Bomb Defusal Manual

Tetopia

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Version 2.2.7

Table of contents

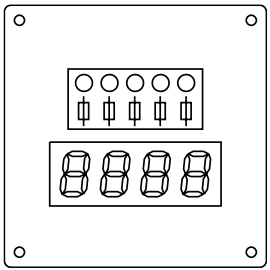
The bomb

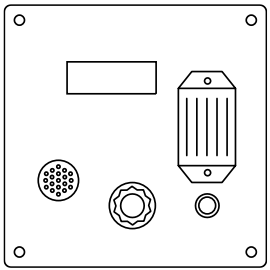
Time keeps ticking… and at the end of time, a life may end as well. So, it might be a good idea to delay the end of time a little.

- The bomb consists of the timer (the countdown display and the screen below it) and the modules (recognizable by the LED in the top right corner).
- In the appendix, you'll find references showing what specific connectors and tools look like, as well as other useful information.

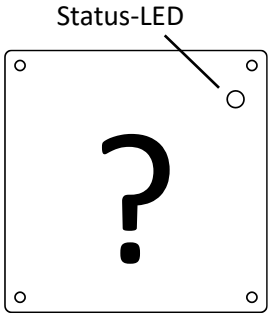
Timer

- The bomb explodes when the timer reaches 00:00.
- Above the countdown, the number of remaining fuses is displayed. For each mistake made during defusal, one fuse burns out. If no fuses remain, the bomb explodes upon the next mistake.





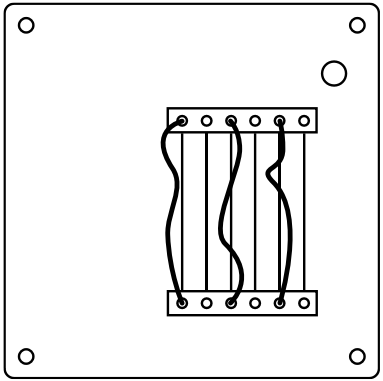
Modules



- Each module comes with its own defusal instructions.
- The LED in the upper right corner of the module indicates its status:
  - Slowly fading in and out in yellow:
    The **module is active** and needs to be defused.
    - Each module must be solved individually to defuse the entire bomb.
    - The order in which the modules are defused does not matter.
  - Constant yellow light:
    The **module is passive** and does not (currently) need to be defused. However, it may become active and turn into an **urgent module**.
  - Flashing red:
    The **module is urgent** and requires immediate attention. It must be managed before the small timer at the bottom center runs out.
  - Constant green light:
    The **module is defused**.
  - Flashing green or off:
    The **module is faulty or not connected** and can be ignored. It does not need to be solved.

PART 1
Normal Modules

Module 01: Wires



In a modern car, several kilometers of wiring are installed. Imagine having to find the correct wire there!

- A wire module can have 3 to 6 single-colored wires.
- Only one correct wire needs to be disconnected to defuse the module.
- The counting of wires starts with the first wire on the left.
- The number of wires does not change, even if a wire is completely removed. The original number at the start of defusal always applies.

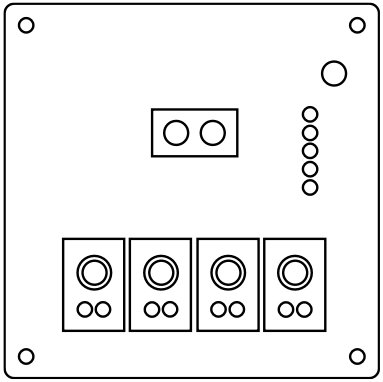
3 Wires:
If there are no blue wires, disconnect the third wire.
Otherwise, if there is exactly one red wire, disconnect the red wire.
Otherwise, if the last wire is black, disconnect the first wire.
Otherwise, disconnect the second wire.

4 Wires:
If there are no red wires and the last wire is yellow, disconnect the last wire.
Otherwise, if the last digit of the serial number is odd and there is more than one yellow wire, disconnect the last yellow wire.
Otherwise, if there are no white wires, disconnect the second wire.
Otherwise, disconnect the third wire.

5 Wires:
If there is exactly one yellow wire and exactly one red wire, disconnect the first wire.
Otherwise, if the last digit of the serial number is even and there is exactly one black wire, disconnect the fourth wire.
Otherwise, if the last wire is red and there are no white wires, disconnect the third wire.
Otherwise, disconnect the last wire.

6 Wires:
If the last wire is yellow, disconnect the fifth wire.
Otherwise, if the last wire is white and there are no blue wires, disconnect the last wire.
Otherwise, if there is more than one black wire and the last digit of the serial number is odd, disconnect the last black wire.
Otherwise, disconnect the third wire.

Module 02: Binary Numbers

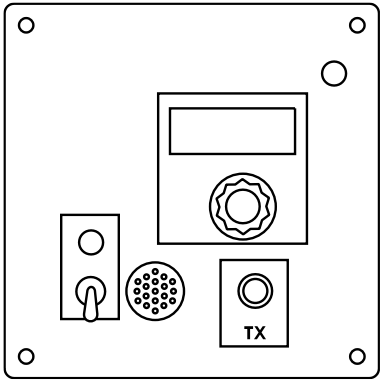


There are only 10 types of people in the world: those who understand binary code, and those who don't. If you don't get this joke, you're part of the 10nd group.

- Press the correct button to advance the module to the next stage. Complete all stages to defuse the module.
- Pressing the wrong button resets the module to stage 1.
- The current stage is indicated by the small LEDs on the right.
- The positions of the buttons are counted from left to right.
- The digits of the large number and the indicators below the buttons are shown in binary. The following values are possible (● on, ○ off): ○○ 0, ○● 1, ●○ 2, ●● 3.

Stage 1:
If the large number is 0, press the button in the second position.
If the large number is 1, press the button in the first position.
If the large number is 2, press the button in the second position.
If the large number is 3, press the button in the fourth position.
Stage 2:
If the large number is 0, press the button with the label "2".
If the large number is 1, press the button in the same position as in Stage 1.
If the large number is 2, press the button in the first position.
If the large number is 3, press the button with the same label as in Stage 1.
Stage 3:
If the large number is 0, press the button with the same label as in Stage 2.
If the large number is 1, press the button in the same position as in Stage 1.
If the large number is 2, press the button in the second position.
If the large number is 3, press the button with the label "3".
Stage 4:
If the large number is 0, press the button in the same position as in Stage 1.
If the large number is 1, press the button in the third position.
If the large number is 2, press the button in the same position as in Stage 2.
If the large number is 3, press the button in the same position as in Stage 3.
Stage 5:
If the large number is 0, press the button with the same label as in Stage 4.
If the large number is 1, press the button with the same label as in Stage 3.
If the large number is 2, press the button with the same label as in Stage 1.
If the large number is 3, press the button with the same label as in Stage 2.

Module 03: Morse



Amateur radio is one of the few areas where Morse code is still actively used today. One of its advantages is that the signal can be transmitted over long distances with very low power. So, thank the inventor of Morse code for this module: Samuel Morse.

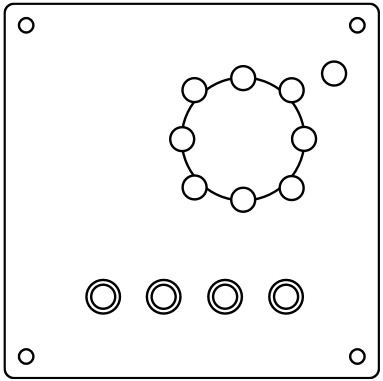
- The toggle switch turns the tone on and off.
- Decode the Morse code by watching the blinking light and listening to the tone, if it is turned on. The right-hand table shows the letters assigned to each Morse sequence, which together form a word from the left-hand table.
- The signal repeats, with a long break between repetitions.
- Once the word is identified, set the corresponding frequency using the control dial and press the transmit (TX) button.
- Morse code is interpreted as follows:
    - A short signal is a dot.
    - A long signal is a dash.
    - There is a longer break between letters.
    - There is a very long break between words.

If the word is:	Transmit on frequency:
Funk	3.503 MHz
Code	3.507 MHz
Pause	3.512 MHz
Uhr	3.518 MHz
Baum	3.525 MHz
Bombe	3.529 MHz
Ton	3.532 MHz
Bilder	3.535 MHz
Samuel	3.538 MHz
Morse	3.541 MHz
Senden	3.547 MHz
Welt	3.553 MHz
Punkt	3.558 MHz
Zeit	3.561 MHz
Strich	3.564 MHz
Signal	3.567 MHz

Morse code:

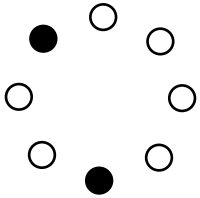
A	• –	U	• • –
B	– • • •	V	• • • –
C	– • – •	W	• – –
D	– • •	X	– • • –
E	•	Y	– • – –
F	• • – •	Z	– – • •
G	– – •		
H	• • • •		
I	• •		
J	• – – –		
K	– • –	1	• – – – –
L	• – • •	2	• • – – –
M	– –	3	• • • – –
N	– •	4	• • • • –
O	– – –	5	• • • • •
P	• – – •	6	– • • • •
Q	– – • –	7	– – • • •
R	• – •	8	– – – • •
S	• • •	9	– – – – •
T	–	0	– – – – –

Module 04: LED Circle

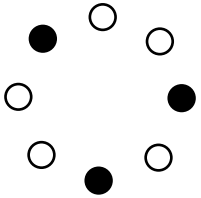


A few blinking LEDs arranged in a circle are enough to make many electronics hobbyists happy. Maybe they'll make you happy too?

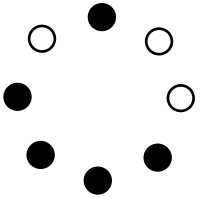
- The LED pattern indicates which button needs to be pressed.
- The buttons are counted starting from the first button on the left.



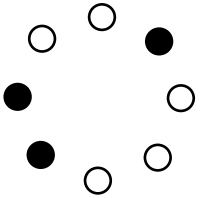
Third Button



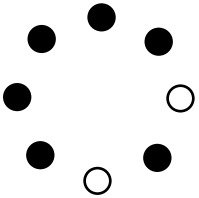
Second Button



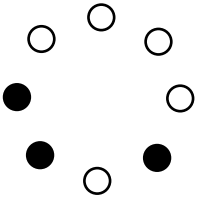
Fourth Button



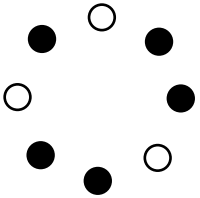
First Button



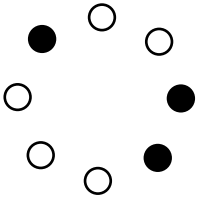
Fourth Button



First Button

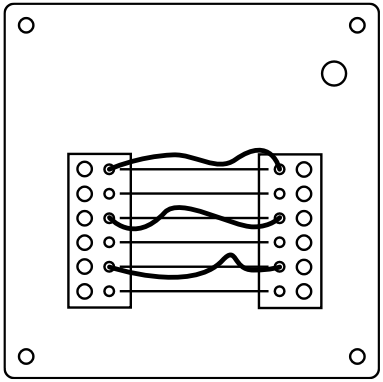


Third Button



Second Button

Module 05: Twisted Wires



These wires aren't like the others. They're twisted! That makes them something entirely different! The good news is, we have a concise set of instructions for what to do with them! …OK, maybe too concise ...

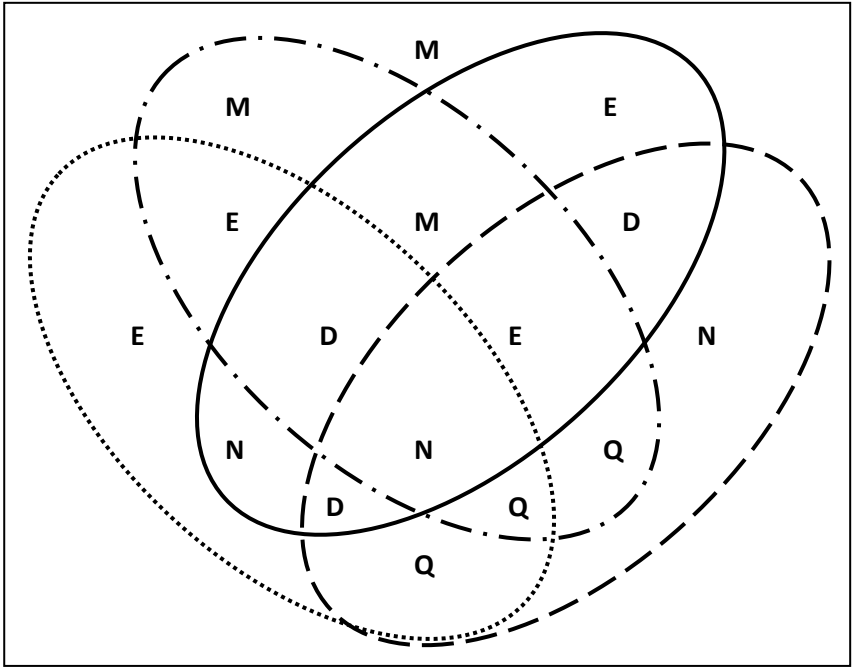
- Examine each wire individually: there is a red LED to the left of the wire and a yellow LED to the right.
- Use the Venn diagram to determine, for each wire/LED combination, whether the wire should be disconnect.
- Each wire can have multiple colors.

– · – · – · –	Wire has red color
———	Wire has blue color
.....	Yellow LED (right) is on
— — — —	Red LED (left) is on

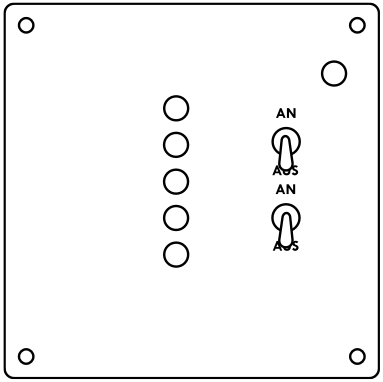
Letter	Instruction
E	Disconnect the wire
N	Do not disconnect the wire
M	Disconnect the wire if fewer than 3 modules remain to be solved*
D	Disconnect the wire if the bomb has more than one rotary knob
Q	Disconnect the wire if the cross sum of the serial number is greater than 17

* "Modules to be solved" refers to active modules as defined earlier under "The bomb."

diagram:



Module 06: Logic Gates



Everything is logical — perfectly logical. Which doesn't mean it can't be confusing. A Vulcan would certainly have no trouble with this module.

- Determine, based on the combination of LEDs, whether the two switches should be turned on or off.
- Depending on the inputs on the left side of the gate, the output on the right side of the gate is ON or OFF.
- The LEDs are the inputs in the first column, the switches are the outputs in the last column.
- The outputs of the previous column are the inputs of the next column.
- The gates have the following meanings:

 AND: If both inputs are ON, the output is ON; otherwise, it is OFF.

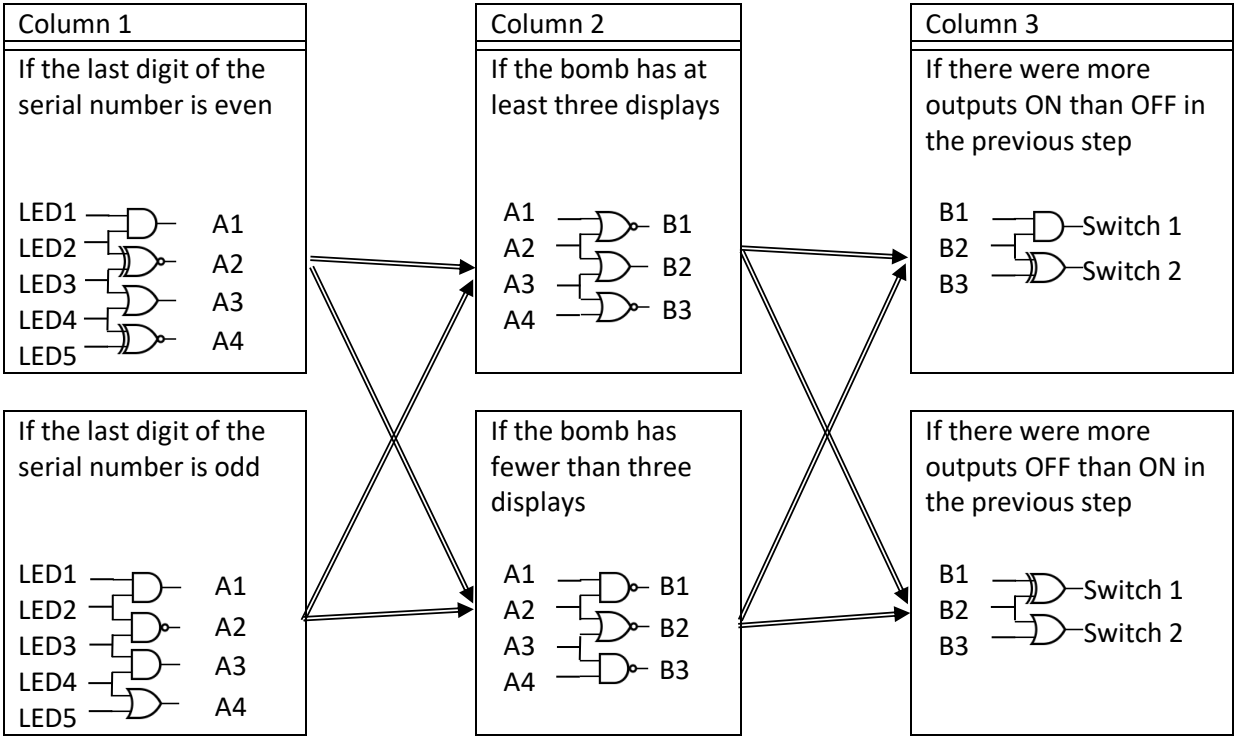
 NAND: If both inputs are ON, the output is OFF; otherwise, it is ON.

 OR: If at least one input is ON, the output is ON; otherwise, it is OFF.

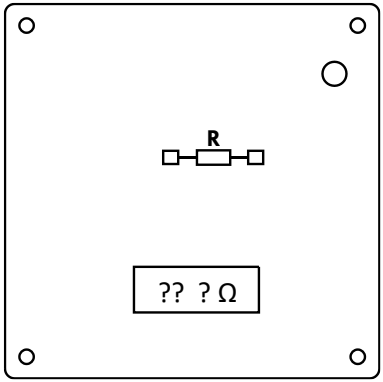
 NOR: If at least one input is ON, the output is OFF; otherwise, it is ON.

 XOR: If exactly one input is ON, the output is ON; otherwise, it is OFF.

 XNOR: If exactly one input is ON, the output is OFF; otherwise, it is ON.


Column 1
If the last digit of the serial number is even
LED1
LED2
LED3
LED4
LED5
A1
A2
A3
A4
If the last digit of the serial number is odd
LED1
LED2
LED3
LED4
LED5
A1
A2
A3
A4
Column 2
If the bomb has at least three displays
A1
A2
A3
A4
B1
B2
B3
If the bomb has fewer than three displays
A1
A2
A3
A4
B1
B2
B3
Column 3
If there were more outputs ON than OFF in the previous step
B1
B2
B3
Switch 1
Switch 2
If there were more outputs OFF than ON in the previous step
B1
B2
B3
Switch 1
Switch 2

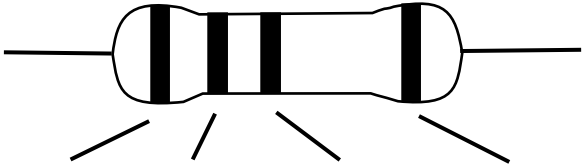
Module 07: Resistor



Resistance is futile!

- The display shows which resistor must be placed between the test points.
- The value of the resistors can be calculated using the table.
- 1 kΩ equals 1,000 Ω, 1 MΩ equals 1,000,000 Ω.
- The spacing between the color bands indicates the reading direction.
- Tolerance does not matter — typical values are ±5%, for example.

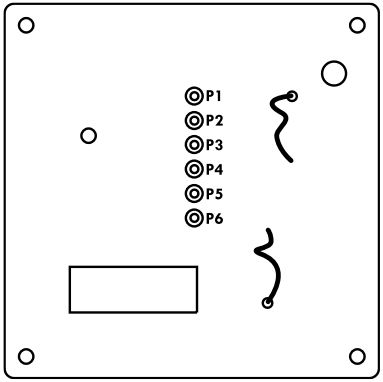
- **WARNING:** Touching the metal leads of the resistor during insertion may cause an error! Only handle the resistor by its body.



Color	1st Digit	2nd Digit	Zeros (Multiplier)	Tolerance
Black	-	0	-	-
Brown	1	1	0	± 1%
Red	2	2	00	± 2%
Orange	3	3	000	
Yellow	4	4	0000	
Green	5	5	00000	± 0,5%
Blue	6	6	000000	
Violet	7	7	-	
Gray	8	8	-	
White	9	9	-	
Gold	-	-	x 0,1	± 5%
Silver	-	-	x 0,01	± 10%
None	-	-	-	± 20%

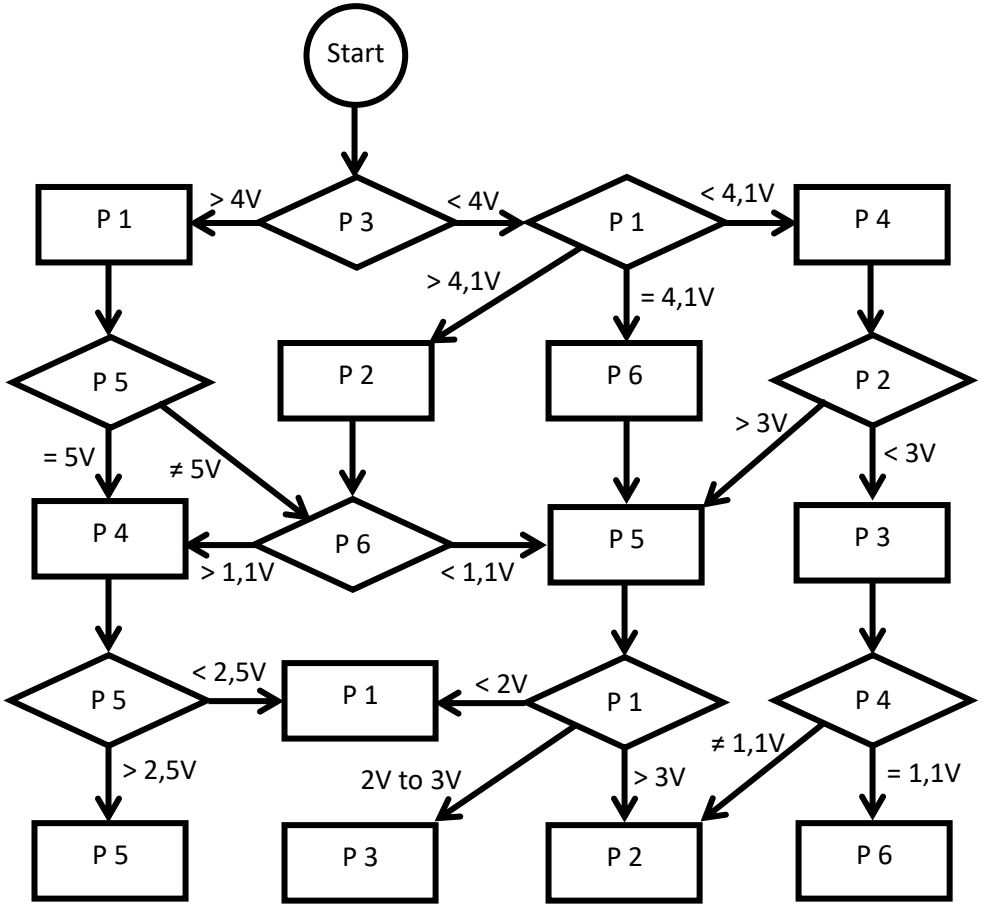
Example: A resistor with a value of **3.9 kΩ** equals **3900 Ω**. That corresponds to the colors**: Orange (3), White (9), Red (00)**, and any color as the final band (tolerance).

Module 08: Volt Meter

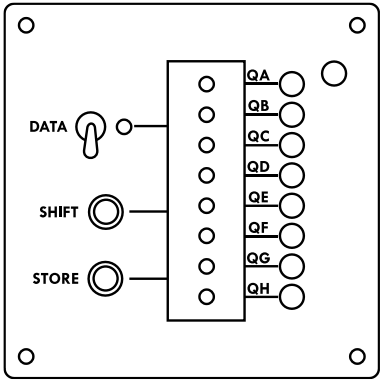


What would a good bomb defusal be without taking a few measurements? After all, you need to know where the current is flowing! But instead of cutting wires, sometimes you have to build some.

- Follow the flowchart. The starting point is the circle.
- Diamonds indicate decision points, where a measurement must be taken at the point specified in the diamond.
- The measuring cable has a probe tip.
- Rectangles indicate where a connection must be made.
- The connection cable has an alligator clip.
- In case of an error, the connection must be removed and the process started from the beginning.
- Do not measure at any point that already has a connection.


Start
P 3
> 4V
< 4V
P 1
P 1
< 4,1V
P 4
> 4,1V
= 4,1V
P 5
P 2
P 6
P 2
> 3V
< 3V
= 5V
≠ 5V
P 4
P 6
> 1,1V
< 1,1V
P 5
P 3
P 5
< 2,5V
P 1
< 2V
P 1
P 4
≠ 1,1V
> 2,5V
2V to 3V
> 3V
= 1,1V
P 5
P 3
P 2
P 6

Module 09: Shift Register



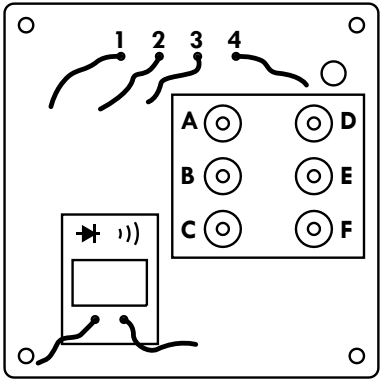
A shift register is a type of sequential logic circuit used to store or transfer binary data. Got it so far? Now: shift that whale!

- Determine from the current outputs QA to QH of the shift register which pattern must be set next.
- The large LEDs show the current outputs, the small LEDs show the internal state of the shift register.
- The “DATA” switch toggles the DATA LED on and off.
- The “SHIFT” button shifts the value of the DATA LED into the internal memory (small LEDs) of the shift register. (The existing values in the register are shifted down by one.)
- The “STORE” button transfers the internal state of the shift register to the outputs and triggers validation.

0 = LED off
1 = LED on
X = any LED state

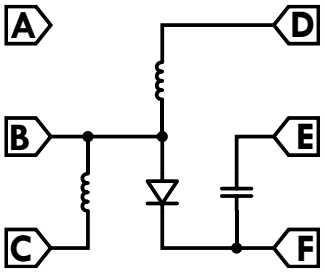
Current	**Target**
X1XX 1X0X	0110 0100
X00X 1XXX	1101 1000
X0XX 0XXX	1001 1001
X1XX 01XX	0100 1001
X1XX 1X10	1011 0101
X01X 1XXX	0111 0101
X1XX 00XX	1000 1011
X1XX 1X11	0011 1010

Module 10: Schematic

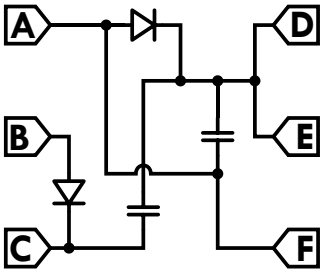


Being able to analyze circuits is an important skill for every electronics technician. How else are you supposed to find the fault on the board?!?

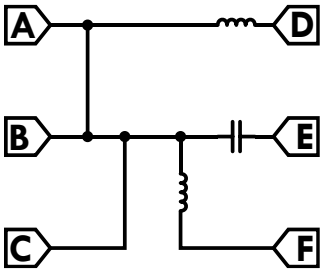
- Use the continuity tester at the bottom left to find out which circuit matches.
- Connect the numbered wires accordingly.
- The continuity tester has a red and a black test lead. It works as follows:
  - If there is no connection, the tester shows “OL” (for "Open Load").
  - If there is a short circuit (direct connection), the tester shows “0,0 V” and beeps.
  - When the tester measures a diode (⊣▷|):
    In forward direction (*red lead* ⊣▷| *black lead*), it shows “0,7 V” and beeps.
    In reverse direction (*red lead* |◁⊣ *black lead*), it shows “OL”.
  - A capacitor (⊣⊢) appears to the tester as an open circuit.
  - An inductor (∿) appears to the tester as a short circuit.



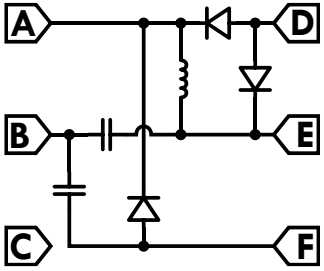
1 -> C
2 -> A
3 -> B
4 -> F



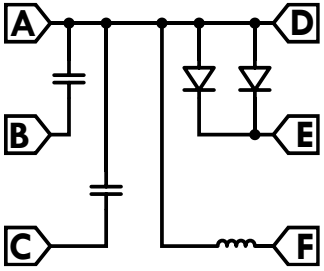
1 -> C
2 -> E
3 -> A
4 -> F



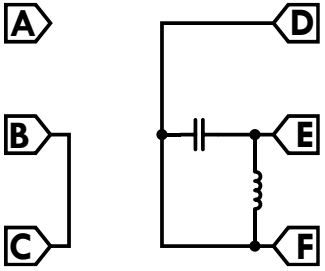
1 -> E
2 -> A
3 -> F
4 -> C



1 -> F
2 -> C
3 -> E
4 -> D

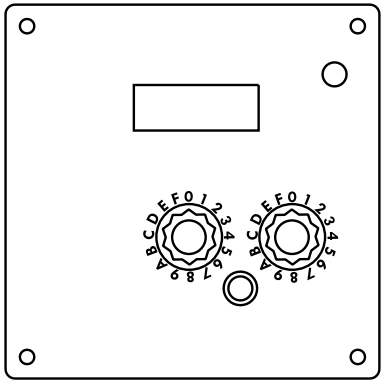


1 -> E
2 -> C
3 -> B
4 -> F



1 -> C
2 -> F
3 -> D
4 -> A

Module 11: ASCII

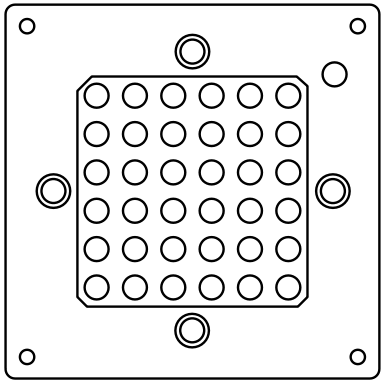


“Johanssen’s Notebook is an inexhaustible source of information. I know she had an ASCII table somewhere. Every computer nerd has one.” – Mark Watney, The Martian

- The text on the display must be entered as ASCII code using the coded rotary switches.
- The small letters in the corners do not belong to the text; they show the current settings of the rotary switches.
- Each letter is confirmed by pressing the button.
- The displayed table shows the mapping of letters and symbols to their corresponding code.
- Control characters not used are shown in italics.

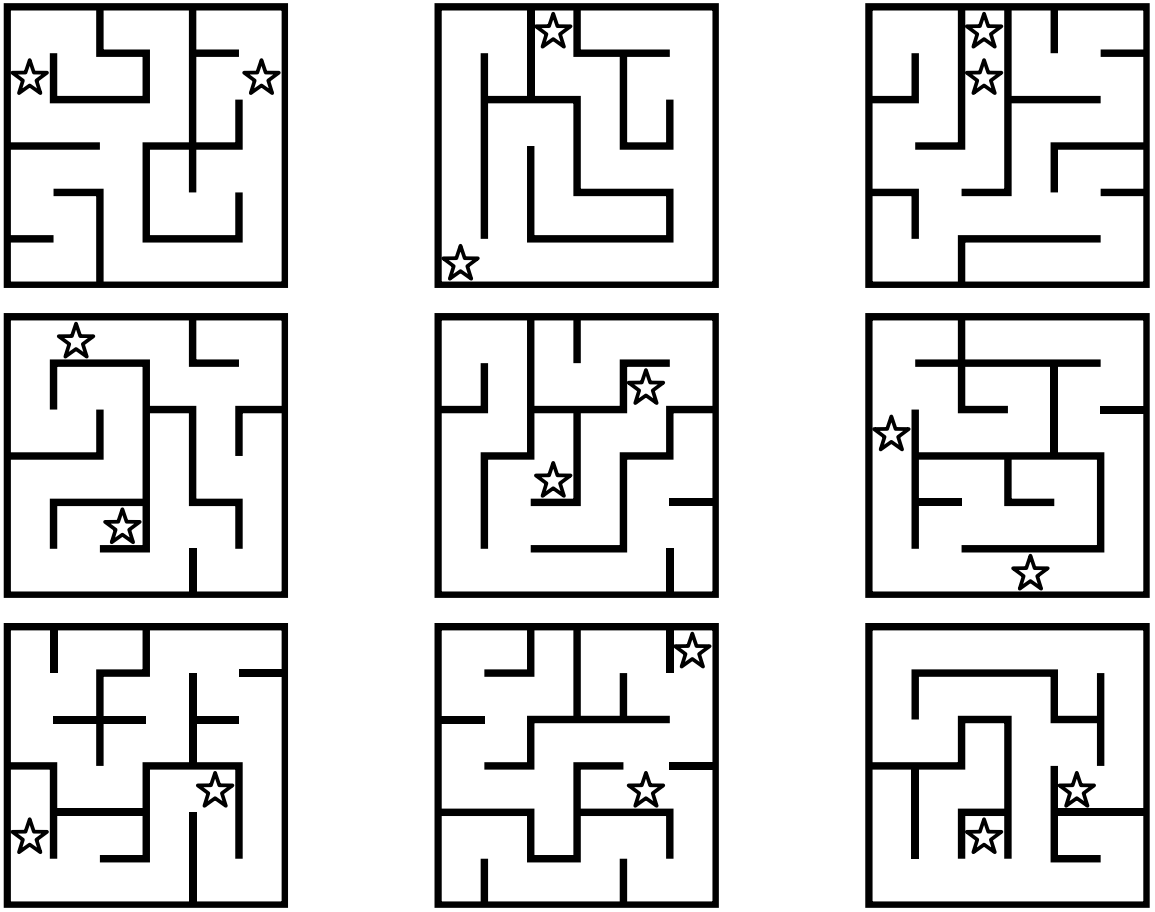
	_0	_1	_2	_3	_4	_5	_6	_7	_8	_9	_A	_B	_C	_D	_E	_F
0_	*NUL* *00*	*SOH* *01*	*STX* *02*	*ETX* *03*	*EOT* *04*	*ENQ* *05*	*ACK* *06*	*BEL* *07*	*BS* *08*	*HT* *09*	*LF* *0A*	*VT* *0B*	*FF* *0C*	*CR* *0D*	*SO* *0E*	*SI* *0F*
1_	*DLE* *10*	*DC1* *11*	*DC2* *12*	*DC3* *13*	*DC4* *14*	*NAK* *15*	*SYN* *16*	*ETB* *17*	*CAN* *18*	*EM* *19*	*SUB* *1A*	*ESC* *1B*	*FS* *1C*	*GS* *1D*	*RS* *1E*	*US* *1F*
2_	*SP* 20	**!** 21	**"** 22	**#** 23	**$** 24	**%** 25	**&** 26	**'** 27	**(** 28	**)** 29	***** 2A	**+** 2B	**,** 2C	**-** 2D	**.** 2E	**/** 2F
3_	**0** 30	**1** 31	**2** 32	**3** 33	**4** 34	**5** 35	**6** 36	**7** 37	**8** 38	**9** 39	**:** 3A	**;** 3B	**<** 3C	**=** 3D	**>** 3E	**?** 3F
4_	**@** 40	**A** 41	**B** 42	**C** 43	**D** 44	**E** 45	**F** 46	**G** 47	**H** 48	**I** 49	**J** 4A	**K** 4B	**L** 4C	**M** 4D	**N** 4E	**O** 4F
5_	**P** 50	**Q** 51	**R** 52	**S** 53	**T** 54	**U** 55	**V** 56	**W** 57	**X** 58	**Y** 59	**Z** 5A	**[** 5B	**** 5C	**]** 5D	**^** 5E	**_** 5F
6_	**`** 60	**a** 61	**b** 62	**c** 63	**d** 64	**e** 65	**f** 66	**g** 67	**h** 68	**i** 69	**j** 6A	**k** 6B	**l** 6C	**m** 6D	**n** 6E	**o** 6F
7_	**p** 70	**q** 71	**r** 72	**s** 73	**t** 74	**u** 75	**v** 76	**w** 77	**x** 78	**y** 79	**z** 7A	**{** 7B	**|** 7C	**}** 7D	**~** 7E	*DEL* *7F*

Module 12: Maze

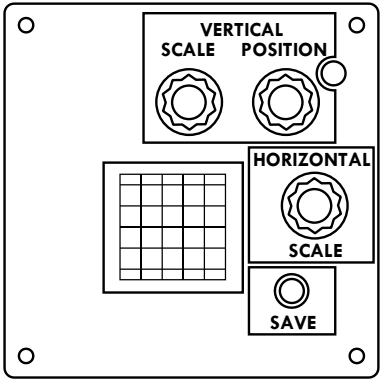


Originally, a maze was a winding, non-branching path whose layout, with regular changes in direction, inevitably led to the goal at the center. Here, however, the goal is neither in the center, nor is it easy to reach.

- Identify the correct maze using the yellow glowing stars in the maze.
- Navigate the blue dot to the white goal using the four buttons on the side.
- The top button moves the blue dot down, the right button left, the bottom button up, and the left button right.
- The blue dot must not cross any walls, which are only visible in the manual.



Module 13: Oscilloscope



An oscilloscope (from Latin oscillare "to swing" and Ancient Greek σκοπεῖν skopein "to observe") is an electronic measuring device that displays the time-dependent course of an electrical voltage on a screen.

- Follow the instructions to determine how the oscilloscope must be configured.
- Once all settings are correct, save the image.
- The "Oscilloscope Quick Guide" explains how to operate an oscilloscope.
- The "Basics of Periodic Signals" section on the next page explains how to identify and measure periodic functions.

Oscilloscope Quick Guide

- The screen of an oscilloscope is divided into horizontal and vertical lines called divisions ("div" for short).
- At the bottom edge of the screen, it shows how many volts (V) or milliseconds (ms) each division currently represents.
- "Horizontal Scale" sets the time scale, i.e. milliseconds per division.
- "Vertical Scale" sets the voltage scale, i.e. volts per division.
- The left edge of the screen shows the current height of the zero level.
- "Vertical Position" adjusts the zero level — this moves the entire waveform up or down.
- "Save" stores the current screen image in the oscilloscope's internal memory.

Instructions

If the base shape is a sine wave:

- Voltage scale: If the peak-to-peak voltage (U_{PP}) is less than 8 volts, choose any voltage scale; otherwise, set 5 V/div.
- Zero level: If the DC offset (U_) is negative, move the oscilloscope's zero level to the upper half; otherwise, to the lower half.
- Time scale: If the sine wave contains harmonics, set the oscilloscope to display exactly one period of the function; otherwise, the time scale can be set freely.

If the base shape is a triangle wave:

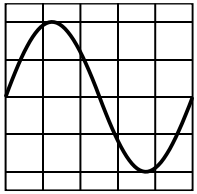
- Zero level: If the DC offset (U_) is positive, move the zero level to the bottom edge of the screen; otherwise, move it to the upper half.
- Time scale: If the period is longer than 7 milliseconds, configure the oscilloscope to show less than one period; otherwise, set 4 ms/div.
- Voltage scale: Any voltage scale may be used.

If the base shape is a square wave:

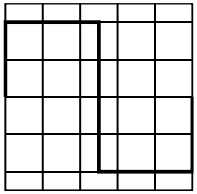
- Voltage scale: If the peak-to-peak voltage (U_{PP}) is greater than 5 V, set 10 V/div; otherwise, set 2 V/div.
- Time scale: If the period T is less than 8 milliseconds, configure the oscilloscope to display a total of 10 milliseconds; otherwise, set 5 ms/div.
- Zero level: Any zero level may be used.

Basics of Periodic Signals

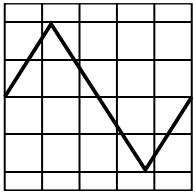
Basic Waveforms



Sine wave

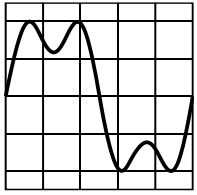


Square wave

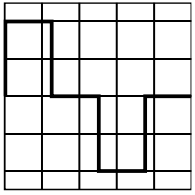


Triangle wave

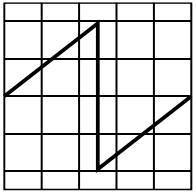
Variants



Sine wave: Harmonic

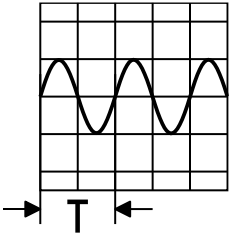


Square wave: Pulse



Triangle wave: Sawtooth

Key Characteristics



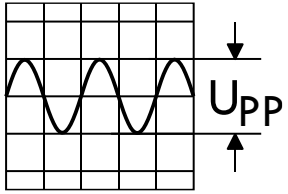
The period T indicates how long it takes for a signal to repeat itself.

In this example, the period is two divisions.

That results in:

- at 1 ms/div:
T = 2 div × 1 ms/div = 2 ms

- at 3 ms/div:
T = 2 div × 3 ms/div = 6 ms



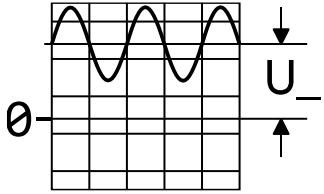
The peak-to-peak value U_{PP} indicates the voltage from the lowest to the highest point.

In this example, the peak-to-peak value is two divisions.

That results in:

- at 1 V/div:
U_{PP} = 2 div × 1 V/div = 2 V

- at 4 V/div:
U_{PP} = 2 div × 4 V/div = 8 V

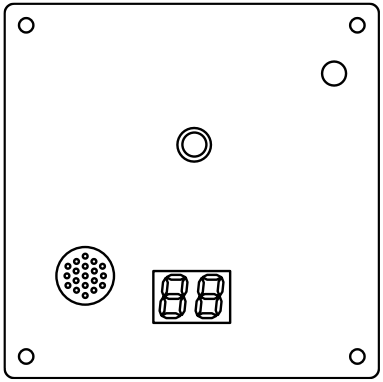


The DC offset U_ indicates how far the average value of the signal deviates from the oscilloscope's zero level.

In this example, the DC offset is positive, because the center of the waveform lies above the zero line.

PART 2
Urgent Modules

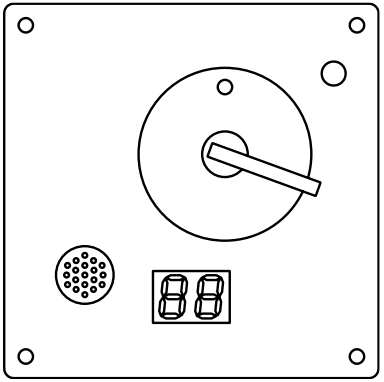
Module 50: Nervous Button



Buttons are made to be pressed.

- When the module activates, press the button before the small timer runs out.
- If the last digit of the serial number is even, the button may only be pressed during odd seconds on the small timer.
- If the last digit of the serial number is odd, the button may only be pressed during even seconds on the small timer.

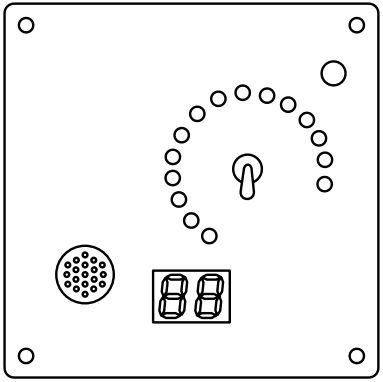
Module 51: Rotating Thingy



Look, it's spinning!

- When the module activates, the rotating thing in the middle must not touch the movable contact.
- The movable contact (outer ring) can be rotated freely.

Module 52: Tone Generator



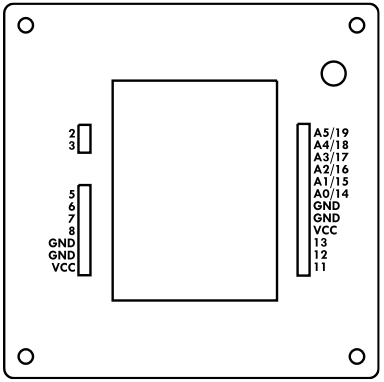
A constant beeping sound — isn't it just annoying?

- The tone frequency must be kept stable.
- When the module activates, the moving LED must not reach the red zone.
- The toggle switch changes the direction of movement.
- If the toggle switch is set to the middle (neutral) position when only the blue LED is lit, the module deactivates.

Module 99: Prototype

Sometimes you have to try things out to know if they work—or blow up. Caution: the circuit may not be fully finished.

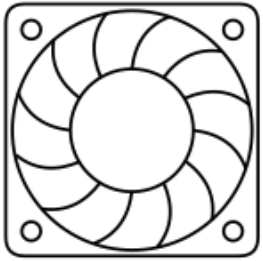
- This module is a prototype.
- The instructions may vary. In case of doubt, consult the external expert.
- The external expert can occasionally be reached on Wednesdays from 18:30 to 22:00 on frequency 145.275 MHz in area C28.



APPENDICES

Appendix A – Identification Marks

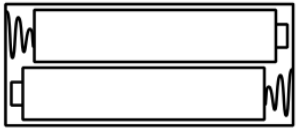
Fan



The fan may be present with or without a protective grille.

Batteries

Batteries in a double holder count as inserted only if both batteries are present.



Batteries in single holders are counted individually.

Buttons and Switches

Push Button Rotary Knob Toggle Switch Slide Switch

Displays

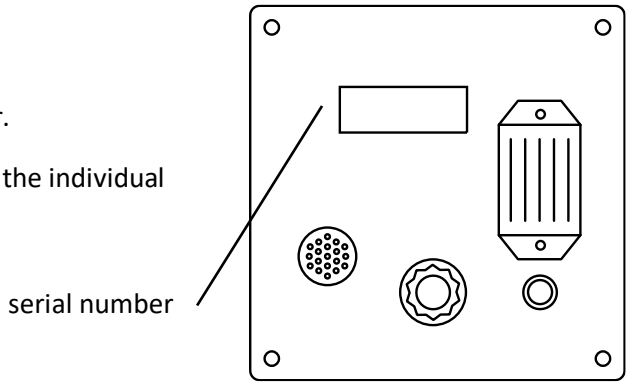
Displays show information using pixels in a rectangular area.

OLED: Monochrome LCD: Color

Serial Number

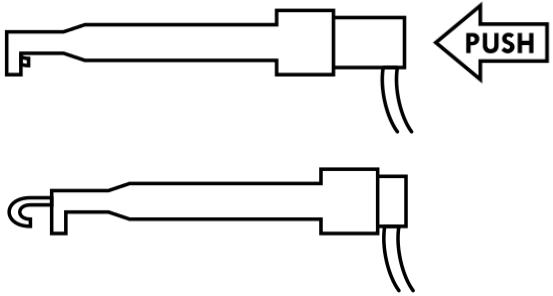
The serial number is located on the display below the timer.

The cross sum of the serial number is calculated by adding the individual digits together. Letters and other characters are ignored.



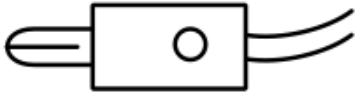
Appendix B – Plugs and Connectors

Probe Tip



Alligator Clip

Miniature Plug



Wire

Appendix C – Assembly Instructions

Materials that are not permanently installed but required for a module are highlighted in **bold**.

Module 01 Wires

Insert **3 to 6 random red, yellow, white, blue, or black wires** side by side into the pin headers. The wires must not cross each other.

- The red wire has a value of 100Ω.
- The yellow wire has a value of 330Ω.
- The white wire has a value of 680Ω.
- The black wire has a value of 2.2kΩ.
- The blue wire has a value of 33kΩ.

For the version with wires to be cut, include a **wire cutter**.

Module 02 Binary Numbers

-/- (no special disarming step)

Module 03 Morse

-/-

Module 04 LED Circle

-/-

Module 05 Twisted Wires

Insert **three to six random red, white, blue, red-white, blue-white, or red-blue wires** horizontally into the connectors.

- The red and red-white wires have a value of 100Ω.
- The white wire has a value of 680Ω.
- The red-blue wire has a value of 2.2kΩ.
- The blue and blue-white wires have a value of 33kΩ.

The wires must be inserted at the same height on both sides.

For the version with wires to be cut, include a **wire cutter**.

Module 06 Logic Gate

Set both switches to the middle position.

Module 07 Resistors

Prepare 22 resistors with the following **values:**

- 100Ω, 180Ω, 330Ω, 470Ω, 680Ω
- 1kΩ, 1.5kΩ, 2.2kΩ, 3.3kΩ, 4.7kΩ, 6.8kΩ
- 10kΩ, 15kΩ, 22kΩ, 33kΩ, 47kΩ, 68kΩ
- 100kΩ, 150kΩ, 220kΩ, 330kΩ, 560kΩ

No resistor should be inserted into the test points.

Include a **flashlight** if working in a dark environment.

Module 08 Volt Meter
Disconnect the connection.

Module 09 Shift Register
-/-

Module 10 Schematic
Remove all plugs.

Module 11 ASCII
-/-

Module 12 Maze
-/-

Module 13 Oscilloscope
-/-

Module 50 Nervous Button
-/-

Module 51 Rotating Thingy
Turn the screw away from the movable arm.

Module 52 Tone Generator
-/-

Appendix D – Game Master Operation

- Reset: The button at the bottom right of the timer restarts the game.
- Menu:
    - Press and hold the rotary knob on the timer within 5 seconds of opening the case for at least one second to enter the menu.
    - Settings:
        - Change Time (**Zeit ändern**): Set the desired starting time for the timer.
        - Setup Number (**Setup Nr.:**) (only effective after restart):
            - Random (**Zufall**): Modules are initialized with a random value. Modules that assign themselves other initial values behave differently each time.
            - Number between 1 and 255: Modules are always initialized with this value and behave identically for the same build.
        - Difficulty (**Schwierigkeit**) (only effective after restart): Defines the difficulty level for the modules. The corresponding manual must be used. (Easy = **Einfach**)
        - Fuses (**Sicherungen**): Number of allowed mistakes before the bomb explodes.
        - When Closed (**Wenn zu**): Defines what happens when the case is closed:
            - Pause: Timer pauses and resumes at the same position when reopened.
            - Reset: Timer resets to the initial time.
            - Continue (**Weiter**): Timer continues running uninterrupted.

- Start: When the bomb should begin countdown:
  - Immediately (**Sofort**): Countdown starts as soon as possible—no further action needed.
  - On Opening (**öffnen**): Bomb must be closed once and then starts when opened.
- Software/Hardware version: The current version is shown here
- Restart Now (Jetzt Neustart?): Option to restart the bomb immediately. (No = **Nein**, Yes = **Ja**)

- Modules blinking green after startup were not recognized or are incorrectly assembled. Check the module, then press the reset button.
- Modules blinking red-green during startup are still in DEBUG mode and must be reprogrammed.
- If the bomb detonates due to excessive errors, the module that triggered the final mistake will display a solid red status LED, while all other modules flash in multiple colors.

Appendix E – Campaign

Required Modules: 01 Wires, 02 Binary Numbers, 03 Morse, 04 LED Circle

Easy

No.	Title	Modules	Time	Fuses	Difficulty
1.1	Every Beginning...	Wires, LED Circle	05:00	5	Easy
1.2	Secret Message	Wires, Morse	05:00	5	Easy
1.3	One, two, 11	Wires, Binary Numbers, LED-Circle	06:00	5	Easy
1.4	A Bit of Everything	Wires, Binary Numbers, Morse, LED Circle	06:00	5	Easy
1.5	How hurry up	Wires, Binary Numbers, Morse, LED Circle	04:00	3	Easy

Hardcore

No.	Title	Modules	Time	Fuses	Difficulty
2.1	You Have to Remember That	Wires, Binary Numbers, LED Circle	06:00	5	Hardcore
2.2	Incoming Message	Wires, Morse, LED Circle	06:00	5	Hardcore
2.3	All Knowledge Combined	Wires, Binary Numbers, Morse, LED Circle	06:00	3	Hardcore
2.4	Now Hurry Up	Wires, Binary Numbers, Morse, LED Circle	04:00	2	Hardcore
2.5	Zero Tolerance	Wires, Binary Numbers, Morse, LED Circle	02:30	0	Hardcore

Required Modules: 01 Wires, 02 Binary Numbers, 03 Morse, 04 LED Circle, 05 Twisted Wires, 06 Logic Gates, 07 Resistor, 08 Measuring Device, 09 Shift Register, 50 Nervous Button

Easy

No.	Title	Modules	Time	Fuses	Difficulty
1.1	Every Beginning...	Wires, LED Circle	05:00	5	Easy
1.2	Secret Message	Wires, Morse	05:00	5	Easy
1.3	One, two, 11	Binary Numbers, LED Circle, Measuring Device	06:00	5	Easy
1.4	Logical Matter	Morse, Twisted Wires, Logic Gates, Measuring Device	06:00	5	Easy
1.5	I Want Attention Now!	Binary Numbers, Twisted Wires, Measuring Device, Nervous Button	05:00	2	Easy
1.6	The Rest of the Party	Wires, Logic Gates, Resistor, Shift Register	05:00	2	Easy
1.7	Now Hurry Up	Binary Numbers, Twisted Wires, Logic Gates, Shift Register	03:00	3	Easy

Hardcore

No.	Title	Modules	Time	Fuses	Difficulty
2.1	Memory Test	Wires, Binary Numbers, Logic Gates	06:00	5	Hardcore
2.2	Long Message	Measuring Device, Morse, LED Circle	06:00	5	Hardcore
2.3	Side Job	Binary Numbers, Logic Gates, Shift Register, Nervous Button	06:00	3	Hardcore

2.4	So Many Wires	Wires, Twisted Wires, Resistor, Measuring Device	06:00	2	Hardcore
2.5	Step On It	Morse, LED Circle, Resistor, Nervous Button	04:00	2	Hardcore
2.6	This Is Too Slow!	Measuring Device, Twisted Wires, Logic Gates, Shift Register	02:30	0	Hardcore

Massive Setup

No.	Title	Modules	Time	Fuses	Difficulty
3.1	A Little Bit More	Binary Numbers, LED Circle, Logic Gates, Measuring Device, Shift Register	07:00	5	Easy
3.2	Workload	Wires, Binary Numbers, Morse, Twisted Wires, Logic Gates, Resistor, Nervous Button	07:30	5	Easy
3.3	A Bit of Everything	Wires, Binary Numbers, Morse, LED Circle, Twisted Wires, Logic Gates, Resistor, Measuring Device, Shift Register, Nervous Button	08:00	3	Easy
3.4	The Full Package	Wires, Binary Numbers, Morse, LED Circle, Twisted Wires, Logic Gates, Resistor, Measuring Device, Shift Register, Nervous Button	08:00	3	Hardcore
3.5	Zero Error Tolerance	Wires, Binary Numbers, Morse, LED Circle, Twisted Wires, Logic Gates, Resistor, Measuring Device, Shift Register, Nervous Button	05:00	0	Hardcore

Required Modules: 01 Wires (2x), 02 Binary Numbers (2x), 03 Morse, 04 LED Circle (2x), 05 Twisted Wires, 06 Logic Gates, 07 Resistor, 08 Measuring Device (2x), 09 Shift Register (2x), 50 Nervous Button, 52 Tone Generator

Clearance Assistant

No.	Title	Modules	Time	Fuses	Difficulty
1.1	Every Beginning…	01, 02, 04	6:00	5	Easy
1.2	Something Old, Something New	01, 02, 07	6:00	5	Easy
1.3	Double Trouble	01, 01, 02, 02, 04, 04	6:00	5	Easy
1.4	Next Level	01, 04, 07, 08	6:00	3	Easy
1.5	Hurry Up!	01, 02, 04	3:00	3	Easy

Ordnance Technician

No.	Title	Modules	Time	Fuses	Difficulty
2.1	Secret Message	02, 04, 03	05:00	5	Easy
2.2	Something's Off	02, 07, 05	05:00	5	Easy
2.3	No More Easy Mode	03, 05, 07, 08	05:00	3	Easy
2.4	This Should Be Familiar	01, 01, 03, 07, 08	05:00	3	Easy
2.5	Rush It!	01, 02, 04, 05, 07	03:00	3	Easy

Explosive Ordnance Disposal

No.	Title	Modules	Time	Fuses	Difficulty
3.1	That's Just Mean	03, 05, 07, 08, 09	05:00	3	Easy
3.2	Zero Tolerance	01, 03, 05, 07, 09	04:00	0	Easy
3.3	A Logical Matter	02, 05, 06, 08	04:00	3	Easy
3.4	Workload Overload	01, 02, 02, 03, 05, 08, 08	05:00	3	Easy
3.5	Chop-Chop!	01, 04, 05, 07	02:30	3	Easy
3.6	A Bit of Everything	01, 02, 03, 04, 05, 06, 07, 08, 09	08:00	5	Easy

Blasting Expert

No.	Title	Modules	Time	Fuses	Difficulty
4.1	What the Hell…?	02, 04, 07, 08	03:00	3	Hardcore
4.2	Take Your Time	01, 03, 05, 06, 08	06:00	3	Hardcore
4.3	The Right Direction	02, 03, 04, 09, 09	04:00	2	Hardcore
4.4	That's Too Slow!	01, 02, 03, 05, 07, 09	03:00	2	Hardcore

Detonator

No.	Title	Modules	Time	Fuses	Difficulty
5.1	I Demand Attention	02, 02, 04, 07, 08, 09, 50	06:00	2	Hardcore
5.2	All Around	03, 05, 04, 09, 52	04:00	2	Hardcore
5.3	Multitasking	01, 05, 06, 09, 50, 52	04:00	0	Hardcore
5.4	The Full Package	01, 02, 03, 06, 07, 08, 09, 50, 52	08:00	2	Hardcore
5.5	It Doesn’t Get Any Worse	01, 02, 03, 04, 05, 06, 07, 08, 09	04:00	0	Hardcore