PTT 5156 DSU ANALYZER

OPERATIONS MANUAL

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SECTION 1 - INTRODUCTION

The DSU Analyzer is a general purpose test set for use with Data Service Units/Channel Service Units (DSU/CSU).

Standard Features

- Display Call Progress
- Detect On/Off Hook
- Generate Test Patterns
- Initiate Loopbacks
- Detect and Record Errors
- Provide Sealing Current and Clocking
- Front Panel and RS-232 Control

Switched 56 Features

- Display Dialed Number
- Vary Wink Durations
- Measure Dialed Number Delays

Standard Equipment

- PTT 5156 (with registered serial number)
- User's Manual
- 4-Wire Reverse Cable

Optional Equipment

- Rack Mount Kit
- Custom Designed Carrying Case

WARRANTY

Processing Telecom Technologies warrants each Model 5156 against defects in material and workmanship for a period of two years from the date the Model 5156 was shipped to the customer. If, at any time during the warranty period, the Model 5156 should malfunction, PTT will repair or, at PTT's option, replace the unit free of charge.

The remedies listed herein are the user's sole and exclusive remedies. PTT shall not be liable for any indirect, direct, incidental, or consequential damages. Owner must return the unit to the factory; shipping prepaid, insured, and packaged to best commercial standard for electronic equipment. PTT will pay shipping charges for delivery on return. The customer is responsible for mode and cost of shipment to PTT.

Warranty does not apply if the unit has been damaged by accident, misuse, or as a result of service or modification by other than PTT personnel.

When returning a 5156 for warranty work, a Return Material Authorization (RMA) number must be obtained from customer service at the following address and phone number:

Customer Service Manager
Processing Telecom Technologies
901 Explorer Boulevard
Huntsville, Alabama 35806-2807
Telephone: 1-800-998-7880
Fax: (205) 971-8751

SECTION 2 - GETTING STARTED

PRODUCT OVERVIEW

The Model 5156 is a small, lightweight, portable analyzer designed for testing Data Service Units/Channel Service Units (DSU/CSU) in a wide range of applications. It is particularly applicable for engineering, manufacturing, system administrators and customer service groups.

PURPOSE

The model 5156 will emulate or simulate the behavior of a digital switch (also referred to as the Central Office) capable of providing four wire switched digital services. The unit simulates the necessary switch functions to verify Switched 56 DSU/CSU call initiation, establishment and call answer. The 5156 can verify the DSU/CSU's performance by displaying all relevant dialed number information and verify acceptable receive signal levels. Additionally, the unit can provide signalling to the Unit Under Test (UUT), generate test patterns and detect/display errors.

STANDARD FEATURES

Standard features include easy front panel operation and an RS-232 serial port for remote control. A Data Termination Equipment (DTE) interface is provided with adjustable rates for use with an external Bit Error Rate (BERT) tester.

INSTALLATION PROCEDURES

Unpacking and Inspection

Carefully inspect the Model 5156 for any shipping damages. If damage is suspected, contact the carrier immediately with information regarding the damage. If possible, keep the shipping container for use in shipping the Model 5156 back for repair or as possible verification of external damage during shipment.

Power-Up Procedure

Plug the 3 prong connection into a 115 VAC outlet. Turn the switch on the rear of the 5156 to the ON position. The unit will display the current software version in the LCD window and begin performing a self test.

Connecting User Equipment to the 5156

User equipment is connected to the Model 5156 by rear panel connectors, (see Rear Panel Layout, Section 3). The **U**nit **U**nder **T**est (UUT) is connected to the 5156 by a 4-Wire, 8 Pin reverse Telco cable (crossover cable) which is supplied with the unit.

Plug one end of the reverse cable into the rear panel jack marked TO UUT and the other end into the device being tested. These cable pin assignment are shown in Table 4, Section 6. If the 5156 is used in conjunction with the PTT 5260 cable simulator, a standard 8 Pin Telco Cable should be used. The 5260 provides the pin reversal in this mode.

Before Testing

A compatible digital data device must be connected to the 5156 by rear panel connectors via the supplied reverse cable. If the connection is established properly, the CMI or DMI LEDs will be illuminated. This represents the idle state that would normally be present between the DSU/CSU and the Central Office switch.

If error analysis is to be performed, an appropriate digital datacom analyzer such as the PTT V.BERT may be connected to either the primary RS-232 channel or the primary V.35 channel on the rear panel. Pin assignments for these connectors are listed in

Tables 1 and 2, Section 6 The V.35 connector is recommended for data rates above 19,200 Bps. The RS-232 connector will perform properly at the higher rates with a low capacitance cable.

An RS-232 terminal device or computer may be connected to the 5156 rear panel command port for remote control operation. Pin assignments for the remote command port are listed in Table 3, Section 6.

REMOTE CONTROL

The Model 5156 is equipped with a standard RS-232 Serial Port for the attachment of a computer or dumb terminal for remote operation. The Baud rate for the command port is fixed at 1200 bps. The data format used by the serial port is 8 data bits, no parity bits and 1 stop bit. Section 4 Remote Commands contains formatting information and identifies the remote commands available for the 5156

OPERATIONAL MODES

The two modes of operation for the Model 5156 Analyzer are Switched 56 and DDS. The mode is set by the CONFIG submenu #1=Loop/DTE Rate, select number 2=56K Dedicated or 3=56K Switched, see Section 3, Manual Operation.

SWITCHED 56 TESTING

The Switched 56 mode offers the ability to make a data connection in the same manner of wiring a normal office telephone. The call is "switched" by the central office to the far end station.

Capabilities include:

1) establish a data connection
2) perform loopback
3) send patterns/measure errors
4) record incoming dialing information

DDS TESTING

The Dedicated Data/Digital Service mode is equivalent to a private line or dedicated line through the central office to the far end. No "switched" services are provided.

Capabilities include:

1) perform loopback
2) send patterns/measure errors
1) perform loopback
2) send patterns measure errors

PRELIMINARY

Before testing, the UUT must be connected to the 5156 by rear panel connectors via the supplied reverse cable. If the connection is established properly, the CMI or DMI LEDs will be illuminated. This represents the idle state that exists between the DSU/CSU and the Switch.

ESTABLISHING A DATA CONNECTION

In the Dedicated Mode a data connection is automatically established upon connection of the cables indicated in the previous step.

The connection is verified when both the Analyzer and UUT CMI or DMI LED's are lighted indicating "Off Hook".

In the Switched 56 Mode a data connection is established by selecting option 1 (CALL UUT) under

the TESTING submenu. The 5156 will start sending Data Mode Idle (DMI) code. The DSU should recognize this signalling as an incoming call and start sending DMI code back to the Analyzer. The establishment of the call is verified by the front panel call progress LEDs. Both the 5156 and the UUT should have lighted LEDs for DMI or "Off Hook".

When both the Analyzer and UUT DMI LED's are lighted - "Off Hook' or data connection established.

The UUT may also establish a call by programming a connect number into the 5156 and then dialing that number. This process is described in detail in Section 3, Configuration Menu items description.

Terminating a Data Connection

In the Dedicated Mode a data connection does not require any termination when the sending of data is complete.

In the Switched 56 Mode a data connection is terminated by selecting item 2 (Hangup) from the TESTING submenu. The UUT should recognize the 5156 terminating the call and start sending CMI code. The termination of the call is verified by the front panel call progress LEDs. Both the Analyzer and UUT should have lighted LEDs for CMI indicating an "On Hook".

The UUT may also be able to terminate the data connection. If the UUT starts sending CMI, the 5156 will assume the call is being terminated. The 5156 will respond by returning CMI code.

Selecting a Loopback

The desired form of loopback the 5156 will use during testing is established by selecting item 3 (Select Loopbk) from the TESTING submenu. Two loopback choices are available; CSU Loopback and V.54 Loopback.

1 - **CSU Loopback:** Established as a means for the network to loopback the DSU/CSU as close as possible to the network interface. It provides a dependable test that will help verify that the network and serving loop are functioning correctly.

The DSU Analyzer reverses sealing current to initiate this loopback.

In normal polarity, the Transmitter pair (TI, R1) is kept positive with respect to the receiver pair (T,R).

Note: *A data connection does not have to be established for a CSU loopback.*

2 - V.54 Loopback: Established as a means for a DSU on one side of the network to loopback a DSU on the other side of the network.

Note: *This loopback is initiated by a pattern sent by the Analyzer; therefore, a data connection must be established for a V.54 loopback.*

Loopback UUT

Loopback UUT is established by selecting item 5 (Loopbk UUT) from the TESTING submenu. The 5156 will maintain this loopback selection until the Enter or Cancel button is pressed. The type of loopback will depend on the loopback selected (see Selecting a Loopback in this section).

When this selection is entered, the 5156 will initiate a loopback (provided a data connection is established in cases of DSU or V.54 loopback) to the UUT.

Selecting a Test Pattern

The desired form of test pattern for the 5156 to use during testing is established by selecting item 4 (Select Pattern) from the TESTING submenu. Six test patterns choices are available; 2047, 511, SP1, SP2, SP3, and SP4.

Send Pattern

Once a data connection is established, the 5156 can send a test pattern to the UUT by choosing option 6 (send Pattern) from the TESTING submenu. The type of pattern sent will depend on the pattern selection (see Selecting a Test Pattern in this section).

This selection will cause the front panel to display the error counter. The error counter may be useful if an external BERT tester is simultaneously

sending the same test pattern through the UUT to the 5156.

LOOPBACK WITH PATTERN

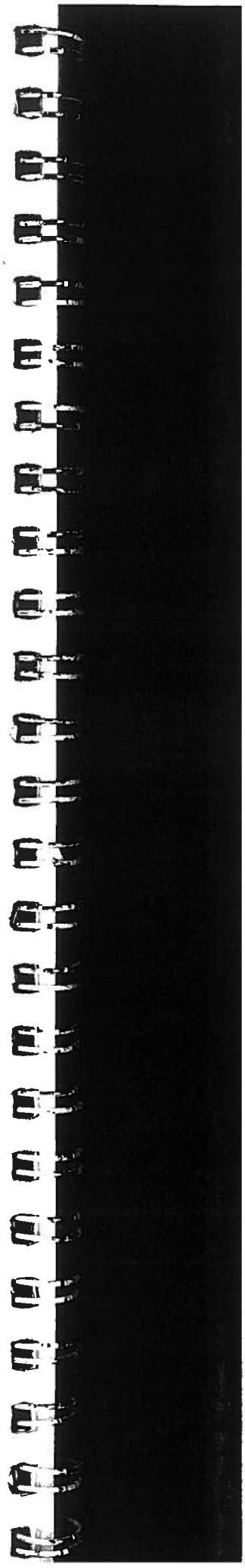
Item 7 (Loopbk W/Ptrn) from the TESTING submenu is used to initiate a loopback, send a test pattern, and measure/record errors.

Note: *The type of loopback and pattern desired must be set prior to this operation.*

The 5156 will count and display any errors.

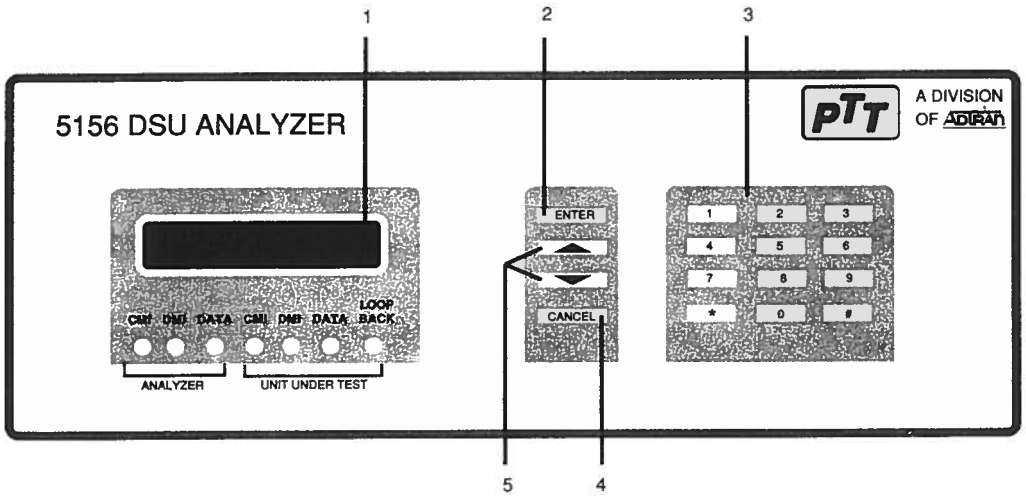
Press: the ENTER button to zero out the counted errors.

Press: the CANCEL button to exit this test.



SECTION 3 - MANUAL OPERATION

FRONT PANEL LAYOUT



Identification of Numbers

Item		Function
1.	**LCD Window:**	Displays menu items and messages.
2.	**ENTER :**	Select menu items and accept numeric entries.
3.	**Numeric Keypad:**	Numbers 1 through 0 are used for direct selection of menu items and to enter Connect Number and Wink Duration. # - Not used. * - Not used.
4.	**CANCEL:**	Exit submenus.
5.	**Up and Down Scroll arrows:**	Change display of menu items. Moves cursor back and forth within numeric entries.

LED IDENTIFICATION

ANALYZER

CMI - **Control Mode Idle** - lighted indicates the 5156 is sending idle codes to the UUT. CMI lighted implies activity between the 5156 and the UUT, but does not indicate an established data connection between the DTE or the 5156 and the DTE on the UUT.

DMI - **Data Mode Idle** - lighted indicates a data connection is established but no data is being sent internally or from a DTE connected to the Analyzer.

DATA - Lighted indicates that information other than idle code (such as test patterns) is being sent from the 5156 or from a DTE connected to the Analyzer.

UNIT UNDER TEST

CMI - **Control Mode Idle** - lighted indicates the 5156 is receiving CMI code from the UUT.

DMI - **Data Mode Idle** - lighted indicates the 5156 is receiving DMI code from the UUT.

DATA - Lighted indicates that information other than idle code is begin received.

LOOPBACK - Lighted indicates the 5156 is sending loopback code (or reversed sealing current) to the UUT.

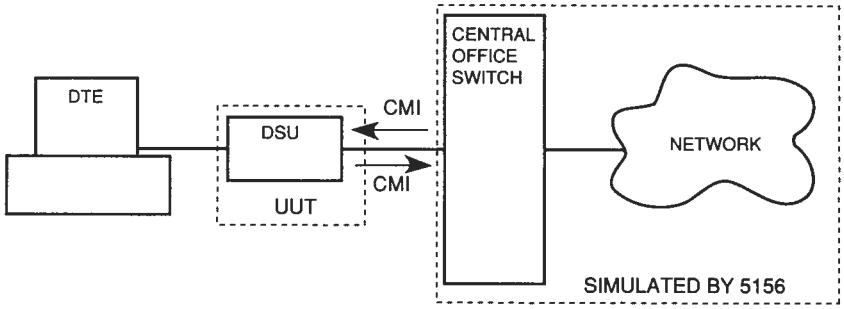
Note: *Once a data connection is established and data is being sent, the 5156 will sometimes recognize DMI patterns within the data. This will cause the DMI LED to "blink".*

LINK CONFIGURATION EXAMPLES

The following example cases illustrate the operation of CMI, DMI and DTE during different times of operation.

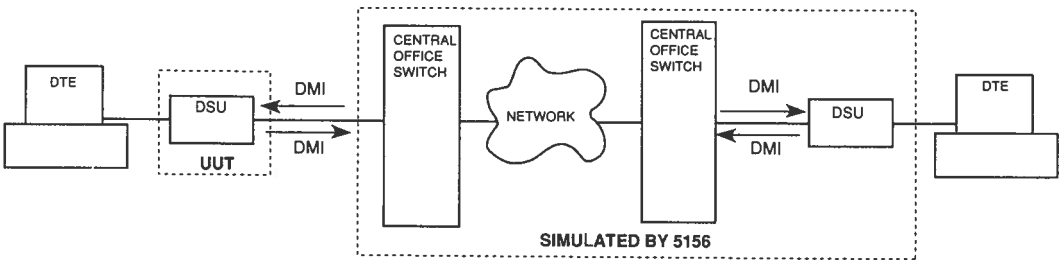
CASE 1: No Phone Call Established and DTE Inactive

When there is no call connected through the network and the Data Terminal Equipment (DTE) is not active, an active link exists between the DSU and the Central Office. The DSU and CO send Control Mode Idle code (CMI) to each other until the DSU establishes a call or an incoming call is received. The CMI LED on the PTT 5156 would be illuminated.



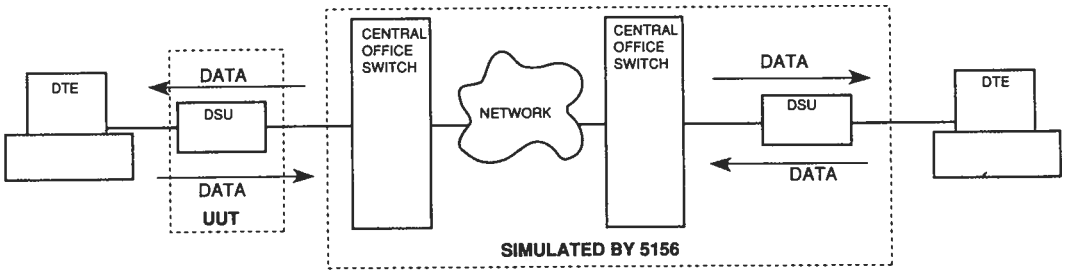
CASE 2: Phone Call Established and DTE Inactive

When a call is established through the network and no data is being sent by the DTEs, the DSU and Central Office on each side of the network exchange Data Mode Idle codes (DMI). The DMI LED on the PTT 5156 would be illuminated.

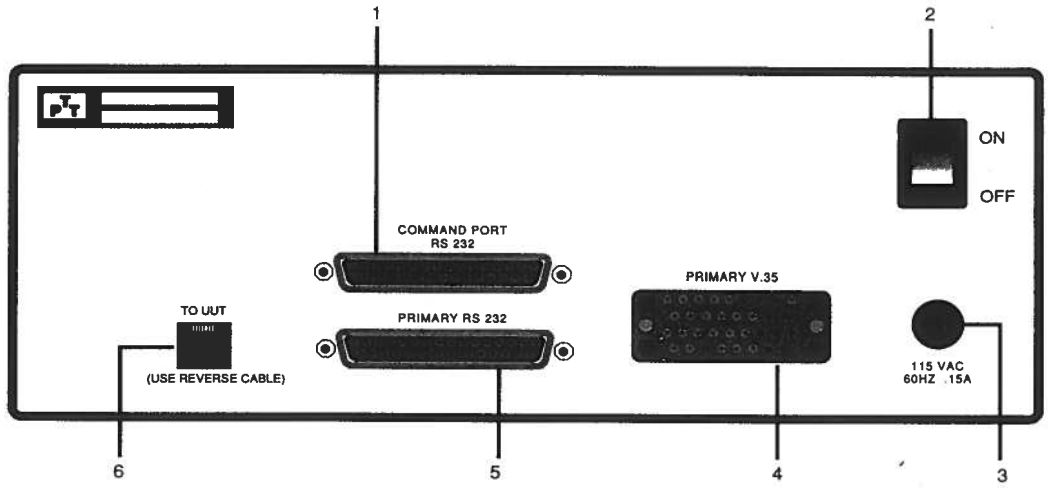


CASE 3: Phone Call Established and DTE Active

When a phone call is established across the network and each of the DTEs are sending Data, the DSU passes the Data along to the Central Office where it is routed across the network and ultimately to the other DTE. When the DTE becomes active, the DSU sends the Data generated by the DTE instead of DMI. The DATA LED on the PTT 5156 would be illuminated.



BACK PANEL LAYOUT



Identification of Numbers

Item		Function
1.	**Command Port RS 232:**	Used for remote control connections to send commands to the PTT 5156.
2.	**Power Switch:**	Used to turn power on or off.
3.	**115 VAC Connection:**	Power cord connection.
4.	**Primary V.35:**	High speed digital data interface.
5.	**Primary RS 232:**	RS 232 digital data interface.
6.	**To UUT:**	Connection to Unit Under Test with reverse cable. This is the Loop Interface.

MANUAL OPERATION AND BUTTON FUNCTIONS

The 5156 Configuration, Testing and Status menus can be negotiated using the Enter Key, Cancel Key and Up or Down Scroll Keys. A numeric keypad is also available to simplify entering telephone numbers, editing important dialing information and direct numeric menu selection.

Enter Button:

The **Enter** button has two main functions.

1. Select flashing menu items
2. Accept numeric entries.

Examples:

1. To Select Menu Items:

Press: the **Up** or **Down scroll** buttons to display menu items

When the desired menu item is flashing

Press: the **Enter** button to select

Results: the submenu is invoked or display of "command accepted", if the submenu item can be performed.

2. To Accept numeric entries:

Press: the numeric keys to display a string of numbers

When the desired numbers are displayed

Press: the **Enter** button to save the number

Results: display of "command accepted".

If the number was entered incorrectly or is invalid, the LCD window displays a prompt to re-enter the number.

At the Status level:

Press: the **Enter** button to clear the last number dialed, Make, Break, and Interdigit times.

Cancel Button:

The **Cancel** button is used to:

1. Exit a submenu which returns to the previous menu; repeat until the desired menu level is displayed.
2. Terminate tests in which a pattern is generated in the 5156.

3. Exit a numeric entry screen without changing the previous selection.

Examples:

1. To Exit a Submenu:

When the Submenu item is displayed
Press: the **cancel** button
Results: the display returns to the previous menu.

2. To terminate a test pattern:

At the desired time
Press: the **cancel** button
Results: the test is immediately interrupted.

3. To Exit a numeric entry screen without changing the previous selection

Any time during the numeric entry prior to recording the entry with the **enter** key
Press: the **cancel** button
Results: the 5156 reverts to the previous numeric setting for that menu selection.

UP and Down Scroll Buttons:

The **Up and Down Scroll** buttons are used to

1. View all of the submenu selections available in the active menu.
   Submenu items display two at a time and in a circular or wrapping fashion. When the submenu items are scrolled, they will continuously appear from beginning to end in a forward (down button) or reverse (up button) pattern.
2. In numeric entries the **Down** scroll button erases one character to the left with each press of the key.

Examples:

1. To view submenu items in a forward pattern:

When the menu is selected and the submenu items are displayed
Press: the **down scroll** button

When the end of the list is reached pressing the down scroll button again will continue the display of the same menu from the beginning.

1. To view submenu items in a reverse pattern:

When the menu is selected and the submenu items are displayed

Press: the **up scroll** button

When the beginning of the list is reached, pressing the up scroll button again will continue the display of the same menu from the end.

The Numeric Keypad

The **numeric** keys are used to

1. Directly select menu items by number even when not displayed in the LCD window.
2. Entering telephone numbers (connect #) and the wink duration for switched 56 dialing.

Examples:

1. To select a menu item by number:

When menu selection is active

Press: the desired submenu item number

Results: the display will automatically update by activating (flashing) the desired selection.

Press: **Enter** to complete the selection.

2. To enter a telephone number:

When the number selection is active

Press: the desired numbers one at a time

Results: as each number is entered, the flashing cursor will move to the next location.

Press: **Enter** to record the entry.

Reminder: the down scroll arrow can be used to backspace through an incorrectly entered number to correct an entry.

MENU STRUCTURE

The opening menu is the access point to all other operations through three numbered menu items, 1=Status, 2=Test and 3=Configuration. The submenu items (on the following pages) vary according to the operational mode, Switched 56 or Dedicated.

LCD display of opening Menu:

The Three Opening Menu Functions

1=STATUS Used to display all relevant information for the number last dialed, such as the interdigit time, the last duration of Control Mode Idle (DMI) and Data Mode Idle (DMI) signaling on the line between pulses. In the Dedicated DSU mode it displays the DTE signalling.

2=TEST Accesses the testing options such as initiating and terminating a phone call to the Unit Under Test, selecting loopback, selecting and sending test patterns and records bit errors.

3=CONFIG Used to set Switched 56 or 56K Dedicated mode. Submenu selections also establish the desired configuration for testing including loop rate, wink duration, connect number, the primary DTE interface, synchronous or asynchronous mode, the setting of the DTE signaling pins or perform a check of the 5156 receive level.

To select and use a menu:

Press: the **up** or **down** scroll button to activate (flashing) the desired menu item

. . . OR . . .

Press: the number of the desired menu.

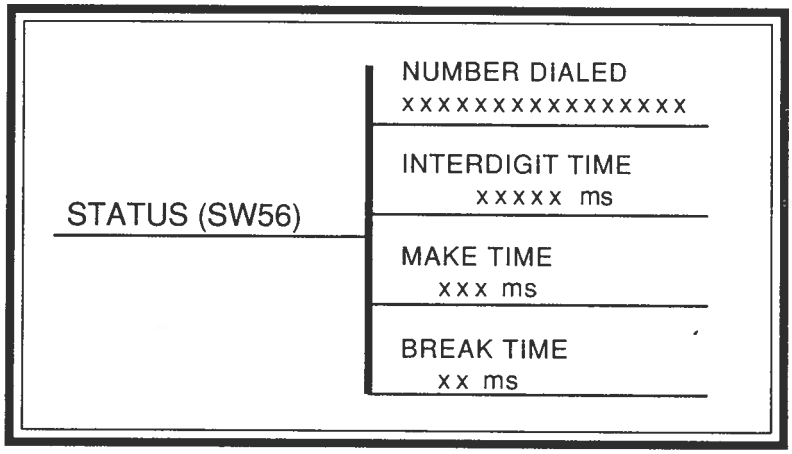
When the desired menu item is flashing,

Press: the **enter** button to select.

1: STATUS MENU - SWITCHED 56 MODE

Purpose

In Switched 56 mode the Status menu is used to display information pertinent to the last dialed number recorded by the 5156.



Submenu Items

Number Dialed: Displays the last number dialed. X = 0 through 9 or a question mark (?) if an unrecognized digit is sent.

Interdigit Time: The recorded time between the last two digits that were dialed. See Figure 1: Dialing Sequence, Section 6.

Make Time: The last duration of Control Mode Idle (CMI) signalling on the line between pulses, see Figure 1: Dialing Sequence, Section 6.

Break Time: The last duration of Data Mode Idle (DMI) signaling on the line between pulses, see Figure 1: Dialing Sequence, Section 6.

Operation

Follow standard operating procedure.
When 1=Status is flashing:

Press: the **enter** button
Results: display of the identification of "number dialed" followed by the number.

Press: the **up or down arrow** button to continue through the submenu items.

1: STATUS MENU - DEDICATED DSU MODE

Purpose

In Dedicated DSU mode the status menu is used to access the display of the current DTE signaling information. Displayed items followed by an asterisk (*) are active.

LCD display of the Status Submenu:

Submenu Items

RS: Request to Send

CS: Clear to Send

TD: Transmit Data

RD: Receive Data

CD: Receive Line Signal Detector

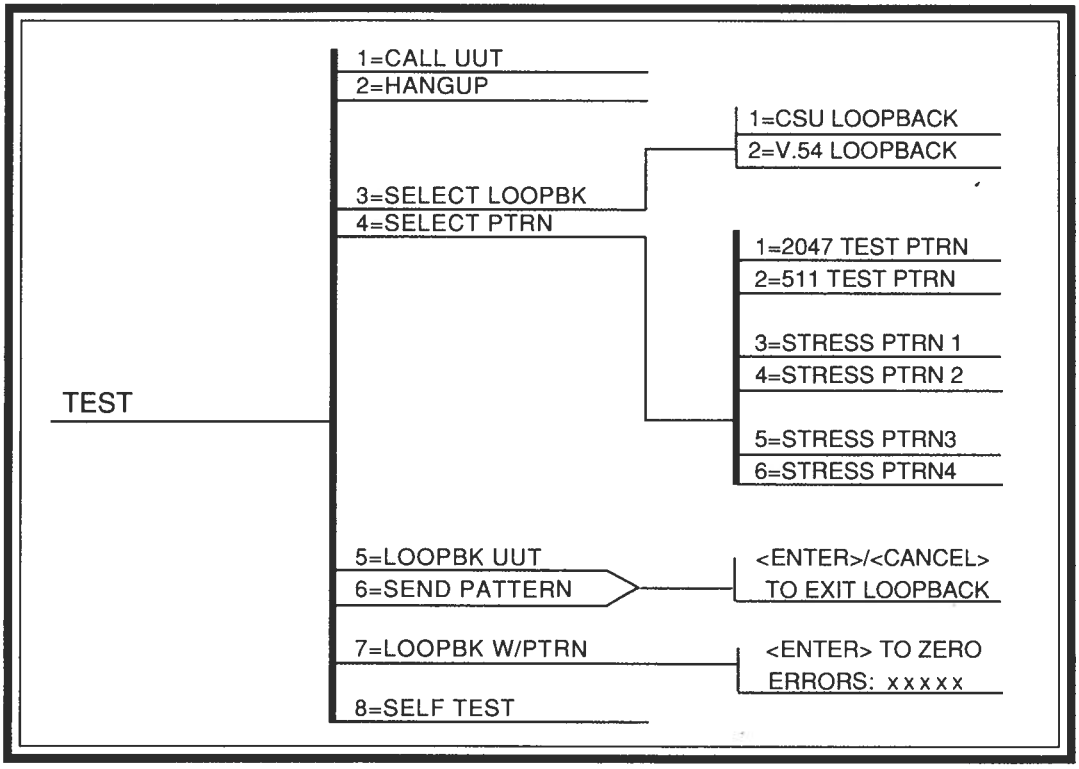
TR: Data Terminal Ready

SR: Data Set Ready

2: TEST MENU - SWITCHED 56 MODE

Purpose

The Test Menu is used to select the testing options such as initiating and terminating a phone call to the Unit Under Test, selecting loopback, selecting test and stress patterns and views the recorded bit errors. The submenus are also used to initiate a loopback to the UUT and begins the sending of a test pattern.



Submenu Items

Call UUT: Will initiate a call from the 5156 to the UUT. The 5156 DMI LED will activate with a steady light indicating the call is signalling.

If the UUT answers, the UUT DMI LED (on the 5156) will also activate.

Hangup: Will terminate the call by sending CMI pattern to the UUT. The call progress LEDs on the 5156 will indicate the status.

Select Loopbk: Selection of the type of loopback to be performed in tests. Two types available. See "Selecting a Loopback" in Operational Modes discussed in Section 2.
1=CSU Loopback
V.54 Loopback

Select Ptrn: Selection of the test pattern sent to the DSU. Available test patterns (by submenu listing) are:
1=2047 Test Ptrn -Standard
2=511 Test Ptrn - Standard
3=Stress Ptrn 1 - 100 bits of all 1s, 8 in a row followed by 100 of all 0s (zeros).
4=Stress Ptrn 2 - 0 (zero) 1111110, 100 bits of 1s, followed by 100 bits of 0s (zeros).
5=Stress Ptrn 3 - constant 00110010 (zeros).
6=Stress Ptrn 4 - constant 01000000 (zeros).

Loopbk UUT: Initiates a loopback to the Unit Under Test. Type of loopback is defined by "Select Loopbk" option.

Enter/Cancel: Press Enter to use the current setting. Press Cancel to exit the menu selection without accepting the current setting.

Send Pattern: Instructs the 5156 to start sending test pattern to the UUT. The type of pattern is defined by "Select Ptrn" option.

Enter/Cancel: Same as of Loopbk UUT.

Note: *When the 5156 is sending test pattern, it will display bit errors of received data. This would allow the UUT or an external BER tester to send pattern back to the 5156 and record errors.*

Loopbk W/Ptrn: Sends the appropriate signalling to loopback the UUT (selected above) and proceed to send test pattern and record bit errors from the received data.

Enter To Zero Errors: After the displays of the number of errors pressing Enter will return the count to zero in preparation for the next count.

Self Test: Performs a self test of the DSU Analyzer. This is equivalent to cycling power off and on.

Operation

Follow standard operating procedure.
When 2=TEST is flashing:

Press: the **enter** button
Results: display of the first two menu items.

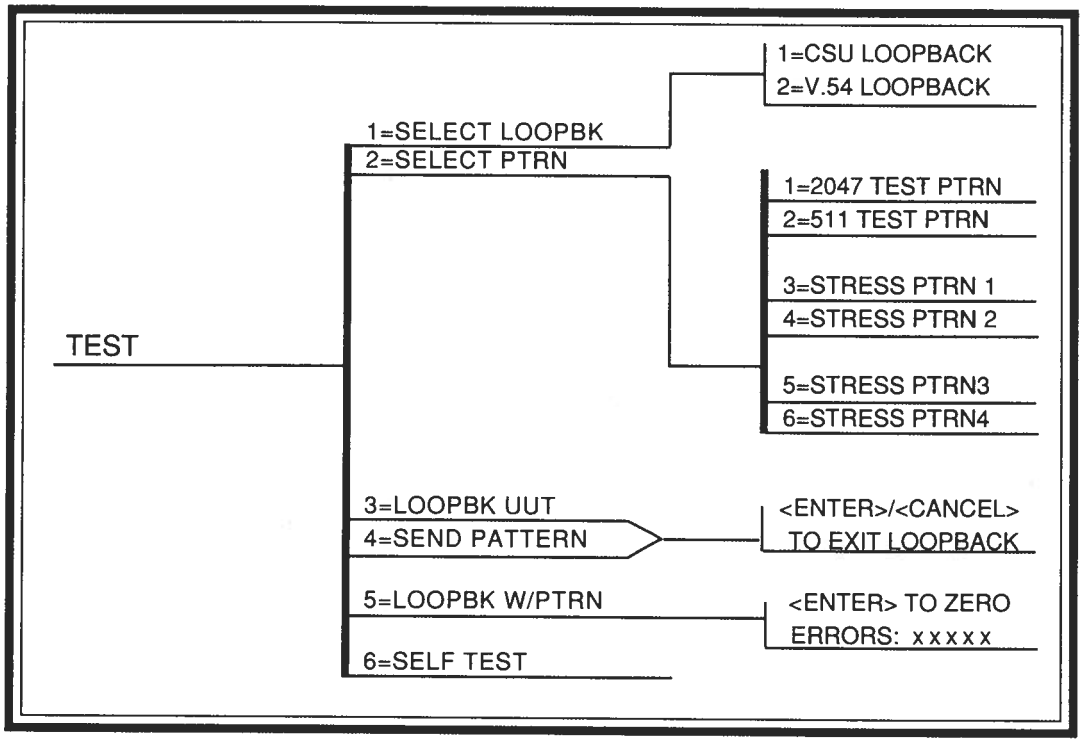
Press: the **up or down arrow** button to continue through the submenu displays.

Press: the **enter** button to select any activate menu item.

2: TEST MENU - DEDICATED MODE

Purpose

The Test Menu is used to select the testing options such as initiating and terminating a phone call to the Unit Under Test, selecting loopback, selecting test and stress patterns and views the recorded bit errors. The submenus are also used to initiate a loopback to the UUT and begins the sending of a test pattern.



Submenu Items

Select Loopbk: Selection of the type of loopback to be performed in tests. Two types available. See "Selecting a Loopback" in Operational Modes discussed in Section 2.
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2=V.54 Loopback

Select Ptrn: Selection of the test pattern sent to the DSU. Available test patterns (by submenu listing) are:
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2=511 Test Ptrn - Standard
3=Stress Ptrn 1 - 100 bits of all 1s, 8 in a row followed by 100 of all 0s (zeros).

4=Stress Ptrn 2 - 0 (zero) 1111110, 100 bits of 1s, followed by 100 bits of 0s (zeros).
5=Stress Ptrn 3 - constant 00110010 (zeros).
6=Stress Ptrn 4 - constant 01000000 (zeros).

Loopbk UUT: Initiates a loopback to the Unit Under Test. Type of loopback is defined by "Select Loopbk" option.

Enter/Cancel: Press Enter to use the current setting. Press Cancel to exit the menu selection without accepting the current setting.

Send Pattern: Instructs the 5156 to start sending test pattern to the UUT. The type of pattern is defined by "Select Ptrn" option.

Enter/Cancel: Same as of Loopbk UUT.

Note: *When the 5156 is sending test pattern, it will display bit errors of received data. This would allow the UUT or an external BER tester to send pattern back to the 5156 and record errors.*

Loopbk W/Ptrn: Sends the appropriate signalling to loopback the UUT (selected above) and proceed to send test pattern and record bit errors from the received data.

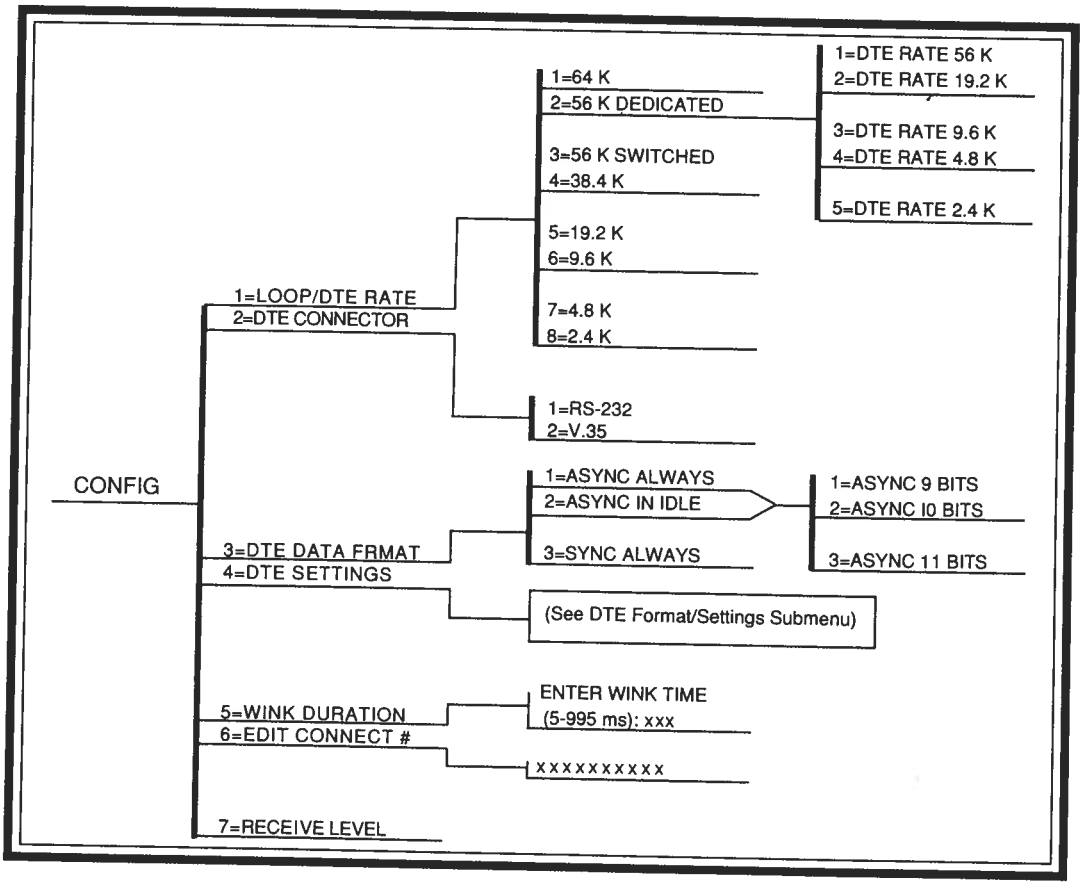
Enter To Zero Errors: After the display of the number of errors pressing Enter will return the count to zero in preparation for the next count.

Self Test: Performs a self test of the DSU Analyzer. This is equivalent to cycling power off and on.

3: CONFIG MENU - SWITCHED 56 AND DEDICATED MODES

Purpose

The Configuration Menu is used to access the setting of the Switched 56 or 56K Dedicated mode. Submenu selections establish the desired configuration for testing including loop rate, wink duration, connect number, the primary DTE interface, synchronous or asynchronous mode, the setting of the DTE signaling pins or perform a check of the 5156 receive level.



Submenu Items

Loop/DTE Rate: Selection of the loop rate between the 5156 and the Unit Under Test. When running in 56K Bps Dedicated mode, a subrate may then be selected from eight submenus.

1=64K Bps

2=56K Dedicated: Five selections available for DTE subrate selection. If one of the available rates is not selected the

DTE rate will be the same as the looprate.

1=DTE Rate 56K Bps
2=DTE Rate 19.2K Bps
3=DTE Rate 9.6K Bps
4=DTE Rate 4.8K Bps
5=DTE Rate 2.4K Bps

3=56K Switched
4=38.4K Bps
5=19.2K Bps
6=9.6K Bps
7=4.8K Bps
8=2.4K Bps

DTE Connector: Contains two submenu items for selecting the rear panel primary DTE interface on the 5156.
1=RS-232
2=V.35

DTE Data Frmat: Contains three submenu items for selection of synchronous or asynchronous mode of operation.
1=Async Always
2=Async in Idle: Allows for selection of the Asynchronous Bits
3=Synch always
1=Async 9 Bits
2=Async 10 Bits
3=Async 11 Bits

DTE Settings: Contains four submenu items for selection of the operation of DTE signalling pins on primary V.35 or RS-232 DTE interfaces.
1=CS Options: Five available selections for **CS** (Clear to Send)
1= Forced On
2=Follows RS (Request to Sent)
3=Follows CD (Carrier Detect)
4= Follows RS = CD
5= Off With Low CD
2= CD Options: Three available selections for **CD** (Receive Carrier Detect)
1=Forced On
2= Normal
3=Off With Low CD

3=TR Options: Two available selections for **TR** (Data Terminal Ready)

1=Ignored
2=Idle When Off

4=SR Options: Six available stions for **SR** (Data Set Ready)

1=Forced On
2=Off OOS Only
3=Off Low CD Only
4=Off Test Only
5=Off Test + OOS
6=Off Test + Low CD

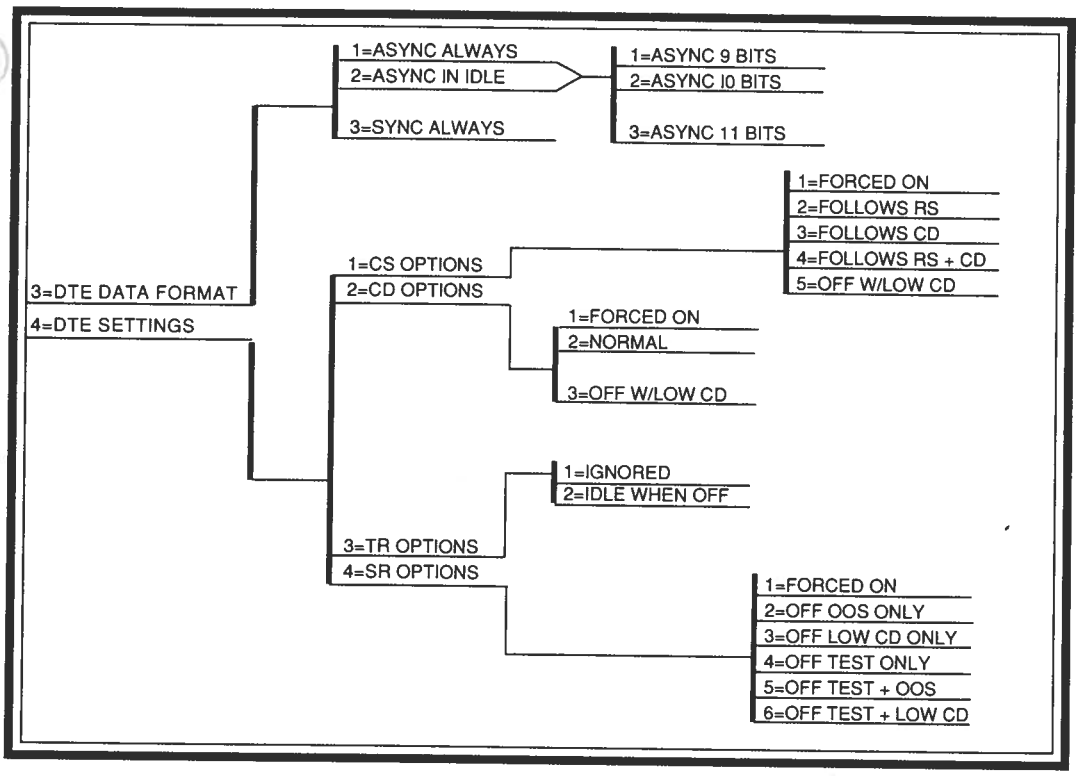
Wink Duration: Enter the wink duration. Range 5 to 995 ms.
See Figure 1 Dialing Sequence, Section 6, for definition of Wink Time.

Connect #: The number entered is recorded and the 5156 will compare this entered number to incoming dialed numbers. If the number dialed by the UUT matches the stored number, the 5156 will "go on-line" after a call is made. If the incoming number does not match the connect number, the 5156 will remain Idle. The number dialed is also stored and can be displayed using the status command.

Receive Level: The 5156 displays its receive level.
Above a minus 34dB (-34dB), displays "OK"

Below a minus 34dB (-34dB), displays "WARNING".

DTE FORMAT/SETTINGS SUBMENU



SECTION 4 - REMOTE CONTROL

REMOTE CONFIGURATION

The 5156 is designed with the built-in option of configuration setup and control from an attached Personal Computer or Dumb Terminal via an RS-232 interface. Any computer or terminal with a standard serial port can be used through a connector labeled COMMAND PORT with a standard 25 pin D-type connector for interfacing serial data devices to the Model 5156.

The Baud rate for the command port is set to 1200 bps. The data format used by this port is 8 data bits, no parity bits, and 1 stop bit.

Command Format	**CR**	Carriage Return: used to terminate all commands
	LF	Line Feed character use after the above Carriage Return is optional
	Blank Spaces	not acceptable when embedded in a command.
	Backspace	use to erase incorrect entries for correction
	[ ]	the brackets are used in the manual only to identify placement of the optional arguments. They are not to be entered as part of the command.
Command Sample	DTERATE[,X1]	All letters are capitalized Separated by commas, not spaces. The bracket character is used only to indicate an optional argument and is not to be entered as a command character

Responses From the 5156

Responses from the 5156 are terminated with a carriage return and a line feed character. The Model 5156 can be configured via RS-232 according to the

commands listing in this section. The following conventions are followed when interpreting the commands;

X - Argument

[ ] - Optional arguments, if omitted the 5156 will return the present argument value.

The response from the 5156 after re-configuring the hardware according to the command given are:

OK - The command has been accepted and implemented

ERR x - Indicates an error message. Where X is the error, it can be located in the Command Response Table.

Restriction

If command arguments are sent to the Model 5156 in form other than exactly as shown in the command summary an invalid argument response will be returned. Brackets [ ] indicate optional arguments and should not be included in the command.

COMMAND	SUMMARY	
ASTATE	Description:	Queries the Analyzer Call Progress status (info given by LEDs on front panel).
	Arguments:	None
	Response:	CMI = Control Mode Idle DMI = Data Mode Idle DATA OPENL
ASTATE	Example Response:	DATA
BREAK	Description:	Queries the DSU Analyzer for the duration of the last break period of the last pulse dial digit detected.
	Arguments:	None
	Response:	Value in milliseconds or ERR code.
BREAK	Example Response:	60
CALL	Description:	Initiates a call to the unit under test by sending DMI until the UUT responds. If no response is made, the Analyzer will return to sending CMI.
	Arguments:	None
	Response:	OK or ERR code
CALL	Example Response:	OK
CLRERR	Description:	Resets the error count to zero.
	Arguments:	None
	Response:	OK or ERR code
CLRERR	Example Response:	OK

CONNUM,X1 Description: Program the connect number into the Analyzer. If the UUT dials this number the Analyzer will go "on line".

Response: OK or ERR

CONNUM Example Response: 1234567890

DIAL Description: Queries the last number dialed by the UUT.

Arguments: None

Response: Returns a 1 to 16 digit number that was dialed.

DIAL Example Response: 18009987880

DTERATE,X1 Description: Selects DTE rate setting of the DSU Analyzer.

Note: *The DTE rate is automatically set by the LRATE command unless dedicated 56K is chosen. In this case, a subrate may be selected using this command.*

Arguments:

X1	=	DTE Rate	
X1	=	2.4	(2.4 kB/s)
X1	=	4.8	(4.8 kB/s)
X1	=	9.6	(9.6 kB/s)
X1	=	19.2	(19.2 kB/s)
X1	=	56	(56 kB/s)

Response: OK or ERR code

DTERATE Example Response: 9.6

COMMAND	SUMMARY
DTETYPE,X1	Description: Selects primary channel DTE interface for the DSU Analyzer.
	Arguments: X1 = DTE Interface X1 = 232 X1 = V35
	Response: OK or ERR code
DTETYPE	Example Response: 232
HANGUP	Description: Disconnects a call to the unit under test. The DSU Analyzer will revert to IDLE (CMI) mode.
	Arguments: none
	Response: OK or ERR code
HANGUP	Example Response: OK
IDIGIT	Description: Queries the DSU Analyzer for the last measured interdigit delay time of the last dialed digit.
	Arguments: none
	Response: Value in milliseconds or ERR code.
IDIGIT	Example Response: 640

LBACK,X1

Description: Selects and sends the requested loopback configuration to the unit under test.

Note: *Only one argument may be sent at a time, but a query will always return with two responses, the Loopback type and the On/Off status.*

Arguments:
X1 = Loopback Mode
X1 = CSU
X1 = V54
X1 = ON
X1 = OFF

Response: OK or ERR code

LBACK

Example Response: V54, OFF

LRATE,X1

Description: Selects loop rate setting of the DSU Tester.

Note: *For all options except 56, the DTE rate will be set to the Loop rate if one is specified.*

Arguments:

X1	=	DTE Rate	
X1	=	2.4	(2.4 kB/s)
X1	=	4.8	(4.8 kB/s)
X1	=	9.6	(9.6 kB/s)
X1	=	19.2	(19.2 kB/s)
X1	=	38.4	(38.4 kB/s)
X1	=	56	(56 kB/s)
X1	=	SW56	(SW56 kB/s)
X1	=	64	(64 kB/s)

Response: OK or ERR code

LRATE

Example Response: 19.2

COMMAND	SUMMARY	
MAKE	Description:	Queries the DSU Analyzer for the duration of the last make period of the last pulse dial digit detected.
	Arguments:	none
	Response:	Value in milliseconds or ERR code.
MAKE	Example Response:	40
NUMERR	Description:	Requests the number of errors measured by the DSU Analyzer. The number of errors accumulates until the CLRERR command is issued.
	Arguments:	none
	Response:	Number of errors, OVERF, or ERR code
NUMERR	Example Response:	6450
RESET	Description:	Resets the 5156. This is equivalent to cycling power off and on.
	Arguments:	none
RESET	Response:	none

TESTP,X1

Description: Selects and starts generating the requested internal test pattern.

Note: *Only one argument may be sent at a time, but a query will always return with two responses, the test type and the on/off status.*

Arguments: X1 = Test Type

X1	=	2047	(2047 pattern)
X1	=	511	(511 pattern)
X1	=	SP1	(stress pattern 1)
X1	=	SP2	(stress pattern 2)
X1	=	SP3	(stress pattern 3)
X1	=	SP4	(stress pattern 4)
X1	=	ON	(send test pattern)
X1	=	OFF	(stops test pattern)
X1	=	WLB	(test with far end loopback)

Response: OK or ERR code

TESTP

Example Response: 2047, ON

USTATE

Description: Queries the UUT Call Progress Status (info given by LED's on front panel).

Arguments: None

Response: CMI = Control Mode Idle
DMI = Data Mode Idle
DATA

USTATE

Example Response: CMI

COMMAND	SUMMARY	
VERSION	Description:	Query for the DSU Tester software version.
	Arguments:	none
VERSION	Response:	Returns #.x where # is the software release number (e.g. 1) and x is the software revision level (e.g. A).

WINK,X1	Description:	Set the wink timing on the DSU Analyzer.
	Arguments:	X1 = Wink Time X1 = 5 ms to 995 ms Step: 5 ms
	Response:	OK or ERR code
WINK	Example Response:	210

SECTION 5 - ERROR CODES

COMMAND RESPONSE ERROR MESSAGES

If the Model 5156 receives a command it cannot interpret, an invalid argument, or a command that cannot be performed due to the present status of the unit, an error message will be generated. The following is a list of the error codes and their description.

Code	Description
ERR 1	Invalid Command.
ERR 2	Invalid Argument.
ERR 3	Data connection not established.

SECTION 6 -TECHNICAL REFERENCE

FIGURE 1 - DIALING SEQUENCE

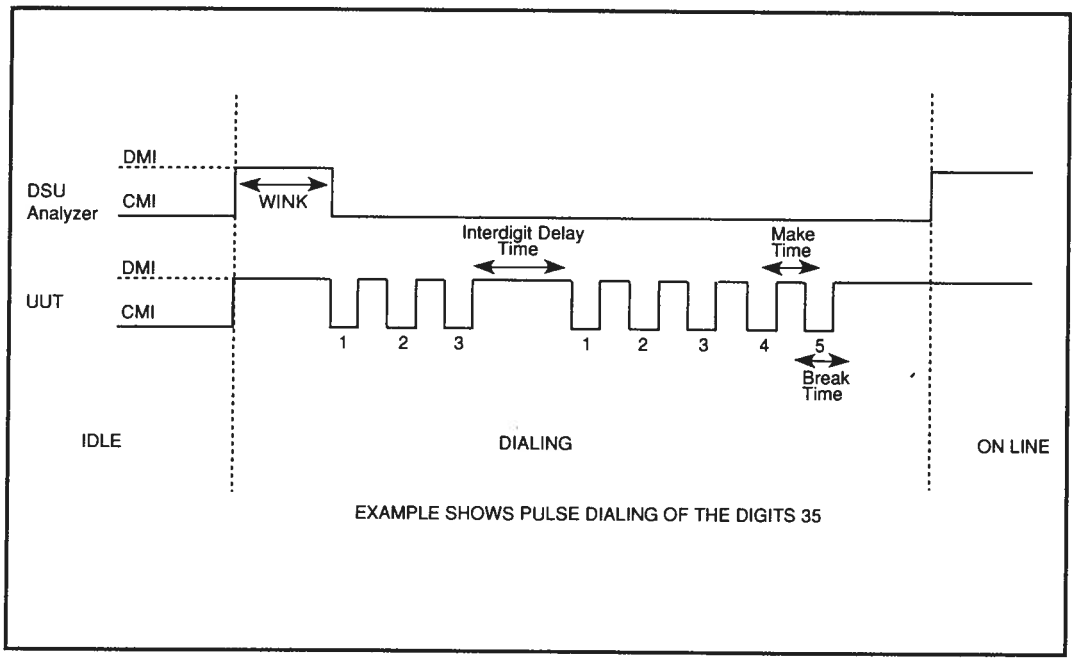


TABLE 1: PIN ASSIGNMENT FOR PRIMARY V.35 CONNECTOR

PIN	CCITT	DESCRIPTION
A	101	Protective Ground (PG)
B	102	Signal Ground (SG)
C	105	Request-to-Send (RTS)
D	106	Clear-to-Send (CTS)
E	107	Data Set Ready (DSR)
F	109	Received Line Signal Detector (CO)
H	---	Data Terminal Ready (DTR)
R	104	Received Data (RD-A)
T	104	Received Data (RD-B)
V	115	Receiver Signal Element Timing (SCR-A)
X	115	Receiver Signal Element Timing (SCR-B)
P	103	Transmitted Data (SD-A)
S	103	Transmitted Data (SD-B)
Y	114	Transmitter Signal Element Timing (SCT-A)
AA	114	Transmitter Signal Element Timing (SCT-B)
U	113	External TX Signal Element (SCX-A)
W	113	External TX Signal Element (SCX-B)
J,K,L		
M,N,Z	---	Not Used
BB-FF		
HH		

TABLE 2: PIN ASSIGNMENT FOR PRIMARY RS-232 CONNECTOR

PIN	CCITT	DESCRIPTION
1	AA	Protective Ground (PG)
2	BA	Transmitted Data (SD)
3	BB	Receive Data (RD)
4	CA	Request-to Send (RTS)
5	CB	Clear-to-Send (CTS)
6	CC	Data Set Ready (DSR)
7	AB	Signal Ground (SG)
8	CF	Received Line Signal Detector (RLSD)
9	*	Reserved for Testing
10	*	Reserved for Testing
11-14	---	Not Used
15	DB	Transmit Clock (SCT)
16	---	Not Used
17	DD	Receive Clock (SCR)
20	CD	Data Terminal Ready (DTR)
24	DA	External TX Clock (SCX)
18-23, 25	---	Not Used

TABLE 3: PIN ASSIGNMENT FOR PRIMARY RS-232 COMMAND PORT CONNECTOR

PIN	CCITT	DESCRIPTION
1	AA	Protective Ground (PG)
2	BA	Transmitted Data (SD) ←
3	BB	Receive Data (RD) →
4	CA	Request-to Send (RTS) ←
5	CB	Clear-to-Send (CTS) →
6	CC	Data Set Ready (DSR) →
7	AB	Signal Ground (SG)
8	CF	Received Line Signal Detector (DCD)
20	CD	Data Terminal Ready (DTR)
9	–	+ 12 Volt Test Point
10	–	- 12 Volt Test Point
11-13	---	Not Used
15-18	---	Not Used
21-23	---	Not Used
14-19	---	Reserved
124-25	---	Reserved

TABLE 4: PIN ASSIGNMENT FOR REVERSE CABLE

End 1:		End 2:	
PIN	COLOR	PIN	COLOR
1	Brown	1	Grey
2	Blue	2	Orange
3	Yellow	3	Black
4	Green	4	Red
5	Red	5	Green
6	Black	6	Yellow
7	Orange	7	Blue
8	Grey	8	Brown