



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

**M.110**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**MAINTENANCE :  
INTRODUCTION AND GENERAL PRINCIPLES**

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**CIRCUIT TESTING**

**ITU-T Recommendation M.110**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation M.110 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.

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## Recommendation M.110

### CIRCUIT TESTING

#### 1 Access points for testing purposes

Access points are required to enable lining-up and subsequent maintenance operations to be performed on international circuits. The required access points are as follows:

1.1 Recommendation M.565 describes and defines the access points needed for international public telephone circuits, these points being referred to as “circuit access points” and “line access points”.

Line access points and circuit access points (or appropriate means for reaching the circuit access points) should be provided for testing all circuits which are used for the provision of international telecommunication services.

Where a circuit uses channel associated signalling, it should be possible to identify and measure at the circuit access points, the signal-transmission parameters, e.g., type of signal, sequence, timing, duration, level and frequency.

1.2 Test access points should also be provided for circuits connected through a repeater station in transit from one country to another. Such access points are known as “intermediate access points”.

1.3 On a leased circuit, the circuit access points are regarded as being located in the renter’s premises, at the demarcation point where connections are made to the terminal equipment used on the circuit<sup>1)</sup>.

1.4 Test access points should also be available at the terminal international centre for circuits terminating within the country at a place remote from the international centre, for example, in the premises of the users of leased circuits or in a voice-frequency telegraph terminal station, etc. Such access points, known as line access points, should be available directly or indirectly to the transmission maintenance point (international line) as defined in Recommendation M.1014 [1] for such circuits.

1.5 In addition to those mentioned in §§ 1.1 to 1.4 above, access points should be provided on the audio input and output of FDM channel multiplex and primary PCM multiplex equipments.

1.6 Access points for testing purposes should be provided on all primary order digital paths. Such access points, known as digital path access points, should be located as near to the ends of the digital path as possible.

With suitable digital test equipment, such digital path access points enable in-service circuit monitoring to be carried out when, for example, digital paths are directly interfaced with digital exchanges or transmultiplexers.

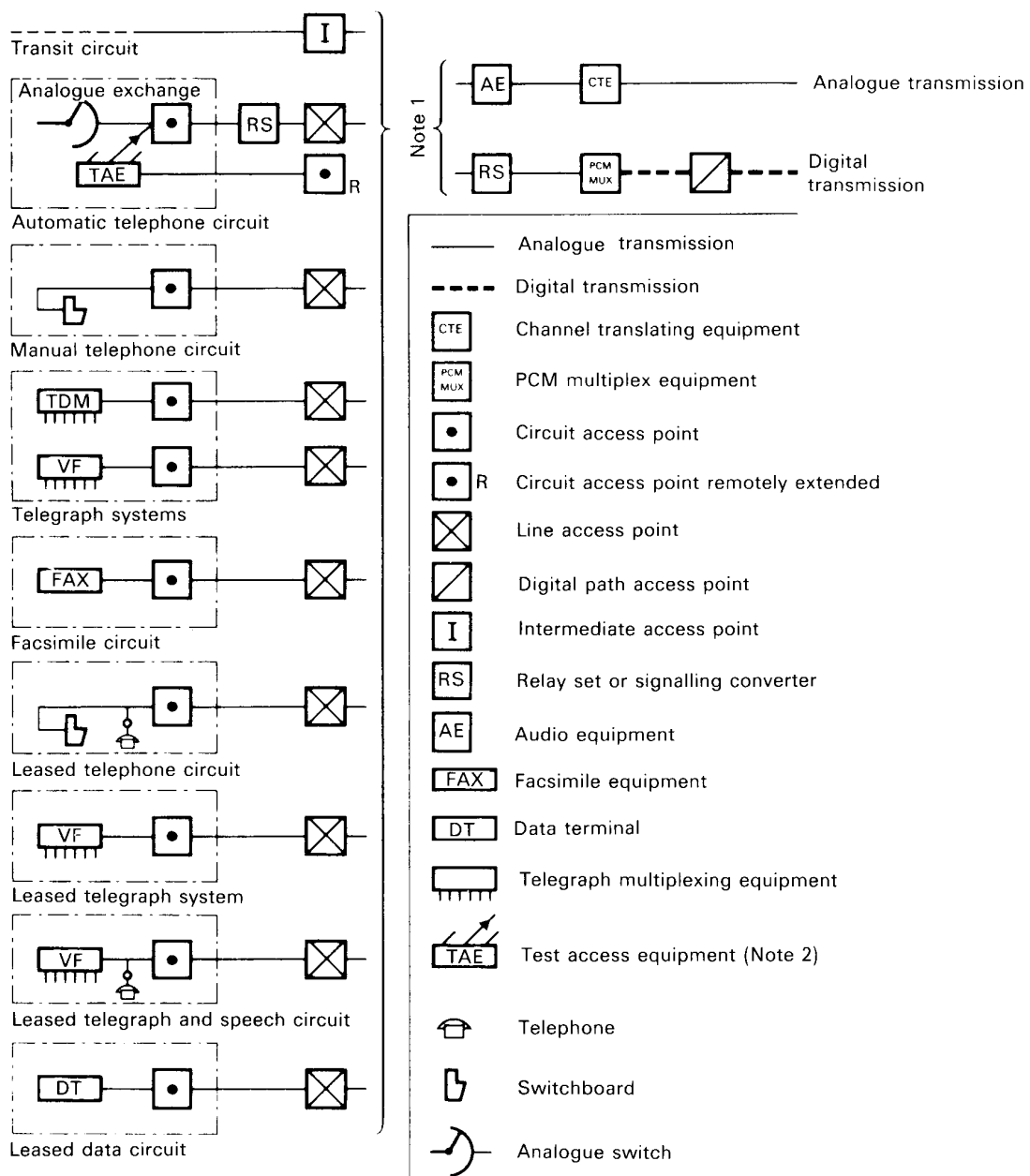
When the digital path is out of service, this same point can be used to transmit and receive signals for both digital path and circuit testing.

1.7 Figure 1/M.110 shows an example of the basic access points for international telephone circuits terminated on an analogue exchange, and for a variety of other telephone-type circuits. Figure 2/M.110 shows the basic access points for telephone circuits terminated on a digital exchange. Figures 1/M.110 and 2/M.110 both show that remote access has been provided to the “circuit access points” of automatic telephone circuits.

1.8 Series M Recommendations relating to the various types of international circuits specify how the above-mentioned access points should be used for line-up and maintenance purposes.

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<sup>1)</sup> The access points required for digital leased circuits have yet to be specified. This matter is for further study by Study Group IV, in association with Study Group XV.



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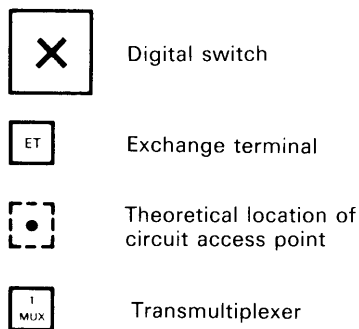
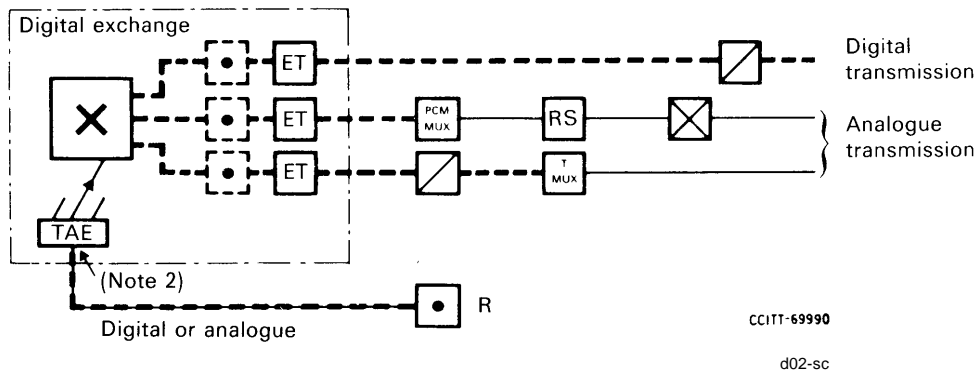
TDM = Time division multiplex  
 VF = Voice frequency multiplex

*Note 1* – Circuits may be routed by analogue or digital transmission media.

*Note 2* – Access may be provided by the normal exchange switching equipment, or by separately provided test access switching equipment.

FIGURE 1/M.110

**Access points for analogue international telephone circuits and other telephone-type circuits**



Note 1 — Other symbols are as indicated in Figure 1/M.110.

Note 2 — Access is normally provided by the exchange switching equipment.

FIGURE 2/M.110

**Access points for digital international telephone circuits**

**2 Measuring and testing equipment**

2.1 The basic types of measuring equipment needed in an analogue environment are:

- signal generators (fixed and variable frequency oscillators and calibrated sending units),
- level-measuring sets,
- calibration units,
- psophometers,
- standard frequency source (or access to such a source),
- equipment for signalling tests.

In addition, delay distortion measuring equipment, frequency counters, interruption recorders, programme meters, impulsive noise counters, phase jitter meters, automatic transmission measuring equipment, and equipment for non-linear and total distortion measurement may be required.

2.2 The basic types of test and measuring equipment needed in a digital environment are as mentioned in § 2.1 above. This need can be met by equivalent digital test/measuring equipment, or by analogue equipment and the use of a “test coder/decoder” to convert digital access points to analogue access points. In some situations, testers for the following will prove useful:

- bit error ratio;
- error-free or errored seconds;
- code violations;
- timing jitter;
- frame alignment.

2.3 The actual requirements for a particular testing centre will depend upon the types of circuit existing at that centre, and the range of tests and measurements that are specified for those circuits in the relevant Series M Recommendations. Reference should also be made to the “facility” requirements specified for the testing points defined in Recommendations M.717, M.718 and M.719.

2.4 The implementation of the worldwide transmission and switching plans makes it necessary for international circuits to be lined up and maintained to a very high degree of accuracy.

It is essential, therefore, to use measuring equipment of high accuracy and stability in order that the maintenance requirements given in the relevant Series M Recommendations for circuits are met, and to ensure uniformity of measurement results.

To this end it is desirable that measuring equipment provided for lining-up and maintaining all classes of circuits should, wherever possible, conform to the measuring instrument specifications given in the Series O Recommendations. Where no CCITT specification is available, the best order of accuracy and stability should be provided, consistent with cost and type of measurement to be made.

### **Reference**

- [1] CCITT Recommendation *Transmission maintenance point international line (TMP-IL)*, Vol. IV, Rec. M.1014.