

Alps Embedded Audio Gateway Beta5.2

Users Guide

Document Version 1.0

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1 Introduction

This document presents a series of examples that illustrate how to control the Alps Embedded Audio Gateway (AG) Bluetooth module in real-world applications. For example, performing data communications over the Serial Port Profile, initiating an outgoing call with the Hands-Free Profile and so on.

Please refer to *Ref[1]* for more detailed information regarding all of the AT Commands and Result Codes used in the examples.

2 Conventions

In the following examples AT commands sent from the host to the module are printed in red and are preceded by the → symbol. Result codes from the module to the host are printed in blue and are preceded by the ← symbol.

Please note that the examples contain no timing information. The time interval between sending AT Commands and receiving Result Codes cannot be defined easily since there are many influential factors involved.

3 Headset Examples

The following example describes how to control the Alps AG for operation with a Bluetooth headset. The example was based upon operation with a Sony Ericsson HBH-60 headset but should be equally applicable to other Bluetooth headsets.

3.1 Initiate Pairing

In order for the Alps AG and the headset to operate they must first be paired. This is the process of exchanging PIN codes and the creation of link keys that are used for authentication.

- Power up the Alps AG module. When the local device details are displayed, ensure that the AG version is correct.

```
← +BINF:852,2,C7,666666,MyAudioGateway  
← READY
```

- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.
- Put the headset into pairing mode. In the case of the HBH-60: from the power off state, press and hold the headset button until a single tone is heard and the LED flashes red and green.
- Register the HSP service record with the AG module. Note that there are no additional features to be specified for the service record when the supported role is AG. If the service is registered correctly, the +BRSR result code will be sent to the host.

```
← AT+BRSR=8,0  
← OK  
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the low power modes are enabled through the link policies setting, the scan parameters are set and the initial MSC is configured.

```
← AT+BWLP=6  
← OK  
← AT+BSSP=800,12,400,50  
← OK  
← AT+BMSC=B,0  
← OK  
← ...
```

- Issue an inquiry from the AG with a Class Of Device filter applied for headset devices. If the target headset is found it will be indicated to the host using a +BINQ result code.

```
← AT+BINQ=200404,FFFFFF,5,A  
← OK  
← +BINQ:A,D9,51ED09,200404,HBH-60  
← +BINC:1
```

- When the inquiry has completed, issue a connection attempt from the AG where the target service is the HSP.

```
← AT+BMST=3,80,37,5A85D5  
← OK
```

- Since this is the first time that the devices have interacted, there will be no link key available so if prompted with a +BLNK result code it should be rejected as shown below. When prompted with the +BPIN result code, enter a PIN code that matches that of the headset. The result of the pairing attempt will be indicated to the host using +BPRC result code.

```
← +BLNK:A,D9,51ED09  
← AT+BLNK=  
← OK  
← +BPIN:A,D9,51ED09  
← AT+BPIN=0000  
← OK  
← +BPRC:A,D9,51ED09,10DC922DE0AA8082CE20FD7C144E393D  
← +BMSC:B,0  
← +BRFC:A,D9,51ED09,3,0,1
```

- At this point the host would normally save the link key and peer address to non-volatile memory so that they can be registered with the module's security database the next time the module is powered up or is reset. The Bluetooth Address / Link Key pair is registered using the AT+BSDA command.
- Pairing has now been completed so the link can be disconnected.

```
← AT+BDIS  
← OK  
← +BCHM:0,0  
← +BRFC: 0,0,0,FFFF,3,0
```

3.2 Incoming Call

This example illustrates the command flow when the AG receives an incoming call, which will be taken using the remote headset.

- Ensure that the headset is powered up. In the case of the HBH-60: from the power off state, press and hold the headset button until a double tone is heard and the LED flashes green only.
- Power up the Alps AG module.
- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.
- Register the HSP service record with the AG module. Note that there are no additional features to be specified for the service record when the supported role is AG. If the service is registered correctly, the +BRSR result code will be sent to the host.

```
← AT+BRSR=8,0  
← OK  
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the low power modes are enabled through the link policies setting, the scan parameters are set and the initial MSC is configured.

```
← AT+BWLP=6  
← OK  
← AT+BSSP=800,12,400,50  
← OK  
← AT+BMSC=B,0  
← OK  
← ...
```

- Initiate connection from the AG to the headset. The connection result is given by the fifth parameter in the `+BRFC` result code where 0 means the connection was successful.

```
← AT+BMST=3,A,D9,51ED09
← OK
← +BMSC:B,0
← +BRFC:A,D9,51ED09,3,0,1
```

- Indicate to the headset that there is an incoming call by sending a series of `RING` commands. Note that the caller line ID is not required here because it is not supported by the HSP. The ring alert should be heard at the headset.

```
← AT+BRNG=
← OK
← AT+BRNG=
← OK
← ...
```

- Accept the call by pressing the headset button. This will be acknowledged at the AG and the audio link will be automatically set up. Note that the headset may send its current volume setting to be used for synchronization.

```
← +BBUT
← +BSCO:0
← +BVGS:B
```

- Control the headset's volume setting. Pressing the headset volume button, the headset's speaker volume is changed and sent to the AG to be used for synchronization. The `AT+BVGS` command may be used to change the headset volume from the AG side.

```
← AT+BVGS=7
← OK
← +BVGS:7
```

- End the call by pressing the headset button. This will be acknowledged at the AG side and the audio link will be automatically dropped. Note that the `RFCOMM` connection is still active at this point.

```
← +BBUT
← +BSCO:3
```

- Disconnect the AG from the headset. Note that the remote address is zeroed for disconnection result codes since there can only be one active connection at a time.

```
← AT+BDIS
← OK
← +BRFC:0,0,0,FFFF,3,0
```

3.3 Outgoing Call

This example illustrates the command flow when the user wishes to make a call from the headset. The AG and the headset must be paired for this to operate correctly.

- Ensure that the headset is powered up. In the case of the HBH-60: from the power off state, press and hold the headset button until a double tone is heard and the LED flashes green only.
- Power up the Alps AG module.
- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.
- Register the HSP service record with the AG module. Note that there are no additional features to be specified for the service record. If the service is registered correctly, the `+BRSR` result code will be sent to the host.

```
← AT+BRSR=8,0
← OK
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the low power modes are enabled through the link policies setting, the scan parameters are set and the initial MSC is configured.

```
← AT+BWLP=6
← OK
← AT+BSSP=800,12,400,50
← OK
← AT+BMSC=B,0
← OK
← ...
```

- Put the AG into connectable state.

```
← AT+BSLV
← OK
```

- Make a connection from the headset to the AG. In the case of the HBH-60: from the power on state press the headset button once. The connection will be made, the button press acknowledged and the audio link will be automatically setup.

```
← +BMSC:B,0
← +BRFC:A,D9,51ED09,3,0,1
← +BMSC:B,0
← +BSCO:0
← +BVGS:B
```

- Control the headset's volume setting. Pressing the headset volume button, the headset's speaker volume is changed and sent to the AG to be used for synchronization. The *AT+BVGS* command may be used to change the headset volume from the AG side.

```
← AT+BVGS=7
← OK
← +BVGS:7
```

- End the call by pressing the headset button. This will be acknowledged at the AG and the audio link will be automatically dropped. Note that the RFCOMM connection is still active at this point.

```
← +BBUT
← +BSCO:3
```

- Disconnect the AG from the headset. Note that the remote address is zeroed for disconnection result codes.

```
← AT+BDIS
← OK
← +BRFC:0,0,0,FFFF,3,0
```

4 Hands-Free Examples

The following example describes how to control the Alps AG for operation with a Bluetooth hands-free unit. The example was based upon operation with a NOKIA CARK112 hands-free unit but should be equally applicable to other Bluetooth hands-free units.

4.1 Initiate Pairing

In order for the Alps AG and the NOKIA CARK112 to operate, they must first be paired. Pairing is a security procedure where PIN codes are exchanged in order to create a link key to be used whenever authentication is required.

- Ensure that the hands-free unit is powered up and is connectable and discoverable.
- Power up the Alps AG module. When the local device details are displayed, ensure that the AG version is correct.

```
← +BINF:852,2,C7,666666,MyAudioGateway
← READY
```

- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.

- Register the hands-free service record with the AG module. At this time, the host must also specify the HF features that it supports. In this particular example, none of the supported features are enabled. If the service is registered correctly, the `+BRSR` result code will be sent to the host.

```
← AT+BRSR=10,0
← OK
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the low power modes are enabled through the link policies setting, the scan parameters are set and the initial MSC is configured.

```
← AT+BWLP=6
← OK
← AT+BSSP=800,12,400,50
← OK
← AT+BMSC=B,0
← OK
← ...
```

- Issue an inquiry from the AG with a Class Of Device filter applied for hands-free devices. When the hands-free unit is found, an indication will be sent to the host using the `+BINQ` result code.

```
← AT+BINQ=200408,FFFFFF,5,A
← OK
← +BINQ:2,EE,7F51E7,200408,Carkit 112
← +BINC:1
```

- When the inquiry has completed, issue a connection attempt from the AG where the target service is HFP.

```
← AT+BMST=4,2,EE,7F51E7
← OK
```

- Since this is the first time that the devices have interacted, there will be no link key available so if prompted with a `+BLNK` result code it should be rejected as shown below. When prompted with the `+BPIN` result code, enter a PIN code that matches that entered at the hands-free side. The result of the pairing attempt will be indicated to the host using `+BPRC` result code.

```
← +BLNK:2,EE,7F51E7
← AT+BLNK=
← OK
← +BPIN:2,EE,7F51E7
← AT+BPIN=1833
← OK
← +BPRC:2,EE,7F51E7,AC2C6C9F6649672CF4D4E2D49E21CC66
← +BMSC:3,0
← +BRFC:2,EE,7F51E7,4,0,18
```

- At this point the host would normally save the link key and peer address to non-volatile memory so that they can be registered with the module's security database the next time the module is powered up or is reset. The Bluetooth Address / Link Key pair is registered using the `AT+BSDA` command.

- Pairing has now been completed so the link can be disconnected.

```
← AT+BDIS
← OK
← +BCHM:0,0
← +BRFC: 0,0,0,FFFF,4,0
```

4.2 Incoming Call

This example illustrates the command flow when the AG receives an incoming call, which will be taken in the hands-free unit.

- Ensure that the hands-free unit is powered up and is connectable.
- Power up the Alps AG module.
- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.
- Register the hands-free service record with the AG module. At this time, the host must also specify the HF features that it supports. In this particular example, none of the supported features are enabled. If the service is registered correctly, the `+BRSR` result code will be sent to the host.

```
← AT+BRSR=10,0
← OK
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the low power modes are enabled through the link policies setting, the scan parameters are set and the initial MSC is configured.

```
← AT+BWLP=6
← OK
← AT+BSSP=800,12,400,50
← OK
← AT+BMSC=B,0
← OK
← ...
```

- Initiate connection from the AG to the hands-free unit. If successful, indicator event reporting will be activated and the hands-free unit may send its speaker and microphone gain settings for synchronization.

```
← AT+BMST=4,2,EE,7F51E7
← OK
← +BMSC:3,0
← +BRFC:2,EE,7F51E7,4,0,18
← +BIER:1
← +BVGS:1
← +BVGM:9
```

- Indicate to the hands-free unit that there is an incoming call by sending a series of RING commands. The ring alert should be heard at the hands-free unit. Note that the `AT+BIES`, `AT+BIEC`, and `AT+BIEP` commands should also be sent to the hands-free unit if it enabled the indicating event reporting activation.

```
← AT+BIEP=1
← OK
← AT+BRNG=
← OK
← AT+BRNG=
← OK
← ...
```

- Accept the call by pressing the hands-free unit button. This will be acknowledged at the AG and the audio link will be automatically set up.

```
← +BCAL:1
← AT+BIEC=1
← OK
← AT+BIEP=0
← OK
← +BSCO:0
```

- End the call by pressing the hands-free unit button. This will be acknowledged at the AG side and the audio link will be automatically dropped. Note that the RFCOMM connection is still active at this point.

```
← +BCAL:0  
← +BSCO:3  
← AT+BIEC=0  
← OK
```

- If the call were terminated at the AG side, the following commands would be sent.

```
← AT+BIEC=0  
← OK  
← AT+BADS  
← OK  
← +BSCO:3
```

- Disconnect the AG from the hands-free unit. Note that the remote address is zeroed for disconnection result codes since there can only be one active connection at a time.

```
← AT+BDIS  
← OK  
← +BRFC:0,0,0,FFFF,3,0
```

4.3 Outgoing Call

This example illustrates the command flow when the user wishes to make a call from the hands-free unit. The AG and the hands-free unit must be paired for this to operate correctly.

- Ensure that the hands-free unit is powered up.
- Power up the Alps AG module.
- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.
- Register the hands-free service record with the AG module. At this time, the host must also specify the HF features that it supports. In this particular example, none of the supported features are enabled. If the service is registered correctly, the +BRSR result code will be sent to the host.

```
← AT+BRSR=10,0  
← OK  
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the low power modes are enabled through the link policies setting, the scan parameters are set and the initial MSC is configured.

```
← AT+BWLP=6  
← OK  
← AT+BSSP=800,12,400,50  
← OK  
← AT+BMSC=B,0  
← OK  
← ...
```

- Put the AG into a connectable and discoverable state.

```
← AT+BSLV  
← OK
```

- Make a connection from the hands-free unit to the AG. In the case of the CARK112: turning on the car ignition will cause an automatic connection attempt.

```
← +BMSC:3,0  
← +BRFC:2,EE,7F51E7,4,0,18  
← +BIER:1  
← +BVGS:1  
← +BVGGM:9
```

- The hands-free unit initiates an outgoing call by recalling the last number dialed by the AG. In the case of the CARK112: press the button twice briefly.

```
← +BDAL:1,  
← +BSCO:0  
← AT+BIEP=2  
← OK
```

- Issue the following command if the audio paths of the outgoing call are routed to the hands-free unit.

```
← AT+BIEP=3  
← OK
```

- Issue the following commands if remote party answered and the call is active.

```
← AT+BIEC=1  
← OK  
← AT+BIEP=0  
← OK
```

- End the call by pressing the hands-free unit button. This will be acknowledged at the AG side and the audio link will be automatically dropped. Note that the RFCOMM connection is still active at this point.

```
← +BCAL:0  
← +BSCO:3  
← AT+BIEC=0  
← OK
```

- If the call was terminated at the AG side, the following commands would be sent.

```
← AT+BIEC=0  
← OK  
← AT+BADS  
← OK  
← +BSCO:3
```

- Disconnect the AG from the hands-free unit. Note that the remote address is zeroed for disconnection result codes since there can only be one active connection at a time.

```
← AT+BDIS  
← OK  
← +BRFC:0,0,0,FFFF,3,0
```

5 Serial Port Examples

The following example describes how to control the Alps AG for operation with a device supporting the Serial Port Profile (SPP). The examples are based upon operation with an Alps USB Dongle / Open Interface (OI) Bluetooth Utility combination.

5.1 Binding

This example illustrates how bind the Serial Port service of the Open Interface Utility with the Serial Port service of the Alps AG. Binding is a procedure required by the OI utility and is not defined by the Bluetooth specifications.

- Power up the Alps AG module. The local device details will be displayed. Ensure that the AG version is correct.

```
← +BINF:852,2,C7,666666,MyAudioGateway  
← READY
```

- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.

- Register the Serial Port Profile (SPP) service record with the AG module. If the service is registered correctly, the +BRSR result code will be sent to the host.

```
← AT+BRSR=1,0  
← OK  
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the initial MSC is set so that the remote device is allowed to transfer data immediately after the connection is established. Additionally, sniff mode and hold mode are enabled by through the link policies setting.

```
← AT+BMSC=B,0
← OK
→ AT+BWLP=6
← OK
← ...
```

- The AG module is placed into the “connect as slave” state. If the default scan parameters are used, the module will become connectable and discoverable.

```
← AT+BSLV
← OK
```

- Issue an Inquiry from the Open Interface (OII) utility. If the AG is within range it should be found readily.
- Once the AG has been found, issue a Service Search from the OII Utility. The utility should indicate that the AG supports the SPP service.
- Bind the AG SPP service with the SPP service provided by the OII Utility.
- In this example, service level authentication is not required so it should be disabled using the OII utility.
- The AG module can now be returned to the idle state.

```
← AT+BCNL
← OK
← +BRFC:0,0,0,FFFF,2,0
```

5.2 Initiate Connection

This example illustrates how to initiate an SPP connection from the AG.

- Power up the Alps AG module.
- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic ‘1’ to HUM.
- Register the Serial Port Profile (SPP) service record with the AG module. If the service is registered correctly, the +BRSR result code will be sent to the host.

```
← AT+BRSR=1,0
← OK
← +BRSR
```

- Before initiating the connection attempt, several parameters must be configured. In the following example, the initial MSC is set so that the remote device is allowed to transfer data immediately after the connection is established. Additionally, sniff mode and hold mode are enabled by through the link policies setting.

```
← AT+BMSC=B,0
← OK
→ AT+BWLP=6
← OK
← ...
```

- If the Bluetooth address of the remote device is unknown, an inquiry should be used to find it. Discovered devices will be reported to the host using the +B/INQ result code.

```
← AT+BINQ=0,0,5,10
← OK
← +BINQ:2,C7,A08C62,10C,USB Dongle
← +BINC:1
```

- The connection can now be initiated.

```
← AT+BMST=0,2,C7,A08C62
← OK
```
- If the remote device has more than one SPP service, the +BSVR and +BSRC result codes will be sent to the host indicating the service details and number of services found respectively. The host must choose which service to connect to using the index parameter.

```
← +BSVR:0,COM1
← +BSVR:1,COM2
← +BSVR:2,COM3
← +BSRC:3
← AT+BSSV=1
← OK
```
- If necessary, open the application that uses the virtual COM port provided by the OII Utility. If this is not done, the AG will not designate its SPP service as being fully connected. The connection result is given by the fifth parameter in the +BRFC result code where 0 means the connection was successful.

```
← +BMSC:B,0
← +BRFC:2,C7,A08C62,0,0,0
```
- To transfer data, ensure that the data interface between the host and the Bluetooth module is set to data mode i.e. apply a logic '0' to HUM. Note that any data received from the peer device when the data interface is in command mode will be discarded.
- Data communication can now commence.
- Disconnect the AG from the peer device. Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.

```
← AT+BDIS
← OK
← +BRFC:0,0,0,FFFF,3,0
```

5.3 Accept Connection

This example illustrates how to accept an SPP connection that was initiated from the remote device.

- Power up the Alps AG module. The local device details will be displayed. Ensure that the Ag version is correct.

```
← +BINF:852,2,C7,666666,MyAudioGateway
← READY
```
- Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.
- Register the Serial Port Profile (SPP) service record with the AG module. If the service is registered correctly, the +BRSR result code will be sent to the host.

```
← AT+BRSR=1,0
← OK
← +BRSR
```
- Before initiating the connection attempt, several parameters must be configured. In the following example, the initial MSC is set so that the remote device is allowed to transfer data immediately after the connection is established. Additionally, sniff mode and hold mode are enabled by through the link policies setting.

```
← AT+BMSC=B,0
← OK
→ AT+BWLP=6
← OK
← ...
```

- The AG module is placed into the “connect as slave” state. If the default scan parameters are used, the module will become connectable and discoverable.

```
← AT+BSLV  
← OK
```

- Initiate the Serial Port connection from the OII Utility. If the application that uses the COM port provided by the OII Utility is open the host will receive the following result codes. The connection result is given by the fifth parameter in the +BRFC result code where 0 means the connection was successful.

```
← +BMSD:B,0  
← +BRFC:2,C7,A08C62,0,0,0
```

- To transfer data, ensure that the data interface between the host and the Bluetooth module is set to data mode i.e. apply logic '0' to HUM.
- Disconnect the AG from the peer device. Ensure that the data interface between the host and the Bluetooth module is set to command mode i.e. apply a logic '1' to HUM.

```
← AT+BDIS  
← OK  
← +BRFC:0,0,0,FFFF,3,0
```

6 References

In the following references xxx is the firmware version and yy is the document version.

Ref[1]	Alps_AG_AT_xxx_yy.pdf	Alps AG AT Command Reference List
Ref[2]	Alps_AG_FRN_xxx_yy.pdf	Alps AG Firmware Release Note

7 Document Change History

Version	Section	Details
Alpha5 1.2	All	Formatting changes for addition of Contents section.
Alpha5 1.2	Examples	Added arrows to commands for readers in black and white.
Alpha6 1.0	Examples	Changed sequences to match Alpha6 firmware.
Alpha6 1.0	3.1 Initiate Pairing	Added comment to explain about registering link keys using <i>AT+BSDA</i> .
Alpha6 1.0	Examples	Corrected mistake where third parameter of <i>+BRFC</i> was referenced instead of the fifth parameter for RFCOMM connection status.
Alpha8 1.0	Examples	Changed sequences to match Alpha8 firmware.
Beta1 1.0	Examples	Changed AG version to match Beta1 firmware.
Beta1 1.1	Examples	Corrected AG version.
Beta2 1.0	Examples	Changed AG version to match Beta2 firmware.
Beta2 1.0	All	Added the section Hands-Free Examples.
Beta3 1.0	Examples	Changed AG version to match Beta3 firmware.
Beta4 1.0	Examples	Changed AG version to match Beta4 firmware.
Beta5 1.0	Examples	Changed AG version to match Beta5 firmware.
Beta5 1.0	All	Changed references to HUM to match new polarity setting.
Beta5.2 v1.0	All	Changed AG version to match Beta5.2 firmware.