RFCOMM

Bluetooth® Test Specification

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- **Revision Date**: 2016-12-13
- **Group Prepared By**: BTI
- **Feedback Email**: bti-main@bluetooth.org

**Abstract:**
This document defines the TSS and TC for the RFCOMM Protocol.
### Revision History

<table>
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<th>Date</th>
<th>Comments</th>
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<tr>
<td>0.92</td>
<td>2002-05-06</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
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<td>Under each subgroup was BV and BI objectives repeated exactly as they were laid out in 4.3.2 and 4.3.3. Deemed redundant, these repetitions were removed</td>
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<tr>
<td></td>
<td></td>
<td>A reference to the test sub group 5. 2.12.4 N/ABI Test Purposes contained no test content and was removed</td>
</tr>
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<td></td>
<td>Under 5.1.1 TP Definition Conventions, the legacy table was removed and instead replaced by TP Definition Conventions in Test Strategy &amp; Terminology Overview, Volume 1, Part A.</td>
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<td>1.1.1r0</td>
<td>2006-11</td>
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<td>TSE: 1914: TP/RFC/BV-09-C and TP/RFC/BV-10-C: remove the Flow Control = 0 on the first two MSC messages.</td>
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<td>1.1.1r1</td>
<td>2006-11-22</td>
<td>TSE 1536: Change MSC parameter negotiations for test case RFC/BV-15-C</td>
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<td></td>
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<td>Move MFCs to their respective test cases</td>
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<td>1.1.1</td>
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<td>2011-11-11</td>
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<td>2012-02-08</td>
<td>TSE 2034: Removal of six test cases. TP/RFC/BV-20-C</td>
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<td>TP/RFC/BV-12-C</td>
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<td>Prepare for publication.</td>
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<td></td>
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<td></td>
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### Revision History

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1 Scope

This Bluetooth document is the Protocol Conformance Test Specification for the RFCOMM Protocol and contains the Test Suite Structure and Test Cases to test the Bluetooth RFCOMM Protocol.

The objective of this document is to provide a basis for the conformance protocol tests for Bluetooth devices giving a high probability of air interface interoperability between different manufacturers' Bluetooth devices.

The general concepts and conformance testing principles as defined in ISO/IEC 9646-1 and ISO/IEC 9646-2 which are part of the OSI Conformance Testing Methodology and Framework (CTMF) are used as a basis for the testing of Bluetooth protocol and profile implementation.
2 References, Definitions, and Abbreviations

2.1 References
This Bluetooth document incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

[1] Specification of the Bluetooth System; RFCOMM with TS07.10 or later
[4] ICS Proforma for RFCOMM Profile
[5] Test Strategy and Terminology Overview
[6] Bluetooth Core Specification v2.0 or later
[7] RFCOMM Implementation eXtra Information for Testing (IXIT)

2.2 Definitions
For the purpose of this Bluetooth document, the definitions from [1], [2], [3], and [5] apply.

2.3 Acronyms and Abbreviations
For the purpose of this Bluetooth document, the abbreviations from [1], [2], [3], and [5] apply.
3  Test Suite Structure (TSS)

3.1  Overview

The RFCOMM Protocol defines the protocols and procedures that shall be used by devices using Bluetooth for setting up virtual serial cable emulation (like RS232) between two peer devices.

Figure 3.1 shows the RFCOMM Protocol in relation to other Bluetooth protocols.

![Diagram of RFCOMM in the Bluetooth Stack]

The Bluetooth Profiles specify two typical configurations (roles) of devices:

- Device A (DevA) - This device takes initiative to form a connection to another device.
  - (DevA is Initiator according to GAP [3])
- Device B (DevB) - This device waits for another device to take initiative to connect.
  - (DevB is Acceptor according to GAP [3])

3.2  Test Suite Structure

Figure 2 shows the Test Suite Structure for the RFCOMM Protocol Conformance Tests.

**RFCOMM**

- Initialize RFCOMM session
- Shutdown RFCOMM session
- Establish DLC
Disconnect DLC
Sending RS 232 control signals
Transfer information
Test command
Aggregate flow control
Remote Line Status indication
DLC parameter negotiation
Remote port negotiation

*Figure 3.2: TSS for the RFCOMM Protocol*

### 3.3 Test Groups

The test groups are organized in 2 levels. The first level defines the protocol groups. The second level contains the standard ISO subgroups BV and BI.

#### 3.3.1 RFCOMM

This group handles testing of features from RFCOMM to transport user data, modem control signals and configuration commands. The test cases found in this group are based on the RFCOMM Protocol specification together with the TS07.10 specification.

The test group objective is to verify the correct implementation of the RFCOMM services.

#### 3.3.2 Valid Behavior (BV) Tests

This type of testing provides testing to verify that the IUT reacts in conformity with the Bluetooth specification, after receipt or exchange of a valid PDU. Valid PDUs means that the exchange of messages and the content of the exchanged messages are considered as valid.

The test subgroup objective is to verify the initialization procedure of an RFCOMM session. The IUT is a device taking on a role as DevA and/or DevB. The IUT may act as either Master or Slave.

#### 3.3.3 Invalid Behavior (BI) Tests

This type of testing provides testing to verify that the IUT reacts in conformity with the Bluetooth standard, after receipt of a syntactically or semantically invalid PDU.

The test subgroup objective is to test the behavior of the IUT in relation to syntactically and contextual correct behavior of the test system.
4 Test Cases (TC)

4.1 Introduction

4.1.1 Test Case Identification Conventions

Test cases shall be assigned unique identifiers per the conventions in [5]. The convention used here is 
<spec abbreviation>/<IUT role>/<class>/<feat>/<func>/<subfunc>/<cap>/<xx>-<nn>-<y>.

Bolded ID parts shall appear in the order prescribed. Non-bolded ID parts (if applicable) shall appear 
between the bolded parts. The order of the non-bolded parts may vary from test specification to test 
specification, but shall be consistent within each individual test specification.

<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Feature Identifier &lt;feat&gt;</th>
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<tr>
<td>RFCOMM</td>
<td>RFCOMM Protocol</td>
</tr>
<tr>
<td>DEVA</td>
<td>Device A (Initiator) Role</td>
</tr>
<tr>
<td>DEVB</td>
<td>Device B (Acceptor) Role</td>
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<tr>
<td>DEVA-DEVB</td>
<td>The role of the IUT does not affect the test procedure. Test Case is role agnostic.</td>
</tr>
<tr>
<td>RFC</td>
<td>RFCOMM Function</td>
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Table 4.1: RFCOMM TC Feature Naming Convention

4.1.2 Conformance

When conformance is claimed, all capabilities indicated as mandatory for this Specification shall be 
supported in the specified manner (process-mandatory). This also applies for all optional and conditional 
capabilities for which support is indicated. All mandatory capabilities, and optional and conditional 
capabilities for which support is indicated, are subject to verification as part of the Bluetooth Qualification 
Program.

The Bluetooth Qualification Program may employ tests to verify implementation robustness. The level of 
implementation robustness that is verified varies from one Specification to another and may be revised for 
cause based on interoperability issues found in the market.

Such tests may verify:

- That claimed capabilities may be used in any order and any number of repetitions that is not excluded 
  by the Specification, OR
- That capabilities enabled by the implementations are sustained over durations expected by the use 
  case, OR
- That the implementation gracefully handles any quantity of data expected by the use case, OR
- That in cases where more than one valid interpretation of the Specification exist, the implementation 
  complies with at least one interpretation and gracefully handles other interpretations OR
- That the implementation is immune to attempted security exploits.
A single execution of each of the required tests is required in order to constitute a pass verdict. However, it is noted that in order to provide a foundation for interoperability, it is necessary that a qualified implementation consistently and repeatedly pass any of the applicable tests.

In any case, where a member finds an issue with the Test Plan Generator, the Test Case as described in the Test Specification, or with the Test System utilized, the Member is required to notify the responsible party via an errata request such that the issue may be addressed.

4.1.3 General Assumptions

No more than one ACL link exists between the Lower Tester and the IUT.

Only one connection at a time and consequently only a point-to-point configuration is considered.

Support of one-slot packets is required to ensure data rates up to 128 kbps.

There are no fixed master slave roles.

DevA and DevB can be either a Data Circuit Endpoint (DCE) or a Data Terminal Endpoint (DTE).

The role of DevA/DevB taken on by the IUT does not matter to achieve a pass verdict for some test cases for this Protocol as indicated in the test purpose and is specified in the test case identifier for role agnostic tests as detailed in Table 4.1. The role of the IUT/Lower Tester for these tests is specified in the IXIT [7] in order to enable the correct test environment conditions to provoke the Lower Tester.

4.1.4 Pass/Fail Verdict Conventions

Each test case has an Expected Outcome section, which outlines all the detailed pass criteria conditions that shall be met by the IUT to merit a Pass Verdict.

The convention in this test specification is that, unless there are a specific set of fail conditions outlined in the test case, the IUT fails the test case as soon as one of the pass criteria conditions cannot be met. If this occurs the outcome of the test shall be the Fail Verdict.

4.2 RFCOMM

Test group objectives:

4.2.1 Initialize RFCOMM Session

Test subgroup objective is to verify the initialization procedure of an RFCOMM session. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

4.2.1.1 RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate]

• Test Purpose

  Verify that the IUT initializes an RFCOMM session and starts the RFCOMM multiplexer on the control channel DLCI0. The IUT is a device taking on the role as DevA. The Lower Tester is Acceptor.

• Reference

  [1] 5.2.1

  [2] 5.3.1
• **Initial Condition**

An ACL link has been established between the IUT and the Lower Tester and the IUT has done an SDP query to get the RFCOMM Server channel number.

• **Test Procedure**

```
<table>
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<tr>
<th>Lower Tester</th>
<th>IUT</th>
<th>Upper Tester</th>
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<tr>
<td>ACL-Link Setup successful</td>
<td>SDP query from IUT to get the RFCOMM Server channel number</td>
<td>RFCOMM_DLC_establishment_request</td>
</tr>
<tr>
<td>IUT to create an L2CAP data channel for RFCOMM</td>
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<td></td>
</tr>
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</table>
```

Figure 4.1: RFCOMM/DEV/A/RFC/BV-01-C [Initialize RFCOMM Session – Initiate]

• **Test Condition**

It must be possible to send an establishment request from the Upper Tester to initiate an RFCOMM session.

• **Expected Outcome**

Pass verdict

The IUT transmits an SABM command with the P-bit set to 1 to establish the dedicated control channel DLCI0.

The FCS field is calculated correctly on the contents of the address, control and length field.

• **Notes**

The value of the T1 timer of the IUT can be taken from the IXIT. The IUT should initiate the baseband link unless already established.

4.2.1.2 RFCOMM/DEV/B/RFC/BV-02-C [Initialize RFCOMM Session - Respond]

• **Test Purpose**
Verify that the IUT responds successfully when the Lower Tester initializes an RFCOMM session and starts the RFCOMM multiplexer on the control channel DLCI0. The IUT is a device taking on the role as DevB. The Lower Tester is Initiator.

- Reference
  [1] 5.2.1
  [2] 5.3.1

- Initial Condition
  An L2CAP connection-oriented data channel has been established and the IUT is in the OPEN state.
  The RFCOMM Server Channel number can be taken from the IXIT.

- Test Procedure

![Diagram](image)

Figure 4.2: RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session – Respond]

- Expected Outcome
  Pass verdict

  The IUT sends a UA response with the F-bit set to 1 upon receiving an SABM command from the Lower Tester to establish the dedicated control channel DLCI0.

  The FCS field is calculated correctly on the contents of the address, control and length field.

- Notes
  The Acknowledgement Timer T1 has a value in the interval 10 - 60 seconds. The test case uses the maximum value. The Lower Tester should initiate the baseband link unless already established.
4.2.2 Shutdown RFCOMM Session

Test subgroup objective is to verify the shutdown procedure of an RFCOMM session. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

4.2.2.1 RFCOMM/DEVA-DEVB/RFC/BV-03-C [Shutdown RFCOMM Session – Lower Tester]

- Test Purpose
  Verify that the IUT responds successfully when the Lower Tester closes the RFCOMM session. The IUT may act as either Master or Slave. The Lower Tester initiates the test procedure.

- Reference
  [1] 5.2.2
  [2] 5.3.4

- Initial Condition
  An RFCOMM session shall be initiated between the IUT and the Lower Tester.
  
  In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session. See RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate].
  
  In case the IUT is a device taking on the role as DevB, the Lower Tester has to initiate the RFCOMM session. See RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session - Respond].

- Test Procedure

![Diagram of RFCOMM session shutdown procedure]

**Figure 4.3: RFCOMM/DEVA-DEVB/RFC/BV-03-C [Shutdown RFCOMM Session – Lower Tester]**
• Expected Outcome

Pass verdict

The IUT sends a UA response with the F-bit set to 1 upon receiving a DISC command from the Lower Tester to release the dedicated control channel DLCI0.

The FCS field is calculated correctly on the contents of the address, control and length field.

Inconclusive verdict

The IUT sends a DM response upon receiving a DISC command from the Lower Tester.

• Notes

The Acknowledgement Timer T1 has a value in the interval 10 – 60 seconds. The test case uses the maximum value.

4.2.2.2 RFCOMM/DEVA-DEVB/RFC/BV-04-C [Shutdown RFCOMM Session - IUT]

• Test Purpose

Verify that the IUT can request to close the RFCOMM session. The IUT may act as either Master or Slave.

Applicable only for IUTs supporting a facility for close down the whole multiplexer session by first sending the DISC command.

• Reference

[1] 5.2.2

[2] 5.3.4

• Initial Condition

An RFCOMM session shall be initiated between the IUT and the Lower Tester.

In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate].

In case the IUT is a device taking on the role as DevB, the Tester has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond].

• Test Procedure
Figure 4.4: RFCOMM/DEVA-DEVB/RFC/BV-04-C [Shutdown RFCOMM Session – IUT]

- **Test Condition**
  It must be possible to send a close request from the Upper Tester to close down an existing RFCOMM session.

- **Expected Outcome**
  **Pass verdict**
  The IUT transmits a DISC command with the P-bit set to 1 to release the dedicated control channel DLCI0.
  The FCS field is calculated correctly on the contents of the address, control and length field.

- **Notes**
  The value of the T1 timer of the IUT can be taken from the IXIT.
4.2.3 Establish DLC

Test subgroup objective is to verify the establishment procedure of a data link connection (DLC). The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

4.2.3.1 RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate]

- Test Purpose
  Verify that the IUT establishes a new data link connection on the RFCOMM session. The IUT is a device taking on the role as DevA. The Lower Tester is Acceptor.

- Reference
  [1] 5.2.1
  [2] 5.4.1

- Initial Condition
  See Initial Condition from RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate].

  The Test RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate] should have been performed successfully.

- Test Procedure
**Test Condition**

It must be possible to send an establishment request from the Upper Tester to build up a DLC.

For the DLC a DLCI in the range 2 to 61 is assignable. A direction bit D is used in conjunction with the RFCOMM Server channel number SCN.
The value of the T1 timer of the IUT should be taken from the IXIT.

The value of K bits indicates the initial credits issued by the IUT and should be taken from the IXIT.

• Expected Outcome

  Pass verdict

  The IUT transmits a PN command with the address field containing the DLCI value associated with the desired connection. The CL-bits must be set to 0x0F and the I-bits, T-bits and NA-bits must all be set to 0.

  The IUT transmits an SABM command with the P-bit set to 1 to establish a data link connection. The address field contains the DLCI value associated with the desired connection.

  The FCS field is calculated correctly on the contents of the address, control and length field.

  K bits indicate the initial credits issued by the IUT.

• Notes

  The IUT should initiate the baseband link unless already established.

4.2.3.2  RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond]

• Test Purpose

  Verify that the IUT responds successfully when the Lower Tester establishes a data link connection on the RFCOMM session. The IUT is a device taking on the role as DevB. The Lower Tester is Initiator.

• Reference

  [1] 5.2.1

  [2] 5.4.1

• Initial Condition

  Perform RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session - Respond].

  The RFCOMM Server Channel number shall be taken from the IXIT declared by the manufacturer.

• Test Procedure
### Test Condition

For the DLC a DLCI in the range 2 to 61 is assignable. A direction bit D is used in conjunction with the RFCOMM Server channel number SCN.

The value of K bits indicates the initial credits issued by the IUT and should be taken from the IXIT.

### Expected Outcome

**Pass verdict**

The IUT sends a PN response with CL-bits set to 0x0E and I-bits, T-bits and NA-bits all set to zero.

And the IUT sends a UA response with the F-bit set to 1 upon receiving an SABM command from the Tester to establish a data link connection.

The FCS field is calculated correctly on the contents of the address, control and length field. K bits indicate the initial credits issued by the IUT.
• Notes

The Acknowledgement Timer T1 has a value in the interval 60 – 300 seconds. The test case uses the maximum value. The Lower Tester should initiate the baseband link unless already established.

4.2.4 Disconnect DLC

Test subgroup objective is to verify the shutdown procedure of an RFCOMM session. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

4.2.4.1 RFCOMM/DEVA-DEVB/RFC/BV-07-C [Disconnect DLC by IUT]

• Test Purpose

Verify that the IUT can request to close the data link connection on the RFCOMM session. The IUT may act as either Master or Slave.

• Reference

[1] 5.2

[2] 5.4.2

• Initial Condition

An RFCOMM session shall be initiated and a data connection shall be established between the IUT and the Lower Tester.

In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate].

In case the IUT is a device taking on the role as DevB, the Tester has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond].

• Test Procedure
Figure 4.7: RFCOMM/DEVA-DEVB/RFC/BV-07-C [Disconnect DLC by IUT]

• Test Condition
  It must be possible to send a release request from the Upper Tester to release an existing data link connection.

• Expected Outcome
  Pass verdict
  The IUT transmits a DISC command with the P-bit set to 1 to release the DLC.
  The FCS field is calculated correctly on the contents of the address, control and length field.

4.2.4.2  RFCOMM/DEVA-DEVB/RFC/BV-08-C [Disconnect DLC by Lower Tester]

• Test Purpose
  Verify that the IUT responds successfully when the Lower Tester closes the data link connection on the RFCOMM session. The IUT may act as either Master or Slave. The Lower Tester initiates the test procedure.

• Reference
  [1] 5.2
  [2] 5.4.2

• Initial Condition
An RFCOMM session shall be initiated and a data connection shall be established between the IUT and the Lower Tester.

In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate].

In case the IUT is a device taking on the role as DevB, the Tester has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond].

- **Test Procedure**

  ![Diagram](image)

  **Figure 4.8: RFCOMM/DEVA-DEVB/RFC/BV-08-C [Disconnect DLC by Lower Tester]**

- **Expected Outcome**

  **Pass verdict**

  The IUT sends a UA response with the F-bit set to 1 upon receiving a DISC command from the Lower Tester to release the data link connection.

  The FCS field is calculated correctly on the contents of the address, control and length field.

- **Notes**

  The Acknowledgement Timer T1 has a value in the interval 10-60 seconds. The test case uses the maximum value.
4.2.5 **Test Command**

Test subgroup objective is to verify the reaction of a test command sent by the Lower Tester on the multiplexer control channel. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

4.2.5.1 **RFCOMM/DEVA-DEVB/RFC/BV-11-C [Respond to Test Command]**

- **Test Purpose**
  
  Verify that the IUT can reply a test command sent from the Tester. The IUT may act as either Master or Slave. The Tester initiates the test procedure.

- **Reference**
  
  [1] 4.3

  [2] 5.4.6.3.4

- **Initial Condition**

  An RFCOMM session shall be initiated between the IUT and the Lower Tester.

  In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session. See RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate].

  In case the IUT is a device taking on the role as DevB, the Lower Tester has to initiate the RFCOMM session. See RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session - Respond].

- **Test Procedure**

  ![Diagram](image)

**Figure 4.9: RFCOMM/DEVA-DEVB/RFC/BV-11-C [Respond to Test Command]**
The verification pattern can contain from one up to 125 value bytes. The verification pattern length shall be provided by IXIT and shall be chosen by the Lower Tester. The bit settings inside the value bytes shall be selected randomly by the Lower Tester.

- Expected Outcome
  
  **Pass verdict**

  The IUT responds with a Test response with the verification pattern the Lower Tester has sent in its Test command.

  The FCS field is calculated correctly and only from the address and the control field.

  The P-bit inside the control field is set to 0.

- Notes
  
  The verification pattern is defined to be up to 125 bytes long. Thus this upper limit is to ensure that the information field of the UIH frame carrying multiplexer commands never becomes bigger than the default value for N1.

### 4.2.6 Remote Line Status Indication

Test subgroup objective is to verify the information procedure of any changes in the RS232 line status. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

#### 4.2.6.1 RFCOMM/DEVA-DEVB/RFC/BV-13-C [Remote Line Status Indication – Lower Tester]

- **Test Purpose**
  
  Verify that the IUT responds to a Remote Line Status Command from the Lower Tester. The IUT may act as either Master or Slave. The Lower Tester initiates the test procedure.

- **Reference**
  
  [1] 5.5.2

  [2] 5.4.6.3.10

- **Initial Condition**
  
  An RFCOMM session shall be initiated and a data connection shall be established between the IUT and the Lower Tester.

  In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate].

  In case the IUT is a device taking on the role as DevB, the Tester has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond].

- **Test Procedure**
**Expected Outcome**

Pass verdict

The IUT responds with an RLS response containing the values it received upon indication from the Lower Tester.

The FCS field is calculated correctly and only from the address and the control field.

The P-bit inside the control field is set to 0.

Inconclusive verdict

The IUT responds with an RLS command containing the values it received upon indication from the Lower Tester.

The IUT sends a DISC command.

---

**Figure 4.10: RFCOMM/DEVA-DEVB/RFC/BV-13-C [Remote Line Status Indication – Lower Tester]**
4.2.6.2 RFCOMM/DEVA-DEVB/RFC/BV-14-C [Remote Line Status Indication – IUT]

- **Test Purpose**
  
  Verify that the IUT sends a Remote Line Status Command upon a change of the remote port line status. The IUT may act as either Master or Slave.

  Applicable only for IUTs with a physical port supporting the service.

- **Reference**
  
  [1] 5.5.2
  
  [2] 5.4.6.3.10

- **Initial Condition**
  
  An RFCOMM session shall be initiated and a data connection shall be established between the IUT and the Lower Tester.

  From the Tester point of view the default port settings shall apply that means the data bits are followed by one stop bit (S-bit = 0). If the IUT sends an RPN command the Tester shall accept the Port Value Octet bits by sending the parameter mask set to 1.

  In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate].

  In case the IUT is a device taking on the role as DevB, the Tester has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond].

- **Test Procedure**
ACL-Link-Setup successful
SDP query from IUT if a DevA to get the RFCOMM Server channel number
L2CAP data channel established
RFCOMM control channel at DLCI 0 and
RFCOMM data link connection on DLCI n established

Command the IUT to send data
and
at the physical serial port there
must be a signal generator
sending a corrupted character
(data bits without a Stop-bit)

Both the IUT and the Lower Tester
use the MSC command
to notify each other of their V.24 control
signals prior sending user data.

Verify that the IUT sends
the correct values for L1 to L4
indicating a Framing Error.

Within each UHI frame the P-bit
must be set to 0

Figure 4.11: RFCOMM/DEVA-DEVB/RFC/BV-14-C [Remote Line Status Indication – IUT]

- Test Condition
  A signal generator is needed to provide the physical serial port with a data stream.

- Expected Outcome
  Pass verdict
The IUT sends a Remote Line Status command upon receiving a data character not terminated with a stop bit. The RLS command indicates the Line Status with the RLS octet field set according to a bit setting of L1=1, L2=0, L3=0 and L4=1.

The FCS field is calculated correctly and only from the address and the control field.

The P-bit inside the control field is set to 0.

4.2.7  DLC Parameter Negotiations
Test subgroup objective is to verify the parameter negotiation procedure for the DLC adjustment. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave

4.2.7.1  RFCOMM/DEVA-DEVB/RFC/BV-15-C [DLC Parameter Negotiation – Lower Tester]

• Test Purpose
Verify that the IUT negotiates DLC parameters upon request from the Lower Tester. The IUT may act as either Master or Slave. The Lower Tester initiates the test procedure.

• Reference
[1] 5.5.3
[2] 5.4.6.3.1

• Initial Condition
The MTU of the L2CAP layer has to be configured such that the requested N1 fits.

An RFCOMM session shall be initiated between the IUT and the Lower Tester.

In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session. See RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate].

In case the IUT is a device taking on the role as DevB, the Lower Tester has to initiate the RFCOMM session. See RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session - Respond].

• Test Procedure
If the IUT is DevA it shall issue a PN command. If the IUT is DevB the Lower Tester will issue a PN command.

- Test Condition
  The manufacturer shall declare with IXIT:

  The maximum frame size N1.
Acceptable values for the UUID for a service record that will yield a DLCI for which a connection can be accepted.

• **Expected Outcome**

  **Pass verdict**

  The IUT responds with a PN response upon receiving a PN command from the Lower Tester. In that the I-bits, T-bits and NA-bits must be set to zero. CL-bits must be set to 0x0E.

  The FCS field is calculated correctly and only from the address and the control field.

  The P-bit inside the control field is set to 0.

• **Notes**

  Before a DLC is set up there must be an agreement on the parameters to be used for that DLC. These parameters are determined by DLC parameter negotiation.

  The following parameters are fixed within RFCOMM:

  The I-bits are all set to zero, which means that UIH frames are used for carrying information.

  The T-bits are all set to zero and define the acknowledgement timer, which is not negotiable in RFCOMM.

  The NA-bits are all set to zero and therefore the maximum number of retransmissions N2 is set to 0.

  The CL-bits are set to 0x0F by the Lower Tester indicating that credit base flow control is supported.

  The following parameters are not fixed within RFCOMM:

  The K-bits indicate the initial number of credits issued in the PN request and in the PN response.

  It is recommended that implementations support connections with N1 < N1_{IUT}. In the very unlikely case that an implementation cannot accept a N1 < N1_{IUT}, the IUT may respond with a DM frame. An IUT (as DevA) may respond with a DM frame to the Lower Tester's PN command with the unacceptable value N1 > N1_{IUT}.

### 4.2.8 Remote Port Negotiations

Test subgroup objective is to verify the negotiation procedure for the remote port adjustment. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

#### 4.2.8.1 RFCOMM/DEVA-DEVB/RFC/BV-17-C [Remote Port Negotiation – Lower Tester]

• **Test Purpose**

  Verify that the IUT negotiates remote port communication settings upon inquiry from the Lower Tester. The IUT may act as either Master or Slave. The Lower Tester initiates the test procedure.

• **Reference**

  [1] 5.5.1
### Initial Condition

An RFCOMM session shall be initiated between the IUT and the Lower Tester.

In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session. See RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate].

In case the IUT is a device taking on the role as DevB, the Lower Tester has to initiate the RFCOMM session. See RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session - Respond].

### Test Procedure

![Diagram showing ACL-Link setup and SDP query]

- **ACL-Link-Setup successful**
- **SDP query from IUT if a DevA to get the RFCOMM Server channel number**
- **L2CAP data channel established**
- **RFCOMM control channel at DLCI 0 established**

- **RPN (DLCI, Port Value Octets)**
  - **DLCI-bits** = (D-bits) + SCN-bits
  - **Port Value Octets** = B1-B8, D1, D2, S, P, PT1, PT2, FLC1-FLC6, XON1-XON8, XOF1-XOF8 set according to the acceptable Port parameters of the IUT (IXIT statement)
  - PM1-PM16 set to 1 (= change) except PM8 set to 0 (reserved)

- **RPN (DLCI, Port Value Octets)**
  - Port Value Octets include
  - PM1-PM14 set to 1 (= accepted proposal, new values are used) except PM8 set to 0 (reserved)
  - PM15 - PM16 ignored by the Lower Tester

*Figure 4.13: RFCOMM/DEVA-DEVB/RFC/BV-17-C [Remote Port Negotiation – Lower Tester]*

### Test Condition

The manufacturer shall declare with an IXIT the following parameters with acceptable values:
- baud rate (2400 bit/s - 230400 bit/s)
- number of data bits (5 bits - 8 bits)
- number of stop bits (1 stop bit (S=0) or 1,5 stop bits (S=1))
- parity (no or yes)
- parity type (odd, even, mark or space)
- flow control (XON/XOFF on input, XON/XOFF on output, RTR on input, RTR on output, RTC on input, RTC on output)
- XON character
- XOFF character
- The UUID for a service record that will yield a DLCI for which a connection can be accepted.

• Expected Outcome
  
  **Pass verdict**

  The IUT responds with an RPN response with the parameter mask set to 1 for all parameters that means it accepts all parameters proposed by the Lower Tester (bit 8 is reserved and shall be set to 0 by the IUT. Bits 15 and 16 are ignored by the Lower Tester).

  The FCS field is calculated correctly and only from the address and the control field.

  The P-bit inside the control field is set to 0.

4.2.8.2  RFCOMM/DEVA-DEVB/RFC/BV-19-C [Remote Port Negotiation – Request]

• Test Purpose
  
  Verify that the IUT responds with its current port values setting upon request from the Lower Tester. The IUT may act as either Master or Slave. The Lower Tester initiates the test procedure.

• Reference
  
  [1] 5.5.1
  
  [2] 5.4.6.3.9

• Initial Condition
  
  An RFCOMM session shall be initiated between the IUT and the Lower Tester.

  In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session. See RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate].

  In case the IUT is a device taking on the role as DevB, the Lower Tester has to initiate the RFCOMM session. See RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session - Respond].

• Test Procedure
4.2.9 Credit Based Flow Control

Test subgroup objective is to verify the flow control using credits. The IUT is a device taking on a role as DevA and/or as DevB. The IUT may act as either Master or Slave.

Figure 4.14: RFCOMM/DEVA-DEVB/RFC/BV-19-C [Remote Port Negotiation – Request]

- Test Condition
  
The manufacturer shall declare with a IXIT:
  
  - Acceptable values for the UUID for a service record that will yield a DLCI for which a connection can be accepted

- Acceptable values for the baud rate

- Expected Outcome
  
  Pass verdict

  The IUT interprets the Lower Tester's RPN command including only one value byte as a request and responds with its current Port Values setting.

  The FCS field is calculated correctly and only from the address and the control field.

  The P-bit inside the control field is set to 0.
4.2.9.1 RFCOMM/DEVA-DEVB/RFC/BV-21-C [Credit Based Flow Control]

- **Test Purpose**
  
  Verify that the IUT handles flow control correctly when the Lower Tester controls the data by issuing credits. The IUT may act as either Master or Slave. The Lower Tester initiates the test procedure.

- **Reference**
  
  [1] 6.5

- **Initial Condition**
  
  An RFCOMM session shall be initiated and a data connection shall be established between the IUT and the Lower Tester.

  In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate].

  In case the IUT is a device taking on the role as DevB, the Tester has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond].

- **Test Procedure**
Figure 4.15: RFCOMM/DEVA-DEVB/RFC/BV-21-C [Credit Based Flow Control]

- Test Condition
  It must be guaranteed that the IUT can send data if requested via the Upper Tester

- Expected Outcome
Pass verdict

The IUT sends a number of UIH frames containing user data according to the initial amount of credits issued by the Lower Tester. Then, the IUT stops sending data until a UIH frame issuing more credits is received.

• Notes
When credit based flow control is being used, the FC bit in the MSC command has no meaning and should be set to zero.

4.2.9.2 RFCOMM/DEVA-DEVB/RFC/BV-22-C [Transfer Information]

• Test Purpose
Verify that the IUT starts transmitting user data on the data link connection. The IUT may act as either Master or Slave.

• Reference
[1] 4.2

• Initial Condition
An RFCOMM session shall be initiated and a data connection shall be established between the IUT and the Lower Tester. The Lower Tester gives initial credits to the IUT in the PN frame transmitted when DLCI is established.

In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVA/RFC/BV-05-C [Establish DLC – Initiate].

In case the IUT is a device taking on the role as DevB, the Tester has to initiate the RFCOMM session and to establish the DLC. See RFCOMM/DEVB/RFC/BV-06-C [Establish DLC – Respond].

• Test Procedure
Sending U IH Data Frames

Upper Tester

Lower Tester

IUT

ACL-Link Setup successful
SDP query from IUT if a DevA to get the RFCOMM Server channel number
L2CAP data channel established
RFCOMM control channel at DLCI 0 and
RFCOMM data link connection on DLCI n established
Initial credits given by the tester in the PN frame during DLCI establishment

Command the IUT to send data
(N 1 = Max, Frame Size)

Both the IUT and the Lower Tester use the MSC command to notify each other of their
V.24 control signals prior to sending user data.

Lower Tester to verify that the IUT sends user data on the
DLCI n according to the initial credits issued by the Lower Tester during DLCI
establishment, and to check that FCS is calculated only on
the content of the address and control fields.

T2 = 60s Maximum Value

• Expected Outcome

Pass verdict

The IUT conveys information data using UIH frames with an information length specified by the length indicator. The maximum number of octets in the information field must not be higher than \( N_1 \) for UIH frames with P/F-bit = 0, and \( N_1 - 1 \) for UIH frames with P/F-bit = 1.

The FCS field is calculated correctly and only from the address and the control fields.

The P-bit inside the control field is set to 0 if no credit field is inserted or 1 if credit field is present in the UIH frame structure.

The IUT stops sending UIH frames containing user data when initial credits count reaches zero.
• Notes
When credit based flow control is being used, the FC bit in the MSC command has no meaning and should be set to zero.

4.2.10  Non-Supported Commands
Test subgroup objective is to verify responder behavior upon reception of an unsupported command type.

4.2.10.1  RFCOMM/DEVA-DEVB/RFC/BV-25-C [Non-Supported Command Response]
• Test Purpose
Verify that the IUT sends a Non-Supported Command (NSC) response and correctly reports the unsupported command type upon reception of an UIH frame containing an unsupported command. The IUT may act as Master or Slave.

• Reference
[1] 4.3

• Initial Condition
• An RFCOMM session shall be initiated between the IUT and the Lower Tester.
• In case the IUT is a device taking on the role as DevA, the IUT has to initiate the RFCOMM session. See RFCOMM/DEVA/RFC/BV-01-C [Initialize RFCOMM Session - Initiate].
• In case the IUT is a device taking on the role as DevB, the Lower Tester has to initiate the RFCOMM session. See RFCOMM/DEVB/RFC/BV-02-C [Initialize RFCOMM Session - Respond].

• Test Procedure

![Diagram](attachment:diagram.png)

ACL Connection Established
SDP query from IUT if DevA to get the RFCOMM Server channel number
L2CAP channel established on PSM=0x0003 (RFCOMM)
RFCOMM control channel at DLCI 0 and
RFCOMM data link connection on DLCI n established

[UIH Frame]
Header:
Address = DLCI 0,
C/R-bit = 0b0 if IUT=DevA, 0b1 if IUT=DevB
EA-bit = 0b1
CTRL = 0xEF
Len = 0x15
Message:
Type = 0xN8 (N ≠ 0x2, 0x5, 0x6, 0x8, 0x9, 0xA, 0xE)
Len = 0x11
Data = 8 bytes of random data
FCS)
Non-Supported Command (NSC) response
Value: Unsupported Command = 0xN3
FCS)
RFCOMM / Test Specification

Figure 4.17: RFCOMM/DEVA-DEVB/RFC/BV-25-C [Non-Supported Command Response]

The P/F bit inside the Control field is set to 0.

• Expected Outcome

Pass verdict

The IUT sends a Non-Supported Command (NSC) response frame to the Lower Tester upon reception of a UIH frame containing an unsupported command type.

The value for the Unsupported Command sent by the IUT matches the value sent by the Lower Tester.

The FCS field is calculated correctly and only from the Address and Control fields.

The P/F bit inside the Control field is set to 0.
# 5 Test Case Mapping

The Test Case Mapping Table (TCMT) maps test cases to specific requirements in the ICS. The product shall be tested in all roles for which support is declared in the ICS document.

The columns for the TCMT are defined as follows:

**Item:** Contains a y/x reference, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS Proforma for RFCOMM Protocol [4]. If the item is defined with Protocol, Profile or Service abbreviation before y/x, the table and feature number referenced are defined in the abbreviated ICS Proforma document.

**Feature:** Recommended to be the primary feature defined in the ICS being tested or may be the test case name.

**Test Case(s):** The applicable test case identifiers required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported.

**Test Case Applicable:** May be used to note if a test is required based on the supported features.

For purpose and structure of the ICS/IXIT Proforma and instructions for completing the ICS/IXIT Proforma refer to the Bluetooth ICS and IXIT Proforma document.

<table>
<thead>
<tr>
<th>Item</th>
<th>Feature</th>
<th>Test Case(s)</th>
<th>Test Case Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFCOMM 1/1</td>
<td>Initialize RFCOMM session – Ability to initiate</td>
<td>RFCOMM/DEVA/RFC/BV-01-C</td>
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<tr>
<td>RFCOMM 1/2</td>
<td>Initialize RFCOMM session – Ability to respond</td>
<td>RFCOMM/DEVB/RFC/BV-02-C</td>
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<tr>
<td>RFCOMM 1/4</td>
<td>Shutdown RFCOMM session – initiated by Lower Tester</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-03-C</td>
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<tr>
<td>RFCOMM (1/3 AND 1/21)</td>
<td>Shutdown RFCOMM session – initiated by IUT</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-04-C</td>
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<tr>
<td>RFCOMM 1/5</td>
<td>Establish DLC - Ability to initiate</td>
<td>RFCOMM/DEVA/RFC/BV-05-C</td>
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<tr>
<td>RFCOMM 1/6</td>
<td>Establish DLC - Ability to respond</td>
<td>RFCOMM/DEVB/RFC/BV-06-C</td>
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<td>RFCOMM 1/7</td>
<td>Disconnect DLC – by IUT</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-07-C</td>
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<tr>
<td>RFCOMM 1/8</td>
<td>Disconnect DLC – by Lower Tester</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-08-C</td>
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<td>RFCOMM 1/11</td>
<td>Respond to Test command</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-11-C</td>
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<tr>
<td>RFCOMM 1/14</td>
<td>Remote Line Status indication – Lower Tester</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-13-C</td>
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<tr>
<td>Item</td>
<td>Feature</td>
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<td>Test Case Applicable</td>
</tr>
<tr>
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<tr>
<td>RFCOMM 1/15 AND SPP 2/1</td>
<td>Remote Line Status indication – IUT</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-14-C</td>
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<tr>
<td>RFCOMM 1/16</td>
<td>DLC parameter negotiation – Lower Tester</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-15-C</td>
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<tr>
<td>RFCOMM 1/19</td>
<td>Remote port negotiation – Lower Tester</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-17-C</td>
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<td>RFCOMM 1/19</td>
<td>Remote port negotiation – request</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-19-C</td>
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<tr>
<td>RFCOMM 1/22</td>
<td>Credit Based Flow Control</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-21-C</td>
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<td>RFCOMM 1/10</td>
<td>Transfer information. Credit Based Flow Control</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-22-C</td>
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<tr>
<td>RFCOMM 1/18</td>
<td>Send Non-Supported Command (NSC) response</td>
<td>RFCOMM/DEVA-DEVB/RFC/BV-25-C</td>
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</tbody>
</table>

Table 5.1: Test Case Mapping