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# **Contact Information**

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## **AMB i.t. Europe**

Amsterdam  
The Netherlands  
Tel: +31 23 529 1893  
E-mail:  
support-eur@amb-it.com

## **AMB i.t. America**

Atlanta  
USA  
Tel: +1 678 816 4000  
E-mail:  
support-us@amb-it.com

## **AMB i.t. Asia**

Tokyo  
Japan  
Tel: +81 3 5275 4600  
Email:  
support-asia@amb-it.com

## **AMB i.t. Australia**

Sydney  
Australia  
Tel: +61 2 9546 2606  
Email:  
support-aus@amb-it.com

**www.amb-it.com**



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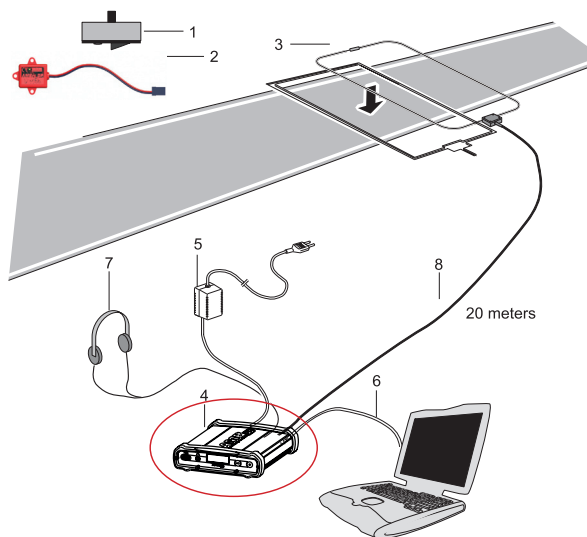
This publication is to be used for the standard model of the product of the type given on the cover page.

AMB i.t.

Manual:AMBRc/Rev.0906

# 1. Introduction

The AMBrc System is designed for the timing and scoring of RC model car races. The (magnetic) signal of each car carrying an AMBrc transponder is picked up by the detection loop installed in the track surface. This loop is connected to the AMBrc decoder. The decoder timestamps the received transponder signals and sends this data to a connected computer. Two types of transponders are available: a rechargeable battery powered transponder and a Direct (externally) Powered transponder. Each transponder has a unique number, which enables you to identify and time/score each RC car on the track.



1. AMBrc rechargeable transponder
  2. AMBrc Direct Powered transponder
  3. Detection loop
  4. AMBrc decoder
  5. 12 VDC adapter for AMB decoder
  6. Connection cable RS232/ TCP/IP network cable
  7. Headphones for decoder
  8. Coax cable and connection box
- Not in picture: charger rack

**Figure 1.1 System overview**

## **2. Installation of the system**

To install the AMBrc system, one needs to install a detection loop, connect the decoder and mount the AMBrc transponders to the cars. For optimal results, please follow the instructions in the following paragraphs carefully.

### **2.1 Installation of the detection loop**

All wiring of the detection loop must be installed according to the drawing below in order to avoid a serious degradation in the performance of the system.

#### **Positioning the detection loop**

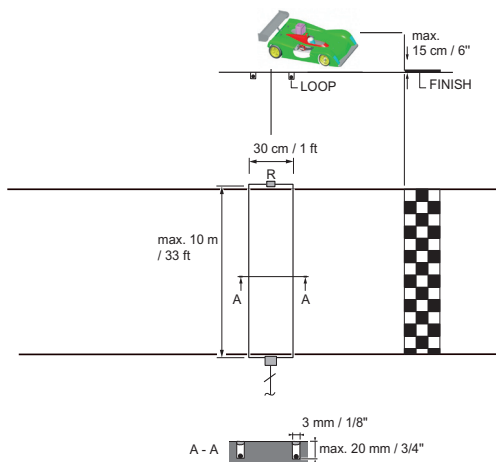
- a) The detection loop must be positioned in such a way that the transponder is above the center of the detection loop when the front of the car is above the finish line. Make sure vehicles cannot pass outside the detection loop. Extend the detection loop outside the track if necessary.
- b) The detection loop can be used for a track width of a maximum 10 m (33 ft).
- c) Cut the slots in the track a maximum of 2 cm (3/4 inch) deep and 30 cm (1 ft) apart.

#### **Installation of the detection loop wires and cabling**

- a) Make sure the slots are clean and dry. This will ensure a perfect seal when the silicone is applied after installation of the wiring. Put the wires of the detection loop in the slots and cut the excess length of the detection loop wires.
- b) When all wires are installed, put the heat shrinkage sleeve over a detection loop wire end. Then solder the loop wire end to the short wire end of the connection box. When soldering the wires together, the solder should flow through the entire connection and not only around it. Now put the shrinkage

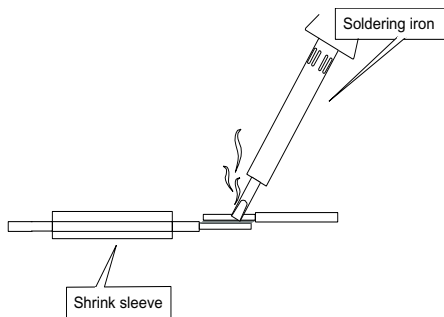
sleeve over the soldered connection and hold it over a heat source to shrink the sleeve (also see the drawing on the next page). Repeat this procedure for the second wire end of the detection loop.

- c) Fill the slot with silicone. Make sure not to overfill the slots and that the silicone is fully under the surface of the track, otherwise tires may pull out the silicone. If any silicone spills out of the slot, remove the excess silicone by scraping the top with a small piece of cardboard. This also ensures that the silicone is pressed into the slot and into the sides of the slot to ensure a perfect seal.



**Figure 2.1 Detection loop installation overview**

- d) In the case of an OFF-ROAD track, cover the loop with carpet or something similar. The carpet can then be covered with sand. Please be aware of the max. distance of 15 cm/6" between the transponder and the detection loop.



**Figure 2.2 Solder the loop wire end**

## **LEARNED BY EXPERIENCE**

If you wish, you may pad the slots with a backing rod or nylon cord before sealing the slot with silicone. This helps to prevent the excessive use of silicone and is also useful when pulling out the silicone if the detection loop has to be replaced.

### **Silicone**

There are a wide variety of silicone types available in hardware stores; it is important that the right type is used. Silicone that can withstand different temperatures as well as both wet and dry conditions since weather situations can vary should be used. If you are unsure, check the specifications of the silicone.

The following types of silicone have been shown to yield lasting results and are recommended by AMB:

- Dow Corning 890SL is a self-leveling silicone kit. It is applied as a liquid and fills the slot completely.
- Purflex is a polyurethane-based silicone that retains its elasticity under a wide range of temperatures.

- f) The detection loop is sensitive to interference, sometimes emitted by nearby cables. When possible, keep other cables 5 m (15 ft) away. Also make sure cars on other parts of the track will not get closer than 5 m (15 ft) to the detection loop, to avoid false inputs.

### **Testing the detection loop installation**

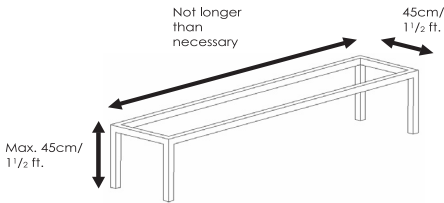
Once the loop has been installed, it should be tested to ensure that it is functioning correctly. We also recommend repeating the same procedure at the start of each race event. You can determine if your loop is functioning correctly by doing the following tests:

- a) Connect the detection loop to the decoder and computer running AMB i.t. timing software (also see paragraph 2.2 Installation of the AMBrc decoder). Check the background noise, which is updated every five seconds in the Track Timing software. The background noise level should be between 0 and 40 points. A higher value may indicate a bad loop installation or interference by other electrical equipment in the area. Try switching off any suspected equipment or removing nearby objects and check for improvements. Short-wave radio transmitters may cause an increased background noise, especially at night.
- b) Check the signal strengths of the transponders as they are picked up by the system during a test (also see paragraph 2.3 Installation of the Transponder). A good loop will yield consistent transponder signal strengths of at least 100 points with a hit rate of at least 20 points. The hit rate may vary depending on the speed of the transponder passages (slower passages yield higher hit counts), but the signal strength should be consistent for the same car.

## Loop installation for temporary tracks

If slots for the loop can not be made in the track, the loop can be fitted overhead on a bridge.

Do not make this bridge of any type of metal or carbon fiber, this will weaken the signal severely.



**Figure 2.3 Bridge for temporary tracks**

- a) Construct a bridge (wood, PVC) with max clearance 45 cm / 1½ ft. (lower is better). Do not make the bridge longer than necessary. Make sure no cars can pass outside the bridge.
- b) Wires of the loop must be 45 cm / 1½ ft apart and fixed underneath the bridge. Put the connection box on top of the bridge. Solder all connections and insulate well.

Please keep in mind that since a bridge has a larger distance between detection loop and passing transponder, this results in a weaker signal for the decoder. At dawn and at night, the interference from short-wave radio signals intensifies strongly and may occasionally cause the transponder signals to get overwhelmed by the interference. To avoid this, keep the loop on the bridge as short (less than 3 m / 10 ft) and low as possible (less than 45 cm / 1.5 ft).



## 2.2 Installation of the transponder

The AMBrc transponder is available in a battery-powered and a Direct Powered (DP) version. The battery-powered transponder can be charged in the AMBrc charger rack.

### Installation of the Direct Powered transponder

The AMBrc Direct Powered transponder is powered by the RC car's receiver and does not need to be charged.

- 1) The transponder must be mounted horizontally (flat). The position of the transponder must be identical in all RC model cars competing in the race for best finish accuracy.
- 2) Transponders must be positioned no higher than 15 cm / 6" (lower is better), with no metal or carbon fiber between the transponder and detection loop.
- 3) Fix the transponder to the car with the help of double-sided adhesive tape or nuts and bolt. Make sure the transponder can not get detached during a race.
- 4) Connect the power plug to a free servo channel or use a Y-splitter.
- 5) Check for an orange LED on the transponder when radio receiver is on.

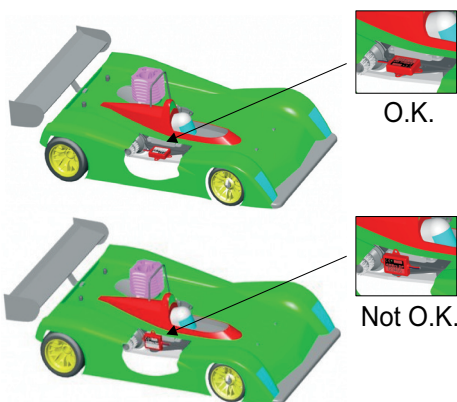


Figure 2.4 Mounting the AMBrc Direct Powered transponder

## **Carbon fiber or metal chassis**

If the AMBrc transponder is fitted directly onto a carbon fibre or metal chassis, the signal from the transponder is weakened severely, which shows as low hits and strength readings from the AMBrc decoder. Try to find a position for the transponder free from the chassis, for instance on the front bumper and check for better readings from the decoder. Hits should be no less than 20 (at speed) and strength not lower than 100 points.

If no good horizontal position can be found, as a last resort the transponder may be placed vertically, with the wiring facing the left- or right side of the car. In that case the signal from the transponder exits over the front and back of the car.

## **Power and polarity**

When no free channel is available use a Y-splitter servo wire, obtainable via your local hobby store.

If the polarity of the servo plug does not match the polarity of your radio receiver, it must be reversed (red wire is +). Carefully lift the plastic lugs of the plug and pull the connectors out. Re-insert the connectors into the plug according to the polarity of the radio receiver. The connectors may not be rotated before re-insertion, otherwise the lugs will not keep the connectors in place. Make sure the connectors are fully seated into the plug and then push the plastic lugs very carefully back into the servo plug.



### **Figure 2.5 Installation of the AMBrc Direct Powered transponder**

When a power voltage of more than 8 VDC is to be used, a resistor of 100 ohms per volt over 8 VDC must be connected in series with the red wire. So 10 VDC means 200 ohms in series with the red wire. Power of the resistor should be/ is 0.1 watt per volt, so 0.2 watt or more in case of 10 VDC.

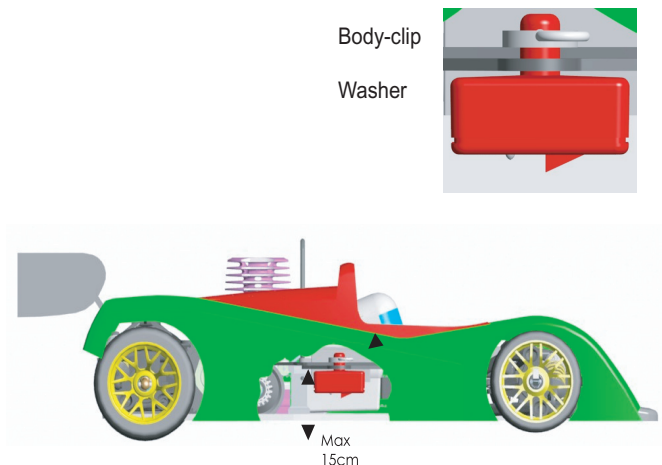
### **Interference**

RC model cars can suffer from self generated interference, resulting in poor range of the radio. This is usually caused by incorrect lay-out of the wiring. The AMBrc DP transponder does not use frequencies used by the RC model cars. However adding some wiring (power to the AMBrc DP transponder) does not help in case of the problem mentioned above.

To check if the signal from the transponder is causing trouble, disconnect the transponder power plug from the receiver and check the performance of the car.

To check if the wiring causes problems, disconnect one lead from the power connector (keep the other lead connected) and check the performance of the car. With one lead disconnected, the transponder is, of course, not working.

## Installation of the rechargeable transponder



**Figure 2.6 Installation of the rechargeable transponder**

- a) The transponder must be mounted **horizontally** (see drawing), preferably inside the car against the side, with the fixing pin pointing upwards or downwards. The position of the transponder must be identical on all RC model cars competing in the race for best finish accuracy.
- b) Transponders must be fitted no higher than 15 cm / 6" (lower is better), with no metal or carbon fiber between the transponder and detection loop.
- c) Put a washer around the fixing pin and fix the transponder with a fixing clip.
- d) Make sure the transponder can not get detached during a race.
- e) Check before each race to see if the green LED on the transponder blinks.

For OFF-ROAD RC model cars, the transponder may be fixed underneath the rear wing.

If the pin breaks, the transponder cover can be replaced (part number 00551102)

### **Charging the transponder**

Charging must be done in the AMB charger rack, which is powered by a standard AMB 12VDC adapter. Input voltage for the rack is 10 - 15 VDC (4 pin power plug type). The charger rack converts the input voltage to a regulated voltage of 3.3 V. as is needed by the AMBrc transponders.

Charging is done at room temperature. When charging, the red LED in each transponder indicates it is charging. One hour charge gives a minimum of 1 hour use, so the relation between charge/use time is one to one or better. Charge time for an empty transponder is 18 hours to reach full charge.

After about 18 hours the red charge led will change over to a steady green led, indicating trickle charge. Transponders may be trickle charged for weeks, but please let the transponders fully discharge once every two months.

When transponders have not been used for a couple of months, the first re-charge will not be fully effective. To ensure maximum capacity, give the transponders a full charge and discharge cycle before use. Use the full charge/discharge cycle to check if transponders have sufficient operating time. When not in use give the transponders a full charge/discharge cycle once every 2 months.

### **Operating time**

Operating time is 18 hours minimum after a full charge. When the transponder is removed from the charger rack the LED will blink green (when sufficiently charged) indicating the transponder is working. A low battery voltage is indicated by a blinking red LED. The amount of time the transponder blinks red (when nearly empty) depends of the amount of charge the battery has received previously. When charged until full,

## **Appendice A: Optional Equipment**

The AMBrc system, as delivered to you, is a complete system for timing and scoring. The optional equipment mentioned in the following paragraphs may prove to be valuable aids.

### **Back-up system**

Since electronic timing and scoring has become an integral part of most racetracks all over the world, a second AMBrc system may serve as a back-up system (e.g. in case of an important event). The signal coming from the detection loop(s) can be connected to both the decoders by using an AMB splitter (article no. 6704) and two short coax cables (2x article no. 6001). Another solution is to place a back-up system detection loop 5 m (15 ft) or more before the main detection loop and connect it separately to the second decoder. Naturally, connecting one or both decoders through a UPS may prevent a failure in the timing and scoring system in case of a power interruption.

## **Appendice B: Useful tool/parts/ equipment**

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### Useful Tools

- Resistance meter (Range at least: 1 Ohm - 1 Mega Ohm)
- Wire cutter / stripper
- BNC Crimper
- (Butane) Soldering gun
- Blade knife
- Coax stripper
- Screw driver (normal and Phillips)

### Useful Spare Parts

- BNC couplers (3 pieces)
- Thick BNC connectors 5 mm 75 Ohm
- Thin BNC connectors 3 mm 75 Ohm
- Shrink sleeves
- Spare loop (for tracks up to 20 m (65 ft) wide)
- Electrical tape

### Additional Tool for new loop installations

- Chalk line to get a straight line on the track surface
- Caulk gun to apply silicone.

Please contact AMB i.t. if you would like to receive detailed specifications on any of the above items.

## **Appendice C: Technical Specifications**

### **AMBrc Rechargeable Transponder**

Dimensions	: 35 x 31 x 12 mm approx. 1.4"x1.2"x 0.5"
Weight	: 22 g
Humidity	: max. 90% relative
Max. speed	: 120 km/h / 75 mph
Temperature range	: 0-50 C / 32-122 F
Operating time	: min. 18 hrs
Charge time	: 16 hrs for full charge
Charge indicator	: LED indicator green / red
Signal transfer	: magnetic induction
Resolution timebase	: 3 ms
Transponder position	: max. height 15 cm / 6"
Charging voltage	: 3.3 VDC

### **AMBrc Transponder Charger**

Transponder Charger	: 380 x 117 x 65 mm approx. 15"x5"x3"
Capacity	: 20 transponders
Power supply	: 10 to 16VDC / 0.4 A via 115/230 VAC adapter

### **AMBrc Direct Powered Transponder**

Dimensions	: 22x28x7 mm approx. 0.9"x1.1"x 0.3"
Weight	: 8 g. complete
Humidity	: max. 90% relative
Max. speed	: 120 km/h / 75 mph.
Temperature range	: 0-50 C / 32-122 F
Operating time	: Unlimited
Signal transfer	: magnetic induction
Resolution timebase	: 3 ms
Transponder position	: max. height 15 cm / 6"



Power	: Power feed from a free receiver channel (ch3 or batt)
Connection Plug	: Connect using a standard servo plug
Power consumption	: 15mA @ 5VDC
Operating voltage	: 4 –8 VDC

### **Detection Loop**

Track width	: max. 10 m / 33 ft
Coax to decoder	: 75 Ohms, double shield, max.length 200 m / 660 ft

Specifications are subject to change without notice.

## Appendix D: CE and FCC Regulations



### **CE information:**

This device complies with the EMC directive 89/336/EEC. A copy of the declaration of conformity can be obtained at:

AMB i.t. BV  
Zuiderhoutlaan 4  
2012 PJ Haarlem  
The Netherlands



### **FCC information:**

This equipment complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This equipment may not cause harmful interference, and (2) this equipment must accept any interference received, including interference that may cause undesired operation.

# **Guarantees & Warranties**

AMB i.t. guarantees that, for a period of twenty four months from the date of dispatch, decoders manufactured or sold by AMB i.t. with defects caused by faulty materials and/or workmanship and/or design, will be repaired. If repair is not possible or economical for AMB i.t., AMB i.t. has the choice to refund the purchase price of these goods or to deliver new goods. AMB i.t.'s liability shall be strictly limited to replacing, repairing or issuing credits at its option for any goods returned within twenty four months from the date of dispatch. AMB i.t. shall not be liable for incidental or consequential damages including, but not limited to costs of removal and reinstallation of goods, loss of goodwill, loss of profits or use. If the requirements set forth above and described below are not complied with, the AMB i.t. warranty/guarantee shall not apply and AMB i.t. shall be discharged from all liability arising from the supply of defective goods.

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## **Remedies and damages**

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- a) AMB i.t. is promptly notified in writing upon discovery by the customer that such goods do not conform to the warranty and the appropriate invoice number and date of purchase information is supplied;
- b) The alleged defective goods are returned to AMB i.t. carriage pre-paid;
- c) Examination by AMB i.t. of goods shall confirm the alleged defect exists and has not been caused by misuse, neglect, method of storage, faulty installation, handling, or by alteration or accident.