BlueCore ä 01

CASIRA Bluetooth Development Kit
User Manual

AN007

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Change History

Version	Date	Comment
a	20 APR 2000	First draft from standard literature
b	12 MAY 2000	First Release Alpha 5
c	25 AUG 2000	Update; Note added on page 20

CONTENTS

1 DEFINITIONS

Bluetooth	A set of technologies providing short range audio and data transfer over radio connections.
BlueCore Ô	Single chip Bluetooth System from CSR.

1.1 Acronyms and Abbreviations

ADC	Analogue to Digital Converter
AGC	Automatic Gain Control – part of the radio
API	Application Program Interface
bc01	BlueCore™01 – CSR Bluetooth chip
BCSP	BlueCore™ Serial Protocol
BIST	Built-in Self Test
CCL	Cambridge Consultants Ltd
CVSD	Continuously Variable Slope Delta (modulation)
DAC	Digital to Analogue Converter
DLL	Win32 Dynamic Link Library.
EXE	Win32 executable
GUI	Graphical User Interface
HCI	Host Controller Interface
ISM	Industrial, Scientific and Medical – unlicensed radio band at 2.4 GHz
L2CAP	Logical Link Control and Adaptation Protocol – a Bluetooth protocol stack layer
LM	Link Manager – a Bluetooth protocol stack
LNA	Low Noise Amplifier
PA	Power Amplifier
PCM	Pulse Coded Modulation – digitised audio sample stream
PIO	Parallel input/output
RF	Radio Frequency
RFCOMM	Serial cable emulation protocol – a Bluetooth protocol stack layer
Scheduler	The BlueCore™01 operating kernel. A simple co-operative multi-tasking scheduler with event queues and memory pool management.
SCO	Synchronous Connection Oriented

SDD	Service Discovery Database– an element of Bluetooth
SDP	Service Discovery Protocol a Bluetooth protocol stack layer
SPI	Serial Peripheral Interface – a synchronous, single master, serial interface
USB	Universal Serial Bus

2 HARDWARE OVERVIEW.

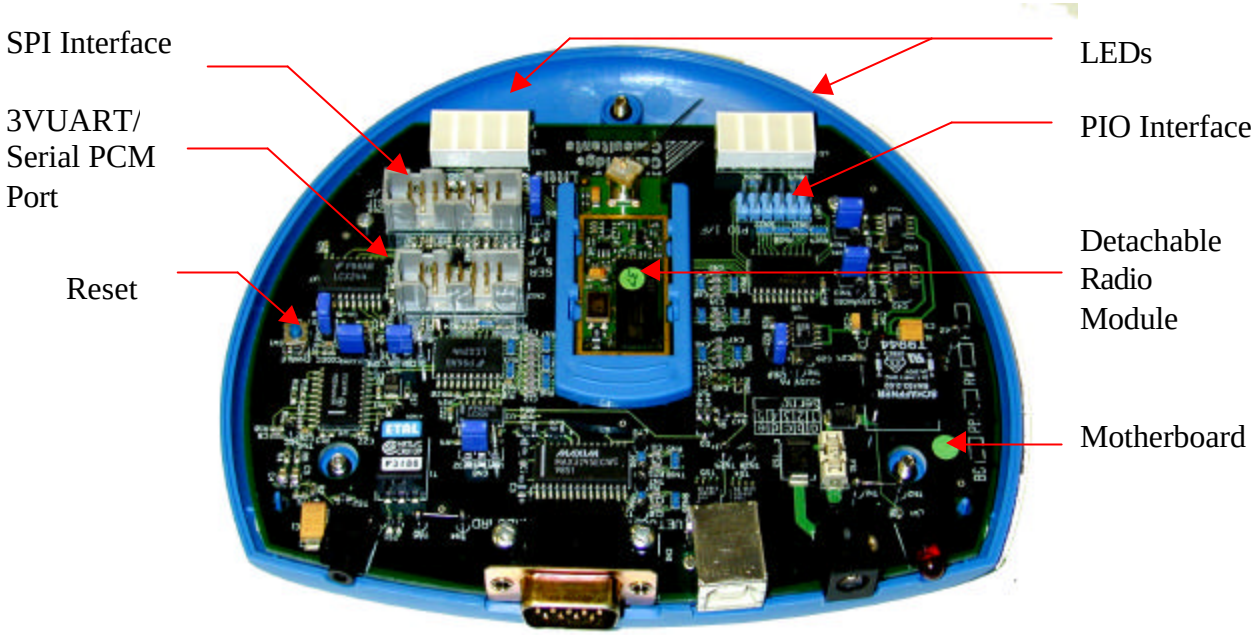
The CSR CASIRA Bluetooth Development kit has been developed primarily to assist CSR's customers in the development of host-side software and external radio circuits outside the BlueCore™ ICs. It will also be used to assist CSR's customers to evaluate the BlueCore™ chips. The Evaluation system consists of two identical modules that allow the user to send both data and voice over a Bluetooth link. Each unit is driven from a PC for data connections and from a headset (supplied with the kit) for voice connection.

Each unit consists of a motherboard and a Bluetooth radio transceiver daughter card module. The first radio module shipped with the system uses the CSR BlueCore™01 chip and also includes the front-end filter, an LNA, a PA, a TX/RX switch, a flash memory, a crystal and an external (connectorised and detachable) antenna. The radio module plugs into the motherboard. Hardware upgrades will be shipped in the format of a new replacement radio module when new versions of the CSR BlueCore™ IC product range become available. The motherboard provides a serial port (RS232), SPI port, USB port, PCM port, power supply socket and audio socket.

One CASIRA Bluetooth Development kit Unit

The on-board CODEC can be used for the voice interface although it is possible to connect direct to the PCM connection via the internal Molex connector. The signal

levels on the RS232 port conform to the RS232 standard and are generated on the motherboard. It is also possible to connect to the BlueCore™01 UART using CMOS (3V) levels using the second internal Molex connector on the 3V UART/Serial PCM port. The USB port is type “B”.



Inside the CASIRA Bluetooth

USB Functionality.

First systems do not support USB. The first new BlueCore™ radio module upgrade will support USB. This is expected to be available in Q3 2000.

Note: When using USB the UART CTS and UART RTS pins are used for the USB- and USB+ respectively. Hence it is not possible to use one unit with both USB and RS232 connections operating simultaneously.

Eight LED’s are provided on each module and the function of each is as follows

LED 0 Radio RX ON

LED 1 Radio TX ON

LED 2 ACL/LMP data received

LED 3 ACL/LMP data transmitted

LED 4 SCO data received

LED 5 SCO data transmitted

LED 6 UART data received

LED 7 UART data transmitted

3 CASIRA BLUETOOTH DEVELOPMENT KIT

The following items are included in the CASIRA Bluetooth Development kit

Qty	Description
1	**Carry-case with handle and external sleeve**
2	**CASIRA Bluetooth Development Kit Units**
2	**Power supplies**
2	**SPI Programming leads**
2	**5 Metre long RS232 leads**
2	**Country specific Mains adapter plugs**
2	**Audio Headsets**
1	**CSR CASIRA Bluetooth Development kit CDROM containing documentation and software.**
1	**CCL BlueStack SDKlite CDROM containing documentation and software.**

4 HARDWARE SETUP

Remove the power supplies and the appropriate mains power connectors from the carry case and push the mains connector onto the power supplies, making sure that they are fully pressed home. Plug these two power supplies into the mains but **DO NOT** connect the DC output connector to the BlueCore™ Evaluation System units yet. **The power supplies should be connected AFTER the BlueChat application is installed and configured.**

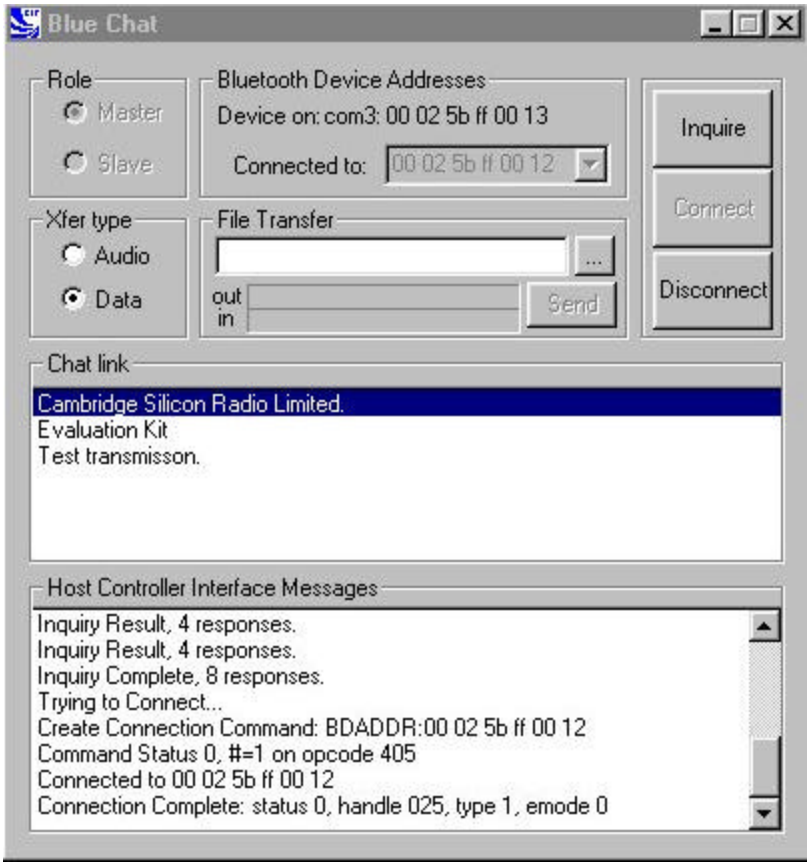
Remove the two serial cables from the carry case and connect one end of each to the COM ports on two PC's (Windows™98 / NT). Connect the other ends of the serial cables to the COM1 port of each of the CASIRA Bluetooth Development kit Units.

Remove the two headsets from the carry case and connect one to each of the CASIRA Bluetooth Development kit Unit headset sockets.

5 OVERVIEW OF THE BLUECHAT APPLICATION.

The CSR CASIRA Bluetooth Development kit is supplied with a PC program called BlueChat that allows the user to send text, send a file and set up a voice connection between the two system units.

A single window display gives a constant report on the Bluetooth radio link via a watch window. The communication between the PC and the CASIRA Bluetooth Development kit Units is at the HCI level.



6 INSTALLING THE BLUECHAT APPLICATION

The BlueChat Application allows the user to issue commands via the RS232 port of a PC running under Windows™98 or Windows™ NT to the Development system units. The software must be installed from the CSR CASIRA Bluetooth Development kit CDROM provided.

System Requirements for the BlueChat Application

- Pentium processor-based personal computer
- Microsoft Windows™98 or Windows™ NT v4.0(service pack 3 or later)
- 16 MB of RAM (24 MB recommended)
- 10 MB of available hard disk space

Installation instructions:

1 Insert the CASIRA Bluetooth Development kit CDROM into your CDROM drive.

2 From your CDROM in the "**software\host\BlueChat**"folder run the file "**install.exe"** and change the path if required, Click "**unzip**", Click "**OK**" and finally Click "**CLOSE**" to complete the installation.

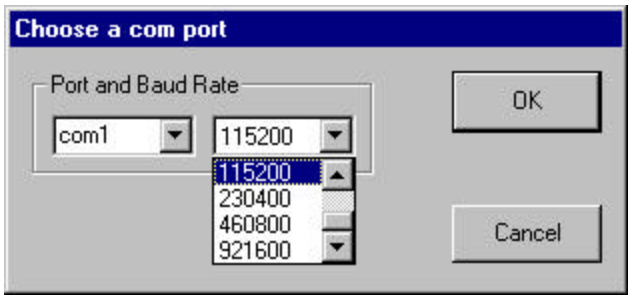
3 From your "**BlueChat"** folder create a shortcut for **BlueChat.exe** and place it on your desktop or taskbar for convenience as required.

BlueChat should now be installed and ready for use.

7 CONFIGURING THE BLUECHAT APPLICATION

Start the BlueChat Program on each PC by double Clicking on the BlueChat shortcut on your desktop, or on the BlueChat Icon in the BlueChat folder.

A port selection window will appear:

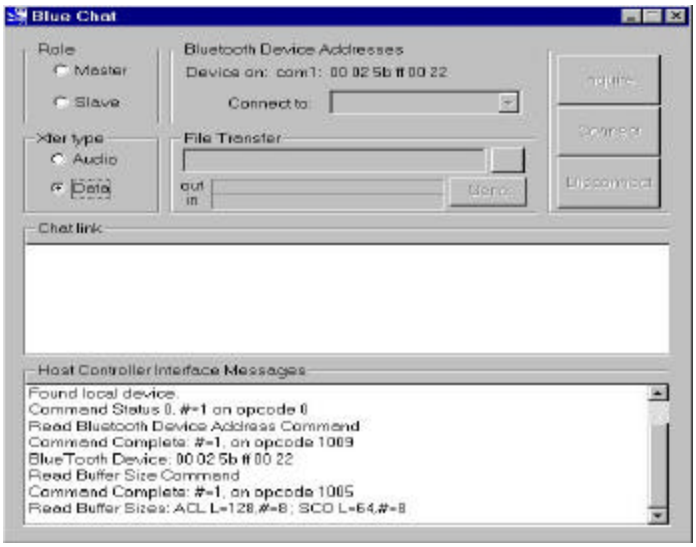


Click on the drop down menu button and select the COM port that you connected the serial cable to for that PC.

Click “OK” when your selection is complete.

Up to two BlueChat windows may be open at any one time allowing a single PC to be used for both evaluation modules. In this mode a different COM port must be selected in each window and each of the CASIRA Bluetooth Development kit Units must be connected to the appropriate COM port.

Now plug in the the power supplies to the CASIRA Bluetooth Development kit System Units. The following screen should appear after a few seconds with the associated messages to show that each PC has connected to the system unit:



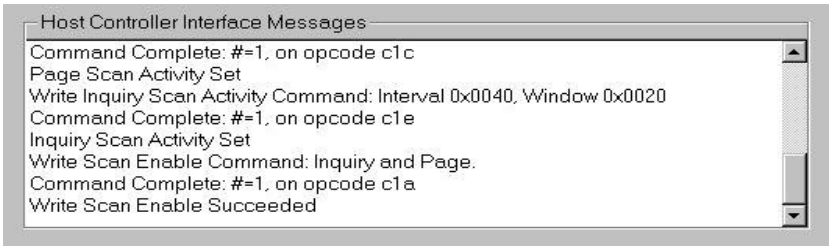
8 ESTABLISHING AN ACL CONNECTION

First make sure that the Xfer type is still set at the default power-on value of 'data'.

Then select the **Role** of one unit to be the **slave** by selecting the slave button:

WARNING –See appendix for a known software deficiency after initial power up of System Units

Selecting a slave causes the first unit to enter inquiry scan mode:



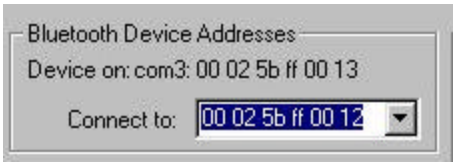
Next, selecting the **role** of the other system unit to be **master** will now cause an "**Inquiry**" to be initiated by the master

The master now collects Bluetooth addresses from Slave modules that can been found on the radio channels.

The "Host Controller Interface Message" window will give information on the results of the Inquiry. This procedure should take approximately 10 seconds to complete. It is usual to see 8 responses after inquiry scan is complete :

The user must ensure that the CASIRA Bluetooth Development kit Units are **NOT** both set to the same Role

On completion of the Inquiry, the addresses of any Slaves found will be shown in the "**Bluetooth Device Addresses**" list. Next select a Slave from the list as shown below.

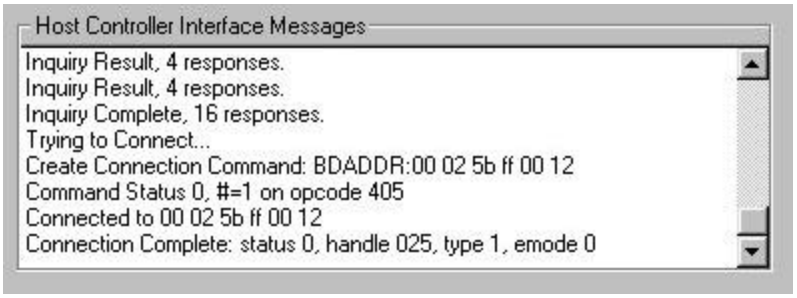


It is only necessary that the the address is shown (selected) in the "Connect to:" window, it is **NOT** necessary to hit return at this point.

Next click on the **Connect** button at the master

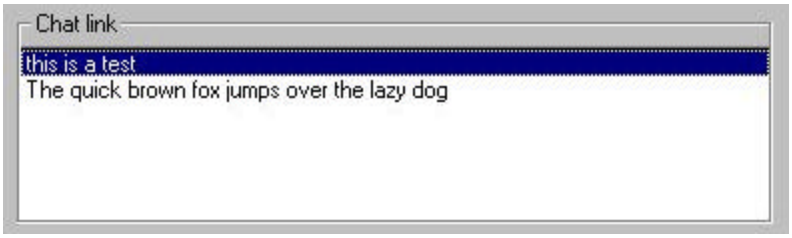
If only one slave is discovered then its address automatically appears in the "Connect to:" window and it is then only necessary to click on the "Connect" button.

The ACL link to the Slave is now set up and the following results are shown at the master



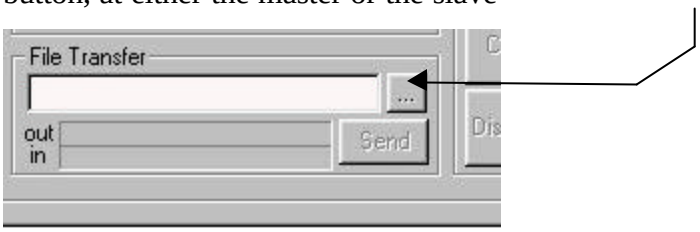
9 SENDING TEXT BETWEEN SYSTEM UNITS OVER AN ACL CONNECTION

Once the connection between the two modules has been completed text data can be sent by clicking on the **Chat link** window and typing a message. The text should appear in the **Chat link** window at the other **BlueChat** PC. Text transfer is bidirectional between master and slave (but remember to click on the "**Chat link**" window first before typing at the other end)

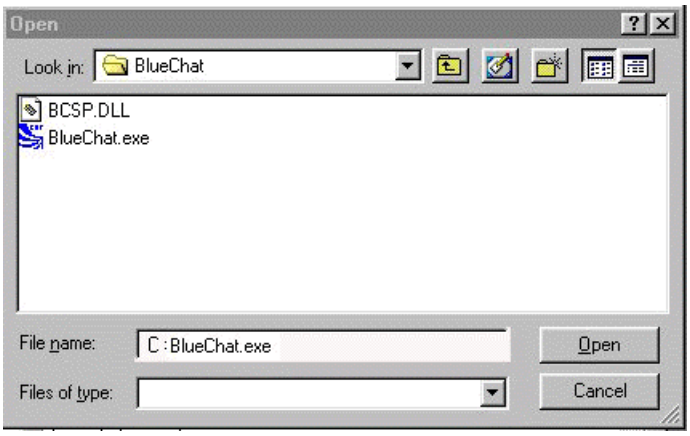


10 SENDING A DATA FILE BETWEEN SYSTEM UNITS OVER AN ACL CONNECTION

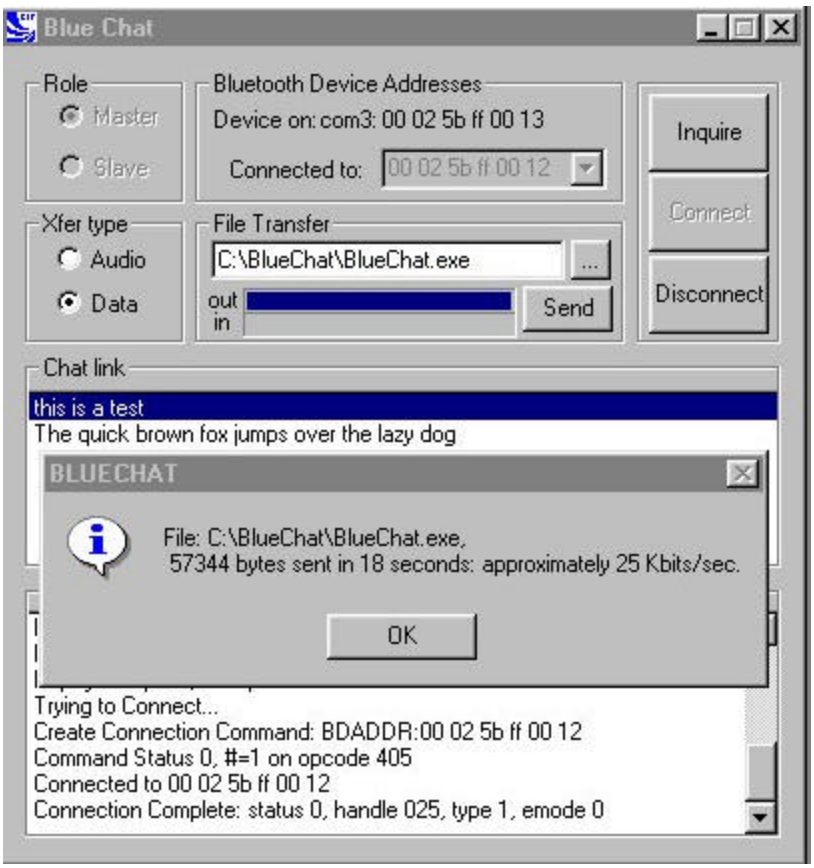
Data may be sent over ACL connection by clicking on the **File Transfer** select button, at either the master or the slave



Select a file to transfer from your chosen directory :



Finally press the **Send** button to transmit the file. A progress bar is shown at during the transmission and when completed the file transfer information is given.



11 DISCONNECTING AN ACL CONNECTION

Pressing the Disconnect button at either system unit will stop the command transfer and close down the ACL connection

It is necessary to re-establish the roles of master and slave after a disconnect. However the BlueChat application will remember the Bluetooth device addresses from previously discovered slaves so it is not necessary to repeat an Inquiry before re-establishing an ACL connection.

12 INITIATING AND BREAKING AN AUDIO CONNECTION

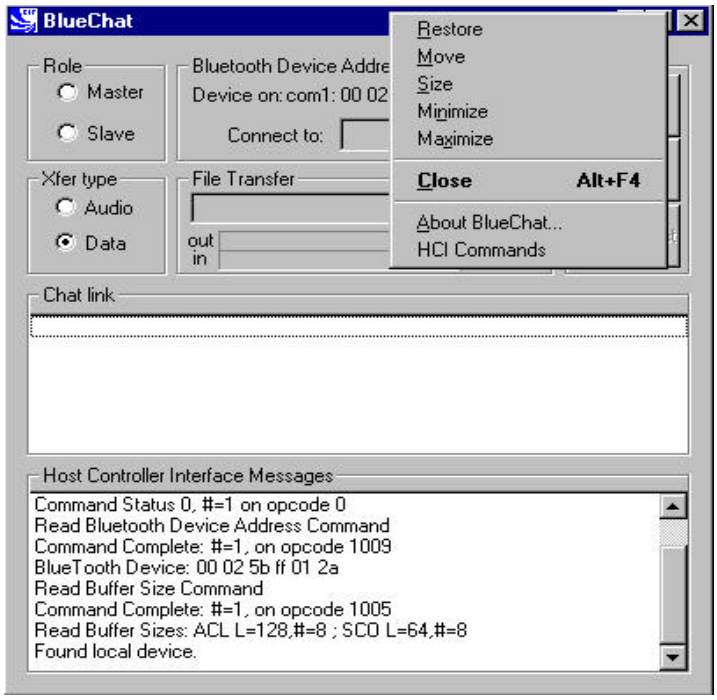
At startup the default **Xfer type** is **Data.**

The audio connection can be established by selecting the Audio button after an ACL connection has first been esatblished

Audio communication between the two headsets is now enabled.

To disconnect an audio connection press the **Disconnect** button.

It is necessary to re-establish the roles of master and slave after a disconnect. However the BlueChat application will remember the Bluetooth device addresses from previously discovered slaves so it is not necessary to repeat an Inquiry before re-establishing an ACL connection. After a new connect the audio connection should be re-established.



13 SENDING CUSTOM HCI COMMANDS.

By editing Bluechat.HCI it is possible to add your own custom HCI commands these may be transmitted across the Bluetooth link. This is achieved by pulling down the HCI command menu by right clicking on the BlueChat toolbar and selecting **"HCI commands"** as shown above.

14 FLASH LOADER INSTRUCTIONS.

The CASIRA Bluetooth Development kit is pre-configured with firmware on the BlueCore™ chips that allows data and voice communication. When new firmware upgrades become available from CSR the user will need to install and use the Flash loader Program supplied with the system to upload the new firmware into the Systems Units.

The Flash loader program "**CSR_Flashloader**" allows the user to download to the evaluation kit Flash memory. The first task of the program is to load into internal RAM a small boot loader that takes data from the UART and stores the data to the external Flash memory. Once the Flash upload is complete and verified the boot loader in RAM will be over written by the executed program.

14.1 Installing the CSR_Flashloader program.

System Requirements for Installing the Flash Loader Application

- Pentium processor-based personal computer
- Microsoft Windows™98 or Windows™ NT v4.0 (service pack 3.0 or later)
- 16 MB of RAM (24 MB recommended)
- 10 MB of available hard disk space which includes room for the Firmware binary files.

Installation instructions

1. Insert the CASIRA Bluetooth Development kit **CDROM** into your CDROM drive.
2. From your CDROM run the "install.exe" file from the "**software\host\CSR_Flashloader**" folder which will created on your hard drive.
3. From your **CSR_Flashloader** directory create a shortcut for **CSR_Flashloader.exe** and place it on your desktop or taskbar as required for convenience.
4. Select close from the unzip menu to exit.

14.2 Connecting the SPI lead for Firmware updates.

Before using the CSR_Flashloader program the SPI programming lead must be connected to the Evaluation module.

Commence as follows:

1 Remove all leads from the Evaluation module.

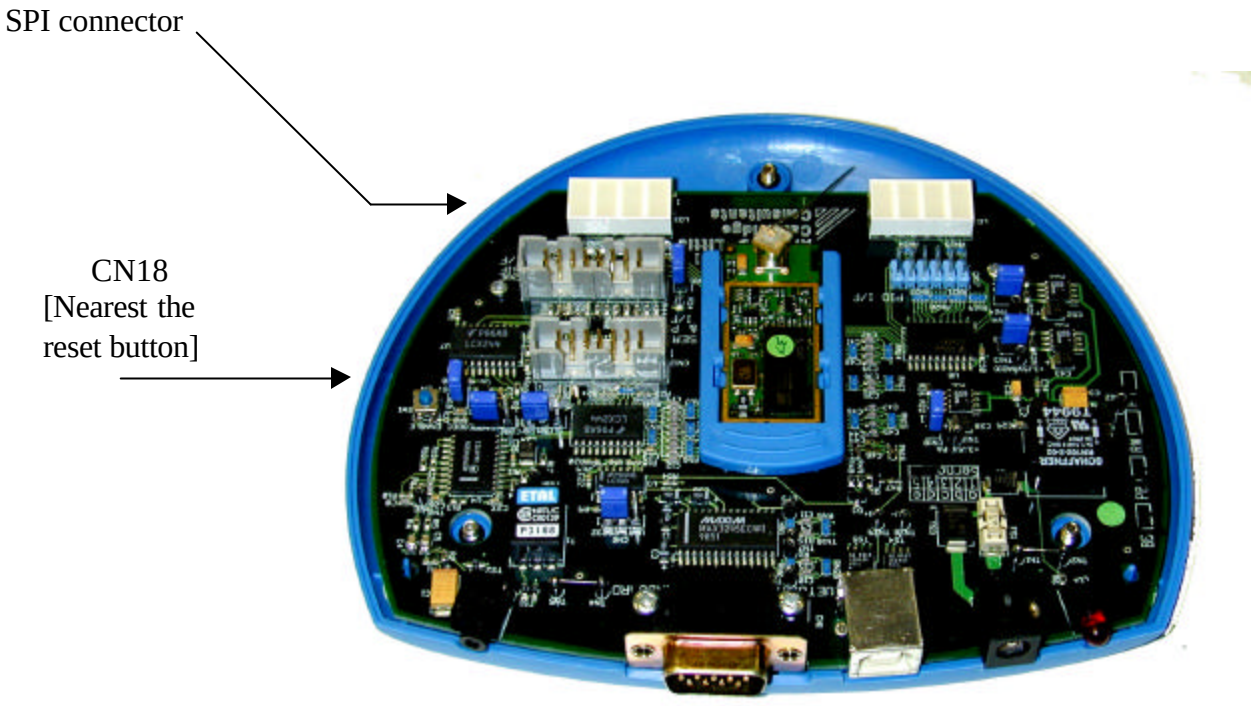
2 Undo the three lid retaining screws in the base of the module.

3 Connect the SPI programming lead to the connector marked **"CN16 SIF".**

4 Connect the other end of the lead to the PC printer port.

5 Connect the DC connector to the "pwr" socket and verify the power LED is lit.

The unit is now ready for Flash Memory programming to commence.



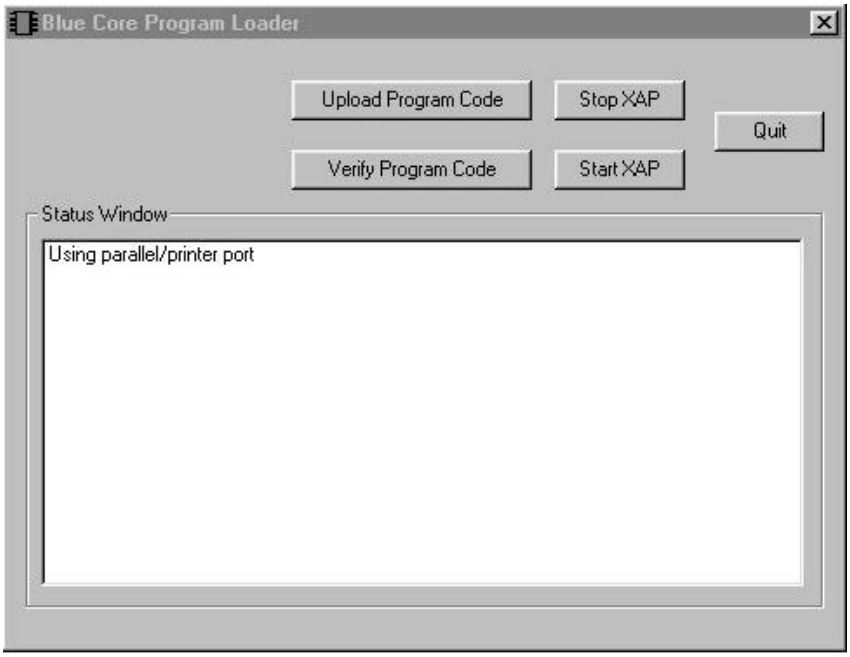
14.3 Running CSR_Flashloader.

Click on the **CSR_Flashloader** shortcut that you created previously.

With the application running the display should be:

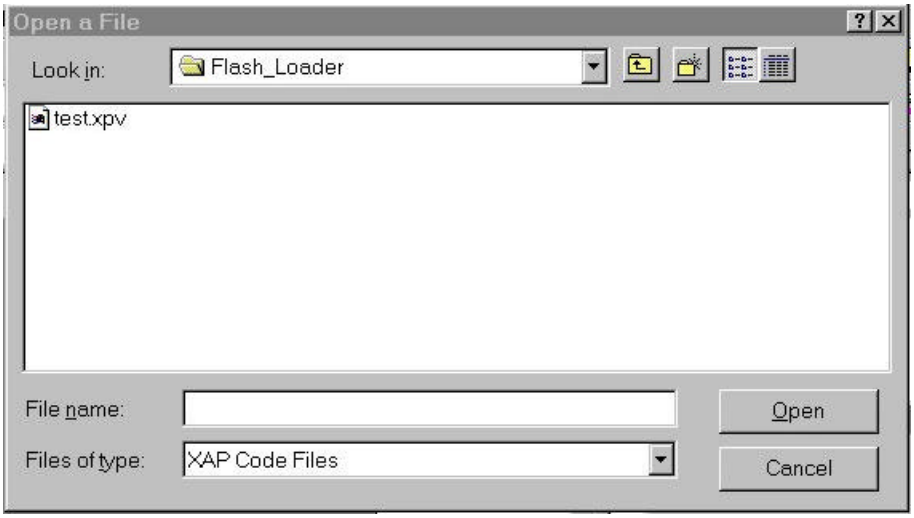
Click on the **Stop XAP** button to stop the internal processor .

NOTE: If you experience any problems running this software from a laptop/notebook PC remove the link CN18 from the Casira motherboard as illustrated above.



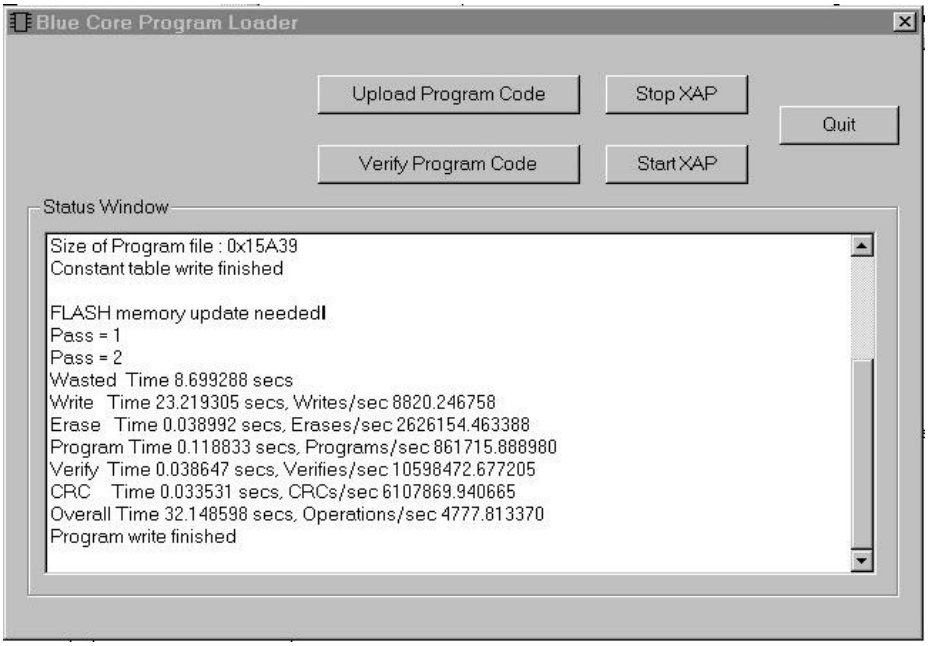
Click on the **Upload Program Code** button to select the file to upload.

A new dialog box is displayed.

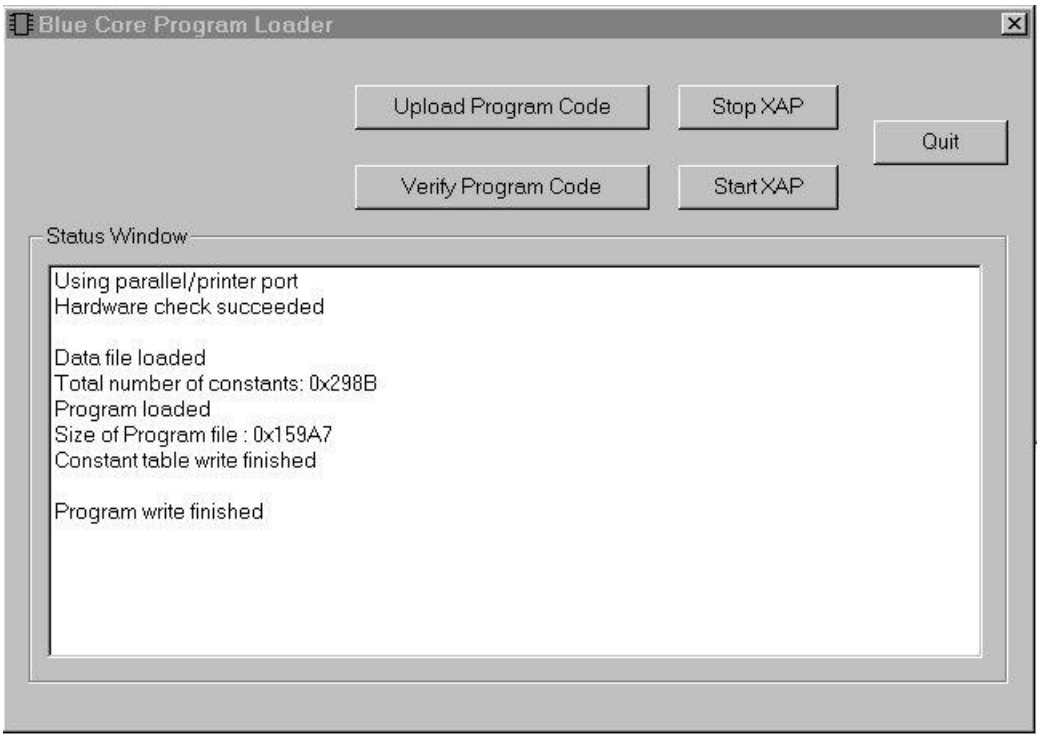


Select the file to upload and click on the Open button.

On completion of the upload the result window will be as shown below.

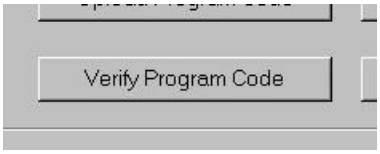


If the file to be uploaded is the same as the file already in Flash then the window will be as follows:

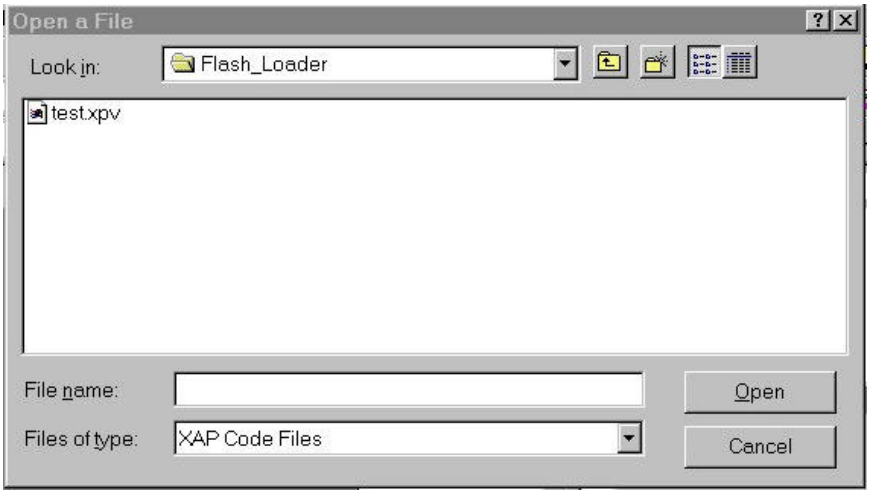


Finally we need to verify the code that was uploaded.

Click on the **Verify Program Code** button .

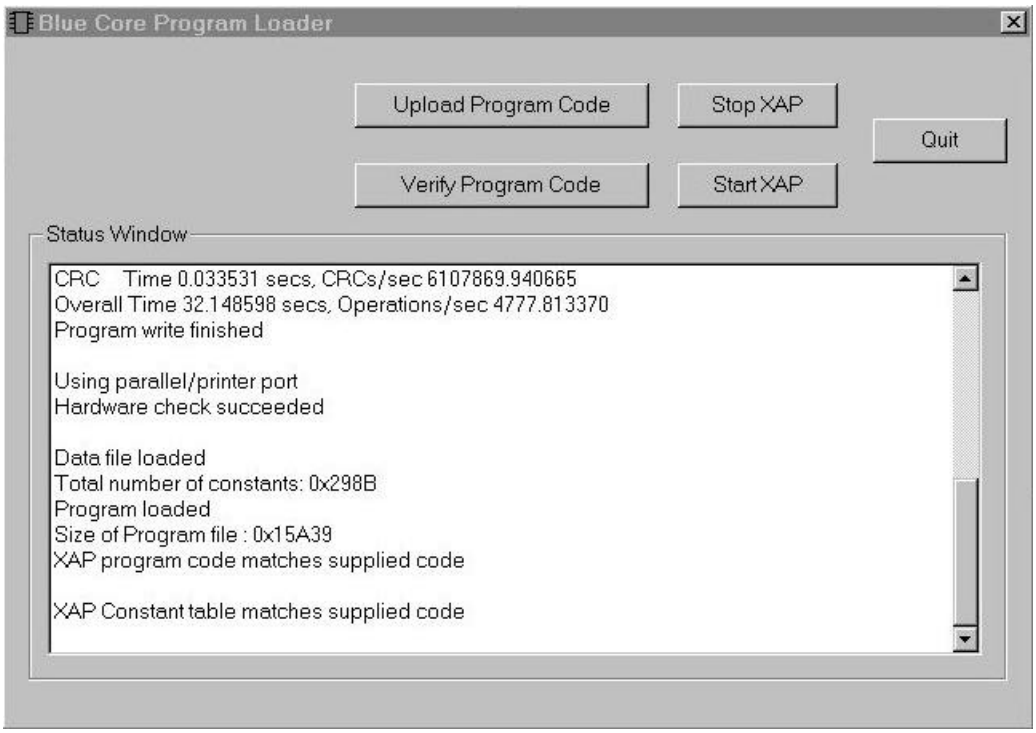


A file select dialog box is displayed.



Select the file to verify against.

Verification of the uploaded code is shown in the information window.



Now press the Start button or power cycle the CASIRA Bluetooth Development kit Unit for the new code to take effect.

Selct **“Quit”** when loading and verification is complete.

15 CAMBRIDGE CONSULTANTS LIMITED COMMAND AND WATCH WINDOW APPLICATION.

The Command and Watch Window Application allows the user to issue commands via the RS232 port of a PC running under Windows™ NT 4.0 to the Evaluation system. The software allows the user to generate scripts that may be used as simple applications using the CCL BlueStack (upper layers host software). This software must be installed from the separate CDROM provided by CCL in the CASIRA Bluetooth Development kit carry case.

Installation, configuration, operating instructions and further documentation on the Cambridge Consultants Limited Command and Watch Window application, together with BlueStack are included on the CCL CDROM.

16 TRADEMARK ACKNOWLEDGMENTS

BlueCore™ is a trademary of Cambridge Silicon Radio Ltd.

BlueStack is a British-registered trademark of Cambridge Consultants Ltd (GB2205395)

Windows™ is a trademark of the Microsoft Corportation

17 APPENDIX: KNOWN FIRMWARE / SOFTWARE DEFICIENCIES AT ALPHA RELEASE:

1. The operation of the System Units can be unreliable when first operated. If the inquire or connect fails during the first BlueChat session it is necessary to stop and start the session again to correctly establish Bluetooth links (rather than repeatedly select the Connect or Inquire buttons). It some cases it is necessary to repeat this procedure until a connection is successfully established.
2. If a disconnect is made during a file transfer, the re-establishment of a connection can result in a failure of the BlueChat Session.
3. Repeated switching between Audio and Data Xfer types results in a failure of the BlueChat session.
4. If a failure of the BlueChat session occurs it is often necessary to cycle the power supply or push the (internal) reset button of the system unit as well as restart the BlueChat session