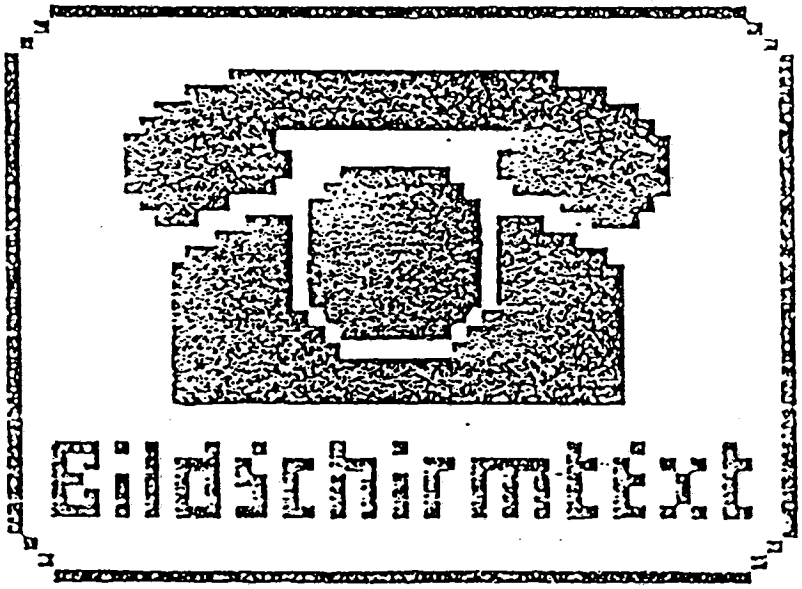
FTZ
157 D2 E

Functional Specification for Bildschirmtext Terminals



Deutsche Bundespost
Fernmeldetechnisches Zentralamt
Section T25
Version December 1983

FTZ
157 D2 E

Functional Specification for

Bildschirmtext Terminals

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Section T25
Version December 1983

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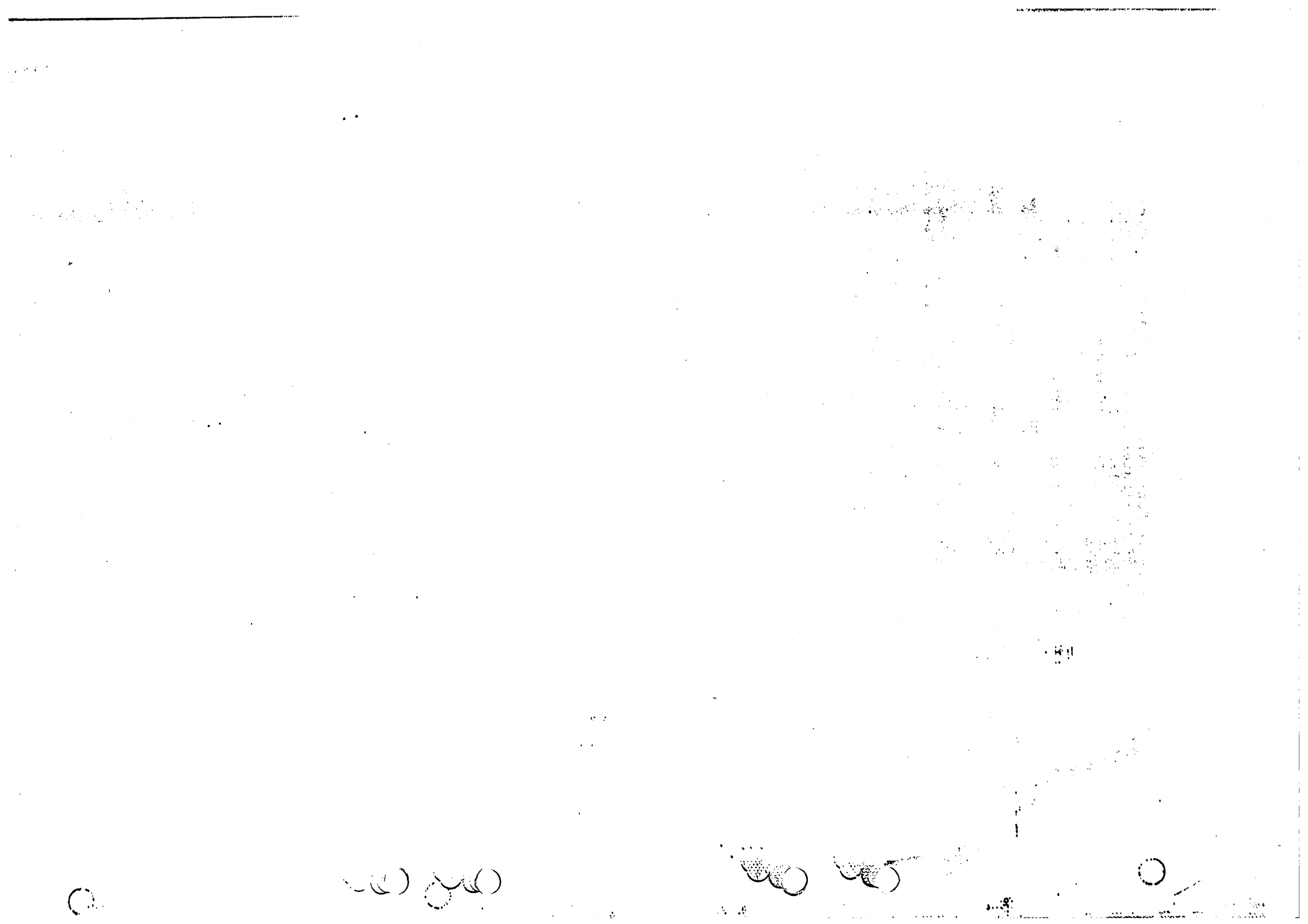

1.0 PREAMBLE

This document "Functional Specification for Bildschirmtext (BTX) Terminals" is the follow-on document to "Specification of a Basic Videotex Terminal operating to the European Videotex Service", published by FTZ T 24-1, Darmstadt.

The "Functional Specification" is available in form of a "loose-sheet-binder" and is kept up-to-date by additions and amendments which, if of a technical nature, will be issued by Sub-working Group 1 "Standardization of Bildschirmtext".

This document has been published and released in the "Amtsblatt des Bundesministers fuer das Post- und Fernmeldewesen" (Official Gazette of the Federal Minister of Posts and Telecommunications).

In addition new sections or new versions will be announced in the "Amtsblatt des Bundesministers fuer das Post- und Fernmeldewesen".

This is the second version of the document. It contains some error corrections and a number of amendments to the first version.

Corrections concerning technical issues, which have already been published within the Subworking Group 1 "Standardization of Bildschirmtext", are additionally listed in Annex 1.7.

The amendments mainly concern Chapters 2.7, 3.6, 11, 12 and a number of annexes have been added.

While most annexes contain additional clarifications and examples the Annexes 7 to 9 are of a different kind.

Annex 7 gives a survey of the presentation level options which may be incorporated in terminals more sophisticated than the basic terminal. Annexes 8 and 9 give additional information for editing terminals. The documents mentioned in these Annexes may be seen as an integral part of this specification but, are issued separately to persons asking for them explicitly.

For terminal manufacturers a layer 6 test concept which allows to check the correct processing of the functions is provided by the Deutsche Bundespost. The procedure of accessing the test data base will be announced.

Copies of the "Functional Specification for Bildschirmtext Terminals" can be obtained from the "Druckschriftenverwaltung" (publications office) of the Fernmeldetechnisches Zentralamt.

A fee of DM 20.-- is payable for the document. The fee covers all Annexes. Updates will be distributed automatically to the owners of this document until a complete new version is announced.

Formal responsibility for the compilation and updating of the document lies with the Fernmeldetechnisches Zentralamt, Referat T25, Postfach 50 00, D-6100 Darmstadt, Federal Republic of Germany.

2.0 GENERAL

2.1 PURPOSE AND SCOPE OF THIS FUNCTIONAL SPECIFICATION

The purpose of this document is to enable manufacturers of Bildschirmtext terminals to design terminals capable of displaying the offered information pages in a functionally correct manner.

Additionally, all electrical, mechanical and functional requirements to which terminals intended for the basic Bildschirmtext service must conform to obtain certification, are defined.

While the electrical and mechanical requirements are mainly specified in regulations of other organisations and bodies and have been included in this document for information only, the functional requirements are described in detail particularly in Chapters 4, 8 and 9. The decoder must be capable of processing these functions which correspond to the facilities of the Bildschirmtext service. This document does not contain any specifications as to the variations in representation on the screen brought about by the design and quality of the display elements nor does it contain any regulations regarding the subjective assessment of the display characteristics.

Furthermore, this document does not affect any of the legal conditions for the use of telecommunication equipment specified in other official publications/regulations.

The minimum functions to be implemented in Bildschirmtext terminals are described. Manufacturers are free to incorporate additional functions, if they so wish.

Editing terminals comprise additional functions which are dealt with in Chapter 9, 10 and Annexes 8 and 9.

2.2 STRUCTURE OF THE BILDSCHIRMTEXT SERVICE

The Bildschirmtext service of the Deutsche Bundespost which conforms to the CEPT standard has the following structure:

1. User terminals for the retrieval of information, the input of replies and the generation of messages for the message service, and editing terminals for information providers. There are privately owned terminals and Deutsche Bundespost-owned public terminals.

2. Local Btx Exchanges supply regional users with pages stored in the database and are equipped with ports to both the user system and the message service. The Exchanges are also provided with the gateway function for access to external computers and with an editor for the editing of pages. The local Exchange automatically forwards the pages to the Btx control centre.

3. Btx control centre with the centralized database for all pages and user records.

4. External computers with databases for transaction processing or internal Btx applications.

Following editing facilities are provided:

- On-line Editor of the Btx Exchange which allows for

  - composition of pages by single character input by the user

  - transfer of precomposed pages to the Btx Exchange as datablock.

  On-line editing employs the reflected copy mode (75 or 1200 bits/sec).

- Bulkupdating which allows for automatic input of pages to the database without user guidance (Annex 9) employing the error correction procedure described in Chapter 4 (75 or 1200 bits/sec).
  Pages edited in bulk update format may also be delivered to the Deutsche Bundespost in form of a magnetic tape (Annex 9).

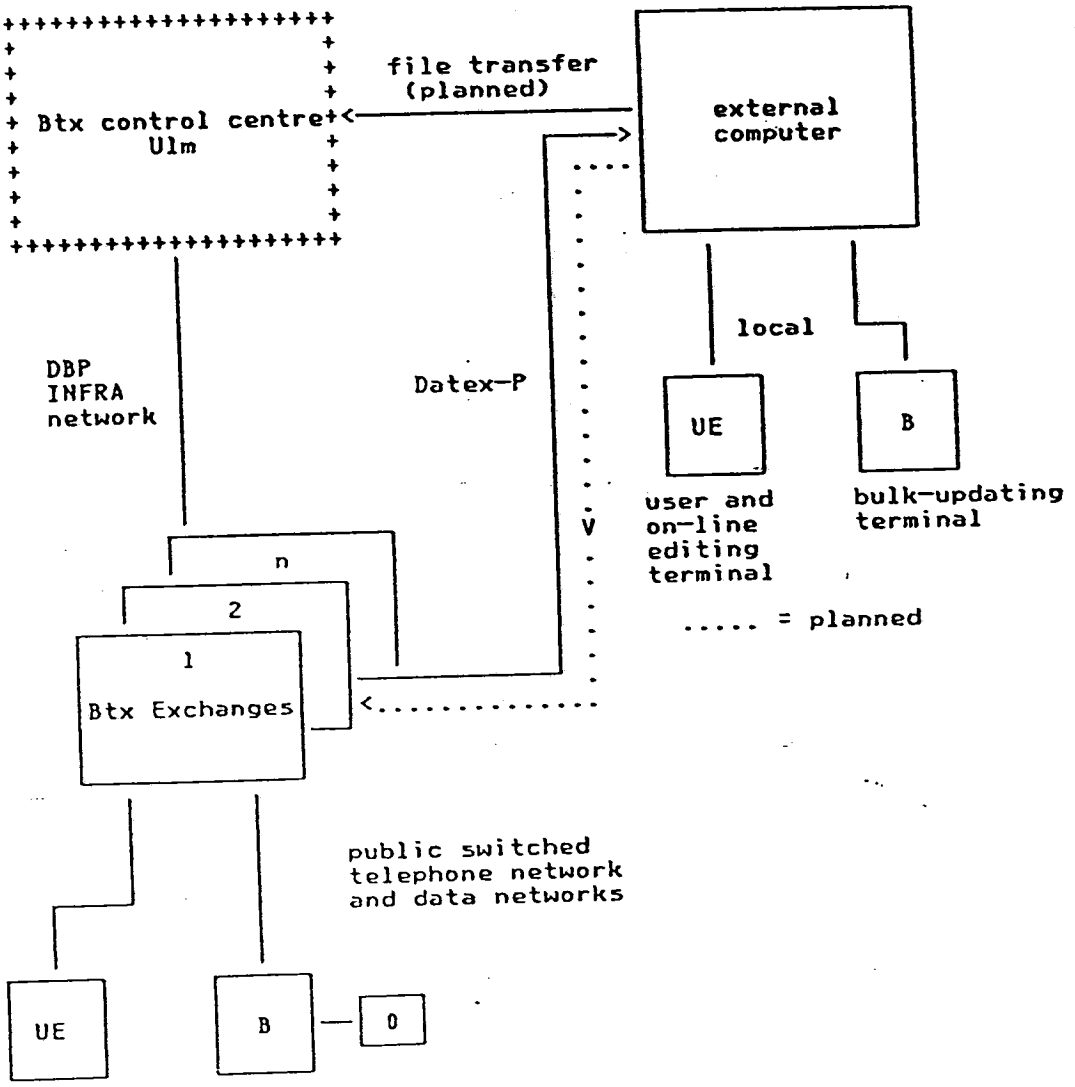
Btx control centre
Ulm
file transfer
(planned)
external
computer
DBP
INFRA
network
Datex-P
local
UE
B
user and
on-line
editing
terminal
bulk-updating
terminal
V
n
2
1
Btx Exchanges
..... = planned
public switched
telephone network
and data networks
UE
B
0

Figure 2.7-1

2.3 INTERFACES BETWEEN TERMINALS AND BTX EXCHANGES

1. Attachment to the public switched telephone network.
2. Attachment to the circuit-switched network Datex-L.
3. Attachment to the ISDN.

Terminals in the public switched telephone network are connected by means of modem D-BT03 (1200/75, dx), D-1200S (1200/75, dx) or D-1200S10/12 (1200/1200, dx).

Attachment to the circuit-switched network Datex-L and to the future ISDN are planned for a later date. Specifications will be included later.

In a later phase of implementation it is envisaged to provide the Btx control centre with an interface permitting file transfer as bulk update from intelligent editing systems or external computers.

2.4 COMPATIBILITY WITH OTHER SERVICES

The Btx service employs the European Videotex Standard as described in CEPT Recommendation "Videotex Presentation Layer Data Syntax" (T/CD 6-1).

2.4.1 OTHER INTERACTIVE VIDEOTEX SERVICES

- Prestel

  Prestel is a subset of the CEPT standard and upward compatibility with Btx is therefore given. British Telecom is planning to adopt the CEPT standard.

- Teletel

  Teletel is a subset of the CEPT standard. Upward compatibility with Btx is given.

- Viditel

  Viditel largely corresponds to Prestel and is a subset of the CEPT standard. Upward compatibility with Btx is given.
  Adoption of the CEPT standard is planned.

- Experimental systems and running services in other European countries

  In many other European countries, trials are performed or Vidoetex services in operation with systems based on Prestel. Consequently, upward compatibility with Btx is given. Since the CEPT standard is supported by all countries, it is expected that it will be adopted when the service is introduced or extended.

- North America

  Several systems with different standards are undergoing tests; NAPLPS is expected to become a largely uniform standard, it is not compatible with the CEPT standard, only the character sets are partly compatible.

2.4.2 OTHER SERVICES

- Teletex

  The teletex character repertoire is a complete subset of the Btx character repertoire, hence upward compatibility is given. The control characters and the functions are dissimilar owing to the difference in service requirements. Interworking between the services by means of protocol conversion is planned.

- Broadcast videotex

  Broadcast videotex (corresponds to the Btx field trial) is a subset of the CEPT standard.

  Adoption of the presentation layer of the CEPT standard is planned.

2.3 INTERFACES BETWEEN TERMINALS AND BTX EXCHANGES

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  Adoption of the presentation layer of the CEPT standard is planned.

2.5 MINIMUM REQUIREMENTS FOR BTX TERMINALS

The following facilities must be incorporated in all Btx Terminals:

- Format: 20 or 24 rows x 40 characters
- Presentation techniques and functions as described in Chapter 8 unless explicitly marked as optional
- Character repertoire
  - 335 ISO-registered characters (alphanumeric and others)
  - 151 mosaic and other characters for pictorial representation
  - A maximum of 94/84 dynamically redefinable characters
  - 1 fallback character
- Attributes
  - 32 foreground colours (incl. transparent)
  - 32 background colours (incl. transparent)
  - 4 character sizes
  - underlining
  - window
  - conceal
  - invert
  - flash (steady and 18 different modes)
  - marked area
  - protected area
- Functions
  - scrolling
  - formatting
  - downloading and invocation of colour palettes
  - downloading and invocation of characters (DRCS)
  - reveal (local function)
  - automatic wraparound control
  - reset functions
- Control Characters
  - basic control character set (C0)
  - 2 attribute control character sets (serial and parallel (C1))
- Decoder architecture

  The architecture is freely selectable. Terminals used for the editing of Btx pages must follow the rules of the reference terminal with stack architecture.

- Keyboard functions according to Chapter 3.4.1
- Data link protocol according to Chapter 4.1 or 4.2
- Interface for modem D-BT03 (75/1200 bauds, dx) or other modems according to Chapters 3.2 and 3.3 or Datex-L interface.
- Colour screen or RGB interface.

2.6 PROTOCOL STRUCTURE OF BTX TERMINALS

In conformity with the architectural model of ISO for Open Systems Interconnection (OSI acc. to ISO 7498), the individual functions of Btx Terminals can also be subdivided into 7 layers with the corresponding protocols:

- Physical protocol (layer 1)
- Data link protocol (layer 2)
- Network protocol (layer 3)
- Transport protocol (layer 4, not applicable)
- Session protocol (layer 5, not applicable)
- Presentation protocol (layer 6, here only for the data syntax)
- Application protocol (layer 7)

2.7 CLASSES OF TERMINALS AND OPTIONAL FUNCTIONS

2.7.1 CLASSES OF TERMINALS

In accordance with the purpose for which they have been designed, Btx Terminals fall basically into 2 categories:

- user terminals
- editing terminals.

User terminals are terminals used for the information, dialogue and message services and differ in type and scope of their design and also as to whether they are used for commercial CRT-equipped workstations. In the latter case, they shall conform to the "Sicherheitsregeln fuer Bildschirm-Arbeitsplaetze im Buerobereich" (safety regulations for CRT-equipped workstations in offices, see the references in Chapter 12).

Editing terminals are terminals used for editing and transmission of pages. They can consist of user terminals additionally equipped with editing facilities or be designed exclusively for editorial work. They operate with the same modems, link protocols, etc. as user terminals but are employed only by information providers.

Classes of editing terminals:

Editing terminals are subdivided in the following classes which may be combined:

1. Editing terminals for page editing with user guidance.

   By means of these terminals pages may be edited

   - on-line employing the on-line editor of the Btx Exchange or
   - off-line. In this case the page contents are transmitted as a block of data to the Btx Exchange under control of the on-line editor.

2. Bulk update devices for page editing without user guidance.

   By means of these terminals pages may be edited off-line and transmitted to the Btx Exchange employing the bulk transfer mode (see bulk update procedure, Annex 9).

All terminal classes must principally conform to the minimum requirements according to Chapter 2.5 when they are capable to access to pages in the Btx system.

Terminals fulfilling the minimum requirements are termed "BTX basic terminals" to illustrate that adherence to the minimum requirements guarantees all users a uniform basic service.

Bulk update devices which operate exclusively in bulk transfer mode need not conform to the minimum requirements for layer 6. These terminals may reduce the layer 6 facilities as required by the application. As far as these facilities are covered by the minimum requirements and/or standardized options described in this document or in CEPT Recommendation T/CD 6-1 they must conform to the corresponding descriptions.
These terminals must also process all information required for the log-on dialogue and editing dialogue in the correct manner (See service handbook for Btx).

2.7.2 OPTIONAL FUNCTIONS

Terminals have a certain freedom of choice and can therefore adjust the implementation of their protocol layers to the functional requirements and technical attachment prerequisites.

The freedom of choice given covers

- options described in this document as "standardized option" to which, if implemented, strict adherence to the specification is mandatory.
- options described or referred to in this document as "recommended options" to which strict adherence to the specification is therefore not mandatory but which are expected to have a normative effect.
- "other options" not mentioned in this document but which may be implemented in conjunction with specific applications without affecting the general Btx service.

For facilities used interactively (not only locally) in the BTX system, a terminal facility identifier is defined on the system side and a specific error code on the terminal side (see. Chapter 4.1).

The following table provides an overview of the functions in terms of the protocol layers.

	Layer 1/3	Layer 2
Standardized option and minimum requirements	Interface for ▪ -Modem DBT03 1) -Modem D1200S -Modem D1200S10/12 -Datex-L (later) -ISDN (later)	Layer 2 Protocol for ▪ -1200/75 bit/dx 1) -1200/1200 bit/dx (asynchronous, BSC-based) •with autom. blockrepetition (receive buffer available) •without autom. blockrepetion (receive buffer not available) •file transfer -2400/2400 Datex-L (synchron., HDLC based) (later) -ISDN (later)
Recommended option	Interface for -cassette recorder -external videomonitor -printer (later) -floppy disc, videodisc, chip card (later) -user keyboard	
Other options	Interface for -editing facilities -other supplementary equipment (e.g. personal computer) -videosynchronisation	

1) The facilities marked with ▪ represent minimum requirements for user and editing terminals which are used for information retrieval. Other layer 1/3 and layer 2 protocols may be implemented alternately or additiona (inclusive or).

Table 2.7-1a

	Layer 6	Layer 7
Standardized option and minimum requirements	▪ -All presentation functions ref. to Chapter 8 ▪ -Character repertory ▪ -Functions ▪ -Attributes ▪ -Formats ▪ -Control characters (sequences) ▪ -Protocol structure ▪ -Downloading procedures -Geometric Option ref. T/CD 6-1 (protocol with various functional levels) -Photographic option ref. T/CD 6-1 (protocol) -Transparent data	▪ Numeric keyboard with functions -Initiator * -Terminator # -Attributes not active -Reveal -Call set up -Call clearing -Editing facilities (on-line or off-line with bulk transfer mode)
Recommended option	-Extension of the presentation functions ref. CEPT T/CD 6-1 for •alphamosaic mode •formats •downloading procedures -Other presentation procedures ref. T/CD 6-1: •photographic (later) •others (later)	
Other options	-Other presentation and/or coding procedures not contained in the CEPT T/CD 6-1 Recommendation -Representation (e.g. for monochrome displays)	In-/output functions for users and edit functions (e.g.: break key, control key)

1) The facilities marked with ▪ represent minimum requirements for user and editing terminals which are used for information retrieval.

Note: For editing facilities and standardized or recommended options according to CEPT Recommendation T/CD 6-1 see Annexes 7,8,9.

Table 2.7-1b

3.0 INTERFACES FOR DATA CIRCUIT-TERMINATING EQUIPMENT (LAYER 1) AND PERIPHERAL EQUIPMENT

3.1 INTERFACE FOR MODEM D-BT

3.1.1 GENERAL CHARACTERISTICS

The circuits interconnecting the D-BT and the Btx Terminal are called interchange circuits. Their length must not exceed 50 m. The line of demarcation between the area of competence of the subscriber and that of the Deutsche Bundespost lies between the socket of the D-BT and the interface connector of the terminal.

3.1.2 FUNCTIONS OF THE INTERFACE CIRCUITS

1. Circuit E (common return)

   This circuit is the common return for all interchange circuits. It may be connected to the Btx Terminal's zero potential.

2. Circuit S (control circuit to D-BT)

   In the ON condition this circuit causes the D-BT to be connected to the telephone line and automatic calling to take place unless the operating mode "manual dialling" is switched on in the D-BT. If the telephone line is occupied (busy condition), connection of the D-BT is prevented. As soon as the D-BT is connected to the telephone line, the call cannot be affected by manipulation of the telephone set.

3. Circuit SD (transmitted data to D-BT)

   On this circuit the data are transferred to the D-BT.

4. Circuit ED (received data from D-BT)

   On this circuit, the data are transferred to the Btx Terminal. During call set-up, this circuit is used for the transmission of control signals and signals in the voice-frequency range. In the absence of signals from the line, interfering signals may be transmitted on ED. During dialling, no signals are transmitted over circuit ED.

3.1.3 ELECTRICAL CHARACTERISTICS OF THE INTERCHANGE CIRCUITS TO D-BT

1. Interchange circuit S

   There is ON condition or binary 1 condition in the case of input voltages between + 4 V and + 7 V.

   There is OFF condition or binary 0 condition in the case of voltages between + 0.8 V and - 0.5 V or currents smaller than 0.1 mA. Voltages up to - 7 V are permissible and do not cause damage.

   In the case of positive input voltages, the input resistance ranges between 120 ohms and 10 kohms. The maximum inverse voltage built up in the modem is 1.7 V.

2. Interchange circuit SD

   There is ON condition or binary 1 condition (marking condition) in the case of input voltages between + 4 V and + 7 V.

There is OFF condition or binary 0 condition (spacing condition) in the case of voltages between 0,8 V and - 0.5 V or currents smaller than 0,1 mA. Voltages up to - 7 V are permissible and do not cause damage.

The input resistance for positive input voltages is greater than 270 ohms. The maximum inverse voltage built up in the modem is 1.7 V.

3. Interchange circuit ED

The generator consists of a variable resistor between circuit ED and circuit E.

A voltage between - 7 V and + 7 V may be applied. The circuit is only functional in the presence of positive voltages. In this case the internal resistance is greater than 270 ohms.

In the case of the binary 1 condition (marking condition), the resistance ranges between 270 ohms and 500 ohms. The maximum inverse voltage built up in the modem is 1 V. The current fed into the system should range between 0.7 mA and 1.2 mA.

In the case of the binary 0 condition (spacing condition) and a positive voltage, the leakage current is smaller than 100 uA.

3.1.4 MECHANICAL CHARACTERISTICS OF THE INTERFACE FOR D-BT03

D-BT03 comprises a 7-pin socket for the interconnecting cables. The connector conforms to DIN 45329 and the pins are assigned as follows:

pin	assignment
1	spare
2	E (common return)
3	spare
4	spare
5	ED (received data)
6	SD (transmitted data)
7	S (control circuit)

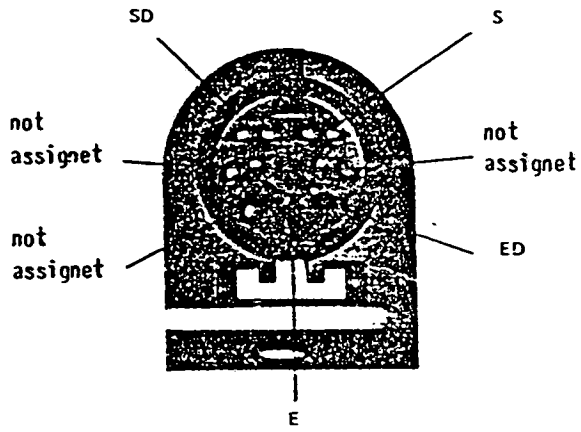


Figure 3.1.-1

3.1.5 INTERPRETATION OF THE INTERFACE SIGNALS BY THE D-BT

The interface signals provide the Btx Terminal with information about the condition of the telephone line

- in the case of a busy condition
- in the case of connection of the D-BT to the line and successful call set-up.

They also provide information for monitoring the audio signal (busy tone). If the Btx Terminal does not have an acoustic signalling facility, the tones must be indicated optically.

The signals also indicate the automatic clearing of a connection in case of a failure.

3.1.6 SIGNALLING OF THE CALL PROGRESS STATES (SEE FIG. 3.1-2)

The control signals on circuit ED indicate whether there is a busy condition on the telephone line or whether the D-BT is connected to the line and is supplied with power. These signals are only transmitted when circuit S is in the ON condition:

The ON condition of circuit S activates a timer (33-35 secs). During this interval, the Btx Terminal checks whether pulses are being transmitted over circuit ED. The following conditions can be distinguished:

1. Busy condition:

   1 polarity > 200 ms within 0 to 4.2 secs. The Btx Terminal then turns OFF circuit S.

2. Successful call set-up:

   1 polarity for > 0.5 ms after 4.2 secs (up to 4.4 secs) to 33 secs (up to 35 secs) indicates that the D-BT is connected to the line and the line current is present. This pulse reactivates the timer.

   Subsequent 1 polarity for 200 ... 400 ms signifies successful call set-up.

3. Unsuccessful call set-up:

   The timer expires without 1 polarity having been present for 200 to 400 ms. The Btx Terminal must then turn OFF circuit S.

3.1.6.1 Control of Tone Monitoring

By means of the ON condition on circuit S during call set-up the presence of signals on circuit ED such as dial tone or busy tone shall be indicated. Monitoring of the call set-up phase is to be terminated as soon as the data connection is established.

3.1.6.2 Control of Circuit SD

When circuit S is turned ON, 1 polarity is applied to circuit SD during tone monitoring. If circuit S is in the OFF condition, 0 polarity must be maintained on circuit SD.

3.1.6.3 Automatic Clearing in case of Failure during Data Transmission

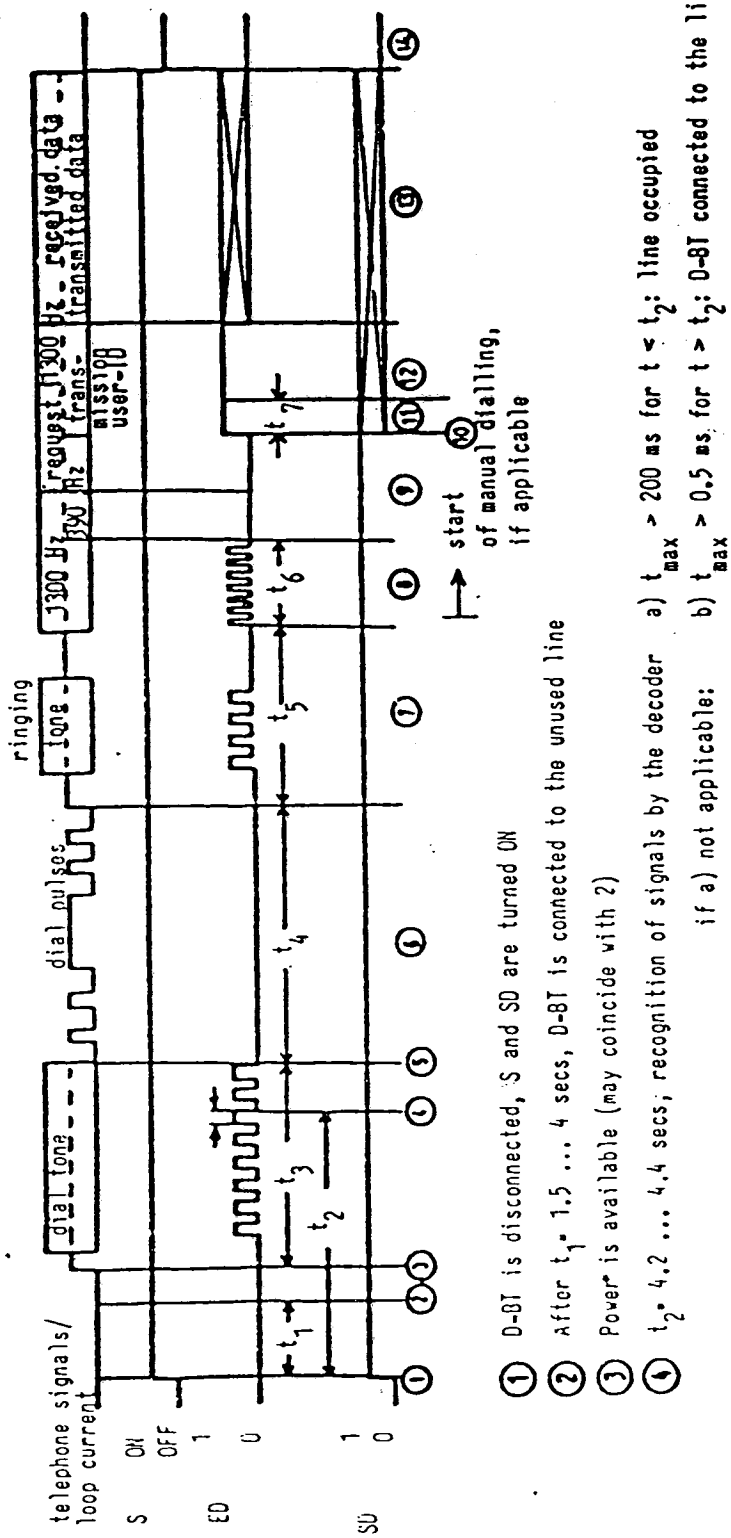
If signal loss occurs on the telephone line during a Btx connection, circuit ED reverts to the OFF condition or transmits random data for the duration of the failure.

If circuit ED remains in the OFF condition for 100 ... 120 ms the Btx terminal turns OFF circuit S and clears the connection.

3.1.6.4 New Connection after Call Clearing

An interval of at least 2 secs must elapse before the Btx Terminal again turns ON circuit S, even if the user gives the ON control immediately after circuit S has been turned OFF.

3.1.6.5 Signal Processing at the Interface



① D-BT is disconnected, S and SD are turned ON
② After t_1 = 1.5 ... 4 secs, D-BT is connected to the unused line
③ Power is available (may coincide with 2)
④ t_2 = 4.2 ... 4.4 secs; recognition of signals by the decoder a) t_{max} > 200 ms for $t < t_2$; line occupied
if a) not applicable: b) t_{max} > 0.5 ms for $t > t_2$; D-BT connected to the line
⑤ 3.2 secs. < t_3 < 5 secs. signals conforming to tones on ED
⑥ Emission of dialled digits; t_4 dependent on call number
⑦ Call set-up time at the exchange; ringing tone (may not be available), possibly busy tone on ED
⑧ t_6 = 1.6 to 1.7 secs reaction time for recognition of 1300-Hz answer tone
⑨ 0 polarity is maintained on ED until character NUL is recognized
⑩ Character NUL recognized
⑪ 200 ms < t_7 < 400 ms recognition, by the decoder, of call establishment
⑫ User identification
⑬ Data traffic
⑭ Idle condition: D-BT switched off.

Figure 3.1-2

3.2 INTERFACE FOR MODEM D1200S

3.2.1 GENERAL CHARACTERISTICS

For the functional characteristics of the interface between data terminal equipment and data circuit-terminating equipment in telephone networks see: CCITT Rec. V.24, DIN 66020 Part 1.

3.2.2 ELECTRICAL CHARACTERISTICS OF INTERCHANGE CIRCUITS

Double-current, unbalanced, up to 20 kbit/s, see: CCITT Rec. V.28, DIN 66020 <Part> 1.

3.2.3 CHOICE OF APPROPRIATE INTERCHANGE CIRCUITS

For the interface between data terminal equipment and data circuit-terminating equipment operating at rates of up to 1200 or 600 bit/s in telephone networks, see: CCITT Rec. V.23, DIN 66021 Part 2.

3.2.4 MECHANICAL CHARACTERISTICS

Data communication - 25-Pin DTE/DCE Interface Connector and Pin Assignments, see: International Standard ISO 2110.

The minimum pins necessary are:

PIN	Interface	
2	D1	) connected
14	HD1	)
3	D2	
6	M1	
5	M2	
20	S1.2	
7	E (common return)	

3.3 INTERFACE FOR MODEM D1200S1012 DUPLEX

3.3.1 GENERAL CHARACTERISTICS

For the functional characteristics of the interface between data terminal equipment and data circuit-terminating equipment in telephone networks see: CCITT Rec. V.24, DIN 66020 Part 1.

3.3.2 ELECTRICAL CHARACTERISTICS OF INTERCHANGE CIRCUITS

Double-current, unbalanced, up to 20 kbit/s, see: CCITT Rec. V.28, DIN 66020 Part 1.

3.3.3 CHOICE OF APPROPRIATE INTERCHANGE CIRCUITS

For the interface between data terminal equipment and data circuit-terminating equipment operating in the duplex mode at rates of up to 1200 bit/s in telephone networks, see: CCITT Rec. V.22, DIN (in preparation).

3.3.4 MECHANICAL CHARACTERISTICS

Data communication - 25-Pin DTE/DCE Interface Connector and Pin Assignments, see: International Standard ISO 2110.

The minimum pins necessary are:

PIN	Interface	
2	D1	) connected
14	HD1	)
3	D2	
6	M1	
5	M2	
20	S1.2	
4	S2	
7	E (common return)	

3.4 KEYBOARDS

3.4.1 NUMERIC KEYBOARDS

The minimum requirement is a numeric keyboard with the digits 0 to 9, which enables pages to be called up according to the menu method. The arrangement of the keys (pushbutton telephone or adding machine arrangement) is left open.

Additionally, the numeric keyboard has to incorporate the function keys *, #, "Telephone" (Btx call set-up/release), "Temporarily Inactive Attributes" and "Reveal". The function "Disconnect" (Btx call clearing) can be invoked by the same or a separate key. The symbols recommended by the Deutsches Institut fuer Normung e.V. (DIN) (German Standards Institute) for the function keys "Telephone", "Temporarily Inactive Attributes", "Reveal" and "Disconnect" are shown in Annex 5. The arrangement, way of implementation and the symbols for the function keys are optional.

3.4.2 ALPHANUMERIC KEYBOARDS (OPTION)

For alphanumeric keyboards for Btx Terminals no Btx-specific keyboard arrangement is defined. The arrangement of the keys should conform to existing DIN Standard 002137 Part 1 or Part 5 or to the CCITT standard for teletex. Particularly in the case of the Btx function keys account should be taken of the standards specifying the relative position of function keys (DIN 2145, DIN 2148).

Regardless of these aspects, alphanumeric keyboards must fullfil the same minimum requirements as numeric keyboards.

3.5 INTERFACE FOR TAPE RECORDER (RECOMMENDED OPTION)

The following interface is recommended for the connection of tape recorders to simple user terminals:

- 5-pin DIN plug
- levels according to DIN 45511
- rate: 1200 bit/s
- frequencies according to CCITT V.23, mode 2 (binary 1 = 1300 Hz, binary 0 = 2100 Hz)
- recording method and character sequence as via the telephone line.

3.6 INTERFACE FOR VIDEOMONITOR (RECOMMENDED OPTION)

The signals specified in DIN Draft Standard EN 50049 and 40060 are recommended for the interface to the external videomonitor.

Extract from the DIN Draft Standard:

RGB signals:

Red signal component	Difference between white level and blanking level: 0.7 V (+ 3db analogue) Impedance 75 ohms Direct component between 0 V and +2V	positive
Green signal component	Difference between white level and blanking level: 0.7 V (+ 3db analogue) Impedance 75 ohms Direct component between 0 V and +2V	positive
Blue signal component	Difference between white level and blanking level: 0.7 V (+ 3db analogue) Impedance 75 ohms Direct component between 0 V and +2V	positive

Blanking signal (required for window feature)

Blanking	0V up to +0.4V 1V up to +3V Impedance	logic 0 logic 1 75 ohms

Sync pulse for synchronizing the monitor

Video output signal	Colour video signal (F BAS) Signal 1V (±3 db) peak-to-peak difference between white level and synchronizing level Impedance 75 ohms Direct component between 0V and +2V If only synchronizing signal is applied, the level is 0.3V peak-to-peak (-3 +10 dB)	positive video

Video input for synchronization of the decoder

	Signal 1V (±3 db) peak-to-peak difference between white level and synchronizing level Impedance 75 ohms Direct component between 0V and +2V If only synchronizing signal is applied, the level is 0.3V peak-to-peak (-3 +10 dB)	positive video

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Video input for synchronization of the decoder

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Command signal for switching over from synchronization to audio signals and vice versa (acoustic monitoring)

Switch-over voltage	0V up to + 2V logic 0 + 10 V up to + 12V logic 1 Input resistance 10 kohms Input capacitance 2 nF The television set interprets logic 0 (2V) for television reception logic 1 (10V) for Btx operation	load for checking: 10 kohms

Audio signal for monitoring of acoustic signals

Audio output (1)	Impedance 1 kohm EMF effective nominal: value		0.5 V
- mono - stereo channel L - channel A (independent)		minimum "	0.2 V
		maximum "	2.0 V

3.7 INTERFACE FOR PRINTERS

No recommendations are issued for this interface until further concepts/models are on the market.

3.8 INTERFACE FOR FLOPPY DISC, VIDEORECORDS, CHIP CARDS

No recommendations are issued for this interface until further concepts/models are on the market.

3.9 ADMISSIBLE TRANSMIT DISTORTION AND RECEIVE MARGIN

The admissible transmit distortion and receive margin are specified in ISO 7480 (currently available as a DIS dated September 1982).

The following values are recommended:

- transmit distortion: 8 % (5 %)
- receive margin: 40 %

4.0 DATA LINK PROTOCOL (LAYER 2)

4.1 DATA LINK PROTOCOL FOR THE BASIC TERMINAL (1200/75 DX AND 1200/1200 DX)

4.1.1 SCOPE

This protocol, which applies to layer 2 of the OSI model, is intended for use primarily for transmission between Btx Exchange and simple types of equipment requiring protection against transmission errors. The design of this protocol is made so that it can be replaced by other layer 2 protocols (e.g. HDLC), without changing protocols in other layers. This document includes only the information transmission phase.

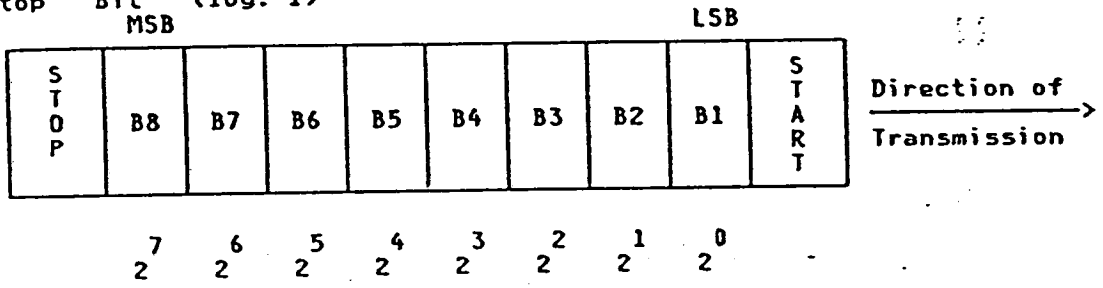
4.1.2 GENERAL

The characteristics of the protocol are:

- Asynchronous transmission
- CEPT Videotex standard
- 8-bit coding
- Full duplex transmission
- Independence of transmission speeds (1200/75 and 1200/1200 bit/s)
- Protected and non-protected transmission
- CRC error detection
- Optional code transparency

4.1.2.1 Bit Structure for Transmission of Characters

1 Start Bit (log. 0)
8 Data Bits (Least Significant Bit is transmitted first).
1 Stop Bit (log. 1)



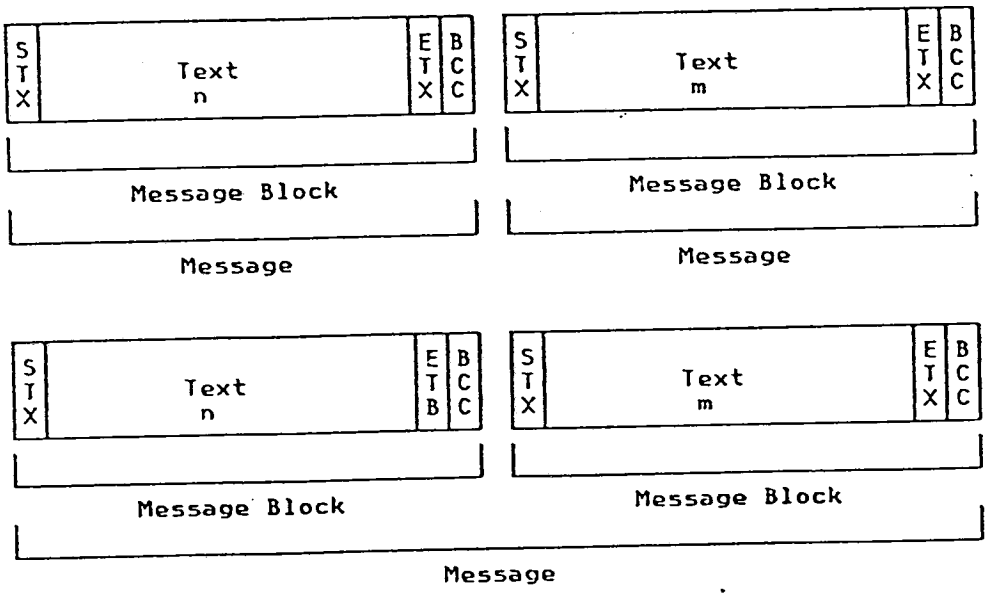
4.1.3 OPERATION OF THE DATA LINK

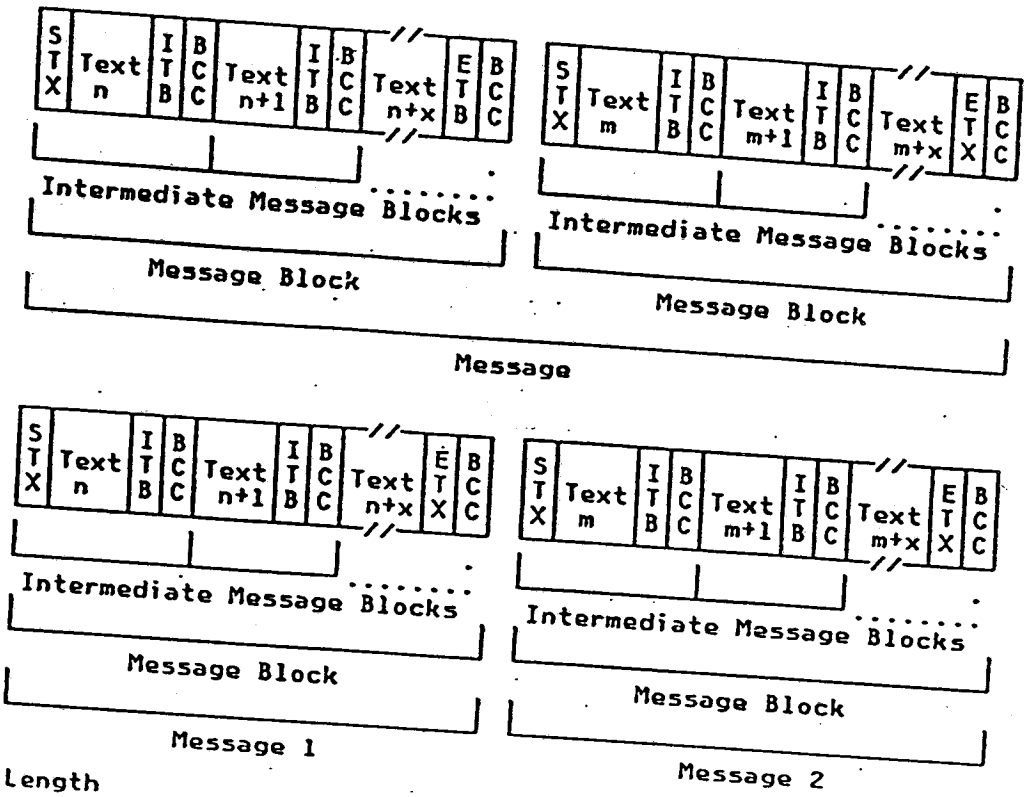
1. Message/ Message Block/ Intermediate Message Block

The message consists of one or more blocks of text data. The text is transmitted in blocks to provide more accurate and efficient error control. The text data is the body of the message and is identified by a start of text (STX) character immediately preceding each block of text. In addition, each block of text except the last is immediately followed by an end of transmission block (ETB) character or an intermediate block (ITB) character. The last block of text in a message is immediately followed by an end of text (ETX) character.

As each message block is completed, it is checked for transmission accuracy at the receiver before the transmission continues.
Blocking is independent of layer 6 information.

- Definitions





2. Data Length

	Intermediate Message Block Length		Message Block Length		Message Length	
	min.	max.	min.	max.*	min.	max.
1200 /1200 bit/s	32	256	0	256/2k	0	2k
1200 / 75 bit/s	32	256	0	256/2k	0	2k
	A	A	A	A	A	A

Number of data bytes, excluding:
STX, ITB, ETB, ETX, DLE STX, DLE ITB, DLE ETB, DLE ETX, the inserted DLE's and the two Block Check Characters (2k = 2048).

* If the message block consists of a subset of intermediate message blocks, the max. value is 2k bytes (2048) instead of 256.

3: Error Checking

Each block of data transmitted is error-checked at the receiving station in one of several ways, depending on the functions employed. The checking method is cyclic-redundancy checking (CRC), which checks the Message, Message Block or Intermediate Message Block after it has been received. After the transmission of a Message, Message Block or Intermediate Message Block, the receiving station normally replies with an ACK, ACK0 or ACK1, which means data are received error free and continue sending; or it replies with NAK, which means data are received but not received error free (e.g., a transmission error was detected), retransmission is necessary. Retransmission of a block of data following an initial NAK is usually attempted at least three times. If the transmitting station receives no reply after having sent a Message, Message Block or Intermediate Message Block, or if the reply is garbled, the transmitting station can request a retransmission of the reply

by sending an ENQ. When the transmitting station is through sending a Message, it may end the transmission by sending an end of transmission (EOT) character.

- CRC-16

A cyclic code redundancy check is a division performed by both the transmitting and receiving stations using the numeric binary value of the message as a dividend, which is divided by a generator polynomial. The quotient is discarded, and the remainder serves as a check character, which is then transmitted as the Block Check Character immediately following a checkpoint character (ITB, ETB, or ETX). The receiving station compares the transmitted remainder to its own computed remainder, and finds no error if they are equal.

The BCC accumulation consists of two bytes (16 bits for CRC-16) when it is transmitted on the line, but functionally it is one sequence.

The following generator polynomial is used:

$$X^{16} + X^{15} + X^{2} + 1$$

- Block Check Summation

Starting of Block Check Character accumulation sets the BCC accumulator to all zeros.

The transmitter sends the true value (not the complement) of the accumulated Block Check Character(s).

The least significant bit of the least significant byte from the two byte Block Check Character is transmitted first.

The receiver compares the accumulated Block Check Character with the Block Check Character(s) received from the line (not compared with a constant).

The start bit and the stop bit of the characters are not included in the block check accumulation.

Refer to the example of CRC generation at the end of Chapter 4.

- Normal Text Mode (non-transparent)

The accumulation is initiated by the first appearance of STX to be transmitted and/or received in the Message, Message Block or Intermediate Message Block. The starting character STX is not included in the accumulation but is used as a signal to clear or reset the accumulation counters to the appropriate initial conditions.

Any other STX character that is transmitted and/or received prior to the transmission and/or receipt of an end of block line control character (ETB, ETX) is included in the accumulation, e.g., a STX following an ITB is included in the accumulation.

ITB when transmitted and/or received will be included in the accumulation and will cause the accumulation counters to be cleared or reset to the appropriate initial condition following transmission and/or receipt of the two contiguous Block Check Character(s). The accumulation is re-initiated with the first character transmitted and/or received following the Block Check Character(s).

The end of block and end of text line control characters (ETB, ETX) are included in the BCC accumulation when transmitted and/or received.

The ENQ line control character may be included in the BCC accumulation, but no BCC will be sent or received, because this initiates a forward abort sequence.

All other characters transmitted and/or received after the start of the BCC accumulation are included in the summation, including the line control character (ITB, ETB or ETX) which signals that the two contiguous BCC characters

follow immediately.

Transparent Text Mode

The block check accumulation is initiated by the first appearance of a DLE STX sequence to be transmitted and/or received in the Message, Message Block or Intermediate Message Block. This starting sequence (DLE STX) is not included in the accumulation but is used to clear or reset the accumulation counters to the appropriate initial condition.

Any other DLE STX transmitted and/or received prior to the transmission and/or receipt of an end of block line control sequence or character (ETB, DLE ETB, ETX or DLE ETX) is included in the accumulation, e.g., a DLE STX sequence following DLE ITB or ITB and its associated BCC characters included in the accumulation.

DLE ITB when transmitted and/or received will cause the accumulation counters to be cleared/or reset to the appropriate initial condition following transmission of the BCC characters. The accumulation is re-initiated with the first character transmitted and/or received following the two contiguous BCC characters.

When a transparent end of block sequence (DLE ITB, DLE ETB or DLE ETX) is transmitted and/or received, the DLE part of the sequence is n o t included in the BCC accumulation. The second character of the sequence (ITB,ETB or ETX) is included in the accumulation.

The DLE character that is inserted immediately preceding a "DLE bit configuration" in transparent text is not included in the accumulation when transmitted and/or received.

The DLE ENQ line control characters may be included in the BCC accumulation, but no BCC will be sent or received, because this initiates a forward abort sequence.

All other characters transmitted and/or received after the start of BCC accumulation are included in the accumulation, including the line control sequence (not DLE part) which signals that the contiguous BCC characters follow immediately.

Sequence	Included in BCC Accumulation	
	Yes	No
DLE DLE	DLE (one)	DLE (one)
DLE ITB	ITB	DLE
DLE ETB	ETB	DLE
DLE ETX	ETX	DLE
DLE STX	——	DLE STX ***
DLE ENQ	No BCC transmitted for block cancel function.	

*** Both DLE and STX are included in the accumulation if preceded immediately by ITB-BCC or DLE ITB-BCC.

4. Data Link Control

Control of the data link is maintained through the use of the following control characters and sequences:

- STX Start of Text (0/2)
- ITB End of Intermediate Transmission Block (0/7)
- ETB End of Transmission Block (1/7)
- ETX End of Text (0/3)
- EOT End of Transmission (0/4)
- ENQ Enquiry (0/5)
- ACK Intermediate Affirmative Acknowledgment (0/6)
- ACK0/1 Alternating Affirmative Acknowledgments (1/0, 3/0) and (1/0, 3/1)
- WACK Wait before Transmit Positive Acknowledgme.. (1/0, 3/11)
- NAK Negative Acknowledgment (1/5)
- DLE Data Link Escape (1/0)
- DLE EOT Disconnect Sequence for Switched Line (In Control Mode) (1/0, 0/4) Refer also to Transparent Text Mode.
- SOH Start of Heading (Used in Btx environment for T.F.I.). (0/1)
- SOH ENQ Request for Terminal Facility Identifier. (0/1, 0/5)

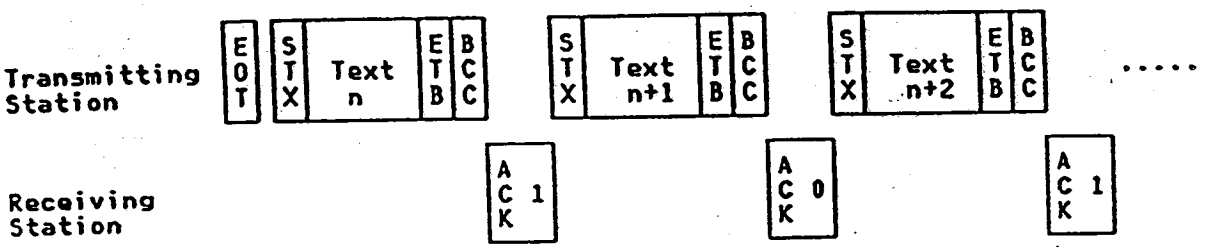
4.1.3.1 STX - Start of Text

This character precedes a block of text characters. Text is that portion of a Message, Message Block or Intermediate Message Block treated as an entity to be transmitted through to the ultimate destination without change.

4.1.3.2 ETB - End of Transmission Block

The ETB character indicates the end of a block of text characters, that is the end of a Message Block or occurs after the last Intermediate Message Block started with STX. The blocking structure is not necessarily related to the processing format. The Block Check Character is sent immediately following ETB. ETB requires a reply indicating the receiving station's status (ACK0, ACK1, NAK, or optionally WACK).

4.1.3.3 Format of Normal Text Blocks



4.1.3.4 ITB - End of Intermediate Transmission Block

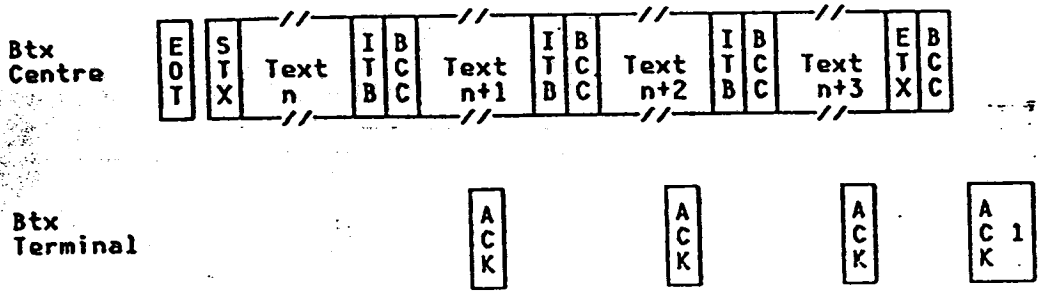
The ITB character is used to divide a block of text characters into Intermediate Message Blocks for error checking purposes. The Block Check Character(s) immediately follow(s) the ITB and reset(s) the block-check count. After the first Intermediate Message Block, successive Intermediate Message Blocks need not be preceded by STX (for transparent data, each successive intermediate block must begin with DLE STX).

Each Intermediate Message Block must be responded with an ACK if received error free. If an error is detected in an Intermediate Message Block, the receiver replies with NAK immediately. The sender now is free to stop the transmission of the remaining text character portion by use of a forward abort sequence. Any ITB, ETB, or ETX still received after having sent a negative acknowledgment (NAK) to an Intermediate Message Block also has to be responded with NAK in order to ensure the correct block-check-sequence to acknowledgment relationship. (The number of acknowledgments must be identical to the number of Intermediate Message Blocks sent). The retransmission may then be initiated with the failing Intermediate Message Block, which can be determined by the number of already received acknowledgments to the Intermediate Message Blocks sent.

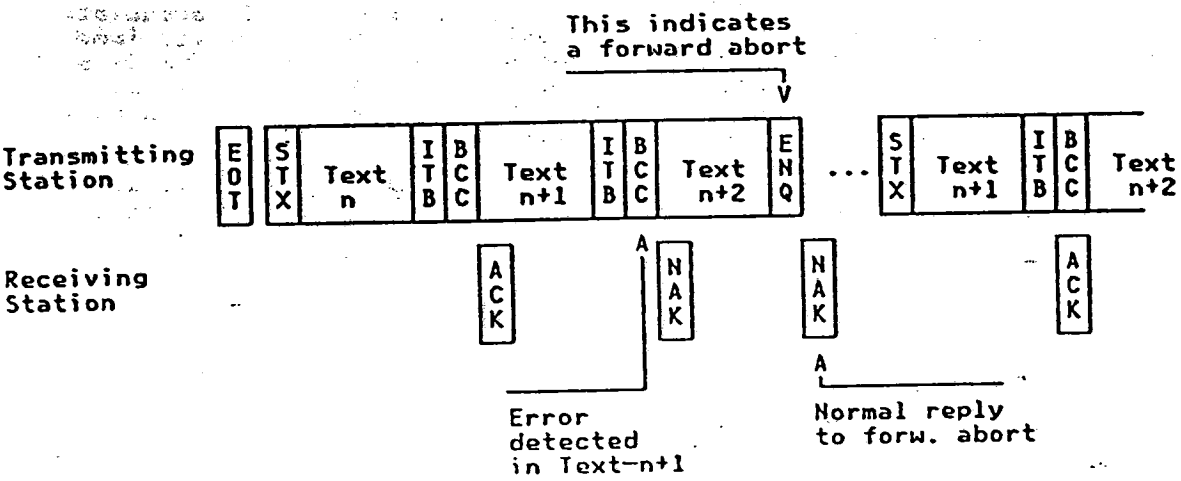
The exact restart point for retransmission can be determined at the data link level, only if the number of acknowledgments is identical to the number of Intermediate Message Blocks sent. Otherwise the situation of missing acknowledgments is handled as a SEVERE ERROR and the restart point must be determined outside of data link level 2.

For examples see the Chapters SCENARIOS and FLOW CONTROL.

4.1.3.5 Intermediate Block Checking (Normal Transmission)



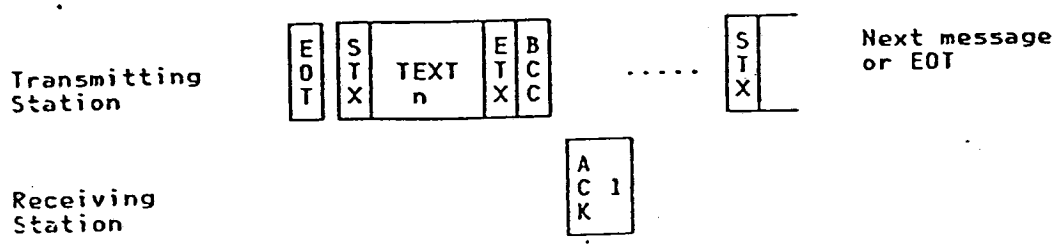
4.1.3.6 Intermediate Block Checking (Error detected)



4.1.3.7 ETX - End of Text

The ETX character terminates a block of text characters that is the end of the Message, Message Block or the last Intermediate Message Block started with STX and transmitted as an entity. The Block Check Character is sent immediately following ETX. ETX requires a reply indicating the receiving station's status (ACK0, ACK1, NAK or optionally WACK).

4.1.3.8 Format of Message or last Message Block



4.1.3.9 EOT - End of Transmission

This character indicates the end of a Message transmission which may consist of one or more Message Blocks or Intermediate Message Blocks. It causes a reset at Link Level 2 in the stations on the line. It sets control mode and sets the alternating ACK0/1 to ACK0. This applies to the sending station as well as to the receiving station on this line. EOT is also used as an abort signal to indicate a system malfunction or operational situation that precludes continuation of the message transmission.

4.1.3.10 ENQ - Enquiry

The ENQ character is used to obtain a repeat transmission of the response to a message block if the original response was garbled or was not received when expected. ENQ is also used to end the current transmission (forward abort sequence). A previously received NAK is not necessarily a prerequisite to end a transmission abnormally with ENQ, it is the decision of the transmitter only to do so. The only valid response to an ENQ in a forward abort sequence is a NAK. The only valid response to a stand-alone ENQ (no forward abort) is a NAK or ACK0/1 to reflect the status of the receiver of the ENQ.

The ENQ character in conjunction with DLE is also used as a part of the File Transfer initiation sequence, which means the DLE ENQ sending station asks for the status of the DLE ENQ receiving station. The response to a DLE ENQ in this case will be normally an ACK0.

See also DLE ENQ description and File transfer.

4.1.3.11 ACK - Affirmative Acknowledgment to Intermediate Message Blocks

This reply indicates that the previous Intermediate Message Block was received without error.

4.1.3.12 ACK0/ACK1 - Alternating Affirmative Acknowledgments

This reply indicates that a Message, a Message Block or the last Intermediate Message Block was accepted without an error and the receiver is ready to accept the next Message, Message Block or Intermediate Message Block of the transmission.

Note that the alternating ACK0/1 is an acknowledgment to the total Message or Message Block if no ITB's are used or it is the acknowledgment to the last Intermediate Message Block only, when ITB's are used.

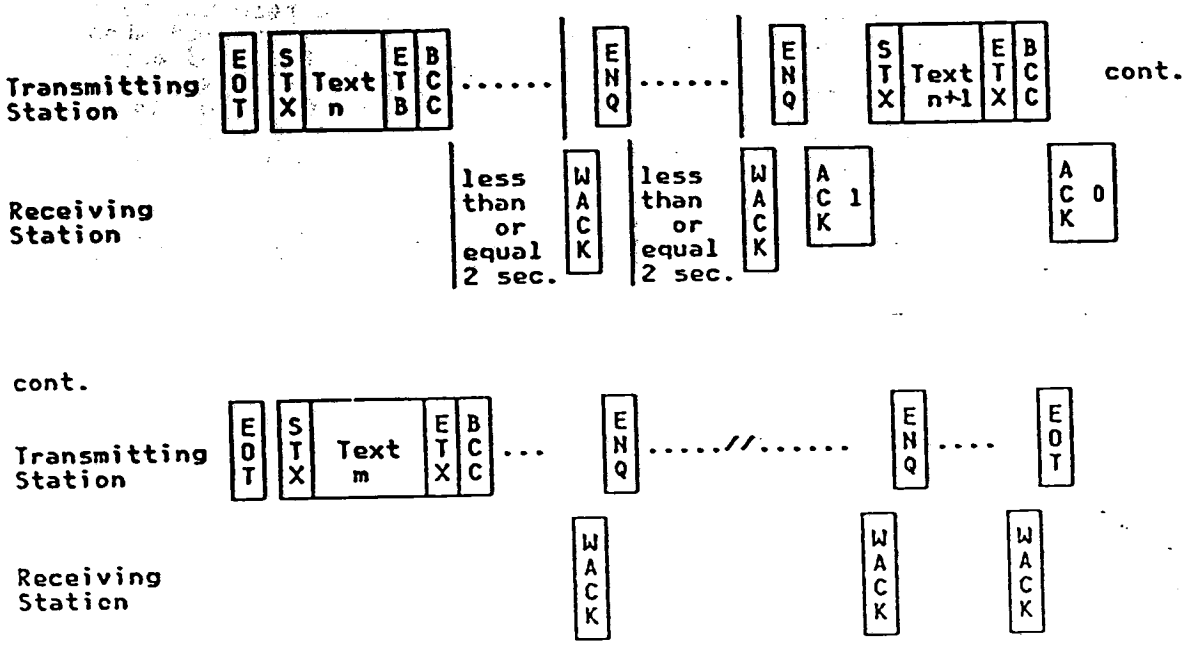
The use of ACK0 and ACK1 provides a sequential checking control for a series of Messages or Message Blocks. Thus it is possible to maintain a running check to ensure that each reply corresponds to the immediately preceding Message, Message Block or the last Intermediate message Block.
Odd numbered blocks are responded with ACK1, while even numbered blocks are responded with ACK0.
ACK0 is always used as the affirmative reply to line bid. (See DLE ENQ description). It is also the reset position initially as well as after an EOT being sent or received.

Both the ACK0 and ACK1 are two character sequences.
ACK0 is represented by DLE 0 (1/0,3/0).
ACK1 is represented by DLE 1 (1/0,3/1).

4.1.3.13 WACK - Wait-Before-Transmit Positive Acknowledgment

WACK allows a receiving station to indicate a "temporarily not ready to receive" condition to the transmitting station. It can be sent as a response to a Message or Message Block. WACK is a positive acknowledgment to the received data block, but does not change the ACK0 or ACK1 status. The normal response to WACK is ENQ, but EOT or DLE EOT are also valid responses. When ENQ is received, the receiving station will continue to respond with WACK until it is ready to continue. See the Continue time-out discussion in Chapter 4.1.8 Time-outs in this document. The ENQ retry limit is set to seven in stage one of Bildschirmtext. The WACK is a two character sequence. WACK is represented by DLE ; (1/0,3/11).

4.1.3.14 The Use of WACK



4.1.3.15 NAK - Negative Acknowledgment

NAK indicates that the previous Message, Message Block or Intermediate Message Block was received in error and the receiver is ready to accept a retransmission.

4.1.3.16 DLE - Data Link Escape

DLE is a control character used exclusively to provide supplementary line control characters, such as WACK, ACK0, ACK1, and transparent mode control characters. The sequences DLE STX, DLE ETX, DLE ITB, and DLE ETB initiate and terminate transparent text. In addition, other DLE control sequences (DLE ENQ, DLE ITB, DLE DLE, DLE EOT) are used to provide active control characters within transparent text as required. For additional information see the Transparent Text Mode discussion in the Additional Data Link Capabilities Chapter.

4.1.3.17 DLE EOT - Disconnect Sequence for a Switched Line

Transmission of DLE EOT on a switched line indicates to the receiver that the transmitter is going "on-hook". Either the calling or the called station may transmit this disconnect sequence. DLE EOT is normally transmitted when all message exchanges are complete, and may optionally be transmitted at any time instead of EOT to cause a disconnect.

See also DLE EOT in Transparent Text Mode.

4.1.3.18 SOH ENQ - Request for Terminal Facility Identifier

The SOH ENQ sequence is used by the Btx exchange to request the Btx Terminal to send its facility identifier. The format of the facility identifier is explained later in this document under Terminal Facility Identifier.

4.1.4 MESSAGE FORMATS FOR BASIC OPERATION

Proper formatting of messages requires use of specifically defined data-link control characters. Specific formatting rules are provided for heading and text data.

Refer to Chapter 4.1.3 topic definitions for the formats.

4.1.5 TEXT

The text data is transmitted in complete units called Messages, which are indicated by STX and concluded with ETX. Each Message is a complete unit that can stand alone and is not necessarily directly related to other Messages being transmitted. A Message can be subdivided into smaller Message Blocks for ease in processing and more efficient error control. Each Message Block starts with STX and ends with ETB (except for the last Message Block of a Message which ends with ETX). A single transmission can contain any number of Message Blocks (ending with ETB) or Messages (ending with ETX). A Message or Message Block can be also subdivided into smaller Intermediate Message Blocks for ease in processing and to have a mechanism for Flow Control. The first Intermediate Message Block starts with STX and ends with ITB, except for the last Intermediate Message Block of a Message or Message Block which ends with ETB or ETX. A single transmission can contain a number of Intermediate Message Blocks. That is, after at least two kbytes of text data an Intermediate Message Block is ended with ETB or ETX.

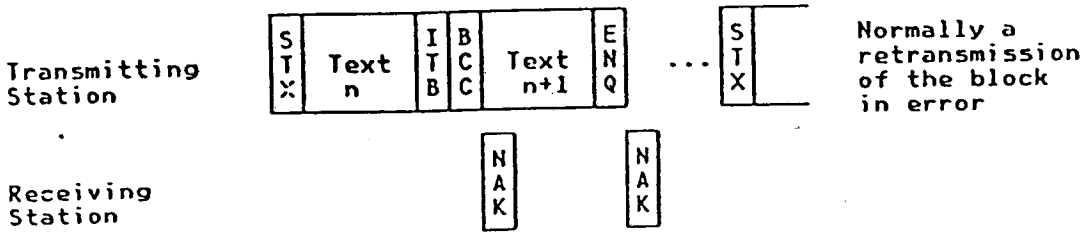
Refer to 4.1.3 topic data length.

An Intermediate Message Block which is not the first one in a chain of multiple Intermediate Message Blocks does not have to be preceded by a STX. An EOT optionally following the last Block ended by ETX indicates a normal end of transmission.

Line-control character sequences within a block of Text Data are not allowed in non-transparent mode, whereas in transparent mode any station receiving a control character within Text Data treats the control character or sequence as data and waits for the block check sequence (BCS) to detect a possible error. If an error is detected, normal recovery procedures are used. If no error is detected, the transmission is treated as valid data.

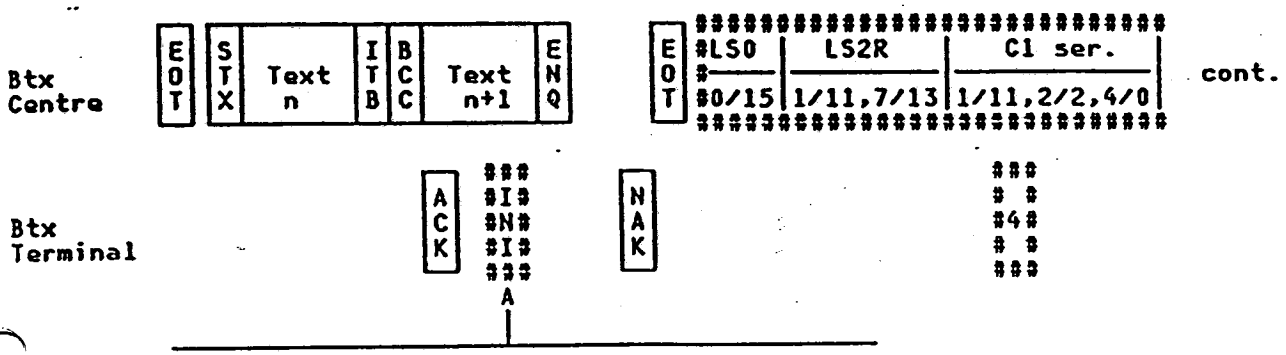
A block of Text Data can be terminated prematurely by using an ENQ character, which signals the receiver to "disregard this block". NAK is always the reply in this situation, since the block is ended with a forced error condition.

4.1.5.1 Forward Abort Sequence

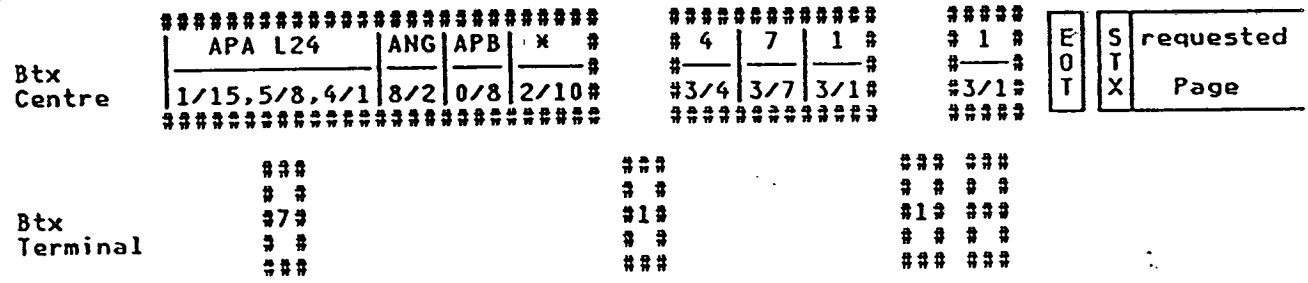


4.1.6 TEXT AND 'ECHOPLEXED' KEYBOARD DATA

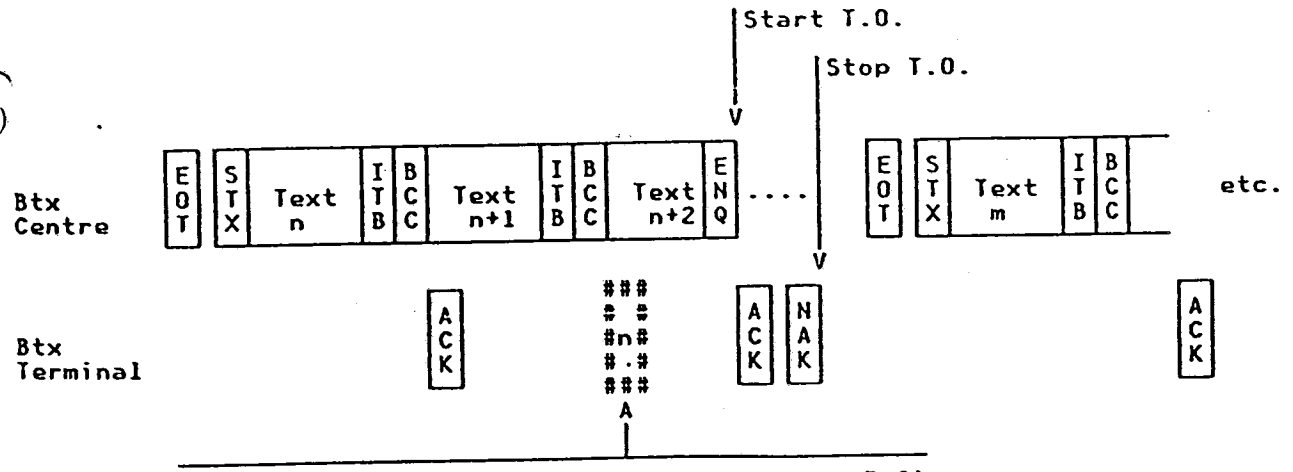
4.1.6.1 Block ended with forced Ending Condition (E N Q)



The INI character (1/3), (* – key) was sent while an 'interruptible Page' was received. This is not a line-control character, but a control character indicating initiation of a control function.

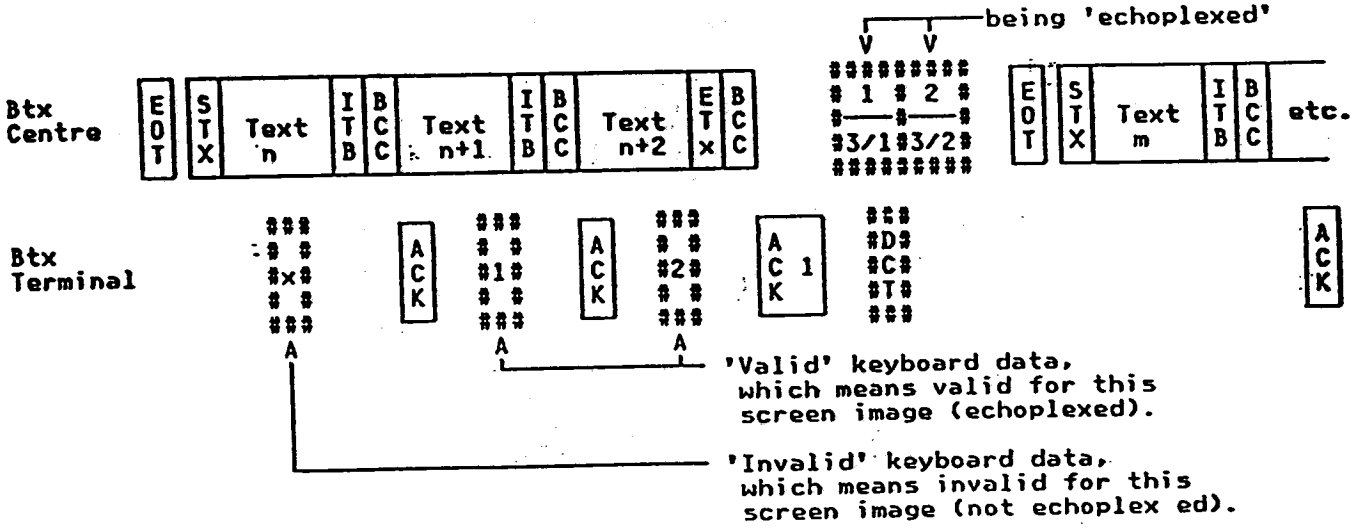


4.1.6.2 Block ended with forced Ending Condition
4.1.6.3 (Selection of a page) (E N Q)



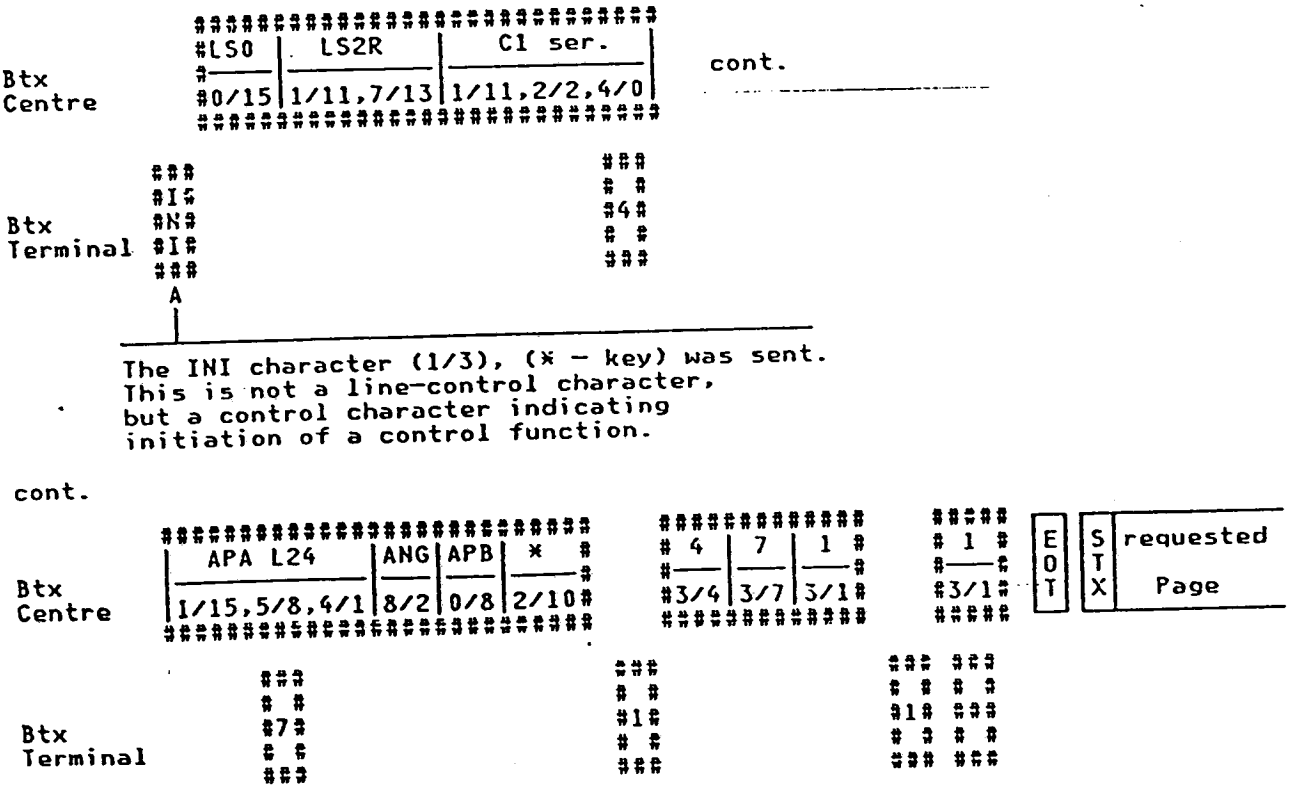
The n is a number between 0 and 9 (3/0 to 3/9) while an 'interruptible page' was received (selection of a page).

4.1.6.4 Dialogue Page being sent, while numeric Input is received



NOTE: Echoplexing is delayed until current text is responded.

4.1.6.5 Btx-page Request *4711# with Echoplexing



4.1.7 SYSTEM STATES

In addition to the function of sending messages over a communication link, a number of control functions are generally required for coordinating the operation of the stations on that link. It is convenient, therefore, to define the operation of the link in terms of "text mode" (message transfer state) and "control mode" (control state).

- The text mode exists on a data link during the transfer of a Message, Message Block or Intermediate Message Block from sender to receiver and the replies required to ensure their correct transfer. That is, text mode is started by STX or DLE STX and is normally ended by ETB, ETX, DLE ETB, DLE ETX, EOT, ENQ, DLE ENQ or DLE EOT.

- Control mode is started by EOT. The Control Mode exists on a data link whenever message transfer is not in process. Control mode ends with STX or DLE STX.

- Control mode is the initial state of the Btx Exchange and the Btx Terminal.

- Transparent Text Mode:

See Chapter 4.1.10 Additional Data Link Capabilities in this document.

4.1.8 TIME-OUTS

Time-outs are used to prevent indefinite data-link tie-ups, due to false sequences or missed response signals, by providing a fixed time within which any particular operation must occur. Due to the different requirements for the various operations, five specific time-out function are provided: Receive, Disconnect, Continue, Secondary and Flow Control.

4.1.8.1 Receive Time-out

This is a nominal twenty-five second time-out, when receiving text (in text mode), and awaiting the next text character, while there is a nominal three-second time-out, when awaiting responses. There is also a nominal three-second time-out when in control mode. This limits the waiting time tolerated for a transmitting station to receive a reply.

- This time-out is started at the initiating time of the receive operation. It is reset and started again when text or line-control characters are received depending on the mode of operation.

- For text mode, the time-out ends after having received the Block Check Characters or after twenty-five seconds, whatever occurs first.

- While awaiting responses, the time-out ends after having received the appropriate response(s) to the Message, Message Block, Intermediate Message Block, or ENQ being sent, or after three seconds, whatever occurs first.

Note:
The receive time-out does not apply for 'keyboard data' sent by the Btx Terminal to the Btx Exchange.

4.1.8.2 Disconnect Time-out

This time-out is used on the switched network data link. It is used to prevent Btx Terminals holding a connection for prolonged periods of inactivity. After a period of inactivity of value, the station will disconnect from the switched network. In the case of Bildschirmtext, the Deutsche Bundespost determines the duration of the time-out.

4.1.8.3 Continue Time-out

This is a nominal two-second time-out associated with the transmission of WACK. The continue time-out is used by stations where the speed of the input devices at the transmitting station may affect buffer availability at the receiver's site and cause transmission delays. A receiving station must transmit WACK to indicate a "temporarily not ready to receive" condition if it is not able to respond within the two-second time-out. The transmitting station sends ENQ in response to WACK to request the actual block acknowledgment, which starts a new two-second continue time-out. The purpose of the time-out intervals is to permit the receiving station to send an appropriate affirmative reply immediately if it becomes appropriate within the interval.

4.1.8.4 Secondary Time-out

This is in principle a receive time-out in text mode. It is a twenty-five second time-out, used at the moment only by the Btx Exchange while doing file transfer and being the SLAVE station.

4.1.8.5 Flow Control Time-out

This is in principle a receive time-out while transmitting Intermediate Message Blocks and expecting acknowledgments to them. It is a threersecond time-out. It is started only at the end of an Intermediate Message Block if the acknowledgment for the previous Intermediate Message Block has not been received yet. It is ended when the outstanding acknowledgment is received or after three seconds, whatever occurs first.

For examples see the Chapter 4.1.15 Flow Control and Recovery in this document.

4.1.9 RETRY COUNTS

The number of retries to retransmit Messages, Message Blocks, Intermediate Message Blocks or ENQ's is determined only by the transmitter of Messages, Message Blocks, Intermediate Message Blocks or ENQ's.

4.1.10 ADDITIONAL DATA LINK CAPABILITIES

These additional capabilities are available on some stations to increase the flexibility of the data link. They include transparent-text mode, file transfer (bulk update), specific error codes, Terminal Facility Identifier and flow control.

4.1.11 TRANSPARENT TEXT MODE

This mode permits greater versatility in the range of coded data that can be transmitted. This is because all data, including the normally restricted data-link line-control characters, are treated only as specific "bit patterns" when transmitted in transparent mode. Thus unrestricted coding of data is permitted for transparent-mode operation. This is particularly useful for transmitting binary data, floating point numbers, packed-decimal data, unique specialized codes, or machine language computer programmes. All data link control characters can be transmitted as transparent data without taking on control meaning.

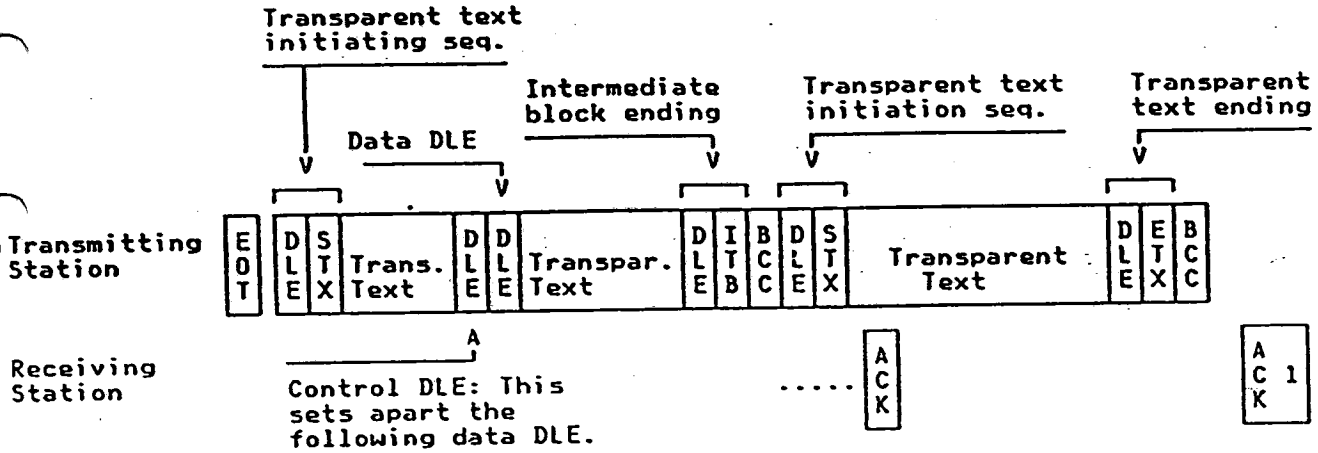
Any data-link control characters transmitted during transparent mode must be preceded by a DLE to be recognized as a line control function. Thus the following sequences are effective during transparent-mode operation:

Sequence	Use
DLE STX	Initiates the transparent mode for the following text (Messages, Message Blocks and Intermediate Message Blocks).
DLE ETB	Terminates a block of transparent text, returns the data link to normal mode, and calls for reply.
DLE ETX	Terminates the transparent text, returns the data link to normal mode, and calls for reply.
DLE ENQ	Indicates while in text mode "disregard this block of transparent data", returns the data link to normal mode, and calls for a reply. It is also used as a 'line bid' in case of a file transfer initiation sequence. The DLE ENQ sending station asks for the status of the DLE ENQ receiving station. The response to a DLE ENQ in this case will normally be an ACK0.
DLE EOT	When in transparent text mode it indicates "disregard this message of transparent data" and returns the data link to normal mode. DLE EOT does not call for a reply.
LLE DLE	Used to permit transmission of DLE as data when a bit pattern equivalent to DLE appears within the transparent data. One DLE is disregarded, the other treated as data.
DLE ITB	Terminates an intermediate block of transparent data, returns the data link to normal mode. DLE ITB calls for a reply, normally ACK, and in case of an error, a NAK. Note that this ACK is a single character and not a sequence of two characters, like ACK0 or ACK1. The Block Check Character follows DLE ITB. If the next intermediate block is transparent, it must start with DLE STX.

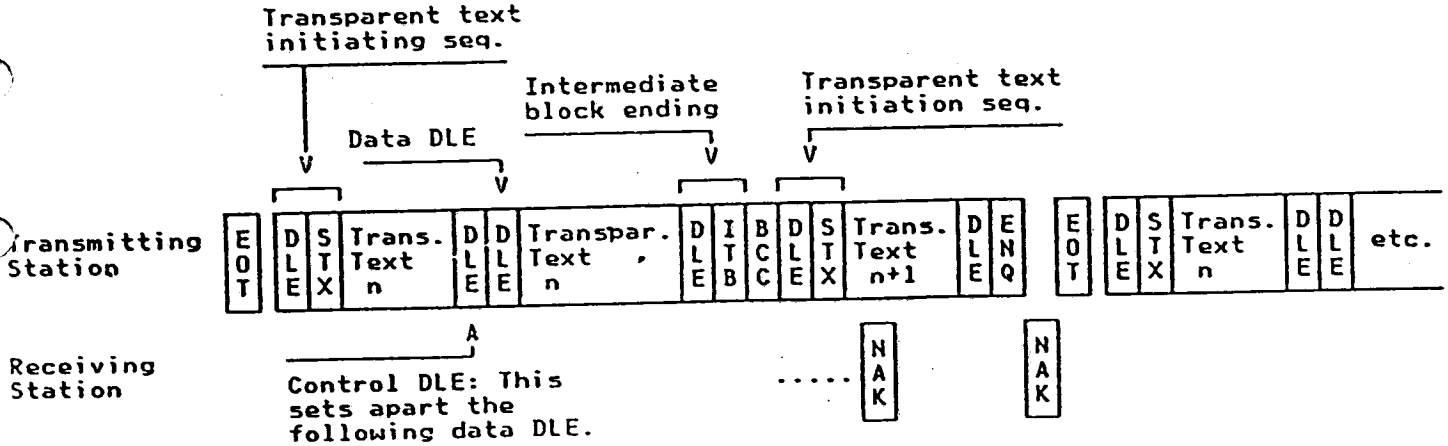
All replies and enquiries are transmitted in normal mode. Transparent data is received on a character-by-character basis; thus the character phase is maintained in the usual manner.

The boundaries of transparent data are determined by the DLE STX and the DLE ITB, DLE ETB, DLE ETX, DLE ENQ or DLE EOT sequences, which initiate and terminate the transparent mode. DLE ITB leaves the stations in text mode (not transparent text mode). Thus, the length of a transparent message can vary with each transmission. For checking the transmitted transparent data, CRC-16 is used.

4.1.11.1 Transparent Text Block, normal Transmission.



Transparent Text Block, Forward Abort.



4.1.12 FILE TRANSFER (OPTIONAL FOR THE BASIC TERMINAL)

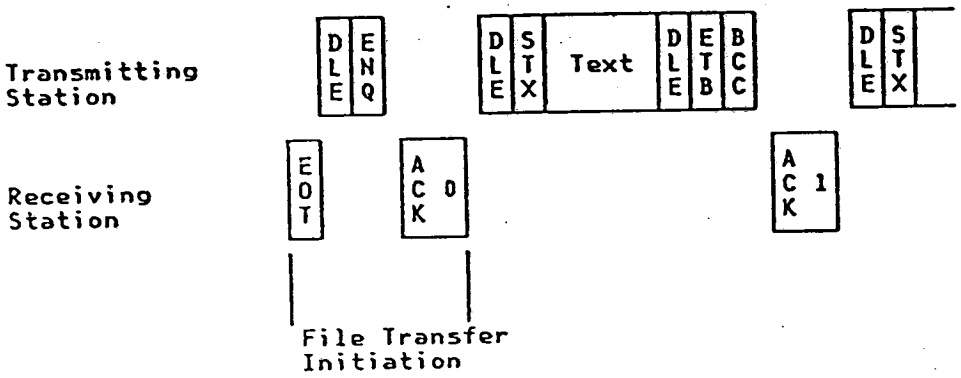
Note: No ITB's nor DLE ITB's are used in case of File Transfer.

A station may send a continuous set of data items by using file transfer. All data transmitted is code transparent, thus allowing any bit combination on the line without conflict to line control characters.

When file transfer transmission is to be started, an initialization sequence consisting of an EOT, DLE ENQ and ACK0 must be instituted. The station attempting to acquire the line sends the DLE ENQ. A station receiving this sequence (and ready for message reception) replies with ACK0. If the station is not ready to receive, it replies with either of the following:

- NAK (Negative Acknowledgment) (NAK is not used by the Btx Exchange
- WACK (Wait before Transmit Positive Acknowledgment)
- The format for the complete initialization phase, including the start of the actual message transmission, is shown in the next figure.

4.1.12.1 File Transfer Initialization Sequence

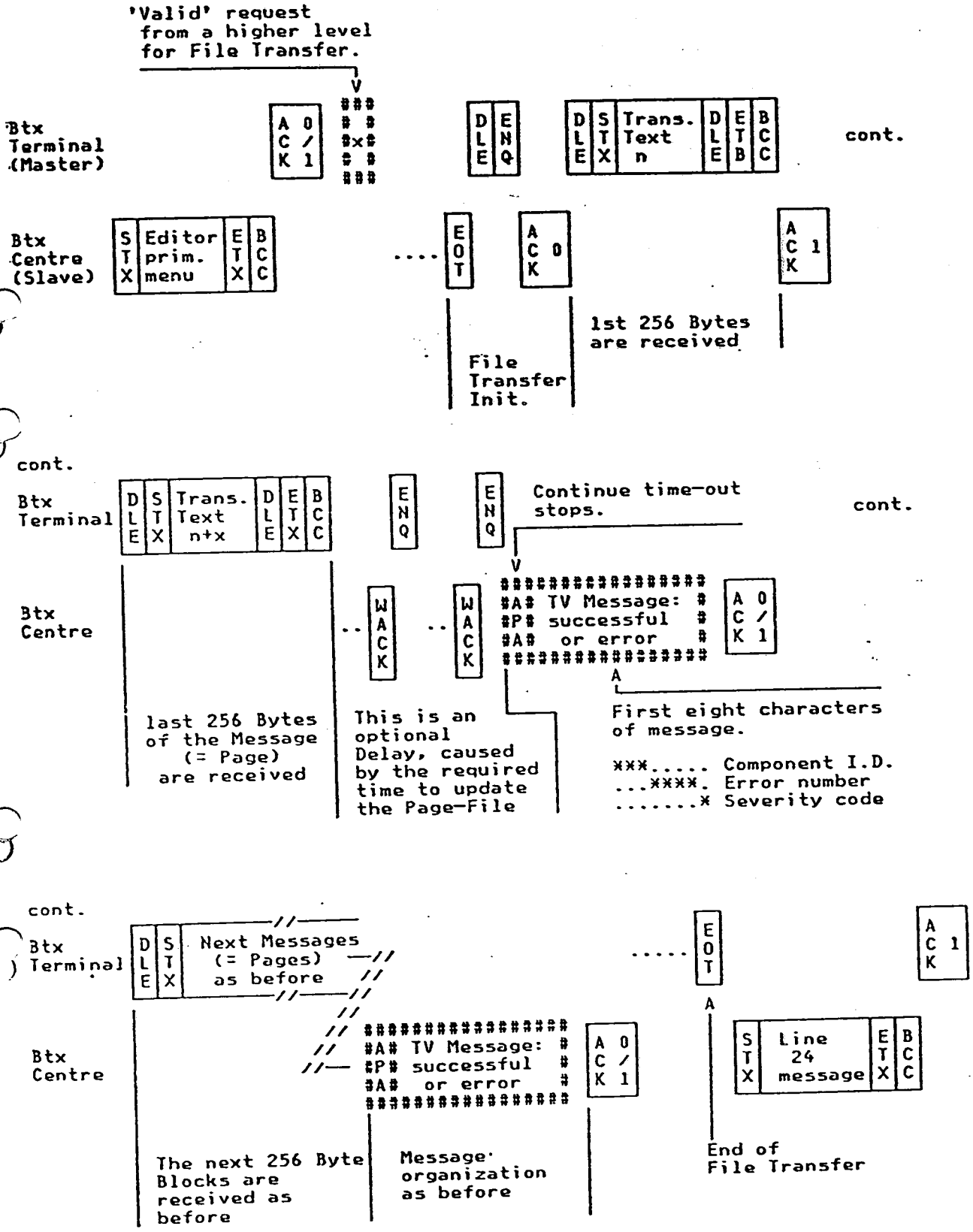


To avoid the problems associated with simultaneous transmission request, each station is assigned as a Master or Slave. The station who wishes to initiate file transfer indicates this by sending a 'Valid' request to the receiver of file transfer data, expects back an EOT, re-acts to this fact by sending out an DLE ENQ and awaits an ACK0. File transfer can start now.
Note:
The sender of text (Messages, Message Blocks or Intermediate Message Blocks) is defined as being the MASTER.
The receiver of text (Messages, Message Blocks or Intermediate Message Blocks) is defined as being the SLAVE.

File transfer is ended normally by the initiator of file transfer by sending an EOT. The station sending EOT will not send an initialization sequence before three seconds have elapsed, thus allowing the other station to bid for the line (by means of DLE ENQ).
If file transfer is initiated and no DLE ENQ is received within three seconds, the Btx Exchange puts the Btx Terminal back to normal mode (dialogue mode) with the help of EOT.

Refer also to the following example and to diagram 4.1.23 .

4.1.12.2 File Transfer (Bulk Update) Btx Terminal to Btx Exchange



4.1.13 SPECIFIC ERROR CODES

All stations must be able to receive from one to four characters following SOH / (0/1,2/15) and preceding an ETB, ETX or EOT.
(If EOT is used, this causes a Link Level 2 Reset).
These characters can be used to indicate special error conditions to the sender. Station specifications determine whether the station will attach any functional significance to these characters or will have the ability to transmit them.

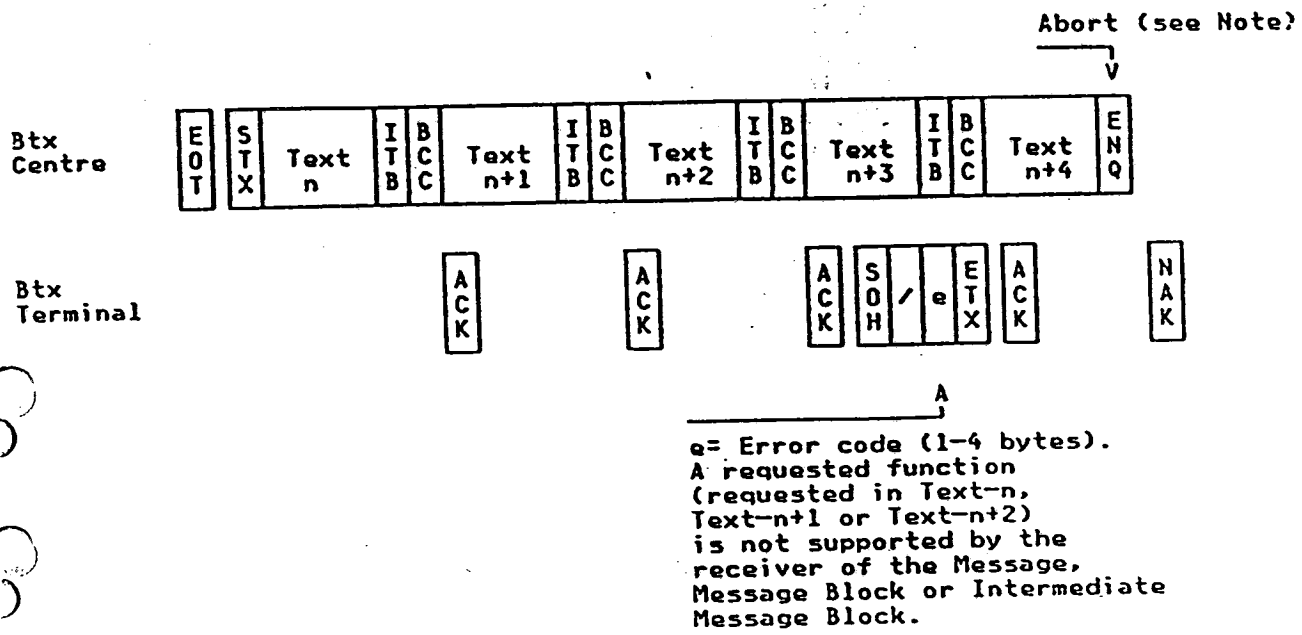
This specific error code sequence can be sent by the Btx Terminal any time; it must be sent contiguously, which means it must not be interrupted by any other acknowledgment or keyboard data.

The format of the character string for the Specific Error Code is similar to the format for the T.F.I. . The sequence

SOH [< option > < parameter >] ETB | ETX | EOT (no BCC)

is used. For definition, see format for T.F.I., Chapter 4.1.14 .
The characters 2/1 to 2/15 are used for the option field, where / (2/15) is the only value which has already been defined.
The parameter field may contain VPCE (level 6) information introduced by US control (1/15) in case of not supported VPDE's on level 6.

4.1.13.1 Use of Specific Error Codes (From Btx Terminal to Btx Exchange)



The one-to four-byte error field may contain the first four bytes of the unsupported function sequence.

e.g. USxxx (1/15, x/x, x/x, x/x)

ESCxxx (1/11, x/x, x/x, x/x)

CSIxxx (9/11, x/x, x/x, x/x)

Note: The receiver of the specific error code may continue or Abort, depending on the error code being received. If the specific error code is sent with an EOT as an ending character, the link is reset and a possible transmission of text would be stopped.

4.1.14 TERMINAL FACILITY IDENTIFIER (T.F.I.)

Terminals with a wide range of capabilities may be connected to the videotex services. e.g. buffered and unbuffered terminals, terminals able or not able to receive all kind of DRCS's and in future terminals with geometric and photographic capabilities may become available. The Btx Exchange has to be aware of the facilities of the terminal connected to it. This can be achieved by the presentation of the Terminal Facility Identifier (T.F.I) which is sent by the terminal to the Btx Exchange to describe its facilities.

T.F.I. sequence may be requested for or sent by the terminal at any time.

Enquiry for T.F.I.

SOH [< option >] ENQ

Response - Sending of T.F.I.

SOH < code > < code >... ETB | ETX | EOT (no BCC in either case)

If the Btx Terminal does not answer to a T.F.I enquiry within three seconds, the defaults, i.e. the basic decoder facilities (40 byte-stack) and 32-byte ITB message blocks, are assumed.

< code > ::= < class > | < option > < parameter >

< class > ::= 0 | 1 | 2 | ....

A A A ——— CEPT 3/0, 3/1, 3/2 ....3/15.

Default Value——>0 (3/0) = Basic decoder facilities (40 bytes stack)
1 (3/1) = Basic decoder facilities (no limited stack)
= Other classes are not yet defined

< option > ::= @ | A | B | ....

A A A ——— CEPT 4/0, 4/1, 4/2 ....4/15.

@ (4/0) = Intermediate block size
= Other 4/x options are not yet defined

< parameter >::= 0 (3/0) = no ITB supported, Message Block Size 256 bytes.
1 (3/1) = not supported
Default Value———>2 (3/2) = 32 bytes max. ITB Message blocks
3 (3/3) = 64 bytes max. ITB Message blocks
4 (3/4) = 128 bytes max. ITB Message blocks
5 (3/5) = 256 bytes max. ITB Message blocks

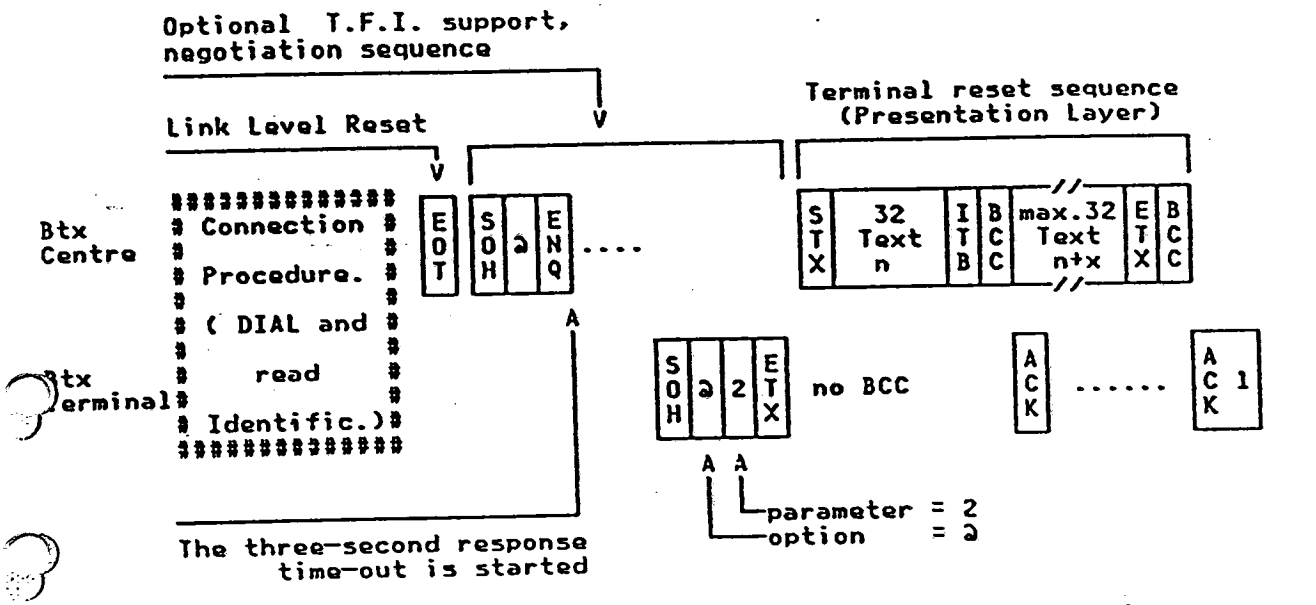
< option > ::= ! | " | # | ....

A A A ——— CEPT 2/1, 2/2, 2/3 ....2/15.

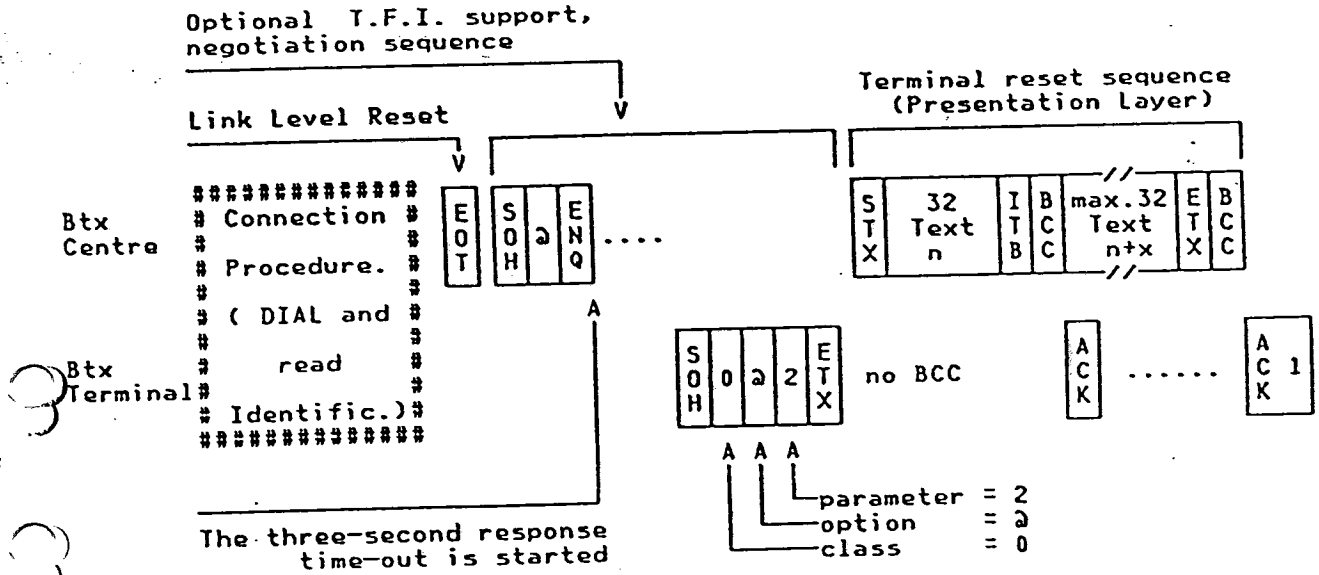
/ (2/15) = one-to four-byte specific error code follows.
= Other 2/x options are not yet defined

< parameter >::= 1/15, x/x, x/x, x/x one-to four-character US sequence.
1/11, x/x, x/x, x/x one-to four-character ESC sequence.
9/11, x/x, x/x, x/x one-to four-character CSI sequence.

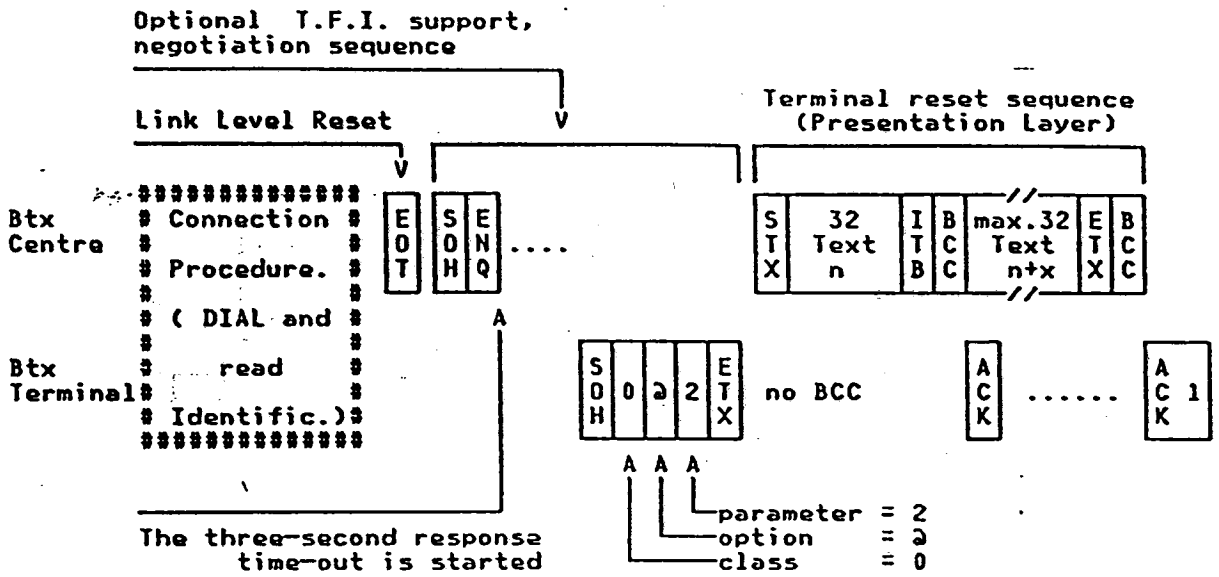
4.1.14.1 Scenario to the T.F.I.



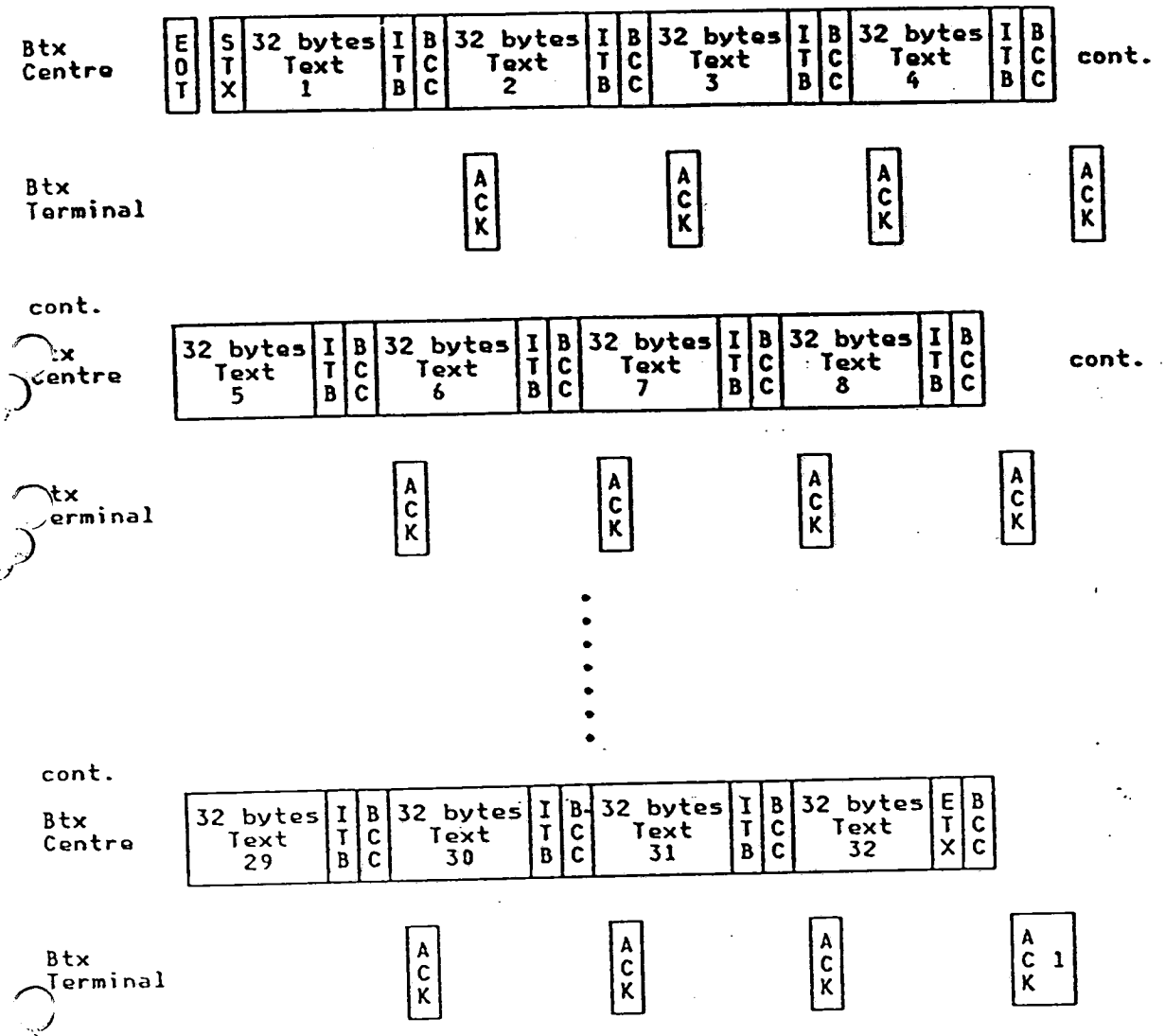
— OR —



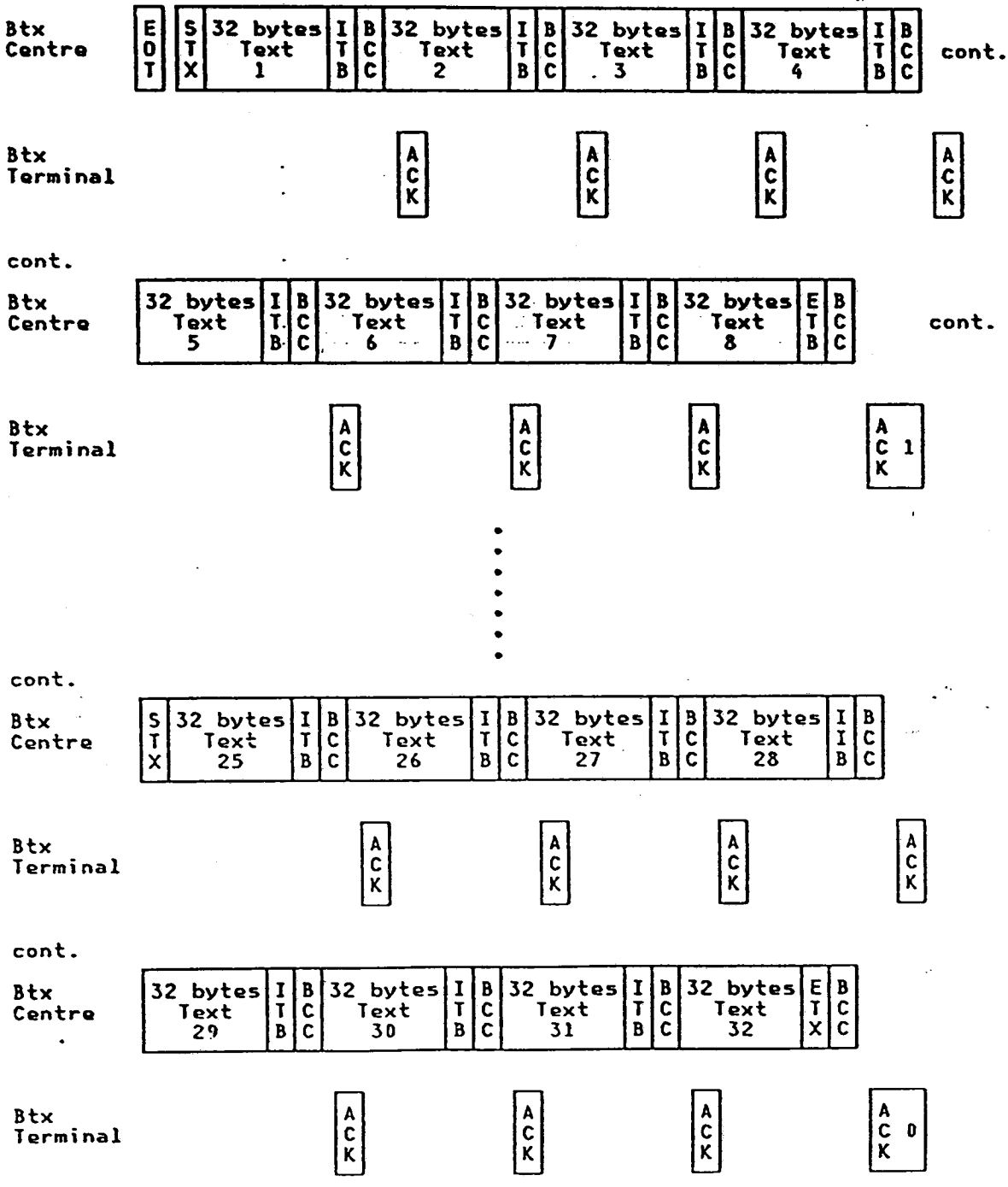
— OR —


Optional T.F.I. support, negotiation sequence
Link Level Reset
Terminal reset sequence (Presentation Layer)
Btx Centre
Btx Terminal
Connection Procedure. (DIAL and read Identific.)
EOT
SOH ENQ
....
STX 32 Text n ITB BCC max.32 Text n+x ETX BCC
A
SOH 0 a 2 ETX
no BCC
ACK ..... ACK 1
A A A
parameter = 2
option = a
class = 0
The three-second response time-out is started

Example 1 of a 1024-byte Message to be transferred to the Btx Terminal using the 32-byte ITB mode default.



Example 2 of a 1024-byte Message to be transferred to the Btx Terminal using the 32-byte ITB mode default.



4.1.15 FLOW CONTROL AND RECOVERY

Flow control in the level 2 protocol for Bildschirmtext works the following way:

1. While the Btx Exchange sends out Intermediate Message Blocks, it checks for the response to the previous Intermediate Message Block after having sent out the last text character of the current Intermediate Message Block. Refer to example 4.1.15 . 1

2. If the response for the previous Intermediate Message Block has already been received at this time and if it is an ACK the transmission continues immediately with sending out the ITB and BCC or ETB/ETX and BCC belonging to the current Intermediate Message Block and continues with the text characters of the subsequent Intermediate Message Block, or it ends in case of the last Intermediate Message Block. Refer to example 4.1.15 . 1

3. If the response for the previous Intermediate Message Block is received and if it is a NAK, an ENQ is sent by the Btx Exchange to initiate a forward abort sequence. Once the forward abort is processed, a retransmission is initiated, beginning with the failing Intermediate Message Block, which is preceded by an optional EOT then STX and the DATA. (The 'optional' EOT is sent in front of the retransmitted Intermediate Message Block only if the retransmitted Intermediate Message Block is the first one of a Message or Message Block). This Intermediate Message Block is the previous one whose negative response initiated the forward abort sequence. Refer to example 4.1.15 . 2 and 4.1.15 . 5

4. If the response for the previous Intermediate Message Block has not been received yet, the Btx Exchange starts a 3-second time-out awaiting the still outstanding response for the previous Intermediate Message Block.

    1) The response is received in time and it is an ACK or the expected ACK0/1 The action being taken is the same as described before. Refer also to example 4.1.15 . 1

    2) The response is received in time and it is a NAK. The action being taken is the same as described before. Refer also to example 4.1.15 . 3

    3) The response is received in time for the last Intermediate Message Block and it is an ACK or not the expected ACK0/1, the acknowledgment is interpreted as a severe error. The recovery and retransmission actions being taken depend on the type of the data that was sent (DRCS data, Chained Pages, Combined Pages), etc. This is outside of the link level 2 responsibility. Refer to example 4.1.15 . 8

5. If the time-out elapses (3 seconds) an ENQ is sent initiating a forward abort sequence. Refer to example 4.1.15 . 4

6. The expected responses to the ENQ and the recovery and retransmission action being taken depend on the four possible situations:

    a. Text n+1 is sent out and Text n is not yet responded, 3-second T.O. starts and times out, ENQ is sent and a 3-second T.O. starts again. Refer to example 4.1.15 . 4

        1) If an ACK and a NAK are received, the ACK is interpreted as the positive acknowledgment to Text n and retransmission starts with Text n+1. Refer to example 4.1.15 . 4

        2) If two NAKs are received, the first NAK is interpreted as the negative acknowledgment to Text n and the second NAK is interpreted as the response to the ENQ, retransmission starts with Text n . Refer to example 4.1.15 . 5

        3) If an ACK only is received, it is interpreted as the positive acknowledgment to Text n, while the response (NAK) to the ENQ is still outstanding. If there is still no additional response (NAK) after three seconds, an EOT is sent and the situation is interpreted as a severe error and its handling is as described before under severe error. Refer to example 4.1.15 . 6

4) If a NAK only is received, it can not be determined whether it is the response to Text n or the response to the ENQ. There is a missing response and after three seconds an EOT is sent, the situation is interpreted as a severe error and its handling is as described before under severe error. Refer to example 4.1.15 . 7

b. The last Intermediate Message Block including ETB/ETX and BCC has been sent out, 3-second T.O.starts and times out, ENQ is sent and the 3 second T.O. starts again.

1) If the expected ACK0/1 is received, no recovery action is necessary. The expected ACK0/1 is interpreted as the positive response to the last Intermediate Message Block.

2) If a NAK only is received, the last Intermediate Message Block is assumed to be in error and it is retransmitted.

3) If the not expected ACK0/1 or an additional response plus the expected ACK0/1 are received, the situation is also interpreted as a severe error and the recovery is as described before under severe error. Refer to example 4.1.15 . 8

7. While the first Intermediate Message Block (even the first Intermediate Message Block in a retransmission after a recovery) is sent, all responses, except the keyboard data, from the Btx Terminal are discarded by the Btx Exchange. This is also true while sending Messages or Message Blocks, because the Btx Terminal has to respond only after having received the appropriate ITB-BCC, ETB-BCC or ETX-BCC. The Btx Exchange does not expect responses while sending the first Intermediate Message Block or Message Block and/or Message (with no ITB's).

Summary

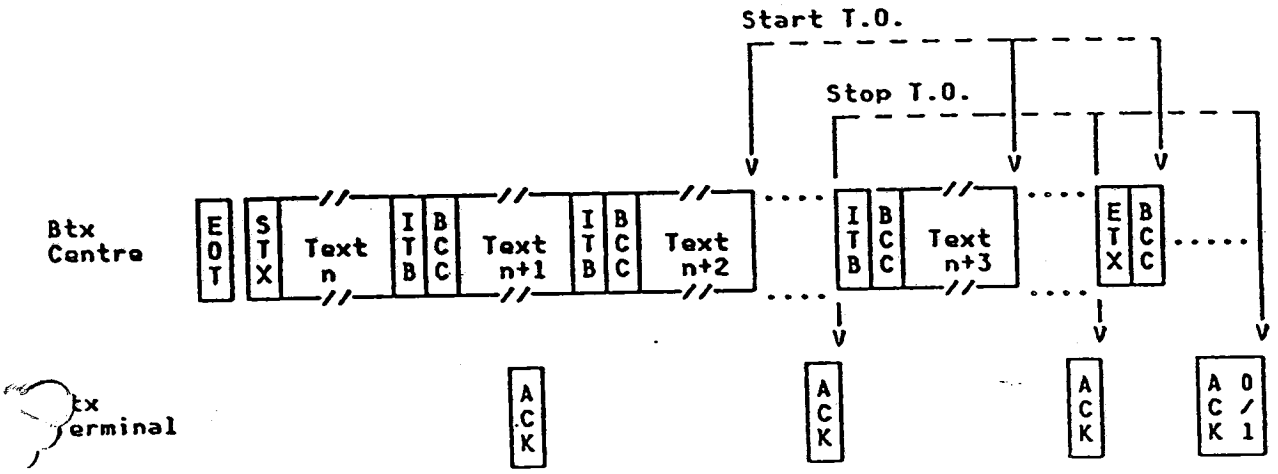
In this protocol there are only two situations that are interpreted as severe error conditions.

1. The total number of responses received is not identical to the number of responses expected. This might happen if the receiver of messages replies with the response and the sender of the message did not recognize that response, or while the sender of a message aborted a transmission for any reason and the receiver did not recognize the EOT(s), already getting new or recovered Intermediate Message Blocks and still sending replies for previous Intermediate Message Blocks. Refer to examples 4.1.15 . 8 and 4.1.15 . 9

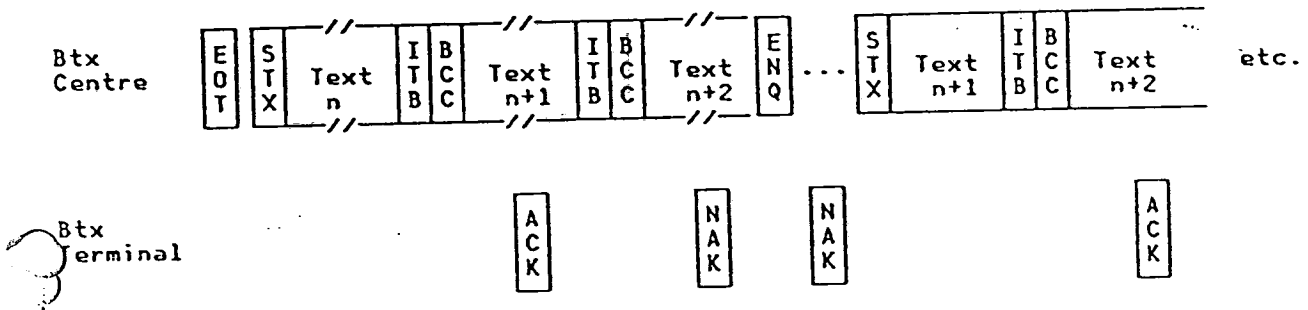
2. The response to the last Intermediate Message Block of a Message Block is not the expected ACK0/1, which means ACK 0 is received instead of an ACK 1, or vice versa.

- Note:
  If a receiver receives Messages, Message Blocks or Intermediate Message Blocks which are longer than determined by T.F.I. or the defaults (32 bytes or 256 bytes for Bulk update), or if the Messages, Message Blocks or Intermediate Message Blocks appear to be longer due to the fact of not having recognized the ending characters (ITB, ETB, ETX), the receiver shall send a NAK as soon as the situation arises. This gives the sender of the Message, Message Block or Intermediate Message Block the possibility to recover at Link Level 2. Otherwise the sender may time-out, send out an ENQ, get back a NAK and have a possible missing response, which is handled as a SEVERE ERROR and can not be recovered at Link Level 2.

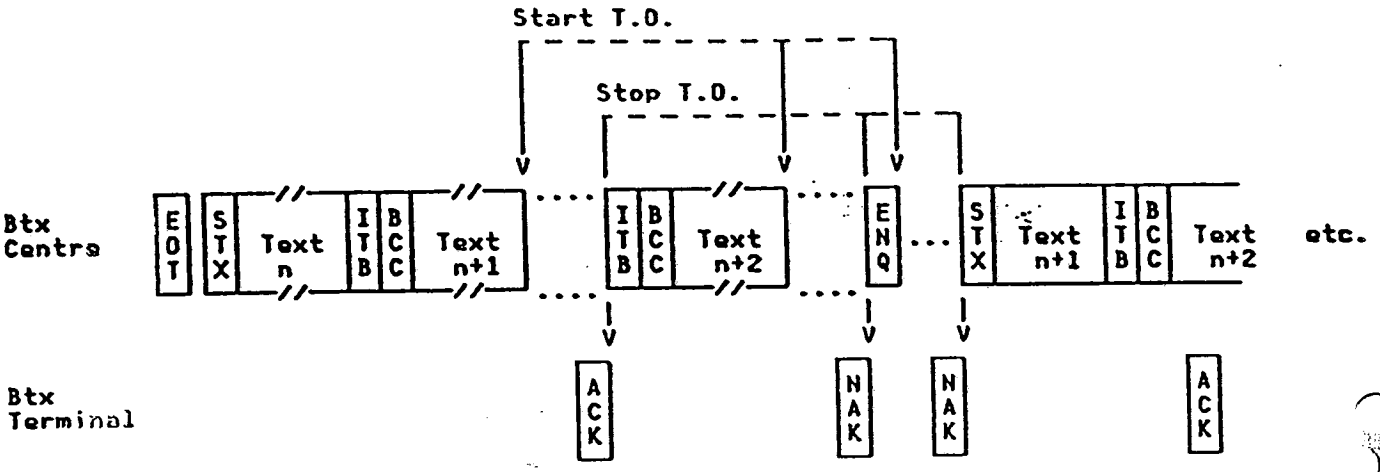
Flow Control, normal Transmission



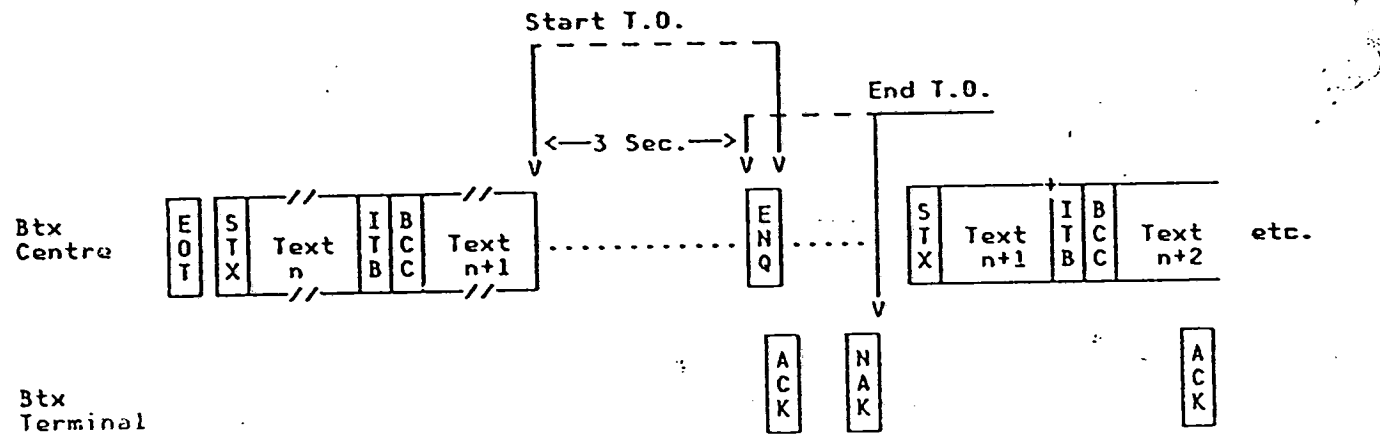
Flow Control, NAK received and Retransmission



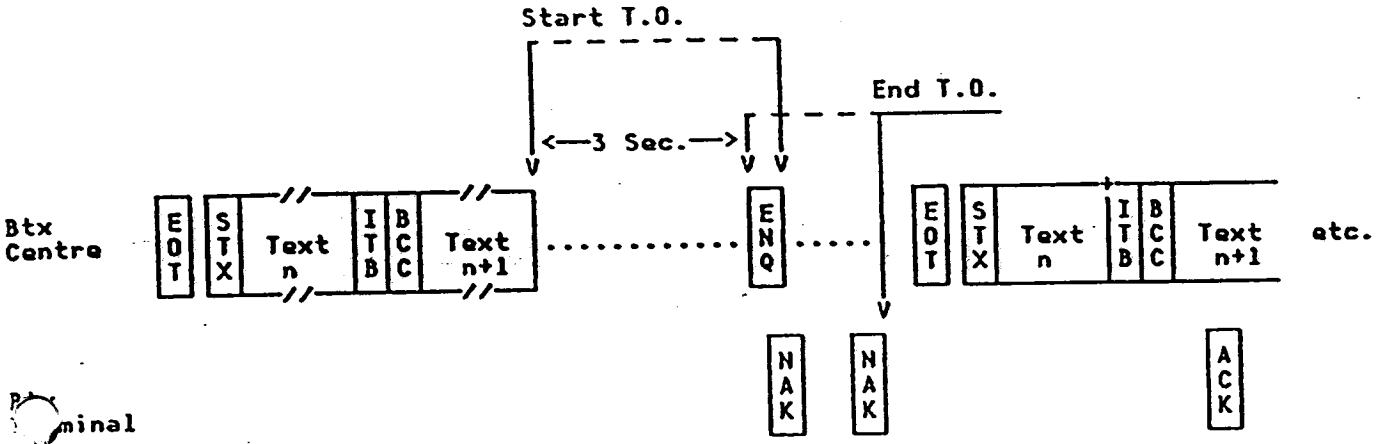
Flow Control, NAK delayed received and Retransmission



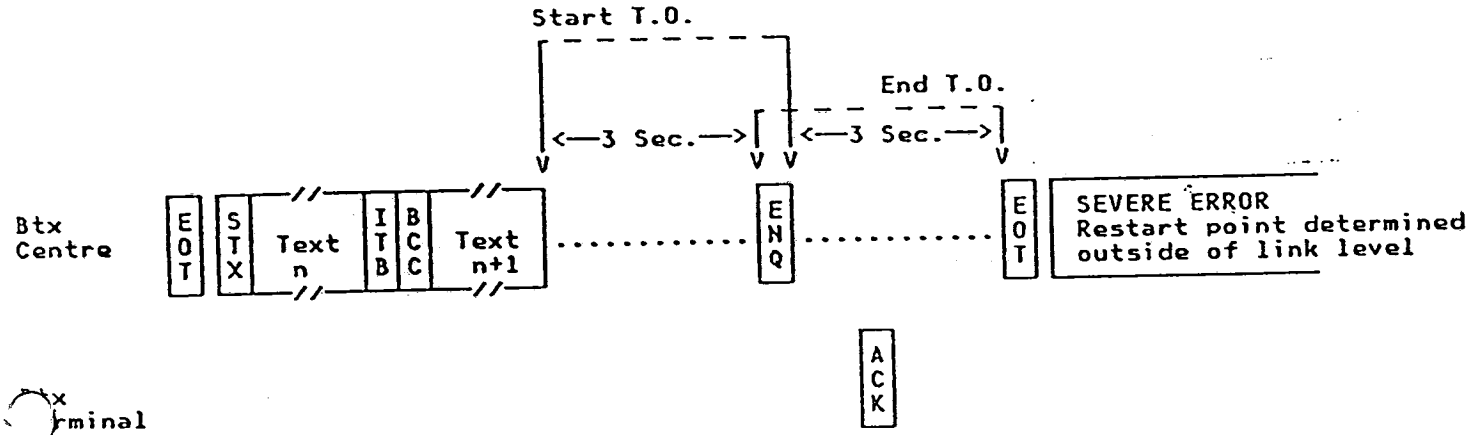
Flow Control, Time-Out and Retransmission, ACK, NAK received



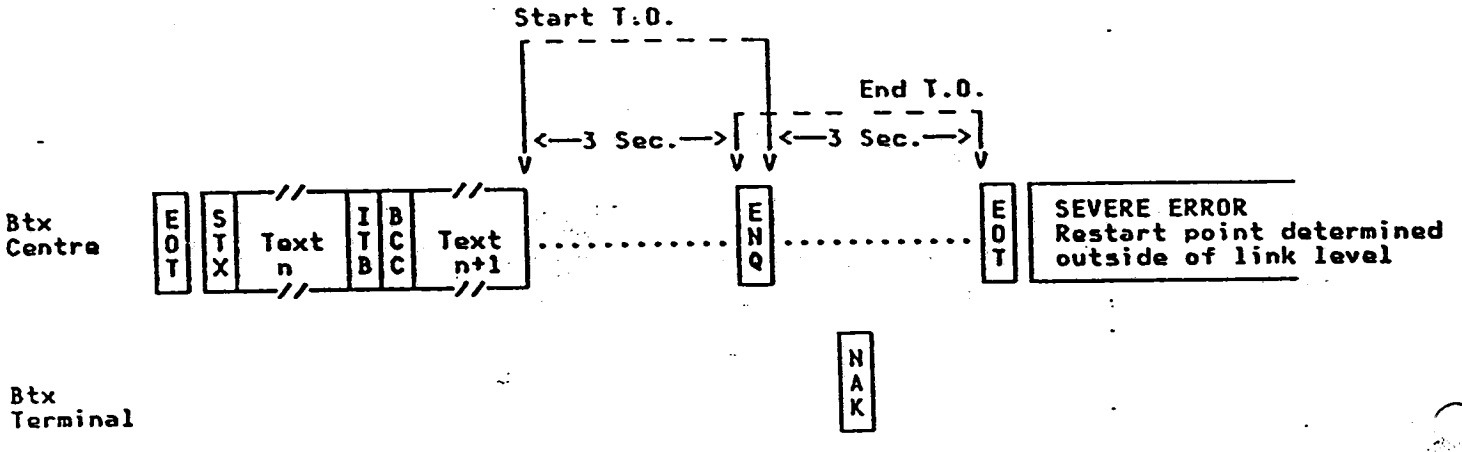
Flow Control, Time-Out and Retransmission, NAK, NAK received



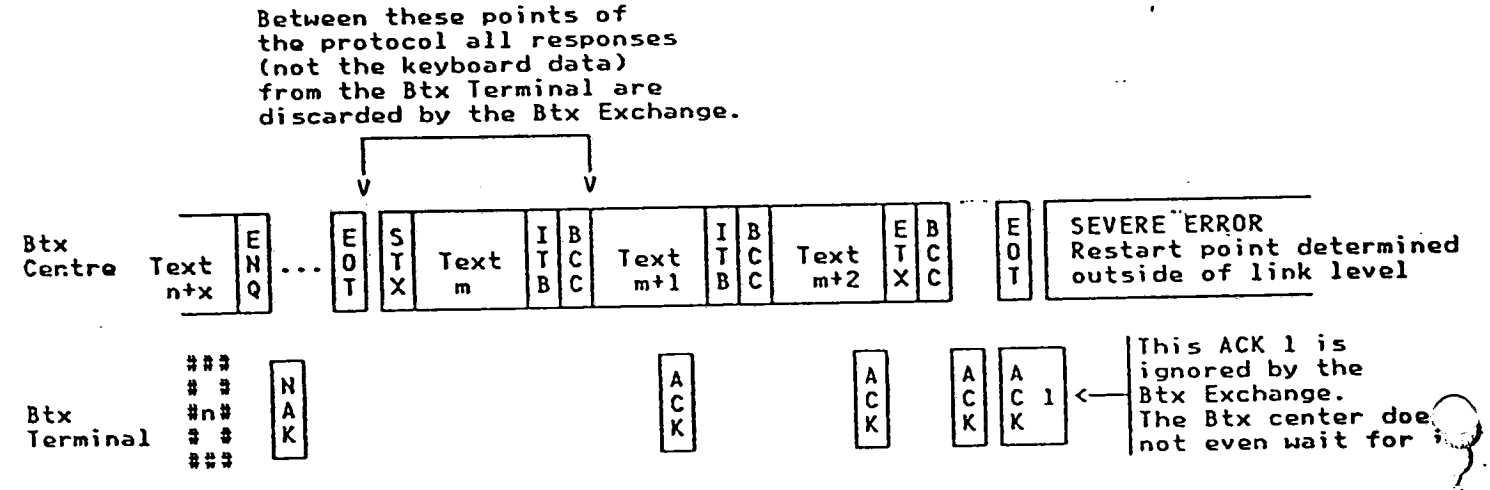
Severe Error Condition, too few Responses received, n o retry on ENQ



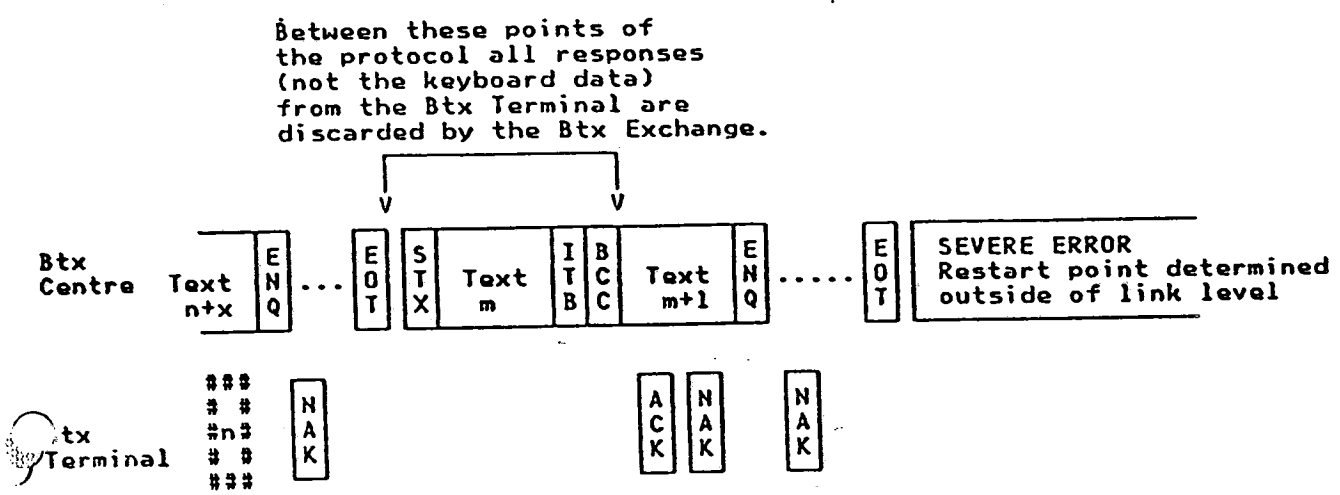
Severe Error Condition, too few Responses received, n o retry on ENQ



Severe Error Condition, too many Responses received



Severe Error Condition, too many Responses received



4.1.16 CEPT VIDEOTEX (CONTROL SET C0)

Refer to: Specification of a Basic Videotex Terminal operating to the EUROPEAN VIDEOTEX SERVICE.

b8	0	0	0	0	0	0	0	0
b7	0	0	0	0	1	1	1	1
b6	0	0	1	1	0	0	1	1
b5	0	1	0	1	0	1	0	1
LSB ↓	0	1	2	3	4	5	6	7
b4 b3 b2 b1								
0 0 0 0	0	NUL	DLE					
0 0 0 1	1	SOH	con					
0 0 1 0	2	STX	rpt					
0 0 1 1	3	ETX	ini					
0 1 0 0	4	EOT	cof					
0 1 0 1	5	ENQ	NAK					
0 1 1 0	6	ACK	SYN					
0 1 1 1	7	ITB	ETB					
1 0 0 0	8	apb	can					
1 0 0 1	9	apf	ss2					
1 0 1 0	10	apd	dct					
1 0 1 1	11	apu	esc					
1 1 0 0	12	cs	ter					
1 1 0 1	13	apr	ss3					
1 1 1 0	14	ls1	aph					
1 1 1 1	15	ls0	apa					

Note: Transmission control characters are denoted in upper case letters

SYN is not used in this asynchronous Link-Level Protocol.

4.1.17 SCENARIOS

Refer also to examples in the previous Chapters 4.1.6 and 4.1.15

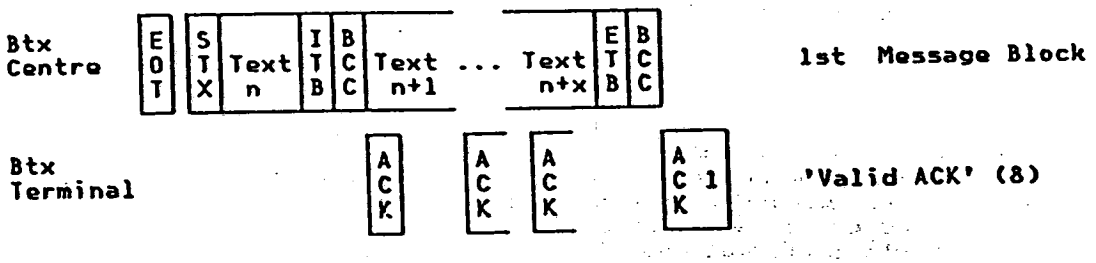
Note:

In any given case, the number of acknowledgments (ACK, NAK, or ACK 0/1) must be identical to the number of blocks (ended by ITB, ETB, ETX or ENQ) sent. Which means also that, if once a NAK was responded within a Message Block all the following intermediate blocks, regardless of whether aborted by an ENQ or not must be responded by NAK's. If the numbers are not equal, the whole Message Block must be retransmitted.

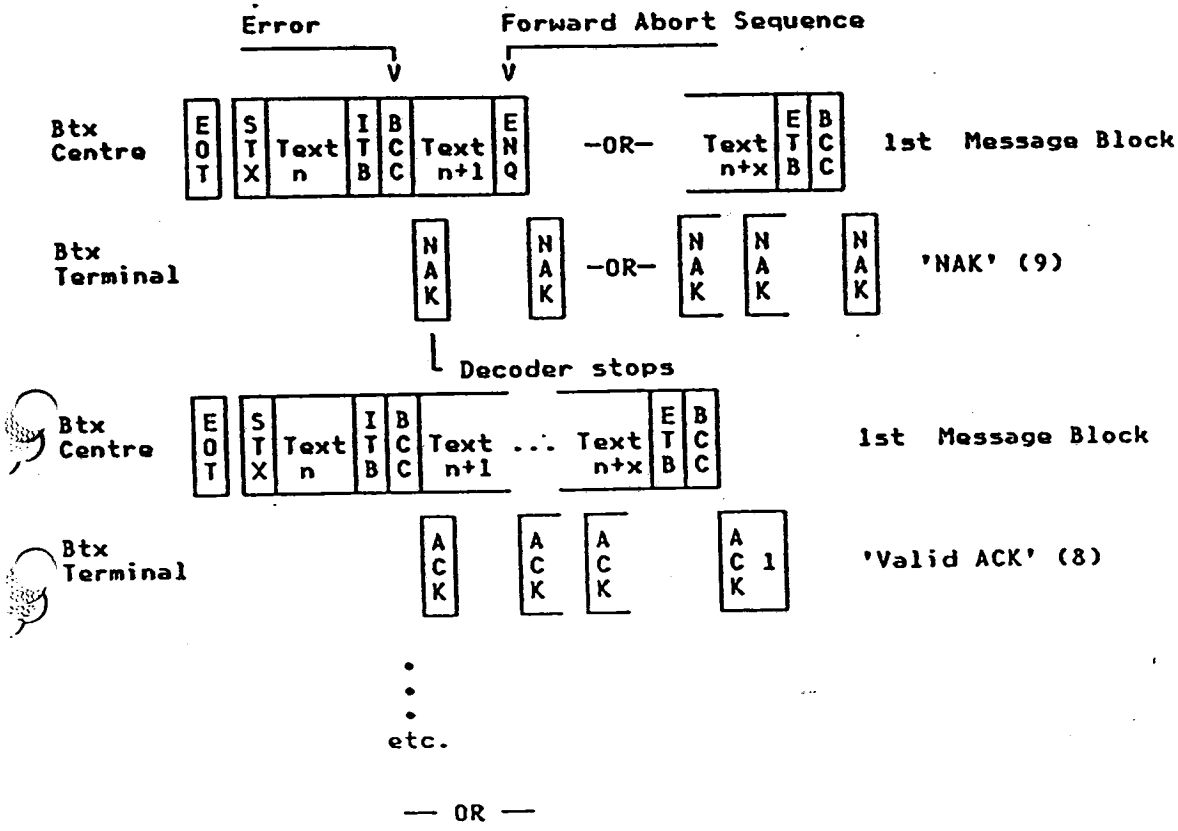
In the following examples it is assumed that all responses, e.g., ACK, ACK0/1 or NAK, are received within the time-out limits.

The ( ) refer to the numbers in the flow diagrams.

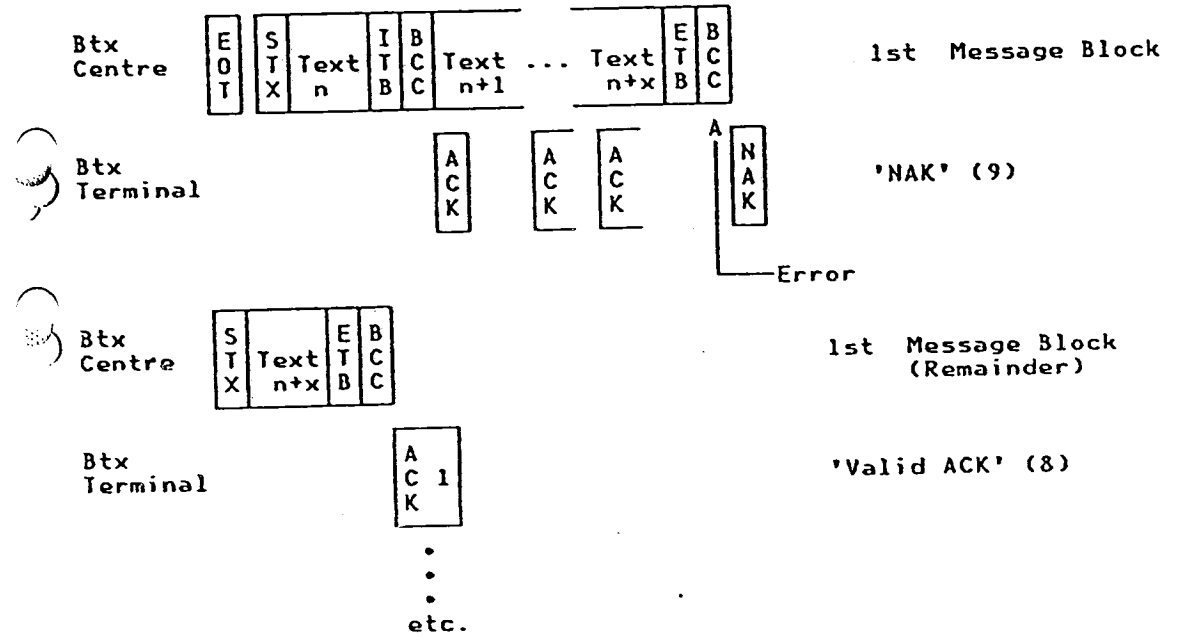
Line Procedure, Error-free Transmission



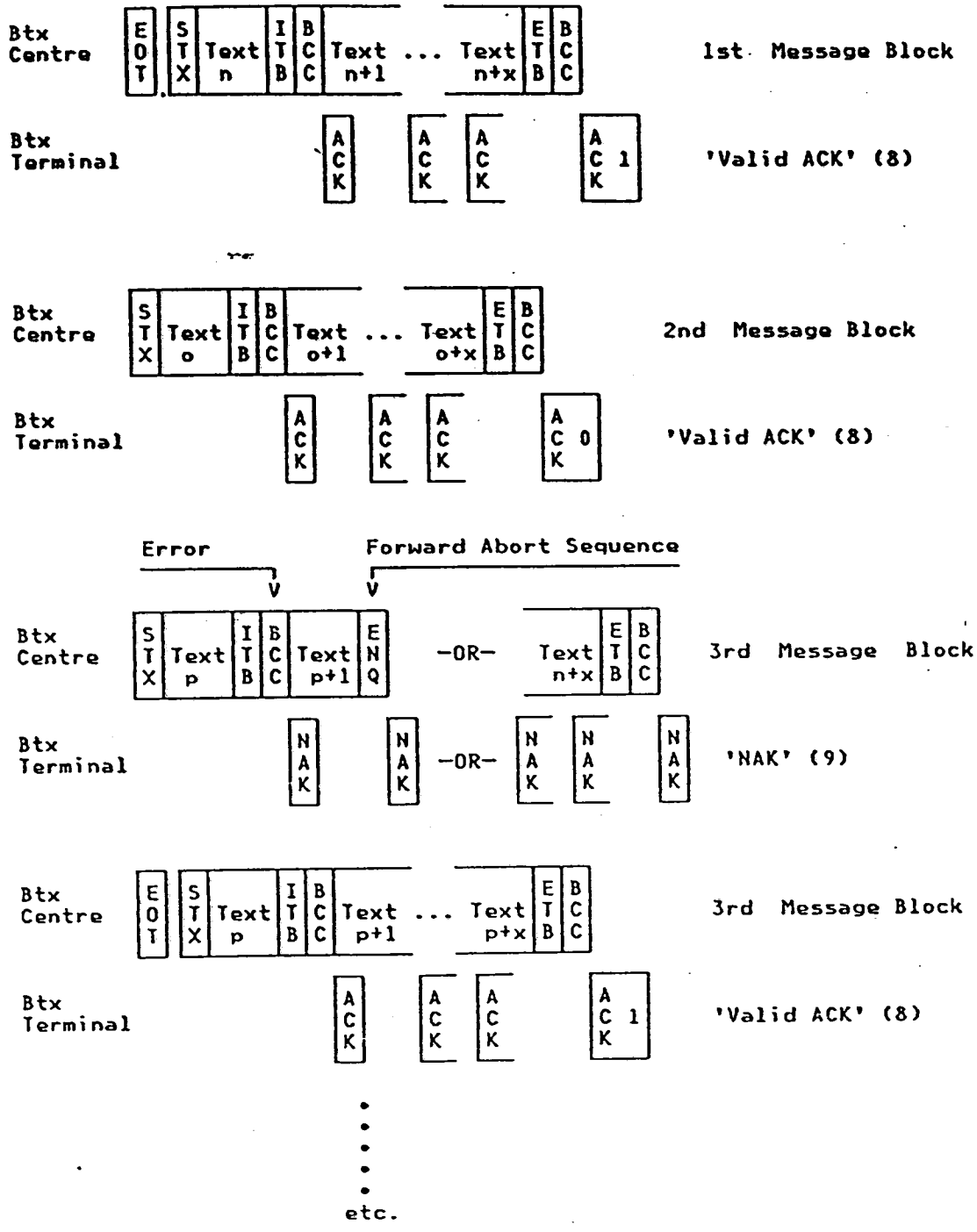
Line Procedure, Error in 1st Message Block



Line Procedure, Error in 1st Message Block

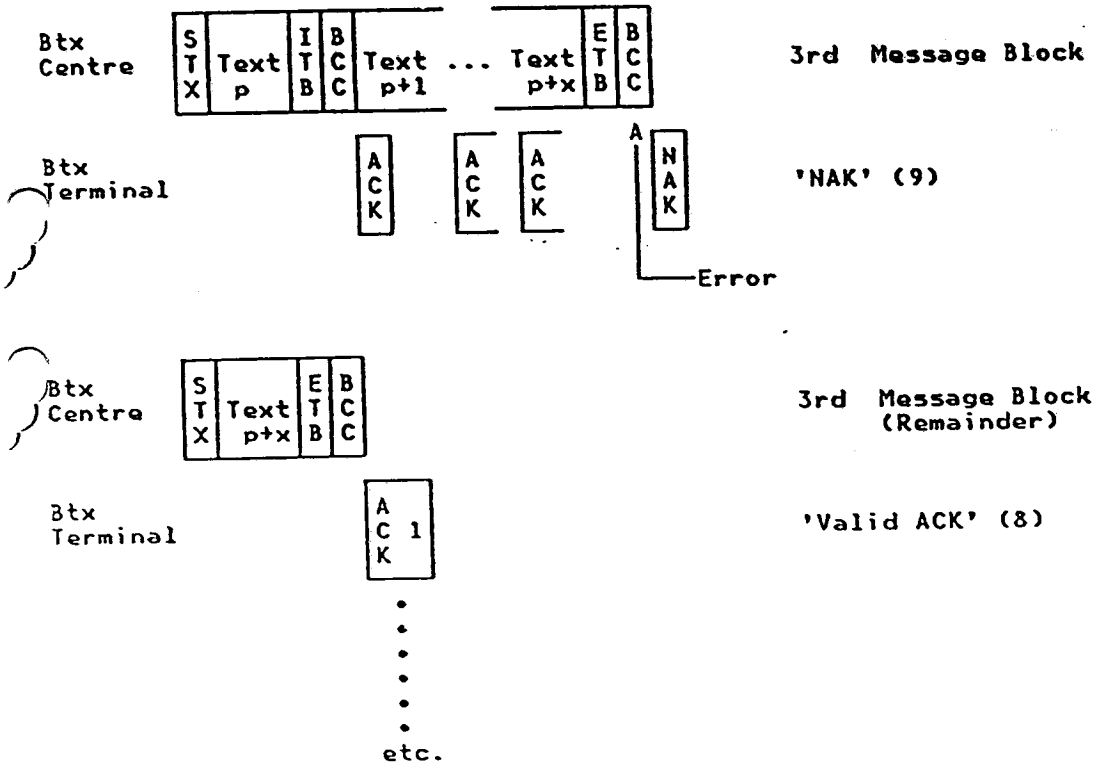


Line Procedure, Error in 3rd Message Block



— OR —

Line Procedure, Error in 3rd Message Block



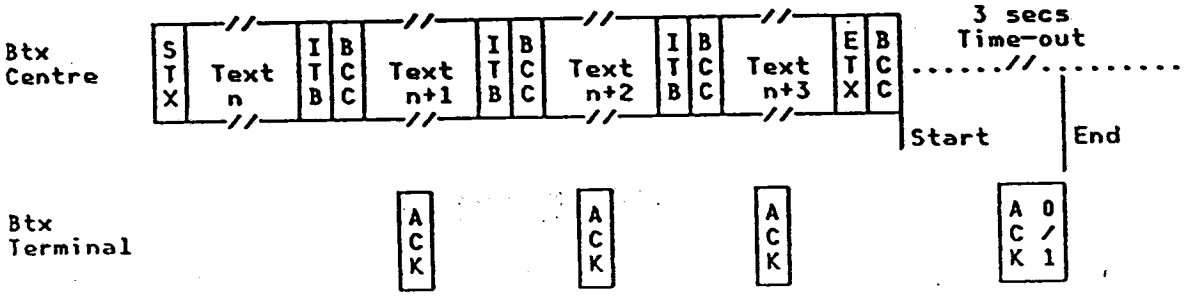
4.1.18 ADDITIONAL EXAMPLES

For the interpretation of the three-second time-out refer to Chapter 4.1.8 'Time-outs' earlier in this document.

Case: Valid ACK (8)

Meaning: The expected ACK 0/1 has been received and the total number of received ACK's, including the expected ACK 0/1 is equal to the number of Intermediate Message Blocks within this Message.

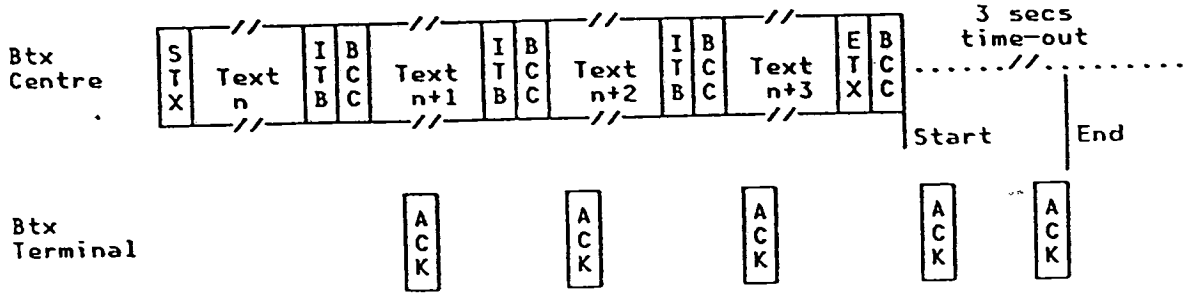
Action: Normal end, continue with next Message.



Case: Wrong ACK, SEVERE ERROR (14)

Meaning: An ACK has been received during the 3-second time-out, which means: too many acknowledgments. The last Intermediate Message Block can be acknowledged with ACK0/1 or NAK only.

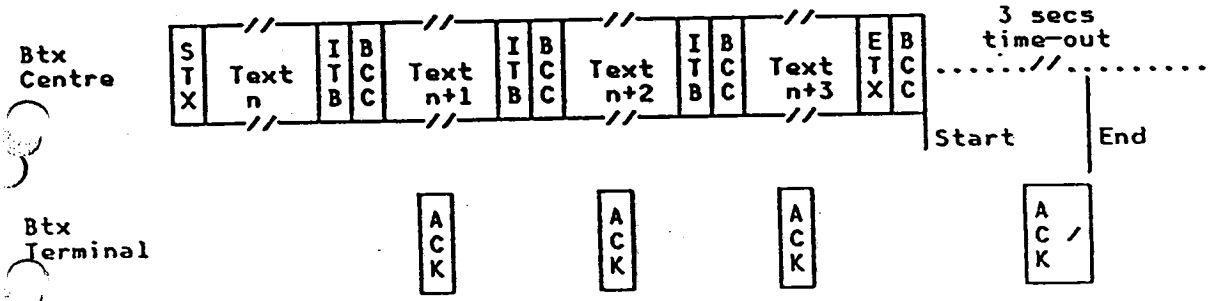
Action: This is a SEVERE ERROR condition, which can not be handled at Link Level 2. The restart point is determined outside of Link Level 2.



Case: Wrong ACK SEVERE ERROR (14)

Meaning: The received ACK 0/1 is not the expected one o r the number of received ACK's, including the received ACK 0/1 is n o t equal to the number of Intermediate Message Blocks.

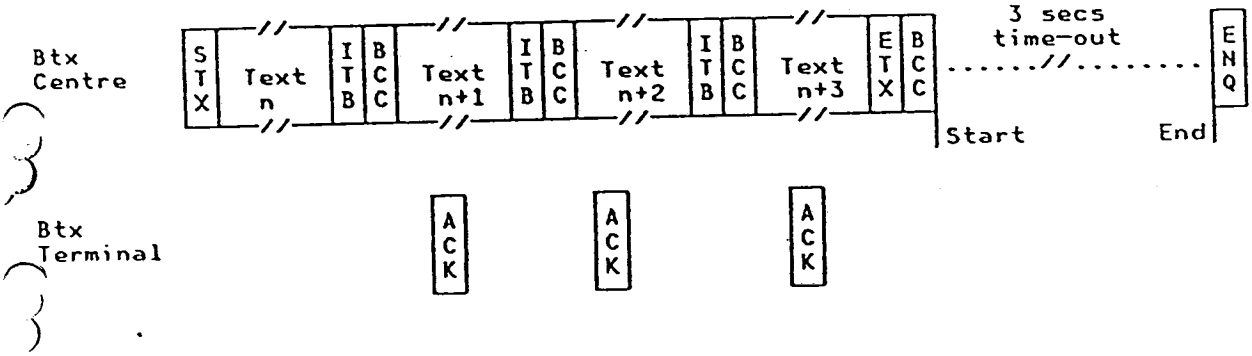
Action: This is a SEVERE ERROR condition, which can not be handled at Link Level 2. The restart point is determined outside of Link Level 2.



Case: Nothing T.O. (15)

Meaning: Nothing was received during the 3-second time-out.

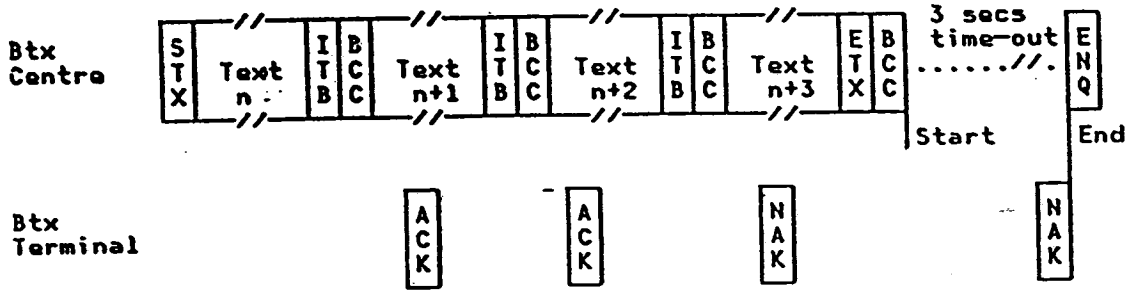
Action: Send ENQ, according to the response to the ENQ, continue with the appropriate diagram. Refer also to 4.1.15.



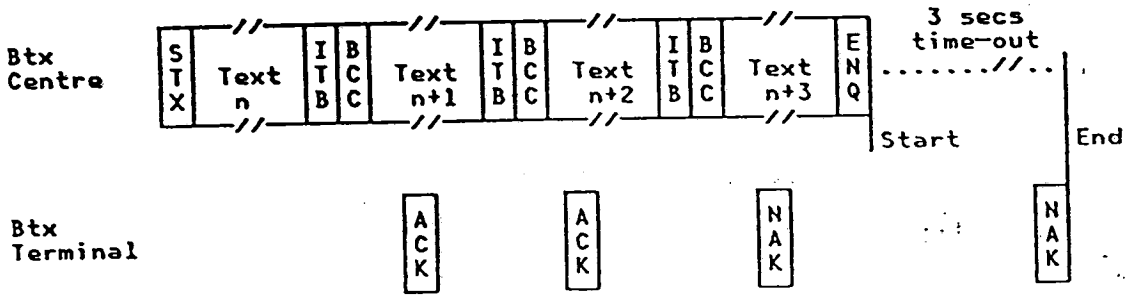
Case: NAK. (9)

Meaning: A NAK was received during the 3-second time-out

Action: Send ENQ. According to the response to the ENQ, continue with the appropriate diagram. Refer also to 4.1.15.



-- OR --



4.1.19 FLOW DIAGRAMS

Message Transfer and Terminate States.
The following notes refer to the flow diagrams Btx Exchange and Btx Terminal.

General comments on flow diagram notation.

Nothing-

This notation in a receive column indicates that the receiving station failed to receive any intelligence for one of two reasons: 1) The transmitting station did not in fact transmit or 2) the receiving station failed to recognize the incoming characters. The receiving station will initiate and complete a 3-second read time-out when an anticipated response is not received. The 3 seconds may be reinitiated a number of times.

T.O.-

This notation indicates that a time-out is to be completed prior to initiating the following action. In some cases the time-out may be optional and will be covered in the corresponding narrative.

n-

This notation is used to imply that a given action or sequence may be repeated a variable number of times to attempt proper or corrective operation. With each repetition the "n" count is reduced by one and at an "n = 0" condition an alternative action is normally taken. In some cases for example, it is possible to reinitiate the retry sequence for additional attempts to complete the operation.

Introductory Notes: In the following flow diagrams a 'text' is defined as a properly formatted block, i.e., one that is framed by the appropriate start (STX, DLE STX) and end (ENQ, ETB, ETX, DLE ENQ, DLE ITB, DLE ETB, DLE ETX) characters. Note also that slave responses (ACK, ACK 0/1, NAK, WACK) are used only for properly formatted blocks.

- (1) When ITB's are used to separate a Message or a Message Block into Intermediate Message Blocks, the following rules are used for the flow control mechanism:

  The first Intermediate Message Block is sent out followed immediately by the text of the second one. At the end of the second one, a check is made for an already received acknowledgment (while the transmitting station is still in text mode).

  If an ACK (8a) has been received, (positive acknowledgment for the previous Intermediate Message Block) the ITB for the second Intermediate Message Block is sent out without a delay and data transfer goes on for the following Intermediate Message Blocks, using the same rules as before.

  If a NAK (9a) has been received (negative acknowledgment for the previous Intermediate Message Block), an ENQ (4a) is sent out without a delay to initiate a forward abort sequence. The expected acknowledgment to this is a NAK (9b).

  If Nothing (15a) has been received (the previous Intermediate Message Block has not been responded), a three-second time-out is started, awaiting the outstanding response. If the outstanding response is received during this time, its handling is exactly the same as described before. If the three-second time-out elapses before a response is received, an ENQ (4b) is sent to initiate a forward abort. Note that the shown ACK (8b) is not a response to the ENQ (4b) but the reply (delayed by the SLAVE) for the previous Intermediate Message Block. One of the NAK's (9b) belongs to that ENQ (4b).

  Note.
  In case of lost responses, the situation is always interpreted as a SEVERE ERROR. The recovery procedure is determined outside of Link Level 2.

  Refer also to 4.1.15 Flow Control and Recovery

- (2) A Message, Message Block or Intermediate Message Block terminated by ETB and the BCC causes the sender to start a 3-second time-out and expect a response during that time from the receiver.

- (3) A Message, Message Block or Intermediate Message Block terminated by ETX and the BCC causes the sender to start a 3-second time-out and expect a response during that time from the receiver.

- (4) A Message, Message Block or Intermediate Message Block terminated by ENQ signals a cancel function for that Message, Message Block or Intermediate Message Block (Forward Abort). It should be noted that zero length text is also possible (STX ENQ) for the block cancel function (forward abort).

- (4a) An Intermediate Message Block terminated by ENQ signals a cancel function for that Intermediate Message Block.

- (4b) An Intermediate Message Block terminated by ENQ signals a cancel function for that Intermediate Message Block.

- (5) The master requests the slave to repeat its last status ACK 0/1, NAK or WACK. (Never ACK)

- (7) The master terminates the current transmission.

- (8) The appropriate alternating acknowledgment is an affirmative response to the last Message, Message Block or the last Intermediate Message Block. Valid ACK means also that the total number of received ACK's including the alternating ACK0/1 must be equal to the number of Intermediate Message Blocks within this Message or Message Block.

- (8a) The ACK is an affirmative response to a successfully received Intermediate Message Block, which was ended by an ITB.

- (8b) This ACK is not an acknowledgment to ENQ (4b) but the reply (delayed by the SLAVE) to the previous Intermediate Message Block.

- (9) The negative acknowledgment is a response to a Message, Message Block or Intermediate Message Block with an invalid BCC or ended with ENQ (block cancel, Forward Abort). The NAK (9) has to be transmitted in case of an invalid BCC e v e r y time an ITB, ETB, ETX is received even if it was already transmitted for a previous Intermediate Message Block. So the number of responses must be identical to the number of Intermediate Message Blocks.

- (9a) The negative acknowledgment is the response to the previous Intermediate Message Block.

- (9b) The negative acknowledgment is the response to the ENQ (4a) or (4b).

- (11) Affirmative response to the last Message or Message Block, denoting that the slave is temporarily unable to receive the next Message or Message Block. Usual action by the master is to send ENQ seeking the proper ACK0/1 before proceeding to send the next Message or Message Block. A master station EOT (7) following the receipt of WACK is an unusual termination condition, i.e., to the link has to reinitiatize following excessive or continuous WACK responses. In this case both stations must assume that the last Message Block was processed by the slave station.

- (13) The slave fails to receive, due either to a transmission error or the fact that the master did not initialize a transmission within the period of a receive time-out. In this case the text transmission must be accepted. It must be assured that the text delay was caused by abnormal transmit delay at the master station and the integrity of the master station must be assumed to ensure that two successive transmissions were not made without an intervening slave response. The slave station may elect to terminate by transmitting EOT after "n" unsuccessful receive time-outs.

- (14) The master station detects a sequential error in the ACK0/1,

- (14a) o r the number of responses received is n o t equal to the number of responses expected.

  - The slave station did not receive the Message, Message Block or Intermediate Message Block (or parts of it), e.g., no start or ending characters were recognized. In this cas the slave station may remain quiet (Nothing / T.O. (15) and the master station will experience a Receive time-out and transmit ENQ (4b) to request the slave status. The slave station will then respond with its previous acknowledgment for the previous Message, Message Block or Intermediate Message Block, resulting in a sequential ACK0/1 error at the master station. The proper ERP procedure for the master station at this point depends on the reply to the ENQ.

    Both (14) and (14a) are handled as a SEVERE ERROR.

- (15) A receive time-out occurred at the master station in response to a Message, Message Block. Nothing was received during this time-out. An ENQ will be sent at the end of the time-out to request the slave status.

- (15a) This means that Nothing was received while the Master is in text mode and is transmitting the current Intermediate Message Block.

- (17) Similar to (15). A STX Text ENQ indicates a forward abort sequence where a NAK is the expected response but in case of a receive time-out the master may send an ENQ to request the status of the slave.

- (22) Receipt of an EOT by the slave station following a transmitted affirmative response to a Message, Message Block or the last Intermediate Message Block, terminated by ETX may be interpreted as normal completion of trans-

mission. Note that this is true only if normal hierarchical conventions relative to usage of ETB and ETX are observed.

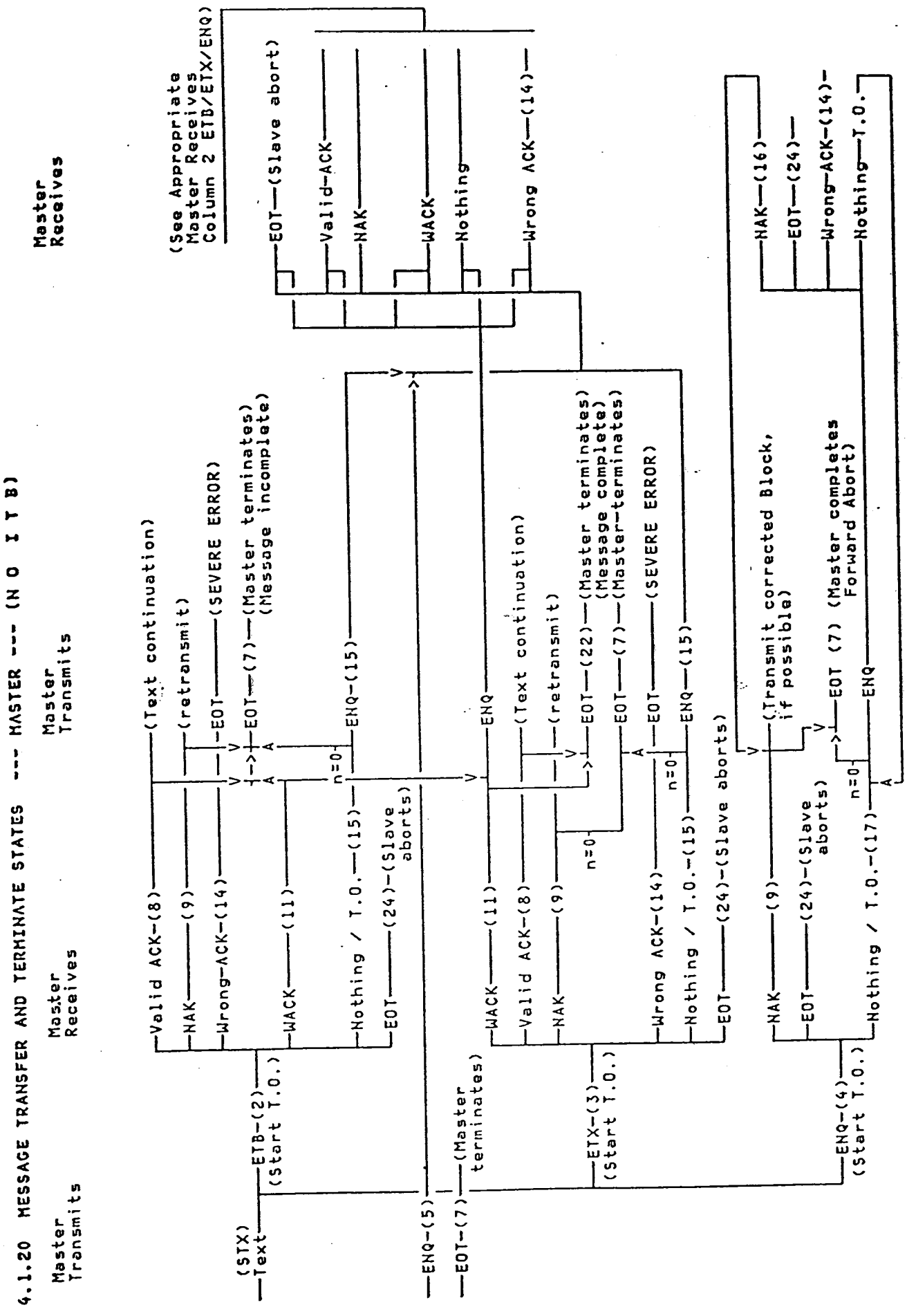
- (23) Receipt of an EOT by the slave station following its NAK response, a Message, Message Block or Intermediate Message Block, terminated with ENQ, completes the forward abort sequence.

- (24) The slave station causes the transmission to be terminated prematurely by transmitting EOT in response to the master station's transmission. This must be considered a slave station abort when it is unable to continue receiving Messages, Message Blocks or Intermediate Message Blocks. The EOT response resets the data link to control mode and does not constitute an affirmative response for the last transmission block. The master station must ensure that the Message, Message Blocks or Intermediate Message Blocks are retransmitted when transmission to the slave is reinitialized.

- (25) An ENQ in response to a previous WACK transmitted by the slave station cannot result in a NAK being returned to the master. The initial WACK transmission implies an affirmative response to the last transmission block.

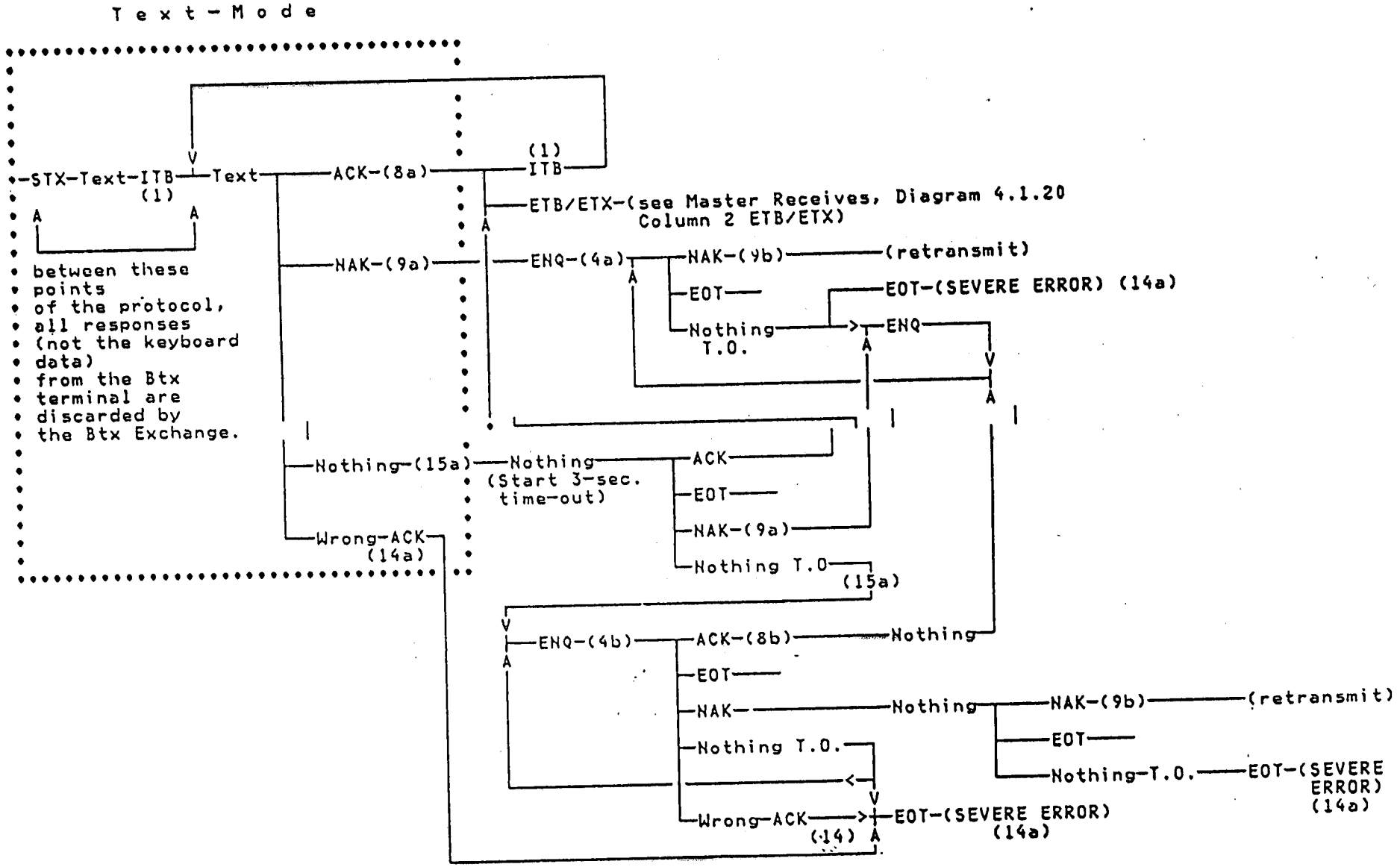
- (26) In case of file transfer only, the Btx Terminal expects an EOT after having requested file transfer and will act as the MASTER for the duration of the file transfer.

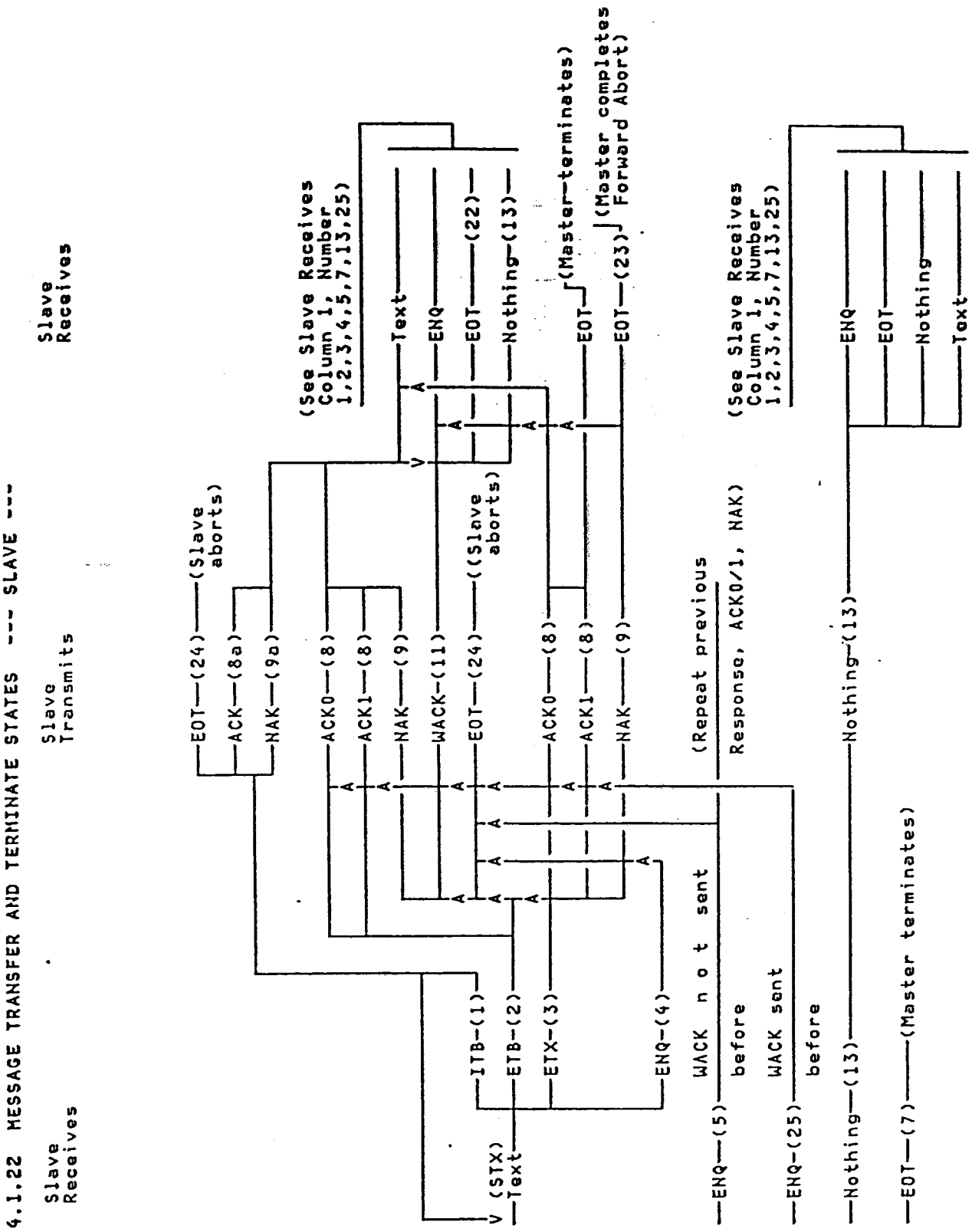
- (27) While doing file transfer, an EOT being sent or received causes the end of file transfer.


4.1.20 MESSAGE TRANSFER AND TERMINATE STATES --- MASTER --- (N O I T B)
Master Transmits
Master Receives
Master Transmits
(STX)-Text
ETB-(2) (Start T.O.)
Valid ACK-(8)
NAK (9)
Wrong-ACK-(14)
WACK (11)
(Text continuation)
(retransmit)
EOT (SEVERE ERROR)
EOT-(7) (Master terminates) (Message incomplete)
Nothing / T.O.-(15)
EOT (24)-(Slave aborts)
ENQ-(15)
n=0
ENQ-(5)
EOT-(7) (Master terminates)
WACK (11)
Valid ACK-(8)
NAK (9)
Wrong ACK-(14)
Nothing / T.O.-(15)
EOT (24)-(Slave aborts)
ETX-(3) (Start T.O.)
(Text continuation)
(retransmit)
EOT (22) (Master terminates) (Message complete)
EOT (7) (Master-terminates)
EOT (SEVERE ERROR)
ENQ-(15)
ENQ
Master Receives
(See Appropriate Master Receives Column 2 ETB/ETX/ENQ)
EOT (Slave abort)
Valid-ACK
NAK
WACK
Nothing
Wrong ACK-(14)
NAK (16)
EOT (24)
Wrong-ACK-(14)
Nothing T.O.
(Transmit corrected Block, if possible)
NAK (9)
EOT (24)-(Slave aborts)
EOT (7) (Master completes Forward Abort)
Nothing / T.O.-(17)
ENQ-(4) (Start T.O.)
ENQ

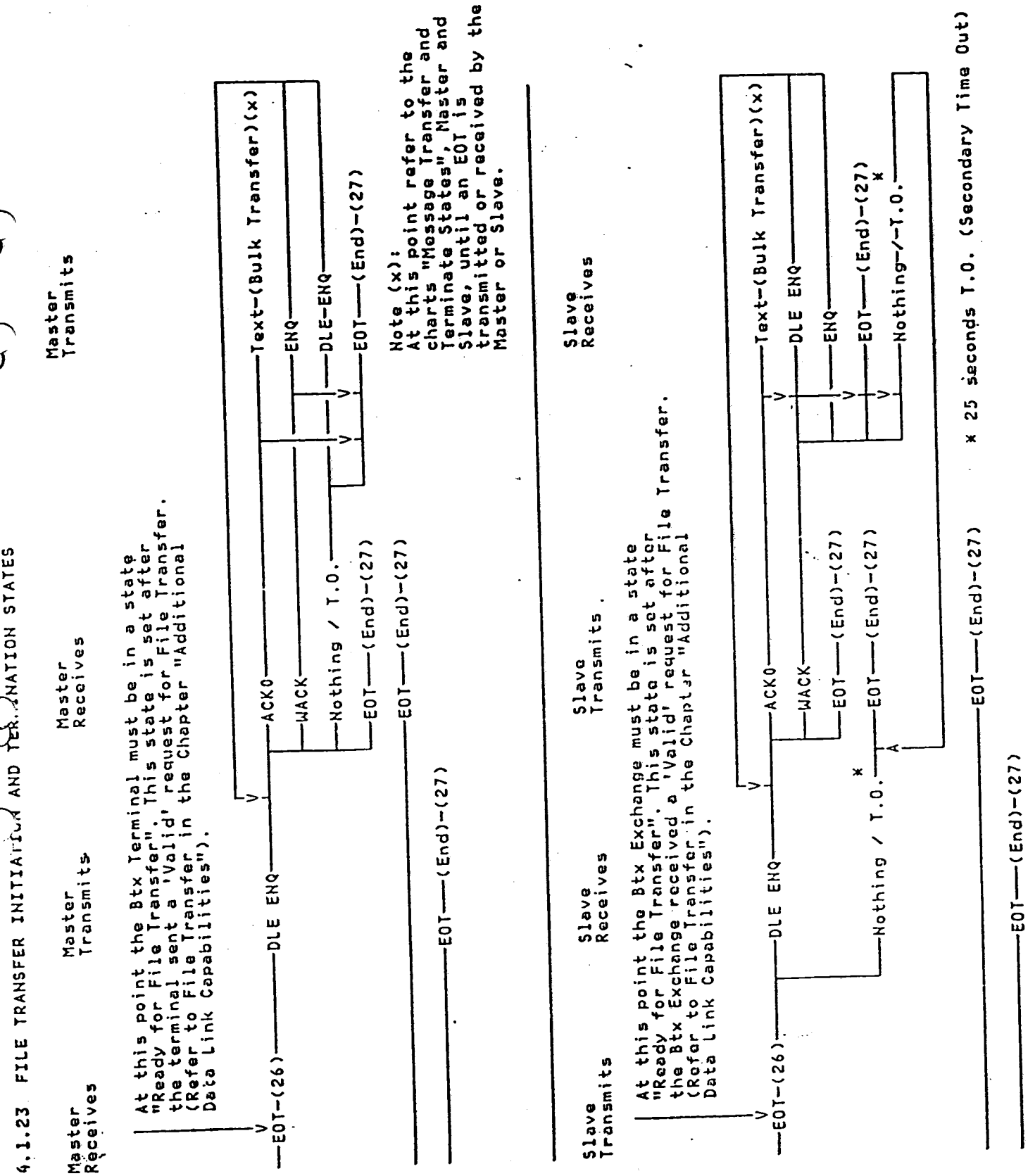
4.1.21 MESSAGE TRANSFER AND TERMINATE STATES --- MASTER --- (I T B)

Master Transmits (Text Mode)	Master Receives (Text Mode)	Master Transmits	Master Receives	Master Transmits	Master Receives	Master Transmits




4.1.22 MESSAGE TRANSFER AND TERMINATE STATES --- SLAVE ---
Slave Receives
Slave Transmits
Slave Receives
EOT—(24)—(Slave aborts)
ACK—(8a)
NAK—(9a)
ACK0—(8)
ACK1—(8)
NAK—(9)
WACK-(11)
EOT—(24)—(Slave aborts)
ACK0—(8)
ACK1—(8)
NAK—(9)
(See Slave Receives Column 1, Number 1,2,3,4,5,7,13,25)
Text
ENQ
EOT—(22)
Nothing—(13)
EOT—(Master terminates)
EOT—(23)—(Master completes Forward Abort)
(See Slave Receives Column 1, Number 1,2,3,4,5,7,13,25)
ENQ
EOT
Nothing
Text
(Repeat previous Response, ACK0/1, NAK)
ITB-(1)
ETB-(2)
ETX-(3)
ENQ-(4)
V (STX)
Text
WACK not sent before
WACK sent before
ENQ—(5)
ENQ-(25)
Nothing—(13)
Nothing—(13)
EOT—(7)—(Master terminates)

4.1.23 FILE TRANSFER INITIATION AND TERMINATION STATES



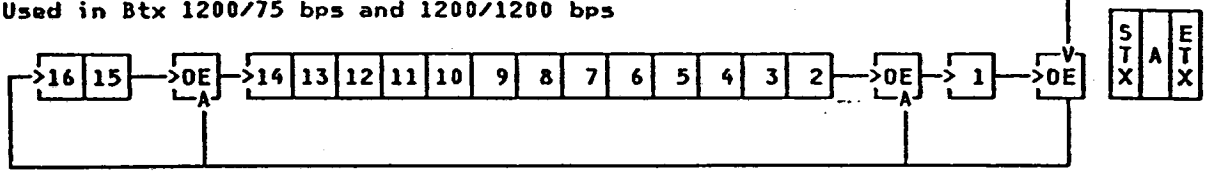
4.1.24 EXAMPLE OF CRC CALCULATION.

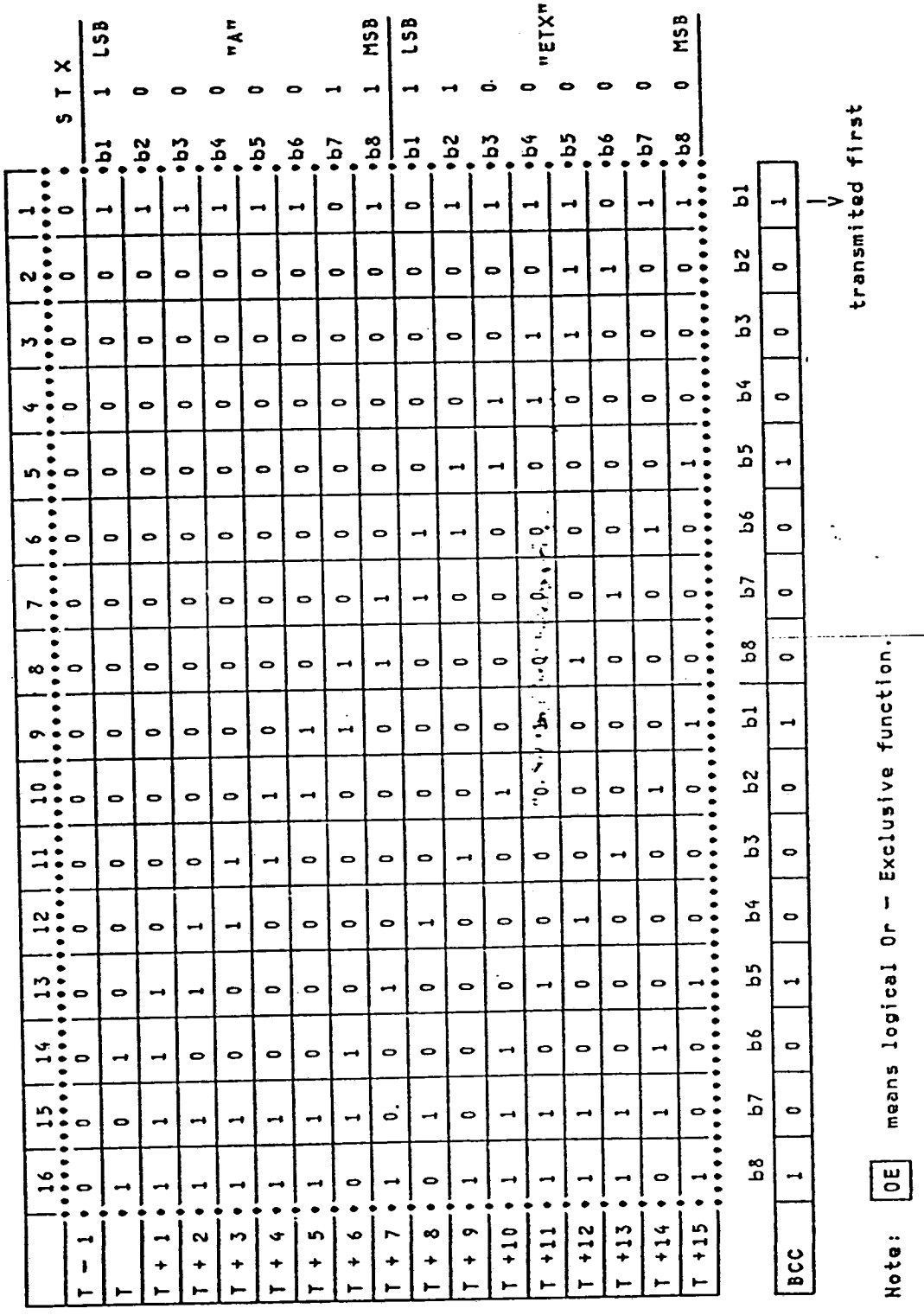
4.1.24.1 STX A ETX being sent or received.

CRC – $X^{16} + X^{15} + X^{2} + 1$

Data (sent or received)

Used in Btx 1200/75 bps and 1200/1200 bps





4.2 DATA LINK PROTOCOL FOR 2400/2400.DX (DATEX-L/HDLC LAPB)

This Chapter is in preparation.

5.0 NETWORK PROTOCOL (LAYER 3)

Btx Terminals can access the Btx service via the following networks and services of the Deutsche Bundespost:

- public switched telephone network
- Datex-L (planned)
- Datex-P (") (External-computer as user)
- ISDN (")

Call set-up/clearing (network protocol according to layer 3 of the ISO model) for modem D-BT is described in Chapter 3.1.

If other modems are used, a different procedure for call establishment is employed (see Chapters 3.2 and 3.3).

The CCITT recommendations for the interfaces conforming to X.21 apply to the network protocol for the planned connection via Datex-L.

Since detailed specifications on ISDN are not yet available, it is premature to define the relevant protocols.

(Ref. Datex-L Handbook of the Deutsche Bundespost).

6.0 TRANSPORT PROTOCOL (LAYER 4)

Btx Terminals are always allocated to a specific Btx Exchange on a permanent basis. It is therefore not necessary to define a protocol for this layer.

7.0 SESSION PROTOCOL (LAYER 5)

This Chapter is in preparation. It will cover log-on/off as well as additional functions for the Btx editor.

8.0 PRESENTATION PROTOCOL SYNTAX (LAYER 6)

8.1 STRUCTURE OF LAYER 6

8.1.1 GENERAL

This Chapter describes the presentation layer, which corresponds to layer 6 of the OSI Reference Model of ISO, with respect to its

- data syntax
- data presentation.

The presentation layer processes the presentation functions and codes in such a manner that they can be interpreted and accessed by the application as required.

In the Btx service, the data transmitted by the system to the terminal are generally presented in specific standardized forms determined by the application.

The presentation modes are in, principle, described by

- the coding structure
- their representation or functional effects.

The presentation characteristics can be subdivided into the following groups:

- alphanumeric information
- graphic information
- characteristics of the information.

The following display types have been defined:

- alphamosaic mode
- geometric mode
- photographic mode.

In addition, the presentation layer may contain data elements not used exclusively for visual presentation or which change the overall structure of the visual presentation elements.

For the basic service the alphamosaic mode and additional mandatory presentation elements have been specified. These are

- downloading of character shapes (DRCS)
- downloading of colours
- format designation
- terminal reset functions.

The geometric and the photographic mode are to be considered as standardized options for the basic service and are described in CEPT recommendation T/CD 6-1 (see Annex 7).

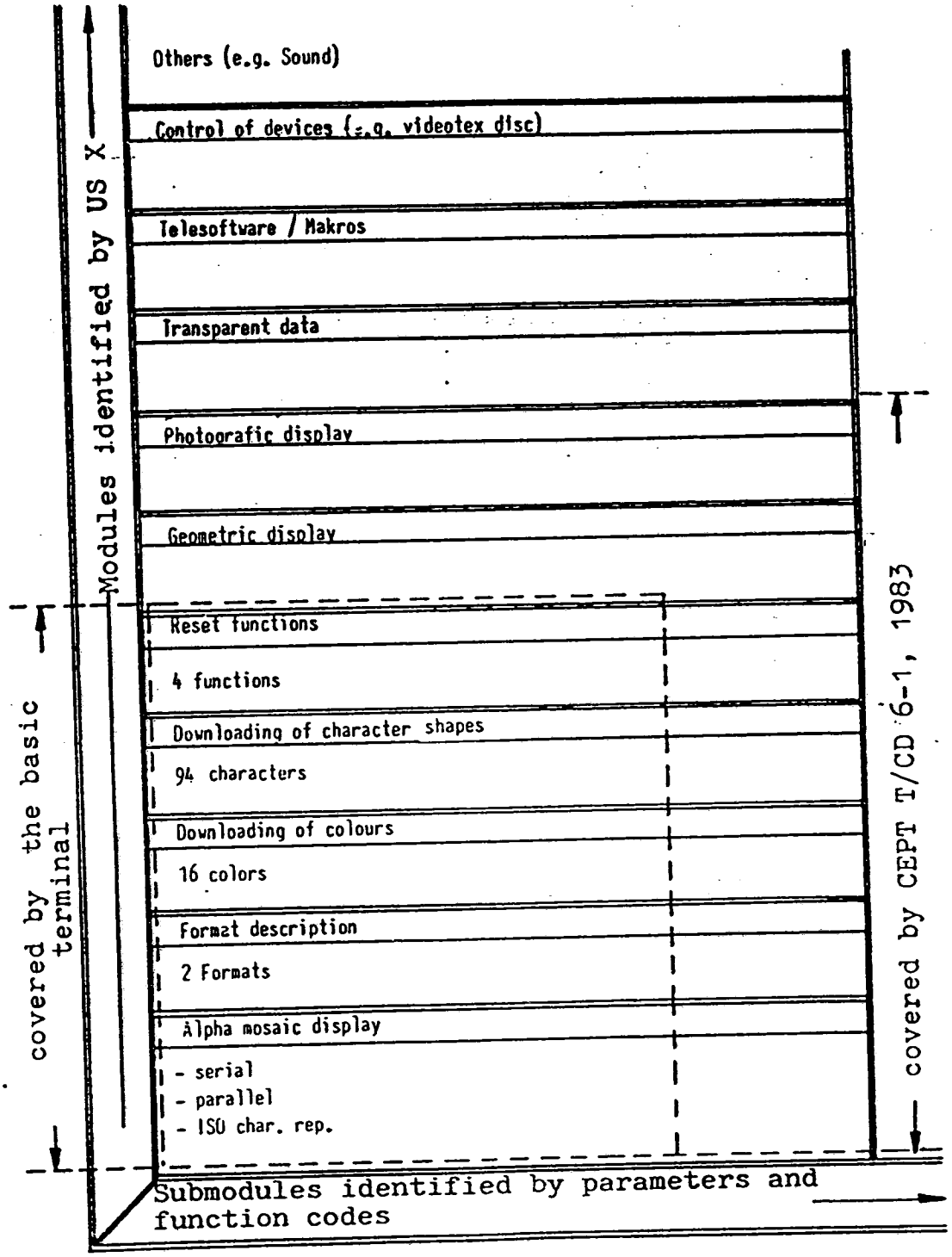


Figure 8.1-1 Principle of the videotex presentation layer data syntax built on a modular structure

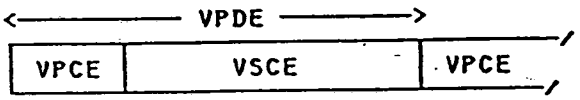
8.1.2 PROTOCOL ELEMENTS OF LAYER 6

The three types of display modes may be used simultaneously though data for each type of display are separated into different 'Videotex Presentation Data Elements (VPDE's) during transmission. The way in which data is used to generate a display may be modified by 'management data'.

Some types of displays and management data are separated into different protocol data units during transmission.

'Videotex Presentation Data Elements' (VPDE's) are generally made of two parts:

- 'Videotex Presentation Control Elements' (VPCE's) which identifies the type of data and
- 'Videotex Service Control Elements' (VSCE's) which contain the actual data.



Format of the VPCE's :

The VPCE's are coded in the format

US x where x is a character in the range 2/0 to 7/14 and US is the unit separator (1/15)

Note: US is called APA in CCITT Rec. S.100
The values assigned to parameter x are described below.

The management VPCE's use values of x in the range 2/0 to 2/15, see Table 8.1-2.

The display VPCE's use values of x in the range 3/0 to 7/14, see Table 8.1-2.

The VPCE introducing the alphamosaic VPDE uses values in the range 4/0 to 7/14, see Table 8.1-2

row	col 2	col 3	col 4 7
0		Geometric (2D)	
1		Geometric (3D)	
2			
3	Define DRCS		
4		Photographic pixel	
5		Photographic table	Alpha-mosaic display
6	Define colour		
7			
8			
9			
10			
11			
12			
13	Define Format		
14			
15	Reset	Transparent data	

Table 8.1-2

The VPCE introducing the geometric VPDE's uses values of x in the range 3/0 to 3/1, see Table 8.1-2.

The VPCE introducing photographic VPDE's uses values of x in the range 3/4 to 3/5, see Table 8.1-2.

VPCE's introducing other independent VPDE's (e.g. Telesoftware, which is to be defined) use other values of columns 2/3 of the code table.

The following management VPCE's have been assigned:

1. Define DRCS: US, 2/3
2. Define COLOUR: US, 2/6
3. Define FORMAT: US, 2/13
4. RESET: US, 2/15.

The Reset management VPCE may introduce display VPDE's e.g.: reset to alpha-mosaic basic status.

VPDE's introduced by US 3/x are not part of the basic terminal but may be implemented as options.

8.2 FUNDAMENTAL FUNCTIONS OF THE BASIC TERMINAL

The terminal supports the character oriented mode

CHARACTER REPERTOIRE

- 335 ISO-defined characters
- 151 mosaic and other characters for pictorial information
- 94/84 redefinable characters maximally
- 1 fallback character

COLOUR REPERTOIRE

- 32 colours
  (Two colour tables, each of which contains 8 values, are fixed. The first one contains full intensity colours, the second one contains reduced intensity colour values and 'transparent' instead of 'reduced intensity black'. The colours in the third and fourth colour tables are redefinable. 16 colours may be redefined from a repertoire of 4096 different colours.)

ATTRIBUTES

- 32 foreground colours
- 32 background colours

- Flash (steady and 18 different modes)
- Underlining
- Conceal
- Size (4 different modes)
- Window
- Invert
- Protected area (applied to full rows)
- Marked area (applied to character positions)

FUNCTIONS

- Scrolling (applied to full rows)
- Designation of the virtual display area (format exchange)
- Multicolour-palette (redefinable colours) (16 of the 32 colours may be redefined)
- Downloading of redefinable characters with three different resolutions
- Device controls

8.3 ABSTRACT TERMINAL MODEL

The videotex service, alphamosaic option, may be described in the form of an abstract terminal. This model is detailed hereafter.

8.3.1 DESCRIPTION

The abstract terminal model is based on a separation between the visual content of the page and its structure. It can be described as if it were composed of three memories.

1. One character memory where one character address from the character generator is stored at every character location.

2. One attribute memory where all the attributes are set in parallel at every location of the screen plus registers for full screen background.

3. One marker memory where every attribute function may be flagged at any character location. When an attribute is modified according to the serial mode, this modification occurs between the current character location and the next set marker related to this attribute (or up to the end of the row).
Optional local functions must not modify any of these memories.

8.3.2 LAYERED STRUCTURE

The display area acts as if it were composed of 3 layers. Each layer is independent of the others.

(a) A full screen background layer (video picture or one of the background full screen colours). It may be subdivided into rows and possibly into columns in the same layer (with time-dependent precedence). The layer (a) is partitioned into the following parts (including border area):
a top part, rows and a bottom part.
The full screen background controls affect all parts, the full row background controls affect one of the row parts.

(b) A defined area background layer

(c) A defined area foreground layer.

8.3.3 ACTION OF ATTRIBUTES ON LAYERS

The transparent colour in either layer (b) or (c) allows see-through to the underlying full screen background layer (a). The character BACKGROUND COLOUR attribute, including the transparent value applies only to layer (b). The full screen and full row background colour attributes affect only layer (a). Its transparent value refers to the video picture. The full screen, full row and parallel INVERT attribute controls affect simultaneously and symmetrically layers (b) and (c).

All other display area attributes apply only to layer (c) with the following exceptions:
The SIZE attribute also affects layer (b) and layer (a) in case of a set window attribute.
Window is a layer (c) attribute. It is valid for a character position but affects the layer (a) (description see Section 8.4). The actions of the combined effect of INVERT and the transparent colour are to be seen in Table 8.3-1

Table 8.3-1 TRUTH TABLE FOR ATTRIBUTE SETTINGS

ATTRIBUTE SETTINGS			Colour of resultant display is taken from the layer indicated.	
			FOREGROUND and underline	BACKGROUND colour
FOREGROUND/BACKGROUND	FOREGROUND	BACKGROUND		
NORMAL	Normal (c)	Normal (b)	c	b
		Transp. (b)	c	a
	Transp. (c)	Normal (b)	a	b
		Transp. (b)	a	a
INVERT	Normal (c)	Normal (b)	b	c
		Transp. (b)	a	c
	Transp. (c)	Normal (b)	b	a
		Transp. (b)	a	a

Foreground is layer (c)
Character background is layer (b)
Full screen background is layer (a)

8.3.4 ATTRIBUTE CONTROL DEFINITIONS

An attribute control causes the desired attribute to be applied to the display graphic characters referenced. Four types of attribute controls are defined:

Full screen attribute controls

1st Group
These affect all the character positions on the screen, except the full screen background colour which affects the full screen background layer (a).

2nd Group
These affect only layer (a).

Full row attribute controls

These affect all the character positions on the defined row, except full row background colour controls which affect the defined row of the full screen background layer (a).

Serial row attribute controls

Attributes set by these apply between markers on a row. They apply from the position of the active position at the time they are received to the end of the row or until a marker set for this attribute is reached. Each of the control functions of this repertoire causes the active position to be advanced one character width forwards; the position thus vacated is to be displayed as the predefined character shape applied at that position which is generally a space. The control HOLD MOSAICS may modify this display. Combinations of control functions may be applied at one character location by using format effectors.

Parallel attribute controls

Attributes set by these are the property of the active position and move with it under the action of format effectors or spacing display characters (including space). They apply to the displayed characters subsequently received until the attributes are changed by relevant controls including certain format effectors (CS, APA, APH). They also apply to spacing display characters (including space) inserted by control commands.

8.3.5 OPERATION OF 'PARALLEL' AND 'SERIAL' MODE CONTROLS

Both of the CCITT modes 'parallel' and 'serial' set only serial attributes in the terminal memory (which means that all attributes set, by either mode, are active between set markers or up to the end of the row).

Parallel mode controls only apply attributes to the character locations where the cursor prints a character (including space), and remain with the cursor when it moves between rows except when the control codes CS, APA or APH are received. The attribute is copied into the attribute memory and markers are set wherever an attribute is changed. Whenever a continuous string of graphic characters, including SPACE, is written on a row, under the parallel mode, then if there is a change of attribute between adjacent character locations, a marker(s) is set. In addition, any existing markers within the overwritten part of the row are deleted. When printing a character with the same attribute value on the previous and on the new adjacent position the marker in between will be deleted.

Serial mode controls set a marker into the marker memory and cause the attribute to be copied immediately into the attribute memory until a marker set for this attribute is encountered in the marker memory or until the end of the row. When in the serial mode, the writing of a graphic character does not modify by itself the attribute in the attribute memory.

Parallel and serial mode control codes are taken from different control sets and therefore they may be unambiguously recognised by the terminal. This is to be achieved by invoking the appropriate parallel or serial C1 set.

The invocation of a parallel or serial C1 set will cause the mode of operation of the terminal to switch. Thus in the serial mode any parallel attributes locked to the cursor will have no effect. Their effect will be restored when the parallel mode is reinvoked (except when APA, CS or APH is sent).

Interaction of serial and parallel mode control codes: a subsequent (in time) parallel mode control code will apply to all characters which the cursor writes while in the parallel mode irrespective of how their attributes had been previously set.

A subsequent (in time) serial mode control will propagate to the right of the cursor position at which it is received until it meets a marker set for the attribute.

A full row control (other than the background colour) has the effect of overwriting the defined attributes on all the positions of the row and has the effect of deleting all markers set for the attribute. The full screen control has the same effect but applied to all rows it does not delete markers (other than background).

8.4 ALPHAMOSAIC DISPLAY

8.4.1 INTRODUCTION

Data sent to the terminal are used to generate alphamosaic displays in which text and graphic characters are displayed, usually in a fixed format of rows and columns. The alphamosaic option for the service is basically described in CEPT Recommendation T/CD 6-1. This paragraph is an extraction from T/CD 6-1 and it deals with additional explanations and necessary specific regulations of a real terminal, here the basic terminal.

8.4.1.1 Format

The default format is 24 rows of 40 columns with automatic wraparound on rows and columns. The format may be changed and automatic wraparound may be deactivated by the 'Define FORMAT' VPDE.

8.4.1.2 Characters

Alphanumeric, block mosaic, smoothed mosaic and line drawing characters are defined. Accented characters are coded using the composition method of coding. The fixed repertoire of characters may be extended with dynamically redefinable characters loaded via the 'Define DRCS' VPDE.

8.4.1.3 Format Effectors

Characters may be positioned within the defined display area by means of format effector controls which move the active position, usually in units of one character position.

8.4.1.4 Attributes

The presentation of characters on the screen may be modified by the application of display attributes. Attributes may be applied to the full screen, full row, part of a row (serial) or to subsequently displayed characters (parallel).

8.4.1.5 Device Control Functions

The action of scrolling, the display of the cursor and similar functions may be controlled by codes transmitted to the terminal.

8.4.2 CHARACTER REPERTOIRE

The character repertoire consists of a fixed repertoire of alphanumeric characters, mosaic characters and line drawing characters. This fixed repertoire may be extended by the use of the DRCS option as described in Section 8.5

Characters of the fixed repertoire are identified according to the scheme described in Annex 4.

8.4.2.1 Alphanumeric Characters

The alphanumeric repertoire consists of the fixed repertoire of 335 characters as listed in Annex 3.

8.4.2.2 Alphamosaic Characters

In addition to the alphanumeric repertoire it is possible to make simple pictures using characters from a mosaic graphic repertoire as defined in Annex 3. Each mosaic character completely fills the area of a character cell on the screen.

The repertoire consists of:

63 graphics consisting of a combination of six rectangular elements (mosaic characters);

48 graphics where the shapes are bounded by lines between corners of six rectangular elements (smoothed mosaic characters);

8 graphics where the shapes are bounded by lines between the corners of the character cell and the centre of the character cell (smoothed mosaic characters);

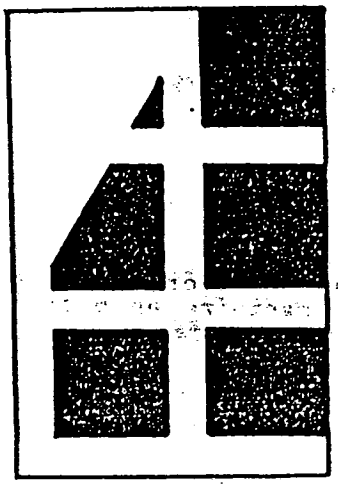
24 line drawing graphics

4 arrows

4 miscellaneous drawing graphics including one graphic with a dot-pattern where approximately 40% of the character cell area has the foreground colour and the remaining area has the background colour.

The shaded areas in the representations of the mosaic character are to be displayed in the defined foreground colour and the unshaded areas are to be displayed in the defined background colour (see Annex 3).

There are two fonts for mosaic graphic characters:
'contiguous' and 'separated'



Example of a character with separated font.
The separated blocks join the right upper
edge of the characters.
The line width is not defined.

8.4.3 FORMAT CONTROLS

8.4.3.1 Format Effector Repertoire

Abbreviation	Name and Definition
APA	ACTIVE POSITION ADDRESSING

A format effector which causes the active position to move to a defined position on the screen in accordance with parameters following. These parameters represent the row address and the column. In the basic terminal a two-character parameter is used.
Cursor attributes are set to default conditions as described in Section 8.4.6.

APB ACTIVE POSITION BACK

A format effector which causes the active position to move backwards one character position on the same row.
Automatic wraparound: 1)

APF ACTIVE POSITION FORWARD

A format effector which causes the active position to move forward to the next character position on the same row.
Automatic wraparound: 1)

APD ACTIVE POSITION DOWN

A format effector which causes the active position to move to the equivalent character position on the following row.
Automatic wraparound: 1)

APU ACTIVE POSITION UP

A format effector which causes the active position to move to the equivalent character position on the preceding row.
Automatic wraparound: 1)

APR ACTIVE POSITION RETURN

A format effector which causes the active position to move to the first character position of the same row.

APH ACTIVE POSITION HOME

A format effector which causes the active position to be moved to the first character position of the first row in the defined display area.
Cursor attributes are set to default conditions as described in Section 8.4.6.

CS CLEAR SCREEN

A format effector which causes the active position to be moved to the first character position of the first row in the defined display area and causes all character positions to be filled with spaces with all attributes set to the default conditions as described in Section 8.4.6.

CAN CANCEL

A control function which fills all character positions from the active position to the end of the row inclusive with spaces. The attributes of the active position are valid until the end of the row and all markers to the right of the active position are deleted. The active position is then returned to its previous location.

SP SPACE

A format effector which advances the active position one character-width forward on the same row. (It is also regarded as a graphic character with no foreground. The space copies the background colour into the active position and moves the active position one character width forward. If used in conjunction with the inversion attribute it copies the foreground colour into the active position and moves the active position one character width forward).
Automatic wraparound: 1)

RPT REPEAT

A format effector which causes the last transmitted graphic character, including SPACE and DEL, to be displayed a number of times as defined by a one-character parameter. This function does not apply to control characters. Attributes are valid in accordance to rules described in other paragraphs.
This format effector must follow immediately after transmission of a graphic character, i.e. the sequence is: 1. graphic character, 2. repeat control, 3. number.
Automatic wraparound: 1)

DEL DELETE

In the mosaic graphics mode the use of DEL moves the active position one space forward, with the vacated space obliterated with the foreground colour. Attributes (double-height, colour, etc.) remain in force (only in connection with the L-set).
In the alphanumeric mode the use of DEL moves the active position one space forward and displays the DELETE graphic character in the vacated position. The shape of DEL may depend on terminal implementation.
Automatic wraparound: 1)

HMS HOLD MOSAIC *

When the mosaic graphics L-set is invoked this function causes the last received graphic character in its previously defined rendition to be displayed, instead of a cursor movement, when a serial attribute control function is received.

RMS RELEASE MOSAIC *

Causes the action of HOLD MOSAIC to be stopped. (Implicit when leaving the row).

*) "Hold graphics" may be executed by the terminal. It is not stored in the terminal as an attribute and therefore not valid when overwritten.
It is only valid when the L-set is in use.
These functions may occur in the serial mode only.

1) Automatic wraparound: If automatic wraparound is active the following rules apply:

- APB on the first character position on the row moves the active position to the last character position of the preceding row. APB on the first character position of the first row moves the active position to the last character position of the last row in the defined display area.

- APF, SP, DEL, and spacing graphic characters if on the last position on the row move the active position to the first on the following row and if on the last character of the last row move the active position to the first character position on the first row in the defined display area.

- APD on the last row moves the active position to the equivalent character position on the first row in the defined display area.

- APU on the first row moves the active position to the equivalent character position on the last row in the defined display area.

Automatic wraparound may be controlled by an appropriate VPCE for format designation.

If automatic wraparound is inactive the cursor does not move at the borders of the displayable area and the next received characters are displayed at the same position.

8.4.3.2 Format designation

For alphamosaic graphic representation the display is formatted in 24 or 20 rows and 40 columns. Graphics of normal size use a character matrix of 10 or 12 vertical and 12 horizontal dots. The format designation is initiated by appropriate protocol control information as described in Section 8.7.
The basic terminal is able to handle both of the above formats.
Although the protocol structure allows for additional format definitions the basic terminal will ignore protocol information defining a format different from the above.
The format designation allows for activating and inactivating of automatic wraparound by appropriate command which is part of the protocol control information.

8.4.4 DEVICE CONTROL

8.4.4.1 Cursor Controls

Abbreviation	Name and Definition
CON	CURSOR ON

A device control function which causes the active position to be indicated.

COF	CURSOR OFF

A device control function which terminates the action of CON.

8.4.4.2 The scrolling mode

Scrolling area

A scrolling area is an area within the defined display area where the characters and their associated attributes move under the action of a format effector or wraparound or a specific control received by the terminal in increments of one character position.

The scrolling function

The procedure of scrolling is defined by two processes:

1. Designation of the screen area inside of which a scroll operation is to be executed.
2. Execution of the scrolling mode by scrolling controls.

In the basic terminal the scrolling operation is applied to full rows. Any number of rows between the second (included) and the last (excluded) rows may be designated for the scrolling mode. The scrolling will be executed in the whole area. The borders of the scrolling area are to be stored in the terminal. The basic terminal supports one scrolling area.

Application of size attributes and scrolling area

The border of the scrolling area must not be crossed by a double-height or double-size character.

- Double-height or double-size characters which cross the border of a scrolling area (i.e. such characters in the row above the scrolling area or in the last row of the scrolling area) are not displayed in double-height or double-size but their attributes remain in the memories.
- Writing of double-height or double-size characters in parallel mode in the row below the lower border of a scrolling area is ignored (i.e. no change of memories) but cursor increment is executed.
- The application of double-height or double-size attributes in the first row (parallel mode) or last row (serial mode) forces a scrolling to occur (see action of scrolling).

If the origin of an enlarged character is scrolled out of the scrolling area the enlarged character disappears completely.

Application of protected attributes and scrolling area.

A protected area inside a scrolling area is scrolled and the rows of the protected area may disappear subsequently.

If a protected area is outside the scrolling area but adjacent to it the rules for scrolling have higher precedence (e.g. application of size attribute in the first or last row of a scrolling area).

If a protected area crosses the border of a scrolling area, the protected area is divided into a protected area inside the scrolling area and one or two adjacent protected area(s) outside the scrolling area and the above rules are applied.

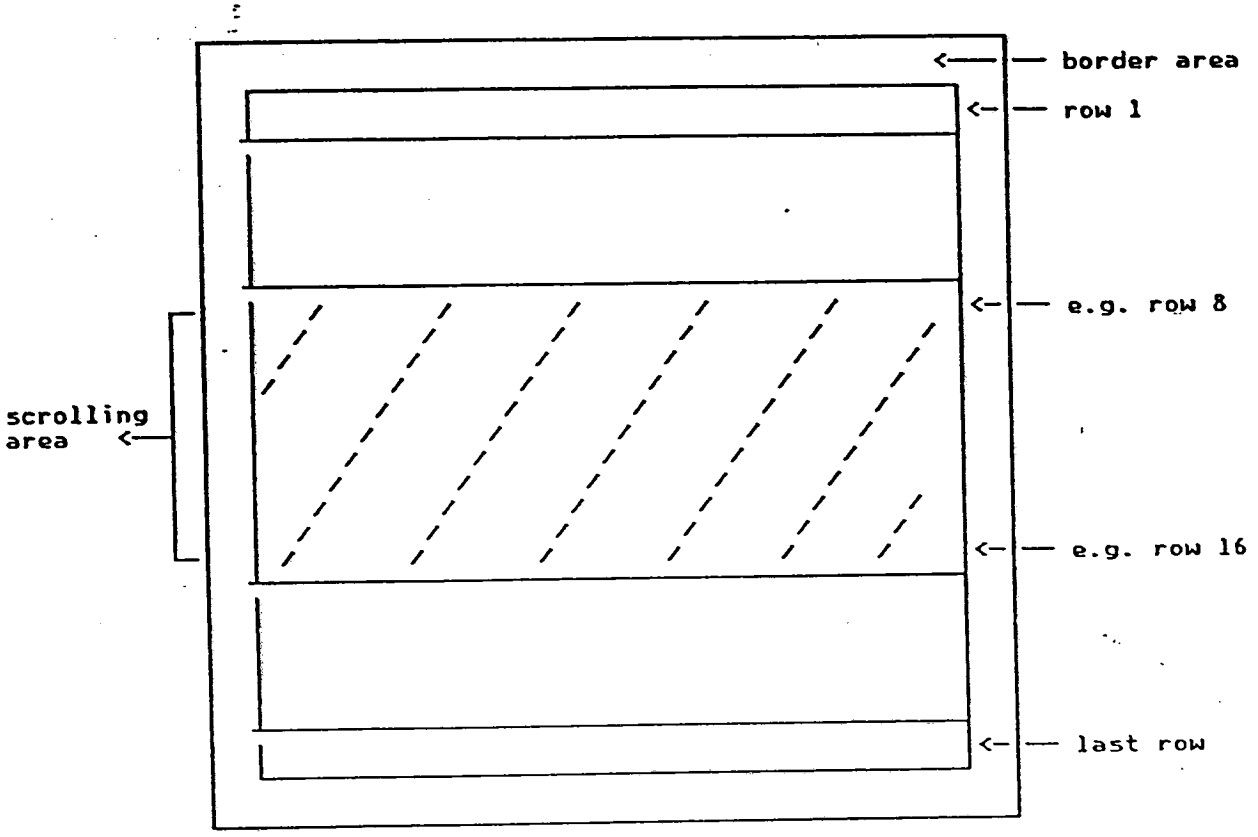


Figure 8.4-1 Screen layout

Designation of screen areas

The designation of a scrolling area is initiated by an appropriate Control Sequence. The basic terminal supports one scrolling area. The designation of a scrolling area may be deleted by designation of a new scrolling area or with the delete scrolling area control or by CS.

The format effectors APA, Row, col. and APH perform a positioning of the active position and give the possibility to move the active position across the boundaries of the scrolling area. The addressing of APA is relative to the defined display area and is independent of scrolling.

Full screen background layer (a) is not affected by scrolling operations.

Procedure of scrolling

The scrolling operation is always initiated by an appropriate subscriber procedure (layer 7). It may be followed immediately by presentation data.

The scrolling operation is executed as follows:

- scroll up

  A scroll-up operation copies the contents of row i to row i-1. The contents of the uppermost row of the scrolling area will be discarded. The lowest row of the scrolling area is filled with spaces (2/0) and default attributes but the layer(a) attributes remain unchanged. Thus the lowest row will show spaces in the row-defined background colour.

- scroll down

  The scroll-down operation copies the contents of row i to row i+1. The content of the lowest row of the scrolling area will be discarded. The uppermost row of the scrolling area is filled with spaces (2/0) and default attributes but the full screen background (layer (a)) attributes remain unchanged. Thus the uppermost row will show spaces in the row-defined background colour.

- Implicit scrolling

  Implicit scrolling may be activated or deactivated by appropriate controls. In case of deactivated implicit scrolling only explicit scrolling or scrolling forced by enlarged characters is executed.

  Implicit scrolling is performed if a transmission sequence (except APA and APH) that would cause the active position to move to the row below (scroll up) or above (scroll down) the defined scrolling area is received. These transmission sequences may be format effectors or characters in case of active wraparound. The active position moves with the scrolled line. After the scrolling operation the cursor movement is executed as in a normal writing process. If implicit scrolling is deactivated normal cursor movements are executed.

- Explicit scrolling

  Two different controls are used to perform a scrolling up or scrolling down of the designated area. No movement of the active position is performed.

- Scrolling forced by application of size attributes

  Writing of double-height or double-size characters in parallel mode into the first row of a scrolling area forces a scroll down and a cursor movement with the scrolled line before writing.

  The reception of a serial double-height or double-size control in the last row of a scrolling area forces a scroll up and a cursor movement with the scrolled line before execution of the control.

- Default:

  - no scrolling area
  - implicit scrolling activated

CS cancels the scrolling and the defined scrolling area. Scrolling does not influence row addressing.

8.4.4.3 Function "Temporarily Inactive Attributes (TIA)"

In the basic terminal the function 'TIA' must be implemented. This function is initiated by the user (local application function) and takes effect as long as the user applies this function. It causes all attributes to disappear from the display until the user chooses the attributes to take effect again. The contents of the memory are not affected.

8.4.4.4 Function "Reveal"

The function 'reveal' is a local user function which causes the concealed characters on a screen to be displayed until the user chooses the attributes to take effect again.

8.4.5 DEFINED ATTRIBUTES

8.4.5.1 Colours

The 8 basic colours are red, green, yellow, blue, magenta, cyan, white and black. They may be represented in full intensity and in reduced intensity. The value of reduced intensity black is interpreted as transparent.

Additionally, 16 freely definable colours may be downloaded.

These 32 colours are organised in 4 tables of colours each of which may be invoked separately.

Foreground

The colour of the graphics shape being displayed. The colour may be any colour from the available colour tables. In case of 'transparent' the full screen background colour or 'the cumulative result of all picture elements previously set' or the video picture is seen.

Background

Character BACKGROUND COLOUR

The colour of the remaining area of the character cell. The colour may be any colour from the available colour tables or be transparent in which case the full screen background colour or the cumulative result of all picture elements previously set or the video picture is seen.

Full screen BACKGROUND COLOUR

The colour of layer (a) of the abstract model.

Transparent Background

The area not occupied by the foreground colour takes the properties of the underlying layer.
In case of application to character positions, layer (a) is displayed, in case of application to full rows, e.g. the video picture is displayed.

Non-concealed characters appear in this picture. If they are also displayed with defined display area transparent background, the foreground only appears over the picture. Concealed characters are displayed as transparent spaces.

8.4.5.2 Underlining

Alphanumeric characters and two colour DRCS are displayed in an underlined rendition in which the underline is considered to be a part of the shape of the graphics character. Mosaic, lined and smooth characters are displayed in the separated font. The separated blocks join the right upper edge of the character. Underlining is not applicable to multicolour DRCS.

8.4.5.3 SIZE

There are four states of character size:

NORMAL-SIZE

The extent of characters occupies the active position.

DOUBLE-HEIGHT

The extent of characters occupies both the active position and the corresponding position of the adjacent row.

DOUBLE-WIDTH

The extent of characters occupies both the active position and the next position of the same row.

DOUBLE-SIZE

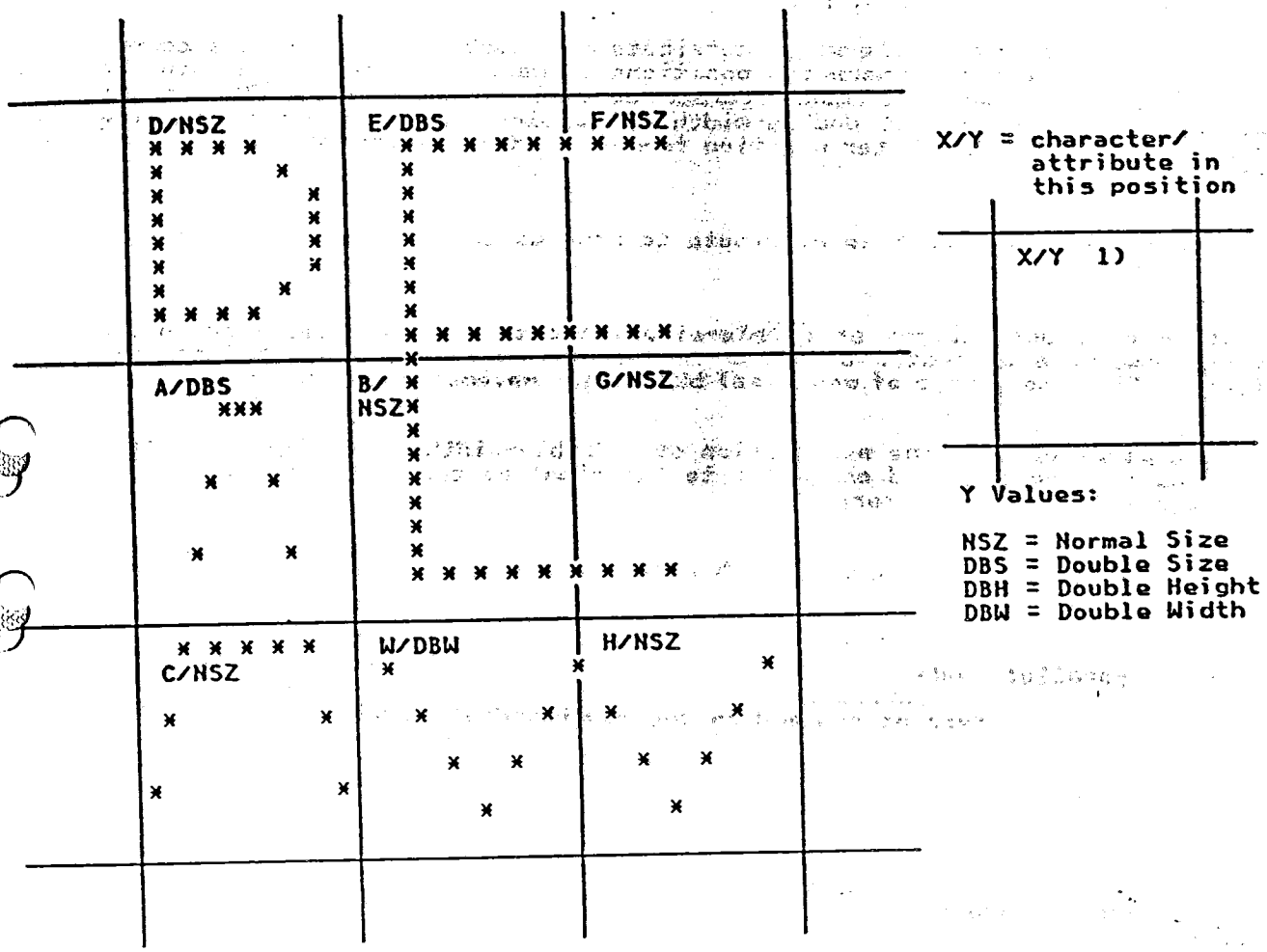
The extent of characters occupies the active position, the next position on the same row and the corresponding two positions on the adjacent row.

Rules for the action of size attributes

1. In the parallel mode the application of the double-height or double-size attribute causes characters to be displayed so that they occupy the character positions on the current row and on the row immediately above. The origin of the characters for subsequent attribute modification is the upper character position. The double-height attributes and double-size attributes are inactive on the top row of the defined display area, i.e. character attributes and markers are not stored, cursor movements are executed. Codes and attributes in the lower position are not changed.

2. In the serial mode the double-height or double-size characters extend downwards, the origin of the character is the upper character position. The double height and the double-size characters are inactive on the bottom row of the defined display area, i.e. not displayed in double-height while stored in the memory.

3. Double-width characters extend to the right, the origin of the character is the left-hand character position. Alternate characters on the row are displayed.



1) Origin of the character where the attribute is stored.

Figure 8.4-2

4. Obscured characters are not displayed at all but remain in the display memories.

5. The whole of an enlarged character is displayed with the attributes that apply to the origin of the character (layers (b) and (c)).

6. Parts of enlarged characters are not displayed.

7. Double size and double width are inactive in the last character position of a row i.e. characters, attributes and markers are stored but the character is displayed in that size which is still possible . Cursor movements are executed as in normal writing procedures. The new character position in case of automatic wraparound is the first in the next row.

8. Enlarged characters which partly cover other enlarged characters are displayed when their origin is in the upper position. The other character is displayed in reduced size.

9. Attributes set at obscured character positions do not take effect if they would break any of the above rules.

10. The application of a double-width attribute or a double-size attribute causes the cursor to move two character positions forward when writing in both the serial and the parallel mode. Cursor control functions APF, APB are not affected. Setting of the double-width or double-size attribute causes the cursor to move one character position forward (different from writing characters).

11. The application of one size attribute terminates the action of another size attribute.

12. Writing of double-height or double-size characters in parallel mode in the first row of a protected area and in the row below the protected area is ignored (i.e. no change of memories) but cursor movements are executed.

13. In the parallel mode the application of a double-width or double-size attribute causes the obscured character to the right of the origin to be written additionally into the memory.

14. If the double-size is not displayable the nearest approach to the attribute set is displayed.

The application of the above rules in case of vertical overlapping of characters in dynamic situations is not guaranteed by all terminals (e.g. the effect of changing character sizes on the whole visible display area by overwriting one character) because that would cause a heavy load on some terminal architectures.

8.4.5.4 FLASH

A character may be displayed in the following mode:

- STEADY
  The characters are displayed normally.

- Or in any of the 18 combinations of the following states and rates:

STATES OF FLASHING

- NORMAL FLASH
  The characters are displayed alternately in the prevailing foreground colour and in the prevailing background colour under the control of a timing device in the receiver.

- INVERTED FLASH
  On the inverted phase of the flashing clock, but the colours are not inverted.

- FLASH between colour tables
  The characters are displayed alternately in the prevailing foreground colour and in the equivalent colour of the next foreground colour table, i.e.: Table 1 (3) colours adopt Table 2 (4) colours. The flashing effect is reversible, i.e. the colours of Table 2 (4) flash to Table 1 (3).

RATES OF FLASHING

Each of the above states may be displayed at either of the following rates.

explicit rates : 50 % ON/OFF ratio at about 1 Hz

33 % ON, 1st phase
33 % ON, 2nd phase
33 % ON, 3rd phase
] -> at about 2 Hz

implicit rates : incremental flash
decremental flash

In the case of implicit rates 3-phase flash is used and the flash phase is sequentially changed for each character in a string of adjacent characters to present an animation effect on the screen (enlarged characters count as single characters).

If a set flash marker is combined with the rate incremental the phases 1, 2, 3, 1 are applied to subsequent character positions to achieve an "apparent movement to the right."

If a set flash marker is combined with the rate decremental the phases 1, 3, 2, 1 are applied to subsequent character positions to achieve an "apparent movement to the left."

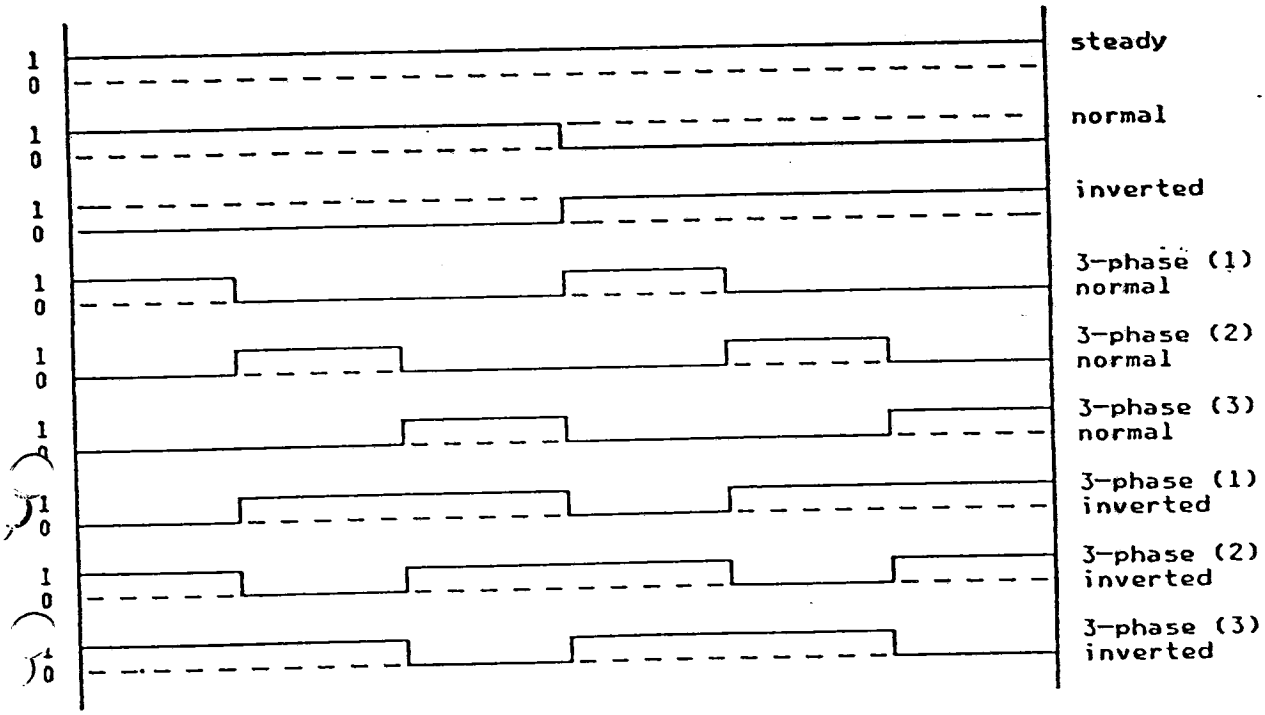


Diagram for the time-relation of different flash modes

Figure 8.4-3a

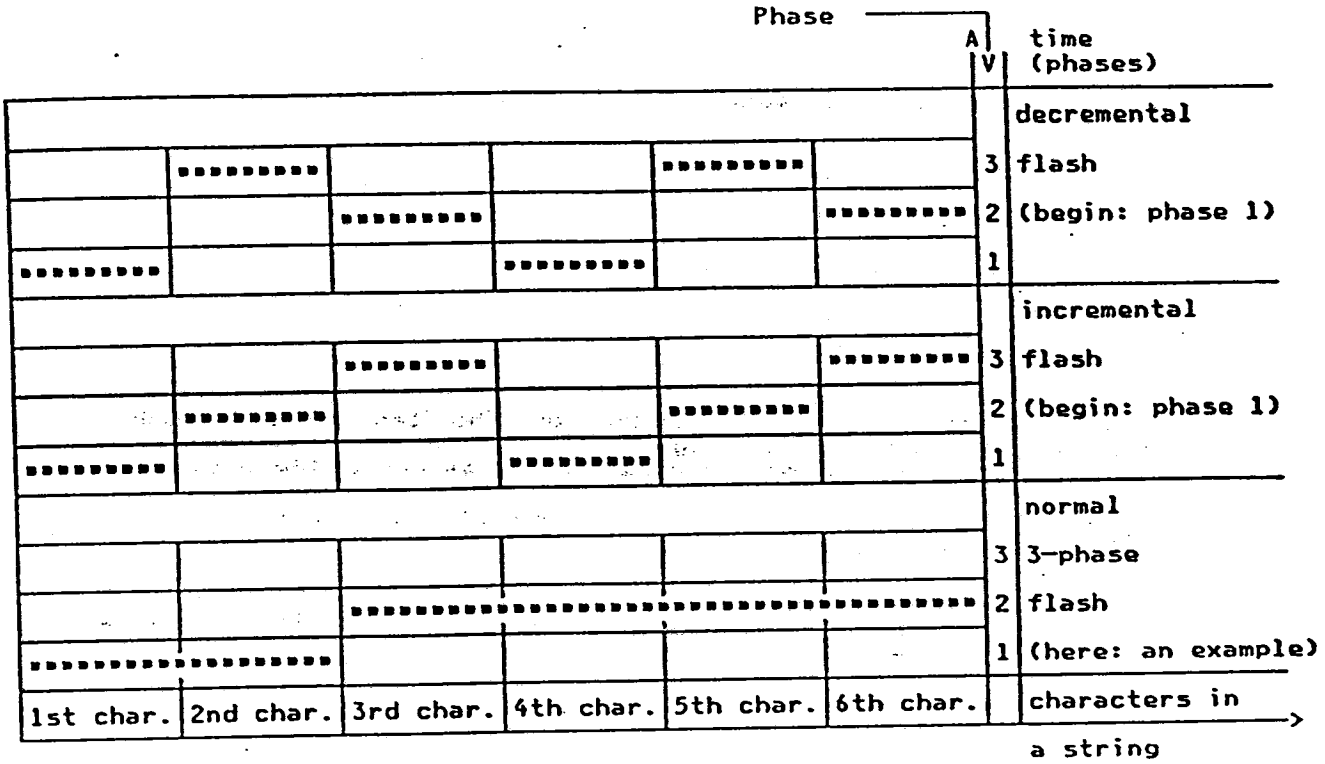


Diagram showing the different position-oriented effects of three-phase flash

Figure 8.4-3b

8.4.5.5 Conceal

Characters are displayed as spaces, i.e. in the prevailing background colour until the user chooses to make them appear. The other foreground and background attributes are not affected.

8.4.5.6 Invert

The characters are displayed as if the foreground and background colours had been exchanged. If FLASH is applied the polarity of the flashing clock is also inverted. (This is different from the flash state 'inverted flash'). The attribute is absolute. In combination with 'flash' and 'invert flash' the normal phase is applied.

8.4.5.7 Window

The 'full screen background' (layer (a)) of the character positions becomes transparent, e.g. the video picture is displayed.
Foreground information and character defined background is not affected.
In the interactive videotex mode this attribute is applied as 'window-function' exclusively (in the broadcast videotex mode it is applied as 'box-function'). The effect of window is to leave the pertaining colours of layer (b) and (c) still available but force the layer (a) colour at the affected character position(s) to be transparent.
In case of enlarged characters the whole layer (a) area covered becomes transparent.

8.4.5.8 Marked Area

Marked areas are strings of character positions whose contents are marked in the terminal for further action, e.g. to be transferred to an ancillary device.

The function "marked area" is treated as a normal attribute. In the basic terminal it is implemented as an attribute marker for character positions but it will have no effect on the display.

The data can then be retrieved from the memory for further processing. (The intelligence for the extraction of the marked area will not be in the basic terminal but in the ancillary device).

8.4.5.9 Protected Area

The function "protected area" is an attribute which generally may be applied to character positions whose contents are protected against alteration, manipulation or erasure after the transmission of the protect control. The protection is valid for characters as well as for attributes until a CS is received or the protection is removed by subsequent controls.

A protected area must not be overwritten. It must not be destroyed by wrong positioning of format effectors. Normal cursor moves are done as in normal writing procedures.

A protected area may be scrolled and therefore may disappear from the screen because the protection is always related to the particular information on the screen. Inside a protected area the normal size rules are applied.

Borders of a protected area must not be crossed by enlarged characters.

Double-height or double-size attributes in the row above the protected area or in the last row of a protected area are not displayed in double height or double size but their attributes remain in the memories.

Writing of double-height or double-size characters in parallel mode in the first row of a protected area and in the row below the protected area is ignored (i.e. no change of memories) but cursor movement is executed.

Note: Inside a protected area the characters, their attributes and markers are protected but not their display (e.g. application of size, reveal function, enable attributes).

8.4.5.10 Colour Tables

Extension of the colour range is accomplished by providing a number of colour tables of 8 colours each. At a given instant only one table may be 'in use'. This table can be invoked using colour table controls.

The fixed repertoire of colours (plus transparent) may be extended with redefinable colours loaded via the 'Define COLOUR' VPDE.

8.4.6 DEFAULTS

8.4.6.1 Default Initiation

The occurrence of certain events causes the default settings to be set. Table 8.4-1 below shows the events leading to the setting of a certain default. This is independent of the current mode of operation of the terminal.

Table 8.4-1 Default Initiation

Default set	Full screen back-ground	Defined display area back-ground	Defined display area fore-ground	Cursor parallel at-tributes	Markers	Clut 4) and scrolling	Device controls
General Reset	x	x	x 3)	x	x	x	x
CS		x	x 3)	x	x	x	
APA				x			
APH				x			
Full Row At-tribute con-trols					x 1)		
CAN					x 2)		

1) For the related attribute in the row.

2) All the markers on the right of the active position up to the end of the row are deleted and attributes of the active position are valid until the end of the row.

3) Default graphic character is SPACE.

4) Only the Clut number but not the contents of the colour map.

8.4.6.2 Default Setting of Attributes

Full screen background	Defined dis-play area background and cursor	Defined dis-play area foreground and cursor	Markers	Colour table	Scrolling	Cursor
Black	Transparent	Colour white Normal size Window off Not con-cealed Steady Not lined Not inverted Not protec-ted Not marked	Off	Colour Table 1	Implicit Scrolling active No de-fined scrolling area	Off

Table 8.4-2 Default setting of attributes

8.4.6.3 Default Colours

The default colours are set according to the following algorithms

colour = R G B

Colour Table	No.		Bit combination R	G	B
1	1	BLACK	0000	0000	0000
	2	RED	1111	0000	0000
	3	GREEN	0000	1111	0000
	4	YELLOW	1111	1111	0000
	5	BLUE	0000	0000	1111
	6	MAGENTA	1111	0000	1111
	7	CYAN	0000	1111	1111
	8	WHITE	1111	1111	1111
2	1	TRANSPARENT	1)	1)	1)
	2	REDUCED INTENSITY RED	0111	0000	0000
	3	" " GREEN	0000	0111	0000
	4	" " YELLOW	0111	0111	0000
	5	" " BLUE	0000	0000	0111
	6	" " MAGENTA	0111	0000	0111
	7	" " CYAN	0000	0111	0111
	8	GREY	0111	0111	0111
3	1	(redefinable) as Colour Table 1			
	2				
	3				
	4				
	5				
	6				
	7				
	8				
4	1	(redefinable) as Colour Table 1			
	2				
	3				
	4				
	5				
	6				
	7				
	8				

1) don't care bit combination

Table 8.4-3 Red, Green and Blue Components of Default Colours

8.4.6.4 Default Code Sets

The primary control function set is designated the C0 set.

The supplementary control function set, the serial C1 set, is designated the default the default code set.

The primary set of characters is designated the G0 set.

The supplementary set of alphanumeric characters is designated the G2 set.

The first supplementary set of mosaic characters is designated the L-set and is invoked by controls in the serial C1 set.

The second supplementary set of mosaic characters is designated the G1 set.

The third supplementary set of mosaic characters is designated the G3 set.
In the 8-bit environment the G0 set is invoked into columns 2-7 and the G2 set is invoked into colums 10-15 of the "in use" code table.

8.4.6.5 Default DCLUT

The default colours for four-colour DRCS are the 1st four colours of Colour Table 1: black, red, green, yellow.

8.4.7 CODING STRUCTURE

8.4.7.1 General

Control functions are coded using primary and supplementary sets and by using combinations of control codes and following parameters.

Two character sets may be invoked into the 8-bit 'in use' code table.

In order to invoke the character sets, locking shift functions are required for all sets (G0, G1, G2 and G3 and L). To enable access to the not invoked sets, single shift functions are also incorporated.

The designation and invocation of the sets from a library to the G0, G1, G2, and G3 set is done in accordance with ISO 2022.

For the designation and invocation of character sets, one-byte controls and control code sequences have been defined.

Control code sequences are always initiated either by the code extension control ESC or CSI.

8.4.7.2 Common Code Extension Control Functions

Abbreviation	Name and Definition	Coding
ESC	ESCAPE A control character that is used to provide additional control functions other than transmission control functions and that alters the meaning of a limited number of contiguously following bit combinations.	1/11
CSI	CONTROL SEQUENCE INTRODUCER A control character that is used to provide additional control functions other than transmission control functions and that alters the meaning of a limited number of contiguously following bit combinations.	9/11

8.4.7.3 Invocation Functions (8-Bit Environment)

Abbreviation	Name and Definition	Coding
LS0	LOCKING SHIFT 0 Invokes the G0 set into columns 2-7 of the code table.	0/15
LS1	LOCKING SHIFT 1 Invokes the G1 set into columns 2-7 of the code table.	0/14
LS1R	LOCKING SHIFT 1 RIGHT Invokes the G1 set into columns 10-15 of the code table.	ESC 7/14
LS2	LOCKING SHIFT 2 Invokes the G2 set into columns 2-7 of the code table.	ESC 6/14
LS2R	LOCKING SHIFT 2 RIGHT Invokes the G2 set into columns 10-15 of the code table.	ESC 7/13

LS3	LOCKING SHIFT 3 Invokes the G3 set into columns 2-7 of the code table.	ESC 6/15
LS3R	LOCKING SHIFT 3 RIGHT Invokes the G3 set into columns 10-15 of the code table.	ESC 7/12
SS2	SINGLE SHIFT 2 Invokes a single character from the G2 set (cols. 2 to 7)	1/9
SS3	SINGLE SHIFT 3 Invokes a single character from the G3 set (cols. 2 to 7).	1/13

All graphic character sets with the exception of the L-set are invoked by the code extension functions above .

The L-set (named the 'first supplementary set of mosaic characters' in T/CD 6-1) is invoked into columns 2 to 7 of the 8-bit-code by using the controls 9/0 to 9/7 of the serial C1-set exclusively. There is no designation and invocation sequence for the L-set. The L-set includes mosaic characters and the same characters as columns 4 and 5 of the primary set of graphic characters. The deactivation of the L-set is executed by using

- the codes 8/0 to 8/7 of the serial C1-set (implicit in a new line)
- the invocation of the parallel C1-set
- clear screen
- LS0, LS1, LS2, LS3

The deactivation of the L-set causes the last invoked character set in the left hand position of the code table to be invoked.

Default designations for character sets:

The primary set of graphic characters is designated the G0 set.

The supplementary set of graphic characters is designated the G2 set.

The 2nd supplementary set of mosaic characters is designated the G1 set.

The 3rd supplementary set of mosaic characters is designated the G3 set.

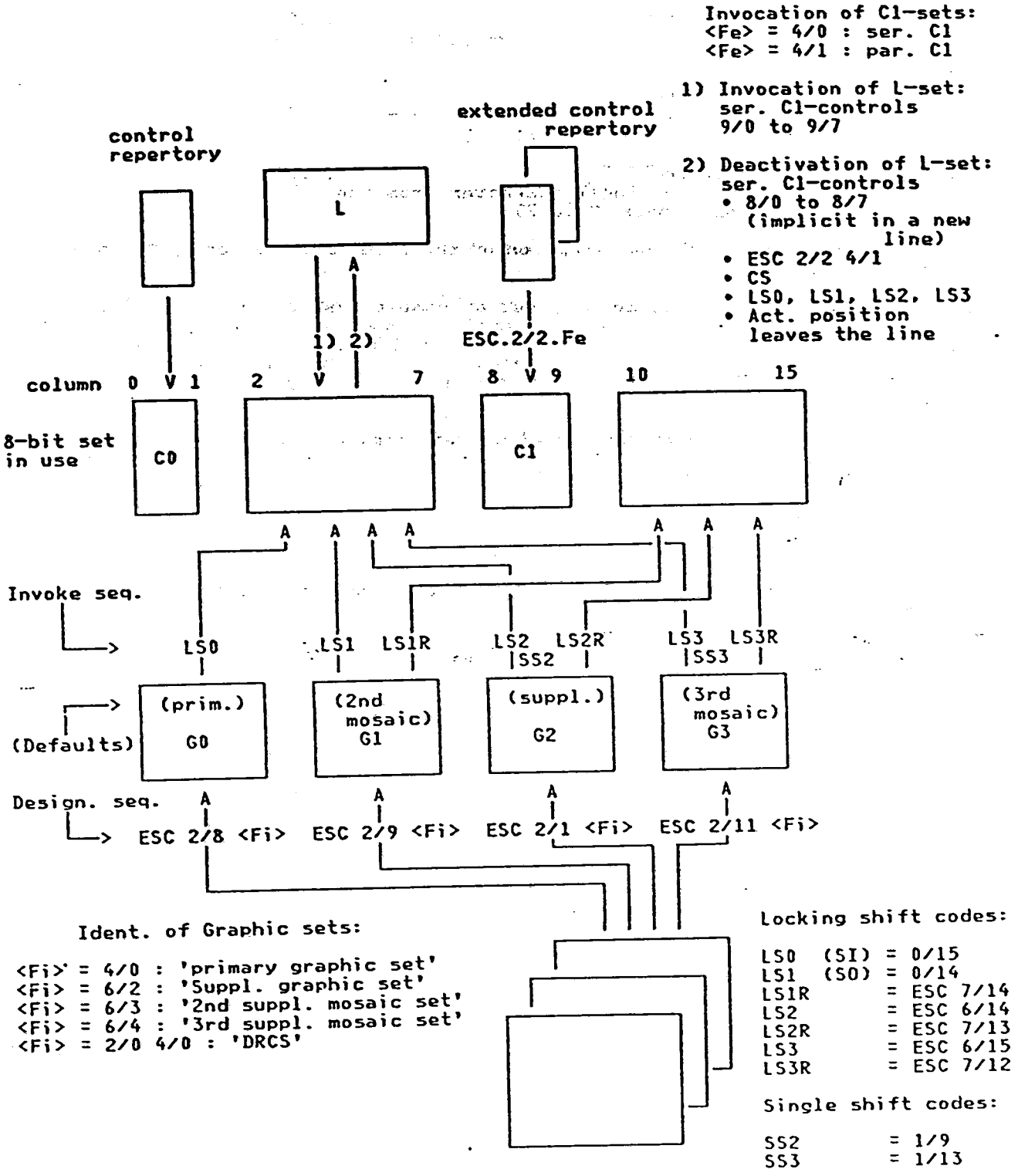

Invocation of C1-sets:
<Fe> = 4/0 : ser. C1
<Fe> = 4/1 : par. C1
1) Invocation of L-set:
ser. C1-controls
9/0 to 9/7
2) Deactivation of L-set:
ser. C1-controls
• 8/0 to 8/7
(implicit in a new line)
• ESC 2/2 4/1
• CS
• LS0, LS1, LS2, LS3
• Act. position leaves the line
control repertory
extended control repertory
L
1) 2)
ESC.2/2.Fe
column 0 1 2 7 8 9 10 15
8-bit set in use
C0
C1
Invoke seq.
LS0
LS1
LS1R
LS2
LS2R
SS2
LS3
LS3R
SS3
(Defaults)
(prim.) G0
(2nd mosaic) G1
(suppl.) G2
(3rd mosaic) G3
Design. seq.
ESC 2/8 <Fi>
ESC 2/9 <Fi>
ESC 2/1 <Fi>
ESC 2/11 <Fi>
Ident. of Graphic sets:
<Fi> = 4/0 : 'primary graphic set'
<Fi> = 6/2 : 'Suppl. graphic set'
<Fi> = 6/3 : '2nd suppl. mosaic set'
<Fi> = 6/4 : '3rd suppl. mosaic set'
<Fi> = 2/0 4/0 : 'DRCS'
Locking shift codes:
LS0 (SI) = 0/15
LS1 (SO) = 0/14
LS1R = ESC 7/14
LS2 = ESC 6/14
LS2R = ESC 7/13
LS3 = ESC 6/15
LS3R = ESC 7/12
Single shift codes:
SS2 = 1/9
SS3 = 1/13

Figure 8.4-4

8.4.7.4 The Primary Control Function Set - (Table 8.4-5)

This set contains two types of elements: those which consist of a single bit combination and those which are used in conjunction with parameters which follow (RPT and APA).

Parameters

- Repeat RPT (char)

  The parameter (char) indicates the number of repetitions of the last received preceding graphic character. The representation is in binary form by means of the 6 least significant bits of the parameter which is taken from columns 4 to 7. The character itself is not included in the count. This function does not apply to control characters. This control function must immediately follow the graphic characters, i.e. the code sequence is

  1) graphic character (two graphic codes in case of a composed character with diacritical marks)
  2) Repeat control
  3) Number

- Active Position Address APA (char) (char)
  A control function with a two or four character parameter. All the characters are within the range 4/0 to 7/14, and they represent respectively the row address and the column address in binary form, with 6 useful bits (bit 6 being the most significant bit) of the first character to be displayed.

  The first character received shall be displayed on the designated character location of the addressed row.

  The default address range of the defined display area is 1 to 24 vertically and 1 to 40 horizontally. The location addressed by APA, 4/1, 4/1 (or APA 4/0, 4/1, 4/0, 4/1 if the format exceeds either 63 rows or 63 columns) is the top left-hand location of the defined display area.

  If the format exceeds either 63 rows or 63 columns then the relevant parameter, i.e. the row or the column address, is coded as a two byte sequence with 12 useful bits, the first byte carrying the most significant bits.

Primary control function set (here representation of layer 6 controls only)

b_4 b_3 b_2 b_1		b_7 0	0	0	0	1	1	1	1
		b_6 0	0	1	1	0	0	1	1
		b_5 0	1	0	1	0	1	0	1
		0	1	2	3	4	5	6	7
0 0 0 0	0								
0 0 0 1	1		CON						
0 0 1 0	2		RPT						
0 0 1 1	3								
0 1 0 0	4		COF						
0 1 0 1	5								
0 1 1 0	6								
0 1 1 1	7								
1 0 0 0	8	APB	CAN						
1 0 0 1	9	APF	SS2						
1 0 1 0	10	APD							
1 0 1 1	11	APU	ESC						
1 1 0 0	12	CS							
1 1 0 1	13	APR	SS3						
1 1 1 0	14	LSI	APH						
1 1 1 1	15	LSO	US (APA)						

Note : Empty positions of columns 1 and 2 denote bit combinations reserved for transmission control characters (layer 2) and application controls (layer 7).

Table 8.4-5

Primary control function set including additional application layer functions for the Btx service and layer 2 controls.

b7	b6	b5	b4		b3 b2 b1 = 0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
					0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE						
0	0	0	1	1	SOH	CON						
0	0	1	0	2	STX	RPT						
0	0	1	1	3	ETX	INI						
0	1	0	0	4	EOT	COF						
0	1	0	1	5	ENQ	NAK						
0	1	1	0	6	ACK							
0	1	1	1	7	ITB	ETB						
1	0	0	0	8	APB	CAN						
1	0	0	1	9	APF	SS2						
1	0	1	0	10	APD	DCT						
1	0	1	1	11	APU	ESC						
1	1	0	0	12	CS	TER						
1	1	0	1	13	APR	SS3						
1	1	1	0	14	LSI	APH						
1	1	1	1	15	LSO	US (APA)						

Table 8.4-6

Note: Empty pos. of cos. 1/2 denote bit combinations which are not a part of the sets specified in the table. The codes 1/3 and 1/12 are used as the application layer control functions "Initiator" (representation = *) and "Terminator" (representation = #). Pos. 1/10 is used as Data Collection Terminator.

8.4.7.5 The Supplementary Control Function Sets

Two supplementary control function sets are defined. One for applying 'serial' attribute controls and one for applying 'parallel' attribute controls.

In the 8-bit environment individual characters of these sets are represented by the combinations in the range 8/0 to 9/15.

The 'Serial' Attribute Control Set - (see Table 8.4-7) (Default-set)

This set is invoked by the sequence ESC 2/2, 4/0

The 'Parallel' Attribute Control Set - (see Table 8.4-8)

This set is invoked by the sequence ESC 2/2, 4/1

Supplementary control function set repertory 1 (serial)

b4	b3	b2	b1		08	09	
					b7 1	1	
					b6 0	0	
					b5 0	0	
					b4 0	1	
0	0	0	0	00	ABK	MBK	Alphanumeric black Mosaic black
0	0	0	1	01	ANR	MSR	Alphanumeric red Mosaic red
0	0	1	0	02	ANG	MSG	Alphanumeric green Mosaic green
0	0	1	1	03	ANY	MSY	Alphanumeric yellow Mosaic yellow
0	1	0	0	04	ANB	MSB	Alphanumeric blue Mosaic blue
0	1	0	1	05	ANM	MSM	Alphanumeric magenta Mosaic magenta
0	1	1	0	06	ANC	MSC	Alphanumeric cyan Mosaic cyan
0	1	1	1	07	ANW	MSW	Alphanumeric white Mosaic white
1	0	0	0	08	FSH	CDY	Flashing begin Conceal display
1	0	0	1	09	STD	SPL	Flashing steady Stop lining
1	0	1	0	10	EBX	STL	End of window Start lining
1	0	1	1	11	SBX	CSI	Start of window Control sequence introducer
1	1	0	0	12	NSZ	BBD	Normal size Black background
1	1	0	1	13	DBH	NBD	Double height New background
1	1	1	0	14	DBW	HMS	Double width Hold mosaic
1	1	1	1	15	DBS	RMS	Double size Release mosaic

Table 8.4-7

Invokation by ESC 2/2 4/0

Supplementary control function set repertory 2 (parallel)

b4	b3	b2	b1		08	09	
					b7 = 1	1	
					b6 = 0	0	
					b5 = 0	0	
					b8 = 0	1	
0	0	0	0	00	BKF	BKB	Black foreground Black background
0	0	0	1	01	RDF	RDB	Red foreground Red background
0	0	1	0	02	GRF	GRB	Green foreground Green background
0	0	1	1	03	YLF	YLB	Yellow foreground Yellow background
0	1	0	0	04	BLF	BLB	Blue foreground Blue background
0	1	0	1	05	MGF	MGB	Magenta foreground Magenta background
0	1	1	0	06	CNF	CNB	Cyan foreground Cyan background
0	1	1	1	07	WHF	WHB	White foreground White background
1	0	0	0	08	FSH	CDY	Flashing begin Conceal display
1	0	0	1	09	STD	SPL	Flashing steady Stop lining
1	0	1	0	10	EBX	STL	End of window Start lining
1	0	1	1	11	SBX	CSI	Start of window Control sequence introducer
1	1	0	0	12	NSZ	NPO	Normal size Normal polarity
1	1	0	1	13	DBH	IPO	Double height Inverted polarity
1	1	1	0	14	DBW	TRB	Double width Transparent background
1	1	1	1	15	DBS	STC	Double size Stop conceal

Table 8.4-8

Invokation by ESC 2/2 4/1

Primary Set of Graphic Characters (Default G0 Set)

b4 b3 b2 b1		b7	0	0	0	0	1	1	1	1
		b6	0	0	1	1	0	0	1	1
		b5	0	1	0	1	0	1	0	1
			0	1	2	3	4	5	6	7
0 0 0 0	0					0	@	P		p
0 0 0 1	1				!	1	A	Q	a	q
0 0 1 0	2				"	2	B	R	b	r
0 0 1 1	3				#	3	C	S	c	s
0 1 0 0	4				¤	4	D	T	d	t
0 1 0 1	5				%	5	E	U	e	u
0 1 1 0	6				&	6	F	V	f	v
0 1 1 1	7				'	7	G	W	g	w
1 0 0 0	8				(	8	H	X	h	x
1 0 0 1	9				)	9	I	Y	i	y
1 0 1 0	10				*	:	J	Z	j	z
1 0 1 1	11				+	;	K	[	k	{
1 1 0 0	12				,	<	L	\	l	|
1 1 0 1	13				-	=	M	]	m	}
1 1 1 0	14				.	>	N	^	n	~
1 1 1 1	15				/	?	O	_	o	

Table 8.4-9

Designation to G<i> set by ESC (2/8 + i) 4/0
International Reference Version

8.4.7.6 Designation of Graphic Characters

Code sets

Five code sets are used to encode the graphic characters, these are:

a) The primary set of characters - Table 8.4-9
This consists of the most frequently used alphanumeric characters and punctuation marks. The bit combination 2/0 is used for SPACE and 7/15 is used for DELETE.

b) The supplementary set of graphic characters - Table 8.4-10
This set contains three types of characters:

- 4/0 to 4/15
  Diacritical marks
- 6/0 to 7/14
  Alphabetic characters which are used in addition to the basic Latin alphabet in the primary set and which are not composed of diacritical marks and basic letters.
- 2/1 to 3/15
  Non-alphabetic characters which are used in addition to those in the primary set.

c) The first supplementary set of mosaic characters - see Table 8.4-11
This set consists of 64 block mosaic characters and 32 text characters the presentation of which is identical to that of the characters of columns 4 and 5 of the primary set of characters.
This set has been established for compatibility reasons only, i.e. it is not to be used for editing of new pages.

d) The second supplementary set of mosaic characters - see Table 8.4-12
This set consists of 63 block mosaic characters, 28 smoothed mosaic characters, two vertical bars and one speckled character.

e) The third supplementary set of mosaic characters - see Table 8.4-12
This set consists of 28 smoothed mosaic characters, 24 line drawing characters and 4 jointive arrows and 3 circle form characters.

The Coding of Characters with Diacritical Marks

Each of these characters is represented by a sequence of two bit combinations. The first part of this sequence consists of a bit combination in the range 4/0 to 4/15 from the supplementary set of graphic characters representing a diacritical mark. The second part consists of a bit combination in the range 4/1 to 5/10 or 6/1 to 7/10 from the primary set of graphic characters representing a basic Latin letter. The diacritical marks are shown in Table 8.4-10 and the basic Latin letters are shown in Table 8.4-9. In case of invalid combinations the basic character is processed, the diacritical mark is ignored. Spaces may be combined with diacritical marks.
7/15 is always represented as DEL (not valid for L-set).

Supplementary Set of Graphic Characters (Default G2 Set)

b7	b6	b5	b4		0	1	2	3	4	5	6	7
					0	1	2	3	4	5	6	7
0	0	0	0	0				°		—	Ω	K
0	0	0	1	1			¡	±	`	¹	Æ	æ
0	0	1	0	2			¢	²	´	®	Đ	đ
0	0	1	1	3			£	³	^	©	ª	ð
0	1	0	0	4			$	×	~	™	Ħ	ħ
0	1	0	1	5			¥	µ	¯	♪		ı
0	1	1	0	6			#	¶	˘		IJ	ij
0	1	1	1	7			§	·	¸		Ŀ	ŀ
1	0	0	0	8			¤	÷	¨		Ł	ł
1	0	0	1	9			‘	’	¨ 1)		Ø	ø
1	0	1	0	10			“	”	°		Œ	œ
1	0	1	1	11			«	»	˛		º	ß
1	1	0	0	12			←	¼		⅛	Þ	þ
1	1	0	1	13			↑	½	˝	⅜	Ŧ	ŧ
1	1	1	0	14			→	¾	˛	⅝	Ŋ	ŋ
1	1	1	1	15			↓	¿	ˇ	⅞	ʼn	

Table 8.4-10

1) Only for reception, presentation as 4/8
Designation to G<i> set by ESC (2/8 + i) 6/2

First Supplementary Set of Mosaic Characters (L Set)

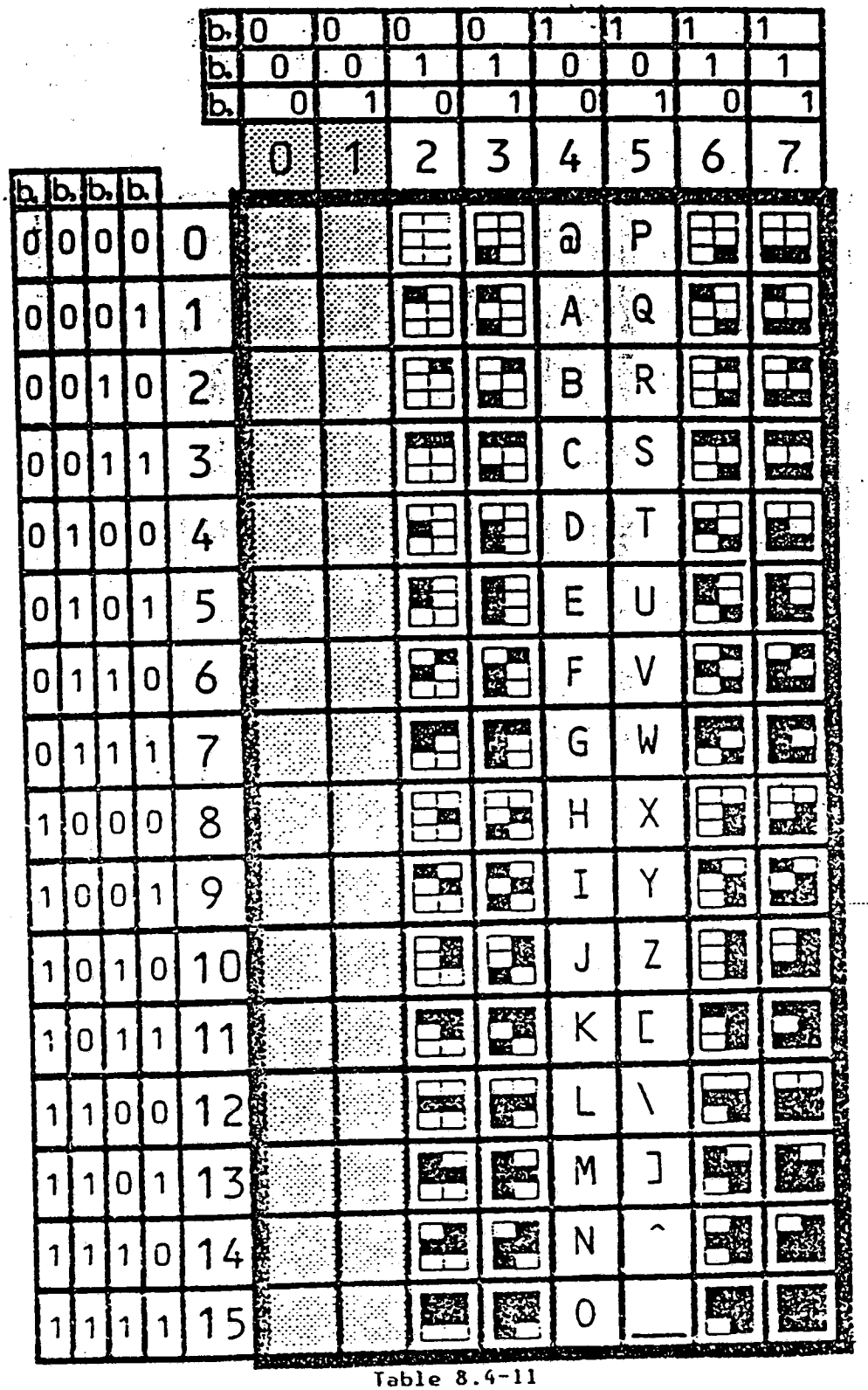


Table 8.4-11

Activated by: serial controls 9/0 to 9/7
Deactivated by: •serial controls 8/0 to 8/7 or by •ESC 2/2 4/1 or by •Clear Screen or by •ESC 2/2 4/1 or by •LS0, LS1, LS2, LS3 or by •leaving the row.

Second Supplementary Set of Mosaic Characters (Default G1 Set)

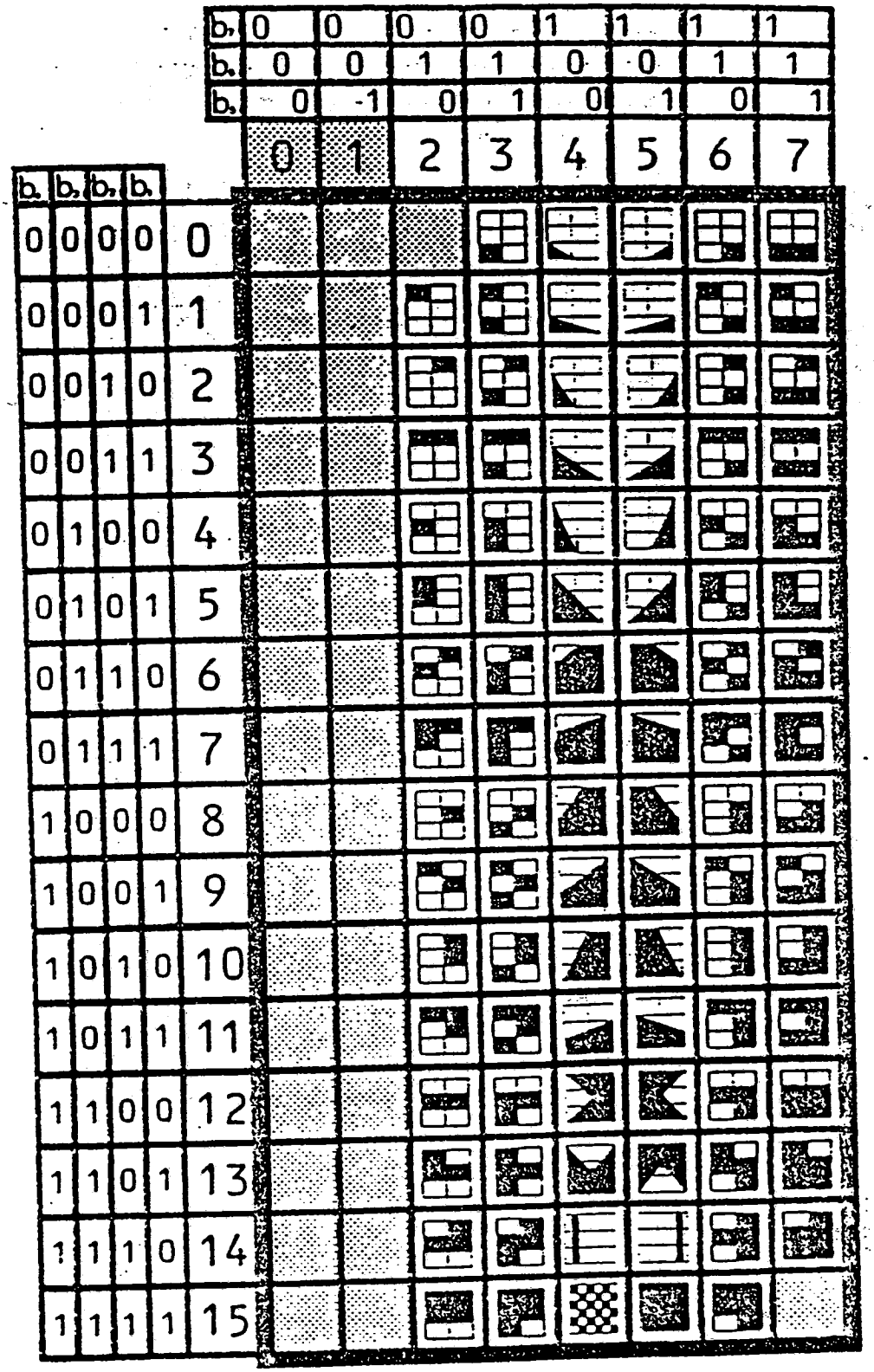


Table 8.4-12

Designation to G<i> set by ESC (2/8 + i) 6/3

Third Supplementary Set of Mosaic Characters (Default G3 Set)

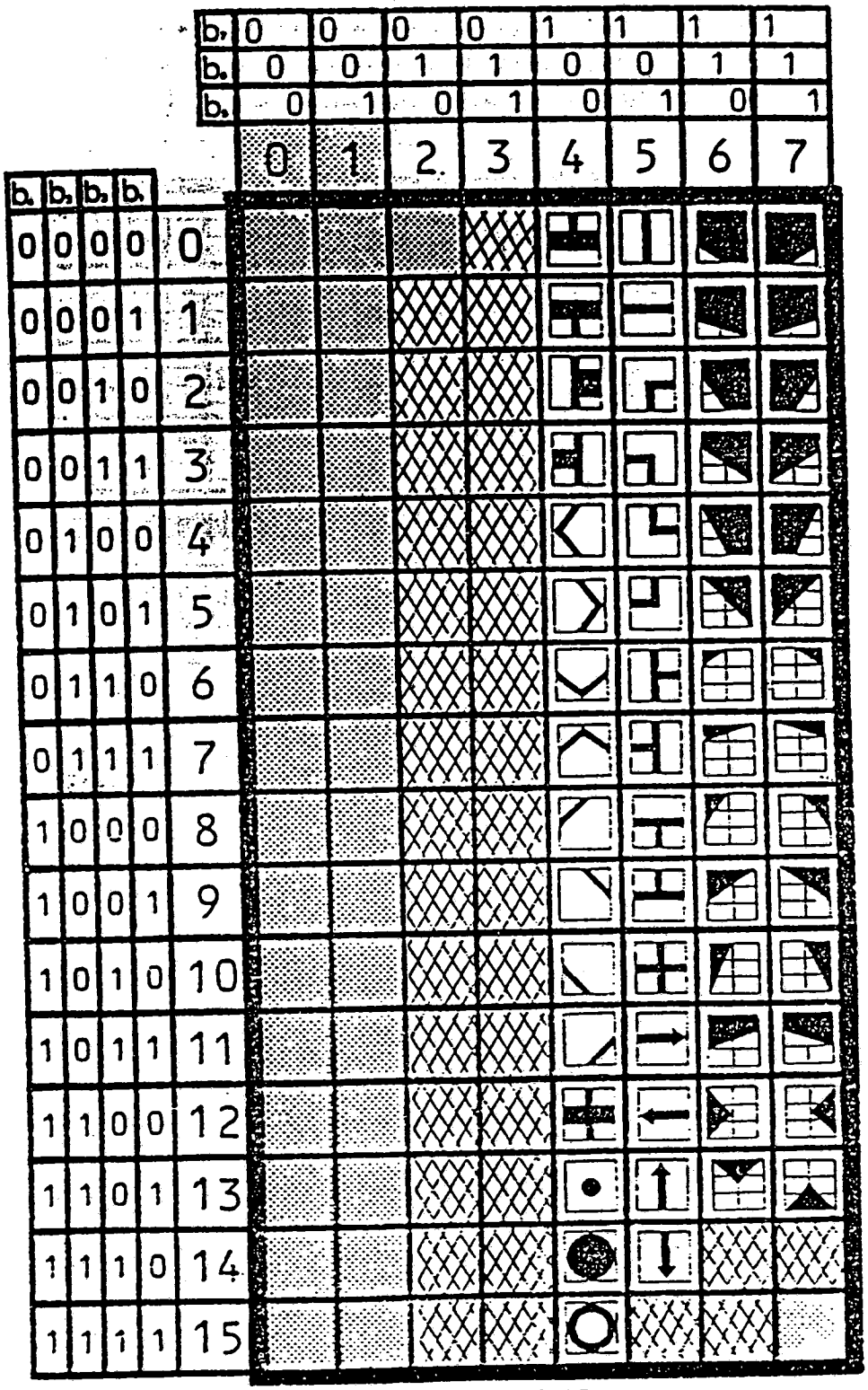


Table 8.4-13

Designation to G<i> set by ESC (2/8 + i) 6/4

8.4.7.7 Attribute Control Repertoire

Serial and parallel controls

Serial and parallel controls are taken from the appropriate C1 sets and affect parts of rows and individual characters respectively according to the description of the two modes.

The currently invoked C1 set indicates whether CSI control sequences should be interpreted as serial or parallel controls.

Colour controls

a) Serial Controls

The FOREGROUND COLOUR may be set to any one of the eight colours of the currently invoked colour palette. The same controls are also used to shift into or out of the first mosaic set (the L-set).

The following 'alpha' foreground colour controls cause the appropriate foreground colour to be applied and a locking shift from the first mosaic supplementary mosaic set (the L-set) back to the G-set previously invoked to cols. 2 to 7.

Abbreviation	Name and Definition	Code
ABK	ALPHA BLACK Invokes 1st colour of the colour palette in use	C1S 8/0
ANR	ALPHA RED Invokes 2nd colour of the colour palette in use	C1S 8/1
ANG	ALPHA GREEN Invokes 3rd colour of the colour palette in use	C1S 8/2
ANY	ALPHA YELLOW Invokes 4th colour of the colour palette in use	C1S 8/3
ANB	ALPHA BLUE Invokes 5th colour of the colour palette in use	C1S 8/4
ANM	ALPHA MAGENTA Invokes 6th colour of the colour palette in use	C1S 8/5
ANC	ALPHA CYAN Invokes 7th colour of the colour palette in use	C1S 8/6
ANW	ALPHA WHITE Invokes 8th colour of the colour palette in use	C1S 8/7

The following 'mosaic' foreground colour controls cause the appropriate foreground colour to be applied and a locking shift to the first supplementary mosaic set (the L-set).

Abbreviation	Name and Definition	Code
MBK	MOSAIC BLACK Invokes 1st colour of the colour palette in use	C1S 9/0
MSR	MOSAIC RED Invokes 2nd colour of the colour palette in use	C1S 9/1
MSG	MOSAIC GREEN Invokes 3rd colour of the colour palette in use	C1S 9/2
MSY	MOSAIC YELLOW Invokes 4th colour of the colour palette in use	C1S 9/3
MSB	MOSAIC BLUE Invokes 5th colour of the colour palette in use	C1S 9/4

MSM	MOSAIC MAGENTA Invokes 6th colour of the colour palette in use	C1S 9/5
MSC	MOSAIC CYAN Invokes 7th colour of the colour palette in use	C1S 9/6
MSW	MOSAIC WHITE Invokes 8th colour of the colour palette in use	C1S 9/7

The following controls affect the character background layer (layer (b)).

Abbreviation	Name and Definition	Code
NBD	NEW BACKGROUND Causes the BACKGROUND COLOUR to adopt the current foreground colour as defined by previous colour controls. The foreground colour remains unchanged.	C1S 9/13
BBD	BLACK BACKGROUND Causes the BACKGROUND COLOUR to invoke the first colour of the colour palette in use.	C1S 9/12

b) Parallel controls

The foreground colour may be set to any one of the eight colours of the currently invoked colour palette in use using the following controls.

Abbreviation	Name and Definition	Code
BKF	BLACK FOREGROUND Invokes 1st colour of the colour palette in use	C1P 8/0
RDF	RED FOREGROUND Invokes 2nd colour of the colour palette in use	C1P 8/1
GRF	GREEN FOREGROUND Invokes 3rd colour of the colour palette in use	C1P 8/2
YLF	YELLOW FOREGROUND Invokes 4th colour of the colour palette in use	C1P 8/3
BLF	BLUE FOREGROUND Invokes 5th colour of the colour palette in use	C1P 8/4
MGF	MAGENTA FOREGROUND Invokes 6th colour of the colour palette in use	C1P 8/5
CNF	CYAN FOREGROUND Invokes 7th colour of the colour palette in use	C1P 8/6
WHF	WHITE FOREGROUND Invokes 8th colour of the colour palette in use	C1P 8/7

The following controls cause the character background layer (layer b) to adopt one of the eight colours of the currently invoked colour palette in use or transparency.

Abbreviation	Name and Definition	Code
BKB	BLACK BACKGROUND Invokes 1st colour of the colour palette in use	C1P 9/0
RDB	RED BACKGROUND Invokes 2nd colour of the colour palette in use	C1P 9/1
GRB	GREEN BACKGROUND Invokes 3rd colour of the colour palette in use	C1P 9/2
YLB	YELLOW BACKGROUND Invokes 4th colour of the colour palette in use	C1P 9/3

BLB	BLUE BACKGROUND Invokes 5th colour of the colour palette in use	C1P 9/4
MGB	MAGENTA BACKGROUND Invokes 6th colour of the colour palette in use	C1P 9/5
CNB	CYAN BACKGROUND Invokes 7th colour of the colour palette in use	C1P 9/6
WHB	WHITE BACKGROUND Invokes 8th colour of the colour palette in use	C1P 9/7
TRB	TRANSPARENT BACKGROUND Invokes transparent background independently of the currently invoked colour table.	C1P 9/14

Flash controls

The following controls are available in both the serial and the parallel mode.

STD	STEADY Cancels the application of any flash attribute	C1S, P 8/9

o State controls

Abbreviation	Name and Definition	Code
FSH	FLASH Applies the normal flash state and 50% rate	C1S, P 8/8
IVF	INVERTED FLASH Applies the inverted flash state and 50% rate	CSI 3/0 4/1
RIF	REDUCED INTENSITY FLASH Applies flash between colour tables and 50% rate	CSI 3/1 4/1

o Rate controls

Abbreviation	Name and Definition	Code
FF1	FAST FLASH 1 Applies the 1st phase of three-phase flash	CSI 3/2 4/1
FF2	FAST FLASH 2 Applies the 2nd phase of three-phase flash	CSI 3/3 4/1
FF3	FAST FLASH 3 Applies the 3rd phase of three-phase flash	CSI 3/4 4/1
ICF	INCREMENT FLASH Three-phase flash is applied to characters so that the phase is sequentially changed for every character (enlarged characters count as single characters) in a string of three adjacent characters to produce an apparent movement to the right.	CSI 3/5 4/1

DCF DECREMENT FLASH CSI 3/6 4/1

Three-phase fast flash is applied to characters so that the phase is sequentially changed for every character (enlarged characters count as single characters) in a string of three adjacent characters to produce an apparent movement to the left (DCF).

The application of any of the rate controls applies a flashing mode which is the combination of the previously set state (i.e. state of the active position in serial mode or state of the cursor in parallel mode) and the requested rate. If no state was previously set (i.e. steady) normal flash is combined with the required rate.

LINING Controls

The following controls are available as serial or parallel controls.

Abbreviation	Name and Definition	Code
STL	START LINING Applies the LINED attribute	C1S, P 9/10
SPL	STOP LINING Stops the application of the LINED attribute.	C1S, P 9/9

SIZE Controls

The following controls are available in both the serial and parallel mode.

Abbreviation	Name and Definition	Code
NSZ	NORMAL-SIZE Applies the NORMAL-SIZE attribute.	C1S, P 8/12
DBH	DOUBLE-HEIGHT Applies the DOUBLE-HEIGHT attribute.	C1S, P 8/13
DBW	DOUBLE-WIDTH Applies the DOUBLE-WIDTH attribute.	C1S, P 8/14
DBS	DOUBLE-SIZE Applies the DOUBLE-SIZE attribute.	C1S, P 8/15

Note

As described before, the action of the DOUBLE-HEIGHT and the DOUBLE-SIZE control is different in the serial and the parallel mode.

Conceal Controls

The following controls are available in both the serial and parallel mode.

Abbreviation	Name and Definition	Code
CDY	CONCEAL DISPLAY Applies the CONCEAL attribute.	C1S, P 9/8
STC	STOP CONCEAL Stops the application of the CONCEAL attribute.	C1P 9/15 CSI 4/2

Invert Controls

The following controls are available as parallel controls.

Abbreviation	Name and Definition	Code
IPO	INVERTED POLARITY Applies the INVERT attribute.	C1P 9/13
NPO	NORMAL POLARITY Stops the application of the INVERT attribute.	C1P 9/12

Serial controls - none.

Window Controls

The following controls are available as serial or parallel controls.

Abbreviation	Name and Definition	Code
SBX	START WINDOW Applies the WINDOW attribute.	C1S, P 8/11
EBX	END WINDOW Stops the application of the WINDOW attribute.	C1S, P 8/10

Marking Controls

The following controls are available as serial or parallel controls.

Abbreviation	Name and Definition	Code
MMS	MARKED MODE START Applies the MARKED attribute.	CSI 3/2 5/3
MMT	MARKED MODE STOP Stops the application of the MARKED attribute.	CSI 3/2 5/4

Full Row Attributes

a) The attributes:

FOREGROUND COLOUR (1 of 8 colours of the colour palette in use) (layer (c))
BACKGROUND COLOUR (1 of 8 colours of the colour palette in use + transparent background) (layer (a))
LINED (start/stop) (layer (c))
SIZE (normal size) (layer (c) and (b))
FLASH (normal/steady) (layer (c) and (b))
CONCEAL (start/stop) (layer (c))
INVERT (invert/normal) (layer (c) and (b))
WINDOW (start/stop) (set in layer (c) but active in layer (a))

are coded as four character escape sequences of the form:

ESC 2/3 2/1 <Fe> for full row attributes

where Fe is the attribute control character from the parallel C1 set (columns 4, 5 as in 7-bit environment).

b) Protecting controls

The following controls are available as full row controls.

Abbreviation	Name and Definition	Code
PMS	PROTECTED MODE START Applies the PROTECTED attribute.	CSI 3/1 5/0
PMC	PROTECTED MODE CANCEL Cancels (removes) the PROTECTED attribute (allows overwriting).	CSI 3/1 5/1

Full Screen Attributes

The following controls are available as full screen controls. They cause the full screen background layer (layer (a)) to adopt one of the eight colours of the currently invoked colour palette or transparent.

Abbreviation	Name and Definition	Code for (Fe)
BKB	BLACK BACKGROUND Invokes 1st colour of the colour palette.	C1P 5/0
RDB	RED BACKGROUND Invokes 2nd colour of the colour palette.	C1P 5/1
GRB	GREEN BACKGROUND Invokes 3rd colour of the colour palette.	C1P 5/2
YLB	YELLOW BACKGROUND Invokes 4th colour of the colour palette.	C1P 5/3
BLB	BLUE BACKGROUND Invokes 5th colour of the colour palette.	C1P 5/4
MGB	MAGENTA BACKGROUND Invokes 6th colour of the colour palette.	C1P 5/5
CNB	CYAN BACKGROUND Invokes 7th colour of the colour palette.	C1P 5/6
WHB	WHITE BACKGROUND Invokes 8th colour of the colour palette.	C1P 5/7
TRB	TRANSPARENT BACKGROUND Invokes transparent background (the underlying video picture)	C1P 5/14

They are coded as four character escape sequences of the form:

ESC 2/3 2/0 <Fe> for full screen attributes

where Fe is the attribute control character from the parallel C1 set (column 4,5 as in 7-bit environment).

Colour Table Controls

The following controls invoke the selected colour table into the colour table.

Abbreviation	Name and Definition	Code
CT1	COLOUR TABLE 1 Invokes 1st colour table.	CSI 3/0 4/0
CT2	COLOUR TABLE 2 Invokes 2nd colour table.	CSI 3/1 4/0
CT3	COLOUR TABLE 3 Invokes 3rd colour table.	CSI 3/2 4/0
CT4	COLOUR TABLE 4 Invokes 4th colour table.	CSI 3/3 4/0

These controls are locking controls and are reset by a contradictory control or clear screen (CS).

Definition of Scrolling Area

Abbreviation	Name and Definition
CSA	CREATE SCROLLING AREA Creates a scrolling area. A previously defined scrolling area is deleted.
DSA	DELETE SCROLLING AREA Deletes scrolling area (parameters are ignored).

Similar CSI sequences are used for CREATE SCROLLING AREA and DELETE SCROLLING AREA; only the final characters are different.

CSI <URT> <URU> 3/11 <LRT> <LRU> <F>

URT: tens value of the upper row
URU: units value of the upper row

LRT: tens value of the lower row
LRU: units value of the lower row

These values are coded from column 3 of the code table, leading zeros may be omitted

F: 5/5 for CREATE SCROLLING AREA
5/6 for DELETE SCROLLING AREA

The action of scrolling is initiated as described in Chapter 8.4.4.2

Execution of Scrolling

a) Implicit scrolling

Abbreviation	Name and Definition	Code
DIS	DEACTIVATE IMPLICIT SCROLLING This deactivates the implicit scrolling, allowing the active position to move across the border of a scrolling area with other methods than APA and APH.	CSI 3/3 6/0
AIS	ACTIVATE IMPLICIT SCROLLING This restores the implicit scrolling effect of format effectors and wraparound.	CSI 3/2 6/0

b) Explicit scrolling

These controls affect the scrolling area.

Abbreviation	Name and Definition	Code
SCU	SCROLL UP This causes a scrolling up of the designated scrolling area. The active position does not move relative to the defined display area.	CSI 3/0 6/0
SCD	SCROLL DOWN This causes a scroll down of the designated area. The active position does not move relative to the defined display area.	CS 3/1 6/0

8.5 DYNAMICALLY REDEFINABLE CHARACTERS

8.5.1 INTRODUCTION

A DRCS is a set of characters whose shapes are sent by the Btx exchange and down-loaded via the line. It may be used to represent alphabetic characters, special symbols, or picture element symbols for constructing fine graphics. Once loaded, the DRCS's are regarded as members of a library that can be designated by appropriate ESCAPE sequences as G0, G1, G2 or G3 sets.

Two types of DRCS have been identified. The first type is the basic DRCS. Only the shapes of the characters are downloaded. Characters are displayed on the screen in the prevailing foreground colour on the prevailing background colour. In the second type of DRCS the downloaded characters are completely defined in foreground colours; i.e. all the dots of a character cell have a defined foreground colour, chosen from a number of colours.

The protocol defined below for downloading of DRCS allows down-loading of both types of DRCS. The protocol is open ended to allow for future extensions.

8.5.2 THE DRCS MODES

8.5.2.1 Overview

The DRCS used in the basic terminal is determined by the following conditions.

1. The DRCS is based on a 12-dot resolution.
2. The capacity of the DRCS Ram is limited to 16 kbits.
3. Several DRCS modes may be used within one picture.
4. The DRCS characters may be described by two to sixteen colours.
5. The choice of the DRCS-mode is made according to S100 by using an SDC sequence.

6. The following modes are defined:

No.	Modes (Dot/Hor. x Dot/Vert. x Bit/Dot)	DATA Bytes per character max. (Byte)	max. number of chars.	DRCS Table	Char. group in stack	Character Code Incr. Factor 1)
1	12 x 10/12 x 1	20/24	94/84	1	5	1
2	6 x 10/12 x 2	20/24	94/84	1	5	1
3	6 x 5/6 x 4	20/24	94/84	1	5	1
4	6 x 10/12 x 1	10/12	94/84	1	5	1
5	6 x 5/6 x 2	10/12	94/84	1	5	1
6	12 x 10/12 x 2	40/48	47/42	1	5	2
7	6 x 10/12 x 4	40/48	47/42	1	5	2

Table 8.5-1

1) The modes 1 to 5 occupy one character position of the transmission code table; the modes 6 and 7 occupy two character positions of the transmission code table.

7. The modes may be freely mixed in one picture until the maximum capacity of one character set is occupied.

8. Designation sequence for the DRCS: ESC 2/x 2/0 4/0

9. In case of overwriting a DRC address with a new DRC always the last received DRC will be displayed correctly.

10. In case of conflict between DRC format (e.g. 12x12) and number of rows (e.g. 24 rows) unpredictable results may occur. However, some terminals may support fallback solutions.

94 · 24 / 376 / 188 / 2256

8.5.2.2 Application of attributes to DRC

All attributes apply to DRC in the same manner as to normal characters.

The underline control causes the underline attribute to be applied (as for alphanumeric character sets).

For multi-colour DRCS the following additional rules apply:

- the foreground colours are given by a separate colour definition procedure, the whole character cell is treated as foreground,
- the background colour is given by the default value or by the applied background colour,
- the underline attribute has no effect.

8.5.2.3 Basic DRCS modes

One dot may be displayed in either the foreground or the background colour in the same way as e.g. a character of the primary graphic set. Therefore,one bit per dot is required for each character definition.

The bit values are defined as follows:

0 display dot in background colour

1 display dot in foreground colour.

Both colours are defined by the foreground and background colour attributes at the character position where the DRC is displayed.

The dot composition:

12 x 10/12 dots requires 120/144 bits
6 x 10/12 dots requires 60/72 bits

for each DRC definition

8.5.2.4 Four-colour modes

One dot may be displayed in 1 of 4 colours. Every dot has to be defined by its foreground colour. Therefore, 2 bits per dot are required for each character definition.

Each dot value refers to 1 of 4 entries of a DRCS colour look-up table (DCLUT). The contents of the DCLUT entry refer to 1 of the 32 colours defined in the colour map (see Define Colour).

The dot composition:

12 x 10/12 dots requires 240/288 bits
6 x 10/12 dots requires 120/144 bits
6 x 5/6 dots requires 60/72 bits

for each DRC definition.

8.5.2.5 Sixteen-colour modes

One dot may be displayed in 1 of 16 colours. Every dot has to be defined by its foreground colour. Therefore 4 bits per dot are required for each character definition.

Each dot value refers to 1 of the 16 redefinable colours.

The dot composition:

6 x 10/12 dots requires 240/288 bits
6 x 5/6 dots requires 120/144 bits

for each DRC definition.

8.5.2.6 Downloading of DRCS

The downloading of DRCS is accomplished using units of two types:

- DRCS header units
- DRCS pattern transfer units.

A DRCS header unit describes the general properties of the DRCS to be loaded. The actual pattern transfer takes place using DRCS pattern transfer units. Both units are coded as Presentation Protocol Data Units (VPDE) in accordance with the Presentation Level Protocol (PLP) as:

US 2/3 Y <data>

Y = 2/0 indicates DRCS header units
Y <> 2/0 indicates DRCS pattern transfer units.

8.5.2.7 DRCS Header Units

A DRCS header unit applies for all following pattern transfer units until the header is redefined or until the end of a session. A DRCS header unit is coded as:

US 2/3 2/0 <ICS> <SDC>

The various fields of the DRCS header unit are coded with bytes from different columns of the code table. This allows certain fields to be omitted if the default conditions apply. The default conditions are mentioned in the description of the fields and are independent of previously loaded header units.

The following header information sequences are generally defined:

<ICS> identification of character set
(occupies codes of column 2 except for the last byte of the ICS sequence)
<SDC> set dot composition
(occupies codes of columns 3 and 4)

The occurrence of different or additional header information which is not described hereafter must be recognized by the terminal but different modes are not to be executed. In the case of additional information the default procedure is always to be executed.

A DRCS header unit applies for all following pattern transfer units until the header is redefined or until the end of a session.

8.5.2.8 <ICS> : Identification of Character Set

The <ICS> field identifies the DRCS to be loaded, by a number which will consequently be used in the designation sequence for this set. With the exception of the last byte, all the bytes of the <ICS> field are taken from column 2 of the code table.

<ICS> : 2/k 2/0 F

k: It indicates whether a possibly existing DRCS identified by the same <ICS> field should be deleted or merely be overwritten by the following pattern transfer units.

0: do not delete existing DRCS

8: delete existing DRCS

F: 4/0 DRCS 1

The default for <ICS> is: 2/0 2/0 4/0 which will identify the DRCS 1 to be loaded with the final character 4/0 for designation. An existing DRCS in this library position will not be deleted.

Note: A graphic set indicated by 2/0 F can be designated as a Gi set (i = 0,1,2,3) in a designation sequence of the following form:

ESC I 2/0 F

in which I = 2/(8 + i) selects the Gi set.

8.5.2.9 <SDC> : Select Dot Composition

The <SDC> field describes the structure of the DRCS to be loaded.
The <SDC> field also discriminates between the two types of DRCS.

The <SDC> is coded with bytes from column 4 of the code table.

<SDC> : 4/p 4/q

p : indicates recommended dot matrix sizes (horizontal x vertical).
There is no default for p.

6:	12x12
7:	12x10
10:	6x12
11:	6x10
12:	6x5
15:	6x6

For different matrices appropriate fallbacks may be used.

q : indicates the number of bits per dot used to code the DRCS. The default for q is 1, indicating 1 bit per dot basic DRCS. Colour DRCS is coded with q <> = 2 or 4

1: 1 bit/dot basic DRCS

2: 2 bit/dot colour DRCS, 4 colours,
default colours: black, red, green, yellow

4: 4 bit/dot colour DRCS, 16 colours,
default colours (see redefinable colours)
16 to 31 of colour map

8.5.2.10 VPCE for DRCS

In case of DRCS-VPCE only necessary information which differs from the defaults must be transmitted.

Instead of the default sequence

US 2/3 2/0 2/0 2/0 4/0 4/p 4/1

(2/0 2/0 4/0 = ICS; 4/p 4/1 = SDC)

only the sequence

US 2/3 2/0 4/p 4/1

must be transmitted.

In case of different ICS or SDC sequences from the default this information must be transmitted additionally.

8.5.2.11 Pattern Transfer Units

Pattern transfer units are coded as:

US 2/3 Y <pattern data>

Y the code of the first character described in the unit; it has a value in the range 2/1 to 7/14 inclusive.

The <pattern data> field of a pattern transfer unit describes the patterns for the characters of the downloaded DRCS, in accordance with the last received DRCS header unit.

The value of the Y parameter defines the code of the first defined character. If the pattern transfer unit contains more character definitions, they will be assigned subsequent codes.

Subsequent codes means each code position plus:

1 in case of DRC's of modes1 to 5

2 in case of DRC's of mode 6 or 7

Data contained in a pattern transfer unit for a character subsequent to a character with code 7/14 will be discarded.

The coding methods to be used for the basic terminal in the <pattern data> is the 'direct' coding method.

8.5.2.12 Pattern Block

A DRCS character cell consists of m dots horizontally and n dots vertically (in total m x n dots). The values of m and n are determined by the <SDC> field of the DRCS header unit. The direct coding method can be used for all possible values of m and n.

Basically the dots of a character cell are loaded, 6 dots at a time, row by row, starting from the top left hand corner, using the 6 least significant bits of codes from columns 4 to 7 of the code table. These bytes are called D-bytes.

High-resolution mode (12 x 10/12 dot)

Two D-bytes are used for one dot line which is to be described, where the first one describes the dots 1 to 6 and the second one describes the dots 7 to 12. For the pattern block 20/24 bytes may be used maximally.

Medium-resolution mode (6 x 10/12 dot)

One D-byte for one dot line is to be used.

For the pattern block 10/12 bytes may be used maximally.

Low-resolution mode (6 x 5/6 dot)

One D-byte for one pattern line is to be used. A pattern block is described by 5/6 bytes maximally.

To improve the efficiency of this code a number of special commands have been added. They are coded as bytes from column 2 of the code table and are called S-bytes. The coding of these bytes is:

code	name	description
2/0	Sf	fill rest of character with '0'
2/1	R1	repeat last complete row once
2/2	R2	repeat last complete row twice
2/3	R3	repeat last complete row 3 times
2/4	R4	repeat last complete row 4 times
2/5	R5	repeat last complete row 5 times
2/6	R6	repeat last complete row 6 times
2/7	R7	repeat last complete row 7 times
2/8	R8	repeat last complete row 8 times
2/9	R9	repeat last complete row 9 times
2/10	R10	repeat last complete row 10 times
2/12	S0	defines a complete row containing '0'
2/13	S1	defines a complete row containing '1'
2/14	Sr	fill rest of character with last complete row
2/15	Ss	fill rest of character with '1'

The actions of the Sf (2/0) command are as follows. The possibly remaining rows of the character are filled with '0'. The action of the Ss (2/15) command is equivalent, but with the character filled with '1'.

The Sr (2/14) command causes the last complete row to be copied in the remaining rows of the character.

The extent of the repeat command (2/1 to 2/10) cannot cross the border of a character. If a repeat command is used as the first byte of a character definition the action is as if the last complete row consisted of all '0'.

Missing bits are assumed to be 0. Remaining bits are discarded.

Missing bytes (e. g. 2nd byte of a pattern row) are assumed to have the value of 0.

8.5.3 BASIC DRCS

One pattern block is used to define one DRC. Dots defined as '1' will be displayed in foreground colour. Dots defined as '0' will be displayed in background colour. Every character is preceded by a pattern block separator coded as 3/0.

8.5.4 COLOUR DRCS

In the pattern transfer units for colour DRCS, a number of bits per dot (see 4/9 in <SDC>) are downloaded to identify the colour of each dot. In the 'direct' coding method the pattern information for the DRCS (or part of it) is transmitted in a number of pattern blocks. A pattern block defines one bit of each of the dots of the DRCS. The pattern blocks are separated by separation bytes (B-bytes) coded in accordance with column 3 of the code table. The pattern block <i> defines the bit i-1 of each dot of the DRC.

code	name	description
3/0	B1	Start of the 1st pattern block, defining the least significant bit of the dot. (i = 0)
3/1	B2	Start of the 2nd pattern block. (i = 1)
3/2	B3	Start of the 3rd pattern block. (i = 2)
3/3	B4	Start of the 4th pattern block. (i = 3)

A pattern block containing all '0' may be achieved by the S-byte 2/0. Equal pattern blocks only have to be transmitted once. In that case the pattern block is preceded by the two (or more) separation bytes to which the pattern block applies. Because of this the order of the B-bytes may be different from that given in the examples below.

Note: Because more than one DRC may be defined in one pattern transfer unit, in the definition of one DRC no pattern block may be omitted.

Four-colour DRCS (2 bits per dot):

Two pattern blocks are required for each DRC definition

Examples:

1) 3/0 <1st pattern block> 3/1 <2nd pattern block>

2) 3/0 3/1 <pattern block> (only colours 0 and 3 of DCLUT used)

3) 3/0 <pattern block> 3/1 2/0 (only colours 0 and 1 used)

4) 3/0 3/1 2/0 (only colour 0 used)

Sixteen-colour DRCS (4 bits per dot):

Four pattern transfer blocks are required for each DRC definition:

Examples:

1) 3/0 <1st pattern block> 3/1 <2nd pattern block>
   3/2 <3rd pattern block> 3/3 <4th pattern block>

2) 3/0 3/1 3/2 3/3 <pattern block> (only colours 16 and 31 of the colour map used)

3) 3/0 <pattern block> 3/1 3/2 3/3 2/0 (only colours 16 and 17 of the colour map used).

DRCS-downloading format definition

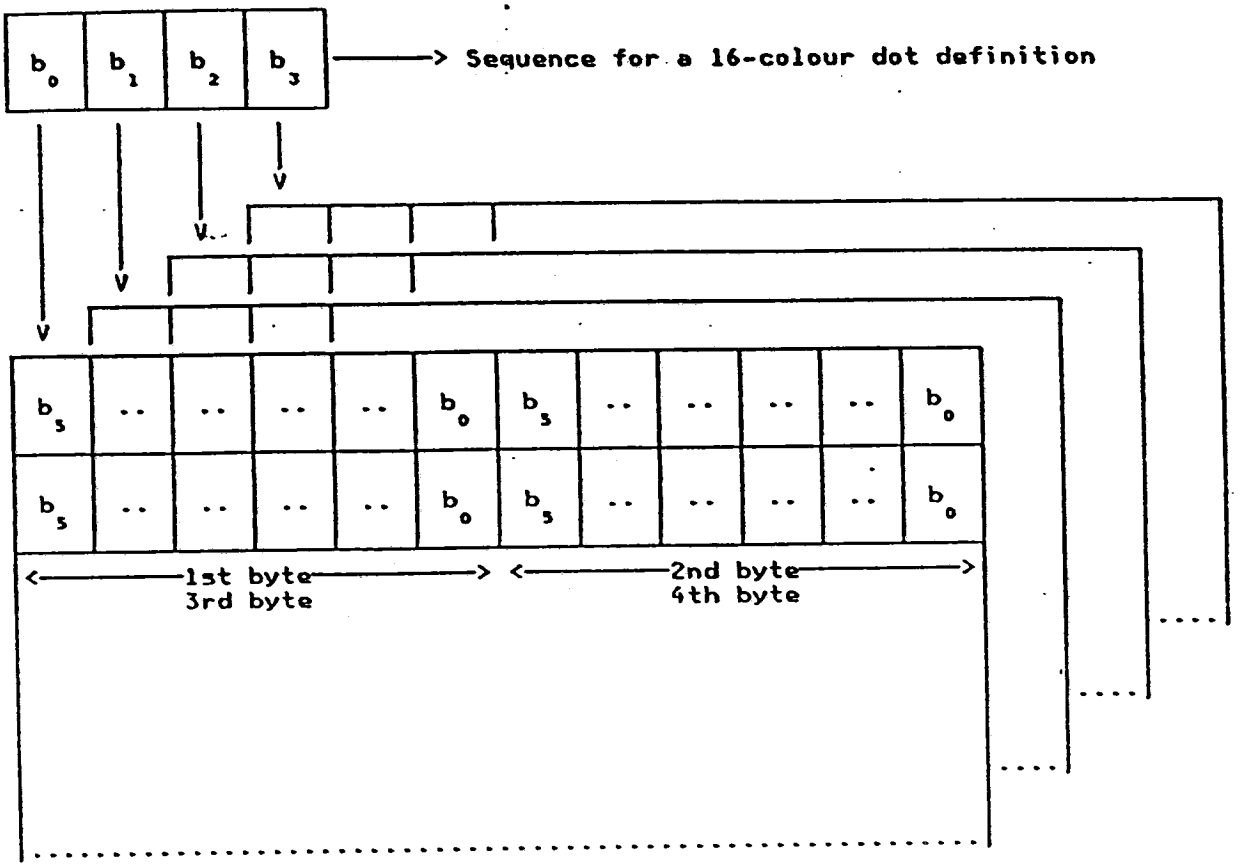


Figure 8.5-1

Relation of DRCS-modes to transmission set

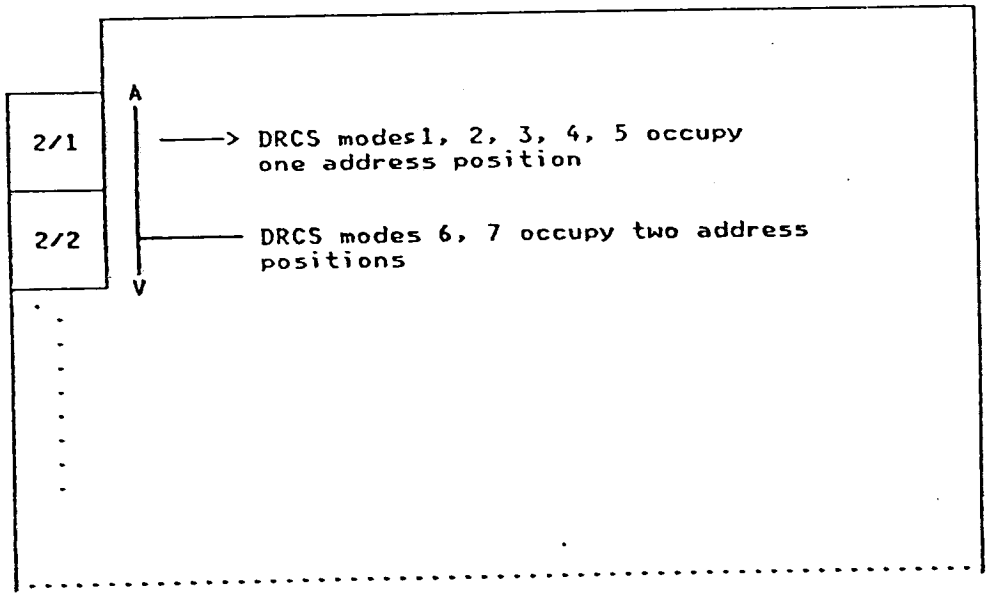


Figure 8.5-2

DIRECT CODING CODE TABLE

0	0	1	2	3	4	5	6	7
0			Sf	B1	0	16	32	48
1			R1	B2	1	17	33	49
2			R2	B3	2	18	34	50
3			R3	B4	3	19	35	51
4			R4		4	20	36	52
5			R5		5	21	37	53
6			R6		6	22	38	54
7			R7		7	23	39	55
8			R8		8	24	40	56
9			R9		9	25	41	57
10			R10		10	26	42	58
11					11	27	43	59
12			S0		12	28	44	60
13			S1		13	29	45	61
14			Sr		14	30	46	62
15			Ss		15	31	47	63

S– B– <———— D bytes ————>

Table 8.5–2

8.6 DYNAMICALLY REDEFINABLE COLOURS (DOWNLOADING OF COLOURS)

8.6.1 INTRODUCTION

The ALPHAMOSAIC C1 sets provide for the selection of eight colours. In this section the method used to extend this colour system and to redefine colours will be described.

8.6.1.1 Colour System Extension

The extension of the colour system is accomplished by providing a number of colour palettes of 8 colours each. At a given instant only one palette can be in use. This palette is selected using a CSI sequence (see Chapter 8.4.7.7). Each palette is implemented as a Colour Look Up Table (CLUT) with 8 entries. The entry in the 'in use' CLUT is selected using the C1 controls according to the table below.

C1 control 8/i or 9/i	colour	entry no. in CLUT
i = 0	Black	0
1	Red	1
2	Green	2
3	Yellow	3
4	Blue	4
5	Magenta	5
6	Cyan	6
7	White	7

The entry in the CLUT contains an ordinal number in the colour map. The contents of this colour map entry define the colour. In the ALPHAMOSAIC mode 4 CLUTS are used. They are named CLUT1, CLUT2, CLUT3 and CLUT4. The size of the colour map is 32 entries, divided into 4 parts of 8 entries each.

In the basic terminal 32 colours which represent the colour map may be taken for graphic representation:

- 8 basic colours of full intensity (1st set P1 with entries 0 to 7)
- 8 basic colours of reduced intensity where reduced intensity black is taken for transparent (2nd set P2 with entries 8 to 15)
- 16 free defined colours (3rd, 4th set P3 and P4 with entries 16 to 31)

The colour set in use is invoked by the control sequence

CSI 3/i 4/0

where i identifies the set P<i+1> to be invoked(<i>=0,1,2,3)

The 16 downloaded (redefinable) colours may be chosen from a colour palette of 4096 values (16 levels for each of RGB) for simultaneous representation on the screen. The 16 levels represent 16 nominally equal steps of brightness.

For colour DRCS (see 8.5) a separate look up table called the DCLUT is provided. The DCLUT contains entries which are used to define the colours used in four colour mode colour DRCS. In the basic terminal the sixteen-colour mode DRCS refers directly to the colour map entries 16 to 31. The colour extension scheme is shown schematically in Figure 8.6-1.

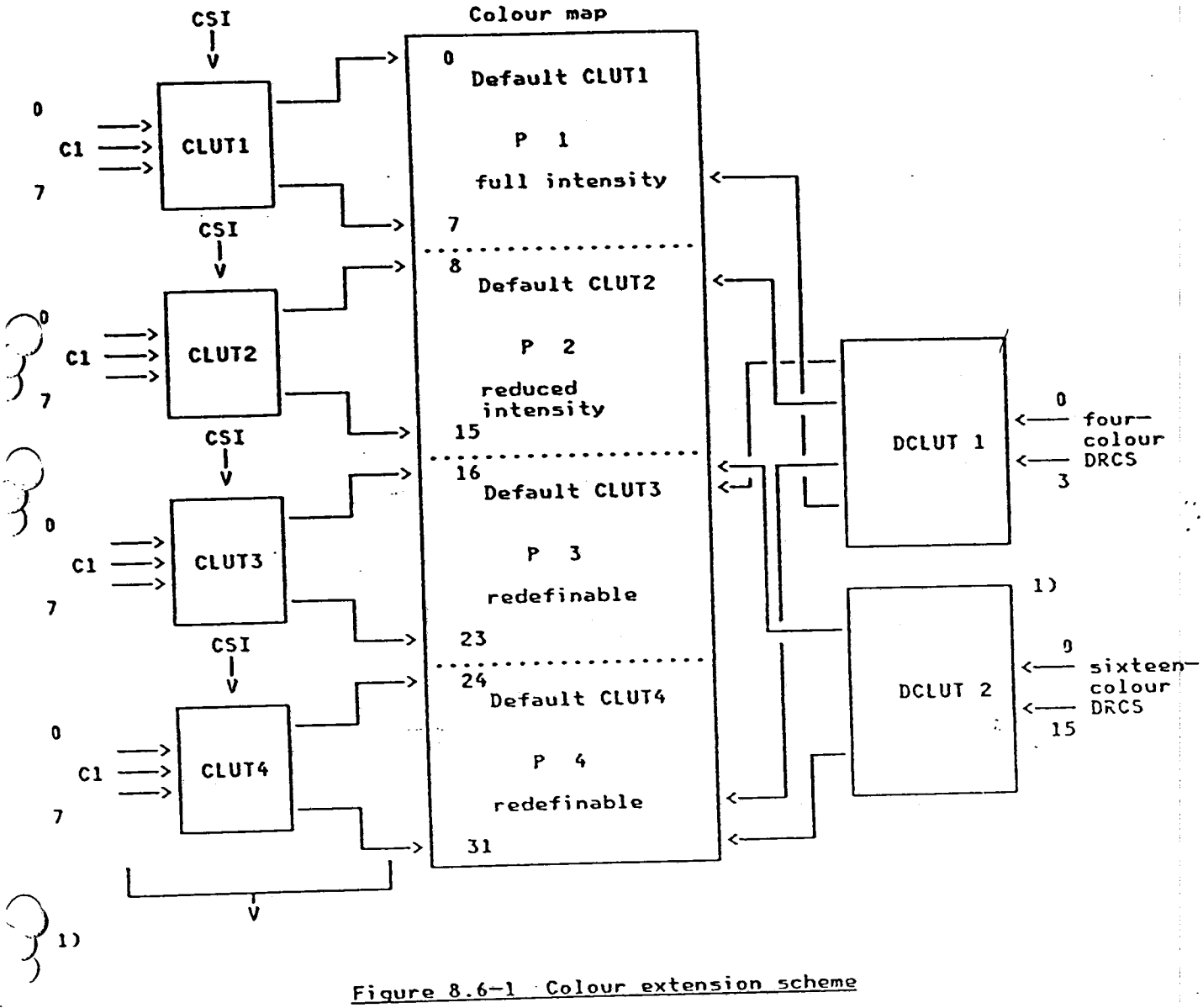


Figure 8.6-1 Colour extension scheme

1) There is no downloading for CLUT's as they refer directly to the appropriate default CLUT's in the colour map.
For the basic terminal the colours inside the CLUT and DCLUT 2 are identical to the colours of the table of the colour map to which they refer. Therefore the contents of the CLUT and DCLUT must not be downloaded explicitly because the default CLUT's are used

8.6.2 CODING OF REDEFINABLE COLOURS

The Define COLOUR VPDE is used to redefine the contents of the colour map, or to redefine the contents of the CLUTs or the DCLUT. The coding is:

US 2/6 Y <data>

Y : determines the function of the Define COLOUR VPDE.

2/0 : Define COLOUR header unit
2/1 : Define Colour reset unit
3/x : COLOUR transfer unit

8.6.2.1 COLOUR Header Unit

A COLOUR header unit applies for all following colour transfer units until the header is redefined or until the end of a session. The header unit is coded as:

US 2/6 2/0 <ICT> <SUR> <SCM>

<ICT> : Identification of Colour Table, is coded as: 2/a 2/b

a : indicates the type of colour table
0 : Colour map
1 : CLUT (not implemented in the basic terminal)
2 : DCLUT (only one DCLUT is implemented in the basic terminal)

b : indicates the number of the unit of the above mentioned colour table type, i.e. 2/0 indicates CLUT 1.

The default coding for <ICT> is 2/0 2/0, identifying the colour map.

<SUR> : Select Unit Resolution, is coded as: 3/c.

c : (1,2...9) indicating the number of bits used to define each unit of the identified table.

The default value for <SUR> = 3/4.

In the basic terminal

<SUR> = 3/4 is used for colour map entries
= 3/5 is used for DCLUT entries

<SCM> : Select Coding Method, is coded as: 4/d.

d : indicates the coding method
0 : entries in colour table
1 : load colour map using R,G,B

The default value for <SCM> = 4/1.

The basic terminal is capable of distinguishing between the different types of header unit information; however, with regards to the redefinable colour mode it is only capable of handling the following modes:

1) US 2/6 2/0

(redefinition of colour map entries coded with 12 bits for RGB. This is simultaneously the default for entries in the colour map whereby 4 bits are used for each of the entry for a colour component).

Only the entries 16 to 31 may be defined

2) US 2/6 2/0 2/2 2/0 3/5 4/0

(redefinition of DCLUT with 5 bits for colour map entry)

8.6.2.2 COLOUR Reset Unit

The COLOUR Reset Unit is used to reset all the colour tables (DCLUT and colour map) to their default values. The reset unit is coded as:

US 2/6 2/1

Note: In the basic terminal the colours 16 to 31 of the colour map and the DCLUT are reset.

The default values of the colour map entries 16 to 23 and 24 to 31 are the 8 colours of the 1st table (P1 full intensity).

The default values of the entries 0 to 3 of the DCLUT are the entries 0 to 3 of the colour map.

8.6.2.3 COLOUR Transfer Units

Colour transfer units are used to load colour tables. The colour table to be loaded and the loading method used are defined by the 'Define COLOUR" header unit. The colour transfer units are coded as:

US 2/6 Y <colour data>

y : indicates the first table entry to be loaded, is coded as:
3/t 3/u

t : (0,1...9) tens of address, leading zeros may be omitted
u : (0,1...9) units of address

<colour data> : bytes in the range of 4/0 to 7/15.

The meaning of the <colour data> is dependent on the preceding 'Define COLOUR' header unit and is defined in the following subsections.

8.6.2.4 Loading DCLUT

This function is identified by the last received 'Define COLOUR' header unit with <ICT> = 2/2 (DCLUT). The least significant <SUR> =5 bits are taken from each byte of the colour data and stored in consecutive locations of the DCLUT, starting at the address indicated by Y.

Data received for addresses outside the identified DCLUT will be discarded. Note: There are 4 entries in the basic terminal DCLUT.

All colour codes are in the range 4/0 to 5/15.

8.6.2.5 Loading the Colour Map Using R G B

This function will be identified by the last received 'Define COLOUR' header unit with <ICT> = 2/0 2/0 and <SCM> = 4/1, or the default header unit. The colour map is loaded starting at the address indicated by Y. The colours are defined in terms of their Red Green and Blue components, each component is defined by <SUR> = 4 bits. Each <colour data> byte contains two bits for each of the primary colours. The coding of the 6 least significant bits of the <colour data> bytes is: R G B R G B, the most significant bits defining the more significant bits of the colour components. A value of '0' of a colour component indicates zero intensity. All '1' bits indicate full intensity. Intermediate values are interpreted in equal steps of brightness. Two <colour data> bytes are required to define one colour map entry.

colour transfer:

bit sequence for one colour binary values:

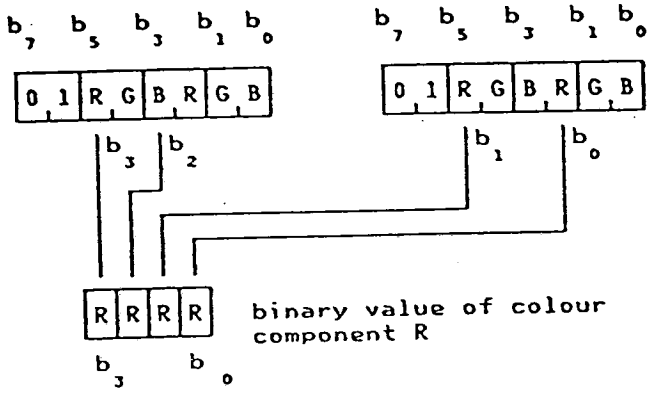


Figure 8.6-2

8.7 FORMAT DESIGNATION

8.7.1 INTRODUCTION

The default ALPHAMOSAIC display format is 24 rows of 40 characters. This format may be redefined using the 'Define FORMAT' VPDE.

8.7.2 CODING

The coding of the 'Define FORMAT' VPDE is as follows

US 2/13 <Y> <WC>

<Y> If Y is from column 2 then the VPDE is being used to define the DOMAIN of a geometric display (for further study, not implemented in the basic terminal).

If Y is 4/1 to 4/14 one of the following formats is defined

4/1 : 40 columns by 24 rows (default)
4/2 : 40 columns by 20 rows

<WC> <WC> is used to define the wraparound controls.

<WC> = 7/0 wraparound (default)
<WC> = 7/1 no wraparound

In case of conflict between DRC-format (e.g. 12 x 12) and number of rows (e.g. 24 rows) unpredictable results may occur

8.7.3 DEFAULTS

The default "Define FORMAT' VPDE is:

US 2/13

The default and fallback are 24 rows by 40 columns and automatic wraparound is effected.

The basic terminal is capable of recognising different formats which are described by any 4/y code but it is only capable of generating the two formats which are described by the codes 4/1 and 4/2.

In the basic terminal the format of rows is specified as follows:

For the display of 24 rows/screen ten tv-lines are used.
for the display of 20 rows/screen twelve tv-lines are used.

If a format exchange is applied within a page unpredictable results may occur.

Default VPDE (in case of the basic terminal the sequence US 2/13 4/1 7/0) must not be transmitted in its full lenght.

In case of the basic terminal the only valid VPDE-sequences are:

US 2/13

US 2/13 7/1

US 2/13 4/2

US 2/13 4/2 7/1

8.8 PRESENTATION RESET FUNCTIONS

8.8.1 INTRODUCTION

The presentation reset functions are used to set predefined states in the terminal and thereby synchronize the videotex service and the terminal at the presentation layer.

8.8.2 CODING STRUCTURE

The coding structure for the reset function is as follows:

US 2/15 <operation> <parameter>

<operation>: This character indicates the display mode being reset, and the operation required. This character is coded from columns 2 to 4 of the code table.

<parameter>: This character is coded from columns 4 to 7 of the code table. Its meaning depends upon the reset operation.

8.8.3 FUNCTIONAL DESCRIPTION AND CODING

8.8.4 ALPHAMOSAIC DISPLAYS

All reset operations for alphamosaic displays are coded from column 4 of the code table and designate that the data following the reset function are to be interpreted as alphamosaic data.

8.8.4.1 Operation: Reset to Defaults

The action of this function is as follows:

The default graphic sets as described in Part 1, Section 8.4.6.4 are designated.

The G0 set is invoked into columns 2 to 7 of the code table and the G2 set is invoked into columns 10 to 15 of the code.

The format is set to the default (24 rows x 40 characters wrap active)

The active position is set to the first character position of the first row.
The defined display area is filled with spaces.

All attributes are set to their default values as described in Section 8.4.6.2

and a) the serial C1 set is invoked

US 2/15 4/1

or b) the parallel C1 set is invoked

US 2/15 4/2

8.8.4.2 Operation: Reset to limited Defaults

The action of this function is as follows:

The default graphic sets as described in Section 8.4.6.4 are designated.

The G0 set is invoked into columns 2 to 7 of the code table and the G2 set is invoked into columns 10 to 15 of the code table.

Format, active position, and attributes are not affected

and a) the serial C1 set is invoked

US 2/15 4/3

or b) the parallel C1 set is invoked

US 2/15 4/4

8.8.4.3 Operation: Service Break to ROW X

This function affects the terminal from the time it is received until a further US sequence is received. The action of this function is as follows:

Previous display states, including character sets, colours, attribute controls and the active position will be stored in the terminal but are no longer active, for the duration of this operation.

The downloading processes to the terminal will be terminated.

The primary set of graphic characters is in columns 2 to 7 of the code table and the supplementary set of graphic characters is in columns 7 to 15 of the code table. Other character sets are not affected.

The format is not affected but wraparound is inactive.

The active position is set to the first character position of the designated row.

Only the following controls of the primary control function set are valid:
APB, APF, APR, CAN, US.

The serial C1 set is invoked and the following controls are invalid:
9/0 to 9/7, 9/11, 9/14, 9/15.

The protected area attribute is inactive, all other attributes remain unchanged.

Colour look-up table No. 1 is active

US 2/15 4/0 <RN>

<RN>:The designated row is coded from colomns 4 to 7 of the code table. The row number is indicated by the binary value of the 6 least significant bits.

8.8.4.4 Operation: Reset to the previous State

The action of this function is to return the terminal to the previous state after a "service break to row X" operation.

US 2/15 4/15

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
00			SP	0	@	P	`	p	ABK		SP	°		—	Ω	K
01			!	1	A	Q	a	q	ANR		¡	±	`	¹	Æ	æ
02			"	2	B	R	b	r	ANG		¢	²	´	®	Đ	đ
03			#	3	C	S	c	s	ANY		£	³	^	©	ª	ð
04			¤	4	D	T	d	t	ANB		$	x	~	tm	Ħ	ħ
05			%	5	E	U	e	u	ANM		¥	µ	¯	♩		ı
06			&	6	F	V	f	v	ANC		#	¶	˘		Ĳ	ij
07			'	7	G	W	g	w	ANW		§	·	˙		Ŀ	ŀ
08	APB	CAN	(	8	H	X	h	x	FSH	CDY	¤	÷	¨		Ł	ł
09	APF		)	9	I	Y	i	y	STD	SPL	‘	’	••[1]		Ø	ø
10			*	:	J	Z	j	z	EBX	STL	“	”	º		Œ	œ
11			+	;	K	[	k	{	SBX		«	»	ъ		º	ß
12			,	<	L	\	l	|	NSZ	BBD	←	¼		⅛	Þ	þ
13	APR		−	=	M	]	m	}	DBH	NBD	↑	½	″	⅜	Ŧ	ŧ
14			.	>	N	^	n	¯	DBW		→	¾	ļ	⅝	Ŋ	ŋ
15		US	/	?	O	_	o	DEL	DBS		↓	¿	ˇ	⅞	ʼn	DEL

1) Only for reception, presentation in fall back as 4/8

Table 8.8-1: Valid codes for the Reset Function "Service Skip to row <PAR>"

9.0 REFERENCE TERMINAL WITH STACK ARCHITECTURE

9.1 DESCRIPTION OF ARCHITECTURE

Memory structure

The Btx service is based on a reference terminal which uses a stack memory structure.

This structure makes optimum use of the capacity of the display memory (2 K x 8 bits).

The display memory consists of two parts: a character memory (1 K x 8 bits) in which each address is allocated to a position in the defined display area, and a second memory which is allocated to the first when needed, i.e. the memory addresses are dynamically allocated to character positions in the character memory.

Each position of the character memory consists of 7 bits for the character identification and 1 bit as a pointer to the second memory. The pointer indicates whether supplementary information, e.g. attribute modifications or a character group change, is stored at this character position in the defined display area.

This additional information is held in the second memory, the memory for attributes and character groups (1 K x 8 bits), whereby a 7-bit code is used per attribute modification or per character group identification and 1 bit is used as a pointer. This pointer determines whether additional information is available or not. With the pointer,, several attributes for a character position on the screen may be allocated, this means various attributes can be allocated to one or more characters. However, the reference terminal can only store up to 40 codes per row for attribute modifications or character group changes. Figures 9.1-1 and -2 show the relationship between characters and attribute changes.

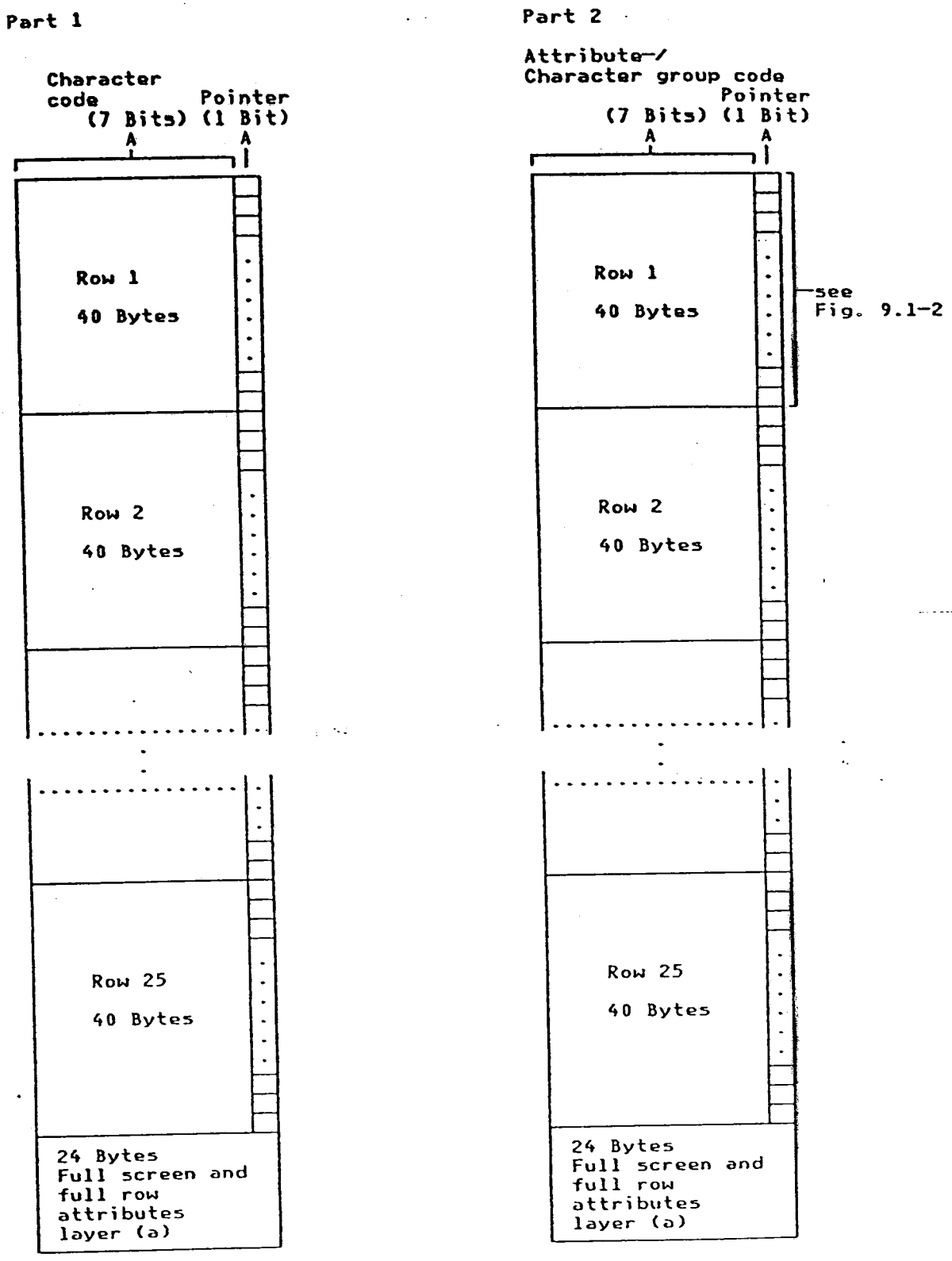


Figure 9.1-1 Structure of the display memory within the reference terminal

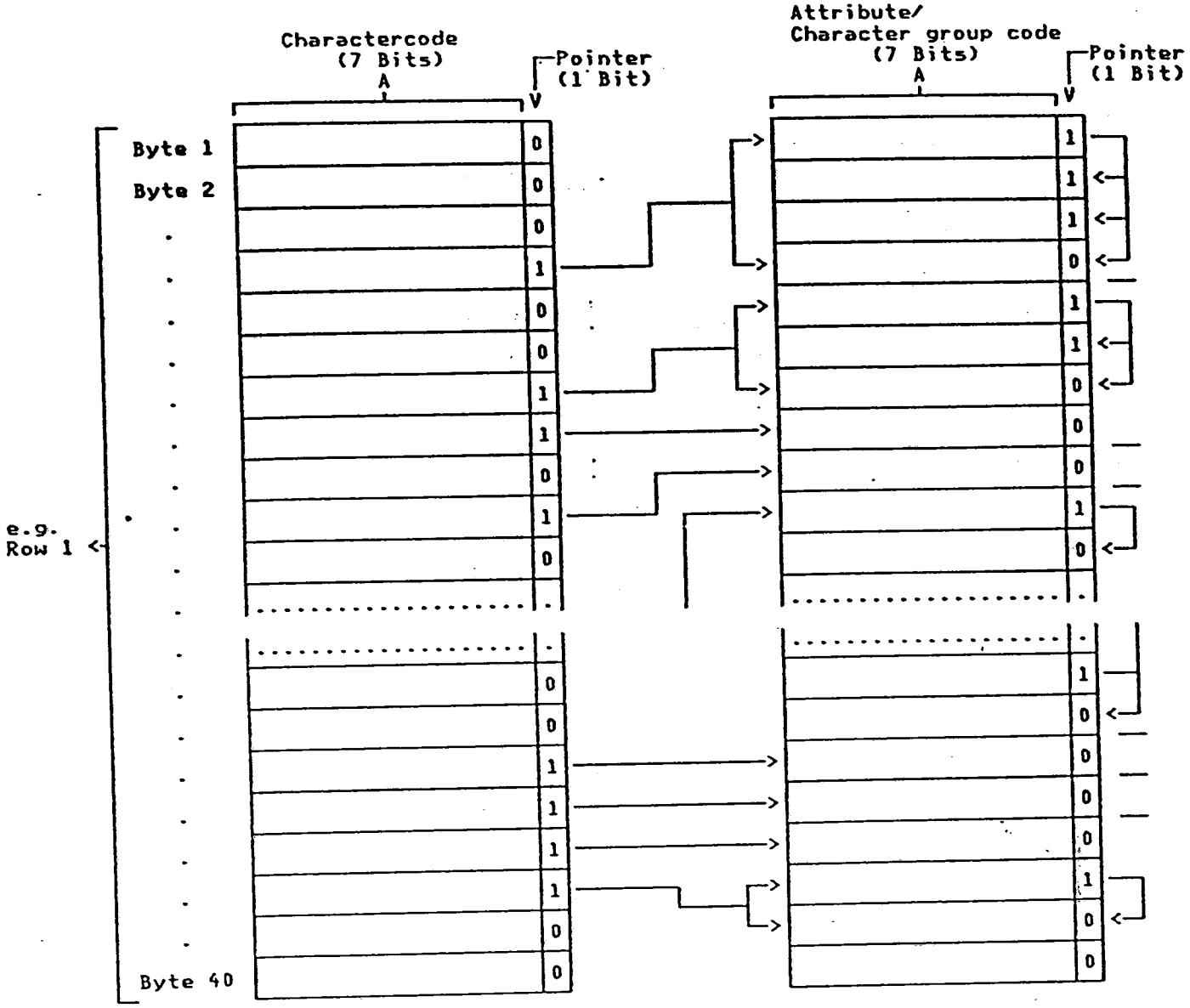


Figure 9.1-2 Dynamic allocation of memory positions

9.2 STACK CODING

Because of the byte structure (7 bits + 1 pointer bit), the character repertory is split up into groups of 128 character codes each. 128 codes are available for attribute modifications and character group changes. Of these,

16	are required for	character group changes and the Lock-bit
32	" "	foreground colours
32	" "	background colours
19	" "	flash (incl. 'steady')
4	" "	size
2	" "	underline
2	" "	invert, on/off
2	" "	conceal, on/off
2	" "	window, on/off
2	" "	marked area
2	" "	protected area
115		11 stack bytes

The grouping of the stack bytes is given in the table below. The following groups have been defined:

- 1 character group byte
- 10 attribute bytes

Coding within the stack bytes is optional.

B7	B6	B5	B4	B3	B2	B1	B0	used for
P	1	1	0	L	T2	T1	T0	Character Group Changes L = Lock-bit, T(x) = Character Groups
P	0	0	F4	F3	F2	F1	F0	Foreground colours
P	0	1	B4	B3	B2	B1	B0	Background colours
P	1	0	X	A3	A2	A1	A0	Flash status x = reserved
P	1	1	1	0	0	W	H	Character sizes
P	1	1	1	0	1	0	U	Underline
P	1	1	1	0	1	1	I	Invert
P	1	1	1	1	0	0	C	Conceal
P	1	1	1	1	0	1	W	Window
P	1	1	1	1	1	0	M	Marked area
P	1	1	1	1	1	1	P	Protected area

P = Pointer-Bit

Table 9.2-1

Grouping of functions is shown here by a coding example

9.3 CHARACTER GROUPS IN THE STACK

A maximum of 8 character groups with 128 characters each can be coded in the character group byte.

The 335 ISO-characters and some lined graphics are contained in 3 character groups, whereby the allocation to the various groups is based on the frequency of use (rather than on the code tables)

Character group 1: Latin-based letters, decimal digits and punctuation marks (see table, Annex 3)

Character group 2: accented letters (see table, Annex 3)

Character group 3: special characters and symbols according to ISO; lined graphics and free character positions (see table, Annex 3)

Character group 4: comprises (see table, Annex 3):

- 63 block mosaic characters
- 56 smooth mosaic characters
- 1 speckled character
- free character positions

Character group 5: the DRCS with 94 characters (max.) is allocated to this group.

Consequently, 3 unused character groups with 128 characters each are available for future extensions with non-Latin based alphabets or with DRCS's.

For the grouping of the character sets, see Annex 3.

The following rules apply to the character groups:

1. The default at the beginning of a row is character group 1.
2. Character group changes occupy one stack byte, invoked character groups can be locked (for the algorithm for Lock-bit application, see Section 9.6.1).
3. The character 'space' is available in all character groups. The combination of "underline" with a space is indifferent.
4. DEL (7/15) is only available in character group 3.

9.4 STACK OVERFLOW

If all 40 stack bytes are occupied, no further markers are set. 1)

Attributes are ignored, characters are represented as character group 1 characters unless another character group has been locked (see Section 9.6.1).

On-line editor of the Btx Exchange:

The stack entries are checked blockwise during editing of the frame while translated into the frame contents code before the page is stored in the data-base.

If there are more than 40 stack entries, a message as well as the information edited up to that point are transmitted to the editor. The editor can then still change the frame.

1) The frame containing more than 40 attribute or character group changes in a row may lead to unpredictable results.

9.5 STACK ATTRIBUTES AND ASSOCIATED MARKER RULES

9.5.1 SINGLE-STATE ATTRIBUTES

- Underline (2 states: start/stop)
- Invert (2 states: invert/normal)
- Window (2 states: start/stop)
- Marked area (2 states: start/stop)
- Conceal (2 states: start/stop)
- Protected area (2 states: start/stop, only as full row attribute)

The setting of a state causes a marker to be set and a stack byte to be occupied according to the rules described in Chapter 8.

9.5.2 MULTI-STATE ATTRIBUTES

- Foreground colour (1 state out of 32)
- Background colour (1 state out of 32)
- Size (1 state out of 4)
- Flash (1 state out of 19)

9.5.2.1 Foreground Colours / Background Colours

The setting of a state causes a marker to be set and a stack byte to be occupied according to the rules described in Chapter 8.

9.5.2.2 Size (States: NSZ, DBH, DBW, DBS)

The setting of a state causes a marker to be set and a stack byte to be occupied according to the rules described in Chapter 8.

9.5.2.3 Flash

- States:
  - Steady
  - Conditions:
    1. - Normal flash
    2. - Inverted flash
    3. - Colour table flash
- Rates:
  - Rates explicit:
    1. - 50 % ON
    2. - 33 % ON, 1st phase
    3. - 33 % ON, 2nd phase
    4. - 33 % ON, 3rd phase
  - Rates implicit:
    1. Increment changes the direction of the phase to the right after each character.
    2. Decrement changes the direction of the phase to the left after each character.

Each state can be combined with a rate so that 18 active states are available. Each combination causes a marker to be set, which has the following effect on the entries in the stack:

- Each of the combinations given in the table below causes a byte in the stack to be occupied.

Implicit rates cause the occupation of one stack byte for the state and of one stack byte for the implicit rate.

Further information about the effect of various flash attribute sequences on the flash status/markers is shown in Annex 1 1.8 .

9.5.3 FULL ROW ATTRIBUTES

The setting of a state causes a marker to be set, a stack byte to be occupied at the first character position as well as all markers associated with this attribute to be deleted in the row.

- Background colour (1 state out of 32)

  The setting of a state does not cause any markers to be set, does not lead to entries into the stack and therefore does not cause the markers of a background attribute to be deleted.

9.5.4 DEFAULT VALUES

Transmitted default values cause a marker to be set and a stack byte to be occupied. Default values which have not been transmitted do not cause the occupation of a stack byte.

9.6 DESCRIPTION OF LOCK-BIT APPLICATION

The Lock-bit serves to reduce the number of stack bytes needed for character group changes. The following rules apply:

- Following Clear Screen, the default condition is defined by spaces from character group 1. This default condition acts as if a Lock-bit for character group 1 were positioned at the beginning of each row. However, the stack does not hold a corresponding Lock-bit.
- If a character position is overwritten by a character from the same character group, only the character code is changed. The stack remains unchanged.
- A character group change with a set Lock-bit applies up to the next but different character group change with a set Lock-bit.
- Assuming that character position X has to be overwritten the character position X-1, X-2 and X+1 must always be checked for a character group change. For the checked part of a row, the required number of bytes in the stack is to be minimized by means of the Lock-bit (Fig. 9.6-1). If a Lock-bit is set within the checked part of the row, the character group change (e.g. to group 2) is interleaved with a more extensive part of the row comprising a different character group change (e.g. to group 1). (See rules in Section 9.6.1)

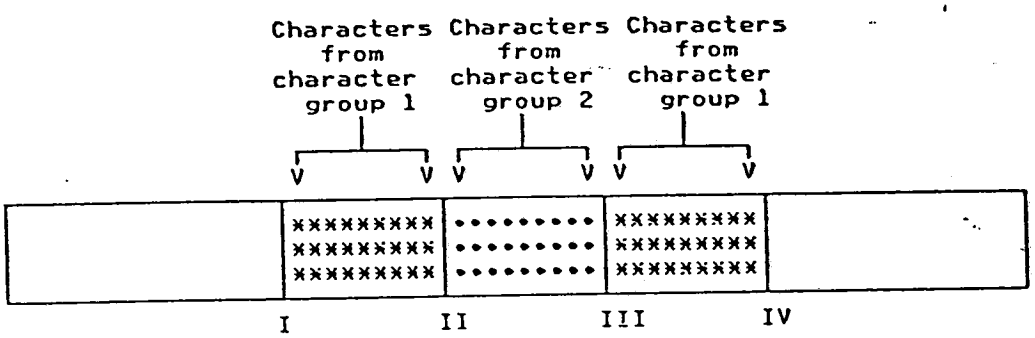


Figure 9.6

In consequence, the character group change set with a Lock-bit and applying to the adjacent part I ... II of the row must also be generated for part III ... IV of the row, i.e. a character group change with a Lock-bit is also set at the beginning of part III ... IV of the row.

In part II ... III all single character changes of the corresponding Lock-bit character group are unnecessary and are no longer stored with a Lock-bit in stack bytes.

9.6.1 RULES FOR LOCK-BIT HANDLING

1. General Rules

The last set LOCKED TABLE is always known.

The state of :

a. the previous 2 character positions

b. the present position

c. the next position

is always known.

1. Decision matrix.

```
Present position-2 .........A
Present position-1 .........B
Present position ...........C
Present position+1 .........D

Last Locked table .........LL
Table .....................T
New Character code ........CHAR
Table of CHAR .............X
Single Table ..............ST
```

****

a. IF:

CHAR = SPACE (Codes 2/0 or 10/0)

THEN ENTER CHAR WITH NO TABLE

In each table there is a space at the same code position.

****

b. IF:

X = LL & LL NOT SET AT C & NO T SET AT C

THEN ENTER CHAR ONLY.

****

c. IF:

X = LL & LL SET AT C

THEN ENTER CHAR ONLY.

****

d. IF:

X = LL & LL NOT SET AT C & LT SET AT C

ENTER CHAR ONLY, THEN MOVE LT TO NEXT FREE POSITION ON RIGHT OF C OR UNTIL ANOTHER LT IS ENCOUNTERED IN WHICH CASE DISCARD LT. DURING THIS SEARCH REMOVE ALL ST THAT ARE = X.

****

e. IF:

X = LL & ST SET AT C

THEN REMOVE ST AND ENTER CHAR ONLY.

****

f. IF:

X = LL & LL NOT SET AT C & ST SET AT C

THEN ENTER CHAR AND REMOVE ST

****

g. IF:

X = ST SET AT C & X < > LL

THEN ENTER CHAR AND RETAIN ST

****

h. IF:

X < > LL & < > ST SET AT A OR B OR C OR D

THEN ENTER CHAR WITH ST

****

i. IF:

X < > LL & = ST SET AT D

THEN ENTER CHAR WITH LT, REMOVE ST AT D AND REINSTATE
LL TO NEXT FREE POSITION ON RIGHT OF D OR UNTIL
ANOTHER LT IS ENCOUNTERED IN WHICH CASE DISCARD LL
DURING THIS SEARCH REMOVE ALL ST THAT ARE = X

****

j. IF:

X < > LL & < > ST SET AT D & = ST SET AT B

THEN ENTER CHAR WITH NO T, CHANGE ST AT B TO LT AND
REINSTATE LL IN NEXT FREE POSITION ON RIGHT OF D OR UNTIL
ANOTHER LT IS ENCOUNTERED IN WHICH CASE DISCARD LL
DURING THIS SEARCH REMOVE ALL ST THAT ARE = X

****

k. IF:

X < > LL & < > ST SET AT B & = ST SET AT A

THEN ENTER CHAR WITH NO T, CHANGE ST AT A TO LT AND
REINSTATE LL IN NEXT FREE POSITION ON RIGHT OF D OR UNTIL
ANOTHER LT IS ENCOUNTERED IN WHICH CASE DISCARD LL.
DURING THIS SEARCH REMOVE ALL ST THAT ARE = X

****

3. Examples for the Lock-bit Handling are given in Annex I, Chapter 2.3.

9.7 L-SET (SERIAL MOSAIC CHARACTER SET)

The L-set characters are contained in character groups 1 and 3 (columns 4 and 5 of the L-set) as well as in group 4 (columns 2/3 and 6/7 of the L-set).

The character 7/15 of the L-set corresponds to character 5/15 of the second supplementary set of mosaic characters.

The L-set is switched off when the cursor leaves a row.

10.0 APPLICATION PROTOCOL (LAYER 7)

10.1 USER FUNCTIONS

10.1.1 COMMON CONTROL FUNCTION

**
(*n**) n = character combination

Cancellation of input information. The second or third * cancels all characters entered so far in row 20/24; the page displayed up to this point remains intact.

10.1.2 SERVICE FUNCTIONS

*0# Return to page of contents, also in the case of connection to an external computer.

*8# Direct invocation of the message service.

*9# Direct invocation of the good-bye page.

If connected to an external computer: disconnection from the external computer and display of the external computer's good-bye page with choices.

*90# Withdrawal from the Btx service with billing information. Direct access to a reference page if new messages are waiting.

*92# Direct access to billing information without leaving the service.

If *0# is entered in a gateway page to an external computer, the connection between the external computer and the Btx Exchange is cleared.

10.1.3 RETRIEVAL FUNCTIONS

*n# (n = page number)

Direct access to a page (not a frame) by means of the page number.

0-9, #

0, 10 to 99, #

Selection from a selection page. Using the numbers 0-9, one of the choices offered on this page may be selected. The input of # normally causes the next frame or next page to be displayed. On the last frame of a page, the function # can be used for selection purposes. In the scrolling mode, the function # is entered to display the next row(s). If a character which is not valid for selection purposes is entered, a corresponding notification appears in row 20/24 and the selection page remains on the screen.

The selection facility may also be composed of 2 digits. In this case the entry of 0, 10 to 99 and # are permitted.

If # or numerical characters are entered, the entries are displayed in row 20/24.

Correction in the case of 2-digit entries:

If the first character entered by the user is incorrect, he can cancel the entry by means of ** and then enter the correct characters.

* If * is entered, it is displayed in row 20/24. One of the special functions described below may then be entered. If a second * is entered, the previous entry is cancelled and the selection page remains on the screen.

*00# Repetition of the complete contents of the page or of the frame just displayed (e.g. in case of stimulated display because of a transmission error). This redisplay is free of charge.

*09# Display of the updated version of the frame or page displayed on the screen (may be liable to a charge).

*# Repetition of the frames or pages previously displayed. It is possible to return to until frame number a within a page as well as up to the three pages previously displayed. If in the scrolling mode, preceding rows are displayed.

Envisaged for implementation at a later date:

*031# - *035#

Marking of the displayed page (frame for direct access to the same page/frame at a later stage within the same session (max. 5)).

- These functions also apply to pages/frames in external computers.
- Overwriting of the markers is possible.

*041# - *045#

Reinvocation of marked pages/frames. The final digits of the marking and the reinvocation function are identical.

- Chargeable pages are redisplayed free of charge
- Marked pages are redisplayed uncharged
- Pages from external computers and Btx Exchanges are treated in the same manner.

10.1.4 ADDITIONAL SERVICE FUNCTIONS

These functions apply to all applications:

*7# Direct access to the user page.

*1# "Application assistance". Direct access to a page giving the user appropriate assistance during the application or providing information on the utilization of the service.

10.1.5 DATA COLLECTION FUNCTIONS

** Moves the cursor backwards (for corrections). The first * initially appears in row 20/24. The following possibilities apply to the entry of the second *:

If the cursor is located within a data field but not at its first character position, it is moved one character position to the left. The initial position of the cursor is not overwritten by a space and the contents remain unchanged.

If the cursor is located at the first character position of a data field, it is moved to the first character position of the preceding data field. The cursor's previous position remains unchanged.

If the cursor is located within/at the first character position of the first data field of a page, no action takes place.

If the cursor is located at the first character position of row 20/24, the cursor is moved backwards to the first character position of the preceding data field.
However, in all previous cases the * in row 20/24 is deleted.

With #, the entry into a field can be terminated before the field is full. The cursor then moves to the first character position of the next data field. The current position of the cursor as well as all subsequent positions are overwritten by spaces (2/0). # at the first position of a data field does not cancel any entries.

If the cursor is located in the last data field data collection is terminated and the cursor moves to the first position in row 20/24.

User action following termination of data collection:

Following the entry of all necessary data for the displayed page, or after the input of *029# or DCT, the user has to decide whether or not he wishes to transmit the input data.

- 2 The input data are not transmitted.
- 19 The input data are transmitted.

When 2 or 19 has been entered, a corresponding acknowledgment appears in row 20/24 together with a request to enter #. Following the display of the acknowledgment on the screen, *-functions may be entered. If # is entered, the Btx service checks whether a follow-up page is available. If so, it is displayed irrespective of whether or not the data were transmitted. If no follow-up page exists, the page associated with digit 1 or 2 is displayed depending on whether or not the page was transmitted. If no follow-up page is associated with either digit 1 or digit 2, page 0 is displayed.

The *02x# functions provide the following:

*021# or APH

The cursor is moved to the first character position of the current data field. If the cursor is already at this position, it is moved to the first character position of the preceding data field. If the cursor is at the first character position of the first data field, no action takes place. If the cursor is already in row 20/24, it is moved to the first character position of the last data field. Any entries in row 20/24 are cancelled. This is the only *02x# function permitted in row 20/24.

*022# or APU

The cursor is moved to the equivalent character position on the preceding row. If the cursor is at the border of a data field, no action takes place.

*024# or APB

The cursor is moved one character position to the left. If the cursor is at the first position of the data field, it is moved to the last position of the preceding data field. If it is at the first position of the first data field, no action takes place.

*026# or APF

The cursor is moved one character position to the right. If the cursor is at the last position of the data field it is moved to the first position of the next data field. If it is at the last character position of the last data field, no action takes place.

*027# or APR

- In a field with subsequent rows: the cursor moves to the first position of the next row.
- In the last (or only) row of a field: the cursor moves to the first position of the next field.
- In the last row or only row of a page: the same action as in the case of DCT takes place.

*028# or APD

The cursor is moved to the equivalent position on the following row. If the cursor is located in the last row of a data field no action takes place.

*029# or DCT

Termination of data collection. The cursor is moved to the first position of row 20/24.

All *02x# functions contain specific layer 6 functions which correspond to the CEPT Standard and which are performed by the terminal. Functions which cause an action at the borders of a field, in particular function *027#, cause the Btx Exchange to transmit a direct cursor address APA X/Y to the terminal.

Control character sequences may be defined for alphanumeric keyboards, which initiate the same functions as described above for the character combination.

10.1.6 LOCAL USER FUNCTIONS

Local user functions can be divided into two groups:

1. User functions which replace character sequences defined in the presentation or the application layer.

   They may be defined especially for alphanumeric keyboards and generate the codes specified in the presentation or the application layer for interworking with the Btx Exchange.

2. User functions which effect local activities only and do not initiate transmission to the Btx Exchange.

Whereas the first group does not require the definition of standards, the following two functions in the second group are mandatory.

10.1.6.1 Function "Temporarily Inactive Attributes"

This function causes all attributes used with the defined display area to be inactive for the duration of the function (key or switch function) and all presentation characters to be displayed with their default attributes.

This function does not affect the display memory (characters, attributes, markers) but only modifies the representation on the screen, i.e. it is a display circuitry function only.

10.1.6.2 Function "Reveal"

This function causes the attribute "conceal" function used within the defined display area to be inactive for the duration of the function (key or switch function).

This function does not affect the display memory (characters, attributes, markers), but only modifies the representation on the screen, i.e. it is a display circuitry function only.

11.0 TECHNICAL REQUIREMENTS FOR THE CERTIFICATION/HOMOLOGATION OF BTX TERMINALS

The application for certification/homologation must be submitted to the Zentralamt fuer Zulassung im Fernmeldewesen ZZF (Central Approval Office for Telecommunications) in D-6600 Saarbruecken.

11.1 TERMINALS CAPABLE OF BEING EMPLOYED AS USER TERMINALS

Minimum requirements in accordance with Chapter 2.5 .

Compliance with the minimum requirements is generally demonstrated by the representation of test scenarios on a colour monitor.

In the case of displays with limited representation capabilities (e.g. monochrome displays), the relevant features must be suitably adapted. The mode of representation is left to the manufacturer. A measuring and acceptance point (SCART plugs are recommended) must be provided outside the terminal for testing the correct processing of the presentation facilities by connecting an RGB monitor.

Proof of compliance with the minimum requirements must be provided in units directly attached to the modem; this is not required for equipment connected beyond these units (e.g. in data processing systems), which do not have a self-supporting access to the network.

11.2 TERMINALS EXCLUSIVELY OPERATING IN BULK TRANSFER MODE

For terminals exclusively operating in bulk transfer mode or for the editing part of a terminal the following regulations are valid:

For editing a subset of the presentation facilities defined by the minimum requirements (see Chapter 2.5) may be implemented.

The functions of the subset must be processed in the correct manner according to the corresponding description in this document, the functions comprised are to be listed for certification/homologation.

The reference terminal with stack-byte-count must be implemented (see Chapter 9).

Information necessary for the processing of the log-on procedure and the editing dialogue must be processed in the correct manner (see references in Chapter 12, item VII).

The correct processing of the log-on procedure and the editing dialogue as well as the correct coding of presentation facilities will be checked for certification/homologation.

11.3 STANDARDIZED OR RECOMMENDED OPTIONS

Facilities which are not a subset of the minimum requirements but listed as standardized or recommended options in Chapter 2.7 (e.g. geometric display) must be processed in the correct manner according to CEPT T/CD 6-1 or the relevant annexes to this document. These facilities must listed for certification/homologation.

For user terminals proof of compliance is given by the correct presentation and processing of test scenarios and for editing terminals by correct coding of the facilities (line interface).

11.4 OTHER OPTIONS

Functions of terminals which are neither covered by CEPT T/CD 6-1 nor by this document (e.g. computer processing performance) are not a relevant subject for certification/homologation and need not be listed.

11.5 RADIO INTERFERENCE CONDITIONS

Interim solution for the elimination of interference

For the elimination of interference, the technical specifications for domestic audio and television receivers according to the Official Gazette of the Federal Minister of Posts and Telecommunications (Nos. 68/1979 and 69/1981) for the Vt/Bt mode of operation of Btx Terminals (in this case applicable to television and data processing monitors) apply.

The test page for videotex is used for the measurement of the interference.

Final regulations for the certification/homologation of Btx Terminals concerning interference will be established at a later date with respect to the new Btx standard.

11.6 RELEVANT INFORMATION ABOUT TERMINAL IMPLEMENTATION AS REQUIRED FOR CERTIFICATION/HOMOLOGATION

The following information concerning details of the Btx Terminal implementation are to be provided for certification/homologation:

Prerequisite:

Display circuitry: hardware

Code Interpreting components: hardware or software

- Hardware
  - Type and/or manufacturer identification or name
  - Separately built modules
  - All in above modules contained components as far as they are relevant according to this document (e.g. microprocessor or storage)
  - Lists of configurations if multiple
- Software
  - Software release
  - Release of operating system software
- Standardized or recommended options

The ZZF must be informed about all changes. The ZZF decides whether a renewed certification/homologation is necessary. The manufacturer has to clarify how the different versions (e.g. software release) are identified (e.g. identification of floppy disk with software for the code interpreting components of a Btx Terminal by name, manufacturer, configuration, date and release No.)

12.0 REFERENCES

I. CEPT

CD/SE T/CD 6-1
'Videotex Presentation Layer Protocol'

II. CCITT

Recommendation S.100
'International Information Exchange for Interactive Videotex'

Recommendation F.300
'Videotex Service'

Recommendation V.3
'International Alphabet No. 5'

Recommendation V.22
'1200 bits per second duplex modem standardized for use on the general switched telephone network and on leased circuits'

Recommendation V.23
'600/1200-baud modem standardized for use in the general switched telephone network'

Recommendation V.24
'List of definitions for interchange circuits between data terminal equipment and data circuit-terminating equipment'

Recommendation V.28
'Electrical characteristics for unbalanced double-current interchange circuits'

III. ISO

ISO 646
'7-bit coded character set for information processing interchange'

ISO 2022
'Code extension techniques for use with the ISO 7-bit coded character set'

ISO 2110
'DTE/DCE interface connection'

ISO 6937
'Coded character sets for text communication'

ISO 6429
'Additional control functions for character imaging devices'

ISO 7480
'Information processing' 'Start-stop signal quality at the DTE/DCE interface'

ISO 7498
'Data Processing - Open System Interconnection - Basic Reference Model'

IV. DIN

DIN 002137 Part 1
'Texttastaturen'

DIN 002137 Part 2
'Datentastaturen'

DIN 002137 Part 5
'Mehrzwecktastaturen'

DIN 002145
'Funktionstasten in Tastaturen; Grundsaetze fuer die Anordnung und Zuordnung'

DIN 045511 Part 1 - 4
'Magnetgeraete'

DIN EN 50049/40060
'Kennwerte fuer Kleinsignalverbindungen zwischen elektronischen Geraeten fuer den Heimbereich und aehnliche Anwendungen: Peritelevisionsverbindung'

DIN 066020 Part 1 (V.24/28)
'Anforderung an die Schnittstelle bei Uebergabe bipolarer Datensignale'

DIN 066021 Part 2 (V.23)
'Schnittstelle zwischen DEE und DUE bis 1200 Bit/s oder 600 Bit/s an Fernsprechleitungen'

V. VDE

VDE 0871
'Funkentstoerung von Hochfrequenzgeraeten'

VDE 0875
'Funkentstoerung von elektrischen Betriebsmitteln und Anlagen in Fernsprechnetzen'

VDE 0878
'Funkentstoerung von Anlagen und Geraeten der Fernmeldetechnik' (regulation in preperation)

VI. Deutsche Bundespost

Amtsblatt 68/1979
69/1981

Teletex Endgeraete Rahmenwerte, FTZ T 12

VII. Official publications of the Deutsche Bundespost currently in preparation

- "Service Handbuch fuer Btx"
- "Seitenueberarbeitung mit Benutzerfuehrung"
- "Beschreibung der Eingabe von Anforderungen zur Seitenueberarbeitung mit Benutzerfuehrung"
- "Protokollhandbuch fuer den Anschluss externer Rechner an Datex P"
- "Sicherheitsregeln fuer Bildschirm-Arbeitsplaetze im Buerobereich"

ANNEXES

The annexes provide complementary information and explanations.
Chapters 1 - 12 have priority over the annexes.

Annexes

Annex 1 Clarifications and examples to facilities of the presentation layer (basic requirements according to chapter 8, 9)

1. Clarifications

1.1 Truth table for action of attributes on layers

1.2 Truth table for the effect of colour table flash

1.3 Truth tables for combinations of Size attributes and scrolling/protected area.

1.4 Clarification of code extension techniques

1.5 Collection of questions to the presentation layer and the corresponding answers.

1.6 Error condition handling (not part of the minimum requirements but recommended for the basic terminal)

1.7 List of corrections to edition No 1 from February 1983.

1.8 Attribute controls and stack status for flash attributes.

2. Examples

2.1 Examples for memory entry and display representation

2.2 Examples of time dependencies in the unified alpha-mosaic model.

2.3 Examples for the action of the Lock-bit in the reference terminal

Annex 2 Abbreviations

Annex 3 Character tables with Allocation of characters to G Sets and Stack-Groups

Annex 4 Identification System

Annex 5 Recommended symbols for function keys on the keyboard

Annex 6 Summary of Codes and Code sequences employed by the basic terminal

Annex 7 Standardized and recommended options for the presentation layer

Annex 8 Special editor functions.

Annex 9 Bulk updating procedure

Annex 1

1 Clarifications and examples to facilities of the presentation layer (see chapter 8, 9)

1. Clarifications

1.1. Truth table for action of attributes on layers

COMBINATION	FUNCTION							
	COL DRC	INV.	CONC	ACT FLA	TR. FOR	TR. BAK	NORMAL ***** A I D *****	WINDOW ***** A I D *****
0	0	0	0	0	0	0	F B 0	F B 0
1	0	0	0	0	0	1	F S 0	F T 0
2	0	0	0	0	1	0	S B 0	T B 0
3	0	0	0	0	1	1	S S 0	T T 0
4	0	0	0	1	0	0	B B 0	B B 0
5	0	0	0	1	0	1	S S 0	T T 0
6	0	0	0	1	1	0	B B 0	B B 0
7	0	0	0	1	1	1	S S 0	T T 0
8	0	0	1	0	0	0	B B 0	B B 0
9	0	0	1	0	0	1	S S 0	T T 0
10	0	0	1	0	1	0	B B 0	B B 0
11	0	0	1	0	1	1	S S 0	T T 0
12	0	0	1	1	0	0	B B 0	B B 0
13	0	0	1	1	0	1	S S 0	T T 0
14	0	0	1	1	1	0	B B 0	B B 0
15	0	0	1	1	1	1	S S 0	T T 0
16	0	1	0	0	0	0	B F 0	B F 0
17	0	1	0	0	0	1	S F 0	T F 0
18	0	1	0	0	1	0	B S 0	B T 0
19	0	1	0	0	1	1	S S 0	T T 0
20	0	1	0	1	0	0	F F 0	F F 0

Legend:

F = Foreground
B = Background
S = Screen colour
T = Transparent (e.g. videopicture)
X = don't care
0 = not set
1 = set

Note:

A - active colour assignment

This is the area of a character position covered by the character shape

I - inactive colour assignment

This is the area of a character position not covered by the character shape

D - colour ORCS selection (active dot position)

COMBINATION	FUNCTION							
	COL DRC	INV.	CONC	ACT FLA	TR. FOR	TR. BAK	NORMAL ***** A I D *****	WINDOW ***** A I D *****
21	0	1	0	1	0	1	F F 0	F F 0
22	0	1	0	1	1	0	S S 0	T T 0
23	0	1	0	1	1	1	S S 0	T T 0
24	0	1	1	0	0	0	F F 0	F F 0
25	0	1	1	0	0	1	F F 0	F F 0
26	0	1	1	0	1	0	S S 0	T T 0
27	0	1	1	0	1	1	S S 0	T T 0
28	0	1	1	1	0	0	F F 0	F F 0
29	0	1	1	1	0	1	F F 0	F F 0
30	0	1	1	1	1	0	S S 0	T T 0
31	0	1	1	1	1	1	S S 0	T T 0
32	1	0	0	0	0	0	X S 1	X T 1
33	1	0	0	0	0	1	X S 1	X T 1
34	1	0	0	0	1	0	X S 1	X T 1
35	1	0	0	0	1	1	X S 1	X T 1
36	1	0	0	1	0	0	B B 0	B B 0
37	1	0	0	1	0	1	S S 0	T T 0
38	1	0	0	1	1	0	B B 0	B B 0
39	1	0	0	1	1	1	S S 0	T T 0
40	1	0	1	0	0	0	B B 0	B B 0

Legend:

F = Foreground
B = Background
S = Screen colour
T = Transparent
(e.g. videopicture)
X = don't care
0 = not set
1 = set

Note:

A - active colour assignment

This is the area of a character position covered by the character shape

I - inactive colour assignment

This is the area of a character position not covered by the character shape

D - colour DRCS selection
(active dot position)

COMBINATION	FUNCTION							
	COL DRC	INV.	CONC	ACT FLA	TR. FOR	TR. BAK	NORMAL ***** A I D *****	WINDOW ***** A I D *****
41	1	0	1	0	0	1	S S 0	T T 0
42	1	0	1	0	1	0	B B 0	B B 0
43	1	0	1	0	1	1	S S 0	T T 0
44	1	0	1	1	0	0	B B 0	B B 0
45	1	0	1	1	0	1	S S 0	T T 0
46	1	0	1	1	1	0	B B 0	B B 0
47	1	0	1	1	1	1	S S 0	T T 0
48	1	1	0	0	0	0	B B 0	B B 0
49	1	1	0	0	0	1	S S 0	T T 0
50	1	1	0	0	1	0	B B 0	B B 0
51	1	1	0	0	1	1	S S 0	T T 0
52	1	1	0	1	0	0	X S 1	X T 1
53	1	1	0	1	0	1	X S 1	X T 1
54	1	1	0	1	1	0	X S 1	X T 1
55	1	1	0	1	1	1	X S 1	X T 1
56	1	1	1	0	0	0	X S 1	X T 1
57	1	1	1	0	0	1	X S 1	X T 1
58	1	1	1	0	1	0	X S 1	X T 1
59	1	1	1	0	1	1	X S 1	X T 1
60	1	1	1	1	0	0	X S 1	X T 1
61	1	1	1	1	0	1	X S 1	X T 1
62	1	1	1	1	1	0	X S 1	X T 1
63	1	1	1	1	1	1	X S 1	X T 1

Legend:

F = Foreground
B = Background
S = Screen colour
T = Transparent (e.g. videopicture)
X = don't care
0 = not set
1 = set

Note:

A - active colour assignment

This is the area of a character position covered by the character shape

I - inactive colour assignment

This is the area of a character position not covered by the character shape

D - colour DRCS selection (active dot position)

1.2. Truth table for the effect of Colour Table Flash

Attribute Mix	COLOUR ASSIGNMENT		STATE OF COLOUR TABLE FLASH
	ACTIVE COLOUR assignment	INACTIVE COLOUR assignment	
Normal	F (x) F ($\overline{x}$)	B B	INACTIVE ACTIVE
Invert	B (x) B ($\overline{x}$)	F F	INACTIVE ACTIVE
Colour DRCS	CDRC (x) CDRC, $\overline{I}$ (3)	S (1) S	INACTIVE ACTIVE
Invert + Colour DRCS	B (x) B ($\overline{x}$)	B (x) B ($\overline{x}$)	INACTIVE ACTIVE
Concealed	B B	B B	INACTIVE ACTIVE
Inverted + Concealed	F F	F F	INACTIVE ACTIVE
Concealed + Colour DRCS	B B	B B	INACTIVE ACTIVE
Inverted + Concealed + Colour DRCS	CDRC CDRC (2)	S (1) S	INACTIVE ACTIVE

Notes: 1. With colour DRC, Screen colour is not strictly the inactive colour but it is seen when a colour DRC dot is transparent. In case of transparent-screen colour or the attribute window the video-picture is seen.
2. Here the colour DRC appears steady.
3. Bit 3 ("the Intensity bit") is complemented.
(x) = colour table x, ($\overline{x}$) = complement colour table to x.

1.3 Truth tables for combinations of size attributes and scrolling / protected area

The tables describe the representation of a character at position 0 with following environment

1	2	3
4	Ø	5
6	7	8

table 1

row Z-1
row Z
row Z+1

These 9 positions are relevant for the representation of characters when the cursor is at position 0.

Legend:

1/2 ext to 0:	Pos. 1 with DBS entry and not obscured or Pos. 2 with DBS or DBH and not obscured.
3 ext dwn:	Pos. 3 with DBS or DBH and not obscured.
4 ext rgt:	Pos. 4 with DBS or DBW and not obscured.
Z-1/Z Scr Bor:	The border of a scrolling area is between Z-1 and Z.
Z/Z+1 Scr Bor:	The border of a scrolling area is between Z and Z+1.
Z-1 prt:	Row Z-1 belongs to a protected area.
Z prt:	Row Z belongs to a protected area.
Z+1 prt:	Row Z+1 belongs to a protected area.

No.	4 ext rgt	1/2 ext to Ø	Z-1 Z Scr Bor	Z-1 prt	Z prt	Display of Ø
Ø	Ø	Ø	X	X	X	NSZ
1	Ø	1	Ø	Ø	Ø	---
2	Ø	1	Ø	Ø	1	NSZ
3	Ø	1	Ø	1	Ø	NSZ
4	Ø	1	Ø	1	1	---
5	Ø	1	1	X	X	NSZ
6	1	X	X	X	X	---

table 2: Size attributes at position 0: NSZ

No.	4 ext rgt	1/2 ext to ↓	3 ext dwn	Z-1 Z Scr Bor	Z-1 prt	Z prt	Display of 0
0	0	0	0	X	X	X	DBW
1	0	0	1	0	0	0	NSZ
2	0	0	1	0	0	1	DBW
3	0	0	1	0	1	0	DBW
4	0	0	1	0	1	1	NSZ
5	0	0	1	1	X	X	DBW
6	0	1	X	0	0	0	---
7	0	1	X	0	0	1	DBW
8	0	1	X	0	1	0	DBW
9	0	1	X	0	1	1	---
10	0	1	X	1	X	X	DBW
11	1	X	X	X	X	X	---

table 3: Size attribute at position 0: DBW

No.	4 ext rgt	1/2 ext to 0	Z-1 Z Scr Bor	Z Z+1 Scr Bor	Z-1 prt	Z prt	Z+1 prt	Display of C
0	0	0	X	0	X	0	0	DBH
1	0	0	X	0	X	0	1	NSZ
2	0	0	X	0	X	1	0	NSZ
3	0	0	X	0	X	1	1	DBH
4	0	0	X	1	X	X	X	NSZ
5	0	1	0	X	0	0	X	---
6	0	1	0	0	0	1	0	NSZ
7	0	1	0	0	0	1	1	DBH
8	0	1	0	0	1	0	0	DBH
9	0	1	0	0	1	0	1	NSZ
10	0	1	0	0	1	1	X	---
11	0	1	0	1	0	1	X	NSZ
12	0	1	0	1	1	0	X	NSZ
13	0	1	0	1	1	1	X	---
14	0	1	1	0	X	0	0	DBH
15	0	1	1	0	X	0	1	NSZ
16	0	1	1	0	X	1	0	NSZ
17	0	1	1	0	X	1	1	DBH
18	0	1	1	1	X	X	X	NSZ
19	1	X	X	X	X	X	X	---

table 4: Size attribute at position 0: DBH

No.	4 ext rgt	1/2 ext to 0	3 ext dwn	Z-1 Z Scr Bor	Z Z+1 Scr Bor	Z-1 prt	Z prt	Z+1 prt	Display of Z
0	0	0	0	X	0	X	0	0	DBS
1	0	0	0	X	0	X	0	1	DBW
2	0	0	0	X	0	X	1	0	DBW
3	0	0	0	X	0	X	1	1	DBS
4	0	0	0	X	1	X	X	X	DBW
5	0	0	1	0	0	0	0	0	DBH
6	0	0	1	0	0	0	0	1	NSZ
7	0	0	1	0	0	0	1	0	DBW
8	0	0	1	0	0	0	1	1	DBS
9	0	0	1	0	0	1	0	0	DBS
10	0	0	1	0	0	1	0	1	DBW
11	0	0	1	0	0	1	1	0	NSZ
12	0	0	1	0	0	1	1	1	DBH
13	0	0	1	0	1	0	0	X	NSZ
14	0	0	1	0	1	0	1	X	DBW
15	0	0	1	0	1	1	0	X	DBW
16	0	0	1	0	1	1	1	X	NSZ
17	0	0	1	1	0	X	0	0	DBS
18	0	0	1	1	0	X	0	1	DBW
19	0	0	1	1	0	X	1	0	DBW
20	0	0	1	1	0	X	1	1	DBS
21	0	0	1	1	1	X	X	X	DBW
22	0	1	X	0	0	0	0	0	---
23	0	1	X	0	0	0	0	1	---
24	0	1	X	0	0	0	1	0	DBW
25	0	1	X	0	0	0	1	1	DBS
26	0	1	X	0	0	1	0	0	DBS
27	0	1	X	0	0	1	0	1	DBW
28	0	1	X	0	0	1	1	X	---
29	0	1	X	0	1	0	0	X	---
30	0	1	X	0	1	0	1	X	DBW
31	0	1	X	0	1	1	0	X	DBW
32	0	1	X	0	1	1	1	X	---
33	0	1	X	1	0	X	0	0	DBS
34	0	1	X	1	0	X	0	1	DBW
35	0	1	X	1	0	X	1	0	DBW
36	0	1	X	1	0	X	1	1	DBS
37	0	1	X	1	1	X	X	X	DBW
38	1	X	X	X	X	X	X	X	---

table 5: Size attribute at position 0: DBS

1.4 Clarification of code extension techniques

- ESC 2/8 F and ESC 2/12 F designate sets of 94 graphic characters which will be used as the GØ set. The designated set is invoked by SI.

- ESC 2/9 F and ESC 2/13 F designate sets of 94 graphic characters which will be used as the G1 set. The designated set is invoked by SO.

- ESC 2/10 F and ESC 2/14 F designate sets of 94 graphic characters which will be used as the G2 set. LS2 invokes the designated set and SS2 invokes one character from the designated set.

- ESC 2/11 F and ESC 2/15 F designate sets of 94 graphic characters which will be used as the G3 set. LS3 invokes the designated set and SS3 invokes one character from the designated set.

- The invocation and designation of character sets are independent of each other; they may be seen in terms of two independent sequential switches in an electrical circuit.

  When a character set is designated by a new designation sequence into a G Set which was already invoked the new character set is automatically available in the code table, i.e. it is not necessary to receive a new invocation sequence. The former contents of the G Set is not longer available.

1.5 Collection of questions and the corresponding answers

These are questions asked by manufacturers and listed with their corresponding answers hereafter for clarification.
Note: Functions which are not mandatory for the basic terminal but are recommended only are not checked for certification.

1. Q: Is the fallback character mandatory?

   A: The fallback character is mandatory. It is recommended for positions which do not have a defined representation (empty positions), the fall back character can also be repeated.

2. Q: Are free character positions in column 4 of the second supplementary character set spacing or non-spacing?

   A: Non-spacing.

3. Q: Is NUL a layer 6 character?

   A: No it is only a layer 2 character which may be used as a time filler. It has no syntactical meaning at layer 6 and therefore ignored.

4. Q: Which is the first flash phase for increment/decrement flash counting at the position with the marker entry?

   A: Always phase 1, i.e. if two increment flash markers are set at adjacent positions both have the same phase.

5. Q: What happens to parallel attributes when the format effector 'cancel' is received?

   A: The parallel attributes are not written to the memory but the attributes of the position where cancel was received are valid for the positions to the right of the cursor until the end of the row.

6. Q: Are diacritical marks also to be displayed as separate characters?

   A: Yes, in combination with a space diacritical marks are displayed as spacing characters.

7. Q: Does the attribute 'window' also affect the character foreground and background?

   A: No, the character foreground and background remains unchanged.

8. Q: Is it necessary to distinguish between mosaic- and alphaspace?

   A: It is recommended that no distinction be made, but it is not mandatory for the basic terminal, a distinction may be made.

9. Q: What happens to the obscured position if DBW or DBS is entered into the memory in the parallel mode?

   A: The attributes of the cursor are valid for both positions of the row where the cursor writes the origin, i.e. the character of the obscured position is written again to the memory. The attributes and characters of the row below (DBS) are unchanged.

10. Q: Is the information held in the display memory different for serial and parallel attributes?

    A: For serial attributes a marker is entered to the memory for every attribute entry (implicit or explicit depending on terminal implementation) but for parallel attributes only difference markers are entered to the memory. After the markers are written to the memory it is not possible to decide whether they were written in parallel or serial mode.

11. Q: What is the default representation of a DRC?

    A: It is recommended to present spaces as defaults.

12. Q: May colours be redefined while the whole picture is already in the memory?

    A: Yes, by sending a VPDE beginning with US 2/6... to the terminal.

In this case the picture on the screen will adopt the new colours as soon as the new colours are in the memory.

Note: In the basic terminal the contents of the Clut are equal to the contents of the colour map, i.e. the cluts are not implemented in a real terminal. The only colour table which has to be implemented is the DCLUT for 4-colour DRCS which refers to colours 0 to 31 of the colour map.

13. Q: May DRC be redefined while the whole picture is already in the memory?

    A: Yes, by sending a VPDE beginning with US 2/3... . The characters on the screen are changed as soon as they accessible from the memory.

14. Q: Is it possible to combine a videopicture and an alpha-mosaic picture on the screen by using the attribute 'window'?

    A: Yes, but while the attribute 'window' is mandatory it is optional for the basic terminal to synchronize a videopicture (interface see section 3.6).

15. Q: What is the default 'full screen background'?

    Q: Black background (no video information)

16. Q: What is the effect of 'marked area'?

    A: The attribute is stored in the memory. The 'marked' information may then be used by more sophisticated devices for further processing, e.g. calculations, presentation in another frame, printing etc. without handling the information surrounding the marked area.

17. Q: What happens with the displayed characters when within a 24-row frame a format change to 20 rows occurs?

    A: This is not a service requirement and therefore not described. It is up to the manufacturer to define the reaction, but a terminal should present the first rows in this case and the logical cursor position is retained.

18. Q: What is 'full screen background'?

    A: The 'full screen background' layer can be addressed as a whole as well as per row (20/24). These rows cover the whole width of the screen. Time dependent precedence means that
    - if the full screen is addressed the colour of the row background changes also
    - if the row background is addressed the colour of the particular row changes only.

    No partitioning into columns is required.

19. Q: Can all six DRC resolutions be mixed on one screen?

    A: DRC's are of different resolution.
    The character position is always of the same size as long as the format is not changed.
    6x6, 6x12, 12x12 relate to 20 character rows.
    6x5, 6x10, 12x10 relate to 24 character rows.

    Therefore, character sizes of 12 and 10 dots vertically cannot be mixed.

20. Q: How are the colours addressed?

    A: A colour is defined by the colour table plus the position in the table, i.e. two controls are needed for a colour definition:
    - the control which invokes the colour table
    - the C1 control which determines the colour itself.

    So, at a given moment when a character is written only one colour table can be in use. In the frame 32 different colours may be in use.

21. Q: What is the effect of colour table flash?

    A: Colour table flash means that the foreground colour changes between tables 1 and 2 or between colour tables 3 and 4.

    In the case of colour black (table 1) the complementary value is transparent (table 2).

22. Q: What is the effect of 'repeat' inside a protected area?

    A: 'Repeat' inside a protected area only causes a cursor movement based on the size attributes applied to the charaters within the protected area.

23. Q: What happens when in the first row of a scrolling area which is also protected a parallel DBH/DBS (equivalent to serial DBH in the last row) is received?

    A: No entry into the memory takes place, no scrolling is performed.

24. Q: Are dynamic effects on the screen guaranteed for certain rules?

    A: Dynamic affects are a special kind of application. Generally the functions should be presented on the sreen with accordance to the speed of the transmission.

    However, with regard to the fact that dynamic effects cannot be guaranteed by all implementations because of different timing conditions (e.g. for overlapping size attributes or for scrolling) this is not mandatory.

    The link level protocol provides a buffer function for incoming data and a flow control function which also influence dynamic effects. For these reasons complicate dynamic effects (e.g. changing the whole contents of the visible display area by overwriting one character position with size attributes) cannot be mandatory for the basic terminals but it is recommended that terminals reproduce the dynamic effect as good as possible.
    After reception of the whole page all terminals must display the information stored according to the rules described.

25. Q: What is the effect of layer 2 controls at layer 6?

    A: No effect, they are ignored at layer 6.

26. Q: What is the meaning of the control US and the relevant US-sequences?

    A: The control US has the highest syntactecal meaning at layer 6

    A VPDE is in principal introduced by a US-sequence.

    A VPDE is in principal terminated by the occurence of the next US-control.

    This applies also to the resetfunction "service break to row X". Generally the service break to row X is terminated by the reset function "reset to the previons state". If any other US-sequence is received after the "service break to row X" the "service break" is also terminated by returning the cursor to the former position reactivating the terminal state of this position and executing the new function introduced by the new US-sequence. The state of the service break is no longer valid.

27. Q: What happens when inside a scrolling area consisting of one row a DBH or DBS control is received?

    A: This is no useful application and therefore no rules are defined. However, for terminals using smooth scrolling it is recommended that scrolling has precedence over the application of size attributes.

28. Q: Which is the addressing range of the 84 DRC in case of 12x12/12x10 dots/character?

    A: The addressing range is given by the first 84 character positions of the code set.

29. Q: May information which does not fit into the memory because the final address is reached during the downloading procedure (e. g. 94/84 character positions of the code set) be stored in the terminal?

    A: It is recommended to ignore information which exeeds the defined addressing range (e. g. character position 94).

30. Q: Which flash phases are applied to characters in different sizes in case of increment/decrement flash?

    A: The flash phase is generally applied to complete characters (e. g. double with and double size characters have one flash phase only). It is recommended that character positions
    which are obscured by size characters from the line above are counted as single characters independent of the size attribute of the obscured character (e. g. if a DSZ-character covers the position of a DBW-character each of the positions obscured are counted as if they would have different flash phases).

1.6 Error condition handling (not part of the minimum requirements and therefore not a matter of certification but recommended for the basic terminal

1. Character sequences are in principle, checked for correctness in their entirety (they are treated as a single control).

   Incorrect ESC-, CSI-, US-sequences are rejected.

   The end of a CSI- or ESC-sequence is determined by the 'final character'. After reception of an incorrect ESC- or CSI-sequence the next following correct character/ character sequence is processed.

   In case of incorrect US-sequences all following information is ignored until the next US is received.

2. Incorrect ESC-, CSI-, US-sequences cause the terminal to send an error message to the service.

   The error message comprises 1 to 4 bytes (see Chapter 4 of this document). This message contains the first bytes of the incorrect sequences (at least: 1/11 = ESC, 9/11 = CSI, 1/15 = US).

3. The alphamosaic mode occupies codes of all columns of the code tables (16 columns in case of an 8-bit environment). All other presentation elements comprise only codes from columns 2 to 7 and 1/15 (DRCS, colour definition, format definition). The reception of data outside this repertoire leads to an interruption of the process until the next US is received.

4. NUL (0/0) is a level 2 character and therefore ignored at level 6. This rule applies to single characters as well as to character sequences (CSI, ESC, US, APA, RPT...), i.e. the occurrence of NUL in a sequence is not treated as an error.

5. A US-code followed by codes from columns 4 to 7 is always interpreted as an APA and introduces an alpha-mosaic element.

   An APA containing addresses which are not within the displayable area in case of a given format is not executed and therefore the parallel attributes of the cursor are not deleted. Nevertheless it introduces a new alphamosaic element.

6. A repeat sequence is treated as incorrect when the sequence

   1. character
   2. RPT
   3. Number (4/1=1 ... 7/14 = 62)

   is interrupted by any other character.

7. Single shifts followed by a character not contained in columns 2 to 7 are ignored.

1.7 List of corrections to edition no. 1 from February 1983

The following corrections of a technical nature to the text of the February 1983 edition have been incorporated in this document:

1. Page 15, Chapter 3.1.4.1:

   The mechanical interface to the modem may be built as a plug or socket.

2. Page 129, table, column 4:

   Pos. 4/14 and 4/15 have been exchanged.

3. Page 146, Chapter 8.5.2.10

   must read: ... only the sequence US 2/3 2/0 4/p 4/1...

4. Page 157:

   The second US sequence must read:

   US 2/13 7/1 (instead of US 2/13 4/1 7/1).

5. Page 161, table:

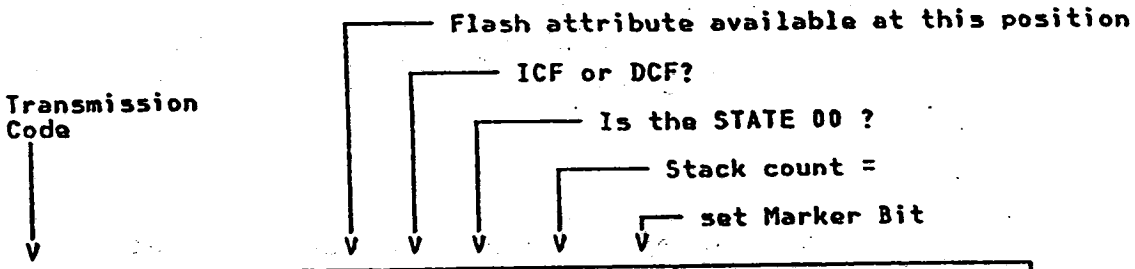
   Code positions 2/0, 10/0, 7/15 and 15/15 (Space and DEL) belong to the valid character repertoire.

6. For APA the addressing of more than 62 rows or columns is changed (now as in T/CD 6-1).

Annex 1

1.8 Attribute controls and stack status for flash attributes

By means of an illustration, the following table shows the attribute and stack status associated with the various transmission codes.

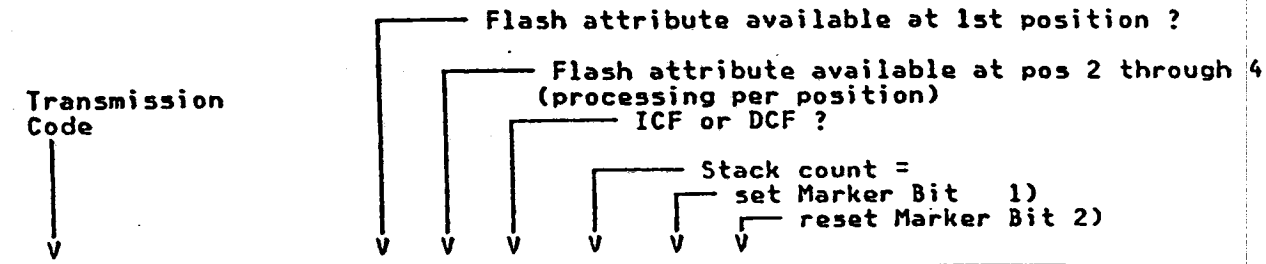


8/9	STD	n y y	. n y	. . .	+1 +0 −1	y n n	steady
8/8	FSH	n y y	. n y	. . .	+1 +0 −1	y n n	normal flash
9/11 3/0 4/1	IVF	n y y	. n y	. . .	+1 +0 −1	y n n	inverted flash
9/11 3/1 4/1	RIF	n y y	. n y	. . .	+1 +0 −1	y n n	colour table
9/11 3/2 4/1	FF1	n y y y	. n n y	. y n .	+1 +0 +0 −1	y n n n	fast flash 1
9/11 3/3 4/1	FF2	n y y y	. n n y	. y n .	+1 +0 +0 −1	y n n n	fast flash 2
9/11 3/4 4/1	FF3	n y y y	. n n y	. y n .	+1 +0 +0 −1	y n n n	fast flash 3
9/11 3/5 4/1	ICF	n y y y	. n n y	. y n .	+2 +1 +1 +0	y n n n	increment flash default mode is FSH
9/11 3/6 4/1	DCF	n y y y	. n n y	. y n .	+2 +1 +1 +0	y n n n	decrement flash default mode is FSH

Table 1

Annex 1

FLASH-Table for full row Attributes



Transmission Code		Flash attribute available at 1st position ?	Flash attribute available at pos 2 through 4 (processing per position)	ICF or DCF ?	Stack count =	set Marker Bit 1)	reset Marker Bit 2)	
1/11 2/3 2/1 4/9	STD	n	.	.	+1	y	n	steady
		y	.	n	+0	n	n	
		y	.	y	−1	n	n	
		.	n	.	+0	n	n	
		.	y	n	−1	n	y	
		.	y	y	−2	n	y	
1/11 2/3 2/1 4/8	FSH	n	.	.	+1	y		normal flash
		y	.	n	+0	.		
		y	.	y	−1	.		
		.	n	.	+0	n	n	
		.	y	n	−1	n	y	
		.	y	y	−2	n	y	

1) Refers to 1st position of the row
2) All other flash markers in the row

Table 2

2.1 Examples for memory entry and display representation

The following examples describe the action of attributes entered into the memory from the position where they are set until the occurence of the next attribute (serial mode). When more than one attribute occurs the attribute in the upper position of the row is set first.

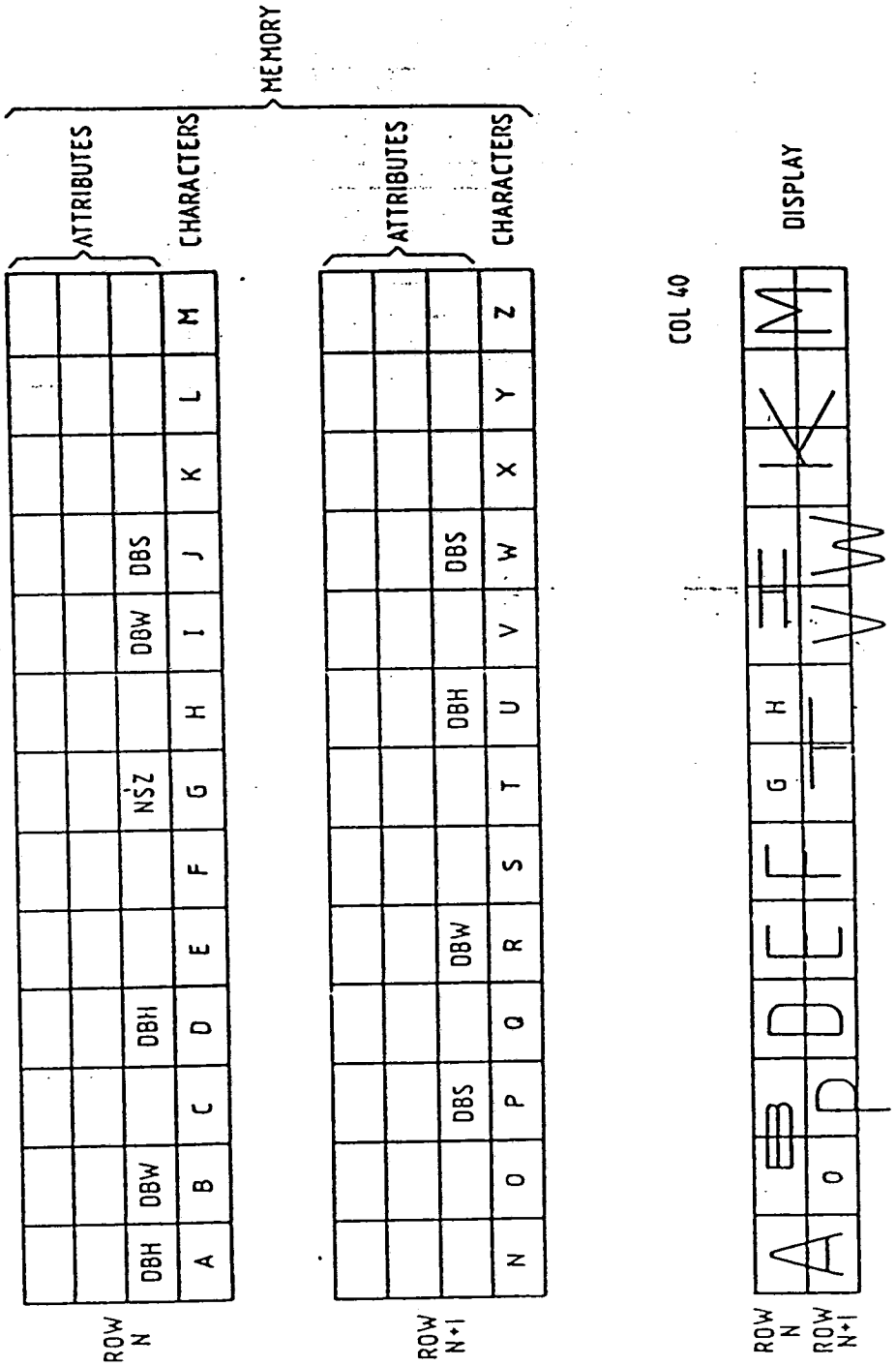


Figure 1

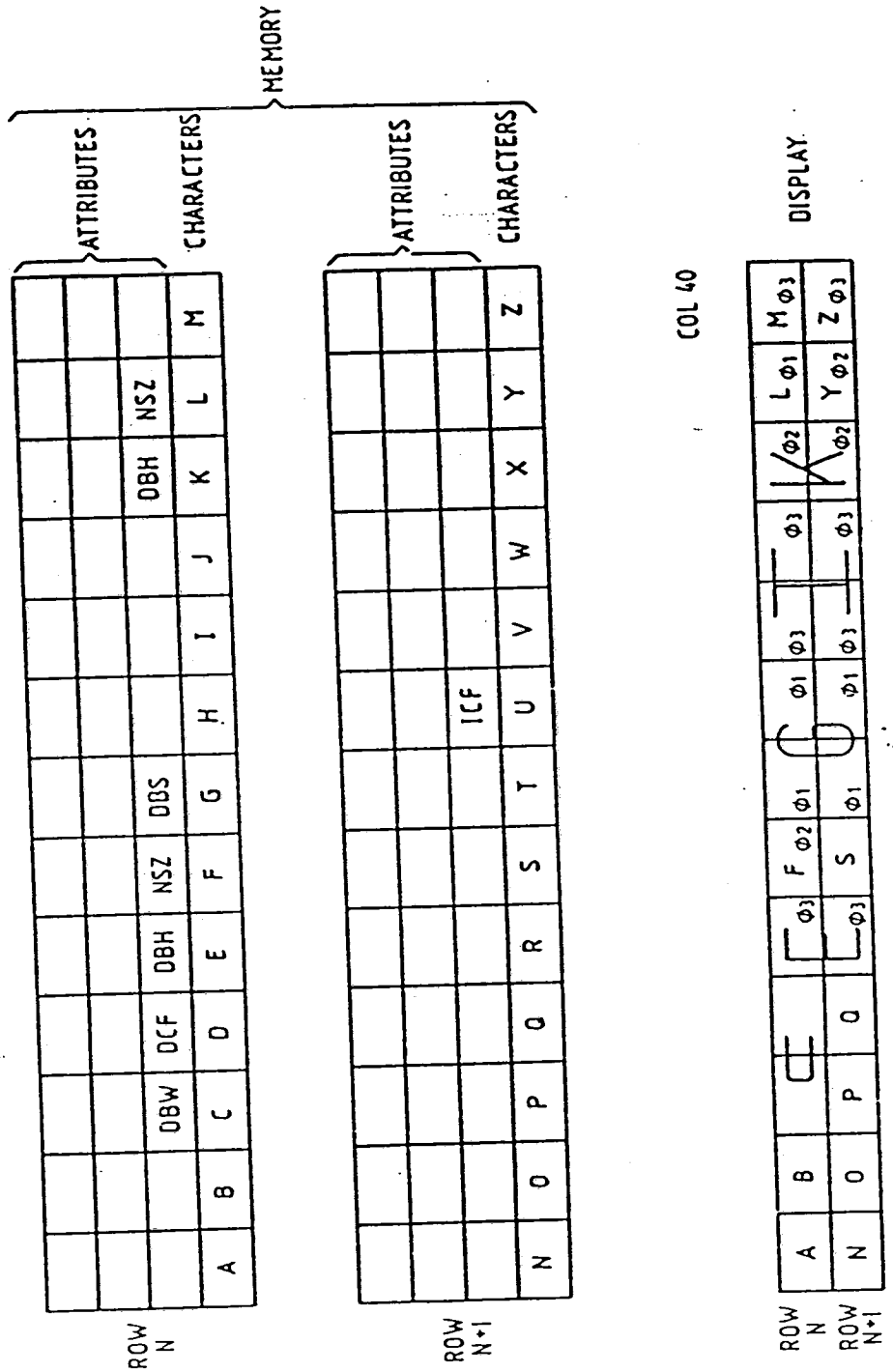

MEMORY
ATTRIBUTES
CHARACTERS
ATTRIBUTES
CHARACTERS
DISPLAY
COL 40
ROW N
ROW N+1
ROW N
ROW N+1
A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
OBH NSZ
OBW DCF OBH NSZ DBS
ICF
Φ1 Φ2 Φ3

Figure 2

Annex 1

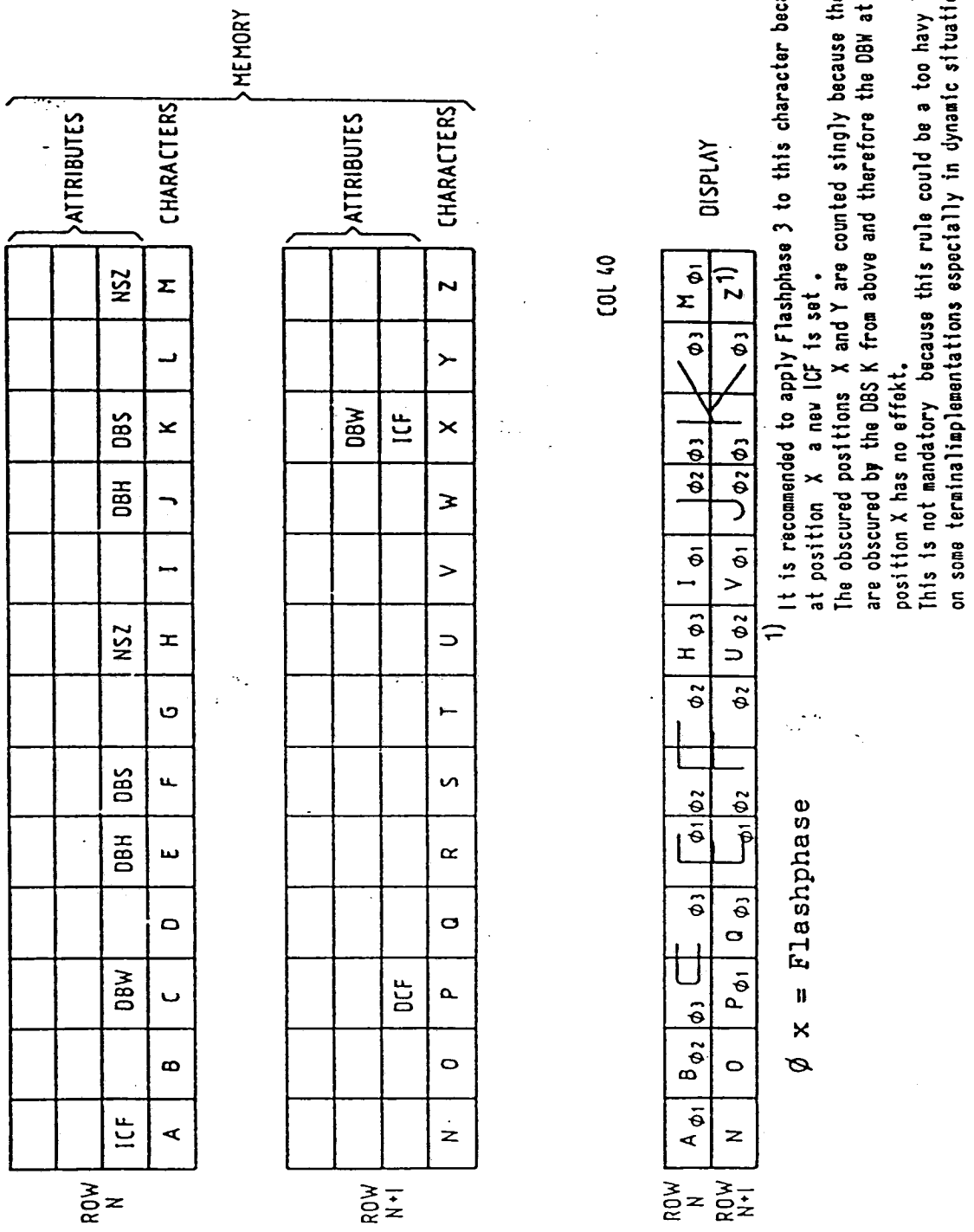


Figure 3

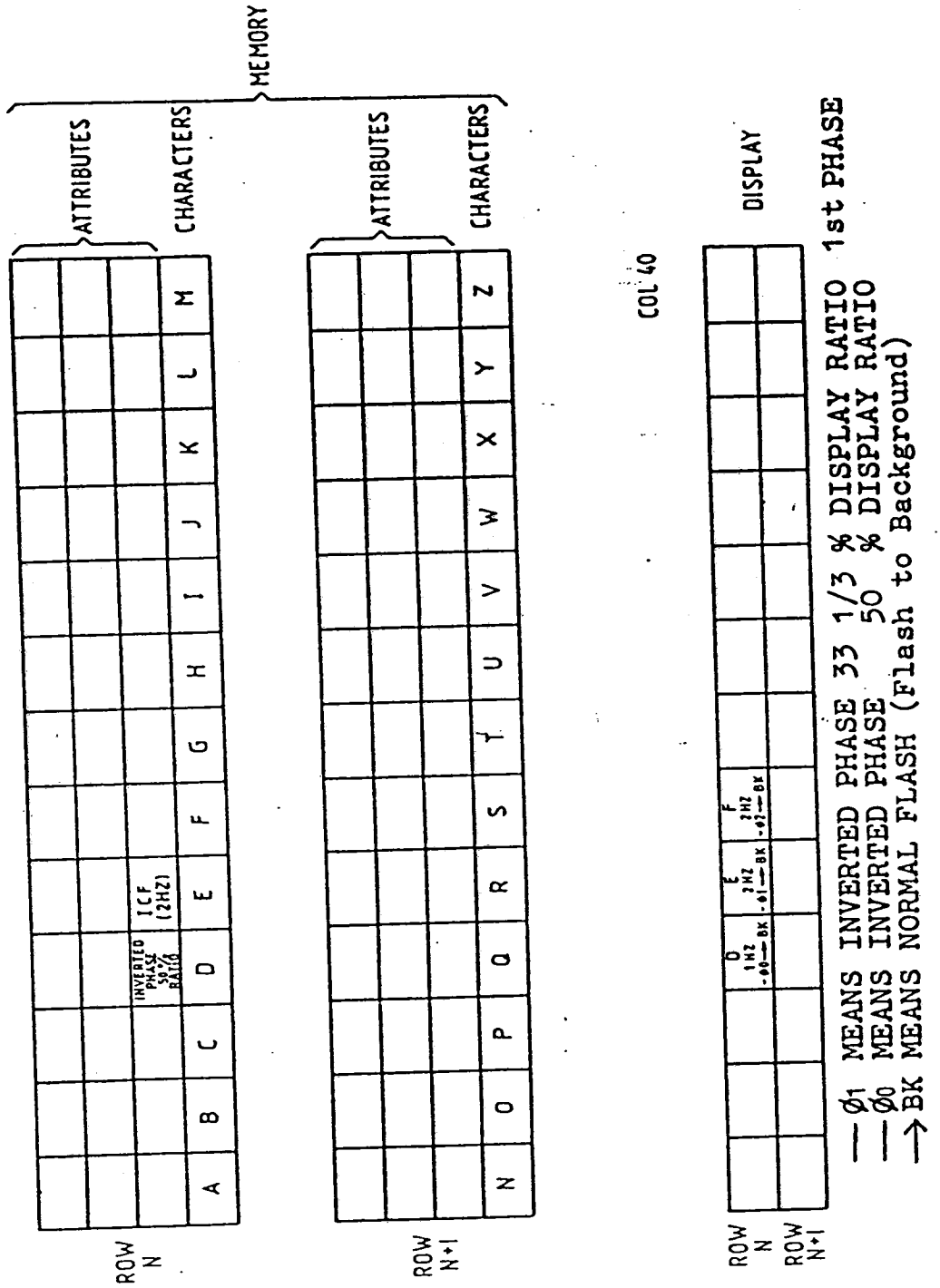

MEMORY
ATTRIBUTES
CHARACTERS
ATTRIBUTES
CHARACTERS
INVERTED PHASE 50% RATIO
ICF (2HZ)
A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
ROW N
ROW N+1
COL 40
DISPLAY
ROW N
ROW N+1
— ϕ_1 MEANS INVERTED PHASE 33 1/3 % DISPLAY RATIO 1st PHASE
— ϕ_0 MEANS INVERTED PHASE 50 % DISPLAY RATIO
→ BK MEANS NORMAL FLASH (Flash to Background)

Figure 4

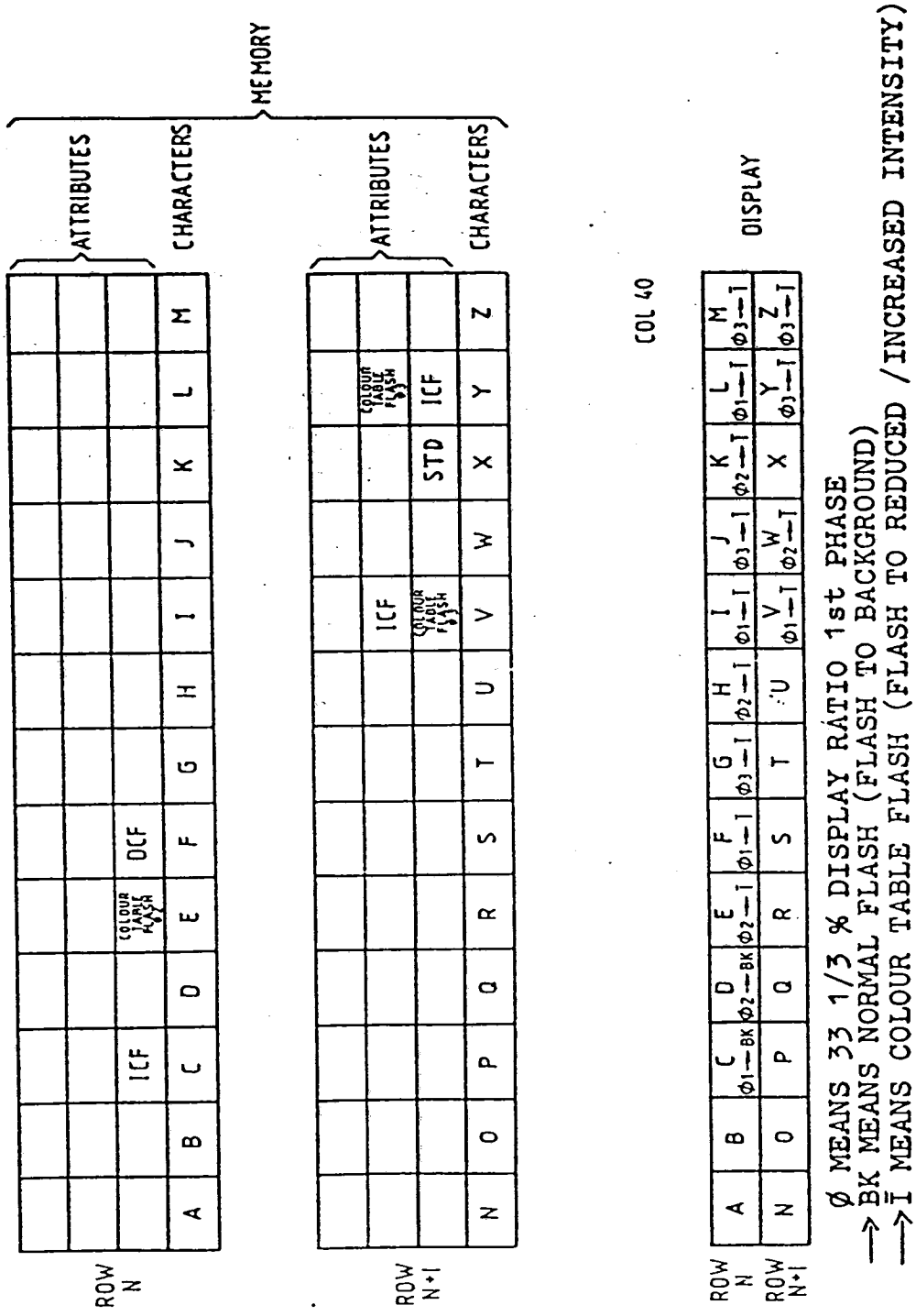

MEMORY
ATTRIBUTES
CHARACTERS
ATTRIBUTES
CHARACTERS
ROW N
ROW N+1
COL 40
DISPLAY
ROW N
ROW N+1
ICF
DCF
STD
Ø MEANS 33 1/3 % DISPLAY RATIO 1st PHASE
→BK MEANS NORMAL FLASH (FLASH TO BACKGROUND)
→Ī MEANS COLOUR TABLE FLASH (FLASH TO REDUCED /INCREASED INTENSITY)

Figure 5

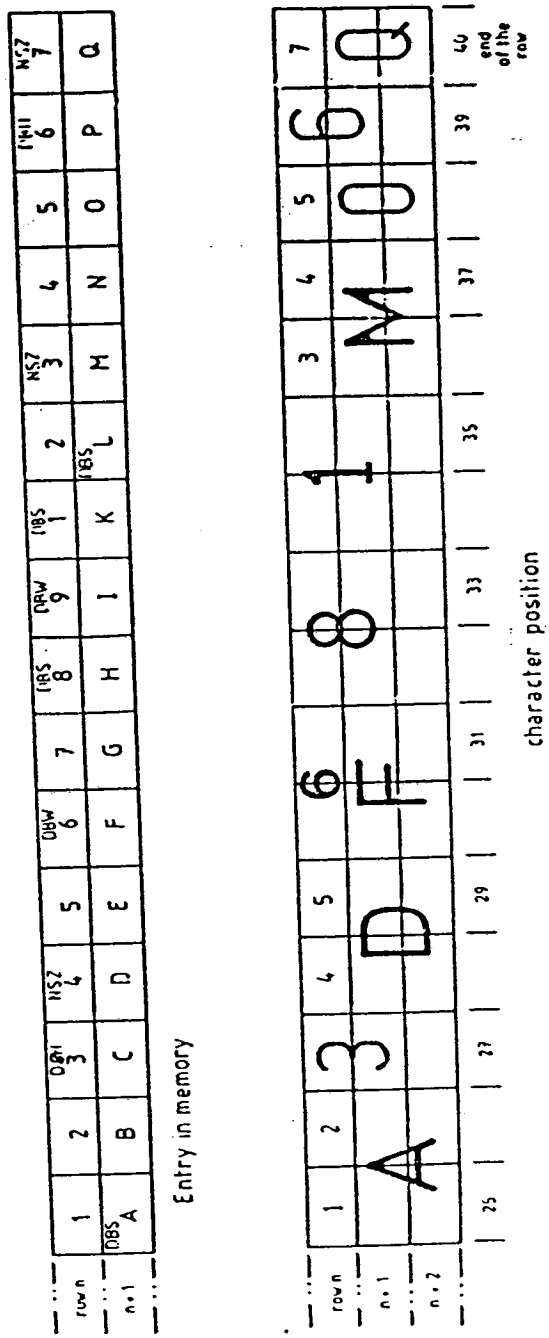
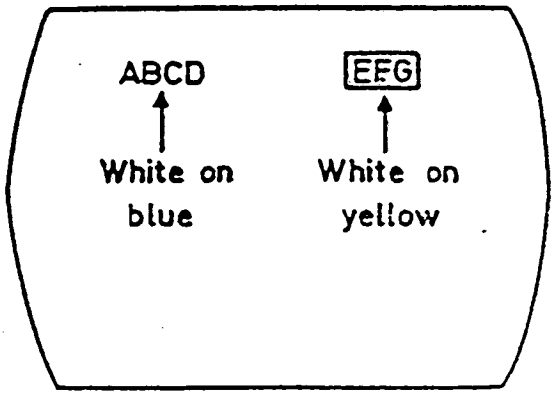

Entry in memory
Visible display
character position
row
n-1
n-2
end of the row
Display according to the rules in 8.4.5.3

Figure 6

2.2 EXAMPLES OF TIME DEPENDENCY IN THE UNIFIED ALPHAMOSAIC MODEL (8 bit-coding)

EXAMPLE 1

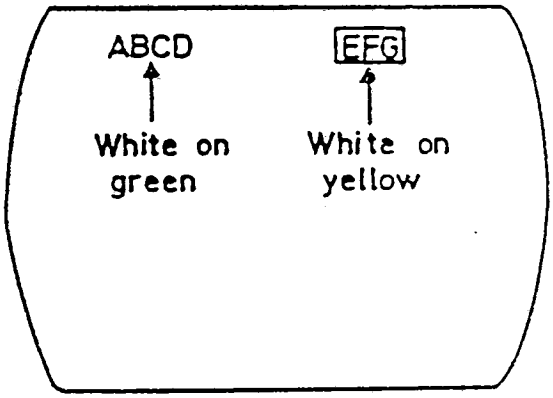
Full screen blue



Codes

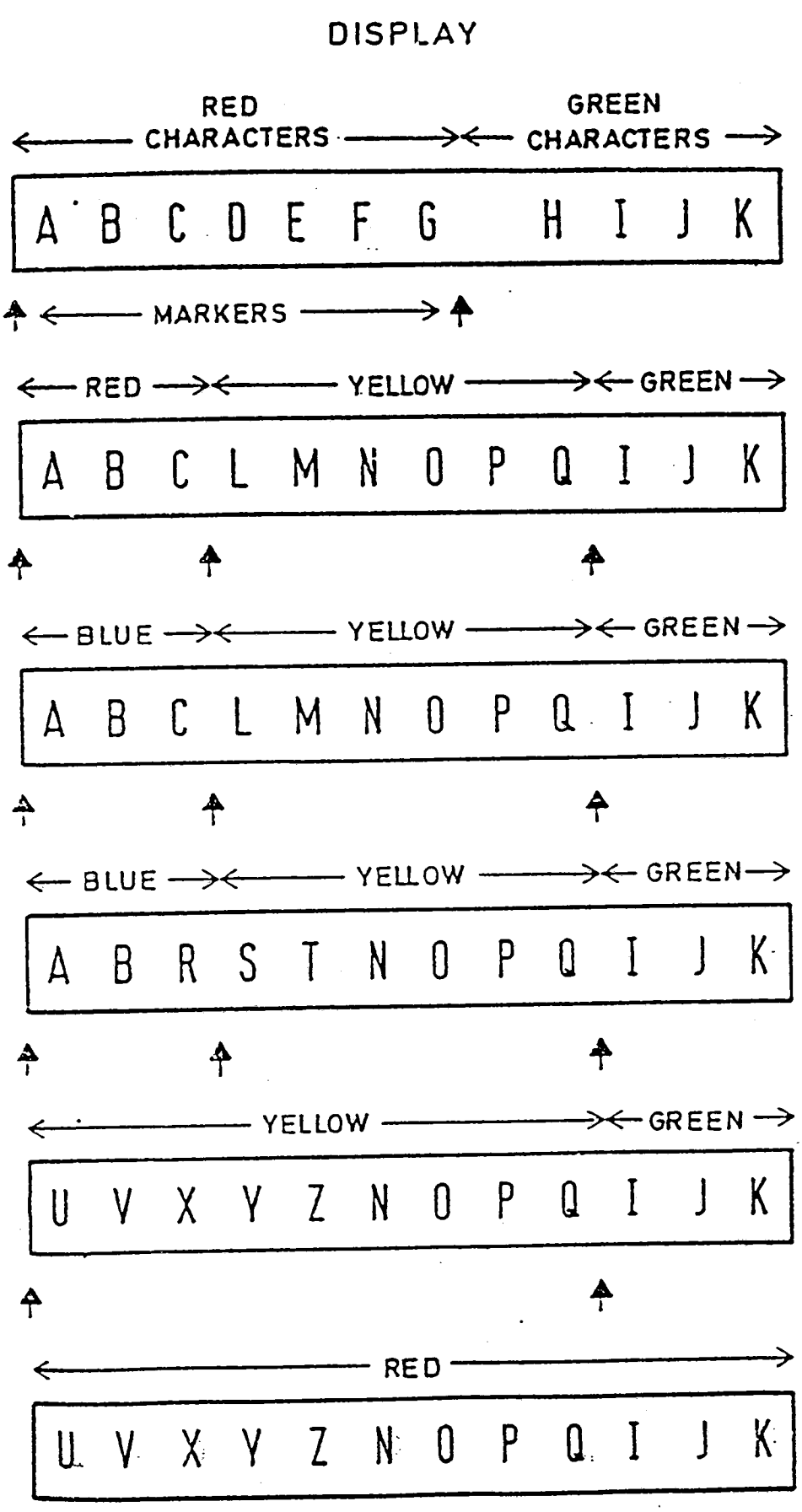
CS, full screen blue background, (transparent background), A, B, C,D yellow background, E,F,G.

Full screen green



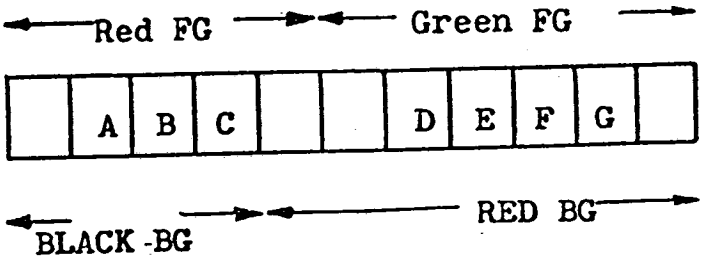
Full screen green background.

EXAMPLE 2


DISPLAY
SEQUENCE OF CODES.
RED CHARACTERS
GREEN CHARACTERS
A B C D E F G H I J K
MARKERS
RED
YELLOW
GREEN
A B C L M N O P Q I J K
BLUE
YELLOW
GREEN
A B C L M N O P Q I J K
BLUE
YELLOW
GREEN
A B R S T N O P Q I J K
YELLOW
GREEN
U V X Y Z N O P Q I J K
RED
U V X Y Z N O P Q I J K
CS
ESC, 2/2, Fs
8/1, APB
A,B,C,D,E,F,G,
8/2
H,I,J,K
APR
APF,APF,APF
ESC,2/2,Fp
8/3
L,M,N,O,P,Q
APR
ESC, 2/2, Fs
8/4
APF,
R,S,T
APR
ESC,2/2,Fp
U,V,X,Y,Z
Row attribute set to red foreground.

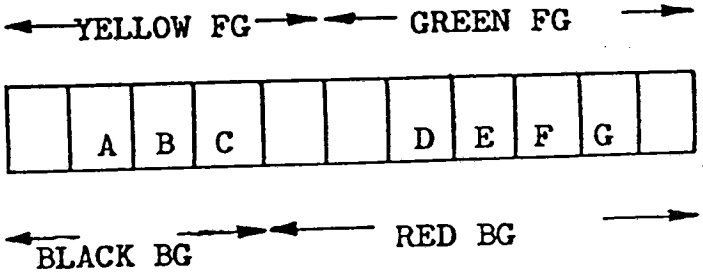
Example 3: NEW BACKGROUND

DISPLAY



SEQUENCE OF CODES

CS
ESC, 2/2, Fs
8/1, A, B, C
9/13, 8/2
D, E, F, G



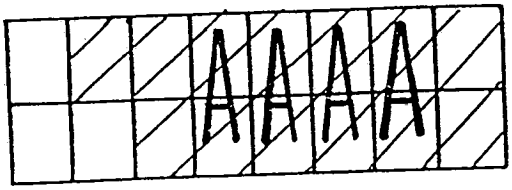
APR, ESC, 8/3

Example 4: DOUBLE HEIGHT AND BACKGROUND COLOUR.

DISPLAY

SEQUENCE OF CODES

CS, ESC, 2/2, FS
8/3, 9/13
8/13, A, A, A, A



 = YELLOW BACKGROUND

2.3 Examples for the action of the lock bit in the reference terminal

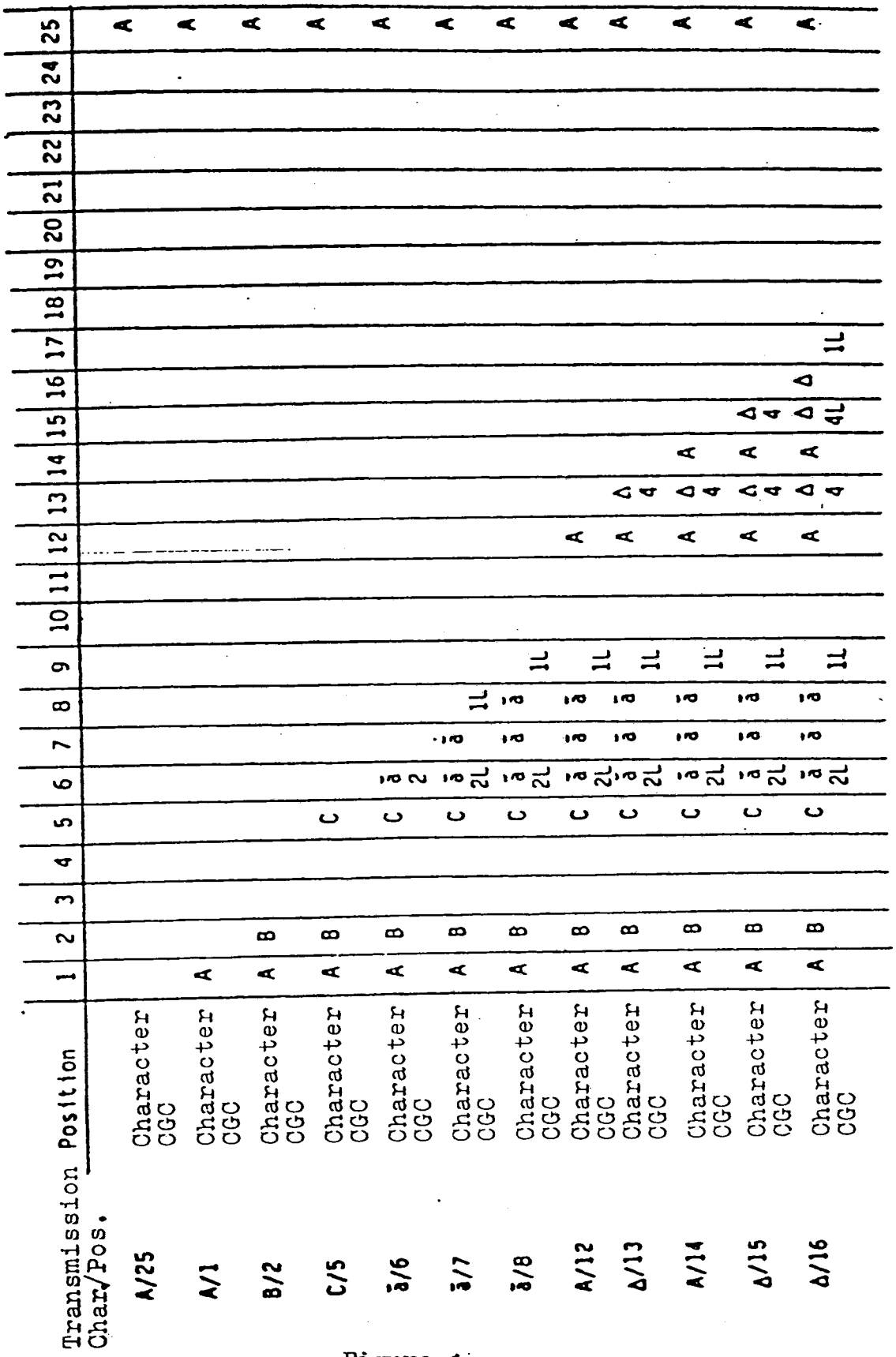


Figure 1

Transmission Char/Pos.	Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Δ/14	Character	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	1L								A
	CGC	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3	1L							A
%/17	Character	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3	ā 2	1L						A
	CGC	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
ā/18	Character	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
	CGC	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
✕/19	Character	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
	CGC	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
ā/20	Character	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
	CGC	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
/15	Character	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A
	CGC	A	B			C	ā 2L	ā	ā	1L			A	Δ 4L	Δ	Δ	Δ	✕ 3L	ā 2	✕	ā 2	1L				A

Spaces are available in all character groups

CGC = Character group change (control byte in stack)
1L = Character group change (e.g. group 1) with lock bit=1
1 = Character group change (e.g. group 1) with lock bit=0

Figure 2

	Pos.	1	5	10	15	20	25
Transmitted Char/at Pos. A/25	Char Tab	....	.....	.....	.....	.....	A
Δ/10	Char Tab	....	.....	Δ.... 4	.....	.....	A
†/11	Char Tab	....	.....	Δ†... 4 2	.....	.....	A
⊥/9	Char Tab	....	....⊥ 3	Δ†... 4 2	.....	.....	A
Δ/8	Char Tab	....	..Δ⊥ 4 3	Δ†... 4 2	.....	.....	A
⊥/7	Char Tab	....	.⊥Δ⊥ 3 4 3	Δ†... 4 2	.....	.....	A
⊥/6	Char Tab	....	⊥⊥Δ⊥ 31 4	Δ†... 2 2 11	.....	.....	A
Δ/20	Char Tab	....	⊥⊥Δ⊥ 31 4	Δ†... 4 2 11	.....	Δ... 4	A
Δ/19	Char Tab	....	⊥⊥Δ⊥ 31 4	Δ†... 4 2 11	...Δ 41	Δ... 11	A
Δ/18	Char Tab	....	⊥⊥Δ⊥ 31 4	Δ†... 4 2 11	..ΔΔ 41	Δ... 11	A

Figure 3

ABBREVIATIONS

A

ABK	Alpha black	Alfanumerische Zeichen schwarz
ACK	Acknowledge (positive)	Positive Empfangsbestaetigung ACK 0/1
AIS	Activate Implicit Scrolling	Impliziten Scroll-Modus aktivieren
AB	Alpha Blue	Alfanumerische Zeichen blau
ANC	Alpha Cyan	Alfanumerische Zeichen cyan
ANG	Alpha Green	Alfanumerische Zeichen gruen
ANM	Alpha Magenta	Alfanumerische Zeichen magenta
ANR	Alpha Red	Alfanumerische Zeichen rot
ANW	Alpha White	Alfanumerische Zeichen weiss
ANY	Alpha Yellow	Alfanumerische Zeichen gelb
APA	Active Position Addressing	Adressierung der aktiven Position
APB	Active Position Back	Aktive Position ein Feld zurueck
APD	Active Position Down	Aktive Position eine Reihe tiefer
APF	Active Position Forward	Aktive Position ein Feld vor
APH	Active Position Home	Aktive Position in Reihe 1 und Spalte 1
APR	Active Position Return	Aktive Position an den Anfang der Reihe
APU	Active Position Up	Aktive Position eine Reihe hoeher

Annex 2

B

BBD	Black Background	Schwarzer Hintergrund
B-byte	The bytes B1 to B4 (start of pattern block 1 to 4)	Die Bytes B1 bis B4 (Einleitung der pattern blocks 1-4)
BKB	Black Background	Schwarzer Hintergrund
BKF	Black Foreground	Schwarzer Vordergrund
BLB	Blue Background	Blauer Hintergrund
BLF	Blue Foreground	Blauer Vordergrund
B1	Start of the 1st pattern block	Beginn des ersten "pattern block"
B2	Start of the 2nd pattern block	Beginn des zweiten "pattern block"
B3	Start of the 3rd pattern block	Beginn des dritten "pattern block"
B4	Start of the 4th pattern block	Beginn des vierten "pattern block"

C

CAN	Cancel	Rest der Reihe mit Leerzeichen fuellen
CDY	Conceal Display	Verdeckte Anzeige
CH	Columns Hundreds	Hunderter Stelle bei der Wahl der Spaltenanzahl
CLUT	Colour Look Up Table	Farbauswahltabelle
CLUT1	Colour Look Up Table1	Farbauswahltabelle 1
CLUT2	Colour Look Up Table2	Farbauswahltabelle 2
CLUT3	Colour Look Up Table3	Farbauswahltabelle 3
CLUT4	Colour Look Up Table4	Farbauswahltabelle 4
CNB	Cyan Background	Cyan Hintergrund
CNF	Cyan Foreground	Cyan Vordergrund
COF	Cursor OFF	Cursor AUS
CON	Cursor ON	Cursor AN
CS	Clear Screen	Bildschirm loeschen
CSA	Create Scrolling Area	Neuen Scroll-Bereich definieren
CSI	Control Sequence Introducer	Einleitzeichen fuer eine Steuerzeichenfolge
CT	Columns Tens	Zehner-Stelle bei der Wahl der Spaltenanzahl
CT1	Colour Table 1	Farbauswahltabelle 1
CT2	Colour Table 2	Farbauswahltabelle 2
CT3	Colour Table 3	Farbauswahltabelle 3
CT4	Colour Table 4	Farbauswahltabelle 4
CU	Columns Units	Einer-Stelle bei der Wahl der Spaltenanzahl
C0	Control Function Set '0'	Steuerfunktionszeichensatz 0
C1	Control Function Set '1'	Steuerfunktionszeichensatz 1

D

DBH	Double-Height	Doppelte Hoehe
DBS	Double-Size	Doppelte Groesse (doppelte Hoehe und doppelte Breite)
DBW	Double-Width	Doppelte Breite
D-Byte	A dot carrying Byte; used for downloading DRCS	Bytes, die zur Uebertragung von DRCS-Zeichen dienen
DCF	Decrement Flash	Dreiphasenblinken rueckwaerts (Ph.3, Ph.2, Ph.1)
DCLUT	DCRS-Colour Look Up Table	DRCS-Farbauswahltabelle
DCT	Data Collection Terminator	Funktion "Datensammlung beenden"
DEL	Delete	Loeschen
DIS	Deactivate Implicit Scrolling	Impliziten Scroll-Modus deaktivieren
DLE	Data Link Escape	Daten-Verbindungs-ESCAPE
DRC DRCS	Dynamically Redefinable Character Dynamically Redefinable Character Set	Frei definierbares Zeichen Zeichensatz mit frei definierbaren Zeichen
DSA	Delete Scrolling Area	Ganzen oder Teil eines Scroll-Bereiches loeschen

E

EBX	End of Box	Ende der Box/des Fensters
ENQ	Enquiry	Anfrage
EOT	End of Transmission	Ende der Uebertragung
ESC	Escape	Erweiterung der Steuermoeglichkeiten durch Steuerketten mit ESC
ETB	End of Transmission Block	Ende des Uebertragungsblocks

F

FF1	Fast Flash 1	Schnelles Blinken 1. Phase
FF2	Fast Flash 2	Schnelles Blinken 2. Phase
FF3	Fast Flash 3	Schnelles Blinken 3. Phase
FSH	Flash	Blinken (normal), Beginn

G

GRB	Green Background	Gruener Hintergrund
GRF	Green Foreground	Gruener Vordergrund
G0	Graphic set 0	Graphik-Satz 0
G1	Graphic set 1	Graphik-Satz 1
G2	Graphic set 2	Graphik-Satz 2
G3	Graphic set 3	Graphik-Satz 3

H

HV	Hue-Volume	Hue Wert
HCS	Hard Copy Start	Printer starten
HCT	Hard Copy Stop	Printer stoppen
HCW	Hard Copy Wait	Printer warten
HMS	Hold Mosaic	Wiederholen des letzten Mosaic-Zeichens, wenn eine serielle Attributkontrollfunktion gesendet wird

I

ICF	Increment Flash	Dreiphasen-Blinken vorwaerts (Ph.1, Ph.2, Ph.3)
ICS	Identification of Character Set	Definiert den Zeichensatz fuer das Laden von DCRS-Zeichen
ICT	Identification of Colour Table	Definiert eine Farbtabelle (CLUT, DCLUT, "Colour map")
IPO	Inverted Polarity	Invertierte Polaritaet
IVF	Inverted Flash	Versetztes Blinken (abwechselnd mit normalem Blinken)

L

LRH	Hundreds value of the lower row	Hunderter-Stelle bei der Wahl der untersten Reihe
LRT	Tens value of the lower row	Zehner-Stelle bei der Wahl der untersten Reihe
LRU	Units value of the lower row	Einer-Stelle bei der Wahl der untersten Reihe
LS1	Locking Shift 1	G1-Zeichensatz in Spalte 2-7 aktivieren
LS1R	Locking Shift 1 Right	G1-Zeichensatz in Spalte 10-15 aktivieren
LS0	Locking Shift 0	G0-Zeichensatz in Spalte 2-7 aktivieren
LS2	Locking Shift 2	G2-Zeichensatz in Spalte 2-7 aktivieren
LS2R	Locking Shift 2 Right	G2-Zeichensatz in Spalte 10-15 aktivieren
LS3	Locking Shift 3	G3-Zeichensatz in Spalte 2-7 aktivieren
LS3R	Locking Shift 3 Right	G3-Zeichensatz in Spalte 10-15 aktivieren

M

MBK	Mosaic Black	Schwarze Mosaik-Zeichen
MGB	Magenta Background	Magenta Hintergrund
MGF	Magenta Foreground	Magenta Vordergrund
MMS	Marked Mode Start	Beginn des markierten Bereiches
MMT	Marked Mode Stop	Ende des markierten Bereiches
MSB	Mosaic Blue	Blaue Mosaik-Zeichen
MSC	Mosaic Cyan	Cyan Mosaik-Zeichen
MSG	Mosaic Green	Gruene Mosaik-Zeichen
MSM	Mosaic Magenta	Magenta Mosaik-Zeichen
MSR	Mosaic Red	Rote Mosaik-Zeichen
MSW	Mosaic White	Weisse Mosaik-Zeichen
MSY	Mosaic Yellow	Gelbe Mosaik-Zeichen

N

NAC	Negative Acknowledge	Negative Empfangsbestaetigung
NBD	New Background	Neuer Hintergrund
NPO	Normal Polarity	Normale Polaritaet
NSZ	Normal Size	Normale Groesse
NUL	Null character	Null-Zeichen

P

P	Pointer to following attribute bytes	Zeiger, der auf ein folgendes Attribut hinweist
P	Parameter in a CSI Sequence	Parameter in einer CSI-Sequenz
P-Byte	Parameter-byte (eq. in a CSI Sequence)	Parameter-Byte (z.B. in einer CSI-Sequenz)
PE	Presentation Entity	Darstellungsinstanz
PMC	Protected Mode Cancel	Erlaubt Ueberschreiben des geschuetzten Bereiches
PMS	Protected Mode Start	Beginn des geschuetzten Bereiches

R

RDB	Red Background	Roter Hintergrund
RDF	Red Foreground	Roter Vordergrund
RDS	Recording Device Start	Aufzeichnungsgeraet Starten
RDT	Recording Device Stop	Aufzeichnungsgeraet Stoppen
RDW	Recording Device Wait	Aufzeichnungsgeraet Warten
RDY	Reveal Display	Anzeige aufdecken
RGB	Red Green Blue	Rot Gruen Blau
RH	Hundreds value of rows	Hunderter-Stelle bei der Wahl der Reihenanzahl
RIF	Reduced Intensity Flash	Blinken mit abwechselnder reduzierter und voller Intensitaet (Blinken zwischen Farbtafeln)
RMS	Release Mosaic	"Hold Mosaic" wird beendet
RPT	Repeat	Wiederholen eines Formatzeichens (Parameter fuer N-mal)
RT	Tens value of rows	Zehner-Stelle bei der Wahl der Reihenanzahl
RU	Units value of rows	Einer-Stelle bei der Wahl der Reihenanzahl
Rx	Repeat last complete row x times	X-maliges Wiederholen der gesamten letzten Reihe

S

SBX	Start Box	Beginn der Box / des Fensters
SCD	Scroll Down	Reihen rollen nach unten
STC	Stop Conceal	Ende des verdeckten Bereichs
SCM	Select Coding Method	Auswahl der Kodierungsmethode
SCU	Scroll Up	Reihen rollen nach oben
SDC	Select Dot Composition	Auswahl der DRCS-Zusammensetzung (Dots/Zeile, Dots/Spalte)
SF	fill rest of character with '0'	Rest des Zeichens mit "0" fuellen
SI	Shift IN	G0-Zeichensatz in Spalte 2-7 aktivieren
SO	Shift OUT	G1-Zeichensatz in Spalte 2-7 aktivieren
SP	Space	Luecke, Leerzeichen
SPL	Stop lining	Ende des Unterstreichens/Separierens
SR	fill rest of character with last complete row	Rest des DRCS-Zeichens mit der gesamten letzten Reihe fuellen
Ss	fill rest of character with '1'	Rest des DRCS-Zeichens mit "1" fuellen
SS2	Single Shift	Ein einzelnes Zeichen des G2-Zeichensatzes aktivieren
SS3	Single Shift	Ein einzelnes Zeichen des G3-Zeichensatzes aktivieren
STD	Steady	Annulieren aller Blink-Attribute
STL	Start Lining	Beginn des Unterstreichens / Separierens
STX	Start of Text	Startzeichen des Textes
SUR	Select Unit Resolution	Pixeltiefe fuer Farbdefinition
S0	defines a complete row containing "0"	fuellt eine ganze DRCS-Zeichenzeile mit "0"
S1	defines a complete row containing "1"	fuellt eine ganze DRCS-Zeichenzeile mit "1"
S2	fill rest of character with "last row"	fuellt den Rest eines DRCS-Zeichens mit der letzten Reihe
S3	fill rest of character with "1"	fuellt den Rest eines DRCS-Zeichens mit "1"

T

TRB	Transparent Background	Transparenter Hintergrund

U

URH	Hundreds value of the upper row	Hunderter-Stelle bai der Wahl der obersten Reihe
URT	Tens value of the upper row	Zehner-Stelle bei der Wahl der obersten Reihe
URU	Units value of the upper row	Einer-Stelle bei der Wahl der obersten Reihe
US	Unit Separator	Trennungszeichen fuer eine komplette Uebertragungseinheit

V

VPDE	Videotex presentation data element	Videotex Presentations Daten Element
VPCE	Videotex presentation control element	Videotex Presentations Steuer-element
VSCE	Videotex service control element	Videotex Dienststeuerelement

W

WC	Wrap Around Control	Automatisches Zeilenweiter-schalten
WHB	White Background	Weisser Hintergrund
WHF	White Foreground	Weisser Vordergrund

Y

YLB	Yellow Background	Gelber Hintergrund
YLF	Yellow Foreground	Gelber Vordergrund

Annex 3

CHARACTER TABLES WITH ALLOCATION OF CHARACTERS TO G SETS AND STACK GROUPS

Characters	Character group in stack				Sum
	1	2	3	4	Cross-total
Latin alphabetical	98	127	9		234
decimal digits	10				10
currency sign			5		5
punctuation marks (including space)	15		6		21
arithmetics			7		7
subscripts/superscripts			3		3
fractions			3		3
miscellaneous symbols (including delete)	4		35		39
diacritical marks			13		13
Subtotal 1	127	127	81		335
fallback	1				1
inclusive space, delete and fallback					336
mosaic				63	63
smooth				56	56
linedrawing (including speckled)			32		32
Subtotal 2	128	127	113	119	487
additional spaces		1	1	1	
Total	128	128	114	120	490

Table A2-1: Summary of character types/groups

Character group 5 contains maximally 94 DRCS characters + 1 space (2/0).

Note:

- Space has only one code (2/0) but is available in all character groups.
- Del (7/15/ except in L-set) is only available in character group 1.
- * and # have 2 codes each but are only available in character group 1.
- Fallback character has no code allocation, but is available in group 1
- 7/15 of L-set corresponds to 5/15 of the 2nd supplementary set of mosaic characters.

The following tables show the allocation of the character sets (default G sets) to the stack character group.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code 1)				Group 2)		
			set	position	set	position	1	2	3
LA01	a	small a	G0	6/1			x		
LA02	A	capital A	G0	4/1			x		
LA11	á	small a with acute accent	G2	4/2	G0	6/1	x		
LA12	Á	capital A with acute accent	G2	4/2	G0	4/1		x	
LA13	à	small a with grave accent	G2	4/1	G0	6/1	x		
LA14	À	capital A with grave accent	G2	4/1	G0	4/1	x		
LA15	â	small a with circumflex accent	G2	4/3	G0	6/1	x		
LA16	Â	capital A with circumflex accent	G2	4/3	G0	4/1	x		
LA17	ä	small a with diaeresis or umlaut mark	G2	4/8	G0	6/1	x		
LA18	Ä	capital A with diaeresis or umlaut mark	G2	4/8	G0	4/1	x		
LA19	ã	small a with tilde	G2	4/4	G0	6/1	x		
LA20	Ã	capital A with tilde	G2	4/4	G0	4/1		x	
LA23	ă	small a with breve	G2	4/6	G0	6/1		x	
LA24	Ă	capital A with breve	G2	4/6	G0	4/1		x	
LA27	å	small a with ring	G2	4/10	G0	6/1	x		

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code [1]				Group [2]		
			set	position	set	position	1	2	3
LA28	Å	capital A with ring	G2	4/10	G0	4/1	X		
LA31	ā	small a with macron	G2	4/5	G0	6/1		X	
LA32	Ā	capital A with macron	G2	4/5	G0	4/1		X	
LA43	ą	small a with ogonek	G2	4/14	G0	6/1		X	
LA44	Ą	capital A with ogonek	G2	4/14	G0	4/1		X	
LA51	æ	small æ diphthong	G2	7/1			X		
LA52	Æ	capital Æ diphthong	G2	6/1			X		
LB01	b	small b	G0	6/2			X		
LB02	B	capital B	G0	4/2			X		
LC01	c	small c	G0	6/3			X		
LC02	C	capital C	G0	4/3			X		
LC11	ć	small c with acute accent	G2	4/2	G0	6/3	X		
LC12	Ć	capital C with acute accent	G2	4/2	G0	4/3		X	
LC15	ĉ	small c with circumflex accent	G2	4/3	G0	6/3		X	
LC16	Ĉ	capital C with circumflex accent	G2	4/3	G0	4/3		X	

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code [1]				Group [2]		
			set	position	set	position	1	2	3
LC21	č	small c with caron	G2	4/15	G0	6/3		X	
LC22	Č	capital C with caron	G2	4/15	G0	4/3		X	
LC29	ċ	small c with dot	G2	4/7	G0	6/3		X	
LC30	Ċ	capital C with dot	G2	4/7	G0	4/3		X	
LC41	ç	small c with cedilla	G2	4/11	G0	6/3	X		
LC42	Ç	capital C with cedilla	G2	4/11	G0	4/3	X		
LD01	d	small d	G0	6/4			X		
LD02	D	capital D	G0	4/4			X		
LD21	ď or ḋ	small d with caron	G2	4/15	G0	6/4		X	
LD22	Ď	capital D with caron	G2	4/15	G0	4/4			X
LD61	đ	small d with stroke	G2	7/2				X	
LD62	Đ	capital D with stroke, Icelandic eth	G2	6/2				X	
LD63	ð	small eth, icelandic	G2	7/3				X	
LE01	e	small e	G0	6/5			X		
LE02	E	capital E	G0	4/5			X		

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code [1]				Group [2]		
			set	position	set	position	1	2	3
LE11	é	small e with acute accent	G2	4/2	G0	6/5	X		
LE12	É	capital E with acute accent	G2	4/2	G0	4/5	X		
LE13	è	small e with grave accent	G2	4/1	G0	6/5	X		
LE14	È	capital E with grave accent	G2	4/1	G0	4/5	X		
LE15	ê	small e with circumflex accent	G2	4/3	G0	6/5	X		
LE16	Ê	capital E with circumflex accent	G2	4/3	G0	4/5		X	
LE17	ë	small e with diaeresis or umlaut mark	G2	4/8	G0	6/5	X		
LE18	Ë	capital E with diaeresis or umlaut mark	G2	4/8	G0	4/5		X	
LE21	ě	small e with caron	G2	4/15	G0	6/5		X	
LE22	Ě	capital E with caron	G2	4/15	G0	4/5		X	
LE29	ė	small e with dot	G2	4/7	G0	6/5		X	
LE30	Ė	capital E with dot	G2	4/7	G0	4/5		X	
LE31	ē	small e with macron	G2	4/5	G0	6/5		X	
LE32	Ē	capital E with macron	G2	4/5	G0	4/5		X	
LE43	ę	small e with ogonek	G2	4/14	G0	6/5		X	

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code [1]				Group [2]		
			set	position	set	position	1	2	3
LE44	Ę	capital E with ogonek	G2	4/14	G0	4/5		X	
LF01	f	small f	G0	6/6			X		
LF02	F	capital F	G0	4/6			X		
LG01	g	small g	G0	6/7			X		
LG02	G	capital G	G0	4/7			X		
LG11	ǵ	small g with acute accent	G2	4/2	G0	6/7		X	
LG15	ĝ	small g with circumflex accent	G2	4/3	G0	6/7		X	
LG16	Ĝ	capital G with circumflex accent	G2	4/3	G0	4/7		X	
LG23	ğ	small g with breve	G2	4/6	G0	6/7	X		
LG24	Ğ	capital G with breve	G2	4/6	G0	4/7		X	
LG29	ġ	small g with dot	G2	4/7	G0	6/7		X	
LG30	Ġ	capital G with dot	G2	4/7	G0	4/7		X	
LG42	Ģ	capital G with cedilla	G2	4/11	G0	4/7		X	
LH01	h	small h	G0	6/8			X		
LH02	H	capital H	G0	4/8			X		

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code [1]				Group [2]		
			set	position	set	position	1	2	3
LH15	ĥ	small h with circumflex accent	G2	4/3	G0	6/8		X	
LH16	Ĥ	capital H with circumflex accent	G2	4/3	G0	4/8		X	
LH61	ħ	small h with stroke	G2	7/4				X	
LH62	Ħ	capital H with stroke	G2	6/4				X	
LI01	i	small i	G0	6/9			X		
LI02	I	capital I	G0	4/9			X		
LI11	í	small I with acute accent	G2	4/2	G0	6/9	X		
LI12	Í	capital I with acute accent	G2	4/2	G0	4/9	X		
LI13	ì	small i with grave accent	G2	4/1	G0	6/9	X		
LI14	Ì	capital I with grave accent	G2	4/1	G0	4/9		X	
LI15	î	small i with circumflex accent	G2	4/3	G0	6/9	X		
LI16	Î	capital I with circumflex accent	G2	4/3	G0	4/9	X		
LI17	ï	small i with diaerosis or umlaut mark	G2	4/8	G0	6/9		X	
LI18	Ï	capital I with diaeresis or umlaut mark	G2	4/8	G0	4/9		X	
LI19	ĩ	small i with tilde	G2	4/4	G0	6/9		X	

1) In this table the code is allocated to the 'Default G-Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code[1]				Group[2]		
			set	position	set	position	1	2	3
LI20	Ĩ	capital I with tilde	G2	4/4	G0	4/9		X	
LI30	İ	capital I with dot	G2	4/7	G0	4/9		X	
LI31	ī	small i with macron	G2	4/5	G0	6/9		X	
LI32	Ī	capital I with macron	G2	4/5	G0	4/9		X	
LI43	į	small i with ogonek	G2	4/14	G0	6/9		X	
LI44	Į	capital I with ogonek	G2	4/14	G0	4/9		X	
LI51	ij	small ij ligature	G2	7/6			X		
LI52	IJ	capital IJ ligature	G2	6/6				X	
LI61	ı	small i without dot	G2	7/5					X
LJ01	j	small j	G0	6/10			X		
LJ02	J	capital J	G0	4/10			X		
LJ15	ĵ	small j with circumflex accent	G2	4/3	G0	6/10		X	
LJ16	Ĵ	capital J with circumflex accent	G2	4/3	G0	4/10		X	
LK01	k	small k	G0	6/11			X		
LK02	K	capital K	G0	4/11			X		

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code[1]				Group[2]		
			set	position	set	position	1	2	3
LK41	k ş	small k with cedilla	G2	4/11	G0	6/11		X	
LK42	K ş	capital K with cedilla	G2	4/11	G0	4/11		X	
LK61	k	small k Greenlandic	G2	7/0				X	
LL01	l	small l	G0	6/12			X		
LL02	L	capital L	G0	4/12			X		
LL11	ĺ	small l with acute accent	G2	4/2	G0	6/12		X	
LL12	Ĺ	capital L with acute accent	G2	4/2	G0	4/12		X	
LL21	ľ or l	small l with caron	G2	4/15	G0	6/12			X
LL22	Ľ or L	capital L with caron	G2	4/15	G0	4/12			X
LL41	l ş	small l with cedilla	G2	4/11	G0	6/12		X	
LL42	L ş	capital L with cedilla	G2	4/11	G0	4/12		X	
LL61	ŧ	small l with stroke	G2	7/8				X	
LL62	Ŧ	capital L with stroke	G2	6/8				X	
LL63	l·	small l with middle dot	G2	7/7				X	

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code 1)				Group 2)		
			set	position	set	position	1	2	3
LL64	L·	capital L with middle dot	G2	6/7				x	
LM01	m	small m	G0	6/13			x		
LM02	M	capital M	G0	4/13			x		
LN01	n	small n	G0	6/14			x		
LN02	N	capital N	G0	4/14			x		
LN11	ń	small n with acute accent	G2	4/2	G0	6/14		x	
LN12	Ń	capital N with acute accent	G2	4/2	G0	4/14		x	
LN19	ñ	small n with tilde	G2	4/4	G0	6/14	x		
LN20	Ñ	capital N with tilde	G2	4/4	G0	4/14	x		
LN21	ň	small n with caron	G2	4/15	G0	6/14		x	
LN22	Ň	capital N with caron	G2	4/15	G0	4/14		x	
LN41	ņ	small n with cedilla	G2	4/11	G0	6/14		x	
LN42	Ņ	capital N with cedilla	G2	4/11	G0	4/14		x	
LN61	ŋ	small eng. Lapp	G2	7/14				x	
LN62	Ŋ	capital eng. Lapp	G2	6/14				x	

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code 1)				Group 2)		
			set	position	set	position	1	2	3
LN63	ŉ	small n with apostrophe	G2	6/15				X	
L001	o	small o	G0	6/15			X		
L002	O	capital O	G0	4/15			X		
l011	ó	small o with acute accent	G2	4/2	G0	6/15	X		
L012	Ó	capital O with acute accent	G2	4/2	G0	4/15		X	
L013	ò	small o with grave accent	G2	4/1	G0	6/15	X		
L014	Ò	capital O with grave accent	G2	4/1	G0	4/15		X	
L015	ô	small o with circumflex accent	G2	4/3	G0	6/15		X	
L016	Ô	capital O with circumflex accent	G2	4/3	G0	4/15		X	
L017	ö	small o with diaeresis or umlaut mark	G2	4/8	G0	6/15	X		
L018	Ö	capital O with diaeresis or umlaut mark	G2	4/8	G0	4/15	X		
L019	õ	small o with tilde	G2	4/4	G0	6/15	X		
L020	Õ	capital O with tilde	G2	4/4	G0	4/15		X	
L025	ő	small o with double acute accent	G2	4/13	G0	6/15		X	
L026	Ő	capital O double acute accent	G2	4/13	G0	4/15		X	

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Alphabetic characters (ISO Repertoire for Latin-based characters)

ID	GRAPHIC	NAME OR DESCRIPTION	Code[1]				Group[2]		
			set	position	set	position	1	2	3
L031	ő	small o with macron	G2	4/5	G0	6/15		x	
L032	Ő	capital O with macron	G2	4/5	G0	4/15		x	
L051	œ	small œ ligature	G2	7/10			x		
L052	Œ	capital Œ ligature	G2	6/10			x		
L061	ø	small o with slash	G2	7/9			x		
L062	Ø	capital O with slash	G2	6/9			x		
LP01	p	small p	G0	7/0			x		
LP02	P	capital P	G0	5/0			x		
LQ01	q	small q	G0	7/1			x		
LQ02	Q	capital Q	G0	5/1			x		
LR01	r	small r	G0	7/2			x		
LR02	R	capital R	G0	5/2			x		
LR11	ŕ	small r with acute accent	G2	4/2	G0	7/2		x	
LR12	Ŕ	capital R with acute accent	G2	4/2	G0	5/2		x	
LR21	ř	small r with caron	G2	4/15	G0	7/2		x	

1) In this table the code is allocated to the 'Default G Set' invoked to the left.
2) Character group in stack memory.

Annex 6

Summary of codes and code sequences employed by the basic terminal (layer 6)

1st code	2nd code	3rd code	4th code	Primary Control Set in column o/... 1/...
0/0				NUL reserved Level 2 (time filler)
0/1				SOH "
0/2				STX "
0/3				ETX "
0/4				EOT "
0/5				ENQ "
0/6				ACK "
0/7				ITB "
0/8				APB active position back
0/9				APF active position foreward
0/A				APD active position down
0/B				APU active position up
0/C				CS clear screen
0/D				APR active position return
0/E				LS1 locking shift G1 to 2/... 7/...
0/F				LSO locking shift GO to 2/... 7/...

1st code	2nd code	3rd code	4th code	Primary Control Set in column 0/... 1/...
1/0				DLE reserved Level 2
1/1				CON cursor on
1/2	i			RPT repeat last i times (i = 4/1 .. 7/E)
1/3				INI reserved Level 7
1/4				COF cursor off
1/5				NAK reserved Level 2
1/6				SYN "
1/7				ETB "
1/8				CAN cancel
1/9				SS2 single shift G2 to 2/... 7/...
1/A				DCT reserved Level 7
1/B	x	x	x	ESC escape (for code extension) ==== (x = parameters)
1/C				TER reserved Level 7
1/D				SS3 single shift G3 to 2/... 7/...
1/E				APH active position home
1/F	x	x	x	US unit separator (also APA!!) ==== (x = parameters, more than 3 possible)

1st code	2nd code	3rd code	4th code	Supplementary Control 1 (serial) SC1 in column 8/... 9/...
8/0				ABK alphanumeric black (... = CLUT 1, colour 0)
8/1				ANR " red (..R = CLUT 1, colour 1)
8/2				ANG " green (.G. = CLUT 1, colour 2)
8/3				ANY " yellow (.GR = CLUT 1, colour 3)
8/4				ANB " blue (B.. = CLUT 1, colour 4)
8/5				ANM " magenta (B.R = CLUT 1, colour 5)
8/6				ANC " cyan (BG.= CLUT 1, colour 6)
8/7				ANW " white (BGR = CLUT 1, colour 7)
8/8				FSH flashing begin
8/9				STD " steady (end)
8/A				EBX end of window
8/B				SBX start of window
8/C				NSZ normal size
8/D				DBH double height
8/E				DBW " width
8/F				DBS " size

1st code	2nd code	3rd code	4th code	Supplementary Control 1 (serial) SC1 in column 8/... 9/...	
9/0				MBK mosaic black	(... = CLUT 1, colour 0)
9/1				MSR " red	(..R = CLUT 1, colour 1)
9/2				MSG " green	(.G. = CLUT 1, colour 2)
9/3				MSY " yellow	(.GR = CLUT 1, colour 3)
9/4				MSB " blue	(B.. = CLUT 1, colour 4)
9/5				MSM " magents	(B.R = CLUT 1, colour 5)
9/6				MSC " cyan	(BG. = CLUT 1, colour 6)
9/7				MSW " white	(BGR = CLUT 1, colour 7)
9/8				CDY conceal display	
9/9				SPL stop lining	
9/A				STL start lining	
9/B	x	x	x	CSI control sequence introducer === x = parameter (more than 3 possible)	
9/C				BBD black background	(CLUT 1, colour 0)
9/D				NBD new "	(= old foreground)
9/E				HMS hold mosaic	
9/F				RMS release "	

Annex 6

1st code	2nd code	3rd code	4th code	Supplementary Control 2 parallel SC2 in column 8/... 9/...
8/0				BKF foreground black (... = CLUT 1, colour 0)
8/1				RDF " red (..R = CLUT 1, colour 1)
8/2				GRF " green (.G. = CLUT 1, colour 2)
8/3				YLF " yellow (.GR = CLUT 1, colour 3)
8/4				BLF " blue (B.. = CLUT 1, colour 4)
8/5				MGF " magenta (B.R. = CLUT 1, colour 5)
8/6				CNF " cyan (BG. = CLUT 1, colour 6)
8/7				WHF " white (BGR = CLUT 1, colour 7)
8/8				FSH flashing begin
8/9				STD " steady (end)
8/A				EBX end of window
8/B				SBX start of "
8/C				NSZ normal size
8/D				DBH double height
8/E				DBW " width
8/F				DBS " size

1st code	2nd code	3rd code	4th code	Supplementary Control 2 parallel SC2 in column 8/.. 9/..
9/0				BKB background black (... = CLUT 1, colour 0)
9/1				RDB " red (..R = CLUT 1, colour 1)
9/2				GRB " green (.G. = CLUT 1, colour 2)
9/3				YLB " yellow (.GR = CLUT 1, colour 3)
9/4				BLB " blue (B.. = CLUT 1, colour 4)
9/5				MGB " magenta (B.R = CLUT 1, colour 5)
9/6				CNB " cyan (BG. = CLUT 1, colour 6)
9/7				WHB " white (BGR = CLUT 1, colour 7)
9/8				CDY conceal display
9/9				SPL stop lining
9/A				STL start lining
9/B	x	x	x	CSI control sequence introducer ==== (x = parameter) more than 3 possible
9/C				NPO normal polarity
9/D				IPO inverted "
9/E				TRB transparent background (= CLUT 2, colour 0)
9/F				STC stop conceal

US	X	Y	...	VDPE's (US sequences 1) US Sq 1
1/F	2/3			Character definitions (DRCS)
		2/0	...	DRCS Header
		Y		Y = 2/1 ... 2/E DRC Transfer
	2/6			Colour definition
		2/0	...	Colour header
		2/1		Colour reset
		3/e		Colour information for entry (e)
	2/D	...	...	Colour definition
	2/F			Reset sequences
		4/0	X	Service break to row x = 4/1 ... 7/E
		4/1		Terminal reset serial with CS
		4/2		Terminal reset parallel with CS
		4/3		Terminal reset serial without CS
		4/4		Terminal reset parallel without CS
		4/F		Reset to previous mode
	X	Y		APA alphamosaic X,Y = 4/0 ... 7/E

ESC				CO code extension ESC Sq 1+2
1/B	2/2	F		Invocation of C1 with F = 4/...
		4/0		serial C1 set (SC1)
		4/1		parallel C1 set (SC2)
	2/3	2/0	Fe	full screen attributes Fe = SC2 4/.. 5/..
		2/1	Fe	full row attributes Fe = SC2 4/.. 5/..
	G	F		Designation Graphic F to G-set
	2/8	F		F = G0
	2/9	F		F = G1
	2/A	F		F = G2
	2/B	F		F = G3
	G	4/0		Primary Graphic (PGS) = G
	G	6/2		Supplementary Graphic (SGS) = G
	G	6/3		2nd. Supplementary Mosaic (SM2) = G
	G	6/4		3rd. Supplementary Mosaic (SM3) = G
	G	2/0	4/0	DRCS 1 (DR1) = G
1/B	4/x			C1 in 7 bit x = 0 ... F = 8/x NOT USED
	5/x			C1 in 7 bit x = 0 ... F = 9/x NOT USED
	6/E			LS2 lock shift left G2 to 2/... 7/...
	6/F			LS3 lock shift left G3 to 2/... 7/...
	7/C			LS3R lock shift right G3 to A/... F/...
	7/D			LS2R lock shift right G2 to A/... F/...
	7/E			LS1R lock shift right G1 to A/... F/...

CSI				C1 code extension	CSI Sq
9/B	3/0	4/0		CT1 locking shift in CLUT1	
	3/1	4/0		CT2 " CLUT2	
	3/2	4/0		CT3 " CLUT3	
	3/3	4/0		CT4 " CLUT4	
	3/0	4/1		IVF flash inverted	state =
	3/1	4/1		RIF " to second colour	two phase
	3/2	4/1		FF1 " 3-phase phase 1	state =
	3/3	4/1		FF2 " 2	if defined then pertaining elese normal
	3/4	4/1		FF3 " 3	
	3/5	4/1		ICF " incremental	
	3/6	4/1		DCF " decremental	
	4/2			STC stop conceal (for serial control)	
	3/2	5/4		MMT marked mode stop SP	
9/B	P	5/5		CSA create scrolling area P = row-u; row-1	
	P	5/6		CSD delete " " P = row-u; row-1	
	3/0	6/0		SCU explicite scroll up	
	3/1	6/0		SCD " down	
	3/2	6/0		AIS activate implicite scrolling	
	3/3	6/0		DIS deactivate " "	

1. Standardized or recommended options for the presentation layer

Standardized or recommended options are not described in the functional specification for the basic terminal. They are only listed hereafter and described in CEPT Recommendation T/CD 6-1 which can be regarded as an integral part of this document (Annex 7), but is for the time beeing distributed as a separate paper identified by no. 157 D 2 CEPT.

1.1 Standardized options

Standardized options for the basic service are those features or display modes which may be implemented optionally.

In case of implmentation these options have to adhere to the functional descriptions given below for the corresponding facilities.

- o Geometric display

  According to CEPT T/CD 6-1, Part 2, which is based on the ISO Standard for the Graphical Kernel System (GKS). The geometric functions are divided into 4 classes (see T/CD 6-1, Part 2, Chapter 5.2).

  Classes 1 and 2 are the basic geometric functions, while classes 3 and 4 are intended for implementation by more complex and sophisticated geometric terminals. Some of the functions of class-3 and class-4 geometric are still under consideration at the moment because implementation of these more complex functions has not yet been finalized.

- o Photographic display protocol according to CEPT T/CD 6-1, Part 3

  In case of implementation of a photographic mode which conforms to T/CD 6-1 the protocol structure described in T/CD 6-1 is mandatory. It is not mandatory to implement the photographic modes described in Appendices A and B, these are recommended options only. When the implemented photographic mode differs from those described in Appendices A and B, its parameters are to be described by means of the protocol (transfer and header units).

- o Transparent data according to CEPT T/CD 6-1, Part 7.

- o Telesoftware

  A protocol for telesoftware identification and its structure according to T/CD 6-1, Part 9.

- o Terminal facility identifier

  According to T/CD 6-1 to allow the identification of several terminal facility levels by the service.

1.2 Recommended options

These are optional features described or referred to in this document or T/CD 6-1 to which strict adherence is not mandatory; however, it is recommended that they be implemented in the way described in the relevant parts.

Examples for these options are

- elements of the alphamosaic mode which are not part of the basic terminal but described in T/CD 6-1
- format designations which are not part of the basic terminal but described in T/CD 6-1
- photographic mode according to Appendices A or B of Part 3 of T/CD 6-1.

SPECIAL EDITOR FUNCTIONS

1. CONTROL CHARACTERS ACCEPTED BY THE ON-LINE EDITOR OF THE BTX EXCHANGE

The following codes/code sequences are accepted by the on-line editor of the Btx Exchange (here only serial mode, phase 1, the functions of the on-line editor will be extended to parallel mode in phase 2 which is expected for 1985)

ESCAPE

1/11

ESC 7/14	G1	to	10 – 15	Locking	→	(invoke)
ESC 6/14	G2		2 – 7	Locking		
ESC 7/13	G2		10 – 15	Locking		
ESC 6/15	G3		2 – 7	Locking		
ESC 7/12	G3		10 – 15	Locking		

ESC 2/2 4/0 C1 serial to 8 – 9 (invoke)

ESC 2/8 4/0	G0–Default	to	G0
ESC 2/9 4/0	G0–Default	to	G1 → (designate)
ESC 2/10 4/0	G0–Default	to	G2
ESC 2/11 4/0	G0–Default	to	G3
ESC 2/8 6/3	G1–Default	to	G0
ESC 2/9 6/3	G1–Default	to	G1 → (designate)
ESC 2/10 6/3	G1–Default	to	G2
ESC 2/11 6/3	G1–Default	to	G3
ESC 2/8 6/2	G2–Default	to	G0
ESC 2/9 6/2	G2–Default	to	G1 → (designate)
ESC 2/10 6/2	G2–Default	to	G2
ESC 2/11 6/2	G2–Default	to	G3
ESC 2/8 6/4	G3–Default	to	G0
ESC 2/9 6/4	G3–Default	to	G1 → (designate)
ESC 2/10 6/4	G3–Default	to	G2
ESC 2/11 6/4	G3–Default	to	G3
ESC 2/8 2/0 4/0	DRCS	to	G0
ESC 2/9 2/0 4/0	DRCS	to	G1 → (designate)
ESC 2/10 2/0 4/0	DRCS	to	G2
ESC 2/11 2/0 4/0	DRCS	to	G3

LS0 (0/15)	G0	to	2 – 7	LOCKING	→	(invoke)
LS1 (0/14)	G1	to	2 – 7	LOCKING		
SS2 (1/9)	single shift 2 from G2				→	applies only to the next character
SS3 (1/13)	single shift 3 from G3					
ESC 2/3 2/0 (fe)	Full Screen Attributes					(fe) from columns 4–5 of the code tables
ESC 2/3 2/1 (fe)	Full Row Attributes					

UNIT SEPARATOR

1/15 (US)

US < Character 4/1 to 7/14>

US 2/13	Define FORMAT	24 x 40, wraparound ON
US 2/13 7/1	Define FORMAT	24 x 40, wraparound OFF
US 2/13 4/2	Define FORMAT	20 x 40, wraparound ON
US 2/13 4/2 7/1	Define FORMAT	20 x 40, wraparound OFF
US 2/15 4/3	Reset limited defaults	

Default US sequences must not be transmitted.
Wraparound ON/OFF is accepted during the editor session but not adopted as page contents code.

A T T R I B U T E S

COLOUR

fs = full screen
fr = full row
s = serial
m = mosaic

8/0	ABK black ALPHA	s	→ displayable area, foreground, alpha
8/1	ANR red	s	
8/2	ANG green	s	
8/3	ANY yellow	s	
8/4	ANB blue	s	
8/5	ANM magenta	s	
8/6	ANC cyan	s	
8/7	ANW white	s	
9/0	MBK black MOSAIC	m	→ displayable area, foreground, mosaic
9/1	MSR red	m	
9/2	MSG green	m	
9/3	MSY yellow	m	
9/4	MSB blue	m	
9/5	MSM magenta	m	
9/6	MSC cyan	m	
9/7	MSW white	m	
9/13	NBD new BACKGROUND	s	→ displayable area, background
9/12	MSB black BACKGROUND	s	
ESC 2/3 2/1 (4/0 - 4/7)		fr	full-row, foreground colour
ESC 2/3 2/1 (5/0 - 5/7)		fr	full-row, background colour
ESC 2/3 2/0 (5/0 - 5/7)		fs	full-screen background colour

TRANSPARENT

Prerequisite:

CSI 3/1 4/0 colour table 2 (invoke)

Then :

8/0	transparent, foreground, alpha
9/0	transparent, foreground, mosaic
8/0 + 9/13	transparent background and transparent foreground
9/0 + 9/13	transparent background and transparent foreground

ESC 2/3 2/1 4/0 transparent, full row, foreground

ESC 2/3 2/1 5/0 transparent, full row, background

ESC 2/3 2/0 5/0 transparent, full screen background

Independently of the Clut:

ESC 2/3 2/1 5/14 transparent, full row background

ESC 2/0 2/1 5/14 transparent, full screen background

UNDERLINING

9/10	STL	start lining	s
ESC 2/3 2/1 5/10			fr
9/9	SPL	stop lining	s
ESC 2/3 2/1 5/9			fr

SIZE

8/12	NSZ	normal size	s
ESC 2/3 2/1 4/12			fr
8/13	DBH	double height	s
8/14	DBW	double width	s
8/15	DBS	double size	s

FLASH

8/9	STD	steady	s	
ESC 2/3 2/1 4/9			fr	
8/8	FSH	flash	s	┐
ESC 2/3 2/1 4/8			fr	├-> default 50 %
CSI 3/0 4/1	IVF	invert flash	s	┘
CSI 3/1 4/1	RIF	between colour tables	s	
CSI 3/2 4/1	FF1	fast flash 1	s	┐
CSI 3/3 4/1	FF2	fast flash 2	s	├-> default FSH (8/8)
CSI 3/4 4/1	FF3	fast flash 3	s	┘
CSI 3/5 4/1	ICF	increment flash	s	
CSI 3/6 4/1	DCF	decrement flash	s	

CONCEAL

9/8	CDY	conceal display	s
ESC 2/3 2/1 5/8			fr
CSI 4/2	STC	stop conceal	s
ESC 2/3 2/1 5/15			fr

WINDOW/BOX

8/11	SBX	start box	s
ESC 2/3 2/1 4/11			fr
8/10	EBX	end box	s
ESC 2/3 2/1 4/10			fr

MARKED MODE

CSI 3/2 5/3	MMS	Marked Mode Start	s
CSI 3/2 5/4	MMT	Marked Mode Stop	s

PROTECTION

CSI 3/1 5/0 PMS Protect Mode Start fr
CSI 3/1 5/1 PMC Protect Mode Cancel fr

POLARITY

ESC 2/3 2/1 5/12 NPO normal polarity fr
ESC 2/3 2/1 5/13 IPO inverted polarity fr

C O L O U R T A B L E S

CSI 3/0 4/0 CT1 colour table 1
CSI 3/1 4/0 CT2 colour table 2
CSI 3/2 4/0 CT3 colour table 3
CSI 3/3 4/0 CT4 colour table 4
→ (invoke)

C U R S O R C O N T R O L

APA	1/15 (r) (c)	active position addressing	
APB	0/8	"	back
APF	0/9	"	forward
APD	0/10	"	down
APU	0/11	"	up
APR	0/13	"	return
APH	0/14	"	home
CAN	1/8	cancel	
SP	2/0	space	
RPT	1/2 (n)	repeat	
DEL	7/15	delete	

F U N C T I O N S (LAYER 7)

CS	0/12	clear screen
INI	1/3	initiator
TER	1/12	terminator
DCT	1/10	data collection terminator

Bulk updating procedure

The description of the bulk updating procedure is an integral, part of this document (Annex 9), but is for the time being distributed as a separate paper identified by no. 157 D 2 BULK.

It describes the structure of pages and data fields which is necessary for off-line editing and automatic page transfer to the Btx-exchange without user guidance by the on-line editor the Btx-exchange