BlueCore ä 01

BlueTest Instruction Manual

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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.

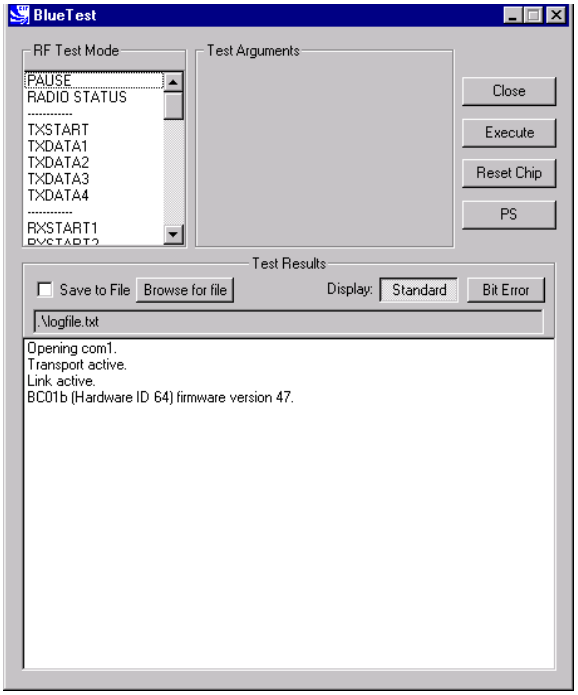
The default file name is `logfile.txt`. It is located in the current directory in which the program resides. Select **Browse for File** to create your own file name and path (using test examples provided).

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 Example Display

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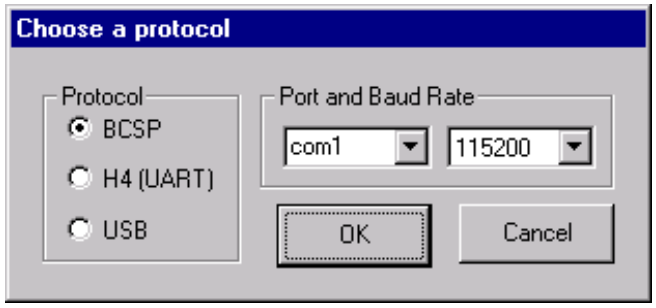
Getting Started

Run **Bluetest.exe**.

Select a Protocol (Default **BCSP**).

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



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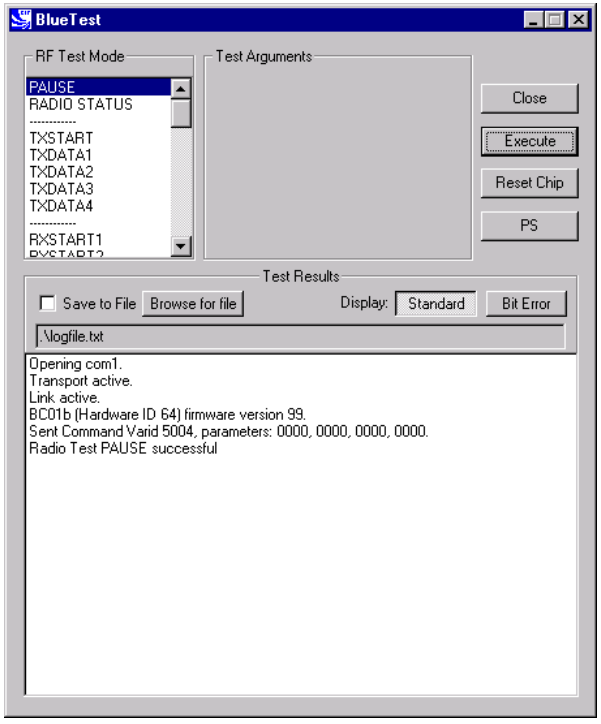
Simple Tests

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.



PAUSE Example Display

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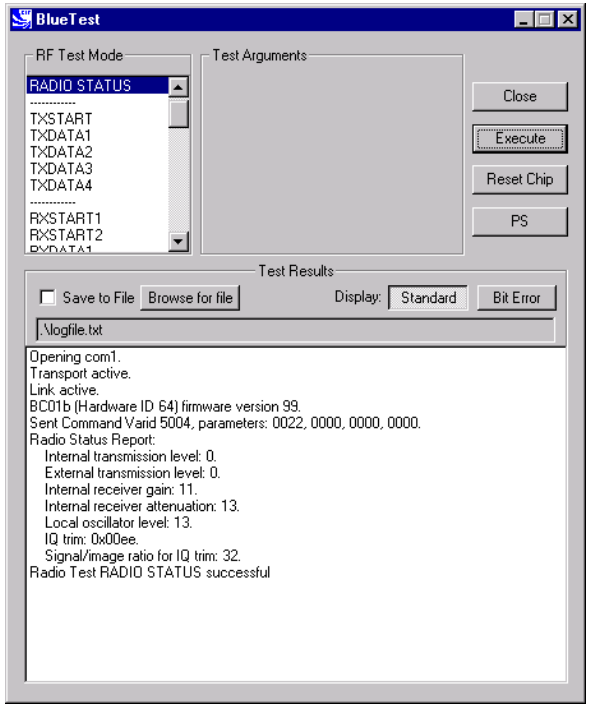
Title	**RADIO STATUS**
Summary	Returns the values from the radio control registers.
Test Arguments	None
Return Data	Internal transmission level External transmission level Internal receiver gain Internal receiver attenuation Local oscillator level IQ trim Signal/image ratio for IQ trim
Exit	Click on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



RADIO STATUS Example Display

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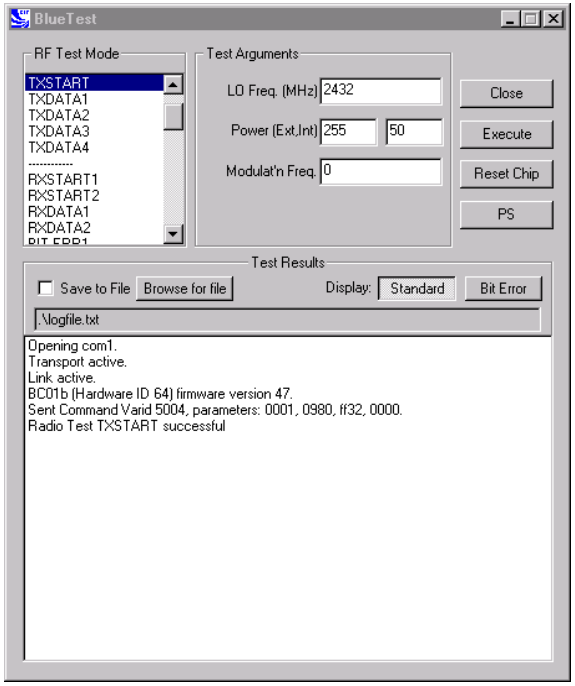
Title	TXSTART
Summary	Enables the transmitter in continuous transmission at a designated frequency (**LO Freq**) with a designated output **Power (Ext, Int)** and designated tone modulation frequency (**Modulat'n Freq**).
Test Arguments	**LO Freq** (Carrier Frequency in MHz) = 2402 to 2480 **Power (Ext, 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

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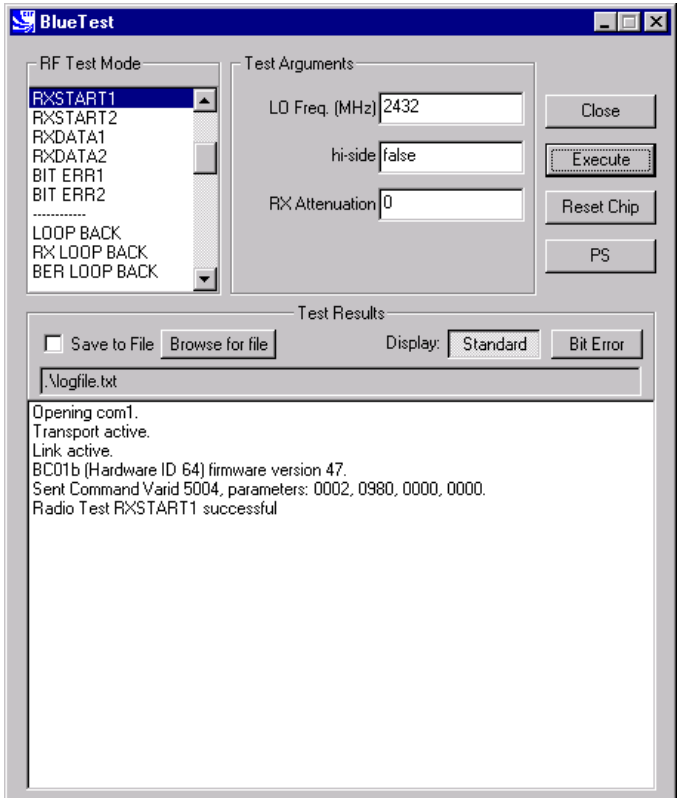
Title	**RXSTART1**
Summary	Enables the receiver in continuous reception at a designated frequency (**LO Freq**) with a choice of low or high side modulation (**hi-side**) and with a designated attenuation setting (**RX Attenuation**). Requires a second unit to be running **TXSTART**. Routes final IF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



RXSTART1 Example Display

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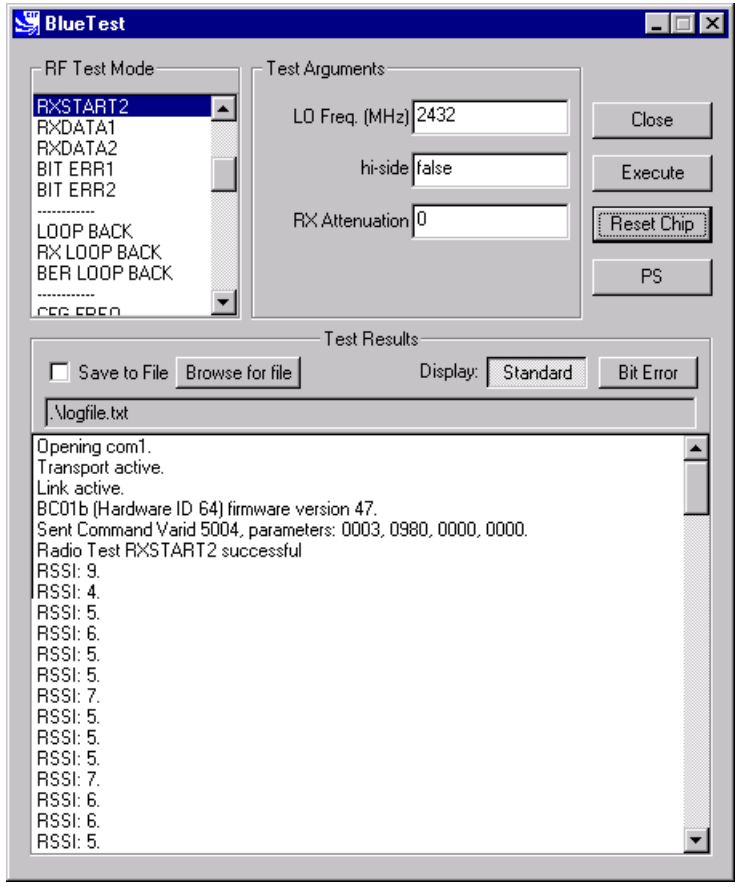
Title	**RXSTART2**
Summary	Enables the receiver in continuous reception, at a designated frequency (**LO Freq**), with a choice of low or high side modulation (**hi-side**) and with a designated attenuation setting (**RX Attenuation**). Digitises the RSSI and sends report regularly to host. Requires a second unit to be running **TXSTART**.
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**.



RXSTART2 Example Display

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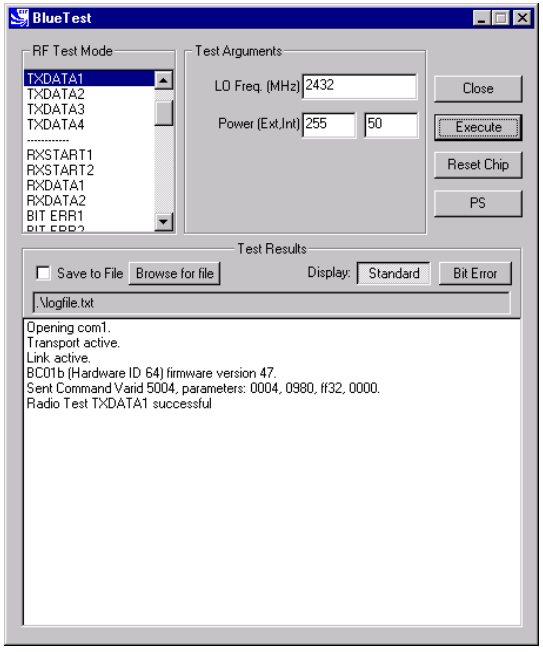
Quantitative Tests

Transmitter Only

Title	**TXDATA1**
Summary	Enables the transmitter, with a designated frequency (**LO Freq**) and output **Power (Ext, Int)**. Payload is PRBS9 data. 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` **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`).
Return Data	None Use an RF Analyser to check carrier output.
Exit	Click on **Reset Chip** or select another **TXDATA** command.

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.



TXDATA1 Example Display

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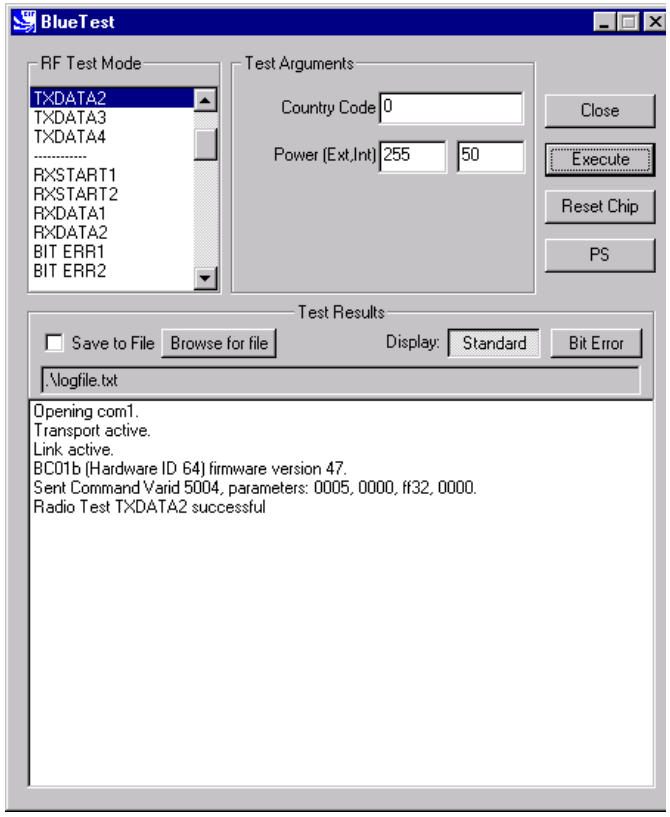
Title	**TXDATA2**
Summary	Enables the transmitter, with a simplified hop sequence designated by **Country Code** and sets output **Power (Ext, Int)**. Payload is PRBS9 data (Default DH1). Receiver is not operating. Packet type and duty cycle can be configured. Refer to Configuration Commands section.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



TXDATA2 Example Display

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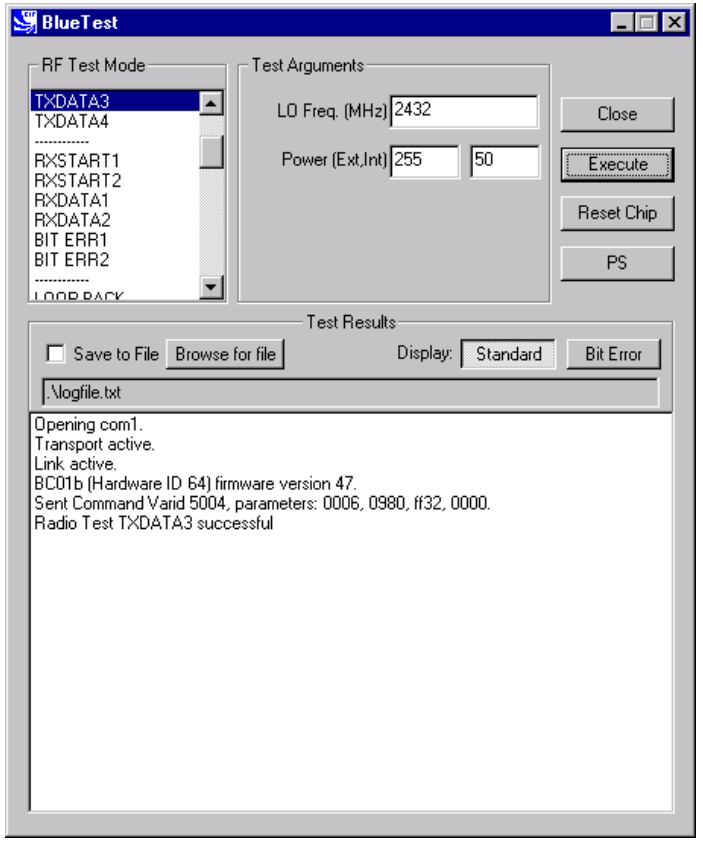
Title	**TXDATA3**
Summary	Enables the transmitter, with a designated frequency (**LO Freq**) and output **Power (Ext, Int)**. Payload is sequence `101010`.... Receiver is not operating. Packet type and duty cycle can be configured. Refer to Configuration Commands section.
Related Test Spec Name	TRM/CA/07/C (modulation characteristic), TRM/CA/09/C (carrier frequency drift)
Test Arguments	**LO Freq** (Carrier Frequency 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`).
Return Data	None Use RF Analyser to check out carrier
Exit	Click on **Reset Chip** or select another **TXDATA** command.



TXDATA3 Example Display

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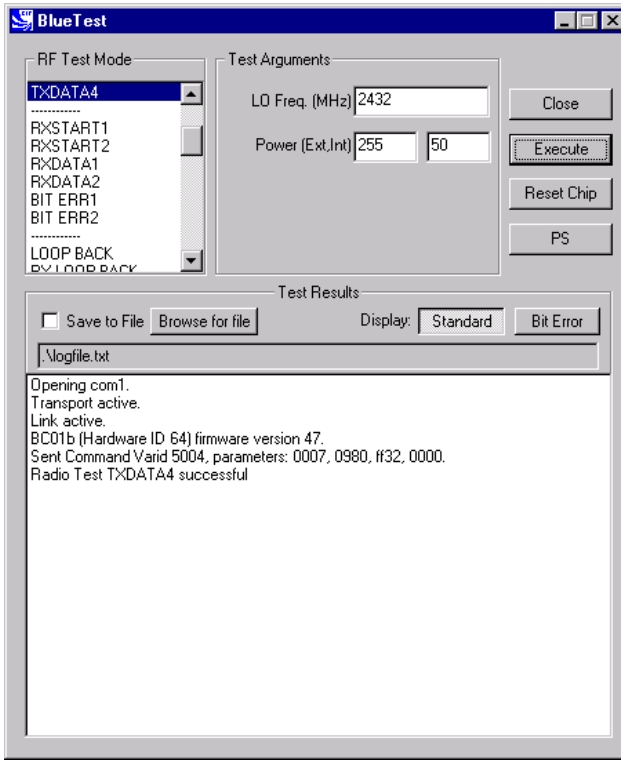
Title	TXDATA4
Summary	Enables the transmitter with a designated frequency (**LO Freq**) and output **Power (Ext, Int)**. Payload is sequence `1111000011110000`…. Receiver is not operating. Packet type and duty cycle can be configured. Refer to Configuration Commands section.
Related Test Spec Name	TRM/CA/07/C (modulation characteristic), TRM/CA/09/C (carrier frequency drift)
Test Arguments	**LO Freq** (Carrier Frequency 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`).
Return Data	None Use an RF Analyser to check out carrier.
Exit	Click on **Reset Chip** or select another **TXDATA** command.



TXDATA4 Example Display

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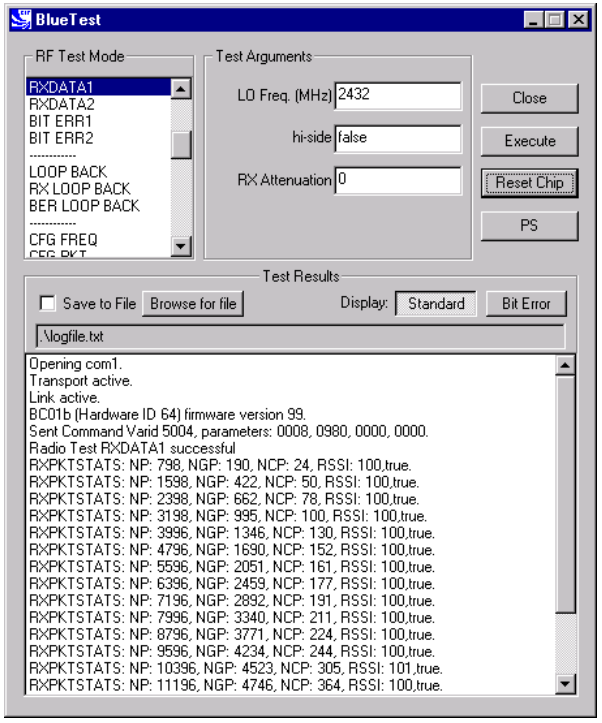
Receiver Only

Title	**RXDATA1**
Summary	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**). 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 **hi-side** = 0 or 1 (default = 0) **RX Attenuation** = 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.



RXDATA1 example display

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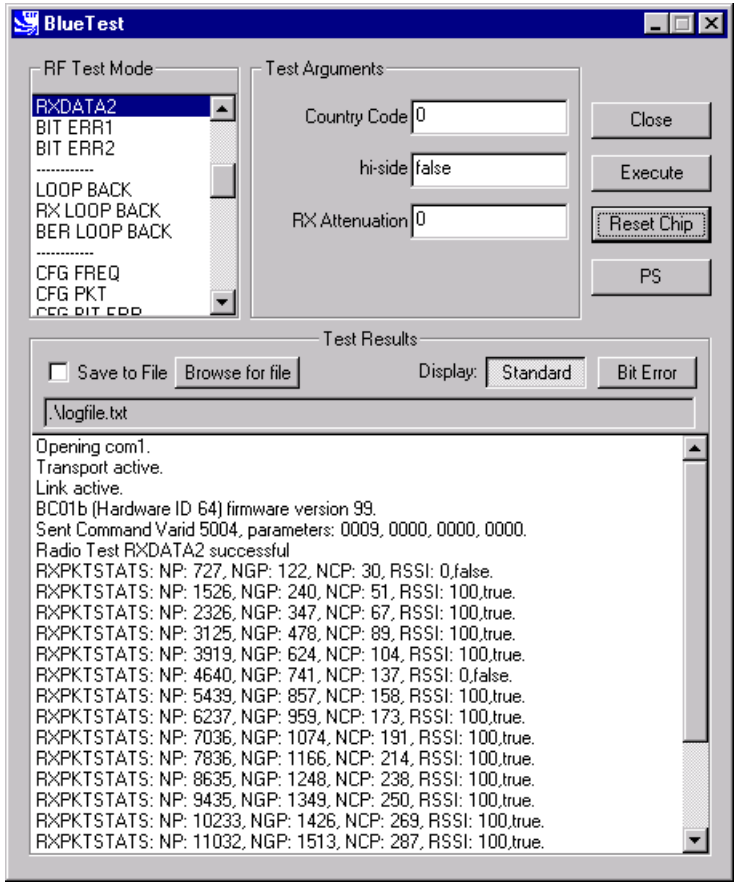
Title	RXDATA2
Summary	Enables the receiver with a simplified hop sequence designated by **Country Code**, with a choice of low or high side modulation (**hi-side**) and with a designated attenuation setting (**RX Attenuation**). The software counts the number of received packets and the number of payloads 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)
Test Arguments	**Country Code** = 0 to 3 (default = 0) **hi-side** = 0 or 1 (default = 0) **RX Attenuation** = 0 to 15 (default = 0)
Return Data	NP = number of packets 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

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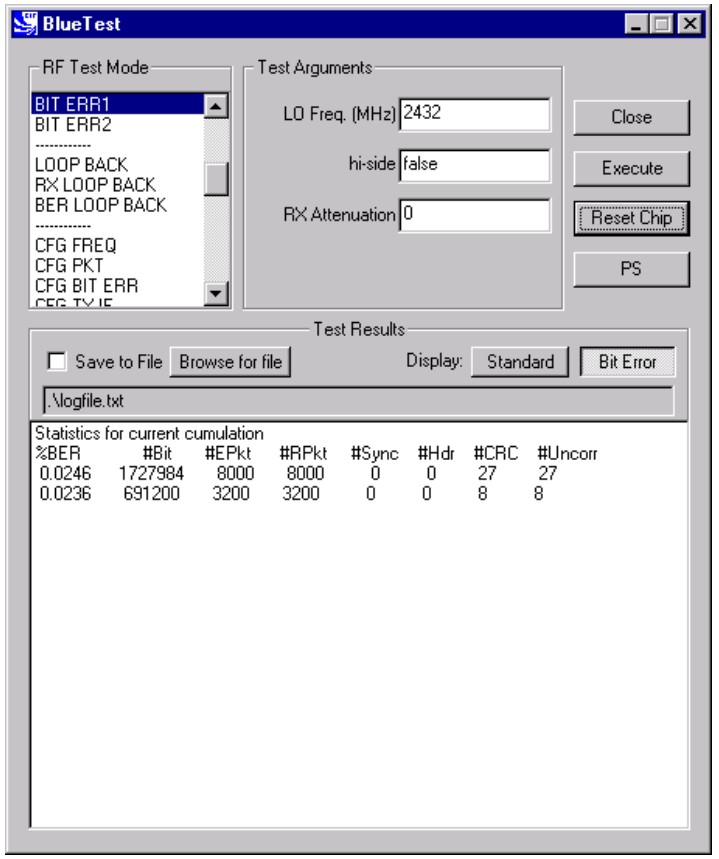
Title	BIT ERR1
Summary	Enables the receiver at a designated frequency (**LO Freq**) with a choice of low or high side modulation (**hi-side**) and with a designated attenuation setting (**RX Attenuation**). Returns a set of reports to the host: ▪ Number of data bits received (payload excluding FEC and CRC) ▪ Number of data bits that were in error. Assumes PRBS9 data starting with `1FF` in each packet ▪ Number of packets received ▪ Number of packets expected, based on `txrx_freq` (default `12500`) ▪ Number of packets with header errors as reported by hardware ▪ Number of packets with CRC errors ▪ Number of packets with uncorrected errors (currently same as CRC errors) ▪ 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 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.



BIT ERR1 Example Display

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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)
Test Arguments	**LO Freq** (Carrier Frequency MHz) = `2402` to `2480` **hi-side** = `0` or `1` (default = `0`) **RX Attenuation** = `0` to `15` (default = `0`)
Note	With a second unit, execute **CFG UAP/LAP** to set the Bluetooth address. Execute **TXDATA1** then execute **CFG UAP/LAP** to set the same Bluetooth address on the Equipment Under Test (EUT) before executing **BIT ERR1**.
Return Data	Eight reports, each two uint32 values (refer to BIT ERR1 Summary).
Exit	Click on **Reset Chip**.

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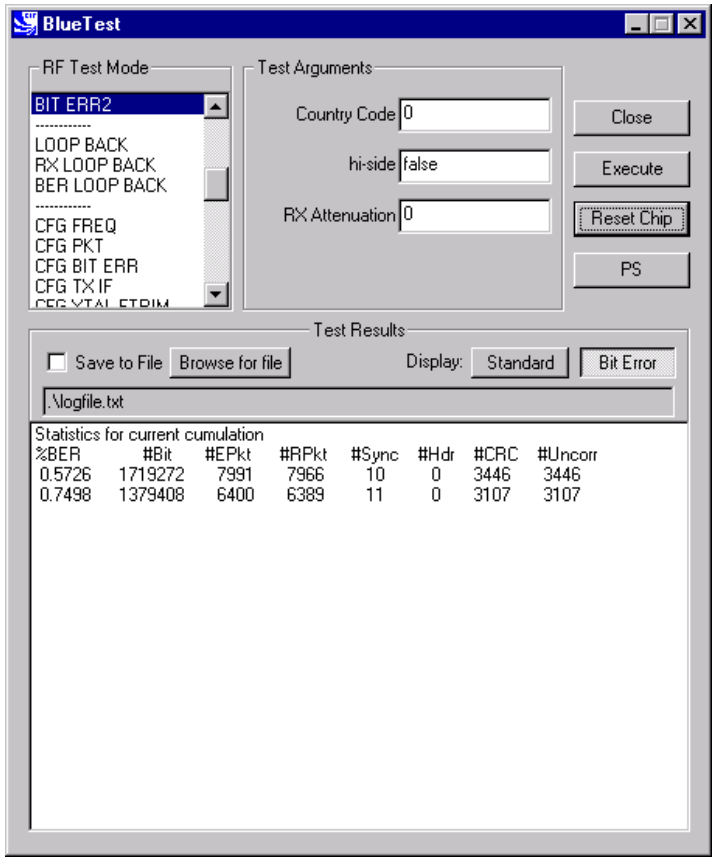
Title	**BIT ERR2**
Summary	Enables the receiver with simplified hopping defined by **Country Code** with a choice of low or high side modulation (**hi-side**), and with a designated attenuation setting (**RX Attenuation**) as for **RXDATA2**. Returns information on bit errors to the host as those given for **BIT ERR1**.
Related Test Spec Name	None, but note that this test allows (as in **BIT ERR1**) the tests RCV/CA/01/C and RCV/CA/02/C (sensitivity), RCV/CA/04/C (blocking performance) to be performed with hopping on. This is a more thorough test than that possible with the 7 Layers equipment.
Test Arguments	**Country Code** = 0 to 3 (default 0) **hi-side** = 0 or 1 (default = 0) **RX Attenuation** = 0 to 15 (default = 0)
Note	With a second unit, execute **CFG UAP/LAP** to set BT address then execute **TXDATA2**, then execute **CFG UAP/LAP** to set the same BT address on the Equipment under Test (EUT) before executing **BIT ERR2**.
Return Data	Nine reports, each two uint32 values as for **BIT ERR1**.
Exit	Click on **Reset Chip**.



BIT ERR2 Example Display

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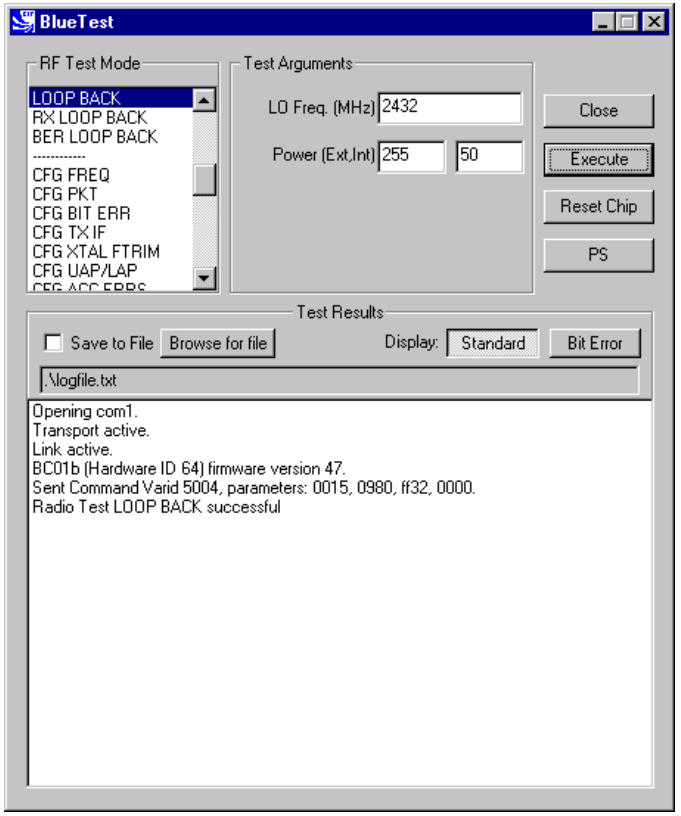
Loopback Test Mode

Title	**LOOP BACK**
Summary	Receives data on **LO Frequency** for data packets and then retransmits this data on the same channel at transmit level `'lvl'`. Highside reception is off and attenuation is set to `0`. Expected reception frequency, `txrx_freq` (default = `12500` microsecs) with single slot packets returned `lb_offs` after receipt (default = `1875` microsecs). Defaults can be changed. See Configuration Commands section.
Related Test Spec Name	None, but note that this test RCV/CA/01/C to RCV/CA/06/C to be performed in loopback without using the LMP commanded loopback test mode. RCV/CA/01/C to RCV/CA/06/C to be performed in loopback, but without using the LMP commanded loopback test mode.
Test Arguments	**LO Freq** (Carrier Frequency MHz)= `2402` to `2480` `(default = 2432)` **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`).
Return Data	None
Exit	Click on **Reset Chip**.



LOOP BACK Example Display

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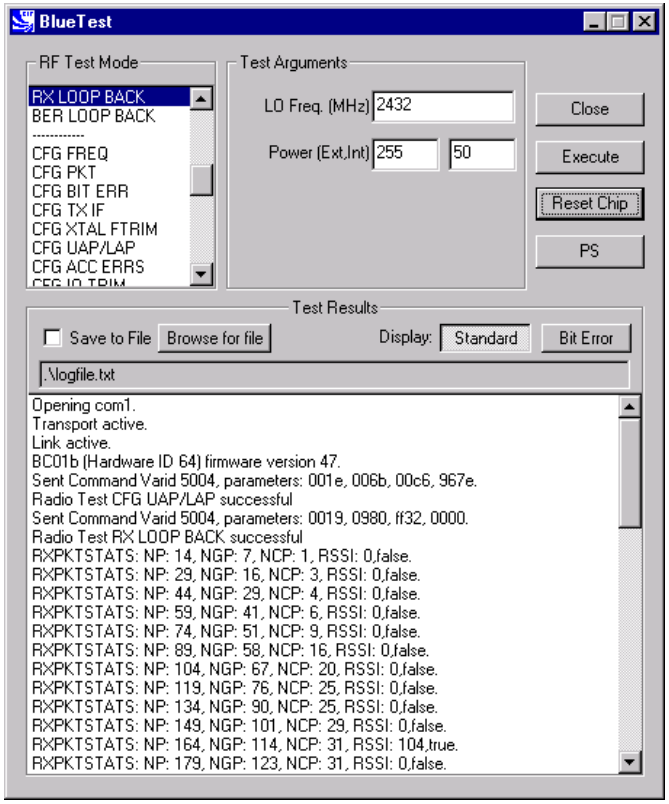
Title	**RX LOOP BACK**
Summary	Transmit PRBS9 data on **LO Frequency** at transmit level and listen for transmissions in the next slot but one. Sends reports as **RXDATA1** back to the host once per second (configurable). Highside reception is off and attenuation is set to `0`. Default is single-slot packets (configurable with `config_freq`). This is designed to be used with a second unit in LOOP_BACK test mode.
Related Test Spec Name	None, but note that this test allows transmission to and reception from Implementation under Test (IUT) in LOOP_BACK test mode with RSSI and BER calculated from FEC.
Test Arguments	**LO Freq** (Carrier Frequency 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`).
Note	With a second unit execute **CFG UAP/LAP** to set the Bluetooth address. Execute **LOOP BACK** then execute **CFG UAP/LAP** to set the same BT address on the Equipment under Test (EUT) before executing **RX LOOP BACK**.
Return Data	`NP` = Number of packets `NGP` = Number of good packets `NCP` = Number of corrected packets `RSSI` = Received Signal Strength Indication `True` = RSSI is reliable, otherwise false
Exit	Click on **Reset Chip**.



RX LOOP BACK Example Display

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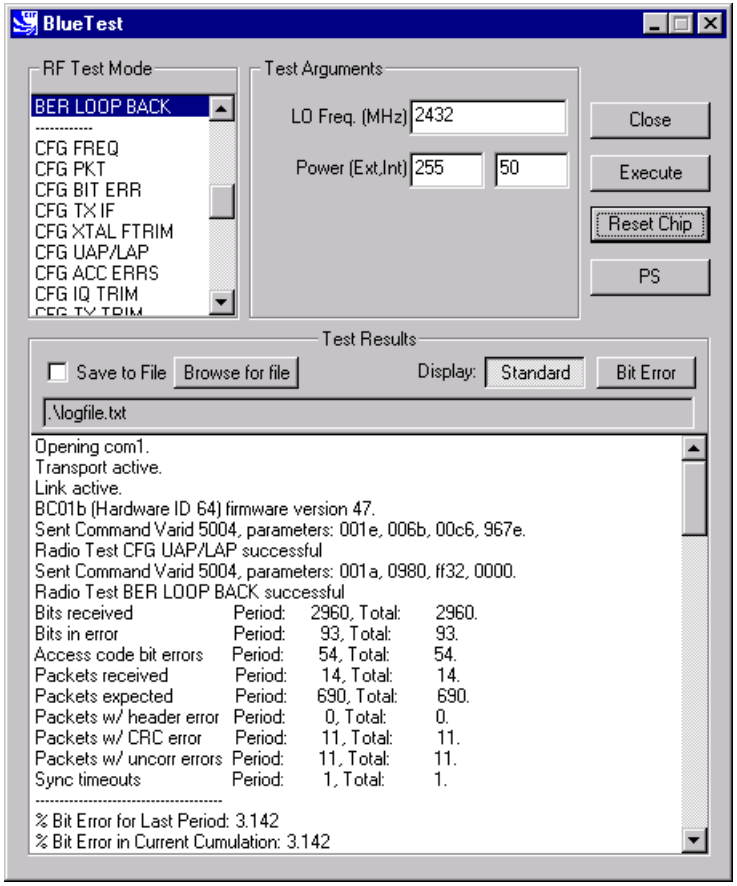
Title	**BER LOOP BACK**
Summary	Transmit PRBS9 data on `LO Frequency` at transmit level and listen for transmissions in the next slot but one. Sends reports as BIT ERR1 back to the host once per second (configurable). Highside reception is off and attenuation is set to zero Default is single slot packets (configurable with `config_freq`). Designed to be used with a second unit in loop_back test mode.
Related Test Spec Name	None, but note that this test allows transmission to and reception from IUT in loopback test mode, with calculation of BER to BT specification.
Called via	BCSP channel 2
Test Arguments	**LO Freq** (Carrier Frequency 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`).
Note	With a second unit execute **CFG UAP/LAP** to set BT address then execute **LOOP BACK**, then execute **CFG UAP/LAP** to set the same BT address on the EUT before executing **BER LOOP BACK**.
Return Data	Nine reports as for **BIT ERR1**.
Exit	Click on **Reset Chip**.



BER LOOP BACK Example Display

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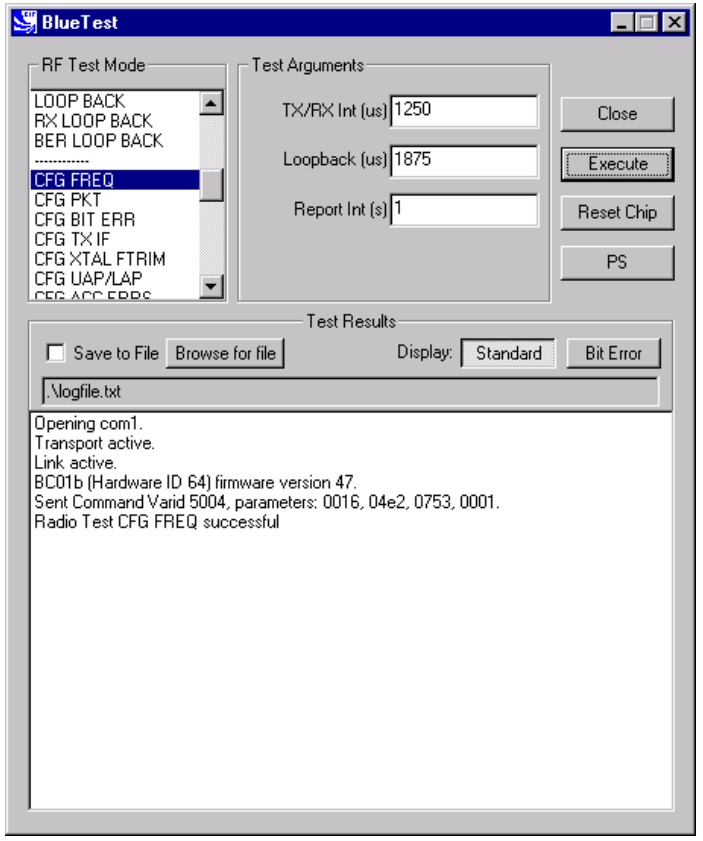
Configuration Commands

Title	CFG FREQ
Summary	Sets three values used in deciding timing details of tests. **Tx/Rx Int** (txrx_freq) sets the period in microseconds between TX and RX events in RXDATA, TXDATA, BIT ERR and LOOP BACK test modes. Default is 1250 (20 slots), maximum 65536. If passed as 0, current value unchanged. **Loopback** (lb_offs) sets the offset in microseconds between a reception event and retransmission of the data in loopback. Default is 1875 (two slots later), must be less than TX/Rx Int (txrx_freq). If passed as zero current value unchanged. **Report Int** (report_freqs) sets the time in seconds between reports to host sent by RXDATA and BIT ERR functions. Default 1, if passed as 0 current value unchanged.
Related Test Spec Name	None
Test Arguments	**TX/RX Int (µS)** = 1 to 65535 (default = 1250) **Loopback (µS)** = 1 to 65535 (default = 1875) **Report Int (S)** = 1 to 65535 (default = 1)
Return Data	None.
Exit	Click on **Reset Chip**.



CFG FREQ Example Display

BlueCore™01

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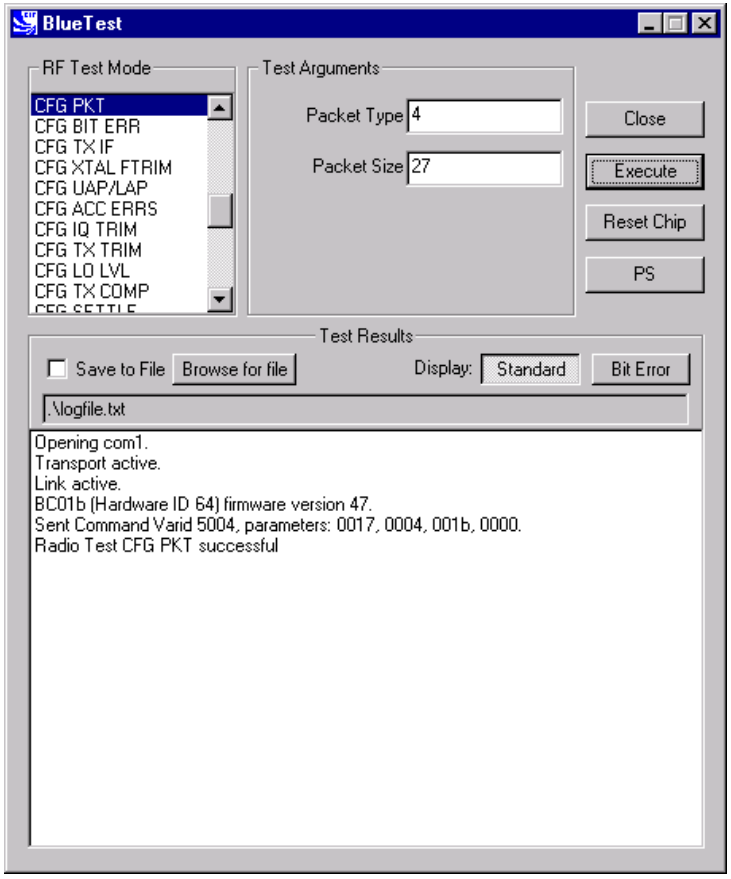
Title	**CFG PKT**
Summary	Sets packet type and size for transmitter tests. It has no effect on RX or LOOP BACK tests. **Packet Type** (pkt-type) is the standard Bluetooth packet type, 0-15 (12-13 not allowed). Any other number sets default: DM5 for **TXDATA1/2**, DH5 for **TXDATA3/4**. **Packet Size** (pkt_size) is the size of data in packet, from one to maximum for type. If zero sets default: 20 bytes for **TXDATA1/2**, 192 bytes for **TXDATA3/4**. Since the two values are connected both values must be set – no default is inferred.
Related Test Spec Name	None
Test Arguments	**Packet Type** = 0 to 15 (default = 4) (see Appendix 5) **Packet Size** = 0 to 339 (default = 27)
Return data	None
Exit	Click on **Reset Chip**.



CFG PKT Example Display

BlueCore™01

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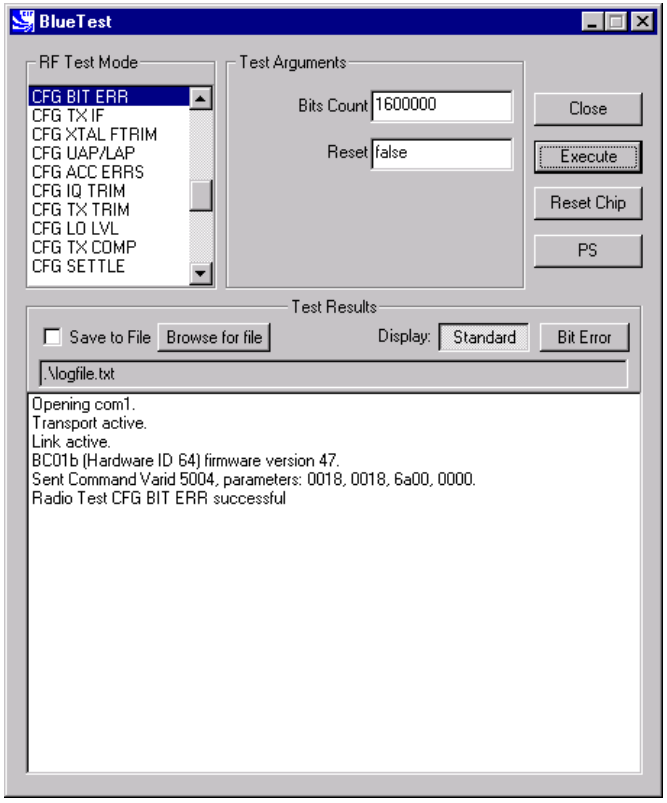
Title	CFG BIT ERR
Summary	Sets two values used in bit error measurements. If **Bits Count** (`bits_count`) is non-zero, the target for total counters is set to this and total count resets at this value. If passed as `0` current value, unchanged. If **Reset** is not `false` and **BIT ERR/2** is active, immediately resets the counters for the total statistics, but not over the last report period.
Related Test Spec Name	None
Test Arguments	**Bits Count** = `1` to `4.2 x 109` (default = `1600000 Bit`) **Reset** = `false (0)` or `true (1)` (default = `false`)
Return Data	None
Exit	Click on **Reset Chip**.



CFG BIT ERR Example Display

BlueCore™01

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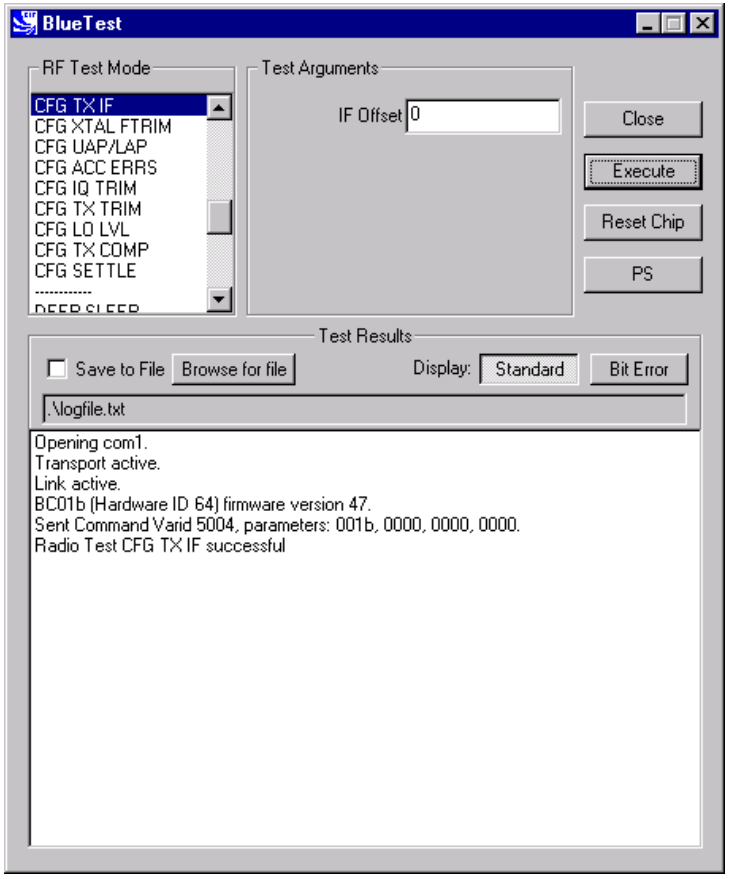
Title	**CFG TX IF**
Summary	Sets the IF frequency used in transmit test modes. The target is zero, but the stack currently uses a default of `-1MHz`. Offset is a signed integer with a range from `+5` to `–5`, in units of `0.5MHz`.
Related Test Spec Name	None
Test Arguments	**IF Offset** = `-5` to `+5` (default = `0`)
Return data	None
Exit	Click on **Reset Chip**.



CFG TX IF Example Display

BlueCore™01

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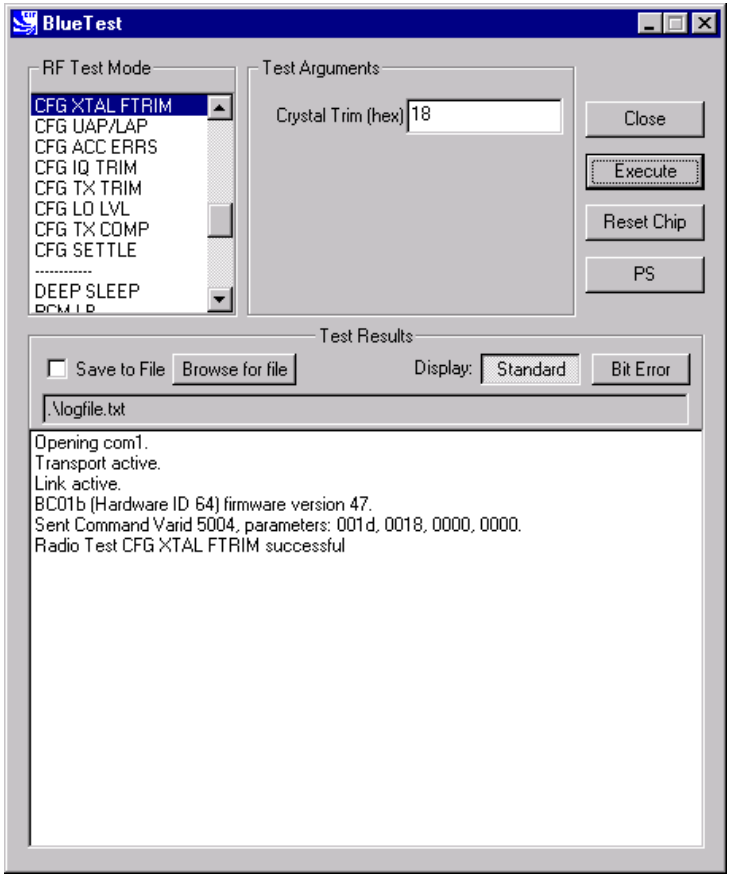
Title	**CFG XTAL FTRIM**
Summary	Timing for **BlueCore01** is controlled by a crystal. This requires trimming for new hardware. This command can be used to set a new trim value either before a radiotest command is started or while a test is already in operation; the change takes effect immediately. **Crystal Trim** (`xtal_ftrim`) is a number between `0` and `63` inclusive. This is not a permanent change.
Related Test Spec Name	None
Test Arguments	**Crystal Trim** = `0` to `63` (typical = `27`)
Note	With **Crystal Trim** set to `0`, the current settings will not change.
Return data	None
Exit	Click on **Reset Chip**.



CFG XTAL FTRIM Example Display

BlueCore™01

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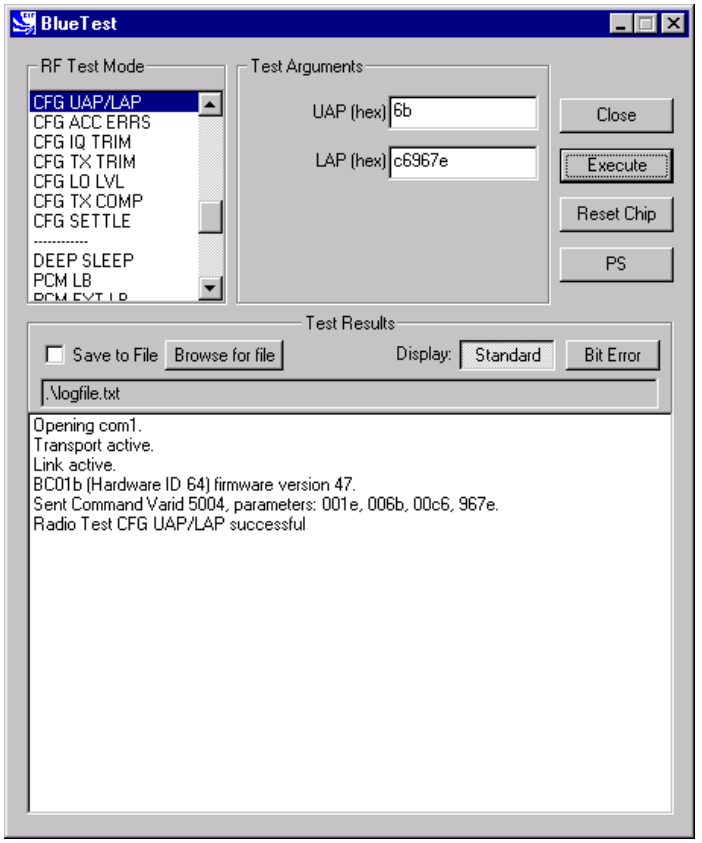
Title	**CFG UAP/LAP**
Summary	Sets the UAP and LAP to be used in tests. **BlueCore01** usually uses its own Bluetooth Device address to determine the access sync code, as if it is master of a piconet. The UAP and LAP are the only parts used. This command allows a special UAP and LAP to be used only in the test modes.
Related Test Spec Name	None
Test Arguments	Bluetooth Address: **UAP** = 0 to FF (Default = 6b) **LAP** = 0 to FFFFFF (Default = c6967e)
Return Data	None
Exit	Click on **Reset Chip**.



CFG UAP/LAP Example Display

BlueCore™01

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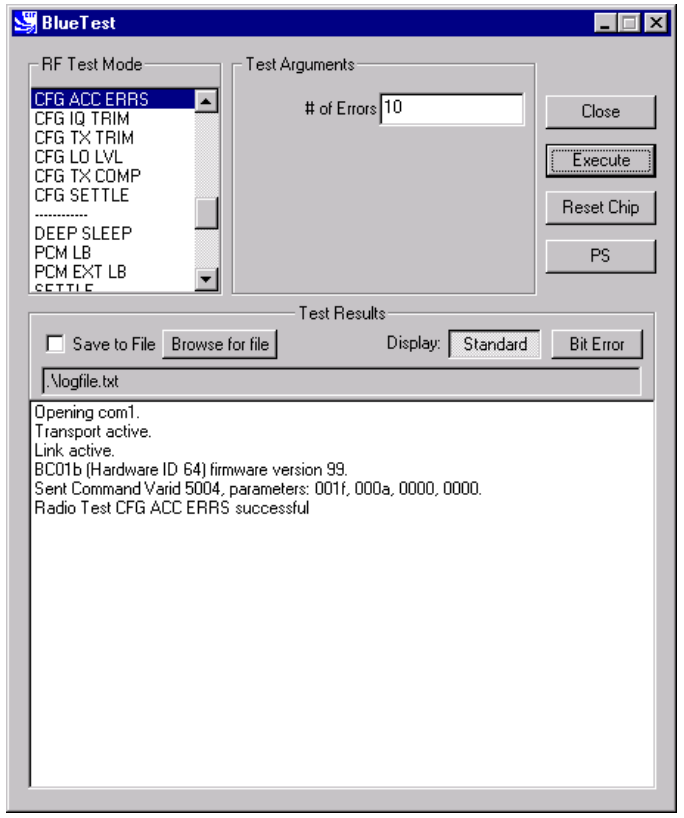
Title	**CFG ACC ERRS**
Summary	The receiver uses a sliding correlator to determine that it has matched the start of a packet. The receiver allows up to **# of errors** (`n_errs`) before a match is rejected.
Related Test Spec Name	None
Test Arguments	**# of errors** = `0` to `15` (default = `10`)
Return Data	None
Exit	Click on **Reset Chip**.



CFG ACC ERRS Example Display

BlueCore™01

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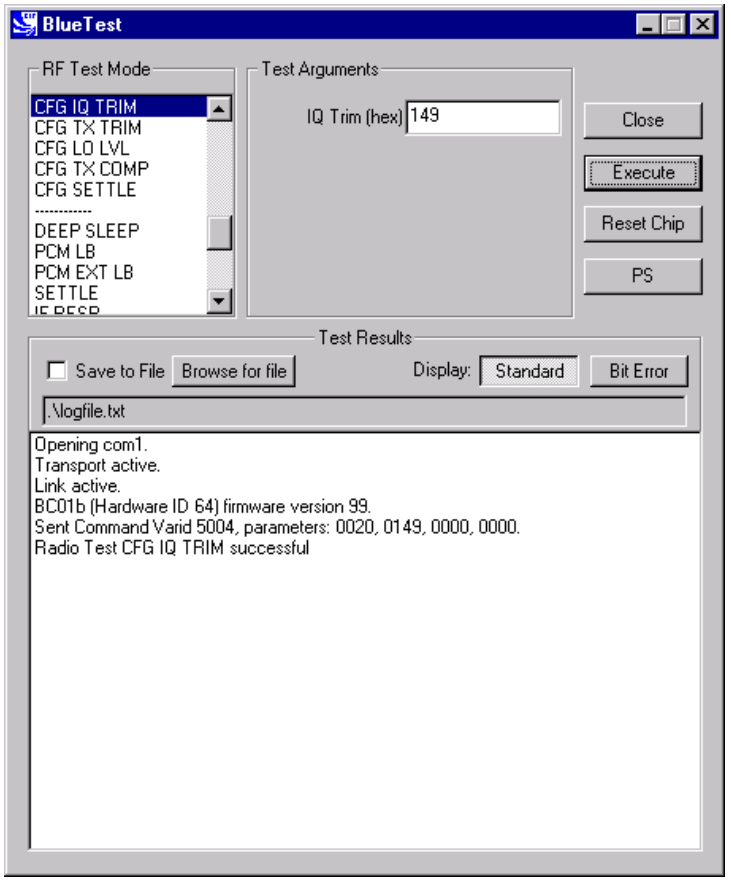
Title	**CFG IQ TRIM**
Summary	Sets the IQ Trim (`trim`) value overriding the value calculated by the internal calibration algorithm. This command is not executed in normal use.
Related Test Spec Name	None
Test Arguments	**IQ Trim** = `0` to `511` (default `149` (hex))
Return Data	None
Exit	Click on **Reset Chip**.



CFG IQ TRIM Example Display

BlueCore™01

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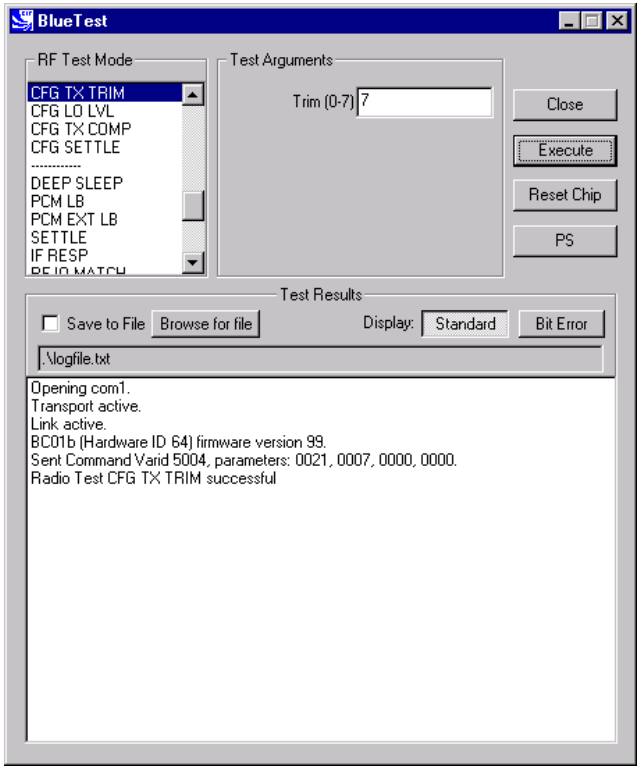
Title	**CFG TX TRIM**
Summary	Sets the Active Member Address (`am_addr`) for the device to be used in the header of all test transmissions to `am_addr`. If the transmitter and receiver are used for the same test, both devices will normally have to be set to the same `am_addr`.
Related Test Spec Name	None
Test Arguments	**Trim** (am_addr) = `0` to `7`, Default = `7`
Return Data	None
Exit	Click on **Reset Chip**.



CFG TX TRIM Example Display

BlueCore™01

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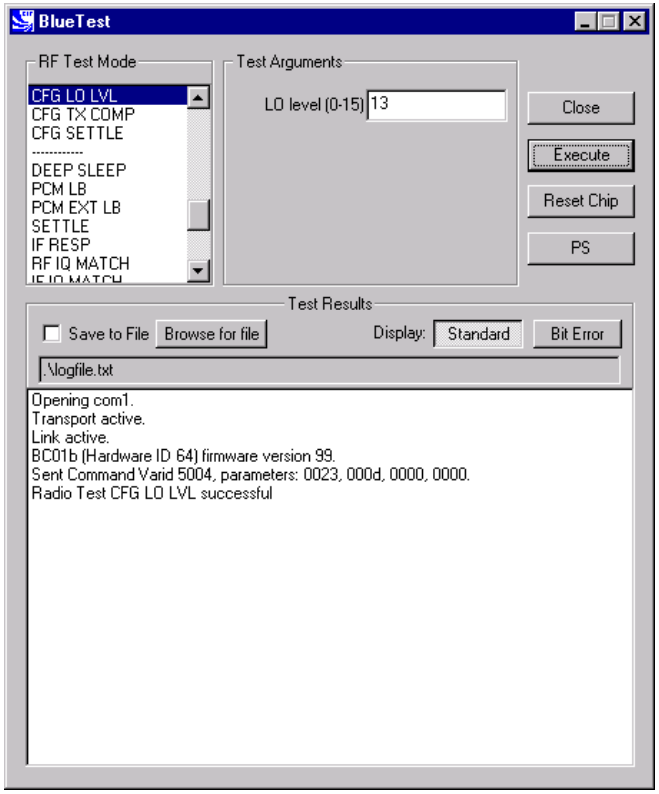
Title	**CFG LO LVL**
Summary	Sets the value of the Analogue Local Oscillator output level to **LO level** (`lvl`), overriding the value calculated by the internal calibration algorithm. This command is not executed in normal use.
Related Test Spec Name	None
Test Arguments	**LO level** = `0` to `15` (default = `13`)
Return Data	None
Exit	Click on **Reset Chip**.



CFG LO LVL Example Display

BlueCore™01

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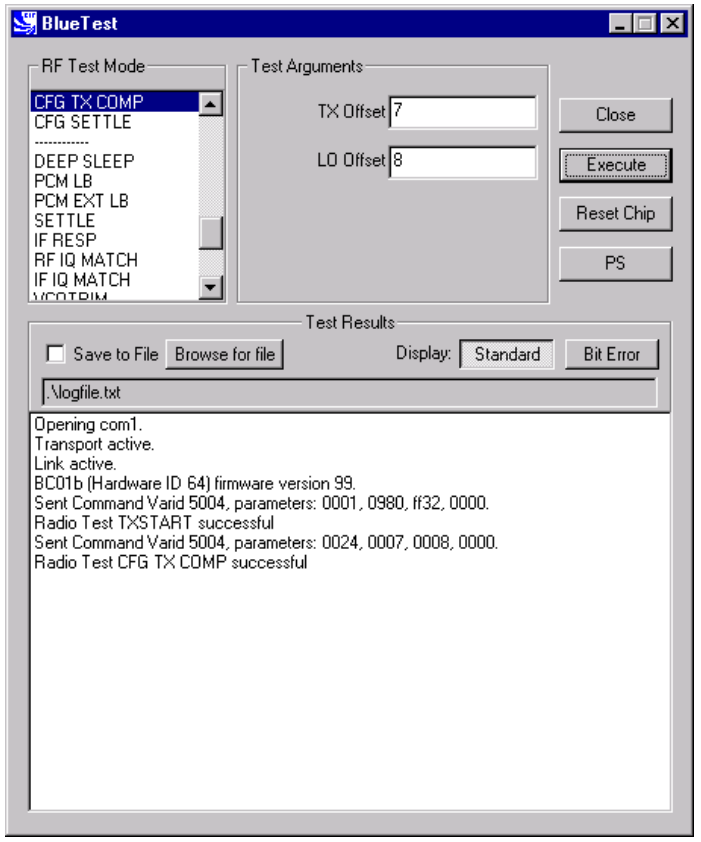
Title	**CFG TX COMP**
Summary	Sets TX Offset (tx_offset) and **LO Offset** (lo_offset) for the firmware's algorithm, which sets the maximum power. Run **TXSTART** before executing **CFG TX COMP**, otherwise there is no transmit power to set.
Related Test Spec Name	None
Test Arguments	**TX Offset**, minimum = `0` (default = `7`) **LO Offset**, minimum = `0` (default = `8`)
Return Data	None
Exit	Click on **Reset Chip**.



CFG TX COMP Example Display

BlueCore™01

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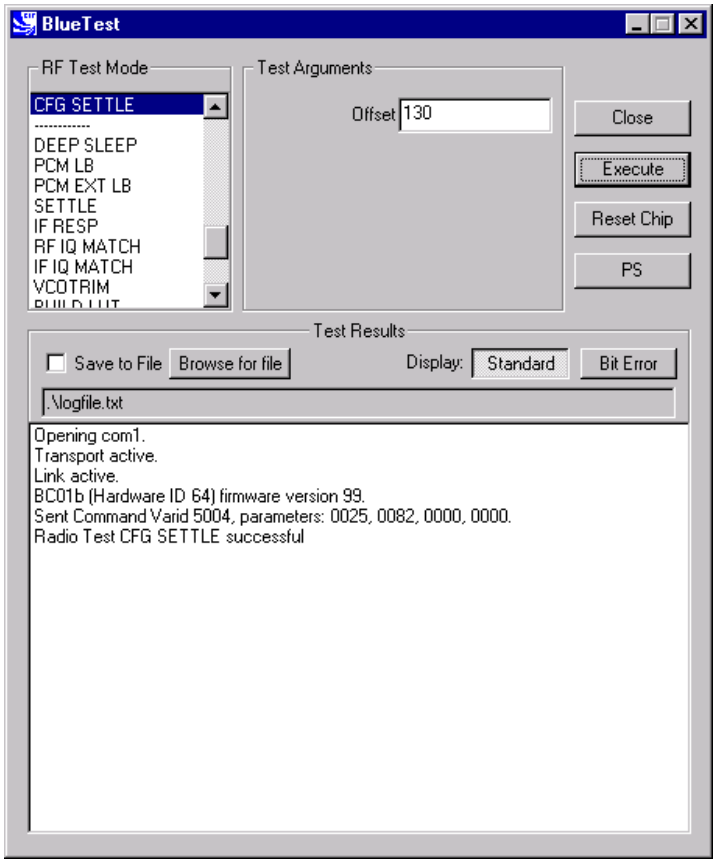
Title	**CFG SETTLE**
Summary	Sets the period (`radio_on_offset`) in microseconds between turning the radio on and starting to transmit.
Related Test Spec Name	None
Test Arguments	**Offset**, minimum = `0` (default = `130`)
Return Data	None
Exit	Click on **Reset Chip**.



CFG SETTLE Example Display

BlueCore™01

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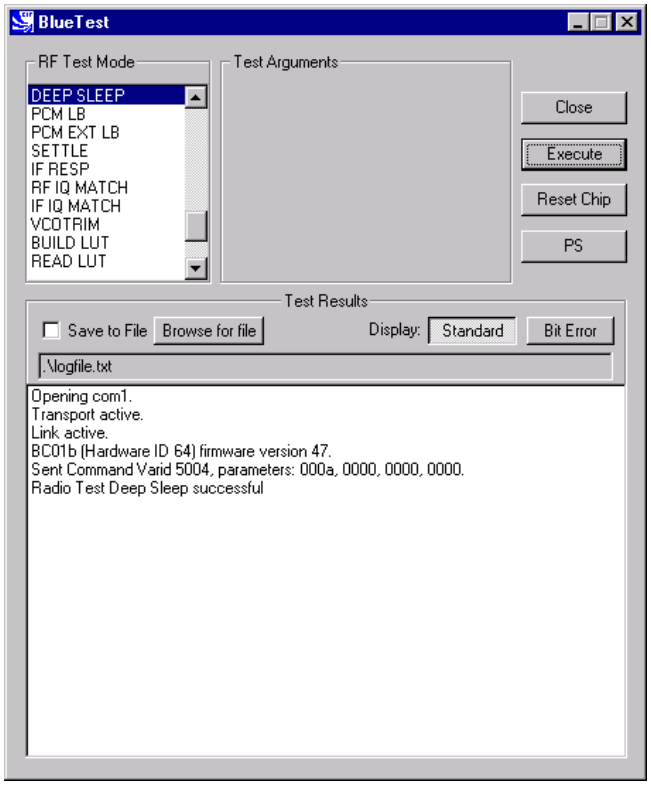
Built-in-Self Test (BIST) Routines

Title	**Deep Sleep**
Summary	Puts the chip into deep-sleep after a delay of half a second until woken by reset or any activity on USB or UART interface.
Return Data	None
Exit	Click on **Reset Chip** or another routine being called.



Deep Sleep Example Display

BlueCore™01

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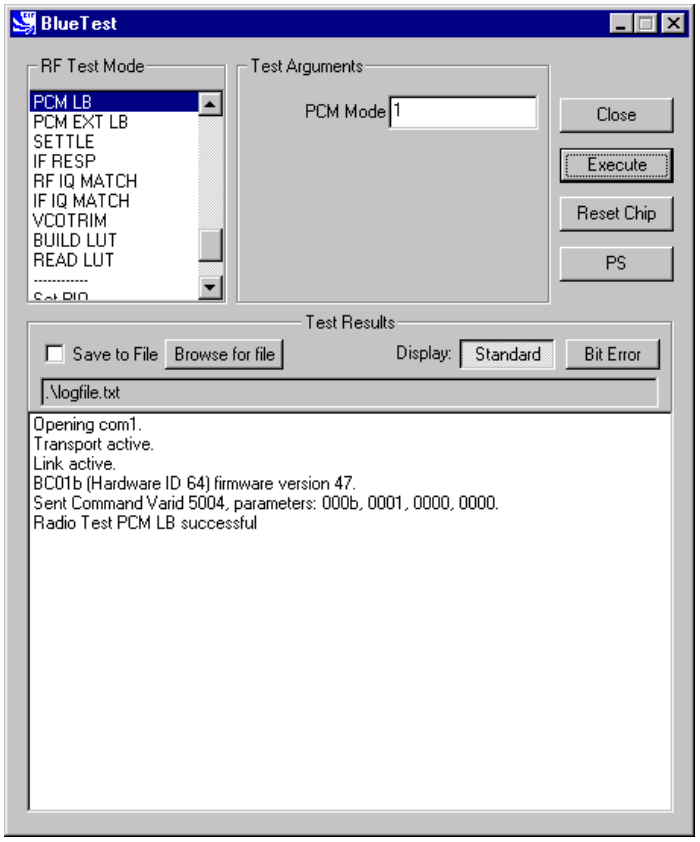
Title	**PCM LB**
Summary	Sets the PCM into LOOP BACK mode, whereby the data read from the PCM input is output again on the PCM out pin. The LOOP BACK is via software and the buffers so there is a pipeline delay. The PCM port mode is selectable. If **PCM Mode** = 0, **BlueCore01** is slave in normal 4-wire configuration If **PCM Mode** = 1, **BlueCore01** is master in normal 4-wire configuration If **PCM Mode** = 2, **BlueCore01** is master in Manchester encoded, 2-wire configuration.
Test Arguments	**PCM Mode** = 0 to 2 (default = 1)
Return Data	None
Exit	Click on **Reset Chip** or another routine being called.



PCM LB Example Display

BlueCore™01

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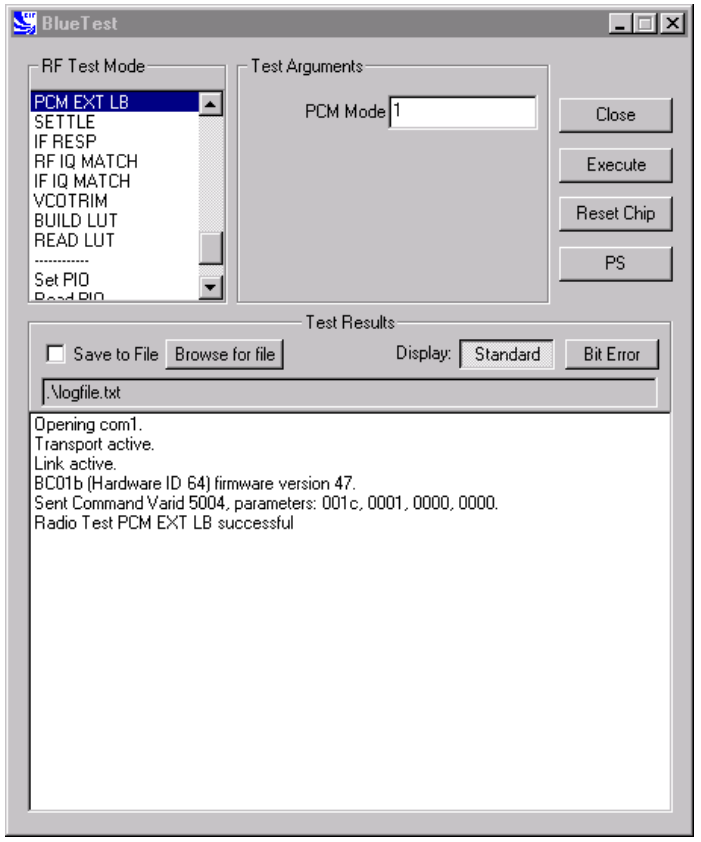
Title	**PCM EXTERNAL LOOPBACK**
Summary	Sets the PCM into external LOOPBACK mode, whereby the data written to the PCM output is read again on the input pin. A check is made that the data read back is the same (up to usual codec transformations) as that written. The LOOP BACK consists of 512 bytes of random data. The PCM port mode is selectable as **PCM Mode** (`pcm_mode`), which is the same as for **PCM LB** (`radiotest_pcm_loop_back`) The external LOOP BACK may be a simple wire.
Related Test Spec Name	None
Note	On the Casira under test, set CN8 jumper to Codec BYP and on header CN12 link pins 10 and 11.
Test Arguments	**PCM Mode** = `0` to `2` (default = 1)
Return Data	None
Exit	Click on **Reset Chip**.



PCM EXT LB Example Display

BlueCore™01

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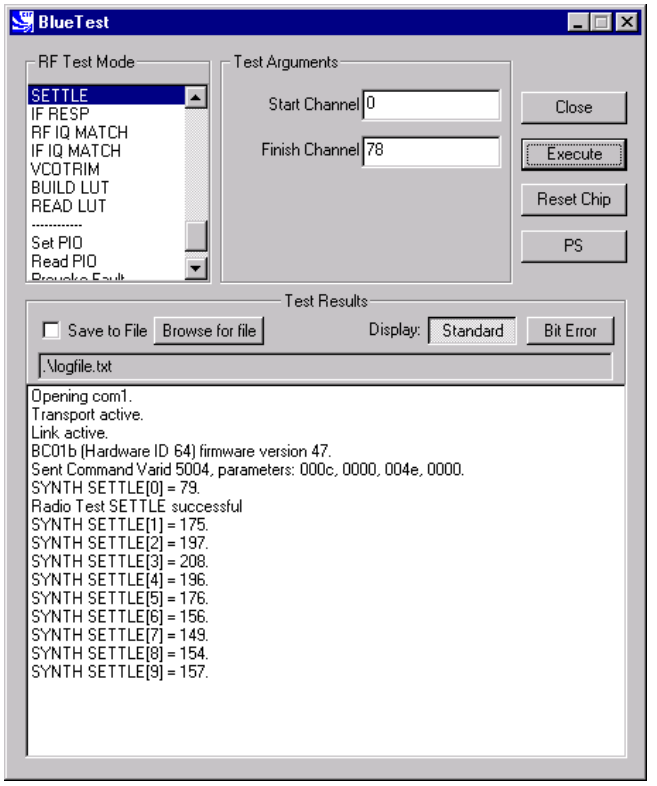
Title	**SETTLE**
Summary	Builds the LUT as normal, then does a step from **Start Channel** (`chan1`) to **Finish Channel** (`chan2`), while the synthesiser is running. It digitises the synthesiser (`LO_TUNE`) `error voltage` at intervals of 10 – 20µs over the next 200µs and writes the results to an array.
Test Arguments	**Start Channel** (`chan1`) = `0` to `78` (default `0`) **Finish Channel** (`chan2`) = `0` to `78` (default `78`)
Return Data	A sequence of `ten` reports of the synthesiser (`LO_TUNE`) error voltage over the next 200µs.
Exit	Click on **Reset Chip** or another routine being called.



SETTLE Example Display

BlueCore™01

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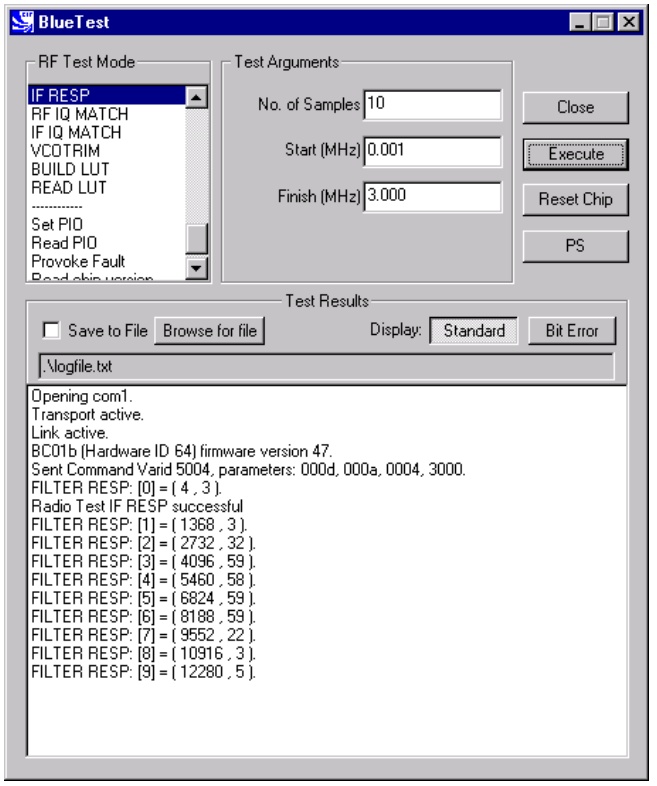
Title	**IF RESP**
Summary	Sweeps transmit IF carrier frequency over designated number of samples (`n_samples`) within range (`0`-3MHz maximum) and measures RSSI. Returns table of RSSI value against frequency offset to characterise IF filter response.
Test Arguments	**No. of Samples** (`n_samples`) = `0` to `65535` (`default = 10`) **Start** (`lo_offset`) = `0` to 3MHz (default `0.001 MHz`) **Finish** (`hi_offset`) = `0` to `3` MHz (default = `3.000` MHz. Must be greater than `lo_offset`)
Return Data	A sequence of reports of RSSI and frequency offset.
Exit	Click on **Reset Chip**.



IF RESP Example Display

BlueCore™01

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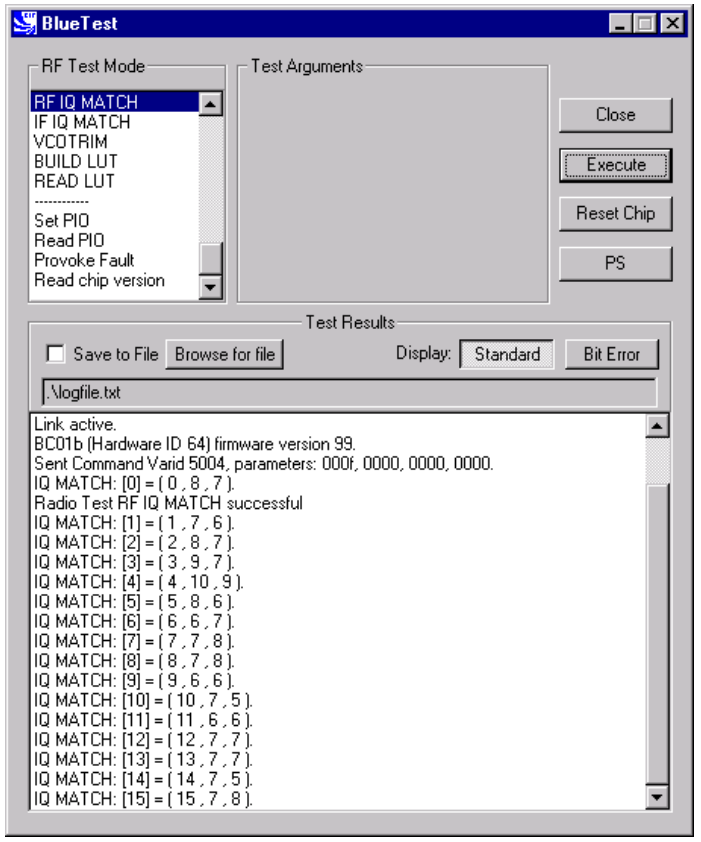
Title	**RF IQ MATCH**
Summary	Measures RF IQ match by injecting test signal, sweeping IQ trim and measuring RSSI for on-channel and image. Returns array of IQ measurements against IQ trim.
Return Data	An array of 16 IQ measurements against IQ trim.
Exit	Click on **Reset Chip**.



RF IQ MATCH Example Display

BlueCore™01

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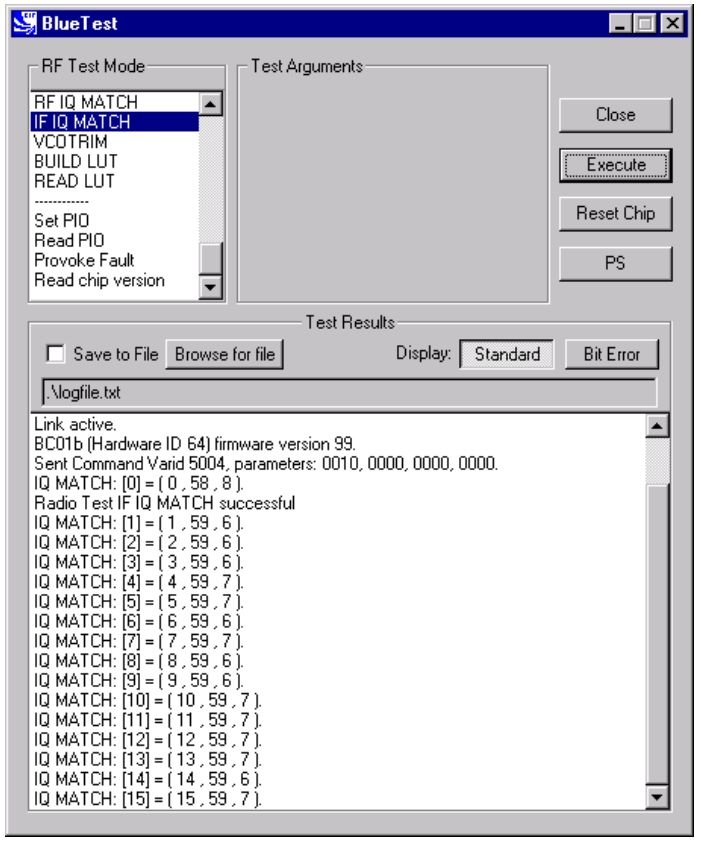
Title	**IF IQ MATCH**
Summary	Measures IF IQ match by injecting test signal, sweeping IQ trim and measuring RSSI for on-channel and image. Returns array of IQ measurements against IQ trim.
Return Data	An array of 16 IQ measurements against IQ trim.
Exit	Click on **Reset Chip**.



IF IQ MATCH Example Display

BlueCore™01

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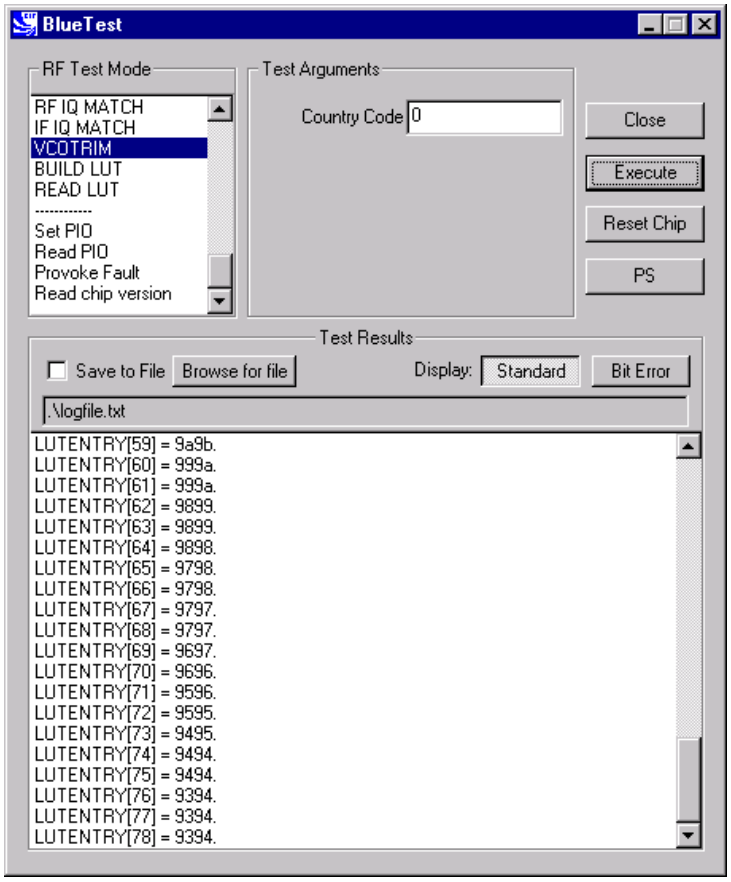
Title	**VCO TRIM**
Summary	Produces look up table of VCO trim versus hop frequencies for a designated country hop sequence.
Test Arguments	**Country Code** (CC) = 0 to 3 (default = 0)
Return Data	An array of 79 values for VCO trim if **Country Code** is 0 otherwise 23 values.
Exit	Click on **Reset Chip**.



VCO TRIM Example Display

BlueCore™01

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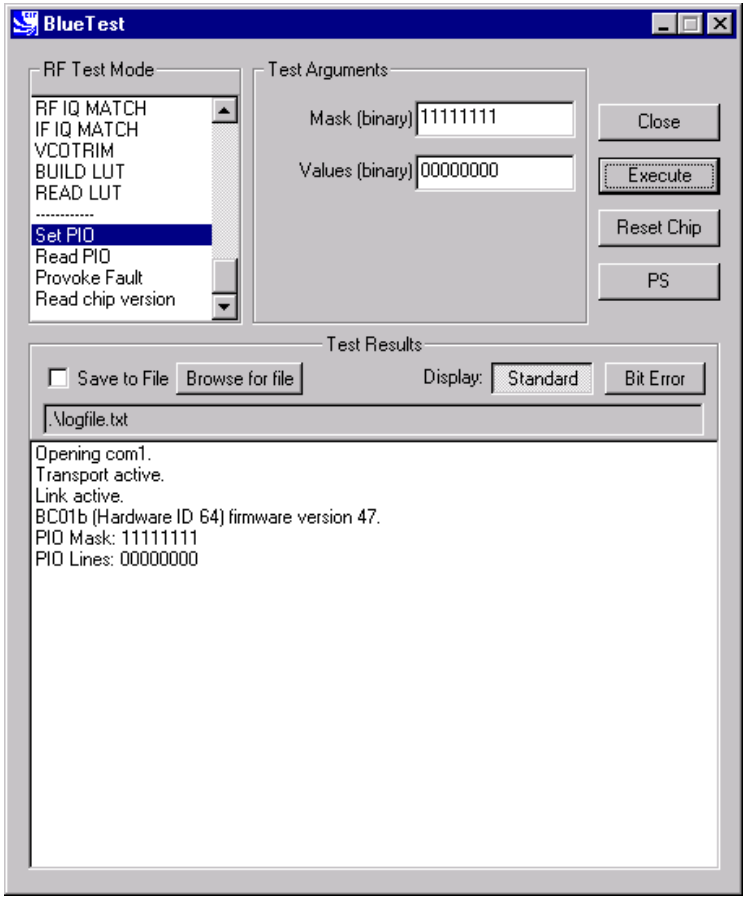
Miscellaneous Test Routines

Title	**Set PIO**
Summary	Enables designated PIO lines as outputs and sets them as desired. To be used with caution since it over-rides previous settings. Bit 0 corresponds to PIO[0], and a logic one enables it as an output.
Test Arguments	**Mask** (default = `11111111`) **Values** (default = `00000000`)
Return Data	None
Exit	Click on **Reset Chip**.



Set PIO Example Display

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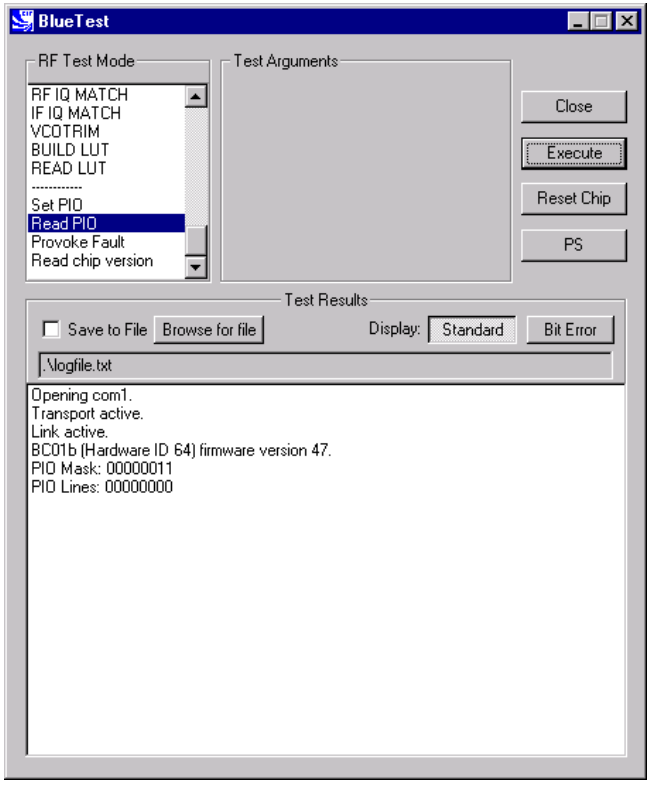
Title	**Read PIO**
Summary	Reads the logic state of the PIO pins. Valid whether they are inputs or outputs.
Return Data	PIO Lines (uint8) sent over BCSP channel 3, giving the logic level at each of the pins.
Exit	Click on **Reset Chip**.



READ PIO Example Display

BlueCore™01

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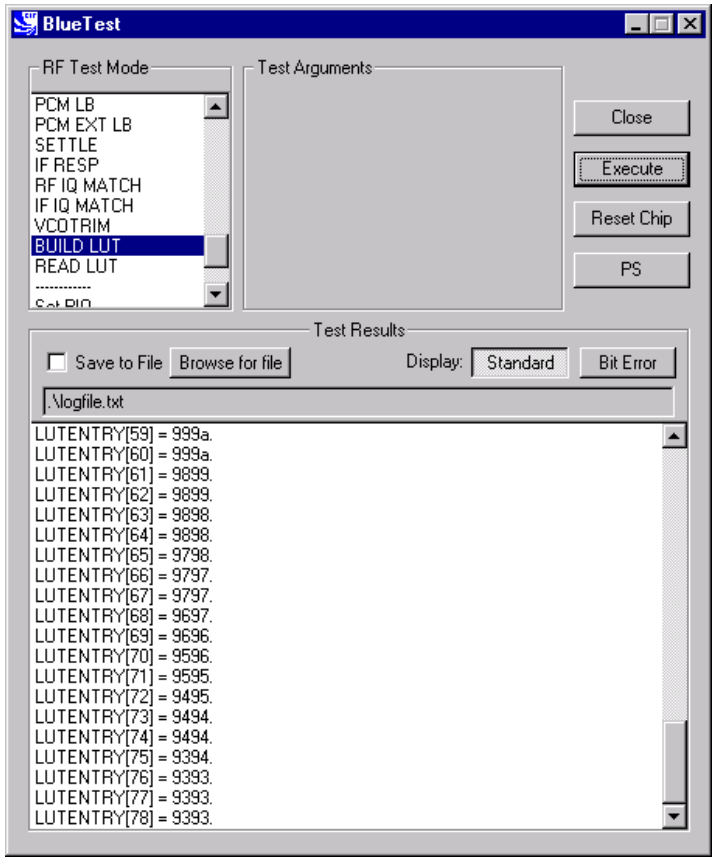
Title	**BUILD LUT**
Summary	Builds the radio's channel LO_TRIM frequency look-up table then returns it to the host.
Return Data	A sequence of 79 uint16 numbers, containing the calibration data just generated.
Exit	Click on **Reset Chip**.



BUILD LUT Example Display

BlueCore™01

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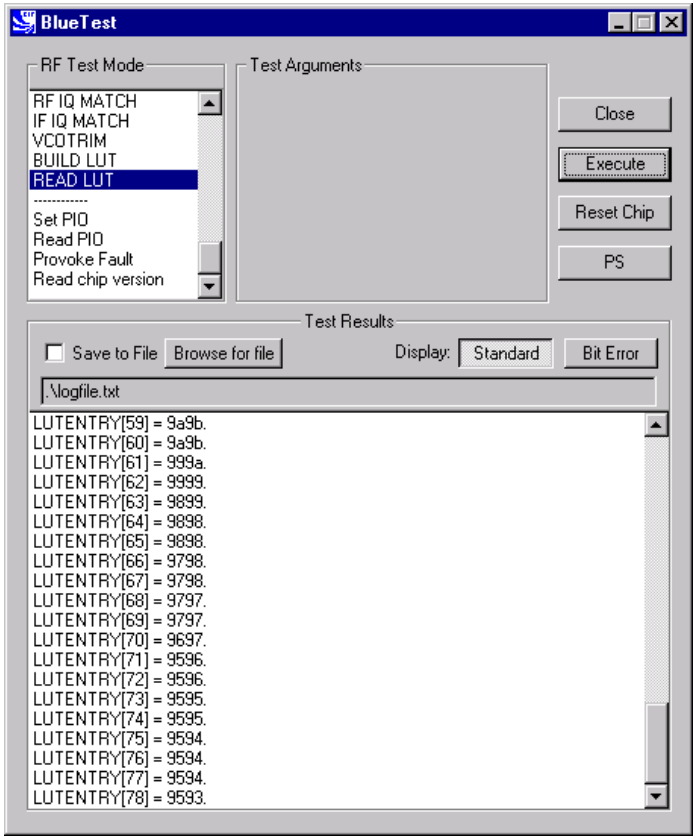
Title	**READ LUT**
Summary	Reports the radio's channel LO_TRIM frequency look-up-table (LUT) to the host.
Return Data	A sequence of 79 (uint16) numbers containing the contents of the look up table (LUT) for Europe and North America or a sequence of 23 (uint16) numbers for other countries. The upper byte contains the transmitter trim and the lower byte contains the receiver trim.
Exit	Click on **Reset Chip**.



READ LUT Example Display

BlueCore™01

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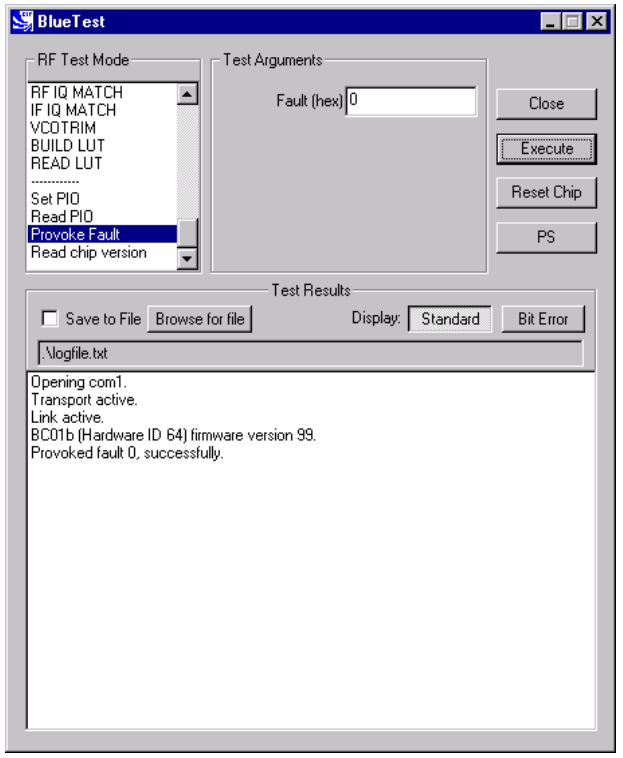
Title	**PROVOKE FAULT**
Summary	Provokes a fault mode in the on-chip processor.
Return Data	None
Test Arguments	**Fault (hex)** = 0 to 2b (default = 0) **Note**: Contact CSR for more information about using fault modes.
Exit	Click on **Reset Chip**.



PROVOKE FAULT Example Display

BlueCore™01

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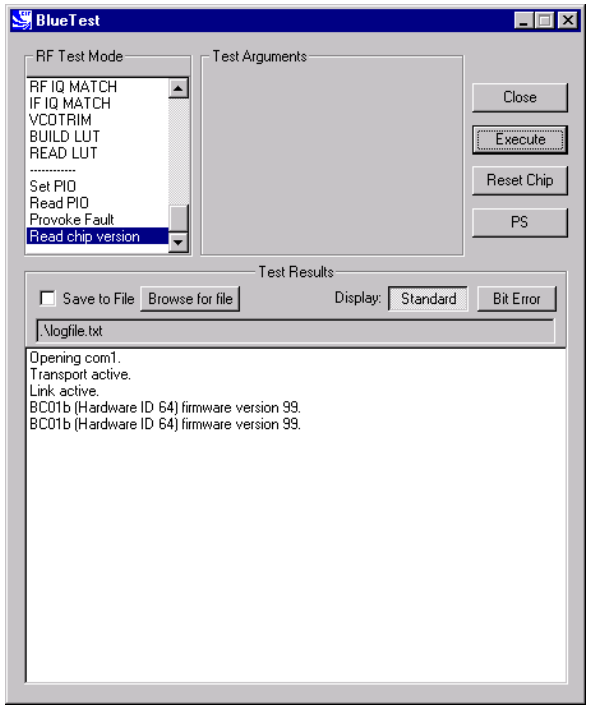
Title	**READ CHIP VERSION**
Summary	Reads the hardware ID and firmware version of device.
Return data	Hardware ID and firmware version.



READ CHIP VERSION Example Display

BlueCore™01

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Persistent Store Keys

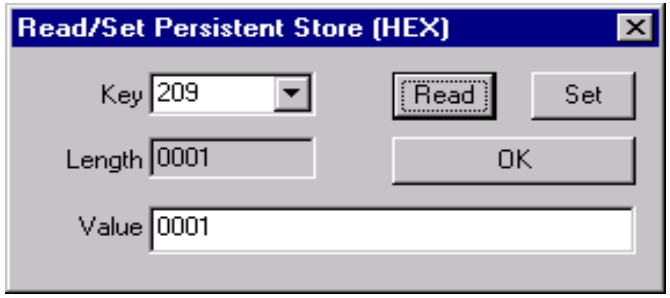
Select **PS** from the main menu.

Enter a **Key** number.

To read a PS Key value, click on **Read**. The setting displays in the **Value** field.

To change a **PS** key setting, enter a different value in the **Value** field and click on **Set**.

To exit, click on **OK**.



PERSISTENT STORE KEY Example Display

BlueCore™01

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Appendix 1

BIST Parameters

Name	Type	Min	Max	Meaning
lo_freq	uint16	2402	2480	Bluetooth channel frequency in MHz
lxlvl	uint16	0	63	Internal amplifier power setting. Use 50 for maximum power
mod_freq	uint16	0	65535	Modulation frequency for modulated carrier transmit test in units of 1/4096 MHz
highside	bool	0	Non-zero	Receive IF setting, use false (0)
rx_attn	uint16	0	15	Initial attenuation setting, overwritten by AGC
country_code	uint16	0	3	Simplified hop sequence code, use country_code 0 for 79 hops
txrx_freq	uint16	1	65535	Period in microseconds between RX and TX events; default 12500 (20 slots)
lb_offs	uint16	1	65535	Offset in microseconds between receive and transmit in loopback
report_freq	uint16	1	65535	Time in seconds between reports to host, default 1
pkt_type	uint16	0	15	Standard Bluetooth packet type (12-13 disallowed. 0, 1, 2 not useful)
pkt_size	uint16	0	339	Size of payload for packet type
bits_count	uint32	1	4.2×10^9	Target for total bits used in BER measurement; default 1.6 M bit
Reset	bool	0	1	1 resets total count for BER measurement
offset_half_mhz	int16	-5	+5	Transmit IF offset; default −2
pcm_mode	uint16	0	2	PCM loopback mode; 0 = 4-wire slave, 1 = 4-wire master, 2 = 2-wire slave

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Name	Type	Min	Max	Meaning
chan1	uint16	0	78	Bluetooth channel number
chan2	uint16	0	78	Bluetooth channel number
n_samples	uint16	0	65535	Number of samples in range from min to max for IF filter response test
lo_offset	uint16	0	65535	Min offset in 1/4096MHz for IF filter response test
hi_offset	uint16	0	65535	Max offset in 1/4096MHz for IF filter response test
output_mask	Uint8	0	FF	Bit mask for PIO; 0=input, 1=output
output	Uint8	0	FF	Bit values for PIO output
xtal_trim	Uint16	0	63	Crystal trim value
uap	Uint16	0	FF	Bluetooth address; Upper Address Part
Lap		0	FFFFFF	Bluetooth address; Lower Address Part
Trim	Uint16	0	511	Value for configuring IQ trim
n_errs	Uint16	0	15	Number of errors
Lvl	Uint16	0	15	Local oscillator output level
tx_offset	Uint16	0		Transmitter offset
lo_offset	Uint16	0		Local oscillator offset
radio_on_offset	Uint16	0		Time between turning radio on and starting to transmit in microseconds

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Appendix 2

Known Software Issue(s) in BlueTest Version 1.4

(a) Pressing the **Reset Chip** button on the GUI while data is being transmitted sends a hardware reset command to the chip and restarts the serial stack software.

Closing the GUI sends a hardware reset command to the chip.

If the link fails, the connection can only be recreated by manually resetting the chip (power off/on) and by clicking on **Reset Chip** or closing down and restarting the GUI (both of which will restart the serial stack software).

The above will not occur if no data is visibly scrolling in the window.

The tests concerned are:

- VCOTRIM
- BUILD LUT
- READ
- LUT

(b) There is a race between command responses indicating that a test has started and the first data relating to that test. This does not affect the test results.

(c) It is not possible to rouse the chip from Deep Sleep except by powering down the chip and restarting.

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Appendix 3

Combining Tests Using a Second Unit

Several tests require a second **BlueCore01** unit to be operating to provide a test signal for the equipment under test. The following table provides a quick reference guide to tests that use a second unit.

EQUIPMENT UNDER TEST / SECOND UNIT	PAUSE	RADIO STATUS	TXSTART	TXDATA1	TXDATA2	TXDATA3	TXDATA4	RXSTART	RXSTART2	RXDATA1	RXDATA2	BIT ERR1	BIT ERR2	LOOP BACK	RX LOOP BACK	BER LOOP BACK	DEEP SLEEP	PCM LB	PCM EXT LB	SETTLE	IF RESP	RF IQ MATCH	IF IQ MATCH	VCO TRIM	BUILD LUT	READ LUT	SET PIO	READ PIO	PROVOKE FAULT	READ CHIP VERSION
PAUSE																														
RADIO STATUS																														
TXSTART																														
TXDATA1																														
TXDATA2																														
TXDATA3																														
TXDATA4																														
RXSTART1			X																											
RXSTART2			X																											
RXDATA1				X																										
RXDATA2					X																									
BIT ERR1				X																										
BIT ERR2					X																									
LOOP BACK																														
RX LOOP BACK														X																
BER LOOP BACK														X																
DEEP SLEEP																														
PCM LB																														
PCM EXT LB																														
SETTLE																														
IF RESP																														
RF IQ MATCH																														
IF IQ MATCH																														
VCO TRIM																														
BUILD LUT																														
READ LUT																														
SET_PIO																														
READ PIO																														
PROVOKE FAULT																														
READ_CHIP_VERSION																														

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Appendix 4

Configuration Commands Available During Tests

Particular configuration commands are appropriate to use during certain tests. The following table is a quick reference guide to which configuration commands can be used during which tests.

Configuration Commands	CFG FREQ	CFG PKT	CFG BIT ERR	CFG TXIF	CFG XTAL FTRIM	CFG UAP/LAP	CFG ACC ERRS	CFG IQ TRIM	CFG TX TRIM	CFG LO LVL	CFG TX COMP	CFG SETTLE
EQUIPMENT UNDER TEST												
PAUSE												
RADIO STATUS												
TXSTART				X	X						X	
TXDATA1		X		X	X	X			X			
TXDATA2		X		X	X	X			X			
TXDATA3		X		X	X							
TXDATA4		X		X	X							
RXSTART1					X							
RXSTART2					X							
RXDATA1					X							
RXDATA2					X							
BIT ERR1			X		X	X	X		X			
BIT ERR2			X		X	X	X		X			
LOOP BACK					X	X						
RX LOOP BACK					X	X						
BER LOOP BACK					X	X						
DEEP SLEEP												
PCM LB												
PCM EXT LB												
SETTLE												
IF RESP												
RF IQ MATCH												
IF IQ MATCH												
VCO TRIM												
BUILD LUT												
READ LUT												
SET PIO												
READ PIO												
PROVOKE FAULT												

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Appendix 5

Bluetooth Packet Types

Use the **CFG FREQ** command to set the frequency as appropriate to the size of the packet type being used in the test.

Segment	TYPE code $b_3b_2b_1b_0$	Slot occupancy	SCO link	ACL link
1	0000	1	NULL	NULL
	0001	1	POLL	POLL
	0010	1	FHS	FHS
	0011	1	DM1	DM1
2	0100	1	undefined	DH1
	0101	1	HV1	undefined
	0110	1	HV2	undefined
	0111	1	HV3	undefined
	1000	1	DV	undefined
	1001	1	undefined	AUX1
3	1010	3	undefined	DM3
	1011	3	undefined	DH3
	1100	3	undefined	undefined
	1101	3	undefined	undefined
4	1110	5	undefined	DM5
	1111	5	undefined	DH5

Extracted from Packet Types section of Specification of the Bluetooth System, v1.1, dated 1 December 2000.

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CSR reserves the right to make technical changes to its products as part of its development programme.

For further information, refer to the following document(s):

Document	Reference
Bluetooth (SIG) Test Specification - RF	Rev 0.9r, dated 31 January 2000
Specification of the Bluetooth System, v1.1	Rev 1.1, dated 01 December 2000

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Regulatory Notes & Information

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

FCC Radiation Exposure Statement:
This device complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment. To maintain compliance, this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

INSTRUCTIONS FOR OEM INTEGRATORS

This transmitter module is authorized to be used in other devices only by OEM integrators. Further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.)

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product.

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"To comply with FCC's RF radiation exposure requirements, this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter."

End Product Labeling

The final end product must be labeled in a visible area with the following:

"Contains TX FCC ID: PIWW360BT

or

"Contains FCC ID: PIWW360BT

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Record of Changes

Date:	Revision:	Reason for Change:
13 SEP 00	a	Original publication of this document (CSR reference: bc01-an-047a).
16 JUL 01	b	Revision and addition of tests and appendices

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