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# I.602

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SERIES I: INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

Maintenance principles

## Application of maintenance principles to ISDN subscriber installations

Reedition of CCITT Recommendation I.602 published in the Blue Book, Fascicle III.9 (1989)

**NOTES**

1 CCITT Recommendation I.602 was published in Fascicle III.9 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

**Recommendation I.602**

## APPLICATION OF MAINTENANCE PRINCIPLES TO ISDN SUBSCRIBER INSTALLATIONS

*(Melbourne, 1988)*

## 1 Scope of application

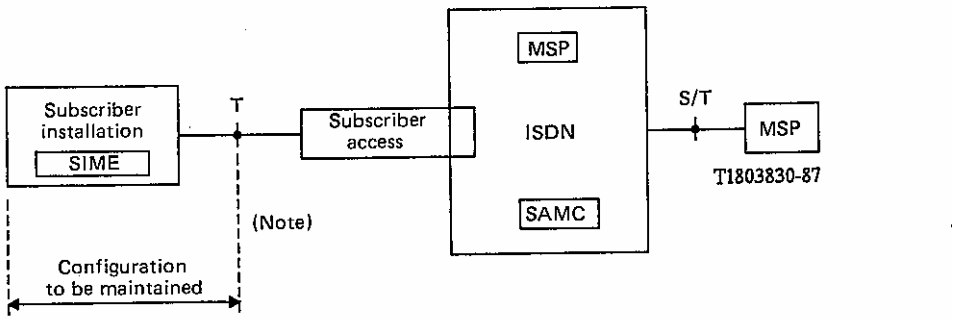
This Recommendation presents the possible elementary functions for the maintenance of the subscriber installation. The functions are to be considered as optional, except when needed to meet specific network interface requirements found in Recommendations I.430 and I.431.

These functions can be controlled by the local side (e.g. from the subscriber premises) and by a remote side [i.e. from an MSP (maintenance service provider), as described in Recommendation I.601].

It is the responsibility of the subscriber installation to ensure that only authorized MSPs are given access to the following functions.

## 2 Network configuration for maintenance activities

Figure 1/I.602 is the basis for the general maintenance principles of the ISDN subscriber installation.




*Note* – In some countries the subscriber installation is allowed to control certain maintenance functions in the subscriber access without authorization of an SAMC.

FIGURE 1/I.602

**Configuration for the maintenance of the subscriber installation**

## 3 Automatic supervision

### 3.1 *Continuous automatic supervision on layer 1*

#### 3.1.1 *General*

This supervision may be realized by permanent automatic mechanisms located in the pieces of equipment of the subscriber installation (see definition in Figure 1/I.602). These automatic mechanisms are operational during the active period of the subscriber basic access. They are designed to detect malfunctioning of particular items, e.g. power supply, quality level of transmission, incoming signal, frame alignment.

#### 3.1.2 *Subscriber installation functions*

The following functions may be supervised:

– monitoring of operation functions within the subscriber installation (e.g. power supply);

– supervision of information related to or received from the digital transmission section.

3.2 *Automatic supervision on layer 2 and layer 3 of the D-channel protocol*

This activity covers supervision of activities on layers 2 and 3 of the D-channel protocol. Automatic supervision on layers 2 and 3 may be made by self-acting mechanisms implemented in the subscriber installation.

There are three categories of automatic supervision which may be performed by layer 2 and layer 3 of the D-channel protocol:

– service provision incapability detection (e.g. detection of incapability of layer 2 to establish a data link connection);

– protocol misoperation detection;

– error monitoring (e.g. layer 2 CRC check procedure can detect the occurrence of an errored frame).

These events (defined in Recommendations I.440 and I.450) should be recorded.

## 4 Internal tests

4.1 *Internal test of the TE1 and TA*

Some of the TEs/TAs may manage internal tests for all or parts of their functionalities. The internal tests may be activated either automatically by the TE and TAs or by a local command in the TE and TAs or by a remote request.

Some of these tests are dependent on the terminal type. Such tests shall not affect the user-network interface, i.e. no test signals shall be transmitted across the interface when a test is in operation.

The terminal equipment may have the ability to abort an internal test sequence, for example, in case of an incoming call attempt. If this test has been requested by an MSP, the subscriber installation should report the discontinuance of the test to the requesting MSP.

The result of an internal test procedure execution should be either *passed* or *failed*, and in the latter case an additional diagnostic information may be given.

4.2 *Internal test of the NT2*

The subscriber should have facilities which can help to verify that the subscriber installation is not affected by a failure. Definitions of these procedures and functions require further study. The functionalities may be similar to the ones presented for the TE and TA in § 4.1.

The following internal tests of the NT2 have been identified:

4.2.1 *Continuity test*

The objective is to verify that the internal S interfaces of the NT2 can be activated. The mechanism which is implemented in the NT2 could be based on a normal activation of the layer 1 of the interfaces.

The principle for such a test is the same as the one defined for the local exchange function (see Recommendation I.603, § 3.3).

4.2.2 *S interface check using loopback 3*

The loopbacks are shown in § 7. The results could be used for failure localization, particularly in the case where the NT2 functions are distributed.

4.2.3 *Test call to the terminal equipment from the NT2*

An NT2 may address one particular terminal equipment of the installation. Thus, it easily controls a test call. This procedure would allow the NT2 to verify the connection of the TE or TA to the installation and also to check layers 1, 2 and 3 operating conditions (e.g. response time supervision).

The test call could be initiated by the SIME.

The test call could be a normal call made for maintenance purposes.

## 5 Test call from the MSP

Further study is required, especially concerning charging and authorization aspects.

## 6 Call to a test responder from the subscriber installation

The MSP may provide test responders that are accessed via normal call procedures. There may be test responders for various teleservices and bearer services.

The selection of the service involved with the test call is made using the lower layer and higher layer compatibility information elements as defined for the normal call control procedures.

## 7 Loopbacks

7.1 *Locations of loopbacks associated with the subscriber installation*

Loopback locations for failure localization and verification are shown in Figure 2/I.602.

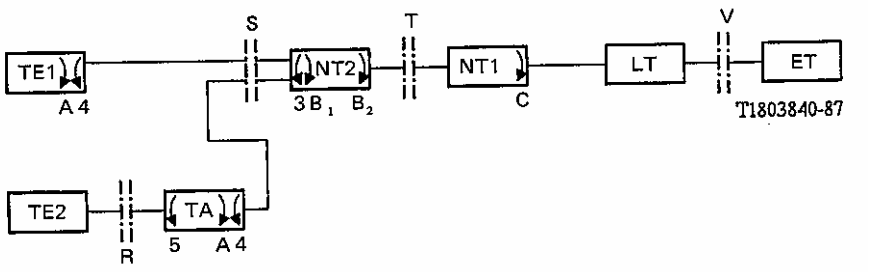



FIGURE 2/I.602

**Loopback locations associated with the subscriber installation**

7.2 *Loopback characteristics for basic rate subscriber installations*

Characteristics of loopbacks are given in Table 1/I.602.

7.3 *Loopback characteristics for primary rate subscriber installations*

Characteristics of loopbacks are given in Table 2/I.602.

## 8 Status request

A piece of equipment, i.e. NT2, TE, TA may have different states regarding its operation and/or maintenance conditions, e.g. in service, out of service, under tests, etc. These states may be defined in the future.

An MSP may request a SIME in the subscriber installation to indicate the current status of a particular terminal and/or of the connected terminal equipment.

## 9 Failure report to MSP

A subscriber installation which has detected that a TE is in a failed condition (e.g. when it is detected that a threshold has been exceeded) may have the ability to inform (via the ISDN), immediately, the MSP responsible for the concerned TE.

After reception of such an information, the MSP may initiate a more precise failure localization.

## 10 Interrogation of parameter values and counters

A MSP may have the ability to access basic information, such as instantaneous value of a parameter or counter.

TABLE 1/I.602

**Characteristics of loopback mechanisms for basic rate subscriber installations**

| Loop-back | Location | Channel(s) looped back | Loopback type | Control point | Control mechanism | Application | Implementa-tion |
|---|---|---|---|---|---|---|---|
| 3 | See Appendix I of Recommendation I.430 | | | | | | |
| 4 | See Appendix I of Recommendation I.430 | | | | | | |
| 5 | Inside the TA, as near as possible to the R interface | $B_1$, $B_2$ | Partial, partial transparent or non-trans-parent | NT2, remote maintenance server or remote user | Message from an MSP (Note 1) | Failure localization | Optional |
| A | See Appendix I of Recommendation I.430 | | | | | | |
| $B_1$ | See Appendix I of Recommendation I.430 | | | | | | |
| $B_2$ | See Appendix I of Recommendation I.430 | | | | | | |
| C | See Appendix I of Recommendation I.430 | | | | | | |

*Note 1* – This loop might also be controlled by signalling in the B-channel as specified in the X- and V-Series Recommendations.

*Note 2* – Activation/deactivation of loopback 3 may be initiated by request from an MSP (by management messages carried via layer 3 in the D-channel). However, the generalization of the test pattern over the loopback would be by the NT2.

*Note 3* – From a technical viewpoint it is desirable that loopback 3 can always be implemented (although not mandatory) and, therefore, the design of protocols for loopback control should include the operation of loopback 3.

*Note 4* – Whether the loopback is transparent or non-transparent is an implementor's decision. Whether or not a transparent loopback is used, the loopback should not be affected by configurations and conditions beyond the point at which the loopback is provided, e.g. by the presence of short circuits, open circuits or foreign voltages.

TABLE 2/I.602

**Characteristics of optional loopbacks for primary rate access**

<table>
<tr><th>Loop-back</th><th>Location</th><th>Channel(s) looped</th><th>Loopback type</th><th>Control point</th><th>Control mechanism</th><th>Implementation</th></tr>
<tr><td>C</td><td>Inside the NT1</td><td>23 B + D or<br>24 B channels<br>(Note 5)<br>30 B + D or<br>31 B channels<br>(Note 6)</td><td>Complete,<br>non-transparent<br>(Note 4)</td><td>TE, NT2</td><td>Layer 1<br>(Note 1)</td><td>Optional</td></tr>
<tr><td>$B_1$</td><td>Inside the NT2, at subscriber side (Note 2)</td><td>B, $H_0$, $H_1$<br>(Note 3)</td><td>Partial,<br>transparent or<br>non-transparent</td><td>TE, NT2</td><td>Layer 1 or<br>Layer 3</td><td>Optional</td></tr>
<tr><td>$B_2$</td><td>Inside the NT2, at the network side</td><td colspan="5" rowspan="2">These loopbacks are optional in the TE/NT2. When used, e.g., as part of an internal test, the TE/NT2 should transmit normal signal to the network.</td></tr>
<tr><td>A</td><td>Inside the TE</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">In NT2, as near as possible to reference point S, towards the ET</td><td rowspan="2">23 B + D or<br>24 B channels<br>(Note 5)<br>30 B + D or<br>31 B channels<br>(Note 6)</td><td rowspan="2">Complete,<br>transparent or<br>non-transparent<br>(see Note to I.601)</td><td>NT2</td><td>Local maintenance</td><td rowspan="2">Optional<br>(Note 8)</td></tr>
<tr><td>NT2</td><td>Layer 3 messages in D-channel or in-band signalling in B-channel<br>(Note 7)</td></tr>
<tr><td>4</td><td>Inside the TA or TE</td><td>B, $H_0$, $H_1$<br>(Note 3)</td><td>Partial,<br>transparent or<br>non-transparent</td><td>NT2, local exchange, remote maintenance server or remote user</td><td>Layer 3</td><td>Optional</td></tr>
</table>

*Note 1* – Transfer of layer 3 service messages may take place between TE (or NT2) and the exchange prior to the use of the layer 1 control mechanism. However, there are situations where the TE (or NT2) may not receive a reply:

a) the message may not be transmitted when the interface is in a failure situation;

b) a network that does not support layer 3 signalling option need not respond.

Definition of layer 1 control signals from TE (or NT2) towards NT1 remains for further study.

*Note 2* – Loopback B is applicable to each individual interface as reference point S.

*Note 3* – The different B, $H_0$ and $H_1$ channel loopbacks are controlled by separate control signals. However, several per channel loopbacks may be applied at the same time.

*Note 4* – The signal toward ET from the NT1 needs further study.

*Note 5* – For 1544 kbit/s interface.

*Note 6* – For 2048 kbit/s interface.

*Note 7* – Activation/deactivation of loopback 3 may be requested from a maintenance service provider (MSP).

*Note 8* – From a technical viewpoint, it is however desirable that loopback 3 always be implemented (though it is not mandatory) and therefore the design of protocols for loopback control should include the operation of loopback 3.

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