International Civil Aviation Organization
Asia and Pacific Office

ASIA/PAC the Guidance Document for AMHS Conformance Testing (AMHS Manual)

Version 3.0 – September 2009

Scope of the Document

This document has been developed by ATN ICG in order to present a comprehensive collection of test and checklist required to ensure conformance and compatibility pertaining to the implementation of AMHS facilities in the Asia and the Pacific Region.

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Document Control Log

Edition	Date	Comments	section/pages affected
0.11	30/03/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
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3.0	11/09/2009	Consequential updates based on amendment made in EUR AMHS Manual Version 3.0	

Table of Contents

1 Structure of the Asia and the Pacific AMHS Conformance Manual

1.1. The Asia and the Pacific AMHS Manual consists of 2 parts. The "Main Part" and the Appendices.

The main part will introduce and provide general guidance and detailed information on requirements concerning AMHS implementation in the Asia and the Pacific Region. They consist of:

1. Structure of the Asia and the Pacific AMHS Conformance Manual
2. Introduction
3. Asia and the Pacific AMHS Requirements
4. System implementation - Guidelines for system requirements
5. Tests and validation of systems
6. Miscellaneous

For better presentation and management, detailed documents, which have been produced on particular subjects initially addressed in the main body of the Manual, have been included as Appendices to the Manual.

1.2. The following Annexes to the Asia and the Pacific AMHS Manual have been produced:

- Annex A: Guidelines on Quality of Service (QOS)
- Annex B: AMHS Conformance Tests
- Annex C: ATN Router
- Annex D: AMHS Testing Requirements
- Annex E: AMHS Inter-Operability Tests
- Annex F: AMHS Pre-Operational Tests

2 Introduction

2.1 Background Information

2.1.1 AFS

The Aeronautical Fixed Service provides, among other things, for the exchange of messages pertaining to the safety of air navigation and the regular, efficient and economical operation of air services.

The following categories of message are handled by the AFS:

- distress and urgency messages
- flight safety messages
- meteorological messages
- flight regularity messages
- aeronautical information services messages
- administrative messages
- service messages

The principal users of messages in the above categories are ATS and the AIS, ATFM, MET and SAR Services which support and complement the ATS.

2.1.2 AFTN/X.25

Initially, the operational requirements for such an information exchange were met by the development of the Aeronautical Fixed Telecommunications Network. The AFTN provides a store-and-forward messaging service for the conveyance of text messages in ITA-2 or IA-5 format, using character-oriented procedures. Although AFTN served its purpose well for many years, AFTN technology has become outdated due to the fact that is remains bound to its telex/telegraphic origins.

The X.25 network provides a common transport service for the conveyance of binary or text application messages in an expeditious and reliable manner.

In the Asia and the Pacific Region, the X.25 provides the reliable backbone data communications infrastructure for the AFTN and a general data communications service to non-AFTN applications such as OPMET.

2.1.3 AMHS

The most recent development with regard to messaging in the ATS environment is the AMHS. The AMHS is a natural evolution from AFTN/X.25, replacing the telegraphic style of working with a modern Message Handling System based on international Standards.

It is presumed that the ATSMHS, being an ATN application, utilizes the infrastructure of the ATN inter-network. However this is not a prerequisite for the initial deployment of the ATSMHS.

There are several advantages of AMHS over AFTN/X.25 including:

- increased speed, capacity and throughput
- enhanced reliability
- extended functionality
- interoperability with other global messaging services
- security capabilities
- use of COTS equipment and services

The provisions pertaining to ATSMHS, such as SARPs and general guidance material, are contained in the following ICAO documents, which constitute the main references for this Manual.

- Annex 10, Volume II, Chapter 4 [1]
- Annex 10, Volume III, Part I, Chapter 3 [1]
- Doc 9705 Sub-Volume III [2]
- Doc 9739 Part III, Chapter 6 [3]
- ICAO Asia and Pacific Regions BASIC ANP [6]
- ICAO Asia and Pacific Regions ANP (FASID) [7]

2.2 ATSMHS Overview

2.2.1 General

The ATN SARPs for the Air Traffic Services Message-Handling Service (ATSMHS) define the ICAO store and forward messaging service used to exchange ATS messages between users over the ATN internet.

The set of computing and communication resources implemented by ATS organizations to provide the ATS Message Handling Service is commonly referred to as AMHS (ATS Message Handling System). The ATS Message Handling System SARPs are compliant with mature message handling systems standards such as ISO/IEC 10021 [10] and ITU-T X.400.

2.2.2 Functional Components

In terms of functionality, the ATSMHS comprises the following components:

(a) the Message Transfer Agent (MTA) which performs the function of the Message switch,

(b) the User Agent (UA) which performs the user access to the MTA and provides an appropriate user interface,

(c) the Message Store (MS) which provides the intermediary storage between MTA and UA and is usually co-located with the MTA, and

(d) the Access Unit (AU) which provides for intercommunication with other Messaging Systems.

(e) the ATN router (Optional)

2.2.3 End systems

Three categories of ATN end systems are defined for the support of the ATS Message Handling Service:

- the ATS message server
- the ATS message user agent
- the AFTN/AMHS gateway

Together, these systems provide connectivity between users at ATN end systems and users at AFTN Stations in three different end-to-end configurations:

a) from an AFTN/X.25 Station to another AFTN Station over the ATN

b) from an AFTN/X.25 Station to an ATN End System, and vice versa

c) from an ATN End System to another ATN End System with ATN routers

2.2.4 Levels of service

Two levels of service are defined within the ATS Message Handling Service:

a) The Basic ATS Message Handling Service

b) The Extended ATS Message Handling Service

The Basic ATS Message Handling Service meets the basic requirements of the MHS Profiles published by ISO as International Standardized Profiles (ISPs), and it incorporates additional features to support the service offered by the AFTN.

Compared to the service of the AFTN, the Basic ATS Message Handling Service offers some significant improvements such as:

- practically unlimited message length
- virtually no limit on the number of addressees of a message
- provision of non-delivery reports
- indication of the subject of a message

The Extended ATS Message Handling Service provides functionality in addition to those of the Basic ATS Message Handling Service such as the introduction of directory services and security mechanisms. Furthermore, in addition to IA-5 text, the extended service allows for the transfer of binary coded data, files etc.

The Extended ATS Message Handling Service is backwards compatible with the Basic ATS Message Handling Service.

2.2.5 Inter-operability

During the transition phase from the AFTN or the X.25 network to the AMHS the inter-perability between systems is achieved by the use of the AFTN/AMHS and X.25/AMHS gateways respectively.

The SARPs for the AFTN/AMHS gateways have been defined by ICAO.

3 AMHS Requirements

3.1 Quality of Service Requirements

The purpose of this section is to define quality of service (QoS) requirements and set target performance objectives for the AMHS. The performance requirements dealt with in this section are the common understanding on what the applications will get in terms of performance and what level of performance the network has to provide. The performance parameters are therefore necessary for designing applications as well as the network itself.

It is also a very subjective matter. So the detail of this section is only included in the appendix for reference. It is not a requirement but just a guideline for those who interests.

3.2 AMHS Addressing

3.2.1 Introduction

This section aims at the production of the AMHS Addressing Plan for all the Potential AMHS users in the Asia and the Pacific Region. This Plan should define the AMHS users addressing in an intuitive way and it should be comprehensible and meaningful to the human user and independent of the use (or not) of any type of Directory service such as X.500.

The Addressing Plan should also provide the rules to extend the addressing defined to other ATSOs (or not yet identified users).

3.2.2 Requirements

The AMHS addressing scheme should meet all of the following requirements:

- The addressing scheme should be as uniform as possible across all AMHS implementations in different Regions (as it is currently the case for AFTN addresses);
- The same addressing scheme should be maintained when indirect AMHS users (i.e. AFTN users or X.25 network users) migrate to AMHS. This implies that the AMHS addressing scheme is pre-defined and published before actual operation of the newly implemented AMHS;
- The addressing scheme should be independent of any constraints that may be imposed by Management Domains (MDs) in the Global MHS (i.e. the non-AMHS services operating globally as commercial services) or by national regulations that may vary from Region to Region; and
- The addressing scheme should allow for the interchange messages with MDs in the Global MHS.

3.2.3 MHS Addressing Structure

Each MHS address consists of a set of MHS standard components referred to as address attributes.

3.2.3.1 High Level MHS Address Attributes

The high level MHS attributes identify an MHS Management Domain as specified in ISO/IEC 10021-2, Section 18.3 [9]. They are determined by the structuring of Management Domains of the MHS Region / organization to which the address belongs. Each attribute must be registered with an appropriate registration authority to ensure that all addresses remain unambiguous. They are as follows:

- **Country (C) Name:**
  This is mandatory, and the possible range of values of the attribute is drawn from the ISO 3166 register of country names. The register contains a special value 'XX', allocated for the purposes of international organizations (i.e. those that are established by international treaty) which do not ‘reside’ within any particular country;

- **Administrative Management Domain (ADMD) Name:**
  This is mandatory, and its value is the name of an MHS Service provider in the context of a particular country. ADMD Names must be registered by a national registration authority. ADMDs registered under the 'XX' country must obtain that registration from the Telecommunication Standardization Sector of the International Telecommunication Union (ITU-T).

- **Private Management Domain (PRMD) Name:**
  This is optional, and its value is the name of an MHS service usually operated by a private organization. PRMD names must be registered either with their respective ADMDs, or with a national register of PRMDs.

3.2.3.2 Low Level MHS Address Attributes

They are as follows:

- **Organization name:**
  The organization name is the most significant naming attribute of the O/R address. Many organizations will operate as sub-naming authorities, allocating name space below their organization name attribute. The function of the domain names, both Administrative and Private, is to provide a relaying mechanism for delivery of the message to the intended destination. Relaying to the intended destination is made easier by the combination of a unique Organization Name within a unique PRMD

- **Organizational unit name:**
  The organizational unit (OU) names are used within the context of a hierarchical addressing structure as identified by the organization name attribute, and should be used to identify meaningful subdivisions of that namespace. The X.400 O/R address allows for up to 4 specified, each up to 32 characters in length, in descending order of significance within the organizational hierarchy.

  The other *OU name* (*OU2-4*) attributes can be used to further subdivide the namespace represented by the *OU1* attribute if necessary. Subordinate OU names should only be used if all superior OU names are in use.

- **Common Name:**
  The common name attribute is the preferred way of Identifying distribution lists and computer applications, avoiding the (mis)use of the personal name attribute. The common name attribute can be up to 64 characters in length.

3.2.3.3 List of Attributes

A complete list of attributes with different information concerning on the Maximum length and type of allowed characters for each attribute type is provided in the following Table:

MNEMONIC FORM ADDRESS ATTRIBUTE	CHARACTERISTICS
Country name	2 alpha or 3 numeric
ADMD name	24 Printable String
PRMD name	24 Printable String
Organization name	64 Printable String
Organizational unit name	32 Printable String
Common name	64 Printable String

Table 1: Mnemonic O/R address attributes maximum length and types

3.2.4 AMHS Addressing Schemes

3.2.4.1 XF-Addressing Scheme

The AMHS SARPs describe a potential AMHS addressing scheme, the XF-Address (translated), composed of the following:

a) an AMHS Management Domain Identifier;

b) an organization-name attribute:

   (1) as specified in ISO/IEC 10021-2, Section 18.3,

   (2) taking the 4-character value “AFTN”, and

   (3) encoded as a Printable String;

c) an organizational-unit-names attribute:

   (1) as specified in ISO/IEC 10021-2, Section 18.3,

   (2) comprising a sequence of one single element, which takes the 8-character Alphabetical value of the AF-Address (AFTN-form address) of the user; and

   (3) encoded as a Printable String.

Note 1. – An XF-Address is a particular MF-Address whose attributes identifying the User within an AMHS Management Domain (i.e. those attributes other than country-name, administration-domain-name and private-domain-name) may be converted by an algorithmic method to and from an AF-Address. The algorithmic method requires the additional use of look-up tables which are limited, i.e. which include only a list of AMHS Management Domains rather than a list of individual users, to determine the full MF-address of the user.

Note 2. – An MF-Address (MHS-form address) is the address of an AMHS user.

A summary of XF-Addressing Scheme can be found in the following table:

Attribute	Attribute value	Remarks
Country-name (C)	C = “XX”, as already obtained by ICAO from ITU-T	
ADMD-name (A)	A = “ICAO”, as already registered by ICAO at ITU-T	
PRMD-name (P)	P = private-domain-name, taking the value of the one or two-letter ICAO Nationality Letters as specified in Document 7910.	Default value will be used to ensure that the attribute value is always defined (see [8]).
Organization name (O)	O = “AFTN”, taking the 4-character value “AFTN” encoded as a Printable String	
Organizational unit-Name (OU1)	OU1 = the 8-letter AF-address (or AFTN indicator) of the considered user	

Table 2: XF-Addressing Scheme

3.2.4.2 CAAS Addressing Scheme

(a) High-level attributes

The following preferred high-level MD and address structure that meets all of the requirements outlined in paragraph 3.2.1 above:

- Country Name = 'XX';
- ADMD Name = ‘ICAO’;
- PRMD Name = preferred operating name assigned by each ATSO or group of ATSOs.

In this way, ICAO creates an international ADMD without addressing constraints Imposed from outside ICAO and its members.

This scheme has placed two requirements on ICAO:

- To obtain from the ITU-T the registration of the name ‘ICAO’ (or some other suitable acronym agreed between ICAO/ANC and ITU-T); and
- To establish and maintain a register of PRMDs established by ATSOs that operate using the 'XX' + ‘ICAO’ address structure, in a way similar to Doc. 7910 [4]and Doc 8585 [5].

  Note. – This scheme does ***not*** *require ICAO itself to operate the ADMD systems since this should be delegated to the participating ATSOs.*

This registration will enable the establishment of regional AMHS services and their later interconnection, and it will provide ATSOs with a good deal of stability within which they can develop their AMHS plans.

(b) Low-level attributes

The CAAS addressing scheme includes the following attributes:

- Organization name (O) = Region,
- Organizational unit 1 (OU1) = Location,
- Common name (CN) = User

Consequences:

- Each ATSO will define the values for the Organization-Name attribute (O) in its Management Domain. The character set to be used for this attribute will be the set of characters allowed by the ASN.1 type "Printable String".
- Organizational Unit 1 (OU1) will be the 4-character ICAO location indicator (as specified in ICAO Doc 7910 [4]) of the user.
- Common Name (CN) will either include the 8-character AFTN address for AFTN users, or the X.25 users (OPMET, AFTN Operator messages). It should be noted that this is partly redundant with the definition of OU1, however it is considered as unavoidable due to the evolutionary nature of the move from AFTN to AMHS.

3.2.5 Asia and the Pacific AMHS Addressing Plan

3.2.5.1 Asia and the Pacific AMHS Addressing Scheme

Major concepts of this AMHS Addressing Plan are shown as follows:

Attribute	Attribute value	Remarks
Country-name (C)	C = “XX”, as already obtained by ICAO from ITU-T	
ADMD-name (A)	A = “ICAO”, as already registered by ICAO at ITU-T	
PRMD-name (P)	P = a name to be defined by each ATSO and registered by ICAO. Such a name will identify a State, an Organization or an organization within a State. .	In the absence of such a name being registered by the ATSO at ICAO, a default value will be used to ensure that the attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910.
Organization-name (O)	O = a value corresponding to local/national geographical information, e.g. a region or a geographical area within a State where the user is located.	The syntax and value are to be defined by the considered ATSO. The table associating such an organization-name to each ICAO location indicator (4 characters) needs to be registered and published by ICAO.

Organizational-unit-name (OU1)	OU1 = the ICAO location indicator (4 characters) of the considered user;
Common-name (CN)	CN = the 8-letter AF-address (or AFTN indicator) of the considered user, irrespective of whether it is a direct or indirect user.

Table 3: AMHS Addressing Plan

Example: MF AMHS Address of Singapore Com center:
/C=XX/A=ICAO/P=Singapore/O=CAASG/OU=WSSS/CN=WSSSYFYX

3.2.5.2 Distribution lists

The scheme to be used for the identification of AMHS Distribution Lists is the same as for potential AMHS users. The O and OU attributes would then represent the expansion point of the Distribution list.

3.2.6 Guidelines on PRMD Name assignment

3.2.6.1 Purpose

A PRMD-name attribute shall be formulated and assigned by each ATSO in order to uniquely identify the AMHS Management Domain of which the considered ATSO is in charge. Practically, the PRMD-name attribute identifies that part of the AMHS for which an ATSO is responsible.

3.2.6.2 Assignment rules

When assigning a value to the PRMD-name attribute the following rules should be considered:

1) It should be representative of the whole AMHS Management Domain for which the ATSO is responsible;

2) It should be as short as possible, an acronym would be sufficient;

Note. – The use of the two-letter ISO 3166 country codes (e.g. SG for Singapore, AU for Australia, US for the United States, etc.) is not advisable, as these codes are used as values of the Country-name attribute and not the PRMD-name attribute. This may confuse the operators.

3) It should be stable and not subject to changes unless there are duly justified technical and/or operational reasons;

4) It should be unique and unambiguous;

Note. – Care should be taken not to use a name or an acronym such as "civil aviation", "ATSO", "DGAC".

5) A default value has been reserved in order to ensure that this attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910 [4].

6) It should only comprise standard characters, e.g. no accented letters or letters that are only used in specific geographical areas;

7) The use of figures is not advisable.

3.2.6.3 Registration

Once assigned by the concerned ATSO, the PRMD-name value(s) shall be registered and published by ICAO after checking its uniqueness, as described in paragraph 3.2.6.2.

Note. – ICAO being the naming authority for AMHS addresses, there is no requirement to register the PRMD-name value(s) with a national authority.

3.2.7 Guidelines on Organization Name assignment

3.2.7.1 Purpose

The purpose of the Organization-name attribute is to allow each ATSO to split, if needed, the AMHS Management Domain (MD) for which it is responsible in distinct geographical areas.

Within a given AMHS Management Domain (identified by the "C", "A" and "P" attributes) two potential AMHS network architectures are possible:

a) Centralised architecture, with one single ATS message server; and

b) Geographically distributed architecture, with several regional ATS message servers.

It is to be noted that architectural aspects and addressing aspects are not completely linked together; in effect the agreed addressing scheme does not place any constraints on the AMHS network deployment plan.

3.2.7.2 Assignment rules

Before assigning a value to the Organization-name attribute, each ATSO should follow the following 3-step process:

1) Develop the general architecture of the AMHS to be implemented;

2) Define the location and the number of sites at which ATS Message Server could be installed within a foreseeable time frame (e.g. 5, 10 or 15 years); and

3) Chose and assign a name to each one of these sites.

A specific case is the situation where a single ATS Message Server is implemented in an AMHS MD, providing services to AMHS users that are all directly attached to this server (centralized architecture). For simplification, it was suggested that a single organization name (O) value be allocated to all location indicators in the AMHS MD.

Potential criteria for the selection of sites include:

- Geographic divisions, such as: North, South, East, West, etc.;
- Administrative divisions of the concerned ATSO, such as ATS, Meteorological, etc.;
- Operational divisions centred around the ACCs (if more than one ACCs exist);
- Operational divisions centred around the main airports;
- Mapping of the AMHS architecture on the existing AFTN / architecture;
- A mixture of the above criteria; and
- Other.

Note. – Care should be taken not to define too many geographical areas within a given AMHS MD as this may lead to less efficient message routing.

When assigning a value to the Organization-name attribute, the following rules should be considered:

1. It should be as short as possible;
2. It should only comprise standard characters, i.e. no accented letters or letters only used in specific geographical areas;
3. The use of figures is not advisable.

Note. – An ATSO should define different values for the Organization-name attribute only if it plans to implement a distributed AMHS architecture in the short, medium or long term future. ATSOs not planning to implement a distributed AMHS architecture should allocate a single value for this attribute.

3.2.7.3 Registration

Once assigned by the concerned ATSO, the Organization-name values shall be registered and published by ICAO, as described in paragraph 3.2.8.3.

Note. – ICAO being the registration authority for AMHS addresses, there is no requirement to register the Organization-name value(s) with a national authority.

3.2.8 Address conversion

3.2.8.1 Addressing Plans requirements

The selected address conversion strategy must take into account the following principles:

- The selected address conversion solution shall be able to support any X.400 addressing plan making use of any address form.
- The AFTN address of an AFTN or AMHS user is unambiguous, internationally recognized and shall not be replaced by another value.

The addresses to be considered are: AFTN, XF-form, CAAS and MF (non- CAAS). It can be concluded that:

- All Asia and the Pacific AFTN/AMHS gateways shall implement the conversions AFTN<=>XF;

- All Asia and the Pacific AFTN/AMHS gateways shall implement the conversions AFTN<=>ATSOs;

- All Asia and the Pacific ATSOs gateways should implement the conversions AFTN<=>ATSOs, together with an ATSOs address space within their remit (SARPs recommendation);

- To deal with the arrival of spurious XF addresses at the Asia and the Pacific ATSOs MDs from the global AMHS, the redirection XF=> ATSOs could be supported by all ATSOs;

- If an ATSO defined an MF (non-ATSO) address space, then all gateways would have to support the conversion AFTN<=> MF (non-ATSO). This is an undesirable alternative since a global and common CAAS has been recommended by ICAO.

3.2.8.2 Address Conversion Scenarios and Criteria

The identified scenarios are the following: single conversion, AMHS transit conversion, AFTN transit conversion and multiple transit conversion.

Once the scenarios have been established, the following considerations for the address conversion have to be performed:

- The result of the address conversion performed in an AFTN/AMHS gateway shall depend only on the pre-defined pair of unambiguously associated AFTN and AMHS addresses, and not on the gateway itself, according to the form published by ICAO and defined by the delivering MD.

- It is recommended that each gateway performing address conversion should have access to the minimal necessary information to perform mappings between AFTN addresses and AMHS addresses and vice-versa. The complete mappings between AFTN addresses and their AMHS equivalents should be published (in electronic form) and made available to all gateways that support address translations.

- The conversion process shall be easy to use and manage, and efficient.

As a conclusion, a compromise solution combining the use of algorithmic tables and X.500 directory is preferred for the address conversion.

3.2.8.3 General model for address distribution and gateway address conversion

A model of address distribution and gateway address conversion is depicted in Figure 1 below. The figure represents information exchanges between ICAO and three ATSOs implementing AMHS Gateways, concerning address conversion. ATSO1 and ATSO2 implement a distributed address publishing service (APS), e.g. by means of ATN X.500 Directory Services. This allows electronic distribution. ATSO3 provides this information to ICAO for manual collation and distribution (e.g. on paper, electronic database), and does not support a directory.

The dotted arrows represent exchanges that are performed in a non-electronic way, e.g. through "paper" procedural exchanges. The full arrows represent exchanges that are performed electronically using appropriate communication protocols.

The model identifies a number of components that are necessary for address conversion:

(1) Collection and distribution of the basic addressing information that establishes equivalence between the different addresses identifying each MHS/AFTN/X.25 user; the content of this information **must** be standardized and made available to all AMHS/AFTN/X.25 Gateways;

(2) Access to, and/or import of the basic addressing information into AFTN/AMHS gateways. This depends on the particular gateway implementation;

(3) Re-structuring the basic addressing information into a format suitable for use by each gateway's internal address conversion procedures (AMI). This is again Gateway implementation specific;

(4) The internal procedures and data structures of the gateway (AMP and AMT) that make use of the re-structured addressing information. This is gateway implementation specific.

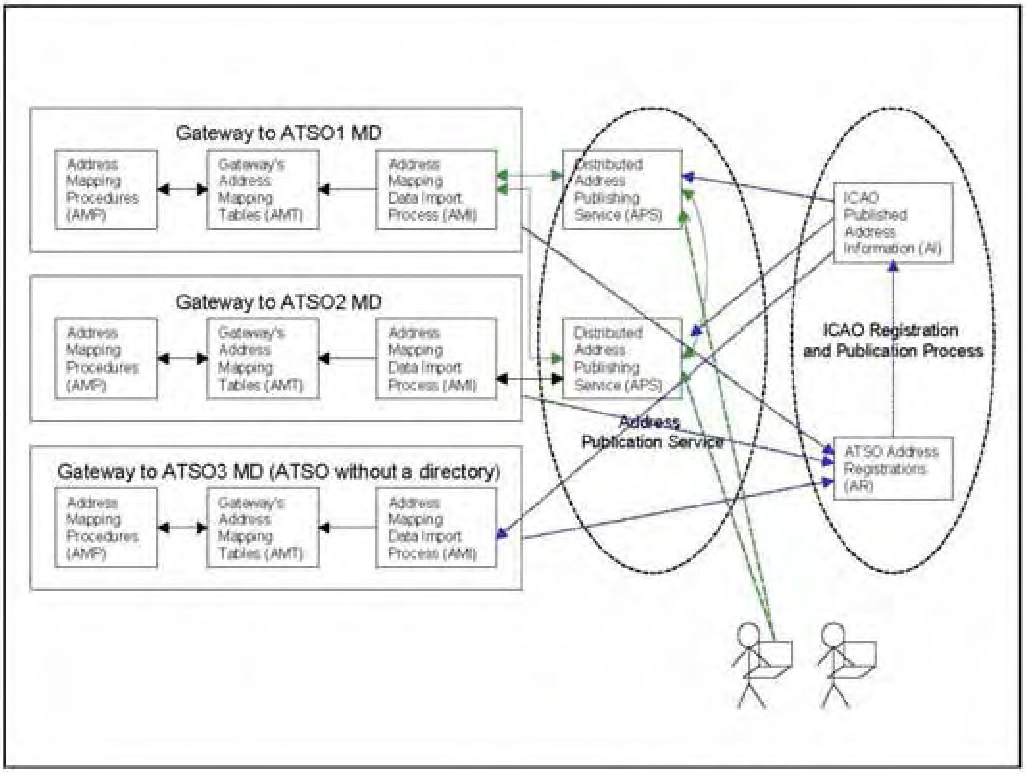


Figure 1: General model for gateway address conversion

The address mapping information content held in AMT and distributed through APS is identical in nature.

The structure of APS must be compatible with many different systems (e.g Different ATSO's Gateways), and must therefore be standardized. There are a number of possibilities for structuring APS:

- As an X.500 Directory Information Tree, thereby enabling implementation of a Distributed APS;
- By some other electronic means (e.g. CSV files);
- On paper.

3.2.8.4 The impact of different paths through the AFTN and AMHS

There is also a potential need for messages to undergo multiple address conversions. In order to minimize message rejection and to regulate the responsibilities for conversions, the following rules should apply:

- Originating MDs (for originator's addresses) shall generate addresses according to the form published by ICAO and defined by the delivering MD (for recipient addresses);
- Delivering MDs shall be authorized to reject messages received with recipient addresses which do not comply with the address form published by ICAO and defined by the delivering MD.
- Delivering MDs should have the capability of redirecting potential internal XF addresses to the corresponding MF(S) form addresses for use within their delivering MD, for a transition period of at least 6 months after publication of the appropriate ICAO documentation.
- Transit domains should not attempt to perform any AMHS <-> AMHS Mapping unless a specific bilateral agreement has been established with the delivering MD (for recipient's addresses) or the originating MD (for originator addresses). Transit MD should only use the attributes C, A, P (which are invariant and predetermined for all AMHS address forms in the ATS) in selecting a message route.

3.2.8.5 Recommended AMHS Address Conversion Strategy

The recommended AMHS address conversion strategy is the means by which the general model represented in Figure 2 should be realized by States in the Asia and the Pacific Region. It is also applicable on a worldwide basis and has been presented and adopted by the ICAO ATNP as the general AMHS address conversion strategy[1]. This strategy is made of the following elements:

a) the establishment, by an appropriate ICAO body or entity, of an ICAO Registration and Publication process as a set of procedures for collecting and publishing AMHS address conversion information on a periodic basis (e.g. twice yearly). This will include:

[1] This will result in the corresponding guidance material being included in Edition 2 of ICAO Document 9739 (Comprehensive ATN Manual).

i) the MD information included in the ICAO Registry of AMHS Management Domains, i.e. the MD identifier and the corresponding ICAO State/territory two letter identifier, together with the specification of the type of implemented addressing scheme (XF or CAAS).

ii) for those MDs having implemented the CAAS, the mapping information providing the organization-name address attribute for each ICAO location indicator;

b) A Distributed Address Publishing Service (APS), based on ATN Directory Services, that allows publication of real-time AMHS address conversion information. This is to be implemented at the earliest opportunity upon ATSOs initiative, with the following principles:

i) use of the directory scheme;

ii) initial population of the Directory Information Base with the information distributed through the ICAO Registration and Publication process;

iii) implementation of a single Directory System Agent (DSA) per ATSO to hold the MD Registry sub-tree, the world-wide ATSO information distributed through the ICAO Registration and Publication process, and the local AMHS MD address conversion information sub-tree; and

c) in co-existence with the use of Address Mapping Tables (AMT) directly derived from the information published through the ICAO Registration and Publication process, for ATSOs that choose to defer the implementation of ATN Directory Services.

As a local implementation matter, ATSOs that envisage implementation of Directory Services for the purpose of the Distributed address publication service (APS) at the same time as they implement AMHS, should also consider the use of directory solutions as a technical option for the gateway's Address Mapping Tables (AMT).

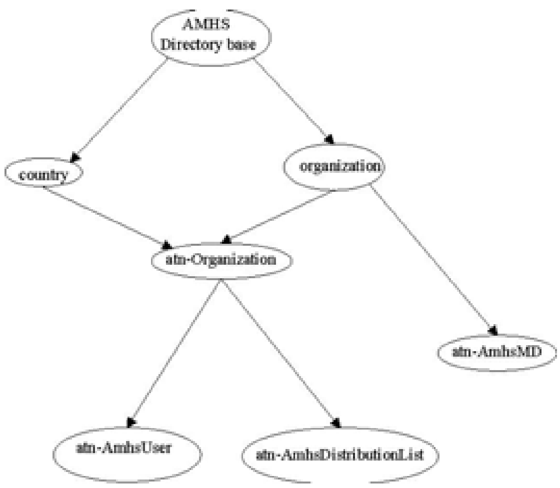


Figure 2: DIT structure for AMHS address conversion

3.2.8.6 Regional Provisions

The strategy above is complemented by the following transitional provisions which may apply regionally.

In case the first element in the above strategy is not implemented by ICAO in a timeframe compatible with early AMHS implementations, an equivalent process may be set up on an ad-hoc basis among ATSOs forming an AMHS island. This is particularly applicable to any countries ATSOs being early AMHS implementers.

In case of ATSOs implementing the second element in the above strategy that initially prefer to group together for the implementation of a single ICAO Regional DSA, the following should apply:

- the MD Registry sub-tree,
- a local AMHS MD ATSOs information sub-tree for each of the ATSOs in the group; and
- the world-wide ATSOs information distributed through the ICAO Registration and Publication process.

The Regional DSA thereby becomes an aggregation of the local DSAs envisaged in the principle strategy.

In the Asia and the Pacific Region, the creation of an Offline Management Centre is recommended to consolidate, co-ordinate and distribute AMHS user address changes across the Region. This Offline Management Centre should implement such a Regional DSA in support of its address management activities.

3.3 AMHS router topology

3.3.1 OSI Model for ATN Router

This section addresses the lower three layers of the OSI seven-layer model for the ATN Ground-Ground (G/G) routers in the Asia/Pacific regional ATN network. The three layers are Network, Data Link and Physical layer.

The ATN uses the ISO/IEC8473 Connectionless Network Protocol (CLNP) as the network protocol. Data are transferred in the CLNP Protocol Data Units (PDUs) over sub-networks such as ISO/IEC 8802 Local Area Network (LAN) and ISO/IEC 8208 (“X.25”) point-to-point connections or packet switched networks. ATN routers bridge these sub-networks together to form an integrated ATN network, relaying data packets between LAN and WAN, and WAN and WAN.

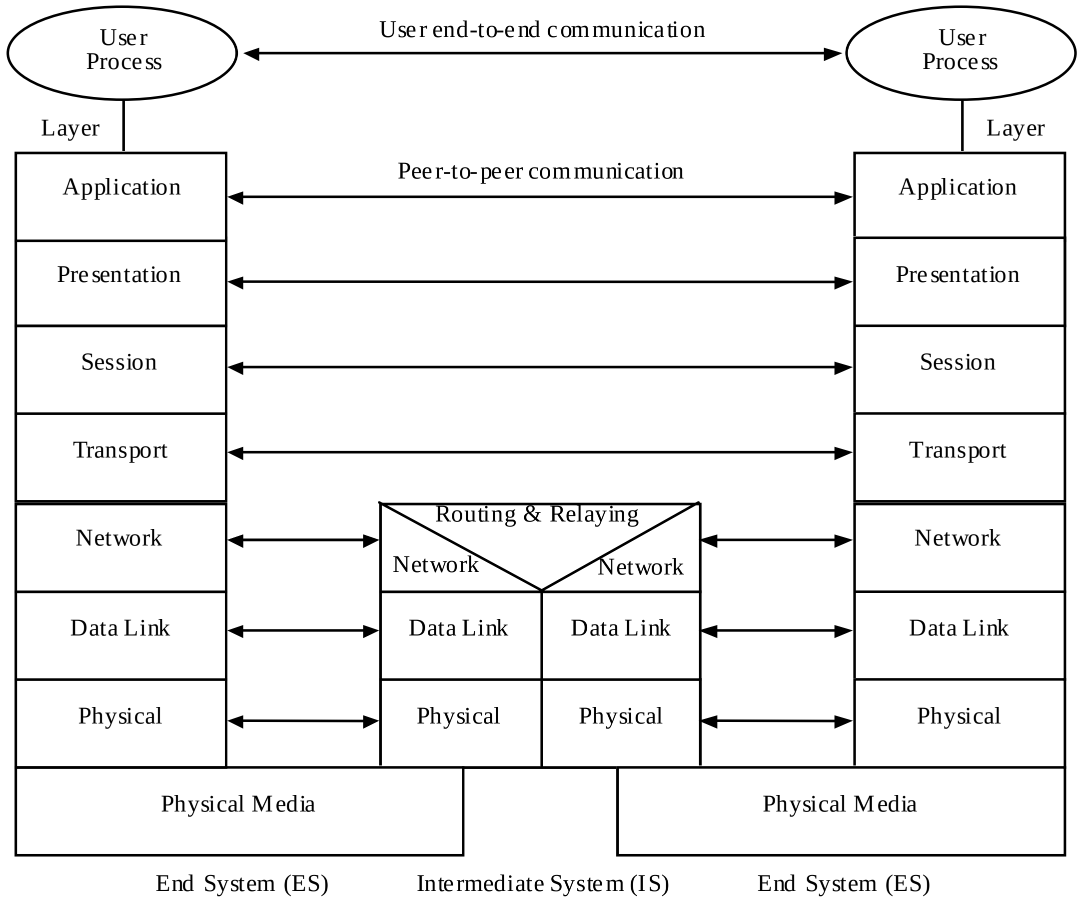


Figure 3: Open System Interconnection reference model

a. Network Layer

The network layer includes three sub-layers:

Sub-network Independent Function (SNICF)

The SNICF **shall** include the following routing and routed protocol:

1. ISO/IEC 10747 — the Inter-Domain Routing Protocol (IDRP); and
2. ISO/IEC 8473-1 — the Connectionless Network Protocol (CLNP).

The SNICF may support the following two optional routing protocols:

1. ISO/IEC 9542 — the End-System to Intermediate-System (ES-IS) protocol; and
2. ISO/IEC 10589 — the Intermediate-System to Intermediate-System (IS-IS) Intra-domain routing information exchange protocol.

Sub-network Dependent Convergence Function (SNDCF)

The proper SNDCF **shall** be implemented for underlying sub-network(s). The most commonly implemented SNDCFs are the following:

1. ISO/IEC 8473-2 — Sub-network Dependent Convergence Function (SNDCF) for Local Area Network (LAN); and
2. ISO/IEC 8473-3 — Sub-network Dependent Convergence Function (SNDCF) for X.25 network.

Sub-network Sub-layer

The sub-network sub-layer is determined by the underlying sub-network. When the data are communicated over X.25 sub-network, the sub-network **shall** include X.25 Packet Layer Protocol (PLP) as specified in ISO/IEC 8208.

b. Data Link Layer

The ATN G/G router Data Link Layer for use within States is a local matter and could be X.25, LAN, etc.

The Data Link Layer used between States is subject to bilateral agreement. To ensure regional interoperability, however, the data link layer requirements for ATN routers that connect to the Asia/Pacific ATN regional network are specified in the Asia/Pacific regional ATN router ICD.

c. Physical Layer

The ATN G/G router Physical Layer is a local or bilateral matter and could use the Physical Layer of X.25, LAN, etc.

3.3.2 Routing and Routed Protocols

Class 4 routers support dynamic routing using the following routing protocols:

1) End system to Intermediate System (ES-IS) routing protocol;

According to ICAO Doc 9705, the ES-IS routing protocol is an optional protocol for ATN G/G routers. However, if ES-IS is supported, it is recommended that to ensure interoperability with End Systems, ATN G/G routers **should** comply with the requirements of ISO/IEC 9542 (ES-IS).

2) Intermediate System to Intermediate System (IS-IS) routing protocol; and

According to ICAO Doc 9705, the IS-IS routing protocol is an optional protocol for ATN G/G routers. However, if IS-IS is supported, it is recommended that to ensure interoperability with IS routers. ATN G/G routers should comply with the requirements of ISO/IEC 10589 (IS-IS).

3) Inter-domain Routing Protocol (IDRP).

   The ATN G/G router shall comply with the requirements in ISO/IEC 10747 (IDRP), section 5.8.3 of ICAO Doc 9705, and the IDRP APRLs specified in the Asia/Pacific regional Ground/Ground router ICD.

4) Connectionless Network Protocol (CLNP)

   The ATN G/G router shall comply with the requirements in ISO/IEC 8374-1, sections 5.6.2 and 5.6.3 of ICAO Doc 9705, and the CLNP APRLs specified in the Asia/Pacific regional Ground/Ground router ICD.

4 AMHS Protocol Scenarios

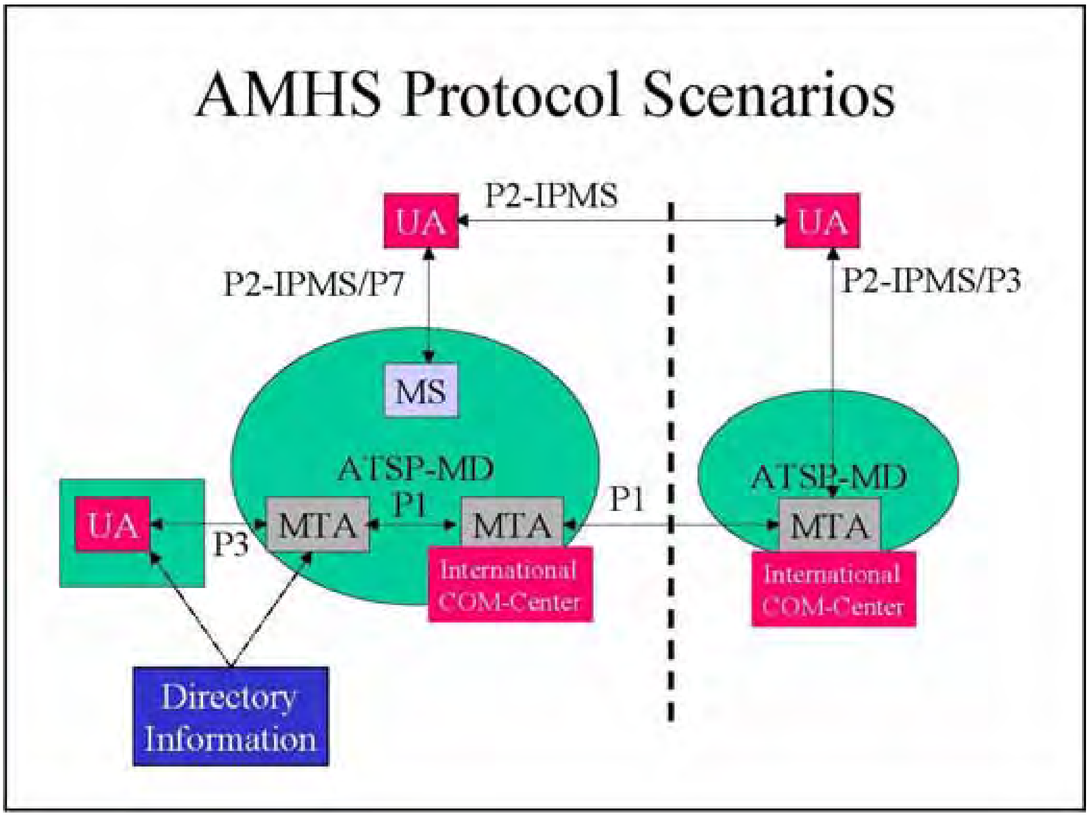


Figure 4: AMHS Systems and interconnecting Protocols

4.1 Applicable Profile

The Profile applies to the following AMHS system components:

a) UA - User Agents

b) MTA - Message Transfer Agents

c) MS - Message Stores

The Profile applies to the following AMHS protocols:

a) P1 - Message Transfer

b) P2 - IPM Content

c) P3 - Message Submission/Delivery

d) P7 - Message Retrieval

The Profile specifies a profile of ATS Message Handling Service conformance called the Asia and the Pacific-AMHS Profile. It is based on the requirements of following:

a) The Basic ATS Message Handling Service (Bas), introduced in the Doc. 9705 Ed. 3, para. 3.1.1 Note 2;

b) A number of further Functional Groups and options selected from the Extended ATS Message Handling Service (Ext), introduced in the Doc. 9705 Ed.3, para 3.1.1 Note 2;

The resulting scope is sufficient to ensure inter-State message interchange using AMHS according to the Basic AMHS requirements stated in Doc. 9705, which covers Basic Message Transfer Capabilities, Distribution Lists, appropriate message size capability and Legal Recording.

Security requirements are not a mandatory part of the Asia and the Pacific-ATSMHS Profile. However, the Profile mandates IP address validation and the protocol includes system identification following transport connection establishment. It must be pointed out that certain Messaging Application Security functions are also mandated in the MHS.

4.2 Use of the Directory

Use of Directory is not mandated in the Profile due to the following reasons:

- There are other ways to implement the distribution of the necessary directory information which are viable at least in the early phases of AMHS implementation;

- Some States will not implement the directory (nor access it) in the first Implementation of AMHS. Some of the reasons for this are that they want to implement AMHS first before taking the next step to the Directory. Also, some currently available AMHS products do not support access to the Directory;

- Some States foresee that Directory Access as specified in Doc. 9705 using X.500 DAP is too costly in terms of software purchase, and they would like to be able to use LDAP (a more cost effective RFC-based equivalent). However, there are no currently available LDAP schema standards covering some of the ATN Directory-specific requirements (and some aspects of X.400 support). There are also no suitable standard LDAP products available;

- In some cases, it is not quite clear what elements of the ATN-Directory Schema are required to support different AMHS functions (e.g. in terms of directory information). These issues need to be resolved by further guidance material on the use of the ATN/AMHS Directory by the ACP. Currently, work is ongoing to fulfill this requirement.

5 System implementation -Guidelines for system requirements

5.1 Introduction

5.1.1. This section is intended to deal with technical and operational requirements for a COM system replacing the AFTN/X.25 system by an AMHS or adding the ATSMHS capability. As indicated by its title, this section covers guidelines for requirements not specified in the AMHS SARPs, but considered by the Group important enough for being included in a Call For Tender for the procurement of an AMHS system.

5.1.2. The main input of this section was a subset of the specifications of an actual Call For Tender issued by one of the Group members, adapted and modified in order to have a 'template' able to be used by any ATSO who intends to procure an AMHS system.

5.1.3. The section covers technical and operational requirements like:

- General facilities
- Addressing - mapping table facilities
- Queue management facilities
- Message repetition facilities
- Tracing facilities
- Sizing
- Availability and reliability

5.1.4. For such a COM system in the following paragraphs the term "**AMHS System**" will be used.

5.1.5. Due to the character of this section (as guidelines for system requirements) the Term "**should**" is used. In a specific Call For Tender this term can be replaced by shall.

5.2 General requirements

5.2.1. The AMHS System should implement the ATSMHS and AFTN/AMHS Gateway facilities in accordance to the specifications defined in the latest approved ATN SARPs for Basic Services, but supporting AFTN messages with a message length up to 64 Kbytes.

Note. – This requirement is not covered by the SARPs, which mandate support of Standard AFTN message length only.

5.2.2. The AMHS System should support several simultaneous associations with an MTA partner (at least, up to 5).

5.2.3. The AMHS System should support simultaneous associations with several MTA partners (one or several associations with each MTA partner) with the same or different “transport” protocols (e.g. TCP/IP to be used within EUR, ATN between ICAO Regions).

5.2.4. The AMHS System should support the total number of simultaneous Associations (sum of all associations) without any restrictions caused by inherent limitations of the system (memory, interfaces, etc).

5.2.5. The AMHS System should allow control of establishment of associations with MTA partners via on-line operator commands; i.e., it should be able to:

- Prevent/allow the establishment of associations with a given MTA partner by AMHS System (local MTA), by MTA partner only or by both partners.
- Prevent/allow the establishment of associations with all configured MTA partners by AMHS System (local MTA), by all MTA partners only or by all partners.
- Force the termination of associations already established with a given MTA partner.
- Force the termination of associations already established with all configured MTA partners.

Note. – The number of actual simultaneous associations to be supported will depend on:

- *the target 'logical' AMHS network topology: for example each centre establishes direct associations with all the other centres or each centres establishes associations with adjacent centres only (as in AFTN);*
- *whether permanent or dynamic connections will be established. Such distinction is only applicable in case there is no requirement for continuous traffic exchange.*

5.2.6. The AMHS System should implement MTA queues. These queues will keep the AMHS messages that:

a) either are pending to be sent; or

b) have been transmitted but for which a delivery report is expected.

Note 1. – The queue referred to in " item a" should be implemented in the MTA.

Note 2. – The queue of messages for which a DR is expected should be implemented in the User Agents and MTCUs of the AFTN/AMHS gateways. The reaction of an AMHS System in case of loss of a DR should be fixed (implementation matter): E.g., would it have to resend the message after timeout? How many attempts to resend the message should be made? A DR or NDR is addressed to the originator of the message, therefore it should be left to the originator to react upon non-arrival of a DR as it is his task to react upon reception of a NDR. If the originator is an indirect (AFTN) user, the AFTN/AMHS gateway has to perform this task on his behalf. Furthermore, a report may take another route than the message it refers to, that means it does not necessarily pass through the same MTAs as the original message.

5.2.7. There should be a logical MTA queue per configured MTA partner. Management of these queues is specified in section 5.4).

5.2.8. The configuration of an MTA partner (via on-line commands) should provide flexibility for each of its parameters. For example:

a) It should be possible to configure the "transport" protocol (e.g. ATN, TCP/IP, TP0/X.25, TP4/X.25) to be used per each MTA partner.

b) In case of selection of TP4/X.25, it should be allowed to configure at least two local X.25 attachments to be used for the connections, several calling – called addresses to be used for initiating a call or acceptance of an incoming call, etc.

c) It should be possible to configure the maximum number of simultaneous associations with each MTA partner.

d) It should be possible to configure whether the associations have to be left permanently established or whether they have to be established and closed depending on traffic.

5.2.9. The AMHS System should allow configuration of all profile items if possible.

5.2.10. The AMHS System should allow configuration of the following profile items, at least:

a) Mapping between AFTN priorities and AMHS Message Transfer Envelope priorities.

b) Values of "rn" and "rnr" in the notification-requests element in the recipient fields in the IPM heading. These values should depend on the value of the AFTN priority.

Note 1. – Both functions should be implemented in the UAs and MTCUs of the AFTN/AMHS gateway since the MTA does not deal with the ATS Message Priority (or AFTN priority) which is contained in the ATS Message Header as part of the IPM body.

Note 2. – The SARPs specify the values of these profile items. It is considered that the implementation should allow the possibility to change them just by configuration in case operational experience recommended other settings. The processing is implementation matter.

5.3 Addressing – mapping tables requirements

5.3.1. The AMHS System should support the CAAS (see section 3.2)

5.3.2. The AMHS System should process and manage AMHS messages received with the O/R name in the XF Addressing Scheme also, even if the ATSO has chosen the CAAS for its internal users.

5.3.3. The AMHS System should provide mechanisms to import mapping tables needed in the AFTN/AMHS Gateway. The tables to be imported will be downloadable from the AMC system.

5.3.4. The implemented facilities in the AFTN/AMHS Gateway which map an AFTN address to an O/R name should be flexible enough to accommodate different O/R structures (Addressing Schemes) and use the minimum number of configuration / lookup tables with the minimum number of entries. As an example for the implementation of the mapping of an AFTN address to an O/R name, the following information should be entered in configuration tables:

i) Attributes and associated values that are fixed for each State. e.g. in the case of States using the address scheme described in section 3.2 the attributes and associated values to be entered should be Country, ADMD and PRMD. Each entry will be indexed by the ICAO routing area or State/territory identifying letters (1 or 2 first characters of the AFTN address).

ii) Attributes whose values can be determined directly from the AFTN address. e.g. in the case of States using the CAAS described in section 3.2, the Organization Unit 1 attribute (first to fourth characters in the AFTN address) and the Common Name (all characters in the AFTN address) should be declared here for them.

iii) Attributes whose values depend on a mapping table. For each such attribute for each State, the following should be specified: the name of the mapping table and the subset of the AFTN address (e.g. one to four first characters, the complete AFTN address, wild characters could be used to define the subset...) that gives the index to the mapping table. The mapping table itself should also be provided. e.g. in the case of countries using the CAAS address scheme described in section 3.2.4.2, the value for the Organization attribute should be defined this way.

5.3.5. The possibility to use a directory should also be contemplated, even if this is not part of the Basic Services.

5.4 Queue management requirements

5.4.1. The AMHS System should provide, in addition to a pure diversion facility of outgoing queues, a reprocessing of messages in X.400 (outgoing) queues in case of longer outages of adjacent MTAs (non-reachability).

Note. – Such reprocessing facilities will be very important during the time period when both AMHS and AFTN/X.25 centres coexist in the Asia and the Pacific Region.

5.4.2. Two types of reprocessing should be envisaged at:

a) the pure X.400 level

b) the AFTN level (in the case of AFTN/AMHS Gateways)

5.4.3. Reprocessing at the pure X.400 level

5.4.3.1. The reprocessing at pure X.400 level should allow :

a) to extract messages waiting in an X.400 queue from this queue,

b) to process these messages again by the X.400 routing software and

c) to route according to possible new or temporarily modified X.400 routing tables.

5.4.3.2. Such a mechanism would allow to extract the messages from the queue associated to a non reachable MTA. The messages could be routed through another centre (MTA) and forwarded through the alternate route only for those recipient addresses for which alternate routes have been activated. For all other recipients addresses the messages remain in the queue. This kind of processing prevents a general forwarding of messages to other centres (MTAs) containing recipient addresses for which rerouting is not intended.

5.4.3.3. The reprocessing at the pure X.400 level should be present in the ATS Message Servers, in AFTN/AMHS Gateways.

5.4.4. Reprocessing at the AFTN level

5.4.4.1. The reprocessing at AFTN level should allow:

a) to extract messages waiting in an X.400 queue,

b) to re-process them by the AFTN layer, and

c) to route them according to the current AFTN, X.25 and X.400 routing tables respecting the updated route availability information (predefined alternate routing).

This reprocessing would solve the problem of non-reachability due to outages, in a heterogeneous AFTN/ X.25/AMHS environment.

5.4.4.2. An X.400 queue can contain messages, reports and probes. The AFTN reprocessing function should only concern the messages. These messages can be of different ‘types,
e.g. i) messages from AFTN/AMHS gateways,
ii) messages from X.25-OPMET/AMHS gateways,
iii) ‘pure’ UA to UA exchanges, etc.

All these messages will be IPM messages, so there is no way to distinguish them at the X.400 (envelope) protocol level.

5.4.4.3. The reprocessing should be restricted to messages generated by an AFTN/AMHS gateway.

5.5 Message repetition requirements

5.5.1. The AMHS System should provide powerful message repetition facilities in the AFTN, X.25 and AMHS subsystems implementation.

5.5.2. The repetition facilities should be able to repeat messages as they were originally transmitted i.e. sent to all recipients following the same transmission paths.

5.5.3. Additionally, the repetition facilities should be able to specify (with the use of wildcards) ‘detailed’ or ‘generic’ destinations. Such destinations can be an AFTN address, an O/R name, all AFTN addresses mapped to a given Ax, all O/R names of a given PRMD, etc.

5.5.4. The AMHS System should find all the messages that were transmitted to such specified 'generic' destinations within a specified time interval and retransmit them only to pending destinations and following the current routing. To avoid a transmission to other destinations originally contained in the message the addresses not matched by the 'generic' destination should be suppressed (address stripping).

5.6 Tracing facilities requirements

5.6.1. The AMHS System should provide a facility to allow generation of X.400 probes.

5.6.2. The user interface of the facility should allow entering of the priority, the O/R name of the originator / destinations and the message length.

5.6.3. The AMHS System should send the reports regarding the probes (delivery, non-delivery) to a configurable instance (e.g. the rejection queue).

Note. – This requirement relates to a user interface requirement. The user should get some notification when the delivery report related to the probe has been received. It is an implementation matter to decide whether this is performed just by allocating a fixed originator O/R name to one of the queues of the system or by another way.

The contents of such reports should be decoded and presented in a 'human' readable and understandable format.

5.6.4. The AMHS System should provide association-tracing facilities to monitor in real time the establishment, interruption and finalization of associations related to adjacent MTAs.

5.7 Sizing requirements

The sizing of the AMHS System operational platform should support the traffic during peak hour situations with:

a) Average peak hour total CPU usage at 30% maximum.

b) Communication adapters loaded at a maximum 30% of their real bandwidth capacity (not the theoretical one) and excluding the redundancy needs.

Note. – The previous values have to be reconsidered by each ATSO depending on the expected lifetime of the AMHS System. As e.g., if the lifetime is expected to be 10 years and the traffic estimates for the peak hour relate to the end of the lifetime, the usage requirements for the CPU and the communication adapters should be greater than 30% (if not, the purchased system will be oversized during quite a number of years)

c) Processing time of a message (High QoS flow type class, see section 3.1) at least less than 1.5 seconds. The processing time is defined as the difference between the moment the latest character of the message enters into the AMHS System and the moment the first character of the message is sent out. This applies for all implemented in / out protocol combinations. For messages of other flow types, the processing time should be less than 3 seconds.

Note. – This value, especially for AMHS, has significant implications in the platform sizing and total network transit time. If the value is too low, a very powerful platform is required; If the value is too high, it could introduce a significant delay in the overall message transmission (specially if the other centres also have high values).

d) Response time to configuration / management on-line commands less than 3 seconds. This response time is related to request from a management position for actions which do not require a query / browsing of a log (e.g. close a PVC, create an Ax, etc).

e) At least sufficient disk space remaining available after:

1. all the standard and specific developed software versions (including the possibility of more than one software versions and two configurations per version) are present on disk,

2. all logs and archive folders corresponding to the number of days to be kept on-line in the system are present on disk.

Note.1 – The precise number of days will depend on the particular policy of each ATSO to comply with the ICAO Legal Requirements

If its policy indicates that all the data has to be kept on the AMHS System, the system should support at least 30 days. If the policy indicates that the data are saved for such purpose somewhere else (e.g. in another system, in an external media like CD-ROM, DAT, cartridge, etc), data concerning fewer days needs to be kept on-line (e.g. three days, one week, etc.).

Note.2 – As for the CPU and communication adapter usage, the value for disk Space shall be reconsidered by each ATSO depending on the expected lifetime of the AMHS System and the traffic estimates related to.

5.8 Availability and reliability requirements

5.8.1. The AMHS System should operate 24 hours per day and 365 days per year.

Note. – The values provided below should be considered as 'minimum' requirements. Each ATSO should reconsider them according to its own policy and internal SLAs with its internal users.

5.8.2. Interruptions for system maintenance and installation should be limited to the Strict minimum and should be less than 60 minutes.

5.8.3. After power is switched on, the AMHS System should be fully operational after a maximum of 15 minutes.

5.8.4. The AMHS System should auto monitor:

- the state of its application processes.
- the state of its system processes.
- the state of its system components (hardware).

5.8.5. The AMHS System should generate an SNMP MIB of the states monitored (see above).

5.8.6. The AMHS System should automatically try to recover from failure conditions in its application processes. If it is not possible to recover without impacting the service, the AMHS System should terminate all its application processes in an orderly manner and restart them afterwards automatically.

5.8.7. The AMHS System should allow an operator to:

a) Stop the AMHS application gracefully (with automatic restart).

b) Stop the AMHS application gracefully (with no automatic restart).

c) Force the AMHS application to stop (with no automatic restart).

d) Start the AMHS application with message recovery (messages that were in queue when the system was stopped are processed and forwarded).

e) Start the AMHS application without message recovery (messages that were in queue when the system was stopped are discarded).

5.8.8. The AMHS System should lose no message that has been acknowledged by it (according to the respective messaging protocol), unless an operator explicitly requests to drop the messages.

5.8.9. The AMHS System should lose no message because of its load.

5.8.10. In case of a switchover (cluster, master/standby) configuration, the following requirements apply:

a) After detection of failure of the primary system unit or after an operator command, the switchover process should last less than five minutes. The duration of the switchover is counted as the time from the failure detection (or operator command) until the time the AMHS restarts forwarding messages again (assuming there are messages in queue or there are new incoming messages).

b) The time needed for the standby unit to detect failure of the primary one should be less than three minutes.

c) The switchover process should be completely automatically without requiring any plugging / unplugging of any type of cables (communications, disks ...). A matrix switch action (if a matrix switch is proposed) is not considered as a cable plug / unplug.

5.8.11. Any period of time longer than one minute, during which the AMHS System does not perform message switching (in a total or partial manner) due to software or hardware problems, should be considered as an interruption of service.

5.8.12. An interruption of service of a AMHS System should be less than 10 minutes when the recovery is automatic. The duration of an interruption is calculated as the time from the moment the last received message was forwarded until the moment the AMHS System starts forwarding messages again (assuming there are messages in queue or there are new incoming messages).

5.8.13. There should be no more than one interruption of service without automatic recovery in a sliding window of six months.

5.8.14. There should be no more than one interruption of service with automatic recovery per day.

5.8.15. There should be no more than two interruptions of service with automatic recovery per month.

5.8.16. There should be no more than three interruptions of service with automatic recovery in a sliding window of three months.

5.8.17. The MTBF of the AMHS System hardware should be higher than 52 weeks.

6 Requirements for statistics

6.1.1 The AMHS System should monitor and produce statistics per direct MTA partner as follows, where the term "data messages" includes all X.400 P1 information objects, i.e. messages, probes and reports:

a) Number of data messages transmitted
b) Average size of the data messages transmitted
c) Maximum size of the data messages transmitted
d) Average number of destination addresses per message transmitted
e) Number of data messages received
f) Average size of the data messages received
g) Maximum size of the data messages received
h) Average transfer time
i) Number of delivery reports transmitted (a subset of item a)
j) Number of non-delivery reports transmitted (a subset of item a)
k) Number of delivery reports received (a subset of item e)
l) Number of non-delivery reports received (a subset of item e)
m) Minimum size of data messages received
n) Minimum size of data messages transmitted
o) Maximum, mean and minimum response time
p) Number of recipients processed
q) Number of messages deferred (the criterion for a deferred message should be specified by a configurable system parameter)
r) Number of messages redirected
s) Number of messages rejected
t) Number of loops detected

6.1.2 The AMHS System and its management tools should be enable to monitor and produce statistics per direct MTA partner, related to traffic volume and quality of service at an overall system level, as follows:

a) Overall traffic volume

b) Maximum outage duration of association between MTAs (if any)

c) Cumulated outage duration of association between MTAs (if any)

6.1.3 Additionally the AMHS System should produce the information specified in 6.1.1 and 6.1.2 for all partner MTAs as a total.

6.1.4 The AMHS System should be able to generate the above statistics in at least the following intervals: 1 day interval, 1 hour interval, 30 minutes interval or better.

6.1.5 The AMHS System should be flexible in configuring other intervals for application statistics generation.

6.1.6 The AMHS System should be flexible in generating statistics at a more detailed level, as e.g., MTA route entries, particular O/R attributes, individual O/R names (to be discussed).

Note. – Each ATSO may consider what requirements on statistics are put on the AMHS System in accordance with its requirements (national and international) and its policy for statistics production. e.g., there can be ATSOs which transfer the traffic logs to another system which will produce all required statistics; in such a case, the AMHS System may be *relieved of too many statistics requirements. If an ATSO does not have such other system, the AMHS System should produce all statistics needed*

The AMHS System should be able to export specific statistic files on a monthly basis. Such a statistic file should contain daily as well as peak hour statistical data in a standard format, covering certain items in 6.1.1 and 6.1.2, because of their specific international relevance.

7 Tests and validation of AMHS systems

7.1 Objective

Experience has shown that, although it is claimed that systems have been implemented according to the one set of protocol specifications, they are often not capable of inter-working. This is due to errors in implementation or to different interpretations of the specifications (SARPs). Testing and validation of systems according to the same set of principles, aims at the detection of such errors and the prevention of incompatibility instances.

The primary objective of this chapter is to formulate recommendations for testing the ability of a given AMHS implementation to function as required at the level of an International Communication Centre within the AFTN/ X.25/AMHS network environment.

This chapter provides general information on the AMHS testing concept. The actual testing methodologies, configurations and procedures are defined in Annex B, Annex C, Annex D, Annex E and Annex F. In these Annexes, tests are described in sufficient detail to give an appreciation of the variety of functions that are covered, the facilities required and the expected results.

7.2 General Principles

The creation of standards for testing is subject to consideration by a number of standardization bodies concerned with open systems (e.g. ISO, ITU-T).

In these standards, *conformance testing* is prescribed for testing a protocol implementation (IUT) with respect to its specification.

If conformance testing could be done in a complete and correct manner, then two different implementations that passed the conformance test would be interoperable. In practice, conformance testing does not necessarily reach the intended point of completeness and correctness. Consequently, conformance testing may be followed by *interoperability testing* to determine whether two or more implementations will produce the expected behaviour under actual operating conditions.

In a more detailed analysis of the objectives of conformance and interoperability testing the following distinctions can be made:

a) The primary objective of interoperability testing is to confirm the end-to-end interoperability of two systems, which have both been developed to a common specification. Performance and load testing are possible, at least in principle.

b) Conformance testing can be defined as the exhaustive testing of an IUT against the functions and procedures defined in an agreed standard. Performance and load testing are not usually part of conformance testing which is restricted to the "logic" of the protocol implementation.

Furthermore, two essential practical differences between conformance and interoperability testing should be pointed out:

a) Incorrect protocol behavior. – Conformance testing allows “provoking” of the IUT, through incorrect protocol behavior, in order to study its stability.

b) Interoperability testing provides only limited possibilities due to (normally) correct protocol implementations in real systems.

c) Distribution of test locations. – Conformance testing can be performed locally between IUT and a conformance testing equipment. Interoperability testing is normally distributed over at least two remote locations, therefore requiring more coordination effort.

Figure 5, below depicts the principal differences in test arrangements for interoperability and conformance testing.

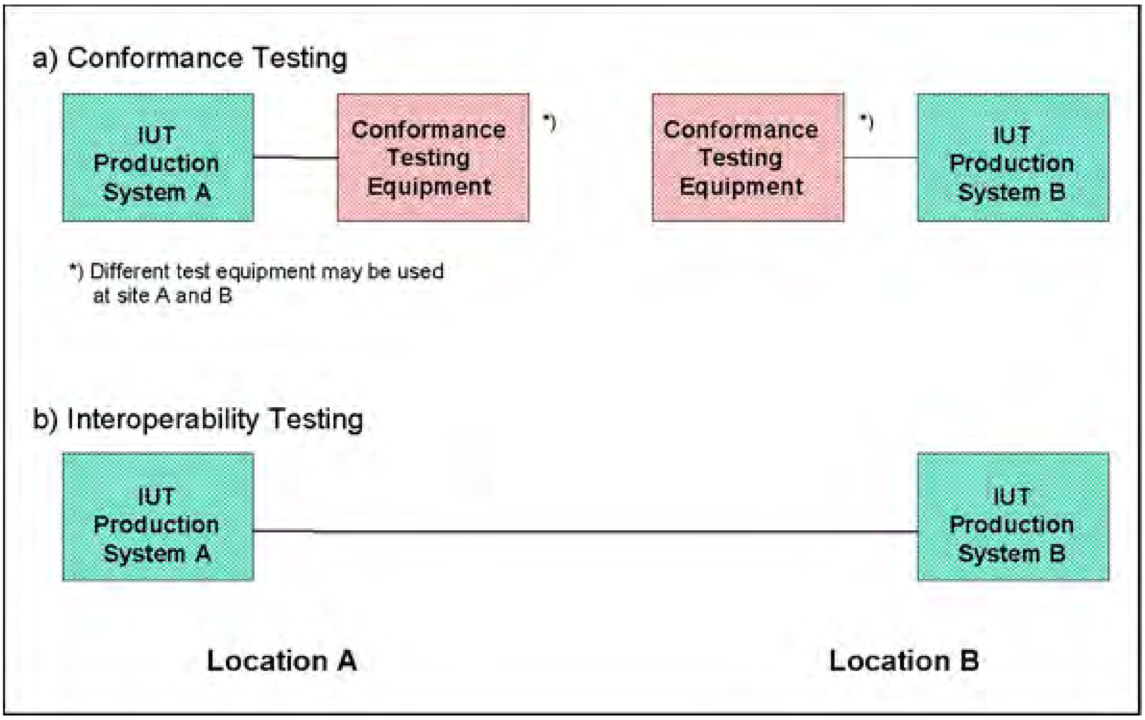


Figure 5: Principal test arrangements for conformance and interoperability testing

7.3 AMHS testing concept

7.3.1 Testing strategy

AMHS system implementations consist of protocol layers according to the principles of the Reference Model for Open Systems Interconnection. The AMHS functions to be tested reside in the application layer of the ISO/OSI reference model. The underlying layers provide supporting communication services, however they are not primarily subject to testing.

Figure 6 provides a generic functional presentation of an AMHS implementation under test.

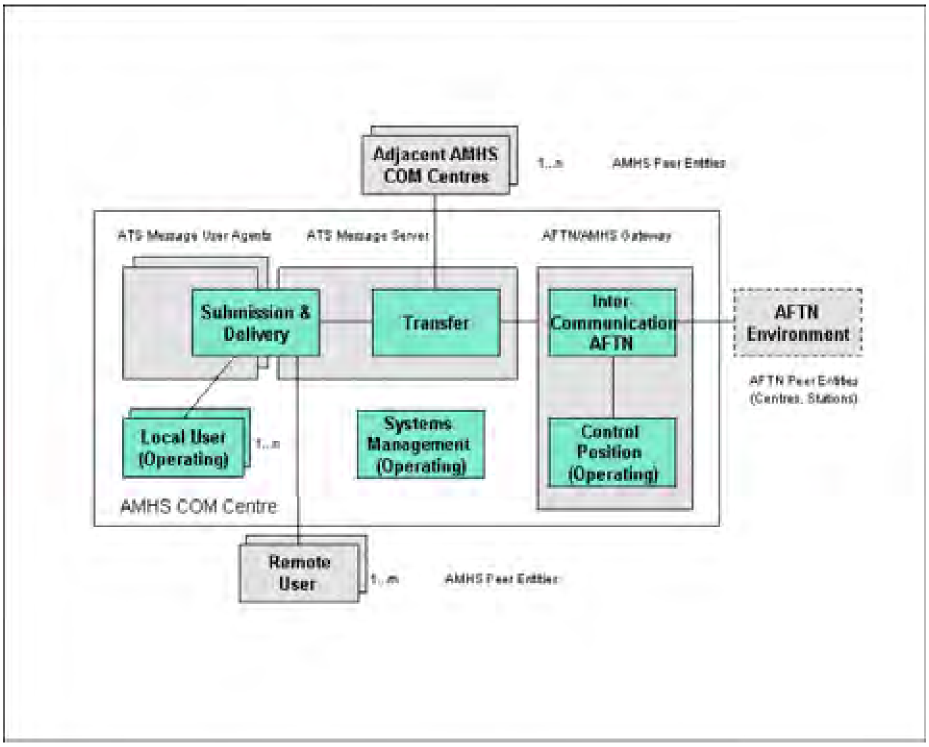


Figure 6: Functional view of an AMHS IUT

7.3.2 AMHS testing phases

7.3.2.1 AMHS Conformance testing

For the purposes of AMHS, *conformance testing* is considered mandatory and shall be performed in parallel with or after the acceptance testing of a new system.

The new system is tested as a *black box,* meaning that that required features are verified by observation of the external *behavior* of the IUT upon stimulation with well defined input events.

A *conformance testing equipment*, called the *AMHS test tool*, is used typically for the production of such input events and the monitoring of the resulting outputs from the IUT. In case such an AMHS test tool or reference implementation is *not* available, a test environment could be configured by using functional components of the IUT itself. Testing in such an environment may be seen as consistency testing rather than conformance testing.

The main AMHS functional areas covered by conformance testing are:

- Transfer of messages probes and reports
- Submission of messages and probes / delivery of messages and reports
- Intercommunication with AFTN
- Naming and addressing
- Parameters
- System management functions.

7.3.2.2 AMHS Interoperability testing

After successful completion of conformance testing, *interoperability testing* is recommended, particularly between AMHS implementations of different manufacturers.

As a first step to interoperability testing the interconnection between pairs of systems should be established and checked.

Then, at the bilateral level, the following functional areas should be covered:

- Submission, Transfer and Delivery Operations (AMHS to AMHS)
- Gateway operations (AFTN to AMHS)
- Gateway operations (AMHS to AFTN)
- Gateway operations (AFTN to AMHS to AFTN)
- Gateway operations – special case scenarios
- Stress traffic situations
- Submission/Transfer/Delivery and Relay operations
- Test of special situations

At the multilateral level, interoperability testing involves more than two organizations, interchanging normal and exception messages and generating specific reactions of their systems.

7.3.2.3 AMHS Pre-operational testing

Before going into operation, pre-operational testing should be carried out between the AMHS systems concerned, within the operational network environment and using duplicated operational traffic.

The configuration details and the actual sub-sets of traffic to be used, have to be co-ordinated between the test partners. In any case, the operational traffic selected for this purpose should be traffic under the responsibility of the Communication Centres under test.

The AMHS relation between the two systems is considered operational, if the exchange of the total of operational traffic between them (or a subset of that), is performed by means of AMHS only. For this operational traffic no other transmission means (AFTN or X.25) is used.

8 References

ICAO Documentation

[1] Aeronautical Telecommunications, Annex 10, Volume II and Volume III

[2] Manual of technical provisions for the Aeronautical Telecommunication Network (ATN), Doc9705, Sub-Volume III: ATS Message Handling Services (AMHS).

[3] Comprehensive ATN Manual (CAMAL), Doc 9739, Part III

[4] Location Indicators, Doc 7910

[5] Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services, Doc 8585

[6] Air Navigation Plan. Asia and Pacific Regions. Volume I, Basic ANP - Doc 9673

[7] Air Navigation Plan. Asia and Pacific Regions. Volume II, FASID - Doc 9673

[8] ASIA/PAC AMHS NAMING REGISTRATION FORM

General technical literature

[9] ISO/IEC 10021-2: Information Technology – Message Handling Systems (MHS): Overall architecture.

[10] ISO/IEC 10021-10 International Standard, Information technology – Message Handling Systems (MHS): MHS routing (1998)

ANNEX A

Guidelines to QOS (Quality of Service)

ANNEX A

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates – change of document version number	all

Table of Contents

1 Scope

The purpose of this section is to define quality of service (QoS) requirements and set target performance objectives for the ASIAPAC AMHS. To this end, the properties of the AMHS are considered from the outside of the network, i.e. at its boundary, without taking into account the way in which the service, as defined on its boundary, is provided from within the network.

The performance requirements dealt with in this section are the common understanding on what the applications will get in terms of performance and what level of performance the network has to provide. The performance parameters are therefore necessary for designing applications as well as the network itself.

Numerical values for performance parameters are defined using the following input:

- anticipated location of message servers and gateways;
- analysis of existing and projected message flows in the ASIAPAC area based on presently available information;
- general design principles;
- user expertise.

As in most cases, in order to arrive at concrete values for the performance parameters, a number of assumptions and restrictions are made:

- QoS is not dependent on traffic volumes;
- QoS is measured between originator-recipient pairs;
- QoS is not geographically dependent;
- QoS is not dependent on time;
- QoS represents worst case performance;
- the underlying network should be sized to accommodate QoS;
- degree of corruption is not relevant to the Corruption QoS parameter;
- corruption is not dependent on message size;
- non reachability due to network causes is typically of the order of a few minutes (60per year);
- the bit error rate of an HDLC link is of the order 10^{-11}.

In dimensioning the AMHS only complete messages should be considered for the Following reasons:

- the message is the basic unit of data at the user interface;
- whole messages are stored and forwarded by MTAs in the network;

- in formulating performance requirements, transport or sub-network performance is not taken into account.

Of course, in dimensioning the network, it will be necessary to consider performance aspects of lower level infrastructure as well, but as a result of the user requirements formulated in this document and their impact on MTA performance.

Further, it is important to note that the specification of performance requirements is based on individual messages, independently of all other messages.

When considering message size, only the volume of user information is relevant since the user has no control (or only very limited control) over the data overhead involved in message handling.

Formulating performance requirements of a given user, taking into account the simultaneous use of the network by other users, does not appear to be feasible. However, it has to be recognised that, in a real world situation, the performance of the network for a given message certainly does depend on the presence of other messages currently being processed. The performance requirements specified here represent minimum or worst-case performance under the load conditions (Traffic Volume Requirements).

Types of performance parameters

There are two distinct groups of performance parameters to be considered in connection with the AMHS. Parameters not dependent on message volumes: These parameters describe the quality of service (QoS), which is available to each individual message considered by itself, e.g. transit time. They can be measured, i.e. they are the quantitative results of the way in which messages are handled by the network.

Message volumes: These parameters describe the volumes of messages, message sizes and their distribution geographically, as they could be generated by users of the network. The parameters could be measured in the user end systems but it is not realistic to measure them in the network.

QoS per individual message

QoS requirements have to be satisfied under worst possible/allowable traffic volumes and most unfavourable originator/recipient pairs within a specific network configuration. Consequently, QoS is formulated for each individual message, independently of other messages being handled by the network.

This choice has been made for the following reasons:

- it is difficult to imagine that users would accept a QoS which is dependent on the demands which other users place on the network at the same time;
- the network has to be dimensioned to handle the maximum message volumes, while performing sufficiently well;
- the QoS requirements represent "worst case" performance when maximum degradation through interaction with other traffic occurs.

It must be pointed out, that AMHS provides the facilities to send messages many orders of magnitude greater than AFTN, with attachments measured in Mb. Clearly transfer times for such messages will be considerably longer than for the short text messages exchanged in AFTN. It is, thus, necessary to qualify the statement that QoS is independent of message size by adding ‘for messages containing similar information to that carried over the AFTN’. If a quantitative limit is required, this will be between 4Kb and 6Kb, being the equivalent size of an AFTN message including the AMHS header.

Independence of QoS on location and time

QoS for an originator/recipient pair is most likely dependent on the relative locations of the two end systems, i.e. whether messages are transmitted with more or less hops through MHS systems (MTAs etc.). However, for simplicity reasons and since QoS requirements are “worst case” requirements, they are stated independently of the location of a message server.

Furthermore, QoS requirements remain constant at all times and are not dependent on date and time of day.

The AMHS performance requirements for the AFTN/AMHS Gateways, could, by agreement, be deemed to apply to interfaces between AMHS functions and AFTN functions in Gateways, e.g. a boundary point consisting of an interface between an internal Message Store and an AFTN handler within a Gateway.

Dependence of QoS on the AMHS service used

It may be necessary to specify different QoS levels for the AMHS corresponding to different sets of services used, i.e. there may be different classes of messages with respect to QoS. The number of QoS levels should be kept small for simplicity and the way in which service parameters map a message to a QoS level must be simple.

The values of QoS provided by the AMHS are useful to the application designer in deciding which services to use and how they are used. For example, the degree of certainty that a message will reach its destination will determine whether AMHS acknowledgement services are used and in what way. Furthermore, the values of QoS are useful in designing higher-level protocols.

2 Specification of performance requirements

The specification and meaningful application of performance requirements is not a simple task. This sub-section outlines some of the difficulties involved and principles to be adopted.

Statistical significance

The way in which performance parameters are formulated is necessarily statistical in nature. This is due to the large number of factors, which affect the performance of the network, such as:

- the current network configuration;
- the current overall load of the network, i.e. the behaviour of all users considered as a whole; and
- the dynamic properties of network nodes and transmission systems.

The need for measurement

For the specification and application of performance requirements to be meaningful, there has to be a framework for measuring performance with respect to the performance parameters. Aspects of a measurement framework which have to be considered are:

- because of the non-deterministic nature of network performance, measurements need to involve large samples of messages, as described in the previous section;
- measurements must be made at different locations simultaneously;
- consistent decisions have to be made as to where measurements are performed, e.g. at service interfaces in MTAs, UAs etc.

Network aspects relevant to performance

The following list contains factors which can affect message handling performance:

- processing speed, limits the capacity due to the store and forward nature of message handling;
- the finite transmission capacity (line speed) of links between nodes, limits the network throughput;
- the transmission times across links, affects the message transit time since complete messages are stored and forwarded a number of times between originator and recipient;
- the efficiency of message queues;
- transmission line failures and errors are obvious sources of degraded performance;
- table configuration errors can have major negative effects on network performance;
- software failures, which are difficult to treat quantitatively.

In designing the network, the performance requirements (amongst other things) have to be translated into properties of individual network components such that overall requirements are satisfied. Of course other considerations such as policy, expandability, ease of maintenance etc. enter into the network design as well.

AMHS Quality of Service Requirements

For reasons of completeness, simplicity and relevance, a minimal set of parameters was selected out of the large range of possibilities for expressing performance properties, to form a suitable "frame of reference" for discussing the dynamic properties of the AISAPAC AMHS:

These parameters defined and described in the following sub-sections in more detail, are:

- Destination Non-Reachability;
- Maximum Transit Time;
- Message Corruption**.**

The selection of these three parameters has been made for the sake of:

- Completeness: all relevant performance aspects of AMHS are covered;
- Simplicity: the formulation of requirements is intentionally kept simple; and
- Relevance: no aspects are included which are not considered to be relevant.

If the performance of the AMHS is such that these parameters are exceeded, then the service is deemed to be of poor quality.

Destination Non-Reachability

Destination Non-Reachability is expressed with respect to pairs of addresses (originator / recipient). It is the probability that a message sent by the originator will not reach the recipient within the Maximum Transit Delay (as defined below).

The above definition shows that the parameters Destination Non-Reachability and maximum Transit Time (see below) are not independent of each other: their definitions are coupled. This is intentional. The philosophy behind this definition is that the value of a message to a person or an application receiving it is dependent on its timely receipt. It is assumed, for a given flow type, that all messages belonging to it have the same value of this parameter.

The definition of Destination Non-Reachability is independent of whether the long (or infinite) transit time for a message is reported to its originator or not. It is also independent of whether acknowledgement procedures within the AMHS or on an application level detect the long (or infinite) transit time or not.

Destination Non-Reachability includes the cases in which messages are "lost", i.e. do not reach their destination in finite time. The probability of message loss must be negligible and this probability is included in the total probability of Destination Non-Reachability. However, there remains a need (for procurement purposes) to place a separate figure on this probability.

In keeping with the above rationale, it is required that the probability of message loss is, at most, one tenth of the probability of Destination Non-Reachability.

Maximum Transit Delay

The Maximum Transit Delay is the time within which a single message has to be transmitted through the network end-to-end so that its transmission is of value to the applications (users).

If this time is exceeded, the receipt of the message is, in principle, of no value to the application. If the non-receipt within this time is known to the application, then, presumably, error procedures, such as message retransmission, will be initiated.

The transit delay is the time taken by the network to make the message available to the Message Store associated with the message recipient (UA). Therefore the boundary points of the network may, in this context, be considered to be the MTAs connected to the UAs serving the originators/recipients. The boundary points can also be the MTA functionality within AFTN/AMHS Gateways.

It must be borne in mind, that the parameters Maximum Transit Delay and destination Non-Reachability only have significance when they are taken together.

Message Corruption

The third Quality of Service Parameter concerns message integrity and is called "Message Corruption". It is the probability that each 1,000 octet content block of a message which arrives at its destination, has been corrupted in any way. The definition of Message Corruption applies only to messages which reach their recipients within the Maximum Transit Delay.

"Corruption" means a deviation, end-to-end, of the content of the received message from the content of the original message. The "content" is also deemed to include parameters, such as originator address, which are delivered together with the message. Corruption can also result from unauthorised changes to a message.

Since the volume unit for defining Message Corruption is large (1,000 octets), the requirement is almost independent of the size of (current) messages. This simplification is based on the assumption that corruption is due to unforeseen system malfunctioning, e.g. faulty software.

The corruption of messages due to such causes is not likely to be dependent on the size of messages. (This is true today, but the upcoming use of ADEXP messages-with message lengths up to 10koctets-has to be mentioned, as well as the potential forthcoming applications interchanging messages with binary body parts).

The probability of corruption due to other parameters such as system load, queue sizes, transmission errors etc. is almost negligible.

It is estimated, that the volume dependent non-detected bit error probability for a 1000 octet message traversing the AMHS and involving 5 links and 5 different systems (MTAs, UAs, MSs) is of the order of one bit in 10^5 or less. This justifies the (almost) volume-independent character of the Message Corruption parameter.

QoS Flow Type Classes

Different types of information exchange, called Flow Types here, place different QoS requirements on the AMHS.

In principle, each Flow Type might need to be associated with its own specific values of the three QoS parameters. However, taking into account the large number of possible Flow Types, this would result in a very complex analysis. A suitable approach to reducing this complexity is the introduction of “QoS Flow Type Classes” as follows:

Define a number of "QoS Flow Type Classes" and associate a set of fixed values of the three QoS parameters with each class. Depending on the properties and needs of applications using specific Flow Types, assign these to the QoS Flow Type Classes.

When engineering the network, message traffic volumes of each class need to be taken into account rather than individual Message Flow Types.

Three QoS Flow Type Classes

The approach outlined above is simple and practical provided the number of classes is small. In addition, there is a requirement that the QoS Flow Type Class to which a message belongs, can be coded in some way in the message itself. This requirement comes from the fact that all AMHS components, e.g. MTAs, must be able, at least in principle, to adapt their processing to the QoS Flow Type Class. The means for this coding must come from standard MHS protocol elements, since development specific to AMHS has to be avoided and the possibility of using third-party-service must be kept open. This rules out, for example, the representation of QoS Flow Type Classes by specific User Parts.

The use of the MHS message priority parameter with three values, "urgent", "normal" and "non urgent", belonging to the P1 protocol handled by MTAs, is currently also not suitable for this purpose. The association of values to messages originating from and destined for the AFTN is fixed by SARPs, since such messages traverse an AFTN/AMHS Gateway. This means that values of the MHS priority parameter cannot be freely assigned to message types which are currently handled by the AFTN.

There is no short-term solution to this problem. However, in the long-term, when the majority of messages handled by the AMHS are originated by and destined for native users, the priority parameter may become available for this purpose, keeping in mind, nevertheless, that various practical issues may need to be resolved. In keeping with the three possible values of the MHS message priority parameter, three corresponding QoS Flow Type Classes are defined:

(a) The "High QoS" Flow Type Class
Properties of this QoS Flow Type Class are:

- message transmissions are part of procedures, i.e. the sending and receipt of messages necessarily lead to actions or processing. Without receipt of the message, these actions or processing would not take place, or

- any corrupt information in messages could have serious consequences. This possibility has to be negligible.

(b) The "Medium QoS" Flow Type Class

This class has similar properties to the High QoS Flow Type Class, however the maximum Transit Time requirement can be somewhat less stringent. This distinction is important, because it can be expected that the Maximum Transit Time requirement will have a sensitive effect on network dimensioning.

Properties of this QoS Flow Type Class are:

- message transmissions tend to be of the nature of "information distribution" or "broadcast", possibly based on distribution lists rather than being parts of operational procedures. They are normally not acknowledged. Transit time and reachability constraints are not critical. In the case of non-delivery of messages, this may be noticed by users, in which case backup activities could be initiated; or

- message corruption could have serious consequences and needs to be as low as for the previous class.

(c) The "Low QoS" Flow Type Class

This class has similar properties to the Medium QoS Flow Type Class, however the Destination Non-Reachability and Message Corruption requirements can be somewhat less stringent. This is due to a certain amount of redundancy in the message contents and/or the regular updating and transmission of messages with similar content.

3 Numerical requirements

Guidelines for system requirements.

	High QoS Flow Type Class	Medium QoS Flow Type Class	Low QoS Flow Type Class
Destination Non-Reachability (probability)	$< 10^{-4}$	$< 10^{-4}$	$< 10^{-3}$
Maximum Transit Delay	< 10 seconds	< 5 minutes	< 5 minutes
Message Corruption (probability)	$< 10^{-6}$	$< 10^{-6}$	$< 10^{-5}$

Table 1: Numerical values of SPACE QoS performance requirements

It must be noted that the above numerical values:

- could be adopted as possible quantitative and qualitative characteristics for setting up the ASIAPAC AMHS network;
- will be reviewed on the basis of compiled AMHS operational experience.

4 Application of performance requirements

The QoS parameters are obviously of importance to the network operators, users and application designers.

The QoS requirements along with the volume requirements for each of the Flow Type Classes at the boundary of the network (servers and gateways) are used, in conjunction with a set of well defined design principles (see 3.3 AMHS topology), in order to:

- determine the local performance of servers and gateways, thus dimensioning their configuration,
- determine the throughput of MTAs and capacity of links,
- draft possible network configurations and select the "optimum" network design, and measure actual network performance.

5 Measurement

The specification of numerical values for Performance Requirements is meaningless unless provision is foreseen for measurement of network performance. Such measurement is needed:

- when implementing and enforcing Service Level Agreements between AMHS service providers and users;
- for acceptance testing of network components;
- to determine network capacity;
- to gain experience in network operation (e.g. testing of various routing strategies, etc.).
- to manage the network efficiently.

Technically, network performance measurement involves, among other things:

- generation of large message/data volumes;
- automation of measurement;
- time-stamping of messages;
- use of statistical analysis.

-End-

ANNEX B

AMHS Conformance and Compatibility Test

ANNEX B

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates and inclusion of new sections	all 1.2, 1.3, 3.1, 4.4 – CT422, CT424 3,2, 4.6, 4.7

Table of Contents

1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional tests for an AMHS Conformance Test, which allows checking an AMHS implementation against the AMHS SARPs as a first step to ensure the interoperability between compliant systems.

1.2 Document Structure

Chapter 2 presents the test environment used for AMHS conformance testing.

Chapter 3 defines the addressing plan implemented in the test environment.

Chapter 4 contains the test procedures with subsections for each AMHS functional area.

Each test procedure is presented in a structured way consisting of

- defined test criteria
- a (brief) scenario description
- reference to the relevant part of the standard specification (SARPS section),
- reference to test classes (N, E_n)

1.3 Test Identification Scheme

Each test procedure has an identifier in the form

CT*xnn*

where CT is an acronym for Conformance Test, *x* is a number identifying the test group[2] and *nn* is a consecutive number identifying the individual test procedure.

Test procedures are presented in six groups:

- test of submission operations (x=1)
- test of delivery operations (x=2)
- test of transfer operations (x=3)
- test of gateway operations converting a user message from AMHS to AFTN (x=4)
- test of gateway operations converting a user message from AFTN to AMHS (x=5)
- tests with special focus on naming and addressing, e.g. address translations between AMHS and AFTN domains (x=6)

[2] Test groups for AMHS conformance tests are identified in Annex D.

2 AMHS Conformance Test Environment

The AMHS Implementation Under Test (IUT) is embedded in a simulated operational environment formed by the AMHS test tool with three MTA instances (representing three adjacent ATS Message Servers or three neighbour PRMDs) and one AFTN/X.25 source/sink (representing an adjacent AFTN/X.25 environment).

The IUT has an AMHS user agent (UA) attached, which is used in submission and delivery tests. Gateway tests involve either the AFTN/X.25 test application or the AFTN user terminal. It is also possible to make use of the IUT's associated Monitor & Control Position – if available - to observe outcomes of the conversion process, especially in error situations.

The AMHS test tool implements three MTA test applications (MTA-1, -2 and -3) to send and receive AMHS messages (IPM, IPN), reports and probes to and from three directions. The test tool generates AMHS data at the X.400/P1 level. It uses the AFTN/X.25 test application or the AFTN user terminal to send and receive AFTN user messages and AFTN service messages.

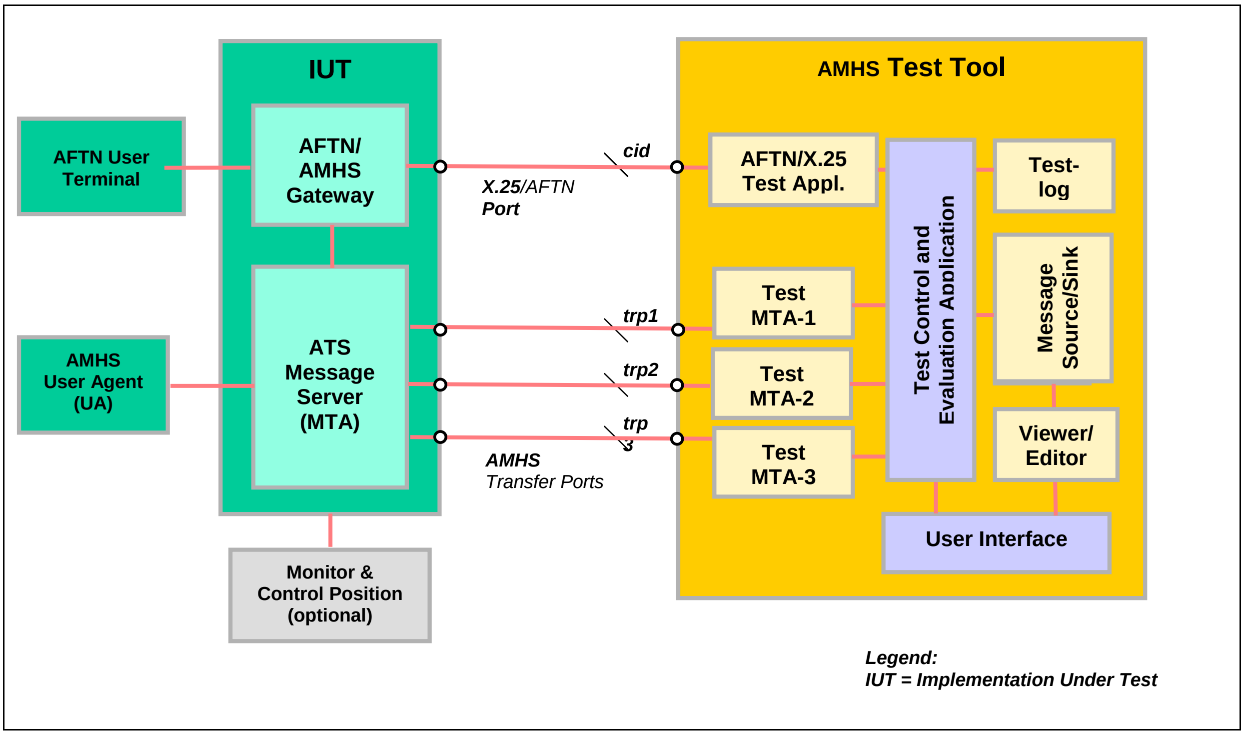


Figure 1: AMHS Conformance Test Environment

Figure 1 shows the test environment used for AMHS conformance tests (setup for the tests CT*xxx* in Part 3, where *xxx* refers to the test case number) and the components of the AMHS Test Tool. The AMHS Test Tool will be interconnected with the IUT's (standardized) external interfaces, i.e.

- three AMHS transfer ports (trp1, trp2, trp3) supporting the X.400/P1 protocol over a TCP/IP/LAN[3], and
- a AFTN/X.25 port (cid).

[3] Optionally, an ATN stack can be supported instead of the TCP/IP interface to support the AMHS X.400/P1 protocol.

All test applications can be controlled independently via user interface through the Test Control and Evaluation Application. The Test Control and Evaluation Application:

- maintains test samples in a repository (message source)
- executes test scripts,
- verifies the received messages (message sink),
- evaluates each performed test step,
- stores every test step result in a test log, and
- keeps record of all sent and received messages during a test run.

Test scenarios involve the test components as depicted in Figure 1 in the following way:

Submission operation tests:

AMHS User Agent	=>	IUT (ATS Message Server)	=>	MTA-1

Transfer operation tests:

MTA-1	=>	IUT (ATS Message Server)	=>	MTA-2 (and for distribution tests also MTA-3)

Delivery operation tests:

MTA-1	=>	IUT (ATS Message Server)	=>	AMHS User Agent

AMHS to AFTN gateway tests:

MTA-1	=>	IUT (ATS Message Server and Gateway)	=>	AFTN/X.25 Test Application or AFTN User Terminal

AFTN to AMHS gateway tests:

AFTN/X.25 Test Application or AFTN User Terminal	=>	IUT (Gateway and ATS Message Server)	=>	MTA-1

3 Addressing Plan for AMHS Conformance Testing

To meet the scope of testing, the test-address space used by AMHS Conformance Testing should include AMHS addresses placed in different AMHS PRMDs (Private Management Domain) and AFTN addresses located in different countries.

As a minimum, there is a need of three generic PRMDs and three generic AFTN countries which may be called: AMHSLAND-1, AMHSLAND-2, AMHSLAND-3, AFTNLAND-1, AFTNLAND-2 and AFTNLAND-3. If required, an extension of the address space should follow the same principles.

This allows covering of all cases of selected addressing schemes, including:

- CAAS (Common AMHS Addressing Scheme) with one single organisation-name value for all location indicators within the PRMD

- CAAS with multiple organisation-name values for different sets of location indicators within the PRMD
- XF (Translated-Form Addressing).

The Nationality Letters AA, AB, AC, BA, BB and BC have been reserved for the purpose of AMHS testing. The PRMD names and addressing schemes used for AMHS Conformance testing are indicated in Table 1:

Nationality Letter	C	ADMD	PRMD	Addressing Scheme
AA	XX	ICAO	AMHSLAND-1	CAAS
AB	XX	ICAO	AMHSLAND-2	CAAS
AC	XX	ICAO	AMHSLAND-3	XF
BA	XX	ICAO	AFTNLAND-1	CAAS
BB	XX	ICAO	AFTNLAND-2	CAAS
BC	XX	ICAO	AFTNLAND-3	XF

Table 1: PRMD names and addressing schemes

The user addresses of AMHSLAND-1 (Addressing scheme: CAAS – single "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1**

O=**AA-REGION** *OU1*=**AAAA** → *CN*=**AAAAMHAA** till **AAAAMHAZ** and *CN*=**AAAAMHBA** till **AAAAMHBZ**

The user addresses of AMHSLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-2**

O=**AB-REGION1**	*OU1*=**ABAA**	→ *CN*=**ABAAMHAA** till **ABAAMHAZ**
O=**AB-REGION1**	*OU1*=**ABAB**	→ *CN*=**ABABMHAA** till **ABABMHAZ**
O=**AB-REGION2**	*OU1*=**ABBA**	→ *CN*=**ABBAMHAA** till **ABBAMHAZ**
O=**AB-REGION2**	*OU1*=**ABBB**	→ *CN*=**ABBBMHAA** till **ABBBMHAZ**
O=**AB-REGION3**	*OU1*=**ABCA**	→ *CN*=**ABCAMHAA** till **ABCAMHAZ**
O=**AB-REGION3**	*OU1*=**ABCB**	→ *CN*=**ABCBMHAA** till **ABCBMHAZ**

Table 2: AMHSLAND-2

The user addresses of AMHSLAND-3 (Addressing scheme: XF)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-3**

O=**AFTN** *OU1*=**ACCCMHAA** till **ACCCMHAZ** and
OU1=**ACCCMHBA** till **ACCCMHBZ**

The user addresses of AFTNLAND-1 (Addressing scheme: CAAS – single "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1**

O=**BA-REGION** *OU1*=**BAAA** → *CN*=**BAAAFTAA** till **BAAAFTZZ**

The user addresses of AFTNLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2**

O=**BB-REGION1**	*OU1*=**BBAA**	→ *CN*=**BBAAFTAA** till **BBAAFTAZ**
O=**BB-REGION1**	*OU1*=**BBAB**	→ *CN*=**BBABFTAA** till **BBABFTAZ**
O=**BB-REGION2**	*OU1*=**BBBA**	→ *CN*=**BBBAFTAA** till **BBBAFTAZ**
O=**BB-REGION2**	*OU1*=**BBBB**	→ *CN*=**BBBBFTAA** till **BBBBFTAZ**
O=**BB-REGION3**	*OU1*=**BBCA**	→ *CN*=**BBCAFTAA** till **BBCAFTAZ**
O=**BB-REGION3**	*OU1*=**BBCB**	→ *CN*=**BBCBFTAA** till **BBCBFTAZ**

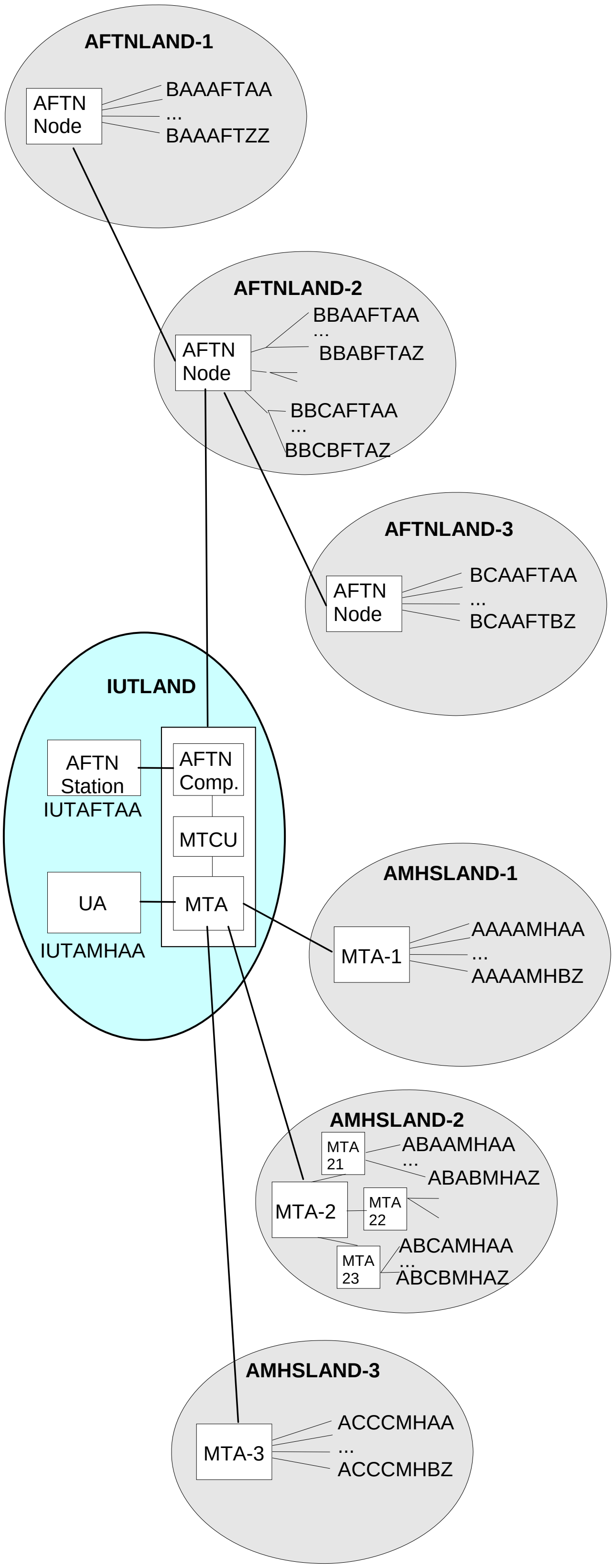
Table 3: AFTNLAND-2

The user addresses of AFTNLAND-3 (Addressing scheme: XF)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3**

O=**AFTN** *OU1*=**BCAAFTAA** till **BCAAFTAZ** and
OU1=**BCAAFTBA** till **BCAAFTBZ**

[The portion left empty]



AFTNLAND-1 (Addressing scheme: CAAS)

```
   C  = XX
ADMD  = ICAO
PRMD  = AFTNLAND-1

e.g.   O  = BA-REGION
     OU1  = BAAA
      CN  = BAAAFTAA
```

AFTNLAND-2 (Addressing scheme: CAAS)

```
   C  = XX
ADMD  = ICAO
PRMD  = AFTNLAND-2

e.g.   O  = BB-REGION3
     OU1  = BBCB
      CN  = BBCBFTAA
```

AFTNLAND-3 (Addressing scheme: XF)

```
   C  = XX
ADMD  = ICAO
PRMD  = AFTNLAND-3

e.g.   O  = AFTN
     OU1  = BCAAFTBZ
```

AMHSLAND-1 (Addressing scheme: CAAS)

```
   C  = XX
ADMD  = ICAO
PRMD  = AMHSLAND-1

e.g.   O  = AA-REGION
     OU1  = AAAA
      CN  = AAAAMHAA
```

AMHSLAND-2 (Addressing scheme: CAAS)

```
   C  = XX
ADMD  = ICAO
PRMD  = AMHSLAND-2

e.g.   O  = AB-REGION3
     OU1  = ABCA
      CN  = ABCAMHAA
```

AMHSLAND-3 (Addressing scheme: XF)

```
   C  = XX
ADMD  = ICAO
PRMD  = AMHSLAND-3

e.g.   O  = AFTN
     OU1  = ACCCMHBZ
```

Figure 2: Addressing Plan

For the IUT itself as test addresses could be used alternatively:

The original, operational AMHS and AFTN addresses assigned to the COM Centre or a generic address space taken from the fictitious PRMD/AFTN country IUTLAND including the generic user addresses IUTAFTAA and IUTAMHAA (or a more comprehensive set of addresses in case of CAAS with multiple "O" values) which may be mapped either onto the CAAS (preferred) or XF addressing scheme. The following table shows the generic address space assigned to the IUT.

CAAS (preferred) – single "O"	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT-REGION** *OU1*=**IUTA** *CN*=**IUTAFTAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT-REGION** *OU1*=**IUTA** *CN*=**IUTAMHAA**
CAAS (preferred) – multiple "O"	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT-REGION1** *OU1*=**IUTA** *CN*=**IUTAFTAA ...** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT-REGION1** *OU1*=**IUTA** *CN*=**IUTAMHAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT REGION2** *OU1*=**IUTB** *CN*=**IUTBFTAA ...** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT REGION2** *OU1*=**IUTB** *CN*=**IUTBMHAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT-REGION3** *OU1*=**IUTC** *CN*=**IUTCFTAA ...** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT-REGION3** *OU1*=**IUTC** *CN*=**IUTCMHAA**
XF	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**AFTN** *OU1*=**IUTAFTAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**AFTN** *OU1*=**IUTAMHAA**

Table 4: Generic address spaces of the IUT

3.1 "Unknown" addresses used for "negative testing"

Some conformance tests use addresses, which are "unknown" for the IUT and provoke specific reaction, e.g. return of a NDR. Several cases must be distinguished:

a) The AMHS component (MTA) of the IUT is not able to route the message, neither to an AMHS domain, nor to the AMHS/AFTN gateway (MTCU). For example, this occurs, when the global domain identifier does not match any X.400 routing entry (Table 5).

b) The AMHS/AFTN gateway component (MTCU) of the IUT is not able to translate the originator or recipient address from AMHS to AFTN (Table 6).

c) The AFTN/AMHS gateway component (MTCU) of the IUT is not able to translate the originator or destination address from AFTN to AMHS (Table 7).

d) The AFTN component of the IUT is not able to route an AFTN message.

Note that AFTN routing is not subject of AMHS conformance tests, and therefore no requirement exists for "unknown" AFTN addresses that do not match a routing indicator in the AFTN routing table.

The following “unknown” addresses may be used in the conformance tests:

“Unknown” AMHS addresses used to test MTA routing
C=**XX** *ADMD*=**ICAO** *PRMD*=**UNKNOWN** *O*=**AA-REGION** *OU1*=**AAAA** *CN*=**AAAAMHAA** ... *CN*=**AAAAMHBZ**
C=**XX** *ADMD*=**ICAO** *PRMD*=**UNKNOWN** *O*=**AB-REGION1** *OU1*=**ABAA** *CN*=**ABAAMHAA** ... *CN*=**ABAAMHBZ**
C=**XX** *ADMD*=**ICAO** *PRMD*=**UNKNOWN** *O*=**AFTN** *OU1*=**ACCCMHAA** ... *OU1*=**ACCCMHBZ**

Table 5: “Unknown” address space for MTA routing tests

“Unknown” AMHS addresses used to test MTCU mappings from AMHS to AFTN
C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BAAA** *CN*=**BAAAFTABC** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BAAA** *CN*=**BAAAFT** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BAAA** *CN=* *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1=* *CN*=**BAAAFTAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BAAX** *CN*=**BAAAFTAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O=* *OU1*=**BAAA** *CN*=**BAAAFTAA**
C=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION** *OU1*=**AAAA** *CN*=**AAAAMHABC** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION** *OU1*=**AAAA** *CN*=**AAAAMH** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION** *OU1*=**AAAA** *CN=* *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION** *OU1=* *CN*=**AAAAMHAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION** *OU1*=**AAAX** *CN*=**AAAAMHAA** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O=* *OU1*=**AAAA** *CN*=**AAAAMHAA**

"Unknown" AMHS addresses used to test MTCU mappings from AMHS to AFTN
C=XX ADMD=ICAO PRMD=AFTNLAND-1 O=BA-REGION OU1=BAAAFTAA
C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=AFTN OU1=BCAAFTABC C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=AFTN OU1=BCAAFT C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=AFTN OU1= C=XX ADMD=ICAO PRMD=AFTNLAND-3 O= OU1=BCAAFTAA C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=ATFM OU1=BCAAFTAA
C=XX ADMD=ICAO PRMD=AMHSLAND-1 O=UNKNOWN OU1=AAAAMHAA
C=XX ADMD=ICAO PRMD=AMHSLAND-3 O=AFTN OU1=ACCCMHABC C=XX ADMD=ICAO PRMD=AMHSLAND-3 O=AFTN OU1=ACCCMH C=XX ADMD=ICAO PRMD=AMHSLAND-3 O=AFTN OU1= C=XX ADMD=ICAO PRMD=AMHSLAND-3 O= OU1=ACCCMHAA C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=UNKNOWN OU1=ACCCMHAA

Remark: This table contains example of "unknown" O/R addresses which cannot be converted into AF-addresses.

Table 6: "Unknown" AMHS addresses for MTCU mapping tests

"Unknown" AFTN addresses used to test MTCU mappings from AFTN to AMHS
AAXXXXXX, AAAXXXXX, AAABXXXX, ABXXXXXX, ABAXXXXX, ABBXXXXX, ABCXXXXX, ABACXXXX, ABABXXXX ACXXXXXX, ACCXXXXX, ACAAXXXX, ACBAXXXX BAXXXXXX, BBXXXXXX, BCXXXXXX

Remark: These addresses match a routing indicator in the AFTN routing table, but not any entry of the MD Look-up Table (Table 8).

Table 7: "Unknown" AFTN addresses for MTCU mapping tests

AFTN/AMHS gateway settings

To fulfil the requirements of the “unknown” addresses following setting of the MD Lookup/CAAS Tables of the AFTN/AMHS gateway (IUT) is requested:

Nationality Letter, Location Indicator	Mapped to	Used addressing scheme
AAAA	C=XX ADMD=ICAO PRMD=AMHSLAND-1	CAAS
ABAA	C=XX ADMD=ICAO PRMD=AMHSLAND-2	CAAS
ABBA	C=XX ADMD=ICAO PRMD=AMHSLAND-2	CAAS
ABCA	C=XX ADMD=ICAO PRMD=AMHSLAND-2	CAAS
ACCC	C=XX ADMD=ICAO PRMD=AMHSLAND-3	XF
BAAA	C=XX ADMD=ICAO PRMD=AFTNLAND-1	CAAS
BBAA	C=XX ADMD=ICAO PRMD=AFTNLAND-2	CAAS
BBBA	C=XX ADMD=ICAO PRMD=AFTNLAND-2	CAAS
BBCA	C=XX ADMD=ICAO PRMD=AFTNLAND-2	CAAS
BCAA	C=XX ADMD=ICAO PRMD=AFTNLAND-3	XF
IUTA	C=XX ADMD=ICAO PRMD=IUTLAND	CAAS

Table 8: MD Lookup Table of the AFTN/AMHS gateway

country-name	ADMD-name	PRMD-name	organization-name	organizational-unit-name
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=AA-REGION	OU1=AAAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-2	O=AB-REGION1	OU1=ABAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-2	O=AB-REGION2	OU1=ABBA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-2	O=AB-REGION3	OU1=ABCA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION1	OU1=BBAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION2	OU1=BBBA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION3	OU1=BBCA
C=XX	ADMD=ICAO	PRMD=IUTLAND	O=IUT-REGION	OU1=IUTA

Table 9: CAAS Table settings of the AFTN/AMHS gateway

3.2 AMHS O/R address used for asymmetric re-conversion tests

Within the AMHS/AFTN address conversion tests for the following AMHS addresses are used to demonstrate the robustness of the address conversion of the IUT introduced by the PDR M7100001[4]. The AFTN addresses will be extracted from the original O/R (Originator/Recipient) address, but the re-conversions do not result in the same AMHS addresses. These AMHS addresses, the AFTN addresses resulting from conversion and the re-converted AMHS addresses are listed in the following table:

	Used AMHS Address	Converted AFTN Address	Re-converted AMHS Address
(1)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BBAA** *CN*=**BBAAFTAA**	BBAAFTAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**BB-REGION1** *OU1*=**BBAA** *CN*=**BBAAFTAA**
(2)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**AFTN** *OU1*=**BCAAFTAA**	BBAAFTAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3** *O*=**AFTN** *OU1*=**BCAAFTAA**
(3)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3** *O*=**AFTN** *OU1*=**BCAA** *CN*=**BCAAFTAA**	BCAAFTAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3** *O*=**AFTN** *OU1*=**BCAAFTAA**
(4)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**AFTN** *OU1*=**BAAAFTAA**	BAAAFTAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BAAA** *CN*=**BAAAFTAA**
(5)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION** *OU1*=**ABAA** *CN*=**ABAAMHAA**	ABAAMHAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-2** *O*=**AB-REGION1** *OU1*=**ABAA** *CN*=**ABAAMHAA**
(6)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AFTN** *OU1*=**ACCCMHAA**	ACCCMHAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-3** *O*=**AFTN** *OU1*=**ACCCMHAA**
(7)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-3** *O*=**AFTN** *OU1*=**ACCC** *CN*=**ACCCMHAA**	ACCCMHAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-3** *O*=**AFTN** *OU1*=**ACCCMHAA**
(8)	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AFTN** *OU1*=**AAAAMHAA**	AAAAMHAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION** *OU1*=**AAAA** *CN*=**AAAAMHAA**

Table 10: AMHS addresses used for asymmetric re-conversion tests

[4] To reduce message rejections due to non-symmetrical address conversion, it is necessary to:
a) detect such situations by checking the result of backward conversion of the address and report the error situations,
b) convert the message to AFTN and transfer it, despite the detected non-symmetry.

4 Test Procedures

4.1 Submission Operations

CT101 - Forward a submitted IPM

CT101	**Forward a submitted IPM**
Test criteria	This test is successful, if the IUT forwards a submitted ATS message (IPM) to a peer MTA correctly.
Scenario description	From the UA send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user reachable via AMHS transfer port *trp1*. • Message 1 (CT101M01) shall have ATS-message-priority KK. • Message 2 (CT101M02) shall have ATS-message-priority GG. • Message 3 (CT101M03) shall have ATS-message-priority FF. • Message 4 (CT101M04) shall have ATS-message-priority DD. • Message 5 (CT101M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. Verify the messages received by the test tool at the AMHS interface. Check the format and contents of MTE, IPM heading and body. In particular, verify the priority value contained in the MTE and the following elements contained in the IPM body: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent), 3.1.2.2.2 (ATS Message Server), 3.1.2.2.3.2.3.1 (ATS-Message-Header)
Test class	Normal AMHS communications

4.2 Delivery Operations

CT201 – Deliver an IPM to a local AMHS user

CT201	**Deliver an IPM to a local AMHS user**
Test criteria	This test is successful, if the IUT correctly delivers an ATS message (IPM) received from a peer MTA to its local AMHS user.
Scenario description	From the AMHS Test Tool send a sequence of five ATS messages (IPMs) to the IUT addressing a local UA. • The first ATS message shall have ATS-message-priority KK. • The second ATS message shall have ATS-message-priority GG. • The third ATS message shall have ATS-message-priority FF. • The fourth ATS message shall have ATS-message-priority DD. • The fifth ATS message shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Verify the messages received at the AMHS user agent. In particular, verify the following elements displayed at the AMHS user agent: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.1.6 (AMHS routing)
Test class	Normal AMHS communications

CT202 – Deliver an IPM containing erroneous ATS-message-header or ATS-message text format

CT202	**Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format**
Test criteria	This test is successful, if the IUT, when receiving an IPM containing erroneous ATS-message-header or ATS-message-text from a peer MTA: • delivers this message to its local AMHS user regardless of the contained error, or • indicates the error situation, or • returns a non-receipt notification or NDR.
Scenario description	From the AMHS Test Tool send a sequence of six messages (IPMs) to the IUT addressed to a local UA. • The first message (IPM) shall contain an empty ATS-message-priority. • The second message (IPM) shall contain an invalid ATS-message-priority • The third message (IPM) shall contain an empty ATS-message-filing-time. • The fourth message (IPM) shall contain an invalid ATS-message-filing-time. • The fifth message (IPM) shall contain an OHI text longer than 53 characters. • The sixth message (IPM) shall contain an empty ATS-message-header. • The seventh message (IPM) shall contain an empty ATS-message-text. Verify that the messages are delivered to the UA. Analyse the IUT's log files with respect to delivered messages and reported errors, if any. Check the contents of the received ATS message and verify the ATS-message-priority, ATS-message-filing-time and ATS-message-text displayed at the UA[5].
AMHS SARPs reference	3.1.2.2.3.2 (IPM text)
Test class	Erroneous AMHS parameters

[5] The displayed message depends on the UA capabilities

CT203 – Deliver an IPM containing empty or invalid IPM heading fields

CT203	**Deliver an IPM containing empty or invalid IPM heading fields**
Test criteria	This test is successful, if the IUT when receiving an ATS message (IPM) from a peer MTA containing empty or invalid IPM heading fields: • delivers this message to its local AMHS user regardless of the empty or invalid IPM heading fields, or • indicates the error situation, or • returns a non-receipt notification or NDR.
Scenario description	From the AMHS Test Tool send a sequence of messages (IPMs) to the IUT addressing a local UA. The Message Transfer Envelope (MTE) shall be correctly formatted while the IPM heading contains empty or invalid values. • The first message shall contain an empty originator field in the IPM heading. • The second message shall contain neither primary nor copy nor blind copy recipient addresses in the IPM heading. • The third message shall contain a primary recipient with an invalid combination of the notification-request flag (rn bit = true and nrn bit = false). Check the IUT's log files with respect to delivered messages and reported errors, if any. Check any messages received and displayed at the UA[6].
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent – AMH21)
Test class	Erroneous IPMS information objects

[6] The displayed message depends on the UA capabilities.

4.3 Transfer Operations

CT301 – Transfer messages (IPMs and IPNs)

CT301	**Transfer messages (IPMs and IPNs)**
Test criteria	This test is successful, if the IUT transfers (forwards) messages (IPMs, IPNs) correctly.
Scenario description	From the AMHS Test Tool send a sequence of messages to the IUT's transfer port *trp1*. All envelopes shall contain a remote recipient address reachable via transfer port *trp2*. All messages shall have the *originator-report-request* flag and the *originating-MTA-report-request* flag set to "non-delivery-report". The sequence of messages shall consist of: • an IPM with ia-5-text body part, • an IPM with general-text body part, • an IPN containing a RN, • an IPN containing a NRN. Monitor the outcome of IUT transfer ports *trp1*, *trp2* and *trp3*. Verify that: • all messages are routed correctly via transfer port *trp2*, and there is no message misrouted, i.e. no output from the IUT at transfer port *trp1* or *trp3*, • there is no NDR returned via *trp1*, • the content of the forwarded message has not changed, but is identical to the original content, • trace information is added in the message transfer envelope (MTE).
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT302 – Transfer a report

CT302	**Transfer a report**
Test criteria	This test is successful, if the IUT transfers (forwards) reports correctly.
Scenario description	From the AMHS Test Tool send two manually prepared reports (a DR and a NDR) to the IUT's transfer port *trp1*. The report transfer envelope shall contain a remote recipient address reachable via transfer port *trp2*. The reports shall contain fictitious values for those fields, which are normally automatically generated from the related subject message, for example, the subject-MTS-identifier and originally intended recipients. Monitor the outcome of IUT transfer ports *trp1*, *trp2* and *trp3*. Verify that: • all reports are routed correctly via transfer port *trp2*, and there is no report misrouted, i.e. no output from the IUT at transfer port *trp1* or *trp3*, • the content of the forwarded report has not changed, but is identical to the original report content, • trace information is added in the report transfer envelope (RTE).
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT303 – Transfer a probe

CT303	**Transfer a probe**
Test criteria	This test is successful, if the IUT transfers (forwards) a probe testing the reachability of a remote AMHS user correctly and returns a NDR, if the probe contains a content-length value which exceeds the length supported by the IUT's MTA component.
Scenario description	From the AMHS Test Tool send two probes to the IUT's transfer port *trp1*. The probe (envelope) shall contain an intended recipient address reachable via transfer port *trp2*. • The first probe shall contain a content length value of 1.048.576 (octets), which is a length, which must be supported by the IUT's MTA component. • The second probe shall contain a content length value of 2.147.483.647 (octets), which is the maximum length in octets specified in X.411:06/1999. It equals the largest integer in 32 bits. Monitor the outcome of IUT transfer ports *trp1*, *trp2* and *trp3*. Verify that: • the first probe is routed correctly via transfer port *trp2*, and there is not any NDR returned from the IUT, • the second probe is either routed correctly via transfer port *trp2* or rejected, if such a length is not supported by the IUT's transfer capabilities. Check, if either a forwarded probe or a NDR is received from the IUT. *Note. – The AMHS Test Tool shall respond with a DR, if it receives a valid probe for a user residing in the test tool's domain.*
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT304– Reject a message, if DL expansion is prohibited

CT304	**Reject a message, if DL expansion is prohibited**
Test criteria	This test is successful, if the IUT distributes a received IPM addressing a distribution list (DL) only, if the *dl-expansion-prohibited* flag is set to “false” and rejects the message, if the *dl-expansion-prohibited* flag is set to “true”. In the latter case, the IUT shall return a NDR.
Scenario description	From the AMHS Test Tool send two IPMs to the IUT’s transfer port *trp1*. The recipient in the message transfer envelope (MTE) shall address a distribution list. The distribution list, in turn, shall address three remote AMHS users, one reachable via transfer port *trp1*, one reachable via *trp2* and one via *trp3*. The first message shall have the *dl-expansion-prohibited* flag set to “false” and the second to “true”. Monitor the outcome of transfer ports *trp1*, *trp2* and *trp3*. Verify that: • only the first message is distributed by the IUT and three messages are received at the AMHS Test Tool, • a NDR is returned to trp1 for the second message.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group)
Test class	Normal AMHS communications

CT305– Loop detection

CT305	**Loop detection**
Test criteria	This test is successful, if the IUT detects that the received message, IPN, report and probe have traversed a loop.
Scenario description	Create a temporary routing loop, i.e. modify the routing table in MTA-2 to forward all messages addressed to AMHSLAND-2 to MTA-1, which in turn forwards those messages to the IUT. Configure the loop detection mechanism in the AMHS Test Tool (MTA-1 and MTA-2) to allow a message to run through the loop 32 times. From the AMHS Test Tool send an AMHS message (IPM) to the IUT addressing an AMHS user in AMHSLAND-2. Verify that: • the IUT detects the loop, • discards the message and • sends a NDR (before the test tool detects that the message has traversed the loop 32 times). Repeat the test for an IPN, a report and a probe. The IUT shall detect the loop in all cases and return a NDR for the IPN and the probe (but not for the report).
AMHS SARPs reference	3.1.1, Note 2a (ISO/IEC 10021), *See also ITU-T Rec. X.411 clause 14.3.1 and clause 12.3.1.*
Test class	MHS procedural errors

CT306– Generate a NDR, if transfer fails

CT306	**Generate a NDR, if transfer fails**
Test criteria	This test is successful, if the IUT correctly generates a NDR, if it can not transfer the received IPM towards the specified recipient.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT's transfer port *trp1*. All messages shall contain an unknown primary recipient address and have different combinations of settings for the *originator-report-request* flag and the *originating-mta-report-request* flag according to Table 11. Verify that in all cases the IUT returns a NDR. Verify that the report is always addressed to the originator of the message. Verify that the *originator-report-request* flag setting in the per-recipient-fields of the generated NDR is equal to the setting in the subject message.
AMHS SARPs reference	3.1.2.2.2.1.1 (AMH22/AMH11)
Test class	Normal AMHS communications

ATS Message	**Value of the originator-report-request element**	**Value of the originating-MTA-report-request element**	**Expected result**
1	no-report(0)	report(2)	IUT returns a NDR with the *originator-report-request* flag set to no-report(0).
2	non-delivery-report(1)	report(2)	IUT returns a NDR with the *originator-report-request* flag set to non-delivery-report(1).
3	report(2)	report(2)	IUT returns a NDR with the *originator-report-request* flag set to report(2).

Table 11: CT306 report request settings[7]

[7] Note that the originating-MTA-report-request argument shall specify at least the level specified in the originator-report=request (see ITU-T recommendation X.411, clause 1.2.2.1.1.1.8)

4.4 Gateway Operations (AMHS to AFTN)

CT401 – Convert an incoming IPM to AFTN format

CT401	**Convert an incoming IPM to AFTN format**
Test criteria	This test is successful, if the IUT converts an IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user. • The first ATS message shall have ATS-message-priority KK. • The second ATS message shall have ATS-message-priority GG. • The third ATS message shall have ATS-message-priority FF. • The fourth ATS message shall have ATS-message-priority DD. • The fifth ATS message shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text and address an AFTN user reachable via the AFTN/X.25 port *cid1*. The optional-heading-information element shall be empty[8]. The implicit-conversion-prohibited attribute of the AMHS message must be set to “false”. Verify the messages received at the AFTN/X.25 interface of the AMHS Test Tool. Check the correct format of the AFTN message. Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.
AMHS SARPs reference	3.1.2.3.5.2 (AMHS IPM conversion)
Test class	Normal AMHS communications

[8] There is a separate test case specified, that will test the conversion of the optional-heading-information element.

CT402 – Convert an IPM containing optional-heading-information in the ATS-message-header

CT402	**Convert an IPM containing optional-heading-information in the ATS-message-header**
Test criteria	This test is successful, if the IUT converts an IPM containing optional-heading-information (OHI) in the ATS-message-header correctly into AFTN format and returns a non-delivery report, if it cannot convert the message, because the OHI text is too long.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over the AMHS transfer port to the IUT. The sequence of IPMs shall address a remote AFTN user. • The first ATS message shall have FF priority and contain OHI text of less than 53 characters[9]. • The second ATS message shall have FF priority and contain OHI text of exactly 53 characters. • The third ATS message shall have FF priority and contain OHI text of more than 53 characters. • The fourth ATS message shall have SS priority and contain OHI text of less than 48 characters[10]. • The fifth ATS message shall have SS priority and contain OHI text of exactly 48 characters. • The sixth ATS message shall have SS priority and contain OHI text of more than 48 characters. Check the AFTN messages received at the X.25/AFTN port and verify the AFTN format. In particular, check the format and contents of the OHI. Verify that the IUT returns a NDR for the third and sixth ATS message containing the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.1.5-b): • "unable-to-transfer" for the *non-delivery-reason-code*, • "content-syntax-error" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to ATS-Message-Header or Heading Fields syntax error" for the supplementary-information.

[9] OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69. (Total line length = OHI text + space + 6 digit filing time + space + 8 characters originator indicator.)
[10] OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 character priority alarm.)

AMHS SARPs reference	3.1.2.3.5.2.2.8 (OHI) 3.1.2.2.3.2.3.4 (ATS Message Optional Heading Info) PDR M4100001
Test class	Normal AMHS communications

CT403 – Generate a DR for a successfully translated IPM

CT403	**Generate a DR for a successfully translated IPM**
Test criteria	This test is successful, if the IUT returns a DR for a successfully translated ATS message (IPM), if a report was requested by the originator or the originating MTA.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT addressing an AFTN user. The IPMs shall have ATS-Message-Priority "FF" and different combinations of settings for the *originator-report-request* flag and the *originating-mta-report-request* flag according to Table 12. The IUT shall convert all ATS messages into AFTN format and forward them via the AFTN/X.25 port *cid1* to the AMHS Test Tool. Check the messages received at the AMHS interface and verify that the IUT sends a DR for every ATS message, if: a) the *originator-report-request* element is set to "report", or b) the originating-mta-report-request element is set to "report" or "audited-report". (see Table 12).
AMHS SARPs reference	3.1.2.3.5.6.1.3 (generation of AMHS reports)
Test class	Normal AMHS communications

ATS Message	Value of the originator-report-request element	Value of the originating-MTA-report-request element	Expected result for conformance test CT403
1	no-report(0)	non-delivery-report(1)	IUT does not return a report
2	no-report(0)	report(2)	IUT returns a DR
3	no-report(0)	audited-report(3)	IUT returns a DR
4	non-delivery-report(1)	non-delivery-report(1)	IUT does not return a report
5	non-delivery-report(1)	report(2)	IUT returns a DR
6	non-delivery-report(1)	audited-report(3)	IUT returns a DR
7	report(2)	report(2)	IUT returns a DR
8	report(2)	audited-report(3)	IUT returns a DR

Table 12: CT403 report request settings[11]

[11] Note that the originating-MTA-report-request argument shall specify at least the level specified in the originator-report-request (see ITU-T recommendation X.411, clause 12.2.1.1.1.8)

CT404 – Generate a NDR, if implicit conversion is prohibited

CT404	**Generate a NDR, if implicit conversion is prohibited**
Test criteria	This test is successful, if the IUT rejects a received IPM addressed to an AFTN user, if the *implicit-conversion-prohibited* attribute is set to “true” and generates a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port *trp1*. The IPMs shall have both the *originator-report-request* and the *originating-MTA-report-request* flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port *cid1*. The first message shall have the argument *implicit-conversion-prohibited* set to “false” and the second message set to “true”. Verify that only the first message is transferred over the AFTN/X.25 test interface to the AMHS Test Tool, and a NDR is generated for the second message and received by the AMHS Test Tool via the transfer port *trp1*. Verify that this NDR contains the following elements (as specified in the AMHS SARPs 3.1.2.3.5.2.1.2): • “conversion-not-performed” for the *non-delivery-reason-code*, • “implicit-conversion-prohibited” for the *non-delivery-diagnostic-code*, and • “unable to convert to AFTN” for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.2
Test class	Normal AMHS communications

CT405 – Generate a NDR, if the ATS-message-header has a syntax error

<table>
<tr><th>CT405</th><th>Generate a NDR, if the ATS-message-header has a syntax error</th></tr>
<tr><td>Test criteria</td><td>This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing erroneous ATS-message-header or ATS-message-text.</td></tr>
<tr><td>Scenario description</td><td>From the AMHS Test Tool send a sequence of seven messages (IPMs) to the IUT addressed to an AFTN user reachable via the IUT’s gateway.
• The first message (IPM) shall contain an empty ATS-message-priority.
• The second message (IPM) shall contain an invalid ATS-message-priority
• The third message (IPM) shall contain an empty ATS-message-filing-time.
• The fourth message (IPM) shall contain an invalid ATS-message-filing-time.
• The fifth message (IPM) shall contain OHI text longer than 53 characters.
• The sixth message (IPM) shall contain an empty ATS-message-header.
• The seventh message (IPM) shall contain an empty ATS-message-text.

Check the messages received at the AMHS- and X.25/AFTN-interfaces of the AMHS Test Tool. Verify that the IUT - except for the seventh message[12] - does not convert the received AMHS messages into AFTN, but returns a NDR for each message via its transfer port trp1. Verify that all NDRs contains the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.1.5-b):
• “unable-to-transfer” for the non-delivery-reason-code,
• “content-syntax-error” for the non-delivery-diagnostic-code, and
• “unable to convert to AFTN due to ATS-Message-Header or Heading Fields syntax error” for the supplementary-information.</td></tr>
<tr><td>AMHS SARPs reference</td><td>3.1.2.3.5.2.1.5-b), 3.1.2.2.3.2.3 (ATS Message Header)</td></tr>
<tr><td>Test class</td><td>Erroneous AMHS parameters</td></tr>
</table>

[12] The AMHS SARPS (3.1.2.2.3.2.4) do not exclude an IPM containing empty ATS-message-text.

CT406 – Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters

CT406	**Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters**
Test criteria	This test is successful, if the IUT, when it receives an ATS message with long ATS-message-text of more than 1800 characters, a) rejects the message and returns a NDR, or b) splits the received IPM into several messages and converts the resulting messages into AFTN format as specified in ICAO Annex 10, Attm. B (changed from D to B with Amendment 78) . *Note:– The AMHS SARPS (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b).*
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT containing ATS-message-text of 4500 characters to an AFTN user recipient. *If case a) is implemented:* Verify that the IUT does not convert the IPM into AFTN format, but returns a NDR. Check the NDR contents received at the TSMS-AMHS interface. Verify that the NDR contains the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*; • "content-too-long" for the *non-delivery-diagnostic-code*; and • "unable to convert to AFTN due to message text length" for the *supplementary-information*. *If case b) is implemented:* Verify that (at least) three AFTN messages are received at the AFTN/X.25 test interface. Check the correct format of the AFTN messages. Check the text field of all received AFTN messages. Verify that the text is complete and unchanged, i.e. compare the received data with the *ATS-message-text* provided in the original IPM.
AMHS SARPs reference	3.1.2.3.5.2.1.7
Test class	Normal AMHS communications

CT407 – Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters

CT407	**Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters**
Test criteria	This test is successful, if the IUT converts a received IPM containing an ATS-messages-text with lines of more than 69 characters, if *conversion-with-loss-prohibited* is set to “false”. Otherwise the IUT shall reject the message and generate a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port. The messages shall have both the *originator-report-request* and the *originating-MTA-report-request* flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port *cid1*. The IPM body shall contain ATS-message-text with lines exceeding 69 characters. In the first message the argument *conversion-with-loss-prohibited* shall be set to “false” and in the second message to the value “true”. Verify that only messages are received at the AFTN/X.25 test interface of the AMHS Test Tool, if the *conversion-with-loss-prohibited* was set to “false”. Check the correct format of the AFTN message. Verify that an additional line feed has been inserted for every text line exceeding 69 characters. In case of message rejection, verify that a NDR is generated and received by AMHS Test Tool via the transfer port *trp1* with the following values: • “conversion-not-performed” for the *non-delivery-reason-code*, and • “line-too-long” for the diagnostic code.
AMHS SARPs reference	3.1.2.3.5.2.1.6 a)
Test class	Normal AMHS communications

CT408 – Convert or reject an IPM, if the ATS-message-text contains characters not allowed by ICAO Annex 10

<table>
<tr><td>CT408</td><td>Convert or reject an IPM, if the ATS-message-text contains characters not allowed by ICAO Annex 10</td></tr>
<tr><td>Test criteria</td><td>This test is successful, if the IUT converts a received IPM containing an ATS-messages-text with characters not allowed by ICAO Annex 10, if conversion-with-loss-prohibited is set to “false”. Otherwise the IUT shall reject the message and generate a NDR.</td></tr>
<tr><td>Scenario description</td><td>From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port trp1. The messages shall have both the originator-report-request and the originating-MTA-report-request flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port cid1.
In the first message the ATS-Message-Text shall contain one or more IA-5 characters that are not allowed by ICAO Annex 10, e.g. the punctuation symbol “;” and have the conversion-with-loss-prohibited argument set to “false”,
The second message shall contain equal ATS-Message-Text, but have the conversion-with-loss-prohibited argument set to “true”,
Verify that only messages are received at the AFTN/X.25 test interface of the AMHS Test Tool, if the conversion-with-loss-prohibited was set to “false”. In such a case, check the converted AFTN message format.
In case of message rejection, verify that a NDR is generated and received by AMHS Test Tool via the transfer port trp1 with the following values:
“conversion-not-performed” for the non-delivery-reason-code, and
“punctuation-symbol-loss” for the diagnostic code.</td></tr>
<tr><td>AMHS SARPs reference</td><td>3.1.2.3.5.2.1.6 c), d) and e)</td></tr>
<tr><td>Test class</td><td>Normal AMHS communications</td></tr>
</table>

CT409 – Reject an IPM with multiple body part

CT409	**Reject an IPM with multiple body part**
Test criteria	This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing multiple body parts.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT transfer port *trp1*. The message shall contain two (or more) IA5-text body parts. Verify that a NDR is generated and received by AMHS Test Tool via the transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code,* • "content-syntax-error" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to multiple body parts" for the *supplementary-information.*
AMHS SARPs reference	3.1.2.3.5.2.1.3
Test class	Erroneous AMHS parameters

CT410 – Distribute an IPM to AMHS and AFTN users

CT410	**Distribute an IPM to AMHS and AFTN users**
Test criteria	This test is successful, if the IUT distributes an IPM addressing both an AMHS and an AFTN user correctly.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) addressing both AMHS and AFTN users to the IUT via transfer port *trp1*. • The IPM Heading of the first message shall contain two primary recipients, which are one AMHS and one AFTN user and two copy recipients, which are also one AMHS and one AFTN user. • The IPM Heading of the second message shall contain two primary recipients, which are one AMHS and one AFTN user and two blind copy recipients, which are also one AMHS and one AFTN user. The message shall have the *originator-report-request* flag set to “non-delivery-report”. Verify that both messages (IPMs) are: • relayed to AMHS transfer port *trp2*, and • relayed and converted to AFTN format and transferred via the AFTN/X.25 port *cid1*. Check the messages received at the AMHS-interface. Verify that: • both messages contain an MTE with all AMHS recipient addresses and an IPM heading with all AMHS and AFTN recipients. Check the messages received at the AFTN/X.25 port. Verify that: • both messages contain the addresses of both AFTN users.
AMHS SARPs reference	3.1.2.2.1 (ATS message user agent), 3.1.2.2.2 (ATS message server), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications

CT411 – Expand a DL addressing both AMHS and AFTN users

CT411	**Expand a DL addressing both AMHS and AFTN users**
Test criteria	This test is successful, if the IUT distributes an IPM addressing AMHS and AFTN users in a distribution list correctly.
Scenario description	From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port *trp1*. The recipient contained in the MTE, shall address a distribution list, for which the IUT is responsible. The distribution list shall address one AMHS user and two AFTN users. The AMHS user is reachable via the AMHS transfer port *trp2* and the AFTN users are reachable via the X.25/AFTN port *cid1*. The first message shall have the *dl-expansion-prohibited* flag set to "false" and the second to "true". Check the messages received at the AMHS and X.25/AFTN interfaces of the AMHS Test Tool. Verify that only the first IPM is: • transferred via AMHS transfer port *trp2*, and • converted to AFTN format and transferred via the X.25/AFTN port *cid1*. Verify for the first IPM that: • one message is received at the AMHS-interface *trp2* containing (only) the AMHS recipient address in the MTE and the DL recipient address in the IPM heading • one AFTN message is received at the X.25/AFTN-interface containing the addresses of both AFTN users Verify for the second message that: • a NDR is returned to *trp1*.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications

CT412 –Split or reject an incoming IPM addressing more than 21 AFTN users

CT412	**Split or reject an incoming IPM addressing more than 21 AFTN users**
Test criteria	This test is successful, if the IUT receives an ATS message (IPM) addressing more than 21 AFTN users and a) splits the received IPM into several messages, each addressing 21 or less AFTN users if no more than 512 AFTN users are addressed, or b) rejects the received IPM and returns a NDR if more than 512 AFTN users are addressed. *Note: – With the resolution of PDR M4050004 a message with more than 21, but no more than 512 recipient addresses must not be rejected by the gateway.*
Scenario description	From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port *trp1*. The message shall have the *originator-report-request* flag set to “non-delivery-report”. • Send one IPM with 512 recipients. Verify that this message is split into 25 AFTN messages, each of the first 24 messages containing 21 addresses, the last one containing 8 addresses. • Send one IPM with 513 recipients. Verify that the IUT does <u>not</u> convert the AMHS message into AFTN format, but returns a NDR via its transfer port *trp1* with the following elements: • “unable-to-transfer” for the *non-delivery-reason-code,* • “too-many-recipients” for the *non-delivery-diagnostic-code,* and • “unable to convert to AFTN due to number of recipients” for the *supplementary-information.*
AMHS SARPs reference	3.1.2.3.5.2.1.8, PDR M4050004
Test class	Normal AMHS communications

CT413 – Remove an unknown address before conversion into AFTN format

CT413	**Remove an unknown address before conversion into AFTN format**
Test criteria	This test is successful, if the IUT that receives an ATS message (IPM) addressed to multiple AFTN users removes any unknown address before conversion.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT via AMHS transfer port *trp1*. The message shall have two (primary) recipients addressing two AFTN users. Only the AMHS address of the first AFTN user can be translated by the MTCU into a valid AFTN addressee indicator, the AMHS address of the second AFTN user is unknown and the MTCU can not find a match in its address look-up table. Check the messages received at the AMHS- and X.25/AFTN-interfaces of the AMHS Test Tool. Verify that the IUT: • converts the received AMHS message into AFTN format, removes the unknown address and sends it via the X.25/AFTN-interfaces *cid1*, • returns a NDR via transfer port *trp1* for the unknown recipient. Verify that the NDR contains the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.2.6.2 d): • “unable-to-transfer” for the *non-delivery-reason-code*, and • “unrecognised-OR-name” for the *non-delivery-diagnostic-code*
AMHS SARPs reference	3.1.2.3.5.2.2.6.2
Test class	Normal AMHS communications

CT414 – Convert an incoming AFTN acknowledgement

CT414	**Convert an incoming AFTN acknowledgement**
Test criteria	This test is successful, if the IUT converts an AFTN acknowledgement (SS ACK message) to a receipt notification correctly.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The IPM shall have the *receipt-notification* request flag activated and the *ATS-message-priority* shall have the value "SS". The IUT shall convert the AMHS message to an AFTN message with priority indicator "SS" and send it via the AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement to the IUT (via the AFTN/X.25 test interface *cid1*). The subject message shall refer to the received AFTN user message. The IUT shall convert this AFTN acknowledgement to an AMHS receipt notification and send it via the AMHS test interface *trp1*. Verify that the AMHS Test Tool receives a receipt notification. In particular, verify that: • the originator indicator contained in the AFTN acknowledgement is translated to the *ipn-originator* (IPN) and the *originator-name* (MTE), • the *receipt-time* of the IPN is generated from the *filing time* of the AFTN acknowledgement, • the value of the *priority* element in the MTE is set to "urgent", • the values of *subject-ipm* and *recipient-name* are inserted correctly from log entries.
AMHS SARPs reference	3.1.2.3.4.3 (conversion AFTN ACK)
Test class	Normal AMHS communications

CT415 – Incoming AFTN acknowledgement with unknown AFTN originator

CT415	**Incoming AFTN acknowledgement with unknown AFTN originator**
Test criteria	This test is successful, if the IUT informs its control position, when the AFTN acknowledgement (SS ACK message) can not be converted because the AFTN originator is unknown.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The IPM shall have the *receipt-notification* request flag activated and the *ATS-message-priority* shall have the value "SS". The IUT shall convert the AMHS message to an AFTN message with priority indicator "SS" and send it via the AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement (SS ACK) to the IUT (via the AFTN/X.25 test interface *cid1*). The subject message shall refer to the received AFTN user message, but the originator of the AFTN acknowledgement (SS ACK) message shall be unknown to the IUT, i.e. not contained in any of the IUT's conversion or address mapping tables. Check the output of the IUT at the AMHS test interfaces and the control position. Verify that the IUT does not send any IPM nor IPN via the AMHS transfer port, but reports the error situation to the control position.
AMHS SARPs reference	3.1.2.3.4.3.2.3
Test class	Erroneous AMHS parameters

CT416 – Incoming AFTN acknowledgement relating to a subject message without receipt-notification request

CT416	**Incoming AFTN acknowledgement relating to a subject message without receipt-notification request**
Test criteria	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not have the receipt notification flag set.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The message shall have the *ATS-message-priority* set to "SS", however, the *receipt-notification-request* shall be deactivated. The IUT shall convert the AMHS message into an AFTN message with priority indicator "SS" and send it over the AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN SS acknowledgement to the IUT with the subject message relating to the previously received AFTN user message. Since the initial ATS message (IPM) did not have the *receipt-notification-request* activated, the IUT shall not convert the AFTN acknowledgement into a RN, but encapsulate the AFTN acknowledgement into an IPM, instead. Check the output of the IUT at the AMHS test interface *trp1* and the control position. Verify that the IUT sends an ATS message (IPM) with the addressed AMHS user as recipient. Verify that the message contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.
AMHS SARPs reference	3.1.2.3.4.3.1.2
Test class	MHS procedural errors, Erroneous IPMS information objects

CT417 – Incoming AFTN acknowledgement without related subject message

CT417	**Incoming AFTN acknowledgement without related subject message**
Test criteria	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not pass the gateway before.
Scenario description	From the AMHS Test Tool send an AFTN acknowledgement (SS ACK message) via the AFTN/X.25 test interface *cid1* to the IUT addressing an AMHS user. The AFTN acknowledgement shall have a fictitious origin subject message in the message text. Check the output of the IUT at the AMHS transfer port and the control position. Verify that the IUT sends an IPM with the addressed AMHS user as recipient. Verify that the IPM contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.
AMHS SARPs reference	3.1.2.3.4.3.1.1
Test class	MHS procedural errors , Erroneous IPMS information objects

CT418 – Convert an AFTN SVC "Unknown Addressee Indicator" to a NDR

CT418	**Convert an AFTN SVC "Unknown Addressee Indicator" to a NDR**
Test criteria	This test is successful, if the IUT converts a received AFTN service message (SVC) of type "Unknown Addressee Indicator" to a NDR correctly.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The IUT shall convert the IPM to an AFTN user message and send it over AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN service message of type "Unknown Addressee Indicator" to the IUT that relates to the formerly received message. The IUT shall convert this AFTN service message to a NDR. Verify that a NDR is generated (as specified in the AMHS SARPs, section 3.1.2.3.4.4) and received by AMHS Test Tool via the AMHS test interface *trp1* with the following elements: • for the report-destination-name the *originator-name* of the subject AMHS message, for the subject-identifier the *message-identifier* of the subject AMHS message, for the actual-recipient-name the *unknown addressee indicator* reported with the SVC, "unable-to-transfer" for the *non-delivery-reason-code*, and • "unrecognised-OR-name" for the *non-delivery-diagnostic-code*.
AMHS SARPs reference	3.1.2.3.4.4 (conversion AFTN SVC unknown)
Test class	Normal AMHS communications

CT419 – Incoming AFTN SVC "Unknown Addressee Indicator" without related subject message

CT419	**Incoming AFTN SVC "Unknown Addressee Indicator" without related subject message**
Test criteria	This test is successful, if the IUT encapsulates a received AFTN service message (SVC) of type "Unknown Addressee Indicator" into an IPM, if the subject message did not pass the gateway before.
Scenario description	From the AMHS Test Tool send an AFTN service message of type "Unknown Addressee Indicator" to the IUT addressing an AMHS user. The AFTN service message shall have a fictitious origin subject message in the message text. Check the output of the IUT at the AMHS transfer port. Verify that the IUT sends an IPM with the addressed AMHS user as recipient. Verify that the IPM contains the original AFTN SVC in the IPM body (ATS-message-text).
AMHS SARPs reference	3.1.2.3.4.4.1.1 b)
Test class	Normal AMHS communications

CT420 – Processing of an incoming SVC QTA RPT Message

CT420	**Processing of an incoming SVC QTA RPT Message**
Test criteria	This test is successful, if the IUT sends an AFTN user message a second time, if it receives an SVC QTA RPT message.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT addressing an AFTN user. The IUT shall convert the message into AFTN format and send it over the AFTN/X.25 test interface to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN service message of type QTA RPT related to the previously received AFTN message. Verify that the IUT does not translate the AFTN service message into an IPM, but processes the QTA RPT so that the previous message is sent to the AFTN user (automatically or by operator intervention) a second time.
AMHS SARPs reference	3.1.2.3.2.1.12
Test class	Normal AMHS communications

CT421 – Probe Conveyance Test

CT421	Probe Conveyance Test
Test criteria	This test is successful, if the IUT (receiving a probe with an AFTN user as intended recipient) generates a DR, if conversion to AFTN is possible or an NDR, if conversion to AFTN is not possible.
Scenario description	From the AMHS Test Tool send a sequence of AMHS probes to the IUT. • Probe 1 shall specify a content-length of 1800 and address an AFTN user recipient reachable via the AMHS/AFTN gateway. • Probe 2 shall specify a content-length of 1800 and address an AFTN user recipient, which is routed by the IUT via the gateway (MTCU), but which can not be mapped onto a valid AFTN address by the MTCU. • Probe 3 shall specify a content-length of 1800 and address two AFTN user recipients, one which can be mapped and one which can not be mapped onto a valid AFTN address. • Probe 4 shall specify a content-length of 10.000 and address an AFTN user recipient reachable via the AFTN/AMHS gateway. • Probe 5 shall specify a content-length of 100.000 and address an AFTN user recipient reachable via the AFTN/MHS gateway. • Probe 6 shall have a recipient argument addressing 512 AFTN users. • Probe 7 shall have a recipient argument addressing more than 512 AFTN users. Check the messages received at the AMHS Test Tool-AMHS interface. Verify that the IUT returns a report for each probe. Check the report contents and determine if it is a DR, NDR or combined report: • A DR shall be returned in response to probe 1. • A NDR shall be returned in response to probe 2. • A DR and NDR (one combined report or two reports) shall be returned in response to probe 3. • Depending on the gateway's capabilities, a DR or NDR shall be returned for probe 4 and 5. • A DR shall be returned for Probe 6. • A NDR shall be returned for Probe 7.
AMHS SARPs reference	3.1.2.3.5.5 (reception of AMHS probe), PDR M4050004, PDR M601003
Test class	Normal AMHS communications

CT422 – Reject an IPM with unsupported content-type

CT422	Reject an IPM with unsupported content-type
Test criteria	This test is successful, if the IUT's gateway component rejects an incoming message of content-type other than IPM 88 and generates a NDR.
Scenario description	From the AMHS Test Tool send a sequence of messages to the IUT via transfer port *trp1* addressed to an AFTN user recipient. The messages shall have different values for the content-type contained in the MTE. • The 1st message shall contain a *built-in content-type* value "interpersonal-messaging-1988(22)". • The 2nd message shall contain a *built-in content-type* value "interpersonal-messaging-1984(2)". • The 3rd message shall contain a *built-in content-type* value "edi-messaging(35)". • The 4th message shall contain a *built-in content-type* value "unidentified(0)". All messages shall contain an IPM body with ATS-message-header and ATS-message-text.[13] Verify that the IUT accepts and converts the 1st message, but rejects 2nd, the 3rd and 4th message. Verify that the IUT returns a NDR for the 2nd, 3rd and 4th message containing: • "unable-to-transfer" for the *non-delivery-reason-code,* and • "content-type-not-supported" for the *non-delivery-diagnostic-code*.
AMHS SARPs reference	3.1.2.3.5.1.1
Test class	Normal AMHS communications, Erroneous AMHS parameters

[13] It is assumed that MTAs on the relay path do not verify the specified content-type against the contained body part(s) and transfer all type of messages towards the gateway (MTCU).

CT423 – Processing of the original-encoded-information-types (EIT)

CT423	**Processing of the original-encoded-information-types (EIT)**
Test criteria	This test is successful, if the IUT's gateway component evaluates the original-encoded-information-types contained in the incoming ATS message and: • accepts (and converts) the message, if it contains one of those values specified in section 3.1.2.3.5.2.1.1 of the AMHS SARPs, or • rejects the message, if it does not contain any of those values and generates a NDR.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user. The messages shall have the following values for the *original-encoded-information-types* (EIT) contained in the Message Transfer Envelope (MTE) • The 1st message shall contain *built-in-encoded-information-types* with value "IA5-text(2)". • The 2nd message shall contain *built-in-encoded-information-types* with value "unknown(0)". • The 3rd message shall contain *extended-encoded-information-types* with OID "2.6.3.4.2" for IA5-text information types. • The 4th message shall contain *extended-encoded-information-types* with OID "2.6.3.4.0" for unknown information types. • The 5th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1}. • The 6th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}. • The 7th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and OID {id-cs-eit-authority 100}. • The 8th message shall contain *extended-encoded-information-types* with (invalid) OID {id-cs-eit-authority 3}. • The 9th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and (invalid) OID {id-cs-eit-authority 7}. • The 10th message shall contain *built-in-encoded-information-types* with value "IA5-text(2)" and *extended-encoded-information-types* with OID "2.6.3.4.2" for IA5-text as well as OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}.

	The messages shall contain a body part corresponding to the (first valid) *original-encoded-information-types* value. Verify that all messages with valid EIT argument are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/X.25 test interface of the AMHS Test Tool. Verify that all messages with any invalid EIT argument are rejected by the IUT and a NDR is returned via transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, and • "encoded-information-types-unsupported" for the *non-delivery-diagnostic-code*.
AMHS SARPs reference	3.1.2.3.5.2.1.1
Test class	Normal AMHS communications and Erroneous AMHS parameters

CT 424 – Incoming IPM with extended body part of type "IA5-text-body-part"

CT424	**Incoming IPM with extended body part of type "IA5-text-body-part"**
Test criteria	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with extended body part of type "IA5-text-body-part" and converts the IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user. • The first message shall contain an extended body part of type "IA5-text-body-part", which includes an ATS-message-header and ATS-message-text with IA5-text characters. The *original-encoded-information-types* attribute shall contain *extended-encoded-information-types* with OID "2.6.3.4.2" (IA5-text). • The second message shall be equal except for the *original-encoded-information-types,* which has a built-in value for IA5-text(2)[14]. • The third message shall be equal to the first, but the *repertoire* argument in the body shall be different from IA5(5). • The fourth message shall be equal to the first, but the body part data shall contain characters different from IA5String, e.g. special characters of local language – as in German "ä", "ö" and "ü" or in French "é". Verify that the first and second message are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/X.25 test interface of the AMHS Test Tool. Check whether the other messages are converted into AFTN format or rejected by the IUT. In case of rejection, verify that an NDR is returned via transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code,* • "content-syntax-error" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to unsupported body part type" for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 2)
Test class	Normal AMHS communications

[14] It is assumed that an extended IA5-text-body-part can be associated with either a built-in EIT or extended EIT value for IA5-text.

CT425 – Incoming IPM with extended body part type "general-text-body-part" and ISO 646 repertoire

CT425	**Incoming IPM with extended body part type "general-text-body-part" and ISO 646 repertoire**
Test criteria	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with extended body part type "general-text-body-part" of which the repertoire set description is Basic (ISO 646) and converts the IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user recipient. All messages shall contain an extended body part of type "general-text-body-part", which includes an ATS-message-header and ATS-message-text with general-text data. The *original-encoded-information-types* shall be set to *extended-encoded-information-types* with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}. The message text (data part) shall include ISO 646 (US-ASCII) characters, only. The parameter argument in the IPM body part shall specify the following character sets: • The 1st message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire. • The 2nd message shall contain character set registration numbers 1 and 5. • The 3rd message shall contain character set registration numbers 2 and 5. • The 4th message shall contain an empty set of character registration. The message text (data part) shall include ISO 646 (US-ASCII – see Table 13) characters, only. Verify that only the first message is accepted by the IUT's gateway component, converted to AFTN format and received at the X.25/AFTN interface of the AMHS Test Tool. Analyze the received AFTN messages with respect to the AFTN message text. Verify that all other messages are rejected by the IUT and an NDR is returned via transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code,* • "content-syntax-error" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to unsupported body part type" for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 3)
Test class	Normal AMHS communications and Erroneous AMHS parameters

20	21 !	22 "	23 #	24 $	25 %	26 &	27 '	28 (	29)	2A *	2B +	2C ,	2D -	2E .	2F /
30 0	31 1	32 2	33 3	34 4	35 5	36 6	37 7	38 8	39 9	3A :	3B ;	3C <	3D =	3E >	3F ?
40 @	41 A	42 B	43 C	44 D	45 E	46 F	47 G	48 H	49 I	4A J	4B K	4C L	4D M	4E N	4F O
50 P	51 Q	52 R	53 S	54 T	55 U	56 V	57 W	58 X	59 Y	5A Z	5B [	5C \	5D]	5E ^	5F _
60 `	61 a	62 b	63 c	64 d	65 e	66 f	67 g	68 h	69 i	6A j	6B k	6C l	6D m	6E n	6F o
70 p	71 q	72 r	73 s	74 t	75 u	76 v	77 w	78 x	79 y	7A z	7B {	7C |	7D }	7E ~	

Table 13: The ISO 646 (US-ASCII) character set

CT426 – Incoming IPM with extended body part type "general-text-body-part" and ISO 8859-1 repertoire

CT426	**Incoming IPM with extended body part type "general-text-body-part" and ISO 8859-1 repertoire**
Test criteria	This test is successful, if the IUT’s gateway component processes a received ATS message (IPM) with extended body part type “general-text-body-part” of which the repertoire set description is Basic-1 (ISO 8859-1) according to its local AMHS Management Domain policy. *Note. – Depending on the local policy of the AMHS Management Domain a received message with extended body part type “general-text-body-part” of which the repertoire set description is Basic-1 (ISO 8859-1) can be converted or rejected.*
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user recipient. All messages shall contain an extended body part of type "general-text-body-part", which includes an ATS-message-header and ATS-message-text with general-text data. The *original-encoded-information-types* shall be set to *extended-encoded-information-types* with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and OID {id-cs-eit-authority 100}. The message text (data part) shall include ISO 8859-1 characters (Latin-1, Western Europe – see Table 14). The parameter argument in the IPM body part shall specify the following character sets: • The 1st message shall contain character set registration numbers 1, 6 and 100 which specify the ISO 8859-1 repertoire. • The 2nd message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire. • The 3rd message shall contain an empty set of character registration. The characters used in the message text (data part) shall be equal for all messages. Check, if the messages are converted or rejected by the IUT according to its local policy. In case of conversion, analyze the received AFTN messages with respect to the characters contained in the AFTN message text. In case of message rejection, check, if the NDR returned via transfer port *trp1* contains the following elements: • “unable-to-transfer” for the *non-delivery-reason-code,* • “content-syntax-error” for the *non-delivery-diagnostic-code*, and • “unable to convert to AFTN due to unsupported body part type” for the *supplementary-information*.

AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 4) 3.1.2.3.5.2.1.4 b)
Test class	Normal AMHS communications and Erroneous AMHS parameters

A0	A1 ¡	A2 ¢	A3 £	A4 ¤	A5 ¥	A6 ¦	A7 §	A8 ¨	A9 ©	AA ª	AB «	AC ¬	AD -	AE ®	AF ¯
B0 °	B1 ±	B2 ²	B3 ³	B4 ´	B5 µ	B6 ¶	B7 ·	B8 ¸	B9 ¹	BA º	BB »	BC ¼	BD ½	BE ¾	BF ¿
C0 À	C1 Á	C2 Â	C3 Ã	C4 Ä	C5 Å	C6 Æ	C7 Ç	C8 È	C9 É	CA Ê	CB Ë	CC Ì	CD Í	CE Î	CF Ï
D0 Ð	D1 Ñ	D2 Ò	D3 Ó	D4 Ô	D5 Õ	D6 Ö	D7 ×	D8 Ø	D9 Ù	DA Ú	DB Û	DC Ü	DD Ý	DE Þ	DF ß
E0 à	E1 á	E2 â	E3 ã	E4 ä	E5 å	E6 æ	E7 ç	E8 è	E9 é	EA ê	EB ë	EC ì	ED í	EE î	EF ï
F0 ð	F1 ñ	F2 ò	F3 ó	F4 ô	F5 õ	F6 ö	F7 ÷	F8 ø	F9 ù	FA ú	FB û	FC ü	FD ý	FE þ	FF ÿ

Table 14: The ISO 8859-1 character set

4.5 Gateway Operations (AFTN to AMHS)

CT501 – Convert an AFTN user message to AMHS format

CT501	**Convert an AFTN user message to AMHS format**
Test criteria	This test is successful, if the IUT converts an AFTN user message to an AMHS message (IPM) correctly.
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of five messages, one for each AFTN priority, i.e. SS, DD, FF, GG, KK. The filing time shall be different for each message and the OHI field shall be empty for all messages[15]. Check the IPMs that the AMHS Test Tool receives from the IUT via the AMHS transfer port. Verify that the IUT has converted the messages correctly according to Table 3.1.2-8 of the AMHS SARPs – see section 3.1.2.3.4.2. Check message envelopes and contents. In particular, verify that: • the *ATS-message-header* and *ATS-message-text* in the IPM body part has the correct format, • the AFTN message text is correctly inserted in the *ATS-message-text* field, • the AFTN message priority is correctly inserted in the *ATS-message-priority* field, • that the IUT has translated the AFTN priority indicator and inserted the correct priority in the message transfer envelope (MTE) – see • Table 15, • the addressee indicator is correctly translated in the corresponding AMHS OR address and entered as *primary-recipient* in the IPM heading and as *recipient-name* in the MTE, • the AFTN originator is translated in the AMHS OR address which was registered for identification of the AFTN originator in the AMHS and allocated to the elements *originator* (MTE), *originator-name* and the sub-component user of the element *this-IPM* (IPM heading), • the filing time is correctly inserted in the *ATS-message-header*.
AMHS SARPs reference	3.1.2.3.4.2
Test class	Normal AMHS communications

[15] Conversion of the optional-heading-information element is subject to another test.

AFTN Priority Indicator	AMHS MTE priority	AMHS ATS-Message-Priority priority-indicator
SS	Urgent	SS
DD	Normal	DD
FF	Normal	FF
GG	non-urgent	GG
KK	non-urgent	KK

Table 15: Mapping of AFTN Priority Indicator for the Basic ATS Message Handling Service[16]

[16] The mapping of the AFTN priority indicator is specified in table 3.1.2-7 of the AMHS SARPs

CT502 – Convert an AFTN user message containing optional heading information

CT502	**Convert an AFTN user message containing optional heading information**
Test criteria	This test is successful, if the IUT converts an AFTN user message containing optional heading information (OHI) correctly into an AMHS message (IPM).
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of • a normal (non-SS) priority AFTN message containing (short) OHI text, • a normal (non-SS) priority AFTN message containing OHI filling the originator line, • an SS priority AFTN message containing (short) OHI text, • an SS priority AFTN message containing OHI filling the originator line. Check the IPMs transferred via the AMHS transfer port. Verify that the IUT has converted the messages correctly. Check envelopes and contents. In particular, verify the correct format of the ATS-message-header.
AMHS SARPs reference	3.1.2.3.4.2.1.6
Test class	Normal AMHS communications

CT503 – Generate an AFTN service message of the type “Unknown Addressee Indicator”

CT503	**Generate an AFTN service message of the type “Unknown Addressee Indicator”**
Test criteria	This test is successful, if the IUT returns an AFTN service message of the type “Unknown Addressee Indicator”, if the translation of addressee indicator fails.
Scenario description	From the AMHS Test Tool send an AFTN messages over the AFTN/X.25 test interface to the IUT. The AFTN message shall contain an addressee indicator which can not be mapped by the IUT. Verify that the IUT does not convert the received AFTN message into an AMHS message (IPM), but returns an AFTN service message of the type “Unknown Addressee Indicator” over the AFTN/X.25 test interface.
AMHS SARPs reference	3.1.2.3.5.4 (NDR conversion)
Test class	Normal AMHS communications

CT504 – Incoming AFTN user message with unknown originator indicator

CT504	**Incoming AFTN message with unknown originator indicator**
Test criteria	This test is successful, if the IUT informs its control position, if during the conversion process the translation of the originator indicator fails.
Scenario description	From the AMHS Test Tool send an AFTN messages over the AFTN/X.25 test interface to the IUT. The AFTN message shall contain an originator indicator which is unknown in the IUT. Verify that the IUT does not send any message via the X.25/AFTN or AMHS interface but informs its control position that the gateway is not able to translate the originator indicator.
AMHS SARPs reference	3.1.2.3.4.2.1.4.1
Test class	Erroneous AMHS parameters

CT505 – Convert a receipt notification

CT505	**Convert a receipt notification**
Test criteria	This test is successful, if the IUT converts a received IPN containing a receipt notification (RN) to an AFTN acknowledgement correctly.
Scenario description	From the AMHS Test Tool send an AFTN user message with priority “SS” via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent as an IPM to the AMHS Test Tool via transfer port *trp1*. Upon receipt of the IPM the AMHS Test Tool returns a RN. Verify that the IUT converts the received RN correctly into an AFTN acknowledgement. In particular, verify that: • the *originator-name* is translated into the *Originator Indicator* of the AFTN acknowledgement, the *receipt-time* forms the *Filing Time* of the AFTN acknowledgment, logged elements of the previously handled *subject AFTN message* are used and inserted correctly into the AFTN acknowledgment.
AMHS SARPs reference	3.1.2.3.5.3 (RN conversion),
Test class	Normal AMHS communications

CT506 – Incoming non-receipt notification

CT506	**Incoming non-receipt notification**
Test criteria	This test is successful, if the IUT reports to its control position and stores the message, if it receives an IPN containing a NRN addressed to an AFTN user.
Scenario description	From the AMHS Test Tool send an AFTN message with priority “SS” via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port *trp1*. Upon receipt of the AMHS message the AMHS Test Tool returns a NRN. Verify that the IUT behaves as specified in the AMHS SARPs, section 3.1.2.3.5.1.2, i.e. • logs the error situation and reports to a control position, and • stores the message for appropriate processing at the control position.
AMHS SARPs reference	3.1.2.3.5.1.2 c) (processing of NRN)
Test class	Erroneous AMHS parameters

CT507 – Generate a NDR as a result of misrouted RN

CT507	**Generate a NDR as a result of misrouted RN**
Test criteria	This test is successful, if the IUT rejects a misrouted IPN containing a receipt notification (RN) and returns a NDR.
Scenario description	From the AMHS Test Tool send a RN to the IUT via transfer port trp1 addressed to an AFTN user. The RN contains a fictitious value for the subject-ipm (subject AFTN message) and is not related to any message that had previously passed the IUT. Verify that the IUT does not transfer any AFTN acknowledgement over the AFTN/X.25 test interface to the AMHS Test Tool, but generates a NDR and sends it via the transfer port *trp1* to the AMHS Test Tool. Verify that the NDR contains the following elements as specified in the AMHS SARPS, section 3.1.2.3.5.3.1.1: • "unable-to-transfer" for the *non-delivery-reason-code*; • "invalid-arguments" for the *non-delivery-diagnostic-code*; and • "unable to convert RN to AFTN ACK service message due to misrouted RN" for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.3.1.1
Test class	MHS procedural errors

CT508 – Convert a non-delivery report (NDR)

CT508	**Convert a non-delivery report (NDR)**
Test criteria	This test is successful, if the IUT converts a received NDR with a *non-delivery-diagnostic-code* of the value "unrecognised-OR-name" to an AFTN service message (SVC) of the type "Unknown Addressee".
Scenario description	From the AMHS Test Tool send an AFTN message via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port *trp1*. The AMHS Test Tool shall return a NDR related to the received message and with a *non-delivery-diagnostic-code* of the value "unrecognised-OR-name". Verify that the IUT converts the received NDR into an AFTN service message (SVC) and sends it over the AFTN/X.25 test interface to the AMHS Test Tool. In particular, verify that: • the *actual-recipient-name* elements (provided with the *per-recipient-fields* in the Report Transfer Content) are converted into AFTN addresses which form the *unknown-addressee-indicators* in the text of the AFTN SVC, priority indicator, addressee indicator, origin and the first-address-line of the subject message are taken from log entries made for the handled subject message, and the filing time is generated correctly by the gateway component of the IUT. • the originator indicator of the service message is the AFTN Address of the AFTN Component of the AFTN/AMHS Gateway
AMHS SARPs reference	3.1.2.3.5.4 (NDR conversion), 3.1.2.3.5.4.2.7
Test class	Normal AMHS communications

CT509 – NDR conversion process failures

CT509	**NDR conversion process failures**
Test criteria	This test is successful, if the IUT reports to its control position, whenever an error occurs in the NDR conversion process.
Scenario description	From the AMHS Test Tool send three AFTN messages via the X.25/AFTN interface to the IUT. The messages shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port *trp1*. The AMHS Test Tool shall return a NDR for each received message. • The 1st NDR shall contain a *non-delivery-diagnostic-code* different from "unrecognised-OR-name".The 2nd NDR shall contain an unknown address in the *actual-recipient-name* element. • The 3rd NDR shall refer to a fictitious subject message that did not pass the gateway before. Check the output of the IUT at the control position. Verify that for each NDR the IUT behaves as specified in the relevant sections of the AMHS SARPs, i.e. • logs the non-delivery situation and reports to a control position, and • stores the non-delivery report for appropriate processing at the control position.
AMHS SARPs reference	3.1.2.3.5.4.1.1, 3.1.2.3.5.4.1.3
Test class	Erroneous AMHS parameters

4.6 Naming and Addressing

CT601 – Address conversion from AMHS CAAS- and XF-addresses to AFTN addresses

CT601	**Address conversion from AMHS CAAS- and XF-addresses to AFTN addresses**
Test criteria	This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators correctly. Conversion shall be correct for both types, i.e. CAAS and XF-addresses. *Note:- The test cases in which the address conversion AMHS-AFTN-AMHS leads to asymmetric results are covered in CT607.*
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer ports *trp1, trp2* and *trp3* to the IUT, addressing different AFTN users reachable via the AFTN/X.25 port *cid1*. • The 1st ATS message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing an AFTN user in AFTNLAND-1. Note that both PRMDs (AMHSLAND-1 and AFTNLAND-1) implement the CAAS with one single organisation-name value for all location indicators within the PRMD. • The 2nd ATS message shall be sent via MTA-2 with originator from AMHSLAND-2 addressing an AFTN user in AFTNLAND-2. Note that both PRMDs (AMHSLAND-2 and AFTNLAND-2) implement the CAAS with multiple organisation-name values for different sets of location indicators within the PRMD. • The 3rd ATS message shall be sent via MTA-3 with originator from AMHSLAND-3 addressing an AFTN user in AFTNLAND-3. Note that both PRMDs (AMHSLAND-3 and AFTNLAND-3) implement the XF addressing scheme. • The 4th ATS message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing three AFTN users, one in AFTNLAND-1, one in AFTNLAND-2 and one in AFTNLAND-3. All messages shall have an IA5-text body part with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[17]. Check the messages received at the X.25/AFTN interface. Verify that the IUT was able to map all AMHS O/R addresses to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages.

[17] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Normal AMHS communications

CT602 – Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses

CT602	**Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses**
Test criteria	This test is successful, if the IUT that converts an AFTN user message to AMHS translates the AFTN originator indicator and all addressee indicators into correct AMHS addresses, which may be either XF- or CAAS addresses.
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 port *cid1* to the IUT addressing different AMHS users reachable via the AMHS transfer ports *trp1, trp2* and *trp3*. • The 1st AFTN user message shall be sent with originator from AFTNLAND-1 addressing an AMHS user in AMHSLAND-1. Note that both PRMDs (AFTNLAND-1 and AMHSLAND-1) implement the CAAS with one single organisation-name value for all location indicators within the PRMD. • The 2nd AFTN user message shall be sent with originator from AFTNLAND-2 addressing an AMHS user in AMHSLAND-2. Note that both PRMDs (AFTNLAND-2 and AMHSLAND-2) implement the CAAS with multiple organisation-name values for different sets of location indicators within the PRMD. • The 3rd AFTN user message shall be sent with originator from AFTNLAND-3 addressing an AMHS user in AMHSLAND-3. Note that both PRMDs (AFTNLAND-3 and AMHSLAND-3) implement the XF addressing scheme. • The 4th AFTN user message shall be sent with originator from AFTNLAND-1 addressing three AMHS users, one in AMHSLAND-1, one in AMHSLAND-2 and one in AMHSLAND-3. Check the messages received at AMHS transfer ports *trp1, trp2* and *trp3*. Verify that the IUT was able to map all AFTN originator and addressee indicators to AMHS O/R addresses. Verify the correct AMHS O/R addresses in the originator and recipient fields of both MTE and IPM headings.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.4.2.1.4.1 (Translation of the AFTN originator indicator) 3.1.2.3.4.2.1.4.2 (Translation of the AFTN addressee indicator)
Test class	Normal AMHS communications

CT603 – Reject an IPM with invalid recipient address (CAAS)

CT603	**Reject an IPM with invalid recipient address (CAAS)**
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type CAAS which can not be mapped to a valid AFTN addressee indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user in the PRMD "AFTNLAND-1" that implements the CAAS. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[18]. • The 1st ATS message shall contain a recipient address with an invalid *common-name* attribute, that contains 9 letters, e.g. "BAAAFTABC". • The 2nd ATS message shall contain a recipient address with an invalid *common-name* attribute, that contains only 6 letters, e.g. "BAAAFT". • The 3rd ATS message shall contain a recipient address with a valid *organizational-unit-names* attribute "BAAA", but an empty *common-name* attribute. • The 4th ATS message shall contain a recipient address with a valid *common-name* attribute "BAAAFTAA", but an empty *organizational-unit-names* attribute. • The 5th ATS message shall contain a recipient address with a valid *common-name* attribute "BAAAFTAA", but an *organizational-unit-names* attribute that is different from the first 4 letters of the *common-name* attribute, e.g. "BAAX". • The 6th ATS message shall contain a recipient address with a valid *common-name* attribute "BAAAFTAA", and correct *organizational-unit-names* attribute "BAAA" but an empty *organization-name* attribute. Verify that for each message a NDR is generated by the IUT with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, and • "unrecognised-OR-name" for the non-delivery-diagnostic-code.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

[18] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 "Use of IPM elements" those addresses are discarded by the MTCU.

CT604 – Reject an IPM with invalid recipient address (XF like)

CT604	Reject an IPM with invalid recipient address (XF like)
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type XF which can not be mapped to a valid AFTN addressee indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user in the PRMD "AFTNLAND-3" that implements the XF addressing scheme. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[19]. • The 1st ATS message shall contain a recipient address with the value "AFTN" in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value "BCAAFTABC". • The 2nd ATS message shall contain a recipient address with the value "AFTN" in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value "BCAAFT". • The 3rd ATS message shall contain a recipient address with the value "AFTN" in the *organization-name* attribute, but an empty *organizational-unit-names* attribute. • The 4th ATS message shall contain an originator address with an empty *organizational-name* attribute and a valid *organizational-unit-names* attribute, e.g. "BCAAFTAA". • The 5th ATS message shall contain an originator address with an invalid organization-name attribute, e.g. "ATFM" and a valid organizational-unit-names attribute, e.g. value "BCAAFTAA" Verify that for each message a NDR is generated by the IUT with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, and • "unrecognised-OR-name" for the *non-delivery-diagnostic-code*.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

[19] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 "Use of IPM elements" those addresses are discarded by the MTCU.

CT605 – Reject an IPM with invalid originator address (CAAS like)

CT605	**Reject an IPM with invalid originator address (CAAS like)**
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type CAAS which can not be mapped to a valid AFTN originator indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user reachable via the AFTN/X.25 port *cid1*. All messages shall be originated from the PRMD "AMHSLAND-1" which implements the CAAS. They shall have a valid recipient address for the PRMD "AFTNLAND-1", but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[20]. • The 1st ATS message shall contain an originator address with an invalid *common-name* attribute, e.g. "AAAAMHABC". • The 2nd ATS message shall contain an originator address with an invalid *common-name* attribute that contains only 6 letters, e.g. "AAAAMH". • The 3rd ATS message shall contain an originator address with a valid *organizational-unit-names* attribute "AAAA", but an empty *common-name* attribute. • The 4th ATS message shall contain an originator address with a valid *common-name* attribute "AAAAMHAA", but an empty *organizational-unit-names* attribute. • The 5th ATS message shall contain an originator address with a valid *common-name* attribute "AAAAMHAA", but an *organizational-unit-names* attribute that is different from the first 4 letters of the *common-name* attribute, e.g. "AAAX". • The 6th ATS message shall contain an originator address with a valid common-name attribute "AAAAMHAA" and correct organizational-unit-names attribute "AAAA", but an empty *organization-name* attribute. Verify that for each message a NDR is generated by the IUT with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, • "invalid-arguments" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to unrecognized originator O/R address" for the *supplementary-information*.

[20] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 "Use of IPM elements" those addresses are discarded by the MTCU.

AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

CT606 – Reject an IPM with invalid originator address (XF like)

CT606	**Reject an IPM with invalid originator address (XF like)**
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type XF which can not be mapped to a valid AFTN originator indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp3* to the IUT addressing an AFTN user reachable via the AFTN/X.25 port *cid1*. All messages shall be originated from the PRMD "AMHSLAND-3" which implements the XF addressing scheme. They shall have a valid recipient address for the PRMD "AFTNLAND-3", but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[21]. • The 1st ATS message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value "ACCCMHABC". • The 2nd ATS message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value "ACCCMH". • The 3rd ATS message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, but an empty *organizational-unit-names* attribute. • The 4th ATS message shall contain an originator address with an *empty organization-name attribute* and a valid organizational-unit-names attribute, e.g. value "ACCCMHAA". • The 5th ATS message shall contain an originator address with an invalid organization-name attribute, e.g. "UNKNOWN" and a valid organizational-unit-names attribute, e.g. value "ACCCMHAA".
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

[21] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 "Use of IPM elements" those addresses are discarded by the MTCU.

CT607 – Asymmetric address conversion from AMHS CAAS- and XF- recipient addresses to AFTN addresses

<table>
<tr><td>CT607</td><td>Asymmetric address conversion from AMHS CAAS- and XF-recipient addresses to AFTN addresses</td></tr>
<tr><td>Test criteria</td><td>This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators although the re-conversion of the AFTN addressee indicators lead to O/R addressees different from the original recipient O/R addresses (asymmetric). The asymmetric recipient address conversion shall be logged and reported to the Control Position.</td></tr>
<tr><td>Scenario description</td><td>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port trp1 to the IUT, addressing different AFTN users reachable via the AFTN/X.25 port cid.

• The 1st ATS message shall be sent via MTA-1 with correct originator from AMHSLAND-1 containing CAAS and XF recipient addresses which are translated into AFTN addresses of which the retranslations do not deliver the same AMHS addresses[22]:

(1) /C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=BA-REGION/OU1=BBAA/CN=BBAAFTAA,

(2) /C=XX/ADMD=ICAO/PRMD=AFTNLAND-2 /O=AFTN/OU1=BCAAFTAA

• The 2nd ATS message shall be sent via MTA-1 with correct originator from AMHSLAND-1 containing a CAAS recipient address with a PRMD value of an MD which has implemented the XF addressing scheme and a valid XF recipient address with a PRMD value of an MD which has implemented the CAAS addressing scheme:

(3) /C=XX/ADMD=ICAO/PRMD=AFTNLAND-3 /O=AFTN/OU1=BCAA/CN=BCAAFTAA,

(4) /C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=AFTN/OU1=BAAAFTAA

All messages shall have an IA5-text body with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[23].</td></tr>
</table>

[22] The AMHS addresses are listed in Table 10.

[23] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

	Check the messages received at the AFTN/X.25 interface. Verify that the IUT was able to convert all AMHS O/R addresses to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages. Check that conversion asymmetries of the recipient addresses are logged and reported to the Control Position.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator) PDR M7100001
Test class	Normal AMHS communications

CT608 – Asymmetric address conversion from AMHS CAAS- and XF- originator addresses to AFTN addresses

CT608	**Asymmetric address conversion from AMHS CAAS- and XF-originator addresses to AFTN addresses**
Test criteria	This test is successful, if the IUT, when converting an AMHS message (IPM) to an AFTN message, translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators, although the re-conversion of the AFTN originator indicator leads to an originator O/R address different from the original O/R address (asymmetric). The asymmetric originator address conversion shall be logged and reported to the Control Position.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer ports *trp1* and *trp3* to the IUT, addressing different AFTN users reachable via the AFTN/X.25 port *cid1*. • The 1st ATS message shall be sent via MTA-1 with a CAAS originator address which is translated into an AFTN address of which the retranslation does not deliver the same AMHS address[24]: (1) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1 /O=AA-REGION/OU1=ABAA/CN=ABAAMHAA The recipient shall be an AFTN user in AFTNLAND-1. • The 2nd ATS message shall be sent via MTA-1 with a XF originator address which is translated into an AFTN address of which the retranslation does not deliver the same AMHS address: (2) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1 /O=AFTN/OU1=ACCCMHAA The recipient shall be an AFTN user in AFTNLAND-1. • The 3rd ATS message shall be sent via MTA-3 with a CAAS originator address with a PRMD value of an MD which has implemented the XF addressing scheme:: (3) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-3 /O=AFTN/OU1=ACCC/CN=ACCCMHAA The recipient shall be an AFTN user in AFTNLAND-1.

[24] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 "Use of IPM elements" those addresses are discarded by the MTCU.

	• The 4th ATS message shall be sent via MTA-1 with a XF originator address with a PRMD value of an MD which has implemented the CAAS addressing scheme:: (4) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1 /O=AFTN/OU1=AAAAMHAA The recipient shall be an AFTN user in AFTNLAND-1. All messages shall have an IA5-text body part with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to "false". Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty. Check the messages received at the AFTN/X.25 interface. Verify that the IUT was able to convert all AMHS O/R addresses[25] to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages. Check that the conversion asymmetries of the originator addresses are logged and reported to the Control Position.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator) PDR M7100001
Test class	Normal AMHS communications

[25]The AMHS addresses are listed in Table 10.

4.7 Transfer, delivery and handling of Non-Delivery Reports (NDR)

CT701 – Transfer a non-delivery report (NDR)

CT701	**Transfer a non-delivery report (NDR)**
Test criteria	This test is successful, if the IUT transfers (forwards) non-delivery reports containing the standardized reason and diagnostic codes correctly.
Scenario description	From the AMHS Test Tool send a set of non-delivery reports to the IUT transfer port *trp1* to be forwarded to another domain. The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 16 below). The report transfer envelope shall contain a remote recipient address (Report Destination) reachable via transfer port *trp2*. The reports may contain fictitious values for those fields which are normally related to a subject message, like subject-MTS-identifier and encoded-information types and originally intended recipients. Monitor the outcome of IUT transfer port *trp2*. Verify that: • all reports are routed correctly via transfer port *trp2*, and • the reason and diagnostic codes of the forwarded report are identical to those contained in the original report.
AMHS SARPs reference	
Test class	Normal AMHS communications

AMHS Report ID	number of Per-Recipient-Fields	reason code	diagnostic codes (range)
CT701M01	*16*	0	0 – 15
CT701M02	*31*	0	0 – 30
CT701M03	*31*	1	0 – 30
CT701M04	*5*	1	46 – 50
CT701M05	*3*	2	8 – 10
CT701M06	*7*	2	19 – 25
CT701M07	*1*	3	31
CT701M08	*14*	4	32 – 45
CT701M09	*1*	5	not used
CT701M10	*1*	6	not used

AMHS Report ID	number of Per-Recipient-Fields	reason code	diagnostic codes (range)
CT701M11	*1*	7	not used
CT701M12	*28*	8	51 – 78

Table 16: AMHS non-delivery-reason-codes and non-delivery-diagnostic-codes used in test messages of CT701 – CT703[26]

Note 1:- The non-delivery-diagnostic-code is an optional element and, for example, not contained in test messages CT701M09, CT701M10 and CT701M11.

Note 2:- Depending on the level of service implemented by the IUT the range of valid non-delivery-reason-codes as well as non-delivery-diagnostic-codes could be different:

Level of Service	ISO/IEC Version	Reason Code Range	Diagnostic Code Range
Basic	ISO/IEC 10021-4:1990	0 – 7	1 – 49
Extended	ISO/IEC 10021-4:1999	0 – 8	1 – 78

[26] Every standardized reason code (0 … 8) and every standardized diagnostic code (0 … 78) is contained at least once in the test messages.

CT702 – Transfer a non-delivery report (NDR) to an AMHS user

CT702	**Transfer a non-delivery report (NDR) to an AMHS user**
Test criteria	This test is successful, if the IUT delivers non-delivery reports containing the standardized reason and diagnostic codes to an AMHS user correctly
Scenario description	From the AMHS Test Tool send a set of non-delivery reports to the IUT transfer port *trp1* to be forwarded to a directly attached AMHS user. The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 16). The report transfer envelope shall contain the recipient address of an AMHS user connected to the IUT. The reports may contain fictitious values for those fields which are normally related to a subject message, like subject-MTS-identifier and encoded-information types and originally intended recipients. Monitor the reports received at the AMHS user agent. Verify that: • all reports are delivered to the AMHS user agent, and • the reason and diagnostic codes of the delivered reports are identical to those contained in the reports sent from the AMHS test tool.
AMHS SARPs reference	
Test class	Normal AMHS communications

Note:- Note 2 of CT701 applies also to CT702.

CT703 – Handling of received non-delivery report (NDR) in the AFTN/AMHS gateway

CT703	**Handling of received non-delivery report (NDR) in the AFTN/AMHS gateway**
Test criteria	This test is successful, if the IUT upon reception by the MTCU of an AMHS non-delivery report logs the error situation and reports to the control position, if the report does not refer to any previously generated subject message or contains a *non-delivery-diagnostic-code* value other than “unrecognised-OR-name(0)”.
Scenario description	From the AMHS Test Tool send a set of non-delivery reports to the IUT addressed to an AFTN user reachable via the AFTN/AMHS gateway. The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 16). The report transfer envelope shall contain the recipient address of an AFTN user reachable via the IUT’s AFTN/AMHS gateway. The reports relate to fictitious subject messages that have never been generated by the MTCU. Monitor the events at the Control Position. Verify that the IUT logs the error situation and reports to the control position for every received NDR.
AMHS SARPs reference	
Test class	Normal AMHS communications

Note:- Note 2 of CT701 applies also to CT703.

CT704 – Transfer a NDR containing non-standard reason or diagnostic codes

CT704	**Transfer a NDR containing non-standard reason or diagnostic codes**
Test criteria	This test is successful, if the IUT transfers non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411).
Scenario description	From the AMHS Test Tool send several NDRs to the IUT transfer port *trp1* to be forwarded to a recipient address reachable via transfer port *trp2*. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes: • CT704M01 contains “9” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT704M02 contains “255” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT704M03 contains “32767” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT704M04 contains “unable-to-transfer” for the *non-delivery-reason-code* and “79” for the *non-delivery-diagnostic-code*. • CT704M05 contains “unable-to-transfer” for the *non-delivery-reason-code* and “255” for the *non-delivery-diagnostic-code*. • CT704M06 contains “unable-to-transfer” for the *non-delivery-reason-code* and “32767” for the *non-delivery-diagnostic-code*. Monitor the outcome of IUT transfer port *trp2*. Verify that: • all reports are routed correctly via transfer port *trp2*, and • the reason and diagnostic codes of the forwarded report are identical to those contained in the original report.
AMHS SARPs reference	
Test class	Erroneous AMHS parameters

CT705 – Deliver a NDR containing non-standard reason or diagnostic codes to an AMHS user agent

CT704	**Deliver a NDR containing non-standard reason or diagnostic codes to an AMHS user agent**
Test criteria	This test is successful, if the IUT delivers non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411) to an AMHS user agent.
Scenario description	From the AMHS Test Tool send several NDRs to the IUT transfer port *trp1* to be forwarded to a directly attached AMHS user. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes: • CT705M01 contains “9” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT705M02 contains “255” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT705M03 contains “32767” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT705M04 contains “unable-to-transfer” for the *non-delivery-reason-code* and “79” for the *non-delivery-diagnostic-code*. • CT705M05 contains “unable-to-transfer” for the *non-delivery-reason-code* and “255” for the *non-delivery-diagnostic-code*. • CT705M06 contains “unable-to-transfer” for the *non-delivery-reason-code* and “32767” for the *non-delivery-diagnostic-code*. Verify that all NDRs are delivered to the AMHS user agent. Check the contained reason and diagnostic codes (if any). Verify that no misleading information is presented to the AMHS user.
AMHS SARPs reference	
Test class	Erroneous AMHS parameters

CT706 – Handling of NDR containing non-standard reason or diagnostic codes in the AFTN/AMHS gateway

CT706	**Handling of NDR containing non-standard reason or diagnostic codes in the AFTN/AMHS gateway**
Test criteria	This test is successful, if the IUT upon reception by the MTCU of an AMHS non-delivery report logs the error situation and reports to the control position, if the NDR contains non-standard reason or diagnostic codes.
Scenario description	From the AMHS Test Tool send several AMHS non-delivery reports to the IUT addressed to an AFTN user reachable via the AFTN/AMHS gateway. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes: • CT706M01 contains “9” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT706M02 contains “255” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT706M03 contains “32767” for the *non-delivery-reason-code* and “invalid-arguments” for the *non-delivery-diagnostic-code*. • CT706M04 contains “unable-to-transfer” for the *non-delivery-reason-code* and “79” for the *non-delivery-diagnostic-code*. • CT706M05 contains “unable-to-transfer” for the *non-delivery-reason-code* and “255” for the *non-delivery-diagnostic-code*. • CT706M06 contains “unable-to-transfer” for the *non-delivery-reason-code* and “32767” for the *non-delivery-diagnostic-code*. Monitor the events at the Control Position. Verify that the IUT logs the error situation and reports to the control position for every received NDR.
AMHS SARPs reference	
Test class	Erroneous AMHS parameters

--- END ---

ANNEX C

Test Procedure
for
ATN Router Connection Test

ANNEX C

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
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Table of Contents

1 Introduction

1.1 This document describes the test procedure for the Ground-Ground (G/G) Aeronautical Telecommunication Network (ATN) router connection, up to 3 ATN router interconnections.

2 References

[1] Asia/Pacific Regional ATN G/G Router ICD for ISO/IEC 8202 Sub-Network.

[2] ASIA/PAC Interface Control Document (ICD) for ATN G/G Router

[3] Test Plan for AMHS Technical Trial between Hong Kong, China and Japan.

[4] "Technical Memorandum of Cooperation between Engineering & Systems Division, Civil Aviation Department, Hong Kong China and Operations and Flight Inspection Division, Civil Aviation Bureau, Ministry of Land, Infrastructure and Transport, Japan: AMHS Trials and Service between Japan and Hong Kong, China", February 2003. (Amended 24 August 2004)

3 Test Overview and Scope

3.1 A joint ATN Router Connection Test between AMHSLAND1 and AMHSLAND2 using a 9.6kbps X.25 PSDN (packet-switched data network) circuit.

3.2 An ATN Router Connection Test is scheduled to verify the connectivity, interoperability, data relaying/routing and redundancy capabilities (where applicable) of the ATN Ground-Ground routers in AMHSLAND1 and AMHSLAND2.

3.3 The ATN Router Connection Test will also confirm that the functions of the AMHSLAND1 and AMHSLAND2 ATN routers were configured in preparation for more than 2 routers tests.

3.4 The system configuration for the test is shown in

Figure 3. Routers in AMHSLAND1 and AMHSLAND2 are linked by an X.25 virtual circuit (VC) over a leased line connection (e.g.64 kbps).

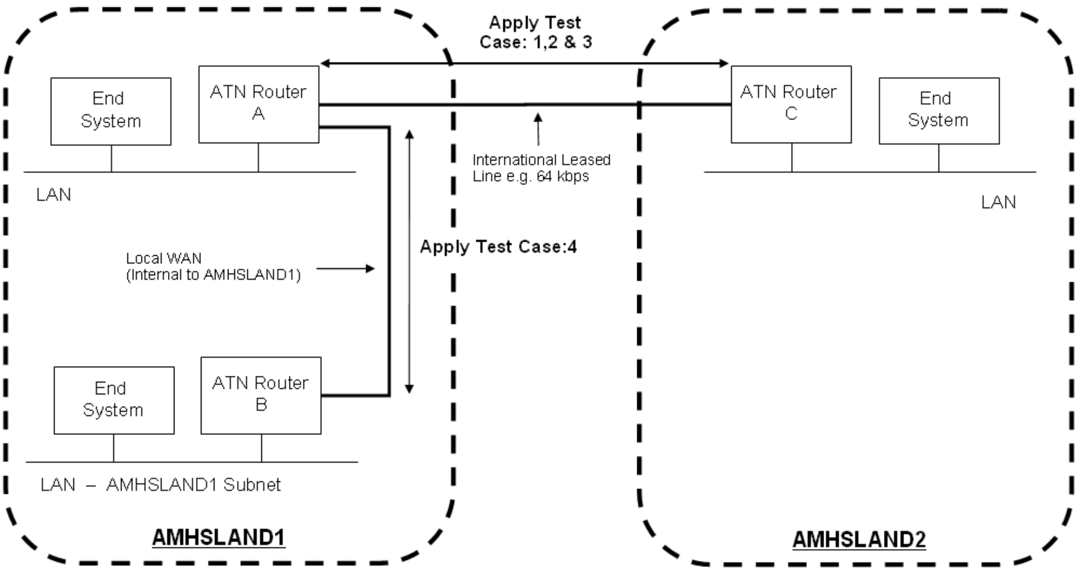


Figure 3 ATN Router Connection Test Configuration

3.5 To test data relay and routing functions, CLNP Echo Request (ERQ) Network Protocol Data Units (NPDU) will be generated by the routers and End Systems. To support these tests, all Intermediate Systems shall be capable of generating CLNP ERQ PDUs, and all Intermediate Systems and End Systems shall be capable of transmitting CLNP Echo Response (ERP) PDUs in response to the receipt of ERQ PDUs. Further, it is desirable that End Systems be capable of generating CLNP ERQ PDUs. Execution of some test items is contingent on End Systems' capabilities.

3.6 Since both AMHSLAND1 and AMHSLAND2 are ATN backbone sites, the proper updating of their routing tables should be tested in detail. This will ensure that the router could relay the data received from its counterpart to another router either within or outside its own domain/ATN site.

3.7 A summary of test items for the ATN Router Connection Test is shown in Table 17.

Table 17 Summary of Test Items for ATN Router Connection Test

No.	Test Item	Details
1	Router Connection Establishment and Maintenance	Establish LAPB, X.25 VC and IDRP connections between routers. Exchange of KEEPALIVE PDUs to maintain IDRP connection.
2	NPDU Relay	Tests to confirm CLNP Echo function of routers, correct NPDU relay, and validation of handling of PDUs with invalid security option parameter.
3	Router end-to-end tests	IDRP route addition/deletion, carrier medium failure/restoration and router failure/recovery.
4	ATN router environment tests	Multiple router route addition/deletion, carrier medium failure/restoration and router failure/recovery in three-domain configurations.

4 Communication Parameters

4.1 The proposed communication parameters for the connection between the routers of AMHSLAND1 and AMHSLAND2 are listed in Table 18.

4.2 The proposed CLNP communication parameters for the End Systems are listed in Table 19. It is proposed to use the NSAP addresses of the AMHS systems that will be used in actual operation for the ES NSAP addresses.

5 Schedule and Test Item Overview

5.1 The test items and planned schedule are shown in Table 20.

Table 18Router Communication Parameters

Protocol	**Item No.**	**Item**	**Parameter**		**Note**
			Router (AMHSLAND1)	**Router (AMHSLAND2)**	
	1.1	NSAP/NET	ROUTER A: 47.0027.81.81524A.00.010101.0302.000000000000.00 ROUTER B: 47.0027.81.854b00.00.010101.0302.000000000000.00	ROUTER C: 47.0027.81.815648.00.010101.0202.0202.012A.0100.00	1
CLNP (RPDU)	2.1	Priority	14	14	2
IDRP	3.1	NLRI	ROUTER A: 47.0027.81.81524A.00.010101 ROUTER B: 47.0027.81.854b00.00.010101	ROUTER C: 47.0027.81.815648.00.010101	
	3.2	RDI	ROUTER A: 47.0027.81.81524A.00.010101 ROUTER B: 47.0027.81.854b00.00.010101	ROUTER C: 47.0027.81.815648.00.010101	
	3.3	SecurityRegistrationID	06 04 2B 1B 00 00	06 04 2B 1B 00 00	2
	3.4	Tag Set Name	07 (ATSC Class Security Tag Set)	07 (ATSC Class Security Tag Set)	2
	3.5	ATSC Class	Class C	Class C	2
	3.6	Holding Time	180 sec	180 sec	2
	3.7	KEEPALIVE Send Timer	60 sec	60 sec	2, 3
	3.8	OPEN PDU Transmission	ROUTER A: AMHSLAND1-AMHSLAND2 : OPEN-PDU send ROUTER A: local circuit: OPEN-PDU send ROUTER B: OPEN-PDU receive	ROUTER C: AMHSLAND2 -AMHSLAND1: OPEN-PDU receive ROUTER C: local circuit: OPEN-PDU send	

Note 1: Compliant with Asia/Pacific ATN addressing plan.

Note 2: For all routers used in tests.

Note 3: The value of the KEEPALIVE send timer is the holding timer value divided by 3.

Table 19Router Communication Parameters (continued)

Protocol	Item No.	Item	Parameter		Note
			Router (AMHSLAND1)	Router (AMHSLAND2)	
X.25	4.1	DTE Address	ROUTER A AMHSLAND1-AMHSLAND2 : 44442000023903 ROUTER A local circuit: 44442000023903 ROUTER B local circuit: 44440110110202	ROUTER C AMHSLAND1-AMHSLAND2 : 48404701021800 ROUTER C local circuit: local matter	
	4.2	LCGN	0	0	4
	4.3	LCN	10	10	4
	4.4	Packet Size	1024	1024	4
	4.5	Window Size	7	7	4
	4.6	Window Size Negotiation	Yes	Yes	4
	4.7	CR Packet Transmission	ROUTER A AMHSLAND1-AMHSLAND2 : Caller (CR send) ROUTER A local circuit: Caller (CR send) ROUTER B local circuit: Called (CR receive)	ROUTER C AMHSLAND1-AMHSLAND2 : Called (CR receive) ROUTER C local circuit: Caller (CR send)	
	4.8	Use of SQ	Yes	Yes	4
	4.9	Packet Sequence	Modulo 8	Modulo 8	4
	4.10	Packet Negotiation	Yes	Yes	4
	4.11	D Bit	OFF	OFF	4
	4.12	M Bit	Yes	Yes	4
	4.13	Restart Request Retransmission Count (R20)	1	1	4
	4.14	Reset Request Retransmission (R22)	1	1	4
	4.15	Clear Request Retransmission Count (R23)	1	1	4
	4.16	Restart Request Timer (T20)	180 sec	180 sec	4
	4.17	DTE Call Request timer (T21)	200 sec	200 sec	4
	4.18	Reset Confirmation Timer (T22)	180 sec	180 sec	4
	4.19	DTE Clear Confirmation Timer (T23)	180 sec	180 sec	4

Note 4: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Table 20Router Communication Parameter (continued)

Protocol	**Item No.**	**Item**	**Parameter**		**Note**
			Router (AMHSLAND1)	**Router (AMHSLAND2)**	
LAPB	5.1	Address	ROUTER A AMHSLAND1-AMHSLAND2 : 03 ROUTER A local circuit: 03 ROUTER B local circuit: 01	ROUTER C AMHSLAND1-AMHSLAND2 : 01 ROUTER C local circuit: local matter	
	5.2	Max Outstanding Number	7	7	5
	5.3	Idle Channel State Timer (T3)	60 sec	60 sec	5, 6
	5.4	ACK Receipt Timer (T1)	3 sec	3 sec	5, 7
	5.5	Frame Retransmission Count	5	5	5
	5.6	Maximum Number of bits in I-Frame (N1)	8248	8248	5, 8
	5.7	Frame Sequence	Modulo 8	Modulo 8	5
Physical	6.1	Interface	X.21/V.11 (Line Speed: 64 kbps)	V.11 (Line Speed: 64 kbps)	5
	6.2	Clock	Local Matter	Local Matter	5

Note 5: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Note 6: APAC ROUTER ICD (ref. [1]) specifies router A: 18–60 seconds, router B: 12–60 seconds.

Note 7: APAC ROUTER ICD (ref. [1]) specifies 6 sec, based on 9,600bps line speed and 256 byte packets.

Note 8: Value depends on the max. X.25 packet size. N1 = packet header size (3) + packet size (bytes) + LAPB address part (1) + LAPB control part (1) + LAPB FCS part (2) in BITS. So if the packet size is 1024 bytes, then N1 is (3 + 1024 + 1 + 1 + 2) * 8 = 8248 bits.

Table 21 End System CLNP Communication Parameters

Protocol	Item No.	Item	Parameter	
			Router (AMHSLAND1)	Router (AMHSLAND2)
	7.1	NSAP	AMHSLAND1 ES: 470027.81.81524a.00.010101.0302.128001091001.01 Third domain ES: 470027.81.854b00.00.010101.0302.000000010051.01	AMHSLAND2 ES: 47.0027.81.815648.00.010101.0202.0202.8002.0100.01
CLNP	7.1	Traffic Type	1 (ATSC/No Traffic Type Policy Preference)	1 (ATSC/No Traffic Type Policy Preference)
	7.2	Security Class	1 (Unclassified)	1 (Unclassified)
	7.3	Priority	8	8
	7.4	Partial Route Recording	No	No

Table 22 Test Items and Schedule

Schedule (UTC)		Test Item No.			Description
Day	**Time**				
		1			**Router Connection Establishment and Maintenance**
			1	1 ~ 2	Data link establishment
			2	1 ~ 4	X.25 VC establishment
			3	1 ~ 2	IDRP connection establishment
			4	1 ~ 2	Exchange of routing information (UPDATE PDU transmission)
			5	1 ~ 2	Maintenance of IDRP connection (KEEPALIVE PDU transmission)
		2			**NPDU Relay**
			1	1 ~ 3	ERQ/ERP NPDU transmission /reply from AMHSLAND1 router to AMHSLAND2 router
			2	1 ~ 3	ERQ/ERP NPDU transmission /reply from AMHSLAND2 router to AMHSLAND1 router
			3	1 ~ 3	ERQ/ERP NPDU transmission/reply from AMHSLAND1 ES to valid destination in AMHSLAND2 domain
			4	1 ~ 3	ERQ/ERP NPDU transmission from AMHSLAND2 ES to valid destination in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
			5	1 ~ 2	ERQ NPDU transmission from AMHSLAND1 ES to unreachable ES in AMHSLAND2 domain
			6	1 ~ 2	ERQ NPDU transmission from AMHSLAND2 ES to unreachable ES in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
			7	1 ~ 2	Routing process in AMHSLAND1 router for NPDU with invalid security option parameter
			8	1 ~ 2	Routing process in AMHSLAND2 router for NPDU with invalid security option parameter (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
		3			**Router end-to-end tests**
			1	1 ~ 5	Manual router disconnection at AMHSLAND1 router and route deletion
			2	1	Route activation from AMHSLAND1 router
			3	1 ~ 5	Manual router disconnection at AMHSLAND2 router and route deletion
			4	1	Route activation from AMHSLAND2 router
			5	1 ~ 3	Carrier medium failure and route deletion at AMHSLAND1 router
			6	1	Carrier medium restoration and route addition at AMHSLAND1 router

Schedule (UTC)		Test Item No.			Description
Day	Time				
			7	1 ~ 3	Carrier medium failure and route deletion at AMHSLAND2 router
			8	1	Carrier medium restoration and route addition at AMHSLAND2 router
			9	1 ~ 2	Failure and recovery of AMHSLAND1 router (redundant configuration)
			10	1 ~ 2	Failure and recovery of AMHSLAND2 router
		4			**ATN Router Tests: Third Domain connected to AMHSLAND1**
			1	1 ~ 5	Router connection of ROUTER B to ROUTER A (ROUTER A–ROUTER C connection already established)
			2	1 ~ 5	Manual router disconnection at ROUTER A of ROUTER A–ROUTER B route
			3	1 ~ 4	Re-activation at ROUTER A of ROUTER A-ROUTER B route
			4	1 ~ 5	Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route
			5	1 ~ 4	Re-activation at ROUTER B of ROUTER A–ROUTER B route
			6	1 ~ 5	Router connection of ROUTER C to ROUTER A (ROUTER A-ROUTER B connection already established)
			7	1 ~ 5	Manual router disconnection at ROUTER C of ROUTER C–ROUTER A route
			8	1 ~ 4	Re-activation at ROUTER C of ROUTER C-ROUTER A route
			9	1 ~ 5	Manual router disconnection at ROUTER A of ROUTER C–ROUTER A route
			10	1 ~ 4	Re-activation at ROUTER A of ROUTER C–ROUTER A route
			11	1 ~ 3	Carrier medium failure of ROUTER A–ROUTER B circuit
			12	1 ~ 4	Carrier medium recovery of ROUTER A–ROUTER B circuit
			13	1 ~ 3	Carrier medium failure of ROUTER C–ROUTER A circuit
			14	1 ~ 4	Carrier medium recovery of ROUTER C–ROUTER A circuit
			15	1 ~ 2	Failure and recovery of ROUTER C
			16	1 ~ 2	Failure and recovery of ROUTER A
			17	1 ~ 2	Failure and recovery of ROUTER B
			18	1 ~ 6	End-to-End CLNP Echo Test between end systems in ROUTER C and ROUTER B domains (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)

6 Test Cases

The table below shows the protocol abbreviations used in sequence diagrams.

Table 23 Protocol Abbreviations

Abbreviation	Protocol	Name
SABM	LAPB	Set Asynchronous Balanced Mode
UA	LAPB	Acknowledgement frame
SQ	X.25	Restart Request
SI	X.25	Restart Indication
SF	X.25	Restart Confirmation
CR	X.25	Call Request
CC	X.25	Call Connected
CQ	X.25	Clear Request
CF	X.25	Clear Confirmation
OPEN PDU	IDRP	OPEN Protocol Data Unit
UPDATE PDU	IDRP	UPDATE Protocol Data Unit
KEEPALIVE PDU	IDRP	KEEPALIVE Protocol Data Unit
CEASE PDU	IDRP	CEASE Protocol Data Unit
ERQ NPDU	CLNP	Echo request Network PDU
ERP NPDU	CLNP	Echo response Network PDU
ER NPDU	CLNP	Error report Network PDU

6.1 Test Case 1: Router Connection Establishment and Maintenance

a) **Objective**

This test is to verify the establishment of LAPB data link, X.25 Virtual Circuit and IDRP connections between the AMHSLAND2 and AMHSLAND1 routers, the exchange of routing information by UPDATE PDUs, and the maintenance of the IDRP connection by the periodic exchange of KEEPALIVE PDUs. The test configuration is shown in Figure 4.

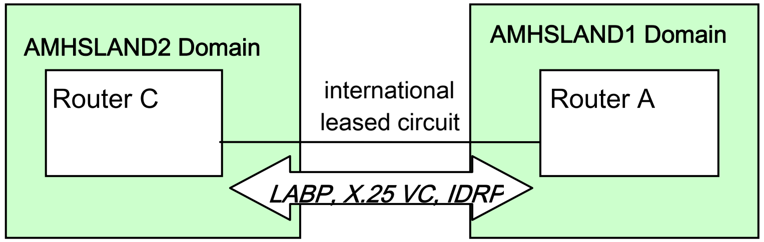


Figure 4 Configuration for router Connection & Maintenance Test

b) **Test Items**

- 1-1: Data link (LAPB) establishment
- 1-2: X.25 Virtual Circuit establishment
- 1-3: IDRP connection establishment (exchange of OPEN PDUs)
- 1-4: Exchange of routing information (exchange of UPDATE PDUs)
- 1-5: Maintenance of IDRP connection (exchange of KEEPALIVE PDUs)

Table 24 Router Connection Establishment & Maintenance Test Procedure

1. Router Connection Establishment & Maintenance		**Test Item**	**Procedure**	**Result**	**Date/Time**
Data link establishment	SABM transmission	1-1-1	Send SABM frame (address: 01) from ROUTER A and confirm ROUTER C receives it.	OK / NG	/ /
	UA transmission	1-1-2	Send UA frame (address: 03) from ROUTER C and confirm ROUTER A receives it and data link is established.	OK / NG	/ /
VC establishment	SQ transmission	1-2-1	Confirm ROUTER A sends SQ packet and ROUTER C receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	SI transmission	1-2-2	After receiving SQ packet from ROUTER A, confirm ROUTER C sends SI packet and ROUTER A receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	CR transmission	1-2-3	Confirm ROUTER A sends CR packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER C receives it.	OK / NG	/ /
	CC transmission	1-2-4	Confirm ROUTER C sends CC packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER A receives it, and VC is established.	OK / NG	/ /
IDRP connection establishment	OPEN PDU transmission from ROUTER A	1-3-1	After VC establishment, confirm ROUTER A sends an OPEN PDU. Confirm ROUTER C receives it.	OK / NG	/ /
	OPEN PDU transmission from ROUTER C	1-3-2	After receiving OPEN PDU from ROUTER A, confirm ROUTER C sends an OPEN PDU. Confirm that ROUTER A receives it, and IDRP connection is established.	OK / NG	/ /

1. Router Connection Establishment & Maintenance		**Test Item**	**Procedure**	**Result**	**Date/Time**
UPDATE PDU transmission	UPDATE PDU transmission from ROUTER A	1-4-1	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and routing information for ROUTER A is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C	1-4-2	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and routing information for ROUTER C is added.	OK / NG	/ /
IDRP connection maintenance	KEEPALIVE PDU transmission from ROUTER A	1-5-1	After IDRP connection established, confirm ROUTER A sends a KEEPALIVE PDU to ROUTER C every 60 seconds. At ROUTER C, confirm routing information received from ROUTER A is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /
	KEEPALIVE PDU transmission from ROUTER C	1-5-2	After IDRP connection established, confirm ROUTER C sends a KEEPALIVE PDU to ROUTER A every 60 seconds. At ROUTER A, confirm routing information received from ROUTER C is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /

Test No.			Sequence Diagram
			Router A / Router C
1	1	1	SABM
1	1	2	UA
			SQ
1	2	1	SI
1	2	2	CR
1	2	3	CC
1	2	4	OPEN PDU
1	3	1	OPEN PDU
1	3	2	UPDATE PDU
1	4	1	UPDATE PDU
1	4	2	Confirm Result / Confirm Result
1	5	1	KEEPALIVE PDU, KEEPALIVE PDU
1	5	2	KEEPALIVE PDU, KEEPALIVE PDU; Confirm Result / Confirm Result

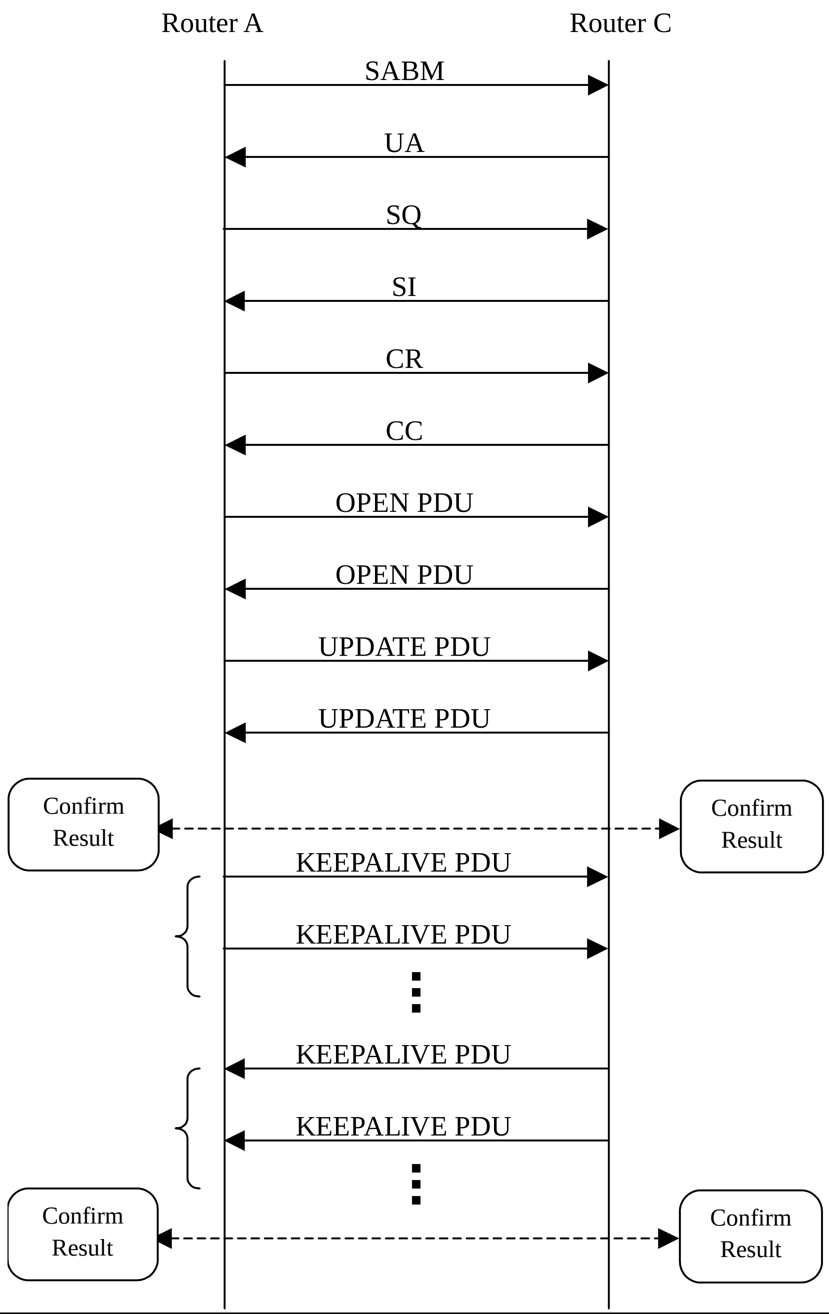


Figure 5 Sequence: Router Connection Establishment and Maintenance

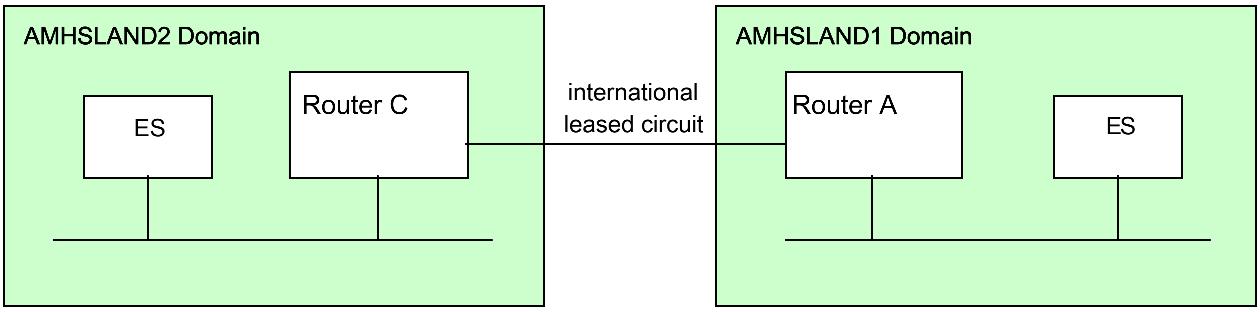
6.2 Test Case 2 : NPDU Relay

a) **Overview**

This test uses the CLNP Echo function to test correct relay and routing of CLNP NPDUs by the AMHSLAND2 and AMHSLAND1 routers. End Systems in both domains are used to verify end-to-end transmission of CLNP PDUs via the routers. The test configuration is shown in Figure 4. The test verifies the following:

(i) CLNP Echo Request/Echo Response function of both routers.
(ii) Relay of CLNP NPDUs by routers to the peer domain.
(iii) ER-PDU returned by peer router when sending a CLNP NPDU to an unknown address in the peer domain.
(iv) Non-relay of CLNP PDUs with incorrect security parameter by own domain router.

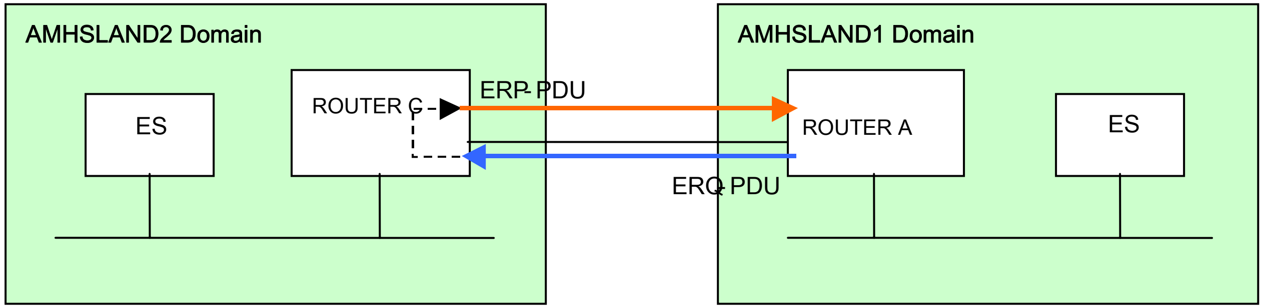
Figure 6 NPDU Transmission and Relay Test Configuration



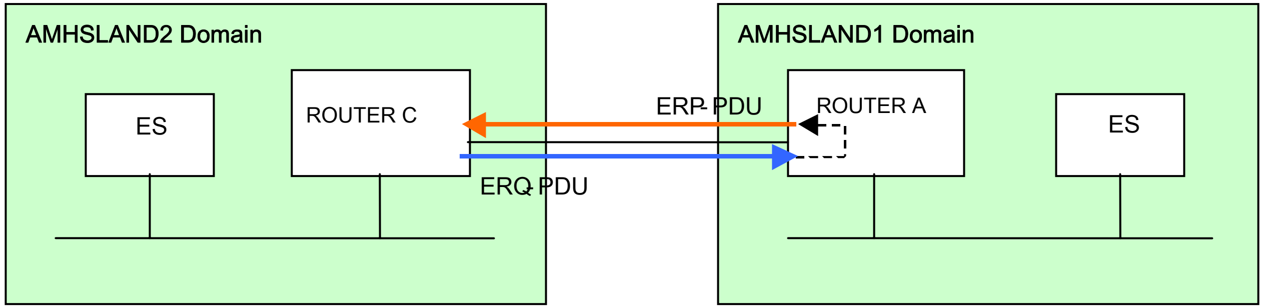
b) **Test Items**

Note: Some of these test items may not be carried out, depending on the capability of End Systems in each domain in to transmit ERQ-PDUs.

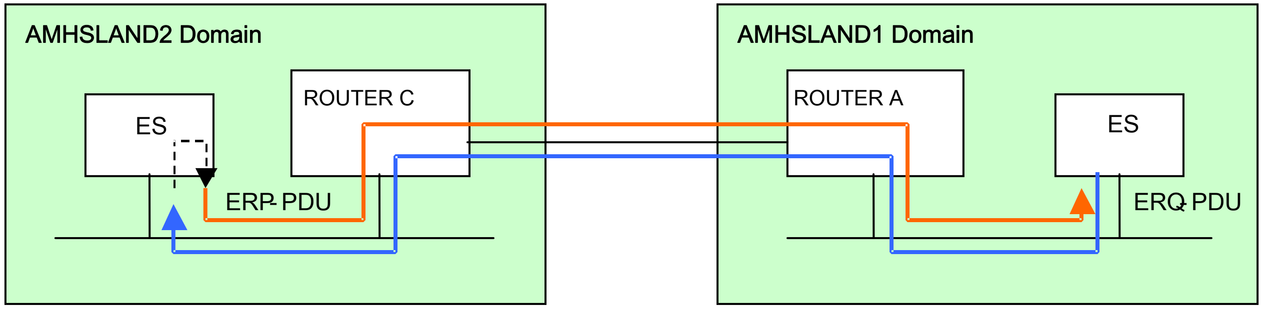
- 2-1: CLNP Echo from AMHSLAND1 router to AMHSLAND2 router.



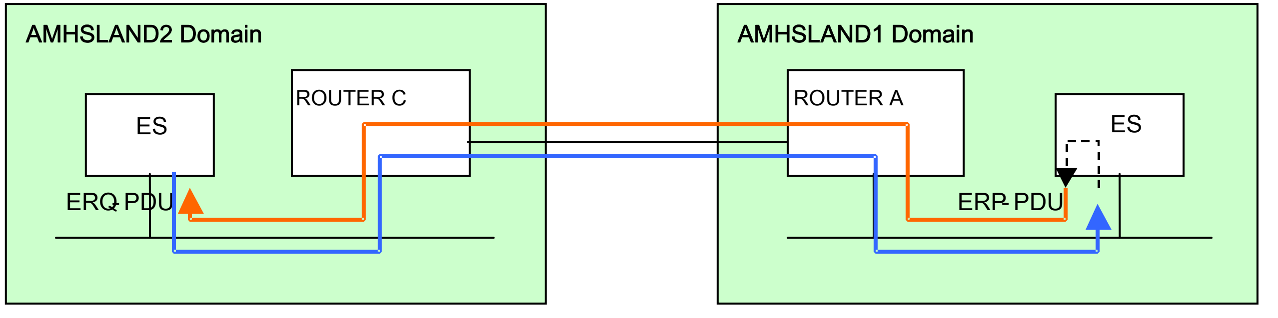
- 2-2: CLNP Echo from AMHSLAND2 router to AMHSLAND1 router.



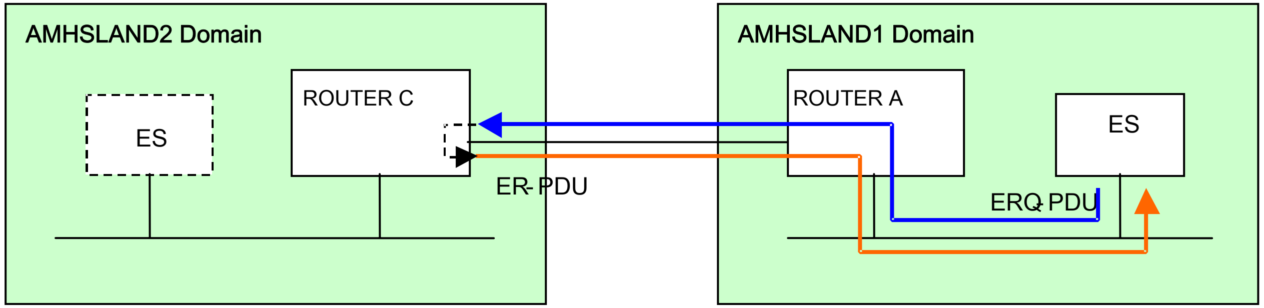
- 2-3: CLNP Echo from AMHSLAND1 End System to valid destination at AMHSLAND2.



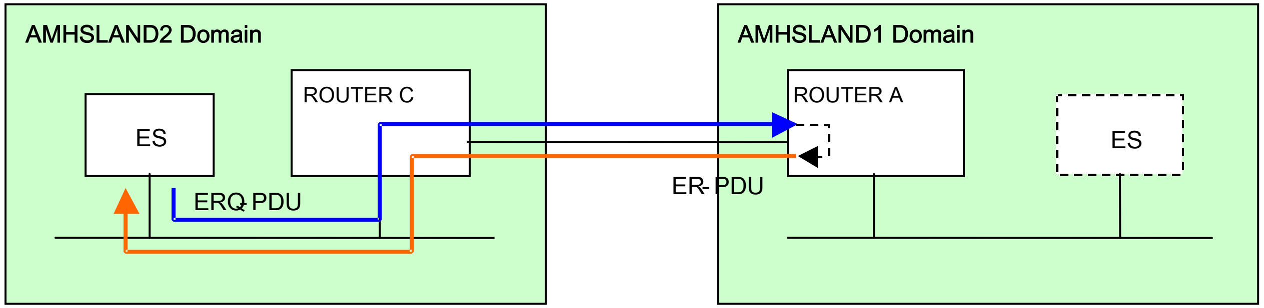
- 2-4: CLNP Echo from AMHSLAND2 End System to valid destination at AMHSLAND1.



- 2-5: CLNP Echo from AMHSLAND1 End System to unreachable AMHSLAND2 End System.

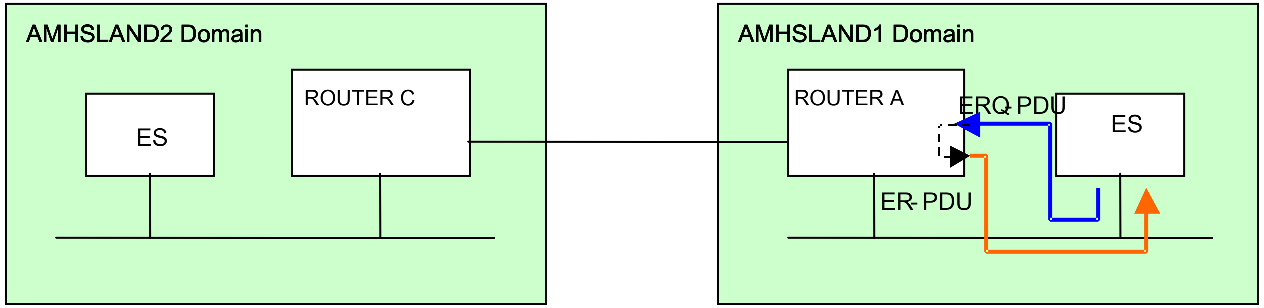


- 2-6: CLNP Echo from AMHSLAND2 End System to unreachable AMHSLAND1 End System.



- 2-7: Routing process in AMHSLAND1 router for NPDU with invalid security parameter.

Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.



- 2-8: Routing process in AMHSLAND2 router for NPDU with invalid security parameter.

Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.

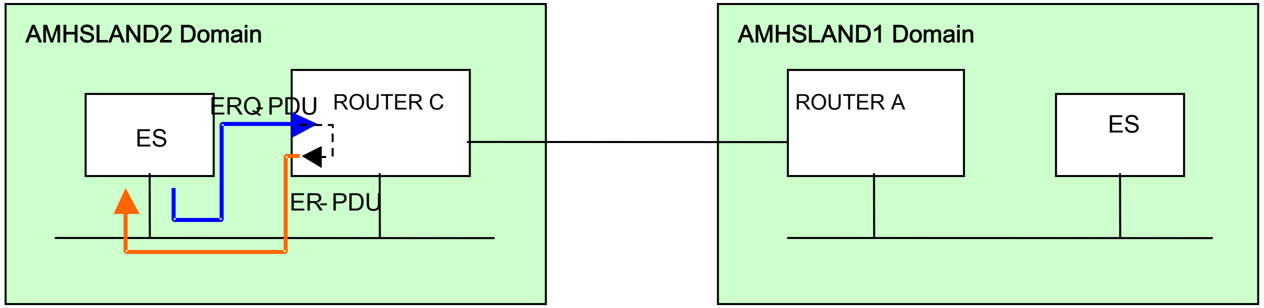


Table 25 NPDU Relay Test Procedure

2. NPDU Relay		**Test Item**	**Procedure**	**Result**	**Date/Time**
ERQ NPDU transmission from AMHSLAND1 router	ERQ NPDU transmission	2-1-1	Send ERQ NPDU from ROUTER A to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	ERP NPDU transmission	2-1-2	After receiving ERQ NPDU, ROUTER C sends ERP NPDU to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-1-3	Repeat from 2-1-1 to 2-1-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 router	ERQ NPDU transmission	2-2-1	Send ERQ NPDU from ROUTER C to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	ERP NPDU transmission	2-2-2	After receiving ERQ NPDU, ROUTER A sends an ERP NPDU to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-2-3	Repeat from 2-2-1 to 2-2-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND1 ES	ERQ NPDU transmission	2-3-1	Send ERQ NPDU from AMHSLAND1 ES to AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	ERP NPDU transmission	2-3-2	After receiving ERQ NPDU, the AMHSLAND2 ES sends an ERP NPDU to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-3-3	Repeat from 2-3-1 to 2-3-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 ES	ERQ NPDU transmission	2-4-1	Send ERQ NPDU from the AMHSLAND2 ES to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /
	ERP NPDU transmission	2-4-2	After receiving ERQ NPDU, the AMHSLAND1 ES sends an ERP NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-4-3	Repeat from 2-4-1 to 2-4-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /

2. NPDU Relay		**Test Item**	**Procedure**	**Result**	**Date/Time**
ERQ NPDU transmission from AMHSLAND1 ES to unreachable system in AMHSLAND2 domain	ERQ NPDU transmission from AMHSLAND1 ES	2-5-1	AMHSLAND1 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND2 domain. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND2 router	2-5-2	Confirm that ROUTER C discards the ERQ NPDU from AMHSLAND1 ES. Confirm that ROUTER C sends an ER NPDU to the AMHSLAND1 ES, and that the AMHSLAND1 ES receives it.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 ES to unreachable system in AMHSLAND1 domain	ERQ NPDU transmission from AMHSLAND2 ES	2-6-1	AMHSLAND2 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND1 domain. Confirm ROUTER A receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND1 router	2-6-2	Confirm that ROUTER A discards the ERQ NPDU. Confirm that ROUTER A sends an ER NPDU to the AMHSLAND2 ES, and that the AMHSLAND2 ES receives it.	OK / NG	/ /
Routing process in AMHSLAND1 router for NPDU with invalid security option parameter	ERQ NPDU transmission from AMHSLAND1 ES	2-7-1	AMHSLAND1 ES sends an ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND2 ES. Confirm ROUTER A receives it.	OK / NG	/ /
	ERQ NPDU processing in AMHSLAND1 router	2-7-2	Confirm ROUTER A discards ERQ NPDU and sends an ER NPDU to AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives the ER NPDU.	OK / NG	/ /

2. NPDU Relay		**Test Item**	**Procedure**	**Result**	**Date/Time**
Routing process in AMHSLAND2 router for NPDU with invalid security option parameter	ERQ NPDU transmission from AMHSLAND2 ES	2-8-1	AMHSLAND2 ES sends ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND1 ES. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU processing in AMHSLAND2 router	2-8-2	Confirm ROUTER C discards ERQ NPDU and ROUTER C sends an ER NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives the ER NPDU.	OK / NG	/ /

Test No.			Sequence Diagram
2	1	1	
2	1	2	
2	1	3	
2	2	1	
2	2	2	
2	2	3	

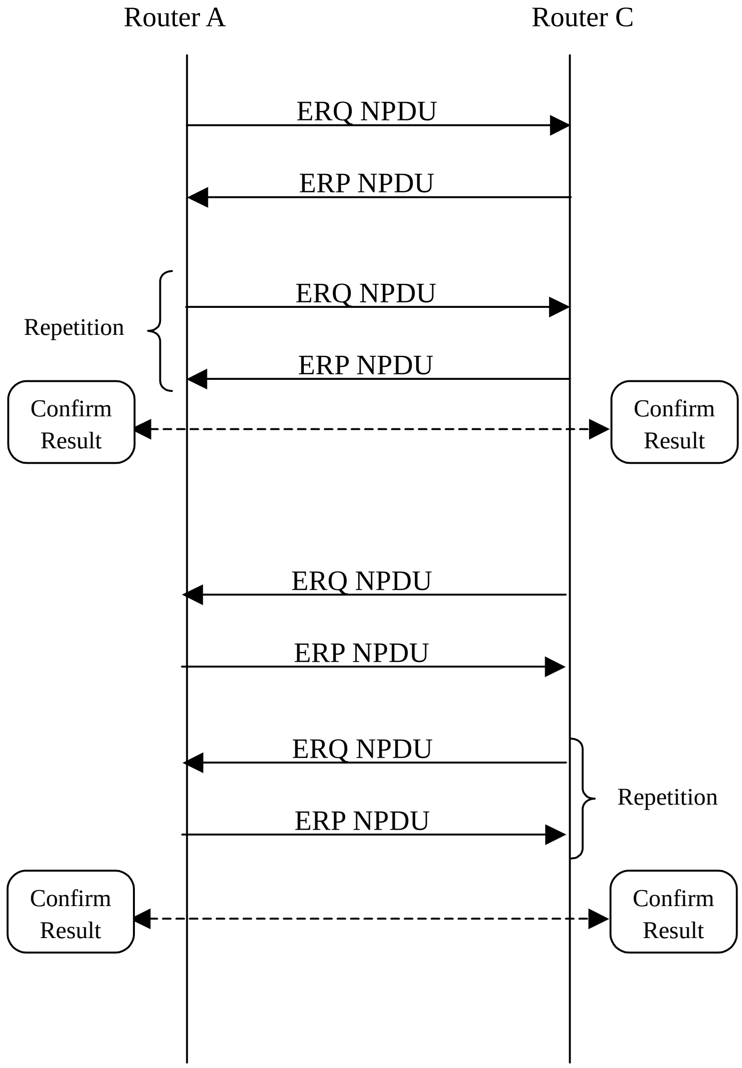


Figure 7 Sequence: NPDU Transmission between Routers

Test No.			Sequence Diagram
2	3	1	
2	3	2	
2	3	3	
2	4	1	
2	4	2	
2	4	3	

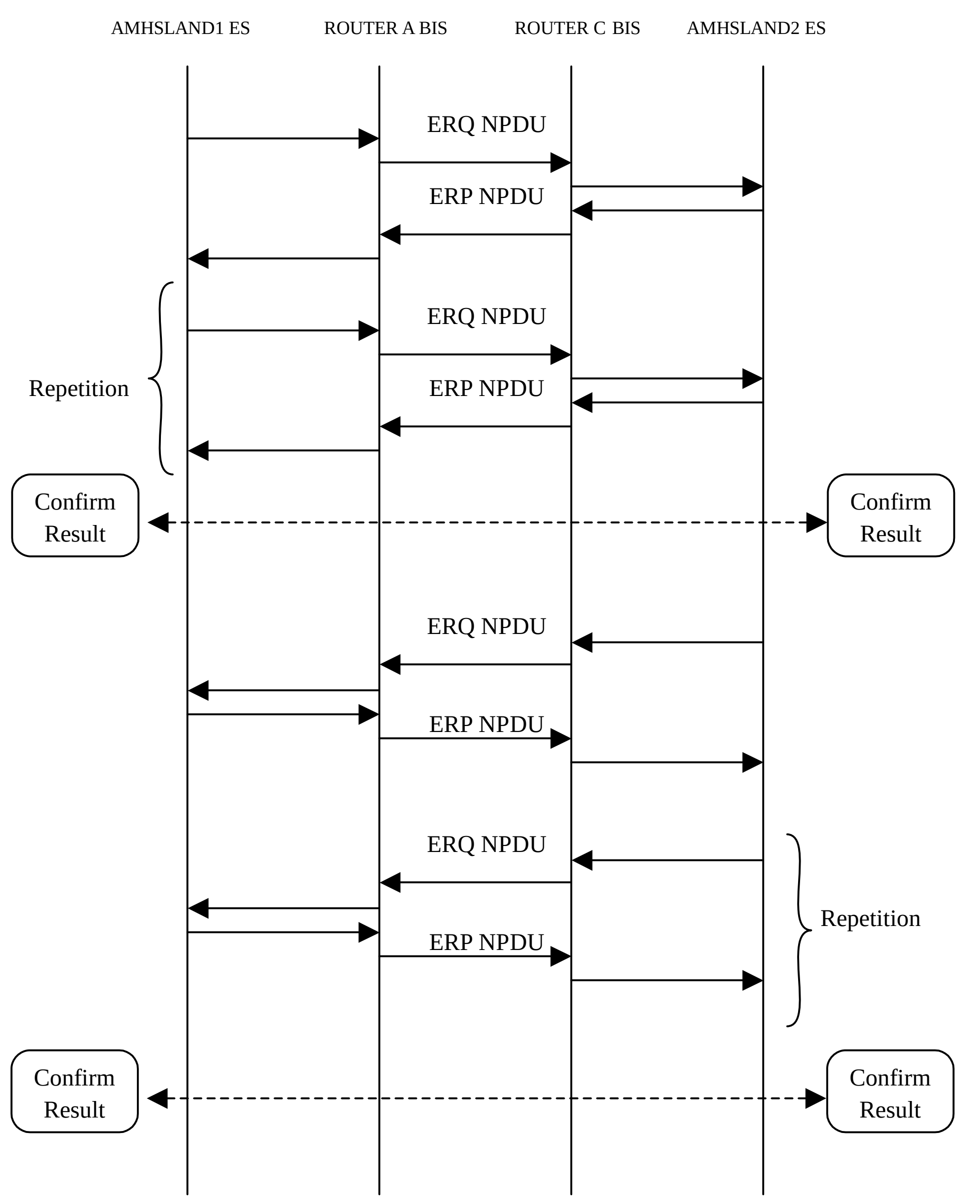


Figure 8 Sequence: NPDU Transmission between End Systems

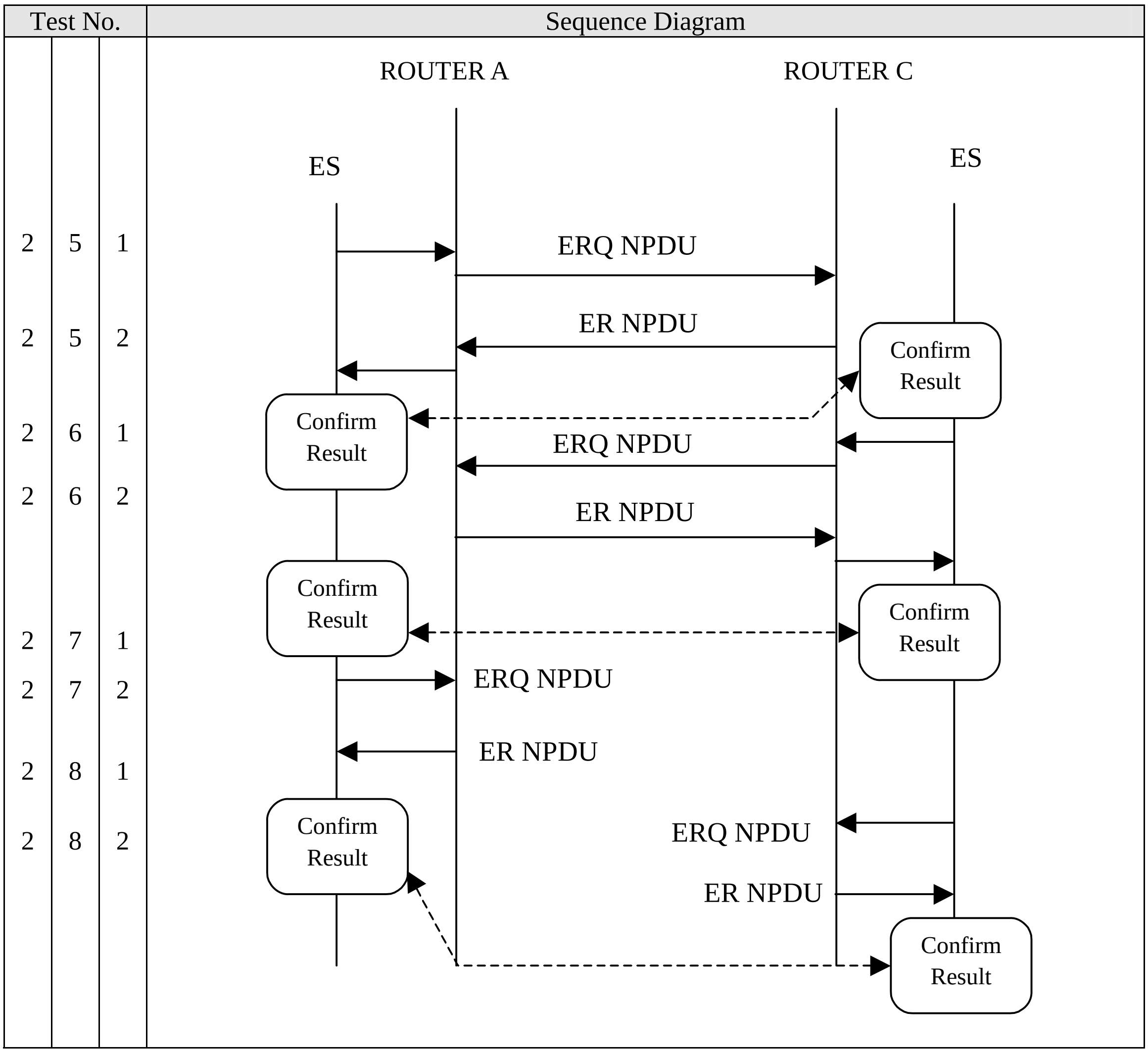


Figure 9 Sequence: NPDU Transmission to Unreachable ES and Handling of NPDU with Invalid Security Parameter

6.3 Test Case 3: Router End-to-End Tests

a) **Objective**

Technical trial to verify the automatic updating of routing tables in the ATN routers through IDRP protocol with routers connecting in end-to-end configuration between AMHSLAND1 and AMHSLAND2.

b) **Test Configuration**

The configuration for this test is shown in Figure 8.

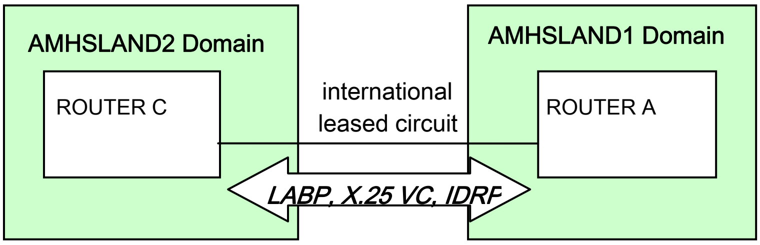


Figure 10 Router End-to-End Test Configuration

c) **Test Item Overview**

3-1: Manual router disconnection at AMHSLAND1 router and route deletion
3-2: Route addition (re-activation of connection) from AMHSLAND1 router
3-3: Manual router disconnection at AMHSLAND2 router and route deletion
3-4: Route addition (re-activation of connection) from AMHSLAND2 router
3-5: Carrier medium failure and route deletion at AMHSLAND1 router
3-6: Carrier medium restoration and route addition at AMHSLAND1 router
3-7: Carrier medium failure and route deletion at AMHSLAND2 router
3-8: Carrier medium restoration and route addition at AMHSLAND2 router
3-9: Failure and recovery of AMHSLAND1 router (redundant configuration)
3-10: Failure and recovery of AMHSLAND2 router

Note:

A detailed test of normal router connection (LAPB, X.25 VC and IDRP) is carried out in Test Items 1-1 through 1-5, and so is not repeated here.

Table 26 Router End-to-End Tests Test Procedure

3. Router End-to-End Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Manual router disconnection at AMHSLAND1 router and route deletion	CEASE PDU transmission from AMHSLAND1 router	3-1-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends CEASE PDU.	OK / NG	/ /
	CEASE PDU transmission from AMHSLAND2 router and route deletion	3-1-2	Confirm ROUTER C receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER C sends CEASE PDU to ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND1 router	3-1-3	Confirm that ROUTER A receives CEASE PDU from ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	CQ transmission	3-1-4	After IDRP disconnected, confirm ROUTER A sends CQ packet to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	CF transmission	3-1-5	After receiving CQ packet, confirm ROUTER C sends CF packet to ROUTER A. Confirm ROUTER A receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND1 router	Router connection restoration after disconnection	3-2-1	At ROUTER A, manually initiate router connection with ROUTER C. (VC call: originate, OPEN PDU: send.) Confirm the router connection is re-established.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Manual router disconnection at AMHSLAND2 router and route deletion	CEASE PDU transmission from AMHSLAND2 router	3-3-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends CEASE PDU.	OK / NG	/ /
	CEASE PDU transmission from AMHSLAND1 router and route deletion	3-3-2	Confirm ROUTER A receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER A sends CEASE PDU to ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND2 router	3-3-3	Confirm that ROUTER C receives CEASE PDU from ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	CQ transmission	3-3-4	After IDRP disconnected, confirm ROUTER C sends CQ packet to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	CF transmission	3-3-5	After receiving CQ packet, confirm ROUTER A sends CF packet to ROUTER C. Confirm ROUTER C receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND2 router	Router connection restoration after disconnection	3-4-1	At ROUTER C, manually initiate router connection to ROUTER A. (VC call: receive, OPEN PDU: receive.) Confirm the router connection is re-established.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND1 router	Data link and VC disconnection	3-5-1	At ROUTER A, simulate a circuit failure by physically disconnecting ROUTER A from the DSU/modem. Confirm that the data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-5-2	After circuit failure, confirm IDRP connection at ROUTER A is closed.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-5-3	After circuit failure, confirm IDRP connection at ROUTER C is closed when the IDRP holding timer expires.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Carrier medium restoration and route addition at AMHSLAND1 router	Data link, VC, and router connection re-establishment	3-6-1	At ROUTER A, restore the circuit by re-connecting ROUTER A to the DSU/modem. Confirm router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND2 router	Data link and VC disconnection	3-7-1	At ROUTER C, simulate a circuit failure by disconnecting the leased line circuit from the modem. Confirm data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-7-2	After circuit failure, confirm IDRP connection at ROUTER C is closed when the IDRP holding timer expires.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-7-3	After circuit failure, confirm IDRP connection at ROUTER A is closed.	OK / NG	/ /
Carrier medium restoration and route addition at AMHSLAND2 router	Data link, VC, and router connection re-establishment	3-8-1	At ROUTER C, restore circuit. Confirm the router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Failure and recovery of AMHSLAND1 router	Failover from active to standby node	3-9-1	At ROUTER A, force failover from active node (#1) to standby node (#2) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
	Failover back to previous active node	3-9-2	At ROUTER A, force failover from active node (#2) to standby node (#1) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

3. Router End-to-End Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Failure and recovery of AMHSLAND2 router	Failover from active to standby node	3-10-1	At ROUTER C, force failover from active node (#1) to standby node (#2). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
	Failover back to previous active node	3-10-2	At ROUTER C, force failover from active node (#2) to standby node (#1). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

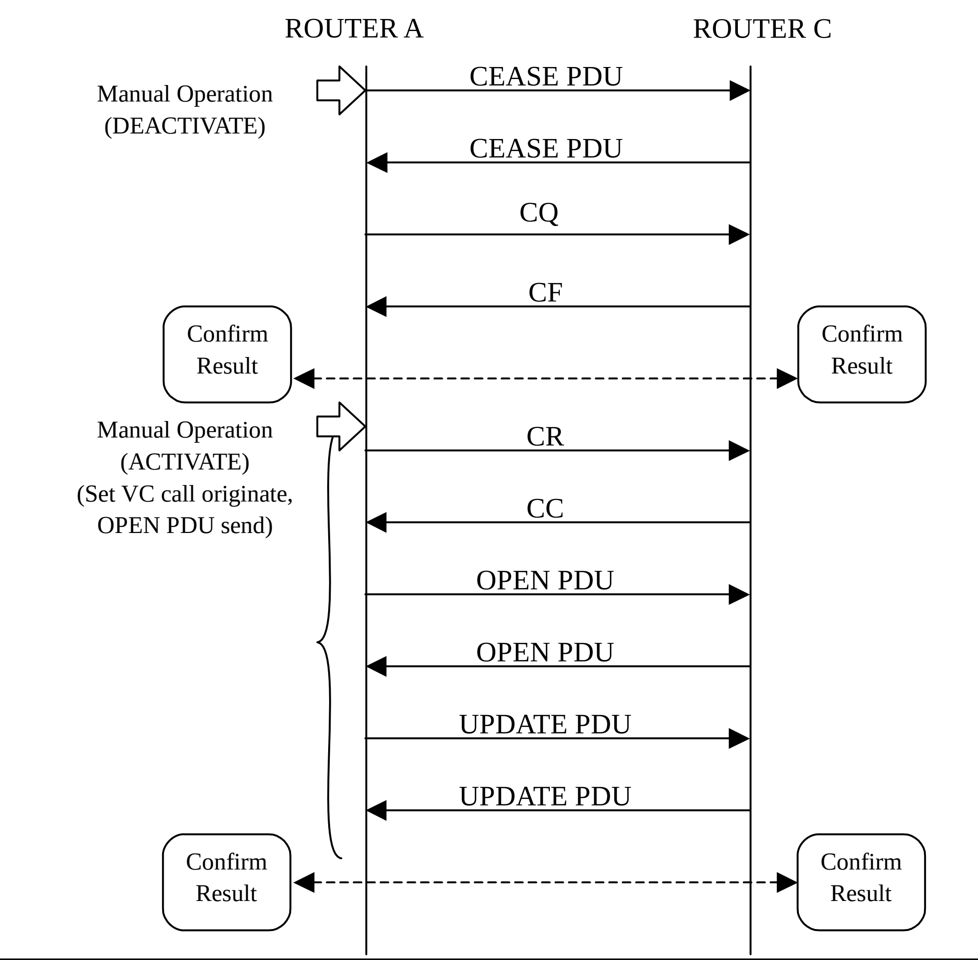
Test No.			Sequence Diagram
3	1	1	
3	1	2	
3	1	3	
3	1	4	
3	1	5	
3	2	1	

Figure 11 Sequence: Manual router Disconnection and Re-connection at AMHSLAND1 router

Test No.			Sequence Diagram
3	3	1	
3	3	2	
3	3	3	
3	3	4	
3	3	5	
3	4	1	

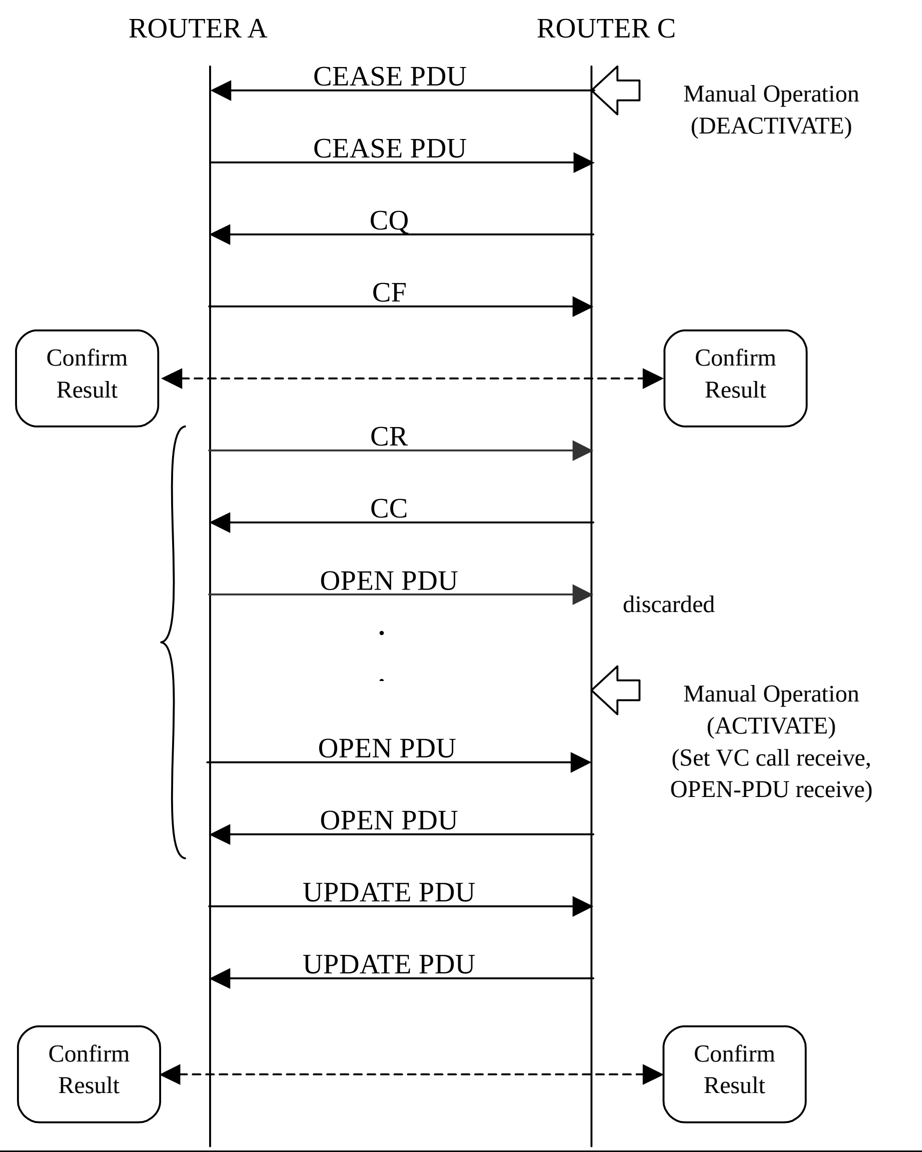


Figure 12 Sequence: Manual router Disconnection and Re-connection at AMHSLAND2 router

Test No.			Sequence Diagram
3	5	1	
3	5	2	
3	5	3	
3	6	1	

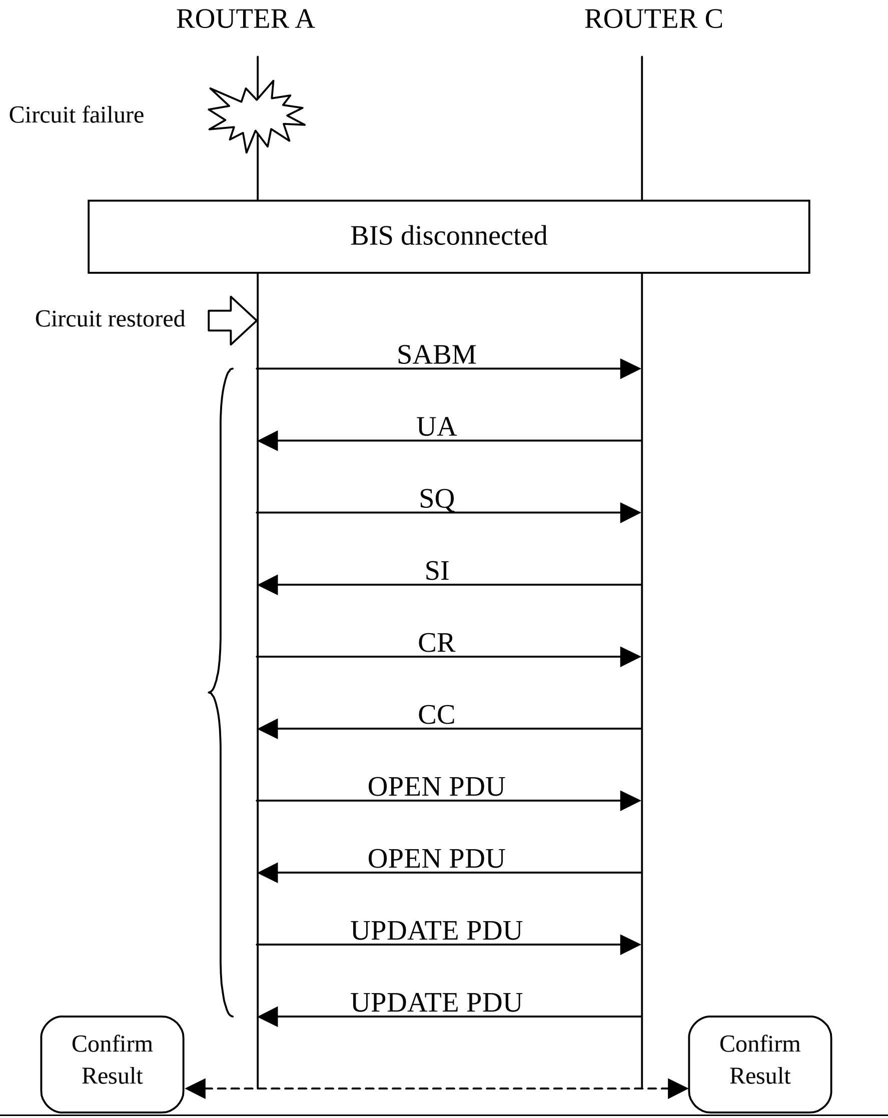


Figure 13 Sequence: Carrier medium failure and recovery at AMHSLAND1 router

Test No.			Sequence Diagram
3	7	1	
3	7	2	
3	7	3	
3	8	1	

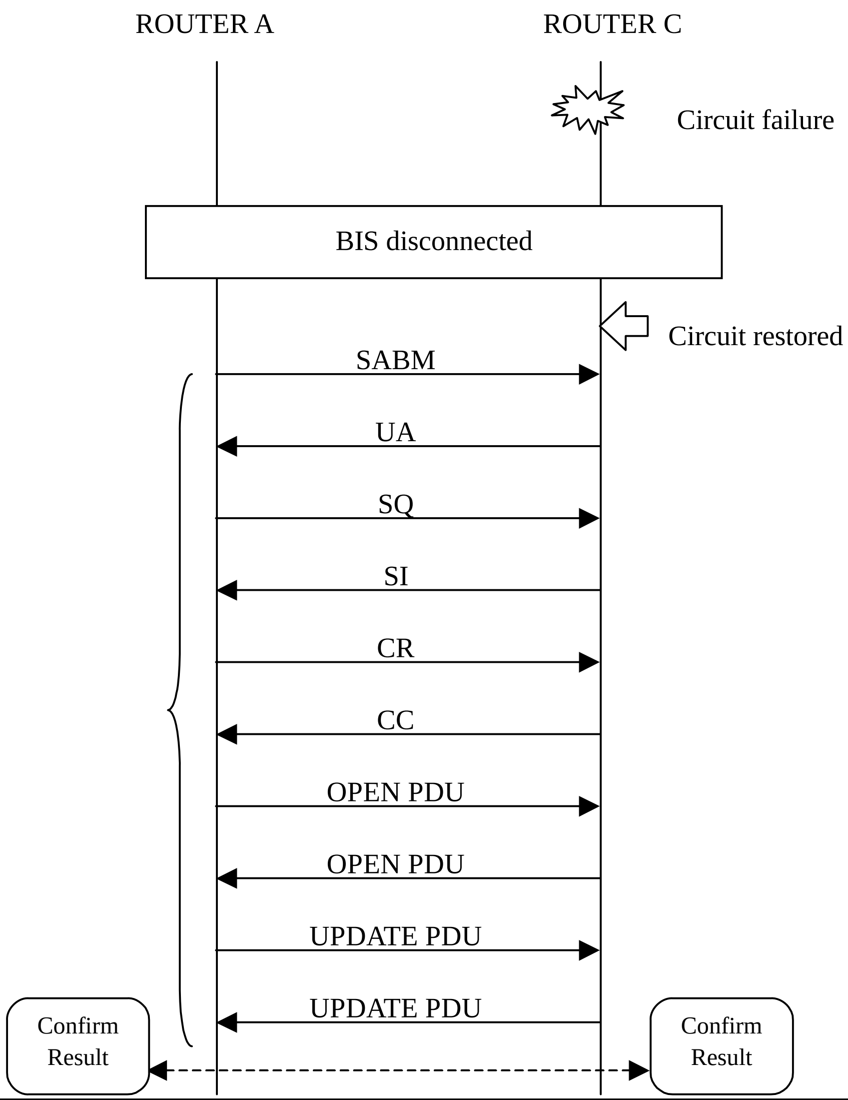


Figure 14 Sequence: Carrier medium failure and recovery at AMHSLAND2 router

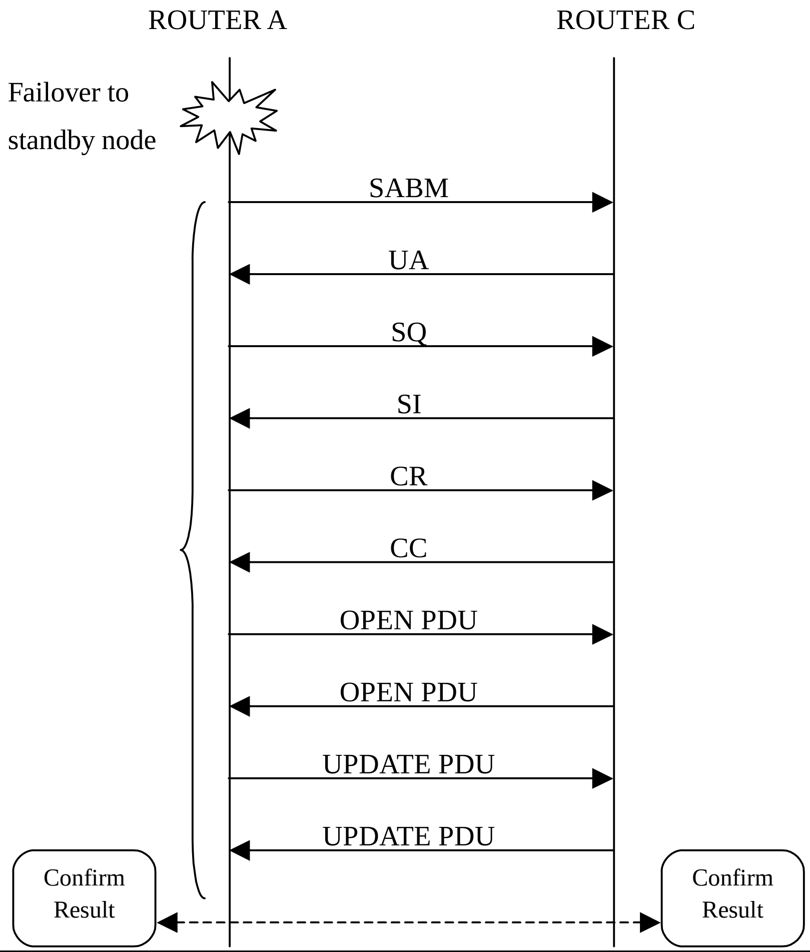
Test No.			Sequence Diagram
3 3	9 9	1 2	

Figure 15 Sequence: AMHSLAND1 router Failure and Recovery

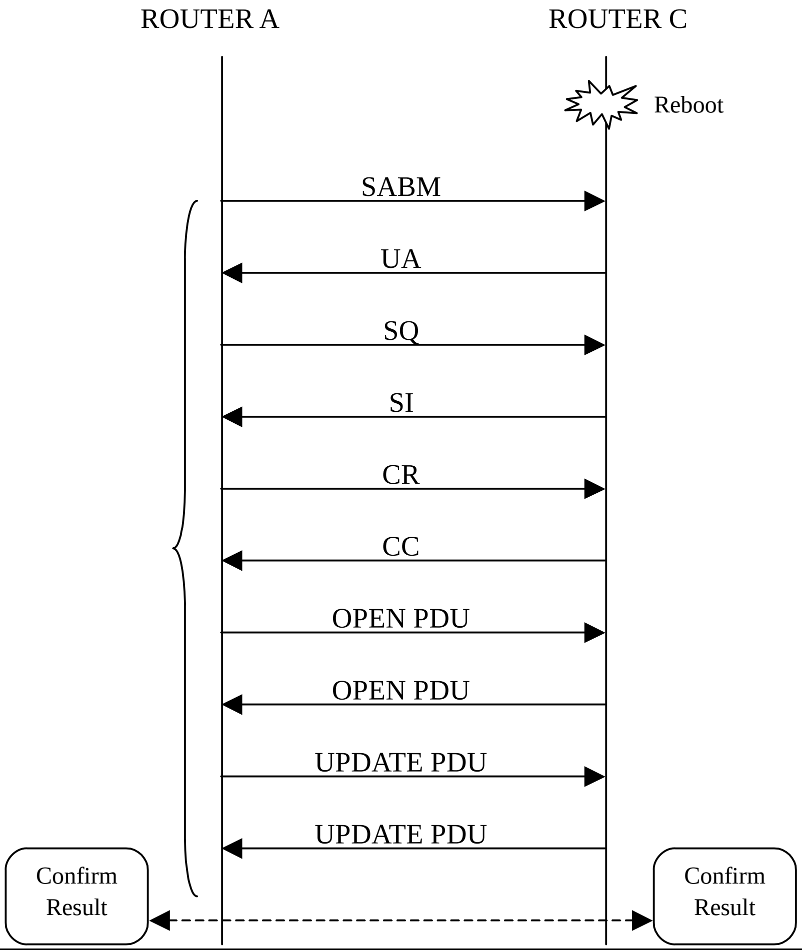
Test No.			Sequence Diagram
3	10	1	
3	10	2	

Figure 16 Sequence: AMHSLAND2 router Failure and Recovery

6.4 Test Case 4: ATN Router Tests (This cover additional tests for subnetwork)

a) **Objective**

Technical trial to verify the automatic updating of routing tables in ATN routers through the IDRP protocol with routers connected in 3routers configurations between AMHSLAND1, AMHSLAND2 and simulated third domains connected to AMHSLAND1 and AMHSLAND2. The test configurations are shown below.

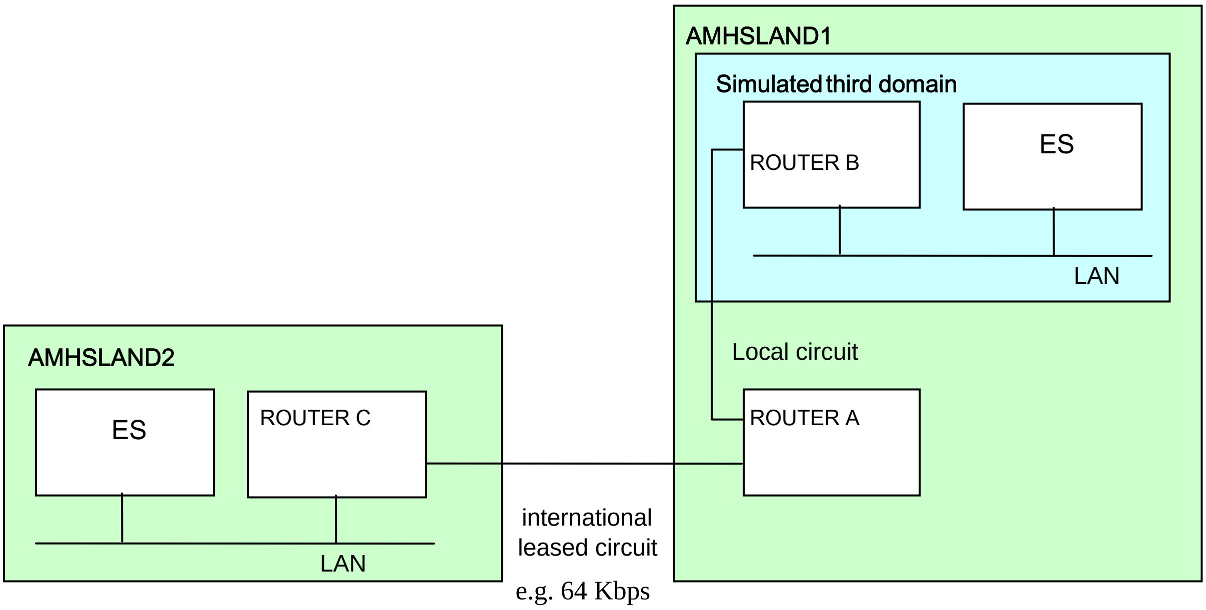


Figure 17 Test Configuration: Simulated Third Domain connected to AMHSLAND1

b) **Test Overview**

(i) Simulated third domain connected to AMHSLAND1.

ROUTER CONNECTION, DISCONNECTION AND RE-ACTIVATION

4-1:	Router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C already established).
4-2, 4-3:	Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.
4-4, 4-5:	Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.
4-6:	Router connection of ROUTER C to ROUTER A (ROUTER B-ROUTER A already established).
4-7, 4-8:	Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation.
4-9, 4-10:	Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation.

COMMUNICATION CIRCUIT FAILURE AND RECOVERY

4-11, 4-12:	Failure and recovery of ROUTER A-ROUTER B circuit.
4-13, 4-14:	Failure and recovery of ROUTER C-ROUTER A circuit.

ROUTER FAILURE AND RECOVERY

4-15:	Failure and recovery of ROUTER C.
4-16:	Failure and recovery of ROUTER A.
4-17:	Failure and recovery of ROUTER B.

END-TO-END DATA RELAY

4-18:	End-to-End CLNP Echo Test between End Systems in ROUTER C and ROUTER B domains. (Subject to End System ERQ-PDU transmission capabilities.)

Table 27 Router Connection, Disconnection and Re-activation Test Procedure: Router A – Router B

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Router connection of ROUTER B to ROUTER A	Data link establishment between ROUTER A and ROUTER B	4-1-1	With VC and IDRP connections established between ROUTER C and ROUTER A, switch on ROUTER B to initiate router connection. Check and confirm data link and VC are established between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP connection establishment between ROUTER A and ROUTER B	4-1-2	After VC establishment, check and confirm IDRP connection established between ROUTER A and ROUTER B by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-1-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-1-4	After IDRP connection established, confirm ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check and confirm route information of ROUTER B is updated correctly.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-1-5	At ROUTER A, after receiving UPDATE PDU from ROUTER B, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received, and that route information of ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER A	4-2-1	At ROUTER A, manually close the router connection to ROUTER B. Confirm ROUTER A sends a CEASE PDU to ROUTER B.	OK / NG	/ /
	CEASE PDU transmission from ROUTER B and route deletion	4-2-2	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /
	Route deletion at ROUTER A	4-2-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
	VC disconnection between ROUTER A and ROUTER B	4-2-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-2-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-3-1	At ROUTER A, manually initiate router connection to ROUTER B (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-3-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-3-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, check that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-3-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that route information to ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER B	4-4-1	At ROUTER B, manually close the router connection to ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	4-4-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B. Confirm ROUTER A sends CEASE PDU to ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER B	4-4-3	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /
	VC disconnection between ROUTER A and ROUTER B	4-4-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-4-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER B	Router connection re-activation from ROUTER B	4-5-1	At ROUTER B, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-5-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-5-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-5-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /

<table>
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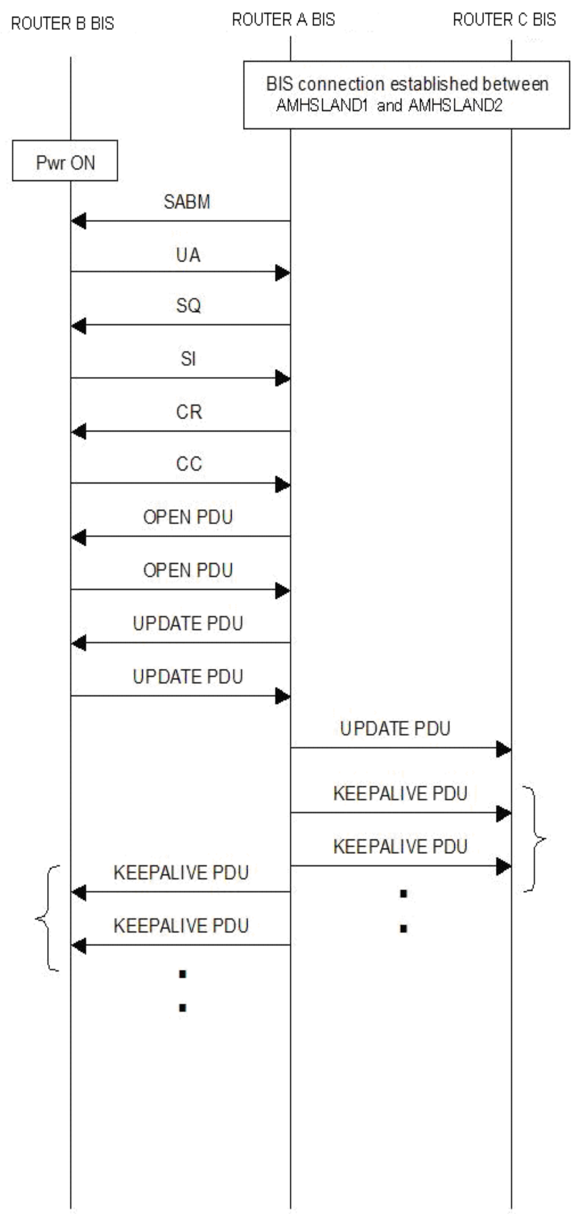
<tr><td>4</td><td>1</td><td>1</td><td rowspan="5">
</td></tr>
<tr><td>4</td><td>1</td><td>2</td></tr>
<tr><td>4</td><td>1</td><td>3</td></tr>
<tr><td>4</td><td>1</td><td>4</td></tr>
<tr><td>4</td><td>1</td><td>5</td></tr>
</table>

Figure 18 Sequence: router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C already established)

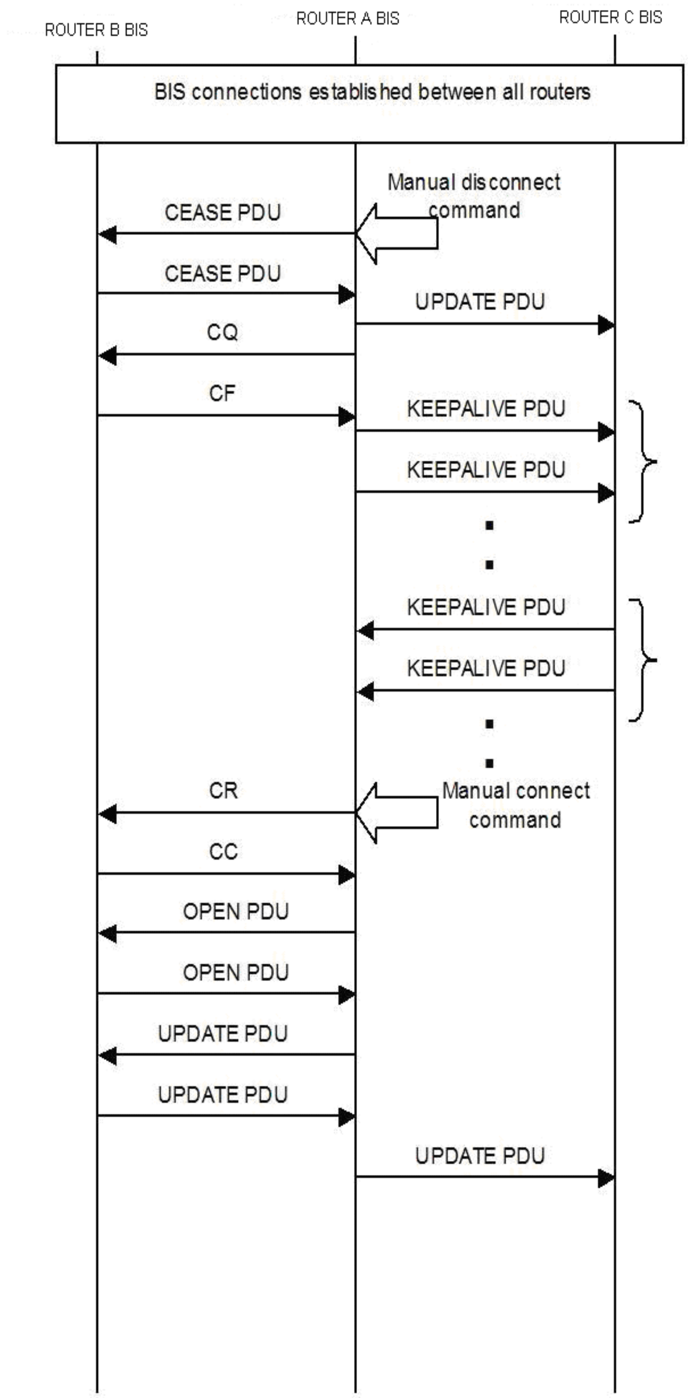
Test No.			Sequence Diagram
4	2	1	
4	2	2	
4	2	3	
4	2	4	
4	2	5	
4	3	1	
4	3	2	
4	3	3	
4	3	4	

Figure 19 Sequence: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.

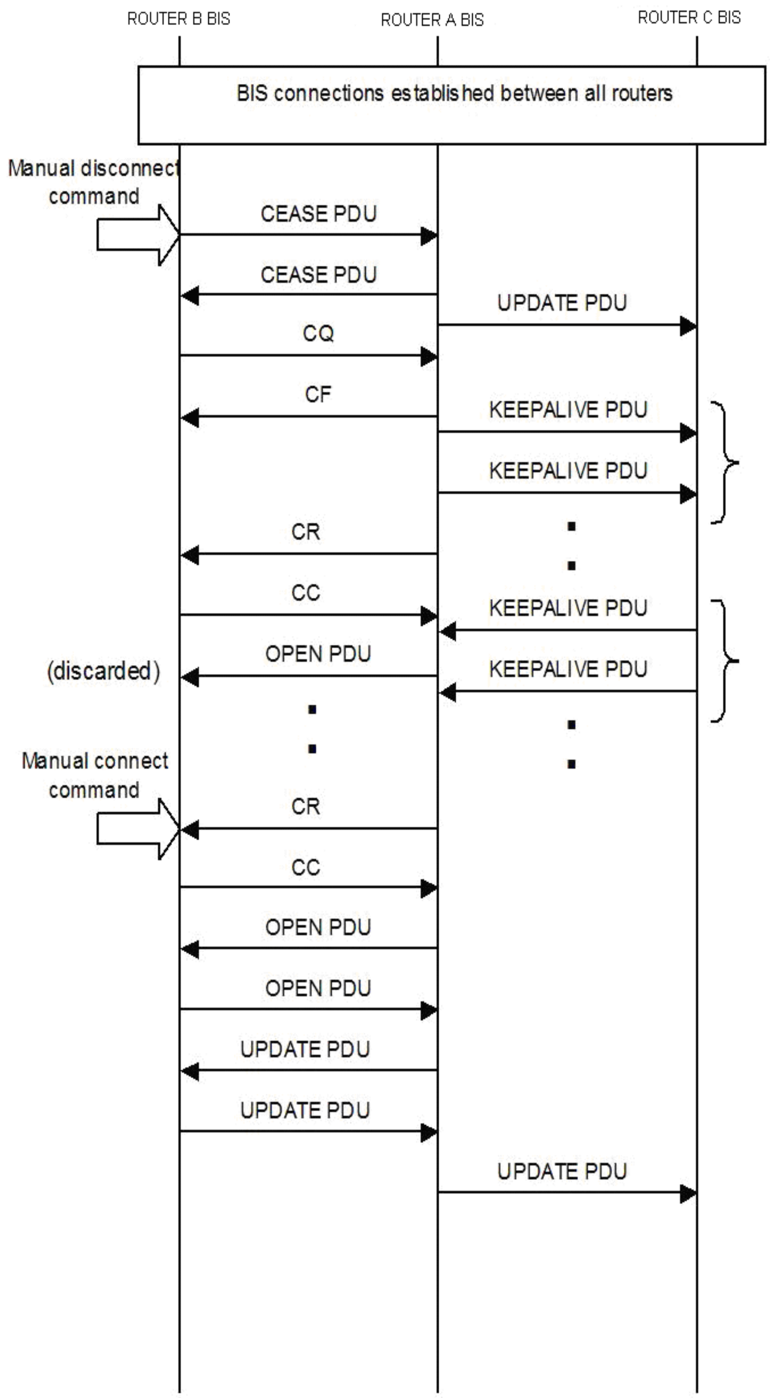
Test No.			Sequence Diagram
4	4	1	
4	4	2	
4	4	3	
4	4	4	
4	4	5	
4	5	1	
4	5	2	
4	5	3	
4	5	4	

Figure 20 Sequence: Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.

Table 28 Router Connection, Disconnection and Re-activation Test Procedure: ROUTER C-ROUTER A

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Router connection of ROUTER C to ROUTER A	Data link establishment between ROUTER C and ROUTER A	4-6-1	With VC and IDRP connections established between ROUTER A and ROUTER B, at ROUTER A, initiate router connection to ROUTER C. Check and confirm data link and VC are established between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP connection establishment between ROUTER C and ROUTER A	4-6-2	After VC establishment, check and confirm IDRP connection established between ROUTER C and ROUTER A by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-6-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-6-4	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm route information of ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-6-5	At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, confirm that route information of ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER C	4-7-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	4-7-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C. Confirm ROUTER A sends CEASE PDU to ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER C	4-7-3	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-7-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-7-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER C	Router connection re-activation from ROUTER C	4-8-1	At ROUTER C, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-8-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-8-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-8-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER A	4-9-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends a CEASE PDU to ROUTER C.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	CEASE PDU transmission from ROUTER C and route deletion	4-9-2	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	Route deletion at ROUTER A	4-9-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-9-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-9-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-10-1	At ROUTER A, manually initiate router connection to ROUTER C (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-10-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-10-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-10-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /

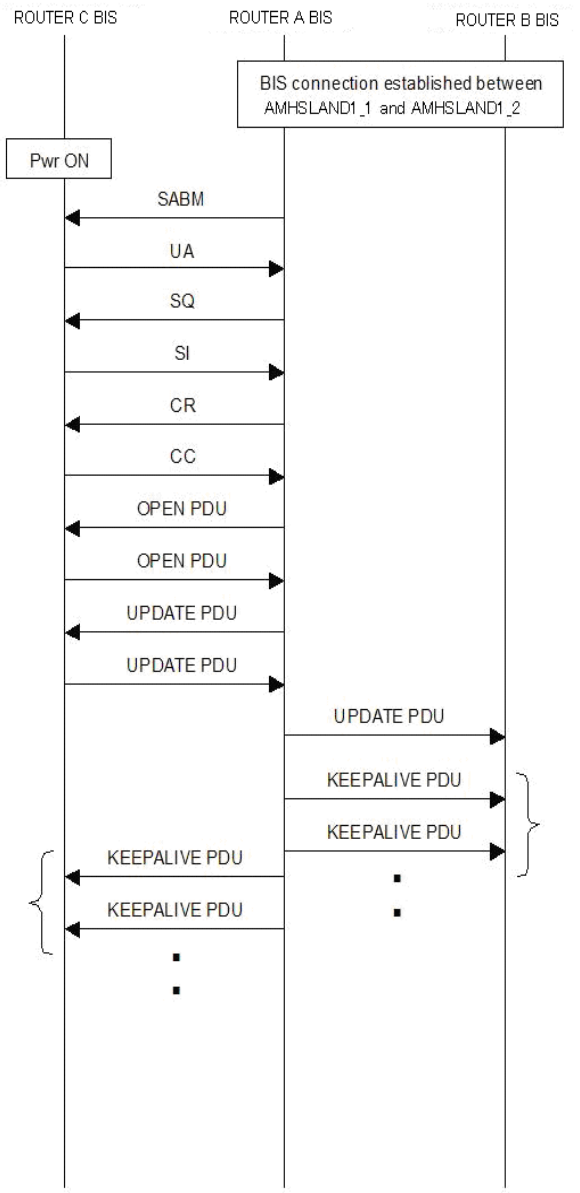
Test No.			Sequence Diagram
4	6	1	
4	6	2	
4	6	3	
4	6	4	
4	6	5	

Figure 21 Sequence: Router connection of ROUTER C to ROUTER A (ROUTER B-ROUTER A already established)

Test No.			Sequence Diagram
4	7	1	
4	7	2	
4	7	3	
4	7	4	
4	7	5	
4	8	1	
4	8	2	
4	8	3	
4	8	4	

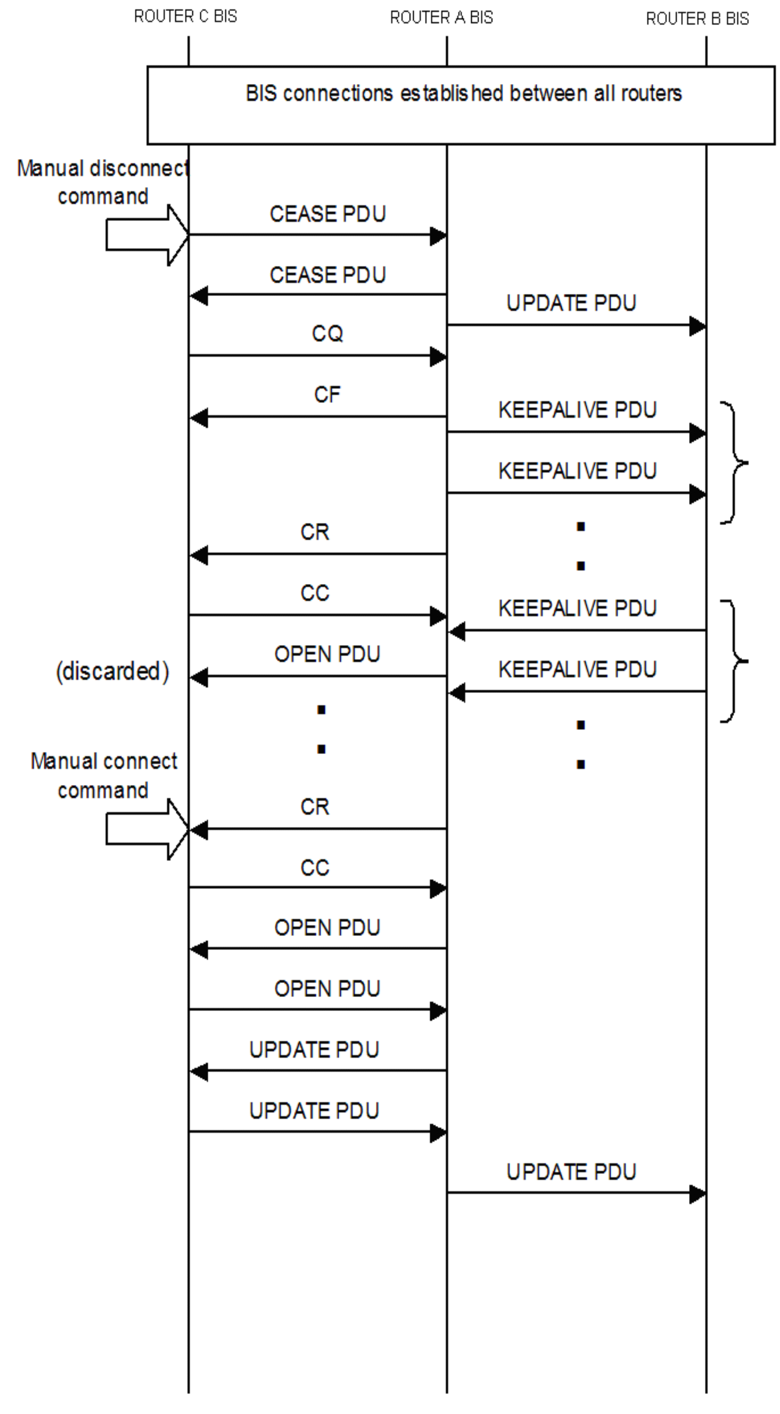
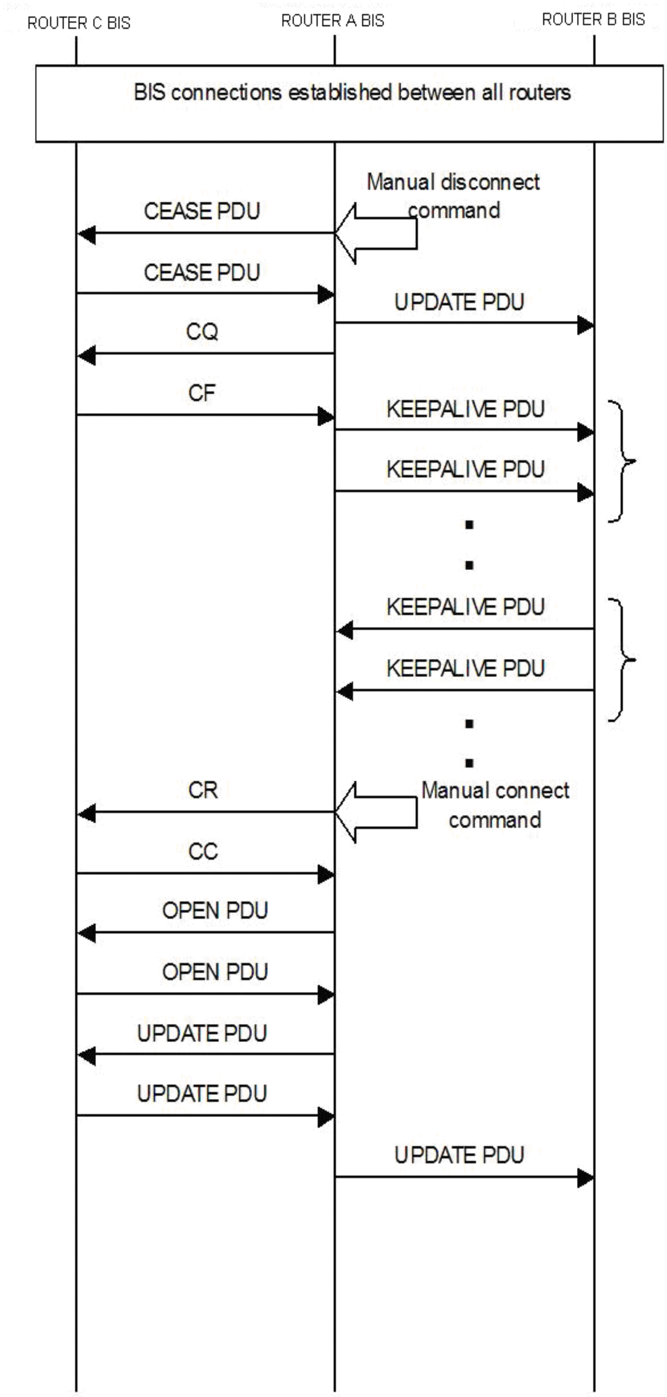


Figure 22 Sequence: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation

<table>
<tr><th colspan="3">Test No.</th><th>Sequence Diagram</th></tr>
<tr><td>4</td><td>9</td><td>1</td><td rowspan="9">
</td></tr>
<tr><td>4</td><td>9</td><td>2</td></tr>
<tr><td>4</td><td>9</td><td>3</td></tr>
<tr><td>4</td><td>9</td><td>4</td></tr>
<tr><td>4</td><td>9</td><td>5</td></tr>
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<tr><td>4</td><td>10</td><td>3</td></tr>
<tr><td>4</td><td>10</td><td>4</td></tr>
</table>

Figure 23 Sequence: Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation

Table 29 Communication Circuit Failure and Recovery Test Procedure: Third Domain connected to AMHSLAND1

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Carrier media failure of ROUTER A-ROUTER B circuit and route deletion	Data link and VC disconnection	4-11-1	Simulate carrier medium failure between ROUTER A and ROUTER B by disconnecting WAN cable from ROUTER B. Check and confirm data link and VC are disconnected between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP disconnection and route update	4-11-2	Check and confirm that IDRP connection between ROUTER A and ROUTER B is closed. At ROUTER A, check that route information for ROUTER B is deleted. At ROUTER B, check that route information for ROUTER A and ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-11-3	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER A-ROUTER B circuit and route addition	Data link, VC, and router connection re-establishment	4-12-1	Restore the ROUTER A-ROUTER B router connection. Confirm router connection is re-established between ROUTER A and ROUTER B.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-12-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B	4-12-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check that route information is added for ROUTER B.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-12-4	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER B.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Carrier media failure of ROUTER C-ROUTER A circuit and route deletion	Data link and VC disconnection	4-13-1	Simulate carrier medium failure between ROUTER C and ROUTER A by disconnecting WAN cable from ROUTER C. Check and confirm data link and VC are disconnected between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP disconnection and route update	4-13-2	Check and confirm that IDRP connection between ROUTER C and ROUTER A is closed. At ROUTER C, check that route information for ROUTER A and ROUTER B are deleted. At ROUTER A, check that route information for ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-13-3	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER C-ROUTER A circuit and route addition	Data link, VC, and Router connection re-establishment	4-14-1	Restore the ROUTER C-ROUTER A router connection. Confirm router connection is re-established between ROUTER C and ROUTER A.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-14-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C	4-14-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, check that route information is added for ROUTER C.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-14-4	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER C.	OK / NG	/ /

Test No.			Sequence Diagram
4	11	1	
4	11	2	
4	11	3	
4	12	1	
4	12	2	
4	12	3	
4	12	4	

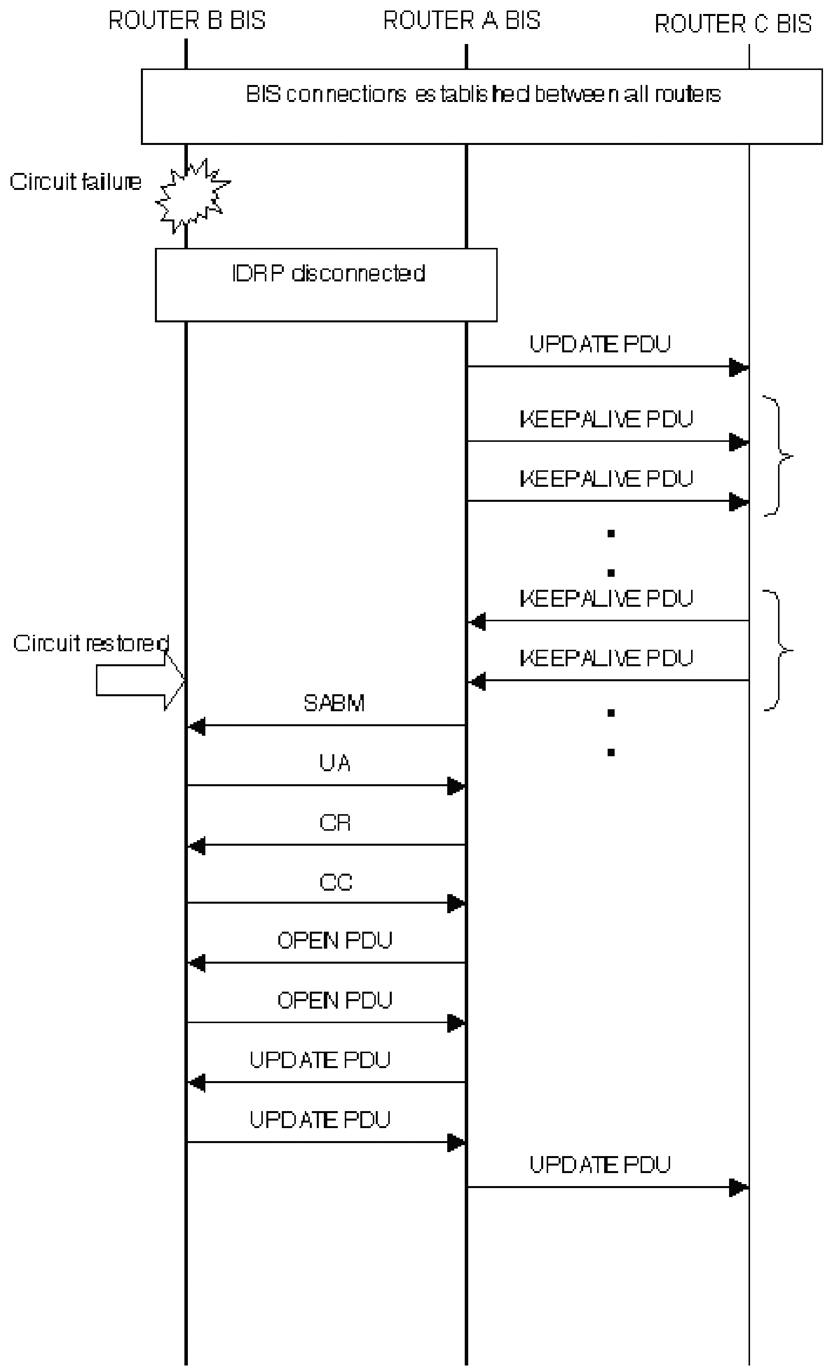


Figure 24 Sequence: Failure and recovery of ROUTER B-ROUTER A circuit

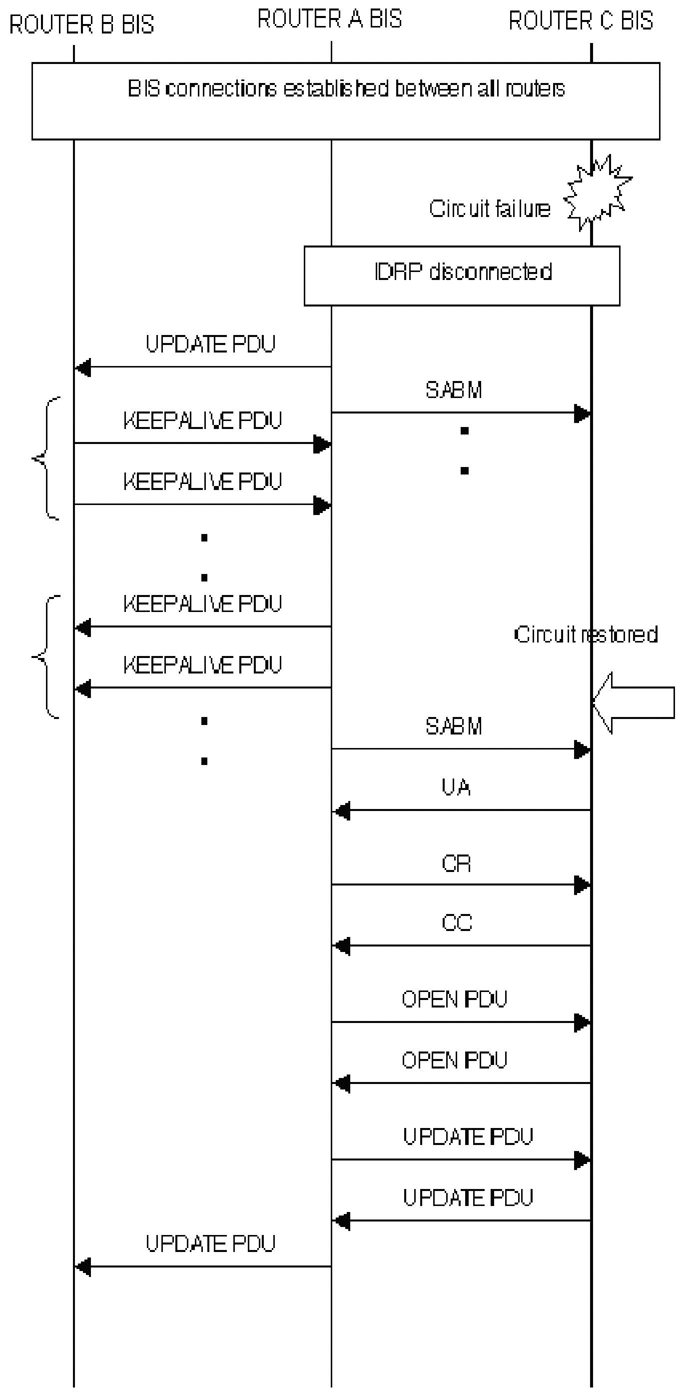
Test No.			Sequence Diagram
4	13	1	
4	13	2	
4	13	3	
4	14	1	
4	14	2	
4	14	3	
4	14	4	

Figure 25 Sequence: Failure and recovery of ROUTER C-ROUTER A circuit

Table 30 Router Failure and Recovery Test Procedure

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Failure and recovery of ROUTER C	Failure of ROUTER C	4-15-1	Simulate failure and recovery of ROUTER C by rebooting the router. At failure: ・ At ROUTER A, check that routing information for ROUTER C is deleted. ・ At ROUTER B, check that routing information for ROUTER C is deleted.	OK / NG	/ /
	Recovery of ROUTER C	4-15-2	Check that the ROUTER C-ROUTER A router connection is automatically re-established after ROUTER C recovers. After recovery: ・ At ROUTER A, check that routing information for ROUTER C is added. ・ At ROUTER B, check that routing information for ROUTER C is added.	OK / NG	/ /
Failure and recovery of ROUTER A	Failure of ROUTER A	4-16-1	Simulate failure and recovery of ROUTER A by forcing failover. At failure: ・ At ROUTER B, check that routing information for ROUTER A and ROUTER C are deleted ・ At ROUTER C, check that routing information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Recovery of ROUTER A	4-16-2	Check that the ROUTER C-ROUTER A and ROUTER A-ROUTER B router connections are automatically re-established after ROUTER A recovers. After recovery: ・ At ROUTER A, check that routing information is added for ROUTER C and ROUTER B. ・ At ROUTER B, check that routing information for ROUTER C and ROUTER A are added. ・ At ROUTER C, check that routing information for ROUTER A and ROUTER B are added.	OK / NG	/ /
Failure and recovery of ROUTER B	Failure of ROUTER B	4-17-1	Simulate failure and recovery of ROUTER B by rebooting the router. At failure: ・ At ROUTER A, check that routing information for ROUTER B is deleted. ・ At ROUTER C, check that routing information for ROUTER B is deleted.	OK / NG	/ /
	Recovery of ROUTER B	4-17-2	Check that the ROUTER A-ROUTER B router connection is automatically re-established after ROUTER B recovers. After recovery: ・ At ROUTER A, check that routing information for ROUTER B is added. ・ At ROUTER C, check that routing information for ROUTER B is added. ・ At ROUTER B, check that routing information for ROUTER A and ROUTER C are added.	OK / NG	/ /

<table>
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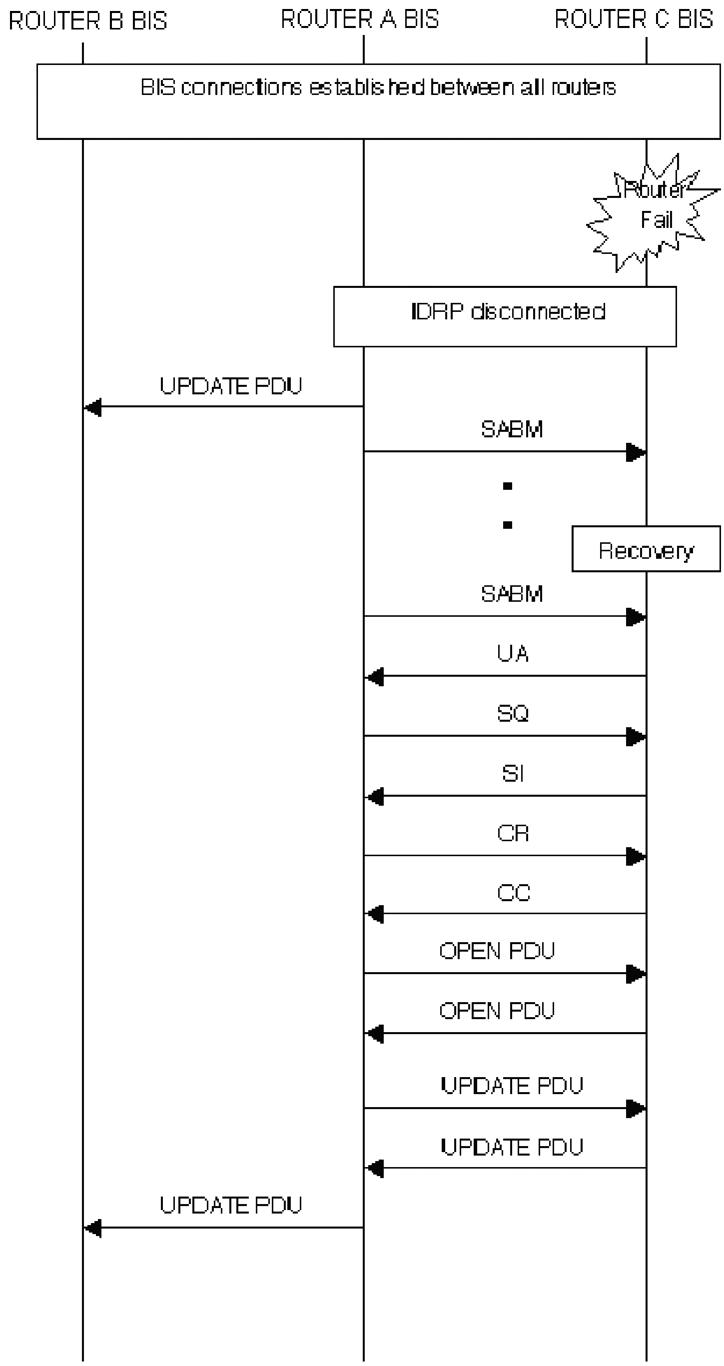
<tr><td>4</td><td>15</td><td>1</td><td rowspan="2">
</td></tr>
<tr><td>4</td><td>15</td><td>2</td></tr>
</table>

Figure 26 Sequence: Failure and Recovery of ROUTER C

<table>
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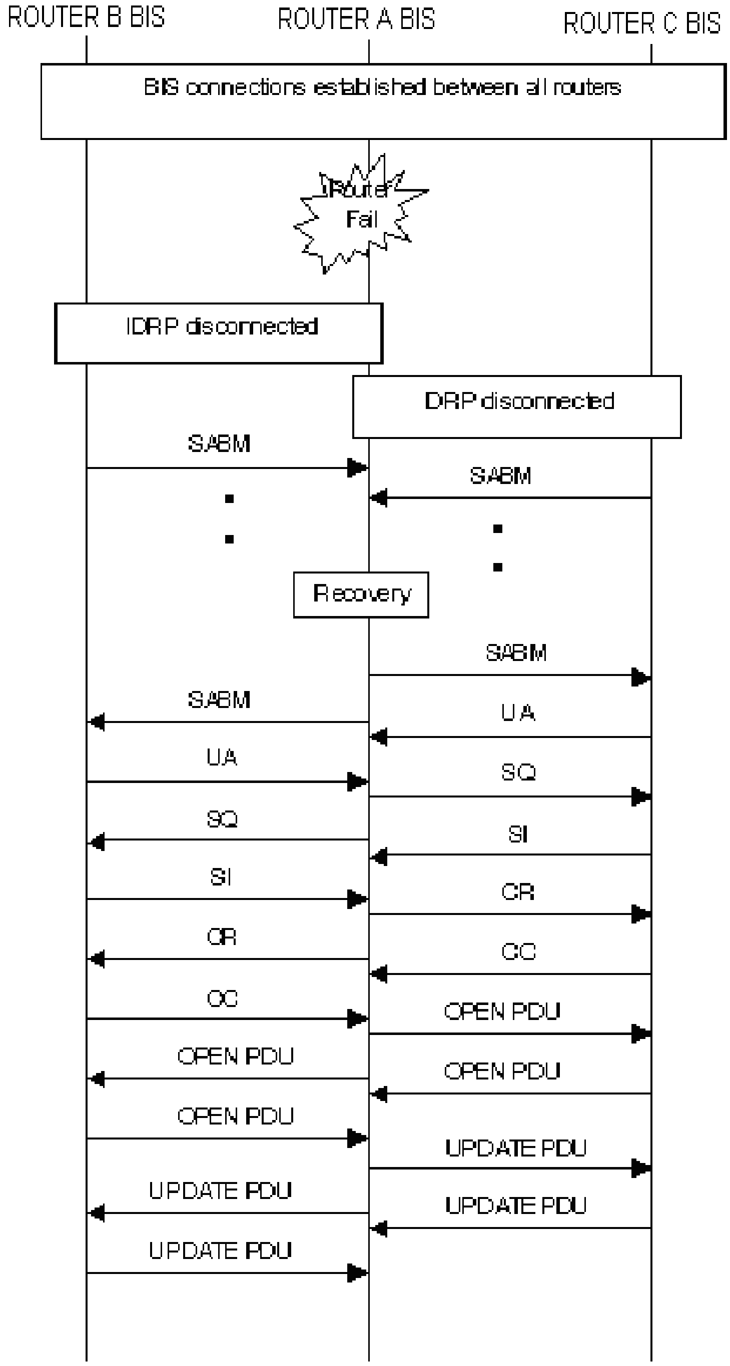
<tr><td>4</td><td>16</td><td>1</td><td rowspan="2">
</td></tr>
<tr><td>4</td><td>16</td><td>2</td></tr>
</table>

Figure 27 Sequence: Failure and Recovery of ROUTER A

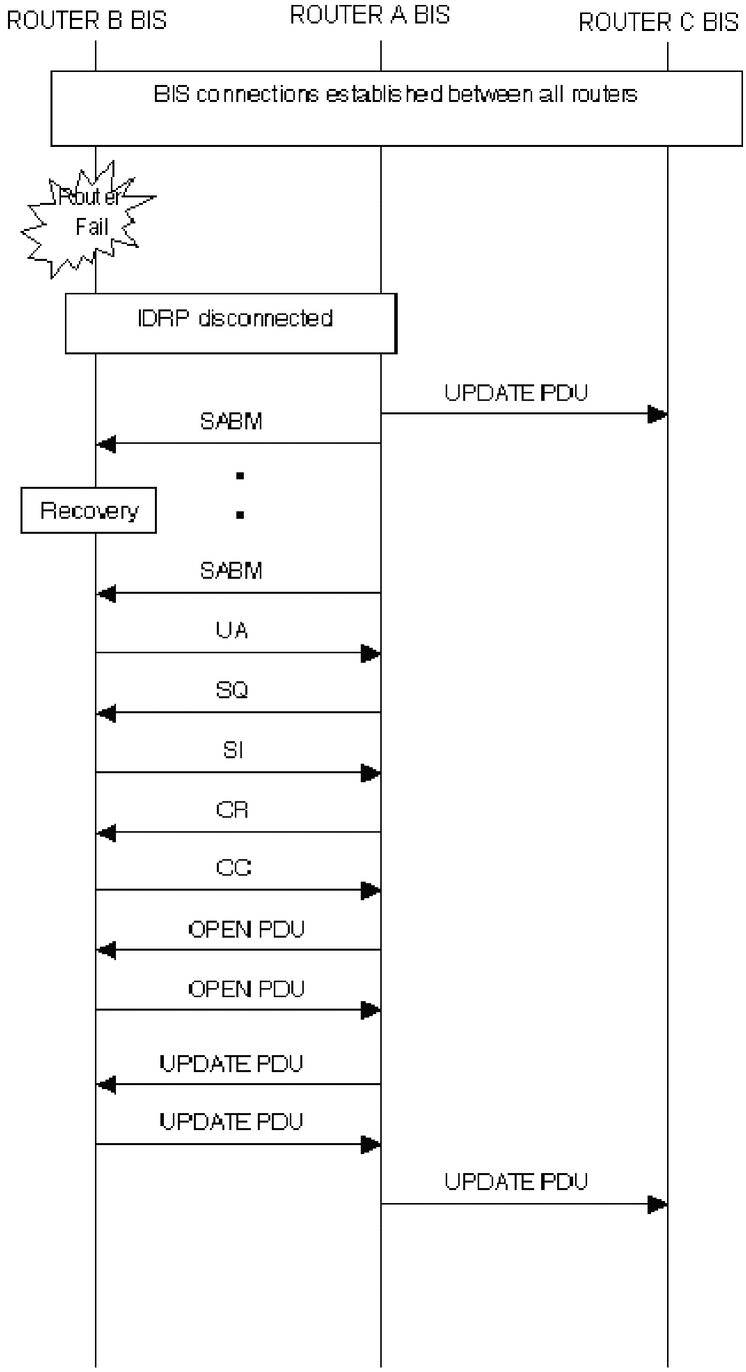
Test No.			Sequence Diagram
4	17	1	
4	17	2	

Figure 28 Sequence: Failure and Recovery of ROUTER B

Table 31 End-to-End CLNP Echo Test Procedure

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
End-to-End CLNP Echo Test between end systems in ROUTER C domain and ROUTER B domain	ERQ transmission	4-18-1	Send ERQ PDU from ES in ROUTER C domain to ES in ROUTER B domain. Confirm receipt of ERQ PDU at ES in ROUTER B domain.	OK / NG	/ /
	ERP transmission	4-18-2	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-3	Repeat 4-18-1 to 4-18-2 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /
	ERQ transmission	4-18-4	Send ERQ PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERQ PDU at ES in ROUTER C domain.	OK / NG	/ /
	ERP transmission	4-18-5	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-6	Repeat 4-18-4 to 4-18-6 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /

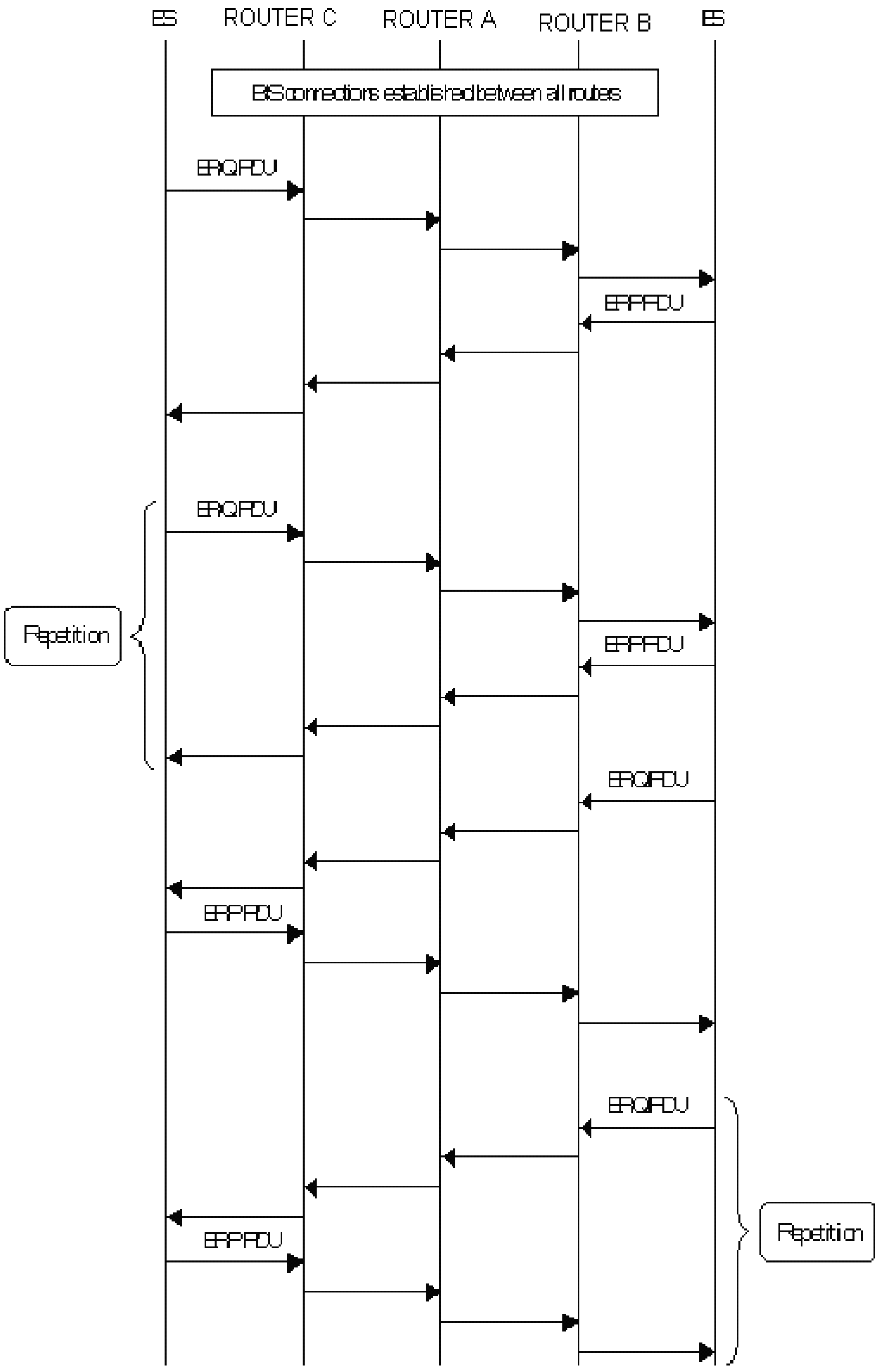
Test No.			Sequence Diagram
4	18	1	
4	18	2	
4	18	3	
4	18	4	
4	18	5	
4	18	6	

Figure 29 Sequence: End-to-End CLNP Echo Tests

- END -

ANNEX D

AMHS Testing Requirements

ANNEX D

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	22/06/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates – change of document version number	all

Table of Contents

Table of Figures

1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional requirements for AMHS testing procedures.

1.2 Scope of the Document

Based on known principles of testing and general assumptions on an AMHS test scenario, the scope of testing for an "AMHS Conformance Test" is specified. Elements of the specifications are generic test groups and related test configurations. Special attention is given to the “provocation” of an AMHS implementation with incorrect protocol behavior (“negative testing”) to analyze its stability (robustness) in out-of-line situations.

Further requirements are specified in terms of configuration parameters (as number of ATS Message Servers and AMHS users represented by test equipment) and the components of AMHS and AFTN information objects to be handled.

In principle, these groups are also valid for interoperability tests. But especially the test groups dealing with “negative testing” cannot be performed by real systems due to the nature of an implementation to avoid such exception situations.

1.3 Document Structure

Chapter 2 is concerned with general aspects of conformance testing and identifies the principal differences to interoperability testing. Key elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment. References are made to ISO/IEC 9646 which provides a general concept of conformance testing and to deliverables of the ACCESS study concerning AMHS testing.

Chapter 3 deals with the scope of AMHS functions to be tested and identifies reference points at AMHS implementations which should be accessible for testing. In addition, the used transport service for AMHS communications is identified and the interface with AFTN at the implemented AFTN/AMHS Gateway is detailed.

Chapter 4 defines AMHS test groups for comprehensive conformance testing of AMHS native communications and gateway operations with the AFTN. Related test configurations are added with explanations on sequences of exchanged AMHS and AFTN information objects. In addition, principles for definitions of test cases are set up including the consideration of so-called “negative testing”.

Chapter 5 specifies the range of parameters values supported in test configurations which place quantitative requirements on the testing equipment as the number of represented adjacent ATS Message Servers and handled AMHS and AFTN users.

Finally, *chapter* 6 identifies the used AMHS and AFTN test data. In particular, the elements of AMHS information objects and their sub-components (as message and message transfer envelope) to be supported are specified in detail.

1.4 References

[1] ICAO DOC 9705-AN/956: The Manual of technical provisions for the ATN, Sub-volume III, Section 3.1 –Edition 3 (2002) – Referred to as AMHS SARPs

[2] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures

[3] ISO/IEC 10021-2 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 2: Overall architecture

[4] ISO/IEC 10021-4 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 4: Message Transfer System: Abstract service definition and procedures

[5] ISO/IEC 10021-7 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 7: Interpersonal Messaging System

[6] ISO/IEC ISP 10611-3 – International standardized profile AMH1n – Message Handling Systems – Common Messaging –AMH11: Message transfer (P1)

[7] ISO/IEC ISP 12062-2 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH21: IPM content

[8] ISO/IEC ISP 12062-3 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH22: IPM requirements for message transfer (P1)

[9] ISO/IEC 9646-1 – Conformance testing methodology and framework – Part 1: General concept (1994)

2 Conformance Testing

The chapter provides an introduction to general aspects of conformance testing and identifies the principal differences to interoperability testing. Elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment.
References are made to ISO/IEC 9646.

2.1 Objectives

Generally, conformance testing attempts to determine whether a given implementation matches a specification. The implementation to be tested is referred to as the *implementation under test (IUT).* A tester provides the IUT with defined inputs and observes the resulting outputs. – ISO/IEC 9646-1 provides a general concept of OSI conformance testing and definitions of related key terms.

Note. – According to ISO 9646-1, the term Implementation Under Test (IUT) refers to an implementation of one or more OSI protocols, being part of a real open system which is to be studied. The System Under Test (SUT) is the real open system in which the IUT resides. – In the following, the term IUT is used when referring to the AMHS implementation to be tested in consideration that only the AMHS aspects within an given (real) ATS communication system are addressed.

ISO/IEC 9646-1 distinguishes three types of standardised conformance testing:

- *Basic interconnection tests*, that is to determine whether or not there is sufficient conformance to the relevant protocols for interconnection to be possible without trying to perform thorough testing.
  .
- *Capability tests*, which are used to verify the existence of one or more claimed capabilities of an IUT (*static* conformance requirements).
  .
- *Behaviour tests* deal with *dynamic* conformance requirements, which specify the observable behaviour of an implementation. Behaviour tests include tests for valid behaviour of the IUT for both valid and invalid inputs by the tester.

The AMHS testing requirements specified in this document focus on *behaviour tests*, i.e. test exercises address implemented AMHS functions in a way as they should be used. *Basic interconnection tests* are an appropriate means to check the correctness of a test configuration before starting detailed test exercises.

The discussed AMHS conformance testing relates to that scope of functions which is typically implemented in an *International Communication Centre*, i.e.

1) AMHS message transfer,
2) AMHS submission and delivery operations with attached AMHS user terminals and
3) Intercommunication with the AFTN/X.25 by means of the AFTN/AMHS Gateway.
   The interface to the AFTN (X.25) is only taken into account in the extent as specified in the AMHS SARPs. For example, the AMHS SARPs do not assume AFTN routing by the gateway. – The Basic ATS Message Handling Service is assumed as the service level supported by the IUT.
   The conformance testing equipment acting as peer system of the AMHS IUT is referred to the *AMHS Test Tool*. The AMHS Test Tool provides the IUT with inputs, records and evaluates responses of the IUT.
   The specified testing requirements refer to an initial functionality of the AMHS Test Tool. Potential future extensions are indicated in the context of the specified sub-items of the test tool.

2.2 Specific aspects of AMHS testing

The AMHS (MHS) functions to be tested reside in the *application layer* of the ISO/OSI reference model. The underlying layers provide supporting communication services, however, are not primary subject of testing.

The context of AMHS conformance testing:

.

(a) the testing of complete systems (“black boxes”) and

.

(b) the testing of individual protocol layers, in particular the application layer.

In case (a) only external interfaces which are part of the IUT are used by the conformance testing equipment. In case (b), on the other hand, the IUT has to be “opened up”, providing the layer to be tested. For this purpose special software modules have to be provided within the IUT for control and observation of the lower and upper service boundary at the layer under test (see ISO/IEC 9646-1).

Recommendations for AMHS conformance testing are:

- the individual components and protocol layers of the IUT not be visible to the conformance testing equipment;

- access to the IUT by the test equipment is only via standard interfaces; and

.

- human readable terminal interfaces (as the Control Position of an AMHS gateway) are not accessed by the test equipment.

This recommended testing approach forms the baseline for the functional requirements placed on the AMHS Test Tool, as follows:

- The AMHS Test Tool will be interconnected with the IUT's external interfaces as far as they are standardised by the AMHS SARPs. Such standardised interfaces are the *AMHS transfer ports* and the *AFTN/X.25 interface*. The IUT is treated as a *black box*.

- Originations and receptions at user terminals have to be performed and observed by an operator who is familiar with the implemented HMI. From that follows that conformance testing needs certain operator assistance at the IUT. (The made assumptions on interfaces which are available at individual IUTs will be outlined by means of an IUT model.)

3 Assumed Test Scenario

3.1 AMHS Functionality of the IUT

3.1.1 AMHS SARPs provisions

The assumption is made that the IUT to be tested provides completely or partially the AMHS functionality as specified by the SARPs in support of the *Basic* ATS Message Handling Service. Figure 1 identifies the key elements of the AMHS which are addressed by SARPs. The figure shall also indicate that the majority of the AMHS functionality is specified by references to the MHS standard series ISO/IEC 10021 and the related profile documentation ISO/IEC ISP 10611 (Common Messaging) and ISP 12063 (Interpersonal Messaging).

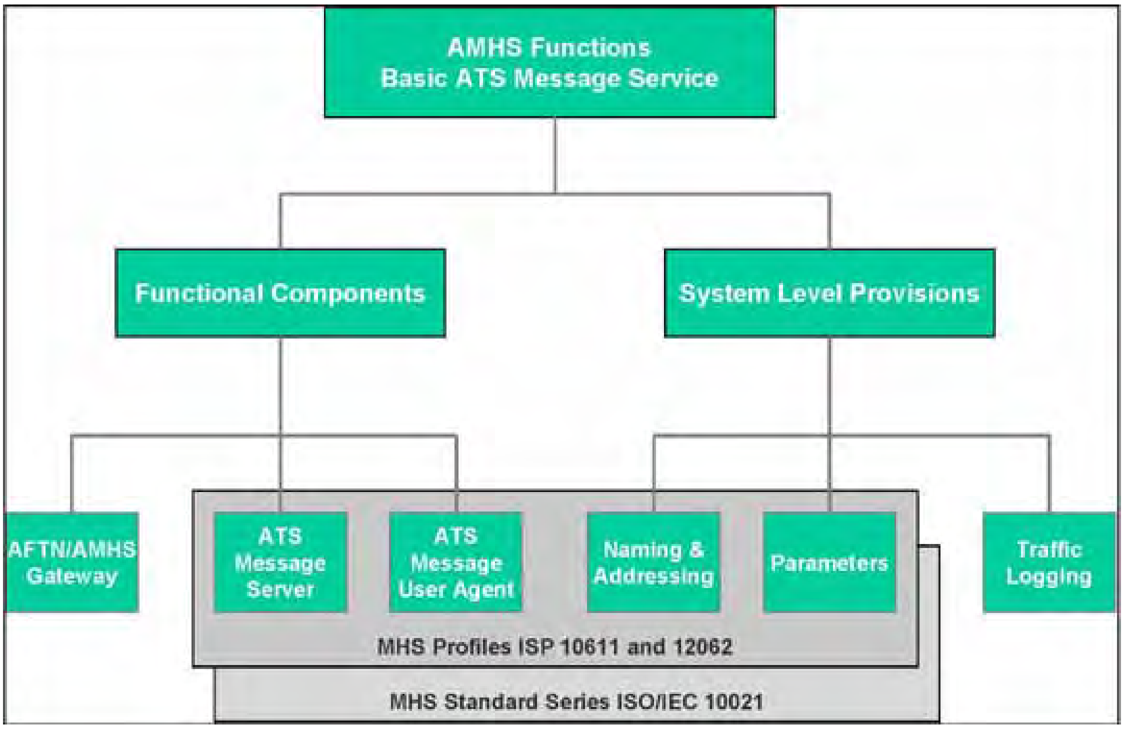


Figure 30: AMHS functionality specified by SARPs

The nucleus of the AMHS is formed by its three functional components:

- *ATS Message Server* performing *transfer* operations with adjacent ATS Message Servers (and AMHS gateways) by means of its inherent (MHS) Message Transfer Agent (MTA). In addition, *submission* and *delivery* operations are performed with one or more attached ATS Message User Agents. Optional (MHS) Message Stores (MS) may provide retrieval services for ATS Message User Agents in connection with message delivery.

- *ATS Message User Agents* each including a (MHS) User Agent (UA) as key component. An ATS Message User Agent interacts on one side with a (local) AMHS user interface and accesses on the other side the transfer level of the AMHS by performing *submission* and *delivery* operations with the superordinated ATS Message Server. Communications between ATS Message User Agents (via ATS Message Servers) are end-to-end and have to comply with the IPM content as specified for the (MHS) Interpersonal Messaging System (IPMS).

- *AFTN/AMHS Gateway* supporting interworking between users of the AMHS and AFTN. The gateway includes for operations with the transfer level of the AMHS and MTA. The mapping functions of the gateway reside in the Message Transfer and Control Unit (MTCU). The operations with AFTN are performed with the AFTN components. Exception handling which needs operator assistance is moved to the Control Position.

The above listed functional components are typically implemented in International Communication Centres performing AMHS message transfers, AMHS message submission and delivery operations with attached AMHS user terminals and intercommunications with the AFTN. However, an AFTN/AMHS Gateway may be also implemented as stand-alone facility allowing existing AFTN communication facilities access to the AMHS.
In addition, the AMHS SARPs address some aspects relating to the system level of an AMHS environment. The key ingredients at the system level of the AMHS are:

- *Naming and addressing* relating to the unambiguously identification of AMHS users and entities at upper layers protocols as needed for communications between AMHS systems. The specifications are based on MHS O/R addressing and ISO/OSI upper layer conventions. Examples are: the Common AMHS Addressing Scheme, Application Process Titles and Transport/Session/Presentation addresses.
.
- *Parameters* define specific AMHS conventions in the framework of the MHS standard. Examples are: The limitation of Receipt Notifications for IPMs with the *importance* value “high” and the definition of the ATS-Message-Header in the IPM body part.
.
- *Traffic logging* in functional components in support of message tracking across the AMHS.

The manner of implementation of the above identified AMHS functionality in the IUT is irrelevant for testing (*black-box* view). The above functional outline is used just as reference for the scope of conformance testing to be supported by the AMHS Test Tool.

3.1.2 Implementation specific AMHS features

Typically, an AMHS implementation includes features which are either beyond the scope of the SARPs or seen as local issue. Examples are: User interfaces (HMI) for local submissions and deliveries, proprietary MTS access protocol and provisions for systems management (including statistics and diagnostic means).
Such features will not be subject of conformance testing, however, may be used in support of conformance testing. Example: IPM submission at local user terminals for verification of correct generation of the related P1 message.

3.2 Modelling of the test environment

Figure 2 illustrates the intended operational environment of the IUT at the level of messaging: Via Transfer Ports of the IUT (logical) connections are established to *n* adjacent ATS Message Servers which in turn provide connectivity to *m* distant ATS Message User Agents. Local access to the AMHS is offered by *p* AMHS User Terminals attached to the IUT. Via the AFTN/AMHS Gateway there is a connection to an adjacent AFTN Communication Centre which in turn provides connectivity to *s* AFTN stations. – The figures *m*, *n*, *p* and *s* are seen as configuration parameters of the test configuration (see Section 5).

Note 1. – The specification of the AFTN/AMHS Gateway assumes an AFTN link to only one adjacent AFTN centre to minimise the AFTN functionality in the gateway. However, in typical implementations, the AFTN/AMHS Gateway is collocated with AFTN centre functions supporting connections to a number of adjacent centres. This aspect of multiple AFTN connections is not considered for conformance testing against the AMHS SARPs.

Note 2. – In the AISAPAC Region, AFTN communications make use of the X.25 transport service. This is taken into account for conformance testing, however, with the limitation, that only one X.25/AFTN link is established between the test tool and the IUT (see Figure 2).

Note 3. – In-depth testing of AFTN and X.25 capabilities of the IUT is not seen as subject of AMHS conformance testing.

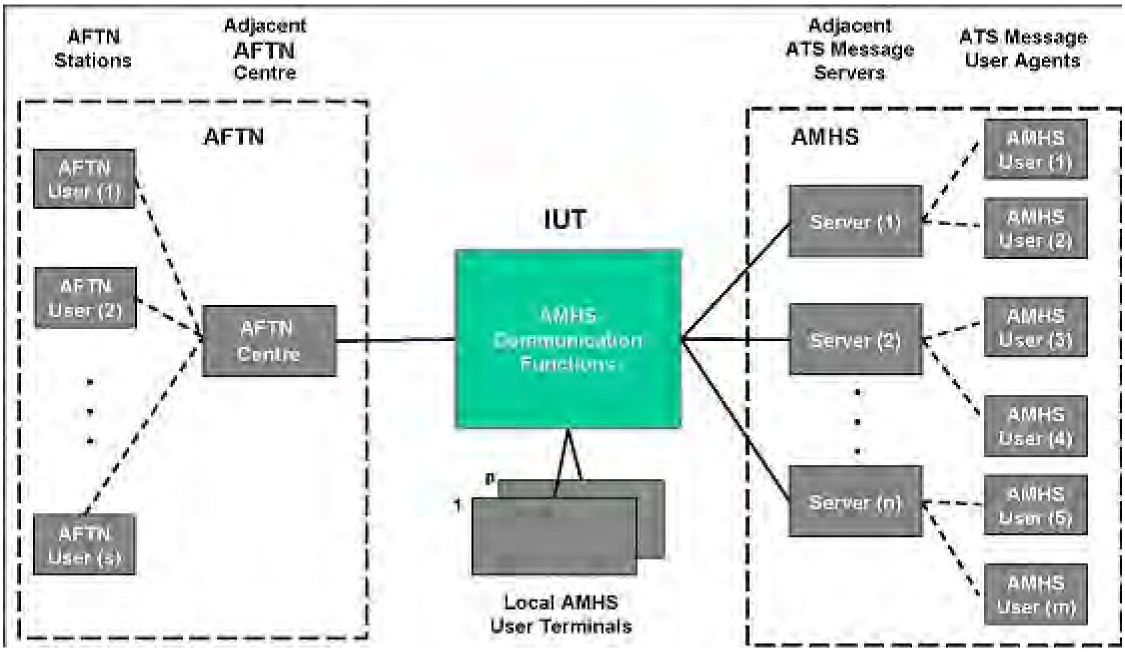


Figure 31: Assumed operational environment of the IUT

The AMHS Test Tool simulates an operational environment for the IUT as depicted in Figure 2. Figure 3 shows the corresponding model of the test configuration. The *COM Interfaces* of the test tool include *n* MTA instances representing the *n* adjacent ATS Message Servers of the IUT and an AFTN/X.25 source/sink representing the AFTN/X.25 environment. Other major functional components of the test tool are the *Test Repository* (containing predefined test scripts and associated test data), *Test Script Editor* (providing an HMI for specifications of test scripts and test data), *Test Log* (containing all the exchanged information objects) and *Test Evaluation* (performing test evaluations based on the test log against various criteria). The *Test Driver* controls the execution of test scripts and enters exchanged information objects in the test log. Finally, the component *Test Management* is tasked with the overall management and administration of the test tool.

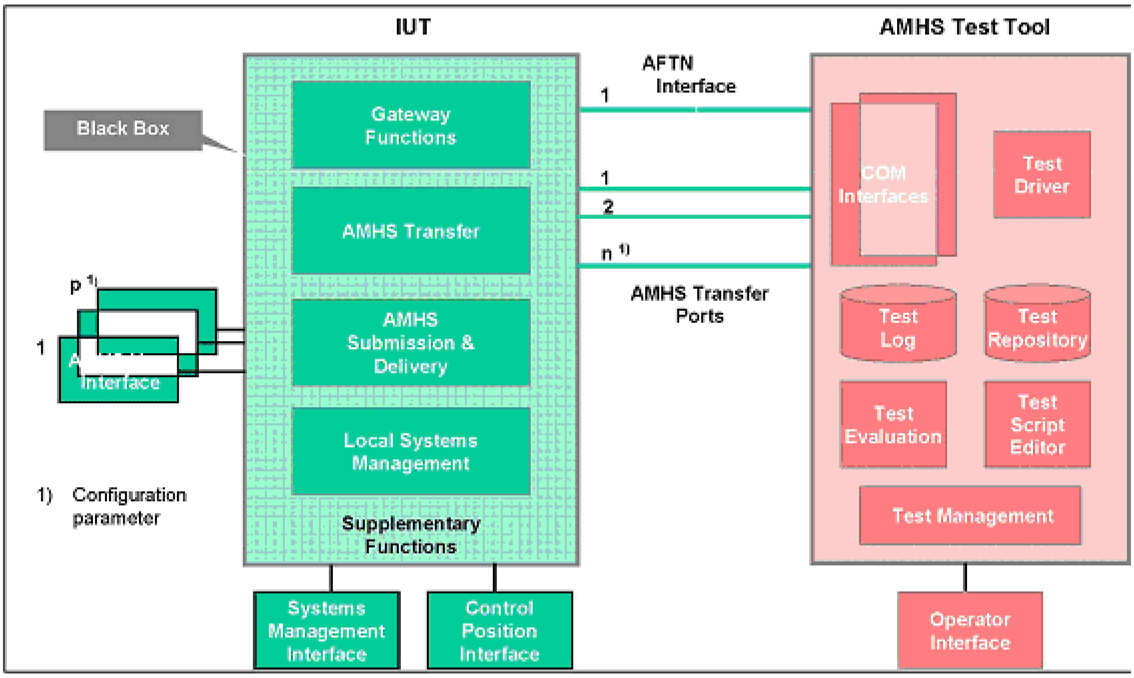


Figure 32: Model of the test environment

The IUT is represented in the modelled test configuration (*Figure 3*) by its functional components which will be subject of testing, i.e. AMHS transfer, AMHS submission/delivery and AMHS gateway functions (cf. Section 3.1). The inclusion of other indicated components of the IUT (as Systems Management Interface) will be addressed in subsequent sections.

The *n* MTA names, the addresses of the *m* ATS Message User Agents, *s* AFTN stations and *p* AMHS User Terminals are considered as configuration parameters which are jointly set up in the IUT and AMHS Test Tool.

Note. – The above outlined functional model includes an abstract, logical view on the AMHS Test Tool for the purpose of understanding the intended testing approach. The real design of the test tool is subject of separate documentation.

3.3 Used Transport Service for AMHS

According to the AMHS SARPs AMHS communications make use of the *ATN Internet Communications Service* (Layer 4). The ISO Transport Service of the class TP0 will be provided over a TCP/IP stack by using the convergence function defined with RFC 1006. The AMHS communications in the test configuration follow this approach.

Note. – Further extensions of the AMHS Test Tool may also support the ATN internet communications Service (aspect of inter-Regional or boundary centres) and TP0 over X.25.

3.4 Communication with the AFTN

The AMHS SARPs specify for the AFTN/AMHS Gateway an AFTN interface by referring to Annex 10, Volume II, i.e. the (asynchronous) *AFTN Teletypewriter Procedures* apply.

Note. – Extensions of the AMHS Test Tool may also support AFTN asynchronous communications and/or AFTN over X.25.

3.5 Points of Reference for testing

With the black-box view at the IUT, the verification of implemented functionality is limited to test inputs and examinations of resulting responses at external (open) interfaces of the IUT. Standardised interfaces of the IUT are directly interfaced by the AMHS Test Tool. At nonstandardised (proprietary) user interfaces of the IUT observations of operator inputs and displayed information are needed. Example: Origination of IPMs to be submitted or presentations of delivered IPMs at local AMHS user interfaces.
Such interfaces of the IUT which are used for conformance testing are referred to as *points of reference*. In the following, these points of reference will be detailed with reference to Figure 3.

3.5.1 Standardised points of reference

3.5.1.1 AMHS Communications

The IUT shall offer *Transfer Ports* for P1 communication with *n* adjacent ATS Message Servers. The lower protocol layers (layers 1 to 4) shall be configured as indicated below:

Layer 4	Layer 3	Layer 2	Layer 1
ISO TP0 RFC 1006 TCP	IPv4	ISO LLC1	10/100 Base T (Ethernet)

Table 32: Lower protocol layers (AMHS communications)

The Transfer Ports of the IUT and AMHS Test Tool shall be physically interconnected via a LAN (Ethernet).

3.5.1.2 AFTN/X.25 Communications

The IUT should offer a X.25/AFTN interface. That means, the IUT conveys AFTN-formatted messages by using the X.25 transport service.
Note. – If the IUT supports only AFTN asynchronous communications or AFTN over X.25 the "Extensions" of the AMHS Test Tool has to be used. The conformance testing is independent from the physical connection used.

3.5.2 Proprietary points of reference

The scope of conformance testing includes submission and delivery operations with local *AMHS user interfaces* of the IUT. Notifications for specified out-of-line situations shall be sent to the *Control Position* of the AFTN/AMHS Gateway. Further, traffic logs generated by the IUT during test exercises have to be verified against the AMHS SARPs by means of retrieval services provided at the IUT's *Operator Positions*.
The style of input and presentation of test data at the above identified three working positions is seen as a local implementation matter and is, therefore, out of scope of conformance testing. The inclusion of these working positions in testing is limited to observation and interpretation of test data.

Next, the handling of the three types of working positions will be discussed in more detail.

3.5.2.1 AMHS user interface

AMHS user interfaces provided at the IUT allow submission of IPMs and Probes and in the opposite direction delivered IPMs, IPNs and Reports have to be brought to the attention of AMHS users. The style of origination and presentation of the mentioned AMHS information objects is seen as subject of implementation. The inclusion of submission and delivery operations in conformance testing requires observations of operator interaction during test exercises.

Note. – Although the MTS access is seen as an implementation matter when supporting only the Basic ATS Message Handling Service, conformance testing shall verify the correct mapping of originated information objects onto P1 information objects; vice versa delivery operations have to map P1 information objects onto displayed objects in a correct manner.

3.5.2.2 Control Position

There is an AMHS SARPs requirement to notify the Control Position of the AFTN/AMHS gateway on specified deviations from the gateway's normal operations. Notifications may be issued for the operator information only or may require operator assistance for recovery from an occurred communication problem. How the Control Position is implemented is out of scope of the AMHS SARPs. However, the correct presentation of notifications at the IUT's Control Position is seen as subject of conformance testing. Appropriate observations have to accompany certain exercises.

3.5.2.3 Access to systems management functions

Access to IUT's systems management functions by means of a related working position shall be possible for:
Preparation of the IUT for the test configuration, and • verification of traffic logs generated by the IUT during test exercises.

4 Supported Scope of Conformance Testing

4.1 General aspects

The scope of testing covers the (native) AMHS communications and interoperations with the AFTN/X.25 by means of the AFTN/AMHS Gateway. The AFTN/X.25 interface is tested for verification of the gateway's capability to intercommunicate with AFTN/X.25, however, is not subject of dedicated conformance testing.
Communication services at lower communication layers (as TCP/IP, X.25, LAN) support the interconnection between the AMHS system and the AMHS Test Tool. In this way, lower communication layers will be included in the test tool, however, there is no intention performing lower layer protocol testing.

The following aspects of conformance testing shall be taken into account:

- *Protocol testing*, encompassing intra-AMHS communications (MTS, IPMS) and AMHS to AFTN/X.25 mappings (and vice versa).

- *Functionality testing*, to ensure the appropriate implementation of AMHS functionality and services (as message submission, transfer, delivery) including the correct mappings between AMHS information objects and user data made visible at users' working positions.

- *Resilience testing*, particularly with regard to the stability of an AMHS implementation against external communication failures.

The reference specification for AMHS testing is the *Basic ATS Message Handling Service* as specified in the AMHS SARPs.

Note. – The incorporation of the Extended ATS Message Handling Service shall be conceptually taken into account in a later extension of the AMHS testing requirements.
Below, the scope of conformance testing will be specified by definitions of generic *test groups* and related *test cases*. These definitions should be seen as a base (minimum) set which do not exclude testing using other equivalent or extended test arrangements.

4.2 Generic test configuration

The scope of AMHS functions expected from the IUT is defined firstly by the implemented AMHS *functional components*, i.e. ATS Message Server, AFTN/AMHS Gateway and ATS Message User Agent and secondly by supplementing *system level provisions* as AMHS naming/addressing, AMHS parameters and AMHS traffic logging (see Section 3.1).
Figure 4 places the above three functional components in a fictitious AMHS communication scenario with flows of AMHS information objects between two (*direct*) AMHS users. In addition, an AFTN/AMHS Gateway supports intercommunications with AFTN users (i.e. *indirect* users of the AMHS). The position of the gateway in Figure 4 should be seen just as an example.

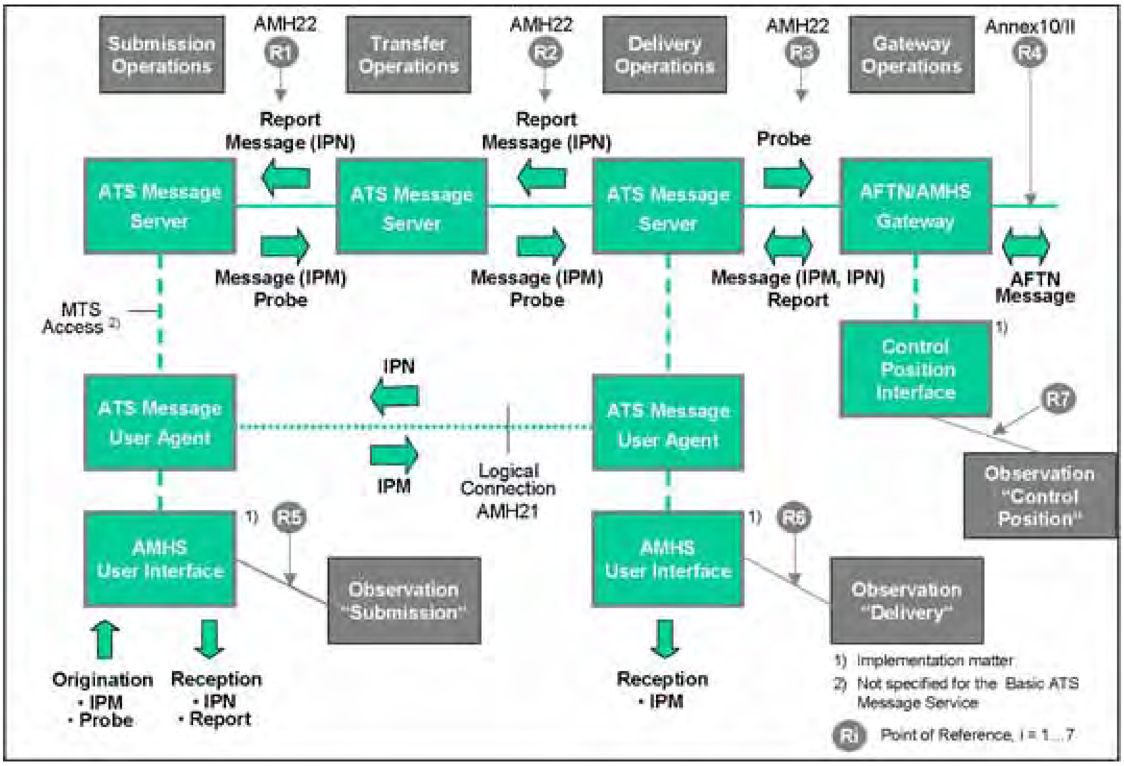


Figure 33: Generic AMHS communication scenario and used Points of Reference for conformance testing

The points of references *R1* to *R7* (in Figure 4) are allocated to the communication scenario according to the principles which have been stated in Section 3.5. The points *R1* to *R3* correspond to communication interfaces which are addressed by the MHS profiles AMH11 or AMH22, respectively [6], [8]. The exchange of IPMs and IPNs between the pair of ATS Message User Agents is subject of the MHS profile AMH21 [7]. Communications at the point *R4* follow the procedures laid down in Annex 10, Volume II, as far as applicable for the AFTN/AMHS Gateway.

The IUT is required to provide the communication functions of the ATS Message Server, ATS Message User Agent and AFTN/AMHS Gateway in any of their positions indicated in Figure 4. For related conformance testing the IUT is placed in various positions of the communication scenario (Figure 4) and the AMHS Test Tool performs the functions of the corresponding AMHS peer entity (entities). The resulting generic test configuration is depicted in Figure 5. The allocated points of reference *R1* to *R7* correspond to them of Figure 4. The reference point R8 is added for identification of the IUT's systems management interface (see Section 3.5.2.3).

Note. – In consideration of testing implementations of the Basic ATS Message Handling Service no point of reference is allocated to the MTS access.

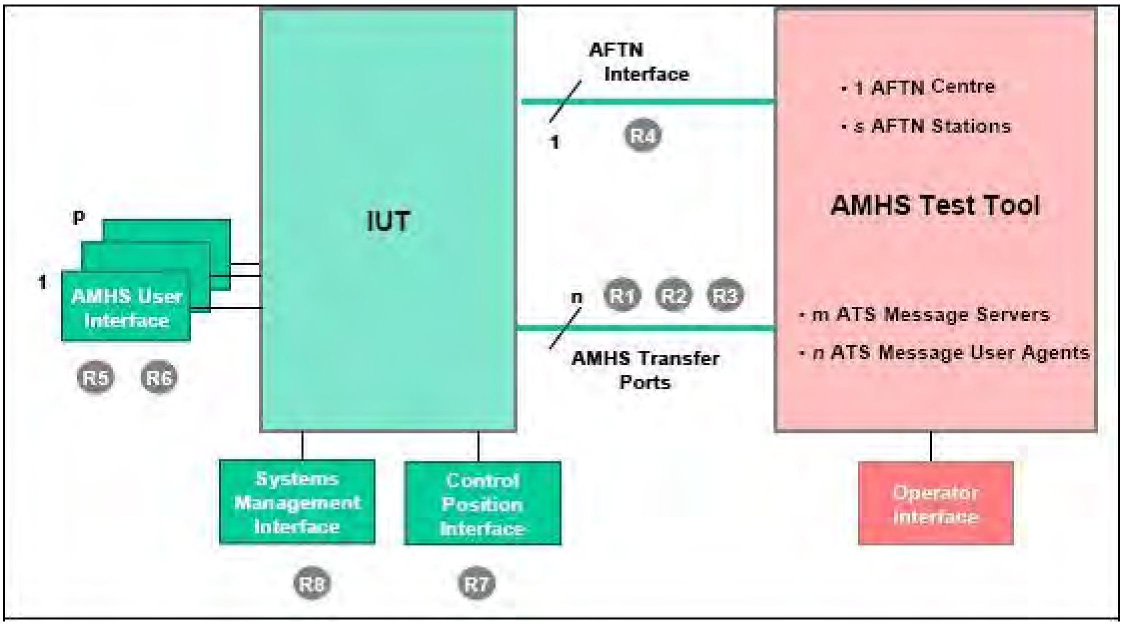


Figure 34: Generic test configuration with points of reference

Note. – In Figure 5 no AFTN user interface is forming part of the IUT. Such interfaces are outside of the scope of the specified AMHS functionality and are placed, therefore, in the IUT's test environment surrounding the IUT (see Figure 2). When testing AFTN/AMHS Gateway functions of the IUT the AFTN peer entities are always represented by the AMHS Test Tool. The AFTN related user actions should be performed by the AMHS Test Tool itself.

4.3 Definition of test groups

Generally, *test groups* provide a logical high-level ordering in test specifications (ISO 96462). Typically, a single test group addresses a particular functional area for which an IUT claims conformance. In the following, AMHS test groups are defined for the purpose of specification of high-level requirements placed on an AMHS Test Tool.

Figure 4 identifies four types of AMHS functional areas to be supported by the IUT: *Submission*, *Transfer*, *Delivery* and *Gateway* Operations. These types of AMHS operations will be constitute a first set of test groups. A second set of test groups is formed by the provisions at the AMHS system level as referred to in Section 3.1.1, i.e. *Naming & Addressing*, *Parameters* and *Traffic Logging*.

The defined test groups reflect the external view at the IUT's functionality and are independent of the chosen implementation model. Below, the defined test groups are handled in detail.

For each of the handled test groups the correspondent test configuration is indicated. These test configurations are of generic nature. In practice, test configurations may be combined for study of local interworking between functional areas in an IUT. Example: Combined test exercises for message submission and local gateway functions.

4.3.1 Submission operations

Subject of the test group *Submission* operations is the origination of *IPMs* and *Probes* at AMHS user interfaces at the IUT and the related generation of *P1 information objects* for transfer to adjacent ATS Message Servers; returned *Reports* and *IPNs* have to be displayed at the IUT in an appropriate manner (see Figure 4).

Figure 6 depicts the test configuration for verification of the *Submission* operations. The test configuration follows from Figure 4 and Figure 5.

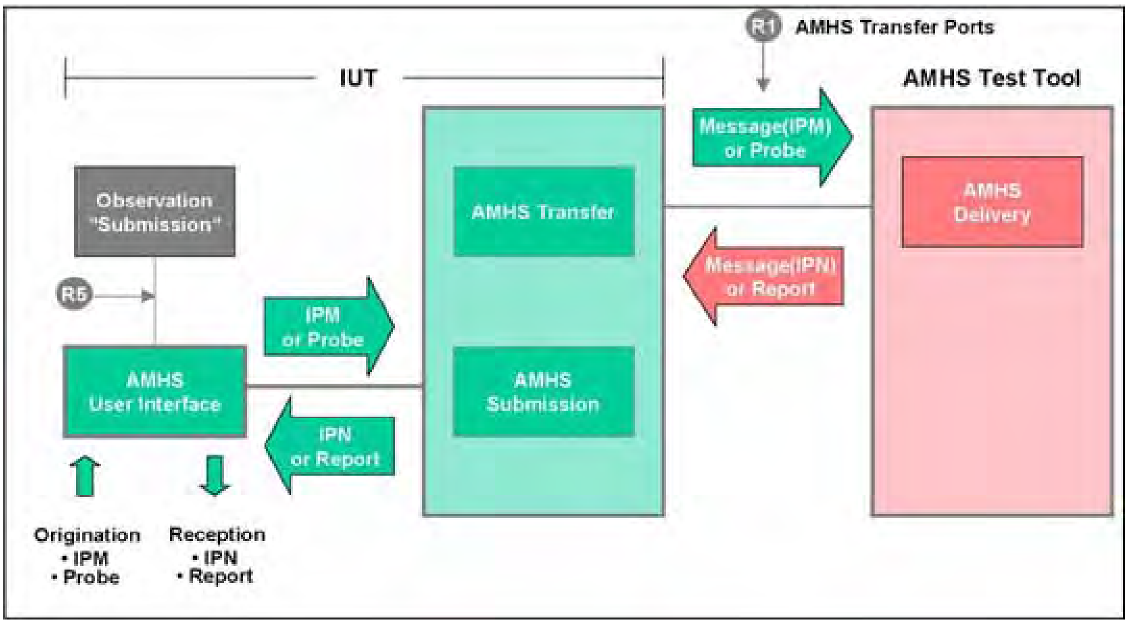


Figure 35: Test configuration "Submission"

For testing of the *Submission* operations the following actions may be performed:

- At an AMHS user interface of the IUT (reference point *R5* in Figure 6) predefined IPMs and Probes are originated for intended recipients. The AMHS Test Tool at the transfer ports of the IUT (*R1*) verifies the correct generation of the related Messages (IPMs) and Probes.

- In the opposite direction, the AMHS Test Tool responds at the transfer ports of the IUT (*R1*) with valid and invalid Messages containing IPNs (upon IPMs) and Reports (upon IPMs and Probes). The presentation of valid IPNs and Reports is observed at the originator's AMHS user interface (*R5*). Invalid responses may effect error notifications at an operator position of the IUT (fault management).

Note. – The local rejection of erroneous originations of IPMs and Probes at IUT's user interfaces is seen as a local implementation matter and is, therefore, out of the scope of conformance testing.

4.3.2 Transfer operations

Subject of the test group *Transfer* operations is the transfer of P1 information objects (i.e. Message, Report, Probe) by the IUT. Rejected transfers of messages and probes have to be indicated by returning of Non-Delivery Reports (NDR). The test group includes handling of multiple recipient addresses (multiple dissemination) and the expansion of Distribution Lists (DLs).

Figure 7 depicts the test configuration for verification of the *Transfer* operations. The test configuration follows from Figure 4 and Figure 5.

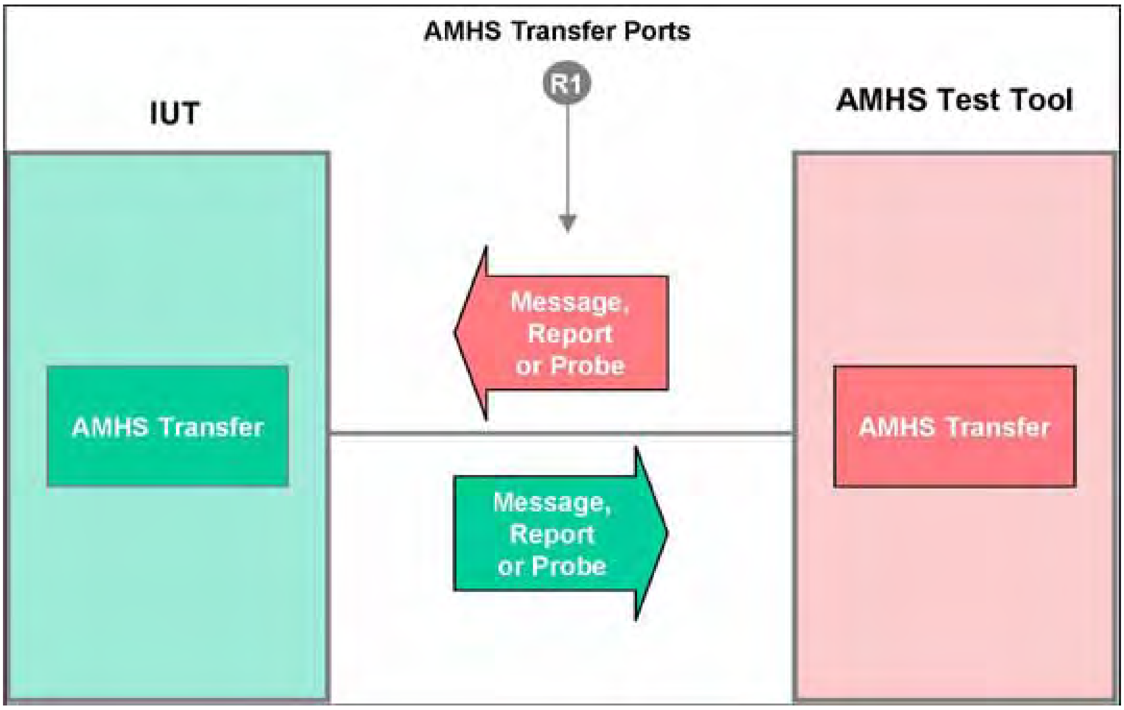


Figure 36: Test configuration "Transfer"

For testing of the *Transfer* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 7) with valid and invalid Messages (containing IPMs or IPNs), Reports and Probes with recipient addresses which are *not* local to the IUT.

- The IUT responds at its transfer ports (*R1*) with the output of one or more Messages, (due multiple dissemination and/or DL resolution), one or more Probes (multiple dissemination) or just the received Reports. The AMHS Test Tool verifies the expected IUT behaviour. Invalid information objects generated by the AMHS Test Tool may effect error notifications at an operator position of the IUT (fault management).

4.3.3 Delivery operations

Subject of the test group *Delivery* operations is the display of received Messages (IPMs) at AMHS user interfaces of the IUT. In addition, the IUT shall generate Reports (DR, NDR) and/or IPNs (RN, NRN) according to the requests contained in the received Messages and Probes.

Figure 8 depicts the test configuration for verification of the *delivery* operations. The test configuration follows from Figure 4 and Figure 5.

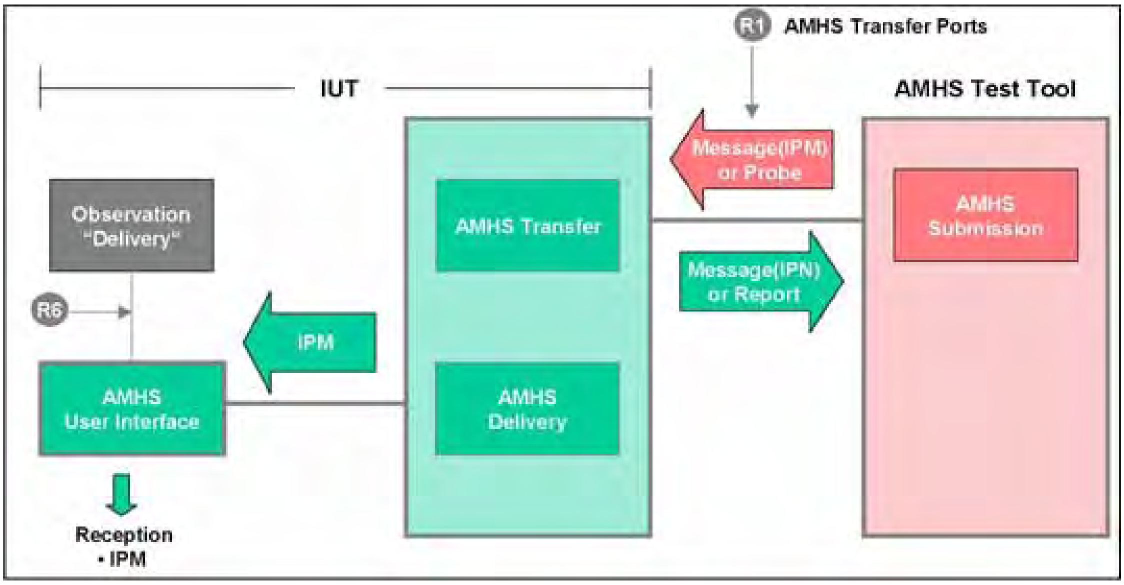


Figure 37: Test configuration "Delivery"

For testing of the *Delivery* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 8) with valid and invalid Messages (containing IPMs) and Probes, both with recipient addresses which are local to the IUT.

- The IUT may respond with one or more of the following actions:

  - Display the received IPM at the appropriate AMHS user interface (*R6*),
  - Returning a Message (IPN) at its transfer Port (*R1*) according to the given *receipt notification request* in the subject IPM,
  - Returning a Report (DR or NDR) at its transfer ports (*R1*) according to the given *report request* in the subject Message or Probe.

4.3.4 Gateway operations

Subject of the test group *Gateway* operations is the bi-directional conversion between AMHS and AFTN user messages and the handling of accompanying service information, i.e. AFTN service messages (SVC), AFTN SS acknowledgements (SS ACK), AMHS Reports and AMHS Receipt Notifications. – Cf. AMHS SARPs [1] para. 3.1.2.3.2.1.4.
Considering the functional complexity of the AFTN/AMHS Gateway, the test group is logically subdivided in three sub-groups: 1) Flow of user message from AMHS to AFTN, 2) Flow of user message from AFTN to AMHS and 3) Handling of Probes. The sub-groups 1) and 2) include the handling of accompanying service information.

4.3.4.1 User Message from AMHS to AFTN

Figure 9 depicts the test configuration for verification of the *Gateway* operations for the flow of a user message from AMHS to AFTN. The test configuration follows from the Figure 4 and Figure 5.

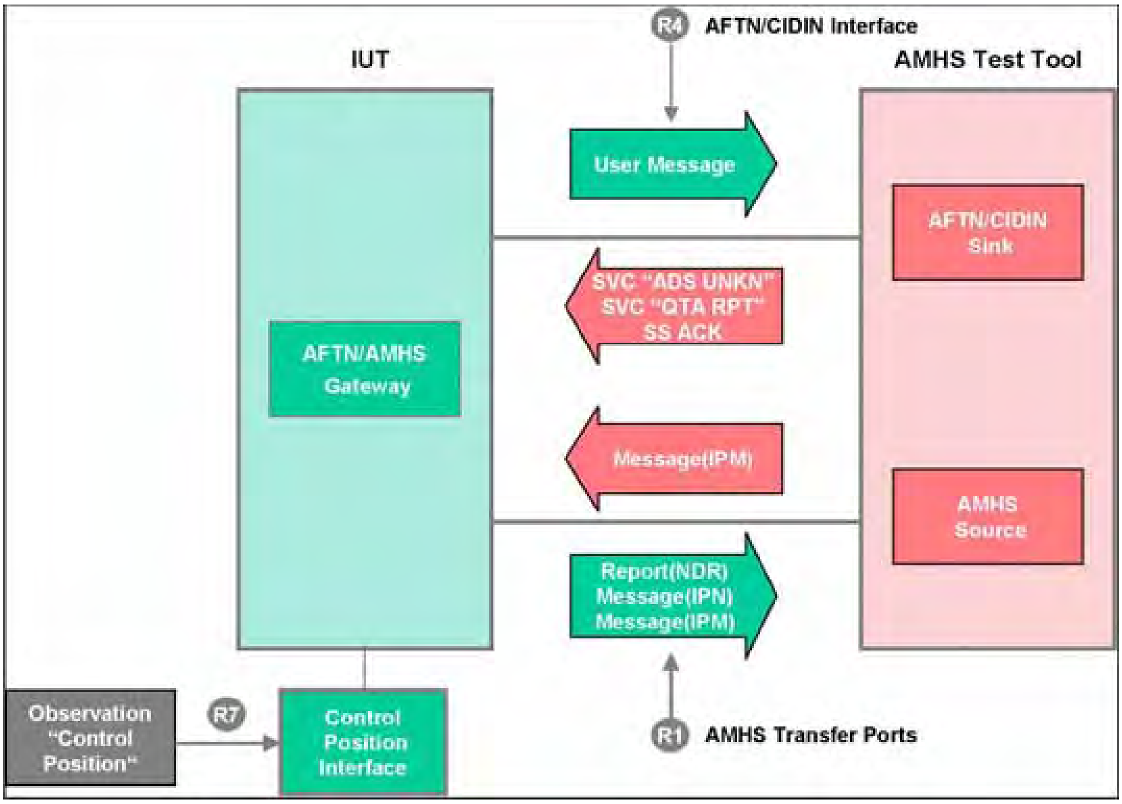


Figure 38: Test configuration "Gateway" – User message from AMHS to AFTN

The following actions may be performed with the Gateway test configuration depicted in Figure 9:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 9) with valid and invalid AMHS Messages containing IPMs. The IUT converts valid AMHS Messages in AFTN user messages which leave the IUT at its AFTN/X.25 interface (*R4*), invalid AMHS Messages are rejected by the IUT with Non-Delivery Reports (NDR) which are returned to the AMHS Test Tool using the IUT's transfer ports (*R1*).

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an AFTN SVC "ADS UNKNOWN" simulating the detection of an unknown destination address within the AFTN. The IUT converts the SVC "ADS UNKNOWN" in a Non-Delivery Report (NDR). In exceptional situation, the SVC "ADS UNKNOWN" is encapsulated by the IUT in an IPM. The NDR or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an SS ACK. The IUT converts the SS ACK in an IPN of the type Receipt Notification (RN). In exceptional situation, the SS ACK is encapsulated by the IUT in an IPM. The IPN or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).

The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an SVC "QTA RPT" requesting the repetition of an AFTN message sent before to a specified AFTN addressee. The IUT retransmits the respective AFTN message via its AFTN/AMHS interface (*R4).*

.

For certain out-of-line situations, which may occur during conversions in the AFTN/AMHS Gateway, the AMHS SARPs [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test exercises at the reference point *R7* in Figure 9.

4.3.4.2 User message from AFTN to AMHS

Figure 10 depicts the test configuration for verification of the Gateway operations for the flow of a user message from AFTN to AMHS. The test configuration follows from Figure 4 and Figure 5.

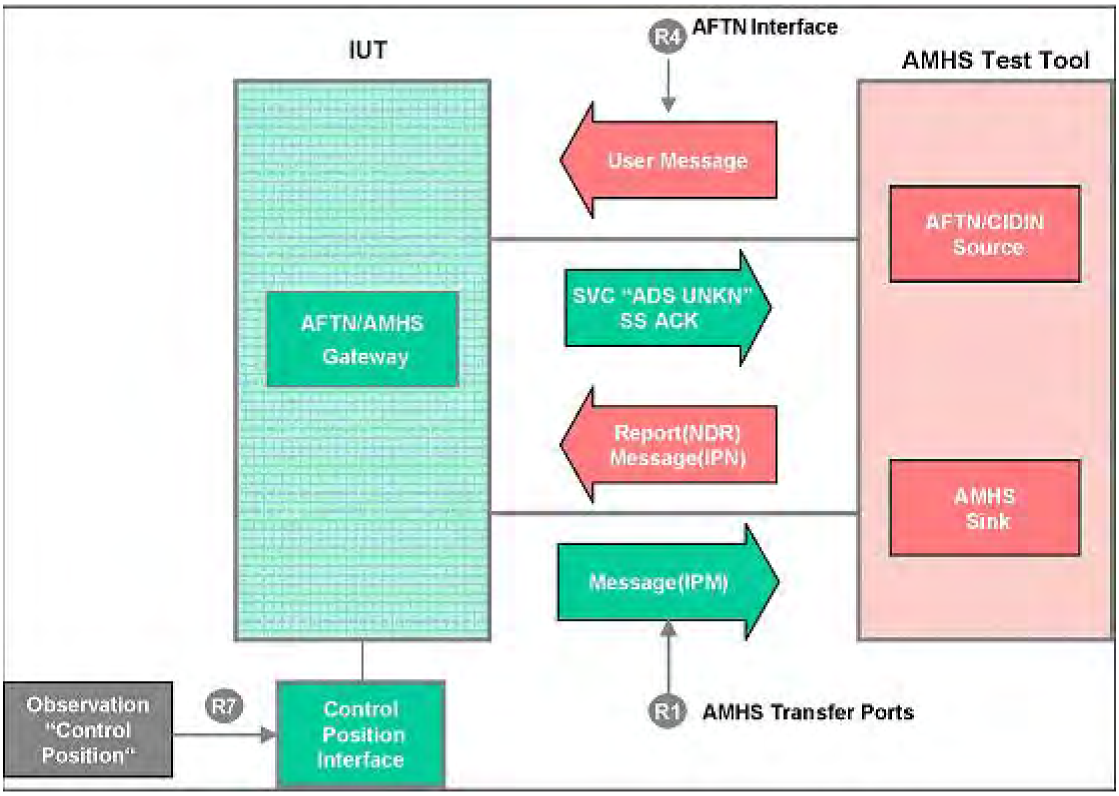


Figure 39: Test configuration "Gateway" – User message from AFTN to AMHS

The following actions may be performed with the Gateway test configuration depicted in Figure 10:

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (reference point *R4* in Figure 10) with valid and invalid AFTN user messages. The IUT converts valid AFTN user messages in AMHS messages containing IPMs which leave the IUT at its transfer ports (*R1*), invalid AFTN user messages are handled according to locally implemented procedures. When the conversion of AFTN addressee indictors fails, the IUT returns AFTN service messages of the type SVC "ADS UNKNOWN" to the AFTN (AMHS Test Tool) via its AFTN/X.25 interface (R4).

- The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with a Non-Delivery Report (NDR) simulating the detection of an unknown recipient address within the AMHS. The IUT converts the NDR in an AFTN service message of the type SVC "ADS UNKNOWN" which leaves the IUT via its AFTN/X.25 interface (*R4*).

The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with an AMHS message containing a Receipt Notification (RN) indicating the reception of a SS-priority message at a specified AMHS recipient. The IUT converts the RN in a SS ACK which leaves the IUT via its AFTN/X.25 interface (R4).

For certain out-of-line situations which may occur during conversions in the AFTN/AMHS Gateway, the AMHS SARPs [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test exercises at the reference point *R7* in Figure 10.

4.3.4.3 Handling of Probes

Figure 11 depicts the test configuration for verification of the Gateway operations when receiving a Probe. The test configuration follows from Figure 4 and Figure 5.

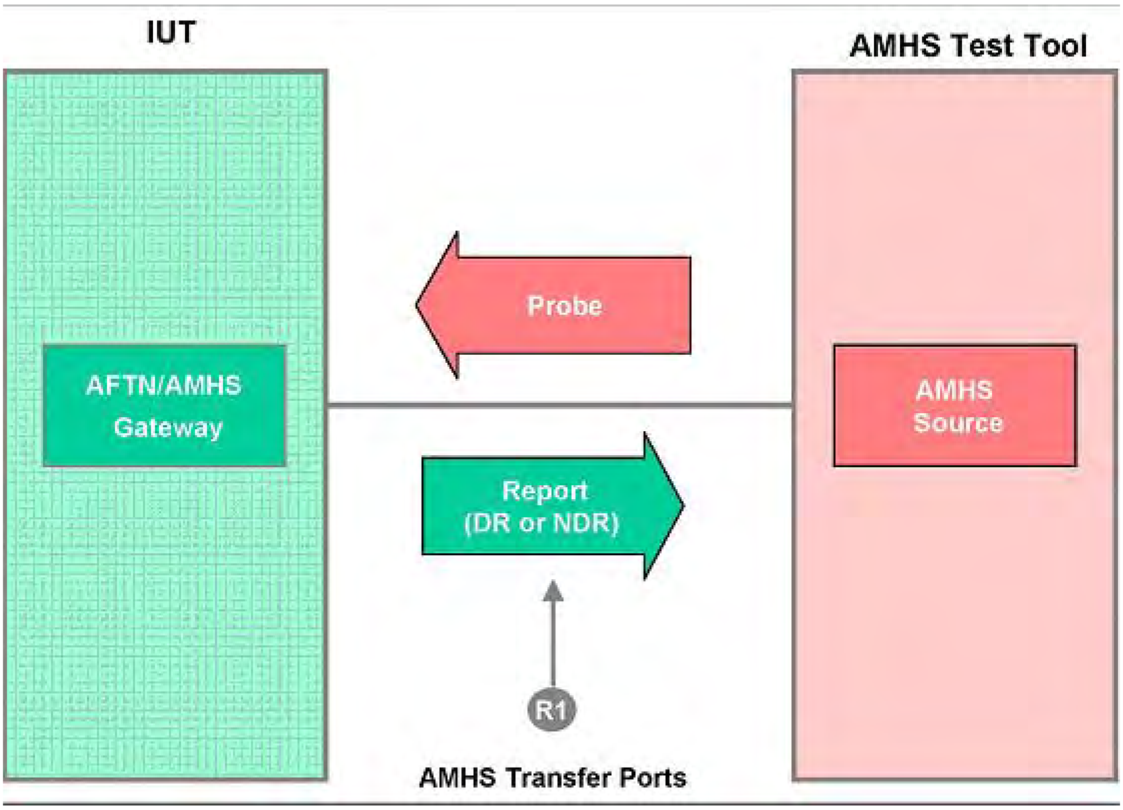


Figure 40: Test configuration "Gateway" – Handling of Probes

The following actions may be performed with the Gateway test configuration depicted in Figure 11:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 11) with valid and invalid Probes.

The IUT verifies whether it could have effected translation in an AFTN user message by comparing certain parameters in the Probe with the capability of its gateway function. The IUT generates in dependence on the result of the verification either a Delivery Report (DR) or a Non-Delivery Report (NDR) which is returned to the AMHS Test Tool via a transfer port (R1).

4.3.5 Naming and addressing

Naming and addressing in the AMHS context relates to the unambiguously identification of 1) users to a global AMHS and 2) communication entities residing in the upper layers of the AMHS communication stack. Focus of conformance testing is the IUT's capability to handle AMHS addressing schemes for identification of users. The second aspect is covered by setting up of configuration parameters in the test configuration (see Section 5).

The AMHS SARPs specify two user addressing schemes which are collectively referred to as MF-addressing schemes: the *XF-addressing scheme* and the *Common AMHS Addressing Scheme (CAAS)*. Preference should be given to the latter. In addition, the SARPs allow to implement within an AMHS Management Domain *locally defined* schemes. The AMHS Test Tool supports the XF-addressing scheme and the CAAS. (Support of other addressing schemes may be subject of further extensions.)

The use of *directory names* is seen as a local matter when supporting the *Basic* ATS Message Handling Service (AMHS SARPs). Their support by the AMHS Test Tool may be subject of further extensions meeting the requirements of the *Extended* ATS Message Handling Service.

An IUT's capability to handle MF-addressing schemes is already implicitly verified with the operations related test groups as defined in Sections 4.3.1 to 4.3.4. However, for in-depth testing of implemented addressing features the establishment of a dedicated test group may be a suitable approach. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10.

Note. – The aspect of a dedicated test groups for in-depth testing of system level provisions applies also to the two remaining test groups defined below.

4.3.6 AMHS parameters

The AMHS SARPs [1] 3.1.2.2.3 specify a number of operational conventions which have the nature of parameters from the MHS point of view. These parameters relate to:

- Use of MF-addresses (see Section 4.3.5)
- User data conventions
    - Only single body part in IPMs
    - Ia-5 text body (Basic ATS Message Handling Service)
- Use of ATS-Message-Header in the body part of IPMs (Basic ATS Message Handling Service)
- Restriction of Notification Requests (IPMS) for SS-priority messages. In-depth testing of the AMHS parameters may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10.

4.3.7 Traffic logging

The AMHS SARPs specify long-term (30 days) logging requirements for the various types of functional components of the AMHS. The requirements make it possible to perform message tracing through the AMHS, in particular when an investigation is needed. The query of the logged information is seen as a local implementation detail.

Logging requirements are placed on the following functional components of the AMHS:

- ATS Message User Agent
- ATS Message Server
- AFTN/AMHS Gateway concerning its sub-components

  - ATN component – [1] Section 3.1.2.3.2.2.6
  - Message Transfer and Control Unit (MTCU) – [1] Section 3.1.2.3.3.1
  - AFTN component – [1] Section 3.1.2.3.21.8-11.

In-depth testing of the traffic logging may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10. Verification of the logged information will make use of the local query and tracing provisions. Access is typically provided at the system management interface of the IUT (cf. reference point *R8* in Figure 5).

4.4 Definition of test cases

According to ISO 9646-2 a *test case* comprises the actions to achieve a specific test purpose. Each test case normally has a single test purpose, such as that of verifying that the IUT has a certain required capability (e.g. the capability to support certain message lengths) or exhibits a certain required behaviour when a particular event occurs (e.g. transfer of submitted messages). Typically, a set of test cases aiming at a common functional area of an IUT are arranged to a *test group* (see Section 4.3).

There may be many criteria for methodical definitions of test cases (within a test group) to achieve an envisaged confidence in a particular functional area of the IUT. Figure 12 depicts proposed two levels of high-order criteria for definitions of AMHS related test cases. The AMHS Test Tool should support conformance testing in a scope as outlined in Figure 12.

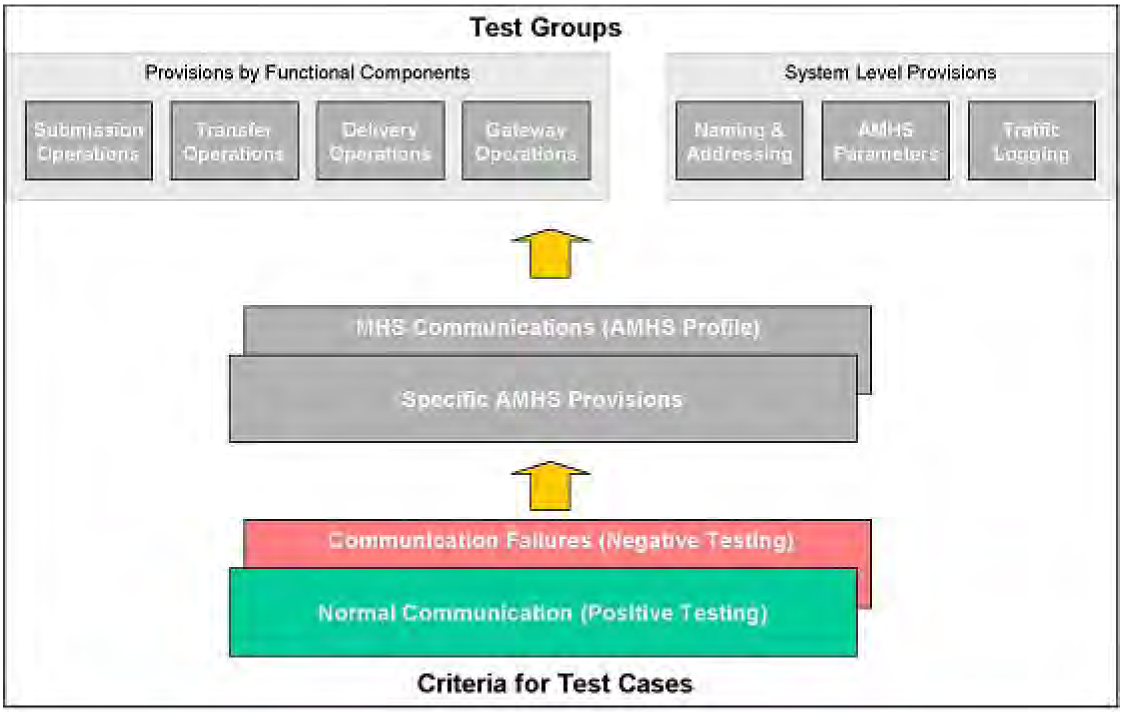


Figure 41: Approach for definition of Test Cases

In Figure 12 a distinction is made between communication requirements which are of general nature in MHS environments and such which are specific to AMHS. The first category of requirements is addressed in the AMHS SARPs just by references to the MHS standard (ISO/IEC 10021) and related profile documentation (ISPs). No further details of MHS procedures are provided with the AMHS SARPs .

In addition, the AMHS SARPs include a number of provisions which are specific for AMHS. Such provisions may relate to supplementary functional components (as AMHS gateways) or specify conventions for which MHS implementations are transparent (e.g. limited use of notification requests). The AMHS SARPs specify the AMHS specific provisions in a “standalone” manner.

Note. – An example of the above made distinction between specific AMHS requirements and underlying MHS features are the AMHS traffic logging requirements: The traffic logging requirements at an ATS Message Server refer to the last element of the trace-information (AMHS SARPs). The trace-information itself (forming part of the message-transfer-envelope) is specified in ISO/IEC 10021-4, 12.3.1. – It is up to the organisation which will operate an AMHS system to limit conformance testing to the SARPs specific elements or to extend testing to the referenced trace-information as defined with the MHS standard.

As second level criteria for definition of test cases a distinction is made between normal MHS/AMHS communications (*positive* testing) and enforcing fault situations (*negative* testing). Figure 13 details this further logical ordering of testing.

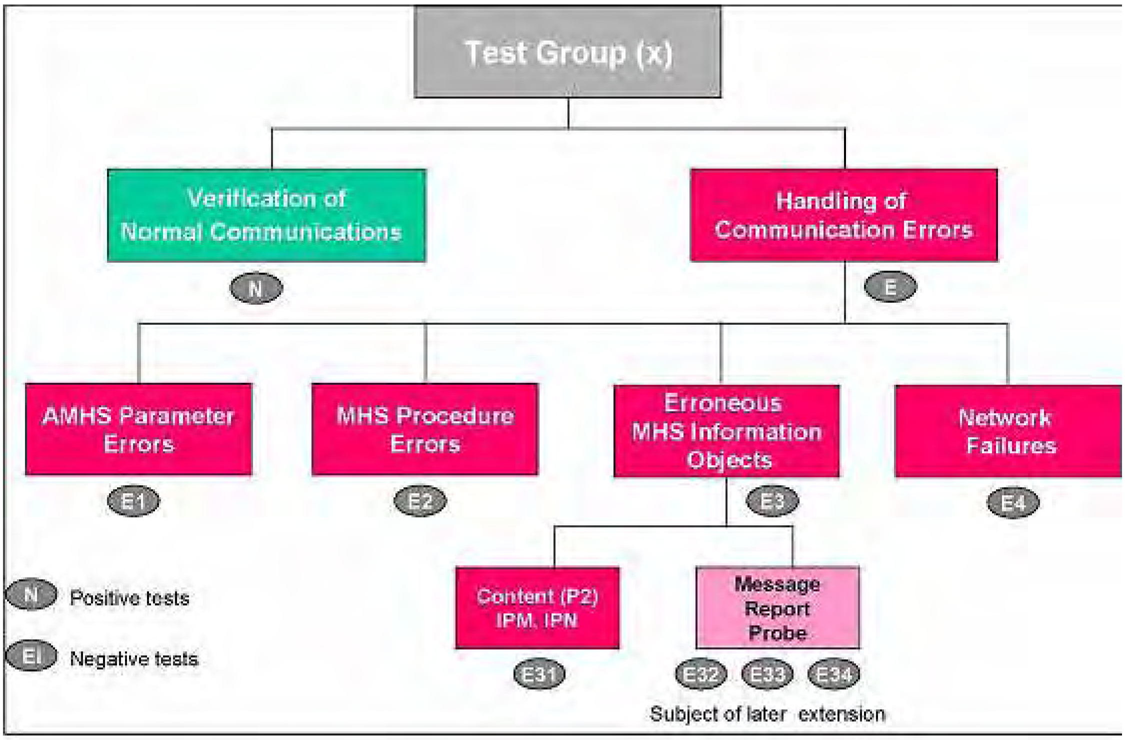


Figure 42: Classes of "Negative Tests"

The test categories indicated in Figure 13 are based on the following definitions:

Normal communications (N). – The AMHS Test Tool provides the IUT with correct inputs and the related responses (behaviour) of the IUT should be in compliance with the AMHS SARPs. It should be noted that a correct response of the IUT not always equals to a successful transmission of an AMHS information object. Example: If the service element *DL-expansion-prohibited* has been set then a DL expansion will not occur.

Erroneous AMHS parameters (E1). – The AMHS SARPs, Parameters, specify a number of specific AMHS conventions as use of MF-addresses, ATS-Message-Header, notification requests and single body part IPMs. It should be noted that violations of such AMHS conventions are not equal with faults in the MHS communication.

MHS procedural errors (E2). – The AMHS Test Tool does not act in compliance with the MHS procedures or the arrangements made in the test configuration. Examples:

1) The IUT is requested to send a message with a Report request, however, the AMHS Test Tool does not return any Report.
2) 2) The AMHS Test Tool uses a recipient address which is unknown in the test configuration.

Erroneous MHS information objects (E3). – That means arguments have not allowed values or information objects are corrupted. A distinction is made between the levels of IPMS and MTS:

- IPMS (E31). – IPMs and IPNs sent to the IUT are not correctly encoded (syntax or semantic errors). Example: Mandatory arguments in the IPM heading are missing or there is no IPM body attached to the IPM heading.

- MTS (E32), (E33), (E34). – Messages, Reports and Probes sent to the IUT are not correctly encoded. Example: In a Report the *Report Transfer Content* is missing.

Network failures (E4). – Transient interruptions of network connections during transmission of AMHS information objects. The AMHS Test Tool supports negative testing of the categories E1, E2 and E31 and E4 (Figure 13).

Note. – Negative testing of the categories E32, E33 and E34 may be subject of further extensions of the testing requirements if experience leads to this need.

A given test group may be transparent for one or more classes of “negative tests”. For example, transfer operations are transparent for AMHS parameter errors (E1) and Content (IPMS) failures (E31). Table 3 indicates in a form of a matrix the valid interrelations between defined test groups and classes of negative tests. Such a testing matrix may be helpful to demonstrate the reached coverage of testing for a given set of test cases.

	Submission Ops	**Transfer Ops**	**Delivery Ops**	**Gateway Ops**	**Naming & Addressing**	**AMHS Parameters**	**Traffic Logging**
N	X	X	X	X	X	X	X
E1	X	n/a	X	X	X	X	n/a
E2	X	X	X	X	n/a	n/a	n/a
E31	X	n/a	X	X	n/a	n/a	n/a
E32 – E34	X	X	X	X	n/a	n/a	n/a
E4	X	X	X	X	n/a	n/a	n/a

X = valid interrelation; n/a = not applicable

Table 33: Applicability of negative testing for test groups (testing matrix)

5 Configuration Parameters

The generic test configuration depicted in Figure 5 needs a number of quantitative adjustments before AMHS Test Tool and IUT are in a position to communicate with each other. The subjects of such adjustments are the values of *configuration parameters* which are inherent in the test configuration. Configuration parameters relate to the number of established communication links, number of simulated AMHS and AFTN users as well as to addresses associated with the various layers of communications. Below the configuration parameters are specified in the categories of AMHS and X.25/AFTN communications.

5.1 AMHS communication

5.1.1 AMHS application

- Number of transfer ports: 3
- Number of AMHS users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

5.2 Layer Addresses

No.	Address Type	AMHS SARPs	Value	
			IUT	AMHS Test Tool
1	Application Process Title	3.1.2.1.5.2.1 4.3.2.2		
2	AE-Qualifier	3.1.2.1.5.2.2	ATS Message Server: AMS(7) AFTN/AMHS Gateway: GWB(8)	
3	Presentation Selector	3.1.2.1.5.2.3	tbd	tbd
4	Session Selector	3.1.2.1.5.2.3	tbd	tbd
5	TSAP	3.1.2.1.5.2.3	tbd	tbd
6	TCP Port	n/a	102	
7	IP Address	n/a	tbd	MTA(1): tbd MTA(2): tbd MTA(3): tbd
8	MAC Address	n/a	tbd	MTA(1): tbd MTA(2): tbd MTA(3): tbd

Reference: Sections 3.3 and 3.5.1.1.

Table 34: Layer addresses (AMHS communications)

5.3 AFTN/X.25 communication

5.3.1 AFTN application

- Number of links: 1
- Number of AFTN users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

5.4 Layer addresses

No.	Address Type	Reference	Value	
			IUT	AMHS Test Tool
1	X.25 Entry (Ae)	[3] 6.1.2.1.4.5	*tbd*	*tbd*
	X.25 Exit (Ax)	[3] 5.1.2.7	*tbd*	*tbd*
2	X.25 DTE	[3] 4.2.1.7	*tbd*	*tbd*

Reference: Sections 3.4 and 3.5.1.2

Table 35*: *Layer addresses (X.25 communications)

5.5 Test Data

The test data generated and evaluated in conformance testing environments with the AMHS Test Tool comprise (cf. Figure 5):

(1) AMHS and AFTN information objects exchanged between the AMHS Test Tool and IUT. These information objects are well defined by the AMHS SARPs and Annex 10, Vol. II [2], respectively.

(2) AMHS information objects entered and presented at AMHS user interfaces of the IUT. Even if these information objects are substantially specified by the AMHS SARPs their appearance at AMHS user interfaces is specific to a given IUT. In addition, when entering AMHS information objects certain parameters may be handled by the IUT as defaults and do not appear at user interfaces at all.

(3) The AMHS SARPs specify events to be reported to the Control Position of an AFTN/AMHS Gateway. However, the style of reporting is an implementation matter.

(4) Traffic log data to be maintained by the IUT are specified in the AMHS SARPs, however, their handling and presentation is specific for each IUT.

Note:
The correct interpretation of test data of the types (2) to (4) needs insight into the IUT's User Manual.

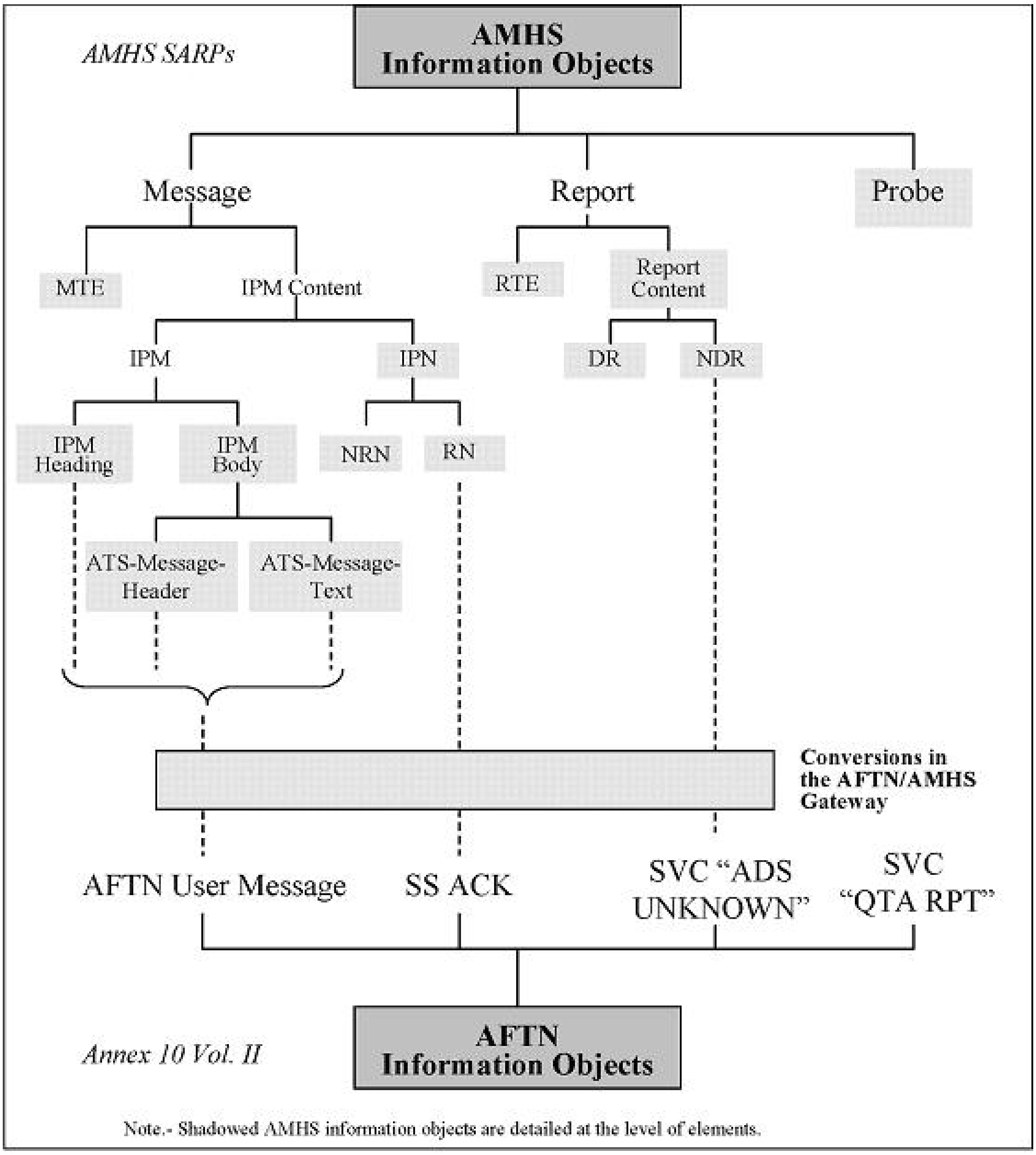


Figure 43 : Information objects supported by the AMHS Test Tool

6 Recommended default values for international MTA names and passwords

6.1 Introduction

6.1.1 AMHS implementation requires the setting of the MTA names and passwords for each communication partner (MTA) connected. In a future fully meshed AMHS Network, unique identification of the MTAs would be required. Additionally, the naming should respect the knowledge and experiences of the operator staff, in order to avoid any unnecessary complications in the transition to AMHS.

6.1.2 One way to achieve this is to use a scheme, in which MTA names and passwords contain keywords which uniquely identify the MTA and facilitate recognition.

6.2 Default values for international MTA names

6.2.1 The recommended scheme of MTA names consists of:

- the term “MTA”
- the Location Indicator of the MTA location and
- a number (for future extensions if required)

6.2.2. All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

Example: In accordance with this scheme the name of the MTA in Singapore, should be: MTA-WSSS -1.

6.2.3 This scheme could be used for the national MTA naming as well.

6.3 Default values for international MTA passwords

6.3.1 Password complications arise because manufacturers deviate in the interpretation of an “empty” password. Some implementations await “nothing”, some hexadecimal 00, others a single “space” character. To avoid misinterpretations during establishment of association(s) all tests could be performed with a common (known) password. Individual secure passwords could be established later, in order to ensure the necessary security of operational AMHS facilities.

6.3.2 The recommended scheme of the default password consists of:

- the term “ICAO”
- the Location Indicator of the MTA location and
- the specific number of the MTA

6.3.3 All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

Example: In accordance with this scheme the default password of the MTA in Singapore should be: ICAO-WSSS-1.

6.3.4 By following this scheme, the default passwords of future MTAs can be determined at any time. If there are no other security requirements such a scheme can simplify the integration of new MTAs in a fully meshed AMHS Network topology.

- END -

ANNEX E

AMHS Inter-Operability Tests

ANNEX E

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	15/06/2007	Creation of the document.	all
2.0	22/09/2008	Editorial updates – change of document version number	all

Table of Contents

References

[1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures

[2] ICAO DOC 9705-AN/956: The Manual of technical provisions for the ATN, Sub-volume III, Section 3.1 –Edition 3 (2002) – Referred to as AMHS SARPs

[3] ASIAPAC AMHS Manual, Main Part

[4] ASIAPAC AMHS Manual, Annex D, AMHS Testing Requirements

Table of Figures

List of Tables

1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional tests for AMHS Interoperability in order to ensure the end-to-end interoperability between AMHS systems under test. These tests are performed after the successful completion of AMHS conformance testing, through which the compliance of all systems under test to the AMHS SARPs has been demonstrated.

For this reason the data used in the interoperability tests are generated either:

- manually; or,
- using records obtained by copy (duplication) and storage of some real traffic occurred among users in service; or
- using parallel duplicated traffic.

Implementations tested in this phase will not be operational systems, but test beds in order to neither disturb the real traffic nor cause potential outages in the operational systems.

As a summary, the correct performance of the interoperability tests included in this document is the previous step to progress the IUT towards a future operational system; this will be done by means of a transition plan to real traffic in the future operational environment.

1.2 Document Structure

Chapter 2 presents the test environment used for AMHS interoperability testing.

Chapter 3 defines the addressing plan implemented in the test environment.

Chapters 4 and 5 contain the general description of the bilateral and trilateral test procedures with subsections for each AMHS functional area. Each test procedure is presented in a structured way consisting of

- defined test criteria,
- a (brief) scenario description,
- reference to the relevant part of the standard specification (SARPs section),

Chapters 6 and 7 contain the detailed test-case descriptions for the bilateral and trilateral test procedures.

Chapter 8 contains the templates for the test messages.

1.3 Test Identification Scheme

Each Interoperability Test procedure has an identifier in the form

ITxnn where:

IT is an acronym for Interoperability Test, *x* is a number identifying the test group[1] and *nn* is a consecutive number identifying the individual test procedure.

Test procedures are classified in two blocks: Bilateral Tests and Trilateral Tests.

The bilateral test groups consist of tests using messages specifically generated by IUTs for trials. The following six groups have been identified:

- testing of submission, transfer and delivery operations (x = 1),

- testing of gateway operations converting a user message from AFTN to AMHS (x=2),
- testing of gateway operations converting a user message from AMHS to AFTN (x=3),
- testing of gateway operations converting a user message from AFTN to AMHS and back to AFTN (x=4),
- testing of gateway operations – special cases (x=5)and
- testing of stress traffic situations (x=6)

The two trilateral test groups are:

- testing of transfer (relay) operations (x=7),
- testing of special situations (alternate routing, traffic loop) (x=8). [1]

[1] Test groups for AMHS conformance tests have been identified in [4].

2 AMHS Interoperability Test Environment

2.1 Application infrastructure

Both AMHS Implementations Under Test (IUTs) are complete systems constituted by AFTN, AMHS and AFTN/AMHS gateway components, with corresponding AFTN and AMHS user terminals and supervision positions, as decided locally by the corresponding organization.

In each IUT, an AMHS User Agent is used in submission and delivery tests. Gateway tests involve an AFTN user terminal. The use of the Monitor & Control Position is required in order to observe the outcome of the conversion processes, especially in out-of-line situations.

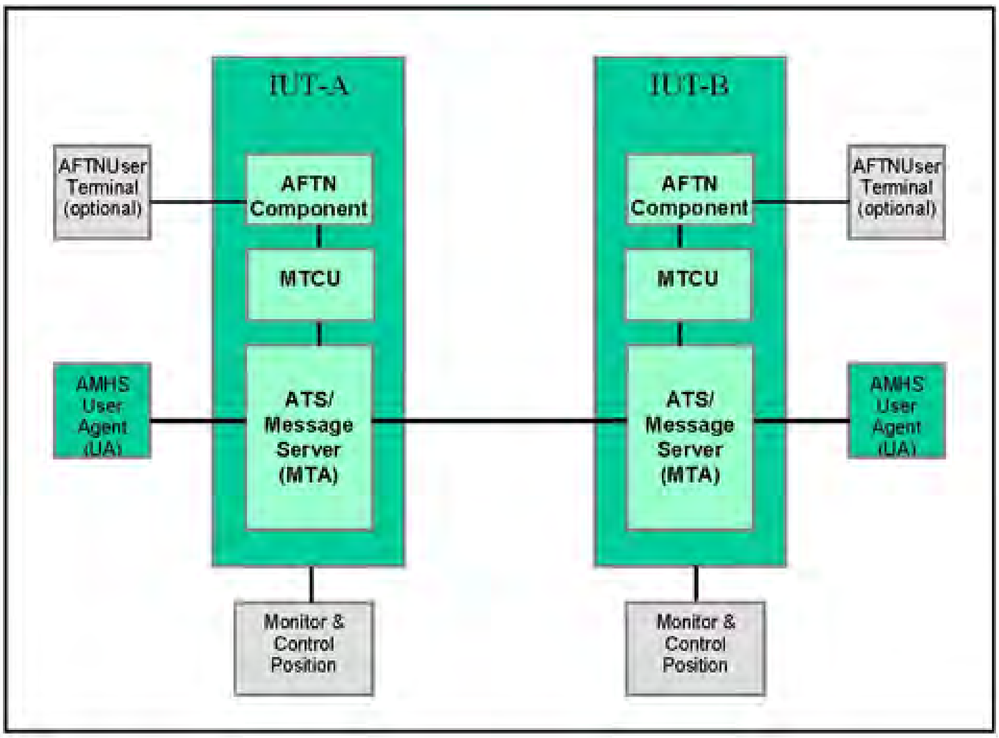


Figure E- 1: AMHS Inter-operability Test Environment

Figure E-1 shows the test environment used for AMHS interoperability tests. Both IUTs will be interconnected via AMHS transfer ports supporting the X.400/P1 protocol over a TCP/IP/LAN.

Note. – In Figure E-1 the AFTN Terminal is directly connected to the AFTN Component in an abstract way. There may exist different implementations with an AFTN component only connected to an AFTN switch or integrated AFTN/AMHS switches. For the interoperability tests it does not matter whether the AFTN Terminal *is connected directly or indirectly.*

The components of the test environment as depicted in Figure 1 are involved in the test procedures in following way:

Submission, Transfer and Delivery operation tests (AMHS => AMHS) (x=1):
AMHS User Agent => ATS Message Server => ATS Message Server => AMHS User Agent

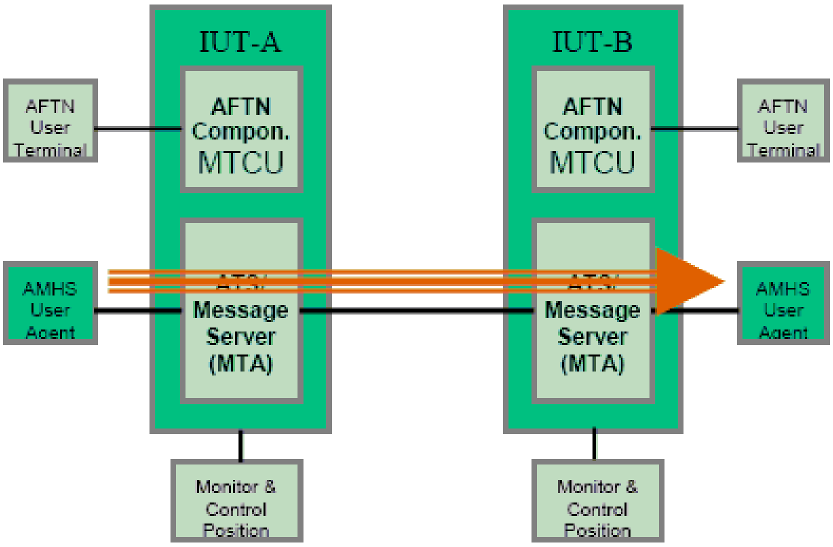


Figure E- 2: UA to UA (IUT-A to IUT-B)

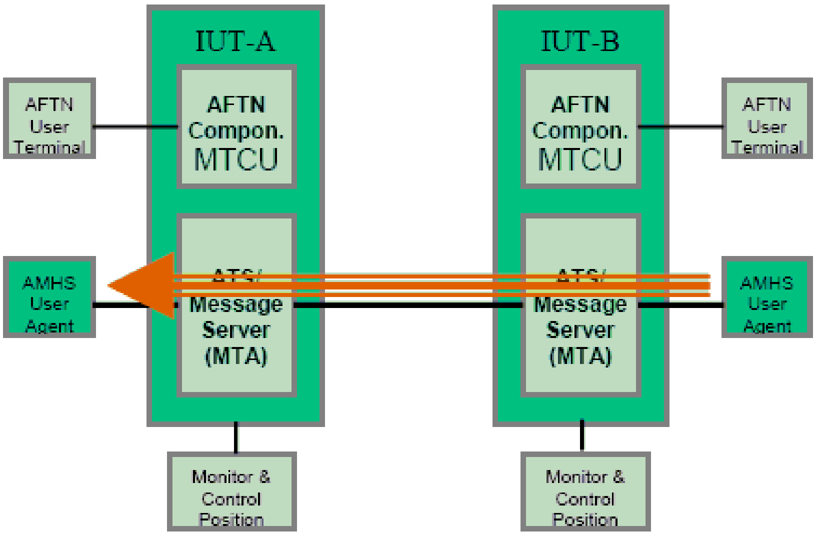


Figure E- 3: UA to UA (IUT-B to IUT-A)

AMHS / AFTN gateway tests (AFTN => AMHS) (x=2):
AFTN Terminal => Gateway and ATS Message Server => UA

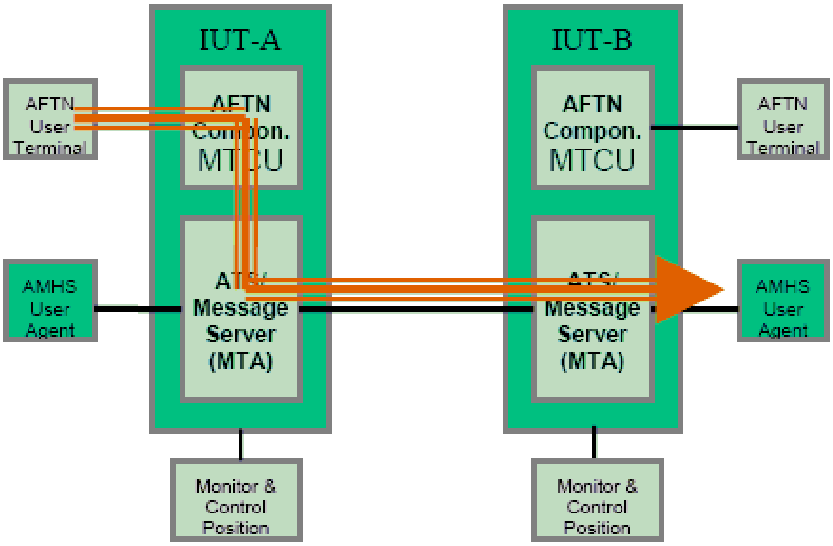


Figure E- 4: AFTN Terminal to UA (IUT-A to IUT-B)

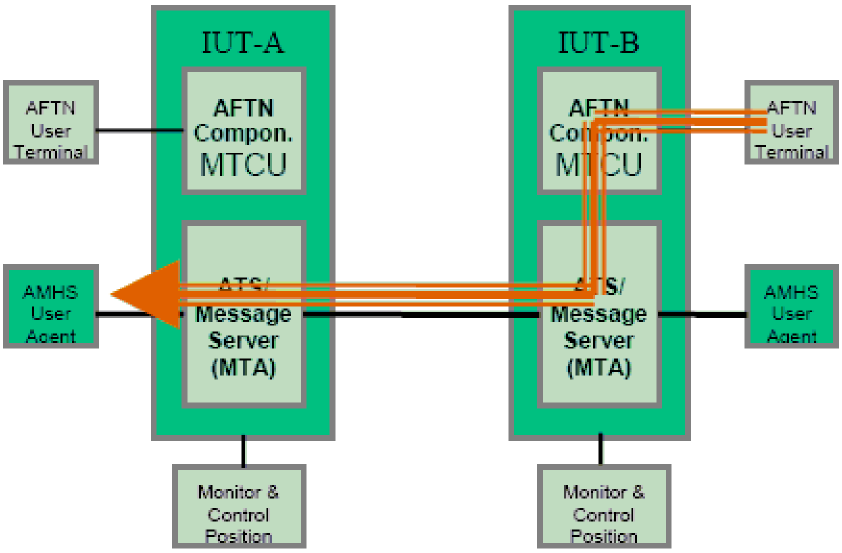


Figure E- 5: AFTN Terminal to UA (IUT-B to IUT-A)

AMHS / AFTN gateway tests (AMHS => AFTN) (x=3):
UA => ATS Message Server and Gateway => AFTN Terminal

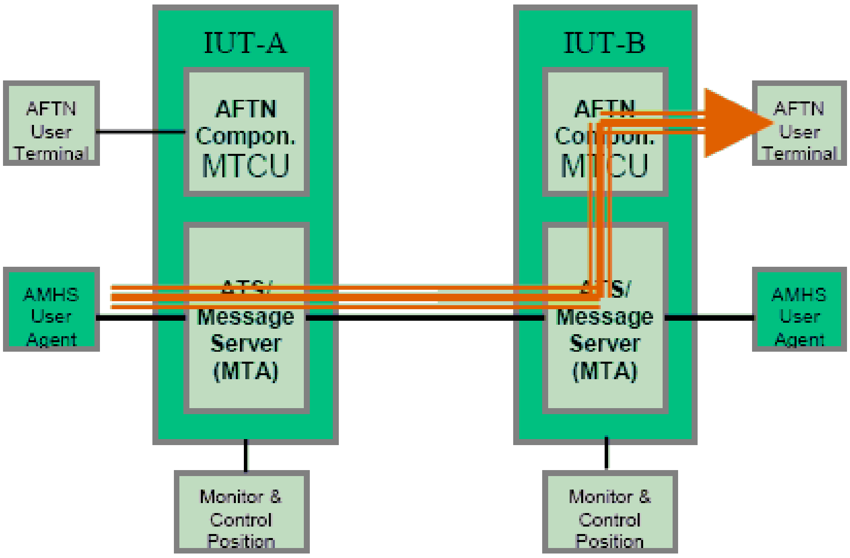


Figure E- 6: UA to AFTN Terminal (IUT-A to IUT-B)

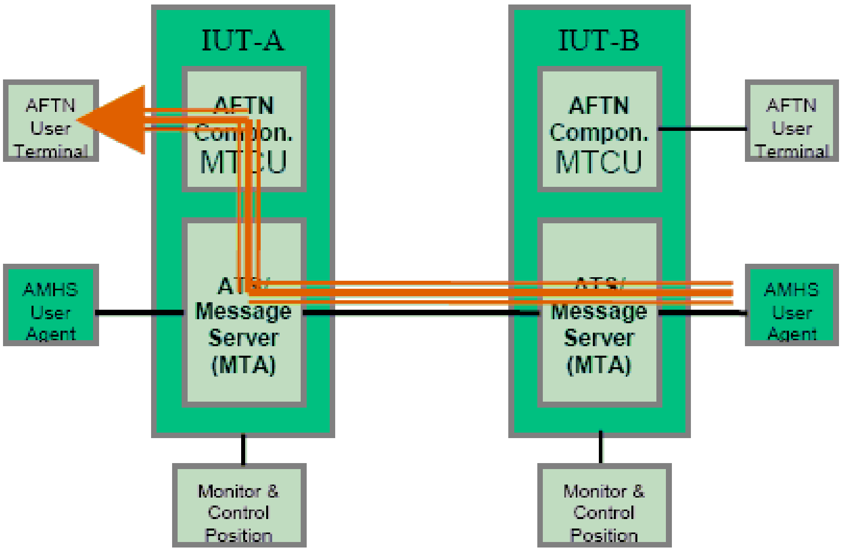


Figure E- 7: UA to AFTN Terminal (IUT-B to IUT-A)

AMHS / AFTN gateway tests (AFTN => AMHS => AFTN) (x=4):
AFTN Terminal => Gateway => ATS Message Servers => Gateway => AFTN Terminal

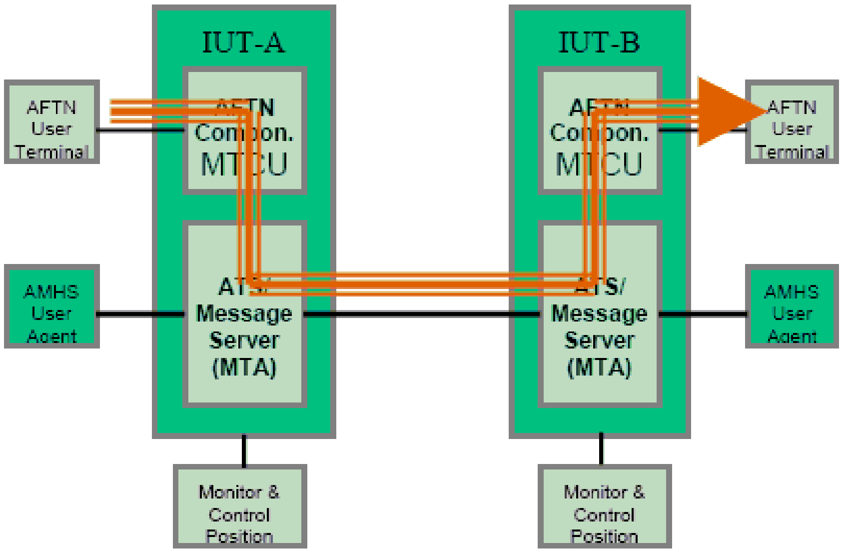


Figure E- 8: AFTN Terminal to AFTN Terminal (IUT-A to IUT-B)

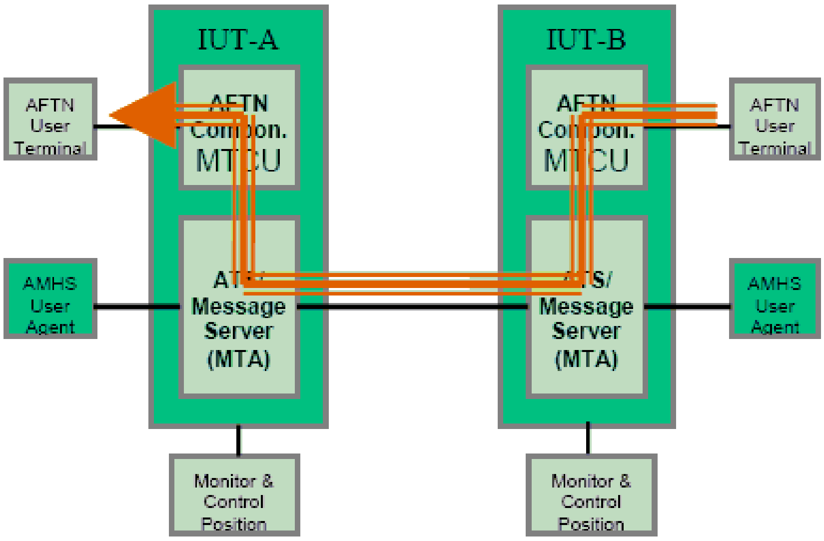


Figure E- 9: AFTN Terminal to AFTN Terminal (IUT-B to IUT-A)

Gateway Operations – special case scenarios (x=5)
For the special case scenarios different combinations of the flows shown above are used.

Stress traffic situations (x=6)
Depending on the stress scenario chosen combinations of the flows shown above are used.

"Relay" operation tests (x=7) – (optional - additional test partner required – IUT-C)
Peer IUT => IUT (ATS Message Server) => peer IUT

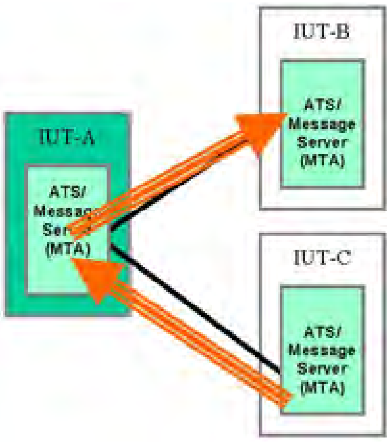


Figure E- 10: "Relay" operation tests

Testing of special situations (x=8) – (optional - additional test partner required – IUT-C and – additional connectivity required IUT-B - IUT-C)

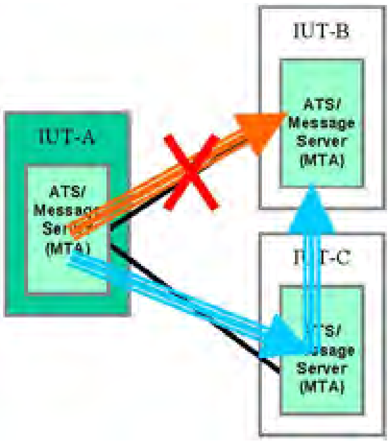


Figure E- 11: Alternate MTA routing

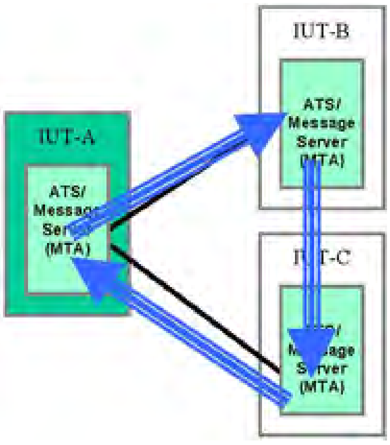


Figure E- 12: Traffic loop test

2.2 Transport infrastructure

To perform the bilateral interoperability tests, an underlying infrastructure for message transport between the two IUTs has to be agreed. In case of multilateral tests an underlying infrastructure for message transport between the involved IUTs (minimum three) has to be agreed. Other "non-standard" solutions may be used for testing. Those refer to the actual network environment or other means offered by communications suppliers, such as ADSL, public internet; in this case, agreement among the parties is necessary due to the potential impact of this solution on the configuration of the timers of the systems concerned, as compared to the standard solution.

2.3 General parameters to be agreed

The following entries and/or parameter shall be agreed between the test partners. Preferred the default values should be used.

2.3.1 Default MTA names and passwords

IUT	MTA name	Remarks
IUT-A	MTA-IUTA-1	
IUT-B	MTA-IUTB-1	
IUT-C	MTA-IUTC-1	

Table 36: Default MTA names

IUT	password	Remarks
IUT-A	ICAO-IUTA-1	
IUT-B	ICAO-IUTB-1	
IUT-C	ICAO-IUTC-1	

Table 37: Default passwords

2.3.2 TSAP addresses

IUT	TSAP address	Remarks
IUT-A	to be agreed bilaterally	
IUT-B	to be agreed bilaterally	
IUT-C	to be agreed	

Table 38: TSAP addresses

2.3.3 IP addresses

IUT	IP address	Remarks
IUT-A	to be agreed bilaterally	
IUT-B	to be agreed bilaterally	
IUT-C	to be agreed	

Table 39: IP addresses

2.3.4 Type and number of associations

IUT	Type of associations	Number of associations	Remarks
IUT-A	monologue	5	
IUT-B	monologue	5	
IUT-C	monologue	5	

Table 40: Default type and number of associations

3 Addressing Plan for AMHS Interoperability Testing

3.1 User addresses

To meet the scope of testing, the test-address space used by AMHS Interoperability Testing should include, for each IUT, the respective AFTN and AMHS addresses and the corresponding AMHS PRMD.

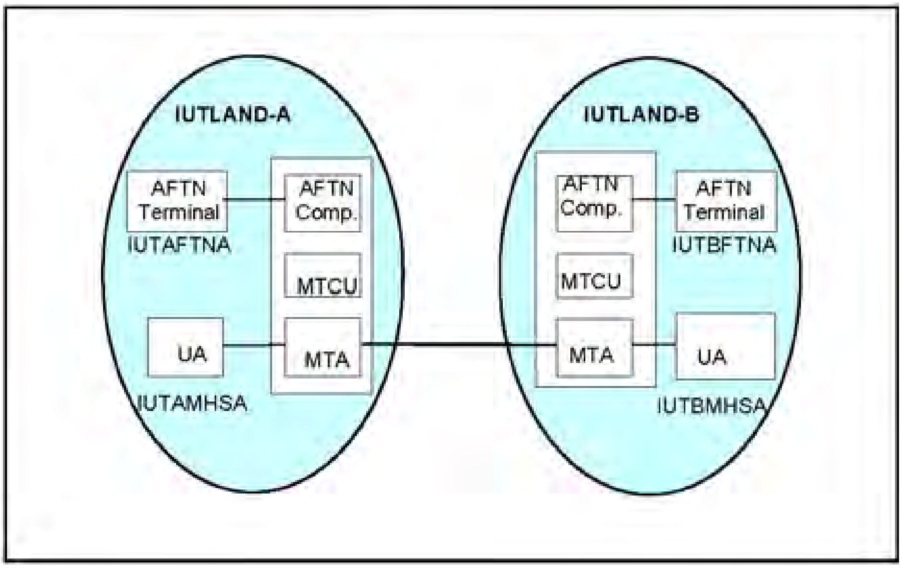


Figure E- 13: Addressing Plan

The original, operational AMHS and AFTN addresses assigned to the COM Centre could be used as test addresses for each IUT. To distinguish between operational and test addresses it is recommended to use alternatively, a generic address space taken from fictitious PRMD/AFTN countries IUTLAND-A and IUTLAND-B.

This includes generic user addresses IUTAFTNA and IUTAMHSA for IUTLAND-A as well as IUTBFTNA and IUTBMHSA for IUTLAND-B, which may be mapped either according to the CAAS (preferred, or a more comprehensive set of addresses in case of CAAS with multiple "O" values) or the XF addressing scheme.

The following tables show the generic address space assigned to the two IUTs and a third IUT if trilateral network tests are performed.

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-A O = A-REGION OU1 = IUTA CN = IUTAFTNA ... IUTAMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-A O = A-REGION1 OU1 = IUTA CN = IUTAFTNA ... IUTAMHSA O = A-REGION2 OU1 = IUAA CN = IUAAFTNA ... IUAAMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-A O = AFTN OU1 = IUTAFTNA ... IUTAMHSA

Table 41: Generic address spaces of IUTLAND-A

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-B O = B-REGION OU1 = IUTB CN = IUTBFTNA ... IUTBMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-B O = B-REGION1 OU1 = IUTB CN = IUTBFTNA ... IUTBMHSA O = B-REGION2 OU1 = IUBB CN = IUBBFTNA ... IUBBMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-B O = AFTN OU1 = IUTBFTNA ... IUTBMHSA

Table 42: Generic address spaces of IUTLAND-B

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-C O = C-REGION OU1 = IUTC CN = IUTCFTNA ... IUTCMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-C O = B-REGION1 OU1 = IUTC CN = IUTCFTNA ... IUTCMHSA O = B-REGION2 OU1 = IUCC CN = IUCCFTNA ... IUCCMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-C O = AFTN OU1 = IUTCFTNA ... IUTCMHSA

Table 43: Generic address spaces of IUTLAND-C

3.2 DL addresses

Distribution List name	Addresses included in the DL	Remarks
IUTADLLO	IUTBFTNA IUTBFTNB IUTBMHSA	
IUTADLRE	IUTAFTNA IUTAFTNB IUTAMHSA	

Table 44: DL addresses of IUT-A

Distribution List name	Addresses included in the DL	Remarks
IUTBDLLO	IUTAFTNA IUTAFTNB IUTAMHSA	
IUTBDLRE	IUTBFTNA IUTBFTNB IUTBMHSA	

Table 45: DL addresses of IUT-B

3.3 AFTN and X.400 Routing Tables

3.3.1 AFTN and X.400 Routing Tables of IUT-A

AFTN Routing Indicator	Routing direction	Remarks
IUTAFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

Table 46: AFTN Routing Table of IUT-A X.400

Routing Indicator X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSA/	UA IUT-A	If CAAS "single "O" type
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSB/	UA IUT-A	If CAAS "single "O" type
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSC/	UA IUT-A	If CAAS "single "O" type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSA/	UA IUT-A	If "XF" type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSB/	UA IUT-A	If "XF" type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSC/	UA IUT-A	If "XF" type
/C=XX/A=ICAO/P=IUTLAND-A	MTCU	
/C=XX/A=ICAO/P=IUTLAND-B	MTA-IUTB-1	
/C=XX/A=ICAO/P=IUTLAND-C	MTA-IUTC-1	
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTB-1	

Table 47: X.400 Routing Table of IUT-A

3.3.2 AFTN and X.400 Routing Tables of IUT-B

AFTN Routing Indicator	Routing direction	Remarks
IUTBFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

Table 48: AFTN Routing Table of IUT-B

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSA/	UA IUT-B	If CAAS "single "O" type
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSB/	UA IUT-B	If CAAS "single "O" type
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSC/	UA IUT-B	If CAAS "single "O" type
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSA/	UA IUT-B	If "XF" type
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSB/	UA IUT-B	If "XF" type

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSC/	UA IUT-B	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-B	MTCU	
/C=XX/A=ICAO/P=IUTLAND-A	MTA-IUTA-1	
/C=XX/A=ICAO/P=IUTLAND-C	MTA-IUTC-1	
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTC-1	

Table 49: X.400 Routing Table of IUT-B

3.3.3 AFTN and X.400 Routing Tables of IUT-C

AFTN Routing Indicator	Routing direction	Remarks
IUTCFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

Table 50: AFTN Routing Table of IUT-C

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSA/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSB/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSC/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSA/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSB/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSC/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C	MTCU	
/C=XX/A=ICAO/P=IUTLAND-A	MTA-IUTA-1	
/C=XX/A=ICAO/P=IUTLAND-B	MTA-IUTB-1	
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTA-1	

Table 51: X.400 Routing Table of IUT-C

3.4 Look-up Table

3.4.1 Generic look-up Table for all Implementations Under Test (IUT) (CAAS single "O" type)

AFTN address	O/R Address (CAAS single "O" type)
IUTAFTN*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/
IUTAFTA*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/
IUTAFTU*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/ ***Note. – This address has to be unknown and not defined in IUT-A***
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLRE/
IUTBFTN*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/
IUTBFTA*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/
IUTBFTU*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/ Note. – This address has to be unknown and not defined in IUT-B
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=X-REGION/OU1=IUTX/CN=IUTXLOOP/

Table 52: Generic look-up table (CAAS single "O" type)

3.4.2 Generic look-up Table for all Implementations Under Test (IUT) ("XF" type)

AFTN address	O/R Address ("XF" type)
IUTAFTN*	/C=XX/A=ICAO/P=IUTLAND-A/
IUTAFTA*	/C=XX/A=ICAO/P=IUTLAND-A/
IUTAFTU*	/C=XX/A=ICAO/P=IUTLAND-A/ ***Note. – This address has to be unknown and not defined in IUT-A***
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLRE/
IUTBFTN*	/C=XX/A=ICAO/P=IUTLAND-B/
IUTBFTA*	/C=XX/A=ICAO/P=IUTLAND-B/
IUTBFTU*	/C=XX/A=ICAO/P=IUTLAND-B/ Note. – This address has to be unknown and not defined in IUT-B
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=AFTN/OU1=IUTXLOOP/

Table 53: Generic look-up table ("XF" type)

Note. – There are further possibilities: IUT-A could have XF addressing scheme whilst IUT-B has CAAS, or vice-versa. In such a case, the corresponding table entries should be selected. To simplify matters it is recommended to use CAAS single "O" type or "XF" type only.

3.5 Local AMHS User address book

3.5.1 Local AMHS User address book for UA of all Implementations Under Test (IUT) (CAAS single "O" type)

Nick name	O/R Address (CAAS single "O" type)
IUTAFTNA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNA/
IUTAFTNB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNB/
IUTAFTNC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNC/
IUTAFTND	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTND/
IUTAFTNE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNE/
IUTAFTNF	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNF/
IUTAFTNG	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNG/
IUTAFTNH	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNH/
IUTAFTNI	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNI/
IUTAFTNJ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNJ/
IUTAFTNK	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNK/
IUTAFTNL	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNL/
IUTAFTNM	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNM/
IUTAFTNN	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNN/
IUTAFTNO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNO/
IUTAFTNP	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNP/
IUTAFTNQ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNQ/
IUTAFTNR	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNR/
IUTAFTNS	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNS/
IUTAFTNT	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNT/
IUTAFTNU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNU/
IUTAFTNV	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNV/
IUTAFTNW	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNW/
IUTAFTNX	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNX/
IUTAFTNY	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNY/
IUTAFTAA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAA/
IUTAFTAB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAB/
IUTAFTAC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAC/
IUTAFTAD	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAD/
IUTAFTAE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAE/
IUTAFTAF	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAF/
IUTAFTAG	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAG/
IUTAFTAH	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAH/
IUTAFTAI	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAI/
IUTAFTAJ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAJ/

IUTAFTAK	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAK/
IUTAFTAL	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAL/
IUTAFTAM	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAM/
IUTAFTAN	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAN/
IUTAFTAO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAO/
IUTAFTAP	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAP/
IUTAFTAQ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAQ/
IUTAFTAR	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAR/
IUTAFTAS	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAS/
IUTAFTAT	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAT/
IUTAFTAU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAU/
IUTAFTAV	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAV/
IUTAFTAW	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAW/
IUTAFTAX	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAX/
IUTAFTAY	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAY/
IUTAFTUU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTUU/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLRE/
IUTBFTNA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNA/
IUTBFTNB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNB/
IUTBFTNC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNC/
till	**To be continued till**
IUTBFTNY	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNY/
IUTBFTAA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTAA/
till	**To be continued till**
IUTBFTAY	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTAY/
IUTBFTUU	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTUU/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=X-REGION/OU1=IUTX/CN=IUTXLOOP/

Table 54: Local AMHS User address book (CAAS single "O" type)

3.5.2 Local AMHS User address book for UA of all Implementations Under Test (IUT) ("XF" type)

Nick name	O/R Address ("XF" type)
IUTAFTNA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNA/
IUTAFTNB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNB/
IUTAFTNC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNC/
till	**To be continued till**
IUTAFTNY	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNY/
IUTAFTAA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTAA/
till	**To be continued till**
IUTAFTAY	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTAY/
IUTAFTUU	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTUU/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLRE/
IUTBFTNA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNA/
IUTBFTNB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNB/
IUTBFTNC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNC/
till	**To be continued till**
IUTBFTNY	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNY/
IUTBFTAA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTAA/
till	**To be continued till**
IUTBFTAY	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTAY/
IUTBFTUU	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTUU/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=AFTN/OU1=IUTXLOOP/

Table 55: Local AMHS User address book ("XF" type)

4 Bilateral Test Procedures

4.1 Submission, Transfer and Delivery Operation (AMHS to AMHS)

4.1.1 IT101 – Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)

IT101	**Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)**
Test criteria	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPM) correctly to a peer MTA which delivers the ATS messages (IPM) to the UA of the receiving IUT.
Scenario description	From the UA of IUT-A send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user in the peer IUT, via AMHS. • Message 1 (IT101M01) shall have ATS-message-priority KK. • Message 2 (IT101M02) shall have ATS-message-priority GG. • Message 3 (IT101M03) shall have ATS-message-priority FF. • Message 4 (IT101M04) shall have ATS-message-priority DD. • Message 5 (IT101M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. Verify the messages received by the remote UA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent), 3.1.2.2.2 (ATS Message Server), 3.1.2.2.3.2.3 (ATS-Message-Header)
Test class	Normal AMHS communications (N)

4.1.2 IT102 – Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)

IT102	**Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)**
Test criteria	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPM) correctly to a peer MTA which delivers the ATS messages (IPM) to the UA of the receiving IUT.
Scenario description	From the UA of IUT-B send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user in the peer IUT, via AMHS. • Message 1 (IT102M01) shall have ATS-message-priority KK. • Message 2 (IT102M02) shall have ATS-message-priority GG. • Message 3 (IT102M03) shall have ATS-message-priority FF. • Message 4 (IT102M04) shall have ATS-message-priority DD. • Message 5 (IT102M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. Verify the messages received by the remote UA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent), 3.1.2.2.2 (ATS Message Server), 3.1.2.2.3.2.3 (ATS-Message-Header)
Test class	Normal AMHS communications (N)

4.2 Gateway Operations (AFTN to AMHS)

4.2.1 IT201 – Convert an AFTN message to AMHS format (IUT-A)

IT201	**Convert an AFTN message to AMHS format (IUT-A)**
Test criteria	This test is successful, if the sending IUT converts AFTN messages correctly to AMHS messages (IPM).
Scenario description	From the sending IUT send a sequence of AFTN messages addressing a remote AMHS user, consisting of five messages: • AFTN message 1 (IT201M01) shall have priority KK. • AFTN message 2 (IT201M02) shall have priority GG. • AFTN message 3 (IT201M03) shall have priority FF. • AFTN message 4 (IT201M04) shall have priority DD. • AFTN message 5 (IT201M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the IPMs that the AMHS user receives in the receiving IUT. Verify that the IUT has converted the messages correctly according to Table 3.1.2-8 of the AMHS SARPs – see section 3.1.2.3.4.2. In particular: • verify that each message has different ATS-filing-time; • verify that the optional-heading-information element is empty; • check the correct format of the ATS message; • verify the ATS-message-priority and the related message transfer priority for each received message; • compare the ATS-message-text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2
Test class	Normal AMHS communications (N)

4.2.2 IT202 – Convert an AFTN message to AMHS format (IUT-B)

IT202	Convert an AFTN message to AMHS format (IUT-B)
Test criteria	This test is successful, if the sending IUT converts AFTN messages correctly to AMHS messages (IPM).
Scenario description	From the sending IUT send a sequence of AFTN messages addressing a remote AMHS user, consisting of five messages: • AFTN message 1 (IT202M01) shall have priority KK. • AFTN message 2 (IT202M02) shall have priority GG. • AFTN message 3 (IT202M03) shall have priority FF. • AFTN message 4 (IT202M04) shall have priority DD. • AFTN message 5 (IT202M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the IPMs that the AMHS user receives in the receiving IUT. Verify that the IUT has converted the messages correctly according to Table 3.1.2-8 of the AMHS SARPs – see section 3.1.2.3.4.2. In particular: • verify that each message has different ATS-filing-time; • verify that the optional-heading-information element is empty; • check the correct format of the ATS message; • verify the ATS-message-priority and the related message transfer priority for each received message; • compare the ATS-message-text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2
Test class	Normal AMHS communications (N)

4.3 Gateway Operations (AMHS to AFTN)

4.3.1 IT301 – Convert an IPM generated by the UA of IUT-A to AFTN format

IT301	**Convert an IPM to AFTN format (IUT-B)**
Test criteria	This test is successful, if the receiving IUT converts IPMs correctly into AFTN format.
Scenario description	Send from IUT-A (UA) a sequence of ATS messages (IPMs) to the IUT-B, addressing an AFTN terminal. • Message 1 (IT301M01) shall have ATS-message-priority KK. • Message 2 (IT301M02) shall have ATS-message-priority GG. • Message 3 (IT301M03) shall have ATS-message-priority FF. • Message 4 (IT301M04) shall have ATS-message-priority DD. • Message 5 (IT301M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. The implicit-conversion-prohibited attribute of the AMHS message must be set to “false”. Check the correct format of the AFTN message. Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.
AMHS SARPs reference	3.1.2.3.5.2 (AMHS IPM conversion)
Test class	Normal AMHS communications (N)

4.4 Gateway Operations (AFTN to AMHS to AFTN)

4.4.1 IT401 – Convert an AFTN message to AMHS and back to AFTN format

IT401	**Convert an AFTN message to AMHS and back to AFTN format**
Test criteria	This test is successful, if the sending IUT-A converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in IUT-B.
Scenario description	From IUT-A send a sequence of AFTN messages addressing a remote AFTN user in IUT-B, consisting of five messages: • AFTN message 1 (IT401M01) shall have priority KK. • AFTN message 2 (IT401M02) shall have priority GG. • AFTN message 3 (IT401M03) shall have priority FF. • AFTN message 4 (IT401M04) shall have priority DD. • AFTN message 5 (IT401M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the AFTN message received by the AFTN user in the IUT-B. • Check the correct format of the AFTN message. • Each AFTN message shall have original filing time. • Each message shall have an empty OHI. • Verify the AFTN priority for each received message. • Compare the AFTN message text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2, 3.1.2.3.5.2
Test class	Normal AMHS communications (N)

4.4.2 IT402 – Convert an AFTN message to AMHS and back to AFTN format

IT402	**Convert an AFTN message to AMHS and back to AFTN format**
Test criteria	This test is successful, if the sending IUT-B converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in IUT-A.
Scenario description	From IUT-B send a sequence of AFTN messages addressing a remote AFTN user in IUT-A, consisting of five messages: • AFTN message 1 (IT402M01) shall have priority KK. • AFTN message 2 (IT402M02) shall have priority GG. • AFTN message 3 (IT402M03) shall have priority FF. • AFTN message 4 (IT402M04) shall have priority DD. • AFTN message 5 (IT402M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the AFTN message received by the AFTN user in the IUT-A. • Check the correct format of the AFTN message. • Each AFTN message shall have original filing time. • Each message shall have an empty OHI. • Verify the AFTN priority for each received message. • Compare the AFTN message text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2, 3.1.2.3.5.2
Test class	Normal AMHS communications (N)

4.5 Gateway Operations – special case scenarios

Note – The following special case scenarios are symmetric. That means, all test-cases have to be performed by IUT-A as well as IUT-B.

4.5.1 IT501 – Distribute an IPM to AMHS and AFTN users

IT501	**Distribute an IPM to AMHS and AFTN users**
Test criteria	This test is successful, if the receiving IUT distributes an IPM addressing both an AMHS and an AFTN user correctly.
Scenario description	From the sending IUT send an ATS message (IPM), addressing both AMHS and AFTN users, at the receiving IUT. The IPM Heading of the message shall contain two primary recipients, which are one AMHS and one AFTN user. The IPM Heading of the next message shall contain additionally, two copy recipients, which are also one AMHS and one AFTN user. Finally the IPM Heading of the last message shall contain additionally two blind copy recipients, which are also one AMHS and one AFTN user. Verify that all the users, whose addresses have been included in the IPM, receive the message correctly.
AMHS SARPs reference	3.1.2.2.1 (ATS message user agent), 3.1.2.2.2 (ATS message server), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications (N)

4.5.2 IT502 – Expand a DL addressing both AMHS and AFTN users

IT502	**Expand a DL addressing both AMHS and AFTN users**
Test criteria	This test is successful, if the receiving IUT distributes an IPM, addressing AMHS and AFTN users in a distribution list, correctly.
Scenario description	From the sending IUT send an ATS message (IPM) to the receiving IUT. The recipient contained in the MTE addresses a distribution list, for which the receiving IUT is responsible. The distribution list shall have the addresses of one AMHS user and two AFTN users as members. The message shall have the *dl-expansion-prohibited* attribute set to "false". Check the messages received in each AFTN user address verifying that each one contains its corresponding address.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications (N)

4.5.3 IT503 – Convert an IPM, if the ATS-message-text contains more than 1800 characters

IT503	**Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters**
Test criteria	This test is successful, if the IUT, when it receives an ATS message with ATS-message-text longer than 1800 characters, a) rejects the message and returns a NDR, or b) splits the received IPM into several messages and converts the resulting messages into AFTN format as specified in ICAO Annex 10, Attn. B [1], or c) converts the received IPM into a "long" AFTN message. Note. – The AMHS SARPs (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b).

Scenario description	From the sending IUT send an ATS message (IPM) containing ATS-message-text of 4500 characters to an AFTN recipient of the receiving IUT. If case a is implemented*:* Verify that the receiving IUT does not convert the IPM into AFTN format, but returns a NDR. Check the NDR contents received at the sending User Agent. Verify that the NDR contains the following elements: • "unable-to-transfer" for the non-delivery-reason-code; • "content-too-long" for the non-delivery-diagnostic-code; and • "unable to convert to AFTN due to message text length" for the supplementary-information. If case b is implemented: Verify that (at least) three AFTN messages are received by the AFTN recipient. Check the correct format of the AFTN messages. Check the text field of all received AFTN messages. Verify that the text is complete and unchanged, i.e. compare the received data with the *ATS-message-text* provided in the original IPM. Verify that the received messages contain the sequence indicators as specified in Attm. B of ICAO Annex 10, Vol. II [1]. If case c is implemented: Verify that the AFTN message is received by the AFTN recipient. Check the correct format of the received AFTN message. Verify that the text is complete and unchanged, i.e. compare the received data with the *ATS-message-text* provided in the original IPM.
AMHS SARPs reference	3.1.2.3.5.2.1.7
Test class	Normal AMHS communications (N)

4.5.4 IT504 – Split an incoming IPM addressing more than 21 AFTN users

IT504	**Split an incoming IPM addressing more than 21 AFTN users**
Test criteria	This test is successful, if the receiving IUT receives an ATS message (IPM) addressing more than 21 AFTN users and splits the received IPM into several messages each addressing 21 or less AFTN users. *Note. – PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages.*
Scenario description	From the sending IUT send an ATS message (IPM) to the receiving IUT. The message shall address 50 (primary) recipients. Verify that the receiving IUT converts the IPM into AFTN format and sends three AFTN messages to its AFTN component. Check the addressee indicators contained in the AFTN messages. Verify that no AFTN recipient is lost and the total number of AFTN addressee indicators contained in all three messages is 50. For example • the first AFTN message contains addressee indicators for the first 21 recipients, • the second AFTN message contains addressee indicators for the next 21 recipients, and • the third AFTN message contains addressee indicators for the remaining 8 recipients.
AMHS SARPs reference	3.1.2.3.5.2.1.8
Test class	Normal AMHS communications (N)

4.5.5 IT505 – Probe Conveyance Test

IT505	**Probe Conveyance Test**
Test criteria	This test is successful, if the receiving IUT generates a report (DR or NDR), when it receives a probe with AFTN users as intended recipients.
Scenario description	From the sending IUT, send AMHS probes to the receiving IUT: a) addressing two AFTN recipients and one AMHS recipient, b) addressing two AFTN recipients, one of which can be mapped and one of which cannot be mapped onto a valid AFTN address. Verify that the receiving IUT returns a. one DR with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA b. a combined DR and NDR or one DR and one NDR in response to the probe received. Verify in all cases that the DRs reporting about the AFTN addresses which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.
AMHS SARPs reference	3.1.2.3.5.5 (reception of AMHS probe), 3.1.2.3.5.6.2.27
Test class	Normal AMHS communications (N)

4.6 Stress traffic situations

4.6.1 IT601 – Stress load

IT601	Stress load
Test criteria	This test is successful, if both IUTs perform AMHS traffic interchange correctly for a number of messages queued in advance.
Scenario description	Defined numbers of messages (beginning with100, 200, till 400 messages) have to be selected from the data base or generated by the UA or the AFTN terminal. These messages need to be queued (in MTAs) in both IUTs, preferably by disabling the physical connector used to send information to the underlying network in one of the IUTs. When reconnecting, the messages queued in both IUTs will be sent simultaneously from the two sites, the rate being defined by the line speed of the interconnection, as well as the process followed by each system. No errors due to malfunction of the IUTs should be observed during the interchange period. The time from sending the first till receiving the last message has to be measured and analysed in both IUTs.
AMHS SARPs reference	None
Test class	Normal (forced) AMHS communications (N)

5 Trilateral Test procedures - optional

5.1 Submission/Transfer/Delivery and Relay operations

5.1.1 IT701 – Submission /Transfer/Delivery between the partner MTAs

IT701	**Submission / Transfer / Delivery between the partner MTAs**
Test criteria	This test is successful, if the messages from all UAs are received by the corresponding UAs of the other the IUTs.
Scenario description	Create “normal” X.400 routing: (see 3.3, AFTN and X.400 Routing Tables) From the UA send an ATS message (IPM) with ATS-message-priority FF addressed to the UA of the other IUTs. • Message 1 (IT701M01) from UA IUT-A to UAs of IUT-B and IUT-C • Message 2 (IT701M02) from UA IUT-B to UAs of IUT-A and IUT-C. • Message 3 (IT701M03) from UA IUT-C to UAs of IUT-A and IUT-B. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. Verify the messages received by both remote UAs. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	None
Test class	Normal AMHS communications (N)

5.1.2 IT702 – Relay operations

IT702	**Relay operations**
Test criteria	This test is successful, if the message from the sending UA is routed by the IUT in between and received by the addressed UA.
Scenario description	Create a "transfer" X.400 routing: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B and PRMD=IUTLAND-C to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-A and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-A and PRMD=IUTLAND-B to IUT-A. From the UA send an ATS message (IPM) with ATS-message-priority FF to one UA of another IUT. • Message 1 (IT702M01) from UA IUT-A to UA of IUT-C • Message 2 (IT702M02) from UA IUT-B to UA of IUT-A. • Message 3 (IT702M03) from UA IUT-C to UA of IUT-B. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. Verify the messages received by the remote UA and passed the IUT in between. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	None
Test class	Normal AMHS communications (N)

5.2 Test of special situations

5.2.1 IT801 – Alternate MTA routing

IT801	**Alternate MTA routing**
Test criteria	This test is successful, if the message from the sending UA is received by the addressed UA
Scenario description	Create a “normal” X.400 routing: (see 3.3, AFTN and X.400 Routing Tables) Cut the direct connection to the IUT to which you intend to send a message. From the UA send an ATS message (IPM) with ATS-message-priority FF to the UA of the IUT concerned. • Message 1 (IT801M01) from UA IUT-A to UA of IUT-B • Message 2 (IT801M02) from UA IUT-B to UAs of IUT-C. • Message 3 (IT801M03) from UA IUT-C to UAs of IUT-A. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. If alternate MTA routing functionality is implemented and configured the message will be forwarded automatically via the “other” connection;otherwise the queued message should be forced to follow the alternate routing by the adequate means (manually). Verify the messages received by the remote UA and passed the IUT in between. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	None
Test class	Normal AMHS communications (N)

5.2.2 IT802– Loop detection

IT802	**Loop detection**
Test criteria	This test is successful; if the one of the IUT detects that the message has traversed a loop.
Scenario description	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B.The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C.The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Send a message addressed to PRMD=IUTLAND-X which will be routed by the IUT to the other IUT so that finally the message is performing a loop. Verify that: • the one of the IUTs detects the loop, • this IUT discards the message and • generates a NDR Verify that the sending IUT receives the NDR Repeat the test with all IUTs, so that all sending IUTs have received the NDR.
AMHS SARPs reference	3.1.1, Note 2a (ISO/IEC 10021), 3.1.2.1.6 (AMHS routing), *See also ITU-T Rec. X.411 clause 14.3.1 and clause 12.3.1*.
Test class	MHS procedural errors (E2)

6 Bilateral Test Procedures – Test Scenarios

6.1 Introduction

The following tables contain the scenarios for the different Interoperability Tests (IT) described in the previous chapters.

The test scenarios consist of several test-cases. The test-case reference is as follows:

ITxxx/TCzz

Test scenario: Txxx where xxx is the scenario number

Test-case: Czz where zz is the number of test-case.

6.2 Submission, Transfer and Delivery Operation (AMHS to AMHS)

IT101	**Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)**		
Test-case id: **IT101/TC01**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: KK FT: <FT> OHI: TEST IT101/TC01 Get the message with IUTBMHSA (UA-terminal of IUT-B).		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: KK - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

<table>
<tr><td>IT101</td><td colspan="3">Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</td></tr>
<tr><td>Test-case id:
IT101/TC02</td><td colspan="3">Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities
A GG priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.</td></tr>
<tr><td>Test description:</td><td colspan="3">From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA:
PRI: GG
FT: <FT>
OHI:
TEST IT101/TC02

Get the message with IUTBMHSA (UA-terminal of IUT-B).</td></tr>
<tr><td>Test control:</td><td colspan="3">Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.
Check
- the ATS-message-priority: PRI: GG
- the ATS-message-filing-time and
- the ATS-message-text</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

IT101	**Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)**		
Test-case id: **IT101/TC03**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities An FF priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: FF FT: <FT> OHI: TEST IT101/TC03 Get the message with IUTBMHSA (UA-terminal of IUT-B).		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: FF - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)		
Test-case id: **IT101/TC04**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: DD FT: <FT> OHI: TEST IT101/TC04 Get the message with IUTBMHSA (UA-terminal of IUT-B).		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: DD - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

<table>
<tr><td>IT101</td><td colspan="3">Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</td></tr>
<tr><td>Test-case id:
IT101/TC05</td><td colspan="3">Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities
An SS priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.</td></tr>
<tr><td>Test description:</td><td colspan="3">From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA:
PRI: SS
FT: <FT>
OHI:
TEST IT101/TC05

Get the message with IUTBMHSA (UA-terminal of IUT-B). A RN is submitted when the message is displayed.
Note. – Depending on UA implementation the user might be requested to send the RN.</td></tr>
<tr><td>Test control:</td><td colspan="3">Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.
Check
- the ATS-message-priority: PRI: SS
- the ATS-message-filing-time and
- the ATS-message-text

Check the reception of a RN on the UA IUTAMHSA of the IUT-A system.</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: **IT102/TC01**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: KK FT: <FT> OHI: TEST IT102/TC01 Get the message with IUTAMHSA (UA-terminal of IUT-A).		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: KK - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: **IT102/TC02**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A GG priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: GG FT: <FT> OHI: TEST IT102/TC02 Get the message with IUTAMHSA (UA-terminal of IUT-A).		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: GG - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: **IT102/TC03**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities An FF priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: FF FT: <FT> OHI: TEST IT102/TC03 Get the message with IUTAMHSA (UA-terminal of IUT-A).		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: FF - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT102	**Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)**		
Test-case id: **IT102/TC04**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: DD FT: <FT> OHI: TEST IT102/TC04 Get the message with IUTAMHSA (UA-terminal of IUT-A)		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: DD - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT102	**Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)**		
Test-case id: **IT102/TC05**	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities An SS priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: SS FT: <FT> OHI: TEST IT102/TC05 Get the message with IUTAMHSA (UA-terminal of IUT-A). A RN is submitted when the message is displayed. *Note. – Depending on UA implementation the user might be requested to send the RN.*		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: SS - the ATS-message-filing-time and - the ATS-message-text Check the reception of a RN on the UA IUTBMHSA of the IUT-B system.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

6.3 Gateway Operations (AFTN to AMHS)

IT201	**Convert an AFTN message to AMHS format (IUT-A)**		
Test-case id: **IT201/TC01**	Tested functionality: Conversion of messages with different AFTN priorities A KK priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: KK IUTBMHSA <FT> IUTAFTNA TEST IT201/TC01 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: KK - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: **IT201/TC02**	Tested functionality: Conversion of messages with different AFTN priorities A GG priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: GG IUTBMHSA <FT> IUTAFTNA TEST IT201/TC02 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: GG - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: **IT201/TC03**	Tested functionality: Conversion of messages with different AFTN priorities An FF priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: FF IUTBMHSA <FT> IUTAFTNA TEST IT201/TC03 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: FF - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: **IT201/TC04**	Tested functionality: Conversion of messages with different AFTN priorities A DD priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: DD IUTBMHSA <FT> IUTAFTNA TEST IT201/TC04 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: DD - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT201	**Convert an AFTN message to AMHS format (IUT-A)**		
Test-case id: **IT201/TC05**	Tested functionality: Conversion of messages with different AFTN priorities An SS priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: SS IUTBMHSA <FT> IUTAFTNA TEST IT201/TC05 The message is converted from AFTN into AMHS format in the MTCU of IUT-A. *Optional:* *Generate a RN at the receiving UA IUTBMHSA of ITU-B.*		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: SS - the message transfer priority: URGENT - the ATS-message-filing-time and - the ATS-message-text *Optional:* If a RN is replied from the UA IUTBMHSA of ITU-B, the MTCU of IUT-A converts it into an SS Ack message which is sent to the AFTN terminal of IUT-A. Check the reception of the SS Ack message at the AFTN terminal IUTAFTNA of IUT-A. .Its originator indicator shall be the AFTN address IUTBMHSA, and its text shall be “R <FT> IUTAFTNA”, where <FT> denotes the filing time of the subject AFTN message.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT202	**Convert an AFTN message to AMHS format (IUT-B)**		
Test-case id: **IT202/TC01**	Tested functionality: Conversion of messages with different AFTN priorities A KK priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: KK IUTAMHSA <FT> IUTBFTNA TEST IT202/TC01 The message is converted from AFTN into AMHS format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: KK - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT202	Convert an AFTN message to AMHS format (IUT-B)		
Test-case id: **IT202/TC02**	Tested functionality: Conversion of messages with different AFTN priorities A GG priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: GG IUTAMHSA <FT> IUTBFTNA TEST IT202/TC02 The message is converted from AFTN into AMHS format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: GG - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT202	**Convert an AFTN message to AMHS format (IUT-B)**		
Test-case id: **IT202/TC03**	Tested functionality: Conversion of messages with different AFTN priorities An FF priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: FF IUTAMHSA <FT> IUTBFTNA TEST IT202/TC03 The message is converted from AFTN into AMHS format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: FF - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT202	**Convert an AFTN message to AMHS format (IUT-B)**		
Test-case id: **IT202/TC04**	Tested functionality: Conversion of messages with different AFTN priorities A DD priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: DD IUTAMHSA Test message ID: IT202M04 <FT> IUTBFTNA DD IUTAMHSA TEST IT202/TC04 <FT> IUTBFTNA TEST IT202/TC04 The message is converted from AFTN into AMHS format in the MTCU of IUT-B. Test message ID: IT202M05		
Test control: <FT> IUTBFTNA TEST IT202/TC05	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: DD - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

<table>
<tr><td>Test-case id:

IT202/TC05</td><td colspan="3">Tested functionality: Conversion of messages with different AFTN priorities

An SS priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.</td></tr>
<tr><td>Test description:</td><td colspan="3">From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A:

SS IUTAMHSA

<FT> IUTBFTNA

TEST IT202/TC05

The message is converted from AFTN into AMHS format in the MTCU of IUT-B.

Optional:

Generate a RN at the receiving UA IUTAMHSA of ITU-A.</td></tr>
<tr><td>Test control:</td><td colspan="3">Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.

Check

- the ATS-message-priority: PRI: SS

- the message transfer priority: URGENT

- the ATS-message-filing-time and

- the ATS-message-text

Optional:

If a RN is replied from the UA IUTAMHSA of ITU-A, the MTCU of IUT-B converts it into an SS Ack message which is sent to the AFTN terminal of IUT-B.

Check the reception of the SS Ack message at the AFTN terminal IUTBFTNA of IUT-B. Its originator indicator shall be the AFTN address IUTAMHSA, and its text shall be “R <FT> IUTBFTNA”, where <FT> denotes the filing time of the subject AFTN message.</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

6.4 Gateway Operations (AMHS to AFTN)

IT301	**Convert an IPM to AFTN format (IUT-B)**		
Test-case id: **IT301/TC01**	Tested functionality: Conversion of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: KK FT: <FT> OHI: TEST IT301/TC01 The message is converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: KK - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT301	Convert an IPM to AFTN format (IUT-B)		
Test-case id: **IT301/TC02**	Tested functionality: Conversion of messages with different ATS-message-priorities A GG priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: GG FT: <FT> OHI: TEST IT301/TC02 The message is converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

<table>
<tr><td>IT301</td><td colspan="3">Convert an IPM to AFTN format (IUT-B)</td></tr>
<tr><td>Test-case id:
IT301/TC03</td><td colspan="3">Tested functionality: Conversion of messages with different ATS-message-priorities
An FF priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.</td></tr>
<tr><td>Test description:</td><td colspan="3">From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B:
PRI: FF
FT: <FT>
OHI:
TEST IT301/TC03

The message is converted from AMHS into AFTN format in the MTCU of IUT-B.</td></tr>
<tr><td>Test control:</td><td colspan="3">Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.
Check
- the AFTN priority: FF
- the AFTN filing time and
- the AFTN message text</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

IT301	**Convert an IPM to AFTN format (IUT-B)**		
Test-case id: **IT301/TC04**	Tested functionality: Conversion of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: DD FT: <FT> OHI: TEST IT301/TC04 The message is converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT301	Convert an IPM to AFTN format (IUT-B)		
Test-case id: **IT301/TC05**	Tested functionality: Conversion of messages with different ATS-message-priorities An SS priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: SS FT: <FT> OHI: TEST IT301/TC05 The message is converted from AMHS into AFTN format in the MTCU of IUT-B. *Optional:* *Send an SS Acknowledgement message from the receiving AFTN terminal.*		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: SS - the AFTN filing time and - the AFTN message text *Optional:* *When the SS Ack message is replied, the MTCU of IUT-B converts it into a RN.* *Check the reception of the RN at the UA IUTAMHSA of ITU-A.*		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: **IT302/TC01**	Tested functionality: Conversion of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: KK FT: <FT> OHI: TEST IT302/TC01 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: KK - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT302	**Convert an IPM to AFTN format (IUT-A)**		
Test-case id: **IT302/TC02**	Tested functionality: Conversion of messages with different ATS-message-priorities A GG priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: GG FT: <FT> OHI: TEST IT302/TC02 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: **IT302/TC03**	Tested functionality: Conversion of messages with different ATS-message-priorities An FF priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: FF FT: <FT> OHI: TEST IT302/TC03 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: FF - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT302	**Convert an IPM to AFTN format (IUT-A)**		
Test-case id: **IT302/TC04**	Tested functionality: Conversion of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: DD FT: <FT> OHI: TEST IT302/TC04 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: **IT302/TC05**	Tested functionality: Conversion of messages with different ATS-message-priorities An SS priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: SS FT: <FT> OHI: TEST IT302/TC05 The message is converted from AMHS into AFTN format in the MTCU of IUT-A. *Optional:* *Send an SS Acknowledgement message from the receiving AFTN terminal.*		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: SS - the AFTN filing time and - the AFTN message text *Optional:* *When the SS Ack message is replied, the MTCU of IUT-A converts it into a RN.* *Check the reception of the RN at the UA IUTBMHSA of ITU-B.*		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

6.5 Gateway Operations (AFTN to AMHS to AFTN)

<table>
<tr><td>IT401</td><td colspan="3">Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)</td></tr>
<tr><td>Test-case id:
IT401/TC01</td><td colspan="3">Tested functionality: Conversion of messages with different AFTN priorities
An AFTN message with KK priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.</td></tr>
<tr><td>Test description:</td><td colspan="3">From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B:
KK IUTBFTNA
<FT> IUTAFTNA
TEST IT401/TC01

The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B.
.</td></tr>
<tr><td>Test control:</td><td colspan="3">Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.
Check
- the AFTN priority: KK
- the AFTN filing time and
- the AFTN message text</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

IT401	**Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)**		
Test-case id: **IT401/TC02**	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with GG priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: GG IUTBFTNA <FT> IUTAFTNA TEST IT401/TC02 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT401	**Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)**		
Test-case id: **IT401/TC03**	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with FF priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: FF IUTBFTNA <FT> IUTAFTNA TEST IT401/TC03 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B. .		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: FF - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT401	**Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)**		
Test-case id: **IT401/TC04**	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with DD priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: DD IUTBFTNA <FT> IUTAFTNA TEST IT401/TC04 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B. .		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

<table>
<tr><td>IT401</td><td colspan="3">Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)</td></tr>
<tr><td>Test-case id:
IT401/TC05</td><td colspan="3">Tested functionality: Conversion of messages with different AFTN priorities
An AFTN message with SS priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.</td></tr>
<tr><td>Test description:</td><td colspan="3">From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B:
SS IUTBFTNA
<FT> IUTAFTNA
TEST IT401/TC05

The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B.

Optional:
Send an SS Acknowledgement message from the receiving AFTN terminal.</td></tr>
<tr><td>Test control:</td><td colspan="3">Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.
Check
- the AFTN priority: SS
- the AFTN filing time and
- the AFTN message text

Optional:
When the SS Ack message is replied, the MTCU of IUT-B converts it into a RN, the RN is re-converted to an SS Acknowledgement message in the MTCU of IUT-A.
Check the reception of the SS Acknowledgement at the AFTN terminal IUTAFTNA of ITU-A.</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><td>IT402</td><td colspan="3">Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)</td></tr>
<tr><td>Test-case id:

IT402/TC01</td><td colspan="3">Tested functionality: Conversion of messages with different AFTN priorities

An AFTN message with KK priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.</td></tr>
<tr><td>Test description:</td><td colspan="3">From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A:

KK IUTAFTNA

<FT> IUTBFTNA

TEST IT402/TC01

The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.</td></tr>
<tr><td>Test control:</td><td colspan="3">Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.

Check

- the AFTN priority: KK

- the AFTN filing time and

- the AFTN message text</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

IT402	**Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)**		
Test-case id: **IT402/TC02**	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with GG priority will be sent from IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: GG IUTAFTNA <FT> IUTBFTNA TEST IT402/TC02 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT402	**Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)**		
Test-case id: **IT402/TC03**	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with FF priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: FF IUTAFTNA <FT> IUTBFTNA TEST IT402/TC03 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: FF - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT402	**Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)**		
Test-case id: **IT402/TC04**	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with DD priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: DD IUTAFTNA <FT> IUTBFTNA TEST IT402/TC04 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT402	**Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)**		
Test-case id: **IT402/TC05**	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with SS priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal of IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: SS IUTAFTNA <FT> IUTBFTNA TEST IT402/TC05 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A. Optional: Send an SS Acknowledgement message from the receiving AFTN terminal.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: SS - the AFTN filing time and - the AFTN message text Optional: When the SS Ack message is replied, the MTCU of IUT-A converts it into a RN, the RN is re-converted to an SS Acknowledgement message in the MTCU of IUT-B. Check the reception of the SS Acknowledgement at the AFTN terminal IUTBFTNA of ITU-B.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

6.6 Gateway Operations – special cases

IT501	**Distribute an IPM to AMHS and AFTN users**		
Test-case id: **IT501/TC01**	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients addressing an AFTN terminal and a UA in IUT-B.		
Test description:	From IUTAMHSA send the following message to: Primary Recipients: IUTBMHSA and IUTBFTNA PRI: FF FT: <FT> TEST IT501/TC01 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by IUTBFTNA and IUTBMHSA in the IUT-B configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: **IT501/TC02**	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients addressing an AFTN terminal and a UA in IUT-A.		
Test description:	From IUTBMHSA send the following message to: Primary Recipients: IUTAMHSA and IUTAFTNA PRI: FF FT: <FT> TEST IT501/TC02 Get the message at the UA- and AFTN terminals of IUT-A.		
Test control:	Check the correct reception of the message by IUTAFTNA and IUTAMHSA in the IUT-A configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT501	**Distribute an IPM to AMHS and AFTN users**		
Test-case id: **IT501/TC03**	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-B.		
Test description:	From IUTAMHSA send the following message to: Primary Recipients: IUTBMHSA and IUTBFTNA Copy Recipients: IUTBMHSB and IUTBFTNB PRI: FF FT: <FT> TEST IT501/TC03 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by IUTBFTNA, IUTBFTNB and IUTBMHSA, IUTBMHSB in the IUT-B configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: **IT501/TC04**	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-A.		
Test description:	From IUTBMHSA send the following message to: Primary Recipients: IUTAMHSA and IUTAFTNA Copy Recipients: IUTAMHSB and IUTAFTNB PRI: FF FT: <FT> TEST IT501/TC04 Get the message at the UA- and AFTN terminals of IUT-A.		
Test control:	Check the correct reception of the message by IUTAFTNA, IUTAFTNB and IUTAMHSA, IUTAMHSB in the IUT-A configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT501	**Distribute an IPM to AMHS and AFTN users**		
Test-case id: **IT501/TC05**	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients, Copy Recipients and Blind Copy Recipients, addressing AFTN terminals and UAs in IUT-B.		
Test description:	From IUTAMHSA send the following message to: Primary Recipients: IUTBMHSA and IUTBFTNA Copy Recipients: IUTBMHSB and IUTBFTNB Blind Copy Recipients: IUTBMHSC and IUTBFTNC PRI: FF FT: <FT> TEST IT501/TC05 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check that at the AFTN Station of IUT-B one message with addresses IUTBFTNA, IUTBFTNB and another message with the address IUTBFTNC is received. Check that at the UA IUTBMHSA one IPM is received which contains the Primary Recipients IUTBMHSA, IUTBFTNA and the Copy Recipients IUTBMHSB, IUTBFTNB, but no Blind Copy Recipients. Check that at the UA IUTBMHSC one IPM is received which contains the Primary Recipients IUTBMHSA, IUTBFTNA, the Copy Recipients IUTBMHSB, IUTBFTNB and one Blind Copy Recipient IUTBMHSC.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: **IT501/TC06**	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients, Copy Recipients and Blind Copy Recipients, addressing AFTN terminals and UAs in IUT-A.		
Test description:	From IUTBMHSA send the following message to: Primary Recipients: IUTAMHSA and IUTAFTNA Copy Recipients: IUTAMHSB and IUTAFTNB Blind Copy Recipients: IUTAMHSC and IUTAFTNC PRI: FF FT: <FT> TEST IT501/TC06 Get the message at the UA- and AFTN terminals of IUT-A.		
Test control:	Check that at the AFTN Station of IUT-A one message with addresses IUTAFTNA, IUTAFTNB and another message with the address IUTAFTNC is received. Check that at the UA IUTAMHSA one IPM is received which contains the Primary Recipients IUTAMHSA, IUTAFTNA and the Copy Recipients IUTAMHSB, IUTAFTNB, but no Blind Copy Recipients. Check that at the UA IUTAMHSC one IPM is received which contains the Primary Recipients IUTAMHSA, IUTAFTNA, the Copy Recipients IUTAMHSB, IUTAFTNB and one Blind Copy Recipient IUTAMHSC.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT502	**Expand a DL addressing both AMHS and AFTN users**		
Test-case id: **IT502/TC01**	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-A addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-B.		
Test description:	IUTADLLO must be configured as a local DL entry in IUT-A containing the addresses IUTBFTNA IUTBFTNB and IUTBMHSA. From IUTAMHSA send the following message to IUTADLLO: PRI: FF FT: <FT> TEST IT502/TC01 Get the message at the UA and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by AFTN terminals IUTBFTNA, IUTBFTNB and UA IUTBMHSA in the IUT-B configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT502	**Expand a DL addressing both AMHS and AFTN users**		
Test-case id: **IT502/TC02**	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-B addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-A.		
Test description:	IUTBDLLO must be configured as a local DL entry in IUT-A containing the addresses IUTAFTNA, IUTAFTNB and IUTAMHSA. From IUTBMHSA send the following message to IUTBDLLO: PRI: FF FT: <FT> TEST IT502/TC02 Get the message at the UA and AFTN terminals of IUT-A.		
Test control:	Check the correct reception of the message by AFTN terminals IUTAFTNA, IUTAFTNB and UA IUTAMHSA in the IUT-A configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT502	**Expand a DL addressing both AMHS and AFTN users**		
Test-case id: **IT502/TC03**	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-A addressing a remote DL in IUT-B which contains addresses of AFTN terminals and the UA in IUT-B		
Test description:	IUTBDLRE must be configured as a local DL entry in IUT-B containing the addresses IUTBFTNA, IUTBFTNB and IUTBMHSA. From IUTAMHSA send the following message to IUTBDLRE: PRI: FF FT: <FT> TEST IT502/TC03 Get the message at the UA and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by AFTN terminals IUTBFTNA, IUTBFTNB and UA IUTBMHSA in the IUT-B configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT502	Expand a DL addressing both AMHS and AFTN users		
Test-case id: **IT502/TC04**	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-B addressing a remote DL in IUT-A which contains addresses of AFTN terminals and the UA in IUT-A		
Test description:	IUTADLRE must be configured as a local DL entry in IUT-A containing the addresses IUTAFTNA, IUTAFTNB and IUTAMHSA. From IUTBMHSA send the following message to IUTADLRE: PRI: FF FT: <FT> TEST IT502/TC04 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by AFTN terminals IUTAFTNA, IUTAFTNB and UA IUTAMHSA in the IUT-A configuration.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

<table>
<tr><td>IT503</td><td colspan="3">Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters</td></tr>
<tr><td>Test-case id:

IT503/TC01</td><td colspan="3">Tested functionality: Conversion of “long” messages

A message with normal priority and length of about 4500 characters is sent from the IUT-A to the IUT-B</td></tr>
<tr><td>Test description:</td><td colspan="3">From UA IUTAMHSA of IUT-A send the following message to the AFTN terminal IUTBFTNA:

PRI: FF
FT: <FT>
OHI:
TEST IT503/TC01
TEXT 4500 CHARACTERS
123456789012345678901234567890123456789012345678901234567890123456789
123456789012345678901234567890123456789012345678901234567890123456789
123456789012345678901234567890123456789012345678901234567890123456789
…
123456789012345678901234567890123456789012345678901234567890123456789
END</td></tr>
<tr><td>Test control:</td><td colspan="3">The SARPs (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b). If the system provides “long AFTN message” capability the message will be converted (case c).

<u>If case a is implemented:</u>

The message is not conveyed to the AFTN component.

Check the Report received at the User Agent position IUTAMHSA

Verify the following Per-Recipient-Report Non-Delivery information:

- Actual-recipient-name: MF-form address of IUTBFTNA

- reason code 1 signifies "unable-to-transfer"

- diagnostic code 7 signifies "content-too-long".

- supplementary information: "unable to convert to AFTN due to message text length".

<u>If case b is implemented:</u>

Check that IUTBFTNA receives several messages.

<u>If case c is implemented:</u>

Check that IUTBFTNA receives one message.</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td>a / b / c</td><td></td><td></td></tr>
</table>

<table>
<tr><td>IT503</td><td colspan="3">Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters</td></tr>
<tr><td>Test-case id:

IT503/TC02</td><td colspan="3">Tested functionality: Conversion of “long” messages

A message with normal priority and length of about 4500 characters is sent from the IUT-B to the IUT-A</td></tr>
<tr><td>Test description:</td><td colspan="3">From UA IUTBMHSA of IUT-B send the following message to the AFTN terminal IUTAFTNA:

PRI: FF
FT: <FT>
OHI:
TEST IT503/TC02
TEXT 4500 CHARACTERS
123456789012345678901234567890123456789012345678901234567890123456789
123456789012345678901234567890123456789012345678901234567890123456789
123456789012345678901234567890123456789012345678901234567890123456789
…
123456789012345678901234567890123456789012345678901234567890123456789
END</td></tr>
<tr><td>Test control:</td><td colspan="3">The SARPs (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b). If the system provides “long AFTN message” capability the message will be converted (case c).

<u>If case a is implemented:</u>

The message is not conveyed to the AFTN component.

Check the Report received at the User Agent position IUTBMHSA

Verify the following Per-Recipient-Report Non-Delivery information:

- Actual-recipient-name: MF-form address of IUTAFTNA

- reason code 1 signifies "unable-to-transfer"

- diagnostic code 7 signifies "content-too-long".

- supplementary information: "unable to convert to AFTN due to message text length".

<u>If case b is implemented:</u>

Check that IUTAFTNA receives several messages.

<u>If case c is implemented:</u>

Check that IUTAFTNA receives one message.</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td>a / b / c</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

IT504	Split an incoming IPM addressing more than 21 AFTN users		
Test-case id: **IT504/TC01**	Tested functionality: Conversion of messages with more than 21 addresses A message with normal priority containing 50 recipients is sent from the IUT-A to the IUT-B.		
Test description:	From IUTAMHSA send the following message to the following addressees (all recipients in the corresponding MF-Form): IUTBFTNA, IUTBFTNB, IUTBFTNC, IUTBFTND, IUTBFTNE, IUTBFTNF, IUTBFTNG, IUTBFTNH, IUTBFTNI, IUTBFTNJ, IUTBFTNK, IUTBFTNL, IUTBFTNM, IUTBFTNN, IUTBFTNO, IUTBFTNP, IUTBFTNQ, IUTBFTNR, IUTBFTNS, IUTBFTNT, IUTBFTNU, IUTBFTNV, IUTBFTNW, IUTBFTNX, IUTBFTNY, IUTBFTAA, IUTBFTAB, IUTBFTAC, IUTBFTAD, IUTBFTAE, IUTBFTAF, IUTBFTAG, IUTBFTAH, IUTBFTAI, IUTBFTAJ, IUTBFTAK, IUTBFTAL, IUTBFTAM, IUTBFTAN, IUTBFTAO, IUTBFTAP, IUTBFTAQ, IUTBFTAR, IUTBFTAS, IUTBFTAT, IUTBFTAU, IUTBFTAV, IUTBFTAW, IUTBFTAX, IUTBFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC01		
Test control:	PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages. The message is split into 3 copies, each conveyed to the AFTN component. The first copy is addressed to 21 of the 50 addressee indicators. The second copy is addressed to further 21 addressee indicators. The third copy is addressed to the remaining 8 of the 50 addressee indicators. Check the correct reception of the messages on the AFTN terminal of IUT-B.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT504	Split an incoming IPM addressing more than 21 AFTN users		
Test-case id: **IT504/TC02**	Tested functionality: Conversion of messages with more than 21 addresses A message with normal priority containing 50 recipients is sent from the IUT-B to the IUT-A.		
Test description:	From IUTBMHSA send the following message to the following addressees (all recipients in the corresponding MF-Form): IUTAFTNA, IUTAFTNB, IUTAFTNC, IUTAFTND, IUTAFTNE, IUTAFTNF, IUTAFTNG, IUTAFTNH, IUTAFTNI, IUTAFTNJ, IUTAFTNK, IUTAFTNL, IUTAFTNM, IUTAFTNN, IUTAFTNO, IUTAFTNP, IUTAFTNQ, IUTAFTNR, IUTAFTNS, IUTAFTNT, IUTAFTNU, IUTAFTNV, IUTAFTNW, IUTAFTNX, IUTAFTNY, IUTAFTAA, IUTAFTAB, IUTAFTAC, IUTAFTAD, IUTAFTAE, IUTAFTAF, IUTAFTAG, IUTAFTAH, IUTAFTAI, IUTAFTAJ, IUTAFTAK, IUTAFTAL, IUTAFTAM, IUTAFTAN, IUTAFTAO, IUTAFTAP, IUTAFTAQ, IUTAFTAR, IUTAFTAS, IUTAFTAT, IUTAFTAU, IUTAFTAV, IUTAFTAW, IUTAFTAX, IUTAFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC02		
Test control:	PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages. The message is split into 3 copies, each conveyed to the AFTN component. The first copy is addressed to 21 of the 50 addressee indicators. The second copy is addressed to further 21 addressee indicators. The third copy is addressed to the remaining 8 of the 50 addressee indicators. Check the correct reception of the messages on the AFTN terminal of IUT-A.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT505	Probe Conveyance Test		
Test-case id: **IT505/TC01**	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-A to IUT-B, addressing AFTN terminals and UAs in IUT-B.		
Test description:	From IUTAMHSA send a probe to IUTBFTNA, IUTBFTNB, IUTBMHSA.		
Test control:	On IUT-A UA IUTAMHSA: One Delivery Report (DR) with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA Verify that the DR reporting about the AFTN addresses contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT505	Probe Conveyance Test		
Test-case id: **IT505/TC02**	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-B to IUT-A, addressing AFTN terminals and UAs in IUT-A.		
Test description:	From IUTBMHSA send a probe to IUTAFTNA, IUTAFTNB, IUTAMHSA.		
Test control:	On IUT-B UA IUTBMHSA: One Delivery Report (DR) with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA Verify that the DR reporting about the AFTN addresses contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT505	**Probe Conveyance Test**		
Test-case id: **IT505/TC03**	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-A to IUT-B, containing the address of an AFTN terminal of IUT-B and an MF address which cannot be translated by the MTCU of IUT-B.		
Test description:	From IUTAMHSA send a probe to IUTBFTNA, IUTBFTUU (address is not provided in the look-up table of IUT-B).		
Test control:	Verify that at UA IUTAMHSA: A Delivery Report, containing the reported recipient IUTBFTNA and a NDR, containing the reported recipient IUTBFTUU, with: - non-delivery-reason-code set to “unable-to-transfer”, - non-delivery-diagnostic-code set to “unrecognized-OR-name” are received. Verify that the DR reporting about the address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT505	Probe Conveyance Test		
Test-case id: **IT505/TC04**	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-B to IUT-A, containing the address of an AFTN terminal of IUT-A and an MF address which cannot be translated by the MTCU of IUT-A.		
Test description:	From IUTBMHSA send a probe to IUTAFTNA, IUTAFTUU (address is not provided in the look-up table of IUT-A)		
Test control:	Verify that at UA IUTBMHSA: A Delivery Report, containing the reported recipient IUTAFTNA and a NDR, containing the reported recipient IUTAFTUU, with: - non-delivery-reason-code set to “unable-to-transfer”, - non-delivery-diagnostic-code set to “unrecognized-OR-name” are received. Verify that the DR reporting about the address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

6.7 Stress traffic situations

IT601	**Stress load**		
Test-case id: **IT601/TC01**	Tested functionality: AMHS traffic interchange after queuing of an amount of messages After queuing of an amount of messages both IUTs start sending a burst of messages		
Test description:	Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs. Select from the data base or generated by the UA and/or the AFTN terminal 100 messages in both IUTs. For example, from IUTAFTNA send 100 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 100 messages to IUTAFTNA, IUTAMHSA, In the result on IUT-A and IUT-B there are 100 messages queued in direction to the peer IUT. Re-establish the connection between IUT-A and IUT-B. The queued messages will be sent simultaneously from both IUTs. Measure the time: from re-establishing the connection till sending the first message and from sending the first till sending the last message. Measure the time: from re-establishing the connection till receiving the first message and from receiving the first message till receiving the last message.		
Test control:	Check that all 100 messages are received at the addressed terminals. Check that no errors or malfunction are reported or observed at the IUTs during the interchange period. Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

The following table can be used to make notes of the Test Control Result.

Test Control	**Result IT601/TC01**	**Result IT601/TC02**	**Result IT601/TC03**
1. Notice the time of re-establishing the connection sending direction.			
2. Notice the time of sending the first message.			
3. Notice the time of sending the last message.			
4. Notice the time of re-establishing the connection receiving direction.			
5. Notice the time of receiving the first message.			
6. Notice the time of receiving the last message.			
7. Notice the number of messages received (shall be equal to the number of messages expected.)			
8. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.			
9. Check the event logging / traffic traces for NDRs. (No NDRs are awaited.)			
10. Check for Control Position events. (No related events are awaited.)			
11. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).			
12. Monitor the underlying network infrastructure (network specialist).			
13. At both sides note the amount of time needed to flush the queues. (Unacceptable delays shall be treated as “FAILED”)			

IT601	**Stress load**		
Test-case id: **IT601/TC02**	Tested functionality: AMHS traffic interchange after queuing of an amount of messages After queuing of an amount of messages both IUTs start sending a burst of messages		
Test description:	Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs. Select from the data base or generated by the UA and/or the AFTN terminal 200 messages in both IUTs. For example, from IUTAFTNA send 200 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 200 messages to IUTAFTNA, IUTAMHSA, In the result on IUT-A and IUT-B there are 200 messages queued in direction to the peer IUT. Re-establish the connection between IUT-A and IUT-B. The queued messages will be sent simultaneously from both IUTs. Measure the time: • from re-establishing the connection till sending the first message and • from sending the first till sending the last message. Measure the time: • from re-establishing the connection till receiving the first message and • from receiving the first message till receiving the last message.		
Test control:	Check that all 200 messages are received at the addressed terminals. Check that no errors or malfunction are reported or observed at the IUTs during the interchange period. Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT601	Stress load		
Test-case id: **IT601/TC03**	Tested functionality: AMHS traffic interchange after queuing of an amount of messages After queuing of an amount of messages both IUTs start sending a burst of messages		
Test description:	Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs. Select from the data base or generated by the UA and/or the AFTN terminal 400 messages in both IUTs. For example, from IUTAFTNA send 400 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 400 messages to IUTAFTNA, IUTAMHSA, In the result on IUT-A and IUT-B there are 400 messages queued in direction to the peer IUT. Re-establish the connection between IUT-A and IUT-B. The queued messages will be sent simultaneously from both IUTs. Measure the time: • from re-establishing the connection till sending the first message and • from sending the first till sending the last message. Measure the time: • from re-establishing the connection till receiving the first message and • from receiving the first message till receiving the last message.		
Test control:	Check that all 400 messages are received at the addressed terminals. Check that no errors or malfunction are reported or observed at the IUTs during the interchange period. Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

7 Trilateral Test procedures - optional

7.1 Submission/Transfer/Delivery and Relay operations

IT701	**Submission / Transfer / Delivery**		
Test-case id: **IT701/TC01**	Tested functionality: Submission, transfer and delivery of messages to different IUTs An IPM submitted in IUT-A is transferred to IUT-B, IUT-C and delivered to the UAs of IUT-B, IUT-C.		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C. From UA IUTAMHSA send an ATS message (IPM) to UA IUTBMHSA and IUTCMHSA: PRI: FF FT: <FT> OHI: TEST IT701/TC01		
Test control:	Verify that the message is received by both remote UAs in IUT-B and IUT-C. In particular, verify: • ATS-message-priority FF, • ATS-message-filing-time, • ATS-message-text.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT701	**Submission / Transfer / Delivery**		
Test-case id: **IT701/TC02**	Tested functionality: Submission, transfer and delivery of messages to different IUTs An IPM submitted in IUT-B is transferred to IUT-C, IUT-A and delivered to the UAs of IUT-C, IUT-A.		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-B routes PRMD=IUTLAND-C to IUT-C and PRMD=IUTLAND-A to IUT-A. From the UA IUTBMHSA send an ATS message (IPM) to UA IUTAMHSA and IUTCMHSA. PRI: FF FT: <FT> OHI: TEST IT701/TC02		
Test control:	Verify that the message is received by both remote UAs in IUT-A and IUT-C. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT701	**Submission / Transfer / Delivery between the partner MTAs**		
Test-case id: **IT701/TC03**	Tested functionality: Submission, transfer and delivery of messages to different IUTs An IPM submitted in IUT-C is transferred to IUT-A, IUT-B and delivered to the UA of IUT-A, IUT-B.		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B. From the UA IUTCMHSA send an ATS message (IPM) to UA IUTAMHSA and IUTBMHSA. PRI: FF FT: <FT> OHI: TEST IT701/TC03		
Test control:	Verify that the messages is received by both remote UAs in IUT-A and IUT-B. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT702	Relay operations		
Test-case id: IT702/TC01	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA and transferred from one IUT to another IUT via a “relay” IUT.		
Test description:	Modify the X.400 routing as follows: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B and PRMD=IUTLAND-C to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-C to IUT-C. Hence, IUT-B is the “relay” IUT. From the UA IUTAMHSA send an ATS message (IPM) to the UA IUTCMHSA. PRI: FF FT: <FT> OHI: TEST IT702/TC01		
Test control:	Verify that the message has passed the IUT-B in between (if possible). Verify that the message is received by the UA IUTCMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT702	Relay operations		
Test-case id: **IT702/TC02**	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA and transferred from one IUT to another IUT via a “relay” IUT.		
Test description:	Modify the X.400 routing as follows: The X.400 routing table of IUT-B routes PRMD=IUTLAND-A and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A. Hence, IUT-C is the “relay” IUT. From the UA IUTBMHSA send an ATS message (IPM) to the UA IUTAMHSA. PRI: FF FT: <FT> OHI: TEST IT702/TC02		
Test control:	Verify that the message has passed the IUT-C in between (if possible). Verify that the message is received by the UA IUTAMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT702	Relay operations		
Test-case id: **IT702/TC03**	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA and transferred from one IUT to another IUT via a “relay” IUT.		
Test description:	Modify the X.400 routing as follows: The X.400 routing table of IUT-C routes PRMD=IUTLAND-A and PRMD=IUTLAND-B to IUT-A. The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B. Hence, IUT-A is the “relay” IUT. From the UA IUTCMHSA send an ATS message (IPM) to the UA IUTBMHSA. PRI: FF FT: <FT> OHI: TEST IT702/TC03		
Test control:	Verify that the message has passed the IUT-A in between (if possible). Verify that the message is received by the UA IUTBMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

7.2 Test of special situations

<table>
<tr><td>IT801</td><td colspan="3">Alternate MTA routing</td></tr>
<tr><td>Test-case id:

IT801/TC01</td><td colspan="3">Tested functionality: Alternate routing capability

An ATS message (IPM) queued due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT).</td></tr>
<tr><td>Test description:</td><td colspan="3">Verify that the X.400 routing tables are configured according section 3.3, thus:

The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C.

The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B.

Cut the direct connection from IUT-A to IUT-B.

From the UA IUTAMHSA send an ATS message (IPM) to the UA IUTBMHSA.

If alternate MTA routing functionality is implemented and configured in IUT-A, the message will be transferred automatically via the “alternate” connection.

Otherwise: Reroute the queued message manually (an operational procedure for should exist).</td></tr>
<tr><td>Test control:</td><td colspan="3">Verify that the messages had passed the IUT-C in between (if possible).

Verify the message received by the UA IUTBMHSA.

In particular, verify:

• ATS-message-priority,

• ATS-message-filing-time,

• ATS-message-text.</td></tr>
<tr><td>Test result:</td><td>PASS</td><td>FAILED</td><td>INCONCLUSIVE</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

IT801	Alternate MTA routing		
Test-case id: **IT801/TC02**	Tested functionality: Alternate routing capability An ATS message (IPM) queued due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT).		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-B routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-C to IUT-C. Cut the direct connection from IUT-B to IUT-C. From the UA IUTBMHSA send an ATS message (IPM) to the UA IUTCMHSA. If alternate MTA routing functionality is implemented and configured in IUT-B, the message will be transferred automatically via the “alternate” connection. Otherwise: Reroute the queued message manually (an operational procedure for should exist).		
Test control:	Verify that the message had passed the IUT-A in between (if possible). Verify the message received by the UA of IUTCMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT801	Alternate MTA routing		
Test-case id: IT801/TC03	Tested functionality: Alternate routing capability An ATS message (IPM) queued due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT).		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-B routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B. Cut the direct connection from IUT-C to IUT-A. From the UA IUTCMHSA send an ATS message (IPM) to the UA IUTAMHSA. If alternate MTA routing functionality is implemented and configured in IUT-C, the message will be transferred automatically via the “alternate” connection. Otherwise: Reroute the queued message manually (an operational procedure for should exist).		
Test control:	Verify that the message had passed the IUT-B in between (if possible). Verify the message received by the UA of IUTAMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT802	Loop detection		
Test-case id: **IT802/TC01**	Tested functionality: A message traversing a loop is detected by an IUT.		
Test description:	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B.The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C.The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. From UA IUTAMHSA send a message (IT802/M01) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop. One IUT detects the looping message, stops the further transfer and non-delivers the message.		
Test control:	Verify that: • the message is discarded • at UA IUTAMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT802	**Loop detection**		
Test-case id: **IT802/TC02**	Tested functionality: A message traversing a loop is detected by an IUT.		
Test description:	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B.The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C.The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. From UA IUTBMHSA send a message (IT802/M02) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop. One IUT detects the looping message, stops the further transfer and non-delivers the message.		
Test control:	Verify that: • the message is discarded • at UA IUTBMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

IT802	Loop detection		
Test-case id: **IT802/TC03**	Tested functionality: A message traversing a loop is detected by an IUT.		
Test description:	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B.The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C.The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. From UA IUTCMHSA send a message (IT802/M03) addressed to IUTXLOOP. The message will be routed cyclically so that it is finally performing a loop. One IUT detects the looping message, stops the further transfer and non-delivers the message.		
Test control:	Verify that: • the message is discarded • at UA IUTCMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.		
Test result:	**PASS**	**FAILED**	**INCONCLUSIVE**

8 Test message templates

8.1 Test message templates for IUT-A

8.1.1 Input device User Agent (UA): IUTAMHSA

From UA IUTAMHSA	**to UA IUTBMHSA**
Test message ID: IT101M01	PRI: KK FT: <FT> OHI: TEST IT101/TC01
Test message ID: IT101M02	PRI: GG FT: <FT> OHI: TEST IT101/TC02
Test message ID: IT101M03	PRI: FF FT: <FT> OHI: TEST IT101/TC03
Test message ID: IT101M04	PRI: DD FT: <FT> OHI: TEST IT101/TC04
Test message ID: IT101M05	PRI: SS FT: <FT> OHI: TEST IT101/TC05

From UA IUTAMHSA	**to UA IUTBFTNA**
Test message ID: IT301M01	PRI: KK FT: <FT> OHI: TEST IT301/TC01
Test message ID: IT301M02	PRI: GG FT: <FT> OHI: TEST IT301/TC02
Test message ID: IT301M03	PRI: FF FT: <FT> OHI: TEST IT301/TC03
Test message ID: IT301M04	PRI: DD FT: <FT> OHI: TEST IT301/TC04
Test message ID: IT301M05	PRI: SS FT: <FT> OHI: TEST IT301/TC05

From UA IUTAMHSA Test message ID: IT501M01	To Primary Recipients: IUTBMHSA and IUTBFTNA PRI: FF FT: <FT> OHI: TEST IT501/TC01
Test message ID: IT501M03	To Primary Recipients: IUTBMHSA and IUTBFTNA To Copy Recipients: IUTBMHSB and IUTBFTNB PRI: FF FT: <FT> OHI: TEST IT501/TC03
Test message ID: IT501M05	To Primary Recipients: IUTBMHSA and IUTBFTNA To Copy Recipients: IUTBMHSB and IUTBFTNB To Blind Copy Recipients: IUTBMHSC and IUTBFTNC PRI: FF FT: <FT> OHI: TEST IT501/TC05

From UA IUTAMHSA Test message ID: IT502M01	To: IUTADLLO PRI: FF FT: <FT> OHI: TEST IT502/TC01
Test message ID: IT502M03	To: IUTBDLRE PRI: FF FT: <FT> OHI: TEST IT502/TC03
From UA IUTAMHSA Test message ID: IT503M01	To: AFTN terminal IUTBFTNA PRI: FF FT: <FT> OHI: TEST IT503/TC01 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 … <63 figure lines 1234567890 … 123456789> 123456789012345678901234567890123456789012345678901234567890123456789 END
From UA IUTAMHSA Test message ID: IT504M01	To IUTBFTNA, IUTBFTNB, IUTBFTNC, IUTBFTND, IUTBFTNE, IUTBFTNF, IUTBFTNG, IUTBFTNH, IUTBFTNI, IUTBFTNJ, IUTBFTNK, IUTBFTNL, IUTBFTNM, IUTBFTNN, IUTBFTNO, IUTBFTNP, IUTBFTNQ, IUTBFTNR, IUTBFTNS, IUTBFTNT, IUTBFTNU, IUTBFTNV, IUTBFTNW, IUTBFTNX, IUTBFTNY, IUTBFTAA, IUTBFTAB, IUTBFTAC, IUTBFTAD, IUTBFTAE, IUTBFTAF, IUTBFTAG, IUTBFTAH, IUTBFTAI, IUTBFTAJ, IUTBFTAK, IUTBFTAL, IUTBFTAM, IUTBFTAN, IUTBFTAO, IUTBFTAP, IUTBFTAQ, IUTBFTAR, IUTBFTAS, IUTBFTAT, IUTBFTAU, IUTBFTAV, IUTBFTAW, IUTBFTAX, IUTBFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC01

8.1.2 Input device AFTN Terminal: IUTAFTNA

From AFTN Terminal IUTAFTNA	**To UA IUTBMHSA**
Test message ID: IT201M01	KK IUTBMHSA <FT> IUTAFTNA TEST IT201/TC01
Test message ID: IT201M02	GG IUTBMHSA <FT> IUTAFTNA TEST IT201/TC02
Test message ID: IT201M03	FF IUTBMHSA <FT> IUTAFTNA TEST IT201/TC03
Test message ID: IT201M04	DD IUTBMHSA <FT> IUTAFTNA TEST IT201/TC04
Test message ID: IT201M05	SS IUTBMHSA <FT> IUTAFTNA TEST IT201/TC05

From AFTN Terminal IUTAFTNA	**to AFTN Terminal IUTBFTNA**
Test message ID: IT401M01	KK IUTBFTNA <FT> IUTAFTNA TEST IT401/TC01
Test message ID: IT401M02	GG IUTBFTNA <FT> IUTAFTNA TEST IT401/TC02
Test message ID: IT401M03	FF IUTBFTNA <FT> IUTAFTNA TEST IT401/TC03
Test message ID: IT401M04	DD IUTBFTNA <FT> IUTAFTNA TEST IT401/TC04
Test message ID: IT401M05	SS IUTBFTNA <FT> IUTAFTNA TEST IT401/TC05

8.2 Test message templates for IUT-B

8.2.1 Input device User Agent (UA): IUTBMHSA

From UA IUTBMHSA	**to UA IUTAMHSA**
Test message ID: IT102M01	PRI: KK FT: <FT> OHI: TEST IT102/TC01
Test message ID: IT102M02	PRI: GG FT: <FT> OHI: TEST IT102/TC02
Test message ID: IT102M03	PRI: FF FT: <FT> OHI: TEST IT102/TC03
Test message ID: IT102M04	PRI: DD FT: <FT> OHI: TEST IT102/TC04
Test message ID: IT102M05	PRI: SS FT: <FT> OHI: TEST IT102/TC05

From UA IUTBMHSA	**to AFTN Terminal IUTAFTNA**
Test message ID: IT302M01	PRI: KK FT: <FT> OHI: TEST IT302/TC01
Test message ID: IT302M02	PRI: GG FT: <FT> OHI: TEST IT302/TC02
Test message ID: IT302M03	PRI: FF FT: <FT> OHI: TEST IT302/TC03
Test message ID: IT302M04	PRI: DD FT: <FT> OHI: TEST IT302/TC04
Test message ID: IT302M05	PRI: SS FT: <FT> OHI: TEST IT302/TC05

From UA IUTBMHSA Test message ID: IT501M02	To Primary Recipients: IUTAMHSA and IUTAFTNA PRI: FF FT: <FT> OHI: TEST IT501/TC02
Test message ID: IT501M04	To Primary Recipients: IUTAMHSA and IUTAFTNA To Copy Recipients: IUTAMHSB and IUTAFTNB PRI: FF FT: <FT> OHI: TEST IT501/TC04
Test message ID: IT501M06	To Primary Recipients: IUTAMHSA and IUTAFTNA To Copy Recipients: IUTAMHSB and IUTAFTNB To Blind Copy Recipients: IUTAMHSC and IUTAFTNC PRI: FF FT: <FT> OHI: TEST IT501/TC06
From UA IUTBMHSA Test message ID: IT502M02	To: IUTBDLLO PRI: FF FT: <FT> OHI: TEST IT502/TC02
Test message ID: IT502M04	To: IUTADLRE PRI: FF FT: <FT> OHI: TEST IT502/TC04
From UA IUTBMHSA Test message ID: IT503M02	To: AFTN Terminal IUTAFTNA PRI: FF FT: <FT> OHI: TEST IT503/TC02 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 … <63 figure lines 1234567890 … 123456789> 123456789012345678901234567890123456789012345678901234567890123456789 END

From UA IUTBMHSA Test message ID: IT504M02	To: IUTAFTNA, IUTAFTNB, IUTAFTNC, IUTAFTND, IUTAFTNE, IUTAFTNF, IUTAFTNG, IUTAFTNH, IUTAFTNI, IUTAFTNJ, IUTAFTNK, IUTAFTNL, IUTAFTNM, IUTAFTNN, IUTAFTNO, IUTAFTNP, IUTAFTNQ, IUTAFTNR, IUTAFTNS, IUTAFTNT, IUTAFTNU, IUTAFTNV, IUTAFTNW, IUTAFTNX, IUTAFTNY, IUTAFTAA, IUTAFTAB, IUTAFTAC, IUTAFTAD, IUTAFTAE, IUTAFTAF, IUTAFTAG, IUTAFTAH, IUTAFTAI, IUTAFTAJ, IUTAFTAK, IUTAFTAL, IUTAFTAM, IUTAFTAN, IUTAFTAO, IUTAFTAP, IUTAFTAQ, IUTAFTAR, IUTAFTAS, IUTAFTAT, IUTAFTAU, IUTAFTAV, IUTAFTAW, IUTAFTAX, IUTAFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC02

8.3 Input device AFTN Terminal: IUTBFTNA

From AFTN Terminal IUTBFTNA	**to UA IUTAMHSA**
Test message ID: IT202M01	KK IUTAMHSA <FT> IUTBFTNA TEST IT202/TC01
Test message ID: IT202M02	GG IUTAMHSA <FT> IUTBFTNA TEST IT202/TC02
Test message ID: IT202M03	FF IUTAMHSA <FT> IUTBFTNA TEST IT202/TC03
Test message ID: IT202M04	DD IUTAMHSA <FT> IUTBFTNA TEST IT202/TC04
Test message ID: IT202M05	SS IUTAMHSA <FT> IUTBFTNA TEST IT202/TC05

From AFTN Terminal IUTBFTNA	**to UA IUTAMHSA**
Test message ID: IT402M01	KK IUTAFTNA <FT> IUTBFTNA TEST IT402/TC01
Test message ID: IT402M02	GG IUTAFTNA <FT> IUTBFTNA TEST IT402/TC02
Test message ID: IT402M03	FF IUTAFTNA <FT> IUTBFTNA TEST IT402/TC03
Test message ID: IT402M04	DD IUTAFTNA <FT> IUTBFTNA TEST IT402/TC04
Test message ID: IT402M05	SS IUTAFTNA <FT> IUTBFTNA TEST IT402/TC05

8.4 Test message templates for multilateral tests

From UA IUTAMHSA Test message ID: IT701M01	To: IUTBMHSA and IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC01
From UA IUTBMHSA Test message ID: IT701M02	To: IUTAMHSA and IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC02
From UA IUTCMHSA Test message ID: IT701M03	To: IUTAMHSA and IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC03

From UA **IUTAMHSA** Test message ID: IT702M01	To: IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC01
From UA **IUTBMHSA** Test message ID: IT702M02	To: IUTAMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC02
From UA **IUTCMHSA** Test message ID: IT702M03	To: IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC03

From UA **IUTAMHSA** Test message ID: IT801M01	To: IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC01
From UA **IUTBMHSA** Test message ID: IT801M02	To: IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC02
From UA **IUTCMHSA** Test message ID: IT801M03	To: IUTAMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC03

From UA **IUTAMHSA** Test message ID: IT802M01	To: IUTXMHSA PRI: FF FT: <FT> OHI: TEST IT802/TC01
From UA **IUTBMHSA** Test message ID: IT802M02	To: IUTXMHSA PRI: FF FT: <FT> OHI: TEST IT802/TC02
From UA **IUTCMHSA** Test message ID: IT802M03	To: IUTXMHSA PRI: FF FT: <FT> OHI: TEST IT802/TC03

- END -

ANNEX F

AMHS Pre-Operational Tests

ANNEX F

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	15/06/2007	Creation of the document.	all
2.0	22/09/2008	Editorial updates – change of document version number	all v

Table of Contents

List of Figures

List of Tables

References

[1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
[2] ICAO DOC 9705-AN/956: The Manual of technical provisions for the ATN, Sub-volume III, Section 3.1 –Edition 3 (2002) – Referred to as AMHS SARPs
[3] ASIAPAC AMHS Manual, Main Part
[4] ASIAPAC AMHS Manual, Appendix C, AMHS Testing Requirements
[5] ASIAPAC AMHS Manual, Appendix D, AMHS Conformance Tests
[6] ASIAPAC AMHS Manual, Appendix E, AMHS Interoperability Tests

1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define AMHS Pre-operational Tests in order to ensure the interoperability between AMHS systems prepared for going into operation. The document defines the objectives and prerequisites as well as the tests themselves.

The AMHS Pre-operational Tests are interoperability type tests. They are the last tests between Operational Systems and should be performed within the operational network environment before the “AMHS cut-over”.

After "AMHS cut-over" the AMHS relation between the two systems is operational. That means: the exchange of the complete operational traffic (or a part of that) is performed by means of AMHS only. For this traffic no other means (AFTN or X.25) are used.

1.2 Objectives of the Pre-operational Tests

The objectives of the AMHS Pre-operational Tests are:

1. To test the interoperability between the AMHS systems in an operational environment.

2. To test the integrity of the messages exchanged.

3. To test the message exchange after a disturbance (e.g. queued messages).

The prerequisites of the AMHS Pre-operational Tests are:

- Successful performance of AMHS Conformance Tests as specified in [5], through which the compliance of all systems under test to the [2] has been demonstrated, and
- Successful performance of AMHS Interoperability Tests as specified in [6], through which the interoperability of these AMHS systems in a test (bed) environment has been demonstrated, and
- Successful performance of Underlying Network Tests, through which is demonstrated that the underlying (IP) network is available and stable, and
- System configuration on both systems (The agreed set is loaded and established.)

The messages used in the AMHS Pre-operational Tests are generated either:

- manually, or
- using parallel duplicated traffic;

1.3 Test Overview

The following tests have to be performed:

1. Go-NoGo Test: A simple test which checks that the configuration and underlying network functions are operating correctly. It is a prerequisite for the subsequent tests.

2. Traffic duplication and verification: For selected AFTN addressee indicators all traffic[1] will be duplicated to corresponding AMHS recipient addresses on the remote system. On the remote system the AFTN message received will be compared with the copy received by the AMHS user.

3. Stress test: The outgoing AMHS traffic recorded in one day within the previous test is repeated from one to the other system and vice versa. To simulate an outage between the involved systems the LAN connection can be disabled; in consequence the messages are queued. If enough messages are queued the LAN connection will be enabled.

4. (Optional) Selected test cases from the AMHS Interoperability Tests: Due to the fact that in the pre-operational test phase the operational system with the complete operational setup is used, a selection of interoperability tests may be repeated.

The estimated duration of the AMHS Pre-operational Tests is 4 days and calculated as follows:

Test ID	Duration	Remark
PRE001 and PRE002	1 hour	inclusive set-up / co-ordination
PRE003	3 days	
PRE003	0.5 day	
optional (selected Interoperability Tests)	1 hour	

Table F- 1: Estimated duration of the AMHS Pre-operational Tests

[1] Traffic consisting of the locally originated AFTN flow and the incoming AFTN flow; *Locally originated AFTN flow*: national AFTN traffic received by the COM Centre addressed to international (or national) communication partners; *Incoming AFTN flow*: international AFTN traffic received by the COM Centre addressed to international (or national) communication partners.

[2] Where aaaa = the location indicator of the MTA location of the Test partner 1.

[3] Where dddd = the location indicator of the MTA location of the Test partner 2.

1.4 Document Structure

Chapter 1 presents the purpose, objectives and test overview.
Chapter 2 presents the test environment used for AMHS Pre-operational Testing.
Chapter 3 defines the set-up and configuration of the AMHS systems.
Chapter 4 defines the addressing plan for AMHS Pre-operational Testing.
Chapter 5 contains the description of the Pre-operational Tests.

2 AMHS Pre-operational Test Environment

2.1 Application infrastructure

The AMHS systems prepared for going into operation are interconnected by means of the operational infrastructure (cf. Figure F-1).

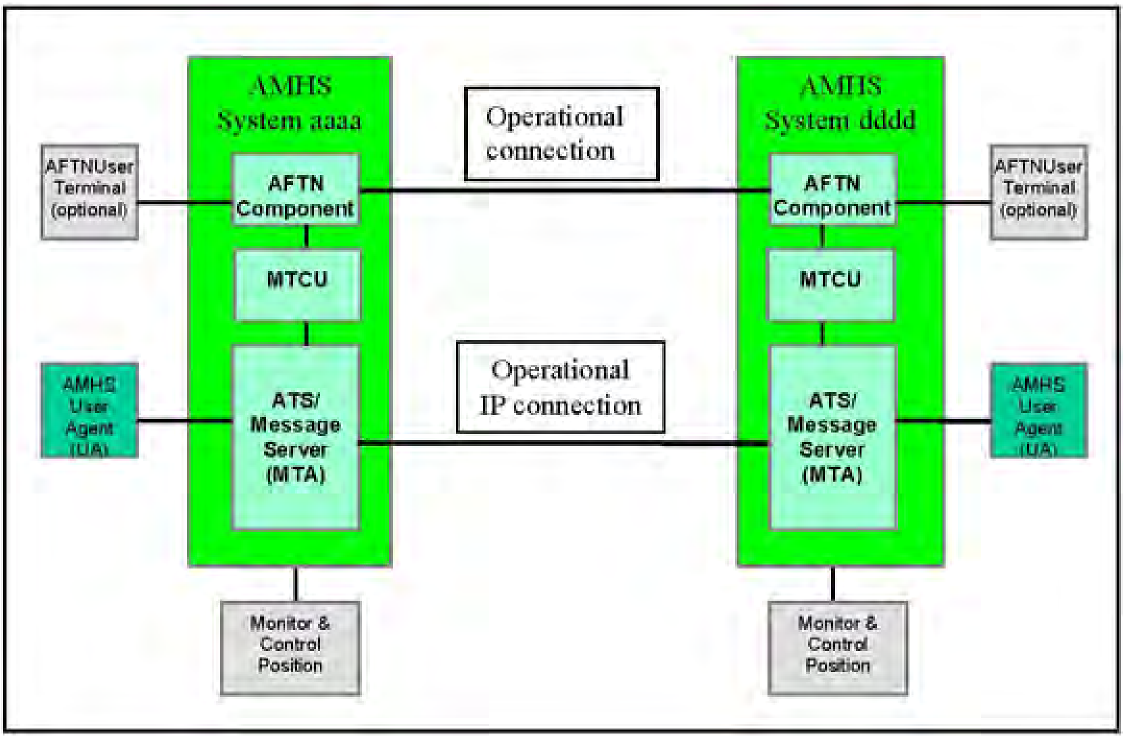


Figure F- 1: AMHS Pre-operational Test Environment

2.2 Transport infrastructure

One of the recommended infrastructures was TCP/IP protocol (IPv4/IPv6). In line with existing recommendations, the operational IP connection should utilize IPv6 at the international level and should provide a redundant connectivity. The redundancy concept of the network ensures the reach ability in any case between the MTAs, while the MTA uses single IP addresses only.

3 Operational system setup - Configuration

The AMHS Systems involved in the pre-operational tests are expected to be configured “as close” to the Operational Systems as possible (with respect to routing tables and look-up tables).

Special addresses needed for testing are listed in this document.

MTA names etc. shall follow the recommendations laid down in [3]. For completeness they are listed hereafter.

3.1 Configuration Lower Layers

Item	Test partner 1	Test partner 2	Recommended values
TSAP	TBD	TBD	e.g. '544350' (“TCP”) or '4D4853' (“MHS”)
IPv6 Address	TBD	TBD	
IP Port	TBD	TBD	102

Table F- 2: Configuration Lower Layers

3.2 Configuration Upper Layers

Item Item	Test partner 1	Test partner 2	Recommended values
MTA Name	MTA-aaaa2-1	MTA-dddd3-1	cf. [3] section 8.2
Password	ICAO-aaaa-1	ICAO-dddd-1	cf. [3] section 8.2
PSAP	not used	not used	not used
SSAP	not used	not used	not used
Number of incoming associations	TBD	TBD	5, should be equal to the outgoing number
Number of outgoing associations	TBD	TBD	5, should be equal to the incoming number
Protocol type	X.400/1988	X.400/1988	cf. PDR M6080001 Phasing out of IPM 1984
Dialogue mode	Monologue	Monologue	

Table F- 3: Configuration Upper Layers

4 Addressing Plan for AMHS Pre-operational Testing

4.1 User addresses

To meet the scope of testing, the test-address space used by AMHS Pre-operational Testing should include for each test partner as minimum one AMHS user.

4.1.1 AMHS Users for Test partner 1

User Name	MF-address	Remarks
aaaaAMHA	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAMHA	or other than AMHA

Table F- 4: Registered AMHS Users (Test partner 1)

Example:

User Name	MF-address	Remarks
LEEEAMHA	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LEEE /CN=LEEEAMHA	

4.1.2 AMHS Users for Test partner 2

User Name	MF-address	Remarks
ddddAMHA	/C=XX/A=ICAO/P=eeee/O=ffff/OU1=dddd /CN=ddddAMHA	or other than AMHA

Table F- 5: Registered AMHS Users (Test partner 2)

Example:

User Name	MF-address	Remarks
EDDDYFYA	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1= EDDD /CN=EDDDYFYA	

4.2 Addresses for Traffic Duplication

Due to the fact that the Pre-operational tests will be performed in an operational environment the addresses selected for duplication cannot be pre-determined in this document. The following tables show two different possibilities how to define these addresses. The test partners have all freedom in definition and selection.

It is recommended to select those addresses for duplication to which a moderate number of messages are usually transmitted.

4.2.1 AFTN Addresses selected for Traffic Duplication -Test partner 1 to Test partner 2

AF Address	O/R address	Remarks
ddaaCOPY	/C=XX/A=ICAO/P=eeee/O=ffff/OU1=ddaa /CN=ddaaCOPY	Copy of a real ddaa address
ddbbCOPY	/C=XX/A=ICAO/P=eeee/O=ffff /OU1=ddbb /CN=ddbbCOPY	Copy of a real ddbb address
ddccCOPY	/C=XX/A=ICAO/P=eeee/O=ffff /OU1=ddcc /CN=ddccCOPY	Copy of a real ddcc address

Table F- 6: AFTN addresses -Test partner 1 to Test partner 2

Example:

AF Address	O/R address	Remarks
LEEECOPY	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LEEE /CN=LEEECOPY	real address: LEEEYNYX
LEEACOPY	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LEEA /CN=LEEACOPY	real address: LEMMYMYX
LECMCOPY	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LECM /CN=LECMCOPY	real address: LECMZAZX

4.2.2 AFTN Addresses selected for Traffic Duplication -Test partner 2 to Test partner 1

AF Address	O/R address	Remarks
aaaaAMHA	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAMHA	Copy of a real aaaa address
aaaaAMHB	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAMHB	Copy of another real aaaa address
aaccAMHC	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aacc /CN=aaccAMHC	Copy of a real aacc address

Table F- 7: AFTN addresses -Test partner 2 to Test partner 1

Example:

AF Address	O/R address	Remarks
EDDDAMHA	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDDD /CN=EDDDAMHA	real address: EDDDYNYX
EDDDAMHB	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDDD /CN=EDDDAMHB	real address: EDZOYMYX
EDZZAMHC	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDZZ /CN=EDZZAMHC	real address: EDZZNAXX

4.3 DL addresses

It is recommended to use for DLs specific Common Names (CN) to make it transparent for the users that this special O/R address is related to a Distribution list. The CN of a DL O/R address should in line with the definition for PDAI in [1].

4.4 AFTN and X.400 Routing Tables

It is recommended that the systems involved in the Pre-operational Tests are configured with the latest valid **AFTN Routing Table** available in the AMC system including the minor changes needed for the Pre-operational Tests themselves.

Only for the selected traffic (bilaterally agreed addresses) shall AFTN routing paths through the MTCU be set up.

Furthermore it is recommended that the systems are configured with the **complete X.400**.

Routing Table covering all existing PRMD names. For all PRMD names which are not involved in the Pre-operational Tests, a default routing to a "Dummy MTA direction" shall be defined in order to handle exceptional situations within the Pre-operational Tests as well as for future operations.

Only for the selected traffic (bilaterally agreed addresses) shall respective X.400 routing paths through the MTCU or to the adjacent MTA be set up.

The recommended complete setup of the X.400 Routing table allows the responsible international COM Centre to ensure that each message entered into an international Network (AFTN, X.25 as well as AMHS) is correct in format and addressing. When using a reduced X.400 routing table, (use of general default routing entries), such checking of addressing cannot be performed, especially if domestic UAs are connected. Only with the full set of PRMD routing entries, is a minimum checking of address validity possible.

4.5 Look-up Tables

4.5.1 Generic look-up Tables

It is recommended that the systems are configured with the complete set of information required for the address translation.

The tables needed are reflected in [8] or in the Intra MD Addressing function of the ATS Messaging Management Centre (AMC). From the AMC the complete **MD Look-up Table** (AMHS MD Register Export. csv) and the complete **CAAS Look-up Tables** (CAAS Table .csv) can be downloaded.

Loading of the complete tables is recommended to ensure that the AMHS application is able to handle the extensive content of the tables covering the address translation of all existing AFTN addresses into AMHS O/R addresses (XF as well as CAAS) and vice versa.

4.5.2 User address look-up Table

It is recommended to start Pre-operational tests and operations with empty **User address look-up tables**.

This kind of functionality should be foreseen for exceptional users and situations. Each entry in this table shall be coordinated with the AMC for the Regional and world-wide use.

5 Test Description

5.1 Test Scenarios

The tests are described in the following test scenarios:

PRExxx where xxx is the scenario number.

The following table contains an overview of the test scenarios:

Test-case id	Test function
PRE001	Go-NoGo test Test partner 1 to Test partner 2
PRE002	Go-NoGo test Test partner 2 to Test partner 1
PRE003	Exchange of duplicated Operational messages, check of integrity.
PRE004	Stress / Load Test (queued data)

Table F- 8: Test Scenario overview

5.2 Pre-operational AMHS Tests

This section contains the test-cases. Each test-case is written on a test sheet, which should be completed during testing.

The top of test-sheet contains the **test-case id** and a description of the **tested functionality**.

The **Test description** contains the instructions for the tester, the addresses used and the test message used.

The **Test control** contains the expected reaction/observation of the Systems under Test (SUTs).

The section **Test result** is used to log the test results.

5.2.1 Go-NoGo test (Partner 1 to Test Partner 2)

Test Reference	Tested Functionality
PRE001	This is a simple test with the purpose to check that the configuration and underlying network work correctly. It is a prerequisite for subsequent tests. An FF priority message is sent from Test partner 1 to Test partner2.

Test description:

From aaaaAMHA send the following FF priority message to ddddAMHA:

```
PRE001
1234567890123456789012345678901234567890123456789012345678901234567890
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

(and so on till)

ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ
```

Check the correct reception at ddddAMHA and send the following acknowledgement if the message is received correctly.

From ddddAMHA send the following message to aaaaAMHA:

ACK001 PLS CONTINUE WITH PRE002

Test control:

Check the correct reception of the message at ddddAMHA. No difference must exist between the message as defined above and the received message.

Test result:

PASS	FAILED	INCONCLUSIVE

5.2.2 Go-NoGo test Test partner 2 to Test partner 1

Test Reference	Tested Functionality
PRE002	This is a simple test with the purpose to check that the configuration and underlying network work correctly. It is a prerequisite for subsequent tests. An FF priority message is sent from Test partner 2 to Test partner1.

<u>Test description:</u>

From ddddAMHA send the following message to aaaaAMHA:

```
PRE002
123456789012345678901234567890123456789012345678901234567890123456789
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

(and so on till)

ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ
```

Check the correct reception at aaaaAMHA and send the following acknowledgement if the message is received correctly.

From aaaaAMHA send the following message to ddddAMHA:

```
ACK002 PLS CONTINUE WITH PRE003
```

<u>Test control:</u>

Check the correct reception of the message at aaaaAMHA. No difference must exist between the message as defined above and the received message.

<u>Test result:</u>

PASS	FAILED	INCONCLUSIVE

5.2.3 Duplicated message exchange

Test Reference	Tested Functionality
PRE003	For selected AFTN destination addresses all traffic will be duplicated to corresponding AMHS recipient addresses at the remote system. At the remote system the AFTN messages received will be compared with the copies transmitted via AMHS.

Test description:

- On the system of Test partner 1 enable the duplication of Operational traffic for the agreed AFTN addressee indicators:

  The duplication shall remain active for 3 days.

- On the system of Test partner 2 enable the duplication of Operational traffic for agreed AFTN addressee indicators:

  The duplication shall remain active for 3 days.

Test control:

Note: Not all details of test control can be defined since two different systems are involved. Therefore the control is done in a general form. The main purpose of this test is to prove the integrity of the message exchange. At the same time, it is possible to detect problems which have not been spotted during previous tests.

1. Compare the number of messages received at the AFTN addresses with the number of messages received as copies at the corresponding AMHS addresses (check if all duplicated messages are received).

2. Compare the contents of the messages received for one randomly selected hour of traffic per day. The method of comparison is a local matter. Some options are:

   a) the messages can be displayed on two screens and compared one by one,

   b) the traffic log can be exported and compared (partly) electronically/in an automated way.

3. Check the event logging of the system for abnormalities in the area of AMHS/X.400/AFTN/AMHS Gateway.

4. Check the event logging / traffic traces for NDRs.

5. Check for Control Position events.

6. Check the X.400/AMHS Diagnostics; check the number of associations used (in particular possible hanging/unused associations).

7. Monitor the underlying network infrastructure (network specialist).

The following table can be used to make notes of the Test Control result:

Test Control	Result
1. Compare the number of messages received as AFTN copy with the number of messages received as AMHS copy.	
2. Compare the contents of the messages.	
3. The messages can be displayed on two screens and compared one by one.	
4. The traffic log can be exported and compared (partly) electronically/in an automated way.	
5. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.	
6. Check whether NDRs have been received or transmitted.	
7. Check for events at the Control Position.	
8. X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).	
9. Monitor the underlying network infrastructure (network specialist).	

The test is failed if messages are lost, duplicated or corrupted. The other observations have to be forwarded to each other in the form of a test log and discussed in a test review.

Test result:

PASS	FAILED	INCONCLUSIVE

5.2.4 Stress / Load Test

Test Reference	Tested Functionality
PRE004	This test is performed to observe the behaviour of both systems during a load/stress situation. The traffic exchanged in test PRE003 is repeated in a burst fashion.

Test description:

1. Disable the duplication of traffic on both sides.
2. Three tests should be run. The amount of messages shall be:
   - 100 for the first test
   - 200 for the second test
   - 400 for the third test
3. Both sides shall retrieve the outgoing AMHS traffic exchanged in PRE003 for an agreed day.
4. Both sides shall inform each other about the amount of messages to be expected.
5. At **Test partner 2** (or 1) interrupt the LAN connection to **Test partner 1** (or 2) by an adequate command (should be agreed between the Test partners).
6. At **Test partner 1** and **Test partner 2** “repeat” the messages retrieved in step 2 and observe a queue with a length as communicated in step 3.
7. The moment to re-connect the LAN is co-ordinated by telephone. Note down the time it takes from re-connecting the LAN till the moment the queues are empty.
8. At **Test partner 2** (or 1) re-establish the LAN connection by adequate means (commands).
9. Observe and notice the incoming and outgoing message flow.

Test control:

1. The number of messages received shall be equal to the number of messages expected.
2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.
3. Check the event logging / traffic traces for NDRs.

4. Check for Control Position events.

5. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).

6. Monitor the underlying network infrastructure (network specialist).

7. At both sides note the amount of time needed to flush the queues.

The following table can be used to make notes of the Test Control result.

Test Control	**Result**		
	100	**200**	**400**
1. The number of messages received shall be equal to the number of messages expected.			
2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.			
3. Check the event logging / traffic traces for NDRs.			
4. Check for events at the Control Position.			
5. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).			
6. Monitor the underlying network infrastructure (network specialist).			
7. At both sides note the amount of time needed to flush the queues.			

Note: The test is failed if messages are lost, duplicated or corrupted. The other observations have to be forwarded to each other in the form of a test log and discussed in a test review.

Test result:

PASS	**FAILED**	**INCONCLUSIVE**

5.2.5 Additional selected and agreed Interoperability Tests

Here the selected and bilaterally agreed Test cases should be listed.

- END -