BS ISO 24102-4:2013

BSI Standards Publication

Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management

Part 4: Station-internal management communications

National foreword

This British Standard is the UK implementation of ISO 24102-4:2013. Together with BS ISO 24102-1:2013, BS ISO 24102-2, BS ISO 24102-3:2013 and BS ISO 24102-5:2013, it supersedes BS ISO 24102:2010, which will be withdrawn upon publication of BS ISO 24102-2 of this series.

The UK participation in its preparation was entrusted to Technical Committee EPL/278, Intelligent transport systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 79275 5

ICS 03.220.01; 35.240.60

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2013.

Amendments issued since publication

Date	Text affected

BS ISO 24102-4:2013

INTERNATIONAL STANDARD

ISO 24102-4

First edition
2013-07-01

Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management —

Part 4: Station-internal management communications

Systèmes intelligents de transport — Accès aux communicat ions des services mobiles terrestres (CALM) — Gestion des stations ITS —

Partie 4: Communications de gestion interne à la station

Reference number
ISO 24102-4:2013(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO 24102 consists of the following parts, under the general title *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management*:

— *Part 1: Local management*

— *Part 3: Service access points*

— *Part 4: Station-internal management communications*

— *Part 5: Fast service advertisement protocol (FSAP)*

The following parts are under preparation:

— *Part 2: Remote management*

— *Part 6: Path and flow management*

Introduction

This International Standard is part of a family of International Standards for communications access for land mobiles (CALM). An introduction to the whole set of International Standards is provided in ISO 21217.

This part of ISO 24012 is part 4 of a multipart International Standard which determines the intelligent transport systems (ITS) station management - station-internal management communications.

The ITS station management entity provides functionality related to the management of communication protocol layers and the security entity presented in the ITS station reference architecture specified in ISO 21217 and presented in Figure 1, and in line with the general ITS architecture specified in ISO 21217.

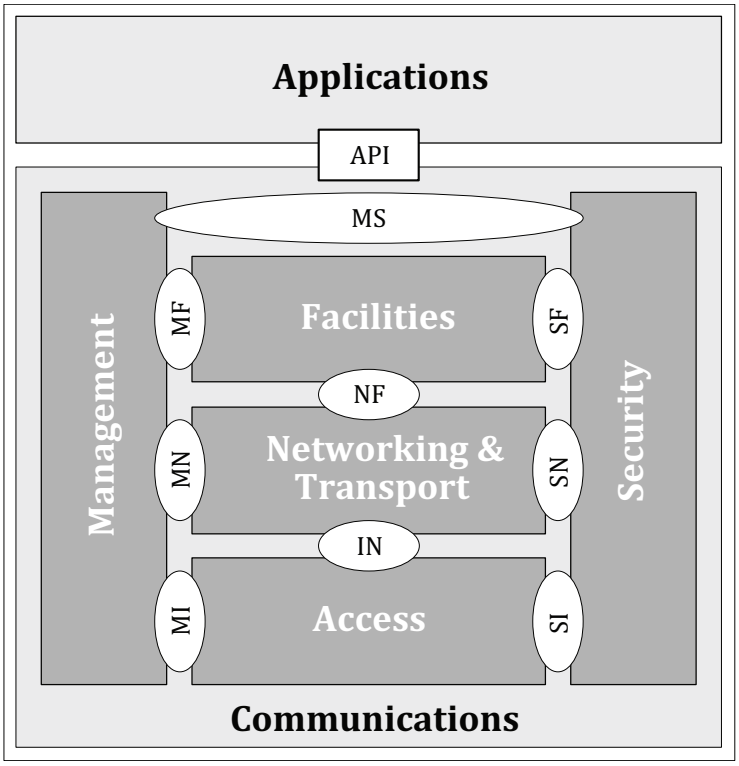

Figure 1 — ITS station reference architecture with named interfaces

ITS station management is specified as a distributed process, where no supervisory entity is employed.

INTERNATIONAL STANDARD **ISO 24102-4:2013(E)**

Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management —

Part 4: Station-internal management communications

1 Scope

This part of ISO 24102 provides specifications for secure ITS station-internal management communications.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 8825-2, *Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)*

ISO 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 21218, *Intelligent transport systems — Communications access for land mobiles (CALM) — Access technology support*

ISO 24102-1, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 1: Local management*

ISO 24102-3, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 3: Service access points*

ETSI TS 102 797-1, *Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Test specifications for Intelligent Transport Systems, Communications access for land mobiles (CALM), ITS station management (ISO 24102); Part 1: Protocol Implementation Conformance Statement (PICS) proforma*

ETSI TS 102 797-2, *Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Test specifications for Intelligent Transport Systems, Communications access for land mobiles (CALM), ITS station management (ISO 24102); Part 2: Test Suite Structure and Test Purposes (TSS & TP)*

ETSI TS 102 797-3, *Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Test specifications for Intelligent Transport Systems, Communications access for land mobiles (CALM), ITS station management (ISO 24102); Part 3: Abstract Test Suite (ATS) and partial PIXIT information*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21217, ISO 21218, ISO 24102-1, and ISO 24102-3 and the following apply.

3.1
ITS-S communication unit
addressable instance of the ITS station reference architecture comprising as an access to the ITS station-internal network

4 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO 21217, ISO 21218, ISO 24102-1, and ISO 24102-3 and the following apply.

ITS-SCU	ITS station communication unit
IIC	ITS-S internal management communications
IICM	IIC Manager
IICA	IIC Agent
IICP	ITS-S internal management communications protocol
n.a.	not applicable

5 ITS station management

The ITS station management includes functionality specified in the various parts of this multipart International Standard:

1) The functionality of local ITS station management specified in ISO 24102-1.

2) The functionality of remote ITS station management specified in ISO 24102-2.

3) The functionality of service access points specified in ISO 24102-3.

4) The functionality of ITS station-internal management communications specified in this part of ISO 24102.

5) The functionality of the "Fast Service Advertisement Protocol" (FSAP) specified in ISO 24102-5.

ITS station-internal management communications interconnects ITS station communication units (ITS-SCUs) of the same ITS station (ITS-S) via the ITS station-internal network illustrated in ISO 21217. This communication is also referred to as "ITS-S internal management communications" (IIC) in this part of ISO 24102. IIC allows remote access to management SAPs specified in ISO 24102-3.

IIC may be secured following the principles of trusted distributed systems.

Detailed mandatory requirements are specified in the following clauses of this part of ISO 24102.

— Clause 6 specifies the IIC reference architecture.

— Clause 7 specifies IIC protocol data units (PDUs).

— Clause 8 specifies communication procedures.

— Clause 9 specifies management procedures.

— Clause 10 specifies security elements and procedures.

— Clause 11 specifies conformance declaration.

— Clause 12 specifies test methods.

— Annexes provide further mandatory requirements.

6 Reference architecture

"ITS-S Internal management Communications" (IIC) is communications between ITS-S Management Entities of different ITS-SCUs of the same ITS via the ITS station-internal network. A specific purpose of IIC is remote access to management service access points MI-SAP, MN-SAP, MF-SAP, and MS-SAP.

The reference architecture for IIC is illustrated in Figure 2.

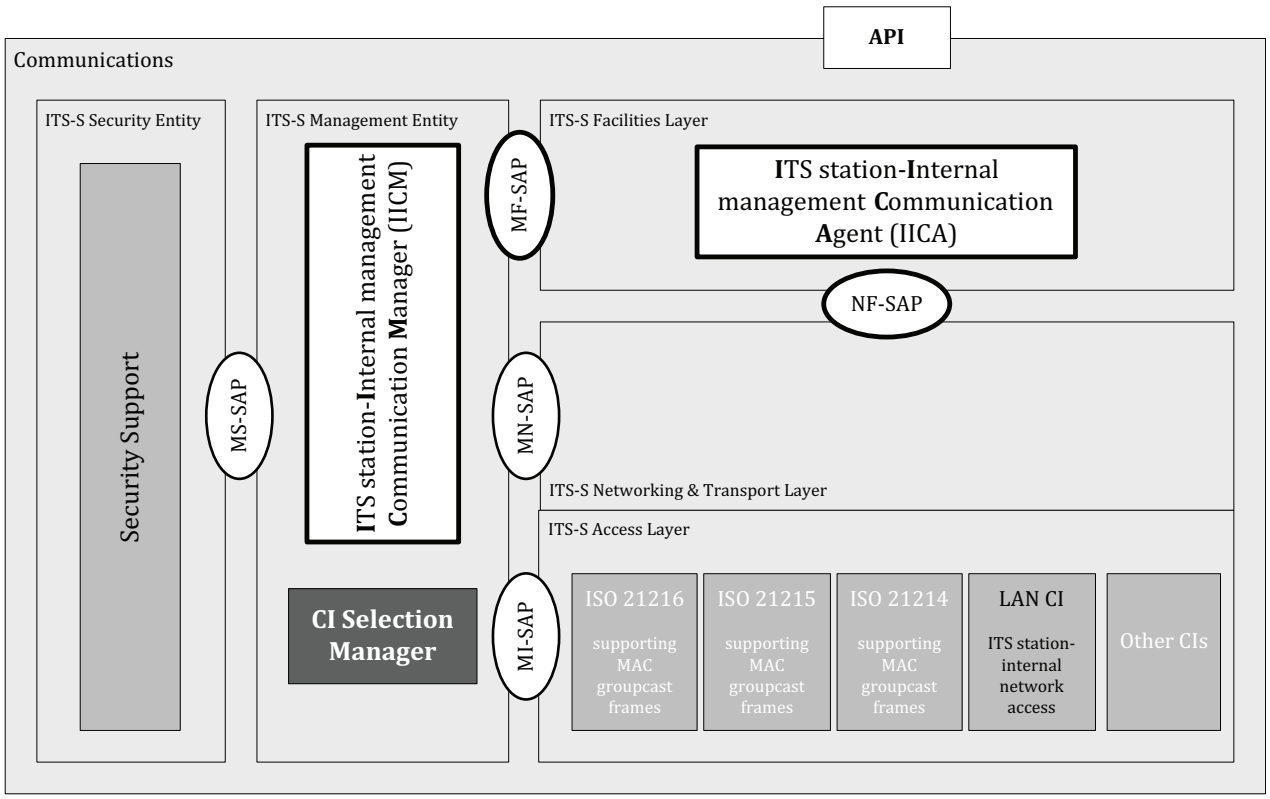

Figure 2 — Reference architecture for ITS station-internal management communications

Source and destination of IIC protocol data units are instances of the "ITS station-Internal management Communications Manager" (IICM). Transmission requests from the IICM are forwarded to the "ITS station-Internal management Communications Agent" (IICA) via the MF-SAP. Notifications of received IIC PDUs are sent by the IICA via the MF-SAP to the IICM.

Communications on the ITS station-internal network is performed between peer instances of the IICA via NF-SAP, a suitable networking and transport layer protocol, the IN-SAP, and a suitable access technology. Source and destination end points of the ITS-S networking and transport layer protocol are identified by an ITS-S port (ITS-SP) with the number PORT_IIC of the IICA identified in [3].

NOTE Figure 2 shows the "Fast networking & transport layer protocol" (FNTP) specified in [3] as an example.

7 Protocol data units

"ITS-S Internal management Communications" (IIC) uses the following protocol data units (PDU) illustrated in Figure 3:

— IIC-Request;

— IIC-Response.

IIIC-Request:

SourceITS-SCU-ID	Destination ITS-SCU-ID	PDU-Counter	PDU-ID	Data	SecRq

IIIC-Response:

SourceITS-SCU-ID	Destination ITS-SCU-ID	PDU-Counter	PDU-ID	Data	Error Status	SecRs

Figure 3 — IIC PDU structure

Details on parameters of these PDUs shall be as specified in Table 1.

Table 1 — IIC PDUs

PDU element	IIC-Request	IIC-Response
SourceITS-SCU-ID	ITS-SCU-ID of source ITS-SCU, which produces the request. See parameter "ITS-scuId" specified in ISO 24102-1.	ITS-SCU-ID of ITS-SCU, which produces the response.
DestinationITS-SCU-ID	ITS-SCU-ID of destination ITS-SCU, which shall evaluate the request.	Same as SourceITS-SCU-ID of related request if not requested otherwise in this part of ISO 24102.
PDU-Counter	Even number generated from a cyclic counter at the ITS-SCU, which produces the request.	PDU-Counter of related request incremented by one.
PDU-ID	Distinguishes IIC-Request and IIC-Response.	Distinguishes IIC-Request and IIC-Response.
Data	Data type identifier followed by request data.	Data type identifier followed by response data.
ErrorStatus	Not existent.	Existent. 0: No error happened >0: Number indicating type of error.
SeqRq	Information authenticating the transmitting station.	Not existent.
SeqRs	Not existent.	Information authenticating the transmitting station.

The ASN.1 specification of the PDUs as provided in Annex A of this part of ISO 24102 shall apply.

ITS-SCU-ID values used in parameters "SourceITS-SCU-ID" and "DestinationITS-SCU-ID" shall be as specified in Table 2.

Table 2 — ITS-SCU-ID value assignment

SourceITS-SCU-ID	DestinationITS-SCU-ID	Description
0		Reserved. Used to indicate "own/local ITS-SCU". Must not be used in communications with other ITS-SCUs.
n.a.	1	ITS-SCU-ID identifying ITS-SCUs with ITS-S host role.
n.a.	2	ITS-SCU-ID identifying ITS-SCUs with ITS-S router role.
n.a.	3 - 7	ITS-SCU-ID identifying ITS-SCUs with an implementation specific role
8 ... 65534		ITS-SCU-ID identifying uniquely a specific ITS-SCU in an ITS station.
n.a.	65535	ITS-SCU-ID identifying all ITS-SCUs.

"PDU-ID" values and the related "Data" values shall be set as specified in Annex B of this part of ISO 24102.

"ErrorStatus" values shall be set as specified in Table 3.

Table 3 — ErrorStatus value assignment

ErrorStatus	Description
0	No error
1	PDU-ID unknown or not implemented
2	Duplicate ITS-SCU-ID
3	Invalid or unknown AliveMessage
4	Invalid or unknown ITS-SCU type
5 ... 254	Reserved for future use
255	Unspecified error

For transmission and reception of these PDUs, the networking and transport layer protocol shall use port number PORT_IIC identified in [3].

8 Communication procedures

8.1 Initialization

8.1.1 IICM

ITS station-internal management communications between addressable ITS-SCUs shall be initialized as specified in Clause 9 on management procedures.

8.1.2 IICA

Prior to the initialization specified in Clause 9, the IICA shall initialize communications via NF-SAP as requested for the selected ITS-S networking and transport layer protocol. As a minimum, the ITS-SP PORT_ICC identified in [3] shall be announced to the ITS-S networking and transport layer protocol.

8.2 Transmission

8.2.1 IIC-Request PDU

Upon request from a protocol in the ITS-S management entity, the IICM shall construct the IIC-Request PDU specified in Clause 7. In case secure transmission is needed, the "Security Support" illustrated in Figure 2 shall be involved via the MS-SAP. Details on security shall be as specified in Clause 10.

The "PDU-Counter" value shall be set to an even value uniquely in an ITS-SCU under the control of the IICM issuing the request. The initial value shall be zero. For every next IIC-Request PDU, the counter value shall be incremented by two. It shall wrap from 65 534 to zero. The IICM shall note the value of the PDU-Counter in case a response is expected.

The IICM shall forward the IIC-Request PDU to the IICA using MF-COMMAND `IICrequestTX` specified in Annex A.

The IICA shall request transmission of the IIC-Request PDU using the appropriate service of the NF-SAP.

8.2.2 IIC-Response PDU

Upon reception of an IIC-Request PDU which requires transmission of an IIC-Response PDU, the IICM shall construct the IIC-Response PDU specified in Clause 7. In case secure transmission is needed, the "Security support" illustrated in Figure 2 shall be involved via the MS-SAP. Details on security shall be as specified in Clause 10.

The "PDU-Counter" value shall be set equal to the value of the "PDU-Counter" contained in the related IIC-Request PDU incremented by one.

The IICM shall forward the IIC-Response PDU to the IICA using MF-COMMAND `IICresponseTX` specified in Annex A.

The IICA shall request transmission of the IIC-Response PDU using the appropriate service of the NF-SAP.

8.3 Reception

8.3.1 IIC-Request PDU

The IICA shall forward an IIC-Request PDU received via NF-SAP to the IICM using MF-REQUEST `IICrequestRX` specified in Annex A.

The IICM shall perform the following steps:

1) Check DestinationITS-SCU-ID:

   i) If it is either 1 or 2 and the selected value does not indicate an existing role of the ITS-SCU, steps 2), 3), 4), and 5) are not performed.

   ii) If it is either 0 or from the range of reserved values, steps 2), 3), 4), and 5) are not performed.

2) Check the PDU-Counter value. In case the value is odd, steps 3), 4), and 5) are not performed.

3) In case the element SecRq is not empty, involve the "Security Support" illustrated in Figure 2 via the MS-SAP as specified in Clause 10.

4) Perform the required action as indicated by PDU-ID and Data contained in the IIC-Request PDU.

5) In case a response is required, the IICM shall prepare the IIC-Response PDU as specified above.

8.3.2 IIC-Response PDU

The IICA shall forward an IIC-Response PDU received via NF-SAP to the IICM using MF-REQUEST `IICresponseRX` specified in Annex A.

The IICM shall perform the following steps:

1) Check DestinationITS-SCU-ID:

   i) If it is either 1 or 2 and the selected value does not indicate an existing role of the ITS-SCU, steps 2), 3), and 4) are not performed.

ii) If it is either 0 or from the range of reserved values, steps 2), 3), and 4) are not performed.

2) Check the PDU-Counter:

   i) In case the value is even, steps 3) and 4) are not performed.

   ii) In case the PDU was privately addressed, check that the value of the PDU-Counter is as required in Table 1. Otherwise, steps 3) and 4) are not performed.

3) In case the element SecRs is not empty, the IICM shall involve the "Security Support" illustrated in Figure 2 via the MS-SAP as specified in Clause 10.

4) Perform the required action as indicated by PDU-ID and Data contained in the IIC-Response PDU.

9 Management procedures

9.1 General

The management procedures specified in Clause 9 include procedures

— for initial assignment of unique ITS-SCU-IDs,

— for ITS-SCU-ID maintenance, and

— for release of ITS-SCU-IDs.

NOTE Uniqueness ITS-SCU-IDs in the range 8 ... 65534 may be achieved by implementation-dependent means.

9.2 ITS-SCU-ID assignment

In case an ITS-SCU does not have a pre-defined unique ITS-SCU-ID, the procedure specified in this subclause shall be followed.

The ITS-SCU shall generate an ITS-SCU-ID as specified in Table 2 as its own ITS-SCU-ID and shall put the selected ITS-SCU-ID to its local ITS-SCU-list. ITS-SCU-ID values already in the local ITS-SCU-list indicate usage by another ITS-SCU in the same station and shall not be selected. Then the IIC-Request PDU `ITS-SCUalive` (new) shall be sent to all ITS-SCUs, indicating a first choice of ITS-SCU-ID in the SourceITS-SCU-ID element, or a new choice of ITS-SCU-ID, and the type of ITS-SCU in the "Data" element. In case of a negative acknowledgement, i.e. indication of usage of this ITS-SCU-ID value by another ITS-SCU (see below), the ITS-SCU shall repeat the procedure with a new ITS-SCU-ID value.

Upon activation, an ITS-SCU may listen to receive IIC-Request PDUs or IIC-Response PDUs in order to identify already allocated ITS-SCU-IDs.

Upon reception of an IIC-Request PDU `ITS-SCUalive` (new), an ITS-SCU shall check the SourceITS-SCU-ID.

— If the SourceITS-SCU-ID is equal to the own ITS-SCU-ID, the receiving ITS-SCU shall send an IIC-Response PDU `ITS-SCUalive` to all ITS-SCUs, reporting the own ITS-SCU-ID and type of ITS-SCU to all ITS-SCUs, indicating ErrorStatus = 2.

— If the SourceITS-SCU-ID is different to the own ITS-SCU-ID, the ITS-SCU shall take this information to its local ITS-SCU-list, if not already present there. An existing entry shall not be updated with this new information. The ITS-SCU shall acknowledge the IIC-Request PDU with the IIC-Response PDU `ITS-SCUalive`, reporting the own ITS-SCU-ID and type of ITS-SCU, indicating ErrorStatus = 0.

Upon reception of an IIC-Request PDU `ITS-SCUalive` (alive), an ITS-SCU shall check the SourceITS-SCU-ID.

— If the SourceITS-SCU-ID is equal to the own ITS-SCU-ID, the receiving ITS-SCU shall send an IIC-Response PDU `ITS-SCUalive` to all ITS-SCUs, reporting the own ITS-SCU-ID and type of ITS-SCU to all ITS-SCUs, indicating ErrorStatus = 2. All ITS-SCUs with this ITS-SCU-ID shall invalidate this ITS-SCU-ID and shall start the procedure to select a new ITS-SCU-ID.

— If the SourceITS-SCU-ID is different to the own ITS-SCU-ID, the ITS-SCU shall take this information to its local ITS-SCU-list, if not already present there. The IIC-Request PDU shall not be acknowledged with an IIC-Response.

Upon reception of an IIC-Response PDU `ITS-SCUalive`, an ITS-SCU shall check the ErrorStatus.

— In case of ErrorStatus = 0, the ITS-SCU shall take this information to its local ITS-SCU-list, if not already present there.

— In case of ErrorStatus = 2, an address conflict was detected. The procedure to be selected upon this event depends on the value of "Message" and SourceITS-SCU-ID contained in the IIC-Response as presented in Table 4.

Table 4 — Error handling procedure for IIC-Response PDU (`ITS-SCUalive`)

ErrorStatus = 2 (Duplicate ITS-SCU-ID)	**SourceITS-SCU-ID = own ITS-SCU-ID**	**SourceITS-SCU-ID ≠ own ITS-SCU-ID**
AliveMessage = new	Map ITS-SCU-ID to ITS-SCUtype reported in the response. Restart ITS-SCU-ID assignment process.	Nothing shall be done.
AliveMessage = alive	**IMPORTANT — This should never happen.** Reset ITS-SCU and restart ITS-SCU-ID assignment process.	**IMPORTANT — This should never happen.** Delete SourceITS-SCU-ID from local ITS-SCU-list.
AliveMessage = delete	**IMPORTANT — This should never happen.** Nothing shall be done.	

9.3 Maintenance of ITS-SCU-ID

An ITS-SCU shall periodically transmit the "alive-signal" IIC-Request PDU `ITS-SCUalive` (alive) in order to indicate its presence in the ITS station. The period of transmission shall be as set in parameter "Talive" specified in ISO 24102-1. The value of "Talive" shall be defined by implementation and shall be unique in an ITS station.

An ITS-SCU periodically shall check the local ITS-SCU-list. If for a period of at least three times "Talive" no "alive-signal" IIC-Request PDU `ITS-SCUalive` (alive) was received, the ITS-SCU shall assume that this ITS-SCU is no longer alive. The ITS-SCU-ID shall be deleted from the local ITS-SCU-list.

9.4 Shutdown of ITS-SCU

In case an ITS-SCU has the capability to perform a power shutdown, prior to performing such a shutdown of an ITS-SCU, the IIC-Request PDU `ITS-SCUalive` (delete) shall be sent to all ITS-SCUs. This message shall not be acknowledged.

10 Security

Details of security data elements presented in Figure 3 and related security procedures will be specified in another International Standard, which is not yet known.

11 Conformance

The "Protocol Implementation Conformance Statements" (PICS) proforma is specified in ETSI TS 102 797-1.

12 Test methods

The “Test Suite Structure & Test Purposes” (TSS&TP) for conformance testing are specified in ETSI TS 102 797-2.

The “Abstract Test Suite” (ATS) for conformance testing is specified in ETSI TS 102 797-3.

Annex A
(normative)

ASN.1 module

A.1 Overview

The following ASN.1 module is specified in this annex:

— CALMiitsscu { ISO (1) standard (0) calm-management (24102) iitsscu (4) version1 (1)}

A.2 Module CALMiitsscu

This module specifies ASN.1 type definitions together with useful ASN.1 value definitions.

Unaligned packed encoding rules (PER) as specified in ISO/IEC 8825-2 shall be applied for this ASN.1 module.

In order to achieve octet alignment enabling cheap implementations, "fill" bits were defined. All fill bits shall be set to the value '0'b.

```
CALMiitsscu { iso (1) standard (0) calm-management (24102) iitsscu (4) version1 (1)}
DEFINITIONS AUTOMATIC TAGS::=BEGIN

IMPORTS
CIaClass, CIclass, CIstatus, Directivity, Link-ID, LLserviceAddr, MACaddress, MedType FROM
CALMllsap {iso(1) standard(0) calm-ll-sap(21218) version1(1)}

ITS-scuId, Param24102No, Param24102 FROM CALMmanagement { iso (1) standard (0) calm-man-
agement (24102) local (1) version1 (1)}

ErrStatus, MF-Command-request, MF-Request-request, MN-Command-request, MN-Request-request,
MI-Command-request, MI-Request-request, MI-Get-request, MI-Set-request, MF-Command-confirm,
MF-Request-confirm, MN-Command-confirm, MN-Request-confirm, MI-Command-confirm, MI-Request-
confirm, MI-Get-confirm, MI-Set-confirm FROM CALMmsap {iso (1) standard (0) calm-management
(24102) msap (3) version1 (1)}

-- Details on SecRq and SecRs to be provided by a standard on security
;
-- End of IMPORTS

-- Types

-- PDUs --
IIC-Request::=SEQUENCE{
     sourceITS-scuId         ITS-scuId,
     destinationITS-scuId    ITS-scuId,
     pduCounter              PduCounter,
     fill              BIT STRING (SIZE(3)),
     pduRequest              IICPpdu,
     secRq                   SecRq
     }

IICPpdu::=CHOICE{
     request                 PduRequest,
     response                PduResponse
     }

SecRq::=OCTET STRING (SIZE(0..65535))

PduRequest::=SEQUENCE{
     requests        CHOICE{
```

```
          alive             ITS-SCUalive,
          mf-rcmd           MF-Command-request,
          mf-rreq           MF-Request-request,
          mn-rcmd           MN-Command-request,
          mn-rreq           MN-Request-request,
          mi-rcmd           MI-Command-request,
          mi-rreq           MI-Request-request,
          mi-rget           MI-Get-request,
          mi-rset           MI-Set-request,
          vCI-info          VCI-info-req,
          vCI-update        VCI-update-req,
          get-param24102    Param24102No,
          set-param24102    Param24102
          }
     }

ITS-SCUalive::=SEQUENCE{
     message         AliveMessage,
     its-scuType     ITS-SCUtype
     }

AliveMessage::= INTEGER{
     alive (0),
     delete (1),
     new (255)
     } (0..255)

ITS-SCUtype::= INTEGER{
     host (1),
     router (2),
     any (255)
     } (0..255)

VCI-info-req::=SEQUENCE{
     medType         MedType,
     ciaClass        CIaClass,
     ciClass         CIclass
     }

VCI-update-req::=SEQUENCE (SIZE(0..255)) OF VCI-Info

VCI-Info::=SEQUENCE{
     linkId          Link-ID,
     medType         MedType,
     ciaClass        CIaClass,
     ciClass         CIclass,
     status          CIstatus
     }

IIC-Response::=SEQUENCE{
     sourceITS-scuId       ITS-scuId,
     destinationITS-scuId  ITS-scuId,
     pduCounter            PduCounter,
     fill             BIT STRING (SIZE(3)),
     pduResponse           IICPpdu,
     errorStatus           PduErrStatus,
     secRs                 SecRs
     }

SecRs::=OCTET STRING (SIZE(0..65535))

PduResponse::=SEQUENCE{
     responses       CHOICE{
            alive           ITS-SCUalive,
            mf-rcmd         MF-Command-confirm,
            mf-rreq         MF-Request-confirm,
            mn-rcmd         MN-Command-confirm,
            mn-rreq         MN-Request-confirm,
            mi-rcmd         MI-Command-confirm,
            mi-rreq         MI-Request-confirm,
            mi-rget         MI-Get-confirm,
```

```
            mi-rset         MI-Set-confirm,
            vCI-info        VCI-info-res,
            vCI-update      NULL,
            get-param24102  Param24102,
            set-param24102  ErrStatus
            }
     }

PduErrStatus::=INTEGER{
     success (0),
     pduUnknown (1),
     duplicateITS-scuId (2),
     invalidAliveMessage (3),
     invalidITSscuType (4),
     unspecFailure (255)
     } (0..255)

VCI-info-res::=SEQUENCE (SIZE(0..255)) OF VCI-Info

-- MF-SAP --

-- MF-COMMANDs --

IICrequestTX::=IIC-Request

IICresponseTX::=IIC-Response

-- MF-REQUESTs --

IICrequestRX::=IIC-Request

IICresponseRX::=IIC-Response

-- General types --

PduCounter::=INTEGER(0..65535)

-- Values

/*

    The ASN.1 specification has been checked for conformance to the ASN.1
    standards by OSS ASN.1 Syntax Checker, and by OSS ASN-1STEP

*/

END
```

Annex B
(normative)

IIC PDUs

B.1 List of PDUs

Table B.1 presents an overview of all ICC PDUs. Further details are specified in the next subclauses of this annex. The column “Response” indicates whether a response PDU is mandatory (yes) or prohibited (no). See also Table 1.

Table B.1 — PDU-ID

Type of PDU	Response	Comment
ITS-SCUalive	yes	Used to assign, maintain, and delete unique ITS-SCU-ID values in a station.
MF-rcmd	yes	A management command MF-COMMAND issued by the ITS station management entity of the local ITS-SCU, to be forwarded to the MF-SAP of one or several remote ITS-SCUs.
MF-rreq	yes	A command MF-REQUEST issued by the local facilities layer, to be forwarded to the ITS station management entity in one or several remote ITS-SCUs.
MN-rcmd	yes	A management command MN-COMMAND issued by the ITS station management entity of the local ITS-SCU, to be forwarded to the MN-SAP of one or several remote ITS-SCUs.
MN-rreq	yes	A command MN-REQUEST issued by the local networking and transport layer, to be forwarded to the ITS station management entity in one or several remote ITS-SCUs.
MI-rcmd	yes	A management command MI-COMMAND issued by the ITS station management entity of the local ITS-SCU, to be forwarded to the MI-SAP of a remote ITS-SCUs.
MI-rreq	yes	A command MI-REQUEST issued by the local access layer, to be forwarded to the ITS station management entity in one or several remote ITS-SCUs.
MI-rget	yes	A command MI-GETPARAM issued by the ITS station management entity, to be forwarded to the MI-SAP of a remote ITS-SCU.
MI-rset	yes	A command MI-SETPARAM issued by the ITS station management entity, to be forwarded to the MI-SAP of a remote ITS-SCU.
VCI-info	yes	Request to all ITS-SCUs containing a router, to report about existing VCIs. Information to be stored in VCI list.
VCI-update	no	Information on change of VCI information to be stored in VCI list. Broadcasted to all ITS-SCUs.
GET-Param24102	yes	Retrieves the value of a management parameter Param24102 specified in ISO 24102-1 from another ITS-SCU.
SET-Param24102	yes	Set the value of a management parameter Param24102 specified in ISO 24102-1 from another ITS-SCU.
COMMAND	yes	Request executing of a command in a remote ITS-SCU.

B.2 PDU details

B.2.1 ASN.1

ASN.1 details of all PDUs shall be as presented in Annex A.

B.2.2 ITS-SCUalive

Table B.2 shows details of the “Data” element in the IIC-Request PDU.

Table B.2 — ITS-SCU-id request PDU

Name	Description
AliveMessage	Indicates type of alive message: “alive” “delete” “new”
ITS-SCUtype	Indicates role of ITS-SCU: ITS-S Host ITS-S Router ITS-S Host and ITS-S Router

This request shall always be transmitted to all ITS-SCUs.

Table B.3 shows details of the “Data” element in the IIC-Response PDU.

Table B.3 — ITS-SCU-id response PDU

Name	Description
Alive Message	Same as in related request
ITS-SCUtype	Same as in related request

With “Alive Message” = “delete”, no IIC-Response PDU shall be transmitted.

B.2.3 VCI-info

Table B.4 shows details of the “Data” element in the IIC-Request PDU.

Table B.4 — VCI-info request PDU

Name	Description
MedType	Indicates requested type of medium as specified in ISO 21218.
CIaClass	Indicates requested CI access class as specified in ISO 21218.
CIclass	Indicates requested CI class as specified in ISO 21218.

Upon reception of this request, an ITS-SCU shall check the required properties of existing CIs/VCIs and shall report the information in the IIC-Response PDU related to this command. The three requirements shall simultaneously be fulfilled for all information reported in the related IIC-Response.

Table B.5 shows details of the “Data” element in the IIC-Response PDU reported for every CI/VCI.

Table B.5 — VCI-info response PDU

Name	Description
Link-ID	As specified in ISO 21218.
MedType	As specified in ISO 21218.
CIaClass	As specified in ISO 21218.
CIclass	As specified in ISO 21218.
CIstatus	As specified in ISO 21218.

B.2.4 VCI-update

Table B.6 shows details of the "Data" element in the IIC-Request PDU. This PDU shall be sent in broadcast mode to all ITS-SCUs.

Table B.6 — VCI-update request PDU

Name	Description
Link-ID	As specified in ISO 21218.
MedType	As specified in ISO 21218.
CIaClass	As specified in ISO 21218.
CIclass	As specified in ISO 21218.
CIstatus	As specified in ISO 21218.

This message shall not be acknowledged.

B.2.5 Remote SAP access

The "Data" element in the IIC-Request PDUs shall contain the SAP service primitives

— MF-Command-request,

— MN-Command-request,

— MI-Command-request,

— MF-Request-request,

— MN-Request-request,

— MI-Request-request,

— MI-Get-request,

— MI-Set-request,

specified in ISO 24102-3. See Annex A.

The "Data" element in the IIC-Response PDUs shall contain the SAP service primitives

— MF-Command-confirm,

— MN-Command-confirm,

— MI-Command-confirm,

— MF-Request-confirm,

— MN-Request-confirm,

— MI-Request-confirm,

— MI-Get-confirm,

— MI-Set-confirm,

specified in ISO 24102-3. See Annex A.

Before the receiving, ITS-SCU forwards a command contained in an IIC-Request PDU to the appropriate layer, it shall temporarily store "CommandRef" and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the IIC-Response PDU related to this command.

Any kind of remote access shall be controlled by the ITS-SCU which receives the request, i.e. allowing to reject a request in case it is not acceptable. Details are outside the scope of this part of ISO 24102.

B.2.6 GET-Param24102

Table B.7 shows details of the "Data" element in the IIC-Request PDU.

Table B.7 — GET-Param24102 request PDU

Name	Description
Param24102No	Reference number of parameter

This request shall be transmitted only to a single ITS-SCUs.

Table B.8 shows details of the "Data" element in the IIC-Response PDU.

Table B.8 — GET-Param24102 response PDU

Name	Description
Param24102No	Reference number of parameter
Param24102Value	Value of referenced parameter

B.2.7 SET-Param24102

Table B.9 shows details of the "Data" element in the IIC-Request PDU.

Table B.9 — SET-Param24102 request PDU

Name	Description
Param24102No	Reference number of parameter
Param24102Value	Value of referenced parameter

This request shall be transmitted only to a single ITS-SCUs.

Table B.10 shows details of the "Data" element in the IIC-Response PDU.

Table B.10 — SET-Param24102 response PDU

Name	Description
Errors.Param24102No	Parameter reference number for which Result.Code applies
Errors.errStatus	Return/error code as specified in ISO 24102-3

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[1] ISO 24102-2, *Intelligent transport systems — Communications access for land mobiles (CALM) — Remote ITS station management*

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ICS 03.220.01;35.240.60

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