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DATA COMMUNICATION OVER THE TELEPHONE NETWORK

GENERAL DATA COMMUNICATIONS INTERFACE LAYER 1 SPECIFICATION

ITU-T Recommendation V.230

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation V.230 was published in Fascicle VIII.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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GENERAL DATA COMMUNICATIONS INTERFACE LAYER 1 SPECIFICATION

(Melbourne, 1988)

1 General

This Recommendation defines the layer 1 characteristics of a General Data Communications Interface (GDCI) between Data Circuit-Terminating Equipment (DCE) and/or Data Terminal Equipment (DTE). Applications include DTE-DCE interfaces, DCE-DCE interfaces, and possible DTE-DTE interfaces (see Figure 1/V.230). The interface specification is based on the ISDN basic user-network interface defined in Recommendation I.430. The differences between the GDCI and the ISDN basic user-network interface provide for the different wiring configurations expected for these interfaces, and they provide a means by which equipment conforming to V.230 can identify whether it has been connected to an interface operating according to V.230 or to an interface operating according to I.430. The characteristics of the GDCI have been chosen so that it is possible to design terminals which are compatible with both I.430 and V.230, and so that inadvertent connection of I.430 equipment to a V.230 passive bus or of GDCI equipment to an I.430 passive bus will not result in passive bus malfunction.

Note - DTE-DTE interfaces are not defined by CCITT.

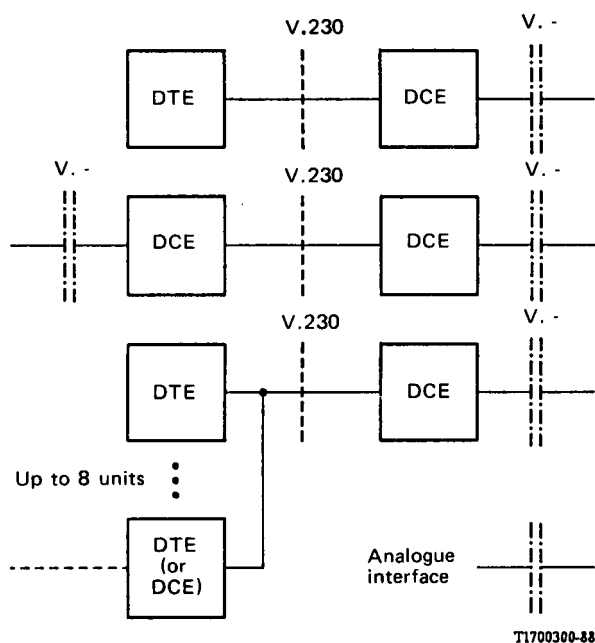


FIGURE 1/V.230

GDCI applications

2 Service characteristics

2.1 Services required from the physical medium

Layer 1 of this interface requires a balanced metallic transmission medium, for each direction of transmission, capable of supporting 192 kbit/s.

2.2 Services provided to layer 2

Layer 1 provides the following services to layer 2 and the management entity.

2.2.1 *Transmission capability*

Layer 1 provides the transmission capability, by means of appropriately encoded bit streams, for the BV and DV channels and the related timing and synchronization functions.

Note - The BV and DV channels correspond to the B and D channels, respectively, as defined in the I-Series Recommendations. Use of the BV and DV channels is defined in Recommendations V.yy and V.zz (V.yy and V.zz: still under study).

2.2.2 *Activation/deactivation*

Layer 1 provides the signalling capability and the necessary procedures to enable equipment to be deactivated when required and reactivated when required. The activation and deactivation procedures are defined in § 6.2.

2.2.3 *D-channel access*

Layer 1 provides the signalling capability and the necessary procedures to enable equipment to gain access to the common resource of the DV channel in an orderly fashion while meeting the performance requirements of the DV-channel signalling system. These DV-channel access control procedures are defined in § 6.1

2.2.4 *Maintenance*

Layer 1 provides the signalling capability, procedures and necessary functions at layer 1 to enable the maintenance functions to be performed.

2.2.5 *Status indication*

Layer 1 provides an indication to the higher layers of the status of layer 1.

2.3 *Primitives between layer 1 and other entities*

Primitives represent, in an abstract way, the logical exchange of information and control between layer 1 and other entities. They neither specify nor constrain the implementation of entities or interfaces.

The primitives to be passed across the layer 1/2 boundary or to the management entity and parameter values associated with these primitives are defined and summarized in Table 1/V.230. For a description of the syntax and use of the primitives, refer to Recommendation X.211 and relevant detailed description in § 6.

TABLE 1/V.230

Primitives associated with layer 1

Generic name	Specific name		Parameter		Message unit contents
	Request	Indication	Priority indicator	Message unit	
L1 < - - > L2					
PH-DATA	X (Note 1)	X	X (Note 2)	X	Layer 2 peer-to-peer message
PH-ACTIVATE	X	X	-	-	
PH-DEACTIVATE	X	X	-	-	
M < - - > L1					
MPH-ERROR	-	X*	-	X	*Type of error or recovery from a previously reported error
MPH-ACTIVATE	X	X	-	-	
MPH-DEACTIVATE	X	X	-	-	
MPH- INFORMATION	-	X	-	X	Connected Attached V-DCE Attached V-DTE Attached NT Attached TE Disconnected

Note 1 - PH-Data Request implies underlying negotiation between layer 1 and layer 2 for the acceptance of the data.

Note 2 - Priority indication applies only to the request type.

3 Modes of operation

Both point-to-point and point-to-multipoint modes of operation, as described below, are intended to be accommodated by the layer 1 characteristics of the GDCL. In this Recommendation, the modes of operation apply only to the layer 1 procedural characteristics of the interface and do not imply any constraints on modes of operation at higher layers.

3.1 Point-to-point operation

Point-to-point operation at layer 1 implies that only one source (transmitter) and one sink (receiver) are active at any one time in each direction of transmission at an S or T reference point. (Such operation is independent of the number of interfaces which may be provided on a particular wiring configuration - see § 4.)

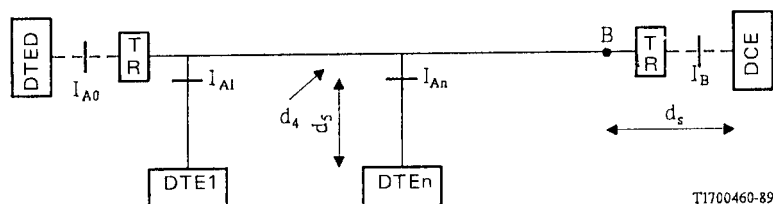
3.2 Point-to-multipoint operation

Point-to-multipoint operation at layer 1 allows more than one equipment (source and sink pair) to be simultaneously active at a GDCL. (The multipoint mode of operation may be accommodated, as discussed in § 4, with point-to-point or point-

to-multipoint wiring configurations.)

4 Types of wiring configuration

The electrical characteristics of the GDCI are determined on the basis of certain assumptions about the various wiring configurations which may exist in the user premises. These assumptions are identified in two major configuration descriptions, §§ 4.1 and 4.2, together with additional material contained in Annex A to this Recommendation. Figure 2/V.230 shows a general reference configuration for wiring in the user premises.



TR	Terminating resistor
I	Electrical interface
B	Location of IB when the terminating resistor (TR) is include in the DCE

FIGURE 2/V.230

Reference configuration for wiring in the user premises location

4.1 Point-to-point configuration

A point-to-point wiring configuration implies that only one source (transmitter) and one sink (receiver) are interconnected on an interchange circuit.

4.2 Point-to-multipoint configuration

A point-to-multipoint wiring configuration allows more than one source to be connected to the same sink or more than one sink to be connected to the same source on an interchange circuit. Such distribution systems are characterized by the fact that they contain no active logic elements performing functions (other than possibly amplification or regeneration of the signal).

The equipment connected to interface point I_B must operate in the "master timing mode" discussed in § 6.6. This equipment is normally a V-DCE. The equipment connected to interface points I_{A0} through I_{An} must operate in the "slave timing mode". These are normally V-DTEs, although a V-DCE may be connected to this point to achieve a DCE-to-DCE connection on the GDCI. Use of a V-DTE as the master timing mode equipment is for further study.

4.3 Wiring polarity integrity

For a point-to-point wiring configuration, the two wires of the interchange circuit pair may be reversed. However, for a point-to-multipoint wiring configuration, the wiring polarity integrity of the interchange circuit (slave-to-master direction) must be maintained between slave mode equipment.

In addition, the wires of the optional pairs, which may be provided for powering, may not be reversed in either configuration.

4.4 Location of the interfaces

The wiring in the user premises is considered to be one continuous cable run with jacks for the equipment attached directly to the cable or using stubs less than 1 meter in length. The jacks are located at interface points I_A and I_B (see Figure 2/V.230). One interface point, I_A , is adjacent to the master mode equipment. The other interface point, I_B , is adjacent to the master mode equipment. However, in some applications, the equipment may be connected to the wiring without the use of a jack or with a jack which accommodates multiple interfaces. The required electrical characteristics (described in § 8) for I_A and I_B are different in some aspects.

4.5 *Wiring associated with the equipment*

The wiring connecting the V-DCE or V-DTE to associated jacks or to other equipment affects the interface electrical characteristics. Equipment that is not permanently connected to the interface wiring may be equipped with one of the following means of connection to the interface point:

- a hard wired connecting cord (of not more than 10 m in the case of a V-DTE and not more than 3 m in the case of a V-DCE) equipped with a suitable plug, or
- a jack with a connecting cord (of not more than 10 m in the case of a V-DTE and not more than 3 m in the case of a V-DCE) equipped with a suitable plug at each end, or
- two jacks with suitable connecting cords or cables which may be used to form a "daisy-chain" connection from one equipment unit to the next, provided that the connecting cords and cables meet the distance limitations set in Annex A. In this case, the electrical interface exists inside the equipment, where the two jacks are wired together with each pin on one jack connected to the like-numbered pin on the other jack and to the internal circuitry of the equipment.

The requirements of V.230 apply to the interface point (I_A or I_B), and the cord forms part of the associated equipment. Note that the equipment may attach directly to the interface wiring without a detachable cord.

Although an equipment may be provided with a cord of less than 5 m in length, it shall meet the requirements of this Recommendation with a cord having a minimum length of 5 m. As specified above, the equipment cord may be detachable. Such a cord may be provided as part of the equipment, or the equipment may be designed to conform to the electrical characteristics specified in § 8 with a "standard ISDN basic access TE cord" conforming to the requirements specified in § 8.9 of Recommendation I.430, and having the maximum permitted capacitance.

The use of an extension cord, of up to 25 m in length, with an equipment in point-to-point operation, is permitted. (The total attenuation of the wiring and of the cord in this case should not exceed 6 dB.)

5 **Functional characteristics**

The following paragraphs show the functions for the interface.

5.1 *Interface functions*

5.1.1 *BV channel*

This function provides, for each direction of transmission, two independent 64 kbit/s channels for use as BV channels.

5.1.2 *Bit timing*

This function provides bit (signal element) timing at 192 kbit/s to enable the equipment to recover information from the aggregate bit stream.

5.1.3 *Octet timing*

This function provides 8 kHz timing for the equipment.

5.1.4 *Frame alignment*

This function provides information to enable equipment to recover the time division multiplexed channels.

5.1.5 *DV channel*

This function provides, for each direction of transmission, one DV channel at a bit rate of 16 kbit/s.

5.1.6 *DV channel access procedure*

This function is specified to enable slave mode equipment to gain access to the common resource of the DV channel in an orderly controlled fashion. The functions necessary for these procedures include an echoed DV channel at a bit rate of 16 kbit/s in the direction master to slave equipment. For the definition of the procedures relating to DV channel access, see § 6.1.

5.1.7 *Power feeding*

This function provides for the capability to transfer power across the interface. The direction of power transfer depends on the application. In a typical application, it may be desirable to provide for power transfer from the V-DCE towards V-DTEs in order to, for example, power an adaptor for a unit which does not conform to V.230. (In some applications, unidirectional power feeding or no power feeding at all, across the interface, may apply.) Other Recommendations concerning power feeding capability are contained in § 9.

5.1.8 *Activation and deactivation*

Activation is necessary to initialize an equipment when power is applied, or when it is connected to the GDCL. Deactivation and activation may also be used to control entry to and exit from a low power consumption mode. The procedures and precise conditions under which these actions take place are specified in § 6.2. For many applications, it will be appropriate for the equipment to remain in the active state at all times after initial activation.

5.2 *Interchange circuits*

Two interchange circuits, one for each direction of transmission, shall be used to transfer digital signals across the interface. All of the functions described in § 5.1, except for power feeding, shall be carried by means of a digitally multiplexed signal structured as defined in § 5.4.

5.3 *Connected/disconnected indication*

The criterion used by equipment to determine whether it is connected or disconnected at the interface is reception of valid incoming frames.

The layer 1 entity within the equipment shall inform the management entity of the connection status using the MPH-INFORMATION INDICATION primitive. The method for determining the message unit contents is discussed in § 6.2.

5.4 *Frame structure*

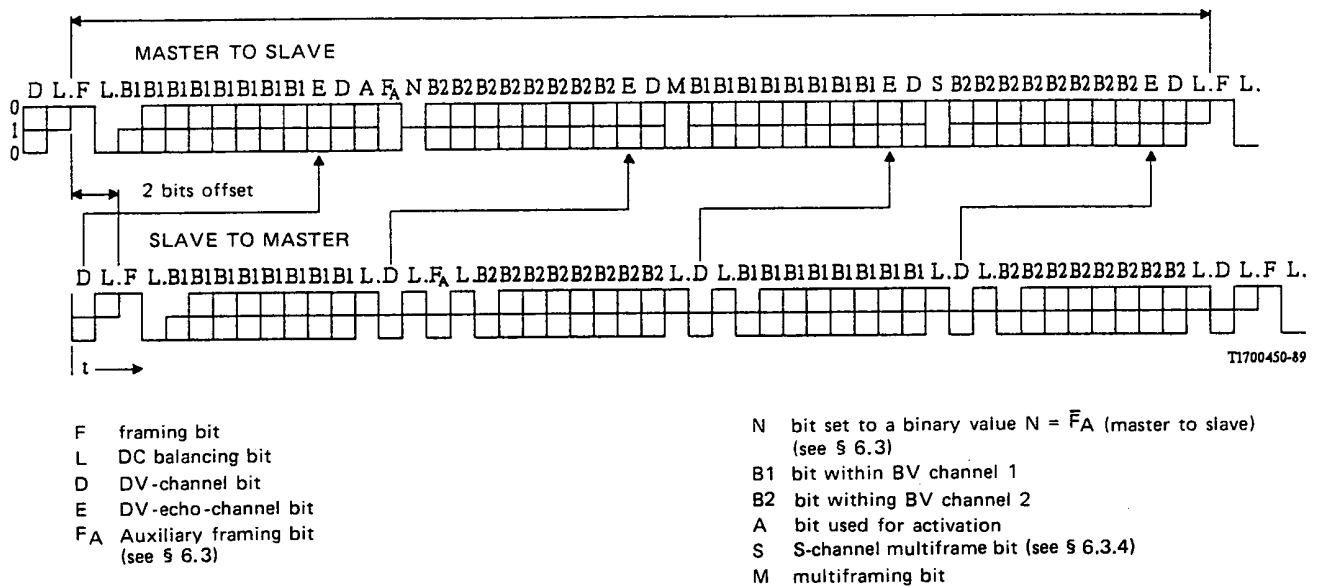
In both directions of transmission, the bits shall be grouped into frames of 48 bits each. The frame structure shall be identical for all configurations (point-to-point and point-to-multipoint).

5.4.1 *Bit rate*

The nominal transmitted bit rate at the interfaces shall be 192 kbit/s in both directions of transmission.

5.4.2 Binary organization of the frame

The frame structures are different for each direction of transmission. Both structures are illustrated diagrammatically in Figure 3/V.230.



Note 1 - Dots demarcate those parts of the frame that are independently DC-balanced.

Note 2 - The FA bit in the direction slave to master is used as a Q bit in every fifth frame if the Q channel capability is applied (see § 6.3.3).

Note 3 - The nominal 2-bit offset is as seen from the slave mode equipment (IA in Figure 1/V.230). The corresponding offset at the master mode equipment may be greater due to delay in the interface cable and varies by configuration.

FIGURE 3/V.230

Frame structure at the GDCI

5.4.2.1 Slave to master

Each frame consists of the following groups of bits; each individual group is DC-balanced by its last bit (L bit):

Bit position	Group
1 and 2	framing signal with balance bit
3-11	BV1 channel (first octet) with balance bit
12 and 13	DV-channel bit with balance bit
14 and 15	FA auxiliary framing bit or Q bit with balance bit
16-24	BV2 channel (first octet) with balance bit
25 and 26	DV-channel bit with balance bit
27-35	BV1 channel (second octet) with balance bit

36 and 37	DV-channel bit with balance bit
38-46	BV2 channel (second octet) with balance bit
47 and 48	DV channel bit with balance bit

5.4.2.2 Master to slave

Frames transmitted by the master contain an echo channel (E bits) used to retransmit the DV bits received from the slaves. The DV-echo channel is used for DV-channel access control. The last bit of the frame (L bit) is used for balancing each complete frame.

The bits are grouped as follows:

<i>Bit position</i>	<i>Group</i>
1 and 2	framing signal with balance bit
3-10	BV1 channel (first octet)
11	E, DV-echo-channel bit
12	DV-channel bit
13	bit A used for activation
14	F _A auxiliary framing bit
15	N bit (coded as defined in § 6.3)
16-23	BV2 channel (first octet)
24	E, DV-echo-channel bit
25	DV-channel bit
26	M, multiframing bit
27-34	BV1 channel (second octet)
35	E, DV-echo-channel bit
36	DV-channel bit
37	S, layer 1 multiframe channel bit
38-45	BV2 channel (second octet)
46	E, DV-echo-channel bit
47	DV-channel bit
48	frame balance bit

5.4.2.3 Relative bit positions

At the slave mode equipment, timing in the direction to the master mode equipment shall be derived from the frames received from the master mode equipment.

The first bit of each frame transmitted from a slave equipment towards the master equipment shall be delayed, nominally, by two bit periods with respect to the first bit of the frame received from the master equipment. Figure 3/V.230 illustrates the relative bit positions for both transmitted and received frames.

5.5 Line code

For both directions of transmission, pseudo-ternary coding is used with 100% pulse width as shown in Figure 4/V.230. Coding is performed in such a way that a binary ONE is represented by no line signal; whereas, a binary ZERO is represented by a positive or negative pulse. The first binary ZERO following the framing balance bit is of the same polarity as the framing balance bit. Subsequent binary ZEROs must alternate in polarity. A balance bit is a binary ZERO if the number of binary ZEROs following the previous balance bit is odd. A balance bit is a binary ONE if the number of binary ZEROs following the previous balance bit is even.

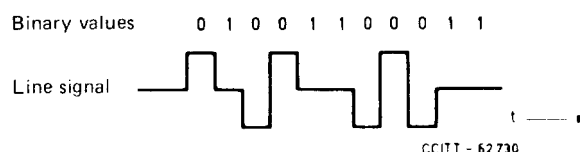


FIGURE 4/V.230

Pseudo-ternary code - example of application

5.6 Timing considerations

Equipment may employ one of two timing sources, if available, for transmission of frames across the interface:

- timing derived from an internal source or from an external source conveyed to the equipment by other means (e.g. timing derived from the receive line timing by a V-DCE). This is referred to as "master timing mode". Exactly one equipment on a GDCI bus must operate in this mode.
- timing derived from the receive side of the interface ("loopback timing"). This is referred to as "slave timing mode".

6 Interface procedures

6.1 DV-channel access procedure

The following procedure allows for a number of slave mode equipments connected in a multipoint configuration to gain access to the DV channel in an orderly fashion. The procedure always ensures that, even in cases where two or more equipments attempt to access the DV channel simultaneously, one, but only one, of the equipments will be successful in completing transmission of its information. This procedure relies upon the use of layer 2 frames delimited by flags consisting of the binary pattern "01111110" and the use of zero bit insertion to prevent flag imitation (see Recommendation I.441).

The procedure also permits equipment to operate in a point-to-point manner.

6.1.1 Interframe (layer 2) time fill

When a slave mode equipment has no layer 2 frames to transmit, it shall send binary ONES on the DV channel, i.e., the interframe time fill in the slave-to-master direction shall be all binary ONES.

When a master timing mode equipment has no layer 2 frames to transmit, it shall send binary ONES or HDLC flags on the DV channel, i.e., the interframe time fill in the master-to-slave direction shall be either all binary ONES or repetitions of the octet "01111110". When the interframe time fill is HDLC flags, the flag which defines the end of a frame may define the start of the next frame.

6.1.2 D-echo channel

The master timing mode equipment, on receipt of a DV-channel bit, shall reflect the binary value, in the next available DV-echo-channel bit position towards the slave mode equipment.

6.1.3 DV-channel monitoring

Slave mode equipment, while in the active condition, shall monitor the DV-echo channel, counting the number of consecutive binary ONES. If a ZERO bit is detected, the equipment shall restart counting the number of consecutive ONE bits. The current value of the count is called C.

Note - C need not be incremented after the value eleven has been reached.

6.1.4 Priority mechanism

Layer 2 frames are transmitted using one of two priority classes. Priority class 1 frames are given priority over priority class 2 frames. Furthermore, to ensure that within each priority class all competing equipments are given a fair access to the DV channel, once an equipment has successfully completed the transmission of a frame, it is given a lower level of priority within that class. The equipment is given back its normal level within a priority class when all equipments have had an opportunity to transmit information at the normal level within that priority class.

The priority class of a particular layer 2 frame may be a characteristic of the equipment which is preset at manufacture or at installation, or it may be passed down from layer 2 as a parameter of the PH-DATA REQUEST primitive. A dual mode (GDCI/ISDN) terminal may thus use the PH-DATA REQUEST primitive to establish the proper priorities for its operation.

The priority mechanism is based on the requirement that slave mode equipment may start layer 2 frame transmission only when C (see § 6.1.3) is equal to, or exceeds, the value X_1 for priority class 1 or is equal to, or exceeds, the value X_2 for priority class 2. The value of X_1 shall be eight for the normal level and nine for the lower level of priority. The value of X_2 shall be ten for the normal level and eleven for the lower level of priority.

In a priority class, the value of the normal level of priority is changed into the value of the lower level of priority (i.e., higher value) when the equipment has successfully transmitted a layer 2 frame of that priority class.

The value of the lower level of priority is changed back to the value of the normal level of priority when C (see § 6.1.3) equals the value of the lower level of priority (i.e., higher value).

6.1.5 Collision detection

While transmitting information in the DV channel, slave mode equipment shall monitor the received DV-echo channel and compare the last transmitted bit with the next available DV-echo bit. If the transmitted bit is the same as the received echo, the equipment shall continue its transmission. If, however, the received echo is different from the transmitted bit, the equipment shall cease transmission immediately and return to the DV-channel monitoring state.

6.1.6 Priority system

Annex B describes an example of how the priority system may be implemented.

6.2 Activation/deactivation

6.2.1 Definitions

6.2.1.1 Slave mode equipment states (normally DTE)

6.2.1.1.1 State F1 (inactive): In this inactive state, the equipment is not transmitting. This state is entered upon loss of power.

6.2.1.1.2 State F2 (sensing): This state is entered after the equipment has been powered on, but has not determined the type of signal (if any) being received.

6.2.1.1.3 State F3 (deactivated): This is the deactivated state of the physical protocol. Neither the master nor the slave equipment is transmitting.

6.2.1.1.4 State F4 (awaiting signal): When the equipment is requested to initiate activation by means of an ACTIVATE REQUEST primitive, it transmits a signal (INFO 1) and waits for a response.

6.2.1.1.5 State F5 (identifying input): At the first receipt of any signal from the master mode equipment, the slave mode equipment ceases to transmit INFO 1 and awaits identification of signal INFO 2 or INFO 4.

6.2.1.1.6 State F6 (synchronized): When the equipment receives an activation signal (INFO 2) from the master, it responds with a signal (INFO 3) and waits for normal frames (INFO 4).

6.2.1.1.7 State F7 (identifying interface): This is a transition state during entry to normal activation. When this state is entered, a timer (T4) is started, and the appropriate (DTE or DCE) identification character is transmitted on the multiframe Q channel. This state continues until either a V-series identification character is received on the multiframe S channel or T4 times out.

6.2.1.1.8 State F8 (lost framing): This is the condition where the equipment has lost frame synchronization and is awaiting re-synchronization by receipt of INFO 2 or INFO 4 or deactivation by receipt of INFO 0.

6.2.1.1.9 State F9 (activated): This is the normal active state with the protocol activated in both directions. Both the master and slave mode equipments are transmitting normal frames.

6.2.1.2 Master mode equipment states (normally DCE)

6.2.1.2.1 State G1 (deactive): In this deactivated state, the equipment is not transmitting.

6.2.1.2.2 State G2 (pending activation): In this partially active state, the master mode equipment sends INFO 2 while waiting for INFO 3. This state will be entered after receiving an ACTIVATE REQUEST primitive, or on the receipt of INFO 0 or lost framing while in state G3 or G5. Then the choice to eventually deactivate is up to higher layers within the equipment.

6.2.1.2.3 State G3 (identifying interface): This is a transition state during entry to normal activation. When this state is entered, a timer (T4) is started, and the appropriate (DTE or DCE) identification character is transmitted on the multiframe S channel. This state continues until either a V-series identification (DTE or DCE) is received on the multiframe Q channel or T4 times out.

6.2.1.2.4 State G4 (pending deactivation): When the equipment wishes to deactivate, it may wait for a timer to expire before returning to the deactivated state.

6.2.1.2.5 State G5 (active): This is the normal active state where the master and slave mode equipment are transmitting INFO 4 and INFO 3 respectively. A deactivation may be initiated by a DEACTIVATE REQUEST primitive, or the equipment may remain in the active state all the time, under non-fault conditions.

6.2.1.3 Activate primitives

The following primitives should be used between layers 1 and 2 and between layer 1 and the management entity in the activation procedures. For use in state diagrams, etc., abbreviations of the primitive names are also given.

PH-ACTIVATE REQUEST (PH-AR)

PH-ACTIVATE INDICATION (PH-AI)

MPH-ACTIVATE REQUEST (MPH-AR)

MPH-ACTIVATE INDICATION (MPH-AI)

6.2.1.4 Deactivate primitives

The following primitives should be used between layers 1 and 2 and between layer 1 and the management entity in the deactivation procedures. For use in state diagrams, etc., abbreviations of the primitive names are also given.

MPH-DEACTIVATE REQUEST (MPH-DR)

MPH-DEACTIVATE INDICATION (MPH-DI)

PH-DEACTIVATE REQUEST (PH-DR)

PH-DEACTIVATE INDICATION (PH-DI)

6.2.1.5 Management primitives

The following primitives should be used between layer 1 and the management entity. For use in state diagrams, etc., abbreviations of the primitive names are also given.

MPH-ERROR INDICATION (MPH-EI)

Message unit contains type of error or recovery from a previously reported error.

MPH-INFORMATION INDICATION (MPH-II)

Message unit contains information regarding the physical layer conditions. The provisionally defined parameters are: connected, disconnected, attached DTE, attached DCE, attached TE, and attached NT.

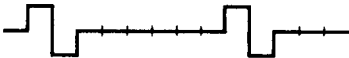
Note - Implementation of primitives in equipment is not for recommendation.

6.2.2 Signals

The identifications of specific signals across the GDCl are given in Table 2/V.230. Also included is the coding for these signals.

TABLE 2/V.230

Definition of INFO signals (Note 1)

Signals from MASTER TO SLAVE		Signals from SLAVE TO MASTER	
INFO 0	No signal	INFO 0	No signal
INFO 2 (Note 3)	Frame with all bits of BV, DV and DV-echo channels set to binary ZERO. Bit A set to binary ZERO. N and L bits set according to the normal coding rules.	INFO 1 (Note 2)	A continuous signal with the following pattern: Positive ZERO, negative ZERO, six ONEs  CCITT-62731 Nominal bit rate = 192 kbit/s
INFO 4	Frames with operational data on BV, DV and DV-echo channels. Bit A set to binary ONE.	INFO 3	Synchronized frames with operational data on BV and DV channels.

Note 1 - For configurations where the wiring polarity may be reversed (see § 4.3) signals may be received with the polarity of the binary ZEROs inverted. All receivers should be designed to tolerate wiring polarity reversals.

Note 2 - Slave mode equipment which does not need the capability to initiate activation of a deactivated V.230 interface need not have the capability to send INFO 1. In all other respects, this equipment shall be in accordance with § 6.2. It should be noted that in the point-to-multipoint configuration more than one slave mode equipment transmitting simultaneously will produce a bit pattern, as received by the master mode equipment, different from that described above, e.g., two or more overlapping (asynchronous) instances of INFO 1.

Note 3 - During the transmission of INFO 2 or INFO 4, the F bits and the M/bits from the master mode equipment provide the Q-bit pattern designation as described in § 6.3.3.