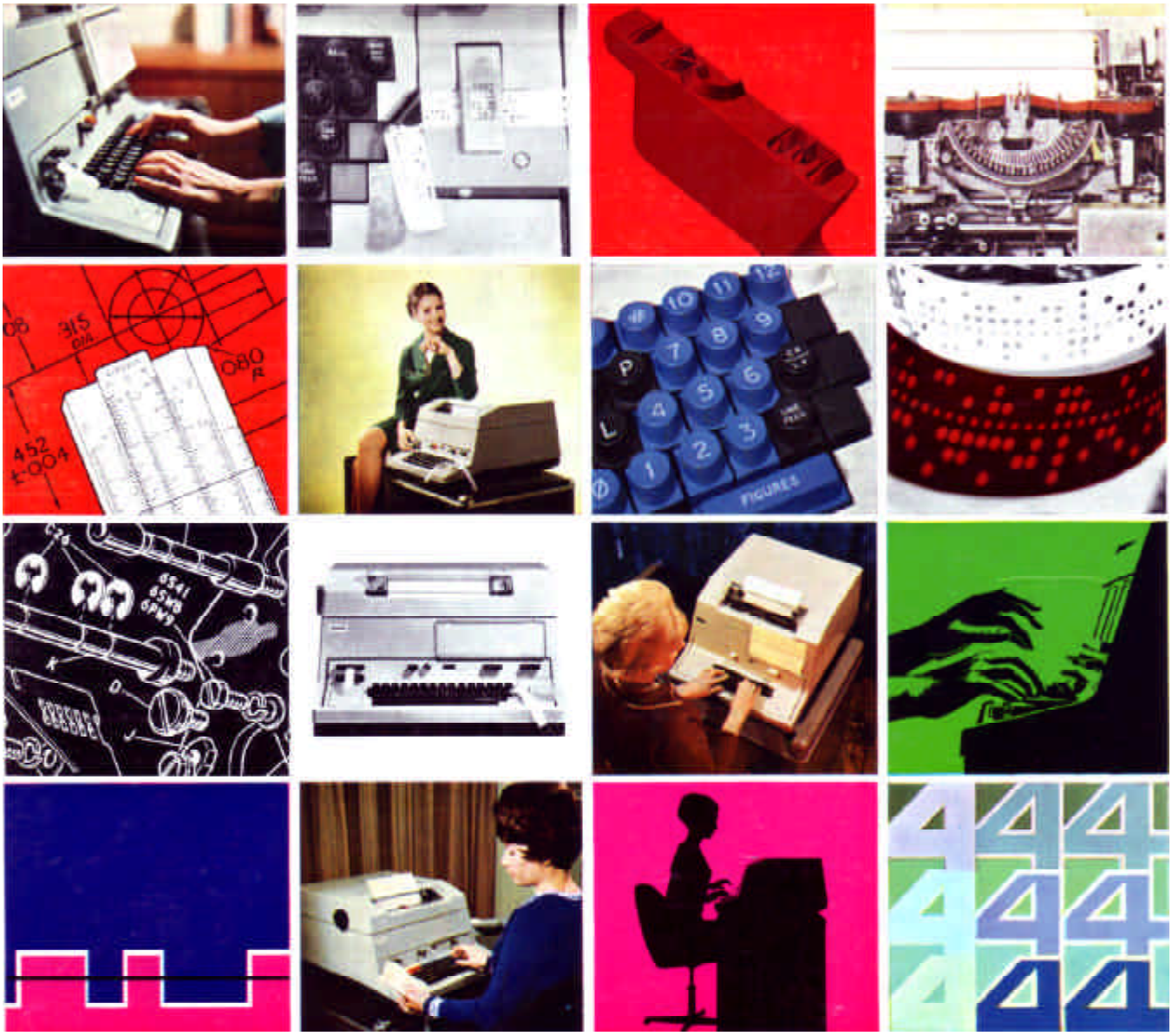


Model 444 Teleprinter
Technical Specification

creed

Contents

Introduction

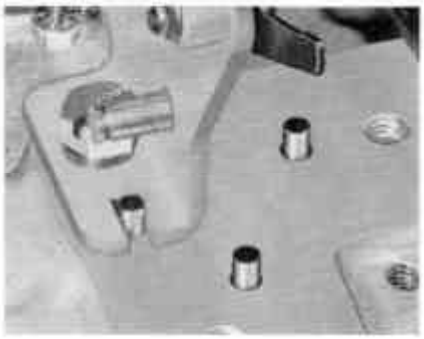
The new Creed Model 444 (pronounced Four, forty-four) is a heavy-duty page-printing teleprinter developed primarily to satisfy British Post Office requirements for a Telex machine to CCITT standards. It can operate in either the simplex or the duplex mode at speeds up to 75 bauds, and is compatible with the majority of teleprinters and circuits now in service. Each character is printed as soon as it is received by type bars carried in a type basket which moves to and fro in front of the stationary paper carriage.

A range of additional optional features has been planned to enable the machine to be used in specialised high-speed telecommunications and data processing applications.

The machine has been designed to operate continuously for long periods and to function reliably with the minimum of maintenance attention. With suitable lubricants and ribbon, it will remain serviceable at temperatures within the range -25°C to -55°C.

Although the Model 444 is basically a 5-unit, start-stop, two shift machine operating on International Telegraph Alphabet No 2, provision has been made in the receiving mechanism for a third shift to which access is made via one of the optional secondaries (F, G or H) or by the 'all space' code SSSSS.

Provision has also been made for subsequent adaptation to 6-unit operation (with shift) throughout the Receiver, Keyboard, Transmitter, Tape Punch Unit, and Tape Reader Unit.



Construction

Robust 'unit construction' for easy maintenance and accessibility. Each major unit is carried on its own casting or frame, and is secured by no more than four screws. Where appropriate, eg on the motor unit, the screws have been made captive. Abutments are provided to locate the units accurately.
All units are interchangeable without need to re-adjust except in isolated cases. Individual components have been designed for easy assembly with the minimum number of adjustments. Units can be dismantled and then reassembled without need for readjustment.
The number of different fabricated parts is approximately 1,250 for a basic transmitter/ receiver version of the machine fitted with a synchronous motor. A further 160 parts are involved in the Tape Reader unit, and 220 parts in the Tape Punch unit.

Speeds

Machine is designed for 50 baud and 75 baud operation, ie 66 and 100 words per minute respectively. Conversion from 50 baud to 75 baud operation by changing motor and hours counter gearing. This conversion can be carried out without removing the motor or disturbing adjacent units.

Signal Divide

The transmitters associated with the keyboard and with the tape reader unit are both designed for 7 1/2 unit operation. The teleprinter receiver is designed to accept 7 or 7; unit signals at 50 bauds, and at 75 bauds. 8 1/2 unit signals are used for 6-unit applications.

Alphabets

Printing in all common Indo-European languages is possible up to a maximum of 56 graphics on two-shift version. Semitic languages such as Hebrew and cursive scripts such as Arabic, both involving a right-to-left type basket traverse action, can be catered for. Use of a third shift increases possible graphics to 84. Nonfeeding type bars carrying 'accents only' are possible.

Optionals

The basic Model 444 machine consists of a 5-unit, 50 baud or 75 baud receiving mechanism fitted with a 3-row or 4-row keyboard, the answer-back facility, an end-of-line warning lamp, the two-colour printing facility, and a motor hours counter.
Optional units and facilities that can be fitted to the basic machine include a Tape Punch unit, a Tape Reader unit, an automatic motor switch, a motor on-speed relay, paper-out contacts, a code recognition unit (stunt box), an automatic carriage-return line-feed facility, a 5- or 6-unit parallel input unit, and a parallel 5or 6-wire output from the code recognition unit.
Special facilities envisaged for Model 444 will include horizontal (repeat space) tabulation, and provision for a parallel 5or 6-wire output direct from the keyboard transmitter (as distinct from the multi-wire output from the code recognition unit). The machine can be supplied as a transmitter-receiver, or as a receiver only. Answer-back and parallel input unit can be fitted to machines without keyboards.

Dimensions and Weight

External overall dimensions of the machine in its sound-reducing cover are

width	20½ inches	52.0 cm
depth	25 5/8 inches	65.1 cm
height	12¾ inches	32.4 cm

Weight of a keyboard machine with a Tape Reader and a Tape Punch and the soundreducing cover is approximately 82 pounds (37.2 kg). This figure does not include the weight of the paper roll and the tape reel. The sound-reducing cover and its base tray weigh approximately 25 pounds
(11.3 kg).

Receiving Electromagnet and Orientation

The standard polarised receiving electromagnet is designed to respond to doublecurrent signals, but can be converted for single-current use by attaching bias
springs to its armature. Manual orientation adjustment determines selection instant over -60% of a code element length. Scale is calibrated to read receive margin directly.

Line Current and Margin

Line current for the polarised electromagnet working on double current signals is 20 mA (80-80V). Single current working (using bias springs) will require 40 mA (120V). The receive margin is at least -42% at 50 bauds, and --38% at 75 bauds.

Circuits

Full Duplex, Half Duplex, or Simplex (single or double current) with electrical local record facilities. Local circuitry for Model 444 is similar to that used for Creed Model 7 and Creed Model 54; the new machine is therefore interchangeable with these earlier machines. It will not be interchangeable with Creed Model Seventyfive circuitry because of the mechanical local record feature of that machine, although Model 444 can work to a Model Seventy-five or to any other make of teleprinter which conforms to CCITT standards.

Local Record

Electrical local record on double-current circuits is obtained by leaking signals from send line back to local electro-magnet. The leak resistor is by-passed and incoming signals connected directly to electromagnet by an automatic sendreceive switch. Single-current circuits obtain local copy by inclusion of receive electromagnet coils in loop circuit. In both these modes an accurate local copy is proof of accurate transmission.

Drive

Transmitting and receiving mechanisms are driven by a single 3000 rpm or 3750 rpm electric motor. Receiver employs three cam shafts (selector, main receive cam shaft, and typebasket feed shaft) each making half a revolution for each character. The keyboard transmitter has a single cam shaft which, for maximum accuracy, makes one complete revolution for each transmitted character.

Both the ratchet and the friction type of clutch is used on the machine. The ratchet clutches incorporate a frictiondriven element which provides the homing torque, helps to equalise the idling/ running load, and reduces impact when the drive is engaged.

Motor Range

Series wound, 3750 rpm, ac single-phase governed motors for any single voltage in range 100-125V (5-volt steps), 200-250V (10-volt steps), at 40, 50 and 60 cps. Series wound 3000 rpm d.c. governed motors initially for British Post Office, 3750 rpm do motors available in future, if required. Range envisaged is 100-125V (5-volt steps), 160V, 200-240V (10-volt steps). Synchronous motors for 50 cps (3000 rpm) and 60 cps (3600 rpm) supplies, and any single voltage in range 110-125V (5-volt steps), 200-250V (10-volt steps).

Power and Signalling Connections

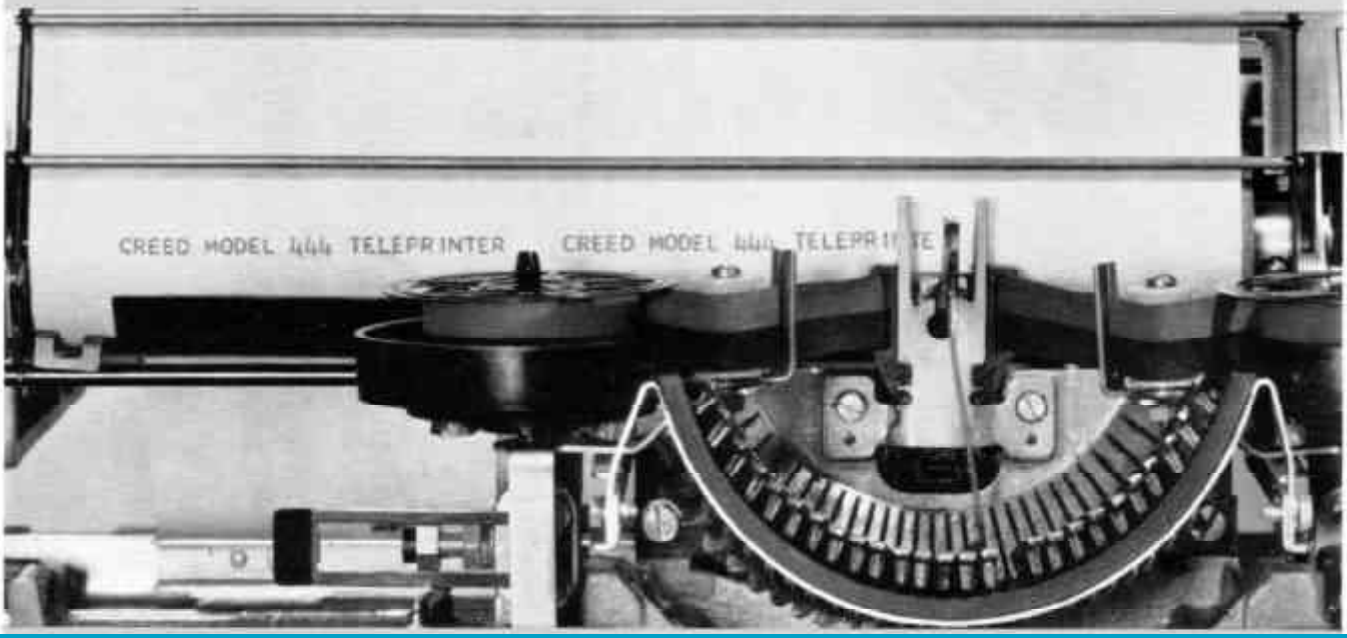
Separate captive cables are provided for motor power (3-way), and for signalling circuits (40-way). Provision for an additional 40-way plug and captive signals cable for code recognition contacts, if capacity of standard cable is exceeded. Electrical connections from the base tray, in which the power and signalling cables terminate, to the teleprinter mechanism are made via a 40-way Plessey series 110 jack-in connector for the signals wiring, and a 6-way Painton Multicon connector (with twin earth pins) for the motor power supplies. Power supply from the teleprinter main base to the motor unit is via another 6-way Painton Multicon connector. The signals and motor connectors are located at the rear of the machine main base adjacent to the motor gearing. Space has been left around all unit connectors so that alternative types of plug with a larger number of pins can be fitted when required.

Maintenance

Routine maintenance for 50-baud machines will consist of inspection, cleaning, and lubrication after each 1000 hours of operation, or at intervals of one year, whichever is earlier. The overhaul interval is 5000 hours or 5 years, whichever is earlier. Maintenance intervals for 75baud working are to be 500 hours initially, with overhaul at 3000 hours or 3 years.

All lubrication points requiring attention at the routine maintenance interval can be reached without dismantling. Only two lubricants: a light oil and a grease will be required. It will not be necessary to relubricate shielded motor bearings as the original lubricant inserted by the bearing manufacturer will last until the bearings are replaced at 5000 hours.

All field maintenance can be carried out with common tools. Gauges will be available to simplify certain adjustments. Main cover and lid are secured to the base tray by two Oddie clips which require a quarter-turn with a screwdriver to release them and so enable the cover to be lifted off. The release of two sliding latches, and the disconnection of the internal power and signals plugs at the rear of the main base, enables the complete receiving and transmitting mechanisms to be lifted out of the base tray, while the input sockets and their cabling remain clamped inside the tray.



Printing Mechanism

The printing mechanism of Model 444 employs a moving typewriter-style type basket, and a stationary platen unit which bears the paper roll. The type basket can hold up to 28 type bars each carrying two characters, so giving a maximum capacity of 56 characters. Provision has been made for increasing this capacity by the use of a third shift position.

A type bar is selected by allowing it to drop into a slot across an arrangement of five castellated comb bars carried on the type-basket carriage unit and controlled by five vanes which are pivoted on the frame of the machine. These vanes are in their turn controlled by the selection mechanism and the incoming signals which it registers. The downward movement of the selected type bar brings it into the path of a print bail which lifts the bar out of its basket and so impresses the type against the ribbon to create an image on the paper. Each character is printed as soon as it is received and the whole printing line is visible while it is being printed.

The case shift action is obtained by raising the rod on which the type bars pivot so as to bring the letters to the printing line, and by lowering the pivot again to bring
figures, symbols, and punctuation marks to the printing line.

The typebasket unit runs on three parallel rails (two guide rails and the shift rail), and is returned to the beginning of the line by a helical spring which is progressively extended as the basket moves along the printing line. On receipt of a 'carriage return' signal the feed mechanism is disengaged and the basket is drawn rapidly back to the left-hand margin position where the impact is absorbed by an air dashpot. The 'carriage return' time (about 200 ms at normal temperatures) is short enough to permit a 'carriage return, line feed, print' sequence at speeds up to 75 bauds. It is not therefore necessary on this machine for a dummy 'letter shift' combination to be inserted after a 'carriage return, line feed' sequence to allow the carriage time to return from a long line.

Printing is through a half-inch wide typewriter ink ribbon which is wound on a flanged spool of the type used on Creed Model 47 and Model Seventy-five machines. The European standard typewriter spool DIN 2103 can also be used. The automatic ribbon feed changeover mechanism will be operated by either a plain or an eyeletted ribbon. A mechanically-operated automatic two-colour printing facility is standard; transmitted copy normally being printed in red, and receive copy in black.

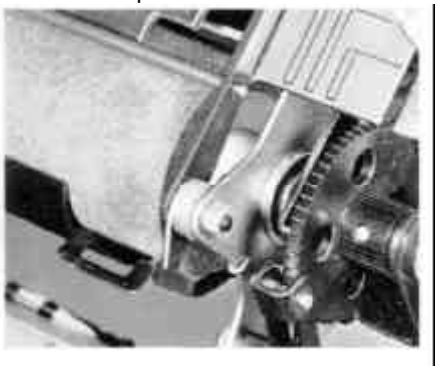
The printing action and the letter feed action can be made inoperative, either individually or jointly, on up to maximum of ten combinations. These normally include Carriage Return, Line Feed, Bell, WRU, Letters, Figures and All Space. The remaining three combinations are available for accents or diacritical signs. An eleventh combination, with print suppression only, is normally allocated to Letter Space.

Letter spacing, ie the distance between centre lines of adjacent characters on the same line, is io inch nominal.

Line length is adjustable from 69 to 75 characters. The letter feed and dashpot mechanisms can be reversed to provide the right-to-left traverse required for non-roman alphabets.

Stationery

British, European, and American paper rolls, both in their normal and reversewound forms, can be accommodated inside the sound-reducing cover. Maximum width for paper rolls is 82 inches (216 mm). Maximum diameter of roll
5 inches (127 mm). Paper guide can be set by operator to accept either 8.3 inch (210 mm) or 82 inch (216 mm) wide paper. Provision for external paper supply, and for sprocket-feed printed stationery. Provision for small sprocket-feed packs within cover; a drop-in container can be substituted for paper tube.
Machine can be fitted with a friction-feed platen, or with a dual-purpose friction/ sprocket feed platen with retractable pins which is capable of being set to accept either plain paper or marginally-punched printed stationery. Platen units can be interchanged without dismantling other units from machine. Platen material is Langitex as on previous Creed teleprinters. An external knob is provided to turn the platen and so advance the paper. Platens will accept friction-feed paper, either single-ply or up to 6-ply, with or without interleaved carbon sheets, and also carbonless multi-plies such as NCR paper. Print force is adjustable by mechanic and can be set to print up to six carbon copies.



Line length adjustable from 69 to 75 characters. Left-hand margin is 0.55 inch (13.9 mm) minimum from edge of paper to centre line of first character, and can be adjusted inwards over 4 character spaces. Right-hand margin is also 0.55 inch
(13.9 mm) minimum for a 75-character line on 82 inch (216 mm) wide paper. This setting can also be adjusted inwards over 4 character spaces. (69-character line will normally be set to 0.75 inch (19 mm) lefthand margin on 8.3 inch (210 mm) paper). Three degrees of line feed by operator setting: 1/6 inch, ,'- inch, and 1/3 inch, ie 4.23 mm, 6.35 mm, and 8.46 mm respectively.

Operator's Manual Controls

Keyboard:	Maximum of 59 key buttons, plus two shift pads and a space bar.
Platen Controls:	Platen pressure roller ON/OFF control lever Line feed control lever Paper guide-face setting Platen knob
Functional keys:	HERE IS key RUN OUT key (see Note 1) CARRIAGE RETURN key
Optionals:	LINE FEED key LETTER SHIFT key (see Note 4) FIGURE SHIFT key
Tape Punch Unit:	PERF OFF key PERF ON key BACK SPACE key ON OVERRIDE key (see Note 2) TAPE RELEASE key (see Note 3) Catch to release panel covering cuttings box
Tape Reader Unit:	TRANSMITTER ON key TRANSMITTER OFF key Tape gate release push button Single-shot button (optional)

Note 1 Run-out occurs on last key depressed, ie to start continuous transmission, depress the selected key, release it, and then depress the run out key.

Note 2 This override key prevents operation of mechanical and/or electromagnetic 'Perf Off' facility. It is an optional facility.

Note 3 Operating this key releases the tape so that it can be pulled through the punch mechanism.

Note 4 These keys operate their respective functions without sending signals to line. Manual carriage return is standard; key will return carriage even if motor is switched off. Manual line feed and shift control keys will only operate the receiver if it is already cycling, ie they cannot initiate a cycle. These keys are intended only for emergency use to correct corruptions, or to remedy the omission of a shift, CR, or LF signal by the distant operator.

Cover

A three-piece metal cover consisting of a base tray, a cover unit proper, and a counterbalanced lid totally enclose the teleprinter mechanism and so reduce machine noise to a minimum. The Tape Reader unit, the Tape Punch unit, an 8-inch diameter tape reel, and a paper roll up to 5-inch diameter (or alternatively a small sprocket-feed pack) can all be accommodated within this cover. The fitting of the Tape Reader and Tape Punch units only affects the keyboard mask, which is readily interchangeable. Receiver-only applications are satisfied by filling the keyboard aperture of the standard cover with a dummy panel.
All three cover units, which together weigh about 25 pounds, are aluminium pressure die castings some 1/10 inch thick, and are lined with sound-reducing plastic foam to give good noise insulation. The joints between the tray and cover, and between the cover and lid are sealed with a rubber strip.
The lid is lightly spring-loaded towards the closed position, and is also stable in the fully-opened position to give easy access to the tape reel, paper roll and ribbon.
The operator views the printing position through a 12-inch wide transparent plastic visor which has been designed so that reflections from room lighting do not reach the operator's eyes. A paper knife is incorporated in the top face of this visor. Recessed hand-holds are provided at the left-hand and right-hand sides of the base tray. By lifting the front of the machine slightly, its weight is transferred from its four rubber feet to two rollers located at the rear of the base tray so enabling the machine to be wheeled to a new position. The entry points of the power and signal cords, which are located at the rear of the base tray, are recessed so that the cables will not be trapped when the machine is moved in this fashion. Cables can be completely concealed if a suitable hole is provided in the desk top. Provision has been made to extend the Tape Punch unit cuttings chute through the base tray into a large container in
the desk.

The cover and external controls were designed by David Mellor R.D.I., Des.R.C.A.

Governed Motors

A full range of 3750 rpm ac, and 3000 rpm dc, governed motor units has been designed. As these units contain all the associated electrical equipment such as governing resistor, on-speed relay, and radio interference suppression components, and plug directly into the main base wiring, it is a simple operation to exchange a motor unit, orto substitute one of a different type or voltage.

The motor unit also contains the microswitch associated with the automatic motor switch facility. This switch is operated by a lever from a mechanical time delay mechanism located on the teleprinter main base.

The motor and its governor are protected by a metal cover which is force ventilated through louvres at the rear of the base tray. This cover completely encloses the motor and governor, and is retained by a single screw; live surfaces such as brush boxes, which would otherwise be exposed when the main cover is removed, are protected by individual plastic covers. In addition to reducing radio interference and noise, and preventing accidental contact with rotating parts, this overall cover prevents brush dust from finding its way on to the teleprinter mechanism and also prevents the motor ventilation system from drying out the lubricants.

Governed motors will reach correct operating speed within 1½ seconds at normal temperatures and nominal supply voltage. A centrifugal governor (see section headed 'Governor') compensates for temperature variations and for supply voltage variations of ±10% holding motor to within ±0.1% of the correct speed. Speed remains stable within ±0.5% over 1000 hours of continuous running.

Brush life averages 2000 hours when the machine is operating at 50 bauds. Brushes are similar to those used on Creed Model Seventy-five but are longer (¾ inch (19.1 mm) effective) and have a greater working area. Each brush is linked to the power supply by an insulated pigtail, and is held against the 45-segment commutator by a spiral spring designed to maintain almost uniform pressure as the brush shortens. Brushes are held in brass boxes carried on an adjustable plastic moulding and are sited so that the brushes trail. The effect of commutator rotation, brush spring pressure, and the offset positioning of the brush boxes combine to press the brushes against the side of their boxes so reducing vibration and sparking.

Bearing life of 10,000 hours fixes the motor overhaul interval during which operation the commutator will need resurfacing. The two double-shielded ball bearings (British Standard type BRL 012) used in the motor are lubricated by the manufacturer and do not require any further attention until the 10,000 hour interval at which they are replaced.

A manually-reset current overload protection device is provided as standard equipment.

Resilient rubber mountings located between the main motor framework and its cradle help to reduce motor noise and vibration.

A black and white 8-segment strobe disc viewed through a 125 dvs (250 cps shutter speed) tuning fork is provided as a visual speed check.

Motor insulation standards are to British Standard 2757 Class E.

Synchronous Motor

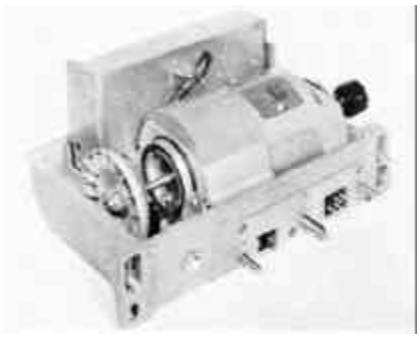
Capacitor-start, capacitor-run motor units constructed and ventilated as governed motors described above, ie unit contains associated electrical equipment, microswitch, overload protection, etc. Absence of brushes enables motor overhaul interval to be extended to 10,000 hours at which time the bearings are replaced. Insulation, resilient mounting, bearings, and other applicable data as for governed motors. The motor reaches synchronous speed within 12 seconds. The space previously taken up by centrifugal governor is now occupied by a fan.

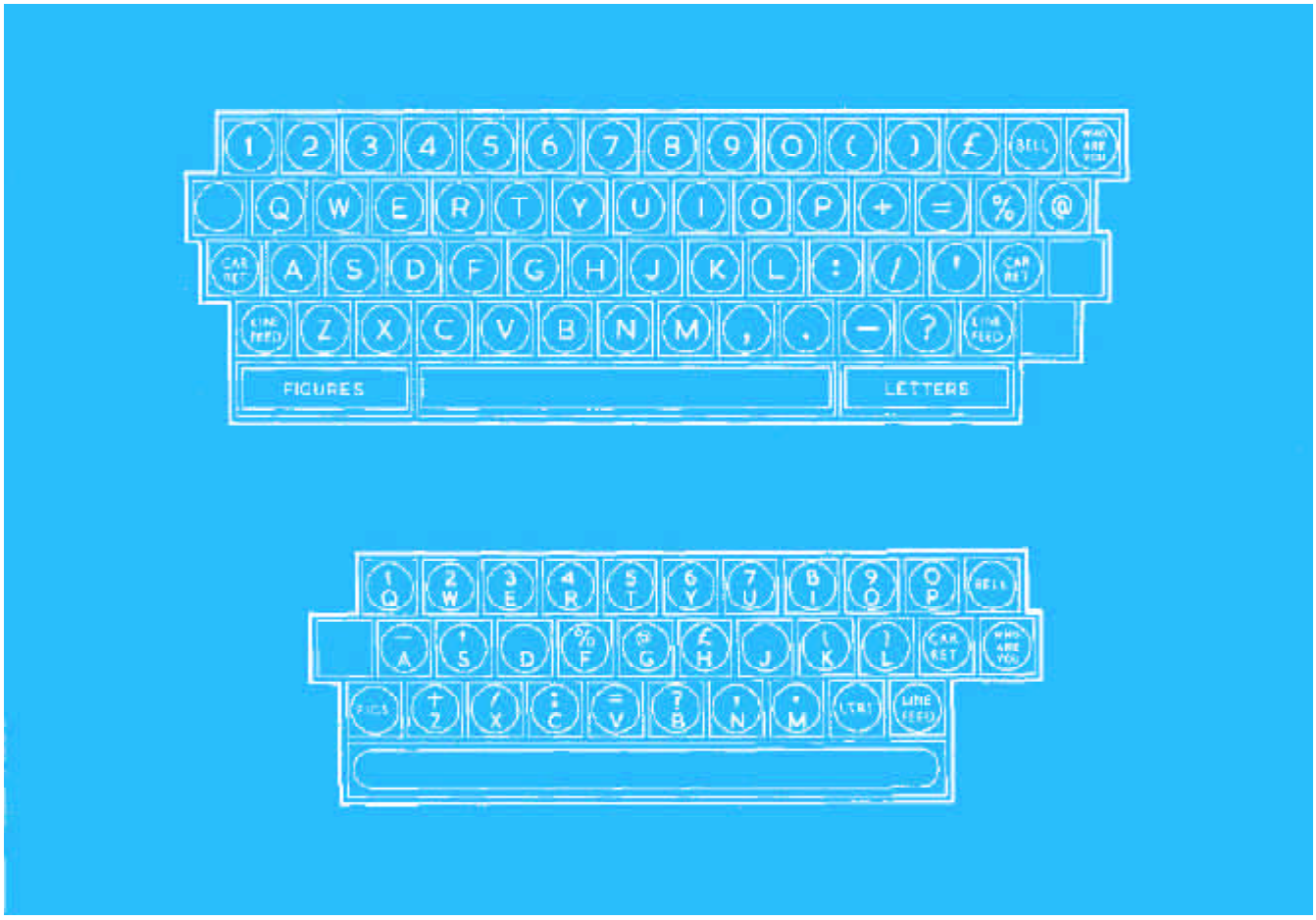
Governor

A centrifugally-operated governor similar in design to those used on previous Creed teleprinters is employed. This device holds the motor speed constant to within -0.1% of nominal in the face of supply voltage variations of -10%.

The governor spring is anchored on a bi-metallic bar which flexes to compensate for the increase in length of the spring as the motor temperature rises. The manually set speed-adjustment screw on the governor spring anchor is electrically insulated from the main supply whatever the position of the governor contacts. Governor contacts are tungsten and are 'in (6.35 mm) in diameter.

Fins on the outside of the plastic governor cover act as a fan to force air over the motor windings and commutator.





Typical three- and four-row keyboards.

Keyboards

Code selection by action of plain (ie uncontoured) keybars on an arrangement of castellated comb bars whose associated parallelogram linkages slide to the left or right depending upon coding.

3- or 4-row full or partial shift lock keyboard arrangements possible. Basic design is for a 63-slot board with 59 key positions plus two shift keys and a space bar. The slots for the shift keys and the space bar cannot normally be used for additional keys because of cut-out in standard mask.

The standard 4-row layout will have 57 operating keys and three pads (ie lozenged-shaped keys) for space, letter shift and figure shift. This layout includes two spare positions which are normally filled by non-operating key bars bearing square flat-topped key buttons which fill up the keyboard mask opening. The maximum number of operating keys for a 4-row layout is therefore 59 keys plus 3 pads. There will also be a condensed 4row layout with 44 keys and one pad. The 3-row layout will have 34 keys plus 1 pad, and will be derived from the condensed 4-row layout by filling the top bank of the keyboard with square flat-topped dummy key buttons.

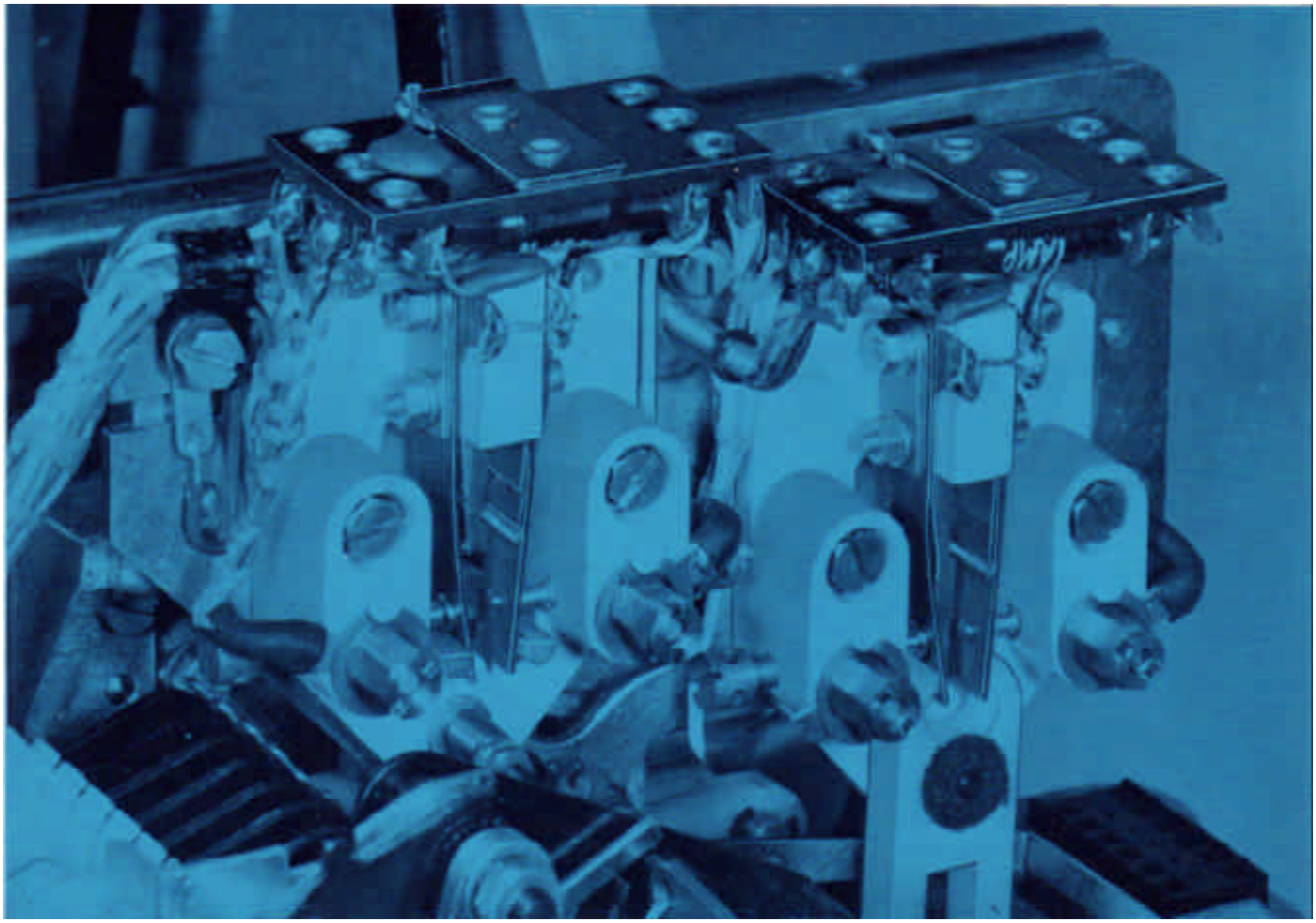
Pitch of keys is 3/4 inch (19.1 mm) horizontally and vertically. Slope is 15 degrees. Average key pressure is less than 6 ounces. Key stroke is 3/16 inch on the top row of keys, and 5/16 inch on the space bar, The individual cylindrical key buttons are inch in diameter.

Two basic versions of the keyboard mask are available: the first a plain mask with no apertures for tape units, the second with two apertures, one for the Tape Reader, the other for the Tape Punch. Dummy panels are used to fill the remaining aperture if only one of these optional units is required. Each of these masks will have three variations: one with no aperture at all for the keyboard (suitable for a Receiveronly machine, or for adaptation to special key arrangements), one with a large aperture to accommodate a 4-row full shiftlock keyboard, and one with a slightly smaller aperture suitable for a condensed 4-row partial shift-lock board.

The standard keybuttons will normally be matt black injection-moulded plastic and will have their white characters preformed and cast into them at the moulding stage. This method of manufacture ensures that the legibility of the key tops will not be affected even by prolonged use.

Alternative colours, in both keybuttons and their characters, can be provided. The upper case character on a key can be in one colour, the lower case character in another colour, and the keybutton itself in yet another colour. For example, one of these non-standard keybuttons might be in green, with a white upper case 'figure' and a black lower case 'letter'.

Special 'organ-type' keys to control the Tape Reader and the Tape Punch, and also to give direct manual control of some machine functions, protrude through horizontal slots in the front face of the keyboard mask immediately above the keyboard. These keys are grouped according to their use and all are within



easy reach of the operating position. For the British Post Office machines these keys will carry plain-language legends such as PERF ON, and RUN OUT. As an alternative, a range of keys have been designed which carry the internationallyused symbols which indicate the purpose of each key diagrammatically, and so avoid the need for alternative keys to cater for foreign language machines.
A storage keyboard for Model 444 is not envisaged at present.

Transmitter

The Model 444 has a single changeover contact, cam-controlled, striker transmitting mechanism which is capable of generating accurate double-current signals or, by a simple readjustment, biasfree single-current signals. An automatic send-receive switch is provided for operation of half-duplex or 2-wire circuits. The transmitting mechanism is designed for long-term stability, and to be easily adjustable without use of special tools or test equipment. Maximum start-stop synchronous transmitter distortion figures when keying each character separately are: ±3% for 50-baud operation ±5% for 75-baud operation A special device is fitted to ensure that Send/Receive switch will return to receive at the end of a cycle, however slowly the cycle may have taken place. This device also provides a short delay on return to avoid splits in the stop signal at cadence or near-cadence speed keying.
(The Tape Reader unit has its own transmitter whose contacts, for British Post Office applications, will be in series with those of the Keyboard Transmitter. In these applications the Tape Reader will also control the send/receive switch associated with the Keyboard Transmitter).

Noise Reduction

Sound and vibration reducing measures include the overall metal cover and base tray with its absorbent lining, the rubber mountings and overall metal cover for the motor, and the resilient rubber mountings between the teleprinter main base and the tray.

Electrical Safety Precautions

The machine satisfies the requirements of the British Post Office Specification D1921 A (Protection Requirements for Telecommunication Equipment), the relevant requirements of the European 'Commission Equipment Electrique' (CEE) for Electric Motor Operated Appliances, and British Standard BS 613 in respect of leakage current from the radio interference suppression circuitry to frame.

Radio Interference and Spark Suppression

Circuitry providing a degree of suppression sufficient to satisfy the requirements of the British Post Office, and also those of the European postal administrations, is employed on Model 444. All transmission contacts are provided with spark quench circuitry. Separate interference suppression provision for the Keyboard Transmitter, the Tape Reader, the motor governor contacts and brushes, and for the brushes of commutator motors. Maximum levels* of radio interference tolerated by British Post Office are indicated in the table below. The radio interference suppression arrangements for Model 444 will satisfy these requirements.

Range	At mains terminals	On send and receive lines	Noise field at 10m
200 Kc/s-1 Mc/s	500 uV max	10 mV max	50 uV/m max
1 Mc/s-3 Mc/s	100 uV max	3 mV max	30 uV max
3 Mc/s-100 Mc/s	100 uV max	100 uV max	20 uV/m max
100 Mc/s-220 Mc/s	315 uV max	200 [kV max	40 uV/m max

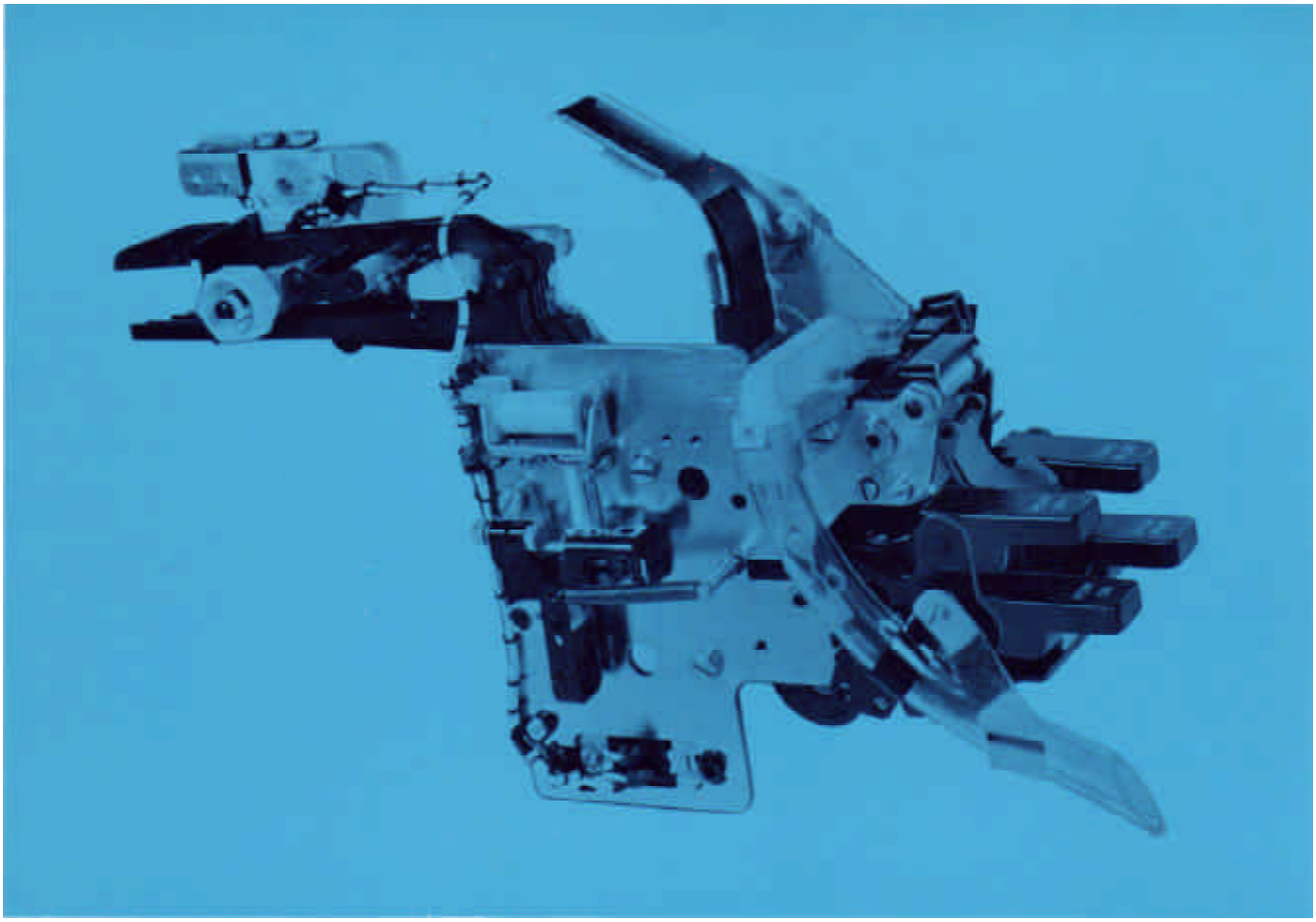
*measurements taken on equipment complying with British Standard 727

Motor Control Switch

A mechanically-operated unit which switches off the motor automatically a short time after the end of the message. At 50 bauds this interval is about 72 seconds, and at 75 bauds is 48 seconds. The teleprinter motor is started again when a space element is received from line, or when the 'letters' key on the local keyboard is operated.
The microswitch which breaks the motor power circuit is located within the motor unit, and is operated by a lever controlled from a mechanical time delay mechanism located beneath and driven from the main cam sleeve.
The motor switch mechanism can be disabled by mechanic when not required, or the switch can be short-circuited without causing damage.

Answer Back

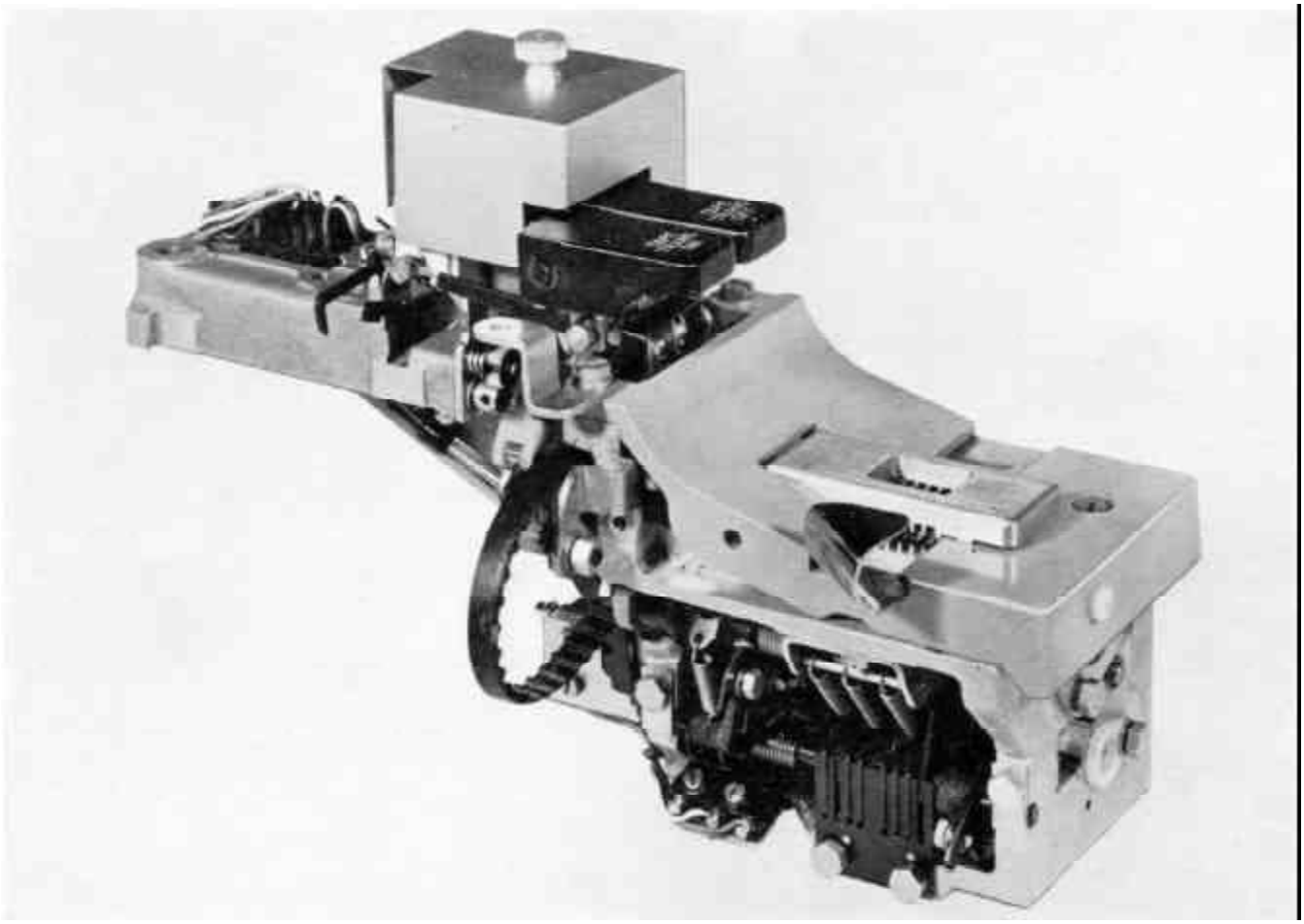
A simple Answer Back device is built into keyboard transmitter unit. An interchangeable 20-character plastic ward drum with break-out projections is used for coding purposes so eliminating need to supply a range of pre-cut metal wards.
Full freedom of coding on all 20 positions of this ward drum, ie it will not be necessary to have the fixed character (normally all-mark or all-space) at the beginning and/or the end of an answer back cycle to prevent mechanical interference with the transmitter, as is required with some other teleprinters.
The Answer Back device has a cadence speed drive, and so transmits to line at the same speed as the associated keyboard transmitter. This feature enables a motor speed check to be made on a distant and unattended machine. The Answer Back mechanism operates only once for each WRU signal received, although it will cycle continuously while the 'Here Is' is held down.
Answer-back 'off-normal' contacts are provided. At 50 baud working these contacts operate within the nine millisecond interval between start of rotation and first start transit. Contacts restore immediately following end of fifth element of the last character. On British Post Office machines a WRU contact will be connected in tandem with the 'Off Normal' contact to provide an earlier warning of impending answer-back operation.
All keys on keyboard are locked during answer-back transmission, with the exception of the letter shift key which may be depressed but is ineffective. On British Post Office machines, the 'letters' key will also be locked. The 'Run Out' key, mounted above the main keyboard, is not locked while the answer-back unit is operating, but operation of this key will not affect answer-back transmission.
The delay between the start transit of an incoming WRU signal, and the start transit of the first answer-back code is approximately 240 milliseconds at 50 bauds.
The Answer-Back mechanism and the associated Keyboard Transmitter mechanism can be fitted to a Receiveronly version of the machine, if required.



Tape Punch Unit

This unit, and its associated drive mechanism, is mounted on the left-hand side of the machine within the cover, and so does not increase the overall width of the machine. It produces 5-track, ',; 6 inch wide tape at the maximum speed of the associated machine. The tape, which is fully-punched, feeds out from the punch towards the operator from beneath a Vshaped tear-off face. The unit is operated from the receiving mechanism. It therefore records received messages directly, and transmitted messages indirectly via the electrical local record path.

Provision has been made for automatic suppression of punching on up to four selected codes which can be in either or in both shifts. Two of these codes can be employed for mechanical control of the 'Perf On' and 'Perf Off' keys.
There is also provision for the remote control of the 'Perf On' and 'Perf Off' keys via two electromagnets, one for each key. If necessary, the unit can punch all 32 combinations.
Centre feed hole tape punching is standard.
A single make contact set (operating point adjustable) which is wired out to the signals plug provides an alarm for a 'tape reel low' condition. Provision can also be made for sensing the tape some six inches before the punching point. Absence of tape at this sensing point operates another contact set.
The Tape Punch and its associated drive mechanism can be fitted by the customer in the field as the necessary drive cams will be included in the main cam shaft assembly when the machine is built. The controls of the Tape Punch unit are listed in the section headed 'Operator's Controls'.



Tape Reader

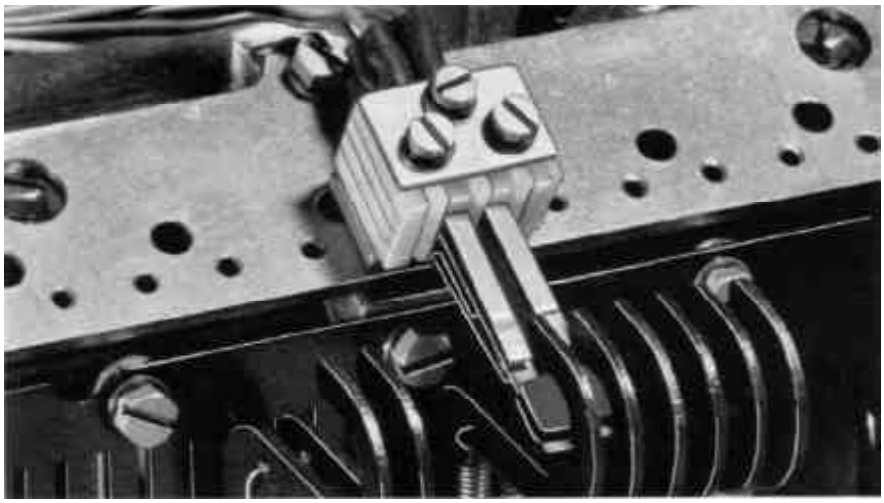
This unit, which is mounted at the righthand side of the keyboard, will read 5-track, 11/16 inch fully-punched and chadless tape at the maximum speed of the associated teleprinter. It is provided with its own cam-driven striker transmitter complete with radio interference suppression circuitry. The tape feeds from right to left and a deflector is provided to guide the tape away from the keyboard and towards the operator after it has been read. When the unit is ON, the teleprinter keyboard is mechanically inhibited, ie the keybars are free but ineffective.

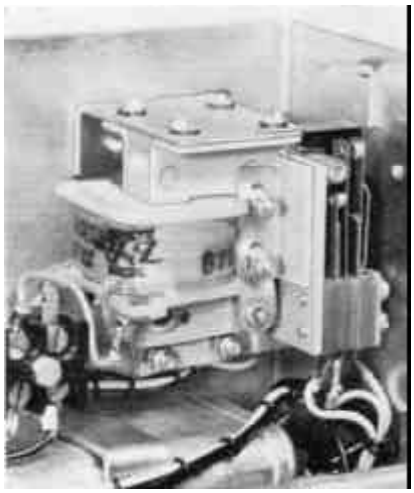
The Reader's transmitter has no Send/Receive Switch of its own but shares the keyboard's transmitter send/receive switch which it controls by means of a push rod. By disabling this control linkage and also the keyboard inhibition device, and by suitably modifying the external electrical control unit, the Tape Reader unit can signal to line while the teleprinter receiver, the Tape Punch, and the keyboard are being used off-line to prepare tape. Under these circumstances the incoming line will generally be terminated by an alarm relay and a circuit arranged to give precedence to the incoming call by operating the electromagnet which arrests the Tape Reader. For single current circuits this electromagnet is in series with the line, and reacts to the call or 'spacing start' signal from the distant station. For double-current circuits, this break-in electromagnet is operated from the control box by a relay. Off-line operation is not possible with the British Post Office version of Model 444 as they require keyboard inhibition on all machines. Electrical indication of the 'Transmitter On' condition is provided by a single changeover contact set operated by the 'On' key. Another changeover contact set indicates when the electromagnetic break-in mechanism is used or when 'tape out' is sensed. Both sets of contacts are wired out to the signals plug and restore when the 'Transmitter Off' key is operated.

No 'tight tape' mechanism is provided. A 'tape out' sensing mechanism is provided which senses the tape once each cycle at a point just behind the reading line, ie the unit will read the last code in the tape and then come to rest.

The controls of the Tape Reader unit are listed in the section headed 'Operator's Controls'.

The unit can be fitted by the customer in the field, as the necessary wiring and drive will be included when the standard machine is built.





Code Recognition Unit (stunt box)

The code recognition unit or 'stunt box' provides means whereby 44 code combinations, in either or in both shifts, can be recognised mechanically and caused to operate an individual contact set. These contact sets can then be used to control switching operations, to switch tape units on or off, to change printing colour, etc. Except for 'Bell' and 'WRU', which are changeovers at British Post Office request, the remainder of these contact sets are normally fleeting single-make, and all operate for some 55 milliseconds in each cycle at 50 bauds. The 'make' time will be reduced at higher operating speeds and will be of the order of 37 ms at 75 bauds. No latching contacts have been provided.

Contacts of the stunt box can also be used to convert incoming 5-unit (or 6-unit) signals into a parallel 5-wire (or 6-wire) output with shift indication.

An additional 40-way signals cord can be provided for the outgoing wiring associated with the code recognition contacts. Two versions of the stunt box are envisaged; a 'full' version, and a 'basic' version.

The full stunt box code bar coding will provide:

- a make contact to operate on each of the 32 codes with contacts operating in both shifts
- a make contact to operate in the 'figures' case for codes 6, 7 and 8 (F, G and H secondary)
- a changeover contact to operate in the 'figures' case for codes 4 and 10 (WRU and Bell)
- five make contacts to give a parallel code output
- one make contact to indicate the 'figure shift' condition
- one contact to operate as a clock pulse making once every receive cycle and having the same timing as the other contacts.

Note that the contacts themselves will only be fitted as required. Arrangements can be varied widely to suit customer's special requirements.

The basic stunt box code bar coding will only provide contacts for the F, G and H secondaries, and for codes 27 to 32 inclusive (ie the usual functional codes). This basic version is to the British Post Office Telex requirements, and in this case only the bell and WRU contact sets will be fitted.

Motor On-Speed Indication

For governed motors a relay can be provided within the motor unit to indicate when the motor shaft has reached governed speed. On synchronous motors a centrifugally-operated switch is used to indicate when the motor has reached 75% of synchronous speed.

Output form for both the governed and the synchronous motors on-speed indication is a single changeover contact set which is wired out to the signals plug.

Finish

Plating and other finishes have been designed to provide protection adequate for indoor use and for storage in temperate climates. This protection is similar in degree to that provided on current Creed equipment.
Subject to certain limitations the finish on Model 444 will also be adequate for general use in tropical climates, although it will not meet all the requirements of some armed forces tropicalisation specifications. For tropical service the standard finishes will have to be supplemented by treating all unplated parts with a corrosion-inhibiting oil after any degreasing solvents have been used, and by the use of dessicants and an airtight container when the machine is put into store.
Visible steel parts of the platen and operator's controls will be stainless steel or matt chrome plate. Parts of the mechanism which are normally free from oil are passivated zinc plate, while steel working parts have a black oxide finish followed by treatment with corrosion-inhibiting oil. Certain steel parts which require a wearresistant surface are hard chrome plated. Finish to machine cover is a stoved epoxy enamel which is not affected by Creed lubricants or by ordinary solvents such as white spirit or trichloroethylene used at room temperatures. This finish will give a degree of protection in tropical environments superior to that obtained from the hammer-effect enamel at present used on Model Seventy-five.
The standard colour for the cover will be the British Post Office Light French Grey, with dark grey for the base tray. The keyboard keybuttons will be matt black with white legends, and the organ-type function control keys mounted above the keyboard are black with a white legend.

Packing

The machine will be shipped inside its silencing cover and tray, secured by nuts screwed to extensions of the two spigots whose primary purpose is to locate the main base casting in the cover tray. When the securing nuts on these spigots are tightened up, the main base is pulled down against its resilient mountings until the four plastic feet on the underside of the base casting make contact with the base tray. This procedure retains the teleprinter securely inside the cover. A third fixing point is provided by a bolt which screws through the base tray into the motor unit base. The silencing cover and lid is then placed over the machine, secured by its two Oddie clips, and the lid is closed.

Hours Counter

An hours counter unit is mounted at the front of the receiver main base and is visible to the operator through a small plastic-filled window located above the keyboard at a point adjacent to the function control keys. It records the length of time the motor is running, up to 9999 hours, and then resets to zero. The driving gears to the counter must be changed for different machine speeds.

End-of-Line Warning

The standard equipment for end-of-line warning is an amber lamp mounted above the keyboard in line with the function control keys and the window of the motor hours counter. This lamp will light when the typebasket is nearing the end of the printing line, and its mechanism can be set by the mechanic to signal at the 54th, 55th, or 56th character of a 69-character line.
A mechanically-operated single-stroke bell can also be provided within the soundreducing cover to signal when the typebasket is nearing the end of a line. The bell operating point is adjustable by the mechanic over the range given below.

line length	earliest bell	latest bell
75 characters	55	66
69 characters	53	64

The bell can also be arranged to ring whenever the secondary code of J (MMSMS) is registered by the receiver.

Two-Colour Printing

An automatic change of printing colour is used to discriminate between messages sent by local keyboard ortape reader, and messages received from line. Provision has been made for remote control of printing colour by means of an electromagnet. Two-colour printing is a standard facility.

J Bell

Secondary interpretation of J code (MMSMS) operates single changeover contact in the code recognition unit (stunt box) for some 55 ms (at 50 bauds) and then restores. Simultaneous mechanical operation of End-of-Line warning bell, if required.

Third Shift

Provision has been made for the use of three shifts on a 5- or 6-unit input. For this mode of operation three characters are fitted to each type bar in the basket instead of the usual two, so increasing the number of possible graphics to 84 (3 x 28). Access to this third shift will be via combination 32 SSSSS, or by any other selected code operating either in letter shift or figure shift, or both shifts. This three-shift facility would enable a full alphabet of capital and small letters, numerals, symbols and punctuation marks to be printed from a 5-unit input. It will also accommodate the large alphabets required by some accented languages, and by data processing systems.
A 'double shift' operation is not necessary to gain access to the third shift as the mechanical construction of the machine is such that any shift can be attained directly from any other.
There is no provision for a full shift lock facility on the third shift in the mechanical design of the keyboard.

Automatic CR/LF

An automatic carriage-return and line feed facility will be made available.

Combined CR/LF

The carriage return and the line feed functions can be combined into one key and one combination, if required. The combined functions can be restricted to one shift if need be.

Paper-Out Contacts

Provision can be made for the paper to be sensed after it leaves the roll and before it passes round the platen roller. The absence of paper at this point can be made to operate a single make contact which is wired out on the signals plug.

Parallel Output (from code recognition unit)

A special version of the keyboard transmitter capable of generating a parallel 5or 6-wire (each with a trip signal) output for data processing applications is
planned as an alternative to the standard serial output.
(A 5- or 6-wire parallel output can also be obtained from the stunt box. See section headed 'Code Recognition').

Horizontal Tabulation

A horizontal tabulation facility is planned. This will be under the control of a special 'TAB' key which will lock down and repeat .space' until released by a pre-set projection on a programming device. The programming device on the sending machine will therefore control the format throughout the circuit.

Six-Unit Operation

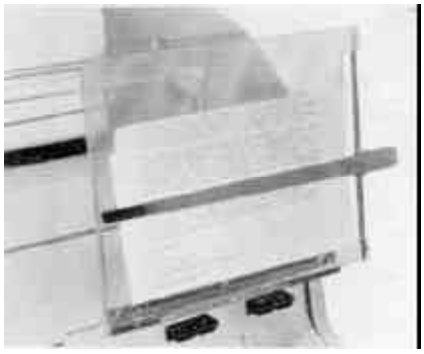
Space has been left throughout the machine for additional components to provide for six-unit operation, including the Tape Punch and the Tape Reader units. This six-unit operation can extend the maximum number of printed characters to 84 (28+28+28)

Parallel Input

A 5- or 6-unit plus trip parallel input unit is available. This unit is located adjacent to the keyboard transmitter and controls the teleprinter receiver through the electrical local record.

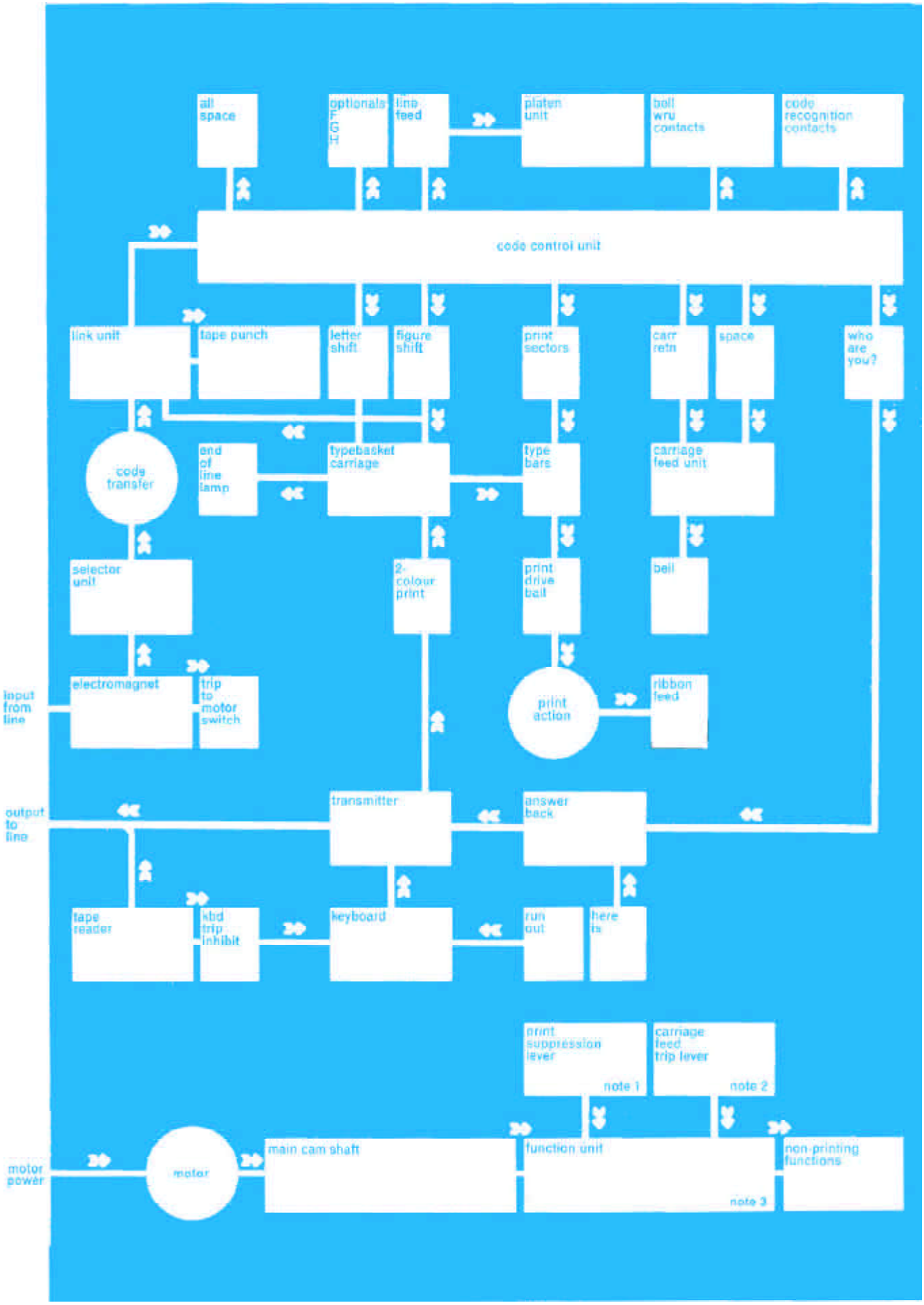
Parallel Output (from keyboard transmitter)

A 5- or 6-wire parallel output can be obtained by serial-to-parallel conversion within the receiver and code recognition unit (stunt box).



Copy Holder

Two forms of copy holder are available: a simple spring wire clip on the right-hand front face of the cover unit as shown on the illustration on page one, and the transparent plastic lectern shown above. The lectern has a horizontal spring-loaded cursor which serves as a retainer for messages and also as a line guide. The whole lectern assembly can slide 5 inches to the right if the operator requires an unobstructed view of the printing line.


all space
optionals
LGT
line feed
platen unit
bell wru contacts
code recognition contacts
code control unit
link unit
tape punch
letter shift
figure shift
print sectors
carr retn
space
who are you?
code transfer
end of line lamp
typebasket carriage
type bars
carriage feed unit
selector unit
2-colour print
print drive bail
bell
input from line
electromagnet
trip to motor switch
print action
ribbon feed
output to line
transmitter
answer back
tape reader
kbd trip inhibit
keyboard
run out
here is
print suppression lever
note 1
carriage feed trip lever
note 2
motor power
motor
main cam shaft
function unit
note 3
non-printing functions

List of Units

keyboard unit
main base unit
keyboard transmitter and answer back
electromagnet and selector unit
side frame (left-hand)
side frame (right-hand)
main camshaft unit link unit
code control unit (code recognition)
function unit
type carriage unit
carriage feed unit
platen unit
hours counter
manual control unit (function keys)
motor unit
layshaft (links motor to main camshaft)
dashpot unit
tape reader unit
tape punch unit
tape punch drive
arm assembly cover unit
signals RIS unit

Model 444 Block Diagram (facing page)
note 1 Print suppression lever inhibits print action on functions.
note 2 Carriage feed trip lever inhibits normal trip to Feed unit on functions.
note 3 Function unit provides power to execute functions.

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