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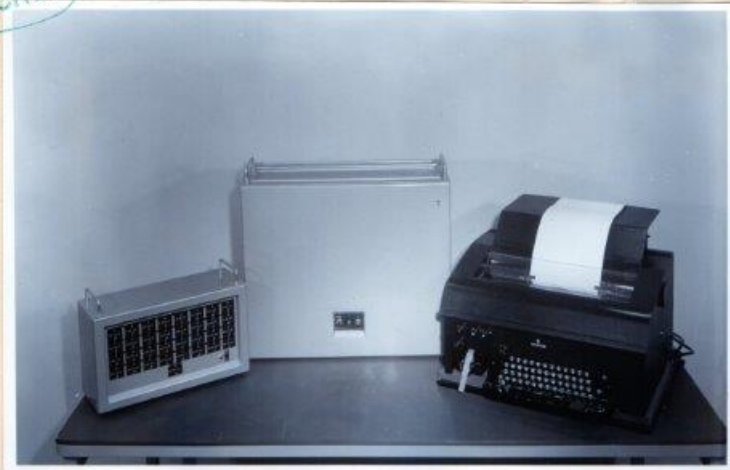
"Philips Usfa Erolet I"
type nr. Us 8020.

For inquiries please apply exclusively
and directly to

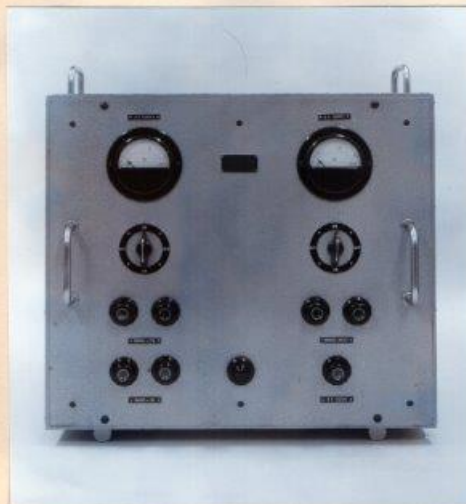
"Philips Usfa N.V."
Schouwbroekseweg 49,
EINDHOVEN.

Netherlands.

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"Philips Usfa Erolet I", type Nr. Us 8020,
with teleprinter and checking counter unit.



Power unit for
"Philips Usfa Erolet I"
type No. Us 8020.

GENERATOR FOR RANDOM SERIES OF SYMBOLS IN THE 5-UNIT CODE
"PHILIPS USFA EROLET I", TYPE NR. Us 8020.

1. General.

The "Erolet I" equipment has been developed by the Netherlands Government's Laboratories and is in production with "Philips Usfa N.V." at Eindhoven.

The "Philips Usfa Erolet I", type nr. Us 8020 is an electronic device, having the character of a roulette (Electronic ROULETTE) destined for the generation of random series of symbols in the 5-unit code.

It is used in combination with one or more teleprinters - which can be equipped with perforators - and/or with detached perforators to lay down the results of the lottery.

All 32 possible symbols of the 5 unit code are available for the Erolet I to compose the random series from. At will, however, the possibilities for the Erolet I to choose from can be limited to any combination of symbols to be designated arbitrarily by means of corresponding switches.

The symbols generated by the roulette can be delivered to the receivers (teleprinters, perforators), either in the form of a continuous series or according to a definite pattern.

2. Construction.

A vertical frame carries a mounting plate, on which plug-in units are fixed. On the rear-side of the plate boxes are mounted containing the diodes. A pertinax plate parallel with the mounting plate and in front of it keeps the plug-in units in place. The electronic tubes of the units are located on the front-side of the pertinax plate. A metal case envelopes the combination. The space inside this case is divided in three compartments by mounting plate and pertinax plate.

The inner compartment is cooled by means of a ventilator, in order to prevent the temperature from rising too high.

The front of the case comprises a door, which can be closed with two keys and behind which the control panel is situated.

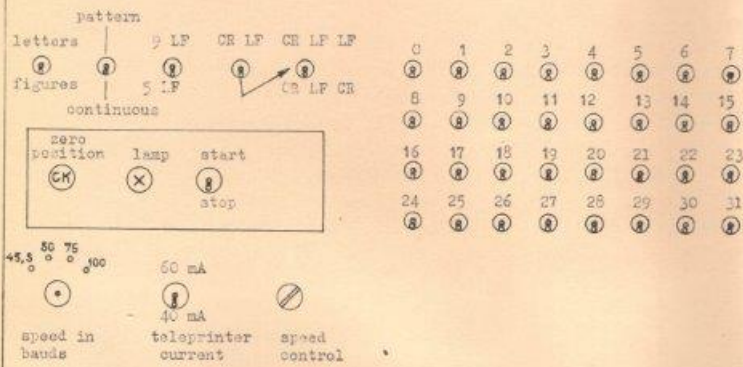
The door has an opening for the control key, the start-stop

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Fig. 1.



"Philips Hefa Erolet I" type no.Us 8020. Interior (front) with control panel.



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switch and the neon lamp, which glows when the equipment is switched on (See fig. 1, framed part). The rest of the switches on the control panel can only be reached after the door has been unlocked. Therefore unauthorized personnel is not in the position to make changes in the adjustments.

The connections with the power unit, the reproducers and with a separate box containing 33 checking counters pass through the case at the rear end.

The dimensions (h x w x d) are :

625 x 665 x 325 (mm) (24.6" x 26.2" x 12.4") (Erolet I proper)

550 x 535 x 415 (mm) (20.9" x 21.1" x 16.3") (power unit)

335 x 470 x 180 (mm) (13.2" x 18.5" x 7.1") (counter unit)

The weight of Erolet I is about 60 kg (132 lbs), that of the power unit is about 86.5 kg (190 lbs), of the counter unit 17.2 kg (38 lbs).

3. Electrical outlay.

Fig. 2 gives the block diagram. The Erolet I comprises 69 plug-in units, 38 electronic tubes and 454 diodes (rectifier cells). Further there are a small number of relays of which one in the apparatus proper, the other ones serving secondary functions. The equipment also comprises a thermo switch, interrupting the power supply in case of overheating. The "Philips Usfa Erolet I" type nr Us 8020 is adapted for ac mains, 50 or 60 c/sec, of 110, 127 or 220 Volts. The generating speed of the Erolet I can be chosen to be 364, 400, 600 or 800 symbols per minute, corresponding with speeds of 45.5 50 75 or 100 bauds of the receivers used. The equipment can be adapted to receivers of 40 milliamps and those of 60 milliamps by simple means of switching. The power consumption of the Erolet I equipment is about 400 Watts.

Admissible mains voltage fluctuations : (- 20%, + 10%).

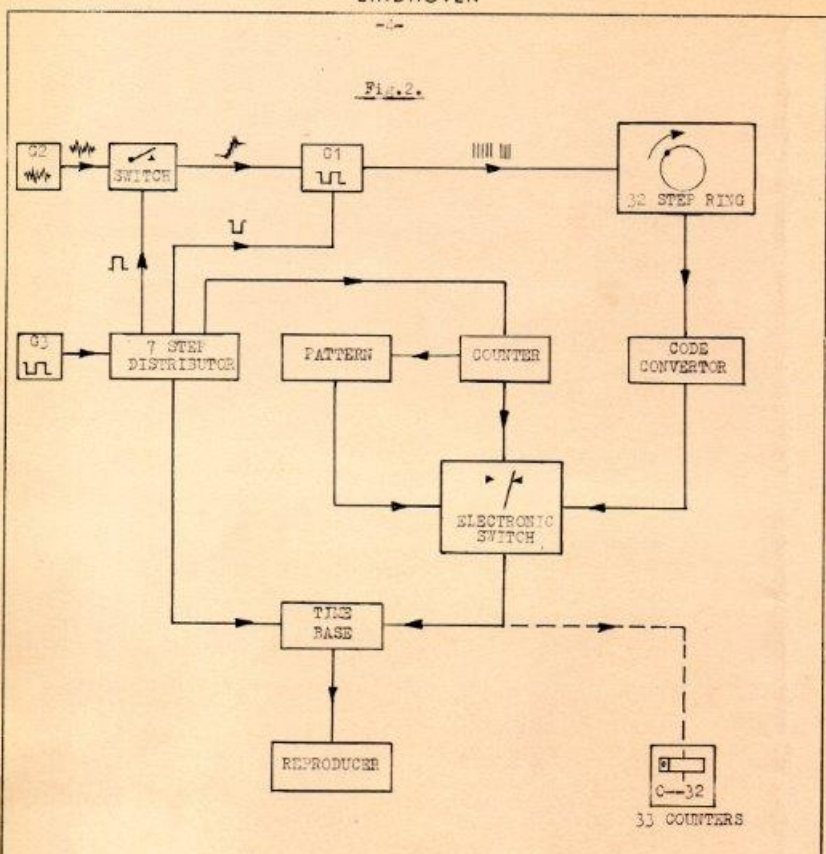
4. Operation. See figs. 1 and 2.

By means of the selector switch at the lower left hand side (fig. 1) the equipment is adapted to the speed of the printer (or perforator) i.e. either 45.5 50 75 or 100 bauds (signals of 7.5 units). At 50 bauds e.g. the equipments produces

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Fig. 2.



Blockdiagram
"Philips Uefa Brolet I" type nr. Ua 0020.

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400 characters per minute.

At this position of the selector switch (50 bauds) the frequency of the generator G3 (see fig. 2), controlling the transmission speed of the equipment, can be checked.

For this purpose a built-in neon lamp and a standard teleprinter tuning fork supplied with the equipment are utilized. Adjustment takes place by means of a potentiometer (lower right hand side of fig. 1). A switch located between this potentiometer and the selector switch for the transmission speed can be put on "40 milliamps" or "60 milliamps" depending on the type of receivers used.

The position of the second switch from the left (fig. 1) in the upper row determines the form in which the key text appears, i.e. as a continuous series of characters or according to a pattern. This pattern then consists of blocks of 10 lines, with 10 groups of 5 characters in every line. In case "pattern" has been chosen it is possible to determine with the first switch in the upper row whether the teleprinter will work in the letter- or figureshift. The third switch determines whether there will be 9 or 5 line spaces between the blocks. By means of the last two switches in the upper row the operational signals for the carriage of the teleprinter receiver after each line in the blocks can be chosen.

The choice is between : "carriage return, line feed", "carriage return, line feed, line feed" and "carriage return, line feed, carriage return".

In both cases, i.e. with production of the characters in a continuous series as well as when production according to a pattern has been chosen, the different symbols to be used for the key must be selected, which is done by means of the 32 switches at the right hand side in fig. 1. For production in a continuous series one obviously is completely free in his choice. In the other case - production in pattern form and especially for page printing - it is necessary to restrict the choice to the characters of either the letter shift or the figure shift. The choice of the form of presentation and the selection of the symbols used will depend on the application

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envisaged. As an example, tape punched with random continuous series composed of all 32 characters is especially suitable for use as key tape for 32 character "on-line" crypto systems. Obviously, for use with all-letter equipment, one has to limit the choice to the corresponding symbols.

After the selections described in the preceding part of this paragraph have been made, the door of the case is closed and the equipment can be put in operation. The power supply unit is switched on separately, after which the neon lamp on the Erolet I lights up. Then, with the only visible switch on the locked "Erolet I" the equipment is started. If necessary, the pattern device can be brought in the zero position by means of the control key (CK, fig. 1).

5. Functioning.

The roulette proper (32 step ring, see fig. 2) consists of 32 electronic elements connected in the form of a ring. Each of the elements corresponds with a certain symbol. The elements not selected via the switches 0 - 31 are excluded from the rotation of the roulette. The 32 ring elements are connected with a static electronic code converter (fig. 2) which - over its 5 terminals - delivers the correct 5 signal elements for each ring element as chosen at random. The choice takes place through the roulette each time receiving impulses from the generator G1 during a definite period, whereas the frequency of this generator has been adjusted at random. (The random choice of the symbols therefore does not take place by impulses of fixed frequency produced during a random period of time, because that would allow less variation and moreover the symbols would not be delivered in a definite rhythm). In case the equipment has been switched on 50 bauds, the generator G1 functions during a definite period of 140 milliseconds, is then stopped during 10 milliseconds and again functions during 140 milliseconds, etc. The random adjustment of the frequency of G1 is obtained through G1 during the stopping period being connected with a noise generator G2. The latter comprises a gas diode, the "noise" of which is amplified.

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The value of such a noise potential varies at random with time. The frequency of G1 is proportional to the potential on a condenser. Every time during the 10 milliseconds' stopping period of G1, the noise generator is connected with this condenser, the potential of which follows the noise potential.

After disconnecting G2, G1 functions during 140 milliseconds with a potential equal to the noise potential at the moment of switching-off. In this way it is made sure that the frequency of G1 in each 140 milliseconds' working period will be fully independent of that in the preceding one. The frequency can vary between 8 and 40 kc/sec. The lengths of the working and stopping periods of G1 are controlled by a generator G3 and a 7 step distributor. For 50 bauds G3 has a frequency of 50 c/sec. Impulses from G3 control the 7 step distributor and the latter controls the switch between G1 and G2 via a relay. During the stopping of G1 the 5 signal elements of the symbol corresponding with the last ring-element having received an impulse from G1, appear on the 5 terminals of the code-converter (fig. 2). Via an electronic switch, these signal elements are put on a time base controlled by the 7 step distributor, and then are transmitted to the reproducer(s) in sequence of time.

In case the equipment has been put on "continuous" (fig. 1) the electronic switch stays in the position indicated in fig. 2 and a continuous series of signals is delivered to the reproducer(s).

If, however, the equipment is switched for obtaining a pattern, the delivery of symbols from the code converter to the time base does not take place continuously. In that case, after every cycle, the 7 step distributor gives an impulse to a counter indicating that a signal has been produced. This counter controls the position of the electronic switch. The latter is in the left hand position after the control key CK has been pushed in, so that the time base is no more connected with the code converter but with the pattern device. This device first gives a preamble stretch built up from several times "5 blank", "carriage return", "line feed", several times "letters" (or "figures" as the case may be; facilitating the tape to be torn

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off afterwards), 5 or 9 times "line feed" (space between the blocks), a number of times "5 blank" (space for numbering the tape), several times "letters" (as mark for correctly putting the tape on the tape reader), then "carriage return", "line feed", after which the electronic switch will come back in the position given in fig. 2. After 5 signals the counter will put the switch back again to the left hand position. Now the pattern device takes care that 2 times "space" is transmitted to the reproducer, after which the electronic switch falls back again in the position as given in fig. 2. This happens 9 times. The 10th time, the pattern device gives e.g. "carriage return" and "line feed". After 10 lines of text have been produced, the pattern device again gives the preamble stretch and a new block begins.

(In the preceding paragraph the form of the pattern chosen for Erolet I, type no. Us 8020 has been described at some length. It will be understood, however, that changing the pattern program is feasible and relatively simple).

6. Checking.

If so desired it is possible to switch in 33 electro-mechanical counters (connection indicated by dashes in fig. 2). 32 of these count the number of times that each symbol has been produced, whereas the 33rd counter totals the number of symbols delivered. The counters can easily be reset on zero by hand.

7. Security.

For this purpose the thermo switch and a security relay have been introduced. The first one disconnects the equipment from the mains in case the temperature would become too high through any accidental cause. The security relay stops the Erolet I in case it notes that the frequency of the generator G1 has stopped changing.

8. Summary.

The "Philips Ufa Erolet I" equipment in combination with teleprinter(s) and perforator(s) produces random series of

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characters, page-printed or punched in tape. The characters utilized for composing the series can be selected arbitrarily and the production can take place continuously or in the form of a definite pattern.

Keying material for cryptographic application can be produced e.g. as :

- a) 32 character perforated continuous tapes for 32 character "on-line" systems;
- b) 26 letters perforated tapes and/or printed pages, either continuous or in blocks of 10 lines each with 10 groups of 5 letters;
- c) 10 figure perforated tapes and/or printed pages, continuous or in blocks;
- d) perforated tapes and/or printed pages with any number of letters under 26 or with any number of characters of the figure shift.

The equipment has the following characteristics :

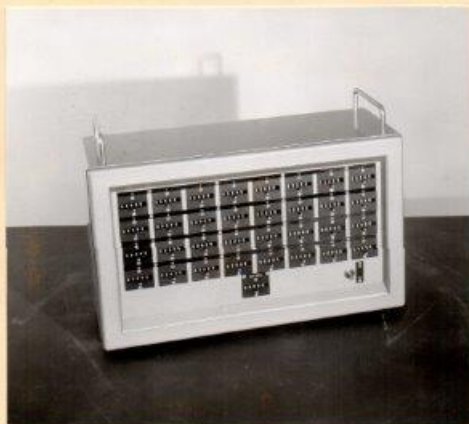
1. Weights : about 60 kg (132 lbs) (Erolet I proper)
86.5 kg (190 lbs) (Power unit)
17.2 kg (38 lbs) (Counter unit)
2. Dimensions : 625 x 665 x 325 (mm) (24.6" x 26.2" x 12.4")
(Erolet I proper)
530 x 535 x 415 (mm) (20.9" x 21.1" x 16.3")
(Power unit)
335 x 470 x 180 (mm) (13.2" x 18.5" x 7.1")
(Counter unit)
3. Power consumption about 400 Watts.
4. Adapted for ac, 50 or 60 c/sec of 110, 127 or 220 Volts.
5. Admissible variation of mains voltage : (- 20%, + 10%)
6. Adapted for teleprinter or perforator currents of 40 and 60 milliamp.
7. Adaptable by simple selector switch to transmission speeds of 45.5 50 75 and 100 bauds.
8. Automatic stopping of the equipment if the random noise generator would happen to fail.

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9. Automatic disconnection from the mains in case the temperature becomes too high.
10. Four separate terminals for connecting reproducers (teleprinters and/or perforators).
11. Generation of random series of characters delivered at will in a continuous sequence or in the form of a definite pattern.
12. The individual symbols and the number (up to 32) of those to be used for the composition of the random series can be chosen arbitrarily.
13. Production capacity 24.000 characters per hour if using normal reproducers with speed of 50 bauds. If reproducers of 100 bauds are available, the production capacity is 48.000 characters per hour.



Checking counter unit.