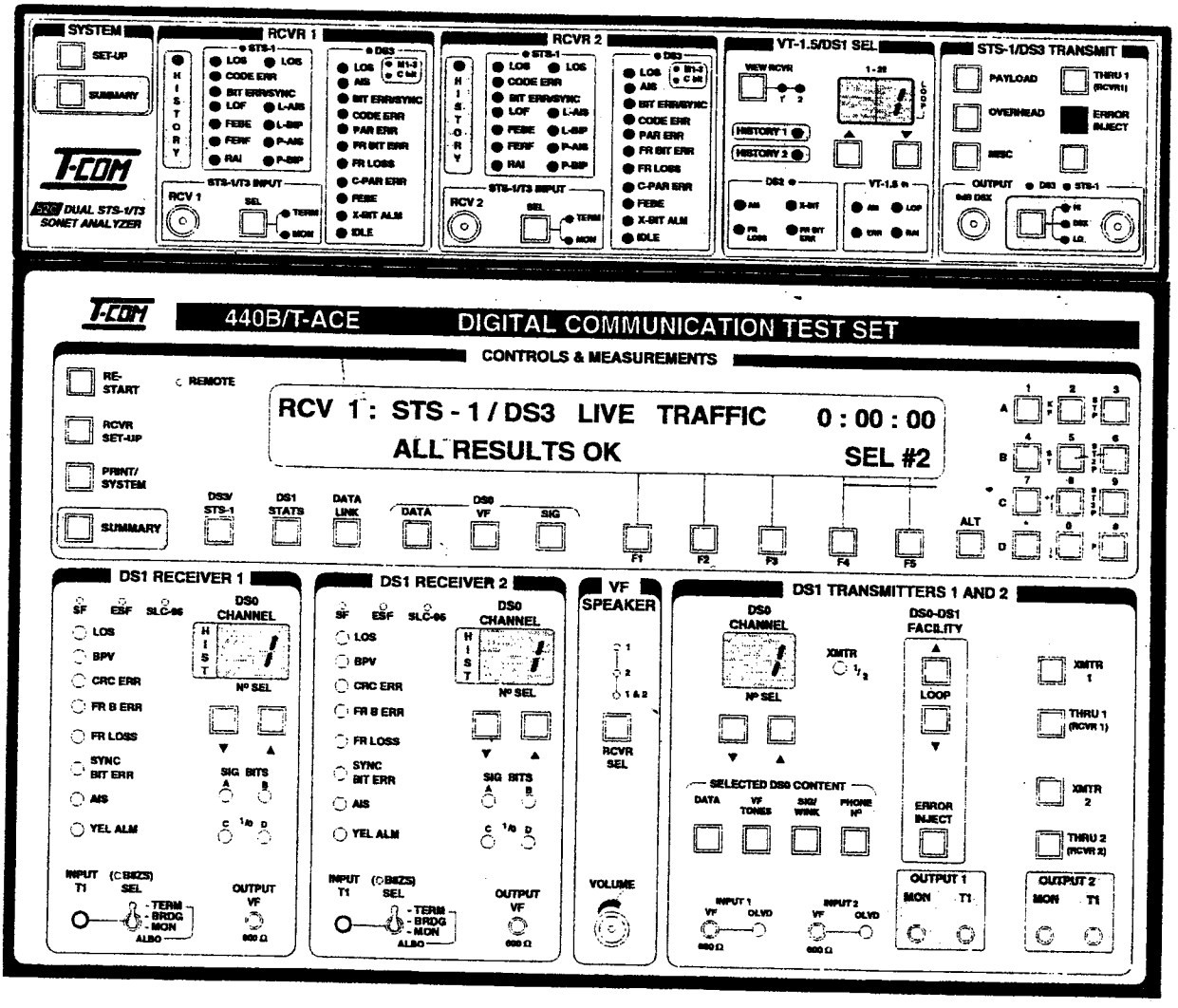
52C DUAL STS-1/DS3 SONET ANALYZER

Quick Guide

52C S/N: _____
SW: 1.1A/B

REL Date: January 1998
Ver: 2.0



440B/T-ACE equipped with 52C SONET Analyzer

52C Dual STS-1/T3 SONET Analyzer

SW 1.1A

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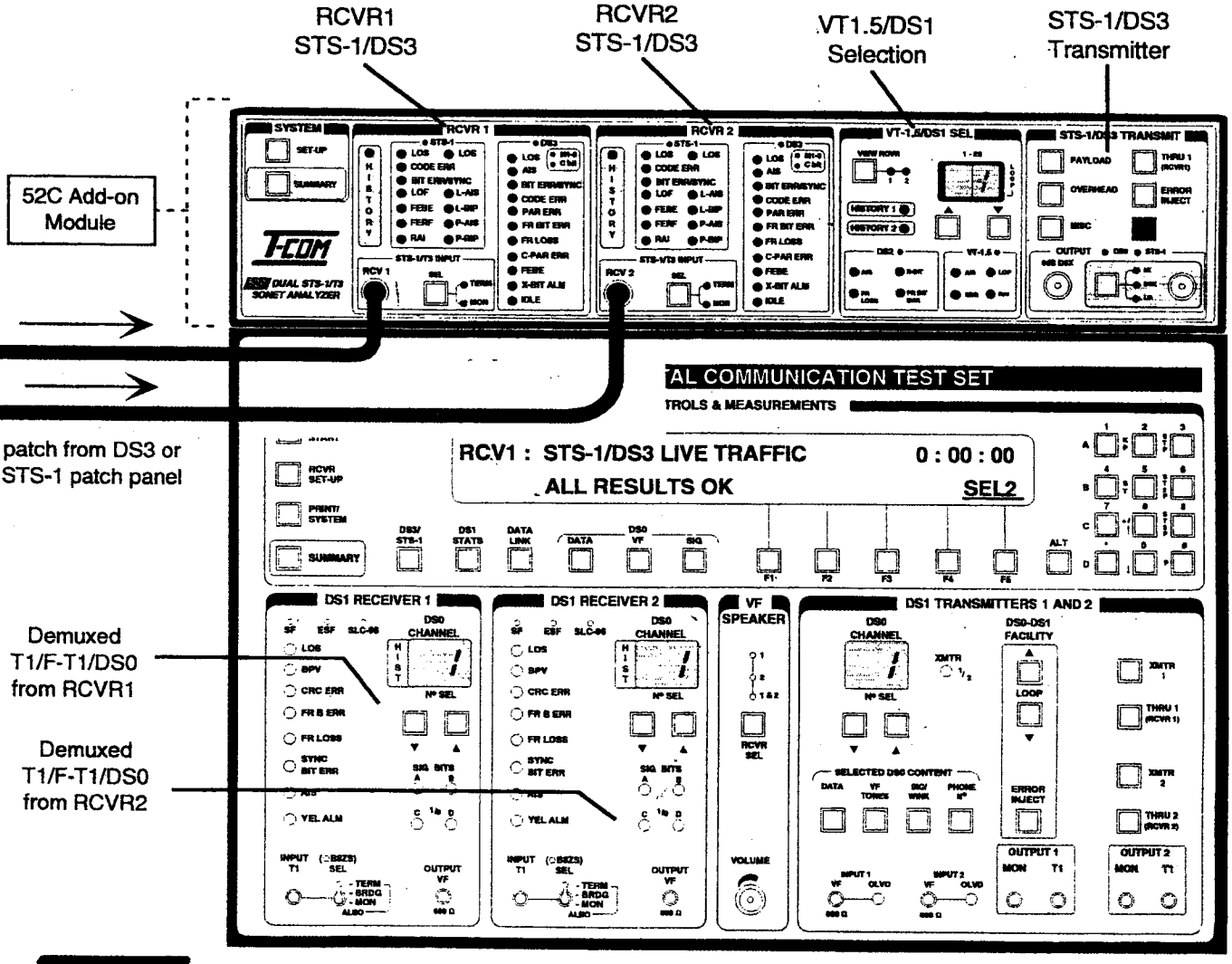
Introduction

The 52C dual STS-1/DS3 SONET Analyzer is a powerful add-on option to the 440B/T-ACE. This unit adds the ability to test STS-1 SONET and DS3 (non-SONET) systems. It can be used to stress test (BERT) new systems or simultaneously monitor both directions of an STS-1/DS3 system, or even monitor two completely different systems. Both 52C receivers automatically identify the type of traffic carried and provide extensive error monitoring. Upon patching in, the 52C receivers automatically determine if a system is DS3 or STS-1. DS3 frame type (M1-3/C-bit) is automatically displayed, and STS-1 payload mapping is also determined (i.e. DS3, VT1.5, or Unequipped). The 52C SUMMARY key provides immediate test status for RCVR1 and RCVR2.

The 52C automatically demultiplexes DS1 traffic riding in STS-1 and DS3 systems. Demuxed signals are internally sent to the 440B/T-ACE base unit's DS1 Receiver 1 and Receiver 2. DS1/DS0 voice and data will appear in the base unit for all the testing made available by the 440B/T-ACE, including:

T1/F-T1	Signaling & SS7
DS0 voice	ESF & SLC-96 data link
DS0A/B (DDS)	Ext. Protocol Analuyzer -
Telephone call capture	Interface (V.35/ RS-232-C)

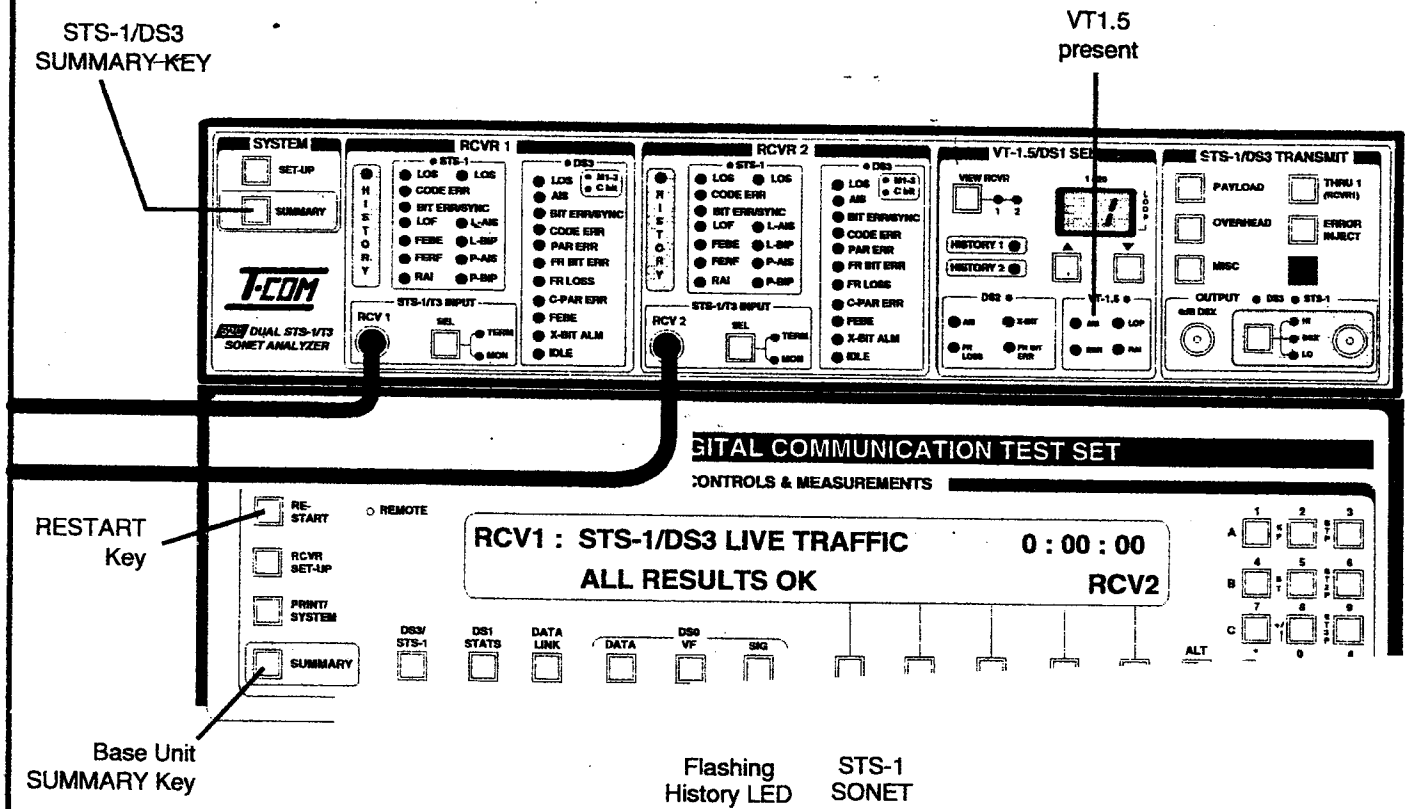


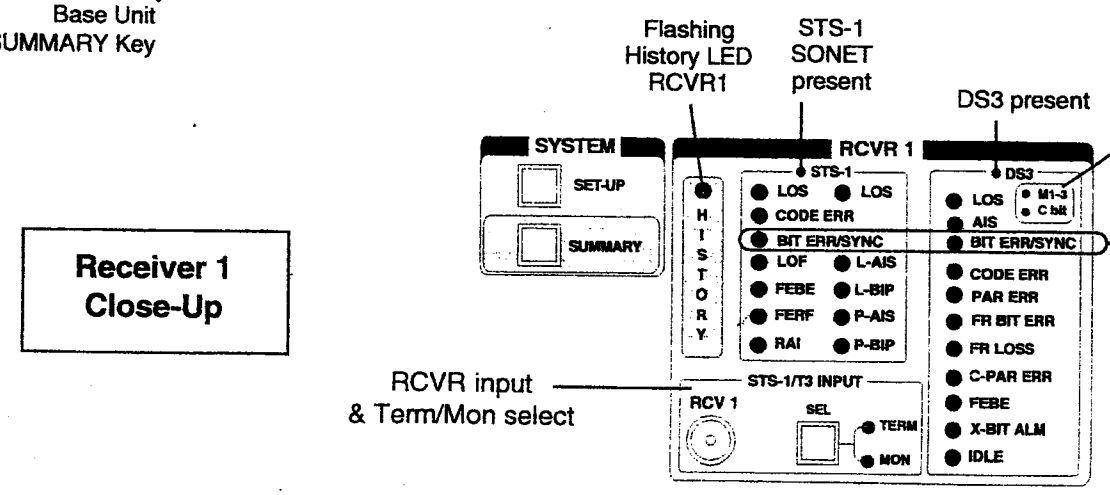
Overview

The 52C is designed to be as automatic as possible. From the moment DS3 or STS-1 systems are patched into RCVR1 or RCVR2, and the RESTART key is pressed, the unit auto-frames, auto-pattern syncs and demuxes signals from STS-1 to DS3 to DS1.

HISTORY LEDs flash when errors are detected, and a dedicated 52C SUMMARY key provides immediate test results for STS-1/DS3 and VT1.5. The 440B/T-ACE base unit's SUMMARY key remains dedicated to DS1, F-T1 and DS0A/B or SS7 test results.

The VT1.5/DS1 SEL section allows the user to scroll through each of the 28 T1s contained in the DS3/STS-1 or the separate VT1.5 channels of the STS-1. Also in this section, the user can select either Receiver's real time DS2 or VT1.5 LEDs by toggling the VIEW RCVR key. *Note: Selecting RCV1 or RCV2 does not interrupt either test.*





A. LED Display

The 52C front panel provides real-time status and error display for both receivers. There are three different types of LEDs: Error type, Frame type, and flashing HISTORY.

Errors

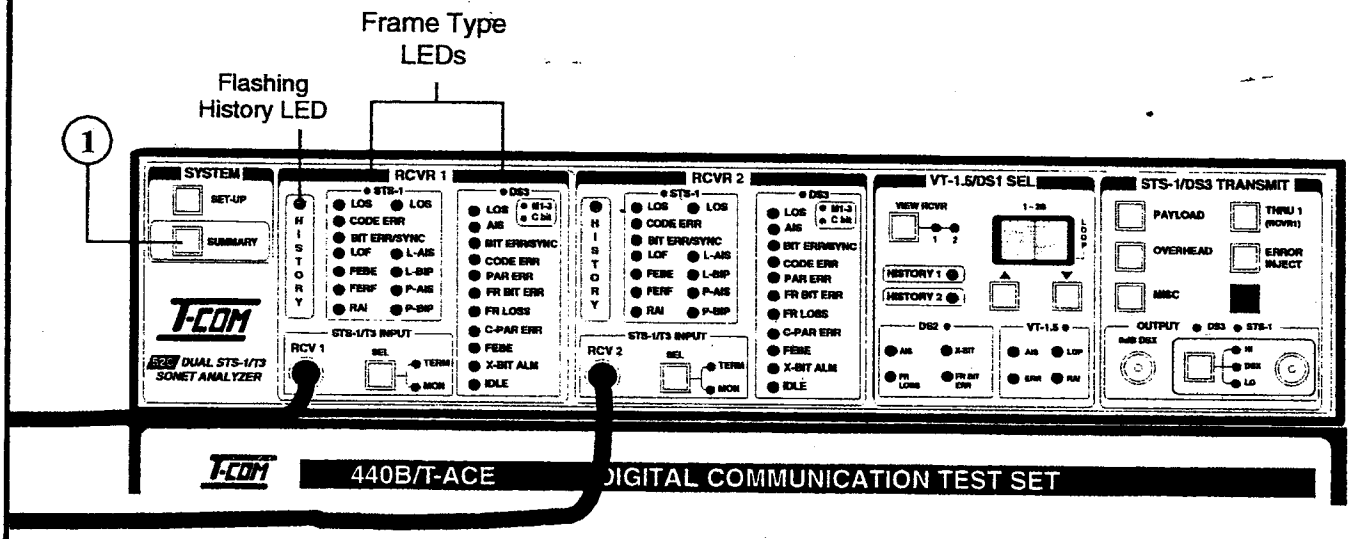
The red error LEDs will only remain illuminated while the error is present. Any error detected will automatically trigger a flashing HISTORY LED, and the HISTORY LED keeps flashing until errors are cleared with the RESTART key. If no HISTORY LEDs are flashing, then no new errors have been detected, and the system(s) under test is (are) running error free.

If any HISTORY LED is flashing, press the 52C SUMMARY key to display the error counts in the summary screen. **Note:** Hold the SUMMARY key down to show individual LED history for both receivers.

Major error types are given their own LED, but due to limited space, some error types are combined as a generic "error" LED, or fall under the category of flashing "HISTORY" LED. For example, there is no dedicated Section BIP LED, however Section BIP errors will trigger the flashing yellow "HISTORY" LED, and the error count will appear in the SUMMARY screen and statistics counters.

Frame Type

The 52C automatically detects the presence of DS3 or STS-1 SONET framing and its mapping (DS3 or VT1.5). Upon patching into RCVR1 or RCVR2, frame LEDs will light to indicate the type of signal being received. For example, if RCVR1 detects a DS3 signal then the yellow DS3 LED will light (and if DS2 framing is detected the DS2 LED, located in the VT1.5/DS1 SEL section, will also light). If an STS-1 signal carrying DS3 formatted traffic is detected, then both the STS-1 and DS3 LEDs will be lit. The DS3 frame type is also automatically detected and displayed with the M1-3/C-Bit LEDs.

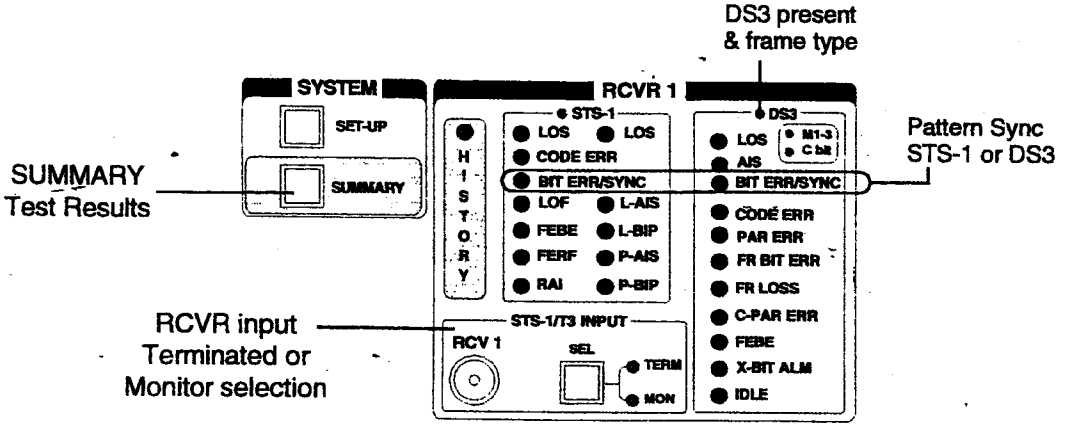


Stress Pattern Sync

The 52C also automatically syncs to standard STS-1 and DS3 stress patterns. Upon patching in and pressing the RESTART key, both receivers independently search for stress patterns. When a pattern is detected, the green SYNC LED will light in the STS-1 or DS3 LED section. The actual pattern type will be displayed in the Summary screen (use 52C SUMMARY key to display).

Receiver Input Settings

When patching into a system, both receivers must have their input levels set according to the application. If patching into a monitor jack, set the input selection to MON. When terminating a signal, set the input selection to TERM.

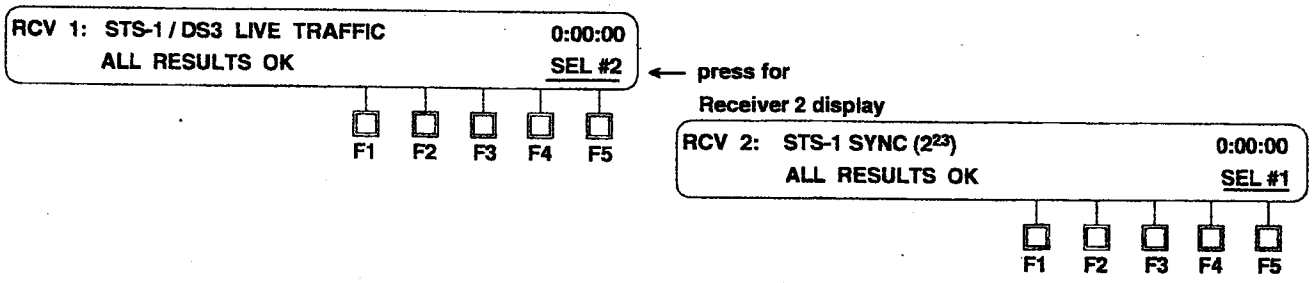


B. SUMMARY Screen

The 52C SUMMARY screen provides the easiest way to display error results for RCV1 and RCV2. Although the LED section does not show every type of error, the SUMMARY screen will display all errors (STS-1, DS3, DS2, VT1.5). Remember, the 440B/T-ACE base unit Summary key provides error results for T1, F-T1 and DS0 (DDS) demultiplexed from the 52C's DS3 or VT1.5 signals.

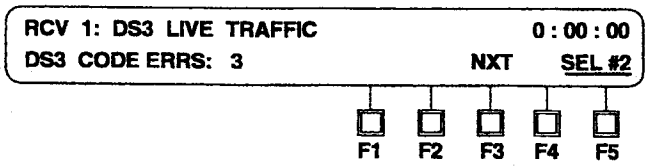
The SUMMARY screen also identifies the payload mapping; whether the system is a DS3, STS-1, STS-1 with DS3 payload, or STS-1 with VT1.5 payload.

1. Press the 52C SUMMARY key. If a live DS3 signal is present on the RCV1 INPUT jack, with no errors, the following summary screen appears:



NOTE: If a signal is present on the RCV2 INPUT, press the SEL#2 softkey (F5) to display RCV2 summary screen. Toggling between RCV1/RCV2 with the F5 softkey will not interrupt ongoing tests. If the History LEDs are not flashing, then no errors have been detected and the corresponding SUMMARY screen will read ALL RESULTS OK.

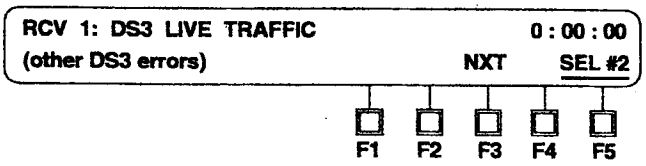
2. When errors are detected, the bottom line of the summary screen will display the error types (instead of ALL RESULTS OK), as shown below:



Receiver 1 display

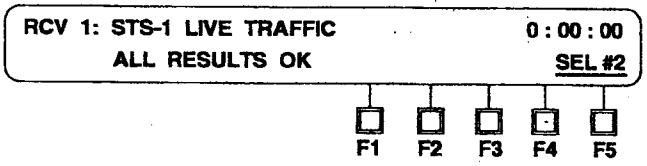
NOTE: NXT appears in the summary screen when more than one type of error has been received.

3. Press the NXT softkey (F3) to scroll through the other errors:



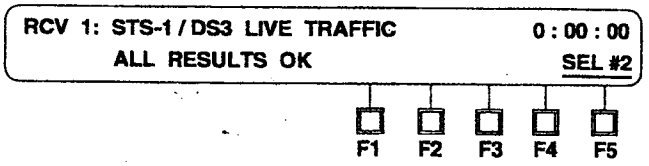
Monitoring STS-1 and/or DS3 SONET Traffic

1. Press the 52C SUMMARY key. If a live STS-1 signal is present on the RCV1 INPUT jack, with no errors, the following summary screen appears:

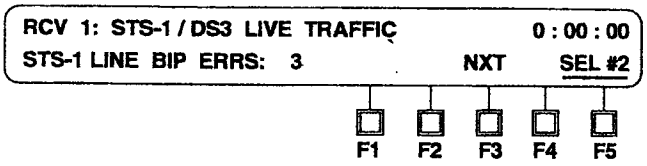


NOTE: If a signal is present on the RCV2 INPUT, press the SEL#2 softkey (F5) to display RCV2 summary screen. Toggling between RCV1/RCV2 with the F5 softkey will not interrupt ongoing tests.

2. If an STS-1 equipped with a DS3 live signal is present on the RCV1 INPUT jack, with no errors:

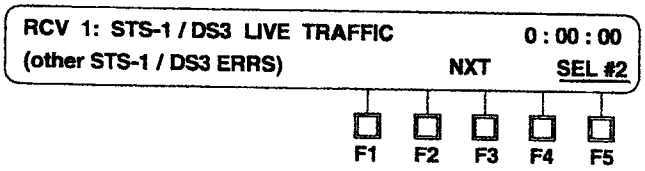


3. For example, if 3 LINE BIP ERRS have been received:

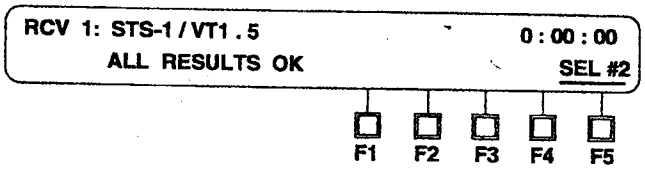


NOTE: NXT appears when more than one type of STS-1/DS3 error has been received.

4. Press the NXT softkey (F3) to read the other STS-1/DS3 errors:

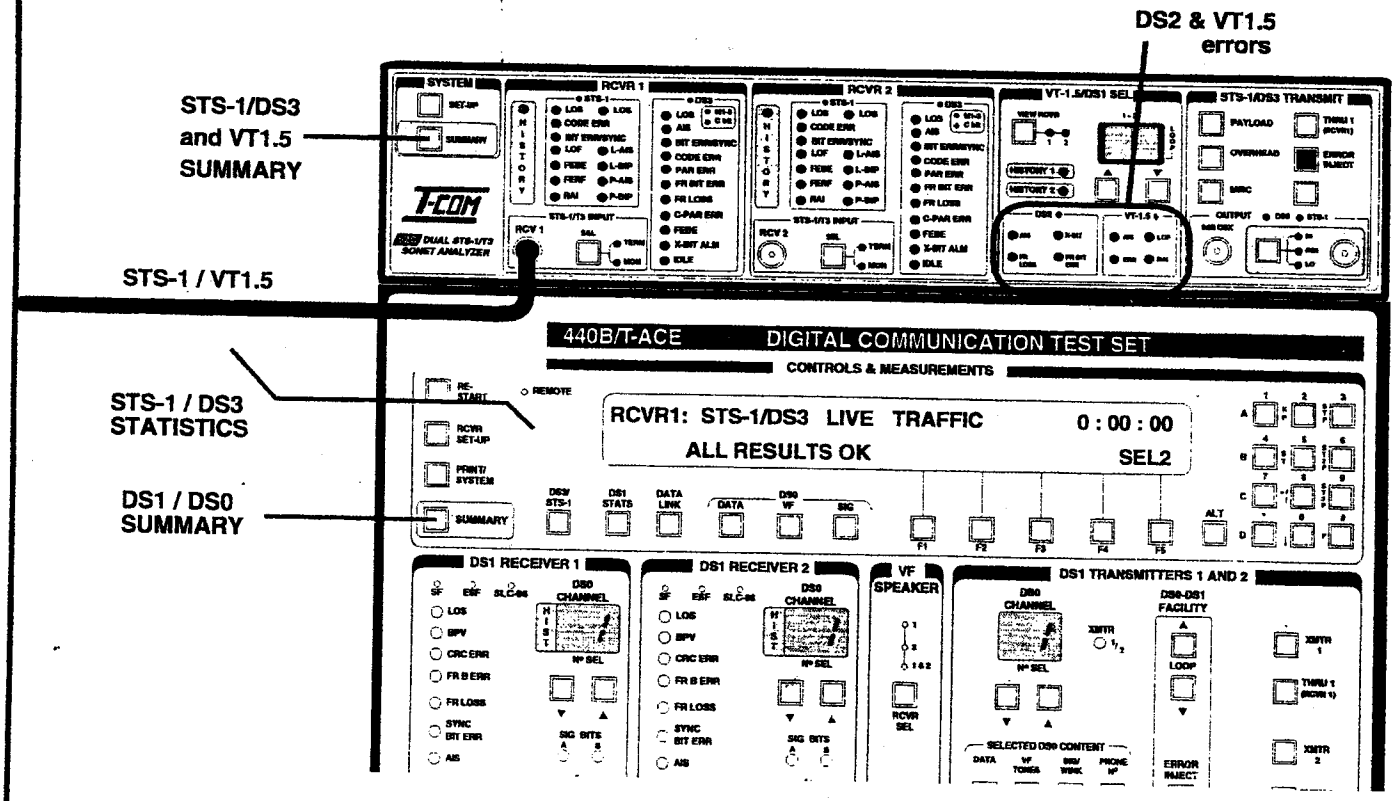


5. If an STS-1 equipped with a VT-1.5 live signal is monitored, the 52C demultiplexes the VT1.5 and internally feeds the DS1 to the corresponding 440B/T-ACE DS1 receiver. Errors corresponding to the VT1.5 can be viewed in the VT1.5 error section as well as in the 52C SUMMARY screen, however the 440B/T-ACE base unit SUMMARY key is used to display the actual DS1 errors (FR Bit, CRCs, etc):



NOTE: The VT1.5/DS1 error section will only display error LEDs for the selected receiver. Use the VIEW RCVR key to toggle between the receiver LED displays for VT1.5 and DS2 error status.

6. If a DS3 signal carrying DS1 signals is monitored, the base unit automatically receives the selected DS1. DS2 errors appear in the 52C SUMMARY screen, and in the DS2 LED section.

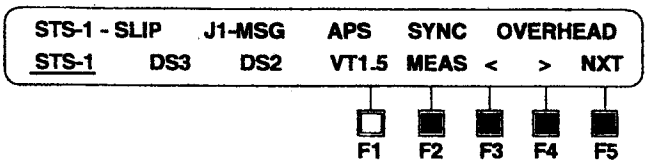


Error Statistics

Although the SUMMARY screen provides a complete list of current errors, some users are interested in errored seconds, bit error rates and other variations. This section describes how to display all error counters.

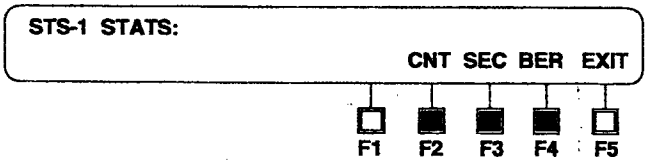
STS-1 Error Statistics

1. Press the base unit DS3/STS-1 key (or DS3/DS1C on the older front panel) to display the following root screen:



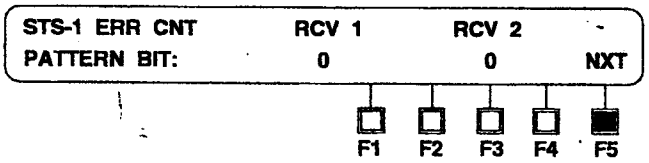
   In the above screen, use the < > softkeys (F3, F4) to underline the desired error statistics. Note: MEAS provides STS-1 level and frequency measurements. Press F2 for direct access to MEAS.

2. When STS-1 is underlined in the root screen above, press the NXT key to display:



From this screen, select CNT for error counts, SEC for errored seconds, or BER for bit error rates.

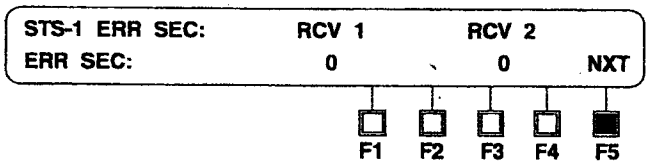
3. Press the CNT softkey (F2):



   NOTE: Pressing NXT scrolls thru:

a. PATTERN BIT	d. P-BIP	g. PTR JUSTIF
b. S-BIP	e. PATH FEBE	h. APS MSG
c. L-BIP	f. CODE	i. Returns to the STS-1 STATS menu

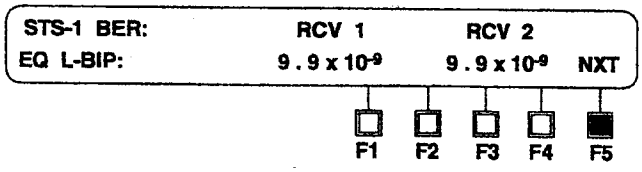
4. Press the SEC softkey (F3) in the STS-1 STATS menu:



   NOTE: Pressing NXT scrolls thru:

a. ERR-SEC	f. CODE	k. LOF
b. LOS-SEC	g. L-AIS	l. LO P
c. S-BIP	h. L-FERF	m. UNAVAIL
d. L-BIP	i. P-AIS	n. SYNC LOSS
e. P-BIP	j. P-RAI	o. Returns to the STS-1 STATS menu.

5. Press the BER softkey (F4):

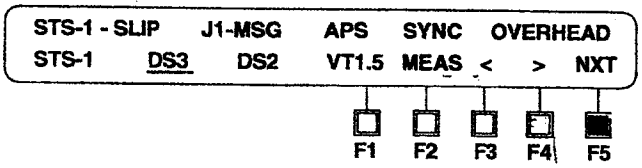


NOTE: Pressing NXT scrolls thru:

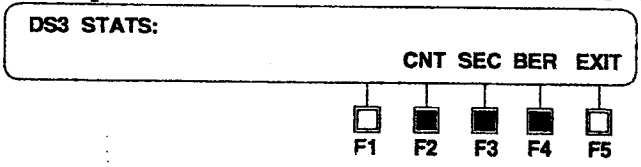
a. BIT
b. EQ L-BIP
c. EQ P-BIP
d. P-FEBE
e. CODE
f. Returns to the STS-1 STATS menu.

DS3 Error Statistics

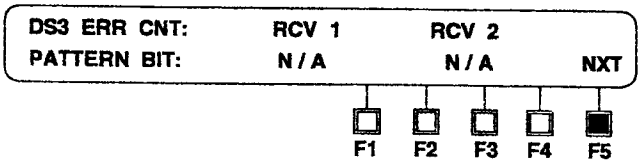
1. Press the base unit DS3/STS-1 key to display the following root screen:



2. When DS3 is underlined in the root screen above, press the NXT key to display:



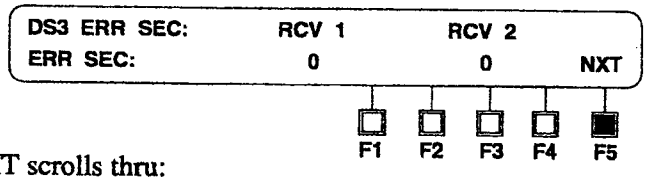
3. Press the CNT softkey (F2);



NOTE: Pressing NXT scrolls thru:

a. PATTERN BIT:
b. FRAME BIT:
c. CODE:
d. PARITY:
e. FEBE:
f. C-PAR:
g. Returns to the DS3 STATS menu.

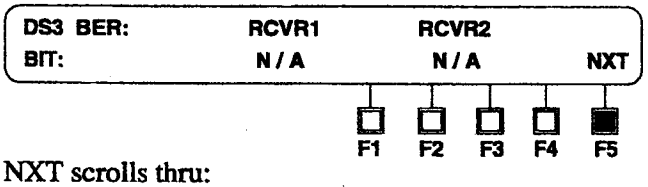
4. Press the SEC softkey (F3)in the DS3 STATS menu:



NOTE: Pressing NXT scrolls thru:

a. ERR SEC
b. LOS SEC
c. BIT
d. CODE
e. PAR
f. FR-LOSS
g. AIS
h. X-BIT ALM
i. SYNC LOSS
j. Returns to the DS3 STATS menu.

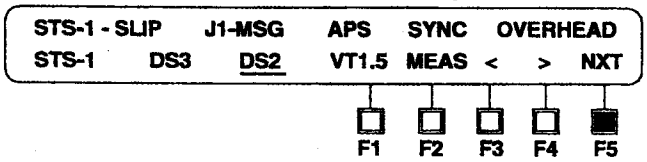
5. Press the BER softkey (F4) in the STS-1 STATS menu:



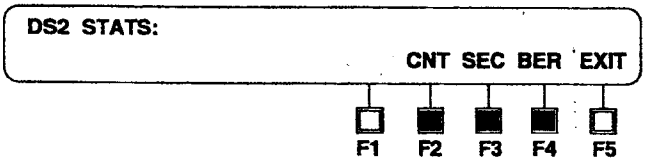
NOTE: Pressing NXT scrolls thru:
a. Bit
b. FR Bit
c. PAR
d. Return to the DS3 STATS menu.

DS2 Error Statistics

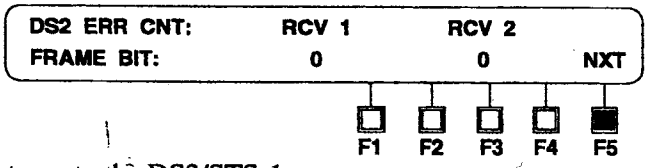
1. Press the base unit DS3/STS-1 key to display the following root screen:



2. When DS2 is underlined in the root screen above, press the NXT key to display:

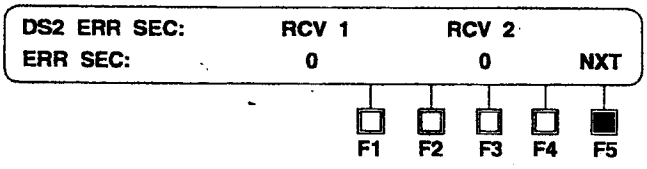


3. Press the CNT softkey (F2);



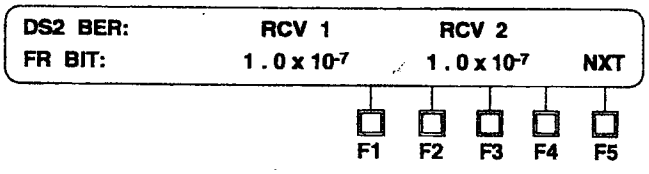
NOTE: Pressing NXT returns to the DS3/STS-1 root screen.

4. Press the SEC softkey (F3) in the DS2 STATS menu:



NOTE: Pressing NXT scrolls thru:
a. ERR SEC
b FR-LOSS
c. AIS
d. X-BIT ALM
e. Returns to the DS2 STATS menu.

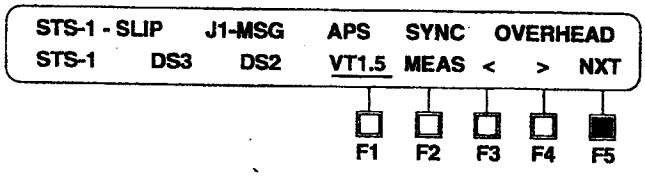
5. Press the BER softkey (F4)in the DS2 STATS menu:



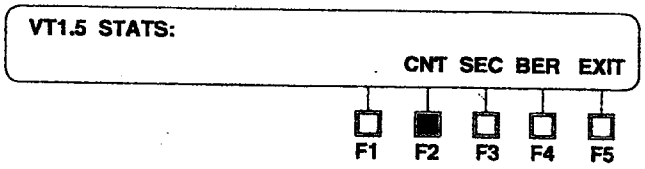
NOTE: Pressing NXT returns to the DS3/STS-1 menu.

VT1.5 Error Statistics

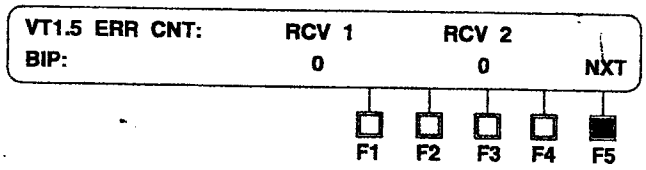
1. Press the base unit DS3/STS-1 key to display the following root screen:



2. With VT1.5 underlined in the root screen above, press the NXT key to display:

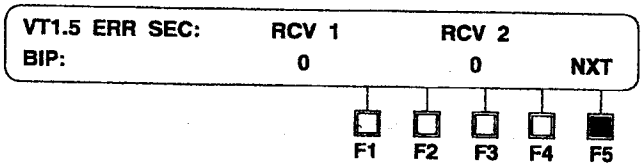


3. Press the CNT softkey (F2):



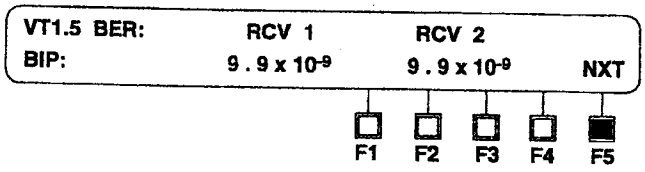
NOTE: Pressing NXT scrolls thru:
- a. BIP
- b. FEBE
- c. PTR JUSTIF
- d. Returns to the VT-1.5 STATS menu.

4. Press the SEC softkey (F3) in the VT1.5 STATS menu:



NOTE: Pressing NXT scrolls thru:
- a. BIP
- b. UNAVAIL
- c. LOP
- d. LOM
- e. AIS
- f. RAI
- g. Returns to the VT-1.5 STATS menu.

5. Press the BER softkey (F4) in the VT1.5 STATS menu:



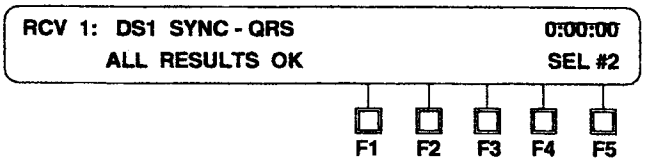
NOTE: Pressing NXT scrolls thru:
- a. BIP
- b. FEBE
- c. Returns to the VT-1.5 STATS menu.

Demuxing DS1/VT1.5

Selecting a DS1 to Demux

As a factory default, the 52C sets both unit receivers to be locked to the same VT1.5/DS1 channel selection. The unit pictured below is set to demux DS1 #2 from both of the DS3/STS-1 signals.

In this case, selecting a DS1 (1-28) signal contained within a DS3 can be accomplished by scrolling through the DS1s in the VT1.5/DS3 SEL section. Once a DS1 is selected, press RESTART and then press the SUMMARY key on the base unit to view a summary screen for the received DS1.



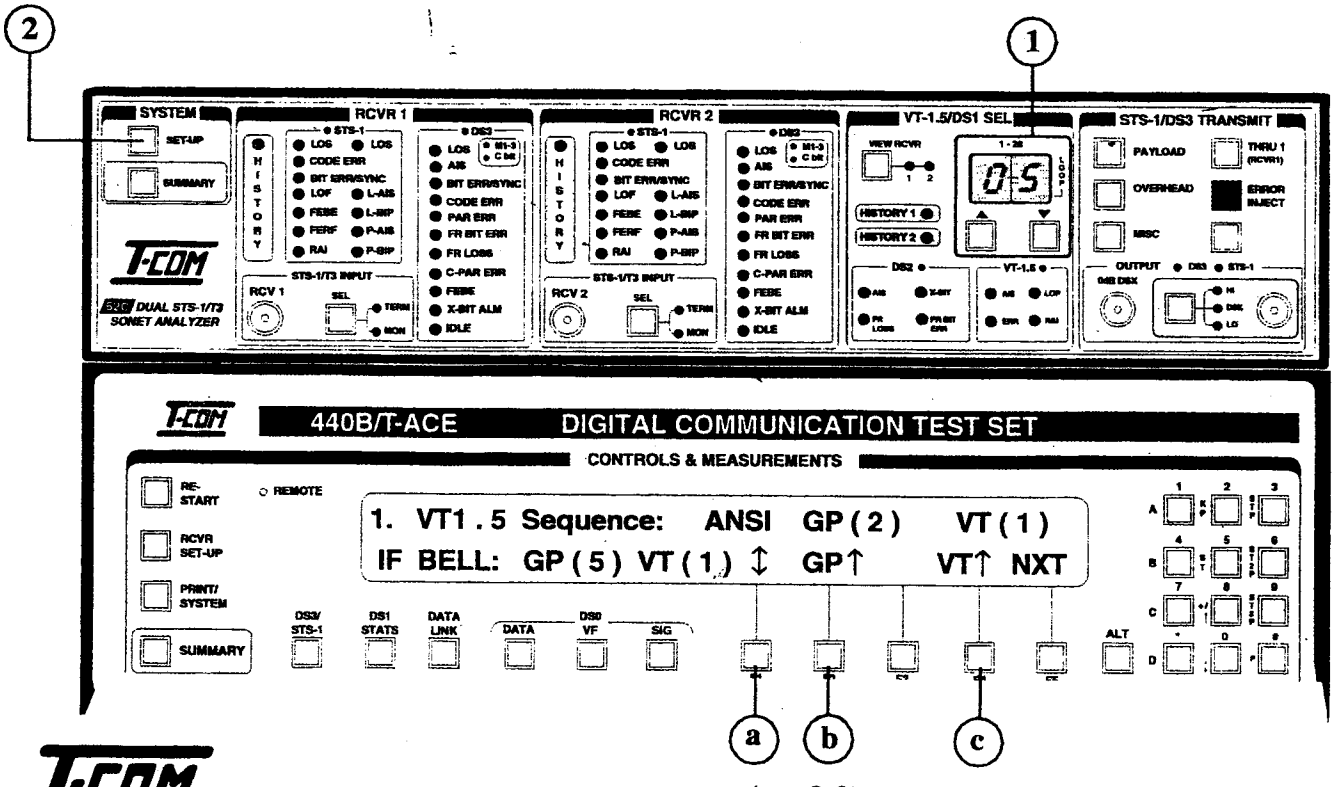
Note: DS1 errors may be caused by DS3 network problems, so it is important to check for a flashing HISTORY LED in the 52C section. Likewise, the 52C SUMMARY screen can be displayed to view DS3/DS2 errors.

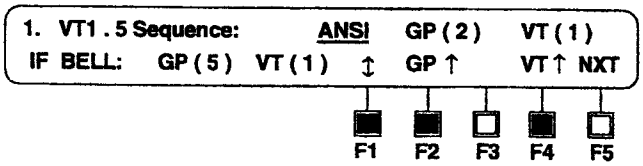
For further testing by the base unit including slip, DS0 voice, DDS, signaling telephone calls, SS7, etc. refer to 440B-TACE manual.

Selecting a VT1.5 to Demux

As a factory default, the 52C sets both receivers to be locked to the same VT1.5/DS1 channel selection.

Selecting an embedded VT1.5 tributary can be obtained either:
1. directly by scrolling through the VT1.5/DS1 SEL display or
2. by selecting the group and tributary using the ANSI or Bell sequence. This is accomplished via the 52C SET-UP key/menu.





Note:
In the screen above, the ANSI sequence is selected, and GP(2) VT(1) is selected. Notice that the 52C VT1.5/DS1 SEL section shows #5. Also, the bottom line of the screen shows the Bellcore equivalent.

a. Use the F1 (↕) key to choose ANSI or BELL grouping
   NOTE: A conversion table is given on the following page for reference
b. Use F2 (GP ↑) to choose a group
c. Use F4 (VT ↑) to choose a VT1.5 from a group.

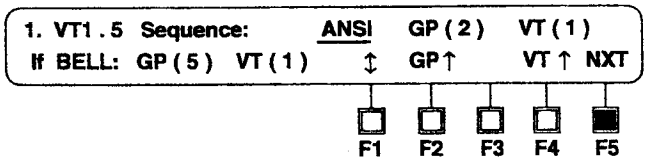
Conversion Table

	ANSI		BELL	
CH	GP( )	VT( )	GP( )	VT( )
1	1	1	1	1
2	1	2	2	1
3	1	3	3	1
4	1	4	4	1
5	2	1	5	1
6	2	2	6	1
7	2	3	7	1
8	2	4	1	2
9	3	1	2	2
10	3	2	3	2
11	3	3	4	2
12	3	4	5	2
13	4	1	6	2
14	4	2	7	2
15	4	3	1	3
16	4	4	2	3
17	5	1	3	3
18	5	2	4	3
19	5	3	5	3
20	5	4	6	3
21	6	1	7	3
22	6	2	1	4
23	6	3	2	4
24	6	4	3	4
25	7	1	4	4
26	7	2	5	4
27	7	3	6	4
28	7	4	7	4

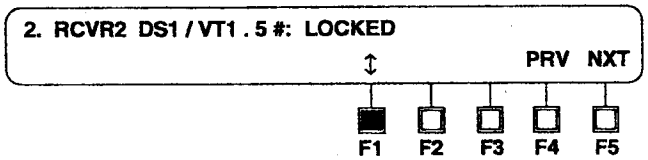
Setting RCVR1 and RCVR2 to independent DS1/VT1.5 channels

In some cases it is useful to monitor two different DS3/STS-1 systems at the same time (see figure #1). In this case the 52C must be set-up to allow independent DS1/VT1.5 selection for each receiver. This will allow the user to demux one DS1/VT1.5 to the base unit RCVR1 and another to RCVR2.

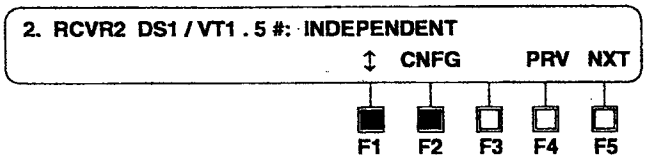
1. Press the 52C SET-UP key to display:



2. Use F5 (NXT) to scroll to:



3. Press F1(↕) to allow RCVR2 to become independent.



When independent is selected, the user can set which channel to monitor by:

4. Pressing the VIEW RCVR button to toggle between RCVR1 and RCVR2.
   a) To select a VT1.5/DS1, use the VT1.5/DS1 SEL (1-28) channel selection.
   b) To select a VT1.5 using Group and Tributary #, and either the ANSI or Bell sequence, press F2 (GP ↑) and F4 (VT ↑) as described in the previous section.

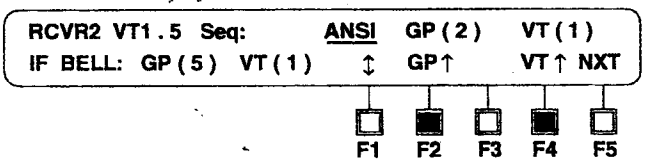
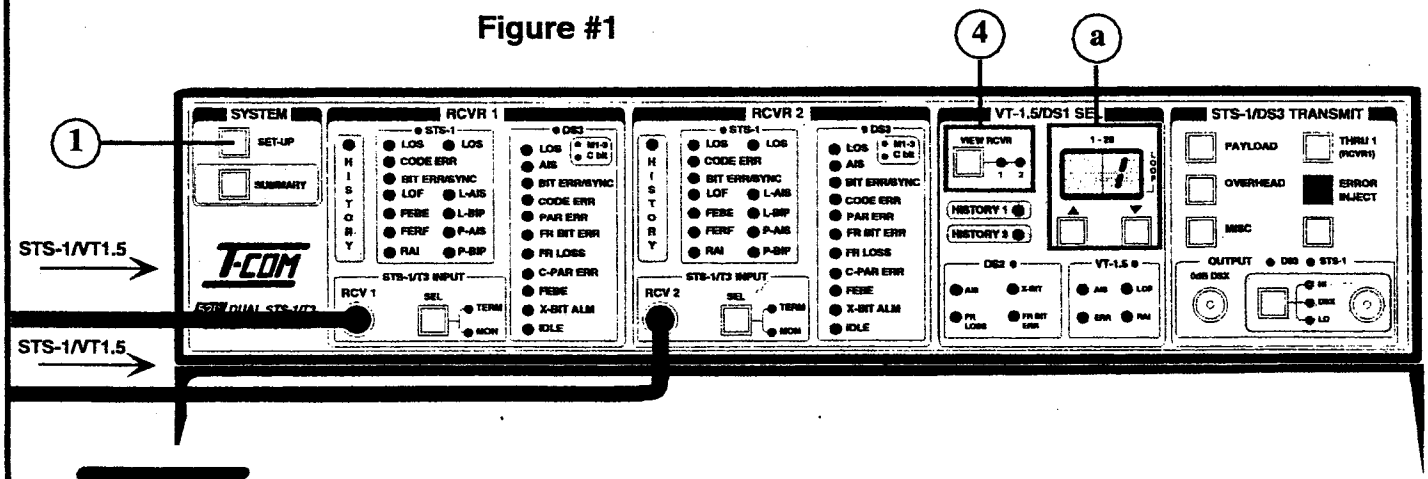


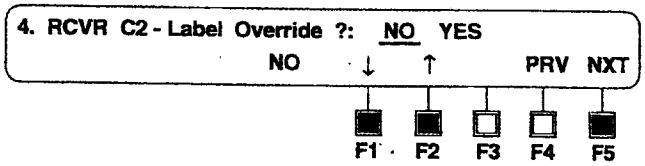
Figure #1



Overriding the C2 Label

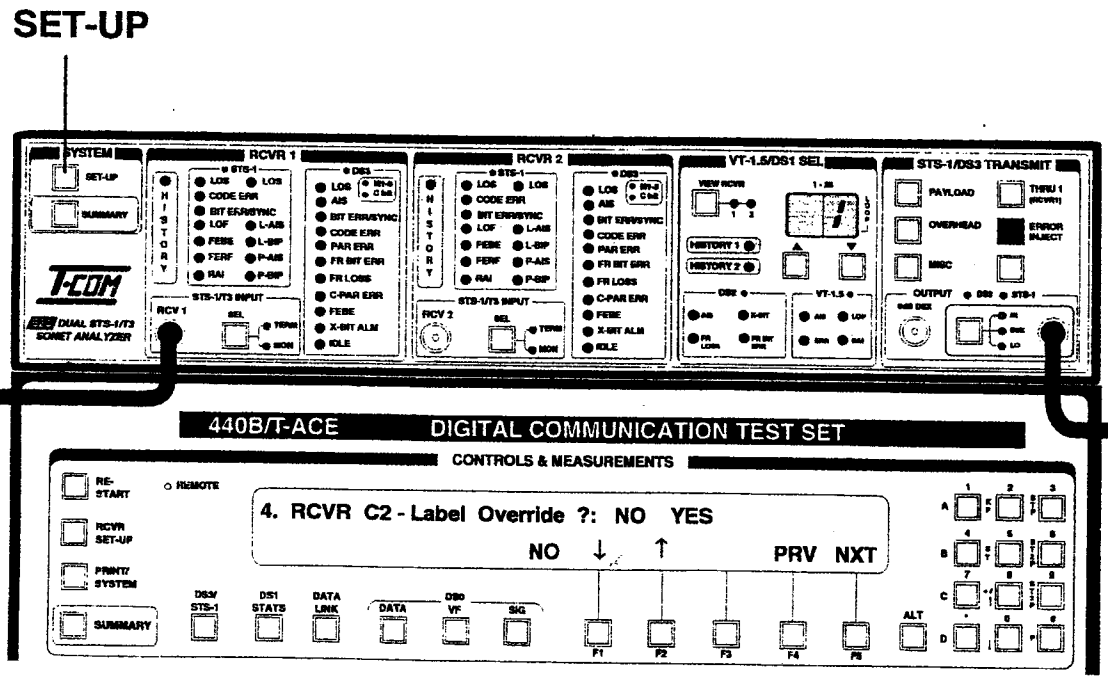
In some cases, a received STS-1 signal may have a mislabeled overhead C2 Label (byte). For example, the payload may be a DS3, but the C2 byte is incorrectly set to 00H (unequipped). Since the 52C automatically establishes the payload structure by reading the incoming C2 label, it may be necessary to override the auto-map/demux capability, and allow setting the receiver to demux a payload structure different than that defined in the decoded C2 label in the STS-1.

1. Press the 52C SET-UP key, and use F5 to scroll to screen 4 shown below:



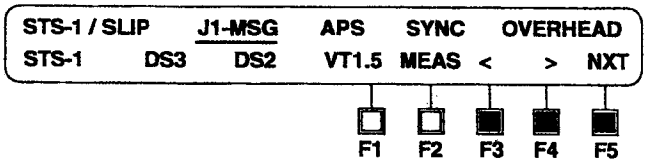
2. Use F1 and F2 to scroll through the following choices:
   a. NO
   b. VT Floating
   c. DS3 Async
   d. Unequipped
   e. Non-Specific

For example, in the screen below, regardless of the decoded C2 Label in either receiver, both receivers will be set to demux a DS3 payload in the STS-1 bitstream:

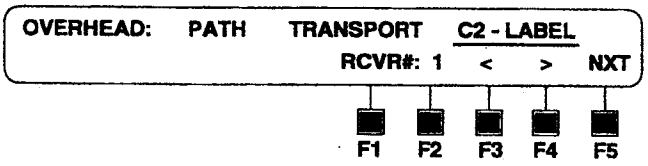


Displaying C2 Label

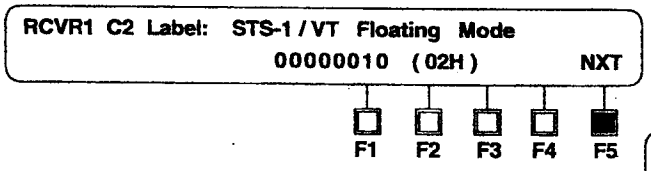
1. Press the STS-1/DS3 key to display the main STATS screen:

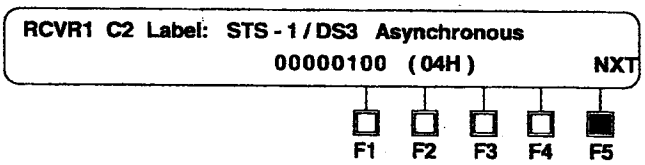


2. Underline OVERHEAD using the < > softkeys and press the NXT key to display the screen below:



3. In above screen, underline C2-LABEL. Toggle between RCVR#1 and #2 with the F1 or F2 softkey. Press NXT to display the C2 signal label as shown in the examples below:





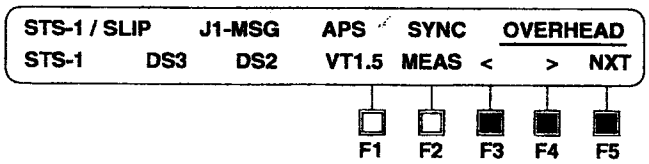
Press NXT to return to the root screen.

The following possible messages may be displayed:

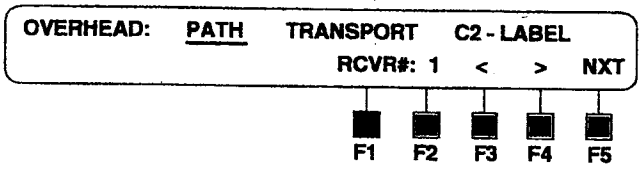
STS-1/Unequipped	00000000 (00H)
STS-1/Equipped/Non Spec.	00000001 (01H)
STS-1/VT Floating Mode	00000010 (02H)
STS-1/DS3 Asynchronous	00000100 (04H)
STS-1/DS4NA Async	00010010 (12H)
STS-1/ATM	00010011 (13H)
STS-1/DQDB	00010100 (14H)
STS-1/FDDI	00010101 (15H)
NON STANDARD	(display byte)
RCVR#1 (OR 2) NOT STS-1	

Displaying Path Overhead Bytes

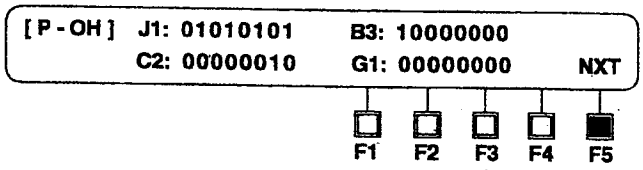
1. Press STS-1/DS3 key to display:



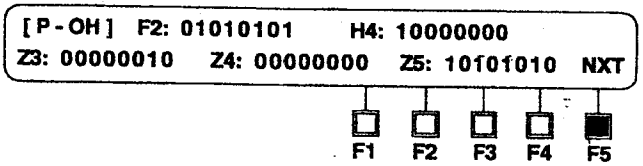
2. In screen above, underline OVERHEAD and press NXT, to display screen below:



3. In above screen, underline PATH. Toggle between RCVR#1 and #2 with F2 softkey. Press NXT to display the path overhead bytes J1, B3, C2, G1 as shown below:



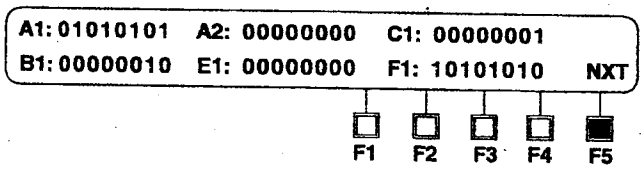
Press NXT to display the next five bytes F2, H4, Z3, Z4, Z5:

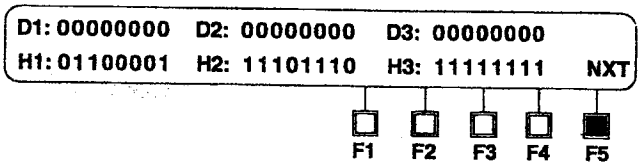


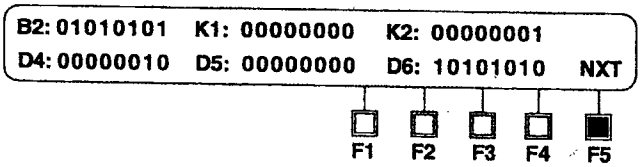
Press NXT to return to the root screen.

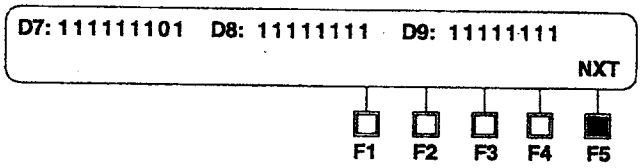
Displaying Transport Overhead

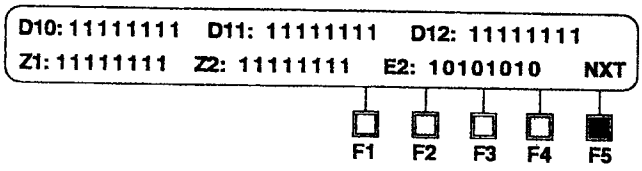
In root screen, underline TRANSPORT. Toggle between RCVR#1 and #2 with F2 softkey. Press NXT to display the Transport Overhead. Press NXT to display the first six bytes A1, A2, C1, B1, E1, F1. Continue pressing NXT to scroll through all five Transport screens.









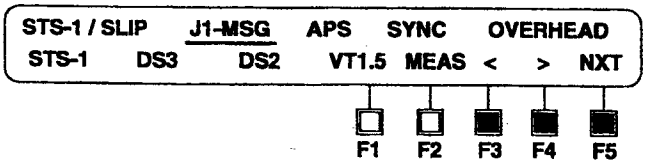


Press NXT to return to the root screen.

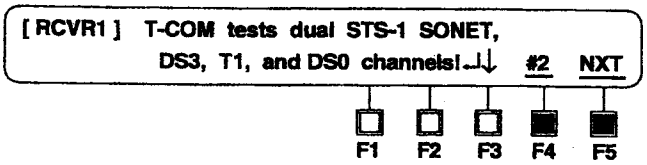
Displaying J1 Trace Message

The STS-1 frame structure contains a 64 byte message. The 52C can display ASCII encoded messages.

1. Press the STS-1/DS3 key in the base unit to display the main STATS screen:



2. Underline J1-MSG using the < > softkeys and press the NXT key to display the J1 trace message below:

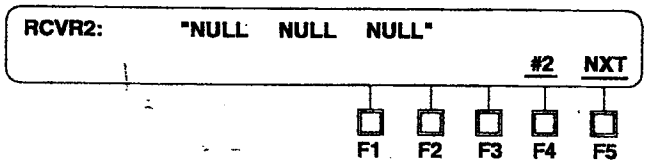


Toggle between RCVR1 and RCVR2 with softkey F4; press NXT to return to the root screen.

The 52C displays non-printable ASCII characters as follows:

- Null characters: ▒
- Carriage Return ↵
- Line Feed ↓
- Other non-printable: ≡

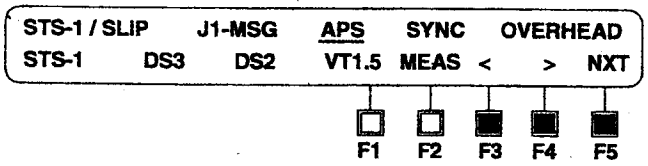
In the example below, there is no trace message in RCVR2 J1 bytes, therefore we show "NULL NULL NULL". If a receiver is not STS-1, then RCVR1 (or 2) "NOT STS-1" is displayed.



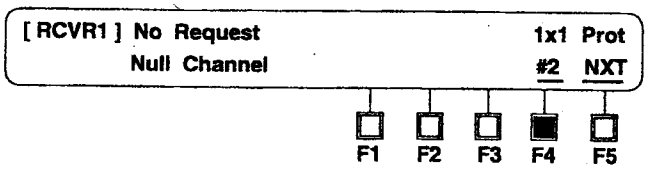
Displaying Automatic Protection Switch Messages

APS messages are automatically decoded and displayed in English (by reading the status of the transport overhead bytes K1 and K2).

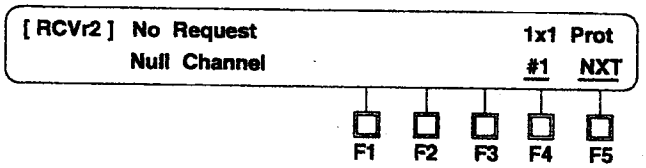
1. Press the STS-1/DS3 key to display the main STATS screen:



2. Underline APS using the < > softkeys and press the NXT key to display the APS decode screen. The example below shows "No Request", and this system is set-up for 1 to 1 protection switching.



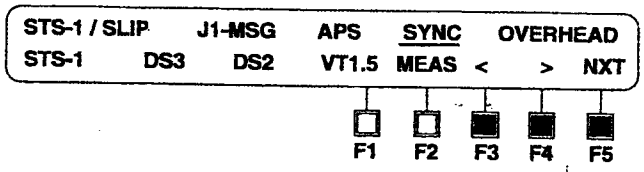
3. Toggle between RCVR1 and RCVR2 display by pressing softkey F4 (#2).



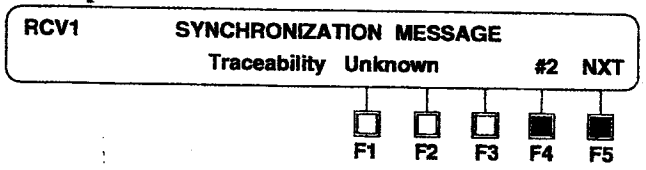
Displaying SYNC Messages

STS-1 systems carry synchronization messages that identify the source of synchronization clock/timing for the SONET system being monitored.

1. Press the DS3/STS-1 key to display:



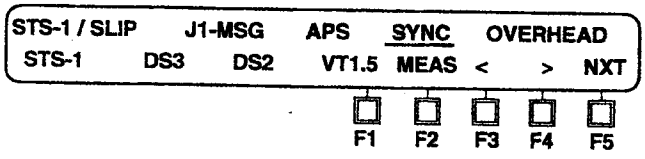
2. Underline SYNC and press NXT, the SYNC message will be displayed. F4 will toggle the screen between the two receivers.



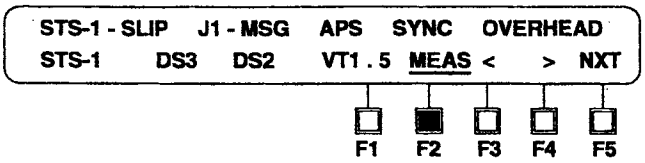
The SYNC message will be one of the following ANSI Sonet Synchronization Messages.

SONET Synchronization Quality Level Description	Quality Level	Z1 Bits B5 - B8
Traceability Unknown	2	0000
Stratum 1	1	0001
Stratum 2	3	0111
Stratum 3	4	1010
+/- 20 ppm clock	5	1100
Reserved for network synchronization	User Assignable	1110
Don't use for synchronization	7	1111

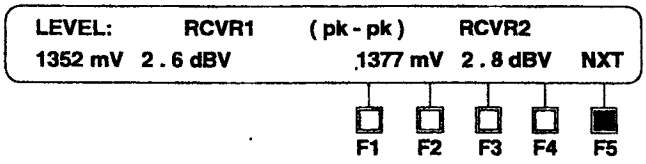
3. Press NXT to return to the opening screen.



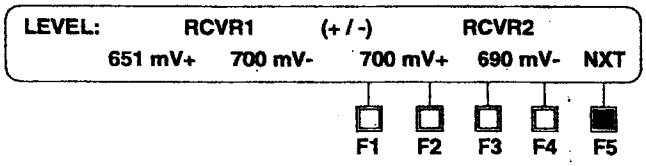
1. Press the DS3/STS-1 key in the base unit to display the following root screen:



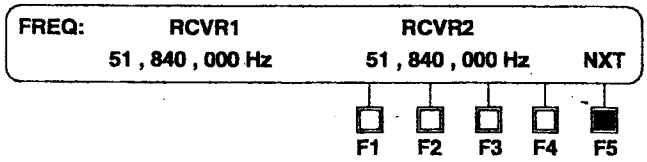
2. In the above screen, press the MEAS softkey (F2) to display the the peak-to-peak measurements:



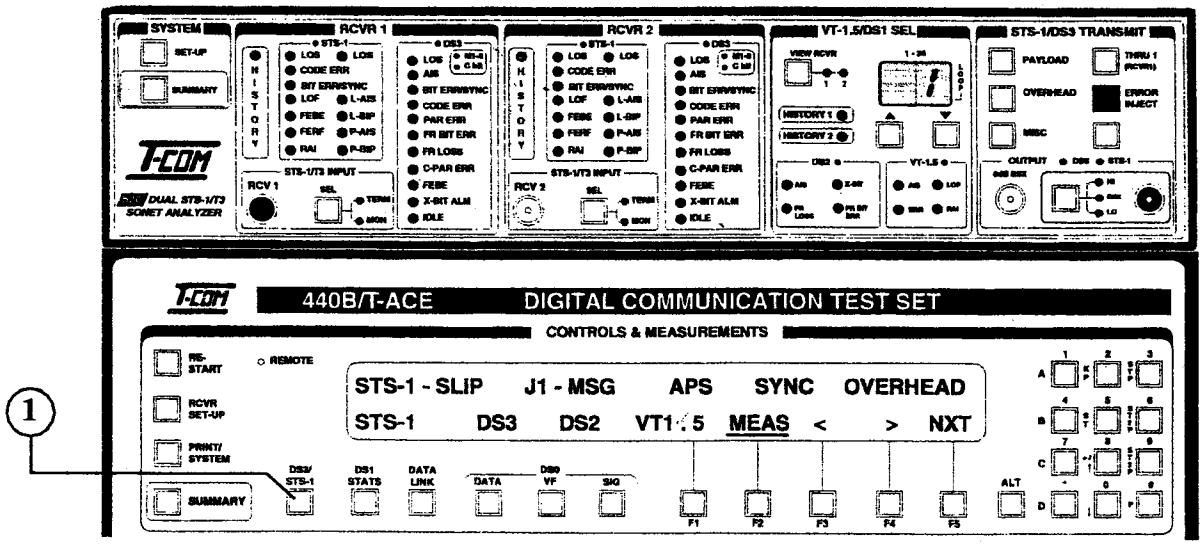
b. Press NXT, softkey (F5) to see the (+) and (-) base-to-peak level measurements:



c. Press NXT for the Frequency measurements

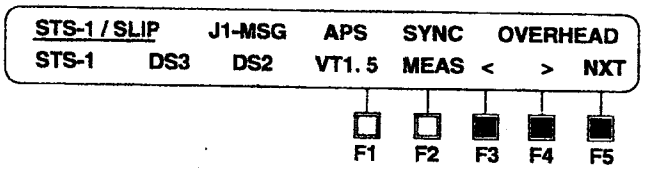


3. Press the NXT softkey (F5) to return to the root screen.



The 52C can perform slip measurement by comparing two STS-1 formatted signals. This test requires that two STS-1 signals are patched into RCVR1 and RCVR2. (The unit is not designed to compare DS3 signals.)

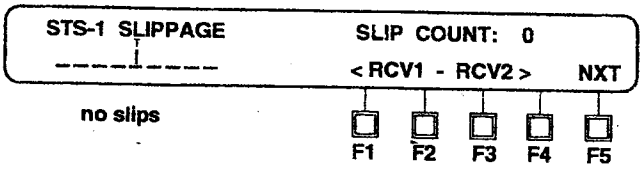
1. Press DS3/STS-1 key to display:



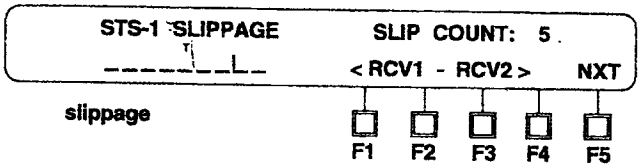
2. Underline STS-1/SLIP and press NXT, to display slip screen below:

3. Press RESTART to begin test.

a

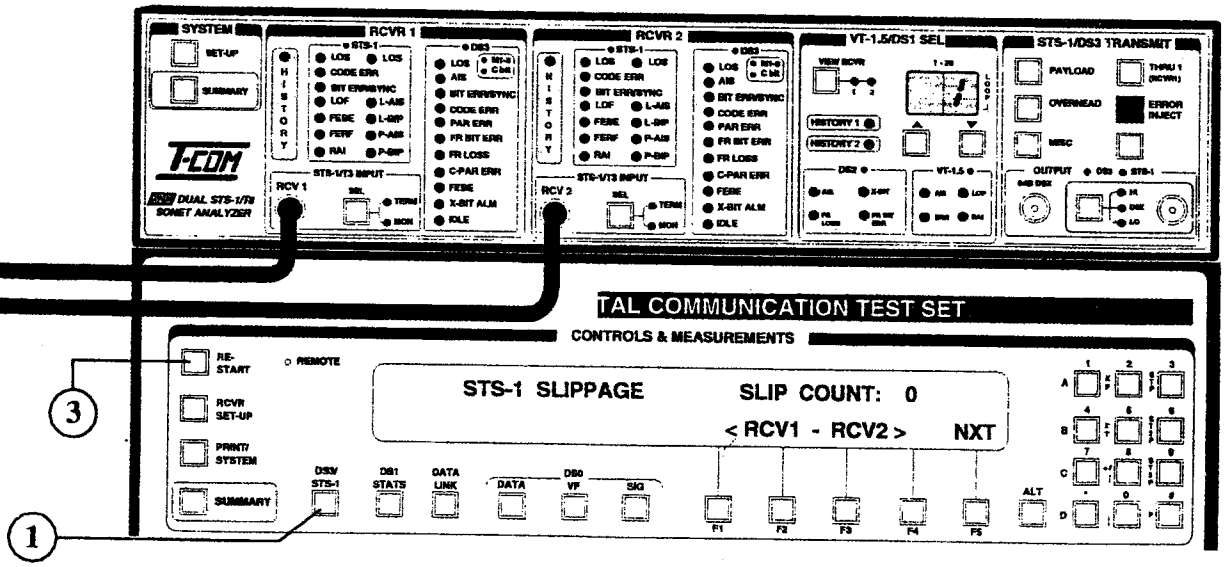


b



a. If the graph shows no movement over time, then no slips have been detected and both systems under test are determined to be synchronized to the same clock.

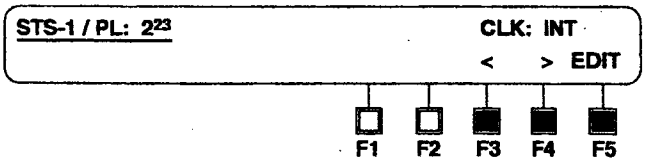
b. If the two STS-1 signals are not synchronized to the same clock, the above screen will show movement in the graph section. The slip count will accrue with each complete STS-1 frame slip.



Transmitting a DS3 Signal with a Stress Pattern

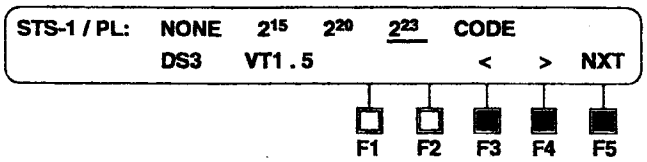
To use the 52C as a DS3 signal source (45 Mb/s), set STS-1/PL to NONE.

1. Press the transmitter PAYLOAD key to display the root screen below. Note that the transmitter is currently set to an STS-1 signal with a 2^{23}-1 stress pattern:

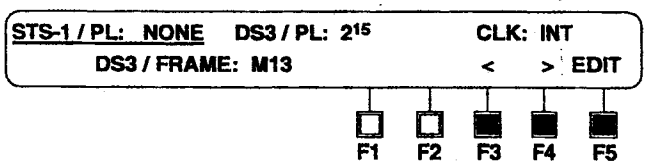


Note that the front panel output STS-1 LED is lit, indicating that the XMTR is currently set-up for STS-1.

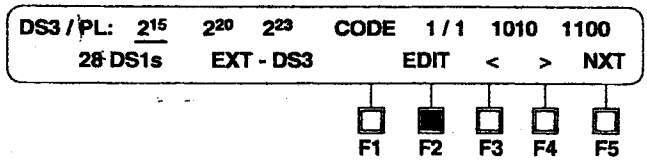
2. In the Payload root screen, underline STS-1/PL (STS-1 Payload) and press EDIT to display:



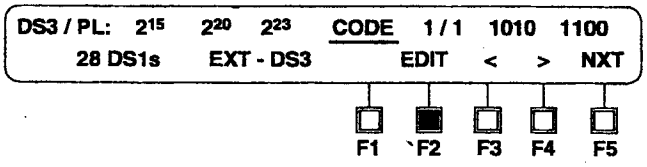
3. In the screen above, underline NONE and press NXT softkey (F5) to display the updated root screen:



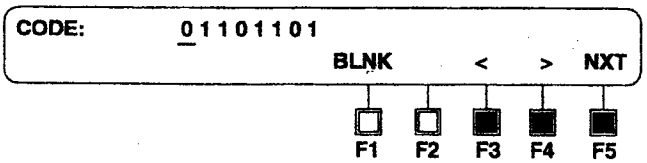
4. In the screen on the previous page, underline DS3/PL (DS3 Payload) then press EDIT to display the screen below, and underline the desired pattern:



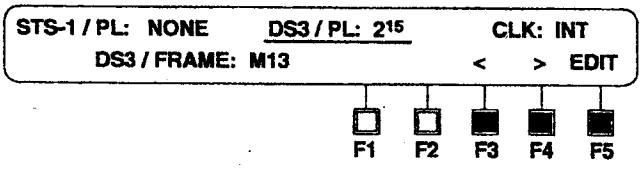
5. If CODE is underlined in step 4, EDIT appears above softkey F2.



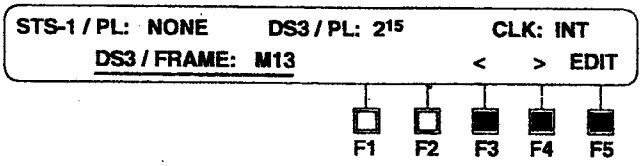
6. To edit CODE, press the EDIT softkey (F2) to display the menu below. Use < > softkeys (F3, F4) and the keypad (1s or 0s) to enter the desired byte. Press NXT (F5) to return to the DS3 screen in step 5:



7. After underlining the desired DS3 payload (i.e. 2^{15}-1), press NXT to display the updated payload screen below.

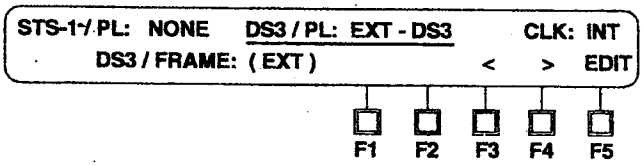


8. Underline "DS3/FRAME" and press EDIT to toggle between M13, C-Bit, and UFR (unframed).

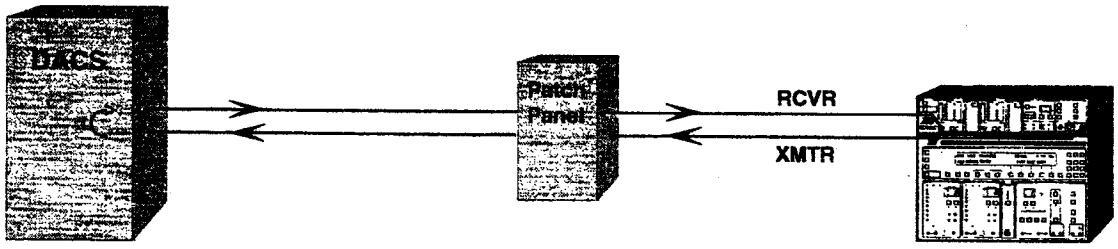


9. Underline CLK and press the EDIT softkey (F5) to display the clock menu screen, and select INT (internal clock) or RCVR1 clock.

10. If DS3/PL is set to EXT-DS3, then the DS3/FRAME will default to (EXT). In this state the DS3/Frame cannot be underlined or edited. The clock will automatically default to the recovered external DS3 source.



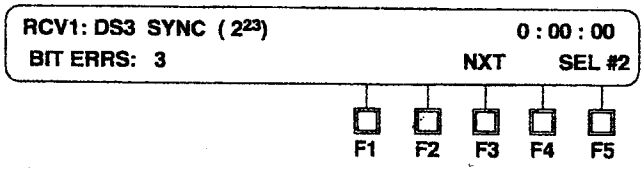
Displaying Test Results



Assuming the system is in loopback:

1. Press the RESTART and 52C SUMMARY keys to display the test results.

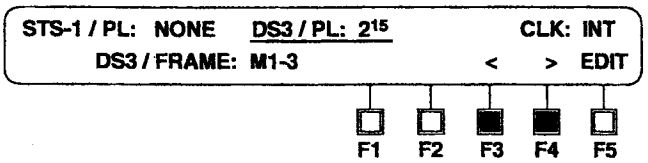
2. The 52C Sync LED should be green to confirm pattern sync. Likewise, the SUMMARY screen should confirm pattern sync.



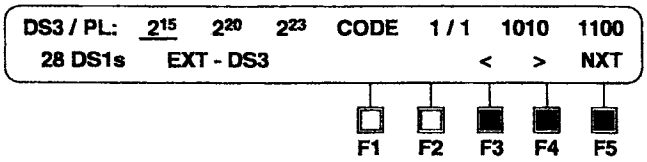
Note: NXT will appear if more than one type of DS3 error has been received.

DS3 with DS1 Pattern

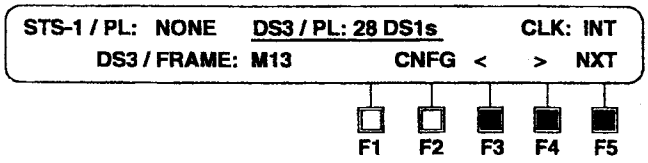
1. Press the PAYLOAD key. Note that STS-1/PL should be set to NONE in order to use the transmitter as a DS3 (45 Mb/s) source. The output DS3 LED should also be lit in the Transmitter section.



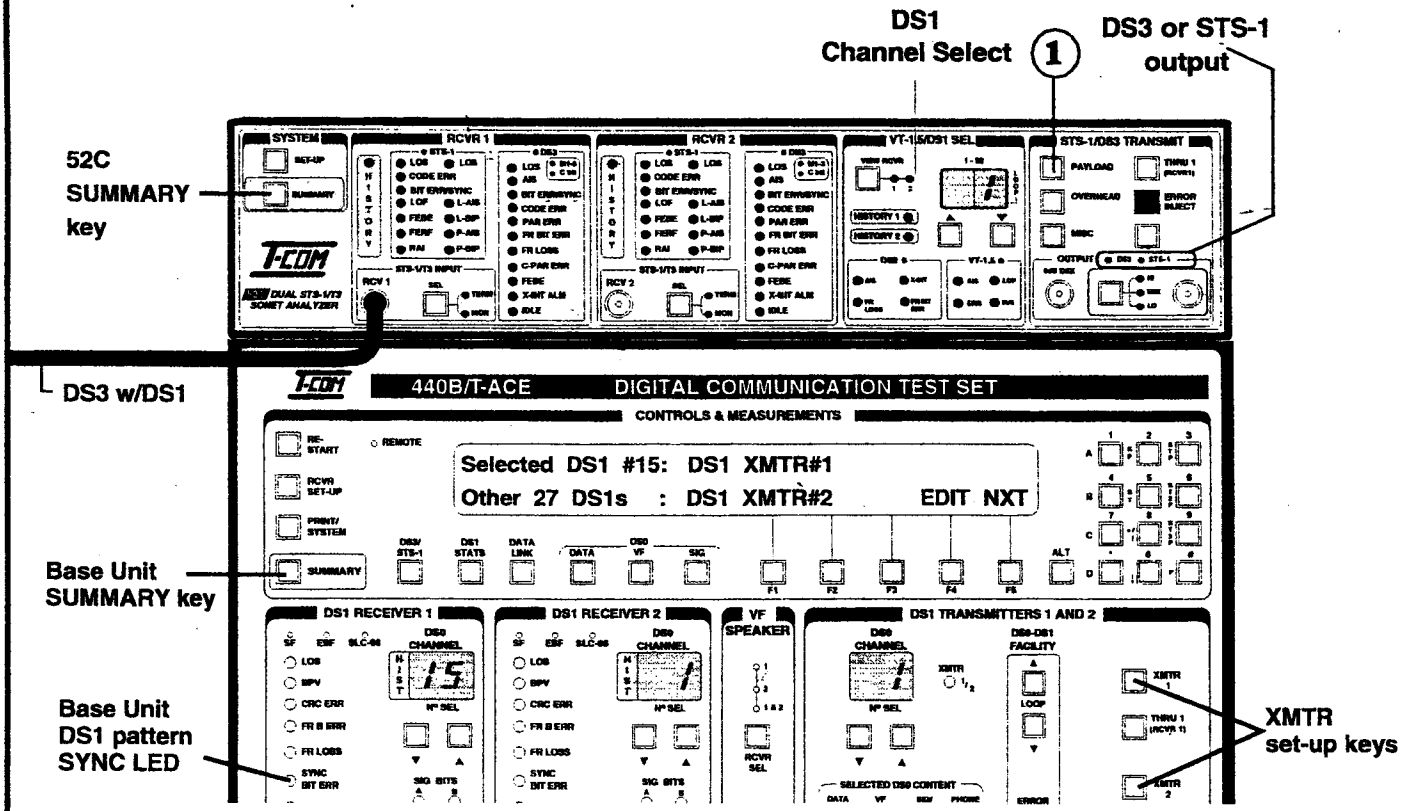
2. Underline DS3 in screen above and press EDIT softkey to display:



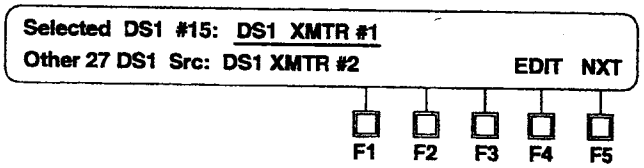
3. In the screen above, underline 28 DS1s and press NXT to display the updated root screen:



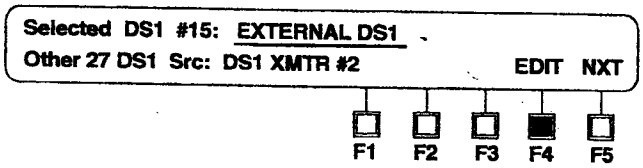
4. Underline DS3/FRAME:M13 and press EDIT to alternate the framing selection between M13 and C-bit.
5. Underline CLK and press the EDIT softkey (F5) to toggle between INT or RCVR1 (recovered clock from Receiver 1).
6. Press EDIT to return to the updated root screen as in step 3.



7. Press CNFG to display the current settings for the 28 DS1s as shown in the screen below:

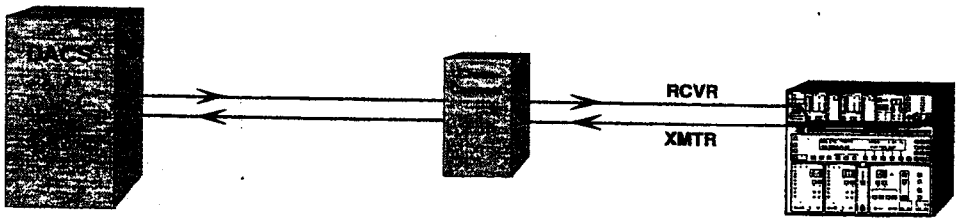


NOTE: The selected DS1 (#15) is set from the front panel channel selector. The content of the selected DS1 is delivered by DS1 XMTR#1 (base unit). The content of the remaining 27 DS1s is delivered by DS1 XMTR#2 (base unit). Changes are made via the base unit XMTR set-up keys.

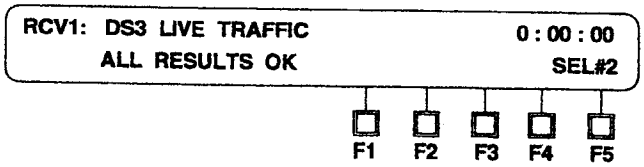


NOTE: An external DS1 signal can be inserted into the "Selected DS1" by using the EDIT softkey (F4) to toggle between DS1 XMTR#1 and EXTERNAL DS1. When EXTERNAL DS1 is selected, patch a DS1 signal into the rear panel EXT DS1 input jack.

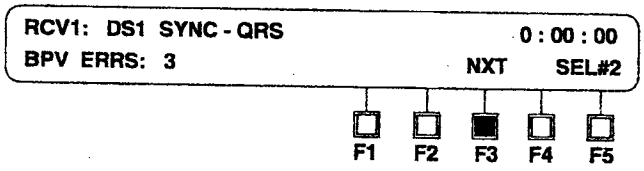
Displaying Test Results

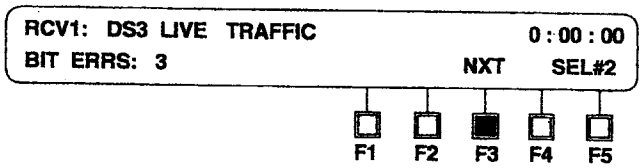


1. While transmitting a DS1 framed signal mapped into a DS3, with the signal looped at the far end, press RESTART and the 52C SUMMARY key to view the SUMMARY screen.



NOTE: To confirm pattern sync press the Base Unit SUMMARY key. The Base Unit Receiver Sync LED will be green if pattern sync has been achieved.

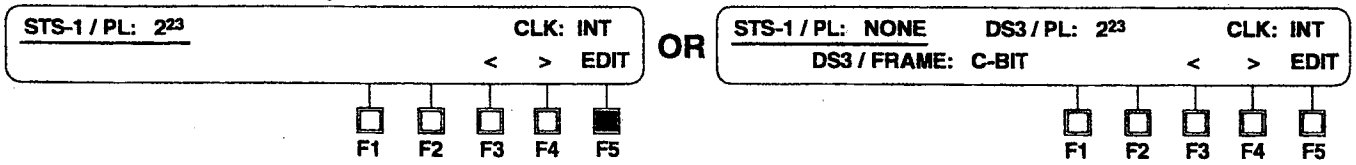




The 440B/T-ACE SUMMARY screen will indicate the error type detected as well as the error count. If more than one error type was detected, NXT will appear above F2.

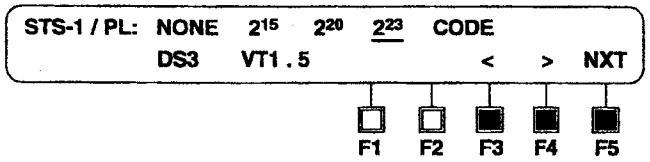
Transmitting an STS-1 Stress Pattern

1. Press the PAYLOAD key:

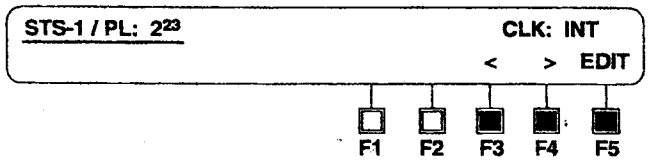


Note: When STS-1/PL is set to NONE, the second screen above appears.

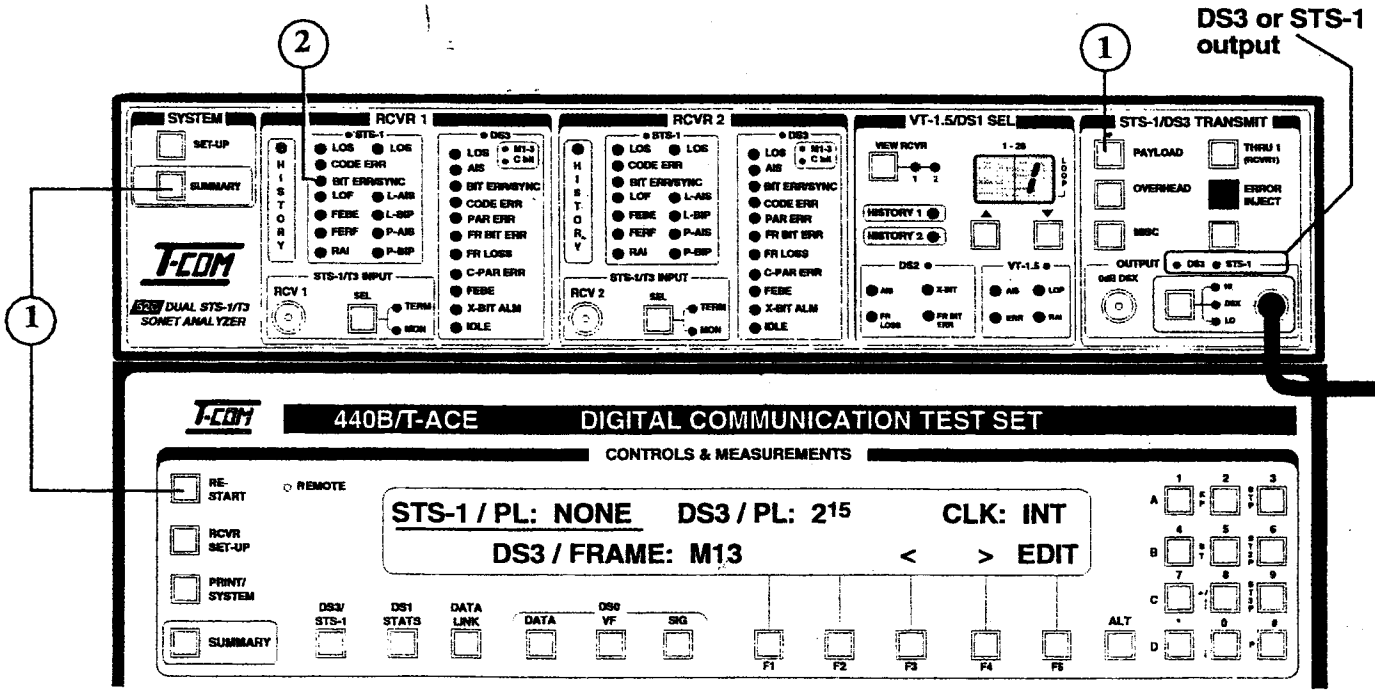
2. Underline STS-1/PL in the above screen and press EDIT to display the STS-1 payload menu below.



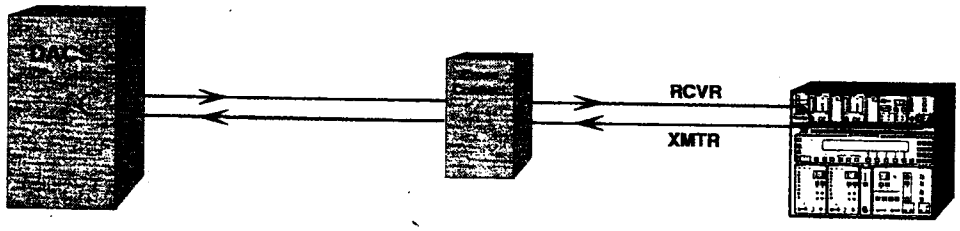
3. In the above screen, underline the desired pattern and press NXT to show updated root screen:



4. Underline CLK in above screen and press EDIT to select RCVR1, INT or EXTas the transmit clock source.

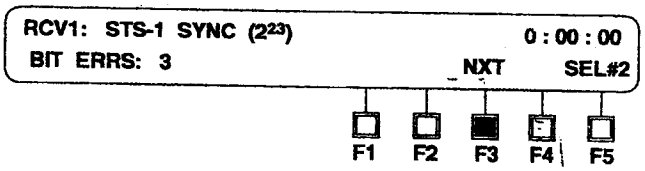


Displaying the Test Results



Assuming the system is in loopback:

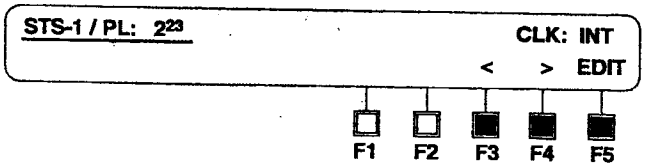
1. Press RESTART and 52C SUMMARY key to display the test results.
2. The 52C SYNC LED should be green to confirm pattern sync. Likewise, the SUMMARY screen should confirm pattern sync.



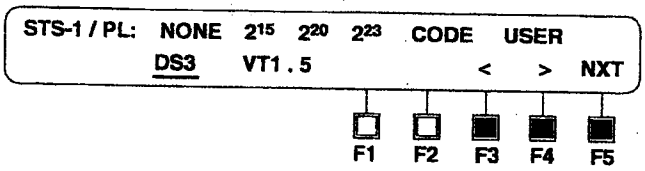
Note: NXT will appear if more than one type of STS-1 error has been received.

Transmitting an STS-1 with an Imbedded DS3

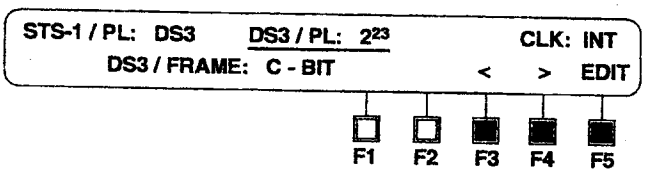
1. Press the PAYLOAD key:



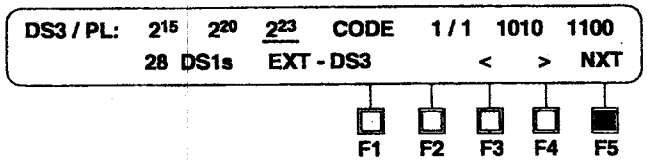
2. In the screen above underline STS-1/PL: and press EDIT to display the screen below.



3. In the screen above underline DS3 and press NXT to display the updated root screen:

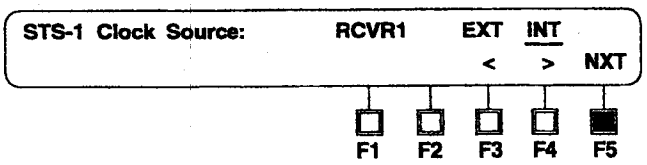


4. By underlining DS3/PL: in the root screen and depressing NXT, you can access the DS3 content menu.



5. In the DS3 content menu screen underline your selection and press NXT to display the updated root screen.

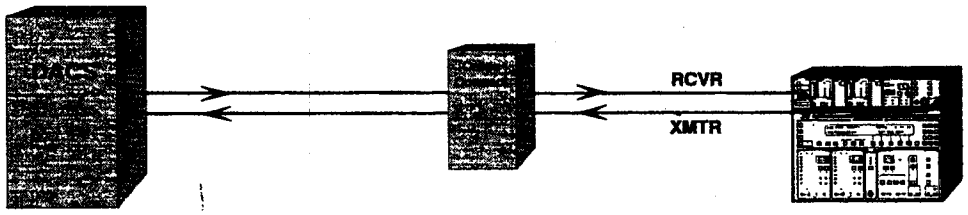
6. By underlining CLK: in this screen, and pressing EDIT,you can select the clock source menu.



7. In the clock source menu screen underline you selection and press NXT to display the updated root screen.

8. By underlining DS3/FRAME: in this screen and pressing EDIT, you can change the framing selection to C-BIT, M13, or UFR.

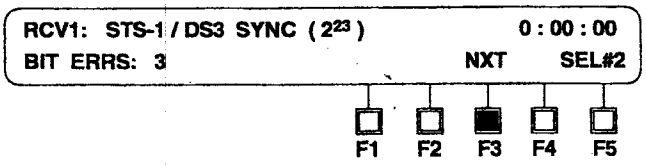
Displaying the Test Results



Assuming the system is in loopback, display the results by:

1. Pressing RESTART and the 52C SUMMARY key to display the test results.

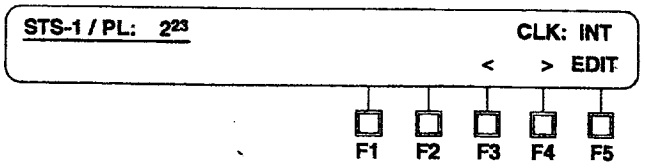
2. The 52C BIT ERR/SYNC LED should be green to confirm pattern sync. Likewise, the SUMMARY screen should confirm the pattern sync.



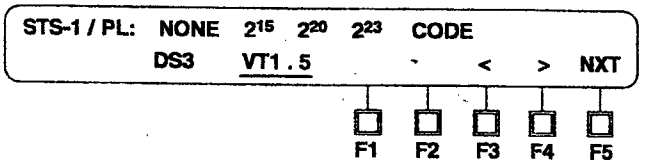
If errors are received the SUMMARY screen will indicate what error was received as well as the number of errors. If more than one error type was received NXT will appear above F3.

Transmitting an STS-1 with an Imbedded VT1.5

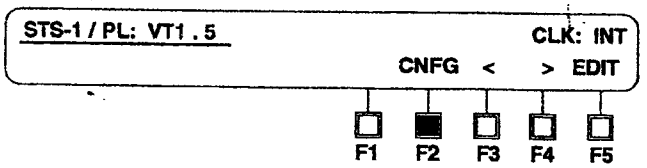
1. Press the PAYLOAD key:



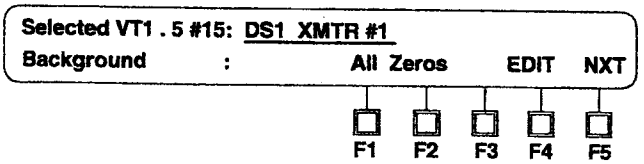
2. In the above screen underline STS-1/PL and press EDIT to display the screen below:



3. Underline VT-1.5 and press NXT to display the updated root screen. Note: The VT-1.5 channel number is selected (and displayed) in the front panel section labeled VT-1.5/DS1 SEL.



4. Press CNFG (F2) softkey, in screen above, to set the content of the selected VT-1.5 payload (#15):

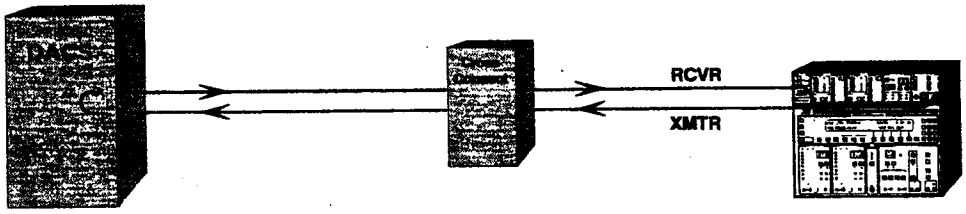


Use the EDIT softkey (F4) in above screen to toggle between DS1 XMTR#1 and EXTERNAL DS1 for the selected VT1.5 source. When DS1 XMTR#1 is shown above, the base unit transmitter delivers the content of the selected VT1.5. Press base unit XMTR#1 SET-UP key to display the content of the selected VT1.5.

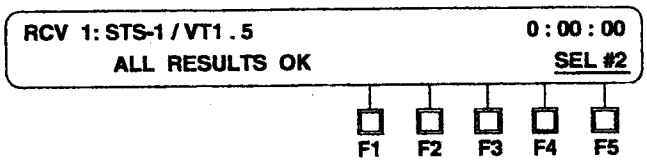
NOTE: Since the transmitter only generates a single VT1.5 signal, the remainder of the STS-1 envelope (background) is All Zeros.

Press NXT to return to the payload root screen.

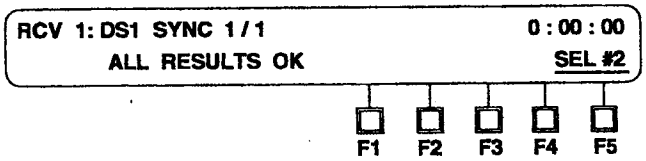
Displaying Test Results

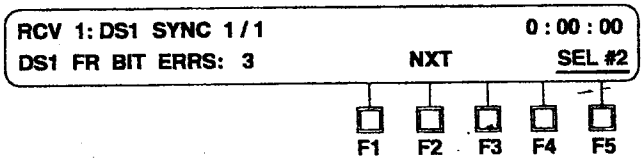


1. While transmitting a VT1.5 framed signal mapped into an SPE, with the signal looped at the far end, press the 52C SUMMARY key and RESTART to view the SUMMARY screen.



Note: To confirm pattern sync the base unit SUMMARY key must be used. Also the base unit receiver SYNC LED will be green confirming pattern synchronization.



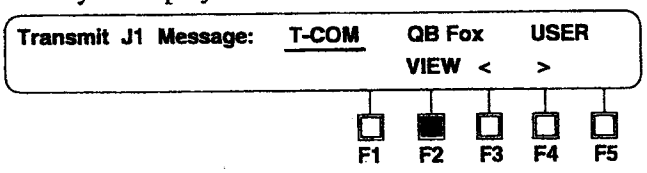


If errors are received the 440B/T-ACE Summary screen will indicate the error type detected as well as the number of errors. If more than one error type was received NXT will appear above F2.

J1 Trace Message

The 52C can transmit three messages, a USER programmable 64 byte ASCII message, a T-COM message and a standard Quick Brown Fox pattern.

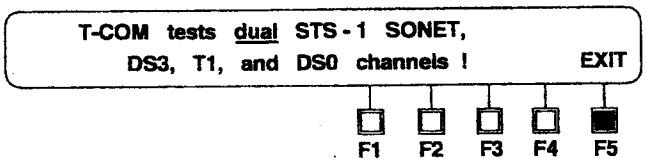
1. Press the OVERHEAD key to display:



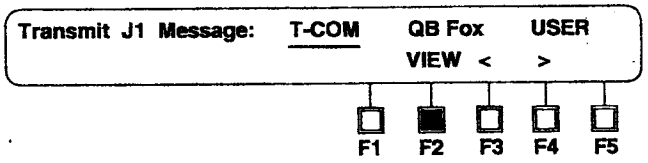
The default J1 message is the following T-COM message:

T-COM tests dual STS-1 SONET,
DS3, T1 and DS0 channels!

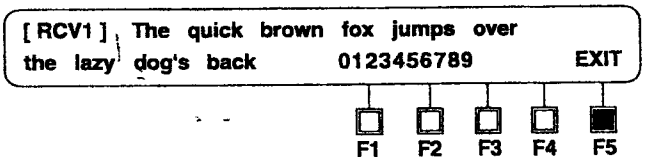
2. Press VIEW in the above screen to display the T-COM message being transmitted:



3. Press the EXIT key to return to the previous screen:



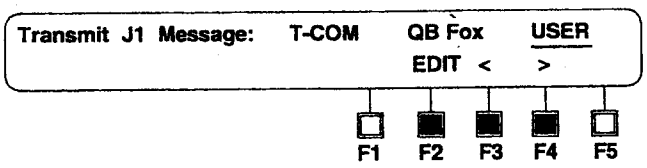
4. Underline QB Fox to send the Quick Brown Fox. Press VIEW to display the complete message:



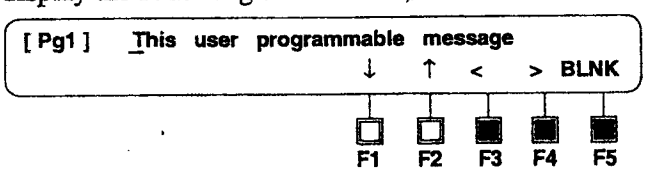
NOTE: The T-COM, QB-FOX, and USER messages automatically include a Carriage Return and Line Feed at the end of the sentences.

Press EXIT to return to the previous screen.

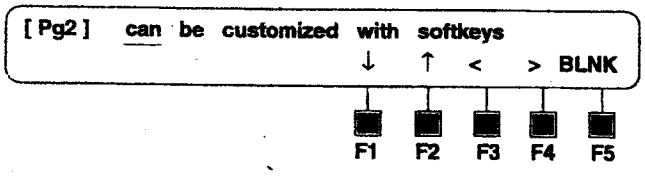
5. To program and send the USER message, underline USER. Note that the VIEW prompt becomes the EDIT prompt:



6. Press EDIT (F2) to display the following screen:



7. Use BLNK softkey (F5) to truncate the message with a Carriage Return/Line Feed. Underline [Pg1] and use keys to toggle to the next page:

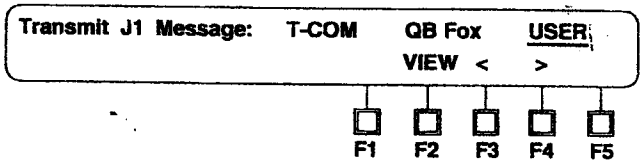


8. Use the < > keys to move the underline to a specific position character. Use the ↓↑ (F1, F2) keys to scroll through ASCII characters.

9. Toggle between Pg1 and Pg2 by underlining [Pg1] and toggling with the ↓↑ keys.

10. Use the BLNK softkey (F5) to erase all characters after the underlined character. The "hidden" Carriage Return/Line Feed will not be erased - it will automatically move to the end of the sentence.

11. To EXIT press the overhead key. This returns you to the following screen:



NOTE: The end of the USER message automatically terminates with a "hidden" Carriage Return/Line Feed. Therefore the user is limited to 62 bytes of programmable characters.

C2 Label

The 52C automatically programs the C2 Label byte according to the current transmitter set-up.

If the transmitter is set-up for STS-1 with stress pattern, then C2 will automatically conform to

STS-1/Equipped/Non Spec.	00000001 (01H)

If the transmitter is set-up for STS-1 with VT1.5, then C2 will automatically conform to

STS-1/VT Floating Mode	00000010 (02H)

If the transmitter is set-up for STS-1 with an imbedded DS3, then C2 will automatically conform to

STS-1/DS3 Asynchronous	00000100 (04H)

Note: At this time the 52C cannot generate the following C2 conditions:

STS-1/Unequipped	00000000 (00H)
STS-1/DS4NA Async	00010010 (12H)
STS-1/ATM	00010011 (13H)
STS-1/DQDB	00010100 (14H)
STS-1/FDDI	00010101 (15H)

The ERROR INJECT key in the transmitter section can be set to immediately send a pre-set error (auto) when pressed, or the key can be used to display a menu screen for selecting a variety of errors and alarms, as well as rates (menu). The ERROR INJECT key can be configured by underlining CNFG in the PRINT/SYSTEM menu.

Note: Changes made in the (PRINT/SYSTEM) CNFG settings affect both the 52C and the base unit.

The factory default setting for the ERROR INJECT key is AUTO. The table below describes the errors injected each time the ERROR INJECT key is pressed.

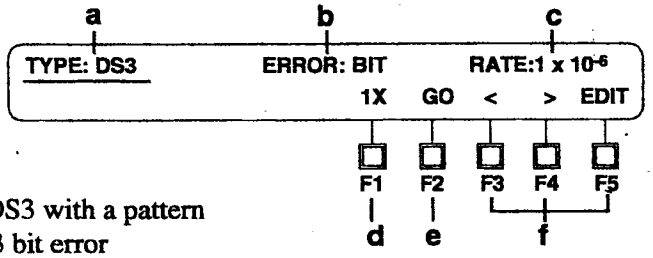
I. When ERROR INJECT is set to : AUTO

XMTR Set-Up MODE	Error injected
STS-1/DS3/28 DS1s	P-BIP and FEBE
STS-1/VT1.5	P-BIP and FEBE
STS-1/Pattern	logic bit error
DS3/Pattern	logic bit error

II When the ERROR INJECT is set to: MENU

Press the 52C ERROR INJECT key to display the following root screen:

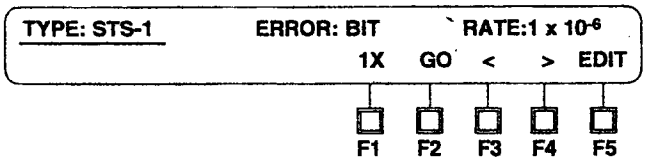
Interpreting ERROR inject menu screen:

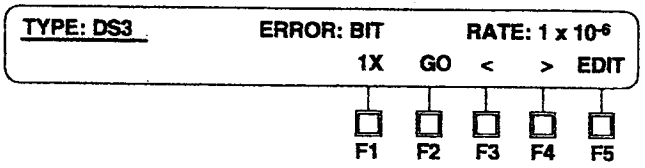


a. Payload type: DS3 with a pattern
b. Error type: DS3 bit error
c. Rate: 1 x 10-6
d. Press 1X softkey to inject a single error
e. Press GO softkey to send at selected Rate
f. To change a, b, or c use < > to underline and press EDIT

Selecting New Types:

Errors are organized by types according to the payload being transmitted. Pressing the ERROR INJECT key will display one of the following root screens:

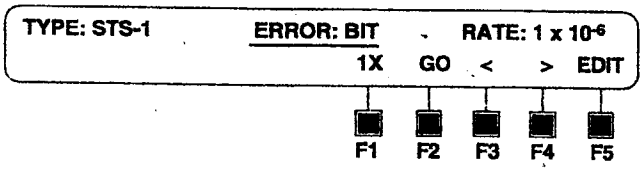




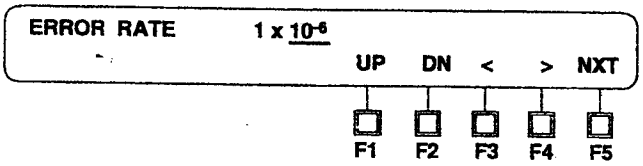
The allowable errors depend on the selected payload type (i.e. STS-1 errors are not available if transmitting a pure DS3 signal).

Selecting New Errors and Alarms

Specific errors and alarms are selected by underlining ERROR and pressing EDIT to display menu choices.

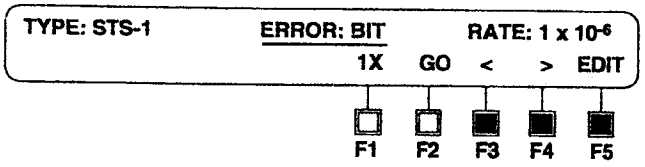


In the above screen, STS-1 bit error is selected. The user can inject a single error by pressing 1X (F1) softkey, or send errors at the rate displayed (1 x 10-6) by pressing GO. To change the rate, underline RATE and press EDIT.

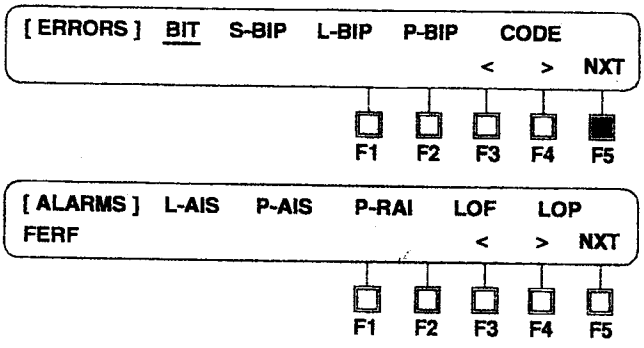


For BIT, S-BIP, L-BIP and P-BIP errors, the rate can be set between 1 x 10^{-4} and 1 x 10^{-9}. If 10^{-4} is selected, the multiplier can only be 1. Code errors can only be sent one at at time

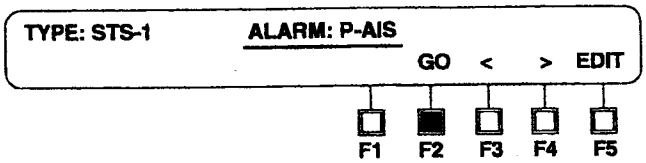
Selecting Error/Alarm type if TYPE is STS-1:



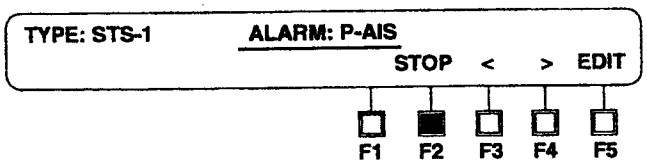
In the root screen above, underline current error (ERROR: BIT), and press EDIT to display the menu screens below. Press NXT in the first (ERROR) screen to display the second (ALARM) screen.



When an ALARM is selected (as shown below), there is no longer a 1X since only continuous GO is available. After GO is pressed, the screen automatically displays a flashing STOP. The STOP key is pressed to end ALARM and ERROR injection.



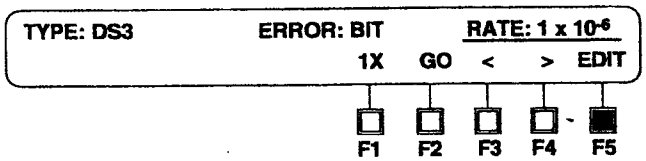
Press GO in above screen to send P-AIS. GO becomes a flashing STOP:



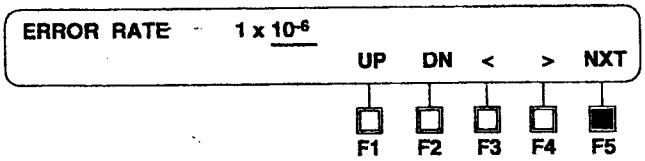
Press STOP to end alarm injection.

Selecting Error/Alarm type if TYPE is DS3:

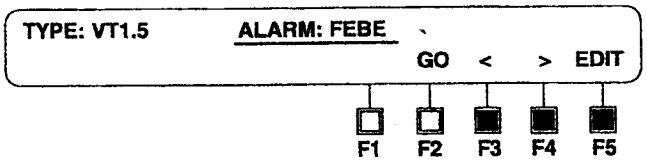
Bit-Err is the only error type available with DS3 type.



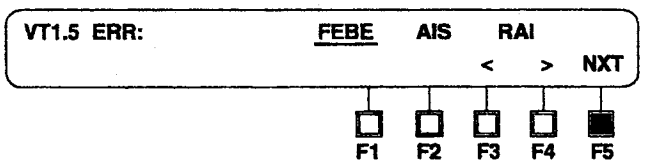
Underline RATE and press EDIT to select rate screen; press NXT to return to screen above.



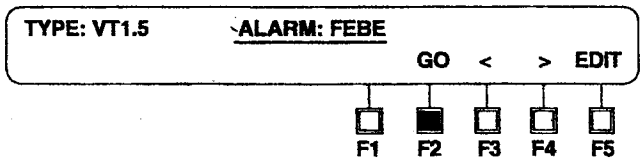
Selecting Alarm type if TYPE is VT1.5:



In the root screen above, underline ALARM and press EDIT to display.

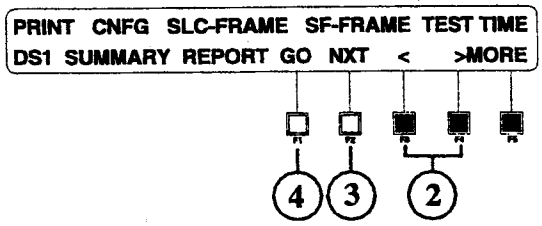


Press NXT to return to the root screen.



Press GO to send the alarm.

1. Press **PRINT/SYSTEM** key on the 440B/TACE base unit to display the root menu screen. Note: see TACE manual for print/system configurations.



2. Use the < (F3) or > (F4) softkeys to move the underline to PRINT.
3. Pressing NXT (F2) will allow the user to scroll through six result choices.
4. Selecting STS-1/DS3 SUMMARY and then pressing GO (F1) will send the following report to the printer port.

```
          STS-1/DS3 SUMMARY
DATE: 01/23/98                TIME: 15:17

          <RCVR 1>                <RCVR 2>
Format: STS-1/DS3 Asynchronous  Format: STS-1/DS3 Asynchronous
Pattern: Live Traffic           Pattern: Live Traffic
DS3 FRAME: C-BIT                DS3 FRAME: C-BIT
Results: All Results OK         Results: All Results OK
STS-1 SLIP COUNT:  0                     0

END 52C STS-1/DS3 SUMMARY
```

The screen will display the receiver summary report for both Receiver 1 and 2.

b) Selecting STS-1/DS3 STATS and pressing GO (F1) will send the following report to the printer port.

SUMMARY Report Continued

STS-1/DS3 STATISTICS

DATE: 01/23/98 TIME: 15:17

	<RCVR 1>	<RCVR 2>
Error Count		
Pattern Bit:	0	0
S-BIP:	0	0
L-BIP:	0	0
S-BIP:	0	0
Path-FEBE:	0	0
Code:	0	0
PTR-JISTIF:	0	0
APS MSG:	0	0
STS-1 SLIP COUNT:	0	0
Errored Seconds		
ERR MSG:	0	0
LOS SEC:	0	0
S-BIP:	0	0
L-BIP:	0	0
S-BIP:	0	0
Code:	0	0
L-AIS:	0	0
L-FERF:	0	0
P-AIS:	0	0
P-RAI:	0	0
LOF:	0	0
LOP:	0	0
UNAVAIL:	0	0
SYNC LOSS:	0	0
P-FEBE:	0	0
DS3 STATS		
DS3 ERR SEC		
ERR MSG:	0	0
LOS SEC:	0	0
BIT ERR:	0	0
CODE ERR:	0	0
PAR ERR:	0	0
FR-LOSS:	0	0
AIS:	0	0
X-BIT ALM:	0	0
SYNC LOSS:	0	0
DS3 BER		
BIT:	0	0
FR BIT:	0	0
PAR:	0	0
FEBE:	0	0
CPAR:	0	0
DS2 ERR CNT		
FRAME BIT:	0	0
DS2 ERR SEC		
ERR MSG:	0	0
FR-LOSS:	0	0
AIS:	0	0
X-BIT ALM:	0	0
VT1.5 CNT		
BIP:	0	0
FEBE:	0	0
PTR-JUSTIF:	0	0
VT1.5 SEC		
BIP:	0	0
UNAVAIL:	0	0
LOP:	0	0
LOM:	0	0
AIS:	0	0
VT1.5 BER		
EQ L-BIP:	0	0
FEBE:	0	0

END 52C STS-1/DS3 STATISTICS

This screen will display all errors (zero if no errors were encountered) related to STS-1/DS3 traffic.

Note: It may be in the user's best interest to down load to a PC considering the length of some reports.

c) Selecting SONET OVERHEAD and pressing GO (F1) will send the following report to the printer port:

SONET OVERHEAD
DATE: 01/23/98 TIME: 11:31

PATH OVERHEAD: Receiver#1

J1: 01101001
B3: 10010101
C2: 00000100
G1: 00000000
F2: 11111111
H4: 11111111
Z3: 11111110
Z4: 11111111
Z5: 11111111

J1-1 Trace Message

This user programmable message
can be changed with softkeys

J1-HEX

69 73 20 75 73 65 72 20 70 72 6F 72 61 6D 6D
61 62 6C 65 20 6D 65 73 73 61 67 65 20 63 61 6E
20 62 65 20 63 68 61 6E 67 65 64 20 77 69 74 68
20 73 6F 66 74 6B 65 79 73 20 20 0D 0A 20 54 68

C2-Label Receiver #1

[04H] STS-1/DS3 Asynchronous

TRANSPORT OVERHEAD: Receiver #1

A1 : 11110110	A2 : 00101000	C1 : 11111111
B1 : 10101010	E1 : 00000000	F1 : 11111111
D1 : 00000000	D2 : 00000000	D3 : 00000000
H1 : 01100001	H2 : 11000000	H3 : 11111111
B2 : 11010100	K1 : 00000000	K2 : 00000000
D4 : 00000000	D5 : 00000000	D6 : 00000000
D7 : 00000000	D8 : 00000000	D9 : 00000000
D10: 00000000	D11: 00000000	D12: 00000000
Z1 : 11111111	Z2 : 11111111	Z3 : 11111111

OVERHEAD Report Continued

PATH OVERHEAD: Receiver #2

J1: 00100000
B3: 10011001
C2: 00000100
G1: 00000000
F2: 11111111
H4: 11111111
Z3: 11111111
Z4: 11111111
Z5: 11111111

J1-2 Trace Message

This user programmable message
can be changed with softkeys

J1-HEX

20 75 73 65 72 20 70 72 6F 67 72 61 6D 6D 61 62
6C 65 20 6D 65 73 73 61 67 65 20 63 61 6E 20 62
65 20 63 68 61 6E 67 65 64 20 77 69 74 68 20 73
6F 66 74 6B 65 79 73 20 20 0D 20 54 68 69 73

C2-Label Receiver #2

[04H] STS-1/DS3 Asynchronous

TRANSPORT OVERHEAD: Receiver #2

A1 : 11110110	A2 : 00101000	C1 : 11111111
B1 : 10101010	E1 : 00000000	F1 : 11111111
D1 : 00000000	D2 : 00000000	D3 : 00000000
H1 : 01100001	H2 : 11000000	H3 : 11111111
B2 : 11010100	K1 : 00000000	K2 : 00000000
D4 : 00000000	D5 : 00000000	D6 : 00000000
D7 : 00000000	D8 : 00000000	D9 : 00000000
D10: 00000000	D11: 00000000	D12: 00000000
Z1 : 11111111	Z2 : 11111111	Z3 : 11111111

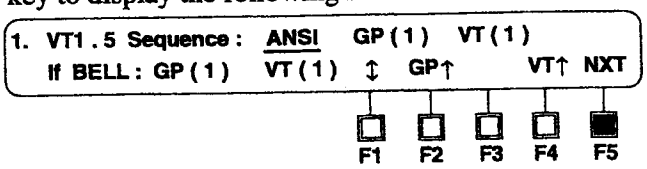
END 52C SONET OVERHEAD

This screen prints the overhead bytes, interprets the trace message in English and in hexadecimal, and prints the transport overhead bytes for both receiver 1 and 2.

Using Orderwire while in an Out-of-Service test

This section describes how to use the SONET orderwire to monitor and/or carry on a conversation by using one of two bytes contained within the overhead. The Line Orderwire Path (E2 byte) is used to communicate between two terminals or from one terminal to a far end office (see Figure 1). The Section Orderwire Path (E1 byte) is used for communication within a section from one terminal to one of the repeaters or regenerators along a span (see Figure 2 on following page).

1. Patch the incoming STS-1 into the RCV1 Input jack.
2. Patch the 52C transmitter output into the transmit direction of the line.
3. Press the 52C SET-UP key to display the following root screen:



4. Press NXT (F5) until 3. [ORDERWIRE] screen is shown

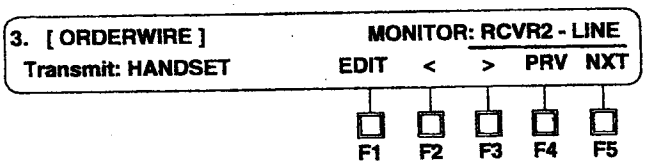
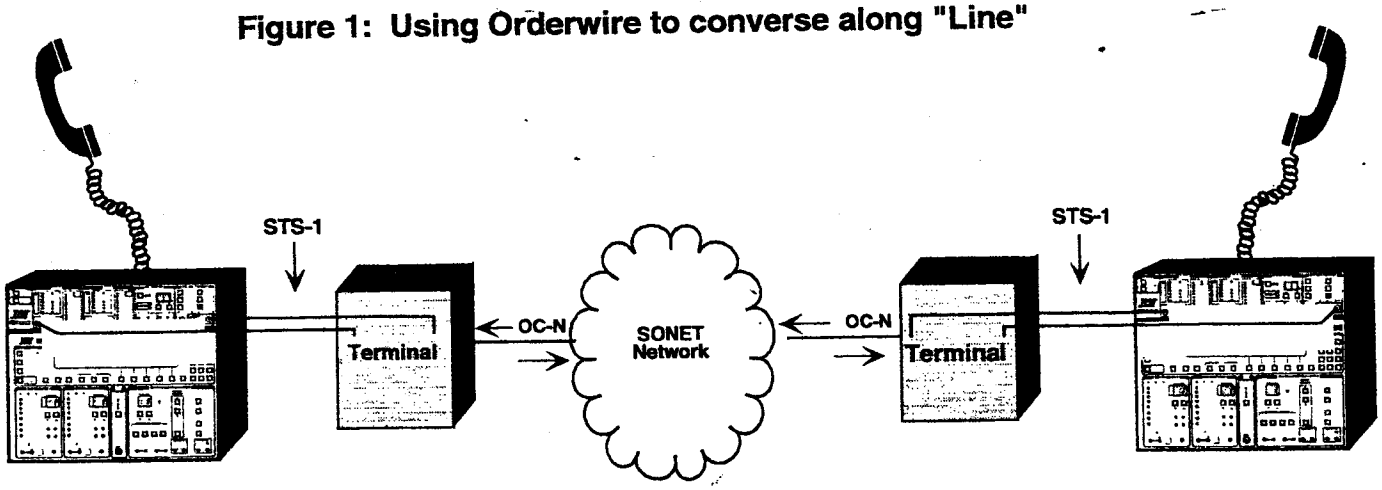


Figure 1: Using Orderwire to converse along "Line"



5. Move underline to MONITOR: and use the EDIT (F1) key to scroll through choices:
   RCVR1 - Line RCVR2 - Line
   RCVR1 - Section RCVR2 - Section

   NOTE: Selecting a monitor mode configures the transmit (talk) to the same configuration (i.e. if MONITOR is set to RCVR - LINE; then the transmit direction will also be LINE)

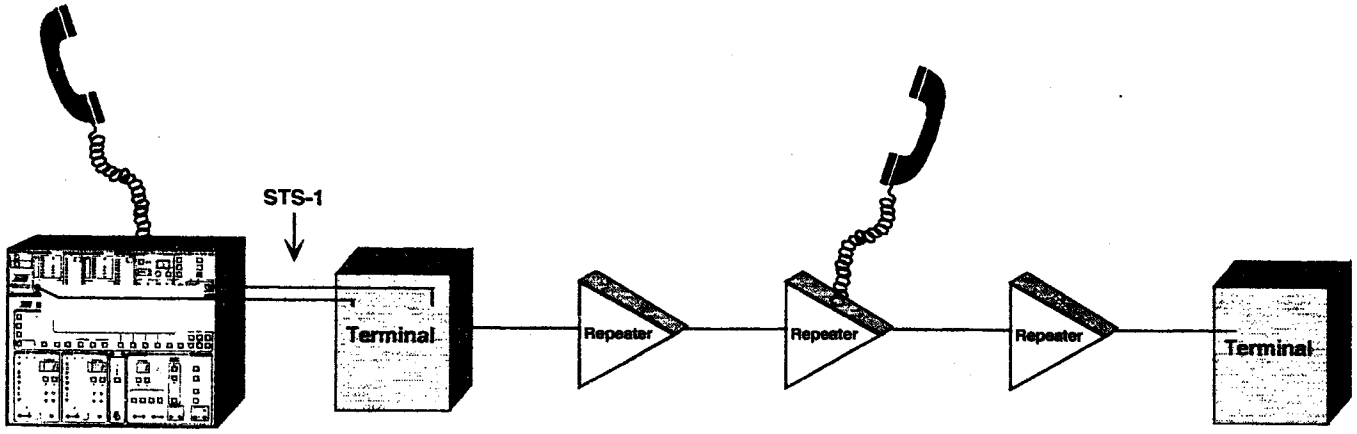
6. Move underline to TRANSMIT: and use EDIT key to toggle between HANDSET to speak or DISABLE to mute transmission.

7. Patch a carbon-microphone, dynamic-earphone, 4-wire (POTS) handset into the back panel of the 52C as shown at the beginning of the section in the page one drawing.

   NOTE: Unlike a standard analog circuit, the SONET orderwire has no loss, therefore communication may be very loud.

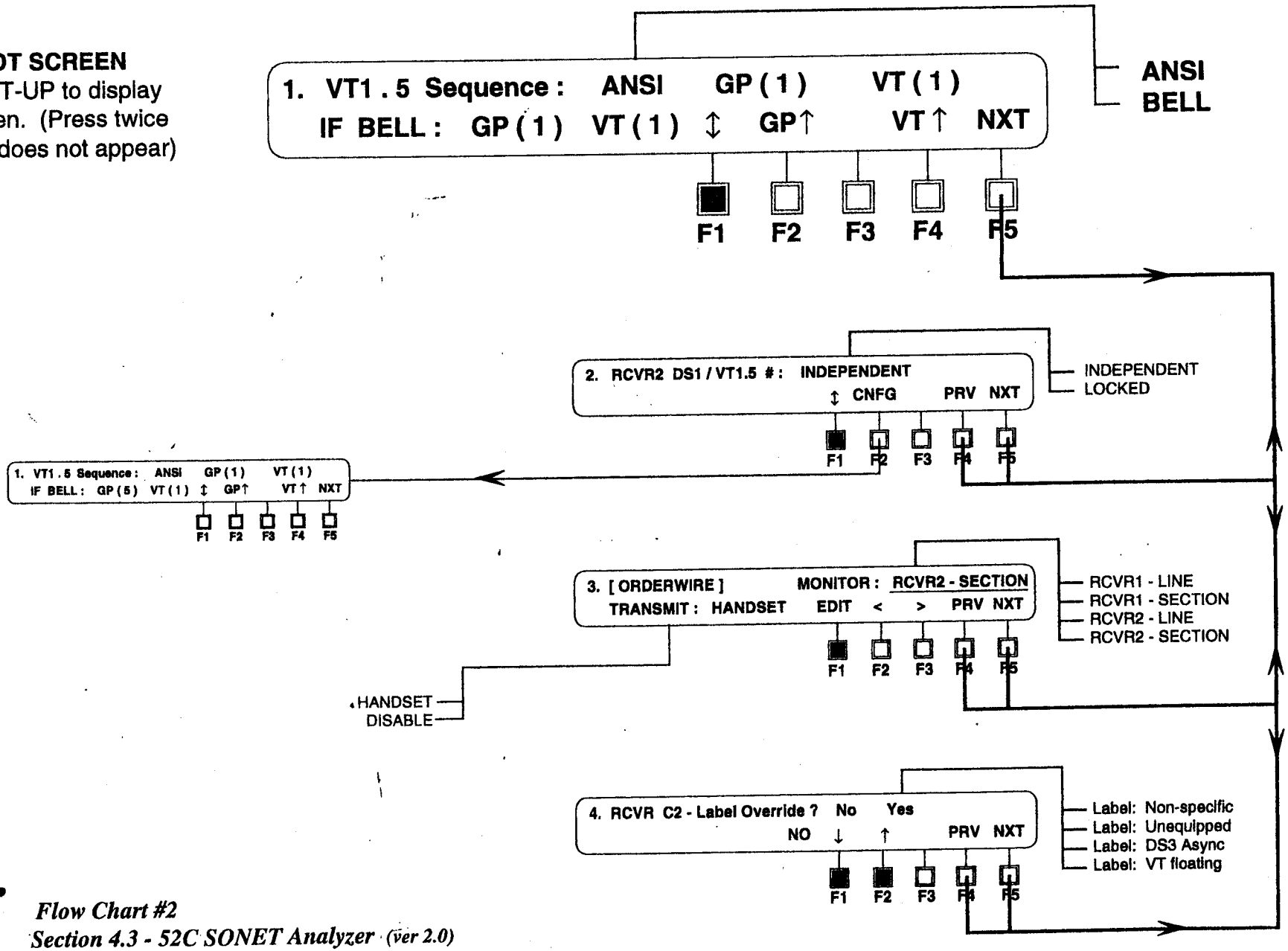
Using the orderwire while in STS-1 Drop-and-Insert mode

Figure 2: Using Orderwire to converse between a terminal and a repeater - "Section"

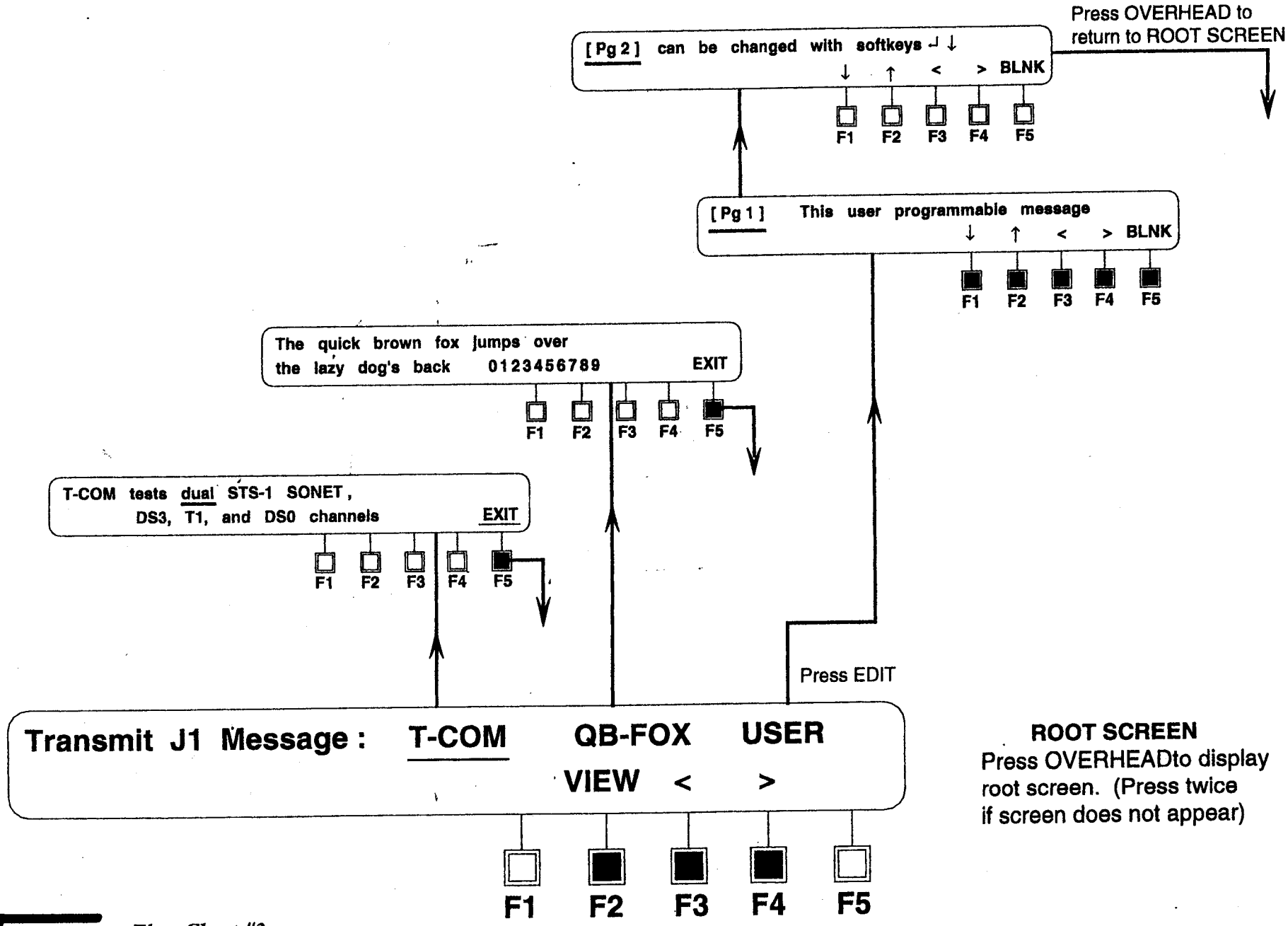


52C STS-1 SET-UP Flow Chart

ROOT SCREEN
Press SET-UP to display root screen. (Press twice if screen does not appear)



52C STS-1 Transmit J1 Trace Message Flow Chart



ROOT SCREEN
Press OVERHEADto display root screen. (Press twice if screen does not appear)