

Radio Description

Radio 4415

Description

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1 Introduction

1.1 Warranty Seal

The product is equipped with a warranty seal sticker.

Note: Seals that have been implemented by Ericsson must not be broken or removed, as it otherwise voids warranty.



2 Product Overview

The radio remotely extends the reach of the Radio System, and is designed to be located near the antenna. The radio is part of a modular radio building concept that enables a variety of installation alternatives that are also easy to expand. Flexible mounting solutions are provided using rails, pole clamps, and brackets. The small size of the radio together with the flexible mounting solutions reduces the site volume. The lower weight also improves the handling of the radio.

An optic cable connects the radio to the Radio System main unit or an expanded macro Radio System. The radios can be connected in a star configuration or in a cascade configuration with optical cable links. An overview of different radio installations is shown in [Figure 1](#).

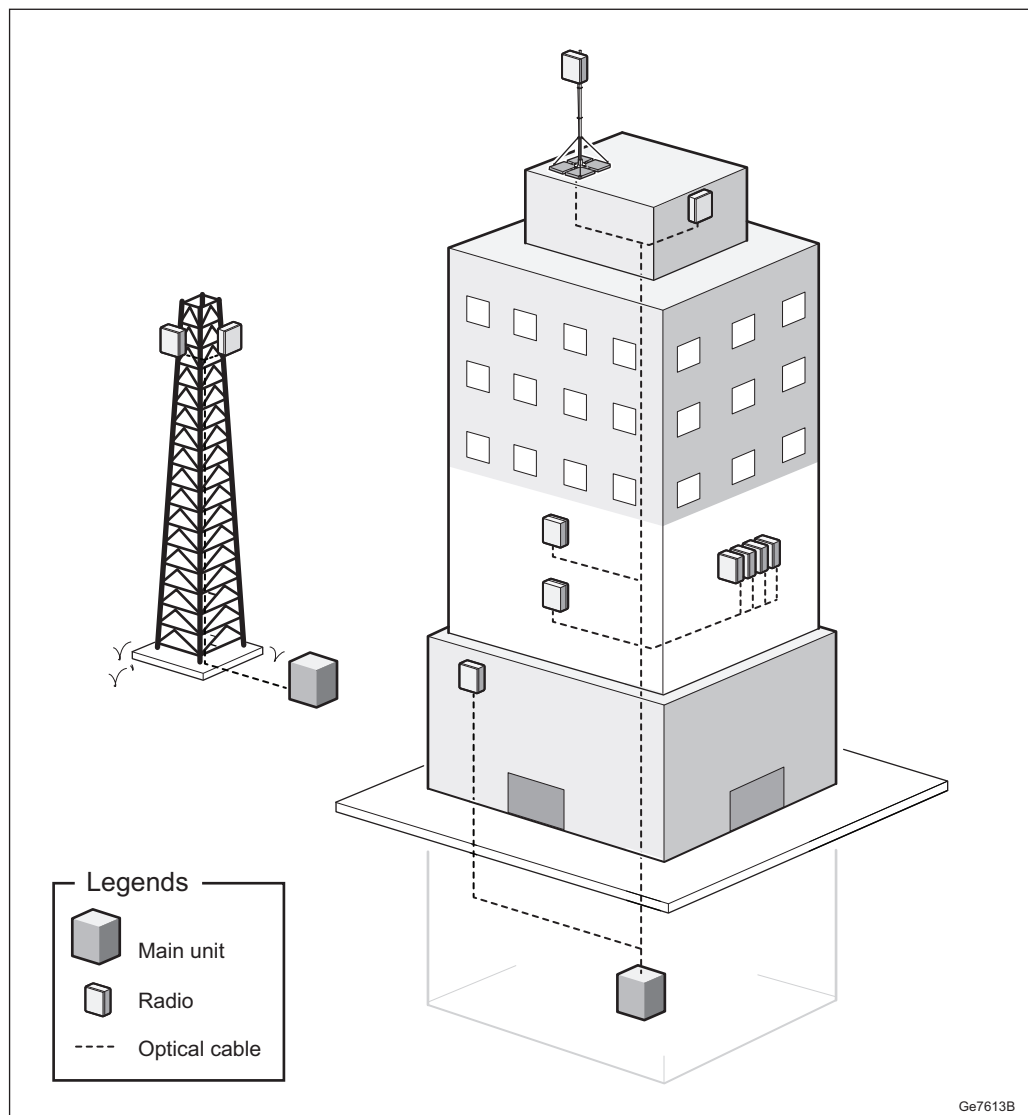


Figure 1 Radio Installations

2.1 Main Features

The following are the main features of the radio:

- Two-wire (DC-C) and three-wire (DC-I) power connections. For two-wire (DC-C) power solutions, a DC adapter is used if applicable.
- GSM, WCDMA, LTE FDD, NB-IoT, NR, and ESS
- Duplex transmitter/receiver (4TX/4RX) branches
- Up to 10.1 Gbps CPRI (optical)



- Complies with 3GPP base station classes Wide Area. For a list of relevant standards, see [Radio Standards Compliance](#) on page 44.

2.2 Variants

- Radio variant with in-built TX monitor ports for frequency bands B1, B3, B3B, and B7.
- Radio variant with compliance to NEBS requirements for frequency bands B2/B25, B30, B66A, and B70.

2.3 Optional Equipment

Optional equipment is the following:

- Fan unit



3 Technical Data

Table 1 Radio 4415 Technical Data

Description	Value
Maximum nominal output power ^{(1) (2)}	<p>4 × 40 W</p> <p>4 × 25 W (B30)</p> <p>(Hardware Activation Codes (HWAC) are required for total output power over 20 W.)</p>
Minimum configurable output power on an RF port	5 W
Number of carriers per branch	<p>LTE: 6 downlink, 6 uplink</p> <p>LTE B70 (R-state ≥ R5): 5 downlink, 3 uplink</p> <p>GSM: 4 downlink, 6 uplink</p> <p>WCDMA: 6 downlink, 6 uplink</p> <p>NB-IoT in-band mode: 1 NB-IoT carrier per configured LTE host carrier</p> <p>NB-IoT standalone mode: 1 carrier, 2 carriers for B1 (R-state ≥ R5), B2 (R-state ≥ R5), B3 (R-state ≥ R5), B3B (R-state ≥ R5), B25 (R-state ≥ R5), B66A (R-state ≥ R5), and B70 (R-state ≥ R5)</p> <p>NB-IoT guard band mode: 1 NB-IoT carrier per configured LTE host carrier</p> <p>NR: 6 downlink, 6 uplink</p> <p>NR B30: 2 downlink, 2 uplink</p> <p>ESS: 4 downlink, 4 uplink</p> <p>ESS B30: 1 downlink, 1 uplink</p> <p>Mixed mode: 6 downlink, 6 uplink</p>
Number of carriers per radio	<p>LTE: 4 × 6 downlink, 4 × 6 uplink</p> <p>LTE B70 (R-state ≥ R5): 4 × 5 downlink, 4 × 3 uplink</p> <p>GSM: 12 downlink, 24 uplink</p> <p>WCDMA: 4 × 6 downlink, 4 × 6 uplink</p> <p>NB-IoT in-band mode: One NB-IoT carrier per configured LTE host carrier</p>



Description	Value
	<p>NB-IoT standalone mode: 4 × 1 carriers, 4 × 2 carriers for B1 (R-state ≥ R5), B2 (R-state ≥ R5), B3 (R-state ≥ R5), B3B (R-state ≥ R5), B25 (R-state ≥ R5), B66A (R-state ≥ R5), and B70 (R-state ≥ R5)</p> <p>NB-IoT guard band mode: One NB-IoT carrier per configured LTE host carrier</p> <p>NR: 4 × 6 downlink, 4 × 6 uplink</p> <p>NR B30: 4 × 2 downlink, 4 × 2 uplink</p> <p>ESS: 4 × 4 downlink, 4 × 4 uplink</p> <p>ESS B30: 4 × 1 downlink, 4 × 1 uplink</p> <p>Mixed mode: 4 × 6 downlink, 4 × 6 uplink</p>
Frequency ⁽³⁾	<p>B1 for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, NB-IoT guard band mode, NR, and ESS</p> <p>1920–1980 MHz uplink⁽⁴⁾</p> <p>2110–2170 MHz downlink</p> <p>B2⁽⁵⁾ for GSM (R-state < R5), WCDMA, LTE, NR, and ESS</p> <p>1850–1910 MHz uplink</p> <p>1930–1990 MHz downlink</p> <p>B2⁽⁵⁾ for NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode</p> <p>1850.3–1909.8 MHz uplink</p> <p>1930.3–1989.8 MHz downlink</p> <p>B2⁽⁵⁾ for GSM (R-state ≥ R5)</p> <p>1850–1910 MHz uplink</p> <p>1930.4–1989.6 MHz downlink (GSM carrier center frequency)</p> <p>B3 for GSM, LTE, NB-IoT in-band mode, NB-IoT standalone mode, NB-IoT guard band mode, NR, and ESS</p> <p>1710–1785 MHz uplink</p> <p>1805–1880 MHz downlink</p> <p>B3B for GSM, LTE, NB-IoT in-band mode, NB-IoT standalone mode, NB-IoT guard band mode⁽⁶⁾, NR, and ESS</p> <p>1710–1765 MHz uplink</p>



Description	Value
	1805–1860 MHz downlink
	B7 ⁽⁷⁾ for LTE, NB-IoT in-band mode, NB-IoT standalone mode, NB-IoT guard band mode, NR, and ESS
	2500–2570 MHz uplink
	2620–2690 MHz downlink
	B7A for LTE, NB-IoT in-band mode, NB-IoT standalone mode, NB-IoT guard band mode, NR, and ESS
	2500–2560 MHz uplink
	2620–2680 MHz downlink
	B25 ⁽⁵⁾ for WCDMA, LTE, NR, and ESS
	1850–1915 MHz uplink
	1930–1995 MHz downlink
	B25 ⁽⁵⁾ for NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode
	1850.3–1914.8 MHz uplink
	1930.3–1994.8 MHz downlink
	B30 for LTE, NR, and ESS
	2305–2315 MHz uplink
	2350–2360 MHz downlink
	B66A for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode, NR, and ESS
	1710–1780 MHz uplink (1710–1755 MHz uplink for WCDMA)
	2110–2180 MHz downlink (2110–2155 MHz downlink for WCDMA)
	B70 for LTE, NB-IoT in-band, NB-IoT standalone mode, and NB-IoT guard band mode
	1695–1710 MHz uplink
	1995–2020 MHz downlink
	1995.3–2019.8 MHz downlink (NB-IoT carrier center frequency)
Dimensions without Fan Unit	
R-state < R5	H×W×D: 420 × 342 × 149 mm



Description	Value
R-state \geq R5 (B1, B2/ B25, B3, B3B, B66A, B70)	H×W×D: 420 × 342 × 131 mm
R-state \geq R5 (B7)	H×W×D: 420 × 342 × 150 mm
R-state \geq R5 (B30)	H×W×D: 420 × 342 × 123 mm
R-state \geq R5 (with NEBS cover)	H×W×D: 420 × 342 × 140 mm
Dimensions with Fan Unit	
R-state < R5 V1 ⁽⁸⁾	H×W×D: 420 × 342 × 160 mm
R-state < R5 V2 ⁽⁹⁾	H×W×D: 420 × 342 × 170 mm
R-state \geq R5 (B1, B2/ B25, B3, B3B, B66A, B70)	H×W×D: 420 × 342 × 148 mm
R-state \geq R5 (B7)	H×W×D: 420 × 342 × 169 mm
R-state \geq R5 (B30)	H×W×D: 420 × 342 × 151 mm
R-state \geq R5 (with NEBS cover)	H×W×D: 420 × 342 × 157 mm
Weight without Fan Unit (R-state < R5) ⁽¹⁰⁾	
B1, B2/B25, B3, B7, B7A, B66A	20 kg
Weight without Fan Unit (R-state \geq R5) ⁽¹⁰⁾	
B1, B2/B25, B3, B3B, B66A, B70	17.5 kg
B7	19 kg
B30	21.5 kg
Weight without Fan Unit (R-state \geq R5 with NEBS Cover) ⁽¹⁰⁾	
B2/B25, B66A, B70	18 kg
B30	22.5 kg
Weight with Fan Unit (R-state < R5 V1) ⁽¹⁰⁾	
B1, B2/B25, B3, B7, B7A, B66A	21.5 kg
Weight with Fan Unit (R-state < R5 V2) ⁽¹⁰⁾	
B1, B2/B25, B3, B7, B7A, B66A	21.3 kg
Weight with Fan Unit (R-state \geq R5) ⁽¹⁰⁾	
B1, B2/B25, B3, B3B, B66A, B70	18.7 kg
B7	20.2 kg
B30	23 kg



Description	Value
Weight with Fan Unit (R-state ≥ R5 with NEBS Cover) ⁽¹⁰⁾	
B2/B25, B66A, B70	19.3 kg
B30	24 kg
Color	
Body	NCS S 1002-B
Front	NCS S 6502-B

(1) For detailed information about licenses and HWAC, see the following:

GSM: User Description, GSM RAN Handling of Software Licenses and Hardware Activation Codes and MCPA Guideline in the GSM RAN CPI library.

WCDMA: Licenses and Hardware Activation Codes in Ericsson Software Model in the WCDMA RAN CPI library.

LTE, NR: Manage Licenses and Hardware Activation Codes in the Radio Node libraries.

- (2) For detailed information about output power, see Hardware-Related Capabilities.
- (3) For information about IBW, see Radio Node Configurations.
- (4) On B1, the frequency point 1966.08 MHz is not supported for NB-IoT mode.
- (5) B2 and B25 are combined in the same radio. Radio 4415 B2/B25 can be configured as B2 or B25.
- (6) The NB-IoT in-band, NB-IoT standalone, and NB-IoT guard band modes does not apply in Japan.
- (7) NB-IoT is not supported in Band 7 for the Canadian market.
- (8) V1 indicates the fan unit with the product number NTB 101 879/1.
- (9) V2 indicates the fan unit with the product number NTB 101 0230/1.
- (10) The weight can differ dependent on the frequency variant

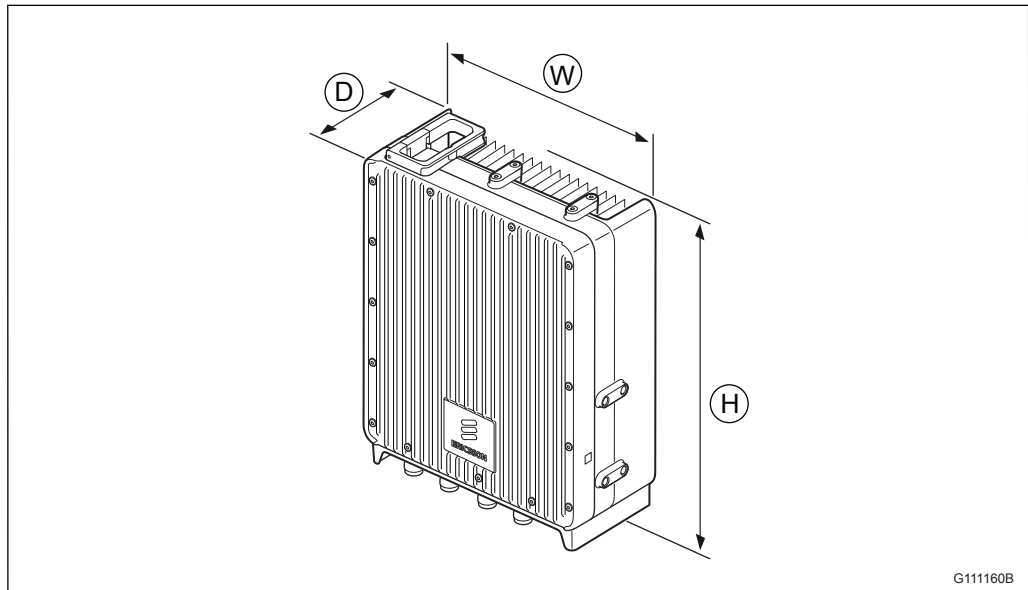


Figure 2 Radio 4415 Height, Width, and Depth

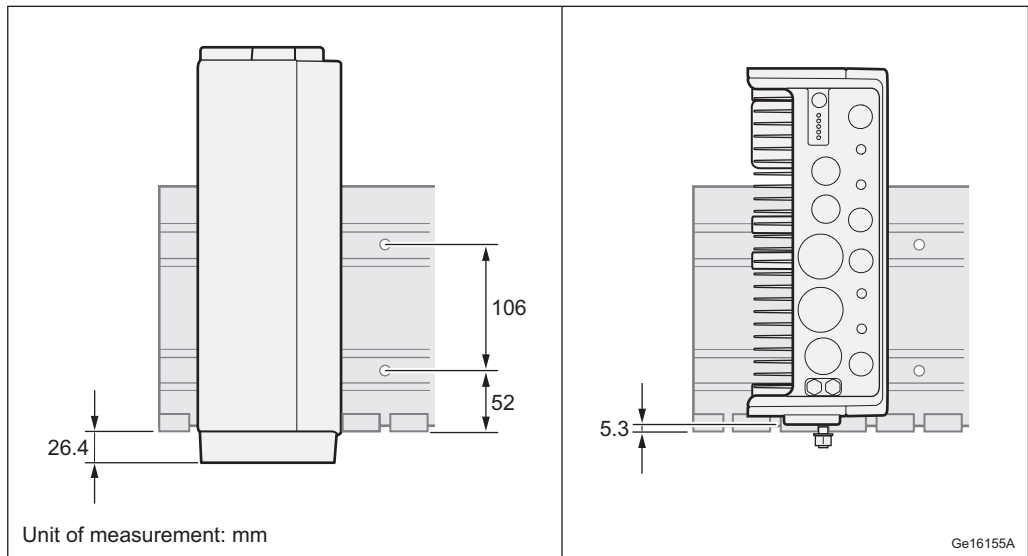


Figure 3 Radio 4415 to Rail Measurement (R-state < R5)

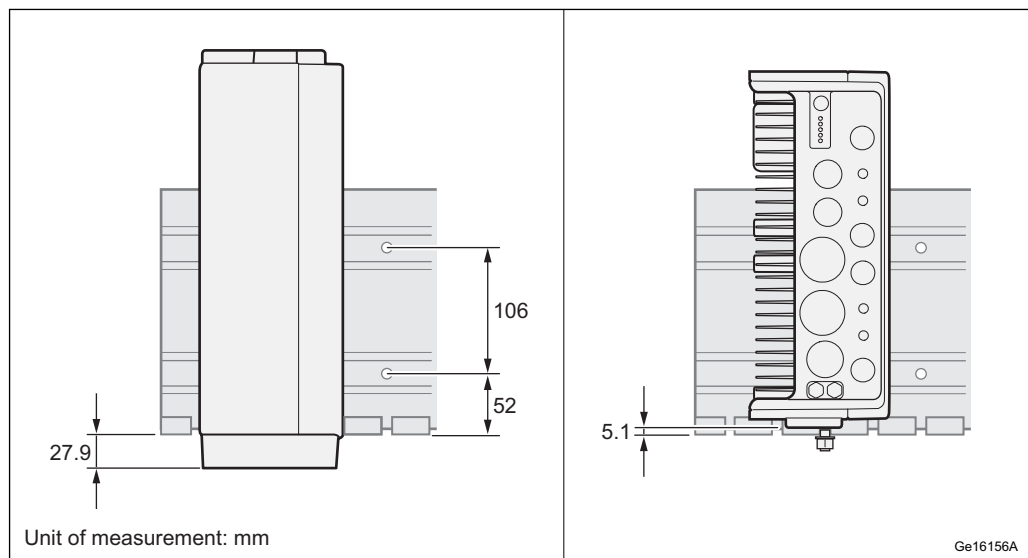


Figure 4 Radio 4415 to Rail Measurement (R-state \geq R5)

Table 2 Fan Unit Technical Data

Description	Value
Dimensions	
R-state < R5 V1	A×B×C×D: 410 × 335 × 87 × 15 mm
R-state < R5 V2	A×B×C×D: 410 × 333 × 94 × 25 mm
R-state \geq R5 excluding B7	A×B×C×D: 410 × 333 × 88 × 25 mm
B7 R-state \geq R5	A×B×C×D: 410 × 333 × 105 × 25 mm
Weight	
R-state < R5 V1	1.5 kg
R-state < R5 V2	1.3 kg
R-state \geq R5	1.2 kg
Color	
Back cover	NCS S 1002-B
Fan box	NCS S 6502-B

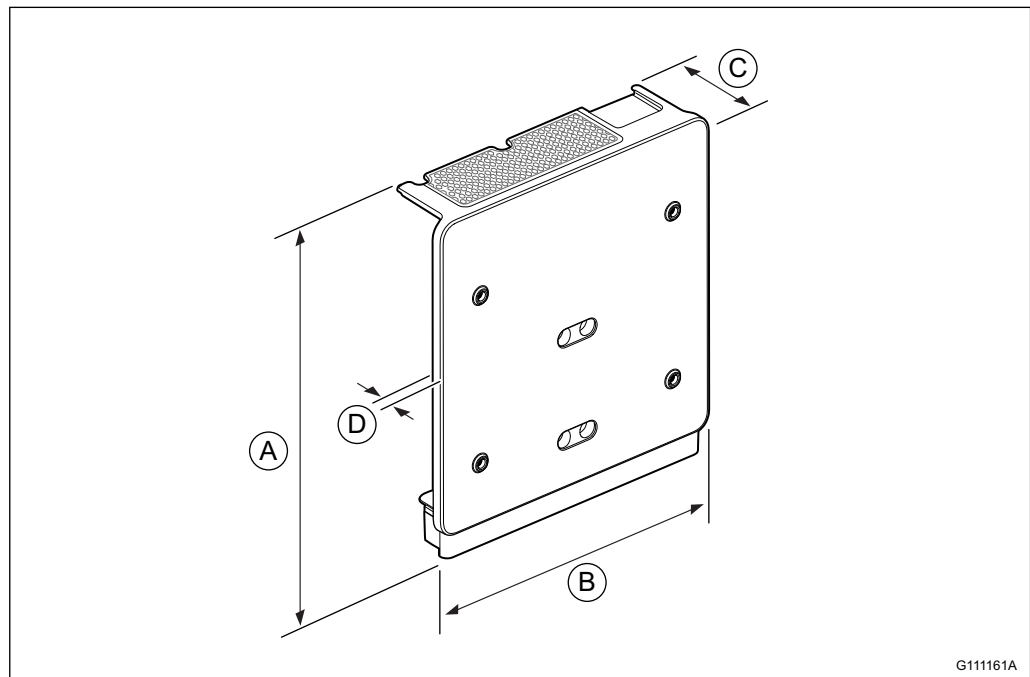


Figure 5 Fan Unit Height, Width, and Depth

3.1 Installation Recommendations

To achieve reliable operation, and maximum performance, an appropriate installation location must be chosen.

3.1.1 Indoor Locations to Avoid

Although the unit is designed for outdoor use, it can also operate in an indoor environment according to ETSI EN 300 019-1-3 class 3.1, 3.2, 3.3, and 3.6. This does not cover installation with heat traps or installation in lofts, where air ventilation does not exist. To ensure smooth performance of the product, it is recommended to ensure that the planned installation site for the unit is not a potential microclimate location. This typically occurs in places such as unventilated lofts, sites with heat traps, or sites where the product is exposed to direct sunlight through windows. Ensure proper ventilation and avoid installing the equipment under glass covers or skylight windows.

3.1.2 Outdoor Locations to Avoid

Although Ericsson declares this product suitable for most outdoor environments, this does not cover installations where the planned installation site for the unit is a potential microclimate location. Typical examples of these microclimate locations are sites where the products are not only exposed to the actual temperature, but also additional temperature as heat coming from dark-colored planes, for example, reflections from the floor or walls. The additional



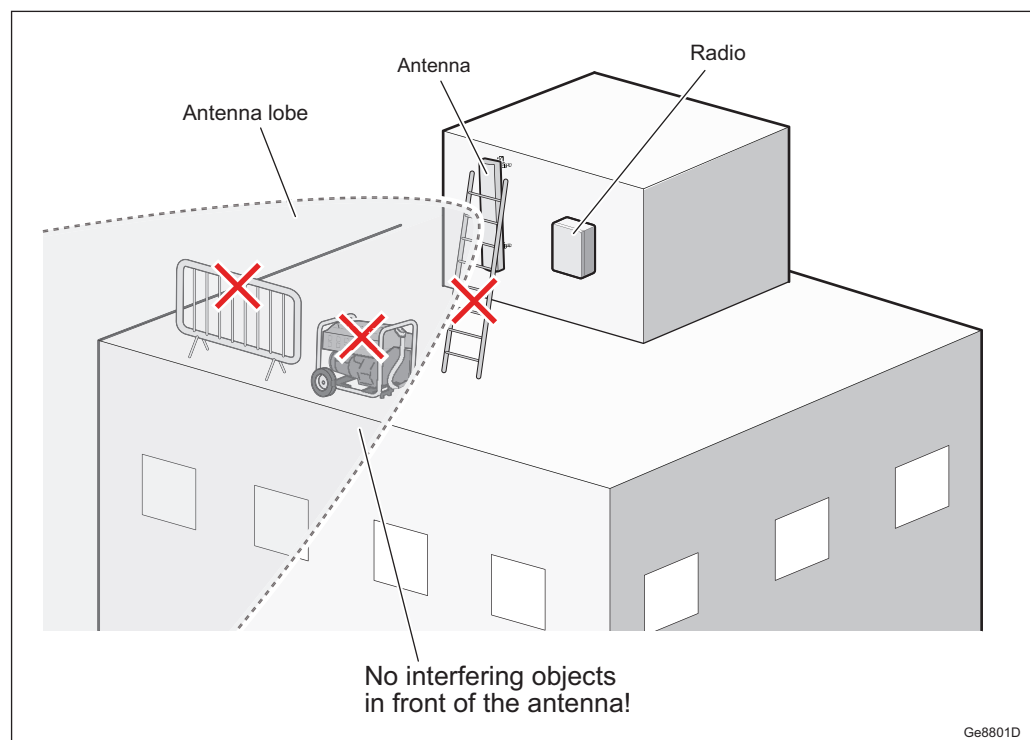
temperature can generate heat traps with temperatures up to 10°C higher than expected.

Avoid installing equipment in the following locations:

- Near the exhaust of the building ventilation system.
- Near the exhaust of the chimney.
- Opposite large surfaces made of glass or new concrete.
- Near overhanging structures such as roof overhangs.

Avoid radio interference by keeping the area directly in front of the antenna clear of the following:

- Metal surfaces or objects such as railings, ladders or chains
- Equipment generating electromagnetic fields, such as electric motors in air conditioners or diesel generators
- RBS equipment





3.1.3 Installations that Require Fan Unit

The fan unit must be used in all installation scenarios where the cables from the radio are not pointing directly downwards. The fan unit must also be used in extreme conditions, such as installations with poor ventilation or installations with heat traps.

3.1.4 Painting Disclaimer

Ericsson recommends to not paint the product as it can affect performance of the product.

Ericsson applies limitations to the warranty and service contract if the product is painted.

If the product is painted, the following commercial limitations apply:

- Failure modes directly related to overheating because of painting are not valid for repair within the scope of the warranty or standard service contract.
- Product failures related to paint contamination of components of the unit are not valid for repair within the scope of warranty or standard service contract.
- When a painted unit is repaired, it might be restored to the standard color before being returned to the market. It is not possible to guarantee that the same unit is sent back to the same place. This is also valid for units repaired under a service contract.
- For repairs within the warranty period or a standard service contract, the customer is charged the additional costs for replacing all painted parts of the unit or the complete unit.

If adaptations are required, contact Ericsson for information.



3.2 Installation Alternatives

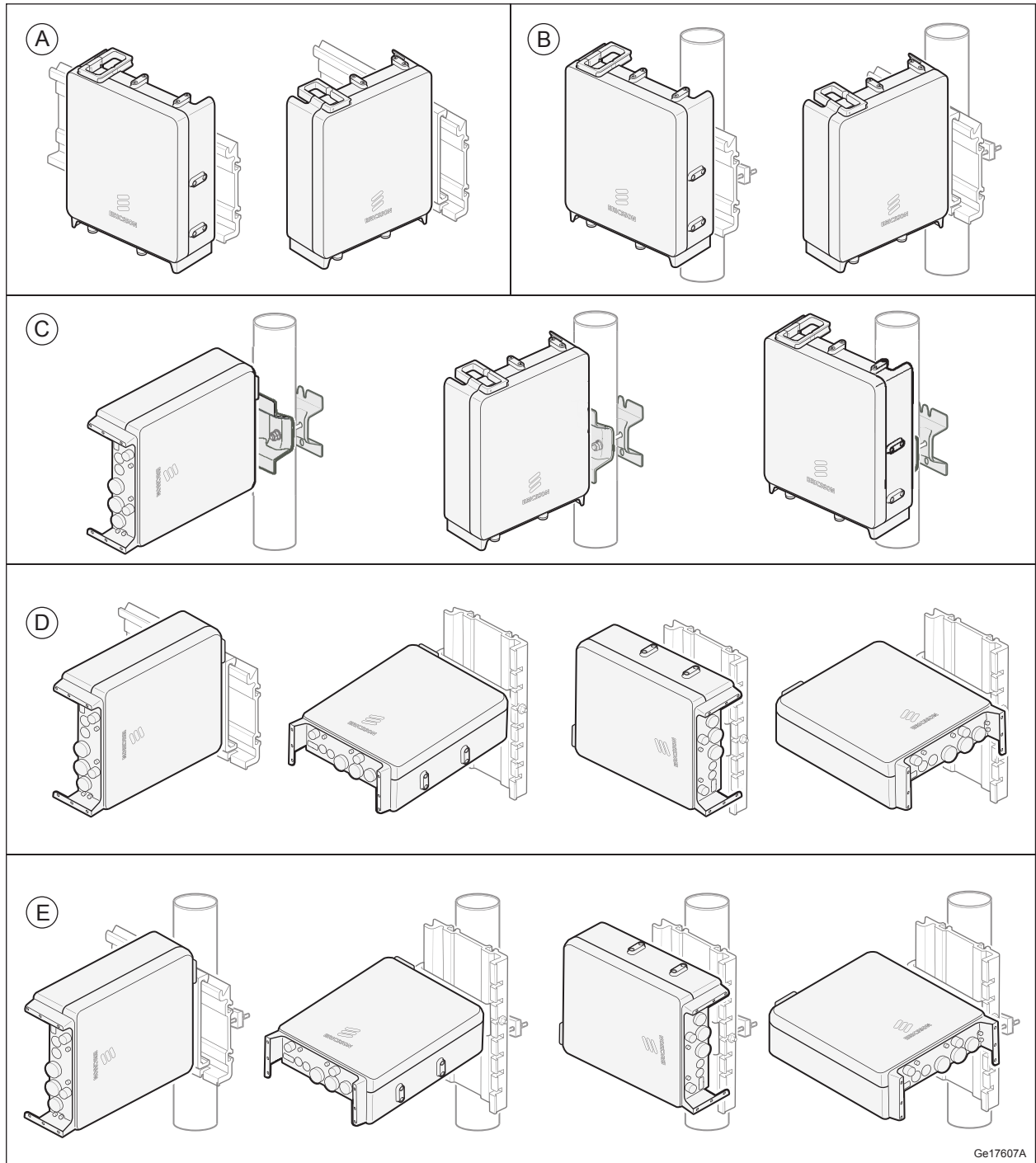


Figure 6 Installation Alternatives 1 (3)

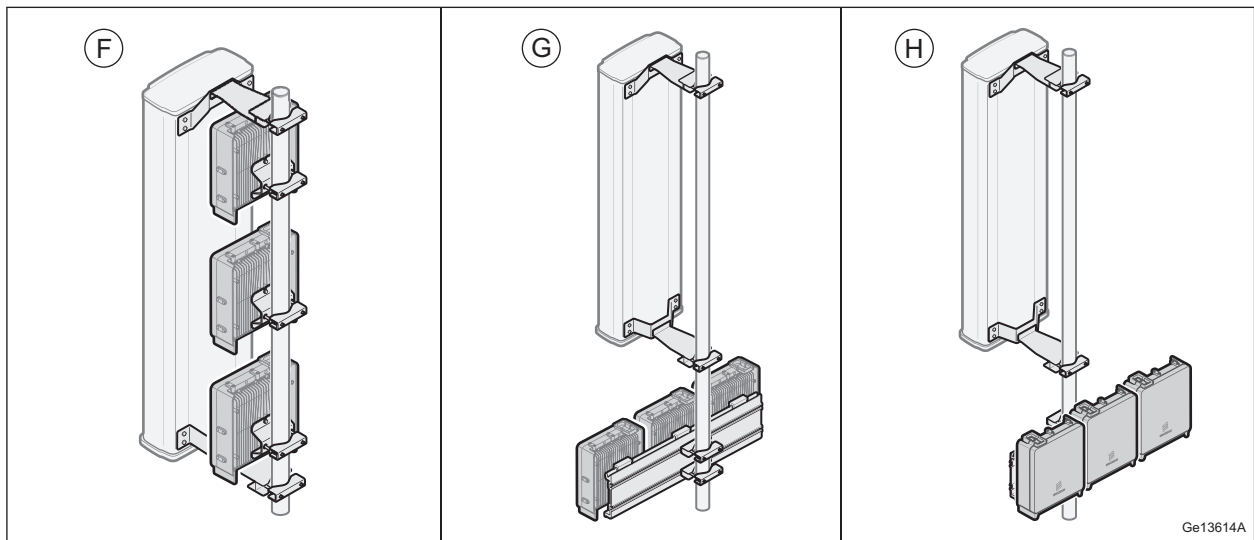


Figure 7 Installation Alternatives 2 (3)

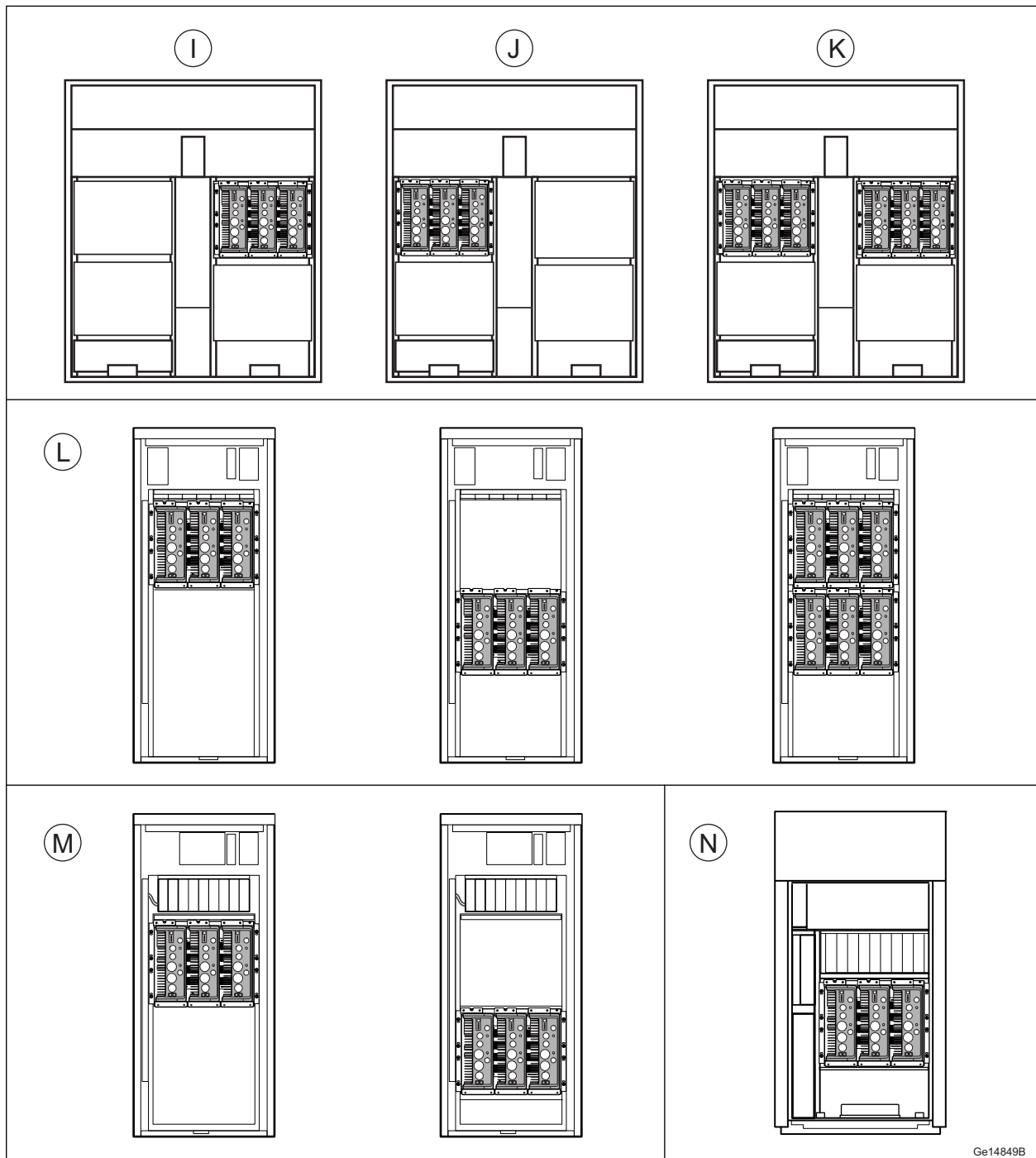


Figure 8 Installation Alternatives 3 (3)

Table 3 Key to Installation Alternatives

Installation Method	Description
A	Wall installation



Installation Method	Description
B	Pole installation
C	Pole installation with single or dual bracket
D	Wall installation with fan unit
E	Pole installation with fan unit
F	Radio Mounted Behind the Antenna (R-state \geq R5) ⁽¹⁾
G, H	Radio Mounted Below the Antenna (R-state \geq R5)
I, J, K	Radio installed inside the RBS 6102 cabinet with 9U subrack ⁽²⁾⁽⁵⁾
L, M	Radio installed inside the RBS 6201 cabinet with 9U subrack ⁽³⁾⁽⁵⁾
N	Radio installed inside the RBS 6101 cabinet with 9U subrack ⁽⁴⁾⁽⁵⁾

(1) For more information, see [Install Radio Mounted Behind the Antenna](#).

(2) For more information, see [Upgrading RBS RBS 6102](#).

(3) For more information, see [Upgrading RBS RBS 6201](#).

(4) For more information, see [Upgrading RBS RBS 6101](#).

(5) For Radio products that support the installation, see [Table 4](#).

Table 4 Radio products that Support Installation in the RBS Cabinet

Unit	Variant	Installation Supported from R-state
Radio 4415 B1	Without TX monitor	From R1B
Radio 4415 B1	With TX monitor	From R5B
Radio 4415 B2B25	Without NEBS cover	From R1B
Radio 4415 B2B25	With NEBS cover	From R1B
Radio 4415 B3	Without TX monitor	R1C
Radio 4415 B3	With TX monitor	R1C
Radio 4415 B3B	—	From R5A
Radio 4415 B7	Without TX monitor	From R1C
Radio 4415 B7	With TX monitor	From R1A
Radio 4415 B66A	Without NEBS cover	From R1E
Radio 4415 B66A	With NEBS cover	From R1E



Unit	Variant	Installation Supported from R-state
Radio 4415 B70	—	From R5B

3.3 Space Requirements

3.3.1 Generic Requirements

Parts of the radio can attain high temperatures during normal operation. Therefore the radio must be installed in a classified service access area. Exception applies when the radio is installed at a height that is not reachable from ground level.

Allow a sufficient working space in front of the radio.

It is recommended that the radio is installed below, or behind the antenna. Do not install the radio closer than 25 m from the main lobe of its own antenna, or antennas belonging to other services or operators using the same site.

All distances in the sections below are minimum distances, and can be increased if necessary for high temperatures, for example roof installations.

3.3.2 Pole or Mast Installation

The installation requirements when installing the radio on a pole or a mast are shown in [Figure 9](#) and [Figure 10](#).

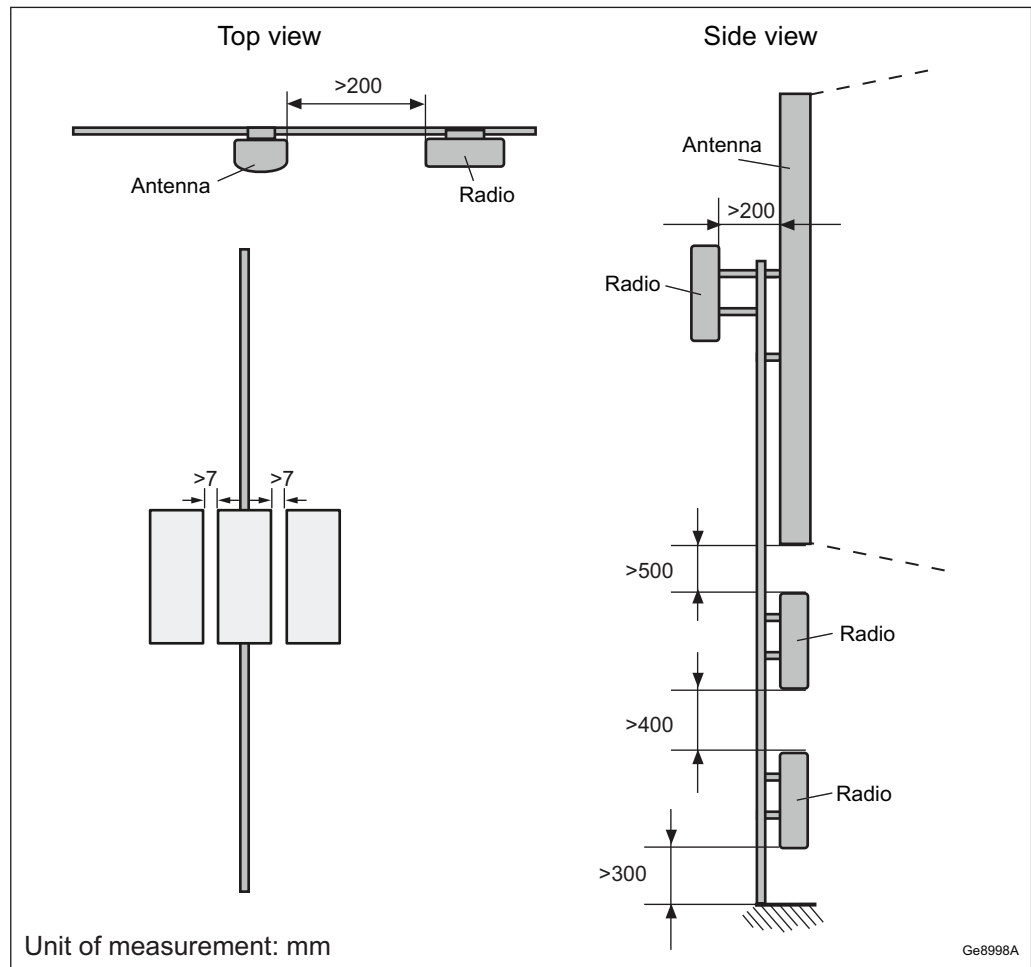


Figure 9 Radio Pole Installation Requirements (R-state < R5 or R-state ≥ R5 with fan)

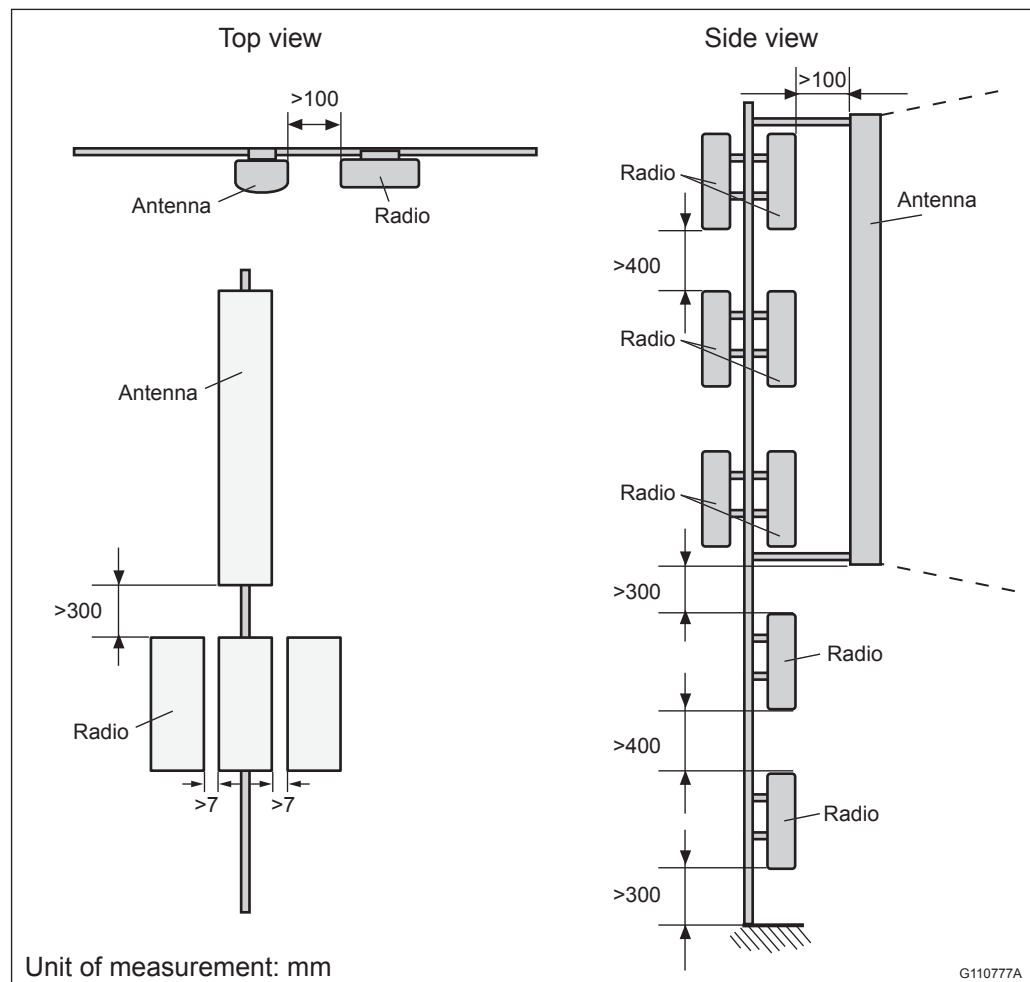


Figure 10 Radio Pole Installation Requirements (R-state \geq R5 without fan)

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal rail on a single pole, or a dual pole installation. Allow a minimum vertical distance of 500 mm (R-state < R5 or R-state \geq R5 with fan) or 300 mm (R-state \geq R5 without fan) between radio and antenna, if installed above or below an antenna. The minimum distance from the bottom of the radio to the floor is 300 mm.

Allow a minimum of 7 mm free space between radios installed side by side on the rail.

Allow for a minimum of 40 mm free space between radios installed side by side on the rail when ambient temperature is expected to be above +45°C.

Note: A radio cannot be installed in the uppermost position of a pole or mast.



3.3.3 Rail Installation on Wall

This section describes the installation requirements when installing the radio on a wall.

3.3.3.1 Radio Installation on Outdoor Wall

The installation requirements if installing the radio outdoor on a wall are shown in [Figure 11](#) and [Figure 12](#).

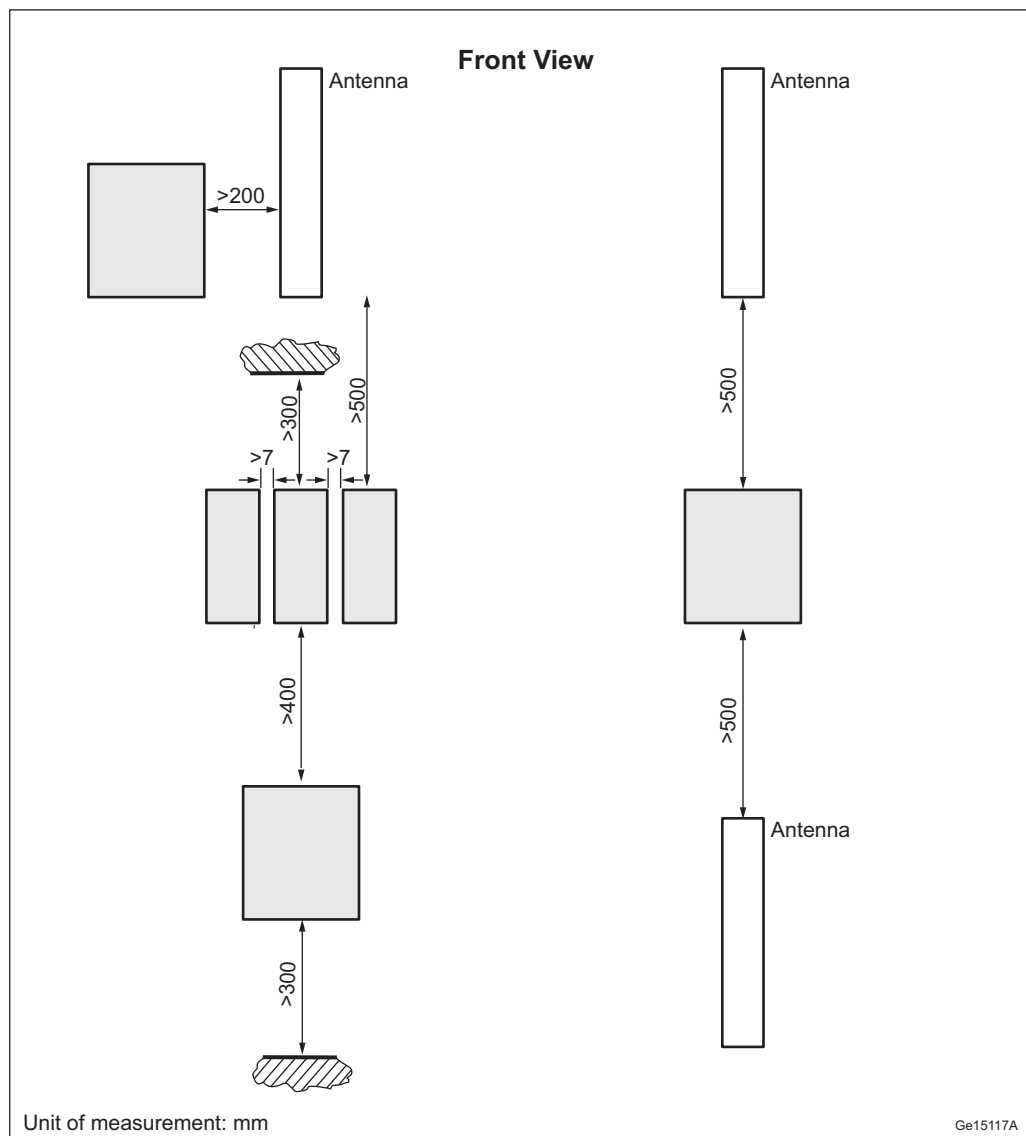


Figure 11 Radio Outdoor Wall Installation Requirements (R-state < R5 or R-state ≥ R5 with fan)

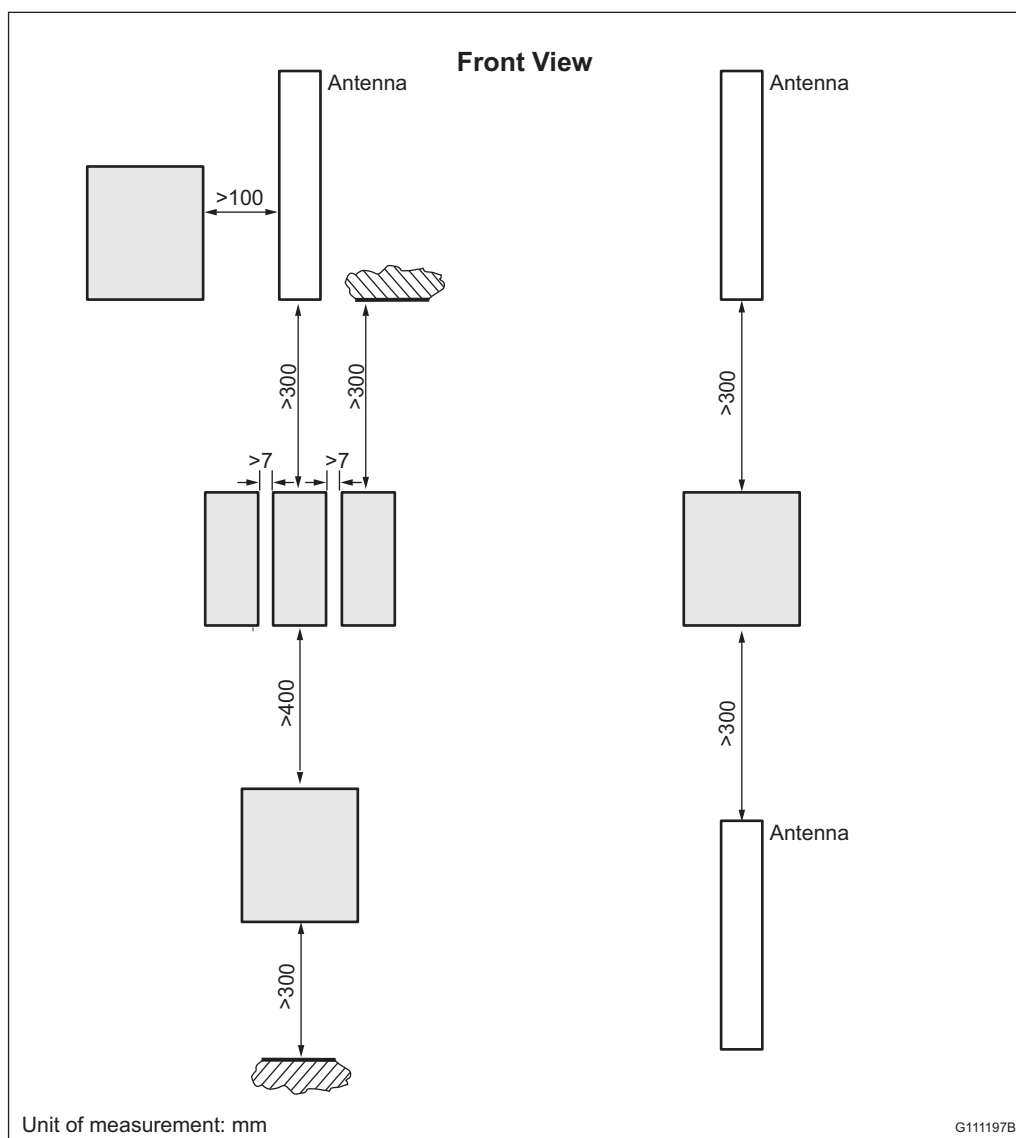


Figure 12 Radio Outdoor Wall Installation Requirements (R-state \geq R5 without fan)

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal rail on a wall. Allow a minimum vertical distance of 500 mm (R-state < R5 or R-state \geq R5 with fan) or 300 mm (R-state \geq R5 without fan) between radio and antenna, if installed above or below an antenna. The minimum distance from the bottom of the radio to the floor is 300 mm.

Allow a minimum of 300 mm free space to any overhanging roof or other structure that may obstruct airflow and create a heat trap.

Allow a minimum of 7 mm free space between radios installed side by side on the rail.



Allow a minimum of 40 mm free space between radios installed side by side on the rail when ambient temperature is expected to be above +45°C.

3.3.3.2

Radio Installation on Indoor Wall

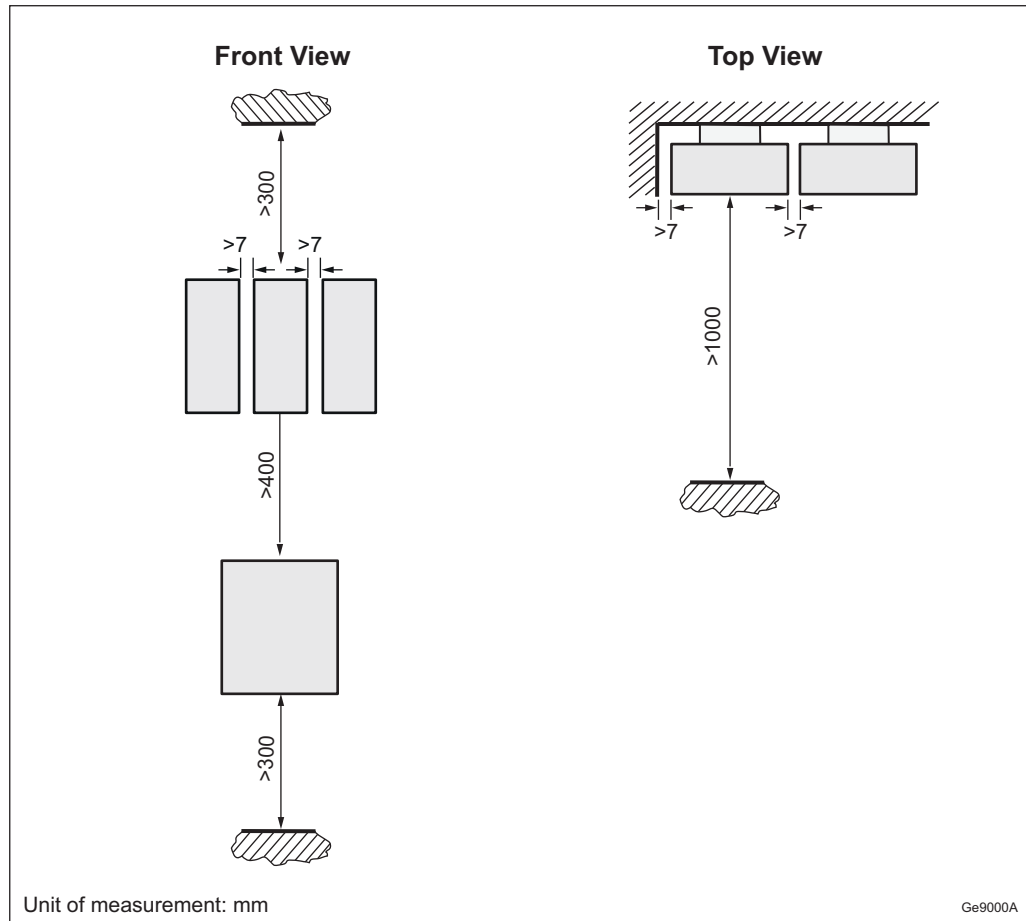


Figure 13 Radio Indoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal rail on a wall. The minimum distance from the bottom of the radio to the floor is 300 mm.

Allow a minimum of 300 mm free space to the ceiling or any overhanging structure that may obstruct airflow and create a heat trap.

Allow a minimum of 7 mm free space between radios installed side by side on the rail.

Allow a minimum of 40 mm free space between radios installed side by side on the rail when ambient temperature is expected to be above +45°C.



3.4 Acoustic Noise

The radio without fan can emit low levels of acoustic noise when operating on low capacity. The sound power level when operating on low capacity in LTE is lower than 36 dB.

With the Radio 4415 fan, the acoustic noise is ambient temperature dependent, as listed below.

Table 5 Maximum Sound Power Level (dB) for Radio 4415 with Fan

Temperature (°C)	Radio 4415 Sound Power Level (dB) (R-state < R5)	Radio 4415 Sound Power Level (dB) (R-state ≥ R5 excluding B7)	Radio 4415 Sound Power Level (dB) (B7 R-state ≥ R5)
< +25	45	40	39
+30	45	40	39
+40	53	40	39
+45	55	40	39
+55	59	40	52

3.5 Environmental Characteristics

This section contains operating environment data for the radio.

3.5.1 Operating Environment

The following are the values for the normal operating environment of the radio:

Temperature ⁽¹⁾	-40 to +55 °C		
Solar radiation	≤ 1120 W/m ²		
Relative humidity	5 – 100%		
Absolute humidity	0.26 – 40 g/m ³		
Maximum temperature change	1.0 °C/min		
Maximum wind load at 150 km/h (pole installed single case)	Radio <R5	without fan	206 N (front), 64 N (side)
		with fan	211 N (front), 79 N (side)



	Radio >R5 (B1 / B2 / B3 / B25 / B66A / B70)	without fan	203 N (front), 53 N (side)
		with fan	208 N (front), 68 N (side)
	Radio >R5 (B7)	without fan	207 N (front), 64 N (side)
		with fan	212 N (front), 80 N (side)
	Radio >R5 (B30)	without fan	203 N (front), 53 N (side)
		with fan	208 N (front), 68 N (side)
	Radio >R5 with NEBS cover	without fan	205 N (front), 59 N (side)
		with fan	210 N (front), 74 N (side)

(1) Depending on installation scenario, traffic load, and configuration, the product can, in the highest 10 °C temperature range, temporarily reduce the output power. This depends on the durations of the high ambient temperature.

3.5.2

Heat Dissipation

The radio is convection cooled and designed for outdoor installation. Avoid indoor installation in a room without adequate ventilation and cooling.

Table 6 Radio Heat Dissipation

Unit	Output Power	Maximum Heat Dissipation
Radio 4415 B1 (R-state < R5)	4 × 40 W	0.49 kW
Radio 4415 B1 (R-state ≥ R5)	4 × 40 W	0.47 kW
Radio 4415 B2/B25 (R-state < R5)	4 × 40 W	0.49 kW
Radio 4415 B2/B25 (R-state ≥ R5)	4 × 40 W	0.51 kW
Radio 4415 B3 (R-state < R5)	4 × 40 W	0.54 kW
Radio 4415 B3 (R-state ≥ R5)	4 × 40 W	0.47 kW
Radio 4415 B3B (R-state ≥ R5)	4 × 40 W	0.47 kW
Radio 4415 B7	4 × 40 W	0.51 kW
Radio 4415 B7A	4 × 40 W	0.49 kW
Radio 4415 B30	4 × 25 W	0.48 kW



Unit	Output Power	Maximum Heat Dissipation
Radio 4415 B66A (R-state < R5)	4 × 40 W	0.49 kW
Radio 4415 B66A (R-state ≥ R5)	4 × 40 W	0.46 kW
Radio 4415 B70 (R-state ≥ R5)	4 × 40 W	0.45 kW

3.5.3 Vibration

This section describes the radio tolerance to vibrations. The radio operates reliably during seismic activity as specified by test method IEC 60068-2-57 Ff.

Maximum level of Required Response Spectrum (RRS)	50 m/s ² within 2–5 Hz for DR=2%
Frequency range	1–35 Hz
Time history signal	Verteq II

The radio operates reliably during random vibration as specified by test method IEC 60068-2-64 Fh

Random vibration, normal operation	0.3 m ² /s ³
------------------------------------	------------------------------------

3.5.4 Materials

All Ericsson products fulfill the legal and market requirements regarding the following:

- Material declaration
- Materials' fire resistance, components, wires, and cables
- Recycling
- Restricted and banned material use

3.6 Power Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the radio.

Different power systems can supply power for multiple radios, if necessary.



3.6.1 DC Power Characteristics

The power supply voltage for the radio is –48 V DC.

Table 7 Radio DC Power Supply Requirements

Conditions	Values and Ranges
Nominal voltage	–48 V DC
Operating voltage range ⁽¹⁾	–36.0 to –58.5 V DC
Non-destructive range	0 to –60 V DC

(1) The operating voltage range refers to the voltage at the radio power input port.

The radio is designed for 3-wire (DC-I) power connections. For 2-wire (DC-C) power solutions, a DC adapter is used.

Fuse and Circuit Breaker Recommendations

The recommendations given in this section are based on peak power consumption and give no information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60934.

The radio has a built-in Class 1 (Type 1) SPD to protect the equipment in case of lightning and network transients. The recommended fuse or circuit breaker rating is therefore dimensioned not to trip the fuse or circuit breaker in case of most SPD operation. The minimum fuse rating can be taken into account only if it is accepted that fuses or circuit breakers trip in such situations.

Table 8 External Radio Fuse and Circuit Breaker Recommendations

Unit (DC Powered)	Output Power	Minimum Fuse Rating ⁽¹⁾	Fuse Rating Recommended for Reliable Operation ⁽²⁾	Maximum Allowed Fuse Rating ⁽³⁾
Radio 4415 B1	4 × 40 W	20 A	25 A	32 A
Radio 4415 B2/B25				
Radio 4415 B3				
Radio 4415 B3B				
Radio 4415 B7				
Radio 4415 B7A				
Radio 4415 B66A				
Radio 4415 B70				
Radio 4415 B30	4 × 25 W	20 A	25 A	32 A

(1) These fuse ratings can only be used if it is acceptable that fuses trip because of lightning or network transients.



- (2) The recommended fuse rating takes into account that external fuses are not to trip because of lightning or network transients.
- (3) The absolute maximum fuse class in accordance with radio design restrictions.

Note: If a fuse or circuit breaker rating above minimum fuse rating is selected, cable dimensioning rules must be reconsidered to make sure that the fuse or circuit breaker tripping criteria are met, see [-48 V DC Power Supply Interface](#) on page 39.

3.6.2 AC Power Characteristics

The radio installation accepts 100–250 V AC when used together with an optional PSU. For more information about the PSU, see [PSU Description](#).

3.6.3 Power Consumption

For information on power consumption, see [Power Consumption Calculations](#).

3.7 System Characteristics

This section describes the system characteristics of the Radio System.

3.7.1 RF Electromagnetic Exposure

For general information about RF EMFs, see [Radio Frequency Electromagnetic Fields](#).

The tables list the compliance boundaries (exclusion zones), outside of which the RF EMF exposure from Radio 4415 is below the limits applicable in:

- EU (1999/519/EC, 2013/35/EU, EN 50385) [Table 9](#)
- Canada (Health Canada Safety Code 6) [Table 10](#)
- USA (47 CFR 1.1310) [Table 11](#)

Table 9 Dimensions of the box-shaped compliance boundary for general public (GP) and occupational (O) exposure for Radio 4415 applicable in the EU and markets employing the ICNIRP



RF exposure limits. The compliance boundaries are determined for maximum output power with 0.5 dB transmission loss and 0.6 dB output power tolerance included.

Mode and Output Power for Radio 4415				Dimensions of the Box-Shaped Compliance Boundary ⁽¹⁾⁽²⁾ (m)							
				Distance in Front of Antenna		Width		Height		Distance Behind Antenna	
Band	Standard	Maximum Nominal Output Power from the Radio	IEC 62232 Installation Class	GP	O	GP	O	GP	O	GP	O
B3 ⁽¹⁾	GSM/LTE/NR	4x40 W	E+	12.1	5.1	9.7	4.4	3.8	1.7	<0.1	<0.1
B3B ⁽¹⁾	GSM/LTE/NR	4x40 W	E+	12.1	5.1	9.6	4.3	3.8	1.7	<0.1	<0.1
B7/ B7A ⁽²⁾	LTE/NR	4x40 W	E+	14.3	4.4	10.9	2.1	2.0	1.6	0.3	<0.1
B1 ⁽¹⁾	WCDMA/LTE/NR	4x40 W	E+	12.7	5.3	9.9	3.6	3.5	1.6	<0.1	<0.1

(1) The compliance boundaries are determined for maximum output power with transmission loss and power tolerance included using the antenna KRE 101 2294/1 for an electrical tilt of 2°.

(2) The compliance boundaries are determined for maximum output power with power tolerance and transmission loss included using the antenna KRE 101 2294/1.

Table 10 Dimensions of the box-shaped compliance boundary for general public (GP) and occupational (O) exposure for Radio 4415 applicable in Canada. The compliance boundaries are determined with 0.5 dB transmission loss and 0.6 dB output power tolerance included.

Mode and Output Power for Radio 4415				Dimensions of the Box-Shaped Compliance Boundary ^{(1) (2)} (m)							
				Distance in Front of Antenna		Width		Height		Distance Behind Antenna	
Band	Standard	Maximum Nominal Output Power from the Radio	IEC 62232 Installation Class	GP	O	GP	O	GP	O	GP	O
B7 ⁽¹⁾	LTE/NR	4x40 W	E+	19.0	6.9	15.0	3.2	2.2	1.9	0.4	0.2
B66A ⁽²⁾	WCDMA/LTE/NR	4x40 W	E+	17.9	7.0	14.2	5.8	5.3	2.2	0.2	0.2

(1) The compliance boundaries are determined for maximum output power with power tolerance and transmission loss included using the antenna KRE 101 2294/1.

(2) The compliance boundaries are determined for maximum output power with transmission loss and power tolerance included using the antenna KRE 101 2294/1 and 2 degrees of electrical down tilt.

Table 11 Dimensions of the box-shaped compliance boundary for general public (GP) and occupational (O) exposure for Radio 4415 applicable in the markets employing the FCC RF



exposure limits. The compliance boundaries are determined for maximum output power with 0.5 dB transmission loss and 0.6 dB output power tolerance included.

Mode and Output Power for Radio 4415				Dimensions of the Box-Shaped Compliance Boundary ⁽¹⁾ (m)							
				Distance in Front of Antenna		Width		Height		Distance Behind Antenna	
Band	Standard	Maximum Nominal Output Power from the Radio	IEC 62232 Installation Class	GP	O	GP	O	GP	O	GP	O
B66A	WCDMA/LTE/NR	4x40 W	E+	12.7	5.7	10.0	4.5	3.7	1.9	0.3	0.2

(1) The compliance boundaries are determined for maximum output power with transmission loss and power tolerance included using the antenna KRE 101 2294/1 and 2 degrees of electrical down tilt.

3.7.2 Software

For information on software dependencies, see [Radio Software Support](#).

3.7.3 Radio Configurations

For information about available radio configurations, see [Radio Node Configurations](#).



4 Hardware Architecture

This section describes the radio hardware structure regardless of configuration or frequency. The DC adapter and radio components are shown in [Figure 14](#) and listed in [Table 12](#).

For a description of the supported radio configurations, refer to [Radio Node Configurations](#).

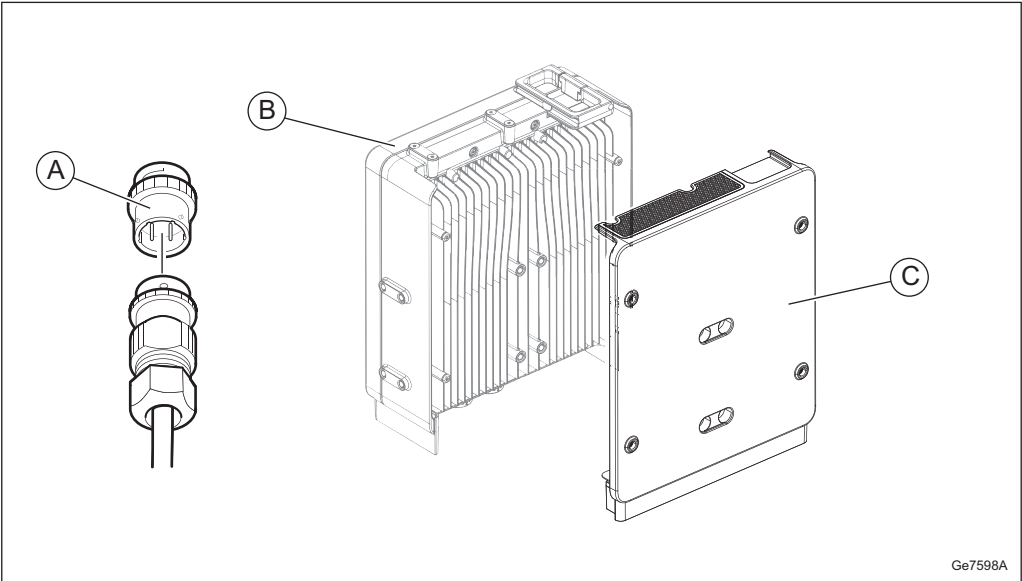


Figure 14 DC Adapter and Radio Components

Table 12 Key to DC Adapter and Radio Components

Position	Component
A	DC adapter for 2-wire (DC-C) connector
B	Radio
C	Fan unit

4.1 Radio Overview

The radio contains most of the radio processing hardware. The following sections describe the components inside the radio.

4.1.1 TRX

The Transmitter and Receiver (TRX) provides the following:



- Analog/Digital (A/D), Digital/Analog (D/A) conversion
- Channel filtering
- Delay and gain adjustment
- Digital predistortion
- RF modulation and demodulation
- Optical cable interface termination
- Four receivers for RX diversity
- RET modem (the antenna system communication link)

4.1.2 Power Amplifier

The MCPA is the linear power amplifier for the RF carriers. The radio has four MCPAs, one for each branch.

4.1.3 Filter Unit

The Filter Unit consists of band-pass filters.

In the radio, the Filter Unit also provides the following:

- Power and supervision for the TMA, or the RIU
- VSWR supervision

4.1.4 DC SPD

The DC SPD board protects the DC power input from lightning currents.

4.1.5 ALD (RET) SPD

An SPD provides overvoltage or overcurrent protection for the ALD (RET) port.

4.1.6 External Alarm SPD

An SPD provides overvoltage or overcurrent protection for the external alarm ports.

4.2 Fan Unit (Optional)

The fan unit is DC-powered (24 V DC) and controlled through the radio external alarm port.

4.3 Optical Indicators and Buttons

The radio is equipped with optical indicators that show system status. The radio optical indicators are located under the maintenance cover. The fan unit optical indicators are located under a cover.

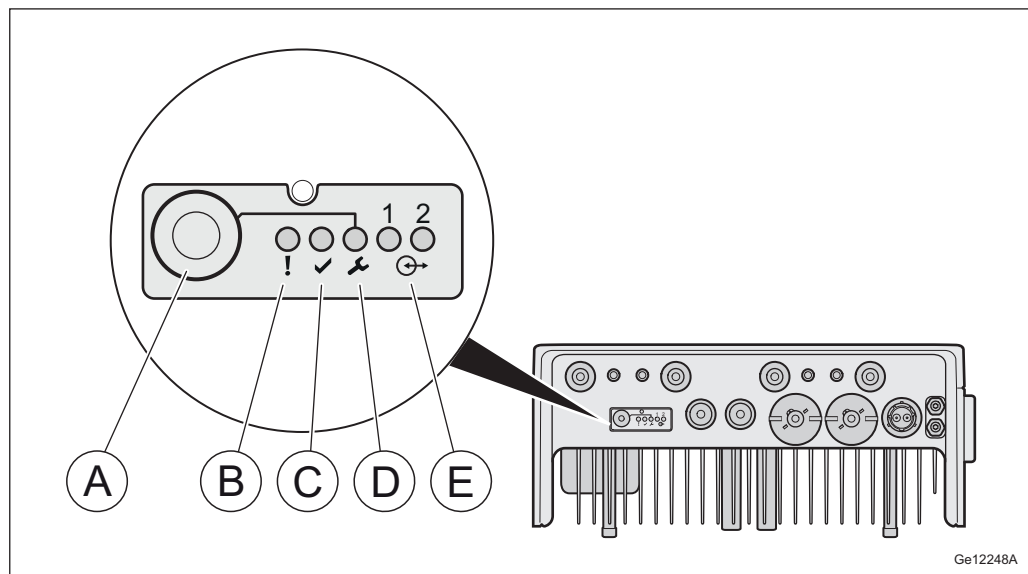
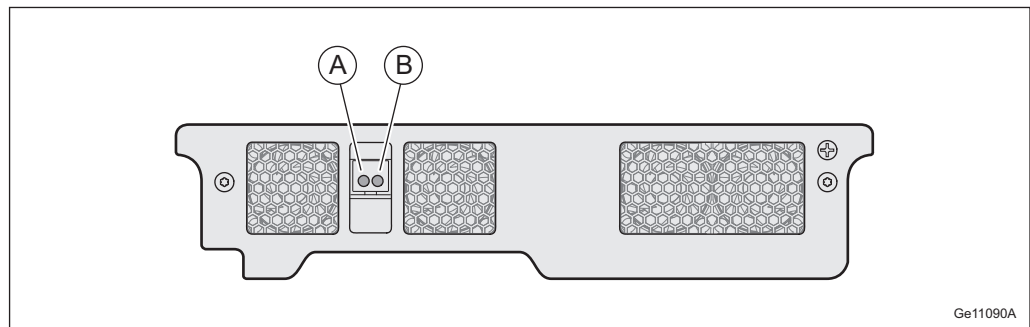


Figure 15 Radio Optical Indicators and Buttons

Table 13 Description of Radio Optical Indicators and Buttons

Position	Name	Marking
A	Maintenance button	–
B	Fault	!
C	Operational	✓
D	Maintenance	🔧
E	Interface 1 Interface 2	⊕→



Ge11090A

Figure 16 Fan Unit Optical Indicators

Table 14 Description of Fan Unit Optical Indicators

Position	Name	Marking
A	Fault	!
B	Operational	✓

For more information about the behavior of the optical indicators and the maintenance button, refer to [Indicators, Buttons, and Switches](#).



5 Connection Interfaces

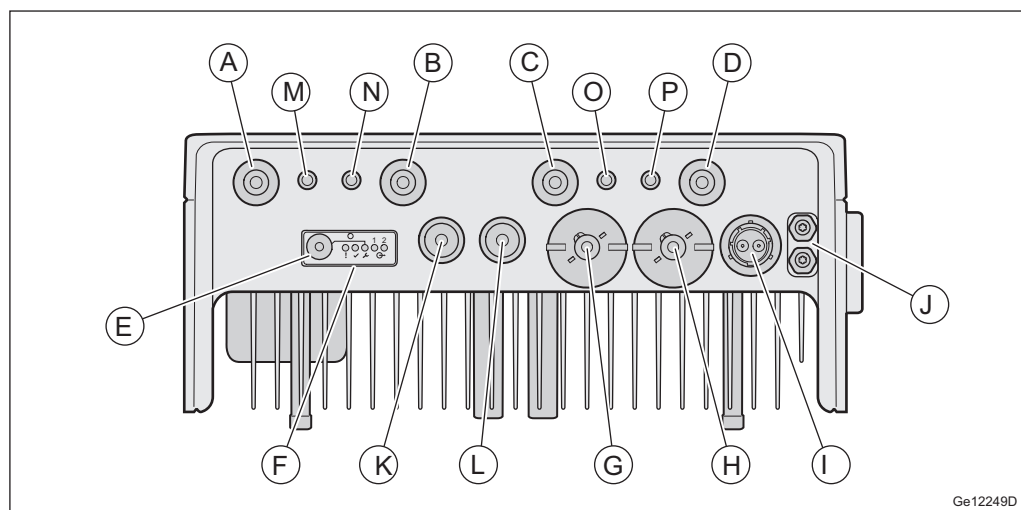


Figure 17 Radio 4415 Connection Interfaces (R-state < R5)

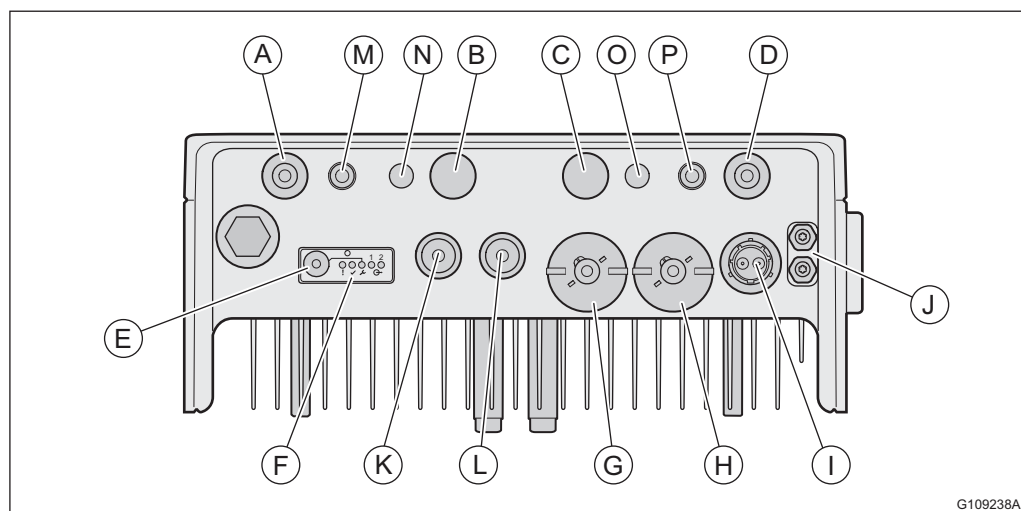
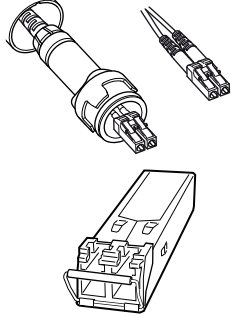
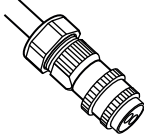

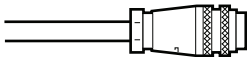
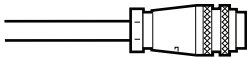
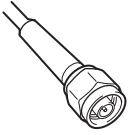


Figure 18 Radio 4415 Connection Interfaces (R-state ≥ R5)

Table 15 Radio Connection Interfaces

Position	Description	Marking	Connector Types	Cable Illustration
A	Antenna A	A	4.3–10 connector	
B	Antenna B	B		
C	Antenna C	C		
D	Antenna D	D		



Position	Description	Marking	Connector Types	Cable Illustration
E	Maintenance button	—	—	—
F	Optical indicators	! ✓ ⚙ ⊕ 1, ⊕ 2	—	—
G	Optical cable 1	⊕ 1	LC (On SFP) with support for FullAXS	
H	Optical cable 2	⊕ 2		
I	–48 V DC power supply	–48V	Power connector	
J	Grounding	⏏	2 × 6 mm dual lug	
K	External alarm and fan unit power supply and control	⚡ ⚙	DIN connector, 14 pin	
L	ALD (used for a RET unit for example)	ALD	DIN connector, 8 pin	
M ⁽¹⁾	TX monitor A	A ⚡	SMA connector	
N ⁽¹⁾	TX monitor B	B ⚡		
O ⁽¹⁾	TX monitor C	C ⚡		
P ⁽¹⁾	TX monitor D	D ⚡		

(1) Optional for B1, B3, and B7.

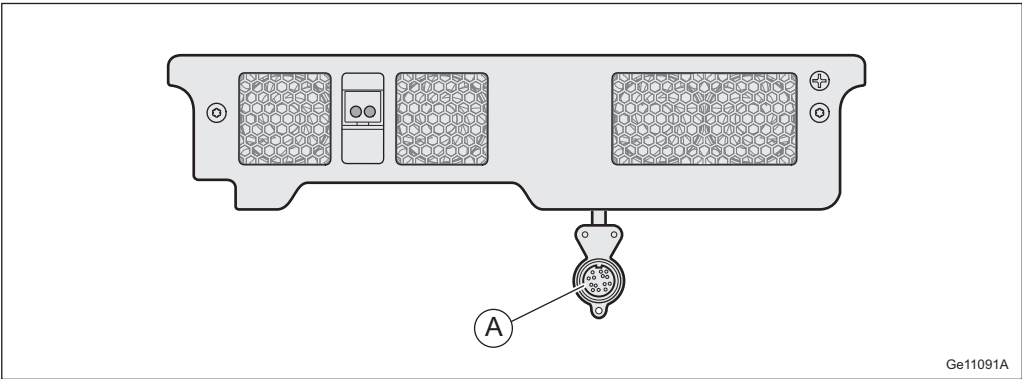


Figure 19 Fan Unit Connection Interface

Table 16 Description of Fan Unit Connection Interface

Position	Description	Marking
A	External alarm	

5.1 Antenna Interface

The antenna interfaces provide connections for the radio to antennas. RF cables connect the radio to the antenna.

Table 17 Radio Antenna Connection Interface Characteristics

Connector Type	RF Cable Type	Cable Connector Type
4.3-10, insert-receiver type	50 Ω coaxial	4.3-10 type

Table 18 Radio Antenna Cable Connectors

Radio Connectors	Antenna Connectors
A (Antenna A)	TX/RX
B (Antenna B)	TX/RX
C (Antenna C)	TX/RX
D (Antenna D)	TX/RX

5.2 Maintenance Button

The maintenance button is at the left of the symbol.





For more information about the maintenance button, see [Indicators, Buttons, and Switches](#).

5.3 Optical Indicators

Optical indicators show the system status.

For more information about the optical indicators, see [Indicators, Buttons, and Switches](#).

5.4 Interface for Optical Cable to Main Unit

The  1 and  2 interfaces provide connections to optical cables for traffic and timing signals between the radio and the main unit. An SFP+ is used to connect the optical cable to the radio.

Note: The radio uses SFP+ modules for optical transmission and optical radio interfaces on Data 1 (optical cable 1) and Data 2 (optical cable 2).

Only use SFP+ modules approved and supplied by Ericsson. These modules fulfill the following:

- Compliance with Class 1 laser product safety requirements defined in standard IEC 60825-1.
- Certification according to general safety requirements defined in standard IEC/EN 62368-1.
- Functional and performance verified to comply with Radio System specifications.

Note: Radio 4415 B3B (R-state = R5A) does not support 2.5 G SFP modules.

Recommended SFP+ modules are obtained from the product packages for the Radio System and the Main Remote Installation products. For more information about SFP modules, see [SFP Module Selector Guide and Site Installation Products Overview](#).

5.5 –48 V DC Power Supply Interface

The –48 V DC power connector for incoming power accepts cables with various cross-sectional areas, depending on the cable length and the radio maximum power consumption. For more information on –48 V DC power cable dimensions, refer to [Site Installation Products Overview](#).

The power cable conductor has a wire for the 0 V DC conductor, and a wire for the –48 V DC conductor. The color codes are market-dependent for both wires.



All cables must be shielded. The shielding must be properly connected both to the power connector and to the grounding interface in the power supply equipment, otherwise the radio overvoltage and lightning protection does not function properly.

5.6 Grounding Interface

The radio must be grounded to protect it from overvoltage and lightning strikes. The grounding interface on the radio accepts a 2 × 6 mm dual lug on a coated cable.

For more information about grounding principles, see [Grounding Guidelines for RBS Sites](#).

5.7 Ext Alarm Interface

Two external alarms can be connected to the radio external alarm port.

5.8 ALD Ctrl Interface

The ALD control (ALD Ctrl) connects an ALD (RET) cable to the radio for antenna system communication.

ALD control is also supported on Antenna Interface connectors.

5.9 TX Monitor Interface (Optional)

The TX monitor interfaces provide the monitoring for the output power.

Table 19 TX Monitor Cable Connectors

Radio Connectors	TX Monitor Connectors
TX Monitor A	SMA Connector
TX Monitor B	SMA Connector
TX Monitor C	SMA Connector
TX Monitor D	SMA Connector

5.10 Optional Equipment Interfaces

The equipment presented in this section is optional and can be ordered separately.



5.10.1 Fan Unit

The fan unit consists of a replaceable fan tray.



6 Standards and Regulations

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity for the radio.

Declaration of Conformity

"Hereby, Ericsson AB, declares that this product is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU and 2011/65/EU."

FCC Compliance Statement

"This device complies with Part 15 of the FCC CFR 47 rules. Operation is subject to the following two conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation."

6.1 Regulatory Approval

The Radio System complies with the following market requirements:

- European Community (EC) market requirements, Radio Equipment Directive (RED) 2014/53/EU

CE (Class 2 equipment). Restrictions to use the apparatus may apply in some countries or geographic areas. Individual license to use the specific radio equipment may be required.

The apparatus may include radio Transceivers with support for frequency bands not allowed or not harmonized within the EC.

- Products containing radio Equipment outside North America and in countries not recognizing the CE-mark may be labeled according to national requirements or standards.

6.1.1 Environmental Standards Compliance

The product complies with the following environmental standard:

Europe

- Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU)



6.1.2 Safety Standards Compliance

In accordance with market requirements, the Radio System complies with the following product safety standards and directives:

International

- IEC 62368-1

Europe

- EN 50385
- EN 62368-1

North America

- Health Canada Safety Code 6
- UL 62368-1
- CSA-C22.2 No. 62328-1

6.1.2.1 Outdoor specific requirements

The Radio complies with the following outdoor specific requirements:

International

- IEC 60529 (IP65)
- IEC 60950-22

Europe

- EN 60529 (IP65)
- EN 60950-22

North America

- CSA-C22.2 No. 60950-22-07
- UL 50E
- UL 60950-22



6.1.3 EMC Standards Compliance

The Radio System complies with the following Electromagnetic Compatibility (EMC) standards:

International

- 3GPP TS36.113
- 3GPP TS37.113
- 3GPP TS25.113

Europe

- ETSI EN 301 489-1
- ETSI EN 301 489-50

North America

- FCC CFR 47 Part 15 B
- IC ICES-003 B

6.1.4 Radio Standards Compliance

The Radio System complies with the following radio standards:

International

- 3GPP TS36.141
- 3GPP TS37.141
- 3GPP TS25.141

Europe

- ETSI EN 301 908-1
- ETSI EN 301 908-14
- ETSI EN 301 908-18
- ETSI EN 301 502

**North America**

- IC RSS-132, 133, 139, 130, 195, 199 (Canada Band/Frequency Specific)
- IC RSS-Gen (Canada)
- RSP-100 (Canada)
- FCC CFR 47 Part: 2, 22, 24, 27, 90 (US Band/Frequency Specific)

6.1.5**Marking**

To show compliance with legal requirements, the product is marked with the following labels:

Europe

- CE mark

North America

- cETLus
- FCC CFR 47 Part 15 Statement
- FCC ID
- IC ICES-003 Statement
- IC ID

The labels are hidden when the fan unit is installed. To make the labels visible, remove the fan unit and reinstall the fan unit according to the instructions. [Figure 20](#) shows where the labels are placed on the radio.

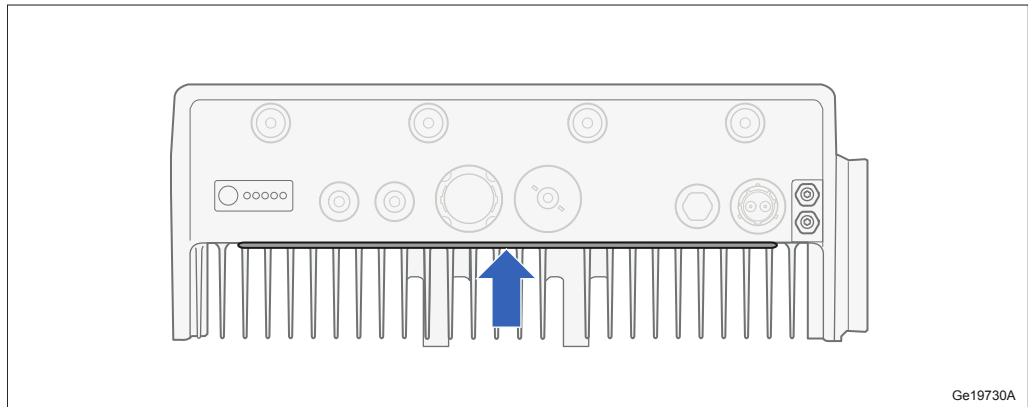


Figure 20 Legal requirement labels

6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory requirements.

6.2.1 Spare Parts

The product adheres to the Ericsson Serviceability and Spare Part Strategy.

6.2.2 Surface Quality

The surface quality of the radio is in accordance with Ericsson standard class A3.

6.2.3 Vandal Resistance

Unauthorized access is not possible without damaging the tamper proof warranty seal.