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R.115

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SERIES R: TELEGRAPH TRANSMISSION

Time division multiplexing

MAINTENANCE LOOPS FOR TDM-SYSTEMS

Reedition of CCITT Recommendation R.115 published in the Blue Book, Fascicle VII.1 (1988)

NOTES

1 CCITT Recommendation R.115 was published in Fascicle VII.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 R.115

MAINTENANCE LOOPS FOR TDM-SYSTEMS

(Malaga-Torremolinos, 1984; amended at Melbourne, 1988)

The CCITT,

considering

(a) the increasing use of TDM transmission systems;

(b) the volume of information circulating on data and telegraph transmission networks;

(c) the savings to be made by reducing interruption time on such links;

(d) the importance of being able to determine responsibilities between the several parties who, of necessity, are involved in maintenance questions for the networks;

(e) the advantages of standardization regarding maintenance,

unanimously declares the following:

1 The locating of faults can be facilitated in many cases by looping and other maintenance procedures in the TDM equipments. These maintenance facilities allow local or remote measurements to be carried out optionally by the Administrations and/or users concerned.

2 Location of the loops

The maintenance loops are positioned in order to make it possible for the Administrations to locate faults to the following function blocks:

– aggregate modem;
– TDM central logic;
– tributary interface unit;
– aggregate line;
– subscriber line.

The loops necessary to fulfil the above listed demands are shown in Figure 1/R.115. Additional loops may be used for the location of faulty boards but these loops are relevant to each particular manufacturer's implementation and are not included here. The number of maintenance loops may be extended to include the subscriber terminal equipment. These loops are left for further study.

3 Names, types and definitions of the loops

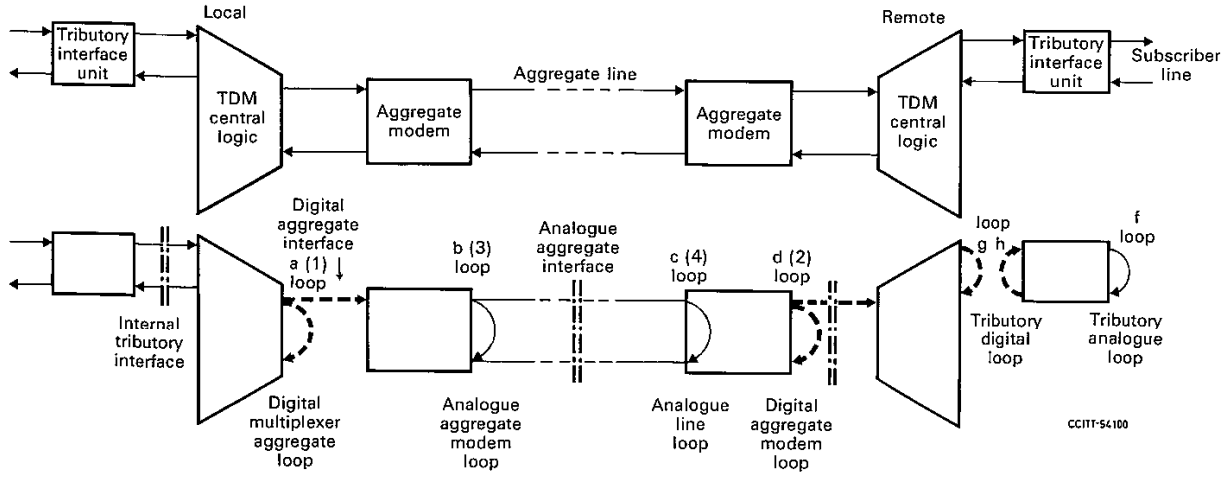
See Figure 1/R.115.

3.1 *Loop a – digital multiplexer aggregate loop*

This loop is a one-way or optionally an echo-back loop (see Figures 2/R.115 and 3/R.115) that shall connect the aggregate data output to the aggregate data input of the TDM central logic. This loop shall be accomplished as close as possible to the digital aggregate interface.

3.2 *Loop b – analogue aggregate modem loop*

This loop is a one-way loop or optionally an echo-back loop (see Figures 2/R.115 and 3/R.115). With this loop, the line signal from the output of the aggregate modem is looped back to the input of the aggregate modem. The loop should include the maximum number of aggregate modem components used in normal working.



Note 1 – A symmetrical set of loops exists as seen from the remote side.

Note 2 – Figures within parenthesis are the loop numbers according to Recommendation V.54.

FIGURE 1/R.115

Maintenance loops

3.3 *Loop c – analogue line loop*

This loop is a one-way loop or optionally an echo-back loop (see Figures 2/R.115 and 3/R.115). With this loop, the incoming line signal at the receiver input of the aggregate modem is looped back to the outgoing direction of the line. It is noted that it may not be possible to correctly receive data that has been sent over the looped circuit.

3.4 *Loop d – digital aggregate modem loop*

This loop is a one-way loop or optionally an echo-back loop (see Figures 2/R.115 and 3/R.115). In this loop the received aggregate digital data from the modem is looped back to the originating side. This loop shall be located as close as possible to the digital aggregate interface.

3.5 *Loop f – tributary analogue loop*

This loop is a one-way loop (see Figure 2/R.115). With this loop, the tributary signal to be sent to the subscriber is looped back towards the multiplex system. This loop shall be accomplished at the subscriber line interface and shall include as many parts of the tributary interface unit as possible. As long as the loop is set the subscriber connection is interrupted.

3.6 *Loop g – tributary digital loop towards the Muldex*

This loop is a one-way loop (see Figure 2/R.115) with the output polarity towards the tributary interface unit strapable to A or Z polarity. Through this loop the channel data as received from the aggregate is looped back to the aggregate towards the distant TDM equipment. This loop shall be accomplished as close as possible to the internal tributary interface which can be located on the tributary interface unit or in the TDM central logic.

3.7 *Loop h – tributary digital loop towards the tributary interface unit*

This loop is a one-way loop with the output polarity towards the muldex-part of the given channel strapable to A or Z polarity. Through this loop the channel data at the tributary input is looped back to the channel output through the tributary interface unit. This loop shall be accomplished as close as possible to the TDM central logic.

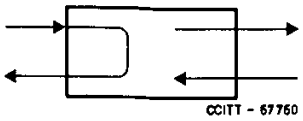


FIGURE 2/R.115

One-way loop

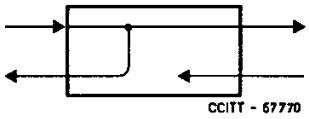


FIGURE 3/R.115

Echo-back loop

FIGURE 4/R.115

Both-way loop

4 Use of the loops

Loops c and d may be used under remote control on international links after bilateral agreements only.

5 Methods of control

5.1 Two types of control might be possible:

a) *Local control of a loop*

A loop is locally controlled when the loop request originates at the location of the equipment to be looped.

b) *Remote control of a loop*

A loop is remotely controlled when the loop request originates at a location other than that of the equipment to be looped.

5.2 When the aggregate modem is using a standard interface to the TDM-equipment, the implementation of the echo-back function and the controls through the digital aggregate interface of loops b, c and d are left for further study.

5.3 The control of loops a, b, c and d should be supervised by a time-out function. The time-out function shall automatically open the loop after a specified time period, measured from the closing of the loop. The length of the time period should be chosen from time intervals 5, 20 or 40 seconds by bilateral agreement between Administrations.

The operation and test procedure for loop f to h is a national matter.

6 Control signalling

6.1 *Alternative A*

When the maintenance facilities are controlled by the software within an exchange, a maintenance centre or a TDM terminal, a control signalling code (CSC) is used where the control signalling characters on the selected maintenance channel shall be in accordance with Table 1/R.115 (see also Recommendation U.12, Table 8/U.12).

TABLE 1/R.115

CSC character number	Parity	Data				Decimal equivalent of data
	b_4	b_3	b_2	b_1	b_0	
1	0	0	0	0	0	0
2	1	0	0	0	1	1
3	1	0	0	1	0	2
4	0	0	0	1	1	3
5	1	0	1	0	0	4
6	0	0	1	0	1	5
7	0	0	1	1	0	6
8	1	0	1	1	1	7
9	1	1	0	0	0	8
10	0	1	0	0	1	9

A complete control signalling code character consists of one start element (Start), followed by four information elements (b_0, b_1, b_2, b_3) one parity element (b_4),and a stop element (Stop) of nominally one and a half unit element, see Figure 5/R.115.

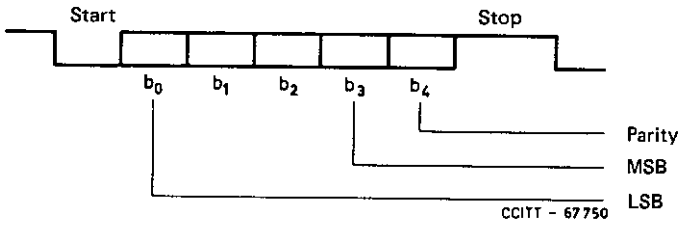


FIGURE 5/R.115

Complete control signalling code (CSC)

Bit b_0 is the least significant bit (LSB) and b_3 is the most significant bit (MSB). For the transmission of decimal numbers from 0 up to 99 the binary code should be used. The 8 binary bits should be split into two characters, No. 1 and No. 2, character No. 1 holding the least significant bits and character No. 2 the most significant bits.

6.2 *Alternative B*

When maintenance facilities do not use control signal according to Recommendation U.12, the signalling characters on the maintenance channel selected must conform to International Alphabet No. 5 (IA5), with an even parity check (see Figure 6/R.115).

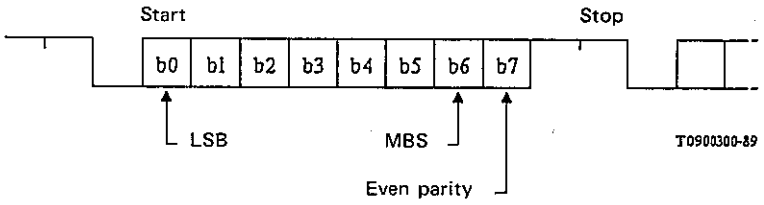


FIGURE 6/R.115

Control signalling format

6.3 *Maintenance channel signalling*

Standardization of signalling on the maintenance channel is left for further study.

7 Routing of the maintenance control signals

One 50 baud channel, or a channel of more than 50 bauds may be allocated (on an optional basis) for maintenance purposes, where possible on a separate system using a parallel route. Where this option is exercised the allocation of the maintenance channel is specified within the respective CCITT Recommendation or bilaterally between Administrations.

The selected maintenance channel should only be used for the transmission of alarms, supervision and remote control signals.

When there is no possibility to use a separate system on a parallel route the control of the loops c and d is left for further study.

8 Application

It may be possible to apply the described maintenance technique to multiplexors conforming to Recommendations R.101, R.111 and other standardized multiplexors.

9 Use of the maintenance channel

Use of the maintenance channel for purposes other than loop control is left for further study.

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