Dialogic®

Dialogic® SS7 Protocols

MTP3 Programmer's Manual

Publication Date: August 2007

Document Number: 05-2471-002, Issue 7

Contents

Figures

Tables

Revision History

Issue No.	Part No.	Date	Description of Changes
7	05-2471-002	19-Apr-07	Changed to Dialogic format. Changes to Message Format in Section 3.2.4, “MTP_MSG_STATUS” on page 15. Changes to tx_pool_size in Section 3.5.2, “MTP_MSG_CONFIG” on page 34.
6	05-2471-001-01	07-Jul-05	Support for additional link and route status queries added using messages: MTP_MSG_R_RT_STATUS, MTP_MSG_R_LK_STATUS and MTP_MSG_UPDATE_L4. Support for Japan specific Signaling Route Test (SRT) added using messages: MTP_MSG_SRT_START and MTP_MSG_SRT_RESULT. Support for dynamic configuration changes added using the messages: MTP_MSG_END_LINKSET, MTP_MSG_END_LINK and MTP_MSG_END_ROUTE.
5	Not Applicable	26-Nov-97	Module enhanced to support Alternative Routing. Format of link set and route configuration messages modified (while maintaining backward compatibility). Link set configuration enhanced so that each link set can (if required) have a different local point code and use a different sub-service field setting. Management Inhibiting now supported. Minor typographical corrections including mnemonics for many message types.
4	Not Applicable	08-Jun-95	Name changed from Level 3 Programmer’s Manual to MTP3 Programmer’s Manual. ANSI and 24-bit point code options added. module_id no longer required in configuration message. Level 2 instance number added.

Note: The latest released issue of this guide can be found at:
http://www.dialogic.com/support/helpweb/signaling

Chapter 1: Introduction

Signaling System Number 7 (SS7), as defined by the ITU-T and other national standards bodies, defines a Message Transfer Part (MTP) for the reliable transfer of messages between different nodes within a telephony network. MTP is conceptually sub-divided into three layers: MTP1, MTP2 and MTP3.

The Signaling Network Functions of the MTP are known as MTP Level 3 (MTP3), as specified in ITU-T Recommendation Q.704, ANSI T1.111.4, and are used by many other national and international standards bodies. The Signaling Network Functions ensure a reliable transfer of the signaling messages even in the event of failures of signaling links or nodes within the signaling network.

MTP3 uses the services offered by the underlying protocol module (for example, MTP2 or M2PA) to achieve point-to-point communication with peer MTP3 implementations.

This manual gives an overview of the operation of the MTP3 module and defines the structure of all messages that can be sent to the module or issued by the module.

1.1 Applicability

This manual relates to the MTP3 software implementation used on Dialogic® SS7 products. It is applicable to MTP3 host-based software and to board-based MTP3 software running on the following Dialogic® boards:

- SS7HD
- SPCI4
- SPCI2S

The manual is intended for use by developers who are using SS7 board-level products and wish to use some or all of the features of the message-based interface to the MTP3 module. Users of the s7_mgt configuration utility should note that the s7_mgt utility generates the configuration messages detailed in this document based on the content of a configuration file therefore, there is no need for the user to generate configuration messages.

This manual is **not** intended for use with the following Dialogic® SS7 products:

- SS7G21
- SS7G22

Users of these Dialogic® products should refer to the appropriate product documentation.

This document describes the interface to the MTP3 module including full details of all run-time configuration options. It applies to revisions of the MTP3 module commencing with a major revision number of 5 (for example, Version 5.00). The module version can be read using the GEN_MSG_MOD_IDENT message described later in this manual.

1.2 Related Information

Refer to the following documents for related information:

- *Software Environment Programmer's Manual* – U10SSS
- *MTP2 Programmer's Manual* – 05-2331
- *M2PA Programmer's Manual* – 05-2407
- *ITU-T Recommendations Q.704, Q.707 – Message Transfer Part*
- *ITU-T Recommendation Q.752 – Monitoring and Measurements*
- *ANSI T1.111.4 – Message Transfer Part*

For more information on Dialogic® SS7 products and solutions, visit http://www.dialogic.com/support/helpweb/signaling/.

Chapter 2: Functional Overview

2.1 MTP3 Module Overview

The MTP3 module is an implementation of the ITU-T Signaling System Number 7 (SS7), Message Transfer Part (MTP) level 3. It implements the Signaling Message Handling and Signaling Network Functions from Q.704, the Signaling Link Test Control from Q.707 and Monitoring and Measurement Reporting from Q.752. The MTP3 module can also be configured at run-time to operate in accordance with ANSI T1.111.

The MTP3 module provides the user with sufficient level 3 functionality to implement a Signaling Point (SP) equipped with multiple link sets, each containing up to 16 signaling links and connecting to multiple destinations either directly or via Signaling Transfer Points (STPs). It supports load sharing within a link set and the full changeover and changeback procedures to ensure that, in the event of a link failure, traffic is transferred to an alternative link in the link set. The module also supports the use of Alternative Link Sets allowing each destination to be reached by two Alternative Routes. These link sets can be configured as “preferred” and “secondary” link sets or as equal priority, in which case, load sharing across the link sets is supported. In the event of a link set failure or recovery, the Forced Rerouting and Controlled Rerouting procedures are invoked.

Messages can be sent to adjacent signaling points using the associated mode of signaling or via signaling transfer points to any remote signaling point using the quasi-associated mode. Received messages destined for the signaling point are presented to the appropriate User Part module, which is provided by the user. The user can activate and deactivate each signaling link set or individual links, inhibit and uninhibit individual links and enable the Signaling Link Test (SLT) procedure in accordance with ITU-T Recommendation Q.707.

The module also supports comprehensive event reporting and measurements in accordance with ITU-T Q.752.

In addition to protocol-related functions, the MTP3 module contains a number of features to assist the user when developing an application. These features include the ability to trace any primitive message received by or issued from the MTP3 module to a management module where it can be recorded or presented to the user. In this way, the user can debug the application without ever needing to gain detailed knowledge of the internal operation of the MTP3 module.

2.2 Module Configuration

Each link set is uniquely identified by a link set identifier (**linkset_id**) with a value in range of 0 to one less than the number of link sets supported. Each link within the module is uniquely identified by a link identifier (**link_id**) with a value in the range of 0 up to one less than the number of links supported. In all message exchanges with the management module, each link is considered to belong to a link set and references to the link are made using the link set identifier (**linkset_id**) and the link reference (**link_ref**), which has a value in the range of 0 to one less than the maximum configured number of links in a link set.

The MTP3 module is configured for operation in conjunction with up to 16 user part modules that lie above the MTP3 module in the protocol stack, and one or more level 2 modules that lie below the MTP3 module in the protocol stack.

Management functions should be provided by a management module that is responsible for correctly configuring the MTP3 module, activating and deactivating the links and recording or presenting the trace messages and event indications to the user.

2.3 Feature Overview

Features of the MTP3 module include:

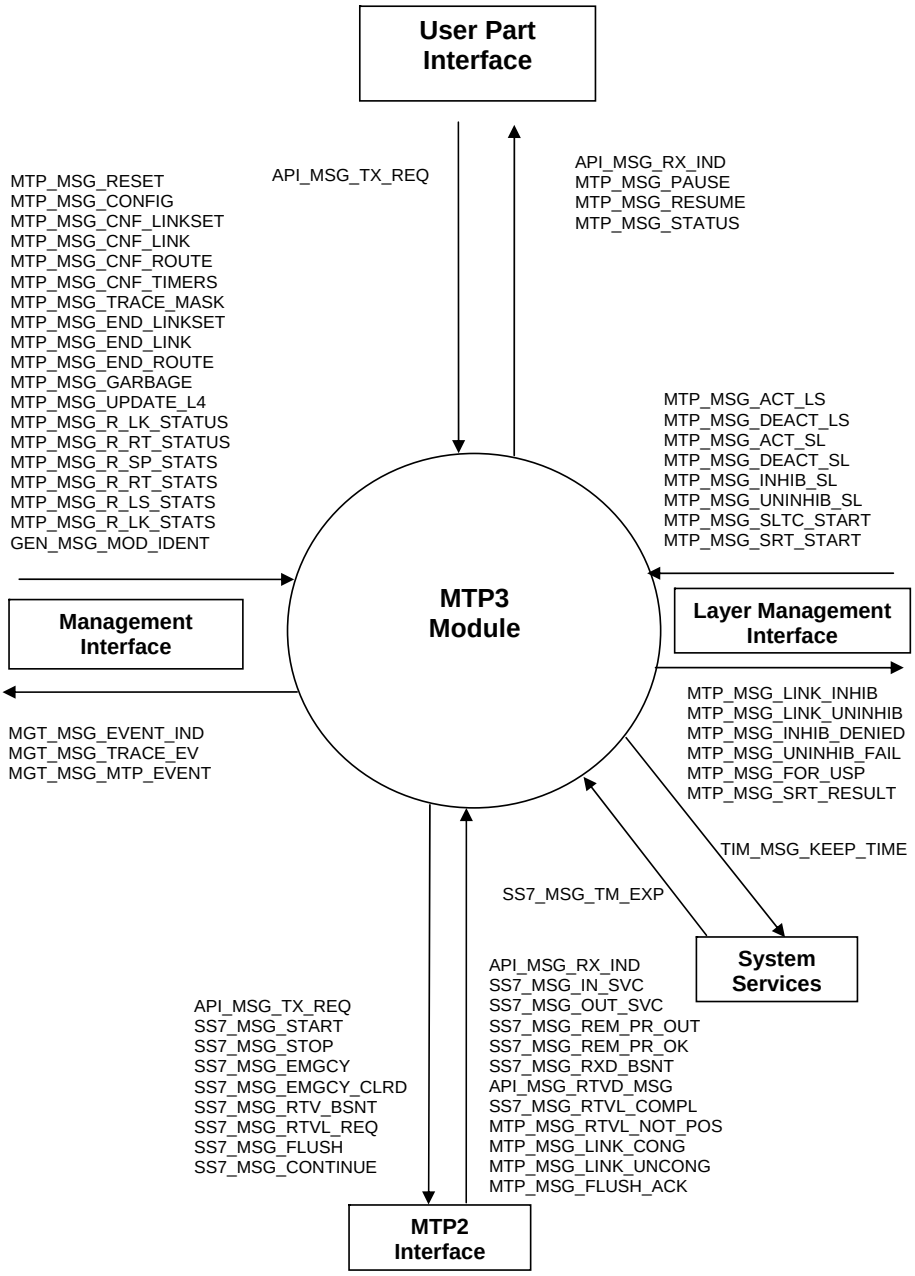
- Software implementation of ITU recommendation Q.704
- Software implementation of ANSI T1.111.4.
- Support for 24-bit point codes (China)
- Support for Japan specific extensions
- Run-time selection between ITU, ANSI, China and Japan operation
- Run-time selection of point code size 14-bit, 16-bit or 24-bit
- Support for dual-operation, where two instances of MTP3 cooperate to form a single local point code
- Support for Alternative Routing and Combined Link Sets
- Support for Signaling Link Test
- Support for Monitoring and Measurements in accordance with ITU-T Q.752
- Message-based interface
- Comprehensive trace options for selectively reporting to system management each primitive issued to, or received by, the MTP3 module

2.4 General Description

The interface to the MTP3 module is entirely message-based, using the structured messages documented in the *Software Environment Programmer's Manual*. The MTP3 module is capable of working in conjunction with board-based MTP2 implementations running on multiple boards and host-based M2PA implementations.

Figure 1 provides an overview of the MTP3 module showing the various interfaces.

Figure 1. MTP3 Context Diagram



Chapter 3: Message Reference

This section describes the individual messages and associated parameters that may be sent to MTP3 or generated by MTP3. The interface is message-based, using messages of type **MSG** as defined in the *Software Environment Programmer's Manual*.

These messages are used for the primitive protocol interface with layer 4 User Part module, the primitive protocol interface with the MTP3 layer management module and for the non-primitive interface to management for the purposes of configuring and managing the MTP3 module.

The messages are grouped into the following categories:

- Protocol Requests from User Part to MTP3
- Protocol Indications from MTP3 to User Part
- Layer Management Requests Sent to MTP3
- Management Indications Issued by MTP3 to Layer Management
- Management Requests Sent to MTP3
- Management Indications Issued by MTP3

3.1 Protocol Requests from User Part to MTP3

Primitive protocol requests are sent from the User Part (for example, ISUP, SCCP etc.) to MTP3 in accordance with the published protocol specifications.

This section of the manual is applicable only to users intending to write their own User Part implementation. When using a User Part from the Dialogic® SS7 product range, the messages for this interface are implemented within the User Part module and the user should consult the User Part documentation, which details the format of the messages that should be sent from the application to the User Part module.

Currently, only the following protocol request is sent from the User Part to MTP3:

- API_MSG_TX_REQ – MTP Transfer Request

When sending a protocol request to MTP3, the user should ensure that the message is sent to the correct **module_id** and the correct **instance** of the MTP3 module (if multiple instances are in use, for example, on different boards).

The default **module_id** for MTP3 is MTP_TASK_ID (0x22). However, host-based MTP3 is capable of running at different module IDs and this can be useful for example where multiple MTP3 modules are running on a single host. The user should ensure that the correct MTP3 module ID is written to the **hdr->dst** field of the message.

Typically, it is appropriate to set the instance value to 0 using the **GCT_set_instance( )** library function. However, if separate MTP3 instances are running on multiple boards, it is necessary to set the instance to the board ID on which the target MTP3 is running.

3.1.1 API_MSG_TX_REQ – MTP Transfer Request

Synopsis

Message issued by the User Part (for example, ISUP, SCCP etc.) to MTP3 to invoke the Message Transfer Request service for transmission to the network.

Message Format

Message Header	
Field Name	**Meaning**
type	API_MSG_TX_REQ (0xcf00)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	Number of octets in Message Signal Unit (MSU)

Parameter Area		
OFFSET	**SIZE**	**NAME**
0	len	MSU data in binary format commencing with the Service Indicator Octet (SIO). The following information is contained in this field: • Originating Point Code • Destination Point Code • Signaling Link Selection • Service Information Octet • User Data The data should be formatted since it is sent to the network commencing with the SIO. The format depends on the point code size currently in use.

3.2 Protocol Indications from MTP3 to User Part

Protocol primitive indications are issued by MTP3 to the appropriate User Part module(s) as configured on a per Service Indicator (SI) basis in the module configuration message (**user_id** field). These indications are in accordance with the published protocol specifications.

Note: This section of the manual is applicable only to users intending to write their own User Part implementation. When using a User Part from the Dialogic® SS7 product range, the messages for this interface are received and processed by the User Part module and the user should consult the User Part documentation, which details the format of the messages that are sent from the User Part to the application.

The User Part module is responsible for releasing all messages sent to it by MTP3.

The following protocol indications are issued by MTP3 to the User Part:

- API_MSG_RX_IND – MTP Transfer Indication
- MTP_MSG_PAUSE – MTP Pause Indication
- MTP_MSG_RESUME – MTP Resume Indication
- MTP_MSG_STATUS – MTP Status Indication

3.2.1 API_MSG_RX_IND – MTP Transfer Indication

Synopsis

Message issued to the User Part by MTP3 to indicate reception of a Message Signal Unit (MSU) from the network.

Message Format

Message Header	
Field Name	**Meaning**
type	API_MSG_RX_IND (0x8f01)
id	The use of this field is controlled by the setting of bit 0 in the **ext_options** field of the module configuration message. • If bit 0 of **ext_options** is set to 0, this field contains the User Part Reference (or Service Indicator). This is primarily useful for backward compatibility. • If bit 0 of **ext_options** is set to 1 (recommended for all new designs), this field provides an indication of the MTP Label Format used in the parameter area as follows: 0 – MTP label contains 14-bit point codes 1 – MTP label contains 24-bit point codes 2 – MTP label contains 16-bit point codes
src	MTP3 module ID
dst	User part module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	Number of octets in MSU

Parameter Area		
Offset	**Size**	**Name**
0	len	MSU data in binary format commencing with the Service Indicator Octet (SIO). The following information is contained in this field: • Originating Point Code • Destination Point Code • Signaling Link Selection • Service Information Octet • User Data The data is formatted since it was received from the network commencing with the SIO. The format depends on the point code size currently in use.

3.2.2 MTP_MSG_PAUSE – MTP Pause Indication

Synopsis

This primitive is issued by MTP3 to indicate to the user part the total inability of providing MTP service to the specified destination.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_PAUSE (0x8403)
id	User Part Reference
src	MTP3 module ID
dst	User Part module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	4

Parameter Area		
Offset	**Size**	**Name**
0	4	Affected destination point code

3.2.3 MTP_MSG_RESUME – MTP Resume Indication

Synopsis

This primitive is issued by MTP3 to indicate to the user the total ability of providing MTP service to the specified destination.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_RESUME (0x8404)
id	User Part Reference
src	MTP3 module ID
dst	User Part module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	4

Parameter Area		
Offset	**Size**	**Name**
0	4	Affected destination point code

3.2.4 MTP_MSG_STATUS – MTP Status Indication

Synopsis

This primitive is issued by MTP3 to indicate to the user part the partial inability of providing the MTP service to the specified destination. This may be due to signaling network congestion or due to unavailability of the remote user part.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_STATUS (0x8405)
id	User Part Reference
src	MTP3 module ID
dst	User Part module ID
rsp_req	0
hclass	0
status	One of the following: • 1 = Remote User Unavailable • 2 = Signaling Network Congestion
err_info	0
len	6 or 8

Parameter Area		
Offset	**Size**	**Name**
0	4	Affected destination point code
4	2	Congestion status (if status = 0x02). This field is set to the current congestion level in the range 0 to 3, where 0 means no congestion and 3 means maximum congestion. Many networks use only a single level of congestion (that is, 1).
6	2	Unavailabilty cause (if status = Remote User Unavailable(1)) The unavailabilty cause may be one of the following: 0 = Unknown 1 = Unequipped User 2 = Inaccessible User

3.3 Layer Management Requests Sent to MTP3

Protocol management primitives are sent from Layer Management to MTP3 in accordance with published MTP3 recommendations. The primitive names are closely aligned with the terminology used in ITU-T Recommendation Q.704.

The layer management primitives allow the user to activate and deactivate signaling links, inhibit and uninhibit signaling links and request manual signaling link tests to be performed.

The full list of layer management requests sent to MTP3 includes:

- MTP_MSG_ACT_SL – Activate Link Set Request
- MTP_MSG_DEACT_SL – Deactivate Link Set Request
- MTP_MSG_INHIB_SL – Inhibit Signaling Link Request
- MTP_MSG_UNINHIB_SL – Uninhibit Signaling Link Request
- MTP_MSG_SLTC_START – Signaling Link Test Request
- MTP_MSG_SRT_START – Start SRT Request (Japan)

When sending layer management requests to MTP3, the user should ensure that the message is sent to the correct **module_id**, the correct **instance** of the MTP3 module (if multiple instances are in use – for example on different boards) and to the correct **id**.

The default **module_id** for MTP3 is **MTP_TASK_ID** (0x22). However, host-based MTP3 is capable of running at different module IDs and this can be useful, for example, where multiple MTP3 modules are running on a single host. The user should ensure that the correct MTP3 module ID is written to the **hdr->ds**t field of the message.

Typically, it is appropriate to set the instance value to 0 using the **GCT_set_instance( )** library function; however, if separate MTP3 instances are running on multiple boards, it is necessary to set the **instance** to the **board_id** on which the target MTP3 is running.

Since links are identified in terms of **linkset_id** and **link_ref**, the **hdr->id** field for all layer management requests should be set to (**linkset_id** * 256) + **link_ref**.

The **hdr->rsp_req** field may be used optionally to request a confirmation. If requested, the MTP3 module confirms acceptance of the primitive by sending the message back to its originator with bit 14 cleared in the type field of the message. This mechanism is described in detail in the *Software Environment Programmer's Manual.*

3.3.1 MTP_MSG_ACT_LS – Activate Link Set Request

Synopsis

This primitive is used by management to request the MTP3 module to activate all the links in a link set.

Note: The preferred mechanism of link activation is to use instead the MTP_MSG_ACT_SL message to activate individual signaling links.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_ACT_LS (0xc30e)
id	linkset_id * 256
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	0

Description

On receipt of this message, MTP3 attempts to activate all links in the link set. Receipt of a confirmation message does not imply that the link set is available for use, merely that MTP3 is attempting to bring the link into service. The user part should determine availability of a signaling relation using the MTP PAUSE and MTP RESUME indications.

The user can determine the current state of individual signaling links on demand using the MTP_MSG_R_LK_STATUS message.

3.3.2 MTP_MSG_DEACT_LS – Deactivate Link Set Request

Synopsis

This primitive is used by management to request the MTP3 module to deactivate all the links in a link set.

Note: The preferred mechanism of link deactivation is to use instead the MTP_MSG_DEACT_SL message to deactivate individual signaling links.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_DEACT_LS (0xc30f)
id	linkset_id * 256
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	0

Description

On receipt of this message, MTP3 attempts to deactivate all links in the link set.

3.3.3 MTP_MSG_ACT_SL – Activate Signaling Link Request

Synopsis

This primitive is used by management to request the MTP3 module to activate the specified single link within a link set.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_ACT_SL (0xc30a)
id	(linkset_id * 256) + link_ref
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	0

Description

On receipt of this message, MTP3 attempts to activate the specified link in the link set. Receipt of a confirmation message does not imply that the link is available for use, merely that MTP3 is attempting to bring the link into service. The user part should determine availability of a signaling relation using the MTP PAUSE and MTP RESUME indications.

The user can determine the current state of a signaling link on demand using the MTP_MSG_R_LK_STATUS message.

3.3.4 MTP_MSG_DEACT_SL – Deactivate Signaling Link Request

Synopsis

This primitive is used by management to request the MTP3 module to deactivate the specified link within a link set.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_DEACT_SL (0xc30b)
id	(linkset_id * 256) + link_ref
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	0

Description

On receipt of this message, MTP3 attempts to deactivate the specified link in the link set.

3.3.5 MTP_MSG_INHIB_SL – Inhibit Signaling Link Request

Synopsis

This primitive is used to request the MTP3 module to invoke management inhibiting on the specified link within a link set.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_INHIB_SL (0xc310)
id	(linkset_id * 256) + link_ref
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	0

Description

On receipt of this message, MTP3 attempts to execute the Management Inhibiting function. For Management Inhibiting to succeed, there must be alternative available links to reach all destinations that can be accessed over the link.

If the procedure is successful, MTP3 stops sending traffic over the link.

If the procedure is not successful, the MTP3 module issues a message to management (MTP_MSG_INHIB_DENIED) indicating that the requested operation has failed.

The user can determine the current state of a signaling link (including whether it is currently inhibited) on demand using the MTP_MSG_R_LK_STATUS message.

3.3.6 MTP_MSG_UNINHIB_SL – Uninhibit Signaling Link Request

Synopsis

This primitive is used to request MTP3 to remove the management inhibit condition for the specified link within a link set.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_UNINHIB_SL (0xc311)
id	(linkset_id * 256) + link_ref
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	0

Description

On receipt of this message, MTP3 attempts to execute the Management UnInhibiting function. If the procedure is not successful, the MTP3 module issues a message (MTP_MSG_UNINHIB_FAIL) to management indicating that the requested operation has failed.

The user can determine the current state of a signaling link (including whether it is currently inhibited) on demand using the MTP_MSG_R_LK_STATUS message.

3.3.7 MTP_MSG_SLTC_START – Signaling Link Test Request

Synopsis

This primitive is used by management to manually request that a signaling link test be carried out in accordance with Q.707 on the specified link.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_SLTC_START (0xc30c)
id	(linkset_id * 256) + link_ref
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	0

Description

Receipt of this message causes a Signaling Link Test to be carried out on the specified link. This test is in addition to the periodic test that is carried out automatically by the module (when configured accordingly).

Typically, this message is not used when the periodic Signaling Link Test is enabled.

3.3.8 MTP_MSG_SRT_START – Start SRT Request (Japan)

Synopsis

Primitive issued by user (or management) to MTP3 requesting that a Japan-specific Signaling Route Test (SRT) be started on the specified signaling link.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_SRT_START (0xc317)
id	(linkset_id * 256) + link_ref
src	Originating module ID
dst	MTP3 module ID
rsp_req	Sending layer's bit set if response required
hclass	0
status	0
err_info	0
len	4

Parameter Area		
Offset	**Size**	**Name**
0	4	DPC – Destination Point Code for SRT message

Description

This primitive is issued by the user to request that a Signaling Route Test be started on the specified link towards the specified DPC.

The MTP3 module generates the message and sends it to the network. It also starts an internal timer (Designated in JT-Q.707/NTT-Q.707 as Timer T10) while waiting for a response. If a successful response is not received, MTP3 generates a second SRT message, restarts the timer, and waits for the response.

On receipt of the response, or failure of the SRT, MTP3 sends an MTP_MSG_SRT_RESULT message to the user indicating the result of the test.

3.4 Management Indications Issued by MTP3 to Layer Management

Protocol management primitives are sent by MTP3 to Layer Management in accordance with published MTP3 recommendations. The primitive names are closely aligned with the terminology used in ITU-T Recommendation Q.704.

The full list of management indications that can be issued by MTP3 includes:

- MTP_MSG_LINK_INHIB – Signaling Link Inhibited Indication
- MTP_MSG_LINK_UNINHIB – Signaling Link Uninhibited Indication
- MTP_MSG_INHIB_DENIED – Signaling Link Inhibit Denied Indication
- MTP_MSG_UNINHIB_FAIL – Signaling Link Uninhibit Failure Indication
- MTP_MSG_SRT_RESULT – SRT Result Indication (Japan)

Messages are sent to the **module_id** configured as the Management module ID (**mgmt_id**) in the MTP3 module configuration message (MTP_MSG_CONFIG), except in the case of the MTP_MSG_SRT_RESULT message where the result is sent to the module that originally requested the SRT.

3.4.1 MTP_MSG_LINK_INHIB – Signaling Link Inhibited Indication

Synopsis

This primitive is used to indicate to management that a link has been inhibited.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_LINK_INHIB (0x8380)
id	(linkset_id * 256) + link_ref
src	MTP3 module ID
dst	Management module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	0

Description

This message is issued to management whenever a signaling link becomes inhibited. This may be due to local inhibiting or remote inhibiting.

The user can determine the current state of a signaling link (including whether it is currently inhibited) on demand using the MTP_MSG_R_LK_STATUS message.

3.4.2 MTP_MSG_LINK_UNINHIB – Signaling Link Uninhibited Indication

Synopsis

This primitive is used to indicate to management that a link has been uninhibited.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_LINK_UNINHIB (0x8381)
id	(linkset_id * 256) + link_ref
src	MTP3 module ID
dst	Management module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	0

Description

This message is issued to management whenever a signaling link that has been inhibited becomes uninhibited.

The user can determine the current state of a signaling link (including whether it is currently inhibited) on demand using the MTP_MSG_R_LK_STATUS message.

3.4.3 MTP_MSG_INHIB_DENIED – Signaling Link Inhibit Denied Indication

Synopsis

This primitive is used to indicate to management that an inhibit request has been denied.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_INHIB_DENIED (0x8382)
id	(linkset_id * 256) + link_ref
src	MTP3 module ID
dst	Management module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	0

Description

This message is issued to management whenever an attempt at inhibiting a signaling link fails.

3.4.4 MTP_MSG_UNINHIB_FAIL – Signaling Link Uninhibit Failure Indication

Synopsis

This primitive is used to indicate to management a failure to uninhibit a link.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_UNINHIB_FAIL (0x8383)
id	(linkset_id * 256) + link_ref
src	MTP3 module ID
dst	Management module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	0

Description

This message is issued to management whenever an attempt at uninhibiting a signaling link fails.

3.4.5 MTP_MSG_SRT_RESULT – SRT Result Indication (Japan)

Synopsis

Primitive issued by MTP3 to notify the result of a (Japan-specific) Signaling Route test to the user.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_SRT_RESULT (0x8321)
id	(linkset_id * 256) + link_ref
src	MTP3 module ID
dst	User module ID (Taken from original SRT request)
rsp_req	0
hclass	0
status	Result of the SRT: • 0 = Success • 1 = Failure (T10 Expiry) • 2 = Failure (Incorrect Test Pattern) • 3 = Failure (SRA received on wrong link) • 5 = Failure (SRT aborted internally) Other values reserved for additional failure reasons.
err_info	0
len	0

Description

This primitive is issued by MTP3 to the user to convey the result of a Signaling Route Test (SRT) on the specified link.

Note: The message is sent to the **module_id** that requested the original SRT (unlike other management indications that are sent to the management module established at configuration time).

3.5 Management Requests Sent to MTP3

In addition to the protocol primitives defined for the MTP3 to User Part interface and the MTP3 to Layer Management Interface, the MTP3 module supports a non-primitive interface for configuration and management.

The non-primitive interface is used to support requests by the user for initialization, configuration and diagnostic purposes and to allow MTP3 to report protocol-based and software error events to the local system management module.

This section describes the formats of all the messages used in the non-primitive interface.

The full list of management requests available to send to MTP3 includes:

- MTP_MSG_RESET – MTP3 Module Reset Request
- MTP_MSG_CONFIG – MTP3 Module Configuration Request
- MTP_MSG_CNF_LINKSET – Link Set Configuration Request
- MTP_MSG_CNF_LINK – Signaling Link Configuration Request
- MTP_MSG_CNF_ROUTE – Route Configuration Request
- MTP_MSG_CNF_TIMERS – MTP3 Timer Configuration Request
- MTP_MSG_TRACE_MASK – MTP3 Trace Mask Configuration Request
- MTP_MSG_END_LINKSET – Link Set End Request
- MTP_MSG_END_LINK – Signaling Link End Request
- MTP_MSG_END_ROUTE – Route End Request
- MTP_MSG_GARBAGE – Clear Garbage Request
- MTP_MSG_UPDATE_L4 – Update Level 4 Request
- MTP_MSG_R_LK_STATUS – Read Link Status Request
- MTP_MSG_R_RT_STATUS – Read Route Status Request
- MTP_MSG_R_SP_STATS – Read Signaling Point Statistics Request
- MTP_MSG_R_RT_STATS – Read Route Statistics Request
- MTP_MSG_R_LS_STATS – Read Link Set Statistics Request
- MTP_MSG_R_LK_STATS – Read Link Statistics Request
- GEN_MSG_MOD_IDENT – Read Module Version Request

When sending layer management requests to MTP3, the user should ensure that the message is sent to the correct **module_id**, the correct **instance** of the MTP3 module (if multiple instances are in use, for example, on different boards) and to the correct **id**.

The default **module_id** for MTP3 is **MTP_TASK_ID** (0x22). However, host-based MTP3 is capable of running at different module IDs and this can be useful for example where multiple MTP3 modules are running on a single host. The user should ensure that the correct MTP3 module ID is written to the **hdr->dst** field of the message.

Typically, it is appropriate to set the instance value to 0 using the **GCT_set_instance( )** library function. However, if separate MTP3 instances are running on multiple boards, it is necessary to set the **instance** to the **board_id** on which the target MTP3 is running.

Care should be taken to correctly populate the **hdr->id** field as different messages require different parameters. In particular, messages relating to links and link sets should be expressed as: (**linkset_id** * 256) + **link_ref**.

The **hdr->rsp_req** field may optionally be used to request a confirmation. If requested, the MTP3 module confirms acceptance of the primitive by sending the message back to its originator with bit 14 cleared in the type field of the message. This mechanism is described in detail in the *Software Environment Programmer's Manual*. Messages intended to read back information from MTP3 must use this mechanism, otherwise MTP3 will not respond to the request.

The MTP3 module returns a confirmation message containing a status value taken from the following table:

Mnemonic	Value	Description
SUCCESS	0	Success
MTP_BAD_PRIM	0x51	Invalid or unexpected message
MTP_BAD_ID	0x58	Invalid ID in header
MTP_GARBAGE	0x65	Failed to clear garbage queue, (in which case, it is necessary to send another MTP_MSG_GARBAGE message at a later time)

3.5.1 MTP_MSG_RESET – MTP3 Module Reset Request

Synopsis

Message used to initialize or to re-initialize the MTP3 module.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_RESET (0x7300)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	0

Description

This message is used to initialize the MTP3 module. All messages received by the module before the first MTP_MSG_RESET message are discarded. Subsequent MTP_MSG_RESET requests cause all system resources requested by the MTP3 module to be released and the module to be reset to its idle state. Whenever the module is reset, it must subsequently be configured (using the MTP_MSG_CONFIG, MTP_MSG_CNF_LINKSET, MTP_MSG_CNF_LINK and MTP_MSG_CNF_ROUTE requests) before attempting to activate signaling links.

3.5.2 MTP_MSG_CONFIG – MTP3 Module Configuration Request

Synopsis

This message is used to configure the MTP3 module. It must be issued after an MTP_MSG_RESET request and before any MTP_MSG_CNF_LINKSET requests are issued.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_CONFIG (0x7303)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	40

Parameter Area		
Offset	**Size**	**Name**
0	2	**options** - Run-time options
2	1	**module_id** – Reserved, should be set to 0
3	1	**mngt_id**- Module ID of management module
4	2	**tx_pool_size** - Transmit pool size
6	2	**timer_res** – Reserved, must be set to 1
8	4	**point_code** – Default Local Point code for MTP3
12	2	**num_links** - Total number of links
14	2	**num_linksets** Total number of link sets
16	1	**ssf** – Default Sub-Service field value
17	5	Reserved for future use, must be set to zero
22	2	**ext_options** – Extended run-time options
24	16	**user_id** - Module ID for each of the 16 user parts

Parameters

- **options**
  This field is a 16-bit field used to convey various run-time options to the module, as shown in the following table (refer also to the **ext_options** field that conveys additional run-time options):

Bit	Meaning
0	This bit is set to disable the discrimination function. Typically, only MSUs with a destination point code equal to the point code of the signaling point are distributed to the user parts. However, if this bit is set, ALL received MSUs are passed to the user parts. • 0 – Normal setting, message discrimination enabled as per protocol specification • 1 – Disable discrimination
1	This bit is set to disable the Sub-Service Field (SSF) discrimination function. Typically, only MSUs with a SSF matching the SSF supplied in the configuration message are accepted for distribution to the user parts. However, if this bit is set, the SSF is not examined by the discrimination function. • 0 – Normal setting, SSF discrimination enabled as per protocol specification • 1 – Disable SSF discrimination
2	This bit is used to control the buffer format used by MTP3 for MTP Transfer Requests and Indications. This field should be set as follows, depending on the MTP3 implementation in use: • For Host-based MTP3, set this bit to 1 • For SS7HD-based MTP3 (ss7.dc4), set this bit to 1 • For SSPCI4 / SPCI2S based MTP3 (ss7.dc3), set this bit to 0

Bit	Meaning
3	This bit is used to determine the behavior when an MSU is received from the network for a User Part that is not currently configured. The module can either discard the message with no further action or issue a User Part Unavailable message back to the network. • 0 – Discard the message • 1 – Issue a User Part Unavailable message
5	This bit is set to disable operation of Management Inhibiting functionality. When set, any attempt to inhibit a signaling link (either locally or remotely is denied). When clear, Management Inhibiting Functionality operates normally. • 0 – Normal setting, enable Management Inhibiting support • 1 – Disable Management Inhibiting support
6	This bit is used to disable the Signaling Route Set Test mechanism. Typically, when a remote signaling point becomes unavailable, a periodic Signaling Route Set Test message is issued in order to ensure that subsequent availability of the signaling point is detected. Setting this bit allows the sending of this message to be disabled. • 0 – Normal setting, enable Signaling Route Set Test • 1 - Disable Signaling Route Set Test
8	This bit is used to select between ITU and ANSI operation. • 0 - ITU (CCITT) operation • 1 - ANSI operation **NOTE:** For correct ANSI operation, the user should always set bits 9, 10 and 11, as well as bit 8.
9	This bit is used to select between 14/16-bit point codes and 24-bit point codes. It must always be set to 1 when the ANSI option is selected. • 0 – Use 14-bit or 16-bit point codes (depending on the setting of **ext_options** bit 4) • 1 – Use 24-bit point codes
10	This bit is used to enable Multiple Congestion States operation. It should always be set when ANSI option is selected. • 0 - Disable Multiple Congestion States • 1 - Enable Multiple Congestion States
11	This bit is used to enable Multiple Message Priority operation. It should always be set when ANSI option is selected. • 0 - Disable Multiple Message Priority operation • 1 - Enable Multiple Message Priority operation
Others	All other bits are reserved for future use and must be set to zero.

- **mngt_id**
  The module identifier of the management module to which trace messages and event notifications are sent.
- **tx_pool_size**
  This parameter is used to set the size of an internal pool of buffers used for generation of MTP3 messages for transmission to the network. This parameter should be set to the following fixed values depending on the specific MTP3 implementation in use:

MTP3 Implementation	tx_pool_size
Host-Based MTP3	0
SS7HD (ss7.dc4)	0
SPCI4 / SPCI2S (ss7.dc3)	20

- **timer_res**
  This parameter is reserved for future use and should always be set to 1.
- **point_code**
  The default local point code of the signaling point (SP) which should lie in the range of 0 to 16383 (for 14-bit point codes) and in the range of 0 and 16777215 (for 24-bit point codes).
  The user can specify the local point code on a per-link set basis if required, allowing MTP3 to connect to more than one network where each network uses a different point code numbering scheme. This is achieved using the **local_pc** parameter in the link set configuration message which overrides the **point_code** parameter.

- **num_links**
  The total number of signaling links to be supported by the signaling point. This is a run-time setting and should be in the range of 1 and the maximum number of links supported by the implementation. If it is known at configuration time that the system requires less than the maximum number of links, **num_links** should be set accordingly to achieve slight performance benefits.
- **num_linksets**
  The number of link sets to be supported by the signaling point. This is a run-time setting and should be in the range of 1 and the compile-time maximum number of link sets. If it is known at configuration time that the system requires less than the maximum number of link sets, **num_linksets** should be set accordingly to achieve slight performance benefits.
- **ssf**
  The default value to be used in the Sub-Service Field (SSF) of all Message Signal Units (MSUs) originating from within the MTP3 module. The valid range is 0 to 15. This parameter is also used in the discrimination function. The user can override this parameter by specifying a per-link set SSF value if required.

  Note: When using ANSI operation, the two least significant bits of the **ssf** parameter must always be set to 1 for correct operation.
- **user_id**
  An array of module identifiers for each of the 16 possible User Parts. These are the modules to which the MTP3 module distributes received messages for this signaling point. The value for any User Parts not implemented should be set to zero. The values for the user parts handled by MTP3 (0, 1 and 2) is typically set to zero to allow these messages to be handled internally by MTP3.

user_id	Suggested Setting
user_id[0]	This parameter is typically set to zero so that **Signaling Network Management** messages are processed by MTP3.
user_id[1]	This parameter is typically set to zero so that **Signaling Network Test & Maintenance** messages are processed by MTP3.
user_id[2]	This parameter is typically set to zero so that ANSI format **Signaling Network Test & Maintenance** messages are processed by MTP3.
user_id[3]	If SCCP is in use, this parameter should be set to the module ID of the **SCCP module**. Otherwise, it should be set to zero.
user_id[4]	If TUP is in use, this parameter should be set to the module ID of the **TUP module**. Otherwise, it should be set to zero.
user_id[5]	If ISUP is in use, this parameter should be set to the module ID of the **ISUP module**. Otherwise, it should be set to zero.
user_id[x]	If Service Indicator x is in use, this parameter should be set to the module ID of the appropriate User Part module. Otherwise, it should be set to zero.

- **ext_options**
  This field is used in addition to the **options** field to convey “extended” run-time options to the module as shown in the following table:

Bit	Meaning
0	This bit is used to control the usage of the **hdr->id** field of MTP Transfer Indication messages. • 0 – The **id** field contains the **User Part Reference** (or Service Indicator), this is primarily useful for backward compatibility. • 1 - The **id** field provides an indication of the **MTP Label Format** used in the parameter area. This is the recommended setting for all new designs.
1	This bit controls how received Transfer Controlled and Signaling Route Set Congestion Messages that are not destined for the local point code are processed. • 0 – Normal operation; messages are discarded. • 1 – Messages are sent to fixed module_id 0x0a.
2	This bit controls MTP3 operation on detection of Remote Processor Outage (RPO). • 0 – On detection of RPO, the signaling link is taken out of service and restoration commences. This setting is useful for backward compatibility. • 1 – Normal setting; RPO is handled in accordance with the ITU-T 1992 (and later) recommendations.

Bit	Meaning
3	This bit is used when MTP3 is operating in dual mode to control which bit of the Sub-Service Field is used to flag messages that have been received by one MTP3 and are being conveyed to the dual module over the inter-MTP3 link set. • 0 – Normal setting; sub-Service Field bit 2 is modified. • 1 – Alternative setting; sub-Service Field bit 0 is modified.
4	This bit is used to select between 14-bit point codes and 16-bit point codes. It is only significant when 24-bit point codes are NOT selected (refer to the **options** parameter). • 0 – Use 14-bit point codes • 1 – Use 16-bit point codes
5	This bit is used to activate Japan-specific MTP3 operation. • 0 – Normal setting; Japan-specific functionality is disabled • 1 – Japan-specific functionality is enabled **NOTE:** For correct Japan-specific operation, the user should also select 16-bit point codes by setting bit 4 as well as bit 5.
6	This bit is used to control the handling of received Route Set Test Messages. It should only be set if bit 1 is also set. • 0 – Normal operation; Route Set Test messages processed by MTP3 • 1 – Route Set Test Messages not processed by MTP3, but passed directly to module_id 0x0a
Others	All other bits are reserved for future use and must be set to zero.

3.5.3 MTP_MSG_CNF_LINKSET – Link Set Configuration Request

Synopsis

This message is used to configure each link set within the signaling point. It must be issued after a MTP_MSG_CONFIG request and before any MTP_MSG_CNF_LINK requests are issued for links within the link set.

This message may also be used to modify existing link sets. If the number of links in the link set needs to be increased or decreased, then this message may be used with the MTPLSF_RECFG option (bit 2 of the **flags** field). First, all links in the link set must be ended. Then, with the reconfigure option set and all other parameters unchanged from when the link set was first configured, the new number of links in the link set may be set.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_CNF_LINKSET (0x7310)
id	linkset_id * 256
src	Sending module ID
dst	MTP3 module ID
rsp_req	used to request a confirmation
hclass	0
status	0
err_info	0
len	16

Parameter Area		
Offset	**Size**	**Name**
0	4	**adj_pc** - Point code of the adjacent signaling point
4	2	**target_cnt**- Reserved; set to zero
6	2	**num_links**- Number of links allocated to the link set
8	2	**flags** - Run-time options
10	1	**sls_bits** - Number of sls bits to use for load sharing within the link set
11	1	**ssf** – Per link set Sub-Service-Field
12	4	**local_pc** – Per-link set local point code

Parameters

- **adj_pc**
  The adjacent point code, that is, the point code of the signaling point at the other end of all signaling links within the link set.
- **target_cnt**
  This field is reserved for future use and should always be set to zero.
- **num_links**
  The number of signaling links that are allocated to the link set.

  Note: Each of these links requires its own configuration message be issued to the module.
- **sls_bits**
  The number of bits from the SLS field to use for load sharing. This should range from 0 to 4. The least significant bits of the SLS are used for load sharing. Typically, this should be set to 4.

- **ssf**

  The value to be used in the Sub-Service Field (SSF) of all Message Signal Units (MSUs) related to this link set originating from within the MTP3 module. The valid range is 0 to 15. The parameter is also used in the discrimination function.

  This field allows the user to specify the SSF on a per-link set basis (instead of using the default SSF specified in the global configuration message). If the user wishes to specify a per-link set SSF value, bit 1 of the flags field in this message must also be set.

  Note: When using ANSI operation, the two least significant bits of the **ssf** parameter must always be set to 1 for correct operation.

- **local_pc**

  The local point code of the signaling point as seen by the network connected to this link set. This should lie in the range of 0 to 16383 (for 14-bit point codes) and in the range of 0 and 16777215 (for 24-bit point codes).

  This field allows the user to specify the local point code on a per-link set basis (instead of using the default **point_code** specified in the global configuration message). When a per-link set local point code is specified, the user must also set bit 0 in the **flags** field of the link set configuration message.

- **flags**

  This field is a 16-bit field containing run-time configuration options for the link set as follows:

Bit	Meaning
0	This bit is used to determine whether or not the user has supplied a per-link set local point code for this link set. If not, the **point_code** parameter from the global configuration message is used instead. • 0 - Use the per module (default) **point_code** as the local point code • 1 - Use the **local_pc** parameter as the local point code for this link set
1	This bit is used to determine whether or not the user has supplied a per-link set sub-service-field (SSF) for this link set. If not, the **ssf** parameter from the global configuration message is used instead. • 0 - Use the per-module (default) SSF for this link set • 1 - Use the per-link set **ssf** parameter for this link set
2	This bit must be set to 1 when the message is being used to modify the existing link set configuration. • 0 – Normal setting; used when link set is first configured • 1 – Reconfiguration; used when the link set is being modified
15	This bit is used to indicate that the link set is the inter-MTP3 link set connecting together the two halves when operating in a dual MTP3 configuration. • 0 – Normal setting • 1 – This link set is the inter-MTP3 link set in a dual configuration
Other bits	All other bits are reserved for future use and must be set to zero.

3.5.4 MTP_MSG_CNF_LINK – Signaling Link Configuration Request

Synopsis

This message is used to configure each link within the signaling point. It must be issued after the MTP_MSG_CNF_LINKSET request that configures the link set in which the link exists.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_CNF_LINK (0x7311)
id	(linkset_id * 256) + link_ref
src	Sending module ID
dst	MTP3 module ID
rsp_req	used to request a confirmation
hclass	0
status	0
err_info	0
len	16

Parameter Area		
Offset	**Size**	**Name**
0	2	**link_id** - link_id of the link within the SP
2	1	**slc**- Signaling link code for the link (SLC)
3	1	**lower**- Module ID of lower layer (for example, MTP2)
4	2	**l2_llid** - Logical link ID of the level 2 link
6	2	**flags** - Link-specific flags (see below)
8	2	**l2_inst** - Level 2 module instance number
10	6	Reserved for future use; must be set to zero.

Parameters

- **link_id**
  The link identifier used to uniquely identify the link within the MTP3 module. The valid range is from 0 to one less than the number of links supported.
- **slc**
  The Signaling Link Code (SLC) that distinguishes this link from others in the link set. This is typically the same as **link_ref**.
- **lower**
  The module ID of the level 2 module for this link. Typically, this is set to the MTP2 module ID.
- **l2_llid**
  The logical link ID of the signaling link within the level 2 module. This is the value that is used in the **id** field of messages issued by MTP3 to MTP2.
- **l2_inst**
  The instance number of the MTP2 module. This is used to determine to which MTP2 module messages for this link should be sent. This allows for multiple instances of the MTP2 module, each running on a separate board.

- **flags**
  This field is a 16-bit field containing run-time configuration options that may be used to modify the operation of the signaling link depending on local requirements. The following flags are defined:

Bit	Meaning
0	This bit is set to override automatic internal selection of the proving period during link alignment. • 0 – Normal setting; proving period is in accordance with the SS7 protocol • 1 – Proving period is controlled by bit 3 as detailed below
1	This bit is set to cause a Signaling Link Test to be successfully carried out on link activation before marking the link as available. If it is not set, the link is marked as available as soon as the link is IN SERVICE at level 2. • 0 - Do not carry out SLT on activation • 1 - Carry out SLT on activation
2	This bit is set to cause a periodic Signaling Link Test to be carried out while a link is in service. In the event that the test fails, the link is marked as unavailable and restoration commences. This option is only valid if bit 1 is also set. • 0 - Do not conduct periodic SLT • 1 - Conduct periodic SLT
3	This bit is only significant when bit 0 is set to cause fixed selection or for Normal or Emergency proving periods during link alignment. • 0 – Always use Emergency proving period during link alignment • 1 – Always use Normal proving period during link alignment
Other bits	All other bits are reserved for future use and must be set to zero.

3.5.5 MTP_MSG_CNF_ROUTE – Route Configuration Request

Synopsis

This message is used to add a route to the MTP3 routing table. It should be issued once for each route. The message specifies which link set or link sets are to be used to reach the destination point code and whether or not to invoke load sharing across the link sets.

When modifying an existing Route, different link sets may be configured and the LSH option may be enabled or disabled.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_CNF_ROUTE (0x7312)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	used to request a confirmation
hclass	0
status	0
err_info	0
len	32

Parameter Area		
Offset	**Size**	**Name**
0	4	**dpc** - Destination Point Code
4	1	**norm_ls** - linkset_id of normal link set
5	1	**second_ls** - linkset_id of optional link set
6	2	Reserved for future use, must be set to zero.
8	2	**flags** - run time options (see below)
10	2	**up_enable** - User part enable mask
12	20	Reserved for future use, must be set to zero.

Parameters

- **dpc**
  The destination point code, that is, the point code of the remote signaling point for which this message is configuring routing data. It may be either an adjacent point code or a point code accessible via an adjacent Signaling Transfer Point (STP).

  Note: A route configuration message must be issued for each adjacent signaling point, even if no user part messages are sent to the adjacent signaling point.

- **norm_ls**
  The **linkset_id** of the normal link set used to reach the specified destination. This may be any of the following options:
  — a) The only link set used to reach the destination.
  — b) The preferred link set used to reach the destination.
  — c) One of a pair of links sets forming a combined link set.
  In the latter two cases, a second link set must also be specified.

- **second_ls**
  The **linkset_id** of an optional second link set used to reach the specified destination. This may be either of the following options:
  — a) The secondary link set used to reach the destination only on failure of the preferred link set.
  — b) One of a pair of link sets forming a combined link set over which load sharing takes place.
  When a second link set is specified, the user must also set bit 0 in the **flags** field of this message.

- **up_enable**
  A 16-bit field used to identify the user parts that are supported over this route. The bits are labelled 0 to 15 and for each user part supported, the bit corresponding to the Service Indicator for that user part should be set. For example, to support just ISUP messages, the ISUP Service Indicator is 5; therefore, bit 5 should be set. Consequently, a **up_enable** value of 0x0020 is appropriate in this case.
- **flags**
  A 16-bit field containing run-time configuration options for the route as follows:

Bit	Meaning
0	This bit is used to determine whether or not the user has supplied a second link set parameter for this route. • 0 - Only a single link set is specified • 1 - Two link sets are specified for this route
1	This bit is used to determine whether or not to load share messages across the two link sets. It is only used when two link sets are specified for the route. When set, the MTP3 module load shares messages for the destination equally across each of the two specified link sets. Otherwise, the MTP3 module considers the normal link set to be the preferred link set and only uses the second link set in the event of failure of the normal link set. • 0 – Disable load sharing, that is, use preferred and secondary link sets • 1 – Enable load sharing across the two link sets
2	This bit can be used to mark the route as a "default" route that is used by MTP3 to carry traffic to any destinations that are not explicitly configured using route configuration messages. • 0 – Normal operation • 1 – This route is a default route permitted to carry traffic for any unknown DPC
3	This bit is used in conjunction with bit 2 to control the behavior of default routes. • 0 – Normal operation. If the route is a default route, it is only used to carry traffic when the configured **dpc** is determined accessible in accordance with normal signaling route accessibility procedures. • 1 – Pseudo DPC operation. The route is considered available to carry traffic as soon as either link set is accessible. MTP3 does not generate Route Set Test messages or expect Transfer Allowed messages for this "default" route.
4	This bit is used to control the behavior in the event that the destination becomes inaccessible over all link sets within the route. • 0 – Normal operation. The destination is declared inaccessible and any buffered messages are discarded. • 1 – An internal 10 second timer is run during which time messages continue to be buffered (subject to capacity), allowing for potential recovery of the route. If the route recovers during this time, buffered messages are transmitted. On expiry of the timer, any buffered messages are discarded.
5	This bit allows the user to disable the Route Set Test (RST) procedure for this route. 0 – Normal operation; generate RST messages 1 – Disable RST; do not generate RST messages
15	This bit must be set to 1 when the message is being used to modify the existing route configuration. • 0 – Normal setting; used when the route is first configured • 1 – Reconfiguration; used when the route is being modified
Other bits	All other bits are reserved for future use and must be set to zero.

3.5.6 MTP_MSG_CNF_TIMERS – MTP3 Timer Configuration Request

Synopsis

This message is used to configure the MTP timer values to values other than their default values. The message can be issued at any time after the MTP_MSG_CONFIG message. The new timer values take effect when the timer is next started.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_CNF_TIMERS (0x7317)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	64

Parameter Area		
Offset	**Size**	**Name**
0	2	version; must be set to zero
2	2	Timer T1
4	2	Timer T2
6	2	Timer T3
8	2	Timer T4
10	2	Timer T5
12	2	Timer T6
14	2	Timer T7
16	2	Timer T8
18	2	Timer T9
20	2	Timer T10
22	2	Timer T11
24	2	Timer T12
26	2	Timer T13
28	2	Timer T14
30	2	Timer T15
32	2	Timer T16
34	2	Timer T17
36	2	Timer T18
38	2	Timer T19
40	2	Timer T20 (ITU)
42	2	Timer T21
44	2	Timer T22 (ITU) or T20 (ANSI)
46	2	Timer T23 (ITU) or T21 (ANSI)
48	2	Timer T24
Offset	**Size**	**Name**
50	2	SLTC Timer T1
52	2	SLTC Timer T2
54	2	Timer T101
56	8	Reserved for future use, must be set to zero.

3.5.7 MTP_MSG_TRACE_MASK – MTP3 Trace Mask Configuration Request

Synopsis

Set the MTP3 module's event masks for tracing (input and output) messages to the management module on a per-primitive basis and reporting Q.752 events on a per-event basis. The fields in the masks are defined below.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_TRACE_MASK (0x5316)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	24

Parameter Area		
Offset	**Size**	**Name**
0	4	**op_evt_mask** - Output event trace mask
4	4	**ip_evt_mask** - Input event trace mask
8	4	**q791_evt_mask** - Q.752 (previously Q.791) event trace mask
12	12	Reserved for future use; must be set to zero.

Parameters

- **op_evt_mask**

  The output event trace mask. This is a 32-bit value with bits set to 1 to cause a trace message to be sent to the system management module whenever a message is issued by MTP3 for the events indicated.

```
 31     30     29     28     27     26     25     24
+------+------+------+------+------+------+------+------+
|   0  |   0  |   0  |   0  |   0  |   0  |   0  |   0  |
|      |      |      |      |      |      |      |      |
+------+------+------+------+------+------+------+------+

 23     22     21     20     19     18     17     16
+------+------+------+------+------+------+------+------+
|   0  |   0  |   0  |FLUSH |  CONT|MSGFOR|UNINH_|INHIB_|
|      |      |      |      |      |USP   |FAIL  |DENIED|
+------+------+------+------+------+------+------+------+

 15     14     13     12     11     10      9      8
+------+------+------+------+------+------+------+------+
|LINK_ |LINK_ |LPO_  |LPO   |RTVL_ |RTV_  |L2_   |L2_EM |
|UNINH |INHIB |RECOV |      |REQ   |BSNT  |NO_EM |      |
+------+------+------+------+------+------+------+------+

 7      6      5      4      3      2      1      0
+------+------+------+------+------+------+------+------+
|L2_   |L2_   |TX_REQ|   0  |STATUS|RESUME|PAUSE |TFR_  |
|STOP  |START |      |      |      |      |      |IND   |
+------+------+------+------+------+------+------+------+
```

  where:

  — FLUSH = Flush Request

  — CONT = Continue Request

  — MSGFORUSP = Message for unknown destination point code indication

  — UNINH_FAIL = MTP Uninhibit Failed Indication

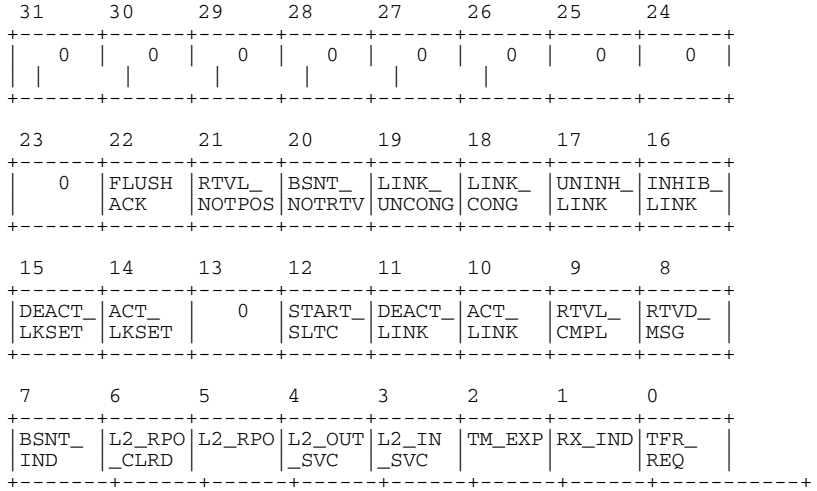
  — INHIB_DENIED = MTP Uninhibit Denied Indication

  — LINK_UNINH = MTP Link Uninhibited Indication

— LINK_INHIB = MTP Link Inhibited Indication
— LPO_RECOV = Local Processor Recovered Indication
— LPO = Local Processor Outage Indication
— RTVL_REQ = Retrieval Request
— RTV_BSNT = Retrieve BSNT Request
— L2_NO_EM = Emergency Ceases Indication
— L2_EM = Emergency Indication
— L2_STOP = Stop Request
— L2_START = Start Request
— TX_REQ = Message for Transmission Request
— STATUS = MTP Status Indication
— RESUME = MTP Resume Indication
— PAUSE = MTP Pause Indication
— TFR_IND = MTP Transfer Indication

- **ip_evt_mask**

The input event trace mask. This is a 32-bit value with bits set to 1 to cause a trace message to be sent to the system management module on receipt of messages indicating the events shown.



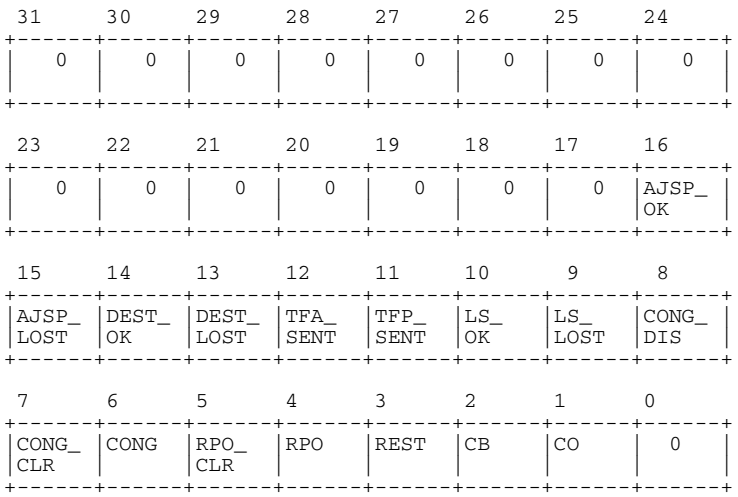
where:

— FLUSH_ACK = Flush Ack Indication
— RTVL_NOTPOS = Retrieval Not Possible Indication
— BSNT_NOTRTV = BSNT Not Retrievable Indication
— LINK_UNCONG = Link Uncongested Indication
— LINK_CONG = Link Congested Indication
— UNINH_LINK = Uninhibit Link Request
— INHIB_LINK = Inhibit Link Request
— DEACT_LKSET = Deactivate Link Set Request
— ACT_LKSET = Activate Link Set Request
— START_SLTC = Start Signaling Link Test Request
— DEACT_LINK = Deactivate Link Request
— ACT_LINK = Activate Link Request
— RTVL_CMPL = Retrieval Complete Indication
— RTVD_MSG = Retrieved Message Indication
— BSNT_IND = BNST Indication
— L2_RPO_CLRD = Remote Processor Outage Cleared Indication

— L2_RPO = Remote Processor Outage Indication
— L2_OUT_SVC = Out Of Service Indication
— L2_IN_SVC = In Service Indication
— TM_EXP = Timer Expiry Indication
— RX_IND = Received Message Indication
— TFR_REQ = MTP Transfer Request

- **q791_evt_mask**
The event mask that determines which Monitoring and Measurement events are generated by MTP3. This is a 32-bit value with bits set to 1 to cause protocol events to be reported to management in accordance with ITU-T Q.752 (previously Q.791). When enabled, events are reported using the MGT_MSG_MTP_EVENT message.

Note: Typically these events should be enabled for normal operation; take care not to inadvertently clear these fields when sending this message to MTP3.



where:

— AJSP_OK = Adjacent SP accessible
— AJSP_LOST = Adjacent SP inaccessible
— DEST_OK = Destination available
— DEST_LOST = Destination unavailable
— TFA_SENT = Transfer Allowed broadcast
— TFP_SENT = Transfer Prohibited broadcast
— LS_OK = Link Set recovered
— LS_LOST = Link Set failure
— CONG_DIS = MSU(s) discarded due to congestion
— CONG_CLR = Congestion cleared
— CONG = Signaling link congested
— RPO_CLR = Remote processor outage cleared
— RPO = Remote processor outage
— REST = Link restoration commenced
— CB = Changeback
— CO = Changeover

3.5.8 MTP_MSG_END_LINKSET – Link Set End Request

Synopsis

Message sent to MTP3 to remove a link set that has previously been configured. Prior to ending a link set, all signaling links must also be removed and all routes using the link set must be ended or modified not to use it.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_END_LINKSET (0x7323)
id	linkset_id * 256
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	0

3.5.9 MTP_MSG_END_LINK – Signaling Link End Request

Synopsis

Message sent to MTP3 to remove a signaling link that has previously been configured.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_END_LINK (0x7324)
id	(linkset_id * 256) + link_ref
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	0

3.5.10 MTP_MSG_END_ROUTE – Route End Request

Synopsis

Message sent to MTP3 to remove a route from the routing table.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_END_ROUTE (0x7325)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	0

Parameter Area		
Offset	**Size**	**Name**
0	4	dpc – Destination point code

Parameters

- **dpc**
  The destination point code for which the route is being removed.

3.5.11 MTP_MSG_GARBAGE – Clear Garbage Request

Synopsis

This message is used to clear the MTP3 module's garbage queue. When the module is reset, it may not be possible to release all frames from the transmit pool as some may still require confirmation from the lower layers. When this happens, the frame is appended to the modules, garbage queue and a message is sent to management. The MTP_MSG_GARBAGE request can be used by management to attempt to clear the garbage queue, freeing the memory for use by other modules.

Note: The garbage queue is only used on certain board-based MTP3 implementations (that is, SPCI4, and SPCI2S). It is not used for host-based implementations or on the Dialogic® SS7HD board.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_GARBAGE (0x731d)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	0

3.5.12 MTP_MSG_UPDATE_L4 – Update Level 4 Request

Synopsis

Message sent to MTP3 to request the broadcast of current route status to all user parts for a specified destination.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_UPDATE_L4 (0x731f)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Used to request a confirmation
hclass	0
status	0
len	4

Parameter Area		
Offset	**Size**	**Name**
0	4	dpc

Description

This message is sent to the MTP3 module to request that all user parts are notified of the current route status for the given destination using the normal MTP PAUSE, MTP RESUME and MTP STATUS primitives.

The message is intended for use after new routes have been configured or following additional user part configuration on a live system (for example, the addition of a new ISUP circuit group). It allows the user to ensure that the user part is updated with the current accessibility of the destination.

The confirmation message indicates success or failure in the status field of the header (success = 0).

Parameters

- **dpc**
  The destination point code for which a status broadcast is requested.

3.5.13 MTP_MSG_R_LK_STATUS – Read Link Status Request

Synopsis

The message is used by (any) external module to request on-demand from MTP3 the per-link availability status of a signaling link.

Note: This is the preferred method of reading link status as it does not require the application to track status indications to know the current status.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_R_LK_STATUS (0x6322)
id	(linkset_id * 256) + link_ref
src	Sending module ID
dst	MTP3 module ID
rsp_req	Must be used to request a confirmation
hclass	0
status	0
err_info	0
len	8

Parameter Area		
Offset	**Size**	**Name**
0	2	**link_id**
2	1	**availability**
3	1	Reserved for future use; currently set to zero
4	2	**state_flags**
6	2	**transient_flags**

Parameters

- **link_id**
  The MTP3 global link ID written into the response for convenience.
- **availability**
  Coded as follows:

Value	Mnemonic	Description
0	MTPLKAV_UNAVAILABLE	Unavailable; the link is not available to carry signaling traffic
1	MTPLKAV_AVAILABLE	Available; the link is available to carry signaling traffic

- **state_flags**
  Contains a number of individual flags that allow the user to determine the reason for link unavailability. It is coded as follows:

Bit	Mnemonic	Description
0	MTPLKSF_FAILED	The link is out of service at MTP2 (either due to failure, deactivation or SLT failure).
1	MTPLKSF_INHR	The link is Remotely Inhibited.
2	MTPLKSF_INHL	The link is Locally Inhibited.
3	MTPLKSF_BLKR	The link is (Remotely) Blocked (that is, a Remote Processor Outage condition currently exists).

- **transient_flags**
  Contains a number of individual flags that provide additional information on the current internal operating state of the link. These conditions are all transient conditions that only last for a few seconds. The field is coded as follows:

Bit	Mnemonic	Description
0	MTPLKTF_CO_IN_PROG	Changeover in progress.
1	MTPLKTF_CB_IN_PROG	Changeback in progress.
2	MTPLKTF_LIN_IN_PROG	Local link inhibit in progress.
3	MTPLKTF_UNH_IN_PROG	Link uninhibit in progress.

3.5.14 MTP_MSG_R_RT_STATUS – Read Route Status Request

Synopsis

Message issued to MTP3 to request current route status for a given destination.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_R_RT_STATUS (0x631e)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Must be used to request a confirmation
hclass	0
status	0
err_info	0
len	20

Parameter Area		
Offset	**Size**	**Name**
0	4	**dpc**
4	4	Reserved; must be set to zero
8	1	**route_status**
9	1	**route_cong**
10	2	Reserved; must be set to zero
12	1	**ls0_status**
13	3	Reserved; must be set to zero
16	1	**ls1_status**
17	3	Reserved; must be set to zero

Description

This message is sent to the MTP3 module to request the current accessibility of a destination (route). The sending module must fill in the **dpc** parameter and set the remainder of the parameter area to zero before sending the message to MTP3. The sending module must also set its response required bit in the **rsp_req** field of the message header. The response includes:

- Current route accessibility (Unavailable or Available)
- Current route congestion status (0, 1, 2 or 3)
- Individual link set accessibility (Unconfigured, Unavailable or Available) of the DPC over each link set

The confirmation message indicates success or failure in the status field of the header (success = 0) and fills in the remaining fields of the parameter area.

The message may be sent by any module, but is intended for use by the system management module in response to a request from the user for route status information.

Parameters

- **dpc**
  The destination point code for which status is requested.
- **route_status**
  The current overall accessibility of the specified destination. Values taken from the table shown below.
- **route_cong**
  The current congestion status of the route in the range 0 to 3, when multiple congestion levels are used or 0 to 1 when a single congestion level is used. 0 indicates no congestion.

- **ls0_status**
  Current accessibility of the destination over the first link set of the route. Values taken from the table shown below.
- **ls1_status**
  Current accessibility of the destination over the second link set of the route. Values taken from the table shown below.

Mnemonic	Value	Meaning
MTPACCESS_UNAVAIL_0	0	Unavailable – Not configured
MTPACCESS_UNAVAIL_1	1	Unavailable – Normal, unspecific
	2 to 7	Unavailable – Reserved for future specific meanings
MTPACCESS_AVAIL_8	8	Available – Normal, unspecific
	9 to 15	Available – Reserved for future specific meanings

3.5.15 MTP_MSG_R_SP_STATS – Read Signaling Point Statistics Request

Synopsis

This message is used by management to request that the module produces a report in accordance with ITU-T Q.752 of the statistics relating to the signaling point as a whole. The statistics are written into the parameter area and the message is returned to the sender. The internal statistics can be reset by setting status = 1 or left unchanged if status = 0.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_R_SP_STATS (0x6318)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Must be used to request a confirmation
hclass	0
status	0 - Read statistics without modification. 1 - Read and reset statistics.
err_info	0
len	8

Parameter Area (Written by MTP3 in Response)		
Offset	**Size**	**Name**
0	4	**version** - set to zero
4	4	Number of MSUs for which no outgoing route was available

3.5.16 MTP_MSG_R_RT_STATS – Read Route Statistics Request

Synopsis

The message is used by management to request that the module produces a report in accordance with ITU-T Q.752 of the statistics relating a particular route. The statistics are written into the parameter area and the message is returned to the sender. The internal statistics can be reset by setting status = 1 or left unchanged if status = 0. The **dpc** field in the parameter area must be initialized by the sending module.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_R_RT_STATS (0x6319)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Must be used to request a confirmation
hclass	0
status	0 - Read statistics without modification. 1 - Read and reset statistics.
err_info	0
len	16

Parameter Area		
Offset	**Size**	**Name**
0	4	**dpc** - (initialized by sender)
4	4	**version** - set to zero
8	4	Number of times the route has been unavailable
12	4	Duration of route unavailable

3.5.17 MTP_MSG_R_LS_STATS – Read Link Set Statistics Request

Synopsis

The message is used by management to request that the module produces a report in accordance with ITU-T Q.752 of the statistics relating to a particular link set. The statistics are written into the parameter area and the message is returned to the sender. The internal statistics can be reset by setting status = 1 or left unchanged if status = 0.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_R_LS_STATS (0x631a)
id	linkset_id * 256
src	Sending module ID
dst	MTP3 module ID
rsp_req	Must be used to request a confirmation
hclass	0
status	0 - Read statistics without modification 1 - Read and reset statistics
err_info	0
len	16

Parameter Area		
Offset	**Size**	**Name**
0	4	**version** - set to zero
4	4	Duration of link set unavailable
8	4	Number of times the adjacent SP has been inaccessible
12	4	Duration of adjacent SP inaccessible

3.5.18 MTP_MSG_R_LK_STATS – Read Link Statistics Request

Synopsis

The message is used by management to request that the module produces a report in accordance with ITU-T Q.752 of the statistics relating to a particular link. The statistics are written into the parameter area and the message is returned to the sender.

Message Format

Message Header	
Field Name	**Meaning**
type	MTP_MSG_R_LK_STATS (0x631b)
id	(linkset_id * 256) + link_ref
src	Sending module ID
dst	MTP3 module ID
rsp_req	Must be used to request a confirmation
hclass	0
status	0 - Read statistics without modification 1 - Read and reset statistics
err_info	0
len	68

Parameter Area		
Offset	**Size**	**Name**
0	4	**version** - set to zero
4	4	Number of changeover attempts for the link
8	4	Duration of link unavailability (for any reason)
12	4	Duration of link inhibition due to local action
16	4	Duration of link inhibition due to remote action
20	4	Duration of unavailability due to link failure
24	4	Duration of link unavailability due to RPO
28	4	Number of local management inhibit
32	4	Number of local management uninhibit
36	4	Number of SIO/SIF octets transmitted
40	4	Number of MSUs transmitted
44	4	Number of SIF/SIO octets received
48	4	Number of MSUs received
52	4	Congestion indications
56	4	Duration of link congestion
60	4	MSUs discarded due to congestion
64	4	Number of congestion events resulting in loss of MSUs

3.5.19 GEN_MSG_MOD_IDENT – Read Module Version Request

Synopsis

Request the module type and software issue number.

Message Format

Message Header	
Field Name	**Meaning**
type	GEN_MSG_MOD_IDENT (0x6111)
id	0
src	Sending module ID
dst	MTP3 module ID
rsp_req	Must be used to request a confirmation
hclass	0
status	0
err_info	0
len	28

Parameter Area (Written by MTP3 Module in Response)		
Offset	**Size**	**Name**
0	2	**type** – Reserved for future use
2	1	**maj_rev** - Major revision number
3	1	**min_rev** - Minor revision number
4	24	**text** – Null terminated string giving textual module identity. “SS7 MTP3”

3.6 Management Indications Issued by MTP3

Management indications are sent to the user nominated management module to advise of events occurring within the MTP3 module such as protocol events, diagnostic traces or error indications.

The full list of management indications available to be sent from MTP3 includes:

- MGT_MSG_MTP_EVENT – MTP3 Q.752 Event Indication
- MGT_MSG_EVENT_IND – Error Indication
- MGT_MSG_TRACE_EV – Trace Event Indication

Management indications are sent to the management module as configured in the **mgmt_id** field of the MTP_MSG_CONFIG message.

The user can select, using trace masks, which events to report and disable the remainder.

The use of the **hdr->id** field is detailed on a per-message basis in this section.

The receiving module is responsible for releasing the message using the **relm( )** library function.

3.6.1 MGT_MSG_MTP_EVENT – MTP3 Q.752 Event Indication

Synopsis

This message is used by level 3 to notify management of various protocol events in accordance with ITU-T Q.752. Notification of individual events can be enabled or disabled using the MTP_MSG_TRACE_MASK message.

Message Format

Message Header	
Field Name	**Meaning**
type	MGT_MSG_MTP_EVENT (0x0301)
id	0
src	MTP3 module ID
dst	Management module ID
rsp_req	0
hclass	0
status	EVENT CODE (see below)
err_info	Timestamp
len	Either 0, 1, 2 or 4

Parameter Area		
Offset	**Size**	**Name**
0	len	Event specific parameters

The EVENT_CODE coding and the meaning of the event specific parameters are given in the following table:

Value	Mnemonic	Parameter	Description
1	MTPEV_CO	link	Changeover
2	MTPEV_CB	link	Changeback
3	MTPEV_REST	link	Restoration commenced
4	MTPEV_RPO	link	Remote processor outage
5	MTPEV_RPO_CLR	link	Remote processor outage cleared
6	MTPEV_CONG	link	Signaling link congestion
7	MTPEV_CONG_CLR	link	Congestion cleared
9	MTPEV_LS_LOST	link set	Link set failure
10	MTPEV_LS_OK	link set	Link set recovered
13	MTPEV_DEST_LOST	point code	Destination unavailable
14	MTPEV_DEST_OK	point code	Destination available
15	MTPEV_AJSP_LOST	link set	Adjacent SP inaccessible
16	MTPEV_AJSP_OK	link set	Adjacent SP accessible

link is indicated as (linkset_id * 256) + link_ref, (size = 2).
link set is indicated as linkset_id, (size = 1).
point code is a 4 byte value, (size = 4).

3.6.2 MGT_MSG_EVENT_IND – Error Indication

Synopsis

This message is used by level 3 to advise management of errors or events occurring within the MTP3 module.

Message Format

Message Header	
Field Name	**Meaning**
type	MGT_MSG_EVENT_IND (0x0008)
id	0 (unless shown below)
src	MTP3 module ID
dst	Management module ID
rsp_req	0
hclass	0
status	error_code (see below)
err_info	Timestamp
len	0

The error_code in the **status** field is coded as shown in the following table:

Value	Mnemonic	ID	Description
0x52	MTP_POOL_EMPTY	0	Indicates that MTP3 has attempted to allocate a message buffer from its internal pool, but the pool is empty. When this happens, MTP3 continues to activate a normal (external) message buffer so there is no impact on operation and no messages are lost.
0x53	MTP_TX_FAIL	0	MTP3 failed to send an MSU to lower layer. This indicates that an internal call to the **GCT_send( )** function has failed.
0x54	MTP_LEN_ERR	0	MSU too long for buffer. This can only happen if the user tries to send an MSU that is physically too long to fit into an internal buffer.
0x55	MTP_SLT_FAIL	link_id	Signaling link test failure. This event is logged on the second expiry of the Signaling Link Test Control timer as a result of not receiving a valid Signaling Link Test Acknowledgement (SLTA) message. This may be due to configuration error (opc, dpc, ssf, slc) or may be as a result of incorrect physical connections (for example, loop back in place or wrong timeslot in use).
0x56	MTP_BAD_DPC	0	Message received for unknown destination. This event can only occur when operating in dual MTP3 mode. It occurs if a message is received from the other MTP3 for passing on to the network, but the DPC has not been configured.
0x57	MTP_TALLOC_ERR	0	Failed to allocate a buffer to send a message to the lower layer. The message is discarded. Under normal usage, this event should not occur.
0x59	MTP_MALLOC_ERR	0	Failed to allocate an internal buffer during Changeback process. In the unlikely event that this event occurs, the changeback operation is completed using the time-controlled diversion. However, this event indicates that the system has run out of messages, so unpredictable operation may result.
0x5a	MTP_BSNT_FAIL	link_id	MTP3 failed to receive a BSNT from MTP2 during a changeover cycle. This may be as a result of a failure of the MTP2 board. MTP3 uses the Emergency Changeover procedure.
0x5b	MTP_RTV_FAIL	link_id	MTP3 failed to retrieve some or all messages from the MTP2 transmission buffer during Changeover. This may be as a result of a failure of the MTP2 board. MTP3 discards any retrieved messages.

Value	Mnemonic	ID	Description
0x5c	MTP_BAD_FSN	link_id	Erroneous FSN in COA. This indicates that MTP2 was unable to complete message retrieval using the received FSN and potentially some messages are discarded during changeover. Recovery should be automatic.
0x5d	MTP_BAD_COO	link_id	A Changeover message was received after changeover had completed. This can happen under different network failure scenarios and is of no real consequence.
0x5e	MTP_SNMM_ERR	0	Internal software error. Please report through normal support channel.
0x5f	MTP_SLTM_ERR	0	Internal software error. Please report through normal support channel.
0x60	MTP_NO_COA	link_id	Failed to receive COA. MTP3 Timer T2 expired while awaiting a Changeover Ack from the remote end. This is an informational message, Changeover continues following timer expiry. Persistent receipt of this message may be an indication of a configuration mismatch with the remote end.
0x61	MTP_NO_CBA	link_id	Failed to receive CBA. MTP3 Timer T5 expired prior to receipt of all Changeback Ack messages. This is an informational message, Changeback continues using the time-controlled method and no resulting impact on operation occurs.
0x66	MTP_TIM_ERR	tim_ref	Attempt to re-use active timer resource (message ID is set to the timer reference). This indicates an internal software error and should be reported through the normal support channel.
0x67	MTP_RRT_OVRFLW	0	Messages discarded due to overflow of Re-Routing buffer. MTP3 has discarded messages during forced or controlled rerouting as a result of an excessive number of messages queued internally. Operation resumes normally, although some messages are lost.
0x68	MTP_FLUSH_FAIL	link_id	Failed to receive Flush Ack from MTP2. This condition could occur if the board on which MTP2 is running has failed.
0x69	MTP_FLUSH_L2	link_id	MTP2 transmission buffer flushes (due to RPO). Unacknowledged messages in the MTP2 transmission buffer have been flushed out due to the excessive duration of the RPO condition.
0x70	MTP_SRT_FAIL	link_id	Signaling Route Test (SRT) Failure (Japan specific). The user is notified of the failure reason in the MTP_MSG_SRT_RESULT message.
0x71	MTP_SRT_RETRY	link_id	Signaling Route Test (SRT) Retry (Japan specific). MTP3 is repeating an SRT as the first attempt was not successful.

3.6.3 MGT_MSG_TRACE_EV – Trace Event Indication

Synopsis

The MTP3 module may be configured to report to management each primitive issued or received. This is useful for trace and diagnostic purposes. The MTP3 event masks are used to enable and disable tracing on a per-primitive basis for each link. The traced primitives are reported as event indications as shown below.

Message Format

Message Header	
Field Name	**Meaning**
type	MGT_MSG_TRACE_EV (0x0003)
id	0
src	MTP3 module ID
dst	Management module ID
rsp_req	0
hclass	0
status	0
err_info	0
len	18 + length of traced data

Parameter Area		
Offset	**Size**	**Name**
0	1	source module id
1	1	destination module id
2	2	id
4	2	type
6	2	status
8	4	timestamp
12	4	pointer to the message being traced
16	2	data length
18	0 to 280	data - Data taken from the payload of a traced transmit or receive frame or the contents of the MSG parameter area

3.7 Message Summary Table

Table 1 lists, by message type, all the messages defined in this manual.

Table 1. Message Summary Table

Message Type	Mnemonic	Description
0x0003	MGT_MSG_TRACE_EV	Trace Event Indication
0x0008	MGT_MSG_EVENT_IND	Error Indication
0x0301	MGT_MSG_MTP_EVENT	MTP3 Q.752 Event Indication
0x1316		Confirmation of MTP_MSG_TRACE_MASK
0x2111		Confirmation of GEN_MSG_MOD_IDENT
0x2318		Confirmation of MTP_MSG_R_SP_STATS
0x2319		Confirmation of MTP_MSG_R_RT_STATS
0x231a		Confirmation of MTP_MSG_R_LS_STATS
0x231b		Confirmation of MTP_MSG_R_LK_STATS
0x231e		Confirmation of MTP_MSG_R_RT_STATUS
0x2322		Confirmation of MTP_MSG_R_LK_STATUS
0x3300		Confirmation of MTP_MSG_RESET
0x3303		Confirmation of MTP_MSG_CONFIG
0x3310		Confirmation of MTP_MSG_CNF_LINKSET
0x3311		Confirmation of MTP_MSG_CNF_LINK
0x3312		Confirmation of MTP_MSG_CNF_ROUTE
0x3316		Confirmation of MTP_MSG_GARBAGE
0x3317		Confirmation of MTP_MSG_CNF_TIMERS
0x331f		Confirmation of MTP_MSG_UPDATE_L4
0x3323		Confirmation of MTP_MSG_END_LINKSET
0x3324		Confirmation of MTP_MSG_END_LINK
0x3325		Confirmation of MTP_MSG_END_ROUTE
0x5316	MTP_MSG_TRACE_MASK	MTP3 Trace Mask Configuration Request
0x6111	GEN_MSG_MOD_IDENT	Read Module Version request
0x6318	MTP_MSG_R_SP_STATS	Read Signaling Point Statistics Request
0x6319	MTP_MSG_R_RT_STATS	Read Route Statistics Request
0x631a	MTP_MSG_R_LS_STATS	Read Link Set Statistics Request
0x631b	MTP_MSG_R_LK_STATS	Read Link Statistics Request
0x631e	MTP_MSG_R_RT_STATUS	Read Route Status Request
0x6322	MTP_MSG_R_LK_STATUS	Read Link Status Request
0x7300	MTP_MSG_RESET	MTP3 Module Reset Request
0x7303	MTP_MSG_CONFIG	MTP3 Module Configuration Request
0x7310	MTP_MSG_CNF_LINKSET	Link Set Configuration Request
0x7311	MTP_MSG_CNF_LINK	Signaling Link Configuration Request
0x7312	MTP_MSG_CNF_ROUTE	Route Configuration Request
0x7316	MTP_MSG_GARBAGE	Clear Garbage Request
0x7317	MTP_MSG_CNF_TIMERS	MTP3 Timer Configuration Request
0x731f	MTP_MSG_UPDATE_L4	Update Level 4 Request
0x7323	MTP_MSG_END_LINKSET	Link Set End request
0x7324	MTP_MSG_END_LINK	Signaling Link End Request
0x7325	MTP_MSG_END_ROUTE	Route End Request
0x830a		Confirmation of MTP_MSG_ACT_SL

Table 1. Message Summary Table (Continued)

Message Type	Mnemonic	Description
0x830b		Confirmation of MTP_MSG_DEACT_SL
0x830c		Confirmation of MTP_MSG_SLTC_START
0x830e		Confirmation of MTP_MSG_ACT_LS
0x830f		Confirmation of MTP_MSG_DEACT_LS
0x8310		Confirmation of MTP_MSG_INHIB_SL
0x8311		Confirmation of MTP_MSG_UNINHIB_SL
0x8317		Confirmation of MTP_MSG_SRT_START
0x8321	MTP_MSG_SRT_RESULT	SRT Result Indication
0x8380	MTP_MSG_LINK_INHIB	Signaling Link Inhibited Indication
0x8381	MTP_MSG_LINK_UNINHIB	Signaling Link Uninhibited Indication
0x8382	MTP_MSG_INHIB_DENIED	Signaling Link Inhibit Denied
0x8383	MTP_MSG_UNINHIB_FAIL	Signaling Link Uninhibit Failure Indication
0x8403	MTP_MSG_PAUSE	MTP Pause Indication
0x8404	MTP_MSG_RESUME	MTP Resume Indication
0x8405	MTP_MSG_STATUS	MTP Status Indication
0x8f00		Confirmation of API_MSG_TX_REQ
0x8f01	API_MSG_RX_IND	MTP Transfer Indication
0xc30a	MTP_MSG_ACT_SL	Activate Signaling Link Request
0xc30b	MTP_MSG_DEACT_SL	Deactivate Signaling Link Request
0xc30c	MTP_MSG_SLTC_START	Signaling Link Test Request
0xc30e	MTP_MSG_ACT_LS	Activate Link Set Request
0xc30f	MTP_MSG_DEACT_LS	Deactivate Link Set Request
0xc310	MTP_MSG_INHIB_SL	Inhibit Signaling Link Request
0xc311	MTP_MSG_UNINHIB_SL	Uninhibit Signaling Link Request
0xc317	MTP_MSG_SRT_START	Start SRT Request (Japan)
0xcf00	API_MSG_TX_REQ	MTP Transfer Request

Chapter 4: Internal Interfaces

The MTP3 module interfaces with the lower layer protocol layer (for example, MTP2) and system services for timer tick information. Detailed knowledge of these interfaces is not required in order to use the MTP3 module, however, for completeness the messages and message types used on these interfaces are detailed in this chapter.

4.1 Primitives Issued by MTP3 to MTP2

Message Mnemonic	Message Type	Brief Description of Internal Use
API_MSG_TX_REQ	0xcf00	Send a Message Signal Unit (MSU) to MTP2 for transmission
SS7_MSG_START	0xc204	Starts the MTP2 Initial Alignment procedure
SS7_MSG_STOP	0xc205	Takes a link out of service
SS7_MSG_EMGCY	0xc207	Notifies MTP2 of an Emergency condition
SS7_MSG_EMGCY_CLRD	0xc208	Cancels a previous Emergency request
SS7_MSG_RTV_BSNT	0xc209	Requests BSNT from MTP2
SS7_MSG_RTVL_REQ	0xc20a	Requests retrieval of unacknowledged messages
SS7_MSG_FLUSH	0xc212	Flushes messages from the transmission and retransmission buffers during periods of processor outage
SS7_MSG_CONTINUE	0xc211	Resumes normal operation following processor outage

4.2 Primitives Received by MTP3 from MTP2

Message Mnemonic	Message Type	Brief Description of Internal Use
API_MSG_RX_IND	0x8f01	Message Signal Unit (MSU) received from the network
SS7_MSG_IN_SVC	0x8303	In Service indication
SS7_MSG_OUT_SVC	0x8304	Out of Service indication
SS7_MSG_REM_PR_OUT	0x8305	Remote Processor Outage indication
SS7_MSG_REM_PR_OK	0x8306	Remote Processor Outage cleared indication
SS7_MSG_RXD_BSNT	0x8307	BSNT indication form MTP2
API_MSG_RTVD_MSG	0x8f08	Retrieved message
SS7_MSG_RTVL_COMPL	0x8309	Retrieval complete indication
MTP_MSG_RTVL_NOT_POS	0x8315	Retrieval not possible indication
MTP_MSG_LINK_CONG	0x8312	Link congestion indication
MTP_MSG_LINK_UNCONG	0x8313	Link congestion cleared indication
MTP_MSG_FLUSH_ACK	0x8316	Flush acknowledgement indication

4.3 Messages Exchanged Between MTP3 and Timer Services

Message Mnemonic	Message Type	Brief Description of Internal Use
SS7_MSG_TM_EXP	0xc002	Periodic 100 ms timer expiry indication sent to MTP3
TIM_MSG_KEEP_TIME	0x7006	Message sent by MTP3 to initialize timer services

4.4 Messages Exchanged Between MTP2 and MTP3 On-board

In addition, three internal messages are used as part of the on-board interface between MTP2 and MTP3 to convey message for transmission to MTP2, to convey received indications to MTP3 and to transfer retrieved messages from MTP2 to MTP3. These messages are not passed off board so the user does not need to use these messages. For completeness they are also listed below:

Message Mnemonic	Message Type	Brief Description of Internal Use
SS7_MSG_TX_REQ	0xc000	Sends a Message Signal Unit (MSU) to MTP2 for transmission
SS7_MSG_RX_IND	0x8001	Indication of a received MSU from MTP2 to MTP3
SS7_MSG_RTVD_MSG	0x8301	Message sent by MTP2 to return retrieved messages to MTP3

Glossary

DPC	Destination Point Code
M2PA	MTP2 Peer to Peer Adaptation Layer. A SIGTRAN protocol used to replicate the services offered by MTP2 while using IP as a transport protocol.
MTP	Message Transfer Part. Layers 1 to 3 of the SS7 protocol stack broadly equivalent to the Physical, Data Link and Network layers in the OSI protocol stack. See also MTP1, MTP2, and MTP3.
MTP1	Message Transfer Part Level 1. An SS7 stack layer that defines the physical and electrical characteristics of the signaling links of the SS7 network. Signaling links use DS0 channels and carry raw signaling data at a rate of 48, 56 or 64 kbps.
MTP2	Message Transfer Part Level 2. An SS7 stack layer that provides link-layer functionality. Ensures that two end points of a signaling link can reliably exchange signaling messages. It provides error checking, flow control and sequence checking.
MTP3	Message Transfer Part Level 3. An SS7 stack layer that provides network-layer functionality. Ensures that messages can be delivered between signaling points across the SS7 network regardless of whether the signaling points are directly connected. It provides node addressing, routing, alternate routing and congestion control.
MSU	Message Signal Unit. A data unit that carries signaling information for call control, transaction processing, network management and maintenance. Typically, the MSU is carried in the Signaling Information Field (SIF) of SS7 messages.
SLT	Signaling Link Test
SRT	Signaling Route Test
SS7	Signaling System Number 7
SSF	Sub-Service Field
STP	Signaling Transfer Points