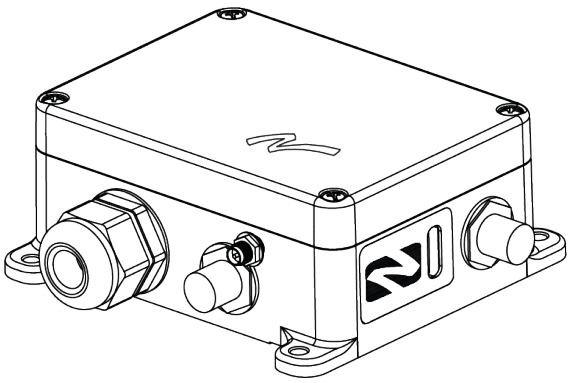
tele radio®
wireless solutions

safe smart strong

END USER INSTRUCTIONS

Receiver: R21-RS02



ED-PM-RX103-EN-v03
Language: English (original)

R21

IMPORTANT! This product is built on base model R21-02.

Datavägen 21

SE-436 32 Askim

Sweden

Phone: +46 (0)31 748 54 60, Email: info@tele-radio.com

CHAPTER 1: INTRODUCTION

Thank you for using a Tele Radio AB product

READ ALL INSTRUCTIONS AND WARNINGS CAREFULLY BEFORE OPERATING THE PRODUCTS.

These End user instructions have been published by Tele Radio AB and are not subject to any guarantees. The End user instructions may be withdrawn or revised by Tele Radio AB at any time and without further notice. Corrections and updates will be added to the latest version of the manual. Always download the End user instructions from our website, www.tele-radio.com, for the latest available version. Keep the safety instructions for future reference.

IMPORTANT! These instructions are intended for end users. The instructions can be printed and handed to end user.

Tele Radio AB remote controls are often built into wider applications. This documentation is not intended to replace the determination of suitability or reliability of the product for specific user applications and should not be used for this purpose. It is the responsibility of any such users or integrators to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use. Tele Radio AB shall not be responsible or liable for misuse of the information contained herein.

Always refer to the applicable local regulations for installation and safety requirements relating to cranes, hoists, material handling applications, lifting equipment, industrial machinery, and/or mobile hydraulic applications using Tele Radio AB products, e.g.:

- applicable local and industrial standards and requirements,
- applicable occupational health and safety regulations,
- applicable safety rules and procedures for the factory where the equipment is being used,
- user and safety manuals or instructions of the manufacturer of the equipment where Tele Radio AB remote control systems are installed.

Tele Radio AB End user instructions do not include or address the specific instructions and safety warnings of the end product manufacturer.

Tele Radio AB products are covered by a warranty against material, construction, or manufacturing faults. See "Chapter 8: Warranty, service, repairs, and maintenance".

1.1 About this document

Before installing or operating the product, read the corresponding documentation carefully.

Tele Radio AB's product range is composed of transmitters, receivers, and accessories intended for use together as a system.

R21 systems are mainly intended for the hydraulic and mobile equipment markets. These systems are not standardized but customized and adapted to each customer's needs. How the outputs are connected to control the object depends on each specific installation and will not be covered in this document. For exact details, see the technical documentation provided for your specific system. Drawings, schematics and connection diagrams are unique and are also provided together with the system. Images shown in this document may therefore not show the exact position of buttons, paddles and are for illustrative purposes only.

These End user instructions cover main technical specifications and standard operating instructions.

Please report any error or omission in this document, as well as any improvement or amendment suggestion to td@tele-radio.com.

1.1.1 COPYRIGHT

1.1.2 TERM AND SYMBOL DEFINITIONS

The capitalized terms and symbol used herein shall have the following meaning:

- WARNING: indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- CAUTION: indicates a hazardous situation which, if not avoided, will result in minor or moderate injury.
- IMPORTANT: is used for information that requires special consideration.
- NOTE: is used to address practices not related to physical injury.

This symbol is used to call attention to safety messages that would be assigned the signal words "WARNING" or "CAUTION".

1.2 About this system

Tele Radio AB's remote control systems are suitable for a wide variety of applications for e.g. stationary or mobile equipments, hydraulic machines, construction, forestry or agriculture equipments and more. Tele Radio AB's transmitters and receivers are highly customizable and can be configured to suit the most wide-ranging application requirements & usage habits.

1.2.1 ABOUT R21 RECEIVERS

R21 receivers have duplex communication and work in continuous mode.

There is one standard model available.

	Connectors	**Base board**	**Expansion boards**			
			CAN	**RS485**	**A/D IOs**	**8-relay**
R21-RS02*	M12 (2) and RP-SMA	●	● (1)	● (1)	○	○

● Standard ○ Optional[1] – Not available

*This product is built on base model R21-02.

1.2.2 COMPATIBILITY

This receiver is compatible with all transmitters and receivers in the Puma range.

[1]Must be purchased separately.

CHAPTER 2: SAFETY

2.1 Warnings & restrictions

Carefully read through the following safety instructions before proceeding with the installation, configuration, operation, or maintenance of the product. Failure to follow these warnings could result in death or serious injury.

This product must not be operated without having read and understood the End user instructions , the specific technical documentation (for customized systems), and having received the appropriate training. The purchaser of this product has been instructed how to handle the system safely. The following information is intended for use as a complement to applicable local regulations and standards.

IMPORTANT! Tele Radio AB remote controls are often built into wider applications. These systems should be equipped with:

- **a wired emergency stop where necessary**
- **a brake**
- **an audible or visual warning signal**

2.1.1 OPERATION

This radio system must not be used in areas where there is a risk of explosion.

This equipment is not suitable for use in locations where children are likely to be present.

Only qualified personnel should be permitted to access the transmitter and operate the equipment.

- **Always follow operating and maintenance instructions as well as all applicable safety procedures and requirements.**
- **Do not open the receiver encapsulation unless you are qualified.**
- **You must satisfy the age requirements in your country for operating the equipment.**
- **It is strictly prohibited to operate the equipment under the influence of drugs, alcohol and/or medications.**

- **Always test the transmitter stop button before operating it. Press the stop button then twist and pull it out. This test should be done on each shift, without a load.**
- **Never use a transmitter if the stop button is mechanically damaged.Contact your supervisor or representative for service immediately.**
- **Never leave the transmitter unattended.**
- **Always switch the transmitter off when not in use. Store in a safe place.**
- **Keep a clear view of the work area at all times.**

2.1.2 MAINTENANCE

Before maintenance intervention on any remote controlled equipments:
• always remove all electrical power from the equipment.
• always follow lockout procedures.

- Keep the safety information for future reference. Always download the End user instructions from our website, www.tele-radio.com, for the latest available version.
- If error messages are shown, it is very important to find out what caused them. Contact your representative for help.
- The functionality of the stop button should be tested at least after every 200 hours' use (see "Stop button" on page 1).
- If the stop button is mechanically damaged, do not use the transmitter. Contact your supervisor or representative for service immediately.
- Do not try to open the encapsulation.
- Always contact your representative for service and maintenance work on the product.
- Keep contacts and antennas clean.

- Wipe off dust using a clean, slightly damp cloth.
- Never use cleaning solutions.
- Check the encapsulation, foils and cable for damages every day. If you use the product although the encapsulation or foil is damaged, moisture can cause serious damage to the electronics.

CHAPTER 3: TECHNICAL DATA

NOTE: The information below may differ in customized systems, please refer to the corresponding technical documentation provided with each system.

3.1 System specifications

Radio frequency band	2405 – 2480 MHz
Frequency management	Direct Sequence Spread Spectrum (DSSS) Field Strength Adaptation Feature
Number of Channels	16 (channel 11 – 26)
Range (typical)	100 m (328 ft), adjustable depending on configuration
System address	32 bit – 4 294 967 295 possibilities
Data format	250 kbit/s
Hamming distance	6
Pairing (registration)	Easy to pair without tools and without opening the receiver housing.
Configuration	Display menu

3.2 Receiver specifications

3.2.1 COMMON SPECIFICATIONS

	R21
Power supply	12–24 V DC (-50%...+35%), max. 7 A
Number of stop relays Max. resistive load	2, potential free[1] 6 A, 30 V DC
Available slots for expansion boards	6[2]
Number of logical digital inputs	up to 4
Number of logical digital outputs	up to 2
Number of Safe I/Os	4 x 10 A
Bus system/ com. protocols standard:	 CAN (J1939 or CANopen)

[1]* Potential free means that a supply voltage is needed to get voltage out of a relay.

[2]E.g. I/Os expansion board (digital and/or analog) or 8-relay expansion board (NO/NC)

	R21
optional:	RS485 (Modbus RTU)[1] Secondary CAN (J1939 or CANopen). NOTE: The two CAN ports can be used for both CANopen and J1939 but **only one CAN port at a time can be used for CANopen**, whereas J1939 can be run in parallel on both ports.
Radio communication	Duplex
Radio frequency output power	EIRP[2] < 12.5 dBm (18 mW)
Antenna	Internal (external passive and active antennas as an option)
Max. number of registered transmitters	32
Data logger	64 Mbit log memory
Backup battery[3]	3 V Lithium (CR 2032X)
Power protection	Built-in reverse polarity, overvoltage and undervoltage protections
Fuse	Self resetting
Safety levels	EN IEC 61508 SIL 3, EN ISO 13849-1, PLe CAT3 (Stop function).
IP code	IP65
Operating temperature	-20...+55 °C / -4...+130 °F
Storage temperature	-30...+80 °C / -22...+176 °F
Dimensions (LxWxH)	120 x 117 x 51 mm / 4.7 x 4.6 x 2.0 in
Weight (typical)	400 g / 0.8 lbs

[1]Modbus RS485 RTU is often unique and must be configured depending on the application/customer's need, therefore no standard configuration is provided. Contact your representative for assistance.

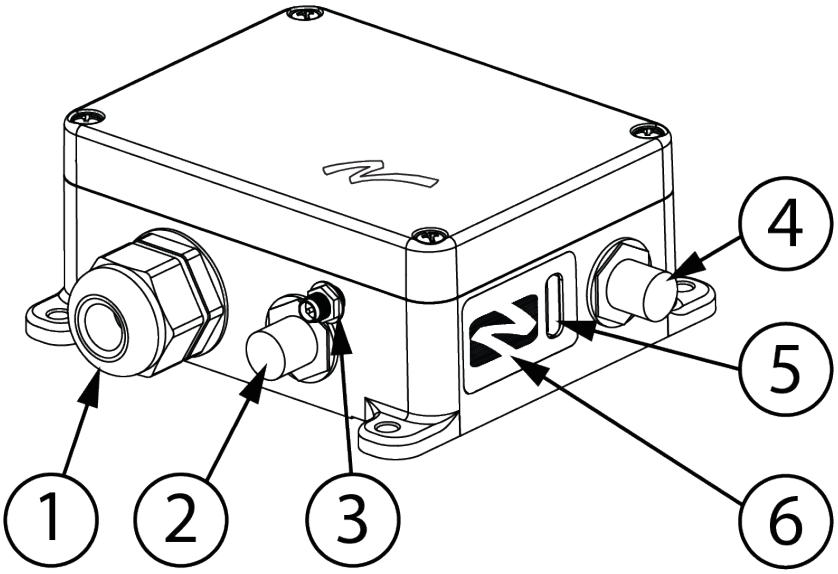
[2]Equivalent isotropic radiated power

[3]For clock backup in case of power disruption/failure. See "7.2 Battery information"

CHAPTER 4: PRODUCT GENERAL DESCRIPTION

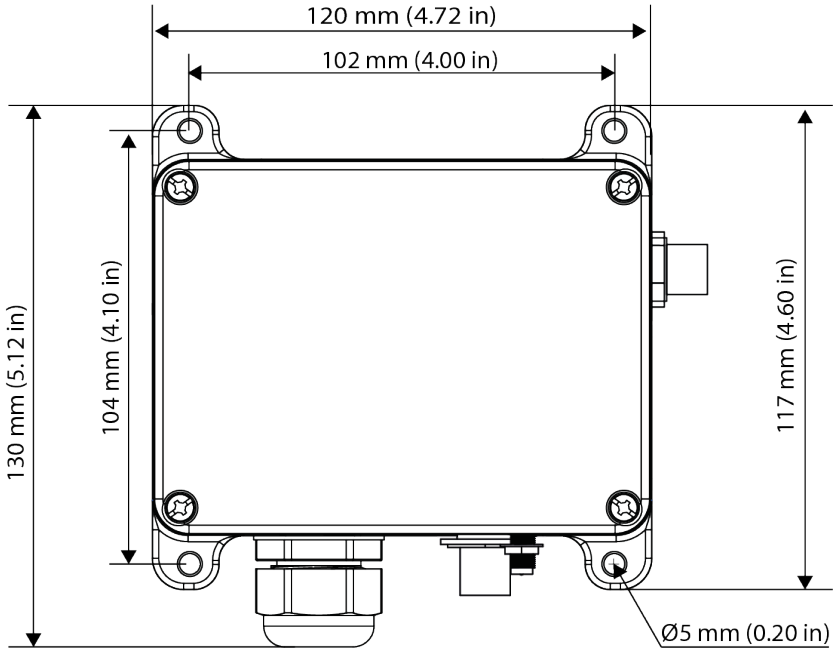
NOTE: The pictures shown in this chapter are for illustrative purposes only. Depending on the configuration, the actual product appearance may differ from the basic model used for reference.

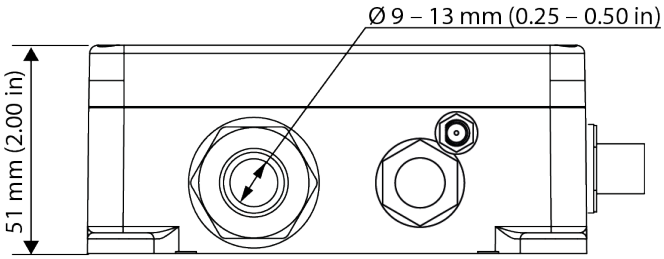
4.1 Receiver description



1. Power cable gland (M20)
2. M12 male connector (CAN bus)
3. RP-SMA connector
4. M12 female connector (cable control)
5. LED indicators
6. Capacitive sensor button (Cap sensor button)

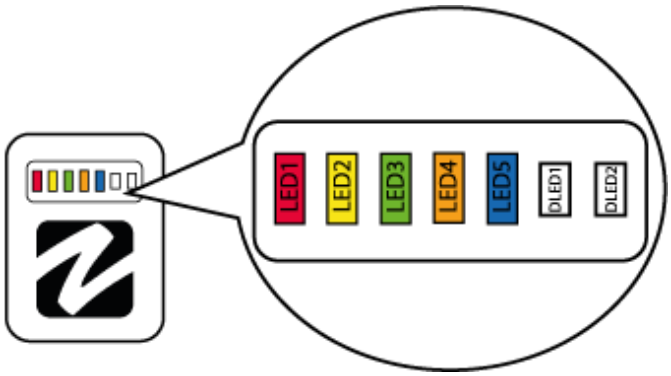
4.2 Mounting dimensions





NOTE: For mounting on a wall or equipment, use 4 M5x30 mm screws or equivalent fastening method.

CHAPTER 5: STATUS AND ERROR INDICATIONS



LEDs 1–5 indicate errors and status for the receiver, DLEDs 1–2 indicate errors and status for CANopen.

5.1 Receiver's status and error codes

LED	Color	Off	On	Flashing	Indicates
1	red		●		One or more transmitters is registered, radio link established
		○			No transmitter is registered
				●	One or more transmitters is registered, no radio link.
2	yellow		●		One transmitter is logged in
		○			No transmitter is logged in
3	green	–	–	–	Not used
4	orange	–	–	–	Not used
5	blue	–	–	–	Not used

● LED is lit ○ LED is off

5.2 CANopen (DLEDs) run status

DLED color	On	Flickering (red/ green alternately)	Single flash	Blinking
Green	Operational state	LSS	Stopped state	Pre-operational state

CANopen communication state	Description
Operational	State for process data transmission.
LSS	LSS services in progress.
Stopped	Except for node guarding or heartbeat messages, a node cannot transmit or receive any other messages in this state.
Pre-operational	State for the configuration of CANopen devices. PDO communication is not possible in this state.

5.3 CANopen (DLEDs) error status

DLED color	On	Flickering (red/ green alternately)	Single flash	Double flash	Triple flash
Red	Bus off	LSS	Warning limit reached	Error control event	Sync error

Contact your representative for assistance.

5.4 J1939 (DLEDs) run status

DLED color	On	Single flash
Green	Operational	No address

J1939 communication state	Description
Operational	Address claim is correct, processing messages.
No address	Address claim is still running or has failed.

5.5 J1939 (DLEDs) error status

DLED color	On	Single flash
Red	Bus off	Warning limit reached

Contact your representative for assistance.

CHAPTER 6: OPERATION

6.1 General information

To control a receiver, the transmitter must be registered and logged in to the receiver. If another transmitter is already logged in to the receiver, it must be logged out before a different transmitter can be logged in.

More than one transmitter can be registered in the receiver, but only one transmitter can be logged in at a time.

6.2 Register a transmitter in a receiver

Registering means establishing communication between the transmitter and the receiver.

R21 receivers can have up to 32 registered transmitters.

NOTE: The registration instructions require access to the receiver housing. For the registration procedure to be successful, the receiver must be powered up.

RISK OF UNINTENDED EQUIPMENT OPERATION
Only transmitters that are intended for use should be registered in the receiver.
Failure to follow these instructions could result in death, serious injury, or equipment damage.

RISK OF UNINTENDED EQUIPMENT OPERATION
Do not perform this action when the receiver is in a session with another transmitter. The radio communication may be interrupted or broken.
Failure to follow these instructions could result in death, serious injury, or equipment damage.

On the Receiver

1. Power the receiver up.
   LED 1 is flashing (red).
2. Press and hold the **Cap sensor** button until LED1 stops flashing.
   LEDs 2–5 flash (fast).
3. Release the **Cap sensor** button.
   LEDs 1–5 flash (slow).
   The receiver is now in registration mode.
   If no register command is received within 30 seconds, the receiver will exit registration mode.[1]

On the Transmitter

4. Make sure that the **Stop** button is pressed.
5. Turn the key switch to the 'On' position (horizontal).
6. Twist and release the **Stop** button.
   The initial start-up logo is displayed.Battery indicator(s) light (s).The display shows:`[Session Selection]`.
7. Enter **Menu mode**(see corresponding transmitter's manual).
8. Navigate to the `[Register]` menu using the **Up/Down** buttons.
9. Press the **Select** button to enter.
10. Choose a location for the receiver to be registered in using the **Up/Down** buttons.
11. Press the **Select** button to select.
    A + sign is displayed in front of the selected location.
12. Press the **Back** button to accept.
    The display shows:`[Registration in progress…]`

When the transmitter's register command is received, …

On the Receiver	On the Transmitter
LEDs 1–5 flash (fast).	*The display shows:*`[Confirm registration on the receiver]`.
12. Press the **Cap sensor** button for at least 2 s. *LEDs 1–5 flash three times.*	*The display shows:*`[Registration successful. Transmitter was registered in HY-RX-xxxxx]`.

[1]It is also possible to exit registration mode by briefly touching the receiver's cap sensor button.

The transmitter is now registered.

On the Receiver	On the Transmitter
LED 1 is flashing (slow).	*The transmitter turns off.*

If not successfully completed:

On the Receiver	On the Transmitter
The receiver exits registration mode. *LED 1 is flashing (red).*	*The display shows:* `[Registration failed Timout]`. The transmitter turns off. Go back and proceed from step 2.

6.3 Log all transmitters out with the receiver

Logging out means stopping the communication between the transmitter and the receiver.

NOTE: This logout option should be used when a lost or damaged transmitter must be logged out from the receiver.

NOTE: If a transmitter has been lost or seriously damaged, use the replace procedure on the transmitter whenever possible.

1. Press and hold the receiver **Cap sensor** button until LED2 stops flashing.
   LED1 goes off, LED2 is lit, LEDs 3–5 keep flashing rapidly.
2. Release the **Cap sensor** button.
   LEDs 1 and 5 flash slowly.
   The logged in transmitter has been logged out. Any registered transmitter can now log in.

CHAPTER 7: BATTERY

7.1 Battery precautions

Carefully read the following safety instructions and warnings before using or disposing of the batteries.

Batteries contain flammable substances such as lithium or other organic solvents, which may result in overheating, rupture or combustion. Failure to read and follow the below instructions may result in fire, personal injury and damage to property if charged or used improperly.

7.1.1 HANDLING AND STORAGE

- **Do not short-circuit, disassemble, deform or heat batteries.**
- **Do not use or charge the battery if it appears to be leaking, deformed or damaged in any way.**
- **Do not solder directly onto batteries.**
- **Store in a cool location. Keep batteries away from direct sunlight, high temperature, and high humidity.**
- **Keep batteries out of reach of small children. Should a child swallow a battery, consult a physician immediately.**

7.1.2 DISPOSAL

When discarding batteries, insulate the + and - terminals of batteries with insulating/ masking tape.

- **Do not place multiple batteries in the same plastic bag.**
- **Do not incinerate or dispose of batteries in fire.**
- **Do not place used batteries in the household waste. Dispose of used batteries in accordance with the applicable regulations and legal requirements.**
- **Batteries that have been disposed of incorrectly may short circuit, causing them to become hot, burst or ignite.**

7.2 Battery information

Keep batteries out of reach of small children. Should a child swallow a battery, consult a physician immediately.

R21 receivers are equipped with one button cell for clock backup in case of a main power failure. If the button battery is drained when a main power failure occurs, the time indicator will show the default date and time. Default date and time will also be used by the real time log.

BATTERY	
Article number	CR2032X
Battery type	Non-rechargeable, replaceable, lithium battery
Weight (typical)	3 g (0.10 oz)
Voltage	3 V / ~220 mAh
Service life	~ 750 h @20 °C 15k load
Self-discharge	~1–2% / year

NOTE: Electronics and batteries must be physically separated before disposal. Make sure that electronics or batteries are not disposed of in household waste.

7.2.1 REPLACE THE BACKUP BATTERY

Contact your representative for assistance.

CHAPTER 8: WARRANTY, SERVICE, REPAIRS, AND MAINTENANCE

Tele Radio AB products are covered by a warranty against material, construction and manufacturing faults. During the warranty period, Tele Radio AB may replace the product or faulty parts. Work under warranty must be performed by Tele Radio AB or by an authorized service center specified by Tele Radio AB.

The following are **not** covered by the warranty:

- Faults resulting from normal wear and tear
- Parts of a consumable nature
- Products that have been subject to unauthorized modifications
- Faults resulting from incorrect installation and use
- Damp and water damage

Maintenance

- Repairs and maintenance must be performed by qualified personnel
- Only use spare parts from Tele Radio AB
- Contact your representative for service or any other assistance
- Keep contacts and antennas clean
- Wipe off dust using a slightly damp, clean cloth

  NOTE: Never use cleaning solutions or high-pressure washer.

CHAPTER 9: REGULATORY INFORMATION

NOTE: Models including additional naming conventions:

Model	Article names	Additional naming conventions
R21	**R21-02**	HY-R21-2

9.1 Europe

Applies to:

R21-02, R21-RS02

9.1.1 CE MARKING

CE

Hereby, Tele Radio AB, declares that the radio equipment type(s) listed above is/are in compliance with the Radio Equipment Directive 2014/53/EU.

The latest version of the complete EU Declaration of Conformity is available on the Tele Radio AB website, www.tele-radio.com.

9.1.2 WEEE DIRECTIVE

This symbol means that inoperative electrical and electronic products must not be mixed with household waste. The European Union has implemented a collection and recycling system for which producers are responsible. For proper treatment, recovery and recycling, please take this product to a designated collection point.

Tele Radio AB strives to minimize the use of hazardous materials, promotes reuse and recycling, and reduces emissions to air, soil and water. When a commercially viable alternative is available, Tele Radio AB strives to restrict or eliminate substances and materials that pose an environmental, health or safety risk.

9.2 North America

Applies to:

R21, R21-01, R21-02

9.2.1 FCC STATEMENT

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

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

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.

To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.

9.2.2 IC STATEMENT

This product complies with Industry Canada's licence-exempt RSSs. 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 device.

Le présent appareil est conforme aux CNR d'Industrie 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;

2) l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Gain of antenna: 3.0 dBi max.

Type of antenna: 50 ohm, Omni-directional

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous ayant le gain admissible maximal et l'impédance requise pour chaque type d'antenne indiqué. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Gain d'antenne: 3.0 dBi maximum

Type d'antenne: 50 ohm, omnidirectionnel

To satisfy IC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended.

Afin d'assurer la conformité aux exigences de la IC en matière d'exposition aux RF, une distance de séparation d'au moins 20 cm doit être maintenue entre l'antenne de cet appareil et toute personne à proximité pendant le fonctionnement de l'appareil. Pour assurer le respect de ces exigences, il n'est pas recommandé d'utiliser l'appareil à une distance inférieure à celle-ci.

9.2.3 FCC/IC LABELS

The radio module in this product is labeled with its own FCC ID and IC numbers. The FCC ID and IC numbers are not visible when the radio module is installed inside another device. Therefore, the outside of the device into which the module is installed must also display a label referring to the enclosed radio module. The final end device must be labeled in a visible area with the following:

“Contains FCC ID: ONFC1602A”

“Contains IC: 4807A-C1602A”

The FCC and IC numbers are found on the product label.

9.2.4 RADIO MODULE

The products described in these instructions contain the radio modules:

PRODUCT	RADIO MODULE
R21	D00005-15

9.3 EAC

Applies to:

R21-01, R21-02, R21-RS02

9.3.1 EAC STATEMENT (ДЕКЛАРАЦИЯ EAC)

This product is declared as compliant within Eurasian Economic Union (EAC). EAC declaration is available on request.

ANNEX A: INDEX

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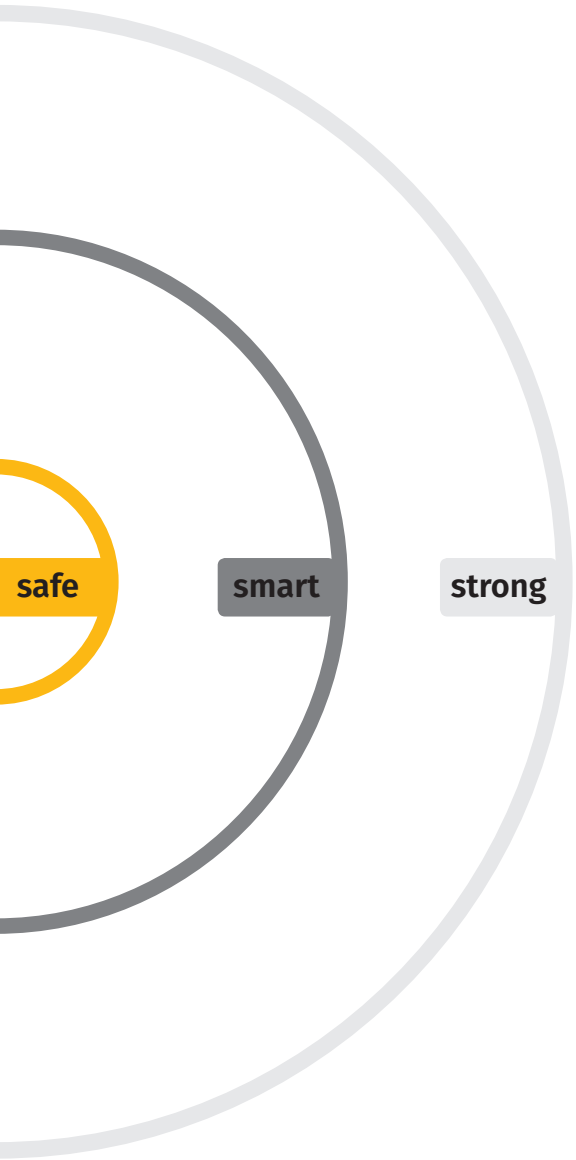

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wireless solutions

These End user instructions are subject to change without prior notice.
Download the latest instructions from *www.tele-radio.com* .