INTERNATIONAL TELECOMMUNICATION UNION

ITU-T M.125

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

MAINTENANCE :
INTRODUCTION AND GENERAL PRINCIPLES

DIGITAL LOOPBACK MECHANISMS

ITU-T Recommendation M.125

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation M.125 was published in Fascicle IV.1 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 M.125

DIGITAL LOOPBACK MECHANISMS

1 General

Loopback can be one of the mechanisms which may be applied to fault localization and failure detection. This Recommendation provides digital loopback definitions and describes loopback applications related to the maintenance phases of Recommendation M.20.

2 Digital loopback definitions

A **digital loopback** is a mechanism incorporated into a piece of equipment whereby a bidirectional communication path may be connected back upon itself so that some or all of the information contained in the bit stream sent on the transmit path is returned on the receive path.

The **loopback point** is the location of the loopback.

The **loopback control mechanism** is the means by which the loopback is operated and released from the loopback control point.

The **loopback control point** is the point which has the ability to directly control loopbacks.

The loopback control point may receive requests for loopback operation from several loopback requesting points.

The **loopback requesting point** is the point which requests the loopback control point to operate loopbacks.

Note 1 – Loopback requests should be subject to identification and authorization.

Note 2 – Possible locations of loopback requesting points are: the network, or a telecommunications management network (TMN), or a maintenance service provider (MSP).

The **loopback test pattern** is the test information transmitted during the operation of the loopback in the channel or channels which are to be redirected by the loopback.

Note 1 – The generation of the test pattern used over the loopback may or may not take place at the control point.

The **loopback application** is the maintenance phase for which the loopback operation is used, as defined in Recommendation M.20.

2.1 *Loopback types*

The following three types of loopback mechanisms are defined:

a) **complete loopback** – A complete loopback is a physical layer [1] mechanism which operates on the full bit stream. At the loopback point, the received bit stream shall be transmitted back towards the transmitting station without modification.

Note – The use of the term “complete loopback” is not related to implementation since such a loopback may be provided by means of active logic elements or controlled unbalance of hybrid transformer, etc. At the control point only the information channels may be available.

b) **partial loopback** – A partial loopback is a physical layer [1] mechanism which operates on one or more specified channels multiplexed within the full bit stream. At the loopback point, the received bit stream associated with the specified channel(s) shall be transmitted back towards the transmitting station without modification.

c) **logical loopback** – A logical loopback acts selectively on certain information within a specified channel or channels and may result in some specified modification of the looped information. Logical loopbacks may be defined to apply at any layer [1], depending on the detailed maintenance procedures specified.

For each of the above three types of loopback mechanisms, the loopback may be further categorized as either transparent or non-transparent:

i) A **transparent loopback** is one in which the signal transmitted beyond the loopback point (the forward signal) when the loopback is activated, is the same as the received signal at the loopback point. See Figure 1 a)/M.125.

ii) A **non-transparent loopback** is one in which the signal transmitted beyond the loopback point (the forward signal) when the loopback is activated is not the same as the received signal at the loopback point. The forward signal may be defined signal or unspecified. See Figure 1 b)/M.125.

Note – Whether or not a transparent loopback is used, the loopback should not be affected by facilities connected beyond the point at which the loop is provided, e.g., by the presence of short circuits, open circuits or foreign voltages.

Annex A to this Recommendation shows some examples of loopbacks.

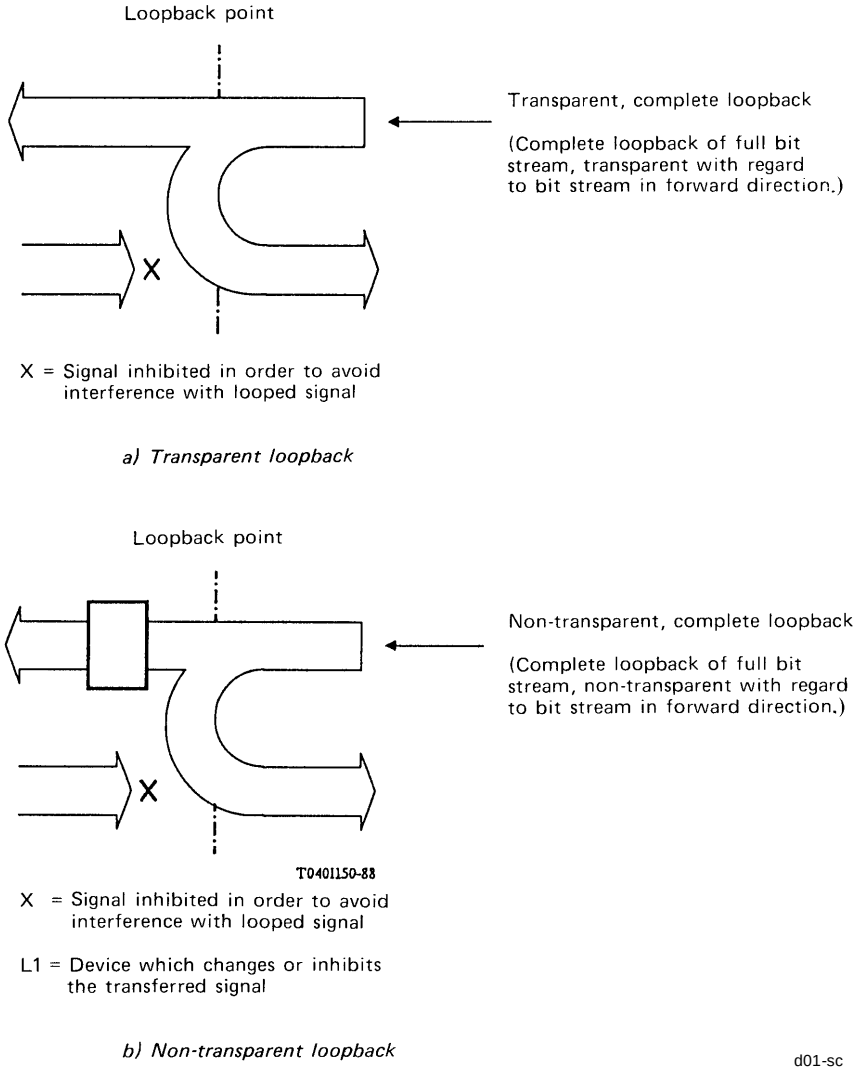

FIGURE 1/M.125

3 Loopback applications

3.1 *Failure detection*

In order to detect failures related to networks maintained by different maintenance organizations, loopbacks should be applied at the borderline separating the maintenance responsibilities. Loopbacks should be located in the maintenance entities (ME) adjacent to the borderline and as close as possible to the borderline. Part of the bit stream can be involved in failure detection. Figure 2/M.125 shows an example with failure detection originated in locations A and B.

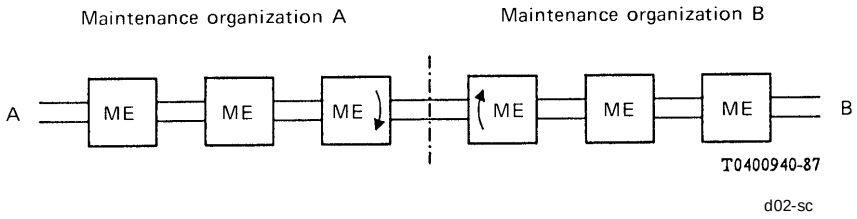

FIGURE 2/M.125

Failure detection with loopbacks

3.2 Fault localization

The localization of faults in networks consisting of n maintenance entities requires at least $n + 1$ loopback mechanisms. The loopback point should be as close as possible to the in- and output ports of the ME in order to include as much as possible of the ME in the loopback mechanism. (See example in Figure 3/M.125.) Part of the bit stream or the complete bit stream can be involved in fault localization, originated in locations A or B.

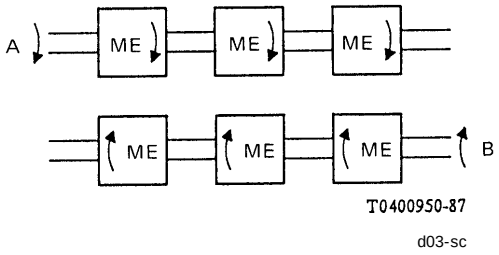

FIGURE 3/M.125

Fault localization with loopback mechanisms

3.3 *Verification*

Verification can require performance tests and measurements of the complete bit stream.

The same loopback location can be used as for fault localization.

4 Loopback operation and release

Loopbacks can be operated/released locally or remotely. Remote operation/release can be based on in-service addressing (e.g., layer 1 protocols) or it can require separate loopbacks addressing systems.

5 Loopback examples (under study – see Annex A)

ANNEX A

(to Recommendation M.125)

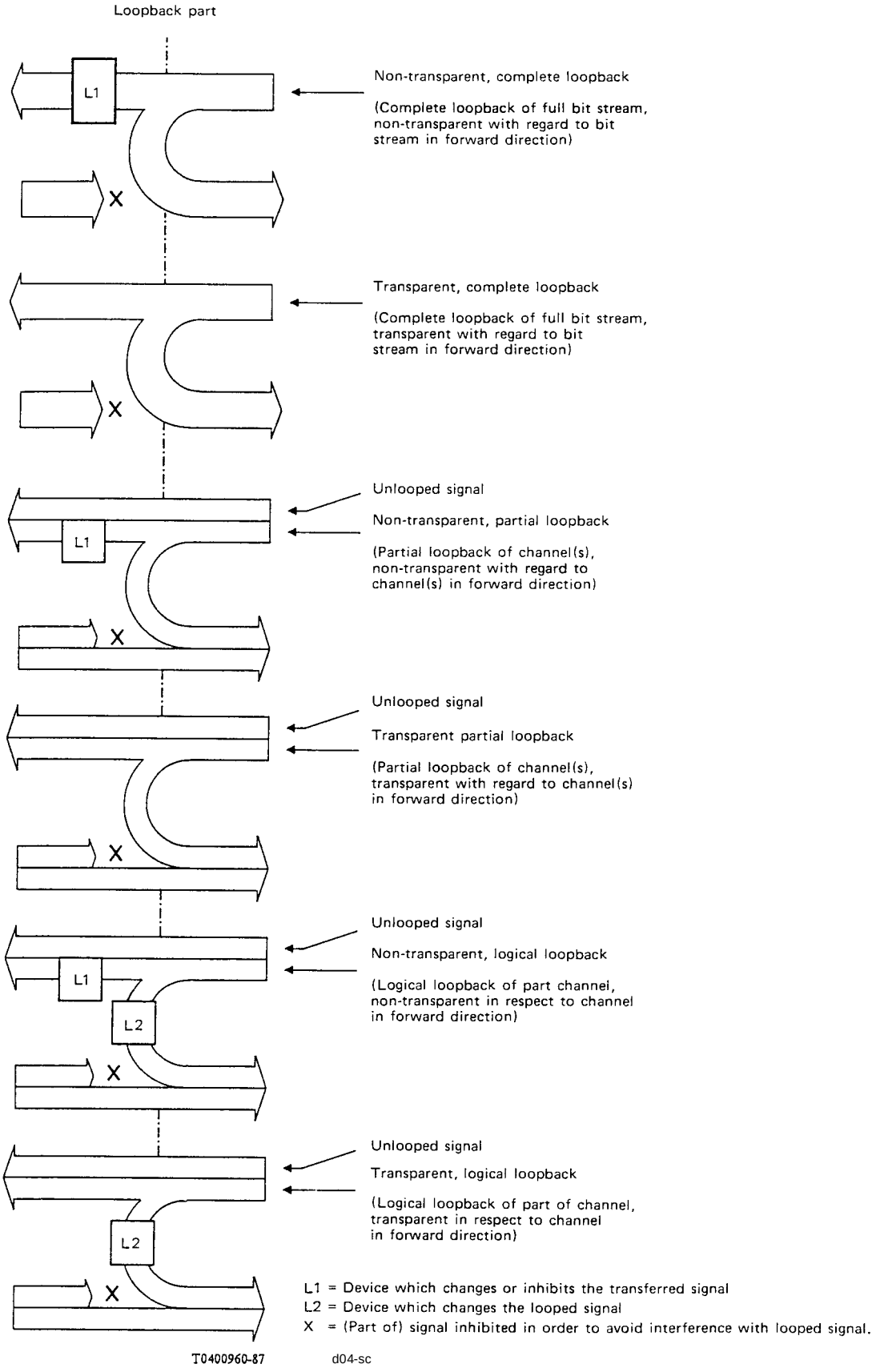

FIGURE A-1/M.125

Examples of loopbacks

Reference

[1] CCITT Recommendation *Reference model of open system interconnection for CCITT applications*, Vol. VIII, Recommendation X.200.