Facit N4000
Punch/Reader-Punch

User's Manual
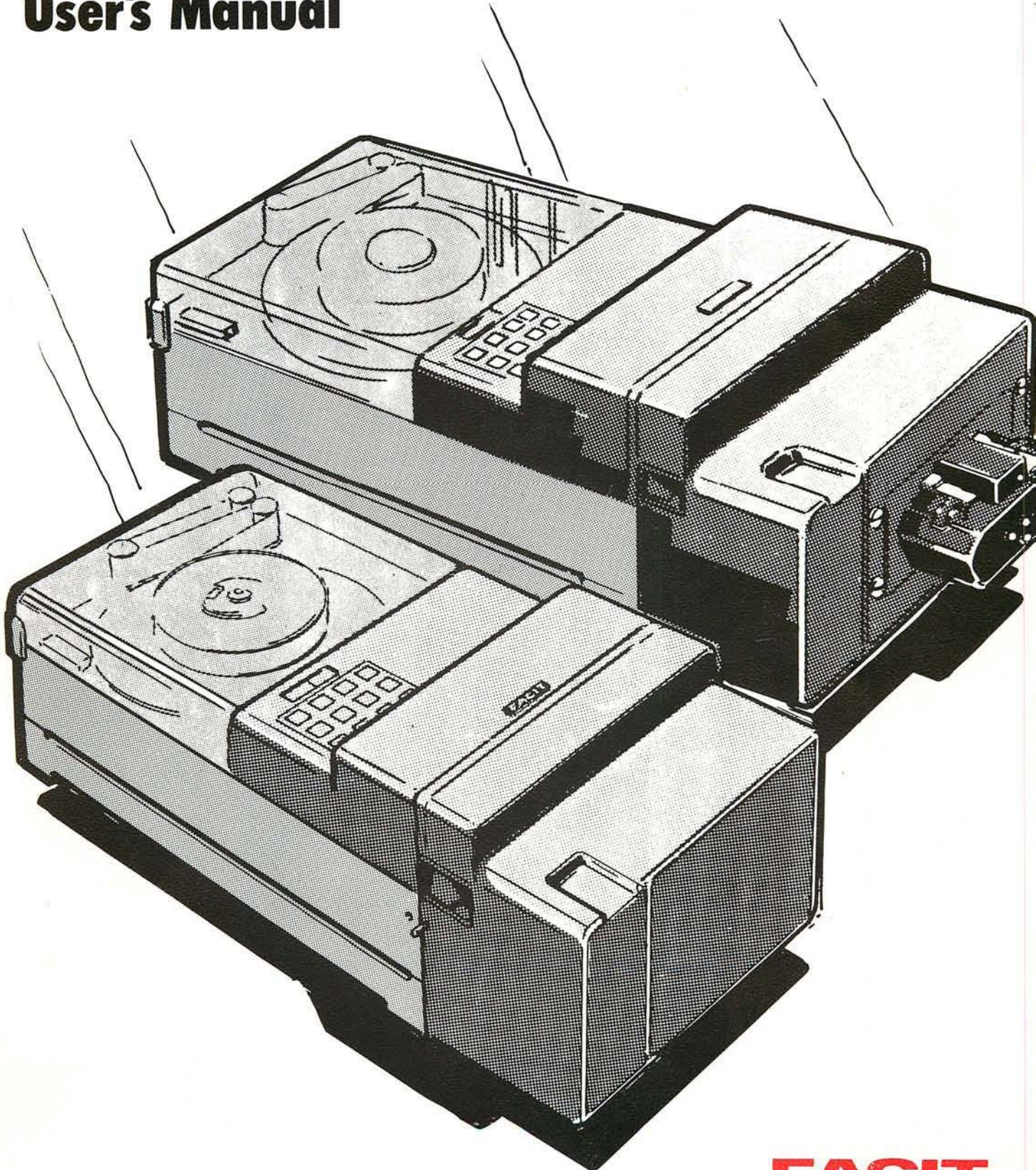
FACIT

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1 Introduction

The Facit N4000 comes in two versions, a paper tape punch and a reader/punch combination.

The paper tape punch, punches 5 to 8 track tapes. Five track is normally used to punch telextapes and eight track mostly for punching NC-programs. The punching speed is 30, 62 or 75 characters per second, operator selectable.

The reader/punch combination can read and punch 5 to 8 track tapes.
The reading speed is 200/500 characters per second, operator selectable.

Both units are designed as stand alone units for table top mounting. Two standard I/O ports are available with CCITT V.24/RS-232-C serial interface.

Facit N4000 has a buffer of ~ 9 K capacity.

Code conversion can be performed. The codes included are the two used NC codes ISO and EIA and the national versions of the telexcode.

A small keyboard and status display are incorporated at the top of the unit; with this all operating system parameters may be quickly and easily entered with no necessity to change PC board DIP switch settings. The status display clearly indicates the unit's current operating status, and also shows simple error messages.

How to get started

Mains connection

- Check that the mains voltage selector on the rear panel, see Fig. 6.1, shows the actual mains voltage.

- Connect the mains cord to rear panel mains inlet and to the mains.

- Switch the ON/OFF switch on the rear panel to ON.

- Check that the status display, see Fig. 4.1, shows OFF.

Punching

Punch tape loading

Load the tape according to section 1.2 **Punch Tape Loading**.

Punching instruction

- Connect the NC/Computer cable plug to the CHANNEL 1 I/O PORT connector on the rear panel, see Fig.6.1.

- Depress the key ON L on the operator keyboard. The status display shows LINE.

- Start the punching from the NC/Computer.

- Tear off the tape when the punching is ready.

If required, blank tape can be fed by depressing OFF L and FEED before tearing off the tape.

Note
The data transmission should be made at 600 bit/s.

Reading

Reader Tape Loading

Load the tape according to section 1.5 **Reader Tape Loading**.

Reading instruction

- Depress the ON L key on the operator keyboard. The status display shows LINE.

- Clear the NC/Computer for reading.

- Depress the START key to start the reading.

- Depress the STOP key to stop the reading.

- Depress the START key to restart the reading.

Note
The data transmission should be made at 600 bit/s.

Because reading is faster than transmission, the reader can stop before the whole tape is read. The reader will restart automatically and continue until the whole tape is read.

The tape can be run quickly through the reader either forwards or reverse, without data being read, by depressing the FF or FB key respectively. The equipment must be off line.

When data is sent over the line, by reading or punching, a special sign (at reading, at punching) is shown in the display to indicate communication. At punching the display returns to "Line", when data has been sent. At reading, when the communication stops by any reason, the display shows "data" if there is data in the buffer. The buffer can be cleared by pressing the Stop key <*> and the display goes back to "Line".

If punching is started after reading and there still is data in the buffer, the buffer is automatically cleared. By sending to N4000 for punching, the display switches from "data", if the buffer is not cleared, to the special line communication sign.

Tape copying

Tape copying instruction

- Depress the OFF L key on the operator keyboard.
  The status display shows OFF.
- Depress the COPY key.
  The status display shows COPY.
- Put the tape in the reader.
- Depress the START key.
  Copying will start.
- Depress the OFF L and ON L keys when copying is finished.

If the raeder stops during copying, it is due to the fact that the reader is faster than the punch. The copying will restart automatically and continue until the whole tape is copied.

1.1 Punch Tape Handling

The tape path through the punch is shown in Fig. 1.1. The blank tape leaves the spool and passes around a pulley on the tape guide arm. The guide arm applies a progressively acting brake which operates on the tape bobbin. This operates to ensure that tape fed through the punch is maintained at a constant tension to ensure accuracy and consistency of punching.

Tape Low and Tape End

When the punch tape supply is low, the error message 'Lo' appears on the display. When the tape is exhausted, or if a jam occurs in the feed mechanism, the message 'Err' blinks on and off on the display.

1.2 Punch Tape Loading

With mains power switched OFF, load tape onto the punch tape holder as follows (see Fig. 1.1).

(1) Move the tape guide arm until it touches the magnetic catch. This action applies the brake to the tape bobbin and frees the tape feed and punch mechanism.

(2) Pull out 2 metres (6 feet) of tape from the new reel and place the reel onto the bobbin.

(3) Lock the bobbin by pushing the centre section downwards by hand as far as possible (see Fig 1.1).

(4) Push upwards the two punch opening pegs (located one at each side of the punch housing – see Figs. 2.1 and 2.2), and pull forward the punch assembly to open the tape feed and punch slot (see Fig. 1.1).

(5) Lead the tape around the guide pulleys and drop it into the tape feed and punch slot.

(6) Push back the punch assembly to close the tape feed and punch slot.

(7) Release the tape guide arm from the magnetic catch.

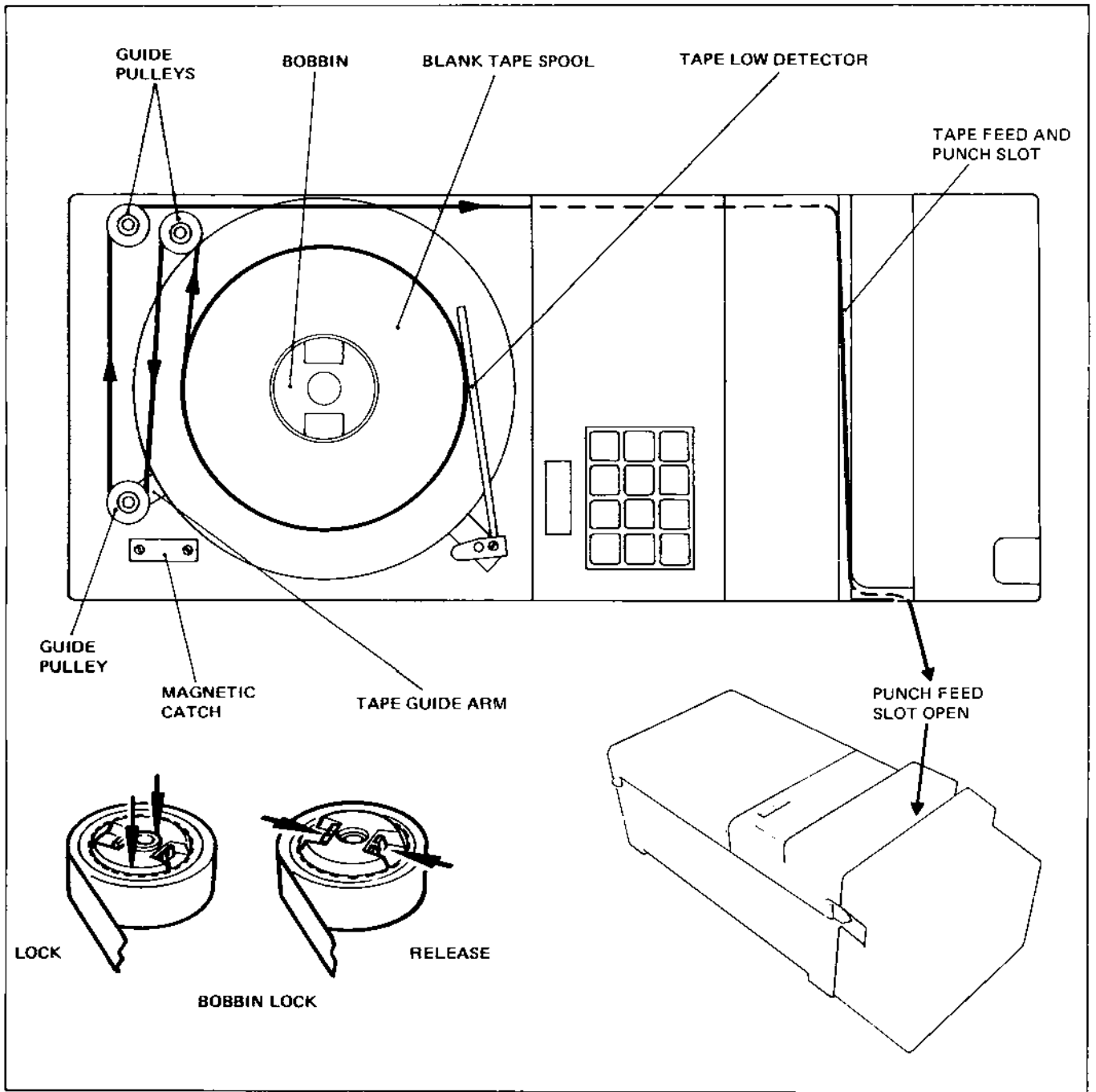(8) Switch the power ON and depress the FEED key until the tape is taut, and feeding correctly from the spool.

Fig. 1.1 Punch Tape Loading

1.3 Punching Accuracy

The accuracy of punching can be checked by using
the Facit template part no. 1114 00 50-00/0 as
shown in Fig. 1.2. It is recommended that this
check is carried out approximately every 50th tape
reel used.

(1) Lay the punched tape on the template as shown
    in Fig. 1.2, with a feed hole accurately
    centered on the leftmost vertical line.

(2) Examine the 50th feed hole on the rightmost
    vertical line. If this line is visible within
    the hole, (i.e. within +-0.5 %), the punch
    accuracy is acceptable.

(3) If the vertical line is not visible (i.e.
    outside +-0.5 %) the punch mechanism requires
    servicing.
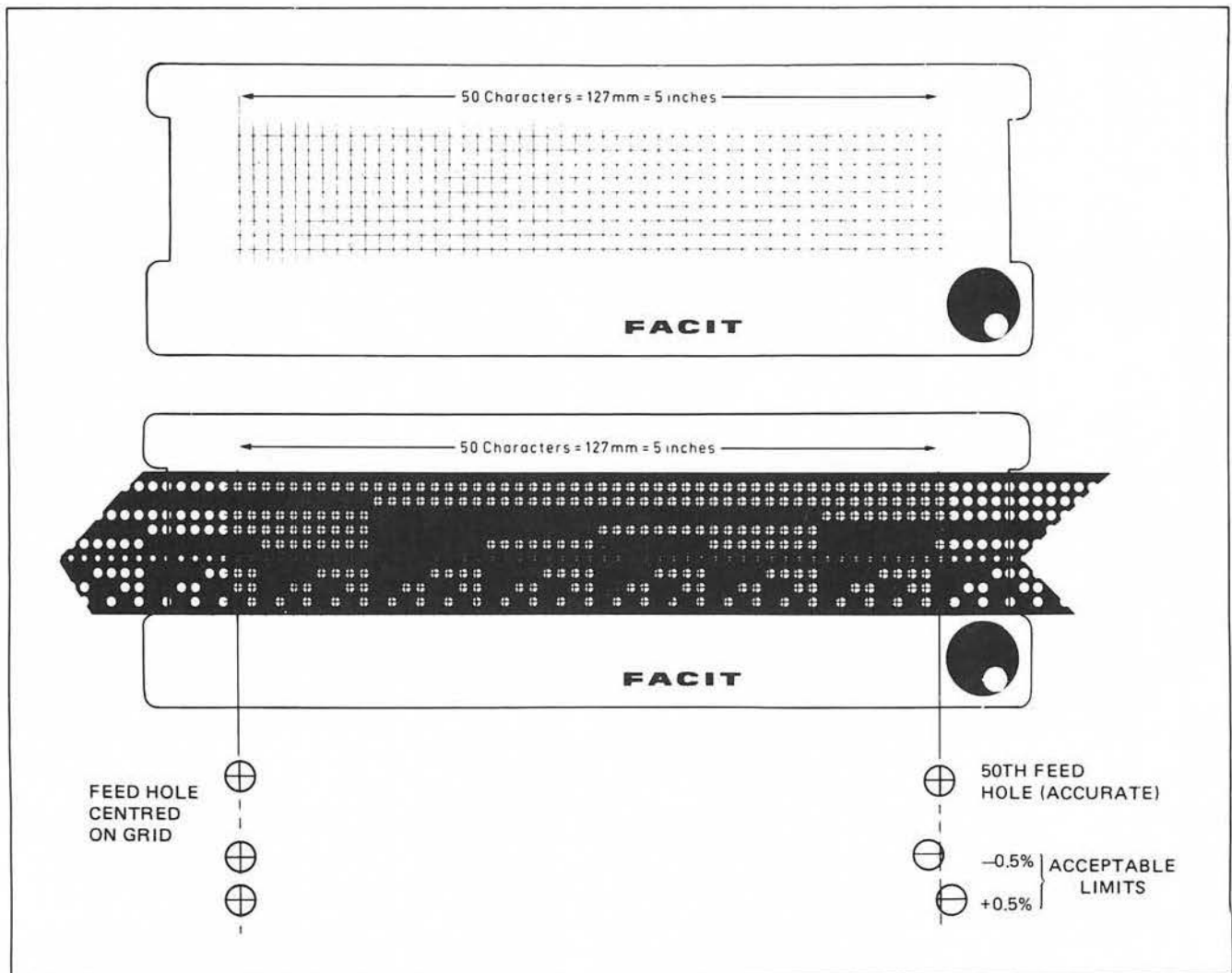
Fig. 1.2 Check Intercharacter Spacing

1.4 Reader Tape Handling (Facit N4000 Combination only)

The tape path through the reader is shown in Fig. 2.5. The tape passes under the entry guide wire, through the tape width selector (adjustable to suit 5, 6/7 and 8 channel tapes), past the reader head and over the drive sprocket. The drive sprocket teeth engage in the tape feed holes to pull the tape past the head.

An indicator lamp on the reader head is lit to show that the optical reader lamp is on.

The tape can be run quickly through the reader either forwards or backwards, without data being read, by depressing the FF or FB key respectively.

Reader Error

A malfunction of the tape reader mechanism stops the transmission of data and the message ´Err´ blinks on and off on the display.
To clear, press <*> key.

1.5 Reader Tape Loading (Facit N4000 Combination only)

Paper tape is loaded into the reader as follows (see Fig. 1.3):

(1) Raise the lift bar to open the entry and exit guides.

(2) Put the tape into the reader and over the drive sprocket.

(3) Lower the lift bar to hold the tape in position; ensure that the tape feed hooles are engaged correctly in the drive sprocket.
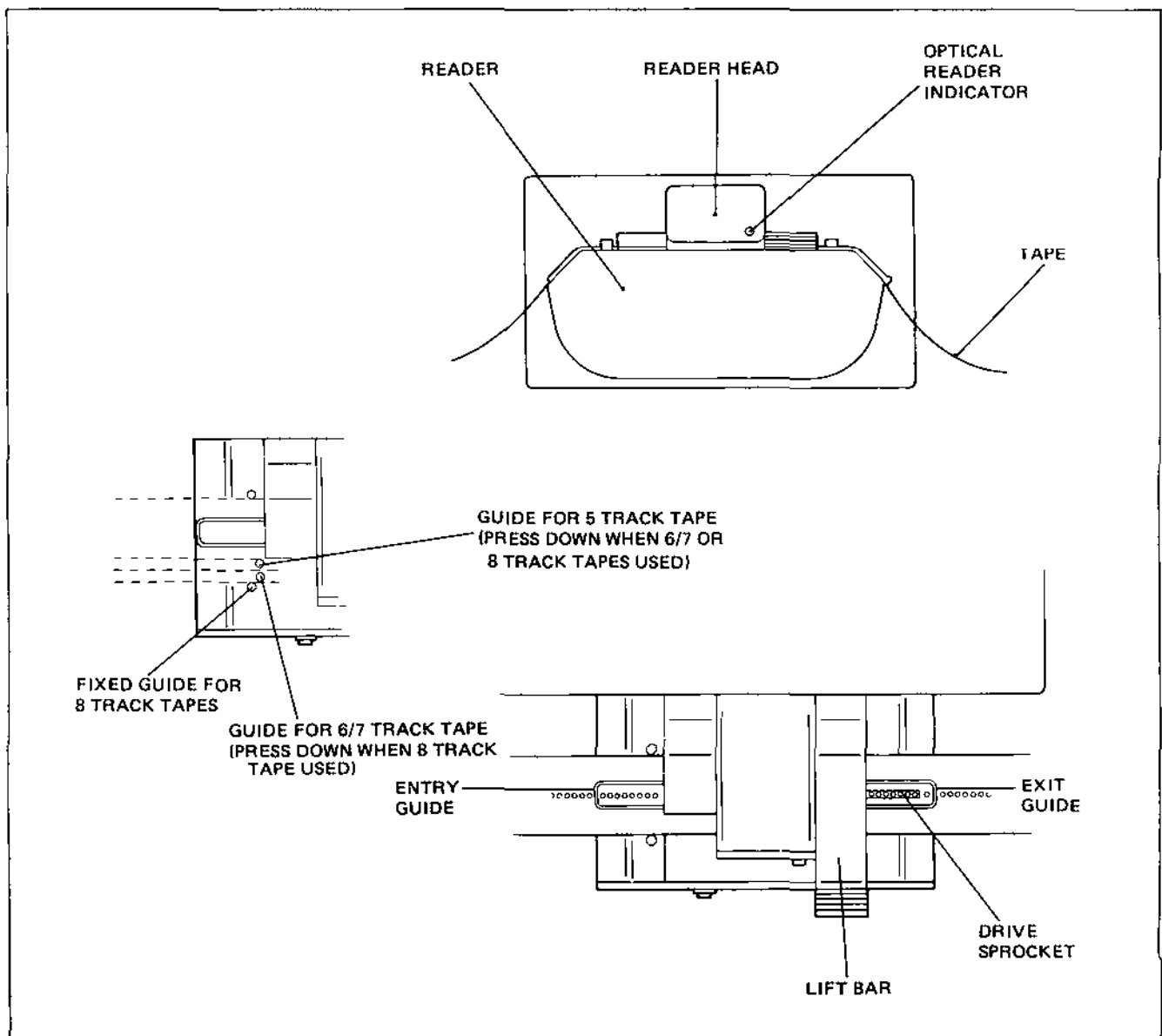

Fig. 1.3 Reader Tape Handling

2 Design and Construction

2.1 Brief Description

The Facit N4000 is shown in Fig. 2.1. The blank
tape is contained on a standard spool at the top
rear of the unit, with the tape feed and punch
mechanism housed under a cover towards the front
of the machine. A semi-transparent lid covers the
tape spool during normal operation, and the amount
of tape left on the spool can easily be seen
without raising the lid.
The reader head is mounted at the front of the
unit next to the chad box.

The punched tape emerges from the exit slot at the
left of the unit; no special arrangement is
included for handling the punched tape.

A tape cutter is fitted in the punched tape exit
slot. The tape is torn off against this cutter to
leave a ´V´ at the end of the tape; this enables
the start and finish of the tape to be correctly
identified.

The chad box is located at the front left of the
unit and may be removed by pulling it out from the
top.

The operator´s keyboard and status display are
situated on top of the unit in front of the lid.

The mains ON/OFF switch, supply fuses and I/O
connector are fitted on the rear panel of the
unit.

LID

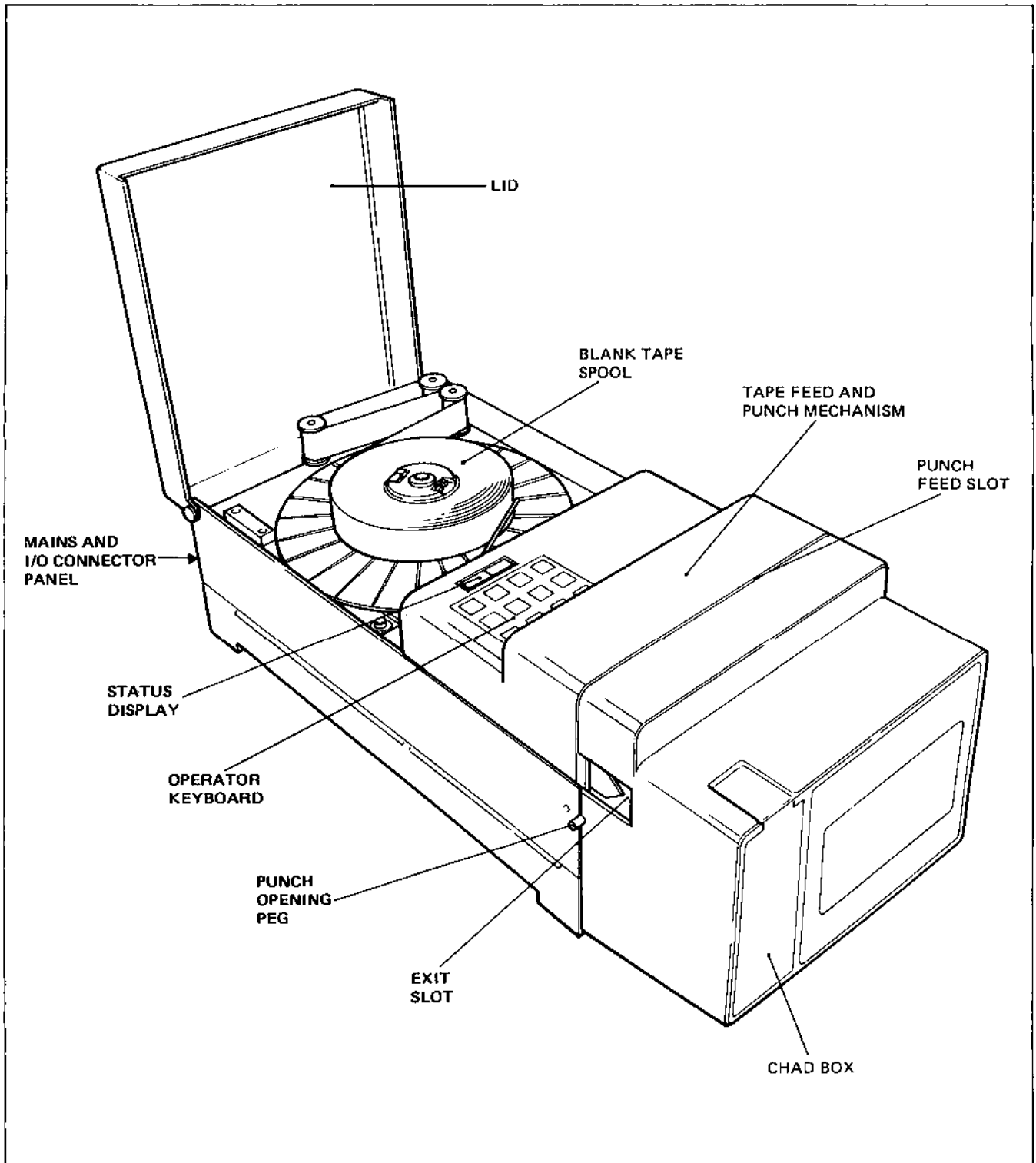BLANK TAPE
SPOOL

TAPE FEED AND
PUNCH MECHANISM

PUNCH
FEED SLOT

MAINS AND
I/O CONNECTOR
PANEL

STATUS
DISPLAY

OPERATOR
KEYBOARD

PUNCH
OPENING
PEG

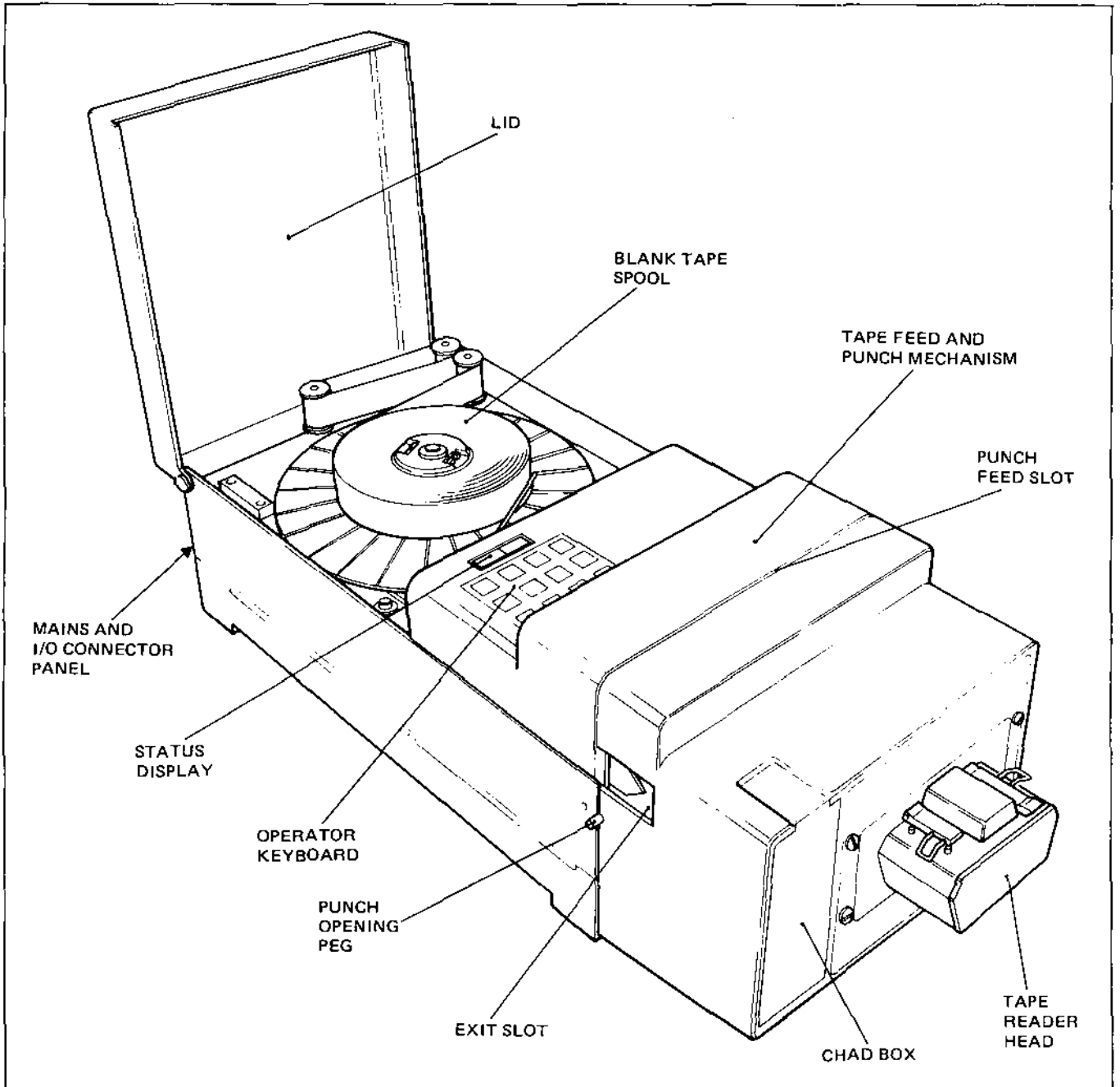EXIT
SLOT

CHAD BOX

Fig. 2.1 Facit N4000 Punch

Fig. 2.2 Facit N4000 Reader/Punch Combination

3 Operation

The unit is intelligent and all programming functions are performed by entries made on the built-in keyboard.

All program parameters are held in RAM, and a battery is incorporated on the interface board to preserve the memory contents when the unit is switched off. The battery capacity is sufficient to retain the memory contents for several years.

3.1 Punch buffer

The overall operation of the punch, and the control of incoming data, is performed by the buffer. The buffer's total capacity is ~9 K. This capacity is shared between Channels 1 and 2 according to the buffer stop address selected for channel 1, in the Program step 12. Each buffer accepts data from its source until full; an instruction is then sent to the source to stop the transmission. The minimum size for either buffer is 256 characters.

The required code conversion of the incoming data is performed prior to reading into the buffer; data in the buffer is therefore always in the correct version for direct punching out.

3.2 Punching out data

Whichever channel has assumed priority for incoming data keeps this priority when punching data.

Data transfer from buffer to punch is controlled and selected in the Program mode (see section 5).

3.3 Buffer Status Signalling

The acceptance of incoming data is controlled by the Full or Empty status of its associated part of the buffer.

The buffer Full or Empty condition is indicated either by X-ON/X-OFF protocol or Ready/Busy status signalling, selectable separately for each channel in the Program mode.

3.4 Punch Speed

The punching speed is 30, 62 or 75 characters per second, operator selectable.

3.5 Time Out

If data is sent to both channels simultaneously,
the channel receiving data first assumes priority
and starts punching. An End of Message character
or a Time Out selected in Program mode 10 can
change priority to the other channel. The Time Out
function is explained fully in Appendix 6.

3.6 Tape Reader (Facit N4000 reader/punch combination only)

Where a reader is included on the unit, data read
from a punched tape is transmitted via channel 1
or channel 2.

Reading takes place at a speed of 200/500
characters per second, operator selectable.

When the reader is started from the keyboard
(start key) data is always transmitted via channel
1. When the reader is started remote, using the
start reader code, data can be transmitted via
channel 1 or 2 depending on the channel used to
send the start reader code. The channel not
affected by reading can accept data for punching.

If reading is attempted while data for punching
remains in any of the buffers for channel 1 or 2,
reading is inhibited and BUSY is displayed.
reading can start when the existing contents are
punched and the channel buffer is empty.

The reader stops when the Stop key is depressed, a
stop reader code is received (either sent over the
line or read on the tape), or when the tape end is
reached.

The transmission continues until the buffer is
empty even if the reader stops due to any of the
conditions above.
The transmission can be controlled using the
X-ON/X-OFF protocol. Sending the code DC3 will
stop transmission and the code DC1 will start
transmission.

Starting the reader with X-ON (DC1)

When X-ON/X-OFF protocol is used, DC1 will start
the reader, DC3 will not stop the reader but the
transmission will be stopped. When other mode than
transparency mode is used, DC1 must be set in
program step 31.

When X-ON/X-OFF protocol is not used, DC1 and DC3
can be used to start and stop the reader in all
modes except transparent mode.

Program step 31, start reader, must be set to 17
and program step 33, stop reader, must be set to
19.

Reader Start with DC1 (XON)

Program Step 3/4	Program Step 6/7	Program Step 9	Program Step 31	Reader Start
2XXX 4XXX	0	0	0	DC1 (XON) starts Reader
2XXX 4XXX	0	≠0	0	DC1 (XON) starts Reader
2XXX 4XXX	≠0	≠0	0	DC1 (XON) does NOT start Reader
2XXX 4XXX	≠0	≠0	17 (DC1)	DC1 (XON) starts Reader
1XXX 3XXX	0	0	0	DC1 (XON) does NOT start Reader
1XXX 3XXX	≠0	≠0	17 (DC1)	DC1 (XON) starts Reader
1XXX 3XXX	≠0	0	17 (DC1)	DC1 (XON) starts Reader

4 Keyboard Controls

All the functions of the Facit N4000 are
controlled from a small keyboard located on the
control panel. A digital readout consisting of
four 7-segment displays is located above the
keyboard.

Each key (except the <0> key) has two functions.
In normal use the upper functions (printed on the
keys) are applicable, and the display shows the
operating status of the unit.

When the <PRGR> key is depressed, the unit enters
the Program mode, and the lower function of each
key then applies. The keyboard is used to enter
numeric programming data, and the display shows
the Program mode values. Programming is described
in section 5.

The keyboard functions in normal use are explained
in the following tables. Most of the keys operate
only with the unit Off-line, and some keys are
functional only when the tape reader is present.

When the mains supply is initially switched on,
the unit goes Off-line, and OFF appears in the
display.
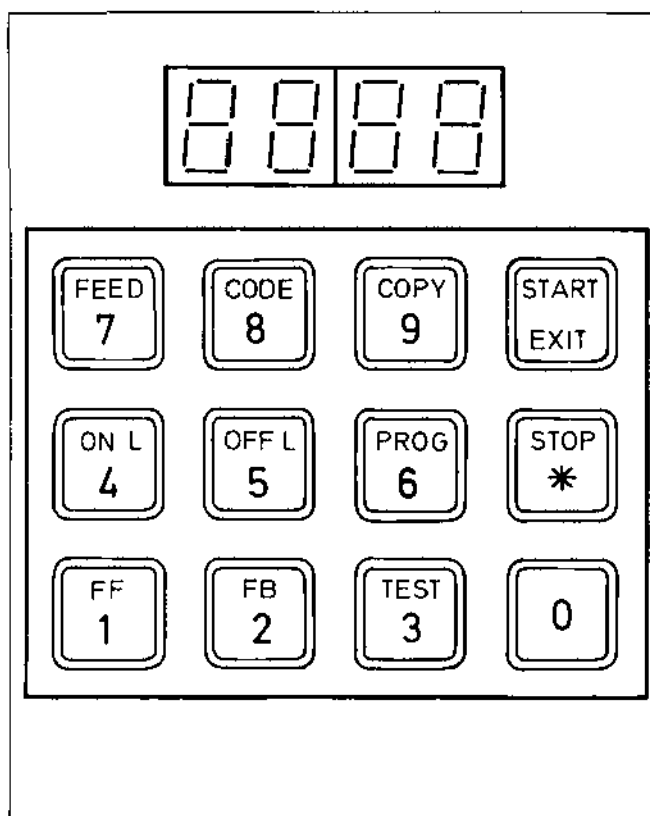
Fig. 4.1 Keyboard and Display

4.1 Key Functions (Facit N4000 punch)

The keys described in Table 4.1 have functions only when the unit is Off-line. When On-line, the only functional key is the <OFF L> key (Table 4.2). The display shows the function initiated by each key when depressed.

KEY	DISPLAY	FUNCTION
FEED	FEEd	Feed holes are punched in the blank tape while the key is depressed.
CODE	CodE	Both code and feed holes are punched in the blank tape while the key is depressed.
ON L	LinE	When this key is depressed and released, the unit goes On-line and can communicate with externally connected equipment via the I/O ports.
PRGR	ProG	When this key is depressed and released, the unit enters the Program Mode (see section 5). The lower functions of all keys now apply.
TEST	tESt	When this key is depressed and released, the unit enters a comprehensive self-test mode (see section 8).

Table 4.1 Key Functions in Off-line Mode

KEY	DISPLAY	FUNCTION
OFF L	OFF	When this key is depressed and released, the unit goes Off-line and is disconnected from the external equipment.

Table 4.2 Key Function in On-line Mode

4.2 Key Functions (Facit N4000 Reader/Punch Combination)

The key functions already described in Tables 4.1 and 4.2 apply also to the Facit N4000 Reader/Punch Combination. The remaining keys allow control of the reader and are described in Tables 4.3 and 4.4.

KEY	DISPLAY	FUNCTION
FF	F F	Tape in the Reader feeds forward while the key is depressed. Reading of data is inhibited.
FB	F b	Tape in the Reader feeds backwards while the key is depressed. Reading of data is inhibited.
COPY	C o P 4	The punch and reader combination enters the Copy mode. A tape in the reader will be directly copied by the punch when the [START] key is depressed (see below).
START	C o P 4	When this key is depressed and released in Copy mode, the Reader and Punch both start. A tape in the reader is directly copied by punch in accordance with the punch programming (see section 5).
STOP	C o P 4	When this key is depressed and released while in Copy mode, the Reader stops. The Punch continues until the buffer is empty.

Table 4.3 Key Functions in Off-line Mode (Reader)

KEY	DISPLAY	FUNCTION
START	L in E	When this key is depressed and released, the Reader starts and data from the tape is read and transmitted via the channel 1 I/O port.
STOP	L in E	When this key is depressed and released, the Reader stops.

Table 4.4 Key Functions in On-line Mode (Reader)

5 Program Mode

The complete range of data handling and interfacing parameters is software controlled by entries made on the keyboard when in the Program mode. Each parameter is held within its specific Program mode number, and the display shows the mode number and the parameter value sequentially. All parameters are displayed numerically.

The user can select modes either in sequence (mode 1, then mode 2, then mode 3, etc.) or directly, and can change the associated parameter value if required.

5.1 Select Modes in Sequence

After depressing the <PRGR> key to enter the Program mode, repeatedly depressing the <*> key will display all modes and their associated parameter values in sequence.

5.2 Select Mode Directly

After depressing the <PRGR> key and then the <*> key to enter mode 1, any other required mode can be selected by depressing the number key(s) required (modes available are 2 to 14, 30 to 39, and 50). The display will show the selected mode number, and depressing the <*> key will then show the parameter value of that mode.

Note: Mode 1 must always be entered First before the required mode is selected.

5.3 Change Parameter Value

The unit as supplied has each of the mode parameters set to a 'default value', which may be changed to suit individual requirements.
This is done by selecting the required mode and depressing the <*> key to display the parameter value. The new required value may then be keyed in directly; the display then shows the new value. Further modes can now be selected as previously described.

5.4 Program Mode 1 to 4

These modes set the baud rate, data word construction and start/stop protocol, selectable separately for channels 1 and 2.

Using the protocols 1 or 3 (Buffer Ready/Busy) means that pin 19 in the interface (see page 34) is set low when 50 characters are left in the buffer. When more space is available, pin 19 is set high again.

Using protocols 2 or 4 means that X-OFF (DC3) is sent when 50 characters are left in the buffer. When more space is available X-ON (DC1) is sent. Echo means that all characters sent are echoed back again. This requires full duplex communication.

If parity (odd or even) is set, parity will be generated when sent from reader to the line and checked when sent from the line to the punch. The checked parity bit is however cleared, and in order to retain the parity bit at the punch, the same parity (odd or even) must be set in program step 5. If parity error is detected on data sent to the punch, the code set in program step no 30-1 to 30-4 is punched. One to four codes can be set in decimal 0-255. If for instance 255 is set, a delete character will be punched each time a parity error is detected. If you set the values 80, 65, 82, 42 the characters "PAR*" will be punched.

5.5 Program Mode 5 (Punch mode and parity)

This mode sets punch and reader parity, and normal (single) or double punching. When double punching is selected, the punch operates twice at each character position. This double punching is desireable with some types of tape to ensure that punching is effected completely.
If parity is selected for the reader, parity will be checked when reading. the checked parity bit is however cleared, and in order to retain the parity bit at the line, the same parity (odd or even) must be set in program step 3. If parity error is detected, the code set in program step 30-1 to 30-4, will be sent to the line.

5.6 Program mode 6 and 7 (Code conversion to punch)

This mode selects the code conversion that is performed on incoming data. Parameter values cater for conversion from incoming data to the required output code.

If Program mode 6/7 is set to 0 (zero) a transparent punching will be made. No function codes will influence the punching. No leaders and trailers will be punched automatically. The first character coming to the buffer will start the punch. No parity is generated if not sent to the punch. Parity can be checked on the line if set in Program mode 3/4.

If Program mode 6/7 is set to 1000, no NUL-characters will be punched. All other characters will be punched as in transparent punch.

When Program mode 6/7 is set to 2000 the transparent punching will start when a DC2 code is received. All characters before DC2 will be ignored. The punching will continue until a DC4 code is received. All characters after the DC4 will be ignored.

5.7 Program mode 8 and 9 (Facit N4000 Combination only)

Mode 8 selects the code conversion performed when in Copy mode (see section 4.2).

Mode 9 selects the code conversion performed during tape reading.

If Copy is set to 0 (zero) a transparent copy will be performed. The reader will continue to read until stopped by Stop key or until end of tape. If the buffer is full, the reader will stop and automatically start again when space is available in the buffer. No function codes (Program modes 30 to 39) will influence the copy. No parity is checked.

If copy is set to 100 a five track telex tape can be copied. A five track tape shall be in the punch. No function codes will influence the copy. If copy is set to 1000, no NUL-characters will be copied. All other characters will be copied as transparent copy.

If any other values is set for Copy, the function codes set in Program 30 to 39 will influence the Copy. This means for instance that reader stop (33) will stop the reader. Parity, as set in Program mode 5, will be checked by reading or generated by punching. Detected parity errors will be punched as the code in Program mode 30.

If Program mode 9 is set to 0 (zero) a transparent
reading will be made. The function codes will not
influence the reading. Parity will be checked if
set in Program mode 5. If program mode 9 is set to
1000, no NUL-characters will be sent. All other
characters will be sent as in transparent reading.

5.8 Program mode 10 (Time Out)

Mode 10 sets the time period that the unit waits
for a late or missing End of Message code before
terminating the message. When in transparency mode
the time out is automatically set to one second.
0 provides 'No Time Out'.

5.9 Program mode 11 (Control code processing)

This Program mode refers to Program modes 30 to
39, see below. This Program mode is only effective
if the code conversion in Program modes 6 to 9
above is other than 0 (zero),1000 and 2000.

There are four positions in this Program mode. The
first and second position decides if the control
characters shall be sent or not over Channel 1 or
Cannel 2. The values can be 0 or 1. If 1, control
characters sent from the host will be punched. If
0, the control characters will not be punched. In
both cases the control characters will release the
function referred to.
The third position refers to the reader. If the
value is 1, the control characters are transmitted
from the reader. If the value is 0 the control
characters are not transmitted from the reader.

The fourth position refers to the copy mode only.
Control characters sent from the reader are copied
if the value is 1. If the value is 0, the control
characters are not copied.

Note
The control characters for Start Reader are never
transmitted or punched.

The control characters for End of Line are always
sent or punched.

5.10 Program mode 12

The total buffer size of about 9300 characters is
shared between Channel 1 and Channel 2 by setting
the end address for Channel 1 buffer.

5.11 Program mode 13

In program mode 13, the puncing speed can be set
to 30, 62 or 75 characters per second.

5.12 Program mode 14

The reading speed can be set to either 200 or 500
characters per second.

5.13 Program mode 30 (Characters for parity error)

In this Program mode four characters can be set as
30-1 to 30-4. The characters shall be set in
decimal form.

The characters set in this Program mode will be
punched if a parity error is recognized at
transmission of data from the host to the punch
and if the Program mode 5, second position is set
to 1 or 2. If, for instance, the four possible
values are set as 1, 1, 1, 1, four characters with
hole in channel one will be punched before the
character with parity error.
The characters set in this mode will be sent to
the host, if a parity error is recognized by
reading and the program mode 5, position 3 is 1 or
2.

5.14 Program modes 31 to 39

These Program modes are only effective if the code
conversion in Program modes 6 to 9 above is other
than 0 (zero),1000 and 2000.
These modes allow the programming of specific
control codes to which the unit will respond. Each
control code may consist of up to four characters,
and each mode is subdivided into four steps to
select and hold each character. Each character is
entered using its decimal value.

Program mode 31.

This program mode is used to set one to four codes
to start the reader. If you wish to start the
reader using DC1 code, set the value 17, decimal
for DC1. See also 3.6 above.

Program mode 32.

Program mode 32 is used to set the code for End of
Line. This code shall correspond to the code for
End of Line sent over the line. It is normally CR
(dec 13) or LF (dec 10) or both of them together.
If both CR and LF are sent, the program mode 13
shall be set to 13 + 10. If no End of Line is
sensed, the punch will start when the buffer is
full or when End of Message (program mode 34) is
sensed or after time out (program mode 10).

Program mode 33.

Program mode 33 is used to stop the reader. When the code set in this program mode is sensed the reader will stop. See also 3.6 above.

Program mode 34.

Program mode 34 is used for End of Message. The code set in this program mode will clear the buffer and make reading possible. If no End of Message is sensed the time out will clear the buffer. The End of Message code can include CR or LF codes. If for instance the End of Message is * (dec 42) and this is always followed by CR + LF, the End of Message codes are set as follows: *CRLF, dec 42, 13, 10.

Program mode 35.

Program mode 35 is used to write in clear text. This function means that characters sent to the punch are represented in hole pattern, which makes it possible to read the tape visually. The hole pattern is depending on the code set in program mode 5 above. For telex tape, five tracks are used and for all other tapes eight tracks are used. Clear text is used to label a telex message or an NC-program tape. The clear text is ended when End of Line is sensed. The clear text can also be ended using a code in program mode 36.

Program mode 37 and 38.

These two program modes are used only for telex code conversion in the Scandinavian countries. Program mode 37 is used to set a code conversion, which translates the national use characters into special locations in the telex code. Program mode 38 is used when international coding is used.

Program mode 39.

Program mode 39 is used to cancel a message by writing the word CANCEL in clear text at the tape. This function is used only when punching telex tapes.

5.15 Program mode 50

In program mode 50, the current program version number is displayed. In mode 60 the Default values can be restored.

5.16 Error Messages

If any mistake is made by the operator during programming, the display shows the message 'Err' (not blinking). Depressing the <*> key will clear the display and allow further program entries.

Program Mode No.	Function	Channel	Values available (Display figure shows Default Value)	
1	Baud rate	Channel 1	110 150 300 600 1200	⌷⎾600⏌⌷
2	Baud rate	Channel 2	2400 4800 9600	

3	Protocol Parity Word length Stop Bits	Channel 1	**Protocol** ───────────────┐ 1 = Buffer Ready/Busy, no echo 2 = X-ON/X-OFF, no echo 3 = Buffer Ready/Busy, echo 4 = X-ON/X-OFF, echo	⌷108 1⌷
			Parity ──────────────────┘	
			0 = No parity 1 = Odd parity 2 = Even parity	
4	Protocol Parity Word length Stop Bits	Channel 2	**Word length** ───────────────	
			7 = 7 bits 8 = 8 bits	
			Stop Bits ─────────────────	
			1 = 1 stop bit 2 = 2 stop bits	

			Punch mode ──────────────┐	
			1 = Normal 2 = Double	⌷120⌷
			Punch Parity ────────────┘	
5	Punch mode Punch parity Reader parity		0 = No Parity 1 = Odd Parity 2 = Even Parity	
			Reader Parity ───────────────	
			0 = No Parity 1 = Odd Parity 2 = Even Parity	

Program Mode No.	Function	Channel	Values available (Display figure shows Default Value)	
6	Code Conversion to Punch (from ASCII)	Channel 1	0 = Transparent punch 1 = ASCII 2 = Telex (5) USA 3 = Telex UK 4 = Telex Scandinavia 5 = Telex Germany 6 = Telex Switzerland 7 = Telex France 8 = Telex Italy	
7	Code Conversion to Punch (from ASCII)	Channel 2	9 = Telex Spain 10 = Telex Portugal 11 = Telex (8) USA (RS-358) 12 = EIA (RS-244) 112 = EIA (RS-244) to ASCII 1000 = Transparent punch without NUL-characters 2000 = Transparent punch with DC2 start and DC4 stop	`[    0]`
8	Copy Mode – Code Conversion from Reader to Punch		0 = Transparent Copy 1 to 12 and 112: As mode 6 100 = Copy Telex to Telex 102 = Telex (5) USA to ASCII 103 = Telex UK to ASCII 104 = Telex Scand. to ASCII 105 = Telex Germany to ASCII 106 = Telex Switzerland to ASCII 107 = Telex France to ASCII 108 = Telex Italy to ASCII 109 = Telex Spain to ASCII 110 = Telex Portugal to ASCII 1000 = Transparent copy without NUL-characters	`[    0]`
9	Code Conversion from Reader		0 = Transparent reading 1, 12 and 112: As mode 6 100 = Telex reading 102 to 110: As mode 8 1000 = Transparent reading without NUL-characters	`[    0]`
10	Time Out		0 to 9999 seconds	`[  60]`

Program Mode No.	Function	Channel	Values available (Display figure shows Default Value)
11	Control Code Processing		0 = Not Punched or Sent 1 = Punched or Sent Channel 1 ——————————— Channel 2 ——————————— Reader ——————————— Copy Mode ———————————

Note 1 Control codes applicable are only those defined in Program Modes 33 to 39.
Note 2 The 'Start Reader' code (mode 31) is never punched or sent.
Note 3 The 'End of Line' code (mode 32) is always punched or sent.

12	End Address for Channel 1 Buffer		256 to 9305
13	Punching speed		30/62/75 characters per second
14	Reading speed		1 = 200 characters per second 2 = 500 characters per second

Program Mode No.	Function	Dec. values available	Default value
30-1 to 30-4	Parity Error	0 to 255	0
31-1 to 31-4	Start Reader	0 to 127	0
32-1 to 32-4	End of Line	0 to 127	10 = LF
33-1 to 33-4	Stop Reader	0 to 127	0
34-1 to 34-4	End of Message	0 to 127	20 = DC4
35-1 to 35-4	Start Clear Text	0 to 127	0
36-1 to 36-4	Stop Clear Text	0 to 127	0
37-1 to 37-4	National Code Conversion	0 to 127	0
38-1 to 38-4	International Code Conversion	0 to 127	0
39-1 to 39-4	Cancel Message	0 to 127	0

Program Mode No.	Function	Channel	Values available (Display figure shows Default Value)
50	Displays program version number		

Program Mode No.	Function	Channel	Values available (Display figure shows Default Value)
60	Restore Default values		0 = Reset Buffers 1 = Restore Default values

<u>Note</u>

Program step 60 is normally not entered when the parameters are set. To enter Program step 60, enter any Program step and press <6><0> on the keyboard. Press <*> key. A 0 is now shown in the display.

To reset the buffers (to the same state as after Power Up), press <0>.
To restore the default parameters, press <1>.
To leave the parameter setting, press <Exit>.
To return to step 1, press <*>.

6 Interface connections

This section describes the external connections required to interface with the Facit N4000. Mains and I/O connectors, fuses and the mains ON/OFF switch are fitted on the rear panel as shown in fig.6.1.

6.1 Data I/O Connectors

The data I/O ports are standard 25 pins V.24/Rs-232-C serial interface connectors. The interface connector pin allocations are shown in fig.6.2. For the Facit N4000 punch both channel 1 and 2 inputs are identical and priority of one channel over the other is established by the buffer status.

For the Facit N4000 combination, data transmitted from the reader goes out via channels 1 or 2 when controlled externally. When controlled from the keyboard (Start key), data goes via channel 1.

Note

+5 V can be supplied on pin 18. Strappings W16 or W17 or both must be connected for this. See picture below.

W17   W16
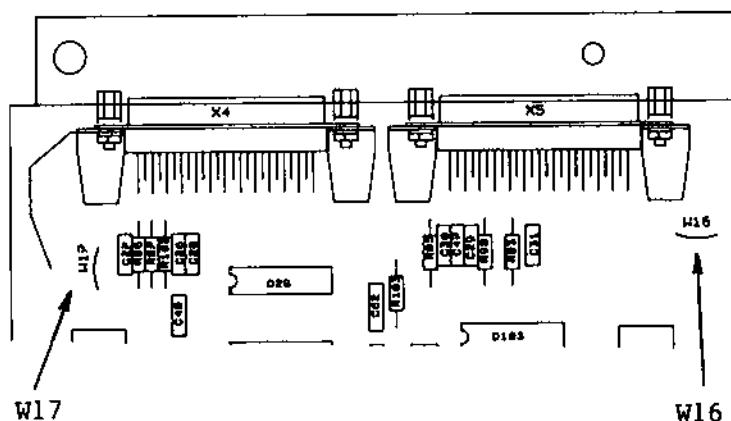
Pin 5 of the RS-232-C interface is connected to +5 V via a resistor and will thus be held High even when not connected to RTS of the host.

6.2 Current Loop Interface

The Facit 5165 current loop interface is available as an option for direct connection between N4000 I/O ports and the user equipment.
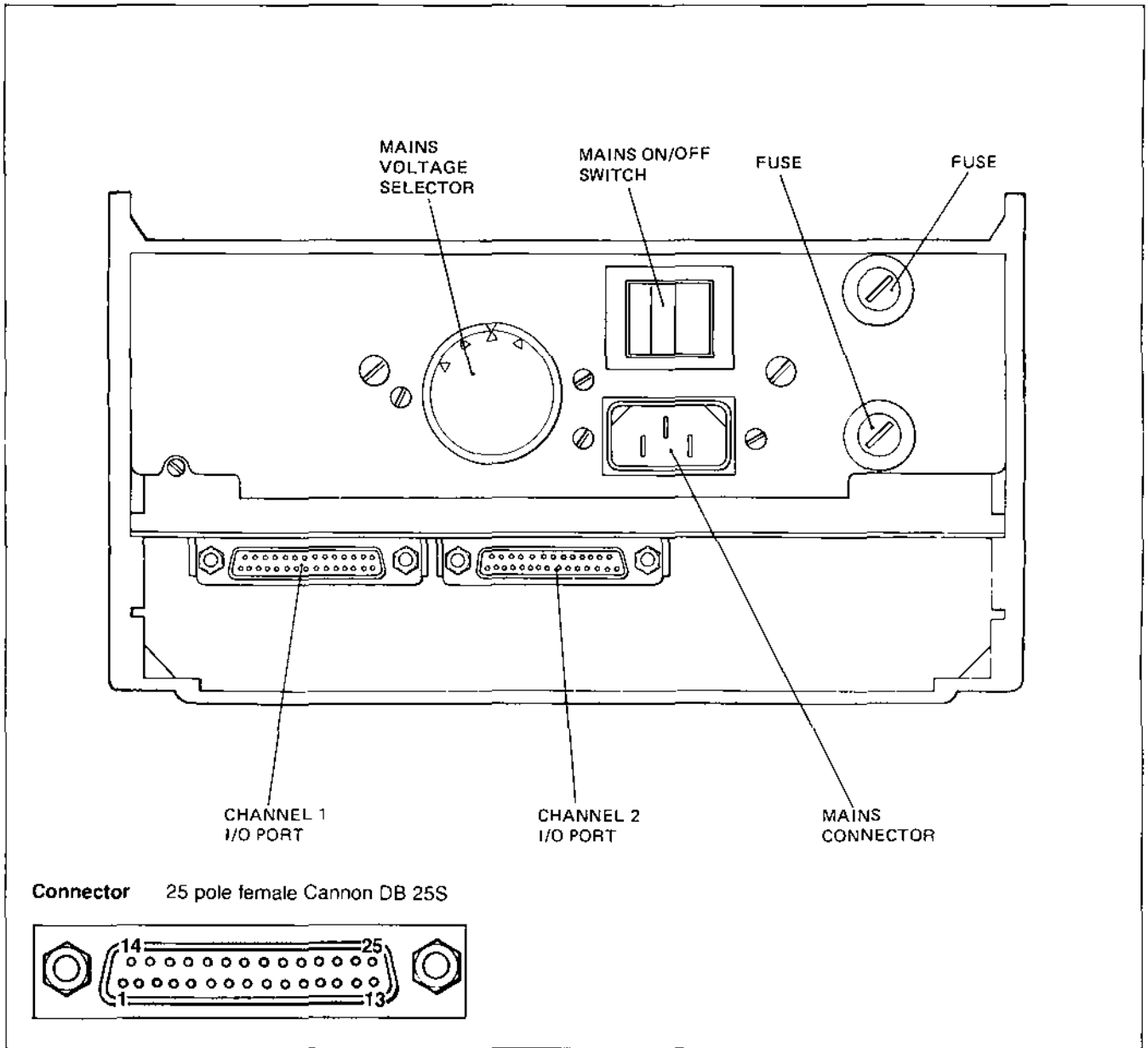
Fig. 6.1 External connections
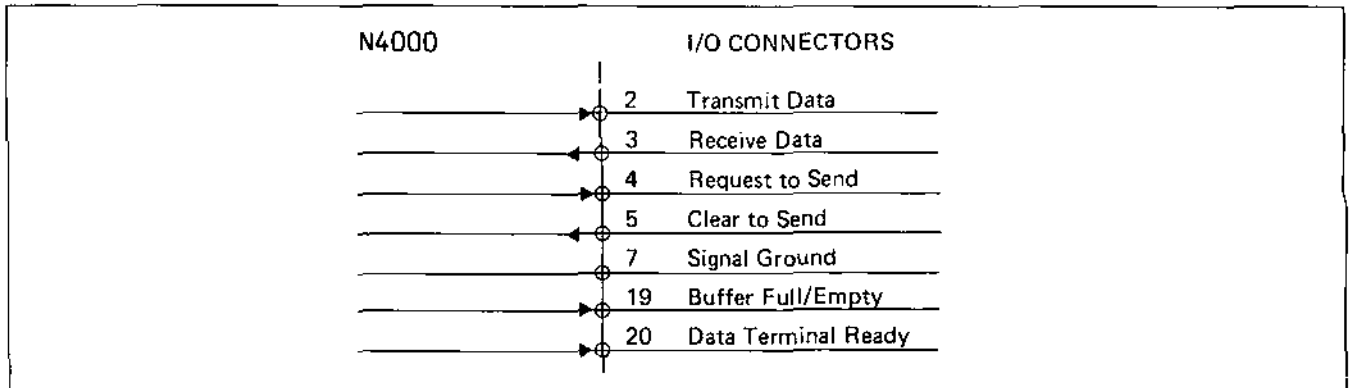
Fig. 6.2 I/O Connector Pin Allocations

7 Technical Specification

Punch

Punching speed	Operator selectable: 30, 62 or 75 characters per second
Punch hole configuration	5 or 8 track ISO standard
Tape widths	5 track 17.5 mm (11/16 in) 8 track 25.4 mm (1 in)
Tape thickness	0.08 - 0.11 mm
Type of tape	ISO standard paper tape
Tape reel hub	Accomodates 50.8 - 52.4 mm (2 in) reel cores
Outside diameter of tape reel	Max. 203 mm (8 in)
Reel capacity	Approximately 300 m (approx. 120,000 characters)
Feed accuracy	Complies with ISO standards: Adjacent rows 3%, 10 rows 1%, 50 rows 0.5 %
Noise level	Idling — None 8 track 30 cps — 58.9 dB(A) 8 track 62 cps — 61.6 dB(A) 8 track 75 cps — 62.3 dB(A)

Reader

Reading speed	Operator selectable: 200/500 characters per second
Reading method	Optical
Tape feed	Stepping motor and sprocket wheel
Tape widths	5, 6/7 and 8 track
Inter-character spacing	To ISO standards
Tape thickness	Maximum 0.25 mm incl. splice

Tape material	Any tape with a transmissivity of up to 60%
Manual tape feed	Bidirectional controlled from keyboard

General

Interface	RS-232-C (V.24)
Buffer	9 KByte
Code conversions	ASCII to 5 track telex National and International versions ASCII to RS-244 (EIA) and RS-358B (8 track version only)
Operator keyboard	12 key keyboard used for operator control and programming control
Operator display	4 digit display showing operating status and program status
AC mains voltage	Switchable for 100/115/220/240V +15% -10%
Power consumption	150W maximum
Dimensions and weight	Height 200 mm Width 220 mm Depth 520 mm (without reader) 575 mm (with reader)

APPENDIX 1
CODE CONVERSION CHART (GENERAL)
ASCII TO 5 TRACK TELEX

| ASCII | | TELEX | | | | TYPE OF CHARACTER |
| | | LS | | FS | | |
CHAR	HEX	CHAR	HEX	CHAR	HEX	
NUL	00	Blank	00			
SOH	01					Control (see note 1)
STX	02					Control
ETX	03					Control
EOT	04					Control
ENQ	05				12	
ACK	06					Control
BEL	07			Bell	1A	
BS	08					Control
HT	09					Control
LF	0A	LF	08			
VT	0B					Control
FF	0C					Control
CR	0D	CR	02			
SO	0E					Control
SI	0F					Control
DLE	10					Control
DC1	11					Control
DC2	12					Control
DC3	13					Control
DC4	14					Control
NAK	15					Control
SYN	16					Control
ETB	17					Control
CAN	18					Control
EM	19					Control
SUB	1A					Control
ESC	1B					Control
FS	1C					Control
GS	1D					Control
RS	1E					Control
US	1F					Control
SP	20	SP	04			
!	21			•	17	
"	22			"	14, 14	Expanded (see note 2)
#	23					National (see note 3)
$	24	DLR	12, 09, 0A			Expanded
%	25					National
&	26	AND	18, 06, 12			Expanded
'	27			'	14	
(	28			(	1E	
)	29			)	09	
*	2A					Control
+	2B			+	11	
,	2C			,	06	

APPENDIX 1
CODE CONVERSION CHART (GENERAL)
ASCII TO 5 TRACK TELEX

| ASCII | | TELEX | | | | TYPE OF CHARACTER |
| | | LS | | FS | | |
CHAR	HEX	CHAR	HEX	CHAR	HEX	
-	2D			-	18	
.	2E			.	07	
/	2F			/	17	
0	30			0	0D	
1	31			1	1D	
2	32			2	19	
3	33			3	10	
4	34			4	0A	
5	35			5	01	
6	36			6	15	
7	37			7	1C	
8	38			8	0C	
9	39			9	03	
:	3A			:	0E	
;	3B					Control
<	3C					Control
=	3D			=	0F	
>	3E					Control
?	3F			?	13	
@	40					National
A	41	A	18			
B	42	B	13			
C	43	C	0E			
D	44	D	12			
E	45	E	10			
F	46	F	16			
G	47	G	0B			
H	48	H	05			
I	49	I	0C			
J	4A	J	1A			
K	4B	K	1E			
L	4C	L	09			
M	4D	M	07			
N	4E	N	06			
O	4F	O	03			
P	50	P	0D			
Q	51	Q	1D			
R	52	R	0A			
S	53	S	14			
T	54	T	01			
U	55	U	1C			
V	56	V	0F			
W	57	W	19			
X	58	X	17			
Y	59	Y	15			

APPENDIX 1
CODE CONVERSION CHART (GENERAL)
ASCII TO 5 TRACK TELEX

| ASCII | | TELEX | | | | TYPE OF CHARACTER |
| | | LS | | FS | | |
CHAR	HEX	CHAR	HEX	CHAR	HEX	
Z	5A	Z	11			
{	5B					National
\	5C					National
]	5D					National
^	5E					Control
_	5F					Control
`	60					Control
a	61	A	18			
b	62	B	13			
c	63	C	0E			
d	64	D	12			
e	65	E	10			
f	66	F	16			
g	67	G	0B			
h	68	H	05			
i	69	I	0C			
j	6A	J	1A			
k	6B	K	1E			
l	6C	L·	09			
m	6D	M	07			
n	6E	N	06			
o	6F	O	03			
p	70	P	0D			
q	71	Q	1D			
r	72	R	0A			
s	73	S	14			
t	74	T	01			
u	75	U	1C			
v	76	V	0F			
w	77	W	19			
x	78	X	17			
y	79	Y	15			
z	7A	Z	11			
{	7B					National
		7C					National
}	7D					National
~	7E					National
DEL	7F	LS	1F			

Note 1   These (control) characters in all languages are only acted upon if defined in the program mode as control characters (see section 5).

Note 2   These symbols are always expanded to the characters shown, in all languages.

Note 3   These characters are converted in accordance with the National or International code variation depending upon the appropriate control character present in the data stream (see section 6.2). The specific conversions are given in Appendix 2.

APPENDIX 2
CODE CONVERSION CHART (NATIONAL AND INTERNATIONAL)
ASCII TO 5 TRACK TELEX

ASCII		US		UK		SW, DK, N		GERMANY		SWITZ.		FRANCE		ITALY		SPAIN		PORTUGAL	
CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX
#	23	NR	(LS) 06 0A	*£ PND	(FS) 05 (LS) 0D 06 12	PND	(LS) 0D 06 12	CONTROL CHAR ONLY		CONTROL CHAR ONLY		PND	(LS) 0D 06 12	PND	(LS) 0D 06 12	PND	(LS) 0D 06 12	CONTROL CHAR ONLY	
@	40	A	(LS) 18	*@ A	(FS) 0B (LS) 18	PARA	(LS) 0D 18 0A 18	PARA	(LS) 0D 18 0A 18	PARA	(LS) 0D 18 0A 18		(FS) 14		(FS) 14	PARA	(LS) 0D 18 0A 18	CONTROL CHAR ONLY	
[	5B	CONTROL CHAR ONLY		CONTROL CHAR ONLY		*Ä AE	(FS) 08 (LS) 18 10	AE	(LS) 18 10	AE	(LS) 18 10	CONTROL CHAR ONLY		CONTROL CHAR ONLY			(FS) 14	CONTROL CHAR ONLY	
\	5C	CONTROL CHAR ONLY		C	(LS) 0E	*Ö OE	(FS) 05 (LS) 03 10	OE	(LS) 03 10	OE	(LS) 03 10	C	(LS) 0E	C	(LS) 0E	*Ñ N	(FS) 05 (LS) 06	CONTROL CHAR ONLY	
]	5D	CONTROL CHAR ONLY		CONTROL CHAR ONLY		*Å AA	(FS) 16 (LS) 18 18	UE	(LS) 1C 10	UE	(LS) 1C 10	A	(LS) 18	A	(LS) 18	?	(FS) 13	*Ã A	(FS) 16 (LS) 18
%	25	PCT	(LS) 0D 0E 01	*% PCT	(FS) 16 (LS) 0D 0E 01	PCT	(LS) 0D 0E 01	0/0	(FS) 0D 17 0D	PCT	(LS) 0D 0E 01	PCT	(LS) 0D 0E 01	PCT	(LS) 0D 0E 01	PCT	(LS) 0D 0E 01	PCT	(LS) 0D 0E 01
—	5E	CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY	
{	7B	CONTROL CHAR ONLY		E	(LS) 10	*Ä AE	(FS) 0B (LS) 18 10	AE	(LS) 18 10	AE	(LS) 18 10	E	(LS) 10	E	(LS) 10	CONTROL CHAR ONLY		CONTROL CHAR ONLY	
|	7C	CONTROL CHAR ONLY		CONTROL CHAR ONLY		*Ö OE	(FS) 05 (LS) 03 10	OE	(LS) 03 10	OE	(LS) 03 10	U	(LS) 1C	U	(LS) 1C	*Ñ N	(FS) 05 (LS) 06	CONTROL CHAR ONLY	
}	7D	CONTROL CHAR ONLY		PARA	(LS) 0D 18 0A 18	*Å AA	(FS) 16 (LS) 18 18	UE	(LS) 1C 10	UE	(LS) 1C 10	E	(LS) 10	E	(LS) 10	C	(LS) 0E	Ã A	(FS) 16 (LS) 18
^	7E	CONTROL CHAR ONLY		CONTROL CHAR ONLY		UE	(LS) 1C 10	SS	(LS) 14 14	SS	(LS) 14 14	CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY		CONTROL CHAR ONLY	

* means National Code conversion. All others are International Code conversions.

(FS) means Figure Shift

(LS) means Letter Shift

APPENDIX 3
CODE CONVERSION CHART (US)
ASCII TO EIA (RS244)

ASCII		EIA	
CHAR	HEX	CHAR	HEX
NUL	00		
SOH	01	Control char only	
STX	02	(see note 1)	
ETX	03		
EOT	04		
ENQ	05		
ACK	06		
BEL	07		
BS	08	BS	2A
HT	09	TAB	3E
LF	0A	CR (EOB)	80
VT	0B		
FF	0C		
CR	0D		
SO	0E		
SI	0F		
DLE	10		
DC1	11		
DC2	12		
DC3	13		
DC4	14		
NAK	15	Control char only	
SYN	16		
ETB	17		
CAN	18		
EM	19		
SUB	1A		
ESC	1B		
FS	1C		
GS	1D		
RS	1E		
US	1F		
SP	20	Space	10
!	21		
"	22	Control char only	
#	23		
$	24		
%	25	%	0B
&	26	&	0E
'	27	Control char only	
(	28	(	1A
)	29	)	4A
*	2A	Control char only	
+	2B	+	70
,	2C	,	3B
—	2D	—	40
.	2E	.	6B
/	2F	/	31

ASCII		EIA	
CHAR	HEX	CHAR	HEX
0	30	0	20
1	31	1	01
2	32	2	02
3	33	3	13
4	34	4	04
5	35	5	15
6	36	6	16
7	37	7	07
8	38	8	08
9	39	9	19
:	3A	O (Letter)	46
;	3B		
<	3C	Control char only	
=	3D		
≥	3E		
?	3F		
@	40		
A	41	A	61
B	42	B	62
C	43	C	73
D	44	D	64
E	45	E	75
F	46	F	76
G	47	G	67
H	48	H	68
I	49	I	79
J	4A	J	51
K	4B	K	52
L	4C	L	43
M	4D	M	54
N	4E	N	45
O	4F	O	46
P	50	P	57
Q	51	Q	58
R	52	R	49
S	53	S	32
T	54	T	23
U	55	U	34
V	56	V	25
W	57	W	26
X	58	X	37
Y	59	Y	38
Z	5A	Z	29
[	5B		
\	5C		
]	5D	Control char only	
^	5E		
_	5F		

APPENDIX 3
CODE CONVERSION CHART (US)
ASCII TO EIA (RS244)

ASCII		EIA		ASCII		EIA	
CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX
`	60	Control char only		p	70	P	57
a	61	A	31	q	71	Q	58
b	62	B	62	r	72	R	49
c	63	C	73	s	73	S	32
d	64	D	64	t	74	T	23
e	65	E	75	u	75	U	34
f	66	F	76	v	76	V	25
g	67	G	67	w	77	W	26
h	68	H	68	x	78	X	37
i	69	I	79	y	79	Y	38
j	6A	J	51	z	7A	Z	29
k	6B	K	52	{	7B		
l	6C	L	43	|	7C	Control char only	
m	6D	M	54	}	7D		
n	6E	N	45	~	7E		
o	6F	O	46	DEL	7F	DEL	7F

Note 1   These (control) characters are only acted upon if they are defined in program mode as control characters (see section 5).

Note 2   Odd parity is always included in EIA code.

APPENDIX 4
CODE CONVERSION CHART (US)
ASCII TO 8 TRACK TELEX (RS358)

ASCII		RS-358-B		ASCII		RS-258-B	
CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX
NUL	00	Blank	00	0	30	0	30
SOH	01	SOH	01	1	31	1	31
STX	02	STX	02	2	32	2	32
ETX	03	STX	03	3	33	3	33
EOT	04	EOT	04	4	34	4	34
ENQ	05	ENQ	05	5	35	5	35
ACK	06	ACK	06	6	36	6	36
BEL	07	BEL	07	7	37	7	37
BS	08	BS	08	8	38	8	38
HT	09	HT	09	9	39	9	39
LF	0A	LF (NL)	0A	:	3A	:	3A
VT	0B	VT	0B	;	3B		
FF	0C	FF	0C	\	3C		
CR	0D	CR	0D	=	3D		
SO	0E	SO	0E	>	3E	Control char only	
SI	0F	SI	0F	?	3F		
DLE	10	DLE	10	@	40		
DC1	11	DC1	11	A	41	A	41
DC2	12	DC2	12	B	42	B	42
DC3	13	DC3	13	C	43	C	43
DC4	14	DC4	14	D	44	D	44
NAK	15	NAK	15	E	45	E	45
SYN	16	SYN	16	F	46	F	46
ETB	17	ETB	17	G	47	G	47
CAN	18	CAN	18	H	48	H	48
EM	19	EM (EUR)	19	I	49	I	49
SUB	1A	SUB	1A	J	4A	J	4A
ESC	1B	ESC	1B	K	4B	K	4B
FS	1C	FS	1C	L	4C	L	4C
GS	1D	GS	1D	M	4D	M	4D
RS	1E	RS	1E	N	4E	N	4E
US	1F	US	1F	O	4F	O	4F
SP	20	SP	20	P	50	P	50
!	21	Control char only		Q	51	Q	51
"	22	"	27, 27	R	52	R	52
#	23	Control char only		S	53	S	53
$	24	DLR		T	54	T	54
%	25	%	25	U	55	U	55
&	26	AND		V	56	V	56
'	27	'	27	W	57	W	57
(	28	(	28	X	58	X	58
)	29	)	29	Y	59	Y	59
*	2A	Control char only		Z	5A	Z	5A
+	2B	+	2B	[	5B		
,	2C	,	2C	\	5C		
—	2D	—	2D	]	5D	Control char only	
.	2E	.	2E	\	5E		
/	2F	/	2F	_	5F		

APPENDIX 4
CODE CONVERSION CHART (US)
ASCII TO 8 TRACK TELEX (RS358)

ASCII		RS-358-B	
CHAR	HEX	CHAR	HEX
	60	Control char only	
a	61	A	41
b	62	B	42
c	63	C	43
d	64	D	44
e	65	E	45
f	66	F	46
g	67	G	47
h	68	H	48
i	69	I	49
j	6A	J	4A
k	6B	K	4B
l	6C	L	4C
m	6D	M	4D
n	6E	N	4E
o	6F	O	4F

ASCII		RS-358-B	
CHAR	HEX	CHAR	HEX
p	70	P	50
q	71	Q	51
r	72	R	52
s	73	S	73
t	74	T	54
u	75	U	55
v	76	V	56
w	77	W	57
x	78	X	58
y	79	Y	59
z	7A	Z	5A
{	7B	Control char only	
		7C		
}	7D		
~	7E		
DEL	7F	DEL	7F

Appendix 5

Code Conversion

This section describes the code conversion which
is performed on incoming data to convert it to the
required format. The format is selected in Program
mode 5, and details of individual character
conversions are given in the Appendixes 1 to 4.
Conversions of control characters depend upon the
control codes selected in Program modes 30 to 39.

ASCII to ASCII

This conversion is performed directly and without
any special formatting.

All characters, except defined control codes, are
punched (or transmitted, if read by the reader).
Control codes initiate their respective functions
and are punched or sent, if this is selected by
Program mode 11.

Codes for National and International conversions
and for Start and Stop Cleartext, do not initiate
any function during conversion.

If parity is included within the incoming data, it
is transferred to bit 8 (if selected by Program
mode 3/4); in this way codes other than ASCII can
be transferred.

ASCII to Telex (5 track)

ASCII characters are converted to 5 track Telex
characters in accordance with Appendix 1 and 2,
depending upon the National version set in Program
mode 6/7. Whenever the code for International
Conversion is detected, further characters are
converted to their international versions.
Changing from national to international and back
can occur whenever required in the same message.
Formatting and code expansion of the telex message
is performed in accordance with the procedures
detailed in Appendix 6.

ASCII to Telex (USA 8 track - RS358)

ASCII characters are converted to 8 track Telex
characters in accordance with Appendix 4. National
and International versions are not available in 8
track telex, and any conversion control codes
present in the incoming message are ignored. The
code characters are however converted in
accordance with Appendix 4.
Clear text punching occurs in the manner as
described in Appendix 6, except that an 8 track
matrix is used for the clear (readable)
characters.

Formatting and code expansion are performed
generally as described in Appendix 6, except that
the maximum telex line length is 72 characters
instead of 69.

ASCII to EIA (RS244)

ASCII characters are converted to 8 track EIA
characters in accordance with Appendix 3. The 5th
track bit is always added to give odd parity, and
is always punched irrespective of the punch parity
setting in Program mode 5.

EIA (RS244) to ASCII

Eight track EIA characters are converted to ASCII
characters in accordance with Appendix 3. In the
EIA code, character CR (EOB) is defined as the End
of Line control code.

Appendix 6

Telex Tape Formatting

This section describes the processing which is
performed on incoming data to convert it to 5
track telex format. The telex format is determined
by the code conversion selected in Program mode
6/7 (see section 5). All other facilties available
for the preparation of telex tapes are also
described.

Clear Text Punching

This facility allows a message to the telex
operator to be punched, in a directly readable
form, at the start of the telex tape. This Clear
Text facility is entered and exited by control
codes selected in Program modes 35 and 36.

The table below explains the transmission sequence
for control codes and data for start/stop of
cleartext and start/stop of telex message, and
describes the action taken by the punch at each
step.

Data In	Punch Action	See note
Code (Start Clear Text)	50 x Feed Forward (FF)	(1)
Data (Message to operator)	Punch Clear Text	(2)
Code (End Clear Text)	50 x FF 10 x LS 2 x CR = New Line 1 x LF	(3)
Data (Telex Message)	Punch Telex	
Code (End of Telex)	2 x CR = New Line 1 x LF 50 x FF	

Notes:

1.

The Start Clear Text code must always precede the
cleartext message. If it arrives within the
message, it is ignored. Other control codes may
precede the Start Clear Text code and will be
acted upon.

If several messages including clear text are sent in sequence it is important, that no data characters are transmitted between the End of Message Code and the code for Clear Text of the following message. If for instance the last line of a preceding message ends with End of Message code and a following End of Line, the End of Line can be included in the End of Message Code.

Example:

End of Message = * (42)

The last line is however transmitted as * + CR. In this case the End of Message is set as * (42) + CR (13) in Program mode 17. The following character, which can be function code for Clear Text of the next message, will then work properly.

2.

Only ASCII coded letters A to Z (upper and lower case) including Space, and numbers 0 to 9 are accepted as cleartext characters. Other characters (except control codes) are ignored. If no cleartext is received, the punch assumes the Stop Clear Text code has been received, (see note 3).

3.

The Stop Clear Text code ceases cleartext punching, and enables telex punching in accordance with the appropriate code conversion chart. In addition to the code for Stop Clear Text an End of Line will act as Stop Clear Text. If End of Line is used the code for Stop Clear Text (19) can be set to Zero.

End of Message Code

The control code for End of Message terminates the message, and the remaining contents of the associated buffer are punched out.

If the End of Message control code is not received, a Time Out function is initiated to re-enable normal operation of the unit.

Time Out Function

The Time Out function allows the unit to 'wait' for a time period set in Program mode 10. After this period has elapsed, the message is terminated. The punch is then re-enabled as described in previous section.

Line Length Adjustment

Each line of telex has a maximum of 69 characters.
If the incoming data has line lengths in excess of
this, an automatic program divides any such lines
into two.

This line adjustment is done after the conversion
to telex code. If the conversion results in a line
longer than 69 characters, an automatic End of
Line is generated. If, however, the first
characters after the 69:th character is an End of
Line (CR or LF or CR + LF) no End of Line is
generated.

Note

Because some incoming ASCII-characters are
expanded when converted to telex code, there is
always a risk that an incoming line of 69
characters can be longer and thus divided into two
lines.

Code Expansion

Some character symbols exist only in particular
national versions and are expanded to letters in
other national versions. Examples of these symbols
are $ (expanded to DLR) and & (expanded to AND).
This process results in an increase in overall
line length, and where included within a tabulated
area, the tabulation may be altered.

To correct this, the number of spaces later in the
message is reduced in proportion, where possible,
as described in the next section.

Reduction of Spaces

In tabulated data, there are normally two or more
spaces between the blocks of characters. The
program calculates this number of spaces.

If the total excedes 62, the code 2 x CR + LF is
added to generate a new line.

If the total is less than 62, the immediately
preceding text is examined. Where any of this text
has been expanded, the number of spaces is reduced
by the same aumont as the extra characters
generated as a result of the expansion.

An example of this technique is shown below:

```
Received message    $1234####XYZ
Expanded            DLR1234####XYZ (2 extra chars.)
With space reduct.  DLR1234##XYZ   (2 less spaces)
```

is used to indicate space (SP).

Where the total quantity of spaces is less than,
or equal to, the number of extra characters, one
space is always kept between blocks of text to
keep them separate.

For example:
*N

```
Received message    $1234##XYZ
Expanded            DLR1234##XYZ (2 extra chars.)
With space reduct.  DLR1234XYZ   (2 less spaces)
Insert one space    DLR1234#XYZ
```

Appendix 7

Test Mode

When the <TEST> key is depressed in the Off-line mode, the unit enters the Test Mode and the display shows TEST. Depressing the <*> key then selects the first of seven test routines, (the display shows 1). Depressing the <TEST> key then starts the first test routine. If this routine is completed without failure, the display then changes to 2, and depression of the <TEST> key starts the second test routine. This procedure is continued until all seven test routines are completed.

Any test routine may be entered by depressing <*> key a number of times until the desired test routine number appears in the display. This test is then started by depressing the <TEST> key.

A fault or failure in any test routine is shown on the display.

Test Mode 1 - Memory Test

The whole buffer memory is written with a ´1´ at each address location, and is then read. The memory is then cleared with ´0´s´ at each address location, and again read.

Reading of the memory starts with the lowest address first. If any location is found to be defective, its decimal address is shown on the display and testing stops.

A faulty address < 2047 indicates that RAM 1 is faulty; if > 2047 then RAM 2 is faulty. If no fault is present, the unit enters Test Mode 2.

Test Mode 2 - Channel 1 Communication Test

This test monitors the transmission and reception of all binary codes for the full set of ASCII characters. A test plug is required, fitted to the I/O port for channel 1, to carry out this test (see *Fig. 7.1*).
The test is performed at the currently set baud rate. Each character is sent, received and checked in turn, until a faulty character is found. The display then shows the faulty character in decimal form and further testing stops. Depressing the <*> key shows the correct character, in decimal form. The test is continued by depressing the <TEST> key; and when completed, the unit enters Test Mode 3.

Test Mode 3 — Channel 2 Communication Test

This test is an exact repeat of Test Mode 2,
except that channel 2 is monitored, and that the
test plug is fitted to the I/O port for channel 2.

Test Mode 4 — Test Tape Punching

In this test, a blank tape is punched with a set
of code holes ranging from Hex 00 (Dec 00) to Hex
1F (Dec 31) (for 5 channel tapes), or Hex 00 (Dec
00) to Hex FF (Dec 255) (for 8 channel tapes),
depending upon the Reader Code Conversion selected
in Program mode 9.

The test tape always starts and finishes with 50 x
NUL. When the test tape is completed, the unit
enters Test Mode 5.

**Test Mode 5 — Test Tape Reading (Facit N4000
Combination only)**

This test enables the test tape punched in Test
Mode 4 to be read by the reader. Note that the
Reader Code Conversion (Program mode 9) must be
set to the same value used in Test Mode 2.

With the tape placed in the reader, depressing the
<TEST> key starts the reader and checks the
punched data. The reader stops when an incorrect
character is read, and the display shows that
character as its decimal value. Depressing the <*>
key will show the correct value in the display.

Testing is continued by depressing the <TEST> key,
and reading continues until the whole tape is
read. The unit then enters Test Mode 6.

Test Mode 6 — Single Track Punching

This test enables individual punch pins to be
checked separately. Depressing the <TEST> key
causes a blank tape to feed through the punch; any
one track 1 to 8 may now be punched continuously
by depressing the required number key 1 to 8. The
track being punched can be changed at any time by
depressing another number key.

Punching is stopped by depressing the <EXIT> key.

Test Mode 7 – Continuous Test Tape Punching

This test is similar to Test Mode 4 except that a
continuous test tape is punched. The tape starts
with 50 x NUL and continues with codes Hex 00 (Dec
00) to Hex 1F (Dec 31) (for 5 channel tapes) or
Hex 00 (Dec 00) to Hex FF (Dec 255) (for 8 channel
tapes). When finished, the code sequence is
immediately restarted (without the leading NUL's);
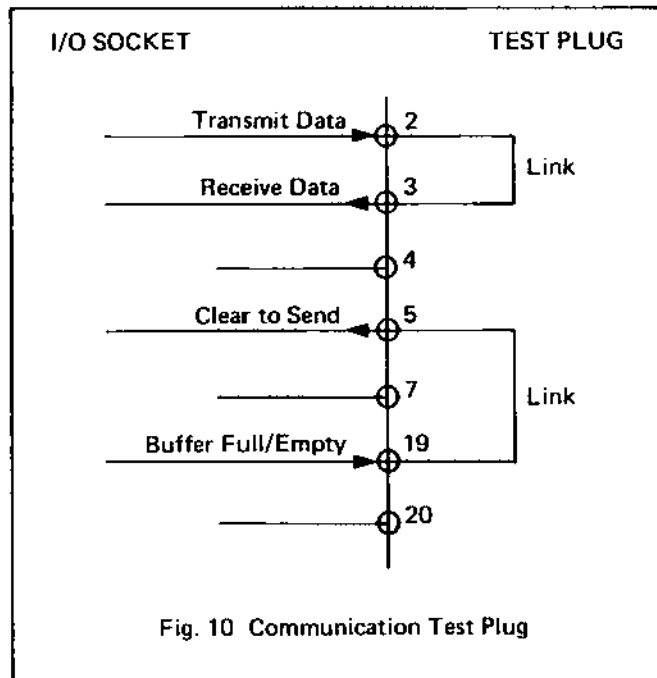this process repeats continuously until the <EXIT>
key is depressed.

Fig. 10 Communication Test Plug

Fig. 7.1 Communication Test Plug

Facit N4000
Punch/Reader-Punch

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