



INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

O.11

(10/92)

SPECIFICATIONS OF MEASURING EQUIPMENT

MAINTENANCE ACCESS LINES



Recommendation O.11

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation O.11 was revised by Study Group IV and was approved under the Resolution No. 2 procedure on the 5th of October 1992.

CCITT NOTE

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

© ITU 1993

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

Recommendation O.11

MAINTENANCE ACCESS LINES

(Published 1972; revised 1984, 1988, and 1992)

Abstract

Defines a number of test access lines for manual and automatic maintenance of international circuits.

Keywords

- automatic testing;
- maintenance access lines;
- testing.

1 General

1.1 *Introduction*

In order to carry out manual and automatic maintenance of international circuits in an automatic telephone network more effectively, the following international maintenance access lines are recommended:

- a) a balanced quiet termination which initially returns a -10 dBm0 test tone;
- b) a maintenance test position or console access line with multiple access codes for both voice communications and/or circuit testing;
- c) a test line to terminate the echo suppressor testing system (ESTS);
- d) a loopback test line (analogue or digital);
- e) a test line to terminate the echo canceller test responder;
- f) a test line to terminate the signalling system functional testing and transmission measuring responder (type *a*) for use with ATME No. 2 (see Recommendation O.22 [6]);
- g) a test line which returns a busy flash signal for use with ATME No. 2 (also referred to as type *c* responding equipment, see Recommendation O.22 [6]).

These test lines should be provided as modular units so that each Administration may choose the number of each type it wishes to install at a given centre.

The test lines listed in a) to e) above will not provide reliable test results for a circuit which is routed through a circuit multiplication system (CMS) employing interpolation techniques [this includes the case where a circuit is routed over time division multiple access/digital speech interpolation (TDMA/DSI) satellite channels] and therefore should not be used in this instance unless a permanent trunk-channel association in both directions of transmission can be made for the duration of the test sequence. The reason for this is that without such a trunk-channel association, circuit continuity may not be maintained within the CMS in the absence of a signal and during very low signal level conditions.

1.2 *Quiet termination test line*

The quiet termination test line is a dialable test line that initially returns a nominal 1020 Hz¹⁾ –10 dBm0 tone for 13 to 15 seconds. After the initial tone period, the test line should present a balanced 600-ohm termination to simulate the nominal exchange impedance. This quiet termination should remain connected until the calling party disconnects. This dialable test line is intended to allow one-man manual 1-way loss, 1-way noise (or noise with tone) measurements and impulsive noise checks on any circuit from the distant switching centre.

1.3 *Test and/or communications access line*

The test and/or communications access line is a dialable access line intended to be located at the circuit maintenance test position or test console location associated with the international switching centres. These access lines are expected to be used for voice communications between the circuit maintenance personnel at the appropriate maintenance elements and as a test access point to make a variety of manual transmission tests. These access lines are potential facilities as a fault report point (circuit) or fault report point (network) and/or testing point (transmission).

Separate access codes will be allocated for each of the access line types described below. This is to ensure that if an Administration wishes to separate the various maintenance functions (i.e. transmission testing, switching testing and fault reports) it can do so. These allocations should not, however, stop those Administrations that wish to combine one or more of the functions, using a single access code.

1.3.1 *Transmission access test lines*

The transmission access test line is a dialable test line intended to be located at the circuit maintenance test position or test console location associated with the international switching centres. These test lines are expected to be used as a test access point to make a variety of manual transmission tests. They may also be used for voice communication purposes associated with the circuit testing.

The proposed dialling plan for these test lines enables a particular test position or console to be selected when the distant switching centre is equipped for this type of dialling access. If the normal test position number (access code) is busy, it is expected that the call should route to an idle test position number via a hunting group. Generally, the allocation of access codes should allow the digits 21 (see § 2.4.2) to cause the incoming test line call to route to the test position or maintenance console normally assigned to the particular circuit group over which the incoming call originated. Then the use of digits 22 to 29 (non CCITT No. 6 signalling) would allow the maintenance personnel to make a test line call to a specific test position or maintenance console at the distant location. This will allow both flexibility in assigning the test positions and consoles, and may also relieve the need for all test positions or consoles to be equipped with the same test equipment.

1.3.2 *Other test and/or communication lines*

A requirement exists for the provision of lines for manual switching and signalling tests and for the provision of facilities for a fault report point (circuit) or a fault report point (network). Codes will be allocated to these lines when the requirements are fully defined.

1.4 *Echo suppressor test line*

The echo suppressor test line is a dialable 4-wire test line intended to terminate the echo suppressor testing system (ESTS) responder on an international switching centre. This test line will allow the maintenance personnel at the distant switching centre using the ESTS director equipment to make one-man semi-automatic echo suppressor tests on the circuits between the two centres.

¹⁾ For further information about the choice of the test reference frequency, refer to Recommendation O.6.

1.5 *Loopback test line*

1.5.1 *Analogue loopback test line*

The loopback test line is a dialable 4-wire test line that initially returns a nominal 1020 Hz –10 dBm0 tone for 13 to 15 seconds. After the initial tone period, the test line should present a balanced 600-ohm termination to the “RETURN” direction for the next 13 to 15 seconds. The “GO” direction should also be terminated in a 600-ohm balanced termination during both these first two intervals.

After the second interval, the 600-ohm terminations should be disconnected. Finally, the “GO” and the “RETURN” directions should be connected (looped around) in the test responder at the correct level until released by the calling station.

The intent of this test facility is to provide a one-man manual means of performing fast transmission tests (level and noise) in both directions. It will also allow seizure and rapid testing by an automatic device at the calling station.

1.5.2 *Digital loopback test line*

The digital loopback test line provides a dialable 4-wire test line capability intended both for use in measuring the error performance of international digital circuits and as a quick method of verifying the continuity of wholly digital, non-PCM encoded and mixed analogue/digital circuits. It consists of circuitry that accepts and loops back on a digital basis the signal from a circuit. The test signal may be any arbitrary digital test pattern or analogue test signal.

Once the tester has accessed the test line at a remote location, the tester may transmit the desired analogue test signals or digital test patterns. The tester may examine the returning signal for the received power (or continuity) of the analogue test signals or the error performance (or continuity) of the digital test patterns.

The proposed dialling plan for this test line enables a particular line to be selected when the distant switching centre is equipped for this type of dialling access. If the normal test line number (access code) is busy, it is expected that the call should route to a busy indication.

1.6 *Echo canceller test line*

The echo canceller test line is a dialable 4-wire test line intended to terminate the echo canceller test responder.

This test facility will allow maintenance personnel at the originating switching centre to make tests of the echo canceller(s) on the circuit under test. Whether the test will be made on both echo cancellers or just the echo canceller at the responder end of the circuit under test will depend on the type of directing equipment being used.

1.7 *ATME No. 2 test lines*

The ATME No. 2 test lines are dialable 4-wire test lines intended to terminate the ATME No. 2 responders (see Recommendation O.22 [6]). The responding equipment is available in two forms:

- a) a signalling system functional testing and transmission measuring device (type *a*);
- b) a signalling system function testing device (type *b*).

The ATME No. 2 equipment, consisting of directing equipment at the outgoing end and responding equipment at the incoming end, is intended to make automatic transmission measurements and signalling system functional tests on all categories of international circuits terminating in exchange with 4-wire switching.

1.8 *Busy flash signal test line*

The busy flash test line is a dialable 4-wire test line intended for use with the ATME No. 2 directing equipment (see Recommendation O.22 [6]). This test line, which is also referred to as type *c* responding equipment in Recommendation O.22 [6], is required in cases when the signalling system used on the circuits to be tested provides a busy flash signal. This test line functionality may be provided within the exchange equipment or by separate responding equipment.

2 **Method of access**

2.1 In general, access arrangements should conform to the Recommendation M.565 [1].

2.2 Access to the test lines at the incoming international exchange will be gained via the normal exchange switching equipment on a 4-wire basis on all incoming and both-way circuits.

2.3 The wiring loss build-out arrangements for the test lines should conform to the Recommendation M.565.

2.4 *Address information*

2.4.1 *Address information sequence*

The following address information will be used to gain access to the maintenance access lines at the incoming international exchange.

i) *CCITT Signalling System No. 4*

- a) terminal seizing signal;
- b) code 13;
- c) code 12;
- d) digit 0;
- e) two digits associated with the particular international test line type to be accessed (see § 2.4.2);
- f) code 15.

ii) *CCITT Signalling System No. 5*

- a) KP1;
- b) digit 7 (non-allocated language digit);
- c) code 12;
- d) digit 0;
- e) two digits associated with the particular international test line type to be accessed (see § 2.4.2);
- f) ST.

iii) *CCITT Signalling System No. 6*

The initial address message format for access to testing devices is given in Recommendations Q.258 [2] and Q.259 [3]. The X digit allocation should be as follows:

- a) 1 (ATME No. 2 responding equipment type *a* for signalling tests and transmission measurements);
- b) 2 (ATME No. 2 responding equipment type *b* for signalling tests only);
- c) 3 (quiet termination test line);
- d) 4 (echo suppressor test line);

- e) 5 (loopback test line);
- f) 6, 7 and 8 (transmission access test line). (See Note);
- g) 9 (echo canceller test line);
- h) 10 (digital loopback test line).

Note – The allocation of the X digit is under the responsibility of Study Group XI. In Signalling System No. 6, the bits of the access codes (bit pattern) sent on the line need not be identical with the actual access code number used by the maintenance staff. As Signalling System No. 6 will mainly be used together with SPC exchanges, it will be possible to translate any access code into an appropriate bit pattern.

iv) *CCITT Signalling System No. 7*

- a) test call indicator in the initial address message as given in Recommendation Q.722 [4];
- b) code 13;
- c) two digits associated with the particular international test line type to be accessed (see § 2.4.2);
- d) code 15 (on request).

v) *CCITT Signalling System R1*

- a) KP;
- b) digits to be agreed upon between the Administrations concerned;
- c) ST.

vi) *CCITT Signalling System R2*

- a) test call indicator;
- b) code I-13;
- c) two digits associated with the particular international test line type to be accessed (see § 2.4.2);
- d) code I-15 (on request).

2.4.2 *Test line codes for CCITT Signalling Systems No. 4, 5, 7 and R2*

i) ATME No. 2 responding equipment type <i>a</i>	61
ii) ATME No. 2 responding equipment type <i>b</i>	62
iii) Busy flash signal.....	63
iv) quiet termination.....	64
v) echo suppressor.....	65
vi) analogue loopback	66
vii) digital loopback.....	68
viii) multiple address capability for transmission access test line	21-29
ix) echo canceller test line.....	67

3 Specifications for the test line apparatus

The following specifications apply to all test line types unless otherwise noted and apply over the range of climatic conditions specified in Recommendation O.3 [7].

3.1 *Tone source characteristics (quiet termination and loopback test lines)*

- a) The nominal tone source frequency should fall within 1004 to 1020 Hz. The tone source frequency including tone source stability and aging should remain within 1002 to 1025 Hz.
- b) Purity of output: ratio of total output to unwanted signal at least 50 dB.
- c) Long-term level stability: ± 0.03 dB.

3.2 *Transmitted level and timing intervals (quiet termination and loopback test lines)*

- a) The test tone level to be transmitted should be -10 dBm0 ± 0.1 dB.
- b) Tone interval for quiet termination test line: 14 s ± 1.0 s. Tone and quiet termination intervals for the loopback test line: 14 s ± 1.0 s.

3.3 *Impedance*

- a) 600 ohms, balanced.
- b) For all cases, longitudinal conversion loss (see Figure 1/O.9 of Recommendation O.9 [8]): at least 46 dB between 300 and 3400 Hz increasing below 300 Hz to at least 60 dB at 50 Hz.

3.4 *Return loss*

At least 46 dB at 1020 Hz, and at least 30 dB between 300 and 3400 Hz.

3.5 *Frequency response*

- a) ± 1 dB from 300 to 3000 Hz (quiet termination, echo suppressor, echo canceller and loopback test lines).
- b) ± 0.5 dB from 300 to 3000 Hz (transmission access test line).

3.6 *Loopback test line level adjustment*

The loopback test line equipment shall provide the proper buildout (loss or gain) in the loopback measurement path to adjust its level to within ± 0.1 dB of the required nominal value. The required nominal value should be determined using Recommendation M.560 [5] and the reference level points at which the loopback test line is employed.

3.7 *Digital loopback test*

The digital loopback test line provides a dialable 4-wire test line capability. This type of test line accepts and loops back received octets from a digital circuit. The octets when looped back, are retransmitted so that the positions of the bits within the octet are preserved; that is, the most significant bit of the retransmitted octet corresponds to the most significant bit of the received octet, and so forth.

The loopbacks may be integrated into the switching network of the digital switching machine, or may be provided in a stand-alone mode, having an external 4-wire 64 kbit/s appearance on the switching machine, similar to existing test lines.

4 Signalling system test line test sequence

4.1 *Circuit seizure*

When an outgoing circuit is to be seized and connected at the distant end to one of the international test lines, the appropriate address information is transmitted in accordance with the specification for the signalling system in use (see § 2.4).

4.2 *Test line answer*

When access is gained to the test line equipment, the answer signal (answer, no charge if Signalling System No. 6) will be transmitted. If the test line is occupied, a busy indication should be returned to the originating end in accordance with the normal signalling for the circuit and for the address concerned.

4.3 *Test line not equipped*

When a test line call is received at a switching centre not equipped to handle that type of test call, the called switching centre should respond with the standard “unallocated number” signal where available for the signalling system employed.

References

- [1] CCITT Recommendation M.565, *Access points for international telephone circuits.*
- [2] CCITT Recommendation Q.258, *Telephone signals.*
- [3] CCITT Recommendation Q.259, *Signalling-system-control signals.*
- [4] CCITT Recommendation Q.722, *General function of telephone messages and signals.*
- [5] CCITT Recommendation M.560, *International telephone circuits – principles, definitions and relative transmission levels.*
- [6] CCITT Recommendation O.22, *CCITT automatic transmission measuring and signalling testing equipment ATME No. 2.*
- [7] CCITT Recommendation O.3, *Climatic conditions and relevant tests for measuring equipment.*
- [8] CCITT Recommendation O.9, *Measuring arrangements to assess the degree of unbalance about earth.*