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CHAPTER II. PROCEDURE USED IN MACHINE DECODING. TOP SECRET-T

ORGANISATION.

The 6812th Signal Detachment functions as a component part of the organization associated with Hut 6, Bletchley Park, the purpose of which is to decode enemy enigma traffic. The departments in and associated with Hut 6 are: -

Intercept stations located in England, France, the Middle East, and at the fighting fronts sending in 3000 to 4000 messages daily.

Registration Room where messages are received and sorted according to key. (Blist, -Bannisters List).

Air Watch, Army Watch, and Research Dept. responsible for breaking the messages and preparing cribs.

Machine Room responsible for details of running Bombes and for contact with OUT Stations.

Bombe Organization Out stations of which 6812th Signal Security Detachment is one.

Decoding Room takes the key found by the bombe, decodes the messages and sends them to Hut 3 (Intelligence) via the Air Watch or Army watch. These watches need to see the completed decodement for information on future cribs.

Hut 3(Intelligence) distributes the information in the decoded messages to the points needing such information, taking care to so disguise the information that the Germans won't realize from the results that the enigma traffic is being broken.

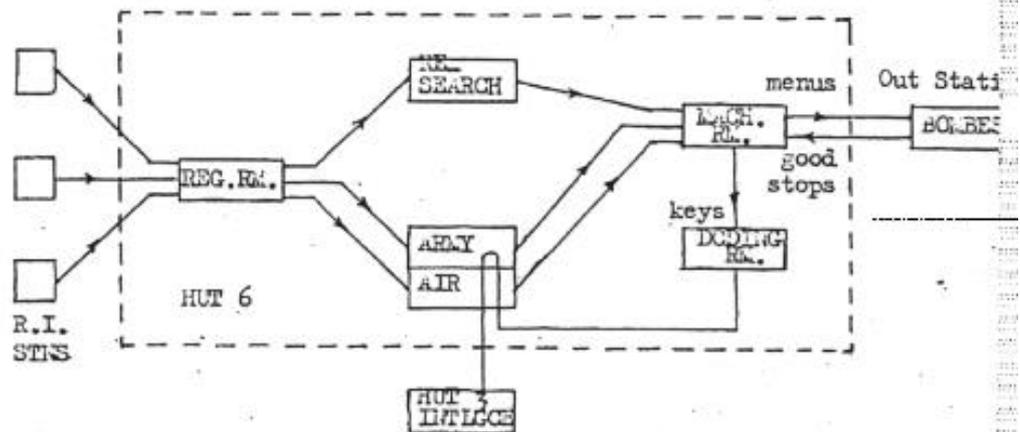
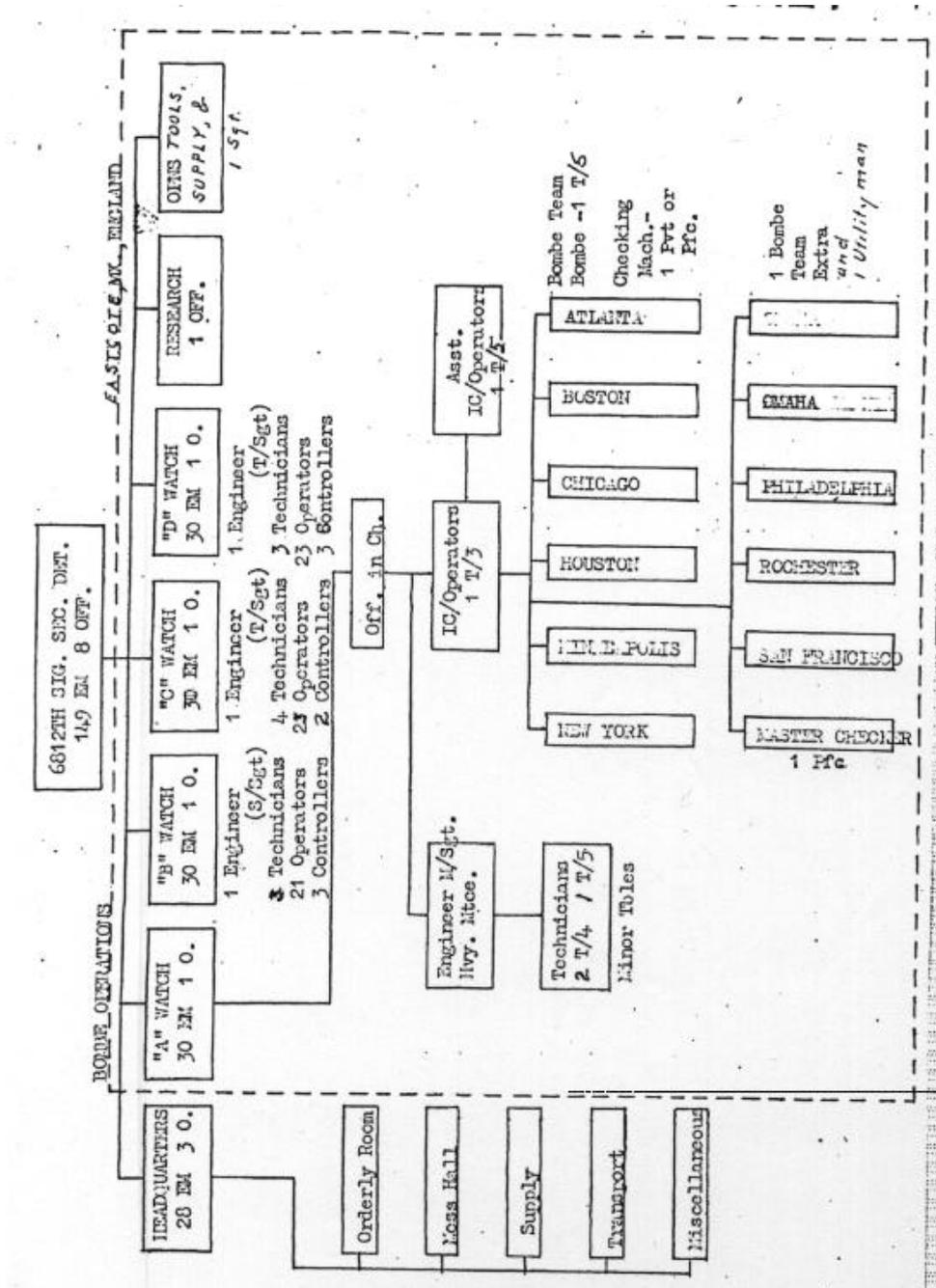


Fig. 38. Organization Chart For Hut 6 and Associated Organizations.

This detachment functions as one of the Out Stations, of which there are six, namely Bletchley Park, Adstock, Gayhurst, Eastcote, Stanmore and USA. USA is physically located in Out Station Eastcote, but operates as an independent unit. USA has only one bay. The machines within a bay are named for cities of the country concerned. USA has ten bombes named as follows; Atlanta, Boston, Chicago, Houston, Minneapolis, New York, Atlanta Philadelphia, Rochester, and San Francisco. Boston, Chicago and New York are of the so-called 39 point type and the others are of the 30 point type. The outstations are operated on a 3 shift, 24 hour basis. In USA the shifts are 0000 to 0800, 0800 to 1730, and 1730 to 2400. The personnel is divided into 4 "watches" A, B, C, and D of 30 men each. Each watch is divided into one IC OPS (In Charge of Operations), one Assistant IC OPS, ten teams of 1 operator and 1 checker each, one engineer, either three or four technicians and the balance of the "watch" as substitute operator-checkers. The "watches" work on a rotating schedule which keeps a "watch" on each shift for approximately one week.

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RECEIPT OF MENU

Menus are received in Out Station USA over a direct teleprinter line from the machine room, Bletchley Park. They are received in the following form:

USA 0 DDD

14/4/5 381M 1 PHILADELPHIA SPARROW 1 1/11 WOS 60 I + RR SSO +
+ D 126 THEN B +

J F
ALXR
MGIT
ESQD
CNK

ALAC LXZC XRZE MGZD GIAA ITAB QDZF CNAG NKZA LIAD MEAF IQAE IDZI ECZH
(JAZB FRZG ESZJ PHANTOMS)
16-17 2/11 SMV+

1617/2/HMF+

The following is an explanation of the symbols:

USA 0 denotes the outstation.
DDD is the marking for an urgent menu which is to be given necessary priorities. Any delay whatever on such a job will be called in to controller BP immediately. URGENT will be written on all such menus before they are given to operators.
14/4/5 indicates a menu with 14 links, 4 letters wide and 5 letters down.
381M denotes a job serial number.
1 indicates that this is the 1st menu on this job.
PHILADELPHIA designates the bombe selected by the machine room at BP to take the menu. The same menu is plugged on other bombes afterward by mutual agreement between BP and ourselves.
SPARROW 1 denotes the key or traffic involved. This particular key Sparrow is the traffic of Y Service, Central Mediterranean.
1/11 indicates the date on which the message involved was intercepted.
WOS 60 designates how many and what type of wheel orders shall be used. In this instance all wheel orders are to be run.
I designates the input to be at I.
+ denotes a full stop in the teleprinter.
RR specifies that a re-run shall be made if any short whatsoever between two letters on the bombe is found at the end of the job. NOT RR indicates that if you find a short between two letters only it is not necessary to re-run the job, but that it shall be re-run if you find two or more shorts.
SSO (Story Stop Only) indicates that BP wants only good stops without any legal contradictions.
D 126 THEN B Indicates that this menu is to be run with the D Uncle Walter patched as shown in the D 126 patching plan. Afterwards it will be run with the regular B Uncle Walter.

J F
ALXR
MGIT
ESQD
CNK

Gives the letter framework of the menu.

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ALAC to Phantoms) designates the links. For example ALAC indicates that there is a link between A and L and that its setting is ZAC.

Three phantom links on this menu are indicated.
16-17 2/11 SMV - is the signature, 16-17 indicates the time of the day, 2 the day of the month, 11 the month and SMV the initials of the operator.
1617/2/HMF - is the acknowledgement from our end of the line.

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PHONETIC ALPHABET.

A phonetic alphabet is used for all verbal communication regarding menus. This alphabet is different from the phonetic alphabet currently in use in the U.S. Army. It is as follows:

Apple	Freddie	Kenneth	Peter	Unicorn
Butter	George	London	Quagger	Vinegar
Charlie	Harry	Monkey	Robert	Willie
Dan	Ink	Nuts	Sammy	X ray
Edward	Johnny	Oliver	Tommy	Yellow
				Zebra

KEY IDENTIFICATION .

In order to identify the enemy organization whose message is being decoded, names have been arbitrarily assigned to their keys. Approximately 200 such names have already been given. They are broken down into 10 general classifications as follows:

1. Animals - German Air Force, Operations.
2. Birds - German Army.
3. Colors - Miscellany of German Air Force and Army. Earliest classification.
4. Fish - German Navy.
5. Flowers - German Air Force, Administration.
6. Fruits - Gestapo and Army Intelligence.
7. Insects - German Air Force, Operational.
8. Limestone - Diplomatic Spy fling.
9. Vegetables - Air Service, Weather.
10. Miscellaneous - All Others.

The decoding handled in USA is broadly divided amongst the animal, bird and insect keys with small amounts of the others. Little or no menus are received for the fish limestone and vegetable keys.

PREPARATION OF MENU.

The first step after the receipt of the menu on the teleprinter is to make up the graphical representation of the menu. The number of copies to be made up depends upon the number of bombes to be used on the job. There should be one copy for each operator and one for each checker. The following represents the menu for the teleprinter message on page 42:

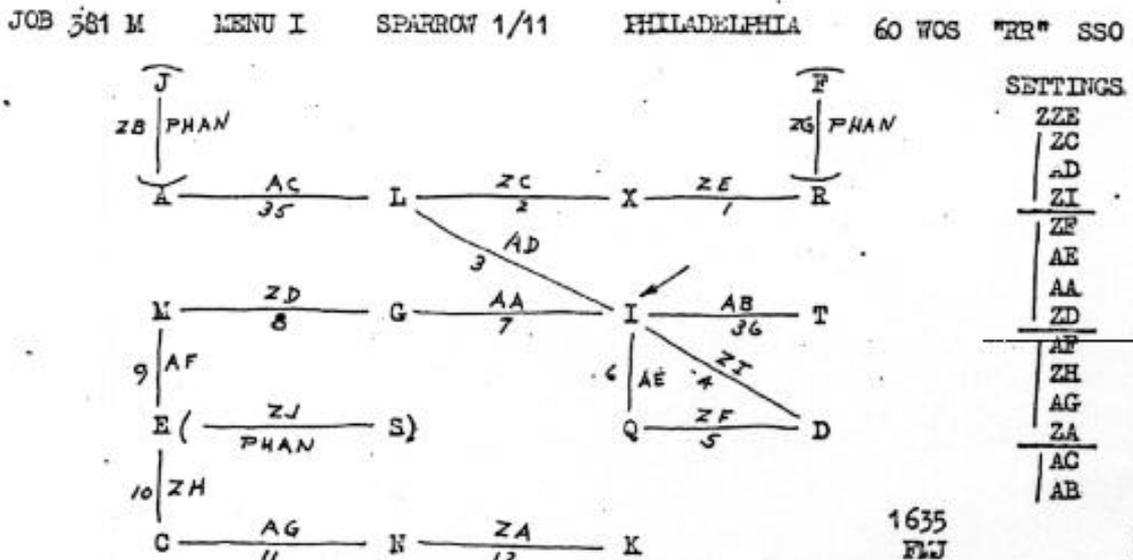


Fig. 39. Preparation of Typical Menu. TOP SECRET

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NUMBERING A MENU

Commons cause the most trouble. Therefore everything should be done to avoid using commons unnecessarily. In view of this try to number the men in one continuous chain, making sure that the commons will be between numbers at the beginning or end of the bank of enigmas when possible. Commons should not be used in a closure unless absolutely necessary.

Always start numbering at the end of a chain, or part of the menu where an odd number of enigmas converge. If numbering is commenced where an even number of enigmas converge, it means using an extra lead and/or common.

When a menu consists of more than twelve enigmas, and therefore can only be plugged up twice, it is most important that the menu is numbered twice, exactly as it is to be plugged up, i.e. according to the numbers of the enigmas on the back of the bombe.

The I/C Ops should write the setting list at the side of the menu sheet before handing it to the operator. This is done for two reasons; first, it avoids confusion when there is more than one menu to go on the machine. Second, it avoids confusion when the menu input on two or more machines. If the settings are on a separate slip of paper they might get confused with the settings for another menu on another machine.

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The menu is made in duplicate. The operator's copy is numbered in color for plugging and the settings of the enigmas are listed in groups of four on the right hand side of the menu. The IC OPS signs his initials and places the time in the lower left hand corner of the operator's copy. The IC OPS checks the menu against the T.P. slip. T.P. slips marked DDD are urgent and are to be given necessary priority.

REARRANGEMENT OF MENU.

A new procedure has been adopted for transmitting menus. Previously the Controller at B.P. indicated what links if any should be run as phantoms. Due to the Controller B.P.'s increased work load and also a desire to leave more flexibility for the Outstation, it has been decided to send through the menus without indicating what links shall be run as phantoms. The Outstation may then adjust the number of phantoms in accordance with the letter-closure chart. It is desirable to obtain at least one stop per wheel order. Suppose the menu as received has 14 letters with no closures on the main chain and 6 letters with no closures on the subsidiary chain. This will give 0 stops per wheel order. The chart shows that removing 2 links from the subsidiary results in 1/2 stop per wheel order, and removing 3 links results in 1 1/2 stops per wheel order. Since the possibility is good of getting at least one machine stop per wheel order by removing 2 links, it would be decided to make that arrangement.

(AES note: the above paragraph is on a separate slip pinned to the original page and obscures some of the original text from "priority" to "The operator")

The operator is required to post his last wheel order when finishing a job on the blackboard in the IC OPS room. It is desirable to have all the bombes running a job finish at about the same time. The total number of wheel orders is therefore roughly divided among the bombes with the exception that one of the three is given a slightly larger amount to cause it to finish last. This machine is not stripped immediately in case there need to be re-runs of any of the wheel orders. Having selected the initial wheel orders the Wheel Order Man then enters them on the Wheel Order Sheet, the Job Sheet and on the back of the operator's copy of the menu. If the wheel order is changed from that previously on the machine, it will be short tested.

Sample Wheel Order and Job Sheets are shown on succeeding pages.

Wheel Order Sheet Explanation. (See Fig. 40)

Job 381 M 60 w/os are to be run and all w/os have already been given to the operators. A few w/os have yet to be checked against the operators job sheets. No w/os are crossed off the w/o sheet unless checked on operators job sheet.

Jot 150 C Only run Nig. X on the L H S of the w/o sheet. All w/os not to be run are immediately crossed out. In this illustration some of the w/os have been given to the operator while the remainder are yet to be assigned.

Job 262 C Only run Nig. Y Pref. n/c 524. First cross out all w/os not to be run; then place a small x for the n/os to be run as preference. Pref. w/os are completed before the remainder of the Nig. Y are to be run.

Job 251 C All w/os are to be run except Nig. Z, therefore all Nig. Z's are crossed out. In this case the job has been completed, Hut 6 has been notified, and we have been told to strip.

Job 233 C N/c 513 is being run. Whenever a not crashing job is run, there are always 32 w/os left to be run after the n/c w/os have been crossed off. In this case some of the w/os have been completed, a stop has brought the job up, and as a result the operator automatically strips the machine. JOB UP is written on the W/O sheet.

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CHANGE IN I/C OPS PROCEDURE

28 November 1944.

1. It was agreed in the original I/C Ops Procedure to issue W/O's so that no drum ran in the same position more than four runs. This was done to reduce reruns necessary in the case of a drum short. Evidence indicates that recently some I/C Ops have run the maximum of 12 W/O's with a drum in the same position. This practise will be discontinued immediately. A maximum of six runs instead of four is authorized with the drum in the same position, I/C Ops will issue W/O's accordingly.

2. Effective immediately a new column will be entered in the Controller's Log Book for entering W/O's rerun on each job for each machine. The information will be taken from the Job Sheet and will be the number of W/O's that have to be rerun for that machine. For example, on a three bank job, reruns will be determined as follows:

1st Bank	2nd Bank	3rd Bank
125	451	324
125RR	351	524
125RR	251	254
135	251RR	254RR

Entry will be the number of W/O's marked RR, four in this case, and not the number of runs involved. If a machine is stripped and short tested, and shorts are found, the number of W/O's to be rerun is authorized at the bottom of the sheet by the technician. If these W/O's are run on another machine that has not stripped yet, the number of W/O's involved will be included in the "W/O's RR" total for the machine with the short. In case the W/O's have to be phoned to B.P., so as to be rerun at a later date, they will not be included in "W/O's RR" total since the job may come up.

3. After all I/C Ops have read and initialed this notice, it will be filed in the Work Notice Book for future reference.

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Z421 x	P	M	/	/	M	Z143	P	/	/	/	/	/	/
Z321 x	P	M	/	/	M	Z543	P	/	/	/	/	/	/
Z521	P	/	/	/	/	243 x	P	/	*	/	/	/	/
Z531	P	/	/	/	/	Z253	B	/	/	/	/	/	/
Y431 x	P	M	C	C	M	Z453	B	/	*	/	/	/	/
Y231	P	/	*	C	M	Y53 x	B	/	*	/	/	/	/
241 x	P	M	/	C	M	Z154	R	/	/	/	/	M	/
541	P	/	/	C	/	354 x	R	/	/	/	R	M	/
Y341 x	P	M	*	C	/	Z254	R	/	/	/	/	M	/
Y351	P	/	*	C	M	Z214	P	/	*	/	/	/	/
Y251 x	P	M	*	C	/	514 x	P	/	/	/	R	/	/
Z451	P	/	*	/	M	314 x	P	/	/	/	R	/	/
Z452	B	/	*	/	M	Z324	B	/	/	/	/	M	/
152 x	B	M	/	R	M	124	B	/	/	/	R	/	UP
Z352	B	/	*	/	M	524 x	B	/	/	/	C	/	/
342 x	P	M	/	R	M	534 x	B	/	/	/	C	/	/
542	P	/	/	C	/	Y234	B	/	/	/	C	/	DB
Y142 x	P	M	C	C	M	Z134	B	/	/	/	/	/	DB
Y132 x	P	*	*	C	/	Z135	R	/	/	/	/	/	/
Z432 x	P	*	/	/	M	435	R	/	*	/	C	/	/
532	P	/	/	C	/	Z235 x	R	/	/	/	/	/	/
Z512 x	P	*	/	/	/	Z245 x	R	/	/	/	/	/	/
312 x	P	*	/	C	/	Z145 x	R	/	/	/	/	/	/
Z412	P	/	/	/	/	Z345 x	R	/	/	/	/	/	/
Z413 x	P	*	/	/	/	Z315	P	/	*	/	/	/	/
Z213	P	/	*	/	/	215	P	/	*	/	C	/	/
Y513 x	P	*	/	R	/	415 x	P	/	/	/	R	/	/
Y523 x	P	*	/	C	/	425 x	B	/	/	/	R	/	/
Z423	P	/	/	/	/	325 x	B	/	/	/	C	/	/
Z123	P	/	/	/	/	Z125	B	/	/	/	/	/	/
60	N.X.	NY	W/O	32 W/O	60	N.X.	NY	W/O	N.C.				

Fig. 40. Typical Wheel Order Sheet.

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SETTING UP MENU ON BOMBE.

Together with his checker the operator plugs up his menu and sets his wheels. There are 10 distinct steps in setting up and putting the bombe in operation. They are:

- (1.) Plug up the bombe,
 - (a.) Plug the enigmas to the commons.
 - (b.) Patch the commons to the diagonal board.
 - (c.) Count the letters plugged on the diagonal board and compare this count with the menu.
 - (d.) Count the number of plugs in the commons. There should never be less than 3. Compare this result between banks.
 - (e.) Compare the commoning jack positions in enigmas between banks.
- {2.} Attach the enigma wheels in proper order from top to bottom.
- (3.) Set the enigma wheels in the proper position from top to bottom.
- (4.) Check the entire bombe for
 - (a.) Loose plugs.
 - (b.) Wrong settings.
 - (c.) Clips in place.
- (5.) Operate one Searching switch for each of the chains in use:
 - (a.) Carry switch should be OFF.
 - (b.) Carry Home switch should be OFF.
 - (c.) Delayed CB switch should be OFF.
 - (d.) Check input board for correct input (Single or Double).
- (6.) Operate Motor and Control switches.
 - (a.) Motor switch is at left as you face the bombe.
 - (b.) Control switch is at right as you face the bombe.
- (7.) Depress Start key.
 - (a.) Start key is at right, Stop at left.
- (8.) Operate Carry switch when bombe has attained its normal speed of 64 rpm (top drum).
- (9.) Observe the clock and enter on the Job Sheet the time the run started.
- (10.) Check the Job Sheet for all entries,

ENTRIES ON JOB SHEET.

At the top of the Operator's Job Sheet put down the name of the machine, the name and date of the menu, the job number, the number and type of the menu, and whether or not reruns are to be made in case of trouble. The following information is entered in the body of the sheet , -RUN NO., TIME STARTED (including signature of the operator), WHEEL ORDER , STOPS , RELAY, and REMARKS. The last 4 entries are repeated for each bank. In the REMARKS column the number of the stop is shown in circle, the link removed in case of a "check stop", and either a check mark or cross to indicate that the checker has found the stop to be either good or bad. A typical job sheet made out for the menu of fig. 39 is shown in fig. 41.

PREPARATION OF CHECK SHEET.

When the bombe seems to be running satisfactorily and the operator is making out his Job Sheet, the checker should fill out his Check Sheet. The alphabet should be written across the top of the sheet. Letters on the main and auxiliary chains should be circled. Put a tadpole (wavy line) below the letters on the subsidiary chain. Letters on phantom links should be indicated by a half circle above or below the letter. Fill in the details called for at the top of the sheet, -TITLE (Menu title and date of intercept), MACHINE, MENU (number) , JOB (number) and the type of menu and whether or not the job is to be rerun in case of trouble. Write down the letters of the menu in the narrow column at the left end of the sheet, starting with the input letter and following consecutively around the menu so as to check through closures first. See typical check sheet made out for

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RUN NO.	TIME STARTED	TOP BANK			MIDDLE BANK			BOTTOM BANK					
		WHEEL ORDER	STOPS	RELAY	REMARKS	WHEEL ORDER	STOPS	RELAY	REMARKS	WHEEL ORDER	STOPS	RELAY	REMARK
1	Joe Smith 1659	251	LJF	L	✓ZZF (2)	312	AER	S	✓				
2	Joe Smith 1717	351	WWQ	B	✓	412	LEY	I	✓				
3	Joe Smith 1734	341	TIK	B	✓		OPH	A	✓				
4	Joe Smith 1802		EFD	W	✓ZZF (9)	413	QYY	B	✓				
5	Bennet 1826	541	MSE	F	✓	213	TBO	B	✓				
6	Bennet 1846	543	IOW	P	✓	231	KIL	B	✓				
7	Bennet 1903		RMG	W	✓		DVM	F	✓				
8	Joe Smith 2026	143	GKL	J	✓ Placed X-22F	241	PCD	O	✓ZZF (16)				
9	Joe Smith 2059	123	SKD	I	✓ZZF (18)	421	CTS	F	✓				
10	Joe Smith 2121	423	TGE	U	✓ R 213 X-22F (21)	451	FEB	O	✓				
11	Joe Smith 2146	423RR	AMH	H	✓	415	TRMS	P	✓				
12	Joe Smith 2202		XVA	U	✓		KPM	U	✓				
		432	H01	M	✓		XRK	Z	✓				
		132	OTZ	V	✓	215	WNE	I	✓ZZF (25)				
		142	GGI	J	✓	315	WKZ	H	✓				
			YDI	E	✓	135	Return for SOT	T	✓				
			WDE	W	✓		MPP	J	✓				
					✓		KTJ	O	✓				
					✓								Ol Contact Error

PHILADELPHIA SPARROW I 1/11 JOB 381 M MENU I

4
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RUN NO.	TIME STARTED	TOP BANK				MIDDLE BANK				BOTTOM BANK			
		WHEEL ORDER	STOPS	RELAY	REMARKS	WHEEL ORDER	STOPS	RELAY	REMARKS	WHEEL ORDER	STOPS	RELAY	REMARKS
13	Joe Smith 2337	514 RR	VRG	I	✓ (30)	435 RR	HTB	0	✓ (9)				
14	Joe Smith 2353	314 RR	CWC	W	✓ (32)	235 RR	WSS	V	-ZF (10)				
15	P. Hayes 0010	512	BKI	O	✓ (36)	245	CFG	H	V-ZF (13)				
			HWX	Z	✓ (37)								
			XHW	H	✓ (38)								
			ALT	W	✓ (39)								
			AZI	W	✓ (40)								
			IZF	B	✓ (41)								
16	FR 0028	513	HJW	J	✓ (43)	254	CFX	J	✓ (15)				
							FMV	P	✓ (16)				
							JLS	M	✓ (18)				

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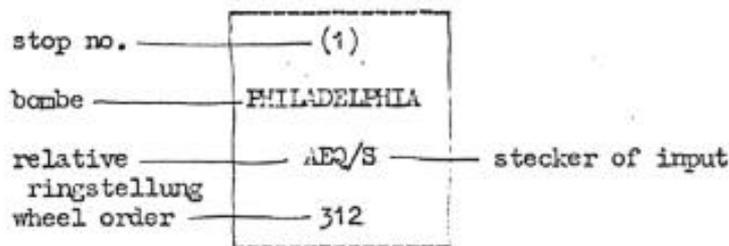
PROCEDURE WHEN BOMBE STOPS.

Whenever the bombe has found a possible solution it stops. A definite procedure should be used in obtaining the information from the stop and restarting the bombe as follows:

1. Bombe slows down and stops automatically.
2. One or more relays fall on indicator on the side of the machine.
3. Check the relay by lifting the bail lever. If the relay does not fall again call a technician.
4. Note on which chain the relay fell and record mentally.
5. Note the settings of the indicator drums.
6. Write in the appropriate column on the job sheet the readings you have taken from the drums and correspondingly the relay that has fallen in the column for this reading.
7. To restart the bombe:
 - a. Press the Start Key.
 - b. Then lift the Bail lever.DO NOT PERFORM THESE TWO OPERATIONS SIMULTANEOUSLY.

MAKING OUT STOP SLIP.

When a stop is reached the operator makes out a stop slip, putting down the stop number, the name of the bombe, the relative ringstellung and stecker of the input letter, and the wheel order, as follows:



EXCESSIVE STOPS PER WHEEL ORDER.

Approximately 4 stops per wheel order is the maximum number that one man can comfortably check. It takes about 15 to 20 minutes to make a run with 4 stops per wheel order. Should the menu yield more than 4 stops per wheel order a call should be made to the Bletchley Park Controller (BP &) to obtain additional links (subsidiary).

(AES Note: this paragraph was on a separate slip pinned to the original page. It obscures the original text.)

Depress the relay letter which is the stecker of the input letter, thereby lighting the stecker of the letter at the other end of the link. In the example this is W. Follow round until all links on the menu have been checked. The checker must go round every closure to ascertain that the stecker returns to the original letter, in the case of the above stop it will be seen that this did happen in the case of the closure I-Q-D and that this was indicated on the check sheet by the check mark against the third stecker letter. Check all steckers against the alphabet at the top of the Check Sheet and mark the confirmations and self steckers. In the example the only confirmation is in the case of steckers R and L. There are no self steckers. All entries onto the subsidiary chain must be checked. When checking

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subsidiary chain all entries back onto the main chain must result in a confirmation, otherwise there is an illegal contradiction and the stop is wrong. The checker inspects the steckers and marks the legal contradictions. In the example there are three legal contradictions on steckers S, W and F. A summary is made of the total number of self steckers, legal contradictions and confirmations for the stop and these are written at the bottom of the stecker column.

In checking stops the checker will always give preference to the first stop on a new wheel order so that the operator will have a good stop checked for each bank as soon as possible.

C.S.K.O. In checking CSKO menus the checker must make sure no consecutive steckers are obtained. To do this, the two letters which are the consecutive steckers of each letter on the menu are written down just to the left of the column of menu letters. As each stecker is obtained, the checker verifies that it is one of the two consecutive steckers shown opposite the menu letters. If it is a consecutive stecker the normal procedure for reporting wrong stops is followed. Remember that A is not a consecutive stecker of Z and vice versa. All other letters have 2 consecutive steckers.

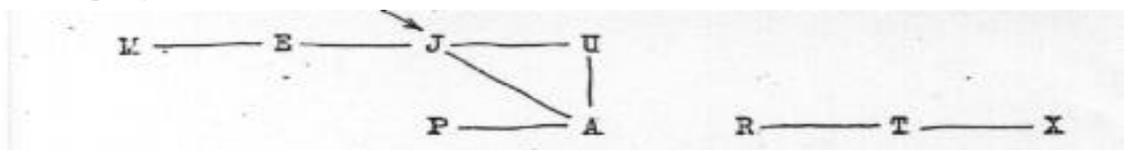
DOUBLE RELAY STOPS. The menu is checked completely with each stecker of the input (each relay), giving two complete stories for the stop. When valuing the stop, the checker first considers each story separately to see if either will stand alone. If neither will stand alone they will be valued together to see if it is a boxing stop. (Note: If one story will stand alone and not the other it cannot be a boxing stop. A boxing stop usually will have confirmations between the two stories. A double relay stop can be the right stop to bring up the job using one of the stories given by the stop. The checker will inform the IC OPS that it is a double relay stop and say which of the two steckers is the one for the good stop. A boxing stop is right from the machine point of view but cannot be the stop to bring the job up.

PHANTOM LINKS. In checking phantom links the checker will put the letters of the phantom links at the bottom of the column of menu letters. To the left of each phantom letter he will put the abbreviation PH. Legal contradictions involving the stecker of a phantom letter are treated the same as legals on outlying links in the analysis of the stop. However an illegal contradiction is also allowable on the phantom link, provided it is the only contradiction on the stop when it is phoned to the IC OPS.

STOP CHECKS AS GOOD.

A correct stop is one that confirms all closures and has no legal contradictions from a machine point of view. In the square at the top of the column the checker puts a check mark for a correct stop and a cross for a wrong stop. The checker will sign his name at the bottom of the stecker column for the first stop he checks and initial all subsequent stops he checks. Certain stops, referred to as Hut 6 stops, are marked in the square at the top of the column by the letters MC in addition to the check mark, and are phoned to the IC OPS as soon as they are completely checked. These are:

1. Any correct stop, excepting a check stop, having no legal contradiction.
2. Any correct stop, except a check stop, with one legal contradiction, provided one of the two letters involved is on an outlying link.
3. Any correct stop, excepting a check stop, in which you reach the subsidiary chain twice by two different steckers from the main chain giving two different steckers for each subsidiary chain letter provide one or both of the main chain steckers are on outlying links.



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	M/C ✓	✓	M/C ✓	M/C ✓
	1	2	3	4
	341 POI	342 NTA	342 FOC	345 VZS
J	/	/	R	/
U	X	X	/	/
A	/	/	F	F
E	R	R	/	/
M	/	/	T	T
P	/	/	/	X
R	E	EQ	JB	IV
T	S	OL	ZM	LS
X	U	VU	KN	IP
	Confirmation Sent in.	Legal Contra- diction Not on Outlying Link. Not Sent In.	Legal Contra- diction One Ltr on Out- lying Sent In.	Legal Contra- diction. 2 Letters on Outly- ing Lk. Sent in.

Note: When phoning in a stop to the IC OPS where a subsidiary chain is involved, and it has been impossible to get on the subsidiary chain from the main chain through checking, the checker must read the settings of the link on the subsidiary to the IC OPS.

As soon as the last stop has been checked the checking sheet will be turned over to the operator who will turn in the menu, job sheet and checking sheet to the IC OPS.

IC OPS PROCEDURE ON HUT 6 STOPS AND END OF RUN.

When the checker phones in the particulars of a correct stop, the IC OPS records the particulars in the Teleprinter Log book in the following form:

Hut 6 Ser.	M/C	Job Name	Job Date	Job No.	Men u w/o No.	Stop	Value	Seq No.	Date	Time Recd	Time Sent	Signature	Remarks	
6/51	Phila	Sparrow	1/11	38114	J	512	HWZ/2	2 can	155	37	1 Nov	12250	2255	P. J. Williams UP R

The Hut 6 Serial number is a message number and is one of a series starting with 1 each day at 0000 and always takes the form of 6/.. The 6 indicates to the Teleprinter Room of Hut 23 where it is received, that the message goes to Hut 6 and it goes direct. In the M/C column is entered the name of the bombe involved. Under Job Name is written the name assigned to the key. The Job Date is the date of interception of the message. In the Job No. column is entered the job

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number assigned by B.P. Under Menu No. is written the menu number assigned by B.P. The Wheel Order is the wheel order of the stop called in by the checker. In the Stop column is entered the relative ringstellung and the stecker of the input letter. Under Value is written the number of self steckers, legal contradictions and confirmations found when this stop was checked. The Stop Number is the number of the stop in the run being made by the particular bombe. The remaining columns are self explanatory.

After the particulars of the stop have been entered in the Teleprinter Log book the information is sent to Hut 6 via the teleprinter. The following shows the make-up of such a message:

```
6/51 PHILADELPHIA SPARROW 1 1/11 381m 1 512 HWXZ 2CON 1SS 37
2255/1/ RJF +
R/MEM+
```

By reference to the Teleprinter Log the various parts of the above message can be easily identified.

->@@

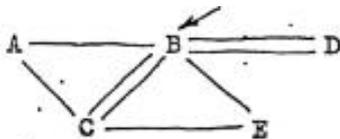
When each bombe has finished its runs on a given menu the IC OPS notifies two different sections of B.P. First a telephone call is made to the Master Checker-Controller Desk in Hut 6 (telephone number B.P.7) and they are notified that Philadelphia has just completed its run on Sparrow, job 381 Monkey. At some later time a search is made of the Teleprinter log and the Operator's Job Sheet to find how many stops have been sent in to Hut 6. This is summarized in a teleprinter message to Hut 6 stop testing room via Hut 23 in the following form:

```
6/59 PHILADELPHIA SPARROW 1 1/11 381M 1 SN 6,11,19,37
```

The message is identical in explanation with the message above sending in the stop except for SN 6,11,19,37 which is a summary of the numbers of the stops shown on the Operator's Log which were previously sent in to Hut 6.

STOP CHECKS AS WRONG.

If the stop checks as wrong the checker must indicate what is wrong at the bottom of the stecker column and on the stop slip before returning the stop slip to the operator. One or more of the following faults might result from checking:



1. Illegal contradiction - A/B
B/F
2. Fails female - Fails B-C female.
3. Fails closure - Fails A-B-C closure.

In addition to indicating all faults found, the checker must go both ways around a closure that fails and put down both sets of steckers in the stecker column opposite the menu letters on the closure.

When the operator receives the returned stop slip with the indication of a wrong stop, he finishes the run on a subsequent wheel order and then replaces the wheel order involved in the wrong stop. The run is again made to bring in the stop in question. When he reaches the point in the run where the stop should come in but does not, the operator stops the bombe and calls the technician. The bombe is turned over to the technician to find the trouble causing the wrong stop. The technician finds and clears the trouble which caused the wrong stop. He records the trouble in the REMARKS column of the Operator's Job sheet. If the trouble is found to be a short circuit it is also recorded in the back of the Machine Log book as follows:

JOB NAME	JOB NO.	W/O	BAIK	SHORTS	DATE	SIGNATURE
SPARROW 1	381M	512	1	8v29.10	4/11	P. E. Williams

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Having cleared the trouble, the technician instructs the operator to make the run over again and if there is no good stop on the run in addition to the wrong stop then a check stop shall be taken in order to fulfil the requirement of getting one good stop per wheel order.

TAKING A CHECK STOP.

A check stop is taken when the slow drum is halfway round and a good stop has not been recorded on each bank. The procedure for taking a check stop is as follows:

1. Turn OFF the Carry Switch.
2. Press the Stop key. The bombe slows down and stops.
3. Turn OFF the Two main power switches and remove the top drum of the selected link. Break a female or the smallest closure. If there is no closure, an outlying link may be taken off. In any case the link being broken must be one or more links removed from the input.
4. Having removed the drum, turn on the TWO main power switches, press the Start Key, and as soon as the bombe speeds up, Operate the Carry Switch.
3. The menu is now weakened and the bombe will stop. When it does shut off first the Carry and then the main power switches. Write down the stop in the usual manner. Replace the removed drum and verify that it has been put back on its correct setting.
6. With the Carry Switch OFF, turn on the two main power switches and start the bombe again by first pressing the Start Key and then lifting the Bail Lever.
7. If the stop comes in again, it is a good stop. If not a notation is placed in the Remarks column of the Operator's Job sheet and on the Stop Slip stating what link was broken.
8. At the end of each run (coming back to ZZZ) check the settings for any shifting during the run. If any shifting is found, call a technician immediately.

STRIPPING THE BOMBE.

Whenever notification is received that a job "up" at some point all bombes working on that job are stripped immediately. Also when a bombe has finished its allotted runs, it is immediately stripped provided the menu is not designated as "Do Not Strip". Turn off the two main power switches, the two Carry Switches, and the Searching and Chain Switches. The Input switch should be thrown to the Single input position because the probability is that the next menu will be of the single input type. One end of each record is unplugged, removing the end that is not plugged into an enigma or a commoning jack.

SHORT TESTING THE BOMBE.

Each bombe is short tested after each job. The operator strips the machine as described above and plugs it for "short test". To plug the machine for "short test" the operator selects six cords and plugs four of them one each into each of the "commons" and the other two one each into the CSKO and SSS jacks. The bombe is then tested by the technician for short circuits using the "trolley". This testing circuit is arranged to test each lead against all the other leads for the possibility of a short with any other lead. When the test is satisfactorily completed, the cords are removed from the "commons" and the CSKO, and SSS jacks. Those ends of the cords in the enigmas and "commoning" jacks are not disturbed.

CHANGE OF WATCH AND NOON RELIEF.

The operators must not leave the bombes at the end of a shift until the relief operator has been thoroughly informed of the status of the job being run, plus any peculiarities or defects of the bombe. This includes a check of the searching and chain switches by the relief operator prior to taking over. The operator will keep an accurate log book and must be up to date at the end of the shift. An operator must never leave the machine while in operation unless properly relieved.

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KEEPING OF RECORDS.

Previous paragraphs have described the records kept in the control Log Book and in the Teleprinter Log Book. Other records which are kept are as follows:

Delay Log:

In this book are recorded all delays in the operation of the machine which are in excess of 15 minutes. Should the delay exceed 30 minutes the B.P. Master Checker is notified at the end of the 30 minutes. The book is a supporting record for Time Sheets. It is arranged as shown:

DATE	TIME		BP INL		MACHINE	JOB		ME- NU	REMARKS	I C
	OUT	IN	OUT	IN		NAME	NO.			
6/12	1335	1447	-	-	HILIA	FALCON	5/12 10P	I	Down Out Of Time	RM
6/12	1345	1445	1355	1445	BOSTON	ASTER	5/12 19P	III	Relay Trouble - Chandler	PA
6/12	1500	1525	-	-	ATLAUTA	CRICKET	5/12 973N	26	OC D Board	W

B.P. is informed immediately of any delay on an urgent menu. The exact cause of the delay is to be entered in the remarks column. The technicians will report delays.

RERUN BOOK.

If the job has been stripped and a defect is later found through short testing inform B.P. and enter the details in the Rerun Book. This is done only if the short is more than a 13-1 short and the menu is marked "RR". No attempt is made to rerun until B.P. notifies us, telling us when to rerun and what Bombe to use. It is then entered like a new job in the Control Log Book, marked "R.R. for Chicago". The Rerun Book is for record only.

JOB NO.	JOB NAME	JOB DATE	WOS NO	MENU NO. RR	MACHINE	REMARKS	INT TAL
983N	SNOWDROP	2/12/49	III		ROCHESTER	Short on Jack - RR - 591, 291, 231, 125, 135, 235, 245, 195, 295, 342, 592, 192, 152, 519	DB

MACHINE LOG BOOK.

One Machine Log Book shall be kept for each Bombe by the operator. It contains all pertinent data relating to the Bombe's operation, the tests made and the short circuits found. It is the responsibility of the operator to keep an accurate log and all entries must be up to date at the end of the shift. The entries are as follows:

ROCHESTER

TITLE	JOB NO.	ME-NU	TIME RECD	TIME START	TIME COMPL	TIME STRIP	PLUGGED BY	STRIPPED BY	NO	T
6/12 Armk	38P	II	2103	2109	0640	0645	Lewis-Rosay	D	10	S
7/12 Falcon	6/2 17P	VIII	0106	0120	0520	0525	Mac-Cowell	B	14	SI
7/12 Falcon	5/12 10P	XIII	0536	0600			Mac-Cowell	B		S

REMARKS
Short Test 2100 J.D.
Short + Relay Test 0050 RBS
Short Test 0540 SD

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		DECLASSIFIED		SECRET		U.S.A.		D.P. 7310.U.F. 44		
		NO.	"	OF RUNS	JOB RECEIVED BY M/C	1st R.S.	1st S.C.	JOB COMPLETE	M/C STRIPPED	REMARKS
PIS	20/11				BROUGHT FORWARD					
	ENTRECK II	599N	7	11				0328	0332	
	30/11									
	JAGUAR	747N	18	10	0400			0742	0745	
	26/11									
	MADELY	781N	4	7	0809			1028	1032	
	(NVI)29/11									
	FALCON II	778N	6	10	1037			1345	1350	
	(KZ)29/11									
	FALCON II	776N	23	7	1410			1620	1625	
30/11										
ENTRECK I	799N	1	8	1628			1923	1925		
25/11										
FUTURE F	804N	2	10	1930			2345	2348		
IIA	25/11				BROUGHT FORWARD					
	SHOWROP	768N	1	5				0135	0137	
	(KZ)29/11									
	FALCON II	776N	1	14	0155			0545	0547	
	30/11									
	JAGUAR	747N	18	6	0550			0825	0830	
	(NVI)29/11									
	FALCON II	778N	6	15	0904			1345	1350	
	27/11									
	MADELY	674N	15	9	1353			1725	1730	
29/11										
FALCON II	772N	10	43	1737			2040	2052		
25/11										
FUTURE F	804N	6		2116			CARRIED FORWARD	CARRIED FORWARD		
IIB	29/11				BROUGHT FORWARD					
	FALCON II	772N	1	4				0350	0350	N/80050-0665
	30/11									
	FUTURE I	704N	7	15	0655			1345	1350	
	(KZ)29/11									
	FALCON II	776N	23	8	1409			1628	1630	
	30/11									
ENTRECK I	799N	1	11	1633			1938	1940	N/S 4850-1930	
30/11										
ENTRECK I	799N	6	10	1955			2330	2335		
30/11										
PROSSINS	814N	1		2339			CARRIED FORWARD	CARRIED FORWARD		
IIC	29/11				BROUGHT FORWARD					
	FALCON II	772N	1	13				0324	0326	
	30/11									
	CACHE	747N	15	6	0407			0653	0659	
	(KZ)27/11									
	ED D	625N	20	11	0713			1415	1425	
	1/12									
BRIGHT	797N	5	13	1155			1718	1720		
27/11										
MAIL II	792N	14	7	1725			1953	1955		
30/11										
ENTRECK I	799N	6		2000			CARRIED FORWARD	CARRIED FORWARD		
IIC	25/11				BROUGHT FORWARD					
	SHOWROP	768N	1	7				0055	0056	
30/11										

CARRIED FORWARD

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	20/11	599N	7	8	Brought Forward		0338	0340	II/S0005-0115
	30/11	JAGUAR	747N	18	7	0400	0725	0728	
	(CKZ)27/11	LED D	623N	20	12	0752	1140	1150	
	1/12	CRICKET	797N	5	14	1155	1830	1833	
	25/11	SOAN		2	11	1910	2227	2230	
	25/11	QUINCE	A13N	85		2236	CARRIED FORWARD		
	30/11	PUFFIN I	784N	7	14	0655	1345	1350	II/S0001-0645
	(KZ)29/11	FALCON II	776N	23	7	1404	1720	1725	
	29/11	FALCON II	772N	10	11	1732	2052	2055	
	25/11	VULTURE P	804N	6		2122	CARRIED FORWARD		
	20/11	LYNETTE	599N	7	12	0005	0342	0346	
	30/11	JAGUAR	747N	15	7	0407	0700	0704	
	(CKZ)27/11	LED D	623N	20	12	0715	1140	1150	
	1/12	CRICKET	797N	5	12	1156	1740	1742	
	29/11	FALCON II	772N	10	10	1755	2058	2100	
	25/11	VULTURE P	804N	6		2119	CARRIED FORWARD		
	25/11	LYNETTE	599N	1	8	BROUGHT FORWARD	0132	0135	
	(KZ)29/11	FALCON II	776N	1	11	0155	0550	0554	
	30/11	LILY	770N	5	4	0623	0825	0830	
	26/11	WADLEY	781N	4	5	0833	1108	1112	
	(KZ)29/11	FALCON II	778N	6	7	1117	1440	1445	
	30/11	LYNETTE I	799N	1	13	1513	1927	1930	
	25/11	VULTURE P	804N	2	11	1935	2310	2313	
	23/11	QUINCE	A13N	85		2318	CARRIED FORWARD		
	29/11	FALCON II	772N	1	8	BROUGHT FORWARD	0320	0323	II/S0007-0417
	(KZ)29/11	FALCON II	776N	1	6	0330	0607	0610	
	30/11	LILY	770N	7	3	0626	0810	0815	
	28/11	WADLEY	781N	4	10	0815	1115	1150	
	27/11	WADLEY	674N	15	14	1203	1640	1645	

Fig. 43. Typical Time Sheet.

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WORK NOTICE BOOK.

This book furnishes a permanent file for notices affecting changes in operation procedure. Such notices are usually put on the bulletin board for about 3 days. After they have been initialed by all IC/OPS and it is reasonably certain that all concerned are familiar with the changes, they are pasted in the Work Notice Book.

TIME SHEET.

The Time Sheet is a record for all bombes and includes all time spent on jobs from midnight of one day to midnight of the next. It is the responsibility of the IC/OPS on the midnight to 8 a.m. shift (graveyard) to prepare the time sheet. The information required is obtained from the Control Log Book and the Daily Log. A sample time sheet is shown in figure 43. It is used locally for the information of the watch officers. It is also sent to the head of the Eastcote Outstation for transmission to Bletchley Park, Hut 6 Statistics. Major Manisty uses the information on the Time Sheet for the allotment of bombes.

TECHNICIANS BULLETIN BOOK.

This book is a permanent file of notices covering changes in the maintenance of the bombes. These notices are usually posted on the bulletin board for Technicians and Engineers. After all Technicians have seen the notice they are pasted in the Technicians Bulletin Book.

MACHINE FAULTS BOOK.

This book is used to record all the types of trouble encountered in the maintenance of the bombes and the remedies necessary to clear the troubles. The entries are made by the watch engineer and initialed by the watch officer. Every trouble encountered is noted down. The book is inspected by the watch officer once each day.

TOOL RELEASE SIGNOUT SHEET.

This is a sheet mounted inside the door of the tool cabinet and serves to provide a running inventory of the tools in the cabinet. As each watch engineer comes on duty he inventories the tools in the cabinet before signing the sheet and releasing the previous watch engineer. Should there be any discrepancies he notes these on the sheet before signing. The watch officer on the day shift (0800 to 1730) each Saturday inspects the tool cabinet and if any tools are found to be missing a Statement of Charges is made to cover the cost of that tool and the money taken from the pay of the watch engineer who last signed that all tools were in the cabinet.

TOOL CHARGE BOOK.

In this book is kept a record of the tools loaned to the R.A.F. The entries are made either by the watch engineer or a technician.

JOBS UP CHART.

This is a bar graph type chart kept on the wall of the IC/OPS room by the IC/OPS. On it is plotted a record of the number of "jobs up" in USA Bay against day of the month. On each unit of the bar graph the letter designation of the "watch" responsible for the job is recorded.

NOTES TO WATCH OFFICERS BOOK.

This book consists of a notebook divided into six sections, one each assigned to each watch officer, one for the special officer and one for general information. This book serves to transmit information between officers and for individual officers to keep memoranda of important items.

SUPPLY BOOK.

This book provides for entering requests for supplies. The person needing the supplies notes the items desired and signs his name and the date. These requests are approved by the signature of the OIC and when sufficient items are accumulated

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they are requisitioned. Space is also provided in the book for noting when the items are received.

ATTENDANCE BOOKS.

A book is kept by each watch showing the attendance for every day of duty in "operations". The entries are made by the watch officer with explanatory notes for any discrepancies.

GRAPHS OF PERFORMANCE OF MACHINES AND PERSONNEL.

For the Commanding Officer, Major M.H.Stewart, a number of graphs were kept to show the performance of the machines and personnel. All the graphs were plotted against time.

1. AVERAGE RUNS PER MACHINE DAY plotted weekly for the entire unit. This graph has proven very interesting. It begins on the 7th May 1944 when the 6812th Signal Security Detachment had only one bombe in operation. Operators and checkers as well as the repairmen were in the process of being trained. The graph clearly shows the progress as the men obtained experience and as each new machine was added to make the final ten. The average runs per machine day increased from 32 runs on 14th May 1944 to an average of 73.3 runs per machine day on 6th May 1945. To understand how much of a record this increase in output really was the following graph must be seen.

2. AVERAGE RUNS PER MACHINE DAY ALL STATIONS plotted monthly. The figures from which the points on this graph are plotted are furnished by the British from Bletchley Park. Time sheets covering each days work were sent to BP daily covering the previous days work. This was done by all of the Out Stations operated by the British also. The figures were averaged at BP and a copy of the results furnished each Station monthly. Graph No.2 shows U.S.A. plotted along with the other five British Stations, for the period during which the figures were made available. At the time operations ceased the average for U.S.A. was approximately 25% above that of the British and increasing rapidly

3. AVERAGE RUNS PER DAY PER WATCH plotted weekly. This graph graphically shows the output of each watch. It can be seen that A and D Watches were almost constantly above the average in output. The various fluctuations almost always have a definite reason as in the case of the large dip in the output of B Watch on 25 March 1945.

4. AVERAGE NUMBER OF RE-RUNS PER MACHINE PER DAY plotted weekly. The top line of this graph shows the average number of runs per machine per day. From this line the average number of re-runs per machine per day is subtracted thereby giving another line or graph representing the actual useful runs per machine per day. The red area between the two can be called "lost work" or "lost effort" because of some error thereby requiring that the work be re-run. It can be seen that the number of re-runs varied between 5.2 and 8.5 over the entire time of operations.

5. AVERAGE RUNS PER DAY PER MACHINE plotted weekly. This set of graphs definitely shows the output of each machine and its general running condition. Those machines which gave the most trouble as far as repairs are concerned can be easily seen by the dips in their graphs. This set of graphs also reflects to some extent the abilities of the engineers and technicians to keep the machines in repair and good running order.

6. BAR GRAPHS SHOWING TROUBLE TIME PER MACHINE plotted for each machine daily. This set of graphs shows the actual out of action time for each machine daily. No other graphs show so well how the abilities of the engineers and technicians improved. The total out of action time dropped from 247.5 hours in January 1945 to 69 hours in April 1945. The four Watch Engineers are to be highly commended for their superior work. T/3 Jack C.Kemp, T/3 Malvern A.Schoch, T/3 Horace T.Chandler and T/4 James M.Church were each awarded on 22 May 1945 the Certificate of Merit European Theater of Operations U.S.Army for their superior performance of duty.

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7. IDLE TIME plotted weekly. This is really three graphs. Average Total Idle Time perday in Hours. Average Total Idle Time per Machine per day in Minutes. Average Time per job per Day in Minutes. The Average Total Idle Time per Day in Hours represents the Idle time for the entire ten machines. The average Total Idle Time per Machine per Day in Minutes is simply the previous graph divided by ten as there are ten machines. The Average Idle Time per Job per Day in Minutes represents the idle time waiting between the time one job is completed and another job is assigned to the machine.

FILES. (IC/OPS ROOM)

JOB FILE. (Temporary)

All pertinent records of current jobs being run on the bombes, jobs to be rerun at the direction of BP because of shorts found at the completion of the original run and "jobs up" for the day are filed in a temporary rile in the IC/OPS office. The complete file of wheel order sheets is also kept here.

OPERATIONAL AND TECHNICAL INFORMATION (Permanent)

Information and instructions covering the operational procedure and technical data on the functioning of the bombes is filed in a permanent file in the IC/OPS room.

TELEPRINTER SLIPS. (Permanent)

The teleprinter slips of all communications regarding jobs to and from Bletchley Park are filed in the permanent rile. These are kept for one month.

JOBS UP. (Permanent)

The records of "jobs up" regardless of where they come up are filed in the permanent rile. These are kept for one week.

JOBS NOT UP. (Permanent)

The records of jobs not up are kept as long as there is filing space. At present this amounts to keeping all jobs of two letter series. A letter series consists of 999 jobs. These are of course apportioned among the out stations so that our file for any one series is only a partial series.