

## KEY TAPES.

Two key-tapes are required in regular operation. These are known respectively as the "A" and "B" tapes. The "A" tape should have one less character than the "B". For example, the "A" tape may have 799 characters and the "B" tape 800 characters. Two tapes of these lengths are sufficient for handling a total of about 100,000 words, after which new and different tapes must be used. As the secrecy of the system depends on the proper handling of these tapes, the following instructions, should be carefully followed:

## PREPARATION OF KEY TAPES.

Key-tapes should be prepared as follows, using the special tape provided for the purpose:

1. Punch a tape on the keyboard perforator. The first four characters of this tape should be "letters" signals and the remaining characters should be selected AT RANDOM, using all of the thirty-two characters of the printer code. This tape should be at least 804 characters long including the four "letters" characters at the beginning.
2. Mark every tenth character by drawing a line across the tape. This operation can be conveniently performed by locking down the selecting pins of a tape transmitter (using the "start-stop" lever) and drawing the tape through this transmitter. Lines may be drawn on the transmitter cover one inch apart to indicate the length of tape corresponding to ten characters. The first mark on the tape should be drawn through the center of the character immediately FOLLOWING the four "letters" characters.

3. Number the marks on the tape. The line across the character FOLLOWING the four "letters" characters should be marked "0", the next one "10", etc.
4. Cut off the tape immediately after the 799th character if it is to be an "A" tape or the 800th character if it is to be a "B" tape.
5. Using the jig provided for this purpose, glue the ends of the tape together so as to form an endless loop, lapping the first two "letters" characters at the beginning over the last two characters on the tape. In gluing, see that the feed holes and edges of the tape line up properly. Use only a small amount of glue as otherwise the splice may be too thick to pass readily through the special ciphering transmitters.
6. Use this first loop as a master tape for preparing other similar tapes by running it through one of the special ciphering transmitters and perforating a tape with the machine perforator. Before performing this operation, turn the left hand switch on the edge of the shelf to the position marked "ON" and the right hand switch on the edge of the shelf to the position marked "TAPE", and turn the levers on the other ciphering transmitter and on the message transmitter to the position marked "STOP". If a large number of tapes are to be prepared, the printer may be removed from the table and a spare machine perforator substituted for it by attaching to the base of the machine perforator the extension plates provided for this purpose. In this case, the right hand switch on the edge of the shelf should be turned to the position marked "BOTH".

7. In preparing duplicate tapes, run the master tape continuously until a sufficient number of duplicate tapes have been perforated. These duplicate tapes will have two "letters" characters at the beginning of each in addition to the regular 799 or 800 characters. These tapes should be cut apart between the last character of one tape and the first "letters" characters at the beginning of the next tape.
8. Glue each of the tapes to form a loop, lapping the two "letters" characters at the beginning over the last two characters, using the jig. The tape loops should now be just 799 or 800 characters long (depending on whether the tape is an "A" or a "B" tape).
9. Compare the duplicate tapes to see that they are exactly alike, by running them through the ciphering transmitters with the lever on the message transmitter turned to position marked "STOP". Any difference in the tapes will be indicated by an operation of the printer.
10. Each tape should be given a designating mark such as "A-1", "B-2", etc. This mark should appear on the tape near the splice. All similar tapes should be marked alike.

#### DELIVERING KEY-TAPES.

The original tapes should be prepared at one point and delivered to the various stations by courier. A sufficient number of tapes should be prepared so that three of each kind may be furnished to each station. Each station will then have two exactly similar spare tapes for each "A" and each "B" tape for use in case the original tapes wear out or are accidentally destroyed. If necessary extra tapes may also be prepared locally at each station. All key-tapes should be prepared on the special paper provided for this purpose.

## USE OF KEY-TAPES.

The particular tapes to be used on any day should be decided on by agreement between the stations. After being used on one day, the key tapes at each station as well as all similar spare tapes must be carefully destroyed.

The numbers on the key-tapes are used to designate the positions at which they are to be set to encipher or decipher each message. Six numbers are used to designate the settings of the two ("A" and "B") tapes. Letters representing these numbers are perforated as the first characters of the enciphered message, as described in the "Operating Instructions for Local Operating Sets". The first three numbers always designate the setting of the "A" tape and the next three numbers designate the setting of the "B" tape. For example, 124379 would mean that the "A" tape should be set at 124 and the "B" tape at 379.

A certain range of numbers should be assigned to each station, and these should be so chosen that the tapes at one station will never combine in such a way as to produce the same key combinations as are used at some other station. If there are only two stations using the same tapes, an initial setting of 000000 should be used at one station, and an initial setting of 400000 at the other station. Under these conditions the "A" tape at the second station will be given such a lead that it will be half a revolution ahead of the "B" tape and the tapes at the first station can only reach this position after they have completed 400 revolutions.

If more than two stations use the same key tapes, the "A" tape should be divided into as many parts as there are stations and initial tape settings assigned accordingly. These parts need not be equal and preferably should be in approximate proportion to the amount of outgoing traffic handled at each station.