## Recommendation T/CD 01-14 (Odense 1986)

# SPECIFICATION OF EQUIPMENT PRACTICE FOR DATA TRANSMISSION EQUIPMENT

Recommendation proposed by Working Group T/WG 10 "Data communications" (CD)

*Text of the Recommendation adopted by the "Telecommunications" Commission:*

"The Conference of European Post and Telecommunications Administrations,

*considering*

that WG.CD. has studied under the auspice of Question CD 1 the harmonization of Data Transmission Equipment,

*recommends*

that the attached specification of equipment pratice for Data Transmission Equipment as contained in Annex 1 to this Recommendation should be taken into account by all CEPT Admininstrations when the implementation of a relevant piece of equipment is being planned by Administrations."

Administrations are free to stipulate additional requirements, and also which of the optional requirements, if any, are to be provided.

*Note 1:* It should be noted that this Recommendation may be revised from time to time.

# Annex 1. Index

# 1. SCOPE

## 1.1. Specification Objectives

This specification describes a cost and space saving equipment practice for data transmission equipment taking into account the current progress in DCE and DTE technology. It specifies the mechanical requirements for plug-in data transmission equipment and the mechanical, functional and electrical characteristics of the interface between such equipment and associated equipment in which the plug-in equipment is intended to be used

— in subracks,
— in telephone sets,
— in stand alone housings,
— in DTEs.

The mechanical requirements of the specification are based on existing IEC standards for connectors, printed circuit boards (PCBs) and subracks.

For the electrical and functional part of the Interface reference is made to the relevant standards of CCITT and ISO. As an alternative to the CCITT Recommendations for electrical characteristics a new electrical characteristic for the interchange circuits is introduced which complies with integrated circuit technology.

This specification shall ensure mechanical and electrical compatibility of plug-in data transmission equipment and its associated counterparts. In particular, the following items are specified:

— Size of PCBs,
— Size of Plug-in Unit,
— Type of connector,
— Pin allocation,
— Electrical characteristics of interchange circuits,
— Electrical requirements for the power supply,
— Environmental conditions.

In this specification the application of the equipment practice to plug-in equipment with V.- and X. -Series Interfaces (Modem and baseband equipment) is elaborated. The application of this specification in other transmission equipment (e.g. multiplexers) is also possible. In that case parts of this specification may not be relevant (e.g. pin allocation of V.-Series interchange circuits) and the term DCE may be replaced by the term data transmission equipment where appropriate. Details will be given in the appropriate equipment specifications.

## 1.2. Card Sizes and their Applications

### 1.2.1. *Card Sizes*

| | Card Size | DCE Width |
|---|---|---|
| Type I A | 160 × 100 mm | *Note 1* 5 HP (nominal) |
| Type I B | | *Note 1* 10 HP (nominal) |
| Type II A | 160 × 233.35 mm | *Note 1* 5 HP (nominal) |
| Type II B | | *Note 1* 10 HP (nominal) |
| Type III | *Note 2* | 5, 7 or 14 HP |

One horizontal pitch (HB) = 5.08 mm.

*Note 1:* The dimensions of the plug-in units should be according to that outlined in 2.3. The space allocated in DTEs for type I/A and B should be 5 or 10 HP and the dimension should be according to that outlined in 2.4. Card spacing in a subrack or DTE may be based on this width. Greater spacings to facilitate cooling, proper accommodation etc. are possible.

*Note 2:* For some applications a larger card than specified herein as types I and II is needed. For the time beeing there is no harmonized version of such a card. Current proposals of different cards are to be found in Figures 2.4 (T/CD 01-14), 2.5 (T/CD 01-14), and 2.6 (T/CD 01-14). Study is underway as matter of urgency to define a harmonized version.

### 1.2.2. *Applications*

The following types of applications are envisaged subject to national regulations.

Plug-in unit for
— DTEs (see *Note 1*),
— Telephone sets (see *Note 1*),
— Stand alone housing (see *Note 1*),
— Subracks.

| Plug-in unit for | Type I *(Note 2)* A | Type I *(Note 2)* B | Type II *(Note 2)* A | Type II *(Note 2)* B | Type III *(Note 2)* |
|---|---|---|---|---|---|
| DTEs | + | + | + | + | ? |
| Telephone sets | + | + | + | – | – |
| Stand alone DCE | + | + | + | + | + |
| Subracks | + | + | + | + | + |

\+ Applicable.
– Not applicable.
? For further consideration.

*Note 1:* In some applications the plug-in unit may be used as a built-in unit.

*Note 2:* The allocation of types I to III to various DCE's is subject to progress in technology. For the time being the following allocation could be envisaged:
Type I/A: V.21, V.22*bis*, V.23, V.26*bis*, V.110, X.20, X.20*bis*, X.21, X.21*bis*, X.22, baseband transmission units.
Type I/B or Type II/A: All of Type I/A and V.26*ter*, V.29, voice plus data transmission units.
Type II/B or Type III: All types of transmission units.

## 1.3. System Elements

Each plug-in unit consists of the following parts:
— one printed circuit board (PCB), which will be supported by guide bars in a subrack or DTE. The unit may comprise other smaller PCBs not supported by guide bars,
— one PCB edge connector (female part), see Note.

and at the discretion of the Administration:
— covers for Type I/A and B (including isolating cover),
— front panel,
— one pair of fixing elements,
— sealing possibility,
— a coding device.

A subrack for plug-in units consists of the following parts:
— slots for accommodation of the plug-in units,
— one pair of guide bars per slot,
— one connector (male part) per slot,
and at the discretion of the Administration:
— one pair of fixing elements per slot,
— slots for accommodation of additional PCBs for distribution-, monitor- and maintenance purposes,
— a slot for a plug-in power supply,
— sealing possibility,
— a coding device.

A DTE or telephone set, which is designed for accommodation of a plug-in DCE, should be equipped with:
— a slot with the dimensions outlined in 2.4.,
— a connector (male part) as outlined in 2.2.,
— one pair of guide bars as outlined in 2.4.,
— a method of fixing plug-in DCE's, e.g. a metric thread (M2.5) as outlined in Figure 2.9. (T/CD 01-14),
and at the discretion of the Administration:
— a coding device.

*Note:* Where national requirements do not allow the connection of the telephone line inside the DTE via the PCB edge connector, the telephone line may be connected via the front panel of the plug-in.
Additional connectors for Type II/A and B cards (e.g. ISO 2110) are optional.

## 2. MECHANICAL SPECIFICATION

*References:*

Cabinets and racks: IEC 297; IEC 297-2; DIN 41 494, Teil 1, Teil 5 Din 41 488.

Plug-in units: IEC 297-3, DIN 41 494, Teil 5.

Printed circuit boards (PCBs): IEC 297-3, DIN 40 801, Teil 2: DIN 41 494, Teil 2; IEC 326-3; IEC 48D (SEC) 12.

Connectors: IEC 603-2, DIN 41 612, Teil 1 and Teil 6; IEC 48B (C.O.) 137; IEC 48B (C.O.) 138.

### 2.1 PCB sizes and dimensions

Type I see Figure 2.1 (T/CD 01-14)
Type II see Figure 2.2(T/CD 01-14)
Type III see Figures 2.4 (T/CD 01-14), 2.5 (T/CD 01-14), 2.6 (T/CD 01-14)

### 2.2. Connectors

The proposed connector for all types of cards shall be a 96-pin connector according to IEC 48B (C.O.) 137 or IEC 48B (C.O.) 138 (see *Note*). The female part of the connector shall be on the PCB of the plug-in unit and the male part on the backplane or the DTE (inverted pin assignment).

The connector may be equipped with less than 96 pins depending on the application.

The use of additional connectors according to ISO 2110 and/or ISO 4903 on the Type II and III PCBs is optional.

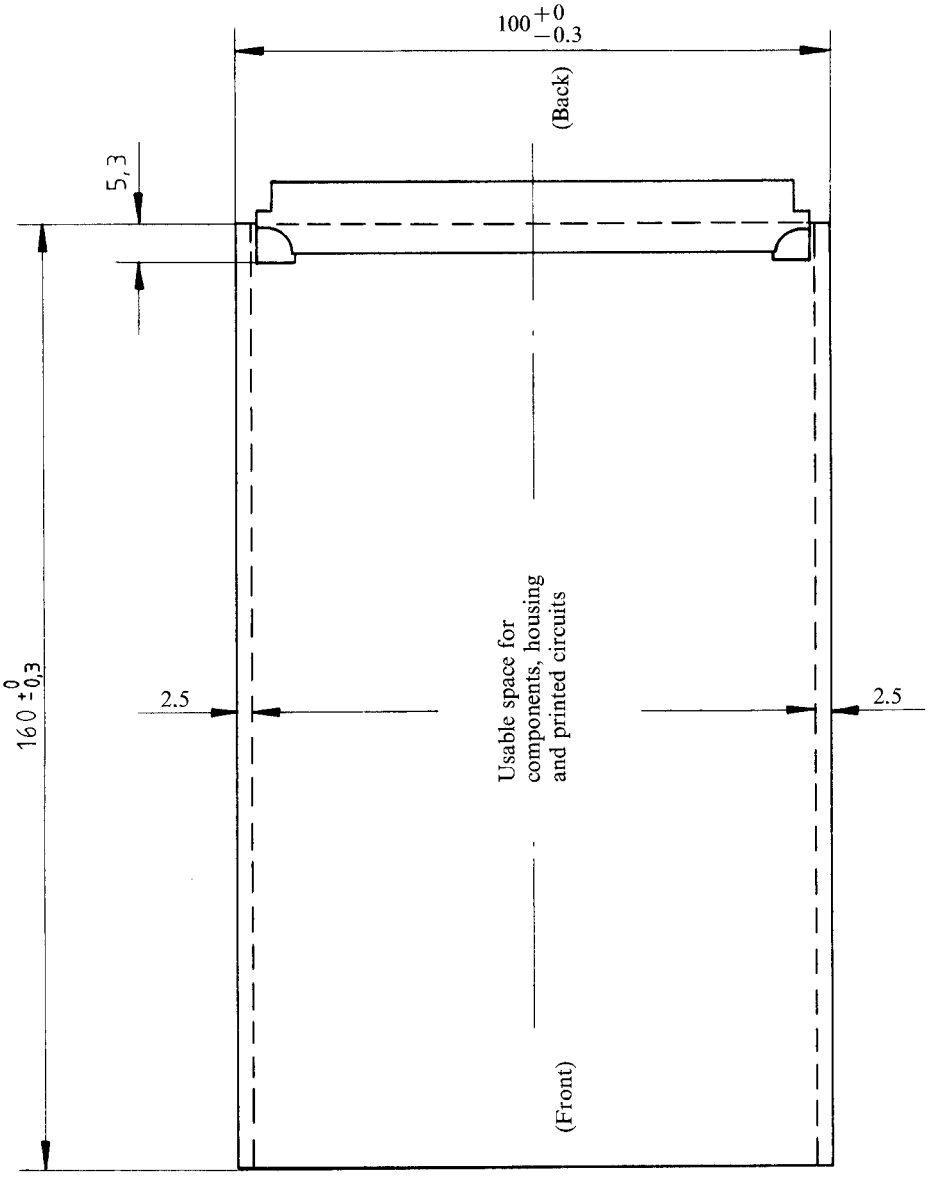
#### 2.2.1. *Position of the connector on the PCB*

The position of the connectors on the 3 types of cards is shown in Figures 2.1 (T/CD 01-14) to 2.6 (T/CD 01-14).

The use of additional connectors (IEC 603-/x or ISO 2110, ISO 4902, ISO 4903,...) is possible.

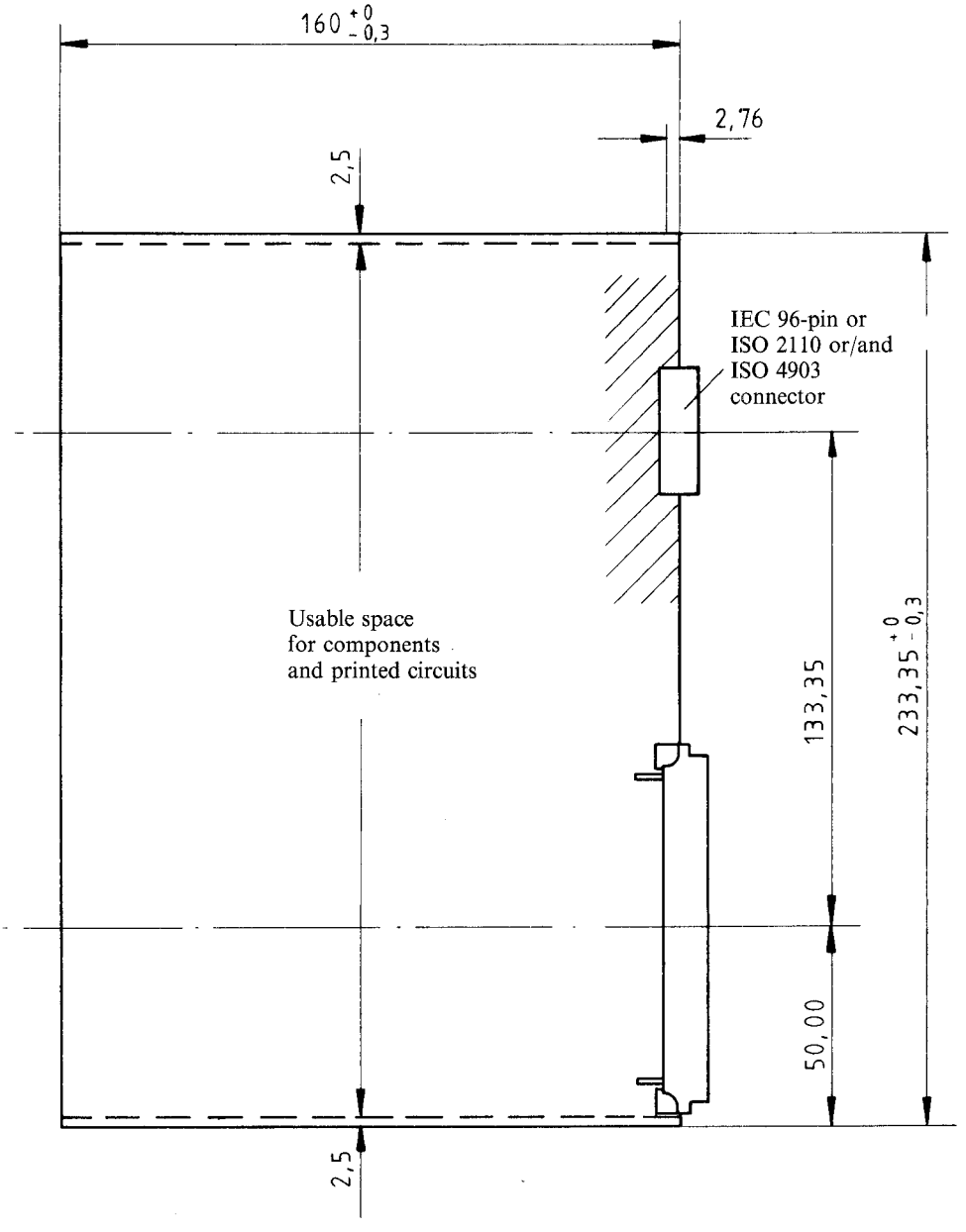
A possible position of the optional connectors is shown in Figure 2.2 (T/CD 01-14).

*Note:* There are two candidates of connectors with inverted pin assignment under discussion: IEC 48B (C.O.)137, the so called DIN-version and IEC 48B (C.O.) 138, the so called Ericsson version. A definite IEC number for the one or the other connector (in the following represented by IEC 602-x) is still open. If a DTE or a rack is intended to accept DCEs with the one or the other type of connector, the differences in the mechanical dimensions should be noted. Figure 2.3 (T/CD 01-14) shows the major differences between both connectors. In all other figures, reference is made to Figure 2.3 (T/CD 01-14) whenever necessary.




*Notes:* Board thickness $1.6 \pm 0.2$, reference IEC 249-2. All dimensions are shown in millimeters.

Figure 2.1 (T/CD 01-14). Type I card basic dimensions.




*Notes:* Board thickness 1.6±0.2 reference IEC 249-2. All dimensions are shown in millimeters.

Figure 2.2 (T/CD 01-14). Type II card basic dimensions.

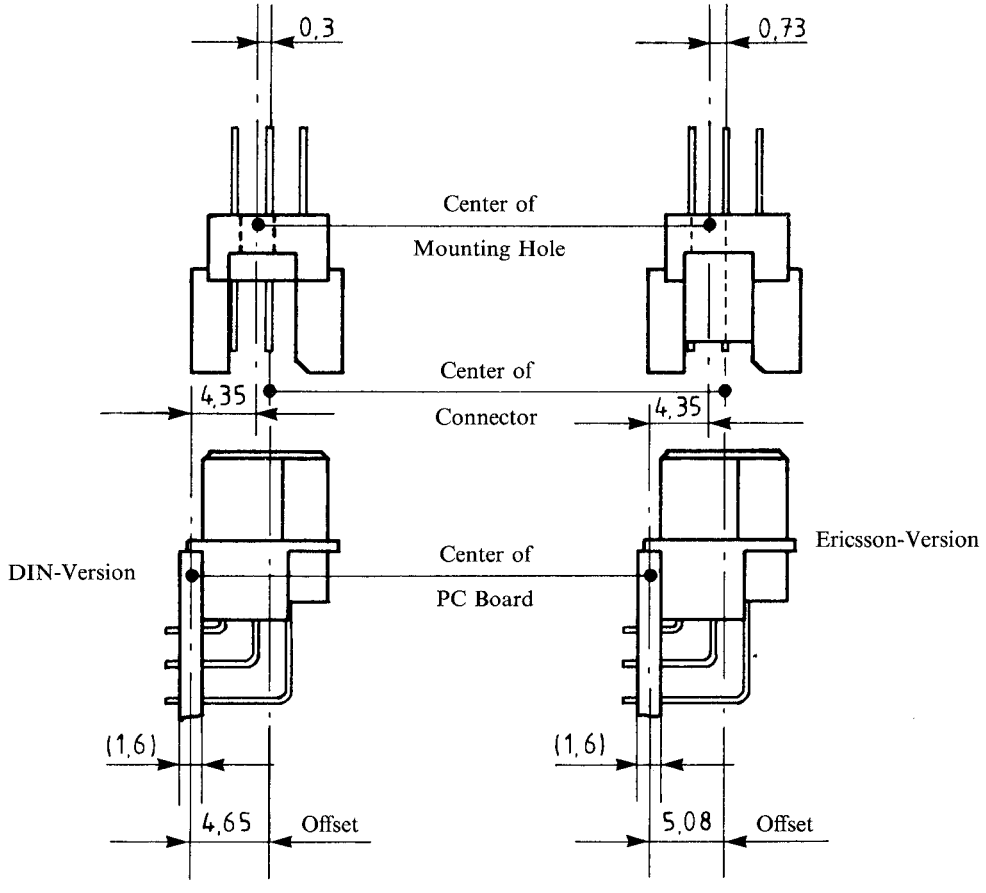



Figure 2.3 (T/CD 01-14). Basic differences between DIN- and Ericsson-Version.

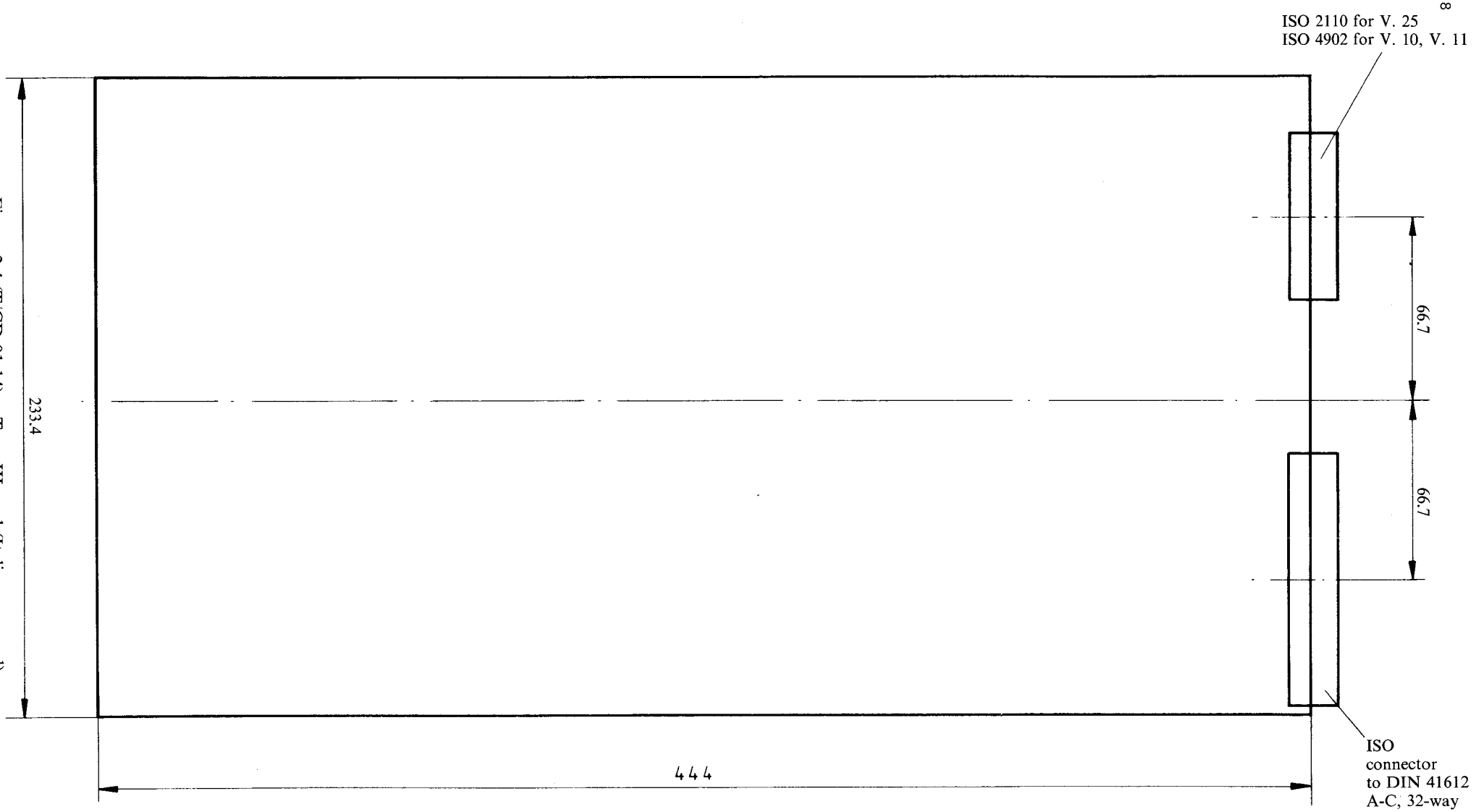



Figure 2.4 (T/CD 01-14). Type III card (Italian proposal).

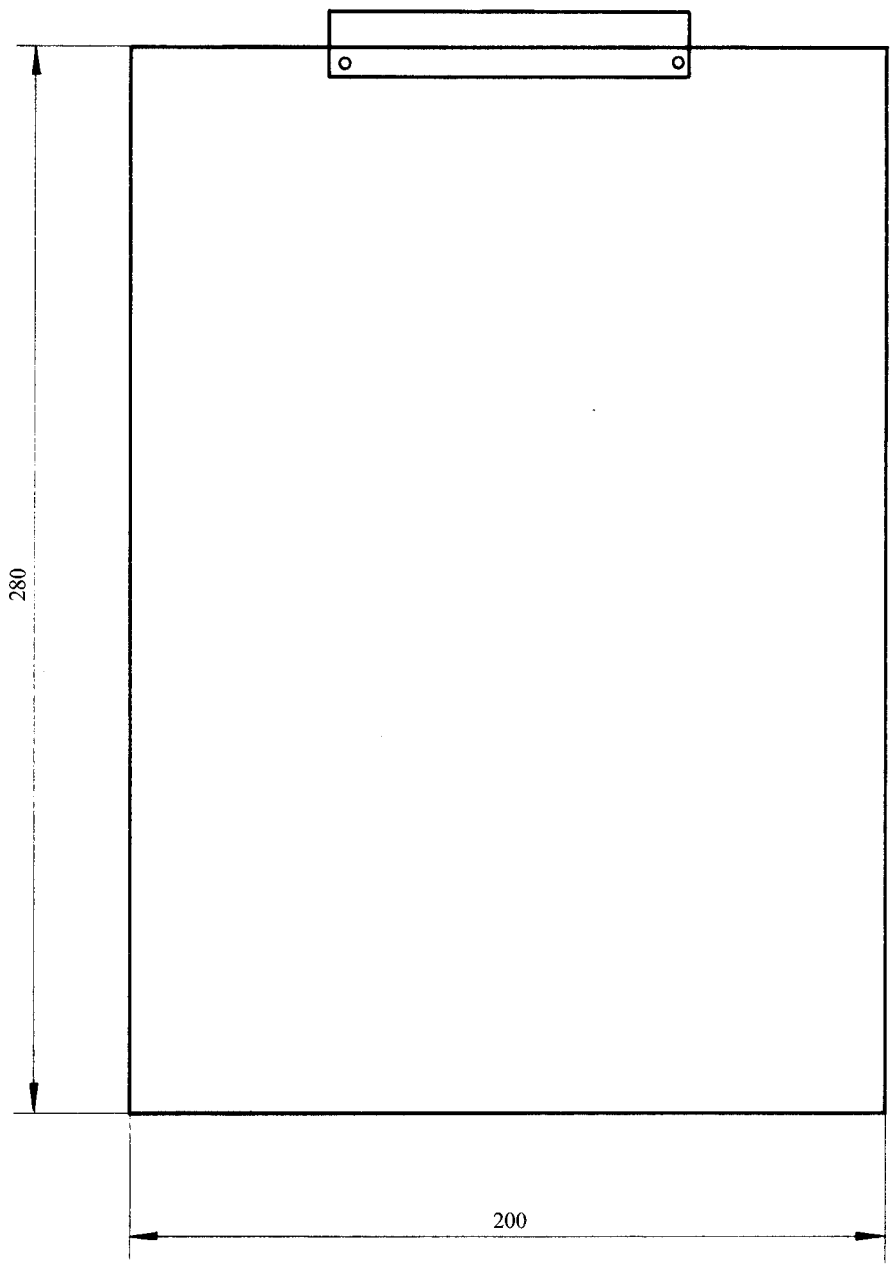



Figure 2.5 (T/CD 01-14). Type III card (Spanish proposal).

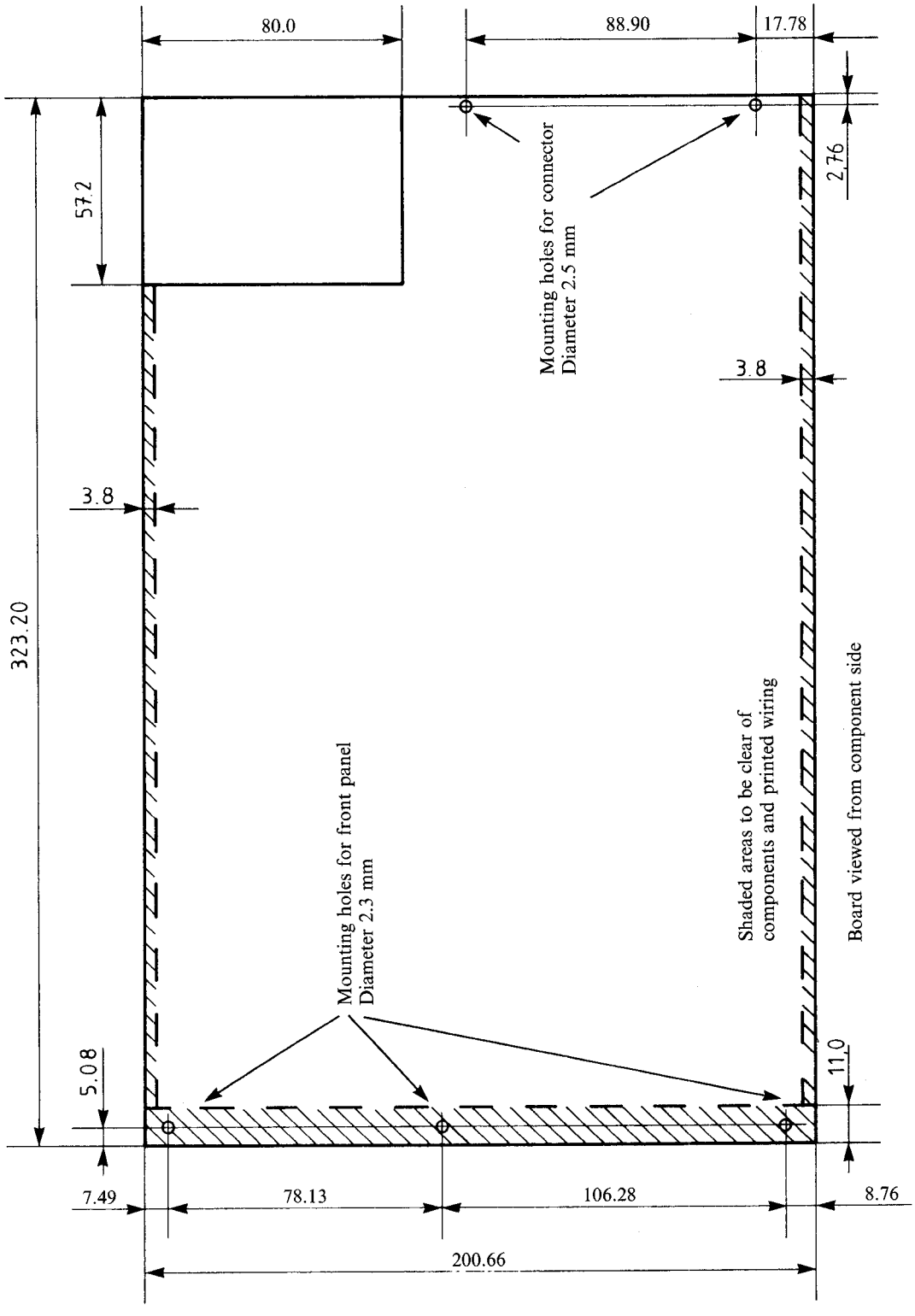
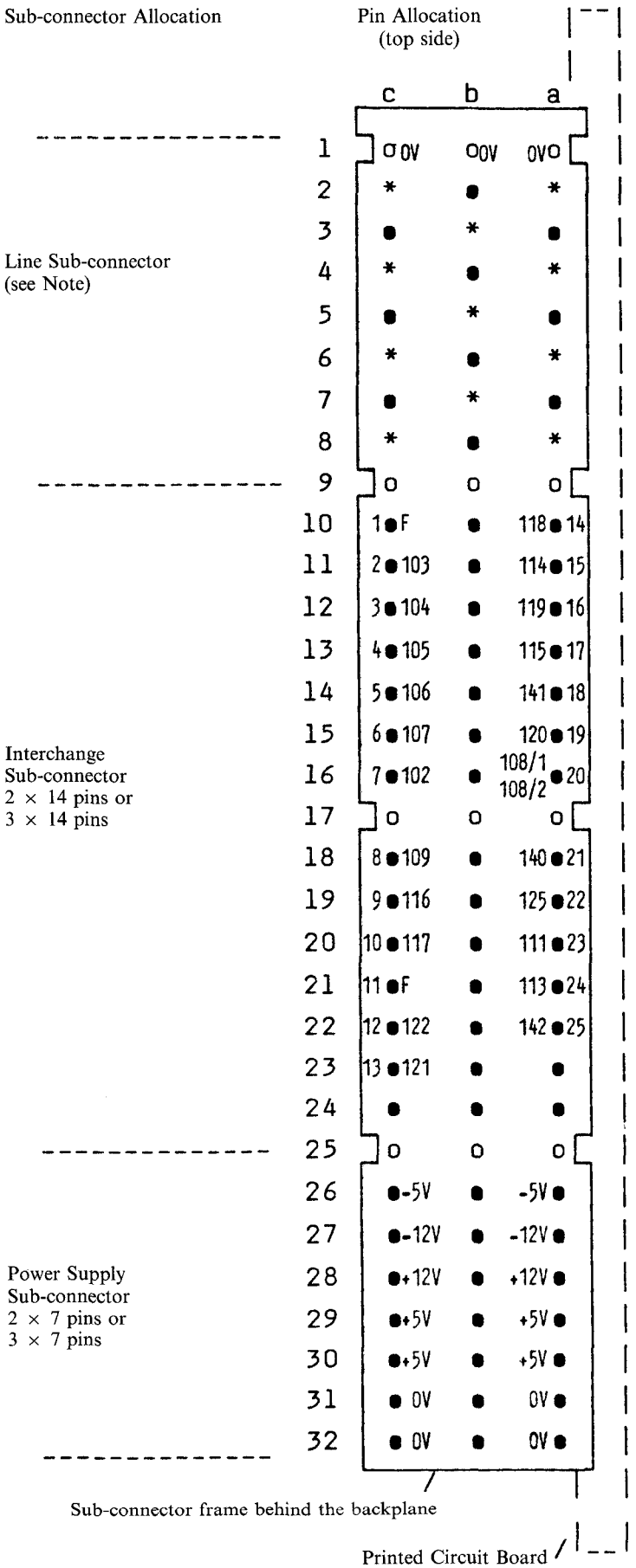



Figure 2.6 (T/CD 01-14). PCB details for type III (British Telecom proposal).

2.2.2. *Pin Allocation*

The pin allocations of the optional connectors according ISO 2110 or 4903 are given in those standards. The 96-pin connector may contain the following circuits:
— digital interchange circuits,
— power supply circuits,
— telephone line circuits (see Note in 1.3.),
— circuits to the telephone set or an equivalent (see Note in 1.3.),
— additional circuits.

In Appendix 1 design objectives for the allocation of all pins are recorded.




View from the rear of the backplane or front view of the PCB edge connector

F: for future international standardization

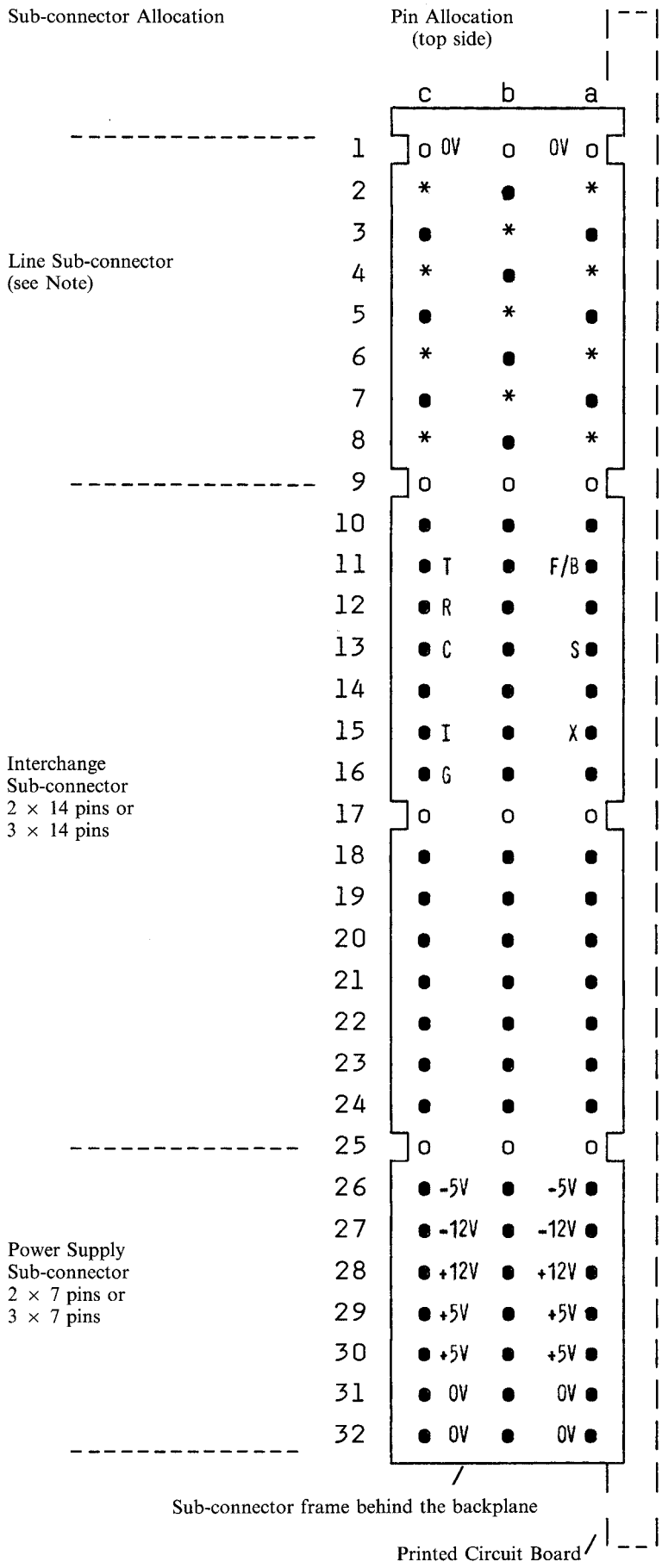
Pins of row b are optional

o Pin cannot be accessed via Sub-connector

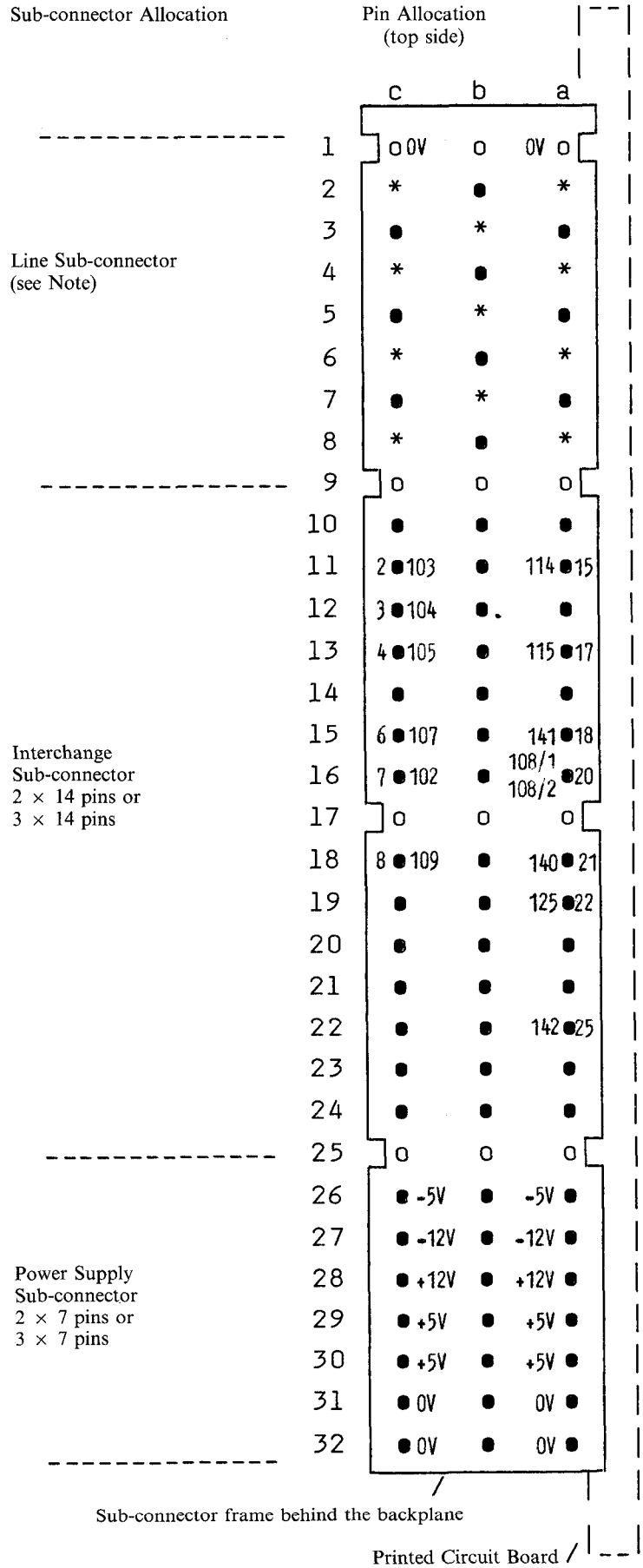
✱ Pin should not be connected (see Note)

xx ● lyy respectively
lyy ● xx: pin has a certain function: lyy is the number of Recommendation V.24 Interchange Circuit, xx is the number of the related pin of the ISO 2110 connector

2.2.2.1. Pin Allocation for Type I and II cards for V.-Series DCEs with TTL electrical characteristics




2.2.2.2. Pin Allocation for Type I and II cards for X.21, X.20, X.22 DCEs with TTL electrical characteristics




View from the rear of the backplane or front view of the PCB connector

Unassigned pins of the interface section are reserved for future international standardization

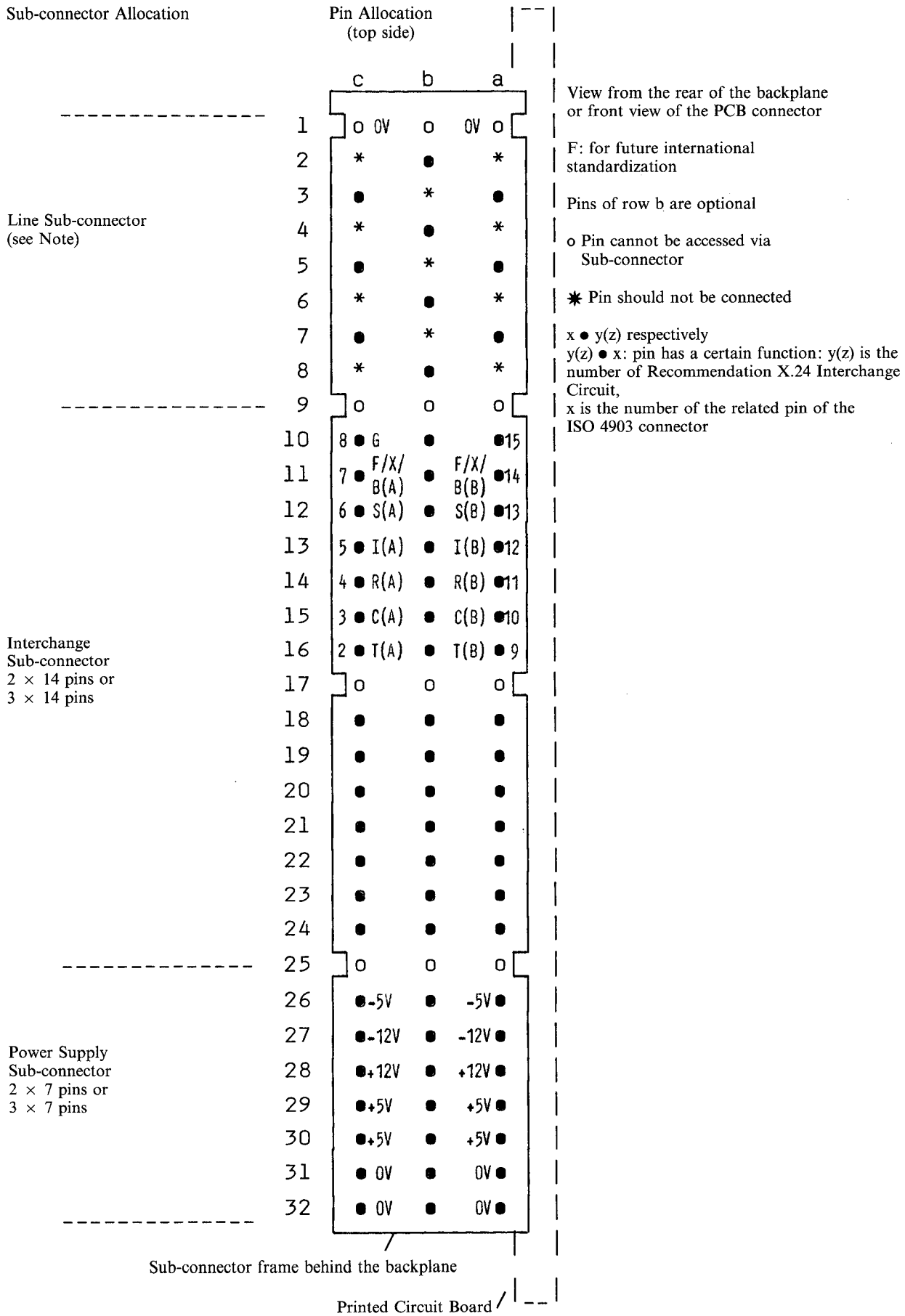
Pins of row b are optional

o Pin cannot be accessed via Sub-connector

✱ Pin should not be connected

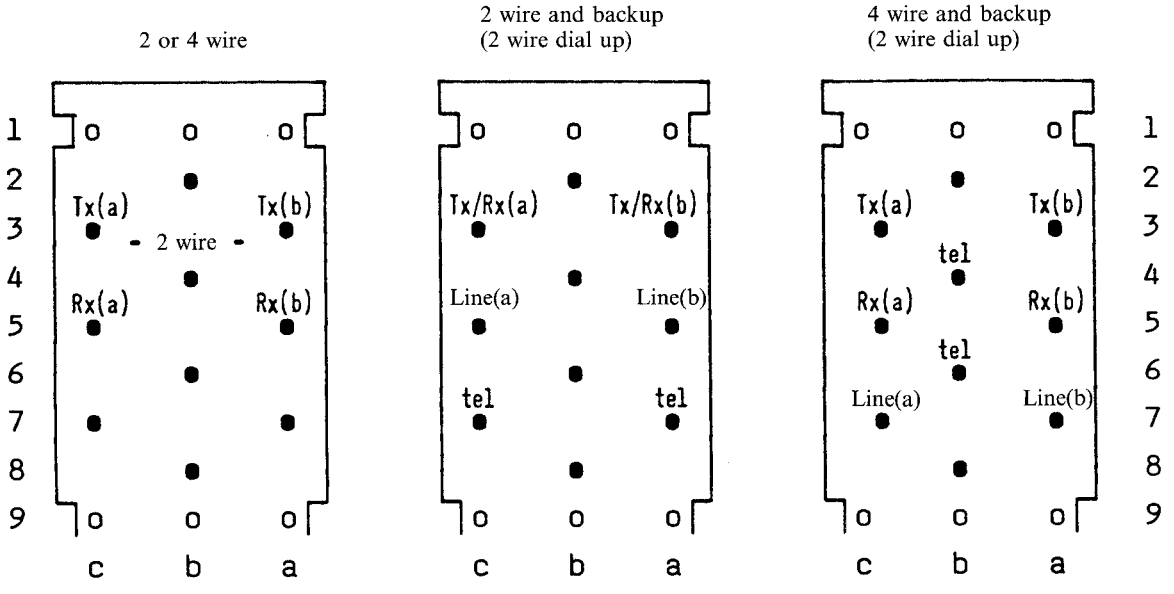
xxolyy respectively
lyyoxx: pin has a certain function: lyy is the number of Recommendation V.24 Interchange Circuit,
xx is the number of the related pin of the ISO 2110 connector

2.2.2.3. Pin Allocation for Type I and II cards for X.20*bis*, X.21*bis* DCEs with TTL electrical characteristics

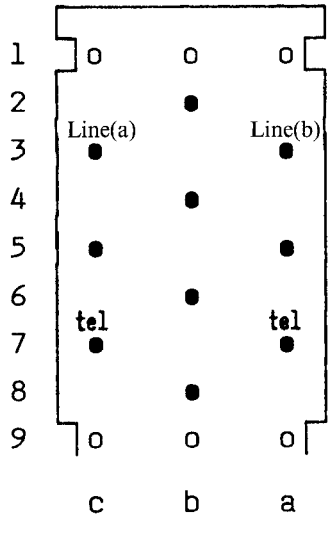



2.2.2.4. Pin Allocation for Type I and II cards for X.21, X.20 and X.22 DCEs with V.11 electrical characteristics

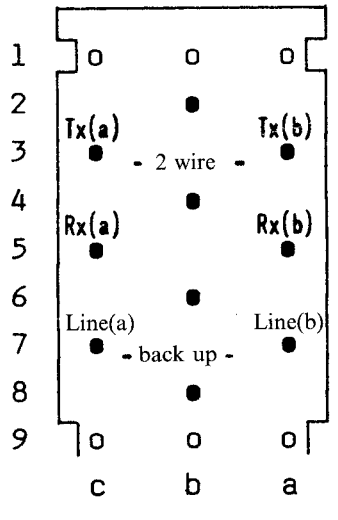
A: *Leased line applications for V.-Series DCEs*




B: *Switched line applications for V.-Series DCEs*




C: *Leased and switched line applications for X.20, X.21 and X.22 DCEs*




*Note:* Pin assignment of Line Sub-connector is done in the following way to provide minimum spacing of approx. 3.5 mm.

Example for the pin allocation for Type III cards (British Telecom Proposal)

| Pin No. | Circuit | | |
|---|---|---|---|
| | A | B | C |
| 1 | 15 V AC | 15 V AC | 15 V AC |
| 2 | 0 V | 0 V | 0 V |
| 3 | 15 V AC | 15 V AC | 15 V AC |
| 4 | 8 V AC | 8 V AC | 8 V AC |
| 5 | 8 V AC | 8 V AC | 8 V AC |
| 6 | ◄——— | — Pins removed — | ———► |
| 7 | ◄——— | — Pins removed — | ———► |
| 8 | | | |
| 9 | 4 W Tx A/2 W PC | 4 W Rx A | PSTN A |
| 10 | 4 W Tx B/2 W PC | 4 W Rx B | PSTN B |
| 11 | Speech A | Speech B | |
| 12 | | | |
| 13 | ◄——— | — Pins removed — | ———► |
| 14 | ◄——— | — Pins removed — | ———► |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | Circuit 104 | Circuit 105 | Circuit 119 |
| 26 | Circuit 114 | Circuit 106 | Circuit 115 |
| 27 | Circuit 103 | Circuit 107 | Circuit 141 |
| 28 | Circuit 118 | Circuit 102 | Circuit 120 |
| 29 | Circuit 121 | Circuit 109 | Circuit 108 |
| 30 | Circuit 142 | Circuit 112 | Circuit 140 |
| 31 | Circuit 122 | Circuit 117 | Circuit 125 |
| 32 | Circuit 113 | Circuit 110 | Circuit 111 |

All remaining pins should be reserved for national use and possible further study.

*Note:* In this application, no sub-connector frame is used.

Example for the pin allocation for Type III cards (Italian Proposal) (32-way connector)

| Pin No. | Circuit a/b |
|---|---|
| 2 | ground |
| 4 | +12 V |
| 6 | ground |
| 8 | −12 V |
| 10 | alarm |
| • | • |
| • | • |
| • | • |
| 22 | Tx(a) |
| 24 | removed |
| 26 | Tx(b) |
| 28 | Rx(a) |
| 30 | Rx(b) |
| 32 | safety earth |

The interchange circuits are on the ISO connector only.

## 2.3 Cover and front panel dimensions

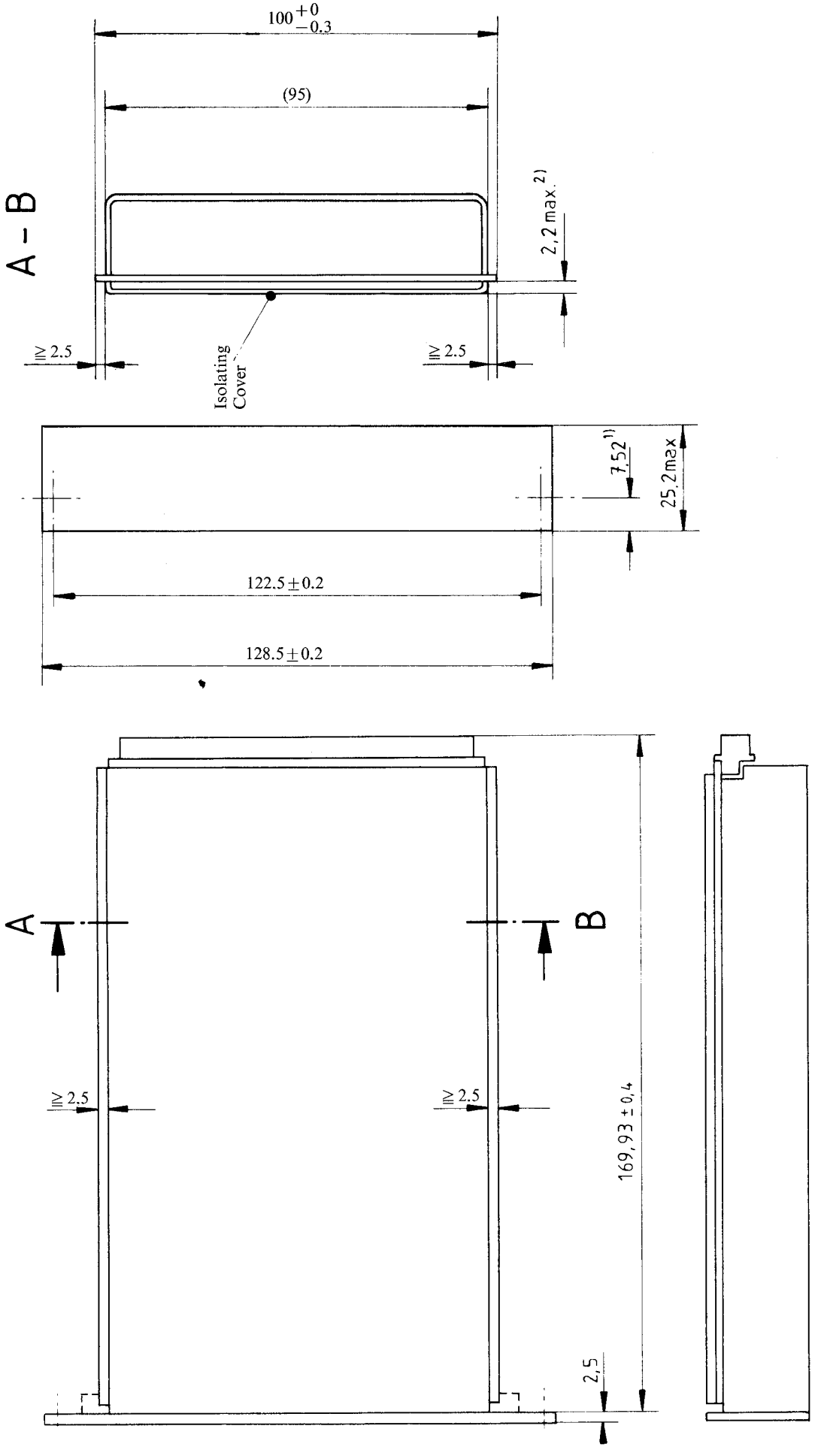
The construction of covers and front panels are shown in Figures 2.7 (T/CD 01-14) and 2.8 (T/CD 01-14). Examples for front panel dimensions are given in Figures 2.10 (T/CD 01-14) and 2.12 (T/CD 01-14).

## 2.4 Slot dimensions

The dimensions of the slot of a DTE for accommodation of a plug-in DCE are shown in Figure 2.9 (T/CD 01-14).

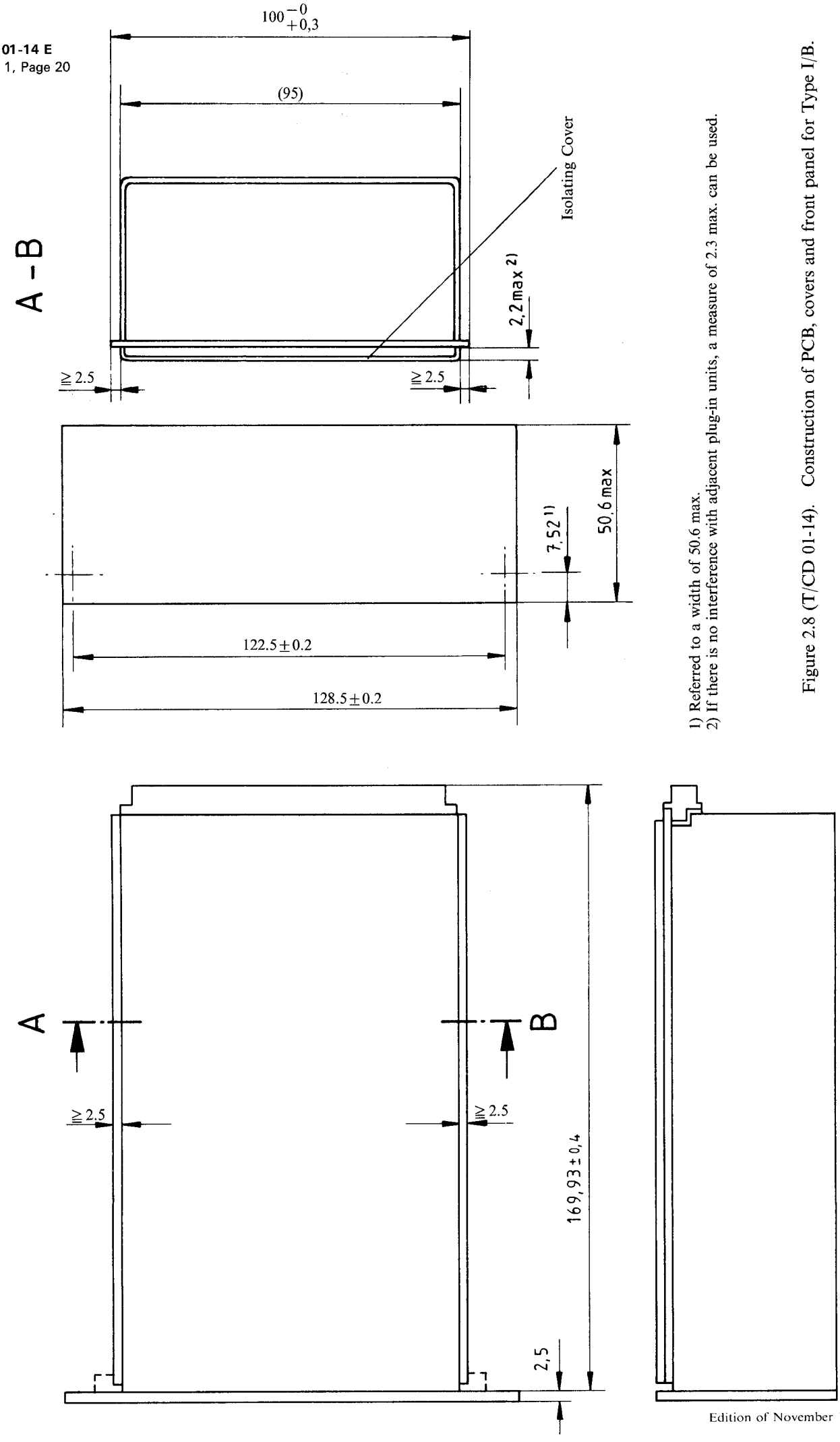
## 2.5 Subrack dimensions

The dimensions of the subracks for the accommodation of Type I and II cards are outlined in Figure 2.11 (T/CD 01-14).



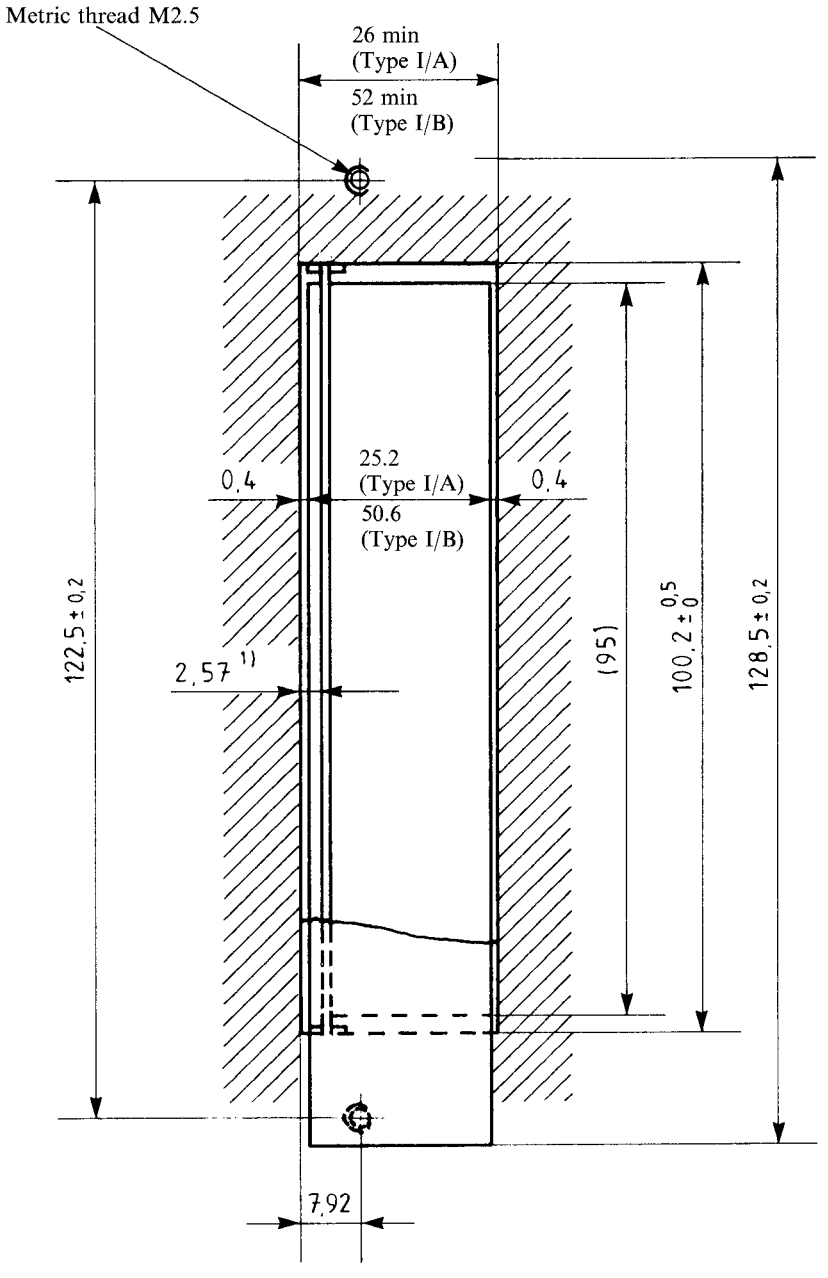

1) Referred to a width of 25.2 max.
2) If there is no interference with adjacent plug-in units, a measure of 2.3 max. can be used.

Figure 2.7 (T/CD 01-14). Construction of PCB, covers and front panel for Type I/A.



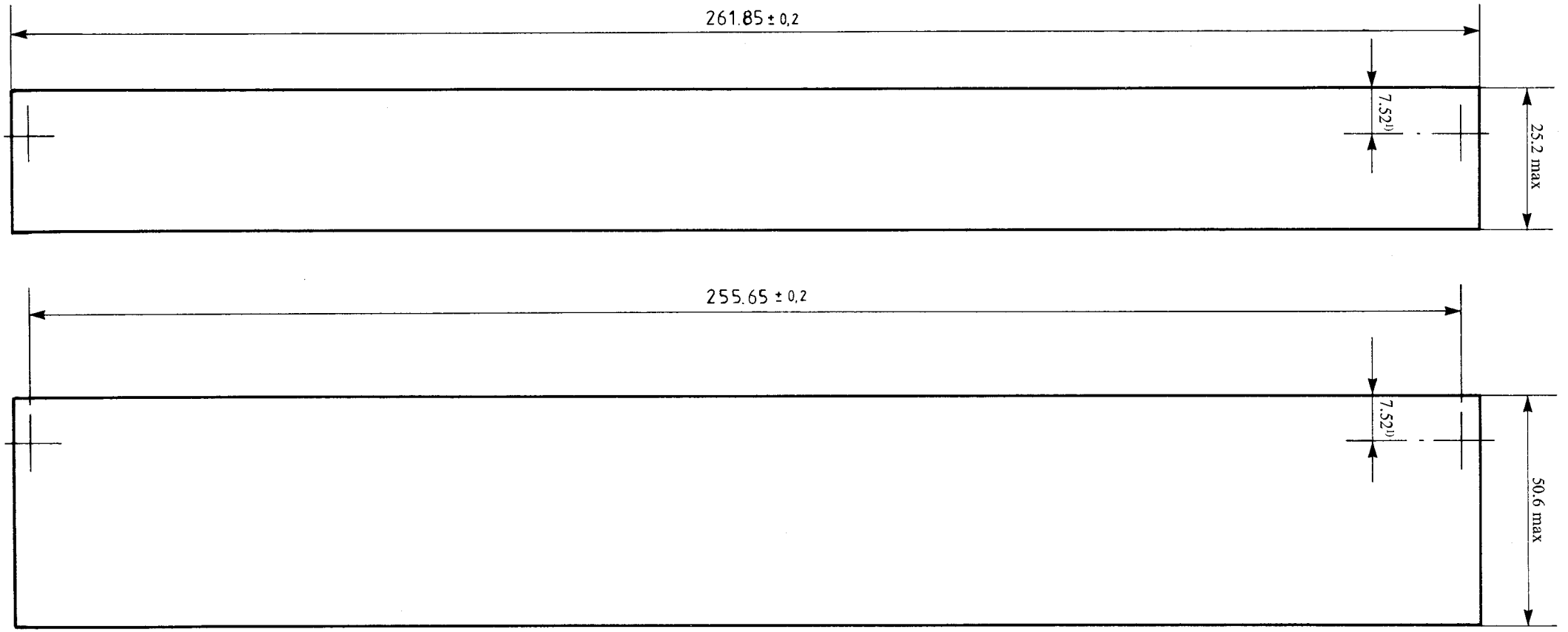

1) Referred to a width of 50.6 max.
2) If there is no interference with adjacent plug-in units, a measure of 2.3 max. can be used.

Figure 2.8 (T/CD 01-14). Construction of PCB, covers and front panel for Type I/B.




1) or 2.67, see Note 2 in Figures 2.7 (T/CD 01-14), 2.8 (T/CD 01-14).

Figure 2.9 (T/CD 01-14). Slot dimensions for Type I/A and Type I/B.




Thickness 2.5 mm

1) See remark 1 in Figure 2.7 (T/CD 01-14).

Figure 2.10 (T/CD 01-14). Front panels for Type II (Examples).

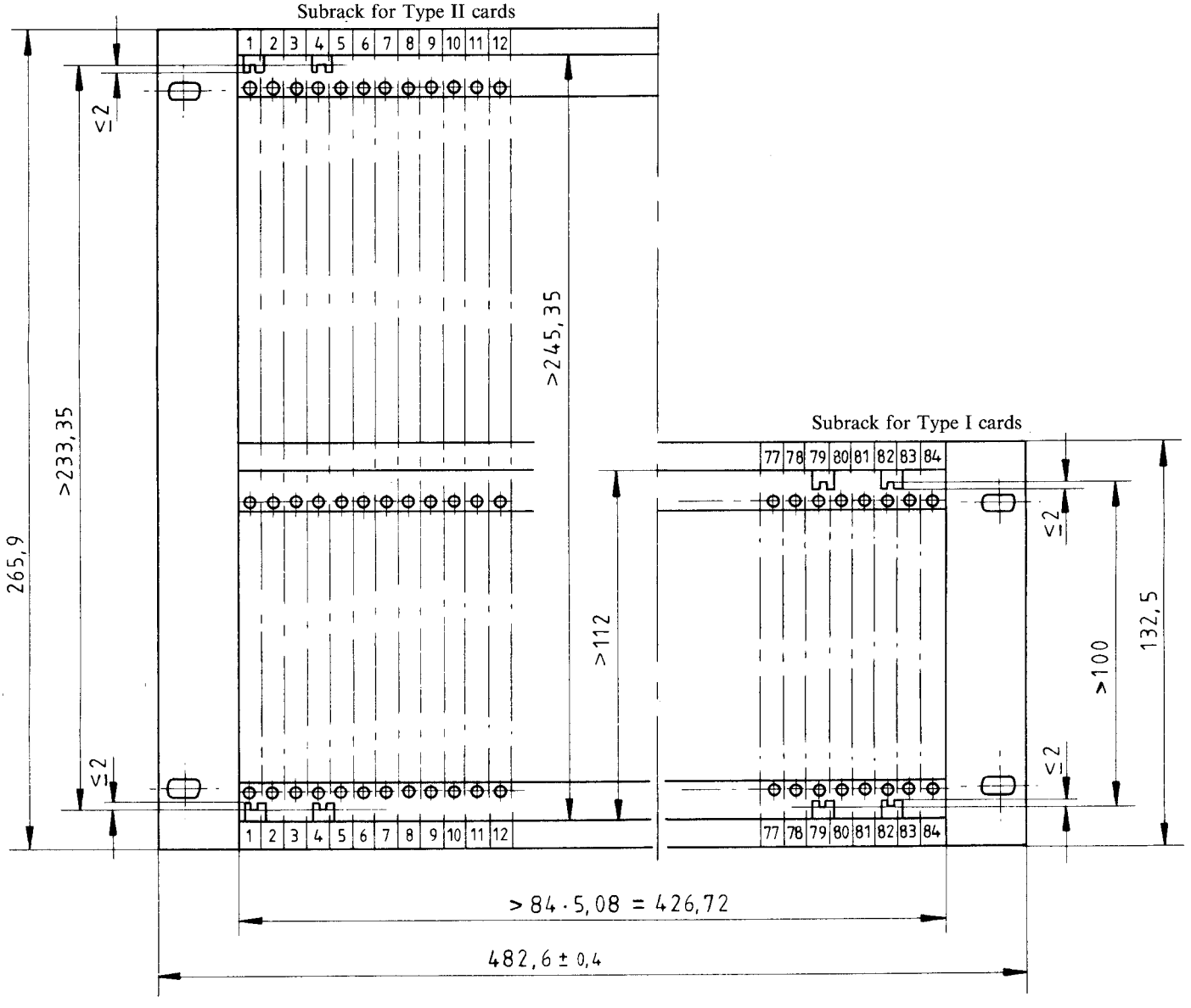
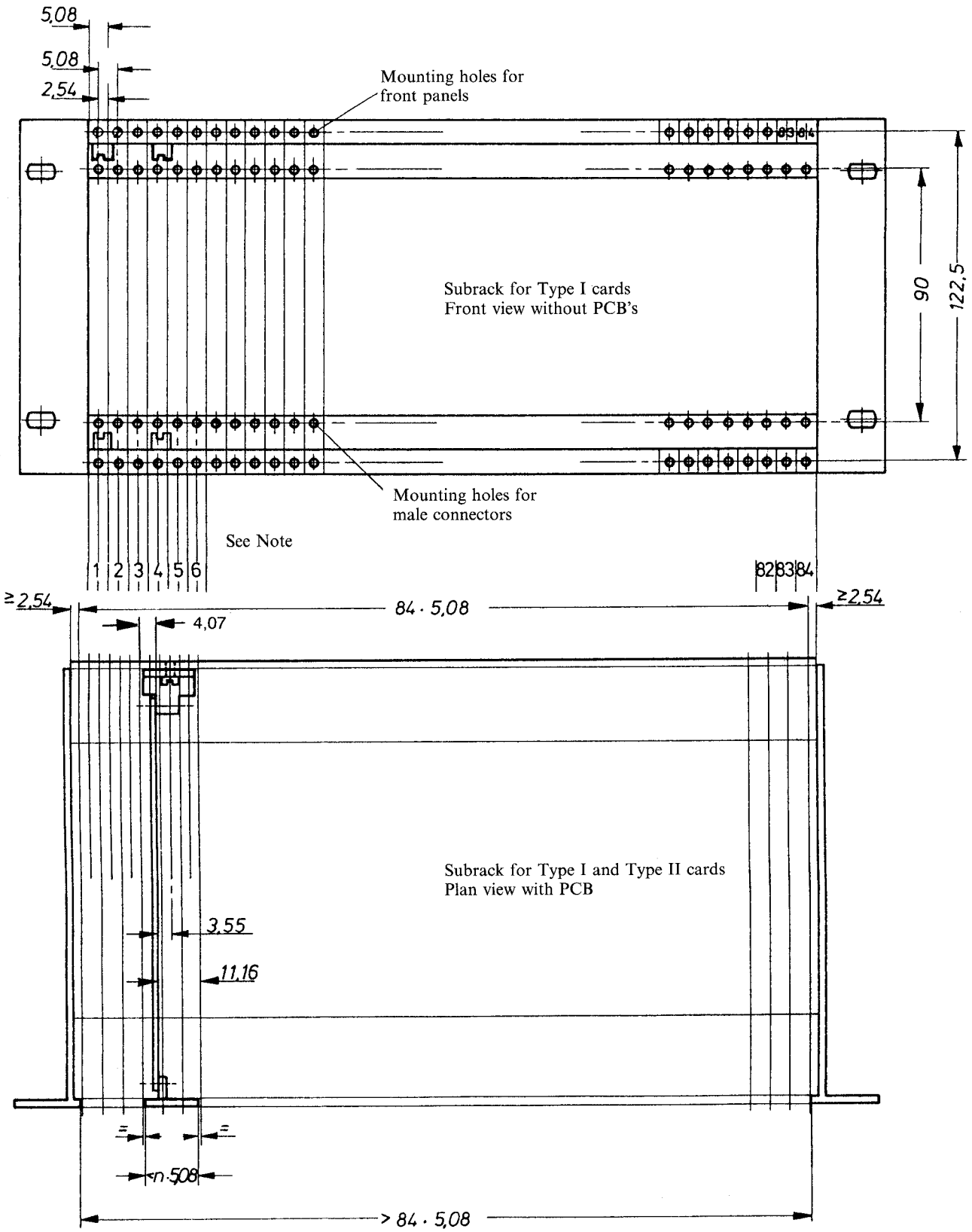
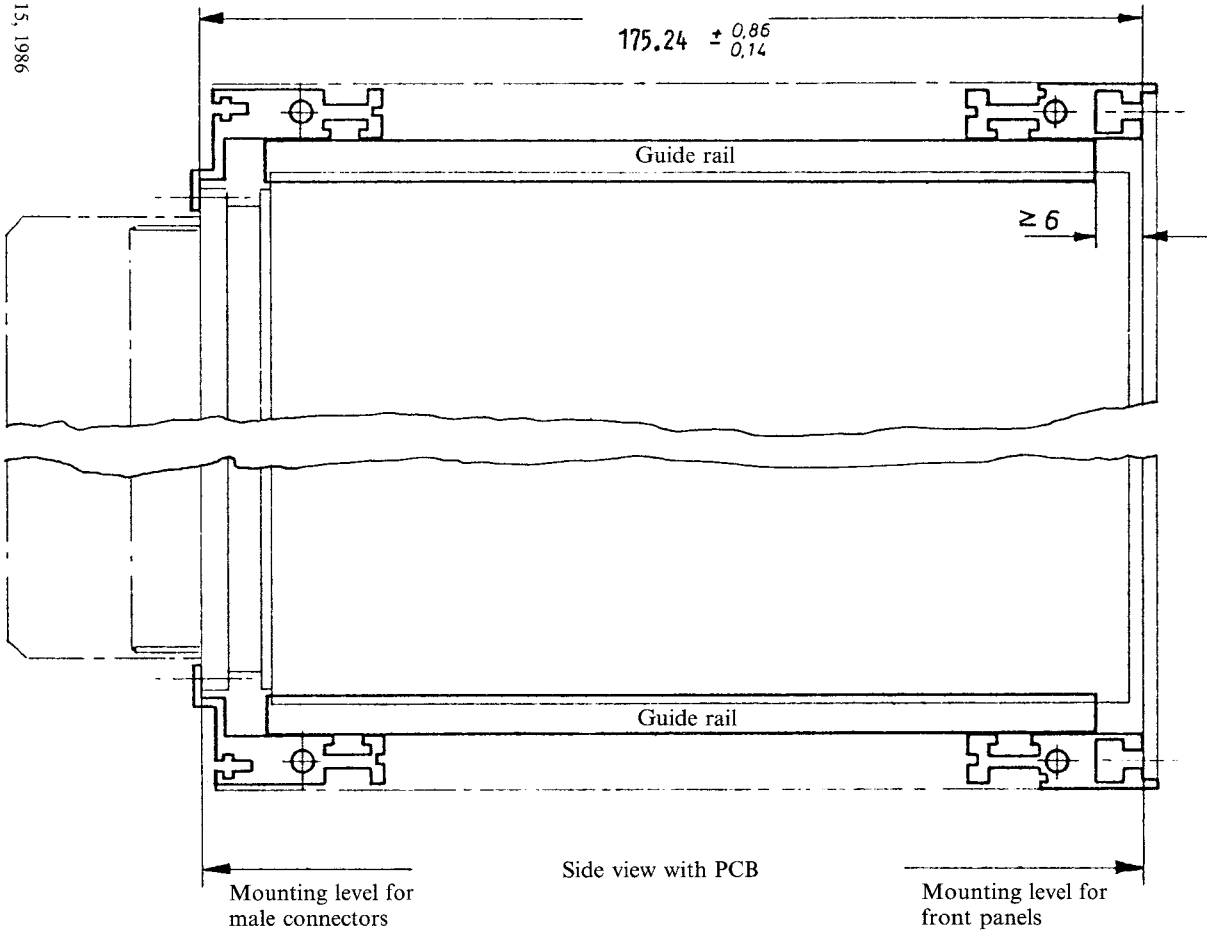


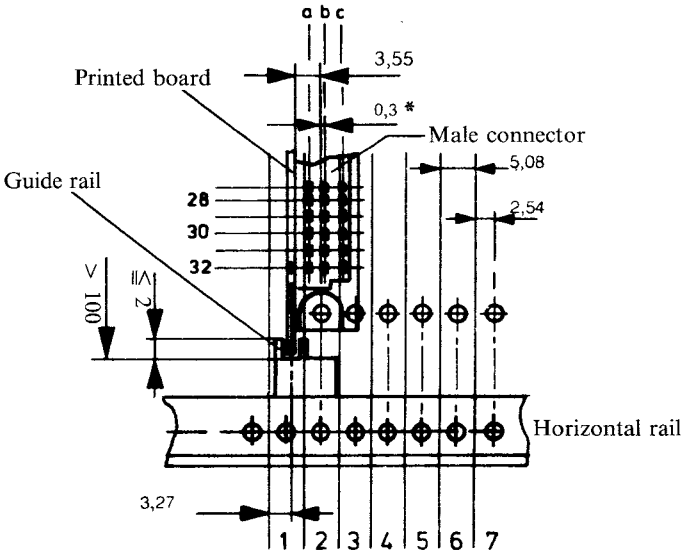

Figure 2.11 (T/CD 01-14). Subrack dimensions.




*Note:* The positions of the guide rails depend on the card spacing.

Figure 2.11 (T/CD 01-14). Subrack dimensions (continued).




Details of a subrack or of a slot of a DTE.
Position of the PCB (shown without connector) and position of the connector of the back-plane.

✱ Measure for DIN connector, see Figure 2.3 (T/CD 01-14).

Figure 2.11 (T/CD 01-14). Subrack dimensions (continued).

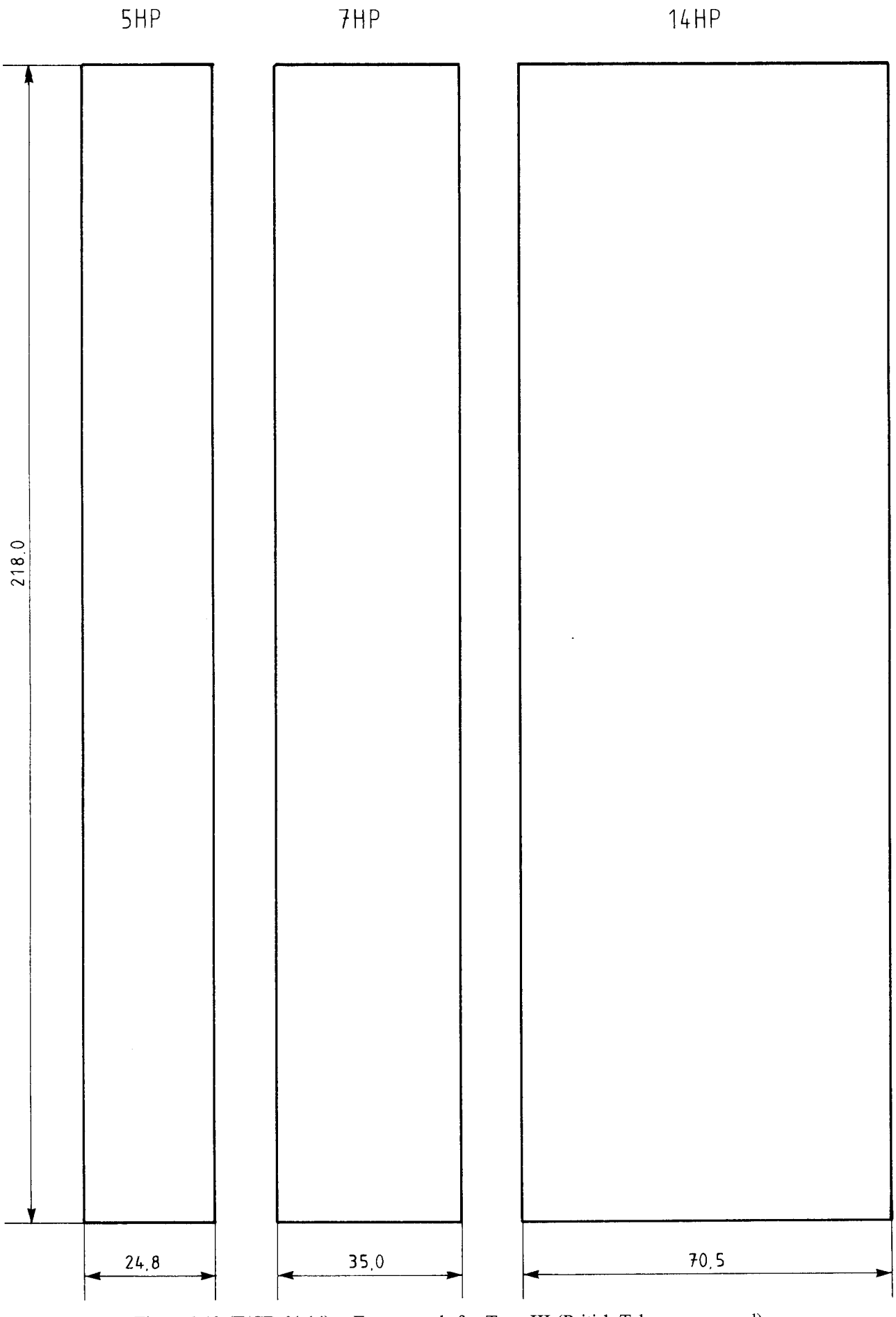



Figure 2.12 (T/CD 01.14). Front panels for Type III (British Telecom proposal).

2.6. **PCB-Coding**

The following coding criteria should be taken into account.

*Types of DCE's:*
— V.-Series
— V.-compatible X.Series
— X.-Series
— Baseband (Inhouse)
— Voice plus Data

*Types of Electrical Characteristics:*
CMOS-TTL compatible
V.28
V.10
V.11
V.12
G.703
National Interface
...

*Types of Power Supply:*
+5 V only
+5 V, −5 V
+5 V, +12 V, −12 V
a.c.
Details are for further study. A possible coding method is given in Appendix 2.

2.7. **Fixing of plug-in units**

For further study.

3. **ELECTRICAL SPECIFICATIONS**

3.1. **Interchange circuits for DCE's plugged into DTE**

When
— the data signalling rate via the interface will not exceed 200 kbit/s,
— the length of the interchange circuits will not exceed 1 m,
— a bus interface is not envisaged,
a LS-TTL-CMOS compatible interface as described below should be used (see Note).

*Transmitter:*
"binary 1" or "OFF" V $\geqslant$ 4.0 volts with load current −0.04 mA
"binary 0" or "ON" V $\leqslant$ 0.4 volts with load current 0.4 mA
risetime $t_r$ $\leqslant$ 500 ns
falltime $t_f$ $\leqslant$ 500 ns.

*Receiver:*
Thresholds
"binary 1" or "OFF" V $\geqslant$ 3.6 volts
"binary 0" or "ON" V $\leqslant$ 0.7 volts.
Load
"binary 1" or "OFF": I $\geqslant$ − 0.04 mA at 4 volts
"binary 0" or "ON": I $\leqslant$ 0.4 mA at 0.4 volts.
Permissible input voltage range: $-0.5$ volts $\leqslant$ V $\leqslant$ 5.5 volts.

The schematic diagram is shown in Figure 3.1 (T/CD 01-14). All measurements are made at +5 V ± 5%. The maximum capacitive load is 50 pF. A short circuit to ground should not damage the device.

Optionnally, also the characteristics as described in CCITT Recommendation V.28 may be applied.

The electrical characteristics of the optional ISO 2110 or 4903 connector are according to V.28 and V.11 respectively.

*Note:* These electrical characteristics provide compatibility between LS-TTL and CMOS integrated circuits if the output of a LS-TTL transmitter is pulled up by means of a resistor connector to the +5 V power supply.

3.2. **Interchange circuits for units plugged into a sub-rack**

The unit when used in a sub-rack may use the electrical characteristics appropriate for the interchange circuits for that type of DCE, e.g. V.28 for V. Series DCE's. Alternatively the TTL-CMOS compatible electrical characteristics as detailed in paragraph 3.1. may be used.

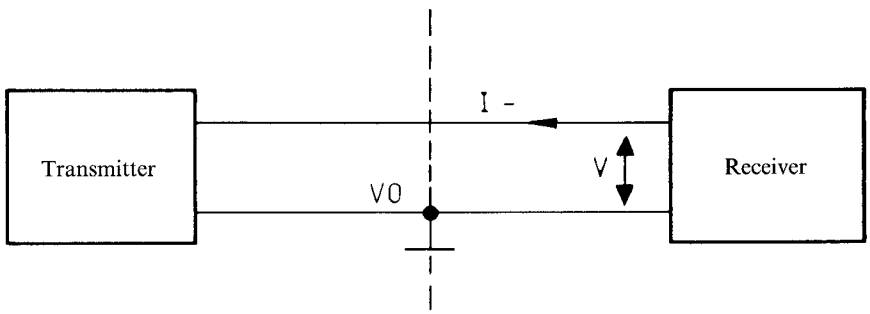



Figure 3.1 (T/CD 01-14). Schematic diagram for LS-TTL CMOS compatible circuits.

3.3. **Power Supply Circuits**

The relevant IEC documents are: IEC 478-1, IEC 478-2, IEC 478-3 and IEC 478-4.

3.3.1. *Power Supply Requirements for Type I cards*

| | Supply Voltage (see Note) | | | |
|---|---|---|---|---|
| Requirement | +5 V | −5 V | +12 V | −12 V |
| Nominal Value<br>− 0.125 V | 5 V<br>+ 0.25 V<br>− 0.25 V | −5 V<br>+ 0.125 V<br>− 0.25 V | +12 V±5% | −12 V±5% |
| Ripple noise below 10 MHz | 100 mVpp | 100 mVpp | 100 mVpp | 100 mVpp |
| Maximum current draw per slot (see 3.3.4.) | | | | |
| Type I/A | 0.6 A | 0.6 A | 0.25 A | 0.25 A |
| Type I/B | 1 A | 1 A | 0.416 A | 0.416 A |

*Reset*

A plug-in unit cannot rely on a specific supply voltage rise- or fall time. The problem of a power-on reset is for further study.

*Combined operation*

In cases of breakdown of any supply voltage or of different start up times of different supply voltages, a plug-in unit must not be damaged.

*Note:* The single power supply of +5 V is preferred.

3.3.2. *Power Supply Requirements for Type II cards*

The power supply for Type I/B and Type II cards shall be d.c. supplies of ± 5 V and ± 12 V. The use of a.c. supplies is for further study.

3.3.2.1. D.C. Power Supply Requirements for Type II cards

| | Supply Voltage | | | |
|---|---|---|---|---|
| Requirement | +5 V | −5 V | +12 V | −12 V |
| Nominal Value | 5 V<br>+ 0.25 V<br>− 0.125 V | −5 V<br>+ 0.125 V<br>− 0.25 V | +12 V ± 5% | −12 V ± 5% |
| Ripple noise below 10 MHz | 100 mVpp | 100 mVpp | 100 mVpp | 100 mVpp |
| Maximum current draw per slot (see 3.3.4.) | | | | |
| Type II/A | 1.2 A | 1.2 A | 0.5 A | 0.5 A |
| Type II/B | 2.4 A | 2.4 A | 1.0 A | 1.0 A |

*Reset*

A plug-in unit cannot rely on a specific supply voltage rise- or falltime. The problem of a power-on reset is for further study.

*Combined operation*

In cases of breakdown of any supply voltage or of different start up times of different supply voltages, a plug-in unit must not be damaged.

3.3.2.2. A.C. Power Supply Requirements for Type II cards

For further study.

3.3.3. *Power Supply Requirements for Type III cards*

The power supply for type III cards may comprise d.c. supplies of ± 5 V, and ± 12 V, or may be a.c. supplies such that d.c. supplies of ± 5 V and ± 12 V may be derived on the card. Details of these supplies are for further study.

3.3.4. *Power dissipation (see Note)*

The following maximum permissible power dissipation is recommended. In cases where higher values cannot be avoided, special precautions for cooling may be required.

Type I/A 3 watts
Type I/B 5 watts
Type II/A 6 watts
Type II/B 12 watts
Type III 20 watts

*Note:* It is the aim to reduce these values. For some applications where cards are rack mounted (e.g. T/TR 02-01 type B racks) lower values may be required.

3.4. **Line circuits**

*Reference:* CEPT T/CD 01-01.

## 4. OTHER PHYSICAL SPECIFICATIONS

### 4.1. Environmental specifications

4.1.1. *Climatic Environment*

*References:* IEC 721-3-3, Class 3K3; CEPT T/TR 02-03; CEPT T/CS 34-06.

4.1.1.1. Climatic conditions during operation

For all types of plug-in units the climatogram shown in Figure 4.1 (T/CD 01-14) shall be taken into account. This climatogram applies to a permanently temperature controlled enclosed location.

*Special conditions for plug-in units inside DTEs:*

The temperature inside a DTE in the environment of the plug-in unit must never exceed 55 °C, if the unit is in operation and dissipates no more power than specified in 3.3.4. Heat radiation at the location of the plug-in unit from parts of the DTE to the unit must be avoided.

4.1.1.2. Climatic conditions during transport

For all types of plug-in DCEs, the climatogram shown in Figure 4.2 (T/CD 01-14) should be taken into account.

4.1.1.3. Climatic conditions during warehousing

For all types of plug-in DCEs, the climatogram shown in Figure 4.3 (T/CD 01-14) should be taken into account.

4.1.2. *Electromagnetic Compatibility (EMC)*

This is for further study.

The results of CISPR will be referenced when the work is finished. (CEPT Draft Recommendation to be expected by 1986 from TR 2.)

The radio interference requirements given by the Administration must be fulfilled by the Data Station (DTE plus plug-in DCE).

4.1.3. *Local Environment*

4.1.3.1. Mechanical Conditions

*References:* CEPT T/TR 02-03; IEC 721-3-3, Class 3M1.
CEPT T/TR 02-06; IEC 721-3-3, Class 3M3.

For plug-in units which are intended to be used at telecommunication centres only, the mechanical conditions (stationary vibration shock) specified in CEPT T/TR 02-03 shall apply. For plug-in DCEs which are intended to be used at the subscribers premises, the mechanical conditions (stationary vibration, shock) specified in CEPT T/TR 02-06, column "Normal conditions" shall apply.

4.1.3.2. Additional Mechanical Conditions for Plug-in DCEs used inside DTEs

Specifications concerning accessibility, safety etc. are for further study.

## 4.2. Mechanical Reliability

To ensure the performance of all requirements concerning mechanical reliability, a plug-in unit with covers should be tested according to the following specifications. The test requirements of all other units are for further study.

4.2.1. *Bump*

*References:* IEC 68-2-29, Testgroup E, Test Eb: Bump
DIN 40046, Teil 26.

All plug-in units with covers must sustain the following test without damage:

Bump duration: 16 ms (halfwave).
Acceleration: 10 g.
Total number: 50 bumps for each of the two directions of each of the three axes.

4.2.2. *Vibration*

*References:* IEC 68-2-6, Testgroup F: Vibration
DIN 40046, Blatt 8.

All plug-in DCEs with housing must sustain the following test without damage:

Frequency range: 10 Hz ... 150 Hz.
Acceleration: 1 g (max.).
Duration: 2 cycles of 15 minutes.

## 4.3. Materiel specifications

For further study.

## 4.4. Safety Requirements

*Reference:* CEPT T/CD 04-03 (1985) or ECMA 83 2nd edition, T/CD 01-01.

# 5. OPERATIONAL SPECIFICATIONS

For further study.

*Climatogram for operation indoor rooms (E.G. station, switching centre)*

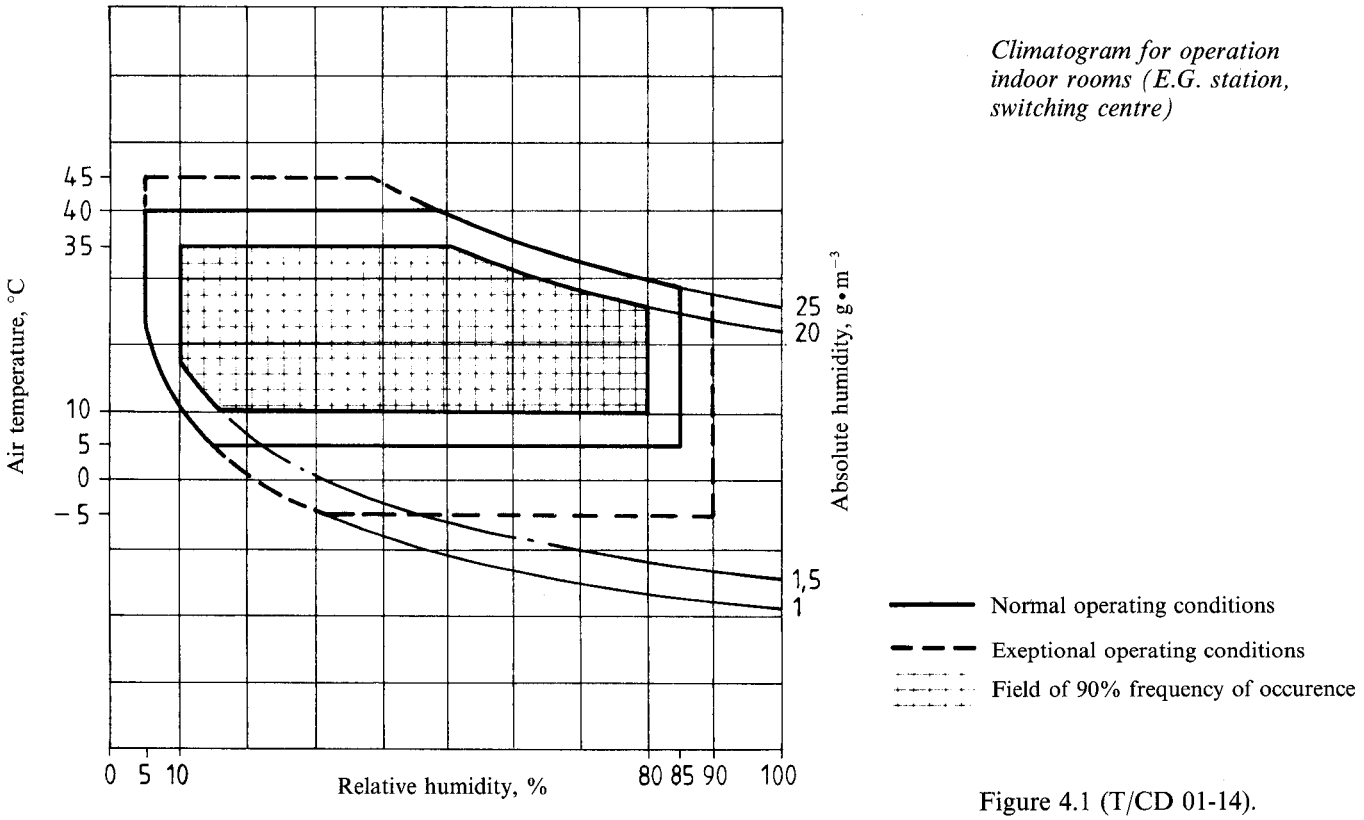



Figure 4.1 (T/CD 01-14).

*Climatogram for transport*
(within the entire geographical area of Europe)

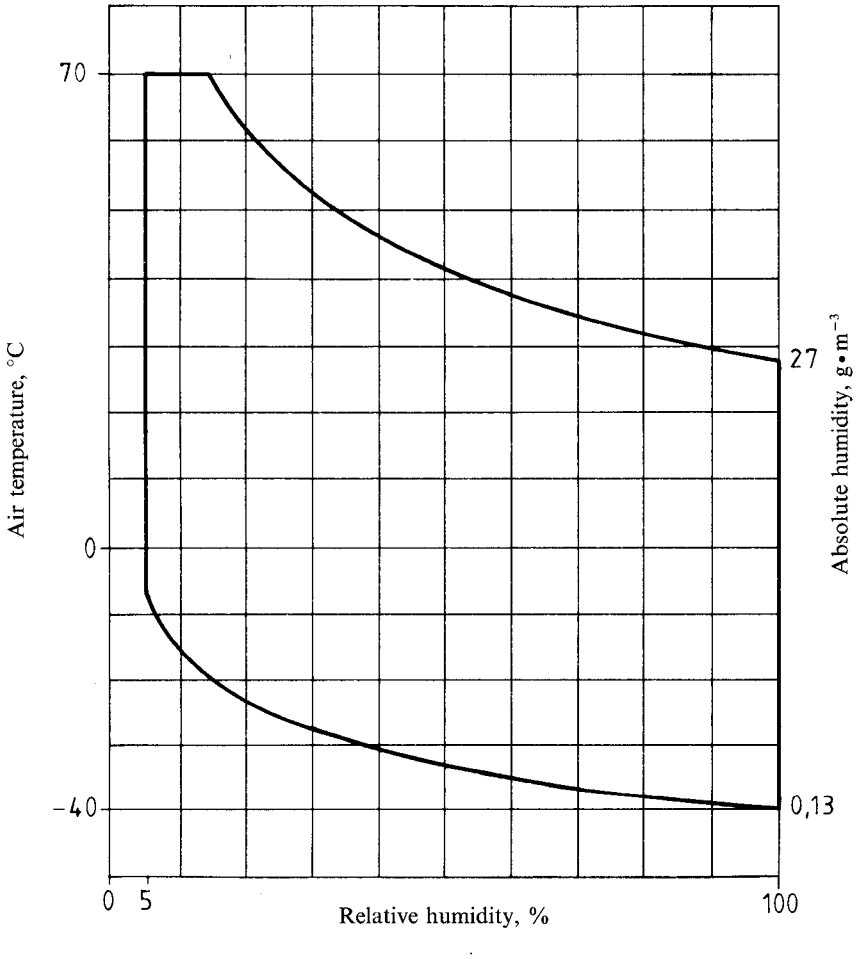



Figure 4.2 (T/CD 01-14).

*Climatogram for warehousing*

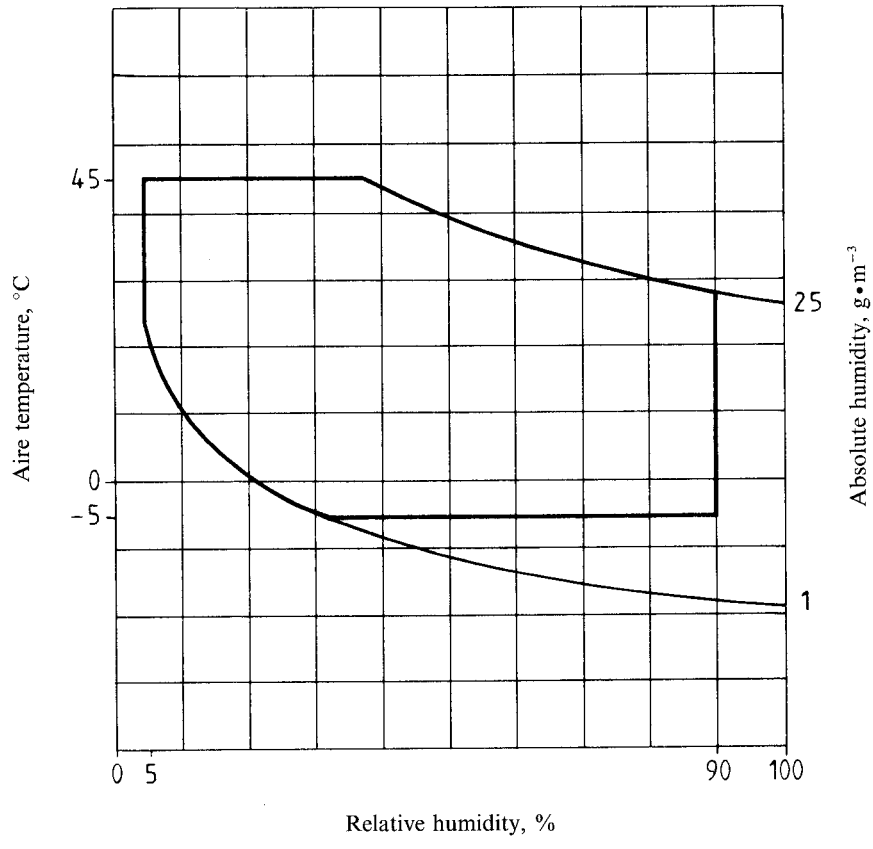



Figure 4.3 (T/CD 01-14).

## Appendix 1

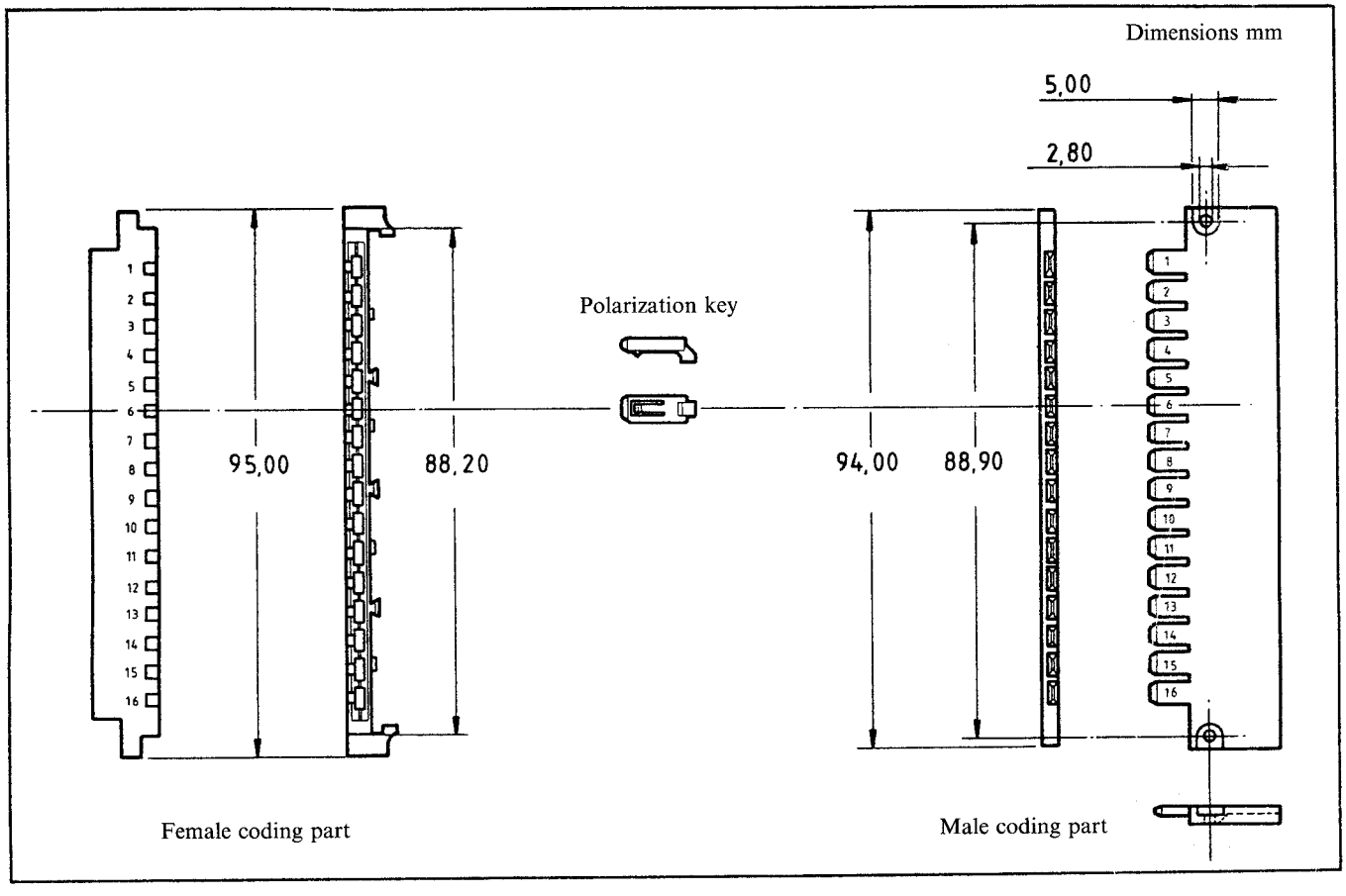
*Design objectives of the Type I and II PCB connector*

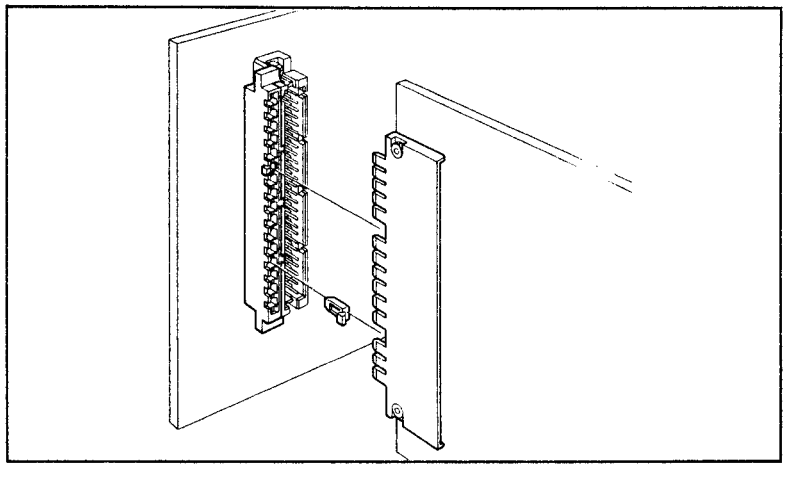
The following design objectives have been taken into account:

— One pin allocation f or Types I and II DCEs.
— Inverted pin assignment.
— Subdivision of the connector into 3 sections which can be accessed separately from the rear of the backplane by sub-connectors:
  — power supply section
  — interchange section
  — line section
— Pins of the power supply section are clustered at one end to enable the use of bus bars.
— 0 volt pins are located at the outermost ends of the connector to provide good grounding during card insertion.
— Pin assigment of the interchange section is provided to allow ribbon cable assemblies towards an ISO 2110 connector.
— Row "b" can be used for special functions.
— Pin arrangement of the line section is provided to achieve minimum spacing of approx. 3.5 mm.
— The pin allocation of the line section depends on the application.

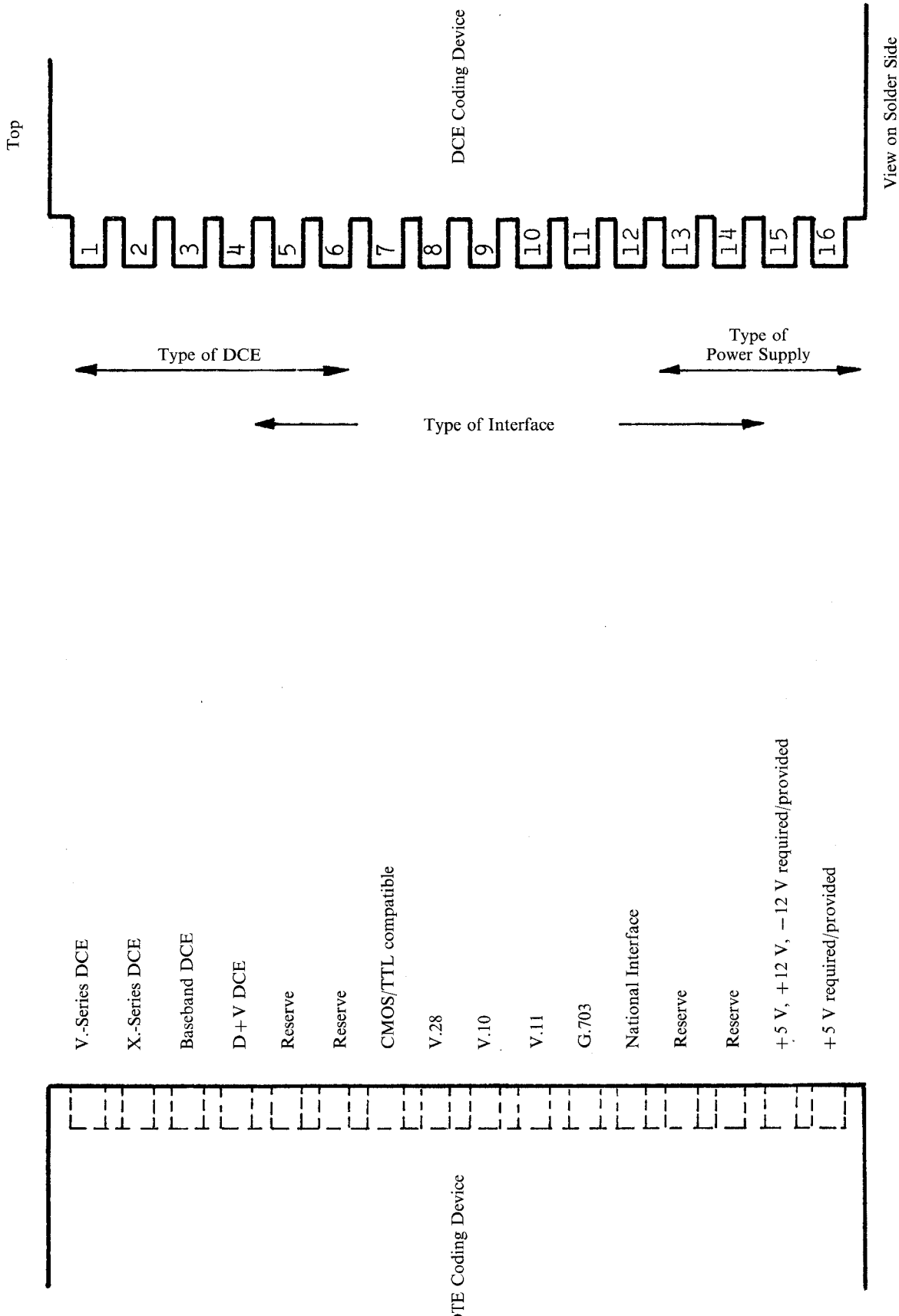
## Appendix 2

*Example for a PCB coding system*



*Note:* Compatible coding systems to this system are available from various manufacturers.




Proposal for a Coding Scheme for Type I Plug-in DCEs