BlueSuite
Operation Manual

EMD, Stevenage, U.K

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or

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This symbol indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This symbol indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.

This symbol indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This symbol indicates a note. The contents are described in the box.

These symbols indicate that the marked part should be recycled.

Table of Contents

About this Manual **2**

Notation conventions used in this manual 2

Glossary of Terminology 3

Scope and Purpose of this Manual 4

1. What is BlueSuite? **5**

1.1 Operating Environment 5

2. Installing the Software **6**

3. Getting Started **7**

3.1 Establishing a Connection 7

3.2 Selecting the Analysis Mode 8

3.3 Setting up the MT8850A for Analysis of Specific Packets and Payloads 12

4. The Graphs **14**

4.1 Frequency Deviation 14

4.2 Power Burst 15

4.3 IQ Diagram 16

4.4 Eye Diagram 17

5. Understanding and Controlling the Graphs **18**

5.1 Colour Coding 18

5.2 Navigating the Graphs 18

5.3 Controlling the Appearance of the Graphs 19

Appendix A: Command Reference **20**

Appendix B: Data Layout for Graph Files **21**

Appendix C: Acquiring Log Data **22**

Appendix D: GPIB Setup **23**

About this Manual

Notation conventions used in this manual

The notation conventions adopted in this manual are detailed in the table below.

[File]	Commands found within the BlueSuite windows or dialog boxes are enclosed in square brackets.
[Connection Control]	The names of windows and dialog boxes are enclosed in square brackets.
“Frequency Deviation”	Text appearing within the body of a window is enclosed in quotation marks.
[Establish Link]	The names of buttons that appear within windows or dialog boxes are enclosed in square brackets.
“Update”	Check boxes that appear in windows or dialog boxes are enclosed in double quotation marks. The term “select” is used to refer to the action of placing a tick within a check box.
[Shift]	The names of keys that appear on the PC keyboard are enclosed by square brackets.
“EUT addr”	Soft keys on the MT8850A are enclosed in quotation marks.
[Config]	Hard keys on the MT8850A are enclosed in square brackets.

Glossary of Terminology

ACL Asynchronous Connectionless Link. Packet switched connection with both synchronous and isochronous services which is suitable for both symmetric and asymmetric data transfer.

BlueSuite The Windows based application developed by Anritsu that communicates via GPIB to a remote MT8850A.

Bluetooth The open specification designed to enable short-range wireless communication between any electronic equipment.

CRC Cyclic Redundancy Check. A 16-bit error correction code added to a data packet to determine whether the packet has been received correctly.

DHx Data-High rate. High speed ACL data packets occupying either 1,3, or 5 slots. DH1 packets can carry up to 28 info bytes and cover a single time slot. DH3 packets can cover up to 3 time slots and contain up to 185 info bytes. DH5 packets can cover up to 5 time slots and contain up to 341 info bytes.

EUT Equipment Under Test. The Bluetooth equipment being tested by the MT8850A.

GPIB General Purpose Interface Bus. The communication link required to enable the BlueSuite software to acquire data from an MT8850A. A GPIB interface card and lead must be fitted to the PC to connect to the MT8850A.

LMP Link Manager Protocol. The protocol used by the Link Manager to perform link setup, configuration, and authentication.

MT8850A The Bluetooth Test Set developed by Anritsu with which the BlueSuite software communicates.

Packet A self-contained unit of information, assembled to Bluetooth specification, and transmitted/received over a Bluetooth channel.

TTL Transistor-Transistor Logic. A common type of digital logic used to design digital systems in which the output is derived from two transistors.

Scope and Purpose of this Manual

This manual has been designed as an introduction to the BlueSuite standard software package. No prior knowledge of the BlueSuite product is assumed, although a basic familiarity with the purpose and operation of the MT8850A unit is expected. The reader is also presumed to be familiar with the operation of, and terminology associated with, a Microsoft Windows operating environment.

Refer to your “MT8850A Bluetooth Test Set Operation Manual” or “Remote Programming Manual” for information relating to the Bluetooth test set hardware.

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1. What is BlueSuite?

BlueSuite is a software package designed to run in a Windows environment. The software is used to interface with, and acquire data from, the MT8850A Bluetooth Test Set to which a Bluetooth enabled product has been connected for testing. The acquired data is then presented graphically on the PC for analysis and debugging purposes that enhance the capabilities of the standard MT8850A displays. At present, communication between the PC with BlueSuite installed and the MT8850A is achieved by means of a GPIB connection although other communication media may be available in future releases.

It should be noted that BlueSuite is used purely as an interface media through which data is acquired for analysis, communications are monitored, or test results are displayed. BlueSuite does not provide, at this stage, any facilities to remotely configure or control the actual tests that are being executed by the MT8850A.

1.1 Operating Environment

The BlueSuite software is designed to operate in either a Windows 95, 98, or 2000 environment. It should be noted that performance cannot be guaranteed when installed on any other system.

Note: A GPIB interface card and lead are required to use the BlueSuite software. Refer to Appendix D for details of the GPIB configuration.

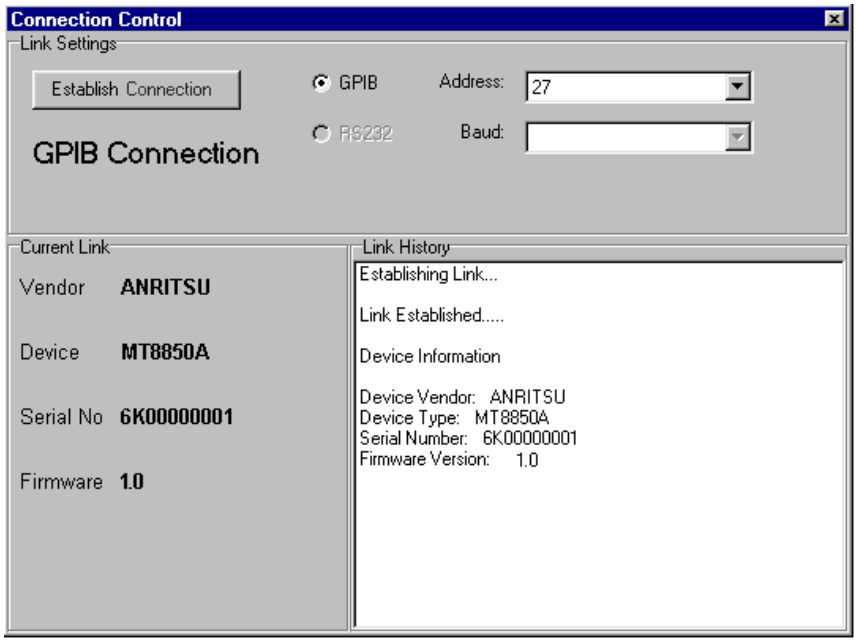
2. Installing the Software

Insert the BlueSuite CD into the drive on the PC and browse the root directory. Locate the setup file and double click to run. Follow the directions displayed to complete installation.

3. Getting Started

3.1 Establishing a Connection

When the BlueSuite application is launched the [Connection Control] dialog box appears automatically within the main window.



The [Connection Control] dialog box is made up of the three panels detailed below.

"Link Settings" This pane allows the user to select the medium for connecting to the MT8850A, and the address to use. Currently only GPIB is available, although RS232 will be available in the BlueSuite Pro release. The baud list box is for use with RS232 settings.

"Current Link" This pane allows the user to confirm the serial number and firmware version of the Bluetooth test set.

"Link History" This pane allows the user to monitor the current connection status between the PC and the MT8850A. A history of all the links created in the current session is recorded and displayed in this window.

A connection must now be established between the EUT and the MT8850A so that test data can be acquired for analysis. Single Slot, Multi Slot and Max Power tests must have completed for graph updates.

(i) Specify the GPIB address of the MT8850A at the "Address" text box. (The default GPIB address for MT8850A is 27.)

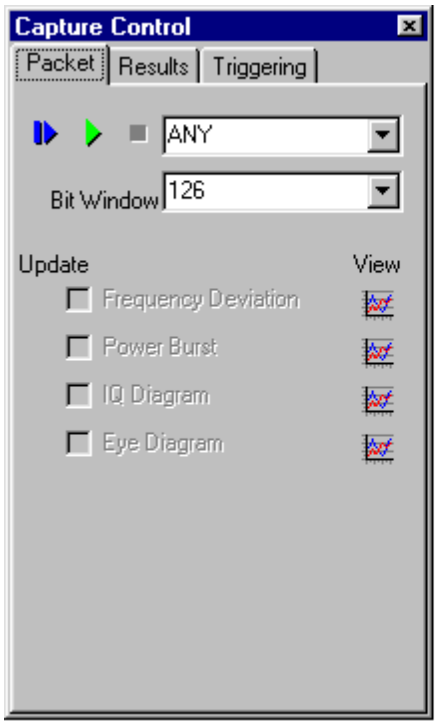
(ii) Click [Establish Connection] to connect.

(iii) The capture control icon is now enabled on the main window toolbar to launch the [Capture Control] dialog box.

3.2 Selecting the Analysis Mode

The [Capture Control] dialog box is split into the following three tabbed pages.

The [Packet] tab



The [Packet] tab allows the user to set the packet type to be captured and the analysis graphs to be displayed. The items in the [Packet] tab are detailed below.

Packet list box: It is possible to request a specific type of packet. Five packet types are available.

- ANY — Retrieves the number of bits specified in the bit window box from the last packet received. This is the default selection. Select from 126, 366, 1622, or 2870 bits.
- NULL — Retrieves the last NULL packet. (A NULL packet consists of the channel access code and packet header only.)
- DH1 — Retrieves the last DH1 packet.
- DH3 — Retrieves the last DH3 packet.
- DH5 — Retrieves the last DH5 packet.

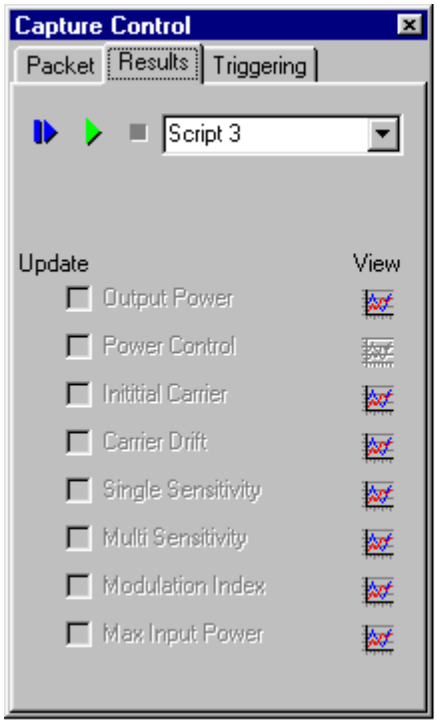
Graph selection: There are four graphs available in BlueSuite, “Frequency Deviation”, “Power Burst”, “IQ Diagram”, and “Eye Diagram”. Click the view box to the right of each graph to launch the corresponding graph window, and select the “Update” check boxes to the left to refresh the data. The four graph types are explained in detail in chapter 4.

Capture Single icon	Instructs the MT8850A to capture one packet, and acquires the test results from the device.
Stop Button icon	Stops data being collected from the unit.
Constant Capture icon	Instructs the MT8850A to continuously capture packets and retrieves the results, until the stop button is pressed.

Data acquisition timing

When the instruction is given by the user to acquire test data, BlueSuite sends a request to the MT8850A for it to direct all received Bluetooth packets into a buffer that stores the last received packet. It then asks for the contents of that buffer at a rate in line with its ability to process the data and display it on screen. This means that the data displayed is a snapshot of the data being received at the time of request (assuming a Bluetooth link is established and maintained between the MT8850A and the EUT). BlueSuite will continue to request a particular type of packet until it becomes available, although this can be aborted at any time using the Stop button.

The [Results] tab

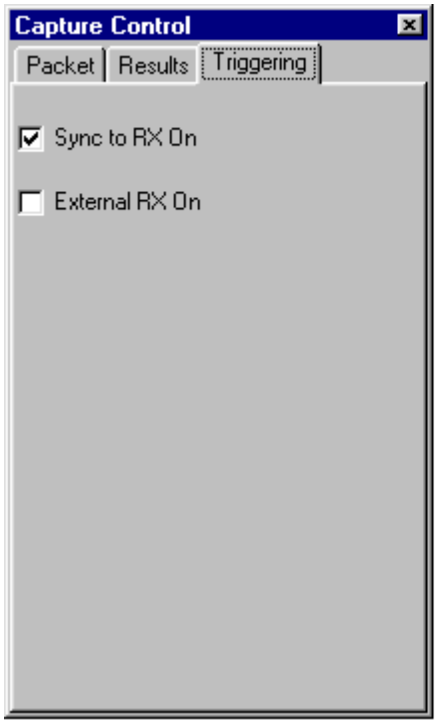


The results tab works in a similar fashion to the [Packet] tab. The data captured from this tab however is simply the measurement results for the selected script, and the items on the [Results] tab are the same as those available on the MT8850A. The result screens generated are also designed to mimic those on the MT8850A.

The eight checkboxes are selected and updated in the same manner as the check boxes on the [Results] tab. Click the view buttons to launch the corresponding result window, and select the “Update” checkbox to update the result screen when data is collected.

Capture Single icon	Instructs the MT8850A to run the script once.
Stop Button icon	Stops data being collected from the unit.
Constant Capture icon	Instructs the MT8850A to run the script continuously. (The PC screen is only updated when the script is complete.)

The [Triggering] tab



There are two options available to allow the user to select the way in which data is captured.

“Sync to RX On”:	Selecting this option results in the capture of only packets received from the EUT in a Bluetooth link. If this is switched off, BlueSuite can be used to analyze EUT transmitter properties outside of a link.
“External RX On”:	This option allows capture of data, with the start of a packet defined by the rising edge of a TTL signal connected to the external trigger port of the MT8850A.

3.3 Setting up the MT8850A for Analysis of Specific Packets and Payloads

BlueSuite software captures packets from a Bluetooth link between the MT8850A and an EUT. If analysis of a specific packet type is required, it is necessary to configure the Bluetooth link to provide that packet type and payload continuously. Four packet lengths can be analysed, NULL packets, DH1, DH3 and DH5. Three payload formats are possible, PRBS9, 11110000 and 10101010.

Viewing NULL packets

To view Null packets, it is simply required to establish a link between the MT8850A and the EUT. This can be done without the EUT entering test mode or running any tests on the MT8850A.

i. Select an editable script (3 to 10)

ii. Press the “EUT addr” soft key.

iii. Set the “Address Source” to “INQUIRY” if the EUT address is not known. Alternatively, set to “MANUAL” and then specify the EUT Bluetooth address.

iv. Press the [Config] hard key.

v. Select “System features”.

vi. Select “Connection Control”.

vii Select “ACL connection only”. If “EUT addr” is set to “MANUAL” and the correct address has been entered, the MT8850A will establish a link with the EUT. If the EUT address is set to “INQUIRY”, select the address of the EUT from those that are displayed.

Note: To return the MT8850A to “Local” status it is first necessary to stop BlueSuite capturing data by clicking the stop icon.

Viewing PRBS9 payloads, all DH packet lengths

The simplest way to view a given DH packet, continuously updating, is to run an output power test in single test mode and in a loop.

i. Select an editable script (3 to 10).

ii. Select “Output power”.

iii. Press the “Single” soft key.

iv. Press the “Setup” soft key and set the following conditions.

Hopping test mode:	ANY
Number of packets:	1000
Test type:	Loopback
Packet type:	DHx

v. Press the [Loop] hard key.

Note: To return the MT8850A to “Local” status it is first necessary to stop BlueSuite capturing data by clicking the stop icon.

Viewing “10101010” and “11110000” payloads

The simplest way to view 10101010 and 11110000 payloads, continuously updating, is to run a modulation index test in single test mode and in a loop.

i. Select an editable script (3 to 10)

ii. Select “Modulation index”.

iii. Press the “Single” soft key.

iv. Press the “Setup” soft key and set the following conditions.

Number of packets:	1000
Test type:	Loopback
Packet type:	DHx

v. Press the [Loop] hard key.

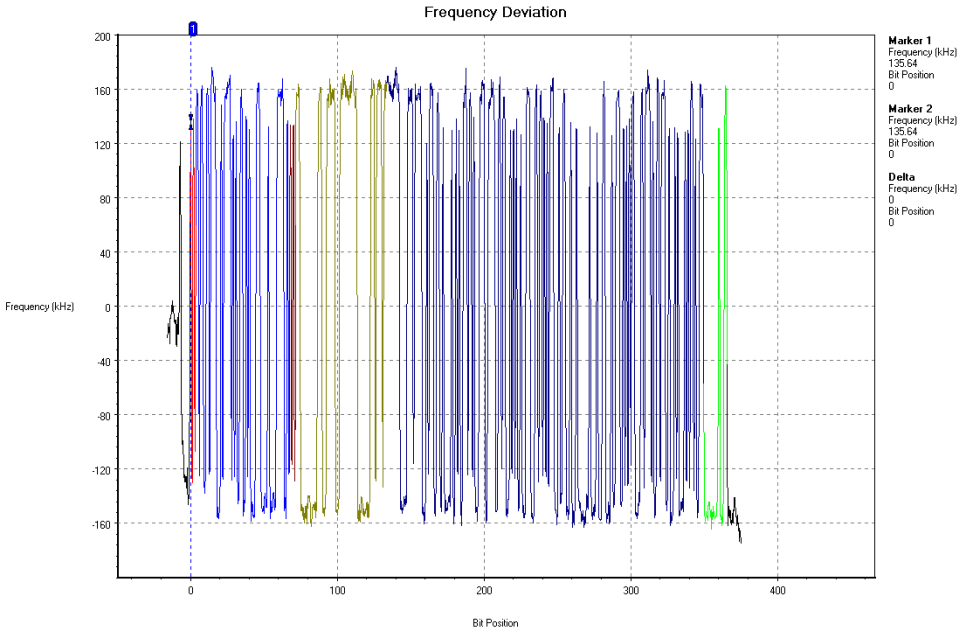
Note: To return the MT8850A to “Local” status it is first necessary to stop BlueSuite capturing data by clicking the stop icon.

4. The Graphs

The data used to produce the graphs is derived from the same data block used by the MT8850A for its own measurements. This data block is an array of frequency/magnitude vectors, and includes a calculated offset to the start of a packet (P0) when viewing triggered data. The graph windows are purely used to display graphs. They have no buttons, but the graphs can be manipulated by clicking and dragging with the mouse as detailed in chapter 5.

4.1 Frequency Deviation

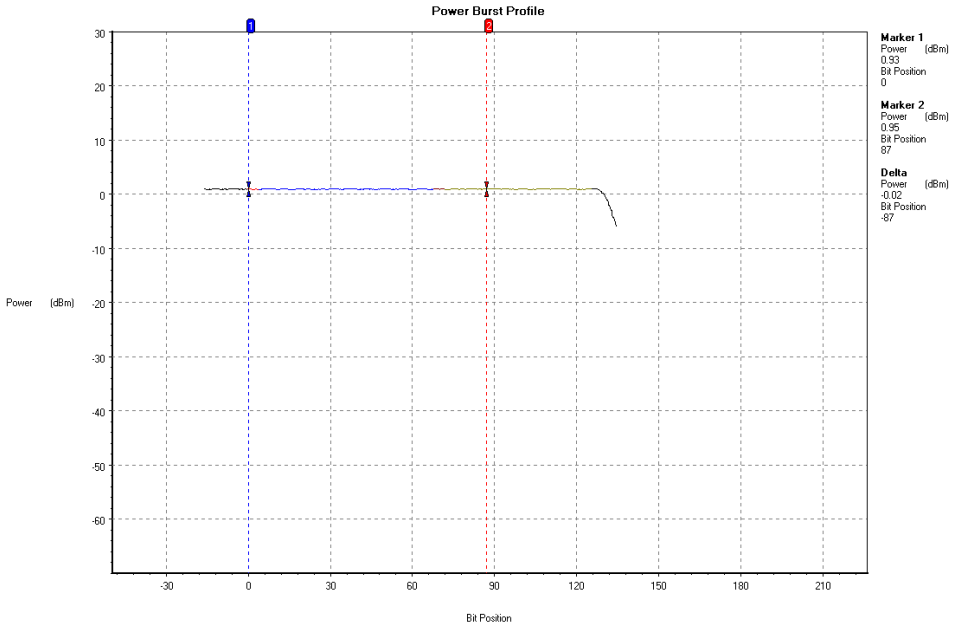
This graph displays frequency deviation plotted against packet bit position of the incoming signal measured at the MT8850As receiver. The start of the data is defined as per the triggering options.



Graph 1: Frequency deviation plotted against bit position of the incoming signal.

4.2 Power Burst

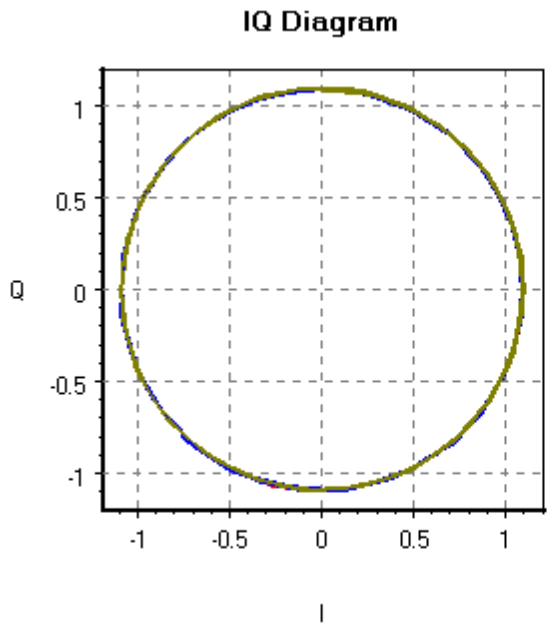
This graph displays the received power level from the EUT, measured at the MT8850A's receiver, plotted against bit position. The start of the data is defined in line with the triggering options.



Graph 2: Received EUT power level plotted against time.

4.3 IQ Diagram

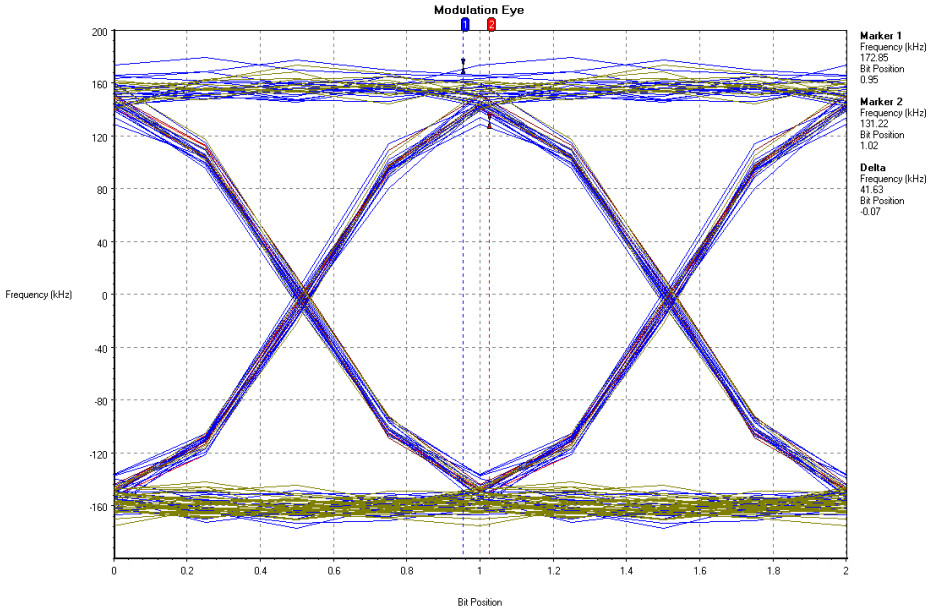
This graph displays phase versus magnitude in polar co-ordinates. Phase is represented by rotation, and magnitude by the distance from the implied origin. This should take the form of an arc, the origin is that implied by the arc. The IQ diagram is normalised to a value of one, which is the equivalent of a received power level of 0dBm.



Graph 3: Phase versus magnitude in polar co-ordinates.

4.4 Eye Diagram

Data received by the MT8850s is displayed as an eye diagram to provide a visual indication of an EUT's transmitter quality. The EUT should be transmitting back to the MT8850A at the highest level possible (preferably 0dBm). The eye diagram displays any distortion in the received data from the EUT, such as inter-symbol interference. The maximum opening of the eye will correspond to the bit 1 position of the horizontal scale +/- 1 sample (0.25uS).



Graph 4: EUT eye diagram.

5. Understanding and Controlling the Graphs

5.1 Colour Coding

The graphs that display are colour coded for easy recognition of the sections of the data packet. The colours carry the following meanings.

Black:	Data outside the packet
Red:	Preamble
Light blue:	Sync word
Maroon:	Trailer
Dark green:	Header
Dark blue:	Payload
Light green:	CRC

5.2 Navigating the Graphs

Various functionality is available to allow the user to more easily view and analyse the data presented in the graph.

Zooming

Zoom in (enlarge) any given section of the graph by holding down the left mouse button and dragging the pointer around the desired area. The selected area is enlarged to fill the entire graph when the mouse button is released. Clicking the right mouse button returns the axis to the default scales.

Scrolling

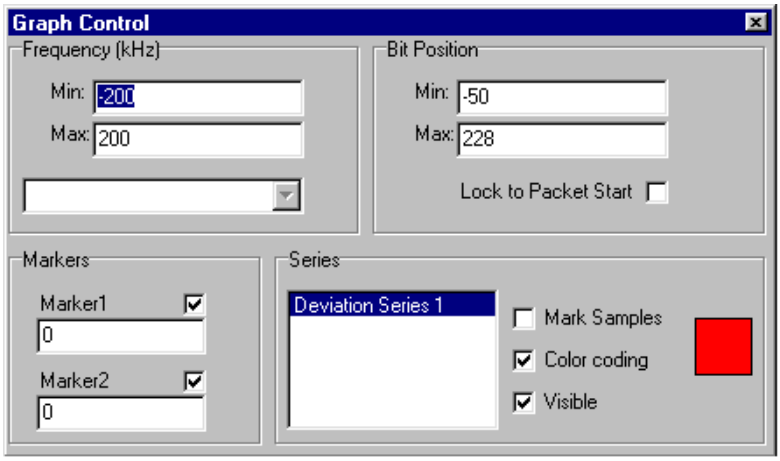
Scrolling can be performed by holding down the [Shift] key on the keyboard and dragging with the left mouse button. The graph can be scrolled in any direction in this manner.

Setting Markers

Marker positions can be set by holding down the [Ctrl] key and pressing either the left mouse button to control marker 1, or the right mouse button to control marker 2. Markers will normally lock the currently selected series' data. If the data is off screen the marker will not be drawn.

5.3 Controlling the Appearance of the Graphs

The [Graph Control] dialog box gives the user control of the currently selected



graph window.

The dialog box is made up of four panes.

Upper panes

The upper two panes allow the user to specify the maximum and minimum values for the axes of the current graph. The titles assigned to these panes change to the corresponding axis on the selected graph window. The [Enter] key must be pressed before the value is sent to the graph. The pane that controls the horizontal axis of the graph allows the user to lock to packet start (not enabled for all graphs). This locks the axis minimum to zero when it is selected, and returns the graph to its previous value when it is unchecked.

"Markers" pane

The "Markers" pane contains a text box and a check box for each marker. The check box controls each marker's visibility, and the text box controls its position relative to the horizontal axis.

"Series" pane

The "Series" pane contains a list box of the series available in the current graph, identified by the series title. Once a series is selected you can control its parameters with the other controls. There are also three check boxes as detailed below.

"Mark Samples"	Select to denote each data point on the graph with a small circle.
"Color coding"	This controls whether the data takes on the colour assigned to it during capture, or is a single colour. The coloured square on the right denotes the series colour used when colour coding is disabled. This can be changed by clicking the square and choosing a different colour.
"Visible"	Controls visibility of series.

Appendix A: Command Reference

This section provides details of the commands found within the menus of the main BlueSuite window. For ease of operation certain of the major commands have been made available as icons on the toolbar, and when this is the case the icon is pictured next to the command.

[File]	[Save Data]	Used to output the data in the currently selected graph window to a raw text file. The file is separated by "\r\n" tokens (new line) and all data is in text format. The layout of the data file is detailed in appendix B.
	[Save Image]	Used to produce an image file of the currently selected graph window. Image formats available are bitmap (.bmp) and metafiles/enhanced metafiles (.wmf, .emf). The user can select the name and location of the file using a file browser.
	[Print]	Used to create a print file and send it to the selected printer context.
	[Exit]	Used to terminate the application.
[Tools]	[Connection Control]	Launches the [Connection Control] dialog box.
	[Capture Control]	Launches the [Capture Control] dialog box.
	[Graph Control]	Launches the [Graph Control] dialog box.
	[LMP Logging window]	Used to acquire a log of the link manager protocol messages transmitted between the MT8850A and the EUT.
[Window]	[Tile vertically]	Used to position windows vertically for ease of viewing.
	[Tile horizontally]	Used to position windows horizontally for ease of viewing.
	[Cascade]	Used to cascade windows across the screen.
[Help]	[About]	An [About] dialog box containing version information.

Appendix B: Data Layout for Graph Files

The structure of the raw text file generated with the [Save Data] command is detailed below.

//HEADER SECTION
Chart Tag (integer value) – for internal use by BlueSuite.
Series Count (integer value) – number of series on this graph.
//DATA SECTION….. repeated for each series

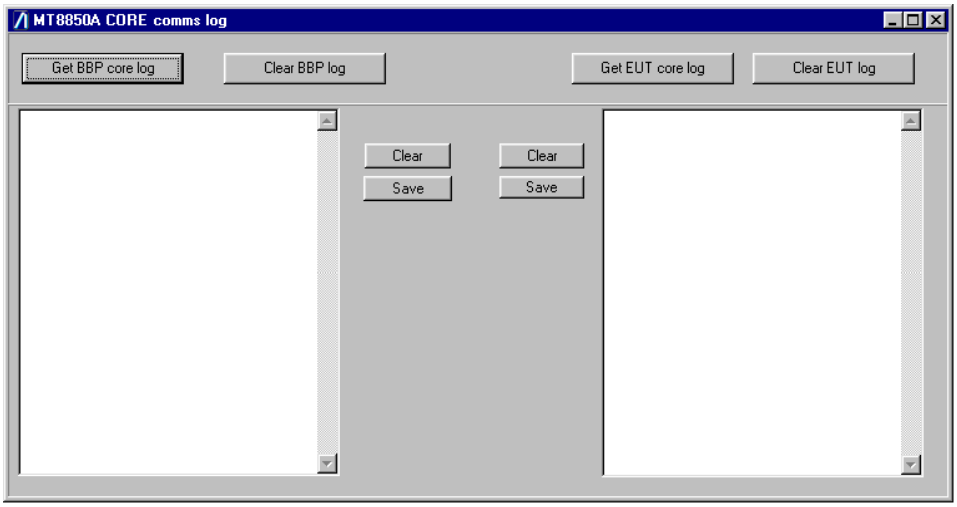
//SERIES HEADER
Series Title – Title for identifying series
Series Points – Count of points in series.

//XVALUES HEADER
"xvalues" – constant string
//X VALUES…. Repeated for each series point
X Value (double value) – half a data point

//YVALUES HEADER
"yvalues"
//Y VALUES…. Repeated for each series point
Y Value (double value) – half a data point

Appendix C: Acquiring Log Data

In the event of interoperation issues between the MT8850A and the EUT, the log window shown below is used to acquire a log of the link manager protocol messages passed between the MT8850A and the Bluetooth EUT. The log data window can be displayed by selecting the [LMP Logging Window] command from the [Tools] menu of the main window.



[Get BBP core log]	Acquires the MT8850A's log of LMP messages.
[Clear BBP log]	Clears the MT8850A's log of LMP messages.
[Get EUT core log]	Acquire the log of LMP messages on the EUT connected to the MT8850A.
[Clear EUT log]	Clear the log of LMP messages on the EUT connected to the MT8850A.
[Clear]	Clear the corresponding list box (the one closest).
[Save]	Launches a save dialog box allowing the saving of the text in the corresponding list box to a file.

Appendix D: GPIB Setup

The following GPIB driver configuration setup is recommended for reliable GPIB communication with the ML8850A Bluetooth Test Set. The setup is expressed in the terms used by the National Instruments GPIB ISA and PCI cards and drivers for Windows and DOS.

GPIB Device Tem-plate

The ML8850A Series default primary address is 27. Separate device tem-plates for the primary address of each device can usually be set up separately. The settings for the device template for the ML8850A are:

Terminate read on EOS:	NO
Set EOI with EOS on write:	YES
Type of compare on EOS:	8 bit
EOS byte:	0x0A (10 decimal)
Send EOI at end of write:	YES
Readdressing:	YES
Secondary address:	NONE

GPIB Card Settings

The recommended GPIB card settings for use with the ML8850A are:

Terminate read on EOS:	NO
Set EOI with EOS on writes:	YES
Type of compare on EOS:	8 bit
EOS byte:	0x0A (10 decimal)
Send EOI at end of write:	YES
System controller:	YES
Assert REN when SC:	YES
Enable Auto Serial polling:	NO
NI card. Cable length for HS488:	OFF

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