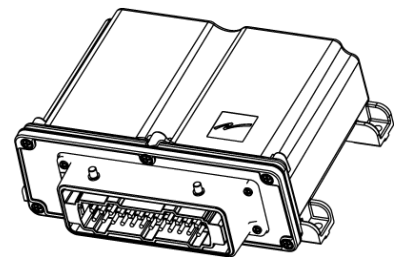
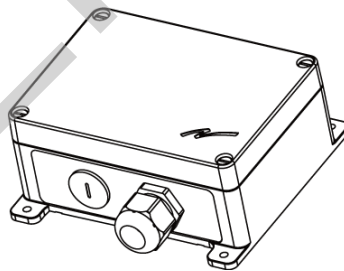


INSTALLATION INSTRUCTIONS

Receivers: R23-01,

*R23-03, R23-08,
R23-11, R23-13*

*R23-02, R23-04,
R23-09, R23-12,
R23-14*



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CHAPTER 1: INTRODUCTION

Thank you for purchasing a Tele Radio AB product



READ ALL INSTRUCTIONS AND WARNINGS CAREFULLY BEFORE MOUNTING, INSTALLING, CONFIGURING AND OPERATING THE PRODUCTS.

These Installation instructions have been published by Tele Radio AB and are not subject to any guarantees. The Installation instructions may be withdrawn or revised by Tele Radio AB at any time and without further notice.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 Installation 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 installers and authorized service and distribution centers. The instructions containing information about the installation and configuration of the radio remote control unit on the machine are NOT intended to be passed on to the end user. Only information that is needed to operate the machine correctly by radio remote control may be passed on to the 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 Installation 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 10: 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.

Tele Radio AB Installation instructions covers main technical specifications, standard installation, configuration and operating instructions , and general troubleshooting.

Should you find any errors of omissions in this documentation, or if you have any suggestions for improvements or amendments, please inform us.

1.1.1 COPYRIGHT

Information in this document is subject to change without notice. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, photographic, mechanical (including photocopying), recording or otherwise for any purpose other than the purchaser's personal use without the written permission of Tele Radio AB.

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 R23 receiver

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.

R23 receivers meet the strictest safety standards and achieved product certifications CAT4 PLd.

NOTE: To comply with Category 4 system architecture, it is mandatory that all parts of the system, including any subsystems, machinery, and any additional devices or hardware such as the wireless radio control receivers and transmitter, are all rated to the category 4 safety level (see "Chapter 3: Functional safety").

R23 receivers have simplex communication with support for duplex and can work in either discontinuous or continuous mode.

There are 9 models available:

	Housing type		Main board	Expansion boards			Bus system
	1 (yellow / black)	2 (black)	10 relays TR702	5 relays TR703	14 relays TR701	DI TR704	CAN/ RS485
R23-01	●		●				
R23-02		●	●				
R23-03	●		●	●			
R23-04		●	●	●			
R23-08	●		●				●
R23-09		●	●				●
R23-11	●		●	●	●	●	
R23-12		●	●		●		
R23-13	●		●	●	●	●	●
R23-14		●	●	●		●	●

● Standard

○ Optional

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 Installation 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 INSTALLATION AND COMMISSION

IMPORTANT! Only licensed or qualified personnel should be permitted to install the product.



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



Always switch off all electrical power from the equipment before installation procedure.



To utilize the safety features of the system, use the stop relays in the safety circuitry of the object/ equipment to be controled.



When the equipment controlled by the receiver's standard relays is connected via the stop relays, make sure that the maximum current through the stop relays is still within the specifications. Contact your representative for assistance.



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 ELECTRIC SHOCK

The receiver must only be opened by qualified installers or authorized personnel.

Make sure the power supply is switched off before opening the receiver. Failure to follow these instructions could result in death, serious injury, or equipment damage.



- The receiver must be securely attached and located where it will not be hit by e.g. any moving parts.
- Do not install the product in areas affected by strong vibrations
- Cable glands and vent plugs must face downwards to prevent water ingress.
- Ensure that the power supply is connected to the correct terminals.
- Ensure that flexible cords and cables are not damaged through friction or stress.
- Do not use damaged cables.
- Ensure cables and connectors do not hang loose.

- The receiver product is designed to withstand normal weather conditions but should be protected from extreme conditions.
- Mount the receiver product in a location where the LEDs are easily visible and the button on the receiver accessible.
- Make sure to install available accessories inside or on the receiver before permanently installing the receiver.

2.1.2 OPERATION



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



- **Make sure that the user satisfies the age requirements in your country for operating the equipment.**
- **Make sure that the user is not under the influence of drugs, alcohol and medications.**
- **Make sure that the user knows and follows operating and maintenance instructions as well as all applicable safety procedures and requirements.**

The user should:



- **Always test the transmitter stop button before operating it. 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.**

2.1.3 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 Installation 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.**

-
- If the stop button is mechanically damaged, do not use the transmitter. Contact your supervisor or representative for service immediately.
 - 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. If the encapsulation or foil is damaged, moisture can cause serious damage to the electronics.

PRELIMINARY

CHAPTER 3: FUNCTIONAL SAFETY

NOTE: The information in this section applies only to the products specified below.

3.1 Safety function

The safety-related stop function in the radio system complies with EN ISO 13849-1:2015 Category 4 PLd. The stop relays on the receiver unit are controlled by the stop button on the transmitter unit. When the stop button is pressed, the stop relays interrupt the power to the safety-related application. The complete end-user system, including the radio system, enters a safe state. The maximum response time for the safety-related stop function is 500 ms.

PN-R23 could also be used in applications for which the safety related parts of the control system implementing the safety function is required to fulfill category 4 specifically (e.g. by type C standards) in addition to the performance level required. In these cases, the following information applies:

To comply with category 4 system architecture, it is required that all parts of the system including subsystems, machinery, transmitters and receivers are all rated to the category 4 safety level.

NOTE: The system is assumed to be a combination of the machinery and its internal workings/control system plus any additional devices or hardware such as the wireless radio control receivers and transmitter.

When including a category 4 device or subsystem in a category 3 rated system then the overall system is considered to be in compliance with the lower rated category.

NOTE: The overall achieved PL must be verified to comply with the performance level required assigned to the safety function for the whole combination of subsystems regardless of which category the individual subsystems fulfill.

Safety function	Mission time	MTTFd	DCavg	Category	Achieved PL
Stop function	20 years	100 years	99%	4	d

** put schematics here **

3.2 Applicable products

The following products are designed to comply with the appointed safety requirements when used together with a R23 receiver:

Product type	Model	Safety requirement fulfilled by the product	Achieved PL for the system: R23 + model
Transmitter	PN-T19-2	EN ISO 13849-1:2015 Category 3 PL d	Cat 3 PL d
Receiver	PN-R15-xx	EN ISO 13849-1:2015 Category 3 PL d	Cat 3 PL d
Receiver	PN-R23-xx	EN ISO 13849-1:2015 Category 4 PL d	Cat 4 PL d

NOTE: Both the receiver and the transmitter used in the specific end-user system must be compliant.

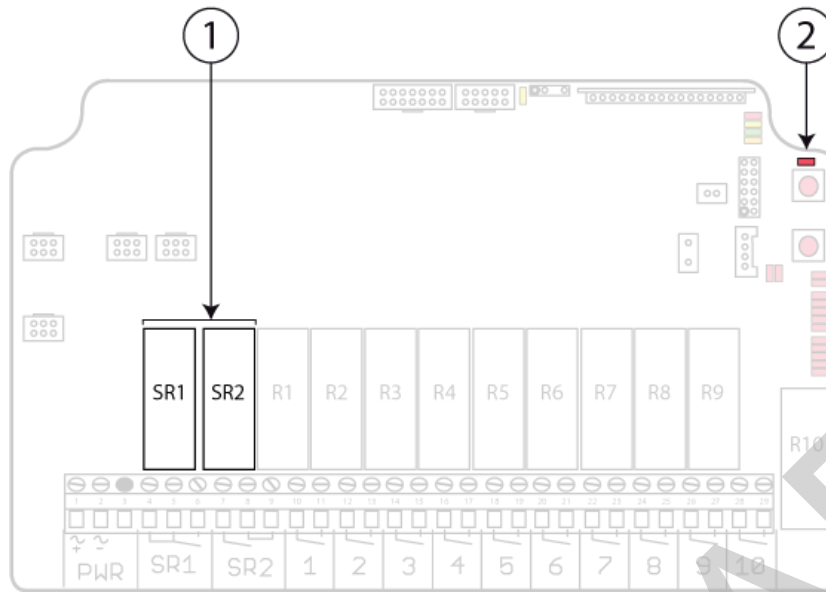
3.3 Installation

The stop relays on the receiver unit must be correctly installed on the end-user system, to ensure that opened/deactivated stop relays interrupt the power to the safety-related application. The safety level of the stop function can only be credited when used in a complete end-user system that complies with EN ISO 13849-1:2015 Category 4 PLd.

3.4 Configuration

The default configuration of the receiver unit complies with the appointed safety requirements. Any reconfiguration that breaches the safety requirements will be indicated by a LED on the main board of the receiver unit. Before commissioning the radio system, the installer must check the LED indication.

Function LED	Status	Indicates
PLd status LED (red)	ON	Not compliant with PLd
	OFF	Compliant with PLd



1. Stop relays SR1-2

2. PLD status LED (red)

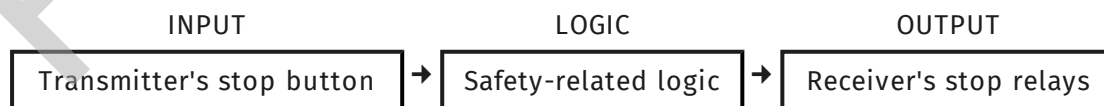
NOTE: All safety-related parameters must be configured as follows in order to comply with the appointed safety requirements:

- The system must be configured in continuous radio mode
- The stop relays must be switched off when the radio link is down
- The radio link timeout must be set to a maximum of 500 ms
- The login/logout function must be activated
- The Custom ID setting must be deactivated, i.e. the receiver must always use the unique transmitter ID code

3.5 Interface

The radio system comprises one SRP/CS (as defined in EN ISO 13849-1:2015), including the stop button (input), the stop relays (output) and the safety-related logic maintaining the stop function (logic).

The interfaces to the SRP/CS are the stop button (as controlled by the operator) and the stop relays.



→: Interconnection

CHAPTER 4: TECHNICAL DATA

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

4.1 Receiver specifications

4.1.1 COMMON SPECIFICATIONS

Input power	12–24 V AC/DC, 48–230 V AC, 50–60 Hz, max. 1 A
Number of stop relays	2 (potential free ¹ , 10 A, 250 V AC)
Relay functionality	Momentary, latching, interlocking (programmable)
Radio type	Low IF topology
Frequency band	2405–2480 MHz
Number of channels	16 (channel 11–26)
Radio communication	Simplex (default), support for duplex
Radio frequency output power	Info needed
Max. number of registered transmitters	16
IP code	IP66
Safety levels	Cat 4 PLd (stop function, see "Chapter 3: Functional safety")
Operating temperature	-20...+55 °C / -4...+130 °F

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

4.1.2 R23-01, R23-03, R23-08, R23-11, R23-13 (HOUSING 1)

	R23-01	R23-03	R23-08	R23-11	R23-13
Number of relays	10	15	10	29	29
	potential free ¹ , 10 A, 250 V AC				
Number of digital inputs	–	–	–	8	8
Number of digital outputs	2	5	2	7	7
Bus system	–	–	CAN/ RS485	–	CAN/ RS485
Dimensions	176 x 160 x 75 mm / 6.9 x 6.3 x 3 in				
Weight	745 g / 1.64 lbs	832 g / 1.83 lbs	745 g / 1.65 lbs	935 g / 2.06 lbs	1053 g / 2.32 lbs
Connector	Cable gland M25 x 1.5 (PA66)				
Antenna	External antenna				

4.1.3 R23-02, R23-04, R23-09, R23-12 (HOUSING 2)

	R23-02	R23-04	R23-09	R23-12	R23-14
Number of relays	10	15	10	24	15
	potential free, 10 A, 250 V AC				
Number of digital inputs	–	–	–	–	8
Number of digital outputs	2	5	2	4	7
Bus system	–	–	CAN/ RS485	–	CAN/ RS485
Dimensions	209 x 147 x 71 mm / 8.23 x 5.8 x 2.8 in				
Weight	919 g / 2.02 lbs	943 g / 2.08 lbs	926 g / 2.04 lbs	1109 g / 2.44 lbs	1037 g / 2.29 lbs
Connector	Harting 24 pin				
Antenna	Internal antenna				

4.2 Current consumption

Input power	R23-01, R23-02		R23-08, R23-09		R23-03, R23-04	
	Min.*	Max.**	Min.*	Max.**	Min.*	Max.**
12 V AC	100	428	144	482	100	580
24 V AC	52	175	72	192	52	226
48 V AC	33	105	44	115	34	138

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

Input power	R23-01, R23-02		R23-08, R23-09		R23-03, R23-04	
	Min.*	Max.**	Min.*	Max.**	Min.*	Max.**
115 V AC	15	45	19	48	15	56
230 V AC	11	25	13	27	10	30
12 V DC	105	355	143	390	105	455
24 V DC	55	188	76	203	55	237

Input power	R23-11		R23-12		R23-13		R23-14	
	Min.*	Max.**	Min.*	Max.**	Min.*	Max.**	Min.*	Max.**
12 V AC	108	950	106	785	151	1000	150	695
24 V AC	55	388	55	332	75	405	75	317
48 V AC	35	265	35	210	45	270	45	190
115 V AC	16	90	16	80	20	90	20	70
230 V AC	11	47	12	42	15	50	13	35
12 V DC	109	740	109	645	147	780	144	502
24 V DC	58	379	57	330	80	400	76	260

*Minimum current consumption = Receiver powered, no active relays, no radio session established.

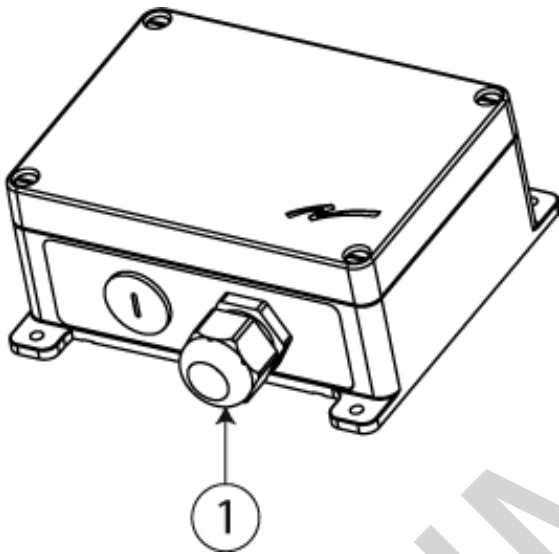
**Maximum current consumption = Receiver powered, all relays on the receiver active, radio session established.

CHAPTER 5: 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.

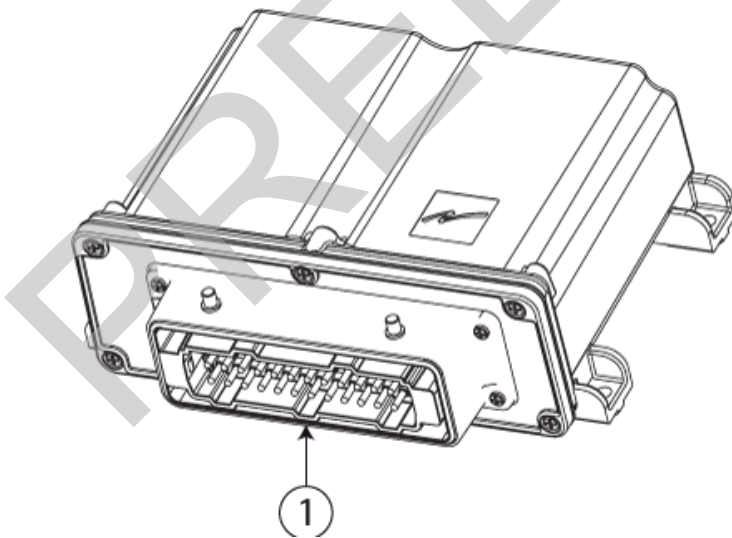
5.1 Receiver description

5.1.1 R23-01, R23-3, R23-8, R23-11, R23-13 (HOUSING 1)



1. Power cable gland (M25x1.5)

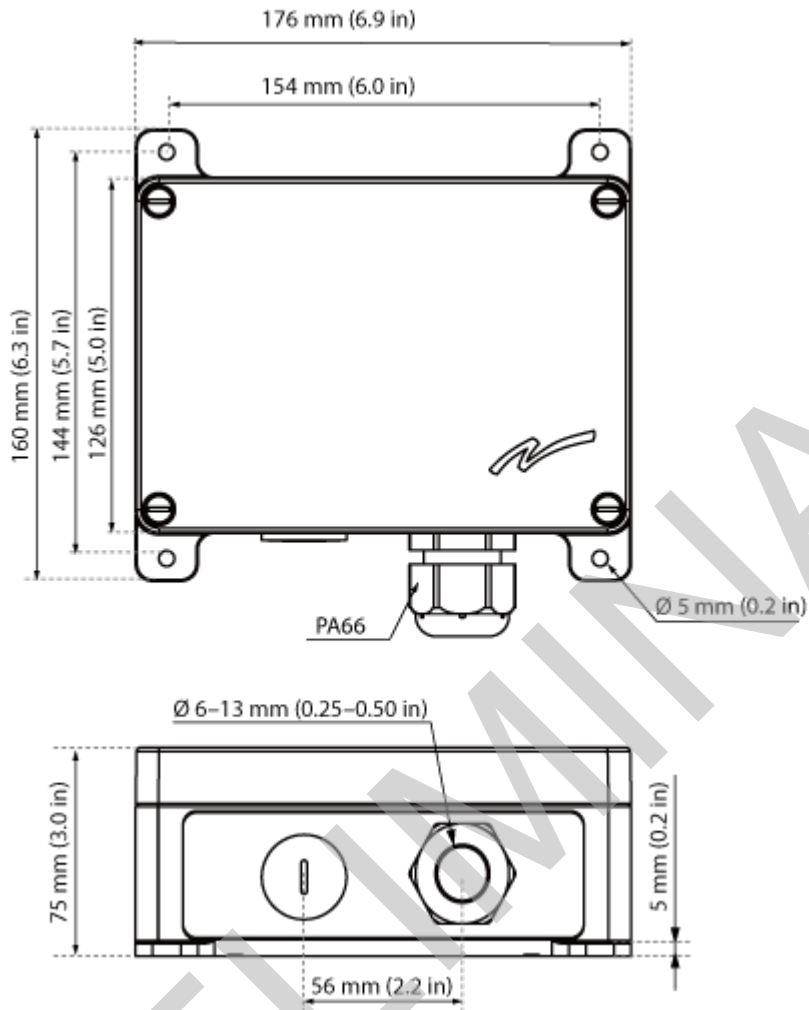
5.1.2 R23-02, R23-4, R23-9, R23-12, R23-14 (HOUSING 2)



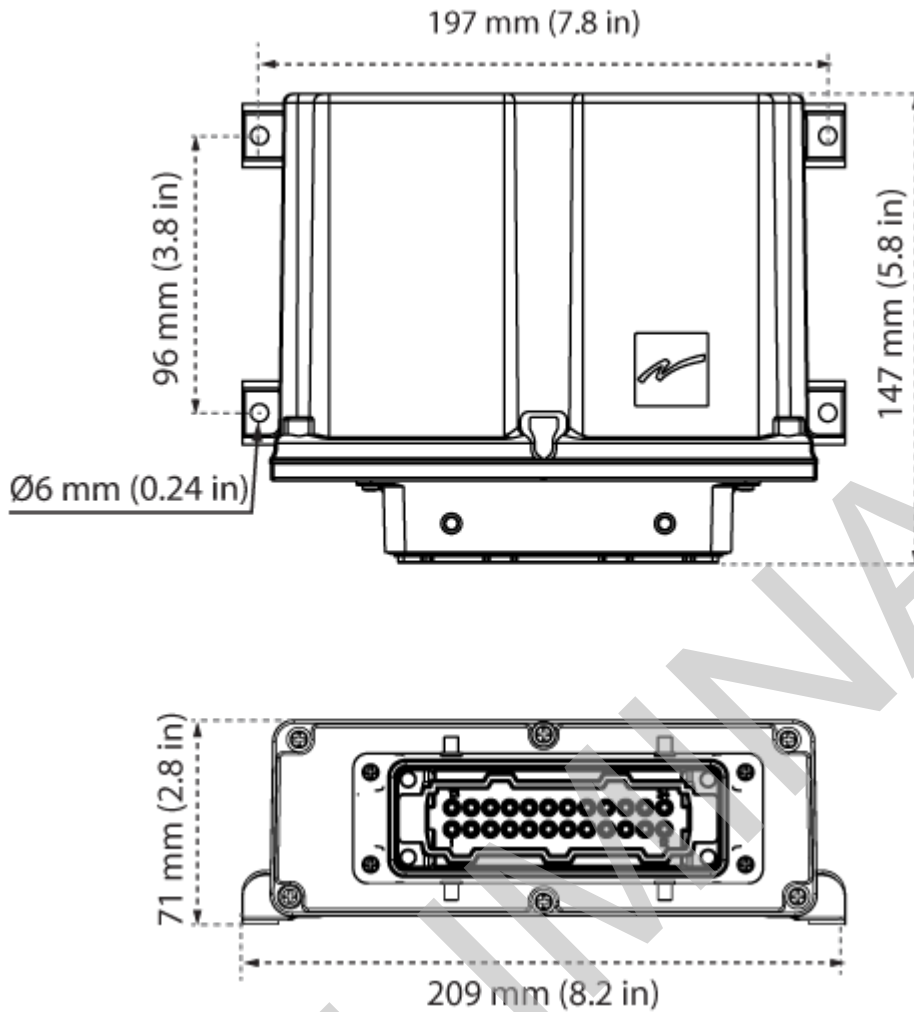
1. 24-pin connector

5.1.3 MECHANICAL INSTALLATION

R23-01, R23-03, R23-08, R23-11, R23-13 (housing 1)



R23-02, R23-04, R23-09, R23-12, R23-14 (housing 2)



5.1.4 INSTALLATION PRECAUTIONS

RISK OF ELECTRIC SHOCK

The receiver must only be opened by qualified installers or authorized personnel.



Make sure the power supply is switched off before opening the receiver. Failure to follow these instructions could result in death, serious injury, or equipment damage.

IMPORTANT! Only authorized personnel should install the product.

Only correct installation complies with the safety levels for the product.

- A permanent installation of the receiver must include fuses in order to protect the equipment and cables from short circuit.

- The receiver must be installed vertically, on a flat and rigid surface, with the cable at the bottom.
- Install the receiver in a location where it is easily visible.
- Consider the wiring limitation and the radio communication limitation to choose the receiver location.
- Ensure no obstacle is impairing the radio communication performance between the receiver and the transmitter.
- The receiver must not be installed inside closed metal containers.
- Make sure any accessories inside or on the receiver are installed before permanently installing the receiver.
- Test the equipment before installing the receiver permanently.

5.2 Antenna

Type of antenna equipped	R23 receivers with...	
	housing 1	housing 2
Internal	<input type="radio"/>	<input checked="" type="radio"/>
External	<input checked="" type="radio"/>	<input type="radio"/>

- Standard
- Optional

The internal antenna can operate at a distance of about 120 m but this working distance can change depending on many factors. Depending on the application and/or the environment, an additional external antenna can be installed on the receivers to optimize data transmission.

5.2.1 EXTERNAL ANTENNA (OPTIONAL)

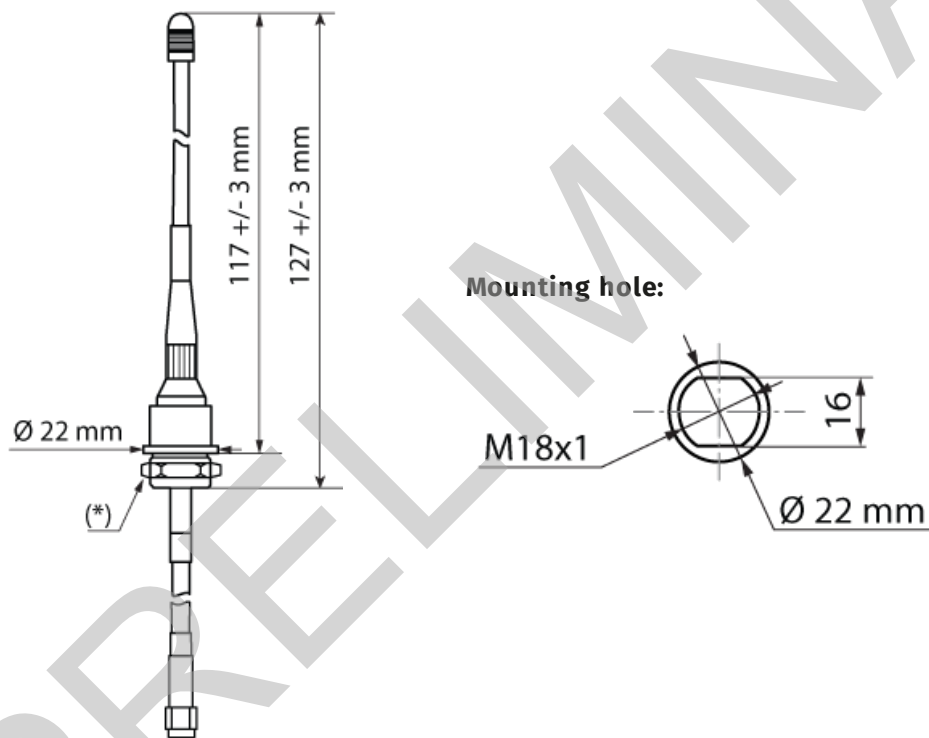
NOTE: If the cable length required is more than 5 m, using an active antenna is recommended.

Specifications

EXTERNAL ANTENNA	1/2-2.4G	1/2-2.4G-K1
Frequency	2405 –2480 MHz	2405 –2480 MHz
Current consumption	max. 500 mA	max. 500 mA
Impedance	50 Ω	50 Ω
Radiation	Omni	

EXTERNAL ANTENNA	1/2-2.4G	1/2-2.4G-K1
Connector	RP- SMA	SMA-J
Range	100 m (328 ft), adjustable depending on configuration	100 m (328 ft), adjustable depending on configuration
Dimensions	19 x 115 x 10 mm / ~ 0.7 x 4.5 x 0.4 in	114 x Ø 10 mm
Weight without cable (typical).	~18 g (0.04 lbs)	~18 g (0.04 lbs)
IP code	IP40	IP40
Cable length	-	1 m / 3.2 ft

5.2.2 MOUNTING DIMENSIONS



(*) Hex nut

5.2.3 PRECAUTIONS FOR THE INSTALLATION OF EXTERNAL ANTENNAS

RISK OF ELECTRIC SHOCK



The receiver must only be opened by qualified installers or authorized personnel.

Make sure the power supply is switched off before opening the receiver. Failure to follow these instructions could result in death, serious injury, or equipment damage.



Before connecting the equipment, make sure that the power supply is switched off.

IMPORTANT! Only authorized personnel should install the product.

Only correct installation meets the safety levels for the product.

- For optimum performance, place the external antennas away from metal objects such as metal girders, high-voltage cables, and other antennas.
- Keep the longest distance possible between the antenna and e.g. engines, welding machines, power sources, inverters, x-ray devices and other radio transmitters.
- Any antenna that is mounted separately must be positioned in as open a space as possible. A hidden antenna significantly impairs the reception.
- Do not mount the antenna in a locker.
- Test the equipment before installing the antennas permanently.

5.3 Repeater & active antenna (optional)

Depending on the application and/or the environment, repeaters or active antennas can be installed on all R20R21 receivers to optimize data transmission.

5.3.1 ABOUT D5-23

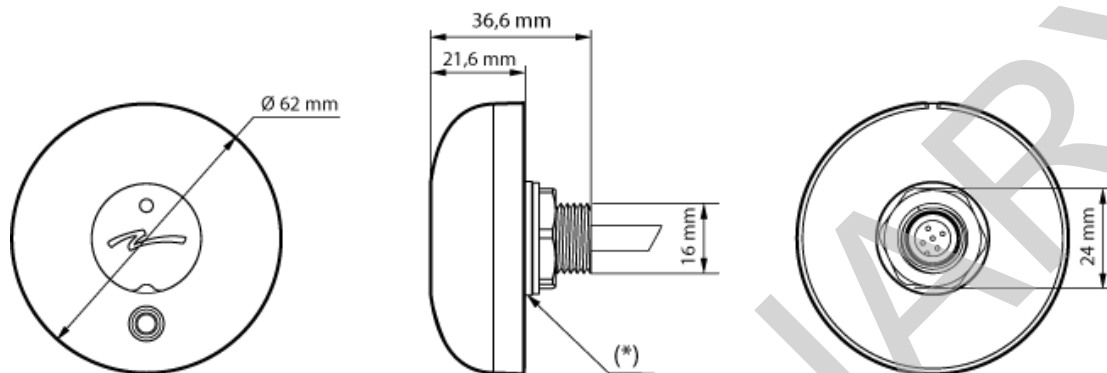
Tele Radio AB D5-23 is a combined repeater /active antenna that can be used to extend transmissions so that the signal can cover greater distances or be received on the other side of an obstruction.

An active antenna is recommended whenever strict control distances are required or when the receiver is mounted in close proximity to unintentional electronic

emitters, e.g. a truck alternator, welding machine or a variable frequency drive. If needed, the active antenna can be used together with one or more repeaters. When used as active antenna, D5-23 is connected to the receiver via a bus-cable.

Each repeater is independent and has a range depending on the environment. A system can have up to 8 repeaters simultaneously.

5.3.2 MOUNTING DIMENSIONS



5.3.3 PRECAUTIONS FOR THE INSTALLATION OF THE REPEATER/ ACTIVE ANTENNA



Before connecting the equipment, make sure that the power supply is switched off.

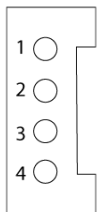
IMPORTANT! Only authorized personnel should install the product.

Only correct installation meets the safety levels for the product.

- Install the repeater/active antenna in a location where the LED and button can easily be seen and accessed.
- For optimum performance, place the repeater/ active antennas away from metal objects such as metal girders, high-voltage cables, and other antennas.
- Keep the longest distance possible between the repeater and e.g. engines, welding machines, power sources, inverters, x-ray devices and other radio transmitters.
- Any repeater that is mounted separately must be positioned in as open a space as possible. A hidden antenna significantly impairs the reception.
- Do not mount the repeater/ active antenna in a locker.
- Test the equipment before installing the repeater/ active antenna permanently.

-
1. Terminal block for power supply (PWR)¹, stop relays (SR) and function relays (R)
 2. Connector for input power²
 3. Stop relays SR1–2
 4. Connector for 48–230 V AC
 5. Connector for 12–24 V AC/DC
 6. Connector for 12–24 V DC³
 7. Function relays 1–10 (NO)
 8. Connector for expansion board⁴
 9. Connector for DO 1–2
 10. Connector for expansion board TR507⁵
 11. Connector for expansion board⁶
 12. Connector for expansion board⁷
 13. Power LED (yellow)
 14. TRABUS contact
 15. Radio module (TR362)
 16. Function LEDs
(1 = red, 2 = yellow, 3 = green, 4 = orange)
 17. Connector for expansion board⁸
 18. PLd status LED (red)
 19. Function button (cancel)
 20. Select button (OK)
 21. Status LEDs for digital outputs 1–2 (red)
 22. LED indicators for stop relays SR1–2
 23. Relay LEDs 1–10 (red)

6.1.1 CONNECTOR FOR DIGITAL OUTPUTS ON THE BASEBOARD



1. +5 V
2. Digital output 1⁹
3. Digital output 2
4. GND

¹By design, input power (PWR) is also connected to connector J21.

²To be connected to either J43, J44 or J45, depending on the voltage to achieve.

³Input to be used when the receiver needs to be able to go low in voltage.

⁴RS485

⁵CAN/J1939

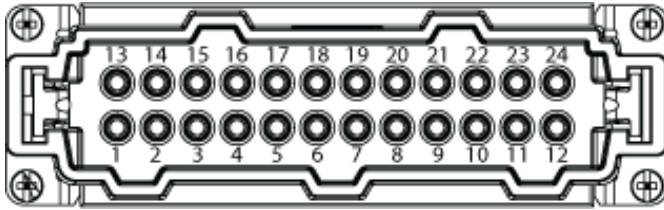
⁶Digital inputs (not in use for the moment).

⁷Big relay board (not in use for the moment).

⁸Relay/DO/+12 V

⁹Open drain, max. voltage 30 V, max. current 100 mA

6.1.2 PINOUT FOR 24 PIN CONNECTOR



Free mapping. Contact your representative for assistance.

16A, 500 V 6KV 3

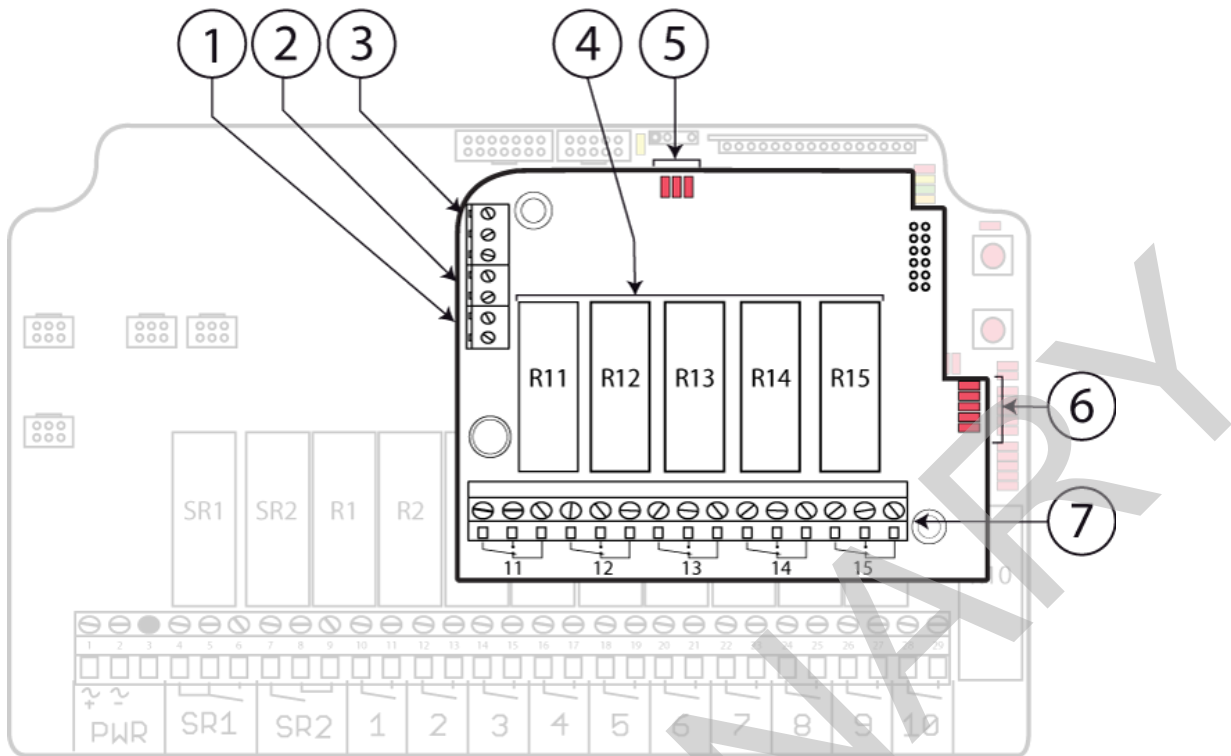
6.2 Expansion boards

Expansion boards can be used to increase the number of I/Os and/or add communication options. There are currently three expansion boards available for the R23 receivers.

EXPANSION BOARDS	Available slots on the base board
14-relay expansion board	1
5-relay expansion board	1
Expansion board for digital inputs	1

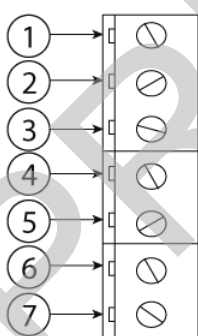
6.2.1 5-RELAY EXPANSION BOARD

NOTE: This relay expansion board is fitted in the following receiver model:
PN-R23-03, R23-04, R23-11



- | | |
|--|---|
| 1. Terminal block for +3.3 V/ GND | 5. Status LEDs for digital outputs 1-3 |
| 2. Terminal block for +5-12 V | 6. Relay LEDs 11-15 (red) |
| 3. Terminal block for digital outputs | 7. Terminal block for function relays 11-15 |
| 4. Function relays 11-15 (change-over) | |

Terminal blocks for digital outputs on the 5-relay expansion board

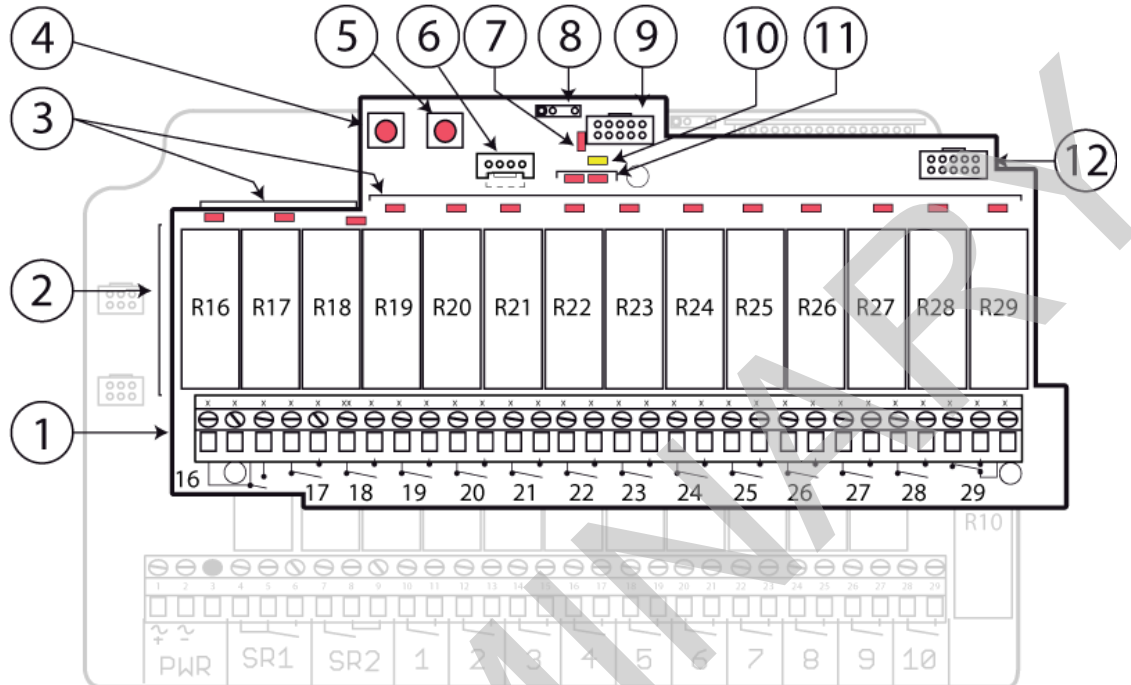


1. Digital output 3¹
2. Digital output 4¹
3. Digital output 5¹
4. +12 V DC
5. +5 V DC
6. +3.3 V DC
7. GND

¹Open drain, max. voltage 30 V, max. current 100 mA

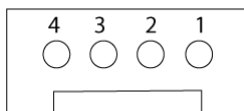
6.2.2 14-RELAY EXPANSION BOARD

NOTE: This relay expansion board is fitted in the following receiver model:
PN-R23-11, R23-12



- | | |
|--|-----------------------------------|
| 1. Terminal block for function relays 16-29 | 7. Function LED 1 (red) |
| 2. Function relays 16-28 (NO) and 29 (NO/NC) | 8. TRABUS contact |
| 3. Relay LEDs 16-29 (red) | 9. Connector J1 for ... need info |
| 4. Function button (Cancel) | 10. Function LED 2 (yellow) |
| 5. Select button (OK) | 11. Status LEDs for DO 6-7 |
| 6. Connector for DO 6-7 | 12. Connector for AI 1-8 |

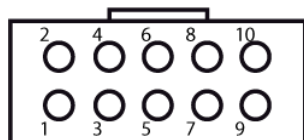
Connector for digital outputs on the 14-relay expansion board



1. +5 V
2. Digital output 7¹
3. Digital output 6¹
4. GND

¹Open drain, max. voltage 30 V, max. current 100 mA

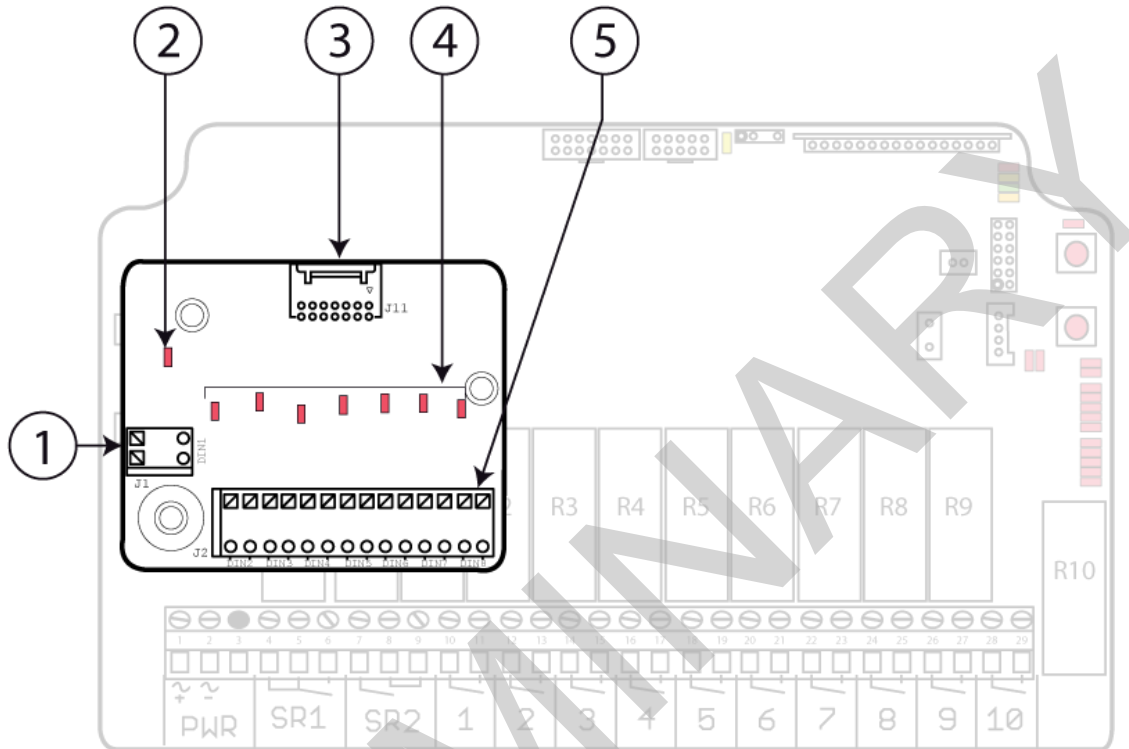
Connector for analog inputs on the 14-relay expansion board



- | | |
|-------------------|--------------------|
| 1. GND | 6. Analog input 6 |
| 2. Analog input 2 | 7. Analog input 5 |
| 3. Analog input 1 | 8. Analog input 8 |
| 4. Analog input 4 | 9. +5 V DC |
| 5. Analog input 3 | 10. Analog input 7 |

6.2.3 EXPANSION BOARD FOR DIGITAL INPUTS

NOTE: This relay expansion board is fitted in the following receiver model:
R23-11



- 1. Terminal block for digital input 1
- 2. Status LED for digital input 1
- 3. Connector to the base board
- 4. Status LEDs for digital inputs 2-8
- 5. Terminal block for digital inputs 2-8

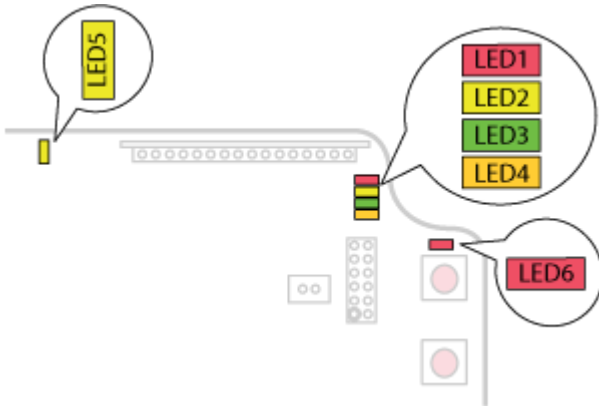
Terminal blocks for digital inputs on the digital inputs expansion board

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
DIN1	DIN2	DIN3	DIN4	DIN5	DIN6	DIN7	DIN8								

-
- | | |
|--------------------|---------------------|
| 1. Digital input 1 | 9. Digital input 5 |
| 2. GND | 10. GND |
| 3. Digital input 2 | 11. Digital input 6 |
| 4. GND | 12. GND |
| 5. Digital input 3 | 13. Digital input 7 |
| 6. GND | 14. GND |
| 7. Digital input 4 | 15. Digital input 8 |
| 8. GND | 16. GND |

PRELIMINARY

CHAPTER 7: STATUS AND ERROR INDICATIONS



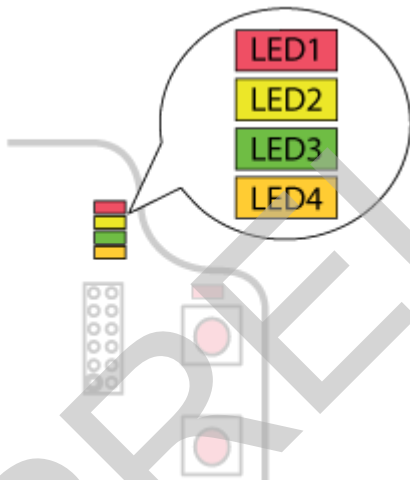
7.1 Function LEDs indication in normal operation

LED	Colour	Off	On	Indicates
5	yellow	●		No power to the receiver
			●	Receiver is powered up
6	red		●	Not compliant with PLd.
		●		Compliant with PLd.
1	red	●		No transmitter is registered.
			●	Flashes once: One or more transmitters are registered. No radio transmission established.
			●	Double flash: One or more transmitters are registered and logged in. No radio transmission established.
			●	Solid: Radio transmission established.
2	yellow		●	Receiving a radio packet from a transmitter other than a Panther.
2	yellow		●	Receiving a radio packet from a transmitter set to a different radio mode (discontinuous or continuous) than the receiver.
3	green		●	
2	yellow		●	Receiving a radio packet from a transmitter that is not registered.
4	orange		●	
3	green		●	Receiving a radio packet, low signal (RSSI).
4	orange		●	Receiving a radio packet, configuration ID not accepted.

LED	Colour	Off	On	Indicates
3	green		●	Receiving a radio packet, custom ID not accepted.
4	orange		●	
2	yellow		●	1. Receiving a radio packet from a registered transmitter. The receiver is already controlled by another registered transmitter. 2. Load select mode is activated but wrong load is transmitted to the receiver.
3	green		●	
4	orange		●	
1-4	red yellow green orange		● ● ● ●	TRABUS mode (PC communication)

7.2 Menu mode indications

The menu mode is accessed by pressing the **Function** button a predefined number of times. The different menus are identified by the function LEDs 1-4 according to the following table.



●: LED is lit. ○: LED is off.

Function LEDs				Menu
LED 1 (red)	LED 2 (yellow)	LED 3 (green)	LED 4 (orange)	
●	○	○	○	Register/ erase transmitters

Function LEDs				Menu
LED 1 (red)	LED 2 (yellow)	LED 3 (green)	LED 4 (orange)	
○	●	○	○	Latching/ momentary relay functions
○	○	●	○	Show settings
○	○	○	●	Show/ change Operating mode
○	○	●	●	Active Load select (extended menu)

7.3 Debug mode indications

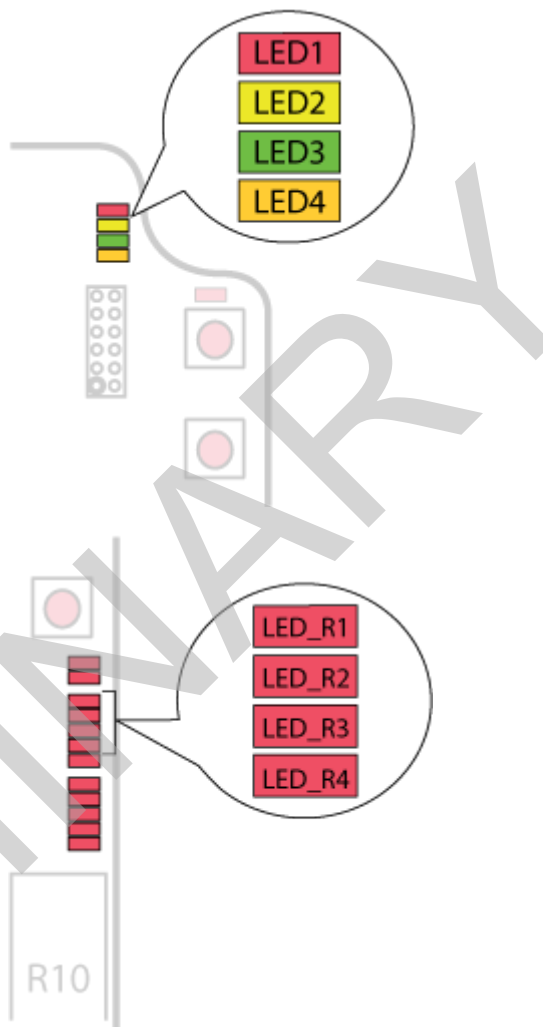
If the debug mode is activated, function LEDs 1–4 will get new functions according to the following table:

NOTE: Only use this setting for debug purpose.

Function LEDs	Color	On	Off	Menu
LED 1	red	●	●	Valid packet received. LED is inverted every time a valid packet is received
LED2	yellow	●		Timeout not reached
			●	Timeout reached, zero button information is added to the receiver.
LED3	green	●		Radio transmission established.
			●	No radio transmission established.
LED 4	orange	–	–	Not used

7.4 Error indications and code messages

Errors are indicated by function LEDs 1–4, which are all flashing at the same time.



Each error is identified by a code indicated by relay LEDs 1–4.

Write down which relay LED(s) are lit and contact your representative for assistance.

●: LED is lit. ○: LED is off.

Relay LED1	Relay LED2	Relay LED3	Relay LED4	Indicates
red	red	red	red	
○	○	○	●	Reading of production data failed
○	○	●	○	Radio module start-up failed
○	○	●	●	Function block error
○	●	○	○	
○	●	○	●	Receiver not locked on channel 11 when using batteryless button (BLB)

Relay LED1 red	Relay LED2 red	Relay LED3 red	Relay LED4 red	Indicates
○	●	●	○	CPU2 communication init error
○	●	●	●	CPU1 safety relays status error
●	○	○	○	CPU1 start-up checks failed
●	○	○	●	CPU1 runtime flow control failed
●	○	●	○	CPU2 communication runtime error
●	○	●	●	CPU2 power error

PRELIMINARY

CHAPTER 8: OPERATION

8.1 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.

All operation instructions require access to the receiver circuit board(s).'



RISK OF ELECTRIC SHOCK

The receiver must only be opened by qualified installers or authorized personnel.

Make sure the power supply is switched off before opening the receiver. Failure to follow these instructions could result in death, serious injury, or equipment damage.

1. Remove the front cover of the receiver. Use a screwdriver to remove the screws.
2. Power the receiver up.
3. The power LED lights (yellow).
4. Proceed with the configuration instructions of your choice.

8.2 Radio mode

The radio mode is determined by the selected **Operating mode**.

To establish a radio link between the transmitter and the receiver, both units must be set to the same radio mode.

This receiver is set to continuous radio mode by default.

Some settings can only be selected when the products are transmitting continuously. These settings are indicated with the note "Only for continuous radio mode."

8.3 Relay functions

This receiver is set to momentary relay functionality by default. The relay remains active while a button is pressed on the transmitter. When the button is released

the relay deactivates. Setting a relay to latching means that the relay becomes active when a button is pressed and remains active until the button is pressed again.

8.3.1 SET MOMENTARY OR LATCHING RELAY FUNCTIONS

The settings options depend on the selected **Operating mode**.

NOTE: The number of relays that can be set to latching varies depending on the selected **Operating mode**.

NOTE: It is not possible to program latching relays in Operating mode 255.

1. Press the **Function** button twice.
The function LED 2 lights (yellow). The lit relay LEDs indicate which relays that have been set to latching.
2. Press the **Select** button.
The first relay LED that can be set to latching/momentary will flash fast.
3. Press the **Function** button to change the setting for the current relay. Relays can be set to latching or momentary and the current setting is indicated by the function LED 2 (yellow).

Function LED 2	Indicates
○	Momentary
●	Latching

●: LED is lit. ○: LED is off.

4. Press the **Select** button to confirm the setting and go to the next relay.
5. Repeat until all relays have been set to either momentary or latching.

After the last relay has been programmed (depending on operating mode and hardware configuration), the receiver will exit to normal operation.

8.4 Logout function

NOTE: Only for continuous radio mode.

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

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

NOTE: The logout function cannot be activated/deactivated in the receiver.
Contact your representative for assistance.

For this receiver, the logout function is activated by default.


PRELIMINARY

CHAPTER 9: CONFIGURATION MENU

All configuration settings require access to the receiver circuit board(s).

RISK OF ELECTRIC SHOCK

The receiver must only be opened by qualified installers or authorized personnel.

 **Make sure the power supply is switched off before opening the receiver.**

Failure to follow these instructions could result in death, serious injury, or equipment damage.

1. Remove the front cover of the receiver. Use a screwdriver to remove the screws.
2. Power the receiver up.
3. The power LED lights (yellow).
4. Proceed with the configuration instructions of your choice.

9.1 Menu mode

To access the different menus, press the **Function** button a predefined number of times, according to the following table. The different menus are identified by the function LEDs 1–4 (see "6.1 Base board").

●: LED is lit. ○: LED is off.

Menu	To access the menu, press the Function button...	Function LEDs light			
		LED 1 (red)	LED 2 (yellow)	LED 3 (green)	LED 4 (orange)
Register/ erase transmitters	once	●	○	○	○
Show/ change Latching/ momentary functions	2 times	○	●	○	○
Show settings	3 times	○	○	●	○
Show/ change Operating mode	4 times	○	○	○	●
Active Load select (extended menu)	4 times then press Select button once	○	○	●	●

9.2 Register the transmitter in the receiver

Registering means establishing communication between the transmitter and the receiver.



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.

NOTE: To establish a radio link between the transmitter and the receiver, both units must be set to the same radio mode.

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

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.

1. Set the transmitter in registration mode (see relevant Tele Radio AB transmitter installation instructions).
2. Press the receiver **Function** button.
The function LED1 lights (red).
3. Press the receiver **Select** button.
All relay LEDs light (red).
4. Press buttons 1 and 2 on the transmitter to be registered in the receiver (see relevant Tele Radio AB transmitter installation instructions).
All function LEDs light.
5. Release the transmitter buttons.

If the transmitter is registered, all relay LEDs flash 3 times.

If no transmitter is found within approximately 10 seconds, the receiver exits to normal operation.

9.3 Show settings

1. Press the **Function** button 3 times

The function LED 3 lights (green).

2. Press the **Select** button.

The relay LEDs 1–4 indicate the current settings according to the following table:

Relay LED	Color	Off	On	Indicates
LED_R1	red	○		Discontinuous transmitting mode
			●	Continuous transmitting mode
LED_R2	red	○		Custom ID not enabled
			●	Custom ID enabled
LED_R3	red	○		Configuration ID not enabled
			●	Configuration ID enabled
LED_R4	red	○		Frequency scan on
			●	Frequency scan off (fixed frequency)

After approximately 10 seconds, the receiver will automatically exit "Show Settings" mode and return to normal operation.

9.4 Operating modes

This receiver is provided with two **Operating modes** as standard (a and 255). For other **Operating modes**, contact your representative for assistance.

NOTE: If **Operating mode** 255 has been selected, it is not possible to change the **Operating mode** from the receiver.

9.4.1 SHOW / CHANGE OPERATING MODE

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.

1. Press the **Function** button 4 times.

Function LED 4 lights (orange)..

*The relay LEDs indicate the current **Operating mode** according to the table*

below:

●: LED is lit. ○: LED is off.

Relay LED 1	Relay LED 2	Relay LED 3	Relay LED 4	Operating mode	Radio mode
●	○	○	○	1 (default)	Continuous radio mode
●	●	●	●	255	Continuous/ discontinuous depending on the settings

NOTE: If no button is pressed within approximately 10 seconds, the receiver will automatically return to normal operation.

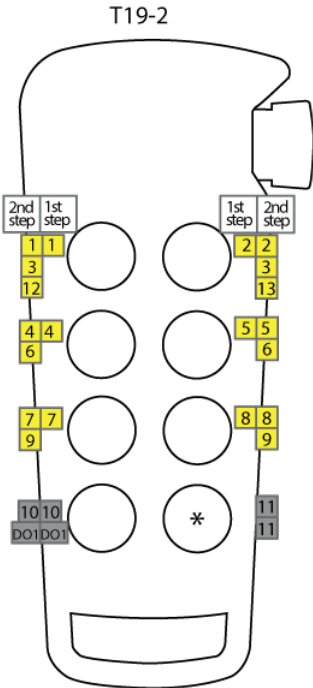
2. Press the **Select** button to change the current **Operating mode**.
The function LED 4 flashes (orange).
3. Press the **Function** button to move to the next available **Operating mode**.
The corresponding status LEDs light.
4. Press the **Select** button to confirm the new **Operating mode**.

The receiver returns to normal operation.

9.4.2 OPERATING MODE 1

NOTE: Only for continuous radio mode.

NOTE: If the radio link is lost, all relays and digital outputs will switch off.



- 2 Relay number on the receiver
- Button functions
- Direction functions
- * Can be used to switch between Loads A and B

Digital outputs... Can be used for...

- D01 e.g. for a +5 V buzzer
- D02 +5 V bright LED to indicate that the stop relays are activated.
- D03-7 N/A

On relays	Stop relays (SR1 + SR2) and DO2 are active when the radio link is up.
Work relays	Relay 29 should be activated if any of the transmitter buttons are pressed.
Load select relays	Load A: relay 14 + 27 Load B: relay 15 + 28
Programmable relay functions	Relay 10 and 11 can be set to latching or momentary.
Interlocking	Between button pairs: 1-2, 3-4, 5-6
Radio mode	Continuous
Zero position check	Active for all functions

9.5 Active Load select

NOTE: If this setting is set to 0 (status LEDs 1–4 are off), the receiver will always be activated when receiving a radio package. For all other settings, the receiver will be activated when the load select on the transmitter corresponds to one of the load select settings enabled in the receiver.

9.5.1 SHOW/CHANGE LOAD(S)

1. Press the **Function** button 4 times.
Function LED 4 lights (orange).
2. Press the **Function** button for approx. 4 seconds or until function LEDs 3 (green) and 4 (orange) light. The receiver is now in extended menu mode. Relay LEDs 1–4 show the current **Load select** setting according to the table below:

●: LED is lit. ○: LED is off.

Relay LED 1	Relay LED 2	Relay LED 3	Relay LED 4	the receiver will be activated when...
●	○	○	○	Load A is selected on the transmitter
○	●	○	○	Load B is selected on the transmitter
○	○	●	○	Load C is selected on the transmitter
○	○	○	●	Load D is selected on the transmitter
○	○	○	○	The receiver does not listen to any load(s) and will always be activated when receiving a radio package.

If no button is pressed within approximately 10 seconds, the receiver will automatically exit the "Active load Select" mode and return to normal operation mode.

To change **Load select**:

3. Press the **Select** button once.
Relay LED 1 flashes. Load A can be activated.

-
4. Press the **Function** button to enable/ unable the Load setting.
Function LEDs 3 (green) and 4 (orange) light when a **Load** has been activated.
They are off when no Load has been selected.
 5. Press the **Select** button to move to the next available **Load** (Load B).
The corresponding status LED flashes and the Load can be activated.
 6. Repeat step 4–5 for **Loads** C–D.
 7. Press the **Select** button to confirm and store the new configuration.
The receiver exits "Active load Select" mode and returns to normal operation.

9.6 Log a transmitter out

NOTE: Only for continuous radio mode.

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

Function LED1 (red) and 4 (orange) are lit to indicate that one or more transmitter (s) are registered in the receiver and that one transmitter is logged in.

1. Press the receiver **Select** button for approx. 4 seconds.
Function LED 4 flashes fast (orange).
2. Release the **Select** button.
Function LED 4 goes off.

All function LEDs light briefly. The logged in transmitter has been logged out. The receiver returns to normal operation. Any registered transmitter can now log in.

9.7 Erase all registered transmitters

NOTE: The following instructions will erase all registered transmitters from the receiver.

NOTE: An erased transmitter cannot be logged in to the receiver until it has been registered in the receiver again.

1. Press the receiver **Function** button once
Function LED 1 lights (red).
2. Press the receiver **Select** button.
Relay LEDs light (red)

-
3. Press the receiver **Function** button for approx. 4 seconds or until relay LEDs go off.
All registered transmitters have been erased. The receiver returns to normal operation.

9.8 Master reset of the receiver

This procedure will erase all settings and all relay mapping from the receiver.

NOTE: The erase function cannot be activated/deactivated in the receiver. Contact your representative for assistance.

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.

1. Press both the **Select** and the **Function** buttons for approx. 10 seconds or until all function LEDs go off.
2. Release both buttons.
All the function LEDs light briefly. The receiver has been reset. The receiver returns to normal operation.

CHAPTER 10: 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 the product in a clean, dry place

Keep contacts and antennas clean

Wipe off dust using a slightly damp, clean cloth

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

CHAPTER 11: REGULATORY INFORMATION

11.1 Europe

Applies to:

R23-01, R23-03, R23-08, R23-11, R23-13

R23-02, R23-04, R23-09, R23-12, R23-14

11.1.1 CE MARKING

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

11.1.2 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.

11.2 North America

Applies to:

R23-01, R23-03, R23-08, R23-11, R23-13

R23-02, R23-04, R23-09, R23-12, R23-14

11.2.1 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.

11.2.2 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.

11.2.3 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: ONFC-1902A

“Contains IC: 4807A-C1902A

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

ANNEX A: GLOSSARY

DC

Diagnostic Coverage

FIT

Failures in time (1 FIT = 1 failure per 10^9 hours)

HFT

Hardware Fault Tolerance

MTTF

Mean Time To Failure

PFH

Probability of Failure per Hour

PL

Performance level

SFF

Safety Failure Fraction

SIL

Safety Integrity Level

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PRELIMINARY



PRELIMINARY

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safe

smart

strong

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