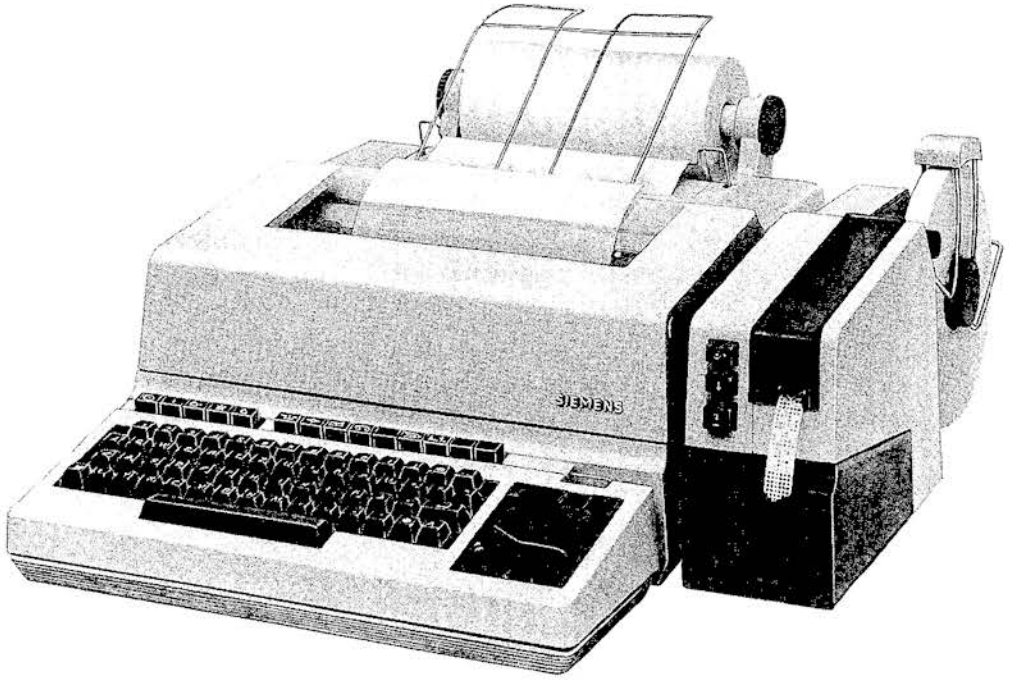
SIEMENS

Teleprinter Model 1000

Description
General Section



1

Contents

1. GENERAL

The Teleprinter Model 1000 is an electronic page teleprinter for communication in 5-bit codes. It conforms to the recommendations laid down by the CCITT and is therefore capable of interworking with existing and future teleprinters throughout the world.

The Teleprinter Model 1000 employs future-oriented technologies, such as LS/MOS technology, robust stepping motors and wear-resistant plastics. The mechanical equipment has been reduced to a minimum. A central drive, necessarily involving a great number of gear elements, has been ruled out right from the outset. This has permitted a maintenance-free teleprinter to be designed with consistently efficient telegraphic capabilities. It is very quiet in operation and has a low volume. Thanks to its pleasing appearance, it blends well with any office environment.

The teleprinter incorporates human engineering features and is very easy to operate. For instance the operator's typing speed is not limited because the electronically coding keyboard, in conjunction with a buffer, has no need for a keyboard inhibition at speeds even as low as 50 bauds. Letters/figures shift is carried out automatically. Only one key must be struck for the New Line function (carriage return and line feed). The same applies to the umlauts ä, ö and ü which are transmitted as combinations ae, oe and ue.

The Teleprinter Model 1000 is an impact printer, uses commercial ink ribbon and ordinary paper and is characterized by its outstanding print quality. The types are arranged on a print wheel (type disk) which can be easily replaced.

The two-color print control permits transmitted text to be printed out in red and received text in black.

An essential feature of the Teleprinter Model 1000 is that it is constructed throughout of modules. All modules are connected to the basic electronics (central control unit) via cables and plugs and can be exchanged very easily and quickly without the need for mechanical or electrical adjustments. In the case of a fault condition, the faulty module can be located and replaced quickly and without any difficulties on the subscriber's premises, no special tools being necessary. The faulty module is repaired in a central workshop.

The Teleprinter Model 1000 can be fitted with an answerback unit, tape punch and tape reader without the basic configuration having to be altered. It is also possible for the tape punch and reader to be replaced by a magnetic tape cassette unit.

The line interfacing modules are integrated in the Model 1000. Replacement of these modules permits the teleprinter to be adapted to a wide variety of signalling types, line conditions and communications networks.

A large number of customer requirements can be easily satisfied by simple alterations to the special-functions module without any special equipment - also on site.

The Teleprinter Model 1000 is capable of working in the local and on-line modes: When working in the local mode, the signalling speed of the teleprinter is invariably 100 bauds (800 characters/minute) irrespective of the signalling speed used on the line. When working on the line, the teleprinter can be set to operate at 50, 75 or 100 bauds.

The Model 1000 can be hooked up to point-to-point circuits, switched networks (telex network, gentex network, dedicated networks and via modems to telephone networks), private automatic branch exchanges (PABX) and radioteleprinter circuits. It can also be used as a console typewriter or log printer for data-oriented applications.

The number to be dialled for establishing a connection is invariably entered on the keyboard, even if dialplate selection is used. The electronic control generates the pulses and causes the dialled number to be printed out.

The teleprinter also permits working in step-by-step character release mode. In this operating mode, each character to be sent requires an external call pulse which is supplied to the teleprinter via a separate line.

If the Model 1000 is required in its receiving-only (RO) configuration, it is available without keyboard and is accomodated in a modified cover.

The Model 1000 can be mounted on a console to enable it to function as a free-standing office unit.

2. TECHNICAL DATA

Telegraph alphabet	International Telegraph Alphabet No. 2 (CCITT) and other 5-bit codes
Signalling speed	50 bauds, if required switchable to 75 bauds 100 bauds
in local mode	100 bauds invariably
Stop element length for transmissions	1.5 unit
Minimum length of stop element for signals received	1.0 unit
Deviation from rated signalling speed	< 1 ‰
Receive margin	49%...44% depending on the line interfacing equipment
Transmit distortion	< 1%...5% depending on the line interfacing equipment
AC power voltage and frequency	187V...264V; 40 Hz...70 Hz or 93.5 V...140 V; 40 Hz...70 Hz (ac and dc current) } adjustable by means of strap on the power supply module
Device fuse	2.5 A medium lag (independent of the ac power voltage)
Power draw without/ with attachment devices	in standby condition 40 W in operation condition 90/120 W
RF suppression	Grade K in accordance with the VDE standards 0875 laid down in the Federal Republic of Germany

Printer

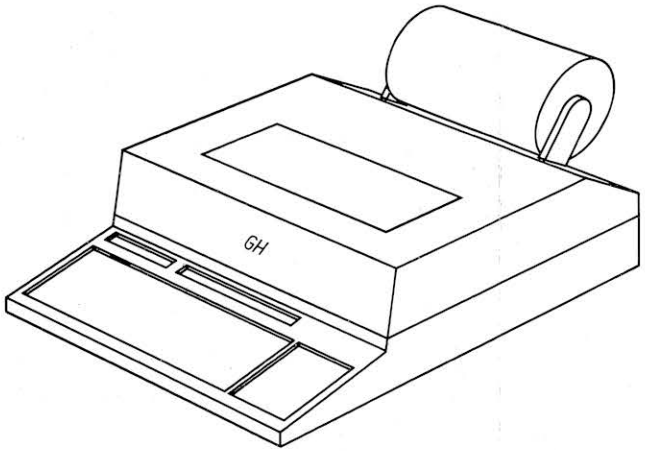
Printable characters	56 characters max.
Number of plies	1 original and 3 carbon copies
Ink ribbon	13 mm wide typewriter ribbon (DIN Standard 2103)
Type style	upper or lower case letters type font OCR-B other type styles on request
Character spacing	2.54 mm (1/10")
Line spacing	adjustable by operator

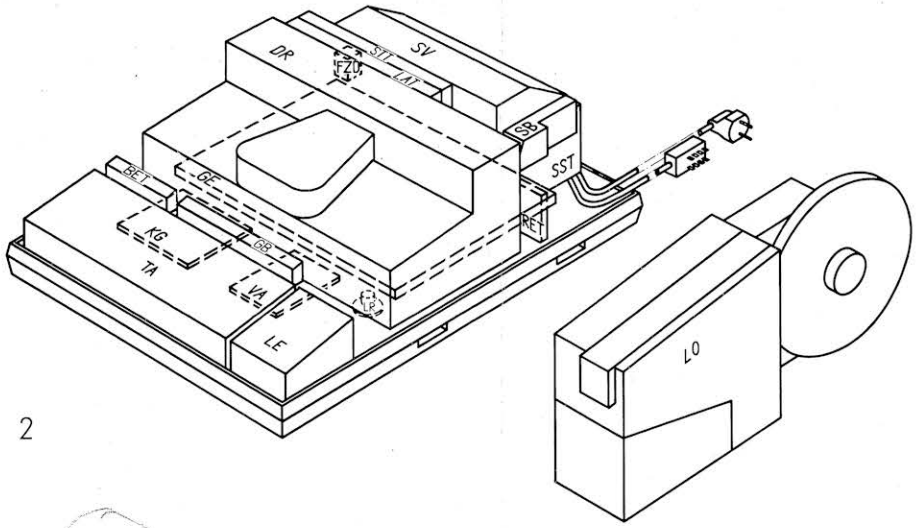
single	1 1/2	double
4.23 mm 1/6"	6.35 mm 1/4"	8.46 mm 1/3"

Two-color print control	outgoing transmission - red print incoming transmission - black print external control if required
Number of characters/line	69 or 72 adjustable for paper widths of 210 or 216 mm 80 characters for paper 250 mm wide with margin perforations
Teleprinter paper	to DIN Standard 6720 sh. 1
Width of teleprinter paper	210 mm, 216 mm (8.5")
or if required	250 mm
or fanfold paper on request	216 mm (8.5"), 250 mm
Diameter of supply roll	outer: 120 mm (5"), 170 mm max. on request
Paper supervision	end-of-paper contact, paper-out condition signalized to the line interfacing equipment for appropriate action
Keyboard	four-row standard keyboard or three or four-row condensed keyboard
n-key rollover function	
keyboard layout	to customer's specification
Key release force	0.8 N
Key stroke	5 mm approx.
Letters/figures shift	automatic
End-of-line warning	audible signal at the 59th character
Overprint lock	after 69 or 72 characters possible
Answerback code	up to 20 freely selectable characters
Tripping	162.5 ms after reception of "who are you" (relative to the start element)
Line interfacing equipment	to customer's specification
Call pulse	
pulse duration	1.5...5 units
pulse sequence	7 units minimum
Punched tape	17.4 mm to DIN Standard 6720, sh. 2
Roll diameter	max. 210 mm
Perforation	to DIN Standard 66016, sh. 1
Magnetic tape	magnetic tape cassette to DIN Standard 66211, sh. 1 and 2, drafted April 1974

Operating noise level without/with attachment devices at 100 bauds (DIN Standard 45635)	< 51/53 dB (A)	
Ambient conditions		
during operation	0...50°C, 10%...90% relative humidity	
during storage and transportation	-25°C...+70°C	
Operating position	Sloped at up to 25° to the horizontal	
Cover dimensions without/ with paper roll (120 mm ø)	Width:	approx. 415/415 mm
	Height:	approx. 208/300 mm
	Depth:	approx. 545/600 mm
with tape punch	Width:	approx. 527 mm
with mag tape unit	Width:	approx. 542 mm
receiving-only machine without/with paper roll (120 mm ø)	Depth:	approx. 440/495 mm
Weight		
receiving-only (RO) machine	approx. 17 kg	
keyboard send/receive (KSR) machine	approx. 19 kg	
with paper tape devices	approx. 24 kg	
with mag tape unit	approx. 22 kg	

BET	Manual controls for switching functions	LO	Tape punch
DR	Printer	LR	Loudspeaker
FZD	Special signal socket	MB	Magnetic tape unit (not shown)
GB	Manual device controls	RET	Relay module
GE	Basic electronics	SB	Switch module
GH	Cover	SST	Protector
KG	Answerback module	STT	Control module
LAT	Line adapter	SV	Power supply
LE	Tape reader	TA	Keyboard
		VA	Special-function module





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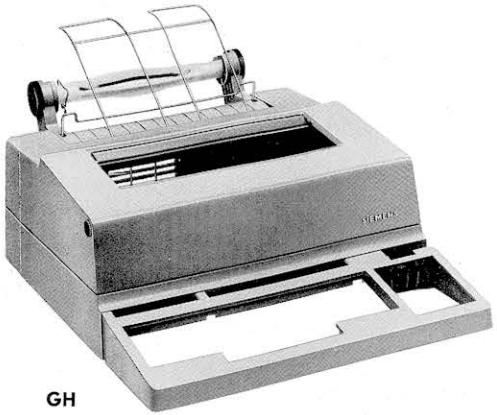
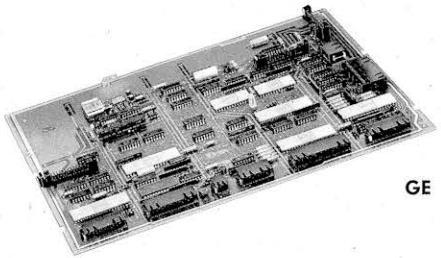
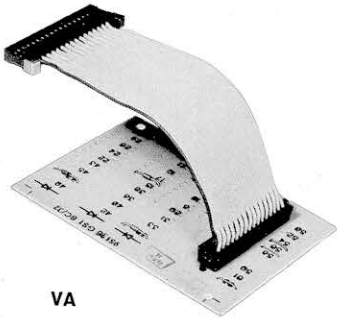


GH

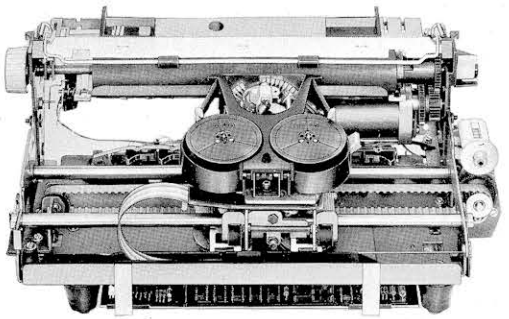


GE

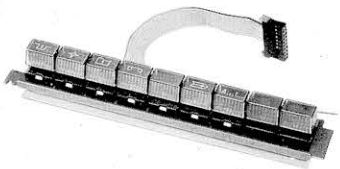


VA

TA



DR



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3. CONSTRUCTION OF THE TELEPRINTER MODEL 1000

(Figure 2)

The Teleprinter Model 1000 is made up of the following modules (Figure 3):

Cover (GH)

The cover consists of light-weight injection-moulded plastic parts. It carries the paper roll holder and holds the lamps which illuminate the print position.

Basic electronics (GE)

The basic electronics is the central control unit for all logic functions. It consists of a pc board and includes transmitter, receiver, the keyboards and printer control, and the controls for the operating modes and the paper tape devices.
The basic electronics is predominantly based on MOS. There is a version for use in the RO teleprinter and a version for use in the KSR teleprinter.

Special-function module (VA)

The special-function module offers a simple means for selecting certain device functions from a variety of options.
It consists of a pc board equipped with diodes or straps according to the device functions selected. Modifications to the special-function module may be carried out on the customer's premises.

Keyboard (TA)

The keyboard consists of individual keys assembled on a mounting board.
The keys are wired on a pc board through diodes and straps. This allows different keyboard layouts to be set up. The electronic coding is implemented in the basic electronics.

Printer (DR)

The printable letters, figures and symbols are arranged on a print wheel of special wear-resistant plastic. This is rotated to the print position by a stepping motor. Printing takes place via an electronically controlled print hammer, the print wheel being stationary. Two stepping motors are used, one for line feed and the other for carriage feed. When the direction of rotation of the latter is reversed it also performs the carriage return function. 4-ply papers can be printed with perfect legibility. The print force is adjustable.
The ink ribbon and print wheel can be easily replaced by the operator.
A contact signalizes the end-of-paper condition. Different responses to this signal are possible.

Manual device controls (GB)

This module comprises the control and indicator elements for the device functions such as unblocking of the keyboard, tripping of the answerback unit or setting the tape punch to continuously ON.

Switch module (SB) (Figure 4)

Located on the switch module is a multiple switch by means of which the print force, the line spacing and, if required, the signalling speed can be set. It also includes the lid contact which, for switching-oriented purposes, signalizes whether the cover lid is open or closed.

Power supply (SV)

The power supply provides all the voltages and currents required for operation of the teleprinter. The new principle it applies ensures low-loss operation. Protection facilities against short-circuiting and excessive heat generation guarantee the reliable operation of the power supply.

RF suppressor (FE)

With the RF suppressor (not shown), grade K is complied with at the ac main power side of the power supply. It also protects the power supply against disturbances from outside such as lightning or overvoltage.

Loudspeaker (LR)

The audible signals at the end of a line and for an incoming call are given over a loudspeaker.

Tape punch (LO)

The tape punch comes in a separate cover and can be retrofitted to the teleprinter, if so desired, without the need for mechanical or electrical adjustment.
Identical rotary armature magnets drive the punch needles and the feed sprocket wheel for transporting the punched tape. Control buttons on the tape punch enable blank tape feed and tape backspacing.
The chad waste box in the tape punch is large enough to collect the cuttings from a whole roll of paper tape.

Tape reader (LE)

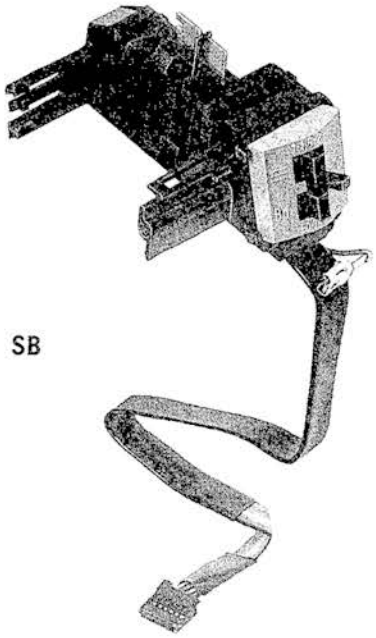
The reader can also be retrofitted without the need for mechanical or electrical adjustment. It is incorporated in the right of the teleprinter next to the keyboard.
If no reader is installed in the Model 1000, its position is covered with a panel.
The reader employs a photoelectric reading method, the tape being fed forward either continuously or by one character at a time.
A sprocket wheel driven by a stepping motor feeds the tape forward.

Magnetic tape unit (MB)

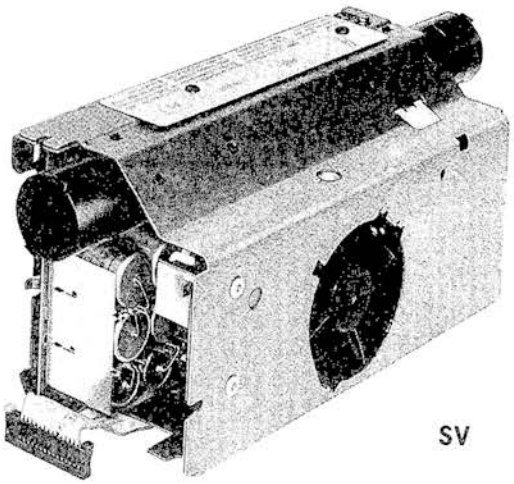
A magnetic tape unit performs the functions of the tape punch and reader and also enables corrections to be made more simply. It is attached to the teleprinter instead of the tape punch. The electrical connections of the magnetic tape unit are compatible with those of the tape punch and reader.

Answerback module (KG)

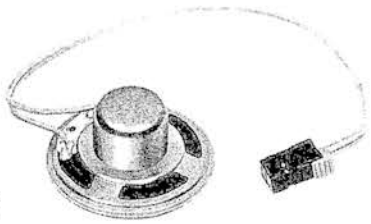
The answerback module consists of a pc board with a diode matrix in which up to 20 characters can be stored. The coding of the answerback module can also be undertaken on the customer's premises. This is done by cutting out diodes from the diode matrix.



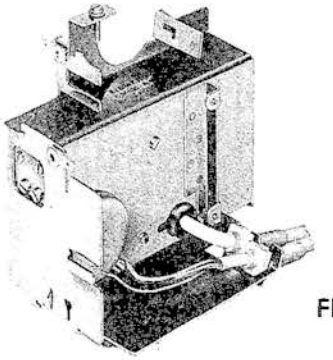
SB



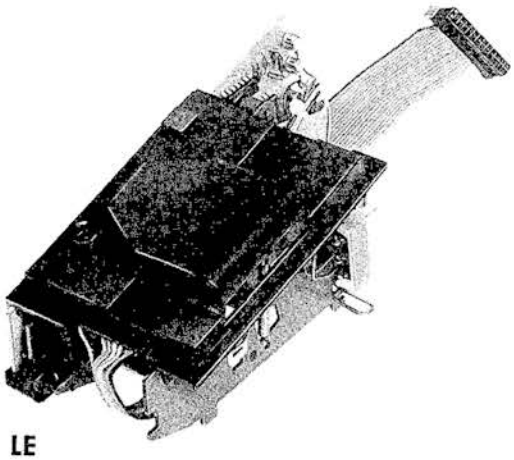
SV



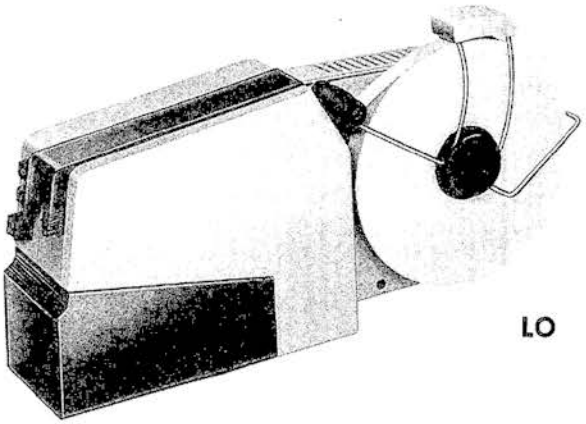
LR



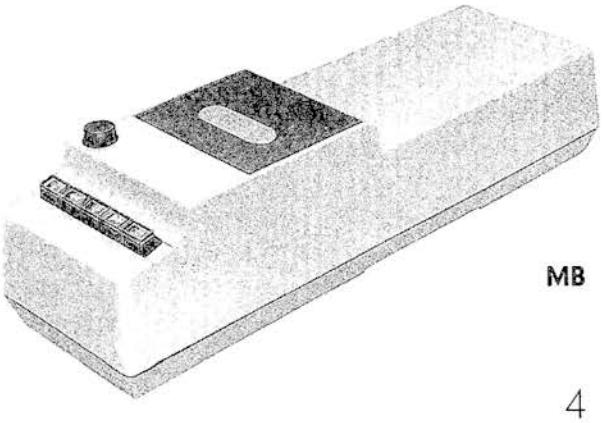
FE



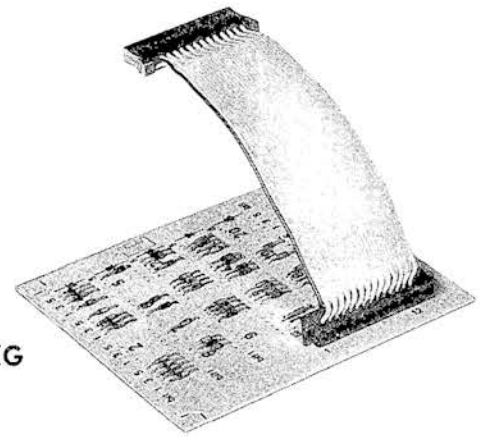
LE



LO



MB



KG

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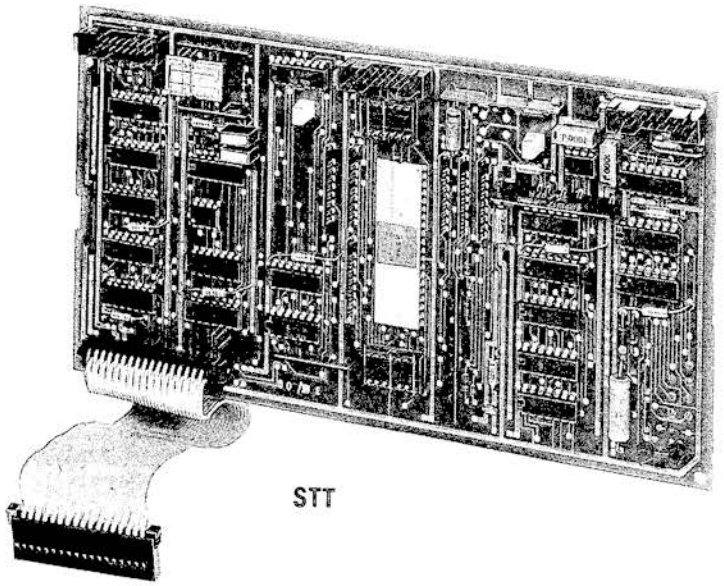
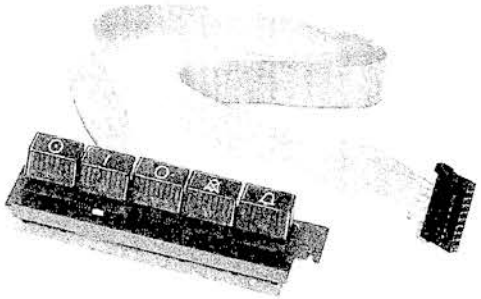
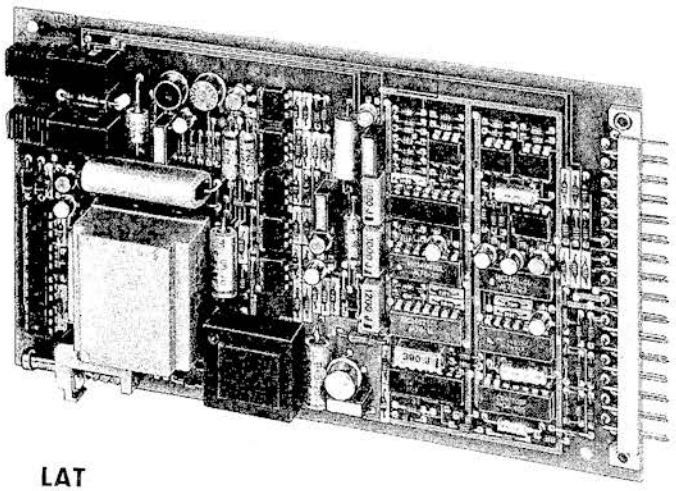


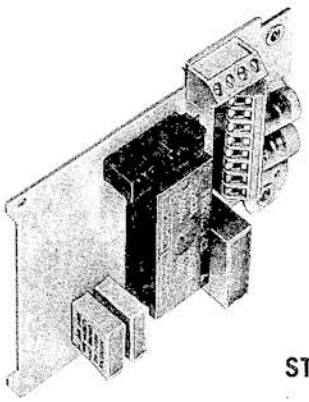
STT



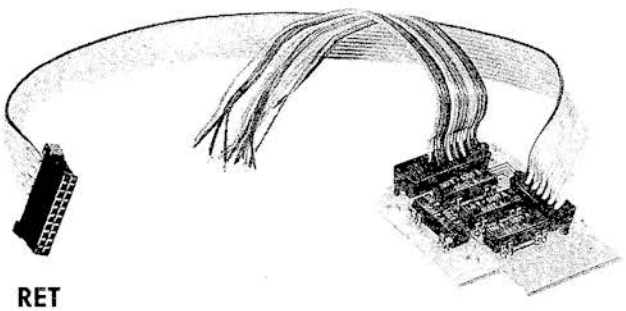
BET



LAT



STT



RET

FZD

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Modules of the line interfacing system (Figure 5)

Different versions of the following modules from different "signalling units" or "matching units".

The signalling unit (FSE) is used for operation in automatically switched networks. The matching unit (APE) is used for connecting the teleprinter to a point-to-point circuit.

Control module (STT)	The control module is a pc board containing the digital circuits for the switching functions, such as setting up and clearing a connection.
Manual controls for switching functions (BET)	The manual controls module works together with the control module. It comprises the controls and indicators for the switching functions. These include call button, disconnect button and local (off-line) button.
Line adapter (LAT)	The line adapter is a pc board which converts the internal voltage levels of the teleprinter to the level on the line. Here, too, dc-decoupling between line and teleprinter takes place.
Protector (SST)	This module ensures that the radio interference suppression satisfies the applicable requirements. In addition, protective facilities against overvoltages on the telegraph line are incorporated.

The signalling and matching units can be supplemented by the relay module and the special signal socket.

Relay module (RET)	This module may contain one or four relays with floating contacts for external control purposes.
Special signal socket (FZD)	The 8-point special signal socket is used for connecting special lines not included in the telegraph line.

4. FUNCTIONAL CONDITIONS

A distinction is made when operating the teleprinter between the standby condition and the operating condition. In the operating condition the teleprinter is set to the local or the on-line mode. In the standby condition, the teleprinter still remains connected to the mains power voltage.

4.1. Standby condition

Approximately 200 ms after application of the ac power voltage, the teleprinter is in the standby condition which is defined as follows:
The control electronics has voltage applied to it in order to be able to recognize control signals,
the input units (keyboard, answerback module, tape reader or magnetic tape unit) and the output units (printer, tape punch or magnetic tape unit) are blocked,
the lighting and blower are switched off and
all stepping motors and all magnets are deenergized.

4.2. Operating condition

In the operating condition a distinction is made between idle and printing condition:

Idle: 0.5 s at the latest after switching on an operating mode, either local or on-line, the teleprinter becomes ready to operate. Keyboard and printer are unlocked, the other input and output units can be activated.
The fan starts to operate and
the print position light is switched on.

Printing: same as idle condition, but at least one input or output unit is in operation.

4.2.1. LOCAL MODE

Local operation is activated by pressing the local button [I] , which is included in the manual controls for switching functions.

The following functions can be performed during local operation:

input of text via the keyboard or the tape reader,
preparation and correction of punched tape,
duplication of punched tape,
preparation and correction of magnetic tapes.

The operating speed in the local mode is invariably 100 bauds. Messages are printed in red only.

In local operation, the information passes from the input units via the basic electronics to the control module and from there, again via the basic electronics board, to the output units.

An incoming call causes the transmitting answerback module, the tape reader and punch (or the magnetic tape unit) to stop automatically and the on-line mode to be activated.

Characters held in the keyboard buffer are erased while characters from the printer buffer will be printed.

The exact procedure is dependent on the particular line interfacing equipment used.

4.2.2. ON-LINE OPERATION

The on-line mode is activated by an incoming call or by pressing the call button ⊙ which is included in the manual controls for switching functions.

In the case of dialplate selection, too, the subscriber number is entered on the keyboard. After the proceed-to-dial signal has been received from the exchange, the keyboard of the Teleprinter Model 1000 is inoperative, except for the figures keys. In the send control (module 2, Fig. 3), the dial pulses are generated and the dialled digit is caused to be transmitted and printed out. As soon as the connection to the dialled subscriber is established, the entire keyboard is automatically released for message transmission.

During on-line operation in the half-duplex mode, the incoming message may be interrupted by the receiving subscriber by his breaking in on the transmission.

In the on-line mode, the information being transmitted passes from the input units via the basic electronics and the signalling unit or matching unit to the telegraph line. In half-duplex operation, the information to be transmitted is also passed to the home output units, just as in local operation.

In the receive direction, the information comes in from the telegraph line via the signalling unit or matching unit and the basic electronics to the output units.

5. PRINCIPLE OF OPERATION

(Figure 6)

5.1. Transmission

Information is entered in the teleprinter via the following units:

keyboard TA,
answerback module KG,
tape reader LE or magnetic tape unit MB

and is supplied as input information to the basic electronics board GE.

A device control ensures that only one of the aforementioned units is in operation at any one time. During this time, the remaining units are blocked.

If the information is input to the teleprinter via the keyboard TA by depressing a key, a precoded combination is passed into the keyboard control in module 1. It is here that the information is properly encoded, e.g. to conform to CCITT Alphabet No. 2. The information then passes through the keyboard buffer in module 1 and reaches the send control in module 2.

In the send control, the appropriate case shift signal, i.e. "Letters" or "Figures", is automatically generated and sent before the character, if necessary.

Part of the send control is the answerback control, which, when the answerback module KG is tripped, generates the code combinations programmed on the answerback module. These are then passed on to the transmitter in module 3. In addition, the answerback control transfers the information unhindered to the transmitter during keyboard operation.

The transmitter supplements the code combinations by adding start and stop elements to form complete telegraph signals. It then transmits these in bit-serial fashion and at the preset time intervals.

Module 3 also contains the tape reader control. This ensures that when the tape reader LE or magnetic tape unit MB are in operation, the information recorded on the punched or magnetic tape is read, converted to telegraph signals and transferred to the transmitter.

The information to be transmitted reaches the signalling unit FSE or matching unit APE via the internal interface S2. Once here, the information passes through the control module STT on its way to the line adapter LAT. In half-duplex operation, the information, having reached the control module STT, is transferred back to the basic electronics GE and the output units to obtain a monitoring copy.

Via the line adapter LAT, the information is sent to line. Radio interference voltages are filtered out in the protector SST.

5.2. Reception

Information is output by the teleprinter via the following units:

printer DR,
tape punch LO or magnetic tape unit MB.

The output information reaches the output units by way of the basic electronics GE. The printer DR always provides a printed record of the information. The information can be additionally recorded by connecting up either the tape punch LO or the magnetic tape unit MB.

The information arriving from the line passes through the protector SST and reaches the line adapter LAT. In the protector SST, radio interference voltages are filtered out and overvoltages drained off. The line adapter converts the line level to the internal signal level. Having passed through the control module STT, the information is transferred to the basic electronics GE via the S2 interface.

The receiver in module 4 converts the bit-serial information into bit-parallel information which is forwarded to the tape punch. At the same time, the information is transferred to the decoder in module 5.

The decoder interprets the received information and adds to it the commands necessary for operating the printer. The information is then forwarded to the printer control in module 6. Certain device functions can be programmed on the special-function module VA for coded information which is not assigned defined functions in CCITT recommendations.

The printer control uses the received information to derive the number of stepping pulses for the stepping motor which rotates the print wheel to the required print position. It also determines the instant the print hammer is to be triggered. The printer control is also responsible for driving the carriage and line feed control in module 7, which generates the pulse sequences for carriage feed, carriage return and line feed. Characters received during the carriage return traverse action are held by a buffer in module 6.

Figure 6

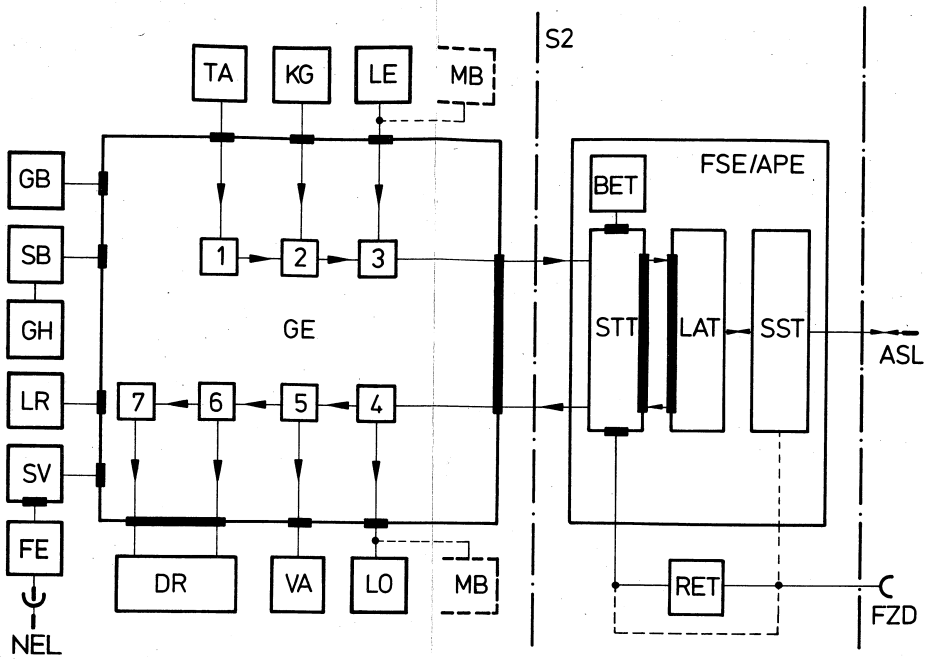
Teleprinter Model 1000 - Block schematic diagram

ASL	Terminal connecting line	LE	Tape reader
APE	Matching unit	LO	Tape punch
BET	Manual controls for switching functions	LR	Loudspeaker
DR	Printer	MB	Magnetic tape unit
FE	RF suppressor	NEL	Power cable
FSE	Signalling unit	RET	Relay module
FZD	Special signal socket	SB	Switch module
GB	Manual device controls	SST	Protector
GE	Basic electronics	STT	Control module
GH	Cover	SV	Power supply
KG	Answerback module	TA	Keyboard
LAT	Line adapter	VA	Special-function module

S2 Interface

1...7 MOS modules

1	Keyboard control
2	Send control
3	Transmitter
4	Receiver
5	Decoder
6	Printer control
7	Carriage travel and line feed control



6

6. SERVICING CONCEPT

A decisive factor in the development of the Teleprinter Model 1000 was the need for an advanced servicing concept with an assured future. This concept offers advantages to telecommunication carrier and subscriber alike and is characterized by the following features:

- The Teleprinter Model 1000 requires no preventive maintenance
- Faults in the Teleprinter Model 1000 are rectified easily and inexpensively on the subscriber's premises through the exchange of the faulty module.
- Modules undergo efficient repair in the workshop.

In order that these basic requirements may be satisfied, the Teleprinter Model 1000 has therefore been constructed in modular form throughout. The modules are removed by means of a screwdriver only, no adjustments being necessary.

The SERVICE TECHNICIAN locates the faulty module on the subscriber's premises and exchanges it. Fault tracing is aided by service instructions with simple Yes-No decisions. The fault removal procedure, including final testing of the modules, generally takes less than 30 minutes.

The Model 1000 Diagnostic Unit provides a further major simplification in the fault finding process. The diagnostic unit, the size of which is that of a matchbox, can be plugged into the diagnostic connector of the basic electronics and permits quick testing of the secondary voltages and of the potentials on essential interface lines with the aid of several indicator lamps.

The REPAIRSHOP TECHNICIAN repairs in a central repairshop the modules he receives from the service technician. The scope of the repairshop equipment to be used depends on the number of teleprinters to be repaired:

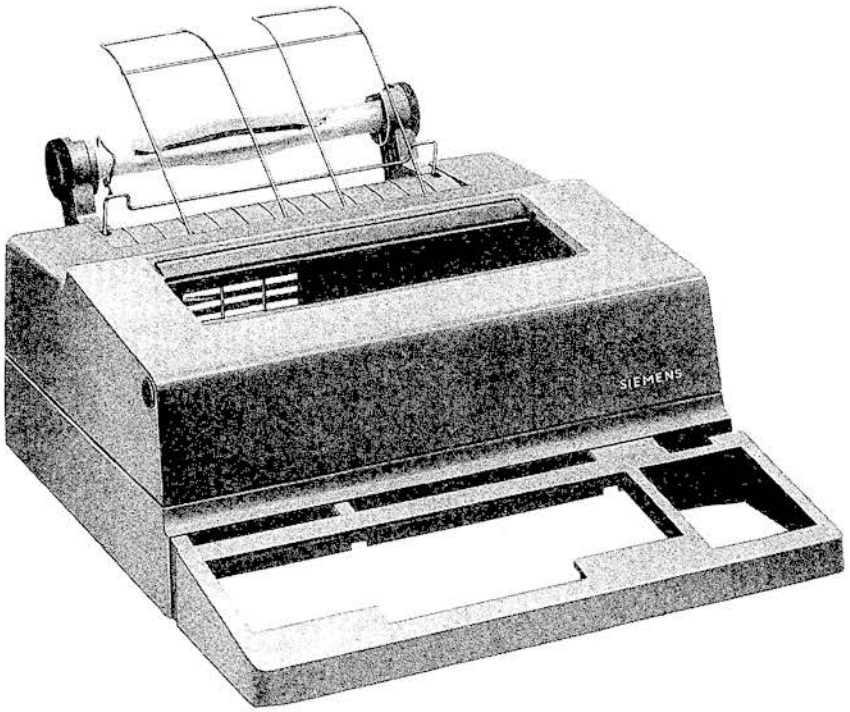
- Repairshop equipment with commercial measuring devices such as oscilloscopes and voltmeters.
  Investment costs for this type of equipment are the lowest, however, the time taken for fault location is relatively long.
  This method does not permit testing of the repaired modules if tolerances are adverse, since only a teleprinter is available for making a functional check of the modules.
- Repairshop equipment comprising testing devices and oscilloscopes developed specifically for the Teleprinter Model 1000.
  Investment costs are low and the time taken for fault location is relatively short.
  Functional checks as well as tests can be carried out at the limits of the tolerance ranges.
- Repairshop equipment comprising computer and program-controlled automatic testers.
  Investment costs are high, however, this type of equipment offers the quickest method of fault location and testing.

Service technicians and repairshop technicians receive instruction in special training courses. The repairshop technician's course is based on that of the service technician. The service technician's training is directed only at the work carried out on the customer's premises, whilst the repairshop technician is given detailed information on the construction and functioning of the Teleprinter Model 1000.

7. OPERATING PRINCIPLE OF THE MODULES (without line interfacing equipment)

7.1. Cover CH

Contents



7

7.1.1. GENERAL

The cover of the Teleprinter Model 1000 (Figure 7) integrates all the modules, including the tapereader, into a single unit.

The tape punch and magnetic tape unit are optional attachments whose covers are designed to harmonize in form and color with that of the teleprinter. The tape punch or magnetic tape unit can be mounted to the right-hand side of the teleprinter.

In its cover the Teleprinter Model 1000 can be used either as a desk-top machine or - by mounting it on a console - as a freestanding unit.

7.1.2. CONSTRUCTION

The cover is made from injection-moulded plastic parts which are lightweight, non-deformable and shockproof. The material and shape of the cover permit easy cleaning.

The cover consists of the lower section and the lid. The two are joined by means of a push-fit hinge. The cover is secured to the base tray by means of three quick-release fasteners.

Openings are provided in the front portion of the cover for the keyboard, the tape reader and the two manual controls modules.

At the rear, the roll holders for printer stationary with a roll diameter up to 120 mm are fixed in position. Paper rolls with a diameter up to 170 mm can be inserted in the roll holders by means of extension pieces. If marginally-punched fanfold paper is to be used, the cover must be modified.

At the rear of the lower cover section, to the left of the ventilation grille, are the type and origin label or the Post Office approval number. To the right of the ventilation grille is a plate for the owner marking. The cover of teleprinters fitted with the special signal socket (FZD) has an opening at the rear right. It is also possible to produce this opening subsequently by breaking off the plastic at the moulded splitting line.

The printed text can be read through a viewing window in the cover lid. The viewing window has a sharp rear edge for tearing off the paper.
The paper is fed out from the cover and passed over the paper deflector.
The cover lid is opened by pressing the two buttons located one at either side.
Affixed to the inside of the lid are the instruction labels for inserting ink ribbon and paper.

Three lamps situated in the lid illuminate the copy. The lamps are connected in parallel and receive current via the lid contact. When the lid is open the lamps do not light.

To help suppress the operating noise of the machine, the cover is lined with foam rubber sheets.

The receiving-only version of the Model 1000, which has no keyboard and tape reader, comes in a modified cover. In material and design this cover corresponds to the one described, except that the front portion for accommodating the keyboard and tape reader is omitted. Neither of these two modules can be retrofitted.

The tape punch or the magnetic tape unit, on the other hand, can be mounted to this cover. The cover can also be converted for using marginally-punched fanfold paper.

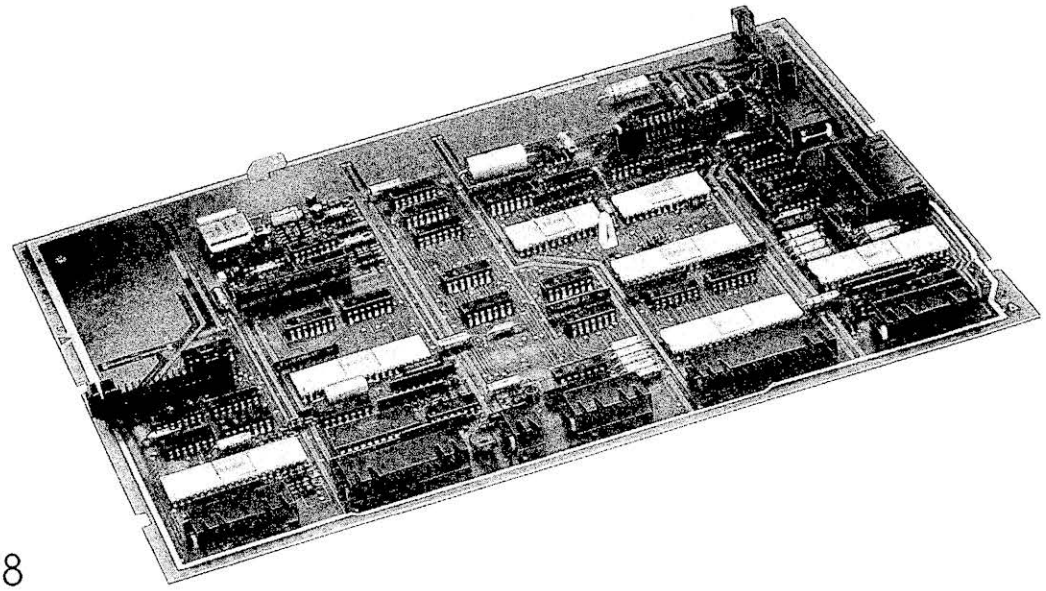
A special space-saving console can be supplied for the receiving-only machine.

7.1.3. EFFECTS OF THE OPERATING MODES ON THE COPY LIGHTING

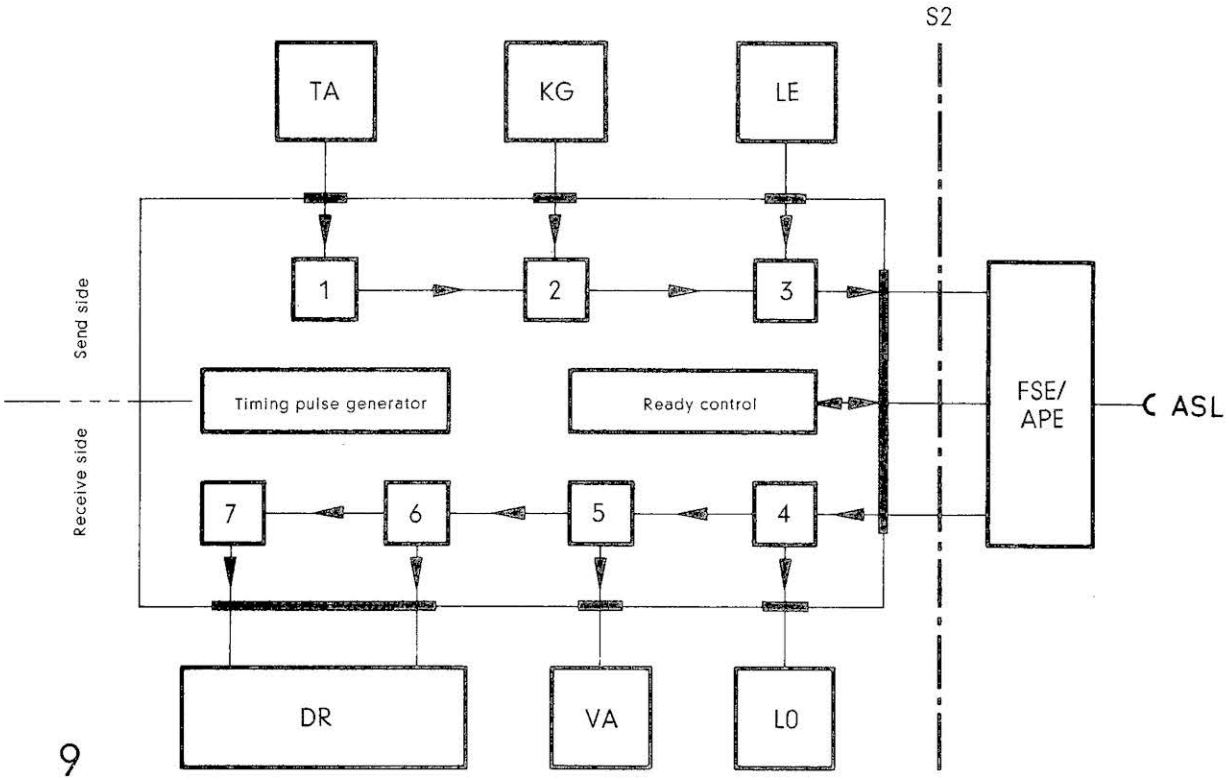
Functional state of the teleprinter	Standby	Operating condition	
	AC power voltage applied	Local or on-line working enabled	
		Idle	Printing
		no input or output module in operation	at least one input or output module in operation
Lamps light	No	Yes	Yes

7.2. Basic electronics CE

Contents



8


S2
TA
KG
LE
1
2
3
Send side
Timing pulse generator
Ready control
FSE/
APE
ASL
Receive side
7
6
5
4
DR
VA
LO

9

7.2.1. GENERAL

The basic electronics (Figure 8) is the central electronic control unit of the Teleprinter Model 1000. It is here that the major part of the information is processed, i.e. in addition to the purely transmitting and receiving functions to be performed, the signals of the connected modules such as tape punch, tape reader etc. are interpreted, matched to one another and distributed. In addition to its control functions, therefore, the basic electronics also acts as a central distributor both for the signalling criteria and for the operating voltages of the entire machine. Additional wiring which would normally be required is not necessary in the case of the Model 1000.

7.2.2. CONSTRUCTION

The basic electronics is in the form of a pc board. It consists of:

- a two-layer, plated-through circuit board,
- electrical components, i.e. seven MOS components, film circuitry, TTL circuitry, discrete components and a crystal,
- plug-in connectors (pin blocks) for connecting the modules,
- a diagnostic connector that connects the diagnostic unit

7.2.3. PRINCIPLE OF OPERATION (Figure 9)

The overall function of the basic electronics can be split up into the two fundamental sub-functions of sending and receiving.

- The send side comprises the transmitter and the controls for the input modules.
- The receive side comprises the receiver and the controls for the output modules.

The send and receive sides are designed in such a way that they function entirely independently of each other (full-duplex method).

The individual functional sequences are mainly under the control of the seven MOS components.

Each MOS component contains the control for a particular input or output module:

MOS component 1 is assigned	to the keyboard,
MOS component 2	to the answerback module,
MOS component 3	to the tape reader, } or to the magnetic
MOS component 4	to the tape punch } tape unit
MOS component 5	to the special-function module,
MOS component 6 }	
MOS component 7 }	to the printer.

Only the timing pulse generator, the ready control for interface S2 and the matching circuits are not implemented in MOS technology.

Superordinate functional units such as the transmitter, the receiver and the coordinating controls are integrated into some of the MOS components mentioned.

The information is interchanged bit-serially between the MOS components so as to minimize the number of terminal pins in the individual components.

7.2.3.1. Keyboard control

The keyboard control (MOS-1; Figure 10) contains the following functional blocks:

- Character generator
- Scanner
  (decoder, multiplexer)
- Key actuation recognizer
- Keyboard buffer
- Character counter
- Overprint lock

7.2.3.1.1. Character generator

A 6-bit binary counter, referred to in the following as the character generator, counts continuously from 0 to 63. Each of these binary numbers represents at the same time the bit combination for a telegraph character, the first five bits forming the actual character and the sixth bit indicating whether the character belongs to the letters case or to the figures case (including symbols). See code table.

Characters which are effective on both the figures and letters side, e.g. CR, LF etc., need be coded once only, leaving the second combination free for special functions.

7.2.3.1.2. Scanner (decoder, multiplexer)

Each key in the keyboard is connected to an X and a Y conductor and thus assigned to a code combination or telegraph character. As the character generator cycles the scanner checks all the contacts one by one to see whether one is closed. Each contact is scanned once per millisecond. Fluctuations in the contact resistance when the contact is closed are tolerable to a relatively large degree, i.e. up to 2 kilohms. At the same time the bit combination associated with the key is present at the input of the keyboard buffer.

By pressing, say, the E key, the X2 and Y8 conductors are shorted via the wire strap and diode. If the character generator arrives at the bit combination 000001 during one of its cycles, and if the E key is depressed, the character "E" is signalled by means of a pulse to the key actuation recognizer.

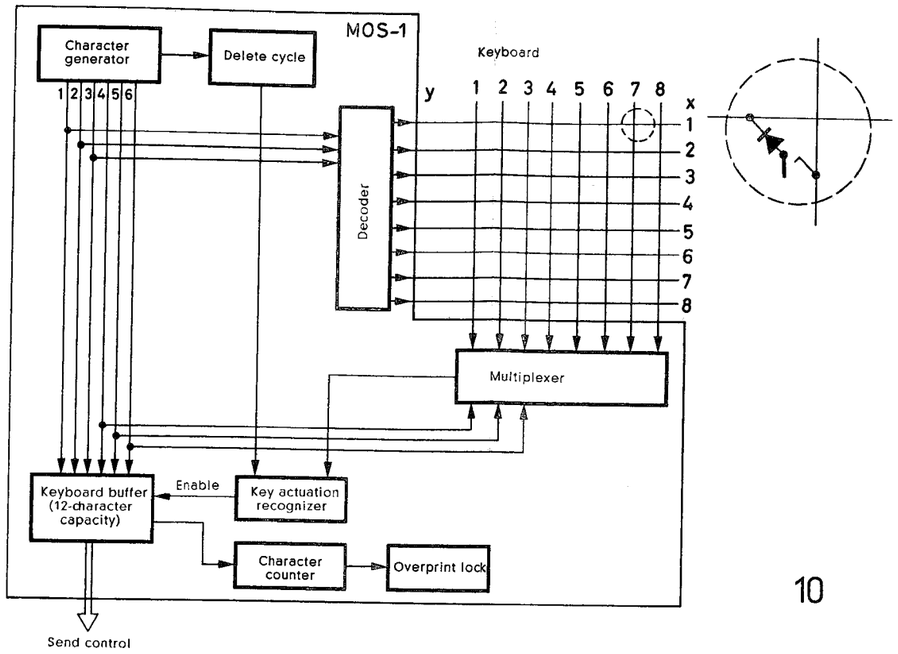
7.2.3.1.3. Key actuation recognizer

As a safeguard against malfunctions and to avoid bouncing of the key contact being interpreted as multiple keying of a character, the key actuation recognizer waits until the character generator has completed its second cycle since the E key was depressed before sending the enable pulse, which causes the bit combination to be transferred to the keyboard buffer. Bouncing of the key contacts for up to 30 milliseconds is admissible (bounces lasting for one to two milliseconds are typical). This operating principle makes the generation of undesired garbled characters impossible even with the fastest keying bursts.

Code table:

Decimal no.	Binary no. Information bits 2^5 2^4 2^3 2^2 2^1 2^0 — Code combination of telegraph character 5 4 3 2 1	Key connection Diode to X... Wire strap to Y...	Telegraph character as per CCITT No. 2 No.	Letters
0	0 0 0 0 0 0	X1 - Y8	32	
1	0 0 0 0 0 1	X2 - Y8	5	E
2	0 0 0 0 1 0	X3 - Y1	28	*)
3	0 0 0 0 1 1	X4 - Y1	1	A
4	0 0 0 1 0 0	X5 - Y1	31	*)
5	0 0 0 1 0 1	X6 - Y1	19	S
6	0 0 0 1 1 0	X7 - Y1	9	I
7	0 0 0 1 1 1	X8 - Y1	21	U
8	0 0 1 0 0 0	X1 - Y1	27	*)
9	0 0 1 0 0 1	X2 - Y1	4	D
10	0 0 1 0 1 0	X3 - Y2	18	R
11	0 0 1 0 1 1	X4 - Y2	10	J
12	0 0 1 1 0 0	X5 - Y2	14	N
13	0 0 1 1 0 1	X6 - Y2	6	F
14	0 0 1 1 1 0	X7 - Y2	3	C
15	0 0 1 1 1 1	X8 - Y2	11	K
16	0 1 0 0 0 0	X1 - Y2	20	T
17	0 1 0 0 0 1	X2 - Y2	26	Z
18	0 1 0 0 1 0	X3 - Y3	12	L
19	0 1 0 0 1 1	X4 - Y3	23	W
20	0 1 0 1 0 0	X5 - Y3	8	H
21	0 1 0 1 0 1	X6 - Y3	25	Y
22	0 1 0 1 1 0	X7 - Y3	16	P
23	0 1 0 1 1 1	X8 - Y3	17	Q
24	0 1 1 0 0 0	X1 - Y3	15	O
25	0 1 1 0 0 1	X2 - Y3	2	B
26	0 1 1 0 1 0	X3 - Y4	7	G
27	0 1 1 0 1 1	X4 - Y4	30	*)
28	0 1 1 1 0 0	X5 - Y4	13	M
29	0 1 1 1 0 1	X6 - Y4	24	X
30	0 1 1 1 1 0	X7 - Y4	22	V
31	0 1 1 1 1 1	X8 - Y4	29	A...
32	1 0 0 0 0 0	X1 - Y4	32	
33	1 0 0 0 0 1	X2 - Y4	5	3
34	1 0 0 0 1 0	X3 - Y5	28	
35	1 0 0 0 1 1	X4 - Y5	1	-
36	1 0 0 1 0 0	X5 - Y5	31	ZWR
37	1 0 0 1 0 1	X6 - Y5	19	'
38	1 0 0 1 1 0	X7 - Y5	9	8
39	1 0 0 1 1 1	X8 - Y5	21	7
40	1 0 1 0 0 0	X1 - Y5	27	<
41	1 0 1 0 0 1	X2 - Y5	4	✠
42	1 0 1 0 1 0	X3 - Y6	18	4
43	1 0 1 0 1 1	X4 - Y6	10	⍾
44	1 0 1 1 0 0	X5 - Y6	14	,
45	1 0 1 1 0 1	X6 - Y6	6	*)
46	1 0 1 1 1 0	X7 - Y6	3	:
47	1 0 1 1 1 1	X8 - Y6	11	(
48	1 1 0 0 0 0	X1 - Y6	20	5
49	1 1 0 0 0 1	X2 - Y6	26	+
50	1 1 0 0 1 0	X3 - Y7	12	)
51	1 1 0 0 1 1	X4 - Y7	23	2
52	1 1 0 1 0 0	X5 - Y7	8	*)
53	1 1 0 1 0 1	X6 - Y7	25	6
54	1 1 0 1 1 0	X7 - Y7	16	0
55	1 1 0 1 1 1	X8 - Y7	17	1
56	1 1 1 0 0 0	X1 - Y7	15	9
57	1 1 1 0 0 1	X2 - Y7	2	?
58	1 1 1 0 1 0	X3 - Y8	7	*)
59	1 1 1 0 1 1	X4 - Y8	30	1...
60	1 1 1 1 0 0	X5 - Y8	13	.
61	1 1 1 1 0 1	X6 - Y8	24	/
62	1 1 1 1 1 0	X7 - Y8	22	=
63	1 1 1 1 1 1	X8 - Y8	29	*)

*) for special functions



7.2.3.1.4. Keyboard buffer

As it is possible for brief spaces to key in characters faster than they can be sent to line, the keyboard is assigned a buffer with a twelve character capacity.

All keyed-in characters pass through the keyboard buffer; from there they are transferred at maximum speed and in correct sequence to the transmitter.

As long as information is contained in the keyboard buffer, the tape reader cannot be activated nor can the answerback be tripped.

If, in exceptional cases, the twelve character capacity of the keyboard buffer is insufficient, the keyboard is inhibited electronically, thus rendering further keying ineffective. This condition is indicated by a lamp in the unlock button in the manual device controls module of the teleprinter. Once this button is depressed, the keyboard becomes operable again.

7.2.3.1.5. Character counter, end-of-line warning, overprint lock (Fig. 2)

The character counter counts all keyed-in characters which result in the printer moving forward one column space. After the 59th character the counter triggers an audible signal which announces the approaching end of the line.

7.2.3.1.6. Overprint lock

An overprint lock can be installed, if required, to be effective after the 69th or 72nd character depending on the version of printer. The keyboard is then blocked for all characters which trigger a column feed. This prevents overprinting of characters at the end of a line. Characters which produce no feed can still be entered.

A lamp in the unlock button of the manual device controls module indicates when the overprint lock is effective.

When the Carriage Return key or New Line key / NL is depressed, the character counter is reset to 0 and the overprint lock cancelled. The lamp in the unlock button goes out.
To correct a punched tape produced during keying, the overprint lock can be cancelled and hence the keyboard unlocked. To effect this, the unlock button must be depressed together with a key on the keyboard. The lamp in the unlock button goes out; however, the character counter is reset to 0 only upon carriage return.

7.2.3.2. Send control (Figure 11)

The send control (MOS 2) contains the following function blocks, which are largely independent of each other:

- Automatic letters/figures shift,
- Selection pulse generator,
- Answerback control,
- Bell signal generator.

7.2.3.2.1. Automatic letters/figures shift

For typing operations on standard keyboards, the automatic letters/figures shift automatically inserts the case shift characters: Letters (A...) or Figures (1...), which are necessary due to the dual assignment of the 5-bit code (letters and figures case).

The character arriving from the keyboard control is first checked in the case shift signal control to determine whether it belongs to the letters or the figures case, i.e. it is compared with the character sent or received previously. If no case identity is found, a command is sent to the case shift inserter and this prefixes the appropriate shift character to the information.

The case shift signal control also ensures that the correct shift signal is given before the transmission of the first character

at the start of a message transmission,

after the machine is switched on, or

after selection is completed.

The automatic letters/figures shift is inhibited

if a command character assigned to both shifts is given,

e.g. carriage return or line feed, or

if the letters or figures shift signals themselves are applied, or

if a condensed keyboard is being used.

In the case of a condensed keyboard, the case shift characters must be keyed in by the operator. The automatic letters/figures shift is here disabled by means of wire strap W58 on the special function module.

7.2.3.2.2. Selection pulse generator

On the Teleprinter Model 1000, selection is by keyboard irrespective of whether the exchange expects dialplate or keyboard selection signals. The line interfacing equipment determines the type of selection the teleprinter is adjusted for. All other keys on the keyboard are ineffective during the selection phase. The selection pulses for each digit and the interdigital intervals are generated electronically.

The arrival of a proceed-to-select signal from the exchange enables the selection to begin. As the selection digits are now entered via the keyboard, the pulse selection sequence control supplies the selection pulses for the first keyed-in digit. The pulse length is 60 ms, the pause length 40 ms. A counter then generates the interdigital interval of 640 ms before the next selection digit. These times are derived from the crystal-controlled timing pulse rate and display a correspondingly high level of accuracy. Each selection digit is printed out by the home printer so that the keyed-in telex no. can be checked.

7.2.3.2.3. Answerback control

The answerback is tripped by pressing the "Here is" button or by reception of the "Who-are-You?" signal. The answerback control initiates the transmission of the answerback code stored in the diode matrix of the answerback module and simultaneously inhibits the other input modules, i.e. the keyboard and tape reader.

A more detailed explanation is to be found in section 7.13, "Answerback module".

7.2.3.2.1. Automatic letters/figures shift

For typing operations on standard keyboards, the automatic letters/figures shift automatically inserts the case shift characters: Letters (A...) or Figures (1...), which are necessary due to the dual assignment of the 5-bit code (letters and figures case).

The character arriving from the keyboard control is first checked in the case shift signal control to determine whether it belongs to the letters or the figures case, i.e. it is compared with the character sent or received previously. If no case identity is found, a command is sent to the case shift inserter and this prefixes the appropriate shift character to the information.

The case shift signal control also ensures that the correct shift signal is given before the transmission of the first character

at the start of a message transmission,

after the machine is switched on, or

after selection is completed.

The automatic letters/figures shift is inhibited

if a command character assigned to both shifts is given,

e.g. carriage return or line feed, or

if the letters or figures shift signals themselves are applied, or

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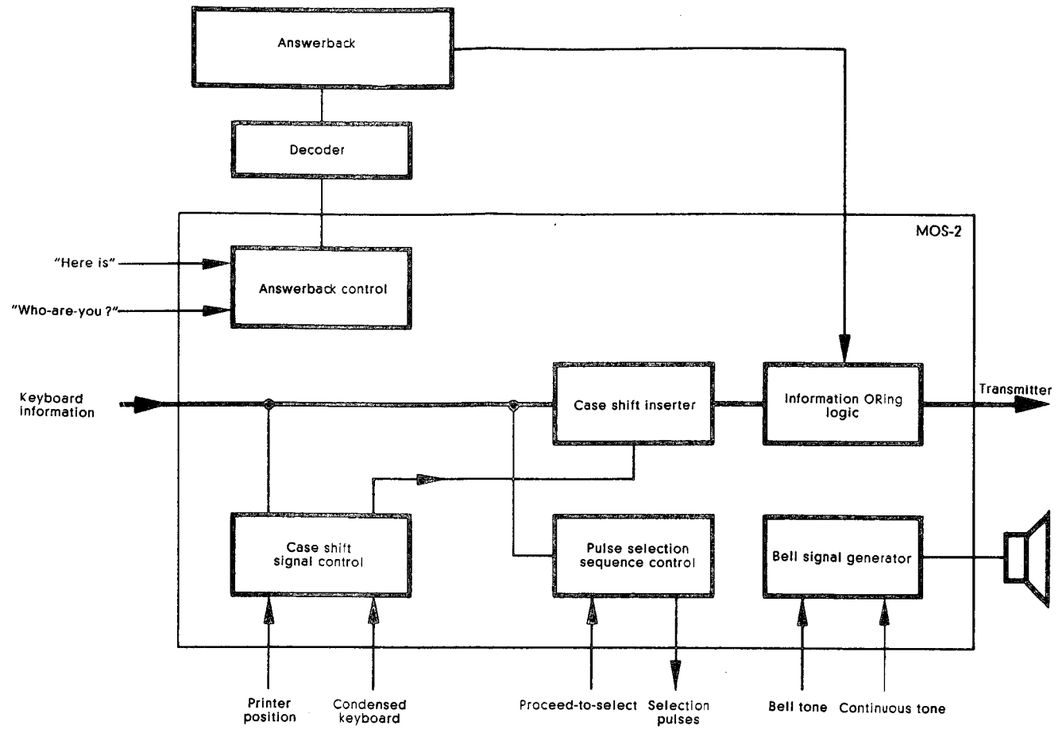
7.2.3.2.3. Answerback control

The answerback is tripped by pressing the "Here is" button [◈] or by reception of the "Who-are-You?" signal. The answerback control initiates the transmission of the answerback code stored in the diode matrix of the answerback module and simultaneously inhibits the other input modules, i.e. the keyboard and tape reader.

A more detailed explanation is to be found in section 7.13, "Answerback module".



7.2.3.2.4. Bell signal generator

This unit controls a small loudspeaker which produces the normal audible signals:

- When a call comes in during local mode working, it produces a continuous 500 Hz tone lasting about 3 seconds. If a call signalization facility is provided, this continuous tone is changed into a periodically-recurring tone of 1 second length.
- After a subscriber has been dialled, it produces a continuous tone of 500 Hz and approximately 3 seconds' length when the call is switched through. If the distant station is busy, it produces a short tone. Besides, the busy condition of the distant station is indicated by the ready-to-operate lamp in the disconnect button [O·] which lights up briefly, while the lamp stays lit during the existence of the connection.
- If a call signalization facility is provided, an incoming call is indicated as a periodically recurring tone of 1 second length which can be silenced with the delete button for the call signal [🔕] or suppressed with the inhibit button for the call signalization [🔔] .
- A bell-like tone (of about 2 kHz) sounds for end-of-line warning and "bell signal".

The loudspeaker is described in section 7.9.

7.2.3.3. Transmitter with tape reader control
(Figure 13)

This MOS circuit (MOS 3) incorporates the following functional units:

- information and command ORing logic,
- transmitter,
- tape reader control,
- stepping motor control,
- feed hole detector,
- break-in detector.

7.2.3.3.1. Information and command ORing logic

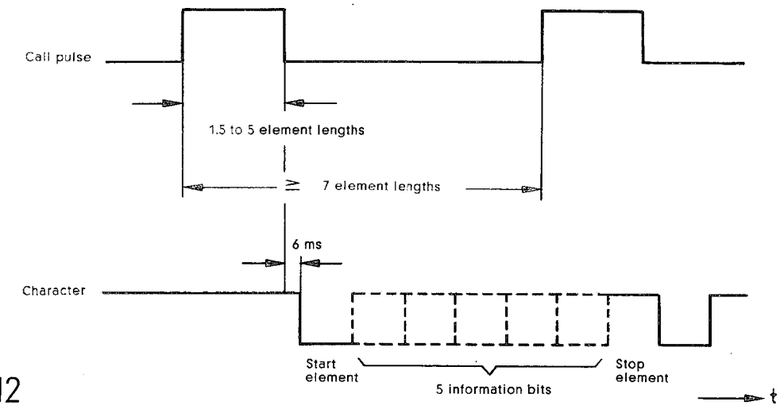
It is here that the code combinations read by the tape reader are injected into the information path for the send direction. Depending on which of the three input modules is activated at the moment, the information arriving from the keyboard or the answerback unit or offered by the tape reader is transferred to the transmitter.

7.2.3.3.2. Transmitter

A shift register incorporated in the transmitter converts the information offered in bit-parallel format by one of the three input modules (reader, answerback unit, keyboard) into serial form. In addition, the five information elements are supplemented with a start element (1.0 unit length) and a stop element (1.5 unit length) to form a telegraph character. The clocking rate of the shift register corresponds to the set telegraph speed. The start-stop distortion of the transmitter is determined only by the deviation of the timing pulse rate (crystal-controlled oscillator) and is therefore very slight (approx. 0.3 %).

A special feature which the teleprinter allows is character-by-character release in response to external call pulses, a function programmable on the line interfacing modules.

In contrast to normal operation, where input characters are transmitted in continuous succession, each character transmitted in the character release mode requires an external call pulse which is sent to the teleprinter over a separate line. As a precondition, a paper tape must be loaded in the reader, the tape retainer lid must be closed and the tape reader must have been switched on by pressing the ON/OFF button or by means of a special character sequence. Each call pulse causes one character to be released from the tape reader. If no paper tape is loaded and the retainer lid is open (or closed), the combination no. 32 (or Letters shift) is sent once; thereafter the tape reader switches off. The relation between call pulse and called character is shown in Figure 12.



12

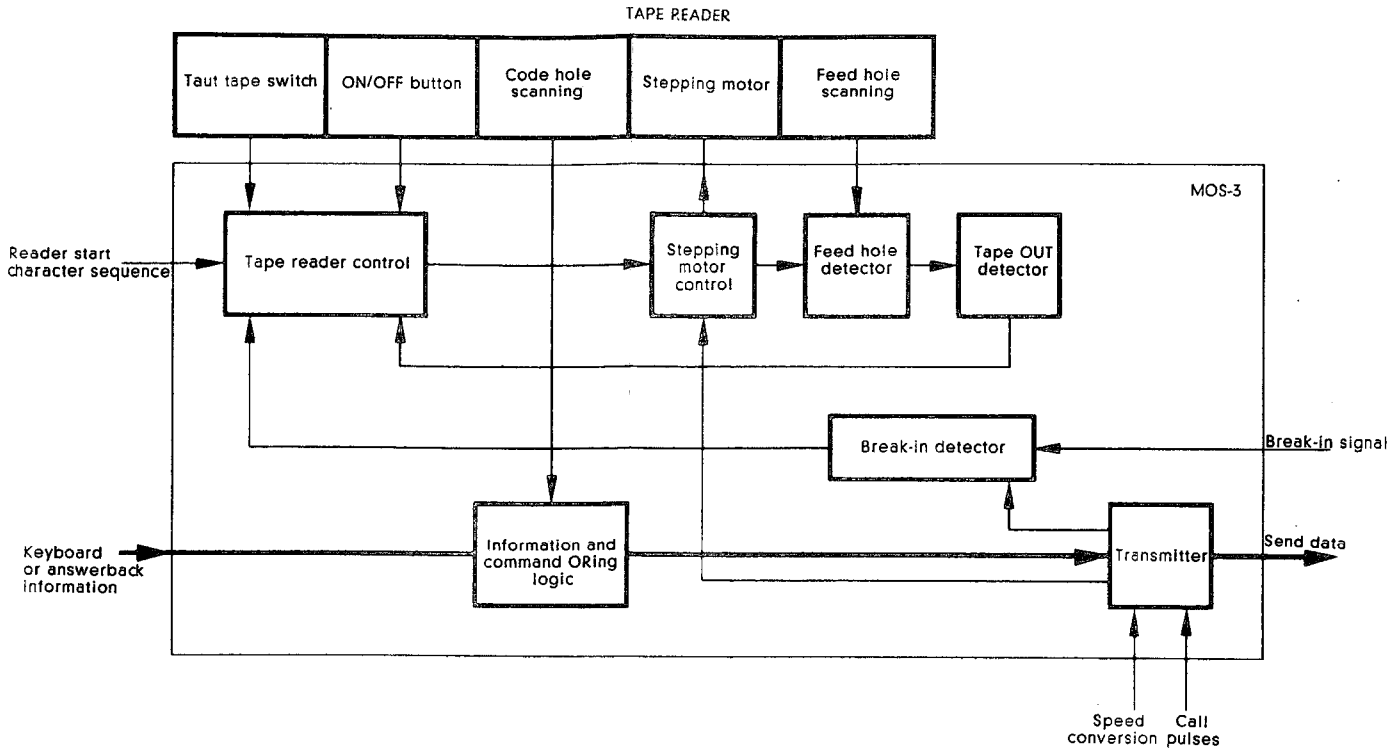
7.2.3.3.3. Tape reader control

The tape reader control coordinates the switching criteria for the Model 1000 tape reader.

The tape reader is switched on or off by pressing the ON/OFF button (see also section 7.11, "Tape reader"). Brief depression of this button (< 250 ms) causes one character only to be read. If the button is pressed longer (> 250 ms), the tape reader remains switched on. It can be switched off again by pressing the button once more for an indefinite time.

The tape reader can also be activated by recognizing four identical characters received as a sequence. This function is programmed on the special-function module.

The tape reader is switched off at the end of the tape or when breaking in by the distant station is recognized (see section 7.2.3.3.6). When the taut tape switch operates, the operation of the tape reader is only interrupted for as long as the tape is taut.


TAPE READER
Taut tape switch
ON/OFF button
Code hole scanning
Stepping motor
Feed hole scanning
MOS-3
Reader start character sequence
Tape reader control
Stepping motor control
Feed hole detector
Tape OUT detector
Break-in detector
Break-in signal
Keyboard or answerback information
Information and command ORing logic
Transmitter
Send data
Speed conversion
Call pulses

13

7.2.3.3.4. Stepping motor control

The stepping motor control supplies the stepping motor with the pulses it requires to feed the tape forward. A status signal from the transmitter and the status of the tape reader control determine the appropriate pulses to be transferred to the tape reader. The pulses are amplified in the tape reader and then used to control the stepping motor.

7.2.3.3.5. Feed hole detector

The feed hole track in the tape is scanned continuously while the tape reader is in operation. The tape reader recognizes the end of the tape has been reached when there is no longer an alternation of light and dark in the tape. Feed hole scanning lags eight feed hole pitches behind code hole scanning so that the end-of-tape signal can only be given when the ninth code perforation is being scanned. This signal causes the tape reader control to switch the tape reader off.

7.2.3.3.6. Break-in detector

This circuit recognizes when telegraph characters transmitted by the distant subscriber are breaking in on the message transmission from the home station and promptly switches the tape reader off.

Breaking in by the distant station is recognized whenever start-polarity of the character breaking in occurs during the stop element of the transmitted character.

7.2.3.4. Receiver with tape punch control
(Figure 14)

This MOS circuit (MOS 4) includes the following functional units:

- receiver,
- tape punch control,
- pulse generator for the tape punch magnets.

7.2.3.4.1. Receiver

The function of the receiver is to derive the exact information from the received pulses, which are frequently heavily distorted during transmission. At the same time, the information arriving bit-serially must be converted to parallel format.

For this purpose, the received telegraph character, beginning with the start element is written into a shift register, the clocking rate corresponding exactly to the telegraph speed. The moment of shifting the character always occurs in the middle of the element.

During the stop element the received information is available in parallel format for a short time for further processing. The shift register is then erased and prepared for reception of the next character.

The crystal-controlled timing pulse generator ensures that the synchronizing error of the receiver is less than 0.01 %. The timing error which arises due to the arriving telegraph character being out of synchronism with the timing pulse is less than 1 %. This produces a receive margin of more than $\pm$ 48 %.

A special feature ensures that the receiver does not cycle continuously when continuous start polarity is applied, e.g. during line interruptions.

7.2.3.4.2. Tape punch control

This circuit block is where the various commands are generated for the tape punch.

The tape punch (described in section 7.10) can be switched on or off manually by pressing the ON/OFF button.

The tape punch control switches the tape punch on or off also by recognizing four identical characters received as a sequence (CCCC for "ON" and FFFF for "OFF", according to CCITT recommendations). This function can be programmed on the special function module.

The tape punch can also be switched on by means of a latching button in the manual device controls module. In this case it is switched on continuously and is not switched off automatically by an incoming call, as is the case when it is activated by means of the ON/OFF button.

When a new roll of tape is being loaded into the tape punch, the accuracy of the code hole spacing in the tape must be ensured. Once the tape gate is closed, therefore, the tape punch control causes the tape leader to be fed through and punched automatically 32 times with code combination 29 (5 holes).

Code combination 29 is also punched for as long as the tape feed button [↓] is held depressed.

The tape punch is turned off whenever the tape supply is exhausted.

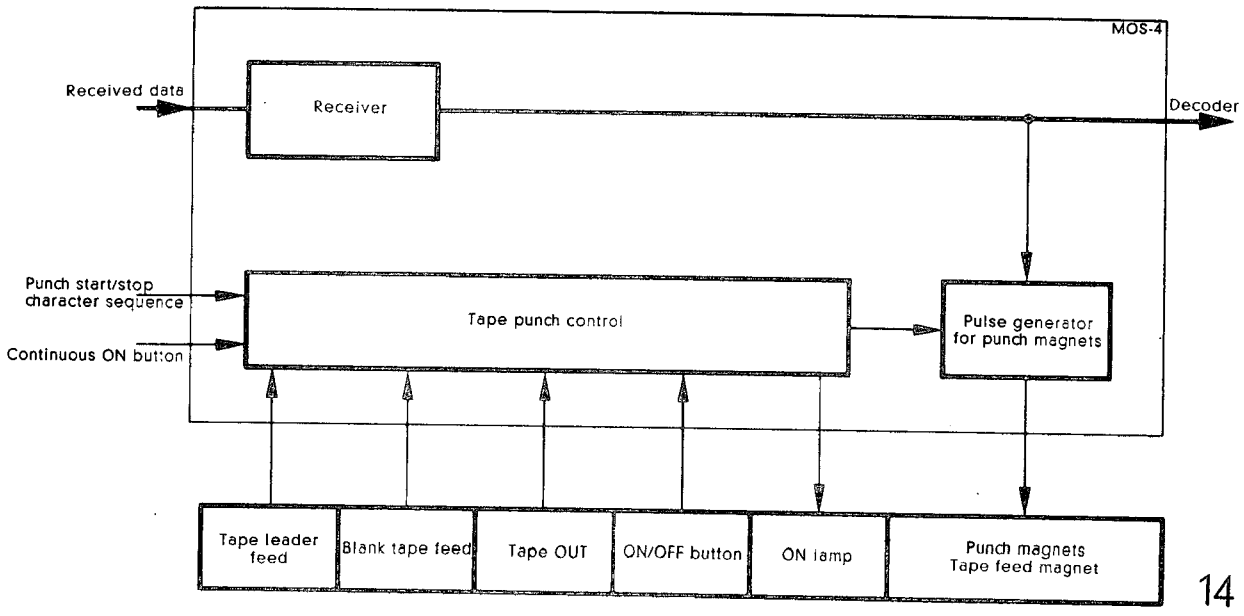
7.2.3.4.3. Pulse generator for the tape punch magnets

This circuit uses the received information to generate the control pulses for the magnet amplifiers. The manner in which it does this is dependent on the set telegraph speed and how the tape punch was activated. The magnet amplifiers control the punch magnets and the tape feed magnet, which drive the punch pins and the sprocket wheel respectively.

The operation of the punch pins for the five information tracks is staggered in time so as to reduce the punching noise.

The time taken to punch one character and feed the tape forward is dependent on the set telegraph speed, i.e.:

120 ms at 50 bauds,
90 ms at 75 bauds,
70 ms at 100 bauds.



TAPE PUNCH

14

7.2.3.5. Decoder
(Fig. 15)

The function of the decoder (MOS-5) is to allocate the teleprinter signals arriving from the receiver to the associated machine function; i.e. the decoder supplies the information for setting the print wheel and determines which machine commands - e.g. print, column feed, line feed, etc. - must be carried out. Allocation of the teleprinter signals to the different functions is variable for some of these signals and can be fixed through the diode matrix of the special-function module.

In the most common version of the Teleprinter Model 1000, read-only memory 1 supplies the machine functions for the 64 possible teleprinter signals, i.e. the basic functions.

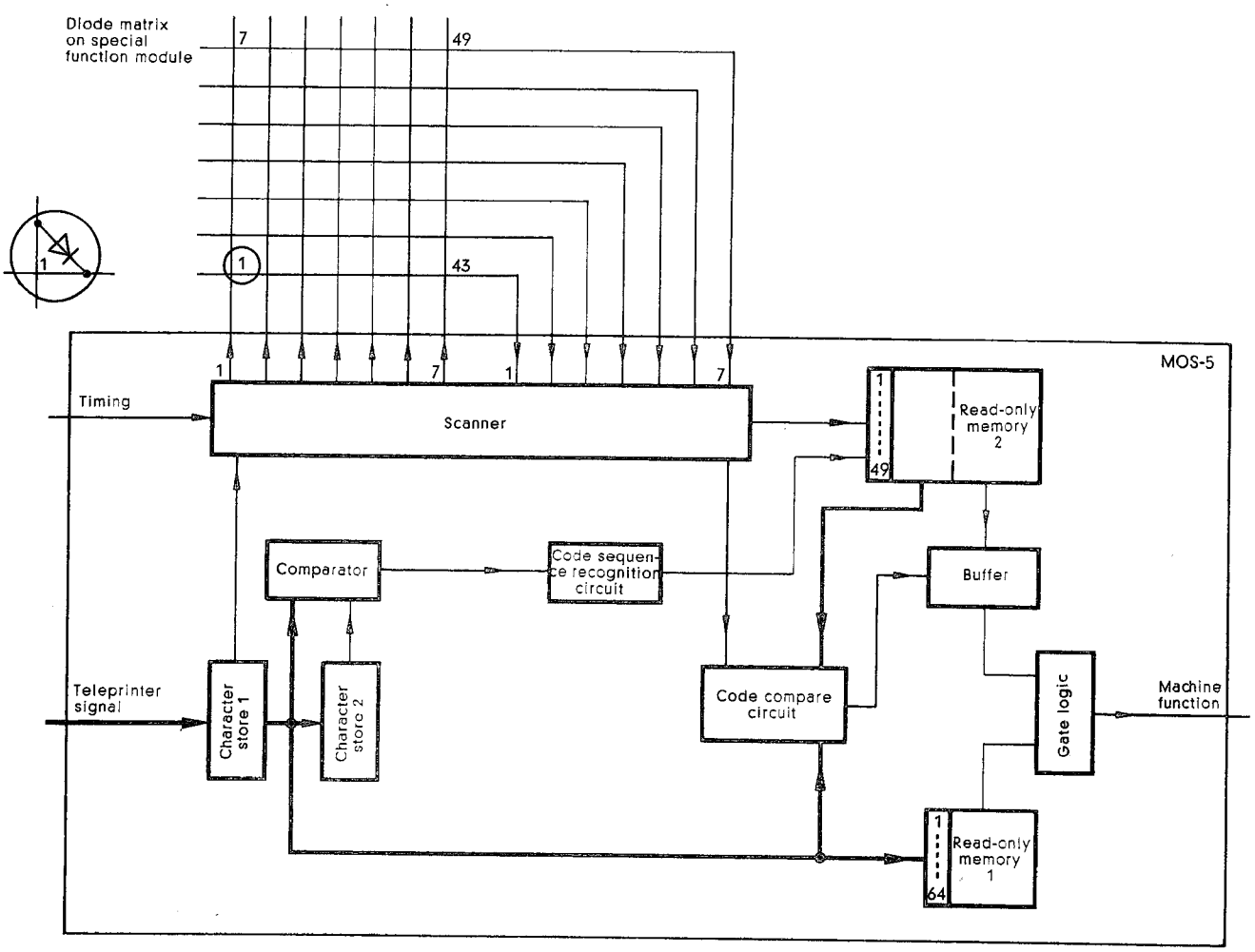
The basic functions of read-only memory 1 can be modified via the contents of read-only memory 2. In accordance with the 49 mounting positions on the diode matrix, it offers 49 modification possibilities which become effective through the insertion of diodes.

As soon as character store 1 has accepted a teleprinter signal arriving from the receiver, the corresponding basic function is present at the output of read-only memory 1 in the form of a code word. At the same time, the scanner - controlled by 66-kHz timing pulses - starts scanning the 49 mounting positions on the diode matrix. Parallel to this, the 49 positions of read-only memory 2 are scanned. In read-only memory 2, each diode position is assigned a specific code combination with predetermined change information, in relation to the basic information contained in read-only memory 1.

The code combination from read-only memory 2 is compared, in a code compare circuit, with the teleprinter signal being applied. If the code combination tallies with the teleprinter signal and, at the same time, notification of the insertion of a diode is received, the change information present at the output of read-only memory 2 is transferred to the buffer. If all 49 locations of read-only memory 2 are scanned, the entire basic function change is held in the buffer in the form of a second code word. By combining the two code words from read-only memory 1 and the buffer, the definitive machine function is generated and fed to the appropriate points in the teleprinter.

In some cases, specific machine functions can also be initiated through the receipt of a number of identical teleprinter signals (code sequence). To this end, the teleprinter signal just received (character store 1) and the preceding signal (character store 2) are stored and compared. If the two signals tally, the signal just received is entered in a shift register. When the specified number of identical, consecutive signals has been attained, the code sequence recognition circuit emits a signal. Combined with the information from the scanner, the signal addresses the relevant location in read-only memory 2. The ensuing procedure, i.e. the transfer to the buffer and generation of the definitive machine function, has already been described.

After receipt of an entire code sequence, the information in the shift register is deleted by the next signal, which does not belong to the code sequence.


Diode matrix
on special
function module
7
49
1
43
MOS-5
Timing
Scanner
1
7
1
7
1
49
Read-only
memory
2
Comparator
Code sequen-
ce recognition
circuit
Buffer
Teleprinter
signal
Character
store 1
Character
store 2
Code compare
circuit
Gate logic
Machine
function
1
64
Read-only
memory
1

15

7.2.3.6. Printer control
(Figure 16)

The printer control is accommodated in two MOS components (MOS 6 and MOS 7). The MOS 6 circuit incorporates the print mechanism control; MOS 7 contains the carriage travel/line feed control.

7.2.3.6.1. Print mechanism control

The received information arriving from the decoder and including the commands for operation of the printer is first transferred to a 5-character buffer whose function is to store the characters received during carriage return. Every print character applied at the buffer output initiates a print cycle lasting 65 ms at all three telegraph speeds. The print cycle is subdivided into the functions:

Positioning of the print wheel,
printout of the character, and
carriage feed.

The print wheel is positioned at the start of each print cycle. This is done by transferring the applied information to the print wheel positioner. The latter contains an arithmetic unit which uses the currently and the previously applied information to determine the necessary sequence of pulses for controlling the stepping motor. The print wheel is thus rotated to the new printing position by the shortest path (see description in section 7.5, "Printer"). Once the print wheel is in position, the command control generates a printing pulse for the hammer magnet, which causes the hammer to fire, the positioned character being then printed.

After the character is printed, a command to the carriage travel-line feed control causes the printer carriage to be fed forward one column.
When the code combination for carriage return or for line feed arrives, the command control derives from it further commands for the carriage travel-line feed control.

The synchronizer ensures the print wheel is accurately positioned. In the event of loss of synchronism, a synchronizing run is started.

The ink ribbon control employs two magnets to move the ribbon to one of three positions depending on the particular operational event:

- Printing in black for message reception,
- Printing in red for message transmission and local working,
- Character visibility position (lowering of the ribbon below the print line).

7.2.3.6.2. Carriage travel/line feed control

This functional unit controls the carriage movement and line feed of the printer. The carriage feed control generates a train of three pulses per column for the column feed function of the printer carriage. These pulses are transferred to the carriage motor via carriage motor control 2.

An acceleration and a deceleration program with increasing and decreasing frequency respectively are included in the program memory to control the acceleration and deceleration of the stepping motor.

When a line feed is to be executed, the line feed control sends the appropriate number of stepping motor pulses to the line feed motor via line motor control 3. The number of stepping motor pulses is dependent on the line spacing set on the switch module.

Four pulses are required for 1-line spacing,
six pulses are required for 1 1/2-line spacing, and
eight pulses are required for 2-line spacing.

7.2.3.7. Timing pulse supply

The entire timing for the teleprinter is derived from a crystal-controlled oscillator with a frequency of 2.112 MHz. Whatever the operational conditions, therefore, the timing pulse generator has the same high accuracy, thus ensuring exceptional telegraphic values in respect of start-stop distortion, receive margin and synchronism.

All time-dependent functions within the basic electronics are also derived from the timing pulse supply, so precluding tolerances dependent on components.

The MOS components require a two-phase timing pulse, which is derived from the oscillator frequency by means of a special circuit.

7.2.3.8. Interface S2 to the line interfacing equipment

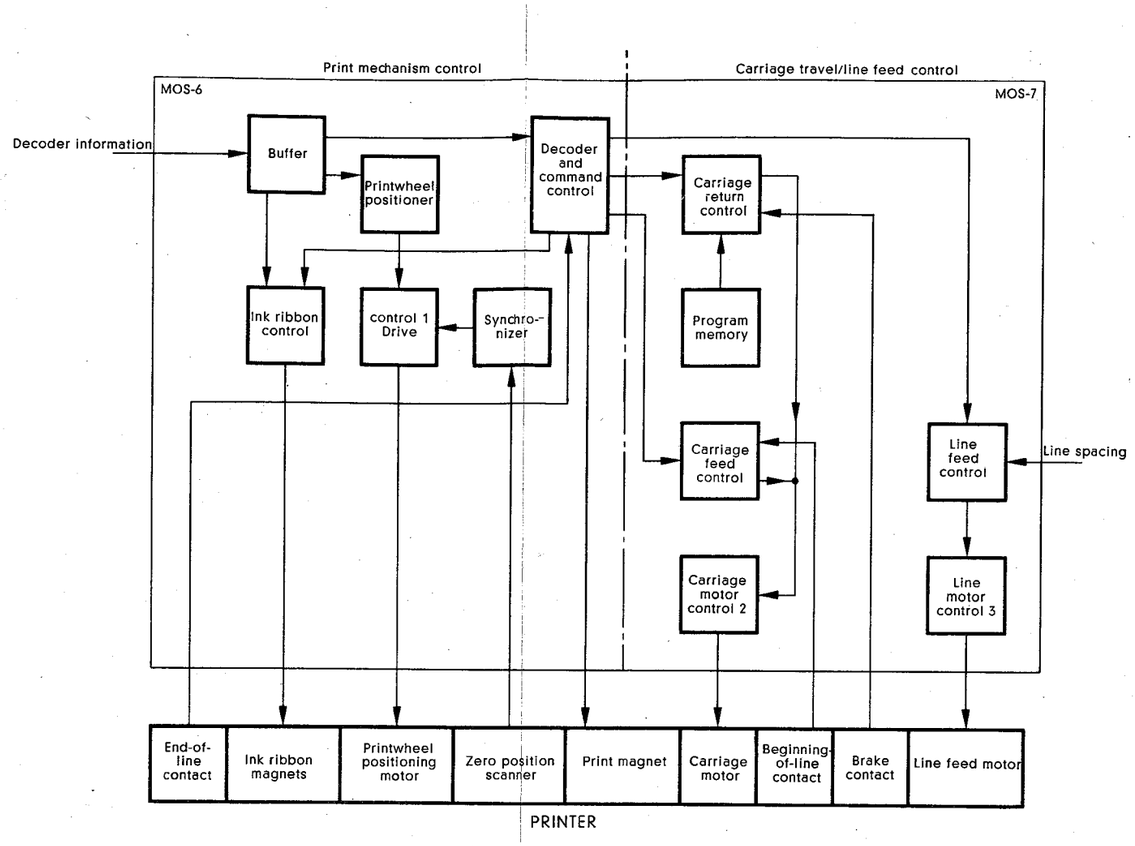
Interface S2 represents the line of demarcation between the device control functions, which remain largely the same for all applications, and the line interfacing system, which exists in many configurations and is determined by the particular circuit type.

Interface S2 is the point via which

- the send and receive data are interchanged,
- the signalling criteria are transferred for the operating mode control of the teleprinter, e.g. local, on-line, half-duplex and full-duplex modes,
- the alarm criteria, e.g. "bell signal and end-of-tape condition, and
- the signals for subscriber selection, e.g. dialplate pulses, are transmitted.

Apart from these signalling criteria, the line interfacing equipment must also be supplied with the necessary operating voltages:

$+ 12.8\ V \pm 5\ \%$, max. 650 mA,
$- 12.8\ V \pm 5\ \%$, max. 580 mA,
$+ 5\ V\ ^{+ 5\ \%}_{- 3\ \%}$, max. 700 mA.



7.2.3.9. Diagnostic unit

A clip connector with appropriate test points is provided on the basic electronics board as a quick means of checking the supply voltages and important signalling criteria.

The test points can be checked by means of the Model 1000 diagnostic unit, which has a light-emitting diode indicator and is simply plugged on. It is also possible, however, to check the test points using conventional test instruments.

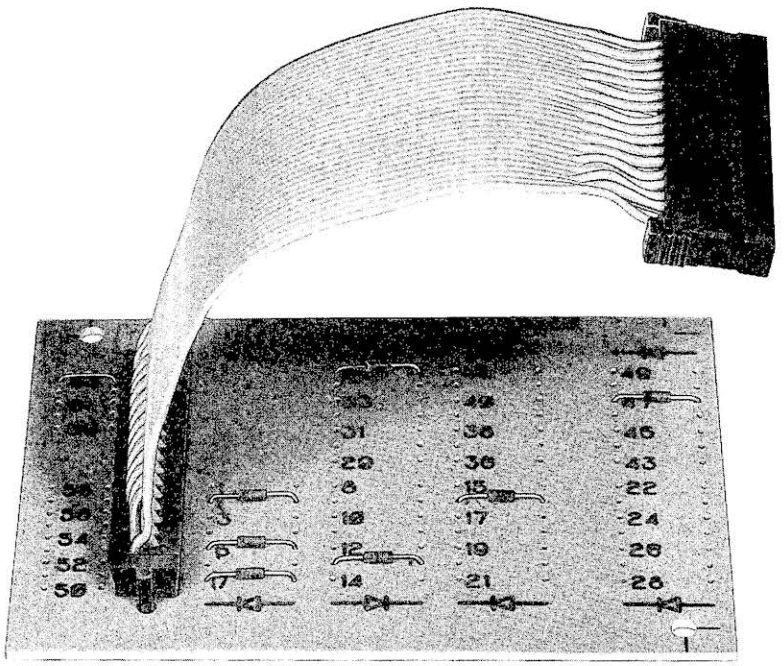
The following criteria are brought to the clip connector:

Supply voltages:
0 V
+ 5 V
+ 12 V
- 12 V
+ 40 V

Signalling criteria:
Punch pulses for the tape punch, tracks 1...5,
Punch pulse for the tape punch, feed hole track,
Tape feed pulse for the tape punch,
Print pulse for the printer.

7.3. Special-function module VA

Contents



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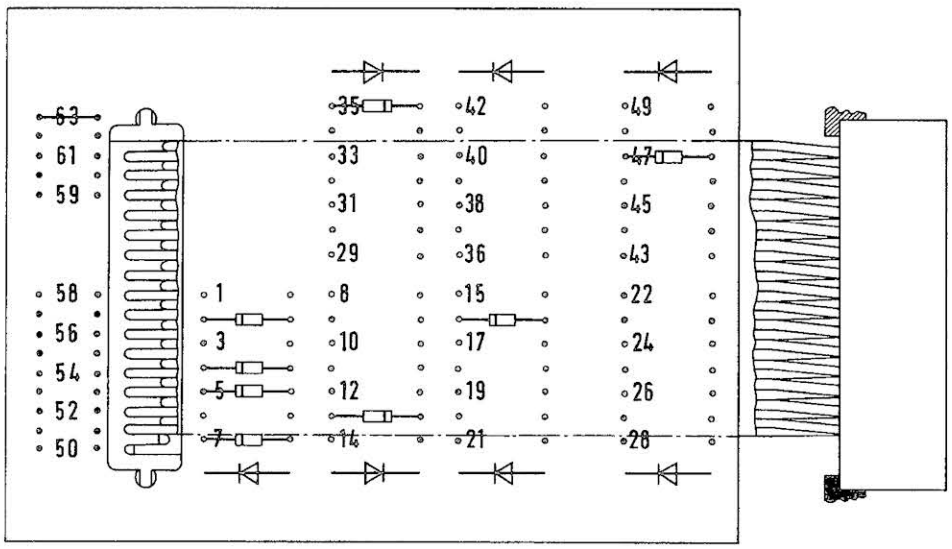
63
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18

7.3.1. GENERAL

The special-function module (Fig. 17) permits adaptation of the Teleprinter Model 1000 to the various operating conditions. By means of appropriate programming - i.e. insertion of diodes and wire straps - specific machine functions can be selected from a large number of capabilities provided for in the teleprinter. Programming is done already at the works.

All possible machine functions are listed in section 4.

Allocation of the diodes and wire straps to the machine functions demanded most frequently is such that generally the special-function module must only be equipped with a small number of diodes and wire straps. In many cases, the special-function module is not needed at all.

The special-function module can be modified in the field by simply inserting and removing diodes and wire straps.

7.3.2. CONSTRUCTION
(Fig. 18)

The special-function module is a plug-in pc board.
It can be equipped with up to 49 diodes, which form a 7 x 7 matrix, and 14 wire straps. The mounting positions are numbered so that the functions allocated to the diodes or wire straps provided can be easily identified with the aid of the table in section 4.

7.3.3. FUNCTIONAL PRINCIPLE

The basic electronics interprets the information stored in the special-function module. During this operation, the diode matrix is accessed by the decoder (MOS 5); the wire straps act on the keyboard control (MOS 1), the send control (MOS 2), the punch control (MOS 4) and the printer control (MOS 6).

7.3.3.1. Diode matrix

Certain machine commands are selected in the teleprinter by the insertion of diodes in the matrix. Typical machine commands would be "printout", "printout suppression", "line feed", "carriage return". Each of the 49 diodes (V1...V49) is assigned a particular machine function (see table in section 7.3.4). The decoder (MOS 5) interprets the diode matrix. The function of the decoder is described in the basic electronics, section 7.2.3.5.

7.3.3.2. Wire straps

By inserting wire straps W50 to W58, -12 V or +5 V is applied to the inputs of the MOS modules concerned. These signals are interpreted by the MOS modules, and the functions allocated to the wire straps are initiated.

When wire straps W59 to W62 are inserted, either the decoder outputs (MOS 5) for relays 3 and 4 of the relay module, or the end-of-paper signals from the printer and tape punch can be applied to the relevant relays. Moreover, one of the decoder outputs can be connected with the punch control (MOS 4) via wire strap W63 and, provided an appropriate diode is inserted and the relevant teleprinter signal is present, the tape punch turned off.

7.3.4. LIST OF MACHINE FUNCTIONS

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
V1	any comb. bit 1	Stop polarity	Start polarity	By appropriately inserting diodes V1...V5, one code combination can be chosen from the 32 possible combinations, to which specific functions can be allocated by inserting further diodes (V42...V49).
V2	any comb. bit 2	Stop polarity	Start polarity	
V3	any comb. bit 3	Stop polarity	Start polarity	
V4	any comb. bit 4	Stop polarity	Start polarity	
V5	any comb. bit 5	Stop polarity	Start polarity	
V6[1)]	any comb.	Code recognition on Ltrs. side	Code recognition on Figs. side	By appropriately inserting diodes V6 and V7, the functions allocated to the selected combination are performed on the Ltrs. or Figs. side or both.
V7[1)]	any comb.	Code recognition on Ltrs. and Figs. sides	Code recognition as defined with V6	
V8	Figs. no. 4	Printing	Print suppression	For special code assignments
V9	Figs. no. 4	Column feed	Feed suppression	For special code assignments
V10	Figs. no. 4	No punching or recording	Punching or recording	Use answerback start only in connection with "No punching" or "No recording", otherwise the answerbacks of the home and distant machines will be tripped in the case of paper tape and magnetic tape transmissions and punched or recorded Figs. no. 4 combination.
V11[2)]	Figs. no. 4	Answerback start	No answerback start	
V12	Figs. no. 6	Printing	Print suppression	For special code assignments
V13	Figs. no. 6	Column feed	Feed suppression	For special code assignments

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
V14[3]	Figs. no. 6	Does not operate contact 3	Operates contact 3	If relay module RET is installed, relay 3 can be operated during transmission or receipt of this combination, to whose potentialfree contact 3 a signal or supervisory device, for example, can be connected. The contact can be loaded with up to 60 V/ 100 mA. It is closed for 55 ms, regardless of the telegraph speed. The closing time starts in the middle of the fifth signal element. The connecting wires for the contact can be brought out via the special signal socket (FZD) or the subscriber connecting cable (ASL).
V15	Figs. no. 7	Printing	Print suppression	For special code assignments
V16	Figs. no. 7	Column feed	Feed suppression	For special code assignments
V17[4]	Figs. no. 7	Does not operate contact 4 or/and punch or magnetic tape unit (recording) - no stop	Operates contact 4 or/and punch or magnetic tape unit (recording) - stop (depending on W60 or W63)	As for V14; however, relay 4 or contact 4. Alternatively or additionally, the punch or magnetic tape unit (recording) can be switched off (strap W63).
V18	Figs. no. 8	Printing	Print suppression	For special code assignments
V19	Figs. no. 8	Column feed	Feed suppression	For special code assignments
V20	Figs. no. 8	Does not operate contact 2	Operates contact 2	As for V14, but relay 2 or contact 2
V21	Figs. no. 9	Printing	Print suppression	For special code assignments
V22	Figs. no. 9	Column feed	Feed suppression	For special code assignments

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
V 23	Figs. no. 9	Does not operate "bell" or contact 2	Operates "bell" and contact 2	As for V14, but relay 2 or contact 2. "Bell" also operated. Note: If relay module RET is not installed, only the "bell" is operated.
V 24	Figs. no. 10	Printing	Print suppression	For special code assignments
V 25	Figs. no. 10	Column feed	Feed suppression	For special code assignments
V 26	Figs. no. 10	Operates "bell" and contact 2	Does not operate "bell" or contact 2	If the diode is not inserted, relay 2 or contact 2 (see also V14) is only operated if relay module RET is also installed.
V 27	Figs. no. 19	Printing	Print suppression	For special code assignments
V 28	Figs. no. 19	Column feed	Feed suppression	For special code assignments
V 29	Figs. no. 19	Does not operate "bell" or contact 2	Operates "bell" and contact 2	As for V14, but relay 2 or contact 2. "Bell" is also operated. Note: If relay module RET is not installed only "bell" is operated.
V 30	Comb. 32	Print suppression	Printing	For special code assignments with 54 or 56 printable characters; e.g. for Arab countries
V 31	Comb. 32	Feed suppression	Character feed	
V 32	Comb. 32	Punching or recording	No punching or recording	For teleprinter networks in which code combination 32 is not permitted, punching or recording of this combination can be prevented.
V 33	4 x Ltrs. no. 3	Does not operate contact 2	Operates contact 2	As for V14; but relay 2 or contact 2

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
V 34[2)]	4 x Ltrs. no.3	Tape reader or magnetic tape unit (reading) - no start	Tape reader or magnetic tape unit (reading) - start	When receiving this character sequence, tape reader or magnetic tape unit (reading) can be turned on.
V 35[2)]	4 x Ltrs. no.3	Tape punch or magnetic tape unit (recording) - no start	Tape punch or magnetic tape unit (recording) - start	When receiving this character sequence, tape reader or magnetic tape unit (recording) can be turned on.
V 36	Comb. 27	Carriage return CR	No CR, but printing and column feed	For special code assignments with 54 or 56 printable characters; e.g. for Arab countries.
V 37	Figs. no. 28	Line feed LF	No LF, no punching or recording, but answerback start when receiving	For special code assignments; e.g. for Arab countries.
V 38[6)]	Ltrs. no. 28	Line feed LF	At the 1st character: CR 2nd char. and succeeding characters: LF	For special code assignments; e.g. for Arab countries.
V 39[6)]	Ltrs. no. 28	Line feed LF	CR and LF together	For special code assignments; e.g. for Arab countries.
V 40	Comb. 30	Figures shift (Figs.)	Ltrs. side: Figs. side: operates "bell"	For special code assignments; e.g. for Arab countries.
V 41[12)]	Red/black change-over	Send: red printing Receive: black printing	Red/black control externally	In the case of external red/black control and installed relay module RET, the teleprinter can be set to red printing by connecting two leads (by means of a contact or similar). The leads can be brought out via the special signal socket (FZD) or the subscriber connecting line (ASL).
V 42[7)]	any comb.	Printing function as per CCITT code table	Printing function as per code table inverted	For special code assignments; see also V1...V7. Note: If the code combination set up by diodes V1...V7 performs the CR or LF function, the printing and column feed functions cannot be inverted; i.e. there is always print and column feed suppression.
V 43[7)]	any comb.	Column feed function as per CCITT code table	Feed function as per code table inverted	

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
V 44[8)]	any comb.	Does not operate contact 2	Operates contact 2	As for V14, but relay 2 or contact 2. See also V1...V7.
V 45[4)]	any comb.	Does not operate contact 4 or/and punch or magnetic tape unit (recording) - no stop	Operates contact 4 or/and punch or magnetic tape unit (recording) - stop depending on W60 and/or W63)	As with V14, but relay 4 or contact 4. Alternatively or additionally, the punch or magnetic tape unit (recording) can be turned off (strap W63); see also V1...V7.
V 46[8)]	any comb.	Does not operate "bell" or contact 2	Operates "bell" and contact 2	As for V14, but relay 2 or contact 2. Additionally, "bell" is operated. Note: If relay module RET is not installed, only the "bell" is operated. See also V1... V7.
V 47[4)]	4 x any comb.	Does not operate contact 4 or/and punch or magnetic tape unit (recording) - no stop	Operates contact 4 or/and punch or magnetic tape unit (recording) - stop (depending on W60 or/and W63)	As for V14, but relay 4 or contact 4. Alternatively or additionally, the punch or magnetic tape unit (recording) can be turned off (strap W63). See also V1...V7.
V 48[2)]	4 x any comb.	Reader or magnetic tape unit (reading) - no start	Tape reader or magnetic tape unit (reading) - start	When receiving this character sequence (see V1...V7), reader or magnetic tape unit (reading) can be turned on.
V 49[2)]	4 x any comb.	Punch or magnetic tape unit (recording) - no start	Punch or magnetic tape unit (recording) - start	When receiving this character sequence (see V1...V7), punch or magnetic tape unit (recording) can be turned on.
W 50	Comb. 27 (Comb. 28)	Unlocking of keyboard (is not counted)	Character (comb. 27) is counted. Comb. 27 and 28 become case-dependent. Keyboard is unblocked by Fig. no. 28.	For special code assignments with 54 or 56 printable characters; e.g. for Arab countries.

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
W 51	Comb. 32	Character is not counted	Character is counted and in addition becomes case-dependent.	For special code assignments with 54 or 56 printable characters. Note: If the strap is not inserted, code combination 32 is assigned to both cases. If the strap is inserted, e.g. in connection with V30 (printing) and V31 (column feed), the character is counted when entered via the keyboard and becomes case-dependent; i.e. it can be coded on the Ltrs. or Figs. side.
W 52[13)]	Keyboard or for RO teleprinter red/black changeover	Without umlauts or red/black control deactivated	With umlauts (AE, OE, UE) or external red/black control	For keyboard layouts for German-speaking countries. The character sequences AE, OE and UE are transmitted by means of keys Ä, Ö and Ü. Note: When using the umlauts, the code combinations Figs. 6 (F), Figs. 7 (G) and Figs. 8 (H) cannot be generated via the keyboard, i.e. they cannot be assigned special characters.
W 53	Figs. no. 10	Character is counted	Character is not counted	For special code assignments; in connection with V25 - feed suppression.
W 54	Figs. nos. 6, 7, 8	Characters are counted	Characters are not counted	For special code assignments; in connection with V13, V16 and V19 - column feed suppression. Note: The "No counting" criterion can, for reasons of circuit design, be selected for these three code combinations jointly only. If not all of these 3 code combinations is assigned either column feed or no column feed, the user must decide whether insertion or non-insertion of the strap is better suited for his purposes.

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
W 55	Overprint lock	Not effective after the 69th character	Effective after the 69th character	The overprint lock prevents several characters being printed on top of each other at the end of the line by locking the keyboard.
W 56	Overprint lock	Not effective after the 72nd character	Effective after the 72nd character	The overprint lock prevents several characters being printed on top of each other at the end of the line by locking the keyboard.
W 57	End-of-line	Column feed suppression	Automatic CR and LF	Automatic CR and LF should only be used in connection with the overprint lock in order that characters CR and LF must be keyed in during keyboard operation. Thus "automatic CR and LF" is only effective when receiving.
W 58	Keyboard	Automatic Ltrs./Figs. shift effective	Automatic Ltrs./Figs. shift not effective	Automatic Ltrs./Figs. shift must be deactivated for condensed keyboards.
W 59[9)]	End of paper tape or magnetic tape	Does not operate contact 4	Operates contact 4	At the end of the paper tape or magnetic tape, relay 4 or contact 4 can be operated. As described for V14, the contact can be wired and brought out.
W 60[9)]	Contact 4	Selection line interrupted	Relay for contact 4 operated	If when sending or receiving specific code combinations, relay 4 or contact 4 is to operate, not only the appropriate diode but also this wire strap must be inserted, since relay 4 can also operate at the end of the paper tape or magnetic tape.
W 61[10)]	Contact 3	Selection line interrupted	Relay for contact 3 operated	If relay 3 or contact 3 is to operate when code combination Figs. no. 6 is sent or received, not only diode V14 but also this wire strap must be inserted, since relay 3 can also be operated at the end of the teleprinter paper.

Mounting position V ≙ diode W ≙ wire strap	Function Effective on	Diode/strap not inserted	Diode/strap inserted	Explanations (Explanations generally refer to function when diode/strap inserted)
W 62[10]	End of teleprinter paper	Does not operate contact 3	Operates contact 3	Relay 3 or contact 3 can be operated at the end of the teleprinter paper. As described for V14, the contact can be wired and brought out.
W 63[11]	Figs. no. 7, any comb., 4x any comb.	Punch or magnetic tape unit (recording) - no stop	Punch or magnetic tape unit (recording) - stop	If the punch or magnetic tape unit (recording) is to be turned off when sending or receiving specific code combinations, not only the appropriate diode but also this wire strap must be inserted.

Comb. Code combination no. as per CCITT Code No. 2

any comb. Freely-selectable code combination (Nos. 1 to 32 as per CCITT Code No. 2)

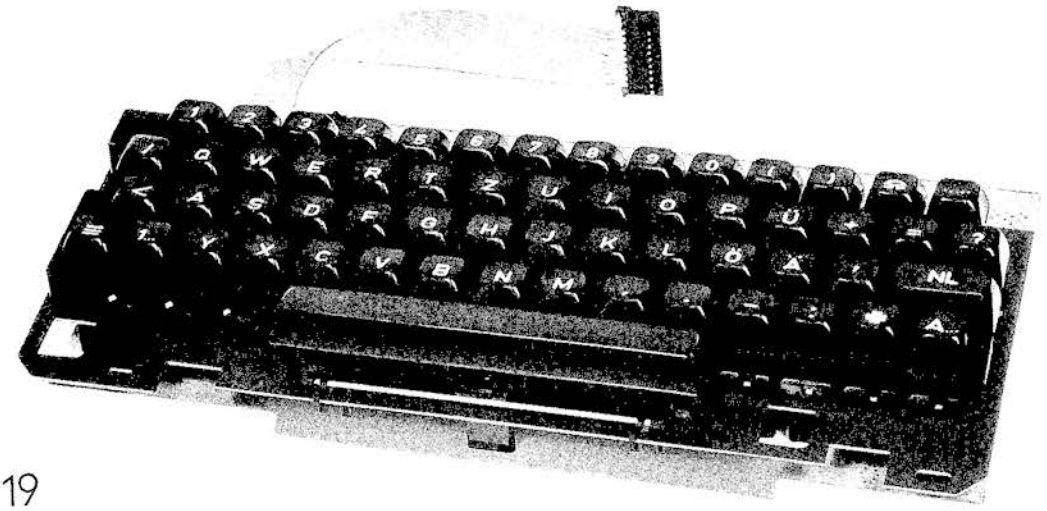
Ltrs. no. Function only effective on Letters side

Figs. no. Function only effective on Figures side

1) Diode V7 has priority over diode V6
2) Function is initiated only when receiving
3) Effective only with W61
4) Effective only with W60 or/and W63
5) Not effective in connection with W62
6) Can only be used alternatively
7) Does not apply for CR and LF
8) Inserted diode has priority
9) Can only be used alternatively
10) Can only be used alternatively
11) Effective only with V17 or/and V45 or/and V47
12) In RO teleprinter effective only with W52.
13) KSR teleprinter: for umlauts.
RO teleprinter: for external red/black control effective only with V41.

7.4. Keyboard TA

Contents



19

7.4.1. GENERAL (Figure 19)

The keyboard design was inspired by human engineering considerations. The keyboard comprises up to 60 keys depending on layout. Unassigned key positions are covered up by dummy keys.

7.4.2. CONSTRUCTION

The keyboard consists of key contacts acting on the keyboard control with keyboard buffer.

Keyboard: Each key of the keyboard is fitted with a contact which closes when the key is depressed. The contact is of the crosspoint type with a gold-plated surface; it is located protected from dust in the key cover. Its contact resistence is = 60 milliohms.

The assignment of the key positions to the code combinations is made in the keyboard. The key assignment can be selected freely and is implemented by inserting diodes and wire straps of varying lengths.

An exception is the New Line key [↵] / [NL] .
Because of its size it can only be assigned to position C13/C14 (see section 7.4.3.3).

Keyboard control: The keyboard control with keyboard buffer is implemented in MOS technology. This enables the design of the keyboard to be kept simple (open contact).
Control and buffer are both contained in the basic electronics.

7.4.3. PRINCIPLE OF OPERATION

7.4.3.1. Keyboard control

The keyboard control is implemented in component MOS-1 in the basic electronics. It is described in section 7.2.3.1 (For subscriber selection via keyboard see section 7.2.3.2.2).

7.4.3.2. Character repetition

When the run-out key (....) is depressed, the character entered last is repeated as long as the run-out key is held depressed. If a different character is keyed in while the run-out key is held depressed, the new character is repeated until the run-out key is released.

7.4.3.3. Character sequences

To facilitate operation of the teleprinter, the keyboard includes keys which trigger certain character combinations. For example, the umlauts ä, ö, ü in use in German-speaking countries are transmitted as the character combination ae, oe and ue respectively.

A New Line key [↵] / [NL] can be provided in place of or in addition to the keys for carriage return and line feed. When pressed, this key causes the character sequence

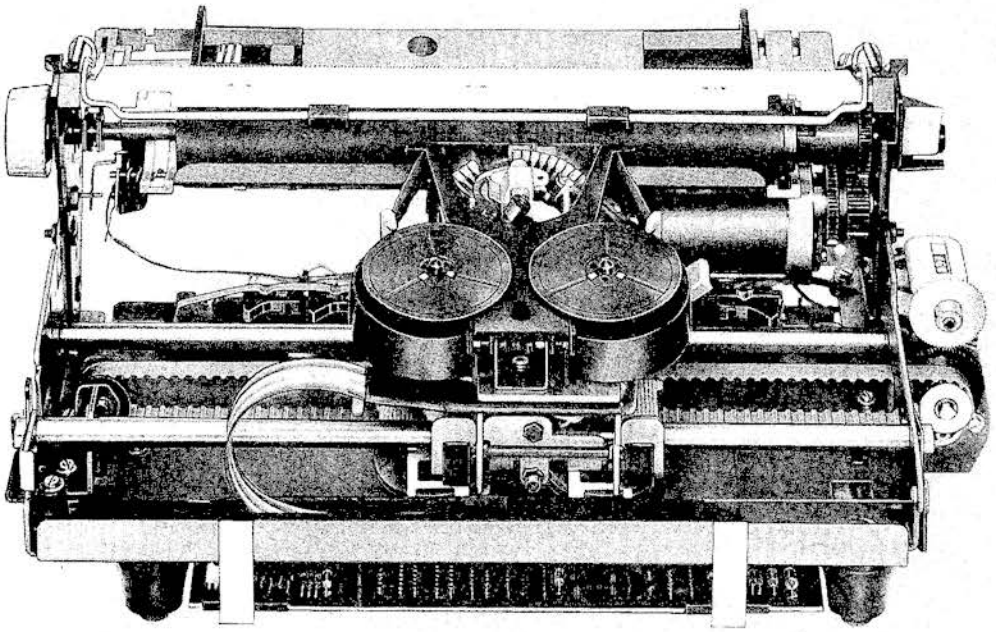
CR LF CR to be generated. The NL key can occupy literally any key position on the keyboard. If it is provided with a broader key button, however, it can only be installed in position C13/14 (middle letters row, to the right).

7.4.4. EFFECTS OF THE OPERATING MODES ON THE KEYBOARD TA

Functional state on the teleprinter	Standby		Operating condition			
	AC power voltage applied		Local or on-line working enabled			
			Proceed to dial	Idle	Printing	
	Teleprinter hooked up to automatically switched network	Teleprinter hooked up to point-to-point dedicated circuit	Call button pressed (in dialled call)	no input or output module in operation	an input module other than keyboard in operation	keyboard only in operation; one output module in operation
Effect on:	KEYBOARD					
All keys except the letters shift key (A...) and the keys for figures 1 to 0	ineffective	ineffective	ineffective	effective	ineffective	effective
Letters shift key (A...)	ineffective	effective	ineffective	effective	ineffective	effective
Keys for figures 1 to 0	ineffective	ineffective	effective	effective	ineffective	effective

7.5. Printer DR

Contents



20

7.5.1. GENERAL

The Teleprinter Model 1000 is equipped with a type printer (Figure 20) which ensures the high standard of print quality only obtainable with impact printing.

The printer's mechanical parts have been reduced to a minimum; it prints up to 15.4 characters/sec.

The type carrier is a print wheel which is a plastic spoked disk. The printing types are fitted to the tips of the spokes.

A stepping motor rotates the print wheel to the appropriate printing position. For this, the printer-associated electronics chooses the shortest angle of rotation of the print wheel to position the tape to be printed.

Once the type is in the printing position, a hammer is actuated by an electro-magnet and strikes the type, which produces an impression of the character on the paper via the intervening ink ribbon.

Normal commercially-available ink ribbons can be used.

The print force is adjustable, for single-ply or for 2-ply to 4-ply stationary.

The paper is fed to the printing position via a rod which regulates paper traction and also via a paper guide which is adjustable for various paper widths.

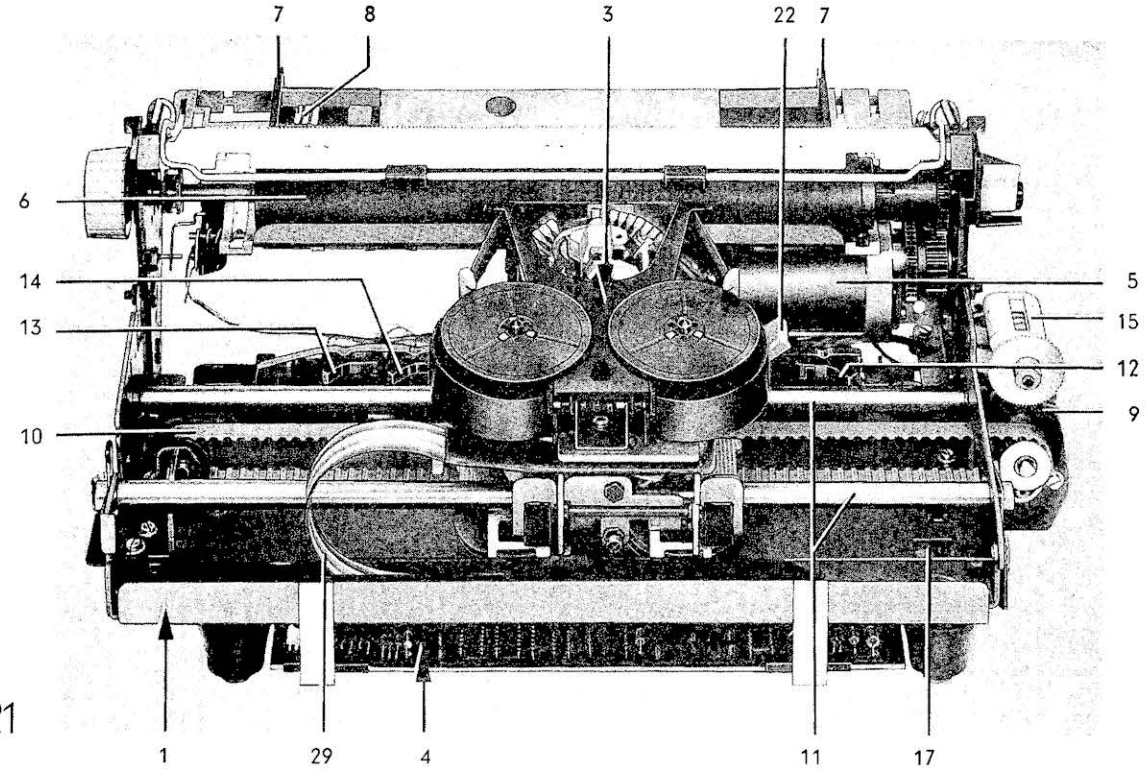
A second stepping motor moves the printer carriage with the printing mechanism along the print line via a toothed belt. Reversing the direction of rotation of this stepping motor causes the printer carriage to return smoothly and without shock to the beginning-of-line position.

Another stepping motor is used for the line feed function. The line spacing can easily be set to single, 1 1/2 or double by means of a switch.

The motion of the printer carriage is used to advance the ink ribbon. A magnet system reverses the ribbon feed direction.

Two further magnet systems position the ink ribbon for printing in red or black, and for making the last characters printed visible.

At telegraph speeds of 75 and 100 bauds, the printer buffer stores the characters received during carriage return.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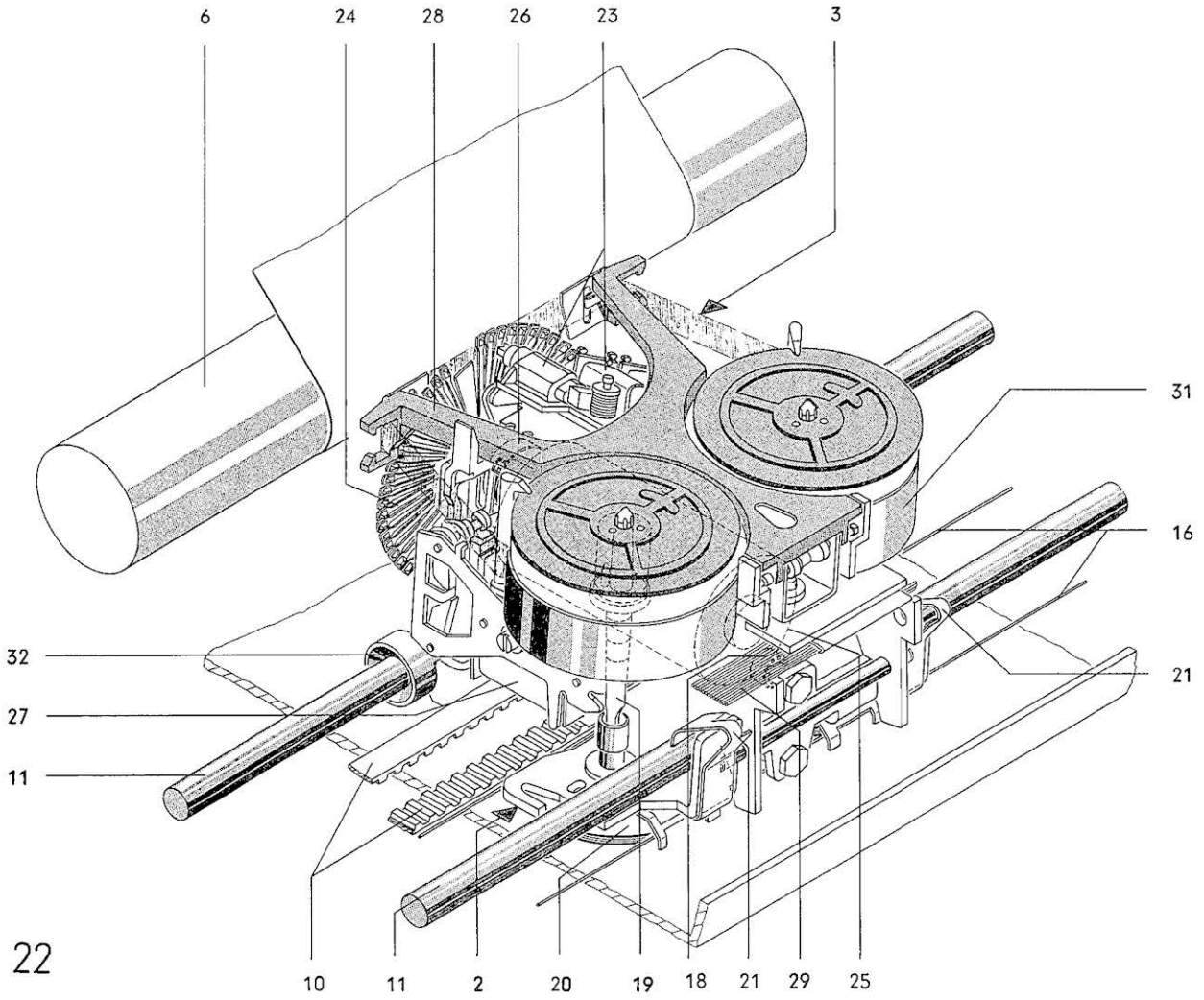
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7.5.2. CONSTRUCTION (Figures 21 and 22)

The printer is composed of:

Printer chassis 1,
Printer carriage 2,
Printing mechanism 3 and
Printer electronics 4.

Printer chassis:

Printer chassis 1 is the supporting part of the printer. It contains:

- The paper feed facility, with
  stepping motor 5,
  platen 6,
  paper guide 7 and
  paper contact 8;
- The carriage drive facility, with
  stepping motor 9,
  toothed belt 10,
  two guide rails 11,
  end-of-line contact 12 (switch S1, Fig. 27)
  beginning-of-line contact 13 (switch S3, Fig. 27)
  braking contact 14 (switch S2, Fig. 27)
  operation unit counter 15;
- The ribbon advance facility, with
  two drive cables 16 and
  magnet 17 for reversing the direction of ribbon feed.

Printer carriage:

Printer carriage 2 runs on two guide rails 11 by means of plain bearings 32 and roller bearings 18 and is linked with stepping motor 9 by toothed belt 10. Axles 19 for taking up the ink ribbon are driven by ribbon drive cables 16, which run over two pulleys 20 fitted with a freewheel mechanism. Printer mechanism 3 is linked with printer carriage 2 via a push-fit joint 21 and is secured in the printing position by means of a mechanical interlock 22. The printing mechanism is easily removed by shifting the lever of the mechanical interlock.

Printing mechanism:

Printing mechanism 3 contains:
printing system 23,
print wheel 24,
stepping motor 25 for positioning the print wheel, photo-electric scanner (not shown) for exact positioning of the print wheel, magnet system 27 for two-color print control and for lowering the ribbon to the character visibility position,
spool carrier 31 with ribbon lifter 28 and ribbon reversal contact,
trailing cable 29, which provides the electrical communication with the printer electronics.

Printer electronics: Printer electronics 4, a pc board, is located under the printer chassis. It carries the power electronics for the printer. This includes all the control circuits and amplifiers required for the stepping motors and electro-magnets. The digital section of the control, the printer buffer for example, is to be found on the basic electronics.

7.5.3. PRINCIPLE OF OPERATION

After a character is received, the stepping motor rotates the print wheel to the appropriate printing position; the character is then printed and the printer carriage advanced by one column. As the carriage feed takes place, the print wheel is already being set to the next printing position.

7.5.3.1. Print wheel positioning

The print wheel (Figure 23) is rotated one pitch with each single step of the stepping motor.

On the basis of the actual position of the print wheel, the printer control on the basic electronics calculates the direction of rotation and the number of pitches by which the print wheel must be rotated to reach the next printing position by the shortest path. Hence, the maximum positioning angle is only 180^{o}.

Special acceleration and deceleration programs are used to accelerate the print wheel from 0 to a rotational speed of 1000 pitches per second within five steps and to decelerate it to 0 again within three steps. If the displacement range is equal to or smaller than seven pitches, the rotational speed is a constant 500 pitches/second.

In conjunction with the photoelectric scanner, the printer control checks the position of the print wheel (actual position) with the position called for by the printer control (address position).

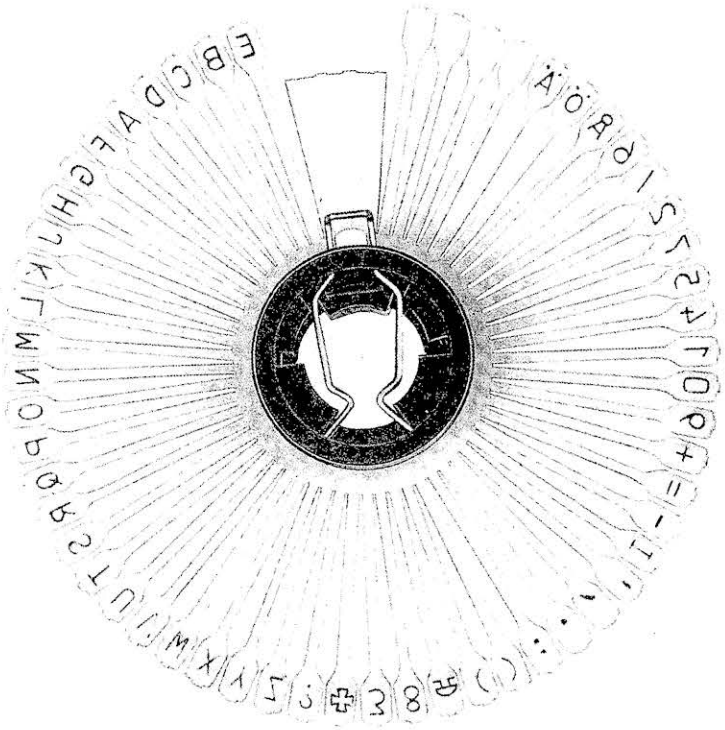
The concurrence of the actual with the address position of the print wheel is checked

whenever the character "e" is selected,
whenever a mode is enabled,
whenever there is a space and
in communication pauses.

The check takes place as follows:

The print wheel assumes a defined position on support 26 (Figure 22). The support has a cutout six pitches wide which is scanned by the photoelectric scanner. If the cutout in the support is recognized at the same time as the pulse combination assigned to the character "e" is applied to the stepping motor, the printer control recognizes that the actual and the address positions are in concurrence.

If there is no concurrence, a synchronization run is executed for a maximum of 156 ms. The characters received during the synchronization run are stored in the printer buffer.



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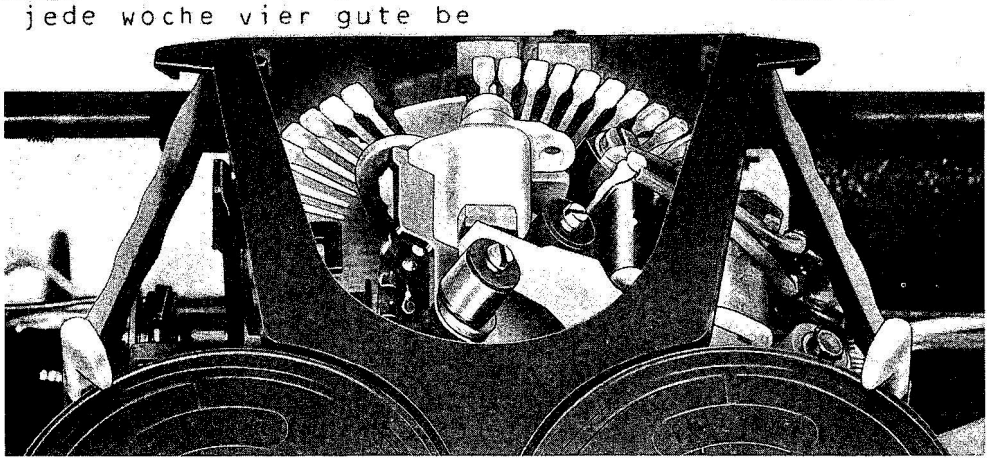
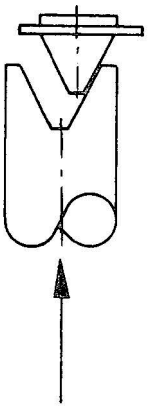
jede woche vier gute bequeme pelze xy 1234567890
jede woche vier gute bequeme pelze xy 1234567890
[redacted]
[redacted]e woche vier gute bequeme pelze xy [redacted]7890
jede woche vier gute be



24



25

Synchronization run:

For coarse adjustment (to six characters precisely), the stepping motor receives a synchronizing signal which it uses to rotate the support together with the print wheel until the photoelectric scanner recognizes the cutout in the support.

For fine adjustment to the right pitch (character "e"), the printer control drives the stepping motor by means of six different pulse sequences. The stepping motor continues to rotate until the photoelectric scanner operates at the same instant as the pulse sequence assigned to the character "e" is recognized.

The character in the printer buffer are now called and printed.

7.5.3.2. Character visibility position (Figure 24)

In this position, the last characters printed can be read also. The character visibility position is assumed whenever an operating mode is enabled and in communication pauses, i.e. whenever 130 ms have elapsed since the last character was printed. This is achieved as follows:

Next to the character "e" on the print wheel there is an open sector four pitches in width. When the print wheel is in the character visibility position, the character "e" is in the printing position. Thus, the open part of the print wheel is situated immediately in front of the last character printed. Simultaneously, the visibility magnet lowers the ink ribbon to give an unobstructed view of the copy area.

7.5.3.3. Printing of characters

To print the positioned character, the electro-magnetically-fired print hammer strikes the type against the ink ribbon.

The front of the print hammer has a wedge shaped indentation; this faces a corresponding projection on the type (Figure 25). This arrangement ensures the horizontal positioning of the type is corrected as the printing action is executed.

The printer control lessens the print force for eight small-area characters, e.g. the full stop, by reducing the current.

If only single-ply paper is to be used for printing, the reduced print force can be set for all characters by means of a switch on the switch module (section 7.7.3.1). This brings a further reduction in printing noise.

7.5.3.4. Printer carriage drive

A stepping motor moves the printer carriage horizontally a column at a time by means of a toothed belt. Three single steps of the stepping motor correspond to one column space. A column space equals 2.54 mm.

The end-of-line position can be set to the 69th or 72nd character by means of the end-of-line contact (switch S1, Figure 28). The end-of-line contact is responsible for carriage feed suppression and for automatic carriage return and line feed.

The return of the printer carriage to the beginning-of-line position is achieved by reversing the direction of rotation of the stepping motor. A carriage return program

contained in the basic electronics brings the acceleration to about 1200 motor steps/second (≈ 1 m/sec). Twelve columns before the beginning-of-line position, a braking contact (switch S2, Figure 28) operates to decelerate the stepping motor to 250 motor steps/second until the printer carriage comes to a halt.

A beginning-of-line contact and the position of the ring counter in the stepping motor control are used for positioning the printer carriage in the first print column of a line. The beginning-of-line contact (switch S3, Figure 28) serves for coarse positioning, while the ring counter marks an exactly reproducible beginning-of-line position.

The carriage return time is about 300 ms. At a telegraph speed of 50 bauds, the carriage return is over within the time required for the two control characters CR and LF.

At 75 and 100 bauds, the time required for the two control characters is only 200 ms and 150 ms respectively. As this time is not sufficient for a carriage return, the printer buffer, a 5-character store, stores the characters received during the carriage return.

As the printer prints at a rate of 15.4 characters/second and 13.33 characters/second are received when operating at 100 bauds, the printer empties the printer buffer again after about ten characters have been printed in the new line.

7.5.3.5. Line feed

An intermediate gear links a stepping motor 5 (Figure 26) with platen 6. Four steps of the stepping motor feed the paper forward by one line when single-line spacing is set.

The line spacing can be set to single, 1 1/2 or double spacing by means of a switch in the switch module (section 7.7.3.1).

Brief depression (< 250 ms) of a button in the manual device controls module advances the paper by one quarter of a line. Longer actuation of this button (> 250 ms) causes the paper to be fed forward for as long as the button is held depressed. This paper feed is not transmitted to the distant station.

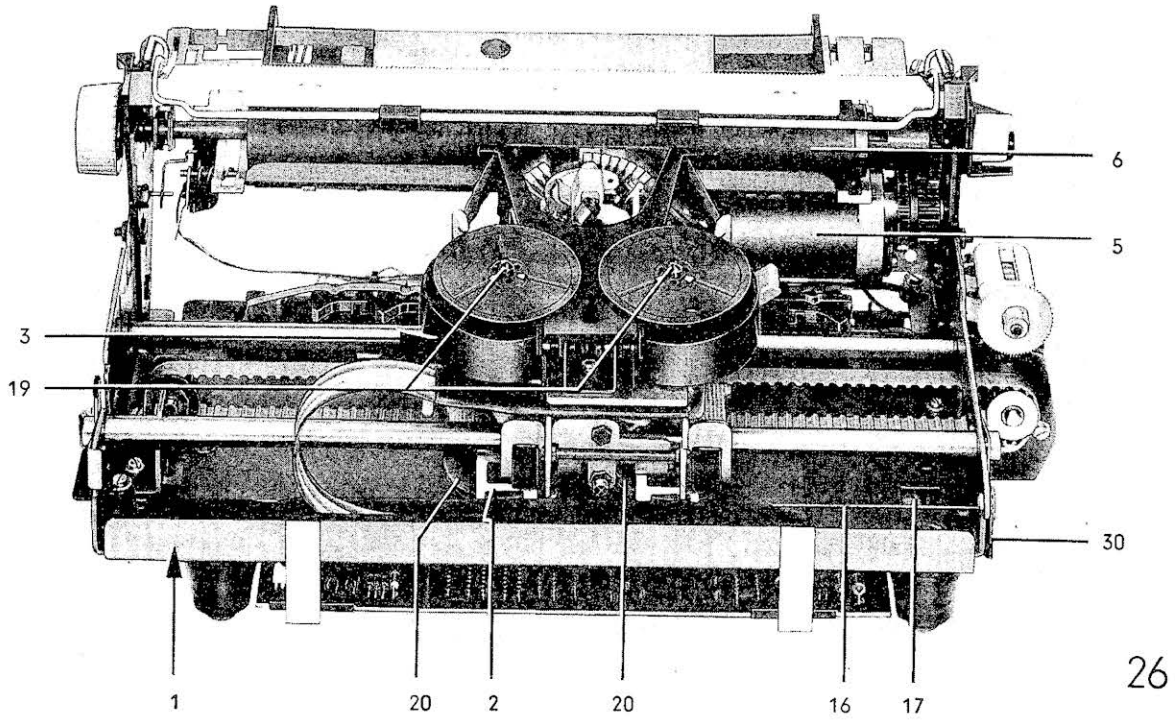
7.5.3.6. Ribbon drive (Figure 26)

The motion of the printer carriage is used for driving the ink ribbon. A magnet system is used to reverse the direction of the ribbon feed.

The two ribbon drive cables 16 which are secured in printer chassis 1 are each lead round a cable pulley 20 in the printer carriage 2 and end at armature 30 of magnet system 17. The position of armature 30 makes one of the two cables 16 taut and the other slack. As the carriage feed is taking place, cable pulley 20 executes a rotary motion on the taut cable 16. This motion is transferred via a clutch to ribbon spool axle 19 in printing mechanism 3.

The end-of-ribbon contact operates when the end of the ribbon is reached and reverses magnet system 17. Armature 30 swings to its other position, thus tensioning the cable which was loose.

During the carriage return, cable pulleys 20 are out of engagement by means of a freewheel mechanism.



7.5.3.7. Two-colour print control; character visibility position

The ink ribbon can assume three positions:

Printing in red	- for local working and transmission
Printing in black	- for message reception
Character visibility position	- i.e. lowering the ribbon below the level of the printed line to make visible the text just printed.

Two hinged-armature magnets incorporated in the printing mechanism move the ribbon lifter to the desired position. The two magnets are energized by the two-colour print control on the printer electronics.

Printing in red	- no magnet is energized
Printing in black	- magnet SW is energized (Figure 28)
Character visibility position	- magnet SB is energized (Figure 28)

7.5.3.8. Paper supervision

A sensing lever built into the paper guide actuates microswitch S4 (Figure 28) when the paper runs out. The resulting signal is sent to the basic electronics. Depending on the line interfacing equipment, this signal may influence the connection, e.g. by terminating the operating state of the teleprinter. It is also possible, depending on how the special function module is programmed, to use the signal for signalling to external points, e.g. for operating a floating contact to which a bell or an alarm lamp can be connected.

7.5.3.9. Operation unit counter

One operating unit is equivalent to one hour of continuous operation at a speed of 50 bauds.

The mechanical counter of the operation unit counter is driven via an intermediate gear of the stepping motor for column feed. During carriage return a freewheel mechanism uncouples the mechanical counter.

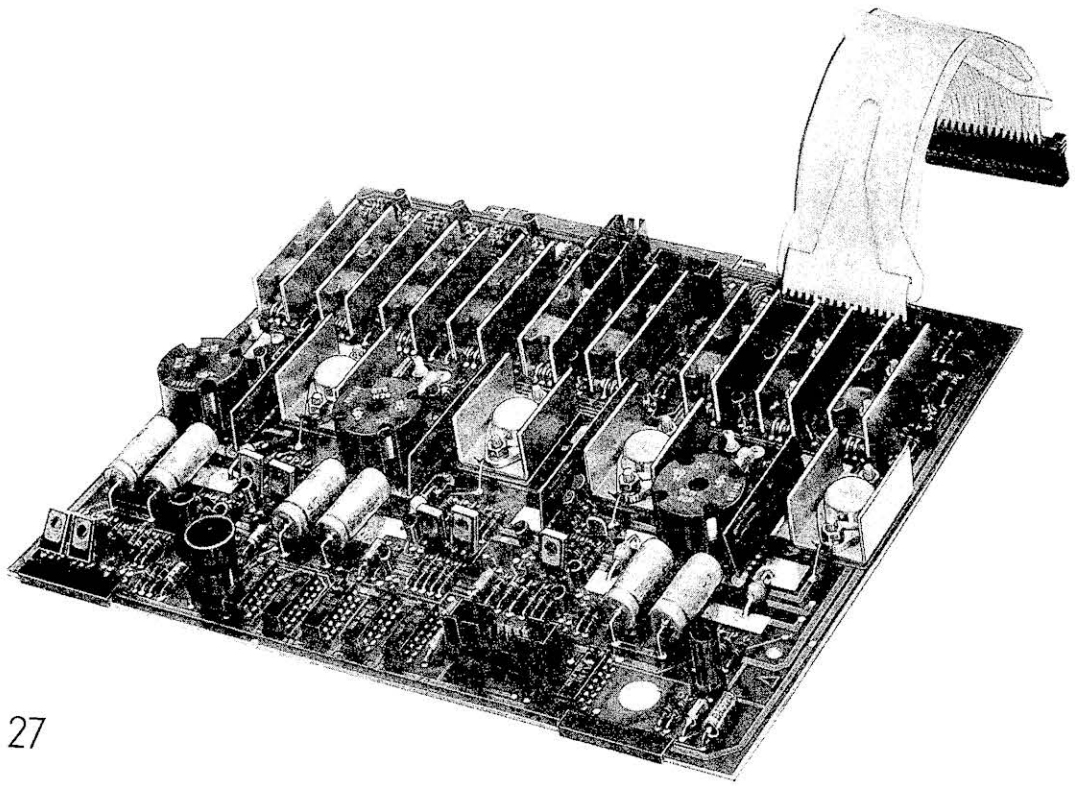
The transmission ratio chosen is such that, in consideration of the frequency of column feeds in German and English texts, the counter gives an indication which reflects the operating time of the mechanical components.

7.5.3.10. Printer electronics (Figures 27, 28)

The printer electronics is a pc board which is located on the underside of the printer. It carries the following amplifiers:

- three AGC amplifiers for the stepping motors
- one AGC amplifier for the printhammer magnet and
- three amplifiers for the magnets of the ink ribbon control and for the ribbon drive.

In addition, the synchronizing information for positioning the print wheel, and the signals from switches S1 to S4 are routed to the basic electronics via the printer electronics.

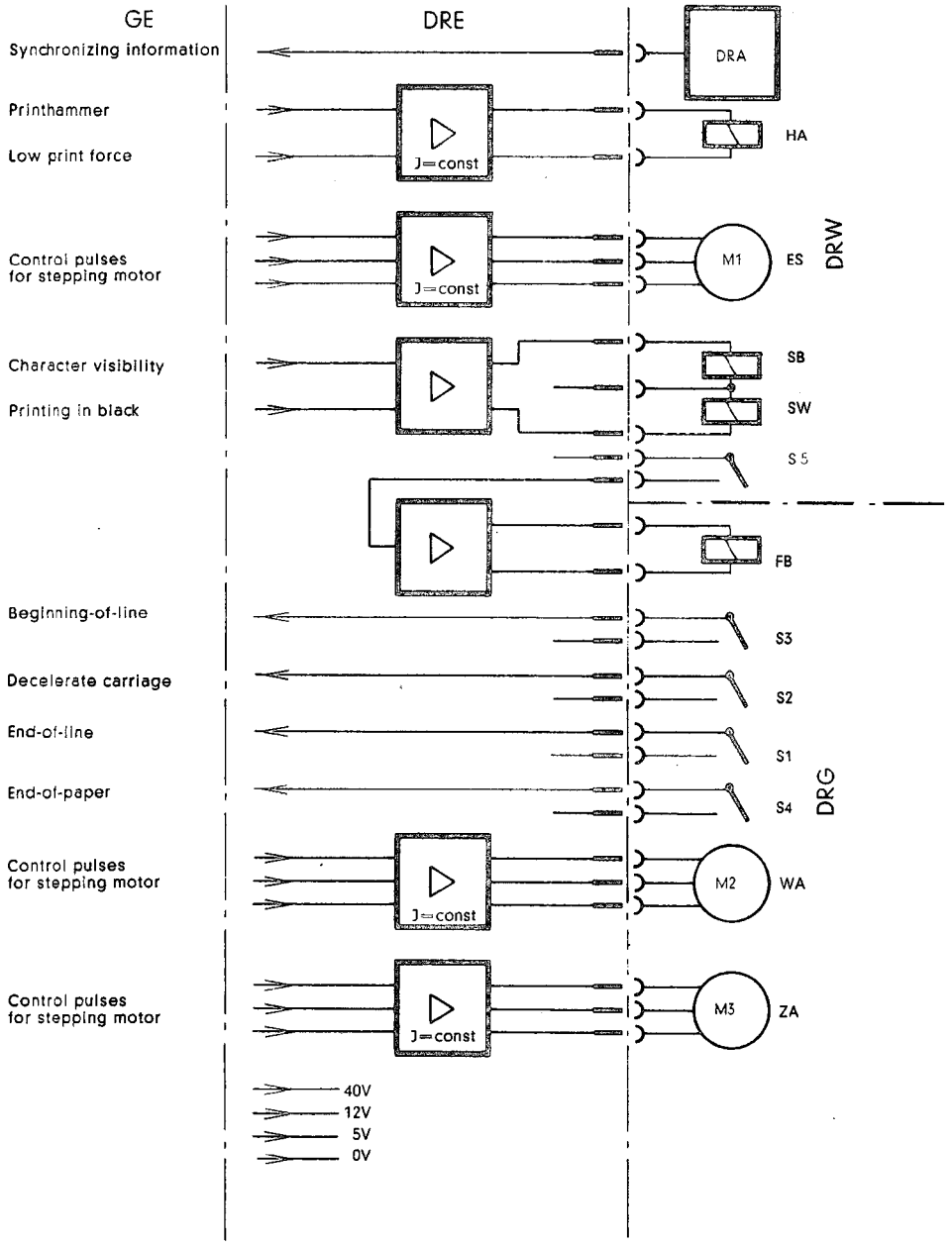


27

Figure 28

Schematic circuit diagram: Printer

DRA	Printer scanner	S1	Switch for end-of-line
DRE	Printer electronics	S2	carriage deceleration
DRG	Printer chassis	S3	beginning-of-line
DRW	Printer carriage	S4	end-of-paper
		S5	end-of-ribbon contact
ES	Positioning stepping motor	SB	Magnet for character visibility position
FB	Magnet for ribbon drive	SW	Magnet for printing in black
GE	Basic electronics	WA	Motor for carriage motion
HA	Printhammer magnet	ZA	Motor for line feed



The AGC amplifiers make use of film circuits which have been matched by laser beam. This obviates the need to match them on the pc board. The AGC amplifiers are controlled by the signals from the basic electronics and supply the current set by the matching operation to the stepping motors or printhammer magnet.

If the amplifiers for the three magnets of the ribbon reversal mechanism are turned on, they first deliver a 40 V pulse about 20 ms long and then switch back to a holding excitation of 12 V.

7.5.3.11. Printer variants

The following variants of the printer are available:

Paper width:	210 mm, 216 mm and 250 mm The various paper widths are set simply by moving tabs on the paper guide pan.
Line length:	69 or 72 characters The line length is set by moving the end-of-line contact against a stop; no adjustment is necessary.
Option for form paper:	If form paper is to be used, a different platen must be installed.

7.5.4. EFFECTS OF THE OPERATING MODES ON THE PRINTER DR

When an operating mode is enabled, the following functions are executed automatically:

- Carriage return to the beginning-of-line position
- Line feed by one line
- Setting print wheel to character visibility position; if required with synchronization run
- Lowering ink ribbon to character visibility position.

Functional state of the Teleprinter	Standby	Operating condition	
	AC power voltage applied	Local or on-line working enabled	
		Idle	Printing
		No input or output module in operation	At least one input or output module operation
Effects on:	PRINTER		
Photoelectric scanner	no current	current	current
Printhammer magnet HA	no current	no current	current with each character
Stepping motor M1 for printwheel positioning	no current	current; printwheel assumes visibility position	current
Magnet SB for visibility position	no current	current ≙ visibility position	no current
Magnet SW for printing in black	no current ≙ red	no current	no current ≙ red current ≙ black
Switch S5 End of ink ribbon	effective; reverses ribbon magnet	effective; reverses ribbon magnet	effective; reverses ribbon magnet
Magnet FB Ink ribbon drive	current or no current possible	current or no current possible	current or no current possible
Switch S3 Beginning-of-line contact	ineffective	effective	effective
Switch S2 Breaking contact	ineffective	effective	effective
Switch S1 End-of-line contact	ineffective	effective	effective
Switch S4 End-of-paper contact	effective; depending on line interfacing equipment	effective; depending on line interfacing equipment	effective; depending on line interfacing equipment
Stepping motor M2 Carriage drive	no current	current	current
Stepping motor M3 Line feed	no current	current	current
Paper feed local	ineffective	effective	effective
Letters/figures shift local	ineffective	effective	effective

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7.6. Manual device controls CB

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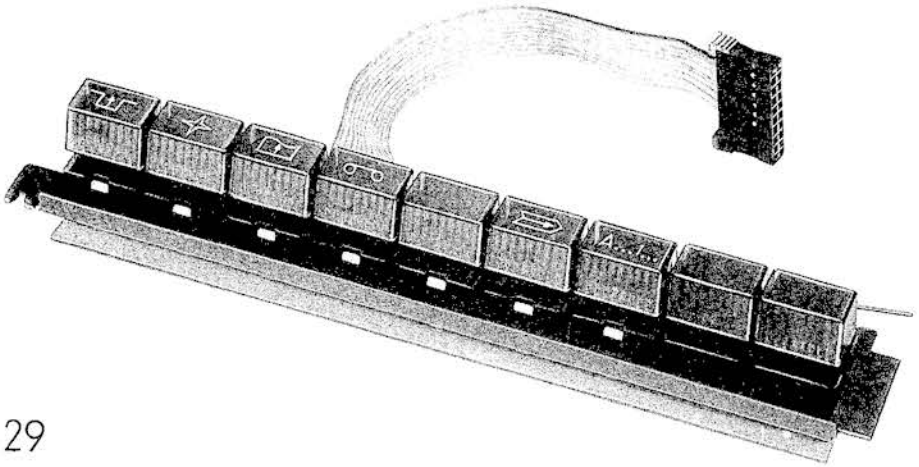

29

7.6.1. GENERAL (Figure 29)

The manual device controls module can accommodate up to seven controls and indicators and a key switch for preventing unauthorized use of the teleprinter. In special cases it is possible to replace the key switch by two further controls or indicators.

Each mounting position on the module is assigned a specific machine function. With the exception of the unlock button for the keyboard, the customer is free to decide which of the machine functions he requires.

If individual mounting positions remain unassigned, dummy buttons are substituted for the controls and indicators omitted.

7.6.2. CONSTRUCTION

The manual controls and indicators are arranged in a row on a carrier plate and are connected to the basic electronics via a pc board and flat ribbon lead. The functions assigned to the manual controls and indicators are denoted by symbol plates on the buttons.

7.6.3. PRINCIPLE OF OPERATION

Mounting position 1:

Button (S1): unlock keyboard
Button with lamp
Symbol: 
Function: Unlocks keyboard

The lamp lights if
the keyboard buffer is full, or
the printer has reached the end-of-line position.

In both cases further typing on the keyboard is ineffective.

In the first case the keyboard is released again by pressing the unlock button, provided at least one character has been called from the buffer.
In the second case the keyboard is released for further typing by pressing the carriage return key.

Mounting position 2:

Button (S2): "Here is"
Button without lamp
Symbol: 
Function: Trips the answerback

Pressing the "here is" button causes the home answerback unit to be tripped and the answerback code to be transmitted. During the transmission the keyboard and tape reader are blocked.

Mounting position 3:

Button (S3): Printer paper feed
Button without lamp

Function: Feeds the printer paper forward

The printer feeds the paper forward for as long as the button is held depressed. Brief depression of the button causes the paper to be fed forward one quarter of a line spacing.

Mounting position 4:

Switch (S4): Data medium ON
Switch without lamp

Function: Enables recording on data medium

When the switch is depressed the tape punch or magnetic tape unit is activated provided an operating mode is enabled and paper tape is loaded in the tape punch or the magnetic tape unit is ready to record. Every message received by the teleprinter is recorded regardless of whether the appropriate buttons on the tape punch or magnetic tape unit have been operated.

Mounting position 5:

unassigned

Mounting position 6:

Button (S6): Output inhibition
Button without lamp

Function: Inhibition of output

While this button is held depressed, all output of information is suppressed, i.e. characters input by the reader, via the keyboard or by the answerback unit are neither printed out nor recorded.
In the case of corrected tapes, for examples, this button enables characters which have been overpunched with code combination 29 (5 holes) to be skipped.
The button is ineffective when operating to line.

Mounting position 7:

Button (S7): Letters/figures shift
Button without lamp

Function: Letters/figures shift

When this button is actuated the teleprinter switches from the letters to the figures case or vice versa without sending the case shift character to line.

Mounting positions 8 and 9:

Switch (S8): Key switch
No symbol
Function: Locks the call button

The key switch allows the function of the call button  to be suppressed, i.e. without the key it is not possible to set up a connection. It has no influence on the reception of messages.
The design of the switch is such that the key can only be removed with the call button in the locked state.
The call button is directly connected to the manual controls for switching-oriented functions via a separate lead.

7.6.4. EFFECTS OF THE OPERATING MODES ON THE MANUAL DEVICE CONTROLS GB

Functional state of the Teleprinter	Standby	Operating condition	
	AC power voltage applied	Local or on-line working enabled	
		Idle	Printing
		No input or output module in operation	At least one input or output module in operation
Effects on:	MANUAL DEVICE CONTROLS		
Button S1 Unlock keyboard	ineffective	effective if keyboard buffer was full	effective if keyboard buffer was full and at least one character has been called
Button S2 "Here is"	ineffective	effective	effective
Button S3 Printer paper feed	ineffective	effective	effective
Button S4 Data medium ON	effective	effective	effective
Button S6 Output inhibition	ineffective	ineffective	effective *) when an input module is in operation
Button S7 Letters/figures shift	ineffective	ineffective	effective when printer in operation
Button S8 Key switch	effective	ineffective	ineffective

*) in local mode only

74

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7.7. Switch module SB

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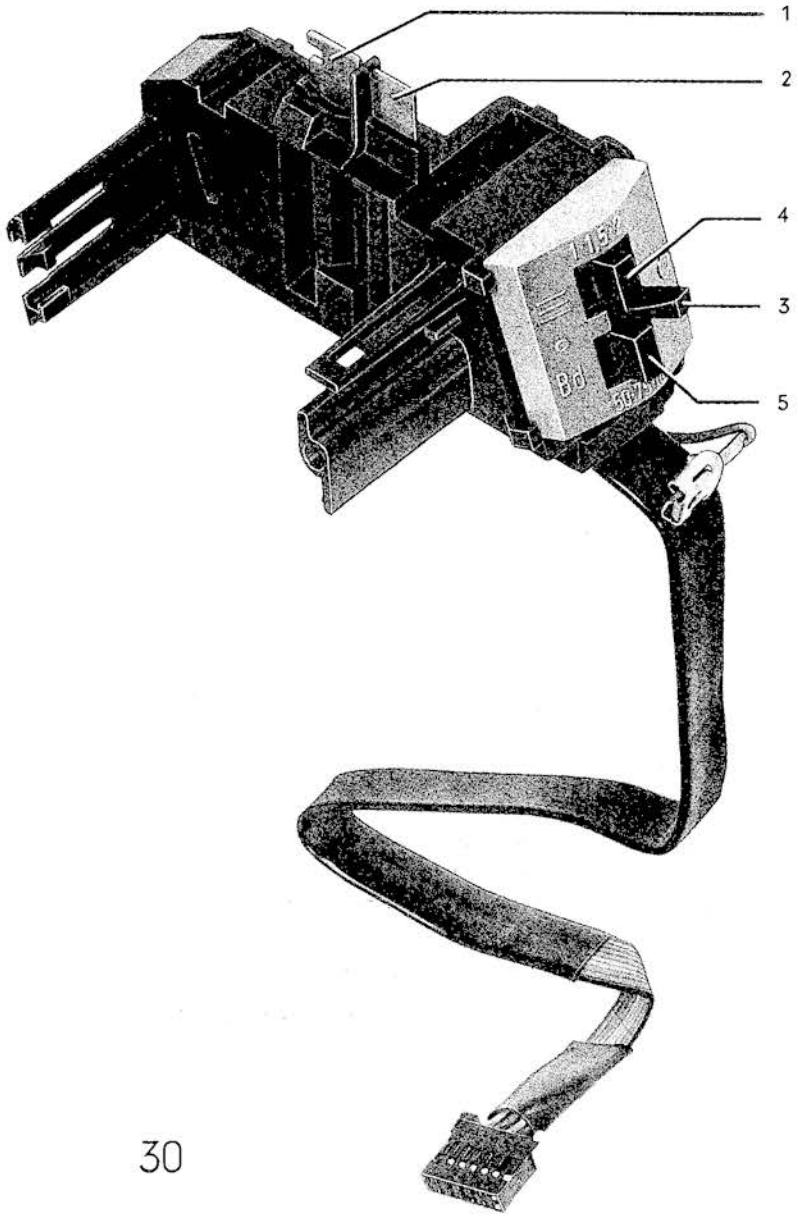


30

7.7.1. GENERAL

The switch module contains the switches for setting the line spacing, print force and Telegraph speed. It is covered with a cap which bears the lettering for the switches. This cap also allows certain positions of the switch for the telegraph speed to be blocked. The cap is designed so that it may only be removed with the aid of a tool.

7.7.2. CONSTRUCTION (see Figure 30)

The switches of the switch module are accommodated in a plastic cover

one switch 3 with three positions for setting the line spacing,

one switch 4 with two positions for setting the print force,

one switch 5 with three positions for setting the telegraph speed,

one lid contact 1, and

the power supply wires 1 and 2 for the reading lamps.

7.7.3. PRINCIPLE OF OPERATION

7.7.3.1. Switch for line spacing

The switch for line spacing enables the operator to set the line spacing to three possible positions - 1-line, 1 1/2-line or 2-line spacing.
The switch position is recognized by the basic electronics, which drives the stepping motor for line feed with the appropriate number of control pulses.

7.7.3.2. Switch for print force

The print force can be adjusted by the operator in accordance with the number of plies contained in the teleprinter paper being used.
There are two possible switch positions, the position for the higher print force being necessary when printing with two to four plies.
The higher print force is achieved by means of wider current peak at the start of the control pulse for the print hammer.

7.7.3.3. Switch for telegraph speed

The telegraph speed can be set to 50, 75 and 100 bauds by means of this switch.
The three telegraph speeds are realized by changing the division ratios of the clock pulse generator.
The switch is set to 50 bauds in the telex version of the teleprinter, the positions for 75 and 100 bauds being blocked with a cap.

If required, two other caps can be supplied:

- settable to 75 and 100 bauds, 50 bauds blocked,
- settable to 50, 75 and 100 bauds.

The telegraph speed of 100 bauds for local working is not affected by this switch.

7.7.3.4. Lid contact

The lid contact signalizes to the control whether the cover lid is open or closed. The response to the position of the switch is dependent on the version of the signalling unit or matching unit installed in the teleprinter. For example, an open lid may cause an already existing connection to be cleared or an incoming call not to be accepted.

7.7.3.5. Power supply for the reading lamps

Power is supplied to the reading lamps in the cover lid via two contact plates. This enables the cover of the teleprinter to be removed without having to split a plug connection.

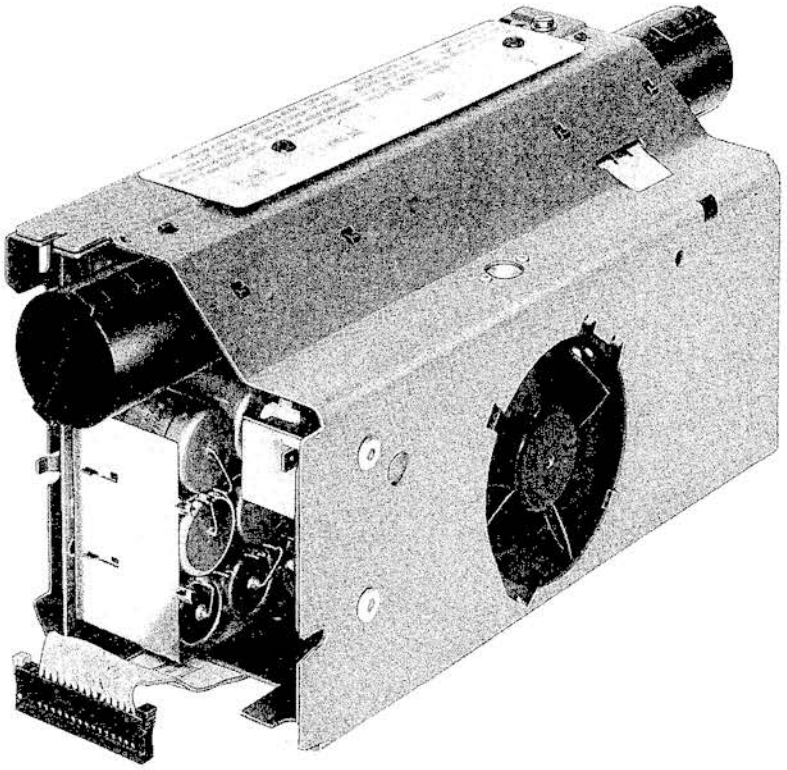
7.7.4. EFFECTS OF THE OPERATING MODES ON THE SWITCH MODULE SB

Functional state of the Teleprinter	Standby	Operating condition	
	AC power voltage applied	Local or on-line working enabled	
		Idle	Printing
		No input or output module in operation	At least one input or output module in operation
Effects on:	SWITCH MODULE		
Switch for line spacing	effective	effective	effective
Switch for print force	effective	effective	effective
Switch for telegraph speed	effective	effective	effective
Lid contact	effective	effective/ineffective *) depending on line interfacing equipment	effective/ineffective *) depending on line interfacing equipment

*) When the cover lid or lid contact is open, the lamp flashes in the call button ⊙ in the manual controls for switching-oriented functions. The built-in line interfacing equipment can be so circuited that neither the local nor the line mode can be enabled. If a call comes in, the teleprinter signals "not ready".

7.8. Power supply SV

Contents



31

7.8.1. GENERAL

The power supply generates the necessary operating voltages for the Teleprinter Model 1000 from the ac mains voltage of 187 V...264 V, or 93.5 V...140 V, 40 Hz...70 Hz. These voltages are as follows:

+ 5 V	for the integrated modules,
+ 12 V	for the lamps in the buttons,
- 12 V	for the MOS modules,
+ 40 V	for the electromagnets and stepping motors.

The ±12 V voltage is also used for supplying power to the line adapter LAT. This contains a voltage converter which supplies the subscriber line, for example, when operating with double (polar) current (see Section 8.2.2. Interface S1 and 8.3.3).

The power supply employs a blocking chopper converter, which supplies current during the blocking phase of the transistor, and a storage transformer with air gap. This converter is particularly small and light.

The use of the blocking chopper converter ensures a very high level of efficiency and gives a wide voltage range at the input to the power supply.

All output voltages from the power supply are dc decoupled from the ac mains source.

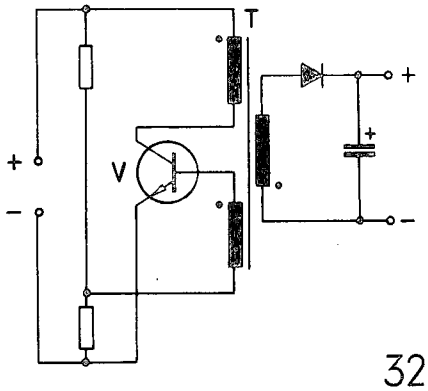
The device fuse (independent of the ac power voltage) is a medium-lag 2.5 A fuse.

Principle of the converter (Figure 32)

The converter operates with a storage and isolating transformer T to which a dc voltage is supplied at timed intervals. The storage transformer stores energy for as long as the transistor is conducting. Only when the transistor is blocked does energy reach the output of the power supply.

The stored energy is determined by the inductance and the charging current reached before the transistor is blocked.

The output voltage is dependent on the load. When current is drawn off, the stored energy and hence the output voltage too is decreased. The power supply is therefore protected against overloading in the event of a short circuit at the output.



32

7.8.2. CONSTRUCTION (Figure 33)

The power supply consists basically of:

cover,
rectifier module SVG,
load module SVL,
electrolytic capacitors C1, C2 and
fan.

Cover: The cover contains all the modules and constituent parts of the power supply. It prevents live parts being touched and also serves as screening.

Rectifier module SVG: The rectifier module contains

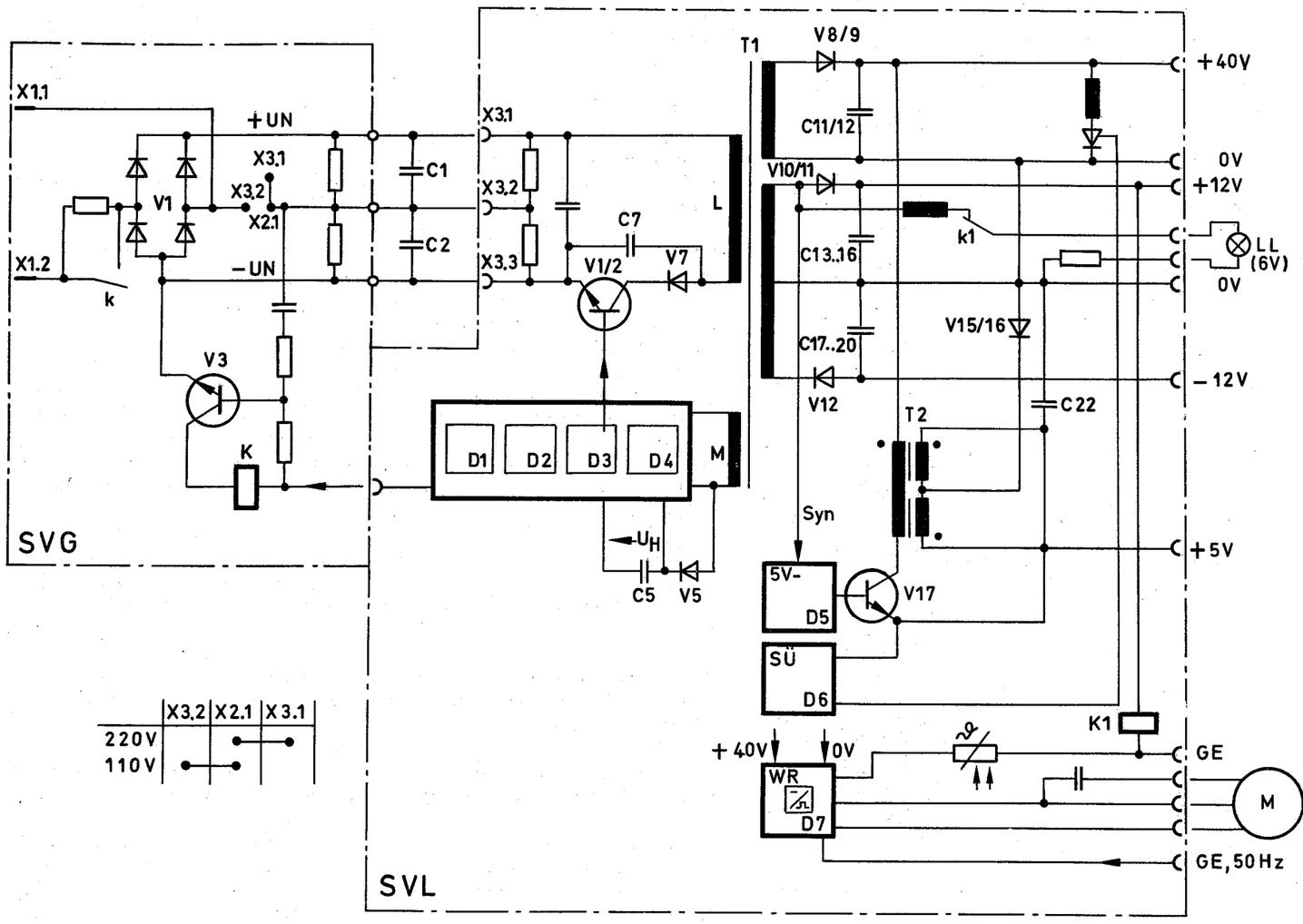
- the rectifier V1,
- a feature permitting to switch from a bridge circuit (for 220 V operation) to a voltage doubler circuit (for 110 V operation),
- the relay K with the voltage-dependent preamplifier for by-passing the dropping resistor.

Load module SVL: The load module is a functionally self-contained pc board. It contains

- the storage and isolating transformer T1,
- the preamplifier D1...D4 for the switching transistors V1/2,
- the 5V controllers D5, D6 with the switching transistor 17 and the storage transformer T2,
- the diodes V8...V16 for rectification and the electrolytic capacitors C11...C20, C22 for smoothing the output voltages,
- the ac-dc converter WR/D7 for generation of the operating voltage for the fan with temperature sensor
- a choke, a resistor and the relay K1 for the copy lamps LL (6 V).

7.8.3. PRINCIPLE OF OPERATION (Figure 33)

The ac power voltage applied to the power supply is rectified on the rectifier module SVG. Electrolytic capacitors C1, C2 smooth the rectified power voltage and store energy. This energy also ensures troublefree operation of the Model 1000 in the event of interruptions in the ac power lasting up to 10 ms. A clamping strap on the rectifier module enables changing from rectification by means of a bridge circuit (220 V operation) to rectification by means of a voltage doubler circuit (110 V operation). A dropping resistor limits the rush-in current; shortly after application of the power voltage, relay K bypasses the dropping resistor and the power supply is ready to operate.



	X3.2	X2.1	X3.1
220V		●	●
110V	●	●	

7

The rectified power voltage is supplied at timed intervals to the storage and isolating transformer T1. This results in a frequency of 30 kHz being generated by the oscillating circuit that consists of capacitor C7 and winding L of transformer T1. Voltages of +12 V, -12 V and +40 V are tapped from the secondary windings of the transformer, they are rectified and smoothed and then applied to the output of the power supply. The +5 V voltage is generated from the +40 V via storage transformer T2 and switching transistor V17 and is regulated by means of controller D5. The voltage is also rectified and smoothed and then applied at the output of the power supply.

In order to keep the output voltages of +12 V, -12 V and +40 V in the required tolerance range when the power supply is subject to different loads (standby and operating states of the teleprinter), the energy supplied to the transformer T1 via switching transistors V1/2 is controlled by means of the preamplifier D1...D4. The transformer T1 includes a measuring winding M which forms an image of the output voltages and serves as reference for the comparator circuit in the preamplifier D1...D4. When the power supply is under heavier load, this preamplifier holds the switching transistor V1/2 conducting longer. In consequence, the storage transformer stores more energy.

The copy lamps LL in the cover are fed with a 6 V ac voltage which is derived from the 12 V ac voltage via a choke and a resistor.

The dc-ac converter WR/D7 contained in the load module SVL converts the 40 V dc into ac voltage under the frequency control of the basic electronics. This ac voltage is used to power the fan when the teleprinter is operating. It is switched on with every operating mode of the teleprinter. During the standby state of the teleprinter, a temperature sensor switches on the fan when the temperature in the power supply reaches $60^{o}C \pm 5^{o}C$.

When the temperature in the power supply mounts to $75^{o}C \pm 5^{o}C$ (e.g. when the fan is defective), the power supply is switched off under the control of a temperature sensor. A subsequent drop in temperature causes the power supply to be switched on again.

If the power voltage reaches values outside the admissible range, the preamplifier switches off the power supply, switching it on again automatically once the out-of-tolerance condition is over.

A voltage arrester is incorporated as a protection against the high voltage peaks which may sometimes occur in power supply networks, during thunderstorms for example.

If one of the output voltages is shorted, the power supply is switched off. Subsequently, it switches on automatically about every 4 seconds to check whether the short circuit is still present. If the short circuit still exists, the power supply immediately switches off again.

7.8.4. EFFECTS OF THE OPERATING MODES ON THE POWER SUPPLY SV

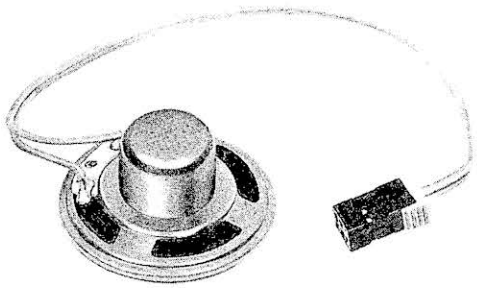
Functional state of the Teleprinter	Standby ac power voltage applied	Operating condition without/with attachment devices Local or line working ON
Effects on:	POWER SUPPLY	
Power draw of the power supply	40 W	90/120 W
Copy lamps in the cover of the Model 1000	off	on

8G

is

BLANK

7.9. Loudspeaker LR



34

The purpose of the loudspeaker is to provide an audible signalization of end-of-line, "bell", and an incoming call.

End-of-line:	During typing operations on the keyboard, a warning signal sounds after the 59th character producing a column feed has been keyed in.
Bell:	The same signal sounds when an agreed code combination is recognized, e.g. combination No. 10 as per CCITT Code No. 2.
Incoming call:	If the teleprinter is called, the loudspeaker sounds at a different pitch.

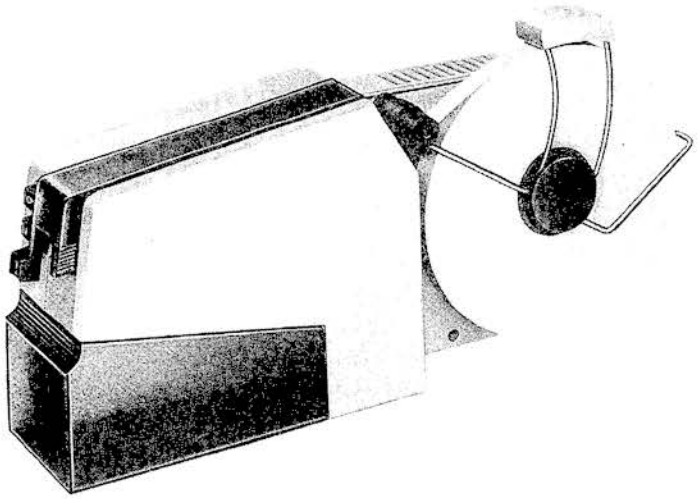
The module consists of:

a loudspeaker (50 ohms, 0.1 W),
a connecting lead with plug.

The loudspeaker is fixed by a wire clip to the base tray of the Model 1000 and is connected to the based electronics board via the two-wire, plug-ended connecting lead.

7.10. Tape Punch LO

Contents



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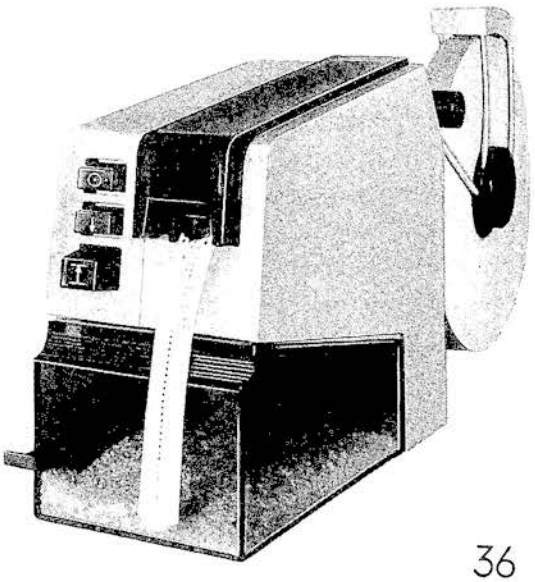
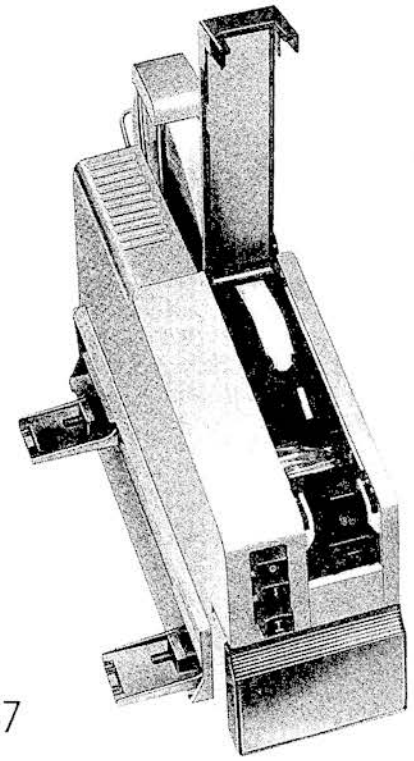


36



37

7.10.1. GENERAL

The punch pins of the punch block and the feed sprocket wheel are driven by rotary armature magnets via four-joint linkages.

Rotary armature magnets were chosen because they produce the least noise and because the matching of the characteristic curve is possible.

The tape is fed forward by the pins of a sprocket wheel, which is also driven by a rotary armature magnet and whicl ensures highly accurate code hole spacing. The requirements according to ISO Recommendation 1154 are satisfied.

The tape punch is equipped with an ON-OFF button, a tape feed button and a tape backspacing button which operates mechanically.

The inserted tape is advanced automatically after the tape gate is closed. This produces a tape leader punched with code combination 29 (letters shift).

The tape punch switches off automatically when it recognizes the end-of-tape condition.

7.10.2. CONSTRUCTION (Figure 38)

The tape punch consists basically of:

punch assembly 9,
punch electronics 4,
carrier plate 29,
cover 33 and lid 17,
tape unwinder 2 and tape guide 8,
chad waste box 20.

Punch assembly

Punch assembly 9 is composed of mounting frame 10 together with rotary armature magnets 11, tape feed unit 25 and punch unit 14.

Mounting frame 10 accommodates rotary armature magnets 11, which are linked with punch pins 36 of punch block 13 (Fig.38) via the four-joint linkages 35 (Fig.39). Tape feed unit 25 and punch unit 14 are mounted on mounting frame 10. Tape guide 8 is positioned on mounting frame 10 and locked in place.

Tape feed unit 25 contains support bracket 16, which bears a rotary armature magnet 18 with a four-joint linkage 15, as well as tape channel 23 and tape feed facility 19, which is mounted on an axle.

Punch unit 14 is composed of punch lever 12, punch block 13, chad chute 28 and chad shaft 27.

Punch electronics

Punch electronics 4 is a pc board incorporating the switching amplifiers for the rotary armature magnets and includes the connectors for leads 5 and 6 to the basic electronics (6) and to the punch assembly (5).

Carrier plate

Punch assembly 9 is mounted on carrier plate 29. Punch electronics 4 and buttons 30, 31 and 32 are also latched in place in carrier plate 29.

Cover and lid

Cover 33 with tape unwinder 2 is placed on carrier plate 29 and locked in position. The cover lid 17 is fastened to cover 33.

Tape unwinder and tape guide

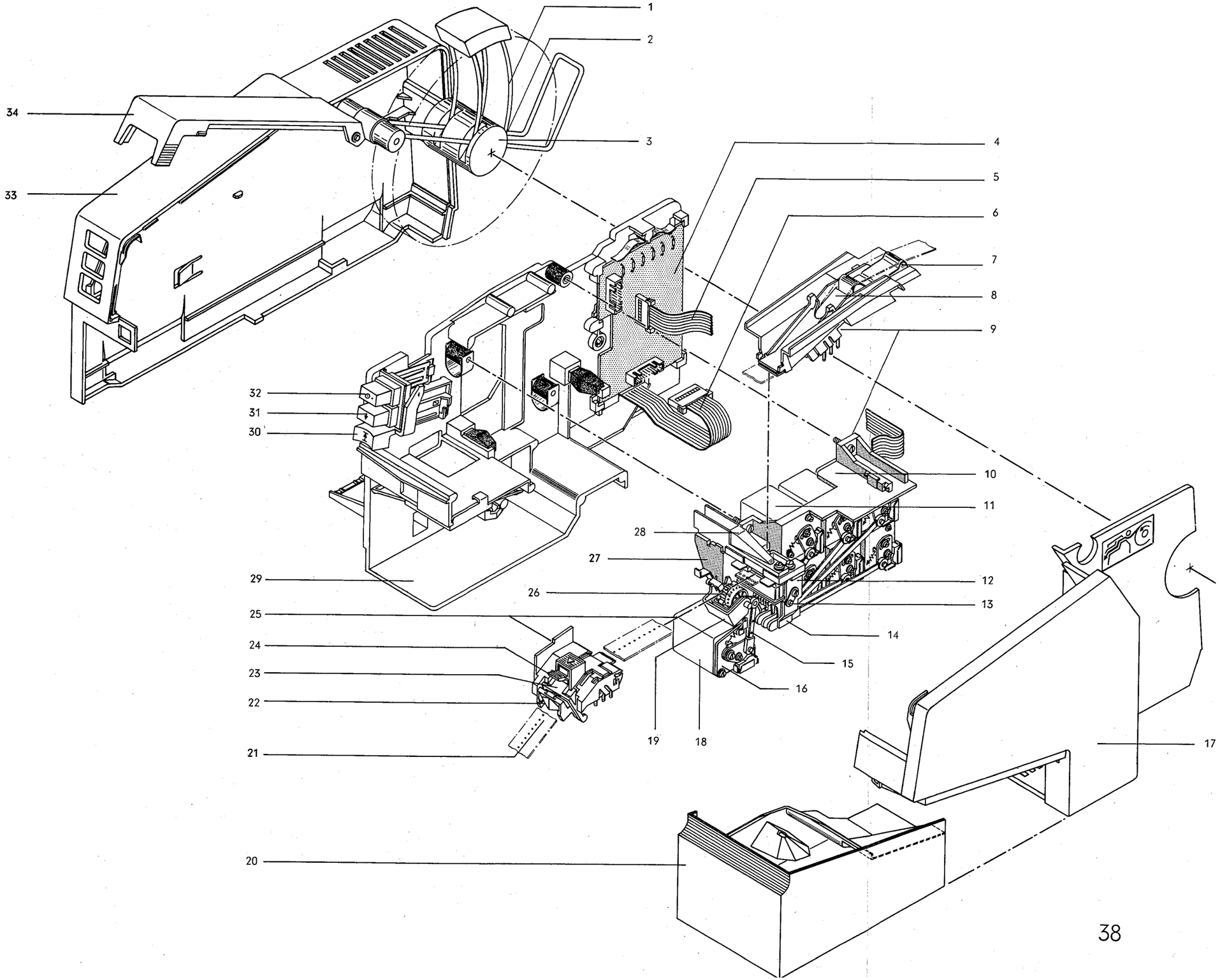
The tape unwinder has a pivoted unwinding guide 1, which guides the roll of paper tape laterally on the stationary core 3.

The tape is fed through the gap between hinged cover 34 and deflector 7 into tape guide 8, which leads into punch block 13. With tape gate 24 open, the tape leaves the tape punch through punch block 13, over sprocket wheel 26 and via the tape exit 21.

Tear-off ridge 22 of tape exit 21 is arrow-shaped and has a sharp edge, so that when the tape is torn off by tugging upwards the end has a V-shaped indentation and the beginning a V-shaped point. This indicates the direction of the tape flow.

Chad waste box

Chad waste box 20 is fixed in position under cover 33. It has the capacity to contain the cuttings from a whole roll of tape, even assuming only the code combination 29 (5 code holes) were to be punched throughout.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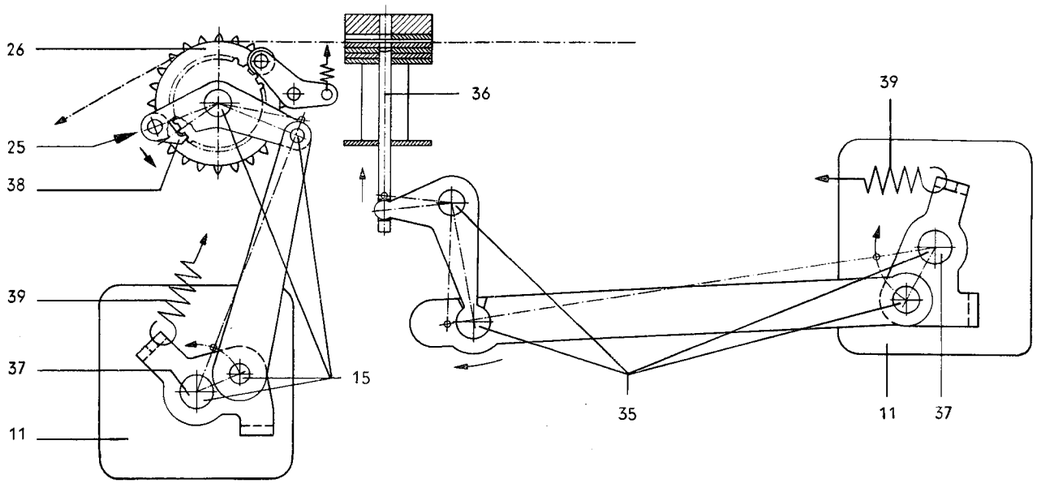
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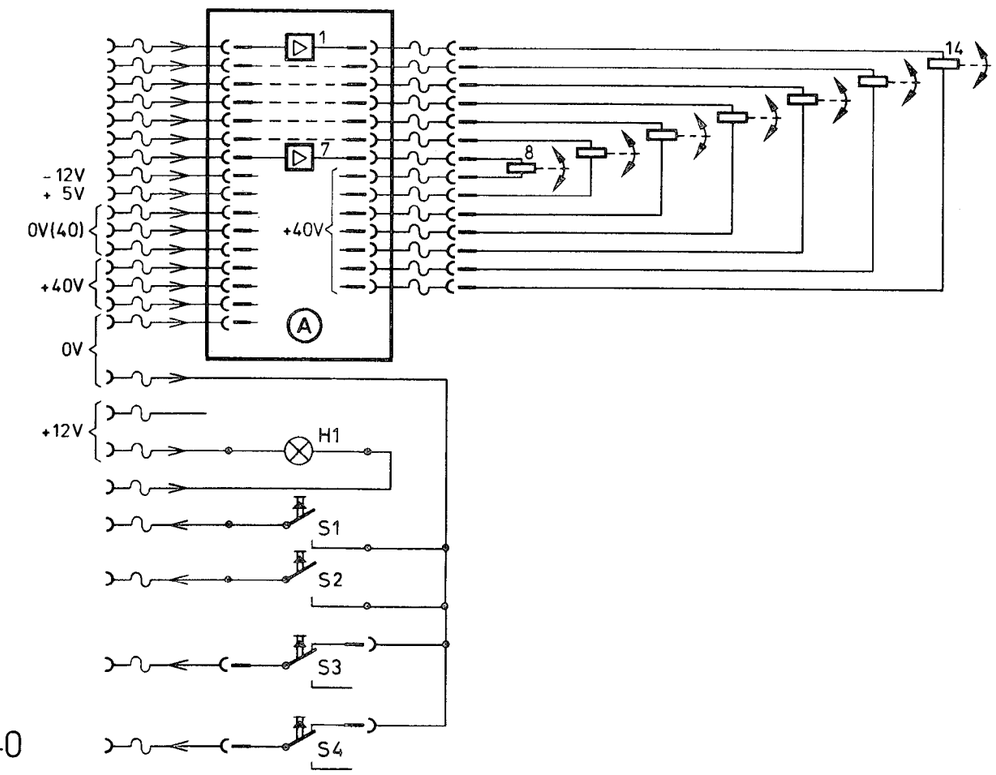

1
7
14
8
- 12V
+ 5V
0V(40)
+40V
0V
+12V
+40V
A
H1
S1
S2
S3
S4

40

7.10.3. PRINCIPLE OF OPERATION

The information supplied by the basic electronics takes the form of TTL signals and controls the rotary armature magnets via the punch electronics (Fig.39). When a rotary armature magnet 11 (Fig.39) is energized, armature 37 rotates away from its preset initial position until it is magnetically latched. The respective four-joint linkage 35 or 15 transfers the armature torque with a relatively large stroke to punch pins 36, or to feed pawl 38 in the case of tape feed unit 25.

Punch pins 36 pierce the tape in a time-staggered sequence. When rotary armature magnets 11 are deenergized, springs 39 pull back armatures 37 to their home position. The elbow leverage effect of the four-joint linkage causes punch pins 36 to be drawn out of the tape with a considerable reserve of force. Sprocket wheel 26 then advances the tape by one character pitch and feed pawl 38 resumes its initial position.

7.10.3.1. Automatic tape feed-in

When the tape is inserted properly and the tape gate closed, the tape feeds in automatically. The basic electronics energizes the rotary armature magnets via the punch electronics repeatedly until there is a tape leader the length of 32 character pitches punched with the "Letters" code combination 29 (i.e. 5 holes).

At the end of the automatic tape feed-in the ON-OFF button becomes operative.

7.10.3.2. Control buttons

The tape punch is switched on or off by pressing the ON-OFF button. If the punch is switched on, the lamp in the button ⊙· is lit.

While the tape feed button ↓ is held depressed, the tape is fed forward and punched with code combination 29 (5 holes).

Each time the tape backspacing button ↑ is pressed, the tape is moved backwards mechanically by one character pitch. Backspacing should be limited to ten character pitches to avoid pinching the edges of the holes when overpunching the tape.

7.10.3.3. End of tape

A spring-loaded strip which projects into the tape guide actuates the end-of-tape contact. The contact opens when the tape runs out and the tape punch switches itself off.

Schematic circuit diagram (Fig. 40)

(A)	Punch electronics	S1	ON-OFF button
1...7	Switching amplifiers	S2	Tape feed button
8...14	Rotary armature magnets	S3	End-of-tape switch
H1	Lamp in ON-OFF button	S4	Tape gate switch

7.10.4. EFFECTS OF THE OPERATING MODES ON THE TAPE PUNCH LO

Functional state on the Teleprinter	Standby	Operating condition		
	AC power voltage applied	Local or on-line working enabled		
		"Data carrier ON" button not depressed	"Data carrier ON" button depressed	
		Idle	Printing	Idle
		No input or output module in operation	At least one input or output module in operation	No input or output module in operation
Effect on:	TAPE PUNCH Condition: Paper tape inserted, tape gate closed			
ON-OFF button ⊙·	ineffective	effective		ineffective
Tape feed button ↓	effective	effective	effective	effective
Tape back-spacing button I	effective	effective	effective	effective
Tape gate switch	effective	effective	effective	effective
End-of-tape switch *)	effective **)	effective	effective	effective

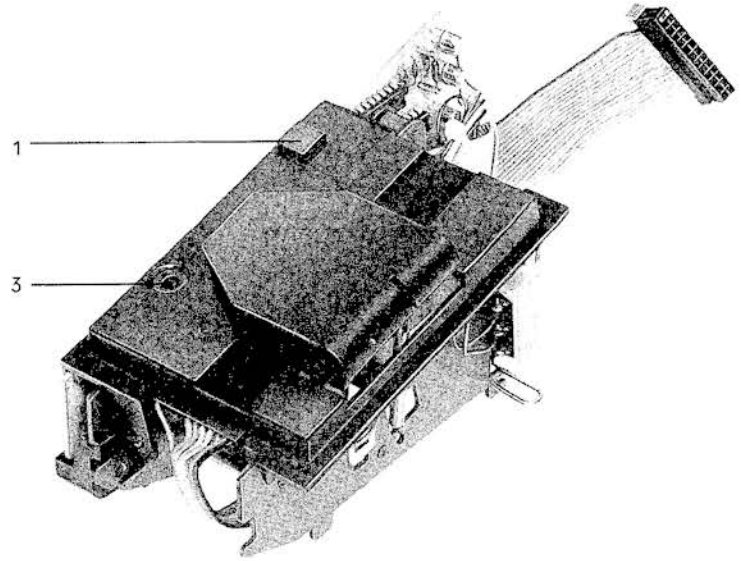
The rotary armature magnets are only energized during the communication phase in response to the control signals from the punch electronics.

The lamp in the ON-OFF button stays lit for as long as the tape punch is switched on.

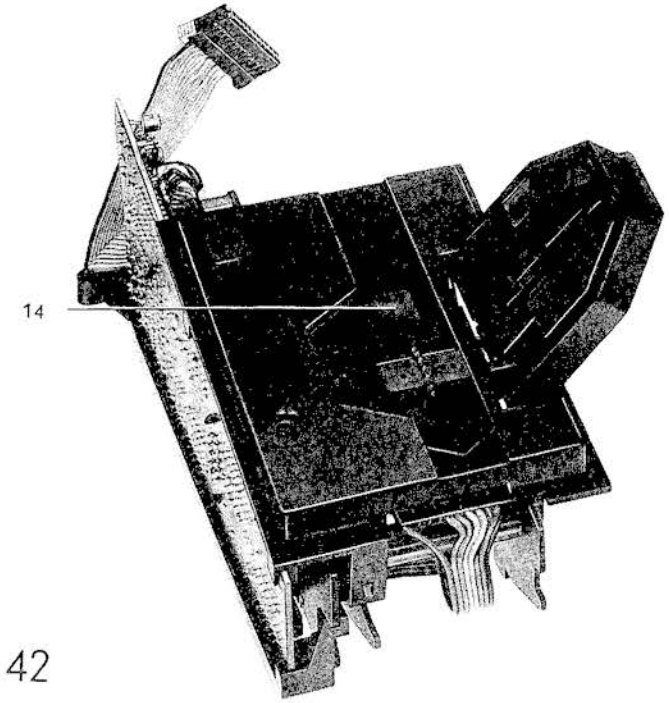
*) Always effective or ineffective depending on customer's specification.
**) Effective only if button "Data medium ON" ⊙⊙ is depressed.

7.11. Tape Reader LE

Contents



41



42

7.11.1. GENERAL

The information on the punched tape is read photoelectrically whilst the tape is stationary by means of luminiscence diodes and phototransistors. A sprocket wheel driven by a stepping motor then feeds the tape forward one character pitch.

The ON-OFF button is used for switching the tape reader on and off. When the reader is switched on, the tape can be fed forward either one character at a time or continuously.

A taut tape switch 2 (Fig. 43) which interrupts the tape feed if the tape becomes too taut, prevents damage to the tape.

Figure 41 - Tape Reader LE

1 ON-OFF button
3 Indicator lamp for ON-condition

Figure 42

14 Feed hole scanning facility

7.11.2. CONSTRUCTION (Figure 43)

The tape reader is composed basically of:

drive unit,
scanning device and
reader electronics.

Drive unit: The drive unit contains a stepping motor 7, an intermediate gear 8 and a sprocket wheel 9 and is accommodated in the frame 11.

Scanning device: The scanning device is mounted on the frame 11 and locked in position. It contains the diode unit and transistor unit, the plastic base 6 with the tape guide 5 and the hinged tape gate 4, which covers the tape guide channel.

The diode unit containing the luminiscence diodes and balancing resistors is accommodated in the tape gate 4.

The transistor unit containing the phototransistors is installed in the plastic base 6.

Reader electronics: The reader electronics 3 is a pc board with the amplifiers for the photoelectric currents and the drivers for the stepping motor.

7.11.3. PRINCIPLE OF OPERATION (Figure 44)

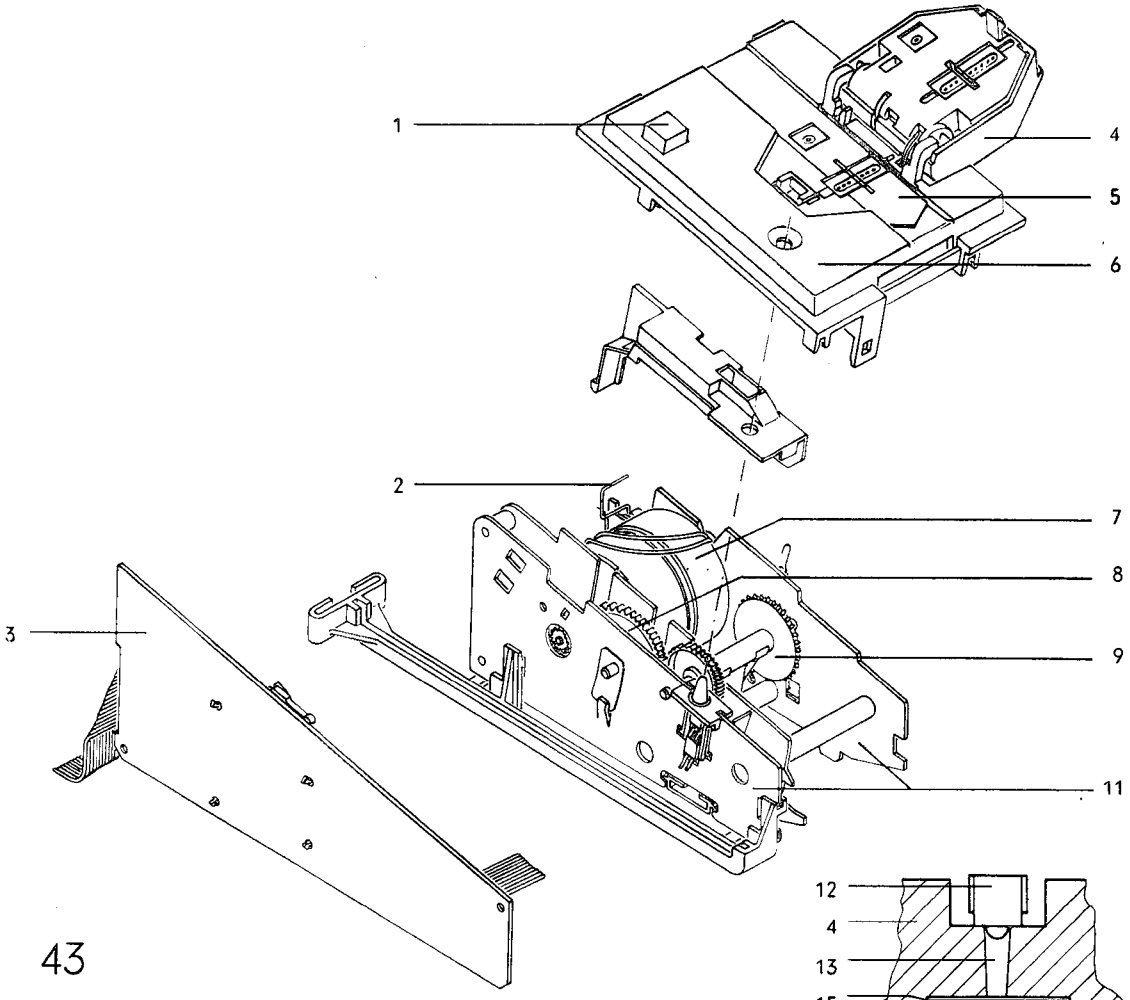
When the tape reader is ON the luminiscence diodes 12 emit infrared light. With tape gate 4 closed and holes punched in the tape 16 - or when no tape is loaded in the reader - this infrared light strikes directly on the opposite phototransistor 17. Amplifiers connected next in circuit amplify the photoelectric currents and forward the information to the interface to the basic electronics.

The light channels 13 in front of the phototransistors 17 and the luminiscence diodes 12 produce a large light-to-dark ratio.

The light channels are covered with glass plates 15 to protect them from dirt.

Schematic circuit diagram of the tape reader (Figure 45)

(A) Reader electronics	1...6	Read amplifier	V	Green indicator for ON-condition
(B) Transistor unit	8...11	Amplifier for controlling the stepping motor	M	Stepping motor
(C) Diode unit	12...17	Phototransistors	S1	ON-OFF switch
	18...23	Luminiscence diodes and balancing resistors	S2	Taut tape switch
	0 V (40)	0 V lead for 40 V		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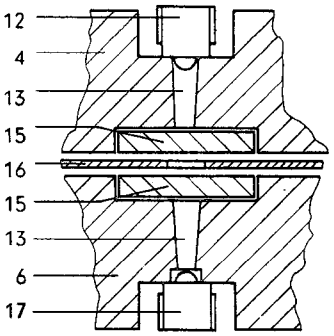
12
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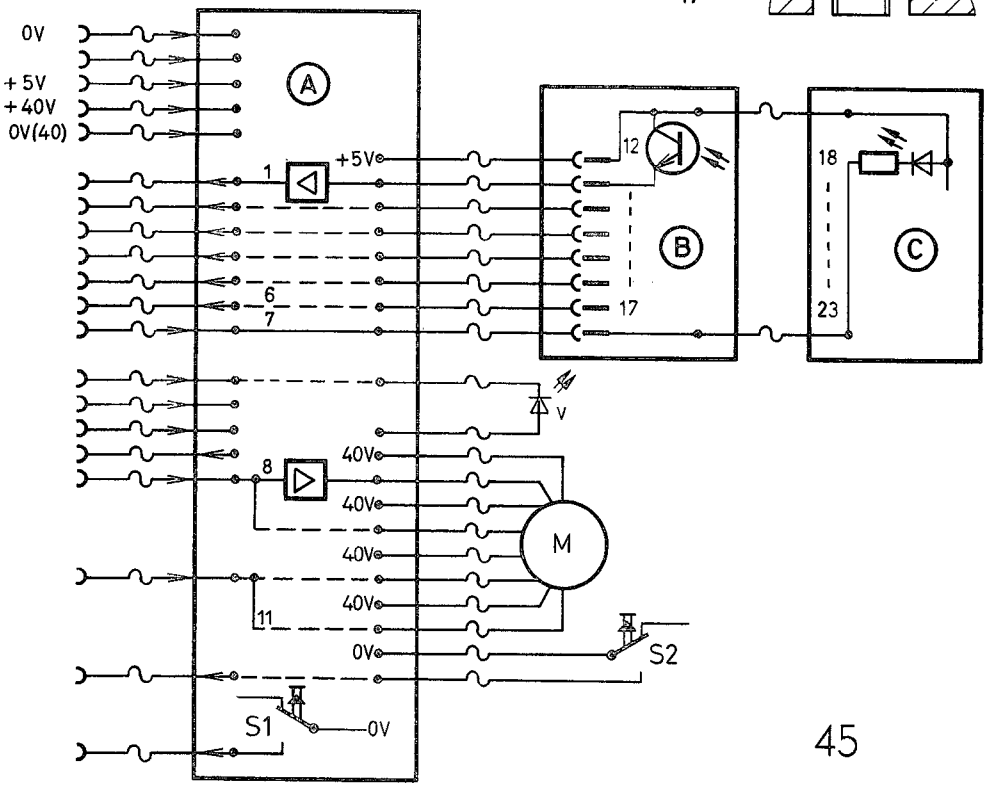
16
15
13
6
17

44


0V
+5V
+40V
0V(40)
A
B
C
1
+5V
6
7
12
17
18
23
V
8
40V
40V
40V
40V
M
11
0V
S2
S1
0V

45

7.11.3.1. Feeding the punched tape forward

It takes four steps of the motor for the sprocket wheel to advance the tape by one character pitch. The selected transmission ratio between stepping motor and sprocket wheel gives the tape an exact rest position in relation to the reading point and provides a high tractive force for the tape.

7.11.3.2. Single character feed - continuous feed

Single character feed is tripped by pressing the ON-OFF button briefly (< 250 ms). Pressing the button longer (> 250 ms) produces continuous feed.

A timing stage in the basic electronics of the teleprinter decides whether single or continuous feed is switched on.

Immediately the ON-OFF button is pressed a character is transferred into the basic electronics. Here the read character is stored and then processed further. The transfer of the character activates the stepping motor and the tape is fed forward by another character. A single character feed is thus completed.

In continuous feed, the process of reading continues until the end-of-tape condition is recognized or a distant subscriber breaks in on the transmission, or until the reader is switched off by pressing the ON-OFF button once more.

7.11.3.3. End-of-tape condition

The end-of-tape condition is recognized via the feed hole scanning facility. The feed hole scanning facility 14 (Figure 42) is located eight character pitches in front of the information scanning facility in the tape-feed direction.

If the reader is set for continuous feed the end-of-tape condition is only recognized if no feed hole is sensed after nine successive light-to-dark changes have occurred. This ensures that the very last character on a tape is also read. When the end-of-tape condition is recognized the reader switches itself off.

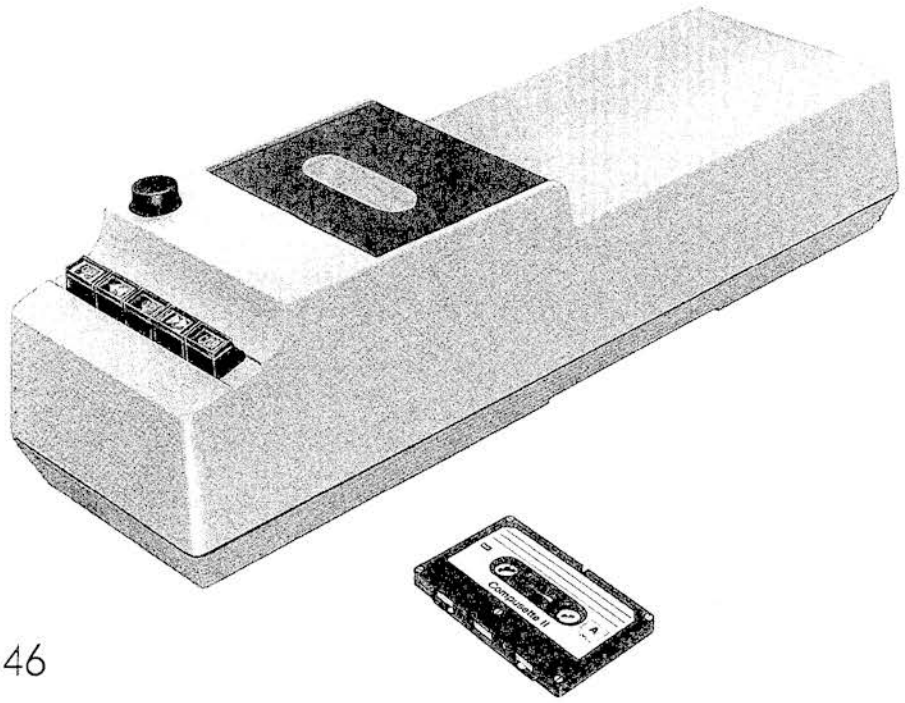
7.11.4. EFFECTS OF THE OPERATING MODES ON THE TAPE READER LE

Functional states of the Teleprinter	Standby	Operating condition		
	AC power voltage applied	Local or on-line working enabled		
		Idle	Printing	
		No input or output unit in operation	At least one input or output unit in operation	
Effect on: TAPE READER			Continuous feed (> 250 ms)	Single feed (< 250 ms)
Stepping motor	no current	current assumes home position	current in home position	current in home position
Sprocket wheel	movable in both directions against minor resistance	can move clockwise or anticlockwise by a max. of 1/2 character pitch to the home position (a pin of the wheel is then in alignment with the markings on the tape guide)	tape is fed forward towards operator	tape is fed forward towards operator
ON-OFF button	ineffective	effective	effective	effective
Light-emitting diodes	no current	no current	current	current
Taut tape switch			effective when tape pull exceeds 1N tape feed is interrupted	effective

Once the disconnect button [O·] in the manual controls module for switching functions has been pressed, the teleprinter is in the rest condition and the tape reader is switched off.

Breaking in by the distant subscriber stops the tape reader. It is then in the idle condition.

While the transmitter blocking button [⊳] in the manual device controls module is held depressed during local working, no information is transmitted, printed or punched. The tape reader, however, continues reading.



46

7.12. Magnetic tape unit MB

The magnetic tape unit (Figure 46) uses a magnetic tape cassette 3.8 as a data medium for information processing. Instead of tape punch and tape reader, the magnetic tape unit may be connected to the teleprinter. No modifications to the teleprinter are required for this purpose. Messages can be recorded by means of the magnetic tape unit. Corrections are possible during recording.

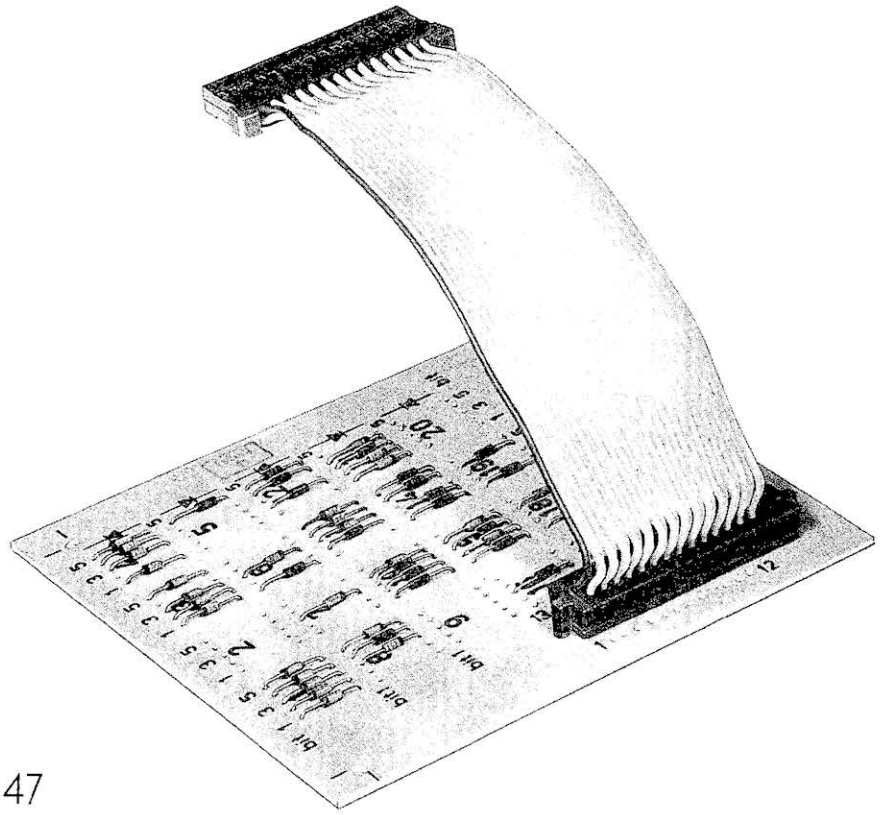
The following functions can be implemented by means of the magnetic tape unit:

- recording,
- correction during recording,
- reading of recorded messages,
- editing of previously recorded messages (correction of characters; addition and erasure of characters, words and sections),
- advancing and backspacing of complete messages,
- automatic printout of the first line of each message (list of the messages recorded on tape),
- erasure of the whole tape.

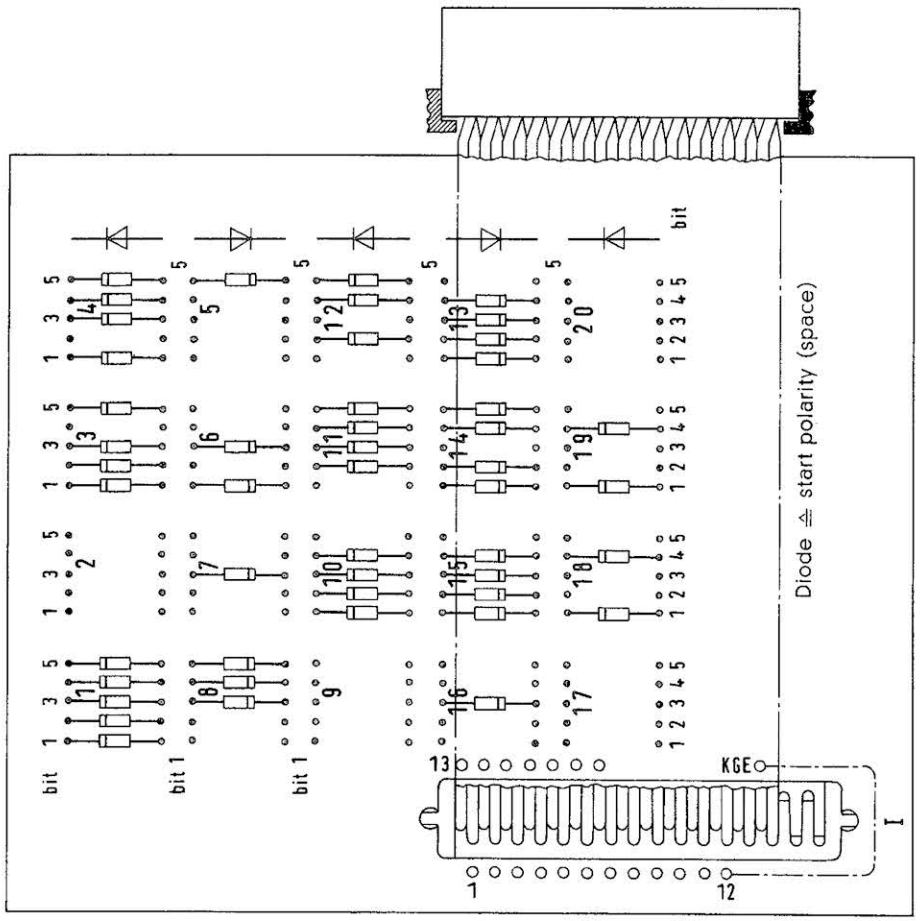
The magnetic tape unit is described in a separate publication.

7.13. Answerback module KG

Contents



47


bit
bit 1
bit 1
bit 1
bit
13
KGE
1
12
I
Diode ≙ start polarity (space)

48

7.13.1. GENERAL

The answerback module (Figure 47) operates electronically and consists of a diode matrix which allows any desired combination of the 20-character answerback sequence to be programmed. The order in which the characters should be sent is laid down in CCITT Recommendation S6:

1st character	Letters or Figures shift A... or 1...
2nd character	Carriage return <
3rd character	Line feed ≡
4th to 19th character	Subscriber's answerback code
20th character	Letters shift A...

The answerback sequence can be programmed even at the subscriber's station without special aids. In order to generate a current pulse within a teleprinter signal, a diode just has to be cut out from the diode matrix.

7.13.2. CONSTRUCTION

The answerback module consists of a pluggable pc board containing up to 100 diodes which are sampled by the answerback control.

Diode matrix: The diode matrix comprises 20 columns and 5 rows (Fig. 49), corresponding to the 20 characters that can be programmed. Each character of the answerback code is assigned 5 diodes (Fig. 48). The bit sequence 1...5 of each character is always counted from left to right. The sequence of the characters 1...20 starts in the top left-hand corner with the first character and winds continuously along the rows down to the 20th character in the bottom right-hand corner.

Bit and character sequences can be seen from the lettered components side of the pc board.

Answerback control: The diode matrix is sampled by the answerback control via a decoder. The answerback control is contained in the MOS-2, the send control, and forms part of the basic electronics.

Since the answerback module is physically separate from the answerback control, a plug-in supervision feature ensures that the matrix can only be sampled if the answerback module is plugged in.

7.13.3. PRINCIPLE OF OPERATION

7.13.3.1. Character generation (circuit schematic, Fig. 49)

The columns of the diode matrix are sampled one after another in turn by the answerback control via a decoder. At the same time, one column at a time is applied to 0 V. The rows which are connected with this column by a diode also carry a potential of about 0 V. The remaining rows continue to carry +5 V. This gives rise to the different levels of a teleprinter signal which are present at the outputs of the answerback module.

7.13.3.2. Operation of the answerback module

The home answerback is tripped by pressing the Here-is key, that of the distant station by reception of the Who-are-you signal.

The answerback control includes a cycle counter which starts counting from 0 to 19 when the answerback module is tripped. In the initial position it is at 0, which corresponds to the first character of the answerback code.

The first coded character in the diode matrix is called and transmitted in response to a start pulse generated by the answerback control. The transmitter module thereupon signals "character transmitted" and the cycle counter advances one column. Upon arrival of a new start pulse the next character is transmitted.

This cycle is repeated until the end of the answerback code is reached.

The answerback code end is signalled after the 20th character. It is also possible to reduce the character sequence by inserting a wire strap. If it is wished to program an answerback code of, say, 12 characters, a wire strap is soldered from point 12 to point KGE (Fig. 48). No wire strap is required when programming an answerback sequence comprising twenty characters.

After the answerback module has completed its cycle the answerback control is reset, i.e. the cycle counter is restored to 0.

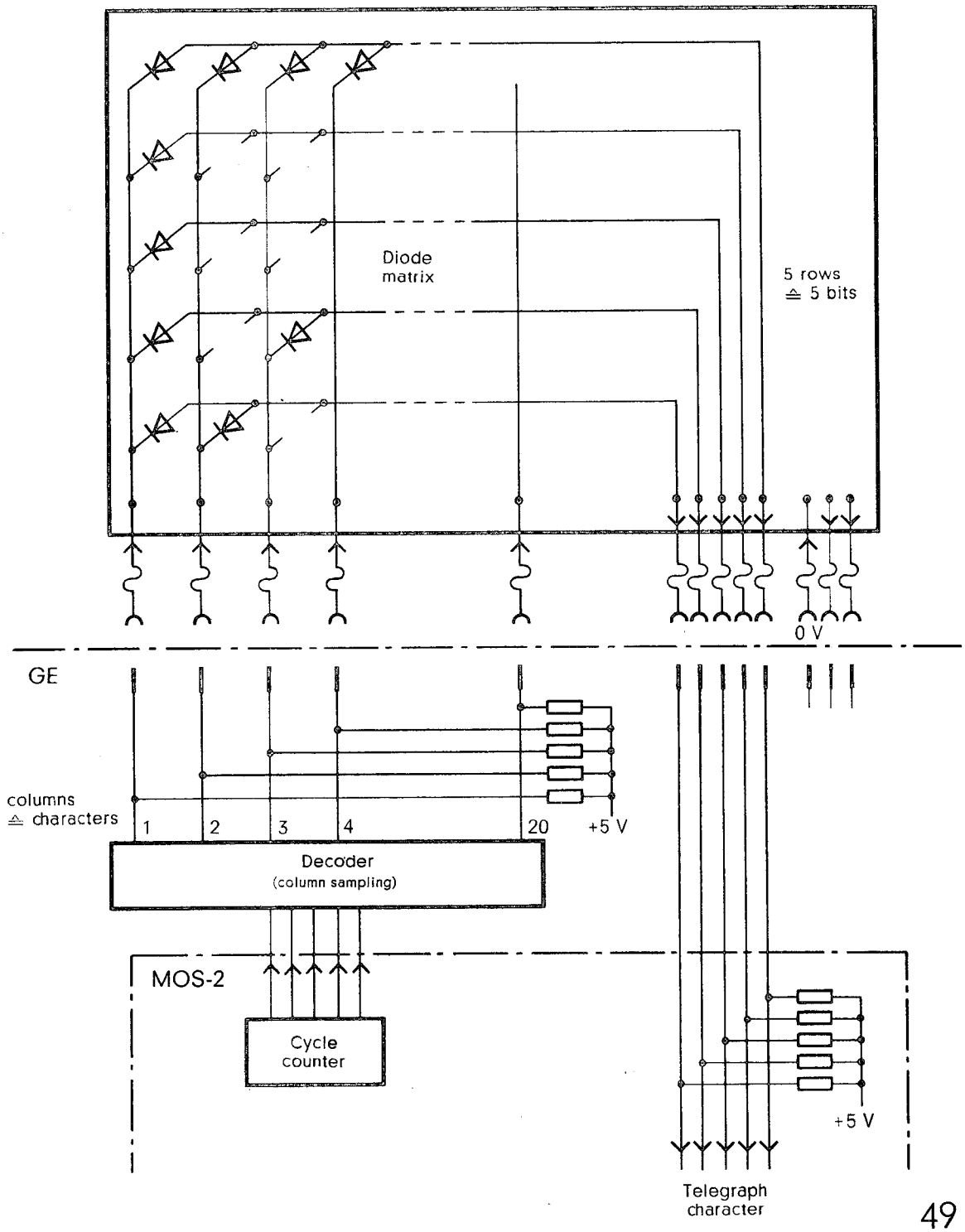
A new answerback sequence cannot be transmitted until after an answerback transmission in progress has been completed.

The answerback start is suppressed if

- the subscriber's station is called,
- the tape reader is in operation,
- the keyboard buffer is not empty.

Tripping delay from the beginning of the start pulse of character Figs. no. 4 until the beginning of the start pulse of the first answerback code character:

Telegraph speed (bauds)	Tripping delay as per CCITT Recommendation no. S6	Actual tripping delay (ms)
50	150 - 600	162
75	100 - 600	126
100	75 - 600	107


Diode
matrix
5 rows
≙ 5 bits
0 V
GE
columns
≙ characters
1
2
3
4
20
+5 V
Decoder
(column sampling)
MOS-2
Cycle
counter
+5 V
Telegraph
character

49

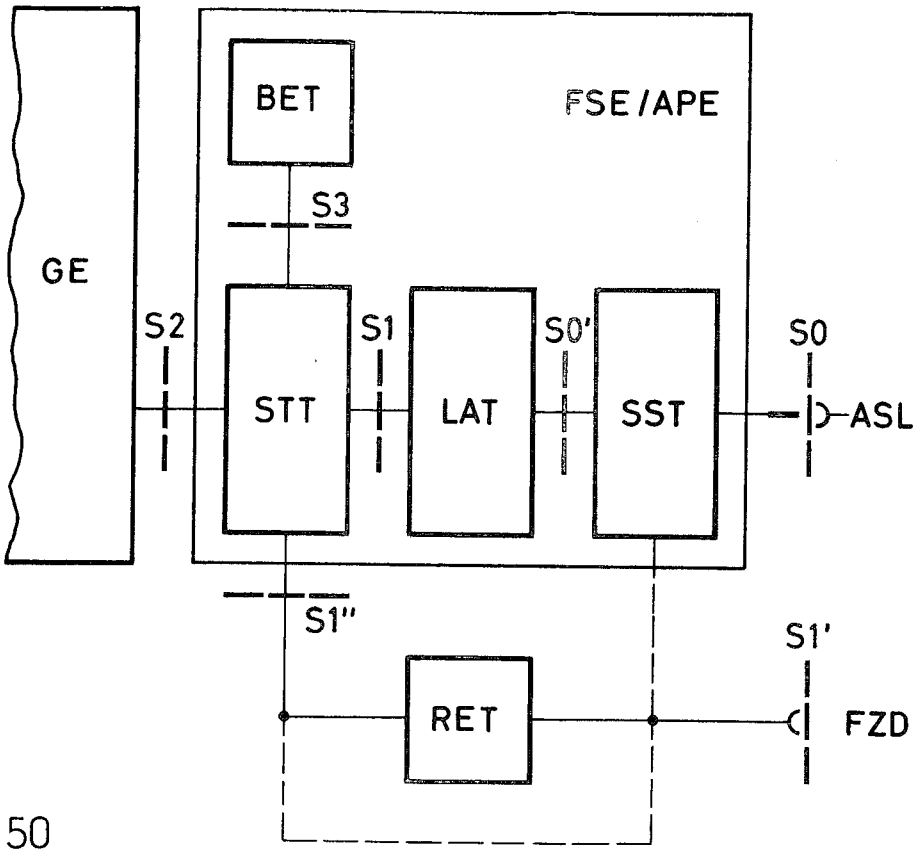
7.13.4. EFFECTS OF OPERATING MODES ON ANSWERBACK MODULE KG

Functional state of the Teleprinter	Standby	Operating condition				
	AC power voltage applied	Local mode ON	On-line working ON			
			Idle	Printing		
			No input or output module in operation	At least one input or output module in operation		
				Dial	Here-is	Who-are-you
Effect on:	ANSWERBACK MODULE					
	Home position	Home position	Home position	Home position	in operation	in operation
Tape reader in operation	Home position	Home position	Home position	Home position	Home position	Home position
Keyboard buffer filled	Home position	Home position	Home position	Home position	Home position	Home position

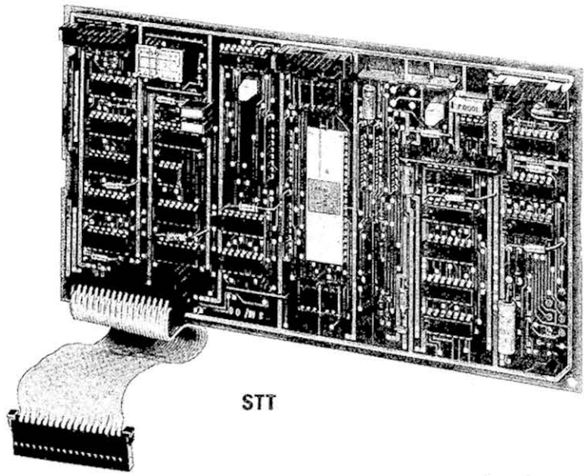
8. PRINCIPLE OF OPERATION OF THE MODULES OF THE LINE INTERFACING SYSTEM

Contents

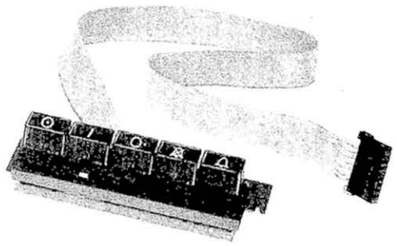
Figure 50: Structure of the line interfacing system



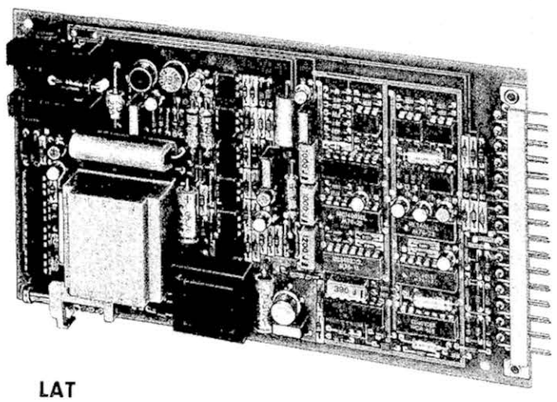
ASL	Subscriber line	S0, S0'	Interfaces
APE	Matching unit	S1, S1', S1"	
BET	Manual control module	S2	
FSE	Signalling unit	S3	
FZD	Special signal socket		
GE	Basis electronics		
LAT	Line adapter		
RET	Relay module		
SST	Protector		
STT	Control module		



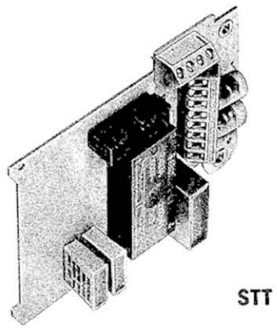
STT



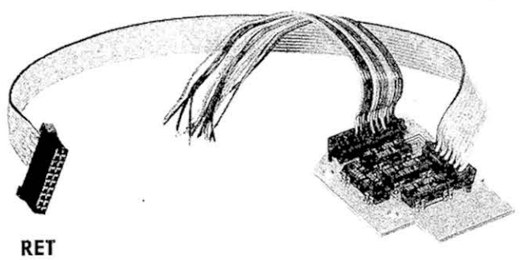
BET



LAT



STT



RET

FZD

8.1. General

The modules of the line interfacing system exist in several configurations which can be combined to form different signalling or matching units.

The signalling units are used for connecting teleprinters to automatically switched networks; the matching units are required for operation in point-to-point dedicated circuits.

The modules of the line interfacing system are incorporated in the teleprinter.

The configuration of the line interfacing system must generally be agreed on an individual basis with the customer. For this reason it is not possible to give a description of the line interfacing equipment which is universally valid. Nonetheless, some essential features of the line interfacing equipment of the Model 1000 are the same in all cases. These are described in the following.

8.2. Construction

8.2.1. MODULES AND ACCESSORY EQUIPMENT

All configurations of the signalling and matching units normally consist of the following modules (Figs. 50, 51):

manual controls module BET,
control module STT,
line adapter LAT and
protector SST.

The relay module RET and the special signal socket FZD are available as accessory equipment.

The control module and the manual controls are used for switching-oriented and operating functions.

The line adapter and the protector perform the transmission-oriented tasks.

The relay module enables floating signal contacts to be brought out via free wires of the subscriber line or via the special signal socket.

The special signal socket is also used for connecting external accessory devices.

All the modules and accessories mentioned are interconnected by means of plugs and cables.

The necessary operating voltages for the modules of the line interfacing system are supplied via interface S2. These are:

Operating voltage	approx.	+12 V;	voltage tolerance	approx. ±5 %
" "	approx.	-12 V;	" "	approx. ±5 %
" "		+ 5 V;	" "	approx. ±5 %
" "		0 V;	reference potential for +12 V, -12 V and + 5 V.	

8.2.2. INTERFACES S0, S0', S1, S2, S3
(Figure 50)

S0 and s0' — Interface S0 is the interface between the teleprinter and the subscriber line. Interface S0' interconnects the line adapter and the protector. The level at these interfaces is determined by the respective distant station.

S1 — Interface S1 connects the control module with the line adapter. The operating voltages +12 V, -12 V and 0 V are supplied to the line adapter. The signals at interface S1 are transferred at electrical values conforming to CCITT Recommendation V.28.

S1' — Explanation: Section 8.2.3.

S1" — Explanation: Section 8.2.3.

S2 — Interface S2 is the transfer interface between the basic electronics and the modules of the line interfacing system. The electrical values of the signals transmitted on the data, control and status signalling lines and on the timing line conform to the TTL level. The operating voltages +12 V, -12 V, +5 V and 0 V are also supplied via interface S2.

S3 — Interface S3 is used for connecting the buttons and lamps of the manual controls to the control module.

8.2.3. POSSIBLE COMBINATIONS OF THE MODULES OF THE LINE INTERFACING SYSTEM

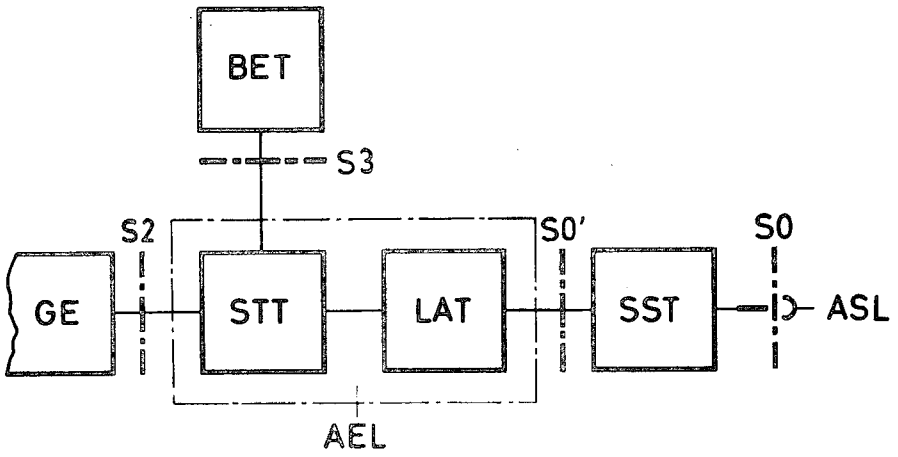
The interfaces S1, S2, S3 and S1" are normally standard for all the modules. The combination of different modules produces different types of signalling or matching units.

The accessory equipment - relay module and special signal socket - is connected via interface S1". Signals with electrical values conforming to CCITT Recommendation V.28 and also signals at TTL level are transferred via interface S1".

The teleprinter (e.g. basic electronics and power supply) generally requires no modification if other types of line interfacing system are to be installed.

The following connection methods are possible:

8.2.3.1. Line interfacing system minus accessories (Figure 52)



52

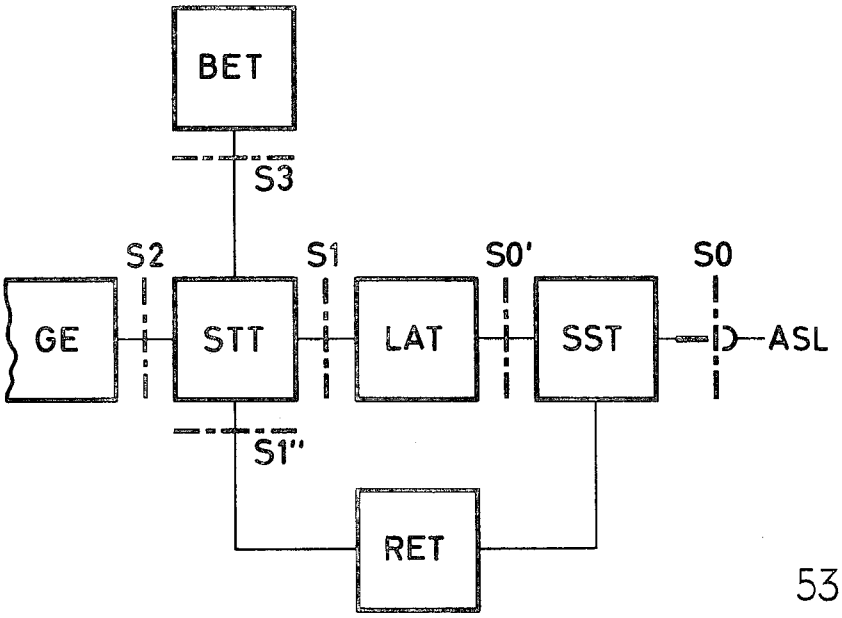
AEL = Interface electronics

When the demands on the logic and the transmission equipment are light, the circuitry of pc boards STT (control module) and LAT (line adapter) can be combined on one module AEL (interface electronics). The V.28 interface S1 is then omitted.

The combined module AEL is installed in place of the SST.

The mounting location for the LAT is left vacant.

8.2.3.2. Bringing out floating signal contacts via free wires of the subscriber line (Figure 53)



53

Depending on how many wires of the subscriber line are assigned for other purposes, this configuration enables up to two floating make contacts (permissible load 60 V/100 mA) to be brought out via interface S0.
Depending on its configuration, the relay module may contain either one or four relays with floating contacts for external control purposes.

If the version with four relays is incorporated, independent criteria can be assigned to two contacts:

either

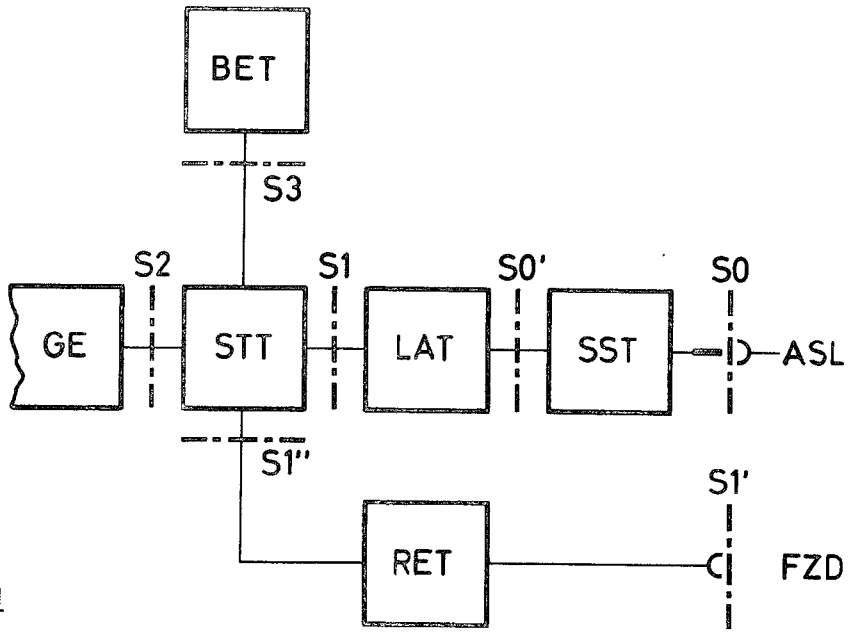
two teleprinter criteria selected on the special function module

or

one teleprinter criterion selected on the special function module and one call signal repetition facility.

If a relay module with a single relay is incorporated, only the call signal repetition facility can be assigned to the subscriber line.

8.2.3.3. Bringing out the data lines and/or the floating signal contacts via the special signal socket (Figure 54)



54

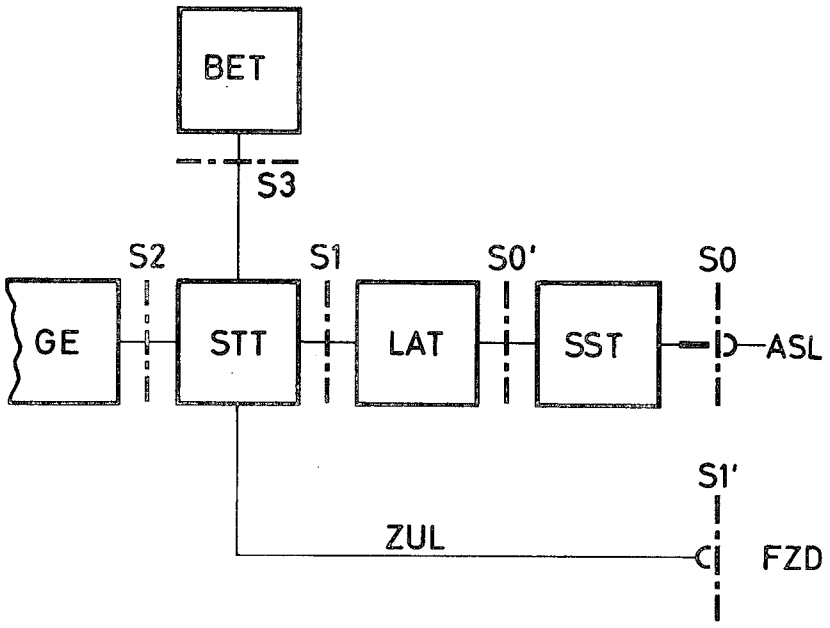
Interface S1':

This serves for bringing out one or up to four floating make contacts if a relay module with one or four relays respectively is incorporated.

All the criteria given in sections 8.3.5.1 and 8.3.5.2 can be assigned to the contacts.

For connection of external devices see Figure 56.

8.2.3.4. Connection of external devices via the special signal socket FZD (Figures 55, 56)



55

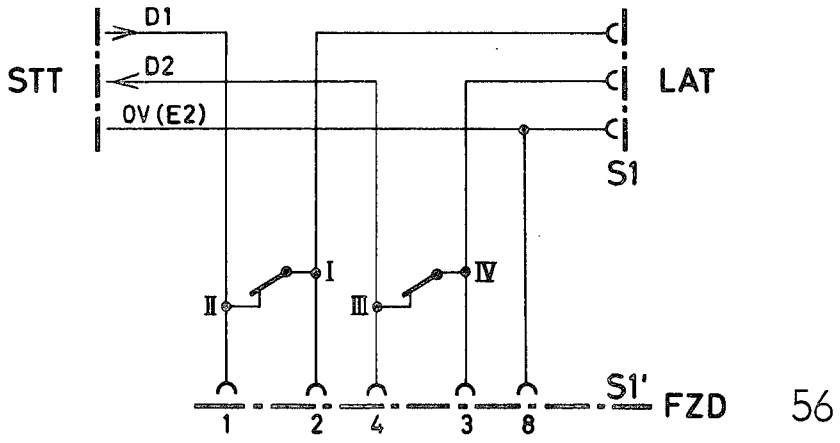
ZUL External device line

Interface S1':

The special signal socket and the external device line can be used to connect an external device, e.g. a date or time generator or sequence numbering device, to the data lines (transmitted and received data) of interface S1.

In this case bringing out floating signal contacts is no longer possible.

Connection of an external device:



56

Electrical values on lines D1, D2 and E2 conform to CCITT Recommendation V.28. The teleprinter is operable when the external device is not connected.

8.3. Principle of operation of the modules

The functional states of the teleprinter and the basic principle of operation during transmission and reception of telegraph characters are explained in Sections 4 and 5 of this description.

Selection on the Model 1000 is always via the keyboard irrespective of dialplate or code selection. The line interfacing equipment determines the selection mode for which the teleprinter is set.

Even when the teleprinter is operating via automatic exchanges using dialplate selection, the desired subscriber station is selected by keying in the call number on the keyboard. The keyed-in digits are converted into the corresponding dial pulse sequences in the basic electronics.

8.3.1. MANUAL CONTROLS MODULE BET

The manual controls module contains up to five illuminated pushbuttons which permit a connection to be set up or cleared and local mode to be enabled. The lamps in the buttons indicate the functional states.

Depressing the manual control buttons causes signals to be passed via interface S3 to the control module. The lamps in the buttons are switched on and off by means of signals from the control module.

The function and mode of operation of the buttons and lamps is dependent on the control module configuration being used. The following table offers a rough guide to the most frequently occurring functions of the buttons and switches:

Mounting positions: | 1 | 2 | 3 | 4 | 5 |

	Function in Signalling units:	Function in Matching units:
Mounting position 1:	Call button with call lamp	
	Call to exchange. Switchover to suffix dialling when operating via exchanges with dialplate selection and multiaddress facility, provided such an option is programmed in the control module.	Enables on-line mode and transmits a start-polarity pulse in standby and during on-line working.
	Call lamp lights when teleprinter is operating via an exchange using dialplate selection as an indication that selection can proceed; when operating via an exchange using code selection the lighting of the lamp indicates that a call has been passed to the exchange.	

	Function in Signalling units:	Function in Matching units:
	Option programmable in control module:	
	Call lamp flashes slowly if there is a malfunction in the subscriber station, e.g. caused by data medium OUT condition, opening of cover lid or pulling of telegraph plug.	Lamp in call button flashes if there is a malfunction in the subscriber station, e.g. caused by data medium OUT condition, opening of cover lid or pulling of telegraph plug.
	Call lamp flashes quickly when teleprinter is operating via exchanges with dialplate selection and multiaddress facilities (suffix dialling mode) as an indication that selection can proceed again once the call button is depressed anew.	
Mounting position 2:	Local button with local lamp 	
	Local lamp lights when local mode is enabled.	Local lamp lights when local mode is enabled.
Mounting position 3:	Disconnect button with ready-to-print lamp 	
	Cleardown of a connection; deactivation of local mode	Disabling of on-line mode when the latter is set to continuously ON; deactivation of local mode.
	Ready-to-print lamp lights during an existing connection.	Ready-to-print lamp lights during enabled on-line mode.
Mounting position 4:	Delete button for call signal, with call signalling lamp 	Button for continuous on-line mode, with lamp 
	Deletes call signal. Lamp lights when call signalling is operative.	Activation of continuous on-line mode while on-line working is proceeding, i.e. no automatic disabling of continuous on-line mode after a predetermined period. Lamp is lit while continuous on-line working is in progress.
Mounting position 5:	Blocking switch for call signalling, with ready-to-operate lamp for call signal 	

Function in Signalling units:	Function in Matching units:
Function: With the switch depressed, the call signalling is disabled; the ready-to-operate lamp does not light. When the switch is not depressed, the call signalling is ready to operate; the ready-to-operate lamp is lit constantly, even when the machine is on standby, or during local working.	

Special version: Manual device controls GB with key switch

The manual device controls GB may include a key switch which enables the call button in the manual controls module BET to be locked.

If the key is removed, or is in the locking position, no outgoing call can be set up.

The key switch has no effect on an incoming call and does not prevent local mode being enabled.

8.3.2. CONTROL MODULE STT

The control module STT performs the switching-oriented and operational functions of the line interfacing system. It basically consists only of digital electronics. The control module interprets the signalling criteria coming from the manual controls or line adapter for call setup or for enabling local mode. It uses these criteria to generate the necessary signals for the next functional sequences. These signals may be passed to the basic electronics, the line adapter or the manual controls, depending on the particular control function to be executed.

The teleprinter is activated by means of the criteria "line mode" or "local mode", which are transferred to the basic electronics via interface S2. The basic electronics replies after a predetermined time by returning a "ready" signal. Cancellation of these criteria, e.g. when the clearing signal is given or by a "data medium OUT" signal, causes the teleprinter to be turned off again.

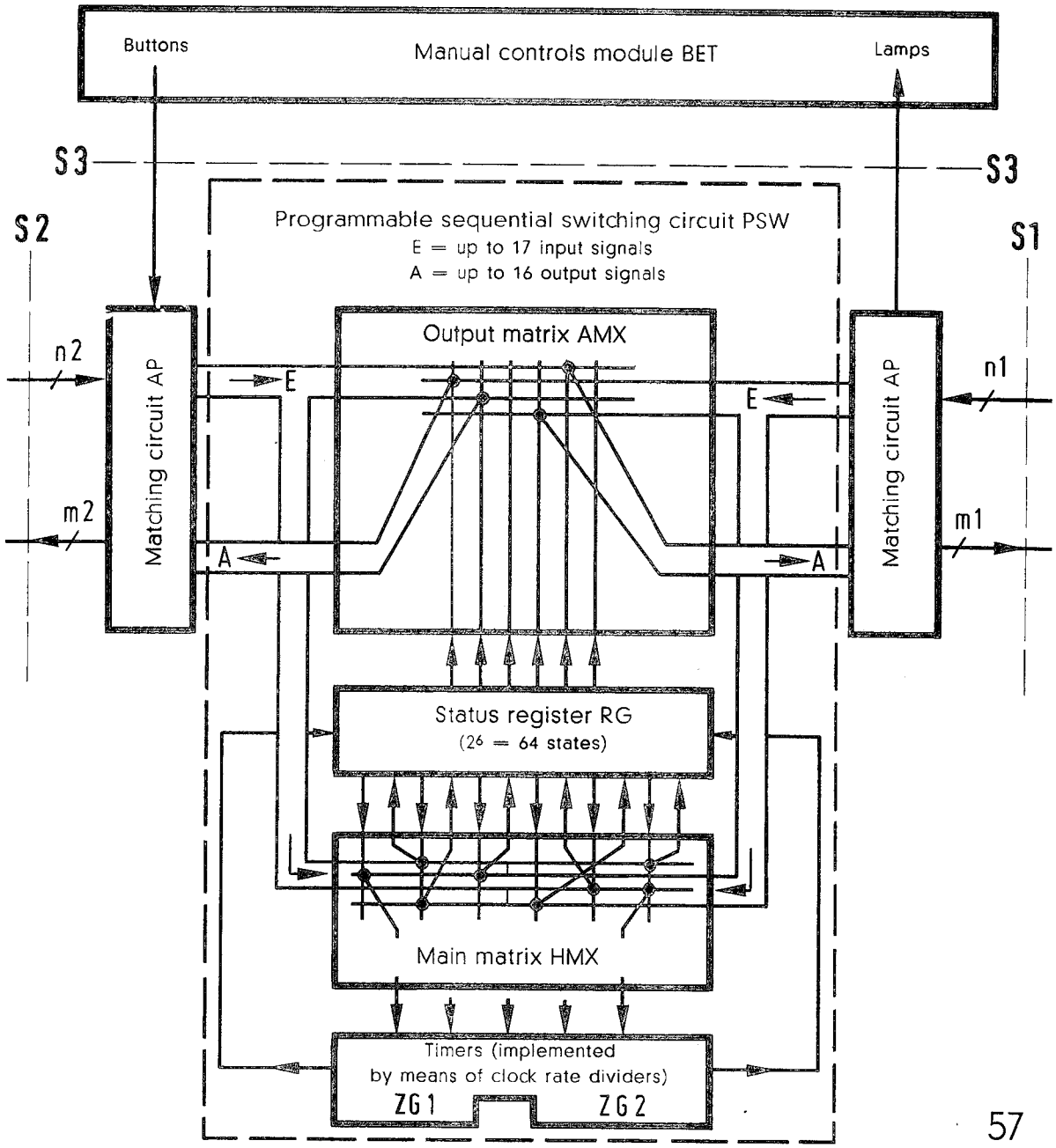
In half-duplex and local mode operation, the information offered on the "transmitted data" line (interface S2) in the control module is passed via the "monitoring loop" on to the "received data" line.

When the teleprinter is operating via an automatic exchange using dialplate selection, the control module sends a signal which causes the basic electronics to convert the selection digits entered subsequently via the keyboard into sequences of dial pulses. These dial pulse sequences are then transmitted via interface S2 and the control module to the line adapter.

Simultaneously, the telegraph characters corresponding to the selection digits are transferred via the "transmitted data" line (interface S2) to the control module. This sends them back to the basic electronics, which controls the printout of the transmitted characters.

Breaking in to stop the tape reader is made via a line specially provided for the purpose.

Construction of control module STT



S1 . . . S3 Interfaces
n2 Input signals } for interface S2
m2 Output signals }
n1 Input signals } for interface S1
m1 Output signals }

The control module STT (Figure 57) normally employs a mask-programmable LSI-MOS circuit, the "programmable sequential switching circuit" PSW, as the central functional unit.

Integrated in this MOS module are a register for storing the operating states (status register RG), two controllable timers (ZG1, ZG2) as well as a main matrix (HMX) and an output matrix (AMX). The control sequence is specified in the matrices by means of mask programming tailored to the particular application. The control sequence is subdivided into operational phases, e.g. "standby" or "outgoing call".

The input signals E are combined in the main matrix with the existing operating state either at once or after a delay. By this means the register status can be changed and a new operating phase entered. The signals or sequences which produce a transition from the current operating phase to a new one are specified in the main matrix. For example, a transition is made from the "standby" phase to the phases "outgoing call" or "local mode" as a result of the input signals "call button" or "local button" respectively.

The output signals A necessary in this case, such as the status on the subscriber line or lamp indicators in the manual controls, are specified in the output matrix.

Different functions, such as the generation of the call signal, division of the timing pulse and logic operations are implemented outside the "programmable sequential switching circuit" PSW by means of TTL integrated circuits.

Matching circuits and level converters are provided for matching to interfaces S1...S3.

Where the demands on the control modules are slight, e.g. in the case of simple matching unit variants, TTL integrated circuits can be substituted for the PSW.

The control module in matching units includes an electrical timeout switch which turns off the teleprinter automatically after a predetermined time (e.g. 32 seconds) has expired since transmission or reception of the last telegraph character. This automatic deactivation can be rendered ineffective during continuous on-line working by means of a button in the manual controls.

Receiving-only machines, which do not require manual controls, normally switch off after 32 seconds. If required, the time-out delay can be extended to 64 seconds or 8 1/2 minutes.

The various timing patterns, e.g. for transmission of a start-polarity pulse, are generated via frequency divider chains, thus keeping the specified times exact within small tolerances and unchanged over the life of the pc board. These timing patterns are controlled by an auxiliary timer from the basic electronics. No adjustments are necessary, therefore, on this module.

8.3.3. LINE ADAPTER LAT

The line adapter (Figure 58) mainly consists of analog electronics. It converts the different levels at interfaces S0 and S0' to the machine-internal voltage level. The line adapter is also where the line circuit is dc decoupled from the machine-internal circuitry. The dc decoupler (GT) prevents mutual interference between teleprinter and subscriber line. It is implemented by means of optocouplers.

The send circuit (SS) is an electronic equivalent of the send contact of conventional teleprinters or the send relay (telegraph relay) of conventional remote control dial units. When the teleprinter is linked to automatic exchanges via two-wire single current lines, the send circuit SS switches the line circuit from the high-impedance to the low-impedance state and vice versa.

The receive circuit (ES) is an electronic equivalent of the selector magnet of conventional teleprinters or the receive relay (telegraph relay) of conventional remote control dial units. With single-current operation via automatic exchanges, the receive circuit ES interprets the polarity of the line current. To distinguish a reversal of polarity on the subscriber line from undershooting, which may also occur during printing to line, polarity changes < 15 ms are suppressed.

The received signals usually show strong deformation of one kind or another and are often beset by heavy disturbances. With high-level single current transmission, the receive circuit interprets the incoming signals by means of a special scanning method with additional integration effect. Noise of < 2 ms on the subscriber line is suppressed. The optimum dynamic properties of the selector magnet used in conventional teleprinters are realized without need for manual adjustments.

The single (neutral) current variants of the line adapter in both signalling and matching units incorporate an electronic overcurrent protector. The receive circuit recognizes when the line current exceeds about 100 mA. The line circuit is then immediately made highly resistive (in the case of signalling units FSE) or interrupted (in the case of matching units APE). After about 100 ms it is switched back to the low-impedance state or closed. If overcurrent continues to flow, the line circuit is once more switched to the high-impedance state or interrupted, and so on.

Owing to the wide, adjustment-free receive margin and the accurate and constant conversion of the signal elements, there is generally no need for a range finder and therefore no provision for one.

In line adapters for double (polar) current operation, the send circuit SS regulates the current in the send path automatically. A current limiter is included in the receive circuit.

The noise voltage filter (GF) helps ensure the noise voltage values required by the telecommunications carriers are observed. The inductance of the noise voltage filter simultaneously improves the transmission characteristics. It is so dimensioned that a Teleprinter Model 1000 can be substituted for a conventional machine with no need for any realignment of the balancing network in the exchanges.

The voltage converter (SW) generates ungrounded auxiliary voltages from the power voltages of +12 V, -12 V and 0 V supplied via interface S2. In the case of an internal power supply, the voltage converter supplies ungrounded keying voltages to the send circuit SS.

The interface adapter (SA) implements the functions of interface S1. By exchanging the line adapter, the teleprinter is enabled to interwork with different full-duplex or half-duplex transmission systems.

When the Model 1000 is hooked up via a low-level system, e.g. with a single-channel data station tie-in system ED 1000, the line adapter incorporates an SEU-B send/receive converter.

8.3.4. PROTECTOR SST (Figure 58)

The protector SST comprises the RF suppressor (FE) and a fine protection against surge voltage (US).

The RF suppressor uses filters to reduce the noise voltages attributable to the teleprinter to permissible levels.

The fine protection against surge voltages uses the same filters and also gas-filled overvoltage arresters to limit brief surge voltages (breakdown voltage approx. 230 V) not eliminated by the normal coarse protection external to the teleprinter to permissible levels.

8.3.5. RELAY MODULE RET

Depending on its particular configuration, the relay module contains either one or four relays, each of which as a make contact ( permissible load 60 V/ 100 mA).

The contacts of these relays are brought out on a floating basis (see sections 8.2.3.2 and 8.2.3.3), i.e. the external devices connected up to the teleprinter are not powered by the latter's power supply.

The relays are controlled by means of TTL-level signals.

If a signal is sent to an external point via a relay, the relay's contact closes

- for 55 ms from the middle of the fifth information element of a received telegraph character, irrespective of the telegraph speed
- for the time the paper, magnetic tape or punched tape supervision feature is operative
- for the time the call signal repetition state exists, or else it opens and closes periodically during this time (selectable on control module).

Moreover, the two-color printing facility may be controlled externally via the relay module RET.

The relay module RET also connects those lines to the special signal socket that are used to loop external transmitters or receivers (e.g. date-time transmitter) into the data lines D1, D2.

8.3.5.1. Relay module with single relay

This relay module can be assigned the following criteria:

Call signal repetition facility	1) and
connection of an external device e.g. sequence numbering device.	2),

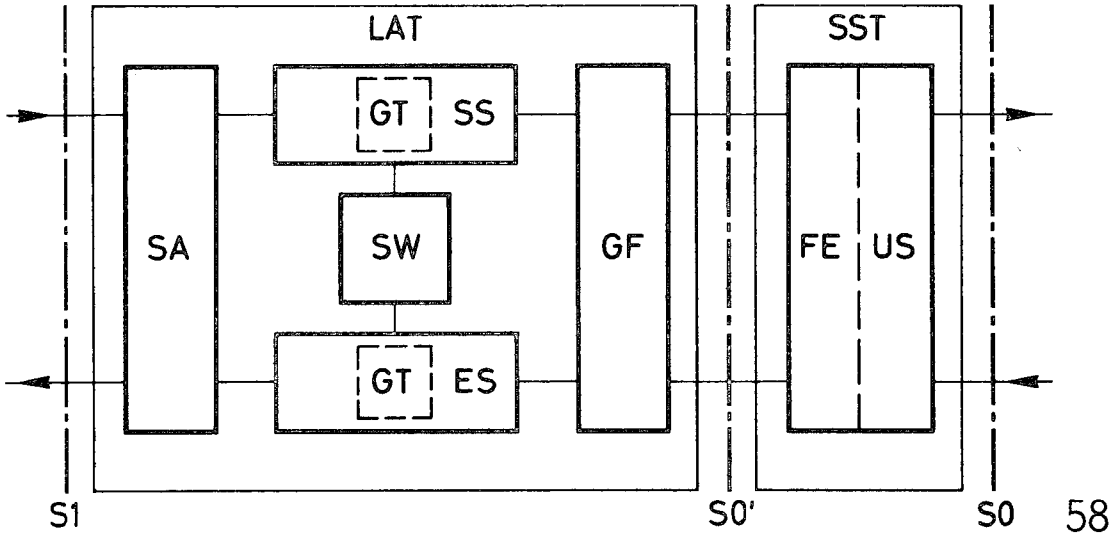
For limitations to this, see 8.2.3.2, Figure 53 and 8.2.3.3, Figure 54.

1) Brought out via subscriber line ASL or special signal socket FZD	(via ASL only when no external devices are connected, otherwise via FZD)

2) Connection only via FZD.

Figure 58

Block diagram showing structure of the line adapter and protector



ES	Receive circuit	S0...S1	Interfaces
FE	RF suppressor	SA	Interface adapter
GF	Noise voltage filter	SS	Send circuit
GT	dc decoupler	SST	Protector
LAT	Line adapter	SW	Voltage converter
		US	Fine protection against surge voltages

8.3.5.2. Relay module with four relays

In optimum configuration, this relay module can be assigned the following mutually independent criteria:

either

3 teleprinter criteria selected on the special function module and
1 call signal repetition facility

or

2 teleprinter criteria selected on the special function module,
1 call signal repetition facility and
1 black/red ribbon shift facility under external control
(selectable on the special function module and by means of straps inserted on the relay module).

or

only in conjunction with a special signal socket FZD

1 connection of an external device
(five lines)

and

1 teleprinter criterion selected on the special function module

or

1 call signal repetition facility
(one floating make contact).

For limitations to this see 8.2.3.2, Figure 53 and 8.2.3.3, Figure 54.

8.4. Effects of the operating modes on the manual controls BET for switching functions in signalling units for neutral current operation

(Based on a frequently used line interfacing system)

Functional state of the Teleprinter	Standby	Proceed-to-dial in the case of dialplate selection	Operating condition			
			Line working		Local working	
			Idle	Printing	Idle	Printing
	AC mains voltage applied Data medium inserted Cover lid closed		no input or output module in operation	at least one input or output module in operation	no input or output module in operation	at least one input or output module in operation
Effects on:	MANUAL CONTROLS					
Call button ⊙ Call lamp	effective does not light	ineffective lights	ineffective does not light	ineffective does not light	effective does not light	effective does not light
Local button I Local lamp	effective does not light	ineffective does not light	ineffective does not light	ineffective does not light	ineffective lights	ineffective lights
Disconnect button ⊙· Ready-to-print lamp	ineffective does not light	effective does not light	effective lights	effective lights	effective does not light	effective does not light

Trouble condition:

When the cover lid is open or in the event of a 'data medium out' condition (no printer paper or paper or magnetic tape inserted), the lamp in the call button ⊙ flashes.

Depending upon the line interfacing equipment installed, neither local nor line working can be started. On arrival of a call, the teleprinter signals "not ready" or "busy" in the case of a collective number group.

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