

Working with the ENIGMA at Panmunjom (Korea)

General Information:

With the capitulation of Japan in summer 1945 the Second World War was officially declared terminated. In some of the liberated countries the political system was not very stable and at some places there developed local conflicts between different parties. This was the case in Korea where in the north communist influenced forces took over and in the south a rather democratic oriented government was set up. This led to the Korean War, starting during the summer months of the year 1950. The war went on with full force until July 1953. On the 27th July 1953, in a place called Panmunjom, an armistice agreement was signed and the Korean War was considered as terminated. One important point agreed upon in the armistice agreement was to introduce an international "Neutral Nations Supervisory Commission" (NNSC), formed by 4 nations that had no active involvement in the Korean war. The South Korean side proposed Switzerland and Sweden as members of this commission, whereas the North Korean side proposed Czechoslovakia and Poland.

During the autumn of 1953 army contingents of the aforementioned 4 countries were transferred to Korea to form the NNSC. The main purpose of the NNSC was to supervise the armistice along the border between South Korea and North Korea and within the demilitarized zone which extended on each side of the border for a distance of 2 km. This is the so called "no man's land". Furthermore the NNSC was charged with the supervision of the "Ports of Entry".

As soon as the first contingents arrived in Korea, headquarters were set up at Panmunjom. The joint camp of the Swiss and Swedish forces was set up on the South Korean side very close to the actual border. The contingents of the Czechoslovak and Polish armies had their joint headquarters on the North Korean side of the border. As soon as the Swiss/Swedish camp was operative the Swiss delegation installed a powerful radio station within the camp site. For many years this radio link was the only direct communication link between the Swiss/Swedish contingents at Panmunjom and their homelands.

The radio station within the Swiss/Swedish camp was operated by members of the Swiss Army and as a service their Swedish colleagues the Swiss radio station also dealt with the radio traffic to and from the Swedish delegation. Moreover, the Swiss radio station also acted as relay station for the Swiss Embassy in Tokyo. This meant, the radio operator at the Swiss Embassy in Tokyo could work office hours. The operating times for the radio link between Korea and Europe were largely influenced by the short wave propagation conditions. This usually meant lots of night shifts for the radio operators at Panmunjom.

In the beginning, right after the war, civil telecommunication links were inexistent. Even at my time, in 1964/65, a telephone conversation between Panmunjom and Seoul was a real adventure. Our camp was connected to the US Forces telephone network. The US Forces telephone network was manually operated. One had to talk through a number operators located at the army telephone exchanges of army camps on the way between Panmunjom and Seoul. With some luck one even got hold of the desired subscriber in Seoul. Telephone calls to Switzerland or Sweden were simply impossible, not to speak of the exorbitant costs that would have been charged.

Therefore the obvious solution was a radio link. At that time radio communication still was considered a special art. Only a limited number of people had the necessary training and the proficiency to work Morse code. In order to ensure continuous radio service the Swiss Army

had stationed 2 skilled radio operators at Panmunjom. Considering the state of the technology at that time the radio link could only be by short wave and by Morse code. Radio telephony was out of question. With AM mode (radio telephony mode) we could occasionally say "Hello" to each other, but the readability was so limited that the transfer of messages was simply impossible. Using Morse code (CW) was, despite the fact that the transmission speed is limited, a much better choice. This really worked, day by day.

The fact, that the radio link "Bülach - Panmunjom" was in daily use between 1953 up to about 1985 speaks for the professionalism of the radio operators of the Swiss Army Signal Corps. Merits also deserve those unknown comrades that have set up the radio stations at the Swiss Army Signal Corps base at Bülach and at the camp at Panmunjom. They have set up at both ends impressive antenna systems that have provided the necessary gain and stability, therefore enabling day after day stable radio connections.

As mentioned, the base station in Switzerland was stationed at the home base of the Swiss Army Signal Corps at Bülach. From there, the radio link was continuously worked from 1953 up to about 1968 or 1969. In 1971 I was attending a technical training course at that base, but the giant rhombic antenna and the barrack housing the radio station were gone. One of the professional instructors stationed there informed me that the radio link to Panmunjom was taken over by a radio station near Bern serving Swiss Embassies worldwide.

My person:

Born in:	1942
Amateur Radio License:	Jan. 1962, Call Sign HB9ACC
Army basic training school:	Summer 1962
NCO training:	1963, afterwards serving as NCO during the summer basic training school 1963
Radio Operator at Panmunjom:	1964/65

Due to a lucky incident and due to the fact that I was already holder of an amateur radio license I was delegated by the base commander to operate the radio link to Panmunjom during my stay as newly appointed NCO at the summer basic training school (boot camp) 1963 at Bülach. Between June up to end November 1963 I performed my job as radio operator but I had nothing to do with enciphering or deciphering of messages.

Then another lucky strike happened. I was offered the job as radio operator on the other side, at Panmunjom Korea. Of course, I instantly accepted this opportunity and within a few weeks I found myself on my way to Korea. There, we two radio operator's, were not only charged with operating the radio links but enciphering and deciphering incoming and outgoing messages was also part of our job. As part of the daily job I learned to operate the coding machine available at Panmunjom. At that time nobody spoke of ENIGMA or NEMA. To us youngsters, this simply was our Coding machine.

The procedures described in this article concerning the daily use of the ENIGMA machine are the procedures as I have experienced them during my stay at Panmunjom in the years 1964/65. The procedures used elsewhere, e.g. within the German Forces during WW2 or within the enciphering teams within the Swiss Army may have been different.

Impressions of Panmunjom 1964/1965

This is an overview of the joint Swiss/Swedish camp at Panmunjom taken from the top of the water tower. The barracks in the foreground belong to the Swiss team whereas the barracks in the background represent the Swedish camp. The actual borderline between South Korea and North Korea was extremely close to the camp. It went through the wooded area on the right side of the picture. The border was and still is the actual demarcation line.



The camp buildings were barracks of corrugated iron. This picture shows the quarters of the subaltern officers, the cook/camp manager and the 2 radio operators. The building attached housed the toilets, the showers and the heating systems. Installed was a warm-air heating with a moderate effect. In the ice cold Korean winters the heating system quite often reached its limits. Since we all were in possession of comfortable US Army sleeping bags, this posed no problem.



My Home is my Castle:

This picture shows my own room. All rooms were fitted with US Army standard furniture. Each room also had a little washing basin. Toilets and showers were located in the attached building. Our quarters were Spartan and small but we loved to live there. In the background one sees a Collins 51J4 radio receiver. I used it to occasionally listen to radio Swiss International. But most times it was tuned to an AFKN station (American Forces Korean Network). Since that time I am a hopeless Coca Cola and country music addict.



This picture shows the barracks housing the radio station and the offices. The radio station was set up on the front of the lower barrack. The upper barrack contained the administration offices, etc.

The radio station worked with an L-antenna with a length of about 100 m. One of the masts is partially visible at the left of the radio shack. The mast height was about 15... 18m. Moreover there was also a vertical antenna fitted that we hardly ever used. The L-antenna worked much more efficient.



Interior view of the radio station:
All equipment at that time was out of US Army Signal Corps stock. We had 2 BC-610 transmitters installed. As one can see, we were well equipped with receivers. We had 3 receivers Collins R-388 (civilian type = 51J4) and 2 receivers Collins R-390. The latter were for us radio operators the non-plus-ultra. These were about the world's best radio receivers available at that time.



Here a detail picture of our BC-610 transmitters. They were considered quite powerful at that time with a nominal power of 600 W. These were real workhorses. I cannot remember ever having experienced a failure with them. They just worked and worked. From the technical viewpoint they were a joy for real radio enthusiasts such as amateur radio operators. For the militia operators of the Swiss Army they were difficult to handle. The operator really had to know what he is doing. Depending on the frequency to be used one had to insert the correct plug-in coil into the final amplifier stage. On the oscillator and preamplifier side one had to work with so called tuning units. One had to insert the correct tuning unit. Most of the time the transmitter was used with crystal control. The crystal's contained in the standard US Army crystal box were used the world over. Every frequency that could be set up with these crystals was usually in multiple uses. On the board between the 2 transmitters one can see a plug-in coil, a tuning unit and a collection of crystals ready to be inserted.



This was my working place. To transmit in Morse code we had the choice between a manual key and a so called bug. A bug is a mechanical semiautomatic key creating dots automatically, whereas dashes have to be keyed manually. All outgoing ENIGMA traffic was transmitted using the manual key. The transmission speed was between 16 and 20 WpM (80...100 characters per minute).



This moderate speed enabled our colleague on the other side of the circuit to easily copy and write down the enciphered text. Plain text messages and service traffic were sent using the bug and at a higher speed.

Working with the ENIGMA

To understand the general situation one must mentally go back to 1964/65. My generation was growing up with the cold war. To us the cold war was reality and we took it as real. An iron curtain was dividing Europe. Two blocks stood fully armed eye to eye. In Asia the cruel Vietnam War was in full force. In whatever country one served, as a member of the armed forces one took the situation seriously. Whoever was employed in a sensitive field, such as communication, coding services, intelligence etc. was carefully trained and he was aware that he only had to know what was really necessary to carry out his job and nothing else. Many things or procedures were declared secret. When something was secret it was accepted to be secret and one never talked about it. This was also the case in the UK at Bletchley Park, where thousands of people were occupied in highly secret areas. Not one of the lower ranks ever made details of his job public. In the end some high ranking officers started publicizing details of the intelligence operations of the code breakers of Bletchley Park.

Members of the Swiss Armed Forces that were occupied in the field of enciphering and deciphering were carefully selected and sworn to secrecy. For many years we kept our mouths shut and we never talked about our work. Over the years more and more information about coding machines and procedures became available so nobody could really break a secret by talking about his own experiences. Anyway, after 50 years, the ENIGMA can no longer be considered a secret. All the photos about ENIGMA's shown in this article are copied with the consent of Tom Perera, W1TP, from his ENIGMA-CD.

Practical procedures when working the ENIGMA

When one transmits a message in enciphered form then the purpose is to prevent unauthorized listeners the read the message. Coding or enciphering, in whatever form, makes the message unintelligible to listeners or the public.

Everything that had to do with enciphering or deciphering was a secret art and had to be kept secret. During many years one hardly found any literature on this subject. The ordinary citizen occasionally saw in war movies short scenes where messages were enciphered or deciphered.

In our case, our superiors needed a system how they could communicate delicate matters in way that not everybody listening to our radio traffic could read the plain text of the messages. To achieve this goal we were in possession of a coding machine. That the coding machine was an ENIGMA was totally unknown to us. It simply was our coding machine. When not in use the coding machine was locked away in a huge safe. The safe was located in the room of my colleague, the other radio operator. The safe had the dimensions of a huge refrigerator and its weight was tremendous. Both radio operators and also the Quartermaster knew the code for the safe. The Quartermaster was usually safeguarding part of his cash stock in the safe.

Our coding machine was considered top secret. Therefore the machine was either stored in the safe or it was in actual use. In order to prevent that unauthorized persons, e.g. our Korean civil employees, ever saw the machine we usually did all the enciphering and deciphering in the room of my colleague. Every piece of paper that could lead to the reconstruction of the keys for a message was at the end of the job carefully burned. I think this was a standard procedure everywhere where enciphered and plain text came together.

As mentioned, the coding machine itself and everything in relation to such machines and their procedures was considered top secret. I do not think that ever one of the radio operators took the risk to take a photo of the machine. Of course nowadays such a photo would have a great historical value.

To encipher or decipher a message one had to be in possession of the keys, this means the information how to set the starting position of the machine. For this purpose we were in possession of two book-like blocks containing many pages of rather thick paper. The blocks were constructed in such a way that we could, e.g. with the help of the world famous Swiss Army Knife, remove the uppermost page. On three sides the pages were carefully bound and fitted with perforations and on the fourth side the pages could be accessed. There one slipped in the knife blade, lifted the uppermost page a little bit. This page then became loose along the perforation. When the page was removed, then one turned the page and on the rear side we found the keys for the next message. These blocks were supplied to us by the coding section of the Swiss Foreign Department at Bern. One block contained the keys for the incoming messages, the other one the keys for the outgoing messages. Every message had an individual key setting that was used only once and never again. This procedure is called "one-time-pad" and experts consider it very safe.

Was the machine an ENIGMA or a NEMA?

Up to the time when more and more information about coding machines became available I was never able to tell whether our coding machine was an ENIGMA or a NEMA. All information about coding machines was top secret and hardly any information about this subject was available.

Until about 15 years ago, I never had dared talking about my training and the daily-use procedures when enciphering or deciphering messages with the ENIGMA machine. In the meantime the archives of the Allied Forces regarding WW2 have been opened and a mass of material about the ENIGMA coding machine has been made available to the public. The ENIGMA and how to operate an ENIGMA is no longer a secret.

We, the radio operators that have been delegated to Panmunjom, Korea, got a crash course on how to operate our enciphering machine. The training session took about 2 hours and we were trained according an old but efficient method used by the British in their former colonies. This principle is called "monkey see – monkey do". After the crash course we knew how to set the keys and how to operate the machine. We were still in the dark about the working principles of the machine. With lots of imagination we could about figure out how the machine was supposed to work. Of course nobody ever told us, that the name of the machine is ENIGMA. This information I acquired only later when information about ENIGMA's became available.

Why the question about ENIGMA or NEMA?

ENIGMA



The ENIGMA was the famous enciphering machine used by the German Forces during WW2. The machine itself is an extremely clever design. It's relatively easy to operate. The same machine and the same code settings are used to code and decode a message. ENIGMA's have been used in huge numbers by the German Wehrmacht, the Air Force and Navy. This led to several executions which are all based on the same principle but would differ in some details.

In a number of armed forces of other countries, among them also Switzerland, ENIGMA machines were in use. The above picture shows on the left side a 3-wheel ENIGMA as it has been employed by the German Wehrmacht. The ENIGMA shown on the right side is a Model K 4 rotor machine. This model K is the so called Swiss ENIGMA and it's exactly the type of machine that we worked with at Panmunjom. The electrical power that was needed to light up the lamps could be supplied by a battery or by a mains supply unit. The latter is shown on the far right.

NEMA

The NEMA machine as shown on the right is a machine developed and built in Switzerland after WW2. It's basically an improved version of the ENIGMA. It was fitted with many more rotors. Moreover the rotors did not move forward in a logical manner as it would be the case with a cyclometer register. They moved in an infrequent and not predictable way. Working the ENIGMA was a rather clumsy job. When depressing one of the keyboard buttons this meant that the whole mechanical part moved on and the only power came from the finger depressing the button. Operators that worked with the NEMA confirmed that this machine was a real finger breaker. As with the ENIGMA, the only power available to move the whole mechanics came from the operator's finger. But the NEMA had, in comparison to the ENIGMA, many more code wheels to be moved.



I guess the reason to equip the Swiss Army contingent at Panmunjom with an ENIGMA was the fact, that the details of the ENIGMA machines were among experts in 1953 no longer a real secret. The design and the function of the NEMA machine was at that time most likely still secret. The risk to lose an, at that time most up to date coding machine, was considered as too high.

Please consider, the ENIGMA was stationed in an army camp located only a few meters from the actual demarcation line between South Korea and North Korea. We were living in the so called no-man's-land. This was a zone extending on each side of the demarcation line for 2 km to the south and a further 2 km to the north. Within this zone there still was occasional fighting going on. The risk that the machine could fall into the hands of unfriendly troops was real.

Another guess from my part concerns the rotors. The rotors that we had for our machine were most likely the training rotors that were supplied together with those ENIGMA machines that were officially sold to collectors by the Swiss Government. It wouldn't have made sense to supply real "war-rotors" to such an exposed place as Panmunjom.

Our colleagues from the Swedish Army had their own coding machine. I have never seen their coding machine and they have never seen ours. I guess the machine in use by our Swedish colleagues was a machine developed by the famous Swedish designer Hagelin, the one who later set up the company Hagelin Cryptos in Switzerland.

The radio operators from the Armies of Poland and Czechoslovakia had their own short wave radio stations and their own coding machines. All their equipment was of Russian origin. This information I once got from my Czechoslovak colleague. He was also a Ham Radio Operator. However unlike me, he did not have his personal call sign. He had a license that enabled him to work on club stations only. We, the radio operators of the 3 nations, we knew each other and now and then we met at official meetings or invitations. However, we never discussed our work, our equipment or our coding machines. This was all considered to be secret ... and that was how it was.

The ENIGMA and its details

Our Swiss ENIGMA (Type K) was installed within a sturdy wooden box that could be locked. When not in use, the machine was locked away in our safe. The picture shows the machine ready to be used, with the separate lamp box on the table and the power supply unit providing the power to the lamps.

This is exactly the machine and the accessories we had at Panmunjom.



In order to use the machine one opened the box, took out the separate lamp box and placed the latter on the table. Then one lifted the cover as shown and the interior of the machine became accessible. One took out the shaft with the rotors. This could be achieved by lifting a locking lever. The rotors were slipped off the shaft. Then the “interior key” was set on each rotor according to the coding instructions. Then each rotor was slipped over the shaft in the correct sequence. Then the cover was closed and as a final step one had to set “external key”, the setting of which was visible through the little windows on the left side of each rotor.



Operating the ENIGMA

As visible on the various photos the ENIGMA had a keyboard similar as the one on a typewriter. However, there was only a reduced character set available. The keyboard was limited to the characters A – Z. Numbers 0 - 9 or punctuations were nonexistent. Above the keyboard there is an arrangement of lamps that is an exact copy of the keyboard. In case the text to be enciphered contained numerical values or important punctuations then these had to be written down in plain text. When it came to encipher a space between words we inserted instead an “X” as a placeholder.

In order to encipher or decipher a message one had to proceed as follows:

- Take out the rotors

- Set on each rotor the so called interior key. (Explained later)
- Slip each rotor over the shaft in the correct sequence.
- Set external key for each rotor according to the coding instructions. The correct value was visible through the small windows located on the left side of each rotor.

When enciphering a message the plain text was keyed in character by character. After having depressed the correct button, the button had to be kept depressed. On the lamp field a lamp lit up. This lamp shows the enciphered character. The enciphered character was carefully noted. Then one went on to the next character of the plain text ... and so on.

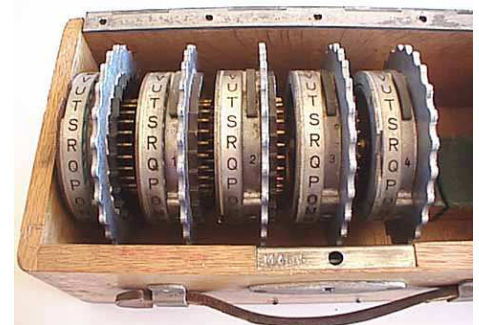
When we had to decipher an incoming message the same procedure was used. Only, in this case the enciphered text was keyed-in and like magic the plain text was shown character by character by the illuminated lamps.

As already mentioned, the operation of the keyboard was a quite cumbersome job. Every time, when depressing a button, the finger power was used to move the whole mechanics of the machine. As long as both operators were available it was a relatively easy job. One of us keyed in the text and the colleague observed the lamps and noted down the results.

However, when one of us was alone, things became more complicated and much slower. Since it was never allowed to have on the same sheet of paper written out the plain text and the enciphered text one had to work with 2 separate sheets. When one was a right-hander one used his left hand to input the text shown on the first sheet. The lamp on the lamp field was lit, and the keyboard button was left depressed until the character shown by the lamp was noted down on the second sheet. Then one proceeded with the next character.

The rotors

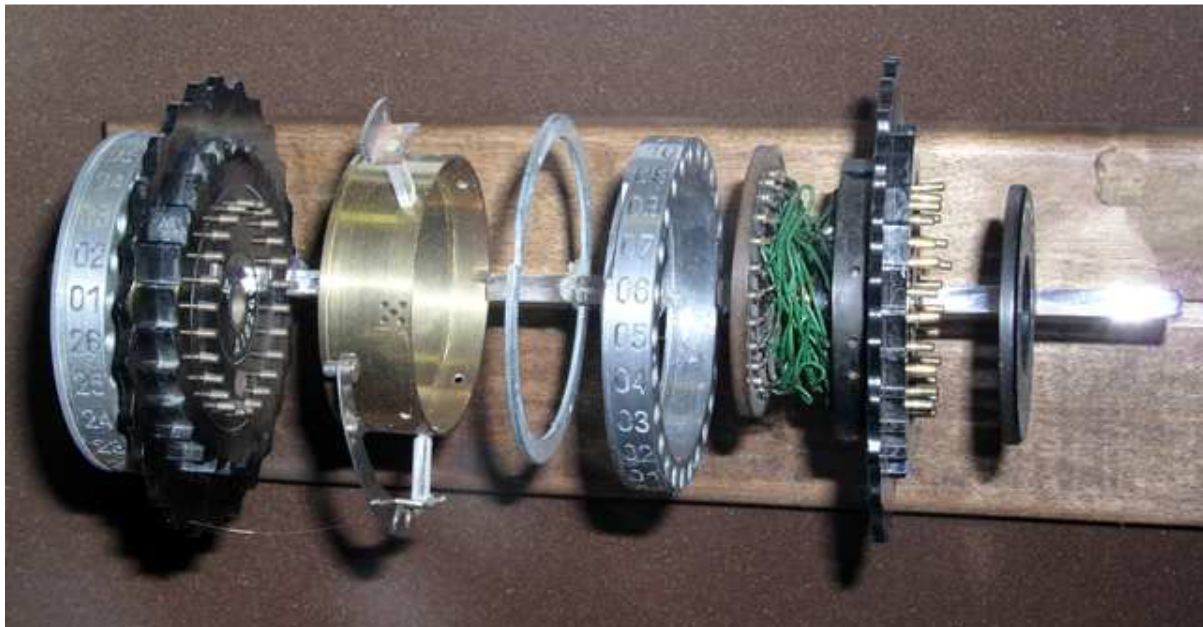
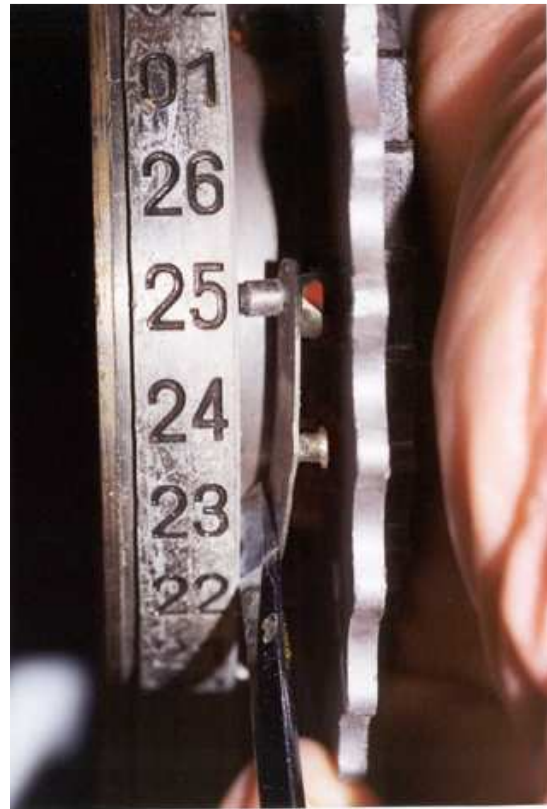
The most important elements of each ENIGMA machine were the rotors. The machine itself was of no importance. It was the rotors that were responsible for the encipherment. The photo on the right shows a wooden box containing 5 different rotors. The rotors shown were exactly the kind of rotors we used. For setting the interior as well as the external key the Swiss Army rotors were all fitted with rings showing engraved characters from A to Z. ENIGMAS used by the German Forces often had rings with engraved numerical characters.



Each rotor is fitted with resilient contact pins on the right side and a fixed contact set on the left side. In the interior of the rotor the contact sets on the left side and the ones on the right side are in a way scrambled in a secret way. The details of the electrical interconnections and the details of the construction of the code wheels are shown in the next chapter.

As already mentioned the ENIGMA was working with a so called “interior key” and a so called “external key”. The interior key was a clever design. The ring with the engraved characters or in the case of German ENIGMAS numerical characters was fitted loose on the rotors. It could be set to any position and it was locked in place by a pin. The pin was fitted to a spring like lever. To set the interior key one lifted the spring operated lever. The one turned the ring until the character shown in the coding instructions was corresponding with the position of the pin. Then one loosened the grip and the pin was sliding in a corresponding hole in the ring. Thus the position of the interior key was fixed. This kind of key-setting was preferably made as long as one had the rotor in his hands. It could however also be done when the rotors were already fitted on the shaft and installed within the machine. It meant some fiddling, but it could be done.

The picture below shows in detail the construction of a rotor and its components. Since the ring is fitted with engraved numerical characters the picture shows a rotor of German origin. It can be taken for granted that the rotors for the Swiss ENIGMA were of identical construction.



When the interior keys were set, the rotors were slipped in the correct sequence over the shaft. Then the shaft was inserted into the ENIGMA machine. Now in each window beside the rotor a character was visible. As a next step the external key had to be set. This was done by turning the rotor until the small window to the left of each rotor showed the correct character as prescribed in the coding instructions. Now, we have set the starting position of the message to be enciphered or deciphered.



Detail photos of a preserved German 3 Rotor-ENIGMA

The next pictures show details of German ENIGMA that is preserved as a "Museum-ENIGMA".

ENIGMA MACHINE MAJOR COMPONENTS:

**ROTORS &
REFLECTOR** ---->
LIGHT PANEL --->
KEYBOARD ----->
PLUGBOARD ----->



The Swiss ENIGMA, as used at Panmunjom is of the same basic design. There are some differences, but the pictures shown are nevertheless meaningful. The principle and the basic design are identical with all executions of the ENIGMA..

The main differences are as follows:

- The rotors were fitted with engraved characters A-Z instead of the numerical characters.
- The so called plug board is not fitted to the Swiss ENIGMA. These are the various sockets on the front side of the ENIGMA machine and the corresponding short circuiting cables. The idea of the plugboard is that an officer is installing the short circuiting cables between the sockets in a prescribed manner. One believed this would increase the security of the encipherment.
- The ENIGMA as shown is a 3-rotor ENIGMA of German origin, whereas the Swiss ENIGMA was a 4-rotor machine.

This shows a close up look of the keyboard and the lamp panel of a Swiss ENIGMA. I can vaguely remember that on the uppermost line of keys there were beside of the characters also fitted numbers as shown in this picture. However, as mentioned we made no use of this feature and we were writing out numerical information in plain text.



Here, the cover is lifted and the interior construction is visible. Lifting the cover was necessary to work on the code wheels as well as to replace defective lamps.



Here the spindle with the rotors is lifted off. It was possible to remove each rotor separately from the spindle. The rotors could be slipped over the spindle in any sequence (as prescribed in the coding instructions). This was used to increase the security of the machine. On our machine we had 4 rotors instead of only 3 as shown here.



Since the rotors were not identical one needed some information in order to identify each rotor. The identification was achieved, as shown in this picture by a number engraved on the rotor itself. This information was provided in the form of Roman Numbers. The "A 10009" is probably the identification number for this individual code wheel.

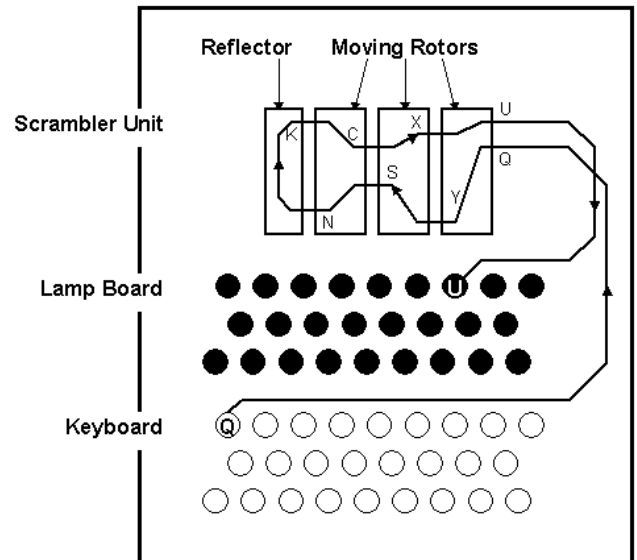


Function principle of the ENIGMA

This is a simplified diagram showing the function principle of the ENIGMA:

In principle it is an electrical enciphering by means of 3 or 4 rotors. The input contacts and the output contacts of the rotors were internally interconnected in a secret way. The lamp current was flowing from the keyboard through the 3 or 4 rotors to a reflector and again through the same 3 or 4 rotors to the lamp board. When keying the next character the rotors moved one step further like a cyclometer.

One of the unique characteristics of the ENIGMA is the fact that a plain text character inputted can never be identical with the enciphered character and vice versa.



A further characteristic of the ENIGMA was the fact that the keyboard contained characters A-Z only. There were no lower case characters, numerical numbers nor punctuations. All numerical numbers or punctuations were written as words. For every space between words we inserted an "X" as place holder. As can be imagined, such a text was quite cumbersome to read. Of course this was mainly an internal thing. In our daily work the sender of the message passed it on to the radio operator as a normal text. The message was then enciphered and sent on via radio. Enciphered messages received were deciphered into plain text and then processed and written out in the form of a plain text telegram. To the recipient it looked like the original message.

How secure was our ENIGMA traffic?

To us radio operators, 22/23 years of age, operating the ENIGMA was a trustworthy function and we tried hard to carry out our work in a serious manner and of course we worked as instructed. Among ourselves we sometimes talked about whether our machine was really secure. We came to the conclusion that most likely the Americans or the Russians would read all our traffic. With the knowledge I have acquired in the meantime I have come to the conclusion that this was most likely not the case. Every message was enciphered with a totally different set of code settings. Messages originating from links like ours where every message is based on totally different code setting could be copied by listening station but they could only in very rare case be deciphered.

Nowadays its common knowledge, that the British codebreakers were able to decipher a remarkable part of the ENIGMA traffic originating from the German Army, Airforce or Navy. If one studies their methods and how they achieved their goals one comes to the conclusion that the ENIGMA was a very secure machine. One should not underestimate the cleverness and the persistence of the British codebreakers. The real reason behind their success is based on the methods and practices the German Forces used in their ENIGMA traffic.

- The sequence of the rotors on the spindle remained identical for long periods and for whole Armies or for the whole Navy.
- The interior key was the daily key for whole Armies or for the whole Navy. It remained identical during 24 hours.
- Moreover the secret lists with the daily settings had to be distributed to a large number of users. The Navy had to provide their ships in advance with coding list for a rather long time span. This could mean a ship had on board the coding lists for several weeks or even months.
- It was practice with the German Forces that the "external key" was selected by the ENIGMA operator. The external key was part of the message and was passed on to the receiving operator as part of the enciphered text. It seems that quite a number of the ENIGMA operators were rather careless in selecting their external keys for the messages. They used easy to guess character sequences, e.g. the name of their sweethearts or a string of adjacent keys on the keyboard. This behavior was a tremendous help to the code breakers. They could easily guess and try such words or combinations of characters.
- Moreover German messages were written down in a standard form and they contained easy to guess phrases such as "Heil Hitler". This gave the codebreakers some valuable guidelines on their way to success.

Sometimes the Allied Forces tried to get hold of the secret code books of the Germans. To achieve this they planned and carried out raids. For example, they sized small ships in arctic waters that were stationed there to provide weather information to the German Forces. They had an ENIGMA and all the coding instructions on board for a time span covering many months. They were not real warships but converted fishery boats. Thus they were easy prey to the British Navy.

One question still remains. Why did they not really train their ENIGMA operators, informed them how the machine works, what are weak points that have to be observed during the enciphering process, etc. My own training was typical. Two hours may be enough to understand how to carry out the job. It would have helped if we would have had more knowledge about the positive points and the critical points that have to be observed when working with the machine.

As already mentioned in our case every message was enciphered with a totally different set of code settings. Messages originating from links like ours where every message is based on totally different code settings could be copied by listening station but they could only in very rare case be deciphered. Moreover there were no routine messages with always identical or very similar text.

Our messages were unique.

For this reason I am confident that the messages passed on through our radio link were secret and could not be deciphered. The content of our message was not of such importance that somebody interested in reading them would have employed a whole deciphering office in order to decipher them. They would have used their manpower to go after more important traffic.

It was a rule that message to be enciphered with our coding machine should be limited to a maximum of 300 characters. These are 60 words of 5 characters each. It was at that time standard practice to transmit encoded traffic in the form of words containing 5 characters each. In case the text of a message exceeded this limit the message was split up into two or

more messages of max 300 characters each. Each of these partial messages was enciphered with totally different code settings.

We were acting as relay station for the Swiss Embassy in Tokyo. From there and to there we received and passed on coded messages containing a much higher number of characters per message. Most likely they had in their possession a NEMA machine that supposedly provided a much higher security.

More than 50 years have elapsed since my job as radio and ENIGMA operator at Panmunjom. The whole article is based on my own remembrance. During the long timespan this radio link was active there could have been procedures in force that are unknown to me. I think, what I have written down about the daily operation of the ENIGMA coding machine is correct and it describes the procedures in the years 1964/65.

Max Rüegger, HB9ACC