



# **BlueTest Instruction Manual**

## AN047

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Bluetooth Qualified



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## Introduction

BlueTest is a program that controls the on-chip built-in-self-test (BIST) software for RF testing. This document explains the facilities offered by the BIST. BlueTest does not execute any of these tests. It sends commands to **BlueCore01** and/or enables the on-chip BIST, then reports any results.

The tests fall into six categories:

- Simple RF tests; used for PCB de-bug and optimisation
- Quantitative tests for transmit and receive; used to establish the performance of the Bluetooth device.
- Loopback test modes; used for qualification and regulatory testing
- Configuration commands to set parameters for other tests
- Built-in self-test routines
- Miscellaneous test routines

Further details about commands, parameters and packet types are included in the appendices following the tests.

### **Running a Test**

In a BlueTest dialog select the **Standard** button to display the entire test. This applies to all of the tests except for the BIT ERR1 and BIT ERR2 tests. Click on **Bit Error** to display these results in a column format.

When running the tests, the results display in a dialog box.

The default file name is logfile.txt. It is located in the current directory in which the program resides. Select **Browse for File** to create your own file name and path (using test examples provided).

To save test results to a file, tick Save to File.

**Note:** Some of these tests require two Bluetooth modules to function correctly. The PCM External Loopback test has notes specifically for use with CSR's Casira development kit. All of the following tests are designed to run with CSR's firmware versions Beta 10.4 and above.

Several tests include entries for **Related Test Spec Name**. These refer to tests in the Bluetooth Special Interest Group (SIG) Test Specification for RF document, rev. 0.9r, dated 31 January 2000.

💐 BlueTest	_ 🗆 🗙
RF Test Mode	Arguments Close Execute Reset Chip PS
	Test Results
Save to File Browse for file	Display: Standard Bit Error
Dpening com1. Transport active. Link active. BC01b (Hardware ID 64) firmware v	rersion 47.

**BlueTest Example Display** 



## **Getting Started**

Run Bluetest.exe.

Select a Protocol (Default BCSP).

Select Port and Baud Rate (Default com1, 115200).

Choose a protocol		
Protocol © BCSP © H4 (UART) © USB	Port and Baud Rate	



**PAUSE Example Display** 



## **Simple Tests**

### **RF Test Mode**

Title	PAUSE
Summary	Halts the current test and stops any radio activity.
Test Arguments	None
Return Data	None
Exit	Click on Reset Chip or enter a new command.

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Title	RADIO STATUS
Summary	Returns the values from the radio control registers.
Test Arguments	None
Return Data	Internal transmission level
	External transmission level
	Internal receiver gain
	Internal receiver attenuation
	Local oscillator level
	IQ trim
	Signal/image ratio for IQ trim
Exit	Click on <b>Reset Chip</b> .

RADIO STATUS		Close
TXDATA3 TXDATA4		Reset Chip
RXSTART1 RXSTART2		PS
Test F	Results	
Save to File Browse for file	Display: Star	ndard Bit Error
Mogfile.txt		
Transport active. Link active. BC01b (Hardware ID 64) firmware version 9' Sent Command Varid 5004, parameters: 002 Radio Status Report: Internal transmission level: 0. External transmission level: 0. Internal receiver gain: 11. Internal receiver attenuation: 13. Local oscillator level: 13. IQ trim: 0x00ee. Signal/image ratio for IQ trim: 32. Radio Test RADIO STATUS successful	3, 12, 0000, 0000, 0000.	

**RADIO STATUS Example Display** 



Title	TXSTART
Summary	Enables the transmitter in continuous transmission at a designated frequency (LO Freq) with a designated output Power (Ext, Int) and designated tone modulation frequency (Modulat'n Freq).
Test Arguments	LO Freq (Carrier Frequency in MHz) = 2402 to 2480 Power (Ext, Int) = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50) Modulat'n Freq = -32768 to 32767 in units of 1/4096MHz
Return Data	None Use RF Analyser to check carrier output.
Exit	Click on Reset Chip.



**TXSTART Example Display** 



Title	RXSTART1
Summary	Enables the receiver in continuous reception at a designated frequency (LO Freq) with a choice of low or high side modulation (hi-side) and with a designated attenuation setting (RX Attenuation). Requires a second unit to be running TXSTART. Routes final IF to TEST_A pin.
Test Arguments	LO Freq (Carrier Frequency MHz)= 2402 to 2480
	hi-side (default = False) set 0 or 1
	<b>RX Attenuation</b> = 0 to $15$ (Default = 0)
Return Data	None
Exit	Click on <b>Reset Chip</b> .

💐 BlueTest		_ 🗆 ×
RF Test Mode	Test Arguments	
RXSTART1	LO Freq. (MHz) 2432	Close
BXDATA1 BXDATA2	hi-side [false	Evecute
BIT ERR1		
LOOP BACK	HA Alteridation jo	Reset Chip
BX LOOP BACK BER LOOP BACK		PS
	Test Results	]
Save to File Browse	for file Display: Standard	Bit Error
Nogfile.txt		
Opening com1. Transport active		
Link active. BC01b (Hardware ID 64) fim	nware version 47	
Sent Command Varid 5004, Badio Test BXSTABT1 suc	parameters: 0002, 0980, 0000, 0000.	
	CESSIG	

**RXSTART1 Example Display** 



Title	RXSTART2
Summary	Enables the receiver in continuous reception, at a designated frequency ( <b>LO Freq</b> ), with a choice of low or high side modulation ( <b>hi-side</b> ) and with a designated attenuation setting ( <b>RX Attenuation</b> ). Digitises the RSSI and sends report regularly to host. Requires a second unit to be running <b>TXSTART</b> .
Test Arguments	LO Freq (Carrier Frequency MHz) = 2402 to 2480 hi-side (default = false) set 0 or 1 RX Attenuation = 0 to 15 (Default = 0)
Return Data	RSSI values, as a uint16, sent over BCSP channel 3 at a rate of about 10 per second. Can be saved to log file. H4 and USB use manufacturer's extensions.
Exit	Click on Reset Chip.

🕌 BlueTest		
- RF Test Mode	- Test Arguments-	
RXSTART2 RXDATA1	LO Freq. (MHz) 2432	Close
BXDATA2 BIT ERR1 BIT ERR2	hi-side false	Execute
LOOP BACK RX LOOP BACK	RX Attenuation 0	Reset Chip
BER LOUP BACK		PS
	Test Results	
🗖 Save to File Browse f	or file Display: Standard	Bit Error
Opening com1. Transport active. Link active. BC01b (Hardware ID 64) firm Sent Command Varid 5004, r Radio Test RXSTART2 succ RSSI: 9. RSSI: 9. RSSI: 5. RSSI: 5.	ware version 47. parameters: 0003, 0980, 0000, 0000. pessful	

**RXSTART2 Example Display** 

\_ 🗆 ×

Close

Execute

Reset Chip

PS

**TXDATA1 Example Display** 

	- Test Arguments
•	LO Freq. (MHz) 2432

Power (Ext,Int) 255

Test Results

50

Display: Standard Bit Error

Note: TXDATA and RXDATA require the same Bluetooth address in each module for **RXDATA** to receive data transmitted by TXDATA. Use CFG\_UAP\_LAP to set

the address used by the BIST.

Save to File Browse for file

💐 Blue Test

TXDATA2 TXDATA3 TXDATA4

RXSTART1

RXSTART2 RXDATA1 RXDATA2 BIT ERR1

.\logfile.txt

- RF Test Mode TXDATA1

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Depring com1. Transport active. Link active. BC01b (Hardware ID & A) firmware version 47. Sent Command Varid 5004, parameters: 0004, 0980, ff32, 0000. Radio Test TXDATA1 successful

Title	TXDATA1
	Enables the transmitter, with a designated frequency (LO Freq) and output Power (Ext, Int).
•	Payload is PRBS9 data.
Summary	Receiver is not operating.
	Packet type and duty cycle can be configured. Refer to Configuration Commands section.
Related Test Spec Name	TRM/CA/03/C (power control), TRM/CA/04/C (Tx output spectrum – frequency range), TRM/CA/05/C (Tx output spectrum – 20dB bandwidth), TRM/CA/06/C (Adjacent channel power), TRM/CA/08/C (Initial carrier frequency tolerance), TRC/CA/01/C (Out-of-band spurious emissions).
Test Arguments	LO Freq (Carrier Frequency MHz) = 2402 to 2480
	<b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).
Return Data	None
	Use an RF Analyser to check carrier output.
Exit	Click on Reset Chip or select another TXDATA command.



**Quantitative Tests** 

**Transmitter Only** 



Title	TXDATA2
	Enables the transmitter, with a simplified hop sequence designated by <b>Country Code</b> and sets output <b>Power (Ext, Int)</b> .
Summony	Payload is PRBS9 data (Default DH1).
Summary	Receiver is not operating.
	Packet type and duty cycle can be configured. Refer to Configuration Commands section.
Related Test Spec Name	TRM/CA/01/C (output power), TRM/CA/02/C (power density)
Test Arguments	<b>Country Code</b> = 0 to 3 (Default = $0$ )
Beturn Date	None
Return Data	Use RF Analyser to check carrier output.
Exit	Click on Reset Chip or select another TXDATA command.



**TXDATA2 Example Display** 



Title	TXDATA3
	Enables the transmitter, with a designated frequency (LO Freq) and output Power (Ext, Int).
Summary	Payload is sequence 101010
Summary	Receiver is not operating.
	Packet type and duty cycle can be configured. Refer to Configuration Commands section.
Related Test Spec Name	TRM/CA/07/C (modulation characteristic), TRM/CA/09/C (carrier frequency drift)
	LO Freq (Carrier Frequency MHz)= 2402 to 2480
Test Arguments	<b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).
Return Data	None
	Use RF Analyser to check out carrier
Exit	Click on Reset Chip or select another TXDATA command.

RF Test Mode       Test Arguments         TXDATA3       LO Freq. (MH2) 2432       Close         RXSTART1       Power (Ext.Int) 255       50       Execute         RXDATA1       RXDATA2       Bit Error       Power (Ext.Int) 255       50       Execute         RXDATA1       RXDATA2       Bit Error       Power (Ext.Int) 255       50       Execute         RXDATA2       Bit Error       Power (Ext.Int) 255       Standard       Bit Error         IOND BACK       Test Results       Test Results       Power (Ext.Int) 255       Standard       Bit Error         Vlogfile.txt       Opening com1.       Transport active.       Link active.       Sent Command Varid 5004, parameters: 0006, 0980, ff32, 0000.         Radio Test TXDATA3 successful       Souccessful       Souccessful       Souccessful	BlueTest			_ 🗆
TXDATA3         TXDATA4         RXSTART1         RXSTART2         RXDATA1         RXDATA2         BIT ERR1         BIT ERR2         LOOD DACK         Test Results         Test Results         Opening com1.         Transport active.         Link active.         BC01b (Hardware ID 64) firmware version 47.         Sent Command Varid 5004, parameters: 0006, 0980, ff32, 0000.         Radio Test TXDATA3 successful	RF Test Mode	- Test Arguments		1
RXSTART1 RXSTART2 RXDATA1 RXDATA1 RXDATA2 BIT ERR1 BIT ERR2 Save to File Browse for file Display: Standard Bit Error Nogfile.txt Opening com1. Transport active. Link active. BC01b (Hardware ID 64) firmware version 47. Sent Command Varid 5004, parameters: 0006, 0980, ff32, 0000. Radio Test TXDATA3 successful	TXDATA3	LO Freq. (MHz) 2432		Close
RXDATA1 RXDATA2 BIT ERR1 BIT ERR2 I DODE DACK Test Results Test Results Test Results Standard Bit Error Nogfile txt Opening com1. Transport active. BC01b (Hardware ID 64) firmware version 47. Sent Command Varid 5004, parameters: 0006, 0980, ff32, 0000. Radio Test TXDATA3 successful	RXSTART1	Power (Ext,Int) 255	50	Execute
Incode Accv       Test Results         Incode Accv       Test Results         Incode Accv       Test Results         Incode Accv       Incode Accv         Incode Accv       Test Results         Incode Accv       Incode Accv         Opening com1.       Incode Accv         Incode Accv       Incode Accv         Opening com1.       Incode Accv         Incode Accv       Incode Accv         Bit Error       Incode Accv         Opening com1.       Incode Accv         Incode Accv       Incode Accv         Dopening com1.       Incode Accv         Incode Accv       <	HXSTART2 RXDATA1 PYDATA2			Reset Chip
Test Results Test Results Test Results Test Results Save to File Browse for file Display: Standard Bit Error Nogfile.txt Opening com1. Transport active. Link active. BC01b (Hardware ID 64) firmware version 47. Sent Command Varid 5004, parameters: 0006, 0980, ff32, 0000. Radio Test TXDATA3 successful	BIT ERR1 BIT FBB2			
Test Results         Save to File       Browse for file       Display:       Standard       Bit Error         Nogfile.txt         Opening com1.         Transport active.         Link active.         BC01b (Hardware ID 64) firmware version 47.         Scott Command Varid 5004, parameters: 0006, 0980, ff32, 0000.         Radio Test TXDATA3 successful				F3
Save to File       Browse for file       Display:       Standard       Bit Error         Mogfile.txt		Test Results		
Nogfile.txt Opening com1. Transport active. Link active. BC01b (Hardware ID 64) firmware version 47. Sent Command Varid 5004, parameters: 0006, 0980, ff32, 0000. Radio Test TXDATA3 successful	Save to File Browse	for file Display:	Standard	Bit Error
Deening com1. Transport active. Link active. BC01b (Hardware ID 64) firmware version 47. Sent Command Varid 5004, parameters: 0006, 0980, ff32, 0000. Radio Test TXDATA3 successful	Verfle W		<u> </u>	
	Link active. BC01b (Hardware ID 64) firn Sent Command Varid 5004, Radio Test TXDATA3 succi	ware version 47. parameters: 0006, 0980, ff32, ( essful	0000.	

**TXDATA3 Example Display** 



Title	TXDATA4
	Enables the transmitter with a designated frequency (LO Freq) and output Power (Ext, Int).
Summary	Payload is sequence 1111000011110000
Summary	Receiver is not operating.
	Packet type and duty cycle can be configured. Refer to Configuration Commands section.
Related Test Spec Name	TRM/CA/07/C (modulation characteristic), TRM/CA/09/C (carrier frequency drift)
	LO Freq (Carrier Frequency MHz) = 2402 to 2480
Test Arguments	<b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).
Return Data	None
	Use an RF Analyser to check out carrier.
Exit	Click on Reset Chip or select another TXDATA command.



**TXDATA4 Example Display** 



### **Receiver Only**

Title	RXDATA1
Summary	Enables the receiver, at a designated frequency ( <b>LO Freq</b> ) with a choice of low or high side modulation ( <b>hi-side</b> ), and with a designated attenuation setting ( <b>RX Attenuation</b> ).
	The software counts the number of received packet and the number of payloads with correctable errors.
	The payload itself is thrown away. The time between receive slots and report frequency can be set. Refer to Configuration Commands section.
Test Arguments	LO Freq (Carrier Frequency MHz)= 2402 to 2480
	<b>hi-side</b> = 0 or 1 (default = 0)
	<b>RX Attenuation</b> = 0 to 15 (default = 0)
Return data	NP = number of packets
	NP = number of good packets,
	NCP = number of corrected packets
	RSSI = value as shown
	True = RSSI is reliable, otherwise false
	The numbers wrap, rather than being reset to 0.
Exit	Click on Reset Chip.

Note: TXDATA and RXDATA require the same Bluetooth address in each module for RXDATA to receive data transmitted by TXDATA. Use CFG\_UAP\_LAP to set the address used by the BIST.

🗳 Blue Test		
RF Test Mode	Test Arguments	
RXDATA1	LO Freq. (MHz) 2432	Close
BIT ERR1 BIT ERR2	hi-side false	Execute
LOOP BACK RX LOOP BACK BER LOOP BACK	RX Attenuation 0	Reset Chip
		PS
	Test Results	
Save to File Browse f	or file Display: St	andard Bit Error
Upening com1. Transport active. BCD1b (Hardware ID 64) firm Sent Command Varid 5004, 1 Radio Test RXDATA1 succe RXPKTSTATS: NP: 798, NC RXPKTSTATS: NP: 7188, N RXPKTSTATS: NP: 7188, N RXPKTSTATS: NP: 7198, N RXPKTSTATS: NP: 7396, N RXPKTSTATS: NP: 6396, N RXPKTSTATS: NP: 6396, N RXPKTSTATS: NP: 6396, N RXPKTSTATS: NP: 7986, N RXPKTSTATS: NP: 7986, N RXPKTSTATS: NP: 7936, N RXPKTSTATS: NP: 7036, N RXPKTSTATS: NP: 7036, N RXPKTSTATS: NP: 7036, N RXPKTSTATS: NP: 10336, RXPKTSTATS: NP: 10336, RXPKTSTATS: NP: 11196, N	ware version 99. parameters: 0008, 0980, 0000, 0000 sesful GP: 422, NCP: 50, RSSI: 100,true. GP: 622, NCP: 78, RSSI: 100,true. GP: 935, NCP: 100, RSSI: 100,true GP: 1346, NCP: 130, RSSI: 100,tru GP: 1346, NCP: 130, RSSI: 100,tru GP: 2459, NCP: 177, RSSI: 100,tru GP: 2459, NCP: 177, RSSI: 100,tru GP: 2459, NCP: 171, RSSI: 100,tru GP: 3240, NCP: 211, RSSI: 100,tru GP: 3271, NCP: 224, RSSI: 100,tru GP: 3271, NCP: 224, RSSI: 100,tru GP: 3271, NCP: 224, RSSI: 100,tru GP: 323, NCP: 305, RSSI: 101,tr NGP: 4726, NCP: 364, RSSI: 101,tr	). ). i.e.

### **RXDATA1 example display**



Title	RXDATA2
	Enables the receiver with a simplified hop sequence designated by <b>Country Code</b> , with a choice of low or high side modulation ( <b>hi-side</b> ) and with a designated attenuation setting ( <b>RX</b> <b>Attenuation</b> ).
Summary	The software counts the number of received packets and the number of payloads with correctable errors.
	The payload itself is thrown away. The time between receive slots and report frequency can be set. Refer to Configuration Commands Section.
Related Test Spec Name	Standby mode spurious emissions (FCC test)
	Country Code = 0 to 3 (default = 0)
Test Arguments	<b>hi-side</b> = 0 or 1 (default = 0)
	<b>RX Attenuation</b> = 0 to 15 (default = 0)
	NP = number of packets
Return Data	NG = number of good packets
	NCP = number of corrected packets
	RSSI = value as shown
	True = RSSI is reliable, otherwise false
	The numbers wrap, rather than being reset to 0.
Exit	Click on Reset Chip.



### **RXDATA2 Example Display**



bc01-an-047b

Title	BIT ERR1
	Enables the receiver at a designated frequency (LO Freq) with a choice of low or high side modulation (hi-side) and with a designated attenuation setting (RX Attenuation).
	Returns a set of reports to the host:
	<ul> <li>Number of data bits received (payload excluding FEC and CRC)</li> </ul>
	<ul> <li>Number of data bits that were in error. Assumes PRBS9 data starting with 1FF in each packet</li> </ul>
	<ul> <li>Number of packets received</li> </ul>
	<ul> <li>Number of packets expected, based on txrx_freq (default 12500)</li> </ul>
	<ul> <li>Number of packets with header errors as reported by hardware</li> </ul>
Summary	<ul> <li>Number of packets with CRC errors</li> </ul>
	<ul> <li>Number of packets with uncorrected errors (currently same as CRC errors)</li> </ul>
	<ul> <li>Number of sync timeouts. Note that until a transmission is received a long timeout is used, so this does not reflect the number of packets expected</li> </ul>
	Each report has two unint32 values. First is value since last report, second is summed over the last bits_count (default = 1.6Mbits).
	Reports are sent according to report_freq set (default = 1 second). The times between receive slots and report frequency can be set, and the count reset. Refer to Configuration Commands section.

DIGGT 631		_ 🗆
RF Test Mode	- Test Arguments	
BIT ERR1	LO Freq. (MHz) 2433	2 Close
ACK ACK ACK ACK BER LOOP BACK BER LOOP BACK ACK ACK ACK ACK ACK ACK ACK	hi-side false RX Attenuation 0	e Execute
		PS
	Test Results	
Save to File Browse	for file Disp	play: Standard Bit Error
Statistics for current cumula %BER #Bit #EP 0.0246 1727984 80 0.0236 691200 320	ition "kt #RPkt #Sync #H 00 8000 0 0 00 3200 0 0	Hdr #CRC #Uncorr 0 27 27 1 8 8

BIT ERR1 Example Display



Title	BIT ERR1 (Continued)
Related Test Spec Name	RCV/CA/01/C and RCV/CA/02/C (sensitivity), RCV/CA/03/C (C/I performance), RCV/CA/04/C (blocking performance), RCV/CA/05/C (intermodulation performance), RCV/CA/06/C (maximum input level)
	LO Freq (Carrier Frequency MHz) = 2402 to 2480
Test Arguments	hi-side = 0 or 1 (default = 0)
	<b>RX Attenuation</b> = 0 to 15 (default = 0)
Note	With a second unit, execute <b>CFG UAP/LAP</b> to set the Bluetooth address. Execute <b>TXDATA1</b> then execute <b>CFG UAP/LAP</b> to set the same Bluetooth address on the Equipment Under Test (EUT) before executing <b>BIT ERR1</b> .
Return Data	Eight reports, each two uint32 values (refer to BIT ERR1 Summary).
Exit	Click on <b>Reset Chip</b> .