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AROFLEX CRYPTO EQUIPMENT UA8116 SERIES

Operating instructions

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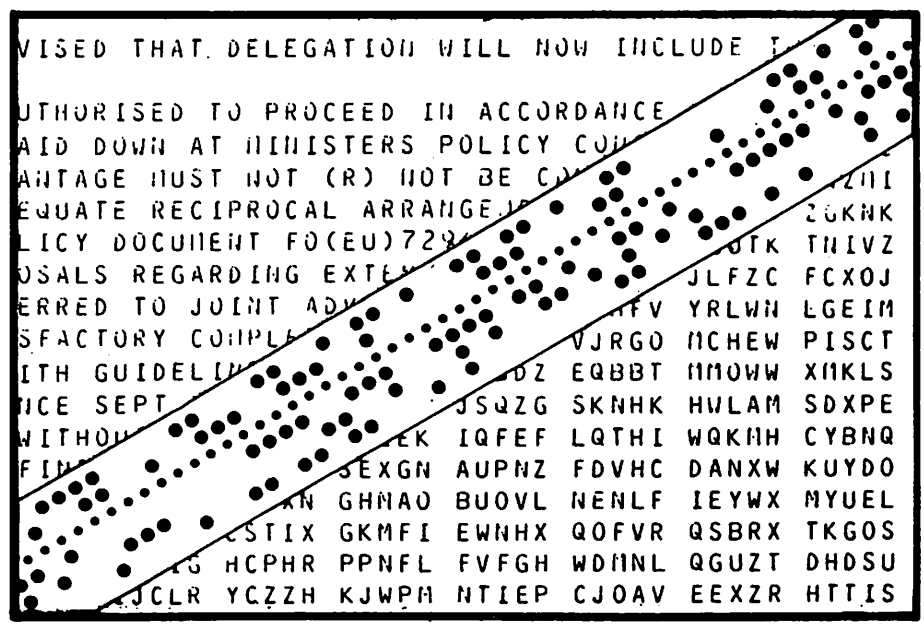

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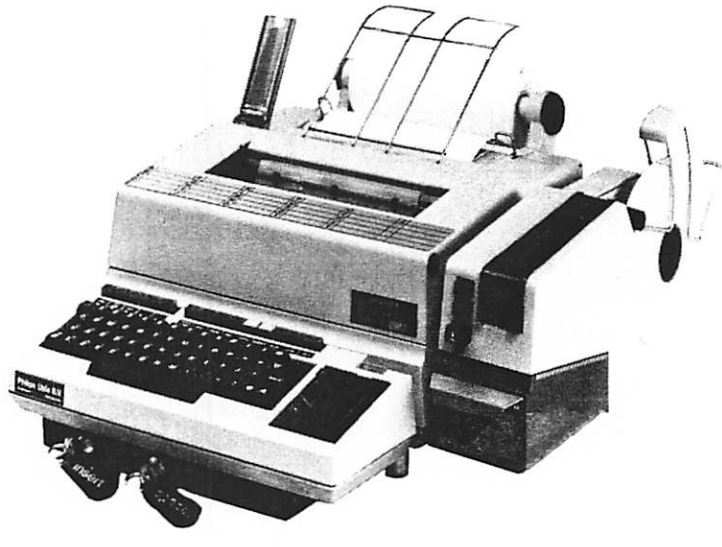

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Section 1 Description

1.1 Introduction

AROFLEX is a compact, self-contained and highly automated combination of a Siemens T1000 teleprinter and a microprocessor-oriented crypto module by Philips Usfa. It is capable of rapid encryption and decryption, with crypto text formatted in 5-letter groups in the English alphabet. It meets the requirements of MCM 46-72 and its operation allows of complete adherence to the ACP-127 procedures.
Two principal modes of operation are incorporated. In the DIRECT mode the input is processed immediately to produce the cryptogram or deciphered message. In the INDIRECT mode the input is printed "as entered," stored internally as crypto text, and output (as cryptogram or deciphered message) in a second operation. The input can therefore be monitored and, if necessary, corrected to eliminate errors.
AROFLEX is equipped with 26 separate key stores, namely 23 "normal" key stores, 2 "special" key stores and 1 "indicator" key store. A lightweight optical tape reader and a clip-on tape punch ensure maximum applicability, and the equipment can be supplied with appropriate line-terminating circuitry for all types of line.

1.2 Applications

AROFLEX can be employed for the following purposes:

- self-contained rapid off-line encryption and decryption
- message preparation with or without instant encryption
- on-line, real-time decryption
- line-connected transmission of previously encrypted text
- end-to-end encryption over telex, ARQ, message-switching and circuit-switching systems, with routing indicators in clear text and contents of the message in crypto
- as a teleprinter with all modern characteristics for transmission and reception of clear text.

AROFLEX makes very little noise in any mode, and can be used without soundproofing or acoustic hoods.

1.3 Cryptographic data

The 26 keysetting stores (compartments) of AROFLEX can be filled from the keying lists by means of the keyboard or tape reader; each keysetting results in a pre-calculated check word so that an immediate check on the correct keysetting (and hence on the correct operation of the equipment) is provided.
Keysettings cannot be recalled after they have been inserted. Hold cells are incorporated to prevent loss of keysetting because of power failures. Keysettings can only be inserted after the physical INSERT key has been turned. The 2 keysetting compartments intended for SPECAT traffic are accessible for keysetting, encryption or decryption only after the SPECAT key has been turned in the SPECAT lock.
The keysettings consist of the compartment address (A . . . Z), a 5-figure indicator, 24 random characters, and the 5-letter check word. In case of emergency, the keysettings can very rapidly be destroyed by actuating the ZEROIZING push-button.
Each message is provided with an automatically generated random message key which prevents overlap and allows repeated use of one keysetting. Ample ComSec measures, such as a shunt device for clear text, are provided to prevent the inadvertent transmission of plain text. Fail-safe supervisory circuits result in immediate crypto alarm in case of single or multiple component failure in essential circuits. On-the-spot production of keysetting lists is possible.

1.4 Operational features

Decryption, whether OFF-LINE or in the line-connected mode, is entirely automatic, with automatic selection of the correct keysetting. The crypto output, consisting of 5-letter groups in accordance with the ACP-127 format, is always printable and conforms with the current formatting arrangements, with automatic page numbering; the group count is printed at the end of the cryptogram.
The crypto memory can store up to 6 pages of crypto text. Correction of input is possible without losing cryptosynchrony.

When an operator makes a mistake in operation or procedure, AROFLEX gives an automatic warning signal (3 rings) and blocks the keyboard and tape reader till the mistake has been corrected. The automatic group count, paging procedure, crypto procedure and End of Message function, combined with the possibility of correcting the clear text message preparation, make for a simple, versatile equipment. The monitoring of the input is a useful feature.
The page copy of all outgoing traffic, which contains a clear indication of the moment when enciphering was started and terminated, permits effective control over the traffic.
The keyboard is equipped with a special key for the Message Validation Signal (Nabla sign, figs H). It also contains an automatic Figures/Letters shift, which comes into action when it is needed; actuation of the "Letters" or "Figures" buttons is not necessary.

The device is equipped with a keyboard memory of 10 characters.

The "Who Are You?" and "Here Is" keys are also accommodated on the keyboard.

The page printer is equipped with an automatic New Line function (CR + LF) which comes into action after the typing of the 69th character or 72nd character on a line, depending upon an adjustment in the telepinter.
This New Line function is not punched or stored in the message memory and serves solely to avoid the typing of a complete line on a single spot if a Carriage Return or Line Feed is omitted or garbled.

1.5 Leading particulars

Input	Keyboard; tape reader; line
Output	Page copy; punched tape; line
Operating modes	Clear text on-line Crypto off-line and crypto line-connected Message preparation With or without monitoring of input Always with automatic decryption
Formatting arrangements	In accordance with ACP-127, i.e. - Format Lines 1 . . .4 without counting LFs - Format Lines 5 . . .11, counting LFs - Automatic paging procedure after every 20 lines - Automatic termination of messages - Maximum 6 pages
Height	265 mm without roll of paper 320 mm with roll of paper
Depth	545 mm without roll of paper 600 mm with roll of paper
Width	530 mm including clip-on tape punch
Weight	25 kg including tape punch
Operating temperature range	– 10° C to + 55° C
Power supply	110 or 220 Vac ± 10%, 50, 60 Hz
Power consumption	150 VA in full operation, 40VA standby
Operating speeds	50, 75 or 100 Baud line-connected 100 Baud off-line
Telegraph code	ITA Code No. 2 (CCITT Alphabet No. 5)

Section 2 Operating controls

The position numbers in the first column, and in parentheses in the text, refer to figure 3.

Pos	Name	Function
1	LINE button	Spring-loaded button for connecting AROFLEX to the line, starting from the standby mode. No function in the OFF-LINE mode. Flashing lamp inside button indicates end of paper roll.
2	OFF-LINE button	Spring-loaded button for putting AROFLEX into the OFF-LINE mode, starting from the standby mode. Lamp is lit when AROFLEX is in the OFF-LINE mode.
3	OUT button	Spring-loaded button for putting AROFLEX into the standby mode from either the line-connected mode or the OFF-LINE mode. Lamp inside button is lit when AROFLEX is in the line-connected mode.
4	--	Spare button, to be used for telex networks etc.
5	--	Spare button, to be used for telex networks etc.
6	PUNCH STANDBY	Two-position button for putting the tape punch into the standby mode for line-connected operation so that all incoming traffic is punched and printed. Depressed position is the PUNCH STANDBY position.
7	PROCEDURE button	Two-position button for starting and terminating the enciphering process. When the button is pushed down, the red lamp inside the button is lit and AROFLEX is ready to carry out the crypto procedure as described in paragraph 4.5.1. After the crypto procedure the clear text heading of Format Lines 1 . . . 4 (if required) may be put in, without counting Line Feeds. Lit lamp denotes PROCEDURE mode. Releasing the button terminates the enciphering process.

Pos	Name	Function
8	PREAMBLE button	Spring-loaded button for putting AROFLEX into the PREAMBLE mode for inputting of Format Lines 5 . . .11 and, if required, Format Lines 14 and 15 before the End of Message function. The Line Feeds of Format Lines 5 . . .11 are counted for the paging procedure. Lit lamp indicates PREAMBLE mode.
9	ENCI button	Spring-loaded button for selecting the enciphering function (indicated by lit lamp). In the DIRECT mode, printing/punching of the cryptogram begins immediately when the ENCI button is pressed, and is terminated by releasing the PROCEDURE button or by pushing the PREAMBLE button (for entering Format Lines 14 and 15 in clear text) and then releasing the PROCEDURE button to generate the EOM. When the ENCI button is pressed in the INDIRECT mode, AROFLEX prints ten slants (//////////) to indicate the point at which enciphering begins. The input is printed/punched in clear text. When enciphering in the INDIRECT mode is terminated (by releasing the PROCEDURE button or pushing the PREAMBLE button) ten slants are printed again.
10	OUTPUT button	Spring-loaded button for producing the enciphered or deciphered output prepared in the INDIRECT mode. The lamp inside the button is lit during production of the output. Pushing the lit button twice stops the output and starts it again at the beginning; the output can be repeated as many times as required. If the OUTPUT lamp lights during enciphering in the INDIRECT mode (accompanied by the procedure signal and blocked keyboard) the memory is full, and enciphering must be terminated in order not to exceed the permitted maximum length of a cryptogram according to ACP-127. In the DIRECT mode it is possible to continue the cryptogram (contrary to ACP-127) to 99 complete pages; the deciphering of such an extremely long cryptogram should also be done in the DIRECT mode.

Pos	Name	Function
11	INDIRECT button	Two-position button for putting AROFLEX into the DIRECT or INDIRECT mode. The INDIRECT mode is selected by pushing the INDIRECT button and is indicated by the lit lamp. The mode of operation must be selected before starting to encipher or decipher. When lit, the lamp inside the INDIRECT button signifies "text in memory". A change from INDIRECT to DIRECT or vice versa resets the memory and extinguishes the lamp.
12	PLAIN button	Two-position button for putting AROFLEX into the PLAIN text mode, indicated by lit lamp and depressed button. Pushing and releasing the PLAIN button clears message memory.
13	CORRECTION button	Spring-loaded pushbutton for character-by-character correction of: – input in the INDIRECT DECI mode – input in the INDIRECT ENCI mode – input for paging information – typed-in manual message key (see paragraph 7.4 and Figure 2) The lamp inside this button has 3 functions: – steady burning in the DECI mode indicates incorrect format – slow blinking + procedure signal in the DECI mode after the 11th group indicates the "no key" condition – fast blinking + procedure signal in any mode indicates a SPECAT condition: the SPECAT key (22) must be inserted and turned before the operation (keysetting, enciphering or deciphering) can proceed, using key compartment X or Y.
14	DECI button	Two-position pushbutton for selecting the deciphering function, indicated by lit lamp.
15	Tape punch on/off	Spring-loaded pushbutton for switching the tape punch on and off; lit lamp inside the button indicates that the punch is switched on. In the line-connected mode this control is overruled by the depressed PUNCH STANDBY button(6).

Pos	Name	Function
16	Tape run out	Spring-loaded button for punching "Letters" continuously, regardless of operating mode or punch activation.
17	Tape backspacer	Spring-loaded button for backspacing the tape for correction ("lettering out"); tape is backstepped one character when the button is pressed firmly.
18	Tape retaining catch	Small two-position catch under the plastic cover, used for lifting the tape retaining pad when a new tape is being inserted; when the catch is pressed home, the punch automatically punches approximately 20 "Letters".
19	Taut-tape contact	Tape for reader must be passed upwards over this contact so that a jammed tape will stop the reader.
20	Tape reader on/off	Spring-loaded button for starting and stopping the tape reader; when tape has been inserted and the cover (21) is closed, pressing the button for a very short time (less than 1/4 second) will advance the tape one character. Pressing the button for a longer time (about 1/2 second) will make the reader step continuously. Pushing the button whilst the reader is stepping will stop the reader.
21	Tape reader cover	Catch-retained cover for opening the tape reader so that a tape can be inserted, engaging the transport holes in the sprocket wheel.
22	SPECAT lock	Lock for inserting and turning the physical SPECAT key for operating with key stores X or Y. The necessity for turning the SPECAT key is indicated by the fast blinking of the CORRECTION lamp (13).

Pos	Name	Function
23	"Zeroize" button	Red spring-loaded button for zeroïzing the key stores and crypto memory in case of emergency. The button must also be used for switching off the hold batteries when AROFLEX is disconnected from the mains and the contents of the crypto memory are to be zeroïzed. Pushing the button extinguishes the drain indicator (25).
24	INSERT lock	Lock for inserting and turning the physical INSERT key for key-setting purposes.
25	Drain indicator	Red light-emitting diode, lit when the "hold" batteries are being drained to retain the contents of the key compartments and crypto memory (for instance during interruptions in the power supply). The fully charged hold batteries keep the memory alive for about 90 minutes. The indicator lights up as soon at the plug is pulled from the mains. The hold batteries are switched off automatically when the output voltage drops below a certain threshold. The hold batteries are constantly trickle-charged as long as AROFLEX is connected to the mains. The indicator is extinguished when the "Zeroize" button (23) is pushed.
26	Connector (front)	For connecting a stand-alone tape punch.
27	Connector (centre)	For connecting a stand-alone tape reader.
28	Connector (rear)	For connecting the warning lamp and shunt device in the line-connected mode.

Section 3 Installation

3.1 Unpacking

1. Lift the insert out of the wooden transport case.
2. Lift the AROFLEX out of the box with the aid of the two ropes, taking care that the right-hand rope does not become entangled with the tape holder of the tape punch.
3. Remove the 4 M8 bolts and large washers from the underside of the padded wooden baseplate.
4. Take the INSERT and SPECAT keys out of the chad container.
5. Store the packing material for future use.

3.2 Installation

3.2.1. For stationary use inside a building

1. Place AROFLEX on the desk or table, check that the mains voltage is 220 volts, and insert the plug into a rim-earthed socket. The lamp inside the LINE button blinks slowly to indicate that there is no paper roll in place.
2. If AROFLEX is to be used in the line-connected mode, terminate the line on the 8-pole line socket.
3. Provide a secure connection to a signal ground to be connected to the wing nut at the rear of the teleprinter, next to the tape punch.

3.2.2. For mobile use in ships and vehicles

1. Place AROFLEX on rubber cushion on top of metal baseplate, and secure by means of four bolt-assemblies (see figure 1).
   Make sure that all rubber washers and spacers fit snugly into the holes provided on the baseplate and the rubber cushion.
2. Fix the metal baseplate (mounting support) to the operating surface by any convenient means using the holes provided for this purpose.

3.3 Mains Supply

The equipment is set for operation from a 220-volt, 50/60 Hz mains supply via rim-earthed "SHUKO" sockets. A spare socket is provided for those places where another type of mains socket is in use.

To operate AROFLEX from a 110-volt mains supply, the power supply unit must be removed and, after opening, be adjusted for 110 volts.

To operate AROFLEX from a dc supply, a dc-to-220Vac converter must be used.

3.4 Preparation

1. Unlock the printing-head assembly by releasing the metal latch which locks the printing head to the rail.

2. Insert a roll of paper as shown in the diagram under the hood.

3. Put the mains plug into the socket. A relay will be heard to energize; AROFLEX is now in the STANDBY mode.
   An automatically switched fan controls the cooling of the power supply unit.

4. Insert a roll of tape in the punch as shown in the diagram on the side of the punch. Release catch (18) under the punch cover so that the tape can be slid in easily. Snap catch (18) into position after the tape has passed underneath it; a number of "Letters" will be punched automatically.

5. Blinking of the LINE lamp (1) indicates that there is no paper for the page copy or that the hood is not closed.

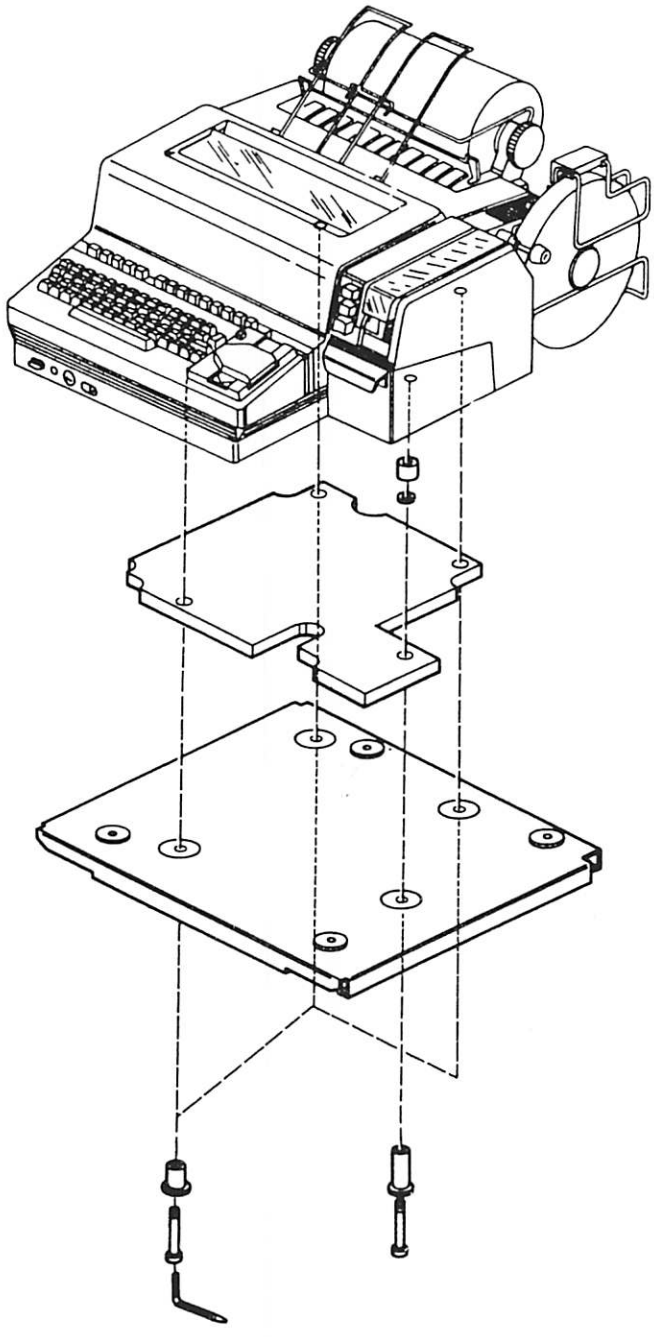


Figure 1: Mounting details

6. AROFLEX is switched into the OFF-LINE mode by pushing the spring-loaded OFF-LINE button (2). The lamp inside this button lights.
   To switch AROFLEX back into the STANDBY mode, with the contents of the memory still alive, push the OUT button (3). All lamps will now be extinguished.

7. AROFLEX is switched off completely only when the mains supply is switched off.
   As soon as AROFLEX is switched off, the Battery Drain Indicator (25) lights, denoting that the hold batteries are switched on to keep the contents of the memory alive.
   The batteries can supply the memory for about 90 minutes and are switched off automatically as soon as the battery voltage drops below a pre-set threshold value. To stop the drain (and consequently reset the memory to zero) push the red "zeroize" button (23) thereby extinguishing the Battery Drain Indicator (25).

3.5 Packing

As unpacking, in the reverse order. Do not forget to secure the printing-head assembly by inserting the latch at the left side of the rail into the notch on the printing head.
Push the red "zeroize" button (23) to make sure that the Battery Drain Indicator (25) is switched off and that all memories are reset.
The baseplate can be fixed to AROFLEX when the equipment is tilted to one side, with the punch uppermost.

Section 4 Operating instructions: OFF-LINE operation

4.1. Introduction

In each of the following procedures it is assumed that the operator starts with all pushbuttons released and lamps extinguished.
A concise summary of all operating instructions is given on the AROFLEX instruction card.

4.2. Operation in Plain Text mode

1. Push OFF-LINE button (2) and PLAIN button (12).
   The lamps inside both buttons light. Text put in via the keyboard or tape reader is printed and punched.

2. As long as PLAIN button (12) is pressed, any other mode of operation is inhibited. Attempts to assume other modes of operation result in the procedure signal only.

3. Mistakes in the input can be corrected by "lettering out" the wrong characters. The tape must be backstepped the required number of steps and the "A . . . " (Letters) key actuated accordingly.

4.3. Keysetting

1. Push the OFF-LINE button (2).

2. Insert and turn the physical INSERT key in the INSERT lock (24): AROFLEX automatically prints "INSERT" to indicate that all compartments are available for keysetting.

3. Select the required key compartment by typing its address character on the keyboard: A . . . W for normal keys, X and Y for SPECAT keys and Z for the indicator key for automatic enciphering/deciphering of the serial number of the keysetting. The selected compartment letter is printed.

NOTES

(1) When a SPECAT compartment (X or Y) is selected, the procedure signal sounds and the CORRECTION lamp flashes rapidly; the SPECAT key must be inserted and turned in the SPECAT lock before proceeding with step 4.

(2) If an indicator key is stored in compartment Z, the first and last group of each cryptogram contain the enciphered serial number of the key used for enciphering the message. If compartment Z is empty each cryptogram begins and ends with the group ZZZZZ.

4. From the key list, type the 5-figure serial number of the required key, the key itself (24 alphabetical characters) and the checkword (5 alphabetical characters); the key is not printed. For keysetting from punched tape, refer to step 9.

5. If all 29 alphabetical characters have been entered correctly, AROFLEX prints the checkword; the fact that this matches the checkword in the key list provides a positive indication that AROFLEX is operating properly and that the key has been inserted correctly.

6. Type a CR or LF. AROFLEX prints INSERT on a new line. Steps 3 and 4 can now be repeated for the next key.

7. If a mistake has been made during the typing of the key or checkword, the procedure signal sounds as the 29th character is typed, and AROFLEX prints two checkwords - the first "as typed" and the second "as calculated". The selected compartment cannot be used for enciphering or deciphering, and therefore Steps 3 and 4 must be repeated after typing a CR or LF. (AROFLEX prints INSERT, and all compartments are available for keysetting; keys previously set in other compartments are not affected.)

8. It is also possible to insert a key without typing the checkword. If a CR or LF is typed after the 24th character of the key, AROFLEX will calculate and print the checkword corresponding to the key "as typed;" this must be checked against the required checkword as shown on the key list. Typing another CR or LF then returns AROFLEX to the INSERT condition as in Step 6.

9. Keys can also be inserted from punched tape; the compartment address can be entered from the keyboard, after which the key can be entered from the tape reader. AROFLEX prints the serial number and checkword of the key, after which the tape reader stops. If each key on the tape finishes with a CR or LF, the next INSERT can be produced by restarting the tape (AROFLEX prints INSERT and the reader stops so that the compartment address can be typed in). If the tape does not contain CR or LF, the next INSERT must be produced by entering CR or LF from the keyboard.

10. The checkword, key serial number or destination can be noted on the AROFLEX tote plate, using a glass marker.

11. When key insertion is complete, remove and store the physical INSERT and SPECAT keys. Push the OUT button (3) to put AROFLEX into the standby condition.

12. To zeroize all keysettings instantly, push the red "zeroize" button (23) on the front of the crypto module; this also switches off the hold batteries.

4.4 Selection of DIRECT or INDIRECT mode

The operating mode must be selected before enciphering or deciphering commences.

In general, the DIRECT mode is used when the input is already on punched tape and need not be monitored; the desired result — cryptogram or deciphered text — appears almost simultaneously with the input. The INDIRECT mode is normally used when the input is to take place from the keyboard and monitoring of the input is operationally desirable; the desired result is produced by pressing the OUTPUT button.

The INDIRECT mode is selected by pressing the dual-action INDIRECT button (11), which latches in the "down" position; the DIRECT mode is selected by releasing the button.

In the INDIRECT mode, the lamp inside the INDIRECT button signifies "text in memory" and is controlled by other crypto controls, as described in the procedures which follow. In the DIRECT mode the lamp is extinguished.

4.5 Enciphering

4.5.1 Crypto procedure

The following crypto procedure must be completed before starting to encipher.

1.	Push OFF-LINE button (2)	Lamp lights inside button
2.	Push PROC button (7)	Lamp lights inside button. AROFLEX prints serial number and checkword of indicator key (if present), followed by SELECT on new line.

3.	Type address character of required key compartment	AROFLEX prints address character. If selected compartment is A . . . W, AROFLEX prints serial number and checkword of key, followed by PAGE 1 on new line. If selected compartment is X or Y, procedure signal sounds and CORR lamp (13) flashes rapidly; SPECAT key must be inserted and turned.
4.	Type Station Identification and Station Serial No. ("paging information," max 17 characters) if required. If paging information is not required, type a CR.	AROFLEX prints paging information and stores in memory. After 17th character, or after CR, AROFLEX generates 15 x LF, 2 x CR, 17 x "Ltrs"
5.	Leave PROC button engaged on completion of crypto procedure.	

NOTE

Mistakes in the first 16 characters of the paging information can be corrected character-by-character, using the CORR button (see paragraph 4.7.).
Alternatively, the crypto procedure can be cancelled and re-started by releasing the PROC button and pressing it again.

4.5.2 Enciphering: DIRECT mode

1.	Carry out crypto procedure (see 4.5.1).	
2.	Ensure that AROFLEX is in DIRECT mode	INDIRECT button is up; lamp in button is not lit.
3.	Switch on tape punch	

NOTE

Omit Steps 4,5 and 6 if plain-text heading is not required.

4.	Type Format Lines 1 . . .4 (see also Step 5)	AROFLEX prints text as typed.

NOTE

Format Lines 1 . . .4 are not counted for ACP-127 paging format.

5.	Press PREAMBLE button (8) after typing the CR-LF at the end of Line 4.	Lamp in button lights; lamp in PROC button is extinguished.
6.	Type Format Lines 5 . . . 11	AROFLEX prints text as typed.

NOTES

(1) In the PREAMBLE mode, Line Feeds are counted for ACP-127 paging procedure, to form a first page of 20 lines.

(2) Redundant Figures/Letters shifts are disregarded.

(3) Format Line 10 cannot be entered as group count is not yet known.

7.	Push ENCI button (9)	Lamp lights inside button; lamp in PROC or PREAMBLE button is extinguished. AROFLEX generates "Start of Crypto" flag: - Letters-Figures-Letters-Figures-Letters - CR-CR-LF - enciphered serial number of key (5-letter group, or ZZZZZ if indicator key is not present) - random message key (5-letter group, repeated five times) - five other crypto groups.
8.	Load message tape into tape reader, and push reader on/off button (20) — see Note (1) below.	AROFLEX prints/punches crypto text

NOTES

(1) Under no circumstances should the clear text contain NNNN, as this is detected as the "End of Crypto" flag and no subsequent groups will be deciphered. If the message includes four consecutive N's, insert a space (or alternatively, several Figs/Letters shifts) to break the sequence.

(2) Before the 21st line of the cryptogram, counting from the place where the PREAMBLE or ENCI button was pressed, AROFLEX automatically inserts the paging information (4 x LF-CR-CR-PAGE 2, followed by the Station Identification and Station Serial Number, if put in during the crypto procedure).

(3) The crypto text is about 25 per cent longer than the original clear text because of the formatting into 5-letter groups and the 32-to-26 conversion.

(4) Printing/punching of the cryptogram lags behind the input of clear text.

(5) Redundant Figures/letters shifts are disregarded.

(6) Cryptograms made in this mode are not stored in the memory.

9.	To terminate enciphering and add clear text (Format Lines 14 and 15) after cryptogram, press PREAMBLE button. If Lines 14 and 15 are not required, proceed to Step 11.	Lamps light inside PROC and PREAMBLE buttons; lamp in ENCI button is extinguished. AROFLEX prints/punches remainder of crypto groups, ending with enciphered serial number of key (or ZZZZZ), BT on new line, group count on new line.
10.	Type clear text of Lines 14 and 15	AROFLEX prints/punches text as typed.
11.	Release PROC button	If AROFLEX was in PREAMBLE mode (Steps 9 and 10), lamps in PROC and PREAMBLE buttons are extinguished; AROFLEX generates 8 x LF, NNNN. If AROFLEX was in ENCI mode, lamp in ENCI button is extinguished; AROFLEX prints/punches remainder of crypto groups, ending with enciphered serial number of key (or ZZZZZ), BT on new line, group count on new line, 8 x LF, NNNN.

	12. Push the OUT button (3) to put AROFLEX into the standby mode.	Lamp inside OFF-LINE button is extinguished.

4.5.3 Enciphering: INDIRECT mode

1.	Carry out crypto procedure (see 4.5.1.)	
2.	Push INDIRECT button	Lamp lights inside button .

NOTE

Omit Steps 3, 4 and 5 if plain-text heading is not required.

3.	Type Format Lines 1 . . . 4 (see also Step 4)	AROFLEX prints text as typed and stores in memory.

NOTE

Format Lines 1 . . . 4 are not counted for ACP-127 paging format.

4.	Press PREAMBLE button (8) after typing CR-LF at end of Line 4.	Lamp in button lights; lamp in PROC button is extinguished.
5.	Type Format Lines 5 . . . 11	AROFLEX prints text as typed and stores in memory.

NOTES

(1) In the PREAMBLE mode, Line Feeds are counted for ACP-127 paging procedure, to form a first page of 20 lines.

(2) Redundant Figures/Letters shifts are disregarded.

(3) Format Line 10 cannot be entered as the group count is not yet known.

6.	Push ENCI button (9)	Lamp lights inside button; lamp in PROC or PREAMBLE button is extinguished. AROFLEX prints 10 slants (//////////) to indicate start of enciphering; this indication is not stored in memory.
7.	Enter clear text from keyboard or tape reader - see Notes (1), (2) and (3) below.	AROFLEX prints clear text and stores enciphered text in memory.

NOTES

(1) Clear text must not contain NNNN, as this is interpreted during deciphering as the "End of Crypto" flag and no subsequent groups will be deciphered. If the clear-text input contains NNNN, insert a space (or alternatively, several Figs/Letters shifts) to break the sequence.

(2) In the INDIRECT mode, AROFLEX automatically imposes the six-page limit required by ACP-127. At some point approaching the end of the sixth page (not visible to the operator), the procedure signal sounds, the OUTPUT lamp lights and the tape reader stops. Enciphering must now be terminated (see Step 8). Depending on the amount of clear text entered in the PROC and PREAMBLE modes, AROFLEX may automatically terminate enciphering at this point.

(3) Mistakes in the clear-text input can be corrected character-by-character, using the CORR button. See paragraph 4.7 for procedure.

8.	To terminate enciphering and add clear text (Format Lines 14 and 15) after cryptogram, press PREAMBLE button (8). If Lines 14 and 15 are not required, proceed to Step 10.	Lamps light inside PROC and PREAMBLE buttons; lamp in ENCI button is extinguished. AROFLEX prints 10 slants (//////////) on new line and stores enciphered serial number of key (or ZZZZZ), BT and group count.
9.	Type clear text of Lines 14 and 15	AROFLEX prints and stores clear text.

NOTE

If termination of enciphering was enforced (see Note (2) above) approximately 100 characters are available for Lines 14 and 15.

10.	Release PROC button	If AROFLEX was in PREAMBLE mode (Steps 8 and 9), lamps in PROC and PREAMBLE buttons are extinguished; AROFLEX generates 8 x LF, NNNN If AROFLEX was in ENCI mode, lamp in ENCI button is extinguished; AROFLEX prints 10 slants (//////////) on new line and stores enciphered serial number of key (or ZZZZZ), BT and group count. AROFLEX then generates 8 x LF, NNNN.
11.	Press tape punch on/off button (15) and OUTPUT button (10)	Lamp lights in OUTPUT button. AROFLEX prints/punches cryptogram, complete with heading, End of Message, and clear text of Format Lines 14 and 15 (if entered).

NOTES

(1) The lamp in the OUTPUT button remains lit until the contents of the memory have been completely printed/punched.

(2) The lamp in the INDIRECT button remains lit until the memory is cleared (see Step 12).

(3) The output can be repeated as many times as required; it can also be stopped (by pressing the lit OUTPUT button) and re-started at the beginning (by pressing the lit OUTPUT button again).

12.	When output is no longer required release INDIRECT button (11) and press PLAIN button (12) twice.	Extinguishes lamp in INDIRECT button; resets memory but leaves keysettings intact.
13.	Push OUT button (3)	Lamp in OFF-line button is extinguished; AROFLEX returns to standby mode.

4.6 Deciphering

The correct keys must be inserted before deciphering commences (see 4.3."Keysetting").

The first character of the input to be deciphered must be Letters, CR or LF.

4.6.1 Deciphering: DIRECT mode

1.	Push OFF-LINE button (2).	Lamp lights inside button.
2.	Ensure that AROFLEX is in DIRECT mode	INDIRECT button is up; lamp in button is not lit.
3.	Push DECI button (14)	Lamp lights inside DECI button.

4.	Switch on tape punch (15)	
5.	Load tape into tape reader and push reader on/off button (20).	AROFLEX prints/punches clear text of headings in bursts of approx. 30 characters or in complete lines. Printing/punching ceases as first crypto groups pass through tape reader (AROFLEX is checking for crypto format and correct key).
6.	If correct key is present in a "normal" compartment, no further intervention by operator is needed.	AROFLEX prints/punches deciphered text (see Note 1)
7.	If correct key is present in a SPECAT compartment AROFLEX responds as shown in next column. Insert and turn physical SPECAT key and re-start tape reader.	Tape reader stops. Procedure signal sounds. CORR. lamp flashes rapidly.
8.	If correct key is not present, AROFLEX responds as shown in next column. Set correct key and repeat deciphering procedure.	Tape reader stops. Procedure signal sounds. CORR. lamp flashes slowly. AROFLEX prints serial number of key used for enciphering (if indicator key is present in compartment Z).

NOTES

(1) Deciphered text is printed/punched in bursts of approx. 20 characters, ending with serial number and checkword of key used.

(2) Format faults light the CORR lamp but do not block the tape reader. Cryptosynchrony is regained sooner or later, depending on the nature and frequency of the faults in the crypto text.

	9.	When deciphering is complete, release DECI button and press OUT button	Lamps in DECI and OFF-LINE buttons are extinguished; AROFLEX returns to standby mode.
4.6.2 Deciphering: INDIRECT mode	1.	Push OFF-LINE button (2)	Lamp lights inside button
	2.	Push INDIRECT button (11)	
	3.	Push DECI button (14)	Lamps light in DECI and INDIRECT buttons.
	4.	Enter cryptogram from keyboard or tape reader	AROFLEX prints and stores clear text of heading, prints first 11 crypto groups, and checks for crypto format and correct key. If input is from tape, tape reader stops.
	5.	If correct key is present in a "normal" compartment, AROFLEX gives no other indications. Continue typing, or re-start tape reader.	AROFLEX prints crypto groups as entered, and stores deciphered text.
	6.	If correct key is present in a SPECAT compartment, AROFLEX responds as shown in next column. Insert and turn physical SPECAT key and continue typing or re-start tape reader.	Procedure signal sounds. CORR lamp flashes rapidly.

7.	If correct key is not present, AROFLEX responds as shown in next column. Set required key and repeat deciphering procedure.	Procedure signal sounds. CORR lamp flashes slowly. AROFLEX prints serial number of required key (if indicator key is present in compartment Z).
8.	If cryptogram contains format errors, AROFLEX responds as shown in next column. Use CORR button as described in paragraph 4.7 See also Note (4).	Procedure signal sounds. CORR lamp lit continuously. Tape reader blocked.
9.	When cryptogram has been entered completely, switch on tape punch (15) and push OUTPUT button (10)	Lamp lights in OUTPUT button. AROFLEX generates 15 x LF, pauses for a few seconds, then prints/punches deciphered text, ending with serial number and check-word of key used.

NOTES

(1) The lamp in the OUTPUT button remains lit until the contents of the memory have been completely printed/punched.

(2) The lamp in the INDIRECT button remains lit until the memory is cleared.

(3) The output can be repeated as many times as required; it can also be stopped at any point (by pressing the lit OUTPUT button) and re-started at the beginning (by pressing the lit OUTPUT button again).

(4) Interim printout (e.g. to check the effect of corrections) can be obtained by pressing the OUTPUT button at any time during input. Input can be resumed when printing stops.

10.	On completion, release DECI and INDIRECT buttons	Lamps in both buttons are extinguished. Memory is cleared.
11.	Press PLAIN button twice	Resets memory but leaves key-settings intact.
12.	Push OUT button	Lamp in OFF-LINE button is extinguished; AROFLEX returns to standby mode.

4.7 Corrections

In the INDIRECT mode, AROFLEX prints the input as entered from the keyboard or tape reader; the desired result (cryptogram or deciphered text) is produced in a separate OUTPUT operation via the internal memory. It is thus possible to monitor the input and make corrections if necessary, eliminating errors from the material held in memory and ensuring error-free output. The CORR button (13) is used for this purpose.

Each time the CORR button is pressed, the last character entered is repeated in the input printout and it (or, during enciphering, its enciphered equivalent) is erased from the memory. For example if, during enciphering the word QWICK was entered instead of QUICK, and the mistake was noticed as the K was entered, the procedure would be as follows:

1.	Press CORR button 4 times (see Note below)	Input printout reads QWICKKCIW; the last character in memory is the enciphered equivalent of the Q.
2.	Type the correct characters UICK	Input printout now reads QWICKKCIWUICK, but only the enciphered equivalent of the corrected word QUICK is stored in the memory.

NOTE

The lamp inside the CORR button lights when the button is pressed, and remains lit whilst AROFLEX is locating and erasing the last character; the button should not be pressed again until the lamp is extinguished.

The internal memory also makes it possible to produce error-free clear-text tapes without "lettering out", using the INDIRECT deciphering mode as a "correctable" plain-text mode. Because AROFLEX will decipher only after it has recognised the start of crypto text (first 11 groups in crypto format), clear text can be entered in the INDIRECT mode, corrected if necessary, and output to tape from the memory. The clear text must be terminated by CR-CR-LF.

4.8 Faults in crypto format

During the input of crypto text for deciphering in the INDIRECT mode, AROFLEX responds to faults in the crypto format as follows:

- input printout stops
- procedure signal sounds
- CORR lamp continuously lit
- Tape reader stops.

Format faults can be corrected as described below.

6-letter group:	AROFLEX automatically rejects the sixth letter. Re-start the tape reader.
4-letter group:	AROFLEX stores the fourth letter and rejects the space. Type a letter and a space, and re-start the tape reader. The added letter will probably produce one wrong character in the output.

Character inserted instead of space between groups:	AROFLEX stores 5 characters of the first group and rejects the sixth. Insert a space and re-start the tape reader; the output will be correct.
Double space between groups:	AROFLEX automatically rejects one space. Re-start the tape reader; the output will be correct.

In the DIRECT deciphering mode, format faults light the CORR lamp but do not stop the input. The synchronisation program ensures that cryptosynchrony is regained sooner or later. Characters inserted instead of spaces between groups have no effect on cryptosynchrony in this mode.

4.9 Figures shift

Corruption of a crypto character to a Figures shift should be corrected as follows :

1. Select PLAIN mode and print out the corrupted tape, marking the point at which the corruption occurred.

2. Copy the corrupted tape, deleting the Figures shift and substituting a character.

3. Decipher the copy tape in the INDIRECT DECI mode.

NOTE

The "Who Are You ?" code (Figures D) is not transferred to the copy tape; consequently the copy tape will not contain any D's which were present in the original crypto text after the corruption. Four-letter groups should be corrected as described in paragraph 4.8, inserting "D + space" from the keyboard.

Section 5 Operation with stand-alone tape equipment

5.1 Adaptors, installation

AROFLEX is equipped with connectors for stand-alone tape equipment: the front connector (26) is for tape punches and the middle connector (27) is intended for tape readers. The following signals are passed through these points.

Pin No.	to tape punch	to tape reader
0	0 = punch on, open = punch off	
1	Given by punch on/off switch	Given by tape on/off switch
2	Data output serial (5V)	Data input serial
3	AROFLEX ground	AROFLEX ground
4	External clock from panel	External clock from reader
5	Not connected	0 = block tape reader condition from AROFLEX

When a "0" is applied to pins 1 of these connectors, the internal clock is blocked and the relevant input/output devices are blocked. As the levels of these AROFLEX signals must be adapted to the levels in the fast tape equipment, adaptors are needed to suit the type of fast tape equipment employed. Tape equipment for up to 900 bauds can be used.

5.2 Enciphering

1. Insert the plugs of both tape machines into the mains supply sockets.

2. Push the OFF-LINE button and the PROCEDURE button; make sure that the INDIRECT button is released.

3. Select the correct keysetting by typing the address of the key compartment on the keyboard; type the station identification and serial number and one Carriage Return.
   Wait till the 15 Line Feeds have been generated.

4. Select the required baud speed on the adaptor, switch on the tape punch, wait till the "ready" signal is lit, and type the required clear text heading (Format Lines 1 . . . 11) on the keyboard or use a previously prepared tape. This heading is not printed but is punched on the fast punch.

5. Push the ENCI button(9); the first 11 groups of the cryptogram are punched.

6. Insert the tape of the message to be enciphered into the tape reader; the lamp on the reading head should be lit when the tape is inserted correctly and the cover is closed. Switch on the tape reader by means of the switch on the adaptor. The clear text tape runs through the tape reader and the cryptogram is punched simultaneously.
Switch off the tape reader at the end of the tape.

7. Release the PROCEDURE button at the end of the clear text tape; owing to the text extension the punch may continue running for some time.

8. It is possible to exceed the maximum length of a transmission section (6 pages) for enciphering extremely long messages when the MEMORY FULL warning (lit OUTPUT button and procedure signal) is ignored.
Cryptosynchrony will not be lost when such a long message is deciphered in the DIRECT mode.

9. Using the red button on the tape punch, run out a sufficient length of tape so that it can be torn off easily.

5.3 Deciphering

1. Insert the plugs of both tape machines into the mains supply sockets.

2. Push the OFF-LINE button and the DECI button; make sure that the INDIRECT button is released.

3. Load the crypto tape into the fast tape reader.

4. Switch on the fast punch. Wait till the "ready" signal is lit, and start the tape reader. The deciphered text is punched in bursts.

5. When deciphering is complete, feed out some more tape so that the punched tape can be torn off; release the DECI button.

5.4 Operation with fast tape punch only

This technique is useful in the INDIRECT mode only, when several identical cryptograms are required, no taped clear message is available, and a fast output is required.

1. Push the OFF-LINE, INDIRECT, and PROCEDURE buttons.
2. Carry out the crypto procedure and put in the clear text heading of the message.
3. Push the ENCI button and put in the clear text after the indication of the start of enciphering (//////////) has printed.
4. Release the PROCEDURE button after the clear text has been put in completely.
5. Switch on the tape punch, wait till the "ready" signal lights up, and push the OUTPUT button. The cryptogram is now punched at the speed set by the switch on the adaptor. The output can be repeated as many times as required. The cryptogram must not exceed the maximum length of the transmission section.

Section 6 Line-connected operation

6.1 Line circuits

The teleprinter contains the appropriate line interfacing circuitry to match the type of line. Connect the line warning lamp to the rear connector (28) and a mains socket and connect the pedal to the line warning lamp. If the lamp is not used, the pedal may be connected to the connector (28) directly.

6.2 ComSec measures

In order to prevent the compromise of classified information because of an operator's mistake, the following ComSec measures have been incorporated:

1. Clear text can be transmitted from the keyboard/tape reader only as long as the pedal (shunt device) is actuated at least every 4 seconds.

2. As soon as AROFLEX is connected to the line, the line warning lamp warns the operator that he is no longer operating in the OFF-LINE mode.

3. Only messages enciphered and stored in the INDIRECT ENCIPHERING mode can be transmitted without repeatedly actuating the shunt device.

4. At the user's option (see paragraph 7.4) even the input of the clear text Heading/Preamble of a line-connected AROFLEX may be subjected to the use of the shunt device in order to force the operator to assume the ENCIPHERING mode as soon as possible.

5. Reception of clear or crypto messages is always possible; an incoming call has priority over the OFF-LINE mode. A standby line-connected AROFLEX will normally have the PUNCH STANDBY and DECI buttons pushed down, so that received messages (both clear text and crypto) will be printed and punched. If a crypto message cannot be deciphered, it will be punched so that it can be processed later.

6. On-line decryption of SPECAT messages is not possible, even when the SPECAT key is inserted and turned in the SPECAT lock. (The very nature of this type of message is against on-line deciphering and leaving the SPECAT key in the lock.)

7. Crypto tapes can be transmitted without actuating the shunt device after at least 15 consecutive crypto groups have passed the tape reader so that the fact is established that indeed a crypto tape in the correct format is being transmitted (only in a half-duplex line mode).

8. When a message is deciphered on-line, the page copy will not show whether or not it has been transmitted in crypto. Therefore the serial number and checkword belonging to the key with which it was deciphered are printed after the end of every on-line deciphered message. At the transmitting end, the text between the 2 groups of 10 slants (//////////) is the text which actually was transmitted in crypto; this can be seen from the page copy.

6.3 Keysetting

1.	Push OFF-LINE button	– lamp lights up, paper is illuminated
2.	Turn INSERT key	– AROFLEX prints INSERT
3.	Type compartment address, system indicator, key and checkword.	
4.	Remove INSERT key	
5.	Push OUT button	– AROFLEX returns to standby mode.

6.4 Transmission of clear text	1.	Release all buttons and push LINE button	— lamp lights up, paper is illuminated, line warning lamp lights.
	2.	Actuate shunt device every 4 seconds whilst using keyboard or tape reader	— text input is printed/punched and transmitted. Blocked keyboard/ tape reader indicate necessity of actuating shunt device again.
	3.	Push OUT button	— AROFLEX returns to standby mode.
	4.	Transmission of "Here Is"	— upon receipt of a "Who Are You ?" signal, the "Here Is" signal is transmitted.
6.5 Transmission of classified text	1.	Push OFF-LINE button	— lamp lights up, paper is illuminated
	2.	Push INDIRECT button	— PROC and INDIRECT lamps light up.
	3.	Push PROC button	— AROFLEX prints serial no. and checkword of indicator key Z (if present), followed by SELECT.
	4.	Type required compartment address	— AROFLEX prints address cha- acter, serial no. and checkword of key, followed by PAGE 1 on new line.
	5.	Type Station Identification and CR.	— AROFLEX generates 15 LFs.
	6.	Type clear-text heading as required. For ACP-127 compliance, use PREAMBLE for Format Lines 5 . . . 11	

7.	Push ENCI button	– AROFLEX prints //////////
8.	Enter clear text	– AROFLEX prints clear text.
9.	Release PROCEDURE button	– AROFLEX prints ///////// to indicate end of enciphering
10.	Push OUT button	– AROFLEX returns to standby mode
11.	Push LINE button	– button and line warning lamp light; paper is illuminated; line is alive
12.	For telex networks: call subscriber in clear, using shunt device	– "Here Is" and "Who Are You" signals can be transmitted without using shunt device
13.	Push OUTPUT button	– Encrypted message, complete with clear heading and ending, is printed/punched and transmitted. OUTPUT can be repeated for other stations having same key.
14.	Push and release PLAIN button	– Memory is reset
15.	Push OUT button	– Connection is cut and AROFLEX returns to standby mode.

6.6 Reception

1.	Push DECI and PUNCH STANDBY buttons	– Incoming messages are printed and punched: incoming cryptograms are automatically deciphered. When deciphering is complete, control group of key setting used is printed. Cryptogram is terminated by normal End of Message function in plain text.

Section 7

Maintenance, routine security check, faultfinding and options

7.1 Periodic maintenance

AROFLEX needs no periodic maintenance apart from applying light lubricating oil to the bar of the printing head once a year.

7.2 Routine security check

7.2.1 Keysetting

1.	Push OFF-line button	Lamp lights inside button
2.	Insert and turn physical INSERT key.	AROFLEX prints INSERT
3.	Type A 12345 AAAA AAAA AAAA AAAA AAAA AAAA (the 24 A's are not printed)	
4.	Type a CR or LF	AROFLEX prints checkword
5.	Type a CR or LF	AROFLEX prints INSERT
6.	Type Z 99999 ZZZZ ZZZZ ZZZZ ZZZZ ZZZZ ZZZZ (the 24 Z's are not printed)	
7.	Type a CR or LF	AROFLEX prints checkword
8.	Type a CR or LF	AROFLEX prints INSERT
9.	Type Y	AROFLEX prints Y; procedure signal sounds; CORR lamp flashes rapidly.
10.	Insert and turn SPECAT key	CORR lamp is extinguished.
11.	Type 66666 YYYY YYYY YYYY YYYY YYYY YYYY (The 24 Y's are not printed)	
12.	Type a CR or LF	AROFLEX prints checkword
13.	Remove and store INSERT and SPECAT keys	
14.	Push OUT button	AROFLEX returns to standby mode.

7.2.2 Preparation of auxiliary tape	1.	Push OFF-LINE and PROC buttons	Lamps light inside both buttons. AROFLEX prints 99999 plus check-word from Step 7 of para 7.2.1, plus SELECT on next line.
	2.	Type Y	AROFLEX prints Y; procedure signal sounds; CORR lamp flashes rapidly.
	3.	Insert and turn SPECAT key	AROFLEX prints 66666 plus check-word from Step 12 of para 7.2.1, plus SELECT on next line.
	4.	Type a CR or LF	AROFLEX generates 15 x LF, 2 x CR, 15 x "Ltrs".
	5.	Switch on tape punch and ensure that AROFLEX is in DIRECT mode.	INDIRECT button up, lamp extinguished.
	6.	Push ENCI button	ENCI button lights, PROC lamp is extinguished; AROFLEX prints and punches eleven 5-letter groups.
	7.	Type MACHINE O.K. CR-CR-LF-NNNN	AROFLEX prints and punches enciphered text.
	8.	Press and release PROC button	ENCI lamp is extinguished. AROFLEX prints and punches rest of cryptogram, finishing with BT, group-count, 8 x LF, NNNN.
	9.	Switch off tape punch; remove and store SPECAT key.	

10.	Push PROC button	PROC lamp lights; AROFLEX prints 99999 plus checkword from Step 7 of para 7.2.1, plus SELECT on new line.
11.	Type A	AROFLEX prints A 12345 plus checkword from Step 4 of para 7.2.1, plus PAGE 1 on new line.
12.	Type a CR or LF	AROFLEX generates 15 x LF, 2 x CR, 15 x "Ltrs".
13.	Switch on tape punch.	
14.	Push ENCI button	ENCI lamp lights; AROFLEX prints and punches eleven 5-letter groups.
15.	Type KKKK	AROFLEX prints and punches enciphered text.
16.	Press and release PROC button.	ENCI and PROC lamps are extinguished. AROFLEX prints and punches rest of cryptogram, finishing with BT, group count, 8 x LF, NNNN.
17.	Run out additional tape, tear off tape and switch off tape punch.	
18.	Push red "zeroize" button	All key compartments are cleared.
19.	Push OUT button	AROFLEX returns to standby mode.

7.2.3 Preparation of test tape

1.	Push OFF-LINE and PLAIN buttons	Both lamps light
2.	Switch on tape punch	
3.	Type as follows (all characters are printed and punched) Z 99999 ZZZZ ZZZZ ZZZZ ZZZZ ZZZZ ZZZZ, checkword from Step 7 of para 7.2.1, CR-CR-LF. Y 66666 YYYY YYYY YYYY YYYY YYYY YYYY, checkword from Step 12 of para 7.2.1, CR-CR-LF, 20 x "Ltrs", CR-CR-LF	
4.	Load auxiliary tape into tape reader, and start reader.	AROFLEX transfers contents of auxiliary tape onto test tape.
5.	Type 20 x "Ltrs".	
6.	Remove test tape and switch off tape punch.	
7.	Press and release PLAIN button.	PLAIN lamp is extinguished.
8.	Push OUT button	AROFLEX returns to standby mode.

7.2.4 Security check

1.	Push OFF-LINE button and ensure that AROFLEX is in DIRECT mode	
2.	Insert and turn INSERT key	AROFLEX prints INSERT
3.	Load test tape into reader and start reader	AROFLEX prints Z; reader stops.
4.	Re-start tape reader	AROFLEX prints 99999 plus checkword from Step 7 of para 7.2.1; reader stops.

5.	Re-start tape reader	AROFLEX prints Y; reader stops; procedure signal sounds, CORR lamp flashes rapidly.
6.	Insert and turn SPECAT key	CORR lamp is extinguished.
7.	Re-start tape reader	AROFLEX prints 66666, plus checkword from Step 12 of para 7.2.1.
8.	Remove INSERT and SPECAT keys	
9.	Push DECI button	DECI lamp lights
10.	Re-start tape reader	Tape runs briefly and stops; procedure signal sounds; CORR lamp flashes rapidly.
11.	Insert and turn SPECAT key	AROFLEX prints: MACHINE O.K. NNNN 66666 plus checkword from Step 12 of 7.2.1.
12.	Restart tape reader	Tape runs briefly and stops; procedure signal sounds; CORR lamp flashes slowly. AROFLEX prints 12345 (serial number of missing key).
13.	Push red "zeroize" button; try to encipher or decipher a message	All key compartments are cleared; enciphering and deciphering are impossible.

If the results of the above check are all positive, AROFLEX is in good working order.

7.3 Faultfinding

Although detailed faultfinding is not done at the user's level, it is a simple matter to determine whether a fault lies in the teleprinter or in the crypto module.

1. Gain access to the main electronics board of the teleprinter and identify the three connectors for flat cables, located on the left-hand side of the board; the centre connector is empty.

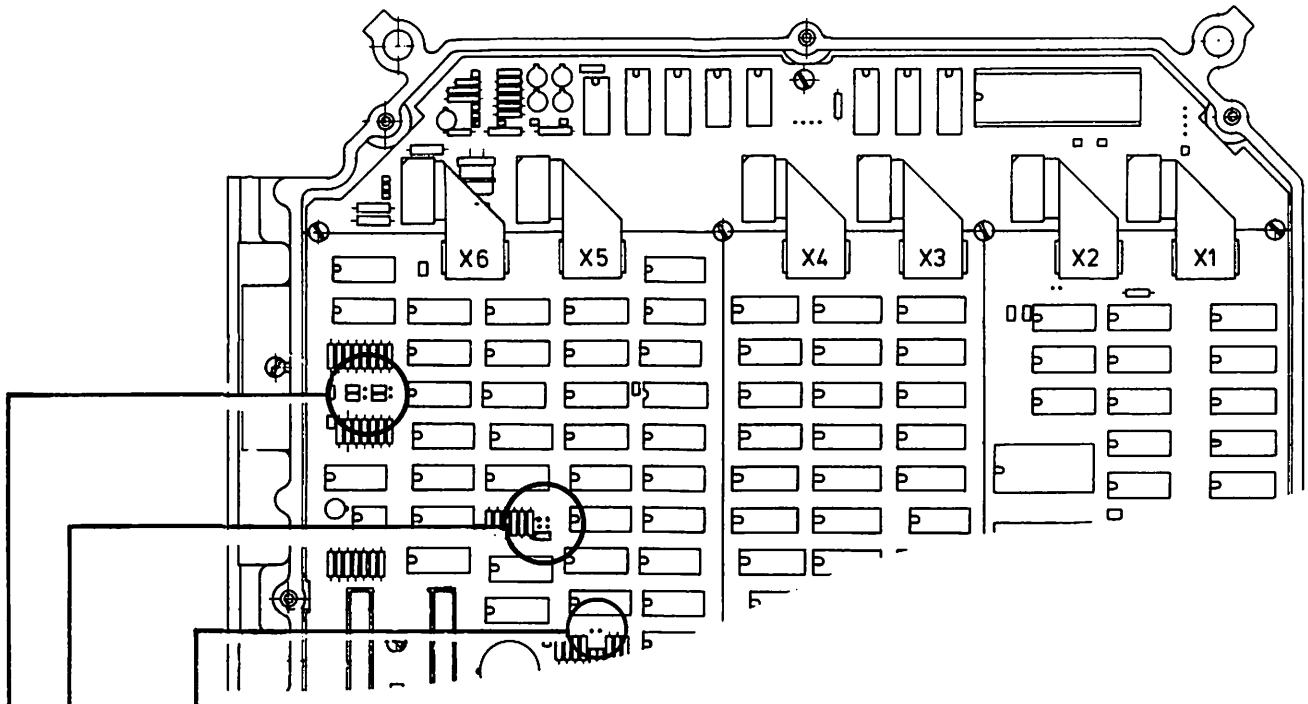
2. Transfer the grey flat cable from its normal position in the rear connector to the empty connector in the centre.

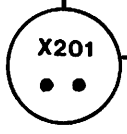
3. Disconnect the other flat cable.

The crypto module is now bypassed and the teleprinter can be tested alone.

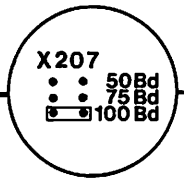
7.4 Options

Optional features incorporated for use at the user's discretion are listed in figure 2. They are selected by placing U-links over the appropriate pins on the interface board in the crypto module, as shown in the figure.

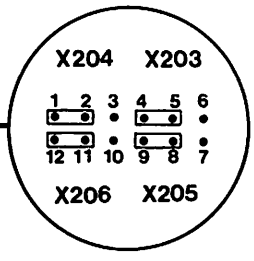




X 201 No strap: shunt device required for clear text, line-connected mode
Strap: shunt device not required for clear text line-connected mode

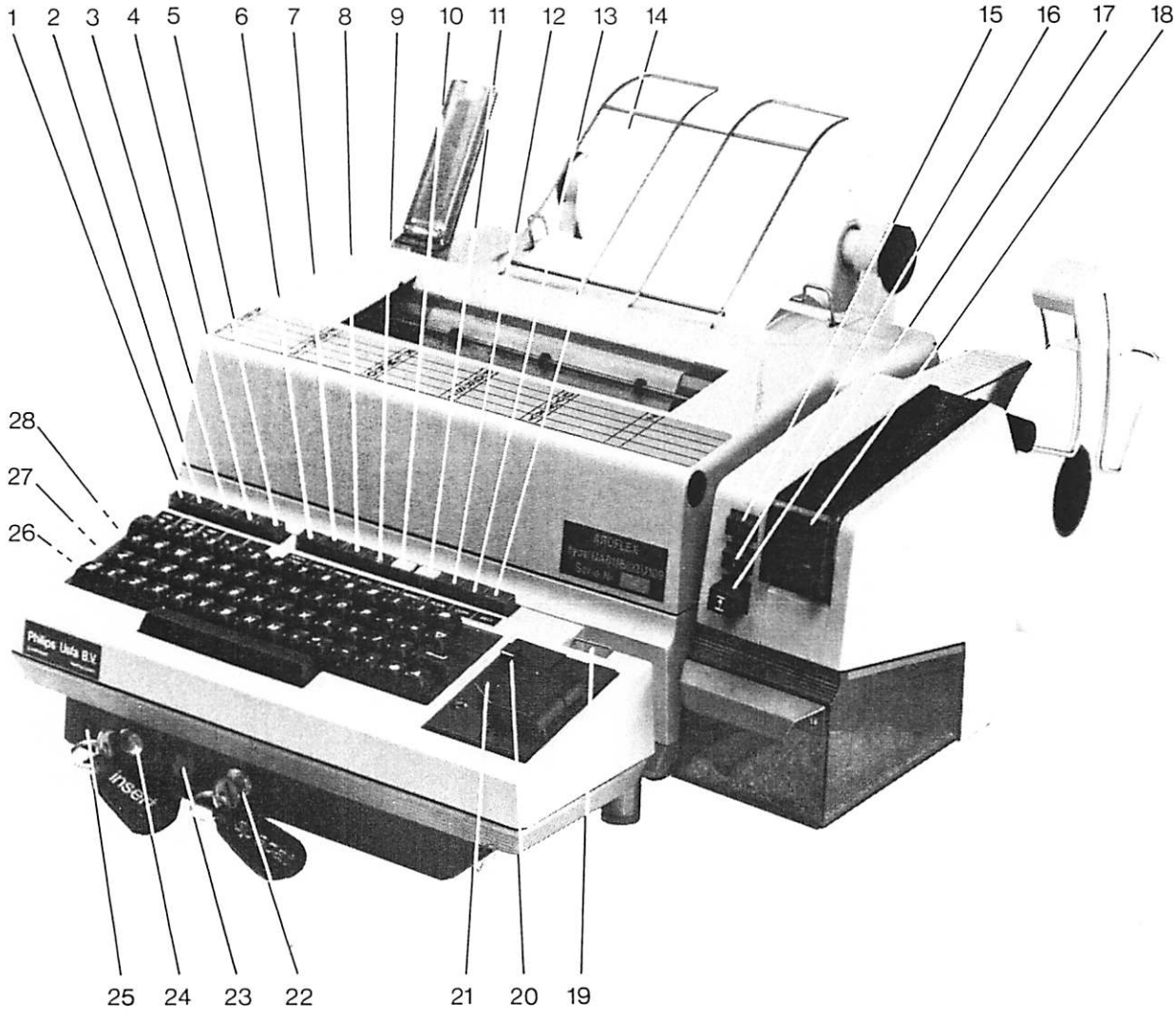


X 207 Baud speed — line connected mode



	YES		NO
X 203	4 — 5	possibility of inputting manual message key after "/".	5 — 6
X 204	1 — 2	automatic print out of PAGE 1 as part of paging information	2 — 3
X 205	8 — 9	shunt device needed in PROC and PREAM mode, line-connected mode	7 — 8
X 206	10—11	automatic insertion of NNNN at end of cryptogram, line-connected mode	11—12

Figure 2: Options



Pushbuttons

1. LINE
2. OFF-LINE
3. OUT (standby)
4. Spare
5. Spare
6. PUNCH STANDBY
7. PROC (procedure)
8. PREAM (preamble)
9. ENCI (encipher)
10. OUTPUT
11. INDIRECT (direct/indirect mode)
12. PLAIN text mode
13. CORR (correction)
14. DECI (decipher)

Other controls

15. Tape punch on/off
16. Tape run-out "Letters"
17. Tape backspacer
18. Tape retaining catch
19. Taut-tape contact
20. Tape reader: on/off/single
21. Tape reader cover
22. Lock for SPECAT key
23. Zeroize and batteries off
24. Lock for INSERT key
25. Battery drain indicator
26. (Front connector): tape punch
27. (Middle connector): tape reader
28. (Rear connector): shunt device and warning lamp

Figure 3: Operating controls