232 MONITOR

Black Box Corporation
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NOTES

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✳ Appendix A Addendum

Example of Programmable Output from View Mode

The steps to execute this option are:

1) Edit your StartString, via option Start Trigger: refer to the example in the manual for specific information. You may use special characters to effect various specific handshaking responses as you wish.

2) Set Function 1 (TD Buffer Search) to Output: press MENU, then BACK twice, then press Set (TEXT) once.

3) Set your Output option to StartString: hit BACK until you see Output, then Set (TEXT) until you see StartString (At this point you could set 511 bert or some other pattern if you wish). Then hit MENU to exit Menu Mode and enter View Mode and leave StartString active. *Note that if you push ENTER (WHERE) instead of MENU the 232 Monitor will execute the Output right then, instead of in the View Mode.*

4) Now, after switching your OUTPUT switch (on side of 232 Monitor) to ON, you are ready to act as a DTE. To execute the output transmission hold down TEXT and WHERE (TD Buffer Search combination) simultaneously until the message "Outputing ?????" comes on the screen. The question marks represent whatever the output option is set to at that time. The data output will be output on pin 2 of the male connector (on the right side).

For further examples of how to use the 232 Monitor see back of Users Guide.

Following is a description of the other sections of the manual. When you first begin using your 232 Monitor it is a good idea to consult this Overview to see what section you should turn to for specific information.

Section 1 Menu Mode

This section describes the options and their values. These options and values set the parameters of the 232 Monitor. You enter the Menu Mode by pressing MENU.

Section 2 View Mode

This section describes those functions of the 232 Monitor which allow you to view data. When you first turn on the 232 Monitor (or press MENU from the Menu Mode) you are in View Mode.

Section 3 Creating HEX Strings

There are several Options which allow you to enter HEX strings. This section describes the process and gives some hints and shortcuts. For an actual step-by-step example of how to set a HEX string, see Example 5.1 in Section 5.

Section 4 Entering & Changing HEX Values

Several of the options in the 232 Monitor require you to enter or change HEX values. Rather than describing this procedure over and over again in the manual it is described fully once here in Section 4.

Section 5 Examples

Here are several narratives explaining everything from how to set various options, to actual troubleshooting case studies. This section starts with a brief description of all of the examples.

Section 6 Troubleshooting

Some problems and their solutions.

Appendix A All Options and All Values

Here is a handy reference table with all of the options and all possible values for those options.

Appendix B Table of Code

This is a table showing the different values for the following codes: ASCII, EBCDIC, IPARS and BAUDOT.

Appendix C   ASCII HEX Printout

Here is a sample of a typical ASCII HEX printout.

Appendix   D   Batteries

These are more than instructions on how to change the battery.
We have provided a few suggestions on how to avoid battery
trouble and how to extend battery life.

are set to. Similarly the (FWD) and (MENU) buttons will always do
an RD Autoconfigure.

This is done via the special characters which can be entered in the StartString and StopString. These strings can then be transmitted via the Output option 1 to 255 times or until [MENU] is pressed. Using Function 1 (TD Buffer Search) this option can be executed from the view mode and returned characters viewed, searched, or dumped to a printer.

• PERFORMANCE EVALUATION.
This is accomplished via the Loop option. See the example in the manual for specific details.

• 10,000 EVENT PULSE TRAP.
To store multiple changes on any of the modem interface lines, use the Modem Control Transitions as documented in the manual (see index). If you don't want accompanying data to fill the buffer use the Suppress Capture menu option to turn off *both* TD and RD data capture. This is an excellent way to isolate broken wires and loose connectors.

All Transmit Options (Output, Loop, Answerback, HEX Report)

When transmitting data the 232 Monitor behaves like a DTE. Data is output on pin 2 (TD) of the male connector on the right side of the unit. The OUTPUT switch must be in the ON position and nothing should be attached to the female connector.

Modem Control Masks

The interface signal masks are created and modified via the StartTrigger and StopTrigger options of Menu mode. This is self documenting and allows the user to select "HI" or "LO" or "??" for any combination of the six interface signals. These masks are retained in memory.

Alternate Autoconfigure Buttons

Although it is a long reach, the [FWD] and [WHERE] button combination will always execute an RD Autoconfigure, no matter what the TD Buffer Search and RD Buffer Search keys

---

232 MONITOR MODES

The six buttons on the face of your 232 Monitor control over sixty functions, therefore each button has to serve many purposes. Although this keeps the design compact, so much functionality may seem confusing at first, so here are a few hints for the novice:

• The 232 Monitor has two major operational modes. These two modes are described in separate sections in the manual:

Menu Mode for changing options or their values, and for executing loopback, output, timer and answerback options.

View Mode for viewing data.

• Move between the Menu Mode and the View Mode by pressing MENU.

• The names on the buttons themselves, and on the labels above and below the buttons help you to make distinctions between functions.

• Appendix A contains every option and all values for every option.

• Enter the Menu Mode; then scroll through options by pressing .FWD or BACK and scroll through (and simultaneously set) values by pressing SET (Text).

• Holding down any button on the 232 Monitor increases the speed of the activity you are performing.

• The 232 Monitor remembers settings, trigger string and all captured data, even if you turn the power off.

SECTION 1

MENU MODE

1. Enter the Menu Mode by pressing MENU.

   In Menu Mode, the SET and ENTER
   labels come into play.

In Menu Mode, the SET and ENTER
labels come into play.

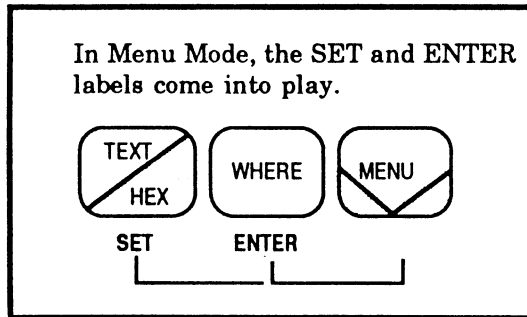TEXT/HEX   WHERE   MENU

SET   ENTER

Figure 1-1. 232 Monitor Label

NOTE

Look at the label of your 232 Monitor. The TEXT
and WHERE buttons take on the additional
functionality of SET and ENTER in the Menu Mode.

2. Use FWD or BACK to scroll through the various options.

3. Once the option is selected, use SET (Text) to scroll
   through the values for the options. A value is set when
   it is displayed and then you leave that option, usually
   by pressing FWD or BACK to scroll to the next option.

4. Press FWD or BACK to scroll to the next option, or press
   MENU to return to the View Mode.

✴ 232 Monitor Hints and Tricks

Following are some tips on how to make the most of your 232
Monitor.

Fast way to transmit data to any RS-232 serial device

The easiest way to test a serial device is to attach a cable from
the right hand (male) connector of the DT150 to the device
you wish to test. If the baud/configuration settings are
correct, all you have to do is hit F1 then SCROLL/PAGE.
Ensure that the output switch is in the ON position and then
the selected OUTPUT pattern will be transmitted. Please
note that the data is transmitted on PIN 2 of the connector
and the default flow control is Xon-Xoff. If the device you are
testing expects to receive data on PIN 3 then you must use a
null modem or break out box to cross (swap) PIN 2 with PIN
3. The DT150 defaults to DTE configuration.

Specialized High Level Tests

• RESPONSE TIME MONITORING.
This is done by using the TIMER menu option. If you are
measuring modem control pattern changes, you will have to
use the Edit ModemCtl Mask choice of the Start Trigger and
Stop Trigger option to select your pattern. Then select "Diff
Bet. ModemCtl Masks" choice of the Timer option. If you
press BACK , the test will continue timing events and reporting
the average until MENU is pressed.

If you wish to use strings of characters to start and stop the
response timer, then you must use Edit/View... choice of Start
Trigger and Stop Trigger options to set up a start and stop
string (up to 80 characters each). In the same manner as
above, use the Timer option, but you must select which line,
TD or RD, is to be examined for the start and stop string.

• PROGRAMMABLE HANDSHAKING.

View Mode Changes

Following are the changes that have occurred in the View Mode functions, and Users Guide, since it went to press.

The TD Buffer Search and RD Buffer Search key combinations add the customization capabilities mentioned above. By setting the TD Buffer Search and RD Buffer Search menu options for the most commonly used functions, the number of keystrokes can be minimized.

- If Autoconfigure (RD or TD) is used most often then TD Buffer Search and RD Buffer Search should be set to this option. When the TD Buffer Search or RD Buffer Search key combination is pressed the 232 Monitor will display "Autoconfig TD/RD" and sense the baud rate and report it to the screen. It will then analyze the incoming data and set the data bits, and parity. To stop the 232 Monitor from adjusting the data bit size and parity, and return to normal error reporting, press the STOP (FWD and TEXT) key combination. The "Configure OFF" message will display.

- The 232 Monitor can serve two purposes simultaneously, that of a Computer Data Source and a Line Monitor. This is accomplished by setting TD Buffer Search to output. Then in the View Mode when the TD Buffer Search key pair is pushed, the transmitted data appears on the TD line and the data returned on the RD line appears below it. When using the special programming characters in conjunction with the Output Trigger String option, complicated handshaking sequences can be initiated and monitored.

All of the 232 Monitor's options' values are set as described above in steps 1 through 4.

Baud Rate:	64000, 19200, 2400, 1200, 75, 56000, 14400, 2000, 600, 48000, 9600, 1800, 300, 38400, 4800, 1243, 150,

The various speeds or baud rates the 232 Monitor can be set to accept.

Stop Bits:	1 1.5 2

The number of stop bits the 232 Monitor can be set to read in asynchronous mode.

Data Bits:	7 8 5 6

The number of data bits the 232 Monitor can be set to read.

Parity:	Odd Even None

The parity your 232 Monitor can be set to read. Choosing Odd or Even assumes an extra bit at the end of the data byte. If parity is wrong, View Mode displays parity error message.

Data Encoding:	NRZ NRZI FM0 FM1

These are the four data encoding methods.

NRZ is used in both synchronous and asynchronous applications.

NRZI, FM0 (biphase space) and FM1 (biphase mark) are all used in various synchronous applications.

Mode:	Async Mono Sync BSC (bisync) SDLC Isochronous

The various modes the 232 Monitor can recognize:

Async is for asynchronous transmissions.

Monosync and BSC modes are byte-oriented synchronous protocols. Monosync uses an 8-bit sync character, while BSC uses two 8-bit sync characters.

SDLC is a bit-oriented synchronous
protocol that uses an 8-bit flag (HEX
7E) to mark the beginning and end of
message envelopes.

Isochronous is a clocked asynchronous
mode that allows asynchronous data to be
sent over synchronous circuits.

Sync Char 1:   (HEX value)
In Monosync mode this byte is used as a
pad character on all transmission
output, loop, and answerback options.
To change the sync character refer to
Section 4 Entering and Changing HEX
Values.

Sync Char 2:   Monosync   Bisync
Refers to the second sync character in
BSC mode or the receive sync character
in Monosync mode. To change the sync
character refer to Section 4 Entering
and Changing HEX Values.

    Sync character one and two are
    loaded automatically in SDLC mode.

SDLC Node: All   Node number (HEX value)

    All   all nodes will be captured.

Node number allows you to specify, in
HEX notation, one SDLC node in a loop or
polled circuit. To change SDLC node
refer to Section 4 Entering and Changing
HEX Values.

Ignore Multiple
Sync Char: Yes   No

Yes tells the 232 Monitor not to capture
sync characters. This is useful when the
sending device sends more than one sync
character and you have no need of saving
the extra characters.

No tells the 232 Monitor to capture all
sync characters.

RTS and CD
Control Sync: No   Yes

No has no effect on synchronization.

ABORT	During SDLC output, transmit an ABORT (8 to 13 hi bits). This also clears the transmitter of all characters.
WAITCHR	During output, stop transmitting string until a character is received.
WAITCSHI	During output, stop transmitting until Clear to Send goes HI.
WAITCSLO	During output, stop transmitting until Clear to Send goes LO.

The above functions are set by scrolling the
hex value with FWD or BACK to a value greater
than FF or less than 0 in the "Edit/View..."
choice of the Start or Stop Trigger option.
Please see example in Appendix A for more
information.

Start & Stop Triggers

Edit/View StartString   Edit/View StopString

Following is an explanation of how to use the Edit/View string choices of the START and STOP TRIGGERS options to implement *Programmable Transmit Control*.

The 232 Monitor has 8 special functions which may be intermixed with transmit characters in the "StartString" and "StopString". All of these are currently input via the "Edit/View..." choice of the "Start Trigger" or "Stop Trigger" options. The "Load String" menu option has been expanded to copy from one string to the other. The 8 functions are:

ANYCHAR	During input, used as a wild card for starting and stopping triggers.
BREAK	During output, transmit a 250 millisecond break in async mode.
LONGBREAK	Same as above but 1 second duration.
PAUS250	During output, pauses transmission for 250 milliseconds.

Drop Sync Char:

Yes means synchronization is dropped on the TD line when request to send (RTS) is low. Synchronization is dropped on the RD line when carrier detect (CD) is low.
None   (HEX value)

None has no effect on synchronization.

Setting a (HEX Value) means synchronization is dropped when this character is received. To change the drop sync character refer to Section 4 Entering and Changing HEX Values.

Ignore Char:

None   (HEX value)

None has no effect on capture.

Setting a (HEX value) tells the 232 Monitor what character not to capture. To change the ignore character refer to Section 4 Entering and Changing HEX Values.

Start Trigger:

Off   TD   RD   Edit/View StartString

Off means you don't wish to begin capturing data at a specific string.

Use TD or RD when you want to begin capturing data (on the transmit or receive data lines respectively) at a specific string. If RD or TD is chosen, the 232 Monitor will begin capturing data at the point it encounters the StartString specified in the Edit/View StartString option. (Note: After it has captured the data it will automatically set Start Trigger to off.)

After it finds the string you have defined, on the line you've indicated, it will begin capturing data from both lines.

TD is pin 2 on both the male and female 232 Monitor RS232C connector; and RD is pin 3 on both the male and female 232 Monitor RS-232-C connector.

Edit/View StartString. Choose this
option when you want to enter, review or
edit the StartString in your 232
Monitor. For the various uses of the
StartString, please see the introduction
to Section 3 Creating HEX Strings.

When you see Edit/View StartString,
press MENU to drop down to the
Edit/View StartString submenu and you
will see the following screen:

```
BACK & FWD scroll values. SET moves the cursor. ENTER
for next char. MENU exit.
```

These instructions are telling you how
to use the next screen. Here are the
instructions with a little more
elaboration:

● Press FWD or BACK to increase or
  decrease the selected (underlined)
  nibble.

● Press SET (Text) to select
  (underline) the desired nibble.

● Press ENTER (WHERE) to accept a byte
  (note, this increments "Current Size"
  counter.)

● Press MENU to store your string and
  exit to the Menu Mode.

Now press any button and you will see
the following screen. To use this screen
read below under HEX, Char # and String.

```
Hex Char String (Current  Size  is:00)
00  #01
```

HEX   Char #   String   Current Size

These three options appear after you
enter the Edit/View String option.
Descriptions follow.

Changes to Menu Options

Following are descriptions of new functionality added to
existing options since the Users Guide went to press.

Start Trigger

There are 2 new choices.:

ModemCtl Mask

This value will cause collection to start only
when the modem interface pattern matches
the mask. Exit by pressing MENU FWD or BACK .

Edit ModemCtl Mask

When ENTER (WHERE) is pressed, allows you to
edit (change or set) the mask. MENU exits from
the screen. See "232 Monitor Hints and
Tricks" section page 7 for more information.

Stop Trigger

There are 2 new choices which are the same as
Start Trigger, except they act to stop the
collection of data or the TIMER.

Timer   Diff. Bet. ModemCtl Masks

Measures the difference in milliseconds
between the occurrence of the Start Trigger
ModemCtl Mask and the Stop Trigger
ModemCtl Mask. The timer option now asks
if you wish to time the difference once or
continuously and report the average. This is
how *response time monitoring* is performed.
The time values are now reported as decimal
numbers up to 16,777,215.

location.

F1
Function 1

TD Buffer Search   OUTPUT
Display Mode   Configure TD

When F1 TD Buffer Search combination of keys (TEXT and WHERE) are pressed in the View Mode, then the above selected choice is executed. When Output is the selected choice, the pattern which is transmitted is the choice that the Output option is set to. For example, if Output was set to Fox and the TD Buffer Search combination pressed, then a Fox message would be transmitted on pin 2 of the male RS-232 connector and returned data on pin 3 would be put into the capture buffer. When Display Mode is the selected choice, then when TD Buffer Search is pressed, the display is changed from expanded to compressed. This can be useful when looking at HEX data. When TD Buffer Search is selected, TD Buffer Search searches the TD buffer for the StartString. The default for F1 is **OUTPUT ASCII** which is handy for testing terminals or printers without going into the **MENU.**

F2
Function 2

RD Buffer Search   Configure RD

When set to RD Buffer Search (the default), a search, as documented in the Users Guide. is executed. When set to Configure RD, the speed of the data on the RD line is determined, then the word size and parity is set. Pushing the STOP combination (FWD and TEXT) will stop the configuration and return to normal error reporting (parity, overflow and framing errors).

HEX

Under this heading is the HEX value (from 00-FF) of the current character. One of the two places will have a cursor under it. This is the place that will be affected by pressing certain buttons as follows:

1. Increase or decrease the nibble above the cursor by pressing FWD or BACK.

2. Press SET (Text) to move the cursor between high and low nibbles.

3. Press ENTER (WHERE) to accept a byte and move on to the next byte.

4. Under String the 232 Monitor will display an ASCII representation of your string as it is built. It is updated as you press ENTER (WHERE). Press FWD and BACK simultaneously to duplicate the previous byte.

5. After you have ENTERed the last byte of your string, press MENU. This will accept the entire string and bring you back to the Menu Mode.

    See Section 3 for a list of hints on using the Edit/View String option and Example 5-1 in Section 5 for an example of how to create a HEX value string.

Char#   00-FF

Shows the current character in the string.

String

An ASCII representation of the string appears here as you build it character by character.

Current Size

Size of string in HEX. Check size before leaving this screen to make sure you have ENTERed all of the bytes.

Stop Trigger: TD   RD   Edit/View StopString

> This option works the same as the Start
> Trigger option except it disables data
> collection rather than enabling it. See
> the descriptions for the previous
> option, Start Trigger, for a description
> of TD, RD, and Edit/View.

After the StopString is found in the data,
the 232 Monitor's interface is disabled:
if you want data capture to begin again
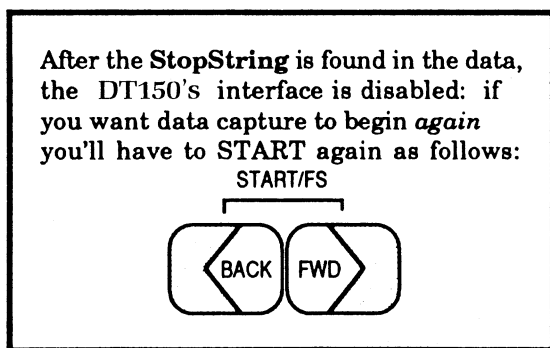you'll have to START again as follows:

```
┌─────────────────────────────────────────┐
│  After the StopString is found in the    │
│  data, the DT150's interface is          │
│  disabled: if you want data capture to    │
│  begin again you'll have to START again   │
│  as follows:                              │
│              START/FS                     │
│           ┌─────────┐                     │
│        ◄BACK││FWD►                        │
│                                           │
└─────────────────────────────────────────┘
```

Figure 1-2. Start/FS

Timer

```
Start/Stop TD      Start/Stop RD
Start TD/Stop RD   Start Rd/Stop TD
Off
```

> After you have created your StartString
> and StopString using the Start Trigger
> and Stop Trigger options, this option
> allows you to specify the lines the 232
> Monitor should monitor (looking for the
> appropriate string) to start then stop
> the timer. The timer will time, to the
> thousandth (.000) of a second, the
> interval between the StartString and the
> StopString.

New Menu Options

Following are new options and their descriptions.

CRC preset **(Ones,Zeros)**

This is only used if SDLC mode is selected with frame status enabled. The preset is the start value for the CRC calculation which is performed at the end of a frame. If "Bad" data is appearing all the time, try changing this choice.

SDLC frame status **Yes   No**

In SDLC this option enables the reporting of frame status(result of CRC check) at the end of each frame. It will show as "*B", "*G", or "*A" for Bad, Good or Abort respectively after the frame in the capture buffer.

Hit ENTER toSet Config **1   2   3   Factory   TD BUFFER**

When ENTER is pressed the configuration (speed, sync char, all storable options) are set to the PREVIOUSLY stored parameters. The configuration does contain a checksum to guard against erroneous re-configuration.

Hit ENTER to Save Config **1   2   3   TD BUFFER**

When ENTER is pressed the current configuration is saved to the indicated location. Note that if configuration is saved to TD Buffer, then it can be OUTPUT to an external device and later reloaded and SET (above). This allows a technician to set the parameters for a customer at a remote

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sync/async serial tester/monitor

Page 2   New Menu Options
Describes any menu options new since the Users Guide went to press.

Page 4   Changes to Menu Options
Indicates options whose description in the Users Guide has changed.

Page 7   View Mode Changes
Describes the new features added to View Mode since the Users Guide went to press.

Page 8   232 Monitor Hints and Tricks
How to make the most of your 232 Monitor.

Page 11 Appendix A Example of Programmable Output from View Mode
Programmable output is one of the exciting new features on the 232 Monitor. This example shows how it is used.

Following is a brief description capabilities that have been added to the 232 Monitor since the Users Guide went to press. These capabilities are documented in this addendum.

- Autoconfiguration of parameters (Baud rate, word size, and parity).

- 38,400 and 57,600 baud async are now supported.

- The default for F1 is now OUTPUT (transmit) ASCII.

- Programmable transmit and view capabilities.

- Matching of any modem interface signal pattern for start or stop triggering or timing calculations.

- The ability to save and restore 3 different configurations.

- Improvements in SDLC CRC checking

- Response time monitoring and performance analysis.

Start/Stop TD will time the interval between the StartString and the StopString on the TD line.

Start/Stop RD will time the interval between the StartString and the StopString on the RD line.

Start TD/Stop RD will time the interval between the StartString on the TD line and the StopString on the RD line.

Start RD/Stop TD will time the interval between the StartString on the RD line and the StopString on the TD line.

Code	ASCII EBCDIC IPARS BAUDOT

Setting one of these values prepares the 232 Monitor to display in the chosen code. See the table in Appendix B to compare the various codes. Baudot is a 5 bit code common in teletype communications.

Display Mode:	Compressed Expanded

In Compressed mode each data line character is displayed one after another. In Expanded mode each data line character is followed by a blank to facilitate reading at high speeds l i k e s o.

Buffer Action:	Stop when full Discard oldest data

If Stop When Full is chosen, the 232 Monitor will stop collecting data when the buffer is full.

If Discard Oldest Data is chosen, the 232 Monitor will clear the buffer when it is full and then begin collecting data anew.

Status Messages:	Normal Long None Short

The 232 Monitor will notify you of certain events when normal is selected e.g. END OF BUFFER.

If you find the Status Messages annoying you can turn them off (None) or view them briefly (Short). To let them linger on the screen, choose Long.

Error Messages: Fatal   Warn   None

                        NOTE

    The 232 Monitor will always pass data through
    itself, even if it cannot recognize speed or
    other configuration parameters.

            If you choose Fatal, the 232 Monitor
            will stop receiving at certain hardware
            errors such as a change in line speed.
            Press any button and it will begin
            receiving again. You may also enter the
            Menu Mode and change a parameter before
            returning to View Mode.

            If you choose Warn, a message will
            appear at certain hardware errors, but
            receiving will continue.

APPENDIX D

BATTERIES

The 232 Monitor has 2 batteries in it. The primary battery is a
9-volt alkaline. We have found that alkaline batteries provide
the longest and most reliable service. Should you decide to use a
rechargeable Nicad battery instead, we recommend you carry a
charged spare as a Nicad can only deliver about 40% of the
capacity of a fresh alkaline. When your battery is running low
you will receive a BATTERY LOW warning on your screen and you
must then change your battery or plug in the AC adapter. You may
plug in the 232 Monitor's external power supply even while the
232 Monitor is in use.

The second battery in the 232 Monitor is a lithium cell which is
used to preserve memory and menu configuration. Should you
notice that your unit "forgets" either of these, it is time to
replace your lithium cell.

REPLACING THE LITHIUM CELL

Lay the 232 Monitor face down on a soft cloth and remove the five
screws. Remove the back cover. Replace the 2 upper screws in
their posts to secure the plastic spacers so they won't get lost.
Carefully remove the circular lithium cell from its holder using
the tip of a small screw driver to lift the battery up and out.
Replace it with a BR-2325 type lithium battery or its equivalent
3.0v only.

Remove the two screws and gently refit the case. First insert
the upper two screws, then find the smallest screw and insert it
in the middle.

                        NOTE

        Damage will result if you try to insert a long
        screw in the center post.

SAMPLE - ASCII HEX PRINTOUT

X at far right indicates changes in signals.
Page number:01   code: ASCII

```
       00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

0000Td
    Rd 54 68 69 73 20 69 73 20 52 44 20 64 61 74 61 20 This is RD data
    DS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    DT LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    RS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO

0010Td
    Rd 77 69 74 68 20 43 54 53 20 61 6E 64 20 44 53 52 with CTS and DSR
    DS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    DT LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    RS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO

0020Td              61 6E 64 20 74 68 69 73 20 69 73 20    and this is
    Rd 20 68 69 20                                      hi
    DS HI HI HI HI LO LO LO LO LO LO LO LO LO LO LO LO    X
    DT LO LO LO LO HI HI HI HI HI HI HI HI HI HI HI HI    X
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS HI HI HI HI LO LO LO LO LO LO LO LO LO LO LO LO    X
    RS LO LO LO LO HI HI HI HI HI HI HI HI HI HI HI HI    X
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO

0030Td 54 44 20 64 61 74 61 20 77 69 74 68 20 44 54 52 TD data with DTR
    Rd
    DS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    DT HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    RS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO

0040Td 20 61 6E 64 20 52 54 53 20 68 69 21              and RTS hi!
    Rd
    DS LO LO LO LO LO LO LO LO LO LO LO LO
    DT HI HI HI HI HI HI HI HI HI HI HI HI
    CD LO LO LO LO LO LO LO LO LO LO LO LO
    CS LO LO LO LO LO LO LO LO LO LO LO LO
    RS HI HI HI HI HI HI HI HI HI HI HI HI
    RI LO LO LO LO LO LO LO LO LO LO LO LO
```

If you find the Error Messages annoying, say for example when watching a line which changes speed in normal operation, you may suppress them by selecting None.

Suppress Capture: Off   RD   TD

Both Choose whether you want data to be captured as follows:

Off   Capture data from both lines

RD   Don't capture RD data.

TD   Don't capture TD data.

Both Disables capture on both lines. Useful when collecting modem control transitions (see "Section 2 View Mode") and you only want to capture hardware handshake changes.

Load String: Off   TD buffer to StartString
                        RD buffer to StartString
                        TD Buffer To StopString
                        RD Buffer To StopString

When TD buffer to StartString or RD buffer to StopString is showing, you can cause the current data in the named buffer (or its first 80 bytes) to be loaded as the StartString or StopString respectively. Using this option, you could enter a string via computer or terminal rather than entering it one byte at a time (using Edit/View String on the 232 Monitor).

Here is how it works:

1. Capture the desired StartString or StopString in the appropriate buffer.

2. Choose TD buffer to StartString or RD buffer to StopString.

3. Leave this option (Pressing or any button) and the StartString or StopString will now be the contents from the respective buffer.

4. You may now check or edit this string through the Edit/View String option in the Start Trigger or Stop Trigger options. See the Edit/View StartString value description under Start Trigger elsewhere in this chapter.

Hex Report:

Off
HEX Dump (w/Modem Ctl)
HEX Dump (w/o Modem Ctl)

The values HEX Dump (w/Modem Control Signals) or HEX Dump (w/o Modem Control signals) will output a formatted report to a printer. "With" or "without" modem controls means you have the option of printing a HEX dump that shows the state of the modem control signals or not. This HEX printout includes each character received (in HEX, ASCII, EBCDIC or BAUDOT depending on the value of the Code option) and its location relative to the beginning of the buffer. For an example of this report see Appendix C.

Output:

Off   Passes
RD Buffer   TD Buffer   ASCII set
511Bert Pattern   All Bits   Spaces
Mark   Fox   Fox2
StartString   StopString

When the Passes value is showing and you press ENTER, the screen will look like this:

```
BACK/FWD scroll value. SET moves cursor
Output: Passes (ENTER to change) 00
```

Use this screen and the FWD, BACK and SET (Text) buttons to set the number of times, in HEX, you would like the output pattern to be repeated. Setting this value to 00 will output the pattern an infinite number of times. Once you have set a passes value, press ENTER to return to the menu options. The following values are all of the patterns you can output on the 232 Monitor.

TABLE OF CODES

Screen	A	B	C	D	E	F	G	H	I	J	K	L	M
ASCII	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D
EBCDIC	C1	C2	C3	C4	C5	C6	C7	C8	C9	D1	D2	D3	D4
IPARS	31	32	33	34	35	36	37	38	39	21	22	23	24
BAUDOT *	03	19	0E	09	01	0D	1A	14	06	0B	0F	12	1C

Screen	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
ASCII	4E	4F	50	51	52	53	54	55	56	57	58	59	5A
EBCDIC	D5	D6	D7	D8	D9	E2	E3	E4	E5	E6	E7	E8	E9
IPARS	25	26	27	28	29	12	13	14	15	16	17	18	19
BAUDOT *	0C	18	0E	0F	0A	05	10	14	1E	13	10	15	1C

Screen	a	b	c	d	e	f	g	h	i	j	k	l	m
ASCII	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D
EBCDIC	81	82	83	84	85	86	87	88	89	91	92	93	94
IPARS	--	--	--	--	--	--	--	--	--	--	--	--	--
BAUDOT	--	--	--	--	--	--	--	--	--	--	--	--	--

Screen	n	o	p	q	r	s	t	u	v	w	x	y	z
ASCII	6E	6F	70	71	72	73	74	75	75	77	78	79	7A
EBCDIC	95	96	97	98	99	A2	A3	A4	A5	A6	A7	A8	A9
IPARS	--	--	--	--	--	--	--	--	--	--	--	--	--
BAUDOT	--	--	--	--	--	--	--	--	--	--	--	--	--

Screen	0	1	2	3	4	5	6	7	8	9	#	%	$
ASCII	30	31	32	33	34	35	36	37	38	39	23	25	24
EBCDIC	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	7B	7D	5B
IPARS	0A	01	02	03	04	05	06	07	08	1B	3C	30	
BAUDOT **	16	17	13	01	0A	10	15	07	06	18	14	03	0D

Screen	.	,	:	;	?	<	>	(	)	[	]	{	}
ASCII	2E	2C	3A	3B	3F	3C	3E	28	29	5B	5D	7B	7D
EBCDIC	4B	6B	7A	5E	6F	4C	6E	4D	5D	AD	BD	8A	9B
IPARS	--	--	--	--	--	--	--	--	--	--	--	--	--
BAUDOT **	1C	0C	0E	1E	19	--	--	0F	123	--	--	--	--

Screen	=	&	!	*	+	/	@	-	`	|	"		
ASCII	3D	24	21	2A	2B	2F	40	5F	60	7C	22		
EBCDIC	7E	50	5A	5C	4E	61	7C	60	--	4F	7F		
IPARS	0E	--	--	--	2C	11	20	1A	--	--	--		
BAUDOT **	0F	1A	--	--	09	--	--	03	--	--	11		

Screen	Space	→	→	_	^	'							
ASCII	20	7E	7F	--	5E	27							
EBCDIC	40	--	--	6D	--	--							
IPARS	1C	--	--	--	--	--							
BAUDOT **	04	--	--	--	--	--	05						

BAUDOT *   **After an SI (1F) character**

BAUDOT **   **After an SO (1B) character.**

HEX FF   *will always appear as a θ (theta).*

Error Messages:	Fatal, Warn, None
Suppress Capture:	Off, TD, RD, Both
Load String:	Off, TD Buffer to StartString, RD Buffer to StartString, TD Buffer to StopString, RD Buffer to StopString
Hex Report:	Off, Hex Dump(w/Modem CTL), Hex Dump (w/o Modem CTL)
Output:	Off, Passes, RD buffer ,TD buffer, ASCII Set, 511Bert Pattern, All Bits, Spaces (HEX 00), Mark, (HEX FF), FOX, FOX2, StartString, StopString
Loop Test:	Off, Passes, RD buffer, TD buffer, ASCII Set, 511Bert Pattern, All Bits, Spaces (HEX 00), Mark (HEX FF), FOX, FOX2, StartString, StopString, Timeout
Flow Control on Transmit:	Off, XON/XOFF, DTR, DSR
Graphic Set:	SX, EX, LF, FF, CR, D1, D3, ESC SX, GX, ET, DL, NK, EB, RS, SY
Exclude (Uses start and end text delimiters):	Off, Control Data, Text Data
Start Text Char:	Specify HEX Character
End Text Char:	Specify HEX Character
Answer Back:	Off, StopString on StartString

The RD Buffer and TD buffer values will output the data captured in those respective buffers.

ASCII set will output all printable ASCII characters. This turns your 232 Monitor into a pocket terminal tester.

511Bert Pattern will generate a pseudo-random bit pattern, count, and report errors.

All Bits will output all bits, that is 0-HEX FF.

Spaces will generate spaces, that is HEX 00.

Mark will generate HEX FF.

FOX will generate THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK

FOX2 will generate THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK. 0123456789

StartString and StopString will generate the StartString or StopString, respectively.

Output data as follows:

1. Set the number of passes (see above).

2. Scroll through the output values and stop on what it is you want to output.

3. Press ENTER (WHERE) and see the following screen:

```
Slide OUTPUT switch to ON.
Hit SCROLL to start/stop.  MENU to end.
```

4. Slide the output switch at the right-front of the 232 Monitor to ON.

5. Press SCROLL to start transmission.

6. Press SCROLL to pause.

7. Press MENU to stop the output.

In sync mode when outputting
the 232 Monitor transmits the
clock on pin 24.

Loop Test: Off   Passes
                    RD Buffer   TD Buffer   ASCII set
                    511Bert Pattern   All Bits   Spaces
                    Mark   Fox   Fox2
                    StartString   StopString   Timeout

The Loop Test is a unique output option
that allows you to accurately measure
the performance of multiplexers and
communications circuits. When you run
this option, it sends the requested
value, starts a timer, then receives the
message back and compares it to the
original message. It then reports all
of the following:

• number of characters sent

• number of characters received round
  trip time in milliseconds (.0000)

• bit errors

• block errors.

When the Passes value is showing and you
press ENTER, the screen will look like
this:

```
BACK/FWD scroll value.  SET moves cursor
Loop Test: Passes (ENTER  to  change)  00
```

Use this screen and the FWD, BACK and
SET (Text) buttons to set the number of
times, in HEX, you would like the output
pattern to be repeated. Setting this
value to 00 will output the pattern an
infinite number of times. Once you have
set a passes value, press ENTER (WHERE)
to return to the menu options.

Following are descriptions of all of the
values, the patterns you can output as
loopback tests, on the 232 Monitor.

The RD Buffer and TD buffer values will
output the data captured in those
respective buffers.

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APPENDIX A

ALL OPTIONS AND ALL VALUES

Factory-set defaults in bold type

Baud rates: 64000, 56000, 48000, 38400, 19200, 14400,
                    9600, 4800, 2400, 2000, 1800, 1243, 1200,
                    600, 300, 150, 75

Stop Bits: 1, 1.5, 2

Data Bits: 8, 7, 6, 5

Parity: Odd, Even, None

Data Encoding: NRZ, NRZI, FM0 (Biphase space),
                    FM1 (Biphase mark)

Mode: Async, Mono Sync, BSC (bisync), SDLC,
                    Isochronous

Following six options only appear when certain Modes are set.

Sync Char 1:   Specify HEX Value

Sync Char 2:   Specify HEX Value

SDLC node: All, Specify HEX Value

Ignore Multiple
Sync Char: Yes, No

RTS and CD
Control Sync: Yes, No

Drop Sync Char: None, Specify HEX value

Ignore Char: None, Specify HEX value

Start Trigger: Off, TD, RD, Edit/View StartString

Stop Trigger: Off, TD, RD, Edit/View StopString

Timer: Off, Start/Stop TD, Start/Stop RD,
                    Start TD/Stop RD, Start RD/Stop TD

Code: ASCII, EBCDIC, IPARS, BAUDOT

Display Mode: E x p a n d e d, Compressed

Buffer Action: Discard oldest data, Stop when full

Status Messages: Normal, Long, None, Short

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Symptom	Resolution
No data is being captured.	Check to see that the output switch on the front of the 232 Monitor is switched off.
Incorrect Capture	Two possible causes: 1) The AC adapter has been pulled from the socket before turning the 232 Monitor off. To avoid this condition, always turn 232 Monitor off before removing AC adapter from the wall socket. 2) Your lithium battery is low. Please read "Appendix D Batteries."

ASCII set will output all printable ASCII characters.

511Bert Pattern will generate a random test pattern, count, and report errors.

All Bits will output all bits, that is 0-HEX FF.

Spaces will generate spaces, that is HEX 00.

Mark will generate HEX FF.

FOX will generate "THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK

FOX2 will generate "THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK. 0123456789

StartString and StopString will generate the StartString or StopString, respectively.

Timeout is not a string to be sent, but is a value used to set the amount of time (in .250 second intervals) the 232 Monitor will wait until it times out. That is, the amount of time after a string is sent it will wait to have that string come back, before it "gives up" and reports a timeout error. The timeout error appears as a lowercase "t" on the report screen.

Because of its power, there are two examples (Examples 5-3 and 5-4 in Chapter 5) devoted to demonstrating this option. Turn to these examples for a more thorough explanation of this option. Below is a brief synopsis of how to use the loop test.

1. Set the number of passes (see above).

2. Scroll through the output values and stop on what it is you want to output.

3. Press ENTER (WHERE) and see one of
   the following two screens. If you
   are in synchronous mode, you will
   see the first screen asking you for
   clock information, async gets only
   the second screen:

```
Hit FWD for external clock or BACK to
use internal clock (output on pin 24)
```

```
Hit FWD to observe flow control.
BACK to ignore flow control.
```

4. If you are testing an "intelligent"
   communications device, like a
   multiplexer, you must observe flow
   control. If it is just a standard
   modem, there isn't any flow control.

5. After you press FWD or BACK, you'll
   get further instructions (Blocksize
   = is the number of characters in the
   pattern you have selected to output;
   one pattern = one block):

```
Hit SET to reset timer. Blocksize=00xx
MENU to end, ANY key to start
```

6. Press any key to start the test.
   The characters that appear on your
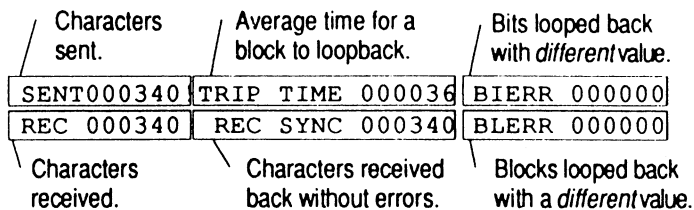   screen are described in the
   following illustration:

```
 / Characters      / Average time for a    / Bits looped back
 / sent.           / block to loopback.    / with different value.
 SENT000340  TRIP  TIME 000036  BIERR 000000
 REC 000340  REC SYNC 000340   BLERR 000000
 \ Characters      \ Characters received   \ Blocks looped back
   received.         back without errors.    with a different value.
```

Figure 1-3. Loop Test Results

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TROUBLESHOOTING

Symptom	Resolution
Data is scrolling by and you want it to stop.	Press the SCROLL button to put you into PAGE mode.
232 Monitor doesn't show data or cursor.	Install a new 9-volt battery or try the wall transformer.
232 Monitor shows a cursor but doesn't appear to capture data.	Press WHERE to see if the size value is changing. If it is, then you are probably in PAGE mode. Change to Scroll Mode. Press SCROLL.
WHERE shows size is not changing. Nothing is happening on screen.	Check to see that trigger is not set to ON and that the SUPPRESS CAPTURE is not set to RD or TD. Note that the 232 Monitor will tell you on power up if either of these options is enabled.
232 Monitor shows only 9's and squares.	Clear the screen by pushing SCROLL simultaneously with TEXT for one second or more. If the symptom persists, contact the supplier from whom you purchased the unit.
232 Monitor won't scroll one character at a time.	When you slow scrolling by pushing forward or back (whichever is the opposite of the current scrolling direction) the cursor will eventually stop on a specific character. If you then push FWD or BACK, the cursor will move one character at a time provided second.
In synchronous mode you can't get your data to look right.	Check sync characters one, two and mode setting. If correct, then try enabling FF or 00 as the drop sync characters. RTS and DCD control sync may help in half duplex operations.
In synchronous mode you can't get any data.	Press FS (Force Sync) and the 232 Monitor will capture all data. Then stop your collection with the STOP buttons and use the SHIFT buttons to shift all data one bit until you can determine the proper sync character and mode.

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ADDITIONAL HINTS

Another common problem you might discover is improper
handshaking. Handshaking, or back pressure occurs, when the
printer, for some reason such as being off line or out of paper,
cannot accept any more characters. When this happens it is the
printer's responsibility to do one of two things. It can drop a
modem control interface signal or send a stop transmission signal
to the computer. In the latter case usually the printer would
send a X-off (13HEX). Within 1 to 9 characters the computer
should stop.

If the 232 Monitor shows the X-off going from the printer to the
computer, but the computer doesn't stop transmitting, then you
might have a bad cable, or the computer may not be set up to look
for X-off/X-on back pressure. When the printer again wants data
it will send a X-on(11HEX). If the computer wasn't responding
properly, then you would see the X-off from the printer to the
computer with out a X-on from the printer later. The symptom
would be garbled characters on the printer, or the printer simply
going off line.

The second form of back pressure (flow control) is to drop a
interface signal, usually DTR (Data Terminal Ready). The 232
Monitor collects the state of all 6 modem control (interface)
signals with each byte captured.

To find the historical state of any modem control signal, place
the cursor on the character which you want to know the signals
for. Press WHERE and then MENU. This puts the where mode screen
into historical mode. The state of the modem control signals on
the right hand side of the display is now what they were"when the
character number under the "Curs." heading was received.

Push FWD or BACK to change the cursor location and if the modem
control signals changed that change will be reflected in the
state display.

By holding FWD or BACK down you can scroll though the various
locations until you see a modem control signal change.

We suggest that if you suspect that the printer is changing modem
control signals, then you find the location in the capture buffer
either visually by scrolling, or by using the SEARCH capabilities
and then enter the where screen (historical mode) and use and
until you see if there was any change in the modem control
signals.

This screen illustrates the results
of a loop test. It is the "score
sheet," of the loop test.

7. When the test is finished (either
    the number of passes has finished,
    or you have pressed MENU), press any
    key to see the following screen
    which is reporting in milliseconds
    the average length of time for a
    character to complete the loop:

```
┌─────────────────────────────────────────┐
│ Average time for character to return in  │
│ .0000 is:  000000                         │
└─────────────────────────────────────────┘
```

Flow Control on
Transmit: Off   XON/XOFF   DTR   DSR

                           Off means you want no flow control.

                           XON/XOFF enables XON/XOFF flow control.

                           DTR means a high DTR signal enables
                           transmission; low DTR inhibits
                           transmission.

                           DSR means a high DSR signal enables
                           transmission; a low DSR inhibits
                           transmission.

Graphics Set: SX EX LF FF CR D1 D3 ESC
                           SX EX ET DL NK EB RS SY

                           The 232 Monitor can only have eight
                           unique graphics characters. This option
                           allows you to select which set you
                           prefer. The second set is more common to
                           synchronous EBCDIC applications.

Exclude: Off   Control Data   Text Data

                           Off has no effect on capture.

                           If you choose Control Data, then all
                           characters except that data between the
                           start of text character (STX) and the
                           end of text character (ETX) will be
                           excluded not captured.

                           If you choose Text Data the data between
                           the start of text character (STX) and
                           the end of text character (ETX), will be
                           excluded, not captured.

Start Txt Character: (HEX value)

                            To change HEX value refer to "Section 4
                            Entering and Changing HEX Values."

End Txt Character: (HEX value)

                          · To change HEX value refer to "Section 4
                            Entering and Changing HEX Values."

                                By selecting different start of text
                                characters and end of text
                                characters, you can include or
                                exclude almost any string to custom
                                tailor the 232 Monitor for your
                                specific application.

Answerback: Off   StopString on StartString

                                When you see the choice "StopString on
                                StartString" press ENTER (WHERE). You
                                will see the following screen:

```
Slide OUTPUT switch to ON
Hit SCROLL to start.
```

                                Press SCROLL and you will see:

```
MENU to end.   ENTER to xmit StartString
Number receptions: 000000      SYNC:*
```

                                *"SYNC" will only appear in sync mode
                                and will show "Gained" or "Lost" based
                                on whether or not synchronization has
                                been achieved by the communications
                                hardware.

                                If you push ENTER (WHERE) it will force
                                a transmission of the StartString. You
                                may do this at any time while answerback
                                is operating. Press MENU to end the
                                test and return to Menu Mode.

15. Now press BACK until the 232 Monitor starts to scroll
    characters backwards.

Each time you hit the button it will scroll faster backward. If
it goes too fast, hit the button to slow backward scrolling.
Repeated hitting of the button will cause the cursor to slow and
stop and finally scroll in the forward direction.

16. Manipulate the cursor until it stops on the erroneous
    "d".

17. Press TEXT (the TEXT/HEX button) and the 232 Monitor
    will change to HEX representation and automatically
    place the cursor on the "d".

In our test case the "d" appears as a "C4". An ASCII "d" is
normally a 44 HEX. Since we are seeing a C4, then the high order
(8th) bit is turned on. Examination will tell us that a 44 HEX
has 2 bits high(1's). The fact that the high order bit has been
set to a 1 tells us that the sending computer has set it to
achieve ODD parity. Odd parity means the total count of all high
bits in any byte must be an odd number. That is why some letters,
those which already have a odd number of bits hi, are not
affected.

18. To correct this problem either set the computer to NO
    parity or SPACE parity. Alternatively, set the printer
    to ODD parity.

19. If you capture a lot of data and only have one or two
    errors, then a time saver is to let the 232 Monitor
    search for the bad character or string. To do this hit
    SCROLL and BACK simultaneously until you see the message
    "Buffer Home."

20. You can then do an RD or TD buffer search for the "Start
    Trigger." The 232 Monitor will find the character or
    string and place the cursor on it for evaluation.

To enter the trigger string please refer to the Menu Mode portion
of the Users Guide.

21. To start the TD buffer search (search through only the
    TD buffer), position the cursor in front of where you
    want to start the search. Then depress and
    simultaneously. The 232 Monitor will show "TD buffer
    search" and then place the cursor on the string when it
    is found. You can then use the (TEXT/HEX) to examine the
    character in HEX.

```
FWD or BACK for Options. SET for Values
Stop Bits: 1
```

6. Press FWD to see Data Bits. Use SET (TEXT) again to get
   the correct setting.

```
FWD or BACK for Options. SET for Values
Data Bits: 8
```

7. Press FWD to see Parity. Use SET (TEXT) to set parity.

```
FWD or BACK for Options. SET for Values
Parity: None
```

8. Press MENU to exit the Menu Mode.

NOTE

There are many more things you can do in Menu
Mode, please refer to the Users Guide for a
detailed description of each.

9. Check to see that the OUTPUT switch is in the OFF
   position.

In the ON position it can interrupt the flow of data. Now you
are ready to start the test.

10. Press WHERE and check to see that the 232 Monitor is in
    Scroll Mode. If it is not in Scroll Mode it will show
    the word "PAGE" next to the heading "Size"

11. Press WHERE again to exit the where screen. If the 232
    Monitor was not in Scroll Mode press SCROLL. Now clear
    the buffer by hitting SCROLL and TEXT simultaneously.
    Hold these buttons down until the display says "Buffer
    Clear."

12. Start the computer sending data to the printer. You
    should see data scrolling across the display of the 232
    Monitor. Continue printing until the printer makes
    mistakes.

13. Now put the printer off line which should stop
    transmission.

14. Examine the printout to find the last character that the
    printer printed incorrectly. Let say that it was an "f".

SECTION 2

VIEW MODE

You enter the View Mode when you first turn on the 232 Monitor.
If you are in the Menu Mode, press MENU to enter the View Mode.
View Mode is used to view data as it is being captured or after
it has been captured and to check the state of modem control
signals in real time or historical modes. By using the buttons on
the 232 Monitor, you have many view options. We'll explore these
buttons one at a time.

Button	Uses
BACK FWD	(START FS) The first time you push these two buttons when on a synchronous line, you enable the capture of data (START). If you push them again, then you force synchronization (FS) which will capture all data without waiting for a sync character. Warning, in force sync, your data may be shifted one or more bits.
FWD TEXT	(STOP) This stops capture of data.
BACK TEXT	(SHIFT) Shifts all data in capture buffer one bit to the right.
SCROLL	Toggles between "SCROLL" and "PAGE" modes in the View Mode. PAGE shows one full screen (40 characters on TD and 40 characters on RD lines) at a time. SCROLL shows one character at a time.
BACK	Press once slowly (at least one second intervals) to scroll backwards through captured data one character at a time in Scroll Mode and one page at a time in PAGE mode.
	Press twice quickly to initiate auto scrolling; then, holding BACK down increases the rate of scrolling. Press FWD to slow it down and reverse it.
BACK SCROLL	(HOME) Press BACK with SCROLL for one second or more to move to the first character in the buffer.
FWD	Press once slowly (at least one second intervals) to scroll forward through captured data one character at a time in Scroll Mode and one page at a time in PAGE mode.
	Press FWD twice quickly to initiate auto scrolling. Then, holding this button down increases the rate of scrolling. Press BACK to slow it down and reverse it.

FWD SCROLL   (END) Press FWD with SCROLL for one second or more
                 to move to the last character in the buffer.

TEXT   Use this button to toggle between TEXT and HEX
                 data display.

TEXT SCROLL (CLEAR) Press TEXT with SCROLL for one second or
                 more to permanently delete all data in the buffer.

WHERE   Pressing this button drops you into the WHERE
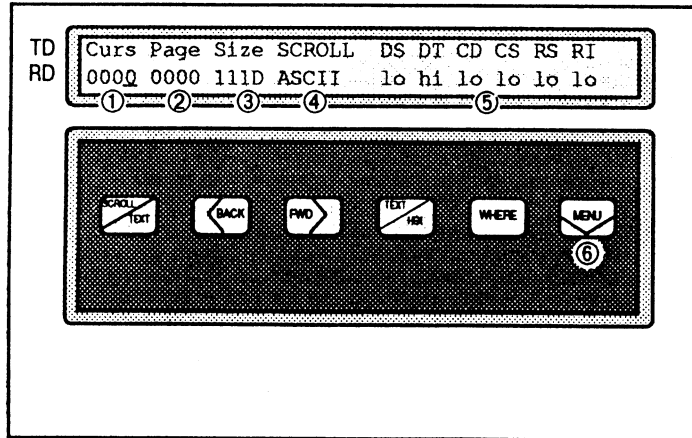   screen.

Figure 2-1. The WHERE screen

1 - Current cursor position
2 - Page number
3 - Amount of data in buffer (see Note 3 following)
4 - Mode of display
5 - Ready states, modem signals (see Note 5 following)
6 - MENU shows Historical Mode
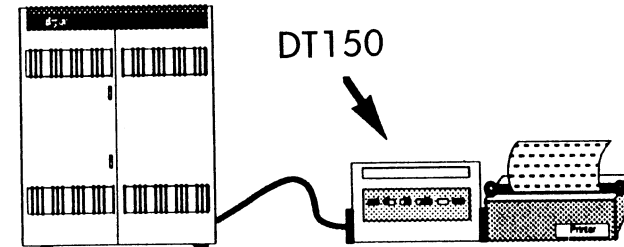
Figure 5-13. Either plug the 232 Monitor directly into the
             printer, or, if it is more convenient, use a cable.

    2. Slide the 232 Monitor power switch (the big one) to the
        ON position.

    3. Press MENU. The screen should look like this:

    ┌───┐
    │ FWD or BACK for Options. SET for Values   │
    │ Baud Rate: 9600   │
    └───┘

    4. If the baud rate shown is not the same as the
        computer's, press SET (TEXT) until the correct value for
        baud rate is displayed.

Remember how to do this, if the baud rate or other configuration
parameters are incorrect you will have to go into Menu Mode
again.

    5. Press FWD to see Stop Bits. If the stop bits entry is
        incorrect press SET (TEXT) again until the correct value
        is showing. If you miss the correct value keep pushing
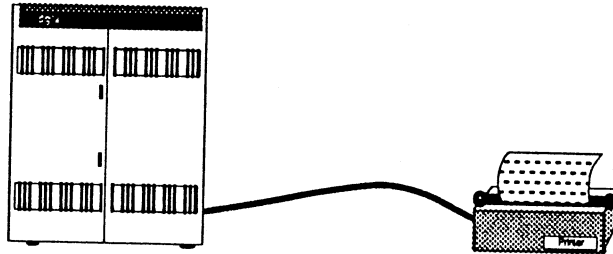   SET (TEXT) and it will come around again.

Figure 5-12. You have been asked to troubleshoot a printer.

Procedure   What you will do is to connect the 232 Monitor
            between the computer and the printer to test what
            the computer outputs.

  1. Disconnect the cable at the printer end from the
     printer. Attach the 232 Monitor to the cable and then
     the other end of the 232 Monitor to the printer. See
     Figure 19.

NOTE 3

Data in buffer. If you plan to use the cursor
location value (Curs) from the WHERE screen as
an exact count of characters received on either
the TD or RD buffer, please be advised the cursor
value reflects the number of characters received
from both the TD pin and the RD pin less any
characters received at the same time (characters
received at the same time on the 232 Monitor
appear one above the other). If you need an
exact count use only one buffer to receive data
or use Suppress Capture to disable one buffer.
Also, when you are in page mode, the cursor
location value is rounded to 20- (in HEX) or
40-characters (in ASCII mode).

NOTE 5

Ready States. This portion of the screen dis-
plays the ready states ("hi" meaning high and
"lo" meaning low) of the following signal lines:

DS Data Set Ready   CS Clear to Send
DT Data Term Ready   RS Request to Send
CD Carrier Detect   RI Ring Indicator

All information in the WHERE screen is dynamically
updated even as you watch the display.

WHERE   As a character is being captured and stored, the
Historical   state of the modem control signals at that instant
Mode   is also being captured and stored. This historical
             information on the state of the modem control
             signals is available using as follows:

             While in View Mode (in real time), press MENU.
             "Historical Mode" will display briefly on the
             screen. Then the 232 Monitor will be displaying
             the historical information on the state of the
             modem control signals as received via the data
             line at a certain point in transmission. That
             point is relative to the Curs (the character
             number of the cursor position) display. To move
             through the characters captured and check on the
             state of the modem controls historically, press
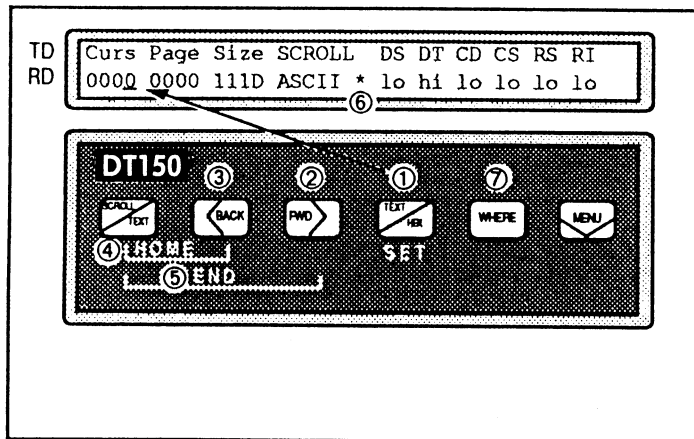   the buttons on the 232 Monitor as follows:

Figure 2-2. The WHERE screen in historical mode.

1 — Press SET (TEXT) to move the cursor to any one of the four positions of the Curs location display.

2 — FWD to increase value of selected position.

3 — BACK to decrease value of selected position.

4 — SCROLL simultaneously with BACK moves to character Ø (first one received) - HOME.

5 — SCROLL simultaneously with FWD to move to the last character (shows as one less than size because first character is zero) - END.

6 — The asterisk indicates you are in Historical Mode.

7 — MENU re-enters WHERE real time.

To check the modem control signals associated with a specific character received, use View Mode to help you easily scroll to the specific character as follows:

    1. Press WHERE to get in View Mode, then scroll until the cursor is positioned one character beyond the position you want to check.

For example, if you were running this test at 9600 baud and you had 8 bits per byte and your block size is 512 bytes, then the TRIP TIME should be 9600/8 which is the number of bytes per second divided into the block size (in this case 512 or 200 HEX) multiplied by 1000 to get milliseconds. The result of this computation should be (512 / (9600/8)) * 1000 or 426 decimal (1AA HEX). If you are using a satellite then the figure would be much larger owing to the time it takes the signal to go from the earth (1/2 second) to the satellite and back (another 1/2 second) to earth.

When you press MENU to stop the test, the figures on the screen will freeze so you may copy them to a log. Press MENU again and the 232 Monitor will divide the TRIP TIME by the block size to give you a standard character trip time in ten thousandths of a second. Since this is the average round trip time divided by the number of characters in a block, this number should be consistent throughout all the different patterns independent of pattern length.

If you have more that one bad block per minute then you are really not doing well. This information when reported to the proper people should result in repairs. When they are done, then you can run your test again to judge the repair.

Example 5-5 Serial Printer Troubleshooting

Purpose   You have just purchased, or been asked to repair, a serial printer that is attached to your computer through an asynchronous link. The printer won't print exactly what the computer sends.

Method   The clues are that the printer prints some characters correctly and some incorrectly. Notably "a","b", and "d" seem to be incorrect while "c", "e","and "f" print correctly. So, we will connect the 232 Monitor to the computer to see if it is sending the correct characters.

Figure 5-11. This screen is showing the real-time results of your loop test. All values are HEX to conserve screen space.

If the SENT count stops at 1 and REC stops at 0, then it is likely that the clock signals are not present. In this case check pins 15 and 17 to make sure that the clock (timing) signals are present.

19. After the test has been running for awhile, press (MENU) and the average trip time will appear.

For your information. ON a land line circuit the TRIP TIME should approximate the block size divided by the result of the computation of the bits-per-second rate divided by the word size in bits. This number should be multiplied by 1000 to get the number in milliseconds.

TRIP TIME = Block size/(bits-per-sec/number of data bits)

2. Press WHERE, then MENU to see the state of the modem control signals at the desired point. Increasing or decreasing the cursor location number will show you the state of the modem control signals before and after the character was received.

MENU   Pressing MENU toggles you back and forth between View Mode and the Menu Mode.

MENU WHERE   Press MENU with WHERE for one second or more while you are looking at data and the 232 Monitor will begin a search routine. It searches forward through the RD buffer from the current cursor location until it finds a match of the StartString. To see how to set the StartString, see "Example 5-1 Setting a StartString" in Section 5.

                    Once the desired string is found, you may then wish to check its location in the buffer by using the WHERE screen.

MENU SCROLL   Press MENU with SCROLL for one second or more to collect modem control transitions. You will see the message "Collecting Modem Control Transitions. Now, whenever a transition occurs on any of the six modem control signals, a marker (HEX FF) will be posted to the RD buffer. The signals are checked 60 times a second, so each time a transition occurs, it will be marked by HEX FF which shows as a q.

                    To turn Collecting Modem Control Transitions off, press MENU with SCROLL again.

                    The way to use the Collecting Modem Control Transitions feature is as follows. Before you begin collecting data, press MENU and SCROLL simultaneously. You'll see the message "Collecting Modem Control Transitions." When you begin capturing data you may notice the transitions being recorded. When viewing data as it is being captured, transitions are seen as the character q (theta). After your data is captured, if you want to check for any transitions in the modem control signals:

                    1. Load FF HEX into the StartString.

                    2. Get into the View Mode and move to the first character (HOME) by pressing BACK with SCROLL.

3. Press WHERE with MENU and the 232 Monitor will display "RD buffer search" and begin searching forward for FF.

4. After it finds the first transition, FF, the page it appears on will appear with the cursor on the transition.

5. Press WHERE to get into the WHERE screen.

6. Press MENU to get into Historical Mode.

7. Now use FWD and BACK to scroll through the changing states and you can see where transitions (HEX FF) have taken place in your data.

13. Press SET (TEXT) four times or until your screen shows the 511 Bert Pattern. If you scroll past it, keep pressing SET, it will appear again.

```
FWD or BACK for Options.  SET for Values
Loop Test:  511 Bert Pattern
```

14. Press ENTER (WHERE).

```
Hit FWD for external clock or BACK to
use internal clock (output on pin 24)
```

15. Press FWD if your modem provides clock on pin 15 and pin 17. If your modem does not provide clock, then press BACK and a clock signal will be generated internally at the baud rate that you have selected. This signal will be output on pin 24. You must use a breakout box or a special connector to connect this signal to 15 or 17 or both depending on which clocks are not provided by the modem.

```
Hit SET to reset timer.  Blocksize = 0200
MENU to end.  ANY key to start
```

This screen gives you reminders of what you may do while the test is underway. You may press SET (TEXT) to zero the time (if you have an accidental long time out, maybe someone accidentally unplugs the 232 Monitor; you may press MENU to stop the test. Blocksize refers to the number of bytes, in HEX, that the 511 Bert Pattern contains.

16. Press any key to see the following important reminder.

```
Slide output switch to on.
Hit any key to start.
```

17. Please turn output switch on now.

18. Press any key to start the test. Your screen will look something like the following.

7. Press SET (TEXT) until your screen looks exactly like
    the one above.

This sets your 232 Monitor into bisync mode which uses two sync
characters.

8. Press FWD until you see the Loop Test option as follows:

```
FWD or BACK for Options.  SET for Values
Loop Test:  OFF
```

9. Press SET (TEXT) once to see the Passes prompt.

```
FWD or BACK for Options.  SET for Values
Loop Test:  Passes (ENTER to change )01
```

10. Press ENTER (WHERE).

Your screen should look like the following screen.

```
BACK/FWD scroll value.  SET moves cursor
Loop Test:  Passes (ENTER to change) 01
```

11. Press BACK.

You have changed passes to zero. Zero is a special reserved
number telling the 232 Monitor to continue sending the pattern
over and over again until you tell it to stop. Your screen
should look like the following screen.

```
BACK/FWD scroll value.  SET moves cursor
Loop Test:  Passes (ENTER to change) 00
```

12. Press ENTER (WHERE).

```
FWD or BACK for Options.  SET for Values
Loop Test:  RD buffer
```

SECTION 3

CREATING HEX STRINGS

Here are some powerful shortcuts you can use when you are
creating HEX strings on screens such as the following:

```
Hex Char String  (Current  Size is:00)
00  #01 n
```

HEX strings are needed in the 232 Monitor as StartStrings and
StopStrings. The strings themselves are used in various ways,
for example, the StartString has three different functions:

1. You can use it to begin capturing data at a specific
    point.

2. After you have captured data, you can use it as a search
    "key" to quickly move to a specific point in the data.

3. You can output the string (once or over and over again)
    This turns your 232 Monitor into a pocket terminal
    tester or printer tester.

HINTS ON THE EDIT/VIEW STRING OPTION

As in several 232 Monitor screens, pressing more than one key can expedite matters in the Edit/View String screens. Pressing:

1 - SCROLL with BACK takes you to the beginning of your string.

2 - SCROLL with FWD will take you to the end of your string.

3 - SCROLL with TEXT will erase your string completely.
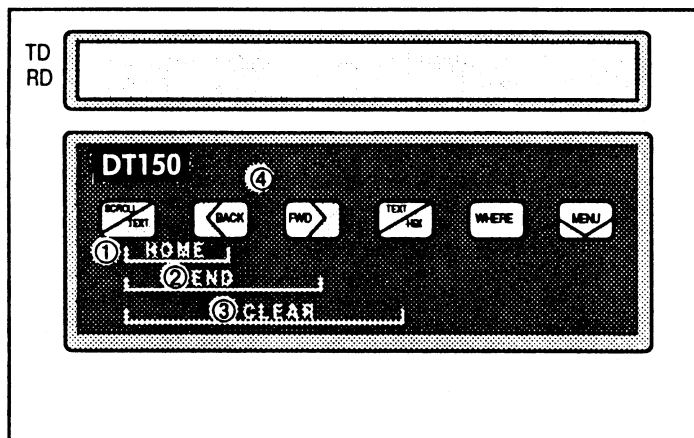
4 - BACK with FWD will duplicate your previous byte.

Figure 3-1. Label Operation.

The Edit/View String screens bring into operation the labels in the lower left corner.

So, for example, if you want to quickly move from the 15th character to the fifth, just press SCROLL with BACK to get to the first character, then press ENTER (WHERE) four times to get to the fifth character.

DT150
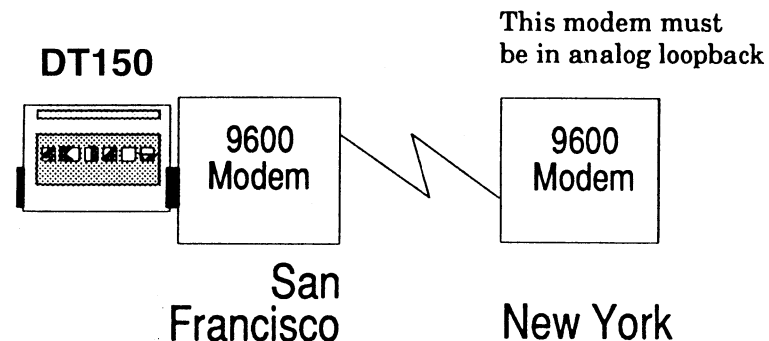
This modem must be in analog loopback

Figure 5-10. Plug the 232 Monitor into the modem in San Francisco and put the modem in New York into analog loopback.

2. Have someone in New York put the New York modem into analog loopback by pressing the AL button on the modem.

3. Slide the 232 Monitor power switch ON.

4. Press MENU. Your screen may already be showing the correct baud rate, if it isn't, proceed to step 5, if it is, skip step 5.

```
FWD or BACK for Options.  SET for Values
Baud Rate:  9600
```

5. Press SET (TEXT) until the baud rate matches your equipment's baud rate.

6. Press FWD until your screen shows Mode. Your screen should look like the following screen, if it does skip the next step.

```
FWD or BACK for Options.  SET for Values
Mode:  BSC
```

San Francisco ⩘ New York

Figure 5-9. Network configuration used in this example.

1. Disconnect the multiplexor in San Francisco and replace
    it with the 232 Monitor. That is, plug the right side
    of the 232 Monitor into the modem as illustrated below.
    Use a cable is that is more convenient.

ENTERING AND CHANGING HEX VALUES

Several of the options on the 232 Monitor require you to set HEX
values. Set HEX values as follows:

```
FWD or BACK for Options. SET for Values.
Sync Char 1:    (ENTER to change)  16
```

*   To change the current value (16 in the above example)
    first press ENTER (WHERE) to see the following.

```
BACK/FWD scroll value. SET moves cursor
Sync Char 1:    (ENTER to change)  16
```

*   Push FWD to increase the nibble above the cursor.

*   Push BACK to decrease the nibble.

*   Push SET (TEXT) to move the cursor to the other nibble.

*   Push FWD and BACK together to set HEX value to 0.

*   Push ENTER (WHERE) to get back to previous screen and
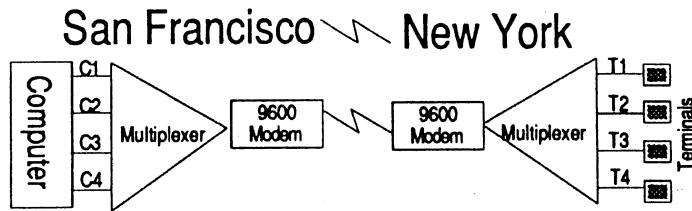   thereby leaving the HEX value at whatever you have set.

SECTION 5

EXAMPLES

The 232 Monitor is a powerful diagnostic tool. Many of its features aren't readily apparent just by thumbing through a reference manual. This section of the User's Guide is filled with examples and case studies showing how to use the 232 Monitor in your everyday work. Following is a brief description of each of the examples and then the actual examples themselves follow.

Example 5-1 Setting a StartString (Creating a HEX String)

We'll go through, step-by-step what is needed in order to create a string using the 232 Monitor. HEX strings have several uses in the 232 Monitor and this example is applicable wherever a HEX string is needed.

Example 5-2 Analysis of a 2780/3780 Bisync Line

We'll take a common bisync line using the 3780 protocol and show you how to test the line.

Example 5-3 Evaluating Trunk Line and Multiplexer Performance

This example shows you how to test a long distance trunk line and a statistical multiplexer.

Example 5-4 Quantifying Errors on a Leased Line

Have you ever wondered how good your leased line really is? Have you ever wanted to complain to a leased line vendor but not been able to say anything more quantifiable than, "I seem to be getting a lot of line hits." This example shows how you can get real numbers to take to your vendor or to help you choose a vendor.

Example 5-5 Serial Printer Troubleshooting

Your printer won't print exactly what the computer sends. Why not? This example not only takes you through a specific example, but it also offers many generalized hints on troubleshooting printers.

Conclusion   The bit and block errors represent line hits. Line hits are normally the fault of the leased line vendor. You may want to try to use this information to negotiate credit with your vendor or to get them to repair the line. Run this test at different times of the day to note any correlation between time of day and errors or delays. In general, more than one block error per minute is considered out of any reasonable specification.

Procedure   You'll test this line by setting up a loop test (see Figure 14) and sending a specific pattern that has been optimized to detect and count bit errors, block errors, characters received and the average round trip time in milliseconds.
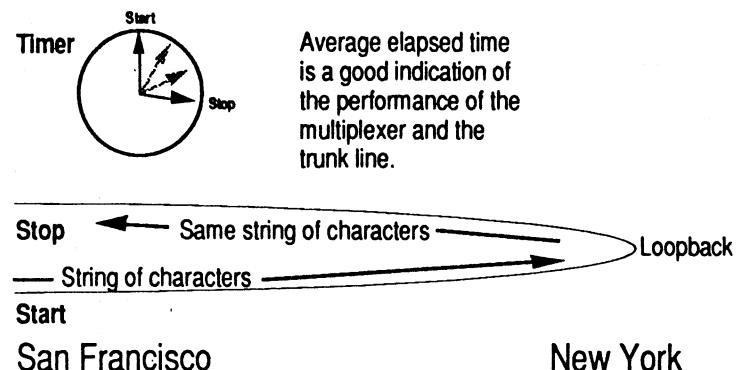

Figure 5-8. To reproduce a scenario similar to the one illustrated here, often called a loopback, follow the steps below.

Imagine you have a point-to-point network from San Francisco to New York. It consists of a high speed synchronous line provided by a long line network. See Figure 5-9.

CAUTION

If you see a lowercase "t" next to the number
of characters received (REC), then a timeout has
occurred. Increase your timeout setting.

TIMEOUT is the last selection on the LOOP menu.
TIMEOUT values are in 250 millisecond increments.
Refer to Section 4 Entering and Changing HEX
Values elsewhere in this manual for information
on changing this value.

23. When the test is over, press any key to get a report
showing the average time it took for one character to
make the return trip.

```
Average time for character to return in
.0000 is: 00000A
```

This number represents, in HEX, the average round trip time for
one character. The smaller the number, the better the
performance.

24. Repeat this test on multiplexer Beta to compare
multiplexer and trunk line performance. If you want an
average over a longer period of time, run the test for
several hours by setting PASSES to 0 as described in
step 9 above.

For a more intensive test of your multiplexers, load up the
multiplexers with data input on more than one asynchronous
channel by using several 232 Monitors as sources of test data
(see Output option). If you only have one 232 Monitor, you can
use any other source for data as long as that source always
transmits its pattern at a consistent speed.

Example 5-4 Determining Transmission Quality of a Point-to-point Synchronous Line

Purpose   To determine the quality of a long distance leased
               line. This information could be used to choose a
               leased line vendor or as documented evidence of
               line trouble for your current leased line vendor.

Method   Attach the 232 Monitor directly to one modem, then
               perform a Loop Test with the 511 Bert Pattern.
               This will show us not only the number of bit and
               block errors (line hits) but also the average
               round trip time and characters received.

Example 5-1 Setting a StartString (Creating a HEX String)

Purpose   You need to create a StartString (a HEX string).
               For all of the uses of the StartString, please
               turn to page 39.

Method   You may set a string with another device and
               download it, or you may set it with the 232
               Monitor itself. The purpose of this example is to
               teach you how to create a HEX string using the 232
               Monitor itself.

Procedure   The quickest way to learn how to set a string with
               the 232 Monitor itself is to try this example.
               Please follow along on your 232 Monitor while we
               work through the following example. We will be
               setting a StartString, but the same procedure is
               used for setting a StopString. The string we will
               create in ASCII code is ABCD.

1. Begin by entering the Menu Mode (press MENU) then
   scrolling through the options (FWD or BACK) until you
   get to Start Trigger.

2. Use the SET (TEXT) button to scroll through the
   values allowed until your screen looks like this:

```
FWD or BACK for Options.  SET for Values.
Start Trigger:   Edit/View StartString
```

Now you need to enter the Edit/View String submenu.

3. Press the ENTER (WHERE) button.

Now the 232 Monitor displays the instructions you will need to
work the subsequent screen:

```
BACK & FWD scroll values.  SET moves the cursor.
ENTER for next char. MENU exits.
```

4. Press any button and you will see the following screen.

```
HEX Char String   (Current Size is:00)
00  #01  n
```

If your screen does not look like this, press
·and hold the SCROLL and TEXT buttons simultan-
eously. This will CLEAR (see "CLEAR" on front
panel) the string.

This is the screen you will use to build your StartString.
Notice HEX 01 has no printable ASCII representation, hence
the n meaning none. Notice too that the 0 (the low nibble)
is underlined. That means it is the currently selected
nibble. We would like to increase the high nibble so we will
now select the high nibble.   `

5. Press SET (TEXT) to move the cursor.

The leading zero (high nibble) should now be underlined,
selected. You increase either nibble by pressing FWD (decrease
it by pressing BACK).

6. Press FWD four times to increase the high nibble to
   four.

Your screen should look like this:

```
HEX Char String (Current Size is:00)
40    #01  @
```

Now let's increase the low nibble.

7. Press SET (TEXT) to move the cursor.

8. Press FWD once.

HEX '41' is ASCII 'A' and that should now be showing on your
screen.

9. Press ENTER (WHERE) to accept this first character and
   prepare to enter your second character.

Your screen now should look like this:

```
HEX Char String (Current Size  is:01)
00    #02  An
```

Notice that your string is now one byte long (Current Size is:
01) but you have already been put in position to work on the
second byte Char #02. The first byte is HEX 41 and it has been
ENTERed. The second byte is currently HEX 00.

18. Because these are statistical multiplexers, you need
    flow control, so press FWD and the following screen
    appears:

```
Hit SET to reset timer. Blocksize=00xx
MENU to end, ANY key to start
```

Blocksize tells you the number of characters in the pattern you
chose in this case Fox.

19. Press any key and see the following important reminder.

```
Slide output switch to on.
Hit any key to start.
```

20. Slide the output switch to on right now.

21. Press any key to begin the test.

22. After ten patterns have been sent and received, you will
    receive real time reports of the number of characters
    sent, number received, bit errors, block errors, and the
    average trip time in 1,000th of a second intervals.
    This is a report of the average trip time. In other
    words, the average length of time it took one block to
    be sent from San Francisco to New York and back. Here
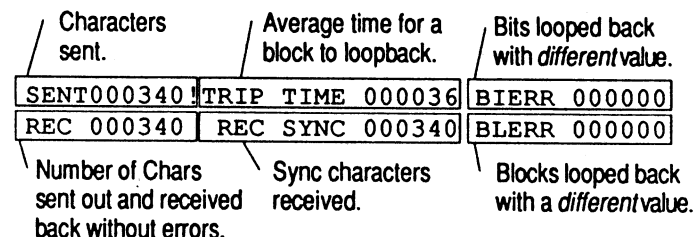   is a sample screen of that test with explanations:

Figure 5-7. This screen shows the results of your loop test.

The default value for PASSES is 1 HEX. If you were to leave it
at one, that would mean that you want one HEX repetition (pass)
of the pattern you choose. We want ten HEX repetitions or
"passes."

> 12. Press ENTER (WHERE) to change the default Passes. Your
>   screen looks as follows:

```
BACK/FWD scroll value. SET moves cursor
Output:  Passes (ENTER to change) 0̲0̲
```

> 13. Press SET (TEXT) to move the cursor.

```
BACK/FWD scroll value. SET moves cursor
Output:  Passes (ENTER  to change) 0̲0̲
```

> 14. Press FWD once to up the PASSES to 10 HEX.

> 15. Press ENTER (WHERE) to accept 10 HEX passes.

```
FWD  or BACK for Options. SET for Values
Loop Test:  Passes (ENTER to change) 10
```

For more information on setting HEX values, see Section 4
Entering and Changing HEX Values.

<center>NOTE</center>

> If you set the Passes value to 0 HEX then the
> test will continue until you stop it by pressing
> MENU.

> 16. Press SET (TEXT) until you see the pattern called Fox.
>   This will print: THE QUICK BROWN FOX JUMPED OVER THE
>   LAZY DOGS BACK

> 17. Press ENTER (WHERE) and you will see the following
>   screen asking if you would like flow control on or off:

```
Hit FWD to observe flow control.
BACK to ignore flow control.
```

<center>46</center>

Let's change the second byte from HEX '00' to HEX '42.'

> 10. First press SET (TEXT) to select (move cursor to) the
>   high nibble.

> 11. Then press FWD four times.

Your screen should look like this:

```
HEX Char String (Current Size is:01)
40   #02   A@
```

Now select the low nibble:

> 12. Press SET (TEXT) to specify low half of HEX character.

> 13. Press FWD twice to increment low nibble from 0 to 2.

> 14. Press ENTER (WHERE) to accept this byte and move to the
>   next one.

Your screen should look like this:

```
HEX Char String  (Current Size  is:02)
00   #03   ABn
```

> 15. Press SET (TEXT) to select high nibble.

> 16. Press FWD four times to change high nibble from 0 to 4.

> 17. Press SET (TEXT) to select low nibble.

> 18. Press FWD three times to change low nibble to 3.

> 19. Press ENTER (WHERE) to accept this byte and move on to
>   the next.

Now you have set byte three to ASCII C and are positioned to
define the fourth byte. Let's cheat and use a shortcut.

> 20. Press FWD and BACK simultaneously and hold down for at
>   least one second.

You've learned the shortcut for copying the previous byte. By the
way the HOME, END and CLEAR labels offer shortcuts too. By
pressing SCROLL with BACK (HOME), you will go to the first
character in your string. SCROLL with FWD (END) takes you to the
last, and SCROLL with TEXT erases the entire string (CLEAR).

<center>35</center>

```
HEX Char String   (Current Size is:03)
43   #04   ABCC
```

21. Press FWD once to change the low nibble to 4.

Your screen should look like this:

```
HEX Char String   (Current Size  is:03)
44   #04   ABCD
```

22. Press ENTER (WHERE).

Your screen should look like this:

```
HEX Char String (Current Size is:04)
00   #05   ABCDn
```

Now, your StartString is completed, so don't press ENTER or you
will add HEX 00 again. Note the size of your string (Current Size
is: 04).

23. Press MENU.

That stored your Trigger string, and brought you out to the Menu
Mode. Specifically to the following screen:

```
FWD or BACK for Options. SET for Values.
Start Trigger: Off
```

Let's say you were setting the StartString so you could begin
capturing data when you receive the string ABCD on the TD line.

24. Press SET (TEXT) until you see TD to set the StartString
     to search on the TD line.

Your 232 Monitor would now begin capturing data when it receives
the ASCII string 'ABCD.' Your screen should look like the
following screen:

```
FWD or BACK for Options. SET for Values.
Start Trigger: TD
```

3. Slide the 232 Monitor power switch ON.

4. Press MENU. Your screen may already be showing the
    correct baud rate for your network, if it isn't proceed
    to step 5, if it does, skip step 5. Your screen should
    look similar to the following sample.

```
FWD or BACK for Options. SET for Values
Baud Rate: 9600
```

5. Press SET (TEXT) until the baud rate matches your
    equipment's baud rate.

6. Press FWD to display the Stop Bits. If this matches
    your equipment, skip the next step.

```
FWD or BACK for Options.  SET for Values
Stop Bits: 1
```

7. Press SET (TEXT) to scroll through and set the correct
    value for the Stop Bits.

8. Press FWD to display the Data Bits. If this matches
    your equipment, skip the next step.

```
FWD or BACK for Options. SET for Values
Data Bits: 8
```

9. Press FWD to display the Data Bits. If this matches
    your equipment, skip the next step.

```
FWD or BACK for Options. SET for Values
Parity: None
```

10. Press SET (TEXT) to scroll through and set the correct
    value for Parity.

11. Press FWD to scroll through the options until you see
    Loop Test. Now press SET (TEXT) once and you will see
    the Passes prompt.

```
BACK /FWD scroll  value.  SET moves cursor
Loop Test: Passes (ENTER to change) 01
```

To reproduce a scenario similar to the one illustrated in figure 5-5, often called a loopback, follow the steps below.

   1. Detach one of the asynchronous lines from the Brand X statistical multiplexer in New York and put that line into loopback.

       Many multiplexers have a control port to implement loopback. If yours does not, then the remote site should use a breakout box to create the loopback. If you know what you are doing you could, at the remote end, also just short pin 2 to pin 3 with a paper clip.

   2. After a loopback circuit is created, attach the male (DTE) connector of the 232 Monitor to the multiplexer in San Francisco, let's choose line C1 as in the magnified illustration below.
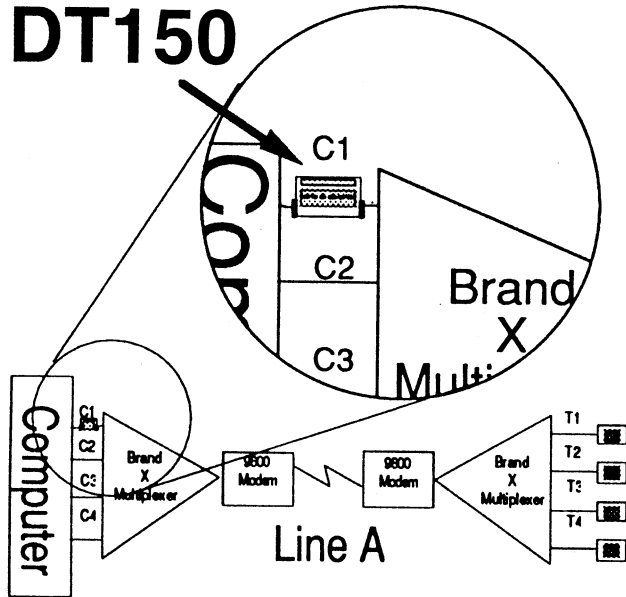

Figure 5-6. Plug the 232 Monitor in between the computer and the multiplexer.

25. Press SET (TEXT) twice.

Your screen should look like this:

```
 _____
|                                                 |
|    FWD or BACK for Options.  SET for Values.    |
|    Start Trigger: Edit/View StartString         |
|_____|
```

Let's check that string. Once again enter Edit/View String submenu.

   26. Press the ENTER (WHERE) button.

   27. Press any button.

As you can see your 232 Monitor's trigger is ABCD.

Example 5-2 Analysis of a 2780/3780 Bisync Line

Purpose   To discover why the reports coming off of your RJE3780 take so long to print (i.e. your printer is not printing to its full capacity.)

Method   We will place the 232 Monitor between the RJ3780 device and the modem that it is attached to; we'll capture data; finally, we'll compare the captured data to what the RJ3780 is actually receiving.

Conclusion   If we see the same text data being transmitted to the RJ3780 three, four, or more times, then the block coming in must not have a correct checksum. This could slow the transmission and therefore the actual throughput which may affect printing speed.

Procedure   We show you how to set up the 232 Monitor and then it will be up to you to actually examine the data for repetitions or other clues. If you do determine that excessive retransmissions are occurring, then you will want to do the synchronous line test like the one in example 5-4.

Here is an example of a test with the 3780 protocol. Follow along on your own 232 Monitor to test your own bisync line.

   1. Turn 232 Monitor on.

The message "Buffer End" will appear briefly because this message always flashes when you first turn on the 232 Monitor. You are in View Mode.

   2. Push MENU to enter the Menu Mode.

You are now prepared to change the options.

3. Push FWD twice.

Your screen should look like the following screen.

```
FWD or BACK for Options.  SET for Values
Data Bits: 8
```

You are now prepared to set data bits. We don't need to set baud
rate because of the clocking signal on pins 15 and 17. And no
need to set stop bits because there aren't any in synchronous
mode. Skip the next step if your Data Bits are properly set.

To change the value of this option:

4. Push SET (TEXT) until the proper value for this option
   is showing.

5. Push FWD to check Parity.

Your screen should look like this:

```
FWD or BACK for Options.  SET for Values
Parity: None
```

6. You are now prepared to set parity if necessary. See 4
   above to change this value.

7. Push FWD to set data encoding if necessary. See 4
   above.

8. Push FWD to set mode if necessary. See 4 above.

9. Push FWD to see the Sync Char 1 value.

Your screen should look like the following screen:

```
FWD or BACK for Options. SET for Values
Sync Char 1: (ENTER  to change) 16
```

Let's assume that 16 HEX is showing and you are using EBCDIC.
You'll probably want 32 HEX.

10. Push ENTER to change the HEX value.

You are now able to scroll (BACK or FWD) through values for each
nibble. The cursor is under the 6 meaning that nibble is
selected. So let's change it first.

Procedure   We will need to create a loopback and then run a
                 test through that circuit see Figure 10.

Imagine you have a point-to-point network from San Francisco to
New York. It consists of two high speed testing synchronous lines
provided by a long line network. See Figure 5-5.

Line A   Terminated with two 9600 Baud modems

San Francisco ∿∿ New York
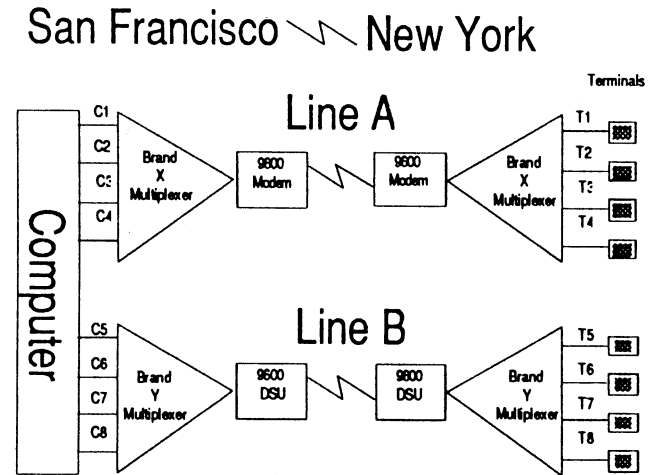
Line B   Terminated with two 9600 Baud DDS Digital Service Units
(DSU).

Figure 5-5. Network configuration used in this example.

Useful Hints

We recommend you read about the Exclude option on page 29.
Exclude allows you to exclude data between or outside of the STX
and ETX characters. Additionally, you can redefine the STX and
ETX to be any value, thereby allowing you to tailor exactly what
the 232 Monitor will store in memory.

Example 5-3 Determining Throughput Performance of Multiplexers

Purpose   You have two brands of statistical multiplexers,
               that is multiplexers from two different
               manufacturers. You want to standardize on one
               manufacturer's multiplexer, testing so you want to
               test each multiplexer independently.

Method   In order to compare the multiplexers, you need to
               compare the average time it takes for characters
               sent from the computer to travel through the
               network and back to the computer, as in Figure 5-4,
               for each of the multiplexers.

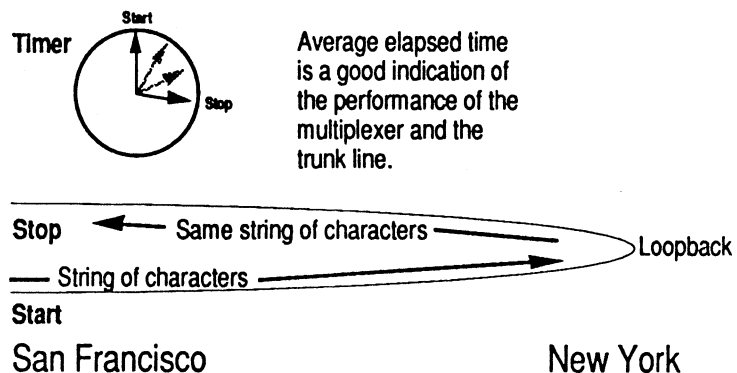

Figure 5-4.   The loopback described in step 1 creates the
               condition illustrated here providing a round trip
               for any characters sent.

Conclusion   The shortest average interval of time for a
               loopback will show the best multiplexer and trunk
               line combination.

---

11. Push BACK four times.

Your screen should look like the following screen:

```
FWD or BACK for Options. SET for Values
Sync Char 1: (ENTER to change) 12
```

12. Push SET to select the other nibble.

```
FWD or BACK for Options. SET for Values
Sync Char 1: (ENTER to change) 12
```

13. Push FWD twice.

```
FWD or BACK for Options. SET for Values
Sync Char 1: (ENTER to change) 32
```

Now you have changed the sync character from 16 to 32 HEX. To
leave it set at 32

14. Push ENTER.

You have returned to the Menu Mode.

```
FWD or BACK for Options. SET for Values
Sync Char 1: (ENTER to change) 32
```

15. Push FWD for Sync Char 2.

16. If necessary, repeat steps 10-14.

17. Push FWD until your screen shows "Drop Sync Char"
    option.

18. Press SET (TEXT) until you screen looks similar to the
    following screen:

```
FWD or BACK for Options. SET for Values
Drop Sync Char: (ENTER to change) FF
```

19. If the HEX value showing is FF, you are set. If it
    isn't, press ENTER and set HEX value as instructed above
    in steps 10-14.

If your system uses 00 HEX instead of FF HEX, you will want to
set the Drop Sync Char as 00 HEX.

20. Push FWD until your screen looks similar to the
    following screen.

```
FWD or BACK for Options.  SET for Values
Code: ASCII
```

21. You are now prepared to set the code if necessary. See
    step 4 above.

22. Push MENU.

You are set to start collecting. We suggest clear the buffer
first.

23. Push SCROLL and TEXT together and hold down for at least
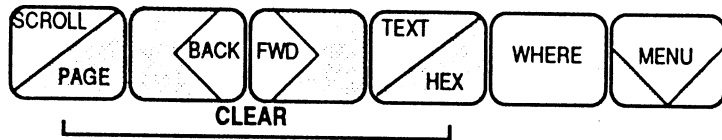   one second as illustrated below.

Figure 5-1. Buffer is now clear.

24. Push START, that is BACK and FWD held down together
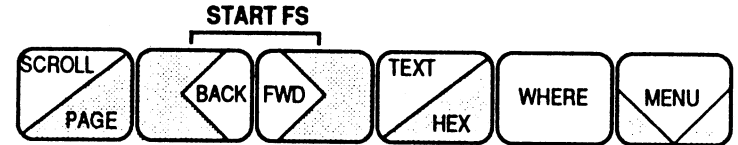   for at least one second. As illustrated below:

Figure 5-2. **START enables the RS-232 interface. Data will be
collected as soon as two sync characters are
received. For viewing options, see Section 2.**

25. Push STOP, that is FWD and TEXT held down together for
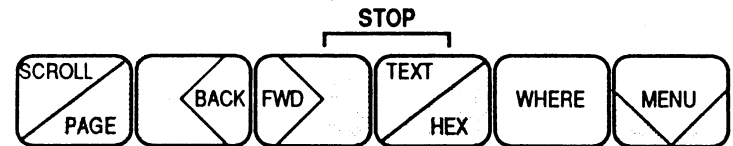   at least one second.

Figure 5-3. This will stop data collection.

Possible problems

If no data appears, push START FS again to Force Sync. This will
cause the 232 Monitor to begin collection of any data without
waiting for any sync character(s). By using the SHIFT
capability, you can see what the correct sync character is and
set it on the 232 Monitor, then try again.