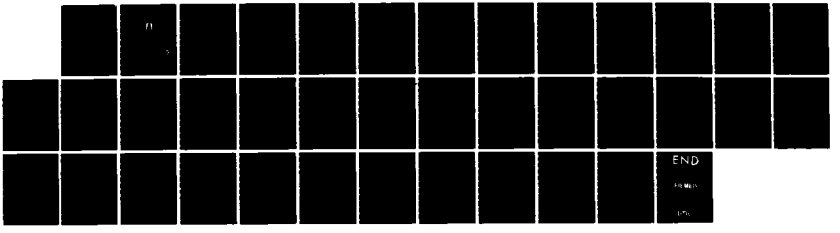
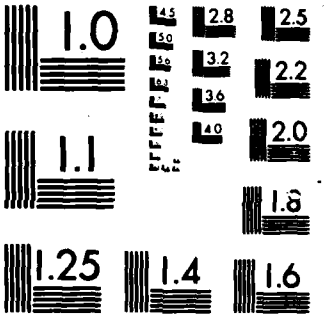
AD-A163 688 CIRCUITS AND EXCHANGE PARAMETERS AT THE C2 INTERFACE IN THE CASE OF SEQUE..(U) FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH 10 JAN 86 FTD-ID(RS)T-0010-86 1/1

UNCLASSIFIED F/G 17/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

FTD-ID(RS)T-0010-86

AD-A163 688

FOREIGN TECHNOLOGY DIVISION

CIRCUITS AND EXCHANGE PARAMETERS AT THE C2 INTERFACE IN THE CASE OF SEQUENTIAL INPUT-OUTPUT OF DISCRETE INFORMATION

GOST 18145-72

DTIC FILE COPY

Approved for public release;
distribution unlimited.

EDITED TRANSLATION

FTD-ID(RS)T-0010-86 10 Jan 86

MICROFICHE NR: FTD-86-C-001364

CIRCUITS AND EXCHANGE PARAMETERS AT THE C2 INTERFACE IN THE CASE OF SEQUENTIAL INPUT-OUTPUT OF DISCRETE INFORMATION GOST 18145-72

English pages: 34

Source: Gost 18145-72, 1972, pp. 1-26

Country of origin: USSR
Translated by: Charles T. Ostertag, Jr.
Requester: FTD/TQCT
Approved for public release; distribution unlimited.

U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh^{-1}
cos	cos	ch	cosh	arc ch	cosh^{-1}
tg	tan	th	tanh	arc th	tanh^{-1}
ctg	cot	cth	coth	arc cth	coth^{-1}
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

STATE STANDARD OF THE USSR

Data Transmission Systems

CIRCUITS AND EXCHANGE PARAMETERS AT THE C2 INTERFACE IN THE CASE OF SEQUENTIAL INPUT-OUTPUT OF DISCRETE INFORMATION

GOST 18145-72

Official Publication

Moscow 1973

UDK 621.394.41/.423.001.8(083,74) Group P85

USSR STATE STANDARD

Data Transmission Systems
Circuits and Exchange Parameters on the C2 Interface in the Case of Sequential Input-Output of Discrete Information

GOST 18145-72

By decree of the State Committee of Standards of the USSR Council of Ministers of 28 September 1972 No 1808 the effective period is established

from 1/1 1974
to 1/1 1979

Non-compliance to the standard is punishable by law.

The present standard extends to circuits and exchange parameters between terminal data equipment (OOD) and data transmission equipment (APD) and the case of sequential input-output of data, and also to both sides of intermediate equipment, which can be hooked up between terminal data equipment and data transmission equipment.

The standard establishes the nomenclature of the interface circuits, the electrical parameters of the signals sent over these circuits, and the technical requirements. Instructions on the selection of interface circuits are given in the appendix.

The present standard is applicable to:

a) synchronous and asynchronous systems of data transmission;

b) the transmission of data over noncommutated communication channels when using connections between two points or a multipoint connection;

c) the transmission of data by way of a commutated network with the use of manual and automatic establishment of connection;

d) to short connecting cables between terminal data equipment and data transmission equipment.

The length of the connecting cables is limited by the electrical parameters of the circuits as defined in section 2.

The electrical parameters defined by the present standard relate to interface circuits which can be represented by an equivalent circuit (Drawing 1).

The standard takes into account the requirements of the recommendations of the MKKTT [International Advisory Committee on Telegraphy and Telephony].

1. Nomenclature of interface circuits

1.1. Series 100. General-purpose circuits.

1.1.1. Circuit 101 - protective grounding.

The circuit should be connected electrically with the housing of the device or equipment. Furthermore, it can be connected with the external grounding, if this is required by existing safety rules.

1.1.2. Circuit 102 - Signal grounding or common return conductor.

The conductor establishes a common potential between the data transmission equipment and the terminal data equipment. Inside the data transmission equipment this circuit should terminate in one point, and the possibility should be provided for its connection with circuit 101 with the help of a jumper inside the equipment.

The jumper should be installed or removed in accordance with the requirements of the existing rules or for reducing the interferences which are induced in the electronic circuits of the equipment.

1.1.3. Circuit 103 - Transmitted data.

Direction: to the data transmission equipment.

By way of this circuit to the data transmission equipment data signals are sent which have been developed by the terminal data equipment for transmission to one or several remote subscribers.

1.1.4. Circuit 104 - Received data.

Direction: from the data transmission equipment.

By way of this circuit to the terminal data equipment data signals are sent which are formed by the data transmission equipment in accordance with the received line signals, obtained from a remote subscriber.

1.1.5. Circuit 105 - Transmission request.

Direction: to the data transmission equipment.

The signals sent over this circuit control the data transmission equipment and switch it to the mode of transmission over the data channels. In the condition "On" the data transmission equipment is switched to the mode of transmission over the data channels. In the condition "Off" the data transmission equipment is switched to the mode of absence of transmission over the data channels.

1.1.6. Circuit 106 - Ready for transmission.

Direction: from the data transmission equipment.

The signals sent over this circuit indicate that the data transmission equipment is ready to transmit data over the data channel.

The condition "On" indicates that the data transmission equipment is ready for transmission of data over the data channel.

The condition "Off" indicates that the data transmission equipment is not ready to transmit data over the data channel.

1.1.7. Circuit 107 - Data transmission equipment ready.

Direction: from the data transmission equipment.

The signals sent over this circuit indicate that the data transmission equipment is ready for operation.

The condition "On" indicates that the signal conversion device or an analogous device is hooked up to the line and that the data transmission equipment is ready for the exchange of other control signals with the terminal data equipment for the exchange of data.

The condition "Off" indicates that the data transmission equipment is not ready for operation.

1.1.8. Circuit 108.1 - To connect the data transmission equipment to the line.

Direction: to the data transmission equipment.

The signals sent over this circuit control the connection to the line or disconnection from the line of the signal conversion device or a device which is analogous to it.

In the condition "On" the data transmission equipment should connect to the line a signal conversion device or a device which is

analogous to it regardless of the condition of the other interface circuits.

- In the condition "Off" the data transmission equipment should disconnect from the line the signal conversion device or a device which is analogous to it after the termination of the transmission of all the data which were sent earlier by way of circuit 103 (Transmitted data).

1.1.9. Circuit 108.2 - Terminal data equipment ready.

Direction: to data transmission equipment.

The signals sent by way of this circuit control the connection to the line or disconnection from the line of the signal conversion device or a device which is analogous to it.

The condition "On" indicates that the terminal data equipment is ready for operation, it prepares the data transmission equipment for connection to the line of the signal conversion device or a device which is analogous to it, and should also indicate the necessity for preservation of the connection which was established by external means.

In the condition "Off" the data transmission equipment should disconnect from the line the signal conversion device or a device which is analogous to it after the termination of the transmission of all the data sent previously by way of circuit 103 (Transmitted data).

1.1.10. Circuit 109 - Detector of the received line signal of the data channel.

Direction: from the data transmission equipment.

The signals sent by way of this circuit indicate whether or not the received line signal of the data channel is in the limits established by the corresponding recommendations for data transmission equipment.

The condition "On" indicates that the received signal conforms to the established limits.

The condition "Off" indicates that the received signal does not conform to the established limits.

1.1.11. Circuit 110 - Detector of quality of data signal.

Direction: from the data transmission equipment.

The signals sent by way of this circuit indicate if there is an error in the data received over the data transmission channel,

in accordance with the criteria selected in the data transmission equipment.

The condition "On" indicates that there are no reasons to assume that an error occurred.

The condition "Off" indicates that an error is asssumed in the data signal, in accordance with the criteria selected in the data transmission equipment.

1.1.12. Circuit 111 - Data transmission rate switch.

Direction: to the data transmission equipment.

The signals sent by way of this circuit serve for the switching of the rate of data transmission in the case of synchronous data transmission equipment, having two rates, or for switching the range of rates of data transmission in the case of asynchronous data transmission equipment, having two ranges of rates.

In the condition "On" the data transmission equipment should switch to the upper rate or the upper range of rates.

In the condition "Off" the data transmission equipment should switch to the lower rate or lower range of rates.

1.1.13. Circuit 112 - Data transmission rate switch.

Direction: from the data transmission equipment.

It is possible to use circuit 111 or circuit 112, but not both simultaneously.

The signals sent by way of this circuit serve for the switching of the rate of data transmission or the range of rates of data transmission in the terminal data equipment depending on the rate, used in the synchronous data transmission equipment, having two rates, or the range of rates in asynchronous data transmission equipment, having two ranges of rates.

In the condition "On" the terminal data equipment should switch to the upper rate or the upper range of rates.

In the condition "Off" the terminal data equipment should switch to the lower rate or the lower range of rates.

1.1.14. Circuit 113 - Synchronization of the elements of the transmitted signal. (Source: terminal data equipment).

Direction: to the data transmission equipment.

The signals sent by way of this circuit ensure in the data transmission equipment the synchronization of the signal elements.

The conditions "On" and "Off" should be maintained for periods of equal duration. Transition from the condition "On" to the condition "Off" should correspond to the middle of each element of the signal in circuit 103 (Transmitted data).

1.1.15. Circuit 114 - Synchronization of the elements of the transmitted signal. (Source: data transmission equipment).

Direction: from the data transmission equipment.

The signals sent by way of this circuit ensure in the terminal data equipment the synchronization of the signal elements..

The conditions "On" and "Off" should be maintained for periods of equal duration. The terminal data equipment should ensure by way of circuit 103 (Transmitted data) a data signal, in which the transfers between the elements take place at the same time as the transfers from the condition "Off" to the condition "On" in circuit 114.

1.1.16. Circuit 115 - Synchronization of the elements of the received signal. (Source: data transmission equipment).

Direction: from the data transmission equipment.

The signals sent by way of this circuit ensure in the terminal data equipment the synchronization of the signal elements.

The conditions "On" and "Off" should be maintained for periods of equal duration. The transfer from the condition "On" to the condition "Off" should correspond to the middle of each element of the signal in circuit 104 (Received data).

1.1.17. Circuit 116 - Switch to the reserve.

Direction: to the data transmission equipment.

The signals sent by way of this circuit serve for selection between the main and reserve devices, for example, the devices for conversion of signals or communication channels, provided in the data transmission system.

In the condition "On" the data transmission equipment should replace the main devices by their corresponding reserves.

In the condition "Off" the data transmission equipment should replace the reserve devices with the main.

1.1.18. Circuit 117 - Reserve indicator.

Direction: from the data transmission equipment.

The signals sent by way of this circuit indicate if the data transmission equipment is found in the reserve mode, in which the main devices provided earlier are replaced by their corresponding reserve devices.

The condition "On" indicates that the data transmission equipment is found in the reserve mode of operation.

The condition "Off" indicates that the data transmission equipment is found in the main mode of operation.

1.1.19. Circuit 118 - Transmitted data of the return channel.

Direction: to the data transmission equipment.

This circuit is equivalent to circuit 103 (Transmitted data) with the only difference that it serves for the transmission of data on the return channel.

1.1.20. Circuit 119 - Received data of the return channel.

Direction: from the data transmission equipment.

This circuit is equivalent to circuit 104 (Received data) with the only difference that it serves for the reception of data on the return channel.

1.1.21. Circuit 120 - Turn on the line signal of the return channel.

Direction: to the data transmission equipment.

This circuit is equivalent to circuit 105 (Transmission request) with the only difference that it serves in the data transmission equipment for control of the function of transmission on the return channel.

In the condition "On" the data transmission equipment should switch to the mode of transmission on the return channel.

In the condition "Off" the data transmission equipment should switch to the mode of absence of transmission on the return channel, when the transmission of all data which was sent earlier by way of circuit 118 (Transmitted data of return channel) is terminated.

1.1.22. Circuit 121 - Return channel ready.

Direction: from the data transmission equipment.

This circuit is equivalent to circuit 106 (Ready for transmission) with the only difference that it indicates the readiness of the data transmission equipment to transmit data on the return channel.

The condition "On" indicates the readiness of the data transmission equipment to transmit data on the return channel.

The condition "Off" indicates that the data transmission equipment is not ready to transmit data on the return channel.

1.1.23. Circuit 122 - Detector of the received line signal of the return channel.

Direction: from the data transmission equipment.

This circuit is equivalent to circuit 109 (Detector of the received signal of the data channel) with the only difference that it indicates if the line signal received on the return channel is found within the limits established by the corresponding recommendations for data transmission equipment.

1.1.24. Circuit 123 - Detector of signal quality of the return channel.

Direction: from the data transmission equipment.

This circuit is equivalent to circuit 110 (Detector of quality of data signal) with the only difference that it indicates whether or not there is an error in the data signal received on the return channel.

1.1.25. Circuit 124 - Selection of frequency group.

Direction: to the data transmission equipment.

The signals received on this circuit serve for selection of the group of frequencies which are preferable for use in the data transmission equipment.

In the condition "On" the data transmission equipment should use all the groups of frequencies for presentation of data signals.

In the condition "Off" the data transmission equipment should use a limited number of groups of frequencies for presentation of data signals.

1.1.26. Circuit 125 - Call indicator.

Direction: from the data transmission equipment.

The signals sent by way of this circuit indicate whether or not the call signal has been received by the data transmission equipment.

The condition "On" indicates that the call signal is being received.

The condition "Off" indicates that the call signal is not being received.

1.1.27. Circuit 126 - Selection of transmission frequency.

Direction: to the data transmission equipment.

The signals sent by way of this circuit serve for the selection of the required transmission frequency in the data transmission equipment.

In the condition "On" the data transmission equipment should select the upper frequency of data transmission.

In the condition "Off" the data transmission equipment should select the lower frequency of data transmission.

1.1.28. Circuit 127 - Selection of receiving frequency.

Direction: to the data transmission equipment.

The signals sent by way of this circuit serve for the selection of the required receiving frequency in the data transmission equipment.

In the condition "On" the data transmission equipment should select the lower frequency of reception.

In the condition "Off" the data transmission equipment should select the upper frequency of reception.

1.1.29. Circuit 128 - Synchronization of the elements of the received signal. (Source: terminal data equipment).

Direction: to the data transmission equipment.

The signals sent by way of this circuit ensure the synchronization of signal elements in the data transmission equipment.

The conditions "On" and "Off" should be maintained for periods of equal duration. The data transmission equipment should provide on circuit 104 (Received data) a data signal, in which the transfers between elements take place in the same amount of time as the transfers from the condition "Off" to the condition "On" in circuit 128.

1.1.30. Circuit 129. Request for reception.

Direction: to the data transmission equipment.

The signals sent by way of this circuit control the data transmission equipment and establish it in the mode of reception on the output of the data channel.

In the condition "On" the data transmission equipment should set the mode of reception of data.

In the condition "Off" the data transmission equipment should set the mode of absence of reception of data.

1.1.31. Circuit 130 - Turn on the tone of the return channel.

Direction: to the data transmission equipment.

The signals sent by way of this circuit control the transmission of tone over the return channel.

In the condition "On" the data transmission equipment should transmit the tone by way of the return channel.

In the condition "Off" the data transmission equipment should cease the transmission of tone on the return channel.

1.1.32. Circuit 131 - Synchronization of received signs.

Direction: from the data transmission equipment.

The signals sent by way of this circuit ensure in the terminal data equipment the synchronization in respect to signs according to the requirements for specific data transmission equipment.

1.1.33. Circuit 132 - Return to mode "no data."

Direction: to the data transmission equipment.

The signals sent by way of this circuit serve for restoring the mode "no data," provided in the data transmission equipment, without disruption of the connection with a remote subscriber.

In the condition "On" the data transmission equipment should restore the "no data" mode.

After establishing of the "no data" mode this circuit should be switched over to the condition "Off."

1.1.34. Circuit 133 - Ready for reception.

Direction: to the data transmission equipment.

The signals sent by way of this circuit control the sending of data by way of circuit 104 (Received data), indicating the capacity of the terminal data equipment to receive a specific amount of data (for example, one block).

The condition "On" should be maintained when the terminal data equipment can accept one block of data, and it compels the intermediate equipment to send the data received to the terminal data equipment. The condition "Off" indicates that the terminal data equipment is not capable of accepting a block of data, and it compels the intermediate equipment to retain this block.

1.1.35. Circuit 134 - Received data issued.

Direction: from the data transmission equipment.

The signals sent by way of this circuit serve for separation of the information message from the control message, sent by way of circuit 104 (Received data).

In the condition "On" the data which present the information message are noted.

The condition "Off" should be maintained in all the remaining cases.

1.1.36. The interface circuits of series 100 can be broken down into four categories: grounding, data, control and synchronization, indicated in Table 1.

Table 1

Column headings: (1) Number of circuit; (2) Purpose of circuit; (3) Grounding; (4, 5) Data; (6, 7) Control; (8, 9) Synchronization; (4, 6, 8) From data transmission equipment; (5, 7, 9) To data transmission equipment.

1	2	3	4	5	6	7	8	9
101	Protection grounding	x						
102	Signal grounding or common return conductor	x						
103	Transmitted data			x				
104	Received data		x					
105	Transmission request					x		
106	Ready for transmission				x			
107	Data transmission equipment ready				x			
108.1	Connect data transmission equipment to line					x		
108.2	Terminal data equipment ready					x		

Table 1 (continued)

Column headings: (1) Number of circuit; (2) Purpose of circuit; (3) Grounding; (4, 5) Data; (6, 7) Control; (8, 9) Synchronization; (4, 6, 8) From data transmission equipment; (5, 7, 9) To data transmission equipment.

1	2	3	4	5	6	7	8	9
109	Detector of received line signal of data channel				x			
110	Detector of quality of data signal				x			
111	Data transmission rate switch					x		
112	Data transmission rate switch				x			
113	Synchronization of elements of transmitted signal (Source: terminal data equipment)							x
114	Synchronization of elements of transmitted signal (Source: data transmission equipment)						x	
115	Synchronization of elements of received signal (Source: data transmission equipment)						x	
116	Switch to reserve					x		
117	Reserve indicator				x			
118	Transmitted data of return channel			x				
119	Received data of return channel		x					

Table 1 (continued)

Column headings: (1) Number of circuit; (2) Purpose of circuit; (3) Grounding; (4, 5) Data; (6, 7) Control; (8, 9) Synchronization; (4, 6, 8) From data transmission equipment; (5, 7, 9) To data transmission equipment.

1	2	3	4	5	6	7	8	9
120	Turn on line signal of return channel					x		
121	Return channel ready				x			
122	Detector of received line signal of return channel				x			
123	Detector of quality of signal of return channel				x			
124	Selection of frequency group					x		
125	Call indicator				x			
126	Selection of transmission frequency					x		
127	Selection of reception frequency					x		
128	Synchronization of elements of received signal (Source: terminal data equipment)							x
129	Request for reception					x		
130	Turn on tone of return channel					x		
131	Synchronization of received signs						x	
132	Return to "no data" mode					x		

Table 1 (continued)

Column headings: (1) Number of circuit; (2) Purpose of circuit; (3) Grounding; (4, 5) Data; (6, 7) Control; (8, 9) Synchronization; (4, 6, 8) From data transmission equipment; (5, 7, 9) To data transmission equipment.

1	2	3	4	5	6	7	8	9
133	Ready for reception					x		
134	Received data issued				x			

1.2. Series 200. Circuits for automatic establishment of connection.

1.2.1. Circuit 201 - Signal grounding or common return conductor.

This conductor establishes the overall potential for all the exchange circuits of series 200, except circuit 212 (Protective grounding). Inside the device for automatic calling this circuit should terminate in one point, and the possibility should be provided for its connection with circuit 212 with the help of a jumper inside the equipment. This jumper should be installed or removed in accordance with the requirements of the existing rules or for reducing the interferences induced in the electronic circuits.

1.2.2. Circuit 202 - Request for call.

Direction: to the data transmission equipment.

The signals sent by way of this circuit are intended for preparing the device for automatic calling for sending a call and for connection of the automatic calling device to the line or its disconnection from the line.

In the condition "On" the data transmission equipment should prepare the automatic calling device for sending a call and connect this device to the line.

In the condition "Off" the automatic calling device should free the line and show that the terminal data equipment has finished using the automatic calling device.

1.2.3. Circuit 203 - Data line busy.

Direction: from the data transmission equipment.

Signals sent by way of this circuit show whether or not the communication channel is being used (for example, for automatic calling, data transmission, telephone call or testing).

The condition "On" indicates that the communication channel is being used.

The condition "Off" indicates that the communication channel is not being used and the terminal data equipment can make a call under the condition that circuit 213 (Indicator of electric power) is found in the condition "On."

1.2.4. Circuit 204 - Remote installation connected.

Direction: from the data transmission equipment.

Signals sent over this circuit indicate whether or not connection with the remote data installation has been established.

The condition "On" indicates the reception of a signal of a remote data installation, testifying to the establishment of a connection.

The condition "Off" should be maintained in all the remaining cases.

1.2.5. Circuit 205 - Uncompleted call.

Direction: from the data transmission equipment.

Signals sent by way of this circuit indicate that the assigned interval of time between successive operations in the calling procedure has expired.

The condition "On" indicates that the assigned interval of time has expired.

The condition "Off" indicates that the calling procedure can be continued.

The initial counting of time begins from the moment when circuit 202 is switched to the condition "On."

Subsequent intervals of time are counted off each time when circuit 210 is switched to the condition "Off."

1.2.6. Circuits of digital signals:

Circuit 206 - Digital signal (2^0).

Circuit 207 - Digital signal (2^1).

Circuit 208 - Digital signal (2^2).

Circuit 209 - Digital signal (2^3).

Direction: to the data transmission equipment.

These circuits of the terminal data equipment assume binary conditions in accordance with Table 2. The totality of binary states of circuits 206-209 represents the code combination of the number or sign of control.

Table 2

Information	Binary conditions			
	209	208	207	206
Digit 1	0	0	0	1
Digit 2	0	0	1	0
Digit 3	0	0	1	1
Digit 4	0	1	0	0
Digit 5	0	1	0	1
Digit 6	0	1	1	0
Digit 7	0	1	1	1
Digit 8	1	0	0	0
Digit 9	1	0	0	1
Digit 0	0	0	0	0
Sign of control EON	1	1	0	0
Sign of control SEP	1	1	0	1

The sign of control EON (End of number) obliges the data transmission equipment to take the necessary measures for expectation of a response from the called data installation.

The sign of control SEP (Separator) indicates the necessity for a break between successive digits and obliges the automatic calling device to introduce the established time intervals.

1.2.7. Circuit 210 - Request for following digit.

Direction: from the data transmission equipment.

The signals sent by way of this circuit indicate whether or not the automatic calling device is ready to accept the following code combination over the circuits of digital signals 206, 207, 208 and 209..

The condition "On" indicates the the automatic calling device is ready to accept the following code combination.

The condition "Off" indicates that the automatic calling device is not ready to accept the following code combination over the circuits of digital signals.

1.2.8. Circuit 211 - Digit issued.

Direction: to the data transmission equipment.

The signals sent by way of this circuit control the read-out of the code combination which was arriving over the circuits of digital signals 206, 207, 208 and 209.

In the condition "On" the automatic calling device should read out the code combination which was arriving over the circuits of digital signals.

In the condition "Off" of circuit 211 the automatic calling device should not read out the code combination which was arriving over the circuits of digital signals.

1.2.9. Circuit 212 - Protective grounding.

This conductor should be connected electrically with the housing of the device or equipment. Also it may be connected with the external ground, if this is required by the existing safety rules.

1.2.10. Circuit 213 - Indicator of power supply.

Direction: from the data transmission equipment.

The signals sent by way of this circuit indicate whether or not electric power is supplied to the automatic calling device.

The condition "On" indicates that the automatic calling device is receiving electric power and is ready for operation.

The condition "Off" indicates that the automatic calling device is not receiving electric power.

1.2.11. The interface circuits of series 200 can be divided into three categories: grounding, data and control (Table 3).

Table 3

Column headings: (1) Number of circuit; (2) Purpose of circuit; (3) Grounding; (4, 5) Data; (6, 7) Control; (4, 6) From data transmission equipment: (5, 7) To data transmission equipment.

1	2	3	4	5	6	7
201	Signal grounding or common return conductor	x				
202	Request for call					x
203	Data line busy				x	
204	Remote installation connected				x	
205	Uncompleted call				x	
206	Digital signal (2^0)			x		
207	Digital signal (2^1)			x		
208	Digital signal (2^2)			x		
209	Digital signal (2^3)			x		
210	Request for following number				x	
211	Digit issued					x
212	Protective grounding	x				
213	Indicator of power supply				x	

2. Electrical parameters of interface circuits

The electrical parameters given in this section relate to all interface circuits, the rate of data transmission of which does not exceed 20,000 bit/s.

Note. In special cases circuits 103 and 104 can be made two-conductor (symmetric).

2.1. Equivalent layout.

2.1.1. The equivalent layout of the interface circuit does not depend on the mutual position of the generator and the load: the generator can be placed in the terminal data equipment, the load in in the data transmission equipment, and vice versa.

The direction of transmission of the signal, indicated in the definition of each circuit (section 1), is taken from the generator to the load.

2.1.2. The overall resistance of the generator (load) includes the resistance of the cable from the side of the generator (load) to the point of the interface.

2.1.3. The equivalent layout of the exchange circuit, given in Figure 1, extends to the interface circuits of the categories: data, control and synchronization.

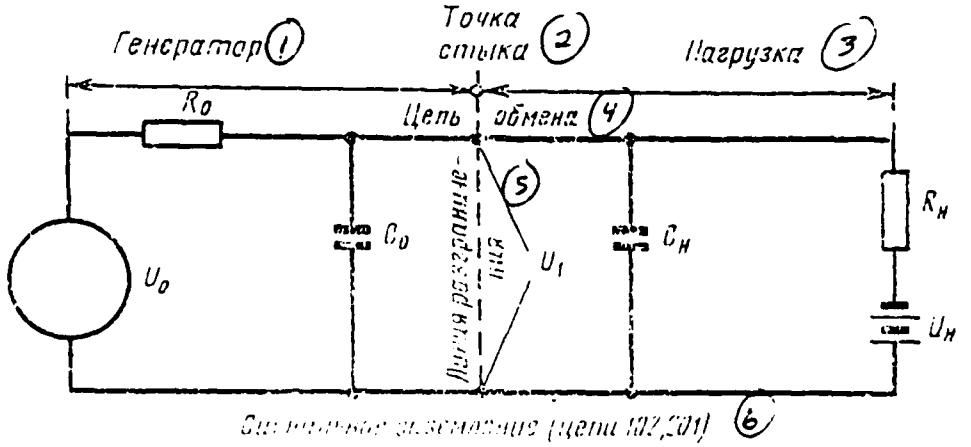


Figure 1.

R_0 - internal resistance of generator on direct current, measured in the point of interface; C_0 - overall shunting capacitance on the side of the generator; U_1 -voltage in the interface point relative to circuit 102 (signal grounding); C_H - overall shunting capacitance from the side of the load, measured at the interface point; R_H - resistance of load on direct current, measured at the interface point; U_H - voltage on the load with an opened circuit; U_0 - voltage of the generator in the idling mode.

Key: (1) Generator; (2) Interface point; (3) Load; (4) Exchange circuit; (5) Line of demarcation; (6) Signal grounding (circuits 102, 201).

2.2. Load.

2.2.1. The equivalent layout for measuring the overall resistance of the load is given in Figure 2.

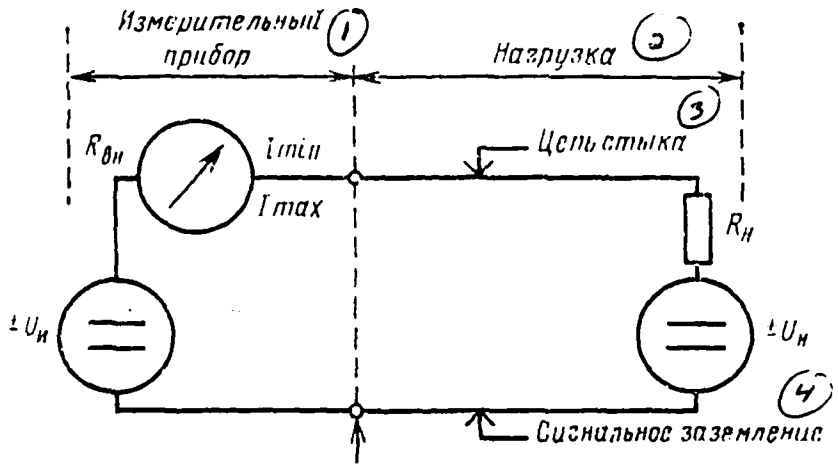


Figure 2.

$U_и$ - voltage, used for measurement of load resistance; I_{min} - minimal value of measured current; I_{max} - maximal value of measured current; $R_{вн}$ - internal resistance of measuring device.

Key: (1) Measuring device; (2) Load; (3) Interface circuit; (4) Signal grounding.

Note. The internal resistance of the measuring device $R_{вн}$ should not be more than 100 ohms.

2.2.2. The overall resistance of the load on direct current should be within the limits from 3000 to 7000 ohms.

2.2.3. In the case of a measuring voltage $U_и$ from 3 to 15 V the current, measured in the layout in (Figure 2), should within the limits:

$$|I_{min}| = \left|\frac{U_и - U_н}{R_{max}}\right| \text{min};$$

$$|I_{max}| = \left|\frac{U_и + U_н}{R_{min}}\right| \text{max}.$$

The graphs of the dependence of current on the measuring voltage $U_и$ are given in Figure 3. If the measured current is found within the limits, stipulated for the given value of $U_и$ (Figure 3), then it is possible to draw a conclusion concerning the conformity of the load in the interface circuit to the requirements of this standard.

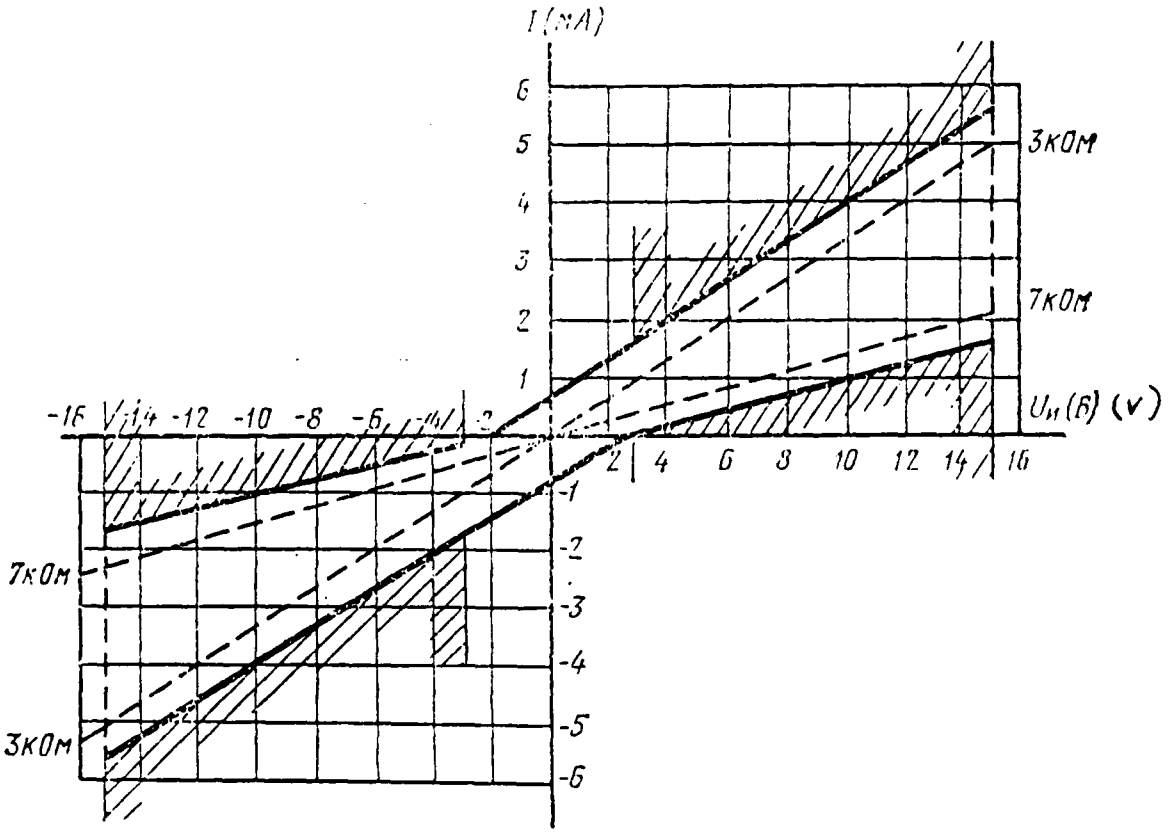


Figure 3. Graph of the dependence of current I min, max on the measuring voltage $U_н$.

For example, when $U_н$ is equal to 10 V the value of the measured current is found within the limits from 1.1 to 4 mA.

Consequently it is possible to draw the conclusion of the conformity of the value of load resistance to the norm.

2.2.4. The voltage on the load with an opened circuit $U_н$ should not exceed 2 V in absolute magnitude.

2.2.5. The value of capacitance, shunting the load resistance and measured in the interface point, should not exceed 2500 pF.

Note. It is permitted to increase the value of capacitance, shunting the load, in the case of a rate of data transmission less than 20,000 bit/s and under conditions of fulfillment of the remaining requirements of section 2 of this standard.

2.2.6. To avoid the appearance of peaks of voltage in the exchange circuits the reactive component of load resistance should not be inductive. The load in the circuit should be calculated for operation with an input signal in the range of values of voltages as determined in p. 2.3.

2.3. Generator.

2.3.1. The gnerator in any interface circuit should be calculated for the condition of no load and short circuiting between it and the other circuits, including the generator and the load; in this case there should be no defects in it itself or in the device which is connected with it.

2.3.2. The voltage of the generator on no load U_0 in any interface circuit should not exceed 15 V in absolute magnitude.

2.3.3. The values of resistance R_0 and capacitance C_0 of the interface circuits from the side of the generator are not standardized, however, the values of R_0 and C_0 should be selected with a calculation that short circuiting between any two interface circuits would not cause the appearance of a current greater than 0.5 A.

2.3.4. If the voltage on the load in the case of an opened circuit U_H is equal to zero, then the voltage U_1 in the interface point should be within the limits of from 5 to 15 V in absolute magnitude (of positive or negative polarity) with any value of load resistance R_H within the limits from 3000 to 7000 ohms.

2.3.5. The value of the shunting capacitance from the side of the generator C_0 of the interface circuit is not standardized. However, the generator should operate with a total capacitance from the side of the generator C_0 and a load capacitance C_H no higher than 2500 pF.

2.4. Signal levels.

2.4.1. For all the interface circuits of the "data" category it is established that the signal is found in the condition of binary "1" when the voltage U_1 in the interface circuit, measured in the interface point, is more negative than minus 3V, and in the condition of binary "0" when the voltage U_1 is more positive than plus 3V.

2.4.2. The circuits of control and synchronization are considered set in the condition "On" when the voltage U_1 is more positive than plus 3V, and set in the condition "Off" when the voltage U_1 is more negative than minus 3V.

2.4.3. The range of voltages between the values plus 3V and minus 3V is defined as the transition zone. The condition of the signal in the circuit is not determined unambiguously when the voltage U_1 is found in this zone. An exception from this definition is described in p. 2.6.

2.5. Transition zone.

2.5.1. The parameters given below for signals, transmitted through the interface point (with a calculation of external inductions), should be ensured by a load, answering to the requirements indicated in p. 2.2.

2.5.2. The signals, formed by the generator on the interface and falling into the transition zone, should cross this zone and reach the opposite condition of the signal. They should not return to the transition zone prior to the appearance of a significant change of the signal.

2.5.3. The load of the interface circuits should not perceive changes of signal polarity as long as the signal is found in the transition zone.

2.5.4. For circuits of control the necessary time of passage of the transition zone by the signal in the course of a change of condition should not be more than 1 ms.

2.5.5. For data and synchronization circuits the necessary time of passage of the signal through the transition zone in the course of a change of condition should not be more than 1 ms or 3% of the nominal duration of one signal element in the corresponding circuit (the minimal value should be taken).

2.5.6. The maximum value of instantaneous rate of change of voltage should not be more than 30 V in 1 μs.

2.6. Detection of malfunctions.

2.6.1. The interface circuits listed below (if they are used) can serve for detection of conditions of an interruption in power supply in the devices connected through the interface, or a break in the

connecting cable:

circuit 105 - Transmission request;

circuit 107 - Data transmission equipment ready;

circuit 108.1/108.2 - To connect the data transmission equipment to the line/Terminal data equipment ready;

circuit 120 - Turn on the line signal of the return channel;

circuit 202 - Request for call;

circuit 213 - Indicator of power supply.

2.6.2. In the case of interruptions in power supply the overall resistance in each of the circuits on the side of the generator should be more than 300 ohms, when the measuring voltage (of positive or negative polarity) in absolute magnitude is no more than 2 V in respect to circuit 102 (Signal grounding).

The load of these circuits should perceive the condition of an interruption in power or a break of the connecting cable of the interface as the condition "Off."

3. Technical requirements.

3.1. Interaction of circuits 103, 105, 106, 107 and 108.1/108.2.

3.1.1. The terminal data equipment should not send data to circuit 103 (Transmitted data), if all the following four circuits are not found in the condition "On" (when these circuits are used):

circuit 105 - Transmission request;

circuit 106 - Ready for transmission;

circuit 107 - Data transmission equipment ready;

circuits 108.1/108.2 - To connect the data transmission equipment to the line/Terminal data equipment ready.

All the data sent by way of circuit 103 in the period of time, when all four circuits (if they are used) are found in the condition "On," are transmitted by the data transmission equipment to the communication channel.

3.1.2. The signals in circuit 107 (Data transmission equipment ready) should be the responses to the signals in circuit 108.1. In this case the adjustment of the data transmission channel (elimination of blocking, for example) will not take place until circuit 107 is switched to the condition "On."

3.1.3. Circuits 108.1 and 108.2 after transition to the condition "Off" cannot be switched again to the condition "On" until the data transmission equipment switches circuit 107 to the condition "Off."
3.1.4. In the data transmission equipment jumpers should be provided for selection of operation with circuit 108.1 or with circuit 108.2.
3.1.5. If the data transmission equipment contains equipment for automatic response to a call, the connection to the line takes place only in response to a combination of the call signal and the condition "On" in circuit 108.2 or 108.1.
3.1.6. In certain special cases (leased lines) circuit 108.1 may be absent - this means that the circuit is constantly found in the condition "On."
3.1.7. In the case of the joint operation of the terminal data equipment and the data transmission equipment the following conditions should be fulfilled:

a) if circuit 107 is found in the condition "Off," the terminal data equipment cannot be considered with the condition of the remaining circuits, coming from the data transmission equipment (an exception is circuit 125 - Call indicator);

b) if circuit 108.1 or 108.2 is found in the condition "Off," the data transmission equipment should not be considered with the condition of the remaining circuits, coming from the terminal data equipment (with the exception of circuits of series 200).

3.1.8. The condition "On" in circuits 107, 108.1 (or 108.2) testify that the signals in the remaining interface circuits, coming from the terminal data equipment or the data transmission equipment, are reliable.

The condition "Off" in circuits 108.1 or 108.2 should not block the action of circuit 125.

3.1.9. The terminal data equipment reports about its intention to transmit data by switching circuit 105 (Transmission request) to the condition "On." In this case the data transmission equipment should switch to the mode of transmission, i.e., should be ready to transmit data, to inform the remote data transmission equipment of this situation, and switch it to the condition of data reception.

3.1.10. If the data transmission equipment switched circuit 106 to the condition "On," then the terminal data equipment can send data to circuit 103 (Transmitted data) through the interface. Switching circuit 106 (Ready for transmission) to the condition "On," the data transmission equipment guarantees that all the data, sent through the interface up until one of the four circuits 105, 106, 107, 108.1 (or 108.2) again switches to the condition "Off," will actually be transmitted to the communication channel. However, the condition "On" in circuit 106 does not guarantee that the remote data transmission equipment is necessarily found in the receiving mode.

3.1.11. The terminal data equipment should not switch the circuit 105 to the condition "Off" until the end of the last element of data (or element of stopping), sent through the interface by way of circuit 103. During operation on a commutated network in the duplex mode, when circuit 105 is not used, the fulfillment of the requirements indicated above is not compulsory, when circuit 108.1 or 108.2 is switched to the condition "Off" for fixing of the moment of termination of communication over the commutated line.

3.1.12. If circuit 105 is used, then the conditions "On" and "Off" in circuit 106 are responses to the conditions "On" and "Off" in circuit 105. A delay of response in circuit 106 to a change of condition in circuit 105 is determined by the type of data transmission equipment used.

3.1.13. Circuit 105 cannot be switched from the condition "Off" to the condition "On" until the data transmission equipment switches the circuit 106 to the condition "Off."

3.1.14. In the intervals of time, during which the circuits 105 (Transmission request) and 106 (Ready for transmission) are found in the condition "On" and from the terminal data equipment data are not arriving, then the terminal data equipment can transmit:

a series of binary "1"s;

a series of binary "1"s and "0"s for maintaining of synchronization by elements;

the signs "SIN";

the signs of rest in accordance with the code used.

3.2. Interaction of circuits 118, 120, 121, 107, 108.1 and 108.2.

3.2.1. The terminal data equipment should not send data by way of circuit 118 (Transmitted data of return channel), unless all the following four circuits are found in condition "On" (when the circuits are used):

circuit 120 - Turn on line signal of return channel;

circuit 121 - Return channel ready;

circuit 107 - Data transmission equipment ready;

circuits 108.1/108.2 - To connect the data transmission equipment to the line/Terminal data equipment ready.

All the data, sent by way of circuit 118 in the course of time, when all four circuits (if they are used) are found in the condition "On," are transmitted by the data transmission equipment to the communication channel.

3.2.2. The interaction of circuits 120, 118 and 121, used for ensuring operation on the return channel, is analogous to that described in points 3.1.9 and 2.1.13.

3.3. Interlocking of circuits 104 and 119.

3.3.1. When interlocking is used the data transmission equipment should maintain the following circuits (if they are used) in a specific condition:

a) circuit 104 (Received data) - in the condition of binary "1", when circuit 109 (Detector of the received line signal of the data channel) is found in condition "Off";

b) circuit 119 (Received data of return channel) - in the condition of binary "1" when circuit 122 (Detector of the received line signal of the return channel) is found in condition "Off."

3.3.2. The data transmission equipment, intended for operation in the half-duplex mode (system with switching of transmission), should maintain the following circuits in a condition, corresponding to the interlocking:

a) circuit 104 - in the condition of binary "1" and circuit 109 - in the condition of "Off," when circuit 105 (Transmission request) is found in the condition "On" and for a short interval of time (which is determined by the data transmission equipment) after transition

of circuit 105 from the condition "On" to the condition "Off";

b) circuit 119 - in the condition of binary "1" and circuit 122 - in the condition "Off," when circuit 120 (Turn on the line signal of the return channel) is found in the condition "On" and for a short interval of time (which is determined by the data transmission equipment) after transition of circuit 120 from the condition "On" into the condition "Off."

3.4. Functioning of circuits 113, 114, 115 and 128.

3.4.1. If circuit 113 (Synchronization of elements of transmitted signal) is used, then the terminal data equipment should send signals of synchronization by elements by way of this circuit in all cases when the source of synchronization of the terminal data equipment is in a condition to form these signals, beginning from the moment when power is supplied to the terminal data equipment.

3.4.2. If circuits 114 and 115 are used, the data transmission equipment should send signals of synchronization by elements by way of these circuits in all cases when the source of synchronization of the data transmission equipment is in a condition to form these signals, beginning from the moment when power is supplied to the data transmission equipment.

The stability and accuracy of the synchronization signals in respect to elements should conform to the requirements posed for the modes, when circuit 109 is found in condition "On." Deviations are permitted during the time when circuit 109 is found in the condition "Off." The stability and accuracy of the synchronization signals in circuit 115 after transition of circuit 109 to the condition "On" should be restored in a minimum of time.

Notes:

1. It is necessary to take into account that data transmission equipment, powered from a central battery by means of a telepone subscriber line, does not receive power when it is found in the mode of a "hung-up telephone receiver."

2. Certain sources of synchronization by elements can operate only when an external signal of excitation arrives on them.

3.4.3. If circuit 128 is used, the terminal data equipment should send signals of synchronization by elements by way of this circuit to the data transmission equipment.

In the intervals of time, during which the signals of synchronization by elements are not sent over circuit 128, the condition "Off" should be maintained in it.

3.5. Special features of operation of circuit 125.

3.5.1. The action of circuit 125 should not be either limited or blocked by the condition of operation of any other interface circuit.

3.6. Interaction of circuits of series 200.

3.6.1. Circuit 202 should be switched to the condition "Off" between calls or attempts at calling and should not be switched to the condition "On" until circuit 203 (Line of data busy) is switched to the condition "Off."

3.6.2. Circuit 204 should be found in the condition "On" until the terminal data equipment finishes using the automatic calling device, i.e., until circuit 202 (Request for call) switches to the condition "Off."

3.6.3. Circuit 205 should be held in the condition "Off" after circuit 204 (Remote installation connected) switches to the condition "On."

3.6.4. The condition of circuits 206, 207, 208, 209 should not be changed until circuit 211 (Digit issued) is found in condition "On."

3.6.5. Circuit 210 cannot switch from the condition "Off" to the condition "On" until circuit 211 (Digit issued) switches to the condition "Off."

3.6.6. Circuit 211 cannot switch to condition "On" until circuit 210 (Request for following digit) is found in condition "Off" and until the terminal data equipment issues the required code combination in respect to the circuits of digital signals.

3.6.7. Circuit 211 should not be switched to the condition "Off" unitl circuit 210 (Request for following digit) is switched to the condition "Off."

APPENDIX

Instructions for selection of interface circuits

1. The interface circuits for any specific joining of terminal data equipment with the data transmission equipment should be selected from the nomenclature of circuits given in this standard.

2. In special cases, between the terminal data equipment and the data transmission equipment it is permitted to introduce additional circuits, the parameters of which conform to the requirements of this standard.

3. The functioning of interface circuits, not stipulated in section 3, and of additional circuits in accordance with p. 2, should be stipulated in the technical assignment for equipment.

4. The minimum nomenclature of circuits for the C2 interface for different nomenclatures of data transmission equipment is given in the table.

Table

Column headings: (1) Name of interface circuits; (2) Number of interface circuits; (3-11) Nomenclature of APD; (3-6) Simplex; (7-8) Half-duplex; (9-10) Duplex; (3) Transmitter; (4) Receiver; (5) Transmitter of forward channel and receiver of return channel; (6) Receiver of forward channel and transmitter of return channel; (7) Receiver-transmitter of forward channel; (8)Receiver-transmitter of forward and return channel; (9) Receiver-transmitter of forward channel; (10) Receiver-transmitter of forward and return channel; (11) Special.

1	2	3	4	5	6	7	8	9	10	11
Protective grounding	101	+	+	+	+	+	+	+	+	+
Signal grounding or common return conductor	102	+	+	+	+	+	+	+	+	+
Transmitted data	103	+	-	+	-	+	+	+	+	+
Received data	104	-	+	-	+	+	+	+	+	+
Transmission request	105	-	-	-	-	+	+	+	+	+
Ready for transmission	106	+	-	+	-	+	+	+	+	+
Data transmission equipment ready	107	+	+	+	+	+	+	+	+	+
Connect APD to line	108.1	+	+	+	+	+	+	+	+	+
Terminal equipment ready	108.2									
Detector of received line signal of data channel	109	-	+	-	+	+	+	+	+	+
Synchronization of elements of transmitted signal (from OOD)	113	+	-	+	-	+	+	+	+	+

Table (continued).

1	2	3	4	5	6	7	8	9	10	11
Synchronization of elements of transmitted signal (from APD)	114	+	-	+	-	+	+	+	+	+
Synchronization of elements of received signal (from APD)	115	-	+	-	+	+	+	+	+	+
Transmitted data of return channel	118	-	-	-	+	-	+	-	+	+
Received data of return channel	119	-	-	+	-	-	+	-	+	+
Turn on line signal of return channel	120	-	-	-	-	-	+	-	+	+
Return channel ready	121	-	-	+	-	-	+	-	+	+
Detector of received line signal of return channel	122	-	-	+	-	-	+	-	+	+
Call indicator	125	-	+	+	+	+	+	+	+	+
Synchronization of elements of received signal (from OOD)	128	-	+	-	+	+	+	+	+	+

Notes:

1. In the case of a special make-up of the APD the nomenclature of circuits on the interface is determined by the developer of the equipment upon agreement with the customer.

2. Circuits 113 and 114, 115 and 128 cannot be used at the same time.

3. Circuits 113, 114, 115 and 128 are not used in the case of an asynchronous APD.

4. Circuit 125 is necessary for operation of the APD on commutated communication channels.

5. Circuits 118-122 are used when a return channel is present.

END

FILMED

3-86

DTIC