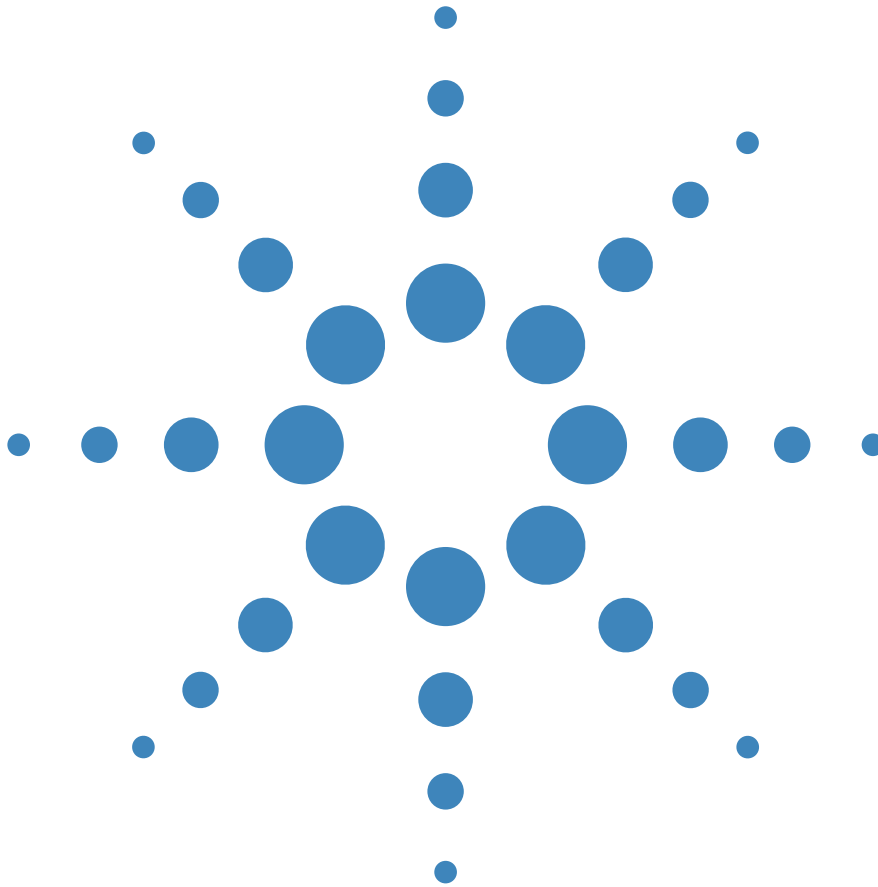


# Agilent E1852B Bluetooth™ Test Set



**Operating Guide**  
Release B.00.06



**Agilent Technologies**

## General

Information contained in this document is subject to change without notice. Agilent Technologies makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Agilent Technologies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishings, performance, or use of this material. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of Agilent Technologies.

The E1852B is listed as a Development Tool for Bluetooth SIG purposes.

Copyright 2001 Agilent Technologies  
Station Road, South Queensferry, Scotland,  
EH30 9TG, UK.

Bluetooth is a trademark owned by the  
Bluetooth SIG, Inc.

Microsoft Windows, 95, 98, NT are U.S.  
registered trademarks of Microsoft Corporation

Pentium is a U.S. registered trademark of Intel  
Corporation.

**Agilent Part No. E1852-90019**

**Printed in UK**

February 2003

## Legal Information

### Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

### Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of three years from date of shipment. During the warranty period, Agilent Technologies will at its option, either repair or replace products which prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges, duties, and taxes for products returned to Agilent Technologies from another country. Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument, or firmware will be uninterrupted or error free.

### Limitation of Warranty






The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance. NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AGILENT TECHNOLOGIES SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

### Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT TECHNOLOGIES SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

# Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

	The Instruction Documentation Symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the supplied documentation.
	Alternating current (AC)
	This symbol indicates the operating switch for 'On' mode.
	This symbol indicates the position of the operating switch for 'Off' mode.
	This symbol indicates that a device, or part of a device, may be susceptible to electrostatic discharges (ESD) which can result in damage to the product. Observe ESD precautions given on the product, or its user documentation, when handling equipment bearing this mark

## Safety Notices

This guide uses warnings and cautions to denote hazards

### WARNING

A warning calls attention to a procedure, practice or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning until the indicated conditions are fully understood and met.

### CAUTION

A caution calls attention to a procedure, practice or the like which, if not correctly performed or adhered to, could result in damage to or the destruction of part or all of the equipment. Do not proceed beyond a caution until the indicated conditions are fully understood and met.

# General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

## **WARNING**


**This is a Safety Class I instrument (provided with a protective earthing ground, incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.**

DO NOT defeat the earth-grounding protection by using an extension cable, power cable, or auto transformer without a protective ground connector. If you are using an auto transformer, make sure its common terminal is connected to the protective earth contact of the power source outlet socket.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gasses or fumes.

DO NOT use repaired fuses or short-circuited fuseholders: For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type.

DO NOT perform procedures involving cover or shield removal unless you are qualified to do so: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only.



**DO NOT service or adjust alone:** Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, service personnel must not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

**DO NOT operate damaged equipment:** Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, **REMOVE POWER** and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Agilent Sales and Service Office for service and repair to ensure the safety features are maintained.

**DO NOT substitute parts or modify equipment:** Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office for service and repair to ensure the safety features are maintained.

# Welcome

Welcome to the E1852B Bluetooth Test Set *Operating Guide*!

The E1852B Bluetooth Test Set provides a low-cost, stand-alone route to proving the performance of Bluetooth devices with measurements on both the transmit and receive paths.

Using the supplied PC user interface you can quickly perform critical RF measurements such as:

- initial carrier frequency error
- FM deviation
- peak and average power
- Bit Error Rate (BER)

Functional testing includes:

- establishing a link using standard Bluetooth protocol
- using page mode for 1-second link set up
- using a frequency hopping source and receiver with known performance

More detailed analysis and fault finding is possible using:

- frequency versus time
- power versus time
- power versus channel number

The CVSD CODEC allows you to send and receive audio signals via rear panel connections and use external signal generators and analyzers to measure the audio performance of a DUT.

To help you develop your own applications, all the commands are logged when using the user interface in ‘debug’ mode. Using standard Windows’ tools, you can copy the commands and paste them into a program to quickly create an automated test sequence.



## Test & Measurement E-mail Updates

Keep up to date with Agilent's free Test and Measurement E-mail Updates. As a subscriber, you will receive customized E-mail updates that match your subject and frequency interests. Your updates will include support, products and services, applications, promotions, events, and other areas.

Subscribe today: <http://www.agilent.com/find/emailupdates>. Our Privacy Statement at <http://www.agilent.com/go/privacy> describes our commitment to you regarding your privacy. Please direct any questions about Agilent's privacy program to [privacy\\_advocate@agilent.com](mailto:privacy_advocate@agilent.com).

More information on Agilent Technologies' Bluetooth solutions is available at: [www.agilent.com/find/assist](http://www.agilent.com/find/assist)

For more assistance with your test & measurement needs or to find your local Agilent office go to: [www.agilent.com/find/bluetooth](http://www.agilent.com/find/bluetooth)

# Documentation Information

This guide is only part of the information supplied. The documentation consists of:

- The *Installation Guide* - Shows you how to check your Bluetooth test set, switch it on and connect it to a Device Under Test. The *Installation Guide* is supplied as a printed book and as an Adobe Acrobat PDF (Portable Document Format) file on the supplied CD-ROM.
- The *Operating Guide* - (*this guide*) - Shows you how to operate your Bluetooth test set from the supplied PC User Interface or using the remote command set.

## Conventions Used in this Guide

The following text conventions are used in this guide.

<b>Run</b>	used to represent the text in the PC interface
<b>Parameter</b>	used to represent a parameter, value or data in an entry field

## Abbreviations Used in this Guide

The following abbreviations are used in this guide.

<b>BD</b>	Bluetooth enabled Device
<b>EUT or DUT</b>	Equipment or Device Under Test
<b>NTP</b>	Normally Transmitted Power or Average Burst Power
<b>PTP</b>	Peak Transmitted Power
<b>BS</b>	Bit Sequence

## Specifications

Full specifications are listed in “Specifications and Characteristics” on page 209.





# Contents

## Introduction

---

Introduction .....	12
External Connections .....	13
Installing the PC Software .....	21

## Making Measurements

---

Configuring the System for Measurements .....	36
Measurement Filtering Techniques .....	39
Power Measurements .....	43
Frequency and Modulation Measurements .....	45
Sensitivity Measurements .....	56
Audio Measurements .....	59

## PC User Interface

---

Introduction .....	70
System Page .....	73
Test Mode Page .....	83
Test Mode Measurement Windows .....	91
Normal Mode Page .....	100
Normal Mode Measurement Window .....	103
RF-Gen Page .....	105
RF-Analyzer Page .....	109
Self-test Page .....	113
Set-up Page .....	115
About Page .....	120

---

## DLL Interfacing

---

Introduction . . . . .	122
DLL Interface . . . . .	123
Calling Convention . . . . .	124
General Format . . . . .	125
Explicit DLL Linking . . . . .	126
Implicit DLL Linking . . . . .	130
Agilent Vee Pro DLL Linking . . . . .	131

## Programming Reference

---

Introduction to the SCPI language . . . . .	134
Configuring the Remote Interface . . . . .	137
Detailed Command Descriptions . . . . .	142
Command Structure . . . . .	200
Sending Commands from the User Interface . . . . .	204
System Error Codes . . . . .	206
Example Program . . . . .	207

## Specifications and Characteristics

---

Introduction . . . . .	210
Functionality . . . . .	211
Performance . . . . .	213
General Specifications . . . . .	215
Regulatory Information . . . . .	217

## Maintenance

---

Self Test . . . . .	220
LED Indicators . . . . .	222
Operator Maintenance . . . . .	223
Contacting Agilent Technologies . . . . .	227
Calibration and Service . . . . .	230



# 1 Introduction

## **What You'll Find In This Chapter**

This Chapter introduces you to the E1852B Bluetooth Test Set.

It contains these sections:

- Introduction on page 12
  - Rear Panel Connections on page 13
  - Front Panel Connections on page 20
-

# Introduction

The E1852B Bluetooth Test Set supports a range of different tests as specified in the Bluetooth RF Test Specifications. It is a stand-alone piece of test equipment and can be used for high throughput manufacturing applications, and as a development or service tool.

For some test situations specified in the Bluetooth RF Test Specifications, additional test equipment, such as an Agilent ESA Spectrum Analyzer or Agilent ESG Signal Generator, can be used to compliment the E1852B bluetooth test set measurements. Consult Agilent Technologies for further details.

The test set is basically a Bluetooth Host Controller with added test capabilities. Used as a test set it acts as the Bluetooth master and the Device Under Test (DUT) acts as the Bluetooth slave.

You can operate the test set using the supplied PC user interface or by sending SCPI format commands, either in the Windows environment or from within a test executive.

The operation of the DUT is controlled via the Air Interface. Using the standard test mode commands, you can set the DUT into test mode and carry out Transmitter and Loop-back Tests.

Bluetooth RF components that are unable to establish a link can be tested using RF Analysis and RF Generator modes.

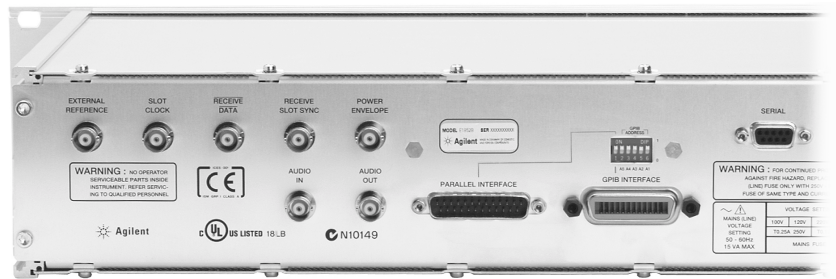
In addition to the RF IN/OUT port for connection with the DUT, several additional front and rear panel connections are provided. These are shown in the Installation Guide and in External Connections on page 13. With the Counter Input on the front panel, the test set can also be used as a frequency counter, measuring system frequencies of a Bluetooth device up to 15MHz.

# External Connections

## Rear Panel Connections

The E1852B Bluetooth Test Set provides rear panel input/outputs for the following functions:

<b>External Reference</b>	10 MHz timebase signal input
<b>Slot Clock</b>	A 1 $\mu$ s wide TTL trigger output at the Bluetooth frame rate (625 $\mu$ s)
<b>Receive Data</b>	Inverted analogue output of the demodulated signal
<b>Receive Slot Sync</b>	A 1 $\mu$ s wide TTL trigger output synchronized with the start of a received burst
<b>Power Envelope</b>	Analog output of the RF power
<b>Audio In</b>	Audio signal input
<b>Audio Out</b>	Recovered audio modulation signal output
<b>Parallel Interface</b>	25 pin male D-type connection for communication with a PC
<b>Serial</b>	9 pin female D-type for downloading firmware
<b>GPIB</b>	Standard GPIB connection for communication with a PC system controller



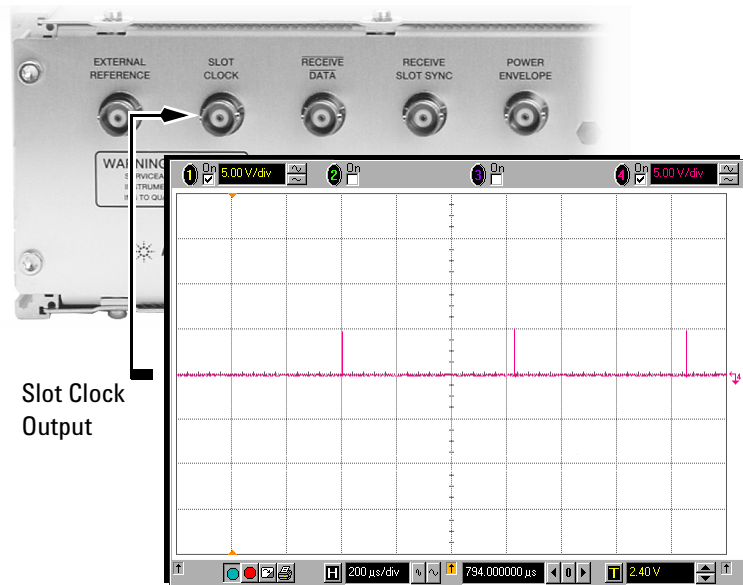
**Figure 1 Rear Panel Connections**

**External Reference** 10 MHz timebase signal input.



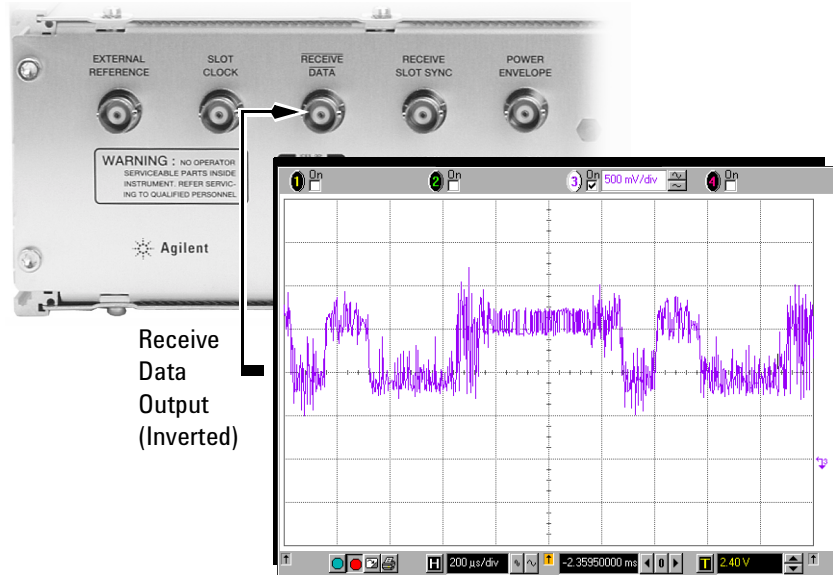
**Figure 2 10 MHz Timebase Input**

**Slot Clock** 1 $\mu$ s wide TTL level pulses at 625 $\mu$ s intervals (Bluetooth frame rate).



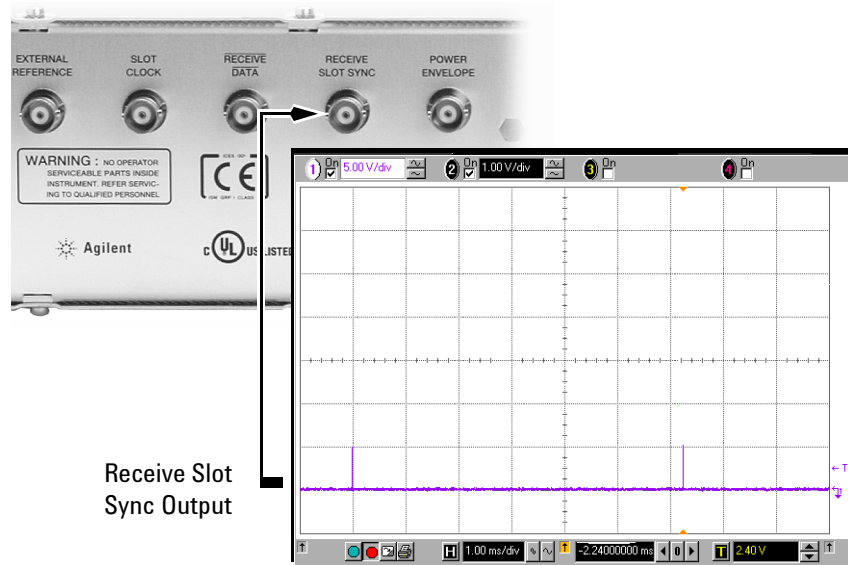
**Figure 3 Slot Clock Output (with DH1 data)**

**Receive Data** INVERTED analogue output of the demodulated signal.



**Figure 4 Receive Data Output**

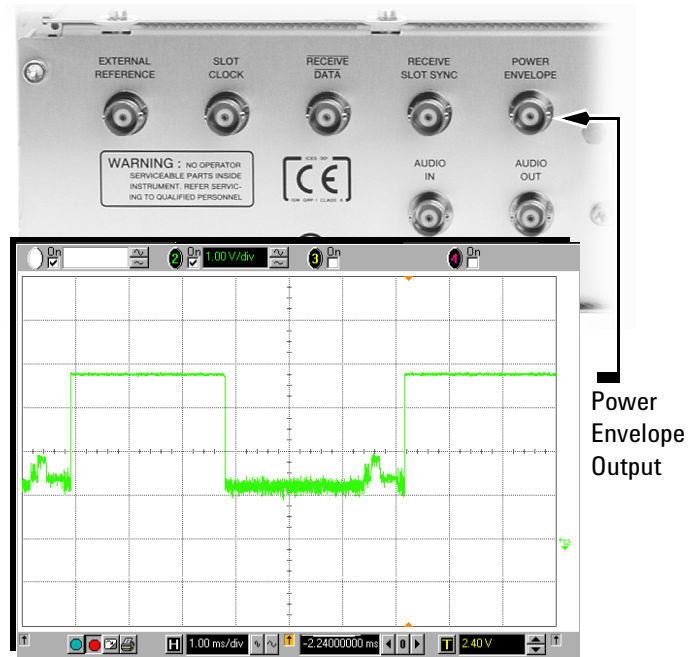
**Receive Slot Sync** A  $1\mu\text{s}$  wide TTL trigger output synchronized with the start of a received burst.



**Figure 5 Receive Slot Sync Output**

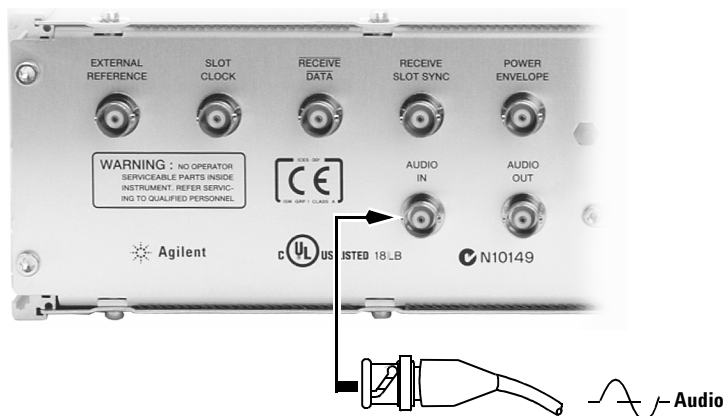


**Power Envelope** Analog output of the RF power.

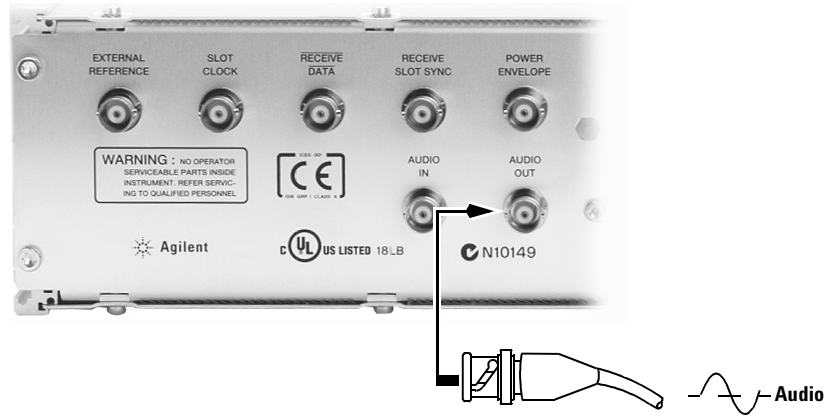


**Figure 6 RF Power Envelope Output**

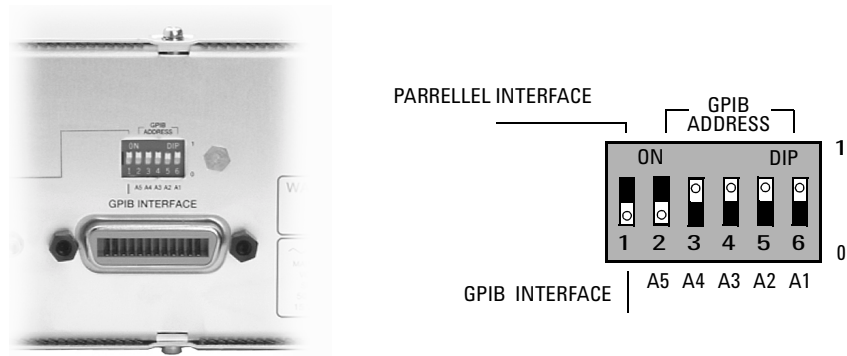
**Audio In** Audio Input. The test set supports CVSD, A-Law, and  $\mu$ -Law audio encoding.



**Audio Out** Audio Output. The test set supports CVSD, A-Law, and  $\mu$ -Law audio decoding.



**GPIB Interface** Standard GPIB connection for communication with your PC.



**Figure 7 GPIB connector and interface/address switches**

**Parallel Interface** 25 pin male D-type connection can be used for communication with your PC.



**Figure 8 Parallel Interface**

**Serial** 9 pin female D-type. The serial port is used for service purposes and to download new test set firmware. Only use the supplied cable for this purpose.

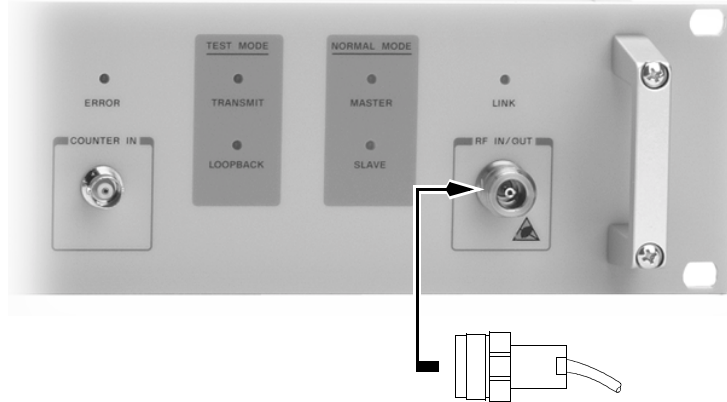
## Front Panel Connections

The E1852B Bluetooth Test Set provides front panel input/outputs for the following functions:

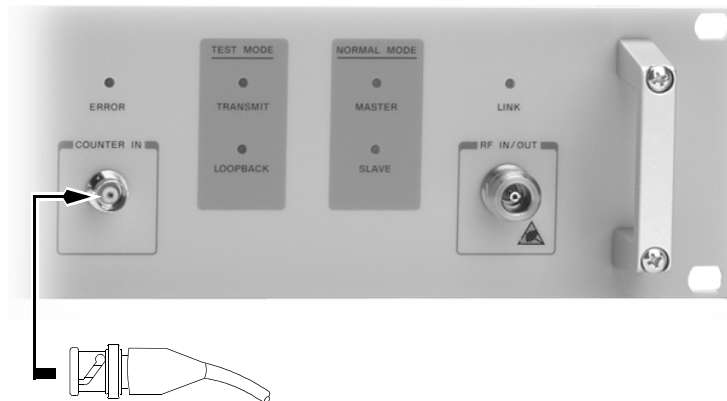
**RF IN/OUT** N-type 50Ω

**COUNTER IN** Use the counter to measure the frequency of signals up to 15 MHz.

1. Make an RF cable connection between DUT and the RF IN/OUT connector. (To maintain regulatory compliance, antenna coupling with the DUT must be carried out in a screened environment. Antenna coupled measurement results are uncalibrated.)



2. A 15 MHz counter is available on the front panel. (High impedance, 500mv rms sensitivity.)



# Installing the PC Software

The E1852B Bluetooth Test Set is equipped with a parallel remote programming interface. This section shows you how to:

- install the PC User Interface on your PC
- install the Dynamic Link Library (DLL) for remote control purposes
- connect your PC or system controller to the test set

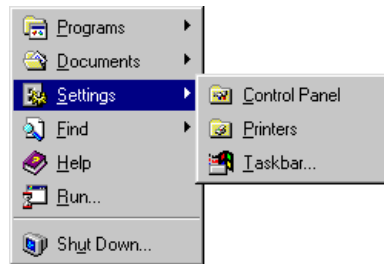
## Minimum System Requirements

For successful operation of the User Interface your PC must meet or better the following requirements:

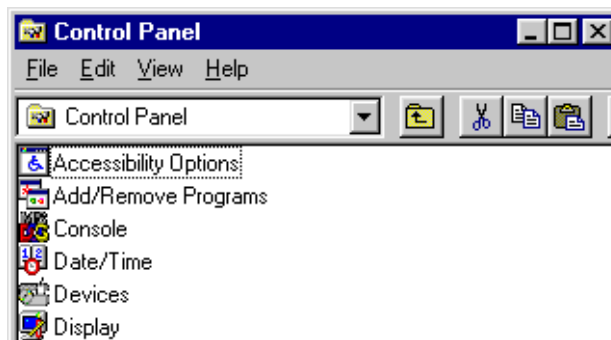
<b>CPU</b>	Pentium 300 MHz
<b>RAM</b>	96 Mbytes
<b>Disc Space</b>	50 Mbytes
<b>Monitor Resolution</b>	1024 x 768 pixels (recommended) or higher
<b>CD-ROM drive</b>	yes
<b>Ports</b>	One parallel, one serial
<b>Operating System</b>	Windows 95/98/NT/2000

## Install the User Interface

1. Turn on your computer. Insert the E1852B Bluetooth Test Set CD-ROM into your CD-ROM drive.
2. Select **Settings** from **Start** button. Select **Control Panel**.

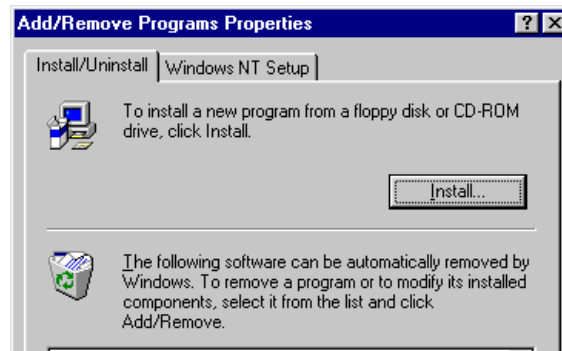


3. Double-click **Add/Remove Programs**.



---

4. Click **Install**.

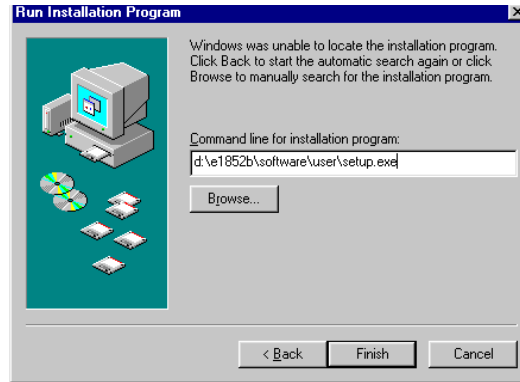


---

5. Click **Next**. Click browse to find the setup.exe file for the User Interface or enter the path name as shown.



6. Click **Finish**. Use the on screen instructions to guide you through the rest of the installation process. The bluetooth test set User Interface is installed into the directory path: **C:\Program Files\Agilent Technologies\E1852B**.



7. When complete, restart your PC. The E1852B Bluetooth Test Set User Interface icon is placed on your PC desktop.

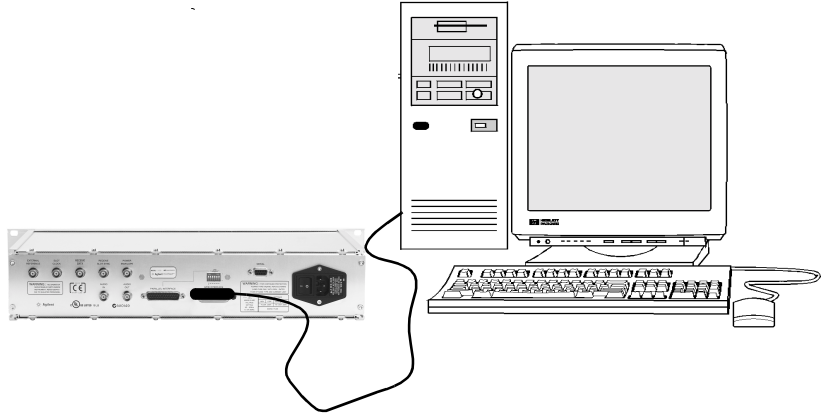


**NOTE** An additional ‘Debug’ mode of operation of the PC interface is available. This can be useful when developing your own test programs. Chapter 5, “Programming Reference” in the E1852B Bluetooth Test Set *Operating and Service Guide* shows you how to access the debug mode.



---

8. Connect the test set and your PC using the parallel interface or GPIB connections in accordance with the selection you made on the rear panel DIP switch.



---

**NOTE** For optimum measurement speed, especially when viewing graphical results windows, use the parallel interface connection.

## Running a Self Test

You can quickly confirm the correct PC connections and operation of your E1852B Bluetooth Test Set.

Ensure that:

- the PC interface and DLL are installed on your PC
- the test set is switched on
- your PC and test set are connected using the parallel or GPIB cable (confirm the correct DIP switch setting)
- no connection to the RF Input/Output connector

---

1. Double click the E1852B Bluetooth Test Set icon (or from the **Start** menu select **Programs, Agilent Technologies, E1852B Bluetooth Tester**).

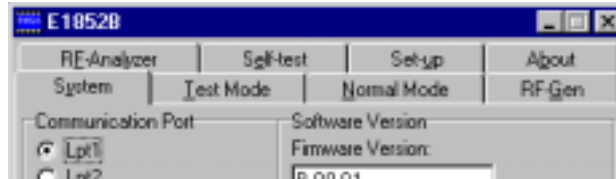


---

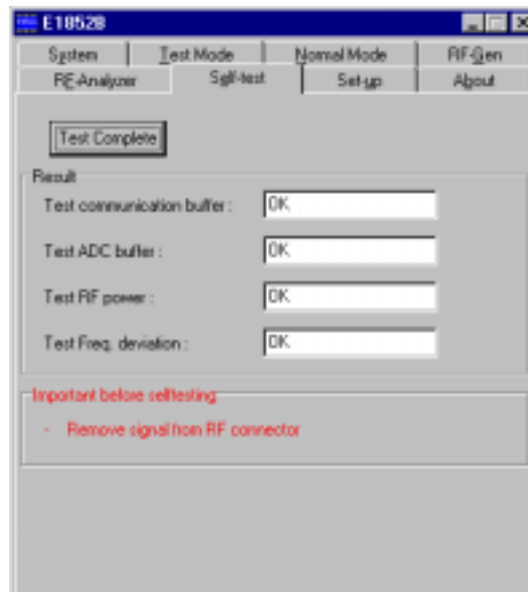
2. During connection, the following message is displayed.



3. When a connection is made, click the **Self-test** tab.



4. Click **Start** to initiate the self test. The **Result** fields are completed during the test.



5. Your E1852B Bluetooth Test Set is now ready for use.

## When the Connection Fails

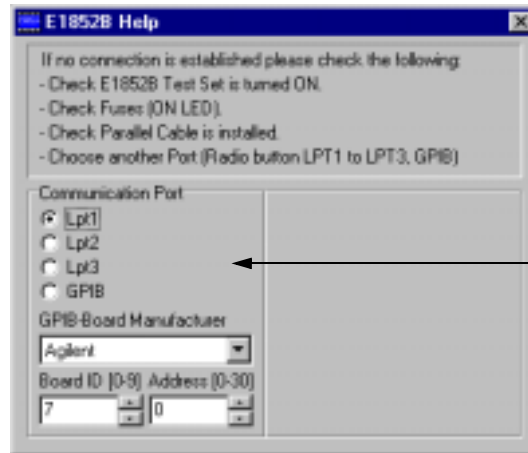
This section shows you what to do if you are unable to complete the confidence test detailed in “Running a Self Test” on page 26.

### No Connection Error - wrong connection selected

If the PC cannot establish communication with your test set the **No Connection** message window is displayed.

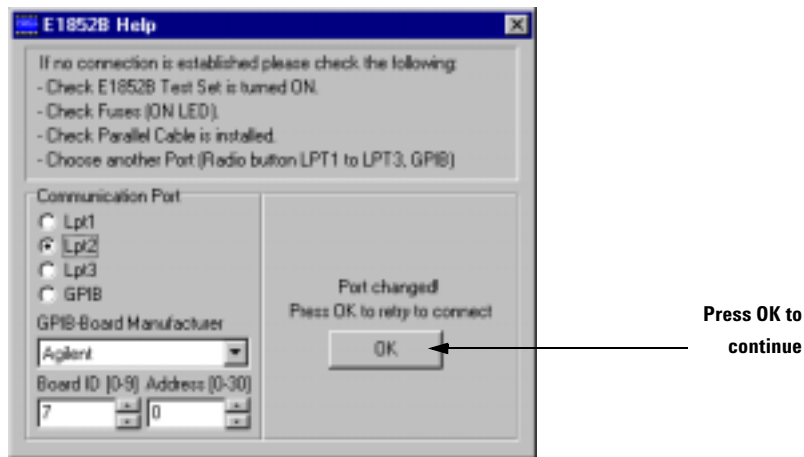


**Press Help** Pressing **Help** displays the connection help window.



Make changes  
as required

The dialog panel gives you diagnostic hints. If you are using a GPIB connection ensure the GPIB radio button is selected and ensure the parameters detailed in the selection boxes match your PC GPIB card and the address selection switches on the test set rear panel.



Any changes you make are identified in the dialog panel. The **OK** button is presented for you press when you are ready to continue.

Click **Retry**. If subsequent attempts fail, displaying the same message, your PC may be using a non-standard port naming convention.

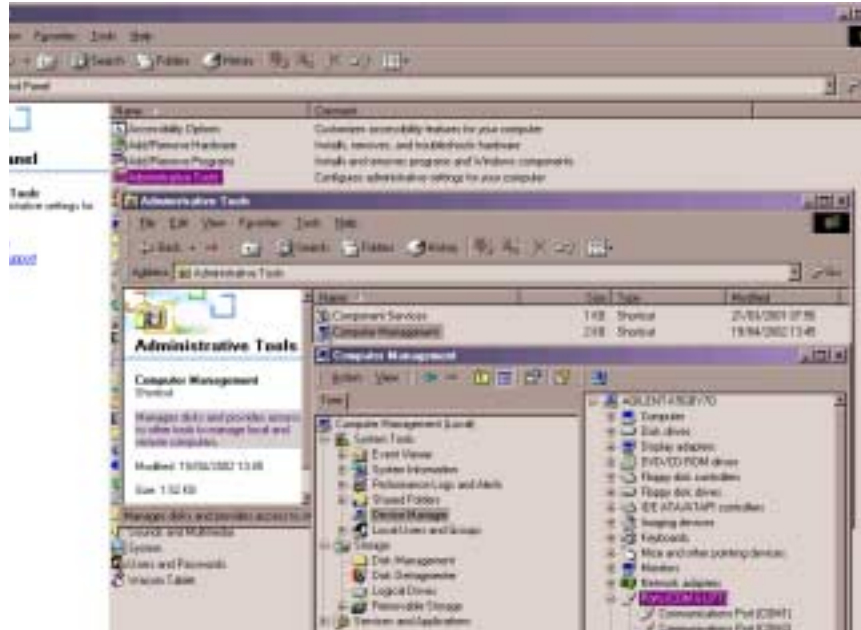
### No Connection Error - Non-standard Port Naming

If the PC cannot establish communication with your test set the **No Connection** message window is displayed.

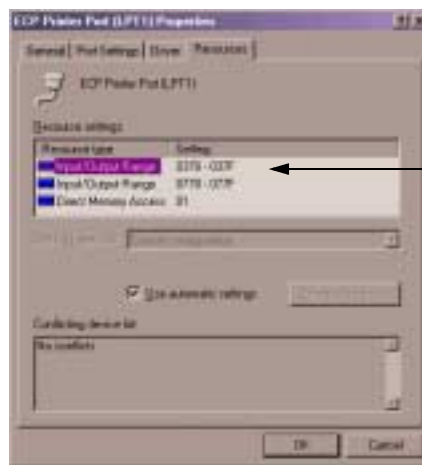


If non-standard port naming is being used on your PC it will not accept the conventional LPT1, LPT2 selection. However, if known, you can establish the connection by entering the 3-digit hexadecimal address using the command line of the Debug version of the E1852B Windows Interface. Proceed as follows:

- Procedure** 1. Use the PC diagnostic tools to identify the hexadecimal address of the parallel port.

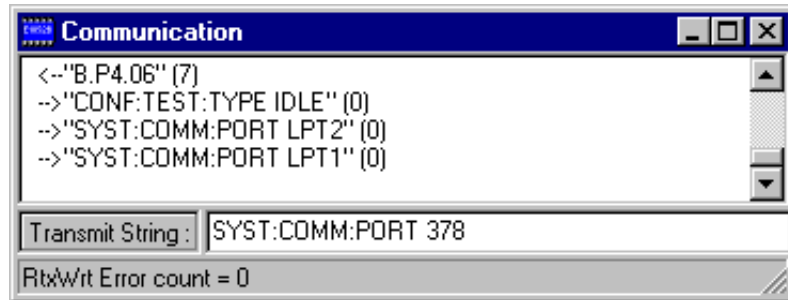


Windows2000: Control Panel -> Administrative Tools -> Computer Management -> Device Manager



Port Address

2. Enter the address in the command line of the Debug E1852B Interface using the `SYST:COMM:PORT <value>` command.

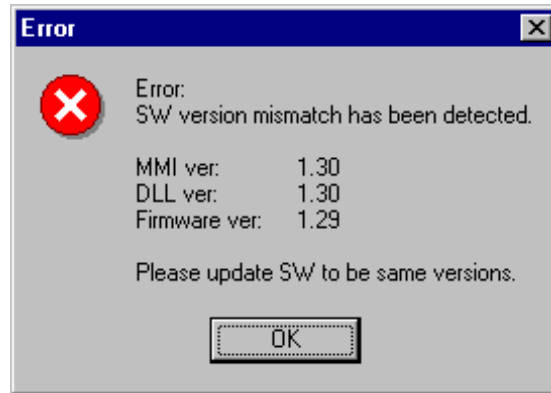


3. Reset the E1852B and re-start the connection process.

If subsequent attempts fail, displaying the same message, please contact your local Agilent office.

## SW Version Mismatch Error

Three components, the PC software, the DLL and the test set firmware must be at the same level of revision. If the PC determines inconsistencies between the 3 components the **SW Version Mismatch** message window is displayed.



To align all the software components proceed as detailed in the “Firmware Download” procedure.

## Firmware Download

To install new test set firmware you must first install the new revision of PC interface software. To download new firmware the test set serial port and the supplied serial cable are used. You also need to run the PC interface in Debug mode.

Latest PC interface software and test set firmware can be obtained from the URL shown in the **About** page of the E1852B PC interface. You can use the Firmware Download Procedure but to ensure you have the most up to date information it is recommended that you use the E1852B Software home page and follow the displayed procedure to download and install the required files.

---

**NOTE** The Error LED turns on during the firmware download procedure. A problem is indicated only if the LED remains lit after the test set has been restarted.



**Procedure** The installation procedure is in three parts:

- Un-install any previous E1852B software from your PC
- Install the PC User Interface on your PC
- Install firmware in the E1852B Bluetooth Test Set

**Un-install** You only need to do this if you have any previously installed E1852B software on your PC. Proceed as follows:

1. On your PC, select **Start > Settings > Control Panel**.
2. Double click **Add/Remove Programs**.
3. Scroll through the list of programs and select the E1852B program.
4. Click **Remove**.

Follow any on screen instructions and when prompted, delete all files including the \*.dll files.

**PC Installation** If you have downloaded the latest firmware, PC user interface and DLL from the Agilent E1852B home page un-compress the package and save it to a temporary directory - **C:\WINDOWS\TEMP\E1852B** recommended.

1. Locate and double click the Setup.exe program icon.
2. Follow the on-screen instructions to complete the installation.

You have now installed the E1852B PC user interface and Dynamic Link Library (DLL).

**E1852B Firmware Installation** To complete the installation, download the new firmware to your E1852B Bluetooth Test Set. Proceed as follows:

1. Connect the test set to your PC with the parallel cable provided.

---

**NOTE** Ensure the serial cable is not connected between the PC and test set at this stage.

2. On your PC select **Start > Programs > Agilent Technologies > E1852B Debug**.
3. Select the E1852B **System** tab.

4. In the **Firmware Update** panel use the scroll button to select the PC serial port.
5. Press **Download**.
6. Highlight the **\*.bsf** file and click **Open**.

When prompted:

- Disconnect the parallel cable
  - Connect the serial cable provided from your PC serial port and the E1852B serial port
  - Cycle the test set power - switch the E1852B off and on again before clicking **OK**.
7. On completion, close the PC user interface and re-start in standard or Debug mode as required.



# 2 Making Measurements

## **What You'll Find In This Chapter**

This Chapter shows you how to set up the test set for measurements.

It contains these sections:

- Configuring the System for Measurements on page 36
  - Measurement Filtering Techniques on page 39
  - Power Measurements on page 43
  - Frequency and Modulation Measurements on page 45
  - Sensitivity Measurements on page 56
  - Audio Measurements on page 59
-

# Configuring the System for Measurements

This chapter introduces the measurement capabilities of the E1852B Bluetooth Test Set.

## General Operating Information

The E1852B Bluetooth Test Set is a rack-mounting system instrument and consequently has no front panel user interface or information display. All control of the test set takes place using the parallel or GPIB interfaces. The supplied Dynamic Link Library (DLL) forms an integral part of communication with the test set.

---

**NOTE** The DLL must be installed even if you only intend to control the test set using your own test application. Refer to “DLL Interface” on page 123 for more information.

To become familiar with the test set, or to operate it in a stand-alone manner, a PC based user interface is supplied. There are two versions of this interface, the ‘Debug’ version providing an additional window and entry line. You can use this window to observe the command and data transfer between your PC and test set. Use the entry line to send remote commands directly.

---

**NOTE** Control of the Delta F2 measurement algorithm and I.F. filter bandwidth can only be achieved by sending the associated remote commands directly. Use the ‘Debug’ version of the PC user interface or your own test application.

## Getting started

Confirm all the required connections have been made between your PC and the test set. Also confirm that you have installed the supplied E1852B Install package from the CD-ROM. Connect the test set to the DUT using an RF cable.

---

**NOTE** To maintain regulatory compliance, antenna connection to the DUT must be carried out within a screened environment. Also, an antenna connection can introduce significant errors.

## On the Windows Interface

Double click the E1852B Bluetooth Test Set icon on your PC desktop.

**System** Click the **System** tab:

- Use **Inquiry** or enter the value directly to ensure the **DUT BD address** is correct for the DUT in use.

**Test Mode** To configure a Bluetooth Test Mode connection with the DUT click the **Test Mode** tab:

- Select the required Bluetooth parameters such as **Frequency Hopping Mode**.
- Select **RF Level** of the test set.
- Select the DUT Mode – **Transmitter Test** or **Loopback**.
- Select the required **Modulation** pattern.
- Use the controls supplied for the DUT to ensure that it is setup to make a Bluetooth test mode connection.
- Click **Page** to make a Bluetooth connection in Test Mode.

---

**NOTE** The test set is configured at shipment for Bluetooth 1.1 compliant device testing. Refer to SYSTem:BlueTooth:VERSion <version> on page 193 to configure the test set for version 1.0B. You must manually change back to Bluetooth 1.1 test set configurations

**Normal Mode** To configure a Bluetooth Normal Mode connection with the DUT click the **Normal Mode** tab:

- Select **RF Level** of the test set to ensure sufficient signal power reaches the DUT input.
- Use the controls supplied for the DUT to ensure that it is setup to make a normal Bluetooth connection.
- Click **Page** to make a Bluetooth connection in Normal Mode.

**RF Analyzer Mode** To configure RF Analyzer measurements click the **RF-Analyzer** tab:

- Select the DUT transmission channel in the **Carrier [0..78]** entry field
- Select modulated signal measurements (**Burst**) or
- Un-modulated signal (**CW**) measurements.
- If **Burst** is selected, choose the required parameters.

---

**NOTE** Changes to DUT settings can only be made using the application provided by your module or device supplier.

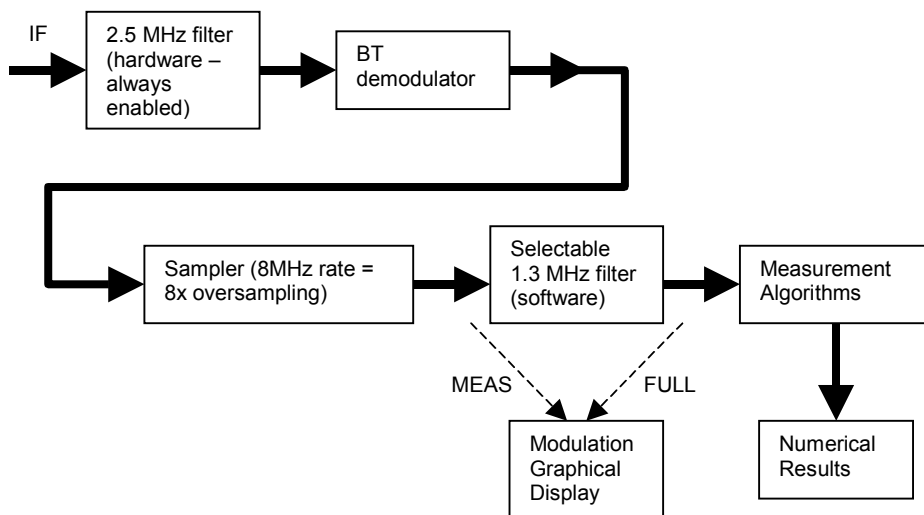
# Measurement Filtering Techniques

The E1852B can apply several methods of filtering and algorithmic processing to the received Bluetooth signal during RF parametric measurements:

1. Selection of a 1.3 MHz narrow-band, or 2.5 MHz wide-band IF filter (1.3 MHz is currently recommended by the Bluetooth RF Test Specification)
2. Two types of algorithmic processing for deltaF2 measurements

---

**NOTE** These features are not available in the PC user interface and can only be accessed by sending the associated remote commands directly to the E1852B. You can use the 'debug' version of the PC user interface to do this or through the use of an external programming environment (such as the E1852B script executor).



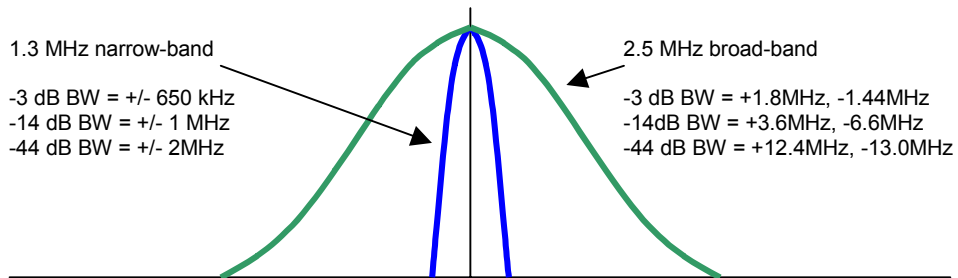
**Figure 9 E1852B Measurement Path**

## 1.3MHz and 2.5MHz IF filtering

The E1852B has two IF filters. The first is a 2.5 MHz wide-band filter implemented in hardware (which is always present in the IF path). The second is a 1.3 MHz narrow-band filter (selectable, and implemented digitally within the E1852B DLL software)

You can select 1.3 MHz narrow-band filtering by using the command `CONF:RF:FILT:BW 1.3` and the 2.5 MHz wide-band filtering by using the command `CONF:RF:FILT:BW 2.5`.

**NOTE** The default setting is 1.3 MHz.



**Figure 10 E1852B Filter Characteristics**

When the 1.3 MHz narrow-band filter is selected the effects of spurious out-of-channel or intermodulation signals are largely eliminated from the E1852B measurement results. A 1.3 MHz narrow-band filter is recommended within the Bluetooth RF Test Specification and should be used when performing final production testing.

When the 2.5 MHz wide-band filter is selected, the E1852B measurement results include the effects of spurious out-of-channel or intermodulation signals. This can be a useful when evaluating the performance of the DUT design during product development.



When the 1.3 MHz narrow-band filter is selected the PC user interface Modulation window (graphical representation of packet data) can be configured to show the demodulated data pre, or post filtering.

Sending `CONF:RF:FILT:MODE MEAS` shows the demodulated data before 1.3 MHz filtering is applied.

`CONF:RF:FILT:MODE FULL` shows the demodulated data after 1.3 MHz filtering is applied.

## DeltaF2 Algorithms

When making deltaF2 measurements, another method for reducing the effects of spurious out-of-channel or intermodulation signals is the use of alternative measurement algorithms.

When making deltaF2 measurements the Bluetooth RF Test Specification asks that the payload is split into blocks of 8-symbols, and for each of those blocks an average frequency is calculated. The average frequency is then used as the reference against which each symbol's deltaF2 deviation is calculated.

There are two methods of calculating the 8-symbol average frequency:

1. Use all samples of the signal during the calculation (the E1852B uses 8x oversampling, hence this calculation uses a total of 64 sample values for each 8-symbol calculation). This method is referred to as `SPEC`.
2. Use only the peak sample value of each symbol to calculate the 8-symbol average (i.e. only 8 values are used in the calculation). This method is referred to as `PEAK`.

Select the `SPEC` method by using the command `CONF:DELTA_F2_ALG SPEC`

Select the `PEAK` method by using the command `CONF:DELTA_F2_ALG PEAK`

---

**NOTE** Default setting is `PEAK`.

The wording of the Bluetooth RF Test Specification does not clearly state the type of averaging method to use for  $\Delta F_2$  measurements. If the averaging method that is specified for  $\Delta F_1$  measurements is to be used (all samples) select *SPEC*. Select *PEAK* when you are working with asymmetrical demodulation to reduce the effect of the asymmetry upon the calculated average frequency.

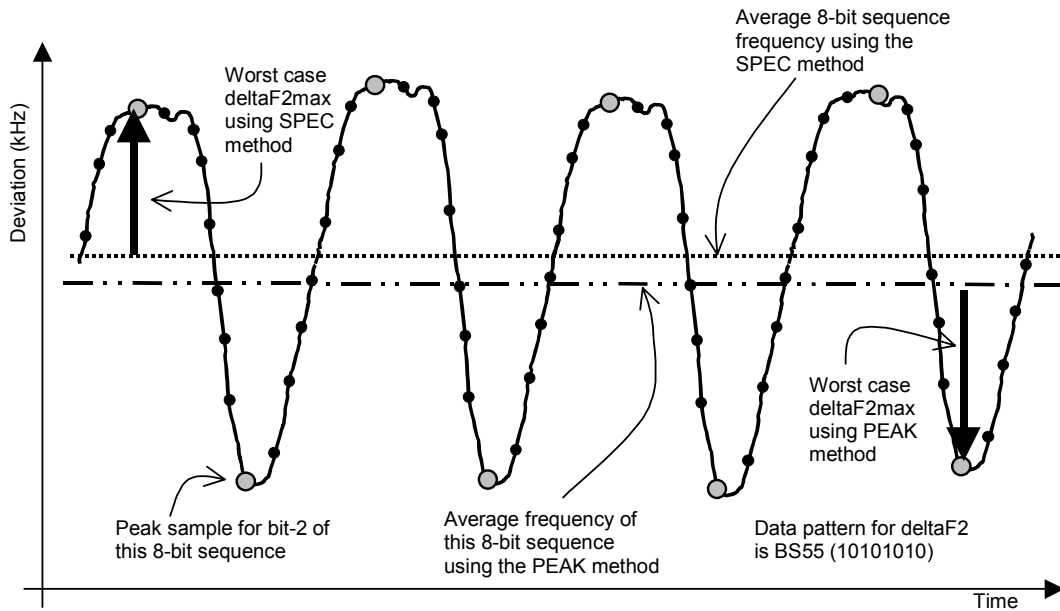


Figure 11 'PEAK' and 'SPEC'

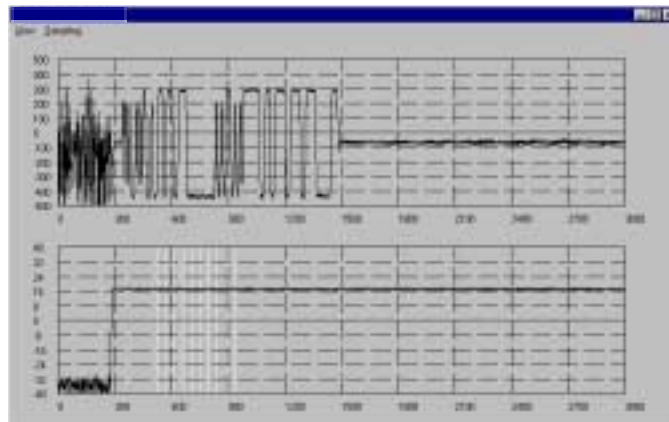
# Power Measurements

Peak and average RF Power of the DUT can be measured in both Normal and Test Modes.

## Average Power - Normal Transmit Power (NTP)

**Test Mode** With a Test Mode connection, average power, is measured by sampling the power value over the main part of the full Bluetooth packet. The number of samples increases as the packet length increases. For best measurement speed, perform the NTP test with DH1 packets. Average power measurements can be obtained in transmitter tests as well as in receiver tests with selectable packet types and modulation patterns.

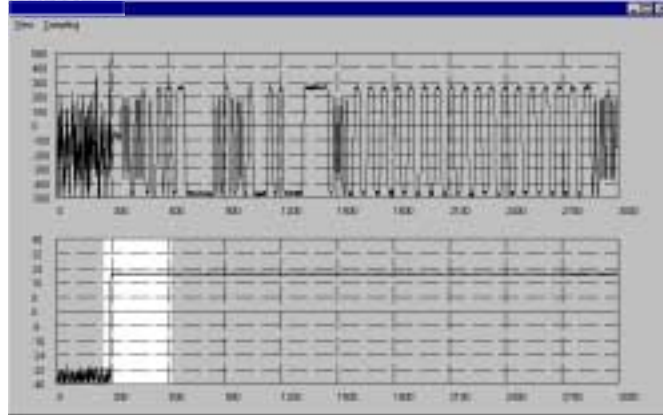
**Normal Mode** With a Normal Mode connection, average power is measured by sampling the power values within the Access Code part of the packet. There is no Bluetooth specification for average power with a Normal Mode connection.



**Figure 12** Average Power Measurement

## Peak Power - Peak Transmit Power (PTP)

With both Normal and Test Mode connections, Peak Power is measured in the beginning of the packet, where the power peak is expected.



**Figure 13** Sampled Modulation

### Remote Commands

The power values can be read out by using the SCPI commands:

READ:NTP? For measuring Average Power and

READ:PTP? For measuring Peak Power.

# Frequency and Modulation Measurements

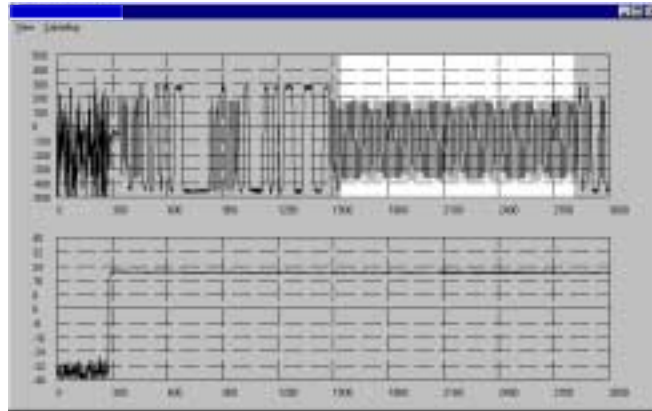
Some frequency and modulation measurements can only be carried out in test mode when the correct packet type is selected.

- Frequency Drift - Both Normal and Test Mode
- Frequency Drift Rate - Test Mode only
- Frequency Deviation
- DELTA\_F1
- DELTA\_F2
- Frequency Offset

## Frequency Drift Measurement

**Test Mode** The frequency drift measurement is made with the modulation pattern BS55 (01010101) and with packet types DH1/DH3/DH5.

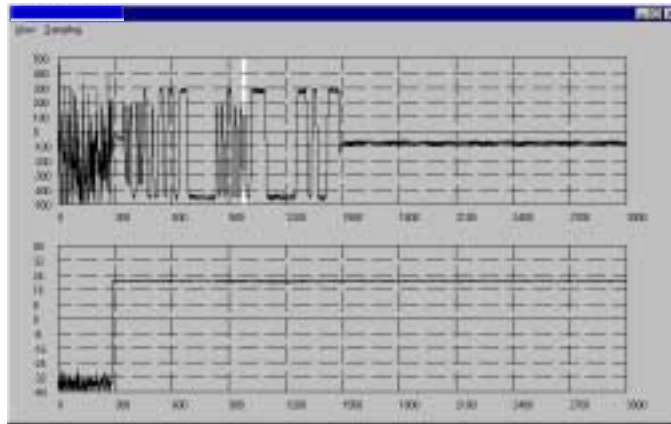
The average frequency of each 10 bits of the payload is calculated. Each calculation is compared with the average frequency of the 4 preamble bits. The greatest difference (worst case) is used as the measurement result.



**Figure 14 Test Mode - Frequency Drift Measurement**

The frequency drift value can be read out by using the SCPI command:  
`READ:FREQ:DRIF:SPEC?`

**Normal Mode** Sampling from the Access Code trailer part of the packet is used to give an approximation of frequency drift. The difference between this average frequency value and the frequency-offset value (measured at the preamble part) is the frequency drift.



**Figure 15 Normal Mode - Frequency Drift Measurement**

**Remote Commands** The frequency drift value can be read out by using the SCPI command:  
`READ:FREQ:DRIF?`

### Frequency Drift Rate Measurement

This measurement reuses the data from frequency drift measurement.

**Test Mode** For every group of 10 bits, the measured frequency drift is compared with the 2 adjacent 10 bit groups. The differences found are the frequency drift rate. The maximum difference (worst case) is taken as the result of the measurement.

The frequency drift rate can be read back using the SCPI command:  
`READ:FREQ:DRIF:SPEC:RATE?`

---

**NOTE** The drift and drift rate measurements are sensitive to noise from the DUT. Results can vary significantly between consecutive measurements.

## Frequency Deviation

**Normal Mode** It is not possible to measure the standard modulation characteristics Delta F1 and Delta F2 with a Normal Mode connection. Instead, this test uses the Access Code part of the burst. 111/000 patterns are used to approximate the Delta F1 result while the Delta F2 result is estimated using 101/010 patterns

The values can be read using the SCPI commands

READ:PSEUDO:DELTA\_F1? and READ:PSEUDO:DELTA\_F2?

## DeltaF1 Measurement

**Test Mode** The measurement modulation pattern is BS0F (00001111 bits), and the packet type is DH1/DH3/DH5. There are three deltaF1 measurements available:

- min, deltaF1max (available only in 'Debug' mode)
- avg, deltaF1max
- max, deltaF1max (available only in 'Debug' mode)

The results are calculated as follows:

1. The average frequency of each '00001111' byte within the payload is calculated. This calculation uses all 8 symbols within the byte. This is referred to as: **avg\_byte\_n**.
2. The average frequencies of the 2nd, 3rd, 5th, and 6th symbols within the byte are calculated. These are referred to as: **avg\_symbol\_2**, **avg\_symbol\_3**, **avg\_symbol\_5**, and **avg\_symbol\_6**.
3. The relative deviation of each of those symbols is calculated, referring to each as **δF1max**.

$$\text{symbol\_2: } \Delta F1\text{max} = (\text{avg\_symbol\_2}) - (\text{avg\_byte\_n})$$

$$\text{symbol\_3: } \Delta F1\text{max} = (\text{avg\_symbol\_3}) - (\text{avg\_byte\_n})$$

$$\text{symbol\_5: } \Delta F1\text{max} = (\text{avg\_symbol\_5}) - (\text{avg\_byte\_n})$$

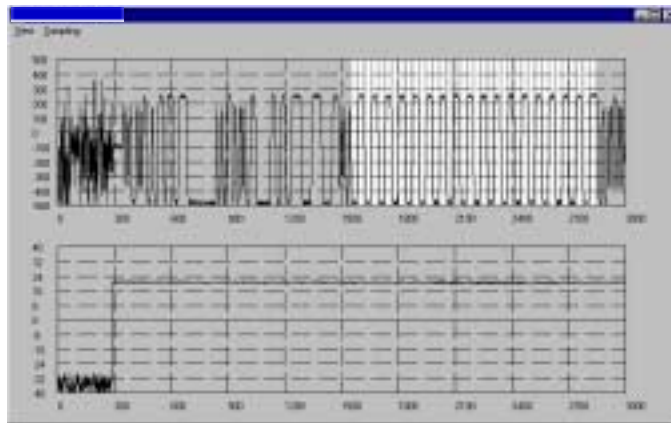
$$\text{symbol\_6: } \Delta F1\text{max} = (\text{avg\_symbol\_6}) - (\text{avg\_byte\_n})$$



4. This is repeated for all bytes within the payload to produce an array of  $\delta F1_{\max}$  values. For example, a DH5 packet of 339 bytes in length requires a total of 1,356 (339 x 4)  $\Delta F1_{\max}$  values.
5. The deltaF1max values, within payload, reported by the E1852B Bluetooth Test Set are as follows:
  - **min, deltaF1max** - the minimum  $\Delta F1_{\max}$  value  
(READ:DELTA\_F1\_LOw?)
  - **avg, deltaF1max** - average of all  $\Delta F1_{\max}$  values  
(READ:DELTA\_F1?)
  - **max, deltaF1max** - the maximum  $\Delta F1_{\max}$  value  
(READ:DELTA\_F1\_HIgh?)

---

**NOTE** The result is used as part of the ‘delta F1/delta F2’ measurement.



**Figure 16** DeltaF1 Measurement

## Delta F2 Average Measurement

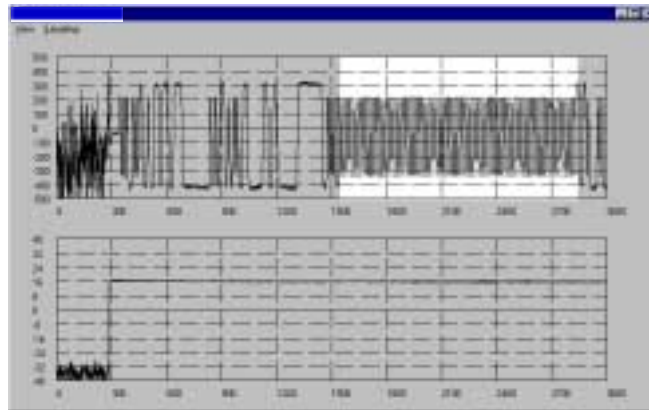
**Test Mode** The measurement modulation pattern is BS55 (01010101 bits), and the packet type is DH1/DH3/DH5.

---

**NOTE** To comply with the Bluetooth RF Test Specification a DH5 packet of length 339 must be used. (it is also recommended that you use a 1.3 MHz narrow band measurement filter - CONF:RF:FILT:BW 1.3)

The deltaF2max measurement identifies the smallest positive or negative frequency deviation from the average frequency within the 8 bits of each byte of the payload. The average for all bytes is then taken as the Delta F2max Average value. There are three deltaF2 measurements available:

- min, deltaF2max (available only in 'Debug' mode)
- avg, deltaF2max
- max, deltaF2max (available only in 'Debug' mode)



**Figure 17 Delta F2 Measurement**

---

**NOTE** The Bluetooth Test Specification refers to avg, delta F2max as  $\Delta F2_{avg}$ .

The results are calculated as follows:

1. Starting with the second symbol of the payload, the payload is divided into 8-symbol sequences.
2. For each 8-symbol sequence (10101010) an average frequency is calculated. This average is referred to as **avg\_seqn\_n**.
3. The maximum deviation from this average is calculated. The value is called **ΔF2max**.

Within each 8-symbol sequence the calculation is performed as follows:

1<sup>st</sup> symbol: **deviation** = **ABS(symbol\_1) - (avg\_seqn\_n)**  
 2<sup>nd</sup> symbol: **deviation** = **ABS(symbol\_2) - (avg\_seqn\_n)**  
 .  
 .  
 .  
 8<sup>th</sup> symbol: **deviation** = **ABS(symbol\_8) - (avg\_seqn\_n)**

**ΔF2max** of this 8-symbol sequence is the maximum of the eight calculated deviations.

4. Steps 2 and 3 are repeated for all 8-symbol sequences within the payload, producing an array of **ΔF2max** values.  
 For example, in a DH5 packet of length 339 bytes, a total of 338 **ΔF2max** values are calculated.
5. Within each payload the deltaF2max results reported by the test set are as follows:
  - min, deltaF2max** - minimum **ΔF2max** value  
(READ:DELTA\_F2\_LOw?)
  - avg, deltaF2max** - average of all **ΔF2max** values  
(READ:DELTA\_F2?)
  - max, deltaF2max** - maximum **ΔF2max** value  
(READ:DELTA\_F2\_HIgh?)

---

**NOTE** The **avg, deltaF2max** result is used as part of the delta F2/delta F1 measurement.

**Measurement Algorithms**

The E1852B Bluetooth Test Set offers two methods of evaluating the minimum value of  $\Delta F_{2\max}$ . The default method uses only the peak value of each symbol (it uses 8 discrete values per 8-symbol sequence). This method can be selected using the SCPI command:

```
CONF:DELTA_F2_ALG PEAK.
```

The second method uses all samples of the 8-symbol sequence (the test set uses 8x oversampling which results in 64 discrete samples per 8-symbol sequence). This method can be selected using the SCPI command:

```
CONF:DELTA_F2_ALG SPEC.
```

Refer to “Measurement Filtering Techniques” on page 39 for more information.

---

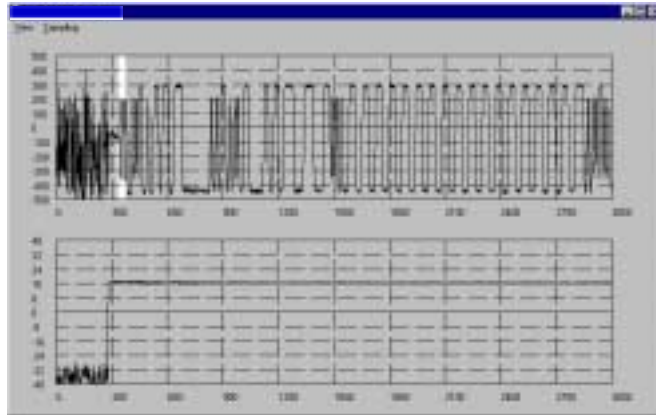
**NOTE**

To comply with the Bluetooth RF Test Specification 99.9% of all  $\Delta F_{2\max}$  results must be  $\geq 115\text{kHz}$ . The E1852B Bluetooth Test Set measurement filter default value is 1.3MHz but 2.5MHz can be selected if required. (refer to `CONF:RF:FILTer:BW <numeric value>` for more information)

## Frequency Offset Measurement (ICFT)

### Normal and Test Modes

This measurement is carried out by identifying the preamble part of a BS55 packet. The preamble is sampled and the average value gives the Frequency Offset value.



The Frequency Offset value can be read out by using the SCPI command: `READ:FREQ:OFFS?`

---

**NOTE** On some types of devices results can vary significantly between consecutive measurements.

---

**NOTE** This measurement must be carried out on a BS55 modulated packet

## 10 Packet Bluetooth Compliant Display

**Test Mode only** The 10 packet Bluetooth Compliant measurements are available only in Test Mode.

	Minimum	Mean	Maximum	Final
ICFT (kHz)	-36.3	-22.5	5.0	-36.3
Freq Drift (kHz)	-5.9	-0.8	4.1	-5.9
Freq Drift Rate (kHz)	-5.9	-2.3	3.9	-5.9
deltaF1,avg (kHz)	150.1	151.7	153.0	153.0
deltaF2,max (kHz)	117.1	127.2	137.4	117.1
deltaF2,max passes [%]				100.0
deltaF2,avg/deltaF1,avg				0.822

Status : **TCONN** Font Size: 14

Buttons: Clear Display, Run

**ICFT** The ICFT measurement is carried out by identifying the preamble part of a BS55 Bluetooth burst. The preamble is sampled and the values displayed. The **Final** column shows the largest numerical value measured in the 10 packets.

**Frequency Drift** The frequency drift measurement is made with the modulation pattern BS55 (01010101) and with packet types DH1/DH3/DH5. The average frequency of each 10 bits of the payload is calculated. Each calculation is compared with the average frequency of the 4 preamble bits. The **Final** column shows the largest numerical value measured in the 10 packets.

**Frequency Drift Rate** For every group of 10 bits, the measured frequency drift is compared with the 2 adjacent 10 bit groups. The differences found are the frequency drift rate. The maximum difference (worst case) is taken as the result of the measurement. The **Final** column shows the largest numerical value measured in the 10 packets.

**deltaF1 average** This measurement is made with a modulation pattern of BS0F (00001111 bits), with packet types DH1/DH3/DH5.

For each byte within the payload, the frequency deviation is calculated for the bits 2, 3 and 6,7 (deltaF1 max. values). The average for all bytes is then taken as the delatF1 average value. The **Final** column shows both maximum and minimum values measured in the 10 packets.

**deltaF2 maximum** The measurement modulation pattern is BS55 (01010101 bits), and the packet type is DH1/DH3/DH5.

For each byte within the payload, the maximum frequency deviation is calculated for the 8 bits (delta F2 max. value). The **Final** column shows the lowest value measured in the 10 packets.

**deltaF2 max passes** The Bluetooth Test Specification states that at least 99.9% of all deltaF2max results must be greater than 115 kHz. The **Final** column shows the percentage of packets with deltaF2max results greater than 115 kHz within the 10 packet measurement.

**deltaF2 max / deltaF1avg** This ratio measurement requires that you change the modulation pattern to obtain results for both. You can use the BS0F pattern to generate deltaF1 results the select BS55 to generate deltaF2 results.

# Sensitivity Measurements

The sensitivity of the DUT is determined using a Bit Error Rate (BER) or a Packet Error Rate test.

## Bit Error Rate

This sensitivity measurement is carried out in Test Mode. The measurement is made by examining every bit in the received payload. The payload used is SPSR (Static Pseudo Random, PN9).

The Bit Error Rate measurement is available with 'running' measurements, where the received payload is measured continuously, and in a static measurement where you can define the number of bits to be used. If a packet is counted as NACK, a Packet Error, it is ignored and not used in the Bit Error Rate calculation.

The Bit Error Rate values can be read out by using the SCPI commands:

```
PROC:BER:START <numeric value>
```

This command erases all previous BER data and starts a new measurement. Hence this command should be used when a parameter is changed during a BER test. (To specify the number of bits to be used in the measurement).

```
READ:BER?
```

This query is used to measure the Bit Error Rate (BER) of the DUT. The measurement is calculated using the specified quantity of bits. The BER measurement may take a long time, depending on the number of bits used (set by the PROC:BER:START command). Your application must poll the test set for a measurement result. When the response is different from Not A Number (NAN), the required number of bits has been transmitted and the measurement is complete. Use the FETCH:BER command if a continuous response is required.



FETCH:BER?

This query is used to continuously measure the Bit Error values of the DUT. It returns the number of bits transferred, erroneous bits detected and running BER%. The data is returned prior to the completion of the measurement and so is only an indication of the BER. Use the READ:BER? command for the measurement result.

## Packet Error Rate

This test is a sensitivity measurement used in both Normal Mode and Test Mode.

The test measures the number of erroneous packets compared to the total number of packets transmitted. Erroneous packets are defined as those with Not Acknowledged (NACK) in the packet header.

The Packet Error Rate values can be read out by using the SCPI commands:

```
PROC:NACK:START <numeric value>
```

This command is used to start an unacknowledged (NACK) count measurement. A NACK measurement can be used as an alternative to the BER measurement. The NACK measurement can be made in Normal mode, whereas you can only make a BER measurement in Testmode.

READ:NACK?

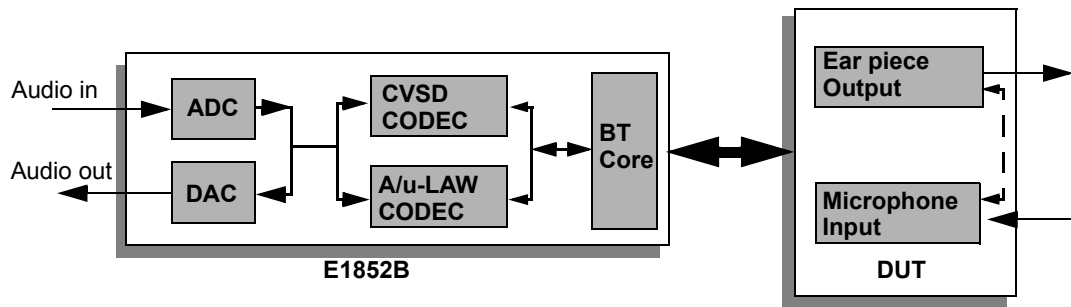
This query is used to measure the Packet Error Rate of the DUT. The NACK count measurement may take a long time, depending on the number of packets used (set by the PROC:NACK:START command). Therefore your application must poll the test set for a measurement result. When the response is different from Not A Number (NAN), the required number of packets has been transmitted and the measurement is complete.

FETCH:NACK?

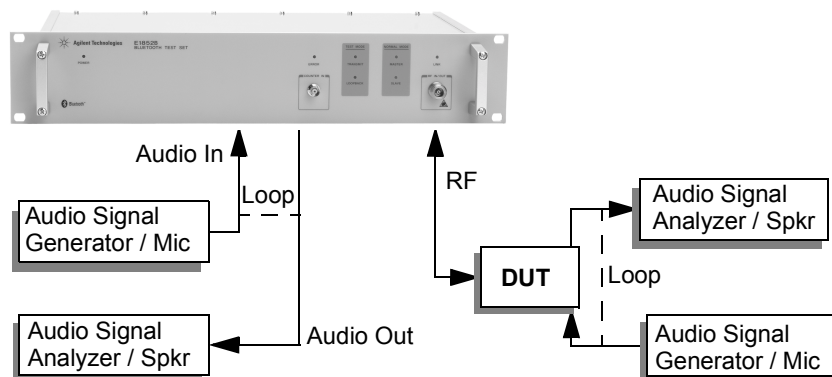
This query is used to continuously measure the Packet Error Rate values of the DUT. The data is returned prior to the completion of the measurement and so is only an indication of the PER. Use the READ:NACK? command for the true measurement.

# Audio Measurements

The Audio In and Audio Out rear-panel connectors provide a path for an audio frequency signal to be transported to and from the DUT using a Normal Synchronous Connection Oriented (SCO) Link. CVSD, A-Law, and  $\mu$ -Law CODECs are supported.



Using the audio functions, you can send a signal from a known, calibrated audio source via the test set and use an audio analyzer to make measurements such as SINAD, frequency response, gain, noise, and distortion on the recovered audio signal from the DUT. Similarly, the reverse signal path may be tested with the audio signal injected at the DUT, recovered from the test set, and measured.



If supported, the audio signal can be looped back by the DUT and recovered and measured from the test set Audio Out port. Additional audio connections to the DUT are not required. The internal audio signal paths within test set enable you to determine any additional distortion, noise, or gain added by the E1852B CODECs.

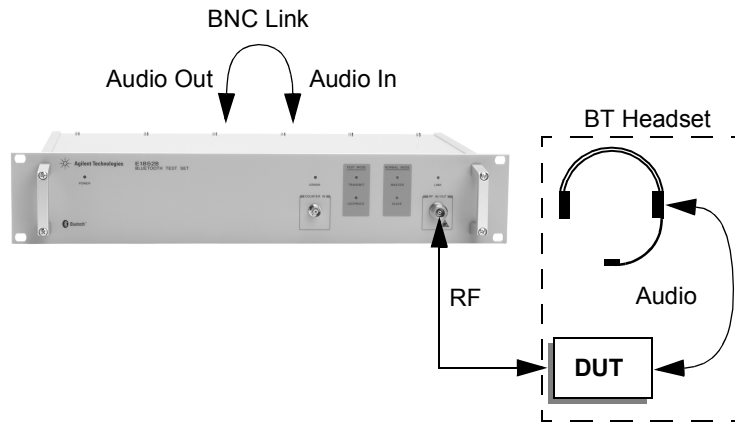
The audio format is selected on the **Normal Mode** connection panel or by specifying the required format using the remote command:

CONFigure:AUDIO\_AIRCODING <value>. The default is CVSD.



## Measurement Setups

**Quick Check** You can quickly check the operation of the complete Bluetooth connection and audio path using a Bluetooth headset or audio enabled DUT and conventional telephony headset.

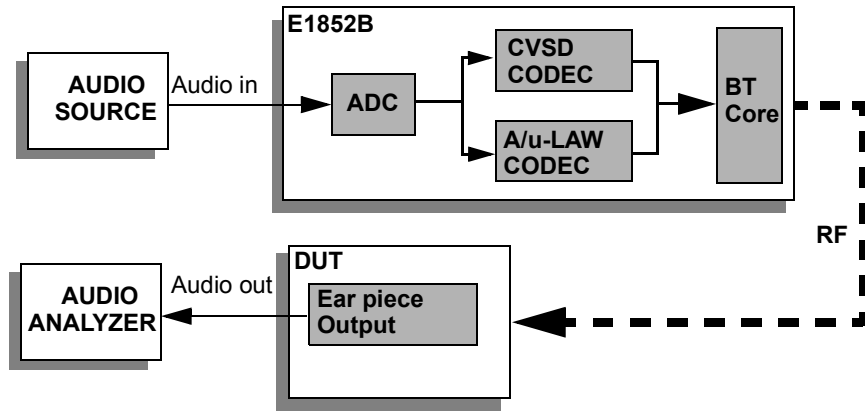


**Figure 18 Quick Check**

Make the connections shown in Figure 18.

- Connect the Audio In and Out rear panel connectors together using a short BNC cable
- Establish a Normal Mode connection  
(PROCEDURE:CONNECTION:SETUP)
- Configure the test set with the type of CODEC required for the DUT  
(CONFIGURE:AUDIO\_AIRCODING <value>)
- Enable the audio connections in the E1852B Bluetooth Test Set  
(CONFIGURE:AUDIO\_CONNECTION ON)
- Enable the audio connections in the DUT
- Speak into the headset microphone
- Listen to your own voice in the ear piece to determine the overall system integrity

**DUT Receive Path** To test the audio performance of the receive signal path of the DUT, send a calibrated audio signal via the test set Audio In connection when a Normal Mode connection is established and make measurements on the recovered audio signal from the DUT output.



**Figure 19 Receive Path Audio Setup**

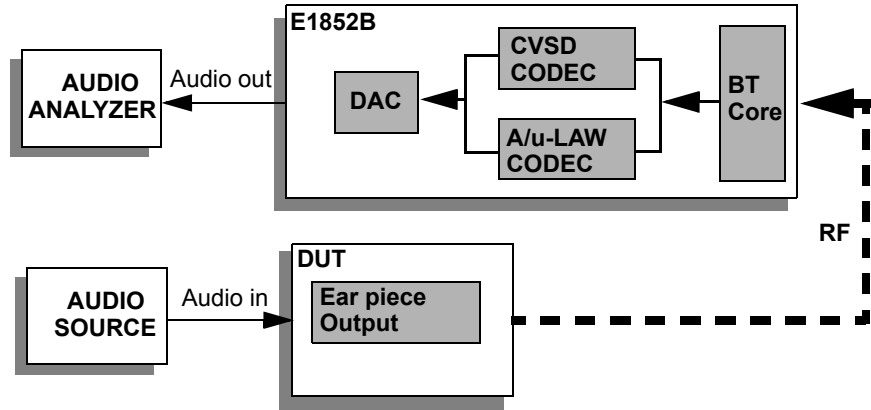
Make the connections shown in Figure 19.

- Establish a Normal Mode connection  
(PROCedure:CONNecTion:SETup)
- Configure the test set with the type of CODEC required for the DUT  
(CONFigure:AUDIO\_AIRCODING <value>)
- Enable the audio connections in the E1852B Bluetooth Test Set  
(CONFigure:AUDIO\_CONNecTion ON)
- Enable the audio connections in the DUT
- Make measurements on the recovered audio signal

---

**NOTE** You can configure zero audio signal conditions whilst maintaining the link by switching the E1852B Bluetooth Test Set audio transmit path off - CONFigure:AUDIO\_MUTE:TX ON - and back on again - CONFigure:AUDIO\_MUTE:TX OFF - as required.

**DUT Transmit Path** To test the audio performance of the transmit signal path of the DUT, send a calibrated audio signal via the DUT Audio connection when a Normal Mode connection is established and make measurements on the recovered Audio Output from the test set.



**Figure 20 Transmit Path Audio Setup**

Make the connections shown in Figure 20.

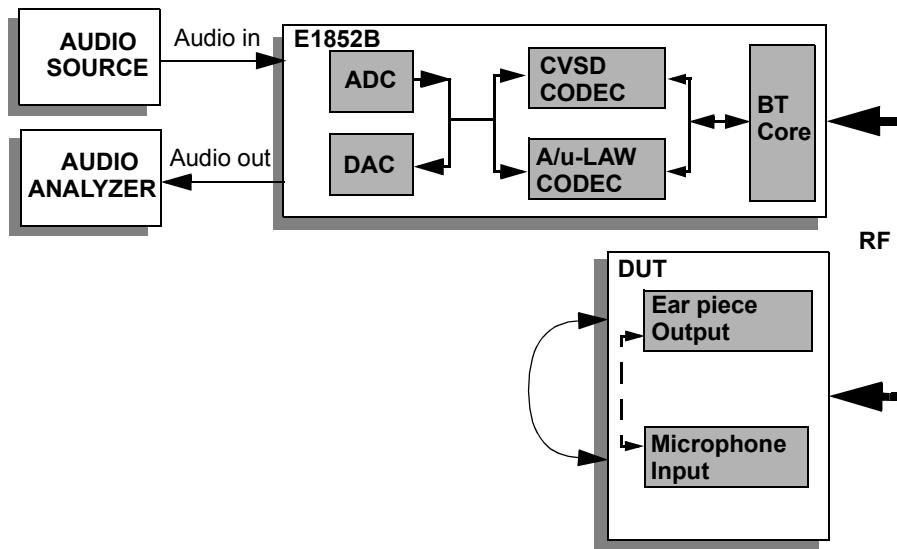
- Establish a Normal Mode connection  
(PROCedure:CONNECTION:SETup)
- Configure the test set with the type of CODEC required for the DUT  
(CONFigure:AUDIO\_AIRCODING <value>)
- Enable the audio connections in the E1852B Bluetooth Test Set  
(CONFigure:AUDIO\_CONNECTION ON)
- Enable the audio connections in the DUT
- Make measurements on the recovered audio signal

---

**NOTE** You can configure zero audio signal conditions whilst maintaining the link by switching the E1852B Bluetooth Test Set audio receive path off - CONFigure:AUDIO\_MUTE:RX ON - and on again - CONFigure:AUDIO\_MUTE:RX OFF - as required.

### Complete DUT Audio Path

To test the performance of both the transmit and receive audio paths of the DUT, a calibrated audio signal is sent to the DUT on a Normal Mode connection, internally or externally looped at the DUT, and transmitted back to the test set. Measurements are made on the recovered audio signal from the test set Audio Out port.



**Figure 21 Complete Path Audio Setup**

Make the connections shown in Figure 21.

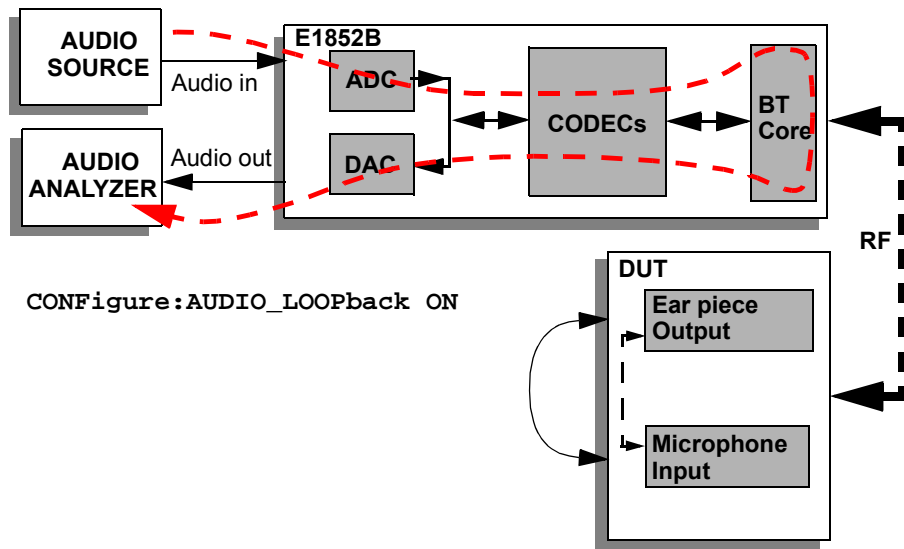
- Establish a Normal Mode connection  
(PROCEDURE:CONNECTION:SETUP)
- Configure the test set with the type of CODEC required for the DUT  
(CONFIGURE:AUDIO\_AIRCODING <value>)
- Enable the audio connections in the E1852B Bluetooth Test Set  
(CONFIGURE:AUDIO\_CONNECTION ON)
- Enable the loopback audio connections in the DUT
- Make measurements on the recovered audio signal



### Test Set Contribution

To improve the accuracy of this measurement you can quantify the noise, distortion, and gain contribution of the test set. This is achieved by looping the audio signal within the test set.

With the configuration shown in Figure 21, CODEC selected, audio enabled (`CONF:AUDIO_CONN ON`), and a Normal Mode connection established, send the command: `CONF:AUDIO_LOOPback ON` to establish the audio signal path shown in Figure 22.



**Figure 22 Audio Loopback On**

Disable the audio loopback within the test set (`CONF:AUDIO_LOOPback OFF`) and subtract the previously obtained audio loopback results from the new system results to identify only the DUT contribution.

## Audio Performance

The following performance characteristics can be expected of the CVSD CODEC:

**Level:** 0dBm0 translates to 775 mVrms analog level, likewise  
775 mVrms analog level translates to 0dBm0

**Frequency  
Range:** 300 to 3400 Hz

**Frequency  
Response<sup>1</sup>:** +0.5dB –1.5dB

**Variation of  
Gain with  
Input Level<sup>1</sup>:**  $\pm < 0.5$ dB

**Idle Noise<sup>2</sup>:** –64 dBm0 (encoder)  
0.5 mV (decoder)

**Out of Band  
Attenuation<sup>3</sup>:** –40dB relative to in-band signal

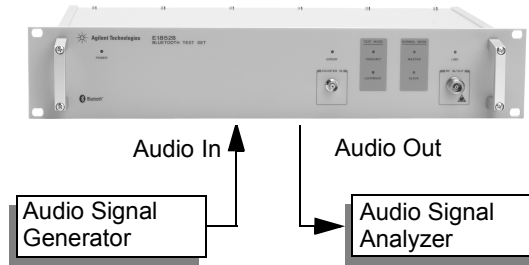
A-Law and  $\mu$ -Law CODECs generally give better performance than CVSD.

<sup>1</sup>In the CVSD linear amplitude range, –50dBm0 to –15dBm0

<sup>2</sup>Psophometric weighted (ITU-T rec. 0.41)

<sup>3</sup>Signals in the frequency range >4 kHz to 32 kHz

To determine the characteristics of the test set at the frequencies and levels of interest, you can loop an Audio Input signal, via the ADC, CODEC, and DAC, to the Audio Output by sending the `CONFigure:AUDIO_LOOPback ON` command.



**Figure 23** Determining Test Set Contribution





# 3 PC User Interface

## **What You'll Find In This Chapter**

This chapter shows you the features of the PC user interface.

It contains these sections:

- Introduction on page 70
  - System Page on page 73
  - Frequency Counter and Attenuation on page 81
  - Test Mode Page on page 83
  - Test Mode Measurement Windows on page 91
  - Normal Mode Page on page 100
  - Normal Mode Measurement Window on page 103
  - RF-Gen Page on page 105
  - RF-Analyzer Page on page 109
  - Self-test Page on page 113
  - About Page on page 120
-

# Introduction

The E1852B Bluetooth Test Set can be controlled by the supplied PC user interface or by use of the SCPI compliant remote command set. The PC interface is intended for easy use in development and service situations. The interface requires only a small amount of desktop space by using tab dividers to partition each major system mode. The program supports installation in Windows 95/98/2000 and Windows NT. Please refer to installation guide for further information.

## Installation

If you have not already done so, install the PC interface and connect your PC by following the procedure detailed in “Install the User Interface” in the E1852B Bluetooth Test Set *Installation Guide*.

---

**NOTE** For optimum measurement speed, especially when viewing graphical results windows, you should use the parallel interface connection.

## Starting the User Interface

You can start the user interface by double-clicking the desktop icon:



or by selecting **E1852B Bluetooth Tester** from the **Start, Programs** menu:

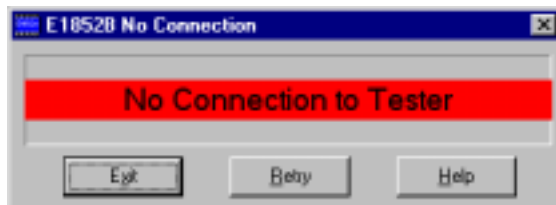


**NOTE** Selecting E1852B **Debug** starts the interface with additional window showing the remote command dialogue between your computer and bluetooth test set. The dialogue can be captured in a log file and may be of use if you intend to develop your our control programs. Some additional frequency deviation measurements are also provided in debug mode.

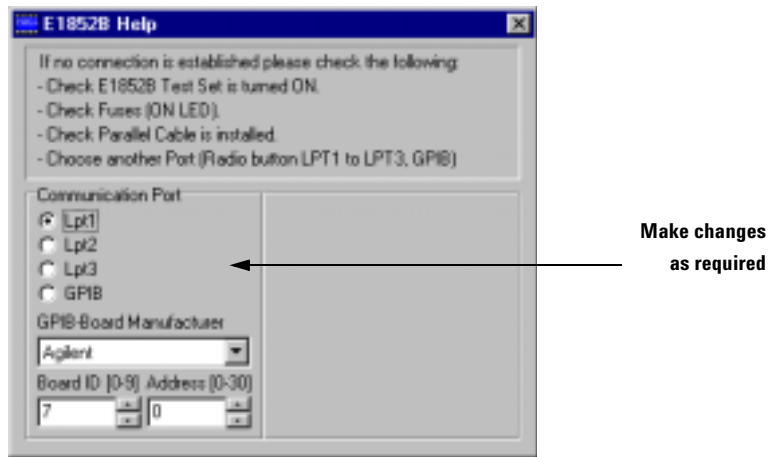
**Start Up** During start-up the following message is displayed:



**No Connection** If the PC cannot establish communication with your test set the **No Connection** message window is displayed.



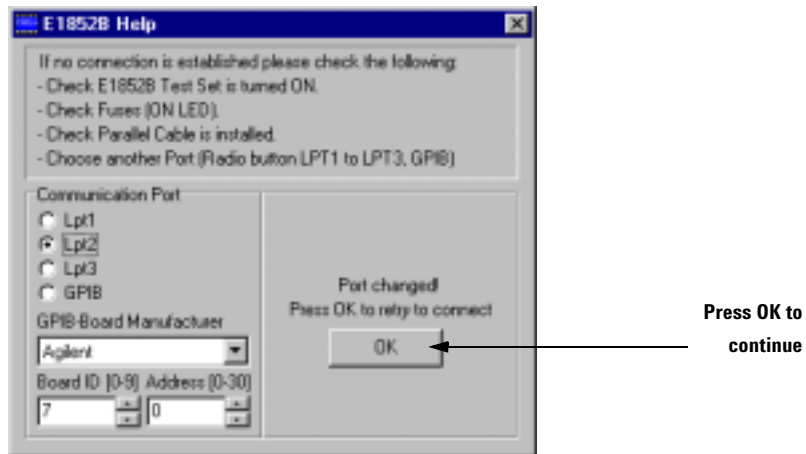
**Press Help** Pressing **Help** displays the connection help window



The dialog panel gives you diagnostic hints. You can also change the Communication Port settings including GPIB parameters.

---

**NOTE** For optimum measurement speed, especially when viewing graphical results windows, use the parallel interface connection.

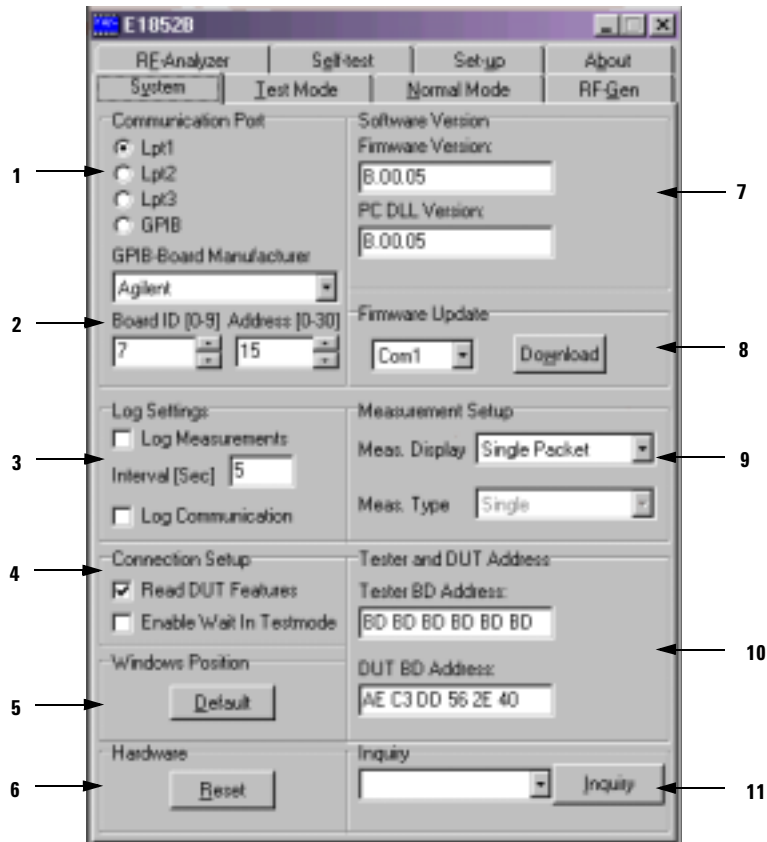


Any changes you make are identified in the dialog panel. The **OK** button is presented for you press when you are ready to continue.



# System Page

The **System** Page contains all the settings required for communication between a PC and the test set, and between the test set and the DUT.



**Figure 24 System Page (Debug Mode)**

## System Page structure

The user interface always opens with the **System** page displayed. It contains the following panels:

### 1. Communication Port

The radio buttons on the **Communication Port** panel are used to select the PC port you want to use for control of the test set.

### 2. GPIB Configuration

The **GPIB-Board Manufacturer** scroll button is used to identify the type of card you have fitted to your computer. If you have an Agilent card, select **7** using the **Board ID** scroll buttons, otherwise use **0**.

Select the GPIB address of the test set (default factory setting 15) using the **Address** scroll buttons.

### 3. Log Settings

The user interface can be configured to store measurement information from the test set at set intervals. The default interval is 5 seconds and can be changed by entering the interval in the **Logging Interval (Sec.)** Field.

Clicking the **Log Measurements** check box opens a dialog box where you can choose the filename and path.



Figure 25 Save Measurement Log

The saved file contains measurements regarding the specific Bluetooth measurement. For example, in loop back measurements, with a 5 second interval, the BER values are logged into the file as shown in Figure 26. This type of text-only file can easily be imported into a spreadsheet for analysis.

NTP, or Normally Transmitted Power, is the average power whereas PTP, Peak Transmitted Power, is the peak power measured.

09:58:58;	TestMode						
09:58:58;	NTP;	PTP;	FrqOff;	FrqDft;	FrqDev;	dAvg;	dMax;
09:59:00;	20.51;	21.00;	4.4;	---	---	---	---
09:59:05;	20.56;	21.60;	-30.2;	---	---	---	---
09:59:10;	-14.17;	-40.40;	-38.2;	---	---	---	---
09:59:15;	0.63;	-40.30;	-20.6;	---	---	---	---
09:59:20;	6.84;	-41.30;	55.4;	---	---	---	---
09:59:25;	-13.69;	-39.40;	-3.1;	---	---	---	---
09:59:30;	-13.51;	-39.90;	68.7;	---	---	---	---
09:59:35;	-12.60;	-43.00;	25.5;	---	---	---	---

dMin;	BER;	PER	
---	81000 0 0.000000;	376 0 0.000000;	
---	512784 0 0.000000;	2376 0 0.000000;	
---	668736 1193 0.178396;	4380 1262 28.812786;	
---	7128 845 11.854658;	6383 3213 50.336834;	
---	14256 1737 12.184343;	8385 5161 61.550388;	
---	22032 2669 12.114198;	10388 7114 68.482864;	
---	29808 3545 11.892780;	12404 9080 73.202194;	
---	37584 4516 12.015752;	14408 11038 76.610214;	

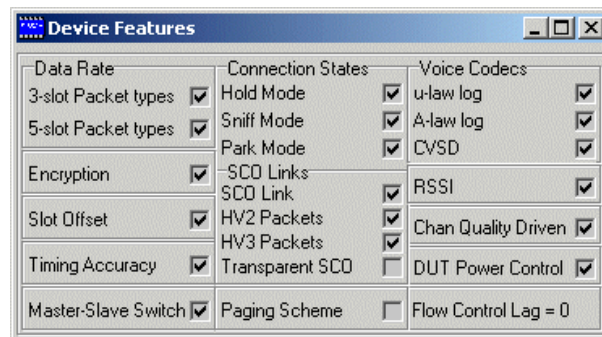
**Figure 26 Log File Content**

**NOTE** You can use **Log Communication** (only available in in Debug mode) to capture all of the data traffic, including the commands.

## 4. Connection Setup

### Read DUT Features

When enabled, the test set polls the DUT on connection and displays the DUT Bluetooth features.



**Figure 27 DUT Features (sample)**

### Enable Wait in Test mode

This command sets the test set to wait in test mode before sending the test activate message to the DUT. This is required by some DUTs. It does not apply to a normal mode connection.

## 5. Windows Position

Clicking **Default** places the user interface window in the upper left corner of your PC display.

## 6. Hardware

Press **Reset** to initialize the test set. All prior test set configurations are retained.

## 7. Software Version

When the test set is started and the user interface program is launched, the test set returns information about the firmware version and the PC Dynamic Link Library (DLL) file.

## 8. Firmware Update (Debug Mode Only)

The Firmware Update panel is used to set the required communication port and initiate the firmware download process. This is only available in debug mode and you should refer to the instructions on the E1852B Software Home Page. (The URL can be found on the **About** page of the user interface.)

---

**NOTE** The user interface software and the test set software must be the same version. If they differ an error message is displayed. Refer to Firmware Download on page 223.

## 9. Measurement Setup

The Measurement Setup panel offers you the choice of configuring Bluetooth compliant 10 packet measurements when in **Test Mode** on or a variety of measurements on single packets in **Test Mode**, **Normal Mode**, and **RF Analyzer**.

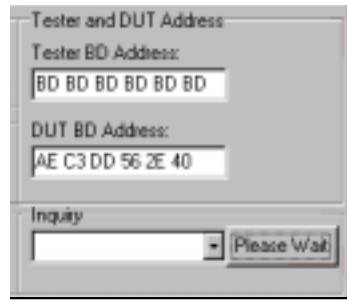
## 10. Tester and DUT address

The 12 digit hexadecimal (hex) BD address of the test set is displayed in the **Tester BD Address:** field. You can choose a new address and save it in the test set memory by entering the new address in the **Tester BD Address:** field and pressing **Reset**. This address may require changing for specific module application programs.

To enable communication between the test set and the DUT, the unique DUT BD address must be entered in the **DUT BD Address:** field.

## 11. Address Inquiry

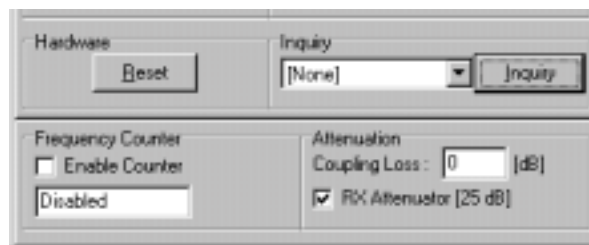
The **Inquiry** function can be used to find any Bluetooth devices in the vicinity of the test set. Press the **Inquiry** button to start the process.



During the inquiry process, the **Inquiry** button changes to **Please Wait**.



When the Inquiry is complete you can scroll through the displayed addresses and select the required device. **[None]** is displayed if no devices are found.



**Table 1 System Page - Panel Summary**

<b>Panel</b>	<b>Parameters</b>	<b>Description</b>
1. Communication Port	Lpt1 Lpt2 Lpt3	PC parallel ports for control of the test set. Lpt1 is default
2. GPIB Configuration	GPIB card GPIB address	Used to configure the GPIB system for communication with the test set
3. Log Settings	Log Measurement	Log file containing all the measurements
	Interval (Sec.)	Length of time between data logging events in seconds
	Log Communication	In Debug mode only, log file containing all the measurements and commands
4. Connection Setup	Read DUT Features	Displays the DUT enabled Bluetooth features
	Enable Wait in Testmode	The test set pauses during a testmode setup as required by some DUTs
5. Windows Position	Default	Pressing Default places the user interface in the top left corner of your PC desktop
6. Hardware	Reset	Pressing Reset initiates a 'warm start' reset of the test set
7. Software Version	Firmware Version	The test set is polled and the Firmware version is displayed
	PC DLL Version	Displays the DLL version held on the PC
8. Firmware Update	Com1 to Com 9	Used to download new firmware to the test set
9. Measurement Setup		
Meas. Display	Single/10Pkt. Compliant	Selects single packet measurements or Bluetooth compliant 10 packet measurements
Meas. Type	Single/Rolling /Sequential	Choice of measurement updates when 10 Packet compliant measurements selected

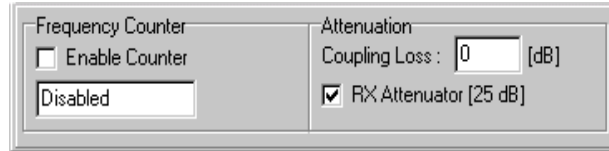
**Table 1 System Page - Panel Summary**

<b>Panel</b>	<b>Parameters</b>	<b>Description</b>
10. Tester and DUT address	Tester BD Address	Entry and display of the BD address of the test set
	DUT BD Address	Entry and display of the BD address of the DUT
11. Address Inquiry	DUT BD Addresses	Used to find out addresses of any BD in the vicinity of the test set



## Frequency Counter and Attenuation

The **Frequency Counter** and **Attenuation** panels are always displayed below the currently selected page.



**Figure 28** Frequency Counter and Attenuation Panels

### Frequency Counter

Clicking the **Enable Counter** check box enables the counter. The frequency of the signal present at the **COUNTER IN** BNC connector on the test set front panel is measured and displayed. (The input parameters are described in “General Specifications” on page 215.)

### Attenuation

If the coupling loss at the RF IN/OUT connector is known, the value can be entered in the **Coupling Loss:** field. The test set factors the loss into the measurement results.

Clicking the **RX Attenuator** box adds 25 dB attenuation to the signal in the test set receive direction.

---

**NOTE** Switch the RX attenuator on when testing Class I devices to ensure the E1852B Bluetooth Test Set receiver operates within its linear range.

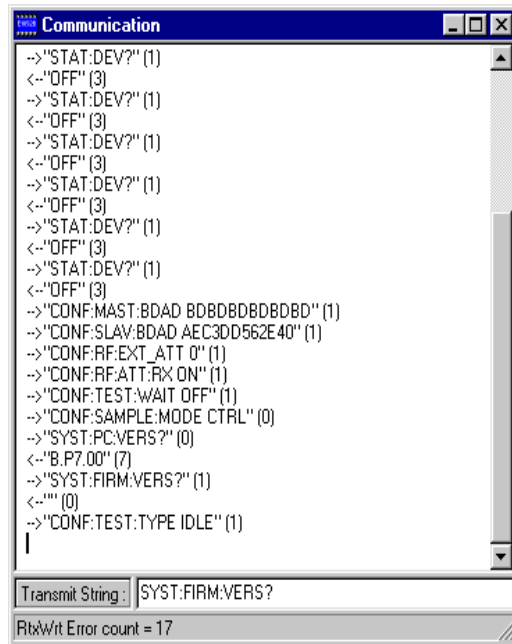
Switch the attenuator off for Class II and Class III devices.

---

**NOTE** Do not connect a signal to the front panel during a measurement.

## Communication window (Debug Only)

The Communication window is only displayed when you start the user interface in debug mode (**Start, Programs, Agilent Technologies, E1852B Debug**).

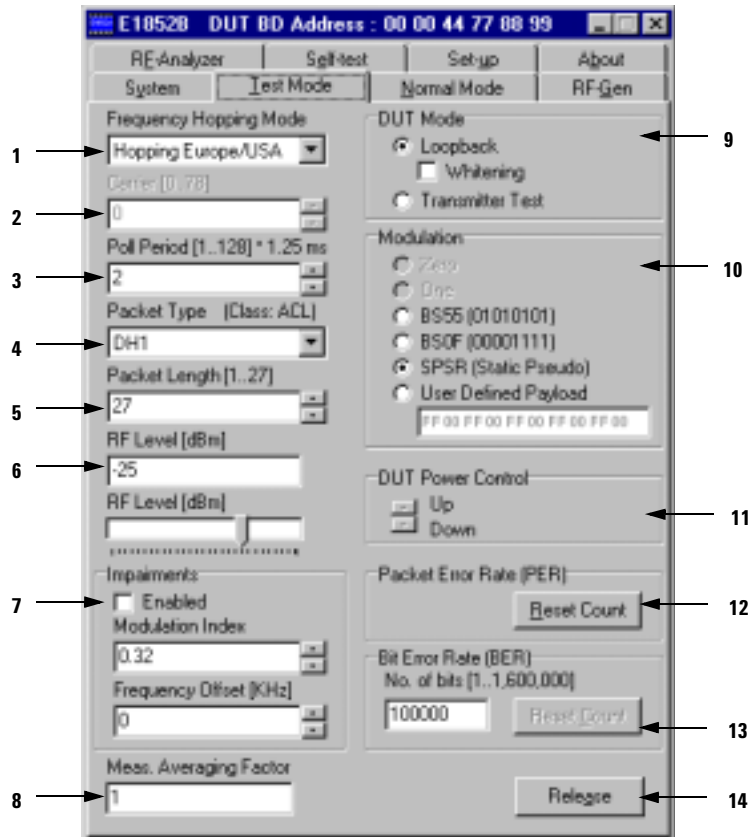


**Figure 29** Communication Window

You can use this window to view and record the communication between your PC and test set, and send one command at a time in the **Transmit String** line. For more information about this feature refer to “Command Structure” on page 200.

# Test Mode Page

The **Test Mode** Page contains the settings required for making measurements in Bluetooth Test Mode<sup>1</sup>.



**Figure 30 Test Mode Page**

<sup>1</sup> There are variations in Bluetooth Test Mode between suppliers. Contact your Agilent support if you have questions or experience problems

## Test Mode Page structure

The **Test Mode** page contains the following panels and entry fields:

### 1. Frequency Hop Mode

In **Test Mode**, you can choose to make measurements on a specific channel or in Bluetooth frequency hopping mode. Use this selection field to select Single Frequency or Hopping Europe/USA.

### 2. Carrier

The **Carrier** entry field is only enabled if you have chosen to make measurements in a single channel. You can select any one of the 79 channels on the ISM band (channel 0 – 78 ~ 2.402 – 2.480 GHz).

Channel 40 is the mid frequency at 2.442 GHz.

### 3. Poll Period

The time period for transmitting Bluetooth test packets in Transmitter or loop back mode.

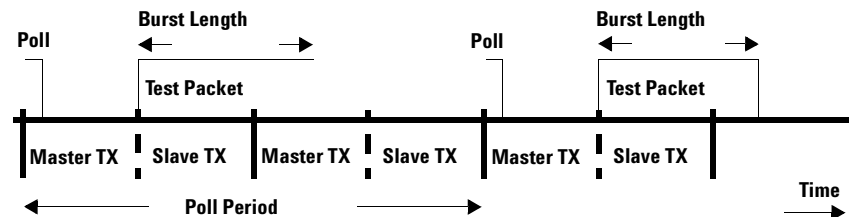
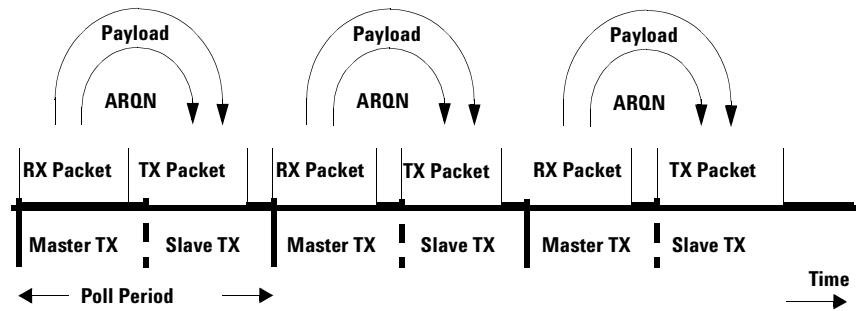


Figure 31 Transmitter Test Mode



**Figure 32 Loopback Test Mode**

## 4. Packet Types

You can select a Bluetooth specific single or multi slot packet. The supported packet types are **DH1**, **DH3**, **DH5**, **HV3**, and **AUX1**. DH (Data High Rate) packets are asynchronous whereas HV (Human Voice) packets are synchronous. Most Bluetooth tests use the DH packets as no error correction is applied to these packets thus the fundamental RF performance is more visible.

## 5. Packet length

The length of the packets can be varied:

<b>DH1</b>	<b>1 to 27</b>
<b>DH3</b>	<b>1 to 183</b>
<b>DH5</b>	<b>1 to 339</b>
<b>HV3</b>	fixed at <b>30</b> bytes
<b>AUX1</b>	<b>1 to 29</b>

## 6. RF Level

The RF power level in the test set transmit direction can be adjusted for sensitivity measurements. The power level is continuously variable from -85 to 0dBm in 1 dB increments. The power level can be entered directly in the **RF Level [dBm]** field or adjusted by moving the **RF Level** slider.

## 7. Impairments

In this panel you can select signal impairments. Enabled only in **Loopback** Mode, you can adjust the **Modulation Index** and the **Frequency Offset** to determine the DUT tolerance of poor transmitter performance. Modulation index values range from 0.28 to 0.35 while frequency offset range is  $\pm 75$  kHz.

## 8. Meas. Averaging Factor

You can choose to make measurements on single packets or average the results over a number of packets up to a maximum of 999. A lower number updates the measurement more frequently. The default setting of 1 is often the optimum value.

## 9. DUT Mode

In this panel you can choose **Loopback** or **Transmitter Test**. Choosing **Loopback** mode enables **Bit Error Rate (BER)** measurements.

Various modulation patterns (**Modulation** panel) are available when **Transmitter Test** mode is selected. In this mode the test set instructs the DUT to transmit the specified patterns. You can specify your own data payload by entering hexadecimal values in the **User Defined Payload** edit line only when in Loopback mode with Data Whitening off. Payload checking occurs on all payload types.

All modulation patterns are available in **Loopback** but **Data Whitening** can only be applied to the **SPSR** data payload.

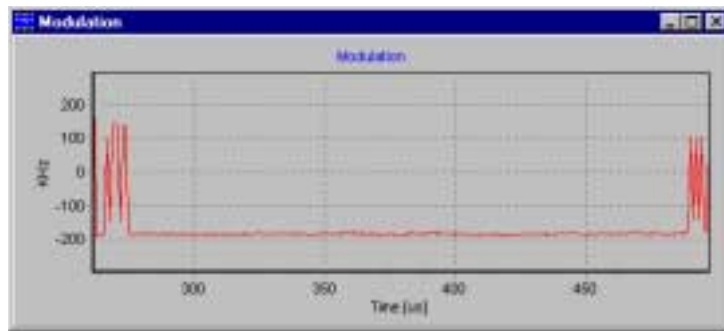
---

**NOTE** Not all devices support this function.

## 10. Modulation

When **Loopback** is the selected **DUT Mode**, all modulation patterns are available (**Zero**, **One**, **BS55**, **BS0F**, and **SPSR** and **User Defined Payload**). For example, BS55 specifies a 01010101 bit pattern. The modulation patterns are shown in Figure 33, Figure 34, Figure 35, Figure 36, and Figure 37.

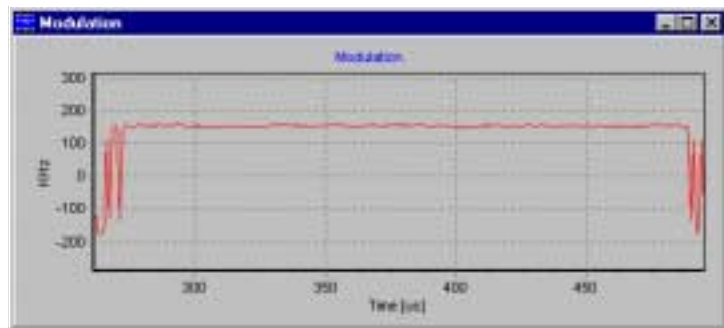
The static pseudo random modulation (**SPSR**) is the only pattern available in **Loopback** with **Whitening** on.



**Figure 33 Modulation Pattern 'Zero'**

---

**NOTE** All '0' or all '1' payloads can be useful for checking for interference on the DUT transmission. Specific radio types may not function correctly or support these payloads.



**Figure 34 Modulation Pattern 'One'**

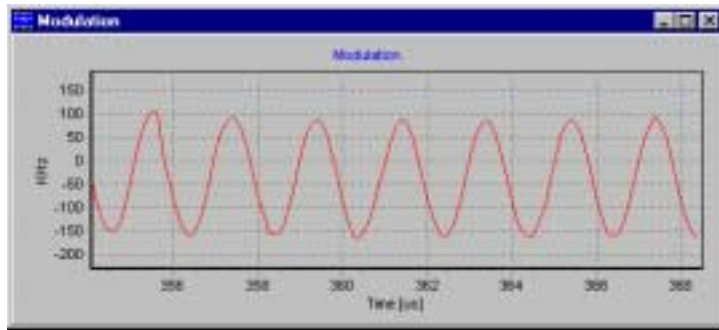


Figure 35 Modulation Pattern 'BS55 (01010101)'

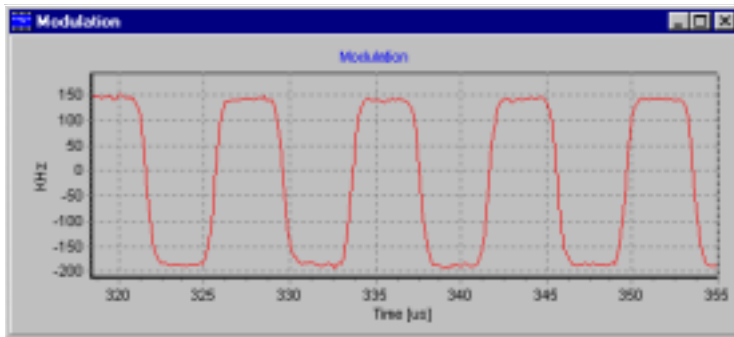


Figure 36 Modulation Pattern 'BS0F (00001111)'

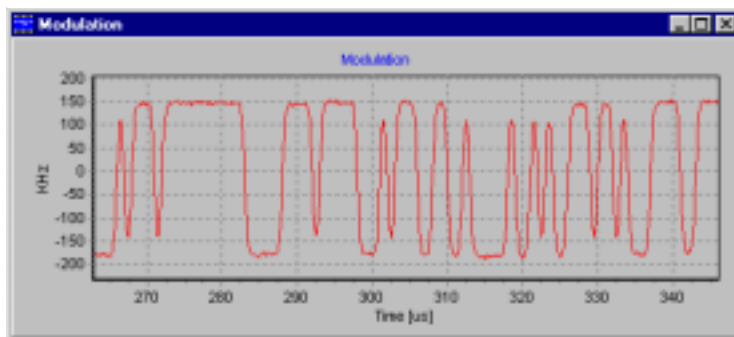


Figure 37 Modulation Pattern 'SPSR (Static Pseudo)'



## 11. DUT Power Control

If the DUT supports this feature, you can use the up/down buttons to control its RF output level.

## 12. Packet Error Rate (PER)

You can reset the running Packet Error Rate by pressing **Reset Count**.

## 13. Bit Error Rate (BER)

You can enter the number of bits to be used in measuring the **Bit Error Rate** in the entry field. The valid range is 1 to 1,600,000 bits.

The Bit Error Rate can be seen to change rapidly with small changes in RF level. A change from 0.01% to over 1% is possible due to a 5dB level change.

## 14. Page/Release

Clicking **Page/Release** opens or closes a Bluetooth RF connection between the test set and the DUT. Clicking **Page** opens a **Measurements** window. Also the **Page** button changes to **Release**. Clicking **Release** closes the connection.

---

**NOTE** Closing the **Measurements** window also releases the connection.

---

**NOTE** In Test Mode release is executed using **LMP-detach**. The E1852B test set does not yet support the **LPM-test\_control** with scenario **exit test mode**.

**Table 2 Test Mode Page - Panel Summary**

<b>Panel</b>	<b>Parameters</b>	<b>Description</b>
1. Frequency Hop Mode	Single Frequency or Hopping Europe/ USA	Selects Frequency Hopping on or off
2. Carrier	0 to 78	Entry and display of the ISM band channel number (0 to 78, 2.402 to 2.480 GHz)
3. Poll Period	1 to 255	Selects the time period for transmitting test packets - depends on packet type
4. Packet Types	DH1 to DH5, HV3 and AUX1	Selects the data packet type
5. Packet Length	1-27 for DH1 1-183 for DH3 1-339 for DH5 AUX1 (fixed) HV3 (fixed)	Selects the packet length
6. RF Level	-85 to 0dBm	Entry field or slider control
7. Impairments	Mod. Index 0.28 to 0.35 Freq. Offset $\pm 75$ kHz	Simulates poor transmitter performance.
8. Meas. Averaging Factor	1 to 999	Selects the number of packets to be used for the measurement
9. DUT Mode	Loopback or Transmitter Test	Selects the test mode required for the DUT - Loopback enables PER and BER measurements, various modulation patterns can be used with Transmitter Test
10. Modulation	Zero, One, BS55, BS0F, SPSR, User Defined	Selects the modulation required for the Transmitter Tests
11. DUT Power Control	variable	Enables adjustment of DUT RF level (if supported by DUT)
12. PER		Running Packet Error Rate
13. BER	1 to 1,600,000	Selects the required bits for the BER measurement (Loopback test)
14. Page/Release		Opens and closes the Bluetooth connection to the DUT

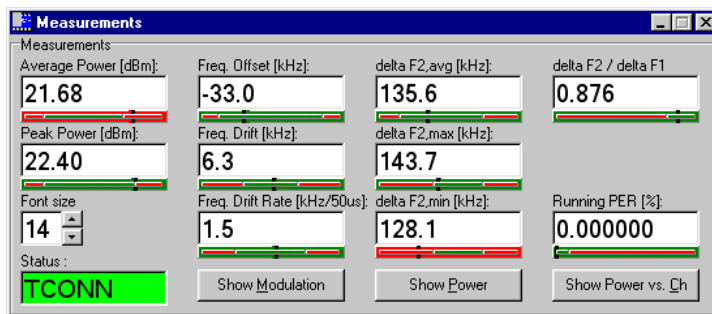
## Test Mode Measurement Windows

When a Bluetooth connection is established, a **Measurements** window is displayed. There are two types of measurement window; **Single Packet Measurements** and **10 Packet Measurements**. The **10 Packet Measurements** window is only displayed when you have selected the **10 Pkt. Compliant** measurement type from the **System Panel** and established a **Test Mode** connection to the DUT. In all other configurations the **Single Packet Measurements** window is displayed.

Configuration	Measurement Window	
	10 Packet	Single Packet
Test Mode connection	•	•
Normal Mode connection	×	•
RF Analyzer	×	•

## Single Packet Measurement Windows

The measurement results are continuously updated and shown in the display fields of this window. Associated with each result is a red/green bar with a small indicator in black which are described in detail in the section Set-up Page on page 115.



**Figure 38 Transmitter Test Measurements Window (BS55 Modulation Selected)**

---

**NOTE** Due to the large amount of data traffic used to generate and refresh these displays, GPIB performance may be slowed.

## RF Measurements in Transmitter Test DUT Mode

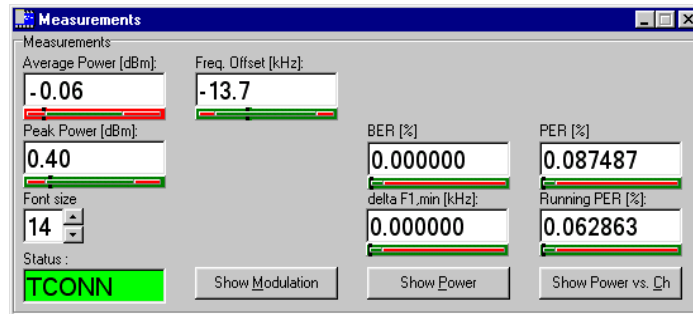
The following parameters are displayed in the **Single Measurements** window during **Transmitter Test**:

- **Average Power**
- **Peak Power**
- **Frequency Offset**
- **Frequency Drift** - 0101 pattern only
- **Frequency drift Rate** - 0101 pattern only
- **Delta F2 Average** - Delta F1 average with 00001111 pattern
- **Delta F2 Max** - using Debug version of user interface only
- **Delta F2 Min** - using Debug version of user interface only
- **Delta F2 / Delta F1**
- **Delta F1 Average**
- **Delta F1 Max**
- **Delta F1 Min**
- **Running PER**

## RF measurement parameters in Loopback DUT Mode.

The following parameters are displayed in the **Measurements** window during **Loopback Test**:

- **Average Power**
- **Peak Power**
- **Frequency Offset**
- **Running BER**
- **BER**
- **Packet Error Rate**



**Figure 39 Loopback Test Measurements Window (Whitening On)**

---

**NOTE** Some extra measurements, not in the Bluetooth specification, using remote commands. (Refer to Chapter 5, “Programming Reference” on page 133.)

## Font size

To view the measurements results from a greater distance you can change the displayed size of text on the **Measurements** window. The font size is selectable from 12 to 18. (Default is 18.)

## Status

The status display line shows the state of the test set or if the connection is off. Colour coding is also used to indicate the state. (Refer to Chapter 5, “Programming Reference” on page 133 about the SCPI states).

## Show/Close Measurement Graphs

When a Bluetooth connection is established, the graph windows can be opened and/or closed. Pressing **Show Modulation**, **Show Power**, and **Show Power vs. Ch** displays the graphs as shown in Figure 40, Figure 41, and Figure 42. When a graph is displayed, the associated button changes to **Close**.

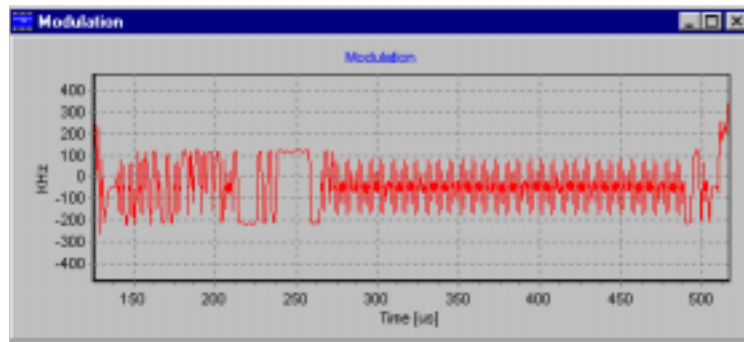


Figure 40 Modulation Display

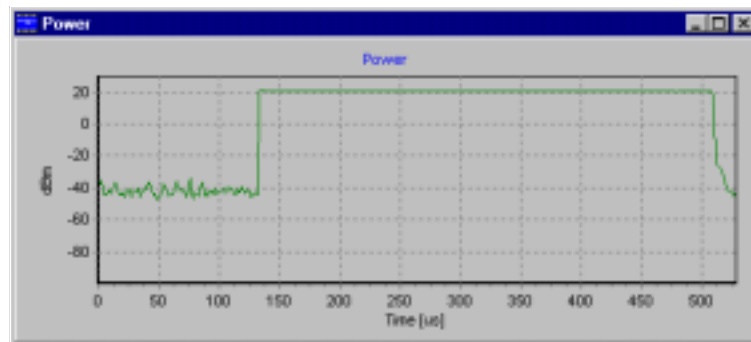
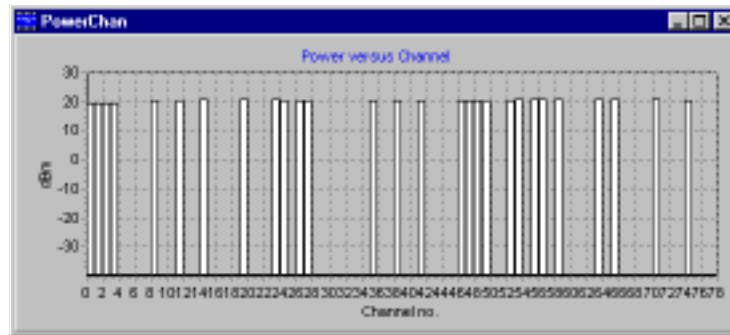


Figure 41 Power Display



**Figure 42 Power vs. Ch Display**

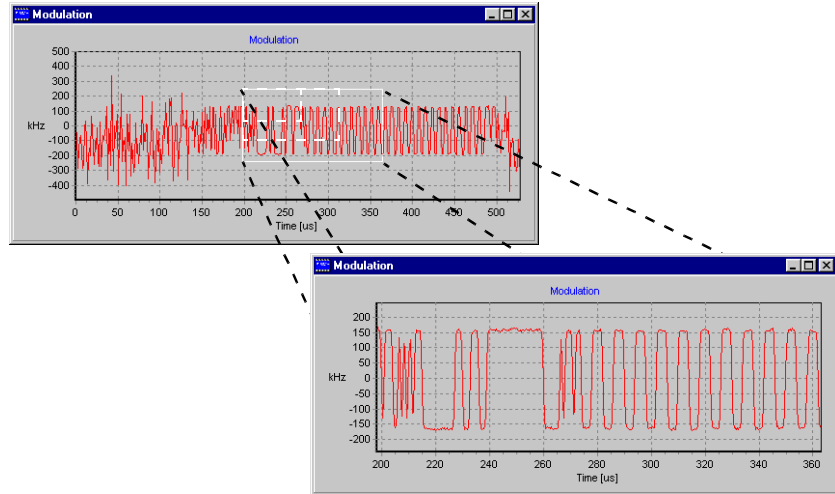
NTP (average power) is measured for each channel. PTP (peak power) cannot be obtained from this measurement. The Power vs. Channel display can be captured even when the DUT is in frequency hopping mode. Simply wait for the channels to be visited



### Zoom function in the graph windows

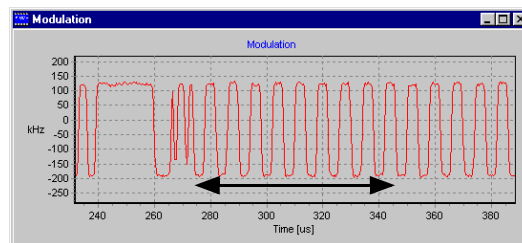
You can zoom in and out on the three graph windows by left clicking and dragging the mouse.

Begin in the upper left corner of the graph. Left click and drag a rectangle to the lower right and release the mouse button.



**Figure 43** Zooming into a trace

Now right click in the display and slide the graph to view the area of interest.



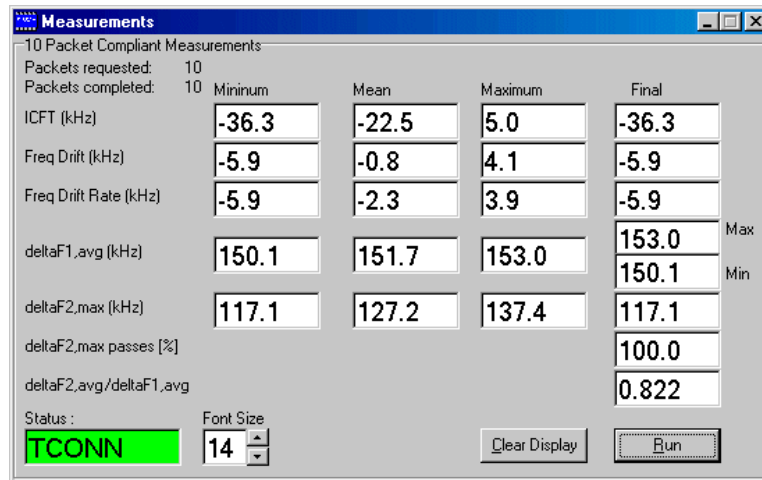
**Figure 44** Scrolling through a trace

Left click in the lower right and drag to the upper left to return to the normal viewing.

**NOTE** Only a small amount of the available data is used to generate the graphical displays. The displays should be regarded only as a close approximation.

## 10 Packet Measurement Window

The **10 Packet Compliant Measurements** window is displayed when you select **10 Pkt. Compliant** and a **Test Mode** connection is made. The **Meas. Type** scroll box offers the choice of **Single**, **Rolling**, and **Sequential**.



**Figure 45 10 Packet Measurements Window - Single Mode (BSOF Modulation Selected)**

- **Single** - This is the single shot mode - the measurements are made on packets 1 to 10 and the results displayed. The measurement is then halted. Pressing **Run** re-starts the measurement
- **Rolling** - The measurements are made on packets 1 to 10 and displayed. On receipt of packet 11 the results for packets 2 to 11 are displayed. This continues with results for packets 3 to 12, 4 to 13, and so on updating the results fields until you stop the measurements.
- **Sequential** - This can be likened to the single shot measurement running continuously. The measurements are made on packets 1 to 10 and the results displayed. The measurements continue and the results are updated with results for packets 11 to 20, 21 to 30 and so on until you halt the measurement.

You can clear all the results at any time by pressing **Clear Display**.

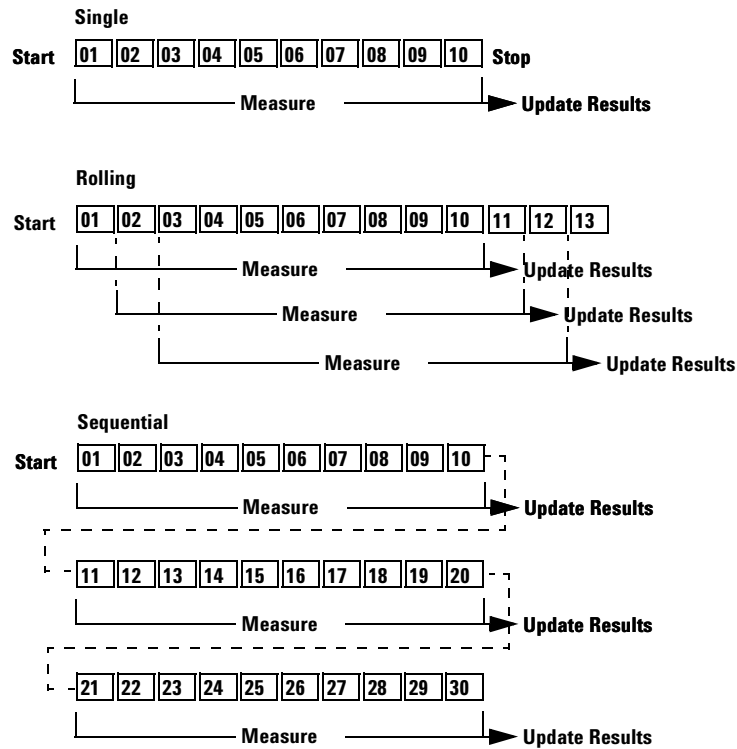


Figure 46 Single, Rolling, and Sequential Measurements

## Compliant Measurements in Transmitter Test Mode

The following parameters are displayed in the **10 Pkt. Measurements** window during **Transmitter Test**:

- **ICFT (Initial Carrier Frequency Tolerance)**
- **Frequency Drift**
- **Frequency Drift Rate**
- **Delta F1, avg**
- **Delta F2, max**
- **Delta F2, max passes**
- **Delta F2, max/deltaF1, avg**

# Normal Mode Page

**Normal Mode** is used to make RF measurements in a Bluetooth connected link where the Bluetooth test mode is not required or is not supported in the DUT. This mode is also use for audio tests. **Normal Mode** test facilities can be used to quickly determine the performance of the DUT before implementing more comprehensive measurements in Bluetooth Test Mode.

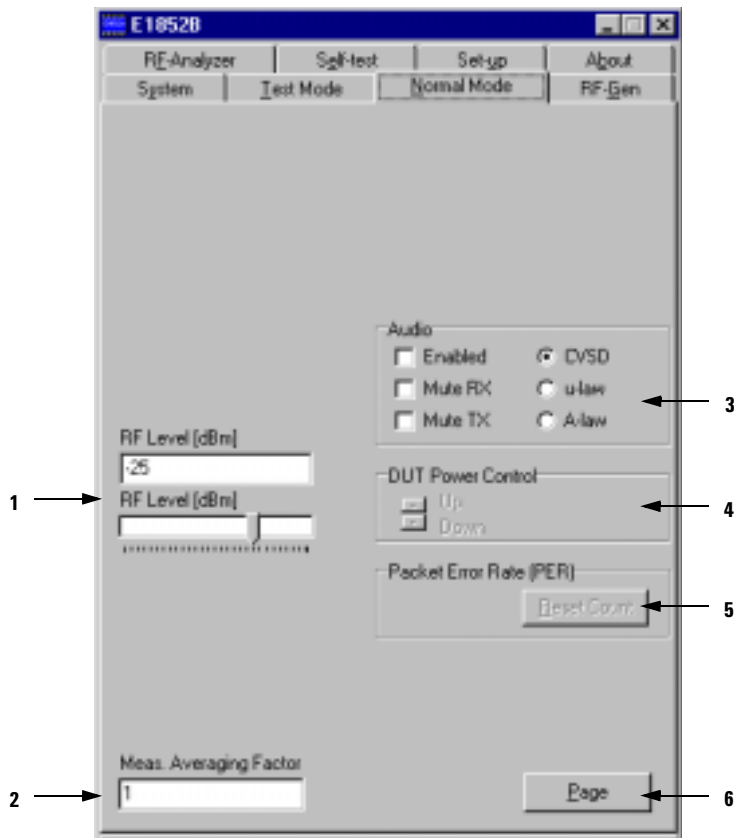


Figure 47 Normal Mode Page

## Normal Mode Page structure

The **Normal Mode** page contains the following panels and entry fields:

### 1. RF Level

The RF power level in the test set transmit direction can be adjusted for sensitivity measurements.

The power levels can be adjusted from  $-85$  to  $0$ dBm.

The power level can be entered directly in the **RF Level [dBm]** field or adjusted by moving the **RF Level** slider.

### 2. Meas. Averaging Factor

You can choose to make measurements on single packets or average the results over a number of packets up to a maximum of 999. A lower number updates the measurement more frequently.

### 3. Audio

The test set currently supports the CVSD audio CODEC.

### 4. DUT Power Control

If the DUT supports this feature, you can use the up/down buttons to control its RF output level.

### 5. Packet Error Rate (PER)

The running Packet Error Rate is displayed on the Normal Mode **Measurements** window.

## 6. Page/Release

The **Page/Release** button opens or closes a Bluetooth RF connection between the test set and the DUT. Clicking **Page** opens a **Measurements** window. When a Bluetooth connection is established, the **Measurements** window is displayed. Also the **Page** button changes to **Release**.

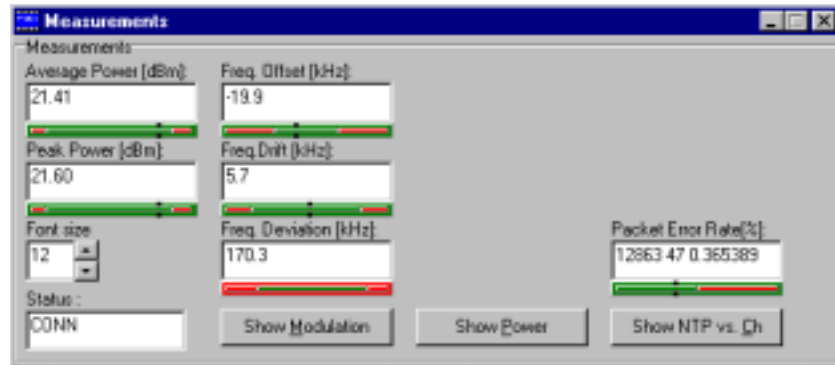
Clicking **Release** closes the connection.

---

**NOTE** Closing the **Measurements** window also releases the connection to the DUT

# Normal Mode Measurement Window

When a **Normal Mode** Bluetooth connection is established, the **Single Packet Measurement** window opens.



**Figure 48** Normal Mode Measurements Window

## RF measurement parameters in Normal Mode.

- **Average Power**
- **Peak Power**
- **Frequency Offset**
- **Frequency Drift**
- **Frequency Deviation**
- **Packet Error Rate**

---

**NOTE** Frequency Drift and Frequency Deviation are good indicators of the DUT performance. They cannot be made in exactly the same way as Testmode because the payload is different.

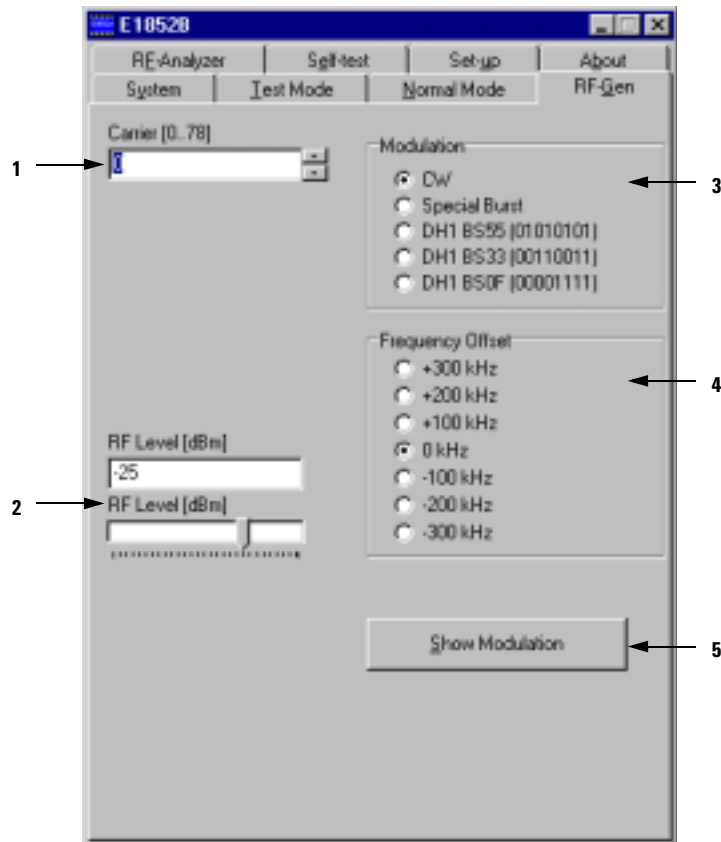
**Table 3 Normal Mode Page - Panel Summary**

<b>Panel</b>	<b>Parameters</b>	<b>Description</b>
1. RF Level	0 to -85 dBm	Entry field or slider to control the RF level
2. Meas. Averaging Factor	1 to 999	Selects the number of packets to be used for the measurement
3. Audio	Enabled, Mute RX, and Mute TX	Enables the audio input and output signal paths to the rear panel. Only CVSD CODEC supported at present.
4. DUT Power Control	variable	Enables adjustment of DUT RF level (if supported by DUT)
5. PER		PER is displayed on the Measurements window. Pressing Reset Count resets and restarts the running count
6. Page/Release		Opens and closes the Bluetooth connection to the DUT



## RF-Gen Page

The **RF-Gen** (RF-Generator) page is used to generate RF signals from the test set on a selected channel within the specified Bluetooth radio band. It can be useful to check a DUT that cannot establish a link or to calibrate a parameter such as Receive Signal Strength Indication (RSSI).



**Figure 49 RF-Generator Page**

## RF-Gen Page structure

The **RF-Gen** page contains the following panels and entry fields:

### 1. Carrier

The carrier frequency can be chosen by selecting one of the 79 channels on the ISM band (channel 0 – 78 ~ 2.402 – 2.480 GHz).

Channel 40 is the mid frequency at 2.442 GHz.

### 2. RF Level

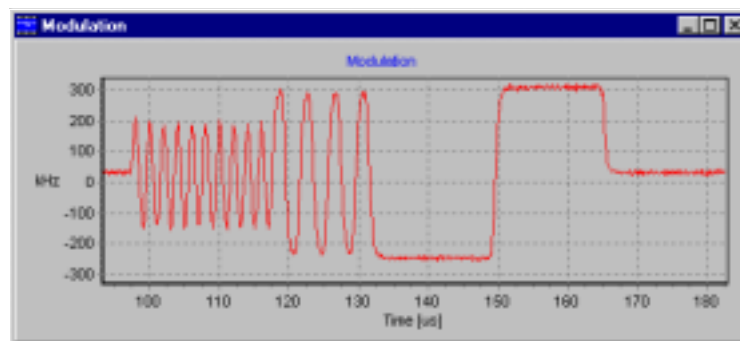
The RF power level in the test set transmit direction can be adjusted for sensitivity measurements.

The power levels can be adjusted from –85 to 0 dBm.

The power level can be entered directly in the **RF Level [dBm]** field or adjusted by moving the **RF Level** slider.

### 3. Modulation

5 modulation patterns are available (**CW**, **Special Burst**, **DH1 BS55**, **DH1 BS33**, and **DH1 BS0F**). The modulation patterns are shown in Figure 50, Figure 51, Figure 52, and Figure 53.



**Figure 50 Special Burst**

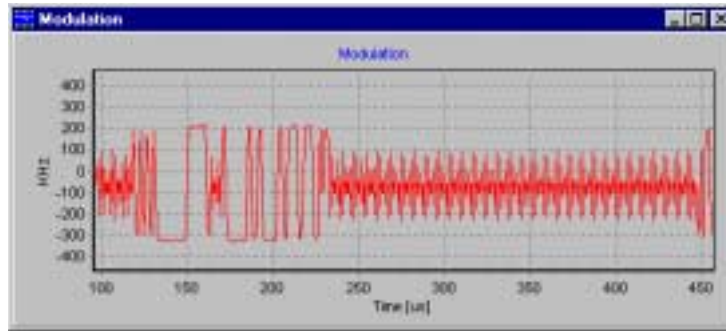


Figure 51 DH1 BS55

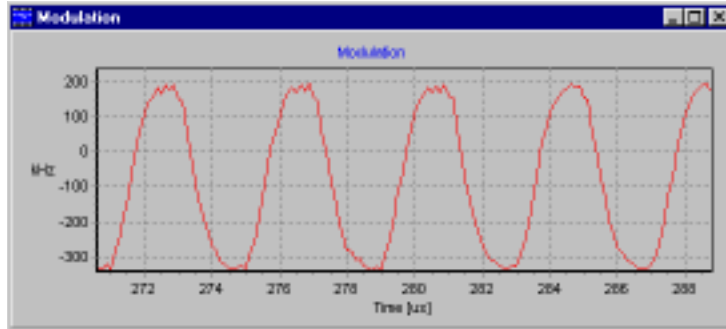


Figure 52 DH1 BS33

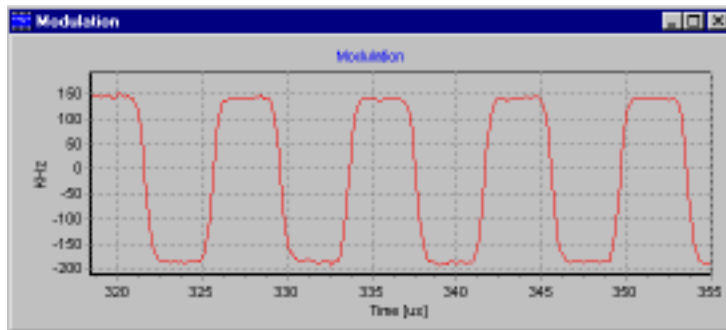


Figure 53 DH1 BS0F

## 4. Frequency Offset

You can apply an offset to the carrier signal from -300 kHz to +300 kHz in 100 kHz steps. This can be used to check how a receiver performs under extreme conditions.

## 5. Show Modulation

Clicking **Show Modulation** opens the **Modulation** graph window showing what is being transmitted.

---

**NOTE** To generate the transmitted modulation pattern display, a small amount of signal is picked off at the RF output of the test set. The amplitude of this signal is influenced by the output signal magnitude and the load/mismatch at the output connector. When the output is loaded correctly we do not recommend using the **Modulation** graph window below -10 dBm output signal levels.

**Table 4 RF-Gen Page - Panel Summary**

Panel	Parameters	Description
1. Carrier	0 to 78	Entry and display of the ISM band channel number (0-78, 2.402-2.480 GHz)
2. RF Level	-85 to 0 dBm	Entry field or slider to control the RF level
3. Modulation	CW, Special Burst, DH1 BS55, DH1 BS33, and DH1 BS0F	Selects the modulation pattern required.
4. Frequency Offset	0 kHz, $\pm 100$ kHz, $\pm 200$ kHz and $\pm 300$ kHz	Selects the frequency offset required
5. Show Modulation		Opens the Modulation Graph window

# RF-Analyzer Page

The **RF-Analyzer** page can make RF measurements on the DUT without first establishing a Bluetooth connection. A Measurements window is displayed when the RF-Analyzer page is selected.

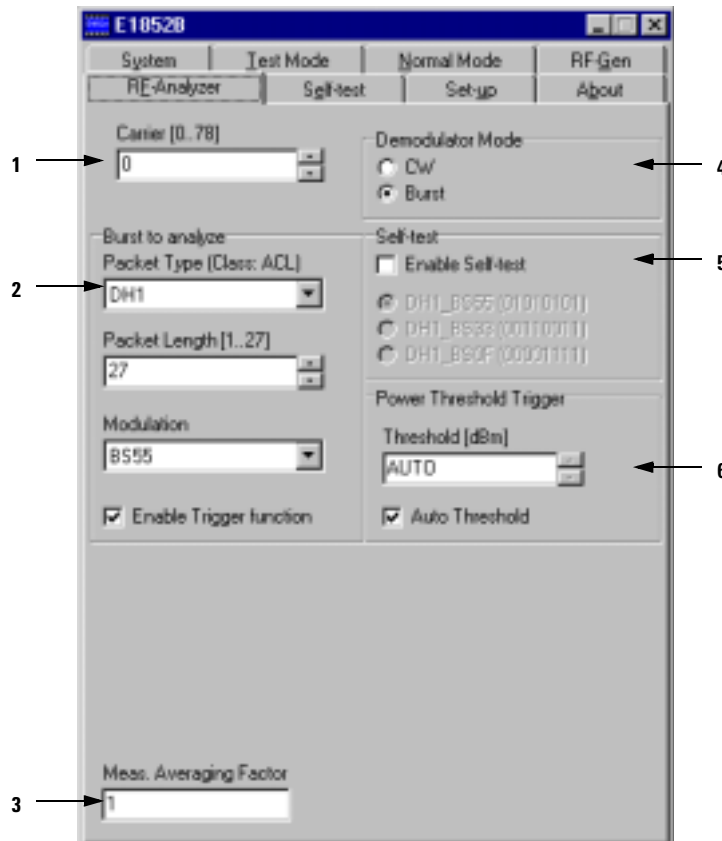


Figure 54 RF-Analyzer Page

## RF-Analyzer Page structure

The **RF-Analyzer** page contains the following panels and entry fields:

### 1. Carrier

The carrier frequency can be chosen by selecting one of the 79 channels on the ISM band (channel 0 – 78 ~ 2.402 – 2.480 GHz).

Channel 40 is the mid frequency at 2.442 GHz.

### 2. Burst to analyze

The **RF-Analyzer** only requires the channel number to be specified if you are making measurements on a DUT transmitting a CW signal. If however, you want to measure a specific burst transmitted by the DUT, you must ensure the **RF-Analyzer** is configured with the same burst parameters. First configure the following:

- **Packet Type** - select the specific single or multi slot packet transmitted by the DUT. The supported packet types are:
  - **DH1, DH3, and DH5**
- **Packet Length** - select the packet length being transmitted by the DUT. Supported lengths are:
  - **1 to 27** for **DH1** single slot packets
  - **1 to 183** for **DH3** multi slot packets
  - **1 to 339** for **DH5** packets.
- **Modulation** - select the modulation pattern being transmitted by the DUT. Supported patterns are:
  - **BS0F**
  - **BS33**
  - **BS55**

### 3. Meas. Averaging Factor

You can choose to make measurements on single packets or average the results over a number of packets up to a maximum of 999. A lower number updates the measurement more often.

### 4. Demodulator Mode

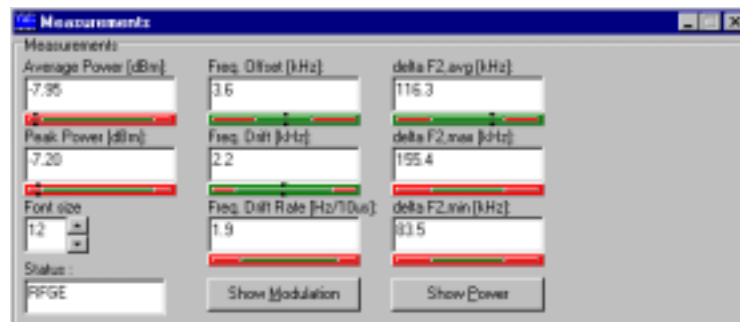
To measure a CW signal only at the channel number specified, simply select **CW**. To make measurements on a DUT transmitting a burst as specified in the **Burst to analyze** panel, click Burst.

### 5. Self-test

The 'Enable Self-test' check-box allows you to make a limited measurement of the test set. The output signal is looped-back internally and the results displayed. This is a useful check of test set performance and can be used to gain familiarity with Bluetooth RF signals.

### 6. Power Threshold Trigger

You can set the threshold value for the power envelope of the bluetooth burst when the Burst Demodulator Mode is enabled. This value used when the measurement attempts to find the power envelope of the applied bluetooth signal.



**Figure 55 RF-Analyzer Measurements - BS55 Modulation Pattern**

**Table 5 RF-Analyzer Page - Panel Summary**

<b>Panel</b>	<b>Parameters</b>	<b>Description</b>
1. Carrier	0 to 78	Entry and display of the ISM band channel number (0-78, 2.402-2.480 GHz)
2. Burst to analyze	Packets DH1 to DH5, HV3 and AUX1  Packet Lengths 1 to 27 for DH1, 1 to 183 for DH3, 1 to 339 for DH5  Modulation patterns BS0F, BS33, BS55	Entry and display fields for information required when making measurements in Burst Mode
3. Meas. Averaging Factor	1 to 999	Selects the number of packets to be used for the measurement
4. Demodulator Mode	CW or Burst	Selects the required measurement method
5. Self Test	DH1_BS55 DH1_BS33 DH1_BS0F	Selects Self Test mode and the data packet/modulation to be measured
6. Power Threshold Trigger	variable	Specifies the burst power trigger level



# Self-test Page

Using the **Self-test** page you can quickly verify the operating status of the test set.

**NOTE** Ensure any connection to the **RF IN/OUT** port is removed.

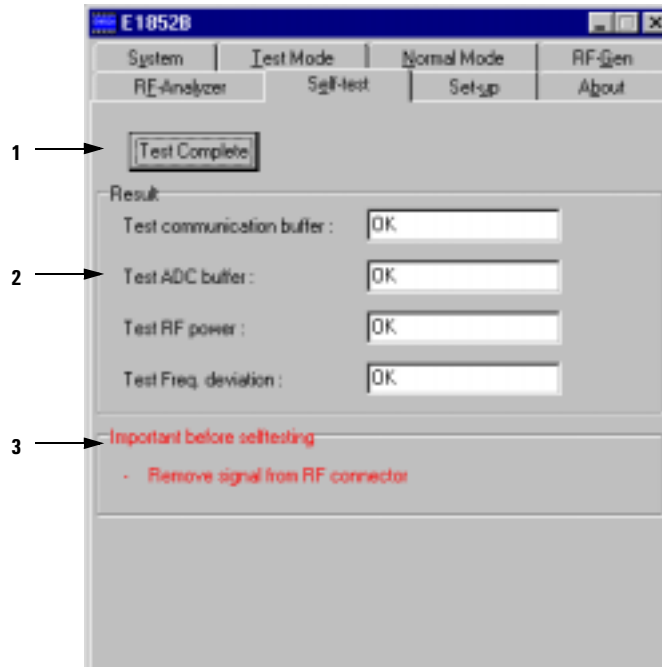


Figure 56 Self-test page

## Self-test Page structure

The **Self-test** page contains the following panels and entry fields:

### 1. Start

Click the **Start** button to begin verification of the test set.

## 2. Result

The four self-test results are displayed in the associated fields.

- **Test communication buffer:**
- **Test ADC buffer:**
- **Test RF power:**
- **Test Freq. deviation:**

**OK** is shown in the display fields when each test has been completed successfully. If a test fails, an error message is displayed. When an error condition occurs first power cycle the test set and rerun the tests. If the error condition persists contact your nearest Agilent Technologies Sales and Service Office (see Contacting Agilent Technologies on page 227.)

## 3. Reminder

You are reminded to remove any connection to the **RF IN/OUT** port.

# Set-up Page

The **Set-up** page provides a limits matrix where you can enter pass and fail values for the measurement parameters. You can quickly configure parameters using the save/recall function to setup previously saved settings. The data entered in this page is used to specify the scale of the red/green bar indicators on the **Measurements** windows.

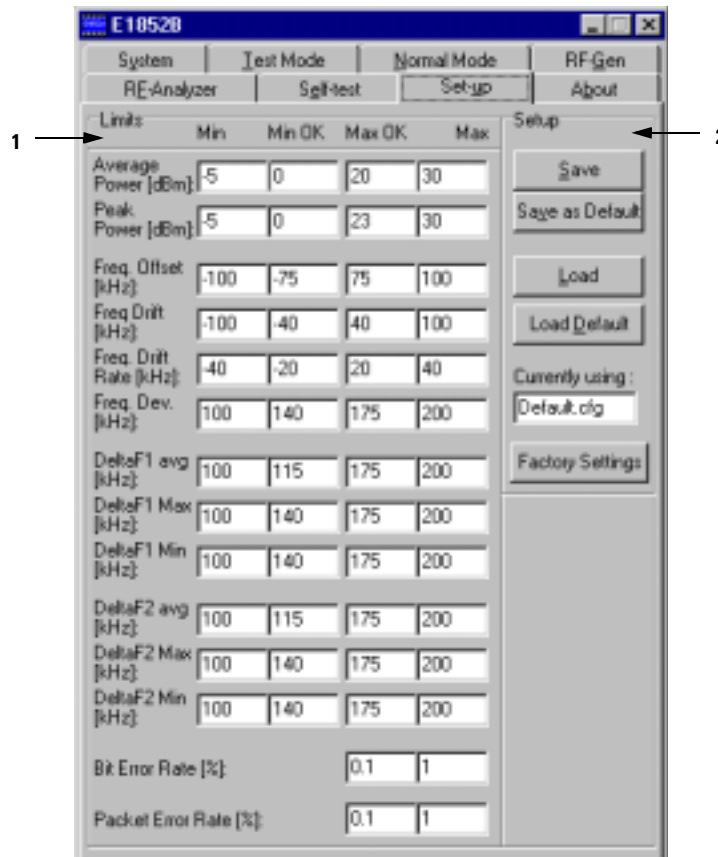


Figure 57 Set-up Page

## Set-up Page structure

The **Set-up** page contains the following panels and entry fields:

### 1. Limits

You can use the entry fields to enter and display the required limits.

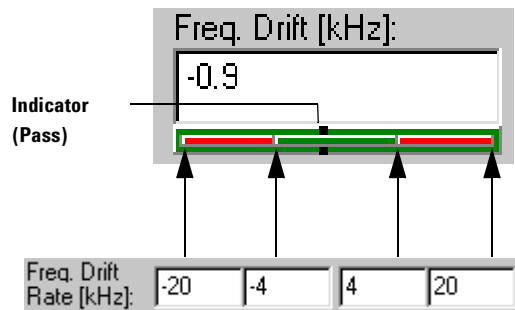
The parameters are as follows:

- **NTP**
- **PTP**
- **Frequency Offset**
- **Frequency Drift**
- **Frequency Drift Rate**
- **Frequency Deviation**
- **Delta F1 avg**
- **Delta F1 Max**
- **Delta F1 Min**
- **Delta F2 avg**
- **Delta F2 Max**
- **Delta F2 Min**
- **Bit Error Rate**
- **Packet Error Rate**

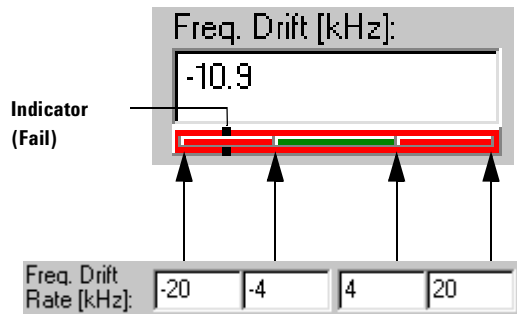
## How the Limits are used

Four limits are required for each parameter. **Min**, **Min OK**, **Max OK**, and **Max** are used to scale the red/green bars for each of the associated parameters on the **Measurements** windows. (see Figure 58 on Page 117)

- **Min** and **Max** limits set the end points of the bar.
- **Min OK** and **Max OK** limits set the position and size of the green 'OK' or 'Pass' section.
- Sections of the bar between the **Min OK** and **Max OK** regions are colored red to indicate a 'Fail'.
- The measurement result is shown numerically in the display field. It is also indicated along the length of the bar by a marker.
- The background area is red when the result is outside the 'OK' limits and changes to green when within the 'OK' limits. (see Figure 58 and Figure 59 on Page 118)



**Figure 58 Frequency Drift Limits and Display Bar (Pass)**



**Figure 59** Frequency Drift Limits and Display Bar (Fail)

## 2. Setup

Setup files provide a convenient and quick method of changing the values in the **Limits** fields. All the values you have entered in the **Limits** fields can be saved in a setup file (.cfg file extension). A setup file can be loaded again to reconfigure the limits to the required values. The name of the set-up file in use is displayed in the **Currently using:** display line.

### Saving and loading setup files

Clicking **Save** opens a dialog window where you can choose the file and path name to create a setup file of the current values. Save these in a folder other than the test set application folder to prevent them being lost if the application folder is uninstalled.



**Figure 60** Save Setup dialog window

Clicking **Load** opens a dialog window for you to choose the required file.



**Figure 61 Load Setup dialog window**

### **Saving and loading the default setup file**

You can save the current set of **Limits** as the default configuration by clicking **Save as Default**. the current configuration is saved as default.cfg. To restore the Limits to your chosen default configuration click **Load Default**.

In addition, you can return all the settings to the factory default values by pressing **Factory Settings**.

# About Page

The **About** page details the version and date of the user interface.

This information can be useful when support from Agilent Technologies is required.



**Figure 62** 'About' page





# 4 DLL Interfacing

## **What You'll Find In This Chapter**

This chapter shows you how the Dynamic Link Library (DLL) is used to communicate with the test set.

It contains these sections:

- Introduction on page 122
  - DLL Interface on page 123
  - Calling Convention on page 124
  - Explicit DLL Linking on page 126
  - Implicit DLL Linking on page 130
  - Agilent Vee Pro DLL Linking on page 131
-

# Introduction

The purpose of this chapter is to help the you develop your own Bluetooth test applications in the test executive you intend to use. In order to successfully control the E1852B Bluetooth Test Set using the SCPI command set, you must first understand how to link to the supplied E1852B Dynamic Link Library (DLL).

Once this is understood, consult the Programming Reference on page 133 for information on the functionality provided by the DLL.

Microsoft Windows provides ways to use dynamic link libraries and various programming/compiler tools adopt slightly different approaches to DLL linking. In this chapter the most common ways to perform DLL linking using Windows WIN32 C++ API are described. Minor adaptations may be necessary when other programming tools are used.

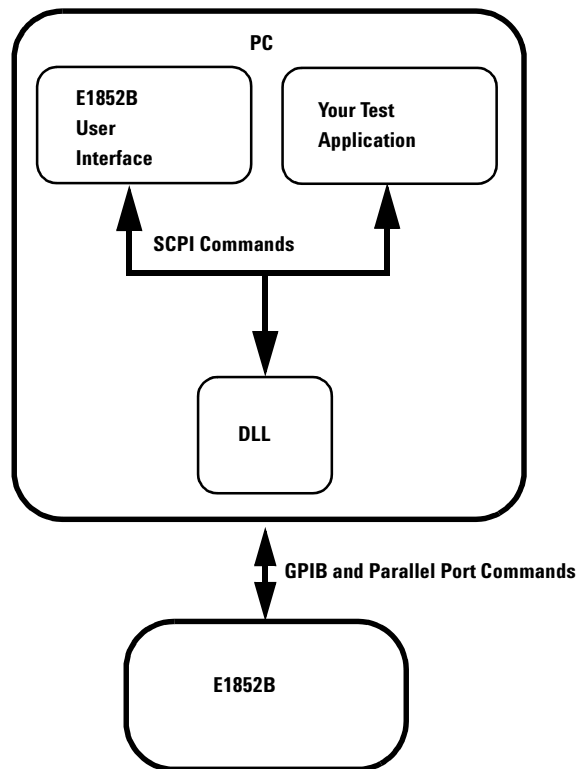
## Terms Used

<b>DLL:</b>	Windows Dynamic Link Library
<b>API:</b>	Application Program Interface

## DLL Interface

The parallel port is used to communicate with the E1852B Bluetooth test set. The commands required for parallel port operation are primitive, involving the use of 'peek' and 'poke' commands to transfer data and functions. The Dynamic Link Library (DLL) acts as a translator between the SCPI commands and the parallel interface commands. An overview of the DLL Interface function is shown in Figure 63. The commands are also routed through the DLL for GPIB operation.

The DLL is available for use by your own test application as shown in the section Calling Convention on page 124.



**Figure 63** The E1852B Dynamic Link Library (DLL)

# Calling Convention

Different programming languages and compilers use different approaches when performing subroutine calls. The methods used to store parameters, return addresses, and so on, on the stack vary. This is called *the calling convention*.

Since the Application may not have been created in the same programming language as the DLL, it becomes necessary to know the calling convention to use when DLL functions are called.

The calling convention used by the E1852B test set DLL is the **`__stdcall`**.

When C++ is used as the Application Programming language, the calling convention is explicitly specified by the **`__stdcall`** keyword in the interface header file E1852Bdll.h.

## DLL Filename and Location

**filename** E1852B.dll

<b>location</b>	<b>Windows NT:</b>	C:\WINDOWS\system32
	<b>Windows 98/2000</b>	C:\WINDOWS\system32

# General Format

The general command format is:

```
RtxWrt(command-string)
```

More commands may be concatenated into one call:

```
RtxWrt(command-string1; command-string2; .. ;  
command-string N)
```

A query can be performed using the format:

```
RtxWrt(query-string?) followed by a RtxRd(result-  
string)
```

---

**NOTE** RtxWrt is a function call to the DLL.

The command consists of a sequence of abbreviations for some words. It is only necessary to enter the upper-case part of the words.

All commands are structured in a way analogous to the SCPI description. The upper-case letters indicate the short form of the command. The E1852B Bluetooth test set only accepts this short form as an abbreviation (according to SCPI), otherwise the long form is used.

## Explicit DLL Linking

With *Explicit Linking*, the Application only requires the interface header file E1852Bdll.h and the DLL itself. All DLL linking is done explicitly by the application program.

Using this approach you must first load the DLL module using the WIN API function:

- LoadLibrary(DLL filename)

Thereafter you must retrieve the addresses for each DLL function explicitly.

- functionPtr = GetProcAddress(DllHandle, function name)

An example is shown below:

```
//-----
// Microsoft Visual C++ 6.0 Win32 Console Demo Application
// demonstrating how to use the dll-interface of the E1852B.
//
// Agilent Technologies, 2001
//-----
/
*****
*                               Include files
*****
/
#define E1852B_VARS // Tells the E1852Bdll.h that we want to
                  // declare the Dll interface functions as
                  // function-pointers, which are then loaded
                  // explicitly.

#include "E1852Bdll.h"
#include "Win32Err.h"
#include "stdio.h"

/*****
*                               Macro definitions
*****
/
#define E1852B_DLL_NAME "E1852B.Dll"
#define LOADFUNC(fname) \
    fname = GetProcAddress(DllHandle, #fname); \
```

```

    if (fname == NULL) \
    { \
        ShowWin32Error(#fname " not found in " E1852B_DLL_NAME); \
        return FALSE; \
    }
/
*****
*
*           Enumerations/Type definitions/Structs
*****
/
/
*****
*
*           Global variables/const
*****
/
/
*****
*
*           Local variables/const
*****
/
static HINSTANCE DllHandle;
char ScpiStr[200];
char ResponseStr[200]
/
*****
*
*           Local Function prototypes
*****
/
/
*****
*
*           Implementation
*****
/
/
*****
* DESCRIPTION:
*****
/
boolean LoadDll(void)
{
    // First load the DLL library
    if (DllHandle == NULL)
    {
        DllHandle = LoadLibrary(E1852B_DLL_NAME);
        if (DllHandle == NULL)

```

```

        DllHandle = LoadLibrary("." E1852B_DLL_NAME);
    if (DllHandle == NULL)
    {
        ShowWin32Error(E1852B_DLL_NAME);
        return FALSE;
    }
// Then setup function pointers.
#ifdef __BORLANDC__
#pragma warn -8075
// Avoid Borland warning
#endif
#pragma warning( disable : 4057) // Avoid Microsoft VC warning
#pragma warning( disable : 4133) // Avoid Microsoft VC warning
#pragma warning( disable : 4113) // Avoid Microsoft VC warning
LOADFUNC(RtxWrt);
LOADFUNC(RtxRd);
}
return TRUE;
}
/
*****
* DESCRIPTION:
*****
/
void UnloadDll(void)
{
    if (DllHandle != NULL)
    {
        FreeLibrary(DllHandle);
        DllHandle = NULL;
    }
}
// End of file.
/
*****
* DESCRIPTION:
*****
/
void SendScpiCommand(char* ScpiStr)
{
    uint16 Errors;
// Send SCPI command
printf("SCPI command      : %s",ScpiStr);
Errors = RtxWrt((far int8 *)ScpiStr);

```



```
    printf("\nSCPI Errors detected: %d",Errors);
// Read the response
    RtxRd((int8 *)ResponseStr);
    printf("\nSCPI response      : %s\n\n",ResponseStr);
}
/
*****
* DESCRIPTION:
*****
/
int main(int argc, char *argv[])
{
    printf("\nAgilent Technologies, 2001\n");
    printf("\nMicrosoft Visual C++ 6.0 Win32 Console Demo
Application.");
    printf("\nDemonstrating how to use the dll-interface of the
E1852B.\n\n");
    if(LoadDll())
    {
// Demonstrate different SCPI commands
        SendScpiCommand("SYST:PC:VERS?");
        SendScpiCommand("SYST:FIRM:VERS?");
        SendScpiCommand("STAT:DEV?");
    }
    return 0;
}
```

## Implicit DLL Linking

With *Implicit Linking* the Application requires the interface header file E1852Bdll.h **plus** the E1852Bdll.lib file (and the DLL itself).

The DLL linking is now done implicitly by the compiler used for creating the Application program. The compiler will recognize this because of the keyword **\_\_declspec(dllimport)** specified in the interface header file. The information needed for the compiler to perform this linking is included in the .lib file. The lib file shall therefore be included in the source file list of the Application project.

Unfortunately there seems to be compiler differences between .lib formats. **Therefore it is recommended to use the implicit DLL linking method only with Borland compilers.** In other cases (e.g. Microsoft), the explicit DLL linking method is recommended.

## Agilent Vee Pro DLL Linking

When using the DLL with an Agilent Vee Pro Application it is necessary to use a special interface header file. The Agilent Vee Pro cannot interpret the conditional compiler directives within E1852Bdll.h. The special interface header file, is therefore basically a stripped down version of the E1852Bdll.h file.





# 5 Programming Reference

## What You'll Find In This Chapter

This Chapter lists and describes the remote command set.

It contains these sections:

- Introduction to the SCPI language on page 134
  - Detailed Command Descriptions on page 142
    - CONFigure Subsystem on page 143
    - FETCH Subsystem on page 168
    - PROCedure Subsystem on page 169
    - READ Subsystem on page 176
    - STATus Subsystem on page 192
    - SYSTem Subsystem on page 193
  - Command Structure on page 200
  - Sending Commands from the User Interface on page 204
  - System Error Codes on page 206
  - Example Program on page 207
-

# Introduction to the SCPI language

The SCPI (standard commands for programmable instruments) command language is recommended when you want to use the test set in high throughput manufacturing environments where the PC user interface is not suitable.

The SCPI commands used with the test set is similar in structure to the SCPI commands used with other Agilent Technologies instruments.

The SCPI language for the test set comprises three levels set up in a hierarchy.

Example:

```
CONF First level
      :TEST Second level
            :TYPE BT Third level
```

The commands should be placed in the corresponding way in accordance with the three command levels. The condition of many of the commands can be queried by adding a '?' to the end of the string.

Example:

```
CONF:TEST:TYPE ?
```

returns IDLE, BT, TESTMODE or RFGE .

## System States

The test set has 12 states. The remote command set and the PC interface are used to change the state according to the required task. `IDLE` for example, is the state immediately after power-on, system reset, or following disconnection from the DUT. In `BT` state, a normal Bluetooth connection is made to the DUT. Likewise, `TESTMODE` is the state required for a Bluetooth Test connection to the DUT. The `RFGE` state is used for other measurements such as power level.

**Table 6 E1852B states**

<b>System State</b>	<b>Description</b>
<b>IDLE</b>	<b>Idle State</b>
<b>RFGE</b>	<b>RF Generator Mode</b>
<b>BT</b>	<b>Bluetooth Normal Mode - no connection</b>
<b>PAGE</b>	<b>Bluetooth Normal Mode - paging the DUT</b>
<b>CONN</b>	<b>Bluetooth Normal Mode - connection made to DUT</b>
<b>DISC</b>	<b>Bluetooth Normal Mode - disconnected from DUT</b>
<b>TESTMODE</b>	<b>Bluetooth Testmode Mode - no connection</b>
<b>TPAGE</b>	<b>Bluetooth Testmode Mode - paging the DUT</b>
<b>TACTIVATE</b>	<b>Bluetooth Testmode Mode - awaiting Test Activate accept from the DUT</b>
<b>TCONTROL</b>	<b>Bluetooth Testmode Mode - awaiting Test Control accept from DUT</b>
<b>TCONN</b>	<b>Bluetooth Testmode Mode - connection made to DUT</b>
<b>TDISC</b>	<b>Bluetooth Testmode Mode - disconnected from DUT</b>

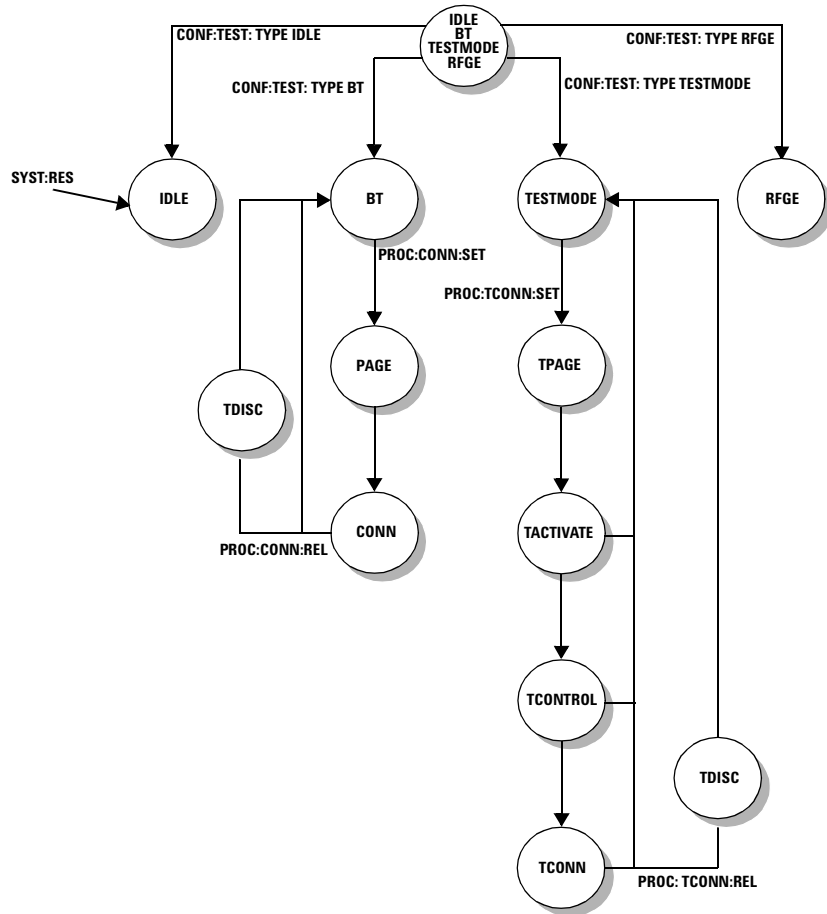


Figure 64 SCPI States



# Configuring the Remote Interface

## Interface selection

You can choose to control the test set remotely using either the GPIB or parallel interfaces.

Use the rear panel DIP switch to select the remote interface type. Refer to Rear Panel Connections on page 13 or the E1852B Bluetooth Test Set *Installation Guide* for more detail.

## Dynamic Link Library (DLL)

The DLL is an integral part of communication with the E1852B Bluetooth Test Set. Even if you intend to only use the remote command set the User Interface and DLL software must be installed on your PC. You must send all commands to the DLL. Do not send commands directly to the parallel or GPIB ports on your PC. Refer to DLL Interface on page 123 for more information.

## GPIB Address

Each device on the GPIB (IEEE-488) interface must have a unique address. The address is set on the rear panel DIP switches A1 to A5. The switches are used to set the address in binary format. A1 is the least significant bit, A5 the most. You can set the test set address to any value between 0 and 31.

Your GPIB bus controller has its own address. Avoid using the bus controller's address for any instrument on the interface bus. Controllers generally use address 21.

A specific address is not required for parallel port operation.

## Factory Default

When shipped from the factory, the DIP switches are configured for address 15.

## Test Mode Connection

When an active Test Mode connection is established, it is highly recommended that a `Stat:DEV?` command is sent immediately following any command that causes the test set to send a Link Management Protocol (LMP) transaction.

Continue to send `Stat:DEV?` until `TCONN` is returned indicating the connection is re-established and the system is ready to proceed.

For example:

```
WRT(CONF:PACK:TYPE DH5)
REPEAT
    WRT_RD(STAT:DEV?)
UNTIL TCONN
```

Use this method with the following commands:

```
CONF:FREQ <value>
CONF:HOP <value>
CONF:MOD <value>
CONF:PACK:LEN <value>
CONF:PACK:TYPE <value>
CONF:POLL:PER <value>
CONF:TEST:MODE <value>
CONF:WHITENING <value>
```

---

**NOTE** You must send the `Stat:DEV?` command immediately following the `CONF:MOD <value>` command otherwise the connection may not reestablish.

## SCPI Command overview

Table 7 SCPI Command Summary

Command	Default value	Page
CONFigure:AUDIO_AIRCODING <value>	CVSD	143
CONFigure:AUDIO_CONNEction <value>	Off	143
CONFigure:AUDIO_LOOPback <value>	Off	143
CONFigure:AUDIO_MUTE:RX <value>	Off	144
CONFigure:AUDIO_MUTE:TX <value>	Off	145
CONFigure:AVERage:BURst <value>	1	145
CONFigure:DELTA_F2_ALGorithm <value>	Peak	146
CONFigure:FREQuency <value>	0	146
CONFigure:HOP <value>	Europe	147
CONFigure:MASTer:BDADdr <value>	Last set value	148
CONFigure:MODulation <value>	BSOF	149
CONFigure:PACKet:LENGth <value>	27	151
CONFigure:PACKet:TYPE <value>	DH1	152
CONFigure:PAYLOAD_CHECK	ON	153
CONFigure:POLL:PERiod <value>	6	154
CONFigure:RF:ATT:RX <value>	Off	155
CONFigure:RF:DIRTY_TX <value>	Off	156
CONFigure:RF:DIRTY_TX:OFFSet <value>	0	156
CONFigure:RF:EXT_ATT <numeric value>	0.00	157
CONFigure:RF:FILTer:BW <numeric value>	1.3	157
CONFigure:RF:FILTer:MODE <value>	Meas	158
CONFigure:RF:LEVel <numeric value>	-35.00	158
CONFigure:RF:TXMODulation:INDEX <value>	0.32	159
CONFigure:RF:TXMODulation:SCALED <value>	70	159
CONFigure:RFGEnerator:DEMODulation <mode>	CW	160
CONFigure:RFGEnerator:DEMODulation:THRESHold <value>	Auto	161
CONFigure:RFGEnerator:MODulation <value>	CW	162
CONFigure:RFGEnerator:TUNE <value>	0	163
CONFigure:SAMPLE:MODE <setting>	Auto	163
CONFigure:SLAVe:BDADdr <value>	2020202020	164
CONFigure:TESTmode:MODE <value>	Tran	164

<b>Command</b>	<b>Default value</b>	<b>Page</b>
CONFigure:TESTmode:STOPping <value>	On	165
CONFigure:TESTmode:TYPE <value>	Idle	165
CONFigure:TESTmode:WAIT <setting>	Off	166
CONFigure:WHITENING <setting>	On	167
<hr/>		
FETCH:BER?	Not Applicable	168
FETCH:NACK?	Not Applicable	168
<hr/>		
PROCedure:BER:START <numeric value>	Not Applicable	169
PROCedure:CONNection:RELease	Not Applicable	169
PROCedure:CONNection:SEtUp	Not Applicable	170
PROCedure:INQuiry:START <value>	Not Applicable	170
PROCedure:INQuiry:STOP	Not Applicable	171
PROCedure:NACK:START <numeric value>	Not Applicable	171
PROCedure:NTP_CHAN:INIT	Not Applicable	172
PROCedure:POWer:SEtUp <value>	Not Applicable	172
PROCedure:SAMPLE:FORCE	Not Applicable	173
PROCedure:TCONNection:CONTINUE	Not Applicable	173
PROCedure:TCONNection:EXIT	Not Applicable	174
PROCedure:TCONNection:RELease	Not Applicable	174
PROCedure:TCONNection:SEtUp	Not Applicable	175
<hr/>		
READ:BER?	Not Applicable	176
READ:CHAN?	Not Applicable	176
READ:DELTA_F1?	Not Applicable	177
READ:DELTA_F2?	Not Applicable	177
READ:DELTA_F1_HIgh?	Not Applicable	178
READ:DELTA_F1_LOw?	Not Applicable	178
READ:DELTA_F2_HIgh?	Not Applicable	179
READ:DELTA_F2_LOw?	Not Applicable	179
READ:DELTA_F2_F1_RATIO?	Not Applicable	180
READ:DELTA_F2_PASSrate?	Not Applicable	180
READ:DEVIation?	Not Applicable	181

<b>Command</b>	<b>Default value</b>	<b>Page</b>
READ:FEATURES?	Not Applicable	182
READ:FREQUENCY_COUNT?	Not Applicable	183
READ:FREQUENCY:DRIFT?	Not Applicable	183
READ:FREQUENCY:DRIFT:SPEC?	Not Applicable	184
READ:FREQUENCY:DRIFT:SPEC:RATE?	Not Applicable	184
READ:FREQUENCY:OFFSET?	Not Applicable	185
READ:INQUIRY?	Not Applicable	185
READ:NACK?	Not Applicable	186
READ:NTP?	Not Applicable	186
READ:NTP_CHAN? <chan no.>	Not Applicable	187
READ:PSEUDO:DELTA_F1?	Not Applicable	187
READ:PSEUDO:DELTA_F2?	Not Applicable	188
READ:PTP?	Not Applicable	188
READ:TESTmode_CoMmanD:STATus?	Not Applicable	189
STATus:DEvice?	Not Applicable	192
STATus:AUDIO_CONN?	Not Applicable	192
SYSTem:BlueTooth:VERSion <version>	1.1	193
SYSTem:COMMunication:PORT <value>	Not Applicable	194
SYSTem:CORE:VERSion?	Not Applicable	195
SYSTem:ERRor?	Not Applicable	194
SYSTem:FIRMWare:VERSion?	Not Applicable	195
SYSTem:PCdriver:VERSion?	Not Applicable	195
SYSTem:RESet	Not Applicable	196
SYSTem:TEST:ADC_BUF?	Not Applicable	197
SYSTem:TEST:COMM_BUF?	Not Applicable	197
SYSTem:TEST:DEVIation?	Not Applicable	198
SYSTem:TEST:PoWeR?	Not Applicable	198
SYSTem:WARM_START	Not Applicable	199

# Detailed Command Descriptions

The following section lists the available commands and parameters in the individual states. The commands are listed by subsystem in alphabetical order.

Default Values are the values configured when the test set is reset.

## CONFigure Subsystem

### CONFigure:AUDIO\_AIRCODING <value>

Configure audio status

<b>Syntax:</b>	CONFigure:AUDIO_AIRCODING <value>		
<b>Value Range:</b>	A_LAW	sets coding format to A-Law	Default Value:
	CVSD	sets coding format to CVSD	CVSD
	MU_LAW	sets coding format to u-Law	
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command is used to set the audio encoding and decoding format of an Synchronous Connection Oriented (SCO) link.		
<b>Examples:</b>	CONF:AUDIO_AIRCODING A_LAW	Selects A-Law format	
	CONF:AUDIO_AIRCODING?	Returns current setting	

### CONFigure:AUDIO\_CONNecTion <value>

Configure audio status

<b>Syntax:</b>	CONFigure:AUDIO_CONNecTion <value>		
<b>Value Range:</b>	ON	Requests enabling Audio in an SCO link	Default Value:
	OFF	Requests disabling Audio	OFF
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command is used to request enabling or disabling audio link in normal mode.		
<b>Examples:</b>	CONF:AUDIO_CONN ON	Sets audio on	
	CONF:AUDIO_CONN?	Returns current setting	

**CONFigure:AUDIO\_LOOPback <value>**

Configure audio status

<b>Syntax:</b>	CONFigure:AUDIO_LOOPback <value>		
<b>Value Range:</b>	ON	Enables Audio loopback	Default Value:
	OFF	Disables Audio loopback	OFF
<b>Applicable in State:</b>	Set: All		
	Query: All		
<b>Description:</b>	<p>This command is used to loop the audio signal within the testset. The signal presented to the Audio Input is encoded in the selected CODEC and passed via the Bluetooth core back to the CODEC. The recovered audio signal is presented at the Audio Output.</p> <p>You can use this to quantify any noise, gain, or distortion added by the test set audio path.</p>		
<b>Examples:</b>	CONF:AUDIO_LOOP ON		Sets audio on
	CONF:AUDIO_LOOP?		Returns current setting

**CONFigure:AUDIO\_MUTE:RX <value>**

Control audio in the receive direction

<b>Syntax:</b>	CONFigure:AUDIO_MUTE:RX <value>		
<b>Value Range:</b>	ON	Mutes audio in the receive direction	Default Value:
	OFF	Un-mute audio in the receive direction	OFF
<b>Applicable in State:</b>	Set: All		
	Query: All		
<b>Description:</b>	This command is used to mute or un-mute the audio signal in the receive direction.		
<b>Examples:</b>	CONF:AUDIO_MUTE:RX ON		Sets mute on
	CONF:AUDIO_MUTE:RX?		Returns current setting



**CONFigure:AUDIO\_MUTE:TX <value>**

Control audio in the transmit direction

<b>Syntax:</b>	CONFigure:AUDIO_MUTE:TX <value>		
<b>Value Range:</b>	ON	Mutes audio in the receive direction	Default Value: OFF
	OFF	Un-mute audio in the receive direction	
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command is used to mute or un-mute the audio signal in the transmit direction.		
<b>Examples:</b>	CONF:AUDIO_MUTE:TX OFF	Sets mute off	
	CONF:AUDIO_MUTE:TX?	Returns current setting	

**CONFigure:AVERage:BURst <value>**

Number of bursts used for Measurements

<b>Syntax:</b>	CONFigure:AVERage:BURst <value>		
<b>Value Range:</b>	1 to 200	Number of bursts	Default Value: 1
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command is used to configure the number of bursts used for averaging when measuring NTP, PTP, Freq.Offset, Freq.Drift and Deviation.  A higher number gives more stable and precise measurements but also increases the duration of the measurements.		
<b>Examples:</b>	CONF:AVER:BUR 10	Sets loopback test mode	
	CONF:AVER:BUR?	Returns current setting	

**CONFigure:DELTA\_F2\_ALGORITHM <value>**

Delta F2 measurement algorithm selection

<b>Syntax:</b>	CONFigure:DELTA_F2_ALGORITHM <value>		
<b>Value Range:</b>	SPEC	Selects 'SPEC' algorithm	Default Value:
	PEAK	Selects 'PEAK' algorithm	Peak
<b>Applicable in State:</b>	Set: RFGE, TESTMODE Query: RFGE, TESTMODE, TCONN		
<b>Description:</b>	This command is used to change the algorithm for the DeltaF2max measurement. Refer to Delta F2 Average Measurement on page 50 for more detailed information		
<b>Examples:</b>	CONF:DELTA_F2_ALG SPEC	Selects the 'Spec' algorithm	
	CONF:DELTA_F2_ALG?	Queries current value	

**CONFigure:FREQUENCY <value>**

Single Frequency Selection

<b>Syntax:</b>	CONFigure:FREQUENCY <value>		
<b>Value Range:</b>	0 to 78	0 = 2402 MHz	Default Value:
			0
<b>Applicable in State:</b>	Set: RFGE, TESTMODE Query: RFGE, TESTMODE, TCONN		
<b>Description:</b>	This command configures the channel used when the test set is configured as RF Generator, or when the Hop Mode is set to single frequency in Testmode.  <b>Note:</b> It is highly recommended that you send Stat:DEV? immediately following this command until TCONN is returned to indicate the connection is re-established and the system is ready to proceed.		
<b>Examples:</b>	CONF:FREQ 50	Sets channel 50	
	CONF:FREQ?	Returns current setting	

**CONFigure:HOP <value>**

Hop Mode selection

<b>Syntax:</b>	CONFigure:HOP <value>		
<b>Value Range:</b>	Europe	Switches hopping on	Default Value:
	Single	Switches hopping off	Europe
<b>Applicable in State:</b>	Set: All		
	Query: All		
<b>Description:</b>	This command configures the Hop Mode used in Testmode. <b>Note:</b> It is highly recommended that you send Stat:DEV? immediately following this command until TCONN is returned to indicate the connection is re-established and the system is ready to proceed.		
<b>Examples:</b>	CONF:HOP EUROPE	Sets Hopping on	
	CONF:HOP?	Returns current setting	

**CONFigure:MASTer:BDADdr <value>**

Master Bluetooth Device Address (test set)

<b>Syntax:</b>	CONFigure:MASTer:BDADdr <value>	
<b>Value Range:</b>	12 digits in hex format	Default Value: Last set value
<b>Applicable in State:</b>	Set: All except CONN, and TCONN Query: All	
<b>Description:</b>	This command configures the Bluetooth Device Address of the test set  Note: This command must be followed by a SYST:WARMSTART to take effect.	
<b>Examples:</b>	CONF:MAST:BDAD AEC3DD56310F	Sets address
	CONF:MAST:BDAD?	Returns current setting

## CONFigure:MODulation <value>

Modulation Scheme Test Mode

<b>Syntax:</b>	CONFigure:MODulation <value>	
<b>Value Range:</b>	BS55	Bit sequence 01010101 (=55 hex) Default Value:
	BS0F	Bit sequence 00001111 (=0F hex) BS0F
	ONE	Constant 1
	20-character Hexadecimal string	User defined data payload.
	SPSR	Pseudo-random bit pattern
	ZERO	Constant 0
	FILE <filename>	
<b>Applicable in State:</b>	Set: All Query: All	
<b>Description:</b>	<p>This command configures the modulation used in Testmode and Transmitter test. Note, when Loopback is selected and whitening is on, SPSR modulation is always selected. If whitening is off, it is possible to use any of the above. When 'FILE' is selected a text file containing up to 339 bytes of modulation (after 339 bytes are read, the rest are discarded) can be used. The format of the bytes in the text file must be hex-characters. Each character can be separated by a space or a comma for clarity. Linefeeds are also allowed.</p> <p>To use <code>Payload</code>, first select Loopback Testmode and whitening off by sending <code>CONF:TEST:MODE LOOP</code> and <code>CONF:WHITENING OFF</code> (in that order).</p>	
<b>Examples:</b>	CONF:MOD SPSR	Selects pseudo-random bit pattern
	CONF:MOD A78D782D99FF930289E3	Sends Hex data
	CONF:MOD FILE C:\TEMP\MYMOD.TXT	Sends file data
	CONF:MOD?	Returns current setting

---

**NOTE** You must send the `Stat:DEV?` command immediately following this command otherwise the connection may not re-establish. Also, all payloads are checked following LMP changes. A valid payload and testmode connection are indicated when `Stat:DEV?` returns `TCONN`.

---

**NOTE** If you have specified modulation using a file, `CONF:MOD?` returns the directory path and filename.

**CONFigure:PACKet:LENgth <value>**

Packet Length selection

<b>Syntax:</b>	CONFigure:PACKet:LENgth <value>		
<b>Value Range:</b>	1 to 339	<b>Restrictions:</b>	<b>Default Value:</b>
		AUX1: 1 to 29 bytes	27
		DH1: 1 to 27 bytes	
		DH3: 1 to 183 bytes	
		DH5: 1 to 339 bytes	
		HV3: 30 bytes	
<b>Applicable in State:</b>	Set: All Query: ALL		
<b>Description:</b>	<p>This command configures the length of the packet sent when in test mode. The command is only applicable when using ACL packet mode.</p> <p>If the specified value is outside the restrictions, the value used is limited to a valid value and the ErrorCode is set to -221, settings conflict.</p> <p><b>Note:</b> It is highly recommended that you send Stat:DEV? immediately following this command until TCONN is returned to indicate the connection is re-established and the system is ready to proceed.</p>		
<b>Examples:</b>	CONF:PACK:LEN 20	Sets a 20 byte packet	
	CONF:PACK:LEN?	Returns current setting	

**CONFigure:PACKet:TYPE <value>**

Packet Type selection

<b>Syntax:</b>	CONFigure:PACKet:TYPE <value>		
<b>Value Range:</b>	AUX1		<b>Default Value:</b>
	DH1	single width TX packet	DH1
	DH3		
	DH5		
	HV3		
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command configures the type of packet used in test mode. <b>Note:</b> It is highly recommended that you send Stat:DEV? immediately following this command until TCONN is returned to indicate the connection is re-established and the system is ready to proceed.		
<b>Examples:</b>	CONF:PACK:TYPE DH1		Configures a DH1 packet
	CONF:PACK:TYPE?		Returns current setting



## CONFigure:PAYLOAD\_CHECK

Specify payload checking following change in testmode parameters

<b>Syntax:</b>	CONFigure:PAYLOAD_CHECK	
<b>Value Range:</b>	ON OFF	Default Value: ON
<b>Applicable in State:</b>	Set: All Query: All	
<b>Description:</b>	You can use this command to configure payload checking when changes in testmode parameters are made. If you set checking ON, payload checking is carried out when the change in testmode parameters has been completed.	
<b>Examples:</b>	CONF:PAYLOAD_CHECK ON	Enables payload checking
	CONF:PAYLOAD_CHECK?	Returns current setting

**CONFigure:POLL:PERiod <value>**

Poll Period (Transmitter Test Modes)

<b>Syntax:</b>	CONFigure:POLL:PERiod <value>		
<b>Value Range:</b>	1 to 255	Poll period [1.25 ms]	Default Value: 6
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	<p>This command configures how often the DUT is polled by the test set in order to transmit a packet.</p> <p>The poll period is only used when running transmitter test, in Testmode.</p> <p><b>Note:</b> It is highly recommended that you send Stat:DEV? immediately following this command until TCONN is returned to indicate the connection is re-established and the system is ready to proceed.</p>		
<b>Examples:</b>	CONF:POLL:PER 10		Sets Poll period to 10 (12.5 ms)
	CONF:POLL:PER?		Returns current setting

**CONFigure:RF:ATT:RX <value>**

Control RF attenuator in the receive direction

<b>Syntax:</b>	CONFigure:RF:ATT:RX <value>		
<b>Value Range:</b>	ON	Receive path Attenuation (25 dB)	Default Value: OFF
	OFF	Zero path attenuation.	
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	Use this command to add attenuation in the receive signal path by turning the 25 dB attenuator on. Sending the switch 'OFF' sets the attenuation to 0 dB.  Note: 0dB attenuation increases the input impedance of test set.		
<b>Examples:</b>	CONF:RF:ATT:RX ON	Places 25 dB attenuation in the receive signal path	
	CONF:RF:ATT:RX?	Returns current setting	

**NOTE** Switch the RX attenuator on (CONF:RF:ATT:RX ON) when testing Class I devices to ensure the E1852B Bluetooth Test Set receiver operates within its linear range.

Switch the attenuator off (CONF:RF:ATT:RX OFF) for Class II and Class III devices.

**CONFigure:RF:DIRTY\_TX <value>**

Set Impairments

<b>Syntax:</b>	CONFigure:RF:DIRTY_TX <value>		
<b>Value Range:</b>	ON	Enable dirty transmitter mode	Default Value:
	OFF	Disable dirty transmitter.	OFF
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	Use this command to add the dirty transmitter impairments RF:DIRTY_TX:OFFSet and RF:TXMODulation:INDEX to the transmitted signal.		
<b>Examples:</b>	CONF:RF:ATT:DIRTY_TX ON	Switches dirty transmitter mode on	
	CONF:RF:ATT:DIRTY_TX?	Returns current setting	

**CONFigure:RF:DIRTY\_TX:OFFSet <value>**

Control

<b>Syntax:</b>	CONFigure:RF:DIRTY_TX:OFFSet <value>		
<b>Value Range:</b>	-200 to 200 [kHz]	Default Value:	
		0	
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	Use this command to specify the dirty transmitter frequency offset impairment. The offset is disabled when the RF:DIRTY_TX <value> is set to OFF.		
<b>Examples:</b>	CONF:RF:ATT:DIRTY_TX:OFFS 50	Sets a 50 kHz offset	
	CONF:RF:ATT:DIRTY_TX:OFFS?	Returns current setting	

**CONFigure:RF:EXT\_ATT <numeric value>**

External RF attenuation compensation

<b>Syntax:</b>	CONFfigure:RF:EXT_ATT <numeric value>	
<b>Value Range:</b>	1 to 100 [dB]	Default Value: 0.00
<b>Applicable in State:</b>	Set: All Query: All	
<b>Description:</b>	This command states the amount of attenuation, caused by cable and connectors, applied to the RF signal between the test set and the DUT. The test set compensates for this attenuation in the measurement results.	
<b>Examples:</b>	CONF:RF:EXT_ATT 0.2	Sets 0.2 dB
	CONF:RF:EXT_ATT?	Returns current setting

**CONFigure:RF:FILTer:BW <numeric value>**

Select the RF filter bandwidth

<b>Syntax:</b>	CONF:RF:FILTer:BW <numeric value>	
<b>Value Range:</b>	1.3 and 2.5 [MHz]	Default Value: 1.3
<b>Applicable in State:</b>	Set: All Query: All	
<b>Description:</b>	This command configures the RF filter bandwidth to either 1.3 MHz or 2.5 MHz. When the 1.3 MHz filter is selected, post filter processing is applied to the selected samples.	
<b>Examples:</b>	CONF:RF:FILT:BW 2.5	Sets 2.5 MHz filter bandwidth
	CONF:RF:FILT:BW?	Queries current value

**CONFigure:RF:FILTer:MODE <value>**

Select the RF filter bandwidth

<b>Syntax:</b>	CONF:RF:FILTer:BW <numeric value>	
<b>Value Range:</b>	FULL, MEAS	Default Value: MEAS
<b>Applicable in State:</b>	Set: All Query: All	
<b>Description:</b>	This command is only applicable when the FILTer bandwidth is set to 1.3 MHz. When set to FULL, all the read functions use the filtered data. Using the MEAS only applies the filtering to the measurement samples and consequently speeds up the measurement graph displays.	
<b>Examples:</b>	CONF:RF:FILT:MODE FULL	Sets FULL mode
	CONF:RF:FILT:MODE?	Queries current value

**CONFigure:RF:LEVel <numeric value>**

RF output level of the test set

<b>Syntax:</b>	CONFigure:RF:LEVel <numeric value>	
<b>Value Range:</b>	-85 to 0	sets test set RF output [dBm] Default Value:
	MAX	set to max output, 0 dBm -35.00 dBm
	MIN	set to min output, -95 dBm
<b>Applicable in State:</b>	Set: All Query: All	
<b>Description:</b>	This command configures the output power of the test set. When used in the RF Generator mode, (RFGE) it is necessary to wait approximately 200ms. before the new output level is valid.	
<b>Examples:</b>	CONF:RF:LEV -60	Sets RF level to -60 dBm
	CONF:RF:LEV?	Returns current setting

**CONFigure:RF:TXMODulation:INDEX <value>**

Transmitter modulation deviation

<b>Syntax:</b>	CONFigure:RF:TXMODulation:INDEX <value>		
<b>Value Range:</b>	0.28 to 0.35	Steps of 0.01	Default Value: 0.32
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command configures the modulation deviation. One step (of 0.01) results in a change in deviation of 5 kHz. In the Bluetooth RF test specification, modulation indices of 0.28 to 0.35 are used.		
	<b>Modulation Index</b>	<b>Deviation</b>	
	0.29	145 kHz	
	0.31	155 kHz	
	0.35	175 kHz	
<b>Examples:</b>	CONF:RF:TXMOD:INDEX 0.28	Sets 140 kHz modulation deviation	
	CONF:RF:TXMOD:INDEX?	Returns current setting	

**CONFigure:RF:TXMODulation:SCALED <value>**

Transmitter modulation deviation

<b>Syntax:</b>	CONFigure:RF:TXMODulation:SCALED <numeric value>		
<b>Value Range:</b>	51 to 100	[%]	Default Value: 70 (%)
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command configures the modulation deviation in 1% steps from 51 to 100%. One step corresponds to approximately 1.5 kHz.		
<b>Examples:</b>	CONF:RF:TXMOD:SCALED 100	Sets 100% modulation depth	
	CONF:RF:TXMOD:SCALED?	Returns current setting	

## CONFigure:RFGEnerator:DEMODulation <mode>

RF Demodulator Mode

<b>Syntax:</b>	CONF:RFGEnerator:DEMODulation <mode>		
<b>Value Range:</b>	CW	CW mode	Default Value:
	BURST	Demodulation looks for Bluetooth burst	CW
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	<p>This command specifies the demodulation mode. When CW is selected, simple Freq.Offset and NTP measurements can be made. No synchronization to the signal is attempted.</p> <p>When Burst is selected, the standard test mode measurement can be made. (Frequency Offset, Delta F1, Delta F2, Freq.Drift) These measurements attempt to lock to the applied Bluetooth signal by searching for the power envelope and the P0 Bit.</p> <p>The various measurements use the normal parameters used for test mode (for example, packet length).</p> <p>See also the command: CONF:RFGE:DEMOM:THRESH.</p>		
<b>Examples:</b>	CONF:RFGE:DEMOM BURST	Sets Burst Mode	
	CONF:RFGE:DEMOM?	Returns current setting	



**CONFigure:RFGenerator:DEMODulation:THRESHold <value>**

RF Demodulator Power Threshold

<b>Syntax:</b>	CONF:RFGenerator:DEMODulation:THRESHold <value>	
<b>Value Range:</b>	-100 to 100	Threshold value for the power envelope of the Bluetooth burst [dBm]. Default Value: Auto
	AUTO	Automatic search for max peak.
<b>Applicable in State:</b>	Set: All Query: All	
<b>Description:</b>	This command specifies the threshold value for the power envelope of the Bluetooth burst when using the 'burst' demodulator mode. Hence this is the value used when the measurement attempts to find the power envelope of the applied Bluetooth signal.	
<b>Examples:</b>	CONF:RFGE:DEMOD:THRESH 20	Sets 20 dBm threshold value
	CONF:RFGE:DEMOD:THRESH?	Returns current setting

**CONFigure:RFGenerator:MODulation <value>**

Modulation Scheme for RF Generator

<b>Syntax:</b>	CONFigure:RFGenerator:MODulation <value>		
<b>Value Range:</b>	BS33	Bit sequence 00110011 (=33 hex)	Default Value:
	BS55	Bit sequence 01010101 (=55 hex)	CW
	BS0F	Bit sequence 00001111 (=0F hex)	
	BURST	Special test burst	
	CW	Constant Wave (no modulation)	
	DH1_BS55	DH1 packet with payload BS55	
	DH1_BS33	DH1 packet with payload BS33	
	DH1_BS0F	DH1 packet with payload BS0F	
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command configures the type of modulation used in RF Generator mode.		
<b>Examples:</b>	CONF:RFGE:MOD CW		Sets CW Modulation
	CONF:RFGE:MOD?		Returns current setting

**CONFigure:RFGenerator:TUNE <value>**

RF Generator Tuning Frequency

<b>Syntax:</b>	CONF:RFGenerator:TUNE <value>		
<b>Value Range:</b>	-3	Offset = -300KHz	Default Value:
	-2	Offset = -200KHz	0
	-1	Offset = -100KHz	
	0	Offset = 0KHz	
	1	Offset = 100KHz	
	2	Offset = 200KHz	
	3	Offset = 300KHz	
<b>Applicable in State:</b>	Set: All Query: Not Applicable		
<b>Description:</b>	This command enables fine tuning of the RF Generator frequency, with the specified offset. Only used for special purposes.		
<b>Example:</b>	CONF:RFGE:TUNE -2		Sets a -200 kHz offset

**CONFigure:SAMPLE:MODE <setting>**

Sampling mode configuration

<b>Syntax:</b>	CONFigure:SAMPLE:MODE <setting>		
<b>Value Range:</b>	AUTO	Sampling handled automatically	Default Value:
	CTRL		AUTO
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command configures the sampling mode of the test set. When AUTO is selected sampling is occurs when a new measurement is requested. When CTRL is selected, sampling only occurs when triggered by the PROC:SAMPLE:FORCE command.		
<b>Examples:</b>	CONF:SAMPLE:MODE CTRL		Sets triggered mode
	CONF:SAMPLE:MODE?		Returns current setting

**CONFigure:SLAVe:BDADdr <value>**

Slave Bluetooth Device Address (DUT)

<b>Syntax:</b>	CONFigure:SLAVe:BDADdr <value>		
<b>Value Range:</b>	12 digits in hex format	<b>Default Value:</b>	202020202020
<b>Applicable in State:</b>	Set: All except CONN, and TCONN Query: All		
<b>Description:</b>	This command configures the DUT address in the test set		
<b>Examples:</b>	CONF:SLAV:BDAD AFC2DE56312F	Sets address	
	CONF:SLAV:BDAD?	Returns current setting	

**CONFigure:TESTmode:MODE <value>**

Testmode Mode selection

<b>Syntax:</b>	CONFigure:TESTmode:MODE <value>		
<b>Value Range:</b>	LOOPback	Loopback test mode	<b>Default Value:</b>
	TRANsmit	Transmitter test mode	TRAN
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	This command configures either transmitter or loopback test mode operation of the test set and DUT.  <b>Note:</b> It is highly recommended that you send Stat:DEV? immediately following this command until TCONN is returned to indicate the connection is re-established and the system is ready to proceed.		
<b>Examples:</b>	CONF:TEST:MODE LOOP	Sets loopback test mode	
	CONF:TEST:MODE?	Returns current setting	

**CONFigure:TESTmode:STOPping <value>**

Test mode selection

<b>Syntax:</b>	CONFigure:TESTmode:STOPping <value>		
<b>Value Range:</b>	ON	Stopping enabled	Default Value:
	OFF	No stopping enabled	ON
<b>Applicable in State:</b>	Set: All		
	Query: All		
<b>Description:</b>	Not all DUT types respond to an LMP command from the test set in the same way. Some types require Poll packets to be sent		
<b>Examples:</b>	CONF:TEST:STOP OFF	Disables stopping	
	CONF:TEST:STOP?	Queries current value	

**CONFigure:TESTmode:TYPE <value>**

Enable counter or Bluetooth testing

<b>Syntax:</b>	CONFigure:TESTmode:TYPE <value>		
<b>Value Range:</b>	BT	Bluetooth Normal mode	Default Value:
	IDLE	Disabled	Idle
	RFGE	RF generator	
	TESTMODE	Bluetooth Test mode	
<b>Applicable in State:</b>	Set: IDLE, RFGE, TESTMODE, BT		
	Query: All		
<b>Description:</b>	This command configures the required testing mode.		
<b>Examples:</b>	CONF:TEST:TYPE BT	Sets Normal Mode	
	CONF:TEST:TYPE?	Returns current setting	

**CONFigure:TESTmode:WAIT <setting>**

Testmode - wait in Setup

<b>Syntax:</b>	CONFigure:TESTmode:WAIT <setting>		
<b>Value Range:</b>	ON	Wait enabled	Default Value:
	OFF	Wait disabled	OFF
<b>Applicable in State:</b>	Set: All		
	Query: All		
<b>Description:</b>	<p>This command sets the test set to wait in test mode before sending the test activate message to the DUT. This is required by some DUTs.</p> <p>With wait enabled the test set makes a normal connection to the DUT when PROC:TCONN:SET is sent but waits for the PROC:TCONN:CONT message. When this is sent the test set sends the test activate message and the test control message to the DUT</p>		
<b>Examples:</b>	CONF:TEST:WAIT ON	Sets Wait On	
	CONF:TEST:WAIT?	Returns current setting	

**CONFigure:WHITENING <setting>**

Enable and disable data whitening

<b>Syntax:</b>	CONFigure:WHITENING <setting>		
<b>Value Range:</b>	ON	Whitening enabled	Default Value:
	OFF	Whitening disabled	ON
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	Data whitening is a scrambling process applied to both the header and data. Data whitening is applied to minimize DC bias in the packet.  <b>Note:</b> It is highly recommended that you send Stat:DEV? immediately following this command until TCONN is returned to indicate the connection is re-established and the system is ready to proceed.		
<b>Examples:</b>	CONF:WHITENING ON	Sets Whitening On	
	CONF:WHITENING?	Returns current setting	

## FETCH Subsystem

### FETCH:BER?

Query Bit Error Rate continuously

<b>Syntax:</b>	FETCH:BER?		
<b>Value Range:</b>	<value>	Number of bits transferred	Default Value:
	<value>	Number of erroneous bits detected	Not Applicable
	<value>	BER [%]	
<b>Applicable in State:</b>	Query: TCONN		
<b>Description:</b>	This query is used to continuously measure the Bit Error values of the DUT. The data is returned prior to the completion of the measurement and so is only an indication of the BER. Note that this is only applicable in loopback test mode.		
<b>Example:</b>	FETCH:BER?		

### FETCH:NACK?

Query NACK Count continuously (Packet Error Rate)

<b>Syntax:</b>	FETCH:NACK?		
<b>Value Range:</b>	<value>	Number of packets transmitted	Default Value:
	<value>	Number of erroneous packets detected	Not Applicable
	<value>	NACK count [%]	
<b>Applicable in State:</b>	Query: CONN, TCONN		
<b>Description:</b>	This query is used to continuously measure the Packet Error Rate values of the DUT. The data is returned prior to the completion of the measurement and so is only an indication of the BER. Use the READ:NACK? command for the true measurement.		
<b>Example:</b>	FETCH:NACK?		



## PROCedure Subsystem

### PROCedure:BER:START <numeric value>

Start Bit Error Rate measurement

<b>Syntax:</b>	PROCedure:BER:START <numeric value>		
<b>Value Range:</b>	1 to 1.6E6	Number of bits used for the BER measurement	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: TCONN Query: Not Applicable		
<b>Description:</b>	<p>This command is used to start the Bit Error Rate (BER) measurement of the DUT.</p> <p>This command erases all previous BER data and starts a new measurement. Hence this command should be used when a parameter is changed during a BER test.</p> <p>Note that this is only applicable when in Loopback mode.</p>		
<b>Example:</b>	PROC:BER:START 1000	Sets a value of 1000 bits for the measurement.	

### PROCedure:CONNec tion:RELease

Release Normal Connection

<b>Syntax:</b>	PROCedure:CONNec tion:RELease		
<b>Value Range:</b>	Not applicable	Default Value: Not Applicable	
<b>Applicable in State:</b>	Set: CONN Query: Not Applicable		
<b>Description:</b>	<p>This command closes (releases) the connection with the DUT. If there is no connection established, error code -221, "Settings Conflict" is returned.</p>		
<b>Example:</b>	PROC:CONN:REL	Closes the connection	

## PROCedure:CONNectio:n:SETup

Setup Normal Connection

<b>Syntax:</b>	PROCedure:CONNectio:n:SETup		
<b>Value Range:</b>	Not applicable	Check with STAT:DEV to confirm connection established	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: BT Query: Not Applicable		
<b>Description:</b>	This command initiates a normal Bluetooth connection (Page) with the DUT. If a connection is already established, error code - 221, "Settings Conflict" is returned.		
<b>Example:</b>	PROC:CONN:SET		Initiates a connection attempt

## PROCedure:INQuiry:START <value>

Scans for Bluetooth devices

<b>Syntax:</b>	PROCedure:INQuiry:START <value>		
<b>Value Range:</b>	1 to 48	Number of inquiry periods of 1.28 seconds	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: IDLE, BT, TESTMODE Query: IDLE, BT, TESTMODE		
<b>Description:</b>	This command initiates an inquiry to find any Bluetooth devices in the vicinity of the test set.		
<b>Example:</b>	PROC:INQ:START 20		Initiates a scan for 20 inquiry periods

## PROCEDURE:INQUIRY:STOP

Halt the current inquiry scan

<b>Syntax:</b>	PROCEDURE:INQUIRY:STOP	
<b>Value Range:</b>	Not Applicable	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: IDLE, BT, TESTMODE Query: Not Applicable	
<b>Description:</b>	This command halts the current inquiry to find any Bluetooth devices in the vicinity of the test set.	
<b>Example:</b>	PROC:INQ:STOP	Halts the inquiry scan

## PROCEDURE:NACK:START <numeric value>

Start NACK Count (Packet Error Rate)

<b>Syntax:</b>	PROCEDURE:NACK:START <numeric value>	
<b>Value Range:</b>	1 to 1.6E6 Number of packets used for calculating the NACK count	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: CONN, TCONN Query: Not Applicable	
<b>Description:</b>	This command is used to start an unacknowledged (NACK) count measurement. A NACK measurement can be used as an alternative to the BER measurement. The NACK measurement can be made in Normal mode, whereas you can only make a BER measurement in Testmode.  All unacknowledged packets are counted and compared the total number of packets sent.	
<b>Example:</b>	PROC:NACK:START 1000	Sets a value of 1000 packets

**NOTE** This command erases all previous NACK data and starts a new measurement. This command should hence be used when different parameters are configured during a NACK test.

**PROCEDURE:NTP\_CHAN:INIT**

Reset the Normally Transmitted Power measurement

<b>Syntax:</b>	PROCEDURE:NTP_CHAN:INIT		
<b>Value Range:</b>	Not Applicable		Default Value: Not Applicable
<b>Applicable in State:</b>	Set: CONN, TCONN		
	Query: Not Applicable		
<b>Description:</b>	This command is used to reset the Normally Transmitted Power (NTP) measurement over the 79 channels. Using this command allows you to change coupling losses or attenuators whilst maintaining a connection to the DUT.		
<b>Example:</b>	PROC:NTP_CHAN:INIT		Reset the NTP measurement

**PROCEDURE:POWER:SETup <value>**

DUT power level control

<b>Syntax:</b>	PROCEDURE:POWER:SETup <value>		
<b>Value Range:</b>	INCR	Increase power one step	Default Value: Not Applicable
	DECR	Decrease power one step	
<b>Applicable in State:</b>	Set: CONN, TCONN		
	Query: Not Applicable		
<b>Description:</b>	This command is used to control the output power of the DUT. (This is only applicable if the DUT supports power control.)		
<b>Example:</b>	PROC:POW:SET INCR		Increments the DUT power level

**PROCEDURE:SAMPLE:FORCE**

Force ADC sampling

<b>Syntax:</b>	PROCEDURE : SAMPLE : FORCE		
<b>Value Range:</b>	Not applicable		Default Value: Not Applicable
<b>Applicable in State:</b>	Set: RFGEN, CONN, TCONN Query: Not Applicable		
<b>Description:</b>	This command is used as the trigger to initiate a new ADC sample when CONF : SAMPLE : MODE is set to CTRL.		
<b>Example:</b>	PROC : SAMPLE : FORCE		Triggers a new ADC sample

**PROCEDURE:TCONNECTION:CONTINUE**

Continue the Testmode connection setup

<b>Syntax:</b>	PROCEDURE : TCONNECTION : CONTINUE		
<b>Value Range:</b>	Not applicable	Check with STAT : DEV? if connection was established	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: TACTIVATE Query: Not Applicable		
<b>Description:</b>	This command continues the setup sequence of a Testmode connection to the DUT. See also the CONF : TEST : WAIT command		
<b>Example:</b>	PROC : TCONN : CONT		Continue to make the connection

## PROCEDURE:TCONNECTION:EXIT

Exit the Testmode

<b>Syntax:</b>	PROCEDURE:TCONNECTION:EXIT	
<b>Value Range:</b>	Not applicable	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: TCONN Query: Not Applicable	
<b>Description:</b>	Some DUTs do not properly support just the PROC:TCONN:REL command. This command causes the test set to command the DUT to leave the Bluetooth Testmode. These DUTs require the PROC:TCONN:EXIT command prior to the PROC:TCONN:REL.	
<b>Example:</b>	PROC:TCONN:EXIT	Exit the testmode connection

## PROCEDURE:TCONNECTION:RELEASE

Release the Bluetooth test mode connection

<b>Syntax:</b>	PROCEDURE:TCONNECTION:RELEASE	
<b>Value Range:</b>	Not applicable	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: TCONN, TACTIVATE, TCONTROL Query: Not Applicable	
<b>Description:</b>	This command closes a Testmode connection with DUT. If there is no connection established, error code -221, "Settings Conflict" is returned.	
<b>Example:</b>	PROC:TCONN:REL	Releases the connection

## PROCEDURE:TCONNECTION:SETUP

Setup a Bluetooth test mode connection

<b>Syntax:</b>	PROCEDURE:TCONNECTION:SETUP		
<b>Value Range:</b>	Not applicable	Check with <code>STAT:DEV</code> if connection is made	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: TESTMODE Query: Not Applicable		
<b>Description:</b>	This command initiates a Testmode connection with DUT. If there is a connection already established, error code -221, "Settings Conflict" is returned.		
<b>Example:</b>	PROC:TCONN:SET		Opens the connection

---

**NOTE** The test set checks all relevant test mode settings prior to the setup. If the settings are inconsistent, the ErrorCode is set to -221: 'Settings conflict'.

## READ Subsystem

### READ:BER?

Read back the Bit Error Rate

<b>Syntax:</b>	READ:BER?		
<b>Value Range:</b>	<value>	BER [%]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN		
<b>Description:</b>	<p>This query is used to measure the Bit Error Rate (BER) of the DUT. The measurement is calculated using the specified quantity of bits.</p> <p>The BER measurement may take a long time, depending on the number of bits used (set by the PROC:BER:START command). Therefore your application must poll the test set for a measurement result. When the response is different from Not A Number (NAN), the required number of bits has been transmitted and the measurement is complete. Use the FETCH:BER command if a continuous response is required.</p> <p>Note that this is only applicable in Loopback mode.</p>		
<b>Example:</b>	READ:BER?		

### READ:CHAN?

Read back the channel number of the burst

<b>Syntax:</b>	READ:CHAN?		
<b>Value Range:</b>	<value>	Channel Number	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN		
<b>Description:</b>	This query is used to read back the channel number of the sampled burst		
<b>Example:</b>	READ:CHAN?		



## READ:DELTA\_F1?

Query Delta F1 Average (Modulation Characteristics)

---

<b>Syntax:</b>	READ:DELTA_F1?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	<p>This query measures the Delta F1 average value of the DUT according to the RF test specifications (Bluetooth Test specification ver. 0.9, chap. 5.1.9).</p> <p>Initial conditions for this command are:</p> <p>Hopping is off Modulation must be BS0F</p>		
<b>Example:</b>	READ:DELTA_F1?		

---

## READ:DELTA\_F2?

Query Delta F2 Average (Modulation Characteristics)

---

<b>Syntax:</b>	READ:DELTA_F2?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	<p>This query measures the Delta F2 average value of the DUT according to the RF test specifications (Bluetooth Test specification ver. 0.9, chap. 5.1.9).</p> <p>Initial conditions for this command are:</p> <p>Hopping is off Modulation must be BS55 Packet length must be &gt;2</p>		
<b>Example:</b>	READ:DELTA_F2?		

---

**READ:DELTA\_F1\_HIgh?**

Query Delta F1 Max High (Modulation Characteristics)

---

<b>Syntax:</b>	READ:DELTA_F1_HIgh?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	This query measures the highest Delta F1 value of the current Delta F1 measurement.  Note: READ:DELTA_F1? must be issued prior to this query		
<b>Example:</b>	READ:DELTA_F1_HI?		

---

**READ:DELTA\_F1\_LOw?**

Query Delta F1 Max Low (Modulation Characteristics)

---

<b>Syntax:</b>	READ:DELTA_F1_LOw?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	This query measures the lowest Delta F1 value of the current Delta F1 measurement.  Note: READ:DELTA_F1? must be issued prior to this query		
<b>Example:</b>	READ:DELTA_F1_LO?		

---

**READ:DELTA\_F2\_HIgh?**

Query Delta F2 Max High (Modulation Characteristics)

---

<b>Syntax:</b>	READ:DELTA_F2_HIgh?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	This query measures the highest Delta F2 value of the current Delta F2 measurement.  Note: READ:DELTA_F2? must be issued prior to this query		
<b>Example:</b>	READ:DELTA_F2_HI?		

---

**READ:DELTA\_F2\_LOw?**

Query Delta F2 Max Low (Modulation Characteristics)

---

<b>Syntax:</b>	READ:DELTA_F2_LOw?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	This query measures the lowest Delta F2 value of the current Delta F2 measurement.  Note: READ:DELTA_F2? must be issued prior to this query		
<b>Example:</b>	READ:DELTA_F2_LO?		

---

## READ:DELTA\_F2\_F1\_RATIO?

Query Delta F2 average versus Delta F1 average ratio

---

<b>Syntax:</b>	READ:DELTA_F2_F1_RATIO?	
<b>Value Range:</b>	<value>	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE	
<b>Description:</b>	<p>This query is used to retrieve the current ratio between the Delta F2 average and the Delta F1 average, as specified in the Bluetooth Test Specification version 0.9, chapter 5.1.9. The most recent values of Delta F1 and Delta F2 averages are used in the calculation (the last results from the queries READ:DELTA_F2? and READ:DELTA_F1?</p> <p>For a valid result both BS55 and BS0F modulation must be applied in test mode</p>	
<b>Example:</b>	READ:DELTA_F2_F1_RATIO?	

---

## READ:DELTA\_F2\_PASSrate?

Query Delta F2 measurement results

---

<b>Syntax:</b>	READ:DELTA_F2_PASSrate?	
<b>Value Range:</b>	<value>      Bits, Failed bits, Rate [%]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE	
<b>Description:</b>	<p>This query returns a string containing the number of bits used for the deltaF2 measurement in the burst, the number of failed bits, and the calculated pass rate. An example of a result could be : "2500 5 99.8"</p> <p>Note: READ: DELTA_F2? must be issued prior to this query.</p>	
<b>Example:</b>	READ:DELTA_F2_PASS?	

---

## READ:DEVIation?

Query frequency deviation of the DUT

---

<b>Syntax:</b>	READ:DEVIation?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN		
<b>Description:</b>	This query measures the frequency deviation of the DUT.		
<b>Example:</b>	READ:DEV?		

---

## READ:FEATURES?

Query DUT Features

<b>Syntax:</b>	READ:FEATURES?		
<b>Value Range:</b>	<F0 F1 F2 F3 F4 F5 F6 F7>	8 feature bytes, byte 0 to byte 7.	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN		
<b>Description:</b>	This command is used to read back the features of the DUT. Response: F0 F1 F2 F3 F4 F5 F6 F7 where F0 is byte 0.		
	Byte 0 Bit	0: 3-slot packets 1: 5-slot packets 2: encryption 3: slot offset 4: timing accuracy 5: switch 6: hold mode 7: sniff mode	
	Byte 1 Bit	0: park mode 1: RSSI 2: channel quality driven data rate 3: SCO link 4: HV2 packets 5: HV3 packets 6: ulaw log 7: Alaw log	
	Byte 0 Bit	0: CVSD 1: paging scheme 2: power control 3: transparent SCO data 4: flow control lag (bit0) 5: flow control lag (bit1) 6: flow control lag (bit2)	
<b>Example:</b>	READ:FEATURES?		

## READ:FREQuency\_COUNT?

Query Frequency Count

<b>Syntax:</b>	READ:FREQuency_COUNT?		
<b>Value Range:</b>	<value>	Frequency [Hz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	This query is used to measure frequency of the signal applied to the frequency counter input connector (COUNT IN). This feature is in particular designed for easy measurement of the DUT crystal frequency.		
<b>Example:</b>	READ:FREQuency_COUNT?		

## READ:FREQuency:DRIFt?

Query Frequency Drift

<b>Syntax:</b>	READ:FREQ:DRIFt?		
<b>Value Range:</b>	<value>	Frequency drift [Hz/s]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN, RFGE		
<b>Description:</b>	<p>This query is used to give an indication of the carrier frequency drift of the DUT. The measurement uses the Preamble and the Trailer part of the burst.</p> <p>This measurement can be used in normal mode. If you can operate the DUT in test mode, use the            READ:FREQ:DRIF:SPEC command instead.</p>		
<b>Example:</b>	READ:FREQ:DRIF?		

**READ:FREQuency:DRIFt:SPEC?**

Query Frequency Drift Specification

<b>Syntax:</b>	READ:FREQ:DRIFT:SPEC?		
<b>Value Range:</b>	<value>	Frequency drift [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	<p>This query is used to measure the carrier frequency drift of the DUT according to the RF test specifications (Bluetooth Test specification ver. 0.9, chap.5.1.11).</p> <p>Initial conditions for this command are:</p> <p>PacketType must be DH1/DH3/DH5</p> <p>Modulation must be BS55</p> <p>Packet length must be &gt; 2</p>		
<b>Example:</b>	READ:FREQ:DRIF:SPEC?		

**READ:FREQuency:DRIFt:SPEC:RATE?**

Query Frequency Drift Specification Rate

<b>Syntax:</b>	READ:FREQ:DRIFT:SPEC:RATE?		
<b>Value Range:</b>	<value>	Frequency drift [kHz/50 $\mu$ s]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	<p>This query is used to measure the carrier frequency drift rate of the DUT according to the RF test specifications (Bluetooth Test specification ver. 0.9, chap.5.1.11).</p> <p>Note: the READ:FREQ:DRIF:SPEC? query must be issued before this query.</p>		
<b>Example:</b>	READ:FREQ:DRIF:SPEC:RATE?		



## READ:FREQuency:OFFSet?

Query Frequency Offset

<b>Syntax:</b>	READ:FREQ:OFFSet?		
<b>Value Range:</b>	<value>	Frequency offset [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN, RFGE		
<b>Description:</b>	This query is used to measure the DUT frequency offset.		
<b>Example:</b>	READ:FREQ:OFFS?		

## READ:INQuiry?

Get results of inquiry scan

<b>Syntax:</b>	READ:INQuiry?		
<b>Value Range:</b>	Not Applicable		Default Value: Not Applicable
<b>Applicable in State:</b>	Query: IDLE ,BT,TESTMODE		
<b>Description:</b>	<p>This command returns the inquiry results as 12 digit Bluetooth addresses. If several devices are found during the inquiry the addresses are concatenated and clearly separated in the return string.</p> <p>Until a device is found the command returns WAIT. IF no devices are found, the command returns STOPPED.</p>		
<b>Example:</b>	READ:INQ?		Read back results of inquiry scan

## READ:NACK?

Query NACK Count (Packet Error Rate)

<b>Syntax:</b>	READ:NACK?		
<b>Value Range:</b>	<value>	NACK [%]	Default Value: "NAN" is returned when the measurement is incomplete
<b>Applicable in State:</b>	Query: CONN, TCONN		
<b>Description:</b>	<p>This query is used to measure the Packet Error Rate of the DUT. The NACK count measurement may take a long time, depending on the number of packets used (set by the PROC:NACK:START command). Therefore your application must poll the test set for a measurement result. When the response is different from Not A Number (NAN), the required number of packets has been transmitted and the measurement is complete.</p> <p>Use the FETCH:NACK command if a continuous response is required.</p>		
<b>Example:</b>	READ:NACK?		

## READ:NTP?

Query Normal Transmit Power (NTP)

<b>Syntax:</b>	READ:NTP?		
<b>Value Range:</b>	<value>	NTP [dBm]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN, RFGE		
<b>Description:</b>	<p>This query is used to measure the Normally Transmitted Power (NTP), burst average power, of the DUT.</p>		
<b>Example:</b>	READ:NTP?		

**READ:NTP\_CHAN? <chan no.>**

Query Normally Transmitted Power (NTP) in a specific channel

<b>Syntax:</b>	READ:NTP_CHAN? <chan no. >		
<b>Value Range:</b>	<chan no.> <value>	Channel no. (0 to 78) NTP for channel no. [dBm]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN, RFGE		
<b>Description:</b>	<p>This query is used to measure the Normally Transmitted Power (NTP), average power, of the DUT for a specified channel. The test set replies with the most recent NTP value for the specified channel</p> <p>If the NTP for this channel has not been previously measured NAN is returned.</p>		
<b>Example:</b>	READ:NTP_CHAN? 40		

**READ:PSEUDO:DELTA\_F1?**

Query Pseudo Delta F1 Average

<b>Syntax:</b>	READ:PSEUDO:DELTA_F1?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	<p>This command initiates a pseudo delta F1 average measurement of the DUT. This is achieved by searching for 111/000 patterns in the access code part of the burst and using these to give an indication of the Delta F1 value.</p> <p>However, unlike the DELTA_F1? measurement, the PSEUDO:DELTA_F1? can be used with a normal connection</p>		
<b>Example:</b>	READ:PSEUDO:DELTA_F1?		

**READ:PSEUDO:DELTA\_F2?**

Query Pseudo Delta F2 Average

<b>Syntax:</b>	READ:PSEUDO:DELTA_F2?		
<b>Value Range:</b>	<value>	Deviation [kHz]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, RFGE		
<b>Description:</b>	<p>This command initiates a pseudo delta F2 average measurement of the DUT. This is achieved by searching for 101/010 patterns in the access code part of the burst and using these to give an indication of the Delta F2 value.</p> <p>However, unlike the DELTA_F2? measurement, the PSEUDO:DELTA_F2? can be used with a normal connection</p>		
<b>Example:</b>	READ:PSEUDO:DELTA_F2?		

**READ:PTP?**

Query Peak Transmit Power (PTP)

<b>Syntax:</b>	READ:PTP?		
<b>Value Range:</b>	<value>	PTP [dBm]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: CONN, TCONN, RFGE		
<b>Description:</b>	<p>This query is used to measure the Peak Transmitted Power (PTP) power of the DUT.</p>		
<b>Example:</b>	READ:PTP?		

## READ:TESTmode\_CoMmanD:STATus?

Query the status of the last testmode command

---

<b>Syntax:</b>	READ:TESTmode_CoMmanD:STATus?		
<b>Value Range:</b>	<value>	PTP [dBm]	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: TCONN, TESTMODE		
<b>Description:</b>	<p>This query is used to read the HCI (returned as a string) indicating that the testmode parameter change has completed. Refer to Table 8 on page 190 for a full list of HCI error code messages.</p> <p>Note: The status register is only updated after the test control complete event occurs. This occurs after the test set sends an LMP test control message to the DUT. It can only happen in TCONN state. You can read the status in TESTMODE,</p> <p>Note: If no error occurred, the result is blank. After readout of an error, the subsequent readouts are blank until a new error occurs.</p>		
<b>Example:</b>	READ:TEST_CMD:STAT?		

---

**Table 8 List of HCI Error Code Messages**

<b>HCI Error Code Message</b>
"HCICOMMAND_SUCCEEDED"
"HCIUNKNOWN_COMMAND"
"HCINO_CONNECTION"
"HCIHARDWARE_FAILURE"
"HCIPAGE_TIMEOUT"
"HCIAUTHENTICATION_FAILURE"
"HCIKEY_MISSING"
"HCIMEMORY_FULL"
"HCICONNECTION_TIMEOUT"
"HCIMAX_NUMBER_OF_CONNECTIONS"
"HCIMAX_NUMBER_OF_SCO_CONNECTIONS"
"HCIACL_CONNECTION_ALREADY_EXIST"
"HCICOMMAND_DISALLOWED"
"HCIHOST_LIMITED_RESOURCES_REJECT"
"HCIHOST_SECURITY_REASON_REJECT"
"HCIHOST_PERSONAL_DEVICE_REJECT"
"HCIHOST_TIMEOUT"
"HCIUNSUPPORTED_PARAMETER_VALUE"
"HCIINVALID_COMMAND_PARAMETER"
"HCIREMOTE_TERMINATE_BY_USER"
"HCIREMOTE_TERMINATE_BY_LOW_RESOURCES"
"HCIREMOTE_TERMINATE_BY_POWER_OFF"
"HCITERMINATED_BY_LOCAL_HOST"
"HCIREPEATED_ATTEMPTS"
"HCIPAIRING_NOT_ALLOWED"
"HCIUNKNOWN_LMP_PDU"
"HCIUNSUPPORTED_REMOTE_FEATURE"
"HCISCO_OFFSET_REJECTED"
"HCISCO_INTERVAL_REJECTED"
"HCISCO_AIR_MODE_REJECTED"
"HCIINVALID_LMP_PARAMETER"
"HCIUNSPECIFIED_ERROR"
"HCIUNSUPPORTED_LMP_PARAMETER_VALUE"
"HCIROLE_CHANGE_NOT_ALLOWED"

---

**HCI Error Code Message**

---

---

"HCILMP\_RESPONSE\_TIMEOUT"

---

---

"HCILMP\_TRANSACTION\_COLLISION"

---

---

"HCILMP\_PDU\_NOT\_ALLOWED"

---

---

"HCIENCRYPTION\_MODE\_NOT\_ACCEPTABLE"

---

---

"HCIUNIT\_KEY\_USED"

---

---

"HCIQOS\_IS\_NOT\_SUPPORTED"

---

---

"HCIINSTANT\_PASSED"

---

---

"HCIPAIRING\_WITH\_UNIT\_KEY\_NOT\_SUPPORTED"

---

## STATus Subsystem

### STATus:DEvice?

Query Device Status

<b>Syntax:</b>	STATus:DEvice?		
<b>Value Range:</b>	BT CONN DISC IDLE RFGE TCONN TDISC TESTMODE		Default Value: Not Applicable
<b>Applicable in State:</b>	Query: ALL		
<b>Description:</b>	This query returns the test set state .		
<b>Example:</b>	STAT:DEV?		

### STATus:AUDIO\_CONN?

Query Audio Link Status

<b>Syntax:</b>	STATus:AUDIO_CONN?		
<b>Value Range:</b>	ON OFF	Audio link is established Audio link is not established	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: ALL		
<b>Description:</b>	This command is used to get the status of an SCO audio link in a normal mode connection.		
<b>Example:</b>	"STAT:AUDIO_CONN?"		



## SYSTEM Subsystem

### SYSTEM:Bluetooth:VERSion <version>

Set Bluetooth Version in the test set

<b>Syntax:</b>	SYSTEM:BT:VERS <version>		
<b>Value Range:</b>	1.0 B 1.1	1.0 B version 1.1 version	Default Value:  1.1
<b>Applicable in State:</b>	Set: All Query: All		
<b>Description:</b>	<p>This command sets Bluetooth version 1.0 B or 1.1 within the test set.</p> <p>You should send a SYST:WARM_START command before proceeding.</p> <p>This command is unaffected by the SYSTEM:RESet command.</p>		
<b>Examples:</b>	SYST:BT:VERS 1.0B	Sets Bluetooth standard 1.0B in the test set.	
	SYST:BT:VERS?	Returns current setting	

**SYSTem:COMMunication:PORT <value>**

Set System Communication Port

<b>Syntax:</b>	SYSTem:COMMunication:PORT <value>	
<b>Value Range:</b>	LPT1 LPT2 LPT3 numeric value GPIB<vendor><Board ID><GPIB address>	Default Value:  Not Applicable
<b>GPIB Value Range:</b>	<NI, AGILENT, KEITHLY><0 to 9><0 to 30>	
<b>Applicable in State:</b>	Set: ALL Query: Not Applicable	
<b>Description:</b>	Use this command to specify the port you are using on your controller to communicate with the test set. If you are using GPIB, you need to specify the manufacturer, ID and the GPIB address of the card.	
<b>Example:</b>	SYST:COMM:PORT LPT2	Sets the port to LPT2

**SYSTem:ERRor?**

Query Last Error

<b>Syntax:</b>	SYSTem:ERRor?	
<b>Value Range:</b>	+0 No Error -102 Syntax Error -221 Settings Conflict -222 Data out of Range -224 Parameter Not Allowed -365 Time out Error -366 Target Error -420 Query Unterminated	Default Value:  Not Applicable
<b>Applicable in State:</b>	Query: ALL	
<b>Description:</b>	This query returns the error status of the last command issued and clears the error.	
<b>Example:</b>	SYST:ERR?	

## SYSTem:FIRMware:VERSion?

Query Firmware Version

<b>Syntax:</b>	SYSTem:FIRMware:VERSion?	
<b>Value Range:</b>	string containing firmware information	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: ALL	
<b>Description:</b>	This query returns the version of the test set Firmware.	
<b>Example:</b>	SYST:FIRM:VERS?	

## SYSTem:CORE:VERSion?

Query BT Core Version

<b>Syntax:</b>	SYSTem:CORE:VERSion?	
<b>Value Range:</b>	string containing core information	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: ALL	
<b>Description:</b>	This query returns the version of the test set BT Core.	
<b>Example:</b>	SYST:CORE:VERS?	

## SYSTem:PCdriver:VERSion?

Query PC-driver Software Version

<b>Syntax:</b>	SYSTem:PCdriver:VERSion?	
<b>Value Range:</b>	String containing PC driver software information	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: ALL	
<b>Description:</b>	This query returns the version of the test set PC-driver.	
<b>Example:</b>	SYST:PC:VERS?	

## SYSTem:RESet

System Reset

---

<b>Syntax:</b>	SYSTem:RESet	
<b>Value Range:</b>	Not Applicable	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: ALL Query: Not Applicable	
<b>Description:</b>	<p>This command is used to reset the settings of the test set and requires 1-2 seconds to complete. Poll the status by issuing the SYSTem:STAT:DEV? command. Until the reset procedure is finished, the returned value is "OFF". When finished the returned value is "IDLE".</p> <p>The SYSTem:BT:VERS command is unaffected by the SYSTem:RESet command.</p> <p>See also SYST:WARM_START.</p>	
<b>Example:</b>	SYST:RES	

---

**SYSTem:TEST:ADC\_BUF?**

Self test of ADC Buffer

<b>Syntax:</b>	SYSTem:TEST:ADC_BUF?		
<b>Value Range:</b>	OK	Test is OK	Default Value:
	Error, xx	Test failed. xx is the number of errors detected	Not Applicable
<b>Applicable in State:</b>	Query: IDLE		
<b>Description:</b>	This selftest command tests that the PC is able to access the ADC buffer of the test set.		
<b>Example:</b>	SYST:TEST:ADC_BUF?		

**SYSTem:TEST:COMM\_BUF?**

Self test of Communication Buffer

<b>Syntax:</b>	SYSTem:TEST:COMM_BUF?		
<b>Value Range:</b>	OK	Test is OK	Default Value:
	Error, xx	Test failed. xx is the number of errors detected	Not Applicable
<b>Applicable in State:</b>	Query: IDLE		
<b>Description:</b>	This selftest command tests that the PC is able to access the communication buffer of the test set.		
<b>Example:</b>	SYST:TEST:COMM_BUF?		

## SYSTem:TEST:DEVIation?

Self test of Deviation

<b>Syntax:</b>	SYSTem:TEST:DEVIation?		
<b>Value Range:</b>	OK Error, xx	Test is OK Test failed. xx is the measured deviation	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: IDLE		
<b>Description:</b>	<p>This selftest command checks the test set is able to both modulate and demodulate the RF carrier.</p> <p>Note: ensure no signals are applied at the RF connector. (if possible remove connections to the RF connector during the test).</p>		
<b>Example:</b>	SYST:TEST:DEV?		

## SYSTem:TEST:PoWeR?

Self test of Power

<b>Syntax:</b>	SYSTem:TEST:PoWeR?		
<b>Value Range:</b>	OK Error, xx	Test is OK Test failed. xx is the measured NTP	Default Value: Not Applicable
<b>Applicable in State:</b>	Query: IDLE		
<b>Description:</b>	<p>This selftest command checks the test set is able to both transmit power and measure power.</p> <p>Note: ensure no signals are applied at the RF connector. (if possible remove connections to the RF connector during the test).</p>		
<b>Example:</b>	SYST:TEST:PWR?		

## SYSTem:WARM\_START

System Warm Start

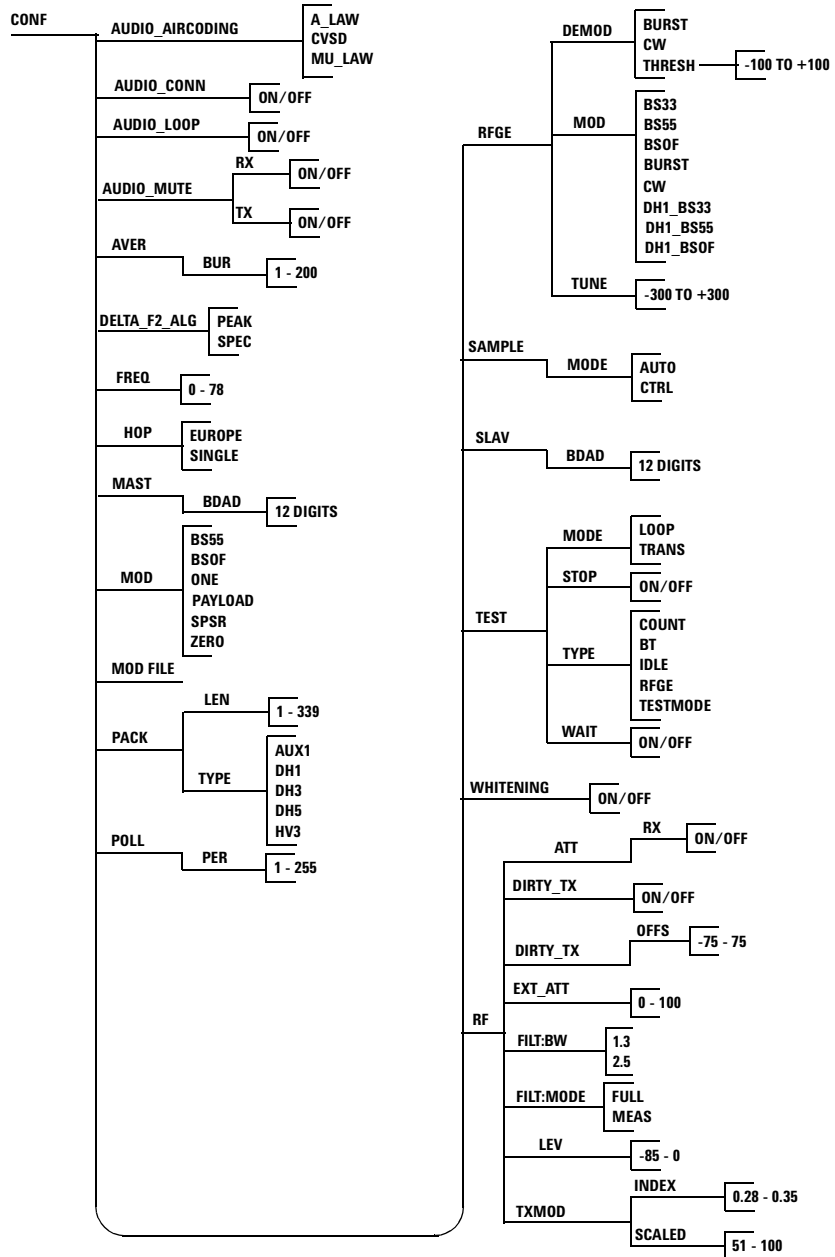
---

<b>Syntax:</b>	SYSTem:WARM_START	
<b>Value Range:</b>	Not Applicable	Default Value: Not Applicable
<b>Applicable in State:</b>	Set: All Query: Not Applicable	
<b>Description:</b>	<p>This command is used to completely reset the test set. All buffers and data registers are cleared and the test set firmware restarted. Using this command is similar to cycling the power and requires approximately 4 seconds to complete.</p> <p><b>Note:</b> Polling the test set with the STAT:DEV? command during the warm start procedure results in a target error. It is recommended that you add wait period to your test application for the duration of the warm start, approximately 4 seconds. When the WARM_START is complete, STAT:DEV? returns IDLE.</p>	
<b>Example:</b>	SYST:WARM_START	

---

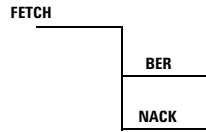
# Command Structure

## CONFigure

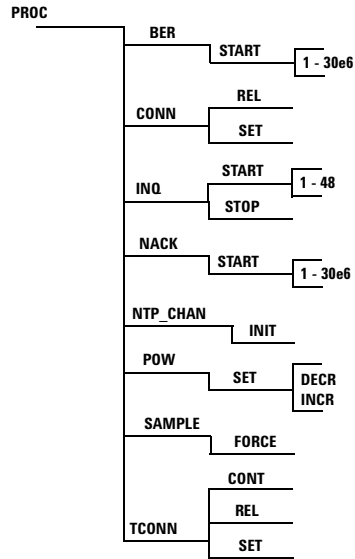




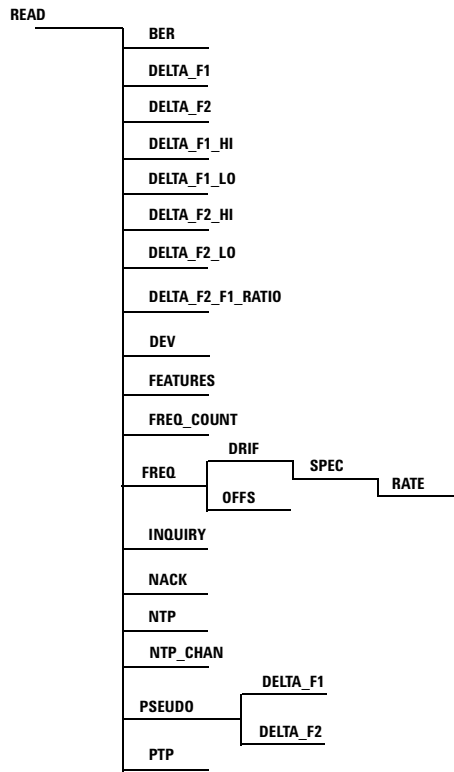
### FETCH



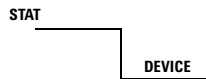
### PROCEDURE



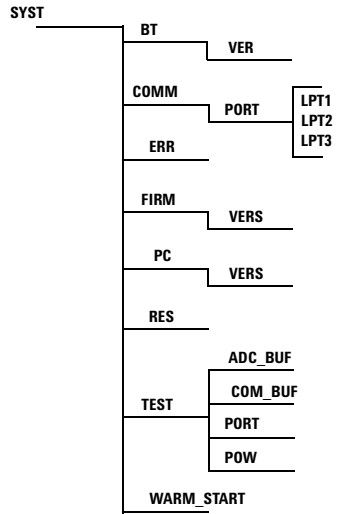
### READ



### STATus



### SYSTem





At the start of the commands showed in the communication area is a arrow showing the direction of the command e.g. an arrow pointing to the right --> is communication from the PC and an arrow pointing to the left <-- is reply from the test set.

Switching between the page tabs shows the commands for configuring the system.

You can enter commands in the single line entry field. You can also capture the dialogue between your PC and test set when operating from the user interface. Saving this log file allows you to examine the commands and can help in the development of your own operating programs.

# System Error Codes

Error Code	Error
+0	No Error
-102	Syntax Error
-221	Settings Conflict - the parameter you are trying to set is not within the current setting range or configuration of the test set. For example, you cannot request a packet length of 339 when the packet type is set to DH1 - the maximum packet length is for DH1 is 27.
-222	Data out of Range
-224	Parameter Not Allowed - The <value> or parameter you are using is not appropriate for the command type you are sending. For example, the command requires a numeric value/parameter and you are sending a string.  Consider the CONF:POLL:PER <value> command. Sending CONF:POLL:PER 3 is valid, sending CONF:POLL:PER THREE is not.
-365	Time Out Error
-366	Target Error - this error is returned if you try to read from the test set while its communications interface (LPT or GPIB) is inactive. For example, during a WARM_START the communications interface is "locked" for approximately 4 seconds. To avoid this error place a 4 second delay between sending the WARM_START command and the first read command to follow it.
-420	Query Unterminated

# Example Program

## Setup for Bluetooth RF measurements

The command setup for a Bluetooth measurement is shown in the following example:

Initial setup for measuring In Bluetooth Test mode (IDLE)

```
CONF:TEST:TYPE TESTMODE
CONF:FREQ 10
CONF:HOP SINGLE
CONF:TEST:MODE TRAN
CONF:PACK:LEN 27
CONF:PACK:TYPE DH1
CONF:MOD BS55
CONF:RF:LEV -35
CONF:POLL:PER 2
CONF:PACK:LEN 27
CONF:PACK:TYPE DH1
```

Paging the Bluetooth DUT Query status of the system (TESTMODE)

```
PROC:TCONN:SET
STAT:DEV?
```

Query Bluetooth RF measurements (TCONN)

```
READ:PTP?
READ:NTP?
```







# 6 Specifications and Characteristics

## **What You'll Find in This Chapter**

This Chapter describes the Specifications and Characteristics of your E1852B Bluetooth Test Set.

It contains the following sections:

- Introduction on page 210
  - Functionality on page 211
  - Performance on page 213
  - General Specifications on page 215
  - Regulatory Information is provided in the *Installation Guide*.
-

# Introduction

This chapter details the specifications and supplemental characteristics of the E1852B Bluetooth Test Set.

**Specifications** - describe the warranted performance and apply after a 60 minute warm-up. These specifications are valid over the operating and environmental range of the test set unless otherwise stated.

**Supplemental characteristics** - *shown in italics*, are intended to provide information useful in applying the test set by giving typical (expected), but nonwarranted performance parameters. These characteristics are shown in italics or denoted as “typical”, “nominal” or “approximate”.

# Functionality

## Test Mode with or without frequency hopping

Ability to act as a Bluetooth Master, perform Inquiry and establish a Paged connection (Bluetooth Specification 1.1) with a Bluetooth device.

**DUT Mode:** Transmitter mode or loopback mode, with or without data whitening

### Transmitter

**Measurements:** Provide the following results:

Average Power  
 Peak Power  
 Frequency Offset  
 Frequency Drift  
 Frequency Drift Rate  
 Frequency Deviation (OF calibrated)  
 Graphical Results showing: frequency versus time, power versus time, power versus channel number

### Receiver

**Measurements:** Number of test bits settable, up to 1.6 million  
 Bit Error Rate  
 Packet Error Rate

**Results Averaging:** 1 to 200

**Poll Period:** 1-255

**Packet Types:** DH1  
 DH3  
 DH5  
 HV3  
 AUX1

**Packet Length:** Variable, according to Bluetooth specifications for each packet type supported

**Packet Payload:** 00000000  
 11111111  
 01010101  
 00001111  
 Pseudo-random (PN9)  
 User Defined Payload

**Power Control:** Instruct Device Under Control (DUT) to increase/decrease RF output power

**Normal Mode** Ability to act as a Bluetooth Master, perform Inquiry and establish a Paged connection (Bluetooth Specification 1.1) with a Bluetooth device.

**Transmitter**

**Measurements:** Power and Frequency measurement results based on the use of a zero length payload.

Graphical results showing: frequency versus time, power versus time, power versus channel number

**Receiver**

**Measurements:** Packet Error Rate

**Results Averaging:** 1 to 200

**Poll Period:** 1

**Packet Payload:** No payload is present in this mode.

**Power Control:** Instruct Device Under Test (DUT) to increase/decrease RF output power.

**RF-Analyzer** Transmitter measurements as described in Test Mode, but for use when no link is established (DH1, DH3 or DH5 packets and 01010101, 00110011 or 00001111 payloads only).

**RF-Generator** Burst or continuous signal on any channel, with selectable power output and frequency offset. 01010101, 00110011 and 00001111 payloads supported.

# Performance

The test set will meet its specifications after 2 hours of storage within the operating temperature range, 60 minutes after turn on.

<b>RF Generator</b>	<b>Frequency:</b>
	<b>Range:</b> 2402MHz - 2480MHz, 79 channels at 1 MHz spacing
	<b>Modulation:</b> Conforms to Bluetooth Radio Specification Version 1.1
	<b>Offset:</b> $\pm 300$ kHz in 100 kHz increments
	<b>Output Power:</b>
	<b>Range:</b> $-85$ dBm to 0dBm
	<b>Resolution:</b> 0.1dB
	<b>Level Accuracy over the ranges<sup>1,2</sup></b>
	<b>-85 to -10 dBm:</b> $\pm 1.0$ dB at $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , ( $\pm 1.4$ dB over full operating temperature)
	<b>&gt;-10 to 0 dBm:</b> $\pm 1.1$ dB at $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , ( $\pm 1.9$ dB over full operating temperature)

<sup>1</sup> A measurement uncertainty of 0.43 dB is included in these limits.

<sup>2</sup> This specification is not applicable above -24 dBm when used in frequency hopping mode.

<b>RF Analyzer</b>	<b>Frequency:</b>	
	<b>Range:</b>	2402 MHz - 2480 MHz, 79 channels at 1 MHz spacing
	<b>Demodulation:</b>	±400 kHz maximum
	<b>Error:</b>	±(Timebase error +5 kHz) (nominal)
	<b>Power Measurement:</b>	
	<b>Range:</b>	-55 dBm to +22 dBm
	<b>Resolution:</b>	0.1 dB
	<b>Accuracy<sup>3</sup> over the input range</b>	
	<b>-30 to +23 dBm:</b>	±0.9 dB at 25°C ±3°C, (±1.3 dB over full operating temperature)
<b>Frequency Counter Input</b>	<b>Range:</b>	10 kHz to 15 MHz
	<b>Frequency Error:</b>	±(Timebase error + 100 Hz) (nominal)
	<b>Resolution:</b>	1 Hz
	<b>Sensitivity:</b>	0.5V RMS (nominal)
<b>Frequency Reference</b>	<b>Internal Timebase:</b>	
	<b>Drift due to temperature:</b>	±2.0 ppm
	<b>Ageing:</b>	±1.0 ppm per year
	<b>Frequency Reference Input:</b>	
	<b>Frequency</b>	10 MHz (nominal)
	<b>Sensitivity</b>	150 mV into 50Ω (nominal)

<sup>3</sup>A measurement uncertainty of 0.36 dB is included in these limits.

These uncertainty values are calculated using ISO TAG4, in line with the 'Guide to the Expression of Uncertainty in Measurement' and are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a confidence level of approximately 95%

# General Specifications

<b>Impairments</b>	<b>Frequency Offset:</b> -75 kHz to +75 kHz (settable in 1 kHz steps)
	<b>Modulation Index:</b> 0.28 to 0.35 (settable in 0.01 steps)
<b>Input / Output Connectors</b>	RF In/Out N(f), 50Ω ( <i>nominal</i> )
	Counter In BNC(f), high impedance
	GPIB Connector, IEEE 488 Standard
	Parallel Port 25-pin D-sub (m)
	Serial Port [RS-232] 9-pin D-sub(f) used for firmware downloads
	Frequency Reference Input, BNC (f) 50Ω ( <i>nominal</i> )
	Audio, BNC (f)
	<ul style="list-style-type: none"> <li>• Audio Input, 130kΩ (<i>nominal</i>)</li> <li>• Audio Output, 50Ω (<i>nominal</i>)</li> </ul>
	Analog Outputs, BNC(f), 50Ω ( <i>nominal</i> )
	<ul style="list-style-type: none"> <li>• Bluetooth Slot Clock (625μs interval)</li> <li>• Receive Data (inverted)</li> <li>• Receive Slot Sync, output synchronized to start of burst</li> <li>• Power Envelope</li> </ul>
<b>Environmental Conditions</b>	<b>Operating Temperature:</b> +15°C to +45°C
	<b>Operating Humidity</b> Up to 95% relative humidity to 40°C (non-condensing)
<b>Power Consumption</b>	<b>Supply Voltage</b> 100-120VAC, 200-240VAC 50-60 Hz 30 VA maximum
<b>Physical</b>	<b>Dimensions</b> 92mm (H) x 280 mm (D) x 484 mm (W) Designed for rack mounting
	<b>Weight</b> 3.6 kg

**Computer Requirements**

The test set requires the use of a PC (not supplied), minimum requirements as follows:

- Pentium<sup>®</sup> Processor or higher, 32MB RAM or more, 200MB available on hard drive
- Windows<sup>®</sup> 95, Windows<sup>®</sup> 98, Windows 2000<sup>®</sup>, Windows NT<sup>®</sup> 4.0 (SP 3)
- Dedicated bi-directional parallel port
- GPIB or dedicated bi-directional parallel port
- 1024 x 768 color monitor resolution
- Microsoft Internet Explorer version 4.0 or higher/ Netscape Communicator Version 4.0 or higher required for software/firmware upgrades.



# Regulatory Information

All regulatory information is contained in the E1852B Bluetooth Test Set *Installation Guide*.





# 7 Maintenance

## **What You'll Find in This Chapter**

This chapter describes the built in tests, error messages, and general maintenance. It contains these sections:

- Self Test on page 220
  - LED Indicators on page 222
  - Operator Maintenance on page 223
  - Contacting Agilent Technologies on page 227
  - Calibration and Service on page 230
-

# Self Test

The test set has two self test modes:

- Power on self test - occurs automatically when you turn on the test set.
- Self-Test - a series of tests you can carry out as required using the PC interface or remote commands.

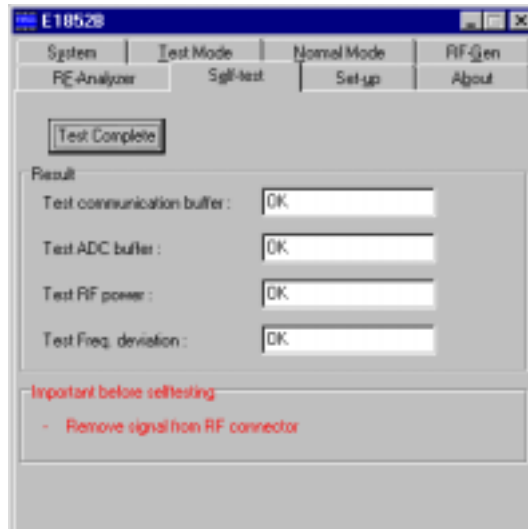
## Power On Test

The power on self test is performed automatically when the test set is turned on and takes approximately 5 seconds to complete. As the power on self test takes place, all the front panel LEDs are lit. When completed, only the Power LED remains lit.

## Self Test

You can carry out a self test from the PC interface or by using remote commands.

## PC Interface



**Figure 65 Self-test page**

Ensure there is no connection made to the RF In/Out port and click **Start** to begin the self test. Refer to Self-test Page on page 113 for more information.

**Remote Interface** To invoke the remote self tests, use the following commands:

- `SYST:TEST:COMM_BUF?`
- `SYST:TEST:ADC_BUF?`
- `SYST:TEST:PWR?`
- `SYST:TEST:DEV?`

## LED Indicators

There are 7 LED indicators on the front panel of the E1852B Bluetooth Test Set. Table 9 shows the behavior of the LED indicators according to the mode of the test set. The Error LED is turned on if the last SCPI command issued was wrong. The Error LED is turned off again as soon as a correct SCPI command is received.

**Table 9 LED Indicators and test set Mode**

Measurement Mode	Power	Error	Transmit	Loopback	Master	Slave	Link
Off							
Initializing	ON	ON	ON	ON	ON	ON	ON
Idle Mode	ON	ON <sup>1</sup>					
RF-generator Mode	ON	ON <sup>1</sup>			ON	ON	
Demodulator Mode	ON	ON <sup>1</sup>			ON	ON	
Normal Mode - Master	ON	ON <sup>1</sup>			ON		ON <sup>2</sup>
Normal Mode – Slave	ON	ON <sup>1</sup>				ON	ON <sup>2</sup>
Transmitter Test Mode	ON	ON <sup>1</sup>	ON		ON		ON <sup>2</sup>
Loopback Test Mode	ON	ON <sup>1</sup>		ON	ON		ON <sup>2</sup>

<sup>1</sup> If wrong SCPI commands is being used

<sup>2</sup> Only if Connection is established

---

**NOTE** The Error LED turns on during the firmware download procedure. A problem is indicated only if the LED remains lit after the test set has been restarted.

# Operator Maintenance

This section describes how to install new revisions of test set firmware. It also shows you how to replace the power line fuse and clean the test set.

## Firmware Download

The PC interface and test set firmware revisions are matched. To install new test set firmware you must first install the new revision of PC interface software. To download new firmware the test set serial port and the supplied serial cable are used. You also need to run the PC interface in Debug mode.

Updated PC interface software and test set firmware can be obtained from the URL shown in the **About** page of the E1852B PC interface. You can use the Firmware Download procedure but to ensure you have the latest information it is recommended that you use the E1852B Software home page and follow the displayed procedure to download and install the required files.

---

**NOTE** The Error LED turns on during the firmware download procedure. A problem is indicated only if the LED remains lit after the test set has been restarted.

## Firmware Download Procedure

The installation procedure is in three parts:

- Un-install any previous E1852B software from your PC
- Install the PC User Interface on your PC
- Install firmware in the E1852B Bluetooth Test Set

**Un-install** You only need to do this if you have any previously installed E1852B software on your PC. Proceed as follows:

1. On your PC, select **Start > Settings > Control Panel**.
2. Double click **Add/Remove Programs**.
3. Scroll through the list of programs and select the **E1852B** program.
4. Click **Remove**.

Follow any on screen instructions and when prompted, delete all files including the \*.dll files.

**PC Installation** If you have downloaded the latest firmware, PC user interface and DLL from the Agilent E1852B home page un-compress the package and save it to a temporary directory - **C:\WINDOWS\TEMP\E1852B** recommended.

1. Locate and double click the Setup.exe program icon.
2. Follow the on-screen instructions to complete the installation.

You have now installed the E1852B PC user interface and Dynamic Link Library (DLL).

**E1852B Firmware Installation** To complete the installation, download the new firmware to your E1852B Bluetooth Test Set. Proceed as follows:

1. Connect the test set to your PC with the parallel cable provided.

---

**NOTE** Ensure the serial cable is not connected between the PC and test set at this stage.

2. On your PC select **Start > Programs > Agilent Technologies > E1852B Debug**.



3. Select the E1852B **System** tab.
4. In the **Firmware Update** panel use the scroll button to select the PC serial port.
5. Press **Download**.
6. Highlight the **\*.bsf** file and click **Open**.

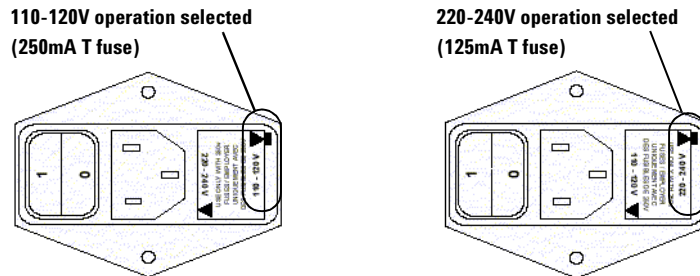
When prompted:

- Disconnect the parallel cable
  - Connect the serial cable provided from your PC serial port and the E1852B serial port
  - Cycle the test set power - switch the E1852B off and on again before clicking **OK**.
7. On completion, close the PC user interface and re-start in standard or Debug mode as required.

## Replacing the Power Line Fuse

The power line fuse is located within the fuse holder and line switch assembly on the rear panel. For 110V to 120V operation the fuse is a T0.25 250V, for 220-240V operation the fuse is a T0.125 250V.

- 1 Remove the power cord from the test set.
- 2 Install the correct fuse in the “selected” position as shown in Figure 66.
- 3 Replace the fuse holder assembly in the rear panel.



**Figure 66** Replacing the Fuse

## Cleaning

To clean the test set, disconnect it's supply power and wipe with a damp cloth only.

# Contacting Agilent Technologies

This section details what to do if you have a problem with your test set.

If you have a problem with your test set, first refer to the section. This chapter contains a checklist that will help identify some of the most common problems.

If you wish to contact Agilent Technologies about any aspect of the test set, from service problems to ordering information, refer to see Sales and Service Offices on page 229.

If you wish to return the test set to Agilent Technologies refer to see Returning Your Bluetooth Test Set for Service on page 230.

## Before calling Agilent Technologies

Before calling Agilent Technologies or returning the test set for service, please make the checks listed in see Check the Basics on page 227. If you still have a problem, please read the warranty printed at the front of this guide. If your test set is covered by a separate maintenance agreement, please be familiar with the terms.

Agilent Technologies offers several maintenance plans to service your test set after warranty expiration. Call your Agilent Technologies Sales and Service Center for full details.

If the test set becomes faulty and you wish to return the faulty instrument, follow the description on how to return the faulty instrument in the section see Sales and Service Offices on page 229.

## Check the Basics

Problems can be solved by repeating what was being performed when the problem occurred. A few minutes spent in performing these simple checks may eliminate time spent waiting for instrument repair. Before calling Agilent Technologies or returning the test set for service, please make the following checks:

- Check that the line socket has power.

- Check that the test set is plugged into the proper ac power source.
- Check that the test set is switched on.
- Check that the line fuse is in working condition.
- Check that the other equipment, cables, and connectors are connected properly and operating correctly.
- Check the equipment settings in the procedure that was being used when the problem occurred.
- Check that the test being performed and the expected results are within the specifications and capabilities of the test set.
- Check operation by performing the Self-test.

## Instrument serial numbers

Agilent Technologies makes frequent improvements to its products to enhance their performance, usability and reliability. Agilent Technologies service personnel have access to complete records of design changes for each instrument. The information is based on the serial number of each test set.

Whenever you contact Agilent Technologies about your test set, have a complete serial number available. This ensures you obtain the most complete and accurate service information. The serial number can be obtained from the serial number label. The serial number label is attached to the rear of each instrument.

## Sales and Service Offices

For more information about Agilent Technologies test and measurement products, applications, services, and for a current sales office listing, visit our web site: <http://www.agilent.com>

You can also contact one of the following centers and ask for a test and measurement sales representative.

<b>UNITED STATES</b>	Agilent Technologies (tel) 1 800 452 4844
<b>CANADA</b>	Agilent Technologies Canada Inc. Test & Measurement (tel) 1 877 894 4414
<b>EUROPE</b>	Agilent Technologies Test & Measurement European Marketing Organization (tel) (31 20) 547 9999
<b>JAPAN</b>	Agilent Technologies Japan Ltd. (tel) (81) 426 56 7832 (fax) (81) 426 56 7840
<b>LATIN AMERICA</b>	Agilent Technologies Latin America Region Headquarters, USA (tel) (305) 267 4245 (fax) (305) 267 4286
<b>AUSTRALIA and NEW ZEALAND</b>	Agilent Technologies Australia Pty Ltd. (tel) 1-800 629 485 (Australia) (fax) (61 3) 9272 0749 (Australia) (tel) 0-800 738 378 (New Zealand) (fax) (64 4) 802 6881 (New Zealand)
<b>ASIA PACIFIC</b>	Agilent Technologies, Hong Kong (tel) (852) 2599 7889 (fax) (852) 2506 9233

In any correspondence or telephone conversations, refer to the power sensor by its model number and full serial number. With this information, the Agilent Technologies representative can quickly determine whether your unit is still within its warranty period.

# Calibration and Service

Routine calibration and performance testing of your E1852B Bluetooth Test Set should be carried out on a yearly basis. Contact your local Agilent sales and service office for details.

## Returning Your Bluetooth Test Set for Service

Use the information in this section if you need to return your test set to Agilent Technologies.

## Package the Bluetooth Test Set For Shipment

Use the following steps to package the test set for shipment to Agilent Technologies for service:

- 1 Fill in a blue service tag (available at the end of the *Installation Guide*) and attach it to the test set. Please be as specific as possible about the nature of the problem. Send a copy of any or all of the following information:
  - Any error messages generated by the test set.
  - Any information on the performance of the test set.

### CAUTION

Damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the test set or prevent it from shifting in the carton. Styrene pellets cause damage by generating static electricity.

- 2 Use the original packaging materials or a strong shipping container that is made of double-walled, corrugated cardboard with 159 kg (350 lb) bursting strength. The carton must be both large enough and strong enough to accommodate the test set and allow at least 3 to 4 inches on all sides of the test set for packing material.

- 3** Surround the test set with at least 3 to 4 inches of packing material, or enough to prevent the test set from moving in the carton. If packing foam is not available, the best alternative is SD-240 Air Cap™ from Sealed Air Corporation (Commerce, CA 90001). Air Cap looks like a plastic sheet covered with 1-1/4 inch air filled bubbles. Use the pink Air Cap to reduce static electricity. Wrap the test set several times in the material to both protect the test set and prevent it from moving in the carton.
- 4** Seal the shipping container securely with strong nylon adhesive tape.
- 5** Mark the shipping container “FRAGILE, HANDLE WITH CARE” to ensure careful handling.
- 6** Retain copies of all shipping papers.

