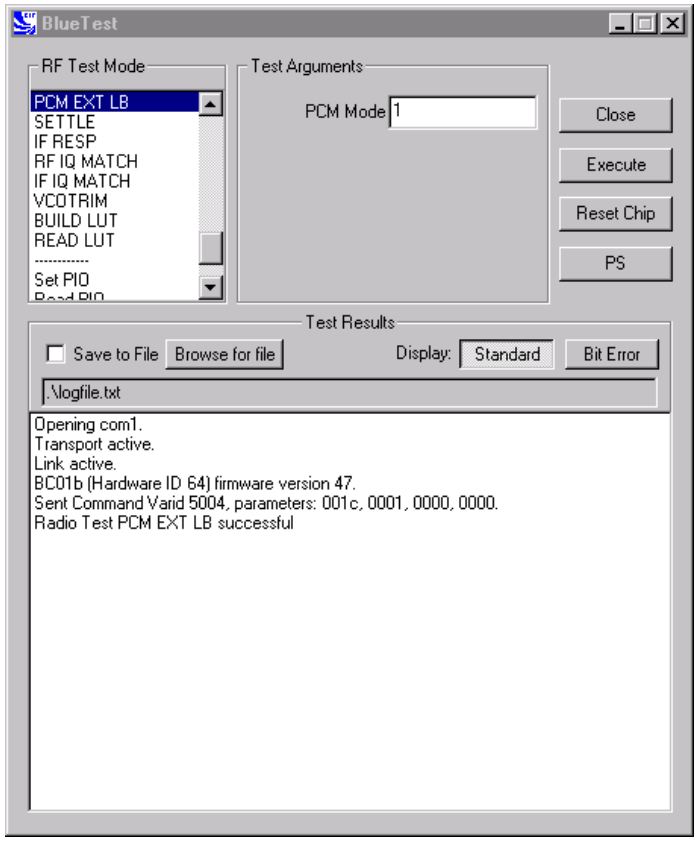
Title	**PCM EXTERNAL LOOPBACK**
Summary	Sets the PCM into external LOOPBACK mode, whereby the data written to the PCM output is read again on the input pin. A check is made that the data read back is the same (up to usual codec transformations) as that written. The LOOP BACK consists of 512 bytes of 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

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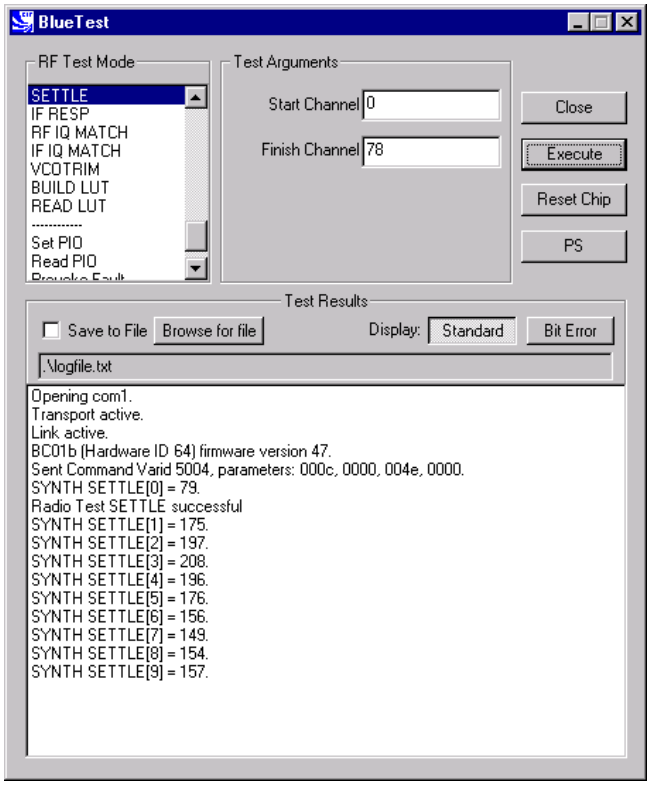
Title	**SETTLE**
Summary	Builds the LUT as normal, then does a step from **Start Channel** (`chan1`) to **Finish Channel** (`chan2`), while the synthesiser is running. It digitises the synthesiser (`LO_TUNE`) `error voltage` at intervals of 10 – 20µs over the next 200µs and writes the results to an array.
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

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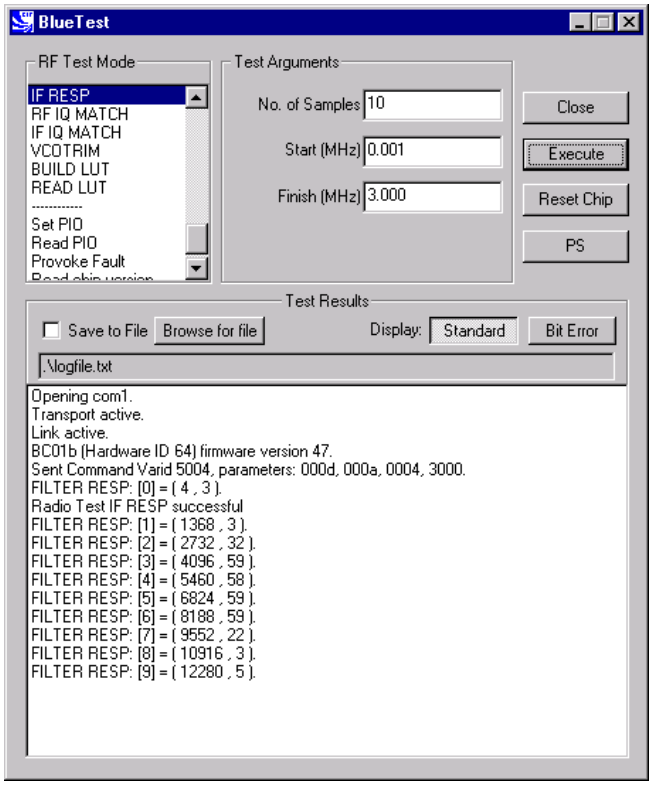
Title	**IF RESP**
Summary	Sweeps transmit IF carrier frequency over designated number of samples (`n_samples`) within range (`0`-3MHz maximum) and measures RSSI. Returns table of RSSI value against frequency offset to characterise IF filter response.
Test Arguments	**No. of Samples** (`n_samples`) = `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

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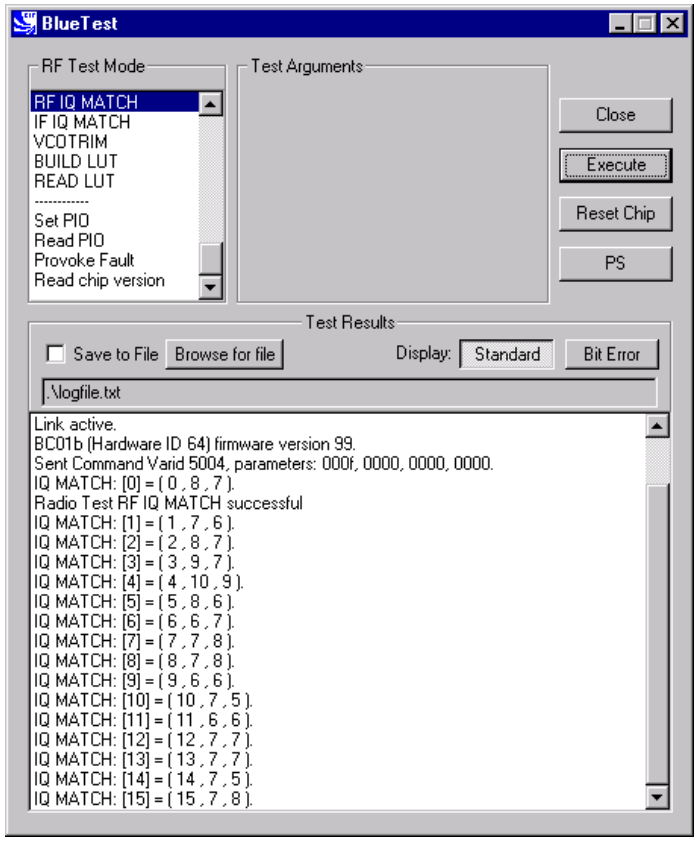
Title	**RF IQ MATCH**
Summary	Measures RF IQ match by injecting test signal, sweeping IQ trim and measuring RSSI for on-channel and image. Returns array of IQ measurements against IQ trim.
Return Data	An array of 16 IQ measurements against IQ trim.
Exit	Click on **Reset Chip**.



RF IQ MATCH Example Display

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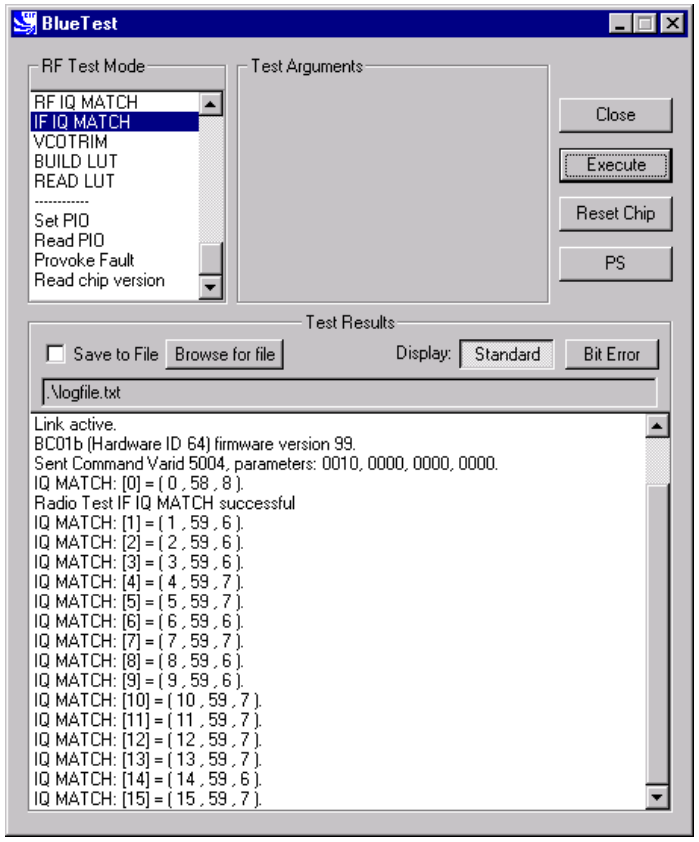
Title	**IF IQ MATCH**
Summary	Measures IF IQ match by injecting test signal, sweeping IQ trim and measuring RSSI for on-channel and image. Returns array of IQ measurements against IQ trim.
Return Data	An array of 16 IQ measurements against IQ trim.
Exit	Click on **Reset Chip**.



IF IQ MATCH Example Display

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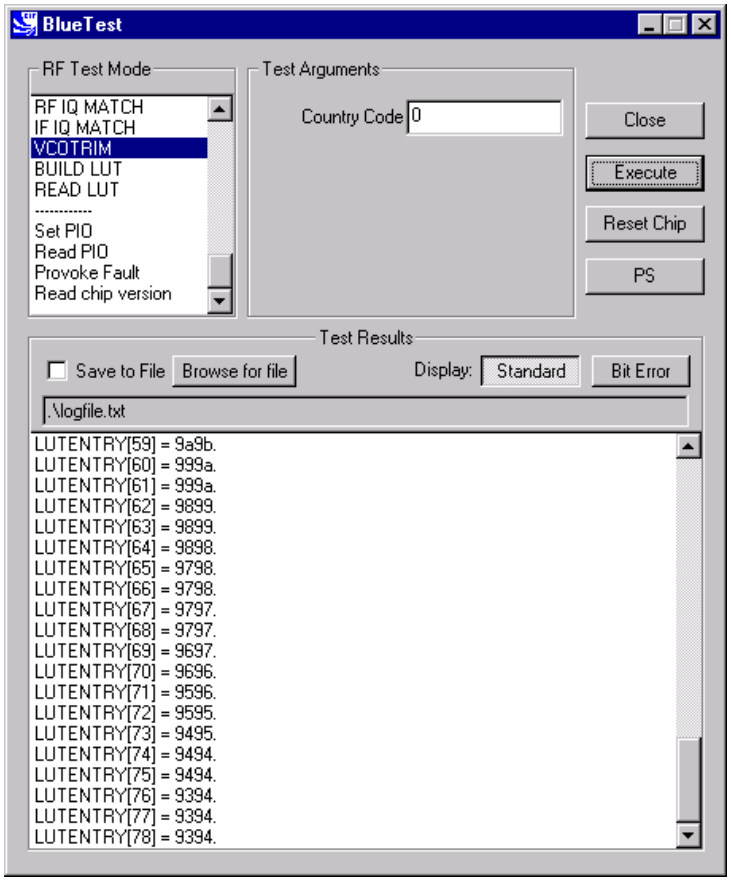
Title	**VCO TRIM**
Summary	Produces look up table of VCO trim versus hop frequencies for a designated country hop sequence.
Test Arguments	**Country Code** (`CC`) = `0` to `3` (default = `0`)
Return Data	An array of 79 values for VCO trim if **Country Code** is `0` otherwise 23 values.
Exit	Click on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



VCO TRIM Example Display

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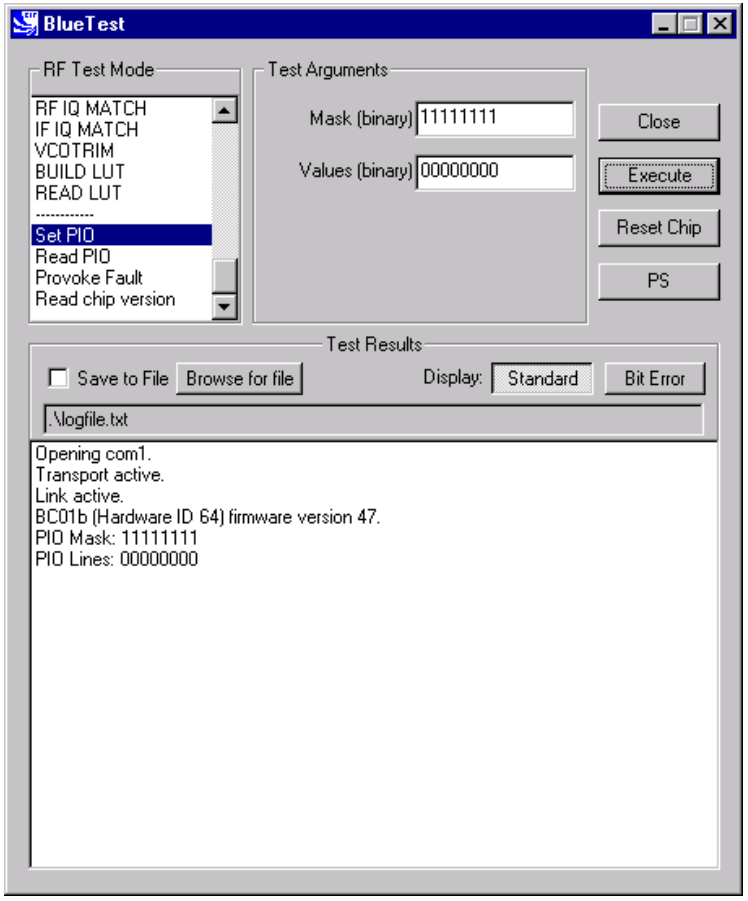
Miscellaneous Test Routines

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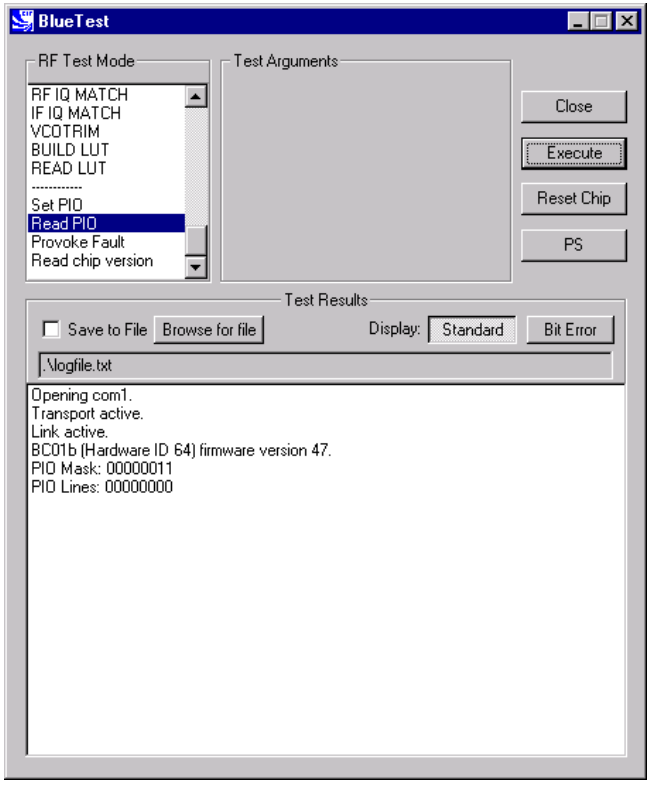
Title	**Read PIO**
Summary	Reads the logic state of the PIO pins. Valid whether they are inputs or outputs.
Return Data	PIO Lines (uint8) sent over BCSP channel 3, giving the logic level at each of the pins.
Exit	Click on **Reset Chip**.



READ PIO Example Display

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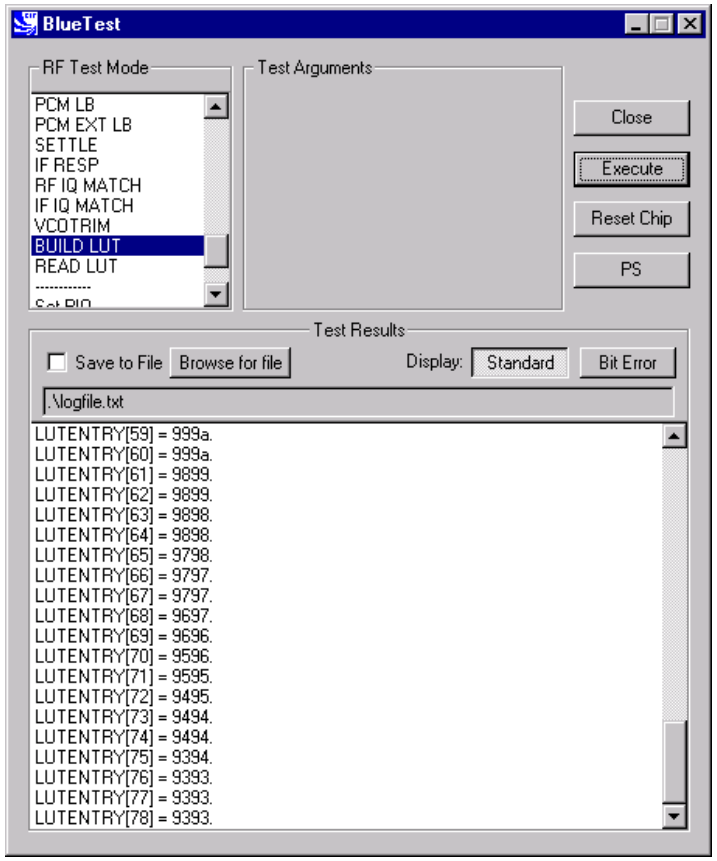
Title	**BUILD LUT**
Summary	Builds the radio's channel LO_TRIM frequency look-up table then returns it to the host.
Return Data	A sequence of 79 uint16 numbers, containing the calibration data just generated.
Exit	Click on **Reset Chip**.



BUILD LUT Example Display

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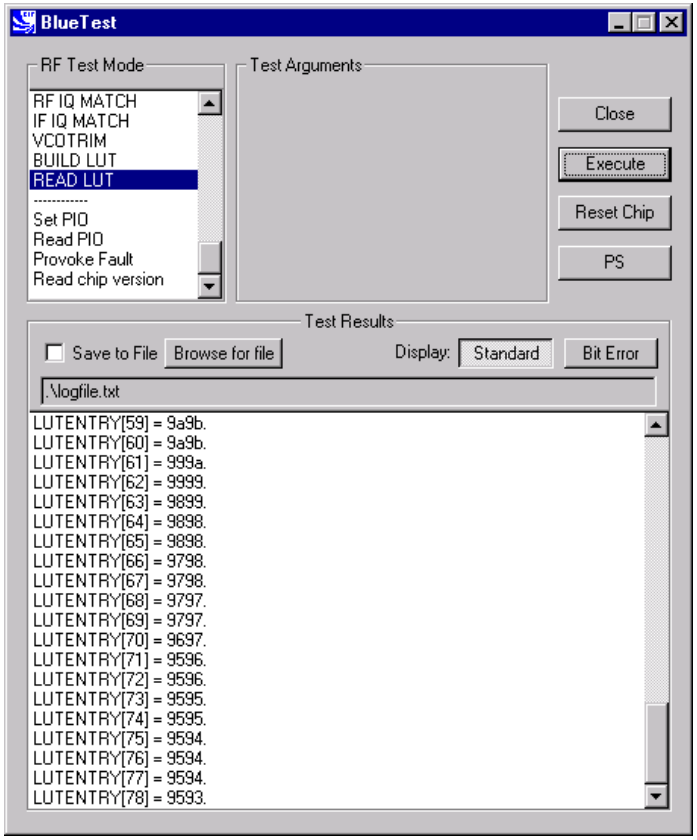
Title	**READ LUT**
Summary	Reports the radio's channel LO_TRIM frequency look-up-table (LUT) to the host.
Return Data	A sequence of 79 (uint16) numbers containing the contents of the look up table (LUT) for Europe and North America or a sequence of 23 (uint16) numbers for other countries. The upper byte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



READ LUT Example Display

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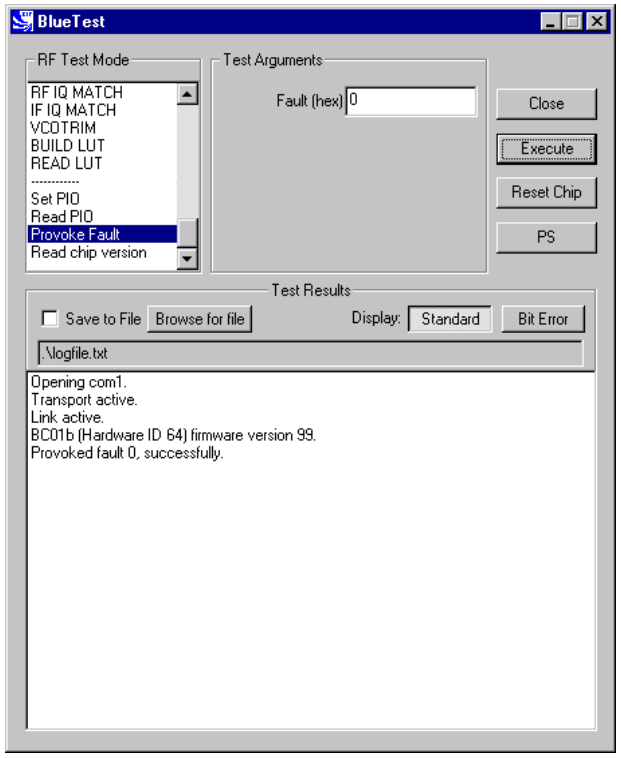
Title	**PROVOKE FAULT**
Summary	Provokes a fault mode in the on-chip processor.
Return Data	None
Test Arguments	**Fault (hex)** = `0` to `2b` (default = `0`) **Note**: Contact CSR for more information about using fault modes.
Exit	Click on **Reset Chip**.



PROVOKE FAULT Example Display

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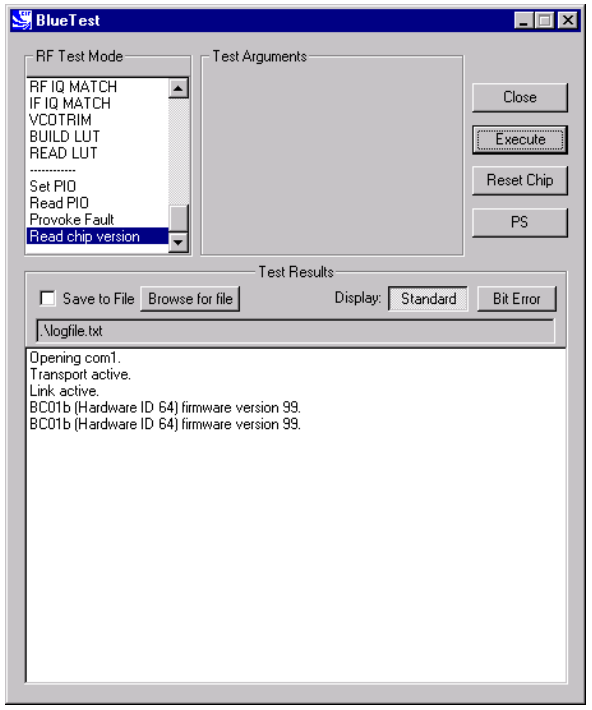
Title	**READ CHIP VERSION**
Summary	Reads the hardware ID and firmware version of device.
Return data	Hardware ID and firmware version.



READ CHIP VERSION Example Display

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Persistent Store Keys

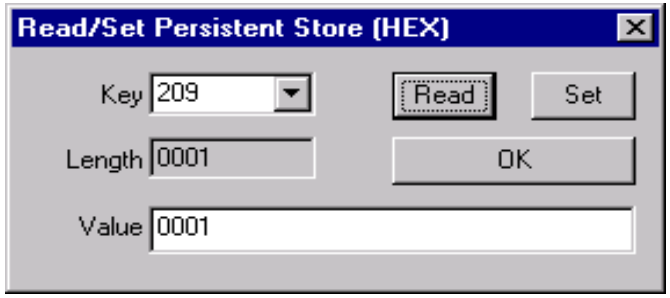
Select **PS** from the main menu.

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

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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.

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
EQUIPMENT UNDER TEST																														
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

This device complies with Part 15 of the FCC Rules.
Operation is subject to the two following 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.
Changes or modifications to the transmitter not expressively approved by CSR could void the authority ability to operate the equipment.

User Label Warning !

The transmitter is in compliance with the Part 15 FCC Rules. A label which demonstrates compliance with the FCC is located on the bottom of the laptop.

The label contains the following information :-
Contains FCC ID:- PIW632500516610
This label ID is to be used only for Dell lap tops. The use of this transmitter outside Dell laptops is illegal.

Transmitter Warning !

Installers of the Bluetooth transmitter should note that the Bluetooth transmitter should not be co-located with any other transmitter, for example WLAN interfaces in the lap top.
The distance between the Bluetooth transmitter and antennas of other radio equipment must be at least 20cm in distance away from each other. Any closer installations require additional certification filings to examine co-location issues.

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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

BlueCore™01

BlueTest Instruction Manual

AN047

July 2001

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