LEGIC Boosters

installation guide

LEGIC Booster
LEGIC Booster 2G
LEGIC Booster Ultimate

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1 Introduction

The LEGIC Booster is an active dual ID tag enabling simultaneous identification of the inserted LEGIC smart card and the embedded vehicle ID resulting in rapid driver and vehicle monitoring.

A LEGIC smart card can be placed in the device (representing driver ID). Additionally a separate ID is programmed in the LEGIC Booster (representing vehicle ID). Once configured, the LEGIC Booster allows a driver ID badge together with its embedded vehicle ID to be read from a distance up to 10 meters (33 feet) in combination with NEDAP TRANSIT readers. This solution substantially enhances the level of security when controlling activities of vehicles that are regularly used by different drivers. Additionally a fully integrated vehicle and personnel access solution can be implemented. The LEGIC Booster Ultimate further enhances the level of security with additional communication by checking the LEGIC Booster Ultimate authenticity.

For more details about the NEDAP TRANSIT reader refer to the TRANSIT installation guide.

The combined vehicle and driver identification is a unique NEDAP patented feature. Optionally the vehicle-ID can be omitted if more information from the LEGIC card is required.

The LEGIC Booster supports LEGIC Advant and Prime cards.
NEDAP can also supply Booster devices that are able to read NEDAP, EM4200, HID-Prox or MIFARE/DESFIRE cards.

The LEGIC Booster was developed based upon the unique patent of the Nedap dual band technology. This technology enables reading of the low frequency credit card sized tag by the TRANSIT microwave reader. The microwave technology in the 2.45GHz band allows identification at a distance up to 10 meters, even at high speeding passage. The LEGIC Booster Ultimate has an extra 433MHz band for a triple band technology for extra LEGIC Booster Ultimate authentication.

Key features:

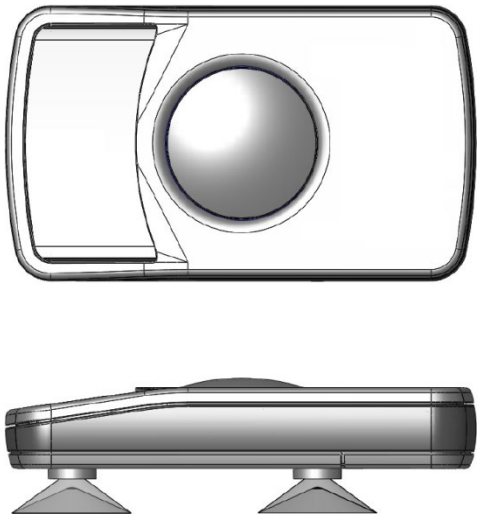
- Combined vehicle and driver identification
- Easy interior mounting
- Push button activation
- Expected lifetime up to 5 years.
- Replaceable batteries (2 x AAA)
- LEGIC Booster secure authentication (LEGIC Booster Ultimate only)

2 Installation

2.1 Dimensions

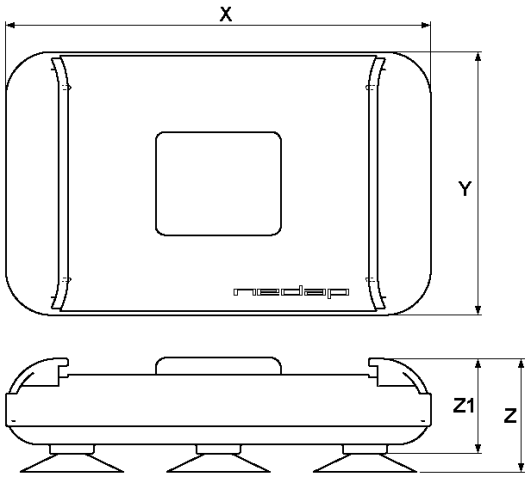
The LEGIC Booster is easily mounted on the interior of the car's windshield by means of suction cups. Users should ensure the visual contact between the LEGIC Booster and any TRANSIT reader is unobstructed with items such as stickers or metalized windshields (see also chapter 2.3 about solar control windshields).

Note: The suction cups must be faced toward the reader to achieve maximum reading distance.



Dimension	mm	inches
Length	111	4.37"
Width	65	2.56"
Height	32	1.26"
Height (without section cups)	24	0.95"

Figure 1: LEGIC Booster 2G and LEGIC Booster Ultimate dimensions



Dimension	mm	inches
Length	116	4.57"
Width	72	2.83"
Height	31	1.22"
Height (without section cups)	26	1.02"

Figure 2: LEGIC Booster dimensions

2.2 Temperature considerations

The LEGIC Booster is designed to operate within the extreme temperature ranges, which often occur behind a vehicle's windshield during the winter or summer seasons (-20°C to +85°C). However the LEGIC card inserted in the LEGIC Booster may not be designed to withstand such temperatures and could suffer damage as a result. Nedap advises to remove the LEGIC card when not in use.

Caution: Do not leave card in access device when leaving the vehicle, as this presents a security risk.

Caution: Do not leave card in access device for long periods of time in extreme heat, as this may damage the card.

2.3 Solar control windshields

From 1997 onwards several car manufacturers introduced vehicles with solar control windshields. The solar control windshields are equipped with a metalized coating, which can block the TRANSIT signal from the LEGIC Booster mounted on the inside of the windshield of the vehicle.
Most of these windshields have a metal free zone where transponders can be mounted. The metal free zone of metalized windshields is most often found in the middle of the windshield behind and slightly below the rear view mirror. In vehicles manufactured after 1998 the metal free zone should be indicated on the window.
We advise the owner to contact the local car dealer if it is not clear where the aperture is exactly positioned in a certain vehicle and where the LEGIC Booster should be mounted.

3 Configuration

The LEGIC Booster is configured by means of configuration cards. This configuration card is a LEGIC Advant transponder that contains all the information that is required to find the user's segment and read the data. The LEGIC Booster only accepts a configuration card after configuration is enabled with a master token card.
A newly purchased LEGIC Booster will accept any master token card. Once a master token has been inserted, the LEGIC Booster will only accept that specific master token and cannot be reconfigured with other master tokens.

3.1 Configuration card set

The configuration card set contains 3 cards that have the exact same stamp.

- The master token IAM n/31 enables the programmer to write the configuration card.
- The master token SAM n/31 enables the LEGIC Booster to accept the configuration card.
- The configuration card.

Note: Previously the set contained only 2 cards (no SAM n/31 card included).
The IAM n/31 card was accepted on the LEGIC Booster as well as on the programmer

A special master token SAM n/32 can be used to perform a 'master token withdraw'. This will release the bonded master token information and enables the Booster to accept any master token again (just like a virgin LEGIC Booster from the factory). The 'withdraw' master token should have the exact same stamp as the original master token. The SAM n/32 card is not included in the master token set.

3.2 Configuration procedure

Follow the procedure below to configure the LEGIC Booster for your application.

1. Insert the master token SAM card in the LEGIC Booster and push the button.
   The LEGIC Booster sounds the buzzer with an increasing frequency: ♪ ♪ ♪
   The LEGIC Booster will now accept your configuration data card.
2. Insert the configuration data card in the LEGIC Booster and push the button.
   The LEGIC Booster sounds the buzzer with a decreasing frequency ♪ ♪ ♪
   The configuration is accepted.
   Now your LEGIC Booster will read the LEGIC smart cards that meet the conditions defined in your configuration.

3.3 Configuration software

NEDAP has developed a software application that allows system integrators to create configuration cards. This software can be downloaded from our partner portal website https://portal.nedapidentification.com.

A LEGIC Advant programmer based upon LEGIC SC-2560 or SM-4500 chipset is required.
For example: KABA B-Net 9107 or KABA B-Net 9108.

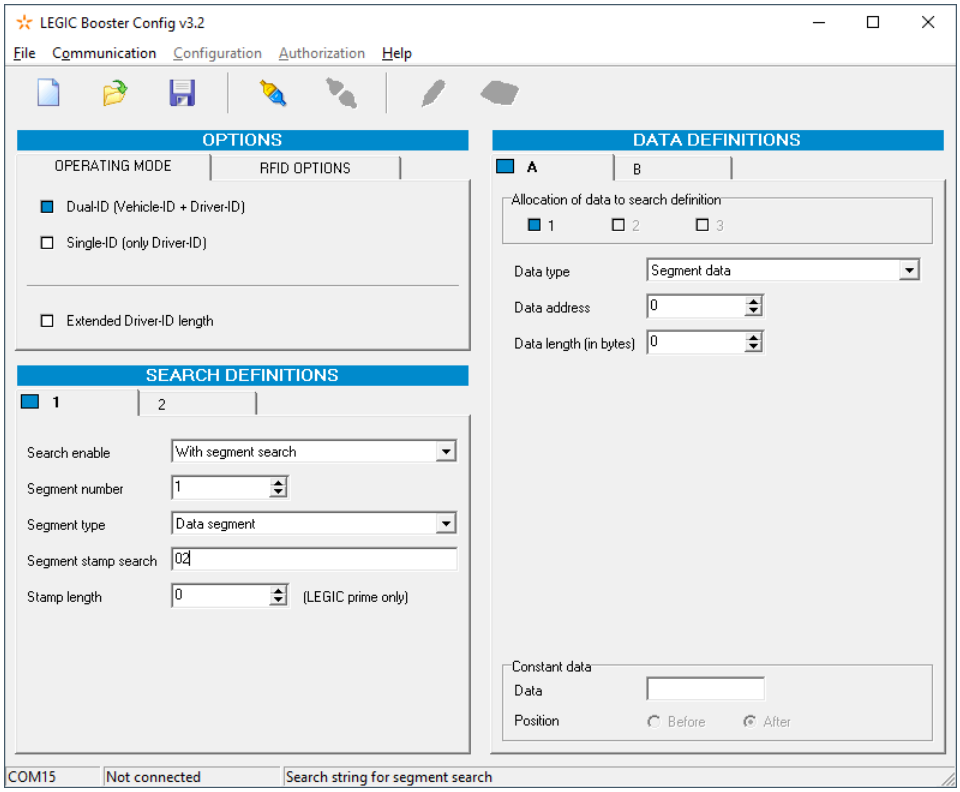


Figure 3: LEGIC Booster configuration software

3.3.1 Create a configuration card

The configuration card contains the information which user cards are supported and which data on these cards must be read. Follow the procedure below to create a configuration card.

1. Specify the OPTIONS
2. Specify the SEARCH DEFINITIONS
3. Specify the DATA DEFINITIONS
4. Load the Master Token IAM.
   Place the master token IAM card on the programmer and click 'Authorization', 'Add'.
   The message 'Authorization accepted' should appear.
5. Write the configuration into a transponder.
   Place the configuration card on the programmer and click 'Configuration', 'Write TXP'.
   The message 'Configuration data written' should appear.

The configuration can be saved in a bcf-file.

Operating mode

Operating modes:

Dual-ID (Vehicle-ID + Driver-ID)	Driver-ID max. 40 bits (=5 bytes) from LEGIC smart card.
Single-ID (only Driver-ID)	Driver-ID max. 80 (=10 bytes) bits from LEGIC smart card.

Extended Driver-ID operating modes:

Dual-ID (Vehicle-ID + Driver-ID)	Driver-ID max. 88 bits (=11 bytes) from LEGIC smart card.
Single-ID (only Driver-ID)	Driver-ID max. 128 bits (=16 bytes) from LEGIC smart card.

RFID Options

Enable ISO15693	Enables reading LEGIC Advant / ISO15693 cards.
Enable ISO14443A	Enables reading ISO14443A cards.
Enable LEGIC prime	Enables reading LEGIC Prime cards.
Enable Inside Contactless	Enables reading Inside Contactless cards (UID only).
Enable FeliCa *	Enables reading Sony Felica cards (UID only).
Enable ISO14443B *	Enables reading ISO14443B cards.

* Requires LEGIC Booster 2G or LEGIC Booster Ultimate

Search definitions

Specify what to search for on the LEGIC card. Up to 3 search definitions can be specified. If no match is found on search definition 1, then it will search for the second.

Search enable	Search enable: + Disabled + No authentication + With segment search
Segment number	Start segment number for searching with segment search stamp. First segment is segment number 1.
Segment type	Segment type to be read. + Any segment type + Data segment + Access segment
Segment stamp search	Search string to search a segment with a specific stamp.
Stamp length (prime only)	Stamp length for access to LEGIC prime transponders. This parameter is not used with LEGIC Advant transponders.

Data definitions

Specify which data to read. Up to 3 data definitions can be defined (A, B and C). These data definitions can be allocated to one or more search definitions.

Please make sure that the total length of the data does not exceed the maximum (depending upon the operating mode selected in Options). The total data length is determined by the data type, data length, constant data for all allocated data definitions. When the data length for the search definition exceeds the maximum the data will be truncated.

Allocation of data to search definition	Allocate the data definition to one or more search definitions. It is also possible to have more than one data definition allocated to the same search definition.

Data type	Type of transponder data to be read. + Unique ID + Segment stamp + Segment data
Data address	Start address of the first byte to read. Address 0 is the first byte. See also the 'Stamp length' setting in the search definition for prime transponders.
Data length (in bytes)	Number of data bytes to read.
UID options	UID formatting options: Only when reading Unique ID + Alignment left or right + Include size + ISO14443A reverse byte order (0x11223344 -> 0x44332211) + LEGIC Prime format (0x11223344 -> 0x11443322)
Data check	Enable data validation using CRC calculation across the read data (only for segment data). + No CRC check + CRC 8 bit (1 byte) + CRC 16 bit (2 bytes)
CRC address	Address of CRC when reading data.
CRC options (prime only)	CRC calculation for LEGIC prime transponders coverage. + Stamp + WRP/WRC/RD
Constant Data	For each data definition optionally 1 or 2 bytes of constant data can be added. This data can be located before or after the transponder data.

3.3.2 Example configuration

In this chapter will be explained how to setup the configuration to accept LEGIC transponders with a Kaba Group Header segment.

Operating Mode		
Operating mode	Dual-ID	Vehicle-ID and driver-ID.
Extended Driver-ID length	no	not used
RFID Options		
Enable ISO15693	yes	LEGIC Advant enabled
Enable ISO14443A	no	not used
Enable LEGIC prime	yes	LEGIC prime enabled
Enable Inside Contactless	no	not used
Enable FeliCa	no	not used
Enable ISO14443B	no	not used
Search Definition		
Search enable	With segment search	Search for a segment.
Segment number	1	Start searching at segment 1.
Segment type	Data segment	Segment must be a data segment.
Segment stamp search	02	Segment stamp should start with 02.
Stamp length	4	KGH defines a stamp length of 4 bytes.
Data Definition		
Allocation of data to search definition	1	Allocate data to search definition 1.
Data type	Segment data	Read data from the searched segment.
Data address	0	Start reading at first byte after the stamp.
Data length	3	Read 3 bytes.

3.3.3 Booster config files

Your configuration can be saved into a Booster Config File (*.bcf). These files contain all the configuration settings as you have defined them. Saved Booster Config Files can be easily opened from within the File menu.

3.4 Testing the configuration

The configuration can be tested on your read/write unit with the LEGIC cards that should be supported. This test can be performed before the configuration cards are created and without any LEGIC Boosters.

3.4.1 Start testing

Start reading by clicking 'Configuration', 'Test' and 'Start Reading' (or press F9).

When a transponder is found that meets the configured search definitions a message appears with the data that was read.

Note for programmers based upon SC-2560 chipset:
The test configuration is first transmitted to the programmer. This will be written to the programmer's RAM IDB settings. Next the software will send the AUTOREAD command.

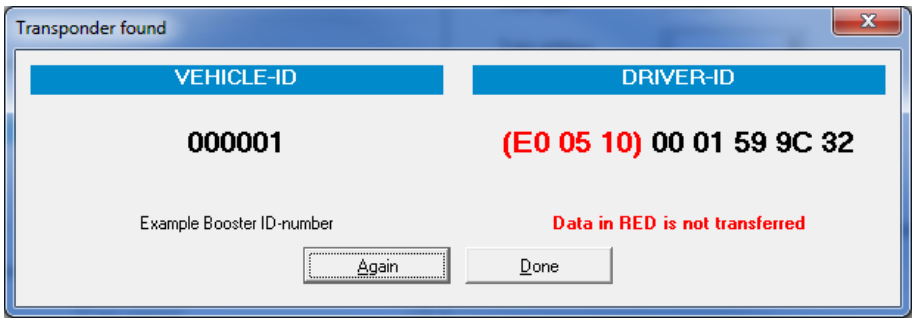


Figure 4: Read data information message

Click 'Again' to repeat the test or 'Done' to stop.

When no transponder is found, you can abort reading by clicking 'Stop Reading' in the 'Configuration', 'Test' menu (or press Shift + F9).

4 Usage information

4.1 Using the LEGIC Booster

Place the LEGIC Booster behind the windscreen of your vehicle as described in chapter 2.
The driver inserts his card and pushes the button on the LEGIC Booster.
A high beep indicates that the card was successfully read.
The TRANSIT reader can identify your LEGIC card up to a distance of 10 meters now.
After 5 seconds (or authentication for LEGIC Booster Ultimate) the LEGIC Booster returns into standby mode.
The driver should remove the LEGIC card from the LEGIC Booster when leaving the vehicle.

4.2 Reading the LEGIC Booster

The LEGIC Booster is battery operated passive tag. The information from the tag is sent to the reader by a method called modulated backscatter. This means that the reader's transmitted signal is modified by the LEGIC Booster in such way that it can be recognized by the reader. For the LEGIC Booster Ultimate an active 433MHz transmitter is used for secure authentication, this is done automatic.

The examples below assume that a TRANSIT reader with P81 firmware is used and show the messages transmitted on the RS232 interface to a host system (TXD). Refer to the reader firmware manual for more details about the reader communication protocol.

Dual-ID mode
The LEGIC Booster cannot be identified until the driver inserts his card and pushes the button. Once the button is pushed the LEGIC Bbooster reads the inserted card and sounds the buzzer upon a successful read. Both vehicle-ID and driver-ID are transmitted to the reader. After 5 seconds (or authentication for LEGIC Booster Ultimate) the LEGIC Booster automatically deactivates.
Example: vehicle-id = 123, driver-id = 7100944, TXD = U00000001230007100944 <CR><LF>

If 'Extended Driver-ID length' is enabled, the following message is transmitted to the host.
Example: vehicle-id = 123, driver-id = 7100944, TXD = Y00000001230000000000000007100944 <CR><LF>

Single-ID mode
The LEGIC Booster is 'sleeping' until the driver inserts his card and pushes the button. The LEGIC smart card is read and the data is transmitted to the host system. After 5 seconds (or authentication for LEGIC Booster Ultimate) the LEGIC Booster automatically deactivates again.
Example: driver-id = 871111111117100944, TXD = U008711111111117100944 <CR><LF>

If 'Extended Driver-ID length' is enabled, the following message is transmitted to the host.
Example: driver-id = 871111111117100944, TXD = Z000000000000008711111111117100944 <CR><LF>

5 Buzzer indications

The LEGIC Booster's built-in buzzer gives audible feedback upon various conditions. The table below describes the buzzer indications.

Description	Buzzer
Button pushed	Short tick
Transponder read	1 high beep
Transponder read (no match with search definitions)	1 low beep
Transponder failed to read (or no card)	no beep
Master Token SAM accepted	3 beeps increasing frequency ♪♪♪
Configuration card read successfully	3 beeps decreasing frequency ♪♪♪
Configuration card not accepted	1 long low beep
Configuration card read failed (e.g. card removed)	3 long low beeps
Power on (configuration preserved)	6 beeps increasing frequency ♪♪♪♪♪♪
Busy launching	2 beeps increasing frequency (repeating for 15 sec) ♪♪
Busy initializing (please wait)	2 long high beeps
Configuration reset	3 high beeps
Battery low (LEGIC Booster 2G)	Morse SOS (· · · – – – · · ·)
Authenticated (LEGIC Booster Ultimate)	2 short beeps increasing frequency ♪♪

6 Battery replacement

The LEGIC Booster contains two replaceable non-rechargeable AAA batteries. The average lifetime of these batteries is approximately 5 years. When replacement becomes necessary follow the procedure below.

1. Open the battery compartment.
2. Remove both batteries. Follow local environment protection laws / regulations for disposal of used batteries.
3. Replace with two new batteries of the same type. Make sure that the polarity matches the indicated polarity.
4. Close the battery compartment and verify if the LEGIC Booster is working properly.

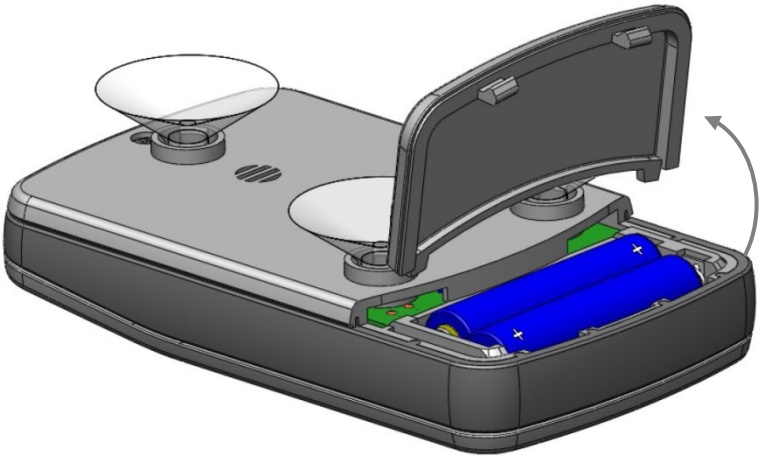


Figure 5: Battery replacement LEGIC Booster 2G and LEGIC Booster Ultimate

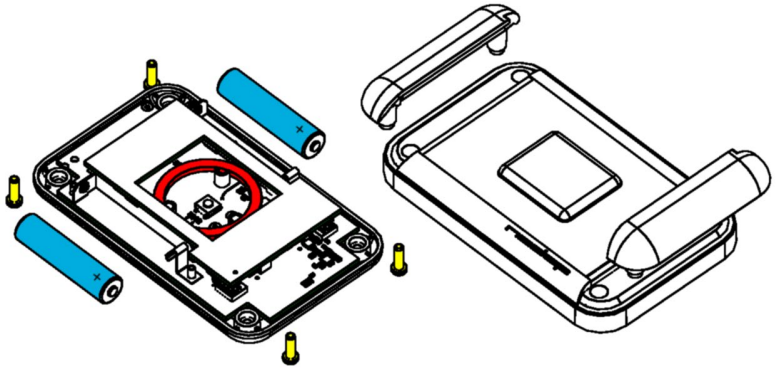


Figure 6: Battery replacement LEGIC Booster

A Technical specifications

ITEM	SPECIFICATION
Part numbers	9961798 – LEGIC Booster 2G 9982817 – LEGIC Booster Ultimate
Dimensions	111 x 65 x 24 mm
Weight	120 gram
Housing	PC and TPU
Color	Gray (RAL 7016 / RAL 7040)
Protection	IP32 (approx. NEMA 2)
Operating frequencies	2.45 GHz / 120 kHz / 13.56 MHz (433 MHz only LEGIC Booster Ultimate)
Operating temperature	-20°C ... +85°C
Storage temperature	-40°C ... +85°C
Relative humidity	10% ... 93% (non condensing)
Identification range	Typically 10 meters (line-of-sight required)
Power supply	2 x AAA batteries, expected lifetime up to 5 years
Certifications	CE, FCC and ISED

B Disposal of equipment

The products will be disposed of by the end-user and discharge Nedap for any liability or responsibility thereof.

The WEEE symbol in Europe indicates that the relevant electrical product or battery should not be disposed of as general household waste in Europe. To ensure the correct waste treatment of the product and battery, please dispose them in accordance to any applicable local laws of requirement for disposal of electrical equipment or batteries. In so doing, you will help to conserve natural resources and improve standards of environmental protection in treatment and disposal of electrical waste (Waste Electrical and Electronic Equipment Directive WEEE 2012/19/EU).

C CE declaration

Hereby, Nedap N.V. declares that the subject equipment is in compliance with directives 2014/53/EU (Radio Equipment Directive) and 2011/65/EU (RoHS). The full text of the EU declaration of conformity is available at the following internet address: https://portal.nedapidentification.com.

D FCC / ISED declaration

LEGIC Booster 2G	**FCC ID: CGDBOOSTER6 and IC: 1444A-BOOSTER6**
LEGIC Booster Ultimate	**FCC ID: CGDBOOSTER11 and IC: 1444A-BOOSTER11**

FCC and ISED Compliance statement

This device complies with part 15 of the FCC Rules and contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) this device may not cause interference and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
Les changements ou modifications n'ayant pas été expressément approuvés par la partie responsable de la conformité peuvent faire perdre à l'utilisateur l'autorisation de faire fonctionner le matériel.

FCC and ISED Radiation Exposure Statement

This equipment complies with FCC (OET Bulletin 65) and Canadian radiation exposure limits set forth in RSS-102 for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 0 mm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Cet équipement est conforme à CNR-102 limites énoncées pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 0 mm entre le radiateur et votre corps.

ISED EMC Declaration

This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de Classe B est conforme à la norme Canadienne ICES-003.

FCC Information to the user

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

E Document revision

Version	Date	Comment
4.8	2020-09-01	HR update: FCC and ISED compliance statement
4.7	2020-08-13	HR corporate style and regulations updated
4.6	2019-01-22	HR update: software version 3.0: added support for SM-4500 programmer
4.5	2016-03-23	Added document number
4.4	2015-05-06	CD update
4.3	2015-05-06	TA update with LEGIC Booster Ultimate
4.2	2015-03-23	TA reviewed and refreshed
4.1	2014-04-29	HR update
4.0	2014-02-13	Layout adjusted to new corporate style.