Tutorial

The tutorial acquaints you with the features of the CTS850 by having you run a test while you explore specific features of the CTS850 SDH/PDH Test Set. For full details on how to use the CTS850, refer to Chapter 3 *Reference*.

The tutorial presents procedures in tables. Perform the procedure by reading from left to right in the table (see example below). The word *none* in a cell indicates that no action is required.

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
Begin with Step 1	Step 2	Step 3	Step 4
		Step 5	Step 6
		Step 7	Step 8, CTS850 instruction is complete

Some procedures require several iterations of highlighting parameters and selecting choices. Some procedures may require more than one menu button or menu page selection as well.

Note: Use the buttons below the display to Select Menu Page. Use the rotary knob to Highlight Parameter. Use the buttons to the right of the display to Select Choice.

Before Turning On the CTS850

This tutorial describes how to perform a bit-error rate (BER) test on an STM-1E signal. To perform the tutorial, you need a 75 coaxial cable with BNC connectors on each end. This tutorial assumes you have set up the CTS850 as described in *First Time Operation*, in Chapter 1 Getting Started.

To set up your CTS850 for the tutorial, perform these steps:

H Check to see that the CTS850 is turned off.

Connect the coaxial cable between the **TRANSMIT** and **RECEIVE** BNC connectors on the front panel (see Figure 2 22).

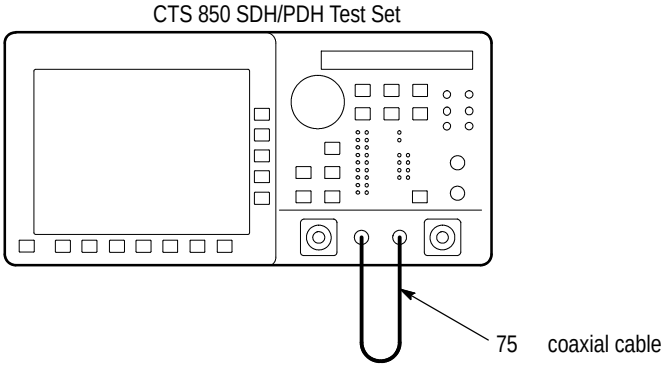

Figure 2 22: Setup for the Tutorial

Press the **ON/STBY** button to turn on the CTS850.

The CTS850 performs its power-on self test and then displays the TRANSMIT menu.

Before proceeding with the tutorial, initialize the CTS850 as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TEST SETUPS	RECALL INSTRUMENT SETUPS	DEFAULT FACTORY SETTINGS	Recall Setup

Setting Transmit Parameters

Before beginning the BER test, set the transmit and receive parameters.

To set the transmit and receive parameters:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	TRANSMIT SETTINGS	Transmit Rate (see Figure 2 23)	STM-1E

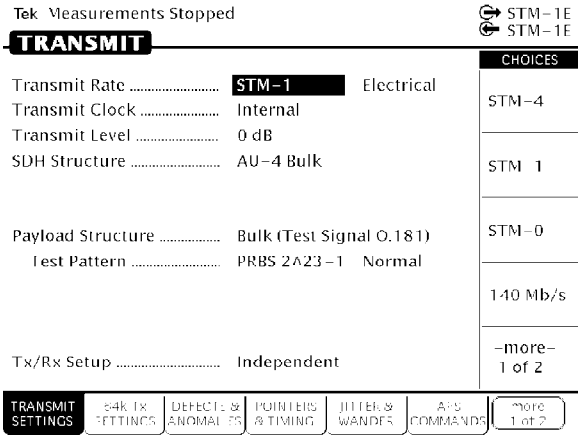

Figure 2 23: The TRANSMIT SETTINGS Page of the TRANSMIT Menu

To set the payload and the test pattern:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		Payload	Bulk (Equipped)
		Test Pattern	PRBS 2^20 1

Setting Receive Parameters

You can set receive parameters two ways. The first way is to set the parameters individually: display the RECEIVE menu and set each parameter manually on the RECEIVE SETTINGS page. The second way is to couple the receive settings to the transmit settings. To do this, use the Tx/Rx Setup line on the TRANSMIT SETTINGS page. (The Tx/Rx Setup line appears on both the TRANSMIT SETTINGS page and the RECEIVE SETTINGS page. To couple transmit settings to the receive settings, you would use the Tx/Rx Setup line on the RECEIVE SETTINGS page.)

To couple the receive settings to the transmit settings:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	TRANSMIT SETTINGS	Tx/Rx Setup	Coupled

As soon as you select Coupled, the icon in the status area changes to indicate the Tx/Rx Setup are coupled.

If the operator couples from the TRANSMIT SETTINGS menu, the TX settings copy to the Receive side of the test unit. If the operator couples from the RECEIVE SETTINGS menu, the RX settings copy to the Transmit side of the test unit.

Setting the Test Time

Before beginning the BER test, you must specify the duration of the test.

To set the duration of the test:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TEST SETUPS (see Figure 2 24)	TEST CONTROL	Test Duration	15 min

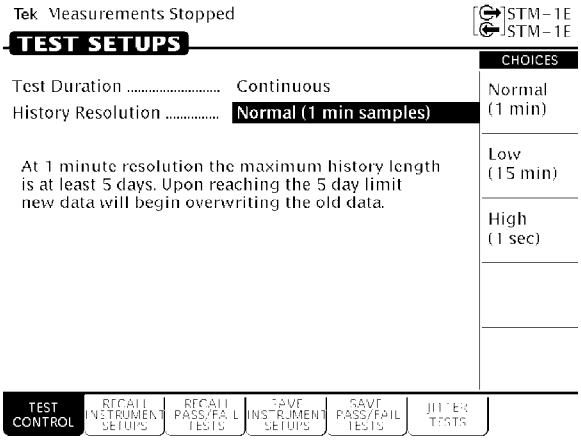

Figure 2 24: The TEST CONTROL Page of the TEST SETUPS Menu

Where Test Results Are Displayed

Once you have set the transmit and receive parameters and the test time, you can begin the test. However, before starting the test, look at the RESULTS menu where the results of the test appear.

To display the RESULTS menu:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	TEST Summary	*none*	*none*

The TEST SUMMARY page contains a summary of the current or most recent test (see Figure 2 25). Just below the menu name is information about the current or most recent test. If the test detected no alarms or errors, the CTS850 displays the message No Alarms No Errors.

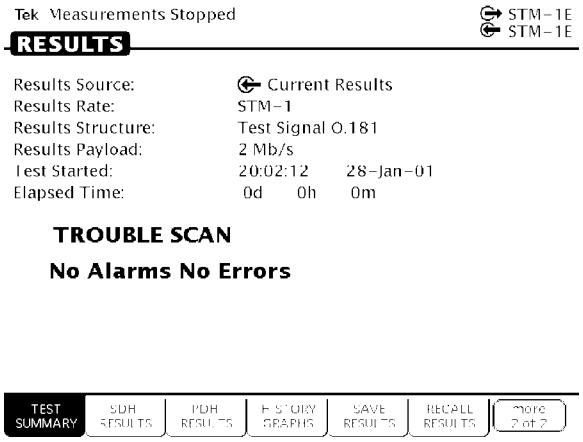

Figure 2 25: The TEST SUMMARY Page of the RESULTS Menu

The RESULTS menu contains ten pages on which results are displayed: TEST SUMMARY, SDH or PDH RESULTS, ERROR ANALYSIS, Performance Analysis, JITTER & WANDER, and HISTORY GRAPHS. Select **SDH RESULTS** to see one way test results are displayed (see Figure 2 26).

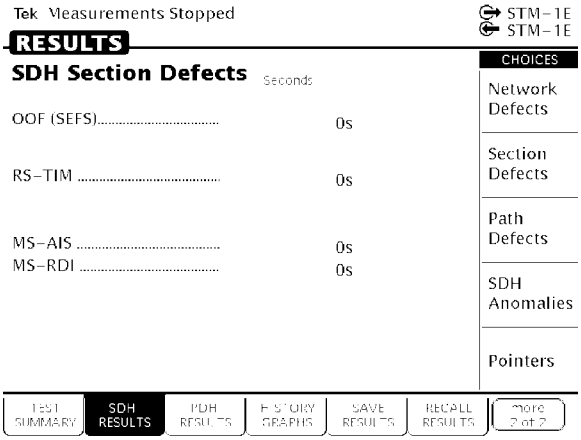

Figure 2 26: SDH Results, SDH Section Defects, from RESULTS menu

The SDH or PDH RESULTS page contains a listing of the different errors that can occur. Since you have not started your test yet, the values are those of the last test run. To continue with the test setup, select TEST SUMMARY.

Begin the Test

Note at the top of the display the message Measurements Stopped. When you start the test, this message will change. To start the test, press the front-panel **START/STOP** button.

Once a test starts, the display changes in two ways. First, the message Running appears at the top of the display (see Figure 2 27). This message line is always visible so you know that a test is running, even if a page is displayed that doesn't contain any information about tests. Second, the test status indicator appears.

There are two elements to the test status indicator. The text above the bar graph indicates how long the test has been running. The text lists the days, hours, minutes, and seconds the test has been running. The bar graph indicates what percentage of the test is complete (except when the test duration is set to continuous).

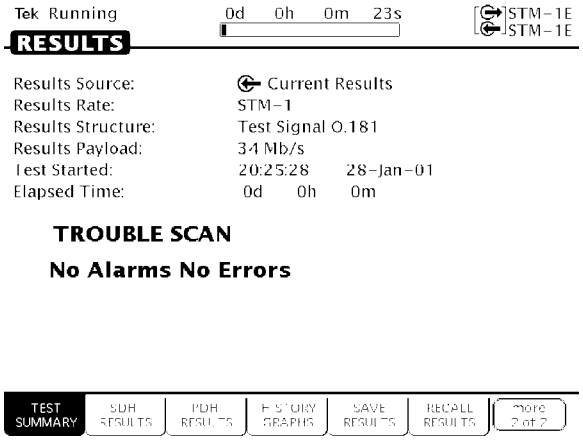

Figure 2 27: The Message Line and Test Status Indicator

Inserting Errors

Now that the test is running, you will insert some errors and see how the CTS850 responds. To set the error insertion parameters, first display the Defects & Anomalies page as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	Defects & Anomalies (see Figure 2 28)	*none*	*none*

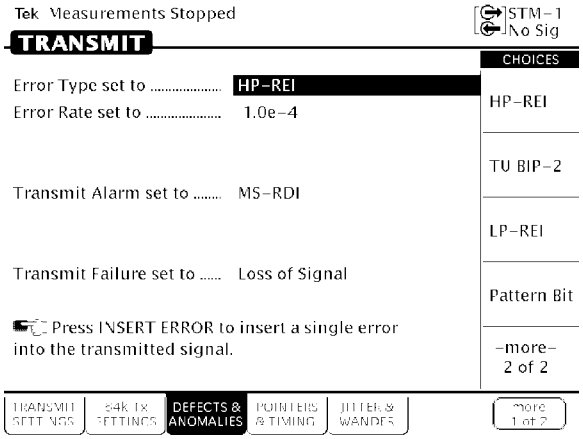

Figure 2 28: The Defects & Anomalies Page of the TRANSMIT Menu

There are two ways to insert errors into the transmitted signal. You can insert errors one at a time or you can set a rate at which the CTS850 inserts errors automatically. Before inserting errors, you must specify the type of error to be inserted. You specify the type of error to be inserted with the Error type set to parameter.

To set the type of error to insert:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		Error type set to	Path B3 BIP

The rate at which errors are inserted is specified on the Error rate set to parameter. An error rate of None specifies that no errors are inserted unless the INSERT ERROR button is pressed. Any error rate

other than None results in a continuous stream of errors being inserted into the transmitted signal.

To insert a single error, press the **INSERT ERROR** button located on the front panel.

When you press the INSERT ERROR button the red ERROR light flashes.

To insert a continuous stream of errors:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		Error rate set to	1.0E-5

Note that the red ERROR light now stays on all the time; errors are being detected continually.

To turn off the automatic error insertion:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	Defects & Anomalies	Error Rate set to	None

Now that errors are no longer being transmitted, the red ERROR light has gone out, although the yellow history light is still on. To clear the error history, press **CLEAR HISTORY**.

Adjusting Pointers

The CTS850 enables you to adjust or move pointers. Note that pointer movements are not necessarily errors. Pointer parameters are set on the POINTERS & TIMING page of the TRANSMIT menu.

To display the POINTERS & TIMING page:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	POINTERS & TIMING (see Figure 2 29)	*none*	*none*

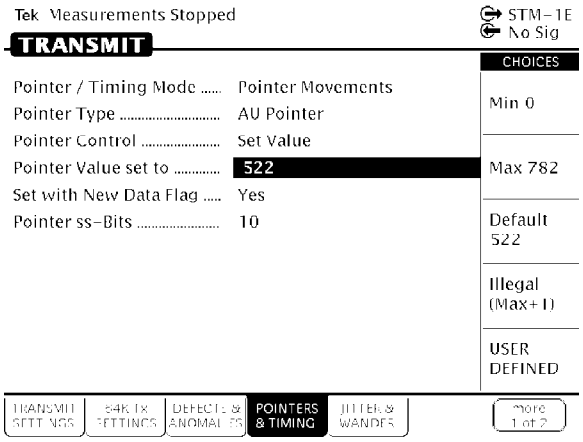

Figure 2 29: Example of Pointers & Timing Page of TRANSMIT Menu

Before adjusting a pointer, you must decide what mode of pointer movement to use. You can change a pointer by adjusting the pointer directly or by using frequency offset. The default mode is Pointer Movements, which allows you to adjust pointers directly.

To specify how the pointer will be adjusted:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		Pointer Control	Single

After selecting Single for pointer control, a message displays that tells you how to adjust the pointer. Pointer movement alternates between increment and decrement.

To adjust a pointer, press the **POINTER ACTION** button on the front panel of the test set.

Each time you press the **POINTER ACTION** button, a pointer adjusts and the **POINTER ACTION** light turns on. Also, a message appears at the top of the display that describes the type of pointer movement that occurs. On this page you can also adjust frequency offset which may cause a network element to generate pointer movements.

Be aware that it is necessary to press the Start/Stop button the front panel to see all the changes. To see the pointer value changing

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	SDH or PDH RESULTS	*none*	Pointers

Now press the **POINTER ACTION** button again.

To adjust a pointer using frequency offset:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	POINTERS & TIMING	Pointer / Timing Mode	Frequency Offset

After selecting Frequency Offset, note that the available parameters change. When in Frequency Offset mode, the only parameters that can be set are Offset Mode and Frequency Offset.

To change the frequency offset of the signal:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		Frequency Offset	Stress +4.6ppm

If the preset choices do not match what you need, use USER DEFINED to define an alternative.

To define a specific frequency offset:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
			USER DEFINED

When you select USER DEFINED, the knob is assigned to adjust the frequency offset. Two choices are available in this mode: Coarse and Fine (see Figure 2 30). Coarse adjusts the frequency offset by 10 ppm. Fine adjusts the frequency offset by 0.1 ppm. The larger the value for frequency offset, the more often the pointer is adjusted.

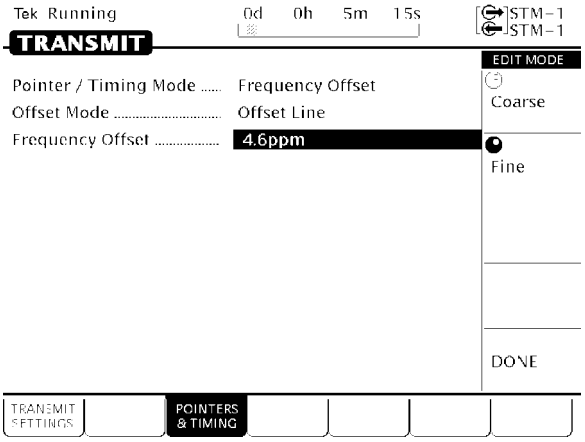

Figure 2 30: Adjusting Frequency Offset Using the Knob

Use the knob to change the value of Frequency Offset; select any value you wish. When you are finished selecting a frequency offset:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
			DONE

To turn off frequency offset:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	POINTERS & TIMING	Frequency Offset	Default 0ppm

Selecting Default 0ppm sets the Frequency Offset back to 0 ppm.

Viewing Section Overhead

The CTS850 allows you to view the section overhead for the transmitted or received signal. To view the section overhead for the transmitted signal, press the MORE 1of 2 Key softkey at the bottom of the test set screen, in order to see more choices:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
TRANSMIT	SECTION OVERHEAD	*none*	*none*

The first line of text under the menu name describes the signal being received and the AU under test (see Figure 2 31).

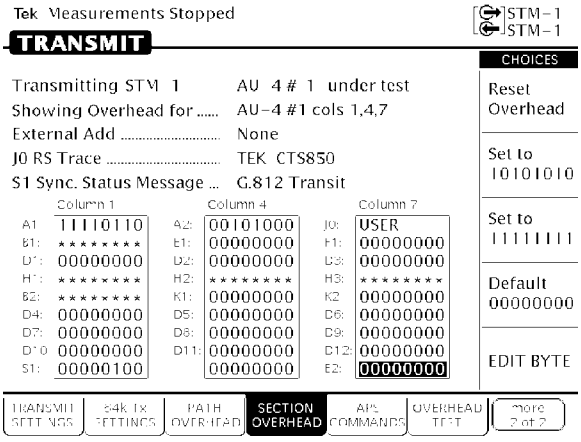

Figure 2 31: Example of Section Overhead Page of TRANSMIT Menu

The Showing Overhead for parameter identifies which columns of the section overhead are displayed. To display the overhead for other overhead columns within the signal, select the appropriate choice.

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		Showing Overhead for	Cols 1, 4, 7

Editing the Section Overhead

Except for certain reserved bytes, you can edit the bytes of the section overhead of the transmitted signal. Reserved bytes are identified by asterisks (*) in the byte content area of the displayed column.

To edit a byte of the section overhead:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		S1 *byte*	**EDIT BYTE**

Once you have selected EDIT BYTE, the CTS850 enters the edit mode (see Figure 2 32).

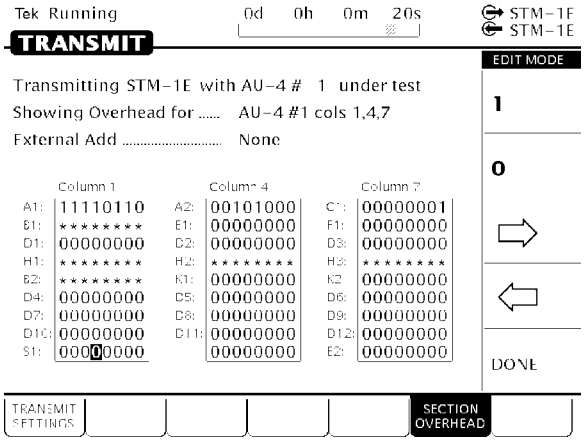

Figure 2 32: The Display in Edit Mode

To change the value of any bit within the byte, highlight the bit you wish to change. To change the value of the highlighted bit, select either 1 or 0. After you assign a value to the highlighted bit, the highlight moves to the next bit to be edited.

Edit the S1 byte to read **10101010**.

Select **DONE** when you have finished editing the byte.

You can assign preset values to the highlighted byte. For example, rather than editing each bit of the byte as you just did, you could also have selected Set to 10101010. To see that the CTS850 is now receiving the new value of the S1 byte:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RECEIVE	SECTION OVERHEAD	*none*	*none*

Verify that the section overhead for columns 1, 4, and 7 is displayed. If it is not:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
		Showing Overhead for	Cols 1, 4, 7

Look at the value of the S1 byte. You will see that it is 10101010, as previously set.

Viewing Test Results

The test has been running for several minutes and errors have been transmitted. To see the test results, you must display the RESULTS menu. To display the RESULTS menu:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	TEST SUMMARY	*none*	*none*

The TEST SUMMARY page identifies the most common errors that the CTS850 has detected. You will see a line that identifies the worst error rate detected and may find listings for other types of errors (see Figure 2 33).

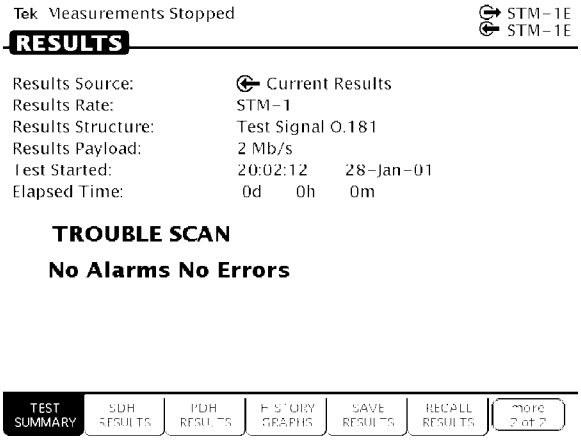

Figure 2 33: The TEST SUMMARY Page of the RESULTS Menu

The SDH or PDH RESULTS page displays all the errors that have been detected. It also displays the error ratio and the number of errored seconds that have been logged (see the following figure).

To display the SDH or PDH RESULTS page:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
	SDH or PDH RESULTS	*none*	*none*

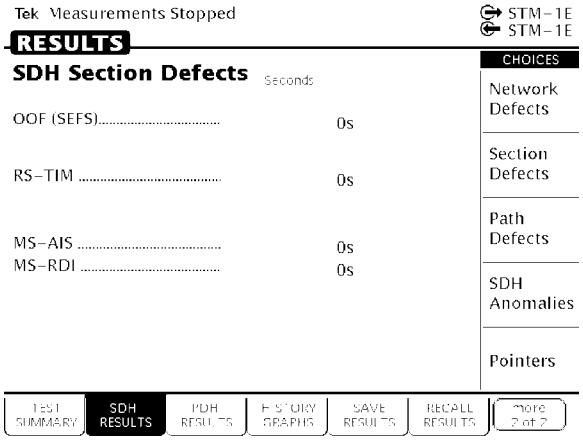

Figure 2 34: SDH Results, SDH Section Defects, from RESULTS menu

This completes the tutorial. For detailed information on CTS850 capabilities, refer to Chapter 3 *Reference*.