INTERNATIONAL TELECOMMUNICATION UNION

ITU-T Q.291

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SPECIFICATIONS OF SIGNALLING SYSTEM No. 6

SECURITY ARRANGEMENTS

GENERAL

ITU-T Recommendation Q.291

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation Q.291 was published in Fascicle VI.3 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.

8.1 GENERAL

Since a common signalling link carries the signals for many speech circuits, a failure of this link will affect all the speech circuits served. Therefore, arrangements must be made to ensure continuity of service for the circuits.

The security arrangements involve the provision of reserve facilities, that may be one or more of the following:

- another signalling link, used in the quasi-associated or load-sharing mode,
- a dedicated reserve signalling link,
- a dedicated reserve transfer link, or
- a circuit, normally used for speech (or other service purposes), to be withdrawn when required for use as a transfer link.

In the last two cases the transfer links must be equipped with signalling terminals and modems and interface adaptors to form signalling links.

Other than possible signalling traffic carrying considerations, there are no restrictions in using a digital reserve signalling link for an analogue regular signalling link and vice versa.

When the regular signalling link fails, all waiting messages marked for retransmission as well as all unacknowledged signal units should be retransmitted over the reserve facility. Subsequent signalling traffic destined for the failed link should then be transferred to the reserve facility. Signalling traffic should be directed to the reserve facility only after the proper preparations have been made [see § 8.6.1 d) below].

When no signalling link is available for carrying signalling traffic during the period of changeover to a non-synchronized reserve or a nominated speech circuit, or during an emergency restart condition, measures must be taken to prevent the storage capacity of the failed signalling system from being exceeded so as to prevent messages from being lost. It is recommended that all free speech circuits should be removed from service during this period (by local busying at each end), to permit traffic to overflow to other routes which are serviceable. When there is no overflow facility, appropriate circuit-group-congestion signals should be returned.

8.2 BASIC SECURITY ARRANGEMENTS

The basic security requirement is taken from the dependability requirements for continuity of signalling service [Recommendation Q.276, § 6.6.1 d)].

Steps should be taken to open up a reserve facility as soon as possible after detection of a fault.

Once the reserve facility has been taken into service, the regular signalling link should not be brought back into service for signalling traffic until it has been checked to be giving satisfactory performance for 1 minute.

Should it happen that the reserve signalling link also fails, another reserve facility should be opened up. When there is no other reserve facility available, an attempt to transfer to any suitable signalling link, using the emergency restart procedure described in Recommendation Q.293, 8.7, must take place.

8.3 TYPES OF FAILURE, RECOGNITION OF FAILURE AND ABNORMAL ERROR RATES

8.3.1 *Types of failure*

The interruption of signalling service may be caused by several types of faults affecting the transfer channels, the modems or interface adaptors or the signalling terminal equipment.

The failure may be indicated as follows:

a) loss of the analogue data carrier or loss of the digital frame alignment,

b) continuous failure of signal units to check correctly,

c) unacceptable intermittent failure of signal units to check correctly, or

d) loss of block or multi-block synchronism.

8.3.2 *Recognition of failure*

Monitoring equipment is provided to recognize all types of signalling channel failures.

At each terminal, the monitoring will be performed on the incoming signalling channel by:

a) monitoring the signal unit error rate, and

b) detection of loss of block or multi-block synchronism.

The *signal unit error rate monitor* recognizes unacceptably high percentages of signal units received incorrectly. A signal unit is recognized as being received incorrectly as a result of an indication from the check bit decoder or the data channel failure detector (see Recommendation Q.277, §§ 6.7.1 and 6.7.2). The signal unit error rate monitor should have the hyperbolic error rate time characteristic shown in Figure 24/Q.291. The signal unit error rate monitor shall be reset to zero whenever:

- the monitor output has been recognized, indicating that the signal unit error rate, as detected by the decoder or the data channel failure detector, has become unacceptable, or
- synchronism of the signalling link has been achieved, or
- after signalling link failure.

Loss of block or multi-block synchronism is detected as described in Recommendation Q.278.

8.3.3 *Recognition of end of failure*

a) *One-minute proving period*

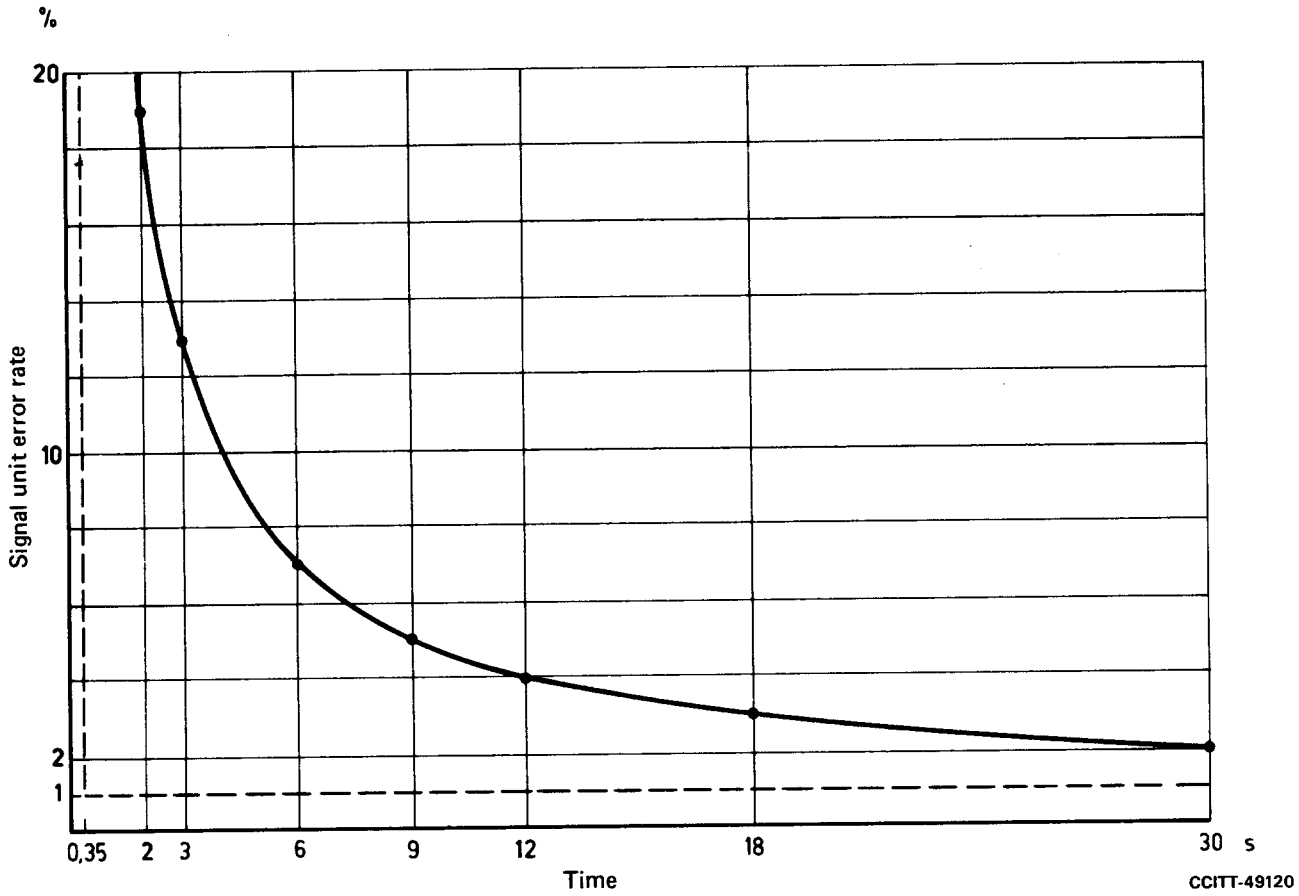
End-of-failure monitoring equipment is provided at each terminal to recognize satisfactory performance of the signalling link after initial synchronization or after a link failure. The signalling link shall not be placed into service until a signal unit error rate of 0.2% or less has been achieved in a proving period of one minute. The end-of-failure monitor will indicate that this error rate has been achieved when it recognizes that no more than:

10 signal units at 2400 bit/s, or

16 signal units at 4 kbit/s, or

240 signal units at 56 kbit/s

have been received in error in a proving period of one minute.



Consecutive signal units received in error for 350 ms will initiate changeover.

Note – The curve is based on a uniform distribution of errors.

Data transmission rate	Number of signal units	
	X	Y
2400 bit/s	31 ± 1	2 500
4 kbit/s	50	4 200
56 kbit/s	700	58 800

Note – The signal unit error rate monitor can also be defined by the following parameters:

a) X consecutive signal units received in error;

b) 2% of signal units in error out of Y received signal units.

FIGURE 24/Q.291

Signal unit error rate monitor characteristic

In the event that the end-of-failure monitor indicates that more than the appropriate number of signal units in error have been received before the one-minute proving period has elapsed, then the end-of-failure monitor shall be reset and the one-minute proving period recommenced.

b) *Emergency proving period*

An emergency proving period is used in conjunction with the emergency restart procedure (see Recommendation Q.293, § 8.7). The emergency proving period is a 2 to 3 second period during which the error rate on the link is such that the end-of-failure monitor does not give an output. The emergency proving period begins when a regular or reserve link achieves synchronism. In the event that the monitor gives an output before the emergency proving period has elapsed, the end-of-failure monitor shall be reset and the emergency proving period recommenced.

c) *No proving period*

No proving period is required when

- changeover to a reserve link is caused by failure of a signalling link (as specified in Recommendation Q.293, § 8.6.1), or when
- block and multi-block synchronism is regained (as specified in Recommendation Q.278, §§ 6.8.4 and 6.8.5).