Viewing Results

This section describes how to view, save, recall, and print test results.

You can look at test results while a test is running or after it has completed. The CTS850 SDH/PDH Test Set can display test results as a summary or in a more detailed tabular form. The CTS850 also displays measurement history in a graphical format.

Press the RESULTS button in the middle of the front panel to call up the RESULTS menus.

G.826, M.2101.1, M.2100, and G.821 Analysis

G.826 Error Performance By monitoring Severly Errored Seconds (SES) events for both directions at a single path end point, a network provider is able to determine the unavailable state of the path. This service measure is intended for in service quality measurements of 2 Mb/s and above (including SDH rates). G.826 uses block based measurements, that is, multiple errors in a block are counted as one block error.

PDH G.826 is based on frame and CRC errors and is an in service measurement. G.826 makes use of block based measurements to get media independent results and thus is more convenient for in service measurement.

M.2101.1 This ITU T provides limits for bringing into service (BIS), and limits for maintenance of international SDH paths and international SDH multiplex sections in order to achieve the performance objectives given for a multiservice environment. These objectives include error performance (Recommendation G.826) and unavailability (Recommendation G.827).

M.2100 This measure of service quality is similar to G.821 in that is uses bit based error measurement. M.2100 combines all error sources during a one (1) errored second count without regard to source (for example, FAS, CRC 4, Code violation, etc.). Out of service measurements use a PRBS pattern, and count bit errors as well as frame related in service error types (for example, FAS, CRC 4). In service measurements count frame related in service error types only (FAS, CRC 4).

G.821 analysis is based on pattern bit errors occurring within the payload of an SDH or PDH rate signal. Bit based measurements are made on the payload with a PRBS pattern. G.821 is an out of service measurement since the normal traffic payload is replaced by a test pattern.

Viewing a Summary of Results

To display a summary of test results:

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

Figure 3 85 shows the TEST SUMMARY page. The top half of the display shows the source of the displayed results, the rate of the displayed results, the structure and payload of the displayed results, when the displayed test results started and the duration of the test (elapsed time). The Results structure is the Receive Setup structure setting for the active test, Payload is the active payload.

The bottom half of the display is where the TroubleScan feature displays information. TroubleScan provides a quick overview of test results by displaying the four most significant alarm, failure, or error conditions that have occurred during the test. The specific conditions that TroubleScan displays depends on the problems detected in the signal during the test.

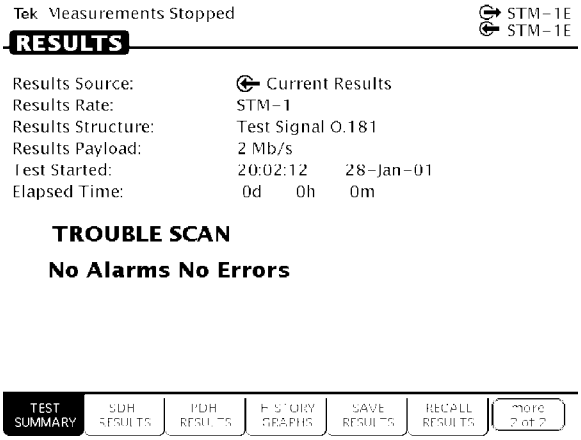

Figure 3 85: The Test Summary Page

Viewing Detailed Results

You can view results either as a summary or as a history. The summary format displays test results in a table. The history format displays test results in a graphical format.

The summary format is displayed on a number of pages in the RESULTS menu. The sub pages available under the RESULTS menu are shown in the table below.

RESULTS

Test Summary	SDH Results	PDH Results	Jitter & Wander	Error Analysis	Perf Analysis	More 1 of 2
Test Summary	SDH Results	PDH Results	History Graphs	Save Results	Recall Results	More 2 of 2

The choices available from each sub page are listed in the following table.

Table 3 37: Vertical Menu Choices, from RESULTS Sub Pages

RESULTS Sub Page	Menu choices Displayed
SDH Results	Network Defects
	Section Defects
	Path Defects
	SDH Anomalies
	Pointers
PDH Results	Network Defects
	PDH Defects
	PDH Anomalies
	PDH Slips
Jitter & Wander	Jitter
	Wander frequency
Error Analysis	SDH G.826
	PDH G.826
	SDH M.2101.1
	PDH M.2100
	Pattern Bit G.821
Performance Analysis	G.826
	M.2101.1

The following menu screens illustrate examples of the sub pages available from the RESULTS menu.

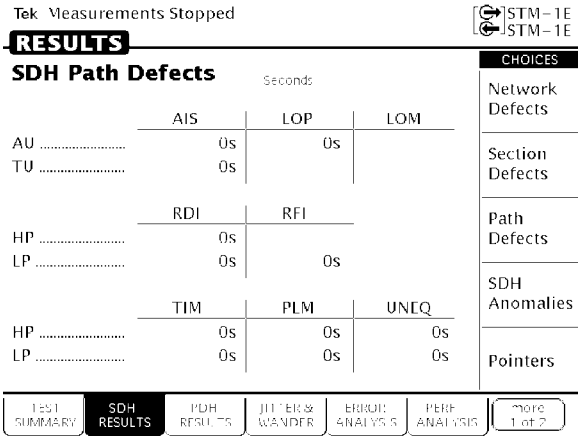

Figure 3 86: Example of RESULTS menu, SDH Results, SDH Path Defects

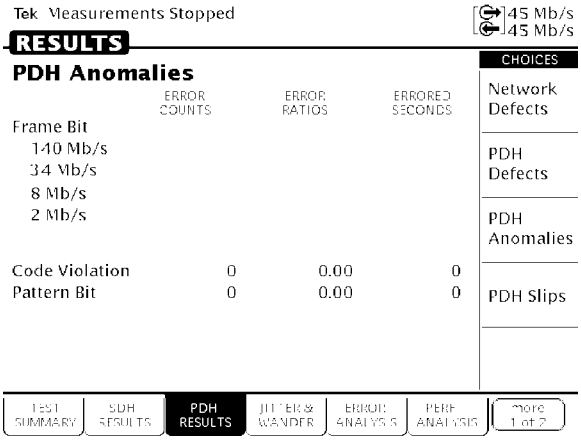

Figure 3 87: Example of RESULTS menu, PDH Results, PDH Anomalies

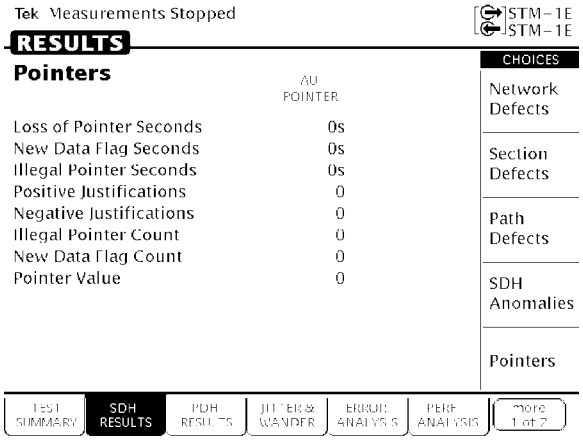

Figure 3 88: Example of RESULTS menu, SDH Results, Pointers

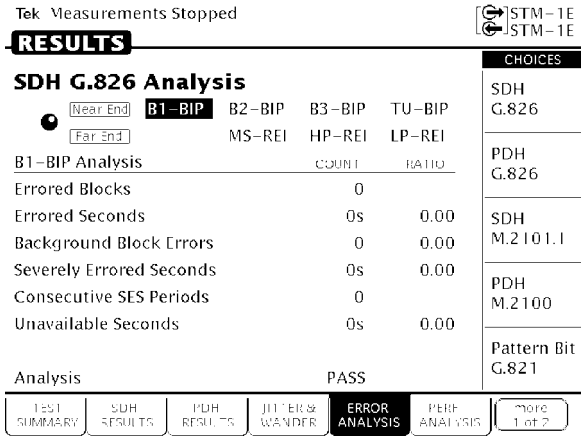

Figure 3 89: Example of RESULTS menu, Error Analysis, SDH G.826 Analysis

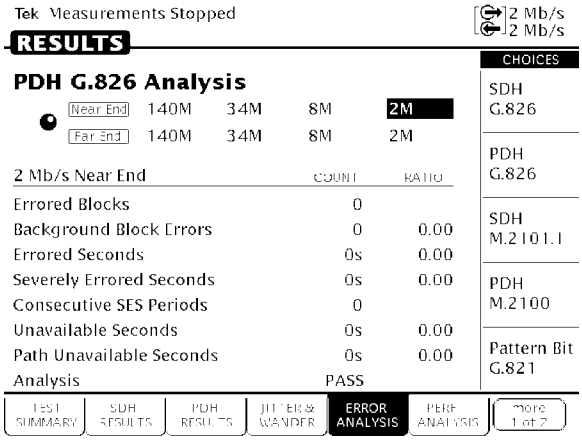

Figure 3 90: Example of RESULTS menu, Error Analysis, PDH G.826 Analysis

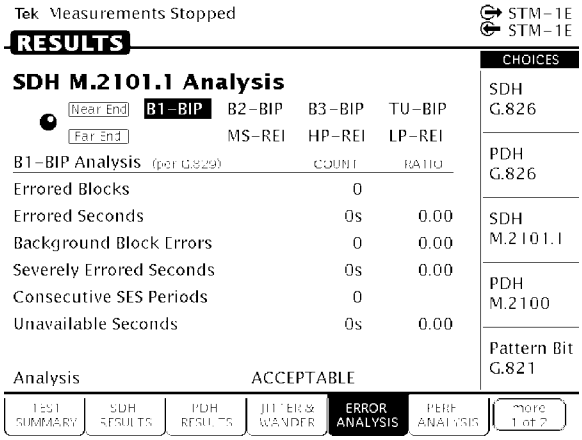

Figure 3 91: Example of RESULTS menu, Error Analysis, SDH M.2101.1 Analysis

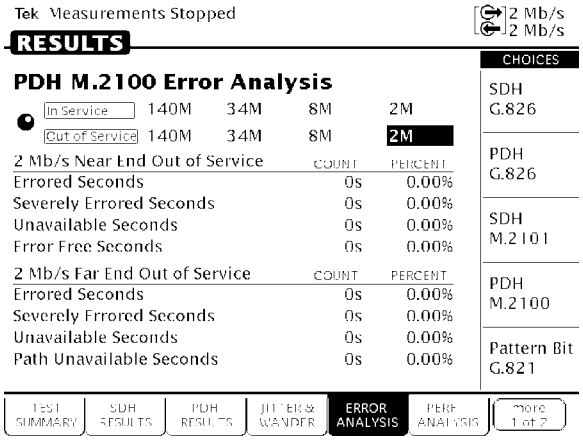

Figure 3 92: Example of RESULTS menu, Error Analysis, PDH M.2100 Analysis

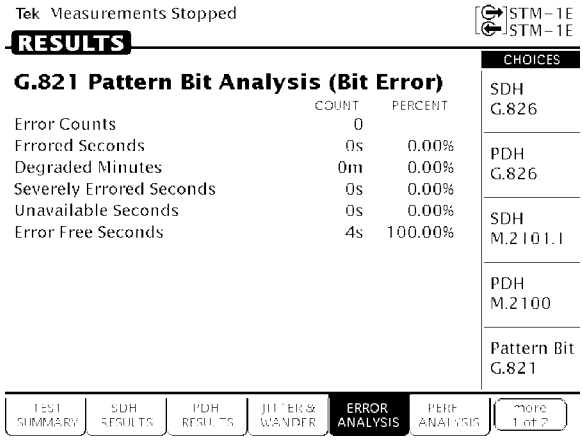

Figure 3 93: Example of RESULTS menu, Error Analysis, G.821 Pattern Bit Analysis

Displaying an Analysis of Test Results

To display an analysis of test results:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	See specific choices	*see specific choices*	

Table 3 38 lists all of the test results that are displayed on the sub pages available from the RESULTS menu.

Table 3 38: SDH Results, from RESULTS menu

Category	Error Displayed
SDH Network Defects	Loss of Signal (Seconds)
	Loss of Frame (Seconds)
	Loss of Synchronization Seconds
	CTS Loss of Power
SDH Section Defects	HP TIM
	AU AIS
	HP RDI
	TU AIS
	LP RDI
	AU LOP
	TU LOP (with PDH mapping/structure)
	TU LOM (with PDH mapping/structure)
SDH Path Defects	AU AIS; AU LOP
	Out of Frame (SEFS); MS AIS; MS RDI; RS TIM
	TU AIS; TU LOP; TU LOM
	HP RDI

Table 3 38: SDH Results, from RESULTS menu (Cont.)

Category	Error Displayed
	LP RDI; LP RFI
	HP TIM; HP PLM; HP UNEQ
	LP TIM; LP PLM; LP UNEQ
SDH Anomalies	STM FAS
	RS B1 BIP
	MS B2 BIP
	Path B3 BIP
	TU Path BIP
	Pattern Bit
	MS REI
	HP REI, LP REI
Pointers	Loss of Pointer Seconds
	New Data Flag Seconds
	Illegal Pointer Seconds
	Positive Justifications
	Negative Justifications
	Illegal Pointer Count
	New Data Flag Count
	Pointer Value

Table 3 39: PDH Results, from RESULTS menu

Category	Error Displayed
PDH Network Defects	Loss of Signal (Seconds)
	Loss of Frame (Seconds)

Table 3 39: PDH Results, from RESULTS menu (Cont.)

Category	Error Displayed
	Loss of Synchronization Seconds
	CTS Loss of Power
PDH Defects	LOCRC (Loss of CRC), LOF, AIS. RDI
	LOMF (Loss of Multiframe)
	FEMFAS
	64k TS 16 AIS; Idle
PDH Anomalies	Frame Bits (140 Mb/s, 34, 8, 2)
	Pattern Bit
	CRC4; Code Violation
	E Bit
PDH Slips	Slip Seconds (Leading, Lagging)
	64k Commanded Slips

Table 3 40: Jitter & Wander, from RESULTS menu

Category	Displayed
Jitter	Peak Peak Jitter
	Positive Peak Jitter
	Negative Peak Jitter
	Jitter Hit Seconds
	Jitter Unlocked Seconds
Timing Quality	Current Frequency Drift Rate
	Maximum Frequency Drift Rate

Table 3 40: Jitter & Wander, from RESULTS menu (Cont.)

Category	Displayed
Wander	Peak Peak Wander
	TIE
	Estimated Bit Slips (2 Mb/s rate only)
	Estimated Frame Slips (2 Mb/s rate only)
Line Frequency	Current Frequency
	Maximum Frequency
	Minimum Frequency

Table 3 41: Error Analysis, from RESULTS menu

Category	Error Displayed
SDH G.826	Near End B1 BIP; B2 BIP, B3 BIP, TU BIP *Use the front panel knob to select layer sub choices*
	Far End MS REI; HP REI; LP REI *Use the front panel knob to select layer sub choices*
	The following may or may not be available for each of the Near End & Far End sub choices above: Errored Blocks; Errored Seconds; Background Block Errors; Severely Erroed Seconds; Consecutive SES Periods; Unavailable Seconds; Path Unavailable Seconds; Analysis
PDH G.826	Near End 140M; 34M; 8M; 2M *Use the front panel knob to select parameters of interest*
	Far End 140M; 34M; 8M; 2M *Use the front panel knob to select layer sub choices*

Table 3 41: Error Analysis, from RESULTS menu (Cont.)

Category	Error Displayed
PDH G.826	The following may or may not be available for each of the Near End & Far End sub choices above: Errored Blocks; Errored Seconds; Background Block Errors; Severely Erroed Seconds; Consecutive SES Periods; Unavailable Seconds; Path Unavailable Seconds; Analysis
SDH M.2101.1	Near End B1 BIP; B2 BIP; B3 BIP; TU BIP *Use the front panel knob to select parameters of interest*
	Far End MS REI; HP REI; LP REI *Use the front panel knob to select parameters of interest*
	The following may or may not be available for each of the Near End & Far End sub choices above: Errored Blocks; Errored Seconds; Background Block Errors; Severely Erroed Seconds; Consecutive SES Periods; Unavailable Seconds; Path Unavailable Seconds; Analysis
PDH M.2100	In Service 140M; 34M; 8M; 2M *Use the front panel knob to select layer sub choices*
	Out of Service 140M; 34M; 8M; 2M *Use the front panel knob to select layer sub choices*
	The following may or may not be available for each of the In Service or Out of Servi e sub choices above: Errored Seconds; Severely Erroed Seconds; Unavailable Seconds; Error Free Seconds; Path Unavailable Seconds
Pattern Bit G.821	Error Counts; Errored Seconds; Degraded Minutes; Severely Errored Seconds; Unavailable Seconds; Error Free Seconds

Table 3 42: Performance Analysis, from RESULTS menu

The following are user selectable choices.

Category	Displayed
G.826	SDH Allocation
	PDH Allocation
	Include UAS
M.2101.1	Test Type: Bring Into Service (BIS); Performance After Repair (PAR); Maintenance; Custom
	Allocation
	Include UAS
	APO (Allocation Performance Objective) Multiplier Section ES; Path ES

Viewing Measurement Histories

The CTS850 records measurement histories whenever you run a test. Measurement histories are displayed as graphs. The graph displays how an individual measurement changed over time. The vertical axis of a graph depends on what is displayed, but the horizontal axis always displays time.

To display a history graph:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	HISTORY GRAPHS	*none*	*none*

Types of Graphs

There are three types of history graphs: bar graphs, line graphs, and on/off graphs.

Bar Graphs. Bar graphs are used for most measurements (see Figure 3 94). There are two kinds of bar graphs: a count graph that displays code violations and pointer justifications and an errored seconds graph that displays errored seconds. Table 3 43 lists the different bar graphs that can be displayed.

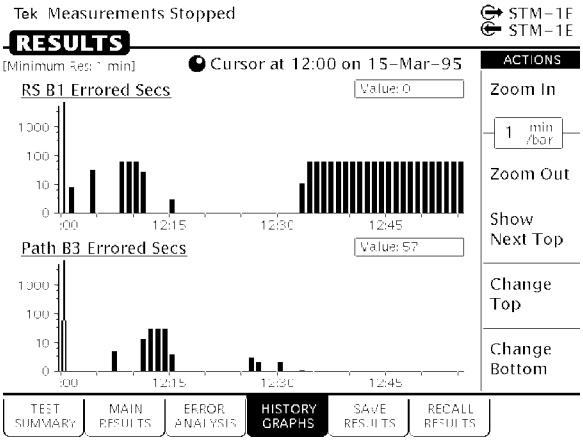

Figure 3 94: Bar Graphs Showing Code Violations and Errored Seconds

Table 3 43: Measurements Displayed as Bar Graphs

Measurement
RS B1 Error Counts
MS B2 Error Counts
MS REI Error Counts
Path B3 Error Counts
HP REI Error Counts
Pattern Error Counts
TU Path Error Counts
LP REI Error Counts
Pattern Error Counts
AU Pointer Justification
AU Pointer Value
TU Pointer Justification

Table 3 43: Measurements Displayed as Bar Graphs (Cont.)

Measurement
TU 12 Pointer Value
E1 Frame Error Counts
CRC Error Counts
Max. Peak to PeakJitter, UI
Max. Peak to PeakJitter, Log Scale
Max. Rate of Frequency Drift, ppm/sec
Jitter Status

Line Graphs. A line graph is used to display pointer movement history (see Figure 3 95). The vertical axis of the line graph ranges from 0 to the maximum, which is different for AUs and TUs. There are several measurements displayed as a line graph, as shown in Table 3 44.

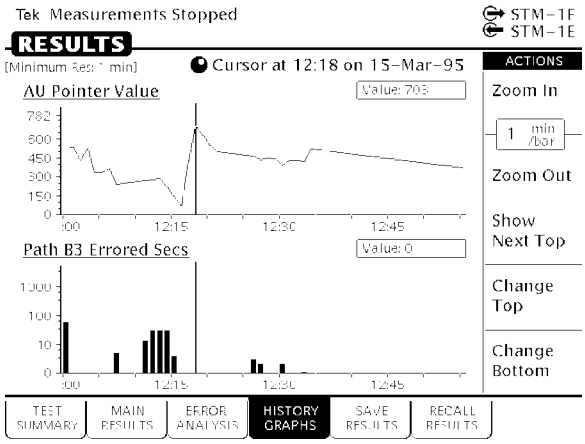

Figure 3 95: Line Graph Showing Pointer Value

Table 3 44: Measurements Displayed as a Line Graph

Displayed Value
AU-4 Pointer Value
TU Pointer Value
Delta Frequency
TIE
Frequency Drift

On/Off Graphs. On/off graphs indicate whether alarms and failures were on or off (see Figure 3 96). There are only two types of on/off graphs, as shown in Table 3 45. One type displays alarms and the other type displays failures.

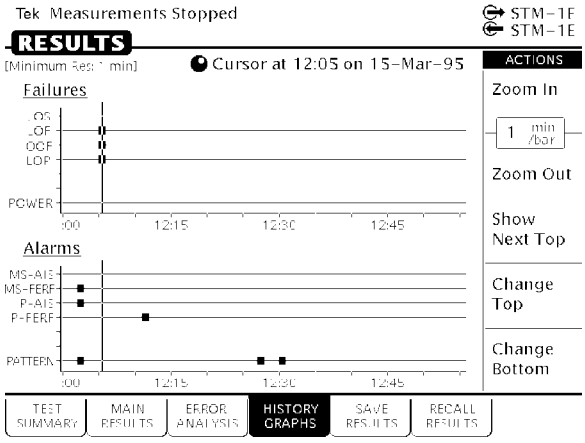

Figure 3 96: On/Off Graphs Showing Failures and Alarms

Table 3 45: Measurements Displayed as On/Off Graphs for SDH Rates

Graph Type	Displayed Value
Failures	LOS
	LOF
	OOF
	AU LOP
	TU LOP
	TU LOM
	Power
SDH Defects	MS-AIS; MS RDI; AU AIS
	HP RDI; TU AIS; LP RDI
	Pattern Lock
	HP Line; LP Line
	HP PLM; LP PLM
	LP RFI

Table 3 46: Measurements Displayed as On/Off Graphs for PDH Rates

Graph Type	Displayed Value
PDH Defects	LOF
	AIS
	RDI
	LES; LAS
	LOCRC

Elements of the History Graph Display

Figure 3 97 shows the elements of a typical history graph display. The HISTORY GRAPHS page always displays two graphs. The two graphs can be changed to display any measurement taken during a test.

Graph Name

Above each graph is a name that identifies the measurement the graph illustrates.

History Resolution

Above the graph name is a line that states the minimum resolution at which the graph can be displayed. The minimum resolution is set at the time the test is run.

Power Out Indicator

If the power to the CTS850 fails while a test is running, the CTS850 displays the words “POWEROUT” on the history graph. POWER-OUT is displayed vertically on the graph and spans the period of time the CTS850 was without power.

Cursor

The cursor is a line that is scrolled across the graph using the knob.

Cursor Position

Just below the menu name is a line that identifies the position of the cursor. Cursor position is identified by time and date.

Measurement Results at Cursor Position

To the right of the graph name is a box that displays the value of the measurement at the cursor location (the box is not displayed for history graphs of alarms or failures). If the displayed graph represents errored seconds, the measurement results box displays the number of errored seconds that occurred during the interval indicated. If the displayed graph represents an error count, the measurement results box displays the number of errors counted during the indicated interval and the resulting bit error rate (BER).

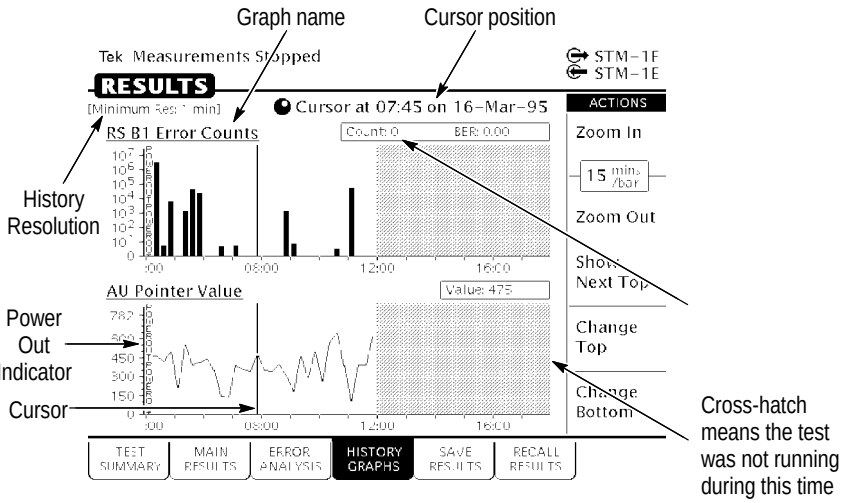

Figure 3 97: Elements of a History Graph

Zooming History Graphs

History graphs display measurement history in intervals. Each interval is represented by a bar on the history graph. The interval of time represented by a bar can be changed. Changing the interval a bar represents is called zooming. History graphs can be zoomed out or in. When a history graph is zoomed out, a bar represents a longer period of time. When a history graph is zoomed in, a bar represents a decreasingly shorter period of time. Table 3 47 lists the intervals a bar can represent, depending on the history resolution setting when the test was run.

Table 3 47: Time Represented by Bars on History Graph

History Resolution = Normal (1 min. samples)	History Resolution = Low (15 min samples)	History Resolution = High (1 sec. samples)
		1 second
1 minute	15 minutes	1 minute
5 minutes	60 minutes	5 minutes
15 minutes	4 hours	15 minutes
60 minutes	12 hours	60 minutes

There are 56 intervals of a history graph displayed on the screen at a time. At a resolution of one minute per bar, a history graph displays test results for a period of 56 minutes. At a resolution of 15 minutes per bar, a history graph displays test results for a period of 840 minutes, or 14 hours.

The minimum test duration required to display results on a history graph is one minute. Tests shorter than one minute will not display any results on the HISTORY GRAPHS page. However, test results do appear on the SDH RESULTS and ERROR ANALYSIS pages for tests shorter than one minute.

The history of test results can be recorded at three resolutions, either 1 second, 1 minute or 15 minutes. At 1 second resolution, two hours of test results can be recorded. At 1 minute resolution, five

days of test results can be recorded. At 15 minutes resolution, 75 days of test results can be recorded.

***NOTE**. When viewing long test durations (for example, five days) at a resolution of one minute, you might see a timestamp error. For example, you might see two one-minute intervals stamped with the same time. The timestamp error is simply revealing the clock accuracy. The correct number of intervals for the test duration are present.*

Panning History Graphs

You can display different portions of a history graph by panning the graph. Panning a history graph shifts the displayed section of the graph to the left or right.

At the maximum resolution of one second per bar, a history graph can display only about one hour of test results. To maintain maximum resolution, you can display the graph at maximum resolution (one second per bar) and pan to other portions of the history graph as necessary.

To pan a history graph, turn the knob.

When the knob is turned, the cursor moves across the history graph. If the history graph contains more data than will fit on the display, the history graph shifts to display additional information. The direction the display shifts depends on which direction the knob is turning.

Changing the Displayed History Graph

To change the displayed history graph:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	HISTORY GRAPHS		Show Next Top
			Change Top
			Change Bottom
		select graph with knob (see Figure 3 98)	Select Graph

- Select **Show Next Top** to automatically display the next graph on the top half of the screen.
- Select **Change Top** to select a different graph for display on the top half of the screen.
- Select **Change Bottom** to select a different graph for display on the bottom half of the screen.
- Select **Cancel** if you decide not to change the displayed graph.

Displaying Mini-Graphs

When you select either Change Top or Change Bottom from the HISTORY GRAPHS page, the selected graph is replaced by three mini-graphs (see Figure 3 98). Each mini-graph is a reduced-size version of a normal graph. Turn the knob to display a different graph. The middle graph, which is highlighted, is the graph that will be displayed full-size when you choose Select Graph. When you turn the knob, the mini-graphs scroll either up or down depending on which direction you turn the knob. Whether the next mini-graph appears at the top or the bottom depends on the direction the knob turns.

Use the mini-graph capability to view several results at once. With mini-graphs displayed, the CTS850 displays four graphs at the same

time. This will enable you to see relationships between different results that might otherwise be difficult to spot.

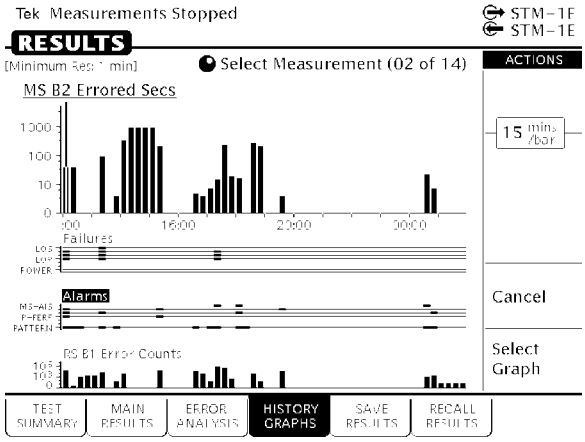

Figure 3 98: Changing the Displayed History Graph

Saving and Recalling Results

You can save the current test results to disk and recall that one set of test results for later display and analysis. If you want to save test results permanently, you must save the test results to disk.

Saving Test Results to Disk

***NOTE**. The CTS850 saves only the last 5 days (at a History Resolution of Normal) or 75 days (at a History Resolution of Low) of test results. If a test runs longer than these limits, the results older than 5 days/ 75 days are discarded.*

To save test results to disk:

1. Name the test results file as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	SAVE RESULTS (see Figure 3 99)	Name	RESLT_XX
			Clear
			EDIT NAME

- If you wish to name the results file as RESLT<Number>, you can save time by selecting **RESLT_XX**. Once you select RESLT_XX, select **EDIT NAME** and edit **XX** to the desired number (or letter). Select **DONE** when you are finished editing the setup name. Be aware that the test set only saves one set of test results to the unit's disk memory.
- Select **Clear** to remove an existing name. A message appears to remind you that you cannot save results to disk without a name.
- Select **EDIT NAME** to enter a name other than RESLT_XX for the pass/fail test. Select **DONE** when you are finished editing the test name.

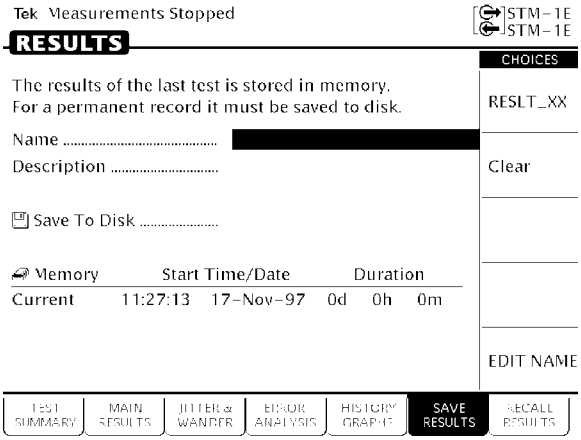

Figure 3 99: The SAVE RESULTS Page

2. Enter a description of the test results file as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	SAVE RESULTS	Description	EDIT TEXT
			None
			Clear

- **H** Select **EDIT TEXT** to enter a description of the test results, up to 24 characters long. Select **DONE** when you are finished editing the description.
- **H** Select **None** if you do not want to use a description.
- **H** Select **Clear** to remove an existing description.

3. Save the test results to disk as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	SAVE RESULTS	Save to Disk	Save Current

At the bottom of the SAVE RESULTS page is one line that identifies the current test by start time/date and by duration.

H Select **Save Current** to save the current test results.

Recalling Test Results from Disk

To recall test results from disk:

1. Insert the disk containing the test results into the disk drive.

2. Select and recall the test results file as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	RECALL RESULTS (see Figure 3 100)		Disk
		select disk file name	Recall Result

***NOTE**. The Disk action displays only files with the extensions .HST and .MST. It does not display any other files on the disk.*

To verify that the file has been recalled, select the TEST SUMMARY page and look at the Results Source line at the top of the page. The Results Source line will display the name of the file recalled.

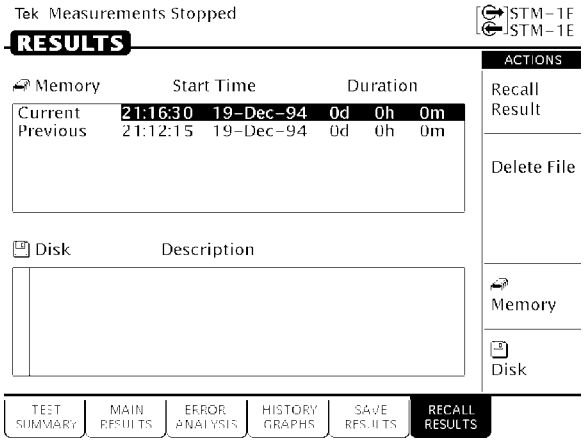

Figure 3 100: The RECALL RESULTS Page

Deleting Test Results from Disk

To delete test results from disk:

1. Insert the disk containing the test results into the disk drive.
2. Select the test results file to be deleted, as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	RECALL RESULTS (see Figure 3 100)		Disk
		select disk file name	Delete File

Recalling Test Results from Memory

To recall test results from memory:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
RESULTS	RECALL RESULTS		Memory (see Figure 3 100)

Printing Results

There are two ways to print out the results of the current test. One way is to tell the CTS850 which results to print from the print dialog box. The second way is to display the results you wish to print out and then print the displayed screen (this is the only way to print out history graphs).

Results are printed according to the Printer Type, which is set on the PRINTER SETUP page. Results can be printed to a printer or to a disk file. Results can be printed to disk in four formats: Windows BMP format, Interleaf image format, Encapsulated PostScript format, and ASCII text.

Printing Results or Error Analysis

When the CTS850 prints test results, it prints out the contents of the SDH RESULTS page or the ERROR ANALYSIS page. The printed results are reformatted so that all results fit on a single page.

Before printing results, check that the printer setup is correct. The printer setup is displayed on the PRINTER SETUP page of the UTILITY menu.

To print the results of the current test:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
PRINT (see Figure 3 101)		Print Results	
		Print Error Analysis	Print
			Abort
			EXIT

- Highlight **Print Results** and then select **Print** to print the contents of the SDH RESULTS page.
- Highlight **Print Error Analysis** and then select **Print** to print the contents of the ERROR ANALYSIS page.
- Select **Abort** to cancel a printout in process.
- Select **EXIT** if you decide not to print out any test results.

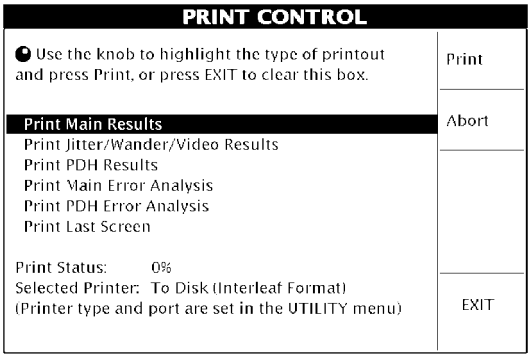

Figure 3 101: The PRINT CONTROL Dialog Box

To print the results of a test saved on disk, recall the results (see page 3 256) and then print as previously described.

Printing History Graphs

To print a history graph from the CTS850:

1. Display the history graph you want to print.

The history graph can be for the current test or it can be recalled from disk.

2. Print the history graph as follows:

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
PRINT (see Figure 3 101)		Print Last Screen	Print
			Abort
			EXIT

- Select **Print** to print the displayed history graph using the settings on the PRINTER SETUP page of the UTILITY menu.
- Select **EXIT** if you decide not to print any test results.
- Select **Abort** to cancel a printout in process.