CAR SYSTEM DIGITAL

FALLER

161365

# Mini analogue-digital conversion kit

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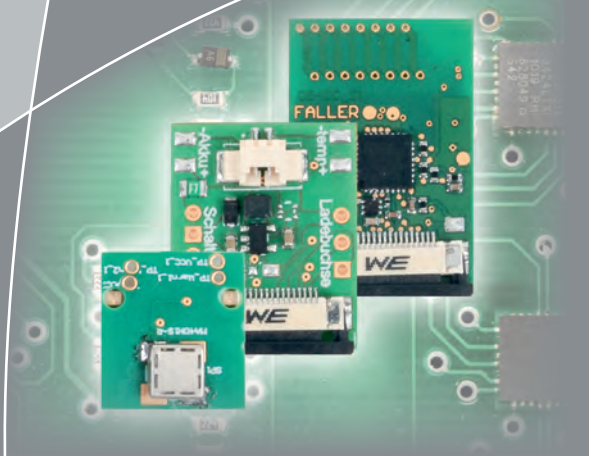


Instruction manual

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# Inhalt

# 1. Welcome to the world of FALLER

**Congratulations—you've found what you're looking for!**

With the "Mini Analog-to-Digital Conversion Kit," you can enable your conventional Car System model vehicle for tracking and control in Car System Digital mode. The programmable conversion board also includes solder pads for optionally equipping the vehicle with light and sound functions.

Please note that immediately after installing the circuit board, you will need the Car System Digital software and hardware to set up and operate your new digital vehicle.

Basic knowledge of electronics and soldering is essential for vehicle conversions. If the conversion board is damaged due to improper soldering or installation errors, the warranty will be void.

**NOTE: When setting up your soldering iron, be sure to follow the safety instructions and the user manual**

Gebr. FALLER GmbH wishes you lots of creative ideas and much enjoyment with your product!!

# 2. Product Overview

## What's Included

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- Cable set
- Digital circuit board
- Temperature sensor
- Solder board
- Ultrasonic board for vehicle tracking in the Car System Digital operation
- User Manual

**TIPP**

A direct line to FALLER Customer Service:

Telefon + 49 (0) 77 23 / 651-106
E-Mail kundendienst@faller.de

**Umrüstplatinen for Car System Digital operation**

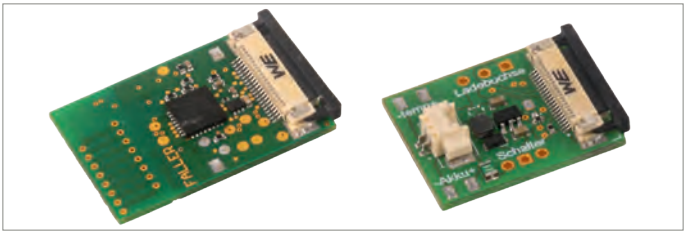


Abb. 1: Digital and solder board for the Car System Digital operation of a conventional Car System model vehicle

**Ultraschallplatine**

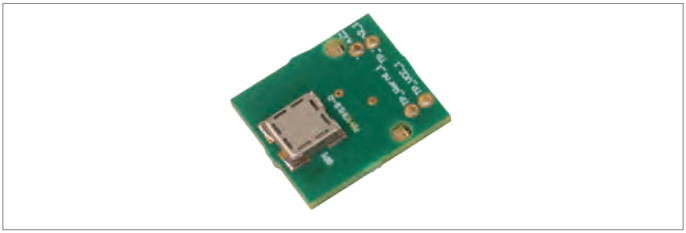

Abb. 2: The Ultrasonic circuit board transmits signals above the audible frequency range that are used by the system to determine the vehicle's position.

**Cable set**

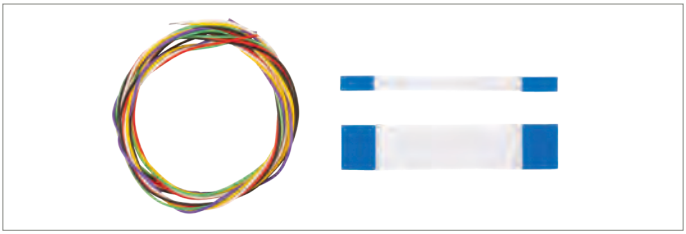

Abb. 3: Use the Flat ribbon cable from the included kit to connenct Soldering, digital, and ultrasonic circuit boards to each other.

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**Temperature sensor**

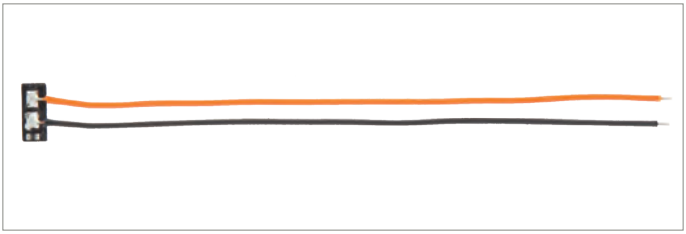

Abb. 4: The temperature sensor is used to monitor the battery charging process. A rise in temperature is interpreted as a shutdown criterion and triggers the end of the charging process.

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**TIPP**

All FALLER instruction manuals are also available as PDF downloads. Please use the product search on www.faller.de.

## Allocation of the Circuit boards

All the necessary connections for the Car System Digital operation of your vehicle to be retrofitted are located on these circuit boards.

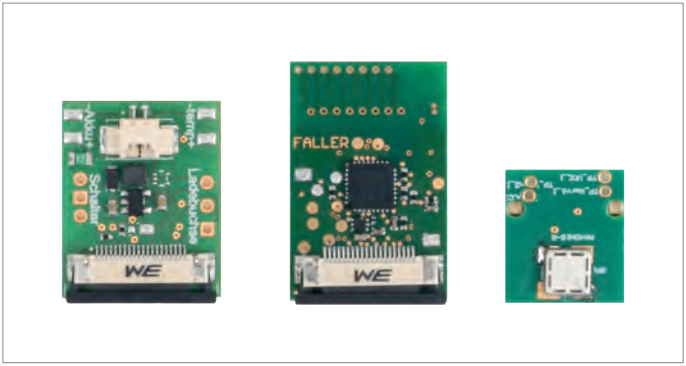


Abb. 5: View Soldering, digital, and ultrasonic circuit boards

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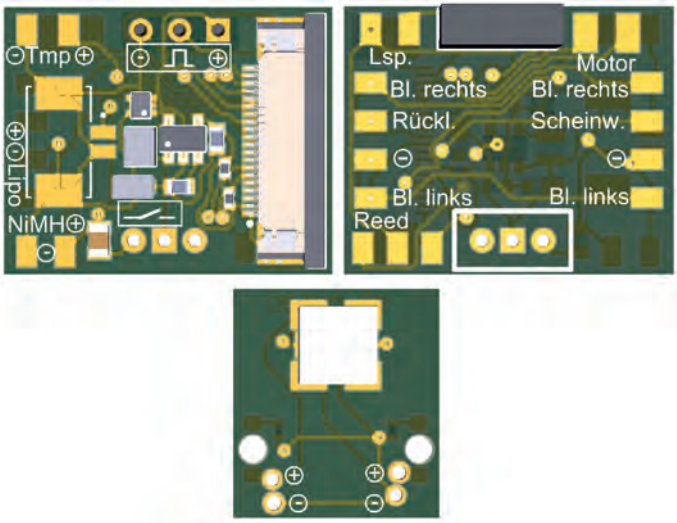


| Circuit board labeling | Explanation |
|---|---|
| ⊖ Tmp ⊕ | Temperature sensor |
| ⊖ ⊓ ⊕ | Charging port |
| Lipo | (optional) Lipo |
| NiMh | Battery (NiMh) |
| —/— | Switch |
| Lsp. | Speaker |
| Bl. rechts | Right turn signal (3,3 V) |
| Bl. links | Left turn signal (3,3 V) |
| Rückl. | Tail light (3,3 V) |
| Scheinw. | Headlights (3,3 V) |

| Circuit board labeling | Explanation |
|---|---|
| ⊖ | Dimensions of taillights/turn signals/headlights |
| Reed | (optional) Reed switch |
| Motor | Engine |
| ⊖ ⊕<br>⊖ ⊕ | Rotating beacon lights |

Tab. 1: BOM

**NOTE on the circuit board pin assignments for connecting the motor:** Depending on the motor's position, the motor connection wires must be swapped to ensure the motor rotates in the correct direction.

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# 3. Setting up the work environment

Below is a list of the recommended tools and necessary materials for the vehicle conversion.

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**TIPPS**

Use double-sided tape to secure items such as the ultrasonic capsule or small soldered components to the work surface and prevent them from slipping. Before soldering, first tin all cable ends from the included cable set. This minimizes the risk of damaging installed components or the circuit boards during soldering due to overheating or prolonged contact with the soldering iron.

## Recommended tools and materials

Please have the following tools and materials ready:

- A soldering iron or soldering station with a power rating of 30–40 watts and a soldering tip that is as thin, clean, and free of oxidation as possible, with a width of approximately 0.8 mm.
- Soldering iron stand or holder for safely storing the soldering iron.
- Electronics solder (solder paste) filled with flux (rosin core) with a diameter of 0.3–0.5 mm. You will need this electronics solder to create all necessary solder joints. Soldering water or acid-based soldering grease are unsuitable for soldering.

- Multimeter with fine test probes for use as a voltage meter when testing the continuity of the reed sensor.
- ESD protection mat for dissipating electrostatic charge. Alternatively, you can touch a radiator to discharge the charge, as heating systems are grounded.
- Wire strippers. Use wire strippers to remove the plastic insulation from the ends of cables and expose the wires for soldering.
- Special side cutters, Item 170688. Use these side cutters to cut lengths of cable from the included cable set.
- Sharp craft knife, Item 170687. Use this craft knife to repair any holes drilled in the vehicle roof, if necessary, or to cut through the circuit traces on the green universal circuit board found in various conventional Car System vehicles.
- Fa pair of tweezers, e.g., item 170558. Using tweezers makes it easier to hold wires in place while soldering.
- Permanent marker. You can use the marker, for example, to precisely mark the future position of the ultrasonic capsule in the vehicle roof, or to mark terminals when desoldering cables.
- A drill press, sheet metal drill bit, or drill bit with a maximum diameter of 5 mm. Use this to drill a hole in the vehicle roof to mount the ultrasonic capsule. Alternatively, you can also create this opening using a cordless screwdriver.
- Using a file or end mill, you can enlarge and refine the holes you have drilled in the vehicle roof until they reach the exact size required to accommodate the ultrasonic capsule.
- A viscous instant adhesive gel for securing the ultrasound transducer.
- Expert Rapid Super Glue, Item No. 170500, for attaching the temperature sensor to batteries or to the battery terminals.
- A magnifying glass, ideally with built-in lighting, for visually magnifying components during soldering.
- Hot glue, “Uhu por” model glue, or double-sided tape for reattaching batteries in model buses after soldering.

# 4. Vehicle models eligible for retrofitting


**NOTE:** Please note that Car System passenger car models are not currently designed for use with Car System Digital.

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Vehicle models compatible with the Car System conversion kit include, for example:

- Two-axle trucks, such as the MB SK, MB Actros, MAN F2000, MAN TGS, Iveco, DAF, and others
- 3-axle trucks, such as the MB SK, MB Actros, Scania, MAN, and others
- Semi-trailers, e.g., Effinger, "Welt im Modell" cases, etc.
- Bus models
- Van, e.g., Mercedes-Benz Sprinter

The following distinctions should be made:

**Conventional analog car system bus models**

Abb. 6: Car System Bus Model

**Traditional, analog Car System truck models**

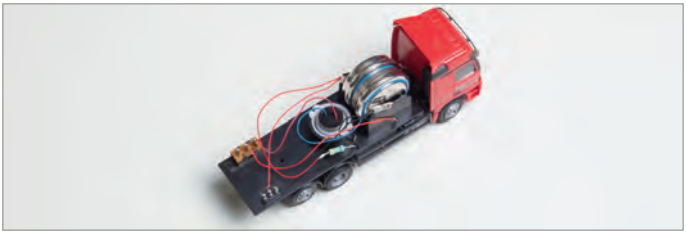

Abb. 7: Car System Truck Model

**Traditional, analog Car System truck models with a pre-installed green universal circuit board featuring soldered batteries**

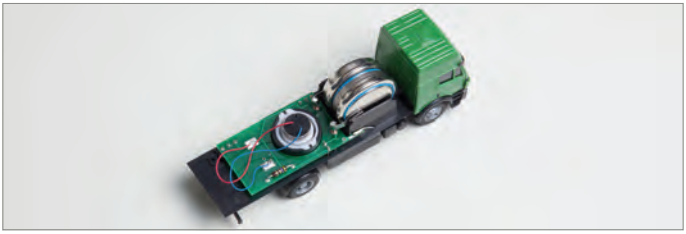

Abb. 8: Car System truck model with universal circuit board, soldered batteries

**Conventional Car System truck models equipped with a pre-installed green universal circuit board and plug-in batteries**

Abb. 9: Car System truck model with universal circuit board, plug-in batteries

**NOTE:**

- Please note that the procedure for installing the circuit boards varies depending on the vehicle model.
- Please note that universal boards with plug-in batteries differ from those with soldered batteries due to the different pinout configurations and the routing of the traces on the boards.
- If a vehicle model is not one of the types shown, it is not compatible with the Car System Digital.

▶ Please contact FALLER Customer Service if the interior of the vehicle you are converting differs from what is shown in this instruction manual.

# 5. Convert a vehicle


**NOTE:**

- Once a conventional Car System vehicle has been converted for Car System Digital operation, reverting it to its original configuration is generally possible only with considerable effort.
- On Car System models that can be converted, all vehicle parts that need to be opened or removed for the conversion are slightly fixed, so that opening the vehicle requires no force. Please note that using excessive force or pressure will generally result in damage to vehicle parts.

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## Mark the polarity of the charging port

Define the pin assignments for the charging port. Identify one of the ports as the “+” (positive) terminal and mark it with a permanent marker according to the charger's pin assignment. One of the two outer terminals must be marked as “+” (positive).

- ▶ Use a permanent marker to mark the “+” (positive) terminal on the outside of the vehicle housing to avoid confusion during soldering and charging later on.
- ▶ Use a permanent marker to mark the “+” (positive) terminal on the inside of the vehicle housing or on the universal circuit board to avoid confusion when soldering later.

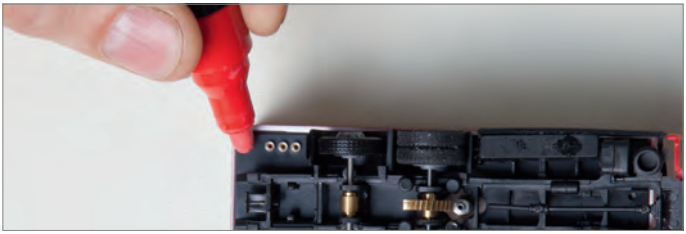

Abb. 10: Mark the polarity of the charging port on the outside of the vehicle housing

Abb. 11: Mark the polarity of the charging port, inside the vehicle housing

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## Prepare the vehicle

**Type: Bus model**

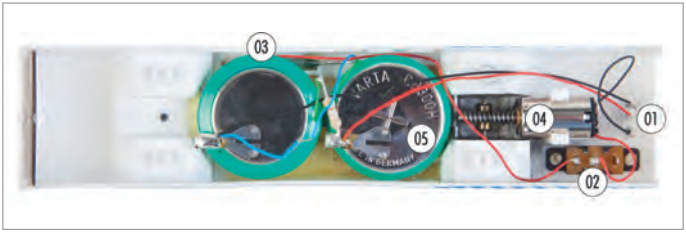


Abb. 12: Bus model, top view


Abb. 13: Bus model, side view

| Item | Component |
|---|---|
| 01 | Charging port |
| 02 | Switch |
| 03 | Reed switch |
| 04 | Engine |
| 05 | Batteries |

Tab. 2: Components of the bus model

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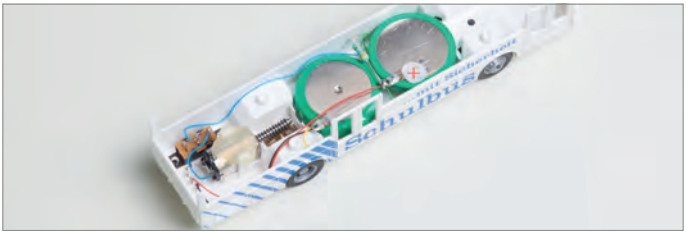


Abb. 14: Bus model, with wiring

**NOTE:**

- Since the wiring in bus models must be completely removed, use a permanent marker to mark the positions of the "+" (positive) and "-" (negative) terminals on the motor before desoldering them. This is crucial when soldering the universal circuit board for the motor's direction of rotation later on.
- Carefully remove the glued-in batteries, as in bus modelsthe reed sensor is located beneath the batteries. After soldering the solder board, secure the batteries if necessary with a small amount of hot glue, the model-making adhesive "Uhu Por," or double-sided tape
- Remove the installed resistor using side-cutting pliers.
- Heat up the soldering iron.
- Disconnect all existing wiring from the components (Charging port, Switch, Reed sensor, Engine, Batteries).

**NOTE:**

- For bus models (unlike other convertible vehicle models), disconnect all wiring completely. Due to its short length, the existing wiring for the engine is insufficient for the subsequent steps.
- The "resistor" and "charger connector bridge" components are no longer needed and can be discarded. Due to the lack of space inside the vehicle after installing the conversion board, the seat insert for bus models can no longer be used, or only the front section—where the driver sits—can be used.

Abb. 15: Bus model, without wiring

**TIPP**

In modified bus models, applying a translucent coating (lamp coating) to the windows blocks the view of the modification board inside the vehicle.

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**Typ: Truck model**

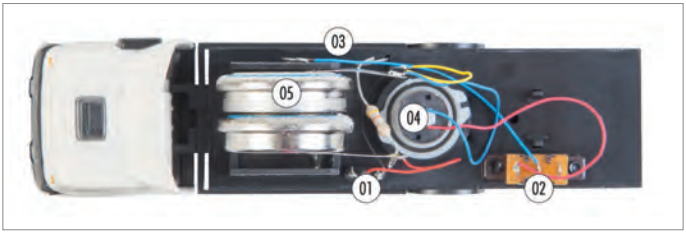


Abb. 16: Truck model, top view

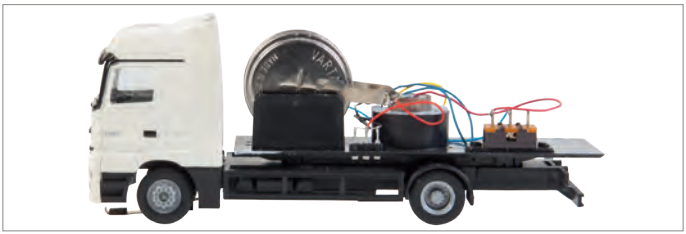

Abb. 17: Truck model, side view

| Item | Component |
|---|---|
| 01 | Charging port |
| 02 | Switch |
| 03 | Reed sensor |
| 04 | Engine |
| 05 | Batteries |

Tab. 3: Truck Model Parts

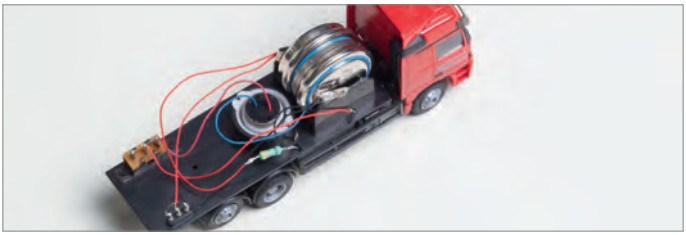

Abb. 18: Truck model, with wiring

**NOTE:**

- Remove the installed resistor using side-cutting pliers.
- Disconnect the two cables coming from the motor. Leave the two cables on the side leading into the motor as they are.
- Disconnect all other components (Charging port, Switch, Reed sensor, Batteries).

Abb. 19: Truck model, without wiring



**Type: Truck model with universal circuit board, soldered batteries**

**RECOMMENDATION:** Do not remove the permanently installed green universal circuit board for the conversion; leave it in the vehicle permanently.

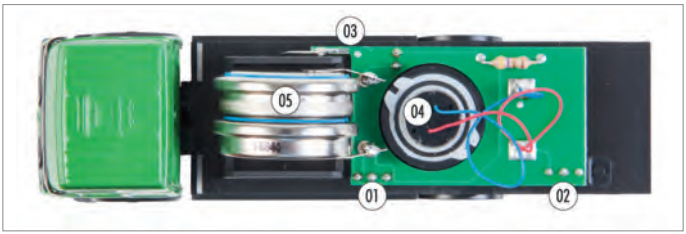


Abb. 20: Truck model, soldered batteries, top view

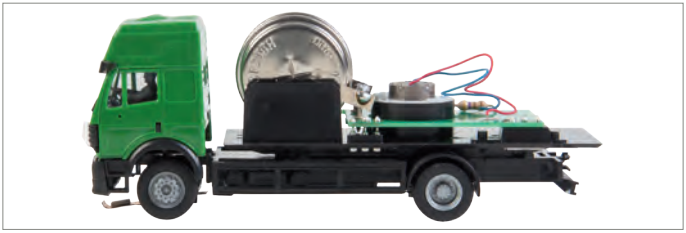

Abb. 21: Truck model, soldered batteries, side view

| Item | Component |
|---|---|
| 01 | Charging port |
| 02 | Switch |
| 03 | Reed sensor |
| 04 | Engine |
| 05 | Batteries |

Tab. 4: Truck model parts, soldered batteries



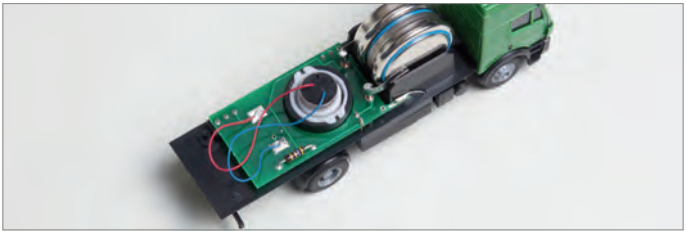

Abb. 22: Truck model with universal circuit board, soldered batteries, and wiring

**NOTE:**

- Remove the installed resistor using side-cutting pliers.
- Disconnect the two cables leading from the Engine on the universal circuit board. Leave the two cables on the side that leads into the motor as they are. Do not damage the two motor connection cables.

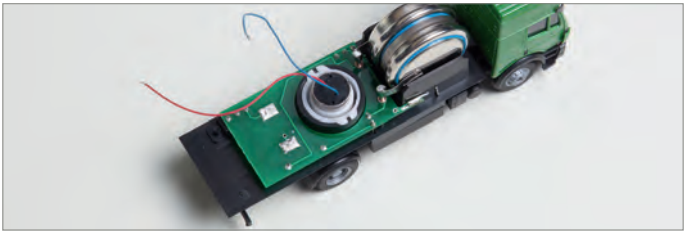

Abb. 23: Truck model with universal circuit board, soldered batteries, without wiring

- Use a wire cutter to disconnect the connection to the reed sensor, taking care to leave the wire as long as possible; see Abb. 24.



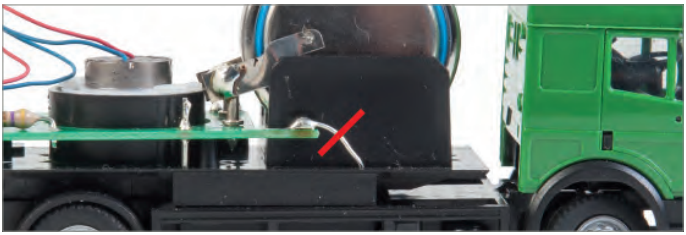

Abb. 24: Cut the reed sensor

- Using a craft knife, cut through five of the traces on the top side of the universal circuit board as shown Abb. 25.

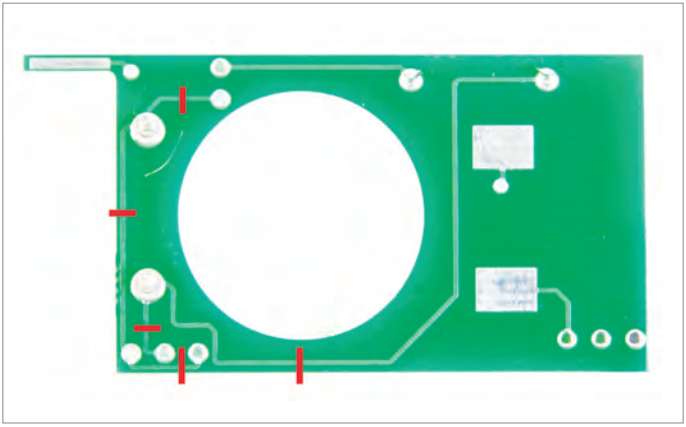

Abb. 25: Cut the circuit traces on the universal board; solder the batteries

**Type: Truck model with universal circuit board, plug-in batteries**

**RECOMMENDATION:** Do not remove the permanently installed green universal circuit board for the conversion; leave it in the vehicle permanently.

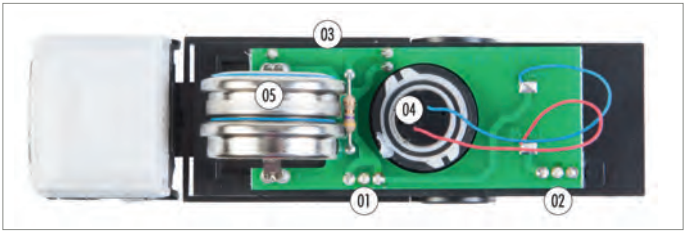


Abb. 26: Truck model, batteries inserted, top view

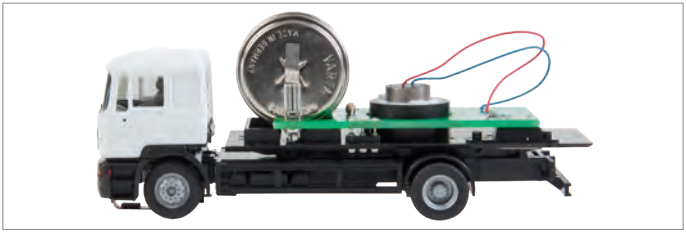

Abb. 27: LKW-Modell, gesteckte Akkus, Seitenansicht

| Item | Component |
|---|---|
| 01 | Charging port |
| 02 | Switch |
| 03 | Reed switch |
| 04 | Engine |
| 05 | Batteries |

Tab. 5: Bauteile LKW-Modell, gesteckte Akkus



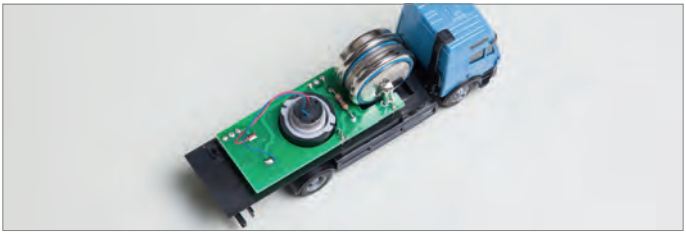

Abb. 28: Truck model with universal circuit board, plug-in batteries, and wiring

**NOTE:**

- Remove the installed resistor using side-cutting pliers.
- Disconnect the two cables leading from the motor on the universal circuit board. Leave the two cables on the side that leads into the motor as they are. Do not damage the two motor connection cables.

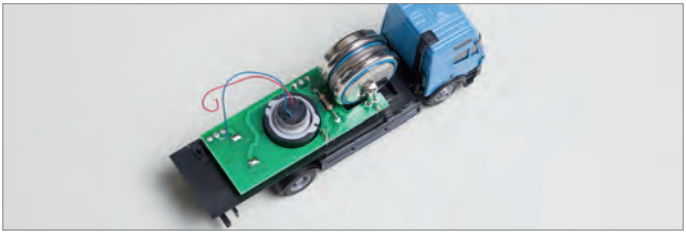

Abb. 29: Truck model with universal circuit board, plug-in batteries, no wiring

- Using a craft knife, cut through two of the traces on the top side of the universal circuit board as shown Abb. 30.
- Drill through the circuit traces on the underside of the universal board using a drill bit or end mill as appropriate Abb. 30.

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**NOTE:** Please refer to the following for the exact dimensions of the holes: Abb. 31.

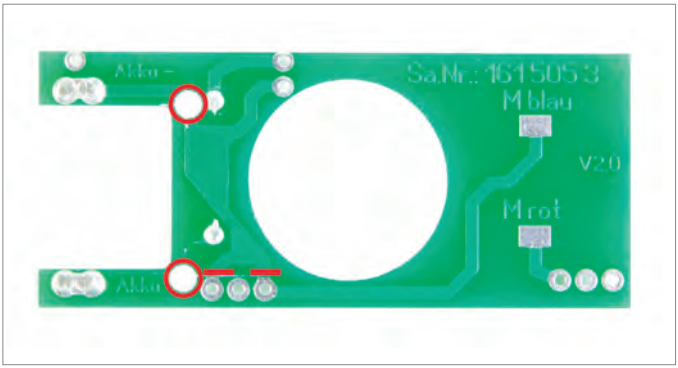


Abb. 30: Cut the circuit traces on the universal board; batteries are connected

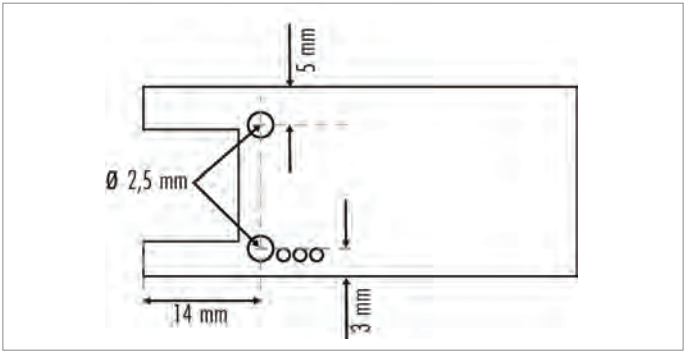


Abb. 31: Drilling through circuit traces on a universal board, batteries inserted

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## Install the ultrasonic capsule

**NOTE:**

- Once installed, the ultrasonic capsule must not be covered by a membrane or similar material. A clear line of sight to the satellites is essential for the ultrasonic capsule to function properly.
- The exact position of the ultrasonic capsule in the vehicle roof is irrelevant during installation, as the dimensions are stored in the Car System Digital software during vehicle programming. Please note that once the roof box or body is installed, the ultrasonic capsule and the built-in batteries must not obstruct each other.
- For a bus model, choose the front half of the vehicle as a suitable location for mounting the ultrasonic capsule. For a truck model, we recommend a position on the vehicle roof approximately above the engine. This will save space in the rear of the vehicle for the later installation of the retrofit board. In the front of the vehicle, there is insufficient space for the ultrasonic capsule due to the built-in batteries.

▶ To determine the exact position of the ultrasonic sensor, first measure the distance from the rear edge of the vehicle to the center of the engine on the open vehicle (without the cargo body) (in the example image: 45 mm).

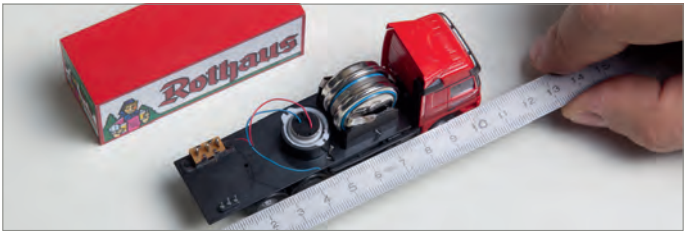


Abb. 32: Determine the position of the ultrasonic sensor: Measurement on the vehicle

- Starting from the back of the suitcase, measure the distance you determined earlier on the top of the suitcase and mark the center of this distance with a permanent marker.

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Abb. 33: Determine the position of the ultrasonic sensor: Measurement on the vehicle body

Abb. 34: Mark the position of the ultrasound probe

- Drill a hole with a maximum diameter of 4.5 mm in the vehicle's body to mount the ultrasonic capsule. Ideally, use a drill press with a sheet metal twist drill or a twist drill bit. Alternatively, you can drill the hole using a standard drill, an end mill, or a cordless screwdriver. . Im Next, file or use a craft knife to trim the hole to fit the shape of the ultrasonic capsule.

**NOTE:** The diameter of the ultrasound capsule is 5 mm. If necessary, work toward this size by making several slightly smaller drill holes.


Abb. 35: Hole in the vehicle body

- Use a craft knife, a file, or a end mill to repair or, if necessary, enlarge the hole in the vehicle roof until it reaches the exact diameter required to accommodate the ultrasonic capsule.

Abb. 36: Repair a hole in the vehicle body

- Use tweezers to open the clamp on the ribbon connector by lifting the black clamp strip up 90°. Insert the ribbon cable into the connector and secure it with the tab (see Figure 37). Make sure that the colored side faces you and the contact surface faces the circuit board. Then put the black clamping strip back in place.
- Secure the ultrasonic circuit board with a small amount of viscous superglue, instant adhesive, or hot glue.

**NOTE: Make sure that no adhesive gets inside the capsule when securing it.**

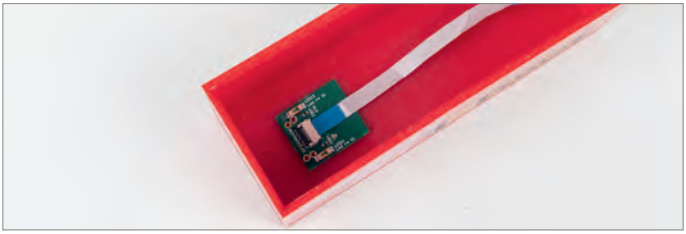

Abb. 37: Secure the ultrasound probe

## Soldering the conversion board

**RECOMMENDATION:** To reduce the risk of a short circuit while soldering, wrap the batteries in a little tape.

- Solder all the necessary connections between the vehicle and the circuit board, one by one.

**TIPP**

Wherever through-holes (holes that can be soldered from both sides) on the conversion board allow, thread the tinned ends of the cables through the holes and solder them to the opposite side of the conversion board. Through-holes are provided for connecting the charging jack and the switch.

- After soldering, use a side-cutting pliers to trim off any excess cable.

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## Overview of Connections

**Connection Overview, Type Bus Model**

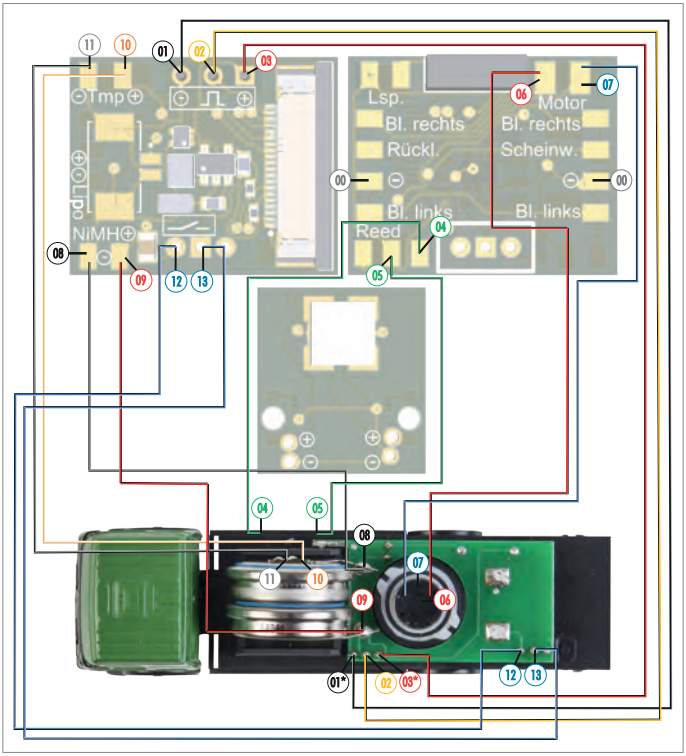


Abb. 38: Wiring diagram, Type bus model

***NOTE:** Locate the "+" (plus) terminal of the charging port that you previously identified and marked, and connect it to terminal "03" on the conversion board. In the wiring diagram Abb. 38 are "01" and "03" For vehicles, these are merely examples of possible configurations. See also Chapter "Convert a vehicle".

| Circuit board labeling | No. | Explanation |
|---|---|---|
| ⊖ | 00 | Dimensions of Taillights/Turn signals/ Headlights |
| ⊖⎍ | 01* | "-" (Negative) charging port |
| ⎍ | 02 | "Data" charging port |
| ⎍⊕ | 03* | "+" (Positive) charging port |
| Reed | 04 | Reed switch |
| Reed | 05 | Reed switch |
| Motor | 06 | Engine |
| Motor | 07 | Engine |
| Akku | 08 | Battery "-" (negative) (NiMH) |
| Akku | 09 | Battery "+" (Positive) (NiMH) |
| Tmp ⊕ | 10 | Temperature sensor "+" (Plus) |
| ⊖ Tmp | 11 | Temperature sensor "-" (minus) |
| ⎯⟋⎯ | 12 | Switch |
| ⎯⟋⎯ | 13 | Switch |

Tab. 6: Connections, Type, Bus Model

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**Connection Overview, Type Truck Model**

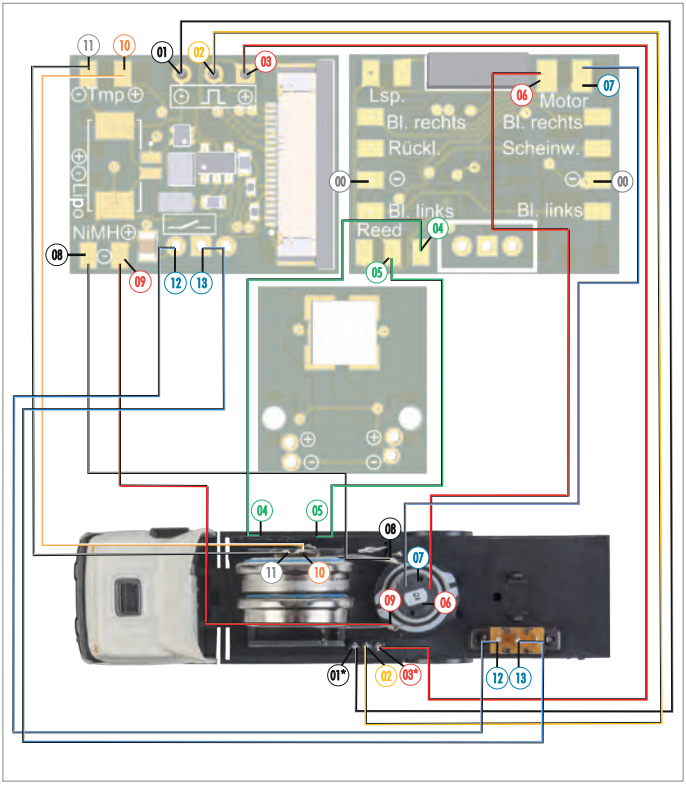


Abb. 39: Wiring diagram, Wiring diagram, Type Bus model

***NOTE:** Locate the "+" (plus) terminal of the charging port that you previously identified and marked, and connect it to terminal "03" on the conversion board. In the wiring diagram Abb. 39 are "01" and "03" For vehicles, these are merely examples of possible configurations. See also Chapter "Convert a vehicle".

| Circuit board labeling | No. | Explanation |
|---|---|---|
| ⊖ | 00 | Dimensions of Taillights/Turn signals/ Headlights |
| ⊖⎍ | 01* | "-" (Negative) charging port |
| ⎍ | 02 | "Data" charging port |
| ⎍⊕ | 03* | "+" (Positive) charging port |
| Reed | 04 | Reed switch |
| Reed | 05 | Reed switch |
| Motor | 06 | Engine |
| Motor | 07 | Engine |
| Akku | 08 | Battery "-" (negative) (NiMH) |
| Akku | 09 | Battery "+" (Positive) (NiMH) |
| Tmp ⊕ | 10 | Temperature sensor "+" (Plus) |
| ⊖ Tmp | 11 | Temperature sensor "-" (Minus) |
| —/— | 12 | Switch |
| —/— | 13 | Switch |

Tab. 7: Connections, Type Truck Model

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**Connection diagram, Type Truck model with universal circuit board, soldered batteries**

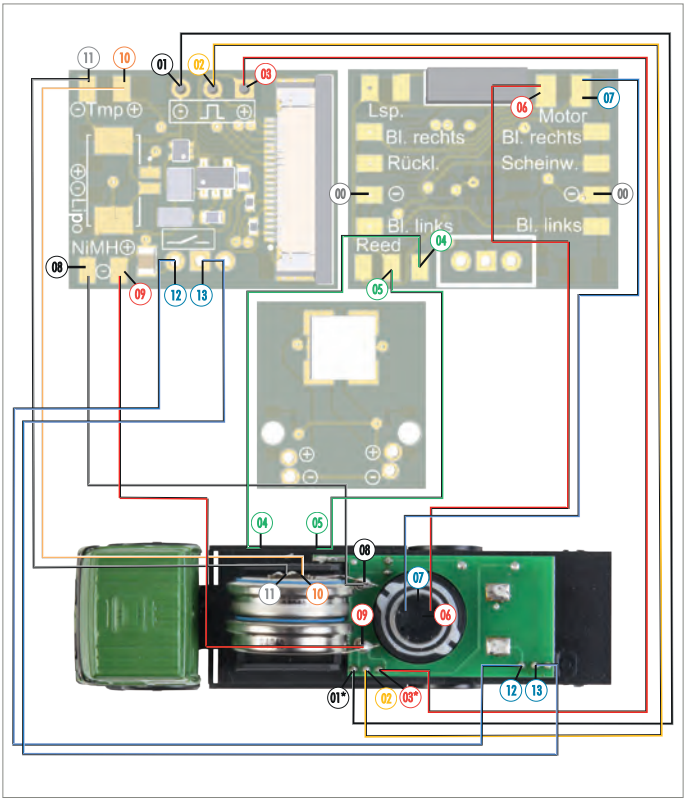


Abb. 40: Wiring diagram, truck model with universal circuit board, batteries soldered.

***NOTE:** Locate the "+" (plus) terminal of the charging port that you previously identified and marked, and connect it to terminal "03" on the conversion board. In the wiring diagram Abb. 40 are "01" and "03" For vehicles, these are merely examples of possible configurations. See also Chapter "Convert a vehicle".

| Circuit board labeling | No. | Explanation |
|---|---|---|
| ⊖ | 00 | Dimensions of Taillights/Turn signals/ Headlights |
| ⊖⎍ | 01* | "-" (Negative) charging port |
| ⎍ | 02 | "Data" charging port |
| ⎍⊕ | 03* | "+" (Positive) charging port |
| Reed | 04 | Reed switch |
| Reed | 05 | Reed switch |
| Motor | 06 | Engine |
| Motor | 07 | Engine |
| Akku | 08 | Battery "-" (negative) (NiMH) |
| Akku | 09 | Battery "+" (Positive) (NiMH) |
| Tmp ⊕ | 10 | Temperaturfühler "+" (Plus) |
| ⊖ Tmp | 11 | Temperature sensor "-" (Minus) |
| —/— | 12 | Switch |
| —/— | 13 | Switch |

Tab. 8: Connections, Type Truck model with universal circuit board, batteries soldered

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**Connection diagram, Type Truck model with universal circuit board, batteries plugged in**

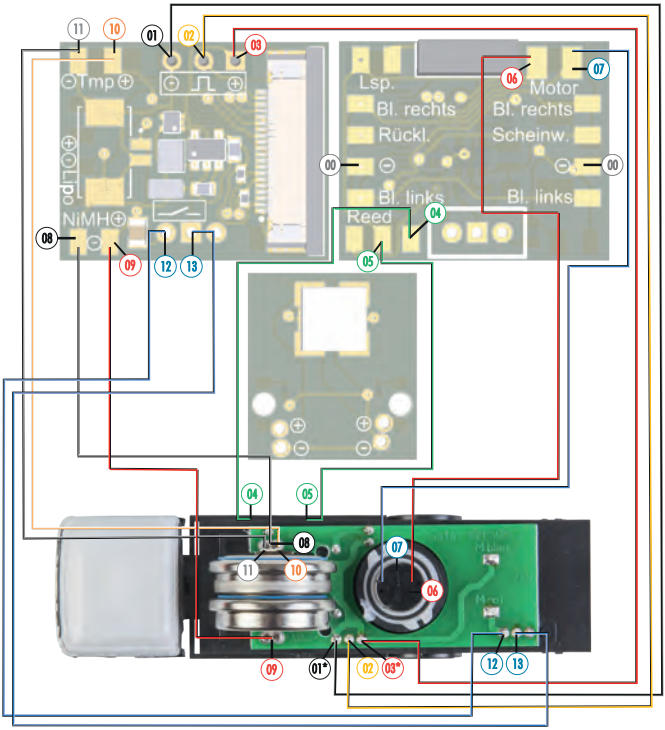


Abb. 41: Wiring diagram, truck model with universal circuit board, batteries plugged in

***NOTE:** Locate the "+" (plus) terminal of the charging port that you previously identified and marked, and connect it to terminal "03" on the conversion board. In the wiring diagram Abb. 41 are "01" and "03" For vehicles, these are merely examples of possible configurations. See also Chapter "Convert a vehicle".

| Circuit board labeling | No. | Explanation |
|---|---|---|
| ⊖ | 00 | Dimensions of Taillights/Turn signals/ Headlights |
| ⊖⎍ | 01* | "-" (Negative) charging port |
| ⎍ | 02 | "Data" charging port |
| ⎍⊕ | 03* | "+" (Positive) charging port |
| Reed | 04 | Reed switch |
| Reed | 05 | Reed switch |
| Motor | 06 | Engine |
| Motor | 07 | Engine |
| Akku | 08 | Battery "-" (negative) (NiMH) |
| Akku | 09 | Battery "+" (Positive) (NiMH) |
| Tmp ⊕ | 10 | Temperature sensor "+" (Plus) |
| ⊖ Tmp | 11 | Temperature sensor "-" (Minus) |
| —/— | 12 | Switch |
| —/— | 13 | Switch |

Connections, truck model with universal circuit board, batteries plugged in

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## Soldering the conversion board step by step

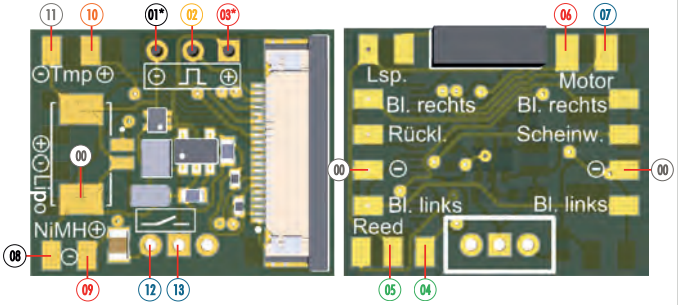


Abb. 42: View of the circuit board, front and back

Solder the components on the circuit board to those in the vehicle.

**ATTENTION**

**Property damage caused by a short circuit**

Contact between the soldering iron and cables, tools, solder, or similar items can cause a short circuit.

- ▶ Solder the batteries last, after you have soldered all the other components.

**Step 1: Solder the charging port**

**NOTE:** Note the mark you have made on the vehicle to indicate the "+" (positive) terminal.

- ▶ Solder the charging port in accordance with the circuit board markings.
  - 01 "-" (Negative) charging port
  - 02 "Data" charging port
  - 03 "+" (Positive) charging port



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**Step 2: Solder the switch**

**NOTE:** When soldering on the underside of the switch, always select the center solder pin and, optionally, one of the two outer solder pins; never solder the two outer pins together. The assignment of "+" (positive) and "-" (negative) is irrelevant.

- Solder the switch in accordance with the circuit board markings.
  - 12 Switches
  - 13 Switches

**Step 3: Check the reed switch**

The reed sensor in the vehicle allows you to use both the Parking Space component (Part No. 161674) in digital mode and your upgraded digital vehicle on conventional Car System installations (Analog Mode).

Abb. 43: Reed switch

REQUIREMENT: You need to determine the position of the reed switch where the switch is open and there is no continuity, meaning your multimeter will not beep during the test; see Abb. 44.

- Before soldering the reed sensor in place, use a multimeter to check for continuity across the three contacts of the reed sensor.
- Use a permanent marker to mark the two positions on the vehicle or on the universal circuit board where the reed switch does not conduct.
- Solder the wires to the two terminals on the reed switch where there is no continuity.

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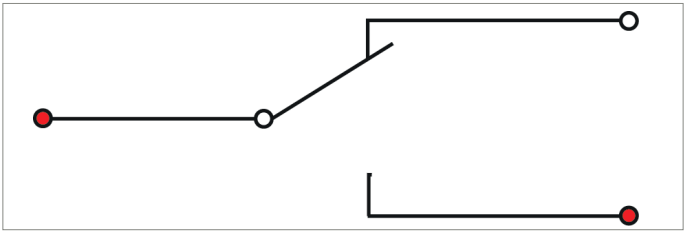

Abb. 44: Through-hole reed sensor

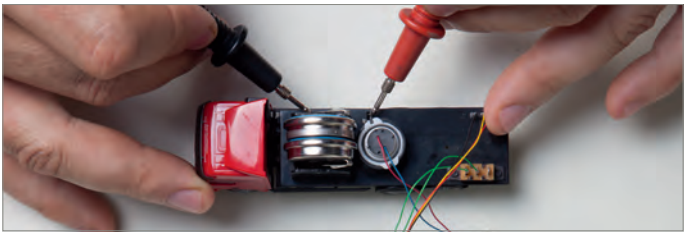

Abb. 45: Check the reed switch

**Step 4: Solder the reed sensor**

- Solder the reed sensor in accordance with the markings on the circuit board.
  - 04 Reed
  - 05 Reed

**Step 5: Connect the breadboard to the ribbon cable**

- Connect the ribbon cable from the ultrasonic board to the digital board (see Figure 46). Open the black terminal strip on the connector. Make sure the contact surface of the ribbon cable faces the board and the colored side of the cable faces you. Use tweezers to insert the cable into the connector and close it by pushing the black retaining clip back into place.

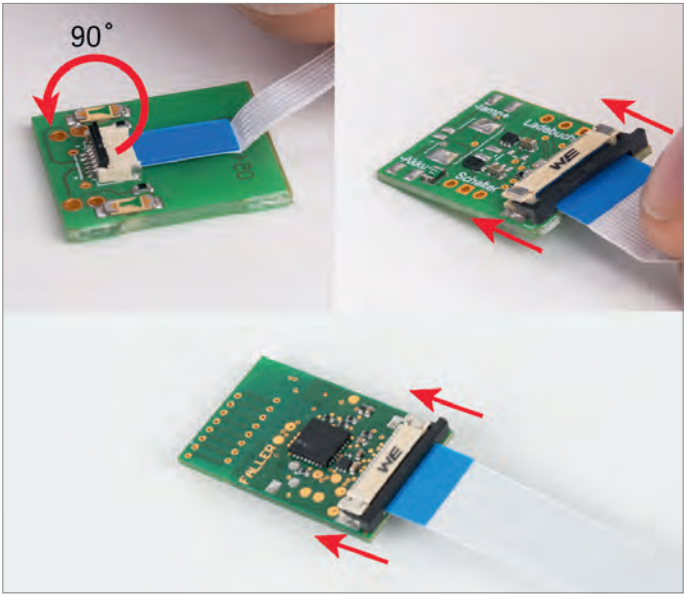


Abb. 46: Connect flat ribbon cables

**Step 6: Solder the Motor**

**NOTE:** Please also refer to the information on the circuit board pin assignments for the motor connection in the chapter "Circuit Board Layout".

- Solder the motor in accordance with the circuit board markings.
  - 06 Motor
  - 07 Motor

**Step 7: Solder the temperature sensor**

**NOTE:** The temperature sensor monitors the battery temperature during charging. A significant rise in battery temperature indicates that the batteries are nearly fully charged and, in addition to voltage measurement, serves as a cutoff criterion for terminating the charging process.

**ATTENTION**

**Property damage caused by a short circuit**

Attaching the temperature sensor to the "+" (positive) terminal of the batteries will cause a short circuit.

- The temperature sensor must always be attached to the "-" (negative) terminal of the batteries.

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Abb. 47: The temperature sensor is used to monitor the battery charging process. A rise in temperature is interpreted as a shutdown criterion and triggers the end of the charging process.

- Solder the temperature sensor in place according to the circuit board markings.
  - Black cable (⊖ Tmp)
  - Orange cable (Tmp ⊕)
- Secure the temperature sensor to the "-" (negative) side of the batteries with a small amount of superglue.

**Step 8: Solder the batteries**

**NOTE:** With the batteries installed, solder the cable ends to the flat-blade connectors for the battery holder. This way, the batteries remain interchangeable.

- First, tin the solder tabs on the batteries.

Solder the batteries in place according to the circuit board markings.

- Solder the black wire to the "-" (negative) terminal of the 08 battery on the circuit board.
- Solder the red wire to the "+" (positive) terminal of the 09 battery on the circuit board.
- Solder the remaining black wire end (08) to the "-" (negative) terminal of the batteries.
- Solder the remaining red wire end (09) to the "+" (positive) terminal of the batteries.

**TIPP**

Make sure the antenna is not blocked by any metal parts. This can significantly reduce the wireless range.

If you use a LiPo battery (optional) instead of a NiMH battery, you can plug it into the designated socket on the circuit board.

# 6. Special Light and Sound Features


**NOTE:**

- Information on the appropriate LED and speaker components can be found in the "Technical Specifications" section.
- Series resistors for connecting LEDs are included as standard on the conversion board.

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## Enable special features

With the built-in conversion board, the vehicle features various light and sound functions, which can be controlled via the processor-controlled charging station, Item 161349, hereinafter referred to as the "charging station" (depending on the function, only in conjunction with a digital control center) or wirelessly while driving via the Car System Digital Master (item no. 161354) and a corresponding input device (PC or digital control center).

- Turn off the vehicle.
- Connect the vehicle to the charging station.
- Start the vehicle.

**TIPP**

For more detailed information on connecting the vehicle to the charging station, please refer to the user manual for the processor-controlled charging station, Part No. 161349.

## Enable functions via the processor-controlled charging station

The F0 through F4 keys activate the following functions (some functions may not be available depending on the vehicle):

| Buttons | Description |
|---|---|
| "F0" | Headlights and taillights |
| "F1" | Rotating beacons |
| "F3" | Ambulance siren |
| "F4" | Horn |
| "F5" | *Left turn signal |
| "F6" | *Right turn signal |
| "F7" | *Hazard lights |
| "F8" | *High beams |
| "F9" | *Flashing the high beams |

Tab. 9: Enabling features (*Features available only when used with a digital control panel)

**NOTE:**

- Functions F5 through F9 can only be activated using the "Car System Digital" software or a digital control unit connected to the charging station.
- The features can be enabled in any order and combination.
- Settings that have been changed via a cable in the vehicle remain saved even after the vehicle is turned off.
- Settings that have been changed via the vehicle's wireless system are not saved after the vehicle is turned off.

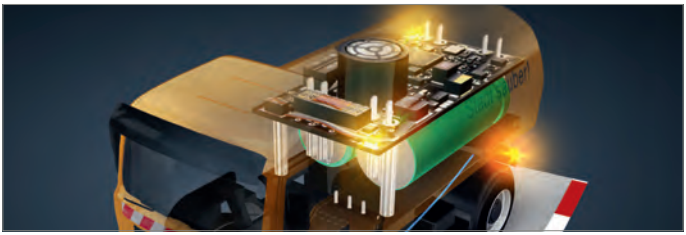
## Enable wireless features while driving



All of the vehicle's functions can be adjusted wirelessly while the vehicle is in operation using the "Car System Digital" software and a PC connected to the Car System Digital master: either by clicking directly on the corresponding icon in the software menu, issuing a command from an automated system, or using voice control.

Similarly, all functions can also be activated via a digital control unit connected to the Car System Digital-Master (see the user manual for your digital control unit).

# 7. Program a digital vehicle



To ensure that the modified vehicle is recognized as an integral component by the other modules of your Car System Digital system, you must first program it using the "Car System Digital" software in just a few steps. During subsequent operation, the vehicle will be added to the system fully automatically each time it is turned on. For more information on the "Car System Digital" software, item 161356, please refer to its user manual.

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## Select battery voltage

To charge your converted vehicle using the charging station, you must first use the "Car System Digital" software to program the battery type and capacity.

- Launch the "Car System Digital" software.
- Schalten Sie das umgerüstete Fahrzeug ein.

  The "Vehicle Overview" window displays the modified vehicle.
- In the menu bar, click "Conversion Board" under "Tools".

  The "Conversion Board" dialog box opens.

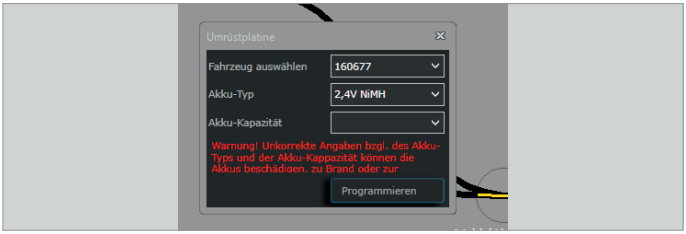


Abb. 48: Display window "Conversion board"

**DANGER**

**Serious injuries caused by a fire or explosion of the batteries**

Incorrect information regarding the battery type and capacity can damage the batteries, causing them to explode or catch fire.

- Make sure you know the type and capacity of the batteries installed in your vehicle.

Under "Select Vehicle," choose the retrofitted vehicle. The retrofitted vehicle will log into the system using the unique ID of your mini retrofit kit, e.g., "160677".

- Under "Battery Type," select the type of built-in batteries.
  - LIPO battery according to labeling
  - Select 2.4 V NiMH for 2 installed cells
- Finally, click "Program".

The message "Programming. Please wait" appears.

Once programming is complete, the message "Programming successfully completed" will appear.

## Create a digital vehicle in the "Car System Digital" software

The characteristics of a modified vehicle vary depending on the engine, transmission, or drive wheels installed. Since this affects factors such as speed, you should define the values for your specific vehicle type.

Create the modified vehicle in the "Car System Digital" software.

- In the vehicle view , click "Edit vehicle types".

The "Edit Vehicle Types" dialog box appears.

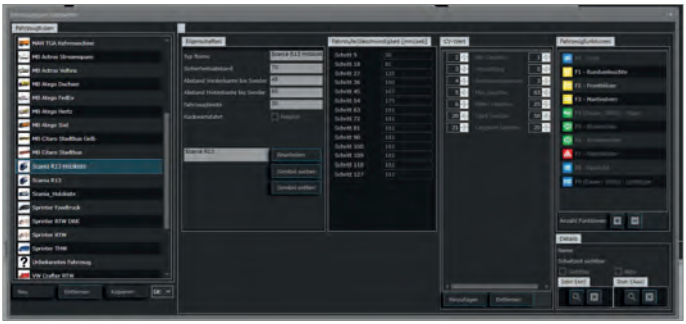

Abb. 49: "Edit Vehicle Types" dialog box

- From the "Vehicle Types" column, select one of the existing vehicles that resembles your modified vehicle.
- Click on the vehicle you want to use as a template.

  The selected vehicle is highlighted in blue.
- Click the "Copy" button at the bottom of the column.

  A duplicate of the copied vehicle is displayed at the bottom of the column.
- In particular, change the values displayed in the second column under "Properties" and adjust them to match the values of your modified vehicle: Type Name, Front Edge to Transmitter (front edge of the vehicle to the center of the ultrasonic capsule), Rear Edge to Transmitter (rear edge of the vehicle to the center of the ultrasonic capsule), Vehicle Width.

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- At the bottom of the second column, under “Search icon,” change the icon displayed under “Vehicle types” to the one for your converted vehicle.

**NOTE:** You can convert images in JPG format to the required PNG file format in Windows by going to Start > Programs > Accessories > Paint.

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# 8. Putting a Digital Vehicle into Service

The vehicle can be operated on any Car System road that has been properly installed.

- Check that the vehicle is in good working order.
- Fully charge the vehicle before using it for the first time.

EN

**TIPP**

To charge the batteries of your Car System Digital vehicles, use only the processor-controlled charging station, item no. 161349. For more information on charging, please refer to the charging station's user manual.

- Schalten Sie das Fahrzeug an.

**NOTE:**

- After the engine is started, the programmed auxiliary functions are activated one after another, and the vehicle accelerates to its normal speed.
- If the vehicle is within the radio range of a Car System Digital Master (Part No. 161354), it will stop immediately and, if a PC with the "Car System Digital" software running is present, will log in accordingly.
- If a master unit (Part No. 161354) is not used, the vehicle operates in "analog" mode. After being turned on, it searches for a radio connection to a master unit for approximately 5 minutes before the radio and ultrasonic sensors are turned off. In this case, the radio and ultrasonic sensors will only be reactivated after the vehicle is turned off and then back on.w

- If the vehicle is not within the radio range of a Car System Digital Master, it behaves like an analog vehicle and can be used without any problems on analog Car System installations.

▶ Position the vehicle on the track so that the handlebar, with the special guide wire attached, makes contact with the track.

▶ Release the vehicle.

# 9. Program vehicle functions


The decoder in the vehicle can be programmed using a DCC-compatible digital command station via so-called configuration variables (hereinafter referred to as CVs).

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**ATTENTION**

**Property damage caused by incorrect settings or programming**

The charging station and vehicle no longer function properly or are damaged.

- Do not attempt to program unless you have sufficient programming knowledge.
- Please refer to the user manual for your digital control panel.

**REQUIREMENT:** A DCC-compatible digital control unit is available. The charging station is connected to the digital control unit.

- Connect the charging station to the "Digital Control Center" port on the programming track of the Digital Control Center.
- Turn off the vehicle.
- Connect the vehicle to the charging station.
- Start the vehicle.

**NOTE:** For more information on connecting a digital vehicle to the charging station, please refer to the user manual titled "Processor-Controlled Charging Station".

Please refer to the user manual for the digital control unit to find out what special considerations apply when programming with CVs.

- Start the vehicle.
- Press the "Program" button on the charging station.
- Set the desired values for the CVs. Please refer to Tab 10 for the value ranges and default values.

| CV | Description | Value | Value range |
|---|---|---|---|
| "1" | Digital address | 3 | 1-127 |
| "2" | Minimum speed | 1 | 1-63 |
| "3" | Start-up delay | 5 | 1-63 |
| "4" | Braking delay | 10 | 1-63 |
| "5" | Max. speed | 63 | 1-63 |
| "7" | Firmware version | | |
| "17" | Long address high byte | 199 | 0-255 |
| "18" | Long Address Low Byte | 208 | 0-255 |
| "20" | Normal speed | 50 | 0-255 |
| "21" | Slow-speed | 25 | 0-255 |
| "23" | Rear lighting brightness 8 0–32 | 8 | 0-32 |
| "24" | Waiting time A: in 0.5-s increments after the operating voltage is applied | 6 | 0-255 |
| "25" | Waiting time B: from engine shut-down until brake lights turn off, in 0.5-s increments | 6 | 0-255 |
| "26" | Delay C: From engine shutdown until the light turns off, in 0.5-s increments | 20 | 0-255 |
| "27" | Delay D: until the motor starts via the solenoid switch in 0.5-s increments | 1 | 0-255 |
| "28" | Front lighting | 8 | 0-32 |

| CV | Description | Value | Value range |
|---|---|---|---|
| "29" | DCC Configuration<br><br>Bit 0 = Reverse the motor's direction of rotation<br>Bit 1 = 1 = 28 Speed settings<br>Bit 5 = 1 long address | 6 | 0-255 |
| "33" | Brake light: Response sensitivity as a difference in driving modes | 15 | 0-255 |
| "34" | Brake light: Afterglow time at drive level 0 in 10-ms increments | 30 | 0-255 |
| "35" | Horn tone duration 1 | 31 | 0-255 |
| "36" | Horn tone duration 2 | 41 | 0-255 |
| "37" | Duration of the horn sound (in 0.1-s increments) | 5 | 0-255 |
| "38" | Duration of the high-beam flash (in 0.1-s increments) | 5 | 0-255 |

| CV | Description | Value | Value range |
|---|---|---|---|
| "49" | Basic configuration | 2 | 0-255 |
| | Bit 0 = Disable motor control (1 = off, 0 = on) | | |
| | Bit 1 = Short-circuit the motor when Braking at a stop sign (1 = Short-circuit the motor, 0 = no motor short circuit) | | |
| | Bit 2 = Magnetic control off-switch, DCC control only (1 = only DCC, 0 = Magnetic control & DCC) | | |
| | Bit 3 = DCC Turn off the radio control | | |
| | Bit 4 = Motor rotation directions (0 = Both motor rotation directions are possible 1 = only one direction of rotation) (CV29 Bit 0 active!) | | |
| "59" | Reset all CVs to factory settings | 0 | 0,1 |

Tab. 10: Configuration variables

**NOTE:**

- A single-digit number in a CV must be read with a leading “0” if you want to determine the part number or vehicle ID from it; for example, if it contains a “5,” read it as “05”.

**Digital address:**

Unique identification number (Indicate) of the vehicle.

**Minimum speed:**

Refers to the lowest gear. Depending on the vehicle, mechanical issues or friction may prevent the vehicle from moving in first gear.

**Acceleration delay/Braking delay:**

The decoder contains curves for acceleration and deceleration. This value can be used to adjust the duration of the acceleration and deceleration.

**Max. speed (adjustable via the digital control panel):**

This value determines the magnitude of the speed signal sent to the motor when the decoder outputs speed step 28.

**Normal speed:**

This is the speed to which the vehicle accelerates after being started or after coming to a stop.



**Slow-speed limit:**

This is the deceleration rate at which the vehicle slows down when the magnetic field sensor detects a south magnetic field.

**Waiting times:**

These values indicate the time, in 0.5-second increments, that the decoder waits before issuing the corresponding command.

**Reset:**

This allows the decoder to be reset to its factory settings.

# 10. Maintenance and Inspection

Car System vehicles are highly detailed replicas of real cars. The vehicles require regular maintenance

so that you can enjoy them and their features for as long as possible.

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## Cleaning

From time to time, the axle bearings, drive components, and steering components of the vehicles should be cleaned of dust and lint. The model tracks should also always be kept free of dust and tire debris.

Clean the vehicles with a dry, soft cloth and a dry, soft brush, or use compressed air. Never use water or harsh cleaning agents.

Lubrication: Just like on the full-scale prototype, all rotating parts on the vehicles (drive axles, front axles) and all moving parts of the steering system (steering knuckles) must be lubricated. We recommend using FALLER Special Lubricant (Item 170488) or the FALLER Special Oiler (Item 170489) for this purpose. The lubrication points are marked in red in Fig. 50. The rule here is: as little as possible—as much as necessary! A pinhead-sized amount of lubricant is sufficient if the parts are dry.

If there is too much oil in the specified areas, it can mix with dust and other contaminants to form a thick, sticky mass that impairs vehicle performance.

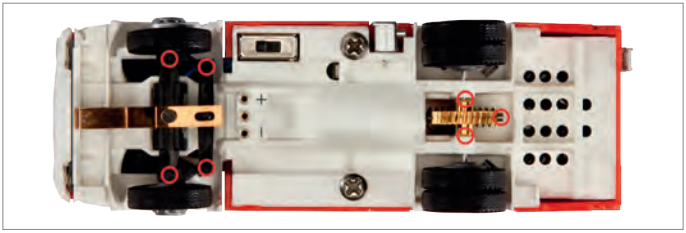

Abb. 50: Lubrication points

## Adjusting the steering slider

Car System vehicles can only be steered optimally if the steering sliders are properly adjusted. This is the case when the vehicle is delivered. However, deviations may occur, for example, due to accidents during operation. In such cases, readjustment is necessary. The steering slider should always glide parallel to the road surface. Please refer to Fig. 51 for the optimal setting. On small vehicles with folded steering slider tips, the magnetic force can be adjusted by bending them open with the tip of a knife. This may be necessary to optimize steering forces, for example, in the event of steering loss due to a magnet positioned too high or if the steering sliders adhere strongly to the road due to an insufficient magnetic gap.



Abb. 51: Adjusting the guide wheel

**NOTE:**

- The steering rack must have a little play at the screw connection.
- The guide rail must rest on the road and be able to swing in both directions.

- To check that the steering wheel is properly aligned, place the vehicle on a completely flat surface, such as a glass plate or a kitchen countertop.

## Tire change

Model cars need maintenance, too. You should change the tires regularly, depending on the mileage. Worn tread leads to a loss of traction and steering problems. This becomes noticeable when cornering or driving uphill. So be sure to check your tires regularly.

**TIPP**

Changing tires is even easier and faster than in real life. Spare tires and all other replacement parts can be ordered through

FALLER Customer Service. Be sure to include your vehicle's part number when placing your order.



## Charge the battery

To charge the batteries in your Car System Digital vehicles, use only the processor-controlled charging station (Item No. 161349). For helpful information and tips on battery charging, please refer to the charging station's instruction manual.

# 11. What should you do if...?


Due to external factors or damage, combined with extremely tight manufacturing tolerances, a vehicle may no longer function properly.

| Error | Source of error | Resolution |
|---|---|---|
| The vehicle is no longer moving. However, additional features can be activated. | Dirt in the transmission | ▶ Clean the vehicle |
| | Decoder incorrectly programmed | ▶ Reset the decoder to factory settings |
| The vehicle is not functioning. Special features cannot be activated. | Battery empty | ▶ Charge the vehicle |
| | Vehicle malfunction | ▶ Please contact<br>▶ FALLER Customer Service |

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| Error | Source of error | Resolution |
|---|---|---|
| If the master is turned on later, the vehicle will not be recognized by the software | More than 5 minutes have passed between starting the vehicle and subsequently turning on the master unit; the vehicle automatically turned off its radio and ultrasonic systems and is now operating as an "Analog Vehicle" | ▶ Turn the vehicle off and then back on |
| Vehicle loses contact with the overhead wire | Handlebar bent | ▶ Align the handlebars so that they rest flat on the road |
| | Road surface too rough | ▶ Repair the road |
| | The front-axle tires are touching the body<br>Broken steering knuckle | ▶ Use a sharp craft knife to create enough clearance; usually, it's enough to slightly chamfer the inside edge of the vehicle's fender |

| Error | Source of error | Resolution |
|---|---|---|
| Vehicle fails to stop at a stop sign | Stop sign installed incorrectly | ▶ Check that the stop point is installed correctly |
| | Stop point wired incorrectly | ▶ To stop a vehicle reliably, the north pole of the coil must be facing upward. If a vehicle's steering slider is pushed away from an activated stop point, the polarity is correct |
| | Voltage at the stop point is too low | ▶ For a stop switch to function properly, it must be supplied with 16 V DC |

Tab. 11: What should you do if...?

# 12. Technical Specifications

## Component Dimensions

| Description | Value |
|---|---|
| Digital circuit board | 26 x 17,5 x 5,5 mm |
| Solder board | 21,5 x 17,5 x 3,5 mm |
| Ultrasonic circuit board | 15 x 13,5 x 3,5 mm |

Tab. 12: Component Dimensions

## Electrical specifications of the outputs

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| Description | Value |
|---|---|
| Headlight output (white LEDs) | 2,9 V / 4 mA |
| Rotating beacons/front-mounted flashing lights (blue LEDs) | 2,9 V / 4 mA |
| Rear lights (red LEDs) | 2,1 V / 5 mA |
| Turn signals (orange LEDs) | 1,9 V / 3 mA |
| Additional LED outputs (F10, F11) | 2,9 V / 4 mA |
| Speaker | 8 Ohm |
| Motor output | max. 250 mA |

Tab. 13: Electrical specifications of the outputs

**NOTE:** All LED outputs provide a positive voltage ("+").

## Battery Specifications

| Description | Value |
|---|---|
| Power supply | Depending on the vehicle, either 1 x 1,2 V oder 2 x 1,2 V NiMH or LiPo 3,7 V |
| Capacity | Depending on the vehicle 170 - 750 mAh |

| Description | Value |
|---|---|
| LiPo connector | Molex-Pico Blade MX 1,25 2-Pol |

Tab. 14: Battery specifications

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The German instruction manual is the original version.