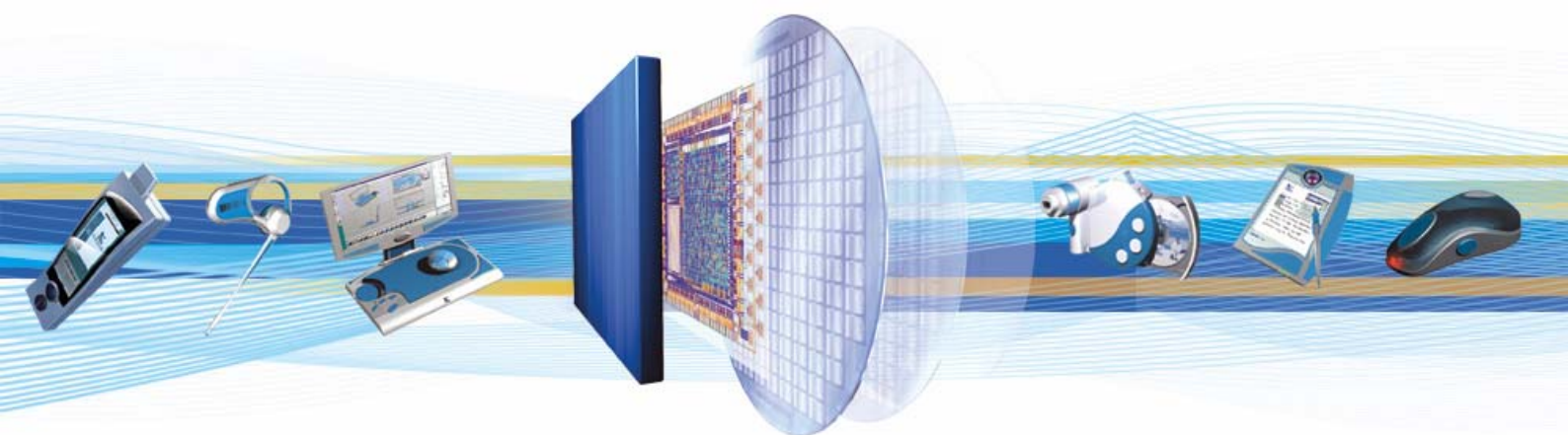**BlueLab™**

BlueLab™ v3.2 Combined AV Headset

Software Release Note

June 2005

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1 Introduction

This document describes the combined AV and Handsfree headset application code, `av_headset_hfp`, shipped with CSR's BlueLab™ v3.2. The application implements the following profiles:

- Advanced Audio Distribution Profile, v1.0

- Audio/Video Remote Control Profile, v1.0

- Handsfree Profile, v1.0

- Headset Profile, v1.1

The combined headset application allows both the AV and Handsfree (or Headset) profiles to be connected simultaneously. This gives the user a seamless audio transfer on an incoming GSM (Global System for Mobile communications) call. For example, music can be streamed from a PC to the headset and on an incoming call the music will be paused and the headset will alert the user. The call can either be taken in the headset or rejected from the headset. The music will resume automatically once the GSM call has completed or has been rejected.

Note:

This application is intended as a reference only. It is expected that customers will make changes to the Man Machine Interface (MMI) and add or remove functionality to match their user requirements and hardware specification.

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2 Target Platform and Development Tools

This release only runs on those platforms supported by BlueLab v3.2, specifically CSR's Bluetooth® wireless technology chip, **BlueCore3-Multimedia,** with a firmware build supporting v6.4 of the Virtual Machine (VM).

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3 Release Functionality

3.1 Standard Profile Functionality

The combined AV handsfree application has been written to comply with the following roles in the supported profiles. It supports all mandatory features for the role that are required by the profile specification.

- Sink, Advanced Audio Distribution Profile
- Controller, Audio /Video Remote Control Profile
- Handsfree Unit, Handsfree Profile
- Headset, Headset Profile

3.2 Additional Profile Functionality

The application extends the standard profile functionality with the following features:

- The Sub-Band Coding (SBC) decoder supports all sampling frequencies defined in the profile specification (listed as optional in the Advanced Audio Distribution Profile).
- MPEG-1,2 Audio decoder (only mp3) supported (listed as optional in the Advanced Audio Distribution Profile).
- A call to the last number dialed can be initiated from the headset (listed as optional in the Handsfree Profile).
- Voice recognition on the AG can be activated from the headset (listed as optional in the Handsfree Profile).
- On link loss the headset automatically attempts to reconnect the Service Level Connection (SLC) to the last AG it was connected to (listed as optional in the Handsfree Profile).
- The audio volume control can be set from the AG as well as from the headset (listed as optional in the Handsfree and Headset Profiles).
- Sniff mode is supported whenever the headset has an established connection (not listed in the supported profiles).
- The headset can play arbitrary tones, such as ring tones and warning beeps (not listed in the supported profiles).

Note:

The Digital Signal Processor (DSP) libraries required to build the MP3 decoder must be obtained and installed separately (please contact the support channel for details).

They contain MP3 technology which incorporates intellectual property owned by Thomson and/or Fraunhofer Gesellschaft.

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3.3 Additional Non-Profile Functionality

- Software providing a time limited demonstration of CSR's Clear Voice Capture (CVC) is provided to allow an evaluation of it's benefits.

3.4 Functional Restrictions

- By default audio streaming is configured to use a rate of 230kb/s (medium quality). This setting can be increased by changing the `sbc_caps_sink` array in `a2dp_sep_handler.c` (in the `a2dp` library) to use `HIGH_QUALITY_BIT_RATE` instead of `MEDIUM_QUALITY_BIT_RATE`. The `a2dp` library needs to be rebuilt for this change to take effect. Alternatively the application can supply its own service capabilities parameters in the call to the `A2dpAddSep` function.

- The headset is unable to determine whether a paired device is an AV source or a phone in the AG role until the device has established a profile-level connection. As a result, the use-case where the user attempts to make an outgoing call through an unconnected phone may not work immediately after pairing.

- Pairing with a phone (AG) while audio is being streamed from an AV source is not supported.

- Battery monitoring is not included in this release although underlying library support is provided for customers who wish to add it.

- This application is intended to be run on the BlueCore3-Multimedia Rev C board only. The microphone input will not function correctly on BlueCore3-Multimedia Rev A boards.

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4 Testing

All testing was performed using the `unified_kalimba` development quality firmware supplied with BlueLab v3.2 and with the application configured to use `MEDIUM_QUALITY_BIT_RATE` AV streaming.

4.1 Interoperability Summary

This section gives a brief summary of the general interoperability status of the combined AV headset application. The AGs that have been tested are divided into three categories:

- No problems. The application works well with this AG and there are no significant interoperability issues.

- Minor problems. One or more issues have been discovered during interoperability testing with this Audio Gateway. The issues discovered may limit certain usage scenarios, but overall the application can still be used with this AG. Where applicable, workarounds have been supplied.

- Major problems. Serious interoperability issues have been discovered with this Audio Gateway. It is either not possible to use the application with this Audio Gateway or the user experience is very poor. Issues that place an AG in this category probably do not have an easy workaround.

4.1.1 No Problems

The following AGs are considered to be fully interoperable with the application. Figures in brackets indicate the firmware version used by the phone:

- HTC/O C500 (4.21.1088, 1337.0.32)
- Motorola MPx220 (4.21.1088 MF:1.30.00)
- Nokia 6230 (V 5.35, RH-12)
- Nokia 6260 (V3.0436.0 RM-25)
- Nokia 6630 (V2.39.151 RM-1)
- Nokia 6670 (V5.0509.0, RH-67)
- Nokia 7280 (V03.22 RM-14)
- Nokia 8800 (V3.08 RM-13)
- Panasonic X70 (A20)
- Sony Ericsson K700i (R2L001)
- Sony Ericsson V800 (R1S025)
- Sony Ericsson P910i (R4D006)

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4.1.2 Minor Problems

The following AGs are considered to have some minor interoperability issues with the application:

- Motorola V635 (R474_G_08 .48.24R_A). Repeatedly transferring a call between a Motorola V635 and the combined headset application may result in the headset being unable to establish an SLC to the handset. Enabling deep sleep on the combined headset (by setting the appropriate PS key) application appears to mitigate this problem. See B-6851 in the Known Issues section.

- Motorola V620 (R376_G_ 0E.65.25R). The hfp link may be abnormally disconnected. To ensure this does not happen make sure the combined headset application has deep sleep enabled (by setting the appropriate PS key).

- Panasonic X70 (A31). With an AV stream and an SLC connection from a Panasonic x70 connected to the combined headset application the ring tone for an incoming GSM call may initially be played very slowly. See B-6847 in the Known Issues section.

- Sharp GX15 (A02-007_-0186). If during an active call routed to the combined headset application the volume buttons on the headset are pressed very quickly, there can be a long delay before the volume level is actually updated. See B-6764 in the Known Issues section.

4.1.3 Major Problems

The following Audio Gateways are considered to have major interoperability issues with the application:

- Sony Ericsson T630 (R6C005) – See B-4685 in the Interoperability Issues section and B-6764 in the Known Issues section.

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4.2 Interoperability Test Descriptions

This section describes the interoperability tests carried out.

Test Name	Test Description
Pairing	Place AV headset into pairing mode. Initiate pairing from the AG. Make sure AG reports pairing has succeeded.
Voice dial	Enable voice recognition on the AG from the headset. Make sure that the AG initiates voice recognition.
Last number redial	Initiate last number redial from the headset. Make sure the AG starts dialling the number.
Outgoing call from AG	Initiate an outgoing call on the AG. Make sure audio is transferred to the headset[1].
Incoming call	Initiate a call to the AG. Make sure in-band or out of band ring tone (depending on whether the AG supports in-band ring tones) is heard in the headset.
Answer call	Initiate a call to the AG. When the user is being alerted in the headset answer the call from the headset.
Reject call	Initiate a call to the AG. When the user is being alerted in the headset reject the call from the headset.
Volume up	Set up an active call. Press the volume up button multiple times. Make sure the volume increases.
Volume down	Set up an active call. Press the volume down button multiple times. Make sure the volume decreases
Call transfer to AG by HS	Transfer the audio stream for an active call from the headset to the AG by initiating the call transfer from the headset.
Call transfer to HS by HS	Transfer the audio stream for an active call from the AG to the headset by initiating the call transfer from the headset.
Call transfer to HS by AG	Transfer the audio stream for an active call from the AG to the headset by initiating the call transfer from the AG.
Terminate call	Hang up an active call from the headset. Make sure the call is released.
Audio stream active	All the tests above were also carried out with the audio stream active. An audio source dongle is connected to the combined headset and music is being streamed when the test is initiated.

Table 4.1: Test Descriptions

Note:

[1] This is not a feature defined in the Handsfree Profile specification. If the call is being initiated on the AG it is up to the AG to decide whether to keep the audio paths routed locally or to transfer the audio to the headset.

Appendix A   Known Issues

This section lists current known issues for the combined AV headset application.

ID	Description
B-6764	If during an active call routed to the combined headset application the volume buttons on the headset are pressed very quickly, there can be a long delay before the volume level is actually updated. This issue has only been seen with the Sony Ericsson T630 which only supports HV1 SCO packets. As this issue is relatively hard to replicate it is considered to be of minor severity.
B-6765	If during an active call routed to the combined headset application the volume buttons on the headset are pressed very quickly, the application may crash. This issue has only been seen with the Sony Ericsson T630 which only supports HV1 SCO packets. It is believed this is caused by B-6764.
B-6851	Repeatedly transferring a call between a Motorola V635 and the combined headset application may result in the headset being unable to establish an SLC to the handset. Enabling deep sleep on the combined headset (by setting the appropriate PS key) application appears to mitigate this problem.
B-7684	If the combined headset is connected to a Motorola V620 and an AV source simultaneously, under certain circumstances the AV audio stream does not restart cleanly and audio drop-outs can be heard.
B-7710	When connected to a Motorola V635 and the link is left idle the SLC between the handset and combined headset may occasionally be dropped unexpectedly.

Table Appendix A.1: Known Issues

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Appendix B   Interoperability Issues

This section lists current known interoperability issues for the combined AV headset application.

ID	Description
B-4552	With both an AV dongle and a Nokia 6310 phone connected to the combined headset application, audio from the phone is distorted. The amount of distortion changes each time the SCO is opened. Investigation shows that the phone is transmitting distorted audio and therefore this issue has been rejected. This issue has been fixed in the Nokia 6310i.
B-4622	The Siemens SX-1 phone will drop the connection to the AV headset approximately 30 seconds after it opens a SCO connection. The phone issues an `LMP_Detach` with a reason code indicating 'LMP timeout' even though the headset has correctly completed all LMP transactions. The headset periodically (once per second) requests the phone to enter sniff mode after the SCO connection has established; the phone consistently refuses this request. It is thought that the detach may be triggered in some way by these requests, even though they are entirely legal according to the Bluetooth specification.
B-4623	The Sony Ericsson P800 phone does not appear to initiate a connection to the combined headset on an incoming call. Furthermore, the headset cannot create a connection to the P800 because service searches for both Headset and Hands-free profile return no results. This appears to be a serious problem with the phone firmware. This bug has been rejected because the problems appear to be with the phone's firmware.
B-4683	If a voice-dial attempt fails on the Sony Ericsson K700i, the phone UI displays a 'retry' dialog requiring the user to select 'yes' or 'no'. The phone will not issue an indication to the headset that voice-dialling has been disabled until the user selects 'no'. The headset will not issue a subsequent voice-dial enable request to the phone until it receives this indication. If the user is unaware that they are required to take an action on the phone, they may believe voice-dialling to be broken. It is thought that this issue is fixed by later versions of the handset firmware.
B-4685	The Sony Ericsson T630 only supports HV1 packets for SCO connections. Since these use 100% of the available Bluetooth bandwidth, the combined headset application cannot maintain a second Bluetooth connection when the phone establishes an audio link so the connection to the AV source is dropped.
B-4690	If connected to a Siemens S55 and an incoming call from a landline phone that initiated the call is rejected, the AV stream does not restart. The handset tested only supports version 0.96 of the hands free profile and the call status indicators it sends to the headset are not sufficient to determine that the incoming call has been rejected.
B-5341	An abnormal link loss is occasionally seen when the combined headset application is connected to a Nokia N-Gage QD handset. This is believed to be an issue on the handset. It is believed this issue has been resolved in later versions of the handset firmware.
B-5360	When using the Sony Ericsson V800 to receive calls, occasionally there is no headset audio when taking an incoming call. If the same call is transferred back to the AG the audio still cannot be heard. This is believed to be an issue on the AG side.
B-6054	Once the IVT stack has connected to the combined headset application, subsequent connect attempts fail. This happens because the IVT stack caches the service handle instead of using the one returned by the headset during the service search. This is believed to be an issue with the IVT stack. The suggested workaround is to restart the stack.
B-6555	Audio transfer fails with Sony Ericsson 802SE. The AG rejects requests for SCO when the link is in sniff mode.
B-6714	If a call is made from a phone connected to the combined headset application whilst streaming audio from the Toshiba stack then the AV stream is disconnected. This results from the Toshiba stack being too slow to respond to a suspend request from the headset.

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ID	Description
B-7031	When connected to a device behaving out of spec by allowing its clock to drift at a rate greater than 250 ppm if the combined headset is slave and sniff is used on the link the connection may be dropped. To stop this happening make sure deep sleep is enabled in the combined headset application by setting the appropriate PS key.
	This issue is considered to be of minor severity as it has only been seen when connected to a device not complying with the Bluetooth specification.

Table Appendix B.1: Interoperability Issues

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Appendix C   Issues fixed relative to BlueLab v3.1

This section lists the combined AV headset application issues that have been fixed relative to BlueLab v3.1

ID	Description
B-4396	On abnormal link loss with the AG the combined headset application attempts to reconnect the Service Level Connection to the AG.
B-4630	Rapid volume button presses from the user will result in volume commands being aggregated by the `hfp` library. This improves the latency with which volume commands are delivered to the AG.
B-4634	The combined headset application stores the AV volume and HFP volume as separate values.
B-4738	Initiate playing local ring tone as soon as a ring indication is received from the AG.
B-4775	When transferring an active call to the combined headset application the Nokia 6310 opens a SCO before the SLC has been fully established. When the SLC is established the "transfer audio" event is triggered but because the AG opened the SCO unexpectedly the audio is transferred back to the AG. On receiving an unexpected SCO connection before the SLC is complete cancel the pending audio transfer action.
B-5250	In HFP mode, if a remote device disables encryption and does not re-enable it within 5 seconds, the combined headset application will disconnect the SLC to that device.
B-5358	Occasionally, on receiving an incoming call from the Sony Ericsson V800 the combined headset application does not play a ring tone properly.
B-5465	The combined headset application cancels the `BUTTON_PLAY_PAUSE_REL` message on a failure to create an SLC connection so it does not continually attempt to connect the SLC if the first attempt failed.
B-5533	The combined headset application accepts an AVRCP connection when it is in the "ready" state.
B-5870	The default PIN code has been changed from "4444" to "8888"
B-5906	The combined headset application checks its current state before attempting to close the AVRCP connection.
B-5919	The combined headset application sends a button press if connected as HSP after an HFP connect has failed.
B-6062	The combined headset application correctly updates its internal state when notified of an incoming call while currently in an active call.
B-6073	The combined headset application now uses the `codec` library.
B-6153	The combined headset application now checks stream validity before routing SCO to the PCM hardware.
B-6194	If the AG does not support an in-band ring tone but opens a SCO while sending RING indications, the combined headset application will play its own ring tone.
B-6281	When streaming SBC audio from the `a2dp_source_dongle` to the combined headset application, there would be glitches every several hours. This was due to clock drift between the two devices. The problem was addressed by DSP changes in B-6347.
B-6546	Support for the Wolfson (WM8731) codec has been added to the combined headset application.
B-6598	The combined headset application no longer attempts to configure the ADC to a rate the hardware does not support.
B-6683	If an AV link is active between an AV source and the combined headset, then the link will no longer be dropped if the headset tries to connect to an AG that is unavailable. An AV link in the streaming state will be suspended if an abnormal link-loss occurs between the combined headset and an AG, while the headset tries to reconnect to the AG.
B-6766	The combined headset application stores the volume setting whenever the SLC is disconnected so it can be restored on reconnection.

Table Appendix C.1: Issues fixed relative to BlueLab v3.1

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Document References

Document	Reference
Specification of the Bluetooth System	Bluetooth SIG, Core, v1.1
Audio/Video Remote Control Profile	Specification of the Bluetooth System, Profiles, v1.0, Audio/ Video Remote Control Profile
Advanced Audio Distribution Profile	Specification of the Bluetooth System, Profiles, v1.0, Advanced Audio Distribution Profile
Handsfree Profile	Specification of the Bluetooth System, Profiles, v1.0, Handsfree Profile
Headset Profile	Specification of the Bluetooth System, Profiles, v1.1, Headset Profile
BlueLab v3.2 Software Release Note	CSR reference blab-srn-001Pa

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Terms and Definitions

BlueCore™	Group term for CSR's range of Bluetooth chips
BlueLab™	CSR's software development kit for applications running in BlueCore's Virtual Machine
Bluetooth®	Set of technologies providing audio and data transfer over short-range radio connections
AG	Audio Gateway
CSR	Cambridge Silicon Radio
DSP	Digital Signal Processor
GSM	Global System for Mobile communications. GSM is a digital cellular communications technology that is available in Europe and the US. GSM offers multiple services for the subscriber such as short message service
HFP	Hands-free Profile
MMI	Man Machine Interface
RFCOMM	Serial cable emulation protocol (element of Bluetooth)
SBC	Sub-Band Coding
SCO	Synchronous Connection-Oriented
SIG	Special Interest Group; Bluetooth SIG controls the Bluetooth specifications
SLC	Service Level Connection

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Document History

Revision	Date:	Reason for Change:
a	01 JUN 05	Initial publication of document (CSR reference blab-srn-002Pa)

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