

Kriegsmarine

M4-UKW = B

M4-UKW = C

## OFFICER-TO-OFFICER PROCEDURE

### Encrypting and Sending a Kriegsmarine 4-rotor Officer-to-Officer message

**Note:** This procedure takes for granted that you already know the Basic Enigma 3-rotor Wehrmacht operating procedure and the Basic Enigma 4-rotor Kriegsmarine operating procedure. This procedure presents the new challenge of double encryption. Officer-to-Officer messages were reserved for only the most secret communications—so secret, that even the ship’s regular radio/Enigma operator could not know the contents.

**Enigma World Code Group (EWCG) Note:** For EWCG purposes, the sender of this message will have to play the roles of both the Officer and the Radio Operator. The sections of this procedure are clearly labeled as to which role the operator is to play, and when.

1. Print-out a paper copy of all of these documents by clicking on the links:
  - This Procedure
  - Inner Settings
  - Outer Settings
  - Bigram Table
  - “Offizier” (German for “Officer”) Key Sheet

Radio Operator
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2. Follow the “Basic Procedure: Encrypting and Sending a Kriegsmarine 4-rotor message,” from step 2 through step 26, to put the daily key into the Enigma machine, then stop. Basic Procedure steps 2 – 26, in Roman numerals, are reprinted here for your convenience:

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- II. Using the “Inner Settings” table, scan down the “Date” column and select the correct date for today. For example, let’s say that today is the 27<sup>th</sup> day of our month. Note the matching “Key Ind.” (Key Indicator): PIZ.
- III. The “UKW” column shows “B,” which means that we will be using the Kriegsmarine M4-UKW = B machine. If you will be using a Key Indicator that has a “C” in this column, select the M4-UKW = C machine.
- IV. Open the cover of the Enigma simulator. Click on the letter “B” located at the left end of the rotor shaft until it shows either “Kriegsmarine M4-UKW = B” or “Kriegsmarine M4-UKW = C,” depending on which machine you are using.
- V. Remove rotors I, II, and III from the rotor shaft and store them in the box, in order.
- VI. The “Inner Settings” table gives you the rotor settings you will use. Click on the Beta or Gamma rotor (depending on which machine you are using) in the box, check the end of the rotor to ensure it shows the letter “A,” then install the rotor on the left end of the rotor shaft.
- VII. Then select rotor II, set it to the letter “T,” and install it next to the Beta or Gamma rotor on the shaft.
- VIII. Working from left to right, set and install the last two rotors onto the shaft. Close the Enigma cover.
- IX. Click on the Stecker plugboard. You will notice that the plugboard is numbered, not lettered.

- X. Using the “Outer Settings” table, scan down the “Key Ind.” (Key Indicator) column until you have located the Key Indicator and date of the month you are using. We are using Key Indicator PIZ for our date, the 27th.
- XI. Set the Stecker plugs as indicated. Stecker plug settings are reprinted here for your convenience:

16/2 25/21 6/20 9/17 22/1 15/4 18/26 8/23 3/14 5/19

Write down your Stecker settings so that you can use them again in Step 15.

Return to the Enigma top view.

- XII. The last column on the “Outer Settings” table is labeled, “Basic Start Position.” Dial-in the “Basic Start Position” letters into the 4 rotors, in order, from left to right. The Basic Start Position is T C X K.
- XIII. Select a random trigram. Let’s use VRM.
- XIV. Using the Enigma keyboard, slowly type-in VRM. As each letter is typed, a letter will illuminate on the Enigma lightboard. Write-down the three letters as they illuminate, in order. For our practice message, they should read KKZ.
- XV. Set these three illuminated letters into the three “regular” rotors, from left to right. Don’t touch the Beta/Gamma rotor. The setting now is T K K Z. This is called the “Final Start Position.” Write down your “Final Start Position” rotor settings so that you can use them again in Step 15.

Note: This next section is the part that elevates the Kriegsmarine 4-rotor Enigma to a higher order of security. It is complicated. Admiral Dönitz wanted it that way! Please follow the steps exactly, in sequence, and keep your scratch paper and pen handy. You will need them!

- XVI. Write-down the “Key Ind.” from Step II. Ours was PIZ.

PIZ

- XVII. Add a random letter to the front of this trigram.

(L)PIZ

- XVIII. Write-down the random-letter trigram that you made-up in step XIII.

VRM

- XIX. Add a random letter to the end of this trigram.

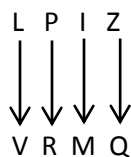
VRM(Q)

- XX. Write these two new “quadgrams,” in order, one on top of the other.

L P I Z

V R M Q

- XXI. Pair-up the letters by drawing short arrows, like this:



- XXII. Now write-out the pairs of letters, like this:

LV =      PR =      IM =      ZQ =

- XXIII. Get your printed-out bigram table. Read the instructions on how to use it.

- XXIV. Using the bigram table, encrypt the pairs of letters you have just written, like this:

LV = KI    PR = BL    IM = KC    ZQ = LH

XXV.    Combine the encrypted letters as follows:

    KI-----BL      KC-----LH

XXVI.    Write-out the new quadgrams (Message Indicators) like this:

    KIBL    KCLH

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The officer is now ready to begin his portion of the procedure.

Officer

3. Verify with the radio operator that the daily key settings for the Enigma have been properly set into the Enigma machine.
4. Secure private use of the Enigma machine from the radio operator.
5. Using the "Offizier" Key Sheet, select the correct row of Stecker settings you will use according to today's date. We are using date 27.
6. Click on that part of the Enigma simulator that displays the Stecker settings.



7. Click on each black number to delete the existing daily key's Stecker settings.
8. Replace the existing daily key's Stecker settings with the "Offizier" Key Sheet Stecker settings. "Offizier" Key Sheet Stecker settings are reprinted here for your convenience:

10/15    23/26    11/2    20/24    7/3    9/16    17/12    18/21    22/25    8/5

Return to the Enigma top view.

- Again, using the “Offizier” Key Sheet, select one of the 26 code names. Let’s choose “Karl.” Note the random 4-letter group that corresponds with this code name: W E W N. This random 4-letter group is called the “Message Start Position.”
- Dial-in the “Message Start Position” letters, W E W N, into the 4 rotors, in order, from left to right.
- Using pen and paper, write-out a “Plain-Language Heading” section that will go near the beginning of the message. Our sample Plain-Language Heading looks like this:

BERGMAN    X    VON    X    KULP    X    OFFIZIER    X    KARL  
(receiver’s last name)                      (from)                      (sender’s last name)                      (“flag word” for officer)                      (code name selected)

Note: Put an “X” between each element in the Plain-Language Heading, thus clearly separating one element from the next.

- Using the Enigma machine, key-in the actual message (not the Plain-Language Heading) one letter at a time, and record the lamp-bulb letters that illuminate, in sequence, on a piece of paper. Our practice message is:

**FOUR TORPEDOES FAILED TO EXPLODE. SUSPECT SABOTAGE. CHECK ALL DETONATORS.**

In encrypted form, our message reads:

**RHKK OCDU ZBCU GLGS FHVA VGPL IXHT ABLY XLTI XKAL HRDN FMXW RQDY HURG UVIB MJZQ**

- When finished, scramble the rotors, and scramble or delete the Stecker plug settings. Return to Enigma top view.
- Give the Plain-Language Heading, the once-encrypted message, and control of the Enigma machine back to the radio operator.

Radio Operator

- Return the rotors and Steckers to their “Final Start Position.” Use your notes from Steps XI and XV to help you.

Return to the Enigma top view.

16. Using the Enigma machine, key-in the Plain-Language Heading and the once-encrypted message, one letter at a time. This is what you should key-in:

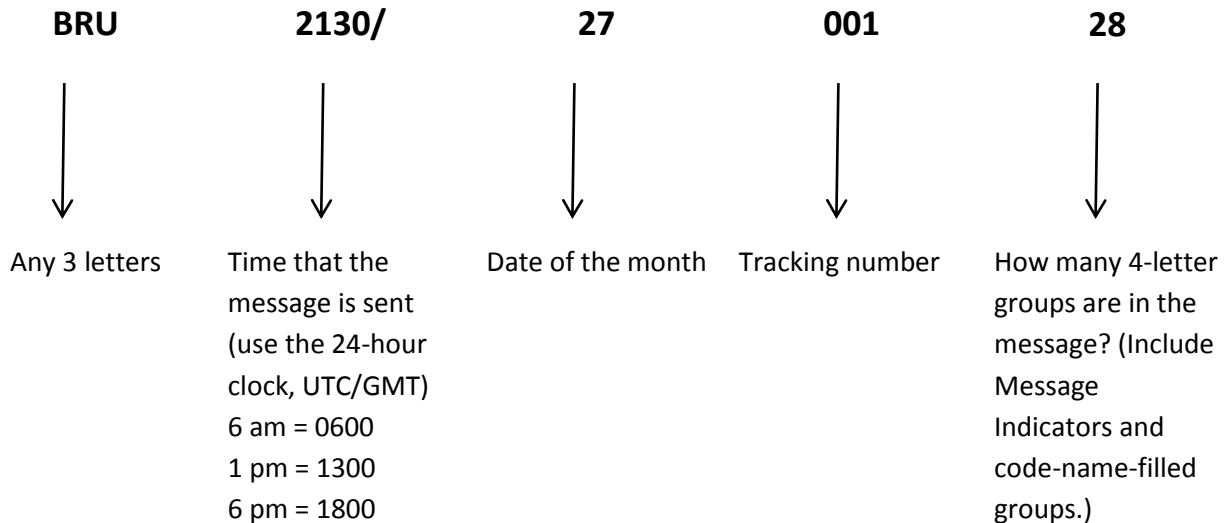
**BERG MANX VONX KULP XOFF IZIE RXKA RLRH KKOC DUZB CUGL GSFH  
VAVG PLIX HTAB LYXL TIXK ALHR DNFM XWRQ DYHU RGUIV IBMJ ZQ**

Record the lamp-bulb letters that illuminate, in sequence, on a piece of paper.

17. This should be the result:

**HKMR RLIQ CLJS XJDJ VVGH KLPH OVYB ADYV ZSEQ IODU UJIG HRVR  
EDIY UERM WPTE IKWW BVIR OSPE AEDH OUFB FFKW OERJ LGZU OA**

18. Using the computer keyboard, not the Enigma keyboard, prepare the Kriegsmarine "header" for your message. This header is placed above the beginning of your message on the email page.



19. Use the computer keyboard, not the Enigma keyboard, to type-in the two quadgrams (Message Indicators) at the beginning and at the end of the email message following the header.

KIBL KCLH -----  
-----  
----- KIBL KCLH

20. Type your encrypted message into the area between the two sets of quadgrams.

21. Your completed email message should look like this:

**KIBL KCLH HKMR RLIQ CLJS XJDJ VVGH KLPH OVYB ADYV ZSEQ IODU UJIG  
HRVR EDIY UERM WPTE IKWW BVIR OSPE AEDH OUFB FFKW OERJ LGZU OA  
KIBL KCLH**

22. Send it!

23. Now you can send your own Officer-to-Officer messages. Choose a new date and a new code name, and everything else will change, too. Oh, and change the message! Be as creative as you like. You are your own "Offizier" of a U-boat or surface ship now.