8-bit. 96 characters. On line transmitter
per second operation. UPPER and lower case printing.
The Creed Envoy Electronic Dataprinter. 8-bit. 96 characters. On
line transmitter-receiver. 10 characters per second operation.
The Creed Envoy Electronic Dataprinter. 8-bit. 96 characters.
On line transmitter-receiver. 10 characters per second operation
UPPER and lower case printing.

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ

envoy

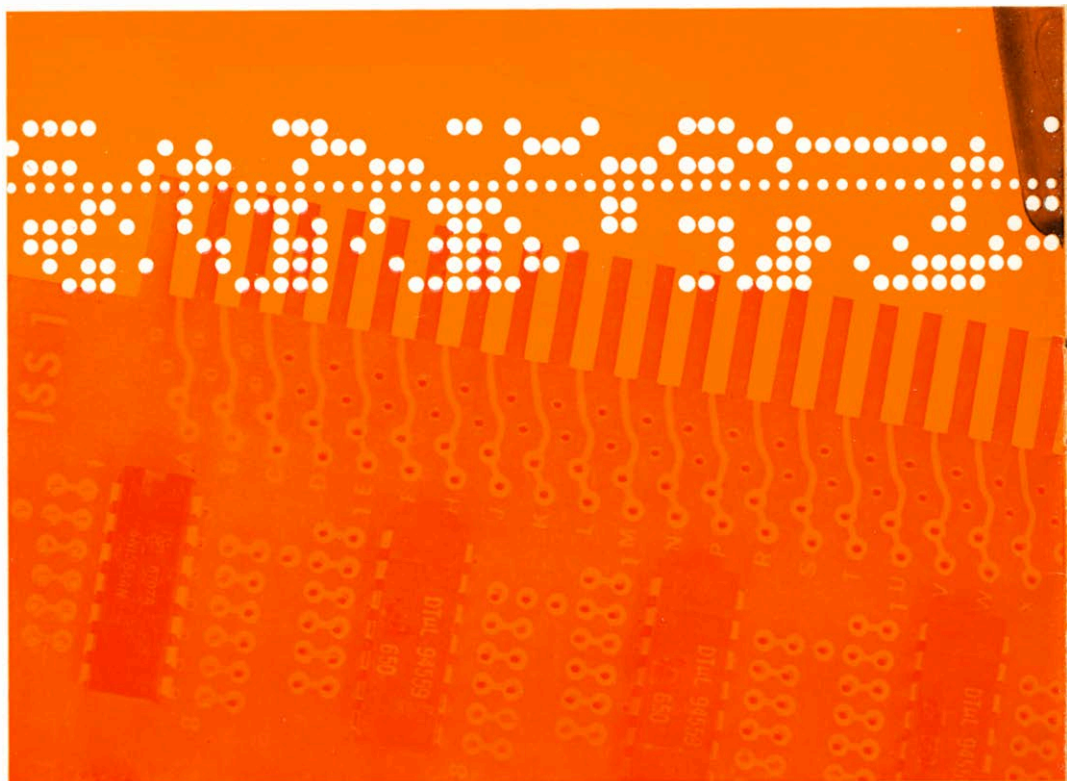## Electronic Dataprinter

creed

Introduction

The Creed Envoy Electronic Dataprinter is an 8-bit, 96 character, serial or parallel mode transmitter-receiver capable of on-line speeds of up to 10 characters per second. It can also be used for off-line tape preparation, duplication, interpretation and editing.

The intricate mechanisms so characteristic of wholly mechanical on-line printers have been replaced by high reliability integrated circuit electronic units. By eliminating mechanical units such as the clutch, selector unit and transmitter unit, reliability has been significantly increased and maintenance time reduced to a minimum. Most of the moving parts most subject to wear in purely mechanical equipment of this type have been replaced by electronics. The mechanical units which remain, handle only comparatively simple functions such as print-out and paper transport.

The Envoy can transmit and receive the full 128 combinations of the ISO 7-bit plus parity data interchange code (CCITT Alphabet No 5) and its 96-character printing repertoire includes upper and lower case letters.

The Envoy's integral tape units and all controls have been positioned for maximum operator convenience and a styled silencing cover is provided as standard.
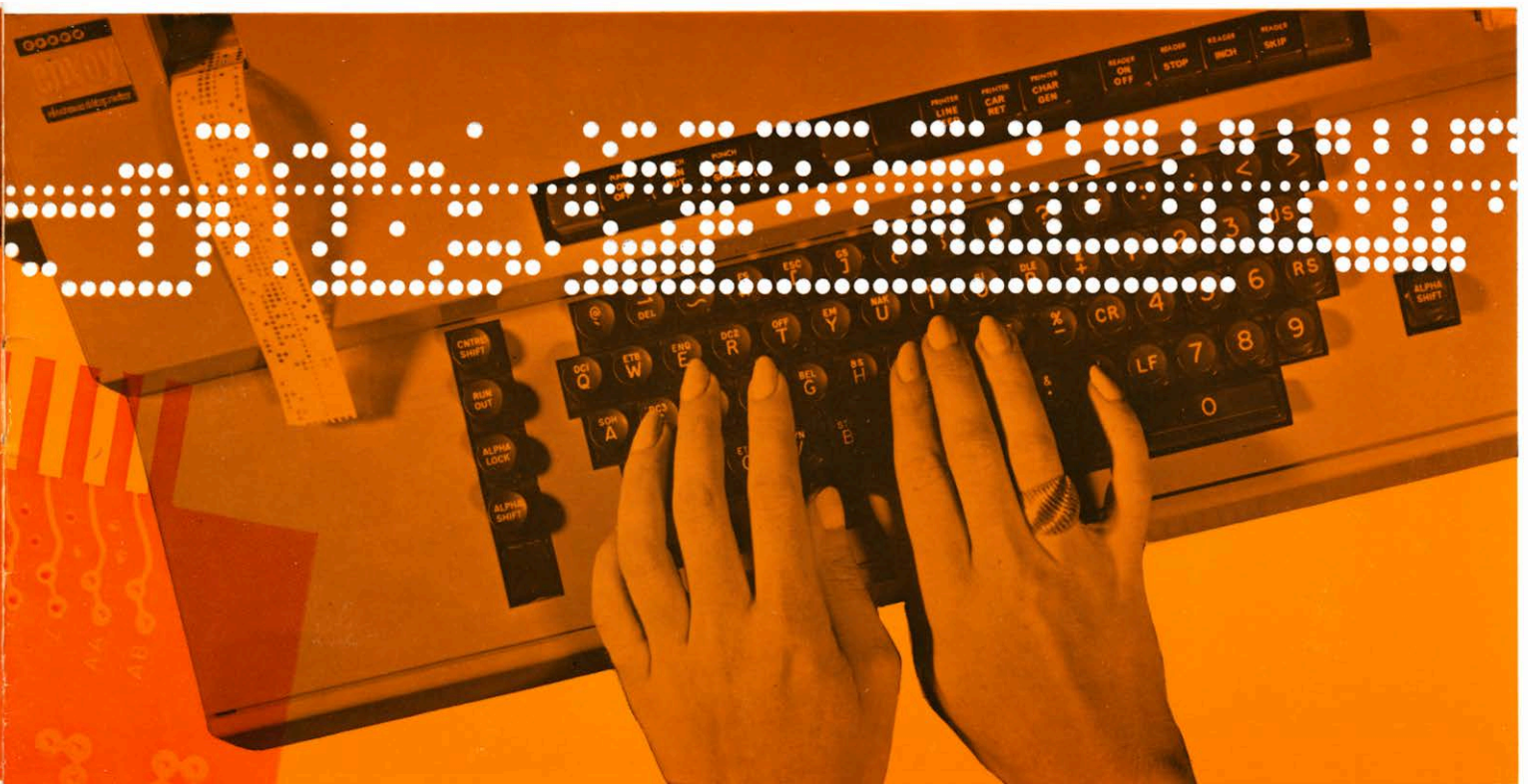
Main Features

■ Serial or parallel 8-bit code operation as on-line data transmitter-receiver. Standard version uses ISO 7-bit+parity Data Interchange Code (CCITT Alphabet No 5).

■ When operated off-line for tape preparation, duplication, interpretation or editing, the Envoy requires only a mains power supply.

■ Operating speed up to 110 bauds (10 characters per second). Intermediate speeds of 50 and 75 bauds (4·5 and 6·8 characters per second) by arrangement.

■ No clutch; mechanism designed for continuous minimum-stress operation with synchronizing revertive control pulse to electronics.

■ High reliability electronics includes Diode Transistor Logic (DTL) integrated circuit, dual-in-line packages.

■ Compatible with all data communication equipment designed to CCITT standards.

■ All standard teleprinter network arrangements possible. Separate input and output circuits for full-duplex operation.

■ Negligible transmit distortion – less than 2·5 per cent at 110 bauds.

■ Wide receive margin; not less than 47·5 per cent at 110 bauds.

■ Available as keyboard machine incorporating integral tape punch and tape reader. A version without attachments and a receiver-only with or without tape punching facility will be available.

■ Electronics perform all timing, code conversion, storage and control functions.

■ Low-level signal voltage transmission and reception meets CCITT data interface requirements. Nominal output/input (double current) 6-0-6v. Interfaces for 80+80v dc signalling available.

■ Stylish silencing cover as standard equipment. Noise level much lower than for comparable mechanical machines.

■ 4-row keyboard provides 62 separate key positions. Can generate all 128 combinations of 7-bit code.

■ 96-character print-out on 72-character line with 10 characters per inch spacing. Code control of backspace and two-colour print-out.

■ Choice of three or six lines per inch spacing. Dual purpose friction or sprocket feed.

■ 8-track tape punch incorporates own drive motor. Accepts 1 inch wide (25·4 mm) paper, parchment or plastic based tapes. Punches up to 10 characters per second. Power operated backspace.

■ 8-track tape reader accepts 1 inch punched tape. Reads up to 10 characters per second. Separate taut-tape and tape-out contacts.

■ Up to 30-code, sequential character generator with no restrictions on coding.

■ Governed motors unnecessary; asynchronous motors with 5,000 hours' maintenance intervals as standard equipment. Delayed switch-off facility available.

■ Simple 1,000 hour interval, periodic maintenance programme. Essential mechanical adjustments can be checked while units remain in position. Many adjustments can be effected while machine is running. Period-of-operation recorder fitted as standard equipment.

■ Fault liability substantially lower than for equivalent mechanical machines. Most of the wearing parts in conventional mechanical machines have been replaced by electronics.

■ Fewer mechanical spares required; plug-in electronic units built up from standard integrated circuit packages.

■ Parallel signal input/output capability using alternative plug-in circuit boards.

■ Local record derived from link between transmitter and receiver provides continuous check on transmission.

■ Character recognition for selective-call electronic switching possible with additional logic.

■ False start signals (line noise) rejected automatically.

Reliability

The use of electronics and the inherently stress-free operation of a clutchless, continuously cycling system, makes the Envoy more reliable than its 'start-stop' counterpart. In normal circumstances, operation for more than 1,000 hours can be expected without need for attention apart from ribbon and paper change. The substitution of plug-in electronics for mechanical assemblies not only reduces down-time, it also markedly reduces the time and skill necessary to carry out periodic maintenance routines.

Ease of Maintenance

Maintenance is simplified by the use of plug-in circuit boards. Once the fault is localized, a replacement plug-in circuit board or unit can be fitted within a few seconds. The mechanical unit is readily accessible and all periodic checks in the routine maintenance programme can be made without disturbing the machine's operational condition. Many adjustments can be effected while the machine is running. Unitized construction makes any task involving dismantling and re-assembly relatively straight-forward.
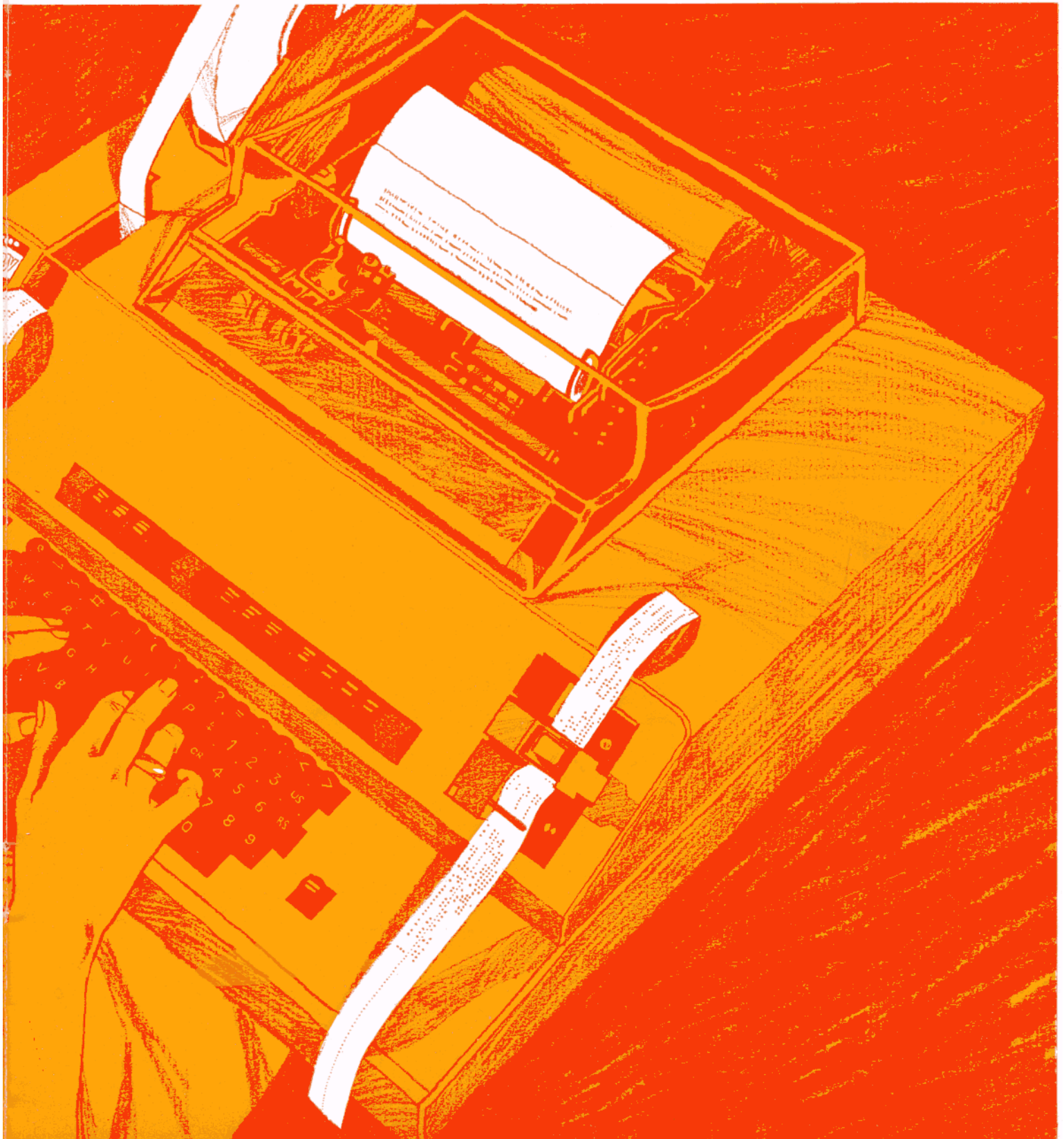
Facilities

The Envoy Dataprinter is available as a keyboard transmitter-receiver with integral tape punch and tape reader and a full range of optional additional facilities. Other versions are:
– Keyboard Transmitter-Receiver less tape punch and/or tape reader;
– Receiver-only with or without tape punch and/or tape reader.
All versions are fitted with an integral silencing cover. Styled by David Mellor, RDI, Des.RCA, this cover is effective in reducing the level of sound generated to not more than that of the average electric typewriter. Overall width of full machine (with tape units) in fitted silencing cover is 24 inches (610 mm). Its overall height less tape reel is 12 inches (305 mm), and depth 24 inches (610 mm). Weight with cover is 120lb (54·5 kg).

Electronics

Plug in electronic units perform all the timing, code conversion, storage and control functions of the equipment. These consist of multi-function printed circuit boards and a power unit. The printed boards are accommodated beneath the machine base casting. Each is designed to be interchangeable with any other board of the same type. Standard forms of dual-in-line DTL integrated circuit packages are used extensively. The number of types involved however, is limited to nine.

Revertive Control Units

These are two identical but independently operating induction generators consisting of a rotating disc carrying a permanent magnet past two stationary induction coils. One unit is associated with the page printer and turns with the printer camshaft. The other is associated with the tape punch and turns with the punch driveshaft. Each generates a continuous train of short duration impulses for conversion into rectangular pulses. These control and time the transfer of information from the receiving electronics to the clutchless printer and tape punch.
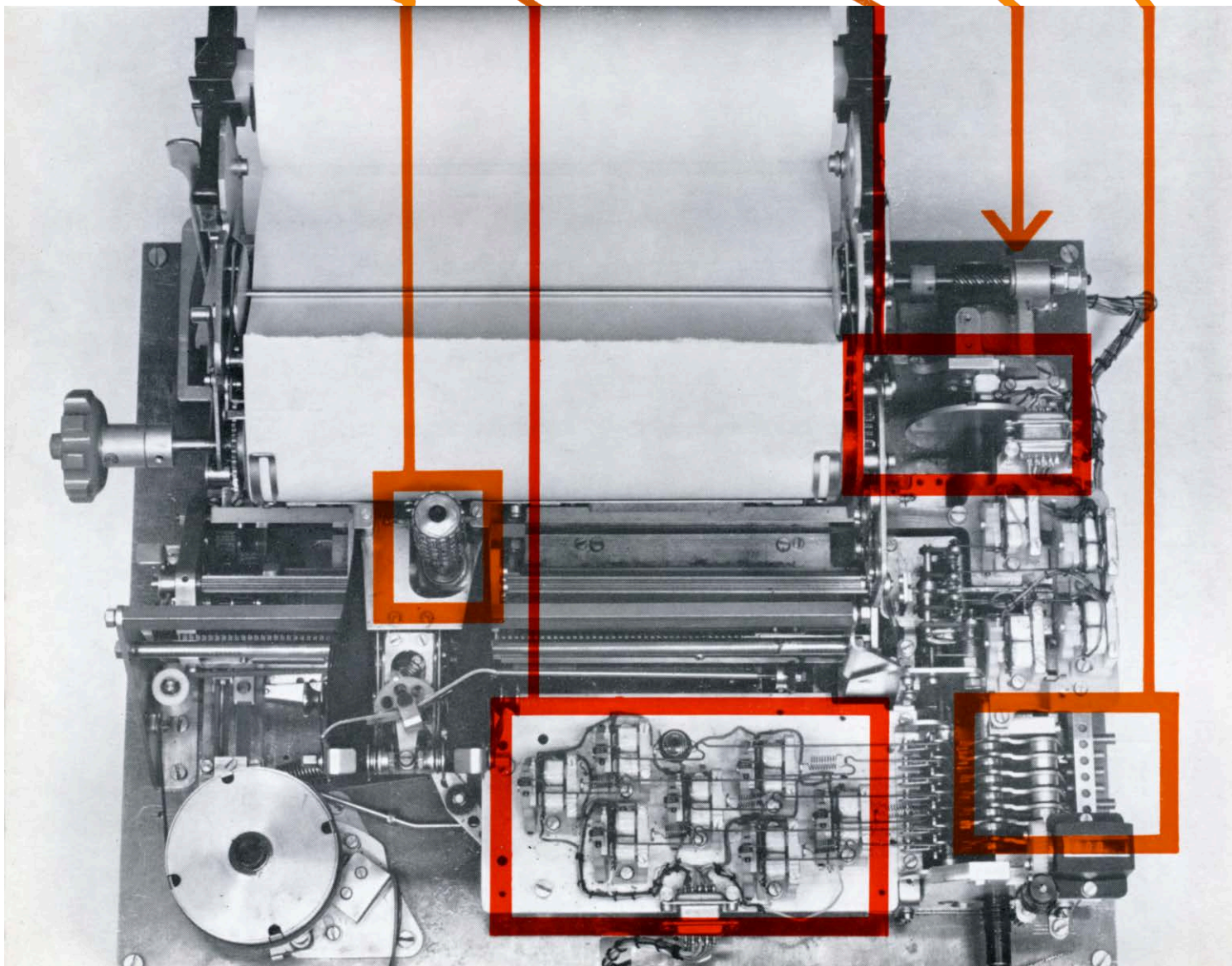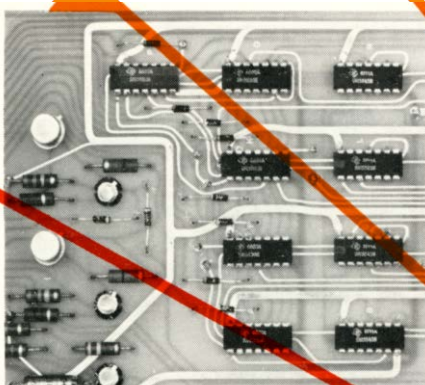
Adjustments

The mechanical adjustment of the Envoy has been very much simplified and the number of individual adjustments reduced by some two-thirds compared with equivalent mechanical equipment. Adjustments can be performed without removing any unit or component. Special steps have been taken to simplify the adjustment of typecylinder rotation and lifting and these can now be carried out while the machine is printing by means of the seven adjustment stop screws indicated.

Character Sequence Generator (Answer Back Unit)

This unit is available for use as a signal source alternative to the keyboard and tape reader. It provides storage for up to 30 coded characters and means for their generation as sequential 8-bit parallel code signals. The unit is an electronic plug-in assembly with no moving parts. It is encoded by means of a plug-in card. Split sequence operation of the unit is possible, a typical application of which is generation of head and end of message.

Keyboard

4-row motorless keyboard provides 62 separate key positions. These, operated singly, or in conjunction with either of two case shift keys, generate all 128 code combinations of the ISO 7-bit code (CCITT Alphabet No 5). An integral 8-element transducer unit converts each output combination into a low-level 7-bit parallel code signal and separate time signal. Maximum average operating speed is 10 characters per second but two-key bursts, at rates of up to 15 characters per second can be accommodated.

Tape Punch

The Envoy's tape punch incorporates its own motor and fits into the machine's cover.
It punches 8-track 1 inch (25·4 mm) wide paper, metal or plastic based tape at up to 10 characters per second. Code setting is by means of a set of electromagnets and the punches feature a concave cutting profile designed to prolong punch life and reduce operating noise. The punch, which can be used while the Envoy is on- or off-line, has local control keys for run-out and back-spacing as well as on-off switching.

Tape Reader

The tape reader is an extremely compact, electromagnetically driven unit, which reads 8-track fully punched tape at up to 10 characters per second. Code sensing is by means of a series of peckers which operate parallel output code contacts. The tape is stepped one hole pitch at a time by a feed-rake system and the code being sensed can be read visually through the open grille of the tape retention gate.
Taut-tape and tape-out alarms are fitted and controls include on-off, single-shot inching and skipping. The reader can be used on- or off-line.
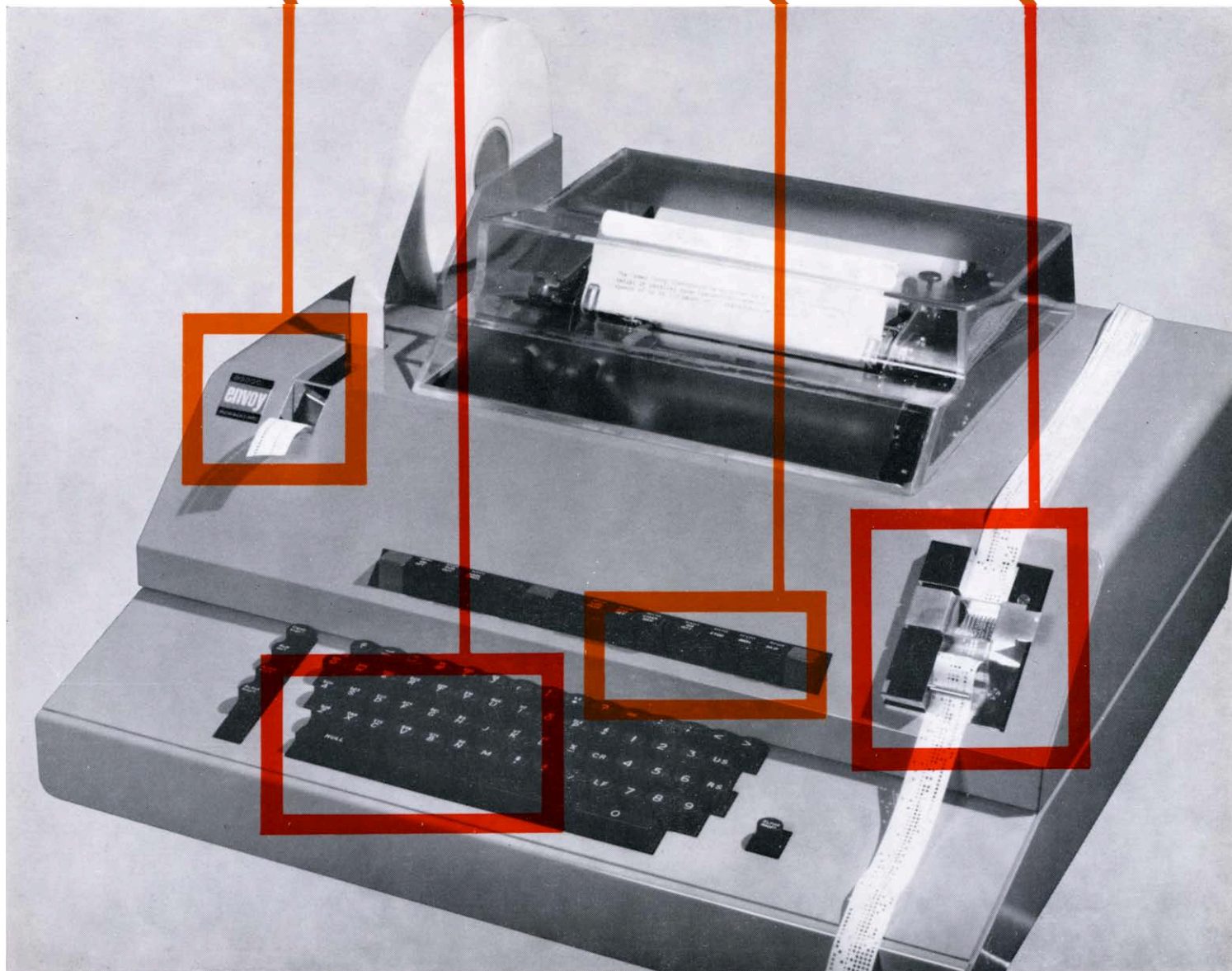
Control Keys

These are adjacent to the keyboard as a separate row of up to 17 local function control keys and/or indicator lamps. Typical controls include on-off switching, backspace, line feed and carriage return for the printer; on-off switching, run-out and backspace for the tape punch and on-off switching, tape inching and skipping for the tape reader. Typical lamps indicate on-off condition, punch tape is low and reader tape is taut or out. Three pushbuttons and four lamps are located to the right of the keyfield (not shown here, see layout on inside back cover).

Code Selection Magnets

A bank of seven electromagnets convert each 7-bit code signal output from the electronics into equivalent mechanical displacement in the printer. The pattern of displacement set up, pre-selects one of 96 character types by determining the amount of typecylinder lift and rotation during the print cycle. Each code signal is received while the magnet armatures are being held up to their pole faces. The magnets receiving 'mark' outputs then hold and those receiving 'spaces' release.

Print-Out

Characters are printed directly by separate metal types carried on the typecylinder. All 96 graphic symbols contained in the ISO 7-bit code are included in six layers of 16 types. The typecylinder selects the character to be printed by lifting and turning. It then prints by striking the fixed platen through an ink ribbon. The maximum printing rate is 10 characters per second. Printing is inhibited for the remaining 32 control codes. Any code disparity detected on the incoming line signals causes the typecylinder to print a substitute error symbol. Up to 72 characters, spaced 0·1 inches (2·54 mm) apart can be accommodated in one full line of type.
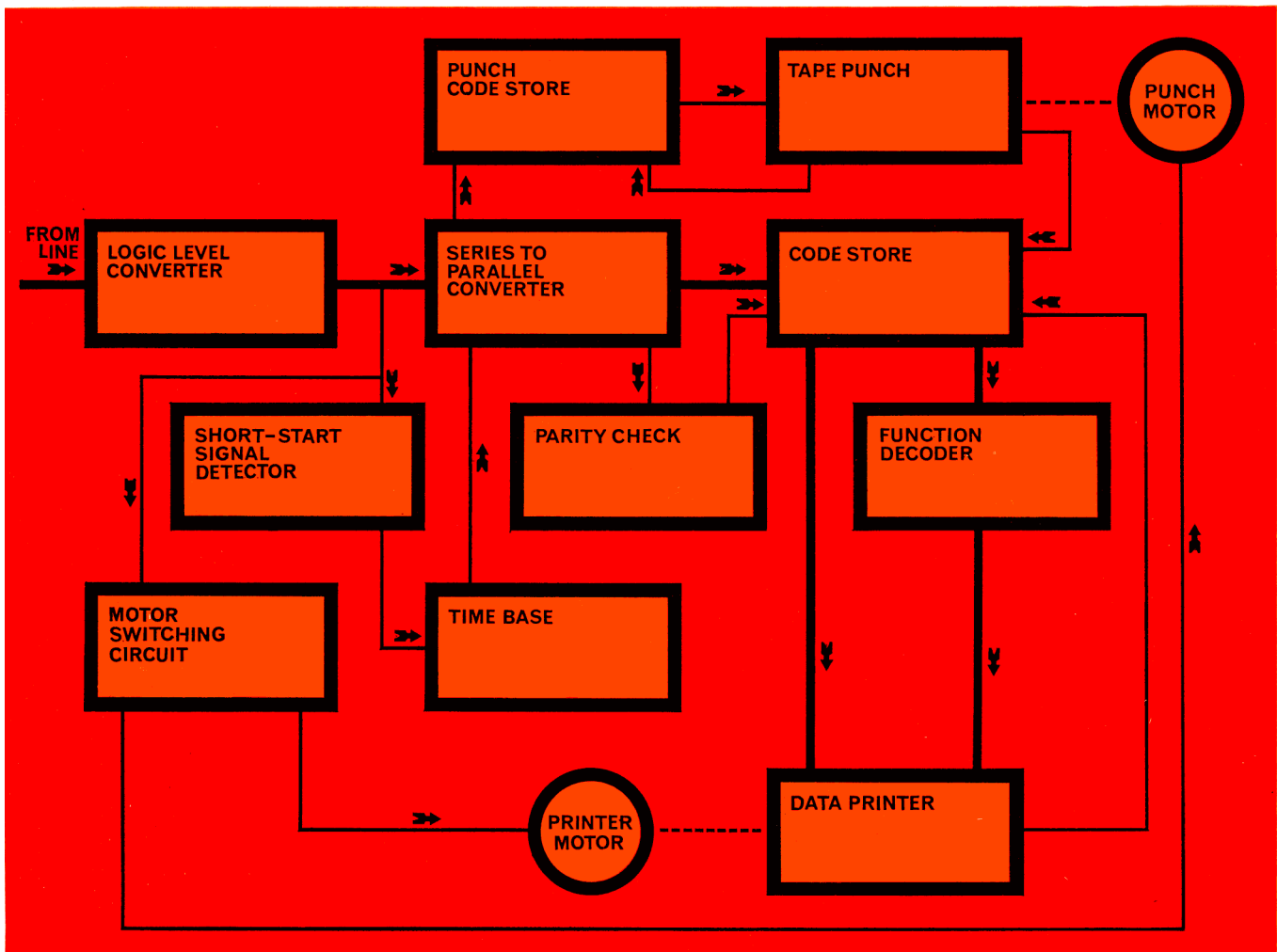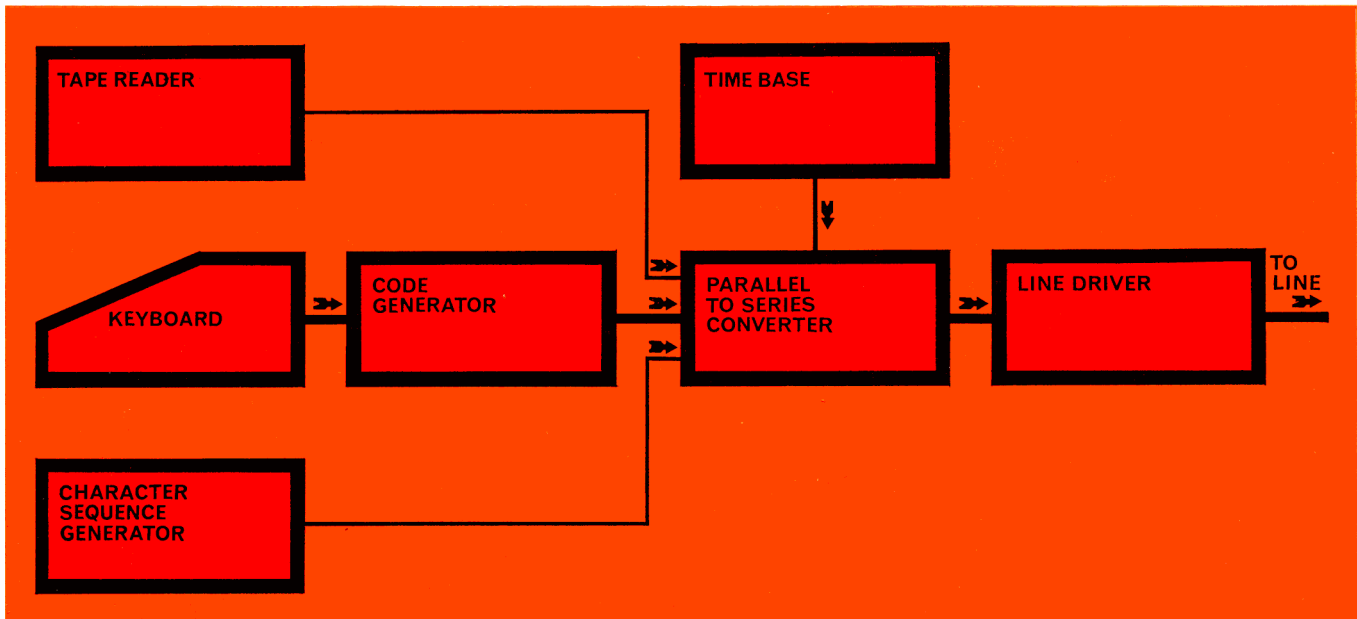
Transmission

Outgoing signals can be originated by any of the KEYBOARD, the TAPE READER and the CHARACTER SEQUENCE GENERATOR (answer back). The depression of a key on the keyboard causes the CODE GENERATOR to present the corresponding 7-bit parallel code signal to the PARALLEL-TO-SERIES CONVERTER. By operating a control shift key with the character keys or by using an alpha case shift, it is possible to generate all 128 combinations of the International Alphabet No 5. Start, stop, and parity signals are added to the code signal before the converter's contents are gated to the LINE DRIVER at the intervals dictated by the TIME BASE. The line driver converts the low-level logic signals received into double current signals suitable for transmission to line.

Because the TAPE READER and CHARACTER SEQUENCE GENERATOR produce true 7-bit parallel code signals, these enter the converter directly. They are processed thereafter as keyboard generated signals.

Reception

Incoming line signals enter the LEVEL CONVERTER where the level is modified to suit the system logic. The start element of each signal is first checked for length by the SHORT-START SIGNAL DETECTOR. If correct, the TIME BASE is switched 'on' and gates the succeeding code elements of the signal into the SERIES-TO-PARALLEL CONVERTER. Spurious signals such as those produced by line noise fail to start the timebase and therefore do not enter the converter.

The PRINTER MOTOR and PUNCH

MOTOR are started via the MOTOR SWITCHING CIRCUIT by the start element of the first line signal received after a period of rest. Both motors continue running for approximately 1·5 minutes after signals cease. They then switch off automatically.

When the last code element has been registered in the converter, its code content is transferred in parallel to the CODE STORE provided code parity is confirmed by the PARITY CHECK unit. Code transfer from the store to the DATA PRINTER takes place when this unit is ready to receive a new code instruction. Code selecting electro-magnets either hold or release to set up each received code combination. Their pattern pre-selects the character printed out during the rest of the printing cycle. Non-graphic codes in the store are recognized by the FUNCTION DECODER which controls separate electromagnets selecting the printer's non-printing functions. All parity error codes read by the check unit cause a special disparity symbol to be printed. With the TAPE PUNCH operative, each registered code transferred to the printer code store is also received by the PUNCH CODE STORE. Its passage to the punch selecting electromagnets then occurs at a suitable time in the punch rotation cycle in the manner of code transfer to the printer magnets.

ISO 7-Bit Code

The standard Envoy uses the International Standards Organisation's 7-bit code. This code was originally published by the American Standards Institution who designated it ASCII (American Standard Code for Information Interchange). After adoption by ISO the code was accepted by the CCITT (International Telegraph and Telephone Consultative Committee) with one or two minor changes, who gave it the designation International Alphabet No 5.

Control Character Designation

NUL		=	NULL (all space)
SOH	(TC1)	=	Start of Heading
STX	(TC2)	=	Start of Text
ETX	(TC3)	=	End of Text
EOT	(TC4)	=	End of Transmission
ENQ	(TC5)	=	Enquiry (WRU)
ACK	(TC6)	=	Acknowledge
BEL		=	Bell
BS	(FE0)	=	Back Space
HT	(FE1)	=	Horizontal Tabulate
LF	(FE2)	=	Line Feed
VT	(FE3)	=	Vertical Tabulate
FF	(FE4)	=	Form Feed
CR	(FE5)	=	Carriage Return
SO		=	Shift Out
SI		=	Shift In
DLE	(TC7)	=	Data Link Escape
DC1		=	Device Control 1
DC2		=	Device Control 2
DC3		=	Device Control 3
DC4		=	Device Control 4
NAK	(TC8)	=	Negative Acknowledge
SYN	(TC9)	=	Synchronous Idle
ETB	(TC10)	=	End of Transmission Block
CAN		=	Cancel
EM		=	End of Medium
SUB		=	Substitute Character
ESC		=	Escape
FS	(IS4)	=	File Separator
GS	(IS3)	=	Group Separator
RS	(IS2)	=	Record Separator
US	(IS1)	=	Unit Separator

Code chart (7654 321):

Col 1	Col 2	Col 3	Col 4
NUL	SPACE	@	`
SOH(TC1)	!	A	a
STX(TC2)	"	B	b
ETX(TC3)	£	C	c
EOT(TC4)	$	D	d
ENQ(TC5)	%	E	e
ACK(TC6)	&	F	f
BEL	'	G	g
BS(FE0)	(	H	h
HT(FE1)	)	I	i
LF(FE2)	*	J	j
VT(FE3)	+	K	k
FF(FE4)	,	L	l
CR(FE5)	-	M	m
SO	.	N	n
SI	/	O	o
DLE(TC7)	0	P	p
DC1	1	Q	q
DC2	2	R	r
DC3	3	S	s
DC4	4	T	t
NAK(TC8)	5	U	u
SYN(TC9)	6	V	v
ETB(TC10)	7	W	w
CAN	8	X	x
EM	9	Y	y
SUB	:	Z	z
ESC	;	[(N1)	{(N4)
FS(IS4)	<	\(N2)	|(N5)
GS(IS3)	=	](N3)	}(N6)
RS(IS2)	>	^	¬
US(IS1)	?	_	DEL

Technical Information

PLUG & SOCKET CONNECTIONS

Mains Plug
The machine is fitted with a 5A 3-pin mains plug.

Signal Plug
The signal plug may vary in size to suit particular requirements, but will be a Painton Multicon type and will provide the following standard connections:

Pin 1   −6v signalling supply
Pin 2   Transmitted data
Pin 3   ÷6v signalling supply
Pin 4   Dataprinter ready
Pin 5   Ready for sending
Pin 6   Data set ready
Pin 7   Signal common return
Pin 8   Data carrier detector
Pin 9   Received data
Pin 10 ON/OFF line switch
Pin 11 5v logic supply
Pin 12 0v logic supply

MAINS SUPPLY
The machine requires a fused mains supply conforming with the following parameters:
Voltage: 230-240v ac +8 per cent −10 per cent
Frequency: 50 Hz ±2 per cent (60 Hz also available)
Fuse rating: PO type 36A, anti-surge 3A
Total power consumption (motors and electronics) 100 watts

CODE
The standard machine employs the ISO 7-bit code.

SIGNALLING PARAMETERS
Character structure:
Each character is transmitted or received as a train of 11 sequential pulses which is made up as follows:

1st element - Start element, +ve potential
2nd   ,,   ⎫ (Least significant)
3rd   ,,   ⎪
4th   ,,   ⎪
5th   ,,   ⎬ 7-code elements
6th   ,,   ⎪
7th   ,,   ⎪
8th   ,,   ⎭ (Most significant)
9th   ,,   - Parity (even) element
10th ,,   ⎫ Stop elements, −ve potential
11th ,,   ⎭

Distortion
The output of the machine will not exceed a gross start-stop distortion of $\pm 2\frac{1}{2}$ per cent (that is, the transit from any one element to the next element will not depart from its nominal position in time [measured from the start transit of each character] by more than $\pm 2\frac{1}{2}$ per cent of an element period).

Margin
The machine will accept and correctly interpret signals having a maximum of $\pm 47\frac{1}{2}$ per cent gross start-stop distortion.

Speed
The nominal transmission speed of the machine is 110 bauds (10 characters per second).

Signalling Voltage
The machine transmits double current signals having a nominal value of $\pm 6v$. Signals received by the machine must exceed 3v measured at the signal plug, the input impedance being approximately 4 kilohm.

Signalling Current
The machine can supply a maximum of 10 mA for transmitted signals. Received signals will draw 2-3 mA from the line, at the nominal 6v.

Waveform
The waveform of transmitted signals will be square. Received signal waveforms should be substantially square to ensure maximum margin.

Protection
The machine is protected against an accidental short-circuit between any signal line and earth, and will withstand at least 25v received signal without damage.
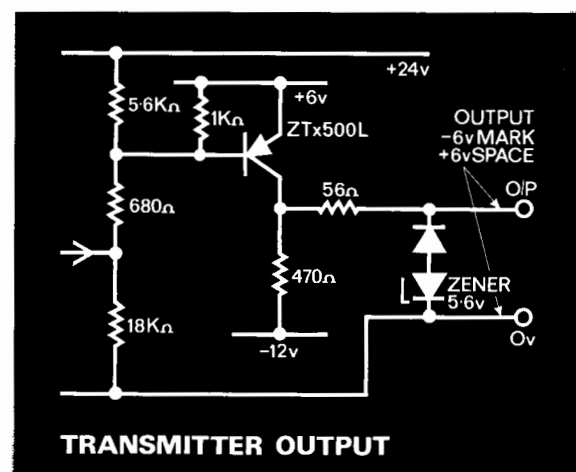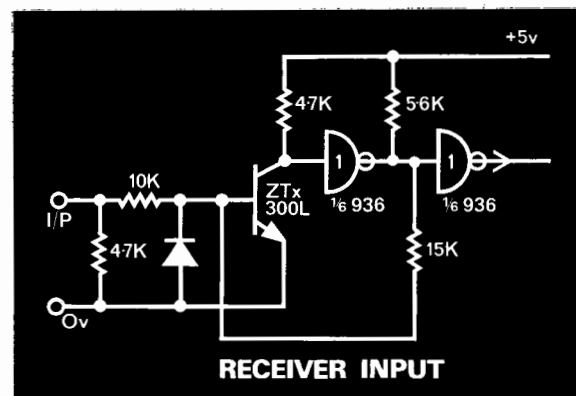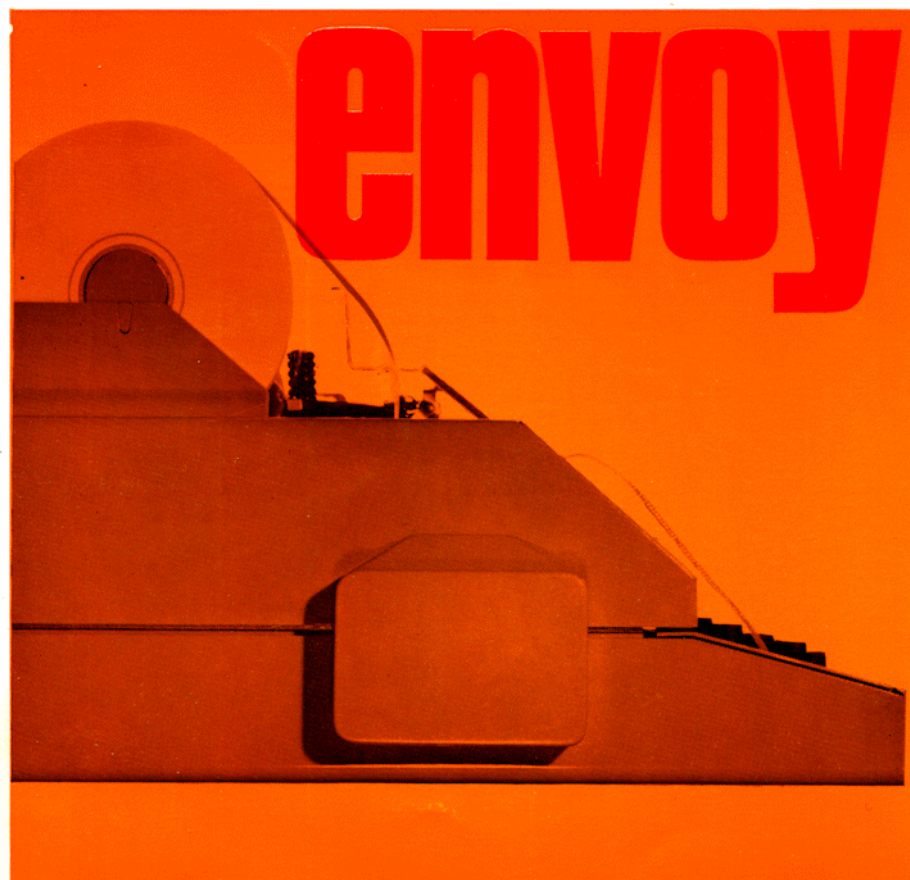
Construction
Two part construction keyboard and print unit with lift-off silencing cover. Printer consists of separate mechanical units and incorporates all receiver and transmitter electronics in the form of plug-in printed circuit boards. Rear inspection panel provides immediate access to boards without removing cover. Human safety is assured by compliance with the requirements of the BPO Protection Requirements for Telecommunication Equipment, D1921A.

Maintenance
Scheduled attention at intervals of 1,000 hours operation or one year, whichever is less. Period-of-operation recorder is fitted as standard. Machine designed to give easy access to all parts requiring maintenance. Readily divides into keyboard and printer unit – the latter into separate mechanical sub-units and plug-in electronics.
Electronics completely interchangeable without selection or adjustment.

Adjustments
Unitised open construction aids access to all parts subject to adjustment. Adjustment checks and most adjustments possible without component

RECEIVER INPUT

TRANSMITTER OUTPUT

removal. Adjustment of typecylinder lift and rotation for correct character selection, carried out while machine is printing.

Electronics Unit
Consists of printed circuit boards accessible through rear inspection panel and a power unit. Standard types of dual-in-line DTL integrated circuit packages used. All units interchangeable with replacements of same type.

Keyboard
Fully interlocked, 4-row, motorless keyboard provides 62 separate key positions. Selected combination locked mechanically until code accepted by electronics. Generates all 128 combinations in ISO 7-bit code (International Alphabet No 5) using upper and lower case alpha shift and control case shift facility. Mean operating speed 10 characters per second.

Control Keys
Local control keys and/or indicating lamps as illustrated. Typical controls include printer line feed, carriage return; tape punch on-off, run-out; tape reader run, stop and skip.

Print Out
Printing rate up to 10 characters per second. Character spacing 10 per inch (25·4 mm). Maximum characters per line 72. 6-layer typecylinder contains all 96 graphics (16 per layer) of ISO 7-bit code. Error symbol substituted for intended character or function if code disparity occurs.

Stationery
Capacity inside cover for one 8 to 8·5 inch (210-216 mm) long, 3·5 inch (89 mm) diameter paper roll containing approximately 180 feet (55 metres) of single-ply paper. Provision for external paper rolls and sprocket-fed fan-fold stationery. Right-hand margin adjustable. Friction/sprocket feed platen with retractable pins. Prints a maximum of five legible copies on standard teleprinter paper.

Tape Punch
Punches 8-track, 1 inch (25·4 mm) paper, plastic and metal based tapes at up to 10 characters per second. Incorporates own drive motor. Fitted with high efficiency long-life concave punches.

Tape Reader
Reads 8-track fully punched tape on- or off-line at up to 10 characters per second. Pecker sensors operate parallel output code contacts. Tape stepped by feed-rake system. Code being read is visible through grille of tape retention gate. Taut-tape and tape-out alarm contacts fitted.

Alarms and Indicators
End-of-line warning contacts with operate position adjustable between 20th and 72nd character in 72 character line. Taut-tape and tape-out contacts on tape reader. Local control keyboard lamps indicate: printer end-of-line condition, taut-tape/tape-out.

Electrical Noise
Radio interference suppression provided to meet British Standard BS800.

Environment
Temperature range +5°C to 50°C with relative humidity of up to 90 per cent.

Dimensions
Width 24 inches (610 mm)
Depth 24 inches (610 mm)
Height 12 inches (305 mm)
Dimensions apply to machine with cover and both tape units but without tape reel.

Weight
Approximate weight including cover and electronics 120lb (54·5 kg).

OPERATION
Motor Speed-up
1·5 secs minimum must be allowed for the motor to reach full speed from rest. This is measured from the beginning of the start element of a character transmitted to the machine.

Control of Attachments
Punch and reader attachments are controlled manually from the row of push-buttons mounted on the front of the machine above the keyboard.
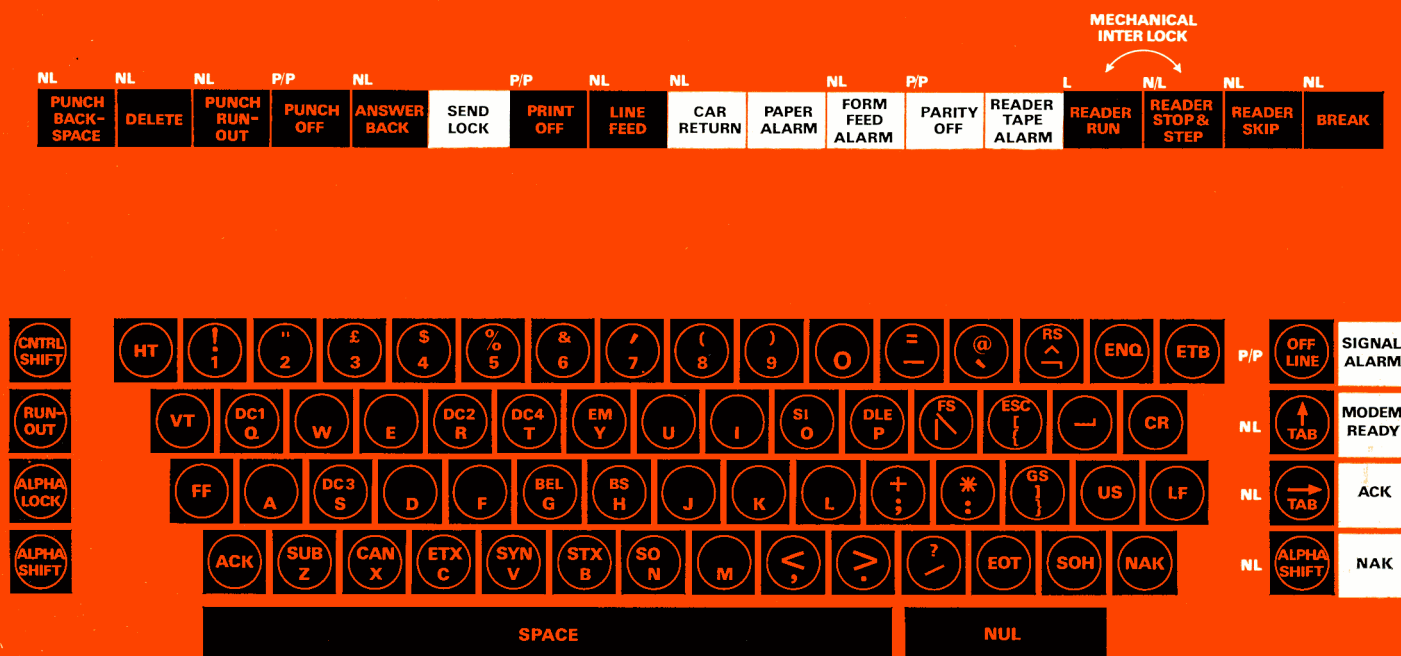The controls provided are as follows:
Reader run ⎫ Mechanically
  „   stop and step ⎭ interlocked
  „   skip
Punch run-out
  „   off (push on, push off)
  „   back-space

Carriage Return
A non-printing character should follow the carriage return (CR) code when the machine is receiving signals at cadence speed, in order to allow time for the printing head to return to the beginning of the line.

TYPICAL ENVOY KEYBOARD LAYOUT

NL=NON LOCKING
L=LOCKING
P/P=PUSH ON/PUSH OFF
LAMP

Envoy Options

Optional Facilities (at extra cost)

Character Sequence Generator (Answer Back)
30 character pre-coded sequence generator, operated from ENQ code, or push button. Can be split into shorter sequences.

Two Colour Print
Prints black for receive, red for send, also inverts colour on parity error.

Form Feed
Form feed action occurs on recognition of form feed code (FF). Feed action stopped by sensing hole in pre-printed stationery.

Bell (Tone-Sounder)
Alarm device utilising miniature loudspeaker, activated by received BEL code and continuing until next character. Can also be activated by single wire input.

Paper Low/Out Alarm
Alarm device to operate lamp, on paper roll low, or fanfold stationery out, may also be gated with printer on-speed contacts to provide dataprinter ready indication.

Modem No 2 Interface
Provides control logic and manual controls for modem No 2 Manual working.

Computer Dialogue Facility
'ACK/NAK routine', employing sequential control techniques to confirm correct reception of blocks of data.

Full Duplex Working
Provision to remove local record, to permit full duplex (simultaneous two way) operation.

Off-Line Switch
Provides for off-line 'local' operation of machines, while inhibiting transmission. When off-line, received signals light INCOMING SIGNALS ALARM. In the on-line state 'printer off' switch, if fitted, is not effective.

Horizontal and/or Vertical Tabulation
Tabulation action triggered by:
(a) incoming code
(b) keyboard generated code
(c) local push-button.

Actions:
(a) local print mechanism feeds to next tab stop
(b) tab code sent to line, print mechanism advances to next tab stop
(c) print mechanism advances to next tab stop, appropriate number of space or line feed signals sent to line.

'DEL' Delete Code Action
Facility to print special symbol for 'DEL' delete code, and facility for tape reader to auto skip 'DEL' code to give clean copy.

Printer Control, Manual ON/OFF
Facility to switch OFF the printer unit, for local tape reproduction. (Effective in the off-line condition only if the ON/OFF line switch is fitted).

Remote Keyboard Lock
Provision to inhibit keyboard from external single wire signal. Optional inhibit controls on two separate control wires.
(a) ignores any key depressed after lock is applied
(b) after lock is applied, stores code of any operated key until the keyboard unlocked, then transmits stored code. Send lock lamp indicates locked condition.

New-line Feature
Combined CR/LF on receipt of NL(LF) code. Reader, keyboard, and answer-back are inhibited while CR takes place.

Parity ON/OFF Switch
In 'parity off' condition machine will accept signals without parity bit.

Break Push-button
A non-locking manual control to transmit continuous space potential to line.

Non-feed Underline and Overline
Underline and overline to be non-feeding characters on the printer.

Character Recognition (Stunt Box)
Facility to recognise received characters for control purposes (stunt box). Recognised characters may provide single wire output at 5v 40 mA, or control internal devices, or indicator lamps, ie reader, punch on/off controls etc.

Inversion of Keyboard Alpha Shift
Non-shift condition gives capital alpha.