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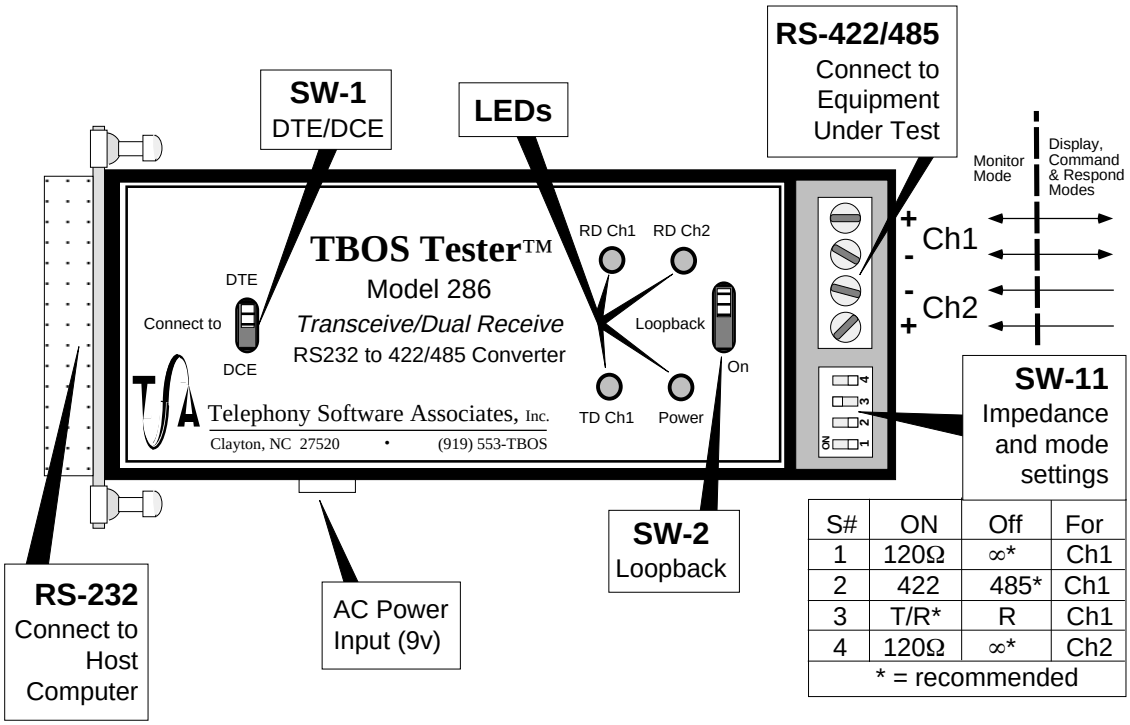
2.2 TBOS Tester™ Hardware Installation

TBOS telemetry is based on a 4-wire RS-422 wiring scheme. However, most personal computers use a simpler 2-wire RS-232 scheme. An RS-232/422 converter is therefore needed to connect the host computer's serial port to the equipment under test. In addition, for Monitor Mode testing the converter must combine two channels of received signal into a single channel for the host computer's use. Finally, some TBOS equipment utilizes a non-standard RS-485 interface rather than RS-422, so the converter must be reconfigurable to operate at RS-485. The Model 286 converter supplied as part of the TBOS Tester™ package (see Figure 2.1) provides these functions.



S#	ON	Off	For
1	120Ω	∞*	Ch1
2	422	485*	Ch1
3	T/R*	R	Ch1
4	120Ω	∞*	Ch2
* = recommended			

Figure 2.1: Model 286 TBOS Tester™ RS-232 to 422 /485 Converter

☞ **NOTE**: The converter supplied with earlier versions of TBOS Tester™ will support all features of Version 4 with the exception of Monitor Mode. If you are using an earlier version converter, follow the hardware installation instructions provided with it and change the "**Support Dual-Rcv**" parameter at **MISC:SETS** to "**N**". Then skip to §2.2.5.

2.2.1 Configuring the Converter

Several switches on the converter must be set correctly to obtain the desired results.

2.2.1.1 Terminating Impedance (SW-11 #1 and #4, default OFF)

Elements 1 and 4 of SW-11, the four position DIP switch, select the termination impedance of the RS-422/485 interface for each channel. The impedance of each channel should typically be set to ∞ (OFF). Channel 2 may need to be changed to 120Ω (SW-11 #4 ON) in some applications.

⚡ **CAUTION**: Return the setting to ∞ (OFF) after testing in such cases. If 120Ω terminations are set in Monitor Mode the link between the Remote and the monitored equipment may be loaded excessively, causing a "Link Down" error at the Central.

2.2.1.2 RS-422 (485 4~wire)/RS-485 2-wire (SW-11 #2, default OFF)

Element #2 of SW-11, the four position DIP switch, lets you select RS-422 (RS-485 4-wire) or RS-485 (2-wire) operation. The protocols are practically identical except that for RS-422 (485 4-wire) the transmit channel idle state is near +3 VDC, whereas the RS-485 2-wire transmitter idle state is near zero VDC. Display and Command Mode tests as well as Respond Mode tests when TBOS Tester™ is the only responding device *may* require the RS-422 setting. Except for these cases, however, the converter should remain set for RS-485 2-wire operation (SW-11 #2 OFF) for the following reasons:

- In Monitor Mode both converter channels are used as receivers. However, the RS-422 setting forces Channel 1 to a non-zero idle voltage. This precludes its use as a receiver and may disrupt communications between the Remote and the monitored equipment, causing a "Link Down" error at the Central.
- RS-485 (2-wire) is preferred in multidrop Respond Mode applications because interaction between transmitters sharing the same channel is minimized.

2.2.1.3 Channel 1 Transceive/Receive Only (SW-11 #3, default ON)

SW-11 element 3 allows Channel 1 when optioned for RS-485 2-wire operation to function as a transceiver (T/R) or a receiver only (R). The normal setting for TBOS Tester™ is SW-11 #3 ON, as this supports all four operating MODEs. The converter can then receive telemetry on both channels and transmits on Channel 1 when data to transmit is presented to it from the host computer. If only Monitor Mode is to be used you can set SW-11 #3 OFF, which disables the converter's transmitter even if data is sent for transmission (thus disabling Display, Command and Respond Modes which all must transmit data). In high-noise environments or other unusual applications this setting may be desirable. Note that if SW-11 #2 is ON (RS-422/485 4-wire option) the position of SW-11 #3 is irrelevant as it pertains only to RS-485 2-wire operation.

2.2.1.4 DTE/DCE (SW-1, default "Connect to DTE")

The slide switch SW-1 allows the TBOS Tester™ RS-232 interface to function as Data Terminal Equipment (DTE) or Data Communications Equipment (DCE). Because most personal computers are configured as DTE, SW-1 should be set "Connect to DTE" in normal use. If the converter is connected to a modem instead of a computer the "Connect to DCE" setting should be used.

☞ **CAUTION:** SW-1 is recessed below the converter housing to avoid inadvertent changes to the switch setting. To avoid short-circuiting components use a non-conductive probe to change the switch setting. The switch is fragile and can be broken easily if force is applied to the switch housing itself instead of the slide element.

2.2.1.5 Loopback (SW-2, default OFF)

When conducting Display and Command Mode tests it is often useful to connect the transmitter to the receiver of the TBOS Tester™ 4-wire interface in order to verify that the tester is working correctly. The loopback switch SW-2 enables this connection to be made without disconnecting the converter from its cable and rummaging around for bits of wire to make the loopback. When a loopback is set using the switch the external connections float (i.e. they are *not* looped back) so the switch can be used without fear of confusing the alarm system to which the converter may be connected. The loopback switch is discussed later in the paragraphs about self testing.

☞ **NOTE:** The loopback switch SW-2 is recessed below the converter housing to avoid inadvertent changes to the switch setting. Use a non-conductive probe to change the switch setting. Exercise caution if using a conductive tool such as a small screwdriver to change the switch setting.

2.2.2 RS-232 Connections

Attach the RS-232 end of the converter (the 25 pin D-connector) to your computer's serial port. For most standard desktop personal computers, a female-to-female gender changer is required. TBOS Tester™ is supplied with a gender changer, which is shipped already attached to the converter. For most laptop personal computers, a DB9-to-DB25 adapter is also required. This adapter is supplied as well with TBOS Tester™ in the form of a one foot long cable.

☞ **NOTE**: If other serial equipment (e.g. a mouse, modem or printer) is attached to the computer make sure that the serial port used for TBOS Tester™ does *not* use the same interrupt (IRQ) as the other equipment. Generally COM1 and COM3 share an IRQ, as do COM2 and COM4.

2.2.3 RS-422/RS-485 Connections

The 4-wire (RS-422/485) end of the converter (with the 4-position screw terminal block) is connected to the monitored equipment or alarm remote under test. This connection can be made with the 4-conductor cable provided with TBOS Tester™ or with a user supplied cable.

Figure 2.2 shows the signal direction for the converter's 4-wire interface in TBOS Tester's various operating **M**ODEs. Channel 1 operates as a transmitter when TBOS Tester™ is **R**UNning in Display, Command and Respond Modes, and as a receiver when TBOS Tester™ is **R**UNning in Monitor Mode. Channel 2 is always a receiver.

☞ **NOTE**: In Monitor Mode although both channels are receivers it is significant which channel is connected to the monitored equipment and which is connected to the Remote. If it is necessary to change the channel assignments you can use the **<Alt-R>** operation instead of physically changing the cable connections.

Designations on equipment under test are not standardized, so the 4-wire connection pattern may be different from one manufacturer and model to the next. The most common pattern is shown in Table 2.1, Column 2 ("Standard").

If the standard wiring pattern fails to operate try using a different pattern. The three other reasonable possibilities (out of 24 possible combinations) appear in the table as Alt1, Alt2 and Alt3 in order of likelihood. Space has been provided in Table 2.2 to write in your equipment names and the wiring patterns they use.

☞ **CAUTION:** The TBOS Tester™ converter and the equipment under test will not be harmed by *temporary* misconnection of the individual 4-wire leads. However, some wiring combinations can force the converter's receive data LED to be ON constantly even when data is not present. Leaving such a misconnection in place for long periods can overheat the RS-422 interface chip and damage the converter. Real data will be detected by the software and be in evidence on screen. The LEDs should also appear to *blink* (rather than being constantly ON) unless the data rate is atypically fast.

Monitor Mode connections should be made in terms of the monitored equipment, not the Remote. For most equipment Channel 1 of the converter is connected to the receive pair on the monitored equipment (which is the transmit pair on the Remote).

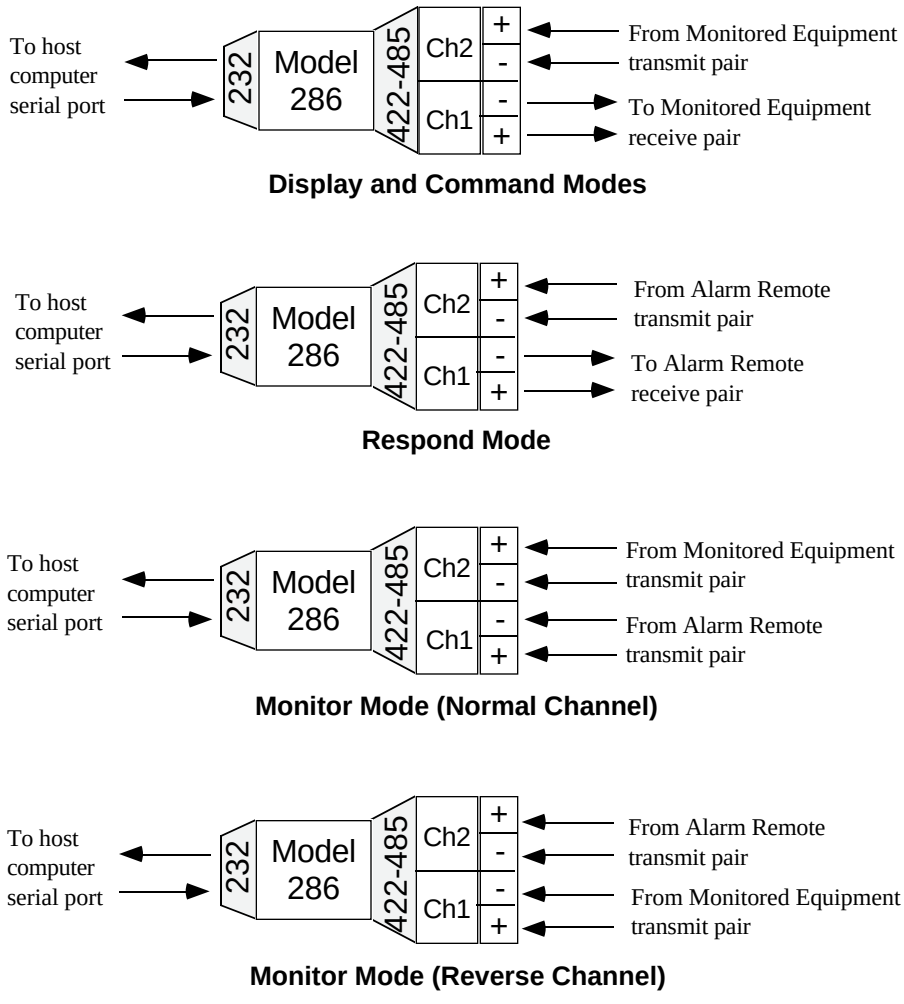


Figure 2.2: TBOS Tester™ Model 286 converter signal flows

TBOS Tester™	**Equipment under test**			
Model 286/(or A4015)	**Standard**	**Alt1**	**Alt2**	**Alt3**
Ch1+/(T+)	Rx Tip (R+)	R-	T+	T-
Ch1-/(T-)	Rx Ring (R-)	R+	T-	T+
Ch2+/(R+)	Tx Tip (T+)	T-	R+	R-
Ch2-/(R-)	Tx Ring (T-)	T+	R-	R+

Table 2.1: Interconnections between TBOS Tester™ and equipment under test

Monitored Equipment (Mfgr/model)	Connection (Std/Alt1-2-3)	Monitored Equipment (Mfgr/model)	Connect (Std/Alt1-2-3)

Table 2.2: Interconnections between TBOS Tester™ and specific equipment

2.2.3.1 TBOS Tester™ Cable

A four conductor cable has been supplied with TBOS Tester™ that assumes the TBOS interface on the equipment under test appears on standard .045" wire-wrap pins. A custom cable may be required if a cable length greater that six feet is needed or if the TBOS interface does not appear on wire-wrap pins. Almost any four conductor cable should be adequate.

2.2.3.2 Connecting TBOS Tester™ to Multiple TBOS Ports

TBOS Tester™ can be used with more than one piece of equipment at a time. As many as eight (8) network elements (assuming one TBOS display address per NE) can be tested simultaneously. The RS-422/485 level signals from each TBOS interface should be connected in parallel (daisy-chained) to the Model 286 converter.

2.2.4 Power Connections

Finally, connect the TBOS Tester™ converter to a convenient source of AC power using the supplied transformer. The "Pwr" LED will light to indicate power is being received.

2.2.5 Connecting a printer to TBOS Tester™

The TBOS Tester™ log, which records status point activity and commands issued through TBOS Tester™, can be printed*during* a test **R**UN as well as **V**IEWed on screen in its entirety after a test. (During a test you can use the log window to view the 22 most recent events for any particular display address). TBOS Tester™ assumes that a parallel printer will be used. If a serial printer is to be used, apply the DOS MODE command (*not* the TBOS Tester™ **M**ODE command) to redirect the parallel port selected from within TBOS Tester™ to the serial port to which the printer is connected. For example, if a serial printer connected to serial port 2 is to be used, type MODE LPT1**:**=COM2**:** at the DOS prompt. Remember that you may need to configure the serial port for use with a printer *before* redirecting the parallel port. Printer information sent by TBOS Tester™ to parallel port 1 will now be redirected to serial port 2. For more information on the DOS MODE command consult your DOS user's manual.

☞ **NOTE:** Redirect ports if necessary *before* invoking TBOS Tester™ to avoid memory fragmentation problems. Do not use the **M**I**SC:E**XIT function to shell to DOS for the purpose of redirecting ports.

2.3 Remote Connections

Most testing applications involve local connection between TBOS Tester™ and the equipment under test (monitored equipment or an alarm remote). However, TBOS Tester™ can also be used to retrieve or convey information to or from a remote location. These applications are described briefly in this section. For additional information please contact TSA on (919) 553-TBOS [553-8267].

2.3.1 Transmitting information to a remote location

In this application TBOS Tester™ is connected locally to monitored equipment in the usual manner, with Display or Monitor Mode used to gather data. The autodialer feature is then employed which enables TBOS Tester™ to call a remote terminal or an alphanumeric pager system when selected alarms occur. If a remote terminal is selected to be called (using the autodialer's log mode) the display or monitor log is downloaded to the terminal by TBOS Tester™ once a connection is established. If a pager is selected to be called (using the autodialer's pager mode) a predetermined message is sent to the pager by TBOS Tester™. A second serial port, modem and dial

out service are required for use by the autodialer. Refer to Chapter Eight for complete information regarding the autodialer feature.

You can also use TBOS Tester™ in conjunction with third party remote computing and communications software (such as Norton pcANYWHERE®). Leave TBOS Tester™ running at a remote site and call it periodically for alarm status and history.

2.3.2 Using TBOS Tester™ to gather information remotely .....

For applications where TBOS Tester™ and monitored equipment are not collocated certain types of modems can be used to transfer the TBOS protocol datastream over a 4-wire leased line or a dial-up telephone line.

☞ **NOTE**: The Monitor Mode feature *requires* TBOS Tester™ to be collocated with the equipment under test, because the signals that indicate whether telemetry originates with the Remote or the monitored equipment are not conveyed by modem.

2.3.2.1 Dial-up access to a single site

You can call any number of remote locations one at a time to scan for TBOS alarms and to send serial commands using TBOS Tester™. A dial-up link must first be established between the TBOS Tester™ computer and the remote equipment using asynchronous modems capable of handling eleven bit words (Hayes® compatible modems, which can process a maximum of ten bits per word, are *not* suitable for this application). Once the link is established TBOS Tester's Display and Command Modes can be used to query and control the remote equipment. Any number of sites with as many as eight monitored equipment elements can be accessed (one site at a time) in this manner from a single TBOS Tester™. Figure 2.3 illustrates this application.

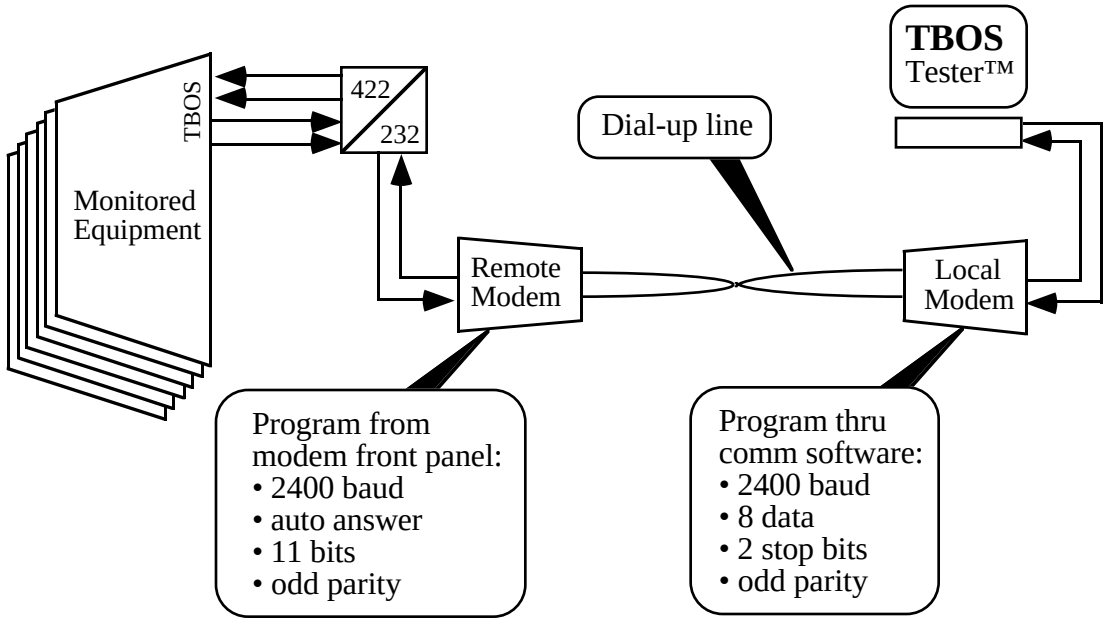


Figure 2.3: Single site surveillance using TBOS Tester™ over a dial-up line

2.3.2.2 Simultaneous monitoring of multiple remote sites

You can also use TBOS Tester™ to monitor as many as eight network elements in different locations provided that a multidrop circuit is nailed up among the monitored sites. In this case multidrop modems connect the TBOS Tester™ protocol converters (one per site) and the TBOS Tester™ host computer to the multidrop data circuit (Figure 2.4).

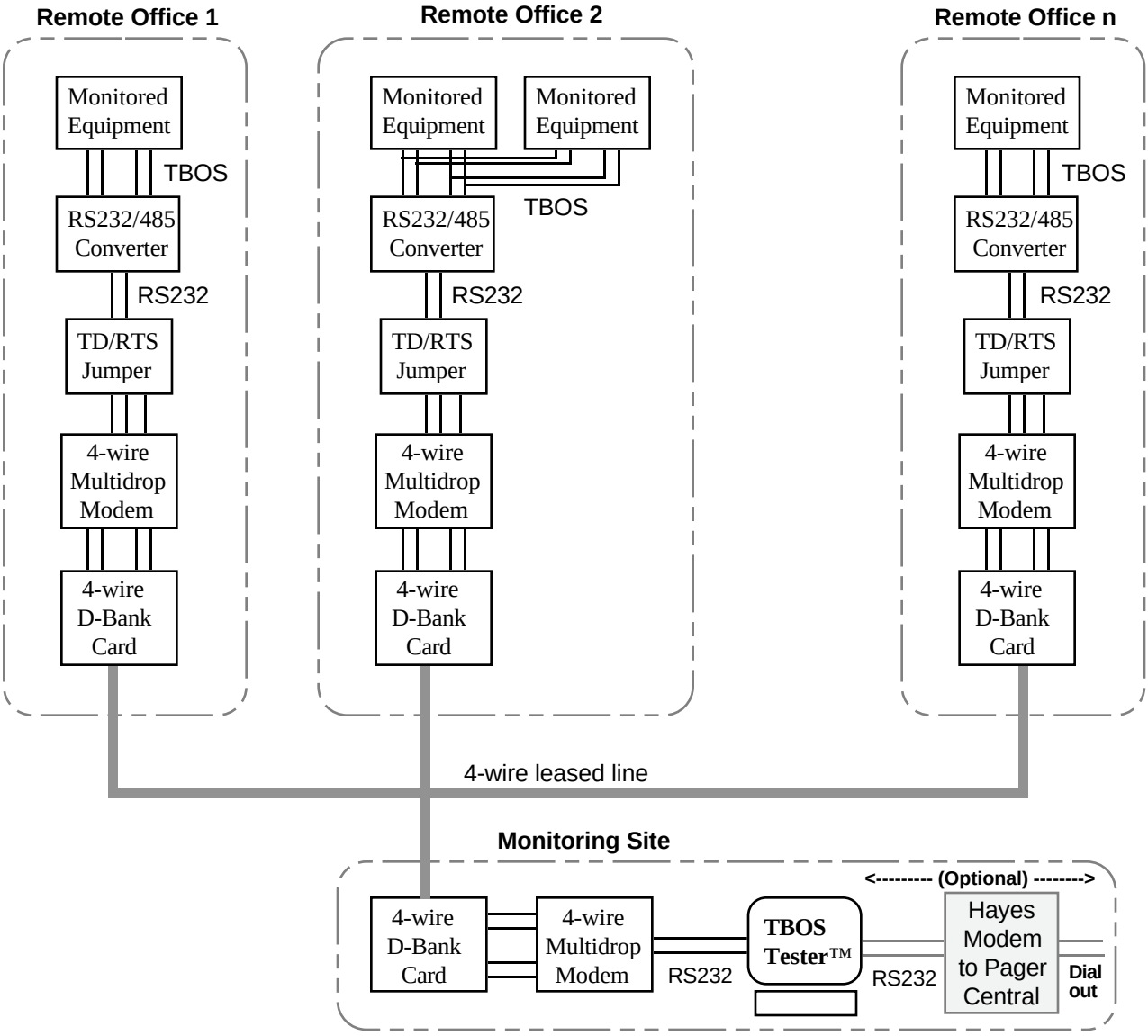


Figure 2.4: Multiple site surveillance using TBOS Tester™ over a leased line

☞ **NOTE:** Be sure you've connected the correct pins (TD and RD) together. Also, be sure the software is in **R**UN mode, not in **S**ELF mode, when conducting a port loopback.

2.6.1.3 Converter Loopback

A converter loopback is set on the 4-wire end of the TBOS Tester™ converter. The Ch1+ and Ch2+ (or T+ and R+) terminals are connected together, as are the Ch1- and Ch2- (T- and R-) terminals. The Model 286 converter normally supplied with TBOS Tester™ version 4 has a loopback switch that makes these connections and isolates the 4-wire cable so external connections will not be a factor. Other converters require the 4-wire cable to be removed and loopback connections made with small wires (e.g. paper clips).

A converter loopback verifies that the TBOS Tester™ software, computer and hardware are functioning all the way out to the 4-wire (RS-422 or RS-485) interface. **R**UNning in Display Mode the self test pattern should appear and the TD and Ch2 LEDs should be lit. If a port loopback works but a converter loopback does not the converter and intervening cables are suspect.

☞ **NOTE**: Make sure the converter is configured as "Connect to DTE", that it is receiving AC power (the Pwr LED on a Model 286 converter should be lit) and that the RS-232 cable connections are snug.

2.6.1.4 Cable Loopback

A 4-wire cable loopback verifies that the entire TBOS Tester™ package is operating correctly. It is performed at the equipment end of the 4-wire cable supplied with TBOS Tester™ or by the user. The cable should first be removed from the equipment under test (monitored equipment or alarm remote). Then connect the Ch1+ and Ch2+ (or T+ and R+) leads together, and connect the Ch1- and Ch2- (T- and R-) leads together (don't short the connected pairs).

RUNning in Display Mode the self test pattern should appear and the TD and Ch2 LEDs should be lit. If a converter loopback works but a 4-wire cable loopback does not the 4-wire cable is suspect. Disconnect it from the converter and check its continuity.

☞ **NOTE**: Be certain when performing a 4-wire test be sure that the loopback switch on the converter, if it has one, is set to "OFF".

2.6.2. LED Indicators

The Model 286 converter typically supplied with TBOS Tester™ version 4 is equipped with four LED indicators, one for power and three for data activity. In normal operation the "Pwr" LED is brightly lit. During a Display Mode converter loopback or cable loopback self-test the "RD Ch1" LED should be dark. The "TD Ch1" and "RD Ch2" LEDs should blink; if the data rate is fast enough they may appear to be lit constantly.

ϟ **CAUTION**: If either of the RD indicators appears constantly lit and no data activity is in evidence on screen a misconnection may be causing the receiver to be ON constantly, rather than in response to data transitions. Such a misconnection if prolonged may damage the converter.

☞ **NOTE**: Other converters equipped with LEDs may have TD and RD indicators only. The RD indicator on such a converter is equivalent to RD Ch2 on the Model 286 converter.

If you suspect a problem with TBOS Tester™, set up a converter loopback or cable loopback self-test and examine the LEDs.

a. Make sure the Pwr LED (if there is one) is lit, indicating AC power is being supplied to the converter.

b. If you see the TD Ch1 (TD) indicator blinking but *not* the RD Ch2 (RD) indicator it means a transmit signal is reaching the converter from the TBOS Tester™ computer but the looped back signal is not being detected. The usual causes are lack of power to the converter, a bad loopback or a faulty converter.

First check the setting of SW-11 #3. If it is OFF the converter is optioned to operate in RS-485 mode as a dual receiver so the transmit signal is not being conveyed at the 4-wire level. Switch SW-11 #3 ON (recommended) to allow Ch1 to transmit when data is presented to the converter. You can also place SW-11 #2 ON, which forces the converter to operate as an RS-422 transceiver, but Monitor Mode will not operate correctly.

Be certain that the loopback is correctly configured. If you are using a Model 286 converter toggle the loopback switch to make sure it is switched fully ON. If you are using a non-standard converter try changing the terminal pairs that are connected (e.g. T+ to R-, etc.) If you are using a cable loopback, switch to a converter loopback to eliminate the cable as a possible cause.

c. If you see the TD Ch1 (TD) *and* RD Ch2 (RD) LEDs blinking but no test pattern on screen (make sure you are viewing a display address that is being scanned) the receive signal from the converter is being blocked before it reaches the TBOS Tester™ software.

Place a physical loopback on the port (as described at §2.6.1.2) to verify the serial port hardware. If this clears the problem the RS-232 cabling is suspect; replace the RS-232 cable or verify its continuity. A converter problem in the RS-232 section is also a possibility. If the problem remains when a port loopback is applied the serial port hardware is suspect; try testing it with another serial device, or move TBOS Tester™ to a different serial port if one is available (remember to change the "**Communications Port**" assignment at MISC:SETS). Also try rebooting your computer.

d. If the TD Ch1 indicator on the converter is not lit (or blinking) the transmit signal from TBOS Tester™ is not reaching the converter. The most likely causes are software or converter misconfiguration.

1. Try *carefully* changing the DTE/DCE switch position. If the self-test pattern fails to appear return the switch to its previous position, and:

2. Set up a port loopback self-test. If the test pattern now appears the RS-232 cabling is suspect; replace the RS-232 cable or verify its continuity. If no test pattern appears (on any display) and timeouts begin accumulating in the Error Window:

3. Set a software loopback and repeat the test. If framing and parity errors begin accumulating the "**Communications Port**" at MISC:SETS has specified a nonexistent serial port. If instead the test pattern now appears it is likely that the "**Communications Port**" setting does not match the physical port to which the TBOS Tester™ hardware is connected. Restore the port loopback (remember to change from **S**ELF to **R**UN) and then change the "**Communications Port**" setting (permissible values are 1 through 4).

4. If none of the settings produces the test pattern the serial port hardware is suspect. Try testing it with another serial device, or move TBOS Tester™ to a different serial port if one is available (remember to change MISC:SETS). Also try rebooting your computer.

2.6.3 Switch Settings

Refer to section 2.2.1.1 through 2.2.1.4 for a discussion of switch settings on the Model 286 converter. For most applications SW-1 should be set to "Connect to DTE", SW-2 (the loopback switch) should be set OFF, elements 1, 2, and 4 of SW-11 should be OFF with element 3 ON. For other converters configure as DCE (connect to DTE) with no terminations.

Some applications (especially multidrop) can be sensitive to the converter's terminating impedance settings. TBOS data link pairs are usually terminated with 120Ω in one location, typically the receiver of the Remote and the receiver of the monitored equipment most distant from the Remote. If you see data link errors accumulating during a Display, Command or Respond Mode test and can find no other cause try adding the 120Ω termination to the converter's receive channel by switching SW-11 #4 ON.

⚡ **CAUTION**: ***Don't* terminate the line during a Monitor Mode test!** The extra load would likely disrupt communications between the Remote and monitored equipment, causing a link down error at the Central.

☞ **NOTE**: Remember to match the "**Support Dual Rcv**" setting at MISC:SETS with the converter you are using. Set this field to "**Y**" when using a TSA Model 286 converter; set it to "**N**" in *all* other cases.

2.6.4. Printer Problems

If the log printer is not printing correctly there are several settings to check but only limited fault isolation is possible. This section offers several suggested actions:

a. Symptom: log entries are double spaced. Change the "**CR/LF**" setting in MISC:LOGS to "**N**".

b. Symptom: log entries are printed on top of each other. Change the "**CR/LF**" setting in MISC:LOGS to "**Y**".

c. Symptom: printer is not printing.

i. Verify that the printer is powered on and selected.

ii. Verify that the "**Printer On**" setting at MISC:LOGS is set to "**Y**".

iii. If it is a parallel printer, verify that the port to which it is connected is the "**Printer Port**" specified at MISC:LOGS. If you aren't sure of the parallel port, try the values 1, 2, and 3 in succession. If possible, try printing from a different program to verify the port, cable and printer.

iv. If it is a serial printer make sure that the "**Printer Port**" specified at MISC:LOGS is *not* the serial port to which the printer is connected, but rather the parallel port redirected to that serial port. For example, a serial port on COM2 would be redirected using the DOS (not TBOS Tester's) mode command after the COM port was set up for the printer. From DOS the command typing:

```
MODE COM2:96,N,8,1,P
```

might be required to configure the serial port for the printer. Then a parallel port (e.g. LPT1) would have to be redirected to the serial port using the command:

```
MODE LPT1:=COM2:
```

Then "**Printer Port**" at MISC:LOGS would need to be set to "1" (*not* "2").

v. Another possible cause of problems with serial printers is assignment of a serial port whose interrupt conflicts with that used for the TBOS telemetry. Avoid using COM1 and COM3 at the same time, or COM2 and COM4 at the same time.

2.6.5. When All Else Fails .....

Call Telephony Software Associates, Inc. on (919) 553-TBOS (553-8267). We're here to help!

☞ **NOTE**: The character scan indicator may be difficult to see when scanning proceeds at a very fast rate, especially on LCD screens.

i. **Using the Datascope Window**: If you need to examine the TBOS datastream more closely a datascope window is available that shows each character in hexadecimal format (Figure 4.8). Press **<Alt-D>** (for *datascope*) to open this window; press it again to return to the alarm point grid.

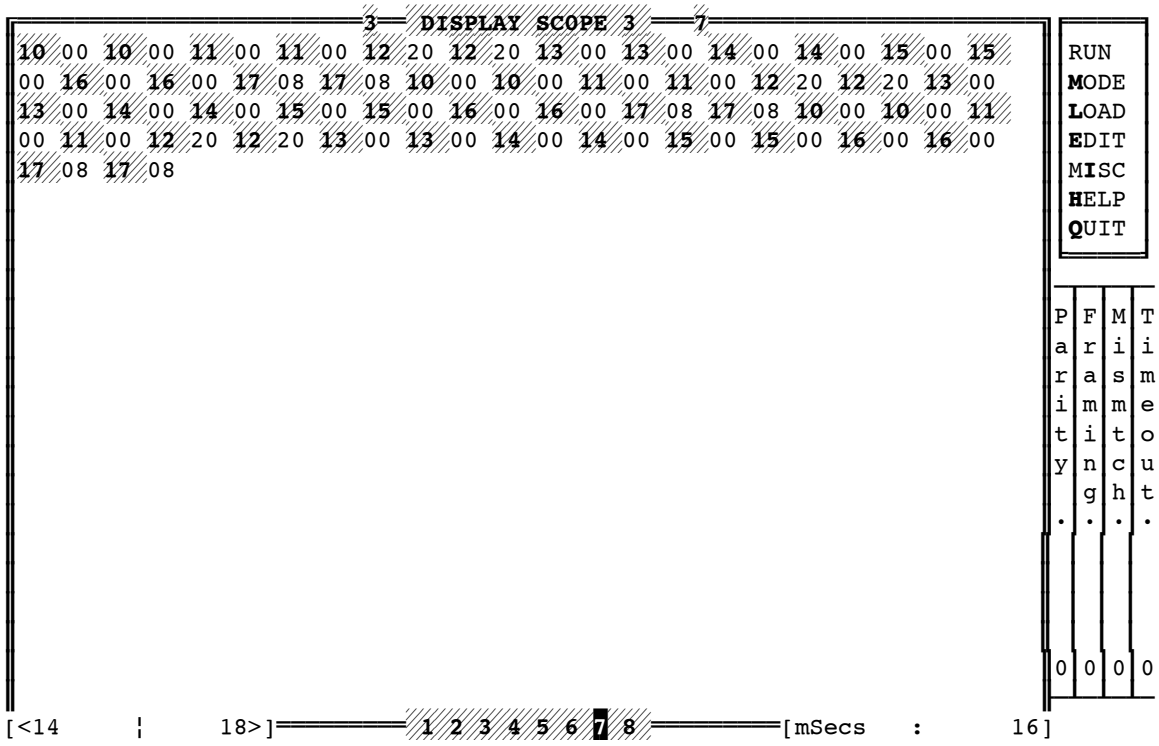


Figure 4.8: Datascope Window

Datascope video attributes: Scan and response bytes are shown in contrasting color/video attributes. Telemetry from the Remote (i.e. scans) have a green background (reverse video on monochrome or LCD screens). Bytes returned from monitored equipment have a blue background (normal video on mono or LCD screens). Errored bytes appear in red on color displays (bold on mono or LCD screens). In Display Mode TBOS Tester™ issues the scan requests in lieu of the Remote, so the telemetry it generates appears in green/reverse video.

Datascope format control: While the datascope is displayed you can press **<Spacebar>** to toggle between a compressed and expanded format. Press **<Alt-P>** (for *pause*) to freeze the accumulation of data (without interrupting alarm scanning); press **<Alt-P>** again to resume posting bytes to the datascope. When the window fills with data the oldest data is overwritten by new data, with a blank line separating the two. You can clear all data from the window at any time by pressing **<Alt-C>** (for *clear*).

Data filtering: The data presented corresponds to the current alarm point grid. For example, if the DISPLAY 3 grid is on screen when you open the datascope window the Address ID changes from DISPLAY 3 to DISPLAY SCOPE 3, and data shown is *only* for display address 3. You can switch to other individual datascope windows just as you would switch from one individual point grid to another by using the **<PgUp>** and **<PgDn>** keys. (You can also use the function keys **<F1~F8>** to switch directly to the desired display address, but any new alarms will be acknowledged in the process, as described earlier at Step d).

Consistent with the point grid screens, the **<Tab>** key toggles between an individual display datascope and the master display datascope, which shows data for *all* display addresses.

j. **Using the Log Window**: Events (scan point changes of state and protocol violations) are posted to the log window in the same format used for the log written to disk. The window is available if you want to see current data in log format without stopping a test to **V**IEW the disk log (see Step l). Press **<Alt-L>** (for *log*) to open this window; press it again to return to the alarm point grid. You can also press **<Alt-D>** to switch directly to the datascope from the log window. A typical display log window is portrayed in Figure 4.9.

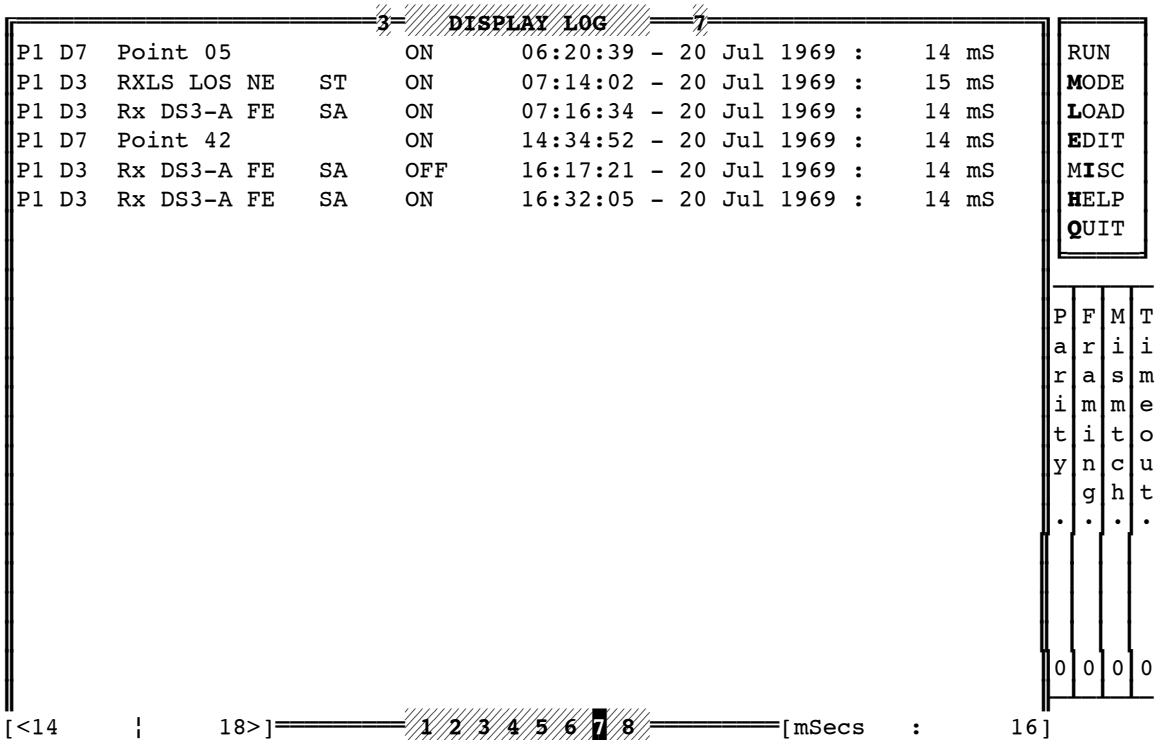


Figure 4.9: Display Log Window

Log filtering: The events posted corresponds to those for the current alarm point grid. For example, if the DISPLAY 3 grid is on screen when you open the log window the Address ID changes from DISPLAY 3 to DISPLAY LOG 3, and the events shown are *only* for display address 3. You can switch to other individual log windows just as you would switch from one individual point grid to another by using the **<PgUp>** and **<PgDn>** keys. (You can also use the function keys **<F1~F8>** to switch directly to the desired log, but any new alarms will be acknowledged in the process, as described earlier at Step d).

Consistent with the point grid screens, the **<Tab>** key toggles between an individual display log window and the master display log window, which shows events for *all* display addresses.

Log window controls: When opened the log window posts the 22 most recent events (if any) that have occurred for the test in progress, and then posts any newly occurring events. As with the datascope window, press **<Alt-P>** to *pause* and resume accumulation of data in the log window. Unlike the datascope window, when you resume posting events to the log window any events that occurred while paused *are* posted

You can clear a log window of events by pressing **<Alt-C>** (*clear*). When you clear an individual display log its events are removed from both the individual log window and the master log window. Other individual display logs are unaffected, however. When you clear the *master* display log window all events are cleared from it *and* from all the individual log windows as well.

k. **Stopping the Test**: Press **Esc** to end the test and return to the Main Menu.

l. **VIEWing a Disk Log**: If the disk logging function was enabled when the test began a log file of events that took place during the test was compiled. If desired you can examine that log on screen using the **MISC:VIEW** command. Press **I** and then **V**. Use the ↑ UpArrow and ↓ DownArrow keys to highlight the active disk log on the list of log files (the default name is "Event") and press Enter↵. The entire disk log is accessible in the viewport. Use the cursor control keys, **<PgUp>**, **<PgDn>**, **<Home>** and **<End>** to navigate through the file. When you are finished **VIEW**ing the disk log, press **Esc** *twice* to return to the Main Menu.

☞ **NOTE**: There are several settings discussed in Chapter Nine that control the creation of disk logs. Disk logs can also be printed after a test is completed or while a test is in progress.

m. **On-line Help**: You can consult the TBOS Tester™ help files for assistance on a variety of topics. From the Main Menu press "**H**" to open the **HELP** system. Select from the list of topics that appears for answers to your questions about TBOS Tester™ operation, usage and features.

☞ **NOTE**: You must stop a Display Mode test (see Step k above) before accessing **HELP**.

n. **Ending the Session**: From the Main Menu, choose a different test mode or end the session by pressing **Q** to **QUIT** TBOS Tester™.

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g. **Select Additional Points**: Use the arrow keys, and the **<Home>** or **<End>** keys to move the cursor block to other points in the grid. Select as many points as needed for the response emulation. Use the **<PgUp>** and **<PgDn>** keys (or **<F1~F8>**) to access other display addresses. You may wish to ensure that the correct points have been reported as ON at your facility maintenance center. If one or more addresses are not responding correctly be sure that the address range settings made at §6.2.d above are correct. Also observe the page scan indicator (Step b) and verify that the addresses that should be responding are being scanned. You may find the Respond Log Window (Step j) useful as well in determining whether commands were received and when points were turned ON or OFF.

h. **Observe Commands**: Respond Mode also replies to TBOS commands sent from the Remote. If a command is received it will be echoed back to the Remote to simulate command acknowledgment. A pop-up window (Figure 6.5) will also appear indicating the command type (momentary, latch or unlatch) received, the HEX code that comprised the command, and the page and point to which the command was directed. The notification will disappear on its own accord in a few seconds. Consult the log or datascope windows (discussed next) if you need to review the data.

```
MOMENTARY COMMAND [(Hex) 40 80 cc ] RECEIVED - Page 1, Point 1
```

Figure 6.5: Command Received Notification

i. **Using the Datascope Window**: If you need to examine the TBOS datastream more closely a datascope window is available that shows each character in hexadecimal format (Figure 6.6). Press **<Alt-D>** (for *datascope*) to open this window; press it again to return to the alarm point grid.

Datascope video attributes: Scan and response bytes are shown in contrasting color/video attributes. Telemetry from the Remote (i.e. scans) have a green background (reverse video on monochrome or LCD screens). Bytes returned from monitored equipment (and from TBOS Tester™ operating in Respond Mode) have a blue background (normal video on mono or LCD screens). Errored bytes appear in red on color displays (bold on mono or LCD screens). Note that all scan bytes are posted whether or not TBOS Tester™ responds to them, but only respond telemetry generated by TBOS Tester™ is posted in the datascope window.

IDEA: If you want to see all telemetry between the Remote and monitored equipment use Monitor Mode, described in Chapter Seven.

Datascope format control: While the datascope is displayed you can press the **<Spacebar>** to toggle between a compressed and expanded format. Press **<Alt-P>** (for *pause*) to freeze the accumulation of data (without interrupting alarm scanning); press **<Alt-P>** again to resume posting bytes to the datascope. When the window fills with data the oldest data is overwritten by new data, with a blank line separating the two. You can clear all data from the window at any time by pressing **<Alt-C>** (for *clear*).

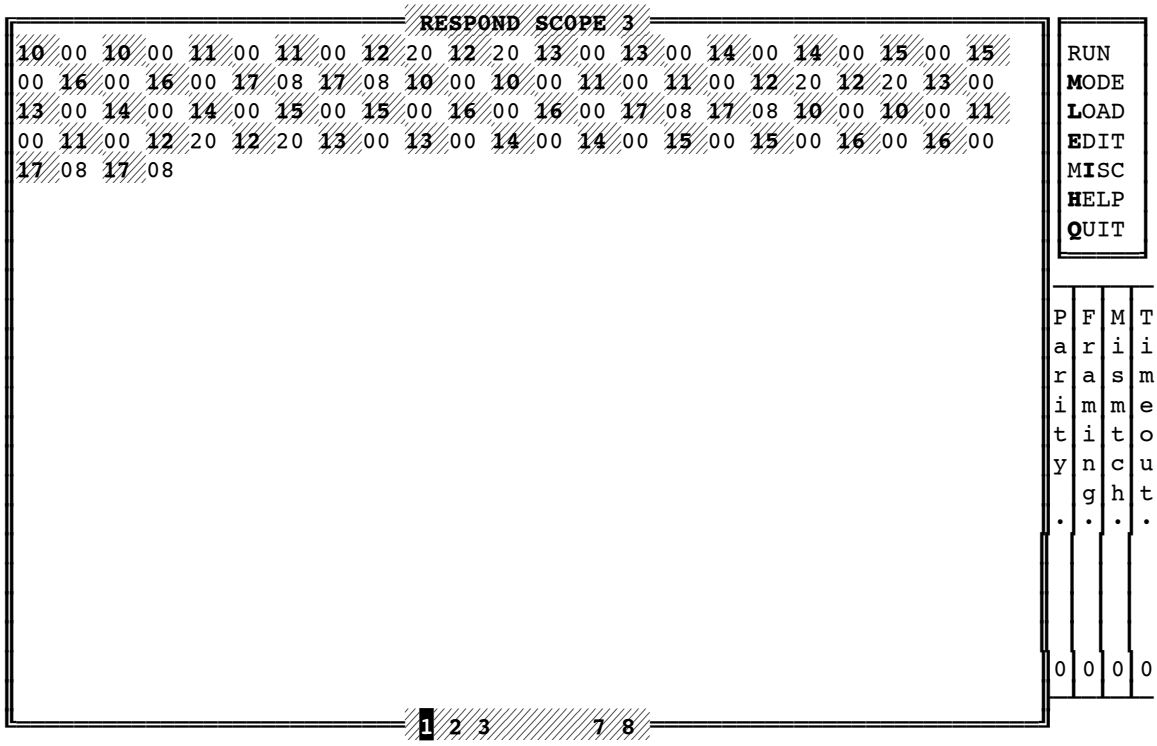

Figure 6.6: Datascope Window in Respond Mode

Data filtering: The data presented corresponds to the current alarm point grid. For example, if the RESPOND 3 grid is on screen when you open the datascope window the Address ID changes from RESPOND 3 to RESPOND SCOPE 3, and the data shown is *only* for display address 3. You can switch to other individual datascope windows just as you would switch from one individual point grid to another by using the **<PgUp>** and **<PgDn>** keys. You can also use the function keys **<F1~F8>** to switch directly to the desired address.

The **<Tab>** key toggles between an individual display datascope and the master display datascope, which shows data for *all* display addresses. The Address ID changes from RESPOND SCOPE 3 (where 3 is the current display) to RESPOND DATASCOPE.

☞ **NOTE**: There is no master *point* display in Respond Mode.

j. **Using the Log Window**: Scan point changes of state made from the TBOS Tester™ keyboard, commands received from the Remote and protocol violations occurring during a Respond Mode test are posted to the log window in the same format used for the log written to disk. The window is available if you want to see current data in log format without stopping a test to **V**IEW the disk log (see Step m). Press **<Alt-L>** (for *log*) to open this window; press it again to return to the alarm point grid. You can also press **<Alt-D>** to switch directly to the datascope from the log window. A typical respond log window is portrayed in Figure 6.7.

Log window controls: When opened the window posts the most recent events (if any) that have occurred for the test in progress, and then posts any newly occurring events. As with the datascope, press **<Alt-P>** to *pause* and resume accumulation of data in the log window; press **<Alt-C>** to *clear* the log window.

Log Filtering: The events posted correspond to those for the current alarm point grid. For example, if the RESPOND 3 grid is on screen when you open the log window the Address ID changes from RESPOND 3 to RESPOND LOG 3, and the events shown are *only* for address 3. You can switch to other individual log windows just as you would switch from one individual point grid to another, using the **<PgUp>** and **<PgDn>** keys. You can also use the function keys **<F1~F8>** to switch directly to the desired display address.

The **<Tab>** key toggles between an individual respond log window and the master respond log window, which shows events and commands for *all* addresses. The Address ID changes to RESPOND LOG with no trailing number when the master respond log window is displayed.

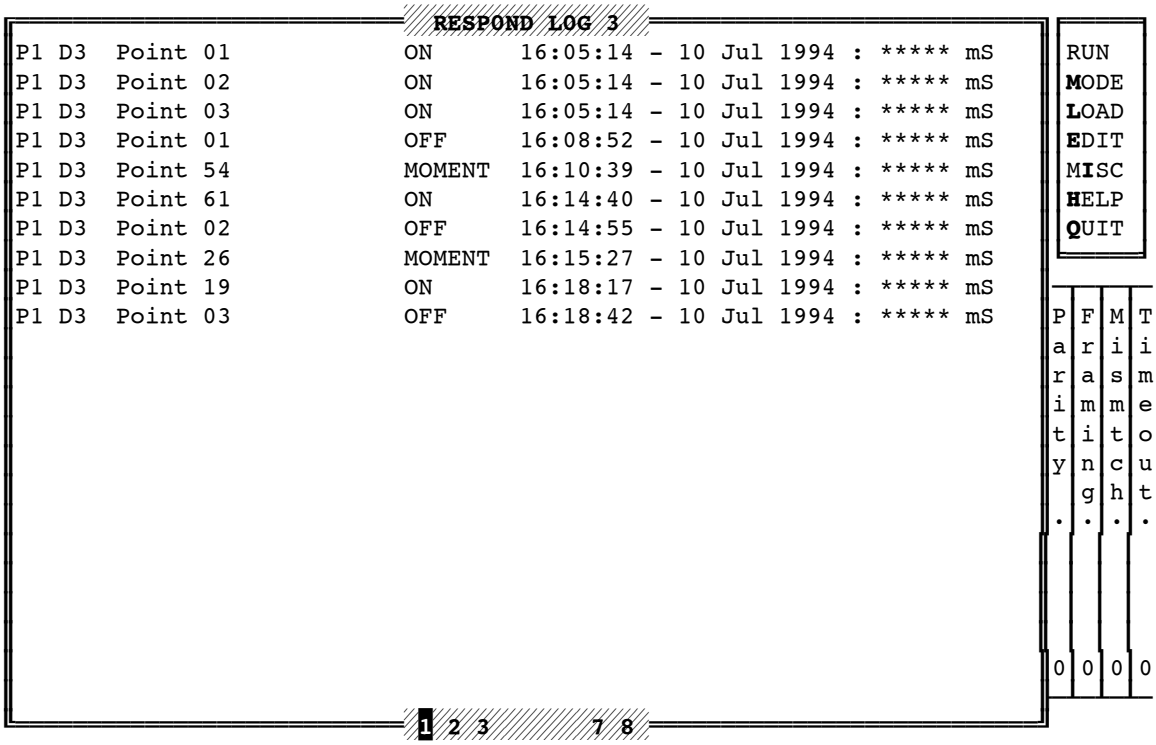

Figure 6.7: Respond Log Window

k. **Error Reporting**: TBOS Tester™ does not report mismatch or time-out errors when operating in Respond Mode as these error types affect Remote behavior, not that of monitored equipment which TBOS Tester™ is emulating in Respond Mode. The counters for these attributes are therefore replaced by "n/a" when TBOS Tester™ is in Respond Mode Parity and framing errors in the receive signal are monitored and reported in all operating MODEs.

To clear the error counters during a test press **<Alt-E>**.

l. **Stopping the Test**: Press the **Esc** key to end the test. You will first be prompted:

```
Save Respond Points (Y/N)?
```

providing an opportunity to save the current pattern of alarm points to a respond point file for future use. Answer **Y** if you want to save the file. You will be prompted for a file name, which should conform to DOS file name rules. The extension .RSP is automatically added. The respond point pattern can be recalled later using the **LOAD:RESP** function, and modified using the **EDIT** functions (see §6.5). If you do not want to save the points for future use, press **N** or simply press **Esc** again.

You will then be asked:

```
Clear Respond Points (Y/N)?
```

If you want to *clear* the current pattern of respond points answer **Y** to turn all alarm points OFF, otherwise press **N** or **Esc** once again to preserve the points for use later in the session and return to the Main Menu.

m. **VIEWing a Disk Log**: If the disk logging function was enabled when the test began a log file of events that took place during the test was compiled. If desired you can examine that log on screen using the **MISC:VIEW** command. Press **I** and then **V**. Use the ↑ UpArrow and ↓ DownArrow keys to highlight the active disk log on the list of log files (the default name is "Event") and press Enter↲. The entire disk log is accessible in the viewport. Use the cursor control keys, **<PgUp>**, **<PgDn>**, **<Home>** and **<End>** to navigate through the file. When you are finished **VIEW**ing the disk log, press **Esc** *twice* to return to the Main Menu.

☞ **NOTE**: There are several settings discussed in Chapter Nine that control the creation of disk logs. Disk logs can also be printed after a test is completed or while a test is in progress.

n. **On-line Help**: You can consult the TBOS Tester™ help files for assistance on a variety of topics. From the Main Menu press **H** to open the **HELP** system. Select from the list of topics that appears for answers to your questions about TBOS Tester™ operation, usage and features.

☞ **NOTE**: You must stop a Display Mode test (see Step l above) before accessing **HELP**.

o. **Ending the Session**: Choose a different test mode or end the session by pressing **Q** to **QUIT** TBOS Tester™.

Parity and framing errors are more common in Monitor Mode than other test modes because there are *two* receive data channels on which these errors can occur. Further, should telemetry be received on both channels at the same time (see "Collisions" below) the data is surely corrupted and one or both of these error types will occur. Parity and framing errors may also be caused by two (or more) monitored equipment elements responding to the same scan request because they have not been properly configured with unique display addresses. Unless the parity and/or framing error count increments at a regular interval or escalates rapidly the errors are more likely a result of test conditions than actual problems on the TBOS link, and can be discounted.

- **Collisions** are a special error type peculiar to Monitor Mode, and are reported on screen below the four standard error counters previously described (see Figure 7.5). In normal operation TBOS polls and responses should be interleaved in an orderly manner; the Remote issues a poll and waits for a response from the monitored equipment before issuing the next poll. Telemetry should therefore not normally be detected on both channels at the same time. However, if monitored equipment is slow to respond or other abnormal conditions exist (typically cabling problems in the serial alarm system or in the connection between TBOS Tester™ and that system) TBOS Tester™ may receive data on both channels simultaneously and be unable to correctly interpret the data. If this occurs the collision error counter will be incremented and the (corrupted) data ignored, that is, the screen display and log will not be updated based on the questionable data received. In Figure 7.5 the collision counter shows that three such occurrences have taken place during the most recent test.

  If one or more of the error counters is regularly or rapidly incrementing, first be sure the channel polarity setting (see 7.3.c above) is correct. Then review the connections described at §7.2.a and the installation instructions at Chapter 2.1. It is possible that polarity as been reversed for one of the RS-485 pairs. Also verify that the "**Port Baud Rate**" at **MISC:SETS** is correct for the equipment under test. The standard rate for TBOS communications is 2400, but some equipment uses 9600. In addition, check the "**Port Parity**" setting which is typically "**O**" (odd, not zero). Also, verify that the "**Port Stop Bits**" setting agrees with that used with the equipment under test (the standard is "**2**"). If the problem persists you may wish to run a self-test as described at Chapter 2.4.

☞ **NOTE**: Monitor Mode is more sensitive to timing issues than TBOS Tester's other operating modes. False error reporting may occur if the polling rate of the monitored system is very rapid and the TBOS Tester™ computer is relatively slow. Using a faster computer, one equipped with a hard disk, disk cache software, a print spooler or other speed enhancements may lessen problems in this situation. Disabling disk logging (especially to a floppy disk) can also remove program overhead and allow Monitor Mode to keep pace with a very fast serial alarm system.

i. **Using the Datascope Window**: If you need to examine the TBOS datastream more closely a datascope window is available that shows each character in hexadecimal format (Figure 7.6). Press **<Alt-D>** (for datascope) to open this window; press it again to return to the alarm point grid.

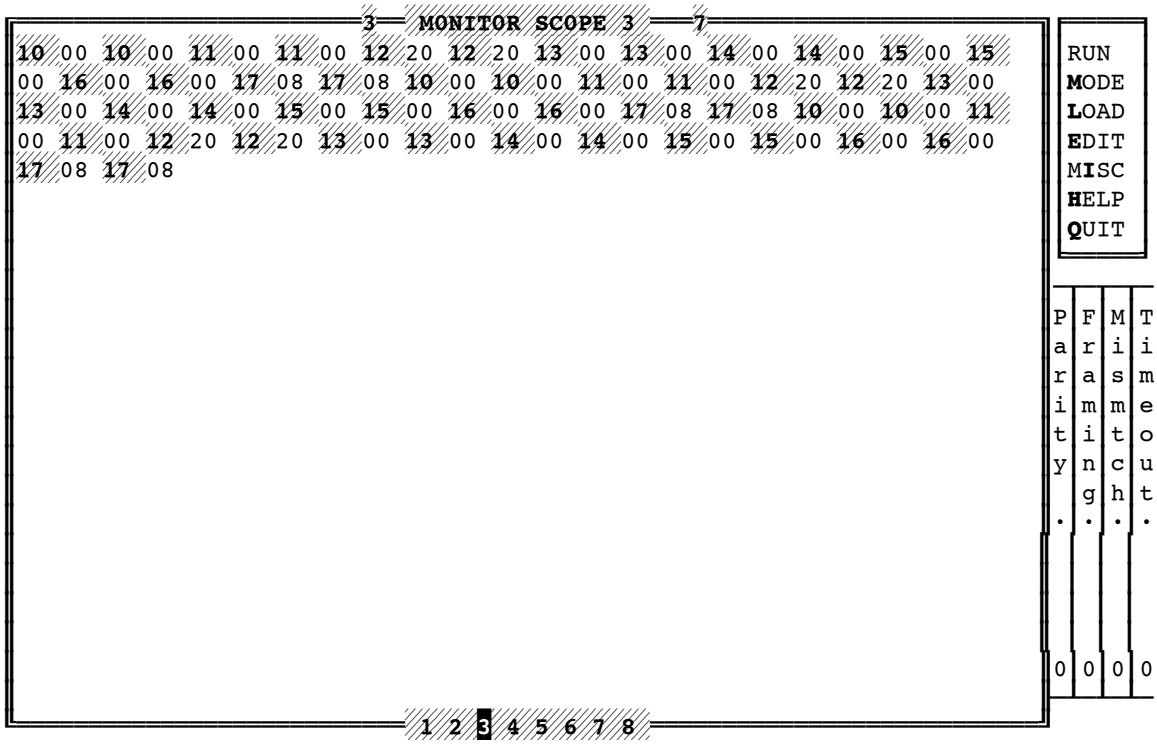

Figure 7.6: Monitor Scope Window

Datascope video attributes: Scan and response bytes are shown in contrasting color/video attributes. Telemetry from the Remote (i.e. scans) have a green background (reverse video on monochrome or LCD screens). Bytes returned from monitored equipment have a blue background (normal video on mono or LCD screens). Errored bytes appear in red on color displays (bold on mono or LCD screens).

Datascope format control: While the datascope is displayed you can press the **<Spacebar>** to toggle between a compressed and expanded format. Press **<Alt-P>** (for *pause*) to freeze the accumulation of data (without interrupting alarm scanning); press **<Alt-P>** again to resume posting bytes to the datascope. When the window fills with data the oldest data is overwritten by new data, with a blank line separating the two. You can clear all data from the window at any time by pressing **<Alt-C>** (for *clear*).

Data filtering: The data presented corresponds to the current alarm point grid. For example, if the MONITOR 3 grid is on screen when you open the datascope window the Address ID changes from MONITOR 3 to MONITOR SCOPE 3 and the data shown is *only* for display address 3. You can switch to other individual datascope windows just as you would switch from one individual point grid to another, using the **<PgUp>** and **<PgDn>** keys. (You can also use the function keys **<F1~F8>** to switch directly to the desired display address, but any new alarms will be acknowledged as described at Step f).

Consistent with the point grid screens, the **<Tab>** key toggles between an individual display monitor scope and the master monitor scope, which shows telemetry for *all* display addresses.

j. **Using the Log Window**: Events (scan point changes of state and protocol violations) are posted to the log window in the same format used for the log written to disk. The window is available if you want to see current data in log format without stopping a test to **V**IEW the disk log (see Step l). Press **<Alt-L>** (for *log*) to open this window; press it again to return to the alarm point grid. You can also press **<Alt-D>** to switch directly to the datascope from the log window. A typical monitor log window is portrayed in Figure 7.7.

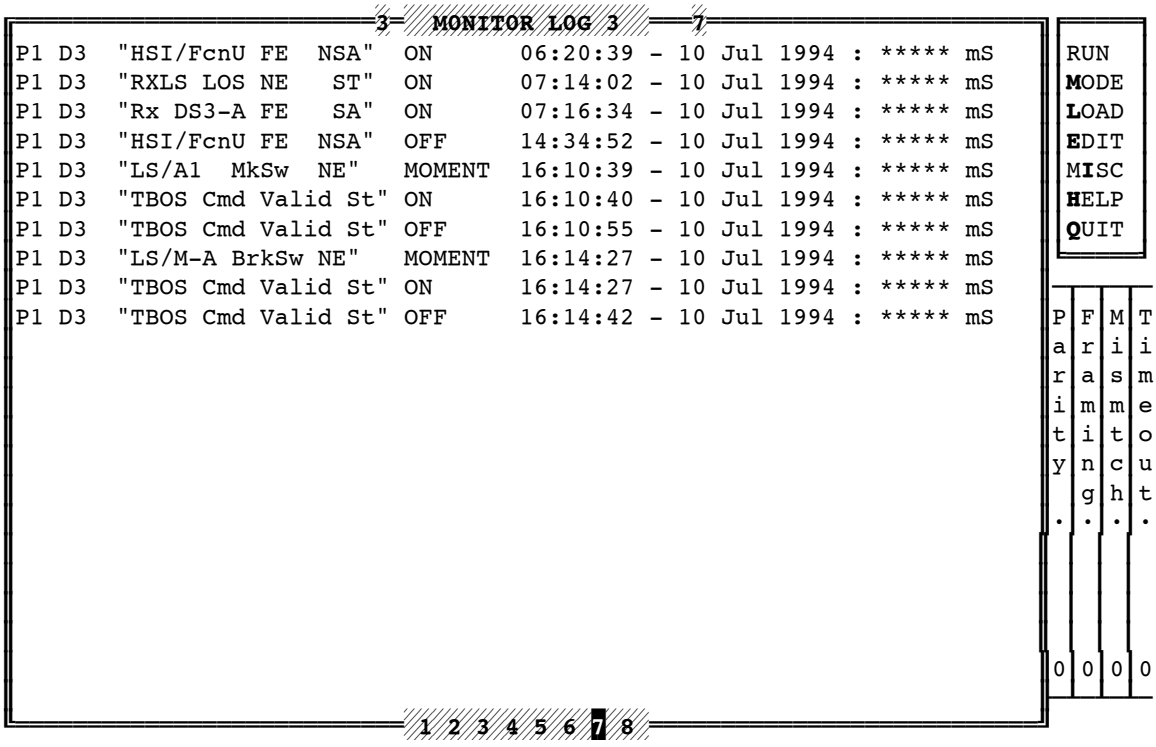

Figure 7.7: Monitor Log Window

Log filtering: The events posted corresponds to those for the current alarm point grid. For example, if the MONITOR 3 grid is on screen when you open the log window the Address ID changes from MONITOR 3 to MONITOR LOG 3, and the events shown are *only* for display address 3. You can switch to other individual log windows just as you would switch from one individual point grid to another by using the **<PgUp>** and **<PgDn>** keys. (You can also use the function keys **<F1~F8>** to switch directly to the desired log, but any new alarms will be acknowledged in the process, as described earlier at Step d).

Consistent with the point grid screens, the **<Tab>** key toggles between an individual monitor log window and the master monitor log window, which shows events for *all* display addresses. The Address ID reads MONITOR ALL when this window is open.

Log window controls: When opened the log window posts the 22 most recent events (if any) that have occurred for the test in progress, and then posts any newly occurring events. As with the datascope window, press **<Alt-P>** to *pause* and resume accumulation of data in the log window. Unlike the datascope window, when you resume posting events to the log window any events that occurred while paused *are* posted

You can clear a log window of events by pressing **<Alt-C>** (*clear*). When you clear an individual monitor log its events are removed from both the individual log window and the master log window. Other individual monitor logs are unaffected, however. When you clear the *master* monitor log window all events are cleared from it *and* from all the individual log windows as well.

k. **Stopping the Test**: Press **Esc** to end the test and return to the Main Menu.

l. **VIEWing a Disk Log**: If the disk logging function was enabled when the test began a log file of events that took place during the test was compiled. If desired you can review that log on screen using the **MISC:VIEW** command. Press **I** and then **V**. Use the ↑ UpArrow and ↓ DownArrow keys to highlight the active disk log on the list of log files (the default name is "Event") and press Enter↵. When you are finished viewing the event log, press **Esc** *twice* to return to the Main Menu.

☞ **NOTE**: There are several settings discussed in Chapter Nine that control the creation of disk logs. Disk logs can also be printed after a test is completed or while a test is in progress.

m. **On-line Help**: You can consult the TBOS Tester™ help files for assistance on a variety of topics. From the Main Menu press **H** to open the **HELP** system. Select from the list of topics that appears for answers to your questions about TBOS Tester™ operation, usage and features.

☞ **NOTE**: You must stop a Monitor Mode test (see Step k above) before accessing **HELP**.

n. **Ending the Session**: Choose a different test mode or end the session by pressing **Q** to **QUIT** TBOS Tester™.

l. Cycle Delay

Specifies the time in seconds (*not* milliseconds) that TBOS Tester™ (operating in Display Mode) will wait between the receipt of the last response in a polling sequence and the first poll in the next sequence. Use this setting to emulate the delay in polling a given piece of equipment by a Remote that polls multiple network elements. The default Cycle Delay is 0 seconds; the value can be adjusted to a maximum of 65,534 seconds (about 18.2 hours).

m. Respond Delay

Specifies the time in milliseconds (beyond its minimum processing time) that TBOS Tester™ (operating in Respond Mode) will wait between the receipt of a poll (scan or command request) and transmission of a response or acknowledgment. Use this setting to "slow down" the TBOS Tester™ computer in order to emulate the processing capabilities of monitored equipment or to simulate transmission delays. The default Respond Delay is 0 milliseconds; the value can be adjusted to a maximum of 65,534 milliseconds (about 65 seconds).

n. On Error

Specifies the action TBOS Tester™ (operating in Display Mode) will take in response to a protocol error (timeout, mismatch, framing or parity error). The On-Error options are **R**eset, **N**ext and **I**gnore (**R**, **N**, **I**), with the default being Ignore. PUB 49001 mandates that an error shall cause the current polling sequence to be aborted and polling resumed with the first point of the first display. This corresponds to the "Reset" option. In practice this could cause some display addresses never to be polled, so TBOS Tester™ provides two alternatives. The "Next" option causes polling to be aborted for the address in which the error occurs and to be resumed with the next address in the sequence. "Ignore" simply continues polling with the next line or character in the sequence.

☞ **NOTE**: CB149 mandates that a Remote attempt to complete a transaction three times before declaring an error. TBOS Tester™ does not make re-attempts, so error conditions may be detected and reported more frequently by TBOS Tester™ than might be indicated by Remote behavior.

o. Enable Beep

Specifies whether an audible alarm is activated when a point changes state (turns ON or OFF). When set to "**Y**" a beep tone is generated at the end of each scan cycle when any unacknowledged alarms are outstanding. This alerts an otherwise occupied operator that an alarm has occurred or cleared.

p. Transition Trigger

Specifies whether the autodialer will initiate a call only when a point within an Autodial range turns ON or will initiate a call when a point turns OFF as well as ON. Refer to Chapter Eight for a complete discussion of the Autodialer feature. A setting of "N" can be overridden with the command line option "**-transit**".

q. Autodial Control

Specifies the autodialer control (.CTL) file to be used. Enter the file name *without* the .CTL extension. If you use **L**OAD**:A**UTO to open a .CTL file its name is automatically placed in this field. The file specification can be overridden using the Command Line Parameter "**-au**" followed by the name of the .CTL file to be used. Refer to Chapter Eight for a complete discussion of the Autodialer feature.

9.4.6.2 MISC:SETS Startup Options

The four M**I**SC**:S**ETS startup options are read from the profile only when TBOS Tester™ is invoked. Consequently any changes to these settings take effect not when M**I**SC**:S**ETS is closed but the next time the TBOS Tester™ application is invoked (provided that the changes are saved).

a. Startup Mode

Specifies whether TBOS Tester™ starts up in **N**ormal mode or automatically starts **R**UNning in **D**isplay Mode or **M**onitor Mode. Use the corresponding letter (**N**, **D**, or **M**) to complete the field. If "**Autodial Enabled**" is set to "Y" the autodialer will be armed for the automatically initiated test. For monitoring applications at unmanned sites this parameter allows the host computer to power up in the appropriate test mode (if the command TBOS is added to the autoexec file). A setting of "D" or "M" can be overridden with the command line option "**-nos[tart]**".

b. Screen Mode

Specifies whether a **C**olor, **M**onochrome or **L**CD monitor is to be used in conjunction with the host computer. Choose the corresponding letter (**C**, **M** or **L**) to complete the field. The setting can be overridden with the command line options "**-color**", "**-mono**" or "**-LCD**". Some LCD screens will work better if the monochrome setting is used.

c. Disable Hirez Timer

This setting specifies whether TBOS Tester's one millisecond resolution timer is enabled or not. The default setting is "**N**" (timer is enabled). The setting can be overridden by the command line options "**-ti[mer]**" and "**-not[imer]**".