** softkey (F5).

    a. If the loop is established, the screen will flash <AWAITING RESPONSE> for less than one second, then displays <LATCH CONFIRMED>.

```
LOOP DSO DEVICE: DSO-DP#1      [XMT#1]
UP   <AWAITING RESPONSE>
```

    b. If the loop up fails, the screen will flash <AWAITING RESPONSE> for approximately five seconds , and then display <Latch NOT FOUND>.

5. To verify that you are in loopback, press RESTART, then SUMMARY to display the pattern sync. You can inject errors in accordance with the procedures in Quick Sheet 5C, Page 4. (Press the red ERROR INJECT key.)

6. To loop up other devices, refer to Quick Sheet 5C, Pages 1-4.
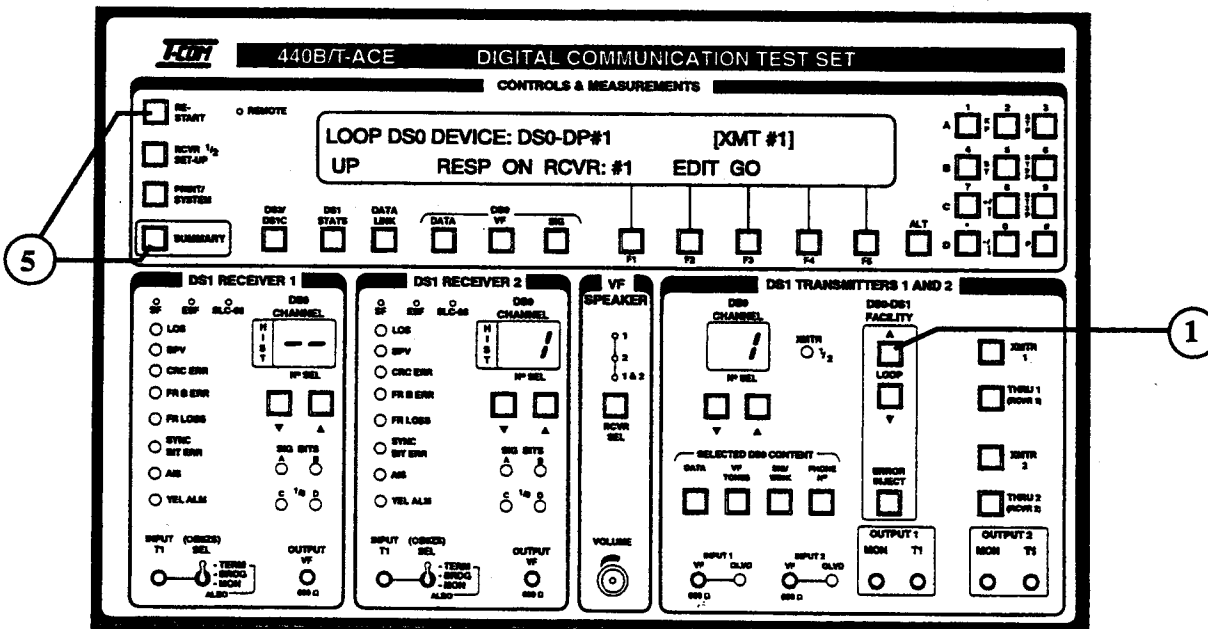
DDS Timing Comparison

When equipped with Option 30, the 440B/T-ACE can provide DDS timing clock slip display and measurement. This is obtained by comparing the DDS channel bank clock to the building integrated timing supply (BITS) outputs: the 8/64 kbps composite clock and T1 station clock.

Option 30 has two bantam jacks accepting external reference timing. One jack, labeled 64 kHz, is designed to connect directly to an unused CC source at the output of the BITS system. The other, labeled 1.544 MHz T1, is designed to connect to the main T1 station clock, also available at the output of the BITS system. (It is also normally available at the DSX-1.)
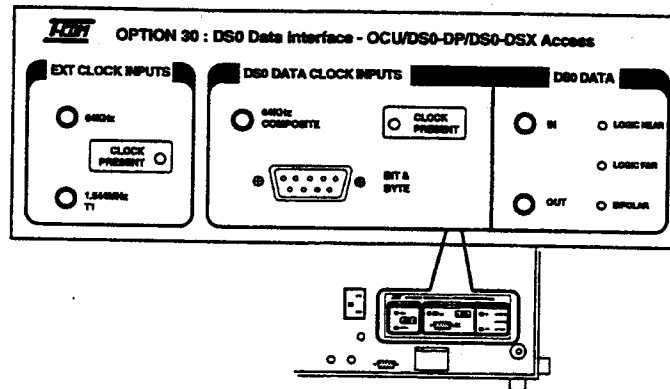
COMPARING THE EXTERNAL REFERENCE CLOCKS TO THE DS0 DATA CLOCK:

One of two clock interfaces has been provided. If T-COM p/n 2998-013-00 was provided, use step 1a. If T-COM p/n 2700-087 was provided, use step 1b.

1a. If testing an AT&T D4 channel bank, connect the T-COM clock interface directly to the Option 30 BIT & BYTE DB-9 jack. The clock interfaces plugs directly into the Option 30 panel. A cable, p/n 2700-101-00, connects between the clock interface (bantam plug) and the DB-9 female connector on the OIU. The green clock present LED in the DS0 DATA CLOCK INPUTS section will light.
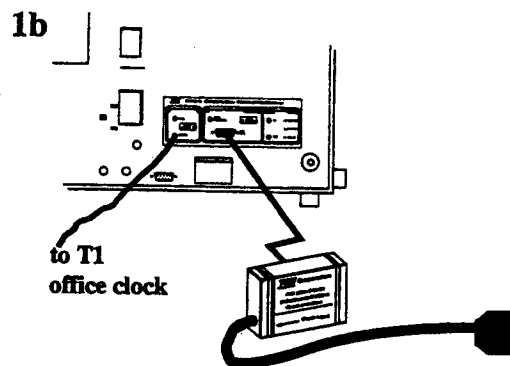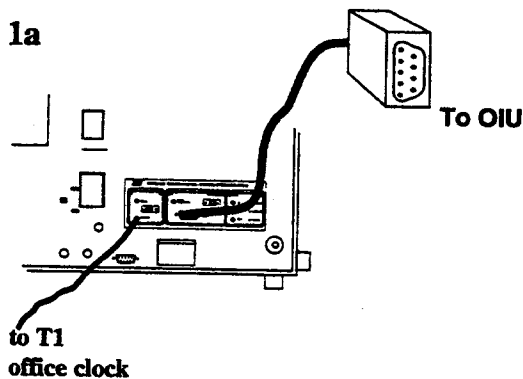
1b. If testing an AT&T D4 channel bank, connect the T-COM clock interface directly to the OIU. The cable from the clock interface has a female DB-9 connector which is connected directly to the male DB-9 jack on the Option 30 panel. The green clock present LED in the DS0 DATA INPUTS section will light.

2. Using a bantam patch cord, connect the T1 station clock to the 1.544 MHz EXT CLOCK INPUT JACK. The green clock present LED in the EXT CLOCK INPUTS section will light.

NOTE: If it is desired to compare to the 64 kHz reference composite clock, instead of the T1 station clock, connect the EXT CLOCK INPUT, 64 kHz jack to an unused (spare) BITS composite clock output source. This jack is always terminated, so do not connect it to a composite source output that is already in use.

3. Depress the **DS1 STATS** and then the **SLIP** softkey (F1). The screen reads:

```
┌─────────────────────────────────────────┐
│  SLIPPAGE    SLIP COUNT:    F             │
│    NA    <RCVR1 - RCVR2>  NXT             │
└─────────────────────────────────────────┘
        □    □    □    □    ■
```
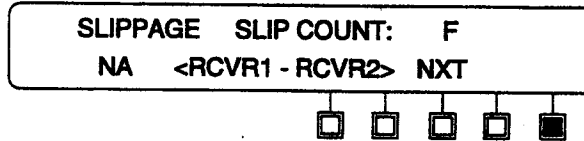
NOTE: The F in the upper right should be flashing to indicate there is no input to Receiver 2.

4. Depress **NXT** softkey (F5)

```
        ┌─────────────────────────────────────────┐
        │  SLIPPAGE      SLIP COUNT:  3             │
  (b)─── │  = ┤_____   <EXT-DSO DATA>  NXT       │
        └─────────────────────────────────────────┘
                □    □    □    □    ■
               (a)
```
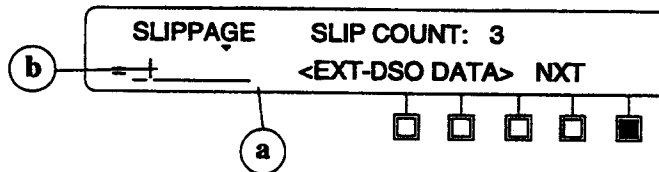
NOTE: The above screen compares the EXTernal reference clocks (1.544 MHz or 64 kHz) to the DS0 DATA clock. This display gives two indications of slippage:

IMPORTANT: Press green RESTART key to start slip test and clear old results.

a. A marker which moves horizontally every time more than seven bits of slippage occur. When this marker moves the equivalent of 193 bits, it returns to the center of the display and one slip is counted. This marker is useful for detecting slippage caused by a lack of synchronization or wander.

b. A vertical bar which increases in height every time one additional bit of slippage is detected. This bar is useful for detecting jitter.

MEASURING THE REFERENCE DS1 FREQUENCIES:

5. Depress the **DS1 STATS** key again, and then depress **MEAS** softkey (F2).

```
┌─────────────────────────────────────────┐
│ [1.]       RCVR 1   RCVR 2 F              │
│ FREQUENCY (Hz)   N/A   HAS LOS   NXT      │
└─────────────────────────────────────────┘
        □    □    □    □    ■
```
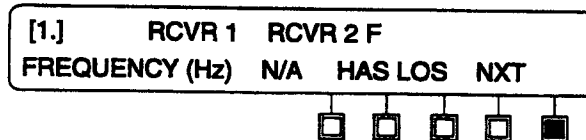
NOTE: The F in the upper right should be flashing to indicate there is no input to Receiver 2.

6. Depress **NXT** softkey (F5). The screen reads:

```
┌─────────────────────────────────────────┐
│ [2.]       EXT REF   DIRDATA              │
│ FREQUENCY (Hz) 1,544,000  1,544,000  NXT  │
└─────────────────────────────────────────┘
        □    □    □    □    ■
```
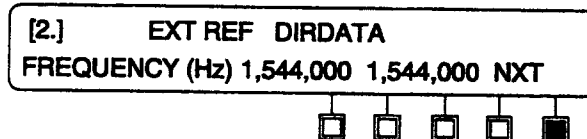
NOTE: DIRDATA stands for Direct Data, which means the frequency of the 64kHz DS0 clock multiplied by 24.125 to derive the associated DS1 frequency (1.544Mb/s). (When a 64kHz external reference is used, the EXT REF will also read the multiplied frequency.)

Press the DS1 STATS key to display:

```
DS1 STATISTICS
        SLIP MEAS CNT SER BER
```
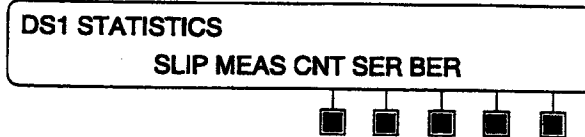
Press the softkeys in the screen above to provide the following measurements:

SLIP key: Displays synchronization timing slip graph and slip count.

MEAS key: Displays T1 level, T1 frequency, and when Option 15 is installed T1/F-T1 Round Trip Delay measurements.

CNT: Displays all individual error counters

SEC: Displays errored-seconds event counters

BER: Displays a variety of bit error rate calculations
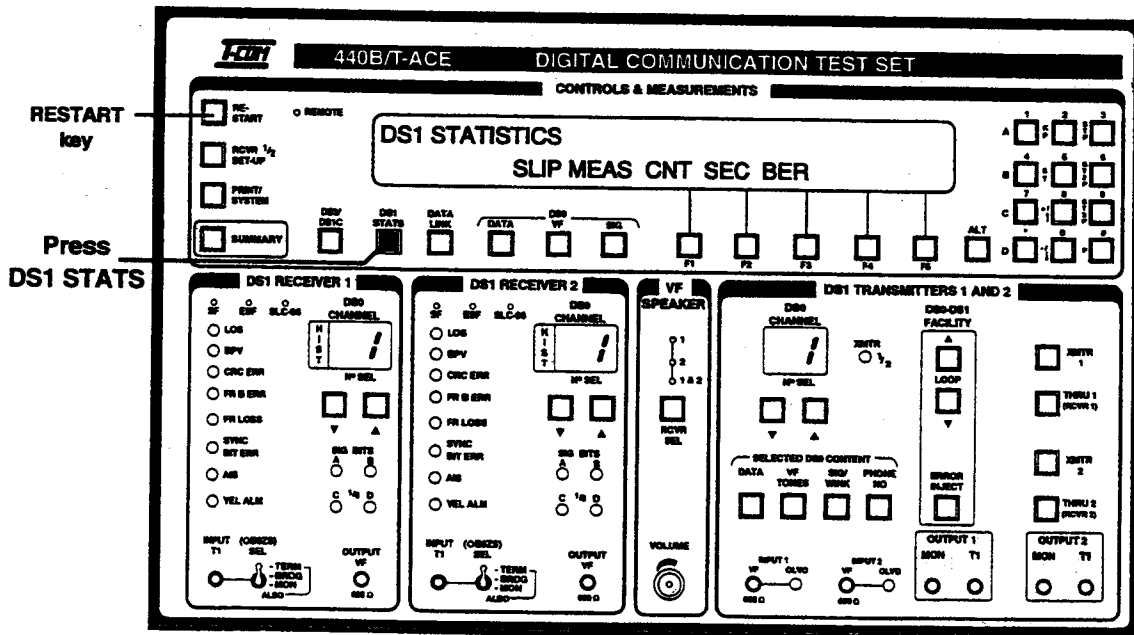
I. Synchronization timing slip testing

The 440B automatically compares the timing clocks for receiver 1 and receiver 2 DS1 signals. The unit provides a graphical display of bit and frame slips, and automatically counts full frame (193 bit) slips.

When monitoring (in-service) the transmit and receive directions of a T1 circuit, the 440B can identify whether the distant end is optioned for Recovered Clock (Loop timing) or whether it is running on Internal Clock (free-running). Likewise, two completely different T1 circuits can be compared to one another to verify that their timing is derived from the same clock source.

Slip measurements are made by comparing two clock sources. Generally, the 440B is used to compare the T1 signals patched into receiver #1 and receiver #2. However, if Option 30 or Option 31 are used, other clock types can be compared for slip measurements.

1. Press the DS1 STATS key to display the opening root screen:

> **DS1 STATISTICS**
>   **SLIP MEAS CNT SER BER**
>
> ■ ■ ■ ■ ■
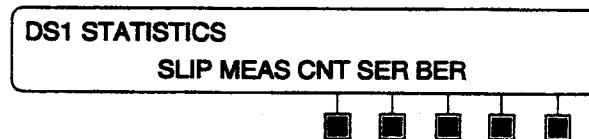
2. Press the SLIP softkey (F1) to display the slip screen below, and press the green RESTART key to begin the test:

> **SLIPPAGE   SLIP COUNT: 0**
> **= _____l_   <RCVR1 - RCVR2>   NXT**
>
> ☐ ☐ ☐ ☐ ■
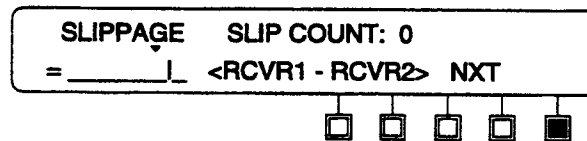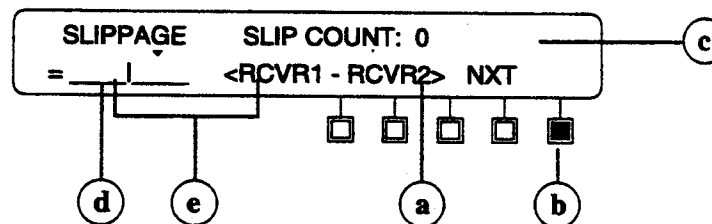
Slip Screen:

a) This title indicates which two clocks are being compared.
b) Use NXT to scroll through various slip screens
c) Total frame slip counts (one frame = 193 bits)
d) Each horizontal line represents a bit slip
e) Movement to the right represents RCVR 1 clock is faster than RCVR 2 clock.
    (If the line jumps back and forth quickly there may be jitter present.)

The first screen displays slip measurement by comparing the T1 signals patched into RCVR1 and RCVR2: note that the screen shows <RCVR1-RCVR2>. Scroll with NXT to the desired slip measurement (depending on the options installed in the unit) and press the green RESTART key to begin the test. For example, scrolling with NXT can display slip screens comparing the following:

Opt 30 External clock with the Bit/Byte DS0 Data clock	<EXT-DS0 DATA>
Opt 30 External clock with the Receiver #1 clock	<EXT-RCVR1>
Opt 30 External clock with the Receiver #2 clock	<EXT-RCVR2>
Opt 31 DTE Receive Clock with the Receiver #2 clock	<DTEr-RCVR2>
Opt 30 External clock with Option 31 DTE receive clock	<EXT-DTEr>

Note: <DTEr-RCVR2> and <EXT-DTEr> are specialized screens that only appear when operating Option 31 in the DTE mode. The 440B can indirectly compare DTE receive and transmit clocks sent by a DCE device. In addition to patching Option 31/DTE via RS-232-C or V.35, the 440B front panel XMTR1 T1 output must be patched to RCVR2 input to operate <DTEr-RCVR2>. To operate <EXT-DTEr> patch an external clock, composite or T1, to the EXT clock inputs. Refer to the Option 31 manual for more information.

II. Measuring T1 Frequency

1. Press the DS1 STATS key to display the opening root screen:

```
DS1 STATISTICS
            SLIP MEAS CNT SER BER
```
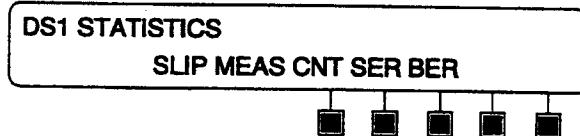
2. Press the MEAS (F2) softkey to display the frequency screen [1.] below. Notice that frequencies for Receiver 1 and 2 are displayed side by side.

```
[1.]        RCVR 1   RCVR 2
FREQUENCY (Hz) 1,543,999 1,544,001  NXT
```
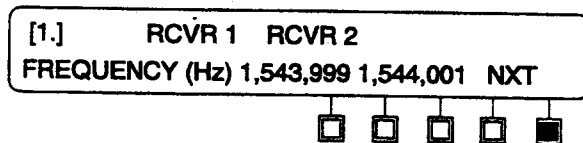
3. Press NXT to scroll to the next frequency measurement screen [2.] which displays T1 frequencies that are phase-locked to the external clock (EXT REF) and the DS0 Data Bit/Byte clock (DIRDATA).

This screen will only appear if Option 30 is installed.

```
[2.]        EXT REF  DIRDATA
FREQUENCY (Hz)  ABSENT   N/A     NXT
```
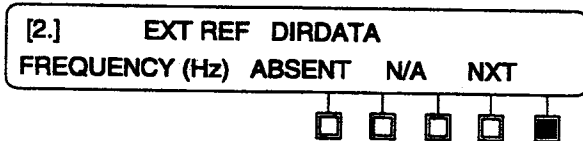
Note: N/A appears below DIRDATA when Option 30 is not selected.
ABSENT appears whenever a clock is not present.

Measuring T1 Level

```
[1.]        RCVR 1   RCVR 2
FREQUENCY (Hz) 1,544,000 1,543,999  NXT
```
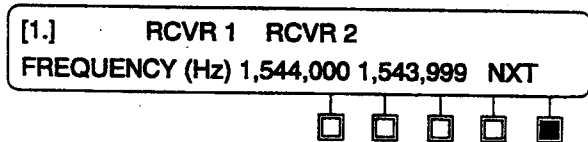
4. In the previous frequency measurement screen, press the NXT (F5) softkey to scroll to screen [3.] which displays the level of the T1 signal presented to the RCVR 1 and RCVR 2 inputs. The measurement is expressed in dBDSX (3V base-pk = 0dBDSX)

```
┌─────────────────────────────────┐
│ [3.]        RCVR 1   RCVR 2      │
│ LEVEL (dBDSX)   0.2    0.3   NXT │
└─────────────────────────────────┘
         □     □     □     □     ■
```

5. Press NXT in the previous screen above to display the level in Volts:

```
┌─────────────────────────────────┐
│ [4.]        RCVR 1   RCVR 2      │
│ LEVEL (Volts)  3.06   3.12   NXT │
└─────────────────────────────────┘
         □     □     □     □     ■
```

6. Press NXT to scroll to the [5.] Round Trip Delay screen (if Option 15 is installed) or to return to the root screen in step 1.

III. Measuring Round Trip Delay (Option 15)

When equipped with Option 15, the 440B/T-ACE measures the T1 and F-T1 round-trip delay on a circuit that is looped back. Because round-trip delay measurements are not available in channelized data or VF modes, the transmitter must first be configured for T1 or F-T1 mode. It is *required* that the circuit under test be looped back. See important notes on pages 8-9.

1. Press the DS1 STATS key to display the opening root screen:

```
┌─────────────────────────────────┐
│ DS1 STATISTICS                  │
│        SLIP MEAS CNT SER BER    │
└─────────────────────────────────┘
         □     ■     □     □     □
```

2. Press the MEAS (F2) softkey to display:

```
┌──────────────────────────────────────────┐
│ [1.]        RCVR 1   RCVR 2               │
│ FREQUENCY (Hz) 1,544,003 1,543,003   NXT  │
└──────────────────────────────────────────┘
         □     □     □     □     ■
```

3. Scroll to the fifth screen shown below, titled [5.] **Round Trip Delay** by pressing the NXT softkey (F5) four times. Depending on the transmitter mode, the screen will be titled **T1** or **F-T1** Round Trip Delay.

```
┌─────────────────────────────────┐
│ [5.] T1 ROUND-TRIP DELAY        │
│              GO     NXT         │
└─────────────────────────────────┘
         □     ■     □     □     □
```

If configured for T1 mode:

```
┌─────────────────────────────────────┐
│ [5.] T1 ROUND TRIP DELAY             │
│              GO    NXT               │
└─────────────────────────────────────┘
        □   ■   □   □   □
```
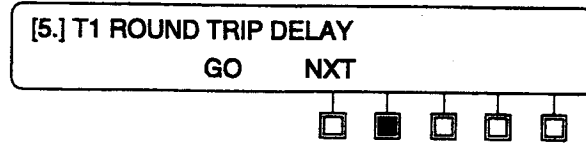
4. Press GO to start Round Trip Delay measurements. The flashing STOP indicates that measurements are in progress. Initially, the screen will show "calculating" and then the current RTD measurement will be displayed (for example 45 microseconds as shown below).

```
┌─────────────────────────────────────┐
│ [5.] T1 ROUND TRIP DELAY             │
│  CALCULATING      STOP    NXT        │
└─────────────────────────────────────┘
        □   ■   □   □   □
```

```
┌─────────────────────────────────────┐
│ [5.] T1 ROUND TRIP DELAY             │
│  45 microseconds    GO    NXT        │
└─────────────────────────────────────┘
        □   ■   □   □   □
```
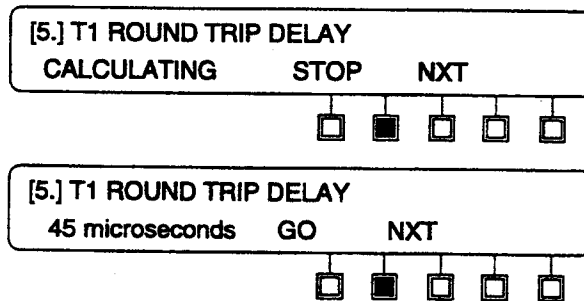
5. Press STOP to freeze the measurement. Press NXT to exit the Round Trip Delay measurement mode.

If configured for F-T1 mode:

```
┌─────────────────────────────────────┐
│ [5.] F-T1 ROUND TRIP DELAY           │
│              GO    NXT               │
└─────────────────────────────────────┘
        □   ■   □   □   □
```
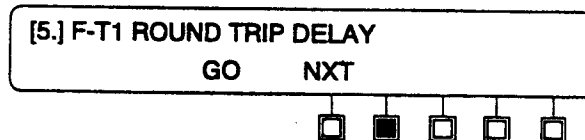
6. Press GO to start Round Trip Delay measurements. The flashing STOP indicates that measurements are in progress. Initially, the screen will show "calculating" until the first measurement for the first channel appears. The unit will automatically scroll through the selected channels, displaying RTD results for each.

```
┌─────────────────────────────────────┐
│ [5.] F-T1 ROUND TRIP DELAY  CH:# 4   │
│  CALCULATING       STOP    NXT       │
└─────────────────────────────────────┘
        □   ■   □   □   □
```

7. To review individual channel results, press STOP to freeze measurements. Note that ↓ ↑ arrows appear above softkeys F3 and F4. Use the arrow softkeys to manually scroll through all selected channels. Press NXT to exit the Round Trip Delay measurement mode.

```
┌─────────────────────────────────────┐
│ [5.] F-T1 ROUND TRIP DELAY  CH:# 4   │
│  79 microseconds     GO  Ø  NXT      │
└─────────────────────────────────────┘
        □   ■   □   □   □
```

Important notes for operating Round Trip Delay

1. The Round Trip delay (RTD) measurement requires that the T1/F-T1 circuit be looped back.

2. The following messages may appear during RTD testing:

   CALCULATING: measurement is in process, no result yet.

   UNSTABLE: two consecutive measurements did not match, delay is either erratic or shifting too quickly to provide a reliable result.

   > 2 sec/check loopback: Delay is either greater than two seconds, or no physical loopback is present. Verify that loopback is present by exiting RTD and acquiring pattern sync (or perform BERT).

   NOT MEASURED: A measurement has not yet been performed on the channel selected for review.

3. This test requires that XMTR#1/RCVR#1 operate as a pair, or that XMTR#2/RCVR#2 operate as a pair. However, either transmitter can be used for RTD. Simply press the desired XMTR key and verify that the set is patched to the associated T1 output and input jacks.

4. The Round Trip Delay measurement can only be performed in T1 or F-T1 mode (not channelized data or VF), therefore the XMTR must first be configured for T1 or F-T1 mode. If the XMTR is not configured for T1 or F-T1, then scrolling to [5.] will cause the following reminder screen to appear for 5 seconds:

   ```
   Round Trip DLY MEAS can't be startted
   in channelized mode
   ```
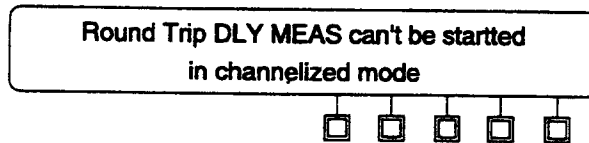
5. Round-Trip delay measurement only runs when the *[5.] Round Trip Delay* screen is displayed and GO is pressed. When RTD is running, STOP will flash. Pressing STOP will discontinue measurement updates, but will not erase results history. Exiting the screen will automatically stop the RTD measurements and erase results history. Pressing any front panel function key during Round Trip Delay will automatically stop the test in progress.
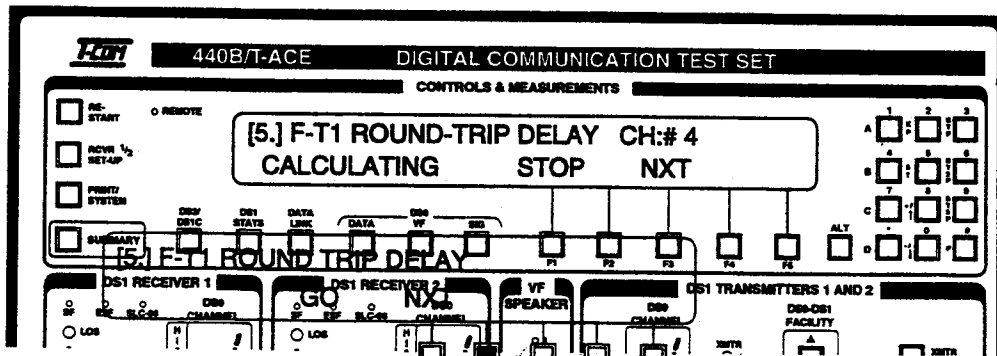
6. If the F-T1 Round Trip Delay measurements are performed, the unit automatically measures delays in each channel assigned in the transmitter F-T1 channel map. To review the results of each channel, press STOP to display the arrow keys, and manually scroll through the channel history. Every channel should have an identical delay measurement. If not, this indicates that the channels are not routed through identical equipment/ facility paths.

7. The RTD measurements are automatically downloaded to the printer port with time/date stamps. After the first measurements are downloaded, only new (different) measurements are subsequently downloaded in order to eliminate redundant print-outs.

Round Trip Delay Applications

Compare delays over different paths, for example T1 circuits transported via microwave radio links versus T1 systems carried through fiber SONET systems.
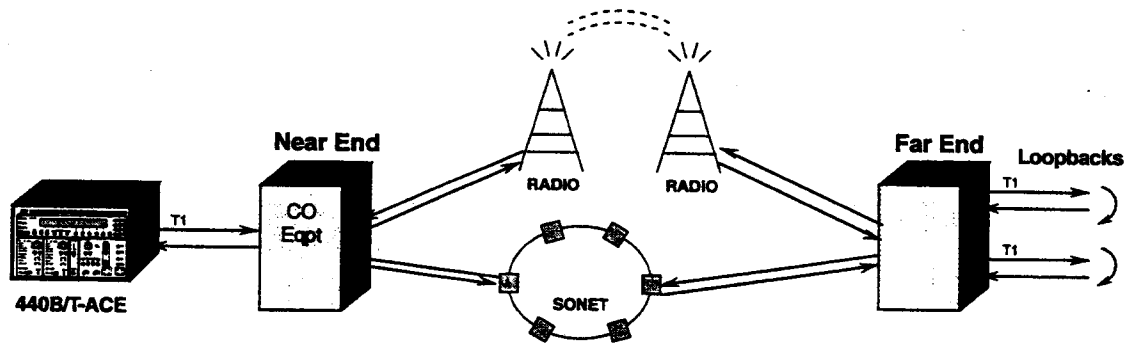
Prove that an aggregate F-T1 bandwidth is fragmented by a DACS and transported via separate paths, by measuring different delays among the F-T1 channels..
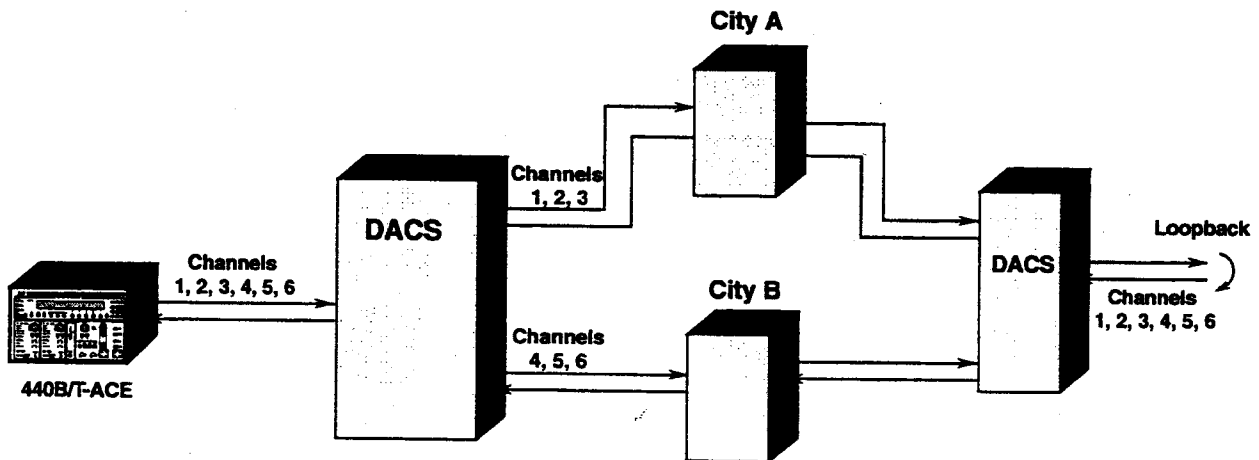
IV. Displaying full DS1 Error Statistics (G.821)

As explained in the SUMMARY Quick Sheet, all errors are automatically displayed in the SUMMARY screen. However, in some cases it is useful to translate individual errors into statistics. The 440B DS1 STATS key provides access to the following types of error counters and statistics (per G.821).

Note: *All error statistics are accumulated simultaneously.*
The following steps are simply to display results.

```
┌─────────────────────────────────────┐
│ DS1 STATISTICS                      │
│            SLIP MEAS CNT SER BER    │
└─────────────────────────────────────┘
              ▫   ▫   ▫   ▫   ▫
```

CNT: Individual Error Counts ——————————————

BIT ERRORS (based on stress patterns)
BPV ERRORS
FRAME BIT ERRorS
CRC ERRORS

SEC ——————————————————

SYNC LOSS-SECS	Sync Loss seconds
LOS-SECS	LOS seconds (Loss of Signal)
FRAME LOSS-SEC	Frame Loss seconds
ERRORED SECS	Errored seconds
SEV ERR-SECS	Severely errored seconds
CSES	Consecutively errored seconds
UNAVAIL SECS	Unavailable seconds
% UNAVAIL SECS	% Unavailable seconds
DEGRADED MINS	Degraded minutes
%DEGRADED MINS	% Degraded minutes
ERROR FREE SECS	Error Free seconds
% EFS	% Error Free seconds
YEL ALARM SECS	Yellow Alarm seconds
AIS SECS	AIS seconds
> 15 0's SECS	> 15 0's seconds (excessive zeros)

BER: Bit Error Rates ——————————————

BER (based on stress pattern)
BPV BER (BER based on BPV errors)
FRAME BER (based on Frame Bit errors)
CRC BER

Displaying DS1 error statistics

1. Press the DS1 STATS key to display the root screen:

```
┌─────────────────────────────────────┐
│ DS1 STATISTICS                       │
│           SLIP MEAS CNT SER BER      │
└─────────────────────────────────────┘
            ☐    ☐   ☐  ■  ☐
```
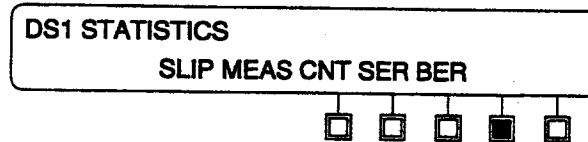
2. Press CNT, SEC, or BER to display the desired types of statistics (refer to the list on the previous page).
   For example, for Unavailable seconds, press SEC to display the first SEC error statistics screen:

```
┌─────────────────────────────────────┐
│         RCVR 1   RCVR 2              │
│ SYNC LOSS-SECS   N/A    N/A   NXT    │
└─────────────────────────────────────┘
            ☐    ☐   ☐  ☐  ■
```
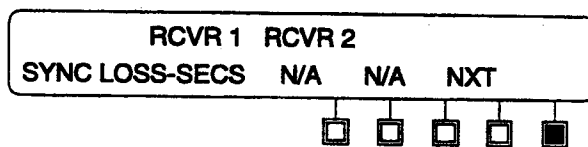
3. Use the NXT softkey to scroll through the 6 screens until the screen below is displayed:

```
┌─────────────────────────────────────┐
│         RCVR 1   RCVR 2              │
│ UNAVAIL SECS      0      0    NXT    │
└─────────────────────────────────────┘
            ☐    ☐   ☐  ☐  ☐
```
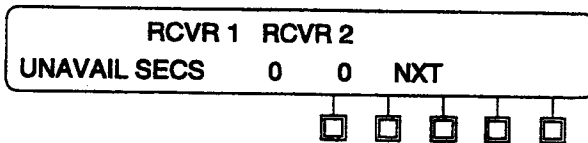
In order to return to the main root screen, you can either continue scrolling with NXT or simply press the DS1 STATS function key.

ESF DATA LINK (Option 10)

The 440B automatically captures ESF Facilities Data Link messages for ANSI (T1, 403) PRMs, ANSI SPRMs (Annex E), ANSI MPRMs (Annex F), and AT&T (Pub 54016) versions. Because the unit is capable of testing two DS1 circuits simultaneously, it is important to verify the number of the receiver being displayed on the screen.

The unit displays the individual one- second Performance Report Messages (PRMs) and accumulates statistical analysis based on these PRMs. Suplemental Performance Report Message (SPRM) data is displayed as it occurs. Individual one-second Network Performance Report Message (NPRM) data accumulates statistical analysis based on these NPRMs. Bit Oriented and AT&T Messages are also displayed. AT&T response messages are automatically downloaded to the printer port.

It is important to note that the 440B is always monitoring for Data Link messages when ESF frame is recognized. Scrolling between individual screens and receivers can be done without interrupting Data Link monitoring.

Because the 440B/T-ACE provides ESF Data Link monitoring and transmit functions the ESF Data Link Quick Sheets are divided into two sections:

1. **Displaying ESF Messages**

2. **Transmitting ESF Data Link Messages**
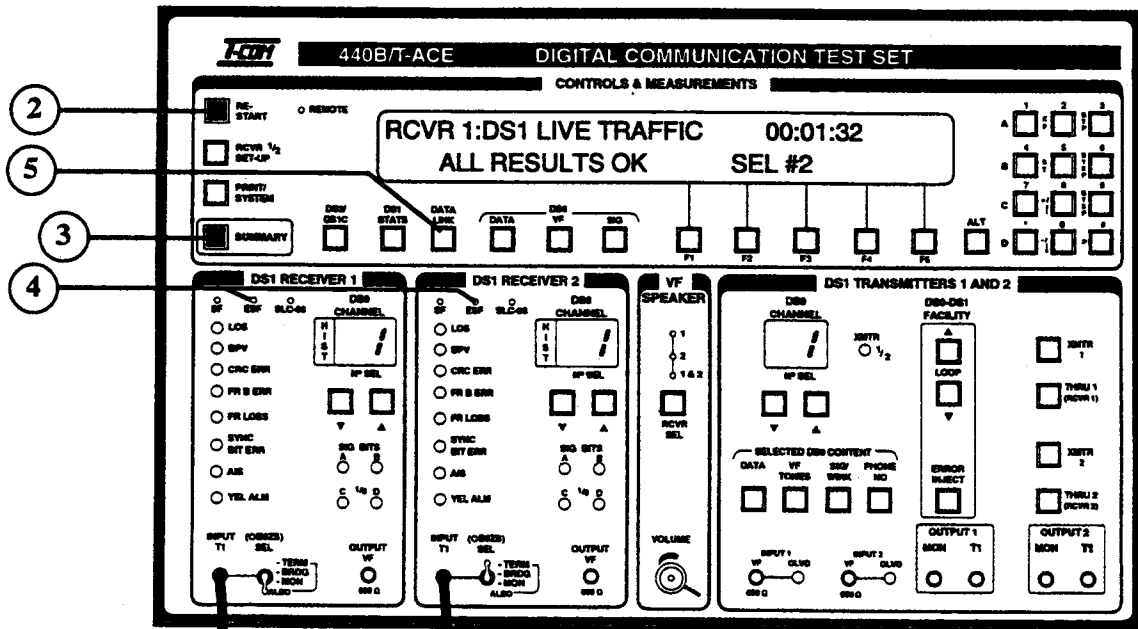
Part 1: Displaying ESF Data Link Messages

1. Patch the DS1 circuit into Receiver 1 or 2 (or both).

2. Press the green RESTART key.

3. Press the SUMMARY key to display the screen shown below. (Refer to Using SUMMARY/HISTORY Features Quick Sheet to interpret this screen)

```
┌─────────────────────────────────────────┐
│ RCV 1: DS1 LIVE TRAFFIC      00:01:32     │
│       ALL RESULTS OK         SEL #2       │
└─────────────────────────────────────────┘
     □    □    □    □    □
```

4. Verify that the DS1 ESF framing LEDs are lit.

5. Press the DATA LINK key to display the opening screen. If the screen doesn't match, press the DATA LINK a second time. The screen will automatically display the type of messages (if any) found.

```
┌─────────────────────────────────────────┐
│ AT&T-MSGs PRMs SPRMs NPRMs    RCVR#1      │
│ BOMs OTHER-MSGs   CLR VIEW <  > SEL       │
└─────────────────────────────────────────┘
     □    □    □    □    □
```
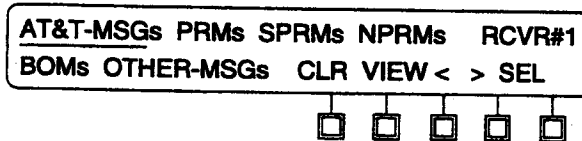
NOTE:

A. The main Data Link screen will only read the type of message found. Therefore at times only one title may be displayed (for example ANSI PRMs).

B. Pressing the DATA LINK key a second time will display the screen below. This screen is only used if the corresponding 440B Transmitter is expected to generate a response to the incoming requests.

```
┌─────────────────────────────────────────┐
│ RCVR#1   RESPOND TO AT&T REQUESTS ?       │
│             YES  NO NXT    ___            │
└─────────────────────────────────────────┘
     □    □    ■    □    ■
```
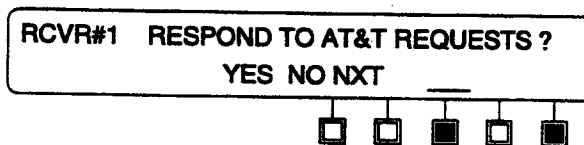
If YES is selected pressing NXT displays the following screen:

```
┌─────────────────────────────────────────┐
│     CHOOSE VALID TARGET ADDRESS           │
│ RCVR#1  ANY  A  B  Y  Z    <  > NXT       │
└─────────────────────────────────────────┘
     □    □    ■    ■    ■
```
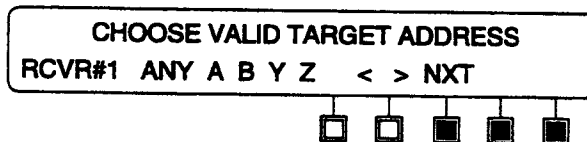
With the < > softkeys select a valid address and press NXT.

C. If no Data Link messages are found for a given receiver, the screen will display:

```
┌─────────────────────────────────────┐
│  NO ESF DATALINK MESSAGES   RCVR#1   │
│  HAVE BEEN RECEIVED        SEL       │
└─────────────────────────────────────┘
      □    □    □    □    ■
```
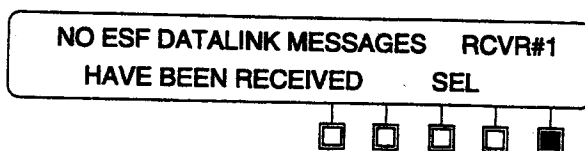
6. Use the SEL softkey (F5) to display either RCVR#1 or RCVR#2. In the example screen above, Receiver #1 is currently displayed.

7. Use the < > softkeys to underline the type of message to be read. For example, underline ANSI PRMs:

```
┌──────────────────────────────────────────┐
│  AT&T-MSGs PRMs SPRMs NPRMs    RCVR#1     │
│  BOMs OTHER-MSGs PRMs STATS <  > SEL      │
└──────────────────────────────────────────┘
      ■    □    ■    ■    □
```
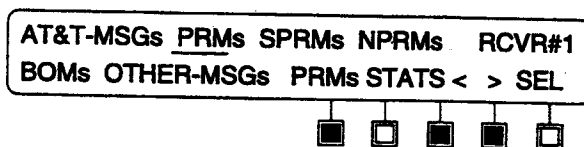
8. Use the PRMs softkey to display the 1 second Performance Report Messages in real time. The moving "second hand" indicates that new seconds are being displayed:

```
┌───────────────────────────────┐   ┌───────────────────────────────┐
│ PRM FROM CI /: NO ERRORS IN LAST │   │ PRM FROM CXR /: NO ERRORS IN LAST │
│ SECOND                        │   │ SECOND            RCVR#1      │
└───────────────────────────────┘   └───────────────────────────────┘
      □   □   □   □   ■                   □   □   □   □   ■
```
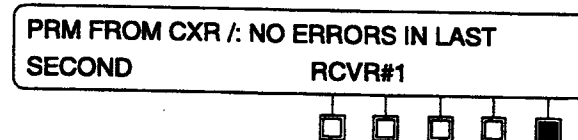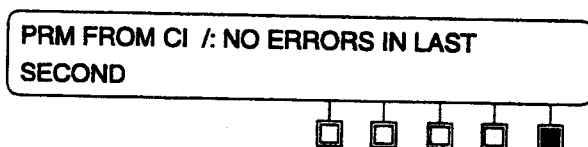
These screens also display the message "PRM from CI" (or CXR) indicating the direction from which the signal is received.

9. Press the NXT softkey to return to the main Data Link screen:

```
┌──────────────────────────────────────────┐
│  AT&T-MSGs PRMs SPRMs NPRMs    RCVR#1     │
│  BOMs OTHER-MSGs PRMs STATS <  > SEL      │
└──────────────────────────────────────────┘
      □    ■    □    □    □
```
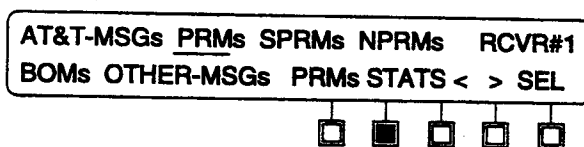
10. Use the STATS softkey to display the first of 8 Data Link statistics screens for Receiver #1 (RCVR#1). The first screen displays the total number of received PRMs and the total number of missing PRMs. Since PRMs should be received every second, the unit keeps track of PRMs.

```
┌──────────────────────────────────────────┐
│  RCVR RECEIVED PRMs  MISSING PRMs         │
│  #1    8527        0    PRV NXT           │
└──────────────────────────────────────────┘
      □    □    □    ■    ■
```
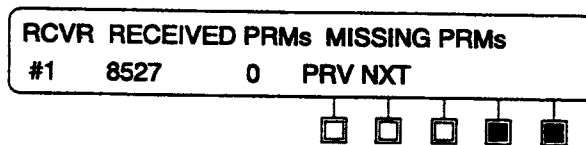
11. Press NXT to scroll to the next screen (or use PRV to display the previous screen). The second screen displays Error Free Seconds and Percentage Error Free Seconds for RCVR#1:

```
┌──────────────────────────────────────────┐
│  RCVR    EFS    % ESF                     │
│  #1    8527   100.00      PRV NXT         │
└──────────────────────────────────────────┘
      □    □    □    ■    ■
```
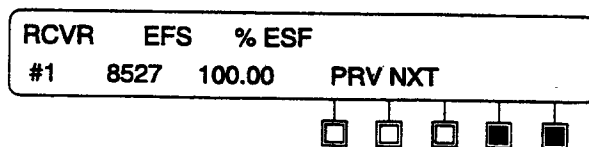
12. Press NXT to scroll to the next screen (PRV for the previous screen). The third screen displays Errored Seconds, Severely Errored Seconds, and Unavailable Seconds:

```
RCVR   ES   SES   UAS
#1     0    0     0    PRV NXT
```
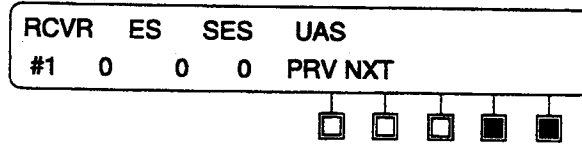
13. Press NXT to display CRC events (0 and 1):

```
RCVR  0 CRC EVENT   1 CRC EVENT
#1      0             0    PRV NXT
```
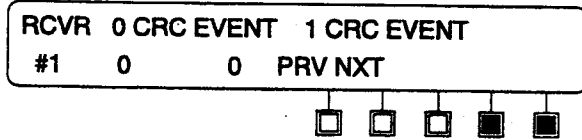
14. Press NXT to display (2-5 and 6-10) CRC events:

```
RCVR  2-5 CRC EVENT  6-10 CRC EVENT
#1      0              0    PRV NXT
```
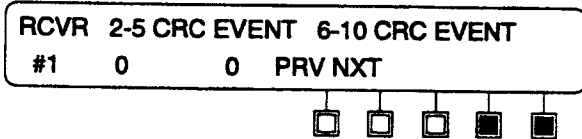
15. Press NXT to display (11-100 and 101-319) CRC events:

```
RCVR  11-100 CRC EVNT  101-319 CRC EVNT
#1      0                0    PRV NXT
```
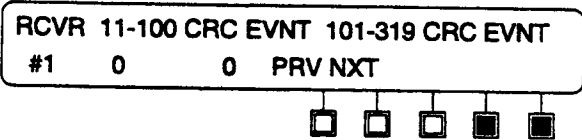
16. Press NXT to display (greater than 319) CRC events and Frame Error Events:

```
RCVR  > 319 CRC EVENT   FE EVNT
#1      0                0    PRV NXT
```
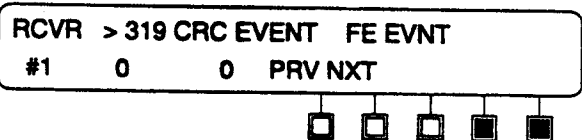
17. Press NXT to display Severely Errored Frame Events, Bipolar Events and Slip Events:

```
RCVR  SE-EVNT  BPV-EVNT  SLIP-EVNT
#1     0        0         0    PRV NXT
```
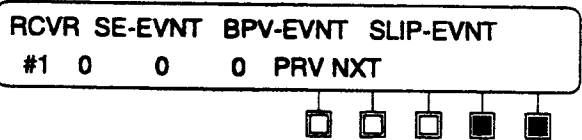
18. Press NXT to return to the main Data Link screen. Remember, all messages might not be present at the same time.

```
AT&T-MSGs PRMs SPRMs NPRMs    RCVR#1
BOMs OTHER-MSGs   CLR VIEW <  > SEL
```
■ ■ ■ ■ ■
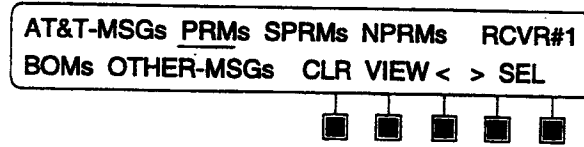
19. If SPRMs have been detected, the "SPRMs" label will be displayed. Use the < > softkeys to underline SPRMs. (This label cannot appear by itself, the PRMs label must always appear with it.)

```
PRMs SPRMs NPRMs    RCVR#1
        VIEW <  > SEL
```
■ ■ ■ ■ ■
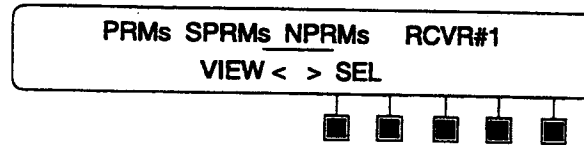
20. Pressing the VIEW key will show details of hte current SPRM. The information displayed represents the latest SPRM received. No historical information or statistics are gathered.

```
SPRMs: R BIT: SPRM INSERTED    RCVR#1
U1<NETWORK>:OK   U2 (CI):OK    NXT
```
■ □ ■ ■ ■
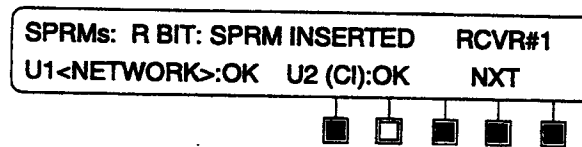
Three pieces of information are available in earch SPRM; the R bit, the U1 bit and the U2 bit. The pattern observed on the R bit indicates one of three possible scenarios:

R BIT - SPRM INSERTED
        (SPRM inserted and frame format conversion ongoing withing the Network)
       - HARDWARE FAULT
        (an internal hardware fault is detected at the point of insertion)
       - INFO ADDED
        (supplementary performance information is added to the PRM)

U1   - OK (indicates no CRC, BPV, or Frame errors are detected from the network)
       - ERR (indicated eitherline code violations, CRC errors, or framing errors are being detected from the network at the point of insertion)

U2   - OK (indicates no CRC, BPV, or Frame errors are detected from the CI)
       - ERR (indicated eitherline code violations, CRC errors, or framing errors are being detected from the CI at the point of insertion)

Sample screens:

```
SPRMs: R BIT: HARDWARE FAULT   RCVR#1
U1<NETWORK>: ERR  U2(CI): OK   NXT
```
■ □ ■ ■ ■

```
SPRMs: R BIT: INFO ADDED       RCVR#1
U1<NETWORK>: ERR  U2(CI): ERR   NXT
```
□ ■ □ □ □
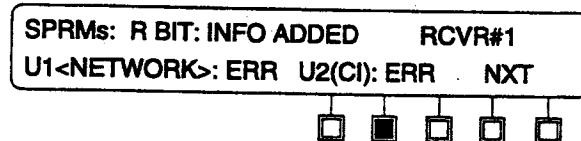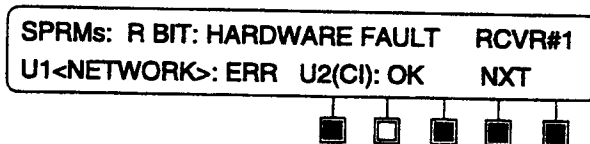
21. If NPRMs have been detected, the "NPRMs" label will be displayed. Use the < > softkeys to underline NPRMs. NPRMs normally will coexist with PRMs. However it is possible for them to stand alone.

```
┌─────────────────────────────────────┐
│   PRMs ___NPRMs   RCVR#1             │
│      PRMs STATs <  > SEL             │
└─────────────────────────────────────┘
        □   □   □   □   □
```
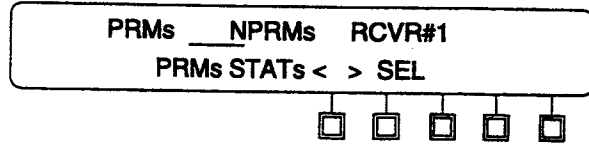
When the NPRM label is selected, the two functions keys "NPRMs" and "STATs" will be displayed. These two keys are similar to the corresponding PRMs keys. The "NPRMs" key leads to a display of information from the previous second, while the "STATs" key leads to a display of historical information.

```
┌─────────────────────────────────────┐
│   PRMs    NPRMs   RCVR#1            │
│      NPRMs STATs <  > SEL           │
└─────────────────────────────────────┘
        □   ■   □   ■   ■
```
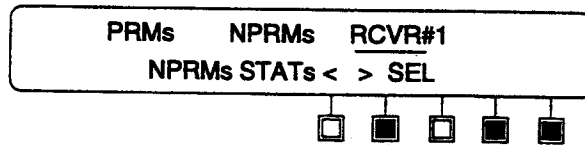
An NPRM can report CRC and Severely Errored Framing events (SEF) for both the near and far end equipment. In addition it can report two system wide flags: a performance Alert flag (PA) and a Frame Format Conversion flag (FC). The PA flag warns that the network performance has fallen below a predetermined trigger level. The FC flag indicates that the CI is sending SF framing and the network is converting this to ESF.

22. Viewing the current NPRM

The current NPRM is viewed by pressing the "NPRMs" function key while the NPRMs label is underlined. If no errors were observed in the previous second, the screen below is displayed. This screen has a spinner character to indicate system activity.

```
┌─────────────────────────────────────┐
│  NPRMs / NO ERRORS IN LAST SECOND   │
│  RCVR#1                  NXT         │
└─────────────────────────────────────┘
        □   ■   □   ■   ■
```
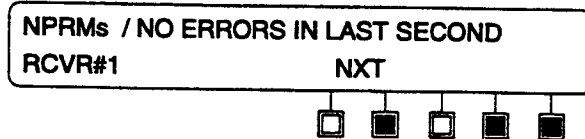
If errors are being reported, the above screen will be replaced with the appropriate error display. A fully loaded NPRM screen is shown below. Normally not all of these errors occur at once.

```
┌─────────────────────────────────────┐
│  NPRMs / PA FAR:  CRC:101-319 SEF   │
│  RCVR#1  FC NEAR:  FE: 2-3   SEF NXT │
└─────────────────────────────────────┘
        □   ■   □   ■   ■
```
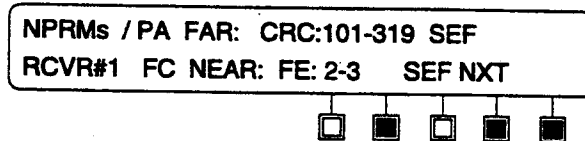
In a more usual case, only some of the errors would be indicated. For example, the far end might be reporting errors while the near end is error free.

```
┌─────────────────────────────────────┐
│  NPRMs /   FAR:  CRC:1              │
│  RCVR#1    NEAR:  CRC:0     NXT      │
└─────────────────────────────────────┘
        □   ■   □   ■   ■
```
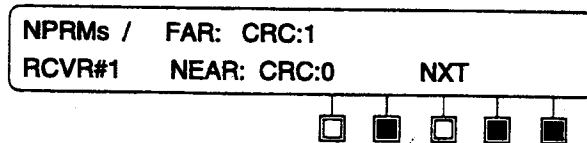
23. **Viewing NPRM STATs**

    The STATs screen will cycle through overall counts, counts for the near end, counts for the far end, and finally a count of Performance Alert (PA) warnings. The system maintains a separate count of errored seconds for the near and far ends.

```
┌─────────────────────────────────────────┐
│    PRMs      NPRMs    RCVR#1             │
│         NRPMs STATs <  > SEL             │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```
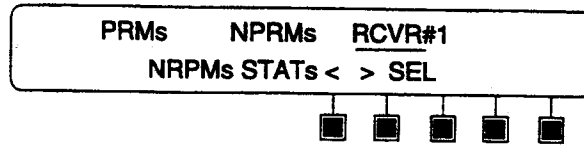
24. With NPRM underlined press the STATs key.

```
┌─────────────────────────────────────────┐
│   NPRMs   RECEIVED  MISSING              │
│   RCVR#1    96       0     PRV NXT       │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```
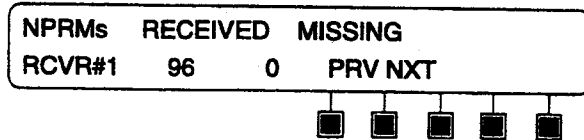
25. Press NXT to step to the next screen.

```
┌─────────────────────────────────────────┐
│   NPRMs     ES    SEF     NEAR   RCVR#1  │
│   120    3    PRV NXT                    │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```
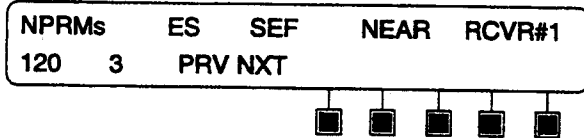
26. Continue to press NXT to step through the full cycle or PRV to return to the preceding screen.

```
┌─────────────────────────────────────────┐
│   NPRMs      EVNT 1 CRC EVNT  NEAR       │
│   RCVR#1    2120    36    PRV NXT        │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```

```
┌─────────────────────────────────────────┐
│   NPRMs   2-100 CRC  100-319 CRC  NEAR   │
│   RCVR#1     0        1     PRV NXT      │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```

```
┌─────────────────────────────────────────┐
│   NPRMs    > 319           NEAR   RCVR#1 │
│   3           PRV NXT                    │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```

```
┌─────────────────────────────────────────┐
│   NPRMs     ES    SEF     FAR   RCVR#1   │
│   2    0    PRV NXT                      │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```

```
┌─────────────────────────────────────────┐
│   NPRMs   0 CRC EVNT  1 CRC EVNT   FAR   │
│   RCVR#1   22120      3      PRV NXT     │
└─────────────────────────────────────────┘
        ■    ■    ■    ■    ■
```
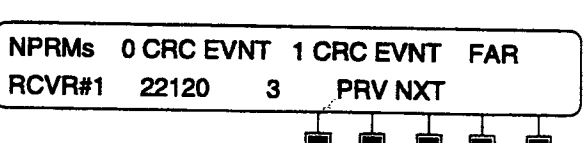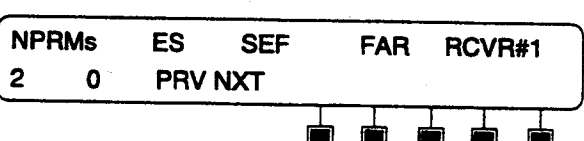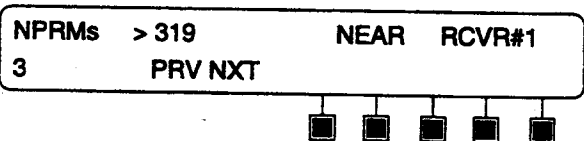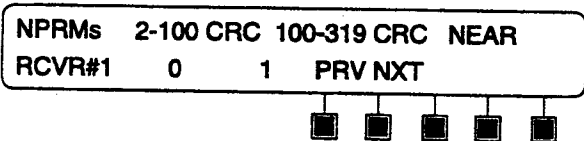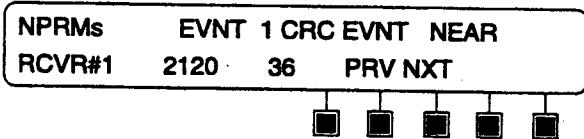
```
┌──────────────────────────────────────────┐
│ NPRMs  2-100 CRC  100-319 CRC   FAR        │
│ RCVR#1    4520         0     PRV NXT        │
└──────────────────────────────────────────┘
         ▣    ▣    ▣    ▣    ▣
```

```
┌──────────────────────────────────────────┐
│ NPRMs    > 319 CRC          FAR            │
│ RCVR#1      120          PRV NXT           │
└──────────────────────────────────────────┘
         ☐    ▣    ☐    ▣    ▣
```

```
┌──────────────────────────────────────────┐
│ NPRMs   PERFORMANCE ALERTS                 │
│ RCVR#1      5           PRV NXT            │
└──────────────────────────────────────────┘
         ☐    ▣    ☐    ▣    ▣
```

The Performance Alert warning does not specify which end is causing the warning. It does not increment the errored second counter. It is a count of the times errors were detected.

27. If the near end is sending SF frame, the display for the near end changes to FE errors.

```
┌──────────────────────────────────────────┐
│ NPRMs     ES    SEF     NEAR    RCVR#1     │
│ 85     0    PRV NXT                        │
└──────────────────────────────────────────┘
         ☐    ▣    ☐    ▣    ▣
```

```
┌──────────────────────────────────────────┐
│ NPRMs   0 FE EVNT  1 FE EVNT    NEAR       │
│ RCVR#1    24567       85     PRV NXT        │
└──────────────────────────────────────────┘
         ☐    ▣    ☐    ▣    ▣
```

```
┌──────────────────────────────────────────┐
│ NPRMs  2-3 FE EVNT  >3 FE EVNT   NEAR      │
│ RCVR#1     0          0      PRV NXT        │
└──────────────────────────────────────────┘
         ☐    ▣    ☐    ▣    ▣
```

28. Press NXT to return to the main menu.

```
┌──────────────────────────────────────────┐
│ AT&T-MSGs PRMs SPRMs NPRMs    RCVR#1       │
│ BOMs OTHER-MSGs  PRMs STATs <  > SEL       │
└──────────────────────────────────────────┘
         ▣    ▣    ▣    ▣    ▣
```

29. Use the < > softkeys to underline AT&T MSGs. Use SEL to display the screen for Receiver #1 and #2.

```
AT&T-MSGs PRMs SPRMs NPRMs   RCVR#1
BOMs OTHER-MSGs   CLR VIEW <  > SEL
```
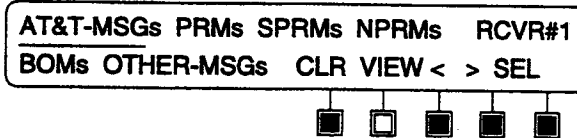
30. Press VIEW to display captured AT&T Data Link Messages. (Pressing CLR will clear/erase all stored messages). The screen below shows that at 10:43 (and 32 seconds) a request for an Enhanced 1 Hour Performance Message was received by the 440B. If this is the most recent message, it will be highlighted with a flashing underline.

```
REQUEST: ENH 1 HR PERFORMANCE MSG
RCVR#1   10:43:32  EXIT  PRNT PRV NXT
```
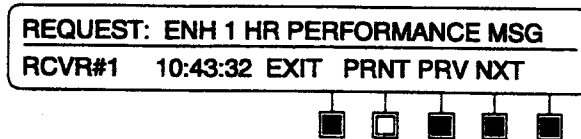
31. Use NXT softkey (F5) to scroll through all captured messages. All messages will be time stamped as above. Use PRV (F4) to scroll backwards (Previous). Use PRNT to download individual messages to printer. Use EXIT to return to main ESF Data Link screen:

```
AT&T-MSGs PRMs SPRMs NPRMs   RCVR#1
BOMs OTHER-MSGs   CLR VIEW <  > SEL
```
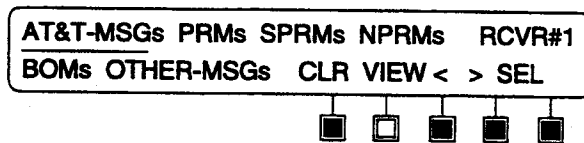
32. Use CLR to erase (clear) all the messages for the type underlined (for example, AT&T MSGs).

33. Use the < > softkeys to underline BOMs. Use the SEL softkey (F5) to choose Receiver #1 or #2. The screen below will display Receiver #1 results:

```
AT&T-MSGs PRMs SPRMs NPRMs   RCVR#1
BOMs OTHER-MSGs   CLR VIEW <  > SEL
```
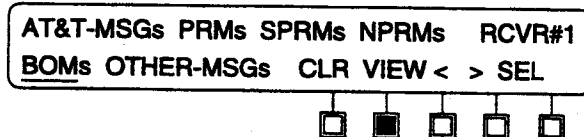
34. Press the View softkey to display Bit Oriented Messages (BOMs) for RCVR#1. The screen below shows that a Line Loop Up command was received at 10:57 (and 38 seconds):

```
BOM CMD: LINE LOOP-UP
RCVR#1   10:57:38  EXIT     PRV NXT
```
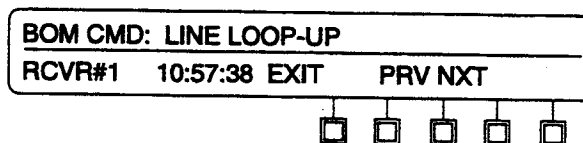
35. If a BOM priority command had been sent, the following screen would be displayed:

```
┌─────────────────────────────────────────┐
│ BOM BEGIN:  YELLOW ALARM (RAI)           │
│ RCVR#1     11:23:46    EXIT   PRV NXT     │
└─────────────────────────────────────────┘
              □  ■  □  ■  ■
```

36. Use the NXT softkey to scroll through additional messages. Use the PRV softkey to scroll backwards (previous). The most recent BOM message will be highlighted with a flashing underline. Use Exit to return to the main ESF Data Link screen.

Note: If a byte message is not recognized as a valid AT&T or ANSI message, or contains a CRC error, the 440B will store the message in the "OTHER MSGs" category.

"Unknown Messages" can be downloaded to the printer in a hexadecimal format. In the screen below, using PRNT (F3) will download the "unknown" message to the printer output.

```
┌─────────────────────────────────────────┐
│ REQUEST:  UNKNOWN MESSAGE                 │
│ RCVR#1     10:43:32  EXIT   PRNT PRV NXT  │
└─────────────────────────────────────────┘
              ■  □  ■  ■  ■
```

This concludes displaying ESF Data Link Messages.

PART 2: Transmitting ESF Data Link messages

The 440B can be set to automatically generate ANSI (TI.403) one second PRMs, based on the status of the DS1 signal received by the corresponding receiver. Receiver 1 and Transmitter 1 are linked (as well as RCVR 2 and XMTR 2). This feature allows the 440B to emulate a CSU/NI for circuit turn-up. The unit also transmits Bit Oriented Messages (BOMs) such as Yellow Alarm, Line and Payload Loopbacks.

The 440B also transmits AT&T (Pub 54016) requests and commands. The test set can emulate an NCOE device by automatically responding to far-end requests and commands, as recognized by either Receiver 1 or 2.

Each transmitter/receiver pair can support the ANSI and AT&T Data Link functions simultaneously, giving you the best of both systems for T1 turn-up.

1. Press the XMTR key to display the DS1 Transmitter root menu screen. (If DL:ESF does not appear in the screen below, then verify that FRAME is ESF):

```
┌──────────────────────────────────┐
│ MODE:T1  PAT:QRS   FRAME:ESF      │
│ CODE:AMI  CLK:INT  DL:ESF  <  > EDIT │
└──────────────────────────────────┘
        ■   ■   ■   ■   ■
```
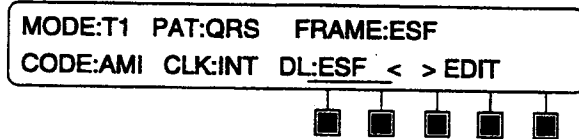
2. In screen above, underline DL:ESF and press EDIT to display the opening DATA LINK screen or press F1 or F2 for direct access to the screen:

```
┌──────────────────────────────────┐
│ T1   ANSI PRMs   AT&T MSGs   BOMs │
│ #1            EXIT <  > NXT       │
└──────────────────────────────────┘
       □   □   □   □   □
```

```
┌─────────────────────────────────────┐
│ T1   ANSI PRMs  AT&T MSGs   BOMs___  │
│ #1              EXIT <  > NXT        │
└─────────────────────────────────────┘
        ☐  ☐  ■  ■  ☐
```
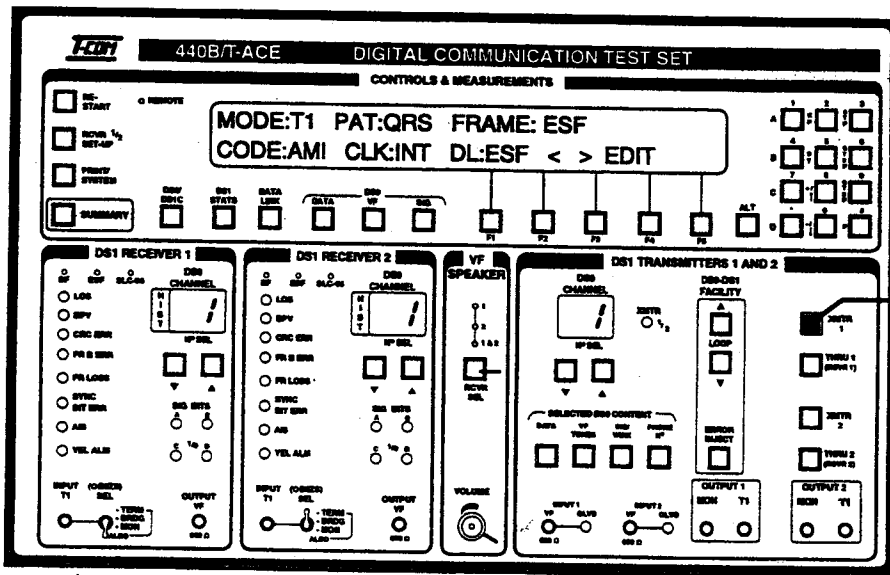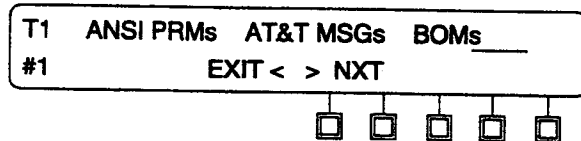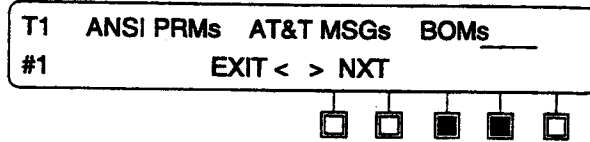
Transmitting One Second PRMs

3. In the screen above, underline the type of ESF Data Link desired (either ANSI PRMs, AT&T, or BOMs). For example, to generate one second PRMs, underline ANSI PRMs with the < > softkeys.

```
┌─────────────────────────────────────┐
│ T1   ANSI PRMs   AT&T MSGs   BOMs    │
│ #1   PRMs SENT FROM: CI EXIT <  > NXT│
└─────────────────────────────────────┘
        ■  ■  ■  ■  ■
```

4. Note that a configuration sentence appears on the bottom line, labeled PRMs SENT FROM:CI. Use the F1 softkey to toggle CI or CXR. The 440B is transmitting PRMs from the CI (customer installation) or from CXR (carrier).

5. Press the GO (F5) softkey in the screen above to begin automatically sending 1 second PRMs. (Notice that the GO softkey becomes a flashing STOP. Press STOP to discontinue.)

6. Press EXIT to return to the root XMTR Set-Up screen (or press XMTR key):

```
┌─────────────────────────────────────┐
│ MODE:T1  PAT:QRS   FRAME:ESF         │
│ CODE:AMI  CLK:INT  DL:ESF  <  > EDIT │
└─────────────────────────────────────┘
        ☐  ☐  ■  ■  ■
```
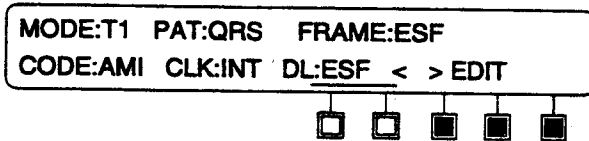
The transmitter will continue sending PRMs until you re-enter the DL:ESF menu and press STOP.

NOTE: Since we are generating PRMs from XMTR1, the messages will be based on the status of the DS1 circuit being monitored by RCVR1. Therefore, until RCVR1 detects an error, the PRM message <NO ERRORS IN LAST SECOND> will be sent.

Moving to other screens, such as SUMMARY, will not interrupt the PRM transmit. However, at any time you can return to the ESF DL screen in the root XMTR Set-Up screen and press STOP to discontinue sending PRMs. It is also possible to re-enter ESF DL screen to send AT&T commands/requests, or BOMs, without interrupting the PRM transmission.

Sending Bit Oriented Messages (BOMs)

7. Press the XMTR key to display the DS1 Transmitter root menu screen, as in step 1.
    (Verify that FRAME is ESF):
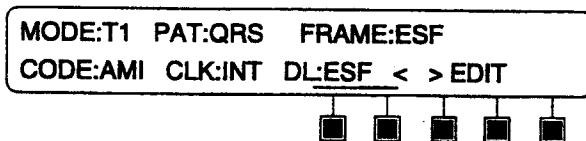
```
┌─────────────────────────────────────┐
│ MODE:T1  PAT:QRS    FRAME:ESF        │
│ CODE:AMI  CLK:INT  DL:ESF  <  > EDIT │
└─────────────────────────────────────┘
        ■    ■    ■    ■    ■
```

8. Underline DL:ESF in the screen above, and press EDIT to display the opening ESF Data Link screen:

```
┌─────────────────────────────────────┐
│ T1    ANSI PRMs  AT&T-MSGs   BOMs___ │
│ #1              EXIT  <  >  NXT      │
└─────────────────────────────────────┘
        □    □    ■    ■    ■
```
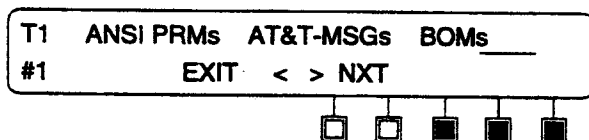
9. Underline BOMs with the < > softkeys and press NXT to display the command screen:

```
┌─────────────────────────────────────┐
│ T1  BOM PRIORITY: YELLOW ALM (RAI)   │
│ #1             EXIT  GO  PRV NXT     │
└─────────────────────────────────────┘
        □    □    ■    ■    ■
```
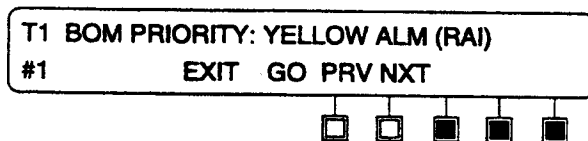
10. Scroll to the desired command with the **NXT** and **PRV** (previous) softkeys. Press **GO** to send the BOM selected. For example, in above screen, pressing GO will invoke **YELLOW ALARM.**

    - If the selected BOM is identified as "PRIORITY", it is sent continuously while the STOP heading flashes. Depressing the STOP softkey (F3) causes sending to stop (and the key heading to change back to "GO"). Leaving the screen with EXIT while F3 flashes STOP does not interrupt the transmission of this message.

```
┌─────────────────────────────────────┐
│ T1  BOM PRIORITY: YELLOW ALM (RAI)   │
│ #1 <SENDING>      EXIT  STOP         │
└─────────────────────────────────────┘
        ■    □    ■    □    □
```
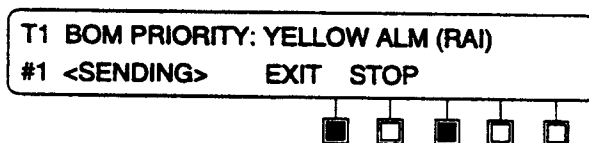
    - If the selected BOM is identified as "COMMAND", it is sent 10 times.
      BOM Command Messages are sent as a burst of 10 iterations.

List of Bit Oriented Messages

```
┌─────────────────────────────────────────────┐
│ T1  BOM COMMAND : LINE LOOP-UP                │
│ #1                 EXIT   GO  PRV NXT         │
└─────────────────────────────────────────────┘
        ■   □   ■   □   □
```
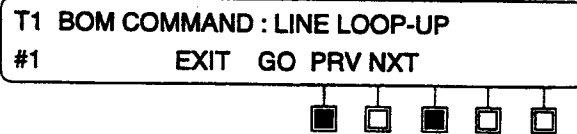
Depressing GO causes the following screen to be displayed for 3 seconds:

```
┌─────────────────────────────────────────────┐
│      BOM COMMAND : LINE LOOP-UP               │
│ #1              HAS BEEN SENT                 │
└─────────────────────────────────────────────┘
        □   □   □   □   □
```
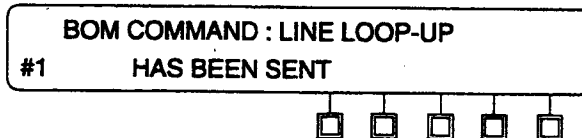
Use NXT softkey to scroll through an array of BOM commands:

1.	Yellow Alarm (RAI)	Priority command
2.	Loopback Retention	Priority command
3.	RAI-CI	Priority command
4.	Line Loop-Up	BOM command
5.	Line Loop-Down	BOM command
6.	Payload Loop Up	BOM command
7.	Payload Loop Down	BOM command
8.	Network Loop Up	BOM command
9.	Universal Loop Down	BOM command
10.	ISDN Loop-Up	BOM command
11.	CI/CSU Loop-Up	BOM command
12.	NT1 Power Off	BOM command
13.	Protection SW Line #1	BOM command
−	....	
−	....	
−	....	
30.	Protection SW Line #27	BOM command
31.	Protection SW Acknowledgment	BOM command
32.	Protection SW Release	BOM command
33.	Stratum 1 Traceable	BOM command
34.	Stratum 2 Traceable	BOM command
35.	Stratum 3 Traceable	BOM command
36.	Stratum 4 Traceable	BOM command
37.	Stratum 3E Traceable	BOM command
38.	± 20 PPM Traceable	BOM command
39.	Network Sync	BOM command
40.	XMT Node Clock	BOM command
41.	SYNC Traceability Unknown	BOM command
42.	Do Not Use For Synchronization	BOM command
43.	Maintenance #1	BOM command

(continued)

44.	Maintenance #2	BOM command
45.	Network MSG #1	BOM command
46.	Network MSG #2	BOM command
47.	Network MSG #3	BOM command
48.	Network MSG #4	BOM command
49.	Customer MSG #1	BOM command
50.	Customer MSG #2	BOM command
51.	Customer MSG #3	BOM command
52.	Customer MSG #4	BOM command

(For each command screen, use PRV to scroll backwards, Press GO to send, and Press EXIT to exit and return to the main Data Link screen)

Sending AT&T Data Link Requests and Commands

11. Press the XMTR key to display the DS1 Transmitter root menu screen. (If DL:ESF does not appear in the screen below, then verify that FRAME is ESF):

```
MODE:T1  PAT:QRS   FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF  <  > EDIT
```
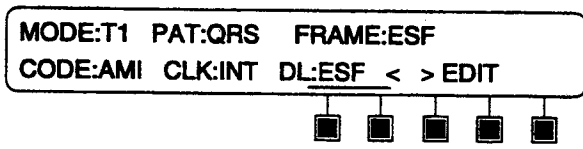
12. Underline DL:ESF in the screen above, and press EDIT (or F1/F2) to display the opening ESF Data Link screen (or press F1 or F2 for direct access):

```
T1    ANSI PRMs  AT&T-MSGs   BOMs
#1           CNFG EXIT <  > NXT
```
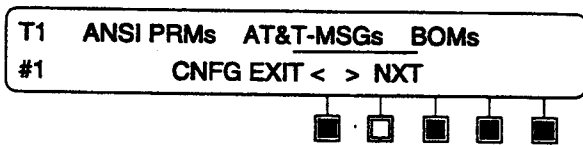
13. Underline AT&T MSGs with the < > softkeys. Notice that CNFG (configure) appears above softkey F1. Press NXT to scroll through a variety of Request commands.

When sending AT&T requests/messages there are several "configurations" to consider"

    a. Originating Address (ORG ADDR)
    b. Target Address (TARGET ADDR)
    c. Command (COMMAND)

14. Press CNFG to display the configuration screen:

```
T1 ORG ADDR:C  TARGET ADDR:A
#1 COMMAND:000     UP  DN <  > EXIT
```
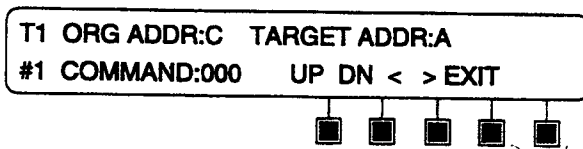
15. Underline and edit the three parameters using the UP and DN softkeys to scroll through the letters, or use the keypad to enter a three digit command number. After entering the values, press EXIT to return to the main Data Link screen.

List of AT&T Request Messages

```
┌─────────────────────────────────────────────┐
│ T1   ANSI PRMs   AT&T-MSGs   BOMs            │
│ #1              CNFG EXIT <  >  NXT          │
└─────────────────────────────────────────────┘
        ☐    ☐    ☐    ☐    ■
```

16. In the screen above, press NXT to display the request screen below:

```
┌─────────────────────────────────────────────┐
│ T1  REQUEST: ESF ERRORS MESSAGE             │
│ #1              EXIT   GO PRV NXT            │
└─────────────────────────────────────────────┘
        ☐    ☐    ■    ☐    ☐
```

17. Press GO to send ESF ERRORS MESSAGE, or press NXT or PRV (previous) to scroll through the complete list of requests:

1. ESF Error Message
2. Enhanced 1 Hour Performance Message
3. Enhanced 24 Hour Errored Seconds Message
4. ENH 24 Hour Unavailable Seconds Message
5. ENH 24 Hour Bursty Error Seconds Message
6. ENH 24 Hour Severely Errored Secs Message
7. ENH 24 Hour Controlled Slips/Loss of Frame
8. ENH CI Configuration Message
9. 1 Hour Performance Message
10. 24 Hour Errored Seconds Message
11. 24 Hour Unavailable Seconds Message
12. Payload Loop-Up
13. Payload Loop-Down
14. Clear Performance Counters-66
15. Clear Performance Counters-194
16. Clear ESF Counters-68
17. Clear ESF Counters-196

Exit the AT&T Request screen with the EXIT key, or simply press another function key. The test set will remember the position you last left your AT&T command screen (even if the set is turned off).

NOTE: The 440B can be used as a Network Interface for T1 turn-up, and therefore can store AT&T (54016) error statistics and respond to far-end requests (1-17 above); receivers must be configured to respond to AT&T requests.

SLC-96 DATA Link (Option 11)

When equipped with Option 11, the 440B provides a SLC-96 Data Link analyzer which automatically captures and displays Data Link alarms and messages. The unit can also transmit alarms, protection switch commands, and maintenance messages.

Background Information

SLC-96 systems carry messages, in full duplex, between the central office (COT) and the remote terminal (RT) over a Data Link. This Data Link carries alarm, maintenance, and protection switching messages.

A SLC-96 system may have one or two data links, depending on the configuration. Mode I and III use only a single data link, carried over the A shelf T1 circuit. Mode II (Concentrator Mode) uses two data links. 1) The first is used to carry standard alarms and messages, plus concentrator information for shelves A and B. 2) The second data link carried over shelf C contains only concentrator messages for shelves C and D.

The same Data Link messages applies to all SLC-96 system configuration, including Central Office Terminal (COT), Subscriber Loop Interface Module (SLIM), or Local integrated Digital Switch (LDS).

This section has two parts:

    1. Monitoring SLC-96 Data Link Messages

    2. Transmitting SLC-96 alarms, commands, and messages

Part 1. Monitoring SLC-96 Data Link Messages

A. Press the DATA LINK function key to display a configuration screen (Press the key a second time if the screen does not display). Use the < > softkeys to select the circuit direction you are monitoring. If you choose FROM RT, then you will monitor the messages sent from the RT towards the COT, SLIM, or a Digital Interface. Select TO RT if monitoring the circuit leaving the Central Office towards the RT.

```
RCVR#1  MONITOR  SLC-96  DATALINK
     FROM RT   TO RT   <  >  NXT
```
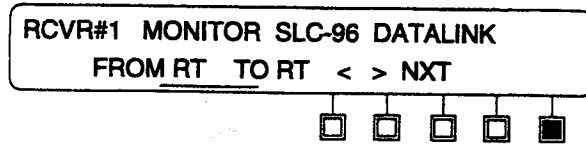
Press **NXT** to display the Data Link Message screen below:

```
MTCE:IDLE    PLS:IDLE      RCVR#1
CFLD:IDLE    ALM:NONE  VIEW <  >  SEL
```
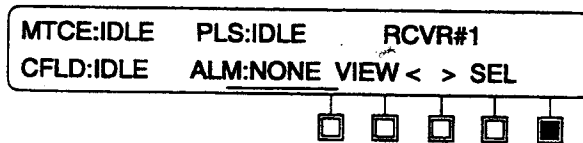
B. Select the desired receiver with the SEL softkey (the screen above is displaying the data link for Receiver 1, so pressing SEL would select RCVR #2).

— Quick Sheet 7A pt 1 - 440B/T-ACE *(ver 0d)* ————————
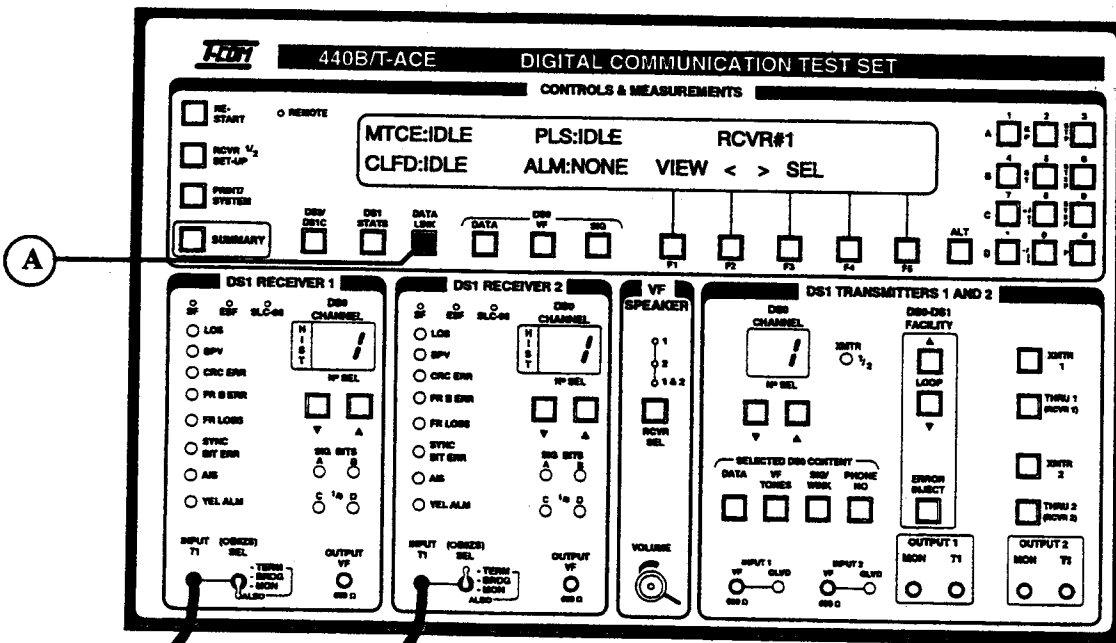
Interpreting the SLC-96 Data Link message screen

```
  (b)              (c)
┌─────────────────────────────────┐
│ MTCE:IDLE   PLS:IDLE    RCVR#2   │
│ CFLD:IDLE   ALM:NONE VIEW <  > SEL│
└─────────────────────────────────┘
  (d)              (a) □ ■ □ □ ■
```

a. ALM:NONE means no alarms exist. ALM:YES would indicate presence of alarms. Underline ALM (with < >) and press VIEW to display all alarms.

b. MTC:IDLE means there are no Maintenance messages. These messages are displayed automatically.

c. PLS:IDLE means that there are no Protection Line Switch messages. These messages are automatically displayed.

d. CFLD:IDLE means that the Concentrator Field is not currently in use (hence we are in Mode I or III). Underline CFLD and press VIEW to display time slot assignments and the subscriber line status (on/off hook).

Displaying Alarms

1. In screen above, use the < > to underline ALM and press VIEW to display the alarm screen below:

```
┌─────────────────────────────────────┐
│ ALARM TYPE: <MAJOR ALARM>            │
│ RCVR#1    23456789'0123456 <  > NXT  │
└─────────────────────────────────────┘
            □ □ ■ ■ ■
```

2. Use the < > softkeys to underline the flashing number. A flashing number indicates an alarm. Underlining the flashing 5, for example, displays the type of alarm. In the case above, a MAJOR ALARM message is being sent over the SLC-96 Data Link from the far-end.

3. The alarms displayed and their positions are determined by the alarm unit in the RT. The alarms that can be displayed are as follows:

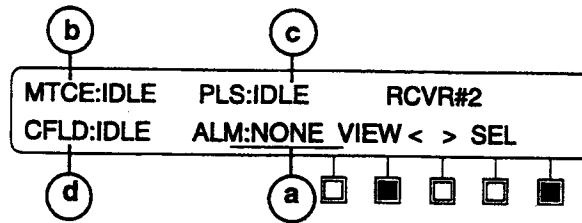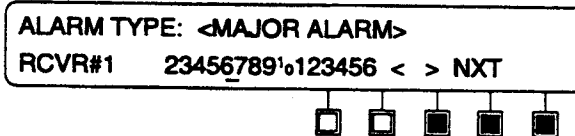|	Alarm Number				Alarm Number		
	COT-13	COT-16	SLIM		COT-13	COT-16	SLIM
Major Alarm	2	5	5	D Shelf Alarm	8	11	11
Minor Alarm	3	6	N/A	A Line FELP	9	12	N/A
Power/Misc Alarm	4	7	N/A	B Line FELP	10	13	N/A
A Shelf Alarm	5	8	8	C Line FELP	11	14	N/A
A Shelf Alarm	6	9	9	D Line FELP	12	15	N/A
C Shelf Alarm	7	10	10	P Line FELP	13	16	N/A

NOTE: Alarms are automatically downloaded to the printer port with time-date stamp, whenever they are set or cleared. This provides an ideal method of tracking Call Blockage, All Channels Busy and Time Slots Available messages.

Press NXT to return to the Message screen

Displaying Maintenance messages

Maintenance messages are automatically read as they occur. Two sets of maintenance messages can be displayed, either From RT or To RT. To choose between them, press the receive DATA LINK key in the Control & Measurements section. The following screen will be displayed. If this screen is not displayed, press the key a second time:

```
RCVR#1  MONITOR  SLC-96  DATALINK
     FROM RT   TO RT  < >  NXT
```
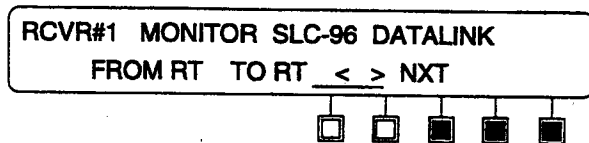
1. Use the < > softkeys (F3, F4) to underline FROM RT or TO RT. this will determine the set of messages that you receive. Press NXT to return to the data link display shown here

```
MTCE:ON-HOOK  PLS:IDLE       RCVR#2
CFLD:IDLE    ALM:NONE VIEW < > SEL
```
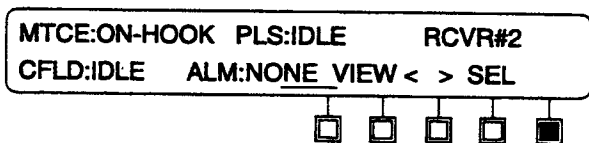
In this screen, the maintenance message is ON HOOK.

The following is a list of the messages which can be displayed:

Messages sent TO RT

	As displayed on the screen
ON HOOK	<ON-HOOK>
PROCEED CR	<PCR>
TEST ALM CR	<TEST-ALM>
ON HOOK/PCR	<ON-H/PCR>

Messages sent FROM RT

	As displayed on the screen
SEIZE-RC	<SRC>
PROCEED-RC	<PCR>
TEST-ALARM-RC	<TEST-ALM>
SEIZE/PROCEED-RC	<S/PCR>

Displaying Protection Line Switch Messages

```
MTCE:SRC   PLS:A-RCV      RCVR#2
CFLD:IDLE   ALM:NONE VIEW < > SEL
```

Protection line switch messages are displayed as they occur. Only one condition can occur at a time. The above screen indicates the "A" shelf is swtiched to protection.

The following protection line switch messages can be displayed:

IDLE	Idle Condition
A-RCV	switched line A, Receive
B-XMT	switched line B, Transmit
C-XMT	switched line C, Transmit
D-XMT	switched line D, Transmit
B-XMT/RCV	switched line B, Transmit & Receive
C-XMT/RCV	switched line C, Transmit & Receive
D-XMT/RCV	switched line D, Transmit & Receive

Displaying Concentrator Field Content

```
┌─────────────────────────────────────┐
│ MTCE:IDLE    PLS:IDLE      RCVR#1    │
│ CFLD:IDLE    ALM:NONE  VIEW <  > SEL │
└─────────────────────────────────────┘
        ☐   ■   ■   ■   ☐
```
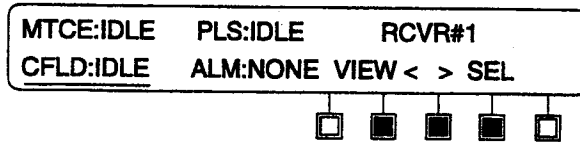
1. Underline CFLD and press VIEW to display the status of the concentrator field. The screen below provides the status of the concentrator field for RCVR #2:

```
┌─────────────────────────────────────┐
│ RCVR  IDLE                           │
│ #1              EXIT CLR NXT         │
└─────────────────────────────────────┘
        ☐   ☐   ☐   ☐   ■
```

Concentrator messages will be displayed on the screen as they occur. The receiver must be set to FROM RT or TO RT to get the correct messages. Select TO/FROM as described in the Maintenance message.

CFLD messages: TO RT

TR-AS/DS	Trunk Assignment/Deassignment
ASG-UPD	Assignment Update
LT	Looping Test
AUR	Activity Update Request
IDLE	Idle
ERR	Error in concentrator field messages

2. Press NXT to see the time slot assignment screens.

```
┌─────────────────────────────────────┐
│ TIME SLOT:  1 2 3 4 5 6 7 8          │
│ RCVR#1      - - - - - - - - NXT      │
└─────────────────────────────────────┘
        ☐   ☐   ☐   ☐   ■
```
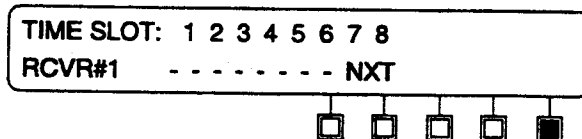
3. Press NXT again to see the next time slot display and again to see the last display.

```
┌─────────────────────────────────────┐
│ TIME SLOT:  9 10 11 12 13 14 15 16   │
│ RCVR#1      - - - - - - - - NXT      │
└─────────────────────────────────────┘
        ☐   ☐   ☐   ☐   ■
```
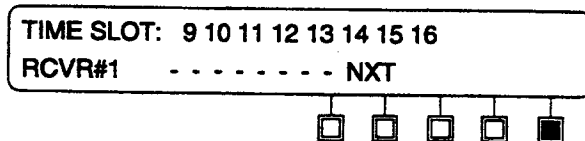
```
┌─────────────────────────────────────────┐
│ TIME SLOT:  17 18 19 20 21 22 23 24      │
│ RCVR#1      - - - - - - - - NXT          │
└─────────────────────────────────────────┘
                    □  □  □  □  ■
```

These screens display the timeslot assignment for each customer.

The following messages may be displayed when FROM RT is selected.

CFLD messages: FROM RT

ACT	Activity
ACT-UPD	Assignment Update
LT	Looping Test
AUR	Activity Update Request
IDLE	Idle
NO ALM	No Alarm

4. Press NXT to display the status of individual subscriber lines. ↑ represents off hook and ↓ represents on hook status for subscribers 1-19. A dash (–) is present in place of the ↑ or ↓ arrows if a channel has never been assigned.

```
┌─────────────────────────────────────────┐
│ SUB LNE:  123456789¹₀123456789           │
│ RCVR#1    ØØØ Ø ØØØ Ø  Ø ØØ Ø ØPRV NXT    │
└─────────────────────────────────────────┘
                    □  □  □  □  ■
```

5. Press NXT to display the screen above for subscribers 20-39.

6. Press NXT again to display the screen for subscribers 40-48.

7. Press NXT to display the status for the 6 component groups:

```
┌─────────────────────────────────────────┐
│ GROUP:   1  2  3  4  5  6                 │
│ RCVR#2   A  U  -  U  U  A PRV NXT         │
└─────────────────────────────────────────┘
                    □  □  □  ■  ■
```

A	=	Activity Report
U	=	Activity Update Report
-	=	Report Not Received

In the screen above, use PRV to scroll backwards (previous) through the above screens, or NXT to return to the root screen.

Sending SLC-96 Data Link commands, alarms, and messages

1. Press the XMTR key to display the opening transmitter Set-Up screen (for example XMTR1). Verify that the FRAME is SLC-96.

```
MODE:T1  PAT:QRS  FRAME:SLC-96-D1D
CODE:AMI  CLK:INT  DL:SLC  <  > EDIT
```

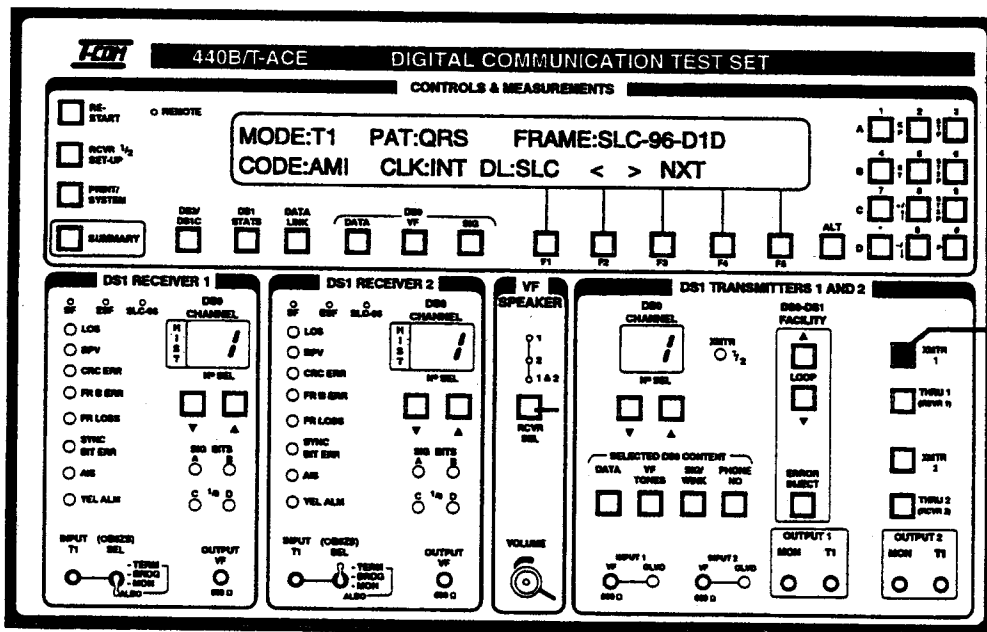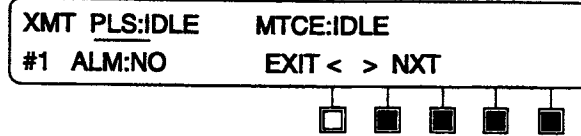2. Underline DL:SLC with the < > softkeys and press EDIT to display the opening SLC-96 transmit screen.

```
XMT  PLS:IDLE      MTCE:IDLE
#1   ALM:NO        EXIT <  > NXT
```
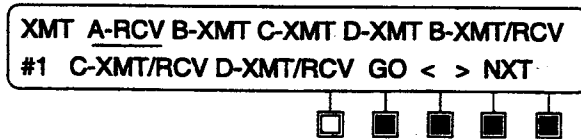
3. Underline PLS, MTCE or ALM with the < > softkeys and press NXT to access the message menu screens.

```
┌─────────────────────────────────────┐
│ XMT  PLS:IDLE      MTCE:IDLE         │
│ #1   ALM:NO        EXIT <  >  NXT    │
└─────────────────────────────────────┘
```
□ ■ ■ ■ ■

Sending Protection Line Switch commands

4. In the screen above, underline **PLS:IDLE** with the < > softkeys, and press **NXT** to display the PLS menu screen:

```
┌──────────────────────────────────────────────────────┐
│ XMT  A-RCV B-XMT C-XMT D-XMT B-XMT/RCV                │
│ #1   C-XMT/RCV D-XMT/RCV  GO  <  >  NXT               │
└──────────────────────────────────────────────────────┘
```
□ ■ ■ ■ ■

5. Underline the desired PLS command with the < > softkey, for example **A-RCV**.

6. Press **GO** to send **A-RCV** switch to protect command. Notice that GO becomes a flashing **STOP**.

7. Press **NXT** to leave the above screen. This will not interrupt the A-RCV command. Notice that the SLC-96 Data Link transmit screen is now updated to show **PLS:A-RCV**.

```
┌─────────────────────────────────────┐
│ XMT  PLS: A-RCV    MTCE:IDLE         │
│ #1   ALM:NO        EXIT <  >  NXT    │
└─────────────────────────────────────┘
```
□ ■ ■ ■ ■
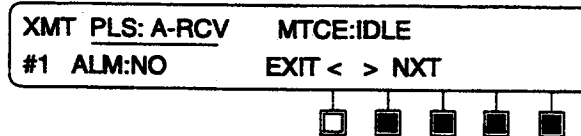
Sending Alarms

8. Underline ALM:NO in the previous screen and press NXT to display the configuration screen:

```
XMT   COT-RT/13  COT-RT/16  SLIM
#1                  <  >  NXT
```
□ □ ■ ■ ■
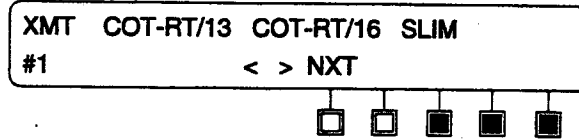
9. Underline the system type with the < > softkeys and press NXT to display the Alarm screen:

```
XMT  <A SHELF ALARM>
#1  56789'₀123456     SET  <  >  NXT
```
□ ■ ■ ■ ■

10. In the screen above, scroll to the desired alarm with the < > softkeys and press SET to transmit.
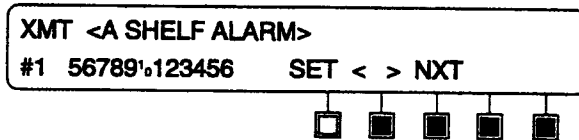
Notice that when 8 is underlined (for example) the title **<A SHELF ALARM>** appears above. Pressing SET will therefore send this alarm, and flash 8 to indicate that it is on. The **SET** softkey command becomes **CLR**; press **CLR** to clear the alarm.

By repeating the above steps, you can SET several alarms at once, also causing the relevant numbers to flash.

11. Press NXT to return to the SLC-96 Data Link transmit screen. The screen will update to show ALM:YES, indicating that Alarms are being sent (we also left the Protection Line Switch A-RCV command on, from step 6):

```
XMT  PLS: A-RCV     MTCE:IDLE
#1   ALM: YES       EXIT <  >  NXT
```
□ ■ ■ ■ ■
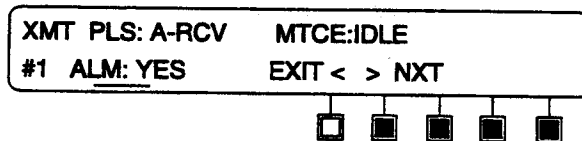
```
┌──────────────────────────────────────┐
│ XMT  PLS:A-RCV      MTCE:IDLE         │
│ #1   ALM: YES       EXIT <  > NXT     │
└──────────────────────────────────────┘
        □   ■   ■   ■   ■
```

Sending Maintenance messages

12. In the screen above underline MTCE:IDLE and press NXT to display the system configuration screen:

```
┌──────────────────────────────────────┐
│ XMT   TRANSMIT  SLC-96  MTCE  MESSAGE │
│ #1    FROM-RT   TO RT    <  > NXT     │
└──────────────────────────────────────┘
            □   □   ■   ■   ■
```

13. Underline your choice (for example, From RT) and press NXT to display the message menu screen:

```
┌──────────────────────────────────────┐
│ XMT  SEIZE-RC  PROCEED-RC  TEST-ALM-CR│
│ #1   SEIZE/PROCEED-RC   GO <  > NXT   │
└──────────────────────────────────────┘
        □   ■   ■   ■   ■
```

14. Underline the desired message with the < > softkeys, and press GO to send it. Notice that GO becomes a flashing STOP.

15. Press NXT to return to the Data Link transmit screen which now shows **MTCE:SRC**.

```
┌──────────────────────────────────────┐
│ T1    PLS:A-RCV     MTCE:SRC          │
│ #1    ALM:YES       EXIT <  > NXT     │
└──────────────────────────────────────┘
        □   ■   ■   ■   ■
```

Leaving the screen will not interrupt the transmitted message.

The ERROR INJECT key in the transmitter section can be set to immediately send a pre-set error when pressed, or the key can be used to display a menu screen for selecting a variety of errors and rates. This error key can be configured for AUTO or MENU in the PRINT/SYSTEM Configuration settings. In other words, when ERROR INJECT is set to AUTO, pressing the red ERROR INJECT key will immediately inject an error (according to the XMTR Set-Up).

Remember to check which XMTR key is lit since both transmitters have independent error injection. In the picture below, errors will be sent into the bit stream delivered by Transmitter 1.

The factory default setting for the ERROR key is AUTO. The table below describes the errors injected when the key is pressed.

I.   When ERROR INJECT is set to: AUTO

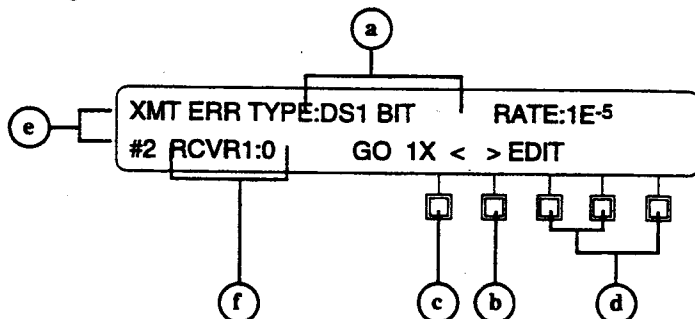| XMTR Set-Up MODE	Error Injected
T1	1 logic bit error in the T1 bit stream
Channelized/DATA	6 logic bit errors in the selected DS0A/B channel
Channelized/Tone	single Frame Bit error in the DS1 bit stream
Channelized/Phone	single Frame Bit error in the DS1 bit stream
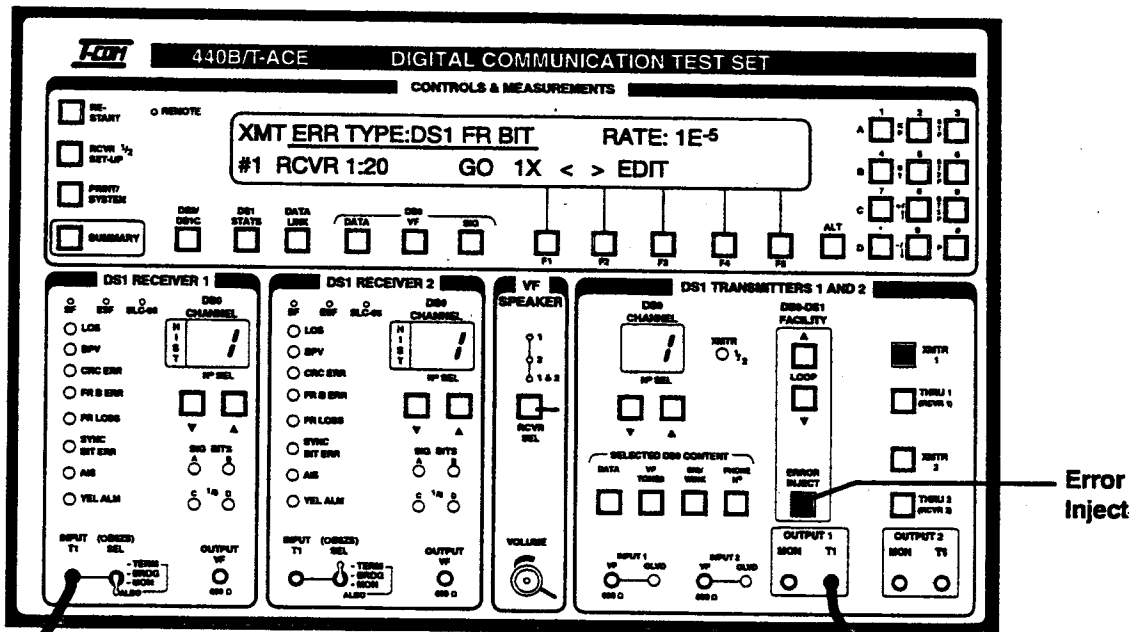
Error
Inject

II. When the ERROR INJECT is set to: MENU

When the error injection is configured by the MENU, a large variety of errors can be sent at T1, Fractional T1, and DS0A/B rates.

Choose XMTR 1 or XMTR 2. Pressing the ERROR INJECT key displays a menu screen similar to the one shown below.

Interpreting ERROR inject menu screen:

```
         ⓐ
  ┌──────────────────────────────────┐
ⓔ │ XMT ERR TYPE:DS1 BIT    RATE:1E-5 │
  │ #2 RCVR1:0      GO 1X < > EDIT    │
  └──────────────────────────────────┘
           ⓕ      ⓒ ⓑ   ⓓ
```

a. The Error Type selected is: **DS1 Bit Error.**
b. Press **1X** softkey to inject a single error.
c. Press **GO** to send errors at the selected rate.
d. To change the **ERROR TYPE, RATE, and** the RCVR use the < > arrows to underline and press **EDIT**.
e. Transmitter #2 is currently displayed.
f. Errors will be displayed for the selected **RCVR** (1 or 2).

SELECTING NEW ERRORS

```
  ┌──────────────────────────────────┐
  │ XMT ERR TYPE:DS1 BIT    RATE: 1E-5 │
  │ #2 RCVR1:        GO 1X < > EDIT    │
  └──────────────────────────────────┘
        ■   ■   ■   ■   ■
```
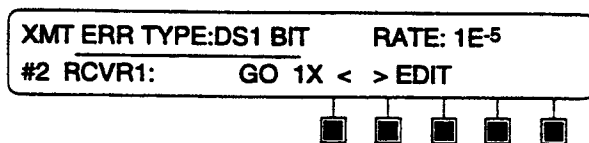
1. Press the ERROR INJECT key to display the screen above. If no screen appears, change the ERROR INJECT Configuration to MENU in the SYSTEM configurations. (see step 7)

```
┌─────────────────────────────────────┐
│ XMT ERR TYPE:DS1 BIT    RATE: 1E-5   │
│ #2  RCVR1:      GO 1X  <  > EDIT      │
└─────────────────────────────────────┘
            □  □  ■  ■  ■
```
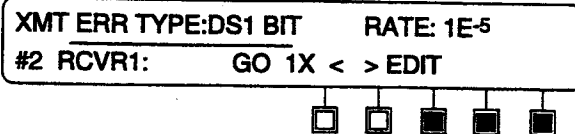
2. Use the < > softkeys to underline ERR TYPE, and press the EDIT softkey to display:

```
┌─────────────────────────────────────┐
│ T1 ERR TYPE: BPV  FR BIT  CRC  YEL-ALM │
│    DS1 BIT            <  > EDIT        │
└─────────────────────────────────────┘
            □  □  ■  ■  ■
```

3. Use the < > softkeys to underline the desired error type. Press the ERROR INJECT key to enter the error selected, and to display the main error menu screen:
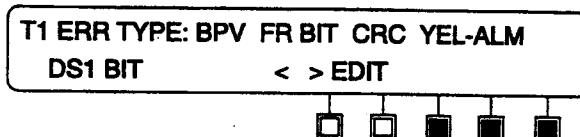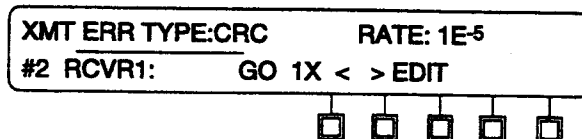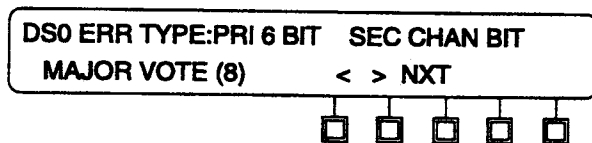
```
┌─────────────────────────────────────┐
│ XMT ERR TYPE:CRC       RATE: 1E-5    │
│ #2  RCVR1:      GO 1X  <  > EDIT      │
└─────────────────────────────────────┘
            □  □  □  □  □
```

When the transmitter is Set-Up for DS0A/B a variety of additional errors can be selected from an additional menu screen. Depending on the specific type of DS0A/B transmitter Set-Up, some of the following errors will appear on a second screen (they are not all available at one time):

[DS0A]

```
┌────────────────────────────────────┐
│ DS0 ERR TYPE:PRI 6 BIT   SEC CHAN BIT │
│   MAJOR VOTE (8)      <  > NXT         │
└────────────────────────────────────┘
        □  □  □  □  □
```

[DS0B]

```
┌────────────────────────────────────┐
│ DS0 ERR TYPE:PRI 6 BIT   SEC CHAN BIT │
│   DS0 FR BIT         <  > NXT         │
└────────────────────────────────────┘
        □  □  □  □  □
```
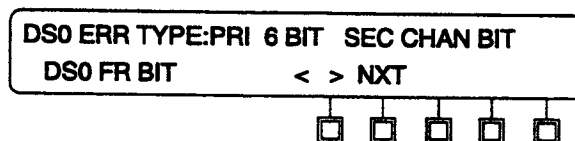
Error Definitions:

PRI 6 BIT	:	6 Bit errors in the primary channel
SEC CHAN BIT	:	1 Bit error injected into Secondary channel
MAJOR VOTE	:	8 Majority vote errors injected into DS0A
DS0B FR BIT	:	1 DS0B Frame Bit error

Selecting a new error injection RATE

Errors can be injected individually or at specified rates. Pressing GO sends selected errors at the rate displayed.

4. Press the ERROR INJECT key to display the opening menu screen:

```
┌────────────────────────────────────────┐
│ XMT ERR TYPE:DS1 BIT      RATE: 1E-5    │
│ #2 RCVR1:      GO 1X <  > EDIT          │
└────────────────────────────────────────┘
        □  □  ■  ■  ■
```

5. Use the < > softkeys to underline RATE, and press EDIT to display the menu screen:

```
┌────────────────────────────────────────┐
│ ERROR      1 x 10-5                     │
│ RATE          UP DN <  > SET            │
└────────────────────────────────────────┘
        ■  ■  ■  ■  ■
```

6. Use the < > softkeys to underline numbers and use the UP/DN softkeys to scroll to desired values. NOTE: SET must be pressed to enter new values.

Frame bit errors are transmitted using a different format. The purpose in sending frame bit errors isusually to determine the point at which frame loss occurs.

In the screen below pressing 1X will cause 1 frame bit in 5 to be errored. This should not cause a frame loss.

```
┌────────────────────────────────────────┐
│ XMT ERR TYPE:DS1 FRM BIT     1 OF 5     │
│ #1 RCVR 1:0        1X <  > EDIT         │
└────────────────────────────────────────┘
        ■  ■  ■  ■  ■
```

Underline 1 of 5 and press EDIT.

```
┌────────────────────────────────────────┐
│ FRAME ERRORS: 1 OF 5  2 OF 5  3 OF 5    │
│                  <  > NXT               │
└────────────────────────────────────────┘
        ■  ■  ■  ■  ■
```

Use the < and > arrows to underline 3 of 5, then press NXT to return to the previous menu.

```
┌────────────────────────────────────────┐
│ XMT ERR TYPE:DS1 FRM BIT     3 OF 5     │
│ #1 RCVR 1:0        1X <  > EDIT         │
└────────────────────────────────────────┘
        ■  ■  ■  ■  ■
```

Pressing 1X will cause 3 of 5 frame bits to be errored. This should always cause a loss of frame.
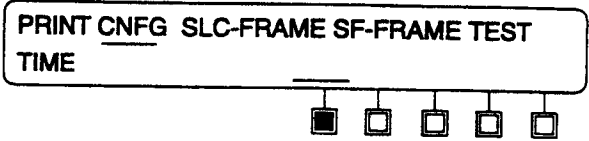
Changing Error Injection from AUTO to MENU

(refer to the PRINT/SYSTEM chapter for full explanation)

7. Press the PRINT/SYSTEM function key to display:

```
PRINT CNFG  SLC-FRAME SF-FRAME TEST
TIME
```
☐ ■ ☐ ☐ ☐
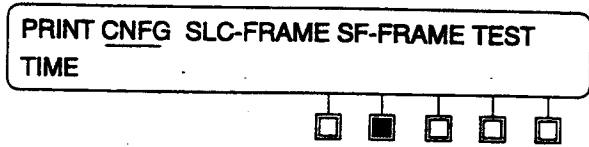
8. Underline CNFG and scroll to 2. ERROR INJECT with NXT.

```
PRINT CNFG  SLC-FRAME SF-FRAME TEST
TIME
```
■ ☐ ☐ ☐ ☐

9. Toggle to MENU or AUTO with softkey (F1).

Because the 440B provides two identical receivers, the unit can be used to test a single T1 circuit, both directions of a circuit, or two completely different T1 circuits. Therefore, the following steps apply to both receivers.

SET-UP

1. Verify that the DS1 Receiver Input SELection toggle switch (labeled SEL) is set to MONitor. Incorrect levels may create BPV + FRAME LOSS LED indication.

   (Note: locking toggle switches must be pulled out in order to change their positions.)

2. Patch from the 440B receiver jack (labeled T1) to the DSX Monitor jack.

3. If LOS LED is on, then no signal is detected (or a 0/0 pattern is being sent without B8ZS).

OPERATION

4. Press the green RESTART key to clear all counters and begin testing.

5. Press the SUMMARY key to display results/status for the two receivers (RCVR #1 or RCVR #2).

6. Use RCVR # 1/2 softkey (F5) to display the SUMMARY screen for either RCVR #1 or RCVR #2. *(See SUMMARY/HISTORY Quick Sheet to interpret SUMMARY screens.)*

   (NOTE: T-ACE counts errors for both regardless of selection.)
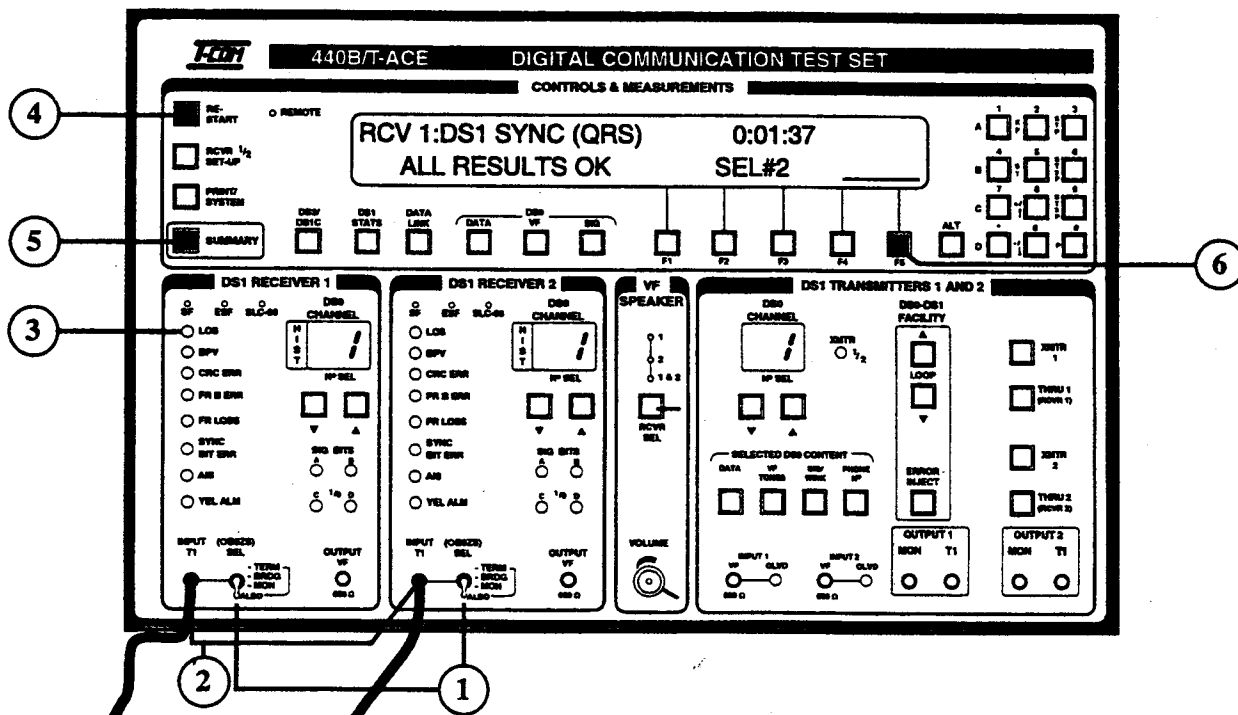
RESULTS

7. SF/ESF/SLC-96 LEDs indicate the recognized frame type.

8. LEDs indicate errors occurring in real time.

9. A flashing channel number indicates error history for that receiver. (Holding the SUMMARY key down will light LEDs with error history.)

10. The SUMMARY screen will display the receiver status and error results for RCVR 1 or RCVR 2. (If there are no errors, ALL RESULTS OK is displayed.)

11. Errors will be displayed on the bottom line of the screen. Use the NXT softkey (F3) to scroll through other error counts.
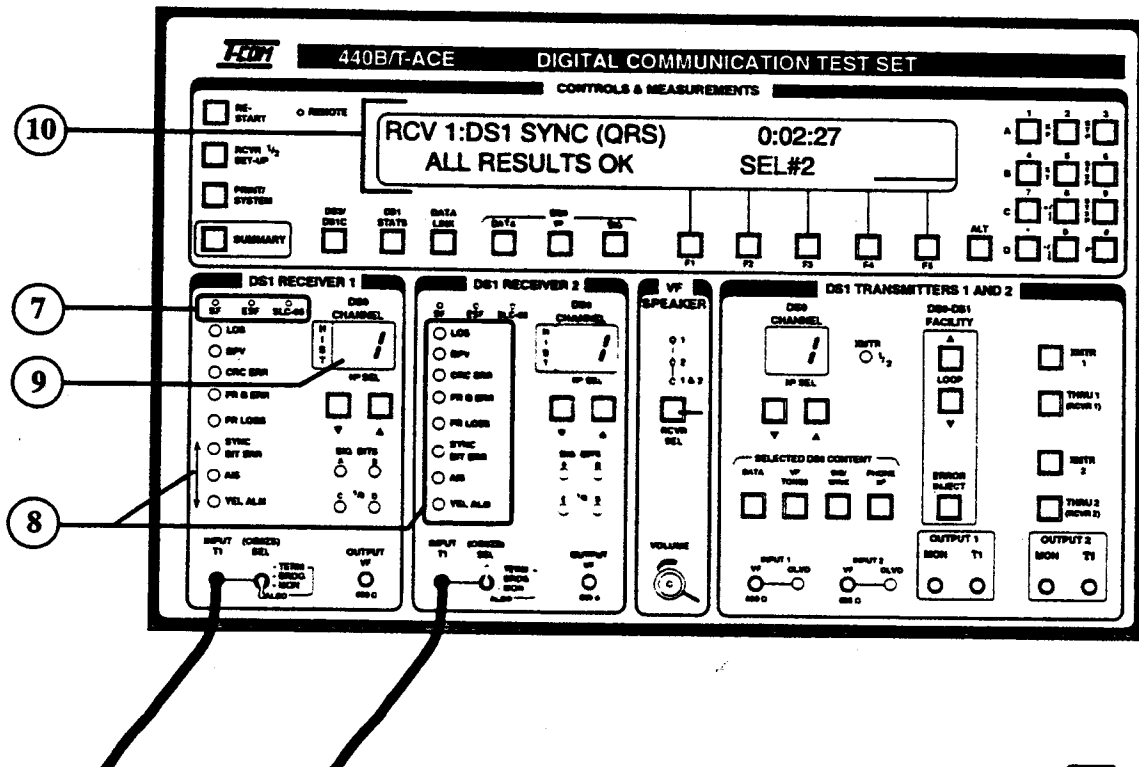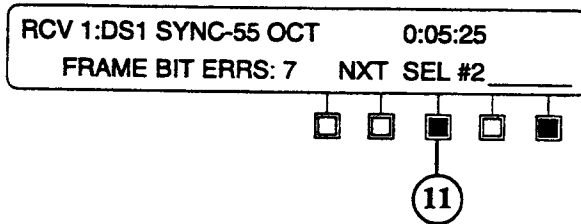
Testing Switched 56 Data Circuits

Switched 56 is a dial-up data service, that provides users with a "virtual" private DDS service accessible over the public switched network. The 440B/T-ACE supports complete Switched 56 testing, when it is equipped with options 12 (DS0A/B DDS Data) and 06 (Telephone Number/Wink).

The 440B can test a Switched 56 circuit on an end-to-end basis, by dialing into the network, gaining access to the customer's CSU/DSU and looping it back, and sending stress patterns (see Figure A).

A Switched 56 circuit can either be tested on out-of-service T1 circuits in a terminated mode, or on live T1 circuits using DS0 drop-and-insert (THRU mode). If testing a Switched 56 on a live T1 circuit, it is important·to read and fully understand the DS0 Drop and Insert section (Quick Sheet 12).

Switched 56 testing with the 440B/T-ACE involves using a combination of the Telephone Number features and DATA testing capabilities.

The 440B/T-ACE provides:

1. Access to an individual DS0 channel in a T1 circuit

2. Dial-up access to the customer's Switched 56 circuit and CSU/DSU

3. Loopback codes (V.54) for looping the customer's CSU/DSU, while maintaining the telephone call

4. Switched 56 stress testing (BERT) using a complete array of stress patterns

5. Digital Switch analysis, including Wink timing measurements, and MF/DTMF telephone number capture.

As shown in Figure A, the 440B is used to access a trunk in the local digital switch, and to dial the customer's telephone number. The customer's CSU/DSU then responds (answers), allowing the 440B to loopback the CSU/DSU, thereby to proceed with stress testing of the customer's circuit.

Figure A
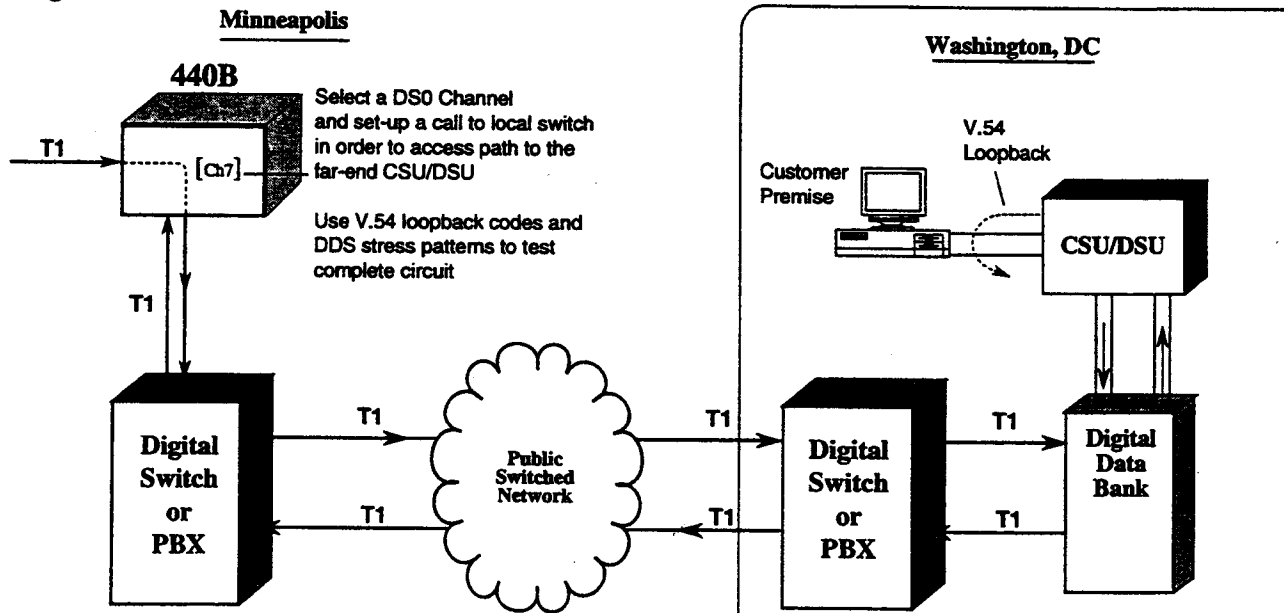
For the purposes of this application, we will assume that the Switched 56 test is performed on an out-of-service terminated T1. The Transmitter 1 is used to send towards the customer, i.e., set-up telephone calls, send loopback codes, and transmit stress patterns. Receiver 1 monitors (BERT) the circuit returning from the customer. For our application, we can assume that the customer's circuit is in DS0 channel #3.

440B

Insert in DS0 #3
   Dial-Up Customer circuit,
   send V.54 loopback & stress pattern

XMTR1

RCVR1

T1

Digital Switch or PBX

Monitor DS0 #3
- **Measure Wink response from Switch**
- **Receive loopback confirmation and stress pattern for error testing**

T1

Public Switched Network

Digital Switch or PBX

T1

T1

Digital Data Bank

CSU/DSU

V.54 Loopback
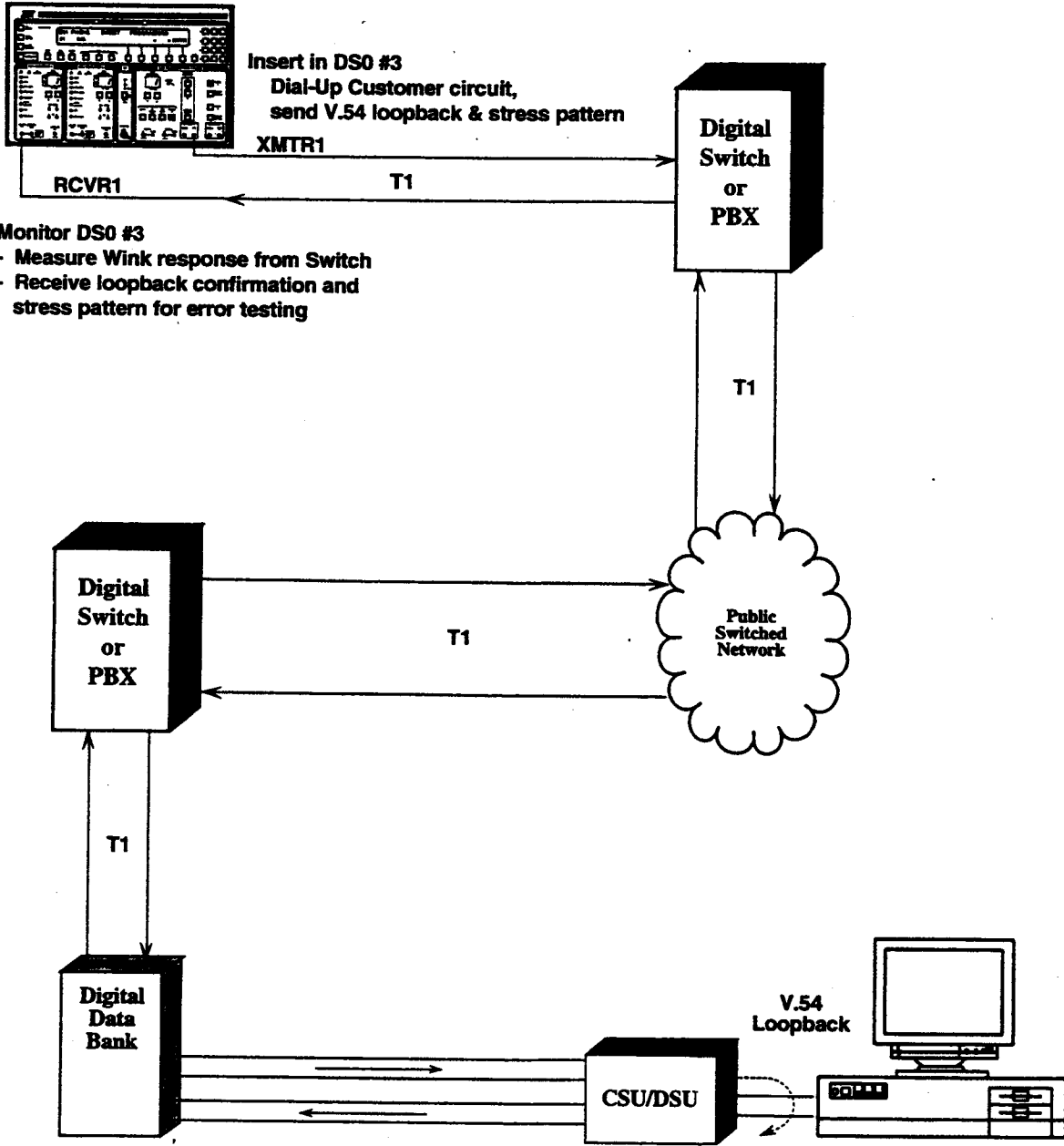
I. Set up DS0 Transmitter 1 for Switched 56

1. Press Transmitter 1 DATA key to display the Data set-up screen:

```
TYPE:DS0A RATE:9.6 MJU:IDLE   [XMT#1]
PRI:511   SEC:NONE         <  > EDIT
```
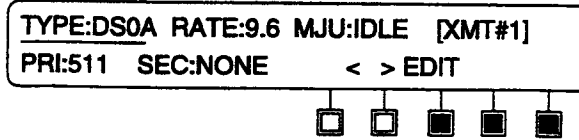
2. Use the < > softkeys (F3, F4) to underline TYPE, and press EDIT to display selection screen:

```
XMT DS0 TYPE:  DSOA  DSOB  SW-56 SS7
#1                    <  > NXT
```
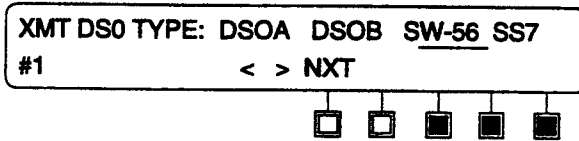
3. Underline SW-56 using the < > softkeys (F3, F4) and press NXT (or the DATA key) to enter the selection and display the new DATA set-up screen:

```
TYPE: SW-56 PAT:511        [XMT#1]
                 <  > EDIT
```
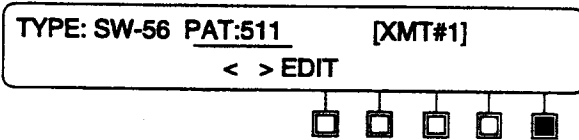
NOTE: To change the current stress pattern selection (511), underline PAT:511 and press EDIT to access the complete library of patterns. After underlining the desired pattern, press the DATA key to enter the new selection and display the DATA set-up screen above.

The 440B is now sending the 511 test pattern into the selected DS0 channel, in a Switched 56 configuration.
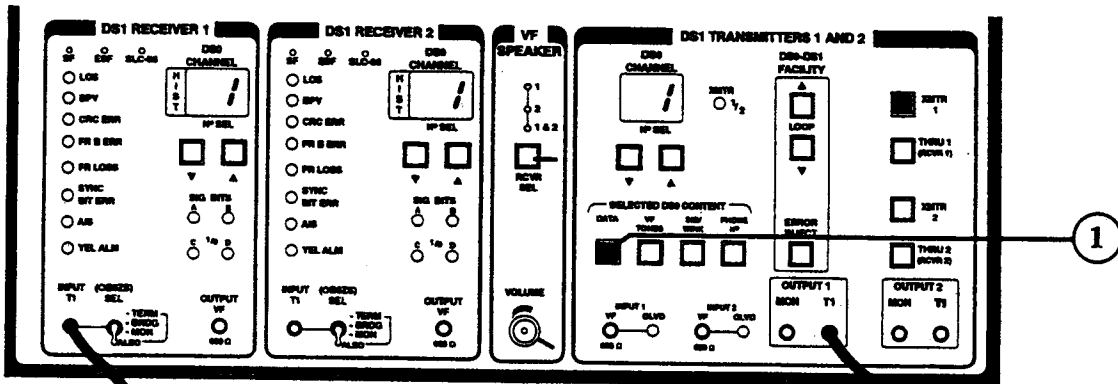
II. Dial Up circuit by sending telephone number

4. Press the PHONE No. key to display

```
┌─────────────────────────────────────────┐
│ DS1 PHONE  DIRECT   PROGRAMMED           │
│ #1  NO.             EDIT <  > ENTR       │
└─────────────────────────────────────────┘
        □  □  ■  ■  ■
```
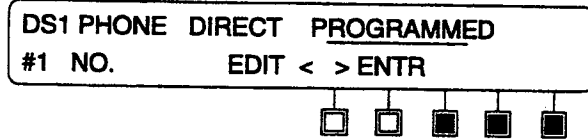
5. Underline Direct to direct-dial, or PROGRAMMED to send a pre-programmed telephone number. (See DS0 Transmit, Quick Sheet 5A). Assuming the telephone number is already preprogrammed, underline PROGRAMMED and press ENTR softkey (F5) to display:

```
┌─────────────────────────────────────────┐
│ DP   Ø 4080®9675555                      │
│ #1  B=61%  10 PPS   Ø   EDIT GO NXT      │
└─────────────────────────────────────────┘
        □  □  □  ■  □
```
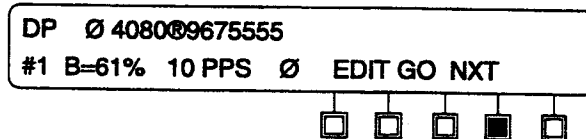
6. Press GO to send the above telephone number. Observe the far-end switch responses on Receiver 1 signaling bit LEDs (6a). When a permanent off hook is received from the far end, press the Transmit Data key (6b).
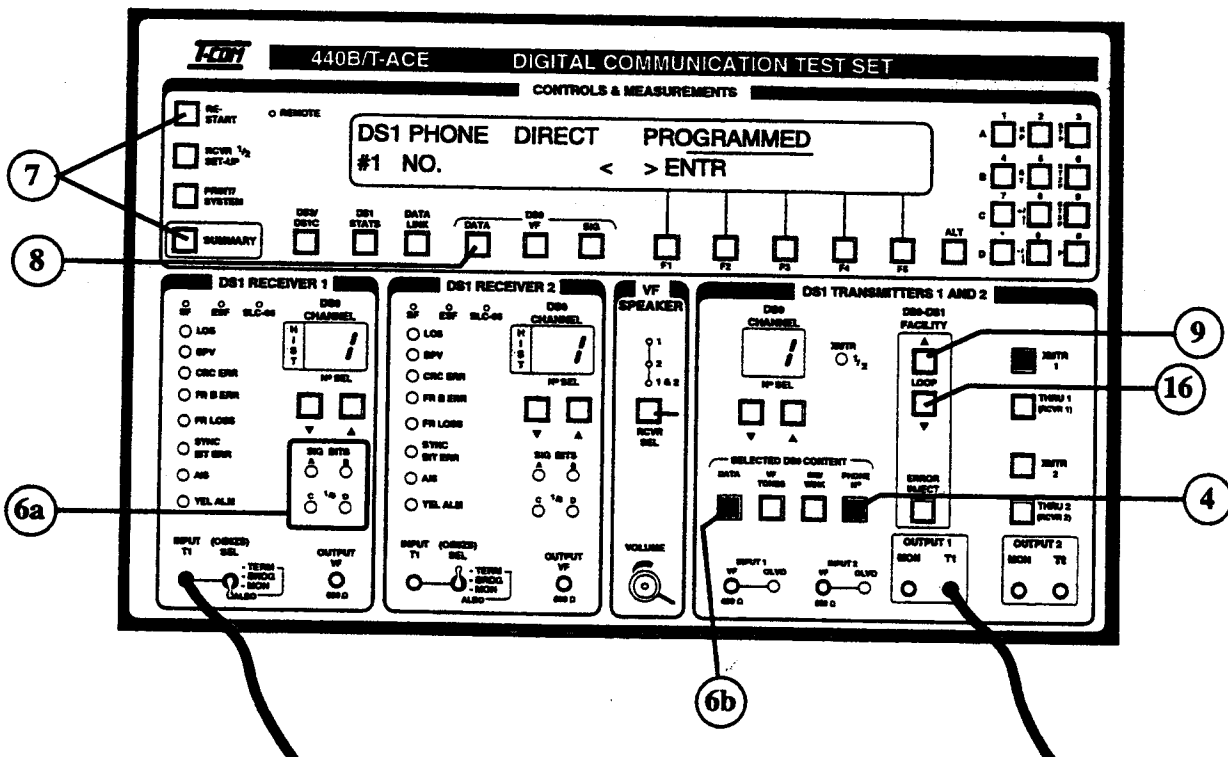
7. Press RESTART and SUMMARY to display the current test status screen on Receiver 1 (circuit coming from the customer):

```
RCV 1:SW-56 SYNC-IDLE      0:00:12
    ALL RESULTS OK         SEL #2
```
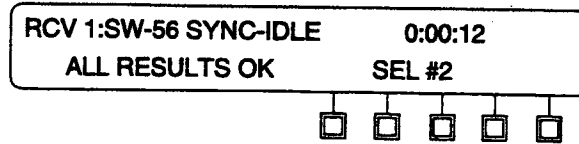
The SUMMARY screen above indicates that the set has acquired synchronization to the IDLE code generated by the customer CSU/DSU.

8. It is sometimes useful to view the current DATA byte to confirm Data network messages and codes. Press the receiver DATA key to display screen below. (Use SEL #2 to display the byte from RCVR 2):

```
RCVR 1 DS0 BITS: 12345678      SEL
SYNC-1/1             ███████#2
```
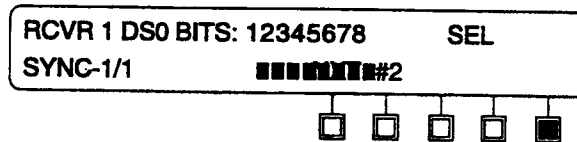
III. Looping back the customer CSU/DSU

9. Press the LOOP UP ▲ key to display the loopback command screen:

```
LOOP DS0 DEVICE:HL222       [XMT#1]
UP         RESP ON RCVR:#1 EDIT GO
```
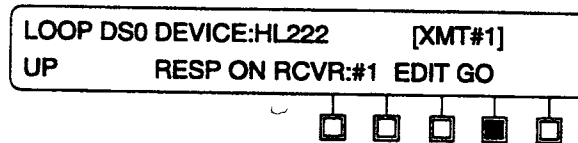
10. Select V.54 loopback code by pressing EDIT softkey (F4) and displaying menu selections:

```
DS0-DP OCU CSU DSU V.54      [XMT#1]
HL222 HL96NY RPTR      <  >  NXT
```
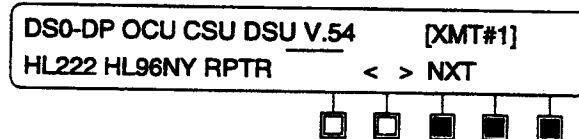
11. Underline V.54 using the < > softkeys and enter the selection by pressing the NXT softkey (F5) or the LOOP UP ▲ key.

Note: Only the V.54 loopback code can be used through a switched environment. The other loopback codes (CSU, OCU etc.) will terminate the telephone call, since they force the A/B signaling bit to 0.

The new Loop screen should display:

```
LOOP DS0 DEVICE:V.54        [XMT#1]
UP         RESP ON RCVR:#1 EDIT GO
```
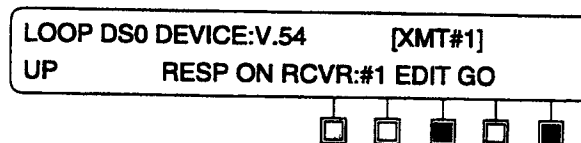
12. Verify that the above screen shows RESPONSE ON RCVR #1. Use softkey F3 to toggle between #1 and #2 selection.

13. Press the GO softkey (F5) to send the V.54 loopback code.

14. Press RESTART and SUMMARY to begin the stress test and display the current test status for Receiver 1.

The SUMMARY screen should display:

```
┌─────────────────────────────────────────┐
│ RCV1: SW-56 SYNC-511      0:00:12        │
│      ALL RESULTS OK       SEL #2         │
└─────────────────────────────────────────┘
        □    □    □    □    □
```

15. Any errors (or call disconnect) will trigger the automatic flashing error history indication, and results will be displayed on the above SUMMARY screen.

IV. Terminating the test

When the test is complete, the CSU/DSU loopback should be discontinued, and the call terminated.

16. Press Loop Down key to display loop screen:

```
┌─────────────────────────────────────────┐
│ LOOP DS0 DEVICE:V.54        [XMT#1]      │
│ DOWN                  GO                 │
└─────────────────────────────────────────┘
        □    □    □    □    ■
```

17. Press GO to send Loop Down command. The screen will show a positive "Loop Down Confirmed" response.

18. Press the Phone No. key in the transmitter section. to display:

```
┌─────────────────────────────────────────┐
│ DP  Ø  4089675555                        │
│ #1 B-61% 10PPS      Ø    EDIT GO NXT     │
└─────────────────────────────────────────┘
        □    □    □    □    □
```

19. When moving from DATA to Phone Nº. ON HOOK is automatically sent, terminating the call.

Using Automated Stress Tests
(AUTO-TEST)

In addition to providing a complete library of stress patterns for T1, F-T1 and DDS Data testing, the 440B/T-ACE also provides automated stress tests. Automated stress tests (AUTO TESTS) are basically a series of stress patterns strung together. Using AUTO TESTS can save a great deal of set-up time, especially when turning up T1 circuits according to tariff requirements. This type of testing can also help identify pattern sensitive network elements, i.e. some equipment may pass a 55 Octet pattern with no problems, but exhibit errors when passing QRS.

The 440B/T-ACE provides two industry standard, automated tests (Bridge-Tap and Repeater), as well as a third, customizable automated test (CUSTOM). In all cases, the 440B/T-ACE maintains Bit Error counts for each individual pattern within the sequence. Therefore, it is easy for the user to identify which stress patterns cause circuit or equipment failures.

Automated tests can be used for T1, Fractional T1, and DS0A/B stress testing. As shown in the following screens, it is important to configure the transmitter to match with the desired receiver (i.e. XMTR 1 with RCVR1 or RCVR2), since specific sequencing instructions must be sent to the receiver by the transmitter.

For the purpose of this application Quick Sheet, we will assume a T1 test. However, automated tests can also be accessed in Fractional T1, DS0A/B and Switched 56 pattern libraries. In DS0A/B, AUTO TESTS are part of the PRI (Primary Channel) test patterns.
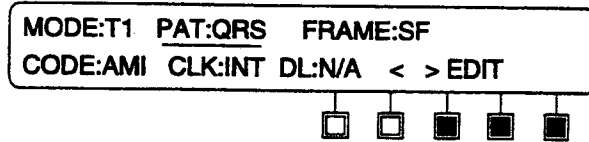
The AUTO TEST screen appears when scrolling through the library of stress patterns, displaying as:
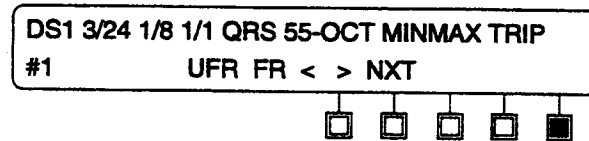
```
DS1 AUTO TESTS: BRDG-TAP  RPTR _____
CUSTOM
```
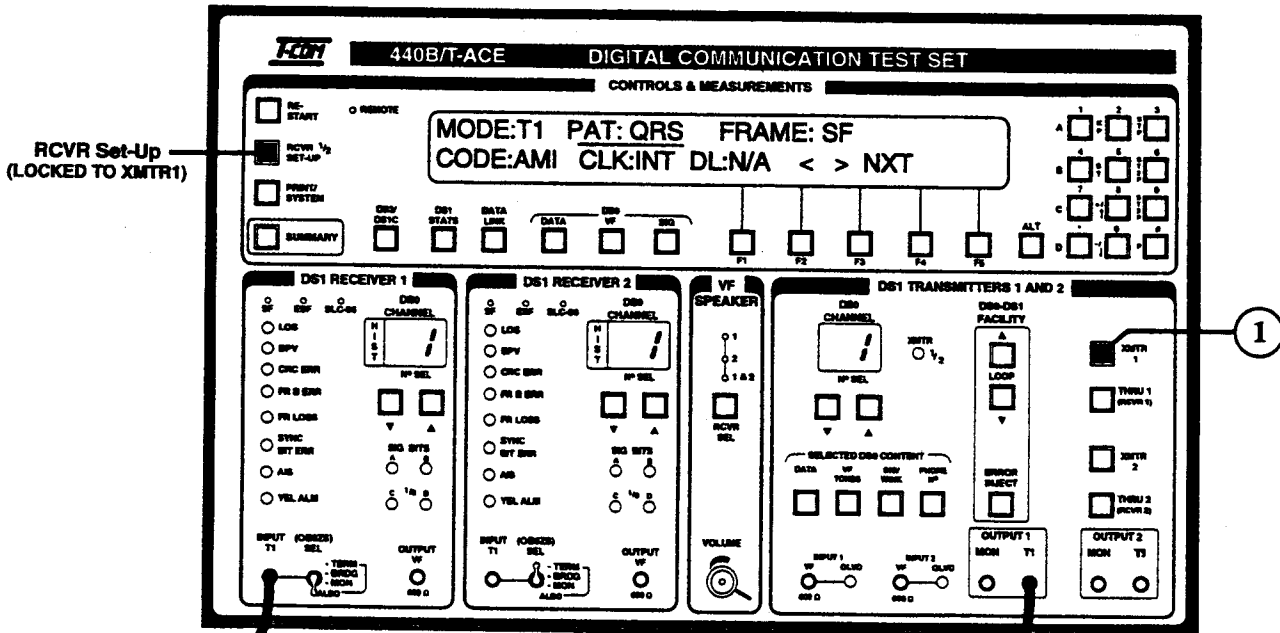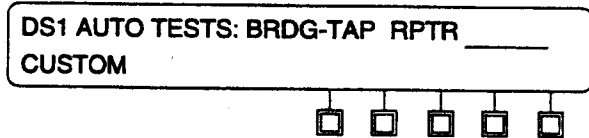
Set Up for T1 automated testing

Verify that the transmitter and receiver are both set for the same test MODE (i.e. T1 or LOCKED TO XMTR).

1. Press the XMTR key to display the opening screen:

```
┌─────────────────────────────────────┐
│ MODE:T1  PAT:QRS    FRAME:SF         │
│ CODE:AMI  CLK:INT  DL:N/A   <  > EDIT│
└─────────────────────────────────────┘
        □  □  ■  ■  ■
```

2. Underline PAT:QRS with the < > softkeys (F3, F4) and press EDIT to access the stress patterns:

```
┌─────────────────────────────────────┐
│ DS1 3/24 1/8 1/1 QRS 55-OCT MINMAX TRIP│
│ #1          UFR FR  <  >  NXT        │
└─────────────────────────────────────┘
        □  □  □  □  ■
```

3. Scroll through the following screens of patterns by using the NXT softkey (F5).

```
┌─────────────────────────────────────┐
│ DS1 63 511 2047 2¹⁵ 2²⁰ 2²³ CODE 0/0 │
│ #1          UFR FR  <  >  NXT        │
└─────────────────────────────────────┘
        □  □  □  □  ■
```
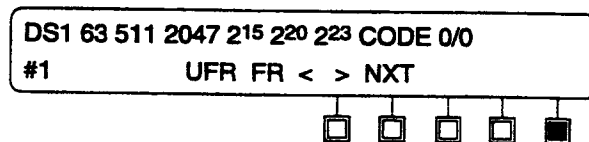
4. When the screen below appears, stop scrolling. Use the < > softkeys to choose the desired AUTO TEST, for example, RPTR (Repeater).

```
┌─────────────────────────────────────┐
│ DS1 AUTO TESTS: BRDG-TAP  RPTR       │
│ CUSTOM                               │
└─────────────────────────────────────┘
        □  □  ■  ■  □
```
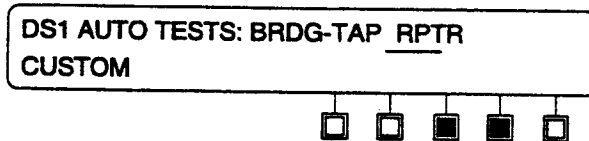
Interpreting the transmitter AUTO TEST screen:

```
                        ⓐ
┌─────────────────────────────────────┐
│ DS1 AUTO TESTS: BRDG-TAP  RPTR       │
│ CUSTOM                               │
└─────────────────────────────────────┘
        ■  ■  □  □  ■
   ⓑ   ⓒ  ⓓ      ⓔ
```
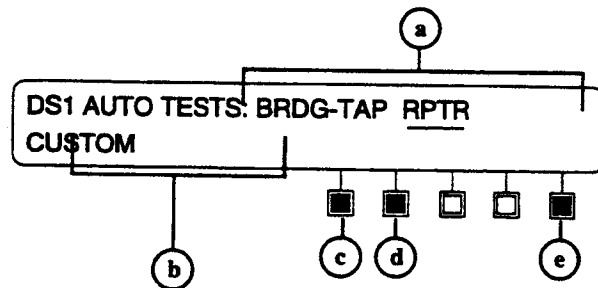
a. Underline any of the three AUTO TESTS with the < > keys.

b. <RCVR #1, CONT> indicates that Receiver 1 is chosen, and the test will run continuously.

c. Press EDIT to change the parameters: <RCVR #1, CONT> (see step 5)

d. Press GO to start the test

e. Press NXT to scroll to the main transmitter set-up screen (displayed in step 1)

Changing the AUTO TEST configurations and creating a CUSTOM test

The Bridge Tap and Repeater tests are pre-defined pattern sequences (as per ANSI/Bellcore specs); therefore, only the receiver selection and test time can be changed for these two tests. However, the CUSTOM test can be customized using the full library of test patterns. In other words, up to 25 patterns can be strung together and every pattern can be set to run for 15 seconds to 1 hour.

For this example, we will set-up the CUSTOM test, therefore scroll to the AUTO TEST screen as show in steps 1-4, and underline CUSTOM as displayed in the screen below:
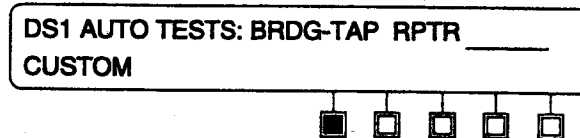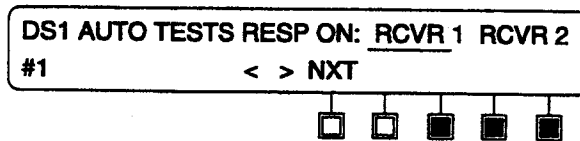
```
DS1 AUTO TESTS: BRDG-TAP  RPTR _____
CUSTOM
```

5. Press EDIT in the screen above to display the menu screen for selecting the corresponding receiver:

```
DS1 AUTO TESTS RESP ON:  RCVR 1  RCVR 2
#1                 <  >  NXT
```

6. Select RCVR 1 or RCVR 2 with the < > softkeys and press NXT to display the menu selection screen for seeing the total test time (either run the sequence a single time, or continuously):

```
DS1 AUTO TESTS: 1-TIME  CONTINUOUS
#1                 <  >  NXT
```
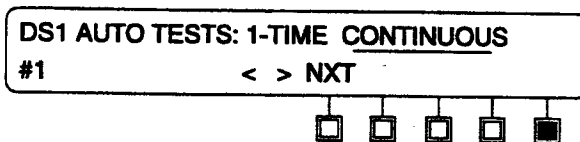
7. In the screen above, press NXT to display the menu screen for setting individual pattern length (how long each pattern will last) from 15 seconds to 1 hour. Use < > and the keypad to enter the desired values, for example 30 seconds:

```
DS1 CUST TEST LENGTH: 00:30
#1 (15 SEC TO 59:59)  UP  DN  <  >  NXT
```
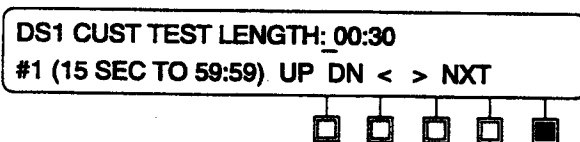
8. Press NXT to display the menu screen for choosing patterns for the sequence:

```
DS1 CUST TEST PAT #:1    PAT:63
#1              LAST NXT <  >  EXIT
```
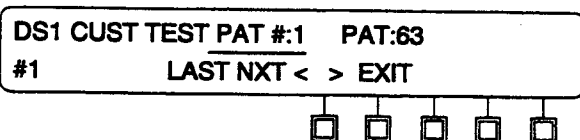
Using the pattern selection screen:

```
         ( a )              ( b )

  ┌─────────────────────────────────────┐
  │ DS1 CUST TEST PAT #:1   PAT:63       │
  │ #1            LAST NXT <  > EXIT      │
  └─────────────────────────────────────┘
              ■   ■  ■  ■  ■

              ( e ) ( d ) ( c )
```

a) PAT #1 indicates which pattern number is being viewed (i.e. #1, #2, ...#25)

b) PAT:63 indicates which stress pattern is selected for the current pattern number (PAT #1 is the 63 stress pattern)

c) To change PAT #1 to a different stress pattern, use the < > softkeys to underline PAT:63, and scroll through the complete library with the NXT softkey.

d) To move to a different pattern number, underline PAT #1 and use NXT to scroll through the sequence.

e) Use the LAST softkey to end the sequence at this position. (i.e. Pressing LAST when PAT #5 is displayed will enter <LAST> for the stress pattern name, limiting the sequence to PAT #1 through PAT #4.

Sample program: entering QRS, 3/24, 1/1, as a CUSTOM sequence.

```
  ┌─────────────────────────────────────┐
  │ DS1 CUST TEST PAT #1   PAT:63        │
  │ #1            LAST NXT <  > EXIT      │
  └─────────────────────────────────────┘
              □   ■  ■  ■  □
```
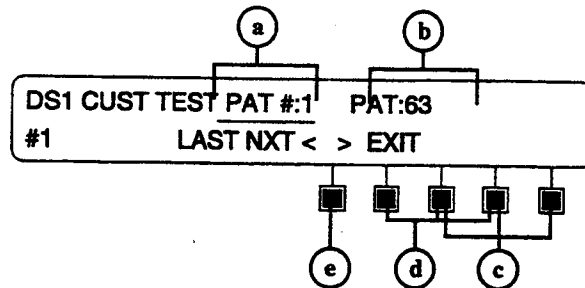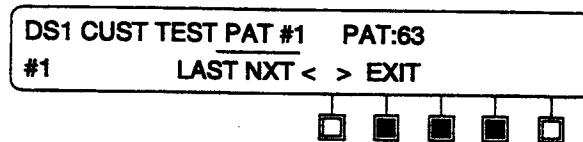
9. Underline PAT # with the < > softkeys, in the screen above, and use the NXT softkey to scroll to #1 if it is not already displayed.

10. Underline PAT:63 in screen above, with the < > softkeys and use NXT to scroll through the library of test patterns, until QRS appears. In the screen below, QRS has been entered as PAT #1:

```
  ┌─────────────────────────────────────┐
  │ DS1 CUST TEST PAT #1   PAT:QRS       │
  │ #1            PRV NXT <  > EXIT       │
  └─────────────────────────────────────┘
              □   ■  ■  ■  □
```
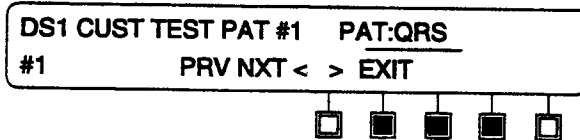
11. Move to PAT #2 by underlining PAT #1 and using the NXT softkey to scroll forward one position:

```
  ┌─────────────────────────────────────┐
  │ DS1 CUST TEST PAT #2   PAT:DDS-1     │
  │ #1            LAST NXT <  > EXIT      │
  └─────────────────────────────────────┘
              □   ■  ■  ■  □
```
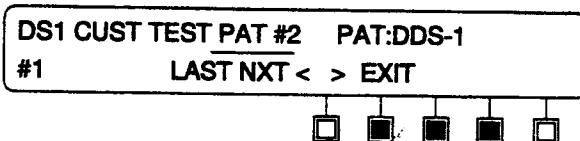
12. Since PAT #2 is currently DDS-1, underline PAT:DDS-1 and use the NXT softkey to scroll to 3/24:

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:2    PAT: 3/24 │
│ #1            PRV NXT < > EXIT       │
└─────────────────────────────────────┘
        □  ■  ■  ■  □
```
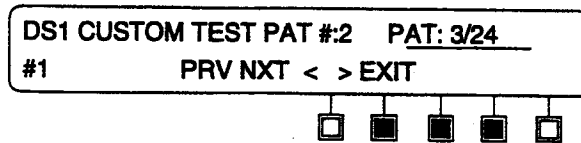
13. Move to PAT #3 by underlining PAT #2 in the screen above, and use NXT to scroll forward one position:

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:3    PAT:511   │
│ #1            PRV NXT < > EXIT       │
└─────────────────────────────────────┘
        □  ■  ■  ■  □
```
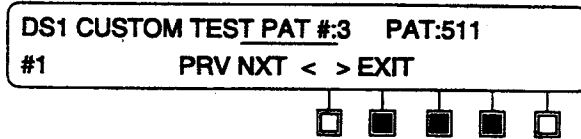
14. Since PAT #3 is currently 511, change the pattern selected by underlining PAT:511 and scroll to 1/1 with the NXT softkey.

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:3    PAT:1/1   │
│ #1            LAST NXT < > EXIT      │
└─────────────────────────────────────┘
        □  ■  ■  ■  □
```

15. Scroll to PAT #4.

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:4    PAT:DDS-2 │
│ #1            LAST NXT < > EXIT      │
└─────────────────────────────────────┘
        ■  □  □  □  □
```
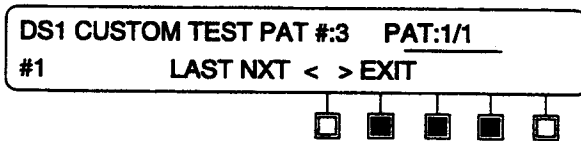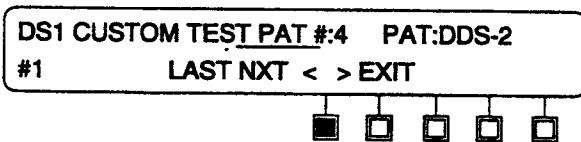
16. In the screen above, press LAST, ending the sequence at Pattern #3:

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:4    PAT:<LAST>│
│ #1            LAST NXT < > EXIT      │
└─────────────────────────────────────┘
        □  □  □  □  ■
```
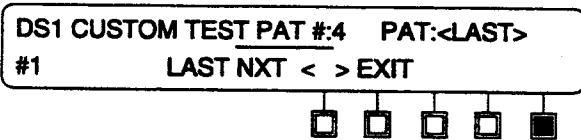
Note: Since the factory default for the CUSTOM test had 25 programmed patterns, it is important to use the LAST command in step 16. Otherwise, the previously programmed patterns *#4-#25) will remain part of the new test.

17. Press the EXIT softkey in the screen above to enter the new CUSTOM program; this will display the opening AUTO TEST screen:

```
┌─────────────────────────────────────┐
│ DS1 AUTO TESTS: BRDG-TAP  RPTR _____ │
│ CUSTOM                              │
└─────────────────────────────────────┘
        □  ■  □  □  □
```
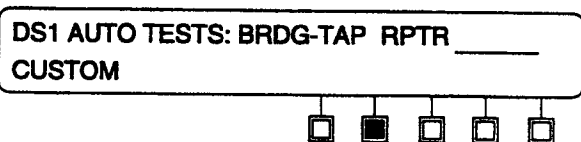
18. Press the GO softkey to begin the test. The screen will show the test pattern being transmitted, along with the elapsed time count down (in parenthesis). Pressing the flashing STOP softkey will discontinue the test:

```
DS1 CUSTOM TEST 1. QRS  (0:23)
#1            STOP    NXT
```
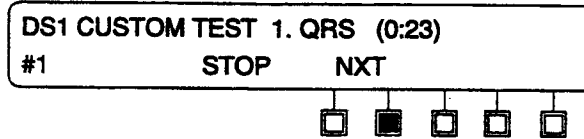
The Factory Default settings can be automatically reprogrammed by using the Configuration setting RESTORE FACTORY DEFAULTS, as described in the PRINT/SYSTEM Quick Sheet.

Viewing Test Results

If the test runs error free, then no LED error History will appear on the corresponding receiver, and the SUMMARY screen will read ALL RESULTS OK. If bit errors occur, the flashing error history will be triggered, and they will be displayed in the SUMMARY screen. In addition, the DS1 STATS key provides access to individual pattern results.

19. Press the DS1 STATS function key to display the screen below, and underline the desired test title. (If, for example, only BRDG TAP was run, then only the DS1 STATS and the BRDG TAP headers will appear in the screen below).

```
DS1 STATS  BRDG-TAP  REPEATER
CUSTOM
```
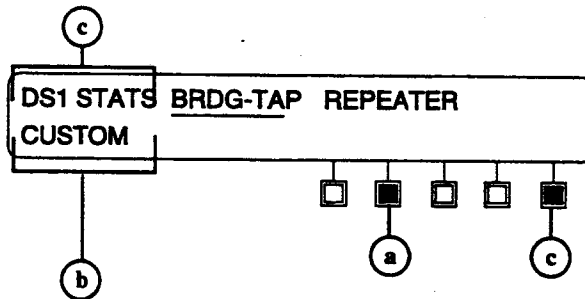
NOTES:

a. Use the F2 softkey to choose RCVR 1 or RCVR 2 test results. In our case, we will display RCVR #1 results

b. If the screen above is flashing <RUNNING> then the test is not complete. If <NO ERRORS DETECTED> is displayed, then it is not necessary to verify individual pattern results, since there will be no errors.

c. To revert to the standard DS1 STATS function (to display SLIP, Frequency, or Level for example) underline DS1 STATS and press VIEW.

20. If <BITS ERRORS DETECTED> appears in the screen above, then press the VIEW softkey to display individual pattern results:

```
RCVR 1: BRDG-TAP TEST RESULTS  SET   A
1. 1/1    BIT ERRS: 0   NXT XMT EXIT
```
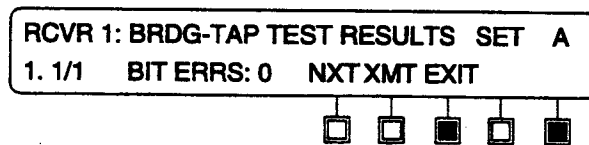
21. In the screen above, use the NXT softkey to scroll through each pattern result (i.e. 1/1, 3/24, QRS, etc.). Press EXIT to return to the main DS1 STATS screen.

NOTE: If a specific pattern shows bit errors, you may want to run this pattern continuously. To set a specific pattern press the SET XMT softkey (F4), which will enter the pattern into the transmitter. **The AUTO TEST must first be stopped.**

For example in the screen below, pattern #12 is a 2:13 stress code. It shows 23 bit errors. Rather than manually programming this pattern into the transmitter's user definable code, you can simply press SET XMT (softkey F4) and the 2:13 pattern will immediately be set at the transmitter pattern.

```
┌─────────────────────────────────────┐
│ RCVR1: BRDG-TAP TEST RESULTS  SET  A │
│ 12. 2:13  BIT ERRS: 0    NXT XMT EXIT│
└─────────────────────────────────────┘
        ☐  ☐  ☐  ■  ☐
```
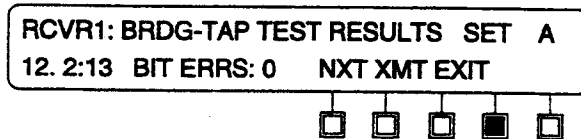
Miscellaneous Notes

A. When an AUTO TEST is in progress, a flashing A will appear in several screens, including the SUMMARY screen. This is simply displayed as a reminder.

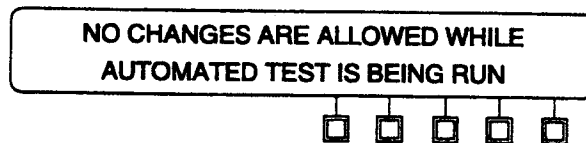B. When viewing the results of an AUTO TEST in the screen above, it is important to understand that this screen only provides BIT ERROR results. Frame Bit Errors, or Bipolar Violations will not appear in this screen. However, the 440B/T-ACE maintains a full time, complete count of all errors in the SUMMARY screen and individual error counters (DS1 STATS). In theory, it is possible that the screen above displays <NO BIT ERRORS FOUND>, while the flashing HISTORY and SUMMARY screen indicate other types of errors. In order to determine when (or during which pattern) the non-Bit Errors occurred, you will need to use the time/date stamped print-out obtained by connecting a printer to the   RS-232-C port.

C. Changes to the XMTR set-up are not allowed while an AUTO TEST is running (as they could introduce errors).

   Attempting to send Loop codes or change the RCVR set-up will cause the following screen to be displayed:

```
┌─────────────────────────────────────┐
│     NO CHANGES ARE ALLOWED WHILE     │
│     AUTOMATED TEST IS BEING RUN      │
└─────────────────────────────────────┘
        ☐  ☐  ☐  ☐  ☐
```

To stop the AUTO TEST, press XMT 1 (or 2) and press STOP.:

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST  2. 3 /24    (0:24)  │
│ #1            STOP     NXT            │
└─────────────────────────────────────┘
        ☐  ■  ☐  ☐  ☐
```
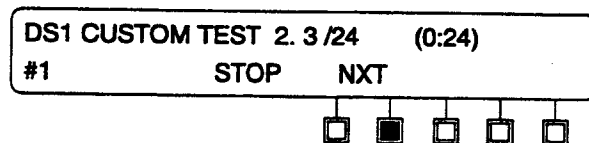
Which returns you to the main AUTO TEST screen:

```
┌─────────────────────────────────────────┐
│ DS1 AUTO TESTS: BRDG-TAP  RPTR  _____    │
│ CUSTOM                                   │
└─────────────────────────────────────────┘
         □    □    □    □    ■
```
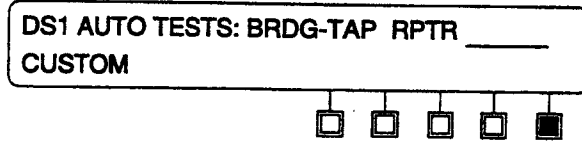
You are now free to return to the XMTR Set-Up (press NXT or the Set-Up key) and make other changes.

D. When scrolling through the library of CUSTOM test patterns (see steps 10, 12, 14) you will encounter <CODE> after the 1/8 pattern, as shown in the screen below:

```
┌─────────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:3   PAT:<CODE>     │
│ #1  PAT NAME:A    EDIT NXT  <  > EXIT    │
└─────────────────────────────────────────┘
         ■    ■    □    □    □
```
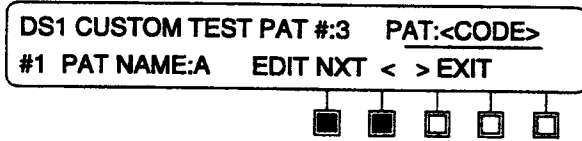
CODE is a user-definable 24 bit pattern. In the screen above, it can be changed by pressing EDIT to display:

```
┌─────────────────────────────────────────┐
│ DS1 CODE  00111000 11111111 01010101     │
│ #1          BLNK    <  > EXIT            │
└─────────────────────────────────────────┘
         ■    □    ■    ■    ■
```

Use the < > to underline a position and use the keypad to insert a 0 or a 1. Use the BLNK to erase (blank-out) all bits after the flashing underline (in order to create a stress pattern with less than 24 bits).

After defining the pattern, press EXIT to enter this CODE into the library, displaying:

```
┌─────────────────────────────────────────┐
│ DS1 CUSTOM TEST PST #:3   PAT:<CODE>     │
│ #1  PAT NAME:A    EDIT    <  > EXIT      │
└─────────────────────────────────────────┘
         ■    □    ■    ■    □
```
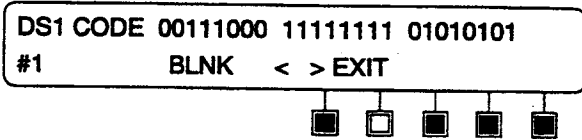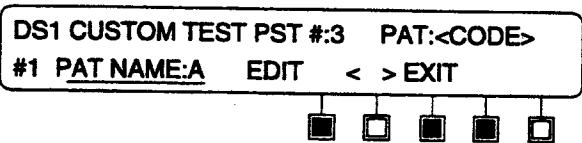
The CODE above is named "A". It can be given any six (6) character name. Use the < > keys to underline PAT NAME:, and press EDIT to display the menu screen for defining the name.

```
┌─────────────────────────────────────────┐
│ PAT NAME: A____                          │
│            UP  DN  <  > EXIT             │
└─────────────────────────────────────────┘
         ■    ■    ■    ■    □
```
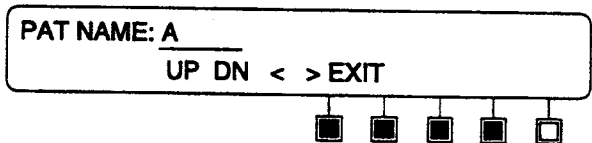
Use the < > keys to move the underline, and the UP/DN softkeys to scroll through characters. For example, PAT #1 can be named JEFF!

Miscellaneous Notes (continued)

```
┌─────────────────────────────────────┐
│ PAT NAME: JEFF!                      │
│              UP  DN  <  > EXIT       │
└─────────────────────────────────────┘
          □    □    □    ■
```
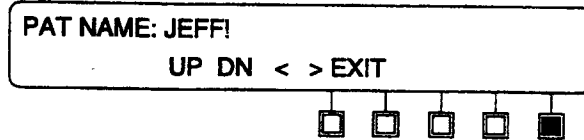
Press EXIT to enter the name. Since several different codes can be programmed, the pattern names may be useful for immediately telling them apart.

E. In steps 10, 12, and 14, the PRV (previous) softkey appears. This allows scrolling back one pattern in case you go too far. However, be careful when scrolling backwards, because the PRV key becomes an EDIT key when <CODE> appears. In other words scrolling backwards one step from the DDS-1 pattern will display <CODE>, and the PRV is replaced by EDIT.

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:4   PAT:DDS-1  │
│ #1             PRV NXT  <  > EXIT    │
└─────────────────────────────────────┘
          ■    □    □    □    □
```

```
┌─────────────────────────────────────┐
│ DS1 CUSTOM TEST PAT #:4   PAT:DDS-1  │
│ #1 PAT NAME:A     EDIT    <  > EXIT  │
└─────────────────────────────────────┘
          ■    □    □    □    □
```
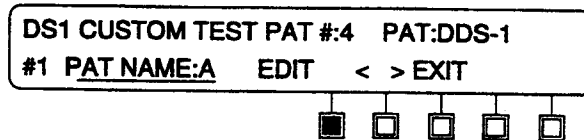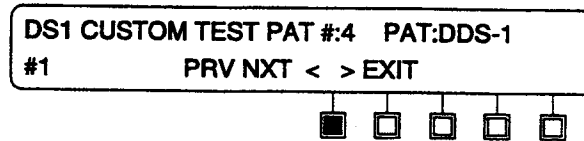
Use PRV to back up only one pattern at a time to avoid confusion.
You cannot back up beyond <CODE>.

A. GENERAL

When equipped with Option 14, the 440B/T-ACE can independently monitor two SS7 channels (56Kb/s or 64Kb/s), non-intrusively, from DS1 monitor jacks. An SS7 circuit can also be tested from other accesses depending on the options installed on your 440B/T-ACE. For instance, you may access an SS7 circuit from:
   – a STS-1 or DS3 bit stream with option 52C
   – a DS3 bit stream with option 52B+
   – a DS0-DP/OCU-DP with option 30

Option 14 also provides a limited SS7 packet transmit simulation using the dual transmitters in terminated or DS0 Drop-and-Insert mode. This may be useful to verify receive functions before system/equipment turn-up.

B. APPLICATIONS

In a typical SS7 network, a Service Switching Point (SSP) is connected to at least two Signal Transfer Points (STPs). In the case of circuit congestion, SS7 packets flow on the second link. Since both 440B receivers can independently monitor SS7 traffic packets, count errors, and accumulate statistics, the user can compare packet flow and performance on two separate links.
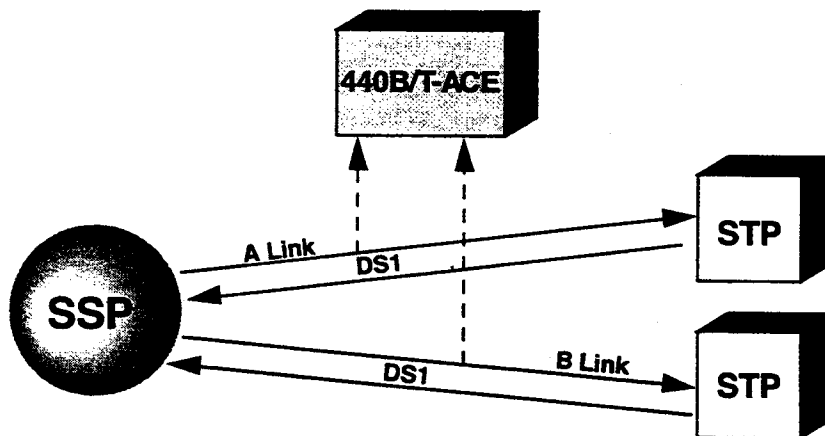
Since SS7 errors are recorded in the background, DS3/2/1 facility errors are also recorded and displayed, permitting the user to distinguish events which affect the SS7 channel only and those that affect both the SS7 channel and the facility. An SS7 link may be composed of many separate interconnected circuit elements such as channel banks, DACS, multiplexers, and fiber terminals. Since the 440B can simultaneously monitor the input and output of these circuit elements, SS7 circuit problems can be easily sectionalized.
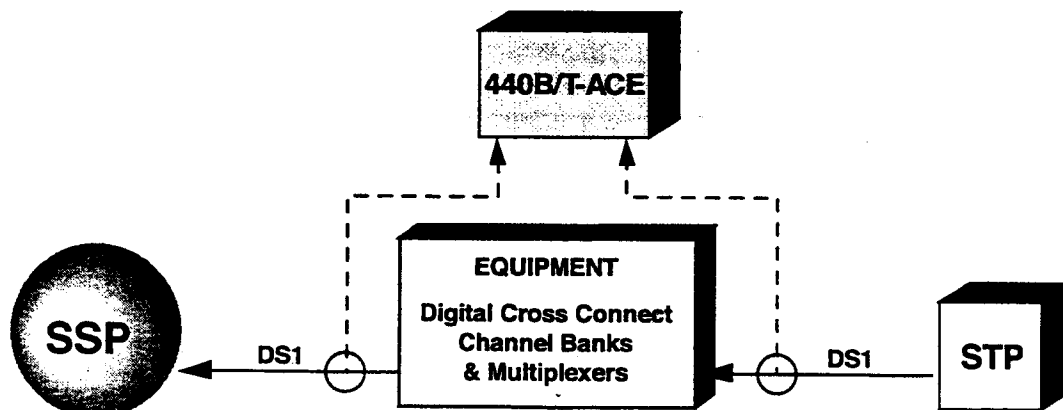
Both transmitters can emulate SS7 packets, allowing switching engineers to check SS7 switch functions prior to cut over. DDS technicians can also use the 440B to test new SS7 circuits and isolate facility problems.
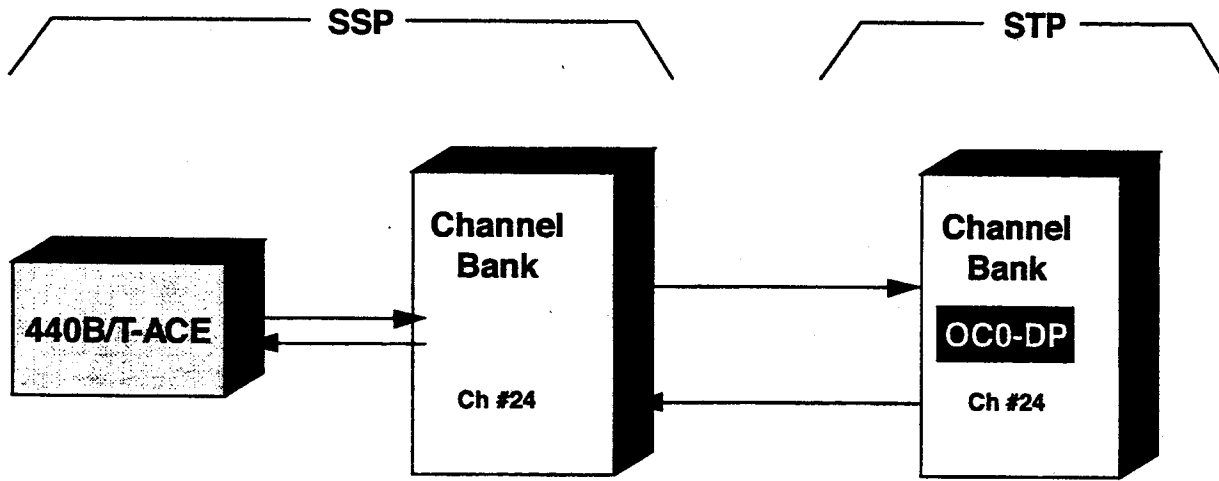
SSP ——————— STP ———————

Channel Bank

Ch #24

Channel Bank

OC0-DP

Ch #24

440B/T-ACE

SS7 errors automatically trigger the flashing HISTORY indicators, and the message "SS7 Errors Detected" appears in the main SUMMARY screen. Since SS7 monitoring occurs in "background" mode, DS1 and DS3 facility errors will continue to be captured automatically. This allows easy isolation of facility troubles from pure SS7 equipment failures. DS0 VF and signaling measurements can also be made on other channels while an SS7 channel is being monitored.

This option provides individual error counts, as well as packet/traffic statistics including total packet counts by type, and % MSUs, LSSUs, FISUs.

The unit's Split Mode capability allows using one receiver for SS7 testing while using the other for unrelated T1, Fractional T1, or DS0A/B BERT or monitoring.

NOTE: When SS7 monitoring is turned on, the main SUMMARY screen will confirm that SS7 testing is underway on the channel displayed. The SUMMARY screen will also automatically show SS7 errors with the message "SS7 Errors Detected" and will trigger flashing Error HISTORY indicators. To display the type of SS7 errors refer to steps 7 and 8.

```
RCV 1:SS7 SYNC (56K CH#24)    0:00:45

  ALL RESULTS OK        SEL #2
```
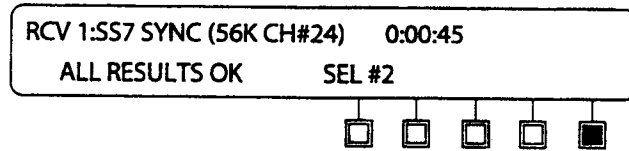
C. RECEIVE ANALYSIS

1. Patch the DS1 circuit(s) into Receivers 1 and 2. Verify that both SEL toggle switches are set to MON. All error/alarm LEDs should be off.

2. Depress the SIG key and underline SS7:

```
BITS CALL(DTMF)  DIGIT  WINK  SS7              __
<R1: OFF  R2: OFF>  CNFG VIEW <  > GO
```
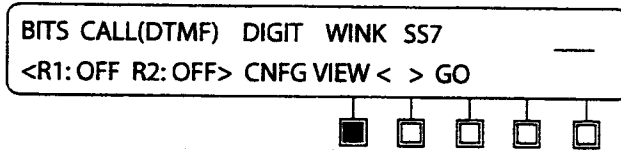
3. Depress the CNFG key (F1) and use the arrow softkeys (F1 though F4) to select the SS7 channel (#24 in this example) to be monitored by each receiver:
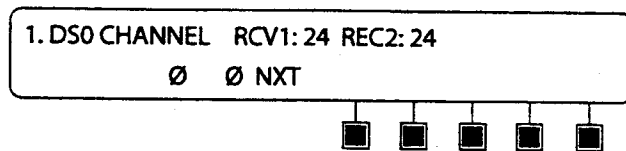
```
1. DS0 CHANNEL   RCV1: 24  REC2: 24
            Ø    Ø  NXT
```

NOTE: Between 1 and 24 there is an "OFF" selection which turns off the SS7 monitoring associated with a particular receiver.

4. Depress NXT and depress F1or F2 (as well as F3 or F4) to select either the 56 or the 64 kbps rate for the SS7 channel in Receiver 1 (and 2):
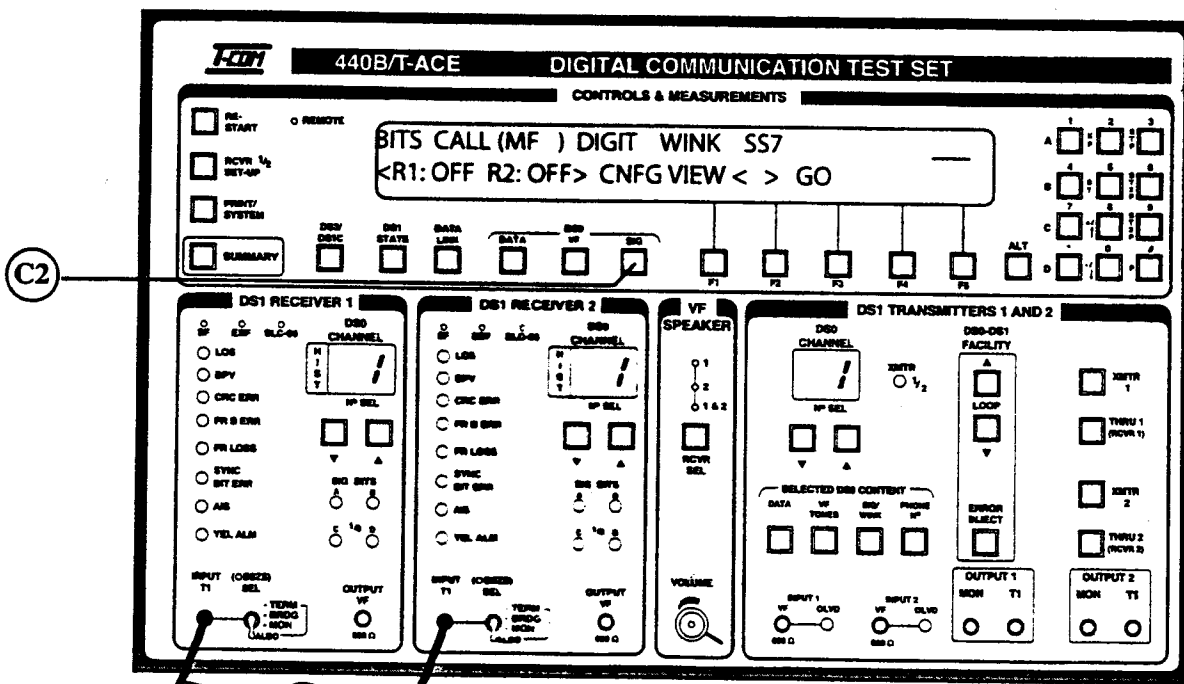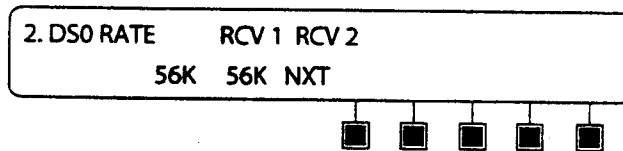
```
2. DS0 RATE       RCV 1  RCV 2
               56K   56K  NXT
```

5. Depress NXT and depress F2 to select either YES or NO:

```
┌────────────────────────────────────────┐
│ 3. LOCK DS0 CHANNEL SELECTION TO        │
│    FRONT PANEL CONTROLS: NO  __  NXT    │
└────────────────────────────────────────┘
        □  ■  □  □  ■
```

Note: The above selection (NO) allows the independent operation of the front panel channel selectors, so that they may be used for VF or SIGNALING measurements while SS7 is being monitored in the background on the previously selected channel (#24 in this example). Depress NXT to return to screen #1.

Starting SS7 Monitoring

6. Depress the DS0 SIG key to return to the main menu screen of Step 1 and depress GO to start monitoring the selected SS7 channel(s):

```
┌────────────────────────────────────────┐
│ BITS CALL(dtmf)  DIGIT  WINK  SS7   __  │
│ <R1: OFF  R2: OFF>  CNFG VIEW <  >  GO   │
└────────────────────────────────────────┘
        □  □  □  □  ■
```

Note: If SS7 is not present on the selected channel(s), "N/A" will appear in the screen above instead of OFF. GO is now a flashing STOP. Depress STOP (F5) to stop monitoring the SS7 channel(s).

7. While monitoring the SS7 channel(s), depress VIEW (F2):

```
┌────────────────────────────────────────┐
│ RCVR 1: SS7 SUMMARY                     │
│    ALL RESULTS OK      RCV2 MORE        │
└────────────────────────────────────────┘
        □  □  □  ■  ■
```

Note: This screen is similar to the DS1 SUMMARY screen, except that only SS7 errors are displayed. Depress F4 to display the RCVR 2 SS7 SUMMARY, if desired.

Viewing all error counter and packet statistics.

8. Depress MORE:

```
┌────────────────────────────────────────┐
│ ERROR COUNTS  STATISTICS                │
│         EXIT <  > ENTR                  │
└────────────────────────────────────────┘
        □  □  ■  ■  ■
```

Note: This screen permits you to select two display modes:
   a. ERROR COUNTS yielding cumulative SS7 error counts
   b. STATISTICS to display the analysis of data packet

9. With ERROR COUNTS underlined, depress ENTR:

```
┌──────────────────────────────────────────────┐
│ [ERR COUNTS]   RCVR 1   RCVR 2                 │
│ CRC          0      0   NXT                    │
└──────────────────────────────────────────────┘
            □  □  □  □  □
```

Note: By depressing NXT (F5), the following error counts can be accessed for RCVR 1 and 2:
a. Cyclic Redundancy Check (CRC)
b. LENGTH INDicator
c. Negative Acknowledgments (NAKS)
d. RETRANSMITS
e. SYNC-LOSS SECondS
f. SYNC-LOSS EVeNTS
g. Processor/OUTAGE SECondS
h. Processor/OUTAGE EVENTS
i. Processor/BUSY SECondS
j. Processor/BUSY EVENTS

10. Depress the DS0 SIG key, the VIEW softkey, and the MORE softkey. Move the underline to STATISTICS:

```
┌──────────────────────────────────────────────┐
│ ERROR COUNTS  STATISTICS                       │
│          EXIT <  > ENTR                        │
└──────────────────────────────────────────────┘
            □  □  ■  ■  ■
```

11. Depress ENTR:

```
┌──────────────────────────────────────────────┐
│ [STATISTICS]   RCVR 1   RCVR 2                 │
│ % MSUs        0.00    0.00   NXT               │
└──────────────────────────────────────────────┘
            □  □  □  ■  ■
```

Note: By depressing NXT, the following statistics can be accessed for RCVR 1 and 2:
a. % Message Signaling Units   (% MSUs)
b. % Link Status Signaling Units   (% LSSUs)
c. % Fill In Signaling Units   (% FISUs)
d. Total Packets   (TOTAL PKTS)
e. Total Message Signaling Units   (TOTAL MSUs)
f. Total Link Status Signaling Units (TOTAL LSSUs)
g. Total Fill In Signaling Units   (TOTAL FISUs)

Note: Depressing F4 allows the above items to be accessed in reverse order.

D. PACKET SIMULATION

When equipped with Option 14, both 440B transmitters can independently simulate SS7 packets to check the receive functions before system turn-up.

IMPORTANT NOTE: Packet simulation is not designed to emulate switch functions and/or Level 3-7 handshaking signals. Do NOT attempt packet simulation on a working network unless you understand SS7 protocol. Sending unauthorized packets could interrupt service or cause the network to crash!

BASIC SETUP

1. Depress the XMTR 1 DS1 SET-UP and then the transmitter DS0 DATA keys:

```
TYPE:DS0A RATE:9.6 MJU:IDLE  [XMT#1]
PRI:2047 SEC:NONE      < > EDIT
```

2. Move the underline to select TYPE. Depress EDIT (F5):

```
XMT DS0 TYPE: DS0A  DS0B  SW-56  SS7
#1              < > NXT                 —
```

3. Move the underline to SS7 and depress NXT (F5):)

```
TYPE:SS7 RATE:56K BFSN: 0/ 0 [XMT#1]
BFIB:0/0 [PKT:PROG# 1  GO] < > EDIT
```

Note: If SS7 were already selected, move the underline first to SW-56 and then move it back to SS7.

4. Move the underline to RATE and depress EDIT (F5):

```
XMT SS7 RATE: 56Kb/s
#1           56 64   ENTR        —
```

Note: This screen allows the selection of 64 kb/s operation by depressing 64 (F3) and ENTR (F5).

5. Depress ENTR to return to the menu screen of Step 3. Move the underline to BFSN and depress EDIT (F5):

```
XMT SS7 BSN:000  FSN:000
#1            UP DN < > ENTR
```

Note: The Forward Sequence Number (FSN) is the sequence number of the signal unit in which it is being carried. The Backward Sequence Number (BSN), used for MSU acknowledgment, is the sequence number of the MSU which has been received at the remote end. To set the FSN (or BSN), move the underline to the desired selection and depress the UP or DN softkeys (F1 and F2).

6. Depress ENTR to return to the menu screen of Step 3. Move the underline to BFIB and depress EDIT (F5):

```
┌─────────────────────────────────┐
│ XMT SS7      BIB FIB             │
│ #1           0  0    EXIT        │
└─────────────────────────────────┘
        ■   ■   □   □   ■
```

Note: The Backward Indicator Bit (BIB) and Forward Indicator Bit (FIB) are used in error correction. Toggling the BIB creates a Negative Acknowledgment, which tells the far end to retransmit MSUs. To toggle the setting, depress F1 or F2.

SENDING A RAW DATA PACKET:

7. Depress EXIT to return to the menu of Step 3. Move the underline to PKT, depress EDIT (F5), and move the underline to DIRECT:

```
┌──────────────────────────────────────────┐
│ XMT SS7 PKT:  DIRECT PROGRAMMED CUSTOM    │
│ #1                 <  > EDIT              │
└──────────────────────────────────────────┘
        □   □   ■   ■   ■
```

8. Depress EDIT (F5) again:

```
┌──────────────────────────────────────────┐
│ PKT ATTR:RAW  CRC:GOOD                    │
│ DIRECT         EDIT NXT <  > ENTR         │
└──────────────────────────────────────────┘
        ■   □   □   □   □
```

Note: If the screen reads FORM (instead of RAW), depress EDIT (F1) and the screen should read as above. Then, to change the CRC from GOOD to BAD, underline CRC and depress EDIT (F1) again.

9. With RAW underlined, depress NXT (F2):

```
┌──────────────────────────────────────────┐
│ 000: 20 FF FE CC 00 55 AA 12 23 40 AB 35  │
│ ATTR:RAW CRC:GOOD  NXT GO <  > EXIT       │
└──────────────────────────────────────────┘
        □   □   □   ■   □
```

Note: This screen allows the construction of the RAW data for the packet in hexadecimal format.

10. To change Byte 000, move the underline one space to the right (to HEX digit 2) and the screen will read:

```
┌──────────────────────────────────────────┐
│ 000: 20 FF FE CC 00 55 AA 12 23 40 AB 35  │
│ ATTR:RAW CRC:GOOD  NXT GO <  > EXIT       │
└──────────────────────────────────────────┘
        □   □   □   □   □
```

Note: Use the UP and DN softkeys (F1 and F2) to select the desired HEX digit. Move the underline one more space to the right (to the Hex 0). Repeat this procedure until Bytes 000 through 011 have been constructed. Then move the underline back to 000 and depress NXT (F1) to access Bytes 012 through 023. Repeat the above procedure for all bytes. When you have reached the last byte in the packet you are constructing, you can truncate the rest of the bytes on the screen by depressing the asterisk (*) key on the numeric keypad.

11. Depress EXIT (F5):

```
TYPE:SS7 RATE:56K BFSN: 0/ 0 [XMT#1]
BFIB:0/0 [PKT: USER   GO] <  > EDIT
```

12. Depress GO (F2) to send the RAW data packet you have just constructed.

SENDING AN MSU PACKET:

13. Underline PKT and depress EDIT (F5):

```
XMT SS7 PRT: DIRECT  PROGRAMMED  CUSTOM
#1              <  > EDIT
```

14. Underline DIRECT and depress EDIT (F5) again:

```
PKT ATTR:RAW  CRC:GOOD
DIRECT         EDIT NXT <  > ENTR
```

Note: To change the CRC from GOOD to BAD, underline CRC and depress EDIT.

15. With RAW underlined, depress EDIT (F1):

```
PKT ATTR:FORM TYPE:MSU  SIO:00100000
DIRECT         EDIT NXT <  > ENTR
```

Note: To edit the Service Information Octet (SIO), move the underline to SIO and use the numeric key pad to enter 1's or 0's in the 8 bit field. The SIO contains the Service Indicator, Network Priority, and Network Indicator.

16. Move the underline back to ATTR and depress NXT (F2):

```
000: 20 FF FE CC 00 55 AA 12 23 40 AB 35
ATTR:FORM TYPE:MSU  NXT GO <  > EXIT
```

Note: This screen allows construction of the MSU packet data in hexadecimal format.

17. To change Byte 000, move the underline one space to the right (to HEX digit 2) and the screen will read:

```
000: 20 FF FE CC 00 55 AA 12 23 40 AB 35
ATTR:FORM TYPE:MSU  NXT  GO  <  > EXIT
```

Note: Use the UP and DN softkeys (F1 and F2) to select the desired HEX digit. Move the underline one more space to the right (to the Hex 0). Repeat this procedure until Bytes 000 through 011 have been constructed. Then move the underline back to 000 and depress NXT (F1) to access Bytes 012 through 023. Repeat the above procedure for all bytes. When you have reached the last byte in the packet you are constructing, you can truncate the rest of the bytes on the screen by depressing the asterisk (*) key on the numeric keypad.

18. Depress EXIT (F5):

```
TYPE:SS7 RATE:56K BFSN: 0/ 0 [XMT#1]
BFIB:0/0 [PKT: USER  GO]  <  > EDIT
```
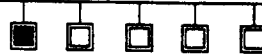
19. Depress GO (F2) to send the MSU packet you have just constructed.

SENDING AN LSSU PACKET:

20. If you want to construct a Link Status Signaling Unit (LSSU) instead of an MSU, move the underline to PKT and depress EDIT (F5) twice to return to:

```
PKT ATTR:RAW  CRC:GOOD
DIRECT     EDIT NXT  <  > EXIT
```

21. Depress EDIT (F1), move the underline to TYPE and depress EDIT:

```
PKT ATTR:FORM  TYPE:LSSU  STAT:00100000
DIRECT     EDIT NXT  <  > EXIT
```

22. Move the underline to STAT:

```
PKT ATTR: FORM  TYPE:LSSU  STAT:00100000
DIRECT     EDIT NXT  <  > EXIT
```

Note: To edit the Link Status Signaling Unit, use the numeric keypad to enter 1's or 0's in the 8 bit data field.

23. Depress EXIT:

```
TYPE:SS7 RATE:56K BFSN: 0/ 0 [XMT#1]
BFIB:0/0 [PKT: USER   GO] < > EDIT
```
☐ ■ ☐ ☐ ☐

24. Depress GO to send the LSSU that you have just constructed.

STORING PROGRAMMED PACKETS:

25. Move the underline to PKT and depress EDIT; move the underline to PROGRAMMED:

```
XMT SS7 PKT: DIRECT  PROGRAMMED  CUSTOM
#1                < > EDIT
```
☐ ☐ ☐ ☐ ■

26. Depress EDIT (F5):

```
PKT 0229FB4DACFE12CA0C010448000A030600
PROG# 1 RAW GOODCRC EDIT GO   NXT EXIT
```
■ ■ ☐ ■ ■

27. Depress NXT (F4) to scroll through the programmed packets. Depress GO when you reach the packet you want to send.

28. To edit a programmed packet, depress EDIT (F1) and follow the previous procedures for editing raw data packets, MSUs, and LSSUs.

29.· Depress EXIT (F5) to return to the main menu:

```
TYPE:SS7  RATE:56K  BFSN: 0/ 0 [XMT#1]
BFIB:0/0 [PKT: USER   GO] < > EDIT
```
☐ ☐ ■ ■ ■

SENDING CUSTOM STRINGS OF PACKETS:

30. Move the underline to PKT and depress EDIT (F5); move the underline to CUSTOM:

```
XMT SS7 PKT: DIRECT  PROGRAMMED  CUSTOM
#1                < > EDIT
```
☐ ☐ ☐ ☐ ■

31. Depress EDIT (F5):

```
SS7 CUSTOM: 1-TIME  CONTINUOUS
#1                < > NXT
```
☐ ☐ ☐ ☐ ■

Note: To send a string of custom packets only once, move the underline to 1-TIME, otherwise leave it under CONTINUOUS to send custom packets continuously.

32. Depress NXT (F5):

```
┌──────────────────────────────────────────┐
│ CUSTOM SEQUENCE: PKT#: 1  PROG#: 1         │
│          LAST NXT  <  > EXIT               │
└──────────────────────────────────────────┘
        □  ■  ■  ■  □
```

Note: This screen displays the first packet in the custom string, PROG#: 1. To change this packet, move the underline to PROG#: 1 and depress NXT (F2) until the desired programmed packet appears on the screen. There are ten programmed packets in the menu. Any of these programmed packets can be changed by returning to Step 26 above.

33. Depress NXT (F2):

```
┌──────────────────────────────────────────┐
│ CUSTOM SEQUENCE: PKT#: 2  PROG#: 2         │
│          LAST NXT  <  > EXIT               │
└──────────────────────────────────────────┘
        □  ■  □  □  □
```

Note: This screen displays the second packet in the custom string, PROG#: 2. Depressing NXT again displays PROG: 3, and so on. (The sequence can have a maximum of ten packets.)

34. Depress LAST (F1) when the last packet you desire in the custom string is selected; for example, if the maximum number (ten) of packets were desired in the custom string:

```
┌──────────────────────────────────────────┐
│ CUSTOM SEQUENCE: PKT#: 10  PROG#:<LAST>    │
│          LAST NXT  <  > EXIT               │
└──────────────────────────────────────────┘
        □  □  □  □  ■
```

35. Depress EXIT (F5):

```
┌──────────────────────────────────────────┐
│ TYPE:SS7 RATE:56K BFSN:000/000 [XMT#1]     │
│ BFIB:0/0 [PKT: USER   GO]  <  > EDIT       │
└──────────────────────────────────────────┘
        □  ■  □  □  □
```

36. Depress GO (F2) to (continuously) send the custom string of ten programmed packets that you just constructed.

37. To verify that the custom string of packets is being sent, patch the Transmitter 1 OUTPUT MON (red) jack into the Receiver 1 INPUT T1 jack, with the SEL switch in the monitor position. Repeat Steps 1 through 7 of Paragraph C above:

```
┌──────────────────────────────────────────┐
│ RCVR1: SS7 SUMMARY                         │
│ CRC: *          NXT RCV2 MORE              │
└──────────────────────────────────────────┘
        □  ■  □  □  □
```

Note: The above screen should read *incrementing CRC errors.

38. Depress NXT (F2):

```
RCVR1: SS7 SUMMARY

LENGTH IND: *      NXT  RCV2  MORE
```

☐ ☐ ☐ ☐ ☐
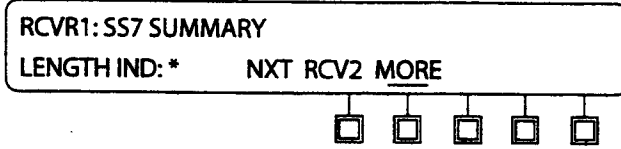
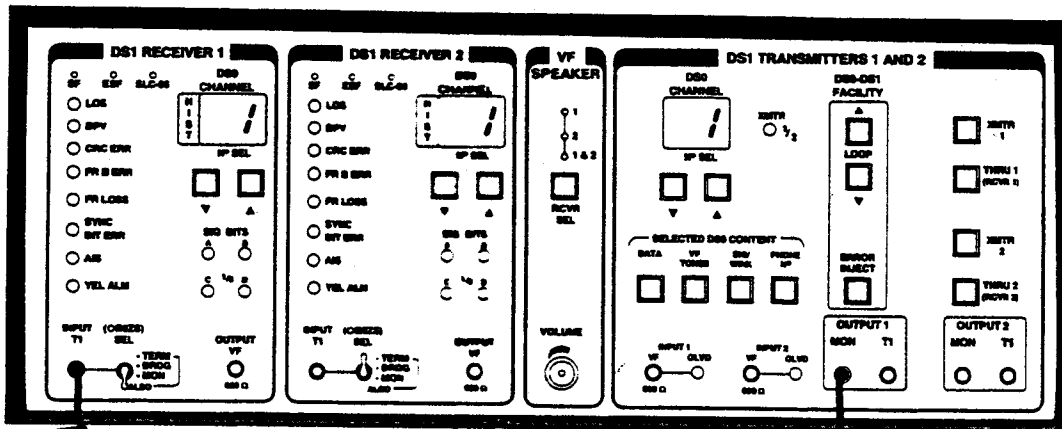**Note:** The above screen should read *incrementing LENGTH INDicator errors.

39. Repeat Steps 8 through 11 of Paragraph C above:

```
[STATISTICS]   RCVR 1   RCVR 2

%MSUs          0.49     N/A   NXT
```

☐ ☐ ☐ ☐ ☐
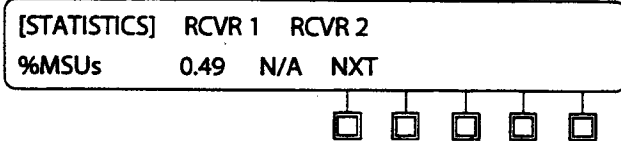
Note: The above screen displays the percentage of MSUs that are being generated by the custom string of packets.

Performing a T1 Loopback on a CSU/Network Interface

The 440B/T-ACE provides loop up/down codes for looping standard T1 CSU's and Network Interfaces. In-band and out-of-band (ESF) loopback codes are provided. The test set also provides a 32-bit user programmable in-band loop code.

When equipped with Option 13, Expanded Loopback Codes, the 440B/T-ACE has the capability of testing smart repeaters manufactured by Westell, Teltrend, and XEL. This capability is designed to be customer specific, because different Bell operating companies use different arming, looping, and/or verification codes. The 440B/T-ACE can presently accommodate: Ameritech, Bell Atlantic, Pacific Bell, US West, Bell South, and NYNEX.

In order to perform loopback testing the transmitter and the receiver must be set up accordingly. Since the 440B/ T-ACE has two independent transmitters and receivers, it is important to verify that the patchcords are plugged into the appropriate color coded transmit T1 OUTPUT jack and the corresponding receive INPUT T1 jack, with the SEL switch in the TERM position.

This section has three parts:

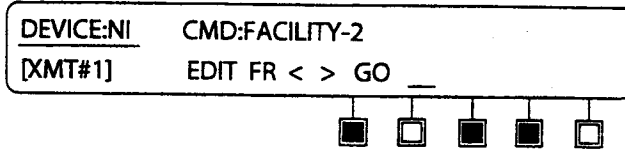> **PART I:** Basic Loop UP/DOWN procedures.
>
> **PART II:** Looping a Network Interface (NI) or CSU.
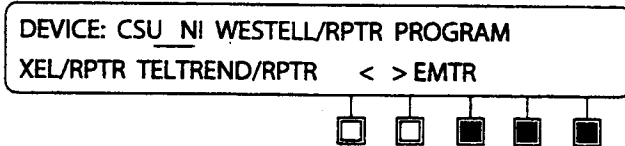>
> **PART III:** Using the Expanded Loopback Codes (Option 13)

PART I: Basic Loop UP/DOWN operation

1. Depress the DS1 FACILITY LOOP ▲ up key. The screen reads:

```
DEVICE:NI      CMD:FACILITY-2

[XMT#1]        EDIT FR < > GO  _
```

2. Depress EDIT softkey (F1). The screen reads:

```
DEVICE: CSU_NI WESTELL/RPTR PROGRAM

XEL/RPTR TELTREND/RPTR    < > EMTR
```
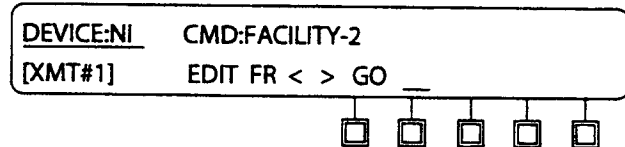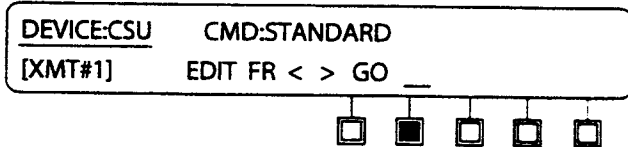
NOTE: The above screen will appear only if Option 13, Expanded Loopback Codes is equipped. If not, the only selections will be CSU, NI, or PROGRAM.

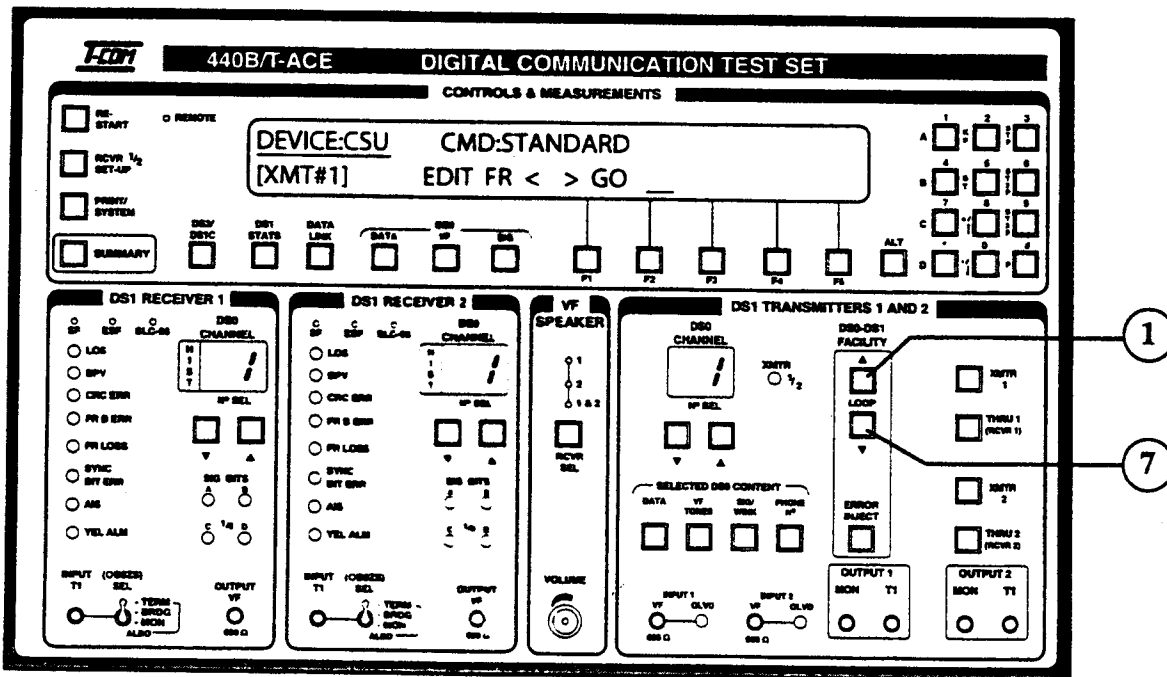3. Use the < > softkeys (F3 and F4) to underline the loop up choice and depress ENTR softkey (F5). The screens read:

a) If CSU (Customer Service Unit) is chosen:

b) If NI (Network Interface) is chosen:

```
DEVICE:CSU     CMD:STANDARD

[XMT#1]        EDIT FR < > GO  _
```

```
DEVICE:NI      CMD:FACILITY-2

[XMT#1]        EDIT FR < > GO  _
```

NOTE: Depress FR (F2) to change from a framed to an unframed loop code.

c) If PROGRAM (a 32 bit user defined pattern) is chosen:

```
DEVICE:PROG    CMD:₁₀₁₀₁₀₁₀₁₀₁₀₁₀₁₀₁₀₁₀
[XMT#1]        EDIT  <  >  GO
```
■ □ ■ ■ ■

NOTE: The first bit is on the upper left, and the last bit is on the lower right.

4. Use the < > softkeys (F3 and F4) to move the underline to CMD and depress EDIT softkey (F1). The screens read:

a) If CSU was chosen:

```
LOOP: STANDARD  ESF-LINE  ESF-PAYLOAD
      11001100          <  > ENTR
```
□ □ □ □ □

b) If NI was chosen:

```
LOOP: FACILITY-1  FACILITY-2  11001100
      ESF-NETWORK           <  > ENTR
```
□ □ □ □ □

c) If PROGRAM was chosen:

```
PROG 00000000 00000000 01010101 01010101
            BLNK <  > EDIT
```
□ □ □ ■ □

NOTE: The 32 bit sequence can be programmed by using the key pad to enter a 1 or a 0 into each bit in the sequence. (Depressing the BLNK softkey (F2) truncates the sequence, if fewer than 32 bits are desired.)

5. From the above screens, select the appropriate command or program codes and depress the ENTR softkey (F5):

NOTE: The 8 bit codes can be also programmed, by depressing the EDIT softkey (F1), and using the keypad to enter a 1 or a 0 into each bit in the sequence. (Depressing the BLNK softkey (F2) also truncates the sequence, if fewer than 8 bits are desired.)

6. To send the selected loop UP pattern, depress the GO softkey (F5). The pattern will be transmitted for approximately 8 seconds.

NOTE: To send the pattern longer than eight seconds, depress the GO as long as desired. (When released, the pattern will continue for 8 more seconds.)

7. To send the loop DOWN pattern, corresponding to the loop UP pattern just sent, depress the DS1 FACILITY LOOP ▼ key, and then depress the GO softkey (F5). The pattern will be transmitted for approximately 8 seconds.

T1 CSU/NI
Loopback Testing

PART II: Looping a Network Interface (NI) or a Customer Service Unit (CSU)

This procedure describes looping a CSU or a NI from a DSX patch panel using Transmitter 1 and Receiver 1 of the 440B. By transmitting different patterns from the 440B, different aspects/characteristics of the T1 circuit and equipment can be stressed.
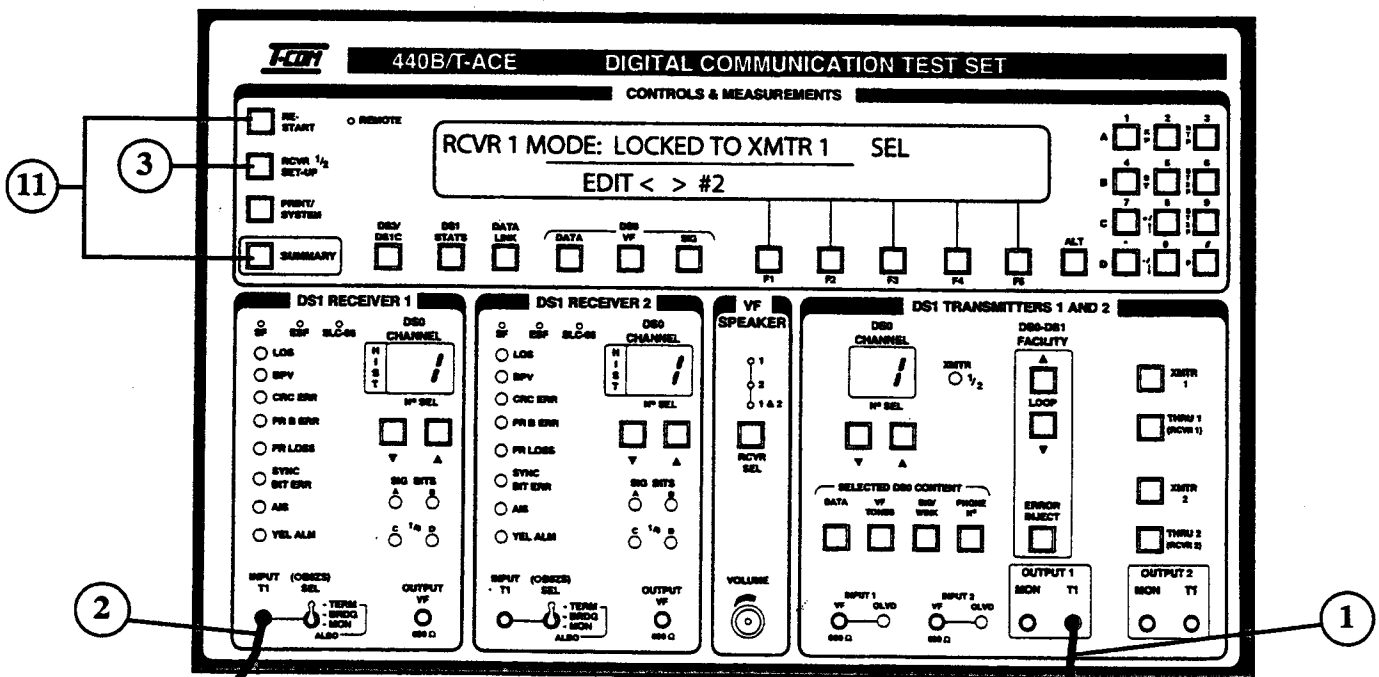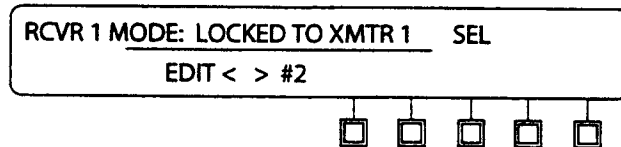
Warning: This is an out-of-service test. Plugging into the IN/OUT DSX jacks will interrupt the T1 circuit. To ensure that the circuit is not in use, patch the 440B receiver into the DSX monitor jack and confirm that there is no customer traffic on the T1. (Refer to Quicksheets for T1 Monitoring and DS0 Monitoring.)

The test set up is as follows:

1. Patch from the 440B Transmitter #1 output to the DSX-IN jack.

2. Patch from DSX-OUT jack to the 440B Receiver #1 jack. Verify that the toggle SEL Switch is set to TERMinate. (The locking switch must be pulled out to change its setting.)

RECEIVER SET UP

3. Press the RCVR SET-UP key to display the Set-Up screen. The underline indicates the MODE chosen for the selected receiver. The screen will display:

RCVR 1 MODE: LOCKED TO XMTR 1   SEL
EDIT < > #2

4. Verify that RCVR 1 MODE is LOCKED TO XMTR1. If not, press EDIT to select LOCKED TO XMTR from the menu screen. Also verify that XMTR#1 is displayed.

```
RCVR 1 MODE:LOCKED TO XMTR 1  T1  F-T1
 DS0A  DS0B  SW-56  XMTR:#1  <  >  NXT
```

TRANSMITTER SET-UP

5. Press XMTR 1 to display root SET-UP. (If screen below does not appear, press XMTR key a second time.)

```
MODE:T1  PAT:QRS  FRAME:SF-D3/D4
CODE:AMI  CLK:INT  DL:N/A  <  > EDIT
```

6. Note that in the screen above, the transmitter is generating a QRS stress pattern, with SF framing, and AMI line coding. Verify that MODE is T1.

LOOP UP

7. Press the DS1 FACILITY LOOP ▲ up key to display the screen below:

```
DEVICE:NI      CMD:FACILITY-2
[XMT#1]        EDIT FR  <  >  GO  __
```

NOTE: Press the FR softkey (F2) to change from a framed to an unframed loop code. Press the GO softkey (F5) to send the NI/Facility-2 loop up command.

8. Depress the EDIT softkey (F1). The screen reads:

```
DEVICE: CSU_NI  WESTELL/RPTR  PROGRAM
XEL/RPTR  TELTREND/RPTR    <  > ENTR
```

NOTE: The above screen will appear only if Option 13, Expanded Loopback Codes is equipped. If not, the only selections will be CSU, NI, or PROGRAM.

9. Use the < > softkeys (F3 and F4) to underline CSU and depress the ENTR softkey (F5). The screen reads:

```
DEVICE:CSU     CMD:STANDARD
[XMT#1]        EDIT FR  <  >  GO  __
```

10. Press the GO softkey (F5) to transmit the loop up pattern. The pattern will be transmitted for approximately 8 seconds.

NOTE: The screen will automatically confirm reception of the loop code by RCVR #1 (loop events are also captured in the SUMMARY screen events.)

11. To verify the looped condition, press the RESTART key and then the SUMMARY key in the CONTROLS AND MEASUREMENTS SECTION. The SYNC LED should be green and the screen should display the following:

```
RCV 1:DS1 SYNC-QRS        0:00:58
   ALL RESULTS OK         SEL #2
```
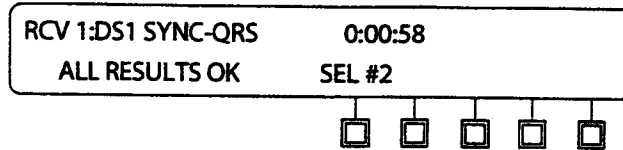
12. If the above screen does not show DS1 SYNC, verify the transmitter and receiver SET-UP.

13. To confirm loop up, transmit a single BIT errors from transmitter 1 using the ERROR INJECT key. Press the SUMMARY key. The display should indicate the number of errors you transmitted.

14. Change the stress pattern in the XMTR set-up (i.e. 3/24, 55 Octet - refer to step 6).

15. Press RESTART and then SUMMARY. The RCVR summary will display the new pattern sync.

NOTE: The in-band loop patterns are as follows:

	Loop Up	Loop Down
CSU	10000...	100100...
NI/Facility 2	11000...	11100...
NI/Facility 1	1100	1110

PART III: Using the Expanded Loopback Codes

NOTE: This section is only applicable if your 440B is equipped with option 13..

1. Depress the DS1 FACILITY LOOP up key. The screen reads:

```
┌─────────────────────────────────────┐
│ DEVICE:NI      CMD:FACILITY-2        │
│ [XMT#1]        EDIT FR < > GO __     │
└─────────────────────────────────────┘
        ■   ■   □   □   □
```

NOTE: Depress FR (F2) to change from a framed to an unframed loop code.

2. Depress EDIT softkey (F1). The screen reads:
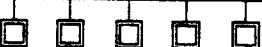
```
┌─────────────────────────────────────┐
│ DEVICE: CSU_NI WESTELL/RPTR PROGRAM  │
│ XEL/RPTR TELTREND/RPTR    < > ENTR   │
└─────────────────────────────────────┘
        □   □   □   □   □
```

3. Using the < > softkeys (F3 and F4) select: WESTELL/RPTR, XEL/RPTR, TELTREND/RPTR, depending on what type of devices are to be looped.

    a) If Westell repeaters are selected, the screen reads:

```
┌─────────────────────────────────────┐
│ WESTELL REPEATER TYPE:               │
│ <3150-56>        DN UP NXT           │
└─────────────────────────────────────┘
        □   □   □   □   □
```

    b) If Teltrend repeaters are selected, the screen reads:

```
┌─────────────────────────────────────┐
│ TELTREND REPEATER TYPE:              │
│ <AMERITECH>      DN UP NXT           │
└─────────────────────────────────────┘
        □   □   □   □   □
```

    c) If XEL repeaters are selected, the screen reads:
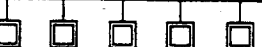
```
┌─────────────────────────────────────┐
│ XEL REPEATER TYPE:  7853  7854       │
│                  < > ENTR            │
└─────────────────────────────────────┘
        □   □   □   □   □
```

4. If Westell was chosen, using the DN and UP softkeys (F3 and F4) change the repeater type inside the <brackets> so that it reads the desired type. If Teltrend were chosen, using the DN and UP softkeys change the company inside the <brackets> so that it reads: AMERITECH, BELL ATLANTIC, PACIFIC BELL, US WEST, BELL SOUTH, or NYNEX, depending on which is desired. Then depress NXT softkey (F5).

    a) If Westell was chosen, the screen reads:

```
┌─────────────────────────────────────┐
│ DEVICE:WSTL/RPTR CMD:ARM-DSX         │
│ [XMT#1]        EDIT < > GO           │
└─────────────────────────────────────┘
        □   □   □   □   □
```

b) If Teltrend was chosen, the screen reads:

```
TELTREND REPEATER DIRECTION:
TEST SET SENDING FROM: DSX NI <  > NXT
```
☐ ☐ ■ ■ ■

NOTE: Use the < > softkeys to select either DSX or NI as appropriate, and then depress NXT softkey (F5). The screen reads:

```
DEVICE:TELT/RPTR  CMD:ARM
[XMT#1]       EDIT  <  > GO
```
☐ ☐ ☐ ☐ ☐

c) If XEL/RPTR was chosen, the screen reads:

```
XEL REPEATER TYPE:  7853  7854
                    <  > ENTR
```
☐ ☐ ■ ■ ■

(1) If 7853 Repeaters are equipped, depress ENTR; If 7854 Repeaters are equipped, go directly to Step (4) below:

```
LOOP UP DEVICE:XEL/RPTR  RPTR:0001:001
[XMT#1]       EDIT EXTND <  > NXT
```
■ ☐ ■ ■ ☐

(2) To change the 7853 Repeater Exchange and Location IDs, move the underline to RPTR:0001:001, depress EDIT, and use the keypad to enter the desired ID digits:

```
LOOP UP: EXCH  LOC       XMT#1
XEL/RPTR 0001  001      <  > NXT
```
☐ ☐ ☐ ☐ ■

(3) Depress NXT, and then GO, to send the loop up command:

```
LOOP UP DEVICE:XEL/RPTR  RPTR:00001:001
[XMT#1]       EDIT EXTND <  > GO
```
☐ ■ ☐ ☐ ■

NOTE: Depress EXTND to send a command to extend the loop up interval another 30 minutes.

(4) If 7854 Repeaters are equipped, move the underline to 7854 and depress ENTR:

```
LOOP UP DEVICE:XEL/RPTR
[XMT#1]  RPTR#:1  EDIT  <  > GO
```
☐ ☐ ■ ■ ☐

(5) To change the 7854 Repeater number, move the underline to RPTR#; the screen now reads:

```
LOOP UP DEVICE:XEL/RPTR
[XMT#1]  RPTR#:1  UP  DN  <  >  GO
```

(6) Using the DN and UP softkeys (F1 and F2), select the desired 7854 Repeater number (1 to 19). Depress GO to send the loop up command.

5. If Westell or Teltrend repeaters were chosen, using the < > softkeys (F3 and F4) move the underline to CMD. Depress EDIT softkey (F1).

a) If Westell was chosen, the screen reads:

```
COMMAND: ARM-DSX  ARM-CPE  LINE  OFFICE
  LOOPBACK-QUERY  SEQUENTIAL  <  >  NXT
```

b) If Teltrend was chosen, the screen reads:

```
COMMANDS: ARM  LINE  OFFICE  QUERY
  F-T1  ALT-QUERY  PWR-QUERY  <  >  NXT
```

6. Depress NXT (if appropriate) to access the other commands in the menus. The following commands are included in these menus:

a) **WESTELL/RPTR:**
   - ARM-DSX: Arming code, for testing from the DSX-1
   - ARM-CPE: Arming code, for testing from the CPE
   - LINE: Line repeater loop codes
   - OFFICE: Office repeater loop code
   - LOOPBACK-QUERY: Repeater loopback query
   - SEQUENTIAL: Sequential line repeater loop codes
   - POWER-QUERY: Power verification query
   - T/O-DISABLE: Loopback time-out disable code
   - PROG1: 16 bit user programmable code
   - PROG2: 16 bit user programmable code

b) **TELTREND/RPTR:**
   - ARM: Arming code
   - LINE: Line repeater loop codes
   - OFFICE: Office repeater loop codes
   - QUERY: Repeater loopback query (Logic Error method)
   - F-T1: Clears FT1 office repeater for T1 operation
   - ALT-QUERY: Repeater loopback query (AIS method)
   - PWR-QUERY: Open power loopback code
   - T/O DISABLE: Loopback time-out disable code
   - PWR-CUT-THRU: Repeater span power cut-thru code
   - POWER DOWN: Remove span power

5. To select the fractional T1 loop DOWN code, depress the DS1 FACILITY LOOP ▼ key. Verify the screen reads:

```
F-T1 V.54 LOOP DOWN          [XMT#1]
                GO
```
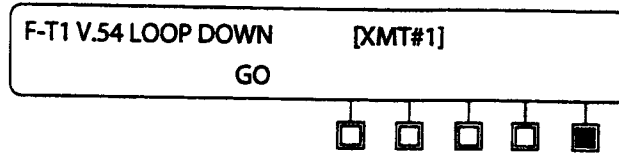
6. To send the loop down code, depress the GO softkey (F5). The pattern will be transmitted for approximately 5 seconds. To verify that the Loop Down was accomplished, after five seconds have elapsed, look at the SYNC LED on Receiver 1; it should be off.
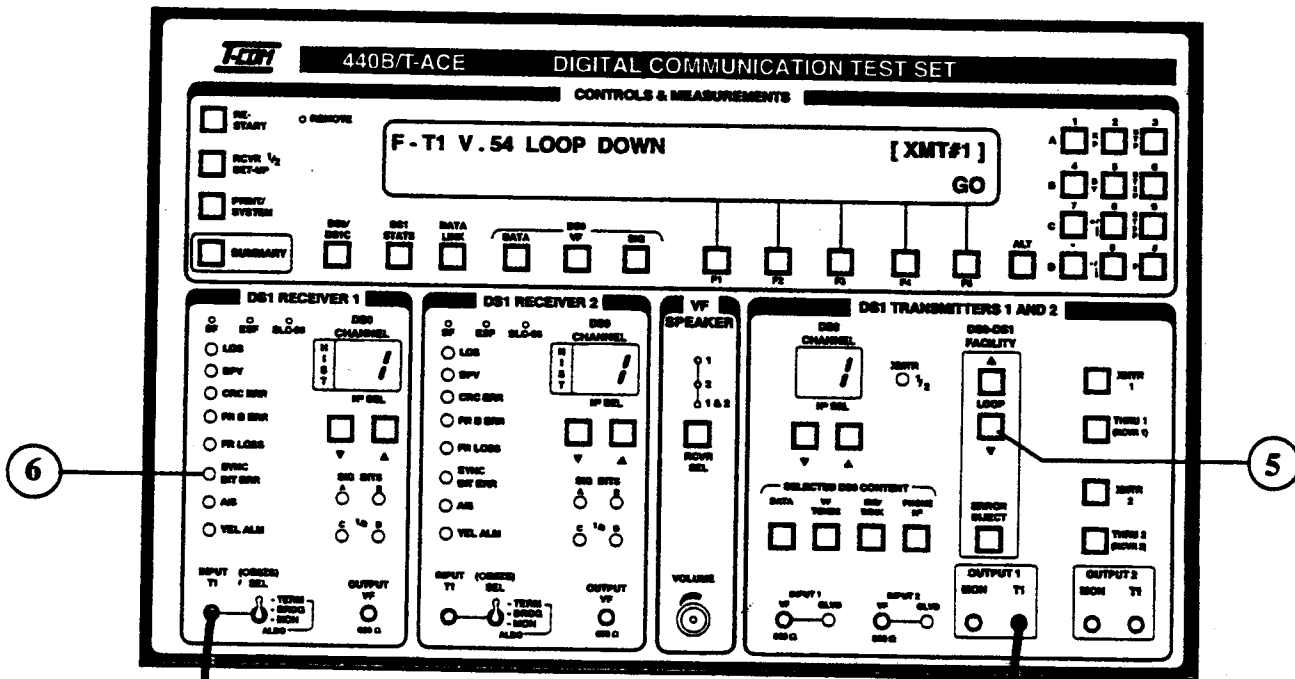
GENERAL

The 440B/T-ACE provides the ANSI/V.54 loop up code for looping a fractional T1 CSU. To access this code, the transmitter under test must be in the fractional T1 mode.

SET-UP

1. Connect the Transmitter 1 T1 OUTPUT jack to the DSX-1 line input jack. Connect the Receiver 1 INPUT T1 jack (with the SEL switch in the TERM position) to the DSX-1 line output jack.

2. Depress the DS1 FACILITY LOOP ▲ key. The screen should now read:

> F-T1 V.54 LOOP UP   [XMT#1]
>
>   GO
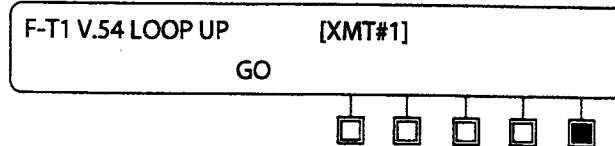
SENDING LOOP CODES

3. To send the selected loop UP pattern, depress the GO softkey (F5). If loopback is accomplished, Loopback Acknowledgment Received will ber displayed for 5 seconds.

4. To verify that the loop back was accomplished, depress the green RESTART key and SUMMARY. The SYNC LED on Receiver 1 should be green and the screen should read:

> RCV 1:F-T1 SYNC (****)   0:00:00
>
>   ALL RESULTS OK   GO
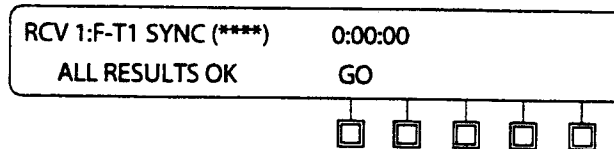
NOTE: *** Indicates pattern being received, which should be the same as the pattern being transmitted.
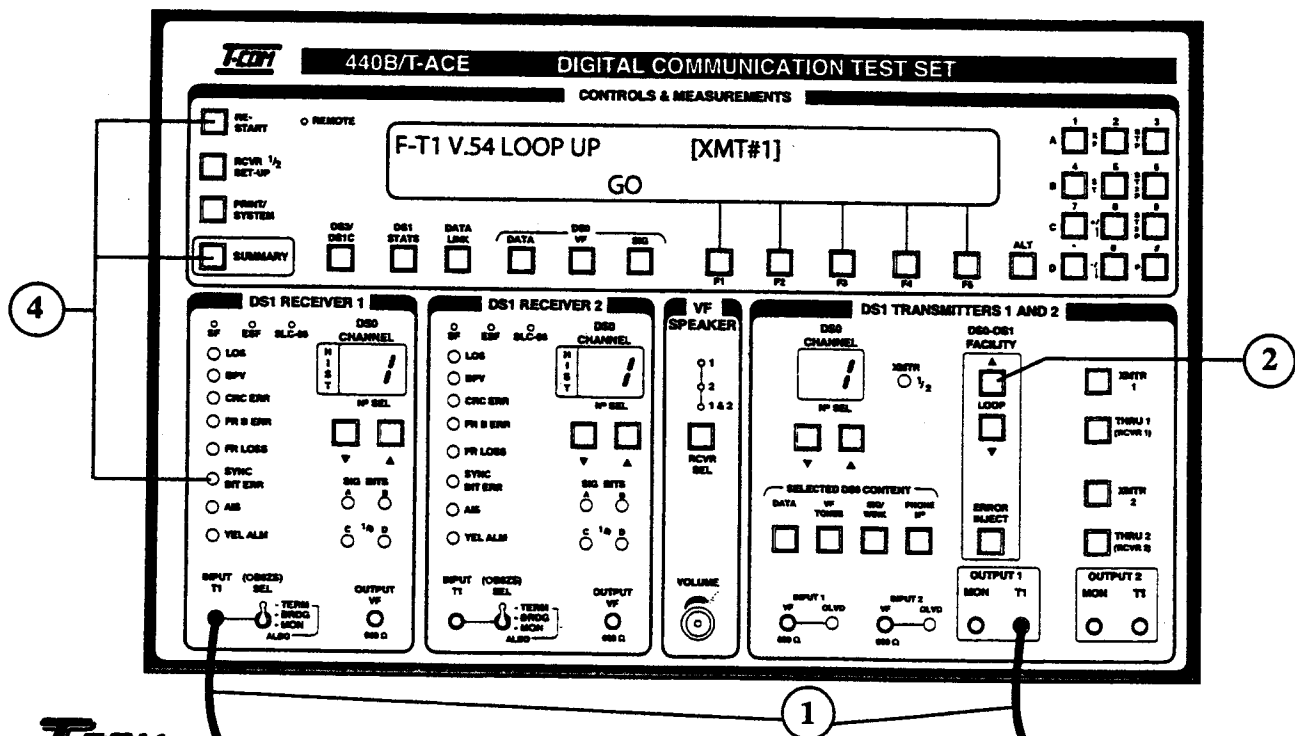
5. To select the fractional T1 loop DOWN code, depress the DS1 FACILITY LOOP ▼ key. Verify the screen reads:

> F-T1 V.54 LOOP DOWN   [XMT#1]
>
>   GO

☐ ☐ ☐ ☐ ■
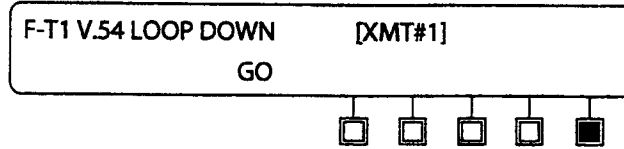
6. To send the loop down code, depress the GO softkey (F5). The pattern will be transmitted for approximately 5 seconds. To verify that the Loop Down was accomplished, after five seconds have elapsed, look at the SYNC LED on Receiver 1; it should be off.
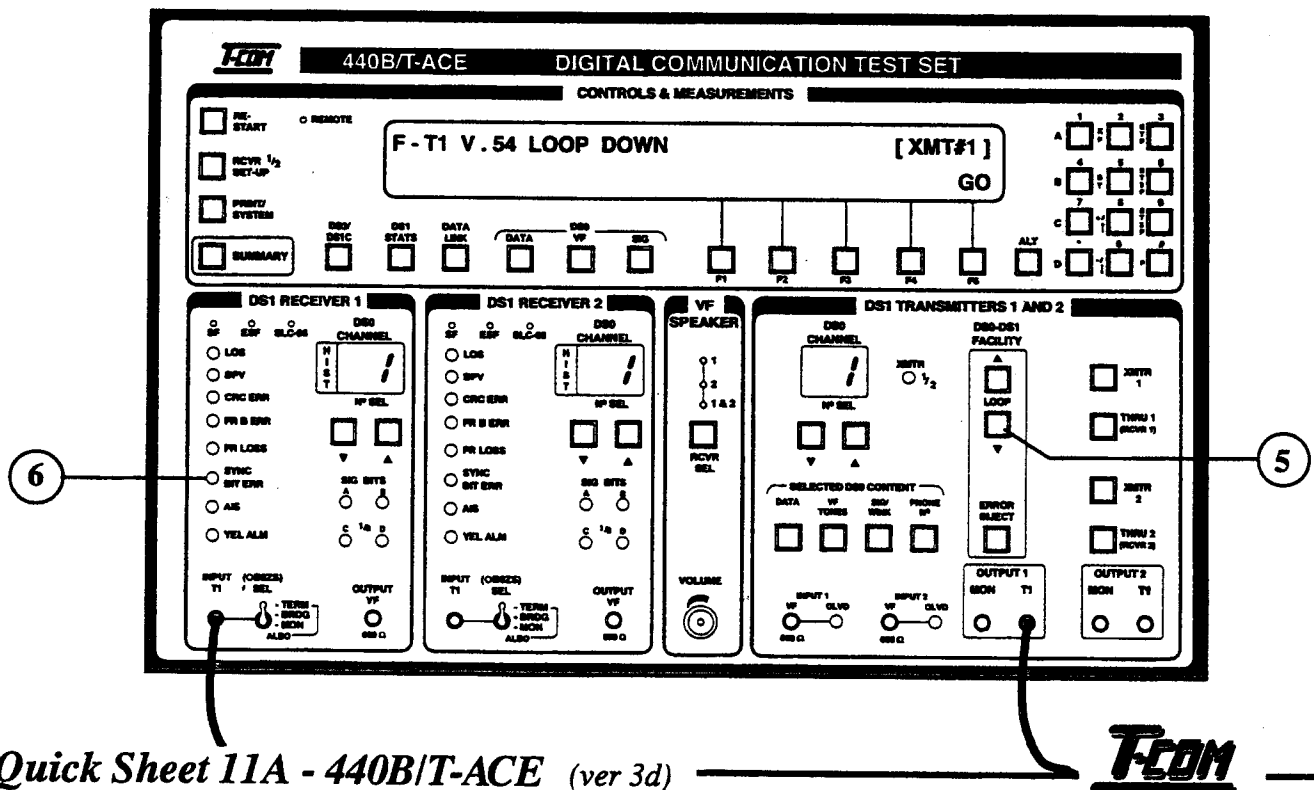
The 440B provides dual-direction, drop-and-insert access, for testing DS0A/B Data, Voice, and Signaling facilities.

Drop-and-Insert is a method of accessing a live T1 circuit, to test an individual DS0 channel, without dropping the remaining 23 DS0 channels. In some cases, the T1 circuit is already turned up, and carrying live traffic, but no direct DS0 channel access exists to trouble-shoot channel problems. Rather than turn down the complete T1 circuit, Drop-and-Insert provides an ideal test option.

The 440B offers full DS0 circuit testing capabilities, including Voice (frequency, level measurement), Signaling (telephone number, Wink analysis)(Figure A) and DATA (DS0A/B loopback and MJU test) (Figure B).

NOTE: Before attempting Drop-and-Insert (THRU) testing, it is important to fully understand the complete test set-up. Improper patchcord configuration can interrupt the T1 circuit and therefore drop all 24 DS0 channels. If you are uncomfortable with this method of testing, but feel you have an important application, feel free to call the T-COM Technical Assistance Department at (650) 964-3415.

Figure A: Testing an individual FX circuit towards a Digital Switch
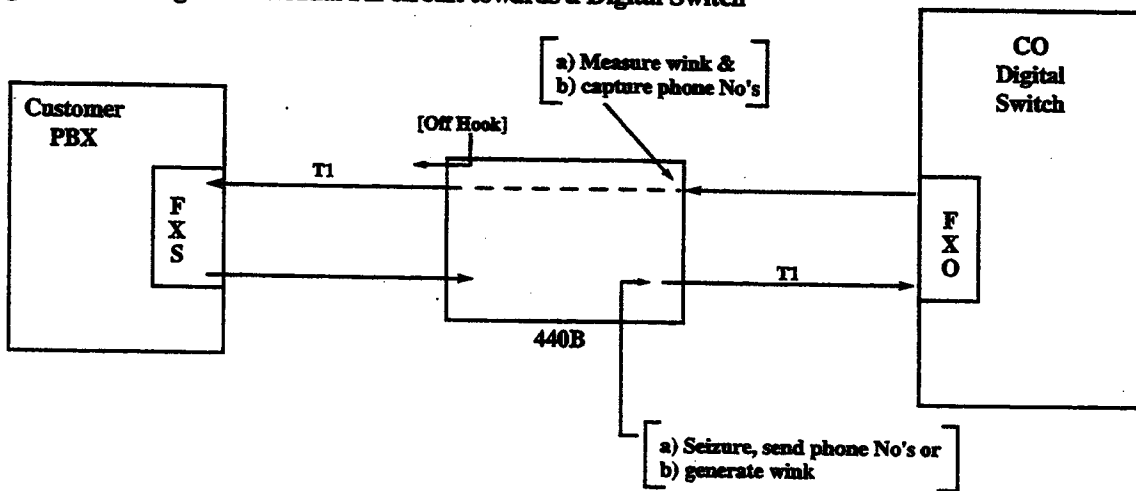
Figure B: DS0A Loopback Testing from the T1 circuit
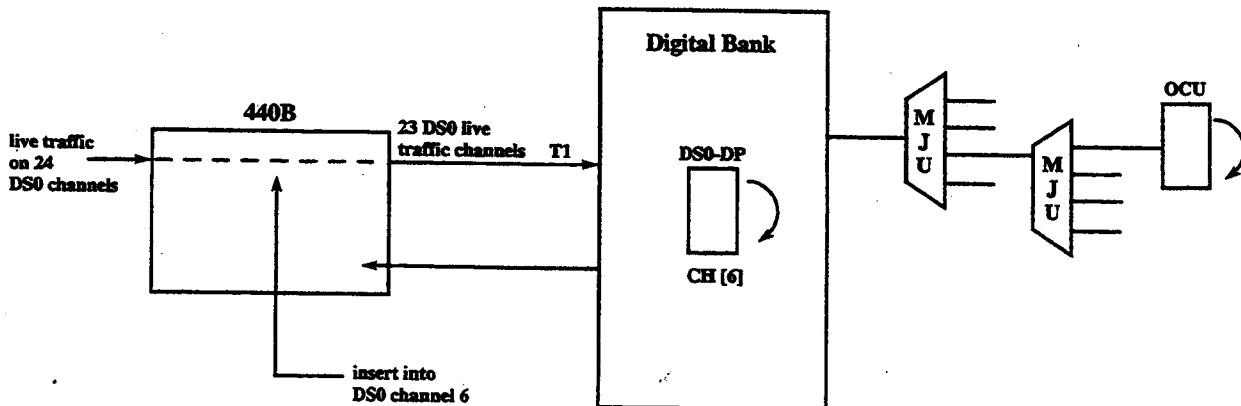
Patching the test set into a circuit

A. Patch the T1 (LINE) DSX Monitor output into Receiver 1 (RCVR 1). This signal will pass THRU Transmitter 1 (**THRU 1**).

B. Press the THRU key to pass the T1 signal presented to the RCVR 1 on through to the T1 Output 1 (red) jack.

C. Patch the Output from Transmitter 1, into the T1 (EQUIPMENT) DSX IN jack. *It is critical that the 440B be in THRU mode (see step 1). This step involves breaking the circuit very briefly, so it must be done quickly and correctly. When done correctly customer traffic will not be dropped.*

The 440B is now directly in the T1 circuit, but passing all traffic THRU. Since you will likely be looping back a specific DS0 channel within the T1 circuit, you need to monitor the return path from the T1 (EQUIPMENT) DSX Monitor jack. This step will not interrupt the circuit.

D. Patch from the T1 (EQUIPMENT) DSX Monitor jack to the 440B Receiver 2 input jack. Verify that the toggle switch is set to MON position.

E. It is strongly recommended that a 100 Ohm termination plug be inserted into the T1 (LINE) DSX OUT jack at the same time as step C. (*When removing all patchcords, the termination plug must be removed from the DS1 IN jack first and then the cord is to be removed.*)
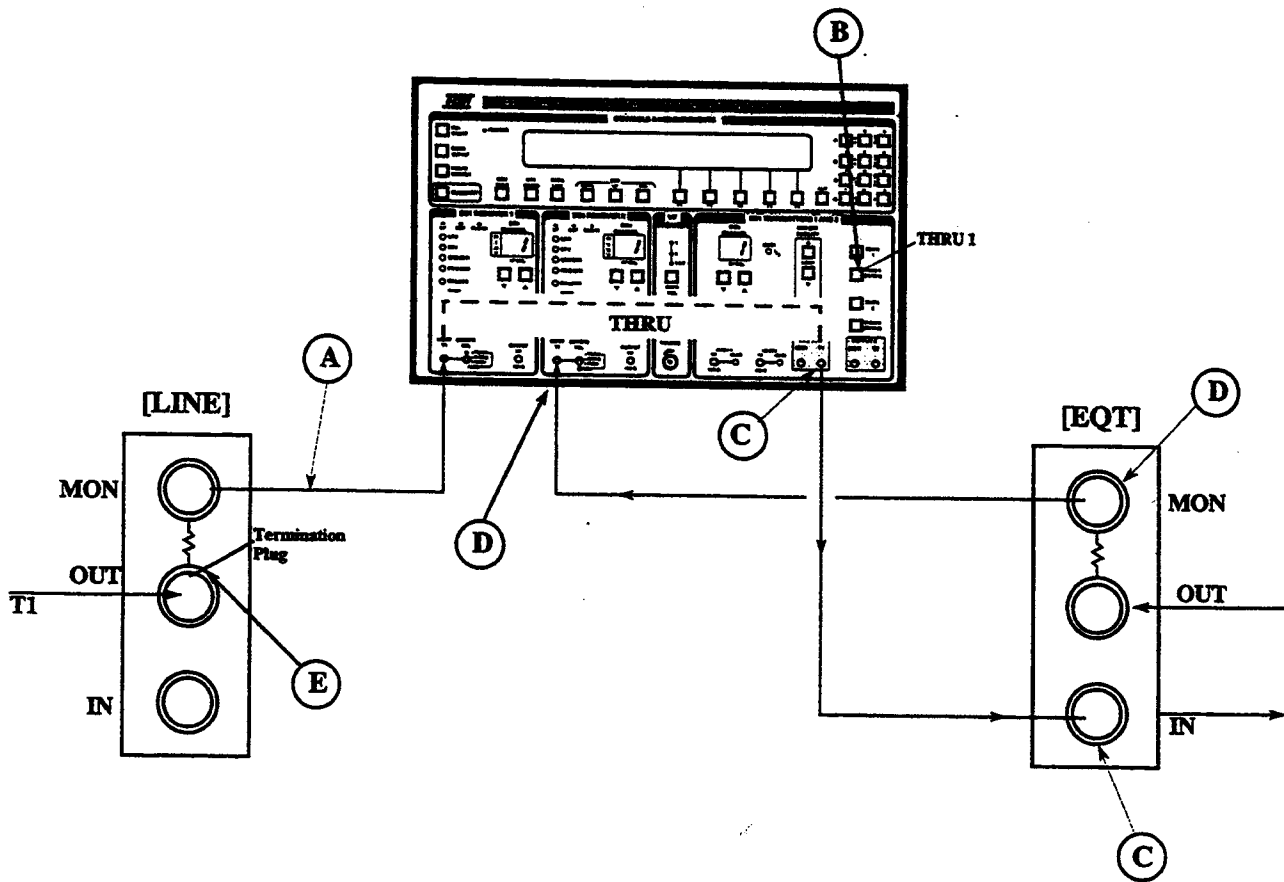
Remark

The drop-and-insert mode can be used for substituting the content of either a single DS0 channel or a set of channels as in the case of fractional T1 (F-T1). This Quick Sheet covers the single DS0 channel substitution; the Quick Sheet 12A covers the fractional T1 channel(s) substitution.

Inserting into an individual DS0 Channel

Before pre-empting a DS0 channel, it is important to first verify the XMTR set-up and, if necessary, to change it. To this end, proceed as follows.

1. Press the XMTR 1 key to display the root XMTR menu:

```
MODE:CHAN-VF/IDLE    FRAME:SF-D3/D4
CODE:AMI  CLK:INT  DL:N/A  <  > EDIT
```
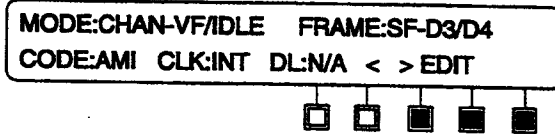
If the MODE selection is CHAN-VF/IDLE or CHAN-VF/TONE, proceed to step 3, alternatively:

2. Edit the screen by underlining the MODE selection with the < > keys and press EDIT; the following menu screen is displayed:

```
XMT MODE:  T1  CHANNELIZED  FT1
#1                 <  > NXT
```
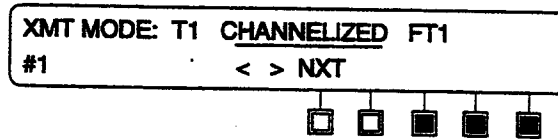
Underline CHANNELIZED with the < > keys and

3. Press the THRU 1 key to display the THRU 1 menu screen:

```
XMT THRU MODE:DS0(CHAN 01)    DL: ESF
#1            NOT INSERTED  <  > EDIT
```
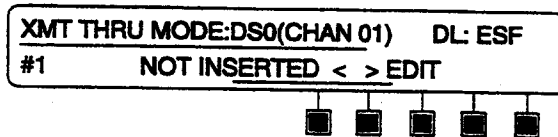
Notes:
– The DL:ESF header is only shown if the DS1 signal applied at RCVR 1 has the Extended Superframe Format (ESF).
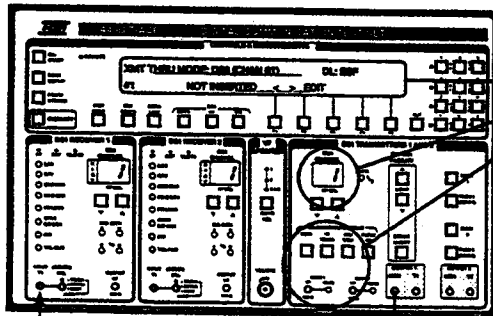
Inserting DATA/VF Tones, Phone No's, Winks into the selected channel. The "Other" 23 channels are passing through.

- The (CHAN 01) reflects the DS0 channel number selected in the transmitter section.
- The DS0 channel selection is not active at this point as reflected by the NOT INSERTED status. Depressing F1 or F2 causes the selection to become active; this condition is reflected by the flashing INSERTED status (replacing the NOT INSERTED status).
- While the selection is active, it is possible to change the selected DS0 channel number. However, to avoid inadvertently disrupting the traffic on another channel, the selection is de-activated upon the change and this is declared by posting for a few seconds the following screen:

> DSO CHANNEL HAS CHANGED -
> DS0 IS NO LONGER INSERTED
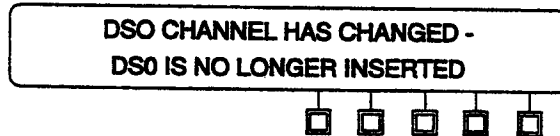
4. When the DS0 selection is active, you can perform the intended tests in that channel by appropriately selecting from any of the following menus: LOOP UP, LOOP DOWN, DATA, VF TONES, PHONE No or ERROR INJECT.

5. For example, when testing the transmission integrity in a looped DS0 data channel, as illustrated by the figure below, press the SUMMARY key and select the RCVR 2 screen:

> RCVR 2:DS0A 9.6 SYNC-2047   0:16:12
> ALL RESULTS OK   SEL #1
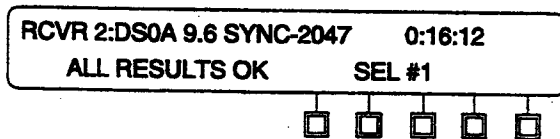
6. Since you are testing the DS0 traffic being transmitted from XMTR 1 through the loop and back to RCVR 2, you will be observing the pattern SYNC LED on Receiver 2 and the SUMMARY screen results for RCVR 2.

SUMMARY screen for RCVR 2

DATA inserted

SYNC

T1

T1

DS0 looped

7. When setting up LOOP Up/Down commands, remember to select the RESPONSE on RCVR #2, by toggling the F3 softkey (the same holds true for MJU testing).

```
LOOP DS0 DEVICE: OCU-LATCHED    [XMT#1]
UP        RESP ON RCVR: #2   SEL #1
```

Getting out of the INSERT mode

Press the THRU 1 key to display the THRU 1 screen:

```
XMT THRU MODE: DS0 (CHAN 01)    DL: ESF
#1            NOT INSERTED  <  > EDIT
```

Use the F1 or F2 softkeys to toggle back to NOT INSERTED. All 24 DS0 channels are now passing THRU the test set, uninterrupted.

Again, changing the transmitter's DS0 channel number automatically reverts the transmitter THRU mode to NOT-INSERTED.

Removing the Patchcords

In order to remove the patchcords without interrupting the traffic, always try to remove the termination plug first and then the patchcord from the T1 (EQUIPMENT) DSX IN jack. (The remaining two patchcords are patched to DSX monitor jacks, so they are not traffic affecting.)

7. When setting up LOOP Up/Down commands, remember to select the RESPONSE on RCVR #2, by toggling the F3 softkey (the same holds true for MJU testing).

```
┌─────────────────────────────────────────────┐
│ LOOP DS0 DEVICE: OCU-LATCHED    [XMT#1]       │
│ UP          RESP ON RCVR: #2   SEL #1         │
└─────────────────────────────────────────────┘
        □    □    □    □    □
```

Getting out of the INSERT mode

Press the THRU 1 key to display the THRU 1 screen:

```
┌─────────────────────────────────────────────┐
│ XMT THRU MODE: DS0 (CHAN 01)   DL: ESF        │
│ #1          NOT INSERTED  <  > EDIT           │
└─────────────────────────────────────────────┘
        ■    ■    ■    ■    □
```

Use the F1 or F2 softkeys to toggle back to NOT INSERTED. All 24 DS0 channels are now passing THRU the test set, uninterrupted.

Again, changing the transmitter's DS0 channel number automatically reverts the transmitter THRU mode to NOT-INSERTED.

Removing the Patchcords

In order to remove the patchcords without interrupting the traffic, always try to remove the termination plug first and then the patchcord from the T1 (EQUIPMENT) DSX IN jack. (The remaining two patchcords are patched to DSX monitor jacks, so they are not traffic affecting.)

Fractional T1 Drop-and-Insert

The 440B also supports F-T1 drop-and-insert. The patchcord set-up will be the same as described in the DSO Drop-and-Insert (Quick Sheet 12).

However, when working with F-T1 you can insert into several 56Kb/s or 64Kb/s DSO channels simultaneously. Before attempting this drop-and-insert, it is important to understand how to configure the 440B correctly for F-T1 (Refer to RECEIVERS and TRANSMITTERS).

There are six basic steps involved for F-T1 Drop-and-Insert:
   a) Determine which DSO channels you want to insert into,
   b) Verify which DSO channels the transmitter will insert into, as well as the stress pattern chosen,
   c) Monitor the T1/F-T1 circuit,
   d) Place the Transmitter into the THRU mode (NOT-INSERTED),
   e) Patch into the DSX IN jack, and
   f) Insert into the selected channels.

Generally, you will use the Receiver 1 to monitor the circuit, and pass the full DS1 on THRU to the Transmitter 1 T1 Output jack. Receiver 2 will then be LOCKED TO XMTR 1, since you will likely be testing the return circuit path (see Figure A).

Figure A

THRU 1

Channels
1

24

Insert into Channels 1, 2, 3
Pass other 21 DSOs THRU

Channels

QRS

24
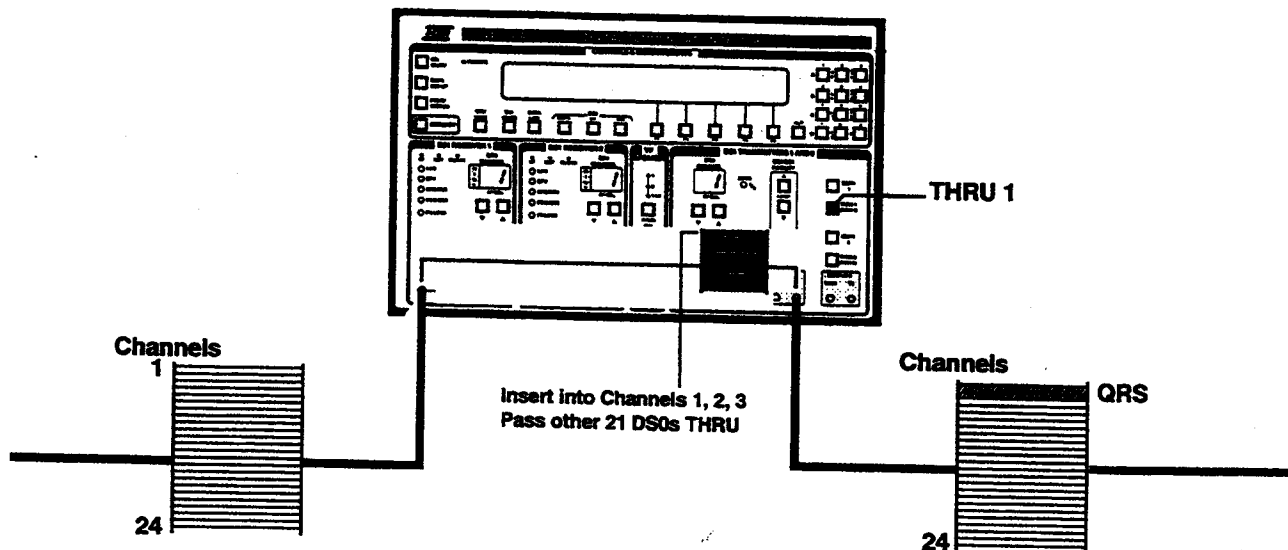
Setting Up the Fractional T1 Drop-and-Insert mode

1. Patch from the DSX Monitor jack into the Receiver 1 input. Verify that the SEL toggle switch is set to MON.

2. Press the XMTR 1 key to display the Set-Up screen:

> MODE:T1 PAT:QRS FRAME:SF-D3/D4
>
> CODE:AMI CLK:INT DL:N/A < > EDIT

3. Underline MODE and press EDIT to display the menu:

> MODE: T1 CHANNELIZED F-T1
>
> #1   < > NXT

4. In the screen above, underline F-T1 and press NXT to display the DS0 channel map below.

> $1234567891_01234567892_01234$ FRACTIONAL
>
> DS0s

LINE

MON

OUT

IN

100 OHM
Termination
Plug

EQUIPMENT

MON

OUT

IN
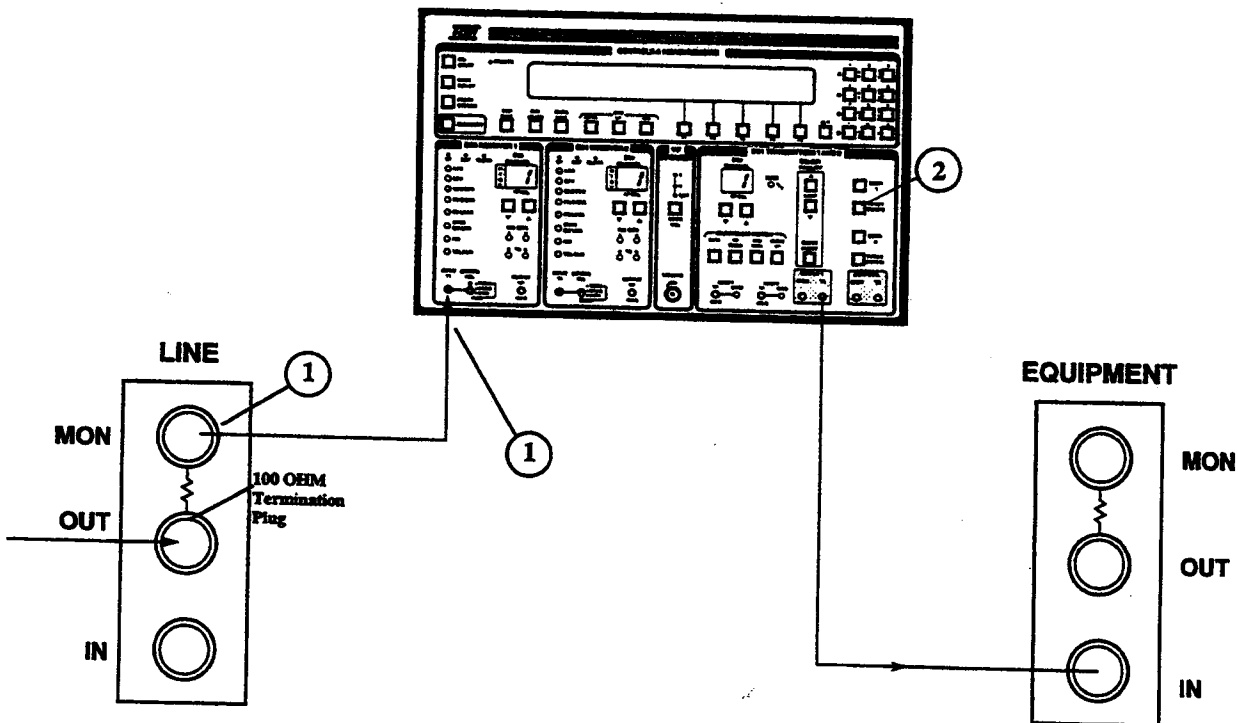
In the screen below the numbers represent channels 1-24. A 1 under the channel number means this channel is selected as part of the "Fractional T1". These will become the channels to be inserted with a stress pattern. The unit inserts the stress pattern "across" the bandwidth, not individually into each channel. If the channels are not aligned perfectly through the network, bit errors will be observed.


```
(a)──── 1234567891₀123456789²₀1234 FRACTIONAL
         DS0s
```
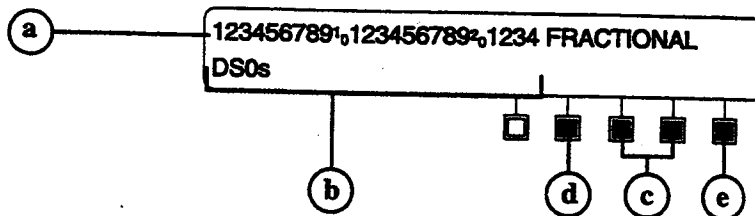
a) The top row represents channels 1-24.
b) A 1 under channels 1,2,3 mean that these DS0's will have a stress pattern inserted (across them). A 0 represents the channels that will pass thru when THRU is pressed.
c) Use the < > and the keypad to enter 1 or 0 in the desired channels.
d) Use the F2 softkey to toggle between 64Kb/s or 56Kb/s.
e) Since we will pass the "other" channels THRU, the NXT screen for defining the "Idle" byte does not apply.

5. Scroll to the main screen with NXT, or press the XMTR key to display the current Set-Up (which now shows MODE:FT1)

```
MODE:FT1 PAT:QRS  FRAME:ESF
CODE:AMI  CLK:INT  DL:ESF  <  > EDIT
```
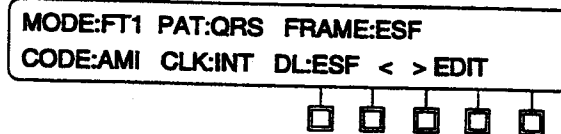
6. Assuming the above screen reflects the stress pattern (QRS) you want to insert in the Fractional T1, as well as the Frame (SF-D3/D4), and Line Code, etc...you are ready to go into the THRU configuration.   NOTE: When in THRU mode both transmitter frame type and line code are set by the receiver based on the received signal. The clock is also recovered wehn in the thru mode. Setting them in this step is academic.

7. Press THRU 1 key. This will pass the full DS1 bitstream from the DSX Monitor jack to the OUTPUT 1 T1 jack.

8. Patch the T1 OUTPUT 1 jack to the DSX IN jack as described in the DS0 Drop-and-Insert (Quick Sheet 12), and use the recommended 100 Ohm termination plug.

9. The THRU screen displays:

```
XMT THRU MODE:FT1(1₀0₀0₀0₀0₀0₀0₀0₀0₀0₀0₀) DL:ESF
#1          NOT INSERTED  <  > EDIT
```
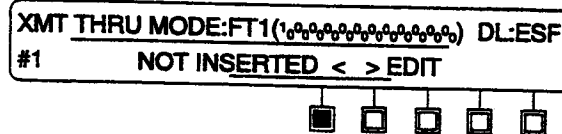
10. The previous screen shows F-T1 underlined, with a condensed channel MAP showing which channels will be inserted when the F1 softkey is pressed. (The top row represents the Odd numbered channels, and the bottom is for Even numbered DS0 channels. 1's mean "selected", while 0's mean the channel will pass THRU.)

11. Press the F1 softkey to toggle to INSERTED, which will insert the QRS pattern across the three selected channels.

The selected DS0 channesl and stress patterns may be changed while in the THRU mode.

```
┌─────────────────────────────────────────────┐
│ XMT THRU MODE:FT1(1,1₀₀₀₀₀₀₀₀₀₀₀₀) DL:ESF   │
│ #1        NOT INSERTED <  > EDIT             │
└─────────────────────────────────────────────┘
        □   □   □   □   ■
```

12. Press EDIT to display the following screen:

```
┌─────────────────────────────────────────────┐
│ XMT THRU MODE: DS0 FT1                        │
│ #1              <  > EDIT                      │
└─────────────────────────────────────────────┘
        □   □   □   □   □
```
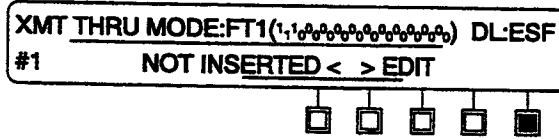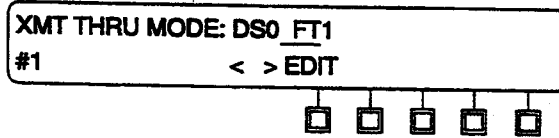
This screen allows the user to switch between DS0 and FT-1 while in the THRU mode.

13. Underline FT-1 and press EDIT. Underline the DS0 to be changed in the screen below and select by using the keypad to enter a 1 or 0.

```
┌─────────────────────────────────────────────┐
│ 123456789₁₀123456789₂₀1234 FRACTIONAL        │
│ DS0s                                          │
└─────────────────────────────────────────────┘
        □   □   □   □   □
```
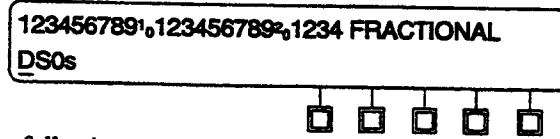
14. Press NXT to display the following screen and underline the desired pattern or use NXT to select from other pattern options.

```
┌─────────────────────────────────────────────┐
│ FT1 3/24 1/8 1/1 QRS 55-OCT MINMAX TRIP      │
│ #1              <  > NXT              __      │
└─────────────────────────────────────────────┘
        □   □   □   □   □
```
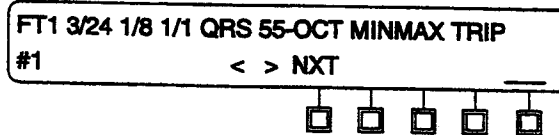
NOTE: It is easiest to configure the Receiver 2 Set-Up MODE as LOCKED to XMTR 1, since the DS0 channels will automatically match. Though, you can configure the receiver to BERT on the "other" channels by setting it up independently. Likewise, you can also configure Receiver 1 independently, thereby performing a stress test on the pattern received originally, as well as the new inserted stress pattern sent by Transmitter 2 (Figure B).

Figure B: BERT on both Received F-T1 patterns

GENERAL

The 440B/T-ACE supports drop and insert testing of the ESF data link. This capability allows the user to insert ESF data link messages to replace the messages that would otherwise pass through the test set.

SET UP

IMPORTANT NOTE: Before attempting this test, read the following procedures carefully to avoid mistakes, *some of which could interrupt the service on all 24 DS0 channels*! If done properly, only a few milliseconds of data can be lost when this test is performed.

1. First, decide the direction into which the ESF data link test signal will be inserted.

NOTE: Normally, the direction of test at the DSX-1 is from the LINE toward the EQUIPMENT. This procedure assumes this fact. If otherwise, this procedure needs to be modified accordingly.

2. Connect a patch cord from the 440B's DS1 Receiver 1 INPUT T1 jack (SEL in MON position) to the DSX-1 LINE MON jack. Connect a patch cord from the 440B's DS1 Receiver 2 INPUT T1 jack (SEL in MON position) to the DSX-1 EQUIP MON jack. Verify that all the red LED's on both receivers are out.

IMPORTANT NOTE: If any red LED's are on, stop the test and clear the problem(s) before proceeding.)

3. Press the DS1 SET-UP THRU 1 key. Verify that this key continues to flash after it is released, and the screen reads:

> XMT THRU MODE:DS0(CHAN 01)   DL: ESF
>
> #1   NOT INSERTED < > EDIT
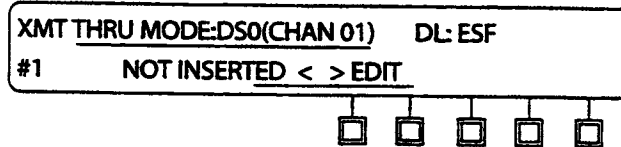
NOTE: "DL:ESF" indicates ESF framing is being received.
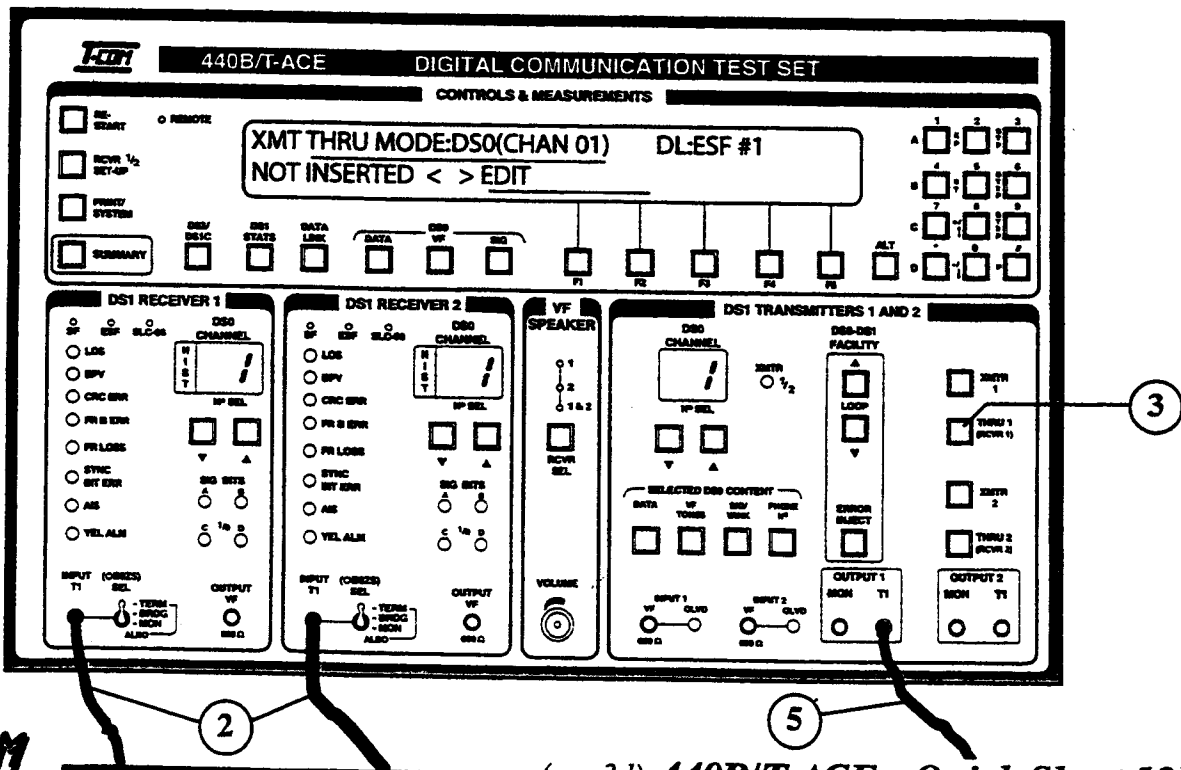
ESF Data Link
Drop and Insert

1. Use the < or > softkeys (F3 and F4) to the underline to DL:ESF:

```
┌─────────────────────────────────────────────┐
│ XMT THRU MODE:DS0(CHAN 01)     DL: ESF _____  │
│ #1           NOT INSERTED <  > EDIT           │
└─────────────────────────────────────────────┘
        ☐    ☐    ☐    ☐    ☐
```
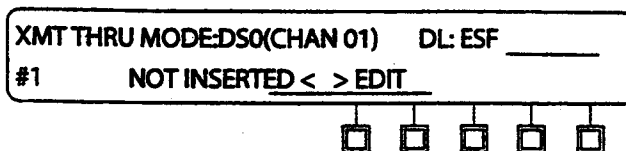
IMPORTANT NOTE: The next step involves breaking the circuit very briefly, so it must be done quickly and correctly.

5. Connect a patch cord from the 440B's Transmitter 1 OUTPUT 1 red T1 jack to the DSX-1 EQUIP IN jack and insert a 100 Ohm termination plug into the DSX-1 LINE OUT jack at the same time. The 440B is now in series with the working circuits passing through the test set, so be very careful from this point onward.

NOTE: Although it may not be absolutely necessary, it is recommended that the DSX-1 LINE out jack output (normally from the T1 office repeater) be terminated while the test is in progress. If this plug is used, remember to remove it before you disconnect the patch cord form the DSX EQUIP IN jack.

INSERTING INTO THE DATA LINK

NOTE: Before inserting a data link message, verify if any data link messages are being received on Receiver 1 by pressing the DATA LINK key. Refer to Quick Sheets 7 and 7A for the procedures to follow to read data link messages.

6. If not already flashing, depress the Transmitter 1 THRU 1 key.

```
┌─────────────────────────────────────────────┐
│ XMT THRU MODE:DS0(CHAN 01)     DL: ESF _____  │
│ #1           NOT INSERTED <  > EDIT           │
└─────────────────────────────────────────────┘
        ☐    ☐    ☐    ☐    ☐
```
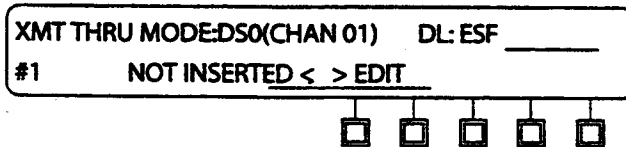
7. To insert data link messages, depress the F1 softkey and the NOT INSERTED on the screen will change to INSERTED, which will flash as long as the insertion is taking place. (To stop the insertion, depress F1 again.)

8. To change the data link message, while INSERTED is flashing, press EDIT (F5) and the data link menu screen will appear. Refer to Quick Sheet 7 and 7A for the procedures to follow to change the data link messages.

ENDING THE DROP AND INSERT TEST

9. When the test is completed, you can remove the plugs and patch cords, but remember to remove them in reverse order.

10. To get the 440B DS1 SET-UP out of the THRU 1 mode, first depress the THRU 1 key, then quickly press the XMTR 1 key. (Turning the power off also disables the THRU mode.)

In order to offer maximum flexibility and customization, several miscellaneous configuration menus are combined under this single function key. Generally, these configurations will be set once, and rarely changed. The following list describes some of the choices provided by the PRINT/SYSTEM function key.

The PRINT/SYSTEM Configuration Flow Chart in the tab section "Flow Charts/Appendices" provides additional details.

Press the PRINT/SYSTEM key to display the root menu screen below:
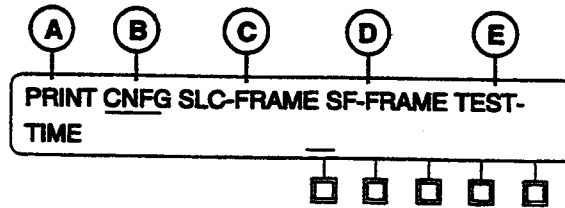
- A. PRINT Test Results

DS1 SUMMARY REPORT
DS1 RECEIVER STATUS
DS1 ANSI PRM SUMMARY
† DS3/DS2 SUMMARY REPORT
† DS3/DS2 STATUS

* STS-1/DS3 SUMMARY
* STS-1/DS3 STATS
* SONET OVERHEAD

† When the instrument is equipped with the 52B+option.
* When the instrument is equipped with the 52C option.

- B. CONFIGURATION (CNFG)

1	AUTO SEARCH	ON	
2	ERROR INJECT	AUTO	
3	BEEPER	OFF	
4	RESTORE DEFAULTS	NO	
5	TEST PROTECTION	OFF	
6	AUTO THRU	OFF	
7	DS1 AIS	UFR ONLY	
8	> 15 0'S CNTR	SYNC L	
9	YEL ALM IN PRINT	NO	
10	OPT 3 CLK-SRC	COMB	
11	ERRORED SEC CALC	USA	
12	64K CLOCK INPUT	TERM	
13	DDS LOOP-BACK	EXT	
14	SUMMARY IN RC	YES	
15	DS3 X-BIT VALUE:	1	(52B+/52C only)
16	52B+/52C DS1 Output	AMI	(52B+/52C only)
17	DS3 AIS IS:	AT&T	(52B+/52C only)
18	DS3 REFRAME IS:	AT&T	(52B+/52C only)

- C. SLC-96 channel sequence (D3/D4, D1D)

- D. SF channel sequence (D3/D4, D2, D1D)

- E. Timed Test Set-Up (Continuous, Selectable)

First Root Screen:

```
PRINT CNFG SLC-FRAME SF-FRAME TEST-
TIME
```
☐ ☐ ☐ ☐ ■
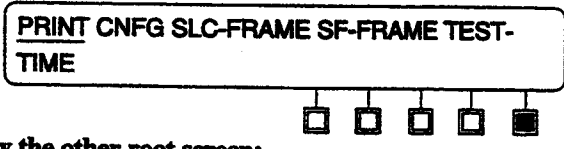
Press MORE [F5] to display the other root screen:

Ⓕ   Ⓖ   Ⓗ   Ⓘ

Second Root Screen:
```
TIME/DATE  SW  RS-232-C  ACTIVITY TIMER
ACTIVITY TIMER= 1 min. SET  <  >MORE
```
☐ ☐ ☐ ☐ ■
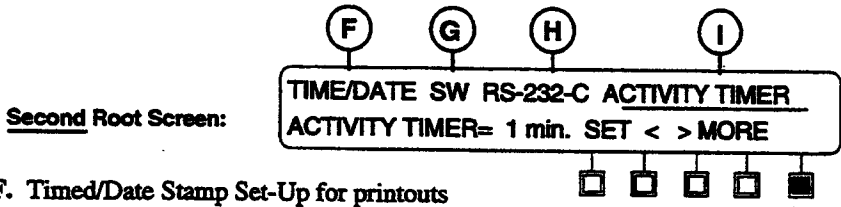
- **F.** Timed/Date Stamp Set-Up for printouts

- **G.** Software Version Identification (ID)

- **H.** RS-232-C port configuration

- **I.** Timed Interval Printing Set-Up

Press MORE to return to first screen.

USING the PRINT/SYSTEM MENUS

Because there are such a large variety of configuration options, the PRINT/SYSTEM menu screens may seem a little complex at first. However, once the structure is understood, you will find it easy to use.

1. Press the PRINT/SYSTEM key to display the first opening screen (of two). The top row consists of a list of main Titles. Each Title has a series of sub-titles (on the bottom row) that can be changed by toggling between choices or edited. CNFG (Configure) contains the longest list of items.

For example, to turn the Error Beeper ON:

1. Use the < > softkeys to underline CNFG.
2. Press NXT (F2) to scroll through Sub-titles until 5. BEEPER OFF is displayed.
3. Turn the error BEEPER ON or OFF by toggling the F1 softkey.

Underline Titles ——————
Selected Subtitles ——————
```
PRINT CNFG SLC-FRAME SF-FRAME TEST-
TIME
```
☐ ☐ ☐ ☐ ☐
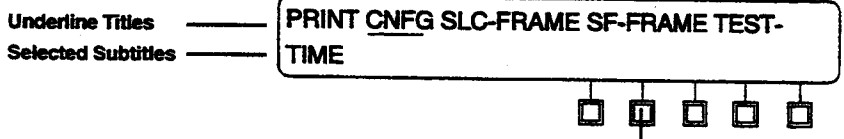
└———— **Use NXT to scroll through titles**
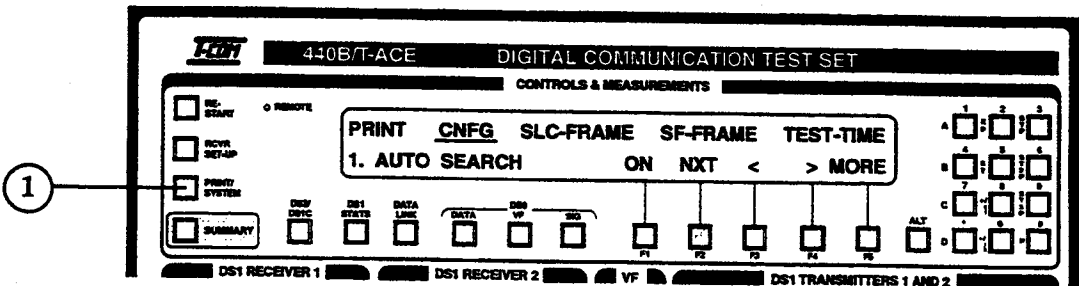
2. Press the MORE softkey (F5) to display the second root screen. Again, the top row lists main titles, while the bottom row shows the selections for the title underlined and commands.

Titles ————→ | TIME/DATE SW RS-232-C ACTIVITY TIMER |
Subtitles ————→ | ACTIVITY TIMER= 1 min. SET < > MORE |

□ □ □ □ ■
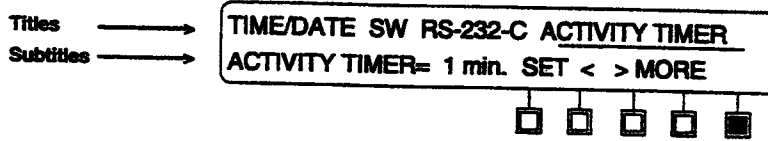
A. DOWNLOADING PRINTOUTS

| PRINT CNFG SLC-FRAME SF-FRAME TEST-
| TIME |

Scroll thru the PRINT menu
with NXT softkey

① — ■ ■ ■ ■ □

②
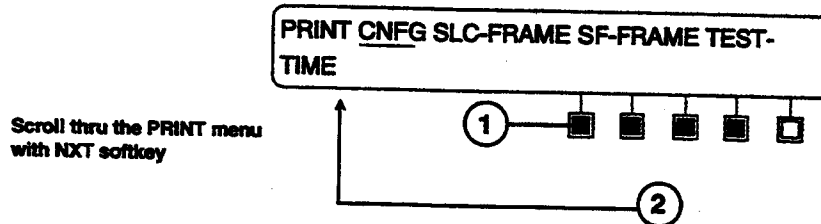
1. Use the < > softkeys (F3, F4) to underline PRINT in the screen above. Note that the bottom row reads DS1 RCVR STATUS. Pressing the GO softkey (F1) will download the DS1 Receiver Status printout to a printer via the RS-232-C port.

2. Press the NXT softkey to scroll through the list of pre-formatted test printouts available:

DS1 SUMMARY REPORT
DS1 RCVR STATUS
DS1 ANSI PRM SUMMARY (only w/Option 10)
DS3/DS2 SUMMARY REPORT (only w/52B⁺)
DS3/DS2 RECEIVER STATUS (only w/52B⁺)

STS-1/DS3 SUMMARY (only w/52C)
STS-1/DS3 STATS (only w/52C)
SONET OVERHEAD (only w/52C)

For example, in the screen below, pressing GO will download the DS1 ANSI PRM SUMMARY printout:

| PRINT CNFG SLC-FRAME SF-FRAME TEST-
| TIME |

Press GO to download
the selected printout

■ □ □ □ □
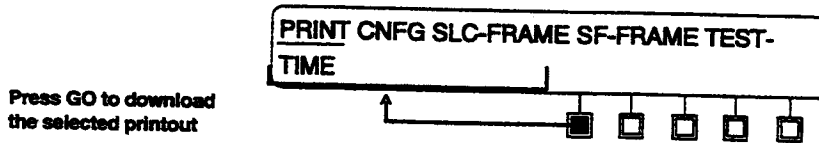
B. CHANGING MISCELLANEOUS CONFIGURATIONS (CNFG)

| PRINT CNFG SLC-FRAME SF-FRAME TEST-
| TIME |

③ — ■ ■ ■ ■ □

② ①
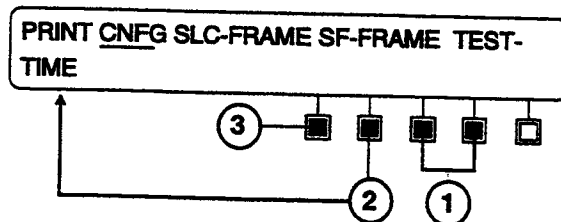
1. Using the < > softkeys, underline CNFG. Note that the bottom screen now displays 1. AUTO SEARCH.

2. Use NXT softkey to scroll through the numbered titles:

1	AUTO SEARCH	ON		10	OPT 3 CLK-SRC	COMB
2	ERROR INJECT	AUTO		11	ERRORED SEC CALC	USA
3	BEEPER	OFF		12	64K CLOCK INPUT	TERM
4	RESTORE DEFAULTS	NO		13	DDS LOOP-BACK	EXT
5	TEST PROTECTION	OFF		14	SUMMARY IN RC	YES
6	AUTO THRU	OFF		15	DS3 X-BIT VALUE:	1
7	DS1 AIS	UFR ONLY		16	52B+/52C DS1 OUT	B8ZS
8	> 15 0'S CNTR	SYNC L		17	DS3 AIS IS:	AT&T
9	YEL ALM IN PRINT	NO		18	DS3 REFRAME IS:	AT&T

3. Use the F1 softkey to to toggle choice (ON/OFF).

Description of Numbered CNFG Titles (Factory Default setting is underlined)

1. AUTO SEARCH (OFF/ON)

Both receivers can be set to automatically search for a variety of standard stress patterns (at DS1/T1, Fractional T1, or DS0A/B rates). When AUTO SEARCH is ON, the receiver SUMMARY screen will flash AUTO while the test set searches through a library of stress patterns. Setting AUTO SEARCH to OFF will instruct the receivers to only search for the pattern being sent by the corresponding transmitter.

NOTE: With Auto-Search ON, the 440B/ T-ACE will search through an exhaustive library of known test patterns, including 1000 Octet user definable patterns. When testing subrate DS0A/B (for example, 2.4Kb/s), the auto-search sequence may take a few seconds. Locking the Receiver Mode to a Transmitter and setting AUTO-Search to OFF, will limit the pattern search to a single pattern being sent by the transmitter. This will make the sync process nearly immediate. Auto-Search was designed to make the 440B compatible during end-to-end BERT tests, when the pattern being sent by the distant end is unknown to the crafts person using the 440B. This feature makes the 440B/T-ACE very automatic, and compatible with a wide variety of T1/DDS test equipment.

2. ERROR INJECT (AUTO or MENU Driven)

The ERROR INJECT key in the transmitter section can be set to send a preset error when pressed, or the key can be used to display a menu screen for selecting a variety of errors and rates. In other words, when ERROR INJECT is set to AUTO, pressing the red ERROR INJECT key will immediately inject an error (according to the XMTR Set-Up).

a. When ERROR INJECT is set to: **AUTO**

XMTR Set-Up MODE	Error Injected
T1	single Bit error
Channelized/DATA	6 Bit Errors
Channelized/Tone	single Frame Bit Error
Channelized/Phone	single Frame Bit Error

b. When ERROR INJECT is set to: **MENU**

Pressing the ERROR INJECT key displays a menu screen. A wide variety of errors can be injected at specific rates.

Interpreting the ERROR INJECT Screen:
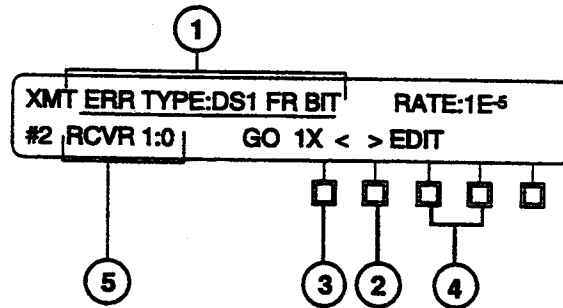
1. The Error Type selected is: DS1 Frame Bit Error
2. Press the 1X softkey to inject a single error
3. Press GO to send at selected RATE (1 x 10-5)
4. Use the < > softkeys to underline RATE and press EDIT to change the RATE
5. Errors will be displayed for the selected RCVR (1 or 2). Use the < > softkeys to underline RCVR and press EDIT to change which receiver's errors are displayed.

(See Error Inject Quick Sheet)

3. ERROR BEEPER (OFF/ON)

Turning the Beeper ON will result in an audible Beep triggered on all errors and alarms. This can be useful if the test set is not in visual range.

4. RESTORE FACTORY DEFAULTS (YES/NO)

This feature provides an easy way to configure the test set exactly as it was when it first left the factory. In other words all USER definable patterns and system configurations (including this section) will revert to original settings.

To Restore Factory Defaults, set RESTORE DEFAULTS to YES, and turn the test set OFF. When the set is powered up again, it will revert completely to factory settings.

5. TEST PROTECTION (OFF/ON)

Setting Test Protection to ON will prevent interruption of test and results by locking the test set in the current test set-up. No front panel key can interrupt the test in progress (including RESTART). In order to unlock the test set-up, the Test Protection must be toggled to OFF.

6. AUTO THRU (OFF/ON)

The 440B can loopback RCVR 1 to XMTR 1 and RCVR 2 to XMTR 2 when it receives a CSU or Network Interface Loopback command. Setting AUTO THRU to OFF will prevent the set form internally responding to loop codes.

7. AIS Definition (Unframed Only/Framed or UFR)

In nearly all cases, AIS is defined as an Unframed All Ones pattern. Some companies are interested in alarming on Framed and Unframed All Ones patterns.

8. > 15 0'S Error count (SYNC Loss/ALWAYS)

The excessive zeros error counter (greater than 15 0's) can be set for two conditions:

    a. SYNC LOSS setting will not count "excessive" zeros that are legitimately part of a stress pattern.

    b. ALWAYS setting will count excessive zeros under all conditions. For example, even when running an error free BERT test on QRS (with AMI line coding), the test set will count > 15 0's seconds (since QRS has strings of zeros that exceed the 15 zeros threshold).

9. Yellow Alarm in Print (YES/NO)

Yellow Alarm Seconds can be included or excluded from printout.

10. Option 03 Clock Source (Combined/Separate)

Option 03 provides external (8 & 64KHz) clock outputs for TPI 108/109, and Western Electric 20908/20909 DDS test sets. Some TPI sets do not have separate input connectors for Transmitter and Receiver, in which case the COMBined selection must be used, and either output clock source on the rear panel of the 440B can be used.

11. Errored Seconds Calc (USA/CAN)

Errored Seconds can be calculated according to either USA or Canadian standards.

12. 64K CLOCK INPUT (TERM/BRDG)

This selection terminates Option 30's COMPOSITE CLOCK input jack. The alternate selection is BRDG which can be selected when it is desired to bridge onto a composite clock source.

13. DDS LOOP-BACK (EXT/STD)

Extended is the standard mode.

14. SUMMARY IN RC (YES/NO)

While under remote control, the test set can display the active SUMMARY screen, or simply display a static "Under Remote Control" message.

15, 16, 17, and 18 will only appear if the 52B+ or 52C option is installed.

15. 52B+/52C DS3 X-Bit Value (0 or 1)

X-Bit Alarm can be defined as X-Bit = 0 or 1. This will define the X-bit for both Receiver and Transmitter.

16. 52B+/52C AUX DS1 Output (AMI/B8ZS)

The T1 output(s) can have the line code set for AMI or B8ZS.

17. DS3 AIS Alarm Definition (AT&T/BELL)

18. DS3 REFRAME IS: (AT&T/BELL)

C. SLC-96 CHANNEL SEQUENCE (D1D and D3/D4)

```
PRINT CNFG SLC-FRAME SF-FRAME TEST-
TIME
            □  ■  □  □  □
```
(a)   (b)   (c)
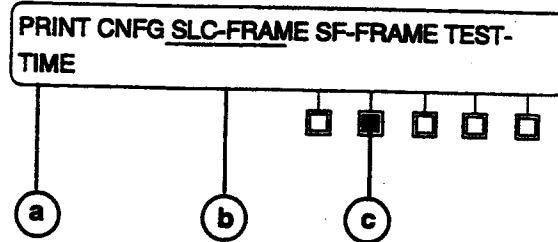
1. Underline SLC-FRAME

   a. RCVR 1 and XMTR 1 are set for D1D Channel Sequence
   b. RCVR 2 and XMTR 2 are set for D3/D4 Channel Sequence
   c. Use the SET softkey to change the Channel sequence for #1 and #2

2. Press SET to display the menu set up screen:

```
XMT #1 AND RCVR #1 SLC-96 DS0 SEQUENCE:
   D1D    D3/D4____   < > NXT
                □  □  ■  ■  ■
```
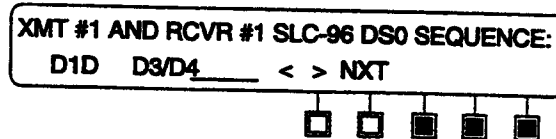
3. Use the < > softkeys to underline your choice, and press NXT to scroll to the second menu screen (for #2). Repeat this step and press NXT to return to the main screen.

D. SF (SuperFrame) CHANNEL SEQUENCE (D1D, D2, D3/D4)

Underline SF-FRAME and repeat steps described above for the SLC-96 FRAME Channel Sequence.

E. TEST TIME (setting up timed tests)

```
PRINT CNFG SLC-FRAME SF-FRAME TEST-
TIME
            □  □  □  □  □
```
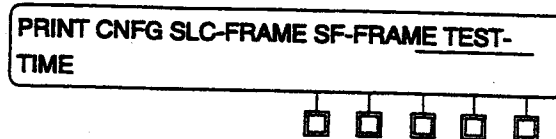
1. Underline TEST TIME and press SET to display the menu screen:

```
TEST   MAX: 999:59:59  CONTINUOUS
TIME               < > SET
                □  □  ■  ■  ■
```
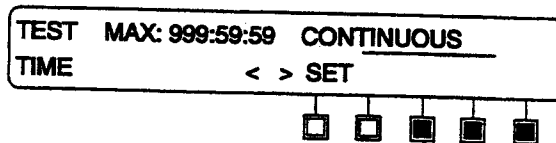
2.   Underline MAX and press SET to display:

```
┌──────────────────────────────────────┐
│ MAXIMUM TEST TIME 000:03:15          │
│               UP  DN  <  >  GO        │
└──────────────────────────────────────┘
        □   □   ■   ■   ■
```
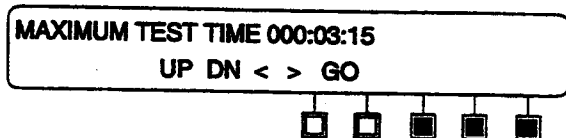
3.   Use the <> softkeys to underline each digit and the UP/DN softkeys to scroll to the desired values.

4.   Press GO to begin the timed test. Upon completion of timed test, the SUMMARY screen will freeze the test time and flash a "T" to indicate the timed test is completed.

F. SETTING TIME/DATE STAMP

1.   Press MORE to toggle to the second PRINT/SYSTEM screen:

```
┌──────────────────────────────────────┐
│ TIME/DATE  SW  RS-232-C  ACTIVITY-TIMER │ ←┐
│ 17:05:21 04/23/94      SET  <  > MORE  │ ←┘  (1)
└──────────────────────────────────────┘
        □   □   ■   ■   ■
```
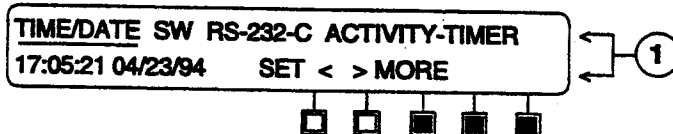
2.   Underline TIME/DATE to display the current TIME/DATE setting. In screen above, Time = 17:05:21, Date = 4/23/94.

3.   Underline TIME/DATE, and press SET to display:

```
┌──────────────────────────────────────┐
│ Time: 17:05   Date: 4/23/94          │
│            UP  DN  <  >  SET          │
└──────────────────────────────────────┘
        ■   ■   ■   ■   ■──(4)
```
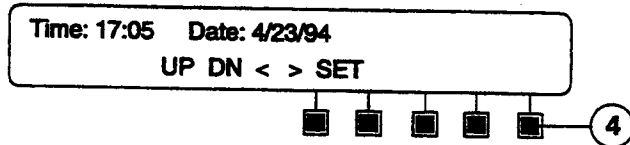
4.   Use the <> softkeys to underline digits and use UP/DN (or the keypad) to enter new values. NOTE: Press SET softkey to save the changes.

G. DISPLAYING the SOFTWARE VERSION

```
┌──────────────────────────────────────┐
│ TIME/DATE  SW  RS-232-C  ACTIVITY TIMER │
│ Version 3.3C        NXT  <  > MORE     │
└──────────────────────────────────────┘
        □   □   □   □   □
```
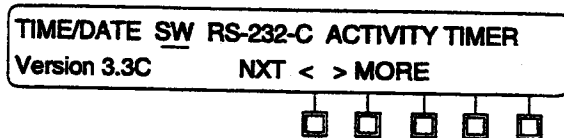
1.   Underline SW to display the software Version number. Use NXT key to identify the options included in the test set.

H. RS-232-C PRINTER INTERFACE CONFIGURATION

```
┌─────────────────────────────────────────┐
│ TIME/DATE  SW  RS-232-C  ACTIVITY-TIMER  │
│ 9600 8 N 1  *CTS    SET  <  > MORE       │
└─────────────────────────────────────────┘
        a  b c d    e      □ ■ □ □ □
```
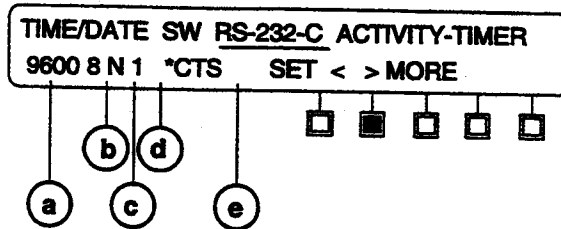
1. Underline RS-232-C to display the current settings:
   - a. 9600 baud rate
   - b. 8 date bits
   - c. No Parity
   - d. 1 Stop Bits
   - e. CTS (see note)

Note: An asterisk * appears next to CTS if the test set does not receive the required CTS handshake from the connected modem or printer. Check your cable or equipment if this occurs.

2. Press SET to display the menu screen for changing settings:

```
┌─────────────────────────────────────────┐
│ Baud Rate:  300 1200 2400 4800           │
│   9600 19200           <  > NXT          │
└─────────────────────────────────────────┘
        □ □ ■ ■ ■
```
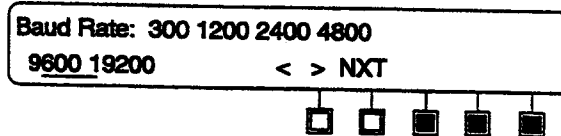
3. Use the < > softkeys to underline choice and press NXT to scroll to the next variable.

4. Press NXT to scroll through the variety of menu set-up screens listed in step 1.

I. ACTIVITY TIMER (Printout interval)

```
┌─────────────────────────────────────────┐
│ TIME/DATE  SW  RS-232-C  ACTIVITY TIMER  │
│ 9600 8 N 1  CTS     SET  <  > MORE       │
└─────────────────────────────────────────┘
        □ ■ □ □ □
```
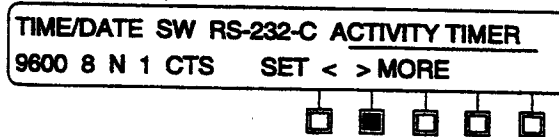
1. Underline ACTIVITY-TIMER to display the current settings. The screen above shows the print out required once per minute.

NOTE: If no changes occur between time periods, or no new erorrs are captured, the unit will not printout. Only when new events occur will a new printout be sent. This feature is designed to save paper and eliminate unneccessary printouts (with identical information). The 440B print-out method is therefore a hybrid between event-driven and time-driven, offering the best of both methods.

2. Press SET to display the menu screen for changing the timed printout:

```
┌─────────────────────────────────────────┐
│ Activity Report Timer   01               │
│            UP  DN  <  > SET              │
└─────────────────────────────────────────┘
        ■ ■ ■ ■ ■
```
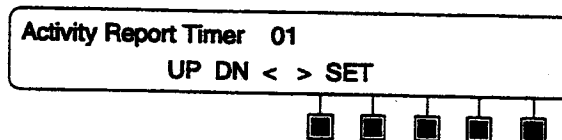
3. Use the < > softkeys and UP/DN (or the keypad) to enter new values (maximum of 60 minutes). Press SET to enter changes.

This concludes the review of the menus under the PRINT/SYSTEM key.

440B/T-ACE DS1 XMTR Set-Up Flow Chart

Stress Patterns

DS1 3/24 1/8 1/1 QRS 55OCT MINMAX TRIP
#1   UFR FR < > NXT

F1 F2 F3 F4 F5

DS1 63 511 2047 2^{15} 2^{20} 2^{23} CODE 0/0
#1   EDIT < > NXT

F1 F2 F3 F4 F5

DS1 CODE 00011100 011111110 00010000
#1

F1 F2 F3 F4 F5

Underline choice and press EDIT
to change USER Patterns

Four programmable
1000 octet patterns

DS1 USER-1 USER-2 USER-3 USER-4
#1   EDIT < > NXT

F1 F2 F3 F4 F5

DS1 DDS-1 DDS-2 DDS-3 DDS-4 DDS-5 DDS-6
#1   UFR FR < > NXT

F1 F2 F3 F4 F5

From any pattern screen
press XMTR1 (2) to jump
directly to the root screen

Idle Channel Content

FRACTIONAL T1 IDLE DS0 PATTERN
01111111   < > NXT

F1 F2 F3 F4 F5

Channels
1, 8 & 17
selected

Selected DS0 Channels (1-24)
123456789^{1}0123456789^{2}01234 FRACTIONAL DS0s
100000001000000000100000 64K < > NXT

F1 F2 F3 F4 F5

23 "other" channels in DS1:

XMT OTHER CHs: IDLE 1000Hz/-20dBm0
#1   < > NXT

F1 F2 F3 F4 F5

Press NXT   Press NXT

MODE: T1 CHANNELIZED FT1
#1   < > NXT

F1 F2 F3 F4 F5

Frame Type:

FRAME TYPE: UFR SLC-96 SD ESF
DS0 SEQUENCE IS: D3/D4 < > NXT

F1 F2 F3 F4 F5

Root Screen

Press XMTR1 or XMTR2 * to
display root screen. (Press twice
if screen does not appear.)

MODE:T1   PAT:QRS   FRAME ESF

CODE:AMI   CLK:INT   DL:ESF < > EDIT

F1 F2 F3 F4 F5

Line Code:

XMTR LINE CODE
          AMI B8ZS NXT

F1 F2 F3 F4 F5

ESF Data Link

T1 ANSI PRMs AT&T MSGs BOMs
#1   EXIT < > NXT

F1 F2 F3 F4 F5

Clock Source:

CLOCK SOURCE: RCVR1 RCVR2 INT
          < > NXT

F1 F2 F3 F4 F5

SLC-96 Data Link

T1 PLS:IDLE   MTCE:IDLE
#1 ALM:NO   EXIT < > NXT

F1 F2 F3 F4 F5

XMT COT-RT/13 COT-RT/16 SLIM
#1   < > NXT

F1 F2 F3 F4 F5

XMTR Keys*

Underline PLS or MTCE
in screen 1 to set XMT switches
or send MTCE messages

XMT <MAJOR ALARM>
#1 567891^{1}0123456   SET < > NXT

F1 F2 F3 F4 F5

- Press XMTR 1 or 2

- Change test set-up by underlining parameter (MODE,
   Pattern, Frame, etc.) with < > and pressing EDIT.

Flow Chart 1 - 440B/T-ACE (ver 1d)   **T-COM**

440B/T-ACE DS0A/B Flow Chart

Root Screen

Press the DATA key to display the root screen. (Press twice if screen does not appear.)

From any derivative of the root screen press the DATA key to return directly to the root screen.

```
XMT  MJU RESPONSE ON:  RCVR1  RCVR2
#1                 ⚡ > NXT
```

Rate Selection
```
XMT DS0B RATE:  2.4  4.8  9.6  19.2
#1                      <  > NXT
```

```
MJU: [1] SEL REL  BLK  MJU-LOOP  REL-ALL
#1              Br: #1 MAP  <_>  GO
```

Press Map

```
XMT DS0 TYPR:  DS0A  DS0B  SW56  SS7
#1                    <  > NXT
```

```
MJU 1 Br#2--> MJU 2 Br#1--> MJU 1 LOOPED
ID:14 B1   ID:52 B34   ID:28      NXT
```

NOTE:
XMTR1 is selected**

```
TYPE:DS0B  RATE:9.6  MJU:IDLE    [XMT#1]
PRI:DDS-5  SEC:BYTE SUBCH:1   <  > EDIT
```

This key decrements the subchannel number

Use the P1 and P2 softkeys to toggle through subchannel number, or underline and EDIT the display:

```
DS0 63 511 2047 2^15 2^20 2^23 CODE 0/0
#1              EDIT <  > NXT
```

```
XMT DS0 SUBRATE CHANNEL: 4
#1              UP  DN    NXT
```

Underline CODE and press EDIT to display
```
DS0 CODE  11000011  ____  ____
#1          BLNK   <  > EXIT
```

```
DS0 DDS-1 DDS-2 DDS-3 DDS-4 DDS-5 DDS-6
#1                <  > NXT
```

If BYTE is selected as pattern for SEC Ch EDIT appears

```
XMT SEC CHAN PAT: NONE  63  511  2047
#1    BYTE (11000011)  EDIT <  > NXT
```

```
DS0 CONTROL CODES:  ASC  IDLE  MUXOOS
#1     TEST UN-MUX        <  > NXT
```

Underline BYTE, press EDIT

```
XMT DATA  12345678
#1 BYTE  11000011      <  > NXT
```

```
DS0 USER-1 USER-2 USER-3 USER-4
#1                <  > NXT
```

```
DS0 3/24 1/8 1/1 55-OCT MINMAX TRIP
#1                <  > NXT
```

- Select XMTR1 or 2
- Press DATA to display root screen
- Change Rates, test patterns, subchannel # by using < > to underline parameter and pressing EDIT
- Step through screens with NXT

XMTR1 selected**

DATA key

Flow Chart 2 - 440B/T-ACE (ver 1d) **T-COM**

440B/T-ACE PRINT/SYSTEM Flow Chart

- Press PRINT/SYSTEM* to display Root Screen #1
- Press MORE (softkey F5) to toggle between Root Screen #1 and #2
- Underline Titles with < > softkeys, scroll through Subtitles with highlighted softkey

Root Screen 1

PRINT CNFG SLC-FRAME SF-FRAME TEST
TIME

Scroll with NXT softkey
Download print with GO

52B+	- Print - download -	52C
DS1 SUMMARY REPORT		DS1 SUMMARY REPORT
DS1 RECEIVER STATUS		DS1 RECEIVER STATUS
DS1 ANSI PRM SUMMARY		DS1 ANSI PRM SUMMARY
DS3/DS2 SUMMARY REPORT		STS-1/DS3 SUMMARY
DS3/DS2 RCVR STATUS		STS-1/DS3 STATUS
		SONET OVERHEAD

CNFG (Miscellaneous Configurations)

PRINT CNFG SLC-FRAME SF-FRAME TEST
TIME

1	AUTO SEARCH	ON
2	ERROR INJECT	AUTO
3	BEEPER	OFF
4	RESTORE DEFAULTS	NO
5	TEST PROTECTION	OFF
6	AUTO THRU	OFF
7	DS1 AIS	UFR ONLY
8	>15 0's CNTR	SYNC L
9	YEL ALM IN PRINT	NO
10	OPT 3 CLK SOURCE	COMB
11	ERRORED SEC CALC	USA
12	64K CLOCK INPUT	TERM
13	DDS LOOP-BACK	EXT
14	SUMMARY IN RC	NO
15	DS3 X-BIT VALUE	0
16	52B+/C DS1 OUT	AMI
17	DS3 AIS ALM SPEC	AT&T
18	DS3 REFRAME IS	AT&T

toggle choice with F1 key

Test Time (setting-up timed test)

PRINT CNFG SLC-FRAME SF-FRAME TEST
TIME

TEST   MAX: 999:59:59 CONTINUOUS
TIME   < > SET

Press GO
to start
timed test

MAXIMUM TEST TIME: 000:03:15
         UP DN < > GO

PRINT CNFG SLC-FRAME SF-FRAME TEST
TIME

XMT #1 AND RCVR #1 SF DS0 SEQUENCE:
   D1D D2 D3/D4   < > NXT

Use < > (F3, F4)
to underline choice

Press NXT to return
to the root screen

PRINT CNFG SLC-FRAME SF-FRAME TEST
TIME

Use < > (F3, F4)
to underline choice

XMT #1 AND RCVR #1 SF DS0 SEQUENCE:
   D1D   D3/D4   < > NXT

Press NXT to return
to the root screen

Root Screen 2

TIME/DATE SW RS-232-C ACTIVITY TIMER
ACTIVITY TIMER= 1 min   SET < > MORE

Use UP/DN keys
to scroll to values
Press SET to enter

Activity Timer (Print Interval)

Activity Report Timer:
         UP DN < > more

Time/Date Stamp

TIME/DATE SW RS-232-C ACTIVITY TIMER
17:05:21 04/23/97   SET < > MORE

TIME: 17:05   Date: 4/23/97
         UP DN < > SET

Press SET
to enter

RS-232-C Printer Output Configuration

TIME/DATE SW RS-232-C ACTIVITY TIMER
9600 8 N 1 NONE   SET < > MORE

A.   Baud Rate: 300 1200 2400 4800
      9600 19200   < > NXT

- B. Data Bits: 7 8
- C. Parity: NONE ODD EVEN
- D. Stop Bits: 1 1.5 2
- E. Flow control: NONE DSR CTS CTS-DSR XON/XOFF

SW: software version

TIME/DATE SW RS-232-C ACTIVITY TIMER
Version 3.3   NXT < > MORE

SW Option(s) #: description

PRINT/SYSTEM key

Flow Chart 3 - 440B/T-ACE (ver 1d)

T-COM