



NATIONAL SECURITY AGENCY
CENTRAL SECURITY SERVICE
FORT GEORGE G. MEADE, MARYLAND 20755-6000

FOIA Cases: 44559
13586
(formerly J9223-99)
17 November 2004

Mr. Frode Weierud
Le Pre Vert, 1041 Rte de Mastegnin
Prevessin-Moens, F-01280
FRANCE

Dear Mr. Weierud:

This is an initial response to your Freedom of Information Act (FOIA) request of 28 October 2004, which was received by this office on 2 November 2004, for a copy of the "Catalog of Enigma Cipher Machine Wirings." Your request has been assigned case number 44559. This letter indicates that we have begun to process your request. There is certain information relating to this processing about which the FOIA and applicable Department of Defense (DoD) and NSA/CSS regulations require we inform you.

For purposes of this request and based on the information you provided in your letter, you are considered a representative of the media. Unless you qualify for a fee waiver or reduction, you must pay for duplication in excess of the first 100 pages. Your request for a waiver of fees has been granted.

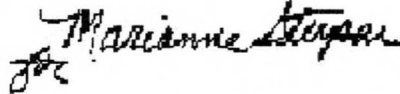
We have completed our search for records responsive to your request. The material responsive to your request is not voluminous or complex, and your request has been placed in the first-in, first-out processing queue for simple cases. Because there are several cases ahead of yours in that queue, however, we are unable to respond to your request within 20 days. We appreciate your patience with our efforts to treat all requesters fairly by responding to each on a "first-in, first-out" basis.

We have received your letter dated 21 October 2004 inquiring about the status of another FOIA case of yours (J9223-99) that is pending with this Agency. Due to an upgrade in our processing system, we have assigned a new case number to that request, FOIA Case 13586. Please be advised, FOIA case 13586 is currently being worked and near completion. Once processing has been completed, we will notify you of our final response.

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13586
(formerly J9223-99)

Correspondence related to either of these requests should include the case number assigned to the request, both of which are included above. Your letter should be addressed to National Security Agency, FOIA Office (DC34), 9800 Savage Road STE 6248, Ft. George G. Meade, MD 20755-6248.

Sincerely,

A handwritten signature in black ink, appearing to read "Marianne Stepan". The signature is written in a cursive style with a small flourish at the end.

PAMELA N. PHILLIPS
Chief
FOIA/PA Office



**NATIONAL SECURITY AGENCY
CENTRAL SECURITY SERVICE**
FORT GEORGE G. MEADE, MARYLAND 20755-6000

FOIA Case: 44559A
26 September 2007

Mr. Frode Weierud
Le Pre Vert
1041 Rte de Mategnin
F-01280 Prevessin-Moens
FRANCE

Dear Mr. Weierud:

This responds to your Freedom of Information Act (FOIA) request of 28 October 2004, which was received by this office on 2 November 2004, for a copy of the National Security Agency document entitled "Catalog of Enigma Cipher Machine Wirings," Control Number 182-4, June 1954. A copy of your request is enclosed. For purposes of this request, and based upon information you previously provided, you are considered a representative of the media. Additionally, you previously requested, and were granted, a fee waiver. There are no assessable fees associated with this request. Your request has been processed under the FOIA, and the document you requested is enclosed. Certain information, however, has been deleted from the enclosure.

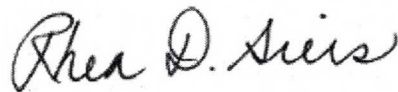
Some of the information deleted from the document was found to be currently and properly classified in accordance with Executive Order 12958, as amended. This information meets the criteria for classification as set forth in Subparagraphs (b), (c), and (g) of Section 1.4 and remains classified TOP SECRET as provided in Section 1.2 of the Executive Order. The information is classified because its disclosure could reasonably be expected to cause exceptionally grave damage to the national security. The information is exempt from automatic declassification in accordance with Section 3.3(b)(1, 3, and 6) of E.O. 12958, as amended. Because the information is currently and properly classified, it is exempt from disclosure pursuant to the first exemption of the FOIA (5 U.S.C. Section 552(b)(1)).

In addition, this Agency is authorized by various statutes to protect certain information concerning its activities. We have determined that such information exists in this document. Accordingly, those portions are exempt from disclosure pursuant to the third exemption of the FOIA which provides for the withholding of information specifically protected from disclosure by statute. The specific statutes applicable in this case are Title 18 U.S. Code 798; Title 50 U.S. Code 403-1(i); and Section 6, Public Law 86-36 (50 U.S. Code 402 note).

Since these deletions may be construed as a partial denial of your request, you are hereby advised of this Agency's appeal procedures. Any person denied access to information may file an appeal to the NSA/CSS Freedom of Information Act Appeal Authority. The appeal must be postmarked no later than 60 calendar days from the date of the initial denial letter. The appeal shall be in writing addressed to the NSA/CSS FOIA Appeal Authority (DJ4), National Security Agency, 9800 Savage Road STE 6248, Fort George G. Meade, MD 20755-6248. The appeal shall reference the initial denial of access and shall contain, in sufficient detail and particularity, the grounds upon which the requester believes release of the information is required. The NSA/CSS Appeal Authority will endeavor to respond to the appeal within 20 working days after receipt, absent any unusual circumstances.

Please be advised that the document appears to be missing some pages. This is because the blank pages in the document were removed. No information was on those pages.

Sincerely,

A handwritten signature in cursive script that reads "Rhea D. Siers".

RHEA D. SIERS
Deputy Associate Director for Policy

Encls:
a/s

DOCID: 3220592 ~~TOP SECRET FROTH~~

NATIONAL SECURITY AGENCY
Washington 25, D. C.

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CATALOG OF ENIGMA CIPHER MACHINE WIRINGS

Compiled by

Astrid Hammarborg

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL
DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE
ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793, 794, AND
798, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER
TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

June 1954

TECHNICAL INFORMATION DIVISION
Bibliographic Research Branch

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~~TOP SECRET FROTH~~~~TOP SECRET FROTH~~INTRODUCTION

By means of the following report, it is intended to bring together under one cover the available Enigma cipher machine wirings used prior to 1946. As one of the principal targets of the combined Anglo-American cryptanalytic effort during World War II, the German Enigma machine was the basis for a considerable number of reports. These have been searched for pertinent material. The record of Enigma wirings is complex and varied due to the use of this machine by many countries in one of its basic forms, or with alterations and innovations. Included in this paper are rotor wirings given by the British, the U.S. Navy, Coast Guard, and Army. Some of these wirings are clearly and explicitly presented; others are briefly noted; many have been taken from work sheets, and bits of scattered, unassociated papers wholly intelligible only to their originators; some exist without accompaniment of explanatory data. Wirings and the machines to which they pertain will be discussed briefly under separate headings insofar as data is available.

Suggestions, critical comments, and additional sources of Enigma information are welcomed from readers for use in subsequent editions of this paper.

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I. BACKGROUND OF THE ENIGMA

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I. BACKGROUND OF THE ENIGMA

The Enigma cipher machine was the backbone of German high-level military cryptography. Its most outstanding performance was exhibited during World War II when a series of variations and ingenious innovations made it the leading target of Allied cryptanalysis. From its first appearance in the mid-1920's to the end of the War, it went through the following forms:

1. The O-Bar Machine, used by the German Fleet.
2. The Commercial or K Enigma, used by German commercial firms, the Post Office, the railways, and other miscellaneous German governmental agencies.
3. The Counter (Zahlwerk) Enigma, also referred to as the "G" and "Abwehr", used by Military Intelligence (Abwehr), by the Reich Security Office (Reichssicherheitshauptamt), and by military attaches.
4. The plugboard (Stecker) Enigma, used by the Supreme Command of the Armed Forces (OKW); the High Command of the Army, and in Army communications down through division; by the High Command of the Air Force, and in Air Force communications, down through group and sometimes squadron.
5. The plugboard Enigma (Schlüssel M), employing an additional rotor, used by the High Command of the Navy, and in

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Naval communications, including the submarine arm.

6. The plugboard Enigma with pluggable reflector D (Stecker mit Umkehrwalze D), used by the Air Force and proposed for the other Services.
7. The plugboard Enigma with Stecker Uhr, introduced by the German Air Force. This device was a security feature by which the stecker of individual messages on the same key could be varied.
8. The plugboard Enigma with variable notch rotors (Lueckenfuellerwalzen), proposed for the Supreme Command Armed Forces, Navy, and Air Force.
9. Cipher Device 39 (Schluesselgeraet 39), proposed for the Supreme Command Armed Forces, and the Army, Navy, and Air Force.

The last two machines do not enter into the period covered by this report. The variable notch rotors had not been distributed for general use and Cipher Device 39 was still in the development stage when the war ended.

The plugboard Enigma is contained in a wooden box about a foot square and six inches deep. When set up for use, it contains three wheels mounted between the endplate and reflector. It has a keyboard with 26 keys, labelled with the letters of the alphabet; a lampboard with 26 bulbs that shine through stencils on which the letters are marked; a stecker board; battery and switch. The lid of the box con-

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tains spare lamps, plugs, etc., and the whole is fitted with a handle for carrying. When a key is depressed, one or more of the wheels rotate one position and a current flows through the machine to one of the lamps. The letter appearing over the lamp is the enciphered result of the depressed key. The endplate is a ring of 26 terminals called entry points. In the unsteckered Enigma these are connected directly to the keys; in the steckered Enigma they are connected to the keys through the stecker board.

The stecker board has 26 pairs of sockets labelled with the letters of the alphabet, one from each pair leading to a corresponding key on the keyboard, the other to the endplate. This plate, if viewed from the side of the wheels and taken in anticlockwise order, is connected to the stecker board sockets in ABCD...Z order, this order being called the diagonal of the machine. Normally, the two sockets of a pair are connected together by a hidden spring. If a stecker is plugged into two pairs of sockets, say A and B, these springs are forced away, and the A key is connected to the endplate at a position which would otherwise be connected to the B key and vice versa. That A and B are connected by such a plug is expressed in the form A/B, or B/A. The effect of the stecker on the encipherment is as follows: if, at a position of the machine, A enciphers as R when there is no stecker, then at the same position with stecker A/B, R/X and perhaps others, B enciphers as X. A letter which is not steckered to another one is said to be self-steckered.

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A wheel has 26 terminals on its right face (as it sits in the machine) and on its left face 26 plate terminals. The plates are connected across by wires to the pins in random order. On the right side is a ratchet wheel and a large sprocket; on the left side is a metal ring, which can move freely relative to the wiring. This ring carries the letters A to Z (or the numbers 1 to 26) in order round its circumference, and is provided with one or two turnover notches on its extreme left edge. It can be held in any one of the 26 positions by a clip, the setting of which is called the ring setting.

The German Army and Air Force used five wheels, numbered I to V, each having one turnover notch in a position which varied from wheel to wheel. The Navy used three additional wheels, VI, VII, and VIII, each having two turnover notches at points diametrically opposite each other on the ring in the same positions on each of the wheels. When inserted in the machine, the wheels are mounted on an axle and the sprockets are held by pawls in the casing of the machine. Any three of the wheels in any order may be in the machine at a given time, and these are referred to as the right-hand, middle, and left-hand wheels. Parts of the sockets project through the casing of the machine, enabling each wheel to be rotated by hand and set to any one of the 26 positions. The position of the wheels is described by the letters on the rings which show through three windows in the casing of the machine; the sequence of the three letters which show are called the window position. The pins of each wheel are in contact

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with the plates to the right of the wheel, or, in the case of the right-hand wheel, with the endplate. The reflector has only 26 pins which are connected in pairs and are in contact with the plates of the left-hand wheel. Unlike the wheels, the reflector is not rotatable in the steckered Enigma.

The O-Bar Enigma came into use in the early 1920's. It had three wheels and no stecker, and the curious characteristic of 29 letters on its keyboard. Of these 29 letters, X always enciphered itself without the current entering the machine, and the 28 letters were enciphered in the normal manner. The rings of the wheels had 28 letters printed on them; curiously, the o-umlaut had been omitted and from this fact the machine derived its name. It was solved by Polish cryptanalysts and all traffic was read. The German Fleet discontinued its use in 1931 when it was superseded gradually by the "Schluessel M" or Navy plugboard Enigma.

The plugboard Enigma was the standard Service machine used by the Army, Air Force, and Navy. The Germans first used this machine with three wheels and six Steckers. The reflector belonging to it was the "A" or "Anton". Having obtained photographs of the keys for three months, during which period the wheel-order remained unchanged, the Poles reconstructed the wiring of wheels 1, 2, and 3. Originally, three wheels, having one notch per wheel, were chosen from a set of five. Later, under German naval procedure, three wheels were chosen from a set of eight, five of which had one notch per wheel and three,

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two notches per wheel. The reflector went through changes from the "A" to the "B" and "C". The "C" was used for a few weeks only in 1940 on one Norwegian air frequency.

The old "B" reflector, which replaced the "A" in the summer of 1937, was abandoned by the Navy and a new "B", half its size, plus an additional wheel (Zusatzwalze) - the number 9 Delta or Beta wheel - were introduced 1 February 1942, making the Navy machine a four-wheel Enigma. The Beta wheel was so wired that when set at the letter A, the combination of it and the new "B" reflector would give an effect equivalent to that of the old "B" reflector, thus enabling holders of the four-wheel machine to continue communicating with holders of the three-wheel machines. On 1 July 1943, a tenth wheel, the Gamma wheel, was introduced. When this wheel was set at the letter A and combined with the new "B" reflector, the effect of the "C" reflector was produced. These last two additional wheels had no notches and were used interchangeably in the fourth wheel position. Subsequently, about 1 January 1944, the Air Force introduced the pluggable reflector "D" which caused considerable difficulties for Allied cryptanalysts. This form of the machine as employed by the Air Force used three one-notched wheels from a set of five. The plugging of the reflector formed part of the key and changed at first three times and later four times a month. At least two Army keys used the "D" reflector with a daily changing plugging, and it seems probable that it was introduced on one of them in 1943. The pluggable reflector was not used by the Navy.

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Still another version of the plugboard Enigma was proposed, using three from a set of five multiple- and variable-notched wheels called the Lueckenfuellerwalzen.¹ The reflector in this machine was a pluggable or non-pluggable fixed plate, as desired. These changes introduced an aspect of unpredictability in key change.

During the 1930's various patents were issued to German inventors for Enigma machines manufactured for sale in Germany and other countries. These machines were used mostly by German commercial firms for sending business instructions to their agents in other countries and could be bought freely on the open market. The Commercial or K Enigma was sold openly until about 1934. It was used in various versions by the Croatian puppet government, the Spaniards, Italians, the Swiss, and, of course, by the Germans themselves. It had three single-notched wheels, a settable reflector, and a fixed input. Many countries rewired the wheels for greater security. After the Nazis acceded to power the machine was withdrawn from the market.

The years 1936 to 1939 cover the period of the Spanish Civil War. When it started, the A Commercial Enigma, an unsteckered machine, was already in existence. A serial number accompanied the A on these machines. They were so marked by their manufacturer, Heimsoeth and Rinke of Berlin. If no letter followed this serial number the machine

1. The compiler tested a set of captured Lueckenfuellerwalzen (in the NSA Museum) for wiring; it was learned that these rotors had the same wiring as the standard military machine.

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was usually a standard Army model used by the German Army, the Schutzstaffel, and the German Air Force. If a Greek letter "Alpha" or "Delta" followed the serial number (e.g., A-246176a) the machine was a standard model returned to its manufacturer for special rewiring. The purpose or destination of these machines has not been determined.

The Italian "K" Naval Enigma was an improved version of the "A" Commercial. It differed from the "A" in that the notch on each of its three wheels was attached to the ring of the wheel instead of to the wheel itself. It was used by the Spaniards during the Spanish Civil War and by the Italians for naval communications between Rome and the Italian colonies. In this capacity it was called by the British the "Italian K" or the "K Italian Naval Enigma".

During the summer of 1937 the German Intelligence Service and its subsection, the Security Service, referred to respectively as "Abwehr"² and "Sicherheitsdienst"³, were sending secret agent traffic from Germany on various networks throughout Europe. This traffic was being intercepted by the British at GC&CS. Mr. Knox of GC&CS is credited with having been the first to solve messages from this traffic and with the setting up of a section for the purpose of continued cryptanalytic attack on the system. This unit was called the "Illicit Series Knox"

2. Amt, Auslandsnachrichten and Abwehr or "AAA", (headed by General Canaris) a part of Hitler's Oberkommando der Wehrmacht (OKW), the Military High Command responsible for coordinating and controlling the Army, Air Force, and Navy in the general conduct of the war.
3. The Sicherheitsdienst (SD) headed by Himmler; the principal intelligence organization of the German Nazi Party.

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Section", thenceforth referred to as ISK. Since the Italian and Spanish traffic, discussed in the previous paragraph, presented the same kind of cryptanalytic problem as the messages coming from Germany, though entirely unrelated, ISK also took this traffic under surveillance, and during the Spanish Civil War solved the Italian K Enigma. By this time, the reflector known as "Anton" had been changed in the standard Service machine to "Bruno".

From the earliest days of World War II (1939-1945) Berlin maintained an extensive network with the main Balkan cities - Vienna, Belgrade, Bucharest, and the whole of eastern occupied Europe as far afield as Salonika and Warsaw. Previously, messages already solved by the British and identified as coming from the Abwehr had been enciphered in a non-machine system. Suddenly towards the end of 1939, Enigma traffic, related to these earlier messages, began to appear on a Berlin to Madrid net and consequently was recognized as also coming from the Abwehr. This traffic involved many keys. Abwehr agents also appeared in Turkey during the early part of the war. They sent numerous messages to the Balkans and to Berlin; throughout the war the Abwehr kept up extensive communications with Madrid and Lisbon.⁴

At the end of the Spanish Civil War, the Spanish used their K

4. It was during 1939 that Cipher Device 39 (Schlüsselgerät 39) was proposed for the Supreme Command Armed Forces, Army, Navy, and Air Force. But there were so many alterations and time difficulties involved in getting this machine under way that it actually never left the development stage.

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Enigma for communications with the Naval attache and the Italians sent theirs to stations in the colonies - Asmara, Rhodes, Tripoli, Bengazi, Leros, and Tobruk. The Enigma referred to by the British as "Italian Naval II" was used for this new Italian traffic and ISK began work on it in April 1940. During this year also, the British recovered the "C" (Caesar) reflector used in the Naval Enigma. This reflector was never used with Army or Air Force keys.

The Abwehr at this time was using ten Steckers and eight wheels. In the course of World War II, it and the Sicherheitsdienst used nine different Enigma machines.⁵ In May 1941 they introduced the Canary Islands Enigma for messages passing between Cisneros and Paris. ISK began attacking these. By December Abwehr traffic had reached a high peak, enabling such good cryptanalytic attack that from then on to the end of the war most of the important Enigma traffic sent by the Abwehr and Sicherheitsdienst was read consistently. Towards the end of the war, an important network of mobile Abwehr units appeared in France and the Low Countries. This network used a key of its own and the decrypted messages provided one of the most important sources of cribs for attack on other Abwehr Enigma systems.

On December 7 1941 (Pearl Harbor Day), the A-837, an old model three-wheel lampboard Enigma, was seized by the U.S. Treasury Department on the premises of CHEMNICO in New York. It was thought that the

5. These were the Group II, GGG, KK, GREEN South American, Canary Islands, SD, RED South American, KD, and the Service Enigmas.

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German censor used this machine and that it probably was the only one employed by German firms throughout the world. On the 25th of this month the first ISK key (Balkan or "B") was solved. The control station for this key was at Berlin and the network included all the principal Balkan cities - Vienna, Bucharest, Zagreb, Sofia, Athens, and Salonika.

Towards the end of 1941 Abwehr and Sicherheitsdienst cipher messages began passing between certain stations in the Gibraltar area using the "GGG" or "3 G" commercial type three-wheel Enigma. This machine was solved by ISK in February 1942. About the same date the Naval Service Enigma became a four-wheel machine by splitting its old reflector into a "Bruno" reflector and a "Beta" Zusatzwalze.

By 1 June 1942 a new wheel had been introduced in the Italian Naval II Enigma. In July, American analysts in the Signal Security Service became aware of the ORANGE Enigma used by the Abwehr and Sicherheitsdienst on a special German diplomatic net operated and controlled by the "Auslands Organisation" which was concerned with German persons living abroad. This was a multi-turnover Enigma with a rotating reflector and without a stecker. It differed from the Commercial machine in the wiring of its wheels and in their motion.

In August of the same year the Swiss Enigma (U.S. cover name: INDIGO), a commercial model with special wiring of its rotors and with its turnover mechanism on the ring, underwent the first of four periodic changes in cipher wheels. Then in October, the KK Enigma was

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captured in North Africa. It was described by the U.S. Army Signal Corps as a revised version of the 11-15-17-notch Group II Enigma, with three wheels and a rotatable reflector and was used by the German Armistice Commission in French Africa. On the tenth of this month the 3-K (GREEN) Enigma, a multiple-notch machine, was first heard on a European station in Cologne. It was believed to be linked with a station in South America. There was also an alternate control from Bordeaux. This machine was solved by the British in December. At this time also, messages transmitted between the Spanish Military Attache in Berlin and Army Headquarters in Madrid were being analysed by ISK. It was assumed that since the Naval Attache used a Commercial machine, the Military Attache would do likewise, although it was certain that the two differed in wiring. About this time, the "Counter" or Zaehlwerk Enigma came into the picture. It was so named from the fact that it had a letter counter in its mechanism. This machine introduced multiple-notch wheels. Approximately 100 of this model were made. They were first issued to German military attaches.

In February 1943 the U.S. Coast Guard solved the 3-K (GREEN) Enigma independently of the British. On 7 April the Swiss (SZD) INDIGO Enigma underwent its second change in wheel wirings. In May the Canary Islands Enigma was solved by the British and was established as a single-turnover, unsteckered type machine used by the Abwehr and Sicherheitsdienst for maintaining a weather- and ship-reporting service between Berlin and the Canary Islands. In the summer of the same year,

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interest was revived in the German diplomatic ORANGE Enigma; July brought forth in the Service Enigma alternate wheels for the reflector and Zusatzwalze. The Caesar and Gamma wheels were solved by the British in mid-July. Later they learned these had already been captured some time previously in North Africa, but had not been sent on to GC&CS. In July, too, British solution of the Italian Naval II Enigma, and the wiring for the INDIGO were obtained.

Until the end of July 1943 the only Enigma messages sent by the Sicherheitsdienst were passed from Pskov and Smolensk to Berlin. On the 27th however, a cipher link was discovered between Rome and Berlin. The machine used by the Sicherheitsdienst was called the "SD Commercial". It was solved by the British in August.

It was during 1943 that the Counter Enigma was withdrawn from the Military Attache service and issued to Military Intelligence (Abwehr). Some were also sold to the Dutch government. In October, American analysts received the April-September keys for the ORANGE Enigma from the British. It was suggested that GGG holders were possibly using the standard Group II machine. November 4th brought mention of a RED (Rot) machine on the 3-N circuit. This was a multiple-notch Enigma using the old Commercial reflector. It was similar to the GREEN machine and was used by the Abwehr and Sicherheitsdienst for communications to South America. By 12 November the first solution of the German diplomatic ORANGE system was effected, and on the same day the British solved the Spanish Military Attache Enigma. It had been used for communications

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between Madrid, Berlin, Rome, Vichy, and Berne.

On December 1943 a machine using RED Enigma wheels and GREEN Enigma reflector was discovered through superenciphered instructions sent from Berlin to Argentina. It appeared that a Kryha machine previously used for communications between these two cities was wearing out, and was to be replaced by the RED Enigma. Confusion reigned. Messages were sent back and forth on BLUE, GREEN, and RED keys. The BLUE key was never solved. The Argentine station revealed in a complaint to Berlin that its machine, the G-208 Enigma⁶, could not decipher the Berlin messages. Finally, Berlin admitted having made an error by using wheels from two different machines, and the combined RED and GREEN Enigma was originated. It was apparently used later by the 4-O component of the Sicherheitsdienst and as such was solved by the U.S. Coast Guard. The British solved the South American RED Enigma in January 1944.

From 1 January to October 1944 the third periodic change occurred in the wiring of the Swiss (SZD) cipher wheels, and in February the cipher link between Rome and Berlin using the SD Commercial changed its cipher system. Thenceforth the Enigma was steckered. Both the Italian service and the Eastern Sicherheitsdienst machine service died early in 1944 at which time the Sicherheitsdienst organization in Turkey began using the Commercial machine. In March, the U.S. Coast

6. A wheel marked G-208 was sold with a machine sent to the Dutch State with the consent of OKW.

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Guard solved the RED (3-N or 3-Nan) Enigma independently of the British. In July the Germans introduced the Enigma Uhr, which was confined to only a few Air Force keys. This device took Allied cryptanalysts completely by surprise, and it was not until after the war that a model was captured. Solution and reconstruction of the machine were obtained from theoretical study within a few days after its introduction. [During the summer a number of "T" or Tirpitz Enigmas, produced by the Germans for the Japanese, were captured in a warehouse in Normandy. In August the Americans raided the port at Lorient in Brittany, France and carried away 60 of these machines. These were similar to the old three-wheel, movable reflector Commercial model, but had a different input sequence, and eight wheels from which three were chosen at a time. In December the principal Enigma used by the Abwehr for European communications - the Group II - was solved by the British. On December third, the KD Enigma was introduced on the Berlin-Madrid-Lisbon network as a Group II replacement for the last part of the German phase of the war. This Enigma used a pluggable "D" (Dora) reflector, had nine notches per wheel and identical turnover pattern for all wheels. Six wheels were recovered, and the machine was solved by the British on 28 January 1945. Near the end of the war the German Air Force made use of a pluggable reflector.

On 1 February 1945 the Swiss made a fourth routine change in the wiring of the SZD cipher wheels. On 20 February and 25 March the

Rumanian Air Force (PINE) and antiaircraft (ASH) traffic, respectively,
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BACKGROUND OF THE ENIGMA

began coming in. The Rumanian Enigma differed from the German Enigma only in the use of a new reflector. During April the equivalent wiring for three wheels of the Swiss (SZD) Enigma was recovered. On the 29th, the A-1214 was captured by U.S. Naval Officers at Brescia in Northern Italy, and sent to Washington for study. It was the old commercial type, its three wheels having Enigma motion and its reflector settable by hand. The wheels, however, had a new set of wirings and were notched the same as the 4-J Coast Guard wheels though for differently numbered wheels.

On 6 May 1945 Germany surrendered to the Allies. In July the TICOM Unit at the Signal Security Agency furnished the wirings for the A-16081 or "Delta" Enigma, used by the German Attache at Zagreb. This was a standard Army Enigma wired for special use. On 3 July the U.S. Military Attache in Buenos Aires reported on the G-260 Enigma, captured by the Argentine Police in a raid on German headquarters.

In September 1945 Japan surrendered to the Allies.



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(b)(1)
(b)(3)-P.L. 86-36
(b)(3)-50 USC 403
(b)(3)-18 USC 798

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A chart on the following page gives in brief outline a description of the progressive changes in the German Enigmas. All the foregoing machines, except the O-Bar, Cipher Device 39, and the ~~NEWA~~ are discussed in the succeeding pages under individual headings, with additional details and variations.

(b) (1)
(b) (3) - P.L. 86-36
(b) (3) - 50 USC 403
(b) (3) - 18 USC 793

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II. PROGRESSIVE CHANGES IN GERMAN ENIGMA

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PROGRESSIVE CHANGES IN GERMAN ENIGMA

| *Enigma model | Used by | Number of rotors | Number of notches | Type of reflector | Type of endplate |
|--|---|----------------------------|---|---|------------------|
| Commercial ("K") | Commercial firms Reichspost Reichsbahn Misc. govt. depts. | 3 | 1 | Rotor, not pluggable | Not pluggable |
| Counter ("Zaehlwerk" "Abwehr" "G") | Military attache until 1943; then Reich Security Office | 3 | Multiple but fixed | Rotor, not pluggable | Not pluggable |
| Plugboard ("Stecker") | Supreme Command Army, Air Force | 3 from set of 5 | 1 | Fixed plate, not pluggable | Pluggable |
| Navy Plugboard ("Schluessel M") | Navy standard machine | 3 from set of 8 & 1 from 2 | 5 with 1 3 with 2 2 with 0 | Fixed plate, not pluggable | Pluggable |
| Plugboard with pluggable reflector (Umkehrwalze D) | Just beginning to be used by Air Force; proposed for Supreme Command Armed Forces, and Army | 3 from set of 5 | 1 | Fixed plate, pluggable | Pluggable |
| Plugboard with variable notch rotors (Luecken-fuellerwalzen) | Proposed for Supreme Command Armed Forces, & for Army, Navy, Air Force | 3 from set of 5 ? | Multiple, changeable, and therefore non-predictable | Fixed plate, pluggable or not pluggable | Pluggable |

* Only machines for which wirings are available are included in this table

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III. OUTLINE OF ENIGMA MACHINES

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OUTLINE OF ENIGMA MACHINES

Page 33

Names: Commercial
K
Swiss Enigma

Used by: Commercial firms
Reichspost
Reichsbahn
Miscellaneous government departments
Swiss Government

- Rotors:
1. Right fixed sequence, usually QWERTZU.
 2. Three cipher wheels which are interchangeable.
Each wheel has one notch.
Construction: Hebern-type wheels; consists of two parts: the core (containing random-mixed wiring); and the tire which may be revolved to any one of 26 positions with relation to the core. Tire setting called "Ringstellung" and affects motion of wheels and acts as concealment of core positions.
 3. Umkehrwalze or reflector - wired on right side only; 26 contact points wired to each other in mixed order to form 13 reciprocal pairs.

Motion: Regular and meter-like.
Wheel 1 moves once with every letter encipherment; wheel 2 steps one when dog engages notch on wheel 1; wheel 3 steps one when dog engages notch on wheel 2 (at same time, wheel 2 will move again).
Reflector remains stationary but may be set by hand at any one of 26 positions.
Encipherment takes place after stepping.

Reflector: Rotor, not pluggable.

Endplate: Fixed, not pluggable.

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OUTLINE OF ENIGMA MACHINES

Names: Zahlwerkmaschine (Z-Maschine) (Counter)
CHANKU (ASA)
ISK (British)
Abwehr
"Q"
Group II type

Used by: Military Attache until 1943; then by Reich Security Office

Rotors: 1. Right fixed sequence.
2. Three cipher wheels which may be interchanged. Multiple but fixed notches - 11, 15, and 17.
3. Rotating Umkehrwalze.

Motion: Wheel 1 steps one with every letter encipherment; wheel 2 steps one when notch on wheel 1 is in effective position; wheel 3 steps one when notch on 2 is in effective position; Umkehrwalze steps one when notch on 3 is in effective position; each wheel moves only when all wheels to its right (faster than it) move.

Reflector: Rotor, not pluggable, rotating.

Endplate: Fixed, not pluggable.

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OUTLINE OF ENIGMA MACHINES

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Names: Plugboard Stecker
YELLOW (ASA)

Used by: Supreme Command, Army, and Air Force

Rotors: Three from a set of 5 available rotors.
Each rotor has one notch.

Motion: Same as Commercial machine.

Reflector: Fixed plate, not pluggable (until later when the pluggable
D Umkehrwalz was introduced).

Endplate: Pluggable, reciprocal stecker.
Generally, six letters were left unsteckered, the other
twenty letters being steckered together in 10 pairs.
Difference between encipherment of this machine and the
Commercial machine lies in endplate steckering.

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OUTLINE OF ENIGMA MACHINES

Names: Navy Plugboard
4-wheel Machine

Used by: Navy components

Rotors: Four cipher wheels; three from set of eight are used; and one from set of two. In set of eight, five wheels with one notch, three wheels with two notches (regular Enigma wheels). In set of two, one is chosen which does not move but may be set in any one of 26 positions by hand; these wheels have no notches; called by Navy the "Beta" wheel.

Motion: Regular Commercial Enigma motion; notch on slow wheel has no effect.

Reflector: Fixed plate, not pluggable.

Endplate: Pluggable.

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OUTLINE OF ENIGMA MACHINES

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Names: Plugboard with variable notch rotors
Lueckenfuellerwalzen

Used by: Proposed for Army, Navy, and Air Force.

Rotors: Three from set of five.

Motion: Based on multiple, variable notch rotors. Notch patterns
changeable and therefore non-predictable.

Reflector: Pluggable or non-pluggable fixed plate.

Endplate: Pluggable.

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OUTLINE OF ENIGMA MACHINES

Names: Plugboard with Pluggable Reflector
UmkehrwalzeD (Dora)
Uncle Dick

Used by: Just beginning to be used by Air Force, but proposed for Army
and Navy as well.

Rotors: 3 from set of 5; 1 notch per rotor.

Motion: Regular Enigma motion.

Reflector: Pluggable fixed plate.

Endplate: Pluggable.

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A. Unsteckered Enigmas

[In listing wheel wirings, the various Enigma machines have been arbitrarily classed according to certain characteristics; the grouping is by no means intended to be definitive. Wheel wirings, as ordinarily given by sources, are with the rings set at letter A. The letters "r" and "l" represent "right" and "left", indicating the direction of the flow of current through the wheels.]

The appendices comprise four documents of interest from TICOM sources. Indices to all wiring sequences and individual machines begin on page 219. Source of material is given with the discussion of each machine. A full list of these sources starts on page 209.]

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ENIGMA WIRINGS

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Name of Machine: COMMERCIAL ENIGMA

Sources: (These are listed under the various types)

The Commercial Enigma is known to have been sold widely prior to 1935. It was used by several governments. Some of these countries rewired the wheels for greater security. Presumably because of its different usages it has been named simply Commercial, A-Commercial, D-Commercial, and K. A serial number prefixed by A without an additional suffix denotes a standard Army machine as issued to the German Army, Air Force, and the SS. In addition, there are various types with the Greek letters Alpha and Delta suffixed to the serial number, e.g., A-246176a. These were standard machines returned to Heimsöeth & Rinke (manufacturers of the machines) for special re-wiring. The purpose or destination of these machines is unknown. One machine included in this report has the letter S suffixed to its serial number.

Basically, the machine has three single-notched wheels, and six wheel orders. The reflector is settable and the endplate sequence is fixed. (All Commercial type Enigmas dealt with at ISK had the QWERTZU input). The three wheels are wired differently and are usually distinguished by the numbers I, II, and III. Each wheel has one notch in its ring so placed that wheel I steps at position E, wheel II at N, and III at Y. The rotatable reflector is moved mechanically, but can be set at any one of 26 positions by hand. The wheels and reflector each have clip position devices (Ringstellung). When the several clip positions are known, a definite setting of the wheels is determined by noting which letter of each ring appears in the window situated in the cover of the machine. The letters are read from left to right starting with the reflector.

This discussion deals with Enigmas in the following order: A types, Swiss, D, K, and those named simply Commercial Enigmas.

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ENIGMA WIRINGS

Name of Machine: A (OLD COMMERCIAL)

Source: 6b (p. 1-3)

These wheels were sold on the commercial market. They were marked A by the manufacturers. At one time the Swiss used this Enigma, and it is believed that they rewired the wheels (but not the reflector) twice in the passage of years.

The reflector on this machine, in addition to being used on the Swiss rewired models, is also used on the Spanish Naval Attache machine and on the Coast Guard 3-N Enigma.

These two wirings were obtained from the U.S. Army Signal Corps. The reflector is the same as for the old commercial machine. Apparently the Swiss rewired the three wheels but not the reflector. No information is available as to notches; they are presumed to be the same as for the old commercial.

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ENIGMA WIRINGS

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Name of Machine: A (OLD COMMERCIAL)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (Paper strip wiring)

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. H R W Y I P C G V X L A F U J B K O D T S M Z N Q E

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
S E W Y M G D L O I U B T X K V J P A F Z C N H R Q

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
L V A D Z P C G Y B H X Q S U E T K F I J W M O R N

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: "A" or OLD COMMERCIAL

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L / M N O P Q R S T U V W X Y Z
1. L P G S Z M H A E O Q K V X R F Y B U T N I C J D W

II. A B C D E F G H I J K' L M N O P Q R / S T U V W X Y Z
S L V G B T F X J Q O H E W I R Z Y A M K P C N D U

III. A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
C J G D P S H K T U R A W Z X F M Y N Q O B V L I E

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

Notch patterns are indicated by /

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ENIGMA WIRINGS

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Note on Swiss and Hungarian Enigmas:

The Swiss Army from time to time rewired the wheels of the Enigma. These wirings were not on file with their manufacturer, Heimsöeth & Rinke. The Hungarians also used wirings not on file there. The Swiss did their own wiring; the Hungarians, who were connected with Konski and Krueger, changed the wirings on the Enigma wheels after the women working for them had left the shop, so their wirings did not agree with the Konski and Krueger records.

The following pages include many Swiss wirings; no Hungarian ones were found.

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ENIGMA WIRINGS

Name of Machine: SWISS ARMY ENIGMA (A-766)

Source: 6a (p. 1, 24, 26-27); 8 (p. 2); 12 (p. 24-26); 34 (p. 216 ff.)

From the equivalent wiring of the two outside wheels, as recovered by the U.S. Coast Guard, the U.S. Signal Corps identified these wheels as the actual ones furnished in the old commercial Enigma machine (lot A-766); the U.S. Navy later identified the traffic as that of the Swiss Army. The wheel order used for this traffic, with respect to the numbers on the actual wheels, was 1, 3, 2 (left to right as one faces the machine). No notches are indicated.

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ENIGMA WIRINGS

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Name of Machine: SWISS ARMY ENIGMA (A-766)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Outside A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 E S M J R U O A H Z D Q B P V G L F I T N X W Y K C

Second A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 W Z A N D F I E C M R U Q G T X P S Y O H J L V K B

2 Inner A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 (combined) Y I Z E D R P O B T W S U Q H G N F L J M X K V A C

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA

Source: 6a (p. 1-2, 4, 24-27); 12 (p. 1, 3, 22, 24-26); 50 (p. 1-4);
60 (p. 1, app.)

Following this account are schematic and derived wirings of the Swiss Enigma as used on the SZD or INDIGO system. The machine employed is a commercial type Enigma with specially wired wheels and turnover mechanism on the ring. The wheel order is apparently a completely random series of the six variations. The reflector is not interchangeable.

The only variable element in the SZD system from August 1942 to October 1944, except for a double encipherment occurring in 1944, was the periodic change every eight to nine months of the rotors. The first three wirings were used from August 1942 through 6 April 1943 (a duplicate of this wiring, not included here, had different turnovers as follows: Red wheel: E/F, Blue wheel: X/Y, and Green wheel: N/O. This wiring corresponds to ringsetting AAAA. A on the right side of the wheel - normal sequence - is connected to A on the left side of the wheel - mixed sequence).

The second three wirings were used from 7 April 1943 through 31 December 1943; the third three from 1 January 1944 to 1 February 1945. The new wirings have all been adapted from GC&CS wirings in which the British Z or 26 is equivalent to American A or 1. This necessitates the conversion of all exchanged information in order to eliminate the discrepancy. In all these changes the endplate sequence and the reflector wiring have remained constant for each wheel, that is, wheel I: Y/Z, wheel II: E/F, wheel III: N/O.

The fourth routine change of wheel wiring for the SZD system took place on 1 February 1945. The last three Swiss wirings given here are effective for that date. One equivalent wheel was recovered on 3 April, the other two on successive days. It was established that no change had been made in the reflector. This apparently represents the first Swiss Enigma wiring and perhaps the first Enigma wiring of any kind recovered by the Signal Security Agency.

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ENIGMA WIRINGS

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Name of Machine: SWISS ENIGMA

(SZD - First recovered wiring August 1942 - 6 April 1943)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors: (schematic wiring)

Red A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 Z N L X V G P U S D B I F Y M Q E C O A R T J H K W

Blue A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
 E B R K S U D V A W I J M Z H L C G T P Y N F O X Q

Green A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
 G C A O N S H K R J Z V P X W Q F T D U E I L B M Y

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA

(SZD - First recovered wiring August 1942 - 6 April 1943)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors: (derived from schematic wiring)

Red I A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 B N P D F U L G I X Z S V C O K Y W M A J H R T Q E

Blue II A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 W Z J Q I G X F A E S R O B T P Y U H L C N V M D K

Green III A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 U Y A M N I T Q J R B F L D E K V H X G W S P Z O C

Reflector: A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 S O W H Y U V J A C I K Z B D E P T Q X F G L M R N

Notch patterns are indicated by /

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ENIGMA WIRINGS

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Name of Machine: SWISS ENIGMA

(Wiring specifications derived from schematic wiring)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

I. 1. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
r. H A N X B W T F S G L U I Z M Y C E P D V O K R J Q

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
S N G C R T V I W Y B H D F O L X P Q M J E A U K Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Y Q B N M P H J V S L O X W C E T R F U A K G I Z D

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
S N R M L G F X Q T P E D B Z K I C A J V U Y H W O

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Page 52 ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA

(SZD - 2d recovered wiring 7 April 1943 - 31 December 1943)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors: (schematic wiring)

Brown I A B C D E F G H I J K L M N O P Q R S T U V W X Y / Z
 J Q G E K F O C R I A D L Y S Z M P W U V B X N T H

Purple II A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
 B U A Q Y H E S P R V Z I N K D L X C T O W M J G F

Orange III A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
 O A N C K Y T I X V Q R Z B S F W U L M P G E J H D

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

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ENIGMA WIRINGS

Page 53

Name of Machine: SWISS ENIGMA

(SZD - 2d recovered wiring 7 April 1943 - 31 December 1943)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors: (derived from schematic wiring)

Brown I A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 R K U W Q V M Y J S A X P C I B O L E G F Z D N H T

Purple II A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 Z G A K C T W I L J F B S N Q X P D Y H M E O R U V

Orange III A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 M A N Y Q C H S D F K J B Z I V E G P O L U W R T X

Reflector: A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 S O W H Y U V J A C I K Z B D E P T Q X F G L M R N

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ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA

(Wiring specifications derived from schematic wiring)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

I. 1. ABCDEFGHIJKLMNOPQRSTUVWXYZ
r. QLNEIGHCMSZJUDKOWARBYVXPTF

II. ABCDEFGHIJKLMNOPQRSTUVWXYZ
YPWJFQZHTRXSGNEKMDOVCBULIA

III. ABCDEFGHIJKLMNOPQRSTUVWXYZ
ZOVSKRJUMPQGAYHIWDTCFLEBXN

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ

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ENIGMA WIRINGS

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Name of Machine: SWISS ENIGMA

(SZD - 3d recovered wiring 1 January 1944 to date [1944])

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors: (schematic wiring)

Blue I A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 A O Z P C H S G F J N B D W I L U K M X Q Y R E V T

Red II A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
 Q O D G W X M C I Z K U J Y A L H F R E B P S T V N

Green III A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
 B H O L J M X S A W D N E F Q T K R V Y P U Z G I C

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

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ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA

(SZD - 3d recovered wiring 1 January 1944 to date [1944])

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors: (derived from schematic wiring)

Blue I A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 A M B L Y T I U V R N Z X E S P G Q O D K C J W F H

Red II A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 K M X U E D O Y S B Q G R C A P T V J W Z L I H F N

Green III A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 Z T M P R O D I A E X N W V K H Q J F C L G B U S Y

Reflector: A Z Y X W V U T S R Q P O N M L K J I H G F E D C B
 S O W H Y U V J A C I K Z B D E P T Q X F G L M R N

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ENIGMA WIRINGS

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Name of Machine: SWISS ENIGMA

(Wiring specifications derived from schematic wiring)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

I. 1. ABCDEFGHIJKLMNOPQRSTUVWXYZ
r. AYFHNCKBUEGXZQILJRMVTS DOWP

II. ABCDEFGHIJKLMNOPQRSTUVWXYZ
MRNVWC PDEIAFZBULQOSKXJHYTG

III. ABCDEFGHIJKLMNOPQRSTUVWXYZ
SEHURIFLTJMGYPVXKWCZDNOQBA

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ

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ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. L A P Y Z H E G X C N D W V R F T Q U I J O K B M S

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Q D B S N P Z E U C I K W T H J Y V G A L O R X F M

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
M H R J F W I A U D C V X T S K B N P Q Z O E G L Y

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

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ENIGMA WIRINGS

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Name of Machine: SWISS ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (probable rewire)

Red r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. T K R J Q M F X L W Y C O B S G P U I V H E Z D N A

Blue A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I B Q G A W R O K L D P M V X T Z C E S F H J Y U N

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
C X B S U Q A G V J H W Y E D M P I F R T L O N Z K

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

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ENIGMA WIRINGS

Name of Machine: NEW SWISS ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (known rewire)

Red r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
l. O U H C T R D Q I M K P G Z B V A S W X L Y E F N J

Blue A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A L E M X I H F O J R P S K B D U W G Z Q Y N T V C

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I A Z K M N X B Y E Q D F L C U O R H P V S J G T W

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

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ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA (INDIGO)

Source: 7; 9 (p. 1)

The wiring of the INDIGO cipher wheels was changed on April 7, 1943. In the INDIGO system companion messages, bearing identical numbers but sent in opposite directions, used the same wheel order and the same ring setting. This new wiring of the wheels was obtained on July 21, 1943. Efforts to apply the known wheel order and the ring setting using this wiring were unsuccessful. The problem became one of adjusting the new wiring so that it could be used with the INDIGO message indicators in subsequent solutions.

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ENIGMA WIRINGS

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Name of Machine: SWISS ENIGMA (INDIGO)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

New Brown A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
P F D J E N B Q H Z C K X R Y L O V T U A W M S G I

Relabeled A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Brown J Q G E K F O C R I A D L Y S Z M P W U V B X N T H

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

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ENIGMA WIRINGS

Name of Machine: SWISS ENIGMA (INDIGO)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Brown A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
J Q G E K F O C R I A D L Y S Z M P W U V B X N T H

Orange A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
O A N C K Y T I X V Q R Z B S F W U L M P G E J H D

Purple A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
B U A Q Y H E S P R V Z I N K D L X C T O W M J G F

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

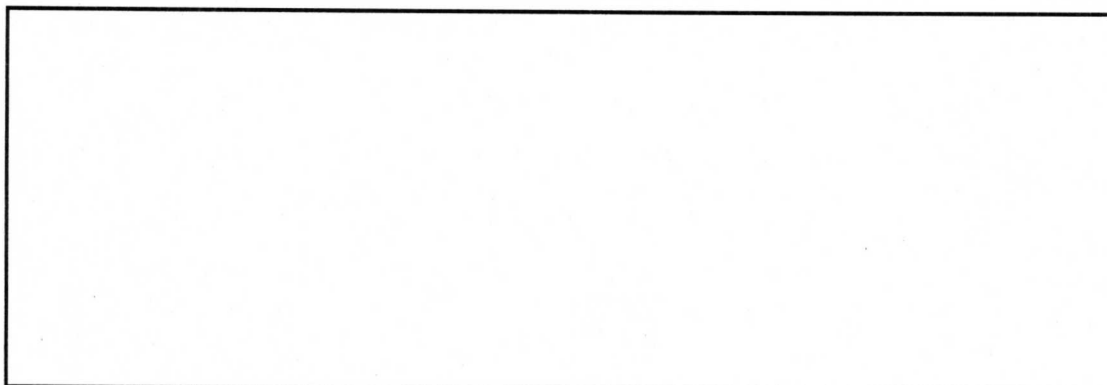
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ENIGMA WIRINGS



(b) (1)
(b) (3) - P.L. 86-36
(b) (3) - 50 USC 403
(b) (3) - 18 USC 798

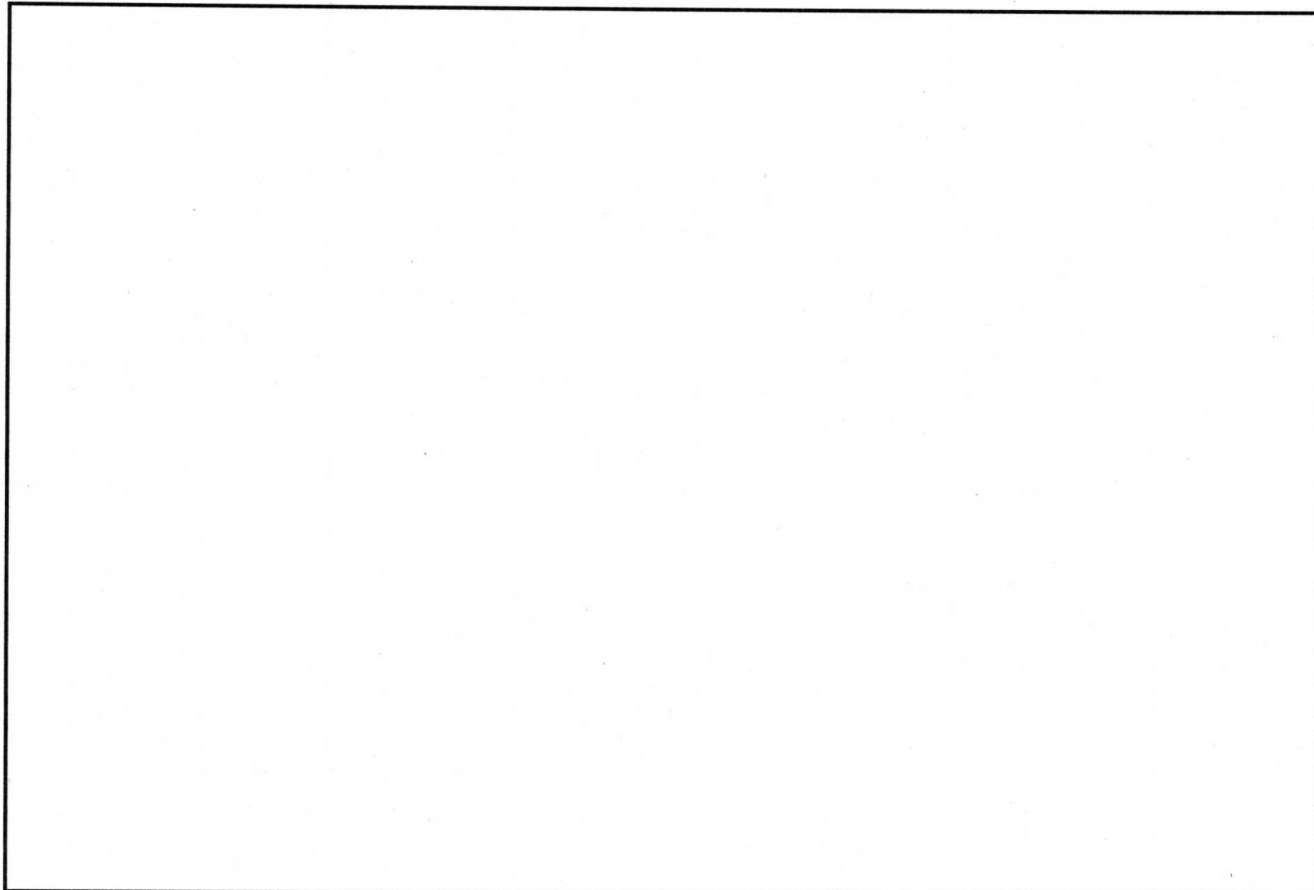
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ENIGMA WIRINGS

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(b)(1)
(b)(3)-P.L. 86-36
(b)(3)-50 USC 403
(b)(3)-18 USC 798

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ENIGMA WIRINGS

Name of Machine: COMMERCIAL ENIGMA (A-827)

Source: 14

Since the A commercial Enigmas are being presented in this report in numerical order for convenience, a comment should be made here concerning the existence of the A-827. Though no wiring is given, Source states that it was rewired corresponding to the wirings of the Croatian Enigma machine which is covered along with other types of K machines.

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ENIGMA WIRINGS

Name of Machine: ENIGMA CIPHER MACHINE (A-837)

Source: 19

The A-837 Enigma was found on the premises of the CHEMNYCO Corporation, 521 Fifth Avenue, New York. It was seized by the Treasury Department 7 December 1941 for eventual retention by G-2. It is the old model four-wheel Enigma (three wheels and reflector) which indicates enciphered and deciphered letters by means of lights flashing under a keyboard arrangement. The first three wheels may be put in the machine in any order: 1, 3, 2; 2, 3, 1; 3, 2, 1; etc.

Since messages enciphered on this model passed through censorship in Germany, it was probably the only one used by German firms throughout the world. The number A-837 appeared on the box as well as on all wheels. The original wheel order as viewed by Source was 3, 1, 2. The clip settings were: wheel III: D; wheel I: A; wheel II: E; and wheel IV (Reflector): B.

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ENIGMA WIRINGS

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Name of Machine: ENIGMA CIPHER MACHINE (A-837)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. L P G S Z M H A E O Q K V X R F Y B U T N I C J D W

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
G R H Y W P Z K F X J B N U S L I A M V P C E Q D T

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
O L H F M J G S V K N W X U D Z C A I P B Q T R E Y

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
O J N F U D H G S B Z T R C A Y X M I L E W V Q P K

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ENIGMA WIRINGS

Name of Machine: A-1214

Source: 6k; 69

The A-1214 Enigma machine was captured by U.S. Naval Officers at Brescia in Northern Italy, and sent to Naval Communications Annex for study. It is of the commercial type, three wheels having Enigma motion and reflector settable by hand. The reflector is the same as the so-called Old Commercial reflector, but the three wheels have a new set of wirings. The notches on the wheels are in the same positions as those of the 4-J Coast Guard machine but not for the same numbered wheels.

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ENIGMA WIRINGS

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Name of Machine: A-1214

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVB NML (Keyboard)

Rotors:

I. r. ABCDEFGHIJKLMNOPQRSTUVWXYZ
1. EKWBIMSDOLCFZVHYUJAQNGRPT
II. ABCDEFGHIJKLMNOPQRSTUVWXYZ
OJDVFNI BSHRKLAWZXQUPYEMGTC
III. ABCDEFGHIJKLMNOPQRSTUVWXYZ
BVLKUJPQXAWMEODCNHIYFGTZSR

Y

E Wrong notches

N

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ
IMETCGFRAYSQBZXWLHKDVUPOJN

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ENIGMA WIRINGS

Name of Machine: STANDARD ARMY "A" (Machine No. A-15465)

Source: 24 (p. 9)

Two damaged wheels belonging to this machine, a No. 1 wheel and a reflector, were captured near Toulon. Numbers instead of alphabetical characters were engraved on the ring of the No. 1 wheel. The machine number on both of these wheels was A-15465. An additional red B appeared on the reflector. All wiring had been destroyed. However, a photograph of the reflector revealed white figures inked in on the pins, starting with number one, directly above the notch in the case, and proceeding in a clockwise direction to number 26. The wiring that follows is based on these figures. Investigation of available material indicated that this wiring was that of the old B reflector for the three-wheel standard Army A-machine. Source states that this reflector will not fit a four-wheel machine because the locating knobs and the positioning notch are not placed properly.

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ENIGMA WIRINGS

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Name of Machine: STANDARD ARMY "A" (Machine No. A-15465)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
"Old B" Y R U H Q S L D P X N G O K M I E B F Z C W V J A T

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ENIGMA WIRINGS

Name of Machine: "DELTA" ENIGMA MACHINE (A-16081)

Source: 6j (p. 1-4); 14

The Delta Enigma machine was used by the German Military Attache at Zagreb. It appears to have been a standard Army Enigma, wired for special use. The wiring as given here was furnished by the TICOM Unit (SSA) in July 1945. The machine came equipped with five wheels and a reflector. Notches are at the same positions as they appear on the standard Service wheels.

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ENIGMA WIRINGS

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Name of Machine: "DELTA" ENIGMA MACHINE (A-16081)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. C V F W J O B X A N Q T D Z U M E Y R P S K G I L H

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
X J G U R H Z M Y D L A T W K S E P N Q Q F O I B V

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
S Y I G X E L D U K B V O A W T Z H Q N F C R M J P

IV. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
H K T Z D S R F W P C Q J I Y X N V M U G E L A O B

V. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z/
W M G R K E J U A Z P T O X I N D Y B Q V H L C P S

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
D O N A J U X T Q E L K S C B Z I V M H F R Y G W P

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ENIGMA WIRINGS

Name of Machine: "ALPHA" ENIGMA MACHINE (A-16749)

Source: 6f (p. 1); 6g (p. 1, 2)

Two wheels (No. 2, No. 3) only of this machine were captured in Italy.

The notches are at the same positions as for the Service wheels.

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ENIGMA WIRINGS

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Name of Machine: "ALPHA" ENIGMA MACHINE (A-16749)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1.
II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
H K Y X G R Z L S W B O A V N U F J T D M Q C I E P
III. A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
L R X E V N T M Y F S D I P U Z J W G C H B Q A K O

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

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ENIGMA WIRINGS

Name of Machine: "S" ENIGMA (A-17245 S)

Source: 61 (p. 1, 2)

The following wiring was used in the A-17245 S Enigma, a machine apparently of the commercial type. No data was found concerning it.

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ENIGMA WIRINGS

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Name of Machine: "S" ENIGMA (A-17245 S)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. V E O S I R Z U J D Q C K G W Y P N X A F L T H M B

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
U E M O A T Q L S H P K C Y F W J Z B G V X I D N R

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
T Z H X M B S I P N U R J F D K E Q V C W G L A O Y

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
C I A G S N D R B Y T P Z F U L V H E K O Q X W J M

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ENIGMA WIRINGS

Name of Machine: COMMERCIAL ENIGMA (MODEL D)

Source: 7; 56 (p. 1, 2, 5)

The Model D Cipher Machine was manufactured in Germany by Chiffriermaschinen A.G. and was sold commercially. It has three interchangeable wheels and a reflector. The 26 electrical contacts on the right side of the wheels are wired in random fashion to a corresponding number of contacts on the left side of the wheels. The reflector is wired on the right side only, the 26 contact points being wired to each other in mixed order to form 13 reciprocal pairs.

The wiring that follows is that of the wheels as sold commercially.

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ENIGMA WIRINGS

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Name of Machine: COMMERCIAL ENIGMA (MODEL D)

Endplate Sequence:

 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

I. A B C D E F G H I J K L M N O P Q R S T U V W X / Y Z
 H R W Y I P C G V X L A F U J B K O D T S M Z N Q E

II. A B C D / E F G H I J K L M N O P Q R S T U V W X Y Z
 S E W Y M G D L O I U B T X K V J P A F Z C N H R Q

III. A B C D E F G H I J K L M / N O P Q R S T U V W X Y Z
 L V A D Z P C G Y B H X Q S U E T K F I J W M O R N

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

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ENIGMA WIRINGS

Name of Machine: K ENIGMA (K-234)

Source: 6f (p. 1-2)

The machine known as the K Enigma is considered to be an improved version of the Commercial Enigma. It was used in Germany by commercial firms, the Post Office, the Railways, and miscellaneous governmental agencies. As such it employed three wheels, having one notch each, a fixed reflector and endplate. The K differed from the A Commercial machine only in the attachment of the turnover; in the A, this was on the wheel; in the K, it was on the ring.

The wiring that follows is of the K-234. This machine was captured at either Penang or Sabang by the British in 1945. Since GC&CS did not want the machine, it was released to the U.S. on request.

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ENIGMA WIRINGS

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Name of Machine: K ENIGMA (K-234)

Endplate Sequence:

 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X / Y Z
 1. G W D Y U O J E A T R H Z C N Q B V L K S P I F M X

II. A B / C D E F G H I J K L M N O P Q R S T U V W X Y Z
 Q L T J X E A R W N V P K I D H C U O B Z S Y G F M

III. A B C D E F G H I J K L / M N O P Q R S T U V W X Y Z
 X P G N K M W D S H C U F E B Y L Q A I V R Z O J T

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 F Q E K C A R U J I D Z S W Y X B G M V H T N P O L

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ENIGMA WIRINGS

Name of Machine: ITALIAN ENIGMAS

Source: 37 (p. 1-3); 55 (p. 5, 84, 86, 110, 174, 178); 64 (p. 20)

During the Civil War in Spain, the Italians and Spaniards used a version of the K Enigma. At the time, the A Commercial Enigma was the only other unsteckered machine in existence. Of the three Italian Enigma wirings presented here, the Italian K or Italian Naval (K) was solved during the time of the Spanish Civil War (1936 - 1939) by the British ISK Section. It was used for naval communication between Rome and the Italian colonies. After the Civil War, the Italians sent their machines to stations in the colonies: Asmara, Rhodes, Tripoli, Bengazi, Leros, and Tobruk. ISK started to work on the new Italian traffic in 1940.

During 1941 and 1942 the Italians introduced two new wheels. The wiring of the first was recovered when the known wheel was in the right-hand position, giving the rod couplings necessary to obtain the wirings of the new middle wheel; the second new wheel was recovered by buttoning up an L dummy message (L dummies are enciphered on the machine by tapping L only; these can be recognized by the absence of L throughout, and will give the wheel order and turnover for the day).

The second Italian Enigma (Italian Naval II) was solved by ISK in July 1943. It is a rewired version of the Italian Naval (K) and was used solely for passing on agents' reports from Rome to a Mediterranean station that was never identified.

In the last Italian Enigma wiring given in this group the wheel order and clips were fixed for the day. Source adds that there had already been two new wheels, the last one having been introduced on 1 June 1942. Traffic dealt mainly with unsigned intelligence reports and wireless instructions that passed between Rome, Tripoli, Rhodes, Mariduset, and occasionally Leros and Bengazi. All stations communicated with Rome, but never with one another.

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ENIGMA WIRINGS

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Name of Machine: ITALIAN NAVAL (K)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 l. O L F D G R X A M K I U B Y V S W Q P J H N E C T Z

Blue A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 T J S O V K Q I X G N H E P C B W A R U Y F D M L Z

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 E S I G R X P W U F D N Q M C J L Y A K V T B H O Z

New Green A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 E T R M J I F A Y O H W Q N B V K P C U L X D S G Z

Purple A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 T J R P S H B D Q E U W X K V O I G F N Y M C A J Z

Black A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 S W M K X L I V Q O J C B U E N D A T F P Y H R G Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 S Q K I T R P O D Z C V N M H G B F A E W L U Y X J

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ENIGMA WIRINGS

Name of Machine: ITALIAN NAVAL II

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVB NML (Keyboard)

Rotors:

Red r. ABCDEFGHIJKLMNOPQRSTUVWXYZ
l. YIXDELOKASCRQBVWMTUHNFGFPJZ

Blue ABCDEFGHIJKLMNOPQRSTUVWXYZ
SWRAGOIVEQLFXHPKDUJTMNCYBZ

Sepia ABCDEFGHIJKLMNOPQRSTUVWXYZ
XBMSEJQUAFLWTKNHDPGCR IYVOZ

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ
FQOMLAWZSKJEDYCXBTIRVUGPNH

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ENIGMA WIRINGS

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Name of Machine: ITALIAN ENIGMA

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

Blue A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 V L U Q X M S K Z I P J G R E D Y C T W A H F O N B

Purple A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 V M T R U J D F S G W Y Z N X Q K I H P A O E M L B

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 G V T O L K H C A Q J Y S P D X M R E W N Z F U I B

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 P J H S Q O N C Y B U M L Q F A E Z D V K T X W I R

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ENIGMA WIRINGS

Name of Machine: SPANISH ENIGMAS

Source: 5 (App. A - p. 4, App. B - p. 10); 6c (p. 1-2); 6d (p. 1-2);
55 (p. 5, 84, 87, 88, 175, 178)

As stated under Italian Enigmas, during the Spanish Civil War the Spaniards were using a version of the K Enigma. Following the war they used their machine for communications with the Naval Attache.

Five Spanish Enigma wirings were found. The first one presented, the SNA (Spanish Naval Attache), is probably of the commercial type. It was supplied by the British and most likely has twists and reletterings. The reflector is the same as on the old Commercial. This wiring does not seem to agree with any of the other Spanish wirings given in this report, but it does appear to be a relettering of the Red, Blue, and Green wheels of the six-wheel Italian Naval (K) Enigma and of its reflector. No information is available as to notch positions.

The machine entitled Spanish Military Attache Enigma, was used for military attache communications between Madrid, Berlin, Rome, Vichy, and Berne. It was solved by the British (ISK) in November 1943. Clip differences are noted as follows:

| | | |
|--------|--------------|------------------|
| G.P.B. | Spanish AAAA | British Z.F.Z.M. |
| P.B.G. | Spanish AAAA | British Z.S.F.O. |

Differences

| | |
|---|----|
| G | 12 |
| B | 14 |
| P | 20 |

Twists

| | |
|---|---|
| G | 7 |
| B | 7 |
| P | 2 |

The B (SPARMA), lettered B for convenience, and the SPARMA (twist-free) that follows it, are possible also military attache wirings. No information is available concerning them except that the former was supplied by the British with twists and reletterings, and is still not twist free.

The fifth wiring was simply labeled "Spanish Machine". Although it appears to have the same reflector as the three military machines just described and the same notch pattern and placement for the corresponding Black, Purple, and Green wheels, it does not seem to agree with any of the versions in the three actual wheels. Possibly it is an Enigma Bombe wiring.

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ENIGMA WIRINGS

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Name of Machine: SNA (SPANISH NAVAL ATTACHE)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

Red A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A P M G E H S Y B N L J V C Z W T X R Q K I O F D U

Blue A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A U K T P W L R J Y H O I F Q D C X B S V Z G E N M

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A F T J H S Y Q X V G E O R N D K M Z B L W U C I P

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
S Q K I T R P O D Z C V N M H G B F A E W L U Y X J

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ENIGMA WIRINGS

Name of Machine: SPANISH MILITARY ATTACHE

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

Purple I r. A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
1. D J E R U N S G A O H Y T X P K F V M C L B W I Q Z

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y / Z
V Q K G N C L I H U X M T J A D O B W F R P Y S E Z

Black A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
M Y K G F L X B A I O V Q W J U E T D R H C S P N Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
K D M B V N S I H X A P C F Z L W U G Y R E Q J T O

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ENIGMA WIRINGS

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Name of Machine: "B" (SPARMA)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

Black r. ABCDEFGHIJKLMNOPQRSTUVWXYZ
l. MYKGFLEXBAIOVQWJUETDRHCSPNZ

Purple ABCDEFGHIJKLMNOPQRSTUVWXYZ
BTOJZQGPFAMUDHNIVYRWKESLCX

Green ABCDEFGHIJKLMNOPQRSTUVWXYZ
GVCSJMXKFOAYHBNIEZTPWLURQD

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ
GEQIBOATDYUNWLFXCSRHKZMPJV

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ENIGMA WIRINGS

Name of Machine: SPARMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)Rotors: (twist-free)Green r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. I P F W Z K X S B N L U O A V R M G C J Y H E D Q TBlack A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
Q D O Y N X L B W M J H T G S E A Z F R V U C I P KPurple A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
L U K F R Z I M S N A D W B P J X Q H C G Y T O E VReflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
E R U O A L J V N G T F Y I D Z S B Q K C H X W M P

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ENIGMA WIRINGS

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Name of Machine: SPANISH ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

Black A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
I H V S Q E D U J O C F A Y K X M T W R P L N G B Z

Purple A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
I V T A C Q H K X B P U S F J O Y D G M E R W N L Z

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y / Z
O R F P Y T D I H N C G L E Q V B U X M J A S K W Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
K D M B V N S I H X A P C F Z L W U G Y R E Q J T O

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ENIGMA WIRINGS

Name of Machine: CROATIAN ENIGMA

Source: 14 (p. 14); 64 (p. 20)

On the following page is given the Croatian Enigma machine wiring for cipher wheels Nos. K 881 - K 892 (ch 11 Tz 364 a-c) and the rotatable reversing wheel No. 1048 (ch 11 Tz 86). The presentation here is in literal form, whereas the original was given in numbers. The top row letters on each wheel represent the movable contacts; the bottom row letters, the fixed contacts. The letters run in a clockwise direction viewed from the front of the movable contacts.

Corresponding to the wirings of the Croatian Enigma, the commercial Enigma machines, models K, K-913, K-914, and A-827, were rewired. No wirings were found for these models.

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ENIGMA WIRINGS

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Name of Machine: CROATIAN ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

Ch 11 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Tz 364 a B T N A Y L I U Q H D X R J V F O M W S E Z K G P C

Ch 11 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Tz 364 b H K W A J X Q V Y N F T L P R U M D E G S C B I Z O

Ch 11 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Tz 364 c U L Q I T S D Y H R O J V F A B M Z G W P C X N E K

Reflector: Wheel # 1048 (Ch 11 Tz 86)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

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ENIGMA WIRINGS

Name of Machine: CANARY ISLANDS ENIGMA

Source: 55 (p. 4, 79-80, 175, 179)

The Canary Islands Enigma was used by the Abwehr and Sicherheitsdienst for maintaining a weather- and ship-reporting service between Berlin and the Canaries. Traffic passing between Cisneros and Paris began coming in to ISK in May 1941. It was assumed, and later established, that the machine was of the single-turnover type, which experience had shown was usually unsteckered. It was solved by the British in May 1943.

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ENIGMA WIRINGS

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Name of Machine: CANARY ISLANDS ENIGMA

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

Red A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
 S L A F D J G O M Y V R Z H W I C X N Q U E K T B P

Blue A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
 W S Q P C A O I Z E M R J U Y H V G D X N L F K B T

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y / Z
 L T Y E M J C S I X R F D K B U W Q H O G N Z V A P

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 Q M S P L H R F O W T E B V I D A G C K Z N J Y X U

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ENIGMA WIRINGS

Name of Machine: GGG (3-G)

Source: 6a (p. 10, 13, 17); 30; 32 (p. 10); 54 (p. 86); 55 (p. 4, 5, 52, 60-62, 176, 179)

Towards the end of 1941 a fair volume of cipher messages began to pass between certain stations in the Gibraltar area and Madrid. The name GGG given to this network was derived from the callsign used by the Algeciras station. The cipher machine used for these communications is known as the GGG or 3-G and was employed by the Abwehr (German Secret Service) and the Sicherheitsdienst (German Security Service) solely between Madrid and Algiers, and Tetuan and several outstations situated in the area of the Straits of Gibraltar.

The GGG machine was solved by ISK analysts in February 1942. It is described as a commercial type Enigma with three wheels, designated Green, Red, and Blue, having regular Enigma motion. Each of these wheels has a fixed notch on its ring, causing the Green wheel to turn over at E/F, the Blue at N/O, and the Red at Y/Z. This is the case for all commercial type Enigmas. The middle wheel turns over irrespective of whether or not the right-hand wheel is in its turnover position. The reflector is rotatable by hand for the setting of a message, but is not affected during an encipherment by any of the wheels. The wiring given is British, and probably has twists in it.

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ENIGMA WIRINGS

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Name of Machine: GGG (3-G)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A L E B H O N C W Y X M F T K U P D V J R Z G I S Q

Blue A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A T Q E L D P K B G U W O R N J F X I Y C H S Z V M

Green A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A J T W P U D K Y O C S G M X V L N Q H E R F I Z B

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
D N M A L P I Q G R W E C B V F H J X Z Y O K S U T

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ENIGMA WIRINGS

Name of Machine: 4-JIG ENIGMA (4-J)

Source: 2 (p. 1-2); 6a (p. 10-12)

This machine has regular Enigma non-metric motion.

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ENIGMA WIRINGS

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Name of Machine: 4-JIG ENIGMA (4-J)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

Red I r. A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
l. S L A F D J G O M V Y R Z H W I C X N Q U E K T B P

Green II A B C D E F G H I J K L M N O P Q R S T U V W X Y / Z
L T Y E M J C S I X R F D K B U W Q H O G N Z V A P

Blue III A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
W S Q P C A O I Z E M R J U Y H V G D X N L F K B T

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Q M S P L H R F O W T E B V I D A G C K Z N J Y X U

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Page 104

ENIGMA WIRINGS

Name of Machine: ROCKET

Source: 6a (p. 3-5)

These wheels were used by the Germans for railway traffic in Northern France. The wiring as shown was furnished by the British.

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ENIGMA WIRINGS

Page 105

Name of Machine: ROCKET

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N / O P Q R S T U V W X Y Z
1. J G D Q O X U S C A M I F R V T P N E W K B L Z Y H

II. A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
N T Z P S F B O K M W R C J D I V L A E Y U X H G Q

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y / Z
J V I U B H T C D Y A K E Q Z P O S G X N R M W F L

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
M R Z I P H O F D W Q V A U G E K B Y X N L J T S C

Notch patterns are indicated by /

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Page 106

ENIGMA WIRINGS

Name of Machine: S. D. COMMERCIAL

Source: 55 (p. 4, 67, 75, 173, 178)

The S. D. Enigma was used by the Sicherheitsdienst for European communications. Until the end of July 1943, the only Enigma messages sent by the Sicherheitsdienst were passed from Pskov and Smolensk to Berlin. The machine used was different from those used by the Abwehr. On 27 July, however, a cipher link was discovered between Rome and Berlin. The wiring given was recovered by the British in August 1943.

Both the Italian and Eastern Sicherheitsdienst machine services ended early in 1944. The cipher system changed in February. From then on the Enigma was steckered.

At the time the above services died, the Sicherheitsdienst organization in Turkey began using the commercial machine.

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ENIGMA WIRINGS

Page 107

Name of Machine: S. D. COMMERCIAL

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

Red r. ABCDEFGHIJKLMNOPQRSTUVWXYZ
l. OFRYLGZDNPJUWQEXATSMHBICVK

Blue ABCDE/FGHIJKLMNOPQRSTUVWXYZ
KUFASEWIPNGDVHQYXZLJOBMCRT

Green ABCDEFGHIJKLMNOP/OPQRSTUVWXYZ
IFCORGGJSTQZVYWELXMPNAUKHDB

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ
LDSBF EQZXRPAYWVKGCUTONIMH

Notch patterns are indicated by /

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Page 108

ENIGMA WIRINGS

Name of Machine: RUMANIAN ENIGMA

Source: 52 (p.1)

The Rumanian Enigma differs from the German machine only in the presence of a new reflector.

Rumil 4 (Ash) and Rumafo 1 (Pine), respectively, were the keys of the Rumanian Antiaircraft and Air units. Pine traffic started 20 February, and Ash on 25 March 1945.

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ENIGMA WIRINGS

Page 109

Name of Machine: RUMANIAN ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
U Y L Q H K I E G W F C P V Z M D S R X A N J T B O

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ENIGMA WIRINGS

Name of Machine: TIRPITZ (T) ENIGMA

Source: 6a (p. 3, 6-9); 24 (p. 13-20); 26 (p.2); 43 (p. 2-3); 59

The Tirpitz or T unsteckered Enigmas were manufactured by the Germans for the Japanese. In the summer of 1944, a number of these were captured in a warehouse in Normandy where some of them were awaiting shipment to Japan.

The machine is similar to the old three-wheel, one-movable-reflector commercial Enigma but differs in the following ways: Its input sequence though fixed is neither QWERTZU not alphabetical; it has eight wheels, all marked "T", from which three were chosen for use at a time, permitting 336 wheel orders in all; its wheels have five notches each, instead of one as in the commercial model. There are four different patterns for this turnover distribution:

| <u>Wheels</u> | <u>Spaces between Notches</u> | <u>Position of Turnover</u> |
|---------------|-------------------------------|-----------------------------|
| 1, 3 | 6 - 6 - 6 - 3 - 5 | E, K, Q, W, Z |
| 2, 4 | 6 - 6 - 5 - 3 - 6 | F, L, R, W, Z |
| 5, 7 | 3 - 5 - 7 - 7 - 4 | C, F, K, R, Y |
| 6, 8 | 4 - 4 - 4 - 7 - 7 | E, I, M, Q, X |

The reflector is moved forward by hand after each group.

Of the four wirings included here, the first, second, and fourth agree in letter values for the eight wheels and reflector, but differ in endplate sequence (no endplate sequence was indicated in the first wiring); the second and third agree in endplate sequence, but differ in letter value; all wirings differ in notch placement, the second one being the only one that agrees with the patterns given above.

Source for the data on the T-258 and T-259 (the fourth wiring in this series) states that Americans raided the port at Lorient in Brittany, August 1944 and, unknown to the Japanese, carried away 60 of these Enigmas.

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ENIGMA WIRINGS

Page 111

Name of Machine: TIRPITZ (T) ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 (Keyboard)

Rotors:

I. r. A B C D E / F G H I J K / L M N O P Q / R S T U V W / X Y Z
 l. K P T Y U E L O C V G R F Q D A N J M B S W H Z X I

II. A B C D E F / G H I J K L / M N O P Q R / S T U V W / X Y Z
 U P H Z L W E Q M T D J X C A K S O I G V B Y F N R

III. A B C D E / F G H I J K / L M N O P Q / R S T U V W / X Y Z
 Q U D L Y R F E K O N V Z A X W H M G P J B S I C T

IV. A B C D E F / G H I J K L / M N O P Q R / S T U V W / X Y Z
 C I W T B K X N R E S P F L Y D A G V H Q U O J Z M

V. A B C / D E F / G H I J K / L M N O P Q R / S T U V W X Y / Z
 U A X G I S N J B V E R D Y L F Z W T P C K O H M Q

VI. A B C D E / F G H I / J K L M / N O P Q / R S T U V W X / Y Z
 X F U Z G A L V H C N Y S E W Q T D M R B K P J O J

VII. A B C / D E F / G H I J K / L M N O P Q R / S T U V W X Y / Z
 B J V F T X P L N A Y O Z I K W G D Q E R U C H S M

VIII. A B C D E / F G H I / J K L M / N O P Q / R S T U V W X / Y Z
 Y M T P N Z H W K O D A J X E L U Q V G C B I S F R

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 G E K P B T A U M O C N I L J D X Z Y F H W V Q S R

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: T-257 ENIGMA

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
 KEJCMNPFXDTSVWLBGIA YHQUORZ (Keyboard)

Rotors: (all rings set at "A")

I. r. ABCDEF/GHIJK/LMNOPQ/RSTUVW/XYZ/
 l. KPTYUELOCVGRFQDANJMBSWHZXI

II. ABCDEF/GHIJK/LMNOPQ/RSTUVW/XYZ/
 UPHZLWEQMTDJXCAKSOIGVBYFNR

III. ABCDEF/GHIJK/LMNOPQ/RSTUVW/XYZ/
 QUDLYRFEKONVZAXWHMGPJBSICT

IV. ABCDEF/GHIJK/LMNOPQ/RSTUVW/XYZ/
 CIWTBKKXNRESPLFYDAGVHQUOJZM

V. ABC/DEF/GHIJK/LMNOPQ/RSTUVW/XYZ
 UAXGISNJBVERDYLFZWTPCKOHMQ

VI. ABCDEF/GHIJK/LMNOPQ/RSTUVW/XYZ
 XFUZGALVHCNYSEWQTDMRBKPJOJ

VII. ABC/DEF/GHIJK/LMNOPQ/RSTUVW/XYZ
 BJVFXTXPLNAYOZIKWGDQERUCHSM

VIII. ABCDEF/GHIJK/LMNOPQ/RSTUVW/XYZ
 YMTPNZHWKODAJXELUQVGCBSIFR

Reflector: ABCDEF/GHIJK/LMNOPQ/RSTUVW/XYZ
 GEKPBTAUMOCNIIJDXZYFHWVQSR

Notch patterns are indicated by / (window readings)

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ENIGMA WIRINGS

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Name of Machine: T-257 ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 K E J C M N P F X D T S V W L B G I A Y H Q U O R Z (Keyboard)

Rotors: (all rings set at "Z")

I. r. A B C D E / F G H / I J K L M / N O P Q R S / T U V W X Y / Z
 1. O S X T D K N B U F Q E P C Z M I L A R V G Y W H J

II. A B C D E / F G H / I J K L M / N O P Q R S T / U V W X Y Z /
 O G Y K V D P L S C I M B Z J R N H F U A X E M Q T

III. A B C D E / F G H / I J K L M / N O P Q R S / T U V W X Y / Z
 T C K X Q E D J N M U Y Z W V G L F O I A R H B S P

IV. A B C D E / F G H / I J K L M / N O P Q R S T / U V W X Y Z /
 H V S A J W M Q D R O E K X C Z F U G P T N I Y L B

V. A B C D E F G / H I J K / L M N / O P Q R S / T U V W X Y Z /
 Z W F H R M I A U D Q C X K E Y V S O B J N G L P T

VI. A B C D E F / G H I J K L M / N O P Q / R S T U / V W X Y / Z
 E T Y F Z K U G B M X R D V P S C L Q A J O H N I W

VII. A B C D E F G / H I J K / L M N / O P Q R S / T U V W X Y Z /
 I U E S W O K M Z A N Y H J V F C P D Q T B G R L A

VIII. A B C D E F / G H I J K L M / N O P Q / R S T U / V W X Y / Z
 L S O M Y G V J N C Z I W D K T P U F B A H R E Q X

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 D J O A S Z T L N B M H K I C W Y X E G V U P R Q F

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: TIRPITZ NON-STECKERED ENIGMA (T-258 & T-259)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 K Z R O U Q H Y A I G B L W V S T D F X P N M C V E (Keyboard)

Rotors:

I. A B C D E / F G H / I J K L / M N O P Q R / S T U V W X / Y Z
 K P T Y U E L O C V G R F Q D A N J M B S W H Z X I
 II. A B C D / E F G / H I J K L M / N O P Q R S / T U V W X Y / Z
 U P H Z L W E Q M T D J X C A K S O I G V B Y F N R
 III. A B C D / E F G / H I J K L / M N O P Q R / S T U V W X / Y Z
 Q U D L Y R F E K O N V Z A X W H M G P J B S I C T
 IV. A B C D / E F G / H I J K L M / N O P Q R S / T U V W X Y / Z
 Y L Q N T I U D H B W M Z P V J G O X K A E R F C S
 V. A B C D E F / G H I J / K L M / N O P Q R / S T U V W X Y / Z
 U A X G I S N J B V E R D Y L F Z W T P C K O H M Q
 VI. A B C D E / F G H I J K L / M N O P / Q R S T / U V W X / Y Z
 X F U Z G A L V H C N Y S E W Q T D M R B K P I O J
 VII. A B C D E F / G H I J / K L M / N O P Q R / S T U V W X Y / Z
 B J V F T X P L N A Y O Z I K W G D Q E R U C H S M
 VIII. A B C D E / F G H I J K L / M N O P / Q R S T / U V W X / Y Z
 Y M T P N Z H W K O D A J X E L U Q V G C B I S F R

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 (movable) G E K P B T A U M O C N I L J D X Z Y F H W V Q S R

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: EARLY GERMAN 3-WHEEL ENIGMA

Source: 17 (p. 1, 3-4)

The wiring given is of an Enigma machine referred to by Source as a Group II Enigma, based on the same principle as the commercial model, but considerably more complicated. According to Source, a booklet, issued with the original machine, recommended as secure, a certain method of using it which the Germans adopted for their Group II traffic. Source states further that this method resulted in the recovery of this Group II wiring without having had access to the actual machine.

This machine had a set of five wheels, numbered I - V, three of which were chosen to be used in any order, giving 60 possible variations. There was one turnover position on each wheel, differing in placement for every wheel. Also, according to Source, the rings on wheels used by the German Army were marked by numbers 1 - 26 instead of by letters.

Since all Group II Enigmas encountered in preparing this report have consistently had the 11-15-17 notch pattern for their wheels, and since there is no indication of choice of three out of a set of five wheels for any of them, this wiring, perhaps, is more properly placed with the commercial type machines, or with the various Service machines.

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ENIGMA WIRINGS

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Name of Machine: EARLY GERMAN 3-WHEEL ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

I. 1. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
r. P E X R Y S N H G Z C V J D F Q K M W A T O B I U L

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
I G X N Y L Q O A C B J S E W T M K R D V H Z U F P

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Y W S P G Z M K N C O V D B E A J G H Q T I L X U R

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
S N R M L G F X Q T P E D B Z K I C A J V U Y H W O

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: ZAEHLWERK (CA-15)

Source: 47

No wiring was found for this machine, but a brief comment on it is made here since it is of the Group II type.

The Zaehlwerk or Counter Enigma is a four-wheel model having gear drive and employing eccentric teeth for wheel progression. It was sold to the Dutch for military use. Subsequent to the outbreak of World War II, two machines were delivered to OKW at Stahnsdorf.

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ENIGMA WIRINGS

Name of Machine: GROUP II ENIGMA

Source: 4 (p. 1, 5, 6, 12, 18); 6a (p. 10, 17, 19); 6h (p. 1-3);
 10 (p. 82); 11 (p. 1); 15; 30; 31; 32 (p. 9); 44 (p. 2); 48;
 55 (p. 4, 172, 177); 61 (p. 1)

The Group II machine, also referred to as the German notation G machine, was the principal Enigma used by the Abwehr until the end of 1944, for European communications. The British ISK section solved the machine in December 1944.

Group II traffic centering on Berlin had approximately 270 out-stations including some ships. This group together with a large group centering on Paris, Brussels, The Hague, Sofia, Vienna, Warsaw, and Zagreb formed one network. These also worked with a large number of out-stations within the subgroups.

Of the three wirings included here, the first two were originally given in digital form. The last one, a twist-free version, appeared as presented in literal form. The first wiring was furnished by the British with the following additional data:

| | | |
|----------------|-------------------------------|------------------------------|
| <u>Wheels:</u> | <u>Wheel characteristics:</u> | <u>Cyclometric turnover:</u> |
| I British Red | Red: 12. 10. 2. 2. | R.B.G. |
| II " Blue | Blue: 19. 3. 2. 2. | R O S A |
| III " Green | Green: 18. 8. | S P T B |
| | | S P T C |

| | |
|------------------------------|----------------------|
| <u>Clip Differences:</u> | <u>Wheel Twists:</u> |
| <u>English</u> <u>German</u> | Red = 8 |
| Reflector = 17 | Blue = 19 |
| Red = 18 | Green = 17 |
| Blue = 12 | |
| Green = 6 | |

| | |
|-------------------------------------|--------------------------|
| <u>Conversion Table</u> | <u>English to German</u> |
| <u>Wheel Order</u> <u>Reflector</u> | Left Middle Right |
| R.G.B. -9 constant | - 2 + 1 -12 |
| G.R.B. | - 7 -11 -12 |
| B.R.G. | -11 - 9 - 6 |
| R.B.G. | - 2 - 3 - 6 |
| G.B.R. | - 7 + 6 + 8 |
| B.G.R. | -11 +12 + 8 |

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ENIGMA WIRINGS

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GROUP II ENIGMA (continued)

The machine associated with the second wiring was presented as being a variation of the commercial Enigma, differing from it by having the wheels turn over cyclometrically, i.e., no wheel can turn over unless all wheels to the right of it are passing through a turnover position. The reflector also is turned over by the wheel immediately to its right. Like the British version, just described, these wheels have 11, 15, 17 turnovers fixed to the rings, but differ in notch placement and individual digit values. A literal wiring not included here, agrees with the second wiring in corresponding values but differs as to notch markings which are given as follows:

Green: A/B/C/DE/F/G/HI/JK/L/MNO/P/Q/RS/TU/V/W/XYZ/ - 17

Blue: A/BC/D/EF/G/H/IJK/LM/N/OPQ/RS/T/UV/WXY/Z/ - 15

Red: A/BCDE/F/GH/IJK/LM/N/OPQR/STU/VW/X/YZ - 11

A pencilled notation made on the paper giving this wiring reads: "wheels probably twisted".

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ENIGMA WIRINGS

Name of Machine: GROUP II ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red I A/B/C/D E/F/G/H I/J K/L/M N O/P/Q/R S/T U/V/W/X Y Z/
R P V E O S B L G K H J T Y U C I A M W Q X F N D Z
C E

Blue II A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z/
W D L C I R U B K J P V A Q M X F S Y O H G T E N Z

Green III A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z
J H B Q Y U K C S L I D N V M A O W F P X G T E R Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
U R Z L V Q Y J W H M D K S P O F B N X A E I T G C

Notch patterns are indicated by /

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ENIGMA WIRINGS

Page 123

Name of Machine: GROUP II ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Green A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z
 A K I C R Z V L D T M J E O W N B P X G Q Y H U F S

Blue A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z/
 A X E M D J S V C L K Q W B R N Y G T Z P I H U F O

Red A/B/C/D E/F/G/H I/J K/L/M N O/P/Q/R S/T U/V/W/X Y Z/
 A S Q W D P T C M H L I K U Z V F J B N X R Y G O E

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 U R Z L V Q Y J W H M D K S P O F B N X A E I T G C

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: GROUP II ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (twist-free)

Red r. A/B/C/D E/F/G/H I/J K/L/M N O/P/Q/R S/T U/V/W/X Y Z/ (17-notch)
1. W R V S U E J F P T L X H B I Q Y O K C A G N Z D M

Blue A/B C/D/E/F/G/H/I J K/L M/N/O P Q/R S/T U V/W X Y/Z/ (15-notch)
K G R Z M S I B A N Y H T Q X F W C L O V E D J P U

Green A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z (11-notch)
F N W J U H P Z X R G O K A S I B Y T D L C Q E M V

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Y D U B J G F W S E O R V Z K X T L I Q C M H P A N

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: ORANGE ENIGMA

Source: 4 (p. 1, 6, 12); 10 (p. 82); 11 (p. 1); 15; 48; 55; 61 (p. 1)

The system GEQ, also known as ORANGE at SSA, was a German machine cipher used on the special diplomatic net by the Abwehr (Intelligence) and Sicherheitsdienst (Secret Police). According to the British, it constituted the majority of the traffic known to them as "ISK" or "Illicit Series Knox" - Mr. Knox being the analyst who first solved messages of this class.

Attention was first directed to GEQ in July 1942 upon the return of Col. S. Kullback (SSD) from England. In October 1943 the British sent a complete list of keys for April - September. The first solution was effected on 12 November.

The ORANGE Enigma used to encipher GEQ traffic was operated and controlled by the "Auslands Organisation", which dealt with Germans living abroad. It is a multi-turnover machine with a rotating reflector but without stecker. It differs from the commercial model only in the wiring of the wheels and in their motion. These are characterized individually as Red, Blue, Green, and Reflector, and positionally as fast, medium, slow, and reflector. The three regular wheels are interchangeable, giving six possible wheel orders. The reflector by its mechanico-electrical composition is a movable endplate rather than a true wheel and cannot be interchanged with the other wheels.

The motion of the ORANGE Enigma differs from that of the Commercial in the following manner: the medium wheel moves every 1, 2, 3, or 4 letters instead of every 26; the slow wheel moves at least once in every four moves of the medium wheel. The reflector moves during encipherment at least once for every four moves of the slow wheel. Presumably, motion is accomplished mechanically by notches on the rings of the wheels, as on the Commercial Enigma. Notches for the Red, Blue, and Green wheels are 17, 15, and 11 respectively. The position of the notches as shown in the wirings is with ring setting at A.

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ENIGMA WIRINGS

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Name of Machine: ORANGE ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red A/B/C/D E/F/G/H I/J K/L/M N/O/P/Q/R S/T/U/V/W/X Y/Z/
A S H E Z Q X J L R M K I T Y F C V B G N P D U W O

Blue A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z/
A N I E C Y R W V F K J D P Z U L O G S X H M B Q T

Green A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z
A Q D I M Y T W C L B H K P N R U E Z J X G O S V F

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
U R Z L V Q Y J W H M D K S P O F B N X A E I T G C

Notch patterns are indicated by /

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ENIGMA WIRINGS

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Name of Machine: GREEN and RED ENIGMAS

Source: 1 (p. 1); 6a (p. 10, 15-16, 21-23); 6e (p. 1-2); 25 (p. 1);
34 (p. 212, 215, 231, 262 ff., 309, 323-325); 41 (p. 4);
54 (p. 96); 55; 67

Enigma machines used by the German Intelligence Service between Berlin and South America have been associated with the colors "blue", "green", and "red". These colors were used confusedly in messages between the two points in reference to keys, stations, and the actual machines.

The BLUE key was never solved. The GREEN machine was used by the Abwehr in 1942 and solved in December of that year by the British and in February of 1943 by the U.S. Coast Guard. The RED machine, as used on the 3-N circuit, was apparently employed by the Abwehr and the Sicherheitsdienst to replace the Kryha (non-Enigma) machine and was solved by the British January 1944 and by the Coast Guard in March 1944. As a result of confusion between Berlin and Argentina with the introduction of the RED machine, a mix-up produced a machine using a combination of RED wheels and GREEN reflector. Apparently this machine was used by the 4-0 part of the Sicherheitsdienst group. At this time Argentina complained to Berlin of inability to decipher messages sent her because the machine being used at that end was the G-208 Enigma.

Another machine, the G-260, with a relettering of one between the wiring of its wheels and the wheels of the RED 3-Nan (twist-free) machine, was captured by Argentine Police in a raid on German agents' quarters, and was reported on by the U.S. Military Attache in Buenos Aires on 3 July 1945.

Still another Enigma, the B-207 (RED "B" machine) is included herein chiefly because the term "RED" has also been tacked on to it. No evidence has been found to indicate that this is a South American machine or that it belongs to this group at all. Only the wiring as shown last, following the more detailed account of these machines under their RED, GREEN, or Sicherheitsdienst Group (4-0) headings, was available. No attempt has been made in this paper to account for any of the differences found.

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ENIGMA WIRINGS

Name of Machine: GREEN ENIGMA (3-KING) (3-K)

Source: 1 (p. 1); 6a (p. 10, 15-16); 34 (p. 231, 324); 55; 67

The 3-King (GREEN) machine, also referred to as the 3-K and the South American GREEN Enigma, was first heard 10 October 1942. The machine is a multiple-notch Enigma employing cyclometric motion, that is, no wheel can turn unless the notches on all wheels to the right are in position. Thus, the cycle of this machine is 26^4 , since the reflector wheel is also mechanically stepped. All known multiple-notch machines have the same distribution of notches on their 11-, 15-, and 17-notch wheels. This turnover pattern plus the rotary reflector produces a "lobster" effect.

Four versions of the GREEN machine are included in this account. Two - the second and fourth - were originally in digital form but are presented here, for convenience, in literal form. The first one, which probably has twists, agrees correspondingly in letter value with the second one, but differs in notch placement. The third and fourth are different from each other as well as from the first and second wirings in letter value and notch placement. All four versions are alike, however, in notch pattern which is reportedly the same as for the Group II machine.

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ENIGMA WIRINGS

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Name of Machine: GREEN ENIGMA (3-KING) (3-K)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z
l. A Y X P G O W L V K R E I M C S N J D B Z T Q H U F

II. A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z/
A Q I Y G S H O F D P V K W Z R X E M J C U N T B L

III. A/B/C/D E/F/G/H I/J K/L/M N O/P/Q/R S/T U/V/W/X Y Z/
A U L T I R J N H D P C O B Z S Y G Q V E K X W F M

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
T Z M J V Y P U Q D N W C K S G I X O A H E L R F B

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: GREEN ENIGMA (3-KING) (3-K)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

- I. A/B/C D/E/F G/H I/J/K L/M N/O/P Q/R/S T/U V/W X/Y/Z
A Y X P G O W L V K R E I M C S N J D B Z T Q H U F
- II. A B/C D/E/F G/H I J/K/L/M N/O/P Q/R/S/T U V/W X/Y/Z
A Q I Y G S H O F D P V K W Z R X E M J C U N T B L
- III. A/B C/D/E/F G/H I/J/K L M/N/O/P Q/R S/T/U/V W X/Y/Z/
A U L T I R J N H D P C O B Z S Y G Q V E K X W F M

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
T Z M J V Y P U Q D N W C K S G I X O A H E L R F B

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ENIGMA WIRINGS

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Name of Machine: SOUTH AMERICAN (GREEN)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red A/B/C/D E/F/G/H I/J K/L/M N/O/P/Q/R S/T U/V/W/X Y/Z/
D M S F E N U I C T B Q Z R V P L X K W J H A G O Y

Blue A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z/
W C R D G Y E L T Q J B U A I S H X P F N Z O V M K

Green A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z
Q O N F W E M B L A H U Y C S I D Z T R P J G X K V

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
W I P M T Z N J B H U R D G X C Y L V E K S A O Q F

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ENIGMA WIRINGS

Name of Machine: GREEN ENIGMA (3-KING) (3-K)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)Rotors:

- I. 1. A B C D/E/F G/H I J/K L/M/N O P/Q R S T/U V/W/X Y Z/ (11-notch)
r. A T O S L Z E X M R J H N Q F D W K P V Y I G C B U
- II. A B/C/D E/F/G/H I J/K L/M/N O P/Q R/S/T U/V W X/Y/Z/ (15-notch)
A Y U J R I E G C T M Z S W H K B P F X V L N Q D O
- III. A/B/C D/E/F/G H/I J/K/L M N/O/P/Q R/S T/U/V/W X Y/Z/ (17-notch)
A N L J U Y R I E G V C Z H M K S F P D B T X W Q O

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
T Z M J V Y P U Q D N W C K S G I X O A H E L R F B

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ENIGMA WIRINGS

Name of Machine: RED ENIGMA (3-NAN) (3-N)

Source: 6a (p. 10, 21-23); 6e (p. 1-2); 25 (p. 1); 34 (p. 212, 215, 262 ff., 309, 323-325); 41 (p. 4); 54 (p. 96); 55 (p. 4)

The RED (Rot) machine was used by the Abwehr and the Sicherheitsdienst for communications to South America on the 3-N circuit. The first mention of its appearance was in a message from Argentina to Berlin on 4 November 1943. It was solved independently by the British in January 1944 and by the U.S. Coast Guard in March 1944.

Like the GREEN Enigma, it is a multiple-notch machine employing cyclometric motion. The cycle of the machine is 26^4 since the reflector wheel is also mechanically stepped. It has the 11-15-17 turnover pattern distribution plus the rotating reflector which produces the "lobster" effect. Through a message from Berlin to Argentina, which indicated the wheel order as R231, the Coast Guard verified that wheels 1, 2, and 3 had 17, 15, and 11 turnovers respectively. A curious thing about the reflector is that it is the same as for the old Commercial machine.

Of the four wirings included with this account, the first one, a literal version with notches marked, corresponded to a digital version, not included here, which was labeled "Mercedes RED" but which showed no notch placement and had no explanatory data accompanying it. The second and third wirings are U.S. Coast Guard recoveries. They give no notch placement. The last wiring is a British version, given originally in digital form. It is correspondingly different from all the other versions and its turnover pattern is indicated as being the same as that for the Group II machines.

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ENIGMA WIRINGS

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Name of Machine: RED ENIGMA (3-NAN) (3-N)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors: (twist-free)

Red I r. A/B/C/D E/F/G H/I J/K/L/M N/O/P/Q/R S/T U/V/W/X Y/Z (17-notch)
l. B R O A K J P Z T L G V X S H E Y U F N I M D W C Q

Blue II A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z (15-notch)
B L H A U O I W Z Q N R F M C K Y J D X G T E P S V

Green III A/B C D E/F/G H/I J K/L M/N/O P Q/R/S T U/V W/X/Y Z (11-notch)
U C G Y D K R P L Z W N J X H V O F B A T I S M Q E

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
L D S B F E Q Z X R P A Y W V K G J C U T O N I M H

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ENIGMA WIRINGS

Name of Machine: RED ENIGMA (3-NAN) (3-N)

Endplate Sequence:

 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors: (with twists)

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (17-notch)
 1. A Y W P S K O U F E J V T C G Z B N I R L X M Q H D

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (15-notch)
 A E P N Z L I D V H J W T C X F R O G B Y M Q U K S

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (11-notch)
 A D Y Q B N U L E H W K P G X F V T Z O J M C I S R

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (twist-free)
 L D S B F E Q Z X R P A Y W V K G J C U T O N I M H

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ENIGMA WIRINGS

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Name of Machine: RED ENIGMA (3-NAN) (3-N)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVB NML (Keyboard)

Rotors: (twist-free)

I. r. ABCDEFGHIJKLMNOPQRSTUVWXYZ
l. DAYWPSKOUFEJVTGZBNIRLXMQH

II. ABCDEFGHIJKLMNOPQRSTUVWXYZ
DAOSWMUCGRPB NKFXJLYVEZHTQI

III. ABCDEFGHIJKLMNOPQRSTUVWXYZ
TSBEZRCOV MFI XLQHYGWUAPKNDJ

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ
LDSBF EQZXRPA YWVKGCUTONIMH

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ENIGMA WIRINGS

Name of Machine: SOUTH AMERICAN II (RED)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red r. A/B/C/D E/F/G/H I/J K/L/M N/O/P/Q/R S/T U/V/W/X Y Z/
 l. C S P B L K Q A U M H W Y T I F Z V G O J N E X D R

Blue A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z/
 K T Q W G C V P J D R U L I M A H X F T E Y S B O Z

Green A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z
 N X L E V R Q J Y I C G U K S W O T A H F B P M D Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 B A M V T N L W U S R G C F Y Q P K J E I D H Z O X

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ENIGMA WIRINGS

Name of Machine: SICHERHEITSDIENST GROUP (4-Q) ENIGMA

Source: 34 (p. 324-325)

The only instance known up to this time of a machine using RED Enigma wheels and GREEN Enigma reflector was the case of the super-enciphered instructions for the RED machine when first sent to Argentina. A Berlin message of 5 December 1943 read: "We got the machines mixed up here".

The Enigma involved here was used by the 4-Q component of the Sicherheitsdienst group and recovered by the U.S. Coast Guard. Its RED wheels agree with those used in the RED (twist-free) machine and its GREEN reflector agrees with the reflector used in the GREEN 3-King machine previously discussed. No notch pattern or placement is shown, but the pattern possibly follows the 17-15-11 design of all known multiple-notch machines.

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ENIGMA WIRINGS

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Name of Machine: SICHERHEITSDIENST GROUP (4-0) ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Red Enigma
Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. D A Y W P S K O U F E J V T C G Z B N I R L X M Q H

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
D A O S W M U C G R P B N K F X J L Y V E Z H T Q I

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
T S B E Z R C O V M F I X L Q H Y G W U A P K N D J

Green Enigma
Reflector:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
T Z M J V Y P U Q D N W C K S G I X O A H E L R F B

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ENIGMA WIRINGS

Name of Machine: B-207 ENIGMA (RED "B" MACHINE)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 (Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 1. L H Q N Y U P G Z B X J T S E K O C A M W R I F V D

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 O M K J H V S C A Y I T Q F B L Z X P D W U N G R E

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 Q X P V L D J T C E Z K R H Y I W O B U F M A S G N

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 N M I E D V H G C R Y U B A Q Z O J X W L F T S K P

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ENIGMA WIRINGS

Name of Machine: KK (GERMAN ARMISTICE COMMISSION ENIGMA)

Source: 4 (p. 18); 6h (p. 1-3); 29 (p. 1); 55 (p. 4, 173, 178)

This machine, referred to by the Germans as the KK Enigma, was captured October 1942 in North Africa. It was used by the German Armistice Commission in French Africa until the early winter of 1942. It is a revised version of the 11-15-17 Group II Enigma. There are three wheels and a rotatable reflector. Wheel I has 17 turnovers; wheel II, 15; and wheel III, 11. There is reason to believe that this machine is one of the "G" series, a letter designation which accompanied most of the cyclometric machines with rotating reflectors.

Mr. William F. Friedman of the Signal Security Agency, who visited the ISK Section at Bletchley Park, says of this machine: "With regard to the traffic used by the German Armistice Commission, it was stated that the British obtained a machine by capture before they were able to solve any traffic. This machine is of the standard ISK type, but has special wirings. One of these machines was captured by American Forces in the Torch Operation and was sent to B.P. where it is still on hand. It is a nicer job than the ordinary E. It also has several additional features, the most important of which is that it has a letter counter and a mechanism whereby the rotors can be rapidly moved forward or backward by a hand crank." (cf. Zaehlwerk CA-15).

Two wirings of the KK Enigma are included here; the first is a British version and the second is the U.S. Army Signal Corps wiring. The turnovers on the British version are the same as for the Group II machine.

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ENIGMA WIRINGS

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Name of Machine: KK (GERMAN ARMISTICE COMMISSION ENIGMA)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red I A/B/C/D E/F/G/H I/J K/L/M N/O/P/Q/R S/T U/V/W/X Y Z/
U M F R Y L E Q D K J X A S H W G T P Z C I O B N V

Blue II A/B C/D/E F/G/H/I J K/L M/N/O P Q/R S/T/U V/W X Y/Z/
E O J V T G L R F P D U C Q H A Z W M B I X N S K Y

Green III A/B C D E/F/G H/I J K/L M/N/O P Q R/S T U/V W/X/Y Z
L F X S J Z Q I K B W T G E R C P A Y U H O D N M V

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
L D H B M Z S C P Y T A E R X I U N G K Q W V O J F

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ENIGMA WIRINGS

Name of Machine: KK ENIGMA (Revised GROUP II)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)Rotors:Red r. A B C/D/E/F/G/H/I/J/K L/M/N O/P/Q R S T U/V/W/X/Y/Z
l. M X U I G C Q O V K J F B Y W S H D N R A Z P L E TBlue A B/C/D/E/F G/H I J/K/L/M/N O P Q/R/S T U V/W/X/Y/Z/
P T M K A I F O U C Y G S W B J N H X E L D R V Z QGreen A/B C D/E/F G/H/I/J/K L/M N/O P Q R S T U V W/X Y Z/
R J P W N B M U H E I A Y X V Q G O D L T Z K C S FReflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
L D H B M Z S C P Y T A E R X I U N G K Q W V O J F

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ENIGMA WIRINGS

Name of Machine: G-208 ENIGMA

Source: 16 (p. 3); 40 (p. 5)

While the debris was being cleaned up in the radio station of the Alexander Barracks in the Hague, an Enigma wheel was found bearing the markings II and G-208. Notches are not indicated on the wiring that follows, but Source maintains that it had "many skip notches". For this reason, and also because of the markings found on the wheel it is included here with Group II machines.

The G-208 Enigma was reported sold with a machine to the Dutch State with the consent of OKW.

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ENIGMA WIRINGS

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Name of Machine: G-208 ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1.
II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
S L V G B T F X J Q O H E W I R Z Y A M K P C N D U
III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: G-260 ENIGMA

Source: 3 (p. 1-4); 6a (p. 23)

This machine was captured by the Argentine Police in a raid on German agent quarters. It was loaned to the U.S. Military Attache in Buenos Aires, who examined and photographed it. The following account is from his report.

The serial number G-260 appears on the exterior of the box containing the machine as well as on each intermediate wheel, the reflector, and the endplate. The contacts on the endplate follow the same order as the letters on the keyboard but in a counter-clockwise direction, i.e., the first letter to the left of Q is W, and the second letter to the left of Q is E.

When the machine was received for examination the wheels had been placed on the wheel shaft in the following order, from left to right, No. 3, 2, 1. The spring clip of wheel I was set at D; of II, at C; of III, at B; of the reflector, at D. The wiring of point to plate contacts while the alphabets were in the above positions was as indicated in the first wiring version presented after this account.

This report of the Military Attache shows a relettering of one between the wiring of wheels themselves and the recovered wiring of the 3-NAN twist-free machine. Due to the notational difficulties encountered between Washington and station "X" in England this is not surprising. The new wiring as given in the Military Attache's report (omitted by Source) is to be preferred to the old wiring. The conversion may be accomplished as follows: increase the letter on both right and left wiring specifications by one, i.e., A - B, B - C, etc. It will be noted that the reflector is the old commercial reflector. The second wiring given here has been converted on the basis of the 3-NAN wiring previously discussed under the heading: RED Enigma.

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ENIGMA WIRINGS

Page 153

Name of Machine: G-260 ENIGMA

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

I. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 H A G U F V S E O N T D X P K Z B W L I C Y J R M Q

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 S V Y E O K D X R L Z C T Q U I P F N B M G A J W H

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 S G W E I A F M T R N B Y P L Z J X Q H D C V K U O

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 R M Q L P H W F J I U D B V T E C A Z O K N G Y X S

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: G-260 ENIGMA

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. R C S P B L K Q A U M H W Y T I F Z V G O J N E X D

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 W C M I B V P J X A R O S G N D L Z K E Y H U F Q T

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 F V D H Z E L S Q M A X O K Y I W P G C B U J T N R

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 I M E T C G F R A Y S Q B Z X W L H K D V U P O J N

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: KD (NEW ISK UNSTECKERED ENIGMA)

Source: 6L (p. 1); 6m (p. 1-2); 38 (p. 1); 55 (p. 4, 176, 179)

The KD machine is an unsteckered, non-cyclometric Enigma which derived its short title from the fact that all its wheels were marked K by the manufacturer and from its use of a pluggable or D (Dora) type reflector. It was introduced 3 December 1944 on the Berlin - Madrid - Lisbon clandestine, three-way network. For security reasons it was used as a Group II replacement by the Abwehr for its German Agent system in the last year of the War. It was solved by the British ISK Section in January 1945. By 28 January the wiring for six wheels had been recovered, and at that time it was thought, somewhat dubiously, that a seventh wheel might still turn up. The six wheels have like turnover patterns and nine notches per wheel. The British wiring that follows was originally presented in digital instead of literal form.

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ENIGMA WIRINGS

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Name of Machine: KD (NEW ISK UNSTECKERED ENIGMA)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
Q W E R T Z U I O A S D F G H J K P Y X C V B N M L (Keyboard)

Rotors:

Red I A/B C D E/F G H/I J K L/M N/O P Q/R S/T U/V W X Y/Z
Q H Z S X N G Y V M F K T L P U I A O D J W E R C B

Blue II A/B C D E/F G H/I J K L/M N/O P Q/R S/T U/V W X Y/Z
I C G Z K W V E P D B Q X J O F T A N M S U Y H L R

Green III A/B C D E/F G H/I J K L/M N/O P Q/R S/T U/V W X Y/Z
R Y U G F Q N W K P E V H S M L J A B O T D I X C Z

Purple IV A/B C D E/F G H/I J K L/M N/O P Q/R S/T U/V W X Y/Z
Q D U L K I X O F S C T Y J P E B M W G N A V R H Z

Sepia V A/B C D E/F G H/I J K L/M N/O P Q/R S/T U/V W X Y/Z
C V F N T Q D M U B G L I W H X O S K J A Z R E P Y

Nero VI A/B C D E/F G H/I J K L/M N/O P Q/R S/T U/V W X Y/Z
V C A N I W O U P J H F S Z T E Q K D L R Y M G X B

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
(pluggable)

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: RAILWAY ENIGMA

Source: 42 (p. 254)

The Railway Enigma is a simple unsteckered machine with three wheels and a movable reflector. Six wheel orders were possible. Each wheel had one turnover notch, and the turnover mechanism was the same as for the standard Service Enigma. The reflector had no turnover mechanism. No specimen of this Enigma ever fell into Allied hands. The wiring was recovered as a result of the extreme weakness of the original indicator system. (Wiring was not given by Source). The wheel known to cryptanalysts as I, was known to the Germans as III, and vice versa.

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ENIGMA WIRINGS

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Name of Machine: RAILWAY ENIGMA

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

- I. r. ABCDEFGHIJKLMNOPQRSTUVWXYZ
1.
II. ABCDE/FGHIJKLMNOPQRSTUVWXYZ
III. ABCDEFGHIJKLMNOPQRSTUVWXYZ

Reflector: ABCDEFGHIJKLMNOPQRSTUVWXYZ

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IV. ENIGMA WIRINGS

B. Steckered Enigmas

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ENIGMA WIRINGS

Page 163

Name of Machine: GERMAN SERVICE ENIGMA

Source: 25 (p. 1); 27 (p. 3, 4, 7); 33 (p. 2); 35 (p. 12, 14, 26, 29, 87); 43 (p. 1.1-1.3, 2.1, 7.1); 55 (p.4)

The Steckered or Plugboard Service Enigma was a three-wheel machine used by the German Army and Air Force and for a time, by the Navy. It was equipped with five wheels that could be used interchangeably in the fast, medium, or slow position of the machine, giving 60 wheel orders. As the Army used the machine, the wheel order selected for one day was rotated in cyclic order. These five wheels, called Sigma wheels, were given the numbers I through V. They had one notch each and were wired differently. The endplate was pluggable and the reflector plate, known as A or Anton, was fixed but unpluggable. The Army used six steckers and the Air Force used a varied number of steckers, usually more than six.

The Navy used the same basic machine with six steckers, but almost immediately instead of five wheels, there were eight from which to select three for the fast, medium, and slow positions: the five Sigma wheels (I-V) and three Delta wheels (VI-VIII). The Sigma wheels had one notch each; the Deltas, two.

The Poles had managed to get pictures of the keys for this machine for a period of three months during which time the wheel order had remained unchanged. As a result of this, they broke the first three Sigma wheels. The British took up where the Poles left off, starting to work on traffic of May 1937. During the summer of 1937 the A reflector had changed to the B reflector, and by April of 1940 ten steckers were in use. By August 1940 the British broke the No. VIII Delta wheel, the last new wheel to be introduced during the War.

In February 1942 the German Navy abandoned the old B reflector. A new B reflector plate and a No. IX additional wheel (Zusatzwalze), referred to as the Beta wheel, were introduced to occupy the space previously taken up by the old B reflector. Thus the machine was now a four-wheel Enigma. The first three positions, as before were occupied by any three of the five one-notched Sigma wheels and Delta wheels; the fourth position was occupied by the No. IX Beta wheel which was so wired that when set at the letter A its effect, combined with that of the new B reflector, would be equivalent to the old B reflector. This was done to permit intercommunication between holders of the three-wheel and four-wheel Enigmas.

(continued)

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ENIGMA WIRINGS

GERMAN SERVICE ENIGMA (continued)

In July 1943 an alternate reflector, the C or Caesar, and an alternate Zusatzwalze, the No. X or Gamma wheel, were introduced. The Gamma wheel, when set at letter A and used with the C reflector, produced the effect of the old C reflector, broken in 1940 as a result of German error. The Caesar and Gamma wheels were broken in July 1943. Later it was discovered that these wheels had been captured in North Africa but had never been sent on to Bletchley Park.

The Zusatzwalzen differed from the other wheels in that they had 26 studs on each side. They were equipped with rings which were never actually used until near the end of the war. They were set by hand to any position and were not moved mechanically. The new B and C reflectors could be inserted only one way and remained fixed throughout the enciphering process.

The C reflector was never brought into use on Army or Air Force keys; their next reflector was the pluggable D or Dora, introduced near the end of the War by the Air Force. This reflector had a shell which could be removed, and an arrangement of plugs effecting a stecker of the contact connections.

The write-ups that follow discuss various versions of the German Service Enigma. The order of their appearance is: British version (one wiring), U.S. Navy version (five wirings), U.S. Army Signal Corps version (two wirings), the YELLOW Enigma (two wirings).

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ENIGMA WIRINGS

Name of Machine: GERMAN SERVICE ENIGMA

Source: 6m (p. 13-22, 37)

The five wirings given here, represent the U.S. Navy versions of the German Service Enigma. In the first (3-wheel) machine three wheels are selected from a set of five to fill the first three positions. In the second (3-wheel) machine three wheels are selected from a set of eight to fill the first three positions. Wheels VI, VII, and VIII are double-notch wheels. The old C reflector was issued for this machine at one time, but apparently was never used.

In the third (4-wheel) machine three wheels are selected from a set of eight to fill the first positions, and the No. IX (Beta) fills the fourth position. Wheels VI, VII, and VIII are double-notch wheels. The combination of the Beta wheel at letter A and the new B (Bruno) reflector gives the old B reflector.

In the fourth (4-wheel) machine three wheels are selected from a set of eight to fill the first three positions, and either the No. IX (Beta) or the No. X (Gamma) is used to fill the fourth position. This fourth position wheel is set by hand and does not advance mechanically. The reflector is chosen from a set of two (B and C) and is fixed. The combination of the Gamma wheel at letter A and a new C (Caesar) reflector gives the old C reflector. Wheels VI, VII, and VIII are double-notch wheels. There are $2 \times 2 \times 8 \times 7 \times 6$ or 1344 possible wheel orders. This machine can be reduced to a 3-wheel machine by proper selection and placement of the fourth wheel and reflector.

The last wiring presented here is a U.S. Navy version of wheel I of the German Service machine. No other data accompanied this wiring.

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ENIGMA WIRINGS

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Name of Machine: GERMAN SERVICE ENIGMA (First)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (3-wheel machine)

r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
l. K F L N G M H E R W A O U P X Z I Y V T Q B J C S D

A B C D / E F G H I J K L M N O P Q R S T U V W X Y Z
F B K E L T J S V Y C M I X U N D R H A O Q Z G W P

A B C D E F G H I J K L M N O P Q R S T U V W X / Y Z
P C E G I K M D Q S U Y W A O Z F J X H B L N V T R

A B C D E F G H I J K L M N O P / Q R S T U V W X Y Z
Y D G U Q X R B L C A S W K T J Z N P H V I M F E O

A B C D E F G H I J K L M N O P Q R S T U / V W X Y Z
H F N Y C E U J L W B X S V G Q K O A D Z P M T R I

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
"Old B" Y R U H Q S L D P X N G O K M I E B F Z C W V J A T

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: GERMAN SERVICE ENIGMA (Second)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 (Keyboard)

Rotors: (3-wheel machine)

I. r. A B C D E F G H I J K L M N O P Q R S T U / V W X Y Z
 l. K F L N G M H E R W A O U P X Z I Y V T Q B J C S D

II. A B C D / E F G H I J K L M N O P Q R S T U V W X Y Z
 F B K E L T J S V Y C M I X U N D R H A O Q Z G W P

III. A B C D E F G H I J K L M N O P Q R S T U V W X / Y Z
 P C E G I K M D Q S U Y W A O Z F J X H B L N V T R

IV. A B C D E F G H I J K L M N O P / Q R S T U V W X Y Z
 Y D G U Q X R B L C A S W K T J Z N P H V I M F E O

V. A B C D E F G H I J K L M N O P Q R S T U / V W X Y Z
 H F N Y C E U J L W B X S V G Q K O A D Z P M T R I

VI. A B C D E F G H I J / K L M N O P Q R S T U V W / X Y Z
 X K Q H W P V N G Z R C F O I A S E L B T Y M J D U

VII. A B C D E F G H I J K / L M N O P Q R S T U / V W X Y Z
 U O A K I H S D Y N Z T X C P V G B J W M Q F L R E

VIII. A B C D E F G / H I J K L M N O P Q R S T U V W X Y / Z
 W G L R I U M Y P D C K T Q E A S B N F X O J V Z H

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 "Old B" Y R U H Q S L D P X N G O K M I E B F Z C W V J A T
 "Old C" F V P J I A O Y E D R Z X W G C T K U Q S B N M H L

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ENIGMA WIRINGS

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Name of Machine: GERMAN SERVICE ENIGMA (Third)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (4-wheel machine)

- I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. K F L N G M H E R W A O U P X Z I Y V T Q B J C S D
- II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
F B K E L T J S V Y C M I X U N D R H A O Q Z G W P
- III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
P C E G I K M D Q S U Y W A O Z F J X H B L N V T R
- IV. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Y D G U Q X R B L C A S W K T J Z N P H V I M F E O
T M F Z K W D O J Y X Q C R N E S U B L A H G V I P (Beta 9)
- V. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
H F N Y C E U J L W B X S V G Q K O A D Z P M T R I
- VI. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
X K Q H W P V N G Z R C F O I A S E L B T Y M J D U
- VII. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
U O A K I H S D Y N Z T X C P V G B J W M Q F L R E
- VIII. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
W G L R I U M Y P D C K T Q E A S B N F X O J V Z H
- IX. (See Beta 9 above, used in 4th position)

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
(NewBruno) E N K Q A U Y W J I C O P B L M D X Z V F T H R G S

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: GERMAN SERVICE ENIGMA (Fourth)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 (Keyboard)

Rotors: (4-wheel machine)

- I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 l. K F L N G M H E R W A O U P X Z I Y V T Q B J C S D
- II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 F B K E L T J S V Y C M I X U N D R H A O Q Z G W P
- III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 P C E G I K M D Q S U Y W A O Z F J X H B L N V T R
- IV. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 Y D G U Q X R B L C A S W K T J / Z N P H V I M F E O
 T M F Z K W D O J Y X Q C R N E S U B L A H G V I P (Beta 9)
 E G T P L B O V F S I N C U J Z D X M R Q A Y W H K (Gamma 10)
- V. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 H F N Y C E U J L W B X S V G Q K O A D Z P M T R I
- VI. A B C D E F G H I J / K L M N O P Q R S T U V W X Y Z
 X K Q H W P V N G Z R C F O I A S E L B T Y M J D U
- VII. A B C D E F G H I J K / L M N O P Q R S T U V W X Y Z
 U O A K I H S D Y N Z T X C P V G B J W M Q F L R E
- VIII. A B C D E F G / H I J K L M N O P Q R S T U V W X Y Z
 W G L R I U M Y P D C K T Q E A S B N F X O J V Z H
- IX. (See Beta 9 above, used interchangeably with Gamma 10
 in 4th position)
- X. (See Gamma 10 above, used interchangeably with Beta 9
 in 4th position)

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 (New Caesar) R D O B J N T K V E H M L F C W Z A X G Y I P S U Q
 (New Bruno) E N K Q A U Y W J I C O P B L M D X Z V F T H R G S
 (used interchangeably)

Notch patterns are indicated by /

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ENIGMA WIRINGS

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Name of Machine: GERMAN SERVICE ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (US Navy wiring)

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. K V X Z H B E G Q W A C F D L N U I Y T M S J O R P

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: GERMAN SERVICE ENIGMA

Source: 6m

The U.S. Army Signal Corps wiring of the German Service Enigma is a relettering of the U.S. Navy wiring which was based on the British wiring. Assumedly the original German model had the letter A opposite the core dot. The British, in error, assumed the dot on the core was opposite Z, and constructed their machine accordingly. As a result, U.S. Navy and U.S. Army Signal Corps wirings differ in appearance. In the U.S. Army Signal Corps wiring, wheels I, II, III, VI, VII, and VIII are offset 1 from the U.S. Navy wirings; wheel IV, offset 2; and wheel V, offset 3. Only one wheel wiring was shown in the version that follows.

It is believed that the Army obtained their wirings from a study of captured German wheels.

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ENIGMA WIRINGS

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Name of Machine: GERMAN SERVICE ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (US Army Signal Corps wiring)

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. U W Y G A D F P V Z B E C K M T H X S L R I N Q O J

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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Page 174

ENIGMA WIRINGS

Name of Machine: GERMAN STECKERED ENIGMA

Source: 42 (p. 261 ff.)

On the following page is the wiring of the German Service Enigma as used by the German Army, Air Force, and Navy. This wiring (originally in digital form) refers to the British version of the machine, which, owing to misunderstanding at the time of the initial breaks, is not the same as the German version. On wheels I, II, III, VI, VII, and VIII the German ring setting is greater than the British by 1. On wheel IV the German ring setting is greater than the British by 3.

The diagonal of the machine, that is, the order of connection of the keys and lamps to the current entry plates, is A B C Z. The order is anti-clockwise, looking at the plates; terminal B is at the top, opposite the windows. (On the German version of the machine, the windows are opposite terminal A, that is, one position forward from the top.) This notation, continued paraxially through the machine, applies to the "rod" letters and also to the reflector.

The pins of the wheel are on the right-hand side, the plates on the left as the wheel is fixed in the machine. The clip is opposite terminal 1. Wheels Beta and Gamma have no turnovers.

A set of three captured wheels (I-III) were tested in NSA-18 and were found to have the same wiring as the first three wheels of this British version. Two others, a Beta and a No. VII, had a wiring corresponding to the like designated wheels shown here.

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ENIGMA WIRINGS

Page 175

Name of Machine: GERMAN STECKERED ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
E K M F L G D Q V Z N T O W Y H X U S P A I B R C J

II. A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
A J D K S I R U X B L H W T M C Q G Z N P Y F V O E

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
B D F H J L C P R T X V Z N Y E I W G A K M U S Q O

IV. A B C D E F G H I J / K L M N O P Q R S T U V W X Y Z
C F T P W Q A K B Z R V J S I Y M O G U H L E D N X

V. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z /
E M X B D T I K V A W R U F P J N Z C Y O L S Q H G

VI. A B C D E F G H I J K L M / N O P Q R S T U V W X Y Z /
J P G V O U M F Y Q B E N H Z R D K A S X L I C T W

VII. A B C D E F G H I J K L M / N O P Q R S T U V W X Y Z /
N Z J H G R C X M Y S W B O U F A I V L P E K Q D T

VIII. A B C D E F G H I J K L M / N O P Q R S T U V W X Y Z /
F K Q H T L X O C B J S P D Z R A M E W N I U Y G V

"Beta" A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
L E Y J V C N I X W P B Q M D R T A K Z G F U H O S

"Gamma" A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
F S O K A N U E R H M B T I Y C W L Q P Z X V G J D

Notch patterns are indicated by /; "Beta" and
"Gamma" wheels have no turnovers.

(continued)

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ENIGMA WIRINGS

GERMAN STECKERED ENIGMA (continued)

Reflectors: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A. E J M Z A L Y X V B W F C R Q U O N T S P I K H G D
 B. Y R U H Q S L D P X N G O K M I E B F Z C W V J A T
 C. F V P J I A O Y E D R Z X W G C T K U Q S B N M H L
 D. O
 (pluggable, but with fixed pairing 2/15)
 "Bruno" E N K Q A U Y W J I C O P B L M D X Z V F T H R G S
 ("Bruno" plus wheel "Beta", in position 1, combine
 to give reflector B)
 "Caesar" R D O B J N T K V E H M L F C W Z A X G Y I P S U Q
 ("Caesar" plus wheel "Gamma", in position 1, combine
 to give reflector C)

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ENIGMA WIRINGS

Name of Machine: YELLOW ENIGMA

Source: 7; 10 (p. 1-2, 4-5); 39

The YELLOW or Plugboard Stecker Enigma was used by the German Army and Air Force in the European and African theaters of operation. It was used for the encipherment of operational messages of a highly secret nature, dealing mainly with matters of supply, administration, and current military operations. The Germans were definitely aware that the Allied Armies had captured the machine, and they relied on the daily keys and the basic nature of the machine for security.

This Enigma is similar to the Commercial Enigma in many of its fundamental parts. There are five cipher wheels available to each holder of the machine. These are completely interchangeable and fit into positions A, B, and C. Each wheel has one notch on its left side similar to other Service wheels. The position of the notches for each wheel relative to the window settings are: I, Q/R; II, E/F; III, V/W; IV, J/K; V, Z/A. The wiring from the 26 contact points on the right side of each cipher wheel to the 26 contact points on the left side is random mixed. In the reflector plate, which is fixed, 13 random mixed wires connect the 26 contact points on its right into 13 reciprocal pairs.

In the two wirings that follow, a comparison of the positions underlined in each will reveal like difference values at these points for the same designated wheel of both machines. These differences are: wheel I, 65; wheel II, 18; wheel III, 71; wheel IV, 192; and wheel V, 1025. The second version, given originally in digital form, was simply named "Enigma Cipher Machine".

Two captured wheels were tested in NSA-18 and were found to have the same wiring as the Nos. IV and V wheels as presented in the first YELLOW Enigma wiring here.

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ENIGMA W1AIN33

Page 179

Name of Machine: YELLOW ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (Yellow normal)

- I. 1. A B C D E F G H I J K L M N O P Q/R S T U V W X Y Z
r. U W Y G A D F P V Z B E C K M T H X S L R I N Q O J
- II. A B C D E / F G H I J K L M N O P Q R S T U V W X Y Z
A J P C Z W R L F B D K O T Y U Q G E N H X M I V S
- III. A B C D E F G H I J K L M N O P Q R S T U V / W X Y Z
T A G B P C S D Q E U F V N Z H Y I X J W L R K O M
- IV. A B C D E F G H I J / K L M N O P Q R S T U V W X Y Z
H Z W V A R T N L C U P X Q C E J M B S K D Y O I F
- V. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z /
Q C Y L X W E N F T Z O S M V J U D K G I A R P H B

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Y R U H Q S L D P X N G O K M I E B F Z C W V J A T

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: ENIGMA

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 (Keyboard)

Rotors:

- I. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 W E Y B D N T X Z C A I K R F V Q J P G L O M H S U
 ("o" point of wheel wiring is at 25)
- II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 Q M Z W E N T G D A V P J F H O S X C Y U K I R L B
 ("o" point of wheel wiring is at 5)
- III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 W J X N Y O G S A R B Q C P E K D H F M T Z U I V L
 ("o" point of wheel wiring is at 20)
- IV. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 X L G O H T U A D S J B U P F Z W Y Q N M R I K E C
 ("o" point of wheel wiring is at 18)
- V. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 T S A J B P V K O I R F Q Z G C E W N L D X M Y U H
 ("o" point of wheel wiring is at 23)

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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IV. ENIGMA WIRINGS

C. Miscellaneous Enigmas

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ENIGMA WIRINGS

Page 183

Name of Machine: 4-I ENIGMA

Source: 34 (p. 326-327)

No wiring was found for the 4-I Enigma. The machine proved to be the Service wheels I, II, and III, with the fixed Bruno reflector and Stecker. It is the only example known to the U.S. Coast Guard of the Service machine being used for clandestine traffic. The Bordeaux end of the 4-I circuit acted as a sort of monitoring and relay station which listened in to certain outstations for the Hamburg control, and furnished Hamburg with the text of an outstation message in the event that Hamburg failed to receive it.

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ENIGMA WIRINGS

Name of Machine: CZECHOSLOVAKIAN GENERAL STAFF ENIGMA

Source: 13 (p. 1-2)

The Czechoslovakian Enigma was used only for higher military staff communications. The variable elements of the machine were the choice of any three of five wheels to be inserted in the machine; choice of cog setting in each of the 1 to 26 positions in the three wheels; choice of the initial position of each of 1 to 26 numbers of each of the three wheels.

No wiring accompanied the discussion of this Enigma.

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ENIGMA WIRINGS

Name of Machine: ENIGMA (unidentified)

Source: 45 (p. 7); 68; 68; NSA-31; NSA-31; unknown

The wirings on the following pages are miscellaneous, unidentified ones, and as far as is recognizable, they are unassociated with any specific Enigma previously discussed. Sources for the six wirings are given in respective order.

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ENIGMA WIRINGS

Page 187

Name of Machine: ENIGMA (unidentified)

Endplate Sequence:

ABCDEFGHIJKLMNOPQRSTUVWXYZ (Endplate)
QWERTZUIOASDFGHJKPYXCVBNML (Keyboard)

Rotors:

Blue I r. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1. T V J Y D S H Z I M B R Q K X L O C F P U W G N A E

Green II A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 N B A M L C K P X J Z D W I V E U F T G Q H R S Y O

Red III A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 Q R X A I H V J B K C L D M E N F U W G Z Y O T S P

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: ENIGMA (unidentified)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)Rotors:

I. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
(Special) C G A M P Q B S T W N R D K U E F L H I O Y J Z V X
(This reflector with r in position Z gives the same
effect as Bruno with B in position A)

Notch patterns are indicated by /

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ENIGMA WIRINGS

Page 189

Name of Machine: ENIGMA (unidentified)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors:

I. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
"RC" F V P J I A O Y E D R Z X W G C T K U Q S B N M H L

Notch patterns are indicated by /

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Page 190

ENIGMA WIRINGS

Name of Machine: ENIGMA (unidentified)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)Rotors: (Unidentified captured wheels located in NSA-31; each one has the number 01182a inscribed on it.)

I. r. A B C D E F G H I J K L M N O P Q R S T U V W X / Y Z
1. N F Q C M Y L J X K G W S D V R I B E A P U Z O H T

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

IV. A B C D E F G H I J K L M N O P Q / R S T U V W X Y Z
O V B S C R I A J U X P T F L Z Y K N W Q M G D H E

V. A B C D E F G / H I J K L M N O P Q R S T U V W X Y Z
P Z S W F I U G D R O Q V T L C X J E N Y M B H A K

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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ENIGMA WIRINGS

Page 191

Name of Machine: ENIGMA (unidentified)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
(Keyboard)

Rotors: (Unidentified captured wheels located in NSA-31)

I. 1. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
r. T R D N S

II. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
H C E X Z

III. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Y W P I S

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Notch patterns are indicated by /

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ENIGMA WIRINGS

Name of Machine: S 3 ENIGMA (unidentified)

Endplate Sequence:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (Endplate)
 (Keyboard)

Rotors: (right side only)

S 3 B A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (3 ea.)
 A O Z P C H S G F J N B D W I L U K M X Q Y R E V T

S 3 R A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (3 ea.)
 Q O D G W X M C I Z K U J Y A L H F R E B P S T V N

S 3 Q A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (3 ea.)
 B N O L J M X S A W D N E F Q T R V X P M Z G I C

Reflector: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 S 3 U I M E T C G F R A Y S Q B Z X W L H K D V U P O J N (1 ea.)

Notch patterns are indicated by /

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V. APPENDICES

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APPENDIX A

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C O P Y

~~TOP SECRET~~

TICOM/DF-190-AM

Enigma Machines in Foreign Countries

S. 4/21

High Command of the Armed Forces
Armed Forces Operations Staff, Armed Forces
Radio Communications Branch (WFSt/Ag WNV/Fu IIa)

Berlin, 13 Sep 1943

File Nr. 1122/43 TOP SECRET

Reference: Your letter 89b 30.28/13d Nr. 1177/43 TOP SECRET

To: High Command of the Armed Forces, Chief of Army Equipment and
Commander of the Replacement Training Army, General Army, Office,
Inspectorate 7 IV¹³ (OKH/Chef H Ruest u Bd E./AHA/In 7 IV¹³).

In response to your letter it is reported in answer to question 1.):
The following countries have Enigma cipher machines with plugboards:
Italy, Romania, Hungary, Slovakia, Bulgaria. There have been delivered
to the following countries:

A. 26-unit printing cipher machines to: Argentina (Ch. 14), Germany-
Japan for the Nitrate Syndicate (Ch. 14), Japan (Ch. 3), and Hungary (Ch.
14)

B. 26-unit light bulb cipher machines similar to model K and model K
(commercial type plus special wirings of the wheels) to: Afghanistan with
identification letter A, Argentina with identification letter A, Brazil
with identification letter A, Chile with identification letter A, Germany
with identification letter A and K to a private customer, England with
identification letter A, France with identification letter A and K, Japan
with identification letter K and T, Mexico with identification letter A,
Austria with identification letter A, Poland with identification letter A,
Russia with identification letter A, Sweden with identification letter A,
Switzerland with identification letter K, Czechoslovakia with identifica-
tion letter A, Hungary with identification letter A, and USA with identi-
fication letter A.

C. 26-unit lamp bulb cipher machines with counter similar to model G
and model G (some with special wirings of the wheels) to: Chile with iden-
tification letter A, Germany with identification letter G (for the
Nitrate Syndicate and I.G. Farben), Holland with identification letter A
and G, Sweden with identification letter A, Czechoslovakia with identifi-
cation letter A, and Hungary with identification letter G.

(continued)

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APPENDIX A

C O P Y

~~TOP SECRET~~TICOM/DF-190-AM

(continued)

D. 10-unit lamp bulb cipher machines with numbers 1-9 and 0 to:
Chile and Sweden.

* * * * *

| | | |
|---|----------------|----------|
| Lorenz for allied (eidgen) military depot | commercial | K323-324 |
| Lorenz for Spanish Morocco | " | K356-358 |
| Japanese Navy | " | K962-963 |
| Switzerland | | K755-858 |
| Croatian General Staff of the Reserves, special wiring | | K881-892 |
| Italian Air Ministry | commercial | K302-311 |
| Italian Military Attache Rome | special wiring | K583-584 |
| Italian Navy | " " | K621-624 |
| Italian Embassy Berlin | " " | K964-967 |
| Italian Naval Attache | " " | K961 |
| Communications of OKH/In 7 IV with the General Staff of the Italian Armed Forces | | G249-250 |
| Chi (Cryptologic Agency) with the Italian Military Attache | special wiring | G247-275 |

Reference question 2.): We do have the wheel wirings. Under the agreement more precise data will not be released right away.

The Chief of the High Command of the Armed Forces

per (Illegible signature)

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APPENDIX B

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C O P Y

~~TOP SECRET "U"~~

TICOM/I-84

S - 4584

FURTHER INTERROGATION OFR. R. DR. HUETTENHAIN AND SDF. DR. FRICKE OF OKW/CHITICOM, 4 September 19451. Who made and wired the Enigma wheels, and where was this done?

The patents were held by the firm of Heimsoeth & Rinke, but they did not build the machines. Heimsoeth was a lawyer from Cologne and Rinke a woman. The man who developed the machine, in collaboration with Fenner, was Dipl.Ing.((Willi)) Korn. The firm received a royalty on every machine built and the Army tried to get rid of them. They were located in Berlin on Uhlanstrasse. The wheels for the Army and Air were made by Konski & Krueger, Berlin, Chausseestrasse, a small firm which probably made only Enigma machines. The Naval machines were made by Ertel in Munich. Other machines were made by the Olympia typewriter company in Erfurt, who also made Lueckenfuellerwalze...

6. What do they know about the Croatian Enigma?

It was the commercial type with different wiring, and no stecker. It was probably used both for diplomatic and service traffic. It was worked on and solved at In 7/VI by Marquardt in the mathematical section, about two years ago. How were the wheel-wirings obtained? They got them from Konski & Krueger, who did the wiring. They could always get any special wheel wirings from them except the Swiss (who did their own wiring) and the Hungarian. The Hungarians were connected with the firm, and they used to take the wheels at night when the women had gone home and change the wirings enough to make the records useless. How many special wirings did K&K make? About 200. Special wirings were controlled by Fu, who had records of them all. At one time they brought them all to Huettenhain, who did not want them and passed them to Mettig, who gave them to Oblt Ecker (liaison Officer to OKL/Chi). Whose special wirings were these? They were used by special units of the Army, such as Hitler's train. Korn said they were getting their records in order and had to keep them somewhere. The officer at Fu connected with this control was Inspektor Boligh, under Colonel Fuchs. It was thought that his office moved to Breslau or Torgau...

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APPENDIX C

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C O P Y

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TICOM/I-104

Report on Berlin Targets by Major Heller

of G.S.I(S), 21.A.G. B.O.A.R.

TICOM, 17 September 1945

TICOM Investigation of Berlin Technical Targets

1. Targets visited:

- (a) Heimsoeth and Rinke, Chiffriermaschinen Gesellschaft
- (b) Siemens, Werner Werke
- (c) AEG
- (d) Lorentz
- (e) Telefunken

Remaining targets were located in the Russian Zone of Berlin.

2. General. All targets had been previously visited by Russian Intelligence and technical experts who had removed virtually all documents and subsequently removed all machinery, plant and equipment. Despite this fact it was possible to collect a certain amount of information and equipment.

3. Heimsoeth and Rinke. Chiffriermaschinen Gesellschaft. This firm mentioned in PROC 5802 as being located in the Steglitzerstrasse 2 was finally located at Uhlandstrasse 138, Wilmersdorf.

All other addresses which have from time to time been mentioned in connection with the manufacture of Enigma machines were previous locations of the above firm who are the sole manufacturers of Enigma machines for all Germany.

Personalities: Ob. Ing. Korn (Absent on 'holiday').
Ing. Schroeder
Ing. Schiele

(continued)

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APPENDIX C

C O P Y

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TICOM/I-104

3. (continued)

Items removed:

a. Zaehlwerkmaschine type CA 15. This machine is a four-wheel model having a gear drive and employing eccentric teeth for wheel progression. It was sold to the Dutch for military use. Subsequent to declaration of war, two machines were delivered to OKW at Stahnsdorf.

b. Lueckenfuellerwalze (drawings and prototype model). This type of wheel was a new design carried out at the request of OKW and intended to replace the existing type throughout the German Armed Forces. It was in fact approved but had not reached production stage at cessation of hostilities. It differs essentially from current type of wheels in use, in that the fixed tooth or teeth which cause the progression of neighbouring wheels, is replaced by 26 variable teeth whose setting can be altered daily. This change in design results in a basic alteration of tyre-setting and wheel body, although in practice only the progression is affected. The prototype obtained is designed for army use and is fitted with a 'neutral' wheel body.

c. Umkehrwalze D. One complete army fitting was obtained. This differs only in external measurements from the naval version. The history of Umkehrwalzen is a little odd. Type was requested by OKW and duly delivered but for unknown reasons, was withdrawn from service almost immediately. Orders were then given to design a new type having improved security characteristics. Type D was the result. This was approved and put into production, but never reached full distribution. It was withdrawn, no reasons being given, and production of type B was recommenced.

Other material located at the factory in Russian territory (Chaussee-strasse 117, Stettiner BHF.).

a. Strip printer adaptor for German Service model. This adaptor fitted over the lamp sockets and consisted of a straightforward teleprinter which was actuated via relays by the current which would normally light the bulbs.

b. Page printer Naval model. Based on the Springschreiber, this model consisted of a straightforward naval type Enigma which was operated electro-magnetically, the enciphered or clear text being printed directly on to a paper page. Only a limited number of these machines were delivered to the navy.

(continued)

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.APPENDIX C

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3. (continued)

c. Numerous commercial 4-wheel models. These are standard commercial models.

d. Russian investigation. Both factory and offices were visited by Capt. Polin and Lt. Medwedjew. Both officers appeared to be fully conversant with the Army model and demonstrated obvious familiarity with the mechanics of the Army model. Ing. Schroeder gained the impression that both were cryptographers. These officers removed a complete set of drawings for the Lueckenfuellerwalze and a Naval type Enigma machine which they stated they had never before encountered. They did not enquire regarding the Umkehrwalzen nor did they obtain a complete model of the Lueckenfuellerwalze.

General

The offices contain large number of files relating to commercial sale of Enigma machines and current production correspondence. Schiele stated that all SECRET files had been burnt before the Russians entered the town. The files were not examined in detail.

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APPENDIX D

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C O P Y

~~TOP SECRET~~TICOM/M-13MANUFACTURE OF ENIGMA MACHINES BY HEIMSOETH AND RINKE, BERLINTICOM, 17 November 1945Report on second visit to Heimsoeth & Rinke, Uhlandstr., 136, Berlin

1. A second visit was paid to this firm with a view to obtaining information on wiring diagrams of drums and full details of serial numbers of the various types of machines manufactured by this firm.
2. According to the statement of Willi Korn, Chief Design Engineer of the firm and present senior representative, all wheel wiring diagrams were destroyed in April at the time of the entry of the Russians into the city. This destruction is stated to apply to ALL wirings including those of commercial machines sold to private individuals prior to declaration of war.
3. Complete correspondence files of all transactions with German War Dept. (OKW/AgWNV/Fu) and allied departments were however found on the premises. These files have been removed and are being forwarded to GCCS for detailed examination.
4. These files contain considerable information on the preparation of specially wired drums together with special orders for foreign governments including such as were members of the Axis. It goes perhaps without saying that duplicates of all machines supplied to organisations other than OKW were supplied to OKW.
5. Appendix 'A' gives a list of serial numbers of those machines manufactured by the Berlin branch of the firm Konski & Krueger and delivered to OKW. Approximately 3000 serial numbers are missing owing to a subcontract being given to a firm Geyer in Nuernberg and who were allocated a separate block of serial numbers.
6. Appendix 'B' is a short summary of the Serial Number types and their special uses or applications.

(continued)

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TICOM/M-13

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7. If further specific information is required, this may, with the exception of wiring diagrams, still be available at the Heimsoeth & Rinke offices.

29 Oct 45

Major Heller
G.S.

(continued)

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APPENDIX D

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Appendix 'A'

TICOM/M-13

| Jahr | Heer | | | Marine | | |
|-----------|---------|-----------------|-----------------|-------------------------|-----------|--|
| | Stuecke | Lfd Nr. | Ges.Lief. Stuck | Lfd Nr. | Ges.Lief. | |
| 1927 | 400 | A366-A756 | 400 | | | |
| 28 | 12 | 866-867 | | | | |
| | | 897-906 | 412 | | | |
| 29 | 52 | 868-896 | | | | |
| | | 907-929 | 464 | | | |
| 30 | 122 | 930-934 | | | | |
| | | 936-1052 | 586 | | | |
| 31 | 160 | 1053-1212 | 746 | | | |
| 32 | 100 | 1253-1352 | 846 | | | |
| 33 | 722 | 1353-2074 | 1568 | | | |
| 34 | 713 | 2075-2787 | 2281 | 401 M501-M901(M1) | 401 | |
| 35 | 1000 | 2788-3787 | 3281 | 60 M902-M961(M1a) | 461 | |
| 36 | 1738 | 3778-5525 | 5019 | | | |
| 37 | 2449 | 5526-7974 | 7468 | 150 M962-M1111(M1a) | 611 | |
| 38 | 2180 | 7975-10154 | 9648 | 310 M1112-M1421(M2) | 921 | |
| 39 | 524 | 10155-10678 | 10172 | 580 M1422-2001(M2a)(M3) | 1501 | |
| 40 | 760 | 10679-11438 | 10932 | 800 M2002-2801(M3) | 2301 | |
| 41 | 1886 | | 12818 | 1011 M2802-3812(M4) | 3312 | |
| 42 | 1774 | | 14592 | 1450 M3813-5262(M4) | 4762 | |
| 43 | 2347 | | 16938 | 2238 M5263-M7500(M4) | 7000 | |
| 44 | | H L | | | | |
| Jan | 190 | 91 6403 46 + 53 | 17129 | 100 Jan | 7100 | |
| Feb | 144 | 120 42 24 | 17273 | 105 Feb | 7205 | |
| Mar | 220 | 80 140 | 17493 | 150 Mar | 7355 | |
| Apr | 200 | 160 40 | 17693 | 120 Apr | 7475 | |
| May | 200 | 150 50 | 17893 | 195 May | 7670 | |
| | | | | K.u.K. = 120 | | |
| | | | | Geyer = 75 | | |
| Jun | 272 | 187 25 | 18105 | 190 Jun | 7960 | |
| | | H SS L | | K.u.K. = 125 | | |
| | | | | Geyer = 65 | | |
| Jul | 291 | 126 40 125=291 | 18396 | 100 Jul | 7960 | |
| | | | | K.u.K. = 90 | | |
| | | | | Geyer = 10 | | |
| Aug | 199 | 84 40 75=199 | 18595 | 240 Aug | 8200 | |
| | | | | K.u.K. = 140 | | |
| | | | | Geyer = 100 | | |
| Sep | 225 | 85 45 95=225 | 18820 | 170 Sep | 8370 | |
| | | | | K.u.K. = 120 | | |
| | | | | Geyer = 50 | | |
| Oct | 267 | 52 45 170=267 | 19087 | 100 Oct | 8470 | |
| Nov | 313 | 153 45 115=313 | 19400 | 30 Nov | 8500 | |
| Dec | 309 | 151 45 113=309 | 19709 | | | |
| 2770=1944 | | | 1500 = 1944 | | | |

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APPENDIX D

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Appendix 'A'

TICOM/M-13

| Jahr | <u>Heer</u> | | | Ges.Lief. Stuck | <u>Marine</u> | |
|------|-------------|---------------------|--|-----------------|---------------|-----------|
| | Stuecke | Lfd Nr. | | | Lfd Nr. | Ges.Lief. |
| Jan | H 106 | SS 75=181 | | 19890 | | |
| | RB | | | | | |
| Feb | 30 + | 9 + 4 + 32 = 75 | | 19965 | | |
| Mar | 20 + | 39 + 45 + 157 = 261 | | 20226 | | |
| Apr | 50 | 30 * 80 | | 20306 | | |

Note: Serial numbers all consecutive. All Army Nos. are "A". Navy Serials also consecutive.

Serials are only those produced in the Berlin Factory. Geyer production listed separately from a separate block of serials.

Appendix 'B'Summary of Serial Types

1. Standard Serial Type A Machines. Serial numbers prefixed by the letter A without additional suffix denotes a standard wiring Army machine as issued to Army, SS, and GAF. A total of some 20,000 such machines were manufactured.
2. Serial A machines with Greek suffix letters. A limited number of standard machines were returned to Helmsoeth & Rinke for special re-wiring. Such machines bore the Greek letters Alpha or Delta as suffix to the main serial number. Wheels likewise received this suffix, (i.e., A246176 a). The purpose or distribution of these machines was not known.
3. Serial B201 - B224. All machines bearing the above serial are specially wired throughout and have wheel and plugboard markings in red. They were believed to be designed for the Fuehrer Hauptquartier.

A limited number of other B serial machines were also prepared for some unspecified special purpose. The wiring diagrams of these machines received special security treatment.

(continued)

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TICOM/M-13

(continued)

4. Serial K301 onwards. All machines bearing a K serial number were specially ordered, each order having a new and different wiring diagram. The machines were supplied without plugboard but had fitted a special adjustable "Umkehrwalze" which was designed to take the place of the plugboard. Some 30 separate wirings were made up for these machines. They are believed to have been intended for use by Agents.

5. Serial G machines. Also known as "Zaehlwerkmaschine". Supplied to Dutch and Hungarian Army. Possibly also to Swiss Army. 200 machines were supplied to OKW for special purposes.

6. Serial M machines. Standard Naval machine. Four modifications brought out numbered, M1 to M4. Type M4 was equipped with ten wheels, numbers 1 - 8 being numbered A, B, etc., and two fixed wheels numbered with corresponding Greek letters. One single position of these two supplementary wheels was designed for working with the standard type A machines.

7. Type T machines. Five hundred of these machines numbered from 1 to 500 were supplied to the Japanese Navy. These machines are standard wiring 8-wheel machines similar to type K.

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VI. LIST OF SOURCES

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vii. WIRING-SEQUENCE INDEX

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(b) (3)-50 USC 403
(b) (3)-18 USC 798VII. WIRING-SEQUENCE INDEX

(An item marked with an asterisk indicates a sequence that appeared originally in digits. "E" represents "endplate"; "R", "reflector".)

| <u>First Six Letters</u> | <u>Wheel No.</u> | <u>Description</u> | <u>Machine</u> | <u>Page</u> |
|--------------------------|------------------|-----------------------|----------------|-------------|
| A D Y Q B N | | 11-notch (with twist) | RED | 138 |
| A E P N Z L | | 15-notch (with twist) | RED | 138 |
| A F T J H S | | Green | SNA | 91 |
| * A J D K S I | II | | Stecker | 175 |
| A J P C Z W | II | Normal | YELLOW | 179 |
| * A J T W P U | | Green | G G G | 101 |
| * A K I C R Z | | Green | Group II | 123 |
| * A L E B H O | | Red | G G G | 101 |
| A L E M X I | | Blue (known rewire) | New Swiss | 60 |
| A M B L Y T | I | Blue (schematic) | Swiss-SZD | 56 |
| A N I E C Y | | Blue | ORANGE | 127 |
| A N L J U Y | III | 17-notch | GREEN | 134 |
| A O Z P C H | I | Blue | Swiss-SZD | 55 |
| A O Z P C H | | B | S 3 | 192 |
| A P M G E H | | Red | SNA | 91 |
| A Q D I M Y | | Green | ORANGE | 127 |
| A Q I Y G S | II | | GREEN | 131 |
| * A Q I Y G S | II | | GREEN | 132 |
| A S H E Z Q | | Red | ORANGE | 127 |
| * A S Q W D P | | Red | Group II | 123 |
| A T O S L Z | I | 11-notch | GREEN | 134 |
| * A T Q E L D | | Blue | G G G | 101 |
| A U K T P W | | Blue | SNA | 91 |
| A U L T I R | III | | GREEN | 131 |
| * A U L T I R | III | | GREEN | 132 |
| * A X E M D J | | Blue | Group II | 123 |
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