

# Minitimer MT-3

Impulsverzögerung

Pulse delay

Retardeur de commutation

Impulsvertraging



Anleitung

Manual

Mode d'emploi

Handleiding

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(Pages I to III in the centre of this handbook are removeable.)

## How to use this manual

If you have no specialist technical training, this manual gives step-by-step instructions for safe and correct assembly of the kit or fitting of the ready-built module, and operation. Before you start, we advise you to read the whole manual, particularly the chapter on safety instructions and the FAQ chapter. You will then know where to take care and how to prevent mistakes which take a lot of effort to correct.

Keep this manual safely so that you can solve problems in the future. If you pass the kit on to another person, please pass on the manual with it.

## Intended use

The kit or the ready-built module can be assembled or fitted using this manual. The ready-built module is designed for use in model railways. It delays electrical switching impulses of a given length for an optional period of time of up to 60 seconds. The module can be used e.g. for the delayed initiation of solenoid accessories (e.g. semaphore signals, points, bistable relays).

The kit and the ready-built module are not suitable for children under the age of 14.

Reading, understanding and following the instructions in this manual are mandatory for the user.

Any other use of the kit is inappropriate and invalidates any guarantees.

## Safety instructions

### Mechanical hazards

Cut wires can have sharp ends and can cause serious injuries. Watch out for sharp edges when you pick up the PCB.

Visibly damaged parts can cause unpredictable danger. Do not use damaged parts: recycle and replace them with new ones.

## Electrical hazards

- Touching powered, live components,
- touching conducting components which are live due to malfunction,
- short circuits,
- connecting the circuit to a higher voltage than designed,
- impermissibly high humidity,
- condensation of water

can cause serious injury due to electrical shock. Take the following precautions to prevent this danger:

- Never perform wiring on a powered module.
- Only use low power for this module as described in this manual and only use certified transformers.
- Connect transformers and soldering stations only in approved mains sockets installed by an authorised electrician.
- Observe cable diameter requirements.
- After the condensation of water do not start working until after a minimum of 2 hours of acclimatisation.
- Mounting the module should only be done in closed, clean, dry rooms. Beware of humidity.
- Use only original spare parts if you have to repair the module.

## Fire risk

Touching flammable material with a hot soldering iron can cause life-threatening fire, burns and toxic smoke. Connect your soldering iron or soldering station only when actually needed. Use the correct soldering iron or station and never leave a hot soldering iron or station unattended.

## Thermal danger

A hot soldering iron or liquid solder accidentally touching your skin can cause skin burns. As a precaution:

- use a heat-resistant mat during soldering,
- always put the hot soldering iron in the soldering iron stand,

- point the soldering iron tip carefully when soldering, and
- remove liquid solder with a thick wet rag or wet sponge.

### **Dangerous environments**

A working area that is too small or cramped is unsuitable and can cause accidents, fires and injury. Prevent this by working in a clean, dry room with enough freedom of movement.

### **Other dangers**

Children can cause any of the accidents mentioned above because they are inattentive and not responsible enough. Children under the age of 14 should not be allowed to work with this kit or the ready-built module.

Little children can swallow small components with sharp edges. Life threatening! Do not allow components to reach small children.

In schools, training centres, clubs and workshops, assembly must be supervised by qualified personnel.

In industrial institutions, health and safety regulations applying to electronic work must be adhered to.

## **EMC declaration**

This product is developed in accordance with the European standards EN 55014 and EN 50082-1, tested corresponding to the EC - directive 89/336/EEG (EMVG of 09/11/1992, electromagnetic tolerance) and meets legal requirements.

To guarantee the electromagnetic tolerance you must take the following precautions:

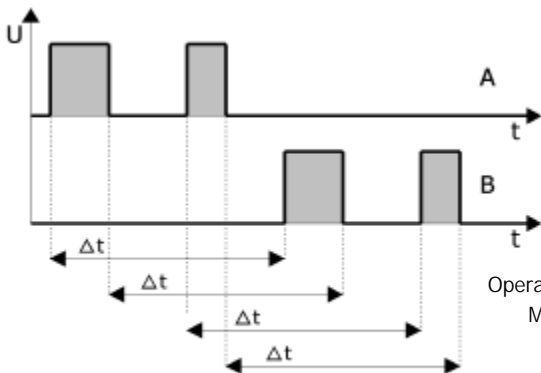
- Connect the transformer only to an approved mains socket installed by an authorised electrician.
- Make no changes to the original parts and accurately follow the instructions, circuit diagram and PCB layout included with this manual.
- Use only original spare parts if you have to repair the kit or the ready-built module.

## Operation overview

The circuit is controlled by an IC that saves the set of the voltage changes at the input of the module and "transfers" them delayed to the output. The delaying period can be set between 0 and ca. 60 seconds.

The period between two voltage changes at the input of the module can be given. The IC can save up to seven voltage changes during the set delaying period. When more than seven voltage changes occur during the set delaying period the voltage changes saved first are overwritten.

The circuit is suitable e.g. for the delayed initiation of solenoid accessories (e.g. semaphore signals, points, bistable relays).



■ Fig. 1:

Operation overview  
Minitimer MT-3

A = Voltage at the input

B = Voltage at the output

U = Voltage

t = Time

$\Delta t$  = Delaying period

## Technical specifications

Supply voltage	16 - 20 Volt a.c. or d.c. voltage
Current consumption (without connected devices)	ca. 5 mA
Max. current loading	1 A
Protected to	IP 00
Ambient temperature in use	0 - + 60° C
Ambient temperature in storage	-10 - + 80° C
Comparative humidity allowed	max. 85 %
Dimensions	ca. 48 x 52 mm
Weight	ca. 17 g

## Checking the package contents

Check the contents of the package for completeness:

- 1 kit, containing the components listed in the parts list, or
- 1 ready-built module.
- 1 manual.

## Choosing a power supply

The module is designed for connection to a model railway power source, i.e. 16-20 Volt direct (d.c.) or alternating (a.c.) voltage.

## Required tools and consumables

Make sure you have the following tools, equipment and materials ready for use:

- a heat-resistant mat
- a soldering iron stand with tip-cleaning sponge
- a small side cutter and wire stripper
- a pair of tweezers and long nose pliers (not necessary for the ready-built module)

- an electronic soldering iron (max. 30 Watt) with a fine tip
- tin solder (0,5 mm. diameter)
- wire (diameter:  $\geq 0,22 \text{ mm}^2$  for all connections)
- a lamp for testing the module

## Safe and correct soldering



### Caution:

Incorrect soldering can cause fires (through excessive heat). Avoid this danger by reading the chapter **Safety instructions** again and following the directions given.

If you have had training in soldering you can skip this chapter.

- Use a small soldering iron with max. 30 Watt. Keep the soldering tip clean so the heat of the soldering iron is applied to the solder point effectively.
- When soldering electronic circuits never use soldering-water or soldering grease. They contain acids that can corrode components and copper tracks.
- Only use tin solder SN 60 Pb (i.e. 60 % tin, 40 % lead) with rosin-based flux.
- Solder fast: long soldering can destroy components and copper tracks, and damages through plated holes.
- Observe correct polarity orientation of semi-conductors, LEDs electrolytic capacitors and integrated circuits before soldering and ensure that the solder time does not exceed 5 seconds, otherwise components can be damaged.
- Apply the soldering tip to the soldering spot in such a way that the part and the soldering spot are heated at the same time. Simultaneously add solder (not too much). As soon as the solder becomes liquid take it away. Hold the soldering tip at the spot for a few seconds so that the tin solder finds its way, then remove the soldering iron.

- Do not move the component for about 5 seconds after soldering. A glossy and perfect soldering spot should remain.
- To make a good soldering joint you must use a clean and unoxidised soldering tip. Clean the soldering tip with a damp piece of cloth, a damp sponge or a piece of silicon cloth.
- Cut the wires after soldering directly above the PCB solder side with a side cutter.
- After placing the parts, please double check for correct polarity. Check the PCB tracks for solder bridges, short circuits created by accident. This would cause faulty operation or, in the worst case, damage. You can remove excess solder by putting a clean soldering tip on the spot. The solder will become liquid again and flow from the soldering spot to the soldering tip.

## Assembling the kit

You can skip this part if you have a ready-built module.

### Preparation

Put the sorted components in front of you on your workbench. An explanation of the separate electronic components follows:

#### Resistors



A resistor will "brake" the current. Mounting orientation is of no importance. Because resistors are very small there is no readable information on them, but their value is given with colour rings.

Key:

Value	Colour ring
1 k $\Omega$	brown - black - red (gold)
4,7 k $\Omega$	yellow - violet - red (gold)
330 k $\Omega$	orange - orange - yellow (gold)

The colour ring in brackets indicates the tolerance of the resistor and is of no importance here.

## Adjustable resistors (Trim pots)



Adjustable resistors are a special kind of resistor, built symmetric. Their orientation is easy to recognise because of their off-centre connection. Their value is easily adjusted with a screwdriver to meet particular requirements.

## Capacitors



There is a difference between “normal” capacitors and electrolytic capacitors which have to be placed in a certain direction. They have a very bright line at one end marked with the minus (-) sign. That end must always be connected to minus.

## Diodes



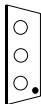
Diodes allow current to flow in one direction only and have to be placed in that direction. The characteristic for a diode is the ring at one end. Place them as drawn in the PCB layout.

## LEDs



LEDs are a special diode. When they are used in the current direction they light up. They are available in diverse forms (colour, shape, max. current, size, luminosity, etc. etc.). The long wire of an LED is the anode (plus) side.

## Transistors



Transistors are in fact power switches. They also have to be placed in a certain direction. The PCB layout will help you to place the transistor. The point in the PCB layout indicates the lettered side of the transistor.

## ICs



The notch on the IC shows the mounting orientation. The PCB layout shows this marking. Micro-Controllers are ICs which contain an individual program to control the circuit.

## Terminal strips

Terminal strips are solder-in screw-type terminals. They provide a solder-free and safe connection of the cables to the circuit.

## Assembling the kit

Start the assembly with the resistors and the diodes. First solder the components on the solder side of the PCB and then cut the excess wires with the side cutter as short as possible. Next solder the IC-socket and the capacitors. Continue with the trimm-pot and the transistor. Finally solder the terminal strips and the LED.



### Caution:

Electrolytic capacitors, transistors, diodes and ICs must be placed in the right direction! If you solder them the wrong way the affected parts can be damaged when you connect the power. In the worst case the whole circuit can be damaged. In any case, a wrongly connected part will not function.

## Performing a visual check

Even if you have a ready-built module you must perform a visual check that screws, plugs and other fasteners are firm and tight to exclude transport damage.



### Caution:

Do not power up the module yet.

Damaged material and/or incorrect handling of parts can always be a danger. After assembling the kit, perform a visual inspection.

Check all nuts, pins and connections as well as the mechanical connections for correct assembly.

Remove all loose parts, wire ends or drops of solder from the PCB. Remove all sharp wire ends.

Check solder spots that are too close to each other for short circuits. Check that all components are polarised correctly. When you have taken all these precautions, go on to the next part.

## Functional test and connecting the mini-timer

If you have purchased a ready-built module, check all functions. Transport damage can never be excluded.

Check the functions of the module with a test lamp. Connect it between X1-1 and X1-2. Follow the connections diagram (fig. 2).

### Test with the smallest delaying period

First turn the trimm pot R7 to the right. This selects the smallest delaying period.

Then connect the module to the power supply (X2-1 und X2-2) and turn the power supply on. The LED must go on without visible delay and so indicates the module is ready for operation.

Next connect the input with earth according to the connections diagram (fig. 2). The test lamp must go on without visible delay. As soon as you disconnect the input from earth, the lamp must go off without visible delay.

### Test with a short delaying period

Disconnect the module from power. Turn the trimm pot R7 slightly to the left for a short delaying period. Repeat the test.

After connecting the module to the power supply the LED must go on with the set delay and so indicates the module is ready for operation. Connect the input according to the connections diagram (fig. 2) with earth again. The test lamp must go on with the set delay. As soon as you disconnect the input from earth , the lamp must go off with the set delay.



#### Caution:

If a component gets too hot, disconnect the mini-timer and power supply from the mains **immediately**. Possible short circuit! Check the assembly!

After performing a successful functional test, disconnect power from the mini-timer. Disconnect the test-lamp from the module and install the module (see figure 2). Proceed as described in the functional test.

### Adjustment of the delaying period

The length of the delaying period is adjusted with the trimm pot R7. By turning the trimm pot to the left the delay is increased. Depending on how the module is housed it might be convenient to adjust the time delay during the functional test using the test lamp.



#### Caution:

After switching on the power supply the module is not ready for operation until the end of the delaying period. The LED D6 shows the module is ready for operation.

**Tip:** If you change the delaying period during operation without disconnecting the module from the power supply the IC first works off the saved voltage changes before the new delaying period is performed.

**Tip:** If you intend to control a solenoid by the mini-timer you can connect it directly to the output.

## FAQ

- Parts are getting too hot and/or start to smoke.



#### **Disconnect the system from the mains immediately!**

Possible cause: one or more components are soldered incorrectly.

→ Perform a visual check.

- The lamp connected for the functional test of the module does not light.

Possible cause: one or more components are soldered incorrectly.

→ Perform a visual check.

Possible cause: The lamp is defective.

→ Check the lamp by connecting it directly to the voltage supply.

If you cannot find the problem, please return the module for repair (address on the cover page).

## Manufacturer's note

According to DIN VDE 0869, the person who builds this kit or brings the circuit into operation is the manufacturer of the product. If he sells the product to another person he is responsible for passing on all the relevant papers. Domestic appliances assembled from a kit are deemed industrial products and must comply with health and safety regulations.

## Certification

This product conforms with the EC- directive 89/336/EWG on electromagnetic radiation and is therefore CE certified.

## Conditional warranty

This product is guaranteed for two years. The warranty includes free repair if the problem is due to material failure or incorrect assembly of the ready-built module by us. Because we have no control over the assembly of the kit, we can only guarantee the quality of the components and the completeness of the kit.

Other claims are excluded. By law, we are not responsible for damages or secondary damages in connection with this product. We retain the right to repair, make improvements, supply spare parts or return the purchase price.

The following invalidate the warranty:

- using an unsuitable soldering iron, solder containing liquid acids or similar,
- if the kit is assembled and soldered poorly, or if damage is caused by not following the instructions in this manual or the circuit diagram,
- if the circuit has been altered and repair attempts have failed,
- if arbitrary changes in the circuit are made,
- if parts are stored incorrectly and if the wires to the switches, the power resistors, etc. are made incorrectly,

- if parts other than the original ones delivered with this kit are used,
- if the copper tracks or soldering points are damaged,
- if parts are placed incorrectly or the circuit is connected incorrectly,
- if damage occurs due to an overload of the circuit,
- if the wrong power or current is connected,
- if damaged by other persons,
- if damaged by the wrong use or abuse of the circuit,
- if parts are damaged due to static because they were touched before a discharge is performed.

## Stückliste - Partslist

### Nomenclature - Stuklijst

Kondensatoren - Capacitors Condensateurs - Condensatoren	C1, C2, C3	220 $\mu$ F/25 V
	C4	100 nF
Dioden - Diodes - Diodes - Diodes	D1, D3, D4	1N4148 *
	D5	1N4004 *
LEDs - LEDs - DEL - LEDs	D6	grün - green vert - groen
Zener-Dioden - Zener diodes Diodes Zener - Zenerdiodes	D2	ZD 5V1
Transistoren - Transistors	T1	BD679
Widerstände - Resistors Résistances - Weerstanden	R1, R2, R4, R6, R8	1 k $\Omega$
	R3	4,7 k $\Omega$
	R5	330 k $\Omega$
Trimpotis - Trim pots Potentiomètres - Trimpotmeter	R7	470 k $\Omega$
Micro-Controller - Micro-Controller Micro-contrôleur - Micro-controller	IC1	PIC 12C508A
IC-Sockel - IC-socket Soquet IC - IC-voetje	8-pol.	1 x
Anreihklemmen - Terminal strips Borniers - Printkroonstenen	X1	2-pol.
	X2	3-pol.

\* oder ähnlich - or similar - ou équivalent - of gelijkwaardig

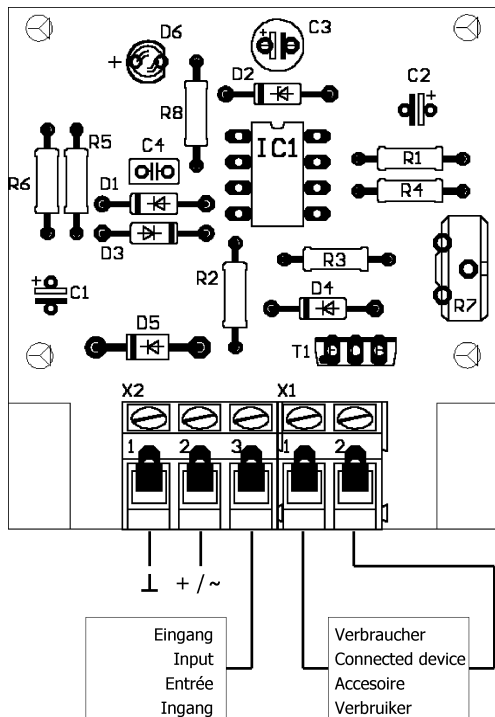
■ ■ ■ Fig. 2:

Bestückungsplan / Anschlußplan

PCB layout / Connections

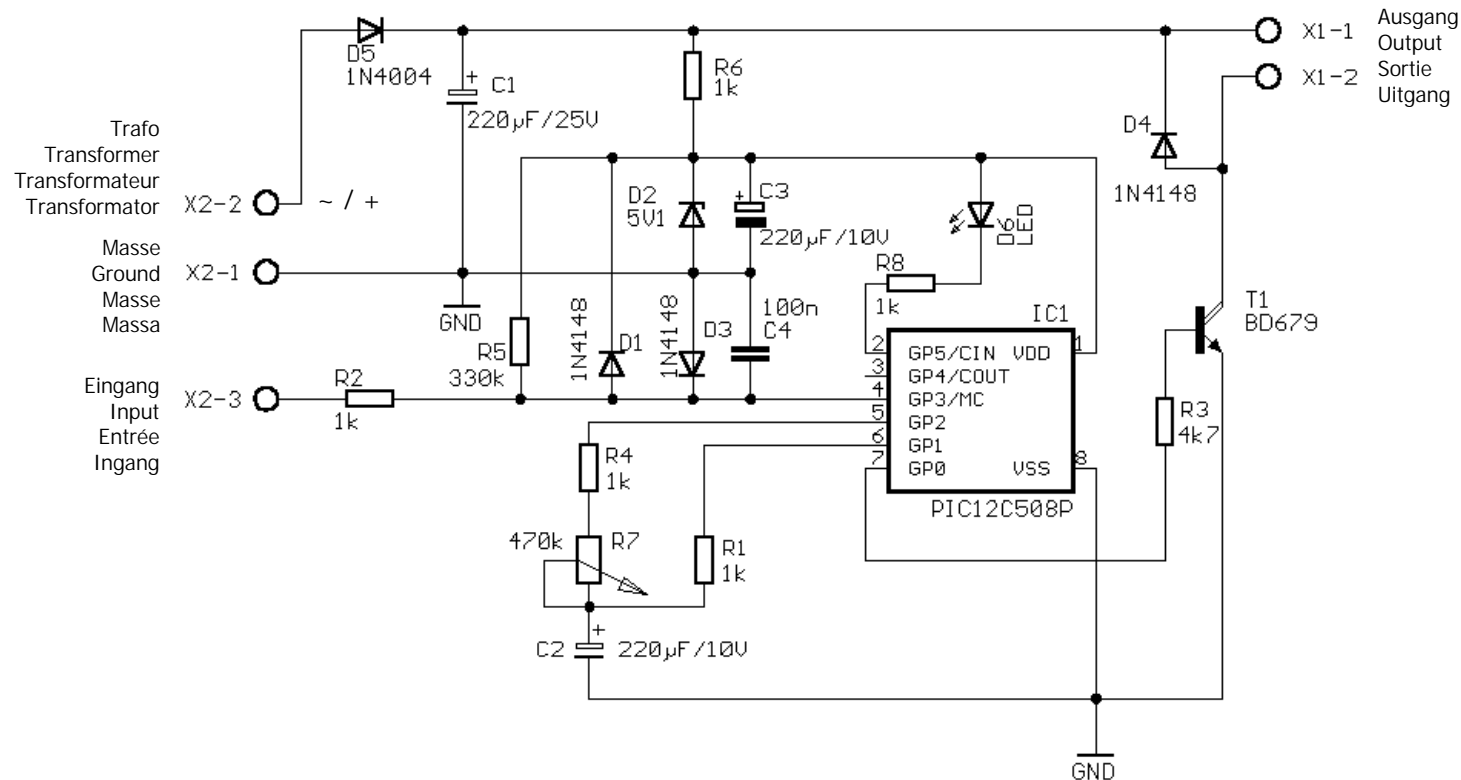
Plan d'implantation / Plan de raccordement

Printplan / Aansluit plan



■ ■ ■ Fig. 3:

## Schaltplan - Circuit diagram - Schéma de principe - Schakelschema



Aktuelle Informationen und Tipps:

Information and tips:

Informations et conseils:

Actuele informatie en tips:

**<http://www.tams-online.de>**

Garantie und Service:

Warranty and service:

Garantie et service:

Garantie en service:

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