



# Dialogic<sup>®</sup> DSI Protocols Stacks

M2PA Programmer's Manual

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Publication Date: December 2011

Document Number: 05-2407-003, Issue 4

## Revision History

Date	Issue No.	Description of Changes
7-Dec-11	4	M2P_MSG_LINK_CNF message supports default values. Maximum throughput module configuration parameter added. Retrieval rate link configuration parameter and option added. New confirmation message status values added. Suggested configuration values table updated. Message names revised to match code (in three places). Corrections to event and error code documentation.
18-Apr-07	3	Changed to Dialogic format. Updated the parameters in <a href="#">Section 4.2.4, "M2P_MSG_TRACE_MASK" on page 35</a> . Supports configuration of the RFC version and a per link option for the support of Draft Version 9. This manual is applicable to M2PA Software Core V1.04 or later.
14-Apr-05	2	Supports the production release of MP2A software core revision V1.02. Updated the Event Codes table in <a href="#">Section 4.2.7 M2P_MSG_EVENT_IND - EVENT Indication</a> .
17-Dec-04	1	Applicable to MP2A software core revision V1.01.

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

<b>1</b>	<b>Introduction</b> .....	5
1.1	Related Documentation.....	5
<b>2</b>	<b>Functional Overview</b> .....	6
2.1	M2PA Module Overview.....	6
2.2	Feature Overview.....	6
2.3	General Description.....	7
<b>3</b>	<b>Message Reference</b> .....	8
3.1	Protocol Requests from M2PA to SCTP .....	8
3.2	Protocol Indications from SCTP to M2PA.....	8
3.3	Protocol Requests from MTP3 to M2PA .....	9
3.3.1	API_MSG_TX_REQ – Message for Transmission Request .....	10
3.3.2	SS7_MSG_START – M2PA Link Start Request .....	11
3.3.3	SS7_MSG_STOP – M2PA Link Stop Request .....	12
3.3.4	SS7_MSG_EMGNCY – M2PA Set Emergency Request.....	13
3.3.5	SS7_MSG_EMGNCY_CLRDR – M2PA Cancel Emergency Request.....	13
3.3.6	SS7_MSG_RTV_BSNT – M2PA BSNT Retrieval Request .....	14
3.3.7	SS7_MSG_RTVL_REQ – M2PA Retrieval Request.....	15
3.3.8	SS7_MSG_LOC_PR_OUT – M2PA LPO Request .....	16
3.3.9	SS7_MSG_LOC_PR_OK – MTP2 LPO Recovered Request .....	16
3.4	Protocol Indications from M2PA to MTP3.....	17
3.4.1	API_MSG_RX_IND – Received Message Indication .....	18
3.4.2	SS7_MSG_IN_SVC – M2PA In Service Indication .....	19
3.4.3	SS7_MSG_OUT_SVC – M2PA Out of Service Indication.....	20
3.4.4	SS7_MSG_REM_PR_OUT – M2PA RPO Indication .....	20
3.4.5	SS7_MSG_REM_PR_OK – M2PA RPO Cleared Indication .....	21
3.4.6	SS7_MSG_RXD_BSNT – M2PA BSNT Indication .....	22
3.4.7	API_MSG_RTVD_MSG – M2PA Retrieved Message Indication .....	23
3.4.8	SS7_MSG_RTVL_COMPL – M2PA Retrieval Complete Indication .....	24
3.4.9	MTP_MSG_RTVL_NOT_POS – M2PA Retrieval Failure Indication .....	25
3.4.10	MTP_MSG_LINK_CONG – M2PA Link Congested Indication.....	26
3.4.11	MTP_MSG_LINK_UNCONG – M2PA Congestion Cleared Indication .....	27
3.4.12	MTP_MSG_FLUSH_ACK – M2PA Flush Acknowledgement Indication.....	28
<b>4</b>	<b>Non-Primitive Interface</b> .....	29
4.1	Confirmation Message Status Values .....	29
4.2	Non-Primitive Interface Messages .....	29
4.2.1	M2P_MSG_CONFIG – Configure M2PA Module .....	30
4.2.2	M2P_MSG_CNF_LINK – M2PA Link Configuration Request.....	31
4.2.3	M2P_MSG_END_LINK – M2PA Link End Request .....	34
4.2.4	M2P_MSG_TRACE_MASK – TRACE MASK Set Request .....	35
4.2.5	M2P_MSG_R_STATE – READ STATE Read Request .....	37
4.2.6	M2P_MSG_R_STATS – READ STATISTICS Read Request .....	39
4.2.7	M2P_MSG_EVENT_IND – EVENT Indication.....	41
4.2.8	M2P_MSG_ERROR_IND – ERROR Indication.....	42
4.2.9	M2P_MSG_LINK_STATE – M2PA Link STATE Indication .....	43
<b>5</b>	<b>Typical Configuration Values</b> .....	44
<b>6</b>	<b>Message Types</b> .....	45
6.1	Message Type Table.....	45
<b>7</b>	<b>Timer Services</b> .....	46
7.1	Introduction.....	46
7.1.1	KEEP_TIME – Keep Time .....	46
7.1.2	TM_EXP – Timer Expiry.....	47
	<b>Glossary</b> .....	48

## Chapter 1: Introduction

The M2PA module is an implementation of the IETF SIGTRAN, SS7 MTP2-User Peer-to-Peer Adaptation Layer (M2PA). This Programmer's Manual is intended for users developing their own application programs that interface with or use the functionality offered by the M2PA module.

The module uses the services offered by the Stream Control Transmission Protocol (SCTP) to exchange signaling messages with remote signaling points. It supports a number of links, each separately configurable allowing the user flexibility in configuring the module.

The M2PA module is intended to be used in conjunction with the Dialogic® SS7 Protocols SCTP and MTP3 modules, either on hardware platforms from Dialogic or on user-supplied hardware. However, the software is portable and the well-defined interface of the module allows it to be used with alternative SCTP and MTP3 implementations as required.

This manual provides an overview of the operation of the M2PA module, defines the structure of all messages that can be sent to, or issued by, the module and describes all configuration parameters.

### 1.1 Related Documentation

The following documents provide information that is related to the information in this manual:

- *IETF Internet draft SS7 MTP2-User Peer-to-Peer Adaptation Layer*
- *IETF RFC 2960 Stream Control Transmission Protocol*
- *SCTP Programmer's Manual*
- *Software Environment Programmer's Manual*
- *SS7 Programmer's Manual for SigTran Host Software*
- *ITU-T Q.703 Message Transfer Part Layer 2*

## Chapter 2: Functional Overview

### 2.1 M2PA Module Overview

The services offered by M2PA and SCTP are used to replace those offered by MTP2. The services offered by MTP2 can be divided into high and low level functions:

- The **high-level functions** include:
  - Link state control
  - Initial alignment control
  - Transmission control
  - Reception control
- The **low-level functions** include:
  - Signal unit delimitation and alignment
  - Error detection
  - Signal unit error monitoring.

M2PA may be considered to replace the high-level functions and SCTP the low-level functions.

The M2PA module is a full implementation including the following services:

- Link alignment (normal and emergency)
- Generation of level 2 header information
- Buffering transmission and retrieval of Message Signal Units (MSU)
- Validation and acknowledgement of received signal units
- Generation and transmission of Link Status Signal Units (LSSU)
- Congestion control

M2PA services MTP3 requests and issues indications to MTP3 and to management. The module supports level 2 monitoring and measurement features.

### 2.2 Feature Overview

Key features of the M2PA module include:

- Implementation of IETF Internet draft M2PA Version 09
- Configuration options on an M2PA Link basis
- User interface common with other Dialogic<sup>®</sup> SS7 Protocols
- Message oriented interface
- Full user control of link supervisory functions; reset, blocking and unblocking
- Support for 24-bit and 7-bit sequence numbers
- Optional support for multiple congestion levels
- Support for message retrieval
- Support for per link statistics
- Support for normal and emergency proving
- Support for local and remote processor outage
- Debug tracing of messages exchanged with SCTP and MTP3

### 2.3 General Description

The interface to the M2PA module is entirely message based using the structured messages documented in the *Software Environment Programmer's Manual*. The M2PA module is capable of working in conjunction with the Dialogic SS7 Protocols MTP3 module or, using the interface specified in this manual, M2PA can be used in conjunction with third-party MTP3 implementations if required.

The M2PA module supports multiple logical M2PA links. Each link is maintained independently of the others. Links are identified by a level 2 logical link identifier (**I2\_llid**). The **I2\_llid** values are in the range from 0 to one less than the number of links supported and are used to identify the link in all messages sent to the M2PA module. At configuration time, a level 3 link identifier is associated with each link and this is used in indications issued to the MTP3 module.

## Chapter 3: Message Reference

This chapter describes the individual messages and associated parameters that may be sent or received when interfacing to the M2PA module.

The interface is a message based interface using messages of type **MSG** as defined in the *Software Environment Programmer's Manual*.

These messages are used for the primitive protocol interface with the MTP3 and SCTP modules and for the non-primitive interface to management for the purposes of configuring and managing M2PA signaling links.

The messages are grouped into the following categories:

- Protocol Requests from M2PA to SCTP
- Protocol Indications from SCTP to M2PA
- Protocol Requests from MTP3 to M2PA
- Protocol Indications from M2PA to MTP3

### 3.1 Protocol Requests from M2PA to SCTP

Primitive protocol requests are sent from M2PA to SCTP in accordance with published M2PA recommendations.

The list of protocol requests sent from M2PA to SCTP includes the following:

Message Type	Type Code	Description
SCTP_MSG_ACTIVATE	0x728a	Starts an SCTP Association
SCTP_MSG_SHUTDOWN	0x728b	Initiates Graceful Shutdown of an SCTP Association
SCTP_MSG_ABORT	0x728c	Aborts an SCTP Association
SCTP_MSG_TX_REQ	0xc280	Queues a data packet for transmission on an SCTP Association

See the *DSI SCTP Programmer's Manual* for a description of these messages.

### 3.2 Protocol Indications from SCTP to M2PA

Primitive protocol indications are sent from SCTP to M2PA in accordance with published M2PA recommendations.

The list of protocol requests sent from the SCTP to M2PA includes the following:

Message Type	Type Code	Description
SCTP_MSG_RX_IND	0x8281	Received data packet from an SCTP Association.
SCTP_MSG_STATUS_CHANGE	0x028d	Reports a change of SCTP Association network status.
SCTP_MSG_NETWORK_STATUS	0x028e	Reports a change of SCTP Association network status
SCTP_MSG_CONG_STATUS	0x028f	Reports a change of SCTP Association transmit congestion status.

See the *DSI SCTP Programmer's Manual* for a description of these messages.

### 3.3 Protocol Requests from MTP3 to M2PA

Primitive protocol requests are sent from MTP3 to M2PA in accordance with published M2PA recommendations. The primitive names used for the M2PA module are closely aligned with the terminology used in *ITU-T Recommendation Q.703*.

This section of the manual is applicable only to users intending to write or interface to their own MTP3 implementation. When using MTP3 from the Dialogic SS7 Protocols, this interface is already implemented within the MTP3 module.

The full list of protocol requests sent from MTP3 to MTP2 includes:

- [API\\_MSG\\_TX\\_REQ](#) – Message for Transmission Request
- [SS7\\_MSG\\_START](#) – M2PA Link Start Request
- [SS7\\_MSG\\_STOP](#) – M2PA Link Stop Request
- [SS7\\_MSG\\_EMGCY](#) – M2PA Set Emergency Request
- [SS7\\_MSG\\_EMGCY\\_CLRD](#) – M2PA Cancel Emergency Request
- [SS7\\_MSG\\_RTV\\_BSNT](#) – M2PA BSNT Retrieval Request
- [SS7\\_MSG\\_RTVL\\_REQ](#) – M2PA Retrieval Request
- [SS7\\_MSG\\_LOC\\_PR\\_OUT](#) – M2PA LPO Request
- [SS7\\_MSG\\_LOC\\_PR\\_OK](#) – MTP2 LPO Recovered Request

When sending messages to M2PA, the user should ensure that the message is sent to the correct **module\_id** and the correct Layer 2 Logical Link ID (**l2\_llid**).

The **hdr->id** field of the message should be set to the correct **l2\_llid**, which is in the range from zero up to one less than the number of signaling links supported by the M2PA instance.

The **hdr->rsp\_req** field may optionally be used to request a confirmation. If requested, the M2PA 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*.

**Note:** Normal MTP3 operation does not require a response from M2PA for these primitives. The mechanism is useful however when debugging an application.

### 3.3.1 API\_MSG\_TX\_REQ – Message for Transmission Request

#### Synopsis

Message issued to a board by MTP3 containing SS7 Message Signal Unit (MSU) for transmission to the network on specified signaling link.

#### Message Format

Message Header		
Field Name	Meaning	
type	API_MSG_TX_REQ (0xcf00)	
id	I2_llid	
src	Originating module_id	
dst	M2PA 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

#### Description

This primitive is issued by MTP3 to request that M2PA transmits an MTP3 Message on the specified link. The parameter area should commence with the MTP Routing Label.

#### Parameters

- **MSU data**  
MSU data in binary format commencing with the Service Information Octet (SIO).

### 3.3.2 SS7\_MSG\_START – M2PA Link Start Request

#### Synopsis

Request to start the initial alignment procedure for the specified link.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_START (0xc204)
id	l2_llid
src	Originating module_id
dst	M2PA module_id
rsp_req	Sending layer's bit set if response required.
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by MTP3 to request that M2PA commences the initial alignment procedure. If the procedure is successful an **In Service** indication is issued. If alignment fails, an **Out of Service** indication is issued.

If an EMERGENCY condition exists, then MTP3 should send an [SS7\\_MSG\\_EMGCY](#) message to M2PA prior to sending the M2PA Link Start Request.

Changes of EMERGENCY condition can be notified by MTP3 to M2PA both prior to sending the M2PA Link Start Request and during link alignment.

**Note:** Receipt of a confirmation message (if requested) does not imply that the initial alignment procedure has been completed, merely that M2PA has recognized the request to start the procedure.

### 3.3.3 SS7\_MSG\_STOP – M2PA Link Stop Request

#### Synopsis

Request to stop a signaling link.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_STOP (0xc205)
id	I2_llid
src	Originating module_id
dst	M2PA module_id
rsp_req	Sending layer's bit set if response required.
hclass	0
Status	0
err_info	0
Len	0

#### Description

This primitive is issued by MTP3 to request that M2PA stops the operation of a signaling link. The link is taken to the Out of Service state without further indications being issued to MTP3.

Once a link has been stopped, MTP3 may request the Backward Sequence Number Transmitted (BSNT) and initiate message retrieval if required.

### 3.3.4 SS7\_MSG\_EMGCY – M2PA Set Emergency Request

#### Synopsis

Request to use the emergency proving period on the next attempt at link alignment.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_EMGCY (0xc207)
id	I2_llid
src	Originating module_id
dst	M2PA module_id
rsp_req	Sending layer's bit set if response required.
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by MTP3 prior to issuing the [M2PA Link Start Request](#) or during initial alignment to cause the next attempt at link alignment to use the emergency proving period instead of the normal proving period.

### 3.3.5 SS7\_MSG\_EMGCY\_CLRD – M2PA Cancel Emergency Request

#### Synopsis

Request to cancel a previous [M2PA Set Emergency Request](#).

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_EMGCY_CLRD (0xc208)
id	I2_llid
src	Originating module_id
dst	M2PA module_id
rsp_req	Sending layer's bit set if response required.
hclass	0
status	0
len	0

#### Description

This primitive is issued by MTP3 prior to cancel any previous Emergency requests and causes the next attempt at link alignment to use the normal proving period.

### 3.3.6 SS7\_MSG\_RTV\_BSNT – M2PA BSNT Retrieval Request

#### Synopsis

Request for BSNT retrieval.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_RTV_BSNT (0xc209)
id	I2_llid
src	Originating module_id
dst	M2PA module_id
rsp_req	Sending layer's bit set if response required.
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by MTP3 to request the sequence number of the last signal unit to be acknowledged, the Backward Sequence Number Transmitted (BSNT). The response is issued by M2PA as an [SS7\\_MSG\\_RXD\\_BSNT](#) indication.

### 3.3.7 SS7\_MSG\_RTVL\_REQ – M2PA Retrieval Request

#### Synopsis

Request retrieval of unacknowledged messages.

#### Message Format

Message Header		
Field Name	Meaning	
type	SS7_MSG_RTVL_REQ (0xc20a)	
id	I2_llid	
src	Originating module_id	
dst	M2PA module_id	
rsp_req	Sending layer's bit set if response required.	
hclass	0	
status	0	
err_info	0	
len	6	
Parameter Area		
Offset	Size	Name
0	1	FSNC
1	1	reserved
2	4	extended_FSNC

#### Description

This primitive is issued by MTP3 to request retrieval of all unacknowledged messages from the retransmission buffer and the transmission buffer, commencing with the message containing a sequence number immediately following the Forward Sequence Number Confirmed (FSNC) provided in the parameter area of the message. These messages can then be retransmitted by MTP3 over an alternative signaling link.

M2PA responds with zero, one or more [API\\_MSG\\_RTVD\\_MSG](#) indications followed by an [SS7\\_MSG\\_RTVL\\_COMPL](#) indication. Only messages with a FSN greater than the given FSNC are retrieved.

#### Parameters

- FSNC**  
 Forward Sequence Number Confirmed. This is the sequence number of the first message to be retrieved. If this is set to 0x80, then the **extended\_FSNC** field is valid.
- reserved**  
 Reserved for future use.
- extended\_FSNC**  
 Extended Forward Sequence Number Confirmed. A 32-bit value; MSB first. This field is used when 24-bit sequence numbers are in use.

### 3.3.8 SS7\_MSG\_LOC\_PR\_OUT – M2PA LPO Request

#### Synopsis

Request to notify M2PA of a local processor outage condition.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_LOC_PR_OUT (0xc20b)
id	I2_llid
src	Originating module_id
dst	M2PA module_id
rsp_req	Sending layer's bit set if response required.
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued either by MTP3 or by management to notify M2PA of a local processor outage condition and requests that M2PA take the appropriate action to deal with such a condition.

### 3.3.9 SS7\_MSG\_LOC\_PR\_OK – MTP2 LPO Recovered Request

#### Synopsis

Request to notify M2PA that the local processor outage condition has cleared.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_LOC_PR_OK (0xc20c)
id	I2_llid
src	Originating module_id
dst	M2PA module_id
rsp_req	Sending layer's bit set if response required.
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued either by MTP3 or by management to notify M2PA that the local processor outage condition has cleared and request that M2PA take the appropriate action to deal with such a condition.

### 3.4 Protocol Indications from M2PA to MTP3

Primitive protocol indications are sent from M2PA to MTP3 in accordance with published M2PA recommendations. The primitive names used for the M2PA module are closely aligned with the terminology used in *ITU-T Recommendation Q.703*.

**Note:** This section of the manual is applicable only to users intending to write or interface to their own SCTP implementation. When using the Dialogic SS7 protocols SCTP module, this interface is already implemented by the SCTP module.

The list of protocol requests sent from M2PA to MTP3 includes:

- [API\\_MSG\\_RX\\_IND](#) – Received Message Indication
- [SS7\\_MSG\\_IN\\_SVC](#) – M2PA In Service Indication
- [SS7\\_MSG\\_OUT\\_SVC](#) – M2PA Out of Service Indication
- [SS7\\_MSG\\_REM\\_PR\\_OUT](#) – M2PA RPO Indication
- [SS7\\_MSG\\_REM\\_PR\\_OK](#) – M2PA RPO Cleared Indication
- [SS7\\_MSG\\_RXD\\_BSNT](#) – M2PA BSNT Indication
- [API\\_MSG\\_RTVD\\_MSG](#) – M2PA Retrieved Message Indication
- [SS7\\_MSG\\_RTVL\\_COMPL](#) – M2PA Retrieval Complete Indication
- [MTP\\_MSG\\_RTVL\\_NOT\\_POS](#) – M2PA Retrieval Failure Indication
- [MTP\\_MSG\\_LINK\\_CONG](#) – M2PA Link Congested Indication
- [MTP\\_MSG\\_LINK\\_UNCONG](#) – M2PA Congestion Cleared Indication
- [MTP\\_MSG\\_FLUSH\\_ACK](#) – M2PA Flush Acknowledgement Indication

All primitives generated by the M2PA module are sent to the “upper” module as defined at configuration time for each link, this should be set to the correct **module\_id** for the MTP3 module.

The **hdr->id** field is always set to the **I3\_link\_id** as configured for the link at configuration time. Note that this need not be the same as the **I2\_llid**. The use of the **I3\_link\_id** means that it is not necessary for the receiving module (for example, MTP3) to examine the sending **module\_id** from which the message was received.

The MTP3 (or “upper”) module is responsible for releasing the message using the **relm()** library function.

### 3.4.1 API\_MSG\_RX\_IND – Received Message Indication

#### Synopsis

Containing received Message Signal Unit (MSU) destined to MTP3.

#### Message Format

Message Header		
Field Name	Meaning	
type	API_MSG_RX_IND (0x8f01)	
id	l3_link_id	
src	M2PA module_id	
dst	upper module_id (for example, MTP3)	
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

#### Parameters

- **MSU data**  
MSU data in binary format commencing with the Service Indicator Octet (SIO).

### 3.4.2 SS7\_MSG\_IN\_SVC – M2PA In Service Indication

#### Synopsis

Indicates that the signaling link is in service.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_IN_SVC (0x8303)
id	I3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA to the “upper” module to indicate the successful completion of the link alignment procedure.

**Note:** The **id** field of this message (and all indications to the “upper” module) contains the **I3\_link\_id**, which is a configuration parameter for the link and need not be the same as the **I2\_llid**, which is used in messages sent to M2PA.

### 3.4.3 SS7\_MSG\_OUT\_SVC – M2PA Out of Service Indication

#### Synopsis

Indicates that the signaling link has failed.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_OUT_SVC (0x8304)
id	l3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA to the “upper” module to indicate that the signaling link is **Out of Service**, either due to an excessive error rate or a failure to complete the alignment operation.

### 3.4.4 SS7\_MSG\_REM\_PR\_OUT – M2PA RPO Indication

#### Synopsis

Indicates a Remote Processor Outage (RPO) condition.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_REM_PR_OUT (0x8305)
id	l3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA to the “upper” module to indicate that a Remote Processor Outage (RPO) condition has been detected.

### 3.4.5 SS7\_MSG\_REM\_PR\_OK – M2PA RPO Cleared Indication

#### Synopsis

Indicates the clearing of a Remote Processor Outage (RPO) condition.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_REM_PR_OK (0x8306)
id	I3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA to the “upper” module to indicate that a signaling link that was previously in the Remote Processor Outage (RPO) condition has now recovered.

### 3.4.6 SS7\_MSG\_RXD\_BSNT – M2PA BSNT Indication

#### Synopsis

Indicates the BSNT.

#### Message Format

Message Header		
Field Name	Meaning	
type	SS7_MSG_RXD_BSNT (0x8307)	
id	l3_link_id	
src	M2PA module_id	
dst	upper module_id (for example, MTP3)	
rsp_req	0	
hclass	0	
status	0	
err_info	0	
len	1	
Parameter Area		
Offset	Size	Name
0	1	BSNT
1	1	reserved
2	4	extended_BSNT

#### Parameters

- **BSNT**  
Backward Sequence Number Transmitted. Set to 0x80 to indicate extended BSNT.
- **reserved**  
Reserved for future use. Set to zero.
- **extended\_BSNT**  
Extended Backward Sequence Number Transmitted. A 32-bit value; MSB first.

#### Description

This primitive is issued by M2PA in response to a [M2PA BSNT Retrieval Request](#). It contains the BSNT in the parameter area of the message.

### 3.4.7 API\_MSG\_RTVD\_MSG – M2PA Retrieved Message Indication

#### Synopsis

Primitive issued by M2PA to MTP3 to indicate the next MSU retrieved from the transmission or retransmission buffer.

#### Message Format

Message Header		
Field Name	Meaning	
type	API_MSG_RTVD_MSG (0x8f08)	
id	I2_llid	
src	M2PA module_id	
dst	Destination module (M2PA upper_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

#### Description

This primitive is used to pass retrieved messages from M2PA to MTP3 to allow them to be retransmitted down another link.

#### Parameters

- **MSU data**  
MSU data in binary format commencing with the Service Indicator Octet (SIO).

### 3.4.8 SS7\_MSG\_RTVL\_COMPL – M2PA Retrieval Complete Indication

#### Synopsis

Indicates the completion of the message retrieval procedure.

#### Message Format

Message Header	
Field Name	Meaning
type	SS7_MSG_RTVL_COMPL (0x8309)
id	l3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA to the “upper” module to indicate that any messages for retrieval have been conveyed using [M2PA Retrieved Message Indication](#) messages, so the retrieval procedure is complete.

### 3.4.9 MTP\_MSG\_RTVL\_NOT\_POS – M2PA Retrieval Failure Indication

#### Synopsis

Indicates that it is not possible to carry out message retrieval.

#### Message Format

Message Header	
Field Name	Meaning
type	MTP_MSG_RTVL_NOT_POS (0x8315)
id	I3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA to the “upper” module to indicate that for some reason it is not possible to carry out or complete the message retrieval procedure. Any retrieved messages issued to MTP3 should therefore be discarded. The message is issued instead of a [M2PA Retrieval Complete Indication](#).

### 3.4.10 MTP\_MSG\_LINK\_CONG – M2PA Link Congested Indication

#### Synopsis

Provides notification of signaling link congestion.

#### Message Format

Message Header		
Field Name	Meaning	
type	MTP_MSG_LINK_CONG (0x8312)	
id	l3_link_id	
src	M2PA module_id	
dst	upper module_id (for example, MTP3)	
rsp_req	0	
hclass	0	
status	0	
err_info	0	
len	1	
Parameter Area		
Offset	Size	Name
0	1	Congestion status

#### Description

This primitive is issued by M2PA on detection of link congestion or a change in the congestion status of a link. Congestion is detected when the total number of messages stored in the transmit and retransmit buffers exceeds a configurable congestion onset threshold. The module can be configured with either a single congestion threshold or multiple congestion onset thresholds.

#### Parameters

- **Congestion status**  
Indicates the level of congestion on the link.

### 3.4.11 MTP\_MSG\_LINK\_UNCONG – M2PA Congestion Cleared Indication

#### Synopsis

Provides notification of the clearing of link congestion.

#### Message Format

Message Header	
Field Name	Meaning
type	MTP_MSG_LINK_UNCONG (0x8313)
id	I3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA when a link which has been congested returns to the uncongested state.

### 3.4.12 MTP\_MSG\_FLUSH\_ACK – M2PA Flush Acknowledgement Indication

#### Synopsis

Provides acknowledgement of the completion of buffer flushing.

#### Message Format

Message Header	
Field Name	Meaning
type	MTP_MSG_FLUSH_ACK (0x8316)
id	l3_link_id
src	M2PA module_id
dst	upper module_id (for example, MTP3)
rsp_req	0
hclass	0
status	0
err_info	0
len	0

#### Description

This primitive is issued by M2PA in response to an MTP\_MSG\_FLUSH message after all messages have been flushed by M2PA from the transmission and retransmission buffers.

## Chapter 4: Non-Primitive Interface

In addition to the primitive interface for passing protocol messages and management messages between the M2PA module and the user modules, the M2PA module supports a non-primitive interface for implementation specific functionality.

The non-primitive interface is used by the user for configuration and diagnostic purposes and to allow M2PA to report protocol based and software error events to the local system management module.

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

### 4.1 Confirmation Message Status Values

When the M2PA module returns a confirmation message containing a status value, the status is one of the following:

Mnemonic	Value	Description
none	0	Success
M2PE_BAD_ID	1	Inappropriate or invalid <b>id</b> in request message
M2PE_BAD_STATE	2	Message received when in an inappropriate state.
M2PE_BAD_MSG	5	Inappropriate or unrecognized message <b>type</b> .
M2PE_BAD_PARAM	6	Invalid parameters contained in message.
M2PE_BAD_LENGTH	11	Bad message length (too short).
M2PE_LICENSE_ERR	14	No license found or license capabilities exceeded.

### 4.2 Non-Primitive Interface Messages

The non-primitive interface comprises the following messages:

- M2P\_MSG\_CONFIG - Configure M2PA Module
- M2P\_MSG\_CNF\_LINK - M2PA Link Configuration Request
- M2P\_MSG\_END\_LINK - M2PA Link End Request
- M2P\_MSG\_TRACE\_MASK - TRACE MASK Set Request
- M2P\_MSG\_R\_STATE - READ STATE Read Request
- M2P\_MSG\_R\_STATS - READ STATISTICS Read Request
- M2P\_MSG\_EVENT\_IND - EVENT Indication
- M2P\_MSG\_ERROR\_IND - ERROR Indication
- M2P\_MSG\_LINK\_STATE - M2PA Link STATE Indication

### 4.2.1 M2P\_MSG\_CONFIG – Configure M2PA Module

#### Synopsis

Configure the M2PA module for operation.

#### Message Format

Message Header		
Field Name		Meaning
type		M2P_MSG_CONFIG (0x7220)
id		0
src		Sending module ID
dst		M2PA MODULE_ID
rsp_req		Used to request a confirmation
hclass		0
status		0
err_info		0
Len		16
Parameter Area		
Offset	Size	Name
0	1	mngt_mod_id
1	1	trace_mod_id
2	2	max_links
4	2	max_throughput
6	10	reserved

#### Description

This message is used to configure the M2PA module for operation. It should be the first message sent to the module (any message received prior to this are discarded) and should only be sent once.

#### Parameters

- **mngt\_mod\_id**  
Module identifier that defines the destination for non-link specific management indications
- **trace\_mod\_id**  
Module identifier that defines the destination for non-link specific trace indications
- **max\_links**  
Maximum number of links that the module is required to handle
- **max\_throughput**  
Maximum throughput required in units of kilo bytes second. This value is checked against capability license.
- **reserved**  
Should be set to zero

## 4.2.2 M2P\_MSG\_CNF\_LINK – M2PA Link Configuration Request

### Synopsis

Configures an M2PA link.

### Message Format

Message Header		
Field Name	Meaning	
type	M2P_MSG_CNF_LINK (0x7221)	
id	M2PA Link ID	
src	Sending module ID	
dst	M2PA MODULE_ID	
rsp_req	Used to request a confirmation	
hclass	0	
status	0	
err_info	0	
len	60	
Parameter Area		
Offset	Size	Name
0	4	options
4	1	l3_mod_id
5	2	l3_link_id
7	1	sctp_mod_id
8	2	sctp_link_id
10	1	mngt_mod_id
11	1	trace_mod_id
12	2	T1
14	2	T2
16	2	T3
18	2	T4n
20	2	T4e
22	2	T6
24	2	T7
26	2	co1
28	2	co2
30	2	co3
32	2	ca1
34	2	ca2
36	2	ca3
38	2	cd1
40	2	cd2
42	2	cd3
44	2	rtvl_rate (accessed only if M2PA_LCFG_RTVL_RATE option = 1)
46	14	reserved

### Description

This message must be sent once for each link being configured.

## Parameters

- **Options**

One of the values in the following table:

Option	Bit	Description
M2PA_LCFG_MCONG	0	Use Multiple Congestion levels
M2PA_LCFG_7BIT	1	Use 7-bit sequence numbers instead of default 24-bit sequence numbers. Use if MTP3 does not support Extended Changeover Procedures.
M2PA_LCFG_VER_9	2	This bit enables support for Draft Version 9 of the M2PA Specification. Default operation supports the RFC specification.
M2PA_LCFG_RTVL_RATE	3	Enables use of the <code>rtvl_rate</code> parameter (in this message). If set to zero, parameter data is ignored.

- **I3\_mod\_id**

Module identifier for the L3 module using this link

- **I3\_link\_id**

Link identifier used by the L3 module for this link

- **sctp\_mod\_id**

Module identifier for the SCTP module used for this link

- **sctp\_link\_id**

Link identified used by SCTP for this link

- **mngt\_mod\_id**

Module identifier for Management module for this link

- **trace\_mod\_id**

Module identifier for Trace module for this link

- **T1**

“Alignment Ready” timer value in the range of 40 to 50 seconds. Units are in seconds. If set to zero, default value of 40 is set.

- **T2**

“Not Aligned” timer value in the range of 5 to 50 seconds. Units are in seconds. If set to zero, default value of 10 is set

- **T3**

“Aligned” timer value in the range 1 to 2 seconds. Units are in seconds. If set to zero, default value of 2 is set.

- **T4n**

“Normal Proving” timer value in the range 7 to 10 seconds. Units are in seconds. If set to zero, default value of 7 is set.

- **T4e**

“Emergency Proving” timer value in the range 400 to 600 milliseconds. Units are in 100 milliseconds. If set to zero, default value of 5 is set.

- **T6**

“Remote Congestion” timer value in the range 3 to 6 seconds. Units are in seconds. If set to zero, default value of 3 is set.

- **T7**

“Excessive Delay Of Acknowledgement” timer value in the ange 0.5 to 2 seconds. Units are in 100 milliseconds. If set to zero, default value of 10 is set.

- **co1**  
Congestion onset MSU threshold 1  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default = 200, otherwise default = 225
- **co2**  
Congestion onset MSU threshold 2  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default = 0, otherwise default = 300
- **co3**  
Congestion onset MSU threshold 3  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default = 0, otherwise default = 375
- **ca1**  
Congestion abatement MSU threshold 1  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default = 100, otherwise default = 200
- **ca2**  
Congestion abatement MSU threshold 2  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default = 0, otherwise default = 275
- **ca3**  
Congestion abatement MSU threshold 3  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default = 0, otherwise default = 350
- **cd1**  
Congestion discard MSU threshold 1  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default= 399, otherwise default = 250
- **cd2**  
Congestion discard MSU threshold 2  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default= 0, otherwise default = 325
- **cd3**  
Congestion discard MSU threshold 3  
If set to zero, a default value is set. If M2PA\_LCFG\_MCONG =0 default= 0, otherwise default = 399
- **rtvl\_rate**  
number of retrieval messages passed to the M2PA user before a gap is introduced. This parameter is accessed only if the M2PA\_LCFG\_RTVL\_RATE option is set to 1.

### 4.2.3 M2P\_MSG\_END\_LINK – M2PA Link End Request

#### Synopsis

Ends an M2PA link.

#### Message Format

Message Header	
Field Name	Meaning
type	M2P_MSG_END_LINK (0x7222)
id	M2PA Link ID
src	Sending module ID
dst	M2PA MODULE_ID
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	0

#### Description

This message must be sent once for each link being ended.

#### 4.2.4 M2P\_MSG\_TRACE\_MASK – TRACE MASK Set Request

##### Synopsis

Sets trace masks on a per M2PA link basis.

##### Message Format

Message Header		
Field Name	Meaning	
type	M2P_MSG_TRACE_MASK (0x7223)	
id	M2PA Link ID	
src	Sending module ID	
dst	M2PA 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	op_evt_mask
4	4	ip_evt_mask
8	4	mgmt_evt_mask
12	4	reserved

##### Description

The M2PA module supports comprehensive tracing options on a per-link and per-primitive basis. The module can be configured to trace any message received or transmitted and a number of management events. This message is used to selectively enable tracing of events. It can be used at any time during operation and continues to be effective until the next TRACE MASK Set Request is received for the same link.

Traced events are indicated to the management module using the TRACE\_EV Event Indication.

##### Parameters

- **op\_evt\_mask**

The output event mask. This is a 32-bit value with bits as described below. When the appropriate bit is set, a trace message is sent to the management module whenever a message is issued by M2PA for the event indicated.

Bit Number	Mnemonic	Description
0	M2POEM_SCTP_ACT_REQ	ACTIVATE ASC
1	M2POEM_SCTP_ABORT_REQ	ABORT ASC
2	M2POEM_MTP_IN_SVC_IND	IN SVC
3	M2POEM_MTP_OUT_SVC_IND	OUT SVC
4	M2POEM_MTP_RPO_IND	REM PROCESSOR OUT
5	M2POEM_MTP_RPO_OK_IND	REM PROCESSOR OUT OK
6	M2POEM_MTP_RXD_BSNT_IND	RXD BSNT
7	M2POEM_MTP_CONG_IND	LINK CONG
8	M2POEM_UNCONG_IND	LINK UNCONG
9	M2POEM_MTP_RTV_FAIL_IND	RTVL FAIL
10	M2POEM_MTP_RTV_MSG_IND	RTVD MSG
11	M2POEM_MTP_RTVLCOMP_IND	RTVL COMPL

Bit Number	Mnemonic	Description
12	M2POEM_SCTP_TX_REQ	ASC DATA REQ
13	M2POEM_MTP_RX_IND	RX IND
14	M2POEM_MTP_FLUSH_ACK	Flush Ack

- **ip\_evt\_mask**

The input event mask. This is a 32-bit value with bits as described below. When the appropriate bit is set, a trace message is sent to the management module whenever a message is issued by M2PA for the event indicated.

Bit Number	Mnemonic	Description
0	M2PIEM_MTP_TX_REQ	Message for transmission request
1	M2PIEM_SCTP_RX_IND	Receive message Indication
2	M2PIEM_SCTP_ACT_FAIL	Activate fail
3	M2PIEM_SCTP_ASC_STATUS	ASC Status
4	M2PIEM_SCTP_ASC_CONG	ASC Cong Status
5	M2PIEM_MTP_START_REQ	Start request
6	M2PIEM_MTP_STOP_REQ	Stop request
7	M2PIEM_MTP_EMGCY_IND	Emergency indication
8	M2PIEM_MTP_EMGCY_CLEAR_IND	Emergency cleared indication
9	M2PIEM_MTP_RTV_REQ	Retrieve request
10	M2PIEM_MTP_RTV_BSNT_REQ	Retrieve BSNT
11	M2PIEM_MTP_LPO_IND	Local Processor Outage Indication
12	M2PIEM_MTP_LPO_CEASES_IND	Local Processor Outage ceases indication
13	M2PIEM_UNEX_MSG	Unexpected Message received
14	M2PIEM_MTP_FLUSH	Flush Request
15	M2PIEM_MTP_CONTINUE	Continue Request

- **mgt\_evt\_mask**

The management event mask. This is a 32-bit value with bits as described below. When the appropriate bit is set, a trace message is sent to the management module whenever a message is issued by M2PA for the event indicated.

Bit Number	Mnemonic	Description
0	M2PMEM_SCTP	Report SCTP Mngt events
1	M2PMEM_M2P	Report M2PA Peer events
2	M2PMEM_MTP	Report MTP3 Mngt Events
3	M2PMEM_STATE	Report Link State Events
4	M2PMEM_UNEX	Report Unexpected Message received

#### 4.2.5 M2P\_MSG\_R\_STATE – READ STATE Read Request

##### Synopsis

Reads the current internal state of an M2PA link.

##### Message Format

Message Header		
Field Name	Meaning	
type	M2P_MSG_R_STATE (0x6224)	
id	M2PA Link id	
src	Sending module ID	
dst	M2PA MODULE_ID	
rsp_req	Used to request a confirmation	
hclass	0	
status	0	
err_info	0	
len	16	
Parameter Area		
Offset	Size	Name
0	1	la_state
1	1	tx_cong_status
2	2	tx_buf_occ
4	1	RPO_status
5	1	LPO_status
6	1	remote_cong_status
7	1	receive_cong_status
8	1	emergency_status
9	7	reserved

##### Description

This message may be sent by Layer Management or other module to request the state of a particular link.

##### Parameters

- **la\_state**

Current Link Alignment state, which can take one of the following values:

Value	Mnemonic	Description
1	S7S_IN_SERVICE	IN SERVICE state
2	S7S_OUT_SERVICE	OUT OF SERVICE state
3	S7S_INIT_ALIGN	INITIAL ALIGNMENT state
4	S7S_ALIGN_NOT_RDY	ALIGNED NOT READY state
5	S7S_ALIGN_READY	ALIGNED READY state
6	S7S_PROC_OUTAGE	Local or Remote Processor Outage state

- **tx\_cong\_status**

Current congestion status. This takes a non-zero value if congested. If multiple congestion levels are being used, then values of 1, 2 and 3 indicate the current level of congestion.

- **tx\_buf\_occ**

Total number of buffered MSUs

- **RPO\_status**

If set, the link is currently in a Remote Processor Outage (RPO) condition.

- **LPO\_status**

If set, the link is currently in a Local Processor Outage (LPO) condition.

- **remote\_cong\_status**  
If set, the link is currently in a Remote Congestion condition.
- **receive\_cong\_status**  
If set, the link is currently in a Receive Congestion condition.
- **emergency\_status**  
If set, the link is currently in Emergency Alignment mode.

## 4.2.6 M2P\_MSG\_R\_STATS – READ STATISTICS Read Request

### Synopsis

Read the current statistics on a particular M2PA link.

### Message Format

Message Header		
Field Name	Meaning	
type	M2P_MSG_R_STATS (0x6225)	
id	M2PA Link id	
src	Sending module ID	
dst	M2PA MODULE_ID	
rsp_req	Used to request a confirmation	
hclass	0	
status	0 = Leave statistics unchanged 1 = Reset statistics after reading	
err_info	0	
len	60	
Parameter Area		
Offset	Size	Name
0	4	insvc_duration
4	4	stats_duration
8	2	align_failures
10	4	txd_octets
14	4	tx_msu_count
18	4	rx_d_octets
22	4	rx_msu_count
26	4	cong_count
30	4	cong_duration
34	4	discard_count
38	4	discard_events
42	18	reserved

### Description

This message may be sent by Layer Management or other module to read statistics for the link. The internal statistics can be reset or left unchanged depending on the setting of the status field.

### Parameters

- **insvc\_duration**  
Duration link in service (Units of 100 ms)
- **stats\_duration**  
Time since stats last reset (Units of 100 ms)
- **align\_failures**  
Number of failed alignment attempts
- **txd\_octets**  
Number of SIF and SIO octets transmitted
- **tx\_msu\_count**  
Number of MSU's transmitted
- **rx\_d\_octets**  
Number of SIF and SIO octets received
- **rx\_msu\_count**  
Number of MSU's received
- **cong\_count**  
Number of congestion events

- **cong\_duration**  
Duration of link congestion (Units of 100 ms)
- **discard\_count**  
Number of MSU's discarded due to congestion
- **discard\_events**  
Number of congestion events leading to MSU discard
- **reserved**  
Reserved for future use. Should be set to zero.

#### 4.2.7 M2P\_MSG\_EVENT\_IND – EVENT Indication

##### Synopsis

Provides an indication of events occurring within the M2PA module.

##### Message Format

Message Header	
Field Name	Meaning
Type	M2P_MSG_EVENT_IND (0x0227)
Id	ID (see table below)
Src	M2P module id
Dst	Management module id
rsp_req	Used to request a confirmation
hclass	0
status	Event Code (see table below)
err_info	0
len	0

##### Description

This message is issued by M2PA to the management module (as configured in the configuration message) to advise of events occurring within M2PA. Specific indications are only issued if the corresponding EVENT bit of the management Trace event mask is set.

The EVENT\_CODE and **id** field are coded as shown in the following table:

Value	Mnemonic	id	Description
1	M2P_EVT_MSG_TYPE	0	Unknown Message Type Received
2	M2P_EVT_UNEX_EVENT	I2_Ilid	An unexpected event has been received on this link.
3	M2P_EVT_SCTP_BAD_LEN	I2_Ilid	An SCTP message has been received with an invalid length.
4	M2P_EVT_SCTP_BAD_ASC_ID	0	An SCTP message has been received with an invalid Association ID
5	M2P_EVT_MTP_BAD_LINK_ID	I2_Ilid	A User message has been received with an invalid link id
6	M2P_EVT_SCTP_ASC_EST	I2_Ilid	SCTP Association has entered the Established State
7	M2P_EVT_SCTP_ASC_FAIL	I2_Ilid	SCTP Association has entered the Failed State
8	M2P_EVT_SCTP_ASC_CONG	I2_Ilid	SCTP Association has entered the Congested State
9	M2P_EVT_UNEX_PEER	I2_Ilid	An Unexpected Message has been received from the Peer M2PA
10	M2P_EVT_UNEX_SCTP	I2_Ilid	An Unexpected Message has been received from SCTP
11	M2P_EVT_UNEX_MTP	I2_Ilid	An Unexpected Message has been received from MTP
12	M2P_EVT_UNEX_MGT	I2_Ilid	An Unexpected Message has been received from Management
13	M2P_EVT_MTP_EMGCY	I2_Ilid	MTP has requested the Link use emergency proving.
14	M2P_EVT_MTP_EMGCY_CLR	I2_Ilid	MTP requests the link use normal proving
15	M2P_EVT_M2P_BAD_FSNR	I2_Ilid	A message has been received with an invalid FSN
16	M2P_EVT_M2P_BAD_BSNR	I2_Ilid	A message has been received with an invalid BSN
17	M2P_EVT_RTV_FAIL	I2_Ilid	A Retrieval Attempt has failed
18	M2P_EVT_CONG_DISCARD	I2_Ilid	Excess Congestion has resulted in the discard of a message.
19	M2P_EVT_MTP_FMT_ERROR	I2_Ilid	A badly formatted message has been received from MTP.
20	M2P_EVT_SCTP_FMT_ERROR	I2_Ilid	A badly formatted message has been received from SCTP.
21	M2P_EVT_RTVL_BUFF_DISCARD	I2_Ilid	Retrieval message buffer has been cleared due to local congestion.

### 4.2.8 M2P\_MSG\_ERROR\_IND – ERROR Indication

#### Synopsis

Notifies system management of various software errors occurring within the module which under normal operating conditions should not occur.

#### Message Format

Message Header		
Field Name	Meaning	
type	M2P_MSG_ERROR_IND (0x0228)	
id	ID (see below)	
src	M2P module id	
dst	Management module id	
rsp_req	0	
hclass	0	
status	ERROR CODE (see below)	
err_info	0	
len	4	
Parameter Area		
Offset	Size	Name
0	2	Parameter 1 (see below)
2	2	Parameter 2 (see below)

#### Description

This message is issued by M2PA to the management module (as configured in the configuration message) to advise of general software events. These events may be due to lack of system resources or errors within the software. Individual indications are issued dependant on the bits set in the management event trace mask.

The ERROR\_CODE, **id** field, **Parameter 1** and **Parameter 2** definitions are as shown in the following table:

Value	Mnemonic	id	Parameter 1	Parameter 2	Description
1	M2P_ERR_TIM_START	link id	timer_type	timer_id	Failed to start Timer
2	M2P_ERR_LNK_END	link id	asc_id	0	Failed to end link.
3	M2P_ERR_UNEX_INT_EVT	link id	state machine id	state id	Unexpected event generated internally.
4	M2P_ERR_BUFF_FAIL	link id	sequence number	0	Failed to buffer MSU

#### 4.2.9 M2P\_MSG\_LINK\_STATE – M2PA Link STATE Indication

##### Synopsis

Informs Management of changes in the current internal state of the M2PA link.

##### Message Format

Message Header	
Field Name	Meaning
type	M2P_MSG_LINK_STATE (0x0226)
id	M2PA Link id
src	M2PA module id
dst	Management module id
rsp_req	0
hclass	0
status	LINK STATE (see below)
err_info	Timestamp
len	0

##### Description

This primitive is used by M2PA to indicate to local management changes of state within the Link State Control function. These indications are only given if the S7\_STATUS bit of the management event trace mask is set.

**Note:** This message is intended for diagnostic and maintenance purposes and does not form part of the protocol specified primitives.

The LINK STATE is coded as shown in the following table:

Value	Mnemonic	Description
1	S7S_IN_SERVICE	Entered IN SERVICE state
2	S7S_OUT_SERVICE	Entered OUT OF SERVICE state
3	S7S_INIT_ALIGN	Entered INITIAL ALIGNMENT state
4	S7S_ALIGN_NOT_RDY	Entered ALIGNED NOT READY state
5	S7S_ALIGN_READY	Entered ALIGNED READY state
6	S7S_PROC_OUTAGE	Entered PROCESSOR OUTAGE state

## Chapter 5: Typical Configuration Values

Table 1 and Table 2 gives typical values to be used in the module and link configuration messages for correct operation of M2PA to quickly get the system up and running.

To ensure the appropriate values are being used for a specific installation, refer to the detailed message definitions in this manual.

**Table 1. Typical Module Configuration Values**

Parameter	Typical Setting
M2PA module ID	0xc1
mngt_mod_id	0xcf (s7_mgt)
trace_mod_id	0xef (s7_log)
max_links	1 or more (as required)
max_throughput	0 (allow up to maximum allowed by license)

**Table 2. Typical Configuration Values**

Parameter	Typical Setting
M2PA link id	N (a number from 0 to max_links-1)
options	0
l3_mod_id	0x22 (MTP3 module)
l3_link_id	N
sctp_mod_id	0xd1
sctp_link_id	N
mngt_mod_id	0xcf
trace_mod_id	0xef
t1	0 (use default)
t2	0 (use default)
t3	0 (use default)
t4n	0 (use default)
t4e	0 (use default)
t6	0 (use default)
t7	0 (use default)
co1	0 (use default)
co2	0 (use default)
co3	0 (use default)
ca1	0 (use default)
ca2	0 (use default)
ca3	0 (use default)
cd1	0 (use default)
cd2	0 (use default)
cd3	0 (use default)
rtvl_rate	0 (not required since option = 0)

## Chapter 6: Message Types

### 6.1 Message Type Table

Table 3 lists, by message type, all the new messages defined in this manual.

**Table 3. Message Types**

Message Type	Mnemonic	Description
0x0226	M2P_MSG_LINK_STATE	M2PA Link STATE Indication
0x0227	M2P_MSG_EVENT_IND	EVENT Indication
0x0228	M2P_MSG_ERROR_IND	ERROR Indication
0x6224	M2P_MSG_R_STATE	READ STATE Read Request
0x6225	M2P_MSG_R_STATS	READ STATISTICS Read Request
0x7220	M2P_MSG_CONFIG	Configure M2PA Module
0x7221	M2P_MSG_CNF_LINK	M2PA Link Configuration Request
0x7222	M2P_MSG_END_LINK	M2PA Link End Request
0x7223	M2P_MSG_TRACE_MASK	TRACE MASK Set Request
0x2224	-	Confirm Link State Request
0x2225	-	Confirm Link Stats Request
0x3220	-	Confirm M2PA Module Configuration
0x3221	-	Confirm M2PA Link Configuration Request
0x3222	-	Confirm M2PA Link End Request
0x3223	-	Confirm M2PA Link Trace Mask Set Request

**Note:** The message type for the confirmation message is set as described in the *System Software Environment Programmer's Manual*, in the paragraph describing the **rsp\_req** field.

## Chapter 7: Timer Services

### 7.1 Introduction

The notion of time in the M2PA module is based on a periodic timer tick received from the timer module every 100ms. This “tick” is used to run all M2PA protocol timers. This chapter details the message formats that are used by the M2PA module to control timer services.

Timer messages include:

- **KEEP\_TIME** - Keep Time
- **TM\_EXP** - Timer Expiry

#### 7.1.1 KEEP\_TIME – Keep Time

##### Synopsis

Message sent to request the timer module to issue a periodic timer tick (TM\_EXP) message to the M2PA module.

##### Message Format

Message Header		
Field Name	Meaning	
type	KEEP_TIME (0x7006)	
id	0	
src	Sending module's ID	
dst	Timer module ID	
rsp_req	0	
class	0	
status	0	
err_info	0	
len	6	
Parameter Area		
Offset	Size	Name
0	4	Reserved
4	2	<b>resolution</b>

##### Parameters

- **reserved**  
Should be set to zero if issued by the user and is discarded when received by the timer module.
- **resolution**  
The number of operating system ticks between timer expiry messages being issued to the M2PA module.

## 7.1.2 TM\_EXP – Timer Expiry

### Synopsis

Periodic timer tick message issued by the timer module.

### Message Format

Message Header		
Field Name	Meaning	
type	TM_EXP (0xc002)	
id	index of timer in table	
src	Timer module ID	
dst	Destination module ID	
rsp_req	0	
class	0	
status	0	
err_info	0	
len	4	
Parameter Area		
Offset	Size	Name
0	4	reserved

### Parameters

- **reserved**  
Must be set to zero.

## Glossary

BSNT	Backward Sequence Number Transmitted.
FSNC	Forward Sequence Number Confirmed.
M2PA	An implementation of the IETF SIGTRAN, SS7 MTP2-User Peer-to-Peer Adaptation Layer (M2PA).
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.
LSSU	Link Status Signal Units. A signal unit that provides link status indications (for example, normal, out of alignment, out of service, emergency status) to the remote end of the signaling link.
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.
Q.703	<i>ITU-T Recommendation Q.703, Message Transfer Part Layer 2</i>
SCTP	Stream Control Transmission Protocol
SIF	Signaling Information Field
SIGTRAN	The IETF Signaling Transport Group
SIO	Service Information Octet
SS7	Signaling System Number 7
SSF	Sub-Service Field
SU	Signal Unit.