Section IV. OPERATION OF EQUIPMENT

22. Operation Cautions

a. GENERAL. Most failures of Converter M-209-(*) can be attributed to careless or faulty operation rather than to the machine. The converter is designed to withstand hard usage in the field, and is therefore rugged in its construction, but it must be handled with a reasonable amount of care if it is to give satisfactory service.

b. CHECK LIST. Certain cautions mentioned throughout this part of the manual, if properly observed, will help to keep the machine running smoothly. These cautions appear below as a check list for the new operator:

(1) In making preliminary settings. each rotor pin must be pushed all the way to the right or left ; do not leave a pin in an intermediate position.

(2) Drum-bar lugs must be properly seated in the holes provided for them.

(3) The reset knob must click into place after being turned, and a complete figure must be visible on the letter counter.

(4) Rotors will click when moved into position. Do not allow a rotor to remain in an intermediate position.

(5) Turn the drive knob in a complete cycle until it locks. Avoid an excessively rapid or jerky motion.

(6) The indicating disk must not be moved until the drive knob has made a complete cycle.

(7) *Never use force to clear a jammed machine.* Paragraph 69 gives instructions for eliminating a Jam.

(8) Check the supply of paper tape in the paper-feed mechanism (par. 31).

(9) Check the ink pad for adequate inking (par. 32).

23. Types of Indicators

a. Every message enciphered by Converter M-209-(*) will carry the following two indicators; they will appear in two five-letter groups immediately preceding and following the cipher text:

(1) *The system indicator*, which identifies the message as having been enciphered by means of Converter M-209-(*), and which is used in deriving the message rotor alinement.

(2) *The message indicator*, from which is derived the actual rotor alinement used to encipher the message. (This alinement is called the message rotor alinement. It is derived as explained in par. 24, and is never transmitted.)

b. In addition, some messages will carry a *key-list indicator*, which will indicate the specific pin and lug setting in use. The key-list indicator will consist of a digraph assigned to the pin and lug

setting according to the following rules, and, when transmitted, will appear in the indicator groups preceding and following the cipher text.

 (1) Each digraph will consist of two different letters.

 (2) Digraphs beginning with I, J, K, L, M, and N are reserved for joint, combined, and certain spe~ cial systems, and will not be used except with those systems. The digraph EM will be used only for emergency keys.

 (3) Each, pin and lug setting will be assigned a random digraph, subject to the provisions of (1) and (2) above. A headquarters will not use the same digraph continuously.

 c. In tactical operations (simulated or actual) only, use of the key list indicator must be specifically authorized by the headquarters issuing the pin and lug settings. For security reasons, in the operation of the Converter M-209-(*), the key list indicator is not used unless the combination of call signs and date-time group on the message is insufficient to identify the key list employed in the encipherment of the message. When the key-list indicator is not used, the system indicator will be substituted in its place, and will then appear twice in the two five-letter indicator groups.

 d. The above indicators will be arranged on the cipher message as explained in paragraph 20.

24. Deriving Message Rotor Alinement

Whenever Converter M-209-(*) is used to encipher a message, the actual alinement of the rotors will be determined as explained below.

 a. MESSAGE INDICATOR. After the prelimanry settings have been made and checked, the first step in preparing to encipher a message is to select the message indicator. This indicator is a group of six letters selected at random by the operator, and *will be different for every message or message part encciphered.* The six-letter message indicator selected should be recorded temporarily, since it will later be included in the indicator groups at the beginning and end of the message. The following procedure is recommended for the selection of random message indicators:

 (1) Set the encipher-decipher knob at C and the letter counter at 0000.

 (2) Rotate each rotor individually a random number of letter positions, starting with the first rotor. (Turning each rotor always an equal number of spaces is *not* random.)

 (3) Upon completion of this random selection, the letters alined along the bench mark form the message indicator.

 (4) *Never* use an alinement found on the machine, or one which results when the letter counter is returned to 0000; *never* use an actual or phonetic

word (unless it occurs by pure chance), and never use any systematically selected indicator. *It is essential that the message indicator be selected in a completely random manner.*

 b. MESSAGE ROTOR ALINEMENT.† (1) Assume, for example, that the six letters of the randomly selected message indicator are D K S L G J. Select any letter of the alphabet by spinning the indicator at random. Record this letter temporarily, since it will be included in the indicator groups. Assume that spinning the disk yields the letter W With the rotors alined at the letters of the message indicator, encipher the selected letter (in this case, W) 12 consecutive times, the cipher resultants of which will be printed on the tape. Tear the tape from the machine. The message rotor alinement is selected from the 12 cipher-text letters appearing on the tape, as explained below.

 (2) Assume that the 12 cipher-text letters printed on the tape are

<div align="center">PDEZU   UMLUY   OB</div>

Reset the letter counter to 0000. On the first rotor (at the left, facing the machine) find the first cipher-text letter resulting from the repeated encipherment of the single selected letter, and set it at the bench mark. In following the example, set P on the first rotor at the bench mark. Find the second

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† The explanation should be followed step by step with a converter set up according to the sample pin and lug seating shown in table IV, page 141.

cipher-text letter D, on the second rotor and set it at the bench mark. Set E on the third rotor at the bench mark. Continue this process until the six rotors have been alined. If the cipher-text letter sought on a rotor does not appear among the letters on the rotor, that letter on the tape is cancelled or passed, and the next letter on the tape which does appear on the rotor is alined at the bench mark. ln the example Z does not appear on the fourth rotor. Pass it by and set U, which does appear on the fourth rotor at the bench mark. Since the next U does not appear on the fifth rotor, pass it by and set M at the bench mark. Set the sixth rotor to L. Disregard the remaining unused letters, L, X, O, B. It is thus seen that the sequence of letters on the tape, P D E Z U U M L U Y O B, yields the actual rotor setting P D E U M L, which is alined along the bench mark. The setting so determined is called the message rotor alinement and is the aline- ment of the rotors when encipherment of the mes- sage text is begun. Destroy the tape on which the 12 letters are printed.

  Note. In rare cases, 12 encipherments of a randomly se- lected letter will yield less than 6 usable letters. If this situ- ation arises, select a new message indicator, and re-encipher the randomly selected letter.

25. Recording Indicators

Assume that the six letters selected at random for

the message indicator are D K S L G J, the letter consecutively enciphered 12 times is W, and the key list indicator of the effective pin and lug setting is VC. The two indicator groups will appear as follows (note that their order is the same at both the beginning and end of the message) :

<u>WW</u> <u>DKS LGJ</u> <u>VC</u> . . . .<u>WW</u> <u>DKS LGJ</u> <u>VC</u>
  1   2   3   1   2   3
(cipher text)

1 The first and second letters of the two groups form the *system indicator* (One letter repeated in these positions serves to indicate that Converter M-209-(*) was used to encipher the message.

2 The third through the eighth letters form the *message indicator*.

3 The ninth and tenth letters form the key-list indicator, which designates the specific pin and lug setting used. When the key-list indicator is omitted (see par. 23c), the system indicator will be inserted in its place as follows:

<u>WW</u> <u>DKS LGJ</u> <u>WW</u> . . . . <u>WW</u> <u>DKS LGJ</u> <u>WW</u>
  1   2   3   1   2   3
(cipher text)

  Caution: UNDER NO CIRCUMSTANCES WILL THE MESSAGE ROTOR AL1NEMENT (the actual alinement of the rotors used for the encipherment of the message) EVER BE TRANSMTTTED.