INTERNATIONAL TELECOMMUNICATION UNION

ITU-T R.116

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MAINTENANCE TESTS TO BE CARRIED OUT ON INTERNATIONAL TDM SYSTEMS

ITU-T Recommendation R.116

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation R.116 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.116

MAINTENANCE TESTS TO BE CARRIED OUT ON INTERNATIONAL TDM SYSTEMS

(Melbourne, 1988)

The CCITT,

considering

(a) the savings to be made by reducing interruption time on TDM links;

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

(c) the advantages of standardization regarding maintenance;

(d) maintenance loops are standardized in Recommendation R.115,

unanimously declares the following:

that when the quality of the TDM-Iink has deteriorated beyond the alarm limit or if the local muldex gives an alarm, supplementary measurement should be performed. The following test and supervision methods can be used.

1 Testing and supervision of TDM systems

1.1 *Bit error rate*

The synchronization bits are supervised and an error rate alarm is issued when the error rate exceeds a preset limit, 10^{-3}, 10^{-4} or 10^{-5}.

1.2 *Bit error counter*

All synchronization bit errors shall be registered in a cyclic counter and it shall be possible to read the value of this counter by command.

1.3 *Routine supervision*

The operation of the TDM equipment and maintenance channel should continuously be supervised by a repetitive test signal. An alarm is issued when a correct acknowledgement is not received for a specified number of test signals. The alarm is reset automatically when the fault situation ceases.

1.4 *Alarm reset*

It shall be possible to reset all alarms from the local side. The command shall also be able to reset the error rate value.

1.5 *System alarms*

Failures that affect operation of the whole or a major part of the TDM equipment are classified as one category. The supervised functions are:

– Carrier:

  Loss of carrier is detected by the data modem through CCITT circuit 109 or the corresponding circuit.

– Synchronization:

  Loss of synchronization is detected by the TDM multiplexer in accordance with the respective CCITT Recommendation.

– Multiplexing logic:

Failure of the TDM central logic is detected by internal supervision facilities within the multiplexer.

– Power:

Failure of the power supply is detected when the telegraph power supply exceeds tolerance limits.

1.6 *Changing of active side*

When the TDM equipment is duplicated the active side can be changed by command or manually.

When the remote or local side is changed automatically or manually, information about what side is executive must be sent when the change has been executed.

1.7 *Looptest on standby side*

When the TDM equipment is duplicated the standby modem can be tested by the setting of loop b by command. The test result is sent over the active maintenance channel.

1.8 *Automatic restart*

When the remote TDM is automatically restarted, information shall be sent informing about the restart and alarm status.

1.9 *Acknowledgement*

The acknowledgement consists of one character and should have the following values:

5 acknowledgement;

0 not acknowledgement.

2 Format of the messages

The messages which will be sent over the 50 baud maintenance channel shall have the following structure:

$C_l\ C_2\ M_1 M_2 \ldots . M_n$

$C_l\ C_2$:Message category (two characters)

$M_1 – M_n$: Information (number of characters unlimited)

After the reception of a message at the receiving end, the receiving end shall send one character to the originating end as an acknowledgement of the reception.

2.1 *Message categories*

The purpose of the message categories (called MC) is to give a direct command or to inform the control equipment in an exchange, a maintenance centre or a TDM about what type of information the following message contains.

The MC consist of two characters, and each character is a decimal number from 0 to 9. The numbers are coded according to alternative A (CSC) in Recommendation R. 115.

2.2 *Information*

The information characters are a part of an order to the remote TDM equipment or information from the remote TDM-equipment, depending on the Message Category Signal.

The number of information characters in a message is not limited.

The characters are decimal numbers from 0 to 9, coded according to alternative A (CSC) in Recommendation R.115.

3 Maintenance messages

Using the format described in § 2 the maintenance messages shall have a message category and information as given in the table below:

TABLE 1

Maintenance messages

Types of messages	Message category	Information
	C_1 C_2	M_1-M_n
Routine supervision	01	–
System alarm reset	02	–
Setting of loop a	03	–
Setting of loop b	04	–
Setting of loop c	05	–
Setting of loop d	06	–
Setting of loop g	07	M_1-M_3 : Channel No.
Setting of loop h	09	M_1-M_3 : Channel No.
Setting of loop f	10	M_1-M_3 : Channel No.
Connection of automatic test eq.	11	M_1-M_3 : Channel No. M_4-M_{23} : Answer back (See note)
Disconnection of automatic test eq.	12	–
Distortion measurement on sub. line	13	M_1-M_3 : Channel No.
Line measurements	14	M_1-M_3 : Channel No. M_4 : Type of line 0 = SC 1 = DC 2 = FS M_5 : Type of measurement 0 = Current 1 = Voltage 2 = Leakage to earth 3 = Leakage betw. conductors 4 = Level FS 5 = Interface test
Change side	15	M_1 : Side b_0 = 0 A side executive b_0 = 1 B side executive b_1 = 0 Standby side halted b_1 = 1 Standby side working
Restart of control unit	16	–
Read bit error counter	17	–
Set loop b on remote standby side modem	18	–
Open line alarm	26	M_1-M_3 : Channel No. M_4: Alarm b_0 = 1 Alarm b_0 = 0 No alarm

TABLE 1 *(continued)*

Types of messages	Message category	Information
Distortion alarm	27	M_1-M_3: Channel No.
Bit error rate	28	M_1: Failure rate 3 = 10^{-3} 4 = 10^{-4} 5 = 10^{-5}
Results of distortion measurement sub. line	29	M_1 M_2: Number of measured transitions M_3 M_4: Maximum distortion
Result of line measurement	30	M_1-M_{10}: Test result M_1 = 0 Level FS OK M_1 = 1 Level FS not OK M_2 = 0 Interf. OK M_2 = 1 Interf. not OK M_3 M_4: Voltage or current on wire 1 and resistance between wire 1 and 2. Resistance to earth, w.1 M_5 M_6: Voltage or current on wire 2 or resistance between wire 3 and 4. Resistance to earth, w.2 M_7 M_8: Voltage or current on wire 3. Resistance to earth, w.3. M_9 $M_{10:}$ Voltage or current on wire 4. Resistance to earth, w.4
System alarms	31	M_1: Type of alarm b_0 = 1 Carrier alarm b_0 = 0 No carrier alarm b_1 = 1 Synchronization alarm b_1 = 0 No synchronization alarm b_2 = 1 Power alarm b_2 = 0 No power alarm b_3 = 1 Mux logic alarm b_3 = 0 No Mux logic alarm
Manually initiated change side	32	M_1: Side b_0 = 0 A side executive b_0 = 1 B side executive b_1 = 0 Standby side halted b_1 = 1 Standby side working
Looptest result from standby side	33	M_1: Result 0 Test OK 1 Test not OK
Automatic restart	34	
Bit error counter	35	M_1-M_3: Result

Note – The answer back message shall be sent using International Alphabet No.2.