time the access will be in either the "out of service due to failure" or "degraded transmission" conditions), the access shall be returned to the "in service" condition. The mechanism/procedure for returning the access to the "in service" condition (e.g. automatic or manual) is not a subject of this Recommendation (see Recommendation I.601).

11.Overall performance measurements

Overall performance measurements could be made as follows, from the point of view of the exchange:

- the measurement may concern a limited number of subscriber accesses at the same time;

- the measurement is only made on demand.

These tests and/or measurements shall not influence the conditions of the subscriber installation for incoming and outgoing calls. This gives the advantage of enabling measurement of the performance independently of the activity in the different channels of the subscriber basic access and also over a longer period of time.

For the performance evaluation of a digital transmission system (over a longer period of time, with permanent activation of the subscriber basic access) the Administration network shall have arrangements for the calculation of the performance levels according to Recommendation G.821.

Note 1 - Whether the loopback is transparent or non-transparent is for further study. 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.

Note 2 - Network control signals for loopbacks may not be harmonized.

6.3.3Use of loopbacks

If the loopback 2 is established, the network part of the subscriber basic access is considered to be correctly functioning. No report is given to the SAMC.

If loopback 2 cannot be established and/or if faulty network conditions are detected, the exchange:

- either goes further in the identification of the failed maintenance entity (see § 6.2) and reports to the SAMC later, once the failed maintenance entity has been identified;

- or informs the SAMC that the network is affected by a failure, in the case of non automatic identification process of the failed maintenance entity is implemented.

6.4Command controlled tests and measurements

For more precise failure localization it would be necessary to obtain line parameter measurements indicating that the value of an electrical parameter is within a certain margin or showing the precise value of the parameter.

For further study.

7.Logistic delay time

See Recommendation M.20.

8.Failure correction

See Recommendation M.20.

9.Verification

The verification that the failure has been corrected is made on demand of the staff.

Tests described in §§ 3, 6 and 11 may be used.

10.Restoration

After the failure has been rectified and the correct operation of the access verified (during which

FIGURE 2/I.603

6.3.2 Characteristics of loopbacks within the subscriber access

The characteristics of loopbacks within the subscriber access are given in Table 1/I.603. Other loopbacks used in support of maintaining the subscriber installation from within the subscriber installation are specified in Recommendation I.602.

TABLE 1/I.603

(ME) has been made (see § 6).

6. Failure localization

6.1 Automatic confirmation of failure within the subscriber basic access

An automatic test procedure to confirm a detected possible failure condition within the subscriber basic access should be provided. It should be initiated on an automatic reaction of the exchange, following abnormal conditions which have been detected by the processes presented above, i.e. continuous supervision, supervision on layer 2 and layer 3, continuity test.

The process is based on loopback techniques which allows the exchange to verify that there is no failure within the network and that the failure condition, if any, is not of a temporary nature.

If failures are detected in the D-Channel layers 2 and 3 communication clear differentiation between failures within the subscriber installation and within the subscriber access should be possible.

6.2 Failed maintenance entity identification

6.2.1 General

Such a function has to be made on demand or automatically following the indication of failed conditions by the network or following a subscriber complaint. It is necessary, before undertaking the appropriate action, to identify (know) the maintenance entity affected by the failure.

6.2.2 Objectives

The main objective of this function which is controlled by the SAMC is to indicate to the SAMC if the failure is:

- within the ET and/or the LT;

-within the line and/or the NT1, separated between NT1 and line ifpossible;

- within the subscriber installation.

6.3 Loopbacks

6.3.1 Locations of loopbacks within the subscriber basic access

Loopback locations for failure localization and verification controlled by the local exchange are shown in Figure 2/I.603.

Note - Other loopbacks might be necessary.

- error monitoring (e.g. the 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.

3.3 Continuity test

3.3.1 General

When the subscriber basic access is not active (normal case and/or unknown failure condition case) or has not been recently activated, a continuity test may be applied in order to detect possible failure condition.

The test should be a simple go/no go test.

Note - The periodicity of testing on each access, if performed on a periodical basis, shall be compatible with the failure detection time value (i.e. the time between failure occurrence and failure detection).

3.3.2 Control of the continuity test

The continuity test is based on a normal activation of layer 1. If the activation is confirmed by a positive result of the continuity test, the subscriber basic access is declared to be in good order for operation. No report is given to the SAMC.

If the activation is not confirmed by a positive result of the continuity test, or if a failure condition is detected during the process, then the exchange will automatically enter into the failure localization process, and will report to SAMC.

The result of the continuity test should be judged to be positive if the NT1 has the capability to signal that there is no failure on the subscriber basic access.

4. System protection

When a failure is detected which has an adverse effect on the availability and/or functionality of network equipment, the access is considered "out of service due to failure" and call attempts may be rejected to prevent further damage or to remove the adverse effect (see Recommendation I.601). In this condition, removal of power from the line may be required.

5. Failure information

A failure confirmed by the exchange and related to a subscriber basic access and/or subscriber installation shall be reported to the SAMC in a message.

The message could be presented after an automatic identification of a failed maintenance entity

Functions, which are allocated to the digital section are listed below:

- detection of loss of frame alignment within the digital system;

- detection of loss of frame alignment on the user-network interface as defined in Recommendation I.430;

- supervision of the power feeding;

- transmission performance monitoring.

Transmission performance monitoring mechanisms are for further study.

Note - In case the digital section has its own failure detection mechanism, failure indication signals may be sent to and received by the local exchange termination. Alternatively, the detection mechanisms are included in the exchange termination.

3.2.1.3Exchange termination functions

Functions which are allocated to the exchange termination are listed below:

- supervision of information related to or received from the digital section;

- transmission performance evaluation.

The transmission performance evaluation is based on a permanent processing of the elementary results presented by the continuous error monitoring of the digital section.

The result of the processing will give information on at least one transmission quality level.

Definition of quality levels and evaluation timing conditions are out of the scope of this Recommendation.

3.2.2Automatic supervision of layers 2 and 3 of the D-Channel protocol

This activity covers supervision of activities of layers 2 and 3 of the D-Channel protocol. Automatic supervision on layers 2 and 3 will be made by self-acting mechanisms implemented in the network (e.g. in the ET).

There are three categories of automatic supervision which may be performed by layers 2 and 3 of the D-Channel protocols:

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

-protocol misoperation detection (e.g. at layer 2, detection of dual TE1 assignment);

Note 2 - In some countries certain maintenance functions within the subscriber access may be controlled by the subscriber installation (SIME).

FIGURE 1/I.603

Configuration for the maintenance of the basic access

3.Failure detection

3.1General

When the digital section (as seen by the exchange) of the ISDN subscriber basic access is in the active state, automatic supervision of the correct functioning of the layer 1 up to the NT1 is operating. This supervision is called continuous automatic supervision on layer 1.

When the ISDN subscriber basic access is in the active state (as seen by the exchange), automatic supervision of the correct functioning of the D-Channel layers 2 and 3 is also operating. This supervision is called automatic supervision on layers 2 and 3 of the D-Channel protocol.

When the ISDN subscriber basic access is not in an active state (as seen by the exchange), the subscriber access may be periodically tested by the exchange. This is called the continuity test.

3.2Automatic supervision

3.2.1Continuous automatic supervision of layer 1

3.2.1.1Objectives

This supervision is realized by permanent automatic mechanisms located in the pieces of equipment of the subscriber basic access (see definition in Figure 1/I.601).

These automatic mechanisms are continuously 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.

The continuous automatic supervision mechanism should be in operation even if there is no subscriber installation connected to the T reference point. For this, it must be possible for the digital section to be placed in a state where the automatic supervision can be performed continuously although the T reference point may not be capable of full activation according to Recommendation I.430.

3.2.1.2Digital section functions

Recommendation I.603

APPLICATION OF MAINTENANCE PRINCIPLES TO ISDN BASIC ACCESSES

1.Scope of application

This Recommendation covers the maintenance of that part of the ISDN subscriber basic access, controlled by the network, follows the maintenance principles as defined in Recommendation M.20 and applies to the basic access directly connected to the local exchange without any multiplexer or concentrator.

The principle of controlled maintenance (as defined in Recommendation M.20) is applied for maintaining the subscriber basic access.

Controlled maintenance is a method of sustaining a desired technical performance by the systematic application of supervision, testing and performance sampling in order to minimize preventive maintenance and to reduce corrective maintenance.

2.Network configuration for maintenance activities

Figure 1/I.603 is the basis for the general maintenance principles of the subscriber access.

SAMC: Subscriber Access Maintenance Centre
SIME: Subscriber Installation Maintenance Entities
MSP: Maintenance Service Provider

Note 1 - The subscriber access contains a digital section which can use different varieties of transmission techniques and may also include a regenerator.