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1: Introduction

The TranX260 system is designed to time and score competition cars and motorcycles. The signal sent by a TranX260 transponder is picked up by the detection loop installed in the track surface. The transponder is mounted on a car or motorcycle. The detection loop is connected to the TranX Extended Loop decoder. The decoder timestamps the received transponder signals and sends this data to a connected computer.

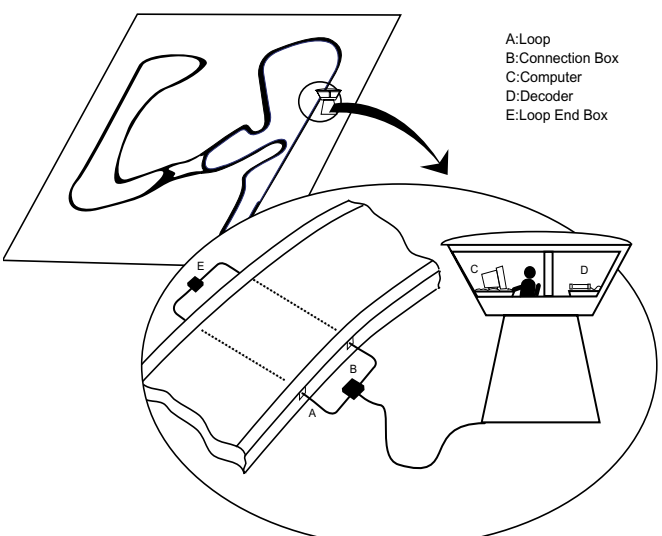


Figure 1.1 System overview

2: Installation of the detection loop

To install the TranX260 system, one needs to install one or more detection loops, connect the decoder and mount the TranX260 transponders to the car/motorcycle. For optimal results, please follow the instructions as described carefully. Appendix B contains a list of useful tools for installing the detection loop.

2.1 Positioning

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.

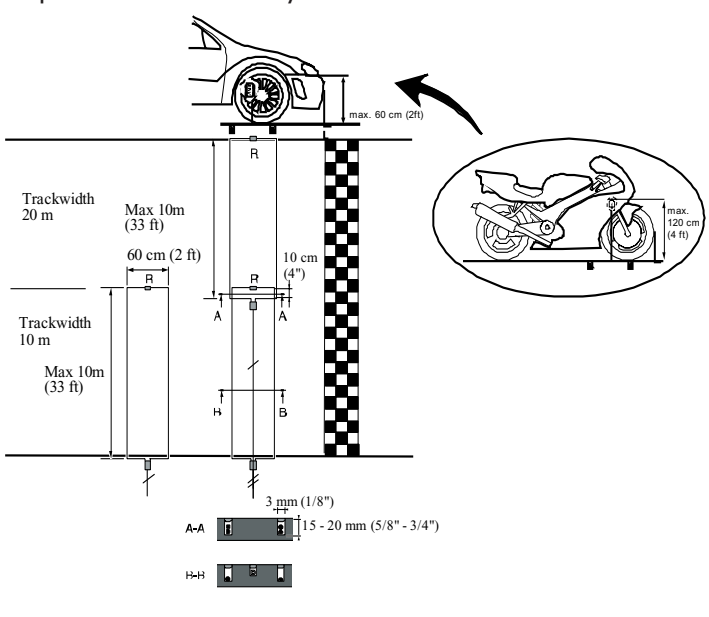


Figure 2.1 Detection loop installation overview

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 cars/motorcycle crosses the finish line. Make sure cars/motorcycle cannot pass outside the detection loop. Extend the detection loop outside the track if necessary.

b) One loop can be used for a track width of max. 10m (33ft). For wider tracks use 2 or 3 (max.) loops. When 2 or 3 detection loops need to be installed, make them of even length with 10 cm (4") overlap.

c) With a seperate loop in the pitlane, connected to the BNC connector marked, loop 3 (PIT) on the decoder, passings registered in the pit lane can be identified as such by the decoder.

d) 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/motorcycles or other parts on the track will not get closer than 5 m (15 ft) to the detection loop, to avoid false inputs.

e) For dirt tracks, the detection loop is best installed in plastic conduits at a maximum of 30cm (1ft) below the surface. The maximum depth should be chosen in a way that the cars/motorcycles cannot dig out the detection loop. However please respect the maximum distance between loop and transponder, which is 60cm (2ft) for cars and 120cm (4ft) for motorcycles.

LEARNED BY EXPERIENCE

When pulling the detection loop wire through the plastic conduit, it is a good idea to pull another non-metal wire through. This wire then can be used to install a new loop wire in case it gets damaged.

2.2 Installation of the detection loop

a) Cut the slots in the track a maximum of 2 cm (3/4 in) deep and 60 cm (2 ft) apart. Make sure the slots are clean and dry. This will ensure a perfect seal when the silicon is applied after the 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) Widen the slot with a chisel where the small connection box of the loop is to be installed. Place the connection box vertically.

c) When all wires are installed, put the heat shrinkage sleeve over a detection loop wire end. Then solder the loop wire 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 below). Repeat this procedure for the second wire of the detection loop.

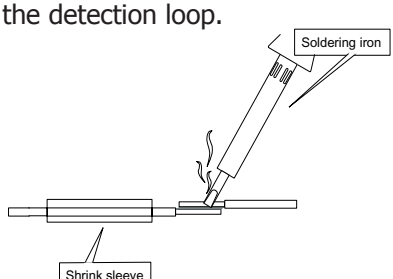


Figure 2.2 Solder the loop wire end

d) Fill the slot with silicone. Before doing this, please test the loop as described in section 2.3. 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 for a perfect seal.

LEARNED BY EXPERIENCE

If you wish, you may pad the slots with 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 is 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.

2.3 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 section 4.1 Installation of the TranX decoder). Check the background noise, which is updated every five seconds in the AMB i.t. timing software. The background noise level should be between 0 and 40 points. A higher value may indicate interference by other electrical equipment in the area or a bad loop installation. Try switching off any suspected equipment or removing nearby objects and check for improvements. Especially at night, short-wave radio transmitters may cause an increased background noise (for more information see Appendix A).

b) If a detection loop has been correctly installed, a transponder should be picked up at the same distance along the entire detection loop. To test this, stand at one end of the detection loop about 8 m (25 ft) away and hold a transponder approximately 120 cm (4 ft) off the ground. Walk slowly towards the detection loop. You will hear a beep in the headphones attached to the decoder when the transponder is detected. Mark the spot where the transponder was detected. Repeat the process for the middle and other end of the detection loop and do the same coming from the other direction. The detection distance from the loop should be approximately the same for all positions (< 20% variation).

c) Check the signal strengths of the transponders as they are picked up by the system during a reality 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 10 points. The hit rate may vary depending on the speed of the transponder passings (slower passings yield higher hit counts), but the signal strength should be consistent (< 10 points variation).

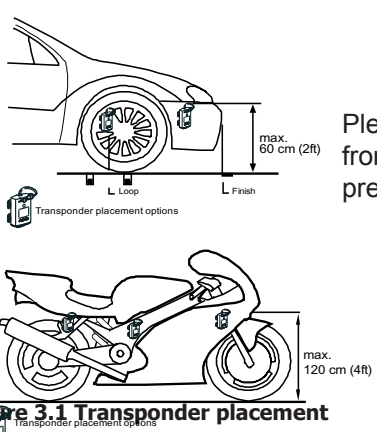
3.Transponder Installation/ Operation

3.1 Installation of the transponder

The TranX260 transponder is available in a battery-powered and Direct Powered (DP) version. The battery-powered transponder can be recharged in a single charger or 34-position charger case.

Positioning the transponder

The position of the rechargeable or Direct Powered transponder is identical. The position of the transponder must be identical on all cars or motorcycles competing in the race. Fix the transponder vertically, max. 60cm (2ft) above the track for cars and 120cm (4ft) for motorcycles. Make sure that the transponder has a clear view to the track with no metal or carbon fiber beneath it. Maximum operating temperature should not exceed 122F/50°C.



Please note that: The front wheel well is the preferred position.

Figure 3.1 Transponder placement

Installation of the Direct Powered transponder

Make sure that the transponder is mounted using pop rivets or screws on all four positions on both sides of the transponder. Use additional tie-wraps for securing the transponder and cable.

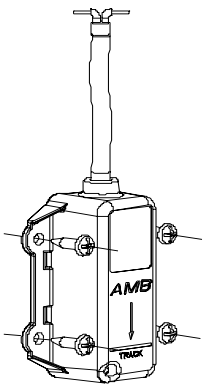


Figure 3.2 Fastening the Direct Powered transponder

Power/ Polarity

Connect the red wire to the +12V (fused circuit) and the black wire to ground (chassis). If the transponder is correctly installed and there is 12V present on the wires, the LED lights continuously.

Installation of the rechargeable transponder
Fix the holder on the car/motorcycle with the fixing rod on top by using tie-wraps or screws. Fasten the transponder in the holder using the supplied fixing pin.

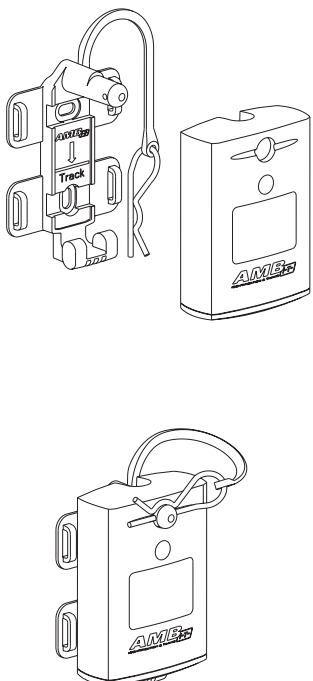


Figure 3.3 Fastening the transponder in the holder

WARNING

A detached transponder can be very dangerous!
Make sure the transponder cannot get detached.
Use additional tie-wraps to secure the pin.

3.2 Charging instructions

The following paragraphs will describe how to charge your TranX260 rechargeable transponder.

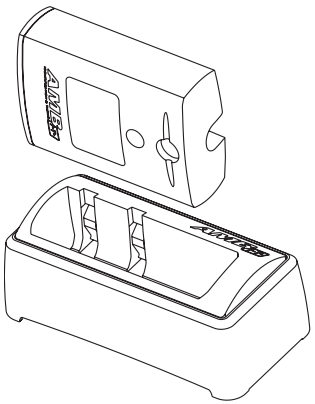


Figure 3.4 : Charging cradle

Connect the adapter to the individual charging cradle or to the 34-position charger case, place the transponder(s) inside and connect it to the appropriate power source.
When charging, the transponder's LED will flash red indicating the transponder is charging. A steady green LED indicates that the transponder is fully charged after approx. 14 hours.

Usage

A full charge yields a minimum of 4 days use. The number of green blinks of the LED is the MINIMUM number of days before the battery is empty. When the LED blinks red, the transponder will work less than 24 hours. A steady red light means the transponder could stop working at any moment.

Sleep mode
A charged/functioning transponder can be put into a sleep mode by placing it in an unplugged charging cradle or charger case. Normal functioning resumes when it is removed from the cradle. While in Sleep mode, the transponder will last up to 3 times longer during a single charge-discharge cycle. The sleep mode is designed to turn off the transponder's signal output and save battery life. It is necessary to use the Sleep mode when travelling by airplane to adhere to airline regulations.

Advice
Charge the transponder once every 3 months. Do not charge longer than necessary as this will reduce the life time of the battery. Doing so voids your warranty.

4.Installation/Operation of the decoder

4.1 Installation of the TranX Extended Loop decoder

The decoder is a precision instrument. Please handle it with care and keep the decoder out of direct sunlight and avoid high humidity. Take special precautions in case of thunderstorms by disconnecting all cables (coax and mains) from the decoder. Nearby lightning strikes may damage the decoder when cables are still connected.

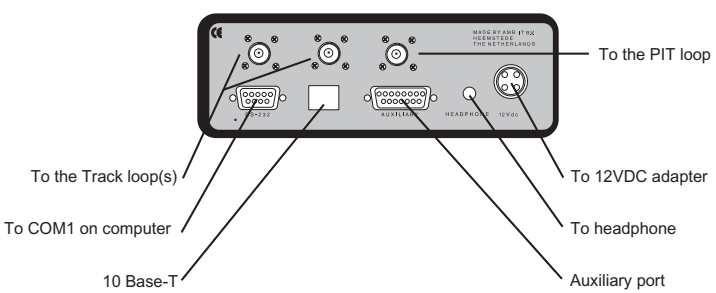


Figure 4.1 Connecting the TranX Extended Loop decoder

a) Connect the detection loop(s) by connecting the 75 Ohm double shielded coax cable(s) to the TranX2 extended loop decoder. Keep the coax cable at least 30 cm (1 ft) away from other cables to avoid interference.

b) Connect the RS232 serial cable between the TranX-Extended Loop decoder and the COM port of the computer.

c) Connect the headphone. A beep will sound for every passing transponder providing an easy check on proper operation of decoder and transponders out on the track.

d) Connect the 12 VDC adapter to the decoder and mains. Since a power interruption will result in a failure of the timing and scoring system, connecting the 12 VDC adapter to mains through a UPS (Uninterruptible Power Supply) is recommended.

e) The auxiliary port can be used to connect a photocell or an external start pulse. For more information on how to connect these devices, contact your nearest AMB i.t. office.

4.2 Operation of the TranX Extended Loop decoder

The decoder is not equipped with an on/off switch, therefore connecting the decoder to mains will turn it on. With each detection of a transponder, a beep will sound in the headphone. Each time the decoder sends data to the computer, the LED blinks red.

Noise level

Every five seconds the TranX decoder sends the average background noise to the computer. The noise (and signal strength) has a range of 0 up to 255 points. Noise level, as shown by the AMB i.t. timing software, should best not exceed 40 points. If the noise level is higher, the received transponder signal strength should be 60 points above noise level to ensure perfect functioning of the system. For instance if the strength is 120 points, the noise level should not exceed 60 points.

Signal strength

Signal strength, as shown by the AMB i.t. timing software, should preferably be below 100 points and should at least be 60 points higher than the indicated background noise. The closer a transponder is to the ground the higher the signal strength.

A higher signal strength gives a higher immunity against interference.

Number of hits
The number of hits, as shown by the AMB i.t. timing software, is an indication of the number of repeated contacts during a passing. A hit-rate varies with the speed of a passing transponder. Slower passings yield higher hit counts. The minimum number of hits should be 20 points.

Firmware update
As we are always looking for 100% reliability and the best performance of all AMB i.t. hardware, your decoder can be updated to the most recent firmware version. Please go to **http://support.amb-it.com** and follow the instructions.

Appendix A : Frequently asked questions

A1: Transponder signals

A few of the transponders are not being detected.

If this is the case, the problem is most likely related to the transponder or the positioning of the transponder.

- Check if the LED on the transponder is blinking. If not, the transponder needs to be charged.
- Check the position of the transponder, refer to paragraph 3.1

None of the transponders are being detected.

If this is the case, the problem is most likely related the detection loop, decoder, computer or cabling. Please take the following steps:

- If a transponder passing, results in a beep on the headphone, but nothing appears on the computer screen, check the cabling between the decoder and the computer.
- Check the coax cables by measuring the resistance (with a multimeter) between the centre pin and the outside of the BNC connector. The reading should be approximately 100 kOhm. If not, the coax has to be replaced.
- Check the loop wires by disconnecting the connection box and measuring the resistance between the loop wires in the track. The reading should be approximately 470 Ohm. If this is not the case, the loop has to be replaced.

A2: Noise level

What if my background noise is higher than 40 points?

An increased background noise is an indication of a higher interference level picked up by the system.

Every five seconds a background noise measurement is performed by the decoder and sent to the computer. The noise level should be less than 40, but never more than 60 points below the transponder signal-strength.

Possible causes of high background noise levels:

- When the detection loop is damaged, a fluctuation in noise level will be more noticeable, especially in wet conditions. If this is the case, please check the loop as described above.
- Electrical equipment close (<3 m) to the loop or coax cable.
- Using a generator with a poor ground connection
- Use of DC/AC converter for AC power.
- Poor connections between the detection loop and the coax cable.
- BNC connector incorrectly fitted to the coax cable.
- Poor ground connection of the AC power. If this is the case, ground the decoder, by connecting the outside of the BNC connectors on the decoder to a piece of metal (copper rod or tube) that goes into the ground.

A3: Signal strength

What if the received signal strength is below 100 points?

- If the signal strength is lower that 100 points, please check the position of the transponder.
- If the signal strength is fluctuating heavily in combination with high noise levels, check the quality of the loop installation and coax cables.

If you have any questions or remarks please contact AMB i.t. You can find our contact details on page 2 of this manual.

Appendix B: Usefool tools/parts/ equipment

Useful Tools

Multi meter (Range at least: 1 Ohm - 1 Mega Ohm)
Wire cutter / stripper
BNC Crimp tool for RG 58 & RG 59
(Butane) Soldering gun
Blade knife
Coax stripper
Screw driver (normal and Phillips)

Useful Spare Parts

BNC couplers (3 pieces)
BNC connectors (5 pieces) for yellow coax
BNC connectors (5 pieces) for brown coax
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.

Appendix C: Technical Specifications

TranX Extended Loop Decoder

Dimensions	: 320x170x55 mm (approx. 13x7x2.2″)
Timer stability	: 0,5 ppm
Timing resolution	: 0,001 sec
Memory	: 25.000 passings
Temperature range	: 0 - 50 °C (32 - 122 °F)
Humidity	: 10% to 90% relative
Power supply	: 12 VDC/0.5 A. The power plug to the decoder is a 4-pin CB radio plug (pins 1, 2 negative (-), pins 3,4 positive (+).
Output	: RS232, 9600 baud, 8 bit, 1 stop-bit
Number of loops	: max. 3, of which one is the PIT loop

TranX260 rechargeableTransponder

Numbers available	: unlimited
Dimensions	: 73x50x22 mm (approx. 2.9x2x0.9″)
Weight	: 100 g
Housing	: Water- and shockproof
Max. speed	: 260 km/h (160 mph)
Timing Resolution	: 0,002 sec
Temperature range	: 0 - 50 °C (32 - 122 °F)
Operating time	: min. 4 days after full charge
Charge time	: min. 14 hours for full charge
Charge indicator	: LED indicates remaining operating time in days
Signal transfer	: magnetic induction

Transponder position	: max. height cars 60 cm (2ft), max. height motorcycles 120 cm (4ft)

TranX260 DP Transponder

Numbers available	: unlimited
Dimensions	: 70x52x27 mm (approx. 2.8x2.1x1”)
Weight	: 179 g inclusive wires 2m (6,6 ft)
Housing	: Water- and shockproof
Power consumption	: 10-30 VDC/15 mA
Max. speed	: 260 km/h (160 mph)
Timing Resolution	: 0,002 sec
Temperature range	: 0 - 50 °C (32 - 122 °F)
Signal transfer	: magnetic induction
Transponder position	: max. height 60 cm (2 ft) cars, max. height 120 cm (4ft) motorcycles

AMB Detection Loop

Track width	: max. 30 m (99 ft)
Coax to decoder	: max. 100 m (330 ft)

AMB Transponder Chargers

Individual charger	: 12 VDC / 0.05 A
34 position charger case	: 12 VDC / 1.0 A

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.

Guarantiees & 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.

EXCEPT AS EXPRESSLY PROVIDED IN THIS SECTION, AMB i.t. MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, NATURE OR DESCRIPTION, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OR MERCHANTABILITY, FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE, OR NONINFRINGEMENT, AND AMB i.t. HEREBY DISCLAIMS THE SAME.

Please see the AMB standard Terms and Conditions of Sale for the additional terms in connection with the sale of goods and services covered by this manual.

Remedies and damages

AMB i.t. shall not incur any liability under the above warranty unless:

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.