Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_RSSI command succeeded.
0x01-0xFF	Read_RSSI command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	The Connection Handle for the Connection for which the RSSI has been read. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

RSSI: *Size: 1 Octet*

Value	Parameter Description
N = 0xXX	Size: 1 Octet (signed integer) Range: -128 ≤ N ≤ 127 Units: dB

Event(s) generated (unless masked away):

When the Read_RSSI command has completed, a Command Complete event will be generated.

7.5.5 Read AFH Channel Map Command

Command	OCF	Command Parameters	Return Parameters
Read_AFH _Channel_Map	0x0006	Connection_Handle	Status, Connection_Handle, AFH_Mode, AFH_Channel_Map

Description:

This command will return the values for the AFH_Mode and AFH_Channel_Map for the specified Connection Handle. The Connection_Handle must be a Connection_Handle for an ACL connection.

The returned values indicate the state of the hop sequence specified by the most recent LMP_Set_AFH message for the specified Connection_Handle, regardless of whether the master has received the baseband ACK or whether the AFH_Instant has passed.

This command shall be supported by a device that declares support for either the AFH_capable_slave or AFH_capable_master feature.

Command Parameters:

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	The Connection Handle for the Connection for which the Channel Map is to be read. Range: 0x0000-0x0EFF (0x0F00-0x0FFF Reserved for future use)

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_AFH_Channel_Map command succeeded.
0x01-0xFF	Read_AFH_Channel_Map command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	The Connection Handle for the Connection for which the Channel Map is to be read. Range: 0x0000-0x0EFF (0x0F00-0x0FFF Reserved for future use)

AFH_Mode: *Size: 1 Octet*

Value	Parameter Description
0x00	AFH disabled.
0x01	AFH enabled.
0x02-0xFF	Reserved for future use.

AFH_Channel_Map: *Size: 10 Octets (79 Bits meaningful)*

Value	Parameter Description
0xXXXXXXXX XXXXXXXX XXX	If AFH_Mode is AFH enabled then this parameter contains 79 1-bit fields, otherwise the contents are reserved. The n^{th} such field (in the range 0 to 78) contains the value for channel *n*: Channel *n* is unused = 0 Channel *n* is used = 1 Range: 0x00000000000000000000-0x7FFFFFFFFFFFFFFFFFFF (0x80000000000000000000-0xFFFFFFFFFFFFFFFFFFFF Reserved for future use)

Event(s) generated (unless masked away):

When the Read_AFH_Channel_Map command has completed, a Command Complete event will be generated.

7.5.6 Read Clock Command

Command	OCF	Command Parameters	Return Parameters
HCI_Read_Clock	0x0007	Connection_Handle Which_Clock	Status, Connection_Handle, Clock, Accuracy

Description:

This command will read the estimate of the value of the Bluetooth Clock.

If the Which_Clock value is 0, then the Connection_Handle shall be ignored, and the local Bluetooth Clock value shall be returned, and the accuracy parameter shall be set to 0.

If the Which_Clock value is 1, then the Connection_Handle must be a valid ACL connection handle. If the current role of this ACL connection is Master, then the Bluetooth Clock of this device shall be returned. If the current role is Slave, then an estimate of the Bluetooth Clock of the remote master and the accuracy of this value shall be returned.

The accuracy reflects the clock drift that might have occurred since the slave last received a valid transmission from the master.

Note: The Bluetooth Clock has a minimum accuracy of 250ppm, or about 22 seconds drift in one day.

Note: See Baseband Specification, Section 1.1, on page 64 for more information about the Bluetooth Clock.

Command Parameters:

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle to be used to identify which connection to be used for reading the masters Bluetooth Clock. Range: 0x0000-0x0EFF (0x0F00 – 0x0FFF Reserved for future use)

Which_Clock: *Size 1 Octet)*

Value	Parameter Description
0xXX	0x00 = Local Clock (Connection Handle does not have to be a valid handle) 0x01 = Piconet Clock (Connection Handle shall be a valid ACL Handle) 0x02 to 0xFF = Reserved

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_BD_CLOCK command succeeded.
0x01 – 0xFF	Read_BD_CLOCK command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	The Connection Handle for the Connection for which the master clock has been read. If the Which_Clock was 0, then the Connection_Handle shall be set to 0 and ignored upon receipt Range: 0x0000-0x0EFF (0x0F00 – 0x0FFF Reserved for future use)

Clock: *Size: 4 Octets (28 bits meaningful)*

Value	Parameter Description
0xXXXXXXXX	Bluetooth Clock of the device requested.

Accuracy: *Size: 2 Octets*

Value	Parameter Description
0xXXXX	+/- maximum Bluetooth Clock error. Value of 0xFFFF means Unknown. Accuracy = +/- N * 0.3125 msec (1 Bluetooth Clock) Range for N: 0x0000 - 0xFFFE Time Range for N: 0 - 20479.375 msec

Event(s) generated (unless masked away):

When the Read_Clock command has completed, a Command Complete event will be generated.

7.6 TESTING COMMANDS

The Testing commands are used to provide the ability to test various functionalities of the Bluetooth hardware. These commands provide the ability to arrange various conditions for testing. For the Testing Commands, the OGF is defined as 0x06.

7.6.1 Read Loopback Mode Command

Command	OCF	Command Parameters	Return Parameters
HCI_Read_Loopback_Mode	0x0001		Status, Loopback_Mode

Description:

This command will read the value for the setting of the Controller's Loopback Mode. The setting of the Loopback Mode will determine the path of information. In Non-testing Mode operation, the Loopback Mode is set to Non-testing Mode and the path of the information is as specified by the Bluetooth specifications. In Local Loopback Mode, every Data Packet (ACL, SCO and eSCO) and Command Packet that is sent from the Host to the Controller is sent back with no modifications by the Controller, as shown in Figure 7.1 on page 560.
]For details of loopback modes see Section 7.6.2 on page 559.

Command Parameters:

None.

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_Loopback_Mode command succeeded.
0x01-0xFF	Read_Loopback_Mode command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Loopback_Mode: *Size: 1 Octet*

Value	Parameter Description
0x00	No Loopback mode enabled. **Default.**
0x01	Enable Local Loopback.
0x02	Enable Remote Loopback.
0x03-0xFF	Reserved for Future Use.

Event(s) generated (unless masked away):

When the Read_Loopback_Mode command has completed, a Command Complete event will be generated.

7.6.2 Write Loopback Mode Command

Command	OCF	Command Parameters	Return Parameters
HCI_Write_Loopback_Mode	0x0002	Loopback_Mode	Status

Description:

This command will write the value for the setting of the Controller's Loopback Mode. The setting of the Loopback Mode will determine the path of information. In Non-testing Mode operation, the Loopback Mode is set to Non-testing Mode and the path of the information as specified by the Bluetooth specifications. In Local Loopback Mode, every Data Packet (ACL, SCO and eSCO) and Command Packet that is sent from the Host to the Controller is sent back with no modifications by the Controller, as shown in Figure 7.1 on page 560.

When the Bluetooth Host Controller enters Local Loopback Mode, it shall respond with one to four connection handles, one for an ACL connection and zero to three for synchronous connections. The Host should use these connection handles when sending data in Local Loopback Mode. The number of connection handles returned for synchronous connections (between zero and three) is implementation specific. When in Local Loopback Mode, the Controller loops back commands and data to the Host. The Loopback Command event is used to loop back commands that the Host sends to the Controller.

There are some commands that are not looped back in Local Loopback Mode: Reset, Set_Controller_To_Host_Flow_Control, Host_Buffer_Size, Host_Number_Of_Completed_Packets, Read_Buffer_Size, Read_Loopback_Mode and Write_Loopback_Mode. These commands should be executed in the way they are normally executed. The commands Reset and Write_Loopback_Mode can be used to exit local loopback mode.

If Write_Loopback_Mode is used to exit Local Loopback Mode, Disconnection Complete events corresponding to the Connection Complete events that were sent when entering Local Loopback Mode should be sent to the Host. Furthermore, no connections are allowed in Local Loopback mode. If there is a connection, and there is an attempt to set the device to Local Loopback Mode, the attempt will be refused. When the device is in Local Loopback Mode, the Controller will refuse incoming connection attempts. This allows the Host Controller Transport Layer to be tested without any other variables.

If a device is set to Remote Loopback Mode, it will send back all data (ACL, SCO and eSCO) that comes over the air. It will only allow a maximum of one ACL connection and three synchronous connections, and these shall all be to the same remote device. If there are existing connections to a remote device and there is an attempt to set the local device to Remote Loopback Mode, the attempt shall be refused.

See Figure 7.2 on page 560, where the rightmost device is set to Remote Loopback Mode and the leftmost device is set to Non-testing Mode. This allows the Bluetooth Air link to be tested without any other variables.

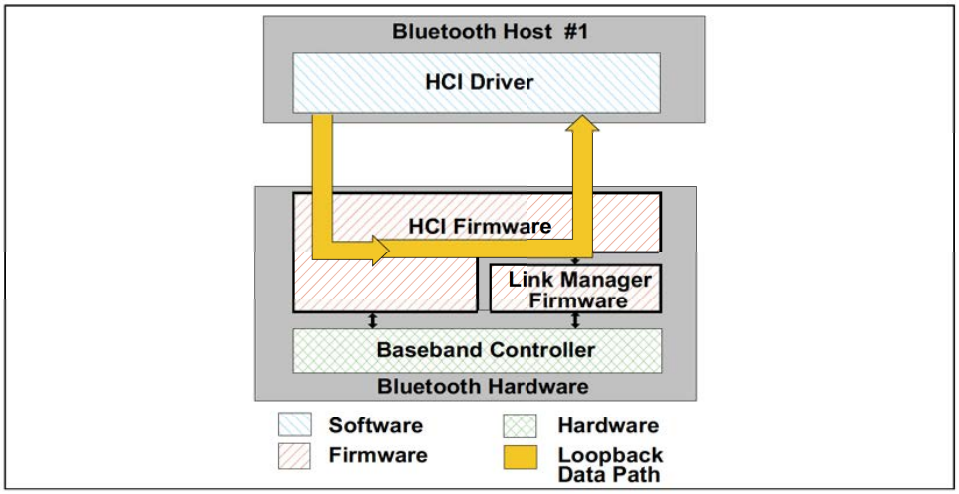


Figure 7.1: Local Loopback Mode

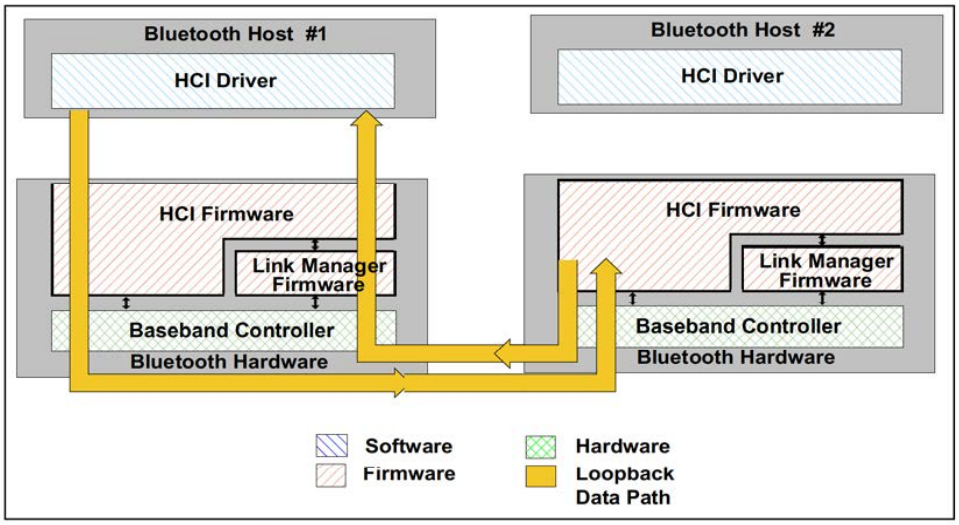


Figure 7.2: Remote Loopback Mode

Command Parameters:

Loopback_Mode: *Size: 1 Octet*

Value	Parameter Description
0x00	No Loopback mode enabled. **Default.**
0x01	Enable Local Loopback.
0x02	Enable Remote Loopback.
0x03-0xFF	Reserved for Future Use.

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Write_Loopback_Mode command succeeded.
0x01-0xFF	Write_Loopback_Mode command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Event(s) generated (unless masked away):

When the Write_Loopback_Mode command has completed, a Command Complete event will be generated.

7.6.3 Enable Device Under Test Mode Command

Command	OCF	Command Parameters	Return Parameters
HCI_Enable_Device_Under_ Test_Mode	0x0003		Status

Description:

The Enable_Device_Under_Test_Mode command will allow the local Bluetooth module to enter test mode via LMP test commands. For details see "Link Manager Protocol" on page 211 [Part C]. The Host issues this command when it wants the local device to be the DUT for the Testing scenarios as described in the "Test Methodology" on page 231[vol. 4]. When the Controller receives this command, it will complete the command with a Command Complete event. The Controller functions as normal until the remote tester issues the LMP test command to place the local device into Device Under Test mode. To disable and exit the Device Under Test Mode, the Host can issue the HCI_Reset command. This command prevents remote Bluetooth devices from causing the local Bluetooth device to enter test mode without first issuing this command.

Command Parameters:

None.

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Enter_Device_Under_Test_Mode command succeeded.
0x01-0xFF	Enter_Device_Under_Test_Mode command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Event(s) generated (unless masked away):

When the Enter_Device_Under_Test_Mode command has completed, a Command Complete event will be generated.

7.7 EVENTS

7.7.1 Inquiry Complete Event

Event	Event Code	Event Parameters
Inquiry Complete	0x01	Status

Description:

The Inquiry Complete event indicates that the Inquiry is finished. This event contains a status parameter, which is used to indicate if the Inquiry completed successfully or if the Inquiry was not completed.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Inquiry command completed successfully.
0x01-0xFF	Inquiry command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

7.7.2 Inquiry Result Event

Event	Event Code	Event Parameters
Inquiry Result	0x02	Num_Responses, BD_ADDR[i], Page_Scan_Repetition_Mode[i], Reserved[i], Reserved[i], Class_of_Device[i] Clock_Offset[i]

Description:

The Inquiry Result event indicates that a Bluetooth device or multiple Bluetooth devices have responded so far during the current Inquiry process. This event will be sent from the Controller to the Host as soon as an Inquiry Response from a remote device is received if the remote device supports only mandatory paging scheme. The Controller may queue these Inquiry Responses and send multiple Bluetooth devices information in one Inquiry Result event. The event can be used to return one or more Inquiry responses in one event.

Event Parameters:

Num_Responses: *Size: 1 Octet*

Value	Parameter Description
0xXX	Number of responses from the Inquiry.

BD_ADDR[i]: *Size: 6 Octets * Num_Responses*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR for each device which responded.

Page_Scan_Repetition_Mode[i]: *Size: 1 Octet * Num_Responses*

Value	Parameter Description
0x00	R0
0x01	R1
0x02	R2
0x03 – 0xFF	Reserved

Reserved[i]: [1] *Size: 1 Octet * Num_Responses*

Value	Parameter Description
0xXX	Reserved.

Reserved[i]: [2] *Size: 1 Octet * Num_Responses*

Value	Parameter Description
0xXX	Reserved, must be set to 0x00.

Class_of_Device[i]: *Size: 3 Octets * Num_Responses*

Value	Parameter Description
0xXXXXXX	Class of Device for the device

Clock_Offset[i]: *Size: 2 Octets * Num_Responses*

Bit format	Parameter Description
Bit 14-0	Bit 16-2 of CLKslave-CLKmaster.
Bit 15	Reserved

1. This was the Page_Scan_Period_Mode parameter in the v1.1 specification. This parameter has no meaning in v1.2 and no default value.
2. This was the Page_Scan_Mode parameter in the v1.1 specification.

7.7.3 Connection Complete Event

Event	Event Code	Event Parameters
Connection Complete	0x03	Status, Connection_Handle, BD_ADDR, Link_Type, Encryption_Mode

Description:

The Connection Complete event indicates to both of the Hosts forming the connection that a new connection has been established. This event also indicates to the Host, which issued the Create Connection, or Accept_Connection_Request or Reject_Connection_Request command and then received a Command Status event, if the issued command failed or was successful.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Connection successfully completed.
0x01-0xFF	Connection failed to Complete. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle to be used to identify a connection between two Bluetooth devices. The Connection Handle is used as an identifier for transmitting and receiving voice or data. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the other connected Device forming the connection.

Link_Type: *Size: 1 Octet*

Value	Parameter Description
0x00	SCO connection.
0x01	ACL connection (Data Channels).
0x02-0xFF	Reserved for future use.

Encryption_Mode: *Size: 1 Octet*

Value	Parameter Description
See Section 6.16 on page 389.	

7.7.4 Connection Request Event

Event	Event Code	Event Parameters
Connection Request	0x04	BD_ADDR, Class_of_Device, Link_Type

Description:

The Connection Request event is used to indicate that a new incoming connection is trying to be established. The connection may either be accepted or rejected. If this event is masked away and there is an incoming connection attempt and the Controller is not set to auto-accept this connection attempt, the Controller will automatically refuse the connection attempt. When the Host receives this event and the link type parameter is ACL, it should respond with either an Accept_Connection_Request or Reject_Connection_Request command before the timer Conn_Accept_Timeout expires. If the link type is SCO or eSCO, the Host should reply with the Accept_Synchronous_Connection_Request or the Reject_Synchronous_Connection_Request Command. If the link type is SCO, the host may respond with Accept_Connection_Request. If the Event is responded to with Accept_Connection_Request, then the default parameter settings of the Accept_Synchronous_Connection_Request (see Section 7.1.27 on page 442) should be used by the local LM when negotiating the SCO or eSCO link parameters. In that case, the Connection_Complete Event and not the Synchronous_Connection_Complete Event, shall be returned on completion of the connection.

Event Parameters:

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the device that requests the connection.

Class_of_Device: *Size: 3 Octets*

Value	Parameter Description
0xXXXXXX	Class of Device for the device, which requests the connection.
0x000000	Unknown Class of Device

Link_Type: *Size: 1 Octet*

Value	Parameter Description
0x00	SCO Connection requested
0x01	ACL Connection requested
0x02	eSCO Connection requested
0x03-0xFF	Reserved for Future Use.

7.7.5 Disconnection Complete Event

Event	Event Code	Event Parameters
Disconnection Complete	0x05	Status, Connection_Handle, Reason

Description:

The Disconnection Complete event occurs when a connection is terminated. The status parameter indicates if the disconnection was successful or not. The reason parameter indicates the reason for the disconnection if the disconnection was successful. If the disconnection was not successful, the value of the reason parameter can be ignored by the Host. For example, this can be the case if the Host has issued the Disconnect command and there was a parameter error, or the command was not presently allowed, or a connection handle that didn't correspond to a connection was given.
Note: When a physical link fails, one Disconnection Complete event will be returned for each logical channel on the physical link with the corresponding Connection handle as a parameter.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Disconnection has occurred.
0x01-0xFF	Disconnection failed to complete. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle which was disconnected. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Reason: *Size: 1 Octet*

Value	Parameter Description
0xXX	Reason for disconnection. See "Error Codes" on page 319 [Part D] for error codes and description.

7.7.6 Authentication Complete Event

Event	Event Code	Event Parameters
Authentication Complete	0x06	Status, Connection_Handle

Description:

The Authentication Complete event occurs when authentication has been completed for the specified connection. The Connection_Handle must be a Connection_Handle for an ACL connection.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Authentication Request successfully completed.
0x01-0xFF	Authentication Request failed to complete. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle for which Authentication has been performed. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

7.7.7 Remote Name Request Complete Event

Event	Event Code	Event Parameters
Remote Name Request Complete	0x07	Status, BD_ADDR, Remote_Name

Description:

The Remote Name Request Complete event is used to indicate that a remote name request has been completed. The Remote_Name event parameter is a UTF-8 encoded string with up to 248 octets in length. The Remote_Name event parameter will be null-terminated (0x00) if the UTF-8 encoded string is less than 248 octets. The BD_ADDR event parameter is used to identify which device the user-friendly name was obtained from.
Note: the Remote_Name Parameter is a string parameter. Endianess does therefore not apply to the Remote_Name Parameter. The first octet of the name is received first.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Remote_Name_Request command succeeded.
0x01-0xFF	Remote_Name_Request command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR for the device whose name was requested.

Remote_Name: *Size: 248 Octets*

Value	Parameter Description
Name[248]	A UTF-8 encoded user-friendly descriptive name for the remote device. If the name contained in the parameter is shorter than 248 octets, the end of the name is indicated by a NULL octet (0x00), and the following octets (to fill up 248 octets, which is the length of the parameter) do not have valid values.

7.7.8 Encryption Change Event

Event	Event Code	Event Parameters
Encryption Change	0x08	Status, Connection_Handle, Encryption_Enable

Description:

The Encryption Change event is used to indicate that the change in the encryption has been completed for the Connection Handle specified by the Connection_Handle event parameter. The Connection_Handle will be a Connection_Handle for an ACL connection. The Encryption_Enable event parameter specifies the new Encryption Enable for the Connection Handle specified by the Connection_Handle event parameter. This event will occur on both devices to notify the Hosts when Encryption has changed for the specified Connection Handle between two devices.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Encryption Change has occurred.
0x01-0xFF	Encryption Change failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle for which the link layer encryption has been enabled/disabled for all Connection Handles with the same Bluetooth device endpoint as the specified Connection Handle. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Encryption_Enable: *Size: 1 Octet*

Value	Parameter Description
0x00	Link Level Encryption is OFF.
0x01	Link Level Encryption is ON.

7.7.9 Change Connection Link Key Complete Event

Event	Event Code	Event Parameters
Change Connection Link Key Complete	0x09	Status, Connection_Handle

Description:

The Change Connection Link Key Complete event is used to indicate that the change in the Link Key for the Connection Handle specified by the Connection_Handle event parameter has been completed.
The Connection_Handle will be a Connection_Handle for an ACL connection.
The Change Connection Link Key Complete event is sent only to the Host which issued the Change_Connection_Link_Key command.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Change_Connection_Link_Key command succeeded.
0x01-0xFF	Change_Connection_Link_Key command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle which the Link Key has been change for all Connection Handles with the same Bluetooth device end point as the specified Connection Handle. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

7.7.10 Master Link Key Complete Event

Event	Event Code	Event Parameters
Master Link Key Complete	0x0A	Status, Connection_Handle, Key_Flag

Description:

The Master Link Key Complete event is used to indicate that the Link Key managed by the master of the piconet has been changed. The Connection_Handle will be a Connection_Handle for an ACL connection. The link key used for the connection will be the temporary link key of the master device or the semi-permanent link key indicated by the Key_Flag. The Key_Flag event parameter is used to indicate which Link Key (temporary link key of the Master, or the semi-permanent link keys) is now being used in the piconet.
Note: for a master, the change from a semi-permanent Link Key to temporary Link Key will affect all Connection Handles related to the piconet. For a slave, this change affects only this particular connection handle. A temporary link key must be used when both broadcast and point-to-point traffic shall be encrypted.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Master_Link_Key command succeeded.
0x01-0xFF	Master_Link_Key command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle for which the Link Key has been changed for all devices in the same piconet. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Key_Flag: *Size: 1 Octet*

Value	Parameter Description
0x00	Using Semi-permanent Link Key.
0x01	Using Temporary Link Key.

7.7.11 Read Remote Supported Features Complete Event

Event	Event Code	Event Parameters
Read Remote Supported Features Complete	0x0B	Status, Connection_Handle, LMP_Features

Description:

The Read Remote Supported Features Complete event is used to indicate the completion of the process of the Link Manager obtaining the supported features of the remote Bluetooth device specified by the Connection_Handle event parameter. The Connection_Handle will be a Connection_Handle for an ACL connection. The event parameters include a list of LMP features. For details see "Link Manager Protocol" on page 211[vol. 3].

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_Remote_Supported_Features command succeeded.
0x01-0xFF	Read_Remote_Supported_Features command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle which is used for the Read_Remote_Supported_Features command. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

LMP_Features: *Size: 8 Octets*

Value	Parameter Description
0xXXXXXXXX XXXXXXXX	Bit Mask List of LMP features. See "Link Manager Protocol" on page 211 [Part C].

7.7.12 Read Remote Version Information Complete Event

Event	Event Code	Event Parameters
Read Remote Version Information Complete	0x0C	Status, Connection_Handle, LMP_Version, Manufacturer_Name, LMP_Subversion

Description:

The Read Remote Version Information Complete event is used to indicate the completion of the process of the Link Manager obtaining the version information of the remote Bluetooth device specified by the Connection_Handle event parameter. The Connection_Handle will be a Connection_Handle for an ACL connection. The LMP_Version event parameter defines the specification version of the Bluetooth device. The Manufacturer_Name event parameter indicates the manufacturer of the remote Bluetooth device. The LMP_Subversion event parameter is controlled by the manufacturer and is implementation dependant. The LMP_Subversion event parameter defines the various revisions that each version of the Bluetooth hardware will go through as design processes change and errors are fixed. This allows the software to determine what Bluetooth hardware is being used and, if necessary, to work around various bugs in the hardware.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_Remote_Version_Information command succeeded.
0x01-0xFF	Read_Remote_Version_Information command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle which is used for the Read_Remote_Version_Information command. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

LMP_Version: *Size: 1 Octet*

Value	Parameter Description
0xXX	Version of the Current LMP in the remote Bluetooth device. For LMP_Version information see https://www.bluetooth.org/foundry/assign-numb/document/assigned_numbers

Manufacturer_Name: *Size: 2 Octets*

Value	Parameter Description
0xXXXX	Manufacturer Name of the remote Bluetooth device, see Table 5.2 on page 303 in the Link Manager Protocol for assigned values (CompId).

LMP_Subversion: *Size: 2 Octets*

Value	Parameter Description
0xXXXX	Subversion of the Current LMP in the remote Bluetooth device, see Table 5.2 on page 303 in the Link Manager Protocol for assigned values (SubVersNr).

7.7.13 QoS Setup Complete Event

Event	Event Code	Event Parameters
QoS Setup Complete	0x0D	Status, Connection_Handle, Flags, Service_Type, Token_Rate, Peak_Bandwidth, Latency, Delay_Variation

Description:

The QoS Setup Complete event is used to indicate the completion of the process of the Link Manager setting up QoS with the remote Bluetooth device specified by the Connection_Handle event parameter. The Connection_Handle will be a Connection_Handle for an ACL connection. For more detail see "Logical Link Control and Adaptation Protocol Specification" on page 15[vol. 4].

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	QoS_Setup command succeeded.
0x01-0xFF	QoS_Setup command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle which is used for the QoS_Setup command. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Flags: *Size: 1 Octet*

Value	Parameter Description
0x00 – 0xFF	Reserved for Future Use.

Service_Type: *Size: 1 Octet*

Value	Parameter Description
0x00	No Traffic Available.
0x01	Best Effort Available.
0x02	Guaranteed Available.
0x03-0xFF	Reserved for Future Use.

Token_Rate: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Available Token Rate, in octets per second.

Peak_Bandwidth: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Available Peak Bandwidth, in octets per second.

Latency: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Available Latency, in microseconds.

Delay_Variation: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Available Delay Variation, in microseconds.

7.7.14 Command Complete Event

Event	Event Code	Event Parameters
Command Complete	0x0E	Num_HCI_Command_Packets, Command_Opcode, Return_Parameters

Description:

The Command Complete event is used by the Controller for most commands to transmit return status of a command and the other event parameters that are specified for the issued HCI command.

The Num_HCI_Command_Packets event parameter allows the Controller to indicate the number of HCI command packets the Host can send to the Controller. If the Controller requires the Host to stop sending commands, the Num_HCI_Command_Packets event parameter will be set to zero. To indicate to the Host that the Controller is ready to receive HCI command packets, the Controller generates a Command Complete event with the Command_Opcode 0x0000, and the Num_HCI_Command_Packets event parameter is set to 1 or more. Command_Opcode, 0x0000 is a NOP (No OPeration), and can be used to change the number of outstanding HCI command packets that the Host can send before waiting. See each command for the parameters that are returned by this event.

Event Parameters:

Num_HCI_Command_Packets: *Size: 1 Octet*

Value	Parameter Description
N = 0xXX	The Number of HCI command packets which are allowed to be sent to the Controller from the Host. Range for N: 0 – 255

Command_Opcode: *Size: 2 Octets*

Value	Parameter Description
0xXXXX	Opcode of the command which caused this event.

Return_Parameter(s): *Size: Depends on Command*

Value	Parameter Description
0xXX	This is the return parameter(s) for the command specified in the Command_Opcode event parameter. See each command's definition for the list of return parameters associated with that command.

7.7.15 Command Status Event

Event	Event Code	Event Parameters
Command Status	0x0F	Status, Num_HCI_Command_Packets, Command_Opcode

Description:

The Command Status event is used to indicate that the command described by the Command_Opcode parameter has been received, and that the Controller is currently performing the task for this command. This event is needed to provide mechanisms for asynchronous operation, which makes it possible to prevent the Host from waiting for a command to finish. If the command can not begin to execute (a parameter error may have occurred, or the command may currently not be allowed), the Status event parameter will contain the corresponding error code, and no complete event will follow since the command was not started. The Num_HCI_Command_Packets event parameter allows the Controller to indicate the number of HCI command packets the Host can send to the Controller. If the Controller requires the Host to stop sending commands, the Num_HCI_Command_Packets event parameter will be set to zero. To indicate to the Host that the Controller is ready to receive HCI command packets, the Controller generates a Command Status event with Status 0x00 and Command_Opcode 0x0000, and the Num_HCI_Command_Packets event parameter is set to 1 or more. Command_Opcode, 0x0000 is a NOP (No OPeration) and can be used to change the number of outstanding HCI command packets that the Host can send before waiting.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Command currently in pending.
0x01-0xFF	Command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Num_HCI_Command_Packets: *Size: 1 Octet*

Value	Parameter Description
N = 0xXX	The Number of HCI command packets which are allowed to be sent to the Controller from the Host. Range for N: 0 – 255

Command_Opcode: *Size: 2 Octets*

Value	Parameter Description
0xXXXX	Opcode of the command which caused this event and is pending completion.

7.7.16 Hardware Error Event

Event	Event Code	Event Parameters
Hardware Error	0x10	Hardware_Code

Description:

The Hardware Error event is used to indicate some type of hardware failure for the Bluetooth device. This event is used to notify the Host that a hardware failure has occurred in the Bluetooth device.

Event Parameters:

Hardware_Code: *Size: 1 Octet*

Value	Parameter Description
0x00-0xFF	These Hardware_Codes will be implementation-specific, and can be assigned to indicate various hardware problems.

7.7.17 Flush Occurred Event

Event	Event Code	Event Parameters
Flush Occurred	0x11	Connection_Handle

Description:

The Flush Occurred event is used to indicate that, for the specified Connection Handle, the current user data to be transmitted has been removed. The Connection_Handle will be a Connection_Handle for an ACL connection. This could result from the flush command, or be due to the automatic flush. Multiple blocks of an L2CAP packet could have been pending in the Controller. If one baseband packet part of an L2CAP packet is flushed, then the rest of the HCI data packets for the L2CAP packet must also be flushed.

Event Parameters:

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle which was flushed. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

7.7.18 Role Change Event

Event	Event Code	Event Parameters
Role Change	0x12	Status, BD_ADDR, New_Role

Description:

The Role Change event is used to indicate that the current Bluetooth role related to the particular connection has changed. This event only occurs when both the remote and local Bluetooth devices have completed their role change for the Bluetooth device associated with the BD_ADDR event parameter. This event allows both affected Hosts to be notified when the Role has been changed.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Role change has occurred.
0x01-0xFF	Role change failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the Device for which a role change has completed.

New_Role: *Size: 1 Octet*

Value	Parameter Description
0x00	Currently the Master for specified BD_ADDR.
0x01	Currently the Slave for specified BD_ADDR.

7.7.19 Number Of Completed Packets Event

Event	Event Code	Event Parameters
Number Of Completed Packets	0x13	Number_of_Handles, Connection_Handle[i], HC_Num_Of_Completed_Packets[i]

Description:

The Number Of Completed Packets event is used by the Controller to indicate to the Host how many HCI Data Packets have been completed (transmitted or flushed) for each Connection Handle since the previous Number Of Completed Packets event was sent to the Host. This means that the corresponding buffer space has been freed in the Controller. Based on this information, and the HC_Total_Num_ACL_Data_Packets and HC_Total_Num_Synchronous_Data_Packets return parameter of the Read_Buffer_Size command, the Host can determine for which Connection Handles the following HCI Data Packets should be sent to the Controller.The Number Of Completed Packets event must not be sent before the corresponding Connection Complete event. While the Controller has HCI data packets in its buffer, it must keep sending the Number Of Completed Packets event to the Host at least periodically, until it finally reports that all the pending ACL Data Packets have been transmitted or flushed. The rate with which this event is sent is manufacturer specific.
Note that Number Of Completed Packets events will not report on synchronous connection handles if synchronous Flow Control is disabled. (See Read/Write_Synchronous_Flow_Control_Enable on page 513 and page 514.)

Event Parameters:

Number_of_Handles: *Size: 1 Octet*

Value	Parameter Description
0xXX	The number of Connection Handles and Num_HCI_Data_Packets parameters pairs contained in this event. Range: 0-255

*Connection_Handle[i]: Size: Number_of_Handles * 2 Octets(12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

*HC_Num_Of_Completed_Packets [i]: Size: Number_of_Handles * 2 Octets*

Value	Parameter Description
N = 0xXXXX	The number of HCI Data Packets that have been completed (transmitted or flushed) for the associated Connection Handle since the previous time the event was returned. Range for N: 0x0000-0xFFFF

7.7.20 Mode Change Event

Event	Event Code	Event Parameters
Mode Change	0x14	Status, Connection_Handle, Current_Mode, Interval

Description:

The Mode Change event is used to indicate when the device associated with the Connection Handle changes between Active mode, Hold mode, Sniff mode, and Park state. The Connection_Handle will be a Connection_Handle for an ACL connection. The Connection_Handle event parameter is used to indicate which connection the Mode Change event is for. The Current_Mode event parameter is used to indicate which state the connection is currently in. The Interval parameter is used to specify a time amount specific to each state. Each Controller that is associated with the Connection Handle which has changed Modes will send the Mode Change event to its Host.

Event Parameters:

Status: Size: 1 Octet

Value	Parameter Description
0x00	A Mode Change has occurred.
0x01-0xFF	Hold_Mode, Sniff_Mode, Exit_Sniff_Mode, Park_State, or Exit_Park_State command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: Size: 2 Octets(12 Bits meaningful)

Value	Parameter Description
0xXXXX	Connection Handle. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Current_Mode: *Size: 1 Octet*

Value	Parameter Description
0x00	Active Mode.
0x01	Hold Mode.
0x02	Sniff Mode.
0x03	Park State.
0x04-0xFF	Reserved for future use.

Interval: *Size: 2 Octets*

Value	Parameter Description
N = 0xXXXX	Hold: Number of Baseband slots to wait in Hold Mode. Hold Interval = N * 0.625 msec (1 Baseband slot) Range for N: 0x0002-0xFFFE Time Range: 1.25 msec-40.9 sec Sniff: Number of Baseband slots between sniff intervals. Time between sniff intervals = 0.625 msec (1 Baseband slot) Range for N: 0x0002-0xFFFE Time Range: 1.25 msec-40.9 sec Park: Number of Baseband slots between consecutive beacons. Interval Length = N * 0.625 msec (1 Baseband slot) Range for N: 0x0002-0xFFFE Time Range: 1.25 msec-40.9 Seconds

7.7.21 Return Link Keys Event

Event	Event Code	Event Parameters
Return Link Keys	0x15	Num_Keys, BD_ADDR [i], Link_Key[i]

Description:

The Return Link Keys event is used by the Controller to send the Host one or more stored Link Keys. Zero or more instances of this event will occur after the Read_Stored_Link_Key command. When there are no link keys stored, no Return Link Keys events will be returned. When there are link keys stored, the number of link keys returned in each Return Link Keys event is implementation specific.

Event Parameters:

Num_Keys: *Size: 1 Octet*

Value	Parameter Description
0xXX	Number of Link Keys contained in this event. Range: 0x01 – 0x0B

BD_ADDR [i]: *Size: 6 Octets * Num_Keys*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR for the associated Link Key.

Link_Key[i]: *Size:16 Octets * Num_Keys*

Value	Parameter Description
0xXXXXXXXXXX XXXXXXXXXX XXXXXXXXXX	Link Key for the associated BD_ADDR.

7.7.22 PIN Code Request Event

Event	Event Code	Event Parameters
PIN Code Request	0x16	BD_ADDR

Description:

The PIN Code Request event is used to indicate that a PIN code is required to create a new link key. The Host must respond using either the PIN Code Request Reply or the PIN Code Request Negative Reply command, depending on whether the Host can provide the Controller with a PIN code or not.
Note: If the PIN Code Request event is masked away, then the Controller will assume that the Host has no PIN Code.

When the Controller generates a PIN Code Request event in order for the local Link Manager to respond to the request from the remote Link Manager (as a result of a Create_Connection or Authentication_Requested command from the remote Host), the local Host must respond with either a PIN_Code_Request_Reply or PIN_Code_Request_Negative_Reply command before the remote Link Manager detects LMP response timeout. (See "Link Manager Protocol" on page 211 [Part C].)

Event Parameters:

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the Device which a new link key is being created for.

7.7.23 Link Key Request Event

Event	Event Code	Event Parameters
Link Key Request	0x17	BD_ADDR

Description:

The Link Key Request event is used to indicate that a Link Key is required for the connection with the device specified in BD_ADDR. If the Host has the requested stored Link Key, then the Host will pass the requested Key to the Controller using the Link_Key_Request_Reply Command. If the Host does not have the requested stored Link Key, then the Host will use the Link_Key_Request_Negative_Reply Command to indicate to the Controller that the Host does not have the requested key.
Note: If the Link Key Request event is masked away, then the Controller will assume that the Host has no additional link keys.

When the Controller generates a Link Key Request event in order for the local Link Manager to respond to the request from the remote Link Manager (as a result of a Create_Connection or Authentication_Requested command from the remote Host), the local Host must respond with either a Link_Key_Request_Reply or Link_Key_Request_Negative_Reply command before the remote Link Manager detects LMP response timeout. (See "Link Manager Protocol" on page 211 [Part C].)

Event Parameters:

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the Device which a stored link key is being requested.

7.7.24 Link Key Notification Event

Event	Event Code	Event Parameters
Link Key Notification	0x18	BD_ADDR, Link_Key, Key_Type

Description:

The Link Key Notification event is used to indicate to the Host that a new Link Key has been created for the connection with the device specified in BD_ADDR. The Host can save this new Link Key in its own storage for future use. Also, the Host can decided to store the Link Key in the Controller's Link Key Storage by using the Write_Stored_Link_Key command. The Key_Type event parameter informs the Host about which key type (combination key, local unit key or remote unit key) that has been used during pairing. If pairing with unit key is not supported, the Host can for instance discard the key or disconnect the link.

Event Parameters:

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the Device for which the new link key has been generated.

Link_Key: *Size: 16 Octets*

Value	Parameter Description
0xXXXXXXXXXX XXXXXXXXXX XXXXXXXXXX	Link Key for the associated BD_ADDR.

Key_Type: *Size: 1 Octets*

Value	Parameter Description
0x00	Combination Key
0x01	Local Unit Key
0x02	Remote Unit Key
0x03-0xFF	Reserved

7.7.25 Loopback Command Event

Event	Event Code	Event Parameters
Loopback Command	0x19	HCI_Command_Packet

Description:

When in Local Loopback mode, the Controller loops back commands and data to the Host. The Loopback Command event is used to loop back all commands that the Host sends to the Controller with some exceptions. See Section 7.6.1, "Read Loopback Mode Command," on page 558 for a description of which commands that are not looped back. The HCI_Command_Packet event parameter contains the entire HCI Command Packet including the header. Note: the event packet is limited to a maximum of 255 octets in the payload; since an HCI Command Packet has 3 octets of header data, only the first 252 octets of the command parameters will be returned.

Event Parameters:

HCI_Command_Packet: *Size: Depends on Command*

Value	Parameter Description
0xXXXXXX	HCI Command Packet, including header.

7.7.26 Data Buffer Overflow Event

Event	Event Code	Event Parameters
Data Buffer Overflow	0x1A	Link_Type

Description:

This event is used to indicate that the Controller's data buffers have been overflowed. This can occur if the Host has sent more packets than allowed. The Link_Type parameter is used to indicate that the overflow was caused by ACL or synchronous data.

Event Parameters:

Link_Type: *Size: 1 Octet*

Value	Parameter Description
0x00	Synchronous Buffer Overflow (Voice Channels).
0x01	ACL Buffer Overflow (Data Channels).
0x02-0xFF	Reserved for Future Use.

7.7.27 Max Slots Change Event

Event	Event Code	Event Parameters
Max Slots Change	0x1B	Connection_Handle, LMP_Max_Slots

Description:

This event is used to notify the Host about the LMP_Max_Slots parameter when the value of this parameter changes. It will be sent each time the maximum allowed length, in number of slots, for baseband packets transmitted by the local device, changes. The Connection_Handle will be a Connection_Handle for an ACL connection.

Event Parameters:

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

LMP_Max_Slots: *Size: 1 octet*

Value	Parameter Description
0x01, 0x03, 0x05	Maximum number of slots allowed to use for baseband packets, see Section 4.1.10 on page 247 and Section 5.2 on page 303 in "Link Manager Protocol" on page 211 [Part C].

7.7.28 Read Clock Offset Complete Event

Event	Event Code	Event Parameters
Read Clock Offset Complete	0x1C	Status, Connection_Handle, Clock_Offset

Description:

The Read Clock Offset Complete event is used to indicate the completion of the process of the Link Manager obtaining the Clock Offset information of the Bluetooth device specified by the Connection_Handle event parameter. The Connection_Handle will be a Connection_Handle for an ACL connection.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_Clock_Offset command succeeded.
0x01-0xFF	Read_Clock_Offset command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 bits meaningful)*

Value	Parameter Description
0xXXXX	Specifies which Connection Handle's Clock Offset parameter is returned. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Clock_Offset: *Size: 2 Octets*

Bit format	Parameter Description
Bit 14-0	Bit 16-2 of CLKslave-CLKmaster.
Bit 15	Reserved.

7.7.29 Connection Packet Type Changed Event

Event	Event Code	Event Parameters
Connection Packet Type Changed	0x1D	Status, Connection_Handle, Packet_Type

Description:

The Connection Packet Type Changed event is used to indicate that the process has completed of the Link Manager changing which packet types can be used for the connection. This allows current connections to be dynamically modified to support different types of user data. The Packet_Type event parameter specifies which packet types the Link Manager can use for the connection identified by the Connection_Handle event parameter for sending L2CAP data or voice. The Packet_Type event parameter does not decide which packet types the LM is allowed to use for sending LMP PDUs.

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Connection Packet Type changed successfully.
0x01-0xFF	Connection Packet Type Changed failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Packet_Type: *Size: 2 Octets*

For ACL_Link_Type

Value	Parameter Description
0x0001	Reserved for future use.
0x0002	2-DH1 may not be used.
0x0004	3-DH1 may not be used.
0x0008[1]	DM1 may be used.
0x0010	DH1 may be used.
0x0020	Reserved for future use.
0x0040	Reserved for future use.
0x0080	Reserved for future use.
0x0100	2-DH3 may not be used.
0x0200	3-DH3 may not be used.
0x0400	DM3 may be used.
0x0800	DH3 may be used.
0x1000	2-DH5 may not be used.
0x2000	3-DH5 may not be used.
0x4000	DM5 may be used.
0x8000	DH5 may be used.

1. This bit will be interpreted as set to 1 by Bluetooth V1.2 or later controllers.

For SCO_Link_Type

Value	Parameter Description
0x0001	Reserved for future use.
0x0002	Reserved for future use.
0x0004	Reserved for future use.
0x0008	Reserved for future use.
0x0010	Reserved for future use.
0x0020	HV1
0x0040	HV2
0x0080	HV3
0x0100	Reserved for future use.
0x0200	Reserved for future use.

0x0400	Reserved for future use.
0x0800	Reserved for future use.
0x1000	Reserved for future use.
0x2000	Reserved for future use.
0x4000	Reserved for future use.
0x8000	Reserved for future use.

7.7.30 QoS Violation Event

Event	Event Code	Event Parameters
QoS Violation	0x1E	Connection_Handle

Description:

The QoS Violation event is used to indicate the Link Manager is unable to provide the current QoS requirement for the Connection Handle. This event indicates that the Link Manager is unable to provide one or more of the agreed QoS parameters. The Host chooses what action should be done. The Host can reissue QoS_Setup command to renegotiate the QoS setting for Connection Handle. The Connection_Handle will be a Connection_Handle for an ACL connection.

Event Parameters:

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle that the LM is unable to provide the current QoS requested for. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

7.7.31 Page Scan Repetition Mode Change Event

Event	Event Code	Event Parameters
Page Scan Repetition Mode Change	0x20	BD_ADDR, Page_Scan_Repetition_Mode

Description:

The Page Scan Repetition Mode Change event indicates that the remote Bluetooth device with the specified BD_ADDR has successfully changed the Page_Scan_Repetition_Mode (SR).

Event Parameters:

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the remote device.

Page_Scan_Repetition_Mode: *Size: 1 Octet*

Value	Parameter Description
0x00	R0
0x01	R1
0x02	R2
0x03 – 0xFF	Reserved.

7.7.32 Flow Specification Complete Event

Event	Event Code	Event Parameters
HCI Flow Specification Complete	0x21	Status, Connection_Handle, Flags, Flow_direction, Service_Type, Token_Rate, Token_Bucket_Size, Peak_Bandwidth, Access Latency

Description:

The Flow Specification Complete event is used to inform the Host about the Quality of Service for the ACL connection the Controller is able to support. The Connection_Handle will be a Connection_Handle for an ACL connection. The flow parameters refer to the outgoing or incoming traffic of the ACL link, as indicated by the Flow_direction field. The flow parameters are defined in the L2CAP specification "Quality of Service (QoS) Option" on page 60[vol. 4]. When the Status parameter indicates a successful completion, the flow parameters specify the agreed values by the Controller. When the Status parameter indicates a failed completion with the Error Code *QoS Unacceptable Parameters* (0x2C), the flow parameters specify the acceptable values of the Controller. This enables the Host to continue the 'QoS negotiation' with a new HCI Flow_Specification command with flow parameter values that are acceptable for the Controller. When the Status parameter indicates a failed completion with the Error Code *QoS Rejected* (0x2D), this indicates a request of the Controller to discontinue the 'QoS negotiation'. When the Status parameter indicates a failed completion, the flow parameter values of the most recently successful completion must be assumed (or the default values when there was no success completion).

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Flow Specification command succeeded
0x01 – 0xFF	Flow Specification command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle used to identify for which ACL connection the Flow is specified. Range: 0x0000 - 0x0EFF (0x0F00 – 0x0FFF Reserved for future use)

Flags: *Size: 1 Octet)*

Value	Parameter Description
0x00 – 0xFF	Reserved for Future Use.

Flow_direction: *Size: 1 Octet*

Value	Parameter Description
0x00	Outgoing Flow i.e. traffic send over the ACL connection
0x01	Incoming Flow i.e. traffic received over the ACL connection
0x02 – 0xFF	Reserved for Future Use.

Service_Type: *Size: 1 Octet*

Value	Parameter Description
0x00	No Traffic
0x01	Best Effort
0x02	Guaranteed
0x03 – 0xFF	Reserved for Future Use

Token Rate: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Token Rate in octets per second

Token Bucket Size: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Token Bucket Size in octets

Peak_Bandwidth: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Peak Bandwidth in octets per second

Access Latency: *Size: 4 Octets*

Value	Parameter Description
0xXXXXXXXX	Access Latency in microseconds

7.7.33 Inquiry Result with RSSI Event

Event	Event Code	Event Parameters
Inquiry Result with RSSI	0x22	Num_responses, BD_ADDR[i], Page_Scan_Repetition_Mode[i], Reserved[i], Class_of_Device[i], Clock_Offset[i], RSSI[i]

Description:

The Inquiry Result with RSSI event indicates that a Bluetooth device or multiple Bluetooth devices have responded so far during the current Inquiry process. This event will be sent from the Controller to the Host as soon as an Inquiry Response from a remote device is received if the remote device supports only mandatory paging scheme. This Controller may queue these Inquiry Responses and send multiple Bluetooth devices information in one Inquiry Result event. The event can be used to return one or more Inquiry responses in one event. The RSSI parameter is measured during the FHS packet returned by each responding slave.

This event shall only be generated if the Inquiry Mode parameter of the last Write_Inquiry_Mode command was set to 0x01 (Inquiry Result format with RSSI).

Event Parameters:

Num_Responses: *Size: 1 Octet*

Value	Parameter Description
0xXX	Number of responses from the Inquiry.

BD_ADDR[i]: *Size: 6 Octets * Num_Responses*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR for each device which responded.

Page_Scan_Repetition_Mode[i]: *Size: 1 Octet* Num_Responses*

Value	Parameter Description
0x00	R0
0x01	R1
0x02	R2
0x03 – 0xFF	Reserved

Reserved[i]:[1] *Size: 1 Octet* Num_Responses*

Value	Parameter Description
0xXX	Reserved.

Class_of_Device[i]: *Size: 3 Octets * Num_Responses*

Value	Parameter Description
0xXXXXXX	Class of Device for the device

Clock_Offset[i]: *Size: 2 Octets * Num_Responses*

Bit format	Parameter Description
Bit 14-0	Bit 16-2 of CLKslave-CLKmaster.
Bit 15	Reserved

RSSI[i]: *Size: 1 Octet * Num_Responses*

Value	Parameter Description
0xXX	Range: -127 to +20 Units: dBm

1. This was the Page_Scan_Period_Mode parameter in the v1.1 specification. This parameter has no meaning in v1.2 and no default value.

7.7.34 Read Remote Extended Features Complete Event

Event	Event Code	Event Parameters
Read Remote Extended Features Complete	0x23	Status, Connection_Handle, Page_Number, Maximum page number, Extended_LMP_Features

Description:

The Read Remote Extended Features Complete event is used to indicate the completion of the process of the Link Manager obtaining the remote extended LMP features of the remote device specified by the connection handle event parameter. The connection handle will be a connection handle for an ACL connection. The event parameters include a page of the remote devices extended LMP features. For details see "Link Manager Protocol" on page 211 [Part C].

Event Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Request for remote extended features succeeded
0x01-0xFF	Request for remote extended features failed – standard HCI error value

Connection_Handle: *Size: 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	The connection handle identifying the device to which the remote features apply. Range: 0x0000-0x0EFF (0x0F00-0x0FFF Reserved for future use)

Page Number: *Size: 1Octet*

Value	Parameter Description
0x00	The normal LMP features as returned by HCI_Read_Remote_Supported_Features
0x01-0xFF	The page number of the features returned

Maximum Page Number: *Size: 1Octet*

Value	Parameter Description
0x00-0xFF	The highest features page number which contains non-zero bits for the local device

Extended_LMP_Features: *Size: 8 Octets*

Value	Parameter Description
0xFFFFFFFFFFFFFFFF	Bit map of requested page of LMP features. See LMP specification for details

7.7.35 Synchronous Connection Complete Event

Event	Event Code	Event Parameters
Synchronous Connection Complete	0x2C	Status, Connection_Handle, BD_ADDR, Link Type, Transmission_Interval, Retransmission Window, Rx_Packet_Length, Tx_Packet_Length Air Mode

Description:

The Synchronous Connection Complete event indicates to both the Hosts that a new Synchronous connection has been established. This event also indicates to the Host, which issued the Setup_Synchronous_Connection, or Accept_Synchronous_Connection_Request or Reject_Synchronous_Connection_Request command and then received a Command Status event, if the issued command failed or was successful.

Event Parameters:

Status: *1 octet*

Value	Parameter Description
0x00	Connection successfully completed.
0x01 –0xFF	Connection failed to complete.See "Error Codes" on page 319 [Part D] for error codes and description.

Connection_Handle: *2 octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle to be used to identify a connection between two Bluetooth devices. Range: 0x0000-0x0EFF (0x0F00 – 0x0FFF Reserved for future use)

BD_ADDR: *6 octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the other connected device forming the connection.

Link_Type: *Size: 1 Octet*

Value	Parameter Description
0x00	SCO Connection
0x01	Reserved
0x02	eSCO Connection
0x03 – 0xFF	Reserved

Transmission_Interval: *1 octets*

Value	Parameter Description
0xXX	Time between two consecutive eSCO instants measured in slots. Must be zero for SCO links.

Retransmission window: *1 octets*

Value	Parameter Description
0xXX	The size of the retransmission window measured in slots. Must be zero for SCO links.

Rx_Packet_Length: *2 octets*

Value	Parameter Description
0xXXXX	Length in bytes of the eSCO payload in the receive direction. Must be zero for SCO links.

Tx_Packet_Length: *2 octets*

Value	Parameter Description
0xXXXX	Length in bytes of the eSCO payload in the transmit direction. Must be zero for SCO links.

Air Mode: *Size: 1 Octet*

Value	Parameter Description
0x00	μ-law log
0x01	A-law log
0x02	CVSD
0x03	Transparent Data
0x04 – 0xFF	Reserved

7.7.36 Synchronous Connection Changed event

Event	Event Code	Event Parameters
Synchronous Connection Changed	0x2D	Status, Connection_Handle, Transmission_Interval, Retransmission Window, Rx_Packet_Length, Tx_Packet_Length

Description:

The Synchronous Connection Changed event indicates to the Host that an existing Synchronous connection has been reconfigured. This event also indicates to the initiating Host (if the change was host initiated) if the issued command failed or was successful.

Command Parameters:

Status: *1 octet*

Value	Parameter Description
0x00	Connection successfully reconfigured.
0x01 –0xFF	Reconfiguration failed to complete. See "Error Codes" on page 319 [Part D] for error codes and description.

Connection_Handle: *2 octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle to be used to identify a connection between two Bluetooth devices. Range: 0x0000-0x0EFF (0x0F00 – 0x0FFF Reserved for future use)

Transmission_Interval: *1 octet*

Value	Parameter Description
0xXX	Time between two consecutive SCO/eSCO instants measured in slots.

Retransmission window: *1 octet*

Value	Parameter Description
0xXX	The size of the retransmission window measured in slots. Must be zero for SCO links.

Rx_Packet_Length: *2 octets*

Value	Parameter Description
0xXXXX	Length in bytes of the SCO/eSCO payload in the receive direction.

Tx_Packet_Length: *2 octets*

Value	Parameter Description
0xXXXX	Length in bytes of the SCO/eSCO payload in the transmit direction.

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APPENDIX A: DEPRECATED COMMANDS, EVENTS AND CONFIGURATION PARAMETERS

Commands, events and configuration parameters in this section were in prior versions of the specification, but have been determined not to be required.

They may be implemented by a controller to allow for backwards compatibility with a host utilizing a prior version of the specification.

A host should not use these commands.

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Page Scan Mode

The Page_Scan_Mode parameter indicates the page scan mode that is used for default page scan. Currently one mandatory page scan mode and three optional page scan modes are defined. Following an inquiry response, if the Baseband timer T_mandatory_pscan has not expired, the mandatory page scan mode must be applied. For details see the "Baseband Specification" on page 55 [Part B] (Keyword: Page-Scan-Mode, FHS-Packet, T_mandatory_pscan)

Value	Parameter Description
0x00	Mandatory Page Scan Mode
0x01	Optional Page Scan Mode I
0x02	Optional Page Scan Mode II
0x03	Optional Page Scan Mode III
0x04-0xFF	Reserved

Read Page Scan Mode Command

Command	OGF	OCF	Command Parameters	Return Parameters
HCI_Read_Page_Scan_Mode	0x03	0x003D		Status, Page_Scan_Mode

Description:

This command is used to read the default Page Scan Mode configuration parameter of the local Bluetooth device. See "Page Scan Mode" on page 612..

Command Parameters:

None

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_Page_Scan_Mode command succeeded.
0x01-0xFF	Read_Page_Scan_Mode command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Page_Scan_Mode: *Size: 1 Octet*

Value	Parameter Description
See Appendix A, "Page Scan Mode" on page 612.	

Event(s) generated (unless masked away):

When the Read_Page_Scan_Mode command has completed, a Command Complete event will be generated.

Write Page Scan Mode Command

OGF: 0x03 (Controller and baseband commands)

Command	OGF	OCF	Command Parameters	Return Parameters
HCI_Write_Page_Scan_Mode	0x03	0x003E	Page_Scan_Mode	Status

Description:

This command is used to write the default Page Scan Mode configuration parameter of the local Bluetooth device. See "Page Scan Mode" on page 612.

Command Parameters:

Page_Scan_Mode: *Size: 1 Octet*

Value	Parameter Description
See Appendix A, "Page Scan Mode" on page 612.	

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Write_Page_Scan_Mode command succeeded.
0x01-0xFF	Write_Page_Scan_Mode command failed. See "Error Codes" on page 319 [Part D] for list of Error Codes.

Event(s) generated (unless masked away):

When the Write_Page_Scan_Mode command has completed, a Command Complete event will be generated.

Read Country Code Command

Command	OGF	OCF	Command Parameters	Return Parameters
HCI_Read_Country_Code	0x05	0x0007		Status, Country_Code

Description:

This command will read the value for the Country_Code return parameter. The Country_Code defines which range of frequency band of the ISM 2.4 GHz band will be used by the device. Each country has local regulatory bodies regulating which ISM 2.4 GHz frequency ranges can be used.

Command Parameters:

None.

Return Parameters:

Status: *Size: 1 Octet*

Value	Parameter Description
0x00	Read_Country_Code command succeeded.
0x01-0xFF	Read_Country_Code command failed. See "Error Codes" on page 319 [Part D] for error codes and description.

Country_Code: *Size: 1 Octet*

Value	Parameter Description
0x00	North America & Europe* and Japan
0x01	France
0x04-FF	Reserved for Future Use.

*. Except France

Event(s) generated (unless masked away):

When the Read_Country_Code command has completed, a Command Complete event will be generated.

Add SCO Connection Command

Command	OGF	OCF	Command Parameters	Return Parameters
HCI_Add_SCO_Connection	0x01	0x0007	Connection_Handle, Packet_Type	

Description:

This command will cause the Link Manager to create a SCO connection using the ACL connection specified by the Connection_Handle command parameter. This command causes the local Bluetooth device to create a SCO connection. The Link Manager will determine how the new connection is established. This connection is determined by the current state of the device, its piconet, and the state of the device to be connected. The Packet_Type command parameter specifies which packet types the Link Manager should use for the connection. The Link Manager must only use the packet type(s) specified by the Packet_Type command parameter for sending HCI SCO Data Packets. Multiple packet types may be specified for the Packet_Type command parameter by performing a bitwise OR operation of the different packet types. The Link Manager may choose which packet type is to be used from the list of acceptable packet types. A Connection Handle for this connection is returned in the Connection Complete event (see below).
Note: An SCO connection can only be created when an ACL connection already exists and when it is not put in park. For a definition of the different packet types, see the "Baseband Specification" on page 55 [Part B].

Note: At least one packet type must be specified. The Host should enable as many packet types as possible for the Link Manager to perform efficiently. However, the Host must not enable packet types that the local device does not support.

Command Parameters:

Connection_Handle *Size 2 Octets (12 Bits meaningful)*

Value	Parameter Description
0xXXXX	Connection Handle for the ACL connection being used to create an SCO connection. Range: 0x0000-0x0EFF (0x0F00 - 0x0FFF Reserved for future use)

Packet_Type: *Size: 2 Octets*

Value	Parameter Description
0x0001	Reserved for future use.
0x0002	Reserved for future use.
0x0004	Reserved for future use.
0x0008	Reserved for future use.
0x0010	Reserved for future use.
0x0020	HV1
0x0040	HV2
0x0080	HV3
0x0100	Reserved for future use.
0x0200	Reserved for future use.
0x0400	Reserved for future use.
0x0800	Reserved for future use.
0x1000	Reserved for future use.
0x2000	Reserved for future use.
0x4000	Reserved for future use.
0x8000	Reserved for future use.

Return Parameters:

None.

Event(s) generated (unless masked away):

When the Controller receives the Add_SCO_Connection command, it sends the Command Status event to the Host. In addition, when the LM determines the connection is established, the local Controller will send a Connection Complete event to its Host, and the remote Controller will send a Connection Complete event or a Synchronous Connection Complete event to the Host. The Connection Complete event contains the Connection Handle if this command is successful.
Note: no Command Complete event will be sent by the Controller to indicate that this command has been completed. Instead, the Connection Complete event will indicate that this command has been completed.

Page Scan Mode Change Event

Event	Event Code	Event Parameters
Page Scan Mode Change	0x1F	BD_ADDR, Page_Scan_Mode

Description:

The Page Scan Mode Change event indicates that the connected remote Bluetooth device with the specified BD_ADDR has successfully changed the Page_Scan_Mode.

Event Parameters:

BD_ADDR: *Size: 6 Octets*

Value	Parameter Description
0xXXXXXXXXXXXX	BD_ADDR of the remote device.

Page_Scan_Mode: *Size: 1 Octet*

Value	Parameter Description
0x00	Mandatory Page Scan Mode.
0x01	Optional Page Scan Mode I.
0x02	Optional Page Scan Mode II.
0x03	Optional Page Scan Mode III.
0x04 – 0xFF	Reserved.



MESSAGE SEQUENCE CHARTS

Between Host and Host Controller/Link Manager

Examples of interactions between Host Controller Interface Commands and Events and Link Manager Protocol Data Units are represented in the form of message sequence charts. These charts show typical interactions and do not indicate all possible protocol behavior.

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1 INTRODUCTION

This section shows typical interactions between Host Controller Interface (HCI) Commands and Events and Link Manager (LM) Protocol Data Units (PDU). It focuses on the message sequence charts (MSCs) for the procedures specified in [3] "Bluetooth Host Controller Interface Functional Specification" with regard to LM Procedures from [2] "Link Manager Protocol".

This section illustrates only the most useful scenarios, it does not cover all possible alternatives. Furthermore, the message sequence charts do not consider errors over the air interface or host interface. In all message sequence charts it is assumed that all events are not masked, so the Host Controller will not filter out any events.

The sequence of messages in these message sequence charts is for illustrative purposes. The messages may be sent in a different order where allowed by the Link Manager or HCI sections. If any of these charts differ with text in the Baseband, Link Manager, or HCI sections, the text in those sections shall be considered normative. This section is informative.

1.1 NOTATION

The notation used in the message sequence charts (MSCs) consists of ovals, elongated hexagons, boxes, lines, and arrows. The vertical lines terminated on the top by a shadow box and at the bottom by solid oval indicate a protocol entity that resides in a device. MSCs describe interactions between these entities and states those entities may be in.

The following symbols represent interactions and states:

Oval	Defines the context for the message sequence chart.
Hexagon	Indicates a condition needed to start the transactions below this hexagon. The location and width of the Hexagon indicates which entity or entities make this decision.
Box	Replaces a group of transactions. May indicate a user action, or a procedure in the baseband.
Dashed Box	Optional group of transactions.
Solid Arrow	Represents a message, signal or transaction. Can be used to show LMP and HCI traffic. Some baseband packet traffic is also shown. These are prefixed by BB followed by either the type of packet, or an indication that there is an ACK signal in a packet.
Dashed Arrow	Represents a optional message, signal or transaction. Can be used to show LMP and HCI traffic.

1.2 FLOW OF CONTROL

Some message sequences are split into several charts. These charts are marked in sequence with different step numbers with multiple paths through with optional letters after the step numbers. Numbers indicate normal or required ordering. The letters represent alternative paths. For example, Step 4 is after Step 3, and Step 5a could be executed instead of Step 5b.

1.3 EXAMPLE MSC

The protocol entities represented in the example shown in Figure 1.1 on page 624 illustrate the interactions of two devices named A and B. Note that each device includes a Host and a LM entity in this example. Other MSCs in this section may show the interactions of more than two devices.

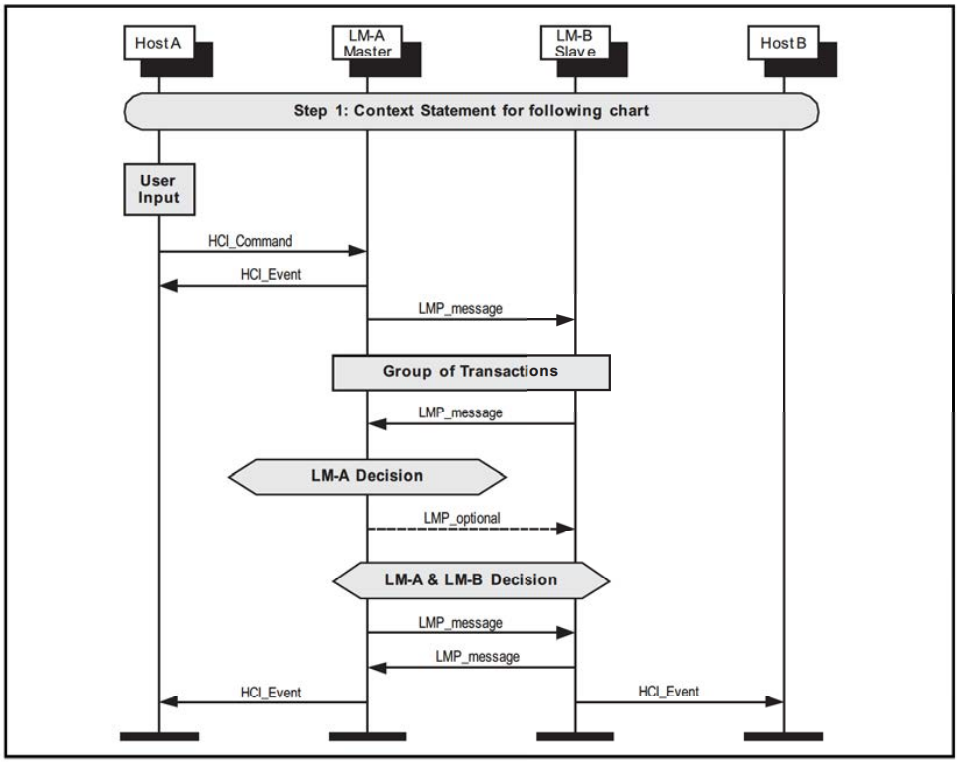


Figure 1.1: Example MSC.

2 SERVICES WITHOUT CONNECTION REQUEST

2.1 REMOTE NAME REQUEST

The service Remote Name Request is used to find out the name of the remote device without requiring an explicit ACL Connection.

Step 1: The host sends an HCI_Remote_Name_Request command expecting that its local device will automatically try to connect to the remote device. (See Figure 2.1 on page 625)

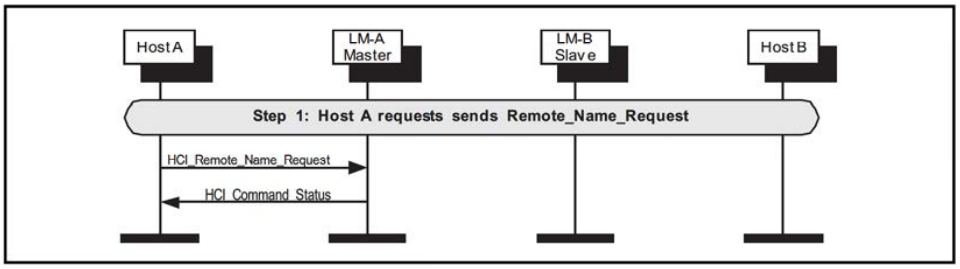


Figure 2.1: Remote name request.

Step 2a: If an ACL Connection does not exist device A pages device B. After the Baseband paging procedure, the local device attempts to get the name, disconnect, and return the name of the remote device to the Host. (See Figure 2.2 on page 625)

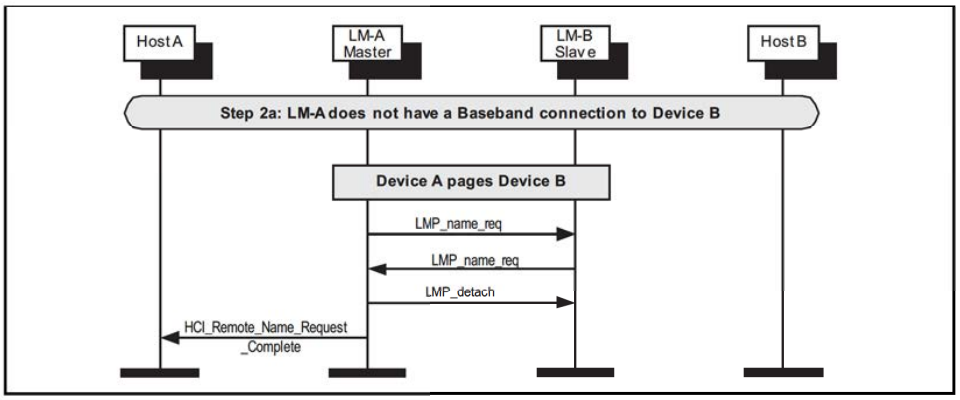


Figure 2.2: Remote name request if no current baseband connection.

Step 2b: If an ACL Connection exists when the request is made, then the Remote Name Request procedure will be executed like an optional service. No Paging and no ACL disconnect is done. (See Figure 2.3 on page 626)

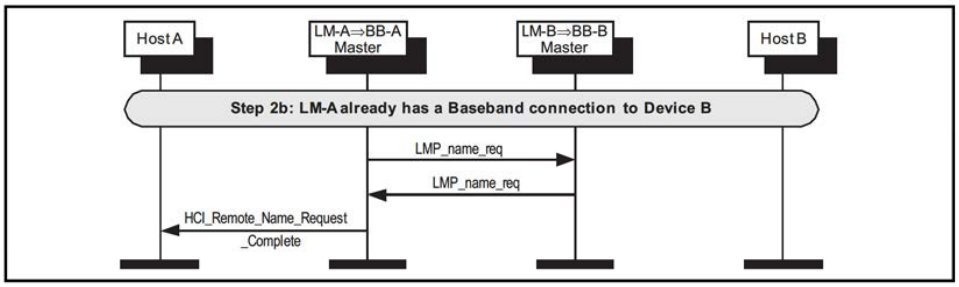


Figure 2.3: Remote name request with baseband connection.

2.2 ONE-TIME INQUIRY

Inquiry is used to detect and collect nearby devices.

Step 1: The host sends an HCI_Inquiry command. (See Figure 2.4 on page 626)

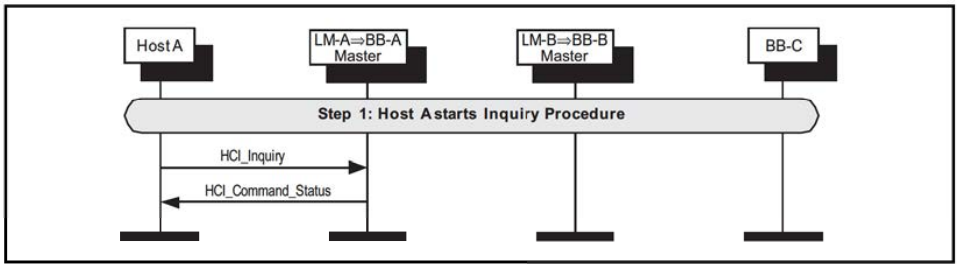


Figure 2.4: Host A starts inquiry procedure.

Step 2: The Controller will start the Baseband inquiry procedure with the specified Inquiry Access Code and Inquiry Length. When Inquiry Responses are received, the Controller extracts the required information and returns the information related to the found devices using one or more Inquiry Result events to the Host. (See Figure 2.5 on page 627)

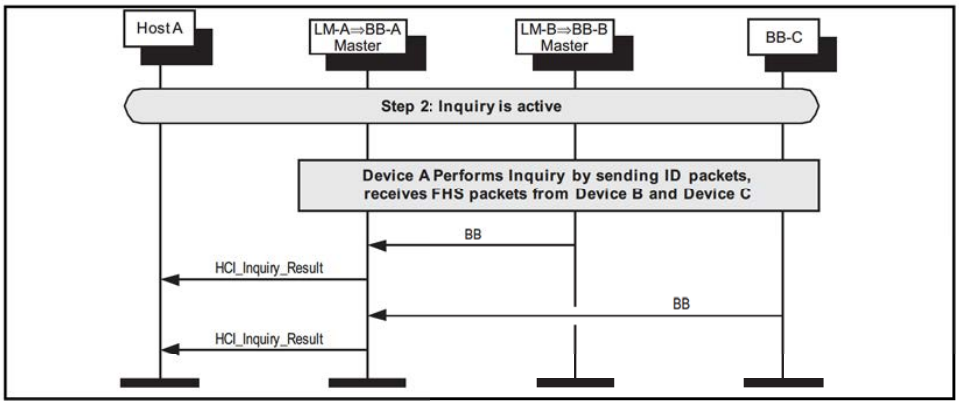


Figure 2.5: LM-A performs inquiry and reports result.

Step 3a: If the host wishes to terminate an Inquiry, the HCI_Inquiry_Cancel command is used to immediately stop the inquiry procedure.
(See Figure 2.6 on page 627)

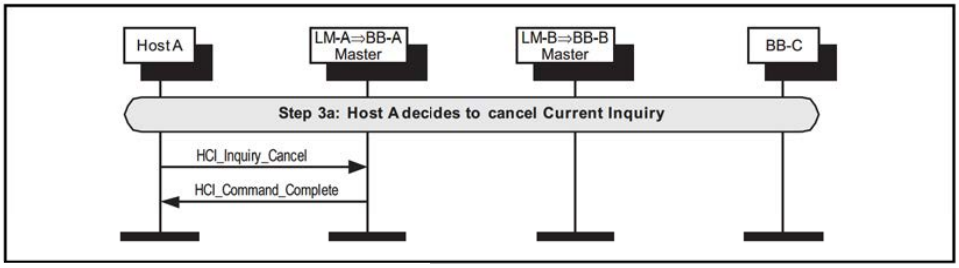


Figure 2.6: Host A cancels inquiry.

Step 3b: If the Inquiry procedure is completed due to the number of results obtained, or the Inquiry Length has expired, an Inquiry Complete event is returned to the Host. (See Figure 2.7 on page 628)

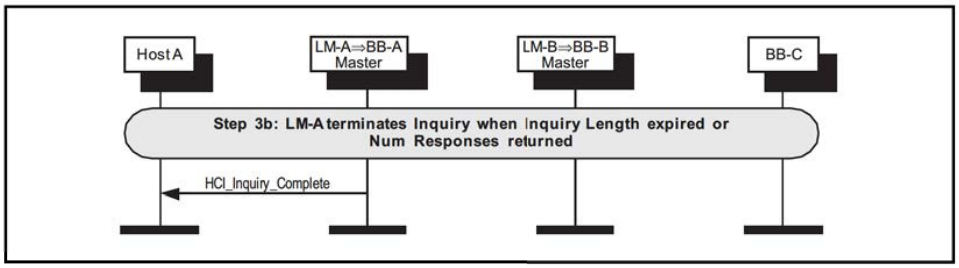


Figure 2.7: LM-A terminates current inquiry.

2.3 PERIODIC INQUIRY

Periodic inquiry is used when the inquiry procedure is to be repeated periodically.

Step 1: The hosts sends an HCI_Periodic_Inquiry_Mode command. (See Figure 2.8 on page 628)

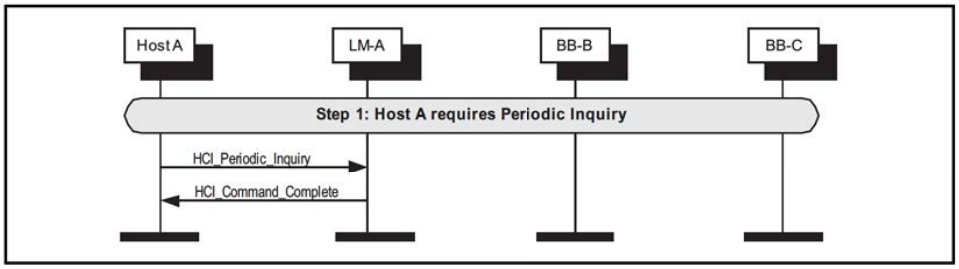


Figure 2.8: Host A starts periodic inquiry.

Step 2: The Controller will start a periodic Inquiry. In the inquiry cycle, one or several Inquiry Result events will be returned. (See Figure 2.9 on page 629)

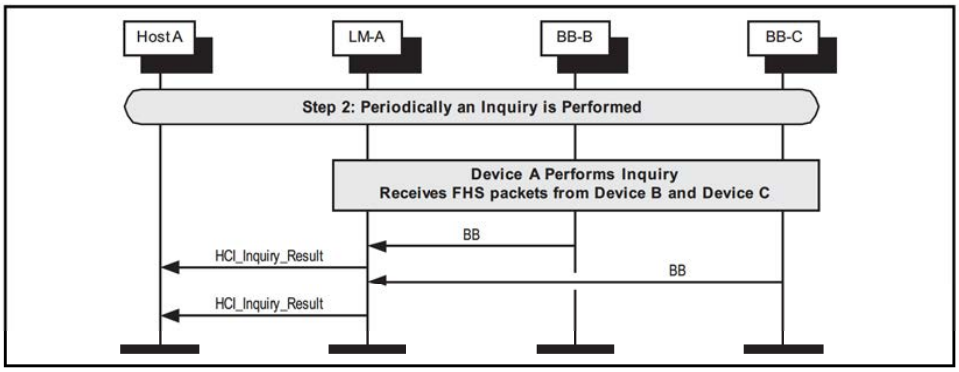


Figure 2.9: LM-A periodically performs an inquiry and reports result.

Step 3: An Inquiry Complete event will be returned to the Host when the current periodic inquiry has finished. (See Figure 2.10 on page 629)

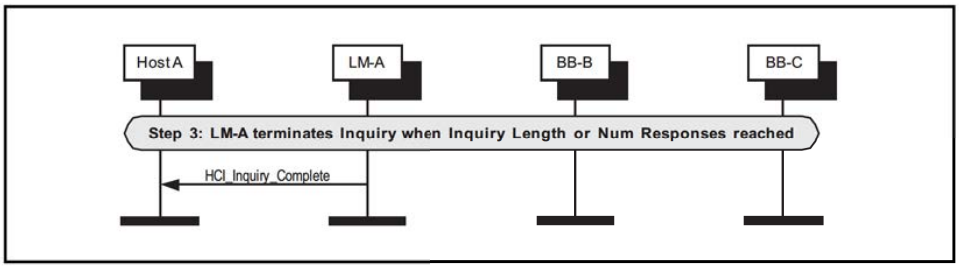


Figure 2.10: LM-A terminates current inquiry.

Step 4: The periodic Inquiry can be stopped using the HCI_Exit_Periodic_Inquiry_Mode command. (See Figure 2.11 on page 629)

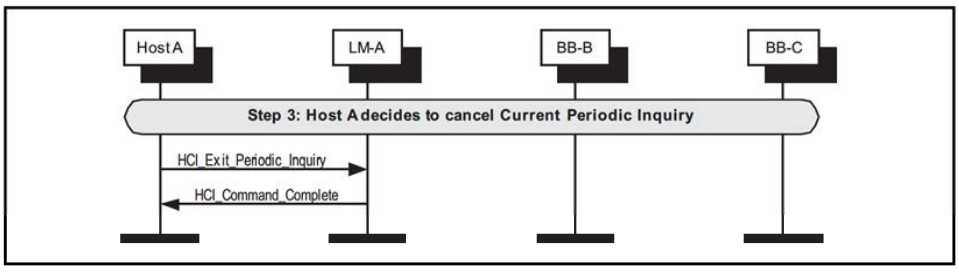


Figure 2.11: Host A decides to exit periodic inquiry.

3 ACL CONNECTION ESTABLISHMENT AND DETACHMENT

A flow diagram of the establishment and detachment of a connection between two devices is shown in Figure 3.1 on page 631. The process is illustrated in 9 distinct steps. A number of these steps may be optionally performed, such as authentication and encryption. Some steps are required, such as the Connection Request and Setup Complete steps. The steps in the overview diagram directly relate to the steps in the following message sequence charts.

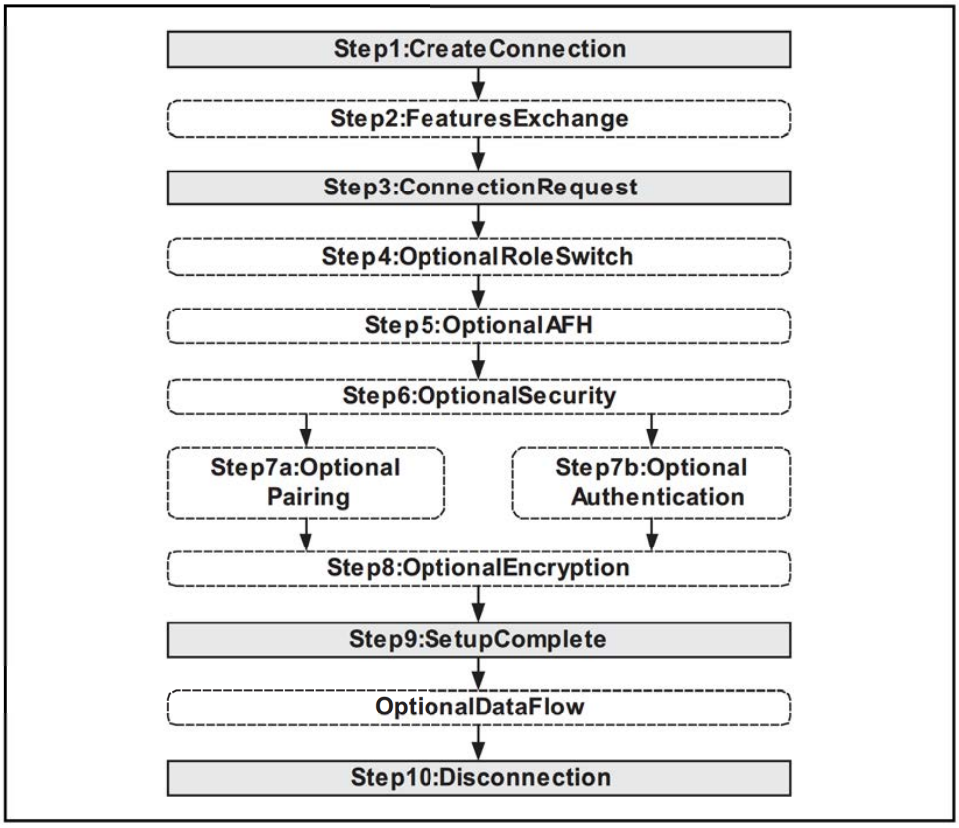


Figure 3.1: Overview diagram for connection setup.

3.1 CONNECTION SETUP

Step 1: The host sends an HCI_Create_Connection command to the Controller. The Controller then performs a Baseband paging procedure with the specified BD_ADDR. (See Figure 3.2 on page 632)

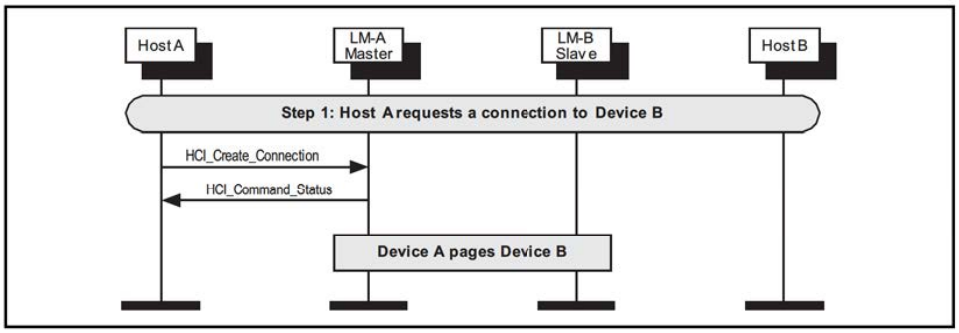


Figure 3.2: Host A requests connection with device B.

Step 2: Optionally, the LM may decide to exchange features. (See Figure 3.3 on page 632)

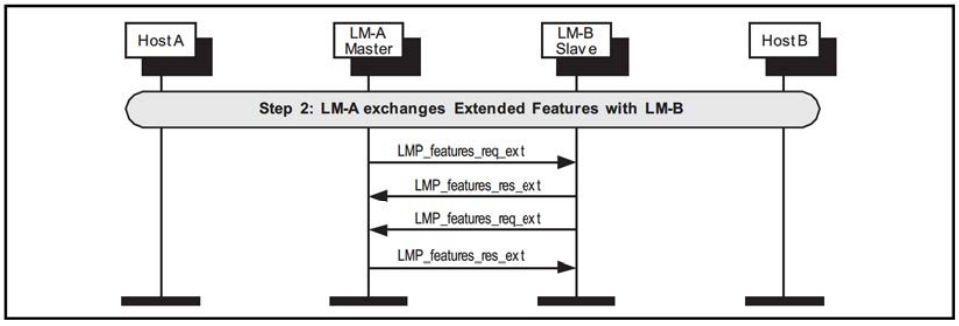


Figure 3.3: LM-A and LM-B exchange features.

Step 3: The LM on the master will request an LMP_host_connection_req PDU. The LM on the slave will then confirm that a connection is OK, and if so, what role is preferred. (See Figure 3.4 on page 632)

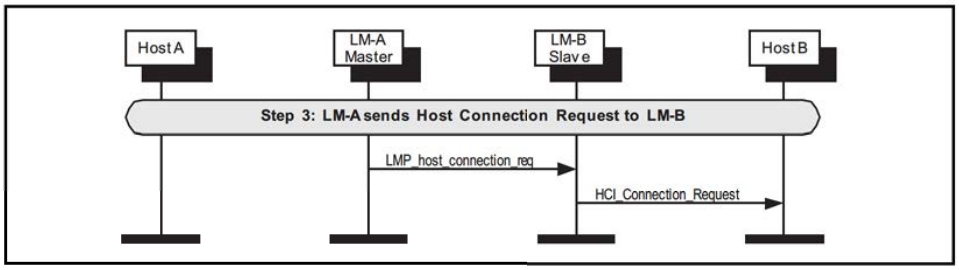


Figure 3.4: LM-A requests host connection.

Step 4a: The remote host rejects this connection, and the link is terminated. (See Figure 3.5 on page 633)

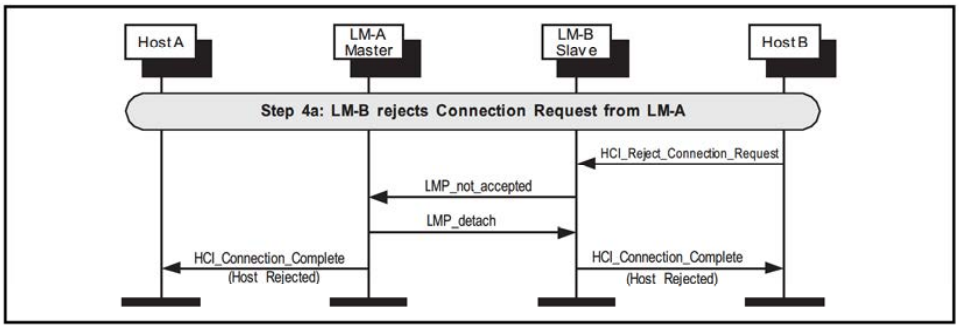


Figure 3.5: Device B rejects connection request.

Step 4b: The remote host accepts this connection. (See Figure 3.6 on page 633)

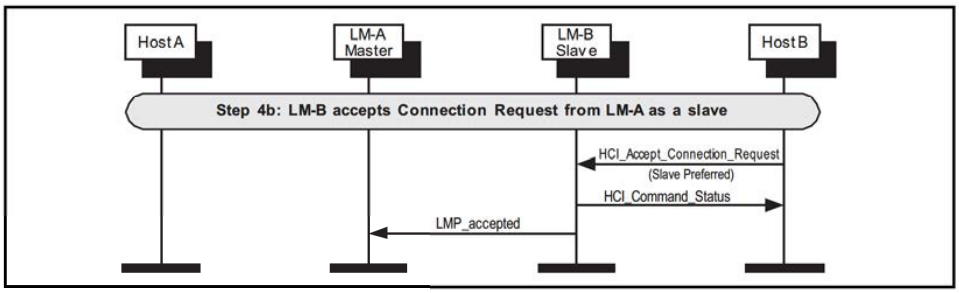


Figure 3.6: Device B accepts connection request.

Step 4c: The remote host accepts this connection but with the preference of being a master. This will cause a role switch to occur before the LMP_accepted for the LMP_host_connection_req PDU is sent. (See Figure 3.7 on page 634)

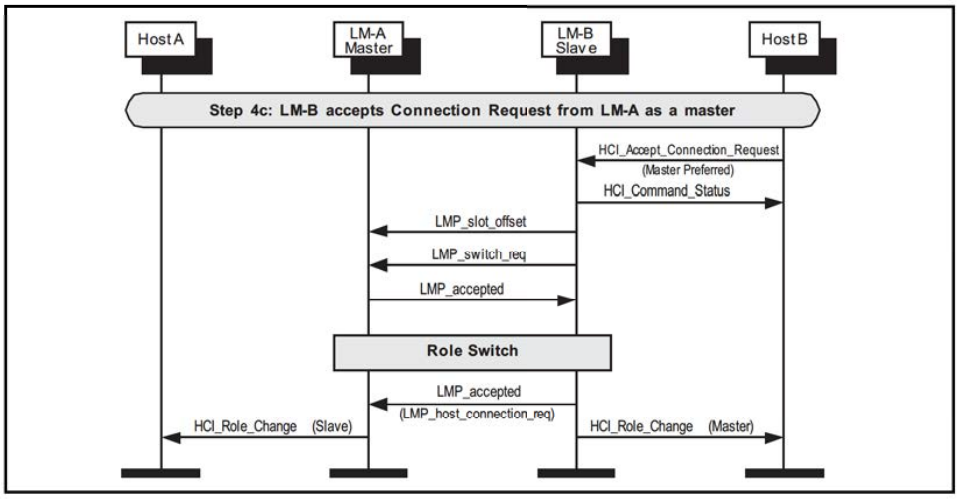


Figure 3.7: Device B accepts connection requests as master.

Step 5: After the features have been exchanged and AFH support is determined to be available, the master may at any time send an LMP_set_AFH and LMP_channel_classification_req PDU. (See Figure 3.8 on page 634)

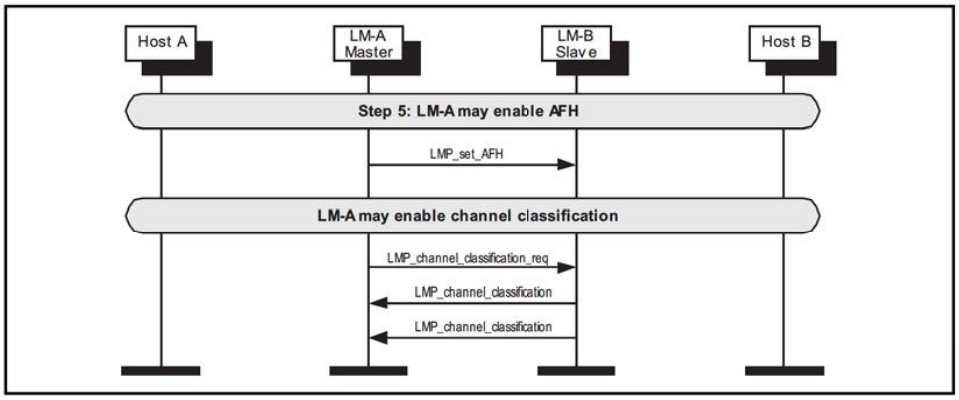


Figure 3.8: LM-A starts adaptive frequency hopping.

Step 6: The LM will request if authentication is required. It does this by requesting the Link Key for this connection from the Host. (See Figure 3.9 on page 635)

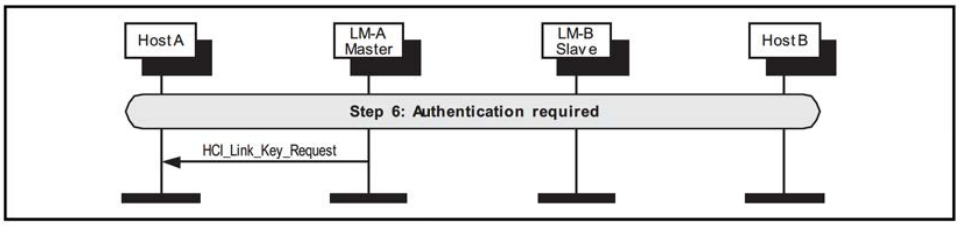


Figure 3.9: Authentication initiated.

Step 7a: If authentication is required by the higher layers and the devices to be connected do not have a common link key, a pairing procedure will be used. The LM will have requested a link key from the host for this connection. If there is a negative reply, then a PIN code will be requested. This PIN code will be requested on both sides of the connection, and authentication performed based on this PIN code. The last step is for the new link key for this connection to be passed to the host so that it may store it for future connections.
(See Figure 3.10 on page 636)

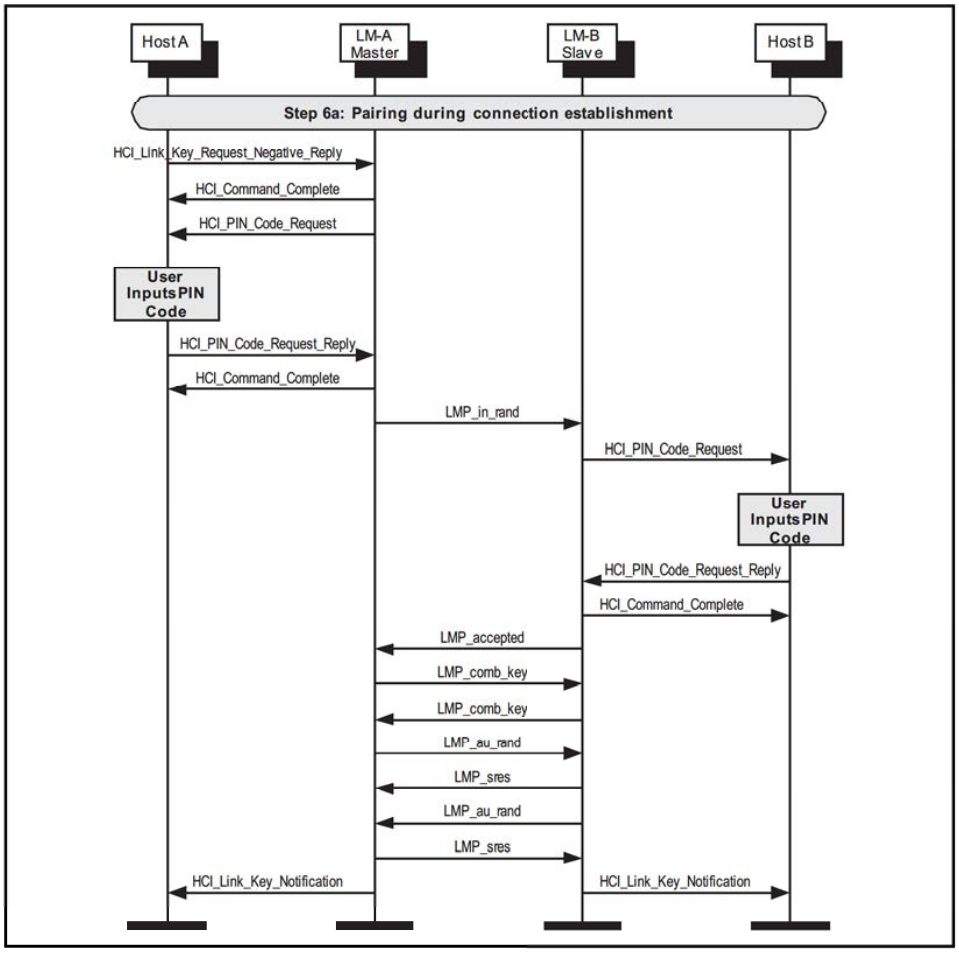


Figure 3.10: Pairing during connection setup.

Step 7b: If a common link key exists between the devices, then pairing is not needed. The LM will have asked for a link key from the host for this connection. If this is a positive reply, then the link key is used for authentication. If the configuration parameter Authentication_Enable is set, then the authentication procedure must be executed. This MSC only shows the case when Authentication_Enable is set on both sides. (See Figure 3.11 on page 637)

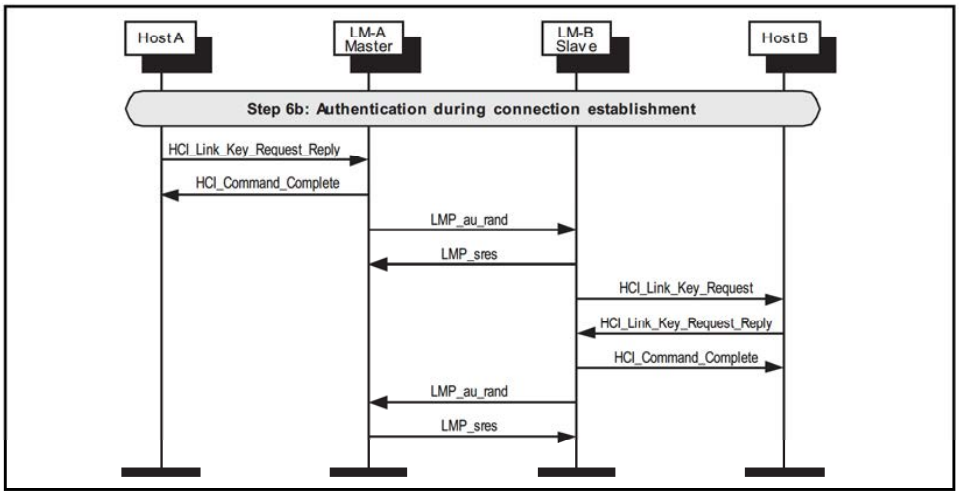


Figure 3.11: Authentication during connection setup.

Step 8: Once the pairing or authentication procedure is successful, the encryption procedure may be started. This MSC only shows the set up of an encrypted point-to-point connection. (See Figure 3.12 on page 637)

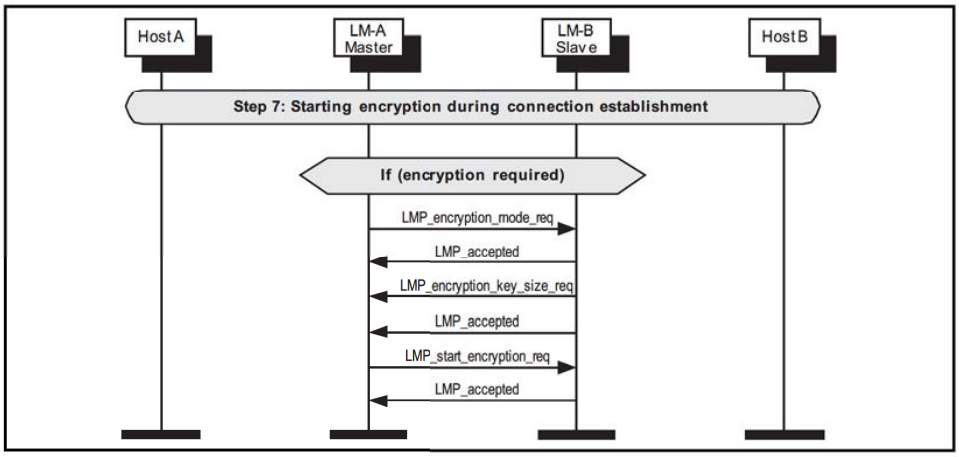


Figure 3.12: Starting encryption during connection setup.

Step 9: The LMs indicate that the connection is setup by sending LMP_setup_complete PDU. This will cause the Host to be notified of the new connection handle, and this connection may be used to send higher layer data such as L2CAP information. (See Figure 3.13 on page 638)

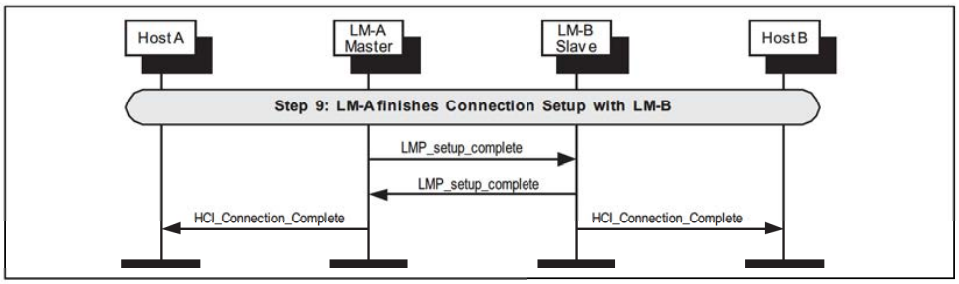


Figure 3.13: LM-A and LM-B finishes connection setup.

Step 10: Once the connection is no longer needed, either device may terminate the connection using the HCI_Disconnect command and LMP_detach message PDU. The disconnection procedure is one-sided and does not need an explicit acknowledgment from the remote LM. The use of ARQ Acknowledgment from the Baseband is needed to ensure that the remote LM has received the LMP_detach PDU. (See Figure 3.13 on page 638)

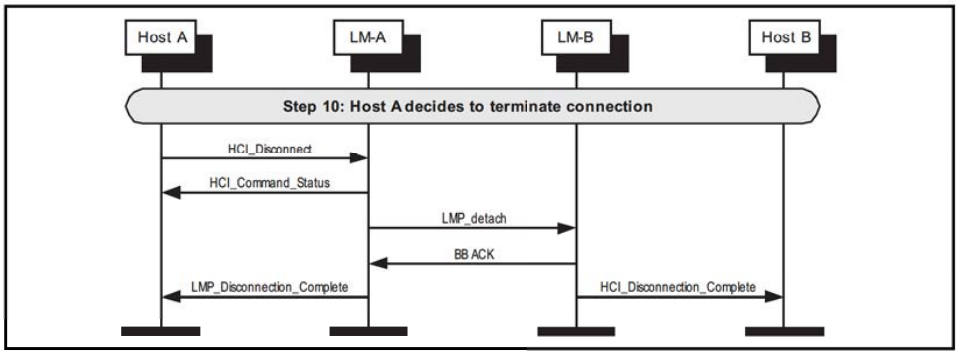


Figure 3.14: Host A decides to disconnect.

4 OPTIONAL ACTIVITIES AFTER ACL CONNECTION ESTABLISHMENT

4.1 AUTHENTICATION REQUESTED

Step 1: Authentication can be explicitly executed at any time after a connection has been established. If no Link Key is available then the Link Key is required from the Host. (See Figure 4.1 on page 639)

Note: If the Controller or LM and the Host do not have the Link Key a PIN Code Request event will be sent to the Host to request a PIN Code for pairing. A procedure identical to that used during Connection Setup (Section 3.1, Step 7a:) will be used. (See Figure 3.9 on page 635)

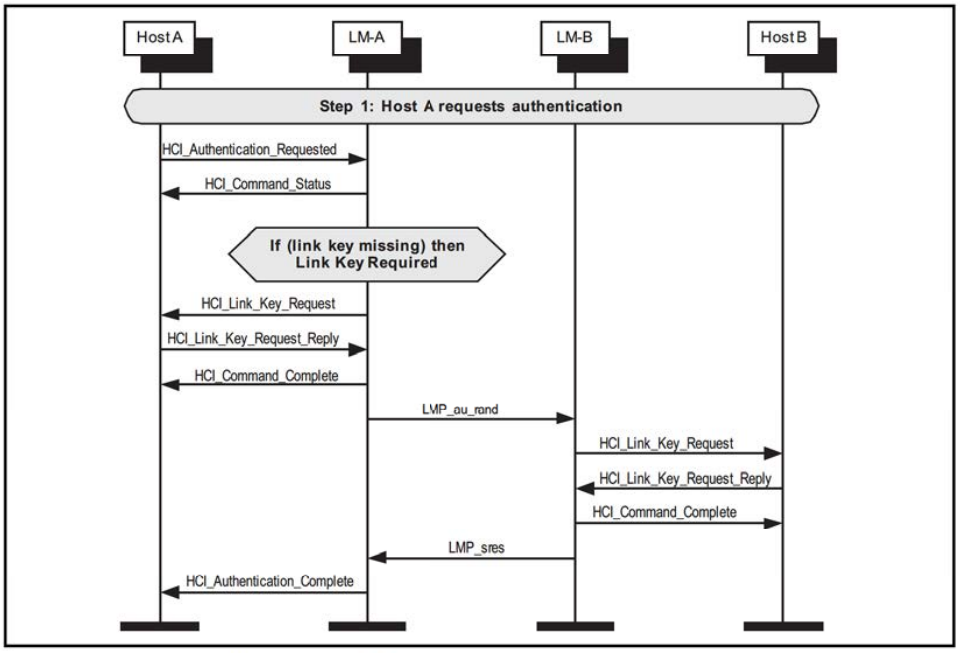


Figure 4.1: Authentication requested.

4.2 SET CONNECTION ENCRYPTION

Step 1: The host may at any time turn on encryption using the HCI_Set_Connection_Encryption command. This command can be originated from either the master or slave sides. Only the master side is shown in Figure 4.2 on page 640. If this command is sent from a slave, the only difference is that the LMP_encryption_mode_req PDU will be sent from the slave. The LMP_encryption_key_size_req and LMP_start_encryption_req PDUs will always be requested from the master. (See Figure 4.2 on page 640)

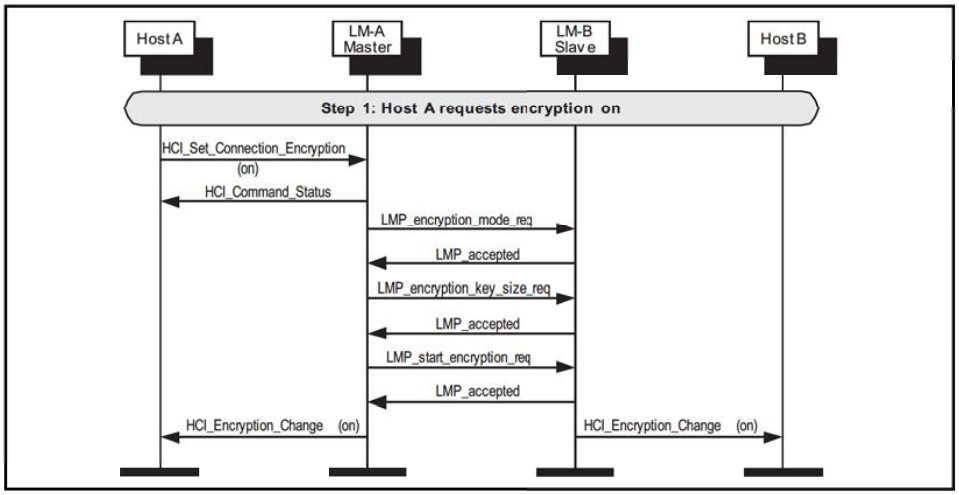


Figure 4.2: Encryption requested.

Step 2: To terminate the use of encryption, The HCI_Set_Connection_Encryption command is used. (See Figure 4.3 on page 640)

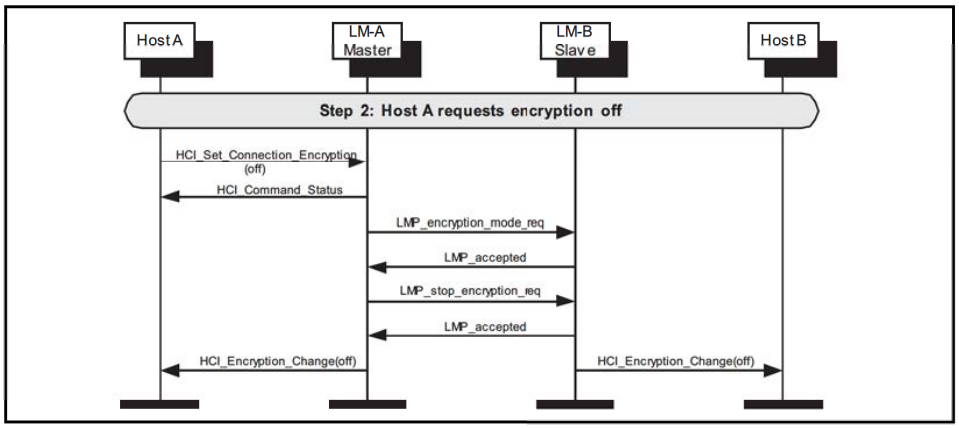


Figure 4.3: Encryption off requested.

4.3 CHANGE CONNECTION LINK KEY

Step 1: The master host (Host A) may change the connection link key using the HCI_Change_Connection_Link_Key command. A new link key will be generated and the hosts will be notified of this new link key. (See Figure 4.4 on page 641).

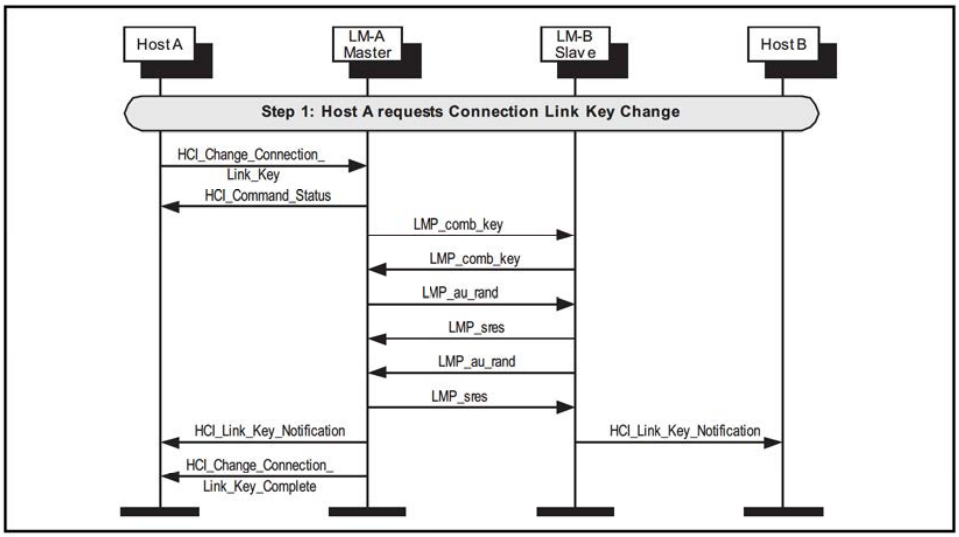


Figure 4.4: Change connection link key.

4.4 MASTER LINK KEY

Step 1: The host changes to a Master Link Key from a Semi-permanent Link Key using the HCI_Master_Link_Key command. (See Figure 4.5 on page 642)

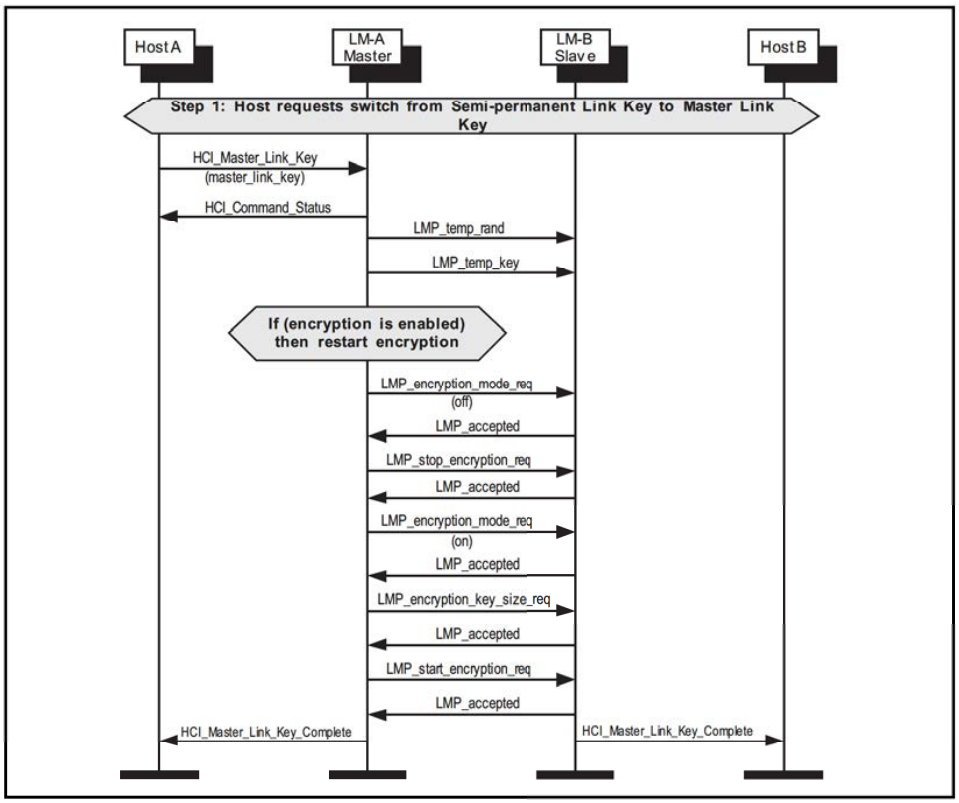


Figure 4.5: Change to master link key.

Step 2: The host changes to a Semi-permanent Link Key from a Master Link Key using the HCI_Master_Link_Key command. (See Figure 4.6 on page 643)

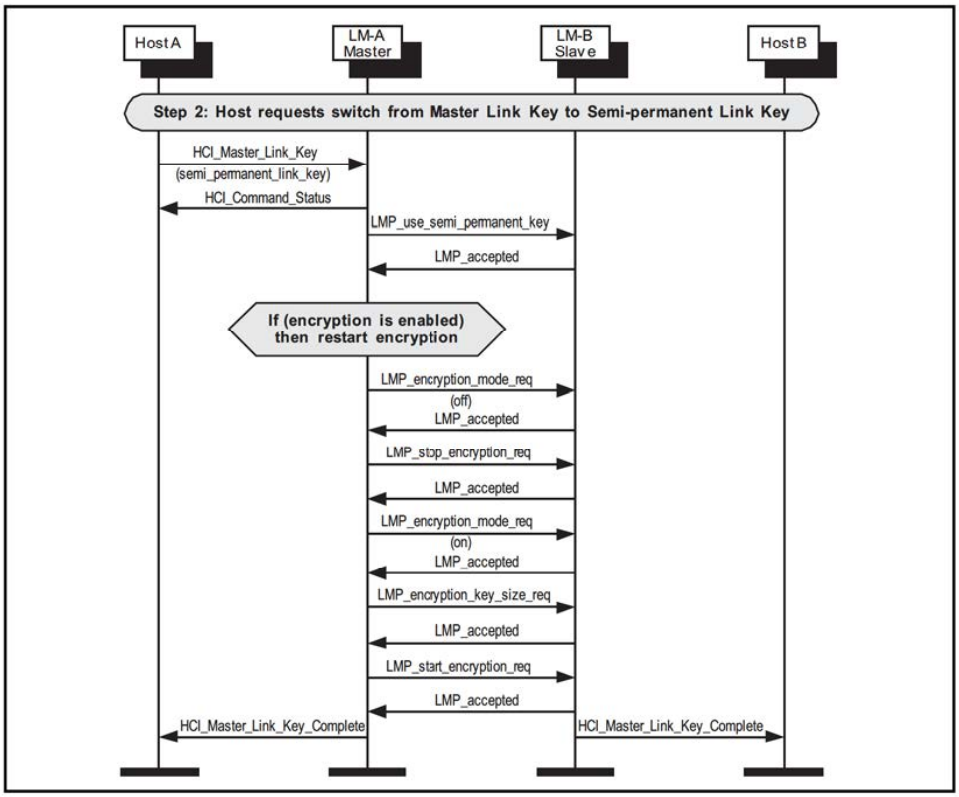


Figure 4.6: Change to semi permanent link key.

4.5 READ REMOTE SUPPORTED FEATURES

Using the HCI_Read_Remote_Supported_Features command the supported LMP Features of a remote device can be read. (See Figure 4.7 on page 644)

If the remote supported features have been obtained previously then the Controller may return them without sending any LMP PDUs.

Step 1: The host requests the supported features of a remote device.

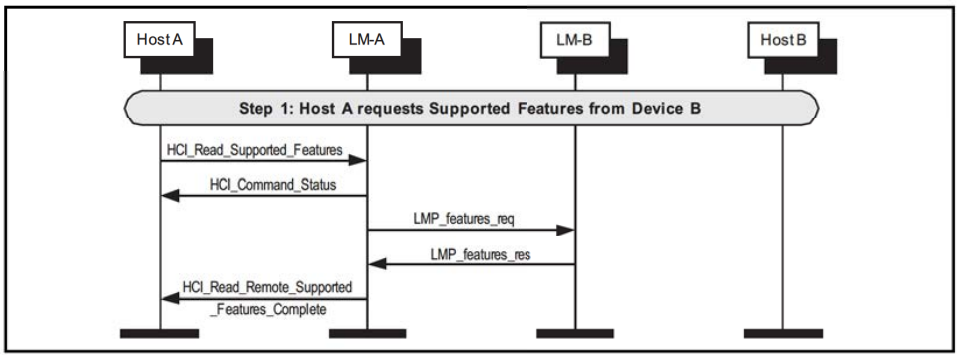


Figure 4.7: Read remote supported features.

4.6 READ REMOTE EXTENDED FEATURES

Using the HCI_Read_Remote_Extended_Features command the extended LMP features of a remote device can be read. (See Figure 4.8 on page 644)

If the remote extended features have been obtained previously then the Controller may return them without sending any LMP PDUs.

Step 1: The host requests the extended features of a remote device.

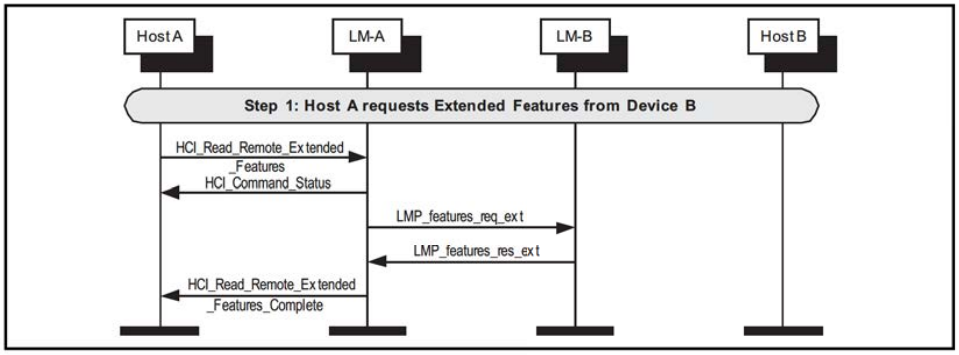


Figure 4.8: Read remote extended features.

4.7 READ CLOCK OFFSET

Using the HCI_Read_Clock_Offset command the device acting as the master can read the Clock Offset of a slave. The Clock Offset can be used to speed up the paging procedure in a later connection attempt. If the command is requested from the slave device, the Controller will directly return a Command Status event and a Read Clock Offset Complete event without sending any LMP PDUs. (See Figure 4.9 on page 645)

Step 1: The host requests the clock offset of a remote device.

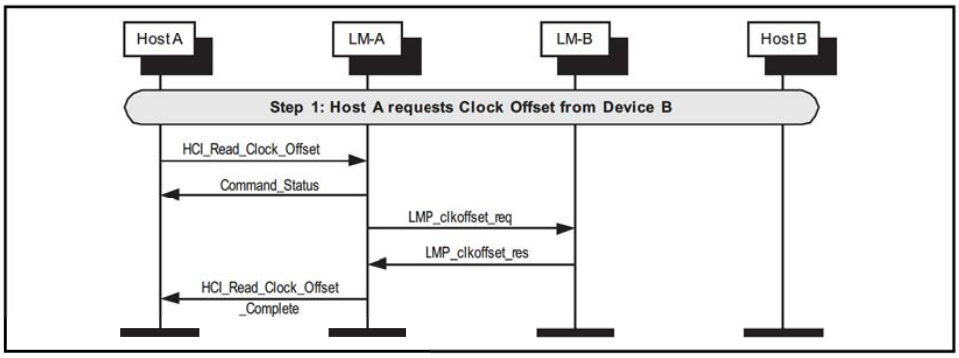


Figure 4.9: Read clock offset.

4.8 READ REMOTE VERSION INFORMATION

Using the HCI_Read_Remote_Version_Information command the version information of a remote device can be read. (See Figure 4.10 on page 645)

If the remote version information has been obtained previously then the Controller may return them without sending any LMP PDUs.

Step 1: The host requests the version information of a remote device.

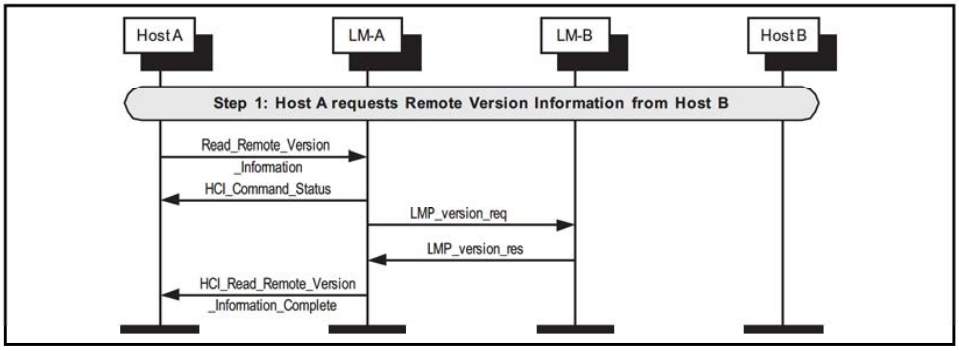


Figure 4.10: Read remote version information.

4.9 QOS SETUP

Using the HCI_Flow_Specification command the Quality of Service (QoS) and Flow Specification requirements of a connection can be notified to a Controller. The Controller may then change the quality of service parameters with a remote device. (See Figure 4.11 on page 646)

Step 1: The host sends QoS parameters to a remote device.

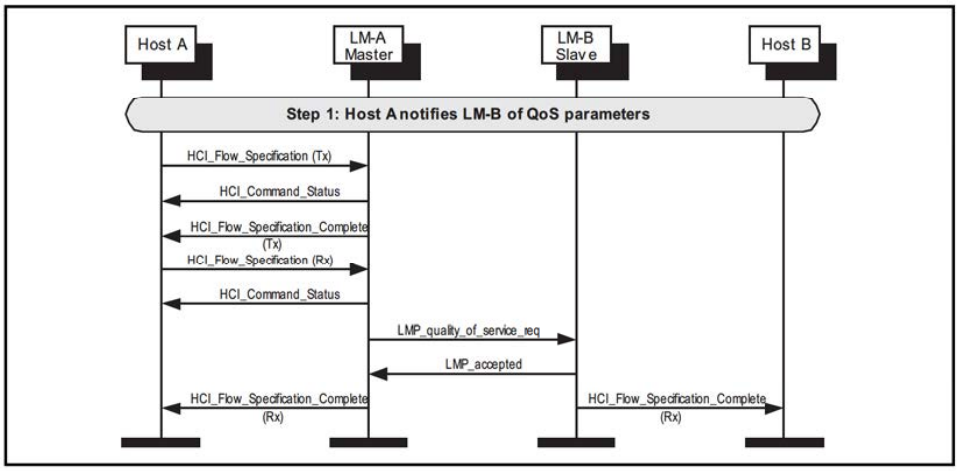


Figure 4.11: QoS flow specification.

4.10 SWITCH ROLE

The HCI_Switch_Role command can be used to explicitly switch the current master / slave role of the local device with the specified device.

Step 1a: The master host (A) requests a role switch with a slave. This will send the switch request, and the slave will respond with the slot offset and accepted. (See Figure 4.12 on page 646)

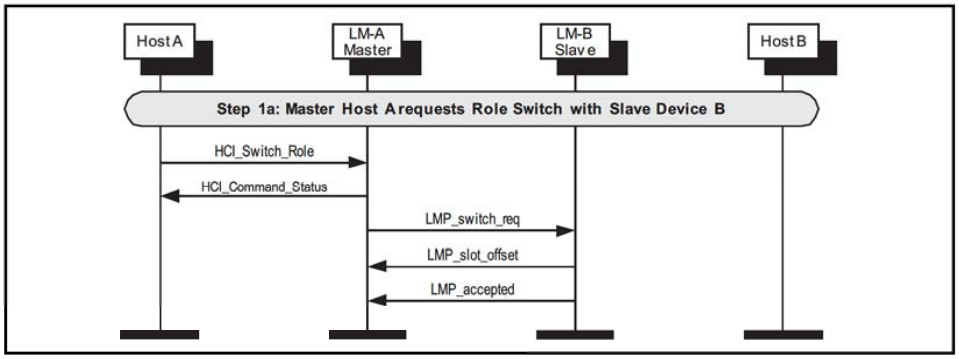


Figure 4.12: Master requests role switch.

Step 1b: The slave host (B) requests a role switch with a master. This will send the slot offset and the switch request, and the master will respond with a LMP_accepted PDU. (See Figure 4.13 on page 647)

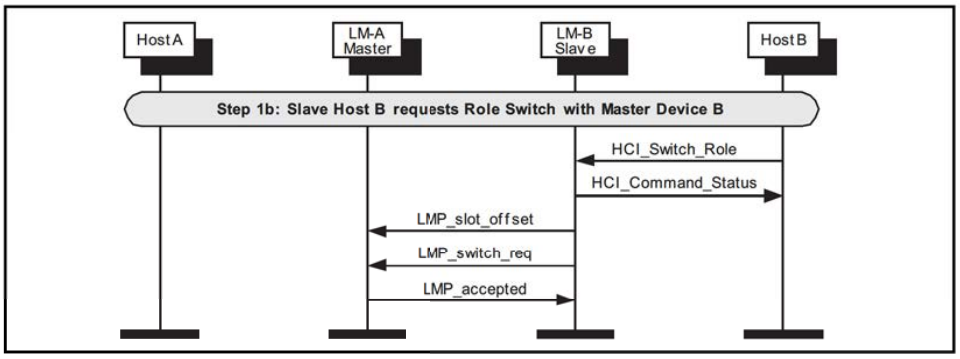


Figure 4.13: Slave requests role switch.

Step 2: The role switch is performed by doing the TDD switch and piconet switch. Finally an HCI_Role_Change event is sent on both sides. (See Figure 4.14 on page 647)

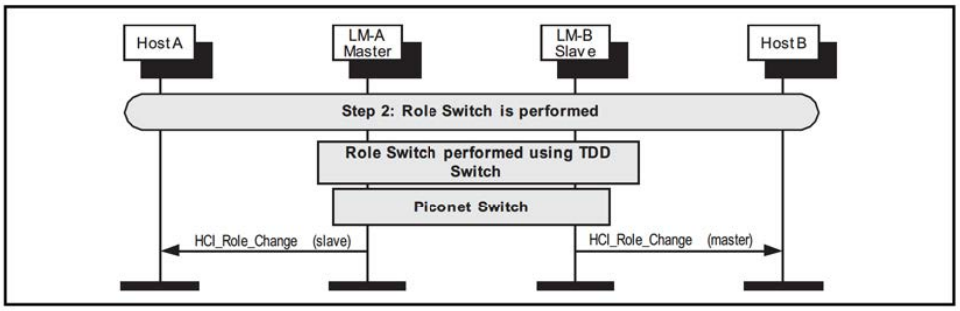


Figure 4.14: Role switch is performed.

5 SYNCHRONOUS CONNECTION ESTABLISHMENT AND DETACHMENT

5.1 SYNCHRONOUS CONNECTION SETUP

Using the HCI_Setup_Synchronous_Connection command, a host can add a synchronous logical channel to the link. A synchronous logical link can be provided by creating a SCO or an eSCO logical transport.

Note: An ACL Connection must be established before a synchronous connection can be created.

Step 1a: Master device requests a synchronous connection with a device. (See Figure 5.1 on page 649)

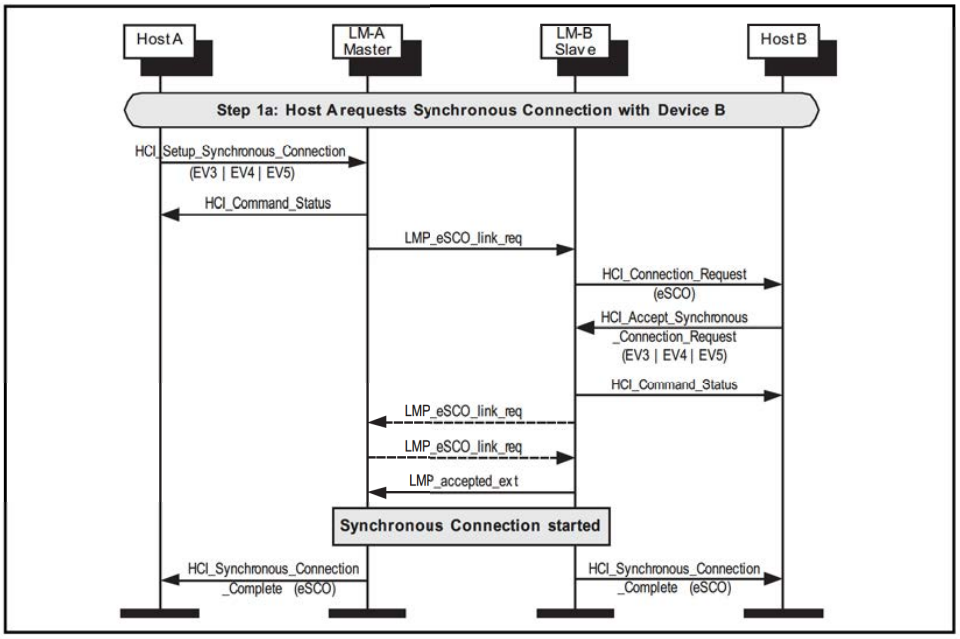


Figure 5.1: Master requests synchronous EV3, EV4 OR EV5 connection.

Step 1b: Slave device requests a synchronous connection with a device.
(See Figure 5.2 on page 650)

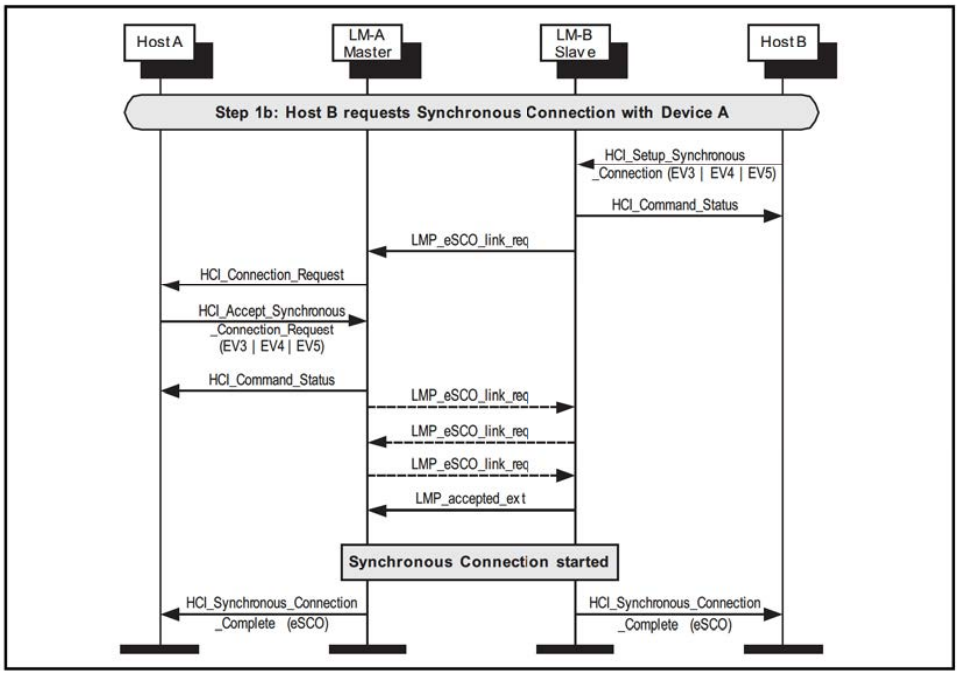


Figure 5.2: Slave requests synchronous EV3, EV4 OR EV5 connection.

Step 1c: Master device requests a SCO connection with a device.
(See Figure 5.3 on page 650)

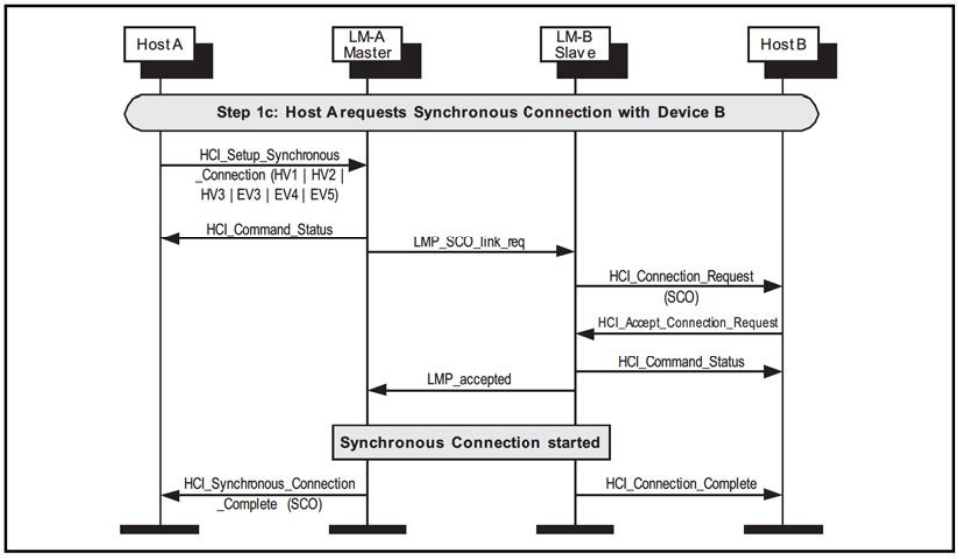


Figure 5.3: Master requests synchronous connection using SCO.

Step 1d: Master device requests a SCO connection with a device.
(See Figure 5.4 on page 651)

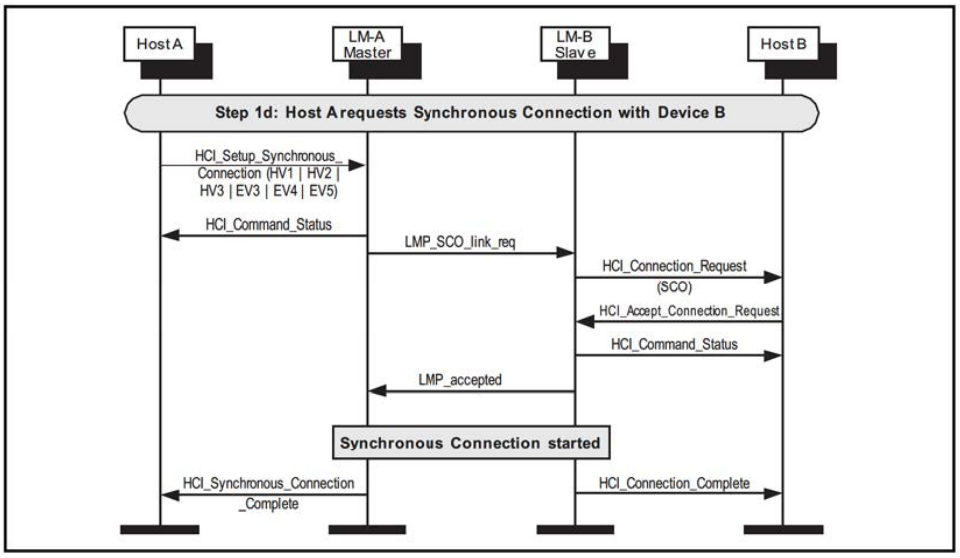


Figure 5.4: Master requests synchronous connection with legacy slave.

Step 1e: Host device requests a SCO connection with a device.
(See Figure 5.5 on page 651)

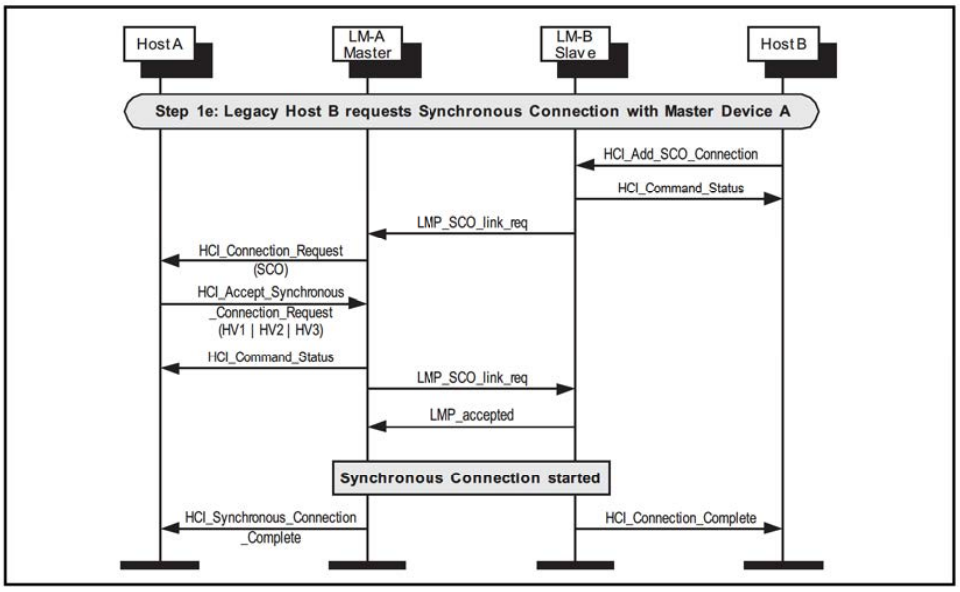


Figure 5.5: Any device that supports only SCO connections requests a synchronous connection with a device.

Step 2a: Master renegotiates eSCO connection (See Figure 5.6 on page 652).

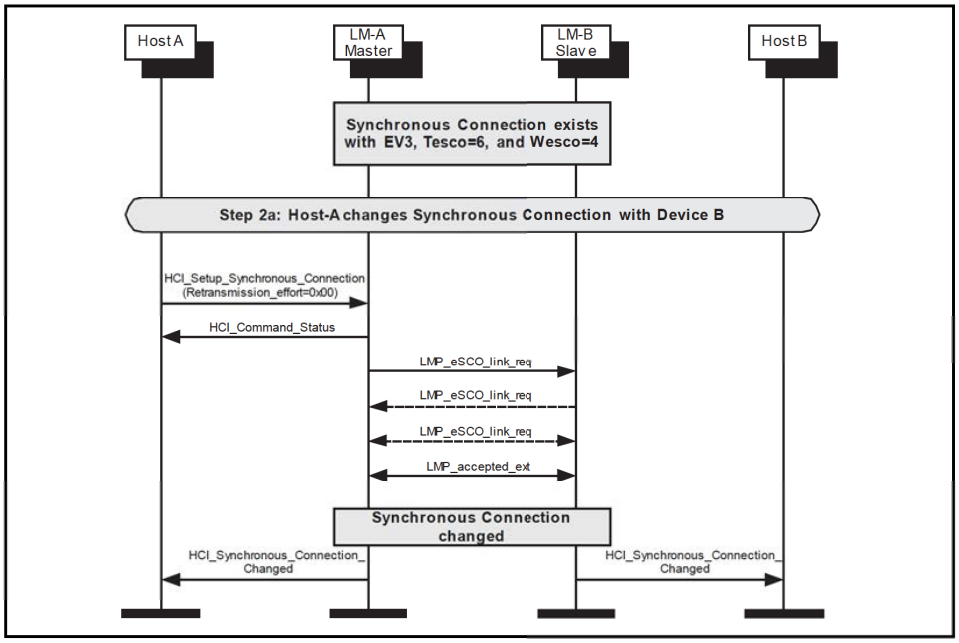


Figure 5.6: Master renegotiates eSCO connection.

Step 2b: Slave renegotiates eSCO connection (See Figure 5.7 on page 652).

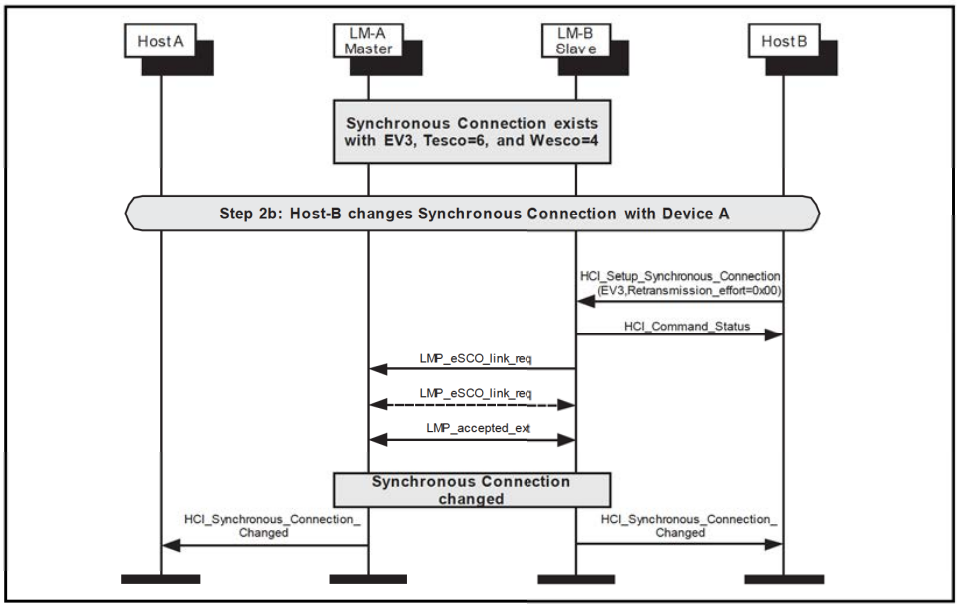


Figure 5.7: Slave renegotiates eSCO connection.

Step 3a: eSCO Disconnection. (See Figure 5.8 on page 653)

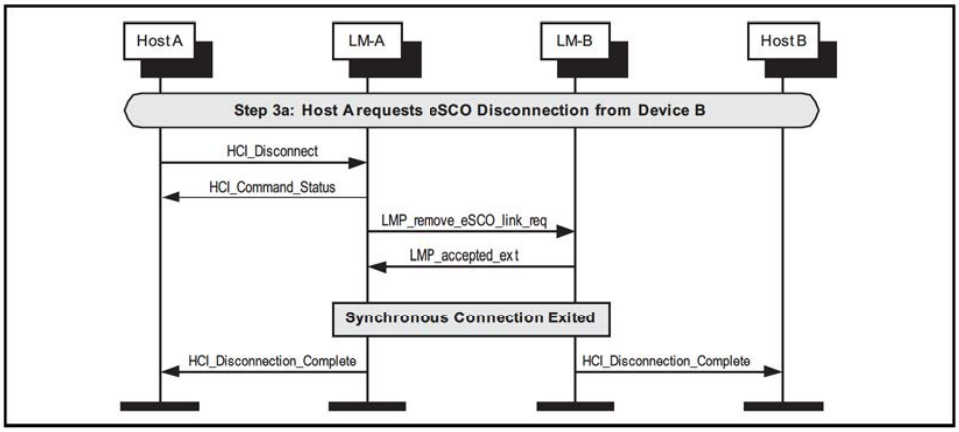


Figure 5.8: Synchronous disconnection of eSCO connection.

Step 3b: SCO Disconnection. (See Figure 5.9 on page 653)

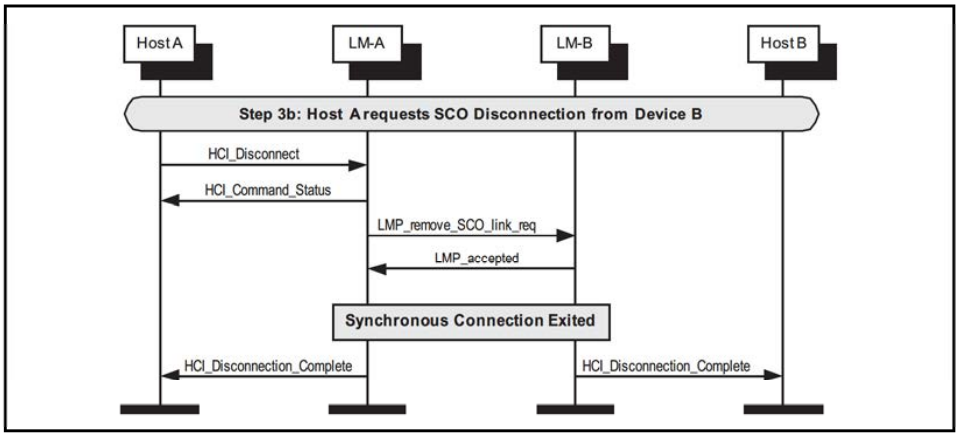


Figure 5.9: Synchronous disconnection of SCO connection.

6 SNIFF, HOLD AND PARK

Entry into sniff mode, hold mode or park state requires an established ACL Connection.

6.1 SNIFF MODE

The HCI_Sniff_Mode command is used to enter sniff mode. The HCI_Exit_Sniff_Mode command is used to exit sniff mode.

Step 1: Host requests to enter sniff mode. Multiple LMP_sniff_req PDUs may be sent as the parameters for sniff mode are negotiated.
(See Figure 6.1 on page 655)

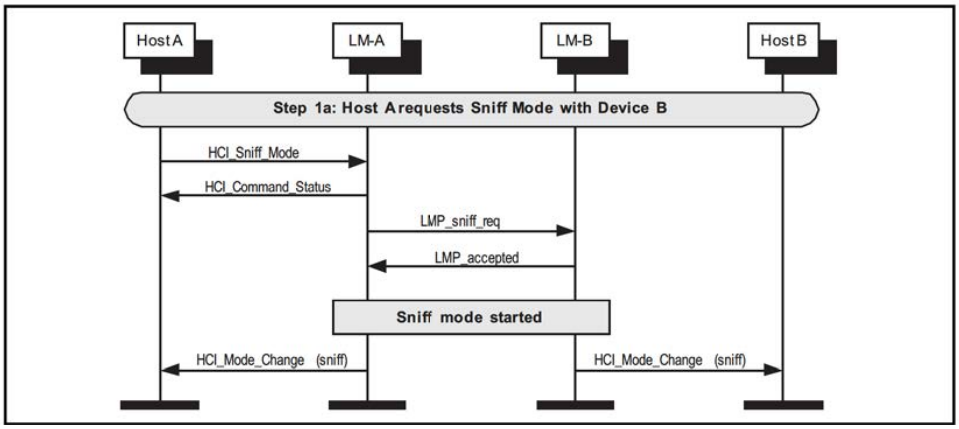


Figure 6.1: Sniff mode request.

Step 2: Host requests to exit sniff mode. (See Figure 6.2 on page 655)

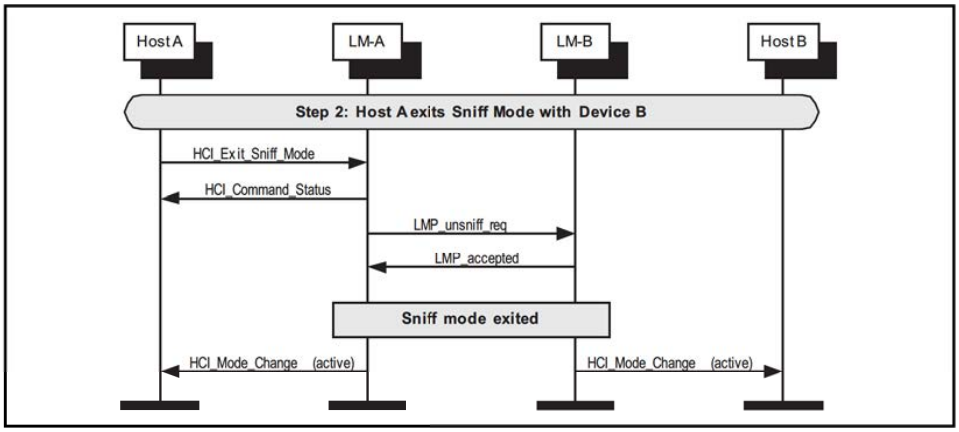


Figure 6.2: Exit sniff mode request.

6.2 HOLD MODE

The HCI_Hold_Mode command can be used to place a device into hold mode. The Controller may do this by either negotiating the hold mode parameters or forcing hold mode. Hold mode will automatically end after the negotiated length of time.

Step 1a: A host requests hold mode. (See Figure 6.3 on page 656)

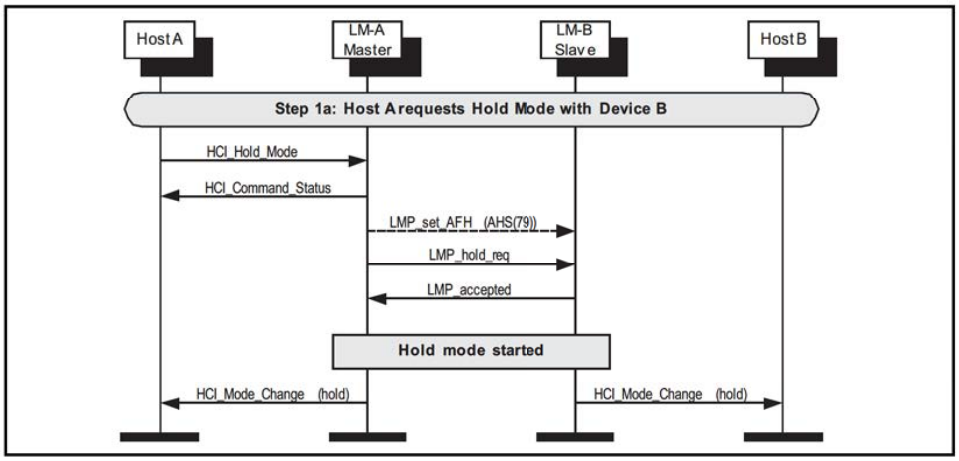


Figure 6.3: Hold request.

Step 1b: A host may force hold mode. (See Figure 6.4 on page 656)

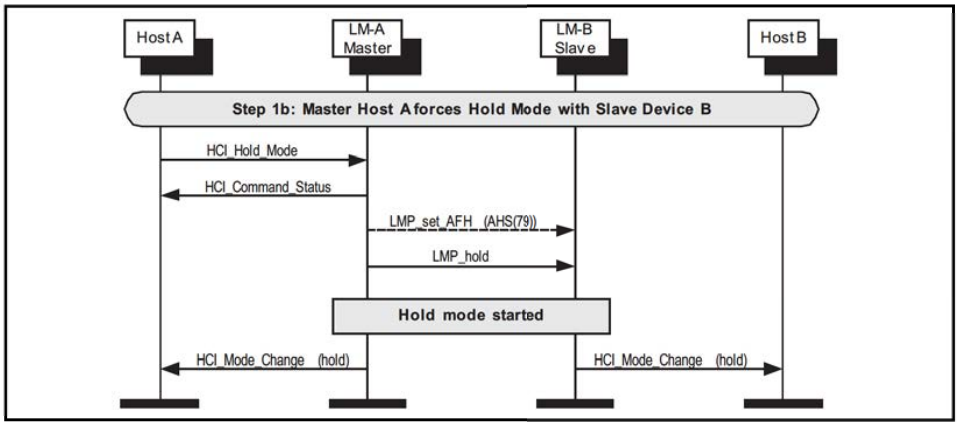


Figure 6.4: Master forces hold mode.

Step 1c: A slave device requests hold mode. (See Figure 6.5 on page 657)

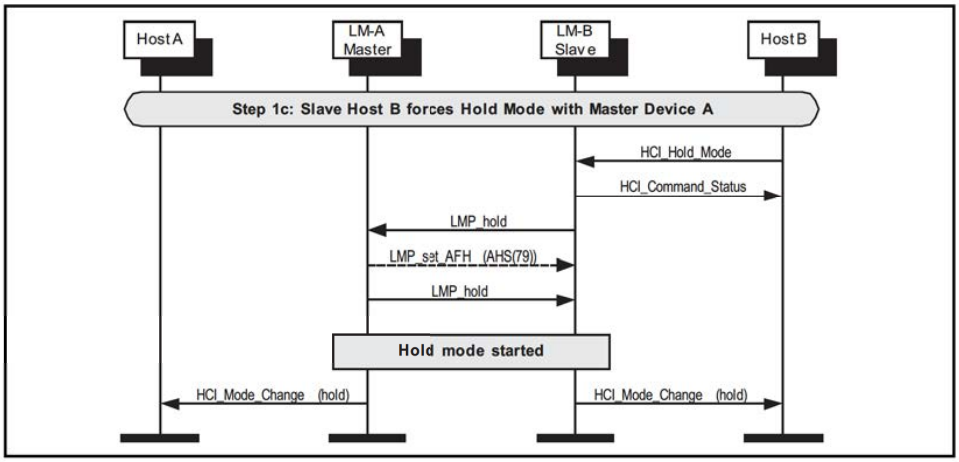


Figure 6.5: Slave forces hold mode.

Step 2: When hold mode completes the hosts are notified using the HCI_Mode_Change event. (See Figure 6.6 on page 657)

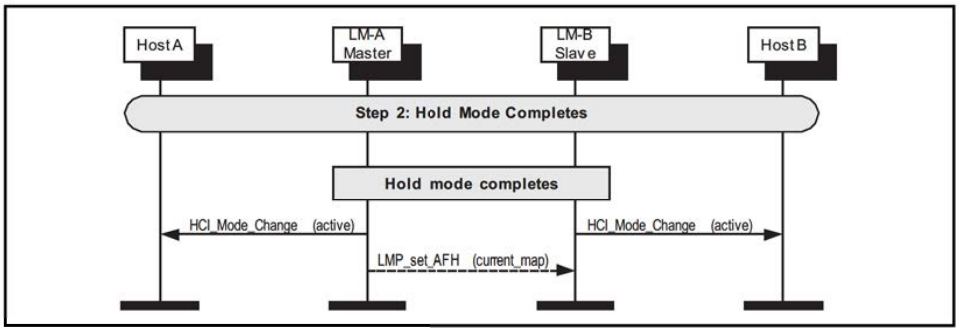


Figure 6.6: Hold mode completes.

6.3 PARK STATE

Park state can be entered by using the HCI_Park_State command.

Step 1a: The master requests to place the slave in the park state. Before sending the LMP_park_req PDU, the master may disable AFH by setting the connection into AHS(79). (See Figure 6.7 on page 658)

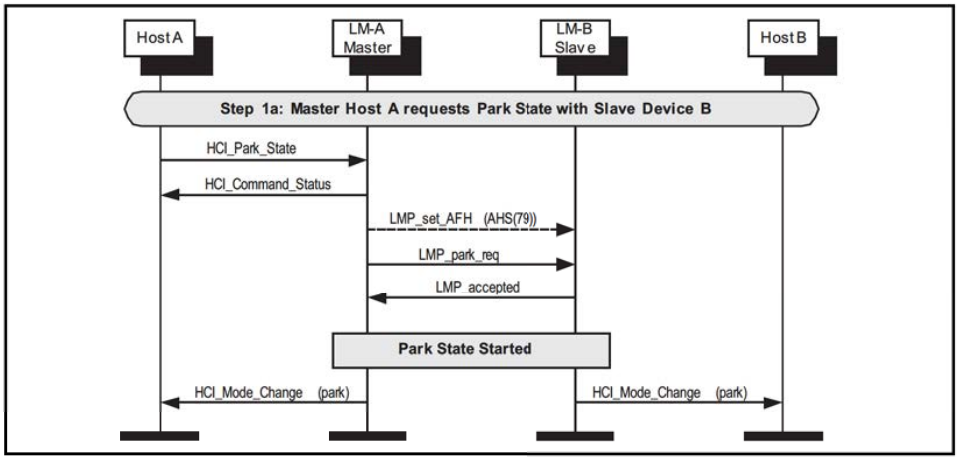


Figure 6.7: Park state request from master.

Step 1b: The slave requests to be placed in the park state. Before sending the LMP_park_req PDU back to the slave, the master may disable AFH by setting the connection into AHS(79). (See Figure 6.8 on page 658)

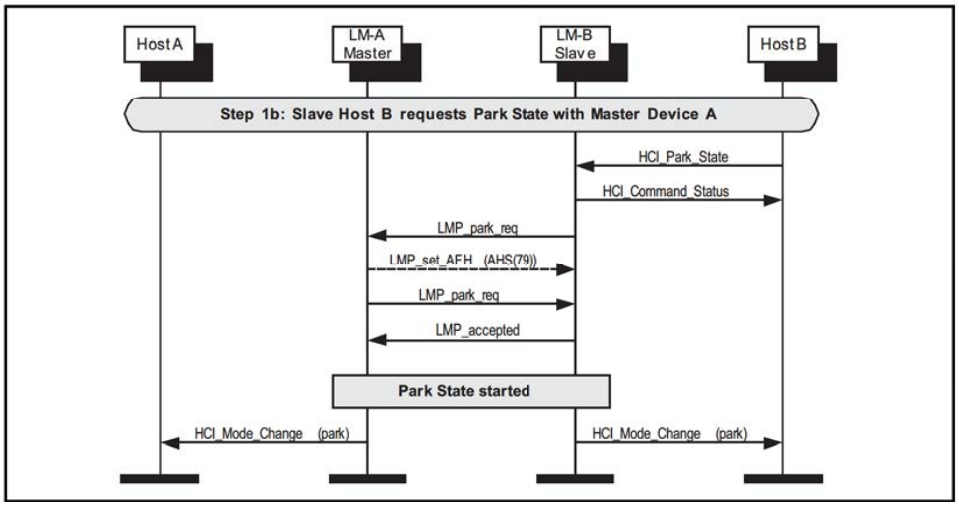


Figure 6.8: Park state request from slave.

Step 2: When in the park state, a slave still needs to unparked for link supervision purposes. The master sends an LMP_unpark_PM_ADDR_req PDU or an LMP_unpark_BD_ADDR_req PDU to the slave during the beacon. Only the PM_ADDR version is illustrated in the figure. (See Figure 6.9 on page 659)

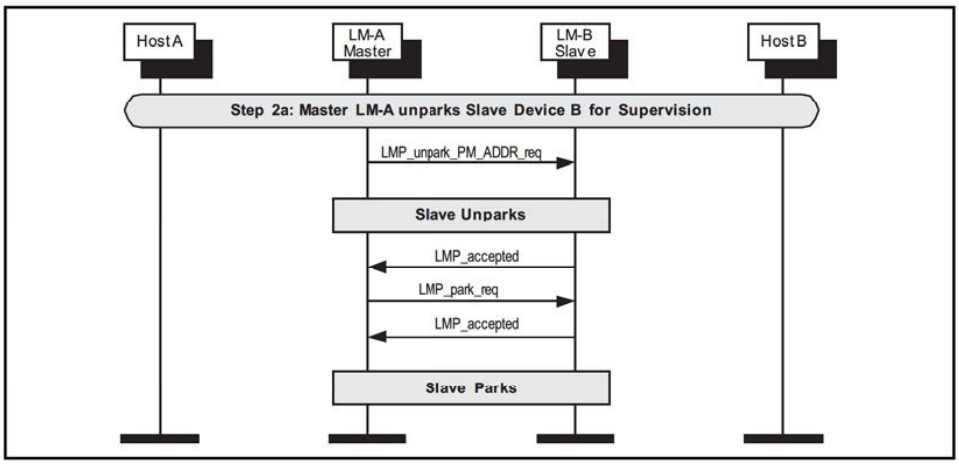


Figure 6.9: Master unparks slave for supervision.

Step 3a: A master may unpark a slave to exit park state. The master should re-enable AFH by setting the current AFH channel map to the unparked slave. (See Figure 6.10 on page 659)

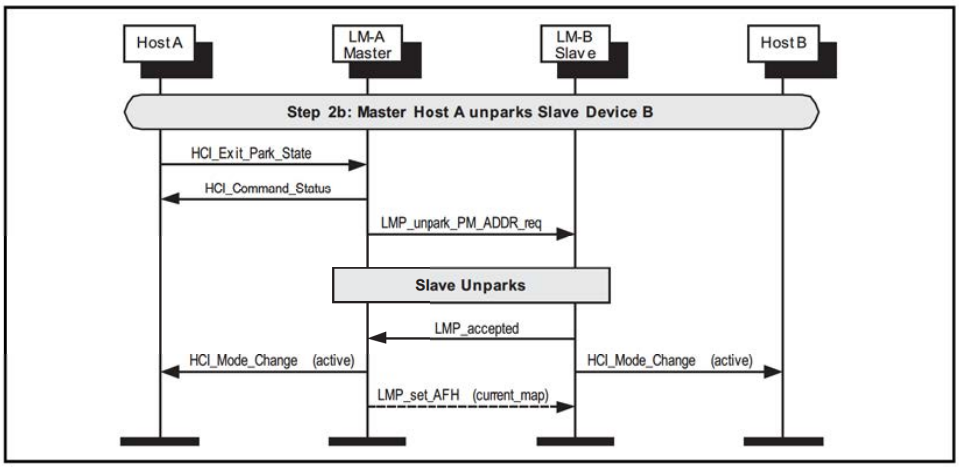


Figure 6.10: Master exits park state with slave.

Step 3b: A slave may request to be unparked by sending a message in an access window. It will then receive instructions from the master to unpark. The master should re-enable AFH by setting the current AFH channel map to the unparked slave. (See Figure 6.11 on page 660)

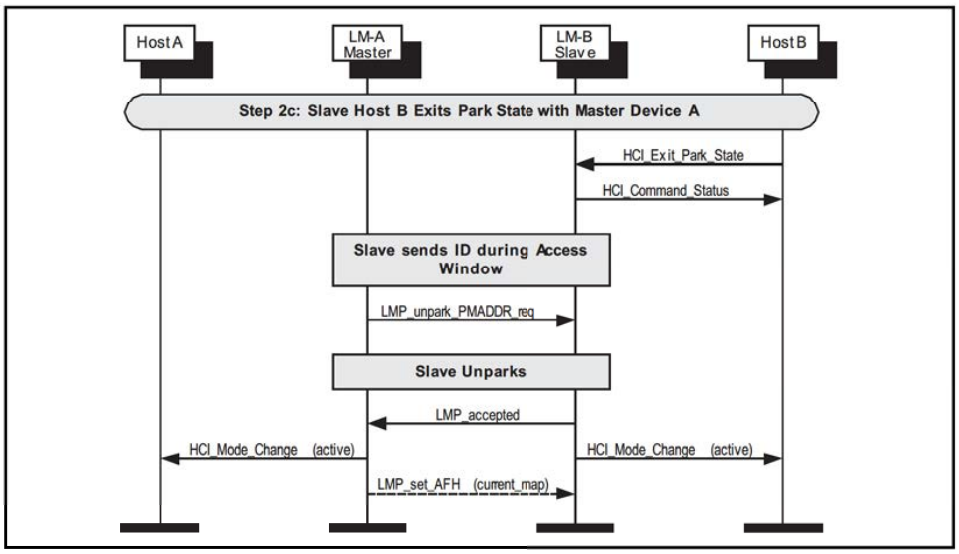


Figure 6.11: Slave exits park state with master.

7 BUFFER MANAGEMENT, FLOW CONTROL

Buffer management is very important for resource limited devices. This can be achieved on the Host Controller Interface using the HCI_Read_Buffer_Size command, and the HCI_Number_Of_Completed_Packets event, and the HCI_Set_Host_Controller_To_Host_Flow_Control, HCI_Host_Buffer_Size and HCI_Host_Number_Of_Completed_Packets commands.

Step 1: During initialization, the host reads the buffer sizes available in the Controller. When an HCI Data Packet has been transferred to the remote device, and a Baseband acknowledgement has been received for this data, then an HCI_Number_Of_Completed_Packets event will be generated. (See Figure 7.1 on page 661)

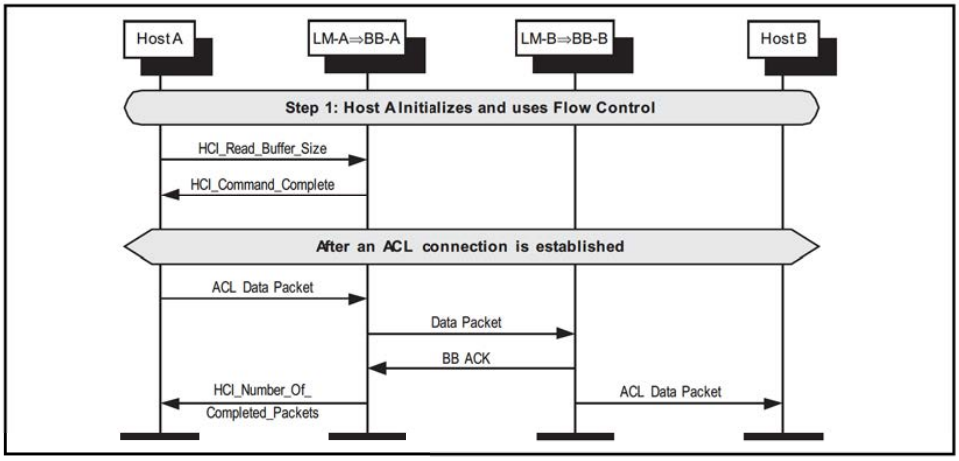


Figure 7.1: Host to Controller flow control.

Step 2: During initialization, the host notifies the Controller that host flow control shall be used, and then the host buffer sizes available. When a data packet has been received from a remote device, an HCI Data Packet is sent to the host from the Controller, and the host shall acknowledge its receipt by sending HCI_Host_Number_Of_Completed_Packets. (See Figure 7.2 on page 662)

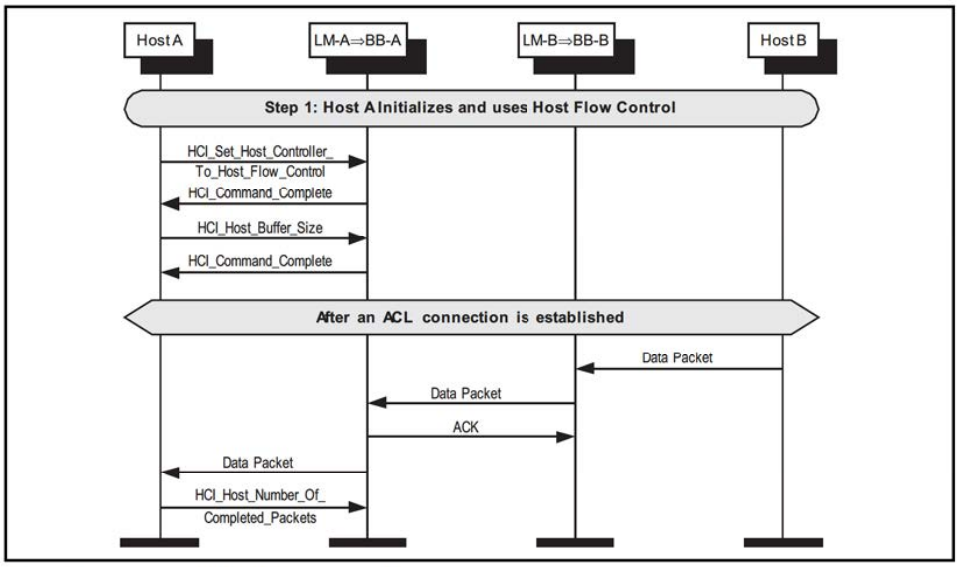


Figure 7.2: Controller to Host flow control.

8 LOOPBACK MODE

The loopback modes are used for testing of a device only.

8.1 LOCAL LOOPBACK MODE

The local loopback mode is used to loopback received HCI Commands, and HCI ACL and HCI Synchronous packets sent from the Host to the Controller.

Step 1: The host enters local loopback mode. Four connection complete events are generated and then a command complete event.
(See Figure 8.1 on page 663)

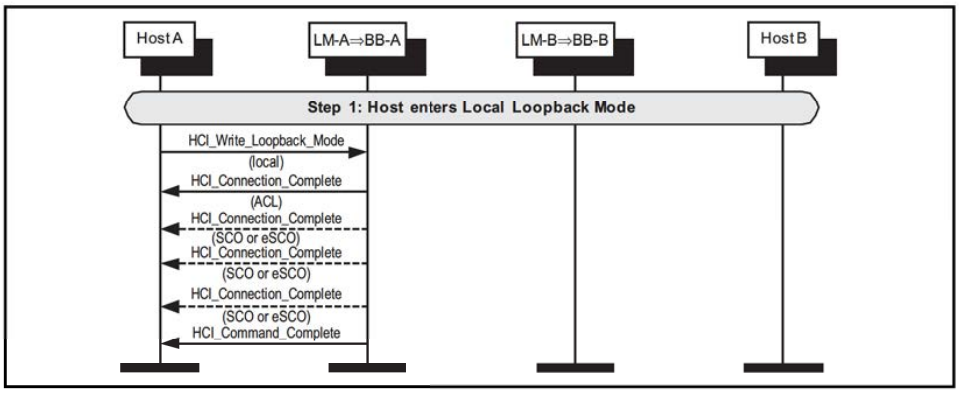


Figure 8.1: Entering local loopback mode.

Step 2a: The host sending HCI Data Packet will receive the exact same data back in HCI Data Packets from the Controller. (See Figure 8.2 on page 663)

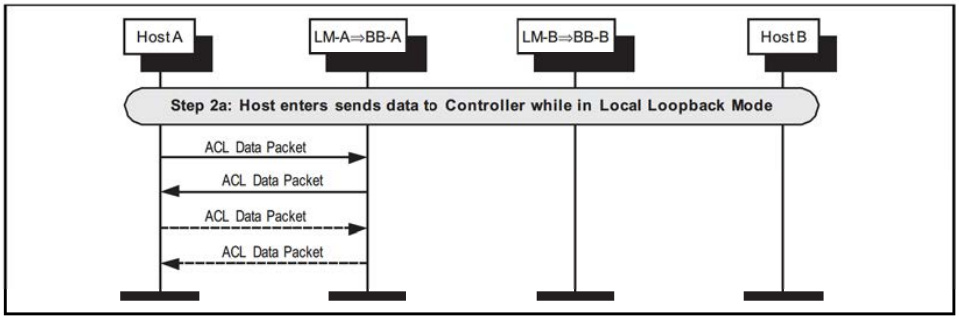


Figure 8.2: Looping back data in local loopback mode.

Step 2b: The host sending most HCI Command Packets to the Controller will receive an HCI_Loopback_Command event with the contents of the HCI Command Packet in the payload. (See Figure 8.3 on page 664)

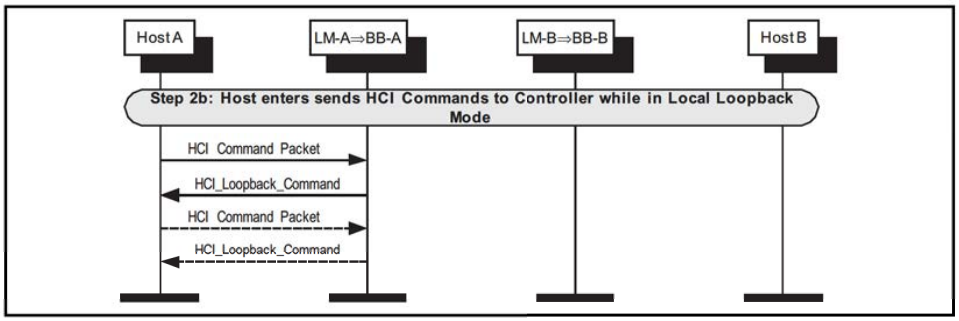


Figure 8.3: Looping back commands in local loopback mode.

Step 3: The host exits local loopback mode. Multiple disconnection complete events are generated before the command complete event.
(See Figure 8.4 on page 664)

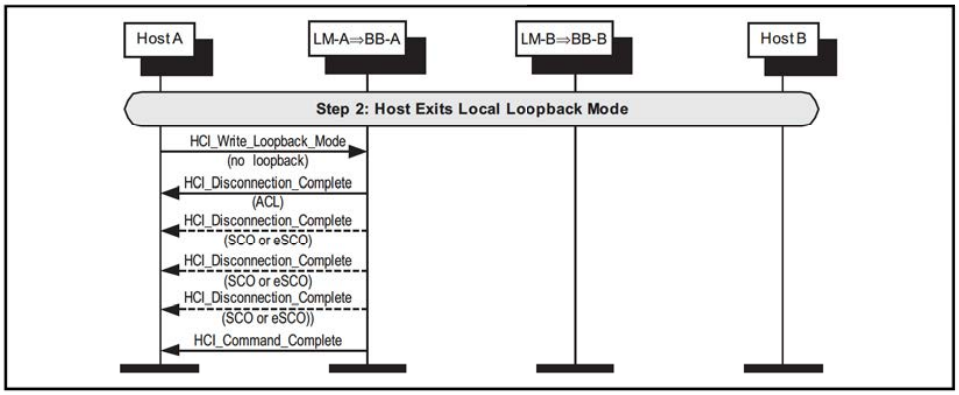


Figure 8.4: Exiting local loopback mode.

8.2 REMOTE LOOPBACK MODE

The remote loopback mode is used to lookback data to a remote device over the air.

Step 1: The remote host first sets up an connection to the local device. The local device then enables remote loopback. (See Figure 8.5 on page 665)

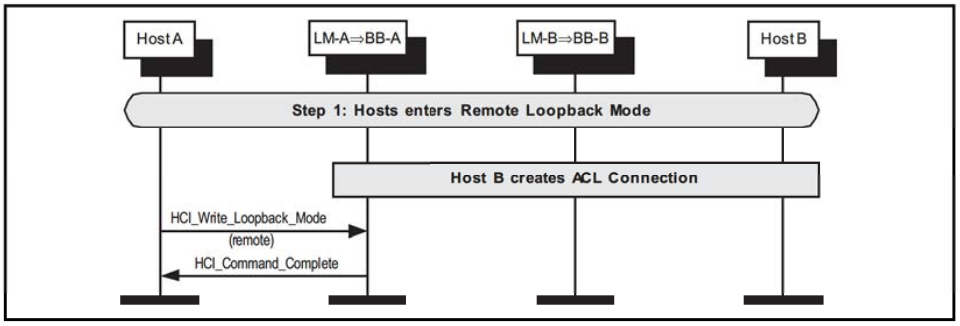


Figure 8.5: Entering remote loopback mode.

Step 2: Any data received from the remote host will be loopbacked in the Controller of the local device. (See Figure 8.6 on page 665)

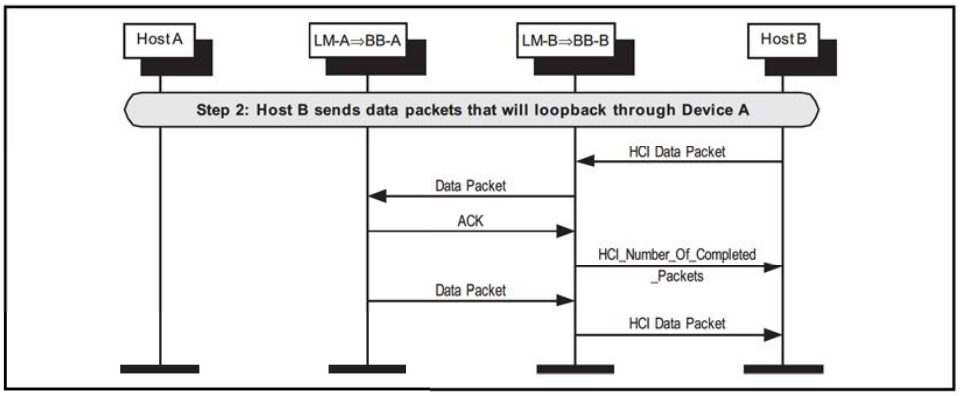


Figure 8.6: Looping back data in Remote Loopback Mode.

Step 3: The local host exits remote loopback mode. Any connections can then be disconnected by the remote device. (See Figure 8.7 on page 666)

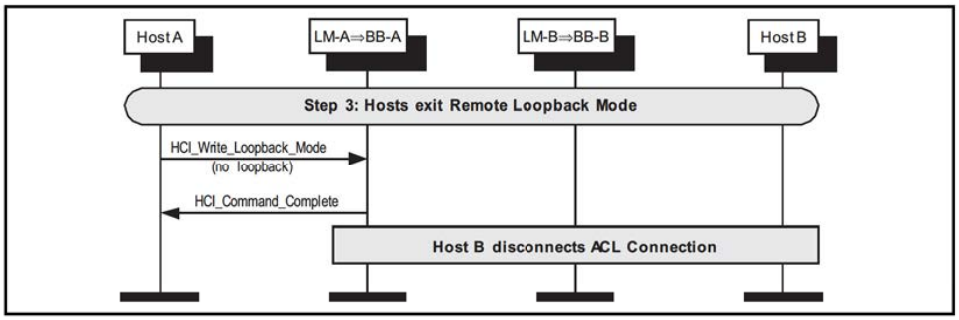


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SAMPLE DATA

This appendix contains sample data for various parts of the Bluetooth baseband specification. All sample data are provided for reference purpose only; they are intended as a complement to the definitions provided elsewhere in the specification. They can be used to check the behavior of an implementation and avoid misunderstandings. Fulfilling these sample data is a necessary but not sufficient condition for an implementation to be fully Bluetooth compliant.

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1 ENCRYPTION SAMPLE DATA

This section contains four sets of sample data for the encryption process.

With respect to the functional description of the encryption engine in the Bluetooth baseband specification, the contents of registers and resulting concurrent values are listed as well. This by no means excludes different implementations (as far as they produce the same encryption stream) but is intended to describe the functional behavior.

In case of misunderstandings or inconsistencies, these sample data form the normative reference.

1.1 GENERATING KC' FROM KC,

where Kc'(x) = g2(x)(Kc(x) mod g1(x)).

```
Note: All polynomials are in hexadecimal notation.
      'L' is the effective key length in bytes.
      The notation 'p: [m]' implies that deg(p(x)) = m.

                              MSB                                      LSB
L = 1
g1:                 [8]       00000000 00000000 00000000 0000011d
g2:                 [119]     00e275a0 abd218d4 cf928b9b bf6cb08f
Kc:                           a2b230a4 93f281bb 61a85b82 a9d4a30e
Kc mod g1:          [7]       00000000 00000000 00000000 0000009f
g2(Kc mod g1):      [126]     7aa16f39 59836ba3 22049a7b 87f1d8a5
-------------------------------------------------------------
L = 2
g1:                 [16]      00000000 00000000 00000000 0001003f
g2:                 [112]     0001e3f6 3d7659b3 7f18c258 cff6efef
Kc:                           64e7df78 bb7ccaa4 61433123 5b3222ad
Kc mod g1:          [12]      00000000 00000000 00000000 00001ff0
g2(Kc mod g1):      [124]     142057bb 0bceac4c 58bd142e 1e710a50
-------------------------------------------------------------
L = 3
g1:                 [24]      00000000 00000000 00000000 010000db
g2:                 [104]     000001be f66c6c3a b1030a5a 1919808b
Kc:                           575e5156 ba685dc6 112124ac edb2c179
Kc mod g1:          [23]      00000000 00000000 00000000 008ddbc8
g2(Kc mod g1):      [127]     d56d0adb 8216cb39 7fe3c591 1ff95618
-------------------------------------------------------------
L = 4
g1:                 [32]      00000000 00000000 00000001 000000af
g2:                 [96]      00000001 6ab89969 de17467f d3736ad9
Kc:                           8917b4fc 403b6db2 1596b86d 1cb8adab
Kc mod g1:          [31]      00000000 00000000 00000000 aa1e78aa
g2(Kc mod g1):      [127]     91910128 b0e2f5ed a132a03e af3d8cda
-------------------------------------------------------------
```

Sample Data

```
L = 5
g1:                [40]        00000000 00000000 00000100 00000039
g2:                [88]        00000000 01630632 91da50ec 55715247
Kc:                            785c915b dd25b9c6 0102ab00 b6cd2a68
Kc mod g1:         [38]        00000000 00000000 0000007f 13d44436
g2(Kc mod g1):     [126]       6fb5651c cb80c8d7 ea1ee56d f1ec5d02
------------------------------------------------------------
L = 6
g1:                [48]        00000000 00000000 00010000 00000291
g2:                [77]        00000000 00002c93 52aa6cc0 54468311
Kc:                            5e77d19f 55ccd7d5 798f9a32 3b83e5d8
Kc mod g1:         [47]        00000000 00000000 000082eb 4af213ed
g2(Kc mod g1):     [124]       16096bcb afcf8def 1d226a1b 4d3f9a3d
------------------------------------------------------------
```

Sample Data

```
L = 7
g1:                [56]        00000000 00000000 01000000 00000095
g2:                [71]        00000000 000000b3 f7fffce2 79f3a073
Kc:                            05454e03 8ddcfbe3 ed024b2d 92b7f54c
Kc mod g1:         [55]        00000000 00000000 0095b8a4 8eb816da
g2(Kc mod g1):     [126]       50f9c0d4 e3178da9 4a09fe0d 34f67b0e
-------------------------------------------------------------
L = 8
g1:                [64]        00000000 00000001 00000000 0000001b
g2:                [63]        00000000 00000000 a1ab815b c7ec8025
Kc:                            7ce149fc f4b38ad7 2a5d8a41 eb15ba31
Kc mod g1:         [63]        00000000 00000000 8660806c 1865deec
g2(Kc mod g1):     [126]       532c36d4 5d0954e0 922989b6 826f78dc
-------------------------------------------------------------
L = 9
g1:                [72]        00000000 00000100 00000000 00000609
g2:                [49]        00000000 00000000 0002c980 11d8b04d
Kc:                            5eeff7ca 84fc2782 9c051726 3df6f36e
Kc mod g1:         [71]        00000000 00000083 58ccb7d0 b95d3c71
g2(Kc mod g1):     [120]       016313f6 0d3771cf 7f8e4bb9 4aa6827d
-------------------------------------------------------------
L = 10
g1:                [80]        00000000 00010000 00000000 00000215
g2:                [42]        00000000 00000000 0000058e 24f9a4bb
Kc:                            7b13846e 88beb4de 34e7160a fd44dc65
Kc mod g1:         [79]        00000000 0000b4de 34171767 f36981c3
g2(Kc mod g1):     [121]       023bc1ec 34a0029e f798dcfb 618ba58d
-------------------------------------------------------------
L = 11
g1:                [88]        00000000 01000000 00000000 0000013b
g2:                [35]        00000000 00000000 0000000c a76024d7
Kc:                            bda6de6c 6e7d757e 8dfe2d49 9a181193
Kc mod g1:         [86]        00000000 007d757e 8dfe88aa 2fcee371
g2(Kc mod g1):     [121]       022e08a9 3aa51d8d 2f93fa78 85cc1f87
-------------------------------------------------------------
L = 12
g1:                [96]        00000001 00000000 00000000 000000dd
g2:                [28]        00000000 00000000 00000000 1c9c26b9
Kc:                            e6483b1c 2cdb1040 9a658f97 c4efd90d
Kc mod g1:         [93]        00000000 2cdb1040 9a658fd7 5b562e41
g2(Kc mod g1):     [121]       030d752b 216fe29b b880275c d7e6f6f9
-------------------------------------------------------------
L = 13
g1:                [104]       00000100 00000000 00000000 0000049d
g2:                [21]        00000000 00000000 00000000 0026d9e3
Kc:                            d79d281d a2266847 6b223c46 dc0ab9ee
Kc mod g1:         [100]       0000001d a2266847 6b223c45 e1fc5fa6
g2(Kc mod g1):     [121]       03f11138 9cebf919 00b93808 4ac158aa
-------------------------------------------------------------
```

Sample Data

```
L = 14
g1:                [112]       00010000 00000000 00000000 0000014f
g2:                [14]        00000000 00000000 00000000 00004377
Kc:                            cad9a65b 9fca1c1d a2320fcf 7c4ae48e
Kc mod g1:         [111]       0000a65b 9fca1c1d a2320fcf 7cb6a909
g2(Kc mod g1):     [125]       284840fd f1305f3c 529f5703 76adf7cf
------------------------------------------------------------
L = 15
g1:                [120]       01000000 00000000 00000000 000000e7
g2:                [7]         00000000 00000000 00000000 00000089
Kc:                            21f0cc31 049b7163 d375e9e1 06029809
Kc mod g1:         [119]       00f0cc31 049b7163 d375e9e1 0602840e
g2(Kc mod g1):     [126]       7f10b53b 6df84b94 f22e566a 3754a37e
------------------------------------------------------------
L = 16
g1:                [128]       00000001 00000000 00000000 00000000 00000000
g2:                [0]         00000000 00000000 00000000 00000001
Kc:                            35ec8fc3 d50ccd32 5f2fd907 bde206de
Kc mod g1:         [125]       35ec8fc3 d50ccd32 5f2fd907 bde206de
g2(Kc mod g1):     [125]       35ec8fc3 d50ccd32 5f2fd907 bde206de
------------------------------------------------------------
```

1.2 FIRST SET OF SAMPLE DATA

```
Initial values for the key, pan address and clock

K'c1[0]   = 00   K'c1[1]   = 00    K'c1[2]   = 00    K'c1[3]   = 00
K'c1[4]   = 00   K'c1[5]   = 00    K'c1[6]   = 00    K'c1[7]   = 00
K'c1[8]   = 00   K'c1[9]   = 00    K'c1[10]  = 00    K'c1[11]  = 00
K'c1[12]  = 00   K'c1[13]  = 00    K'c1[14]  = 00    K'c1[15]  = 00

Addr1[0] = 00   Addr1[1] = 00    Addr1[2] = 00
Addr1[3] = 00   Addr1[4] = 00    Addr1[5] = 00

CL1[0]  = 00   CL1[1]  = 00    CL1[2]  = 00    CL1[3]  = 00


================================================================================================
         Fill LFSRs with initial data
================================================================================================

  t  clk#    LFSR1    LFSR2     LFSR3      LFSR4          X1 X2 X3 X4   Z  C[t+1] C[t] C[t-1]

  0     0    0000000* 00000000* 000000000* 0000000000*     0  0  0  0    0  00     00   00
  1     1    0000000* 00000001* 000000000* 0000000001*     0  0  0  0    0  00     00   00
  2     2    0000000* 00000002* 000000000* 0000000003*     0  0  0  0    0  00     00   00
  3     3    0000000* 00000004* 000000000* 0000000007*     0  0  0  0    0  00     00   00
  4     4    0000000* 00000008* 000000000* 000000000E*     0  0  0  0    0  00     00   00
  5     5    0000000* 00000010* 000000000* 000000001C*     0  0  0  0    0  00     00   00
  6     6    0000000* 00000020* 000000000* 0000000038*     0  0  0  0    0  00     00   00
```

Sample Data

7	7	0000000*	00000040*	000000000*	0000000070*	0	0	0	0	0	00	00	00
8	8	0000000*	00000080*	000000000*	00000000E0*	0	0	0	0	0	00	00	00
9	9	0000000*	00000100*	000000000*	00000001C0*	0	0	0	0	0	00	00	00
10	10	0000000*	00000200*	000000000*	0000000380*	0	0	0	0	0	00	00	00
11	11	0000000*	00000400*	000000000*	0000000700*	0	0	0	0	0	00	00	00
12	12	0000000*	00000800*	000000000*	0000000E00*	0	0	0	0	0	00	00	00
13	13	0000000*	00001000*	000000000*	0000001C00*	0	0	0	0	0	00	00	00
14	14	0000000*	00002000*	000000000*	0000003800*	0	0	0	0	0	00	00	00
15	15	0000000*	00004000*	000000000*	0000007000*	0	0	0	0	0	00	00	00
16	16	0000000*	00008000*	000000000*	000000E000*	0	0	0	0	0	00	00	00
17	17	0000000*	00010000*	000000000*	000001C000*	0	0	0	0	0	00	00	00
18	18	0000000*	00020000*	000000000*	0000038000*	0	0	0	0	0	00	00	00
19	19	0000000*	00040000*	000000000*	0000070000*	0	0	0	0	0	00	00	00
20	20	0000000*	00080000*	000000000*	00000E0000*	0	0	0	0	0	00	00	00
21	21	0000000*	00100000*	000000000*	00001C0000*	0	0	0	0	0	00	00	00
22	22	0000000*	00200000*	000000000*	0000380000*	0	0	0	0	0	00	00	00
23	23	0000000*	00400000*	000000000*	0000700000*	0	0	0	0	0	00	00	00
24	24	0000000*	00800000*	000000000*	0000E00000*	0	1	0	0	1	00	00	00
25	25	0000000*	01000000*	000000000*	0001C00000*	0	0	0	0	0	00	00	00
26	26	0000000	02000000*	000000000*	0003800000*	0	0	0	0	0	00	00	00
27	27	0000000	04000000*	000000000*	0007000000*	0	0	0	0	0	00	00	00
28	28	0000000	08000000*	000000000*	000E000000*	0	0	0	0	0	00	00	00
29	29	0000000	10000000*	000000000*	001C000000*	0	0	0	0	0	00	00	00
30	30	0000000	20000000*	000000000*	0038000000*	0	0	0	0	0	00	00	00
31	31	0000000	40000000*	000000000*	0070000000*	0	0	0	0	0	00	00	00
32	32	0000000	00000001	000000000*	00E0000000*	0	0	0	1	1	00	00	00
33	33	0000000	00000002	000000000*	01C0000000*	0	0	0	1	1	00	00	00
34	34	0000000	00000004	000000000	0380000000*	0	0	0	1	1	00	00	00
35	35	0000000	00000008	000000000	0700000000*	0	0	0	0	0	00	00	00
36	36	0000000	00000010	000000000	0E00000000*	0	0	0	0	0	00	00	00
37	37	0000000	00000020	000000000	1C00000000*	0	0	0	0	0	00	00	00
38	38	0000000	00000040	000000000	3800000000*	0	0	0	0	0	00	00	00
39	39	0000000	00000080	000000000	7000000000*	0	0	0	0	0	00	00	00

Start clocking Summation Combiner

40	1	0000000	00000100	000000000	6000000001	0	0	0	0	0	00	00	00
41	2	0000000	00000200	000000000	4000000003	0	0	0	0	0	00	00	00
42	3	0000000	00000400	000000000	0000000007	0	0	0	0	0	00	00	00
43	4	0000000	00000800	000000000	000000000E	0	0	0	0	0	00	00	00
44	5	0000000	00001001	000000000	000000001D	0	0	0	0	0	00	00	00
45	6	0000000	00002002	000000000	000000003B	0	0	0	0	0	00	00	00
46	7	0000000	00004004	000000000	0000000077	0	0	0	0	0	00	00	00
47	8	0000000	00008008	000000000	00000000EE	0	0	0	0	0	00	00	00
48	9	0000000	00010011	000000000	00000001DD	0	0	0	0	0	00	00	00
49	10	0000000	00020022	000000000	00000003BB	0	0	0	0	0	00	00	00
50	11	0000000	00040044	000000000	0000000777	0	0	0	0	0	00	00	00
51	12	0000000	00080088	000000000	0000000EEE	0	0	0	0	0	00	00	00
52	13	0000000	00100110	000000000	0000001DDD	0	0	0	0	0	00	00	00
53	14	0000000	00200220	000000000	0000003BBB	0	0	0	0	0	00	00	00
54	15	0000000	00400440	000000000	0000007777	0	0	0	0	0	00	00	00
55	16	0000000	00800880	000000000	000000EEEE	0	1	0	0	1	00	00	00
56	17	0000000	01001100	000000000	000001DDDD	0	0	0	0	0	00	00	00
57	18	0000000	02002200	000000000	000003BBBB	0	0	0	0	0	00	00	00
58	19	0000000	04004400	000000000	0000077777	0	0	0	0	0	00	00	00
59	20	0000000	08008800	000000000	00000EEEEE	0	0	0	0	0	00	00	00
60	21	0000000	10011000	000000000	00001DDDDD	0	0	0	0	0	00	00	00

Sample Data

61	22	0000000	20022000	000000000	00003BBBBB	0	0	0	0	0	00	00	00
62	23	0000000	40044000	000000000	0000777777	0	0	0	0	0	00	00	00
63	24	0000000	00088001	000000000	0000EEEEEE	0	0	0	0	0	00	00	00
64	25	0000000	00110003	000000000	0001DDDDDD	0	0	0	0	0	00	00	00
65	26	0000000	00220006	000000000	0003BBBBBB	0	0	0	0	0	00	00	00
66	27	0000000	0044000C	000000000	0007777777	0	0	0	0	0	00	00	00
67	28	0000000	00880018	000000000	000EEEEEEE	0	1	0	0	1	00	00	00
68	29	0000000	01100031	000000000	001DDDDDDC	0	0	0	0	0	00	00	00
69	30	0000000	02200062	000000000	003BBBBBB8	0	0	0	0	0	00	00	00
70	31	0000000	044000C4	000000000	0077777770	0	0	0	0	0	00	00	00
71	32	0000000	08800188	000000000	00EEEEEEE0	0	1	0	1	0	01	00	00
72	33	0000000	11000311	000000000	01DDDDDDC1	0	0	0	1	0	00	01	00
73	34	0000000	22000622	000000000	03BBBBBB83	0	0	0	1	1	11	00	01
74	35	0000000	44000C44	000000000	0777777707	0	0	0	0	1	10	11	00
75	36	0000000	08001888	000000000	0EEEEEEE0E	0	0	0	1	1	01	10	11
76	37	0000000	10003111	000000000	1DDDDDDC1D	0	0	0	1	0	01	01	10
77	38	0000000	20006222	000000000	3BBBBBB83B	0	0	0	1	0	11	01	01
78	39	0000000	4000C444	000000000	7777777077	0	0	0	0	1	01	11	01
79	40	0000000	00018888	000000000	6EEEEEE0EF	0	0	0	1	0	10	01	11
80	41	0000000	00031110	000000000	5DDDDDC1DE	0	0	0	1	1	00	10	01
81	42	0000000	00062220	000000000	3BBBBB83BC	0	0	0	1	1	01	00	10
82	43	0000000	000C4440	000000000	7777770779	0	0	0	0	1	01	01	00
83	44	0000000	00188880	000000000	6EEEEE0EF2	0	0	0	1	0	11	01	01
84	45	0000000	00311100	000000000	5DDDDC1DE5	0	0	0	1	0	10	11	01
85	46	0000000	00622200	000000000	3BBBB83BCB	0	0	0	1	1	01	10	11
86	47	0000000	00C44400	000000000	7777707797	0	1	0	0	0	01	01	10
87	48	0000000	01888801	000000000	6EEEE0EF2F	0	1	0	1	1	11	01	01
88	49	0000000	03111003	000000000	5DDDC1DE5E	0	0	0	1	0	10	11	01
89	50	0000000	06222006	000000000	3BBB83BCBC	0	0	0	1	1	01	10	11
90	51	0000000	0C44400C	000000000	7777077979	0	0	0	0	1	00	01	10
91	52	0000000	18888018	000000000	6EEE0EF2F2	0	1	0	1	0	10	00	01
92	53	0000000	31110030	000000000	5DDC1DE5E5	0	0	0	1	1	11	10	00
93	54	0000000	62220060	000000000	3BB83BCBCB	0	0	0	1	0	00	11	10
94	55	0000000	444400C1	000000000	7770779797	0	0	0	0	0	10	00	11
95	56	0000000	08880183	000000000	6EE0EF2F2F	0	1	0	1	0	00	10	00
96	57	0000000	11100307	000000000	5DC1DE5E5F	0	0	0	1	1	01	00	10
97	58	0000000	2220060E	000000000	3B83BCBCBF	0	0	0	1	0	00	01	00
98	59	0000000	44400C1C	000000000	770779797E	0	0	0	0	0	11	00	01
99	60	0000000	08801838	000000000	6E0EF2F2FC	0	1	0	0	0	01	11	00
100	61	0000000	11003070	000000000	5C1DE5E5F8	0	0	0	0	1	11	01	11
101	62	0000000	220060E0	000000000	383BCBCBF0	0	0	0	0	1	01	11	01
102	63	0000000	4400C1C0	000000000	70779797E0	0	0	0	0	1	11	01	11
103	64	0000000	08018380	000000000	60EF2F2FC1	0	0	0	1	0	10	11	01
104	65	0000000	10030701	000000000	41DE5E5F83	0	0	0	1	1	01	10	11
105	66	0000000	20060E02	000000000	03BCBCBF04	0	0	0	1	0	01	01	10
106	67	0000000	400C1C05	000000000	0779797E09	0	0	0	0	1	10	01	01
107	68	0000000	0018380A	000000000	0EF2F2FC12	0	0	0	1	1	00	10	01
108	69	0000000	00307015	000000000	1DE5E5F825	0	0	0	1	1	01	00	10
109	70	0000000	0060E02A	000000000	3BCBCBF04B	0	0	0	1	0	00	01	00
110	71	0000000	00C1C055	000000000	779797E097	0	1	0	1	0	10	00	01
111	72	0000000	018380AA	000000000	6F2F2FC12F	0	1	0	0	1	11	10	00
112	73	0000000	03070154	000000000	5E5E5F825E	0	0	0	0	1	11	11	10
113	74	0000000	060E02A8	000000000	3CBCBF04BC	0	0	0	1	0	11	11	11
114	75	0000000	0C1C0550	000000000	79797E0979	0	0	0	0	1	00	11	11
115	76	0000000	18380AA0	000000000	72F2FC12F2	0	0	0	1	1	10	00	11
116	77	0000000	30701541	000000000	65E5F825E5	0	0	0	1	1	11	10	00
117	78	0000000	60E02A82	000000000	4BCBF04BCB	0	1	0	1	1	00	11	10

Sample Data

118	79	0000000	41C05505	000000000	1797E09796	0	1	0	1	0	11	00	11
119	80	0000000	0380AA0A	000000000	2F2FC12F2C	0	1	0	0	0	01	11	00
120	81	0000000	07015415	000000000	5E5F825E59	0	0	0	0	1	11	01	11
121	82	0000000	0E02A82A	000000000	3CBF04BCB2	0	0	0	1	0	10	11	01
122	83	0000000	1C055054	000000000	797E097964	0	0	0	0	0	01	10	11
123	84	0000000	380AA0A8	000000000	72FC12F2C9	0	0	0	1	0	01	01	10
124	85	0000000	70154151	000000000	65F825E593	0	0	0	1	0	11	01	01
125	86	0000000	602A82A3	000000000	4BF04BCB26	0	0	0	1	0	10	11	01
126	87	0000000	40550546	000000000	17E097964C	0	0	0	1	1	01	10	11
127	88	0000000	00AA0A8D	000000000	2FC12F2C99	0	1	0	1	1	01	01	10
128	89	0000000	0154151A	000000000	5F825E5932	0	0	0	1	0	11	01	01
129	90	0000000	02A82A34	000000000	3F04BCB264	0	1	0	0	0	10	11	01
130	91	0000000	05505468	000000000	7E097964C9	0	0	0	0	0	01	10	11
131	92	0000000	0AA0A8D0	000000000	7C12F2C992	0	1	0	0	0	01	01	10
132	93	0000000	154151A1	000000000	7825E59324	0	0	0	0	1	10	01	01
133	94	0000000	2A82A342	000000000	704BCB2648	0	1	0	0	1	00	10	01
134	95	0000000	55054684	000000000	6097964C91	0	0	0	1	1	01	00	10
135	96	0000000	2A0A8D09	000000000	412F2C9923	0	0	0	0	1	01	01	00
136	97	0000000	54151A12	000000000	025E593246	0	0	0	0	1	10	01	01
137	98	0000000	282A3424	000000000	04BCB2648D	0	0	0	1	1	00	10	01
138	99	0000000	50546848	000000000	097964C91A	0	0	0	0	0	01	00	10
139	100	0000000	20A8D090	000000000	12F2C99235	0	1	0	1	1	00	01	00
140	101	0000000	4151A120	000000000	25E593246A	0	0	0	1	1	11	00	01
141	102	0000000	02A34240	000000000	4BCB2648D5	0	1	0	1	1	01	11	00
142	103	0000000	05468481	000000000	17964C91AB	0	0	0	1	0	10	01	11
143	104	0000000	0A8D0903	000000000	2F2C992357	0	1	0	0	1	00	10	01
144	105	0000000	151A1206	000000000	5E593246AE	0	0	0	0	0	01	00	10
145	106	0000000	2A34240C	000000000	3CB2648D5C	0	0	0	1	0	00	01	00
146	107	0000000	54684818	000000000	7964C91AB8	0	0	0	0	0	11	00	01
147	108	0000000	28D09030	000000000	72C9923571	0	1	0	1	1	01	11	00
148	109	0000000	51A12060	000000000	6593246AE2	0	1	0	1	1	10	01	11
149	110	0000000	234240C0	000000000	4B2648D5C5	0	0	0	0	0	00	10	01
150	111	0000000	46848180	000000000	164C91AB8A	0	1	0	0	1	01	00	10
151	112	0000000	0D090301	000000000	2C99235714	0	0	0	1	0	00	01	00
152	113	0000000	1A120602	000000000	593246AE28	0	0	0	0	0	11	00	01
153	114	0000000	34240C04	000000000	32648D5C51	0	0	0	0	1	10	11	00
154	115	0000000	68481809	000000000	64C91AB8A2	0	0	0	1	1	01	10	11
155	116	0000000	50903012	000000000	4992357144	0	1	0	1	1	01	01	10
156	117	0000000	21206024	000000000	13246AE288	0	0	0	0	1	10	01	01
157	118	0000000	4240C048	000000000	2648D5C511	0	0	0	0	0	00	10	01
158	119	0000000	04818090	000000000	4C91AB8A23	0	1	0	1	0	00	00	10
159	120	0000000	09030120	000000000	1923571446	0	0	0	0	0	00	00	00
160	121	0000000	12060240	000000000	3246AE288D	0	0	0	0	0	00	00	00
161	122	0000000	240C0480	000000000	648D5C511B	0	0	0	1	1	00	00	00
162	123	0000000	48180900	000000000	491AB8A237	0	0	0	0	0	00	00	00
163	124	0000000	10301200	000000000	123571446F	0	0	0	0	0	00	00	00
164	125	0000000	20602400	000000000	246AE288DF	0	0	0	0	0	00	00	00
165	126	0000000	40C04800	000000000	48D5C511BE	0	1	0	1	0	01	00	00
166	127	0000000	01809001	000000000	11AB8A237D	0	1	0	1	1	00	01	00
167	128	0000000	03012002	000000000	23571446FA	0	0	0	0	0	11	00	01
168	129	0000000	06024004	000000000	46AE288DF5	0	0	0	1	0	01	11	00
169	130	0000000	0C048008	000000000	0D5C511BEA	0	0	0	0	1	11	01	11
170	131	0000000	18090011	000000000	1AB8A237D5	0	0	0	1	0	10	11	01
171	132	0000000	30120022	000000000	3571446FAA	0	0	0	0	0	01	10	11
172	133	0000000	60240044	000000000	6AE288DF55	0	0	0	1	0	01	01	10
173	134	0000000	40480089	000000000	55C511BEAA	0	0	0	1	0	11	01	01
174	135	0000000	00900113	000000000	2B8A237D54	0	1	0	1	1	10	11	01

Sample Data

175	136	0000000	01200227	000000000	571446FAA8	0	0	0	0	0	01	10	11
176	137	0000000	0240044E	000000000	2E288DF550	0	0	0	0	1	00	01	10
177	138	0000000	0480089C	000000000	5C511BEAA0	0	1	0	0	1	11	00	01
178	139	0000000	09001138	000000000	38A237D540	0	0	0	1	0	01	11	00
179	140	0000000	12002270	000000000	71446FAA81	0	0	0	0	1	11	01	11
180	141	0000000	240044E0	000000000	6288DF5503	0	0	0	1	0	10	11	01
181	142	0000000	480089C0	000000000	4511BEAA06	0	0	0	0	0	01	10	11
182	143	0000000	10011381	000000000	0A237D540D	0	0	0	0	1	00	01	10
183	144	0000000	20022702	000000000	1446FAA81A	0	0	0	0	0	11	00	01
184	145	0000000	40044E04	000000000	288DF55035	0	0	0	1	0	01	11	00
185	146	0000000	00089C08	000000000	511BEAA06A	0	0	0	0	1	11	01	11
186	147	0000000	00113810	000000000	2237D540D5	0	0	0	0	1	01	11	01
187	148	0000000	00227021	000000000	446FAA81AA	0	0	0	0	1	11	01	11
188	149	0000000	0044E042	000000000	08DF550355	0	0	0	1	0	10	11	01
189	150	0000000	0089C085	000000000	11BEAA06AA	0	1	0	1	0	10	10	11
190	151	0000000	0113810A	000000000	237D540D54	0	0	0	0	0	10	10	10
191	152	0000000	02270215	000000000	46FAA81AA9	0	0	0	1	1	10	10	10
192	153	0000000	044E042A	000000000	0DF5503553	0	0	0	1	1	10	10	10
193	154	0000000	089C0854	000000000	1BEAA06AA7	0	1	0	1	0	01	10	10
194	155	0000000	113810A8	000000000	37D540D54E	0	0	0	1	0	01	01	10
195	156	0000000	22702150	000000000	6FAA81AA9D	0	0	0	1	0	11	01	01
196	157	0000000	44E042A0	000000000	5F5503553A	0	1	0	0	0	10	11	01
197	158	0000000	09C08540	000000000	3EAA06AA75	0	1	0	1	0	10	10	11
198	159	0000000	13810A80	000000000	7D540D54EA	0	1	0	0	1	10	10	10
199	160	0000000	27021500	000000000	7AA81AA9D5	0	0	0	1	1	10	10	10
200	161	0000000	4E042A00	000000000	75503553AB	0	0	0	0	0	10	10	10
201	162	0000000	1C085400	000000000	6AA06AA756	0	0	0	1	1	10	10	10
202	163	0000000	3810A800	000000000	5540D54EAC	0	0	0	0	0	10	10	10
203	164	0000000	70215000	000000000	2A81AA9D58	0	0	0	1	1	10	10	10
204	165	0000000	6042A001	000000000	5503553AB0	0	0	0	0	0	10	10	10
205	166	0000000	40854002	000000000	2A06AA7561	0	1	0	0	1	10	10	10
206	167	0000000	010A8004	000000000	540D54EAC3	0	0	0	0	0	10	10	10
207	168	0000000	02150009	000000000	281AA9D586	0	0	0	0	0	10	10	10
208	169	0000000	042A0012	000000000	503553AB0C	0	0	0	0	0	10	10	10
209	170	0000000	08540024	000000000	206AA75618	0	0	0	0	0	10	10	10
210	171	0000000	10A80048	000000000	40D54EAC30	0	1	0	1	0	01	10	10
211	172	0000000	21500091	000000000	01AA9D5861	0	0	0	1	0	01	01	10
212	173	0000000	42A00122	000000000	03553AB0C3	0	1	0	0	0	11	01	01
213	174	0000000	05400244	000000000	06AA756186	0	0	0	1	0	10	11	01
214	175	0000000	0A800488	000000000	0D54EAC30D	0	1	0	0	1	01	10	11
215	176	0000000	15000911	000000000	1AA9D5861A	0	0	0	1	0	01	01	10
216	177	0000000	2A001223	000000000	3553AB0C35	0	0	0	0	1	10	01	01
217	178	0000000	54002446	000000000	6AA756186A	0	0	0	1	1	00	10	01
218	179	0000000	2800488D	000000000	554EAC30D5	0	0	0	0	0	01	00	10
219	180	0000000	5000911B	000000000	2A9D5861AA	0	0	0	1	0	00	01	00
220	181	0000000	20012236	000000000	553AB0C355	0	0	0	0	0	11	00	01
221	182	0000000	4002446C	000000000	2A756186AA	0	0	0	0	1	10	11	00
222	183	0000000	000488D9	000000000	54EAC30D54	0	0	0	1	1	01	10	11
223	184	0000000	000911B2	000000000	29D5861AA8	0	0	0	1	0	01	01	10
224	185	0000000	00122364	000000000	53AB0C3550	0	0	0	1	0	11	01	01
225	186	0000000	002446C8	000000000	2756186AA0	0	0	0	0	1	01	11	01
226	187	0000000	00488D90	000000000	4EAC30D540	0	0	0	1	0	10	01	11
227	188	0000000	00911B20	000000000	1D5861AA81	0	1	0	0	1	00	10	01
228	189	0000000	01223640	000000000	3AB0C35502	0	0	0	1	1	01	00	10
229	190	0000000	02446C80	000000000	756186AA05	0	0	0	0	1	01	01	00
230	191	0000000	0488D901	000000000	6AC30D540B	0	1	0	1	1	11	01	01
231	192	0000000	0911B203	000000000	55861AA817	0	0	0	1	0	10	11	01

Sample Data



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232   193    0000000  12236407  000000000  2B0C35502F      0  0  0  0    0  01     10   11
233   194    0000000  2446C80E  000000000  56186AA05F      0  0  0  0    1  00     01   10
234   195    0000000  488D901C  000000000  2C30D540BF      0  1  0  0    1  11     00   01
235   196    0000000  111B2039  000000000  5861AA817E      0  0  0  0    1  10     11   00
236   197    0000000  22364072  000000000  30C35502FD      0  0  0  1    1  01     10   11
237   198    0000000  446C80E4  000000000  6186AA05FB      0  0  0  1    0  01     01   10
238   199    0000000  08D901C8  000000000  430D540BF6      0  1  0  0    0  11     01   01
239   200    0000000  11B20391  000000000  061AA817EC      0  1  0  0    0  10     11   01

Z[0]  = 3D
Z[1]  = C1
Z[2]  = F0
Z[3]  = BB
Z[4]  = 58
Z[5]  = 1E
Z[6]  = 42
Z[7]  = 42
Z[8]  = 4B
Z[9]  = 8E
Z[10] = C1
Z[11] = 2A
Z[12] = 40
Z[13] = 63
Z[14] = 7A
Z[15] = 1E

================================================================================================
        Reload this pattern into the LFSRs
        Hold content of Summation Combiner regs and calculate new C[t+1] and Z values
================================================================================================
LFSR1  <= 04B583D
LFSR2  <= 208E1EC1
LFSR3  <= 063C142F0
LFSR4  <= 0F7A2A42BB
C[t+1] <= 10

================================================================================================
        Generating 125 key symbols (encryption/decryption sequence)
================================================================================================
240     1    04B583D  208E1EC1  063C142F0  0F7A2A42BB      0  1  0  0    0  10     11   01
241     2    096B07A  411C3D82  0C78285E1  1EF4548577      1  0  1  1    1  10     10   11
242     3    12D60F4  02387B04  18F050BC3  3DE8A90AEF      0  0  1  1    0  01     10   10
243     4    05AC1E9  0470F609  11E0A1786  7BD15215DF      0  0  0  1    0  01     01   10
244     5    0B583D2  08E1EC13  03C142F0C  77A2A42BBF      1  1  0  1    0  00     01   01
245     6    16B07A5  11C3D827  078285E18  6F4548577E      0  1  0  0    1  11     00   01
246     7    0D60F4B  2387B04F  0F050BC30  5E8A90AEFD      1  1  1  1    1  00     11   00
247     8    1AC1E97  470F609E  1E0A17860  3D15215DFA      1  0  1  0    0  11     00   11
248     9    1583D2E  0E1EC13D  1C142F0C0  7A2A42BBF4      0  0  1  0    0  01     11   00
249    10    0B07A5D  1C3D827B  18285E181  74548577E9      1  0  1  0    1  10     01   11
250    11    160F4BB  387B04F7  1050BC302  68A90AEFD2      0  0  0  1    1  00     10   01
251    12    0C1E976  70F609EE  00A178605  515215DFA5      1  1  0  0    0  00     00   10
252    13    183D2ED  61EC13DD  0142F0C0B  22A42BBF4B      1  1  0  1    1  01     00   00
253    14    107A5DA  43D827BA  0285E1817  4548577E97      0  1  0  0    0  00     01   00
254    15    00F4BB4  07B04F74  050BC302F  0A90AEFD2E      0  1  0  1    0  10     00   01
255    16    01E9769  0F609EE8  0A178605E  15215DFA5C      0  0  1  0    1  11     10   00
256    17    03D2ED3  1EC13DD0  142F0C0BD  2A42BBF4B9      0  1  0  0    0  00     11   10
257    18    07A5DA7  3D827BA0  085E1817B  548577E972      0  1  1  1    1  11     00   11
```

Sample Data

258	19	0F4BB4F	7B04F740	10BC302F6	290AEFD2E5	1	0	0	0	0	01	11	00
259	20	1E9769F	7609EE80	0178605ED	5215DFA5CA	1	0	0	0	0	10	01	11
260	21	1D2ED3F	6C13DD01	02F0C0BDA	242BBF4B94	1	0	0	0	1	00	10	01
261	22	1A5DA7E	5827BA03	05E1817B4	48577E9729	1	0	0	0	1	01	00	10
262	23	14BB4FC	304F7407	0BC302F69	10AEFD2E53	0	0	1	1	1	00	01	00
263	24	09769F9	609EE80E	178605ED2	215DFA5CA7	1	1	0	0	0	10	00	01
264	25	12ED3F2	413DD01C	0F0C0BDA4	42BBF4B94F	0	0	1	1	0	00	10	00
265	26	05DA7E5	027BA038	1E1817B49	0577E9729F	0	0	1	0	1	01	00	10
266	27	0BB4FCA	04F74071	1C302F693	0AEFD2E53F	1	1	1	1	1	11	01	00
267	28	1769F95	09EE80E3	18605ED27	15DFA5CA7F	0	1	1	1	0	11	11	01
268	29	0ED3F2B	13DD01C6	10C0BDA4F	2BBF4B94FE	1	1	0	1	0	10	11	11
269	30	1DA7E56	27BA038D	01817B49F	577E9729FD	1	1	0	0	0	10	10	11
270	31	1B4FCAD	4F74071B	0302F693E	2EFD2E53FB	1	0	0	1	0	01	10	10
271	32	169F95B	1EE80E37	0605ED27D	5DFA5CA7F7	0	1	0	1	1	01	01	10
272	33	0D3F2B7	3DD01C6E	0C0BDA4FB	3BF4B94FEF	1	1	1	1	1	00	01	01
273	34	1A7E56F	7BA038DC	1817B49F6	77E9729FDE	1	1	1	1	0	01	00	01
274	35	14FCADF	774071B9	102F693ED	6FD2E53FBD	0	0	0	1	0	00	01	00
275	36	09F95BE	6E80E373	005ED27DB	5FA5CA7F7B	1	1	0	1	1	10	00	01
276	37	13F2B7C	5D01C6E7	00BDA4FB6	3F4B94FEF7	0	0	0	0	0	11	10	00
277	38	07E56F9	3A038DCE	017B49F6C	7E9729FDEE	0	0	0	1	0	00	11	10
278	39	0FCADF2	74071B9C	02F693ED8	7D2E53FBDD	1	0	0	0	1	10	00	11
279	40	1F95BE5	680E3738	05ED27DB0	7A5CA7F7BA	1	0	0	0	1	11	10	00
280	41	1F2B7CA	501C6E71	0BDA4FB60	74B94FEF74	1	0	1	1	0	01	11	10
281	42	1E56F94	2038DCE2	17B49F6C0	69729FDEE8	1	0	0	0	0	10	01	11
282	43	1CADF29	4071B9C4	0F693ED80	52E53FBDD1	1	0	1	1	1	11	10	01
283	44	195BE53	00E37389	1ED27DB01	25CA7F7BA3	1	1	1	1	1	01	11	10
284	45	12B7CA6	01C6E713	1DA4FB602	4B94FEF747	0	1	1	1	0	01	01	11
285	46	056F94C	038DCE26	1B49F6C04	1729FDEE8E	0	1	1	0	1	11	01	01
286	47	0ADF299	071B9C4D	1693ED808	2E53FBDD1C	1	0	0	0	0	10	11	01
287	48	15BE532	0E37389A	0D27DB011	5CA7F7BA38	0	0	1	1	0	10	10	11
288	49	0B7CA64	1C6E7135	1A4FB6022	394FEF7471	1	0	1	0	0	01	10	10
289	50	16F94C9	38DCE26A	149F6C044	729FDEE8E2	0	1	0	1	1	01	01	10
290	51	0DF2993	71B9C4D4	093ED8089	653FBDD1C4	1	1	1	0	0	00	01	01
291	52	1BE5327	637389A9	127DB0112	4A7F7BA388	1	0	0	0	1	11	00	01
292	53	17CA64E	46E71353	04FB60224	14FEF74710	0	1	0	1	1	01	11	00
293	54	0F94C9C	0DCE26A6	09F6C0448	29FDEE8E21	1	1	1	1	1	01	01	11
294	55	1F29939	1B9C4D4D	13ED80890	53FBDD1C42	1	1	0	1	0	00	01	01
295	56	1B53272	37389A9A	07DB01121	27F7BA3884	1	0	0	1	0	10	00	01
296	57	1CA64E5	6E713534	0FB602242	4FEF747108	1	0	1	1	1	00	10	00
297	58	194C9CB	5CE26A69	1F6C04485	1FDEE8E210	1	1	1	1	0	11	00	10
298	59	1299397	39C4D4D3	1ED80890A	3FBDD1C420	0	1	1	1	0	00	11	00
299	60	053272F	7389A9A6	1DB011214	7F7BA38840	0	1	1	0	0	11	00	11
300	61	0A64E5E	6713534C	1B6022428	7EF7471081	1	0	1	1	0	00	11	00
301	62	14C9CBD	4E26A699	16C044850	7DEE8E2102	0	0	0	1	1	10	00	11
302	63	099397A	1C4D4D32	0D80890A0	7BDD1C4205	1	0	1	1	1	00	10	00
303	64	13272F4	389A9A65	1B0112141	77BA38840B	0	1	1	1	1	00	00	10
304	65	064E5E8	713534CB	160224283	6F74710817	0	0	0	0	0	00	00	00
305	66	0C9CBD1	626A6997	0C0448507	5EE8E2102E	1	0	1	1	1	01	00	00
306	67	19397A3	44D4D32E	180890A0E	3DD1C4205C	1	1	1	1	1	11	01	00
307	68	1272F46	09A9A65D	10112141D	7BA38840B8	0	1	0	1	1	10	11	01
308	69	04E5E8C	13534CBA	00224283A	7747108171	0	0	0	0	0	01	10	11
309	70	09CBD19	26A69975	004485075	6E8E2102E3	1	1	0	1	0	10	01	10
310	71	1397A32	4D4D32EB	00890A0EA	5D1C4205C7	0	0	0	0	0	00	10	01
311	72	072F465	1A9A65D7	0112141D5	3A38840B8F	0	1	0	0	1	01	00	10
312	73	0E5E8CA	3534CBAF	0224283AA	747108171F	1	0	0	0	0	00	01	00
313	74	1CBD194	6A69975E	044850755	68E2102E3E	1	0	0	1	0	10	00	01
314	75	197A329	54D32EBC	0890A0EAB	51C4205C7D	1	1	1	1	0	01	10	00

Sample Data

315	76	12F4653	29A65D79	112141D56	238840B8FA	0	1	0	1	1	01	01	10
316	77	05E8CA6	534CBAF2	024283AAD	47108171F4	0	0	0	0	1	10	01	01
317	78	0BD194D	269975E5	04850755B	0E2102E3E9	1	1	0	0	0	11	10	01
318	79	17A329A	4D32EBCB	090A0EAB6	1C4205C7D2	0	0	1	0	0	00	11	10
319	80	0F46535	1A65D797	12141D56D	38840B8FA5	1	0	0	1	0	11	00	11
320	81	1E8CA6A	34CBAF2F	04283AADA	7108171F4B	1	1	0	0	1	01	11	00
321	82	1D194D5	69975E5F	0850755B4	62102E3E97	1	1	1	0	0	01	01	11
322	83	1A329AA	532EBCBF	10A0EAB68	44205C7D2F	1	0	0	0	0	11	01	01
323	84	1465355	265D797F	0141D56D1	0840B8FA5E	0	0	0	0	1	01	11	01
324	85	08CA6AB	4CBAF2FF	0283AADA2	108171F4BC	1	1	0	1	0	01	01	11
325	86	1194D56	1975E5FF	050755B45	2102E3E979	0	0	0	0	1	10	01	01
326	87	0329AAD	32EBCBFF	0A0EAB68A	4205C7D2F3	0	1	1	0	0	11	10	01
327	88	065355A	65D797FF	141D56D14	040B8FA5E7	0	1	0	0	0	00	11	10
328	89	0CA6AB4	4BAF2FFF	083AADA28	08171F4BCF	1	1	1	0	1	11	00	11
329	90	194D569	175E5FFF	10755B450	102E3E979E	1	0	0	0	0	01	11	00
330	91	129AAD3	2EBCBFFF	00EAB68A1	205C7D2F3C	0	1	0	0	0	10	01	11
331	92	05355A6	5D797FFF	01D56D142	40B8FA5E78	0	0	0	1	1	00	10	01
332	93	0A6AB4D	3AF2FFFE	03AADA285	0171F4BCF1	1	1	0	0	0	00	00	10
333	94	14D569B	75E5FFFD	0755B450A	02E3E979E2	0	1	0	1	0	01	00	00
334	95	09AAD37	6BCBFFFA	0EAB68A15	05C7D2F3C4	1	1	1	1	1	11	01	00
335	96	1355A6E	5797FFF4	1D56D142A	0B8FA5E788	0	1	1	1	0	11	11	01
336	97	06AB4DC	2F2FFFE8	1AADA2854	171F4BCF11	0	0	1	0	0	11	11	11
337	98	0D569B8	5E5FFFD0	155B450A9	2E3E979E23	1	0	0	0	0	11	11	11
338	99	1AAD370	3CBFFFA1	0AB68A153	5C7D2F3C46	1	1	1	0	0	10	11	11
339	100	155A6E0	797FFF43	156D142A7	38FA5E788D	0	0	0	1	1	01	10	11
340	101	0AB4DC0	72FFFE87	0ADA2854E	71F4BCF11B	1	1	1	1	1	10	01	10
341	102	1569B81	65FFFD0E	15B450A9D	63E979E236	0	1	0	1	0	11	10	01
342	103	0AD3703	4BFFFA1C	0B68A153B	47D2F3C46C	1	1	1	1	1	01	11	10
343	104	15A6E07	17FFF438	16D142A76	0FA5E788D8	0	1	0	1	1	10	01	11
344	105	0B4DC0F	2FFFE870	0DA2854EC	1F4BCF11B0	1	1	1	0	1	11	10	01
345	106	169B81F	5FFFD0E1	1B450A9D8	3E979E2360	0	1	1	1	0	01	11	10
346	107	0D3703F	3FFFA1C3	168A153B0	7D2F3C46C1	1	1	0	0	1	10	01	11
347	108	1A6E07E	7FFF4386	0D142A761	7A5E788D83	1	1	1	0	1	11	10	01
348	109	14DC0FD	7FFE870C	1A2854EC2	74BCF11B07	0	1	1	1	0	01	11	10
349	110	09B81FB	7FFD0E19	1450A9D84	6979E2360E	1	1	0	0	1	10	01	11
350	111	13703F6	7FFA1C33	08A153B09	52F3C46C1C	0	1	1	1	1	11	10	01
351	112	06E07EC	7FF43867	1142A7612	25E788D838	0	1	0	1	1	00	11	10
352	113	0DC0FD8	7FE870CF	02854EC25	4BCF11B071	1	1	0	1	1	11	00	11
353	114	1B81FB1	7FD0E19E	050A9D84B	179E2360E3	1	1	0	1	0	00	11	00
354	115	1703F62	7FA1C33D	0A153B096	2F3C46C1C7	0	1	1	0	0	11	00	11
355	116	0E07EC4	7F43867B	142A7612C	5E788D838E	1	0	0	0	0	01	11	00
356	117	1C0FD88	7E870CF6	0854EC259	3CF11B071C	1	1	1	1	1	01	01	11
357	118	181FB11	7D0E19ED	10A9D84B3	79E2360E38	1	0	0	1	1	11	01	01
358	119	103F622	7A1C33DA	0153B0967	73C46C1C71	0	0	0	1	0	10	11	01
359	120	007EC45	743867B5	02A7612CE	6788D838E3	0	0	0	1	1	01	10	11
360	121	00FD88B	6870CF6B	054EC259C	4F11B071C6	0	0	0	0	1	00	01	10
361	122	01FB117	50E19ED7	0A9D84B38	1E2360E38C	0	1	1	0	0	10	00	01
362	123	03F622F	21C33DAE	153B09671	3C46C1C718	0	1	0	0	1	11	10	00
363	124	07EC45F	43867B5C	0A7612CE2	788D838E30	0	1	1	1	0	01	11	10
364	125	0FD88BF	070CF6B9	14EC259C4	711B071C61	1	0	0	0	0	10	01	11

1.3 SECOND SET OF SAMPLE DATA

```
Initial values for the key, BD_ADDR and clock

K'c2[0]   = 00   K'c2[1]   = 00    K'c2[2]   = 00    K'c2[3]  = 00
K'c2[4]   = 00   K'c2[5]   = 00    K'c2[6]   = 00    K'c2[7]  = 00
K'c2[8]   = 00   K'c2[9]   = 00    K'c2[10]  = 00    K'c2[11] = 00
K'c2[12]  = 00   K'c2[13]  = 00    K'c2[14]  = 00    K'c2[15] = 00

Addr2[0] = 00   Addr2[1] = 00    Addr2[2] = 00
Addr2[3] = 00   Addr2[4] = 00    Addr2[5] = 00

CL2[0]  = 00   CL2[1]  = 00    CL2[2]  = 00    CL2[3]  = 03


================================================================================================
         Fill LFSRs with initial data
================================================================================================

  t  clk#    LFSR1    LFSR2     LFSR3      LFSR4          X1 X2 X3 X4   Z  C[t+1] C[t] C[t-1]

  0     0    0000000* 00000000* 000000000* 0000000000*    0  0  0  0    0  00     00   00
  1     1    0000001* 00000001* 000000001* 0000000001*    0  0  0  0    0  00     00   00
  2     2    0000002* 00000002* 000000002* 0000000003*    0  0  0  0    0  00     00   00
  3     3    0000004* 00000004* 000000004* 0000000007*    0  0  0  0    0  00     00   00
  4     4    0000008* 00000008* 000000008* 000000000E*    0  0  0  0    0  00     00   00
  5     5    0000010* 00000010* 000000010* 000000001C*    0  0  0  0    0  00     00   00
  6     6    0000020* 00000020* 000000020* 0000000038*    0  0  0  0    0  00     00   00
  7     7    0000040* 00000040* 000000040* 0000000070*    0  0  0  0    0  00     00   00
  8     8    0000080* 00000080* 000000080* 00000000E0*    0  0  0  0    0  00     00   00
  9     9    0000100* 00000100* 000000100* 00000001C0*    0  0  0  0    0  00     00   00
 10    10    0000200* 00000200* 000000200* 0000000380*    0  0  0  0    0  00     00   00
 11    11    0000400* 00000400* 000000400* 0000000700*    0  0  0  0    0  00     00   00
 12    12    0000800* 00000800* 000000800* 0000000E00*    0  0  0  0    0  00     00   00
 13    13    0001000* 00001000* 000001000* 0000001C00*    0  0  0  0    0  00     00   00
 14    14    0002000* 00002000* 000002000* 0000003800*    0  0  0  0    0  00     00   00
 15    15    0004000* 00004000* 000004000* 0000007000*    0  0  0  0    0  00     00   00
 16    16    0008000* 00008000* 000008000* 000000E000*    0  0  0  0    0  00     00   00
 17    17    0010000* 00010000* 000010000* 000001C000*    0  0  0  0    0  00     00   00
 18    18    0020000* 00020000* 000020000* 0000038000*    0  0  0  0    0  00     00   00
 19    19    0040000* 00040000* 000040000* 0000070000*    0  0  0  0    0  00     00   00
 20    20    0080000* 00080000* 000080000* 00000E0000*    0  0  0  0    0  00     00   00
 21    21    0100000* 00100000* 000100000* 00001C0000*    0  0  0  0    0  00     00   00
 22    22    0200000* 00200000* 000200000* 0000380000*    0  0  0  0    0  00     00   00
 23    23    0400000* 00400000* 000400000* 0000700000*    0  0  0  0    0  00     00   00
 24    24    0800000* 00800000* 000800000* 0000E00000*    1  1  0  0    0  01     00   00
 25    25    1000000* 01000000* 001000000* 0001C00000*    0  0  0  0    0  00     00   00
 26    26    0000001  02000000* 002000000* 0003800000*    0  0  0  0    0  00     00   00
 27    27    0000002  04000000* 004000000* 0007000000*    0  0  0  0    0  00     00   00
 28    28    0000004  08000000* 008000000* 000E000000*    0  0  0  0    0  00     00   00
 29    29    0000008  10000000* 010000000* 001C000000*    0  0  0  0    0  00     00   00
 30    30    0000010  20000000* 020000000* 0038000000*    0  0  0  0    0  00     00   00
 31    31    0000020  40000000* 040000000* 0070000000*    0  0  0  0    0  00     00   00
 32    32    0000040  00000001  080000000* 00E0000000*    0  0  1  1    0  01     00   00
 33    33    0000080  00000002  100000000* 01C0000000*    0  0  0  1    1  00     00   00
 34    34    0000101  00000004  000000001  0380000000*    0  0  0  1    1  00     00   00
```

Sample Data

35	35	0000202	00000008	000000002	0700000000*	0	0	0	0	0	00	00	00
36	36	0000404	00000010	000000004	0E00000000*	0	0	0	0	0	00	00	00
37	37	0000808	00000020	000000008	1C00000000*	0	0	0	0	0	00	00	00
38	38	0001011	00000040	000000011	3800000000*	0	0	0	0	0	00	00	00
39	39	0002022	00000080	000000022	7000000000*	0	0	0	0	0	00	00	00

Start clocking Summation Combiner

40	1	0004044	00000100	000000044	6000000001	0	0	0	0	0	00	00	00
41	2	0008088	00000200	000000088	4000000003	0	0	0	0	0	00	00	00
42	3	0010111	00000400	000000111	0000000007	0	0	0	0	0	00	00	00
43	4	0020222	00000800	000000222	000000000E	0	0	0	0	0	00	00	00
44	5	0040444	00001001	000000444	000000001D	0	0	0	0	0	00	00	00
45	6	0080888	00002002	000000888	000000003B	0	0	0	0	0	00	00	00
46	7	0101111	00004004	000001111	0000000077	0	0	0	0	0	00	00	00
47	8	0202222	00008008	000002222	00000000EE	0	0	0	0	0	00	00	00
48	9	0404444	00010011	000004444	00000001DD	0	0	0	0	0	00	00	00
49	10	0808888	00020022	000008888	00000003BB	1	0	0	0	1	00	00	00
50	11	1011110	00040044	000011111	0000000777	0	0	0	0	0	00	00	00
51	12	0022221	00080088	000022222	0000000EEE	0	0	0	0	0	00	00	00
52	13	0044442	00100110	000044444	0000001DDD	0	0	0	0	0	00	00	00
53	14	0088884	00200220	000088888	0000003BBB	0	0	0	0	0	00	00	00
54	15	0111109	00400440	000111111	0000007777	0	0	0	0	0	00	00	00
55	16	0222212	00800880	000222222	000000EEEE	0	1	0	0	1	00	00	00
56	17	0444424	01001100	000444444	000001DDDD	0	0	0	0	0	00	00	00
57	18	0888848	02002200	000888888	000003BBBB	1	0	0	0	1	00	00	00
58	19	1111090	04004400	001111110	0000077777	0	0	0	0	0	00	00	00
59	20	0222120	08008800	002222220	00000EEEEE	0	0	0	0	0	00	00	00
60	21	0444240	10011000	004444440	00001DDDDD	0	0	0	0	0	00	00	00
61	22	0888480	20022000	008888880	00003BBBBB	1	0	0	0	1	00	00	00
62	23	1110900	40044000	011111100	0000777777	0	0	0	0	0	00	00	00
63	24	0221200	00088001	022222200	0000EEEEEE	0	0	0	0	0	00	00	00
64	25	0442400	00110003	044444400	0001DDDDDD	0	0	0	0	0	00	00	00
65	26	0884800	00220006	088888800	0003BBBBBB	1	0	1	0	0	01	00	00
66	27	1109000	0044000C	111111000	0007777777	0	0	0	0	1	01	01	00
67	28	0212001	00880018	022222001	000EEEEEEE	0	1	0	0	0	11	01	01
68	29	0424002	01100031	044444002	001DDDDDDC	0	0	0	0	1	01	11	01
69	30	0848004	02200062	088888004	003BBBBBB8	1	0	1	0	1	10	01	11
70	31	1090008	044000C4	111110008	0077777770	0	0	0	0	0	00	10	01
71	32	0120010	08800188	022220010	00EEEEEEE0	0	1	0	1	0	00	00	10
72	33	0240020	11000311	044440020	01DDDDDDC1	0	0	0	1	1	00	00	00
73	34	0480040	22000622	088880040	03BBBBBB83	0	0	1	1	0	01	00	00
74	35	0900081	44000C44	111100080	0777777707	1	0	0	0	0	00	01	00
75	36	1200103	08001888	022200101	0EEEEEEE0E	0	0	0	1	1	11	00	01
76	37	0400207	10003111	044400202	1DDDDDDC1D	0	0	0	1	0	01	11	00
77	38	080040E	20006222	088800404	3BBBBBB83B	1	0	1	1	0	01	01	11
78	39	100081C	4000C444	111000808	7777777077	0	0	0	0	1	10	01	01
79	40	0001038	00018888	022001010	6EEEEEE0EF	0	0	0	1	1	00	10	01
80	41	0002070	00031110	044002020	5DDDDDC1DE	0	0	0	1	1	01	00	10
81	42	00040E0	00062220	088004040	3BBBBB83BC	0	0	1	1	1	00	01	00
82	43	00081C1	000C4440	110008081	7777770779	0	0	0	0	0	11	00	01
83	44	0010383	00188880	020010103	6EEEEE0EF2	0	0	0	1	0	01	11	00
84	45	0020707	00311100	040020206	5DDDDC1DE5	0	0	0	1	0	10	01	11
85	46	0040E0E	00622200	08004040C	3BBBB83BCB	0	0	1	1	0	11	10	01
86	47	0081C1D	00C44400	100080819	7777707797	0	1	0	0	0	00	11	10
87	48	010383A	01888801	000101032	6EEEE0EF2F	0	1	0	1	0	11	00	11
88	49	0207075	03111003	000202064	5DDDC1DE5E	0	0	0	1	0	01	11	00

Sample Data

89	50	040E0EA	06222006	0004040C8	3BBB83BCBC	0	0	0	1	0	10	01	11
90	51	081C1D5	0C44400C	000808191	7777077979	1	0	0	0	1	00	10	01
91	52	10383AB	18888018	001010323	6EEE0EF2F2	0	1	0	1	0	00	00	10
92	53	0070756	31110030	002020646	5DDC1DE5E5	0	0	0	1	1	00	00	00
93	54	00E0EAC	62220060	004040C8C	3BB83BCBCB	0	0	0	1	1	00	00	00
94	55	01C1D59	444400C1	008081919	7770779797	0	0	0	0	0	00	00	00
95	56	0383AB2	08880183	010103232	6EE0EF2F2F	0	1	0	1	0	01	00	00
96	57	0707565	11100307	020206464	5DC1DE5E5F	0	0	0	1	0	00	01	00
97	58	0E0EACA	2220060E	04040C8C8	3B83BCBCBF	1	0	0	1	0	10	00	01
98	59	1C1D594	44400C1C	080819191	770779797E	1	0	1	0	0	00	10	00
99	60	183AB28	08801838	101032323	6E0EF2F2FC	1	1	0	0	0	00	00	10
100	61	1075650	11003070	002064647	5C1DE5E5F8	0	0	0	0	0	00	00	00
101	62	00EACA1	220060E0	0040C8C8E	383BCBCBF0	0	0	0	0	0	00	00	00
102	63	01D5943	4400C1C0	00819191D	70779797E0	0	0	0	0	0	00	00	00
103	64	03AB286	08018380	01032323A	60EF2F2FC1	0	0	0	1	1	00	00	00
104	65	075650C	10030701	020646475	41DE5E5F82	0	0	0	1	1	00	00	00
105	66	0EACA18	20060E02	040C8C8EA	03BCBCBF04	1	0	0	1	0	01	00	00
106	67	1D59430	400C1C05	0819191D4	0779797E09	1	0	1	0	1	00	01	00
107	68	1AB2861	0018380A	1032323A9	0EF2F2FC12	1	0	0	1	0	10	00	01
108	69	15650C3	00307015	006464752	1DE5E5F825	0	0	0	1	1	11	10	00
109	70	0ACA186	0060E02A	00C8C8EA4	3BCBCBF04B	1	0	0	1	1	00	11	10
110	71	159430C	00C1C055	019191D48	779797E097	0	1	0	1	0	11	00	11
111	72	0B28618	018380AA	032323A90	6F2F2FC12F	1	1	0	0	1	01	11	00
112	73	1650C30	03070154	064647520	5E5E5F825E	0	0	0	0	1	11	01	11
113	74	0CA1860	060E02A8	0C8C8EA40	3CBCBF04BC	1	0	1	1	0	11	11	01
114	75	19430C0	0C1C0550	19191D480	79797E0979	1	0	1	0	1	11	11	11
115	76	1286180	18380AA0	12323A900	72F2FC12F2	0	0	0	1	0	11	11	11
116	77	050C301	30701541	046475201	65E5F825E5	0	0	0	1	0	11	11	11
117	78	0A18602	60E02A82	08C8EA402	4BCBF04BCB	1	1	1	1	1	10	11	11
118	79	1430C04	41C05505	1191D4804	1797E09796	0	1	0	1	0	10	10	11
119	80	0861808	0380AA0A	0323A9008	2F2FC12F2C	1	1	0	0	0	01	10	10
120	81	10C3011	07015415	064752011	5E5F825E59	0	0	0	0	1	00	01	10
121	82	0186022	0E02A82A	0C8EA4022	3CBF04BCB2	0	0	1	1	0	10	00	01
122	83	030C045	1C055054	191D48044	797E097964	0	0	1	0	1	11	10	00
123	84	061808A	380AA0A8	123A90088	72FC12F2C9	0	0	0	1	0	00	11	10
124	85	0C30115	70154151	047520111	65F825E593	1	0	0	1	0	11	00	11
125	86	186022A	602A82A3	08EA40222	4BF04BCB26	1	0	1	1	0	00	11	00
126	87	10C0455	40550546	11D480444	17E097964C	0	0	0	1	1	10	00	11
127	88	01808AA	00AA0A8D	03A900888	2FC12F2C99	0	1	0	1	0	00	10	00
128	89	0301155	0154151A	075201111	5F825E5932	0	0	0	1	1	01	00	10
129	90	06022AA	02A82A34	0EA402222	3F04BCB264	0	1	1	0	1	00	01	00
130	91	0C04555	05505468	1D4804445	7E097964C9	1	0	1	0	0	10	00	01
131	92	1808AAA	0AA0A8D0	1A900888A	7C12F2C992	1	1	1	0	1	00	10	00
132	93	1011555	154151A1	152011115	7825E59324	0	0	0	0	0	01	00	10
133	94	0022AAB	2A82A342	0A402222B	704BCB2648	0	1	1	0	1	00	01	00
134	95	0045556	55054684	148044457	6097964C91	0	0	0	1	1	11	00	01
135	96	008AAAC	2A0A8D09	0900888AE	412F2C9923	0	0	1	0	0	01	11	00
136	97	0115559	54151A12	12011115D	025E593246	0	0	0	0	1	11	01	11
137	98	022AAB2	282A3424	0402222BA	04BCB2648D	0	0	0	1	0	10	11	01
138	99	0455564	50546848	080444575	097964C91A	0	0	1	0	1	01	10	11
139	100	08AAAC8	20A8D090	100888AEA	12F2C99235	1	1	0	1	0	10	01	10
140	101	1155591	4151A120	0011115D5	25E593246A	0	0	0	1	1	00	10	01
141	102	02AAB22	02A34240	002222BAA	4BCB2648D5	0	1	0	1	0	00	00	10
142	103	0555644	05468481	004445755	17964C91AB	0	0	0	1	1	00	00	00
143	104	0AAAC88	0A8D0903	00888AEAA	2F2C992357	1	1	0	0	0	01	00	00
144	105	1555911	151A1206	011115D55	5E593246AE	0	0	0	0	1	01	01	00
145	106	0AAB222	2A34240C	02222BAAA	3CB2648D5C	1	0	0	1	1	11	01	01

Sample Data

146	107	1556445	54684818	044457555	7964C91AB8	0	0	0	0	1	01	11	01
147	108	0AAC88B	28D09030	0888AEAAA	72C9923571	1	1	1	1	1	01	01	11
148	109	1559117	51A12060	11115D555	6593246AE2	0	1	0	1	1	11	01	01
149	110	0AB222F	234240C0	0222BAAAB	4B2648D5C5	1	0	0	0	0	10	11	01
150	111	156445F	46848180	044575557	164C91AB8A	0	1	0	0	1	01	10	11
151	112	0AC88BF	0D090301	088AEAAAE	2C99235714	1	0	1	1	0	10	01	10
152	113	159117F	1A120602	1115D555D	593246AE28	0	0	0	0	0	00	10	01
153	114	0B222FE	34240C04	022BAAABA	32648D5C51	1	0	0	0	1	01	00	10
154	115	16445FD	68481809	045755574	64C91AB8A2	0	0	0	1	0	00	01	00
155	116	0C88BFA	50903012	08AEAAAE8	4992357144	1	1	1	1	0	01	00	01
156	117	19117F5	21206024	115D555D1	13246AE288	1	0	0	0	0	00	01	00
157	118	1222FEA	4240C048	02BAAABA2	2648D5C511	0	0	0	0	0	11	00	01
158	119	0445FD5	04818090	057555744	4C91AB8A23	0	1	0	1	1	01	11	00
159	120	088BFAA	09030120	0AEAAAE88	1923571446	1	0	1	0	1	10	01	11
160	121	1117F55	12060240	15D555D11	3246AE288D	0	0	0	0	0	00	10	01
161	122	022FEAA	240C0480	0BAAABA22	648D5C511B	0	0	1	1	0	00	00	10
162	123	045FD54	48180900	175557444	491AB8A237	0	0	0	0	0	00	00	00
163	124	08BFAA9	10301200	0EAAAE889	123571446F	1	0	1	0	0	01	00	00
164	125	117F553	20602400	1D555D113	246AE288DF	0	0	1	0	0	00	01	00
165	126	02FEAA7	40C04800	1AAABA227	48D5C511BE	0	1	1	1	1	10	00	01
166	127	05FD54F	01809001	15557444F	11AB8A237D	0	1	0	1	0	00	10	00
167	128	0BFAA9F	03012002	0AAAE889E	23571446FA	1	0	1	0	0	00	00	10
168	129	17F553F	06024004	1555D113D	46AE288DF5	0	0	0	1	1	00	00	00
169	130	0FEAA7E	0C048008	0AABA227A	0D5C511BEA	1	0	1	0	0	01	00	00
170	131	1FD54FC	18090011	1557444F5	1AB8A237D5	1	0	0	1	1	00	01	00
171	132	1FAA9F9	30120022	0AAE889EB	3571446FAA	1	0	1	0	0	10	00	01
172	133	1F553F2	60240044	155D113D7	6AE288DF55	1	0	0	1	0	00	10	00
173	134	1EAA7E4	40480089	0ABA227AE	55C511BEAA	1	0	1	1	1	00	00	10
174	135	1D54FC9	00900113	157444F5D	2B8A237D54	1	1	0	1	1	01	00	00
175	136	1AA9F93	01200227	0AE889EBA	571446FAA8	1	0	1	0	1	00	01	00
176	137	1553F26	0240044E	15D113D75	2E288DF550	0	0	0	0	0	11	00	01
177	138	0AA7E4C	0480089C	0BA227AEA	5C511BEAA0	1	1	1	0	0	00	11	00
178	139	154FC98	09001138	17444F5D4	38A237D540	0	0	0	1	1	10	00	11
179	140	0A9F931	12002270	0E889EBA9	71446FAA81	1	0	1	0	0	00	10	00
180	141	153F262	240044E0	1D113D753	6288DF5503	0	0	1	1	0	00	00	10
181	142	0A7E4C5	480089C0	1A227AEA7	4511BEAA06	1	0	1	0	0	01	00	00
182	143	14FC98B	10011381	1444F5D4F	0A237D540D	0	0	0	0	1	01	01	00
183	144	09F9316	20022702	0889EBA9E	1446FAA81A	1	0	1	0	1	11	01	01
184	145	13F262D	40044E04	1113D753D	288DF55035	0	0	0	1	0	10	11	01
185	146	07E4C5A	00089C08	0227AEA7A	511BEAA06A	0	0	0	0	0	01	10	11
186	147	0FC98B4	00113810	044F5D4F5	2237D540D5	1	0	0	0	0	01	01	10
187	148	1F93169	00227021	089EBA9EB	446FAA81AA	1	0	1	0	1	11	01	01
188	149	1F262D2	0044E042	113D753D7	08DF550355	1	0	0	1	1	10	11	01
189	150	1E4C5A4	0089C085	027AEA7AE	11BEAA06AA	1	1	0	1	1	10	10	11
190	151	1C98B48	0113810A	04F5D4F5C	237D540D54	1	0	0	0	1	10	10	10
191	152	1931691	02270215	09EBA9EB8	46FAA81AA9	1	0	1	1	1	01	10	10
192	153	1262D22	044E042A	13D753D71	0DF5503553	0	0	0	1	0	01	01	10
193	154	04C5A44	089C0854	07AEA7AE2	1BEAA06AA7	0	1	0	1	1	11	01	01
194	155	098B488	113810A8	0F5D4F5C4	37D540D54E	1	0	1	1	0	11	11	01
195	156	1316910	22702150	1EBA9EB89	6FAA81AA9D	0	0	1	1	1	11	11	11
196	157	062D220	44E042A0	1D753D712	5F5503553A	0	1	1	0	1	11	11	11
197	158	0C5A440	09C08540	1AEA7AE25	3EAA06AA75	1	1	1	1	1	10	11	11
198	159	18B4880	13810A80	15D4F5C4B	7D540D54EA	1	1	0	0	0	10	10	11
199	160	1169100	27021500	0BA9EB897	7AA81AA9D5	0	0	1	1	0	01	10	10
200	161	02D2201	4E042A00	1753D712E	75503553AB	0	0	0	0	1	00	01	10
201	162	05A4403	1C085400	0EA7AE25C	6AA06AA756	0	0	1	1	0	10	00	01
202	163	0B48807	3810A800	1D4F5C4B8	5540D54EAC	1	0	1	0	0	00	10	00

Sample Data

203	164	169100F	70215000	1A9EB8971	2A81AA9D58	0	0	1	1	0	00	00	10
204	165	0D2201E	6042A001	153D712E3	5503553AB0	1	0	0	0	1	00	00	00
205	166	1A4403C	40854002	0A7AE25C6	2A06AA7561	1	1	1	0	1	01	00	00
206	167	1488079	010A8004	14F5C4B8D	540D54EAC3	0	0	0	0	1	01	01	00
207	168	09100F2	02150009	09EB8971B	281AA9D586	1	0	1	0	1	11	01	01
208	169	12201E5	042A0012	13D712E37	503553AB0C	0	0	0	0	1	01	11	01
209	170	04403CA	08540024	07AE25C6E	206AA75618	0	0	0	0	1	11	01	11
210	171	0880795	10A80048	0F5C4B8DD	40D54EAC30	1	1	1	1	1	11	11	01
211	172	1100F2A	21500091	1EB8971BA	01AA9D5861	0	0	1	1	1	11	11	11
212	173	0201E54	42A00122	1D712E374	03553AB0C3	0	1	1	0	1	11	11	11
213	174	0403CA9	05400244	1AE25C6E9	06AA756186	0	0	1	1	1	11	11	11
214	175	0807952	0A800488	15C4B8DD3	0D54EAC30D	1	1	0	0	1	11	11	11
215	176	100F2A5	15000911	0B8971BA6	1AA9D5861A	0	0	1	1	1	11	11	11
216	177	001E54A	2A001223	1712E374C	3553AB0C35	0	0	0	0	1	00	11	11
217	178	003CA94	54002446	0E25C6E98	6AA756186A	0	0	1	1	0	11	00	11
218	179	0079528	2800488D	1C4B8DD31	554EAC30D5	0	0	1	0	0	01	11	00
219	180	00F2A50	5000911B	18971BA62	2A9D5861AA	0	0	1	1	1	10	01	11
220	181	01E54A0	20012236	112E374C4	553AB0C355	0	0	0	0	0	00	10	01
221	182	03CA940	4002446C	025C6E988	2A756186AA	0	0	0	0	0	01	00	10
222	183	0795280	000488D9	04B8DD310	54EAC30D54	0	0	0	1	0	00	01	00
223	184	0F2A500	000911B2	0971BA620	29D5861AA8	1	0	1	1	1	10	00	01
224	185	1E54A00	00122364	12E374C40	53AB0C3550	1	0	0	1	0	00	10	00
225	186	1CA9400	002446C8	05C6E9880	2756186AA0	1	0	0	0	1	01	00	10
226	187	1952800	00488D90	0B8DD3101	4EAC30D540	1	0	1	1	0	11	01	00
227	188	12A5000	00911B20	171BA6202	1D5861AA81	0	1	0	0	0	10	11	01
228	189	054A000	01223640	0E374C404	3AB0C35502	0	0	1	1	0	10	10	11
229	190	0A94000	02446C80	1C6E98808	756186AA05	1	0	1	0	0	01	10	10
230	191	1528001	0488D901	18DD31011	6AC30D540B	0	1	1	1	0	10	01	10
231	192	0A50003	0911B203	11BA62023	55861AA817	1	0	0	1	0	11	10	01
232	193	14A0006	12236407	0374C4047	2B0C35502F	0	0	0	0	1	11	11	10
233	194	094000C	2446C80E	06E98808E	56186AA05F	1	0	0	0	0	11	11	11
234	195	1280018	488D901C	0DD31011D	2C30D540BF	0	1	1	0	1	11	11	11
235	196	0500030	111B2039	1BA62023A	5861AA817E	0	0	1	0	0	11	11	11
236	197	0A00060	22364072	174C40475	30C35502FD	1	0	0	1	1	11	11	11
237	198	14000C0	446C80E4	0E98808EA	6186AA05FB	0	0	1	1	1	11	11	11
238	199	0800180	08D901C8	1D31011D5	430D540BF6	1	1	1	0	0	10	11	11
239	200	1000301	11B20391	1A62023AB	061AA817EC	0	1	1	0	0	10	10	11

```
Z[0]  = 25
Z[1]  = 45
Z[2]  = 6B
Z[3]  = 55
Z[4]  = 5F
Z[5]  = C2
Z[6]  = 20
Z[7]  = E5
Z[8]  = C4
Z[9]  = F8
Z[10] = 3A
Z[11] = F1
Z[12] = FF
Z[13] = 89
Z[14] = 02
Z[15] = 35

================================================================================================
         Reload this pattern into the LFSRs
```

Sample Data

Hold content of Summation Combiner regs and calculate new C[t+1] and Z values

```
LFSR1  <= 1C45F25
LFSR2  <= 7FF8C245
LFSR3  <= 1893A206B
LFSR4  <= 1A02F1E555
C[t+1] <= 10
```

Generating 125 key symbols (encryption/decryption sequence)

240	1	1C45F25	7FF8C245	1893A206B	1A02F1E555	1	1	1	0	1	10	10	11
241	2	188BE4A	7FF1848B	1127440D7	3405E3CAAB	1	1	0	0	0	01	10	10
242	3	1117C95	7FE30917	024E881AF	680BC79557	0	1	0	0	0	01	01	10
243	4	022F92B	7FC6122F	049D1035E	50178F2AAF	0	1	0	0	0	11	01	01
244	5	045F257	7F8C245E	093A206BD	202F1E555E	0	1	1	0	1	10	11	01
245	6	08BE4AE	7F1848BC	127440D7A	405E3CAABC	1	0	0	0	1	01	10	11
246	7	117C95C	7E309178	04E881AF4	00BC795579	0	0	0	1	0	01	01	10
247	8	02F92B8	7C6122F0	09D1035E8	0178F2AAF2	0	0	1	0	0	11	01	01
248	9	05F2570	78C245E1	13A206BD0	02F1E555E5	0	1	0	1	1	10	11	01
249	10	0BE4AE1	71848BC2	07440D7A0	05E3CAABCA	1	1	0	1	1	10	10	11
250	11	17C95C3	63091784	0E881AF40	0BC7955795	0	0	1	1	0	01	10	10
251	12	0F92B87	46122F09	1D1035E80	178F2AAF2B	1	0	1	1	0	10	01	10
252	13	1F2570F	0C245E12	1A206BD01	2F1E555E56	1	0	1	0	0	11	10	01
253	14	1E4AE1F	1848BC25	1440D7A03	5E3CAABCAC	1	0	0	0	0	00	11	10
254	15	1C95C3E	3091784A	0881AF407	3C79557958	1	1	1	0	1	11	00	11
255	16	192B87D	6122F094	11035E80F	78F2AAF2B1	1	0	0	1	1	01	11	00
256	17	12570FA	4245E128	0206BD01E	71E555E562	0	0	0	1	0	10	01	11
257	18	04AE1F4	048BC250	040D7A03D	63CAABCAC5	0	1	0	1	0	11	10	01
258	19	095C3E8	091784A0	081AF407A	479557958A	1	0	1	1	0	01	11	10
259	20	12B87D1	122F0941	1035E80F4	0F2AAF2B14	0	0	0	0	1	11	01	11
260	21	0570FA3	245E1283	006BD01E9	1E555E5628	0	0	0	0	1	01	11	01
261	22	0AE1F46	48BC2506	00D7A03D2	3CAABCAC50	1	1	0	1	0	01	01	11
262	23	15C3E8C	11784A0C	01AF407A5	79557958A0	0	0	0	0	1	10	01	01
263	24	0B87D18	22F09419	035E80F4A	72AAF2B140	1	1	0	1	1	11	10	01
264	25	170FA30	45E12832	06BD01E94	6555E56280	0	1	0	0	0	00	11	10
265	26	0E1F460	0BC25065	0D7A03D28	4AABCAC501	1	1	1	1	0	00	00	11
266	27	1C3E8C0	1784A0CB	1AF407A50	1557958A03	1	1	1	0	1	01	00	00
267	28	187D181	2F094196	15E80F4A0	2AAF2B1406	1	0	0	1	1	00	01	00
268	29	10FA302	5E12832C	0BD01E941	555E56280C	0	0	1	0	1	11	00	01
269	30	01F4604	3C250658	17A03D283	2ABCAC5019	0	0	0	1	0	01	11	00
270	31	03E8C09	784A0CB0	0F407A506	557958A033	0	0	1	0	0	10	01	11
271	32	07D1812	70941960	1E80F4A0C	2AF2B14066	0	1	1	1	1	11	10	01
272	33	0FA3024	612832C1	1D01E9419	55E56280CD	1	0	1	1	0	01	11	10
273	34	1F46049	42506583	1A03D2832	2BCAC5019A	1	0	1	1	0	01	01	11
274	35	1E8C093	04A0CB07	1407A5065	57958A0335	1	1	0	1	0	00	01	01
275	36	1D18127	0941960F	080F4A0CB	2F2B14066B	1	0	1	0	0	10	00	01
276	37	1A3024F	12832C1F	101E94196	5E56280CD7	1	1	0	0	0	00	10	00
277	38	146049F	2506583E	003D2832C	3CAC5019AE	0	0	0	1	1	01	00	10
278	39	08C093E	4A0CB07D	007A50658	7958A0335D	1	0	0	0	0	00	01	00
279	40	118127C	141960FA	00F4A0CB0	72B14066BA	0	0	0	1	1	11	00	01
280	41	03024F8	2832C1F4	01E941961	656280CD74	0	0	0	0	1	10	11	00
281	42	06049F1	506583E9	03D2832C2	4AC5019AE9	0	0	0	1	1	01	10	11
282	43	0C093E2	20CB07D2	07A506585	158A0335D3	1	1	0	1	0	10	01	10
283	44	18127C5	41960FA5	0F4A0CB0B	2B14066BA7	1	1	1	0	1	11	10	01
284	45	1024F8A	032C1F4B	1E9419616	56280CD74F	0	0	1	0	0	00	11	10
285	46	0049F15	06583E97	1D2832C3C	2C5019AE9F	0	0	1	0	1	10	00	11

Sample Data

286	47	0093E2B	0CB07D2F	1A5065859	58A0335D3E	0	1	1	1	1	00	10	00
287	48	0127C56	1960FA5E	14A0CB0B2	314066BA7D	0	0	0	0	0	01	00	10
288	49	024F8AD	32C1F4BC	094196164	6280CD74FB	0	1	1	1	0	11	01	00
289	50	049F15A	6583E978	12832C2C8	45019AE9F6	0	1	0	0	0	10	11	01
290	51	093E2B5	4B07D2F0	050658591	0A0335D3ED	1	0	0	0	1	01	10	11
291	52	127C56B	160FA5E0	0A0CB0B22	14066BA7DA	0	0	1	0	0	01	01	10
292	53	04F8AD7	2C1F4BC1	141961645	280CD74FB5	0	0	0	0	1	10	01	01
293	54	09F15AF	583E9783	0832C2C8A	5019AE9F6A	1	0	1	0	0	11	10	01
294	55	13E2B5E	307D2F06	106585915	20335D3ED5	0	0	0	0	1	11	11	10
295	56	07C56BD	60FA5E0D	00CB0B22B	4066BA7DAA	0	1	0	0	0	11	11	11
296	57	0F8AD7A	41F4BC1B	019616457	00CD74FB54	1	1	0	1	0	10	11	11
297	58	1F15AF4	03E97836	032C2C8AF	019AE9F6A9	1	1	0	1	1	10	10	11
298	59	1E2B5E9	07D2F06C	06585915E	0335D3ED52	1	1	0	0	0	01	10	10
299	60	1C56BD2	0FA5E0D8	0CB0B22BC	066BA7DAA4	1	1	1	0	0	10	01	10
300	61	18AD7A5	1F4BC1B0	196164578	0CD74FB549	1	0	1	1	1	11	10	01
301	62	115AF4B	3E978361	12C2C8AF0	19AE9F6A92	0	1	0	1	1	00	11	10
302	63	02B5E96	7D2F06C2	0585915E0	335D3ED524	0	0	0	0	0	10	00	11
303	64	056BD2D	7A5E0D85	0B0B22BC1	66BA7DAA49	0	0	1	1	0	00	10	00
304	65	0AD7A5B	74BC1B0A	161645783	4D74FB5493	1	1	0	0	0	00	00	10
305	66	15AF4B6	69783615	0C2C8AF07	1AE9F6A926	0	0	1	1	0	01	00	00
306	67	0B5E96D	52F06C2B	185915E0F	35D3ED524C	1	1	1	1	1	11	01	00
307	68	16BD2DB	25E0D857	10B22BC1F	6BA7DAA499	0	1	0	1	1	10	11	01
308	69	0D7A5B7	4BC1B0AF	01645783F	574FB54933	1	1	0	0	0	10	10	11
309	70	1AF4B6F	1783615F	02C8AF07F	2E9F6A9266	1	1	0	1	1	01	10	10
310	71	15E96DF	2F06C2BF	05915E0FF	5D3ED524CC	0	0	0	0	1	00	01	10
311	72	0BD2DBF	5E0D857F	0B22BC1FE	3A7DAA4998	1	0	1	0	0	10	00	01
312	73	17A5B7F	3C1B0AFE	1645783FD	74FB549331	0	0	0	1	1	11	10	00
313	74	0F4B6FF	783615FD	0C8AF07FA	69F6A92662	1	0	1	1	0	01	11	10
314	75	1E96DFF	706C2BFB	1915E0FF5	53ED524CC4	1	0	1	1	0	01	01	11
315	76	1D2DBFE	60D857F6	122BC1FEB	27DAA49988	1	1	0	1	0	00	01	01
316	77	1A5B7FD	41B0AFEC	045783FD7	4FB5493310	1	1	0	1	1	10	00	01
317	78	14B6FFA	03615FD8	08AF07FAE	1F6A926620	0	0	1	0	1	11	10	00
318	79	096DFF4	06C2BFB1	115E0FF5D	3ED524CC40	1	1	0	1	0	01	11	10
319	80	12DBFE8	0D857F63	02BC1FEBB	7DAA499881	0	1	0	1	1	10	01	11
320	81	05B7FD0	1B0AFEC6	05783FD77	7B54933103	0	0	0	0	0	00	10	01
321	82	0B6FFA1	3615FD8C	0AF07FAEF	76A9266206	1	0	1	1	1	00	00	10
322	83	16DFF42	6C2BFB18	15E0FF5DE	6D524CC40C	0	0	0	0	0	00	00	00
323	84	0DBFE85	5857F631	0BC1FEBBD	5AA4998819	1	0	1	1	1	01	00	00
324	85	1B7FD0B	30AFEC62	1783FD77A	3549331033	1	1	0	0	1	00	01	00
325	86	16FFA16	615FD8C5	0F07FAEF5	6A92662067	0	0	1	1	0	10	00	01
326	87	0DFF42D	42BFB18B	1E0FF5DEA	5524CC40CE	1	1	1	0	1	00	10	00
327	88	1BFE85B	057F6317	1C1FEBBD5	2A4998819C	1	0	1	0	0	00	00	10
328	89	17FD0B7	0AFEC62E	183FD77AA	5493310339	0	1	1	1	1	01	00	00
329	90	0FFA16F	15FD8C5C	107FAEF55	2926620672	1	1	0	0	1	00	01	00
330	91	1FF42DF	2BFB18B9	00FF5DEAA	524CC40CE5	1	1	0	0	0	10	00	01
331	92	1FE85BF	57F63172	01FEBBD55	24998819CA	1	1	0	1	1	00	10	00
332	93	1FD0B7F	2FEC62E4	03FD77AAA	4933103394	1	1	0	0	0	00	00	10
333	94	1FA16FF	5FD8C5C9	07FAEF555	1266206728	1	1	0	0	0	01	00	00
334	95	1F42DFF	3FB18B93	0FF5DEAAA	24CC40CE51	1	1	1	1	1	11	01	00
335	96	1E85BFF	7F631727	1FEBBD554	4998819CA3	1	0	1	1	0	11	11	01
336	97	1D0B7FE	7EC62E4F	1FD77AAA9	1331033947	1	1	1	0	0	10	11	11
337	98	1A16FFC	7D8C5C9F	1FAEF5553	266206728E	1	1	1	0	1	10	10	11
338	99	142DFF9	7B18B93F	1F5DEAAA7	4CC40CE51D	0	0	1	1	0	01	10	10
339	100	085BFF3	7631727F	1EBBD554E	198819CA3B	1	0	1	1	0	10	01	10
340	101	10B7FE6	6C62E4FF	1D77AAA9C	3310339477	0	0	1	0	1	00	10	01
341	102	016FFCC	58C5C9FE	1AEF55538	66206728EE	0	1	1	0	0	00	00	10
342	103	02DFF98	318B93FC	15DEAAA70	4C40CE51DC	0	1	0	0	1	00	00	00

Sample Data

343	104	05BFF31	631727F8	0BBD554E1	18819CA3B9	0	0	1	1	0	01	00	00
344	105	0B7FE62	462E4FF1	177AAA9C2	3103394772	1	0	0	0	0	00	01	00
345	106	16FFCC5	0C5C9FE2	0EF555384	6206728EE4	0	0	1	0	1	11	00	01
346	107	0DFF98A	18B93FC4	1DEAAA709	440CE51DC9	1	1	1	0	0	00	11	00
347	108	1BFF315	31727F88	1BD554E12	0819CA3B93	1	0	1	0	0	11	00	11
348	109	17FE62A	62E4FF11	17AAA9C24	1033947726	0	1	0	0	0	01	11	00
349	110	0FFCC54	45C9FE22	0F5553849	206728EE4C	1	1	1	0	0	01	01	11
350	111	1FF98A8	0B93FC44	1EAAA7093	40CE51DC99	1	1	1	1	1	00	01	01
351	112	1FF3150	1727F889	1D554E127	019CA3B933	1	0	1	1	1	10	00	01
352	113	1FE62A0	2E4FF112	1AAA9C24F	0339477267	1	0	1	0	0	00	10	00
353	114	1FCC541	5C9FE225	15553849E	06728EE4CF	1	1	0	0	0	00	00	10
354	115	1F98A82	393FC44B	0AAA7093C	0CE51DC99F	1	0	1	1	1	01	00	00
355	116	1F31504	727F8897	1554E1279	19CA3B933E	1	0	0	1	1	00	01	00
356	117	1E62A09	64FF112F	0AA9C24F2	339477267D	1	1	1	1	0	01	00	01
357	118	1CC5412	49FE225E	1553849E4	6728EE4CFB	1	1	0	0	1	00	01	00
358	119	198A824	13FC44BC	0AA7093C9	4E51DC99F7	1	1	1	0	1	10	00	01
359	120	1315049	27F88979	154E12792	1CA3B933EE	0	1	0	1	0	00	10	00
360	121	062A093	4FF112F3	0A9C24F24	39477267DC	0	1	1	0	0	00	00	10
361	122	0C54127	1FE225E6	153849E48	728EE4CFB8	1	1	0	1	1	01	00	00
362	123	18A824E	3FC44BCD	0A7093C91	651DC99F71	1	1	1	0	0	11	01	00
363	124	115049C	7F88979A	14E127922	4A3B933EE2	0	1	0	0	0	10	11	01
364	125	02A0938	7F112F35	09C24F244	1477267DC5	0	0	1	0	1	01	10	11

1.4 THIRD SET OF SAMPLES

```
Initial values for the key, pan address and clock

K'c3[0]   = FF   K'c3[1]   = FF    K'c3[2]   = FF    K'c3[3]  = FF
K'c3[4]   = FF   K'c3[5]   = FF    K'c3[6]   = FF    K'c3[7]  = FF
K'c3[8]   = FF   K'c3[9]   = FF    K'c3[10]  = FF    K'c3[11] = FF
K'c3[12]  = FF   K'c3[13]  = FF    K'c3[14]  = FF    K'c3[15] = FF

Addr3[0] = FF   Addr3[1] = FF    Addr3[2] = FF
Addr3[3] = FF   Addr3[4] = FF    Addr3[5] = FF

CL3[0]  = FF   CL3[1]  = FF    CL3[2]  = FF    CL3[3]  = 03


================================================================================================
         Fill LFSRs with initial data
================================================================================================

  t  clk#    LFSR1    LFSR2     LFSR3      LFSR4          X1 X2 X3 X4   Z  C[t+1] C[t] C[t-1]

  0     0    0000000* 00000000* 000000000* 0000000000*    0  0  0  0    0  00     00    00
  1     1    0000001* 00000001* 000000001* 0000000001*    0  0  0  0    0  00     00    00
  2     2    0000003* 00000002* 000000003* 0000000003*    0  0  0  0    0  00     00    00
  3     3    0000007* 00000004* 000000007* 0000000007*    0  0  0  0    0  00     00    00
  4     4    000000F* 00000009* 00000000F* 000000000F*    0  0  0  0    0  00     00    00
  5     5    000001F* 00000013* 00000001F* 000000001F*    0  0  0  0    0  00     00    00
  6     6    000003F* 00000027* 00000003F* 000000003F*    0  0  0  0    0  00     00    00
  7     7    000007F* 0000004F* 00000007F* 000000007F*    0  0  0  0    0  00     00    00
  8     8    00000FF* 0000009F* 0000000FF* 00000000FF*    0  0  0  0    0  00     00    00
  9     9    00001FF* 0000013F* 0000001FF* 00000001FF*    0  0  0  0    0  00     00    00
 10    10    00003FF* 0000027F* 0000003FF* 00000003FF*    0  0  0  0    0  00     00    00
 11    11    00007FF* 000004FF* 0000007FF* 00000007FF*    0  0  0  0    0  00     00    00
 12    12    0000FFF* 000009FF* 000000FFF* 0000000FFF*    0  0  0  0    0  00     00    00
 13    13    0001FFF* 000013FF* 000001FFF* 0000001FFF*    0  0  0  0    0  00     00    00
 14    14    0003FFF* 000027FF* 000003FFF* 0000003FFF*    0  0  0  0    0  00     00    00
 15    15    0007FFF* 00004FFF* 000007FFF* 0000007FFF*    0  0  0  0    0  00     00    00
 16    16    000FFFF* 00009FFF* 00000FFFF* 000000FFFF*    0  0  0  0    0  00     00    00
 17    17    001FFFF* 00013FFF* 00001FFFF* 000001FFFF*    0  0  0  0    0  00     00    00
 18    18    003FFFF* 00027FFF* 00003FFFF* 000003FFFF*    0  0  0  0    0  00     00    00
 19    19    007FFFF* 0004FFFF* 00007FFFF* 000007FFFF*    0  0  0  0    0  00     00    00
 20    20    00FFFFF* 0009FFFF* 0000FFFFF* 00000FFFFF*    0  0  0  0    0  00     00    00
 21    21    01FFFFF* 0013FFFF* 0001FFFFF* 00001FFFFF*    0  0  0  0    0  00     00    00
 22    22    03FFFFF* 0027FFFF* 0003FFFFF* 00003FFFFF*    0  0  0  0    0  00     00    00
 23    23    07FFFFF* 004FFFFF* 0007FFFFF* 00007FFFFF*    0  0  0  0    0  00     00    00
 24    24    0FFFFFF* 009FFFFF* 000FFFFFF* 0000FFFFFF*    1  1  0  0    0  01     00    00
 25    25    1FFFFFF* 013FFFFF* 001FFFFFF* 0001FFFFFF*    1  0  0  0    1  00     00    00
 26    26    1FFFFFF  027FFFFF* 003FFFFFF* 0003FFFFFF*    1  0  0  0    1  00     00    00
 27    27    1FFFFFF  04FFFFFF* 007FFFFFF* 0007FFFFFF*    1  1  0  0    0  01     00    00
 28    28    1FFFFFF  09FFFFFF* 00FFFFFFF* 000FFFFFFF*    1  1  0  0    0  01     00    00
 29    29    1FFFFFF  13FFFFFF* 01FFFFFFF* 001FFFFFFF*    1  1  0  0    0  01     00    00
 30    30    1FFFFFF  27FFFFFF* 03FFFFFFF* 003FFFFFFF*    1  1  0  0    0  01     00    00
 31    31    1FFFFFF  4FFFFFFF* 07FFFFFFF* 007FFFFFFF*    1  1  0  0    0  01     00    00
 32    32    1FFFFFF  1FFFFFFF  0FFFFFFFF* 00FFFFFFFF*    1  1  1  1    0  10     00    00
 33    33    1FFFFFF  3FFFFFFE  1FFFFFFFF* 01FFFFFFFF*    1  1  1  1    0  10     00    00
 34    34    1FFFFFF  7FFFFFFC  1FFFFFFFF  03FFFFFFF*     1  1  1  1    0  10     00    00
```

Sample Data

35	35	1FFFFFF	7FFFFFF9	1FFFFFFFF	07FFFFFFFF*	1	1	1	1	0	10	00	00
36	36	1FFFFFF	7FFFFFF3	1FFFFFFFF	0FFFFFFFFF*	1	1	1	1	0	10	00	00
37	37	1FFFFFF	7FFFFFE7	1FFFFFFFF	1FFFFFFFFF*	1	1	1	1	0	10	00	00
38	38	1FFFFFF	7FFFFFCF	1FFFFFFFF	3FFFFFFFFF*	1	1	1	1	0	10	00	00
39	39	1FFFFFF	7FFFFF9F	1FFFFFFFF	7FFFFFFFFF*	1	1	1	1	0	10	00	00

Start clocking Summation Combiner

40	1	1FFFFFF	7FFFFF3F	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	0	01	10	00
41	2	1FFFFFF	7FFFFE7F	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	1	10	01	10
42	3	1FFFFFF	7FFFFCFF	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	0	10	10	01
43	4	1FFFFFF	7FFFF9FF	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	0	00	10	10
44	5	1FFFFFF	7FFFF3FF	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	0	11	00	10
45	6	1FFFFFF	7FFFE7FE	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	1	00	11	00
46	7	1FFFFFF	7FFFCFFC	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	0	00	00	11
47	8	1FFFFFF	7FFF9FF9	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	0	10	00	00
48	9	1FFFFFF	7FFF3FF3	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	0	01	10	00
49	10	1FFFFFF	7FFE7FE6	1FFFFFFFF	7FFFFFFFFF	1	1	1	1	1	10	01	10
50	11	1FFFFFE	7FFCFFCC	1FFFFFFFE	7FFFFFFFFF	1	1	1	1	0	10	10	01
51	12	1FFFFFC	7FF9FF99	1FFFFFFFC	7FFFFFFFFF	1	1	1	1	0	00	10	10
52	13	1FFFFF8	7FF3FF33	1FFFFFFF8	7FFFFFFFFF	1	1	1	1	0	11	00	10
53	14	1FFFFF0	7FE7FE67	1FFFFFFF0	7FFFFFFFFF	1	1	1	1	1	00	11	00
54	15	1FFFFE0	7FCFFCCF	1FFFFFFE1	7FFFFFFFFF	1	1	1	1	0	00	00	11
55	16	1FFFFC0	7F9FF99F	1FFFFFFC3	7FFFFFFFFF	1	1	1	1	0	10	00	00
56	17	1FFFF80	7F3FF33E	1FFFFFF87	7FFFFFFFFE	1	0	1	1	1	00	10	00
57	18	1FFFF00	7E7FE67C	1FFFFFF0F	7FFFFFFFFC	1	0	1	1	1	00	00	10
58	19	1FFFE01	7CFFCCF8	1FFFFFE1E	7FFFFFFFF8	1	1	1	1	0	10	00	00
59	20	1FFFC03	79FF99F0	1FFFFFC3C	7FFFFFFFF0	1	1	1	1	0	01	10	00
60	21	1FFF807	73FF33E0	1FFFFF878	7FFFFFFFE1	1	1	1	1	1	10	01	10
61	22	1FFF00F	67FE67C0	1FFFFF0F0	7FFFFFFFC3	1	1	1	1	0	10	10	01
62	23	1FFE01E	4FFCCF80	1FFFFE1E1	7FFFFFFF87	1	1	1	1	0	00	10	10
63	24	1FFC03C	1FF99F00	1FFFFC3C3	7FFFFFFF0F	1	1	1	1	0	11	00	10
64	25	1FF8078	3FF33E01	1FFFF8787	7FFFFFFE1E	1	1	1	1	1	00	11	00
65	26	1FF00F0	7FE67C02	1FFFF0F0F	7FFFFFFC3C	1	1	1	1	0	00	00	11
66	27	1FE01E1	7FCCF805	1FFFE1E1E	7FFFFFF878	1	1	1	1	0	10	00	00
67	28	1FC03C3	7F99F00A	1FFFC3C3C	7FFFFFF0F0	1	1	1	1	0	01	10	00
68	29	1F80787	7F33E015	1FFF87878	7FFFFFE1E1	1	0	1	1	0	10	01	10
69	30	1F00F0F	7E67C02A	1FFF0F0F0	7FFFFFC3C3	1	0	1	1	1	11	10	01
70	31	1E01E1E	7CCF8054	1FFE1E1E1	7FFFFF8787	1	1	1	1	1	01	11	10
71	32	1C03C3C	799F00A9	1FFC3C3C3	7FFFFF0F0F	1	1	1	1	1	01	01	11
72	33	1807878	733E0152	1FF878787	7FFFFE1E1E	1	0	1	1	0	00	01	01
73	34	100F0F0	667C02A5	1FF0F0F0F	7FFFFC3C3C	0	0	1	1	0	10	00	01
74	35	001E1E0	4CF8054B	1FE1E1E1F	7FFFF87878	0	1	1	1	1	00	10	00
75	36	003C3C1	19F00A96	1FC3C3C3F	7FFFF0F0F0	0	1	1	1	1	00	00	10
76	37	0078783	33E0152C	1F878787F	7FFFE1E1E1	0	1	1	1	1	01	00	00
77	38	00F0F07	67C02A59	1F0F0F0FF	7FFFC3C3C3	0	1	1	1	0	11	01	00
78	39	01E1E0E	4F8054B3	1E1E1E1FF	7FFF878787	0	1	1	1	0	11	11	01
79	40	03C3C1C	1F00A966	1C3C3C3FF	7FFF0F0F0F	0	0	1	1	1	11	11	11
80	41	0787838	3E0152CC	1878787FF	7FFE1E1E1E	0	0	1	1	1	11	11	11
81	42	0F0F070	7C02A598	10F0F0FFF	7FFC3C3C3C	1	0	0	1	1	11	11	11
82	43	1E1E0E0	78054B30	01E1E1FFF	7FF8787878	1	0	0	1	1	11	11	11
83	44	1C3C1C0	700A9660	03C3C3FFE	7FF0F0F0F0	1	0	0	1	1	11	11	11
84	45	1878380	60152CC0	078787FFC	7FE1E1E1E0	1	0	0	1	1	11	11	11
85	46	10F0700	402A5980	0F0F0FFF8	7FC3C3C3C0	0	0	1	1	1	11	11	11
86	47	01E0E00	0054B300	1E1E1FFF0	7F87878780	0	0	1	1	1	11	11	11
87	48	03C1C00	00A96601	1C3C3FFE0	7F0F0F0F00	0	1	1	0	1	11	11	11
88	49	0783800	0152CC03	18787FFC0	7E1E1E1E01	0	0	1	0	0	11	11	11

Sample Data

89	50	0F07000	02A59806	10F0FFF80	7C3C3C3C03	1	1	0	0	1	11	11	11
90	51	1E0E000	054B300D	01E1FFF00	7878787807	1	0	0	0	0	11	11	11
91	52	1C1C001	0A96601A	03C3FFE01	70F0F0F00F	1	1	0	1	0	10	11	11
92	53	1838003	152CC035	0787FFC03	61E1E1E01E	1	0	0	1	0	10	10	11
93	54	1070007	2A59806B	0F0FFF807	43C3C3C03C	0	0	1	1	0	01	10	10
94	55	00E000F	54B300D7	1E1FFF00F	0787878078	0	1	1	1	0	10	01	10
95	56	01C001F	296601AE	1C3FFE01F	0F0F0F00F1	0	0	1	0	1	00	10	01
96	57	038003F	52CC035C	187FFC03F	1E1E1E01E2	0	1	1	0	0	00	00	10
97	58	070007F	259806B8	10FFF807F	3C3C3C03C4	0	1	0	0	1	00	00	00
98	59	0E000FE	4B300D71	01FFF00FE	7878780788	1	0	0	0	1	00	00	00
99	60	1C001FD	16601AE2	03FFE01FD	70F0F00F10	1	0	0	1	0	01	00	00
100	61	18003FA	2CC035C5	07FFC03FB	61E1E01E21	1	1	0	1	0	11	01	00
101	62	10007F4	59806B8B	0FFF807F7	43C3C03C43	0	1	1	1	0	11	11	01
102	63	0000FE8	3300D717	1FFF00FEE	0787807887	0	0	1	1	1	11	11	11
103	64	0001FD0	6601AE2F	1FFE01FDC	0F0F00F10E	0	0	1	0	0	11	11	11
104	65	0003FA0	4C035C5F	1FFC03FB8	1E1E01E21D	0	0	1	0	0	11	11	11
105	66	0007F40	1806B8BE	1FF807F70	3C3C03C43B	0	0	1	0	0	11	11	11
106	67	000FE81	300D717C	1FF00FEE1	7878078877	0	0	1	0	0	11	11	11
107	68	001FD02	601AE2F8	1FE01FDC2	70F00F10EF	0	0	1	1	1	11	11	11
108	69	003FA05	4035C5F0	1FC03FB84	61E01E21DE	0	0	1	1	1	11	11	11
109	70	007F40B	006B8BE0	1F807F708	43C03C43BC	0	0	1	1	1	11	11	11
110	71	00FE816	00D717C0	1F00FEE11	0780788778	0	1	1	1	0	10	11	11
111	72	01FD02C	01AE2F81	1E01FDC23	0F00F10EF1	0	1	1	0	0	10	10	11
112	73	03FA059	035C5F02	1C03FB847	1E01E21DE3	0	0	1	0	1	10	10	10
113	74	07F40B3	06B8BE05	1807F708F	3C03C43BC7	0	1	1	0	0	01	10	10
114	75	0FE8166	0D717C0B	100FEE11E	780788778F	1	0	0	0	0	01	01	10
115	76	1FD02CD	1AE2F817	001FDC23D	700F10EF1F	1	1	0	0	1	11	01	01
116	77	1FA059B	35C5F02F	003FB847A	601E21DE3F	1	1	0	0	1	10	11	01
117	78	1F40B37	6B8BE05E	007F708F4	403C43BC7F	1	1	0	0	0	10	10	11
118	79	1E8166E	5717C0BD	00FEE11E9	00788778FF	1	0	0	0	1	10	10	10
119	80	1D02CDC	2E2F817A	01FDC23D3	00F10EF1FE	1	0	0	1	0	01	10	10
120	81	1A059B9	5C5F02F5	03FB847A6	01E21DE3FD	1	0	0	1	1	01	01	10
121	82	140B373	38BE05EB	07F708F4C	03C43BC7FB	0	1	0	1	1	11	01	01
122	83	08166E7	717C0BD7	0FEE11E98	0788778FF7	1	0	1	1	0	11	11	01
123	84	102CDCF	62F817AE	1FDC23D31	0F10EF1FEF	0	1	1	0	1	11	11	11
124	85	0059B9F	45F02F5C	1FB847A63	1E21DE3FDE	0	1	1	0	1	11	11	11
125	86	00B373E	0BE05EB9	1F708F4C7	3C43BC7FBC	0	1	1	0	1	11	11	11
126	87	0166E7D	17C0BD72	1EE11E98F	788778FF78	0	1	1	1	0	10	11	11
127	88	02CDCFB	2F817AE5	1DC23D31F	710EF1FEF1	0	1	1	0	0	10	10	11
128	89	059B9F7	5F02F5CA	1B847A63F	621DE3FDE2	0	0	1	0	1	10	10	10
129	90	0B373EF	3E05EB94	1708F4C7F	443BC7FBC4	1	0	0	0	1	10	10	10
130	91	166E7DF	7C0BD728	0E11E98FF	08778FF788	0	0	1	0	1	10	10	10
131	92	0CDCFBE	7817AE50	1C23D31FF	10EF1FEF10	1	0	1	1	1	01	10	10
132	93	19B9F7D	702F5CA1	1847A63FE	21DE3FDE21	1	0	1	1	0	10	01	10
133	94	1373EFB	605EB942	108F4C7FC	43BC7FBC43	0	0	0	1	1	00	10	01
134	95	06E7DF7	40BD7285	011E98FF8	0778FF7886	0	1	0	0	1	01	00	10
135	96	0DCFBEF	017AE50A	023D31FF0	0EF1FEF10D	1	0	0	1	1	00	01	00
136	97	1B9F7DF	02F5CA15	047A63FE1	1DE3FDE21A	1	1	0	1	1	10	00	01
137	98	173EFBF	05EB942B	08F4C7FC3	3BC7FBC434	0	1	1	1	1	00	10	00
138	99	0E7DF7F	0BD72856	11E98FF87	778FF78869	1	1	0	1	1	00	00	10
139	100	1CFBEFF	17AE50AC	03D31FF0F	6F1FEF10D3	1	1	0	0	0	01	00	00
140	101	19F7DFE	2F5CA159	07A63FE1E	5E3FDE21A7	1	0	0	0	0	00	01	00
141	102	13EFBFC	5EB942B3	0F4C7FC3C	3C7FBC434F	0	1	1	0	0	10	00	01
142	103	07DF7F8	3D728566	1E98FF878	78FF78869F	0	0	1	1	0	00	10	00
143	104	0FBEFF0	7AE50ACD	1D31FF0F0	71FEF10D3E	1	1	1	1	0	11	00	10
144	105	1F7DFE1	75CA159B	1A63FE1E1	63FDE21A7D	1	1	1	1	1	00	11	00
145	106	1EFBFC3	6B942B36	14C7FC3C3	47FBC434FB	1	1	0	1	1	11	00	11

Sample Data

146	107	1DF7F86	5728566D	098FF8786	0FF78869F7	1	0	1	1	0	00	11	00
147	108	1BEFF0C	2E50ACDB	131FF0F0C	1FEF10D3EF	1	0	0	1	0	11	00	11
148	109	17DFE19	5CA159B6	063FE1E19	3FDE21A7DF	0	1	0	1	1	01	11	00
149	110	0FBFC33	3942B36D	0C7FC3C32	7FBC434FBF	1	0	1	1	0	01	01	11
150	111	1F7F866	728566DB	18FF87865	7F78869F7E	1	1	1	0	0	00	01	01
151	112	1EFF0CC	650ACDB6	11FF0F0CB	7EF10D3EFC	1	0	0	1	0	10	00	01
152	113	1DFE199	4A159B6D	03FE1E196	7DE21A7DF9	1	0	0	1	0	00	10	00
153	114	1BFC333	142B36DB	07FC3C32C	7BC434FBF3	1	0	0	1	0	00	00	10
154	115	17F8666	28566DB6	0FF878659	778869F7E6	0	0	1	1	0	01	00	00
155	116	0FF0CCC	50ACDB6D	1FF0F0CB3	6F10D3EFCC	1	1	1	0	0	11	01	00
156	117	1FE1999	2159B6DA	1FE1E1966	5E21A7DF99	1	0	1	0	1	10	11	01
157	118	1FC3332	42B36DB5	1FC3C32CC	3C434FBF33	1	1	1	0	1	10	10	11
158	119	1F86664	0566DB6B	1F8786599	78869F7E67	1	0	1	1	1	01	10	10
159	120	1F0CCC8	0ACDB6D6	1F0F0CB33	710D3EFCCE	1	1	1	0	0	10	01	10
160	121	1E19991	159B6DAC	1E1E19666	621A7DF99D	1	1	1	0	1	11	10	01
161	122	1C33323	2B36DB58	1C3C32CCC	4434FBF33B	1	0	1	0	1	00	11	10
162	123	1866647	566DB6B0	187865999	0869F7E676	1	0	1	0	0	11	00	11
163	124	10CCC8F	2CDB6D60	10F0CB333	10D3EFCCEC	0	1	0	1	1	01	11	00
164	125	019991E	59B6DAC0	01E196666	21A7DF99D9	0	1	0	1	1	10	01	11
165	126	033323C	336DB580	03C32CCCD	434FBF33B3	0	0	0	0	0	00	10	01
166	127	0666478	66DB6B01	07865999A	069F7E6766	0	1	0	1	0	00	00	10
167	128	0CCC8F0	4DB6D603	0F0CB3334	0D3EFCCECD	1	1	1	0	1	01	00	00
168	129	19991E1	1B6DAC07	1E1966669	1A7DF99D9B	1	0	1	0	1	00	01	00
169	130	13323C3	36DB580E	1C32CCCD3	34FBF33B37	0	1	1	1	1	10	00	01
170	131	0664786	6DB6B01C	1865999A7	69F7E6766F	0	1	1	1	1	00	10	00
171	132	0CC8F0D	5B6D6039	10CB3334F	53EFCCECDF	1	0	0	1	0	00	00	10
172	133	1991E1A	36DAC073	01966669E	27DF99D9BF	1	1	0	1	1	01	00	00
173	134	1323C35	6DB580E6	032CCCD3C	4FBF33B37E	0	1	0	1	1	00	01	00
174	135	064786A	5B6B01CD	065999A78	1F7E6766FC	0	0	0	0	0	11	00	01
175	136	0C8F0D5	36D6039B	0CB3334F0	3EFCCECDF9	1	1	1	1	1	00	11	00
176	137	191E1AA	6DAC0737	1966669E1	7DF99D9BF3	1	1	1	1	0	00	00	11
177	138	123C354	5B580E6E	12CCCD3C3	7BF33B37E7	0	0	0	1	1	00	00	00
178	139	04786A9	36B01CDC	05999A787	77E6766FCE	0	1	0	1	0	01	00	00
179	140	08F0D53	6D6039B8	0B3334F0E	6FCCECDF9C	1	0	1	1	0	11	01	00
180	141	11E1AA6	5AC07370	166669E1D	5F99D9BF38	0	1	0	1	1	10	11	01
181	142	03C354C	3580E6E0	0CCCD3C3A	3F33B37E70	0	1	1	0	0	10	10	11
182	143	0786A99	6B01CDC0	1999A7875	7E6766FCE1	0	0	1	0	1	10	10	10
183	144	0F0D533	56039B81	13334F0EB	7CCECDF9C2	1	0	0	1	0	01	10	10
184	145	1E1AA66	2C073703	06669E1D6	799D9BF385	1	0	0	1	1	01	01	10
185	146	1C354CC	580E6E06	0CCD3C3AC	733B37E70B	1	0	1	0	1	11	01	01
186	147	186A998	301CDC0C	199A78759	66766FCE17	1	0	1	0	1	10	11	01
187	148	10D5331	6039B818	1334F0EB2	4CECDF9C2F	0	0	0	1	1	01	10	11
188	149	01AA662	40737031	0669E1D65	19D9BF385E	0	0	0	1	0	01	01	10
189	150	0354CC5	00E6E063	0CD3C3ACB	33B37E70BD	0	1	1	1	0	00	01	01
190	151	06A998A	01CDC0C6	19A787596	6766FCE17B	0	1	1	0	0	10	00	01
191	152	0D53315	039B818C	134F0EB2C	4ECDF9C2F6	1	1	0	1	1	00	10	00
192	153	1AA662A	07370318	069E1D659	1D9BF385ED	1	0	0	1	0	00	00	10
193	154	154CC54	0E6E0630	0D3C3ACB3	3B37E70BDB	0	0	1	0	1	00	00	00
194	155	0A998A8	1CDC0C60	1A7875967	766FCE17B6	1	1	1	0	1	01	00	00
195	156	1533151	39B818C0	14F0EB2CE	6CDF9C2F6C	0	1	0	1	1	00	01	00
196	157	0A662A3	73703180	09E1D659D	59BF385ED8	1	0	1	1	1	10	00	01
197	158	14CC547	66E06301	13C3ACB3A	337E70BDB0	0	1	0	0	1	11	10	00
198	159	0998A8E	4DC0C602	078759675	66FCE17B61	1	1	0	1	0	01	11	10
199	160	133151D	1B818C05	0F0EB2CEB	4DF9C2F6C2	0	1	1	1	0	01	01	11
200	161	0662A3B	3703180B	1E1D659D6	1BF385ED85	0	0	1	1	1	11	01	01
201	162	0CC5477	6E063017	1C3ACB3AC	37E70BDB0B	1	0	1	1	0	11	11	01
202	163	198A8EF	5C0C602F	187596759	6FCE17B617	1	0	1	1	0	10	11	11