Firmware Release Notes - BTM510/BTM511			
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Firmware Release Notes - BTM510/BTM511

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CHANGE HISTORY

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013	v18.1.3.4	Sebastian Schillack	09 May 12
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016	v18.1.3.8	Sebastian Schillack	22 Nov 12
017	v18.1.3.9	Sebastian Schillack	21 Dec 12
018	Updated BTM51x-devkit references	Sebastian Schillack	02 Jan 13
019	v18.1.3.10	Sebastian Schillack	06 Feb 13
020	Fixed table 16.2 (LED blink pattern, 2 was missing)	Sebastian Schillack	20 Feb 13
021	V18.1.4.0	Sebastian Schillack	26 Feb 13
022	V22.1.4.1	Sebastian Schillack	16 Aug 13
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025	V22.1.4.4	Sebastian Schillack	30 Apr 14
026	V22.2.5.0	Sebastian Schillack	24 Feb 2015

CONTENT

FIRMWARE VERSION 22.2.5.0 (PRODUCTION F/W)

February 2015

General Information

This release is production firmware. The majority of features and functions are now covered by automated regression tests.

This firmware is has been qualified with Bluetooth SIG as an end product under QDID 62011.

New Features (compared to v22.1.4.4)

Compared to precedent firmware version, no new features were added. A number of issues and bugs were identified during regression testing and were fixed. In addition, a few minor changes were made related to fine tuning of functionality and default behaviour (e.g. factory default values of selected S-Registers etc.).

AT Command Interface

This section lists the changes in the AT command interface with this firmware release. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New/Changed AT Commands

The following AT commands were added, mainly in order to meet AVRCP1.5 PTS testing requirements.

- AT+AVQPP – Query TG play status of addressed (selected) player
- AT+AVQPV – Query TG player application setting values (for all attributes)
- AT+AVQPT…– Query TG player application settings attribute text
- AT+AVQPR... – Query TG player application settings attribute range
- AT+AVQPE... – Query TG player application setting attribute value(s) text
- AT+AVSAI – Add item to now playing list
- AT+SIT – Changed: if another (ring) tone is already playing, then it will be stopped before the new one is being played back. In previous f/w version, tone requests by AT+SIT were queued.

New/Changed S-registers

- S390 – AVRCP 1.5 configuration, changed: bit7 added, bit1 and bit6 ignored
- S396 – New register: un-register SPP service record once connected
- S397 – New register: AVRCP1.5 notification control

New Messages (all AVRCP1.5)

The following messages were added, mainly in order to meet AVRCP1.5 PTS testing requirements. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- AVBS – Battery status of remote TG changed notification
- AVSS – System status of remote TG changed notification
- AVPPC – Playback position changed notification
- AVTE – Track reached end notification
- AVTS – Track reached start notification
- AVAPC – Available players changed notification

- AVUC <UID_counter> – UIDs changed at TG notification

New ATIs

- ATI1008 – Diagnostics: fTempEnabled, fAcsEnabled
- ATI1009 – Diagnostics: ComTxBufFailCnt

AVRCP1.5

This section contains updated documentation about AVRCP1.5 on BTM51x. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

AVRCP1.5 AT Command Overview

- AT+AVQ… – Command family: query AVRCP related data (parameters/items/attributes etc.);
- AT+AVS… – Command family: set AVRCP related data (player/browsing path etc.)

Messages

The following table lists all AVRCP1.5 messages in alphabetical order. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

Message / Tag	Type
AVAPC	Available players changed notification
AVAPI	Available player item
AVAPL	Available players list start / end
AVBS	Battery status of remote TG changed notification
AVCPL	Current play list start / end
AVFC	Folder (path) changed confirmation
AVFSI	File system item (folder)
AVFSL	File system list start / end
AVMEA	Media element attribute (browsing)
AVMEI	Media element item (track)
AVNPA	Now playing track attribute
AVNPC	Now playing content has changed notification
AVNPT	Now playing track attributes start / end
AVPA	Player application setting attribute only
AVPC	Player application setting changed list start / end (indication of value change)
AVPE	Player application setting attribute value text
AVPI	Play item confirmation
AVPL	Player application setting response list start / end (response to AT+AVQPV/A)
AVPP	Playback status/parameters response (AT+AVQPP)
AVPPC	Playback position changed notification
AVPS	Play status changed notification
AVPT	Player attribute text
AVPV	Player application setting attribute/value pair
AVSBP	Set browsed player confirmation
AVSPC	Addressed ('selected') player changed notification
AVSS	System status of remote TG changed notification
AVSSP	Set addressed ('selected') player confirmation
AVTC	Track changed notification

AVTE	Track reached end notification
AVTS	Track reached start notification
AVUC	UIDs changed notification
AVVC	Absolute volume changed indication

AVRCP1.5 Application Notes

AVRCP1.5, in contrast to previously supported AVRCP1.0, introduces a number of advanced features for control of a remote audio player, such as:

- Browsing the virtual file system on the TG (media player), change path, select a media element item (i.e. a track) for play back
- Query various information from the TG data base (media player), e.g. track details (attribute list), list folder content
- Control of player application settings (shuffle, repeat etc.)
- Registration for reception of event notifications
- Absolute volume control.

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages. Whenever information appears insufficient, look up AVRCP1.5 specification document for clarification and more background information.

AVRCP1.5 Initialisation, Role Configuration

At boot time, AVRCP functionality is initialised according to S-Registers S301 (AVRCP role). In order to enable functionality of AVRCP1.5, S301 must be set to 3 (new default value) which corresponds to role 'target and controller'. The only ***target*** functionality required here is to receive volume change commands from the remote device (phone). When volume is changed at the phone, then the relevant message causes BTM51x's audio output gain to be set accordingly, provided an A2DP link exists with the same device and BTM51x is audio sink. This is the only scenario where the phone acts as CT and BTM51x is acting as TG. Given that in all other scenarios BTM51x is acting as CT and a phone is acting as TG, the volume case is neglected when stating that only AVRCP1.5 CT role is supported.

In addition, for the volume case to be functional, BTM51x TG features are set to category 2 internally which is hardcoded.

It has been observed during development that S302 must be set to 1 (category 1). If S301=3 (target and controller), then S302 value stands for CT functionality. If S302 has a different value while S301=3, then features may not work as described or not work at all. Category 1 is the use case which was focused on for this release.

The new default values for S301 (=3) and S302 (=1) reflect these findings.

AVRCP Connection Setup

When BTM51x connects to a remote TG device by AVRCP1.5, a number of information is exchanged between TG and CT in the background, e.g.: AVRCP features, profile extensions (beyond AVRCP1.0) and event capabilities. These TG characteristics are buffered in BTM51x and can be queried using e.g. AT+AVQRF, AT+AVQXT, AT+AVQEC. These are mainly used for BTM51x internal purposes, i.e. rejecting unsupported requests etc.

Subsequently to this exchange, BTM51x attempts to register as many event capabilities as possible in order to receive relevant notifications from TG. The outcome of this can be checked using AT+AVQRE, which returns flags set for all events that have been successfully registered.

Typically, the TG (phone) will register for notifications on local BTM51x volume change events. In this case, the volume change notification is sent each time the local output gain is changed by e.g. AT+GOU/AT+GOD etc. The phone is using this value to keep aware of current output gain setting and also to update its display.

AVRCP Operation

Once AVRCP has successfully connected and registered for events, typical notification messages will be forwarded to UART, e.g. play status changed (start/pause), now playing track changed, player settings (repeat, shuffle etc.) changed, available players and so forth.

For a number of notifications, BTM51x subsequently and automatically queries more data related to the new status, i.e. now playing track attributes (Title, Artist, Album etc.) and prints it to UART. It has been observed that in some circumstances multiple events, occurring virtually at the same time, will cause multiple lists of e.g. now playing track attributes. If this is interfering a host controller, S390 also allows to prevent automatic queries for a number of notifications, see S390 bits 4/5/7. Queries for now playing track attributes can also be carried out by AT command at any time (AT+AVQNP).

UID Cache

In the virtual file system, folders and media element items (track) are uniquely identified by a 64bit UID (unique identifier). This UID is always contained in relevant UART messages (list items). Given that handling 64bit values may be inconvenient for resource constrained host microcontrollers or for a human beings during evaluation, BTM51x can cache up to 10 UIDs of an item list in an internal array. For a subsequent command, a listed item can then be referred by its UidCacheIndex, which is between '0' and '9', rather than the UID which is 16 characters long.

UID cache feature is enabled by default and can be disabled by setting S391=0. The quick start example above also covers this feature.

Browsing

Browsing feature allows a CT device to navigate, view and launch media content on the TG. A browsing channel is created automatically on top of an existing AVRCP link whenever required. After 5 seconds of no browsing activity, the browsing channel is closed by BTM51x. This browsing channel handling happens in the background, invisible to the user or host controller. no messages concerning browsing channel are sent to UART.

Media content on the target is structured in a tree oriented virtual file system. BTM51x provides AT commands to change current path and to list items in the current path/folder. When listing folder items (AT+AVQFS), it is likely to happen that the number of items being returned is limited by AVRCP packet size which means that only a partial window of the entire folder list is returned by one command. This is why a start offset parameter <s> can be appended to AT+AVQFS<s> which must be less or equal the total number of items in current folder. If omitted then <s> defaults to 0 meaning that list will be returned from top (first item).

The total number of items is indicated in the change path/folder confirmation (AVFC $<nItems>) and also in the start tag of a file system list (AVFSL $<nItems>,$<nStartOffs>,$<nEndOffs>,$<nTotalItems>).

AT+AVQFSN ('N'='next') permits to list the next window of folder items by calculating the following start offset dynamically from the last printed list (start_offset + nItems actually returned). Hence, multiple calls of AVQFSN will print all chunks of an item list without having to manage start offsets for each window by host controller.

The following Table 0-1 gives an overview of AT commands for navigating the virtual file system. More detail about each command can be found in **Error! Reference source not found.** and **Error! Reference source not found.**.

Standard operations for file system navigation	
AT Command	**Short Description**
AT+AVQFS[<s>[,<e>]]	List folder items (current path)
AT+AVSP<n>	set path downwards
AT+AVSPU	set path upwards one level

AT+AVSPI<n>	play item (selected by browsing)
AT+AVQMI<n>	query media item attributes
Arguments: <n>: UidCacheIndex or UID <s>: start_offset, optional, set to 0 if not passed <e>: end_offset, optional, set to <s>+9 if not passed	

Table 0-1: Standard navigation AT commands

Beyond standard operations like list folder items, set path up/down etc. (defined in AVRCP1.5 specification) BTM51x provides a set of combined commands which facilitate more convenient navigation. See Table 0-2 below.

BTM51x combined operations		
Navigation Command	**Short Description**	**Comment**
AT+AVQFSN	List folder items next window	AT+AVQFS<s> with start offset <s> managed by BTM51x
AT+AVSPR	set path upwards to root	Multiple calls of AT+AVSPU until root folder is reached
AT+AVSPQ<n>	set path downwards and query	= AT+AVSP<n> ; AT+AVQFS
AT+AVSPUQ	set path upwards one level and query	= AT+AVSPU ; AT+AVQFS
AT+AVSPRQ	set path upwards to root and query	= AT+AVSPR ; AT+AVQFS
Arguments: <n>: UidCacheIndex or UID		

Table 0-2: BTM51x combined navigation AT commands

AVRCP Sniff Mode Delay

It has been observed that responses to AVRCP requests (AT commands) are delayed in the range of about 0.5s … 1s. This is likely to be caused by sniff mode.

AVRCP1.5 Continuation

This feature caters for the case that e.g. media element attributes may not fit into a single packet due to large size (e.g. a very, very long track name or similar). This is why AVRCP1.5 spec has defined four different packet types:

```
Single (0) / Start (1) / Continue (2) / End (3)
```

If all attribute data fits into a single packet, then packet type will be 'Single' (0). If attribute data is spread over more than one packet, then the first packet type will be 'Start' (1), followed by zero or more packets of type 'Continue' (2), followed by a terminating packet of type 'End' (3).

On BTM51x this becomes relevant for representation of now playing track attributes – "AVNPA…" message. In order to cater for this feature, the current packet type is appended immediately to AVNPA<n> as a single decimal character ['0'…'3']. In by far most cases this will be '0'. However, if the packet type is '1', then more 'AVNPA<pt>…' messages must be expected as described above (pt=2, finally pt=3). For each packet received, a separate AVNPA<pt>… message is sent to UART.

This feature has only been tested against PTS (profile tuning suite) but not against a test TG due to lack of support on the latter (not having a long enough track name) [Ref.4-46].

AVRCP1.5 AT Command Reference

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages. Whenever information appears insufficient, look up AVRCP1.5 specification document for clarification and more background information.

- S390 – AVRCP1.5 configuration – The flags of S-register 390 have been designed so that cleared flags correspond to machine- friendly, automated and complete configuration, whereas set flags (except bits 4,5,7) correspond to a more human friendly configuration.
- S397 – AVRCP1.5 notification control – S-register 397 allows to disable certain AVRCP1.5 notifications. It was found during testing that disabling certain notifications can help to simplify requirements for the host controller's parser algorithm. Messages that are currently not covered by S397 can only be suppressed by S504=1, which (unfortunately) generally prevents any output on BTM51x UART (silent mode).
- Query Commands
- Set Commands
- Item Lists
- AVRCP1.5 Message Syntax

Resolved Issues

- Module lock-up for "AT+AVSBPn" and "AT+AVSSPn" [Ref.4-64] – If browsing is not supported on TG, then these commands have caused a module lock-up in the past. Should be fixed now.
- Duplicate SPP service record [Ref.4-65] – It was found that SPP had registered two service records. Fixed by now.
- Missing 'NO CARRIER' with S507=2, SPP [Ref.4-44] – In a scenario where the remote device is sending data and immediately closing the link afterwards, it was observed that "NO CARRIER" was missing at the UART, due to data still being delivered in fast mode (S507=2) which was blocking the "NO CARRIER" message. Fixed now.
- Data loss and module lock up with S507<2, SPP [Ref. 4-45] – In a scenario where the remote device is sending data and immediately closing the link afterwards, it was observed that not all of the buffered data has been delivered at the time when "NO CARRIER" was sent to UART. Remaining buffered data was delivered on a subsequent connection. In addition a module lock-up was observed in such scenario. Fixed now.
- S308=15 (Auto-BTX "ALL/ALL") not working as expected [Ref.4-49] – For S308=15, ATI27 was still returning 3 (connectable, discoverable) even after all enabled profiles were connected. Fixed now.
- AT&F7 – SSR parameters were not set as described in f/w release notes [Ref.4-51] – Fixed in source code.
- Unexpected "ERROR 129" on "AT+HSGGI?" [Ref.4-50] – Fixed in source code.
- Missing option to stop a playing ringtone [Ref.4-52] – On call answer/reject/terminate, a playing ringtone was not stopped. This has been fixed. Now also on AT+SIT<n>, a playing tone is cancelled before the new one is played back. Prior to the fix, ringtones were queued on AT+SIT<n>.
- Module lock-up on AT+BTB<6digit passkey> when triggered by AT+SPD [Ref.4-53] – Fixed in source code.
- A2DP stream not started while SCO active and when S355=3 [Ref.4-55] – Fixed in source code. Was a follow-up issue of library upgrade to BL6.3
- Number of items not captured on AT+AVSP<n> response [Ref.4-66] – The number of items in AT+AVSP (set browsed player) response was not captured internally, causing an unexpected value for <nTotalItems> in a subsequent AT+AVQFS response list start tag (AVFSL…). Fixed now. See also known issue [Ref.4-67] below.
- Missing ERROR 078 on AT+HFA while A2dp streaming and S355==0/2 [Ref. 4-56] – Found by regression testing, response was HF"AU2" and HFG"AU2", remote end should not indicate anything. Now fixed.
- Unexpected whitespace after "AVSV OK" [Ref. 4-58] – Fixed.
- AVRCP1.5 event capabilities, wrong flags on AT+AVGRE/AVQEC [Ref.4-59] – On transformation from EventID to bitmask, a -1 was missing in the shift command. Fixed now. For previous f/w version (22.1.4.4) values can be corrected by applying a shr 1 (>>1).

- Memory leak on AT+HFGC1 [Ref.4-60] – It was identified that repeated calls of AT+HFGC1 without additional parameters causing a memory leak. Fixed now.
- AT+AVQPR<n>: start tag 'AVPL $0001' was missing [Ref.4-61] – When querying range of player application setting values, the start tag was missing in the response. Fixed in source code.
- AT+AVQPE: unexpected 'AVPL ERROR $0007', 'ERROR 135' [Ref.4-62] – Observed when AT+AVQPE (query player app. settings values text) was issued without any extra parameter. Fixed now.
- AT+AVSPQ: AVFSL… with unexpected start offset [Ref.4-68] – The unexpected start offset was caused by a parameter <a> of a precedent command AT+AVQFS<a>,<b>. This has been fixed.
- FMC_HF_GREEN_BUTTON_REDIAL_PARAM (0x14) [Ref.4-70] – Values outside of range [0…3] are causing immediate re-dial (as if value==0). Has been fixed, values outside range are ignored now.
- MPS: missing FS44100 message on stream resume after call hang-up [Ref.4-71] – Observed in a particular MPS (multi profile spec) condition, now fixed.
- Missing 'OK' on AT+HFGA while A2DP streaming with S355=1 or 3 [Ref.4-57] – Found by regression test, now fixed
- Unexpected HFG status (ATI66) after AT+HFGCH operations [Ref.4-73] – When SLC connected, after terminating calls using AT+HFGCH, ATI66 returned '3' (InCallSlc) although no more call record was existing at HFG rather than the expected '1' (SlcConnected); fixed now.

Known Issues

- Total number of items for AT+AVQFS [Ref.4-67] –

> **Note:** If AT+AVQFS (query file system) is issued first time without precedent AT+AVQAP / AT+AVSBP, then no information about total number of items is available for the file system list (AVFSL…). If this information is regarded as important, then an extra AT+AVSBP is recommended initially.

- Theoretic possibility of internal UART Tx buffer overrun [Ref.4-69] – It has been identified that in theory there is certain (very low) risk of UART Tx data being lost due to buffer overrun. This could cause e.g. parts of AVRCP1.5 lists missing, including list terminators. Although it is regarded to be very unlikely, a detector was implemented to count such conditions if they should occur. Whenever there is a suspicion that this could have happened, ATI1009 (ComTxBufFailCnt) will confirm so if the value returned is > 0.
- MPS: unexpected order of messages 'FS44100, APSTR' vs. 'HF"AU0"' [Ref.4-63] – In an MPS (multi profile specification) scenario it was observed that under certain conditions, after finishing a call (closing the SCO channel) and on automatic A2DP stream resumption, the message HF"AU0" (SCO closed) was sent only after 'FS44100, APSTR' (A2DP audio on, A2DP stream resume). Although this is not expected and not logic, there was no way to solve this issue in short term. This is why, unfortunately, the parser of a host controller must be designed in a way to tolerate this behaviour.
- AUTO_BTX for HFG: revert to conn./disc. on connection released [Ref.4-72] – It was observed that in particular situations after disconnection of HFG ATI27==0 whereas ATI27==3 would be expected due to default S308 setting. In the precedent scenario HFG call records were tested and AT+HFGCH* was issued. This has not been investigated in more detail yet.
- Late AVPTC1 message [Ref. 4-54] – It was observed that under certain conditions AVPTC1 (confirmation button released) was sent quite late. E.g. when sending AT+AVC44 (start playing), AVPTC1 was received about 1s after start of audio stream (APSTR,<). Has not been investigated in detail.
- When in sniff-sub-rating mode: ATI44/144 returning 0:0 (no sniff mode) [Ref.4-48] – Given that sniff mode is a pre-requisite for sniff-sub-rating, ATI44/144 should not indicate no sniff mode by ATI44/144 = 0:0. Sub-rating intervals are integer multiples of current sniff interval.
- AT+SRM<pm> / AT+SRS<pm> not accepting decimal parameter 'pm' [Ref 5-35] – This was observed during regression test. Workaround: parameter profile mask must be passed as hex with '$' prepended.
- CVC-HS2mic with PCM or I2S interface – bad sound [Ref. 5-36] – Sometimes a bad sound was observed under this condition during listen tests. Has not been investigated in detail yet.

- **ATH* while incoming call ringing [Ref. 5-20] –** It was observed that sending ATH* to BTM51x while a call is incoming/ringing (HFP) can cause unexpected behaviour of BTM51x. Recommendation is to avoid this situation.
- **Arbitrary recovery time after disconnect [Ref.5-21]** – It was observed that an obviously arbitrary recovery time after disconnection is causing a 'NO CARRIER' response on a new connection attempt (AT+SPD… / AT+APD… / AT+AVD… etc.). Workaround: insert a 1 second delay before issuing a new connection command (0.5s may also do but possibly not as stable as 1s).

FIRMWARE VERSION 22.1.4.4 (ENGINEERING F/W)

April 2014

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release is engineering firmware and must be used for development purposes only.

The upgrade to AVRCP1.5 comes with plenty of new command and messages. They have been tested manually but are not covered by automated regression tests yet. Given that AVRCP1.5 contains a high level of complexity, it can happen that bugs or missing features become obvious when testing against different TG devices (e.g. phones). Please get in touch with Laird and help to improve the f/w with your feedback.

New Features (compared to v22.1.4.3)

- AVRCP1.5 for controller role (CT), including:
  - Absolute volume control
  - Now playing track attributes
  - Current play list
  - Folder browsing
  - Etc. …

AT Command Interface

This section lists the changes in the AT command interface with this firmware release. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New S-Registers

- S389 – Input function mapping codes (FMC) parameter
- S390 – AVRCP 1.5 configuration
- S391 – Enable UID cache

New ATIs

- ATI80 – AVRCP 1.5 diagnostics
- ATI350 – Detailed list of available CVC images, duplicate of ATI318

New ERROR Codes

ERROR 131	AVRCP, reserved
ERROR 132	AVRCP, reserved
ERROR 133	AVRCP, requested action or feature not supported by remote device

ERROR 134	AVRCP, operation failed (internal issue)
ERROR 135	AVRCP, received avrcp status code "not successful"
ERROR 136	AVRCP, browsing not supported
ERROR 137	AVRCP, not connected
ERROR 138	AVRCP, parameter mismatch or out of range (e.g. start offset > end offset)

Changed S-Registers

- S301 – AVRCP role, new range, new default value
- S302 – AVRCP category, new default value:

Other Changes

- New function mapping code (FMC) for input GPIO
- AT+BTL2 removed

Known Issues

- AT+AQFS<s>[,<e>] - parser issue with end_offset <e> – When passing the optional end_offset parameter <e> to this command, then an error is returned which is likely to be a parser issue. Workaround: don't use the optional <e> parameter, it will then default to <s>+9 which effectively returns 10 items at maximum, beginning with start_offset <s>.
- AT+AVVC: calculation of output gain from absolute volume – It has been observed that subsequent repeated incremental volume changes on the phone once in the sequence will produce the same output again. This occurs somewhere in the middle of the range, typically at 6 or 7.

FIRMWARE VERSION 22.1.4.3 (ENGINEERING F/W)

February 2014

General Information

This release contains a number of new features, partly requested by customers and partly required to pass Bluetooth SIG qualification (PTS testing), as well as a few bug-fixes.

New Features (compared to v22.1.4.2)

- Remote volume control for HFP and HSP
- Ringtones / status indication tones
- MPS (multi profile specification) compatibility layer
- Tolerant pairing policy / Android compatibility

AT Command Interface

This section lists the changes in the AT command interface with this firmware release. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New AT Commands

- AT+HFGG… – Command family: query / set / increment / decrement remote gain of HF
- AT+HSGG… – Command family: query / set / increment / decrement remote gain of HS
- AT+SIT<n> – Play a pre-defined tone
- AT+GO<n>, AT+GI<n> – Set absolute value of local <I>/<O> analogue gain
- AT+APB<x> – Block/reject any incoming A2DP connection, needed for PTS testing

- AT+AVB<x> – Block/reject any incoming AVRCP connection, was needed for PTS testing

New S-Registers

- S382 – Enable tolerant pairing policy / Android compatibility
- S386 – Enable MPS (multi profile specification) compatibility layer
- S387 – Tone volume (analogue output only)
- S388 – Ring tone select

Changed S-Registers

- S581 – HF supported features, new default value.

Application Notes

This section lists functional description of new features. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- Remote volume control (HFP, HSP)
- (Ring) Tones
- MPS compatibility layer
- Tolerant pairing policy/Android compatibility

Other Changes

- VGS/VGM indications for HS,HSG,HF,HFG – Now always printing two digits, padding with a leading '0' if value <=9

Fixed Issues

- HF notification when HFG changes its in-band-ring settings HF"+BSIR:0/1" [Ref 4-37] – This notification was not suppressed when S504=1 (silent operation enabled) but now it is. If an SLC exists, then the current HFG's in-band-ring setting can be queried from HF using AT+HFF?. Then apply the mask of 0x08 to the HFG supported features (second part of response).
- Command AT+GIR [Ref 4-38] – When restoring current input gain from S-Register, instead of expected input gain (S590) the output gain (S589) was referenced. This has been fixed.
- HSG: a connection attempt to another HSG was not rejected but successful [Ref 4-39] – This has been fixed. If the remote device is a HSG, then AT+HSGD<BdAddr> will now respond with "NO CARRIER", as expected.
- HSG - module reset on incoming connection from another HSG [Ref 4-40] – This has been fixed.

Known Issues

- GPIO output FMC "Audio On" (0x05) not working for (ring) tones [Ref 4-41] – A GPIO utilized to indicate audio activity (i.e. for control an external audio amplifier) does currently not indicate playback of a tone. On BTM51x-DVK-04, J9 should be set to position 3V3 in order to hear the tone.

FIRMWARE VERSION 22.1.4.2 (ENGINEERING F/W)

December 2013

General Information

This release contains a number of features which were missing in the previous version such as support for PCM/I2S interface and CVC (due to the changes in CSR API). A number of new features has been added an a couple of bugs were fixed.

New Features (compared to v22.1.4.1)

- Support for PCM and I2S (digital audio interfaces) added back in
- Fixed sampling rate for I2S and PCM: internal sampling rate conversion for external audio codec, for A2DP sink and (e)SCO
- Low power features for HFP,HSP and SPP: sniff mode (SM), sniff sub-rating (SSR)
- Pre-defined power setting parameters (AT&F0..8)
- Auto-BTX extended by multi profile policy
- CVC support completed, 7th generation, ADK 2.5.1
- A2DP encoders and decoders upgraded to ADK2.5 (SBC, APTX, AAC)

AT Command Interface

This section lists the changes in the AT command interface with this firmware release. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New AT Commands

- **AT&F7, AT&F8 –** pre-defined sniff/SSR parameters for HFP, HSP, and SPP.
- **AT+BTL7, AT+BTL8** – PCM cross loopback

New S-Registers

- S348 – SSR (maximum) remote interval
- S349 – SSR (minimum) remote timeout
- S350 – SSR (minimum) local timeout
- S364 – Delayed sniff mode (experimental)
- S365 – Initial power mode after entering a connection
- S384 – I2S format configuration, corresponds to PSKEY_DIGITAL_AUDIO_CONFIG (&01D9)
- S385 **–** Append channel info to unsolicited 'FS….INT' message

Changed S-Registers

- S308 – Auto-BTX extended by multi-profile policy
- S314 – A2DP audio interface select (re-enabled)
- S315 – (e)SCO audio interface select, re-enabled
- S318 – SCO DSP image select, disabled X2M (5)
- S419 – Loopback sampling rate, fixed sampling rate

New ATIs

- ATI44 – Current power mode (active / sniff / passive) and sniff interval of SPP/HSP/HFP
- ATI45 – Current sniff sub-rating (SSR) parameters of SPP/HSP/HFP link in slots
- ATI46 – Current link policy power table
- ATI144 – Power mode and sniff interval in ms
- ATI145 – Like ATI45, but all values in milliseconds instead of slots.
- ATI146 – Like ATI46, but all values in milliseconds instead of slots.

- ATI318 – detailed list of available CVC images

Changed ATIs

- **ATI35** – Compact list of available CVC images
- **ATI38** – List of A2DP decoder images

Other Changes

- ATI&Fx (x=1..8) – Changes sniff parameters for medium and low power configuration
- "FS…" message for PCM – Role indication appended: PCM**_M** (master) / PCM**_S** (slave)

Application Notes

This section lists functional description of new features. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- External PCM Configuration
- I2S Configuration
- SCO Audio Interfaces
- Fixed sampling rate (PCM / I2S), S419 mapping
- CVC, 7th generation
- Low power operation
- Page- and inquiry- scanning
- Multi-profile auto BTX (S308)
- Sniff mode (SM)
- Sniff sub-rating (SSR)
  Registers related to SSR:
  - S348 – SSR (maximum) remote interval
  - S349 – SSR (minimum) remote timeout:
  - S350 – SSR (minimum) local timeout:

  More details about SSR can be found in the BTM41x low power application note.
- Pre-defined power settings (AT&F0..8)

Fixed Issues

- **HFP1.6 specification** – Missing feature to reject audio request from HF [Ref.4-29]. This issue (as described in v22.1.4.1 'known issues') should be fixed now.
- **Support for digital audio interfaces PCM and I2S [Ref.4-29]** – PCM and I2S are supported again. Ranges of S314 and S315 adjusted as follows:

  S314 (A2DP audio interface select): 0..2 (onboard / I2S_M / I2S_S)

  S315 (SCO audio interface select): 0..4 (onboard / I2S_M / I2S_S / PCM_M / PCM_S)
- **AT+SPD… causing PAIR 2… if local link key not available [Ref 4-32]** – The connection attempt was not successful in this scenario. This issue has been fixed, a new pairing process will be initiated in this case.
- **Trusted device list with two entries (AT+BTT?) [Ref. 4-33] –** If in this scenario the second entry was deleted (using AT+BTD<BdAddr>), then the first entry also disappeared unexpectedly. This bug has been fixed.
- **AT+HFD with existing (locally initiated) SPP link causing parser lock-up [Ref 4-35] –** In this scenario the module did not respond any longer. May apply to other profile's 'Dial'- command as well. Was caused by an internal state machine bug and should be fixed now.

Other Changes

- **S318 range = 0…4 (X2M removed) –** The option to select X2M (2 microphone example for NB[8kHz] and WB[16kHz]) by S318=5 has been removed due to flash memory limitations

Known Issues

- **Garbling/scrambling like sound artefacts for CVC plugins in WBS mode [Ref 4-33] –** This issue is observed whenever the SPI connection between BTM51x and PC is inactive, i.e. UFE or PsTool is **not logically** connected, like in the final productive application. The noise originates from the send path (see UFE).
  Workaround:
  For HS1M (S318=1) and HS2M (S318=2), this issue can be worked around by disabling the AEC (acoustic echo cancellation) block in UFE. For HF (S318=3) such a workaround could not be found. Only disabling wideband speech / WBS [ATS376=0 / AT+HF(G)W0] would help here.
- **Instabilities with ACR/ACS [Ref 4-36] –** During regression testing, a couple of instabilities, related to auto connect record (ACR) and auto connect service (ACS) were observed in particular scenarios. These will be investigated in detail prior to next production release.

FIRMWARE VERSION 22.1.4.1 (ENGINEERING F/W)

August 2013

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release is based on CSR bluestack unified 26g and CSR libraries originated from ADK2.5 / Bluelab 6.3. Due to the number of fundamental changes in bluestack API and CSR libraries, this firmware version has a slightly higher risk of unknown issues being found during testing and application development. Nevertheless, existing regression tests have successfully passed which provides a basic level of confidence.

This release is engineering firmware and must be used for development purposes only.

New Features (compared to v18.1.4.0)

- Hands-free profile (HFP)
- CVC: support of 7th generation, UFE working with USB2SPI now, no LPT interface required any longer
- SPP-SCO using WBS
- Improved management of call records for HFG

AT Command Interface

This section describes changes in the AT command interface with this firmware release. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New AT Commands

- AT+UC<x>
- AT+RX<x>
- AT+HFN<x>
- AT+HFFV?
- AT+HFV<x>
- AT+HFW<x>
- AT+HFGV<x>
- AT+HFGW<x>
- AT+HFGW?
- AT+HFGF?
- AT+HFGFV?
- AT+HFGFN?
- AT+HFGCH*
- AT+HFGCHL

Changed AT Commands

- AT+HFGCA (HFG call answer)
- AT+HFGCH (HFG call hang-up)
- AT+BTT? (Query trusted device list)
- AT+GOU (Incremental increase of output gain - volume)

New S-Registers

- S376 – Enable WBS
- S377 – Enable CVC-BEX
- S378 – Close audio on voice recognition stop
- S379 – Enable all SLC RX messages
- S380 – Enable all unknown command messages
- S381 – HFP indicators enable mask
- S383 – Enable inquiry exception

Changed S-Registers

- S375 – Inhibit active encryption request
- S584 – Enable/Disable SCO/eSCO
- S581 – Set HF supported features
- S596 – Set HFG supported features
- S589/S590 – Set output gain level
- S689/S690 – Set output overall gain level

New ATIs

- ATI39 –Query current DSP image plus short string descriptor

New Asynchronous Messages

- HSRX"<data>" / HSGRX"<data>"
- HFRX"<data>" / HFGRX"<data>"
- HSUC"<data>" / HSGUC"<data>"
- HFUC"<data>" / HFGUC"<data>"

Changed Asynchronous Messages

- SCO/eSCO/WBS sampling rate (FS16000):
- Link key type appended to pairing message (PAIR 0 …):

New GPIO Function Mapping Codes (FMC)

- Outputs:
  - Indicate voice recognition status (HF): 7
  - Indicate voice recognition status (HFG): 8
- Inputs:
  - Toggle voice recognition activation (AT+HFVT): 18d (0x12)
  - Toggle voice recognition activation (AT+HFGVT): 19d (0x13)

New Codes for Status Indication (D744/D745)

- 18d (0x12) – Voice recognition active, priority for status 'voice_recognition active' is below status 'audio_on'

Application Notes

This section lists functional descriptions of new features. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- Wide Band Speech (HFP)
- Transmitting custom commands over SLC/ACL
- Inquiry exception
- Voice recognition activation
- SPP-SCO with wide band speech (WBS)
- Change of gain range (volume) for BTM51x on-board codec
- Pairing and link key type
- Other changes
  - DUN (dial up network) profile disabled
  - PAIR 1 vs. PAIR 2
  - Single connection per HS-HF and HSG-HFG profile instance:
  - ATI52 deprecated (encryption status of primary and secondary link)

Fixed Issues

- Command to make held call active – The new behavior of AT+HFGCA (see section 0) allows you to make a held call active [Ref. 4-4]
- HS-Service record issue – Changed order of HS service record UUIDs: 0x1108 now is placed on first, 0x1131 on second position. It was observed that legacy devices (HSG) were not connecting when seeing 0x1131 first. This should be fixed now that 0x1108 appears at first position in the service class list.
- HF indicators not suppressed in silent operation (S504=1) – Some HF indicators were still being sent to the UART although silent operation was enabled (S504=1). This has been fixed.

Known Issues

- PCM and I2S interface are not yet supported (S314, S315) – Support for external PCM and I2S interface has not been integrated yet with the new underlying firmware, due to significant changes in the API

and architecture. Therefore S314 and S315 are currently limited to a value of 0, meaning that only the on-board codec (ADC/DAC) is supported. [Ref. 4-30]

- CVC support is incomplete – AT commands and module functions related to CVC support were not fully tested and may not function properly (e.g. ATI35). This is due to some non-trivial changes in the CVC structure which were assigned a lower priority to be rectified.
- ATI51 (encryption status per connected profile) not working reliably – Wrong indications (flag cleared when expected to be set) were observed for ATI51 during testing, especially on repeated connections. Although a connected profile connection is encrypted, it is not being indicated as such in the ATI51 profile mask. This is caused by the underlying stack returning out-dated parameter values (of earlier connections).
  However, it has been manually verified that the bluestack confirms encryption of every new ACL to other BT2.1 devices, as it is mandated in the BT2.1+EDR specification.
  Suggestion is to ignore ATI51 until further notice. [Ref. 4-27]
- NO CARRIER <profile_uuid> inconsistent if connection rejected by remote device – For all profiles the profile_uuid is appended, except for HSG and HFG. [Ref. 4-28]
- HFP1.6 specification missing feature to reject audio request from HF – If a HFG doesn't have audio resource available (e.g. busy with an SPP-SCO link to another device), and a HF (SLC connected) requests audio (AT+HFA), then the codec negotiation takes place as defined in HFP1.6 spec, but the HFG doesn't initiate the actual SCO link due to unavailable audio resource. On the HF side, the expected HF"AU2" is missing and subsequent procedures may fail due to wrong internal audio state (still waiting for SCO from HFG). [Ref. 4-29].

FIRMWARE VERSION 18.1.4.0 (PRODUCTION F/W)

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release does not contain new features. The majority of existing features, as well as fixed issues have passed automated regression tests successfully. Some issues were discovered and fixed. Known issues exist as well. Fixed and known issues are described below.

This firmware is qualified for production.

New S-Registers

- S375 – inhibit active enforcement of encryption for remote devices BT2.0 or earlier

Resolved Issues

In comparison to v18.1.3.10 the following issues were fixed:

- S372 (prevent auto re-pair) only working once: It was observed that preventing automatic re-pair (if local link key exists but remote link key missing) only worked for the first connection attempt, because the local link key was deleted in this case. So a subsequent connection has re-initiated pairing although S372=1.
  This issue should be fixed now. Any connection attempt should fail if a link key exists locally but not remotely. The local link key will not be deleted. [Ref. 3-39]
- Function mapping code "Audio On" (0x05, output) was not working for HF audio. This issue should be fixed now. [Ref. 3-40]

Known Issues

- ATI11 responses 41,44 not working as expected for SPP:
  It was observed that ATI11 "NO CARRIER" reason codes 41 ("link loss") and 44 ("remote link key missing") do not work as expected for serial port profile (SPP) [Ref. 3-33]
- AutoConnect not successful for A2DP and AVRCP after link loss while HSP connection with active audio (SCO) exists to another device: It was observed that in this scenario no reconnection has occured although A2DP and AVRCP are in the ACR of DUT and the peer device is connectable.
  Workaround: after releasing the HSP SCO audio, A2DP and AVRCP were connecting automatically as expected. The reason could be lack of memory but this has not be confirmed as root cause yet. [Ref. 3-35]
- AT+HFGC1["<number_string>",<type$_{dec}$>]: a possible memory leak was identified for this AT command if the optional arguments <*number_string*> and <*type*> are passed. A memory leak can be identified if repeated calls of a particular AT-command is causing ATI1000 value (number of available memory slots) to decrease continuously. The issue has not been reproduced yet. [Ref 3-32]
- LED0/1 status indication phase difference: During an automated test it was observed if LED0 and LED1 are configured identically (S744==S745), on final disconnection of the test case (SPP disconnect), the point in time when the new blinking pattern is applied differs between LED0 and LED1 by about 1..2s, causing a phase difference of the blinking pattern between LED0 and LED1. [Ref. 3-37]
- Quick new connection after disconnection: unexpectedly failed connection attempts were observed if the new dial command was issued immediately after receiving "NO CARRIER.."

  Workaround: inserting a delay of at least 200ms before issuing the new dial command should solve the issue. [Ref. 3-41]
- AT+APD<BdAddr> responding one time unexpectedly with NO CARRIER under very particular circumstances. Sequence to reproduce: ATS372=1 (inhibit auto re-pair), SPP connect attempt unsuccessful (remote link key missing), ATS372=0 (allow auto re-pair), now a subsequent AT+APD attempt fails (NO CARRIER). But any subsequent AT+APD<BdAddr> should work as expected (new pairing involved).
  Changing S372 is probably not be a realistic use case, so this issue has been assigned very low severity. [Ref. 3-34]
- ATI51/52 (encryption status): There has been some confusion regarding encryption API functions in the underlying library. According to CSR newsgroups, all connections except SDP (service discovery profile) to a peer device of BT version 2.1 should be encrypted automatically with factory default S-register settings (security level S320=2).
  This also means that ATI51/52 response is only valid for peer devices which are BT2.0 or earlier. In addition it was observed that ATI51/52 may not always be correct for SPP.
  So if the peer device is BT version 2.1 or later, ATI51/52 can be ignored, because any connection will be encrypted (except SDP). For BT2.0 peer devices (and earlier), BTM51x with factory default S-Registers will actively enforce encryption for all profiles. If not wished, this default behaviour can be disabled by S375 (for incoming/outgoing/either direction).

Other Changes

The following alternative PS-Keys were removed from boot mode 1 (AT mode) in order to allow PsUpdate.bat to work with PSKEY_PCM_CONFIG32 and PSKEY_PCM_FORMAT:

ALT_PSKEY_PCM_CONFIG32(&01b3)

ALT_PSKEY_PCM_FORMAT(&01b6)

In previous f/w versions, changing the original key using PsUpdate.bat didn't have any effect for PSKEY_PCM_CONFIG32 or PSKEY_PCM_FORMAT, because boot mode alternative keys do always override the original key.

FIRMWARE VERSION 18.1.3.10 (ENGINEERING F/W)

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release contains a fix for AAC decoder implementation, bug fixes for issues found by regression testing and a few new commands and registers etc.

Persistent store management is explained in a dedicated section.

This release is engineering firmware and must be used for development purposes only.

New AT Commands

Management of persistent store:

- AT+NVQ<size> – query available free space in current flash segment, size=optional
- AT+NVF – flood current flash segment to trigger defragmentation on next reset

New S-Registers

- S374 – Automatic reset for host less operation

New Function Mapping Code Changes

Output FMC 0x06 has been added to indicate whenever any profile is connected.

Other Features/Functionality

- Management of persistent store

Resolved Issues

- A fix provided by CSR (ADK2.0) has been implemented to solve AAC compatibility issues with iOS devices. The fixed AAC decoder DSP image is now being used for each AAC connection. [Ref. 3-31]
- New maximum EIR data size = 112 (verify by ATI29)
  Due to changes in the memory layout the maximum size of EIR data had to be limited to 112 Bytes. This is required to prevent a module lock up loop which can occur if data with size > 112 Bytes contained in EIR persistent store which is copied to the baseband at boot time. The only way to recovery was deletion of some PSKEYs. [Ref. 3-14 / bz 273]
- Reboot on "AT+BTEW?"

  An bug was identified where a module reboot occurs if the data to be displayed contains non-printable characters (which would be displayed in their hex value with leading '\'). Example to reproduce: AT+BTE+""; AT+BTE+"\01A"; AT+BTEW; AT+BTEW?

  Firmware versions affected: v18.1.3.8, v18.1.3.9

  The issue should be fixed now. [Ref. 3-9 / bz 262]

  ATI28 (current sampling frequency for ADC,DAC): no value was displayed for SCO connections. Should be fixed now [Ref. 3-42]
- New range for S744 and S745: "1..17,0..10"
  [was "1..18,0..10" before, but status-ID 18 was invalid]

Other Changes

- SPP parser exception for auto connect:
  Up to now, when attempting an SPP connection, the AT parser was fully suspended until the connection was established ("CONNECT") or until the connect attempt failed ("NO CARRIER") for some reason. This was found to be inconvenient in auto connect scenarios. It happened that suddenly the AT parser did not react as expected due to the auto connect service (ACS) starting an SPP connection attempt in the background. To solve this, an exception was added which keeps the AT parser alive when ACS is attempting an SPP connection. However, only a limited subset of AT commands is available when ACS is enabled. Refer to section • "
- ".
- Added "AT+NVF" and "AT+NVQ" to the list of available commands when auto connect service (ACS) is enabled.
- Auto Connect Records:
  - On "AT+ACL<n>" (load AC record from persistent store to scratch memory) the index field is set to [0]. This allows distinguishing the scratch record from a record in persistent store: the scratch record (AT+AC?) should always have index = [0] whereas any record from persistent store (ATI72) should have an index of greater or equal [1].
- AC-service is disabled automatically if no more AC-records exists, e.g. after normal disconnect
- Changed year to 2013 on ATI5, new response:
  "Laird Technologies Inc, UK, (c)2013"

AAC Licensing

This firmware contains AAC technology which incorporates intellectual property owned by numerous third parties.

Supply of this product does not convey a license under the relevant intellectual property of those third parties nor imply any right to use this product in any finished end user or ready-to-use final product. An independent license for such use is required.

For details, please visit http://www.vialicensing.com.

FIRMWARE VERSION 18.1.3.9 (ENGINEERING F/W)

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release contains a first implementation of status indication for LEDs. Status indication complements the auto connect feature of previous release, enabling host-less operation of BTM51x for typical use cases.

In addition, dynamic registers are introduced with this release. This new type of register is designed to cope with future automation requirements.

A few bug fixes are contained as well.

This release is engineering firmware and must be used for development purposes only.

New AT Commands

- AT+SILx=y – test LED blink pattern
- AT+NVQ<size> – internal debug command for persistent store, size=optional
- AT+NVF – internal debug command for persistent store, should not be used

New S-Registers

- **S744 / S745** – LED blink pattern to status assignment (S744=LED0; S745=LED1)

New Function Mapping Codes (FMC)

- 0x05 – "AudioOn", for GPIO outputs:

New ATIs

- **ATI75** – query current BdAddr for cautious page scanning (=incoming peer address):

New Error Codes

114	ACR option flags wrong
115	tuple length doesn't match (DREG)
116	internal error code (DREG)
117	non-volatile memory for dynamic register exhausted (DREG)
118	maximum number of tuples exceeded (DREG)
119	maximum dynamic register data length exceeded (DREG)
120	internal error code (DREG)
121	internal error code (DREG)

Other Features/Functionality

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- Dynamic Registers
- Status Indication
- Example for host less operation

Resolved Issues

- Cautious page scanning (AT+BTP/G<BdAddr> and AT+BTM<BdAddr>):

  This feature was not working as expected for HFP,HSP and DUN. Incoming connection- and pairing requests were accepted from any device.

  Whenever a cautious page scanning address is set, only the device with matching BdAddr is expected to pair and connect successfully. Incoming requests from any other device are expected to be refused.

  This issue has been fixed now. [Ref 3-30]

  ATI75 allows querying the current cautious page scanning address which helps to make the process more transparent. Please read also section 0.

FIRMWARE VERSION 18.1.3.8 (ENGINEERING F/W)

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release contains mainly bug fixes for the previous release (18.1.3.7), as well as a few new ATI commands and S-Registers.

This release is engineering firmware and must be used for development purposes only.

New ATIs

- ATI51 – query encryption status combined (OR-ed)
- ATI52 – query encryption status separately

New S-Registers

- S372 – inhibit auto (re-)pair
- S373 – default ACR option flags

Other Changes

- S316 ignored for A2DP sink, see "Issues fixed / Memory shortage…" below.
- "AT+AVCnn" command group enabled while AC-service is running (ACS parser limitation)

Resolved Issues

- Entering repeatedly "AT+BTEW?" was causing reboot:
  A memory leak was discovered in the display function for this command. When memory slots are exhausted, the reboot occurred. Should be fixed now. [Ref. 3-9/2-20 bz 262/263]
- AT+BTT? (trusted device list, "TDL") inconsistent:
  When re-pairing a device which is already contained in the local TDL, this pairing was not shown any longer. First seen in 18.1.3.7. This issue should be fixed now. [Ref.3-27 / bz 291]
- Encryption inconsistent:
  Encryption was found to be inconsistent because it was not enforced for all profiles. It was enforced for A2DP and AVRCP in previous versions and possibly for HFP but obviously not for the remaining profiles. As of now, for all profiles (except DUN) on entering a connection, a request is sent to encrypt the link. ATI51 and ATI52 allow to query the current encryption status for all connected profiles. [Ref. 3-26 / bz 290]
- Memory shortage when using external audio codec (I2S, S314>0):
  For each codec enabled (SBC/APTX/AAC), two memory slots were consumed by the possibility of setting supported sampling rates of the external I2S device in the SEP capabilities using S316. As of now, S316 is ignored for A2DP sinks and support for 44.1kHz and 48kHz is advertised in the SEP capabilities per default. That means the external I2S device must be able to deal with both of these sampling rates. Other sampling rates are not accepted during SEP negotiation/configuration. No more memory slots are consumed for this usage scenario now. [Ref. 3-29 / bz 292]
- ACR-table in RAM was not cleared on AT&F* - This should be fixed now.

FIRMWARE VERSION 18.1.3.7 (ENGINEERING F/W)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

The new auto connect service (ACS) and auto connect records (ACR) allow automatic (re-) connection with flexible configuration. Refer to section 0 for an introduction and to section **Error! Reference source not found.** for an example.

This release contains new commands to manage the HCI role (master/slave) of BTM51x and to query status information of all connected profiles. This is allows optimizing performance in multi profile / multi device scenarios.

Firmware version v18.1.3.6 was skipped.

This release is engineering firmware and must be used for development purposes only.

New Features (compared to v18.1.3.5)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- Auto connect service (ACS) allowing automatic connection or re-connection initiated by BTM51x
- Auto connect records (ACR) allowing flexible configuration of ACS
- Status information for all connected profiles:
- Set local HCI role manually or automatically per profile on connect
- YES/NO button for secure simple pairing as new GPIO functions
- Connectable/discoverable by GPIO, optional time window (S371)
- Link supervision timeout (S535) applies to outgoing connections of all profiles now, new default value = 5 (s)
- Error message codes changed from 2 to 3 digits with leading zeroes
- Trusted ("AT+BTT?") device list now organised as FIFO
- Bug fixes for a couple of known issues (see below)

Other Features

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- Profile Mask

New AT Commands

- AT+SR<role>,<profile_mask> – request local HCI role for one given profile
- ATI54 – Print remote device's Bluetooth addresses of connected profiles
- ATI55 – Print RSSI (receiver strength indicator) for connected profiles
- ATI56 – Print local HCI role for connected profiles
- ATI11 – New codes for "NO CARRIER" reason:
- ATI72 – Query auto connect table (list of ACRs)
- ATI73 – Query auto connect service (ACS) status

New AT Commands for Auto Connect

- AT+ACSn: start/stop auto connect service (ACS)
- AT+ACS?: query status of auto connect service

ACR Scratch Record (Volatile Memory)

This section lists AT commands for manipulation of the ACR scratch record in volatile memory. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- AT+AC?: query auto connect scratch record
- AT+ACC: clear auto connect scratch record
- AT+ACA=<BdAddr> : set BdAddr
- AT+ACI=<interval> : set reconnect attempt interval in seconds
- AT+ACO=<option> : set option flags

ACR Table in Persistent Store

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- **AT+ACW :** write scratch record to persistent store (prepend)
- **AT+ACRn :** replace record in persistent store by scratch record
- **AT+ACLn :** load (copy) record from persistent store to scratch record
- **AT+ACDn :** delete one record from persistent store
- **AT+ACD* :** delete all records from persistent store

New S-Registers

- **S368 -** Set SLAVE role on connect:
- **S369 -** Set MASTER role on connect:
- **S319** – SPP smart disconnect
- **S370** – Auto Connect Service mode, bitmask
- **S371** – Discoverable / connectable window for FMC 0x11

Changed S-Registers

- **S535:** link supervision timeout in seconds
- **S559:** alternate response message for ERROR and OK bit mask

New Error Codes

Error Code	Definition
95	DSP plugin doesn't support 'query mode'
96	DSP busy
97	profile is busy with a current request
99	real error code is greater than 99 – query ATI12 to obtain the actual error code
100	ACR table not available in RAM
101	ACR - a record for the same BdAddr already exists in persistent store and at least one flag of that record's profile mask overlaps with the profile mask of the scratch record
102	ACR – write to persistent store was not successful
103	ACR – the history index passed doesn't exist
104	ACR is invalid (e.g. BdAddr=000000000000 or profile mask=0)
105	AC-service stopped by safety timeout (in status 'attempt')
106	ACR table empty, AC-service not started
107	AC-service must be stopped for modification of ACR-table
108	missing profile mask in S102: at least one profile flag contained in the ACR table is not set in S102
109	command not allowed when AC-service is running. Stop service to enable full parser
110	ACS precondition failed - module is discoverable and/or connectable
111	ACS precondition failed - inquiry in progress
112	ACS precondition failed - pairing in progress
113	ACS precondition failed - legacy SPP auto connect (AT+BTR) is enabled

New GPIO Function Mapping Codes (FMC)

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- Pairing Button "YES": 0x0E, equivalent to command AT+BTBY
- Pairing Button "NO" : 0x0F, equivalent to command AT+BTBN
- Cancel Inquiry: 0x10 (an equivalent AT command does not exist)
- Make discoverable/connectable: 0x11, equivalent to command AT+BTP

Other Changes

- ATI11 (reason for "NO CARRIER" message) is now updated for the reasons "link loss" (41) and "remote link key missing" (44). In the latter case, a new pairing is initiated automatically in order to make the connection attempt successful. Hence, "remote link key missing" should be seen rarely on ATI11. See also fixed issues below.
- If a connection attempt of the local BTM51x is actively rejected by a remote device (ATI11 returning 4), the profile UUID is now appended to the resulting "NO CARRIER" message (e.g. "NO CARRIER 1101"). The appended profile UUID can be suppressed by ATS329=1.

Resolved Issues

- AAC with short drop-outs when initiated from BTM51x:

  It was observed that the issue is fixed by the following command sequence:

  S368=$180 // request HCI slave for all AVRCP and A2DP connections

  AT&W // store S-registers in non-volatile memory

  With this setting, on each connection of either AVRCP or A2DP, the module issues a request to become slave. This fix was tested with an iPhone. The AAC audio signal did not contain short gaps when the iPhone is the master of the link. Alternatively to S368, the manual commands "AT+SRS,$80" or "AT+SRS,$100" solve the issue as well. In connection with an iPhone (A2DP,AVRCP) it was observed that changing the role for one profile (e.g. A2DP/$80) changes the role of the other connected profile (e.g. AVRCP/$100) as well. [Ref. 3-17 / 280]
- Unexpected disconnect in SPP command and connected mode when de-asserting DSR:
  This issue has been fixed and should not occur any longer. [Ref. 3-22 / 286]
- Incoming SPP stream is stopping after about 895 characters received:
  Typing one character on the local terminal application was required to resume incoming stream. This issue has been fixed [Ref. 3-21 / 285]
- Rfcomm not flushed on SPP disconnect:
  The remaining content of Rfcomm buffer is printed on next connection and any new data transfer is blocked. Rfcomm buffer need to be flushed on SPP disconnect. The issue has been fixed. [Ref. 3-25 / 289]
- Remote link key missing:
  If the remote link key is missing, but a local link key is available from a previous pairing, a new pairing is initiated automatically on connection attempt now. In previous versions the outcome of a connection attempt in this circumstance was a "NO CARRIER" message and ATI11 returning 6 ("connection has failed)". Provided the automatic pairing is successful, the connection attempt should be successful as well. [Ref. 3-3 / 261]

Other Features/Functionality

This section lists AT commands for passing the ACR scratch record to persistent memory and vice versa. Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- Auto connect service (ACS)

Known Issues

- When connecting to a Motorola Droid Razr phone (XT910) with APTX enabled (S307=1) but not streaming yet, ATI26 returns "SBC" instead of the expected "APTX". However, once audio streaming is started, ATI26 returns the correct response which is "APTX.." with extra information about the MusicManager version of the DSP image. This is regarded as cosmetic issue. [Ref 3-20]
- When issuing AT+SRx for Headset profile (HSP) with active audio channel (SCO), it was observed the role change doesn't work. [Ref 3-23]
  Workaround: close the audio channel (SCO) first, then the role change works.
  Command to close the audio channel: AT+HSB (from HS) / AT+HSGR (from HSG)

FIRMWARE VERSION 18.1.3.5 (ENGINEERING F/W)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release contains an upgrade of all A2DP encoders and decoders to CSR's most recent ADK2.0:

Encoders (A2DP source role): SBC, APTX

Decoders (A2DP sink role): SBC, APTX, AAC

All decoders now support MusicManager, a graphical tool for editing of A2DP post processing parameters (e.g. EQs, filters etc.). Interoperability issues which were observed with APTX should be fixed with this release.

Due to the upgrade to the latest APTx version, a new APTx license key is required. Please refer to the appropriate section below.

This release is engineering firmware and must be used for development purposes only.

New Features (compared to v18.1.3.4)

- MusicManager supported by all A2DP decoders (CSR ADK2.0)
- Initiating A2DP from BTM51x is now possible with optional codecs enabled (S307>0) Priority list of optional codecs when initiating A2DP:
- I2S sampling rate offset: S367 (experimental)

New S-Registers

- S367 – I2S sampling rate offset [0…2047] default=0:

Extended ATI Commands

- ATI26 – print current A2DP decoder info
- ATI38 – list available A2DP decoders

New APTx License Key

Due to the upgrade of APTX version, a new APTX license key is required. This will affect all BTM51x development kits with current firmware version of 18.1.3.4 and earlier.

Issue: audio signal will mute for the APTX decoder, once the firmware has been upgraded to 18.1.3.5.

Solution: please provide the Bluetooth device address(es) of your BTM51x development kit(s) to Laird Technologies (ATI4). We will subsequently send you instructions of how to install the new license key.

Other Changes (compared to 18.1.3.4)

- The link policy power table for SPP sniff mode is now limited to one row with "passive" mode. If sniff parameters enabled (affecting SPP only), then the mode is "sniff" and parameters are set as per S-registers. This should prevent high power consumption for one second when jumping to the first row of the table, which used to be "active mode" previously. [Ref 3-18]

Known Issues

- AAC with short drop-outs when initiated from BTM51x – If initiating an A2DP link from BTM51x (A2DP sink, S307=2 or 3) and the agreed codec is AAC (e.g. to an iPhone), then short dropouts were observed in the analogue audio signal. [Ref. 3-17 / 280]
- Maximum recommended output gain=12 to prevent distortion – During testing of A2DP decoders (SBC,AAC,APTX) against various source devices with a 0dB sine wave of 100Hz and 1000Hz, in some cases distortion occurred with the default output gain of 15 (AT+GO?). This distortion can be prevented by lowering the output gain (AT+GOD). Although there were slight differences, an output gain of 12 allowed to eliminate the distortion in all of the tested combinations. [Ref.3-16 / 282]

FIRMWARE VERSION 18.1.3.4 (ENGINEERING F/W)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release contains an updated AAC decoder which fixes a bug when playing a 1kHz sine wave at 0dB full scale. In addition, commands were added to cater for SysId/BuildNo query of post processing algorithms (MusicManager) and mode set/query for AAC and SBC decoder.

v18.1.3.3 is skipped for internal reasons.

This release is engineering firmware and must be used for development purposes only.

New Features (compared to v18.1.3.2)

- AT commands for SBC and AAC decoder post processing algorithms

New AT Commands

- AT+APMx – set A2DP decoder post processing mode, with x='0'..'5':
- AT+APM? – query current A2DP decoder post processing mode

New S-Registers

- S363 – set decoder post processing default mode [1..3]:

New and Extended ATI Commands

- ATI38 – List all A2DP sink decoders with post processing support
- ATI26 – This command has been extended to display SysId, BuildNo and DecoderFriendlyName when in A2DP streaming mode.

New ERROR Codes

- 93 – A2DP is not in streaming state or not in A2DP sink role (decoder)
- 94 – command not supported by current decoder plugin

Other Features

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- A2DP decoder post processing modes (SBC or AAC)

FIRMWARE VERSION 18.1.3.2 (ENGINEERING FIRMWARE)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This release does not contain new features, but 2 bug fixes of the production release 18.1.3.0, which are described below. Firmware version number 18.1.3.1 was skipped for internal reasons.

This release is engineering firmware and must be used for development purposes only.

Resolved Issues (compared to 18.1.3.0)

- AVRCP issue with Blackberry Bold 9700: There was an issue in ACRVP in v18.1.3.0. Although many devices and mobile phones worked well, some did not, for example the BB9700. The problem was that the BB9700 has either disconnected itself from AVRCP or not initiated an AVRCP link at all. This is fixed now [Ref.3-16].
- AVRCP direction indicator: A direction indicator ('<' or '>') for AVRCP was missing but is now present as well in the AVRCP CONNECT message. Example:

  "CONNECT 0016A4000B64,110E**,<**" - incoming

  "CONNECT 0016A4000B64,110E**,>**" - outgoing

  With the new S362=1 the AVRCP direction indicator can be suppressed, just in case backward compatibility is preferred. Otherwise, S331(direction indicator style) applies as well. [Ref 3-13]

New S-Registers (compared to 18.1.3.0)

- S362 – Suppress AVRCP direction indicator:

Known Issues

- All known issues, listed for v18.1.3.0 in section 0, still exist, except AVRCP direction indicator [Ref 3-13].

FIRMWARE VERSION 18.1.3.0 (PRODUCTION FIRMWARE)

Regression Testing

Automated regression tests have been executed to cover all implemented features as well as fixed bugs to a reasonable level. This aims to make sure that all AT commands and features function as described in the BTM51x user manual. However, given the huge amount of possible combinations of Bluetooth profiles, roles and S-Register settings, there may be untested use cases left.

This firmware is qualified for production. The BTM51x user manual is updated with this release as well.

Resolved Issues (compared to 18.1.2.5)

- ATI57 – Response for AVRCP flag was wrong (0x80), is now fixed (0x100)
- HFP – In the first SCO link (audio) after a module reset, the audio signal was not routed to the ADC/DAC, this has been fixed
- Auto SCO release on CVC security fail – When a SCO connection (audio) is established with CVC enabled (S318>0) and the CVC security check fails (ERROR 83), then the module automatically releases the SCO connection. The failed security check would block any audio signal to be routed through the ADC/DAC, so the auto release just cleans up this exceptional scenario. With properly configured CVC, the security check should always pass. However, during the development phase this issue can occur easily.

Changed S-Register Defaults

- S332 = 1 in factory default setting (was 0 before).

Limitations

- The maximum length for extended inquiry data is 112 Bytes. The Bluetooth specification allows up to 240 Bytes, but this cannot be achieved on BTM510/511 due to internal memory limitations. [Ref 3-1]
- External audio codec I2S master clock: in addition to the I2S signals (SD_IN, SD_OUT, WS, SCK), external audio CODECS often require a high frequency synchronisation clock from one master clock source in the system. This master clock would typically be created by the BTM51x and the clock frequency would be 12MHz or 24MHz. BTM51x has no means of providing this master clock to an external I2S device. If a 12MHz or 24MHz master clock is required, then BTM52x should be used instead of BTM51x. If master clock synchronisation is missing, then artefacts will be audible in periodic intervals. In the use case of a wave file player/recorder (no codec) the I2S signals are sufficient and no master clock synchronisation is required. [Ref 3-2]

Known Issues

- A connection attempt of any profile fails ("NO CARRIER") if the peer's device BD address is stored in the local list of trusted devices (AT+BTT? or AT+BTW?), but for any reason the local device's BD address is not stored in the peer's device trusted device list any longer (link key missing). [Ref 3-3]
  Workaround (a) (recommended): use AT+BTW<BdAddr> to initiate new pairing to generate new link keys on both ends.
  Workaround (b): the link key for the remote device can be deleted from the trusted device list (AT+BTD<BdAddr>) or from cache (AT+BTDW). A new connection attempt (e.g. AT+SPD<BdAddr>) should initiate new pairing automatically.
- HF: ATH111E and ATH* (for HF) do not respond with 'OK' but with 'NO CARRIER' only. [Ref. 3-5]
- HFG, call records: There are currently no AT command available for the following purposes:
  - Clear a waiting call [Ref. 3-6]
  - Make a held call active [Ref. 3-7]

- HFG: "AT+HFGE<ext_err_code>": an issue with extended error codes has been observed. AT+HFGE<ext_err_code> does not work as expected. Workaround: do not use extended error codes but simple error messages, i.e. AT+HFGE (without parameter). [Ref. 3-8]
- EIR: after repeatedly issuing AT+BTE+? or AT+BTEW? (provided data is stored in the RAM and persistent buffer) the commands stop working or only display a part of the buffered data. It has been observed that this issue occurs after in the regression tests after the 42nd repetition of the test sequence. [Ref. 3-9]
- HF: order of HF"AU0/1" messages: it has been observed that the position of HF"AU0" or HF"AU1" can vary within the asynchronous message sequence during a call or a call setup. [Ref 3-10]
- HSG: the asynchronous message 'FS8000,INT' is sent prior to 'HSG"B"' which is not correct. From a the logical sequence point of view one would expect 'HSG"B"' first and 'FS8000,INT' thereafter. However, the content of these messages is correct. [Ref. 3-11]
- HSG, CVC enabled: a redundant 'HSG"AU1"' is being sent between 'HSG"B"' and 'CVCID …' [Ref 3-12]
- AVRCP direction indicator missing: AVRCP does not display a direction indicator (incoming '<' or outgoing '>') when a connection is established. Compared to all other profiles this is inconsistent. [Ref. 3-13]
- EIR: when filling up the RAM buffer with > 112 bytes of EIR data (AT+BTE+"…") and writing the buffer to the baseband (AT+BTE~) a module panic occurs (reset). The length of EIR data is limited to <= 112 bytes with this release. [Ref 3-14]

FIRMWARE VERSION 18.1.2.5 (ENGINEERING FIRMWARE)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New Features (compared to v18.1.2.4)

- AAC codec support for A2DP sink
  - PCM interface now supported
- Additional audio features for SBC encoder (A2DP sink), configurable with CSR's UFE/Universal Parameter Manager via SPI interface:
  - Parametric equalizer
  - 3D stereo enhancement
  - Compander
- CVC support added for HSG, HFG and SPP-SCO (was limited to HS and HF in 18.1.2.4)

Extended S-Registers

- S307 – Enable optional A2DP codec:
- S315 – SCO audio interface select:

New ATI Commands

- ATI37 – SPP-SCO link type

New Error Codes

- 92: AT+BTAx not permitted, occurs if one of HF/HFG/HS/HSG and SPP is connected to one peer device. Reason: a SCO link is part of the HFP/HSP specification. Requesting SPP-SCO ("AT+BTAx") would cause confusion in this scenario.

Messages Changed

- SPP-SCO (AT+BTAx):

AAC Licensing

This firmware contains AAC technology which incorporates intellectual property owned by numerous third parties.

Supply of this product does not convey a license under the relevant intellectual property of those third parties nor imply any right to use this product in any finished end user or ready-to-use final product. An independent license for such use is required.

For details, please visit http://www.vialicensing.com.

Additional Features

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

- SCO Audio – Internal/External Audio Interfaces
- SCO Input/Output channel

Resolved Issues (compared to 18.1.2.4)

- HFP/HSP SCO request when SPP enabled: When one of HF/HFG/HS/HSG was enabled along with SPP and an incoming SCO request occurred, the message "AUDIO ON (SCO)" was printed to the UART, but actually something like HF"AU1" would be expected. A subsequent status mismatch was caused too. This issue has been fixed. [Ref 2-7]

General Information

This release is engineering firmware and must be used for development purposes only.

Firmware Version 18.1.2.4 (Engineering Firmware)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New AT Commands

- AT+HFFN?

Resolved Issues (compared to 18.1.2.3)

- PC-DCD issue (SPP): this issue [Ref 2-30] was only fixed if the connection was initiated from the PC side. But if the connection was initiated from BTM51x, the DCD line was not asserted on the PC's virtual COM port (can be detected with EzurioTerminal.exe). This second issue has been fixed now as well [Ref 2-34].
- A2DP reconnection issue: after closing down an A2DP connection in an unclean way e.g. by switching off Bluetooth at the peer device during streaming, the BTM51x made an automatic reset (panic) on entering the next A2DP connection. This issue has been fixed now. [Ref 2-33]

General Information

This release is engineering firmware and must be used for development purposes only.

FIRMWARE VERSION 18.1.2.3 (ENGINEERING FIRMWARE)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New Features (compared to v14.1.2.1)

- Clear Voice Capture (CVC) support, configurable DSP algorithms for noise reduction and echo cancellation (NREC) provided by CSR:
- New bluestack firmware:
  - New version = 23i
  - Build number = 6530 (ATI1)

New AT Commands

- AT+HFZ
- AT+HFF?

New ATI Commands

- ATI32 – Query CVC license key
- ATI35 – Query list of available CVC images with SYSID, security status, technical name and SDK
- ATI36 – Status of boot-time CVC license check, applies if S318 > 0
- ATI57 – Query profile flags of current connections, same format as S register 102
- ATI58 – Query number of current connections, sum of ATI60..ATI67
- ATI59 – Returns '1' if a pre-set PIN code (by AT+BTK="…") is available

New S-Registers

- S318: Select CVC DSP image

New Asynchronous Messages

- When a CVC image is loaded on entering a SCO (audio) link:
  "CVCID xxxx" whereby: xxxx = SysId (4 hex digits)
- When the security check for a CVC image has failed (invalid or no license key):
  HF"AU2" or HS"AU2"
  ERROR 83 will be returned as well.
  In this case the SCO link will remain but no audio can be heard due to failed security check. Make sure that a valid CVC license key exists and S318 contains the correct setting.

CVC Limitations

- Only the BC05 on-board codec is supported. External audio interfaces like PCM/I2S are not supported with this release.
- CVC only applies to SCO connections of the HF or HS instance. CVC does not apply to the audio gateway role of neither HFP (HFG) nor HSP (HSG).
- A license key is required for the CVC images. For development purposes, CSR provide free trial license keys. This firmware provides all necessary means in order to allow CVC trial development and license key management in conjunction with CSR tools. The application note "CVC on BTM5xx" describes the necessary details.

New Error Codes

- 82 – No CVC license key stored or more than 5 words (invalid length, ATI32)

- 83 – CVC security failed (on loading CVC image for a SCO connection)
- 84, 85, 86, 87 – F/W internal CVC error codes, should not occur with released firmware
- 88 – CVC SYSID request timeout, can occur on ATI35 if UART baud rate is too low
- 89 – HF request to disable NREC in HFG failed, because NREC feature is not supported by both ends. Support for both ends can be checked with AT+HFF? (NREC mask for HF=1; NREC mask for HFG=2)
- 90 – CVC boot time check failed: occurs if S318>0 at boot time and selected CVC image does not have a valid license key
- 91 – HF: "ERROR" was received from the HFG on a DTMF request ("AT+HFMi" on UART = "AT+VTS=i" on SLC)

Resolved Issues (compared to 14.1.2.1)

- A2DP 48kHz issue: when the module was configured as A2DP sink and the remote device sets up a DAC sampling frequency of 48kHz, the module has rebooted. This issue has occurred for example with the Broadcom Bluetooth stack and a couple of mobile phones. It was a bug in the module's firmware and has been fixed. [Ref. 2-31]
- S555=3: On expiration of the post reset time window (see S554) the module reverts to not discoverable/not connectable (ATI27=0) instead of connectable only (ATI27=2). This has been fixed. [Ref. 2-27]
- PC-DCD issue: when connecting to a PC via SPP, the DCD line was not asserted (can be seen on e.g. Ezurio Terminal) during the connection. This has been fixed. [Ref. 2-30]
- When a remote device enables Sniff Sub Rating, the Bluetooth device address of that device was printed to the UART unexpectedly. This has been fixed now [Ref. 2-29]

Resolved Issues (compared to 18.1.2.2)

- Incoming audio in a SCO link was blocked when a CVC image was selected. This issue has been fixed.

Known Issues

- When initiating an SPP connection from a BTM5xx to a PC with Microsoft Bluetooth stack, DCD is not asserted on the PC end. This can be detected by a terminal program, e.g. Ezurio Terminal. If the connection is initiated from the PC, then DCD is asserted as expected. [Ref 2-34]

General Information

The first part of the firmware version number has changed from 14 to 18. This reflects the transition from bluestack firmware 23e to 23i. The change was required in order to support the 5th generation of CVC. ATI1 now returns the new bluestack build number: 6530.

Firmware Version 18.1.2.2 (Engineering Firmware)

This engineering release was a preview version for 18.1.2.3 and was not distributed widely.

Version 18.1.2.2 is identical with 18.1.2.3 from the feature's prospective.

However, 18.1.2.2 contains a bug which blocks incoming audio in a SCO link if CVC is enabled. This issue is fixed in v18.1.2.3.

FIRMWARE VERSION 14.1.2.1 (ENGINEERING FIRMWARE)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

General Information

This firmware is an engineering release for a particular project. It contains a new feature for a HF to request creation of DTMF tones from a HFG (e.g. mobile phone) as well as a couple of bug fixes.

This release is engineering firmware and must be used for development only. The new features of this release are not covered yet by automated regression tests. There have been manual sanity checks but there might still be bugs and untested use cases left.

New AT Commands

- AT+HFM<x> (with <x>=0…9,*,#,A...D)

Resolved Issues (compared to 14.1.2.0)

- Secure Simple Pairing (SSP): leading zeroes were not displayed in the SSP passkey of the following asynchronous messages:

  PAIR ? <BdAddr>, "<friendlyname>",<Passkey>

  PASSKEY N <BdAddr>,"<friendlyname>",<Passkey>

  Therefore it was possible that passkey contained less than 6 digits. This has been fixed now. Leading zeroes will be inserted so that a 6 digit passkey will be guaranteed in any case. [Ref 2-25]

- Serial Port Profile (SPP): On the hang-up attempt of the 7th SPP connect/disconnect cycles, the module went through a reset automatically. This could possibly lead to issues because this behaviour is probably not expected by the host controller. However, this issue has been fixed now. [Ref 2-21]
- Serial Port Profile (SPP): When issuing AT+BTX (disable discoverable and connectable) in command and connected mode of SPP, and subsequently issuing ATO, ERROR 04 was returned which was preventing the return to data and connected mode (SPP). This issue has been fixed. [Ref. 2-26]

FIRMWARE VERSION 14.1.2.0 (PRODUCTION FIRMWARE)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New Features (compared to v14.1.1.2)

- I2S digital stereo audio interface support:
- GPIOs (general purpose input/output) support:
- Full APTX license for all modules from production (not for field upgrade)
- EIR (extended inquiry response data) improved, maximum data length = 160 Bytes
- Tested by regression tests
- All features of previous production and engineering firmware (v14.1.1.0, v14.1.1.1, v14.1.1.2)

New and Enhanced AT Commands

- AT+BTL3: I2S cross loopback mode, I2S master, sampling rate defined by S419

- AT+BTL4: I2S cross loopback mode, I2S slave, sampling rate defined by S419

New ATI Commands

- ATI28: query current audio sampling rate, displayed for input and output
- ATI29: query maximum data length for EIR data
- ATI30: query current RAM buffer length (EIR)
- ATI31: query current baseband buffer length (EIR)
- ATI411: short press duration (time in ms)
- ATI412: medium press duration (absolute time in ms, S411+S412)
- ATI413: long press duration (absolute time in ms, S411+S412+S413)

New S-Registers

- S309: Enable asynchronous "FS" message (currently used sampling frequency)
- S314 : A2DP audio interface select
- S315 : SCO audio interface select
- S316 : external codec sampling frequency capabilities for A2DP
- S650: GPIO pin state mask
- S651..S658: GPIO configuration registers, for details see below "GPIO Configuration"
- S669: GPIO input strong bias enable bitmask
- S670: read/write pin states of all GPIOs in one step
- S411: short press duration in (ms), granularity 200ms
- S412: medium press duration in (ms), added to value of S411, granularity 500 ms
- S413: long press duration (ms), added to values of S411+S412, granularity 500 ms

New Asynchronous Messages

- Current sampling frequency:
  "FSddddd,<interface>" whereby:
  ddddd=sampling frequency in Hz (4 or 5 digits)
  <interface> = "INT" (internal codec) / "I2S_M" (I2S master) / "I2S_S" (I2S slave)
  FS-message can be disabled by S309 or S504.

New Error Codes

- 79: writing to modem control line is not permitted by GPIO S-register
- 80: attempting to write the pin state of a GPIO that is configured as input
- 81: Maximum size of EIR data exceeded (ATI29)

General Information

All Features described for this firmware version (v14.1.2.0) have been tested by automated regression tests to a reasonable level. A number of bugs have been found and were fixed before releasing this firmware.

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

Resolved Issues (compared to 14.1.1.2)

- The implementation of the EIR commands (AT+BTE family) have shown a number of instabilities in previous f/w versions. Many of these issue have been resolved and the EIR implementation can be

regarded as much more stable with this version. It was also found that the maximum EIR data length is limited to 160 Bytes due to internal memory limitations. [Ref. 1-28]

- When inquiring with friendly name (e.g. AT+BTIN) and a remote device was discoverable but not connectable, this remote device was not listed in the inquiry results though discoverable. This has been fixed now. If the friendly name cannot be retrieved (e.g. due to not connectable), then a '!' will be displayed instead of the friendly name. [Ref 1-29]
- Range of S102 limited to 0...$1FF (was 0..$7FF)

Known Issues

- The maximum length for extended inquiry data is 160 Bytes. The Bluetooth specification allows up to 240 Bytes, but this cannot be achieved on BTM510/511 due to internal memory limitations. [Ref 2-1]
- 4 out of the 8 GPIO lines are bound to modem control line functionality (DTR, DSR, DCD, RI). Hence, only the 4 remaining GPIO lines are "real" GPIOs. [Ref 2-2]
- External audio codec sync: in addition to the I2S signals (SD_IN, SD_OUT, WS, SCK) , external audio CODECS often require a high frequency synchronisation clock from one master clock source in the system. This master clock would typically be the BTM51x and the clock frequency would be in the range of 12MHz or 24 MHz or similar. BTM51x cannot provide this clock to an external I2S device. BTM52x possibly can, but confirmation an tests are still outstanding. If this high frequency clock synchronisation is missing, artefacts will be audible in periodic intervals. In the use case of a wave file player/recorder (no codec) the I2S signals are sufficient and no HF synchronisation is required. [Ref 2-3]
- Auto connection at boot time (AT+BTR) only applies to SPP [Ref. 2-4, 1-4]
- S324 is ignored, SSP timeout is fixed to about 30 seconds (probably error in CSR library) [Ref. 2-5, 1-3]
- When the link key for a device is existing locally (AT+BTT? or AT+BTW?) but the link key is missing in the remote device (e.g. it was deleted there), creating a connection (AT+SPD<BdAddr>) will result in NO CARRIER rather than new pairing. This issue is caused by the underlying Bluetooth stack and can only be resolved with a future update. The first number of the firmware version (14 here) indicates the Bluetooth stack version in use. So in every firmware version beginning with '14' this issue will be present. [Ref. 2-6, 1-7]
  Workaround (a) (recommended): use AT+BTW<BdAddr> to initiate new pairing to generate new link keys on both devices.
  Workaround (b): the link key for the remote device can be deleted from the trusted device list (AT+BTD<BdAddr>) or from cache (AT+BTDW). A new connection attempt (AT+SPD<BdAddr>) should initiate new pairing automatically. However, this might not work with some legacy (BT2.0 and earlier) devices. Hence workaround (a) is recommended.
- It has been observed that the audio related USMs for HFP and HSP (e.g. HF"AU1" / HFG"AU1" / HS"AU1" / HSG"AU1") can appear as „AUDIO ON (SCO)" or "AUDIO ON (eSCO)". This not intended and can happen if SPP is enabled along with HFP or HSP. Workaround: disable SPP in S102 if not needed. [Ref 2-7, 1-26]
- ATH* and ATH111E do not work with HS instance (Headset unit of HSP), workaround: use AT+HSH instead. [Ref. 2-10]
- HFG, call records: There are currently no AT command available for the following purposes:
  - Clear a waiting call [Ref. 2-11, 1-16]
  - Make a held call active [Ref. 2-12, 1-17]
  - Clear a held call [Ref. 2-13, 1-18]
- HFG: "AT+HFGE<ext_err_code>": an issue with extended error codes has been observed. AT+HFGE<ext_err_code> does not work as expected. Workaround: do not use extended error codes but simple error messages, i.e. AT+HFGE (without parameter). [Ref. 2-14, 1-10]
- EIR: after repeatedly issuing AT+BTE+? or AT+BTEW? (provided data is stored in the RAM and persistent buffer) the commands stop working or only display a part of the buffered data. It was not possible to manually reproduce this issue consistently.[Ref.2-20]

FIRMWARE VERSION 14.1.1.2 (ENGINEERING FIRMWARE)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New Features (compared to v14.1.1.1)

- APTX codec for A2DP source (fully) and sink (demo) supported:
- Configure UART for high throughput or low latency

New ATI Commands

- ATI26: query active A2dp codec
- ATI27: query current scan state

New S-Registers

- S307 : optional A2DP codec enable [0..1], default = 0
- S308 : Auto-BTX on A2DP connection [0..3], default = 3
- S544 : configure UART for high throughput or low latency (default=1,high throughput)

Other Changes

- Maximum number of trusted devices changed back from 9 to 10 (ATI6)

General Information

This release (v14.1.1.2) is engineering firmware and must be used for development only. The new features of this release are not covered yet by automated regression tests. There have been manual sanity checks but there might still be bugs and untested use cases left.

Resolved Issued (compared to 14.1.1.1)

- If S504=1 (silent operation enable), the "CONNECT" message was not suppressed on "ATO", this has been fixed [Ref. 1-27]
- New S308 is automating the workaround of AT+BTX after creation of A2DP connection [Ref 1-23]

FIRMWARE VERSION 14.1.1.1 (ENGINEERING FIRMWARE)

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

New Features (compared to v14.1.1.0)

- Support for simultaneous A2DP + HFP added
- Support for extended inquiry response (EIR) data enhanced, enabling up to 240 Bytes of EIR data

New AT Commands

- AT+APU : suspend A2DP streaming but retain A2DP link
- AT+APR : resume A2DP streaming
- AT+BTE : clear EIR data from baseband
- AT+BTE? : query EIR data from baseband
- AT+BTE="<data>" : write EIR data to RAM buffer and baseband

- AT+BTE="" : delete EIR data from RAM buffer and baseband
- AT+BTE+"<data>" : append EIR data to RAM buffer
- AT+BTE~ : copy EIR data from RAM buffer to baseband
- AT+BTE+? : query EIR RAM buffer
- AT+BTE+"" : clear EIR RAM buffer
- AT+BTEW : copy EIR RAM buffer to persistent store
- AT+BTED : delete EIR data from persistent store
- AT+BTEW? : query EIR data from persistent store,
- note: the content of the persistent EIR data storage is copied to the baseband at boot time

New S-Registers

- S355 : audio resource override [0..3], default = 1:
- S356 : enable restoring of last gain used for SCO [0..3], default = 3:
- S357 : enable restoring of last gain used for A2DP [0..3], default = 3:

New Unsolicited Messages

- APSTR,< : streaming started, initiated remotely
- APSTR,> : streaming started, initiated locally
- APSUS,< : streaming suspended, initiated remotely
- APSUS,> : streaming suspended, initiated locally

New ATIs

- ATI61:
- ATI21: SCO token, index of the profile instance owning an active SCO connection (0=none, 1=HS, 2=HSG, 3=HF, 4=HFG, 5=SPP_BTA)
- ATI22: last SCO output gain
- ATI23: last SCO input gain
- ATI24: last A2DP output gain
- ATI25: last A2DP input gain

New Error Codes

- 76: memory allocation attempt was unsuccessful
- 77: incorrect A2DP state (see ATI61)
- 78: request rejected due to priority (related to S355 settings)

Other changes

- Maximum number of trusted devices changed from 10 to 9 (ATI6)

General Information

This release (v14.1.1.1) is engineering firmware and must be used for development only. The new features of this release are not covered yet by automated regression tests. There have been plenty of manual sanity checks but there might still be bugs and untested use cases left.

Resolved Issued (compared to 14.1.1.0)

- Deprecated undocumented usage of LED1 to indicate audio related states (e.g. loopback) [Ref. 1-24]

- Module was not discoverable after releasing an SPP connection (ATH) while S512=4 [Ref 1-25]. This issue has been fixed.

Known Issues

- It has been observed that an A2DP source with an active SCO connection (HFG) will reject an incoming A2DP connection request if A2DP is not allowed to override SCO (S355). In the same circumstance the A2DP source can initiate an outgoing A2DP connection, but it will not initiate the start of the A2DP stream. This is not really an issue, but the different behaviour towards incoming and outgoing connections might not be expected as this.
- It has been observed that the audio related USMs for HFP and HSP (e.g. HF"AU1" / HFG"AU1" / HS"AU1" / HSG"AU1") can appear as „AUDIO ON (SCO)" or "AUDIO ON (eSCO)". This not intended and can happen if SPP is enabled along with HFP or HSP. Workaround: disable SPP in S102 if not needed. [Ref 1-26]

FIRMWARE VERSION 14.1.1.0

Refer to the BTM51x User Guide and Hardware Integration Guides for detailed information. Documentation can be found on the Laird Embedded Wireless Solutions Support site on the BTM51x Product Pages.

Features

- Bluetooth 2.1 / 2.1+EDR
- Supported Profiles:
  - Serial port profile (SPP)
  - Advanced Audio Distribution Profile (A2DP, Source / Sink)
  - Audio/Video Remote Control Profile (AVRCP, Control / Target)
  - Hands-free Profile (HFP, Hands-free unit and Audio Gateway)
  - Headset Profile (HSP, Headset and Audio Gateway)
  - Dial-up Network Profile (DUN, Dial Terminal)
- SCO/eSCO audio connection
- Sniff mode
- Standard / non standard UART baud rates configurable
- Secure simple pairing (SSP)
- Extended inquiry response (EIR)
- CSR Bluestack build 5365 (native mode, 56bit encryption, 23e)
- Bluetooth approval, listed under QDID B016227
- Tested by regression tests

Changes in AT Command Set (compared to 14.0.0.11)

- New feature "Call Records": AT+HFGC? – query call records
- New S-register: S354 – enable/disable verbose mode for call record presentation
- New command: "AT+HFGB0/1" (disable/enable in-band-ringing) when SLC connected
- HF state (ATI65) enhanced by 5 (call setup – SLC) and 6 (call setup – audio)
- "AT+HFGH" returns ERROR 63 when issued during a call setup state (ATI66 = 5 or 6)
- "AT+HFGA" and "AT+HFGR" return ERROR 63 when issued during a call setup state (ATI66 = 5 or 6)

Resolved Issued (compared to 14.0.0.11)

- AVRCP – A BTM410/411 has refused incoming AVRCP connections (observed in CT and TG role); this has been fixed [Ref. 0-2; 0-3]

- AVRCP – Company ID was incorrect in "AVUR" response to "AT+AVU"; this has been fixed [Ref. 0-4]
- AVRCP – Operation ID "previous channel" (0x32) missing in documentation, Operation IDs 0x32…0x37 wrong by one in documentation; has been corrected in documentation and updated in firmware. The previously wrong operation IDs have been shifted by one to be correct, e.g. "page down" corresponds to 0x38. [Ref. 0-6]
- ATS690=? has reported 215..215. This issue has been fixed [Ref. 0-7]
- AT+GIU and AT+GOU went up to 23 but maximum value is 22. This is fixed now. [Ref.0-8]

Known Issues

- GPIOs not accessible by AT-commands, [Ref. 1-5]
- In some cases General Bonding (automated pairing during connection setup) with **legacy** devices (BT2.0 or earlier) does not work. It did not work when tested against a BISM2. However the issue did not appear when tested against a BTM510 that was converted to BT2.0. or when tested against a BTM430 (BT2.0). This implies that this issue is likely to be caused by the remote device. [Ref. 1-1]
  Workaround: use AT+BTW<BdAddr> to initiate dedicated bonding prior to connection establishment with a legacy devices.
- S324 is ignored, SSP timeout is fixed to about 30 seconds (probably error in CSR library) [Ref. 1-3]
- When the link key for a device is existing locally (AT+BTT? or AT+BTW?) but the link key is missing in the remote device (e.g. it was deleted there), creating a connection (AT+SPD<BdAddr>) will result in NO CARRIER rather than new pairing. This issue is caused by the underlying Bluetooth stack and can only be resolved with a future update. The first number of the firmware version (14 here) indicates the Bluetooth stack version in use. So in every firmware version beginning with '14' this issue will be present. [Ref1-7]
  Workaround (a) (recommended): use AT+BTW<BdAddr> to initiate new pairing to generate new link keys on both devices.
  Workaround (b): the link key for the remote device can be deleted from the trusted device list (AT+BTD<BdAddr>) or from cache (AT+BTDW). A new connection attempt (AT+SPD<BdAddr>) should initiate new pairing automatically. However, this might not work with some legacy (BT2.0 and earlier) devices. Hence workaround (a) is recommended.
- All profiles: It has been observed, that after profile disconnection ("NO CARRIER") a delay of at least 200ms is required, before the module can initiate a connection again successfully. [Ref. 1-8].
- AVRCP: It has been observed that on a link between two BTM510/511, one end configured as target (TG), the other end configured as control (CT), a value of "Bad profile" in S311 (AVRCP response type) at the target side is causing a timeout response (AVPTC 4,<OpId>,0) to AT+AVC<OpId> issued at the CT side. It has not been clarified if this issue is caused by either TG or CT. [Ref. 1-9]
- HFG: "AT+HFGE<ext_err_code>": an issue with extended error codes has been observed. AT+HFGE<ext_err_code> does not work as expected. Workaround: do not use extended error codes but simple error messages, i.e. AT+HFGE (without parameter). [Ref. 1-10]
- HFG: "ATH11F" does not release SLC but returns ERROR 56. Workaround: use "AT+HFGH" instead. [Ref.1-11]
- HFG: "ATH*" displays "NO CARRIER" but does not release the SLC. Workaround: use AT+HFGH instead [Ref. 1-12]
- HFG, call records: There are currently no AT command available for the following purposes:
  - Clear a waiting call [Ref. 1-16]
  - Make a held call active [Ref. 1-17]
  - Clear a held call [Ref. 1-18]
- Multiple profiles: The usage of multiple profiles at the same time (other than A2DP and AVRCP) has not been tested and might cause issues. Only the profile(s) which is/are used shall be enabled. If too many profiles are enabled, the module can become instable and reboot due to lack of memory. [Ref 1-21]
- Multiple profiles: A2DP-SNK, AVRCP-CT, HF : this scenario would require additional AT commands and S registers which are not available with this firmware.

- A2DP-SNK: when connected to an A2DP source and streaming audio, sometimes gaps in the audio stream have been observed. This was due to the module still being in discoverable and connectable state after A2DP has connected. The problem could be solved by issuing "AT+BTX" (make module not discoverable and not connectable). [Ref. 1-23]
- Undocumented usage of LED1 to indicate audio related states (e.g. loopback) can disturb normal operation of LED1 [Ref. 1-24]
- Module is not discoverable after releasing an SPP connection (ATH) while S512=4 [Ref 1-25]

Interoperability Tests with Mobile Phones

Phone	Test (role of BTM51x)	Result / Comment
HTC Touchpro 2 (windows mobile, BT2.1)	Inquiry/Pairing	no serious issues
	HFP (HF)	no serious issues
	HSP (HS)	incoming connection accepted by phone, but no audio is initiated by phone when AT+HSB was issued at BTM
	DUN (DT)	no issues
Sony Ericsson K800i (BT 2.0)	Inquiry/Pairing	no issues
	HFP (HF)	no issues
	HSP (HS)	not supported by phone
	DUN (DT)	no issues
Nokia E71 (BT 2.0)	Inquiry/Pairing	BTM can be found by phone, pairing can be initiated by phone
	HFP (HF)	connection from BTM is accepted but released immediately by the phone.
	HSP (HS)	Not tested
	DUN (DT)	Not tested