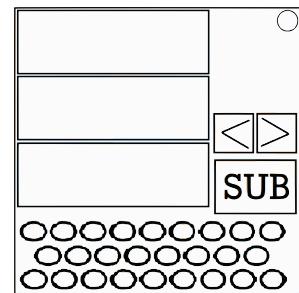


## On the Subject of the Ultimate Cipher

All ciphering techniques are required to solve this module.

On the module, you will see 3 screens, a keyboard, 2 arrows, and a submit button.

Pressing the right arrow takes you to the next page. Pressing the left arrow takes you to the previous page. There is a total of 5 pages.



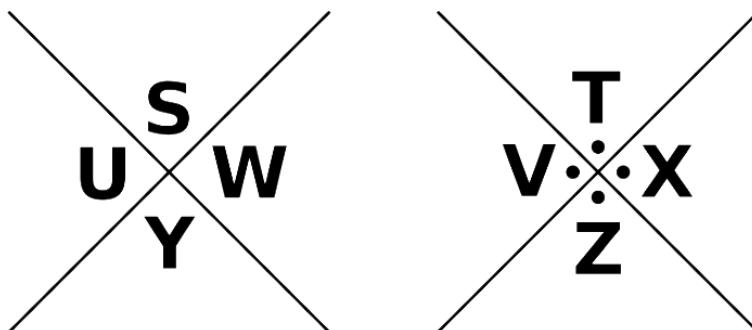
- Page 1: Top screen shows 6 symbols, the 2 screens below show 6 digit numbers.
- Page 2: Top screen shows a word. Middle screen shows a number.
- Page 3: Top screen shows a letter followed by roman numerals. Middle screen shows 3 letters. Bottom screen shows a number of paired letters.
- Page 4: All 3 screens show a word.
- Page 5: Top screen shows 6 symbols.

To disarm this module, you have to decrypt the word using the mechanics down below.

### Step 1: Pigpen Cipher

On page 1, the top screen shows 6 symbols. Decrypt it by using the pigpen cipher below

A	C	E	B	D	F
G	I	K	H	J	L
M	O	Q	N	P	R



**Step 2: Letter Transposition**

For this, you will need the 2 numbers on the screens below the top screen. Take the 1st number from the middle screen to use for the column. Then take the 1st number from the bottom screen to use for the row. Use both numbers of the table below to get an instruction.

	0	1	2	3	4	5	6	7	8	9
0	34	16	14	24	25	23	45	34	R4	24
1	26	14	RV	15	R2	34	56	R3	26	25
2	23	RV	R1	RV	12	25	36	46	R2	25
3	35	12	46	24	45	R5	13	15	26	R5
4	R1	13	14	16	35	12	35	R3	25	R4
5	23	45	R3	46	16	36	R4	R5	34	R2
6	13	12	RV	12	R3	35	36	15	36	23
7	45	24	56	R4	R5	R2	35	23	56	46
8	RV	26	R1	13	13	56	15	15	24	34
9	36	R1	14	56	16	45	16	14	26	46

- ##: Switch the 2 letters at those positions.
- R#: Shift the whole word to the right # times.
- RV: Reverse the entire sequence.

Do this for each digit on the 2 screens to complete the transposition process.

**Step 3: Vigenere Cipher**

On page 2 of the module, the top screen shows a word

Take the first letter of your encrypted word and the first letter on the top screen and translate them into numbers using the table below.

Add the two numbers together, and then turn them back into a letter with the same table.

If the numbers add up to something above 25, subtract 26 until the number is between 0 - 25.

Repeat for each letter.

A	8	H	13	0	14	V	9
B	0	I	7	P	3	W	17
C	16	J	22	Q	19	X	15
D	12	K	23	R	4	Y	20
E	5	L	6	S	21	Z	24
F	11	M	18	T	25		
G	10	N	1	U	2		

#### Step 4: Base Caesar Cipher

On page 2 of the module, the middle screen shows a number. However this number is not in base 10.

To figure out which base the number is in, take the sum of the alphanumeric positions of the letters of the encrypted word you have so far (A = 1, B = 2, ... Z = 26). Then modulo 8 the sum (subtract 8 to the sum until the number is between 0 - 7), then add 2. The resulting number is the base of the number.

To convert the number to base 10 follow the steps below:

- Step 1: Above each of the digits in your number, list the power of the base that the digit represents. Start at 0 on the right and increment by 1 as you go left for each digit.
- Step 2: Multiply each digit by the power of the base.
- Step 3: Add all the numbers together to get your base 10 number.

EX: 132, Base 5

$$5^2 \ 5^1 \ 5^0$$

$$1 \ 3 \ 2$$

$$5^2 * 1 = 25$$

$$5^1 * 3 = 15$$

$$5^0 * 2 = 2$$

$$25 + 15 + 2 = 42$$

132 in base 5 is equal to 42 in base 10.

After converting the number to base 10, add the number to each letter of the encrypted word to get a new encrypted word.

**EX:**

$$A + 12 = 1 + 12 = 13 = M$$

$$E + 21 = 5 + 21 = 26 = Z$$

$$G + 24 = 7 + 24 = 31 - 26 = 5 = E$$

$$H + 123 = 8 + 123 = 131 - 26 = 105 - 26 = 79 - 26 = 53 - 26 = 27 - 26 = 1 = A$$

### Step 5: Enigma Cipher

On page 3 of the module, you will see a configuration of the rotors/reflector, the rotors setup below that, and a plugboard setup on the bottom.

### Step 5A: Configuration of the Rotors/Reflector/Plugboard

The screen at the top shows what type of rotors are used, the order they are in, and which reflector is used. Use the correct rotor charts and correct reflector chart to use to create an Enigma Decryptor.

They are read in this order: Reflector-Bottom Rotor-Middle Rotor-Top Rotor.  
Above the top rotor, you will type A-Z to use as the plugboard.

Use the schematic at the bottom to help you create the Enigma Decryptor.

The rotors below the screen shows what letter each one is at. Shift the letters until the bottom left letter is equal to the letter on the rotor.

For each pair of letters on the plugboard setup, switch the 2 letters positions on your plugboard.

#### Rotor I

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

#### Rotor II

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

#### Rotor III

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

Rotor IV

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

Rotor V

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

Rotor VI

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

Rotor VII

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

Rotor VIII

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
A	B	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

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

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

Reflector C

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

## Enigma Schematic

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

TOP ROTOR/RIGHT ROTOR

MIDDLE ROTOR

BOTTOM ROTOR/LEFT ROTOR

REFLECTOR

### Step 5B: Rotor Turning Mechanics

On an enigma machine, everytime a letter is pressed, the rotors turn then a light lits up a single letter. Unfortunately we don't have an enigma machine with these wirings so you have to act like one. The first thing you have to do is turn rotors based on the rules below then decrypt the letter. This next section talks about how rotor turning mechanics work.

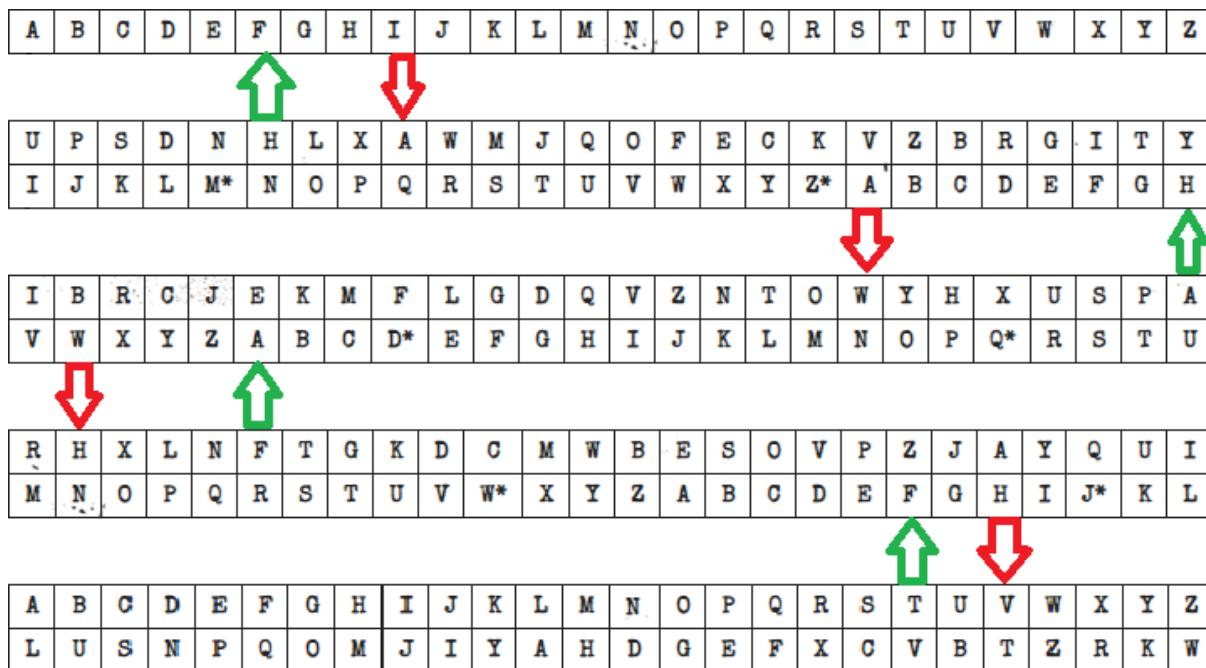
You will notice a couple letters on the bottom row of the rotors have \* next to them. Depending on which rotor it's on will have different effects:

- If the asterisk is at the leftmost edge of the middle rotor, all 3 rotors will turn
- Otherwise, if the asterisk is at the left most edge of the right/top rotor, both the middle and top/right rotor will turn.
- Otherwise, only the right/top rotor will turn
- Each turn only goes up 1 step on the rotor (Ex: A → B, G → H, Z → A, etc.)

### Step 5C: Using the Enigma Decryptor

- 1: Take the letter of your word and find it on the plugboard row of the decryptor.
- 2: Go straight down to the top row of the top rotor to recieve a new letter.

- 3: Find the new letter in the bottom row of the top rotor.
- 4: Go straight down to the top row of the middle rotor to receive a new letter.
- 5: Find the new letter in the bottom row of the middle rotor.
- 6: Go straight down to the top row of the bottom rotor to receive a new letter.
- 7: Find the new letter in the bottom row of the bottom rotor.
- 8: Go straight down to the top row of the reflector to receive a new letter.
- 9: Find the new letter in the bottom row of the reflector.
- 10: Go straight up to the bottom row of the bottom rotor to receive a new letter.
- 11: Find the new letter in the top row of the bottom rotor.
- 12: Go straight up to the bottom row of the middle rotor to receive a new letter.
- 13: Find the new letter in the top row of the middle rotor.
- 14: Go straight up to the bottom row of the top rotor to receive a new letter.
- 15: Find the new letter in the top row of the top rotor.
- 16: Go straight up to the plugboard row to receive your decrypted letter.
- The example below uses I as the letter which will decrypt it to F.



Repeat steps 4B and 4C for each letter of your word to get a new encrypted word.

### Step 6: Playfair Cipher

On page 4 of the module, you will see 3 words, 1 on each screen.

To obtain the key use the number of batteries on the bomb to get the order of the words from the 3 screens:

0 BAT: Top, Middle, Bottom

1 BAT: Top, Bottom, Middle

2 BAT: Middle, Top, Bottom

3 BAT: Middle, Bottom, Top

4 BAT: Bottom, Top, Middle

5+ BAT: Bottom, Middle, Top

Once you have the correct order of the words, create a 5x5 matrix of letters starting with the 3 words in the correct order. Then fill the rest with the unused letters of the alphabet. Each letter must occur only once in the matrix, so only add the first occurrence. Remove any Js from the matrix.

Replace any Js from your encrypted word to Is and split the word into character pairs. For each pair:

- If the 2 letters are exactly the same, keep them as is.
- Otherwise, if the letters appear on the same row of your matrix, replace them with the letters to their immediate left respectively, wrapping around to the right side of the row.
- Otherwise, if the letters are on the same column of your matrix, replace them with the letters immediately above, wrapping to the bottom.
- Otherwise, replace each of them with the letter on the same row but in the column of the other letter in the original pair.

### Step 7: Mechanical Cipher

On page 5 of the module, the top screen shows another pigpen cipher word. Use step 1 to decipher it.

Use the now deciphered pigpen word for the rows and use the word you have been decrypting for the past 5 steps as the columns. For each letter of each word, use the table below to get a new letter. Do this for each letter to get your decrypted word.

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

Once you finally have your decrypted word, you can submit it. Once you start typing, all the screens will go black and the bottom screen will show what you are typing.

To clear it, just click one of the arrows. This goes to one of the pages and clears any input you put in. It will not let you go over 6 letters on input.

Once you are satisfied with your input, press the button labeled "SUB" to submit your answer. On a strike, the module will go back to the first page of the module, but it does not regenerate.