All drawings appearing in this Recommendation have been done in Autocad.

Recommendation Q.512

EXCHANGE INTERFACES FOR SUBSCRIBER ACCESS

1 General

This Recommendation applies to digital local and combined exchanges for telephony in Integrated Digital Networks (IDN) and mixed (analogue/digital) networks, and also to local and combined exchanges in Integrated Services Digital Networks (ISDN). The field of application of this Recommendation is more fully defined in Recommendation Q.500.

2 Scope of Recommendation

Exchange interfaces for subscriber access that have been considered are described, and illustrated in Figure 1/Q.512 and Table 1/Q.512, but it is not intended to specify every interface. Other interfaces are for further study (e.g., those for dynamic multiplexed basic rate access, broadband access, etc.).

FIGURE 1/Q.512 - T1108841-88

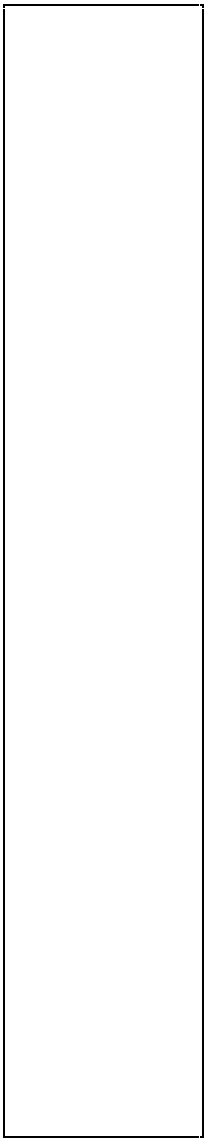


TABLE 1/Q.512

Interface references

Access type	Interface/reference points	Paragraph	Related physical Recs.	Related OAM Recs.	Application to connect
Basic access digital section	V_1	3.2	(Note 1)	G.960 (Note 1) I.603	ISDN basic access (2B + D)
Generic digital section	V_2	3.3	G.703 G.704 G.705	None	Digital network equipment, supporting any combination of access types
Generic subscriber access (Note 2) digital section	V_3	3.4		G.706 I.604 (Note 3)	Digital subscriber equipment
Digital access link (Static multiplex)	V_4	3.5		G.706 I.605	A multiple of ISDN basic accesses
Generic analogue subscriber access	Z	4.1	None (Note 4)	None	Analogue subscriber lines

Note 1 — Recommendation G.961 specifies the characteristics of a digital transmission system on metallic local lines which may form part of the basic access digital selection.
Note 2 — In the case of ISDN access this is the primary rate access digital section.
Note 3 — Only in the case of ISDN application, G.706 and I.604 are recommended.
Note 4 — Characteristics other than those defined in Recommendations Q.551 to Q.554 are not subject of CCITT Recommendation.

This Recommendation is not intended to define any transmission system, network or subscriber equipment in or connected to, a digital exchange via these interfaces. Therefore only the characteristics of the interfaces are described.

Digital exchange interfaces for subscriber access are defined at the V reference point which is the boundary between the ET and the digital access section or link. These interfaces are designated interface V and are defined to allow flexibility of implementation for different exchange and transmission equipment realizations. However, a physical interface will not be specified for all subscriber access types identified (see Figure 1/Q.512).

In this Recommendation, a digital section is defined as the whole of the means of digital transmission of a digital signal of specified rate between two consecutive reference points. A digital link comprises one or more digital sections and may include either a multiplexer or concentrator, but not switching.

3 Characteristics of digital exchange interfaces for subscriber access

3.1 *General*

As an objective, the characteristics of digital interfaces on the subscriber side of the exchange should be aligned with the characteristics of ISDN user/network access structures (Recommendation I.411).

However in many countries, digital access arrangements not structured according to ISDN principles are used, e.g., to ensure compatibility with existing networks and services and it is expected that these arrangements will continue to be used for several years. Only certain characteristics of these arrangements are the subject of CCITT Recommendations.

3.2 *Interface V1*

3.2.1 *General*

Interface V_1 may be used at the V_1 reference point to connect to an ISDN basic access digital section for the provision of a single basic access. The characteristics of the basic access digital section are defined in Recommendation G.960 and the characteristics and parameters of a digital transmission system which may form part of the digital section for the ISDN basic rate access are given in Recommendation G.961.

3.2.2 *Functional characteristics*

The functional description is illustrated in Figure 2/Q.512 and the following functional requirements are defined:

1) *(2B + D) channels*

To provide the bidirectional transmission capability for two B channels and one 16 kbit/s D channel as described in Recommendation I.412.

2) *Bit timing*

To provide bit (signal element) timing to enable the digital section to recover information from the aggregate bit stream.

3) *Frame timing*

To provide frame timing to enable digital section and ET to recover the time division multiplexed channels.

4) *CV_1 channel*

The CV_1 channel provides, for each direction of transmission, the capability to transfer management functions required for the digital section as specified in Recommendations G.960 and I.603. The CV_1 channel may carry one or more functional links. These functions include activation from network side, activation from network side, activation request from a digital section, deactivation from ET side, operation and maintenance signals.

5) *Power feed*

This function provides for remote power feeding for the digital section and possibly terminal equipment. This function is optional.

3.2.3 *Electrical characteristics*

The electrical characteristics of interface V_1 are not subject to CCITT Recommendations.

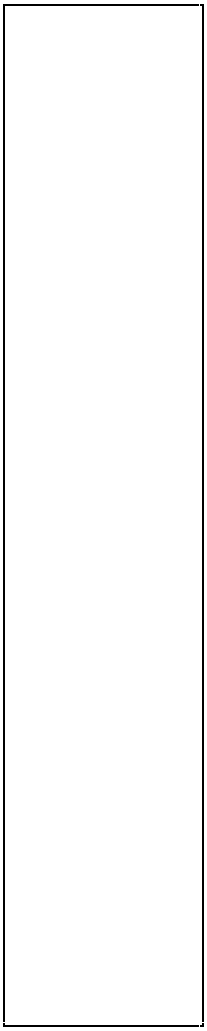
3.2.4 *Channel types, channel allocation and signalling*

The channel types associated with interface V_1 include two B channels and one D channel as defined at the user network interface in Recommendation I.412. In addition, the CV_1 channel is required to support the operational and maintenance functions.

The channel allocation is not subject to CCITT Recommendations.

The D channel signalling procedures are defined in the Q.920 and Q.930—Series Recommendations.

Figure 2/Q.512 - T1107731-88



3.3 *Interface V2*

3.3.1 *General*

Interface V_2 is a generic digital interface used to connect remote or local digital network equipment via a first or second order digital section. This network equipment may support any combination of analogue, digital and ISDN subscriber access. The characteristics of this interface may not be structured according to the ISDN principles.

3.3.2 *Functional characteristics*

The functional characteristics depend on the specific application of the V_2 interface. These are not generally subject to CCITT Recommendations.

3.3.3 *Electrical characteristics*

The electrical characteristics of interface V_2 are described in Recommendation G.703.

The basic frame structure at interface V_2 should be identical to that of the first or second order rate multiplexes described in Recommendations G.704 and G.705.

3.3.4 *Channel types, channel allocation and signalling*

The channel types, channel allocation and signalling depends on the specific application of the V_2 interface. These are not generally subject to CCITT Recommendations.

3.4 *Interface V3*

3.4.1 *General*

Interface V_3 is a digital interface used to connect digital subscriber equipment (e.g., PABX) via a generic digital subscriber section. The characteristics of this interface may not be structured according to the ISDN principles. In this case, only the electrical characteristics defined in § 3.4.2 are recommended. However, in the case of ISDN where interface V_3 is used to connect a primary rate access digital section for the provision of a single primary rate access, all of the following characteristics apply.

3.4.2 *Functional characteristics*

The use of the Cyclic Redundancy Check (CRC) procedures described in Recommendations G.704 and G.706 is recommended. The information on the status of the CRC processing shall be passed across the V_3 interface. The maintenance procedures are defined in Recommendation I.604.

3.4.3 *Electrical characteristics*

The electrical characteristics of interface V_3 are described in Recommendation G.703.

The frame structure at interface V_3 should be identical to that described in Recommendations G.704 and G.705.

3.4.4 *Channel types, channel allocation and signalling*

The channel types and allocation associated with interface V_3 are 30 B + 1 D at 2048 kbit/s or 23 B + 1 D at 1544 kbit/s as described in Recommendation I.431.

The channel allocation should also consider that:

a) when the signalling for the B channels in one primary rate structure is carried by the D channel in another primary rate structure, the channel timeslot normally used for signalling may be used to provide an additional B channel;

b) at interface V_3 the designated number of B channels is always present within the multiplexed channel structure, but one or more of the B channels may not be used in any given application.

The D channel signalling procedures are defined in the Q.920 and Q.930—Series Recommendations.

3.5 *Interface V4*

3.5.1 *General*

Interface V_4 is a digital interface used to connect a digital access link which includes a static multiplexer supporting several basic access digital sections. The local digital multiplexer application is considered to be a subset of the remote digital multiplexer application.

3.5.2 *Functional characteristics*

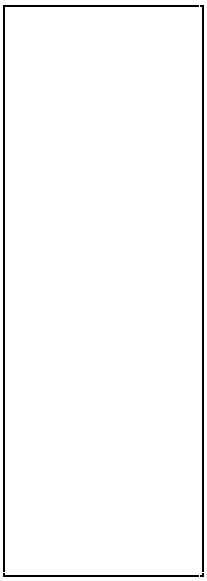
The functional description is illustrated in Figure 3/Q.512 and the following functional requirements are defined:

— $m \times (2\ B + D + CV_1)$: to provide the bidirectional transmission capability for the B, and D, CV_1 channels from each basic rate access section.

— Timing: to provide the necessary timing information for bit transmission, frame synchronization and subscriber line synchronization.

— Operations and maintenance: to provide the transmission capability to carry the operation and maintenance signals of the digital link and the basic access muldex as defined in I.605.

Figure 3/Q.512 - T1106942-88



The use of the Cyclic Redundancy Check (CRC) procedures described in Recommendations G.704 and G.706 are recommended. The information on the status of the CRC processing shall be passed across the V_4 interface.

3.5.3 *Electrical characteristics*

The electrical characteristics of interface V_4 are described in Recommendation G.703.

The basic frame structure at interface V_4 should be identical to that of the first order multiplexes described in Recommendations G.704 and G.705.

3.5.4 *Channel types, channel allocation and signalling*

3.5.4.1 *General*

The V_4 interface is composed of a number of individual ISDN basic rate access digital sections, as described in § 3.2.

The channel allocation at interface V_4 is defined within a first order structure using a static multiplexing principle as follows:

3.5.4.2 *Static multiplexed at 2048 kbit/s*

3.5.4.2.1 *Channel allocation*

In this case 12 basic access channels are multiplexed in a static manner using fixed allocation of the channels. Figure 4/Q.512 illustrates the channel allocation for 2048 kbit/s, where 24 channel timeslots are used by B1 and B2 channels and 6 channel timeslots are used by the D and CV_1 channels of the 12 basic accesses.

The CV_1 and D channels of two basic accesses are multiplexed into one channel timeslot. Five contiguous channel timeslots are occupied by two basic accesses each consisting of B1 + B2 + D + CV_1 channels.

Channel timeslot 0 is used for frame alignment including the application of CRC4 according to Recommendation G.704. Additionally, the alarm handling facilities of channel timeslot 0 are used for maintenance of the primary link as described in Recommendation I.605.

According to the channel allocation shown in Figure 4/Q.512, the CV_1 channels are located in timeslots 5, 10, 15, 21, 26 and 31. These represent 8 bits, namely two bits for each of the D and CV_1 channels of two basic accesses.

Channel timeslot No.	Contents
0	Frame alignment signal/Remote service alarr (See Recommendation G.704)
1	B1,1
2	B2,1
3	B1,2
4	B2,2
5	D1, $CV_1$1, D2, $CV_1$2
6	B1,5
7	B2,5
8	B1,6
9	B2,6
10	D5, $CV_1$5, D6, $CV_1$6
11	B1,9
12	B2,9
13	B1,10
14	B2,10
15	D9, $CV_1$9, D10, $CV_1$10
16	Not used
17	B1,3
18	B2,3
19	B1,4
20	B2,4
21	D3, $CV_1$3, D4, $CV_1$4
22	B1,7
23	B2,7
24	B1,8
25	B2,8
26	D7, $CV_1$7, D8, $CV_1$8
27	B1,11
28	B2,11
29	B1,12
30	B2,12
31	D11, $CV_1$11, D12, $CV_1$12

B1,i B1 channel of basic access i
B2,i B2 channel of basic access i
Di D channel of basic access i
CV_1i Control CV_1 channel of basic access i

FIGURE 4/Q.512

Channel allocation at the V_4 interface for 2048 kbit/s

3.5.4.2.2 *CV_1 channel structure*

To facilitate separate treatment of bundles of two basic accesses, represented by five 64 kbit/s channels, multi—frame alignment should be performed individually for each bundle. The relevant overhead information should be contained in the CV_1 channels. CV_1 channel structure is for further study.

The D channel signalling procedures are defined in the Q.920 and Q.930—Series Recommendations.

3.5.4.3 *Static multiplexed 1544 kbit/s*

For further study.

4 Characteristics of analogue exchange interface for subscriber access

4.1 *Interface Z*

Interface Z is a generic analogue interface defined at the exchange side of an analogue subscriber line used to connect subscriber equipment (e.g., single telephone set or PABX).

It is recognized that the characteristics of analogue interfaces (generally designated Z interface) vary considerably from country to country and therefore it is not intended that those interfaces be the subject of CCITT Recommendations beyond those aspects covered in Recommendations Q.551/552.

5 Combined digital and analogue interface for subscriber access

In the evolution towards an ISDN, user network accesses may exist which have a combination of both analogue and digital interfaces.

This type of interface is not presently considered to be a matter for CCITT Recommendations.