Bluetooth™ Module Specification

Model number	Function	Specification revision	Remarks
UGTZ2-¤¤¤A UGTZ4-¤¤¤A	On chip Antenna / Coax. RF connector Flash memory (256k bytes), Reference oscillator built in UART or USB interface	Advanced Info 2.8.4	

Digit	Definition	Contents
Digit 0~3	Bluetooth™ Module Including Base Band	UGTZ
Digit 4	Antenna output	Built in SMD antenna =“2” With Coax. RF connector =“4”
Digit 5	Status of products	X: Engineering Sample -: Mass production
Digit 6	Power class & Connector type	Class 1 & B-B, UART =“1” Class 1 & B-B, USB =“A”
Digit 7~8	Serial number	Customer dependent
Digit 9	Revision	Starting from A

All specifications are preliminary which may be changed without any prior notice

CONFIDENTIALITY NOTES:

This specification contains confidential information, which shall not be provided to any third parties without agreement notice.

This product is subject to export regulations of Japanese government.
It should not be exported without authorization from the appropriate governmental authorities.

GENERAL

PURPOSE AND SCOPE

This document contains the specifications pertinent to the radio module for Bluetooth™ system, which comply with BLUETOOTH™ DOCUMENT Version August1.0 issued in August 1999.
ALPS Bluetooth™ Module contains complete radio part including antenna and base band processor (16bits RISC processor, flash memory, RAM). Also high accuracy reference oscillator is built in and sub clock for extremely low power management purpose. Protocol software is already downloaded which is interface to HCI layer.

STANDARD OPERATING CONDITIONS

Qualified temperature	Nominal: +15 °C to +35 °C Extreme: 0 °C to +40 °C
Operating Temperature	0 °C to +60 °C
Storage Temperature	-25 °C to +75 °C
Supply Voltage VCC_OC	Nominal: +3.3 V Extreme: +3.3 V ± 0.1 V
Supply Voltage VCC_PA	Nominal: +3.3 V Extreme: +3.3 V ± 0.1 V
Absolute Maximum Ratings Supply Voltage	+3.6V
Reference Oscillator	<±20 ppm

FEATURES LIST

Features	Contents
Antenna	SMD ceramic antenna
Coax. RF Connector	HIROSE U.FL-R.SMT
Power level	Class1 (+20 dBm Max.) Class3 (0 dBm Max.)
Program memory	256k bytes x 16 bits Flash
RAM	20k bytes x 16 bits
Reference oscillator	Built in
Sub clock oscillator	Built in
Audio interface	PCM A-Law, μ-Law (CVSD)
Serial data interface	UART / USB (OHCI, UHCI)
Physical connector	Board to board (Panasonic AXKF20345)

MECHANICAL CHARACTERISTICS

Aspect	No contamination No scratches No strains
Dimensions	Refer to assembly drawings
Weight	TBD g Typ.

DESCRIPTION OF MODULE

Radio

Bluetooth™ Module fully integrated 2.4 GHz radio transceiver with Class1 or Class3 power amplifier, receiver and frequency-hopping synthesizer. For design comfort, ceramic antenna is built in together. In order to facilitate power management each section of the radio may be powered up and down separately. Various switches have been added to control power to the transmitter, the frequency synthesizer/VCO, the receiver and the LNA.

Base band

Bluetooth™ Module contains link controller, which performs all the real-time functions of the Bluetooth™ baseband protocol layer, including data transfer and connection management. The device also controls states of operation enables sniff, park and hold modes of operation. Real-time functions such as frequency-hopping burst timing and clock synchronization are also implemented in this hardware. During data transmission, the transmitter side This is required for flow control and the fast acknowledgement dictated by Bluetooth™. Further processing is required to format the data into the Bluetooth™ packet format before it may be applied to the GFSK modulator. On the receive side the controller performs error correction and de-scrambling before de-packetizing the incoming payload and storing it in RX buffers.

The link controller hardware also implements the basic, repetitive actions of paging, inquiry, page or inquiry scans and the general Bluetooth™ modes of park and sniff. This ensures that the processor used to implement the Link Manager and other lower layer protocol can be kept inactive. In doing this it should be noted that for low-power modes
Detail Functions of base band is described as below.

FEC - Forward Error Correction

FEC provides the ability to correct any errors, which might have occurred during the transmission of the original data. FEC rate of 1/3, 2/3, and Automatic Repeat Request (ARQ) are implemented.

Whiten / De-whiten - Scramble/Unscramble

Whitening/Scramble refers to the addition of randomized data to avoid any undesirable DC bias effects in the transfer of data packets. De-whitening/Unscramble is the reversal of the original process where the original data can be extracted.

Encrypt/Decrypt - Apply/remove encryption

Encryption is the security feature where keys are used to prevent the access of data to unauthorized sources. This functional block is responsible for the processing of authentication and key management functions required by Bluetooth™

CRC - Cyclic redundancy check

This is the error detection function implemented to process the CRC field within the payload section of a Bluetooth™ transfer packet. On the receive side, the CRC is checked with the expected value based on algorithms. On the transmit, and proper CRC is generated to and appended to the payload.

HEC - Header error correction

This is the error correction function implemented dealing with the 8-bit HEC field of the Bluetooth™ packet header as specified in Version 1.0B spec.

ATTENTION

For FAA (Federal Aviation Association) compliance

FAA proposal is to restrict use of any wireless devices during entire flight. This restriction is applied for also Bluetooth™ as well. Customer must implements disable switch of Bluetooth™ functionality by hardware or software. Module contains disable and enable radio over extended HCI commands, which shall be implemented into application software for any products, which might be carried out to airplane.

RADIO PART SPECIFICATION

COMMON PHYSICAL LAYER SPECIFICATIONS

Operating Frequency	2402 MHz to 2480 MHz
Carrier Spacing	1.0 MHz
Channel	79 (22 for France)
Duplexing	TDD
Symbol Rate	1 Mbps
Modulation Method	GFSK BbT = 0.5
TX Modulation Polarity	Binary one: Positive Frequency Binary zero: Negative Frequency
RX Data Out Polarity	Fc+dF:"H" Fc-dF: "L"

RF (TX) SPECIFICATIONS

	Min	Typ	Max	Unit	Temp.	Volt
***Class 1** Normal Transmit Power						
Maximum controlled level	0	+8	+20	dBm	Extreme	Extreme
Minimum controlled level			+4	dBm	Nominal	Nominal
Power control step size	2		8	dB	Nominal	Nominal
***Class 3** Normal Transmit Power		-7	0	dBm	Extreme	Extreme
Radio Frequency Tolerance	-75		+75	kHz	Extreme	Extreme
Radio Frequency drift					Extreme	Extreme
One slot	-25		+25	kHz		
Three slot	-40		+40	kHz		
Five slot	-40		+40	kHz		
PLL Lockup Time			140	.s	Extreme	Nominal
Peak Deviation 00001111	±140		±175	kHz	Extreme	Extreme
0101	80			%		
0101	±115			kHz		
Spurious Emission(In Band)	*1)				Extreme	Extreme
±550 kHz	-20			dBc		
|M-N| = 2			-20	dBm		
|M-N| ≥ 3			-40	dBm		
Spurious Emission(out of Band)	*2)				Extreme	Extreme
30 MHz ~ 1 GHz			-36	dBm		
1 GHz ~ 12.75 GHz			-30	dBm		
1.8 GHz ~ 1.9 GHz			-47	dBm		
5.15 GHz ~ 5.3 GHz			-47	dBm		

Note: *1) The transmit power shall be measured in a 100 kHz bandwidth.

Frequency offset	Test Condition
± 550 kHz	RBW: 30 kHz, VBW: 300 kHz
|M-N| = 2	RBW: 100 kHz, VBW: 300 kHz
|M-N| ≥ 3	RBW: 100 kHz, VBW: 300 kHz

M : Transmit channel, N : Measured channel

*2) The transmit power shall be measured in a 100 kHz bandwidth.

RF(RX) SPECIFICATION

	Min	Typ	max	Unit	Temp.	Volt
Reference Sensitivity Level (BER=0.001)		-78	-70	dBm	Extreme	Extreme
Reference Interference Level BER<=0.1%	*1)					
Co-ch interference C/I_{co}	11			dB	Nominal	Nominal
Adj. (1 MHz) interference C/I_{1MHz}	0			dB		
Adj. (2 MHz) interference C/I_{2MHz}	-30			dB		
Adj. (≥3 MHz) interference C/I_{3MHz}	-40			dB		
Image Ch interference C/I_{Image}	-9			dB		
Image Ch interference C/I_{Image}	-20			dB		
Out of Band Blocking BER ≤0.1 %	*2)				Nominal	Nominal
30 MHz ~ 2 GHz	-10			dBm		
2 GHz ~ 2.4 GHz	-27			dBm		
2.5 GHz ~ 3 GHz	-27			dBm		
3 GHz ~ 12.75 GHz	-10			dBm		
Intermodulation Characteristics	*3)				Nominal	Nominal
BER ≤ 0.1%	-39			dBm		
Carrier Level: -64 dBm						
Maximum Usable Level	-20			dBm	Nominal	Nominal
Spurious Emission						
30 MHz ~ 1 GHz			-57	dBm	Nominal	Nominal
1 GHz ~ 12.75 GHz			-47	dBm		
Current Consumption					Nominal	Nominal
During receive slot		130	220	mA		
During transmit slot (Class1)		200	330	mA		
During transmit slot (Class3)		155		mA		
Standby mode		0.25	1	mA		

Note *1) Carrier Signal Level: -67 dBm (Adj.(≥3 MHz), Image)
Carrier Signal Level: -60 dBm (Co-chi, Adj.(1 MHz), Adj.(2 MHz)) Frequencies where the requirements are not met are called spurious response frequencies. Five spurious response frequencies with a distance of ≥2 MHz from the wanted signals are allowed. On these spurious response frequencies a relaxed interference requirement C/I = -17 dB must be met.

Note *2) Carrier Signal level: -67 dBm
24 exceptions are permitted which are dependent upon the given receive channel frequency and are centered at a frequency which is an integer multiple of 1 MHz. At 19 of those spurious response frequencies a relaxed power level -50 dBm of the interfere may used to achieve a BER of 0.1 % and at the remaining 5 spurious response frequencies the power level is arbitrary.

Note *3) Carrier signal level: -64 dBm
A static sine wave signal at f1 with a power level of -39 dBm. A Bluetooth™ module signal at f2 with a power level of -39 dBm. Such that f0 = 2f1 -f2 and |f2 -f1| = n*1 MHz, where n can be 3, 4 or 5. The system must fulfill one of there alternatives.

REFERENCE INTERFERENCE SIGNAL DEFINITION

A modulated Interfering signal is defined as:

Modulation = GFSK
Modulation index = 0.32 ±1 %
BT = 0.5 ±1 %
Bit rate 1Mbps ±1 ppm
Modulating data = PRBS9
Frequency Accuracy better than ±1 ppm

BASE BAND SPECIFICATION

Program memory

Module contains on chip flash memory (256k bytes x 16 bits) which includes Bluetooth™ protocol stack under HCI firmware and RFCOMM interface. Software is upgradable using downloading software.

Internal RAM buffer

Internal RAM buffer is provided and shared 8k bytes for transmit and receive ring buffer.

Hardware RESET sequence

When SYSTEM_RESET is asserted to module, microprocessor will be initialized.
In case of power on reset, SYSTEM_RESET should be kept Low after DC power is supplied

FLASH memory management

Bluetooth™ module contains on chip flash memory (256k bytes x 16 bits) which enable to update protocol software. Programming / verification data on chip flash will be transmit / receive via serial interfaces which supported. User is able to re-write / erase program either via UART or USB.

(1) Erase mode
It will be assigned as Extended HCI command, which can be given either UART or USB

(2) Erase verify mode
It will be assigned as Extended HCI command, which can be given either UART or USB

(3) Programming mode
It will be assigned as Extended HCI command, which can be given either UART or USB

(4) Program verification mode
It will be assigned as Extended HCI command, which can be given either UART or USB

Note: HCI firmware only.
In case of RFcom interface, if cannot be upgraded over Host interface.

PHYSICAL INTERFACE

TxD, RxD, RTS(USB_D+), CTS(USB_D-) form a conventional asynchronous data serial port. The interface is programmable over a variety of bit rates; no, even or odd parity; one or two stop bits and hardware flow control on or off. The default condition on power-up is pre-assigned in the (external) Flash memory.

The maximum UART data rate is 1.5 Mbps. Two-way hardware flow control is implemented by RTS and CTS. RTS is an output and is active low. CTS are an input and are active low. These signals operate according to normal industry convention.

The port carries a number of logical channels: HCI data (both SCO and ACL), HCI commands and events, L2CAP API, RFCOMM API, SDD-B API and device management. For the UART, these are combined into a robust tunneling protocol Serial Protocol (BCSP) where each channel has its own software flow control and cannot block other data channels.

Alternatively a firmware version is available to support full speed (12 Mbps) USB. The UART_RTS pin is reconfigured as USB_D+ and the UART_CTS pin is reconfigured as USB_D-. Both OHCI and UHCI are supported.

UART (Universal Asynchronous Receiver Transmitter)

Base band processor contains individual transmitter and receiver blocks thus user can use full bi-directional communication. And possible to receive and transmit in continuous by double buffer structure.

Host controller can re-configure data format using a private communications logical channel running over the UART. Data bit will be transmitted from LSB as default setting.

Possible configuration

Bluetooth™ Module can handle UART baudrate from 9.6kbps up to 1.5Mbps.

Baud Rate:	Min 9600 baud, Max 1.536Mbaud
Flow Control:	RTS/CTS or none
Parity:	On or Off
Number of Stop Bits	1 or 2

User Configurable Baudrate Setting

Bluetooth™ Module can change its baudrate using extended HCI commands from Host. Possible baudrate Setting is shown the following formula.

*PS(PreScale) value=0.004096 * Desired Baud Rate[bps] + 0.499 (Value must be changed to integer)*
*Baudrate Clock Error [%]=((PS*1000 / 4.096)-Desired Baud Rate[bps])/Desired Baud Rate[bps] (x100)*

Default Data format

User can set desired data format (software setting should be determined) by the following selection However, Host shall communicate with default setting UART connection initiated at first time.

Baudrate:	115.2k bps
Data bit length:	8 bit
Stop bit length:	1
Parity:	None (In case of BCSP I/F: Even)

Polarity

All V24 interface(TxD, RxD, RTS, CTS) is set to ACTIVE LOW

Initializing / Wake / Reset over UART interface

The UART interface is capable of resetting the Blutooth Module upon reception of a BREAK signal.

A BREAK is identified by a continuous logic high on the UART_RX pin, as shown in Figure 1. If BREAK is longer than a predefined constant (user programmable over extended HCI window 1 ms ~ 255 ms) , a reset will occur. This feature allows a host to initialize the system to a known state.

Also module contains wake / awake features that is usable if host CPU will be used as sleep mode for save current consumption.

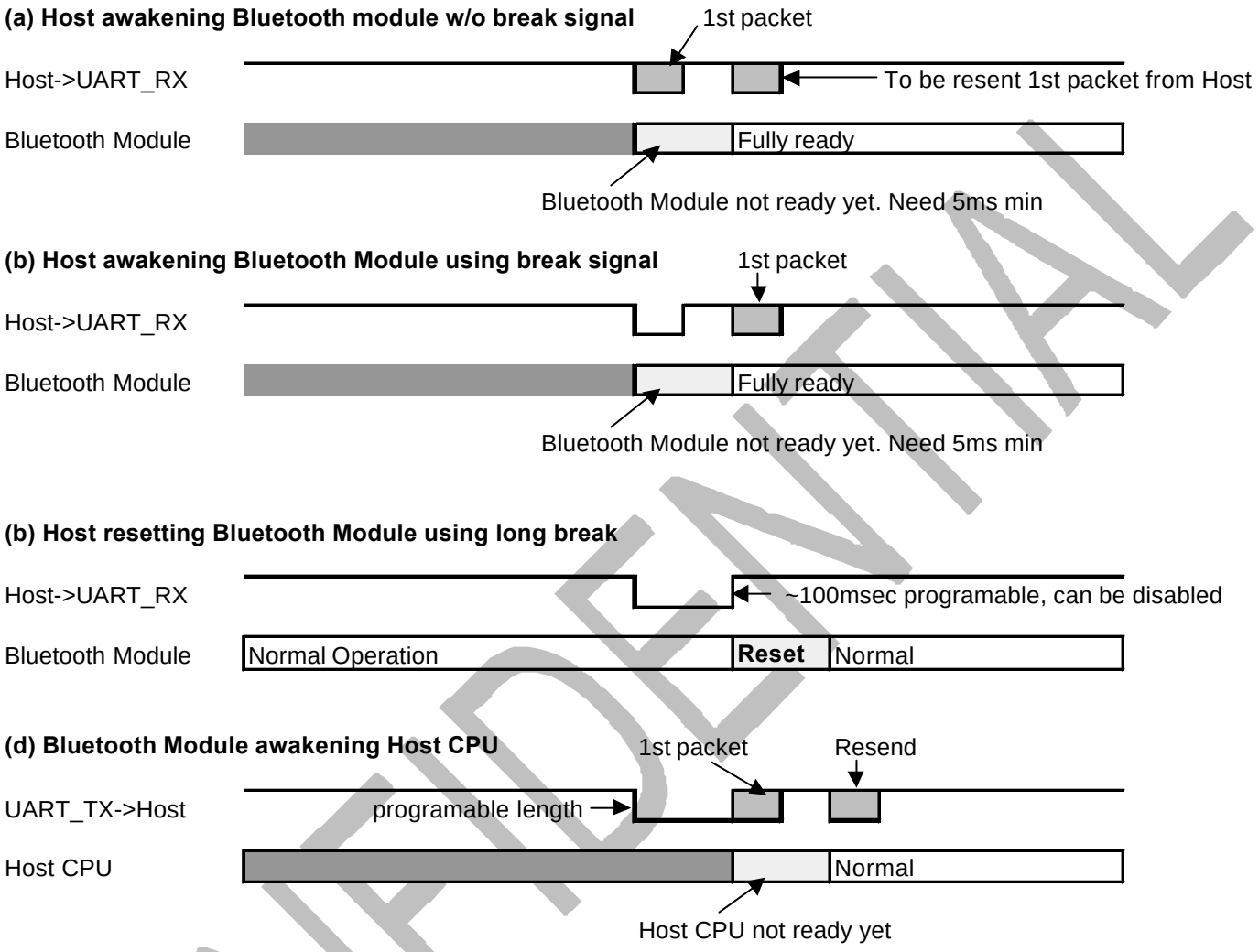


Fig 1

USB

USB interface is compliant with Universal Serial Bus Specification 1.1 and supports 12 Mbps “Full Speed” And this USB interface support single ended data interface. And also USB interface according to Bluetooth™ Specification 1.0b “USB transport layer” as well, including interface suggested by Intel for further power management.

SUMMARY OF SUPPORTED FEATURES

Items	Description
Application	BT Module works as "Host" only (to be used in built in PC or US). It does not comply to as "Target"
Speed	"High speed mode" only
USB Windows Class	Wireless Controller (bDeviceClass=0xE0h)
USB Sub class	RF Controller (bDeviceSubClass=0x01h)
USB Protocol code	Bluetooth™ Programming (bDeviceProtocol=0x01)
OHCI/UHCI	Supported
SCO support	SCO supported as Isochronous transfer mode
Transfer mode	Bulk, Control and Isochronous supported
USB data packets length	All packet size supported according to Bluetooth™ Spec 1.0B
Number of endpoints	6 end points
USB manufacture code	Unless specified, persistent storage saving "ALPS" as manufacture
HCI extended commands	All private commands will be capsuled to payload and de-capsuled in Module Stack

DESCRIPTION OF EACH HARDWARE INTERFACE

Module Pin	Name	I/O	Requirement	Description
USB_DP	D+	bi-dir	Mandatory	Defined in USB spec 1.1
USB_DM	D-	bi-dir	Mandatory	Defined in USB spec 1.1
USB_WAKE	Notify	output	Optional	To wake up host that BT Module has some events Or whilst USB lines disconnected(USB_DEATCH input is “High”)
USB_DETACH	Remove	input	Optional	To disconnect D+/D- lines from Host setting DP/DM to high impedance
VBUS_IN	VBUS	input	in proposal	To protect to be drawn current from DP when Host (Hub or root) in power down but BT Module exiting it is used for self-powered mode

RESET CONTROL

Reset mode	Requirement	Description
Power On Reset	Mandatory	Hardware reset. Power on reset circuit is built in Module RESET port is not required to connecting Host for production. To do HARD RESET, input high level (V_{IH}) of minimum 200 μs to reset terminal.
HCI reset commands	Mandatory	Software reset. Supported by ALPS Bluetooth™ Driver
Drive D+ D- low simultaneously	Mandatory	USB defined reset

USB ENDPOINT EXPECTATIONS

This section outlines specific USB endpoints that are required in order to function properly with the host. This section assumes a basic familiarity with USB.

-DESCRIPTOR OVERVIEW

The USB device is expected to be a high-speed device. The firmware configuration consists of two interfaces. The first interface (interface zero) has no alternate settings and contains the bulk and interrupts end-points.

The second interface (interface one) provides scalable isochronous bandwidth consumption. The second interface has four alternate settings that provide different consumption based on the required isochronous bandwidth. The default interface is empty so that the device is capable of scaling down to no isochronous bandwidth. An HCI frame - consisting of an HCI header and HCI data - should be contained in one USB transaction. A USB transaction is defined as one or more USB frames that contain the data from one IO request. For example, an ACL data packet containing 256 bytes (both HCI header and HCI data) would be sent over the bulk endpoint in one IO request. That IO request will require four 64-byte USB frames-and forms a transaction. The endpoints are spread across two interfaces so, when adjusting isochronous bandwidth consumption (via select interface calls), any pending bulk and/or interrupt transactions do not have to be terminated and resubmitted. See details BLUETOOTH™ SPECIFICATION Version 1.0 B HCI USB Transport Layer (Part H:2) about configurations.

-CONTROL ENDPOINT EXPECTATIONS

Endpoint 0 is used to configure and control the USB device. Endpoint 0 will also be used to allow the host to send HCI-specific commands to the host controller. When the USB firmware receives a packet over this endpoint that has the Bluetooth™ class code, it should treat the packet as an HCI command packet.

-BULK ENDPOINTS EXPECTATIONS

Data integrity is a critical aspect for ACL data. This, in combination with bandwidth requirements, is the reason for using a bulk endpoint. Multiple 64-byte packets can be shipped, per millisecond, across the bus.

Suggested bulk max packet size is 64 bytes. Bulk has the ability to transfer multiple 64 byte buffers per one millisecond frame, depending on available bus bandwidth.

Bulk has the ability to detect errors and correct them. Data flowing through this pipe might be destined for several different slaves. In order to avoid starvation, a flow control model similar to the shared endpoint model is recommended for the host controller.

-INTERRUPT ENDPOINT EXPECTATIONS

An interrupt endpoint is necessary to ensure that events are delivered in a predictable and timely manner. Event packets can be sent across USB with a guaranteed latency. The interrupt endpoint should have an interval of 1 ms. The USB software and firmware requires no intimate knowledge of the events passed to the host controller.

-ISOCHRONOUS ENDPOINTS EXPECTATIONS

These isochronous endpoints transfer SCO data to and from the host controller of the radio.

Time is the critical aspect for this type of data. The USB firmware should transfer the contents of the data to the host controllers' SCO FIFOs. If the FIFOs are full, the data should be overwritten with new data.

These endpoints have a one (1) ms interval, as required by Chapter 9 of the USB Specification, Versions 1.0 and 1.1. The radio is capable of three (3) 64Kb/s voice channels (and can receive the data coded in different ways – 16-bit linear audio coding is the method that requires the most data). A suggested max packet size for this endpoint would be at least 64 bytes. (It is recommended that max packet sizes be on power of 2 boundaries for optimum throughput.) However, if it is not necessary to support three voice channels with 16-bit coding, 32 bytes could also be considered an acceptable max packet size.

LIMITATIONS

-Power Specific Limitations

Today, the host controller of USB capable machines resides inside a chip known as PIIX4. Because of the design, the USB host controller will not receive power while the system is in S3 or S4. This means that a USB wakeup can only occur when the system is in S1 or S2.

Another issue with the USB host controller is that, while a device is attached, it continually snoops memory to see if there is any work that needs to be done. The frequency that it checks memory is 1ms. This prevents the processor from dropping into a low power state known as C3. Because the notebook processor is not able to enter the C3 state, SIGNIFICANT power loss will occur. This is a real issue for business users – as a typical business user will spend almost 90% of their time in the C3 state.

OTHER LIMITATIONS

Data corruption may occur across isochronous endpoints. Endpoints one and two may suffer from data corruption. USB provides 16-CRC on all data transfers. The USB has a bit error rate of 10 -13 .

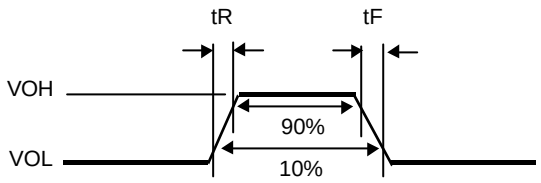
Note that when a dongle is removed from the system, the radio will lose power (assuming this is a bus-powered device). This means that devices will lose connection.

DC Characteristic

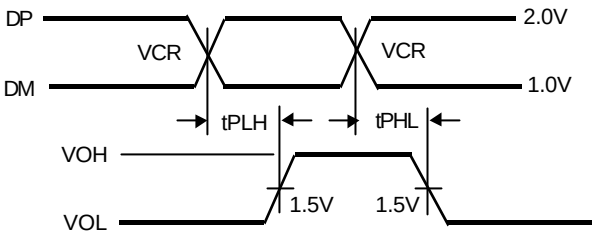
Symbol	*Parameter*	*Test Conditions*	*MIN*	*MAX*	*Unit*
INPUT LEVELS					
VDI	Differential Input Sensitivity	|(DP)-(DM)|	0.2		V
VIL	Low voltage		+0.2	VCC*0.3	V
VIH	High voltage		VCC*0.7	VCC +0.2	V
OUTPUT LEVELS					
VOL	Static output LOW voltage	I_{OL}=10mA		+0.3	V
VOH	Static output HIGH voltage	I_{OH}=-10mA	+2.8		V
LEAKAGE CURRENT					
ILO	HiZ state data line leakage current	0V<VIN<VCC		+/-10	μA
CAPACITANCE					
CIN	Transceiver capacitance	Pin to GND		20	pF
OUTPUT RESISTANCE					
ZDRV *1	Driver output resistance	Steady state drive	6	18	Ω

AC Characteristic (DP,DM for FULL SPEED)

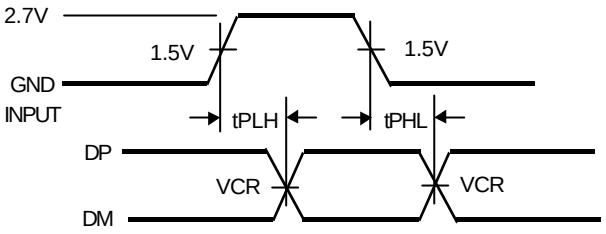
Symbol	*Parameter*	*Test Conditions*	*MIN*	*MAX*	*Unit*
DRIVER CHARACTERISTIC		CL=50pF; Rpu=1.5k on DP to VCC			
TR	Rise time	Between 10% and 90% waveform1	4	20	ns
TF	Fall time	Between 10% and 90% waveform1	4	20	ns
TRFM	Rise / Fall time matching	(tR/tF)	90	111.1	%
VCRS	Output signal crossover voltage		1.3	2	V
DRIVER TIMING					
TpLH	Driver propagation delay	waveform 2		18	ns
TpHL	(VPO, VMO/FSEO to DP/DM)	waveform 2		19	ns
TpHZ	Driber disable delay	waveform 4		13	ns
TpLZ	(OE# ro DP/DM)	waveform 4		13	ns
TpZH	Driver enable delay	waveform 4		17	ns
TpZL	(OE# to DP/DM)	waveform 4		17	ns
RECEIVER TIMING					
TpLH	Receiver propagation delay	waveform 3		16	ns
TpHL	(DP,DM to RCV)	waveform 3		19	ns
TpLH	Single ended receiver delay	waveform 3		8	ns
TpHL	(DP,DM o VP, VM)	waveform 3		8	ns



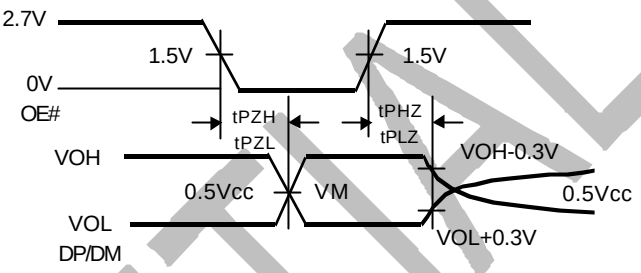
Waveform 1



Waveform 2



Waveform 3



Waveform 4

PCM

Features

Bluetooth™ Module implements an audio transcoder to translate between A-law, µ-law and linear voice data from the host and A-l a w, µ-law and CVSD voice data over the air. Voice interpolation for lost packets is also included. PCM_OUT, PCM_IN, PCM_CLK and PCM_SYNC carry one, bi-directional channel of voice data using 13bit PCM at 8kHz. The PCM_CLK and PCM_SYNC pins can be configured as inputs or outputs, depending on whether Bluetooth™ Module is the generator of the 8KHz reference. When programmed as outputs, interfaces directly to PCM audio chips.

PCM_SYNC operates at a fixed clock frequency of 8kHz. When PCM_SYNC is operated as an output (master mode) a clock frequency of 8kHz is generated from this pin. When operated as an input (slave mode) 8kHz must be input on this pin.

PCM_CLK operates at a fixed clock frequency of 256kHz. When PCM_CLK is operated as an output (master mode) a clock frequency of 256kHz is generated from this pin. When operated as an input (slave mode) 256kHz must be input on this pin.

Bits 1 to 13 of the PCM_OUT data carry the current output sample value. Bits 14 to 16 carry a three-bit signal level value. When used with the Motorola MC145483 PCM or compatible devices these 'level bits' allow to vary the level of the audio signal output from the PCM device.

ITU-Compounding Law

Both µ Law and A Law supported

Reference PCM CODEC IC;

Motorola Semiconductor: +3.0 V 13 bit linear PCM codec MC145483.

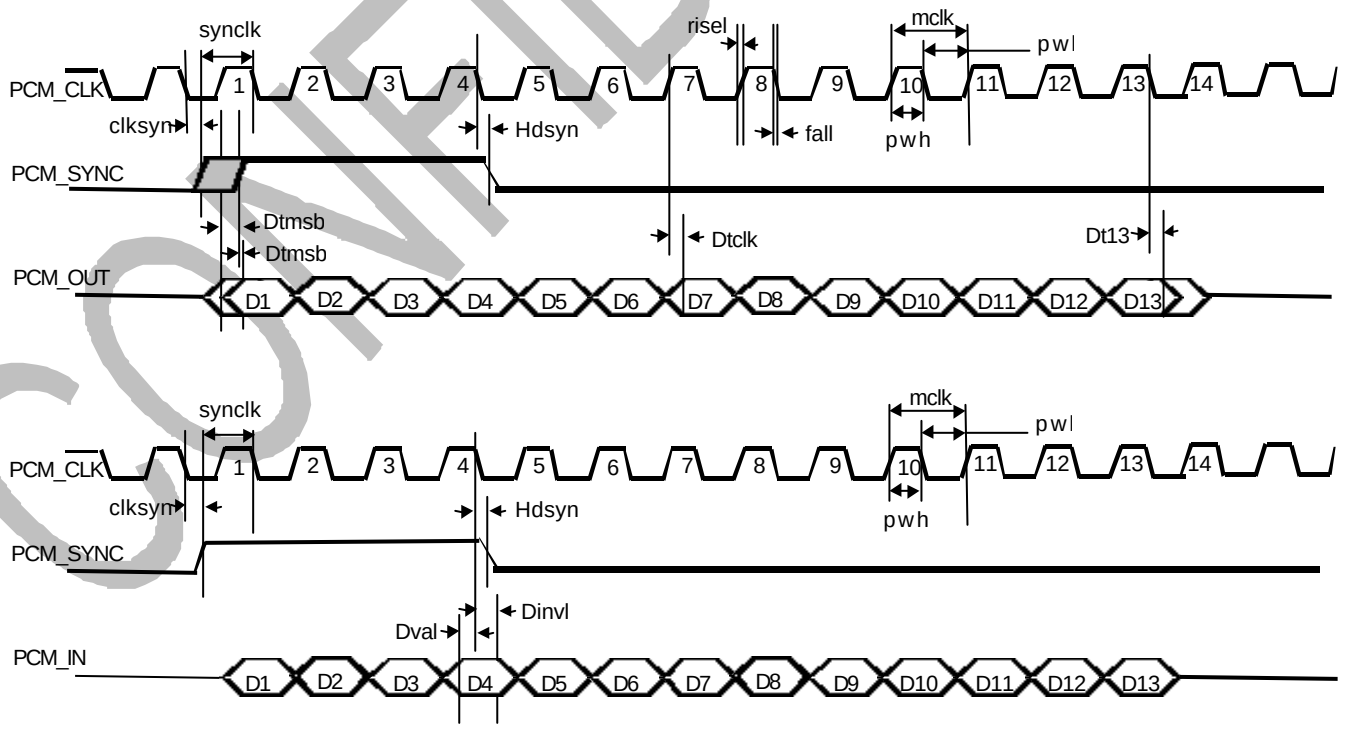
PCM_OUT and PCM_IN 13 bit data format

PCM data stream is output from MSD in a sequential order, the following complement data format should be used for maximum positive code and negative zero and full scale.

Input / Output level	Sign bit	MSD											
+ Full scale	0	1	1	1	1	1	1	1	1	1	1	1	1
+One step	0	0	0	0	0	0	0	0	0	0	0	0	1
+0	0	0	0	0	0	0	0	0	0	0	0	0	0
-One step	1	1	1	1	1	1	1	1	1	1	1	1	1
-Full scale	1	0	0	0	0	0	0	0	0	0	1	0	1

Operating condition

Symbol	*Parameter*	*Conditions*	*MIN*	*TYP*	*MAX*	*Unit*
VIH	Input High Voltage (PCM_CLK, SYNC, IN, PWRDWN)		VCC-0.5		VCC	V
VIL	Input Low Voltage (PCM_CLK, SYNC, IN, PWRDWN)		0		0.6	V
VOH	Output high voltage (PCM_CLK, SYNC,OUT)		2.2		VCC	V
VOL	Output low voltage (PCM_CLK, SYNC,OUT)		0		0.4	V
Mclk	Shift clock output (PCM_CLK)	at room temp	-20	256kHz	20	ppm
Sync	8khz sync clock (PCM_SYNC)	at room temp	-20	8kHz	20	ppm
Dc	Clock duty cycle ratio	at room temp	45	50	55	%
Pwh	Min pulse(High) width of PCM_CLK	See Fig	50			ns
Pwl	Min pulse width(Low) of PCM_CLK	See Fig	50			ns
Rise	Rising time for PCM signals	See Fig			50	ns
Fall	Falling time of PCM signals	See Fig			50	ns
clksyn	Hold time form PCM_CLK(low) to PCM_SYNC(High)	See Fig	20			ns
synclk	Setup time form PCM_SYNC(High) to PCM_CLK(Low)	See Fig	80			ns
Hdsyn	Hold time from 4th Period of PCM_CLK(Low) to PCM_SYNC(Low)	See Fig	50			ns
Dtmsb	Delay time from PCM_SYNC or PCM_CLK, whichever later, to PCM_OUT for valid MSB data	See Fig			60	ns
Dtclk	Delay time from PCM_CLK Hi to PCM_OUT for valid data	See Fig			60	ns
Dt13	Delay time from later of 13th PCM_CLK falling edge, or falling edge of PCM_SYNC to PCM_OUT to be High Z	See Fig			60	ns
Dval	Setup time PCM_IN valid to PCM_CLK(Low)	See Fig	0			ns
Dinv	Hold time PCM_CLK(Low) to PCM_IN invalid	See Fig	50			ns



PIN DESCRIPTION (Board to Board connector)

Name	No	I/O	Function	Active state	Usage	External Connection (UART)	External Connection (USB)
GND	1	---	Ground		GND	GROUND	GROUND
PCM_OUT	2	O	PCM data stream output (No use for USB mode)	Hi:1 Lo: 0	PCM	PCM input (DR[*1]) Or NC*2	NC
PCM_IN	3	I	PCM data stream input (No use for USB mode)	Hi:1 Lo: 0	PCM	PCM output(DT[*1]) Or NC*2	NC
PCM_PWR_DWN	4	O	PCM power down control output (No use for USB mode)	1: Inactive 0: Power Down	PCM	PCM Power Down (PDI[*1]) Or NC[*2]	NC
VBUS_IN	5	I	To sense if VBUS is ON For self power mode	Hi: DP/DM Active Lo: DP/DM → Hi Z	USB	NC	USB VBUS Or See [*3]
RxD	6	I	UART / RxD from DTE (No use for USB mode)	Hi:0 Lo:1	UART	TxD	NC
TxD	7	O	UART / TxD to DTE (No use for USB mode)	Hi:0 Lo:1	UART	RxD	NC
RESET	8	I	System Reset. It is not required for production. (for test purpose)	Hi: Active (Reset) Lo: Inactive	RESET	Host CPU port Or NC[*2]	NC
USB_WAKE	9	O	To wake up host when Module has some events during Suspend/Resume state or whilst USB_DETACH in is High	Hi: Wake Host Lo: No active	USB	NC	Wake up port Or Hi[*2]
VCC_OC	10	---	Regulated supply voltage for Other circuit.	3.3 V	Power	DC POWER	DC Power
GND	11	---	Ground		GND	GROUND	GROUND
RTS	12	O	UART / Ready To Send to DTE (No use for USB mode)	Hi: De-assert Lo: Assert	UART	CTS	NC
USB_DETACH	13	I	To disconnect D+/D- lines from Host, changing D+/D- to try state	Hi: DP/DM→Hi Z Lo: DP/DM Active	USB	NC	Detach port or Low[*2]
CTS	14	I	UART / Clear To Send from DTE (No use for USB mode)	Hi: De-assert Lo: Assert	UART	RTS	NC
PCM_SYNC	15	I/O	Connection to PCM frame sync Input/output of 8Khz (No use for USB mode)	Hi: Active Lo: Inactive	PCM	Frame Sync I/O (FST, FSR[*1]) or NC[*2]	NC
USB_DP	16	I/O	Positive USB differential data bus	1:>VOH(min) 0: <VOL(max)	USB	NC	USB D+
USB_DM	17	I/O	Negative USB differential data bus	1:<VOL(max) 0: >VOH(min)	USB	NC	USB D-
PCM_CLK	18	I/O	Connection to PCM reference Clock input/output of 256kHz (No use for USB mode)	Hi: 1 Lo: 0	PCM	PCM Clock I/O (BCLKR,BCLKT,MCLK[*1]) or NC[*2]	NC
NC	19	NC	For internal test use	-----	Test	NC	NC
VCC_PA	20	---	DC supply voltage for Power Amp. Regulated DC source recommended.	3.3V	Power	DC POWER	DC Power

[*1] PIN name is based on Motorola 13bit Linear PCM codec filter MC145483
[*2] Termination method if this pin is not used
[*3] Bus powered device or PC integrated device does not contain VBUS. In this case this pin should be pulled up to +5.0 V.

DC CHARACTERISTIC (except PCM, USB_DP, DM): VCC_OC = 3.3 V

Mode	Symbol	MIN	MAX	UNIT	PIN	CONDITION
Input HIGH level	V_{IH}	VCC*0.7	VCC +0.2	V	RESET,CTS, RxD, DETACH	
Input LOW level	V_{IL}	0	VCC*0.3	V	RESET,CTS, RxD, DETACH	
Input HIGH level	V_{IH}	+4.0	+5.25	V	VBUS_IN	
Input LOW level	V_{IL}	0	+0.7	V	VBUS_IN	
Output High level	V_{OH}	VCC-0.5	VCC	V	TxD, RTS, WAKE	
Output low level	V_{OL}	----------	0.2	V	TxD, RTS, WAKE	
Output current LOW	I_{OL}	----------	4	mA	All of individual input pin	
Output current HIGH	I_{OH}	----------	-4	mA	All of individual input pin	

RELIABILITY TEST

TEST METHOD

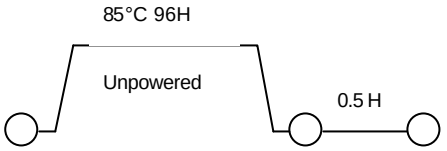
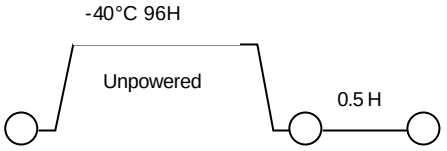
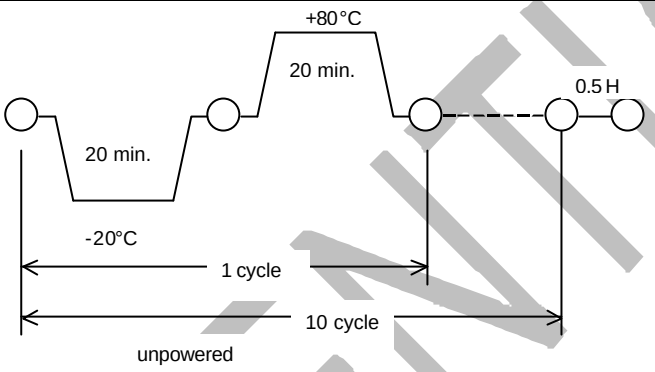
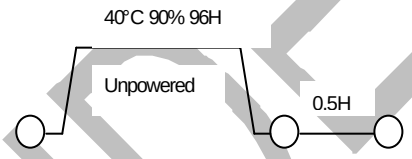
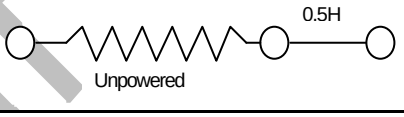
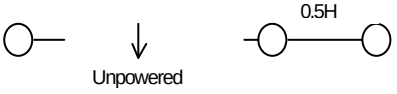
ITEM	Condition	Specification
High Temperature Test (No power applied)		Table 1
Temperature Test		Table 1
Temperature Shock		Table 1
Humidity Test		Table 1
Vibration Test	Vibration Frequency:10 Hz, 55 Hz, 10 Hz (1 cycle / 1 minutes) Total Amplitude :1 mm Direction :X, Y, Z (Each direction 40 minutes) 	Table 1
Drop Test	Drop Point (Height): 1 m Receiving board: Wooden board (20 x 20 x 3 cm.) Drop times: 1 times Direction : Any direction without the part of connector 	Table 1

TABLE-1

TX Frequency Accuracy	±75 kHz MAX.
Normal Transmitter Power	+20 dBm MAX. (Class1) +0 dBm MAX. (Class3)
Input Sensitivity	-70 dBm MAX.

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. ALPS customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify ALPS for any damages resulting from such improper use or sale.

Appendix 1

SOFTWARE

Module contains Bluetooth™ protocol stack under HCI (Host Controller Interface) compliant with Bluetooth™ specification Ver1.0B. All commands are supported via UART driver.

Protocol software may be upgraded until full compatibility is proved by Bluetooth™ Test Qualification Program.

User is required to download software to on chip flash in module when new software would be released.

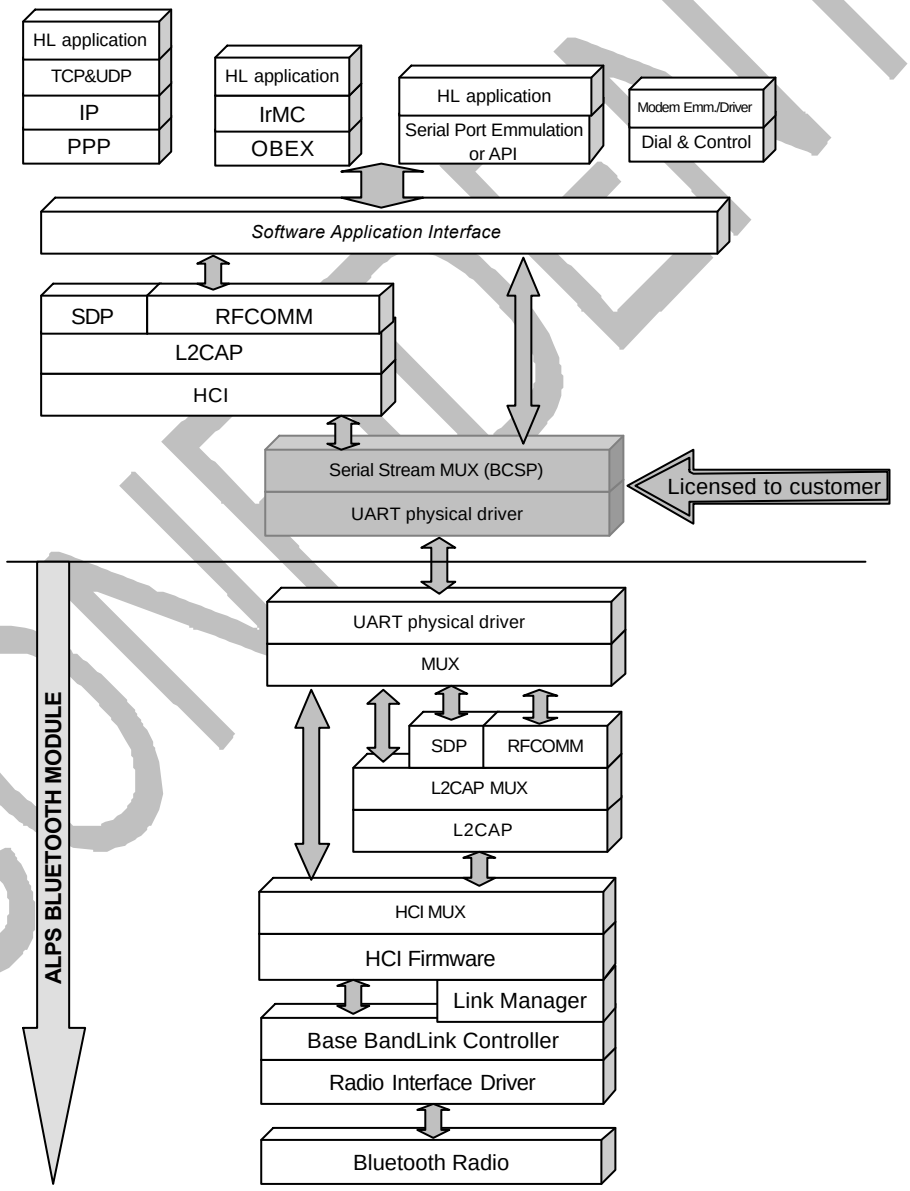
Software Releases:

Protocol software release is planned by the following schedule.

Phase	Planned release	Features
Alpha release	5/ 2000	Basic HCI features (see appendix 2)
Alpha + release	8/ 2000	RFCOMM/SDP/L2CAP supported
Beta release	9/ 2000	USB supported
Final release(V1)	Q4/ 2000	Bluetooth™ protocol stack had been certified

Software architecture

The following drawing shows how to be consist of bluetooth™ module protocol stack. User is required to Develop either HCI driver or directly application software.



Supported service

Supported service by built in protocol software is shown appendix 2

Supported HCI command list

Please refer to attached appendix 2 for supported HCI commands in each phase

Bluetooth™ Serial Protocol(BCSP)

Because of Universal architecture at protocol stack(Not only HCI but L2CAP, SDP, RFCOMM access Is possible with same protocol stack), SLIP(Serial Line Internet Protocol) like interface required above UART driver on your Host processor , which is called BCSP.

This BCSP will be licensed to ALPS's customer free of charge.

In regarded with architecture of BCSP, refer to "BCSP User Reference Guide"

BCSP will work on the basis of specific "Scheduler" which will be provided with "BCSP software"

Appendix 2. Supported service

Description of status

Description	Contents
X	Will not be available.
O	Optional. May not be available.
M	Mandatory. Will be available.
M1	Mandatory Adapted Layer. Will be available as part of the "Joint Marketing Agreement for BT Host Software
D	Desirable
C1	If piconet supports encrypted broadcast then M else O
C3	Shown as mandatory in BT spec. Poor spec detail may result in support after V1

1. Specific implementation

Service contents	BT Spec reference No	Alpha	Beta	V1
processor put into sleep mode when no processing required by scheduler	None	O	O	M
All software packaged as libraries of functions	None	X	M	M
The host software should not depend on the host providing a privileged operating mode	None	M	M	M
Software able to operate without RFCOMM and SDP	None	M	M	M
Software able to operate without L2CAP	None	M	M	M
Single data link version of L2CAP capable of being run on chip	None	X	M1	M1
Single data link version of RFCOMM capable of being run on chip	None	X	M1	M1
SDP capable of being run on chip	None	X	M1	M1
Architecture capable of supporting HCI over SPI and USB	None	M	M	M
Fixed host-controller build that supports configuration of higher layers location between host and host controller on initialization.	None	X	X	M

2. General software requirements

Service contents	BT Spec reference No	Alpha	Beta	V1
Asynchronous data channel	part B 1	M	M	M
Single synchronous voice channel	part B 1	M	M	M
The master can support up to three SCO links to different slaves	part B 3.2	X	M	M
A slave can support up to three SCO links from same master	part B 3.2	X	O	M
or two SCO links if the links originate from different master	part B 3.2	X	X	X
Simultaneous support for asynchronous data and synchronous voice (DV packets)	part B 1	O	M	M
Up to two slaves can be active in a piconet	part B 1	X	M	M
Up to seven slaves can be active in the piconet	part B 1	X	O	M
Scatternet	part B 1	X	X	X
Service discovery	part E	X	M1	M1

3. Non time critical baseband requirements

Service contents	BT Spec reference No	Alpha	Beta	V1
Master/slave switch	part B 10.9.3	O	M	M
Bluetooth™ security	part B 14	O	O	M
Non-real time aspects of paging procedures	part B 10.6	M	M	M
Non-real time aspects of Inquiry procedures	part B 10.7	M	M	M

4. Link Manager requirements

Service contents	BT Spec reference No	Alpha	Beta	V1
General response messages	part C 3.1	O	M	M
Authentication	part C 3.2	O	M	M
Pairing	part C 3.3	O	M	M
Change Link Key	part C 3.4	O	M	M
Change Current Link Key	part C 3.5	X	O	C1
Encryption	part C 3.6	X	O	M
Clock Offset Request	part C 3.7	O	M	M
Slot Offset Information	part C 3.8	O	M	M
Timing Accuracy info request	part C 3.9	O	M	M
LMP Version	part C 3.10	O	M	M
Supported Features	part C 3.11	O	M	M
Switch of aster slave role	part C 3.12	O	C3	C3
Name request	part C 3.13	O	M	M
Detach	part C 3.14	M	M	M
Hold mode	part C 3.15	M	M	M
Sniff mode	part C 3.16	O	M	M
Park mode	part C 3.17	X	X	M
Power control	part C 3.18	X	M	M
Quality driven change DM/DH	part C 3.19	O	O	O
Quality of Service (QOS)	part C 3.20	X	X	C3
SCO Links	part C 3.21	M	M	M
Control of multi-slot packets	part C 3.22	M	M	M
Paging Scheme	part C 3.23	X	X	X
Link Supervision	part C 3.24	M	M	M
LMP_host_connection_req	part C 4	M	M	M
LMP_setup_coplete	part C 4	M	M	M
Test modes	part C 6	M	M	M
Control of multiple links	part C	X	O	M

5. L2CAP requirements

Service contents	BT Spec reference No	Alpha	Beta	V1
L2CAP data packets up to 64 kilobytes in length.	part D 1.1	M1	M1	M1
Real time audio data over L2CAP.	part D 1.1	X	X	X
Protocol Multiplexing	part D 1.1	M1	M1	M1
Segmentation and Re-assembly	part D 1.1	M1	M1	M1
Quality of Service	part D 1.1	X	X	C3
Connection-oriented bi-directional data channels	part D 4.1	M1	M1	M1
Group-oriented connection-less uni-directional channels	part D 4.2	X	X	X
Signaling channel	part D 2.2	M1	M1	M1
re-establish physical connection when the Keep Alive timer expires	part D 3.4	O	M1	M1
L2CAP_Data	part D 3.1.3	M1	M1	M1
L2CA_ConnectReq	part D 3.1.4	M1	M1	M1
L2CA_ConnectRsp	part D 3.1.4	M1	M1	M1
L2CA_ConnectRspNeg	part D 3.1.4	M1	M1	M1
L2CA_ConfigReq	part D 3.1.4	M1	M1	M1
L2CA_ConfigRsp	part D 3.1.4	M1	M1	M1
L2CA_ConfigRspNeg	part D 3.1.4	M1	M1	M1
L2CA_DisconnectReq	part D 3.1.4	M1	M1	M1
L2CA_DisconnectRsp	part D 3.1.4	M1	M1	M1
L2CA_DataRead	part D 3.1.4	M1	M1	M1
L2CA_DataWrite	part D 3.1.4	M1	M1	M1
Service Connection Request (SVCNREQ)	part D 3.1.4	M1	M1	M1
Service Configuration Request (SVCFREQ)	part D 3.1.4	M1	M1	M1

Service Termination Request (SVTMREQ)	part D 3.1.4	M1	M1	M1
Send Data (SVSNDATA)	part D 3.1.4	M1	M1	M1
Response timeout expired (RTX)	part D 3.1.5	M1	M1	M1
Extended Response timeout expired (ERTX)	part D 3.1.5	O	M1	M1
Command reject signaling command	part D 5.1	M1	M1	M1
Connection request signaling command	part D 5.2	M1	M1	M1
Connection response signaling command	part D 5.3	M1	M1	M1
Configuration request signaling command	part D 5.4	M1	M1	M1
Configure response signaling command	part D 5.5	M1	M1	M1
Disconnection request signaling command	part D 5.6	M1	M1	M1
Disconnection response signaling command	part D 5.7	M1	M1	M1
Echo request signaling command	part D 5.8	M1	M1	M1
Echo response signaling command	part D 5.9	M1	M1	M1
Information request	part D 5.10	M1	M1	M1
Information response	part D 5.11	M1	M1	M1
Link up	part D 3.1.1	M1	M1	M1
Link down	part D 3.1.1	M1	M1	M1
QoS option negotiated over the air interface	part D 6	X	X	X
Config parameter options - MTU	part D 6.1	M1	M1	M1
Config parameter options - variable Flush Timeout	part D 6.2	X	X	X
Config parameter options - default Flush Timeout	part D 6.2	X	M1	M1
Config parameter options - QoS No Traffic	part D 6.3	X	M1	M2
Config parameter options - QoS Best Effort	part D 6.3	X	M1	M3
Config parameter options - QoS guaranteed	part D 6.3	X	X	C3
Handoffs	part D 7	X	X	X
L2CA_ConnectInd	part D 7.1	M1	M1	M1
L2CA_ConfigInd	part D 7.1	M1	M1	M1
L2CA_DisconnectInd	part D 7.1	M1	M1	M1
L2CA_QoSViolationInd	part D 7.1	x	x	C3
L2CA_ConnectReq	part D 7.2	M1	M1	M1
L2CA_ConnectRsp	part D 7.3	M1	M1	M1
L2CA_ConfigReq	part D 7.4	M1	M1	M1
L2CA_ConfigRsp	part D 7.5	M1	M1	M1
L2CA_DisconnectReq	part D 7.6	M1	M1	M1
L2CA_WriteData	part D 7.7	M1	M1	M1
L2CA_ReadData	part D 7.8	M1	M1	M1
L2CA_GroupCreate	part D 7.9	X	X	X
L2CA_GroupClose	part D 7.10	X	X	X
L2CA_GroupAddMember	part D 7.11	X	X	X
L2CA_GroupRemoveMember	part D 7.12	X	X	X
L2CA_GroupMembership	part D 7.13	X	X	X
L2CA_Ping	part D 7.14	M1	M1	M1
L2CA_GetInfo	part D 7.15	M1	M1	M1
L2CA_DisableCLT	part D 7.16	X	X	X
L2CA_EnableCLT	part D 7.17	X	X	X

6. RFCOMM requirements

Service contents	BT Spec reference No	Alpha	Beta	V1
Supports one emulated serial port	part F 2.3.1	O	M1	M1
Supports >1 emulated serial port	part F 2.3.1	O	O	M1
Can run one TS 07.10 session	part F 2.3.2	O	M1	M1
Can run multiple TS 07.10 sessions	part F 2.3.2	X	O	M1
Uses the basic option of TS 07.10	part F 4.1	X	M1	M1
Support for TS 07.10 frame types – SABM,UA, DM, DISC, UIH	part F 4.2	X	M1	M1
Support for TS 07.10 UI frame types	part F 4.2	X	X	X
Test Command (Test)	part F 4.3	X	M1	M1
Flow Control On command (Fcon)	part F 4.3	X	M1	M1
Flow Control Off command (Fcoff)	part F 4.3	X	M1	M1
Modem Status command (MSC)	part F 4.3	X	M1	M1
Remote Port Negotiation command (RPN)	part F 5.5.1	X	M1	M1
Remote Line Status (RLS)	part F 5.5.2	X	M1	M1
DLC parameter negotiation (PN)	part F 5.5.3	X	M1	M1
Non Supported Command Response (NSC)	part F 4.3	X	M1	M1
Supports type 1 convergence layer in TS	part F 4.4	X	M1	M1
Maximum Frame Size (N1) 127	part F 5.3	X	M1	M1
Maximum Frame Size negotiable, 23 –32767	part F 5.3	X	X	O

7. Service Discovery Profile requirements

Service contents	BT Spec reference No	Alpha	Beta	V1
Suitable for use on devices of limited complexity.	part E 1.3	X	M1	M1
Client caching of service discovery information.	part E 1.3	X	X	X
Transport independent	part E 1.3	X	X	X
Uses L2CAP as its transport protocol.	part E 1.3	X	M1	M1
Server ensures that no service record handle values are re-used while a connection remains established.	part E 2.2	X	M1	M2
Multiple PDUs sent/handled in a single L2CAP packet.	part E 4	X	O	M1
Client interface for searching for services on a remote device.	part E 2.7	X	M1	M1
Client interface for requesting attributes from a remote device.	part E 2.3	X	M1	M1
Client interface for a combined search and attribute request on a remote device.	part E 2.7	X	M1	M1
Client interface for terminating an active search.	part E 2.7	X	M1	M1
Server interface for service record registration.	part E 2.2	X	M1	M1
Server interface for service record de-registration.	part E 2.2	X	M1	M1
SDP _ErrorResponse	part E 4.4.1	X	M1	M1
SDP_ServiceSearchRequest	part E 4.5.1	X	M1	M1
SDP_ServiceSearchResponse	part E 4.5.2	X	M1	M1
SDP _ServiceAttributeRequest	part E 4.6.1	X	M1	M1
SDP_ServiceAttributeResponse	part E 4.6.2	X	M1	M1
SDP_ServiceSearchAttributeRequest	part E 4.7.1	X	M1	M1
SDP_ServiceSearchAttributeResponse	part E 4.7.2	X	M1	M1

Appendix2 Supported extended HCI Commands

Category	Mode	Purpose	Available	Permanency	Necessity *1	Enter Command	Exit Command
Test Mode (for TELEC, FCC)	To be set to CW mode with designated TX frequency without modulation(TELEC)	Frequency accuracy (TELEC)	Y	None	M	tbd	tbd
	To be set to burst(DM5) mode with designated TX Frequency generated internal PRBS-9 (TELEC)	SS bandwidth Out of band spurious output power Frequency range	Y	None	M	tbd	tbd
	To be set burst mode(DM5) with country based hopping mode, generated internal PRBS-9 based (TELEC)	SS bandwidth Out of band spurious output power	Y	None	M	tbd	tbd
	To be set to CW mode with designated TX frequency Generated interna PRBS-9(TELEC)	Output power	Y	None	M	tbd	tbd
	To be set to CW mode with designated RX frequency (TELEC)	Out of band spurious emissions(idle)	Y	None	M	tbd	tbd
	To be set to Hop mode (DM5) based on country hopping channel without modulation(TELEC)	occupancy of hopping time	Y	None	M	tbd	tbd
Production Mode	To be set (burst) mode with designated single TX frequency with bit pattern "101010"	TRM/CA/07/C, 09/C	Y	None	O	tbd	tbd
	To be set (burst) mode with designated single TX frequency with bit pattern "00001111"	TRM/CA/07/C	Y	None	O	tbd	tbd
	To set designated power control	TRM/CA/03/C	Y	None (keep value until reset)	M	tbd	tbd
	To set software sleep mode	current consumption	Y	None	O	tbd	tbd
	To be set RX receiver with designated frequency and Return no.of received Packets and no of payload with corrective error *2	RCV/CA/01C, 02C, 03C, 04C, 05C	Y	None	O	tbd	tbd
	To be set D/A voltage to align TCXO and to be stored into persistent storage	Frequency alignment	Y	NVM	M	tbd	tbd
Essential	To write country code	for HCI commands	Y	NVM	M	tbd	tbd
	To write BD_ADDR	for HCI commands	Y	NVM	M	tbd	tbd
	To write local supported feature	for HCI commands	not cfmd	NVM	M	tbd	tbd
	To write local version Information	for HCI commands	not cfmd	NVM	M	tbd	tbd
	To write firmware version	for trace purpose	Y	NVM	M	tbd	tbd
Utility	Set default baudrate, start/stop bits, parity, data bits	for UART config	Y	NVM	M	tbd	tbd
	To adjust read RSSI value *3	for accurate RSSI	not cfmd	NVM	O	tbd	tbd
	Firmware upgrade(download)		Y	None	M	tbd	tbd
	Firmware verification(upload)		Y	None	M	tbd	tbd
	Disable / Enable Radio	for FAA compliance	Y	NVM	M	tbd	tbd
USB *5	Device Descripter / idVendor	Vendor ID (assigned by USB org)	not cfmd	NVM	M	tbd	tbd
	Device Descripter / idProduct	Product ID (assigned by Manufacture)	not cfmd	NVM	M	tbd	tbd
	Device Descripter / bcdDevice	Device release No (Binary code decimal based)	not cfmd	NVM	M	tbd	tbd
	Device Descripter / iManufacture	Manufacture name by string	not cfmd	NVM	M	tbd	tbd
	Device Descripter / iProduct	Product described by string	not cfmd	NVM	M	tbd	tbd
	Device Descripter / iSerialNumber	SN described by string	not cfmd	NVM	M	tbd	tbd
	Configuration Descripter / MaxPower	For max current description	not cfmd	NVM	M	tbd	tbd
	Configuration Descripter / bmAttribute	Change Self / Bus powered	not cfmd	NVM	M	tbd	tbd

*1	M=Mandatory, O=Optional
*2	To set receiver active with designated channel. Expected data format is with ™ header and X bytes of random data with 2/3FEC And returns no. of received packets and no of pay loads with correctable errors and report to USB/UART transport layer
*3	RSSI may vary depending on RF. This adjustment register compensate RF IC dependency when HCI_READ_RSSI was sent from Host
*4	Descripter parameters might not be covered to comply USB spec 1.1. To be discussed and reviewed later.

Appendix3 Supported HCI Commands

Item	HCI_Command	OCF	Parameters	Return Parameters	OpeCode	Alpha	Beta	V1
Link control Commands	HCI_Inquiry	0x0001	LAP, Inquiry_Length, Num_Response	---	0x0401	M	M	M
	HCI_Inquiry_Cancel	0x0002	---	Status	0x0402	M	M	M
	HCI_Periodic_Inquiry_Mode	0x0003	Max_Period_Length, Min_Period_Length, LAP, Inquiry_Length, Num_Responses	Status	0x0403	O	O	M
	HCI_Exit_Periodic_Inquiry_Mode	0x0004	---	Status	0x0404	O	O	M
	HCI_Create_Connection	0x0005	BD_ADDR, Packet_Type, Page_Scan_ Repetition_Mode, Page_Scan_Mode, Clock_Offset, Allow_Roll_Switch	---	0x0405	O	O	M
	HCI_Disconnect	0x0006	Connection_Handle, Reason	---	0x0406	M	M	M
	HCI_Add_SCO_Connection	0x0007	Connection_Handle,Packet_Type	---	0x0407	M	M	M
	HCI_Accept_Connection_Request	0x0009	BD_ADDR, Role	---	0x0409	M	M	M
	HCI_Reject_Connection_Request	0x000A	BD_ADDR, Reason	---	0x040A	M	M	M
	HCI_Link_Key_Request_Reply	0x000B	BD_ADDR, Link_Key	Status, BD_ADDR	0x040B	O	M	M
	HCI_Link_Key_Request_Negative_Reply	0x000C	BD_ADDR	Status, BD_ADDR	0x040C	O	M	M
	HCI_PIN_Code_Request_Reply	0x000D	BD_ADDR, PIN_Code_Length, PIN_Code	Status, BD_ADDR	0x040D	O	M	M
	HCI_PIN_Code_Request_Negative_Reply	0x000E	BD_ADDR	Status, BD_ADDR	0x040E	O	M	M
	HCI_Change_Connection_Packet_Type	0x000F	Connection_Handle, Packet_Type	---	0x040F	X	O	M
	HCI_Authentication_Requested	0x0011	Connection_Handle	---	0x0411	O	M	M
	HCI_Set_Connection_Encryption	0x0013	Connection_Handle, Encryption_Enable	---	0x0413	X	O	M
	HCI_Change_Connection_Link_Key	0x0015	Connection_Handle	---	0x0415	O	M	M
	HCI_Master_Link_Key	0x0017	Key_Flag	---	0x0417	O	M	M
	HCI_Remote_Name_Request	0x0019	BD_ADDR, Page_Scan_Repetition_Mode, Page_Scan__Mode, Clock_Offset	---	0x0419	O	M	M
	HCI_Read_Remote_Supported_Features	0x001B	Connection_Handle	---	0x041B	O	M	M
	HCI_Read_Remote_Versionh_Information	0x001D	Connection_Handle	---	0x041D	O	M	M
	HCI_Read_Clock_Offset	0x001F	Connection_Handle	---	0x041F	O	M	M

Item	HCI_Command	OCF	Parameters	Return Parameters	OpeCode	Alpha	Beta	V1
Linlk policy Commands	HCI_Hold_Mode	0x0001	Connection_Handle, Hold_Mode_Max_Interval, Hold_Mode_Min_Interval	---	0x0801	M	M	M
	HCI_Sniff_Mode	0x0003	Connection_Handle, Sniffe_Max_Interval, Sniffe_Min_Interval, Sniff_Attempt, Sniff_Timeout	---	0x0803	O	M	M
	HCI_Exit_Sniff_Mode	0x0004	Connection_Handle	---	0x0804	O	M	M
	HCI_Park_Mode	0x0005	Connection_Handle, Beacon_Max_Interval, Beacon_Min_Interval	---	0x0805	X	M	C2
	HCI_Exit_Park_Mode	0x0006	Connection_Handle	---	0x0806	X	M	C2
	HCI_QoS_Setup	0x0007	Connection_Handle, Flags, Service_Type, Token_Rate, Peak_Bandwidth, Latency, Delay_Variation	---	0x0807	X	X	C3
	HCI_Role_Discovery	0x0009	Connection_Handle	Status, Connection_Handle, Current_Role	0x0809	M	M	M
	HCI_Switch_Role	0x000B	BD_ADDR, Role	---	0x080B	O	M	M
	HCI_Read_Link_Policy_Settings	0x000C	Connection_Handle	Status, Connection_Handle, Link_Policy_Settings	0x080C	M	M	M
	HCI_Write_Link_Policy_Settings	0x000D	Connection_Handle, Link_Policy_Settings	Status, Connection_Handle	0x080D	M	M	M

Item	HCI_Command	OCF	Parameters	Return Parameters	OpeCode	Alpha	Beta	V1
Hostcontroller	HCI_Set_Event_Mask	0x0001	Event_Mask	Status	0x0C01	M	M	M
&	HCI_Reset	0x0003	---	Status	0x0C03	M	M	M
Base Band	HCI_Set_Event_Filter	0x0005	Filter_Type, Filter_Condition_Type, Condition	Status	0x0C05	M	M	M
Commands	HCI_Flush	0x0008	Connection_Handle	Status, Connection_Handle	0x0C08	O	M	M
	HCI_Read_PIN_Type	0x0009	---	Status, PIN_Type	0x0C09	O	M	M
	HCI_Write_PIN_Type	0x000A	PIN_Type	Status	0x0C0A	O	M	M
	HCI_Create_New_Unit_Key	0x000B	---	Status	0x0C0B	O	M	M
	HCI_Read_Stored_Link_Key	0x000D	BD_ADDR, Read_All_Flag	Status, Max_Num_Key, Num_Keys_Read	0x0C0D	O	M	M
	HCI_Write_Stored_Link_Key	0x0011	Num_Keys_To_Write, BD_ADDR, Link_Key	Status, Num_Keys_Written	0x0C11	O	M	M
	HCI_Delete_Stored_Link_Key	0x0012	BD_ADDR, Delete_All_Flag	Status, Num_Keys_Deleted	0x0C12	O	M	M
	HCI_Change_Local_Name	0x0013	Name	Status	0x0C13	O	M	M
	HCI_Read_Local_Name	0x0014	---	Status, Name	---	X	M	M
	HCI_Read_Connection_Accept_Timeout	0x0015	---	Status, Conn_Accept_Timeout	0x0C15	M	M	M
	HCI_Write_Connection_Accept_Timeout	0x0016	Conn_Accept_Timeout	Status	0x0C16	M	M	M
	HCI_Read_Page_Timeout	0x0017	---	Status, Page_Timeout	0x0C17	M	M	M
	HCI_Write_Page_Timeout	0x0018	Page_Timeout	Status	0x0C18	M	M	M
	HCI_Read_Scan_Enable	0x0019	---	Status, Scan_Enable	0x0C19	M	M	M
	HCI_Write_Scan_Enable	0x001A	Scan_Enable	Status	0x0C1A	M	M	M
	HCI_Read_Page_Scan_Activity	0x001B	---	Status, Page_Scan_Interval, Page_Scan_Window	0x0C1B	M	M	M
	HCI_Write_Page_Scan_Activity	0x001C	Page_Scan_Interval,Page_Scan_Window	Status	0x0C1C	M	M	M
	HCI_Read_Inquiry_Scan_Activity	0x001D	---	Status, Inquiry_Scan_Interval, Inquiry_Scan_Window	0x0C1D	M	M	M
	HCI_Write_Inquiry_Scan_Activity	0x001E	Inquiry_Scan_Interval, Inquiry_Scan_Window	Status	0x0C1E	M	M	M
	HCI_Read_Authetication_Enable	0x001F	---	Status, Authentication_Enable	0x0C1F	O	M	M
	HCI_Write_Authentication_Enable	0x0020	Authentication_Enable	Status	0x0C20	O	M	M
	HCI_Read_Encryption_Mode	0x0021	---	Status, Encryption_Mode	0x0C21	O(T)	O	M
	HCI_Write_Encryption_Mode	0x0022	Encryption_Mode	Status	0x0C22	O(T)	O	M
	HCI_Read_Class_of_Device	0x0023	---	Status, Class_of_Device	0x0C23	M	M	M
	HCI_Write_Class_of_Device	0x0024	Class_of_Device	Status	0x0C24	M	M	M
	HCI_Read_Voice_Setting	0x0025	---	Status, Voice_Setting	0x0C25	M	M	M
	HCI_WRite_Voice_Setting	0x0026	Voice_Setting	Status	0x0C26	M	M	M
	HCI_Read_Automatic_Flush_Timeout	0x0027	Connection_Handle	Status, Connection_Handle, Flush_Timeout	0x0C27	M	M	M

	HCI_Write_Automatic_Flush_Timeout	0x0028	Connection_Handle, Flush_Timeout	Status, Connection_Handle	0x0C28	M	M	M
	HCI_Read_Num_Broadcast_Retransmissions	0x0029	---	Status, Num_Broadcast_Retran	0x0C29	M	M	M
	HCI_Write_Num_Broadcast_Retrnsmission	0x002A	Num_Broadcast_Retran	Status	0x0C2A	M	M	M
	HCI_Read_Hold_Mode_Activity	0x002B	---	Status, Hold_Mode_Activity	0x0C2B	M	M	M
	HCI_Write_Hold_Mode_Activity	0x002C	Hold_Mode_Activity	Status	0x0C2C	M	M	M
	HCI_Read_Transmit_Power_Level	0x002D	Connection_Handle, Type	Status, Connection_Handle, Transmit_Power_Level	0x0C2D	O	M	M
	HCI_Read_SCO_Flow_Control_Enable	0x002E	---	Status, SCO_Flow_Control_Enable	---	O	M	M
	HCI_Write_SCO_Flow_Control_Enable	0x002F	SCO_Flow_Control_Enable	Status	---	O	M	M
	HCI_Set_Host_Controller_to_Host_Flow_Control	0x0031	Flow_Control_Enable	Status	0x0C31	X	M	M
	HCI_Host_Buffer_Size	0x0033	Host_ACL_Data_Packet_Length, Host_SCO_Data_Packet_Length, Host_Total_Num_ACL_Data_Packets, Host_Total_NumSCOL_Data_Packets	Status	0x0C33	X	M	M
	HCI_Host_Number_Of_Completed_Packets	0x0035	Number_of_Handles, Connection_Handle, Host_Num_Of_Completed_Packets	---	0x0C35	X	M	M
	HCI_Read_Link_Supervision_Timeout	0x0036	Connection_Handle	Status, Connection_Handle, Link_Supervision_Timeout	0x0C36	M	M	M
	HCI_Write_Link_Supervision_Timeout	0x0037	Connection_Handle, Link_Supervision_Timeout	Status, Connection_Handle	0x0C37	M	M	M
	HCI_Read_Number_Of_Supported_IAC	0x0038	---	Status, Num_Support_IAC	0x0C38	M	M	M
	HCI_Read_Current_IAC_LAP	0x0039	---	Status, Num_Current_IAC, IAC_LAP	0x0C39	M	M	M
	HCI_Write_Current_IAC_LAP	0x003A	Num_Current_IAC, IAC_LAP	Status	0x0C3A	M	M	M
	HCI_Read_Page_Scan_Period_Mode	0x003B	---	Status, Page_Scan_Period_Mode	0x0C3B	M	M	M
	HCI_Write_Page_Scan_Period_Mode	0x003C	Page_Scan_Period_Mode	Status	0x0C3C	M	M	M
	HCI_Read_Page_Scan_Mode	0x003D	---	Status, Page_Scan_Mode	0x0C3D	M	M	M
	HCI_Write_Page_Scan_Mode	0x003E	Page_Scan_Mode	Status	0x0C3E	M	M	M

Item	HCI_Command	OCF	Parameters	Return Parameters	OpeCode	Alpha	Beta	V1
INFORMATIONAL	HCI_Read_Local_Version_Information	0x0001	---	Status, HCI Version, HCI Revision, LMP Version, Manufacturer_Name, LMP Subversion	0x1001	O(T)	M	M
PARAMETERS	HCI_Read_Local_Supported_Features	0x0003	---	Status, LMP_Features	0x1003	O(T)	M	M
	HCI_Read_Buffer_Size	0x0005	---	Status, HC_ACL_Data_Packet_Length, HC_SCO_Data_Packet_Length, HC_Total_Num_ACL_Data_Packets, HC_Total_Num_SCO_Data_Packets	0x1005	O(T)	M	M
	HCI_Read_Country_Code	0x0007	---	Status, Country_Code	0x1007	O(T)	M	M
	HCI_Read_BD_ADDR	0x0009	---	Status, BD_ADDR	0x1009	O(T)	M	M
STATUS	HCI_Read_Failed_Contact_Counter	0x0001	Connection_Handle	Status, Connection_Handle, Failed_Contact_Counter	0x1401	O	M	M
PARAMETERS	HCI_Reset_Failed_Contact_Counter	0x0002	Connection_Handle	Status, Connection_Handle	0x1402	O	M	M
	HCI_Get_Link_Quality	0x0003	Connection_Handle	Status, Connection_Handle, Link_Quality	0x1403	X	M	M
	HCI_Read_RSSI	0x0005	Connection_Handle	Status, Connection_Handle, RSSI	0x1405	X	O(T)	M
TESTING	HCI_Read_Loopback_Mode	0x0001	---	Status, Loopback_Mode	0x1801	O(T)	M	M
	HCI_Write_Loopback_Mode	0x0002	Loopback_Mode	Status	0x1802	O(T)	M	M
	HCI_Enable_Device_Under_Test_Mode	0x0003	---	Status	0x1803	M	M	M

Remarks: of supported HCI command progress

Description	Contents
X	Will not be available.
O	Optional. May not be available.
M	Mandatory. Will be available.
M1	Mandatory Adapted Layer. Will be available as part of the "Joint Marketing Agreement for Bluetooth™ Host Software
D	Desirable
?	Insufficient information available.
O(T)	Optional but useful for testing
C1	If piconet supports encrypted broadcast then M else O
C2	If supported by hardware and software
C3	Shown as mandatory in BT spec. Poor spec detail may result in support after V1.
S'T)	Sufficient functionality for hardware testing is required

Appendix4 USB descriptors list in Bluetooth™ firm ware

All Descriptors Report (14:36 - 29/8/100)

Device Descriptor Fields:
bLength
bDescriptorType
bcdUSB
bDeviceClass
bDeviceSubClass
bDeviceProtocol
bMaxPacketSize0
idVendor
idProduct
bcdDevice
iManufacturer
Language ID
iManufacturer String
iProduct
Language ID
iProduct String
iSerialNumber
bNumConfigurations

Configuration Descriptor, Index 0x00
bLength
bDescriptorType
wTotalLength
bNumInterfaces
bConfigurationValue
iConfiguration
bmAttributes
MaxPower

INTERFACE Descriptor (Number 0x00, Alternate Setting 0x00)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

Endpoint Descriptor 0x81
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

Endpoint Descriptor 0x02
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

Endpoint Descriptor 0x82
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

INTERFACE Descriptor (Number 0x01, Alternate Setting 0x00)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

Endpoint Descriptor 0x03
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

Endpoint Descriptor 0x83
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

INTERFACE Descriptor (Number 0x01, Alternate Setting 0x01)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

Endpoint Descriptor 0x03
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

Endpoint Descriptor 0x83
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

INTERFACE Descriptor (Number 0x01, Alternate Setting 0x02)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

Endpoint Descriptor 0x03
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

Endpoint Descriptor 0x83
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

INTERFACE Descriptor (Number 0x01, Alternate Setting 0x03)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

Endpoint Descriptor 0x03
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize

bInterval

Endpoint Descriptor 0x83
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

INTERFACE Descriptor (Number 0x01, Alternate Setting 0x04)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

Endpoint Descriptor 0x03
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

Endpoint Descriptor 0x83
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

INTERFACE Descriptor (Number 0x01, Alternate Setting 0x05)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

Endpoint Descriptor 0x03
bLength
bDescriptorType
bEndpointAddress
bmAttributes
wMaxPacketSize
bInterval

Endpoint Descriptor 0x83
bLength
bDescriptorType
bEndpointAddress
bmAttributes

wMaxPacketSize
bInterval

INTERFACE Descriptor (Number 0x02, Alternate Setting 0x00)
bLength
bDescriptorType
bInterfaceNumber
bAlternateSetting
bNumEndpoints
bInterfaceClass
bInterfaceSubClass
bInterfaceProtocol
iInterface

NonStandard Descriptor
bLength
bDescriptorType
Data