MACKENZIE & ALBRITTON LLP
155 SANSOME STREET, SUITE 800
SAN FRANCISCO, CALIFORNIA 94104

TELEPHONE 415/288-4000
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November 11, 2019

VIA EMAIL

Christopher Diaz, Esq.
City Attorney
City of Los Altos
c/o Best, Best & Krieger LLP
2001 North Main Street, Suite 390
Walnut Creek, California 94596

Re: Verizon Wireless Application No. SE19-00019
Wireless Facility, Right-of-Way at 155 Almond Avenue, Los Altos
Tolling Agreement: December 31, 2019

Dear Christopher:

We write to you on behalf of our client, GTE Mobilnet of California Limited Partnership dba Verizon Wireless ("Verizon Wireless"), with respect to the above-referenced wireless facility application (the "Application").

At the October 29, 2019 Los Altos City Council hearing on the Application, the City Council expressed a desire to continue the hearing in order to allow the City to review additional materials submitted by Verizon Wireless regarding the Application. At the request of the City Council, Verizon Wireless agreed to toll all applicable statutes of limitations and shot clock periods for the Application by 30 days.

This letter, when countersigned, will confirm an agreement between Verizon Wireless and the City to extend the commencement of the statute of limitations under 47 U.S.C. Section 332(c)(7)(B)(v) to no earlier than December 31, 2019.

This Letter Agreement shall not be construed as an admission by the City that absent this extension it would have failed to act within time periods required by applicable federal, state, or local laws or regulations; or that its failure to act on the Application on or before December 31, 2019 would be a violation of the same. This Letter Agreement is not intended to imply or assure any particular outcome of the City's processing of the Application. Except as required to give effect to this extension, neither party waives any claims or defenses it might otherwise have.

This letter agreement may be executed in counterparts and scanned, or facsimile signatures shall be deemed equivalent to original signatures. If acceptable, please return a countersigned copy to me at your earliest convenience.

Sincerely,

Paul B. Albritton

cc: Gail Karish, Esq.
Chris Jordan

ACCEPTED AND AGREED TO:

City of Los Altos

By: _____

Printed name: Chris Jordan

Title: City Mgr.

Indian Wells
(760) 568-2611
Irvine
(949) 263-2600
Manhattan Beach
(310) 643-8448
Ontario
(909) 989-8584

BEST BEST & KRIEGER
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Gail A. Karish
(213) 617-7491
gail.karish@bbklaw.com

November 25, 2019

VIA EMAIL

John DiBene
Asst VP & Sr Legal Counsel
AT&T Mobility
5001 Executive Pkwy # 2W901
San Ramon, CA 94583
Email: jd3235@att.com

Re: City of Los Altos/Tolling Agreement for AT&T Mobility Application Nos. SE19-00009, SE19-00003, SE19-00017, SE19-00004, SE19-00010, SE19-00011, SE19-00005, SE19-00006, SE19-00012, SE19-00013, SE19-00007, and SE19-00008

Dear Mr. DiBene:

I am writing on behalf of my client, the City of Los Altos (the "City"). This letter shall serve as an agreement (the "Letter Agreement") between the City and AT&T Mobility (the "Applicant") regarding the above-referenced applications (the "Applications"), received on March 22, 2019, and one on May 28, 2019.

On October 29, 2019, at the City of Los Altos City Council administrative public hearing concerning AT&T's appeal of the denial of the Applications, the Applicant's representative agreed to toll the FCC shot clock to a later date to give the City additional time to consider the Applicant's additional supporting documentation which was submitted shortly before the hearing, and to conduct the appeal hearing and take final action on the Applications. The purpose of this Letter Agreement is to memorialize that agreement, and set a date certain for the extension of the time for final action on the Applications as follows: December 31, 2019.

This Letter Agreement shall not be construed as an admission by the City that absent this extension it would have failed to act within time periods required by applicable federal, state, or local laws or regulations; or that its failure to act on the Applications on or before December 31, 2019 would be a violation of the same. This Letter Agreement is not intended to imply or assure any particular outcome of the City's processing of the Applications. Except as required to give effect to this extension, neither party waives any claims or defenses it might otherwise have.

This Letter Agreement may be executed in counterparts, and scanned or facsimile signatures shall be deemed equivalent to original signatures. Please return a countersigned copy to me at your earliest convenience.

Sincerely,

Gail A. Karish
BEST BEST & KRIEGER LLP
Counsel for the City of Los Altos

Accepted and Agreed for AT&T MOBILITY
whom I have express authority to bind:

Signature: _____

Name: John D. Bene

Title: AVP & Senior Legal Counsel

Date: 11/26/19

City of Los Altos
One North San Antonio Road
Los Altos, California 94022-3087
Tel: (650) 947-2700
Fax (650) 947-2701

Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at
AT&T #1, 141 Almond Avenue, Application No. SE19-00009

Dear Applicant,

The above referenced application to locate a personal wireless facility at 141 Almond Avenue was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

> *Required Applicant Content No. 6. Completion of an RF exposure guidelines checklist, and proof of all applicable licenses or other approvals required by the FCC. Applicant shall also provide documentation sufficient to show that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.*
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> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

Engineering Services Department, Los Altos City Hall, 1 North San Antonio Road, Los Altos, CA 94022

The materials should be accompanied by a cover letter which clearly identifies the application which such materials are intended to supplement. The materials must be received **no later than Wednesday, December 4, 2019 at 5:00 p.m.** to be considered. We anticipate acting on your application soon after that date.

If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

City of Los Altos
One North San Antonio Road
Los Altos, California 94022-3087
Tel: (650) 947-2700
Fax (650) 947-2701

Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at
AT&T #2, 687 Linden Avenue, Application No. SE19-00003

Dear Applicant,

The above referenced application to locate a personal wireless facility at 687 Linden Avenue was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

> *Required Applicant Content No. 6. Completion of an RF exposure guidelines checklist, and proof of all applicable licenses or other approvals required by the FCC. Applicant shall also provide documentation sufficient to show that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.*
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> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

Engineering Services Department, Los Altos City Hall, 1 North San Antonio Road, Los Altos, CA 94022

The materials should be accompanied by a cover letter which clearly identifies the application which such materials are intended to supplement. The materials must be received **no later than Wednesday, December 4, 2019 at 5:00 p.m.** to be considered. We anticipate acting on your application soon after that date.

If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

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One North San Antonio Road
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Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #3, 421 Valencia Drive, Application No. SE19-00017**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 421 Valencia Drive was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

> *Required Applicant Content No. 6. Completion of an RF exposure guidelines checklist, and proof of all applicable licenses or other approvals required by the FCC. Applicant shall also provide documentation sufficient to show that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.*
>
> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

Engineering Services Department, Los Altos City Hall, 1 North San Antonio Road, Los Altos, CA 94022

The materials should be accompanied by a cover letter which clearly identifies the application which such materials are intended to supplement. The materials must be received **no later than Wednesday, December 4, 2019 at 5:00 p.m.** to be considered. We anticipate acting on your application soon after that date.

If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

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Los Altos, California 94022-3087
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Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #4, 33 Pine Lane, Application No. SE19-00004**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 33 Pine Lane was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

> *Required Applicant Content No. 6. Completion of an RF exposure guidelines checklist, and proof of all applicable licenses or other approvals required by the FCC. Applicant shall also provide documentation sufficient to show that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.*
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> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

Engineering Services Department, Los Altos City Hall, 1 North San Antonio Road, Los Altos, CA 94022

The materials should be accompanied by a cover letter which clearly identifies the application which such materials are intended to supplement. The materials must be received **no later than Wednesday, December 4, 2019 at 5:00 p.m.** to be considered. We anticipate acting on your application soon after that date.

If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

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One North San Antonio Road
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Tel: (650) 947-2700
Fax (650) 947-2701

Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at
AT&T #5, 49 San Juan Court, Application No. SE19-00010

Dear Applicant,

The above referenced application to locate a personal wireless facility at 49 San Juan Court was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

> *Required Applicant Content No. 6. Completion of an RF exposure guidelines checklist, and proof of all applicable licenses or other approvals required by the FCC. Applicant shall also provide documentation sufficient to show that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.*
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> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

Engineering Services Department, Los Altos City Hall, 1 North San Antonio Road, Los Altos, CA 94022

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If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

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Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at
AT&T #6, 791 Los Altos Avenue, Application No. SE19-00011

Dear Applicant,

The above referenced application to locate a personal wireless facility at 791 Los Altos Avenue was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

> *Required Applicant Content No. 6. Completion of an RF exposure guidelines checklist, and proof of all applicable licenses or other approvals required by the FCC. Applicant shall also provide documentation sufficient to show that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.*
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> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

Engineering Services Department, Los Altos City Hall, 1 North San Antonio Road, Los Altos, CA 94022

The materials should be accompanied by a cover letter which clearly identifies the application which such materials are intended to supplement. The materials must be received **no later than Wednesday, December 4, 2019 at 5:00 p.m.** to be considered. We anticipate acting on your application soon after that date.

If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

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One North San Antonio Road
Los Altos, California 94022-3087
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Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #7, 98 Eleanor Avenue, Application No. SE19-00005**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 98 Eleanor Avenue was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

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> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

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If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

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Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #8, 182 Garland Way, Application No. SE19-00006**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 182 Garland Way was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

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> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

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In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

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The materials should be accompanied by a cover letter which clearly identifies the application which such materials are intended to supplement. The materials must be received **no later than Wednesday, December 4, 2019 at 5:00 p.m.** to be considered. We anticipate acting on your application soon after that date.

If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

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One North San Antonio Road
Los Altos, California 94022-3087
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Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #9, 491 Patrick Way, Application No. SE19-00012**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 491 Patrick Way was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

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>
> The submitted Mobility Radio Frequency Statement does not meet the above requirement, as it does not provide sufficient information to demonstrate that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.

Required Applicant Content No. 9. A written report that analyzes acoustic levels for the proposed wireless telecommunications facility and all associated equipment including, without limitation, all environmental control units, sump pumps, temporary backup power generators, and permanent backup power generators in order to demonstrate compliance with Los Altos Municipal Code Chapter 6.16 Noise Regulations and Resolution 2019-35. The acoustic analysis must be prepared and certified by an engineer and include an analysis of the manufacturers' specifications for all noise-emitting equipment and a depiction of the proposed equipment relative to all adjacent property lines. In lieu of a written report, the applicant may submit evidence from the equipment manufacturer that the ambient noise emitted from all the proposed equipment will not, both individually and cumulatively, exceed the applicable limits.

In the letter appeal of the denial decision filed by the applicant dated on September 20, 2019, it is stated that the facility will comply with the City's noise standards. However, no acoustic analysis was provided.

If you elect to submit additional materials, they must be provided in writing and delivered to the following address:

Engineering Services Department, Los Altos City Hall, 1 North San Antonio Road, Los Altos, CA 94022

The materials should be accompanied by a cover letter which clearly identifies the application which such materials are intended to supplement. The materials must be received **no later than Wednesday, December 4, 2019 at 5:00 p.m.** to be considered. We anticipate acting on your application soon after that date.

If you have any questions, please contact Engineering Services Director Jim Sandoval at jsandoval@losaltosca.gov.

Sincerely,

Chris Jordan
City Manager

City of Los Altos
One North San Antonio Road
Los Altos, California 94022-3087
Tel: (650) 947-2700
Fax (650) 947-2701

Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #10, 300 Los Altos Avenue, Application No. SE19-00013**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 300 Los Altos Avenue was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

> *Required Applicant Content No. 6. Completion of an RF exposure guidelines checklist, and proof of all applicable licenses or other approvals required by the FCC. Applicant shall also provide documentation sufficient to show that the proposed facility will comply with generally-applicable health and safety provisions of the Los Altos Municipal Code and the FCC's radio frequency emissions standards.*
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Tel: (650) 947-2700
Fax (650) 947-2701

Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #11, 130 Los Altos Avenue, Application No. SE19-00007**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 130 Los Altos Avenue was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

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Chris Jordan
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One North San Antonio Road
Los Altos, California 94022-3087
Tel: (650) 947-2700
Fax (650) 947-2701

Suresite
Attn: Annie Freeman, Site Development Specialist
2033 Gateway Place, 5th Floor
San Jose, CA 95110

November 25, 2019

RE: Request for Additional Information: Application for personal wireless facility located at **AT&T #12, 356 Blue Oak Lane, Application No. SE19-00008**

Dear Applicant,

The above referenced application to locate a personal wireless facility at 356 Blue Oak Lane was denied by the City Manager, as it was communicated to the applicant by letter dated September 17, 2019. In addition to the appeal of the denial decision filed by the applicant dated on September 20, 2019, the applicant also submitted additional materials on October 28, 2019 that supplements the request to the City Council to reverse the denial decision and reprove the reference application.

Los Alton Municipal Code (the "Code") Chapter 11.12 requires all applications for a wireless telecommunication facility permit shall include all the information listed under Section 11.12.050(A). City staff reviewed the supplemental materials in addition to all the materials submitted previously, and the following applicant content is not sufficient.

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Sincerely,

Chris Jordan
City Manager

MACKENZIE & ALBRITTON LLP
155 SANSOME STREET, SUITE 800
SAN FRANCISCO, CALIFORNIA 94104

TELEPHONE 415 / 288-4000
FACSIMILE 415 / 288-4010

December 10, 2019

VIA EMAIL

Mayor Jan Pepper
Vice Mayor Neysa Fligor
Councilmembers Jeannie Bruins,
Anita Enander and Lynette Lee Eng
City Council
City of Los Altos
1 North San Antonio Road
Los Altos, California 94022

Re: Verizon Wireless's Appeal of City Manager's Denial of
Application No. SE19-00019
Small Cell Wireless Facility, Right-of-Way at 155 Almond Avenue
City Council Agenda, December 17, 2019

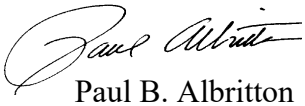
Dear Mayor Pepper, Vice Mayor Fligor and Councilmembers:

We write again on behalf of our client Verizon Wireless regarding its appeal of the City Manager's denial of a small cell facility in the Almond Avenue right-of-way (the "Proposed Facility"). In our prior letter of October 23, 2019, we explained that denial of the Proposed Facility would constitute a prohibition of service under the federal Telecommunications Act. 47 U.S.C. § 332(c)(7)(B)(i)(II). Denial also would violate California Public Utilities Code Section 7901 that grants telephone corporations such as Verizon Wireless a statewide right to place their equipment along any right-of-way. Indeed, the various wireless facility location restrictions of the Los Altos Municipal Code and *Design and Siting Guidelines* have a prohibitive effect throughout much of the City.

Verizon Wireless has commissioned an independent analysis of those restrictions. The result is shown in the attached *City of Los Altos Wireless Telecommunications Facility Analysis* prepared by Richard Kos, AICP, of San Jose State University. As calculated in Mr. Kos's analysis, wireless facilities are prohibited in 91.93% of the total area within the Los Altos city limits. In particular, the analysis confirms that the great majority of the City's rights-of-way are off-limits to wireless facilities. The analysis affirms the general prohibition of wireless service in Los Altos that is preempted by federal and state law. As noted in our prior letter, the exceptions process does not excuse provisions of the Code or design guidelines that are preempted.

We have no illusion that the Council will grant Verizon Wireless's appeal under the provisions of the City's current Code and siting guidelines. However, Verizon Wireless wants to make sure that the Council is fully informed of the prohibitive nature of these recently-adopted regulations. We would be pleased to answer any questions you may have regarding Mr. Kos's analysis. Verizon Wireless appreciates your consideration of its appeal.

Very truly yours,



Paul B. Albritton

Attachment

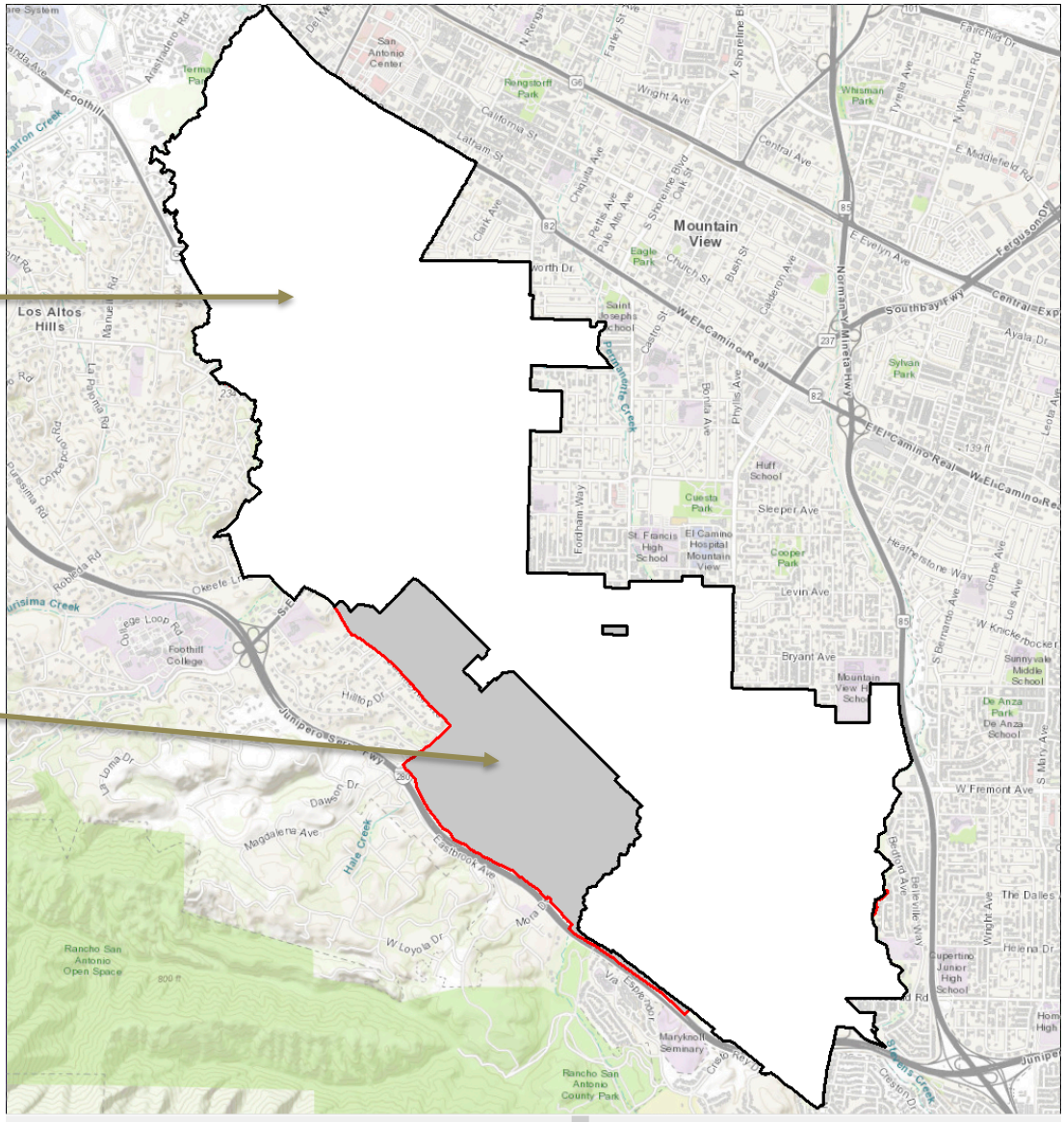
cc: Christopher Diaz, Esq.
Gail Karish, Esq.
Chris Jordan
Vency Woo

City of Los Altos Wireless Telecommunications Facility Analysis
Methodology for calculating percentage of city land area
permitting/prohibiting wireless telecommunications facilities

Step 1. Calculate area of Los Altos city limits and sphere of influence.[1]

4,164.22 acres in city limits (6.51 sq. mi.)

637.22 acres in Los Altos sphere of influence



[1] Area calculated by author using ArcGIS 10.6.1 and the NAD83 California State Plane Zone III projection, planar units in feet. For comparison, the US Census Bureau lists the area of the city as **6.48** square miles: https://www2.census.gov/geo/docs/maps-data/data/gazetteer/2016_Gazetteer/2016_gaz_place_06.txt (accessed November 22, 2019). To maintain consistency of calculations throughout this report, only the author-calculated areas using ArcGIS will be reported (i.e. 4,164.22 acres; 6.51 sq. miles).

Step 2. Calculate the area of parcels (not including rights-of-way) in each zoning district:

In Los Altos City Limits:

ZONING	No. Parcels	Acres
CD	45	13.62905719
CD/R3	164	53.06700138
CN	107	36.67943208
CRS	126	20.35659167
CRS/OAD	7	1.328183426
CT	241	92.54624468
OA	46	21.99015899
PC	28	49.80284541
PCF	56	163.3639171
PCF/R1-10	7	90.85162377
PUD	333	68.00412482
R1-10	9237	2635.790414
R1-20	118	82.84539805
R1-H	72	35.46118031
R3-1	227	20.28982181
R3-1.8	302	25.44781258
R3-4.5	91	14.35932685
R3-5	100	11.62340161
Unclassified	2	2.64799
TOTAL	**11309**	**3440.084526**

In Los Altos Sphere of Influence:

Zoning	No. Parcels	Acres
PCF	5	99.00728321
R1-10	517	166.5744121
R1-20	447	207.3661853
R1-40	53	55.58118146
R1-H	30	18.69944337
Unclassified		0.016197655
TOTAL	**1052**	**547.2447031**

Step 3. Note relevant provisions of city code pertaining to the siting of wireless telecommunications facilities (Council Resolution No. 2019-35, adopted August 5, 2019, pgs. 3-4)

D. **Order of Preference—Location.**

Wireless facilities shall only be permitted in the City in accordance with the following table:

Description Wireless Facility	*Private Property*		*Public Right-of-Way*[4]
	A-J, U, W[1] *Zoning Districts*	*All Other Zoning Districts*	*Non-Residential Districts*
Roof-mounted facility, building-mounted facility, or facility mounted on an existing pole	*Not Permitted*	*Use Permit*	*Use Permit*
Facility mounted on a replacement pole or new telecommunications tower	*Not Permitted*	*Use Permit*	*Use Permit*
New wireless telecommunications collocation facility	*Not Permitted*	*Use Permit*	*Use Permit*
Eligible facilities request[2] *or application pursuant to California Government Code Section 65850.6*[3]	*Permitted*	*Permitted*	*Permitted*

1 See Section 14.04.010 (A-J, U, W) of the Code.
2 See requirements of Section 11.12.100.
3 See requirements of Section 11.12.110.
4 Non-Residential Districts are defined in Section 14.04.010(K, L, O-S, V)

Furthermore, within the general categories specified above, the order of preference for the location of wireless telecommunications facilities from most preferred to least preferred is:

1. Commercial districts (as defined in Section 14.04.010 (K, L, O-R, V) of the Code).
2. Public districts (as defined in Section 14.04.010 (S) of the Code).

Facilities located in the public rights-of-way shall have their preference evaluated based on the least-preferred zoning district adjacent to the proposed facility.

E. **Other Location Preferences** and Conditions

1. Mid-block locations are preferred instead of at more visible corners and street intersections except if proposed on traffic signal control poles.

2. Where allowed by exception as provided in 7.H.4, new poles should be located in the parkway strip whenever possible and in alignment with existing trees, utility poles, and streetlights.

3. Where allowed by exception as provided in 7.H.4, new poles should be an approximately equal distance between trees when possible, with a minimum separation of 15 feet or the tree's drip line, whichever is greater, such that no proposed disturbance shall occur within the critical root zone of any tree.

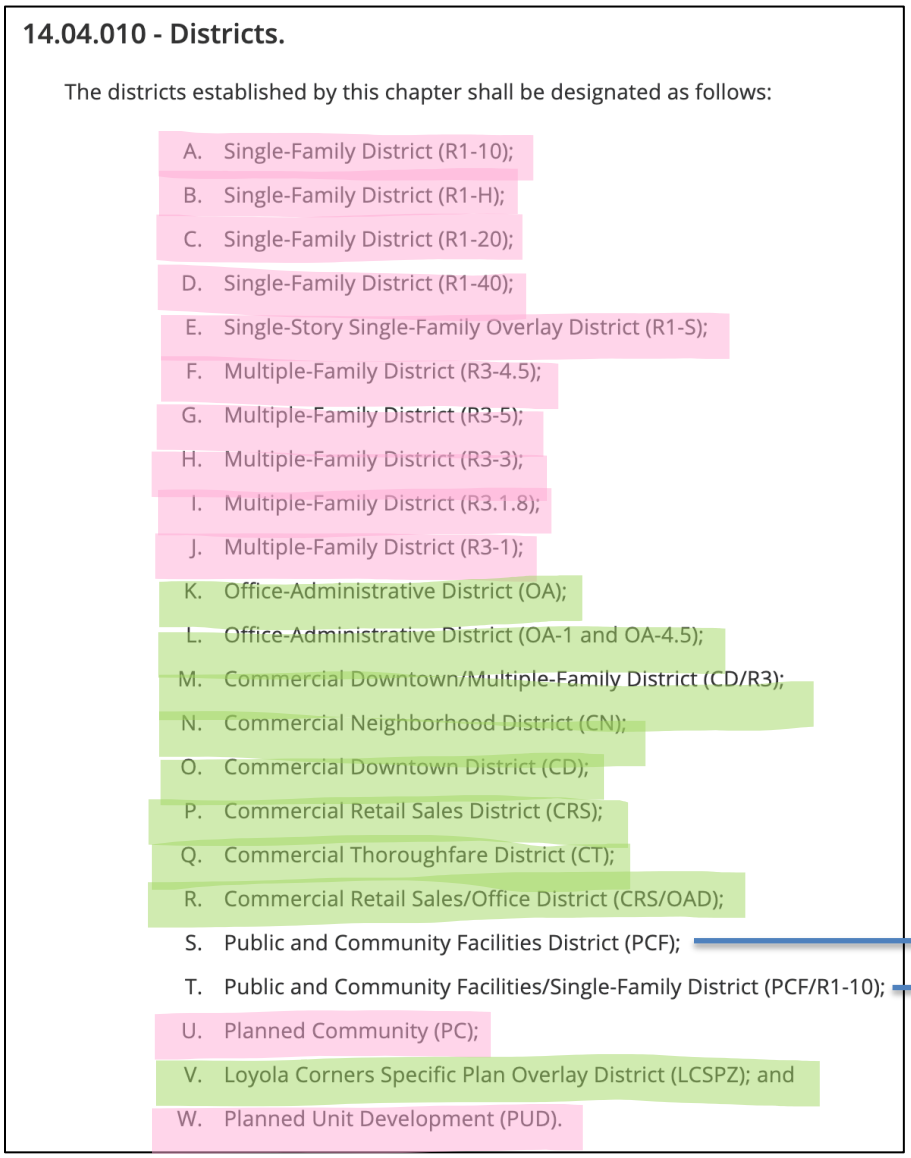
4. No facilities shall be permitted in any public park in a Public and Community Facilities (PCF) District.

5. No facilities shall be permitted within 500 feet of any school in a PCF District.

6. Each small cell facility must be separated by at least 1,500 feet.

Step 4. List zoning districts where wireless telecommunications facilities (WTFs) are:

- **prohibited** (red highlighting – see footnote 1 in Council Resolution No. 2019-35)
- **permitted** (green highlighting – see footnote 4 in Council Resolution No. 2019-35)
- Note: districts M, N, and T are not captured by foonotes 1 and 4 referenced above, and therefore are considered "all other zoning districts".
- This analysis assumes that PCF and PCF/R-10-zoned school parcels themselves **prohibit** WTFs per Section 4(E)(5), in addition to the 500-foot buffer, where WTFs are also **prohibited** on both private property and right-of-ways within that buffer.
- Note: district E is an overlay district that supplements regulations for the underlying district. Visual inspection of the official Los Altos zoning map confirms that all district E (i.e. R1-S) areas are coincident with R1-10 zoning (which **prohibits** wireless facilities).
- Note: district V is also an overlay district. Visual inspection of the official Los Altos zoning map confirms that all district V (i.e. Loyola Corners Specific Plan) areas are coincident with CN zoning (which **permits** wireless facilities). There is one PCF-zoned parcel in district V (APN 19340048). It has been coded as permitting wireless facilities since no school or park is present on that parcel.

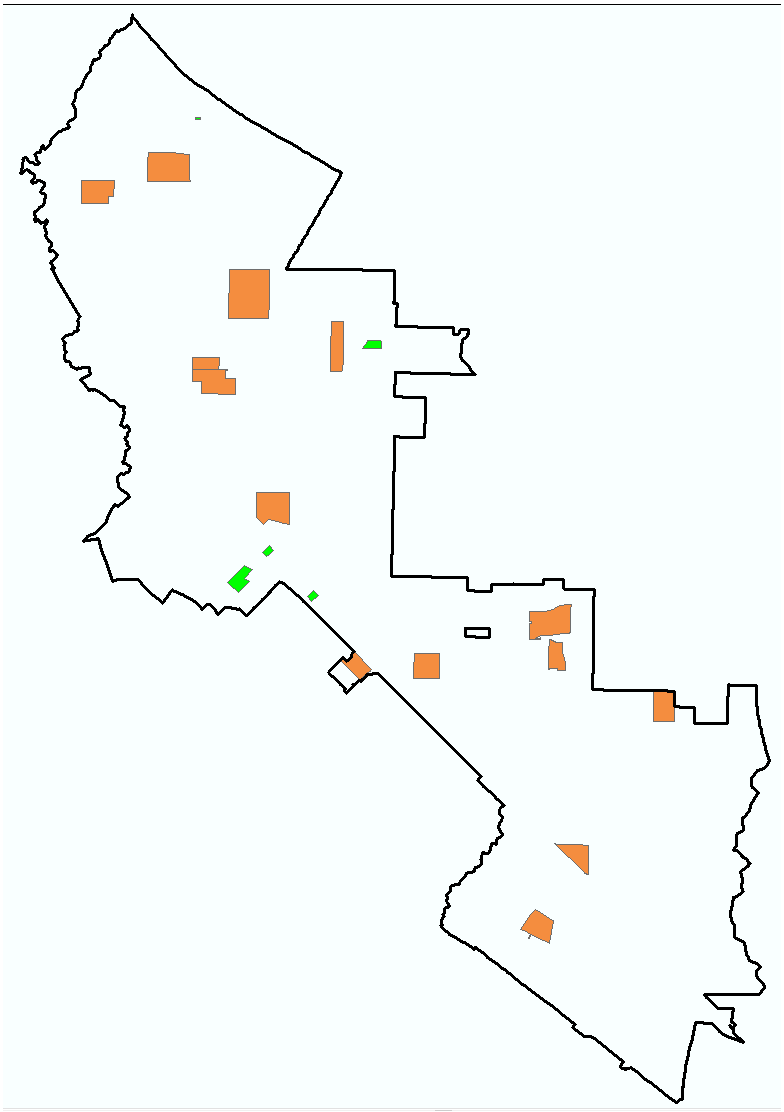


14.04.010 - Districts.

The districts established by this chapter shall be designated as follows:

A. Single-Family District (R1-10);
B. Single-Family District (R1-H);
C. Single-Family District (R1-20);
D. Single-Family District (R1-40);
E. Single-Story Single-Family Overlay District (R1-S);
F. Multiple-Family District (R3-4.5);
G. Multiple-Family District (R3-5);
H. Multiple-Family District (R3-3);
I. Multiple-Family District (R3.1.8);
J. Multiple-Family District (R3-1);
K. Office-Administrative District (OA);
L. Office-Administrative District (OA-1 and OA-4.5);
M. Commercial Downtown/Multiple-Family District (CD/R3);
N. Commercial Neighborhood District (CN);
O. Commercial Downtown District (CD);
P. Commercial Retail Sales District (CRS);
Q. Commercial Thoroughfare District (CT);
R. Commercial Retail Sales/Office District (CRS/OAD);
S. Public and Community Facilities District (PCF);
T. Public and Community Facilities/Single-Family District (PCF/R1-10);
U. Planned Community (PC);
V. Loyola Corners Specific Plan Overlay District (LCSPZ); and
W. Planned Unit Development (PUD).

Allowing WTFs in districts S and T is dependent on presence of parks or schools



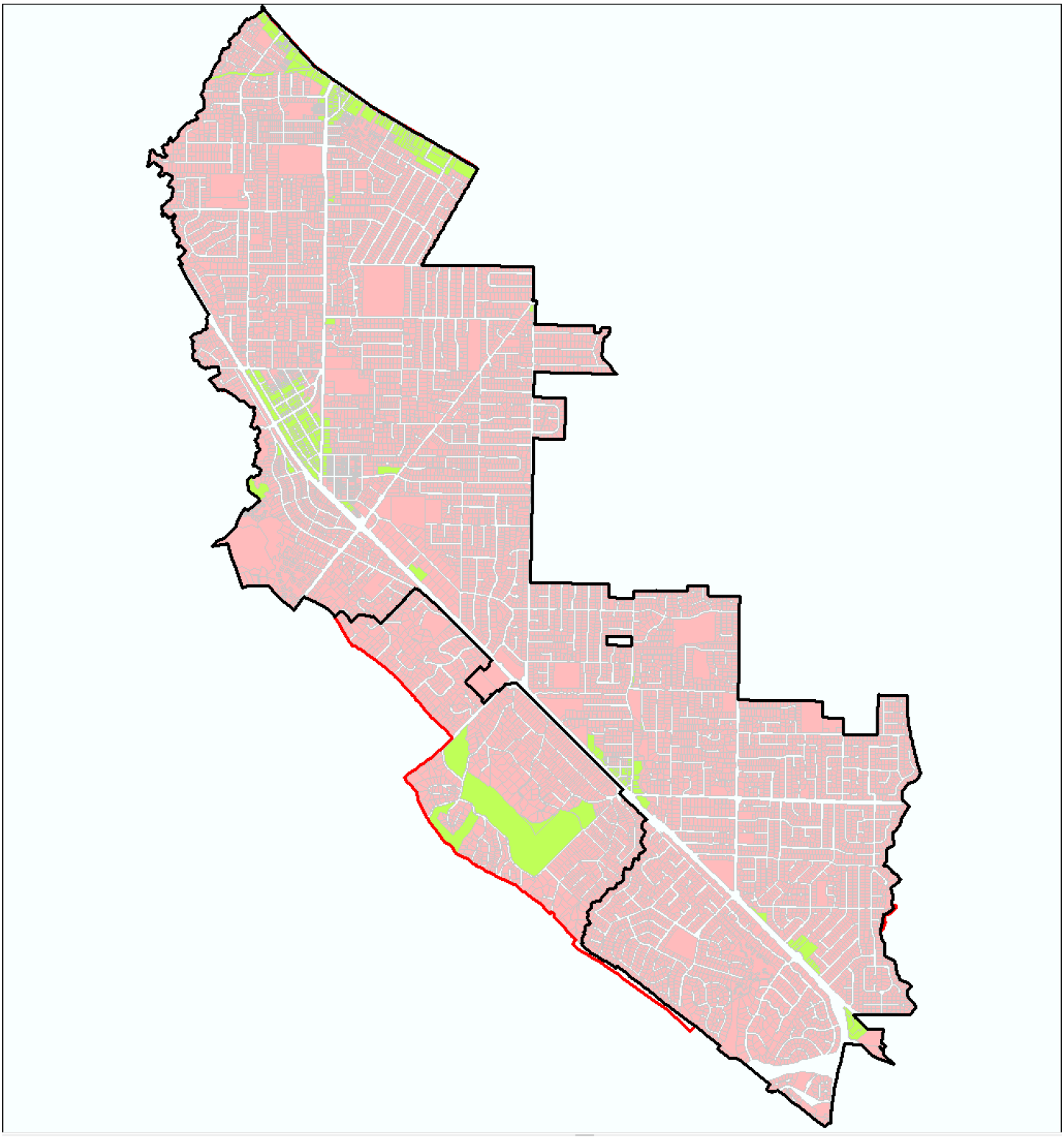
Step 5: Identify all school parcels (public and private) in PCF or PCF/R-10 districts per Council Resolution Section (4)(E)(5). Wireless facilities are prohibited on such parcels and within 500 feet of these parcels (including right-of-ways). Methodology:

- 19 total parcels were identified with public and/or private schools (in green or orange on map to the left)
- Of these 19 parcels, 14 parcels are in PCF or PCF/R1-10 zones (in orange)
- 500-foot buffers were delineated around these 14 parcels.
- If any parcel (or portion thereof) intersects these 500-foot buffers, the parcels were tagged as prohibiting wireless facilities (note: 2,040 parcels resulted)
- Note: no schools are present in the Los Altos Sphere of Influence

Step 6: Identify all parcels in PCF districts containing parks per Council Resolution (4)(E)(4). Wireless facilities are prohibited within these parcels. Methodology:

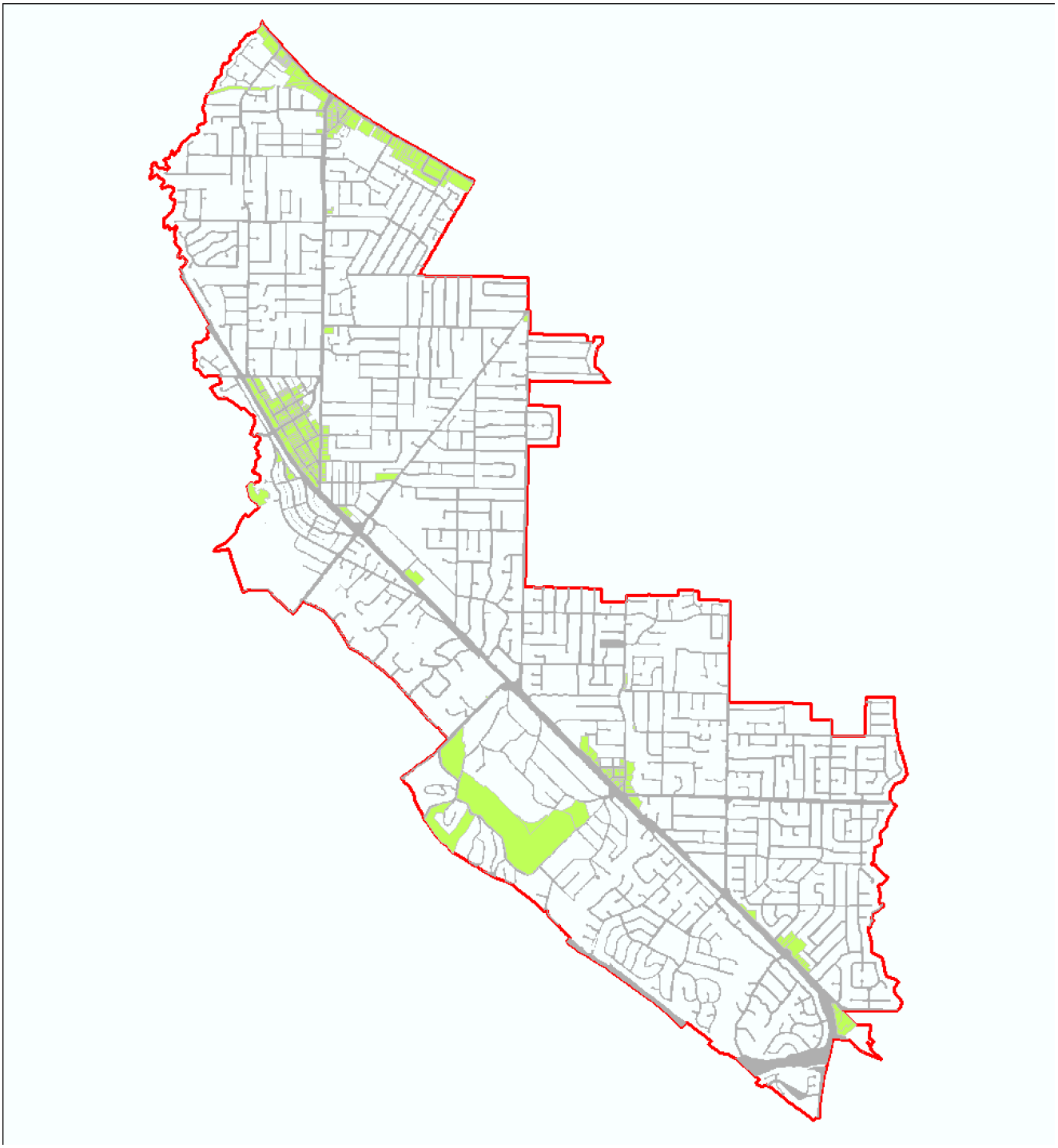
- Per the Los Altos Parks Plan there are 12 parks in the city. The following parks are in PCF Districts and the 18 parcels that encompass them were tagged as prohibiting wireless facilities:
  - Heritage Oaks
  - Hillview
  - Lincoln
  - Shoup
  - Redwood Grove
  - Rosita
  - McKenzie
  - Village Park
  - Marymeade
  - Grant
  - Montclaire
- These parks are not in PCF Districts:
  - Community Plaza
- All other PCF parcels without parks are tagged as permitting wireless facilities, unless these parcels fall within 500-foot school buffers, in which case WTFs would be prohibited.

Step 7. Assign a color to each parcel: wireless facilities permitted (green); wireless facilities prohibited (red). The map below depicts parcels both within city limits and in the Sphere of Influence. Right of way areas have not yet been considered – see Step 8.



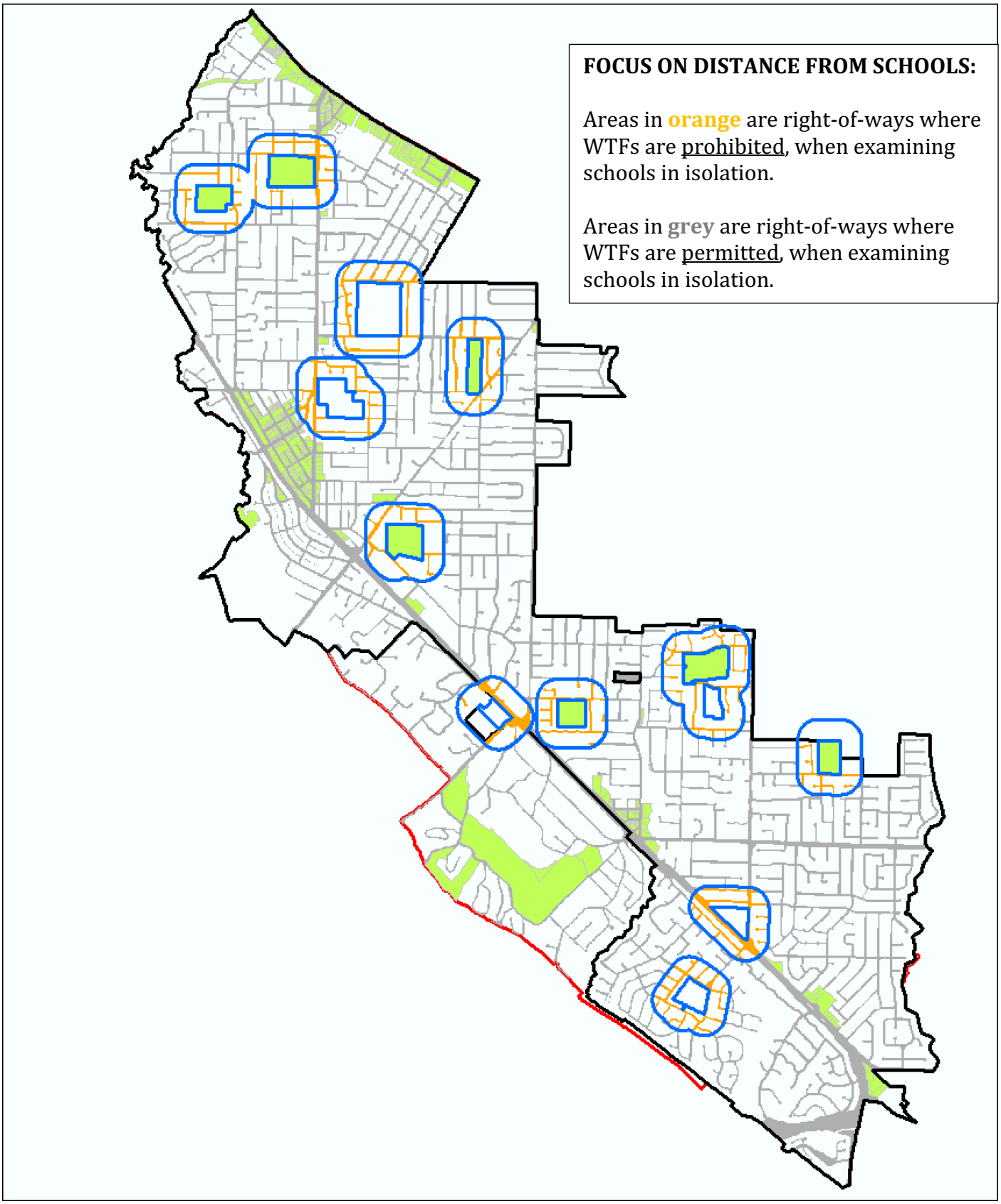
Step 8a. Consider impact of city regulations on right-of-ways. Dissolve all parcel boundaries, then use "Erase/Difference" function to isolate rights-of-way (grey) in combined city limits and sphere of influence. Add layer of areas where wireless telecommunications facilities are permitted (green).

Note: there are 908.70 acres in right-of-ways within the area depicted below.[2]

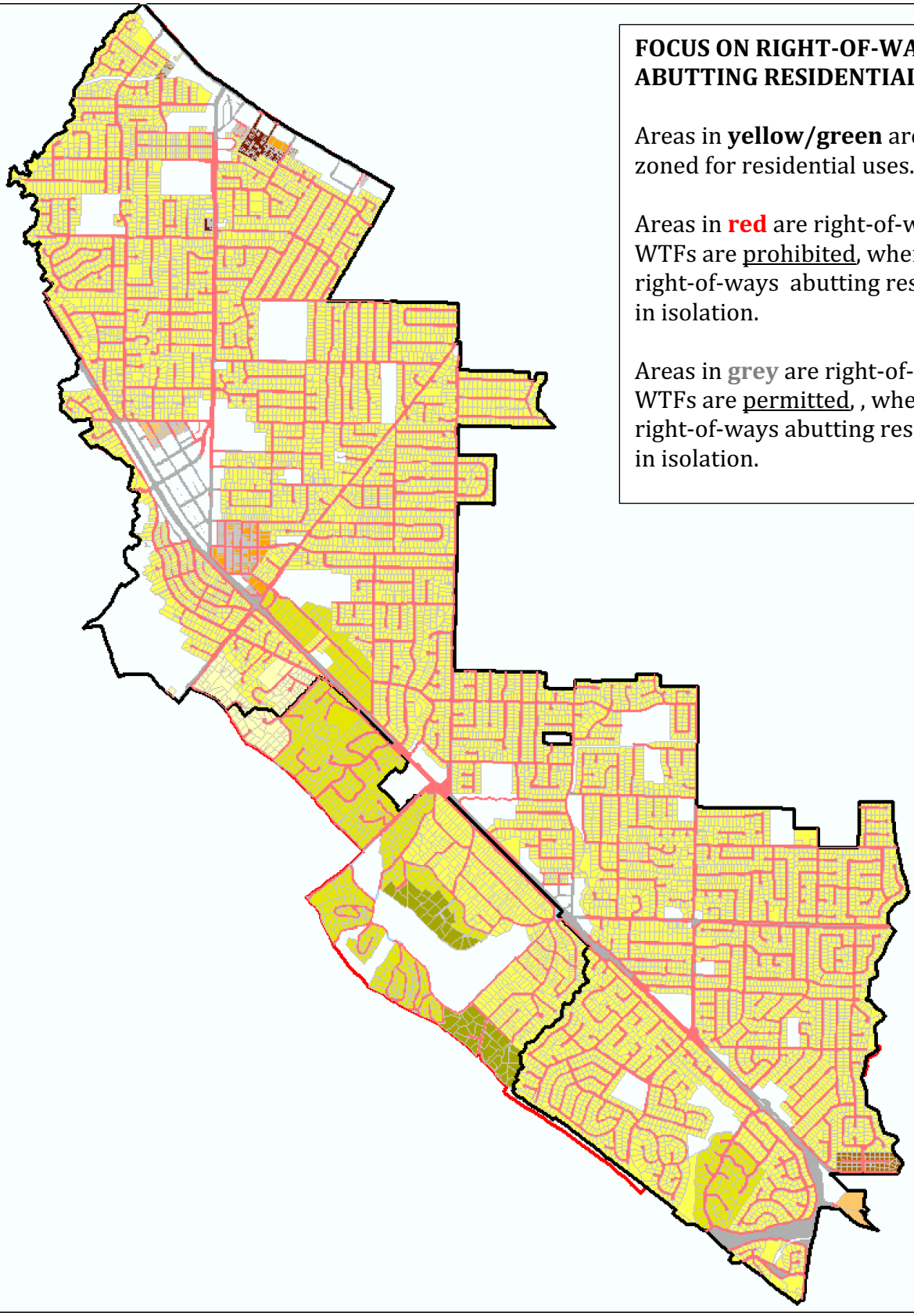


[2] 79.62 acres are within right-of-ways in the sphere of influence; 829.08 acres are within right-of-ways in the city limits.

Step 8b. Identify all right-of-ways within 500 feet of public and private schools in PCF or PCF/R-10 zones. WTFs are not permitted in these right-of-way areas, **shown in orange**. The 500-foot buffers are shown below in blue. They surround parcels zoned **PCF/R1-10** where schools are located (with light green interiors) and parcels where there are schools in **PCF** zones (with white interiors).



Step 8c. Identify all right-of-ways abutting residential districts – WTFs are **prohibited** in these right-of-ways. The districts are R1-H, R1-10, R1-20, R1-40, R3-1, R3-1.8, R3-3, R3-4.5, R3-5…..also known as districts A, B, C, D, F, G, H, I, and J. (assume 50-foot distance from outer edge of these parcels; intersect result with right-of-way map layer……result below – WTFs prohibited in the **red** areas.)



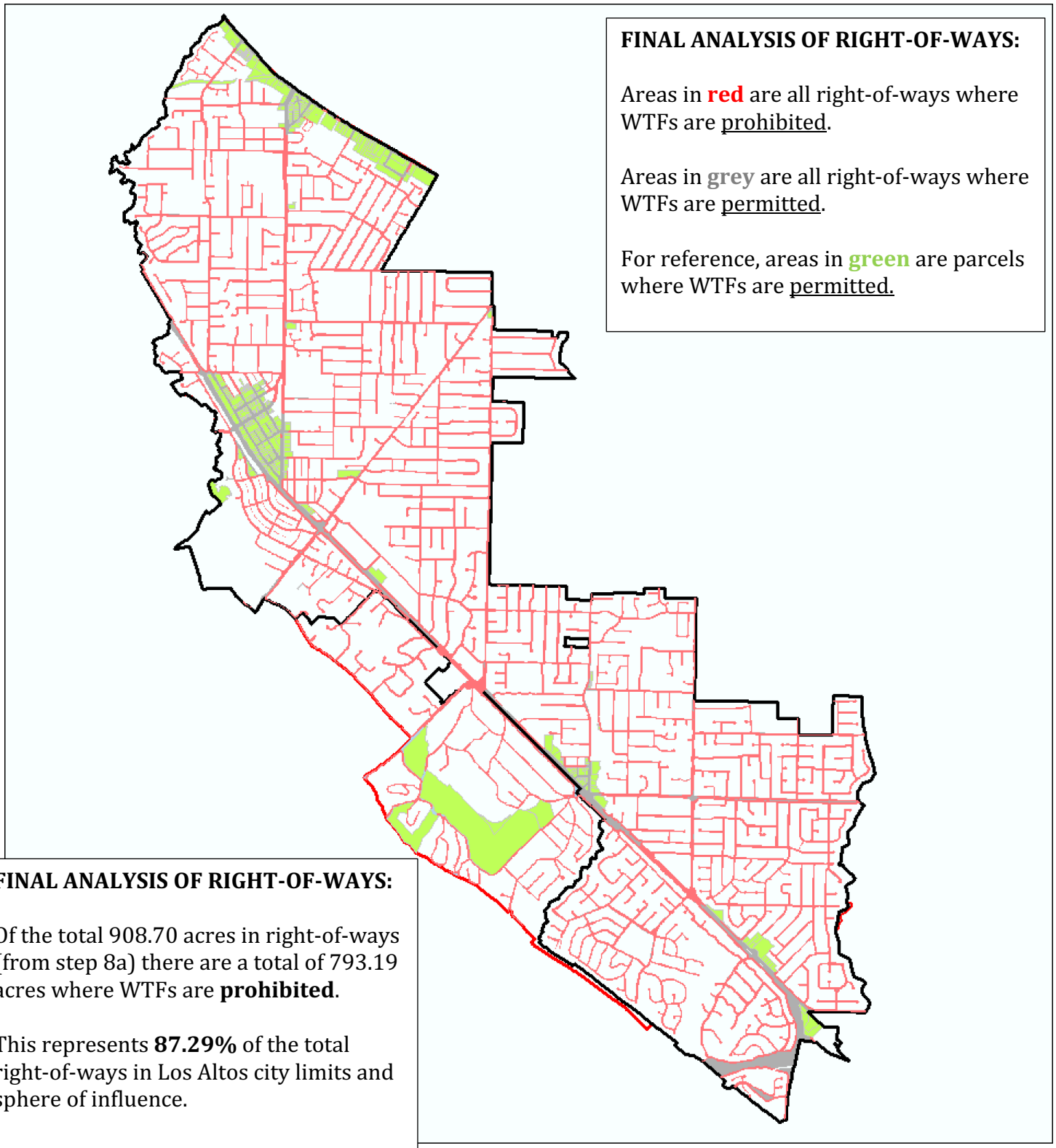
FOCUS ON RIGHT-OF-WAYS ABUTTING RESIDENTIAL ZONES:

Areas in **yellow/green** are parcels zoned for residential uses.

Areas in **red** are right-of-ways where WTFs are prohibited, when examining right-of-ways abutting residential zones in isolation.

Areas in **grey** are right-of-ways where WTFs are permitted, , when examining right-of-ways abutting residential zones in isolation.

Step 8d. To avoid double-counting right-of-way areas from steps 8b and 8c, merge all right-of-way polygons into a single map layer, then dissolve the result. Result: **red right-of-way areas prohibit WTFs** by virtue of abutting residential districts and/or they are within 500 feet of public and private schools in PCF or PCF/R-10 zones….or are in parks in PCF zones.



FINAL ANALYSIS OF RIGHT-OF-WAYS:

Areas in **red** are all right-of-ways where WTFs are prohibited.

Areas in **grey** are all right-of-ways where WTFs are permitted.

For reference, areas in **green** are parcels where WTFs are permitted.

FINAL ANALYSIS OF RIGHT-OF-WAYS:

Of the total 908.70 acres in right-of-ways (from step 8a) there are a total of 793.19 acres where WTFs are **prohibited**.

This represents **87.29%** of the total right-of-ways in Los Altos city limits and sphere of influence.

Step 9. Summary results table:

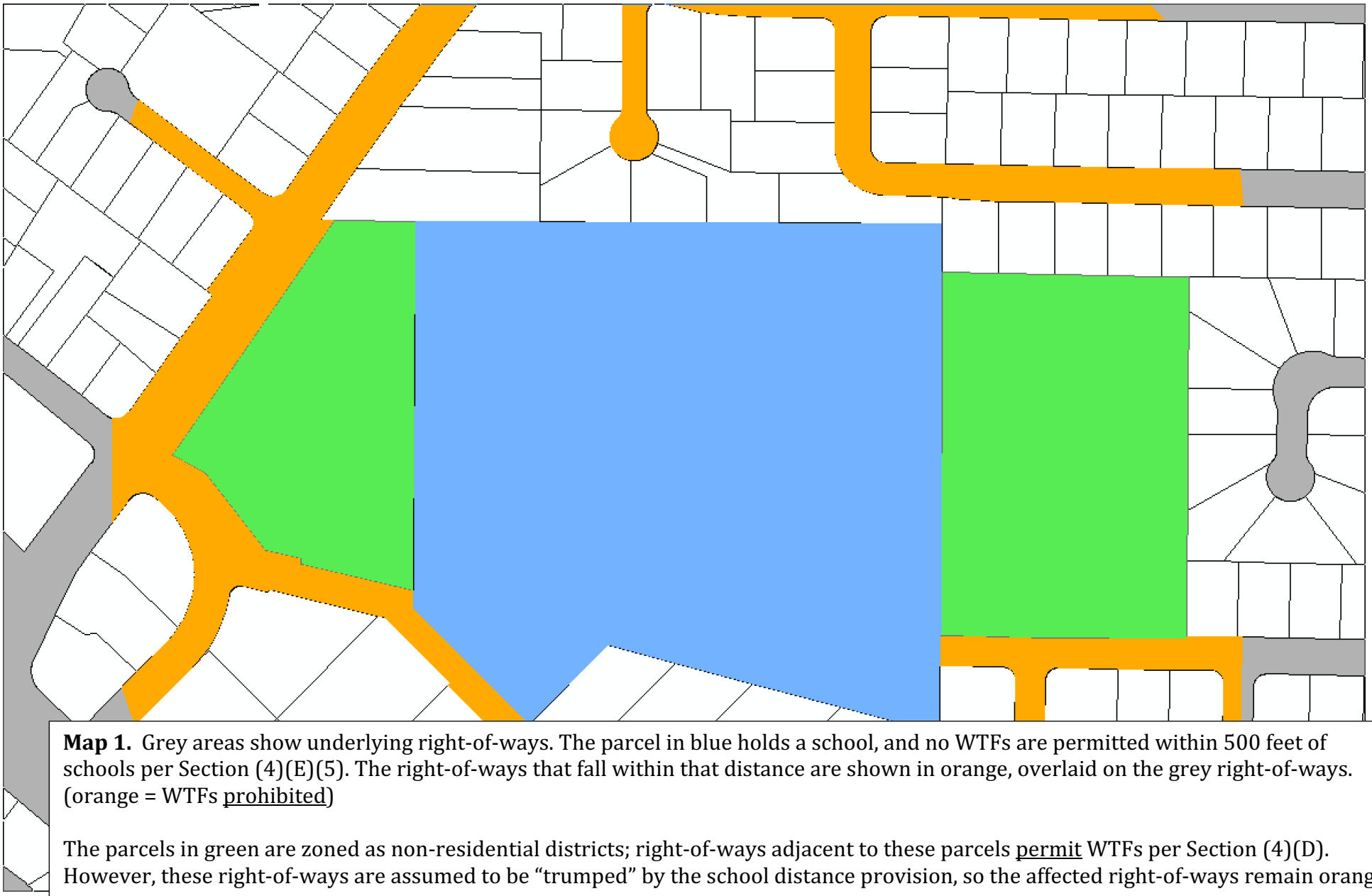
	Within City Limits			Within Sphere of Influence		
	Acres (within parcels)	**Acres** (within right-of-ways)	**Percentage of City Limits**	**Acres** (within parcels)	**Acres** (within right-of-ways)	**Percentage of Sphere of Influence**
Wireless Facilities Prohibited	3,205.04	718.99	(3,205.04 + 718.99) / 4,268.40= **91.93%**	448.22	74.20	(448.22 + 74.20)/626.86 = **83.34%**
Wireless Facilities Permitted	234.28	110.09	(234.28 + 110.09) / 4,268.40 = **8.07%**	99.02	5.42	(99.02 + 5.42) / 626.86 = **16.66%**
Subtotals	3,439.32*	829.08**		547.24*	79.62**	
Totals	4,268.40***		100%	626.86****		100%

* aligns with results of Step 2

** aligns with results of Step 8a

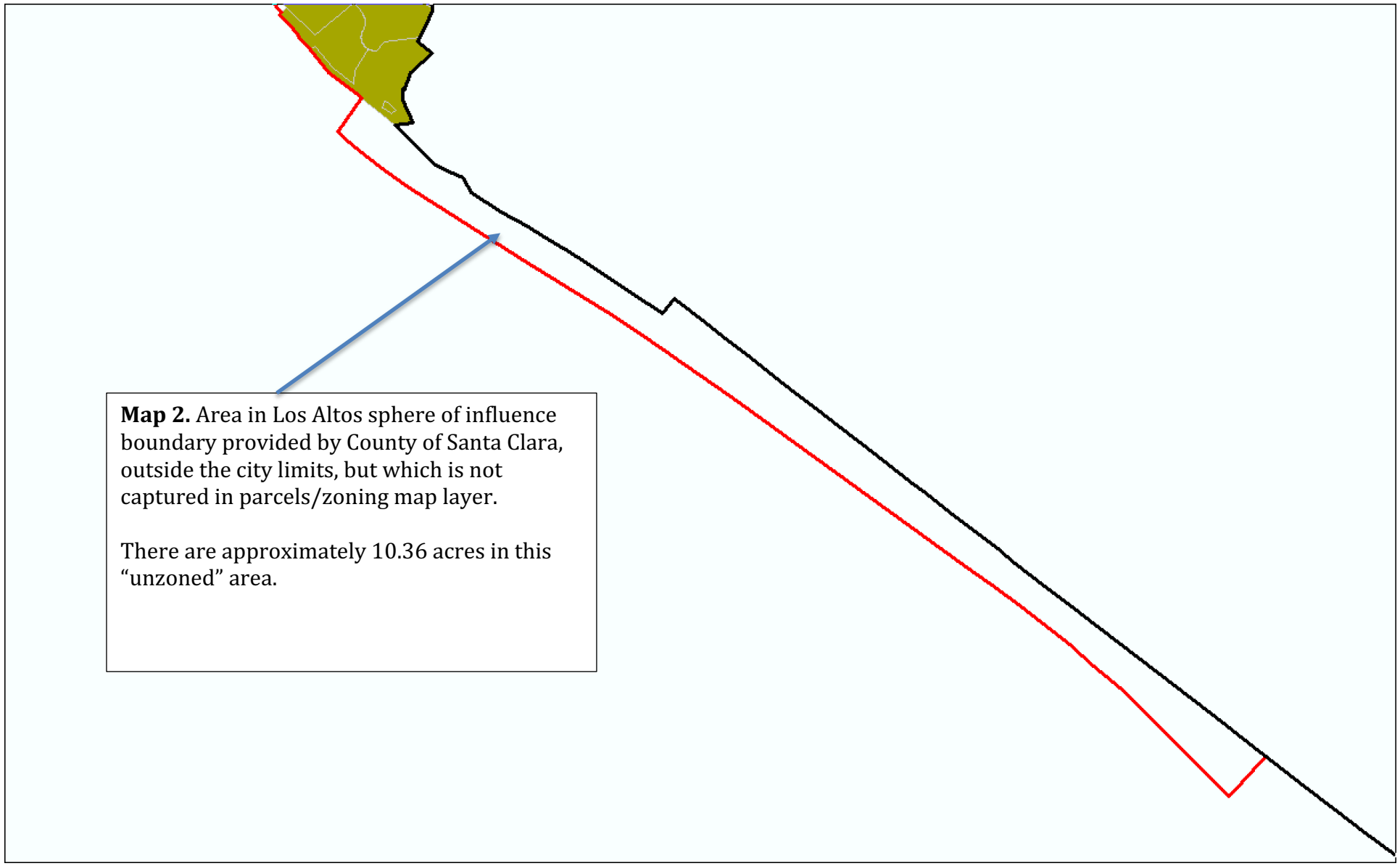
*** this value represents the total area of the city limits (both parcel areas and right-of-ways) based on calculations for this analysis. Recall from Step 1 that the total city limits was noted as 4,164.22 acres. The discrepancy is 104 acres. The discrepancy is explained by the apparent 'conflict' between portions of right-of-way that are impacted by multiple ordinance provisions: **(1)** prohibitions of WTFs within 500 feet of school properties; **(2)** prohibitions of WTFs in right-of-ways abutting residential districts; and **(3)** provisions in Section (4)(D) that permit WTFs in right-of-ways adjacent to "non-residential districts" (i.e. districts K, L, O, P, Q, R, S, V). There are approximately 100 acres of right-of-way in such areas of "conflict" and this overlap is factored into the last two rows in the table above. It has been assumed that in these areas of conflict that the more restrictive **(1) and (2)** trump permissive **(3)** in terms of siting WTFs. ***(see example in map 1 below)***

**** this value represents the total area of the sphere of influence (both parcel areas and right-of-ways) based on calculations for this analysis. Recall from Step 1 that the total sphere of influence was limits was noted as 637.22 acres. The discrepancy is 10.36 acres – this is explained by the "tail" of the sphere of influence area provided by the County of Santa Clara in which there are no Los Altos-related zoning areas ***(see map 2 below)***



Map 1. Grey areas show underlying right-of-ways. The parcel in blue holds a school, and no WTFs are permitted within 500 feet of schools per Section (4)(E)(5). The right-of-ways that fall within that distance are shown in orange, overlaid on the grey right-of-ways. (orange = WTFs <u>prohibited</u>)

The parcels in green are zoned as non-residential districts; right-of-ways adjacent to these parcels <u>permit</u> WTFs per Section (4)(D). However, these right-of-ways are assumed to be "trumped" by the school distance provision, so the affected right-of-ways remain orange.



Map 2. Area in Los Altos sphere of influence boundary provided by County of Santa Clara, outside the city limits, but which is not captured in parcels/zoning map layer.

There are approximately 10.36 acres in this "unzoned" area.

ERICSSON

City of Los Altos
Atten: Vency Woo
1 N San Antonio Rd, Los Altos, CA 94022
December 4, 2019

Letter from AT&T in response to 11/25/2019 letter requesting additional information

Dear Ms. Woo,

Please review the attached submittal items supplied to address the City's concerns. We are pleased to work with the City of Los Altos and willing to provide further clarification and answer any additional questions that City staff may have. Thank you for your time and consideration and we look forward to hearing from you.

Thank you,

Ivan Toews
Site Acquisition Manager
CRAN Small Cell

Ericsson
6140 Stoneridge Mall Rd. Suite 350
Pleasanton, CA 94588
Mobile 408-840-1035
ivan.toews@ericsson.com
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HAMMETT & EDISON, INC.
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ROBERT L. HAMMETT, P.E.
1920-2002
EDWARD EDISON, P.E.
1920-2009

DANE E. ERICKSEN, P.E.
CONSULTANT

BY EMAIL MG387K@ATT.COM

December 4, 2019

Mr. Marc Grabisch
AT&T Mobility
5001 Executive Parkway
San Ramon, California 94583

Dear Marc:

As you requested, we have evaluated the small cells that AT&T Mobility is proposing to install at twelve PG&E poles sited in the City of Los Altos, as tabulated below, with regard to acoustic noise emission levels.

Based on construction drawings from Precision Design, dated between October 29, 2018, and July 25, 2019, AT&T proposes to install equipment items on the side of the utility pole at each location, including a "bus bar" for electrical grounding, a disconnect switch, and a power meter. Above that passive equipment is a 5-foot concealment shroud, housing the two Ericsson radio units for small cell operation: one Model RRUS 11 and one Model 4415. Based on the Ericsson equipment specifications, enclosed with this letter (see pages 15 and 25, respectively), neither unit is fitted with fans, as they are cooled by the natural convective flow of air across their cooling fins.

Data from Ericsson indicates that the Model 4415 can make a little noise during low usage, even when, as is the case here, it is not configured with the optional cooling fan: less than 36 dBA sound power, which corresponds to a noise level of 45 dBA, the City's most restrictive limit, at a distance of just 4 inches. This would not extend beyond the shroud itself, which is to be installed at least 13 feet above ground. Therefore, both radio units are considered to be silent and so compliance with the City's noise emission limits is ensured.

Please let me know if any questions arise on this analysis.

Sincerely yours,

Bill Hammett

William F. Hammett

scn

e-mail: mail@h-e.com
Delivery: 470 Third Street West • Sonoma, California 95476
Telephone: 707/996-5200 San Francisco • 707/996-5280 Fax • 202/396-5200 D.C.

Enclosures

cc: Mr. Ivan Toews – BY EMAIL IVAN.TOEWS@ERICSSON.COM
Ms. Nancy Sandoval – BY EMAIL NS184S@ATT.COM

Site No.	Address
CRAN_RSFR_LOSA0_01	141 Almond Avenue
CRAN_RSFR_LOSA0_02	687 Linden Avenue
CRAN_RSFR_LOSA0_03	421 Valencia Drive
CRAN_RSFR_LOSA0_04	33 Pine Lane
CRAN_RSFR_LOSA0_05	49 San Juan Court
CRAN_RSFR_LOSA0_06	791 Los Altos Avenue
CRAN_RSFR_LOSA0_07	98 Eleanor Avenue
CRAN_RSFR_LOSA0_08	182 Garland Way
CRAN_RSFR_LOSA0_09	491 Patrick Way
CRAN_RSFR_LOSA0_10	300 Los Altos Avenue
CRAN_RSFR_LOSA0_11	130 Los Altos Avenue
CRAN_RSFR_LOSA0_12	356 Blue Oak Lane

ERICSSON

Remote Radio Unit Description

RRUS 11 and RRUS 61

Description

Contents

1 Introduction

This document describes the Remote Radio Unit multi-Standard (RRUS) 11 and the RRUS 61. In the document, RRUS without a model number means both RRUS 11 and RRUS 61.

Note: Remote Radio Unit (RRU) is often used as a generic expression for a remotely installed Radio Unit (RU). It is also the name of models prior to the RRUS versions described in this document, for example Remote Radio Unit Wideband (RRUW).

1.1 Warranty Seal

The product is equipped with a warranty seal sticker.

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

2 Product Overview

The RRUS remotely extends the reach of the RBS by up to 40 km. The RRUS is designed to be located near the antenna. A fiber optic cable connects the RRUS to the RBS main unit or an expanded macro RBS. The RRUSs can be connected in a star or cascade configuration with optical cable links, as shown in Figure 1.

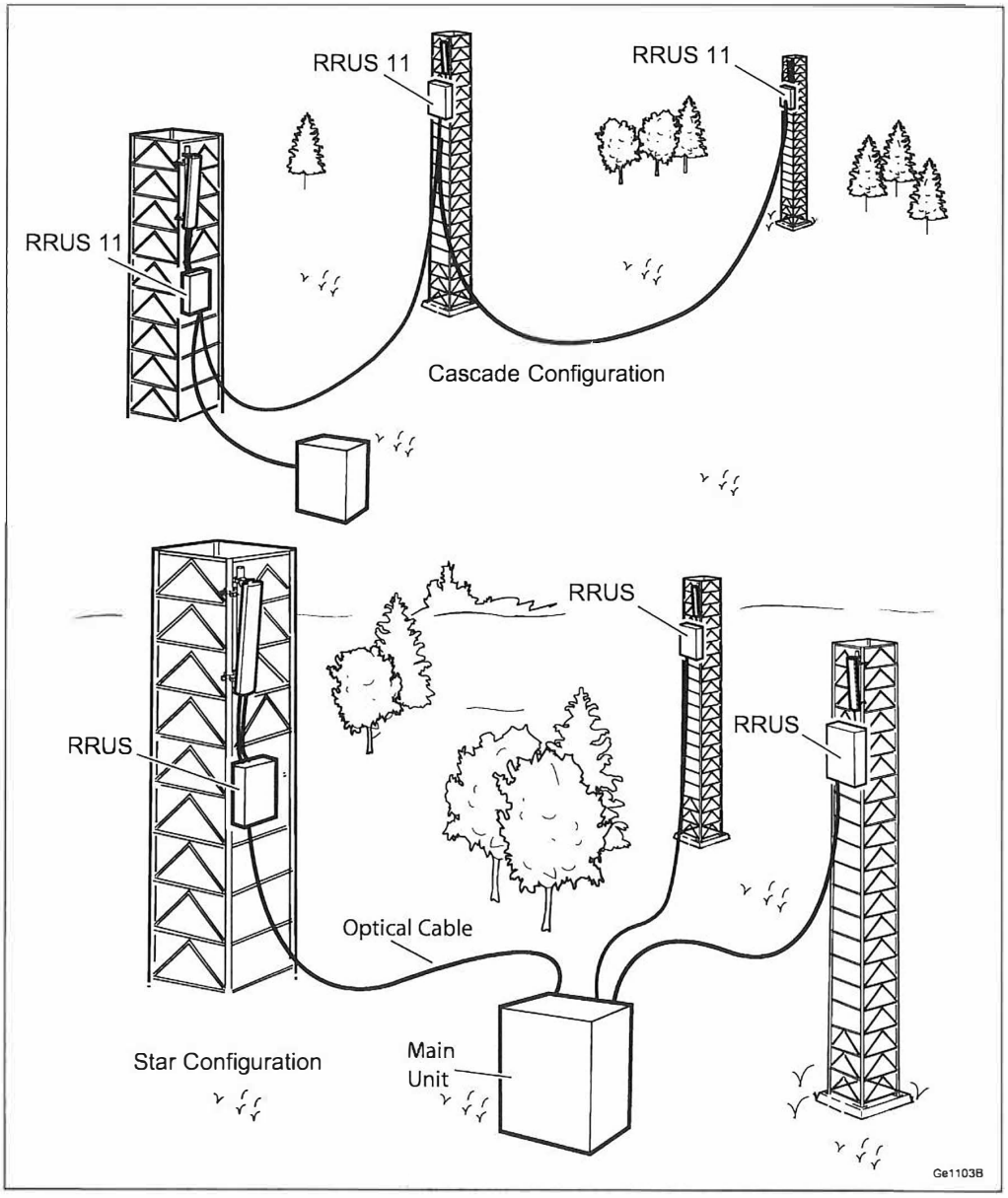


Figure 1 RRUSs in Star and Cascade Configurations

2.1 Main Features

Depending on the software application, the RRUS supports the Antenna Line Devices (ALDs), and the Remote Electrical Tilt Unit (RETU). The RETU can be connected either through the ASC or the RET Interface Unit (RIU) over the antenna interface, or directly using the RRUS ALD, or Remote Electrical Tilt (RET) control interface.

For LTE and WCDMA configurations with dual transmitter (TX) RRUSs, redundancy can be achieved by cross-connecting the antenna feeders between the RRUS and the antenna. For more information, refer to *Cross-Sector Antenna Sharing Redundancy* and *Antenna System Equipment* or *Manage Hardware Equipment*.

The RET interface on the RRUS is the link to the antenna communication system. See Table 14 for information about the RRUS connection interface for ALD (RET).

RRUS 11 supports Wideband Code Division Multiple Access (WCDMA), Code Division Multiple Access (CDMA), LTE Frequency Division Duplexing (LTE FDD) and Massive IoT (MI). It has two duplex receiver/transmitter (RX/TX) branches and supports cross connection of RX ports with other RRUs.

RRUS 61 supports LTE Time Division Duplexing (LTE TDD). It has two duplex RX/TX branches.

RRUS 11 can be used together with an RRUS A2, RRUS A3, or Radio 0208 to provide a four RX branch implementation for Main Remote applications. For more information, refer to *Remote Radio Unit Description* of RRUS A2, *Remote Radio Unit Description* of RRUS A3, or *Radio Description* of Radio 0208.

2.2 Optional Equipment

The optional equipment for the RRUS is the following:

- Wall installation equipment
- Pole installation equipment
- Power Supply Unit (PSU)
- Radio Frequency (RF) monitoring port

3 Technical Data

This section contains information about the physical characteristics, environmental data, and the power supply of the RRU.

3.1 Dimensions

This section contains information about the technical data and dimensions for the RRUS 11, and RRUS 61.

3.1.1 RRUS 11

Table 1 lists the technical data for the RRUS 11. Figure 2 shows the dimensions for the RRUS 11.

Table 1 RRUS 11 Technical Data

Description	Value
Maximum nominal output power, subject to license handling.(1) (2)	2x10 W, 2x20 W, 2x30 W, 2x35 W, and 2x40 W(3) Hardware Activation Code (HWAC) is required for total output power over 20 W.
Number of carriers, subject to license handling.(1)	WCDMA: 1 to 4 carriers CDMA: 1 to 4 carriers LTE: 1 to 2 carriers MI, NB-IoT In-band mode: 1 to 2 carriers(4) Mixed mode: 2 to 4 carriers
Frequency(5)	1920 to 1980 MHz uplink 2110 to 2170 MHz downlink B1 for WCDMA, LTE and MI
	1850 to 1910 MHz uplink 1930 to 1990 MHz downlink B2 for WCDMA, LTE and MI
	1710 to 1755 MHz uplink 2110 to 2155 MHz downlink B4 for CDMA, WCDMA, LTE and MI
	824 to 849 MHz uplink 869 to 894 MHz downlink B5 for CDMA, WCDMA, LTE and MI (6)
	2,500 to 2,570 MHz uplink 2,620 to 2,690 MHz downlink B7 for LTE and MI
	699 to 715 MHz uplink 729 to 745 MHz downlink B12 for LTE and MI(7)
	777 to 787 MHz uplink 746 to 756 MHz downlink B13 for LTE and MI
	832 to 862 MHz uplink 791 to 821 MHz downlink B20 for LTE and MI
	1850 to 1915 MHz uplink

Description	Value
	1930 to 1995 MHz downlink B25 for LTE and MI
	1850 to 1910 MHz uplink 1930 to 1990 MHz downlink B25 for CDMA and MI
	817 MHz to 824 MHz uplink 862 MHz to 869 MHz downlink B26A for CDMA, LTE and MI
	814 MHz to 824 MHz uplink 859 MHz to 869 MHz downlink B26B for LTE and MI
	821 MHz to 835 MHz uplink 866 MHz to 880 MHz downlink B26C for LTE and MI
Dimensions with Solar Shield and Handle	
Height	500 mm
Width	431 mm
Depth	182 mm
Weight with solar shield, handle and accessories	
RRUS 11 B1, B5, B26C	23 kg
RRUS 11 B2, B4, B7, B13, B25	24 kg
RRUS 11 B12, B26A, B26B	25 kg
RRUS 11 B20	22 kg
Color	
Gray	

(1) Detailed information about licenses and hardware activations codes (HWAC) can be found in:

GSM: User Description, 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 the WCDMA RAN CPI library.

LTE: Manage Licenses in the Radio Nodes libraries.

(2) Detailed information about output power can be found in the Output Power user guides.

(3) For RRUS 11 B7, 2x30W is guaranteed for operating ambient temperatures < +50 °C. For higher temperatures, 2x20W is guaranteed. For RRUS 11 B26B, maximum output power is 2x35 W for LTE 2 carrier configuration. For RRUS 11 B26C single carrier, maximum output power is 2x40 W, and for multi-carriers, it is back off 0.5 dB.

(4) One NB-IoT carrier per configured LTE carrier

(5) Information about Instantaneous Bandwidth (IBW) can be found in RBS Configurations.

(6) For CDMA RRUS 11 B5 supports frequency from 869.88 MHz to 893.10 MHz.

(7) RRUS 11 for B12 has a bandwidth that is 2 MHz narrower than 3GPP. The supported frequency corresponds to EARFCN (Channel Numbers) of 5010-5169 in downlink and 23010-23169 in uplink.

The RRUS 11 size, height, width, and depth with solar shield, is shown in Figure 2.

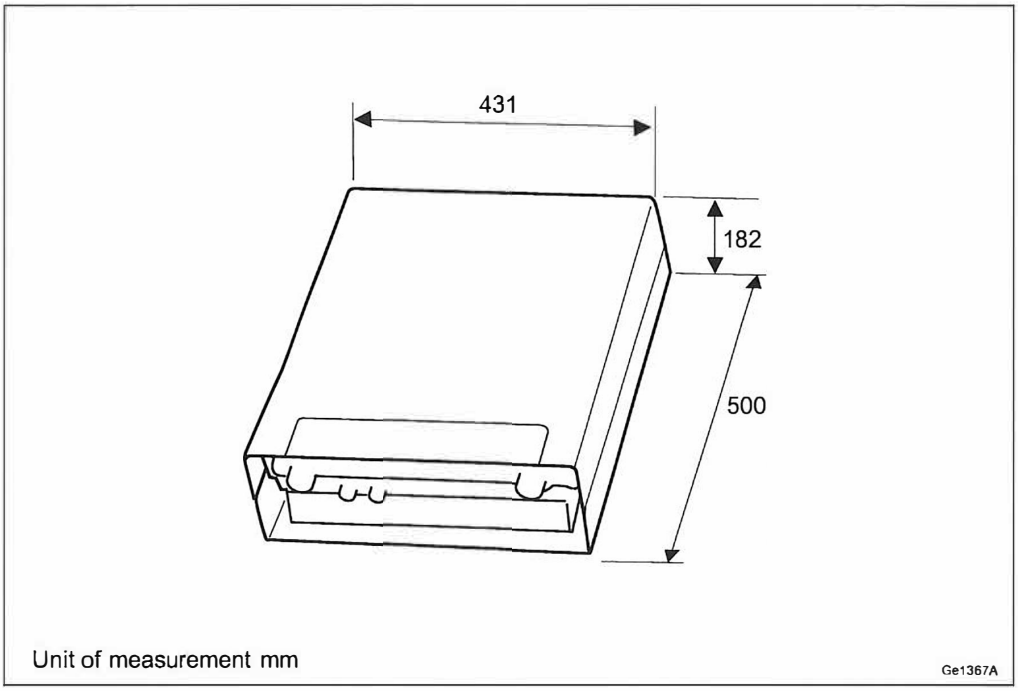


Figure 2 RRUS 11 Height, Width, and Depth with Solar Shield

3.1.2 RRUS 61

Table 2 lists the technical data for the RRUS 61. Figure 3 shows the dimensions for the RRUS 61.

Table 2 RRUS 61 Technical Data

Description	Value
Maximum nominal output power, subject to license handling.(1) (2)	B38, B39, B40, B41A, B41C: 2x10 W, 2x20 W , 2x30 W, and 2x40 W. B40B, B40,C, B40D: 2x10 W, 2x20 W, and 2x30 W. Hardware Activation Code (HWAC) is required for total output power over 20 W.
Number of carriers, subject to license handling.(1)	1 carrier.
Frequency(3)	2575 to 2615 MHz uplink and downlink B38 for LTE
	1880 to 1915 MHz uplink and downlink

Description	Value
	B39 for LTE
	2302.5 to 2322.5 MHz uplink and downlink B40B for LTE
	2305 to 2325 MHz uplink and downlink B40C for LTE
	2320 to 2340 MHz uplink and downlink B40D for LTE
	2300 to 2382 MHz uplink and downlink B40 for LTE
	2496 to 2658 MHz uplink and downlink B41A for LTE
	2535 to 2655 MHz uplink and downlink B41C for LTE
Dimensions without Solar Shield and Handle	
Height	406 mm
Width	416 mm
Depth	128 mm
Dimensions with Solar Shield and Handle	
Height	500 mm
Width	431 mm
Depth	182 mm
Weight	
RRUS 61	21.6 kg
Color	
Gray	

(1) Detailed information about licenses and hardware activations codes (HWAC) can be found in:

GSM: User Description, 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 the WCDMA RAN CPI library.

LTE: Manage Licenses in the Radio Nodes libraries.
(2) Detailed information about output power can be found in the Output Power user guides.
(3) Information about IBW can be found in RBS Configurations.

The RRUS 61 size, height, width, and depth with solar shield, is shown in Figure 3.

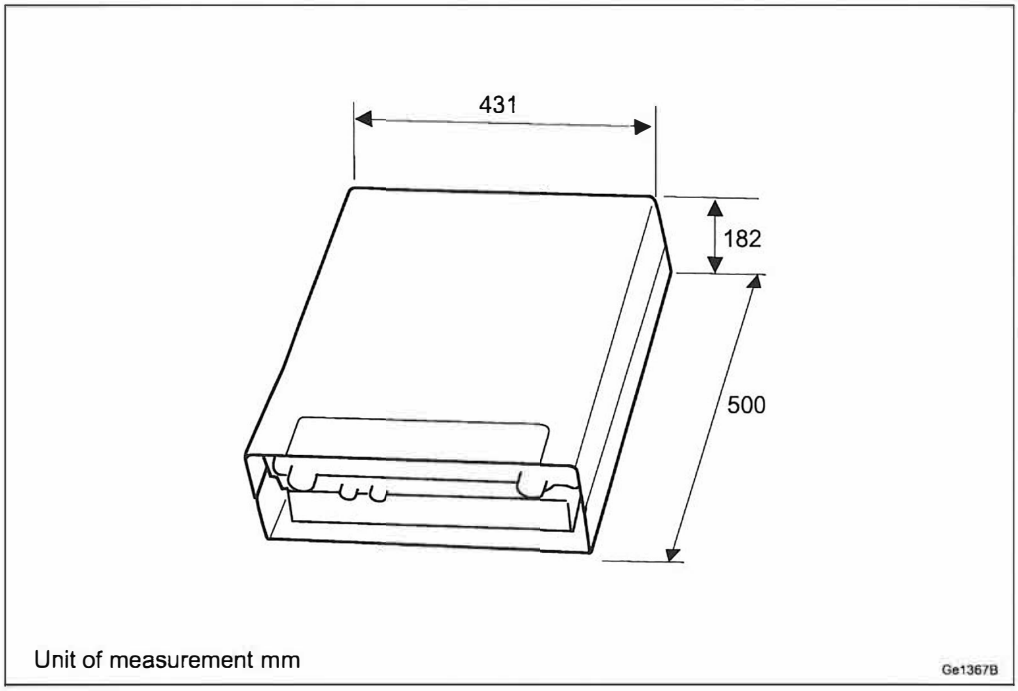


Figure 3 RRUS 61 Height, Width, and Depth with Solar Shield

3.2 Installation Recommendations

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

3.2.1 Indoor Installation Environments to Avoid

Although the unit is designed for outdoor use, it can be used indoors. For indoor locations Ericsson recommends to operate according to ETSI 300 019-1-3 class 3.1 and 3.3. 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. Avoid installing the equipment under glass covers or skylight windows without proper ventilation.

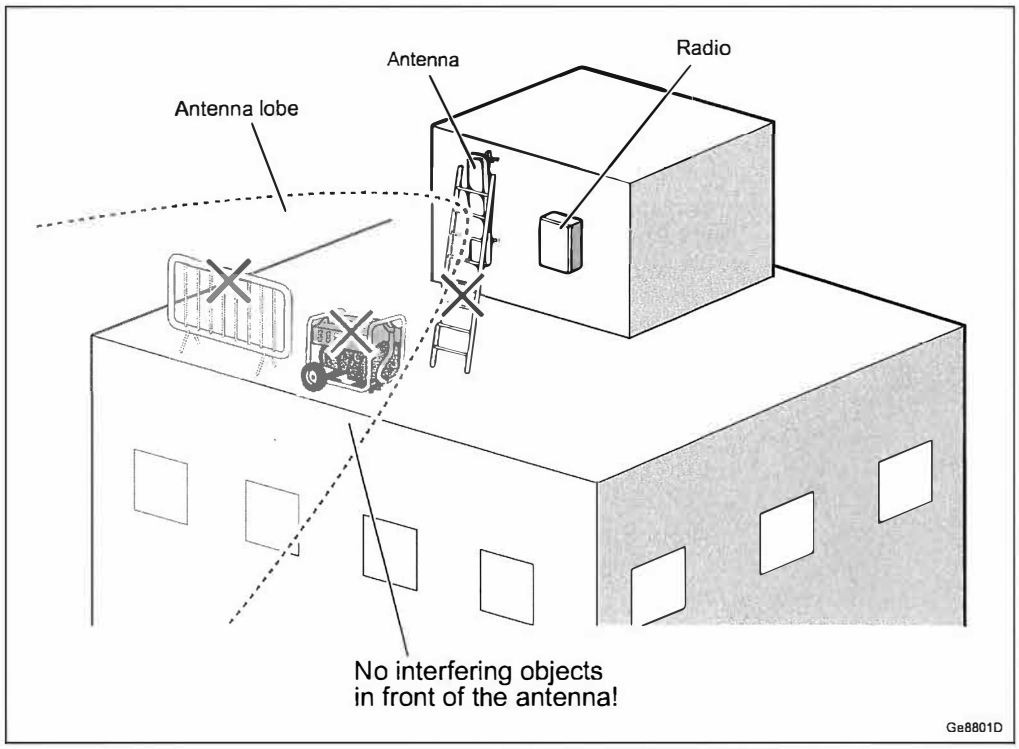
3.2.2 Outdoor Installation Environments to Avoid

The RRU is designed for outdoor use but to ensure optimal operation avoid the following:

- Hot microclimates caused, for example, by heat radiated or reflected from dark or metallic walls or floors
- Chimney mouths or ventilation system outlets
- Large glass or concrete surfaces

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



3.2.3 Painting Limitations

Ericsson does not recommend painting the RRU as it may affect radio performance of the unit.

Ericsson will apply limitations to the warranty and service contract if the RRU is painted.

3.2.3.1 Technical Limitations

If the RRU is painted, be aware of the technical limitations below:

- Sunlight on dark paint may increase the temperature of the RRU causing it to shut down.
- The plastic surfaces and the plastic covers are suited for painting with normal commercially available one or two component paints.
- Never use metallic paint or paint containing metallic particles.
- Ensure that ventilation and drainage holes are free from paint.
- Ensure proper adhesion of the paint.

3.2.3.2 Commercial Limitations

If the RRU is painted, the commercial limitations below apply:

- Failure modes directly related to overheating due to 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 will be restored to the standard color before being returned to the market. It is not possible to guarantee the same unit being 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 will be charged the additional costs for replacing all painted parts of the unit or the complete unit.

3.3 Space Requirements

This section describes the space requirements for installing the RRUS.

The RRUS with cable connections running downwards can be installed as follows:

- On a wall
- On a pole or mast

Both wall and pole installations can be indoors or outdoors.

Pole installations can be on monopoles, masts, or towers. Figure 4 shows sample pole installations.

3.3.1 Generic Requirements

The RRUS is installed with the cable connections facing downwards.

Allow a minimum of 1 m free space in front of the RRUS to ensure sufficient working space.

Note: If no other possibilities are available, under exceptional conditions, the RRUS may be installed horizontally with the front downwards. This installation alternative limits the power supply options and the maximum output power. Details regarding optional actions can be found in *Install Remote Radio Units*.

It is recommended that the RRUS is installed below the antenna. The minimum distance between the RRU and the antenna, and between two RRUs are shown in Figure 5, Figure 6, and Figure 7.

Note: The distance between the antenna and the RRU needs to be increased if the antenna azimuth is in the direction of the RRU.

3.3.2 Pole Installation

Figure 4 shows example pole installations (left to right: single unit on a monopole, two units on a tower on different struts, and three units on a monopole).

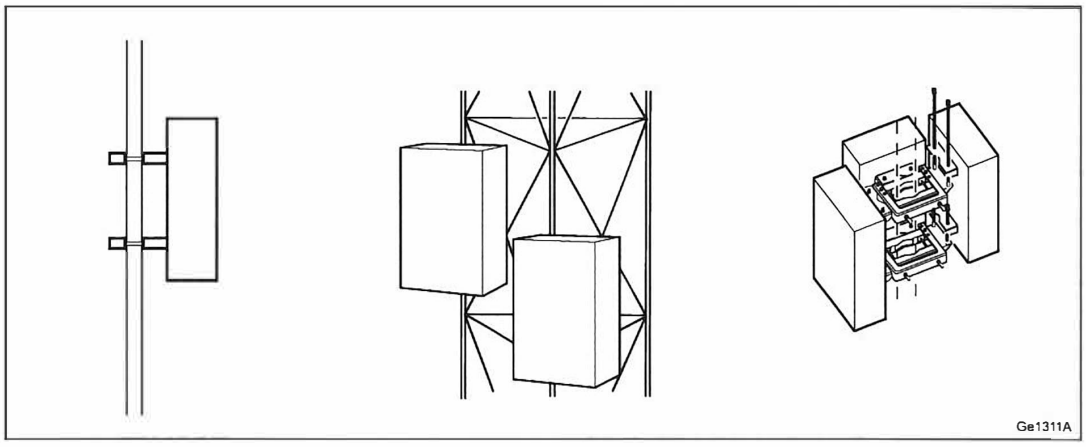


Figure 4 Sample Site Layout for Pole Installation

Figure 5 shows the installation requirements when installing the RRU on a pole.

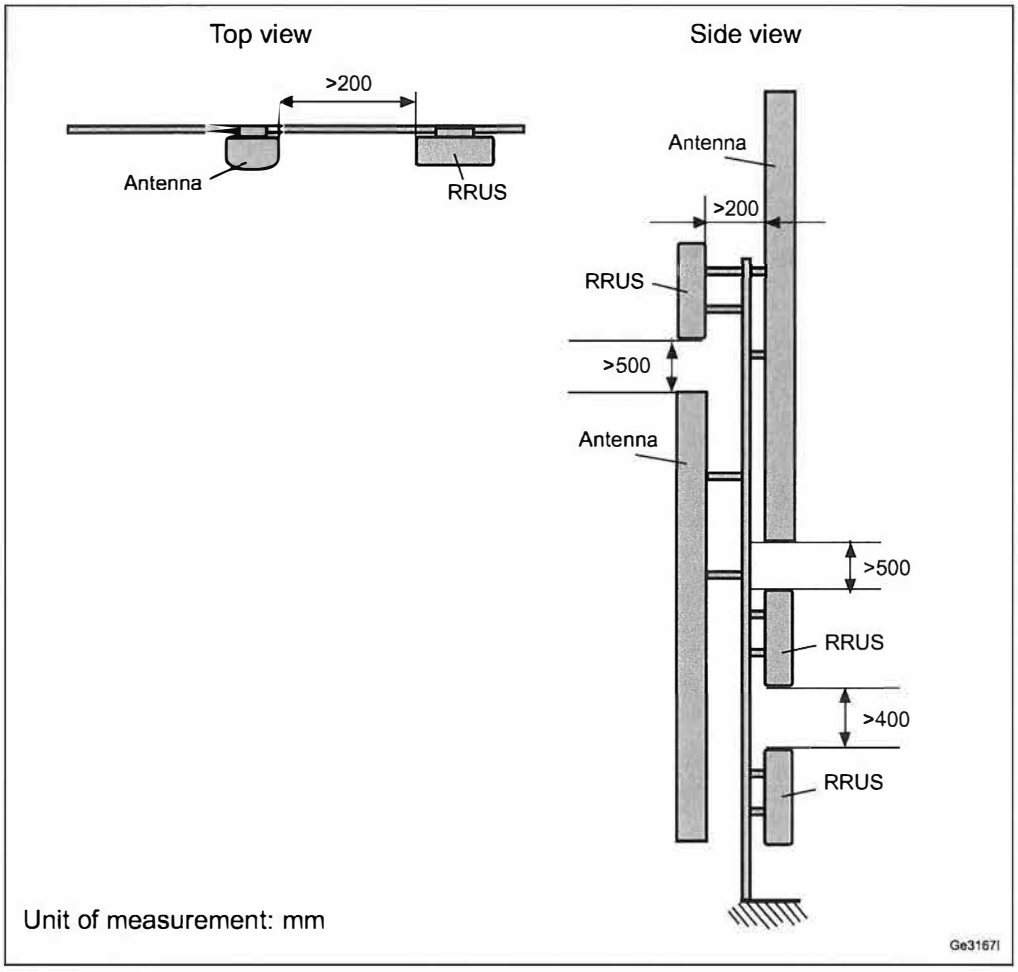


Figure 5 RRU Pole Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between RRUSs installed vertically on a pole. Allow a minimum vertical distance of 500 mm between RRUS and antenna, if installed above or below an antenna. Allow a minimum of 200 mm free space between RRUSs installed side by side. The minimum distance from the bottom of the RRUS to the floor is 300 mm.

Note: An RRU can not be installed in the uppermost top position of a pole or mast.

For an RRUS with AC power supply, the mounting bracket supports only two RRUS units.

The supported pole diameters are listed in Table 3.

Table 3 Pole Diameters

Mounting Equipment	Pole Diameter	Supported RRUSs
Single fixture	60 – 120 mm	All types
Mounting bracket	35 – 155 mm	All types

3.3.3 Wall Installation

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

3.3.3.1 RRU Installation on Outdoor Wall

The installation requirements if installing the RRU outdoor on a wall are shown in Figure 6.

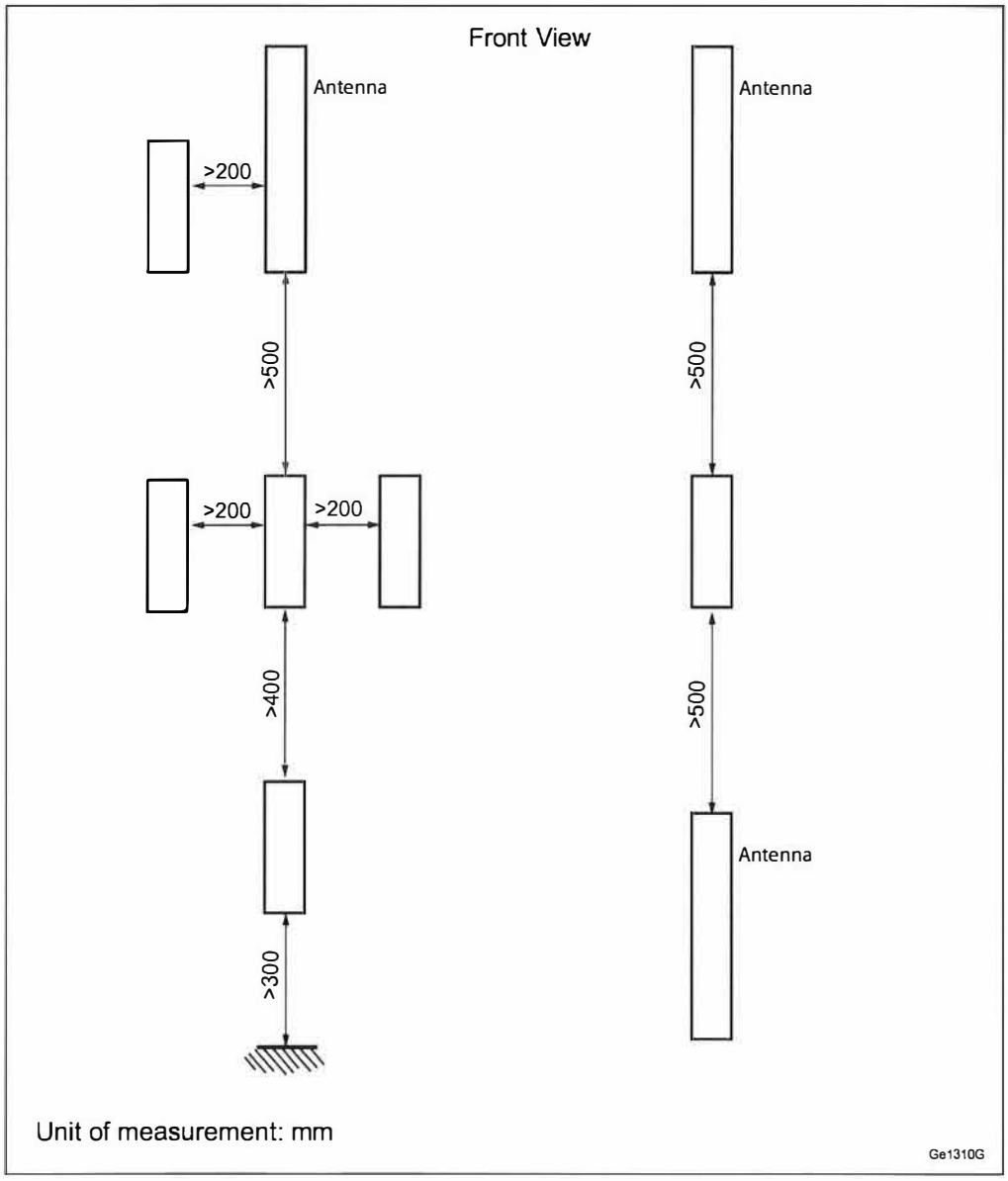


Figure 6 RRU Outdoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between RRUSs installed vertically on a wall. Allow a minimum vertical distance of 500 mm between RRUS and antenna, if installed above or below an antenna. Allow a minimum of 200 mm free space between RRUSs installed side by side. The minimum distance from the bottom of the RRUS to the floor is 300 mm.

Note: An RRU can not be installed in the uppermost top position on a wall.

3.3.3.2 RRU Installation on Indoor Wall

The installation requirements if installing the RRU on an indoor wall are shown in Figure 7.

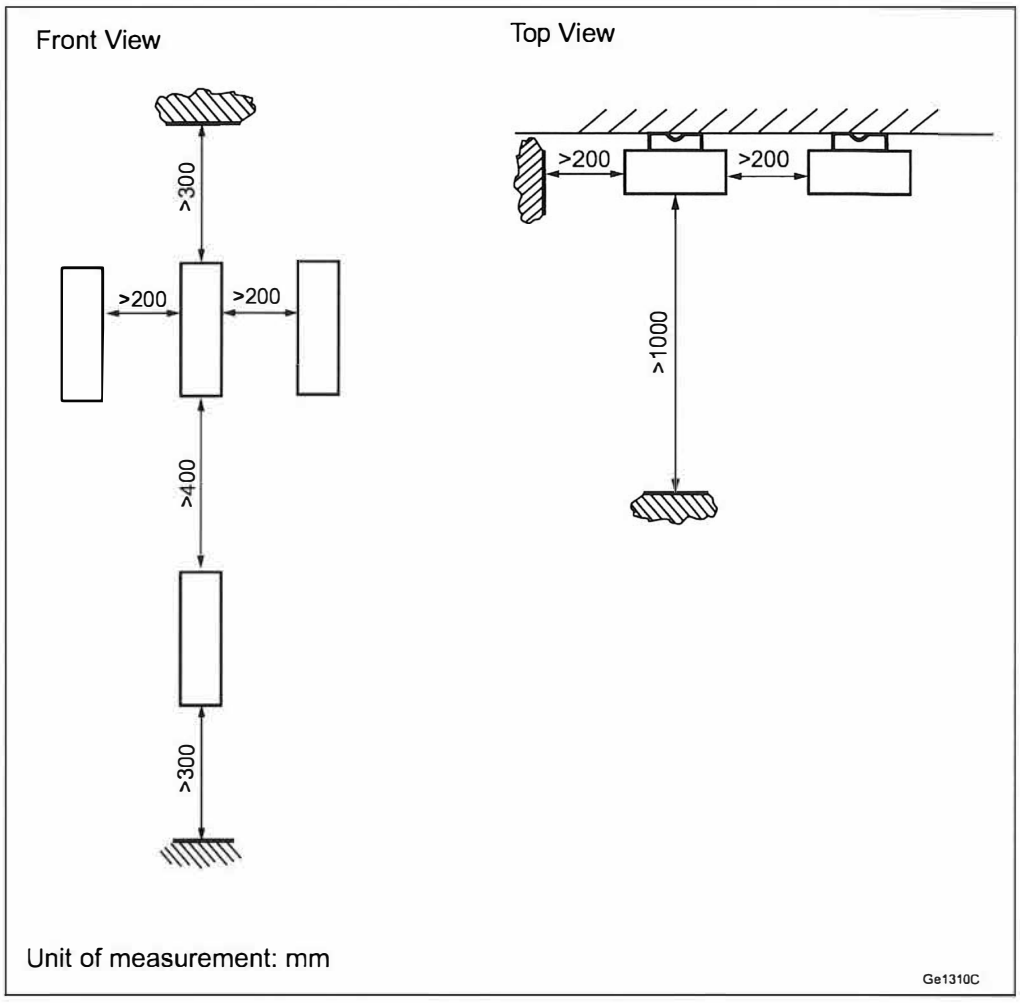


Figure 7 RRU Indoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between RRUSs installed vertically on a wall. Allow a minimum of 200 mm free space between RRUSs installed side by side. The minimum distance from the bottom of the RRUS to the floor is 300 mm.

3.4 Acoustic Noise

The RRUS does not generate acoustic noise.

3.5 Environmental Characteristics

This section contains RRUS operating environment data.

3.5.1 Operating Environment

The following is a list of values for the RRUS normal operating environment:

Temperature	-40 to +55 °C -40 to +45 °C (RRUS 11 B1, B2, B4, B20; in high load scenario: 2x40 W) -40 to +50 °C (RRUS 11 B5, RRUS 61 B40; in high load scenario: 2x40 W)
Solar radiation	≤ 1,120 W/m²
Relative humidity	5 to 100%
Absolute humidity	0.26 to 40 g/m^3
Maximum temperature change	1.0°C/min
Maximum wind load at 50 m/s (pole installed single case)	430 N (front)

3.5.2 Heat Dissipation

The RRUS is convection cooled and designed for outdoor installation. The values shown in Table 4 are meant to give an idea of heat dissipation when the unit is installed indoor or around other RRUs. Indoor installation in a room without adequate ventilation and cooling must be avoided.

Table 4 RRUS Heat Dissipation

Unit	Output Power	Maximum Heat Dissipation
RRUS 11 B1, B4	2x30 W	0.34 kW
	2x40 W	0.43 kW
RRUS 11 B2	2x30 W	0.35 kW
	2x40 W	0.43 kW
RRUS 11 B5, B26C	2x30 W	0.26 kW
	2x40 W	0.30 kW
RRUS 11 B7	2x30 W	0.46 kW
RRUS 11 B12	2x30 W	0.32 kW
	2x40 W	0.43 kW

Unit	Output Power	Maximum Heat Dissipation
RRUS 11 B13	2x40 W	0.43 kW
RRUS 11 B20	2x30 W	0.32 kW
	2x40 W	0.33 kW
RRUS 11 B25	2x30 W	0.35 kW
	2x40 W	0.43 kW
RRUS 11 B26A	2x40 W (1)	0.33 kW
RRUS 11 B26B	2x40 W	0.43 kW
RRUS 61 B38, B39, B41A, B41C	2x40 W	0.34 kW
RRUS 61 B40	2x40 W	0.34 kW
RRUS 61 B40B, B40C, B40D	2x30 W	0.27 kW

(1) Maximum output power is limited to 2x30 W if using RRUS11, KRC 161 287/1.

3.5.3 Vibration

This section describes the RRUS tolerance to vibrations. The RRUS operates reliably during seismic activity as specified by test method IEC 60 068-2-57 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 RRUS operates reliably during random vibration as specified by test method IEC 60 068-2-64 Fh method 1

Random vibration, normal operation	0.5 m^2/s^3

The RRUS operates reliably during shock as specified by test method IEC 60 068-2-27 Ea

Peak acceleration	40m/s^2
Duration	22 ms

3.5.4 Materials

All Ericsson products fulfill the legal and market requirements regarding:

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

3.6 Power Supply Characteristics

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

The power for multiple RRUSs can be supplied from different power systems if required.

3.6.1 DC Power Supply Characteristics

The power supply voltage for the RRUS is -48 V DC. The power supply requirements are listed in Table 5.

Table 5 RRUS DC Power Supply Requirements

Conditions	Values and Ranges
Nominal voltage	-48 V DC
Operating voltage range	-38.0 to -58.5 V DC
Non-destructive range	0 to -60 V DC

Fuse and Circuit Breaker Recommendations

External fuse and circuit breaker capabilities for the RRUS are listed in Table 6.

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 609 34.

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

Table 6 RRUS Fuse or Circuit Breaker Recommendations

Unit (DC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 11 B1, B4	2x10 W	9 A	25 A	32 A
	2x20 W	10 A		
	2x30 W	13 A		
	2x40 W	15 A		
RRUS 11 B2, B5, B12, B13, B20, B25, B26A, B26B, B26C	2x10 W	8 A		
	2x20 W	10 A		
	2x30 W	13 A		
	2x40 W	15 A		
RRUS 11 B7	2x10 W	10 A		
	2x20 W	13 A		
	2x30 W	16 A		
RRUS 61 B38, B39, B41A, B41C	2x40 W	12 A		
RRUS 61 B40	2x40 W	12 A		
RRUS 61 B40B, B40C, B40D	2x10 W	7 A		
	2x20 W	8 A		
	2x30 W	10 A		

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

(2) The recommended fuse rating takes into account the fact that external fuses are not to trip due to lightning or network transients.

(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

Note: If a fuse or circuit breaker rating above minimum fuse rating is selected, cable dimensioning rules in *Position C, -48 V DC Power Supply Interface* on page 30 shall be reconsidered to make sure that the fuse or circuit breaker tripping criteria are met.

3.6.2 AC Power Supply Characteristics

The RRUS AC accepts 100 to 250 V AC if it is used together with the optional PSU. The power supply requirements are listed in Table 7.

Table 7 RRUS AC Power Supply Requirements

Normal Voltage Range	Tolerance Range
200 to 250 V	180 to 275 V AC (1)
100 to 127 V	90 to 140 V AC (1)
Connection	Phase-neutral
Frequency range	50 to 60 Hz
Voltage harmonics	< 10% at full load (2)
Shut-off allowance	At undervoltage or overvoltage (3)
Inrush current peak	< 40 A

Normal Voltage Range	Tolerance Range
Inrush current duration	< 10 ms

(1) AC connected through a PSU AC 02

(2) Must comply with IEC 61000-3-2

(3) Alarm raised at 70 ± 5 V, ceased at 80 ± 5 V (phase voltage)

Fuse and Circuit Breaker Recommendations

External fuse and circuit breaker capabilities for the RRUS are listed in Table 8.

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 609 34.

The PSU AC 02 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 for not tripping the fuse or circuit breaker in case of SPD operation. The minimum fuse rating could be taken into account only if it is accepted that fuses or circuit breakers trip in such situations. The PSU AC 02 is described in *PSU AC 02 (Optional)* on page 25.

Table 8 RRUS Fuse/Circuit Breaker Recommendations

Unit (AC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 11 B1, B4, B5, B12, B13, B20, B25, B26A, B26B, B26C	2x30 W / 2x40 W	• 7 A (100 to 127 V AC) • 4 A (200 to 250 V AC)	32 A	32 A
RRUS 11 B1, B2, B4, B5, B26C	2x40 W	• 8 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
RRUS 11 B7	2x30 W	• 8 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
RRUS 61 B38, B39, B41A, B41C	2x40 W	• 7 A (100 to 127 V AC) • 3.5 A (200 to 250 V AC)		
RRUS 61 B40	2x40 W	• 7 A (100 to 127 V AC) • 3.5 A (200 to 250 V AC)		

Unit (AC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 61 B40B, B40C, B40D	2x30 W	• 5 A (100 to 127 V AC) • 2.5 A (200 to 250 V AC)		

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

(2) The recommended fuse rating takes into account the fact that external fuses are not to trip due to lightning or network transients.

(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

3.6.3 Power Consumption

For information on power consumption, refer to *Power Consumption Guideline for RBS 6000*.

3.7 System Characteristics

This section describes the system characteristics of the RBS.

3.7.1 RF Electromagnetic Exposure for RBS 6000

General information on RF Electromagnetic Fields (EMF) for RRUSs connected to an RBS from the 6000 family can be found in *Radio Frequency Electromagnetic Fields*.

Information about radio access specific compliance boundaries for electromagnetic exposure can be found in *Radio Frequency Electromagnetic Exposure*.

3.7.2 Software

Information on software dependencies can be found in *Compatibilities for Hardware and Software*.

3.7.3 Radio Configurations

Information about available radio configurations can be found in *RBS Configurations*.

4 Hardware Architecture

This section describes the RRUS hardware structure regardless of configuration or frequency. The RRUS components are shown in Figure 8 and listed in Table 9.

Note: The supported configurations are described in *RBS Configurations*.

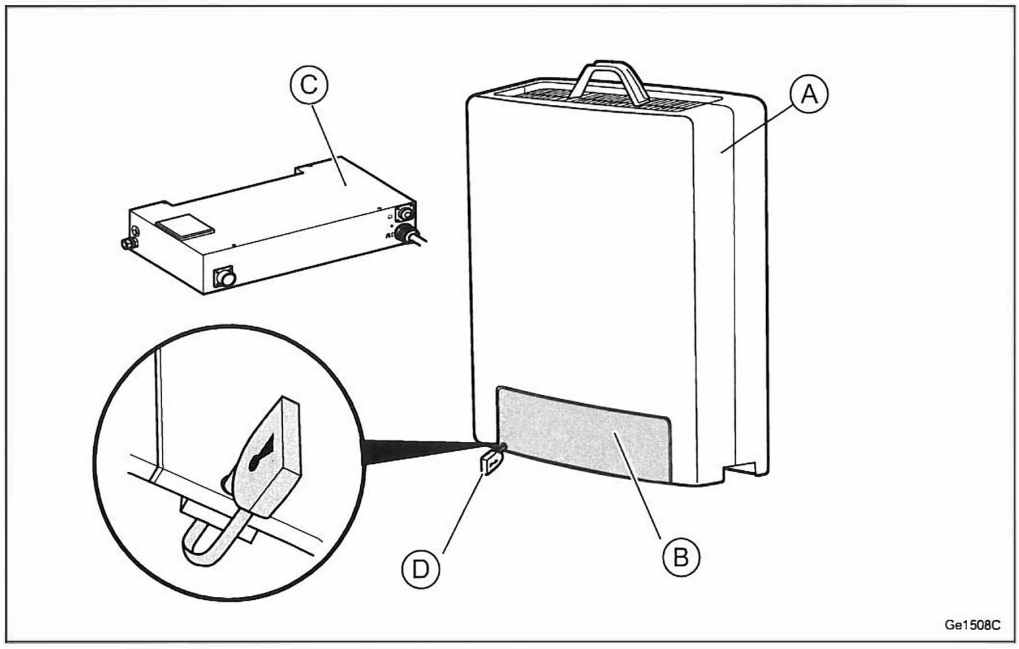


Figure 8 RRUS 11 and RRUS 61 Components

Table 9 Key to RRUS Components

Position	Component
A	Solar shield
B	Slide cover
C	PSU (optional)
D	Hole for padlock (optional, valid in RRUS 11 solar shield variant 2 only)

4.1 RRUS Overview

The RRUS contains most of the radio processing hardware. The following sections describe the component units inside the RRUS.

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
- Two receivers for RX diversity
- RET receiver (the antenna system communication link)

4.1.2 PA

The Power Amplifier (PA) is the linear power amplifier for the RF carrier. RRUS 11 and RRUS 61 have two PAs, one for each branch.

4.1.3 FU

The Filter Unit (FU) consists of band-pass filters and low-noise amplifiers.

In the RRUS, the FU also provides the following:

- Power and supervision for the ASC, the TMA, the TMF, or the RIU
- Voltage Standing Wave Ratio (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/overcurrent protection for the ALD (RET) port.

4.1.6 External Alarm SPD

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

4.2 Solar Shield

The solar shield protects the RRUS from solar radiation. The solar shield is also part of the cooling design. Figure 8 shows the solar shield.

Note: Always attach the solar shield to the RRUS regardless of whether the RRUS is installed in a shady or in a sunny location.

4.3 Slide Cover

The slide cover hides the optical indicators and the maintenance button.

More information can be found in *Connection Interfaces* on page 28.

4.4 Optical Indicators and Buttons

The RRUS is equipped with optical indicators that show system status. The optical indicators are located on the overlay marking. Table 10 describes how to interpret the optical indicators for RRUS when WCDMA and LTE controlled.

Table 10 RRUS Optical Indicators WCDMA or LTE Controlled

Marking	Indicator	Color	Mode	Indicates
!	Fault	Red	Off	No fault detected in RRUS
			On	Fault detected in RRUS
✔	Operational	Green	Off	RRUS not operational
			On	Power present
			Blink (2 Hz)	Load or testing in progress
			Blink (0.5 Hz)	Dependent resource missing
🔧	Maintenance	Blue (1)	Off	RRUS not in maintenance mode
			On	RRUS in maintenance mode
			Blink (0.5 Hz)	Shutdown in progress
⊖→ 1, ⊖→ 2	Interface	Green	Off	Disconnected
			On	Connected
LMT	–	-	-	Not used
Button:				
🔧	Maintenance	-	-	Switch RRUS mode between Remote and Maintenance

(1) The color can also be yellow. The yellow optical indicator can blink busy.

4.4.1 Maintenance Button Function

See *Indicators, Buttons, and Switches* for information about the maintenance button.

4.5 PSU AC 02 (Optional)

The PSU is required for the AC power input option. The PSU converts RRUS input main power 100 - 250 V AC to -48 V DC and is installed on the back of the RRUS. Figure 9 shows the PSU.

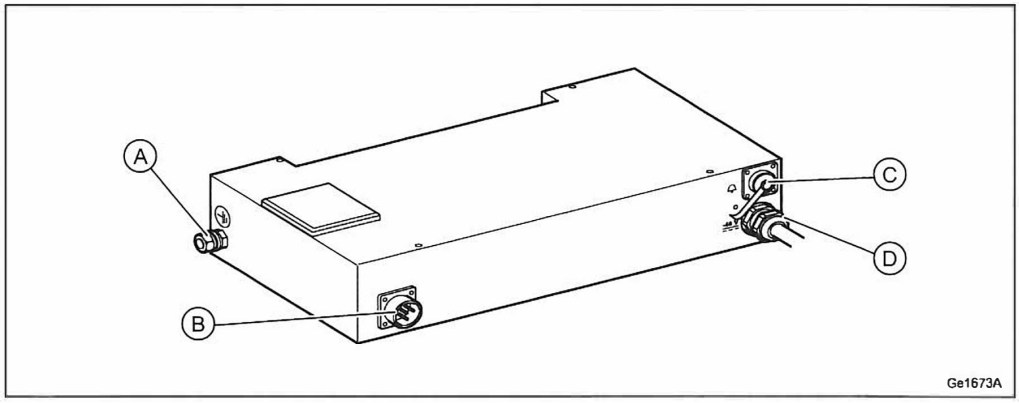


Figure 9 PSU AC 02

Table 11 PSU AC 02 Connection Interfaces

Position	Interface
A	Grounding interface
B	AC power interface
C	Interface for future use
D	DC power interface

For more information about PSU AC 02, see *PSU Description*.

4.6 PSU 48 02 (Optional)

The PSU 48 02 converts -48 V DC 3-wire to -48 V DC 2-wire.

The PSU 48 02 components are shown in Figure 10 and listed in Table 12.

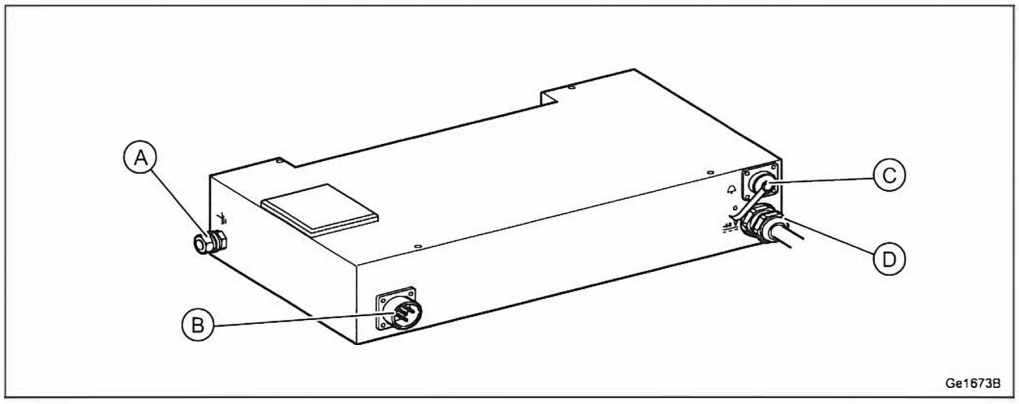


Figure 10 PSU 48 02

Table 12 PSU 48 02 Connection Interfaces

Position	Interface
A	Grounding interface
B	DC power interface (3-Wire)
C	Interface for future use
D	DC power interface (2-Wire)

For more information about PSU 48 02, see *PSU Description*.

4.7 RF Monitoring Port for RRUS 11 (Optional)

The RF monitoring port can be used to monitor the RRUS downlink RF output power without interrupting service. The RF monitoring port components are shown in Figure 11 and listed in Table 13.

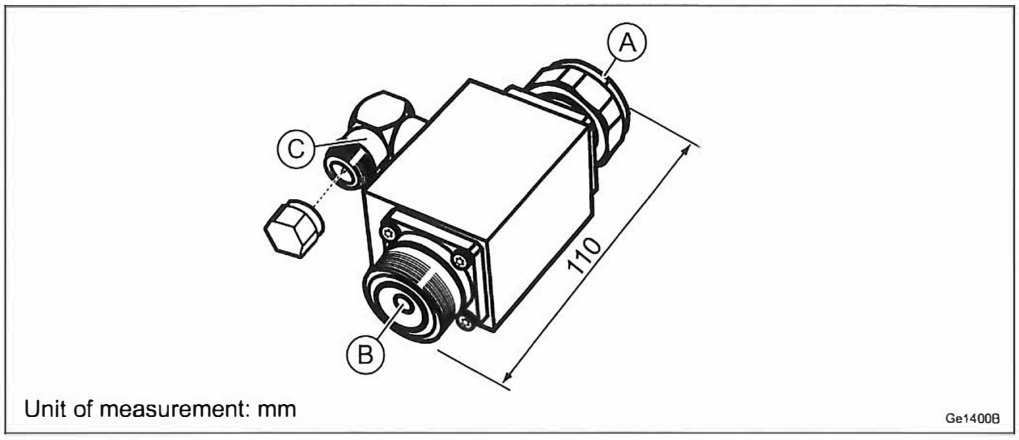


Figure 11 RF Monitoring Port

Table 13 RF Monitoring Port Overview

Position	Interface
A	7/16 RF connector used for connecting to **A** or **B** interface
B	7/16 RF connector for connecting the RF cable
C	N-type RF connector for pairing with connector on monitoring equipment (including metal protective cap to be used when the interface is not in use)

The RF monitoring port is connected to the **A** or **B** antenna interface on the connection interface panel at the bottom of the RRUS. The **A** and **B** interfaces support bidirectional, RX/TX traffic, but only the TX direction can be monitored.

Using the RF monitoring port does not affect RRUS performance. RF leakage due to connecting the antenna cables through the monitoring port does not exceed that of a standard RF cable. Insertion loss between port A and port B is less than 0.2 dB.

5 Connection Interfaces

This section contains information about the RRUS connection interfaces. The RRUS connection interfaces are shown in Figure 12, and listed in Table 14.

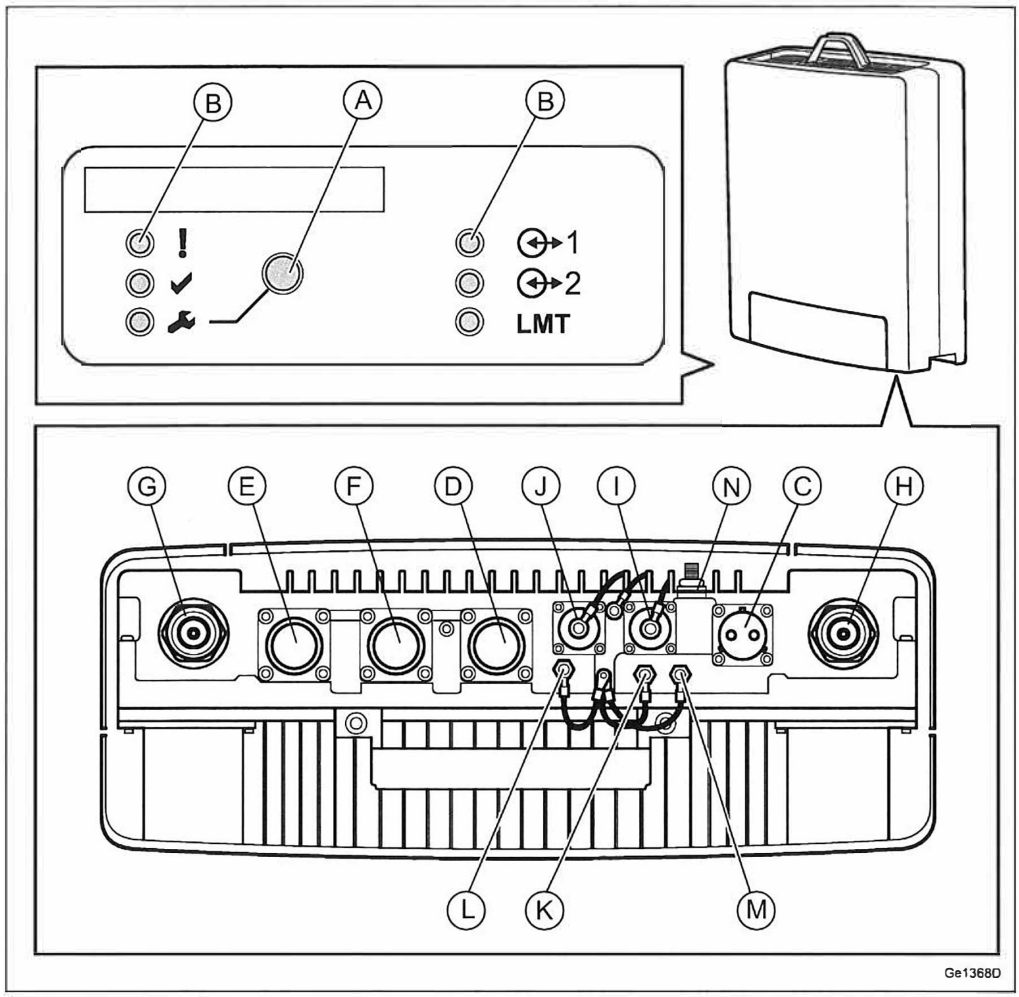
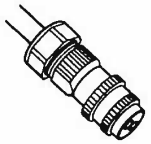
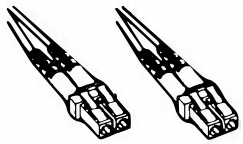
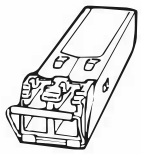
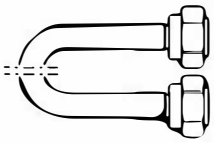
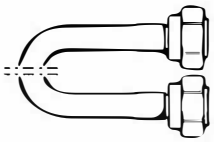
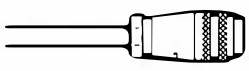
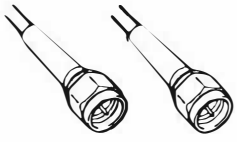


Figure 12 RRUS Connection Interfaces

Table 14 RRUS Connection Interfaces

Position	Description	Marking	Connector Types	Cable Types
A	Maintenance button	🔧	-	-

Position	Description	Marking	Connector Types	Cable Types
B	Optical indicators	! , ✔ , 🔧 1, 2 LMT	-	-
C	-48 V DC power supply		Screw terminal connector	
D	–	LMT	-	-
E	Optical cable 1	1	LC (On SFP)	 
F	Optical cable 2	2		
G	Antenna 1	A	7/16 connector	
H	Antenna 2	B		
I	ALD (used for a RET unit for example)	ALD	Mini-DIN connector, 8 pin	
J	External alarm		Alarm connector	
K(1)	Cross connect RXA	RXA I/O	SMA connector	
L(1)	RXA co-site	RXA Out		

Position	Description	Marking	Connector Types	Cable Types
M(1)	Cross connect RXB	RXB I/O		
N	Grounding	⏚	M8 bolt	

(1) Applicable for RRUS 11 only.

5.1 Position A, Maintenance Button

The maintenance button is located at the left of the 🔧 symbol.

Note: Use a pointed object, for instance a screwdriver or a pencil tip, to press the maintenance button.

More information about the maintenance button can be found in *Indicators, Buttons, and Switches*.

5.2 Position B, Optical Indicators

Optical indicators show the system status. More information about the optical indicators can be found in *Indicators, Buttons, and Switches*.

5.3 Position C, -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 RRU maximum power consumption. For more information on -48 V DC power cable dimensions, see *Main-Remote 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 RRUS overvoltage and lightning protection does not function properly.

5.4 Position D, LMT

Not used.

5.5 Position E and F, Interface for Optical Cable to Main Unit

The ⊙→ 1 and ⊙→ 2 interfaces provide connections to optical cables for traffic and timing signals between the RRUS and the main unit. A Small Form-factor Plugable (SFP) is used to connect the optical cable to the RRUS.

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

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 60950-1.
- Functional and performance verified to comply with RBS specifications.

Recommended SFP modules are obtained from the product packages for the RBS and the Main Remote Installation products. See *Spare Parts Catalog* and *Main-Remote Installation Products Overview* for more information.

5.6 Position G and H, Antenna Interface

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

The antenna connection interface characteristics of these cables are described in Table 15.

Table 15 RRUS Antenna Connection Interface Characteristics

Connector Type	RF Cable Type	Cable Connector Type	Cable Product Number
7/16 IEC-169-4 insert-receiver type	50 Ω 1/2-inch coaxial	7/16 insert-type on both ends	TSR 951 70

The antenna cables must be connected as described in Table 16.

Table 16 RRUS Antenna Cable Connectors

RRUS Connectors	Antenna Connectors
A (Antenna 1)	TX/RX
B (Antenna 2)	TX/RX

5.7 Position I, ALD Ctrl Interface

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

5.8 Position J, Ext Alarm Interface

Two external alarms can be connected to the RRUS external alarm port, as shown in Figure 13.

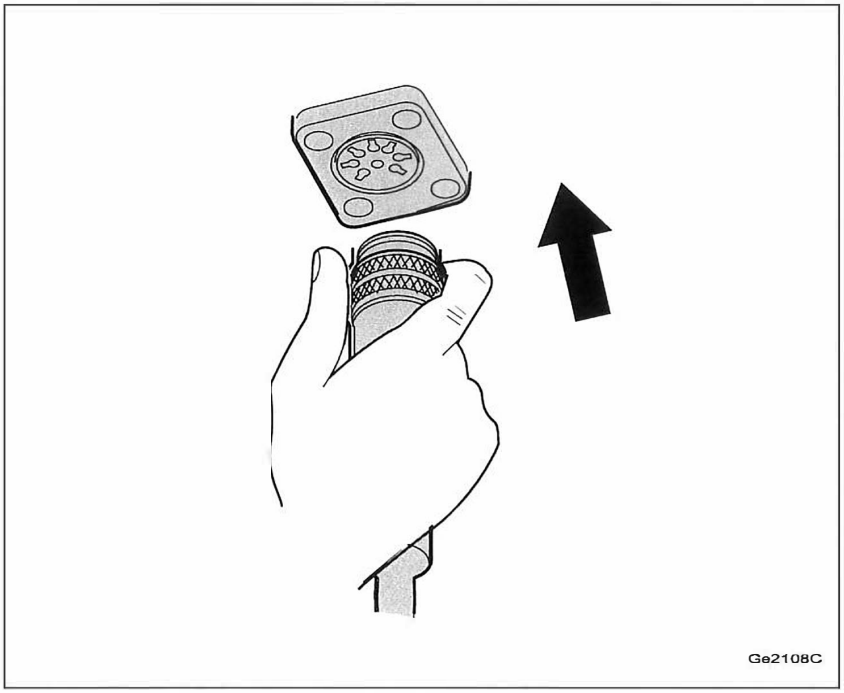


Figure 13 External Alarm Interface

Table 17 lists some major characteristics related to the handling of external alarms in the RRU.

Table 17 External Alarms and Output Characteristics

Alarm Input Port Details	Characteristics
Number of input ports	2

Alarm Input Port Details	Characteristics
Maximum sensed impedance for a closed loop condition	Closed (less than 1 kΩ)
Minimum sensed impedance for an open loop condition	Open (greater than 33 kΩ)
Maximum current sourced from port interface	1.0 mA
Maximum voltage sourced from port interface	5.5 V

5.9 Position K and M, RXA I/O and RXB I/O Interface (RRUS 11 Only)

The RXA I/O and RXB I/O interface port is used to cross connect the RRUS 11 for antenna diversity, as shown in Figure 14.

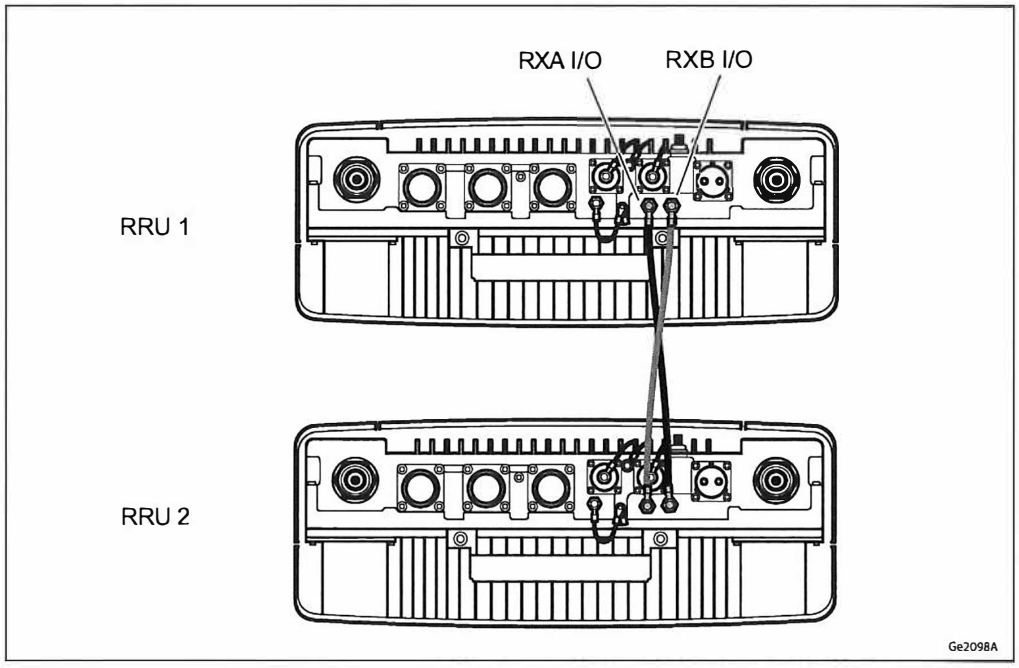


Figure 14 Cross Connecting RRUS 11

5.10 Position L, RXA Out Interface (RRUS 11 Only)

The RXA Out interface port is used to co-site RRUS 11s, as shown in Figure 15.

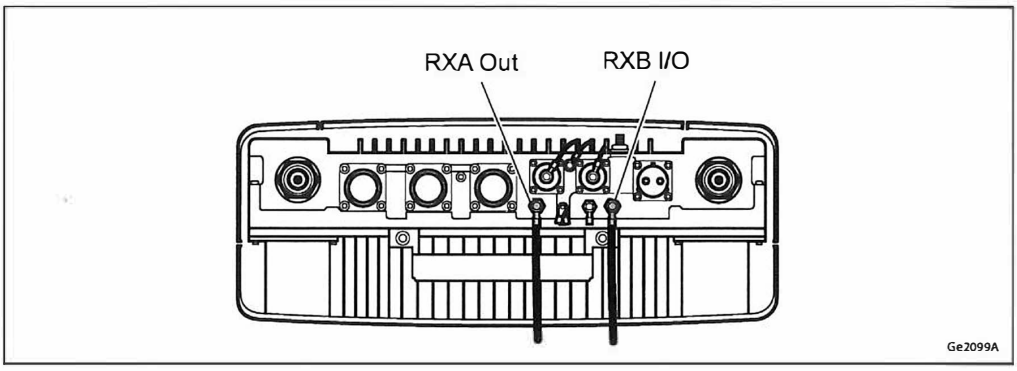


Figure 15 Co-siting RRUS 11

5.11 Position N, Grounding Interface

The RRUS must be grounded to protect it from overvoltage and lightning strikes. The grounding interface on the RRUS accepts a small cable lug on a short, coated cable. Bolt the cable and the loop into place with an M8 bolt as shown in Figure 16.

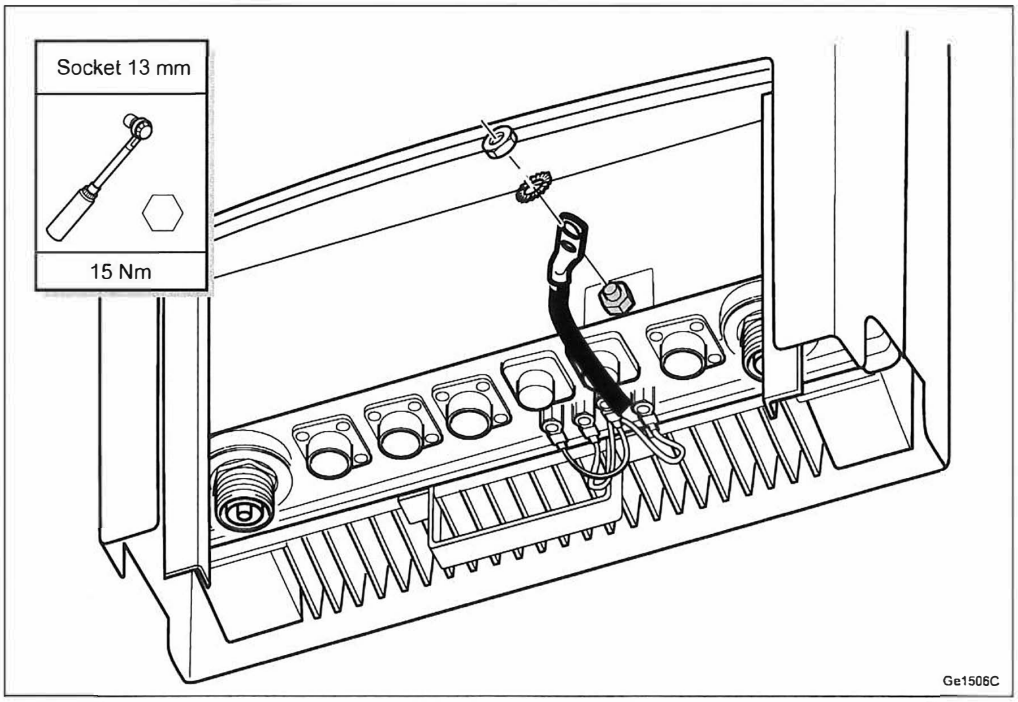


Figure 16 RRUS Grounding Interface

5.12 Optional Equipment Interfaces

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

5.12.1 PSU AC (Optional)

The PSU (also called the PSU AC) uses an AC power interface available from Ericsson. The AC cable is connected to the PSU with a contact on the cable. The AC connector comes with the RRUS.

All cables must be shielded. The shielding must be grounded on both the PSU and the power supply equipment side with the site Main Earth Terminal (MET). Each power cable conductor can have a 1.5–4 mm² cross-sectional area.

The PSU is shown in Figure 9.

Note: The wire color code in the external AC power supply cable is market dependent.

5.12.2 PSU 48 02 (Optional)

The PSU 48 uses a DC power interface available from Ericsson.

All cables must be shielded. The shielding must be grounded on both the PSU and the power supply equipment side with the site Main Earth Terminal (MET). Each power cable conductor can have a 2.5–10 mm² cross-sectional area.

The PSU is shown in Figure 10.

5.12.3 RF Monitoring Port for RRUS 11 (Optional)

The optional RF monitoring port allows either periodic or continuous downlink RF output power monitoring without interrupting RRUS 11 service. The monitoring interface can be found on the optional RF monitoring port. The RF monitoring port can be placed on each antenna interface that is a transmitter port.

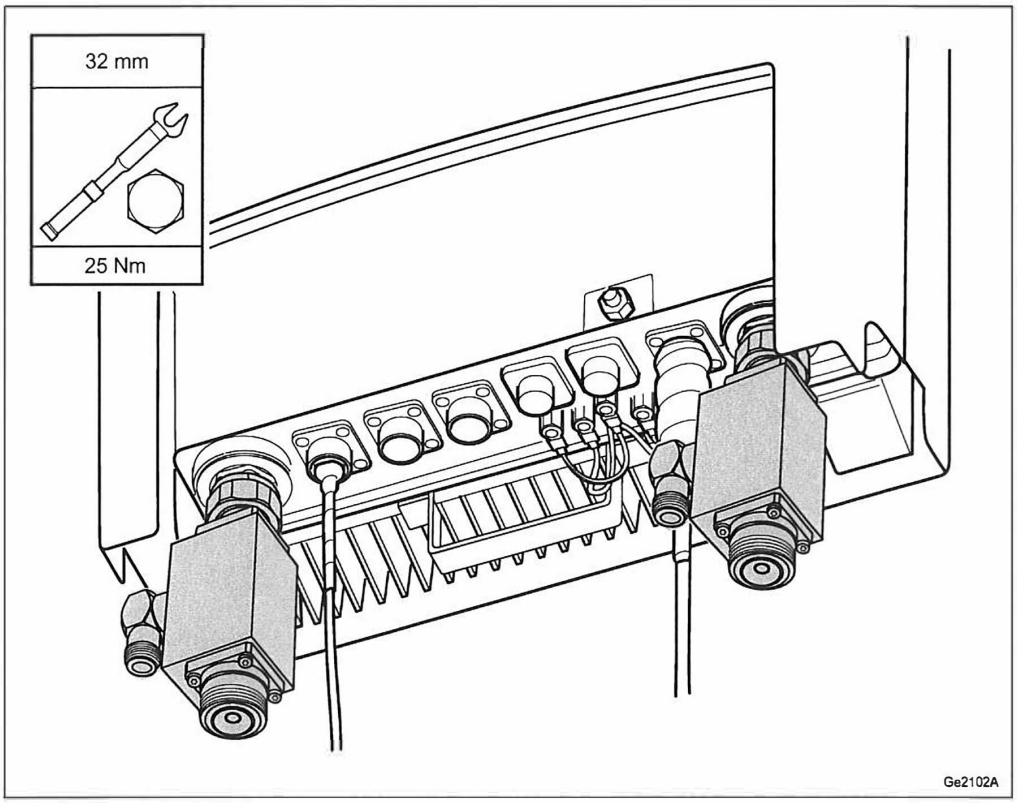


Figure 17 RF Monitoring Interface Connection

6 Standards and Regulations

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

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.*"

6.1 Regulatory Approval

The RBS complies with the following market requirement:

- EC (European Community) market requirements, Radio Equipment Directive 2014/53/EU and Directive 2011/65/EU.
- The apparatus may include Radio Transceivers with support for frequency bands not allowed or not harmonized within the European Community (EC).
- Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU).
- North American market requirements.
- 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

- EN 50 581 (RoHS)

6.1.2 Safety Standards Compliance

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

International

- IEC 60 950-1 Ed2 with amendment A1

Europe

- EN 50 385
- EN 60 950-1 Ed2 with amendment A1

North America

- CSA-C22.2 No.60950-1-07 with amendment A1
- FCC CFR 47 Part 1.1310
- Health Canada Safety Code 6
- UL 60950-1

6.1.2.1 Outdoor specific requirements

The RBS complies with the following outdoor specific requirements:

International

- IEC 60 529 (IP55)
- IEC 60 950-22

Europe

- EN 60 529 (IP55)
- EN 60 950-22

North America

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

6.1.3 EMC Standards Compliance

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

International

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

Europe

- ETSI EN 301 489-1
- ETSI EN 301 489-8
- ETSI EN 301 489-23

North America

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

6.1.4 Radio Standards Compliance

The RBS complies with the following radio standards:

International

- 3GPP TS25.141
- 3GPP TS36.141
- 3GPP TS37.141
- 3GPP TS51.021

Europe

- ETSI EN 301 502
- ETSI EN 301 908-1

- ETSI EN 301 908-3
- ETSI EN 301 908-14
- ETSI EN 301 908-18

North America

- FCC CFR 47 Part 2 (USA)
- FCC CFR 47 Part 22, 24, 27 and 90 (USA frequency dependent)
- IC RSS-130,132, 133, 139 and 199 (Canada frequency dependent)
- IC RSS-Gen (Canada)

6.1.5 Marking

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

Europe

- CE mark

North America

- FCC CFR 47 Part 15 Statement
- FCC ID (located on RRU)
- IC ICES-003 Statement
- IC ID (located on RRU)
- usETL/cETL

6.2 Other Standards and Regulations

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

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 RRUS is in accordance with Ericsson standard class A3.

6.2.3 Vandal Resistance

Unauthorized access is not possible without damaging the unit.

ERICSSON

Radio Description

Radio 4415

Description

Contents

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.

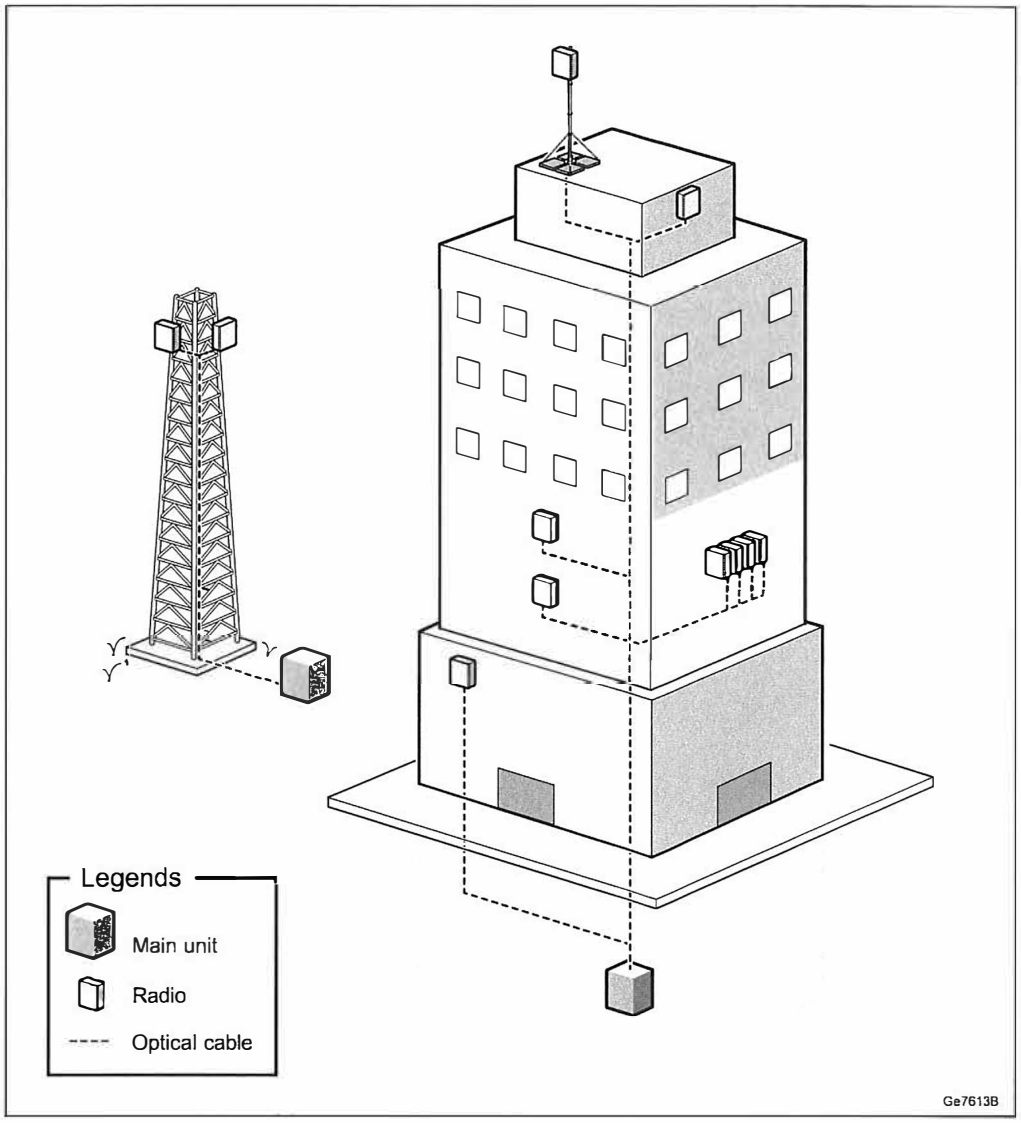


Figure 1 Radio Installations

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.
- GSM, WCDMA, LTE FDD, NB-IoT, and NR
- 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 42.

— Supports *Basic Stand-alone Radio Installation Check*, that helps to identify potential faults before the radio is connected to the network.

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]	4 × 40 W 4 × 25 W (B30) (License key is required for total output power over 4 × 5 W.)
Number of carriers per branch	LTE: 6 downlink, 6 uplink LTE B70 (R-state ≥ R5): 5 downlink, 3 uplink GSM: 4 downlink, 6 uplink WCDMA: 6 downlink, 6 uplink NB-IoT in-band mode: 1 NB-IoT carrier per configured LTE host carrier 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) NB-IoT guard band mode: 1 NB-IoT carrier per configured LTE host carrier NR B2/B25: 3 downlink, 3 uplink
Number of carriers per radio	LTE: 4 × 6 downlink, 4 × 6 uplink LTE B70 (R-state ≥ R5): 4 × 5 downlink, 4 × 3 uplink GSM: 12 downlink, 24 uplink WCDMA: 4 × 6 downlink, 4 × 6 uplink NB-IoT in-band mode: One NB-IoT carrier per configured LTE host carrier 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) NB-IoT guard band mode: One NB-IoT carrier per configured LTE host carrier NR B2/B25: 2 × 3 downlink, 2 × 3 uplink

Description	Value
Frequency[3]	B1 for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 1920–1980 MHz uplink[4] 2110–2170 MHz downlink
	B2[5] for GSM (R-state < R5), WCDMA, LTE, and NR 1850–1910 MHz uplink 1930–1990 MHz downlink B2[5] for NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 1850.3–1909.8 MHz uplink 1930.3–1989.8 MHz downlink B2[5] for GSM (R-state ≥ R5) 1850–1910 MHz uplink 1930.4–1989.6 MHz downlink (GSM carrier center frequency)
	B3 for GSM, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 1710–1785 MHz uplink 1805–1880 MHz downlink
	B3B for GSM, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode[6] 1710–1765 MHz uplink 1805-1860 MHz downlink
	B7[7] for LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 2500–2570 MHz uplink 2620–2690 MHz downlink
	B7A for LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 2500–2560 MHz uplink 2620–2680 MHz downlink
	B25[5] for WCDMA, LTE, and NR 1850–1915 MHz uplink 1930–1995 MHz downlink

Description	Value
	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
	2305–2315 MHz uplink 2350–2360 MHz downlink B30 for LTE
	B66A for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 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
R-state ≥ R5 (B1, B2/ B25, B3, B3B, B66A, B70)	H×W×D: 420 × 342 × 131 mm
R-state ≥ R5 (B7)	H×W×D: 420 × 342 × 150 mm
R-state ≥ R5 (B30)	H×W×D: 420 × 342 × 123 mm
R-state ≥ 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 ≥ R5 (B1, B2/ B25, B3, B3B, B66A, B70)	H×W×D: 420 × 342 × 148 mm
R-state ≥ R5 (B7)	H×W×D: 420 × 342 × 169 mm
R-state ≥ R5 (B30)	H×W×D: 420 × 342 × 151 mm
R-state ≥ R5 (with NEBS cover)	H×W×D: 420 × 342 × 157 mm

Description	Value
Weight without Fan Unit (R-state < R5) (10)	
B1, B2/B25, B3, B7, B7A, B66A	20 kg
Weight without Fan Unit (R-state ≥ 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 ≥ 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 ≥ R5) (10)	
B1, B2/B25, B3, B3B, B66A, B70	18.7 kg
B7	20.2 kg
B30	23 kg
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: 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 RBS 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) For the Canadian market, the maximum total output power of LTE 5 MHz and NB-IoT mixed mode is 44.5 dBm. This applies for the NB-IoT carrier allocated in band 2689–2690 MHz.
(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

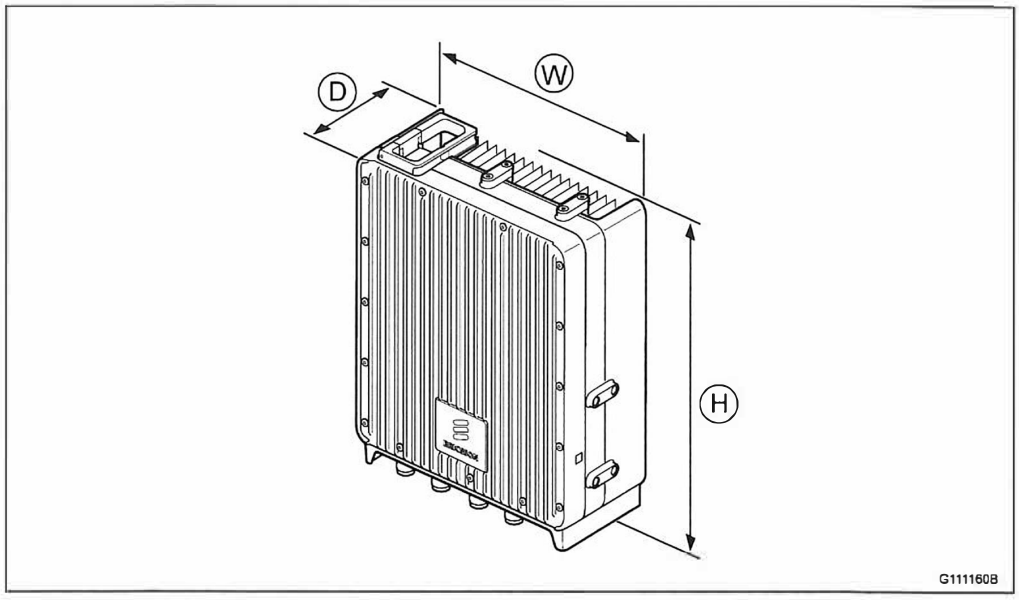


Figure 2 Radio 4415 Height, Width, and Depth

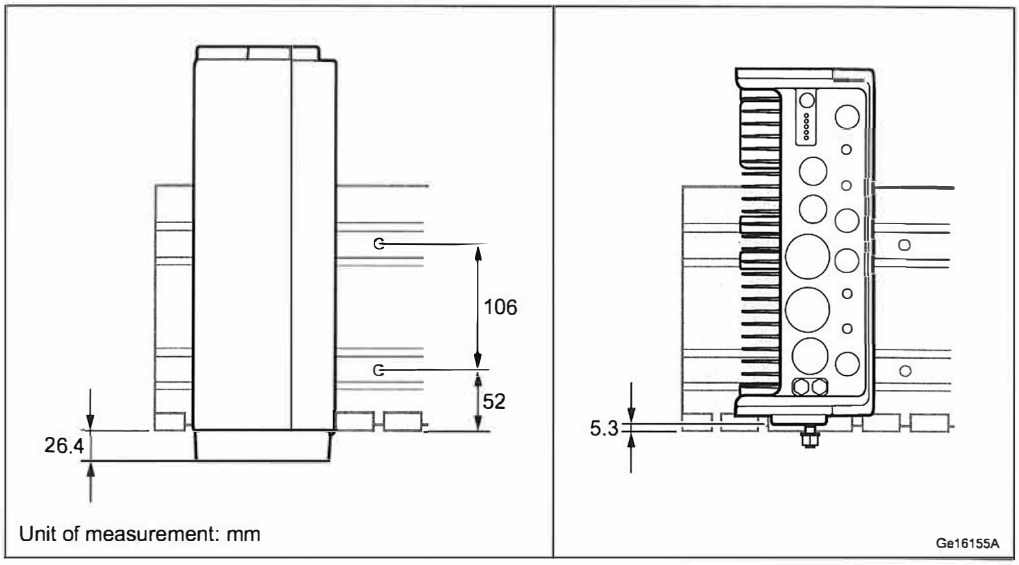


Figure 3 Radio 4415 to Rail Measurement (R-state < R5)

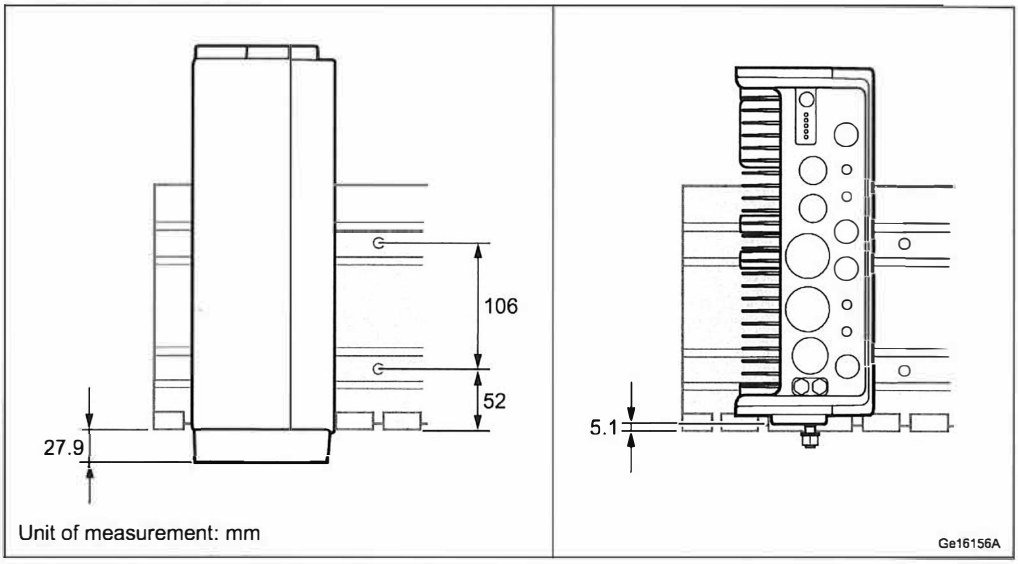


Figure 4 Radio 4415 to Rail Measurement (R-state ≥ R5)

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 ≥ R5 excluding B7	A×B×C×D: 410 × 333 × 88 × 25 mm

Description	Value
B7 R-state ≥ 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 ≥ R5	1.2 kg
Color	
Back cover	NCS S 1002-B
Fan box	NCS S 6502-B

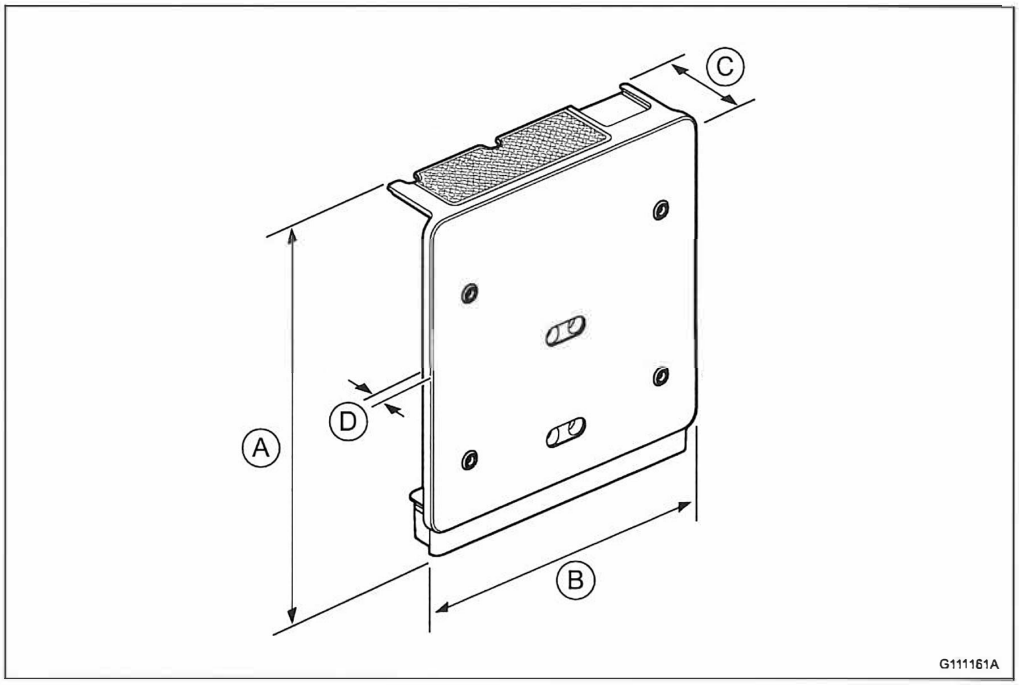


Figure 5 Fan Unit Height, Width, and Depth

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 building ventilation system.

— Near the exhaust of the chimney.

— Opposite large surfaces made of glass or new concrete.

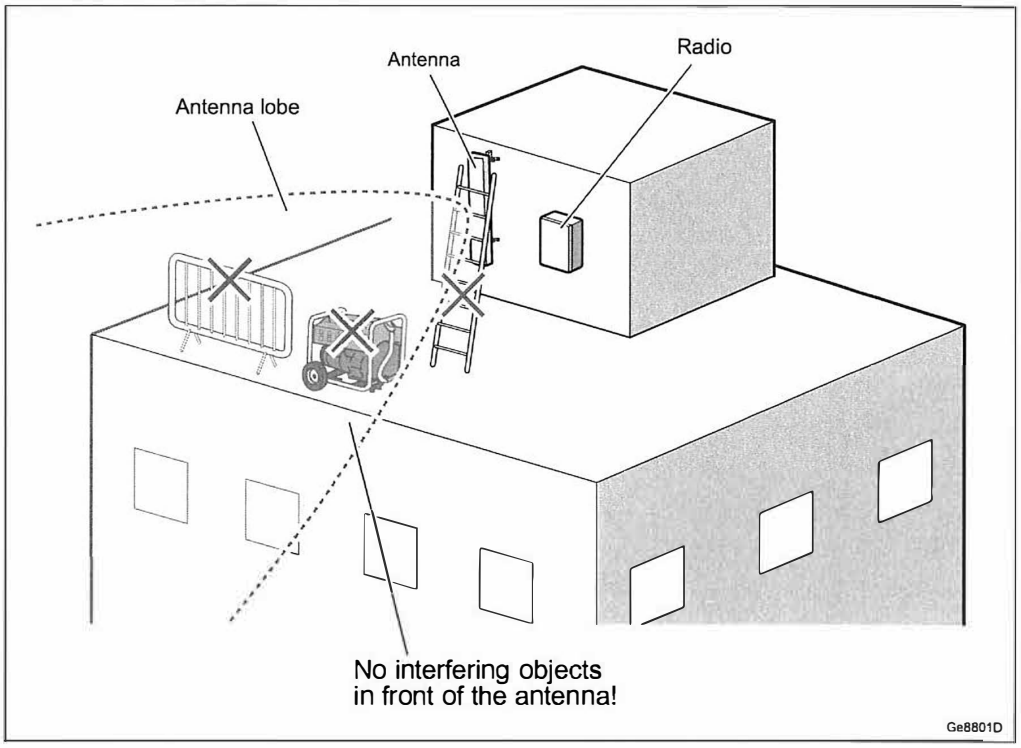
— Near overhanging structures such as roof overhangs.

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

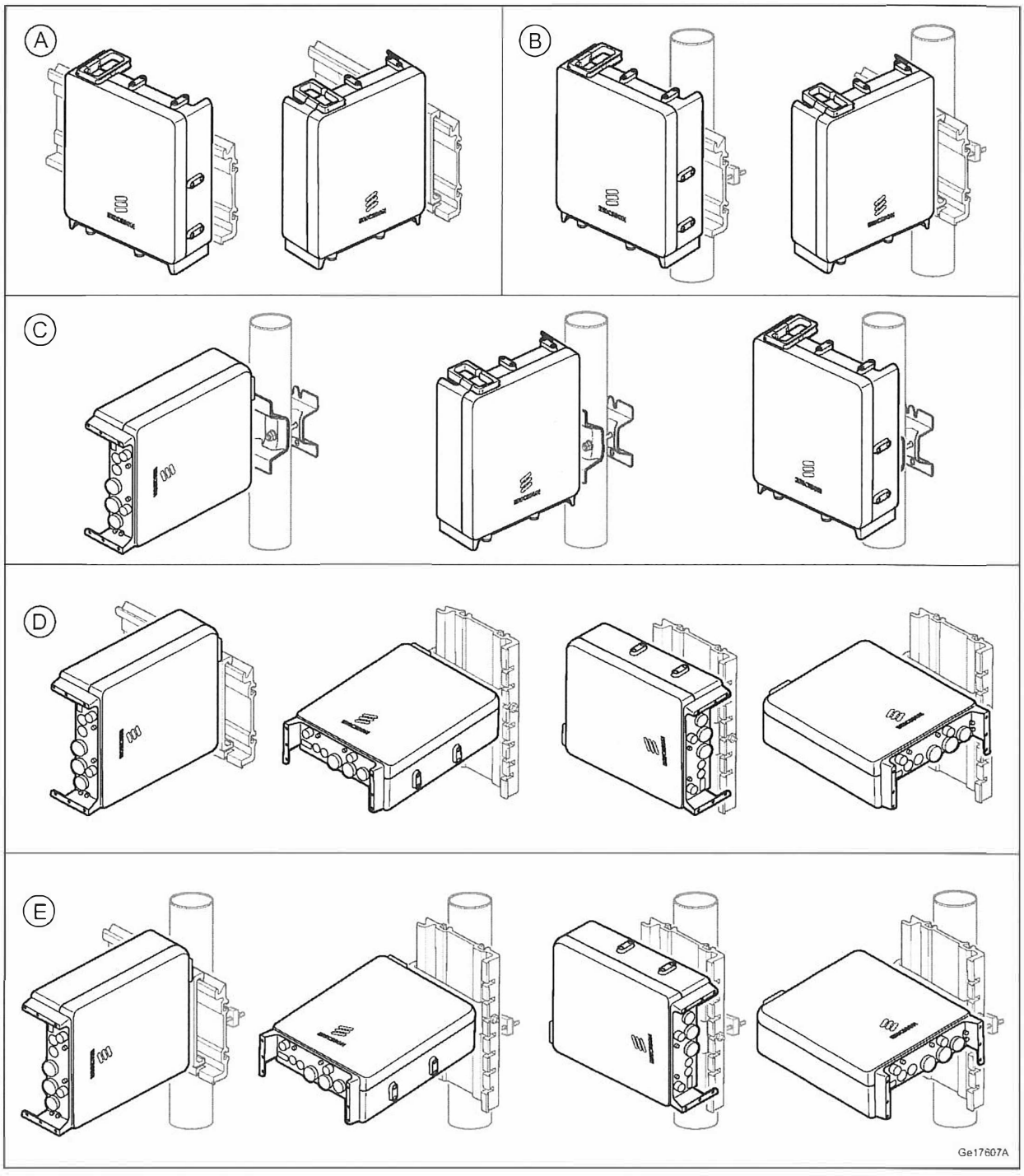


Figure 6 Installation Alternatives 1 (3)

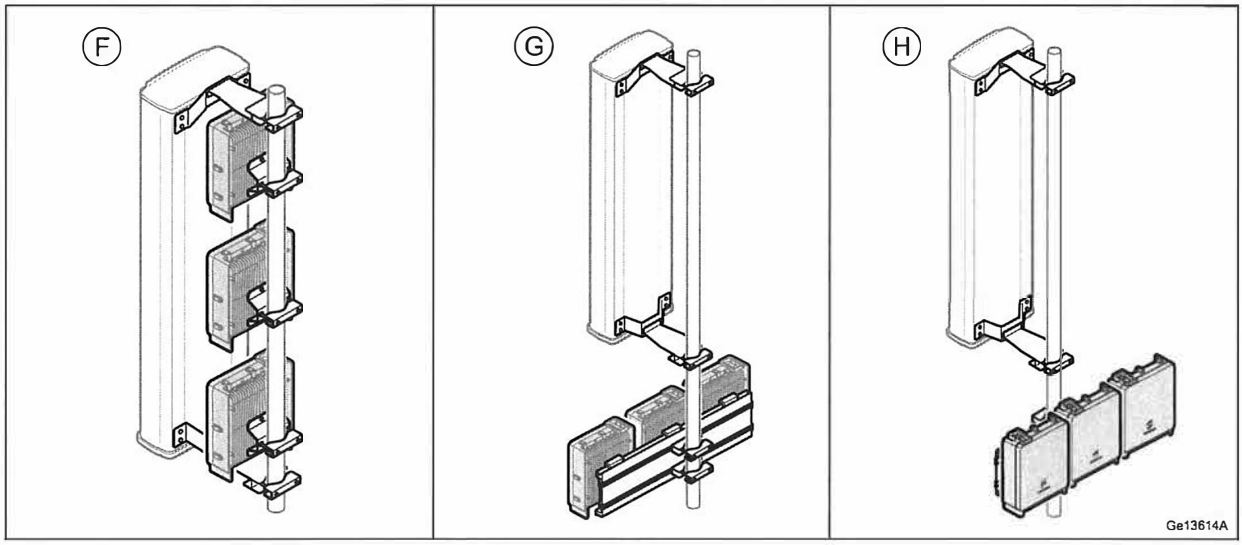


Figure 7 Installation Alternatives 2 (3)

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 ≥ R5)(1)
G, H	Radio Mounted Below the Antenna (R-state ≥ 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 variants that support the installation, see Table 4.

Table 4 Radio Variants that Support Installation in the RBS Cabinet

Unit	Product Number	R-state
Radio 4415 B1	KRC161635/1	R4B, R5B, R5B/A, R5C, R5D
Radio 4415 B1	KRC161635/2	R5B, R5B/A, R5C, R5D
Radio 4415 B2B25	KRC161636/1	R1B, R1B/A, R2B/A, R2D, R5C, R5C/1, R5D, R5E, R5F
Radio 4415 B2B25	KRC161636/3	R1B, R1B/A, R5C, R5C/1, R5D, R5E, R5F
Radio 4415 B3	KRC161637/1	R1C, R1D, R5D, R5E, R5G, R5H, R5H/A, R5K, R5K/A, R5M
Radio 4415 B3	KRC161637/2	R1C, R1D, R5D, R5F, R5F/A, R5K, R5K/A, R5M
Radio 4415 B3B	KRC161771/2	R5A, R5A/1, R5B
Radio 4415 B7	KRC161495/1	R1C, R1C/A, R1C/B, R5B, R5C
Radio 4415 B7	KRC161495/2	R1A, R1B, R1B/A, R5B, R5C
Radio 4415 B7A	KRC161676/1	R1A, R1B

Unit	Product Number	R-state
Radio 4415 B66A	KRC161644/1	R1E, R1F, R5B, R5B/A, R5C
Radio 4415 B66A	KRC161644/3	R1E, R1F, R5B, R5B/A, R5C
Radio 4415 B70	KRC161760/3	R5B, R5C

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 it 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.

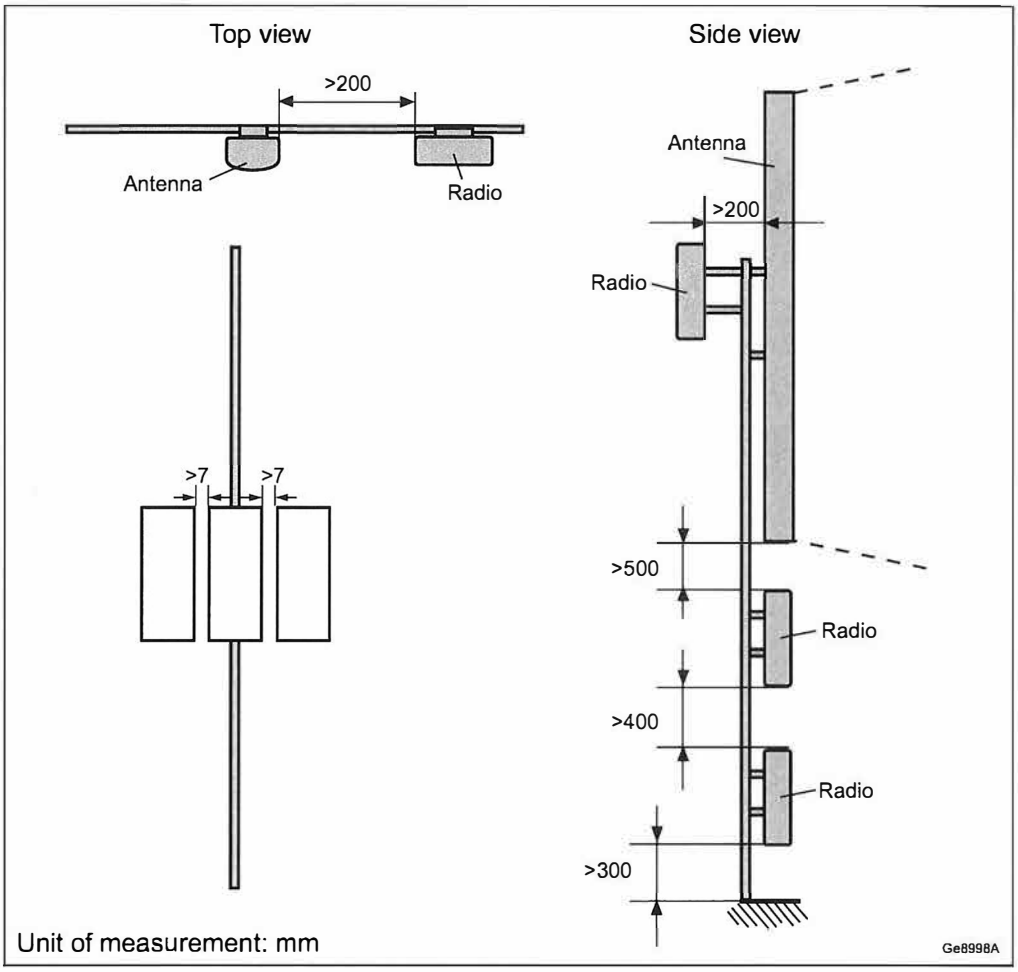


Figure 9 Radio Pole Installation Requirements (R-state < R5 or R-state ≥ R5 with fan)

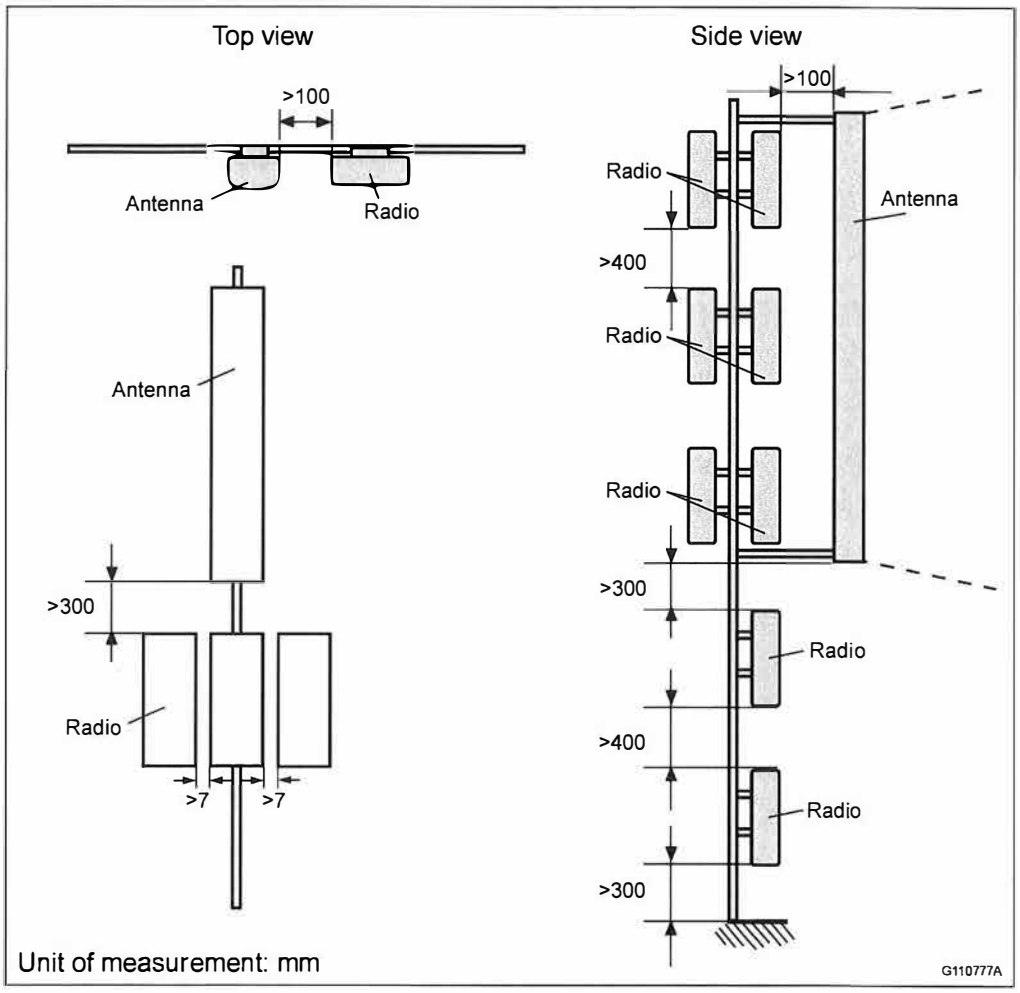


Figure 10 Radio Pole Installation Requirements (R-state ≥ R5 without fan)

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 ≥ R5 with fan) or 300 mm (R-state ≥ 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.

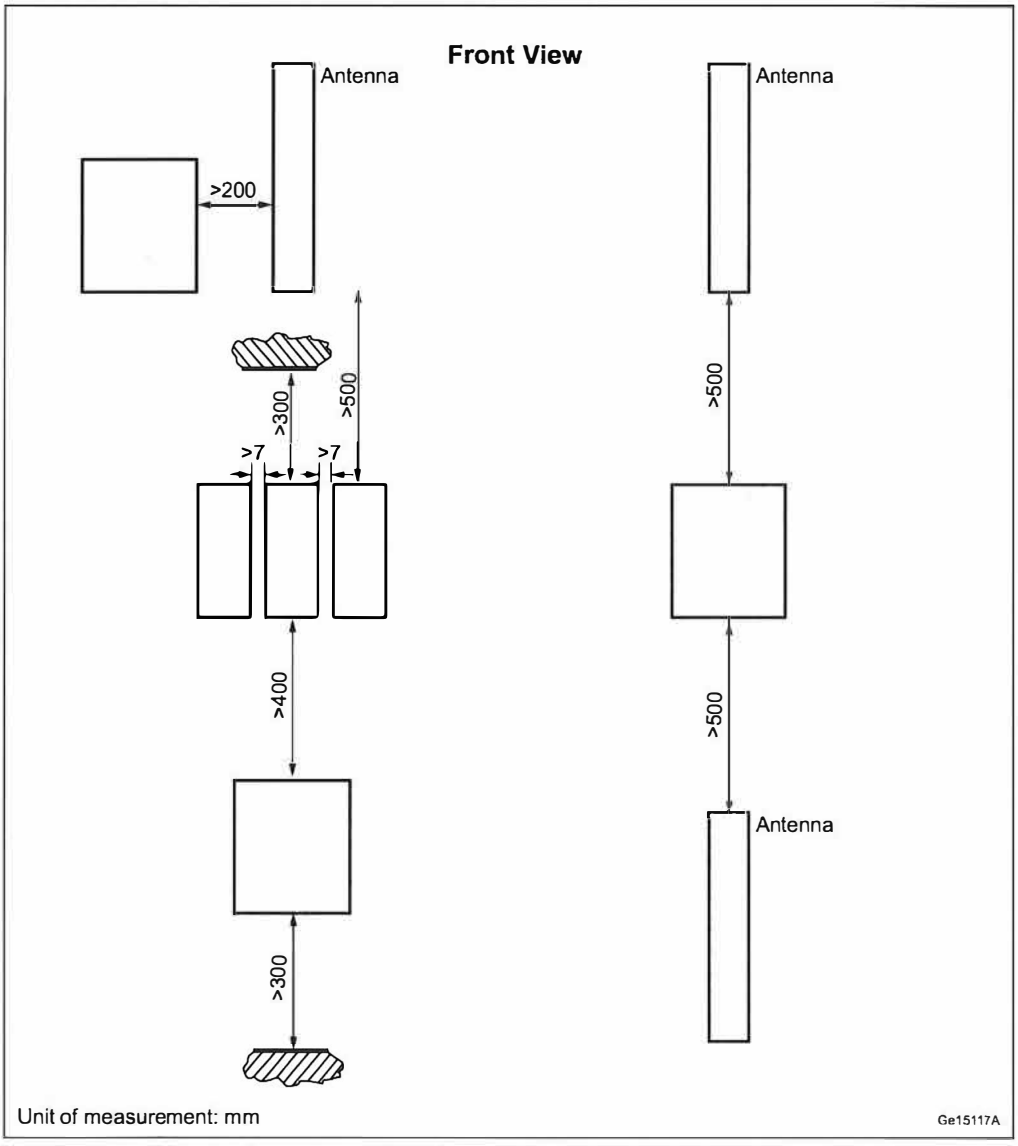


Figure 11 Radio Outdoor Wall Installation Requirements (R-state < R5 or R-state ≥ R5 with fan)

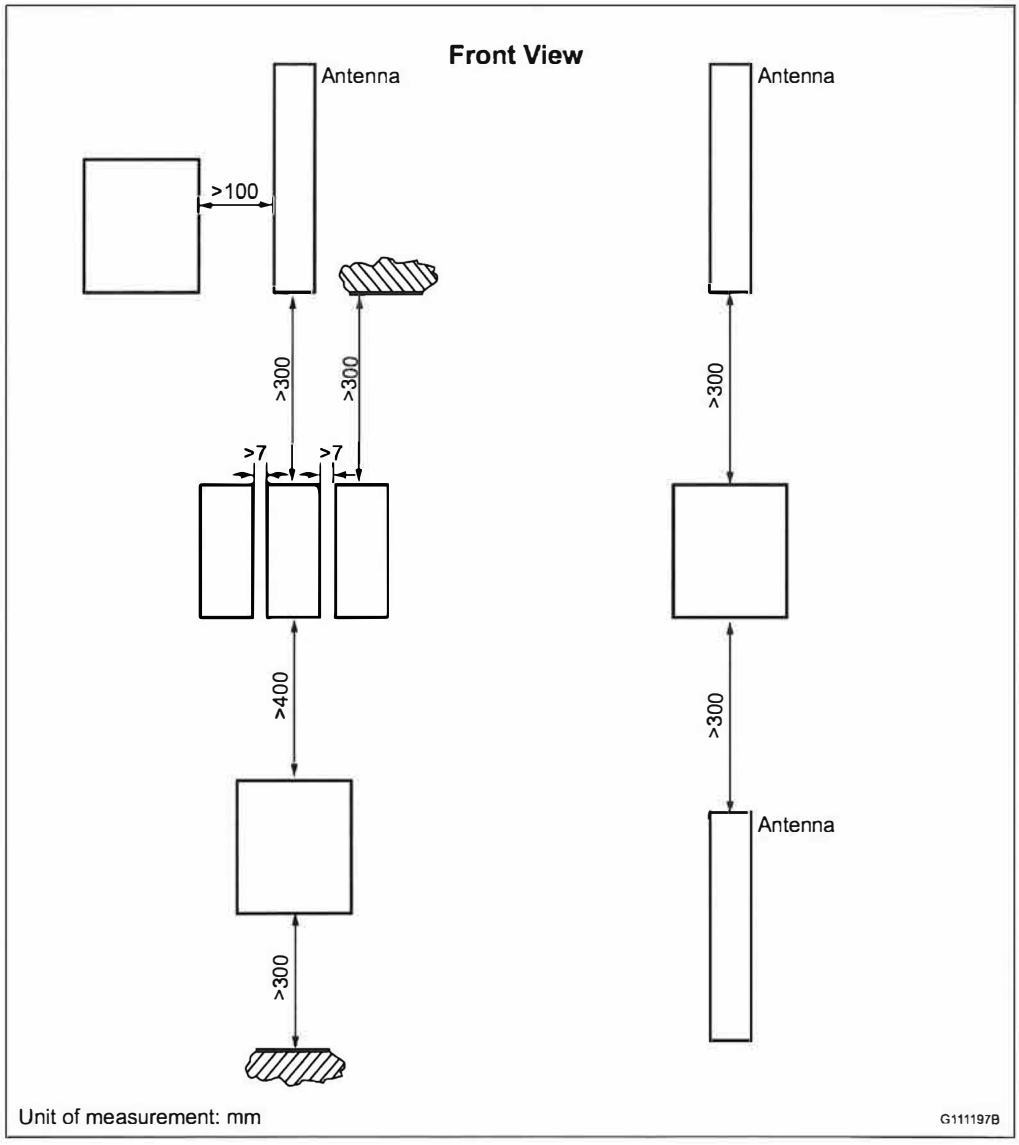


Figure 12 Radio Outdoor Wall Installation Requirements (R-state ≥ R5 without fan)

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 ≥ R5 with fan) or 300 mm (R-state ≥ 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

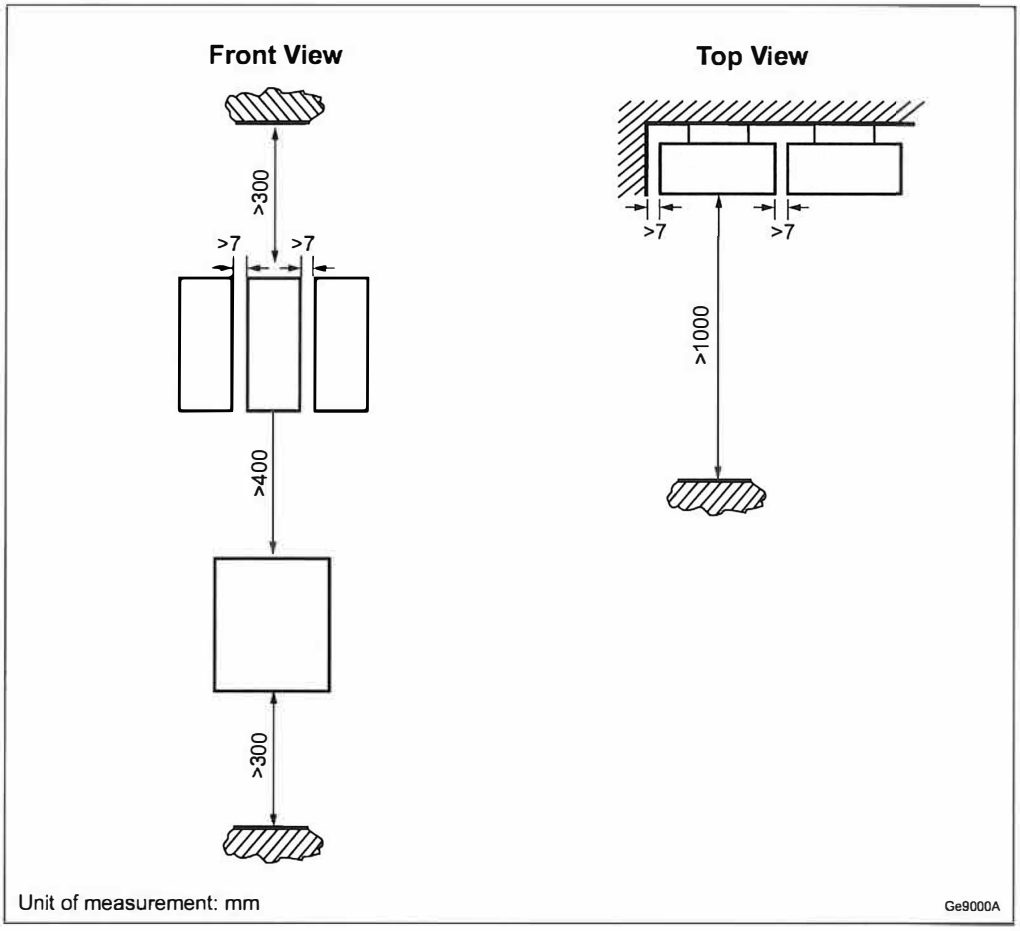


Figure 13 Radio Indoor Wall Installation Requirements

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 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	≤ 1,120 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 50 m/s (pole installed single case)	260 N (front)

(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
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 37.

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.

For information about radio access specific compliance boundaries for electromagnetic exposure, see Radio Frequency Electromagnetic Exposure.

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 RBS 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 9.

For a description of the supported radio configurations, refer to RBS Configurations.

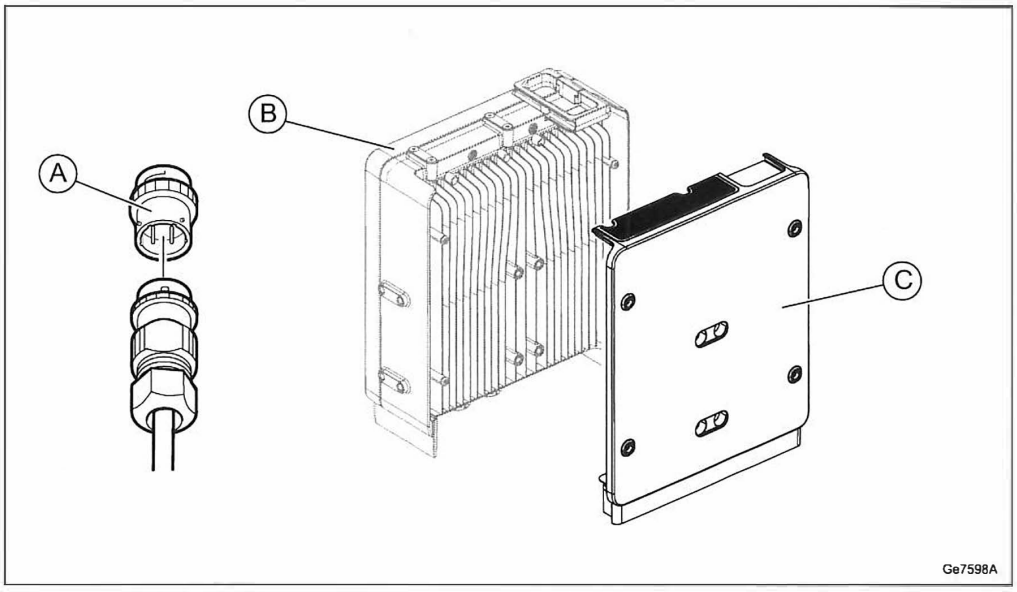


Figure 14 DC Adapter and Radio Components

Table 9 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.

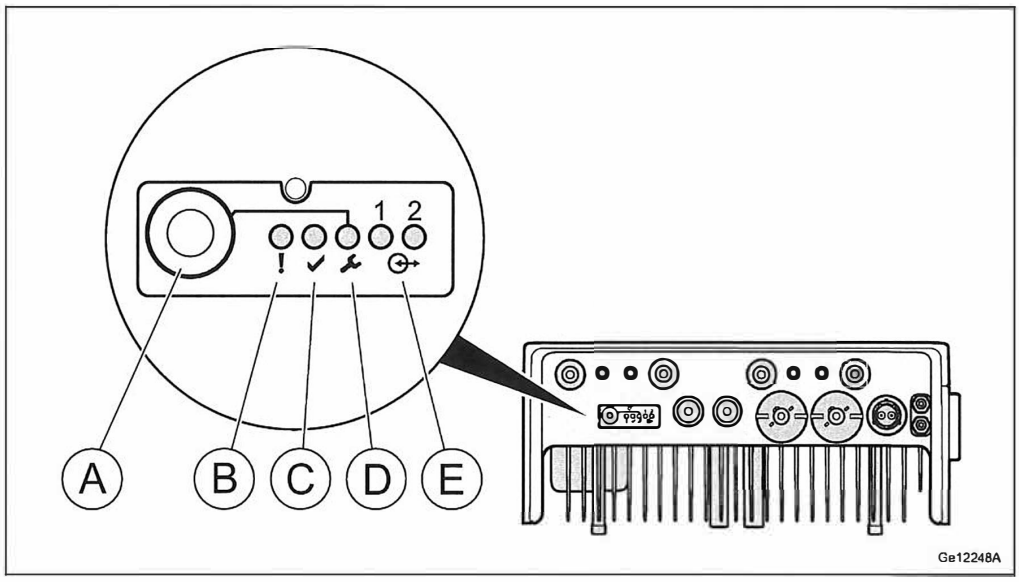


Figure 15 Radio Optical Indicators and Buttons

Table 10 Description of Radio Optical Indicators and Buttons

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

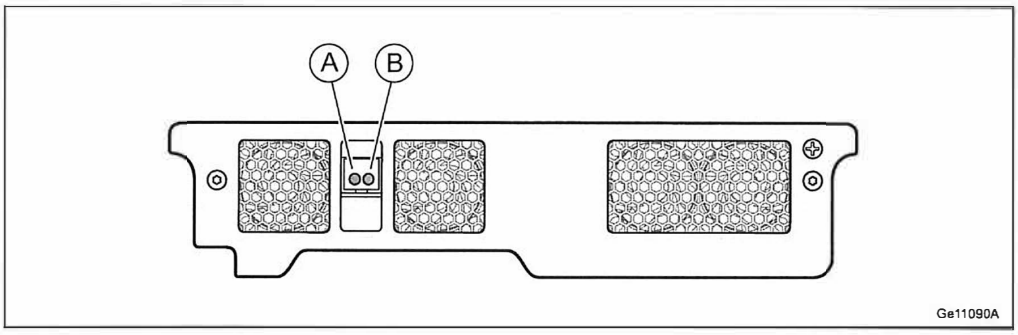


Figure 16 Fan Unit Optical Indicators

Table 11 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

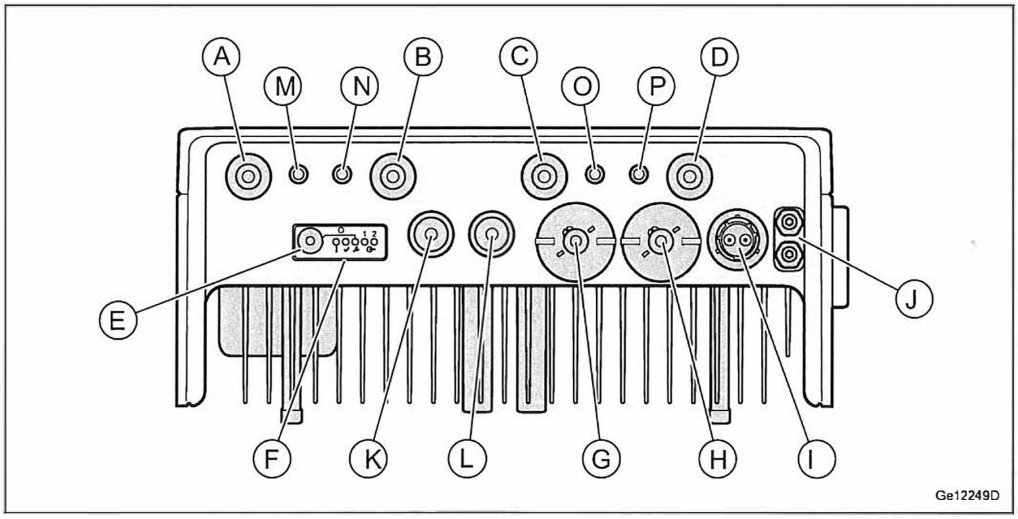


Figure 17 Radio 4415 Connection Interfaces (R-state < R5)

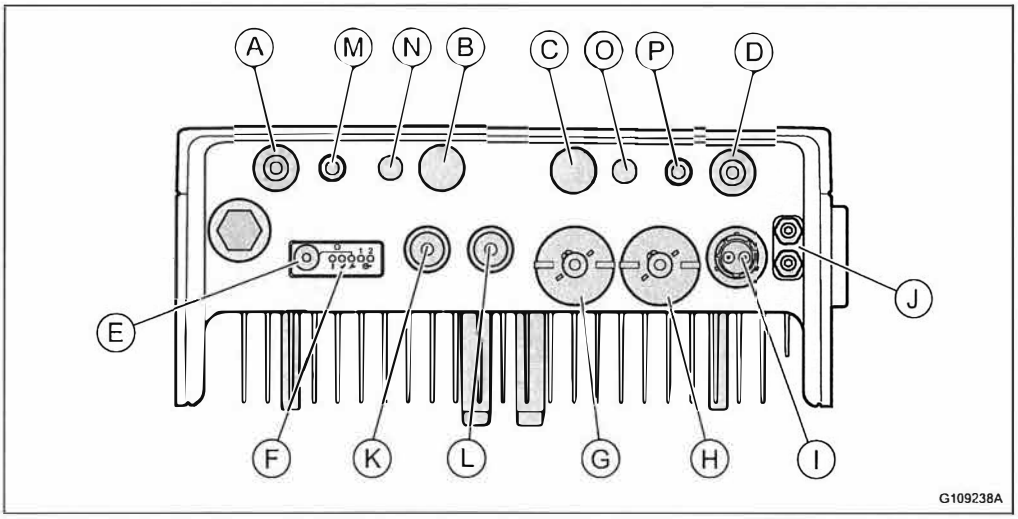
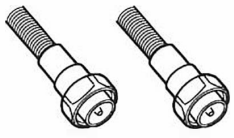
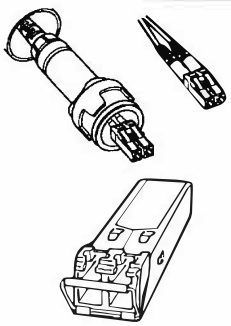
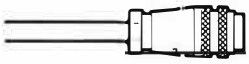
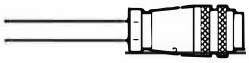


Figure 18 Radio 4415 Connection Interfaces (R-state ≥ R5)

Table 12 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 × M6 bolt	
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.

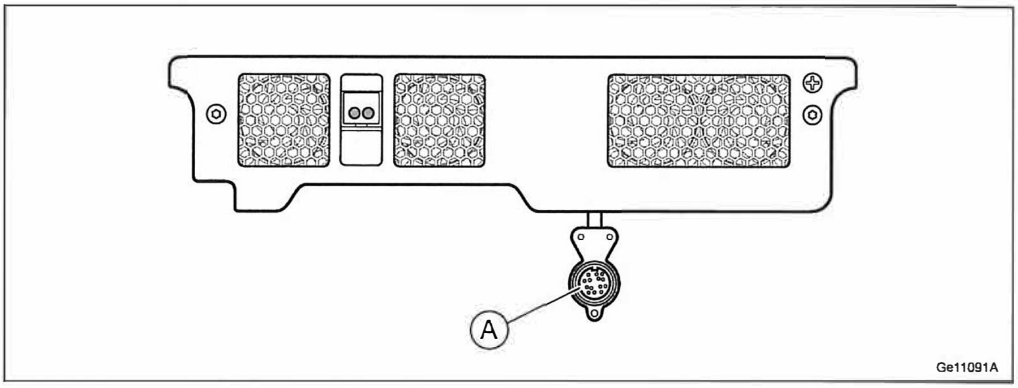


Figure 19 Fan Unit Connection Interface

Table 13 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 14 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 15 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 Main-Remote 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 Main-Remote 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 an M6 dual cable 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 16 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

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.

HAMMETT & EDISON, INC.
CONSULTING ENGINEERS
BROADCAST & WIRELESS

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1920-2002
EDWARD EDISON, P.E.
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DANE E. ERICKSEN, P.E.
CONSULTANT

BY EMAIL MG387K@ATT.COM

December 4, 2019

Mr. Marc Grabisch
AT&T Mobility
5001 Executive Parkway
San Ramon, California 94583

Dear Marc:

As you requested, we have evaluated the small cells that AT&T Mobility is proposing to install at twelve PG&E poles sited in the City of Los Altos, as tabulated below, with regard to acoustic noise emission levels.

Based on construction drawings from Precision Design, dated between October 29, 2018, and July 25, 2019, AT&T proposes to install equipment items on the side of the utility pole at each location, including a "bus bar" for electrical grounding, a disconnect switch, and a power meter. Above that passive equipment is a 5-foot concealment shroud, housing the two Ericsson radio units for small cell operation: one Model RRUS 11 and one Model 4415. Based on the Ericsson equipment specifications, enclosed with this letter (see pages 15 and 25, respectively), neither unit is fitted with fans, as they are cooled by the natural convective flow of air across their cooling fins.

Data from Ericsson indicates that the Model 4415 can make a little noise during low usage, even when, as is the case here, it is not configured with the optional cooling fan: less than 36 dBA sound power, which corresponds to a noise level of 45 dBA, the City's most restrictive limit, at a distance of just 4 inches. This would not extend beyond the shroud itself, which is to be installed at least 13 feet above ground. Therefore, both radio units are considered to be silent and so compliance with the City's noise emission limits is ensured.

Please let me know if any questions arise on this analysis.

Sincerely yours,

Bill Hammett

William F. Hammett

scn

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Enclosures

cc: Mr. Ivan Toews – BY EMAIL IVAN.TOEWS@ERICSSON.COM
Ms. Nancy Sandoval – BY EMAIL NS184S@ATT.COM

Site No.	Address
CRAN_RSFR_LOSA0_01	141 Almond Avenue
CRAN_RSFR_LOSA0_02	687 Linden Avenue
CRAN_RSFR_LOSA0_03	421 Valencia Drive
CRAN_RSFR_LOSA0_04	33 Pine Lane
CRAN_RSFR_LOSA0_05	49 San Juan Court
CRAN_RSFR_LOSA0_06	791 Los Altos Avenue
CRAN_RSFR_LOSA0_07	98 Eleanor Avenue
CRAN_RSFR_LOSA0_08	182 Garland Way
CRAN_RSFR_LOSA0_09	491 Patrick Way
CRAN_RSFR_LOSA0_10	300 Los Altos Avenue
CRAN_RSFR_LOSA0_11	130 Los Altos Avenue
CRAN_RSFR_LOSA0_12	356 Blue Oak Lane

ERICSSON

Remote Radio Unit Description

RRUS 11 and RRUS 61

Description

Contents

1 Introduction

This document describes the Remote Radio Unit multi-Standard (RRUS) 11 and the RRUS 61. In the document, RRUS without a model number means both RRUS 11 and RRUS 61.

Note: Remote Radio Unit (RRU) is often used as a generic expression for a remotely installed Radio Unit (RU). It is also the name of models prior to the RRUS versions described in this document, for example Remote Radio Unit Wideband (RRUW).

1.1 Warranty Seal

The product is equipped with a warranty seal sticker.

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

2 Product Overview

The RRUS remotely extends the reach of the RBS by up to 40 km. The RRUS is designed to be located near the antenna. A fiber optic cable connects the RRUS to the RBS main unit or an expanded macro RBS. The RRUSs can be connected in a star or cascade configuration with optical cable links, as shown in Figure 1.

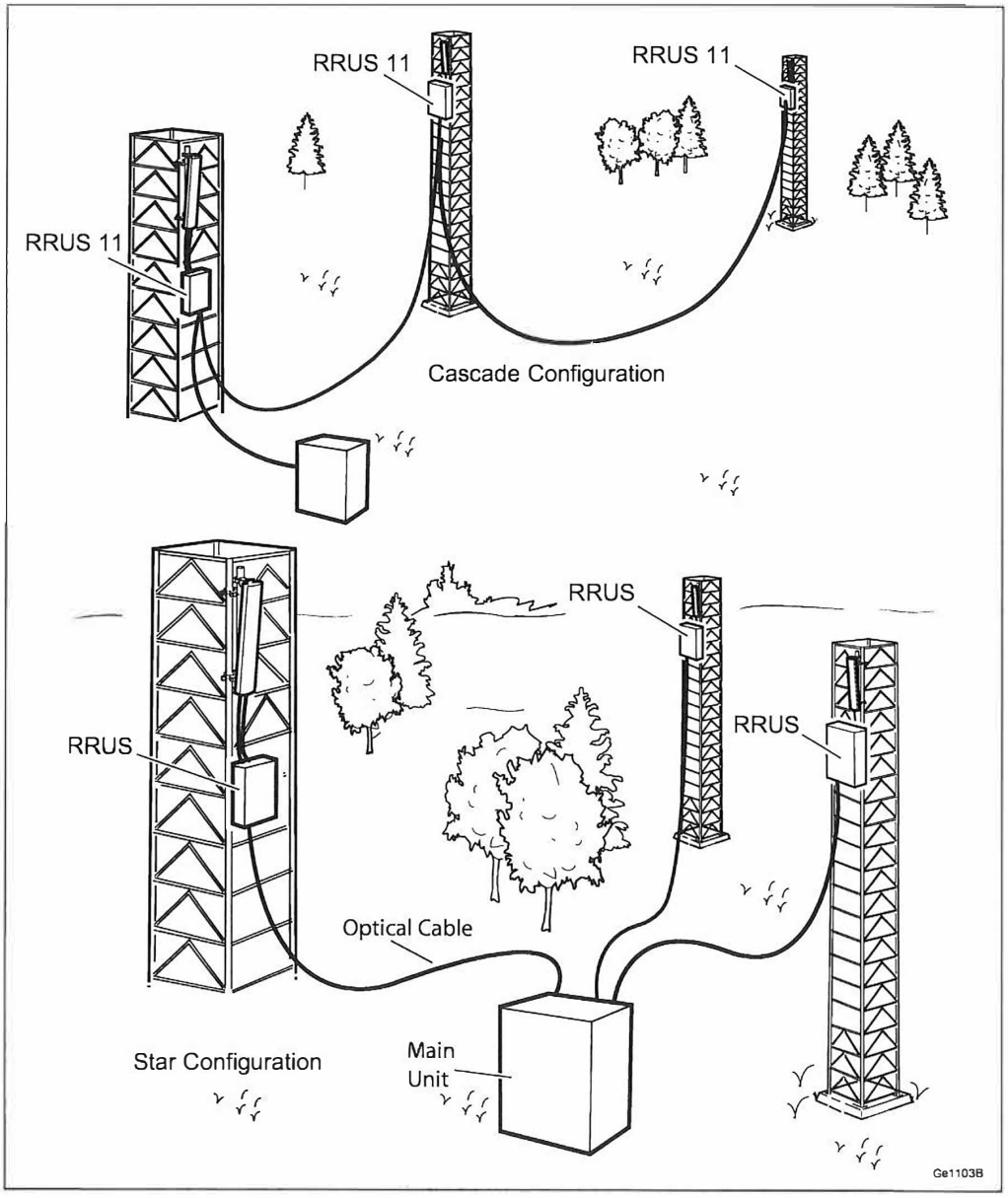


Figure 1 RRUSs in Star and Cascade Configurations

2.1 Main Features

Depending on the software application, the RRUS supports the Antenna Line Devices (ALDs), and the Remote Electrical Tilt Unit (RETU). The RETU can be connected either through the ASC or the RET Interface Unit (RIU) over the antenna interface, or directly using the RRUS ALD, or Remote Electrical Tilt (RET) control interface.

For LTE and WCDMA configurations with dual transmitter (TX) RRUSs, redundancy can be achieved by cross-connecting the antenna feeders between the RRUS and the antenna. For more information, refer to *Cross-Sector Antenna Sharing Redundancy* and *Antenna System Equipment* or *Manage Hardware Equipment*.

The RET interface on the RRUS is the link to the antenna communication system. See Table 14 for information about the RRUS connection interface for ALD (RET).

RRUS 11 supports Wideband Code Division Multiple Access (WCDMA), Code Division Multiple Access (CDMA), LTE Frequency Division Duplexing (LTE FDD) and Massive IoT (MI). It has two duplex receiver/transmitter (RX/TX) branches and supports cross connection of RX ports with other RRUs.

RRUS 61 supports LTE Time Division Duplexing (LTE TDD). It has two duplex RX/TX branches.

RRUS 11 can be used together with an RRUS A2, RRUS A3, or Radio 0208 to provide a four RX branch implementation for Main Remote applications. For more information, refer to *Remote Radio Unit Description* of RRUS A2, *Remote Radio Unit Description* of RRUS A3, or *Radio Description* of Radio 0208.

2.2 Optional Equipment

The optional equipment for the RRUS is the following:

- Wall installation equipment
- Pole installation equipment
- Power Supply Unit (PSU)
- Radio Frequency (RF) monitoring port

3 Technical Data

This section contains information about the physical characteristics, environmental data, and the power supply of the RRU.

3.1 Dimensions

This section contains information about the technical data and dimensions for the RRUS 11, and RRUS 61.

3.1.1 RRUS 11

Table 1 lists the technical data for the RRUS 11. Figure 2 shows the dimensions for the RRUS 11.

Table 1 RRUS 11 Technical Data

Description	Value
Maximum nominal output power, subject to license handling.(1) (2)	2x10 W, 2x20 W, 2x30 W, 2x35 W, and 2x40 W(3) Hardware Activation Code (HWAC) is required for total output power over 20 W.
Number of carriers, subject to license handling.(1)	WCDMA: 1 to 4 carriers CDMA: 1 to 4 carriers LTE: 1 to 2 carriers MI, NB-IoT In-band mode: 1 to 2 carriers(4) Mixed mode: 2 to 4 carriers
Frequency(5)	1920 to 1980 MHz uplink 2110 to 2170 MHz downlink B1 for WCDMA, LTE and MI
	1850 to 1910 MHz uplink 1930 to 1990 MHz downlink B2 for WCDMA, LTE and MI
	1710 to 1755 MHz uplink 2110 to 2155 MHz downlink B4 for CDMA, WCDMA, LTE and MI
	824 to 849 MHz uplink 869 to 894 MHz downlink B5 for CDMA, WCDMA, LTE and MI (6)
	2,500 to 2,570 MHz uplink 2,620 to 2,690 MHz downlink B7 for LTE and MI
	699 to 715 MHz uplink 729 to 745 MHz downlink B12 for LTE and MI(7)
	777 to 787 MHz uplink 746 to 756 MHz downlink B13 for LTE and MI
	832 to 862 MHz uplink 791 to 821 MHz downlink B20 for LTE and MI
	1850 to 1915 MHz uplink

Description	Value
	1930 to 1995 MHz downlink B25 for LTE and MI
	1850 to 1910 MHz uplink 1930 to 1990 MHz downlink B25 for CDMA and MI
	817 MHz to 824 MHz uplink 862 MHz to 869 MHz downlink B26A for CDMA, LTE and MI
	814 MHz to 824 MHz uplink 859 MHz to 869 MHz downlink B26B for LTE and MI
	821 MHz to 835 MHz uplink 866 MHz to 880 MHz downlink B26C for LTE and MI
Dimensions with Solar Shield and Handle	
Height	500 mm
Width	431 mm
Depth	182 mm
Weight with solar shield, handle and accessories	
RRUS 11 B1, B5, B26C	23 kg
RRUS 11 B2, B4, B7, B13, B25	24 kg
RRUS 11 B12, B26A, B26B	25 kg
RRUS 11 B20	22 kg
Color	
Gray	

(1) Detailed information about licenses and hardware activations codes (HWAC) can be found in:

GSM: User Description, 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 the WCDMA RAN CPI library.

LTE: Manage Licenses in the Radio Nodes libraries.

(2) Detailed information about output power can be found in the Output Power user guides.

(3) For RRUS 11 B7, 2x30W is guaranteed for operating ambient temperatures < +50 °C. For higher temperatures, 2x20W is guaranteed. For RRUS 11 B26B, maximum output power is 2x35 W for LTE 2 carrier configuration. For RRUS 11 B26C single carrier, maximum output power is 2x40 W, and for multi-carriers, it is back off 0.5 dB.

(4) One NB-IoT carrier per configured LTE carrier

(5) Information about Instantaneous Bandwidth (IBW) can be found in RBS Configurations.

(6) For CDMA RRUS 11 B5 supports frequency from 869.88 MHz to 893.10 MHz.

(7) RRUS 11 for B12 has a bandwidth that is 2 MHz narrower than 3GPP. The supported frequency corresponds to EARFCN (Channel Numbers) of 5010-5169 in downlink and 23010-23169 in uplink.

The RRUS 11 size, height, width, and depth with solar shield, is shown in Figure 2.

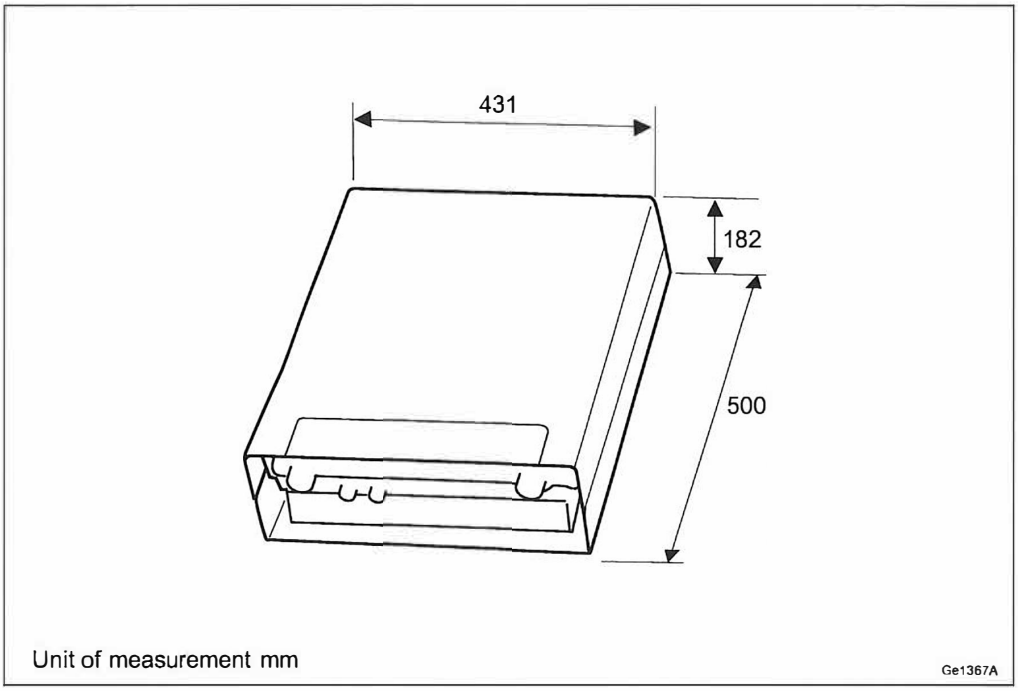


Figure 2 RRUS 11 Height, Width, and Depth with Solar Shield

3.1.2 RRUS 61

Table 2 lists the technical data for the RRUS 61. Figure 3 shows the dimensions for the RRUS 61.

Table 2 RRUS 61 Technical Data

Description	Value
Maximum nominal output power, subject to license handling.(1) (2)	B38, B39, B40, B41A, B41C: 2x10 W, 2x20 W , 2x30 W, and 2x40 W. B40B, B40,C, B40D: 2x10 W, 2x20 W, and 2x30 W. Hardware Activation Code (HWAC) is required for total output power over 20 W.
Number of carriers, subject to license handling.(1)	1 carrier.
Frequency(3)	2575 to 2615 MHz uplink and downlink B38 for LTE
	1880 to 1915 MHz uplink and downlink

Description	Value
	B39 for LTE
	2302.5 to 2322.5 MHz uplink and downlink B40B for LTE
	2305 to 2325 MHz uplink and downlink B40C for LTE
	2320 to 2340 MHz uplink and downlink B40D for LTE
	2300 to 2382 MHz uplink and downlink B40 for LTE
	2496 to 2658 MHz uplink and downlink B41A for LTE
	2535 to 2655 MHz uplink and downlink B41C for LTE
Dimensions without Solar Shield and Handle	
Height	406 mm
Width	416 mm
Depth	128 mm
Dimensions with Solar Shield and Handle	
Height	500 mm
Width	431 mm
Depth	182 mm
Weight	
RRUS 61	21.6 kg
Color	
Gray	

(1) Detailed information about licenses and hardware activations codes (HWAC) can be found in:

GSM: User Description, 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 the WCDMA RAN CPI library.

LTE: Manage Licenses in the Radio Nodes libraries.
(2) Detailed information about output power can be found in the Output Power user guides.
(3) Information about IBW can be found in RBS Configurations.

The RRUS 61 size, height, width, and depth with solar shield, is shown in Figure 3.

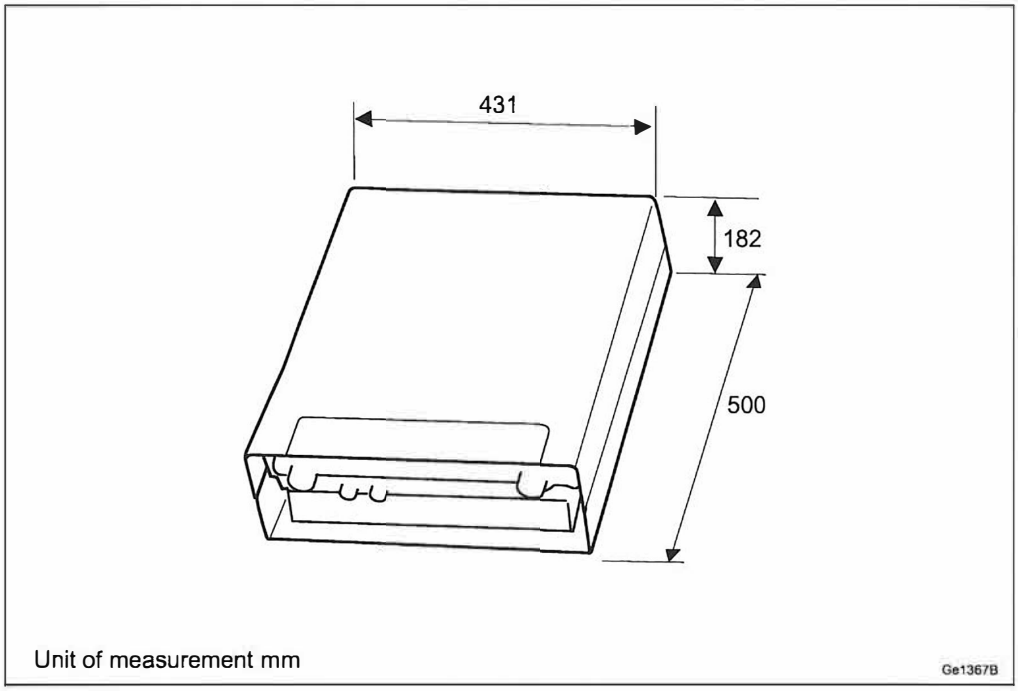


Figure 3 RRUS 61 Height, Width, and Depth with Solar Shield

3.2 Installation Recommendations

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

3.2.1 Indoor Installation Environments to Avoid

Although the unit is designed for outdoor use, it can be used indoors. For indoor locations Ericsson recommends to operate according to ETSI 300 019-1-3 class 3.1 and 3.3. 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. Avoid installing the equipment under glass covers or skylight windows without proper ventilation.

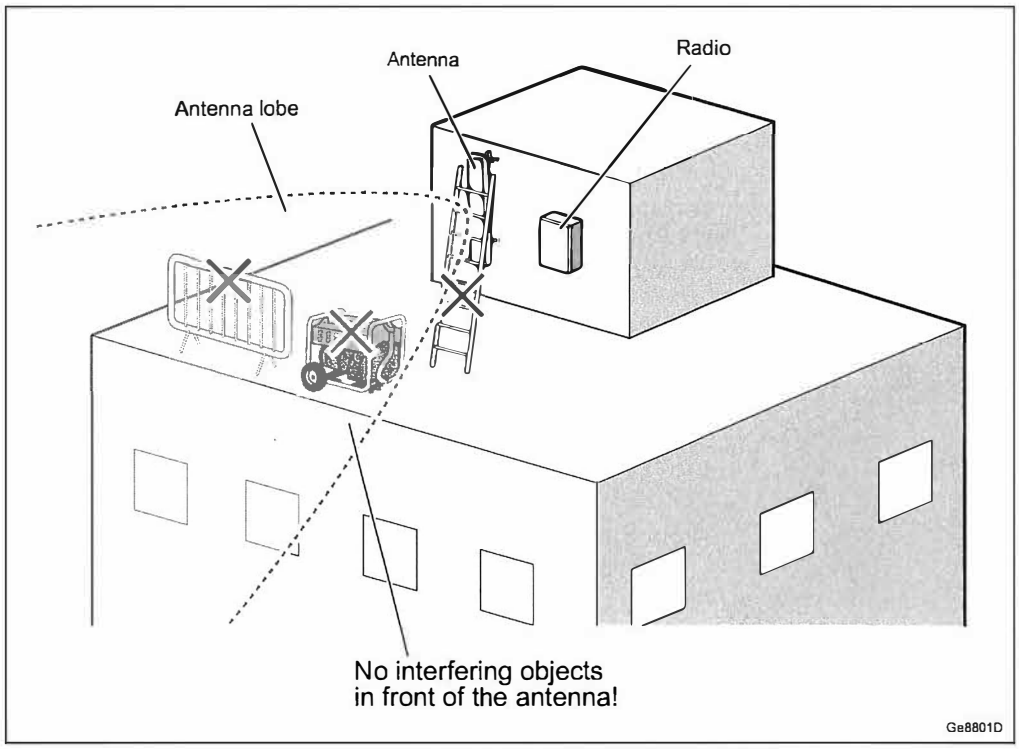
3.2.2 Outdoor Installation Environments to Avoid

The RRU is designed for outdoor use but to ensure optimal operation avoid the following:

- Hot microclimates caused, for example, by heat radiated or reflected from dark or metallic walls or floors
- Chimney mouths or ventilation system outlets
- Large glass or concrete surfaces

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



3.2.3 Painting Limitations

Ericsson does not recommend painting the RRU as it may affect radio performance of the unit.

Ericsson will apply limitations to the warranty and service contract if the RRU is painted.

3.2.3.1 Technical Limitations

If the RRU is painted, be aware of the technical limitations below:

- Sunlight on dark paint may increase the temperature of the RRU causing it to shut down.
- The plastic surfaces and the plastic covers are suited for painting with normal commercially available one or two component paints.
- Never use metallic paint or paint containing metallic particles.
- Ensure that ventilation and drainage holes are free from paint.
- Ensure proper adhesion of the paint.

3.2.3.2 Commercial Limitations

If the RRU is painted, the commercial limitations below apply:

- Failure modes directly related to overheating due to 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 will be restored to the standard color before being returned to the market. It is not possible to guarantee the same unit being 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 will be charged the additional costs for replacing all painted parts of the unit or the complete unit.

3.3 Space Requirements

This section describes the space requirements for installing the RRUS.

The RRUS with cable connections running downwards can be installed as follows:

- On a wall
- On a pole or mast

Both wall and pole installations can be indoors or outdoors.

Pole installations can be on monopoles, masts, or towers. Figure 4 shows sample pole installations.

3.3.1 Generic Requirements

The RRUS is installed with the cable connections facing downwards.

Allow a minimum of 1 m free space in front of the RRUS to ensure sufficient working space.

Note: If no other possibilities are available, under exceptional conditions, the RRUS may be installed horizontally with the front downwards. This installation alternative limits the power supply options and the maximum output power. Details regarding optional actions can be found in *Install Remote Radio Units*.

It is recommended that the RRUS is installed below the antenna. The minimum distance between the RRU and the antenna, and between two RRUs are shown in Figure 5, Figure 6, and Figure 7.

Note: The distance between the antenna and the RRU needs to be increased if the antenna azimuth is in the direction of the RRU.

3.3.2 Pole Installation

Figure 4 shows example pole installations (left to right: single unit on a monopole, two units on a tower on different struts, and three units on a monopole).

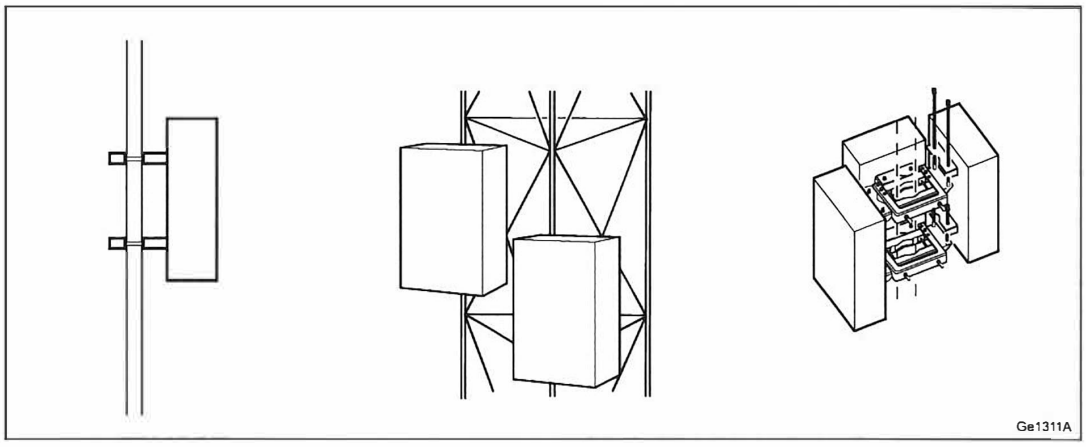


Figure 4 Sample Site Layout for Pole Installation

Figure 5 shows the installation requirements when installing the RRU on a pole.

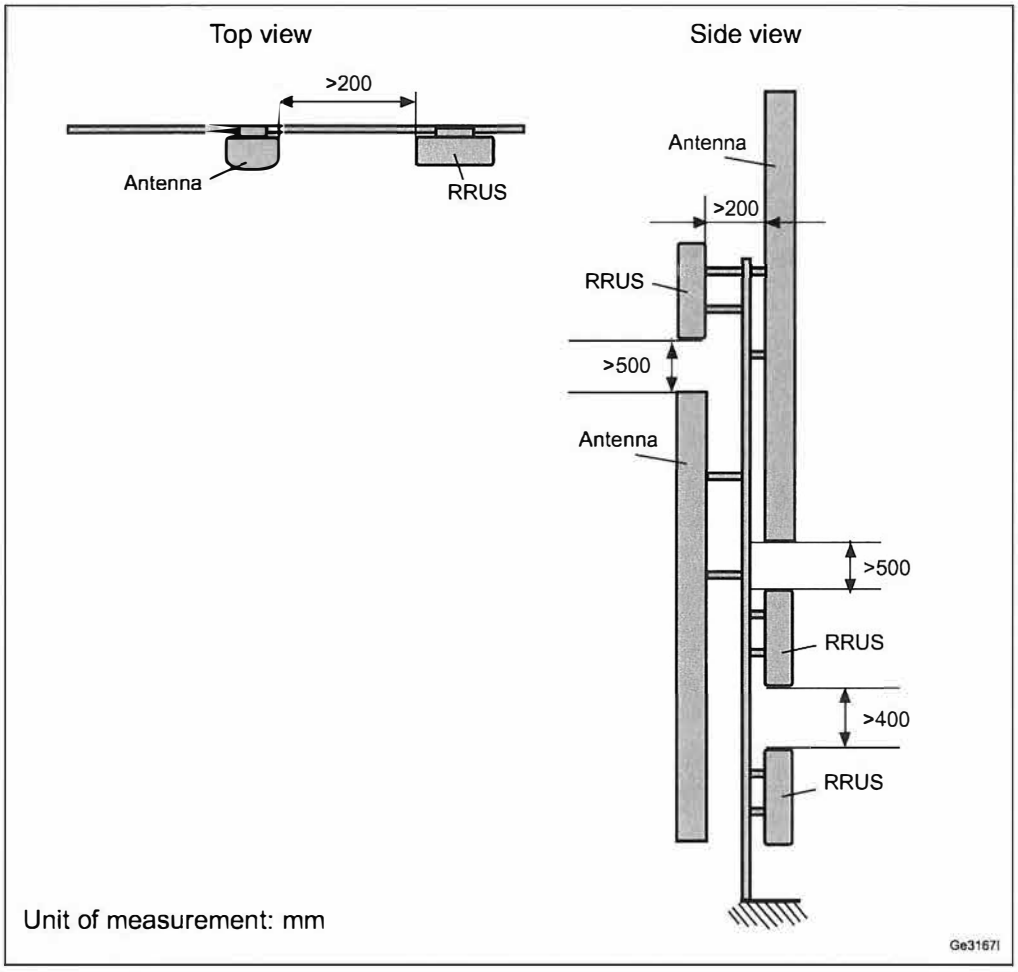


Figure 5 RRU Pole Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between RRUSs installed vertically on a pole. Allow a minimum vertical distance of 500 mm between RRUS and antenna, if installed above or below an antenna. Allow a minimum of 200 mm free space between RRUSs installed side by side. The minimum distance from the bottom of the RRUS to the floor is 300 mm.

Note: An RRU can not be installed in the uppermost top position of a pole or mast.

For an RRUS with AC power supply, the mounting bracket supports only two RRUS units.

The supported pole diameters are listed in Table 3.

Table 3 Pole Diameters

Mounting Equipment	Pole Diameter	Supported RRUSs
Single fixture	60 – 120 mm	All types
Mounting bracket	35 – 155 mm	All types

3.3.3 Wall Installation

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

3.3.3.1 RRU Installation on Outdoor Wall

The installation requirements if installing the RRU outdoor on a wall are shown in Figure 6.

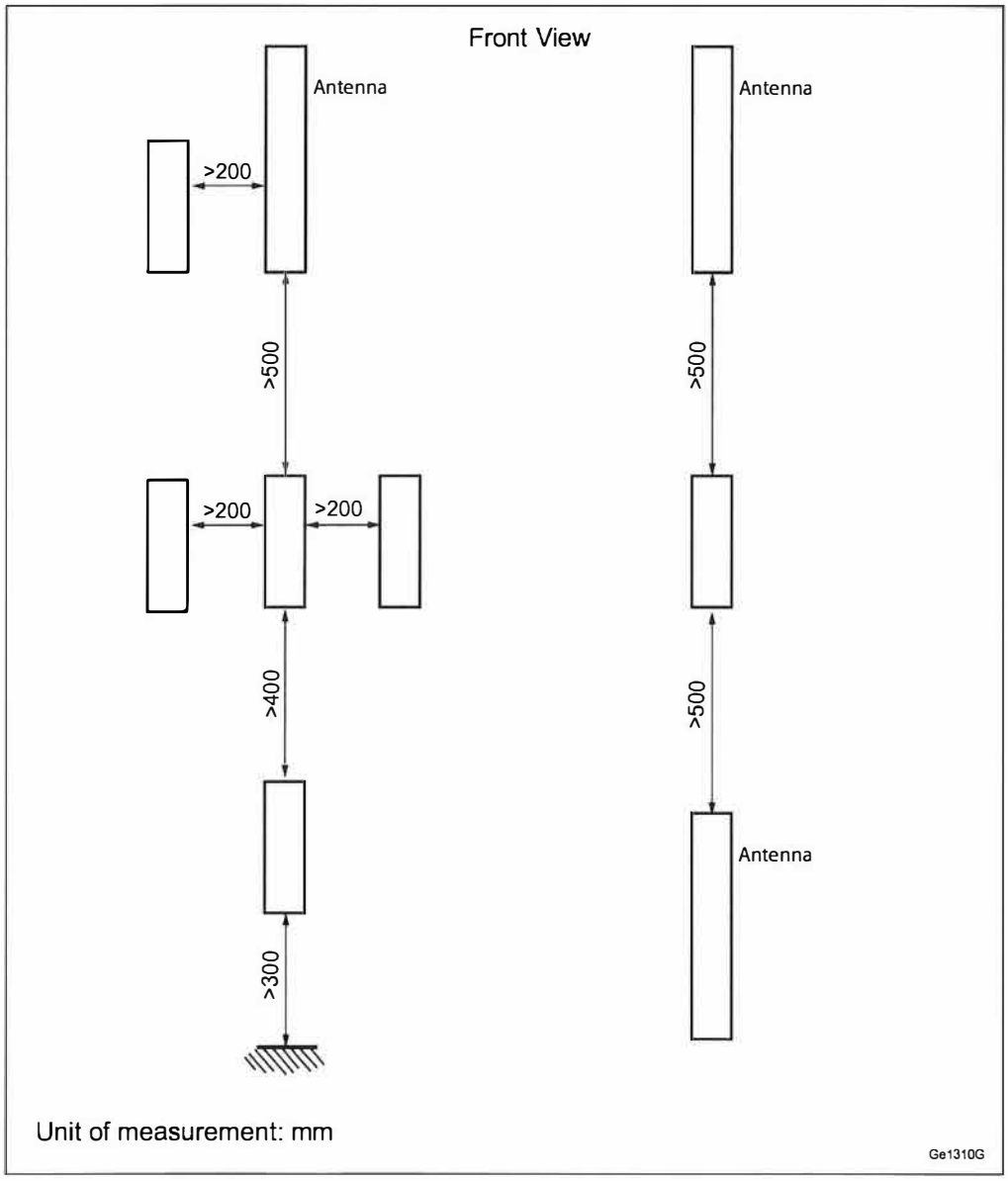


Figure 6 RRU Outdoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between RRUSs installed vertically on a wall. Allow a minimum vertical distance of 500 mm between RRUS and antenna, if installed above or below an antenna. Allow a minimum of 200 mm free space between RRUSs installed side by side. The minimum distance from the bottom of the RRUS to the floor is 300 mm.

Note: An RRU can not be installed in the uppermost top position on a wall.

3.3.3.2 RRU Installation on Indoor Wall

The installation requirements if installing the RRU on an indoor wall are shown in Figure 7.

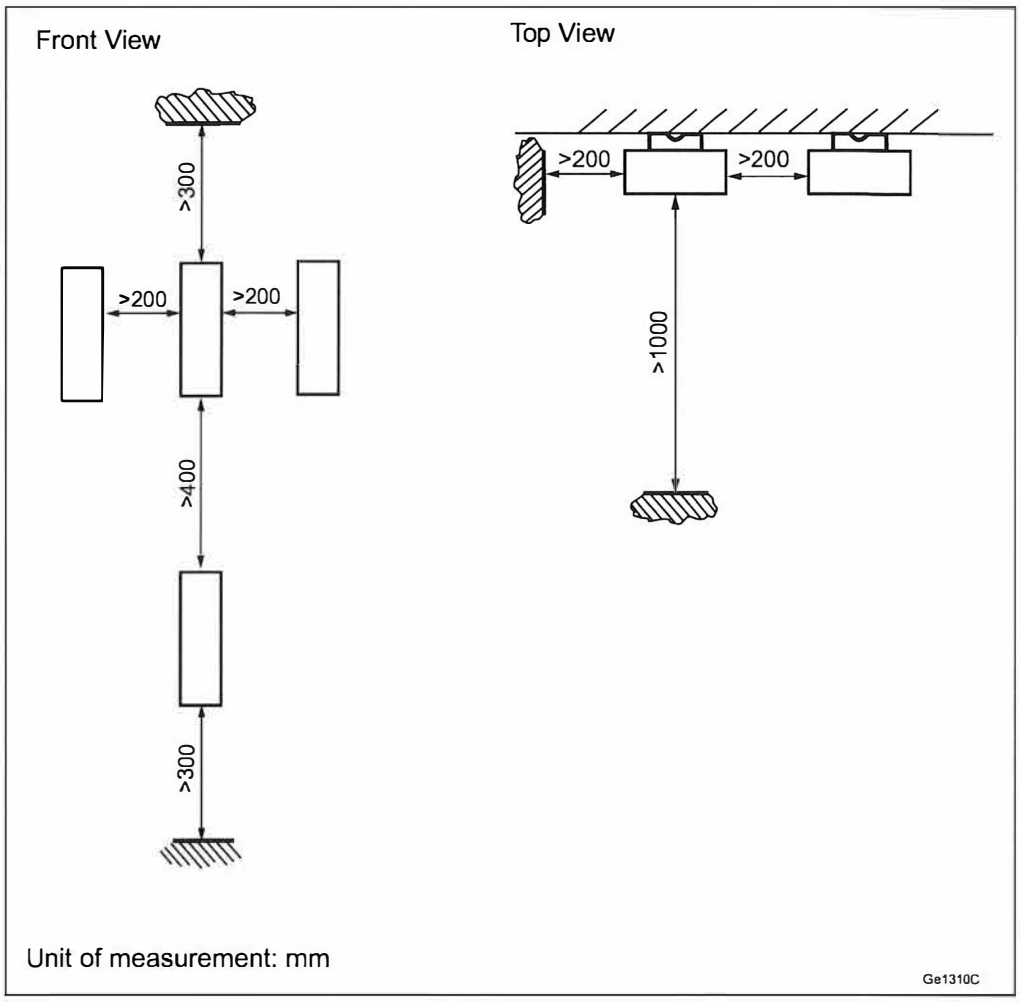


Figure 7 RRU Indoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between RRUSs installed vertically on a wall. Allow a minimum of 200 mm free space between RRUSs installed side by side. The minimum distance from the bottom of the RRUS to the floor is 300 mm.

3.4 Acoustic Noise

The RRUS does not generate acoustic noise.

3.5 Environmental Characteristics

This section contains RRUS operating environment data.

3.5.1 Operating Environment

The following is a list of values for the RRUS normal operating environment:

Temperature	-40 to +55 °C -40 to +45 °C (RRUS 11 B1, B2, B4, B20; in high load scenario: 2x40 W) -40 to +50 °C (RRUS 11 B5, RRUS 61 B40; in high load scenario: 2x40 W)
Solar radiation	≤ 1,120 W/m²
Relative humidity	5 to 100%
Absolute humidity	0.26 to 40 g/m^3
Maximum temperature change	1.0°C/min
Maximum wind load at 50 m/s (pole installed single case)	430 N (front)

3.5.2 Heat Dissipation

The RRUS is convection cooled and designed for outdoor installation. The values shown in Table 4 are meant to give an idea of heat dissipation when the unit is installed indoor or around other RRUs. Indoor installation in a room without adequate ventilation and cooling must be avoided.

Table 4 RRUS Heat Dissipation

Unit	Output Power	Maximum Heat Dissipation
RRUS 11 B1, B4	2x30 W	0.34 kW
	2x40 W	0.43 kW
RRUS 11 B2	2x30 W	0.35 kW
	2x40 W	0.43 kW
RRUS 11 B5, B26C	2x30 W	0.26 kW
	2x40 W	0.30 kW
RRUS 11 B7	2x30 W	0.46 kW
RRUS 11 B12	2x30 W	0.32 kW
	2x40 W	0.43 kW

Unit	Output Power	Maximum Heat Dissipation
RRUS 11 B13	2x40 W	0.43 kW
RRUS 11 B20	2x30 W	0.32 kW
	2x40 W	0.33 kW
RRUS 11 B25	2x30 W	0.35 kW
	2x40 W	0.43 kW
RRUS 11 B26A	2x40 W (1)	0.33 kW
RRUS 11 B26B	2x40 W	0.43 kW
RRUS 61 B38, B39, B41A, B41C	2x40 W	0.34 kW
RRUS 61 B40	2x40 W	0.34 kW
RRUS 61 B40B, B40C, B40D	2x30 W	0.27 kW

(1) Maximum output power is limited to 2x30 W if using RRUS11, KRC 161 287/1.

3.5.3 Vibration

This section describes the RRUS tolerance to vibrations. The RRUS operates reliably during seismic activity as specified by test method IEC 60 068-2-57 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 RRUS operates reliably during random vibration as specified by test method IEC 60 068-2-64 Fh method 1

Random vibration, normal operation	0.5 m^2/s^3

The RRUS operates reliably during shock as specified by test method IEC 60 068-2-27 Ea

Peak acceleration	40m/s^2
Duration	22 ms

3.5.4 Materials

All Ericsson products fulfill the legal and market requirements regarding:

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

3.6 Power Supply Characteristics

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

The power for multiple RRUSs can be supplied from different power systems if required.

3.6.1 DC Power Supply Characteristics

The power supply voltage for the RRUS is -48 V DC. The power supply requirements are listed in Table 5.

Table 5 RRUS DC Power Supply Requirements

Conditions	Values and Ranges
Nominal voltage	-48 V DC
Operating voltage range	-38.0 to -58.5 V DC
Non-destructive range	0 to -60 V DC

Fuse and Circuit Breaker Recommendations

External fuse and circuit breaker capabilities for the RRUS are listed in Table 6.

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 609 34.

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

Table 6 RRUS Fuse or Circuit Breaker Recommendations

Unit (DC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 11 B1, B4	2x10 W	9 A	25 A	32 A
	2x20 W	10 A		
	2x30 W	13 A		
	2x40 W	15 A		
RRUS 11 B2, B5, B12, B13, B20, B25, B26A, B26B, B26C	2x10 W	8 A		
	2x20 W	10 A		
	2x30 W	13 A		
	2x40 W	15 A		
RRUS 11 B7	2x10 W	10 A		
	2x20 W	13 A		
	2x30 W	16 A		
RRUS 61 B38, B39, B41A, B41C	2x40 W	12 A		
RRUS 61 B40	2x40 W	12 A		
RRUS 61 B40B, B40C, B40D	2x10 W	7 A		
	2x20 W	8 A		
	2x30 W	10 A		

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

(2) The recommended fuse rating takes into account the fact that external fuses are not to trip due to lightning or network transients.

(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

Note: If a fuse or circuit breaker rating above minimum fuse rating is selected, cable dimensioning rules in *Position C, -48 V DC Power Supply Interface* on page 30 shall be reconsidered to make sure that the fuse or circuit breaker tripping criteria are met.

3.6.2 AC Power Supply Characteristics

The RRUS AC accepts 100 to 250 V AC if it is used together with the optional PSU. The power supply requirements are listed in Table 7.

Table 7 RRUS AC Power Supply Requirements

Normal Voltage Range	Tolerance Range
200 to 250 V	180 to 275 V AC (1)
100 to 127 V	90 to 140 V AC (1)
Connection	Phase-neutral
Frequency range	50 to 60 Hz
Voltage harmonics	< 10% at full load (2)
Shut-off allowance	At undervoltage or overvoltage (3)
Inrush current peak	< 40 A

Normal Voltage Range	Tolerance Range
Inrush current duration	< 10 ms

(1) AC connected through a PSU AC 02

(2) Must comply with IEC 61000-3-2

(3) Alarm raised at 70 ± 5 V, ceased at 80 ± 5 V (phase voltage)

Fuse and Circuit Breaker Recommendations

External fuse and circuit breaker capabilities for the RRUS are listed in Table 8.

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 609 34.

The PSU AC 02 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 for not tripping the fuse or circuit breaker in case of SPD operation. The minimum fuse rating could be taken into account only if it is accepted that fuses or circuit breakers trip in such situations. The PSU AC 02 is described in *PSU AC 02 (Optional)* on page 25.

Table 8 RRUS Fuse/Circuit Breaker Recommendations

Unit (AC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 11 B1, B4, B5, B12, B13, B20, B25, B26A, B26B, B26C	2x30 W / 2x40 W	• 7 A (100 to 127 V AC) • 4 A (200 to 250 V AC)	32 A	32 A
RRUS 11 B1, B2, B4, B5, B26C	2x40 W	• 8 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
RRUS 11 B7	2x30 W	• 8 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
RRUS 61 B38, B39, B41A, B41C	2x40 W	• 7 A (100 to 127 V AC) • 3.5 A (200 to 250 V AC)		
RRUS 61 B40	2x40 W	• 7 A (100 to 127 V AC) • 3.5 A (200 to 250 V AC)		

Unit (AC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 61 B40B, B40C, B40D	2x30 W	• 5 A (100 to 127 V AC) • 2.5 A (200 to 250 V AC)		

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

(2) The recommended fuse rating takes into account the fact that external fuses are not to trip due to lightning or network transients.

(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

3.6.3 Power Consumption

For information on power consumption, refer to *Power Consumption Guideline for RBS 6000*.

3.7 System Characteristics

This section describes the system characteristics of the RBS.

3.7.1 RF Electromagnetic Exposure for RBS 6000

General information on RF Electromagnetic Fields (EMF) for RRUSs connected to an RBS from the 6000 family can be found in *Radio Frequency Electromagnetic Fields*.

Information about radio access specific compliance boundaries for electromagnetic exposure can be found in *Radio Frequency Electromagnetic Exposure*.

3.7.2 Software

Information on software dependencies can be found in *Compatibilities for Hardware and Software*.

3.7.3 Radio Configurations

Information about available radio configurations can be found in *RBS Configurations*.

4 Hardware Architecture

This section describes the RRUS hardware structure regardless of configuration or frequency. The RRUS components are shown in Figure 8 and listed in Table 9.

Note: The supported configurations are described in *RBS Configurations*.

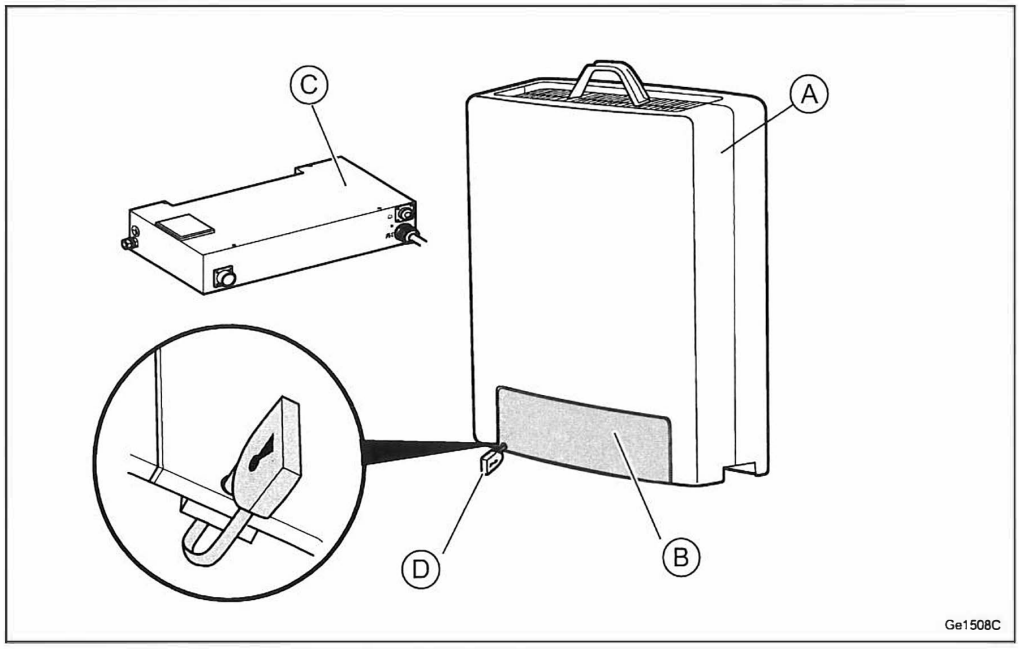


Figure 8 RRUS 11 and RRUS 61 Components

Table 9 Key to RRUS Components

Position	Component
A	Solar shield
B	Slide cover
C	PSU (optional)
D	Hole for padlock (optional, valid in RRUS 11 solar shield variant 2 only)

4.1 RRUS Overview

The RRUS contains most of the radio processing hardware. The following sections describe the component units inside the RRUS.

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
- Two receivers for RX diversity
- RET receiver (the antenna system communication link)

4.1.2 PA

The Power Amplifier (PA) is the linear power amplifier for the RF carrier. RRUS 11 and RRUS 61 have two PAs, one for each branch.

4.1.3 FU

The Filter Unit (FU) consists of band-pass filters and low-noise amplifiers.

In the RRUS, the FU also provides the following:

- Power and supervision for the ASC, the TMA, the TMF, or the RIU
- Voltage Standing Wave Ratio (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/overcurrent protection for the ALD (RET) port.

4.1.6 External Alarm SPD

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

4.2 Solar Shield

The solar shield protects the RRUS from solar radiation. The solar shield is also part of the cooling design. Figure 8 shows the solar shield.

Note: Always attach the solar shield to the RRUS regardless of whether the RRUS is installed in a shady or in a sunny location.

4.3 Slide Cover

The slide cover hides the optical indicators and the maintenance button.

More information can be found in *Connection Interfaces* on page 28.

4.4 Optical Indicators and Buttons

The RRUS is equipped with optical indicators that show system status. The optical indicators are located on the overlay marking. Table 10 describes how to interpret the optical indicators for RRUS when WCDMA and LTE controlled.

Table 10 RRUS Optical Indicators WCDMA or LTE Controlled

Marking	Indicator	Color	Mode	Indicates
!	Fault	Red	Off	No fault detected in RRUS
			On	Fault detected in RRUS
✔	Operational	Green	Off	RRUS not operational
			On	Power present
			Blink (2 Hz)	Load or testing in progress
			Blink (0.5 Hz)	Dependent resource missing
🔧	Maintenance	Blue (1)	Off	RRUS not in maintenance mode
			On	RRUS in maintenance mode
			Blink (0.5 Hz)	Shutdown in progress
⊖→ 1, ⊖→ 2	Interface	Green	Off	Disconnected
			On	Connected
LMT	–	-	-	Not used
Button:				
🔧	Maintenance	-	-	Switch RRUS mode between Remote and Maintenance

(1) The color can also be yellow. The yellow optical indicator can blink busy.

4.4.1 Maintenance Button Function

See *Indicators, Buttons, and Switches* for information about the maintenance button.

4.5 PSU AC 02 (Optional)

The PSU is required for the AC power input option. The PSU converts RRUS input main power 100 - 250 V AC to -48 V DC and is installed on the back of the RRUS. Figure 9 shows the PSU.

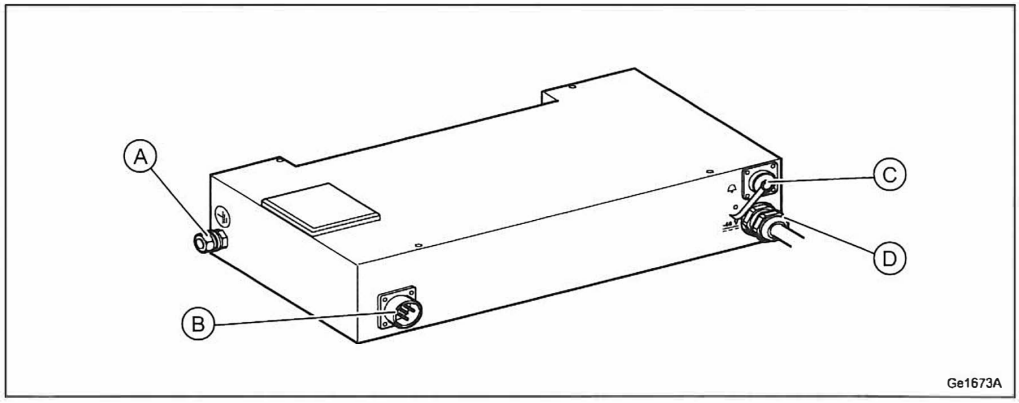


Figure 9 PSU AC 02

Table 11 PSU AC 02 Connection Interfaces

Position	Interface
A	Grounding interface
B	AC power interface
C	Interface for future use
D	DC power interface

For more information about PSU AC 02, see *PSU Description*.

4.6 PSU 48 02 (Optional)

The PSU 48 02 converts -48 V DC 3-wire to -48 V DC 2-wire.

The PSU 48 02 components are shown in Figure 10 and listed in Table 12.

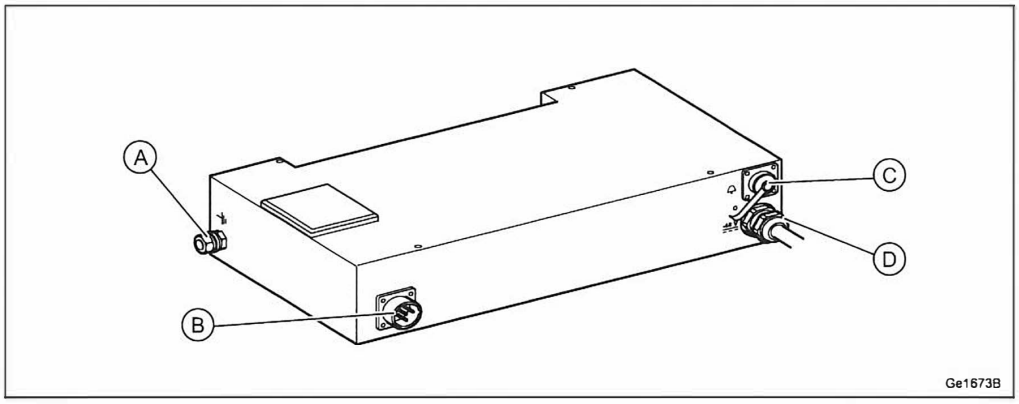


Figure 10 PSU 48 02

Table 12 PSU 48 02 Connection Interfaces

Position	Interface
A	Grounding interface
B	DC power interface (3-Wire)
C	Interface for future use
D	DC power interface (2-Wire)

For more information about PSU 48 02, see *PSU Description*.

4.7 RF Monitoring Port for RRUS 11 (Optional)

The RF monitoring port can be used to monitor the RRUS downlink RF output power without interrupting service. The RF monitoring port components are shown in Figure 11 and listed in Table 13.

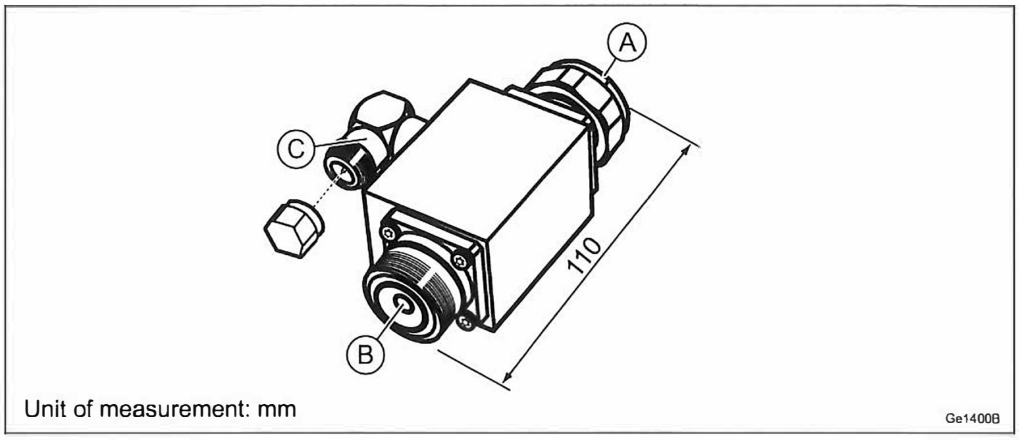


Figure 11 RF Monitoring Port

Table 13 RF Monitoring Port Overview

Position	Interface
A	7/16 RF connector used for connecting to **A** or **B** interface
B	7/16 RF connector for connecting the RF cable
C	N-type RF connector for pairing with connector on monitoring equipment (including metal protective cap to be used when the interface is not in use)

The RF monitoring port is connected to the **A** or **B** antenna interface on the connection interface panel at the bottom of the RRUS. The **A** and **B** interfaces support bidirectional, RX/TX traffic, but only the TX direction can be monitored.

Using the RF monitoring port does not affect RRUS performance. RF leakage due to connecting the antenna cables through the monitoring port does not exceed that of a standard RF cable. Insertion loss between port A and port B is less than 0.2 dB.

5 Connection Interfaces

This section contains information about the RRUS connection interfaces. The RRUS connection interfaces are shown in Figure 12, and listed in Table 14.

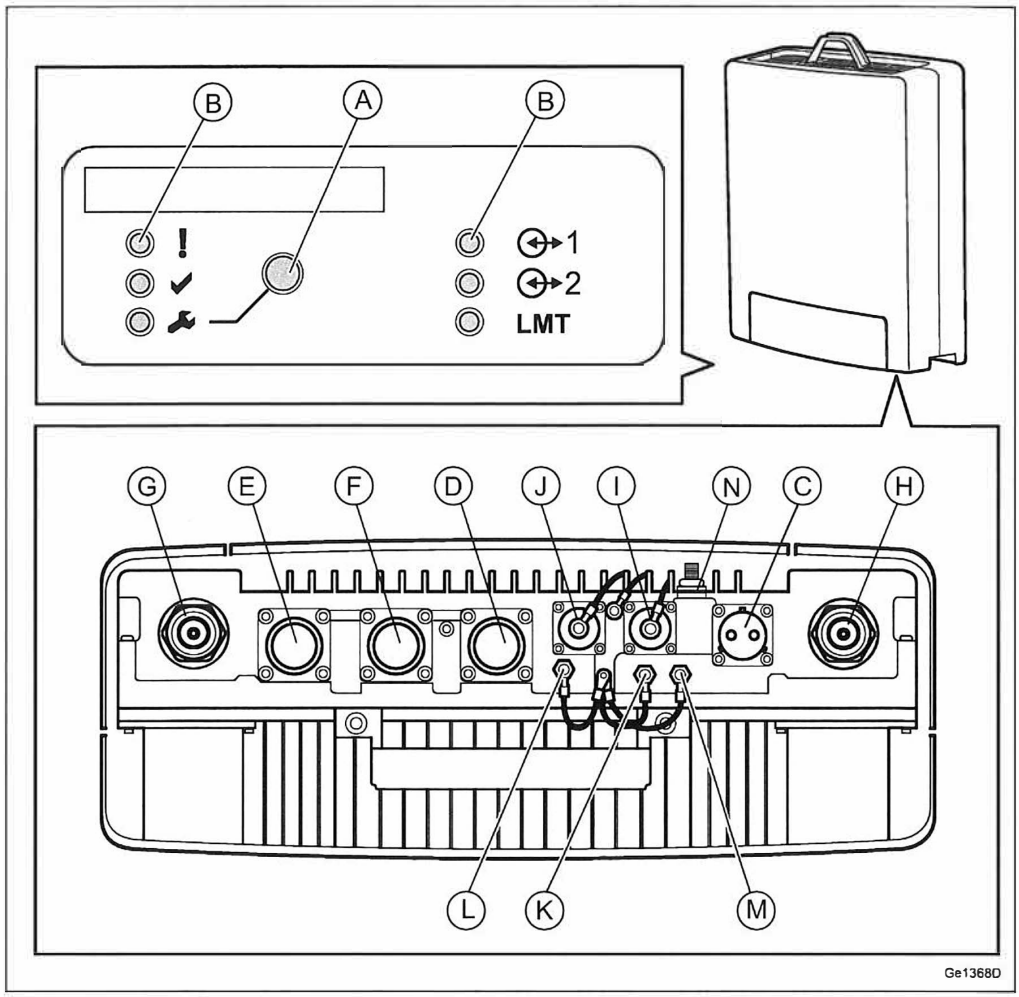
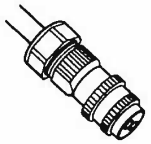
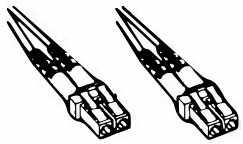
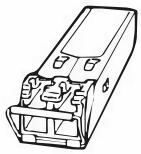
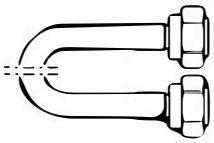
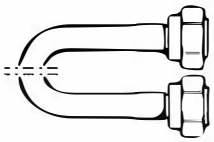
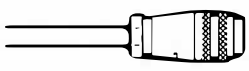
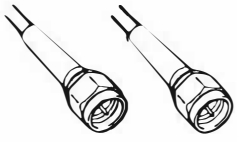


Figure 12 RRUS Connection Interfaces

Table 14 RRUS Connection Interfaces

Position	Description	Marking	Connector Types	Cable Types
A	Maintenance button	🔧	-	-

Position	Description	Marking	Connector Types	Cable Types
B	Optical indicators	! , ✔ , 🔧 1, 2 LMT	-	-
C	-48 V DC power supply		Screw terminal connector	
D	–	LMT	-	-
E	Optical cable 1	1	LC (On SFP)	 
F	Optical cable 2	2		
G	Antenna 1	A	7/16 connector	
H	Antenna 2	B		
I	ALD (used for a RET unit for example)	ALD	Mini-DIN connector, 8 pin	
J	External alarm		Alarm connector	
K(1)	Cross connect RXA	RXA I/O	SMA connector	
L(1)	RXA co-site	RXA Out		

Position	Description	Marking	Connector Types	Cable Types
M(1)	Cross connect RXB	RXB I/O		
N	Grounding	⏚	M8 bolt	

(1) Applicable for RRUS 11 only.

5.1 Position A, Maintenance Button

The maintenance button is located at the left of the 🔧 symbol.

Note: Use a pointed object, for instance a screwdriver or a pencil tip, to press the maintenance button.

More information about the maintenance button can be found in *Indicators, Buttons, and Switches*.

5.2 Position B, Optical Indicators

Optical indicators show the system status. More information about the optical indicators can be found in *Indicators, Buttons, and Switches*.

5.3 Position C, -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 RRU maximum power consumption. For more information on -48 V DC power cable dimensions, see *Main-Remote 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 RRUS overvoltage and lightning protection does not function properly.

5.4 Position D, LMT

Not used.

5.5 Position E and F, Interface for Optical Cable to Main Unit

The ⊙→ 1 and ⊙→ 2 interfaces provide connections to optical cables for traffic and timing signals between the RRUS and the main unit. A Small Form-factor Plugable (SFP) is used to connect the optical cable to the RRUS.

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

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 60950-1.
- Functional and performance verified to comply with RBS specifications.

Recommended SFP modules are obtained from the product packages for the RBS and the Main Remote Installation products. See *Spare Parts Catalog* and *Main-Remote Installation Products Overview* for more information.

5.6 Position G and H, Antenna Interface

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

The antenna connection interface characteristics of these cables are described in Table 15.

Table 15 RRUS Antenna Connection Interface Characteristics

Connector Type	RF Cable Type	Cable Connector Type	Cable Product Number
7/16 IEC-169-4 insert-receiver type	50 Ω 1/2-inch coaxial	7/16 insert-type on both ends	TSR 951 70

The antenna cables must be connected as described in Table 16.

Table 16 RRUS Antenna Cable Connectors

RRUS Connectors	Antenna Connectors
A (Antenna 1)	TX/RX
B (Antenna 2)	TX/RX

5.7 Position I, ALD Ctrl Interface

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

5.8 Position J, Ext Alarm Interface

Two external alarms can be connected to the RRUS external alarm port, as shown in Figure 13.

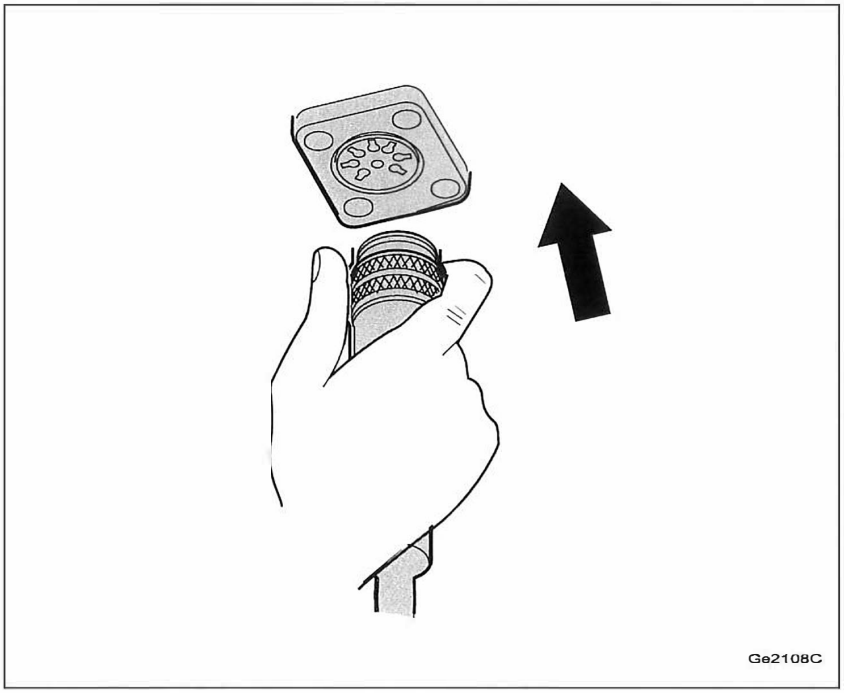


Figure 13 External Alarm Interface

Table 17 lists some major characteristics related to the handling of external alarms in the RRU.

Table 17 External Alarms and Output Characteristics

Alarm Input Port Details	Characteristics
Number of input ports	2

Alarm Input Port Details	Characteristics
Maximum sensed impedance for a closed loop condition	Closed (less than 1 kΩ)
Minimum sensed impedance for an open loop condition	Open (greater than 33 kΩ)
Maximum current sourced from port interface	1.0 mA
Maximum voltage sourced from port interface	5.5 V

5.9 Position K and M, RXA I/O and RXB I/O Interface (RRUS 11 Only)

The RXA I/O and RXB I/O interface port is used to cross connect the RRUS 11 for antenna diversity, as shown in Figure 14.

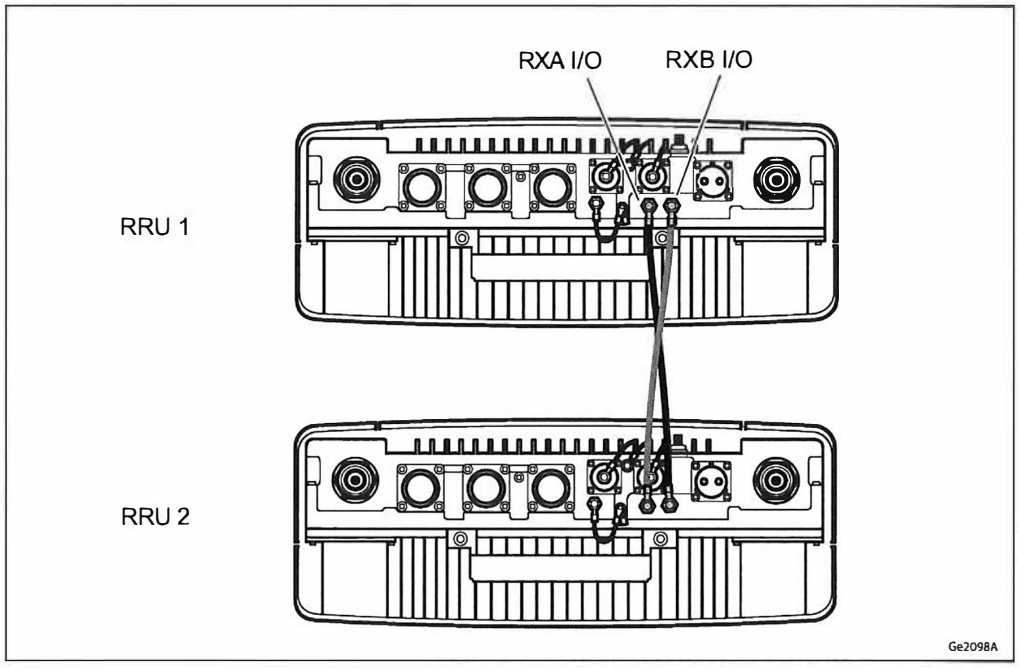


Figure 14 Cross Connecting RRUS 11

5.10 Position L, RXA Out Interface (RRUS 11 Only)

The RXA Out interface port is used to co-site RRUS 11s, as shown in Figure 15.

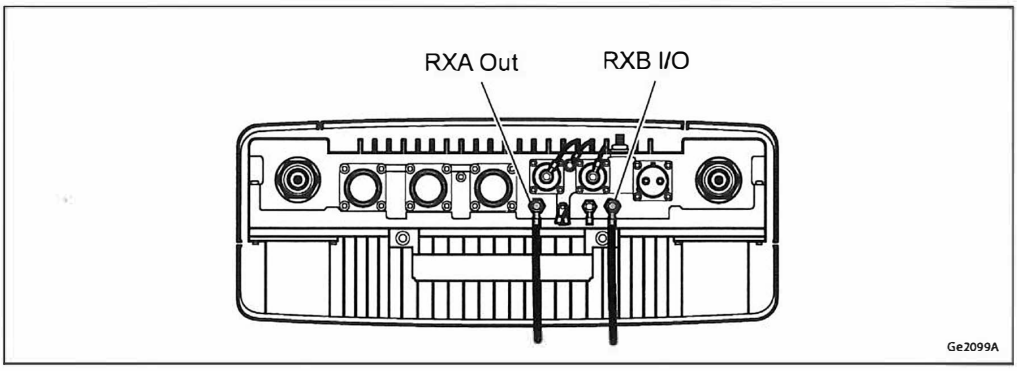


Figure 15 Co-siting RRUS 11

5.11 Position N, Grounding Interface

The RRUS must be grounded to protect it from overvoltage and lightning strikes. The grounding interface on the RRUS accepts a small cable lug on a short, coated cable. Bolt the cable and the loop into place with an M8 bolt as shown in Figure 16.

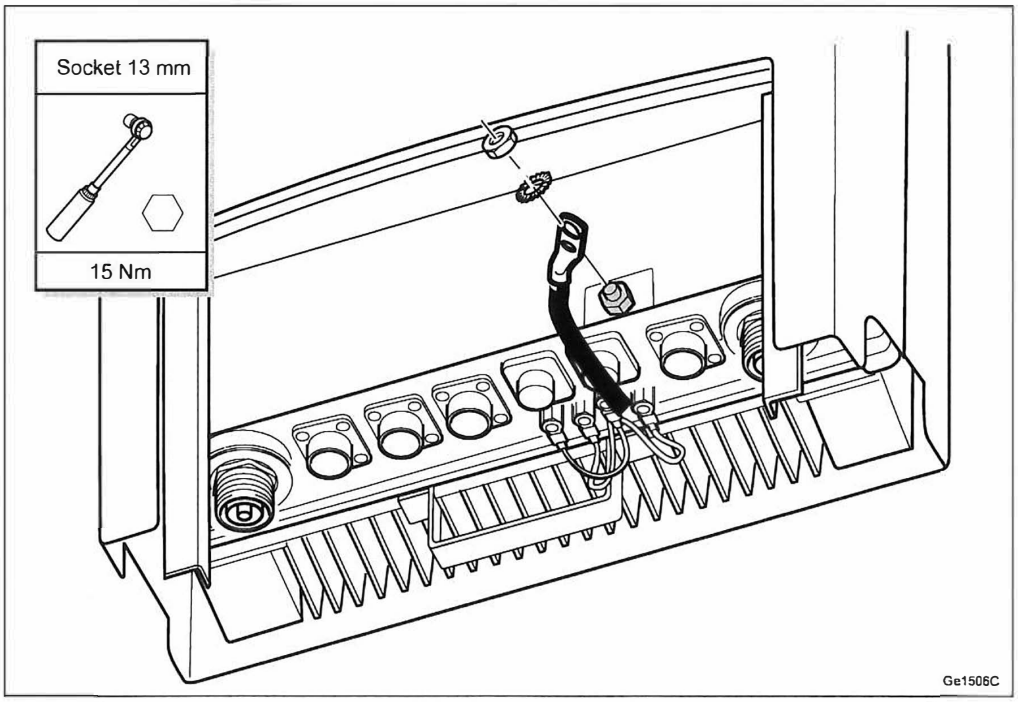


Figure 16 RRUS Grounding Interface

5.12 Optional Equipment Interfaces

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

5.12.1 PSU AC (Optional)

The PSU (also called the PSU AC) uses an AC power interface available from Ericsson. The AC cable is connected to the PSU with a contact on the cable. The AC connector comes with the RRUS.

All cables must be shielded. The shielding must be grounded on both the PSU and the power supply equipment side with the site Main Earth Terminal (MET). Each power cable conductor can have a 1.5–4 mm² cross-sectional area.

The PSU is shown in Figure 9.

Note: The wire color code in the external AC power supply cable is market dependent.

5.12.2 PSU 48 02 (Optional)

The PSU 48 uses a DC power interface available from Ericsson.

All cables must be shielded. The shielding must be grounded on both the PSU and the power supply equipment side with the site Main Earth Terminal (MET). Each power cable conductor can have a 2.5–10 mm² cross-sectional area.

The PSU is shown in Figure 10.

5.12.3 RF Monitoring Port for RRUS 11 (Optional)

The optional RF monitoring port allows either periodic or continuous downlink RF output power monitoring without interrupting RRUS 11 service. The monitoring interface can be found on the optional RF monitoring port. The RF monitoring port can be placed on each antenna interface that is a transmitter port.

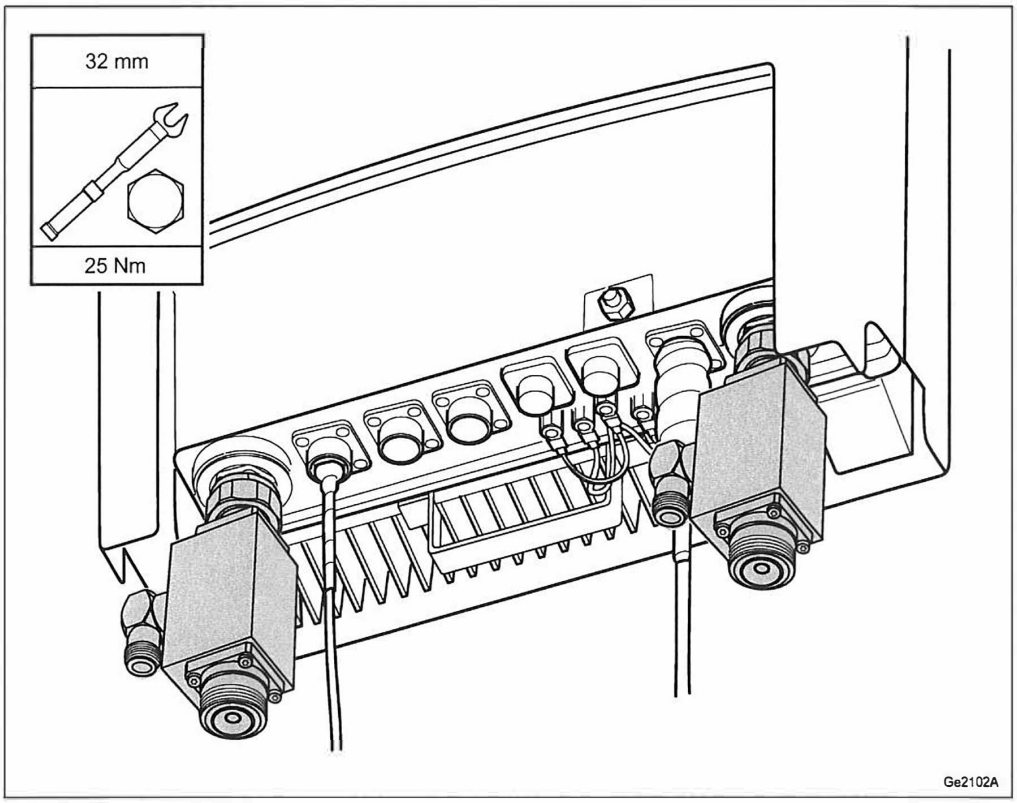


Figure 17 RF Monitoring Interface Connection

6 Standards and Regulations

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

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.*"

6.1 Regulatory Approval

The RBS complies with the following market requirement:

- EC (European Community) market requirements, Radio Equipment Directive 2014/53/EU and Directive 2011/65/EU.
- The apparatus may include Radio Transceivers with support for frequency bands not allowed or not harmonized within the European Community (EC).
- Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU).
- North American market requirements.
- 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

- EN 50 581 (RoHS)

6.1.2 Safety Standards Compliance

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

International

- IEC 60 950-1 Ed2 with amendment A1

Europe

- EN 50 385
- EN 60 950-1 Ed2 with amendment A1

North America

- CSA-C22.2 No.60950-1-07 with amendment A1
- FCC CFR 47 Part 1.1310
- Health Canada Safety Code 6
- UL 60950-1

6.1.2.1 Outdoor specific requirements

The RBS complies with the following outdoor specific requirements:

International

- IEC 60 529 (IP55)
- IEC 60 950-22

Europe

- EN 60 529 (IP55)
- EN 60 950-22

North America

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

6.1.3 EMC Standards Compliance

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

International

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

Europe

- ETSI EN 301 489-1
- ETSI EN 301 489-8
- ETSI EN 301 489-23

North America

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

6.1.4 Radio Standards Compliance

The RBS complies with the following radio standards:

International

- 3GPP TS25.141
- 3GPP TS36.141
- 3GPP TS37.141
- 3GPP TS51.021

Europe

- ETSI EN 301 502
- ETSI EN 301 908-1

- ETSI EN 301 908-3
- ETSI EN 301 908-14
- ETSI EN 301 908-18

North America

- FCC CFR 47 Part 2 (USA)
- FCC CFR 47 Part 22, 24, 27 and 90 (USA frequency dependent)
- IC RSS-130,132, 133, 139 and 199 (Canada frequency dependent)
- IC RSS-Gen (Canada)

6.1.5 Marking

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

Europe

- CE mark

North America

- FCC CFR 47 Part 15 Statement
- FCC ID (located on RRU)
- IC ICES-003 Statement
- IC ID (located on RRU)
- usETL/cETL

6.2 Other Standards and Regulations

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

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 RRUS is in accordance with Ericsson standard class A3.

6.2.3 Vandal Resistance

Unauthorized access is not possible without damaging the unit.

ERICSSON

Radio Description

Radio 4415

Description

Contents

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.

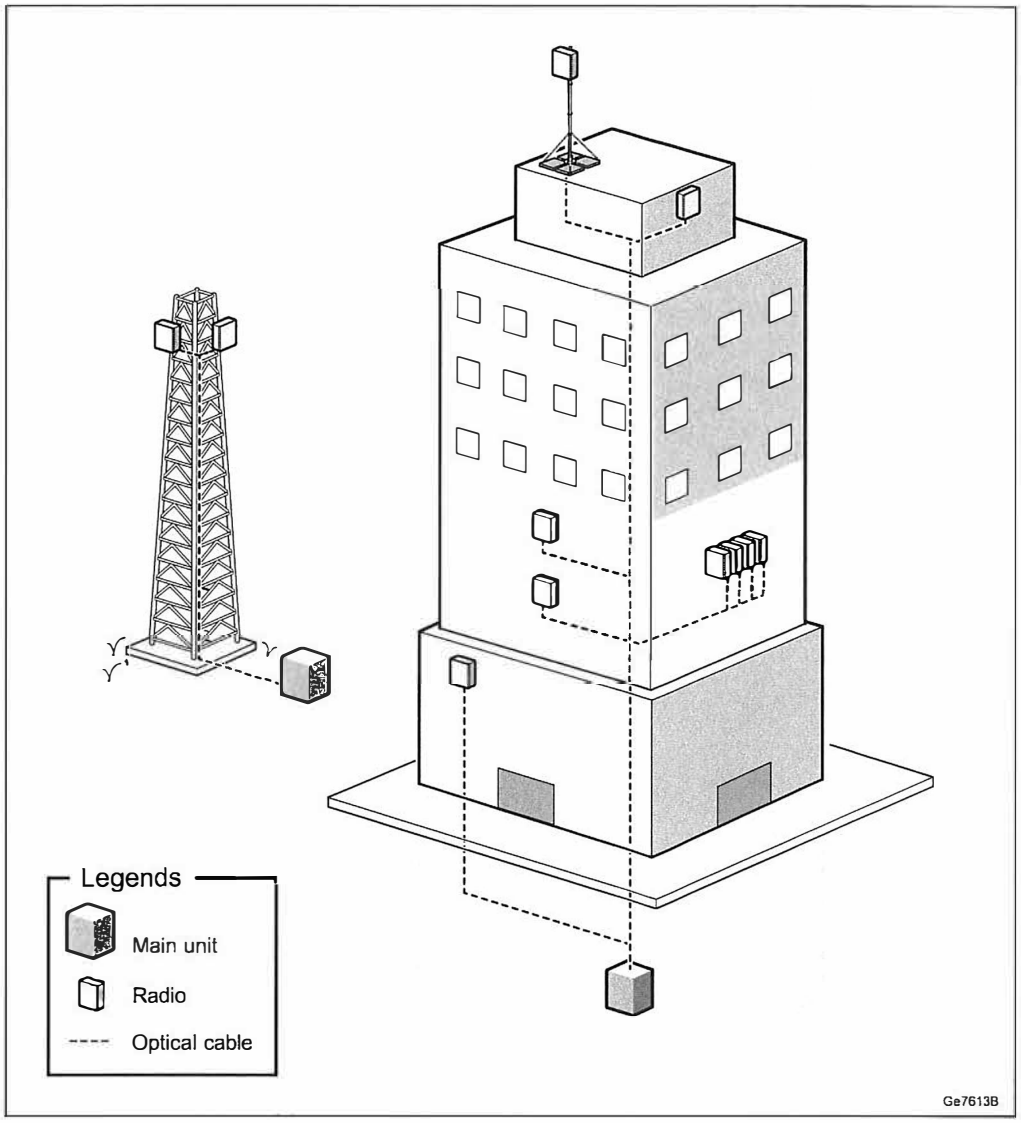


Figure 1 Radio Installations

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.
- GSM, WCDMA, LTE FDD, NB-IoT, and NR
- 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 42.

— Supports *Basic Stand-alone Radio Installation Check*, that helps to identify potential faults before the radio is connected to the network.

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]	4 × 40 W 4 × 25 W (B30) (License key is required for total output power over 4 × 5 W.)
Number of carriers per branch	LTE: 6 downlink, 6 uplink LTE B70 (R-state ≥ R5): 5 downlink, 3 uplink GSM: 4 downlink, 6 uplink WCDMA: 6 downlink, 6 uplink NB-IoT in-band mode: 1 NB-IoT carrier per configured LTE host carrier 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) NB-IoT guard band mode: 1 NB-IoT carrier per configured LTE host carrier NR B2/B25: 3 downlink, 3 uplink
Number of carriers per radio	LTE: 4 × 6 downlink, 4 × 6 uplink LTE B70 (R-state ≥ R5): 4 × 5 downlink, 4 × 3 uplink GSM: 12 downlink, 24 uplink WCDMA: 4 × 6 downlink, 4 × 6 uplink NB-IoT in-band mode: One NB-IoT carrier per configured LTE host carrier 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) NB-IoT guard band mode: One NB-IoT carrier per configured LTE host carrier NR B2/B25: 2 × 3 downlink, 2 × 3 uplink

Description	Value
Frequency[3]	B1 for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 1920–1980 MHz uplink[4] 2110–2170 MHz downlink
	B2[5] for GSM (R-state < R5), WCDMA, LTE, and NR 1850–1910 MHz uplink 1930–1990 MHz downlink B2[5] for NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 1850.3–1909.8 MHz uplink 1930.3–1989.8 MHz downlink B2[5] for GSM (R-state ≥ R5) 1850–1910 MHz uplink 1930.4–1989.6 MHz downlink (GSM carrier center frequency)
	B3 for GSM, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 1710–1785 MHz uplink 1805–1880 MHz downlink
	B3B for GSM, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode[6] 1710–1765 MHz uplink 1805-1860 MHz downlink
	B7[7] for LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 2500–2570 MHz uplink 2620–2690 MHz downlink
	B7A for LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 2500–2560 MHz uplink 2620–2680 MHz downlink
	B25[5] for WCDMA, LTE, and NR 1850–1915 MHz uplink 1930–1995 MHz downlink

Description	Value
	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
	2305–2315 MHz uplink 2350–2360 MHz downlink B30 for LTE
	B66A for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode 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
R-state ≥ R5 (B1, B2/ B25, B3, B3B, B66A, B70)	H×W×D: 420 × 342 × 131 mm
R-state ≥ R5 (B7)	H×W×D: 420 × 342 × 150 mm
R-state ≥ R5 (B30)	H×W×D: 420 × 342 × 123 mm
R-state ≥ 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 ≥ R5 (B1, B2/ B25, B3, B3B, B66A, B70)	H×W×D: 420 × 342 × 148 mm
R-state ≥ R5 (B7)	H×W×D: 420 × 342 × 169 mm
R-state ≥ R5 (B30)	H×W×D: 420 × 342 × 151 mm
R-state ≥ R5 (with NEBS cover)	H×W×D: 420 × 342 × 157 mm

Description	Value
Weight without Fan Unit (R-state < R5) (10)	
B1, B2/B25, B3, B7, B7A, B66A	20 kg
Weight without Fan Unit (R-state ≥ 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 ≥ 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 ≥ R5) (10)	
B1, B2/B25, B3, B3B, B66A, B70	18.7 kg
B7	20.2 kg
B30	23 kg
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: 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 RBS 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) For the Canadian market, the maximum total output power of LTE 5 MHz and NB-IoT mixed mode is 44.5 dBm. This applies for the NB-IoT carrier allocated in band 2689–2690 MHz.
(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

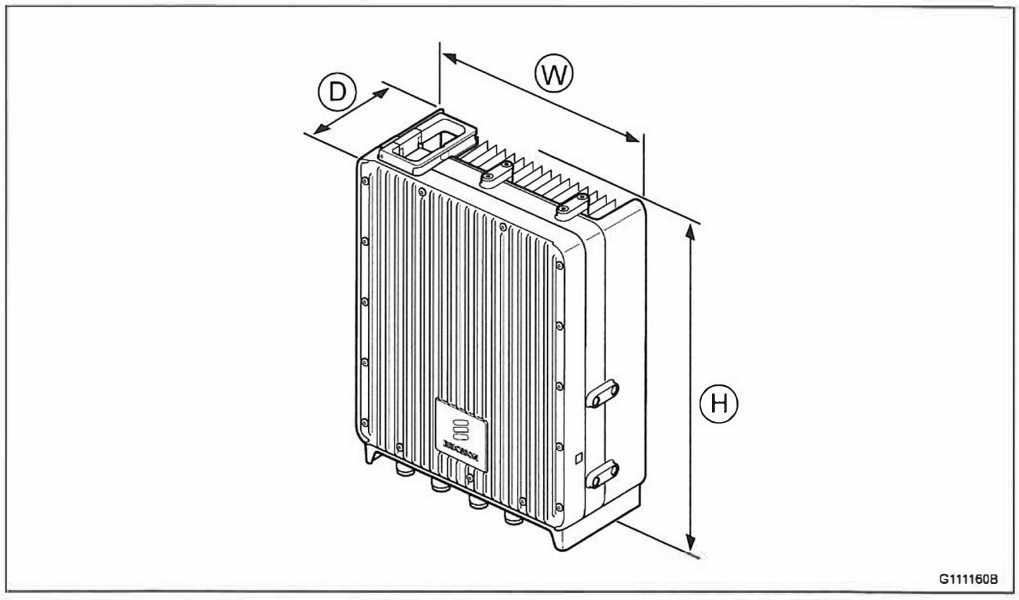


Figure 2 Radio 4415 Height, Width, and Depth

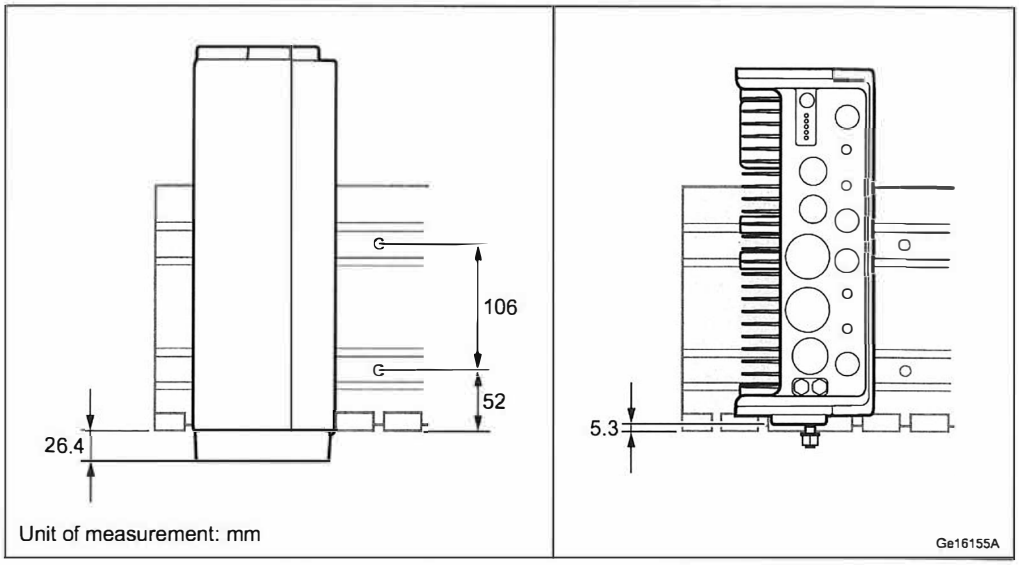


Figure 3 Radio 4415 to Rail Measurement (R-state < R5)

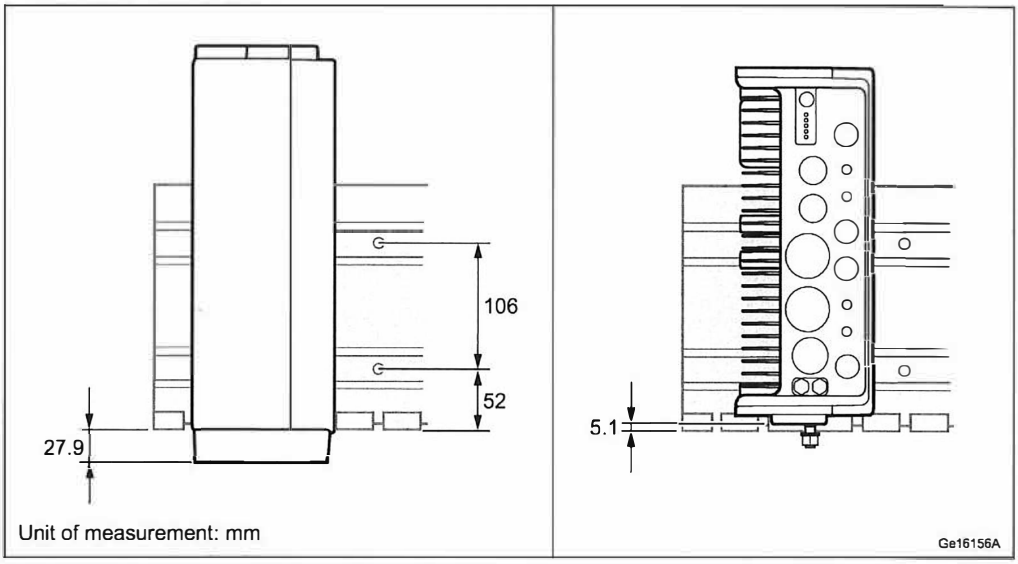


Figure 4 Radio 4415 to Rail Measurement (R-state ≥ R5)

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 ≥ R5 excluding B7	A×B×C×D: 410 × 333 × 88 × 25 mm

Description	Value
B7 R-state ≥ 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 ≥ R5	1.2 kg
Color	
Back cover	NCS S 1002-B
Fan box	NCS S 6502-B

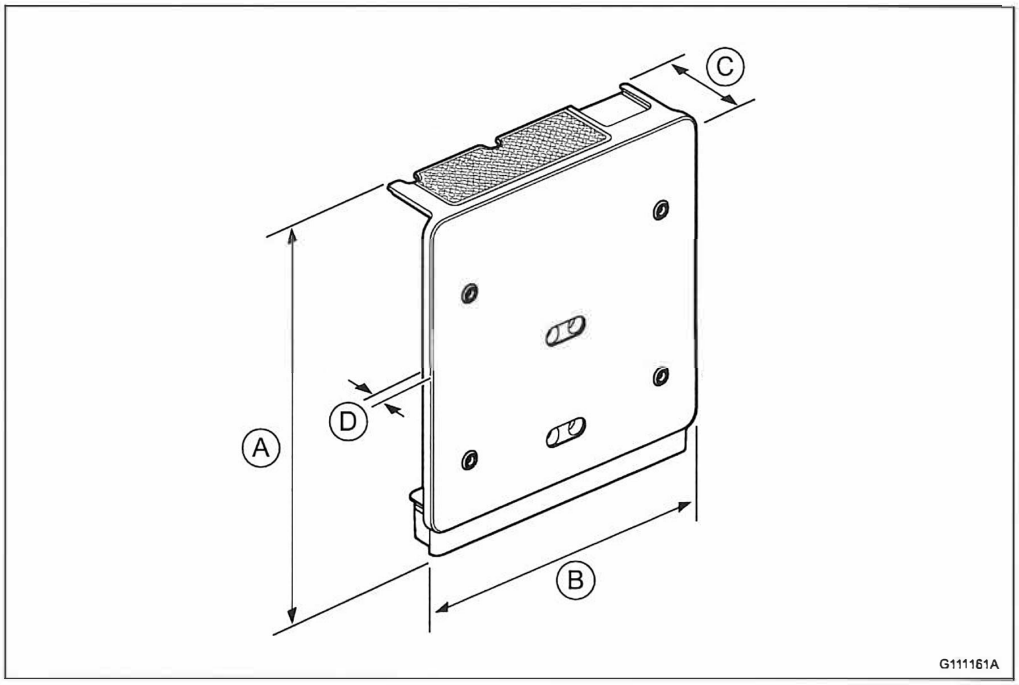


Figure 5 Fan Unit Height, Width, and Depth

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 building ventilation system.

— Near the exhaust of the chimney.

— Opposite large surfaces made of glass or new concrete.

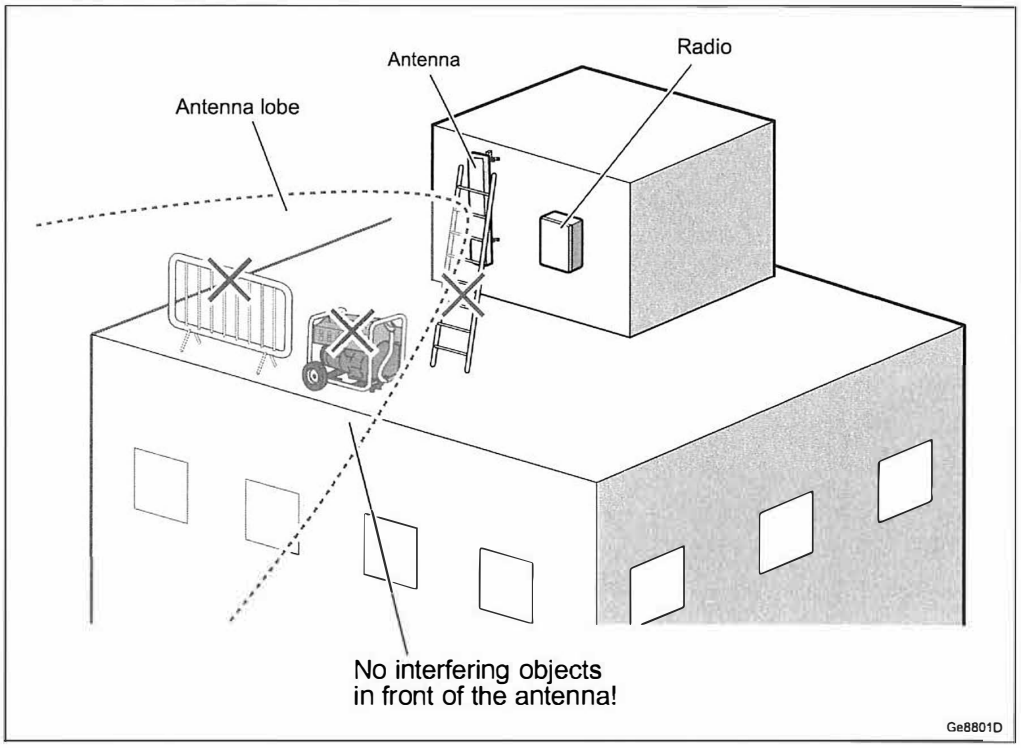
— Near overhanging structures such as roof overhangs.

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

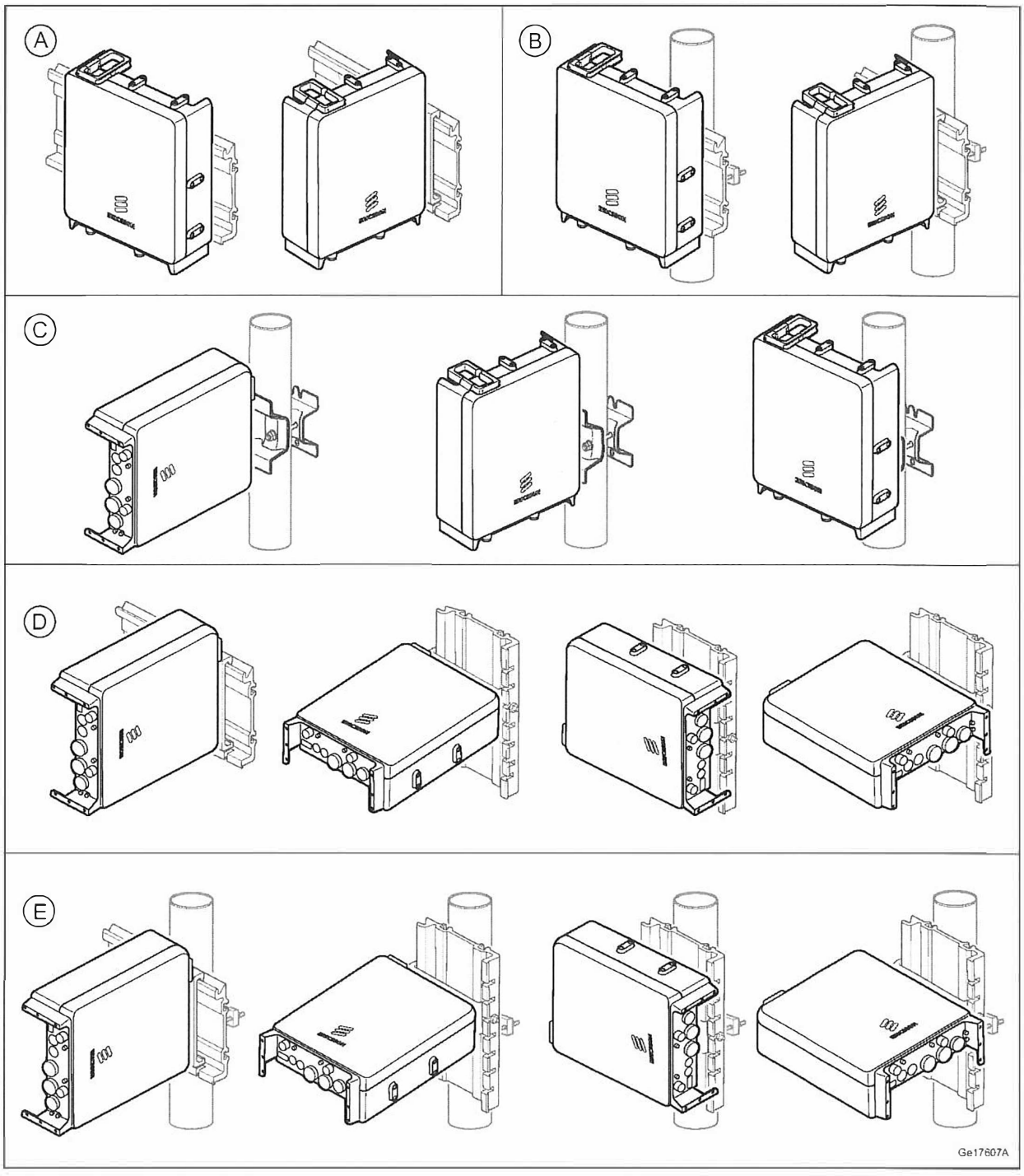


Figure 6 Installation Alternatives 1 (3)

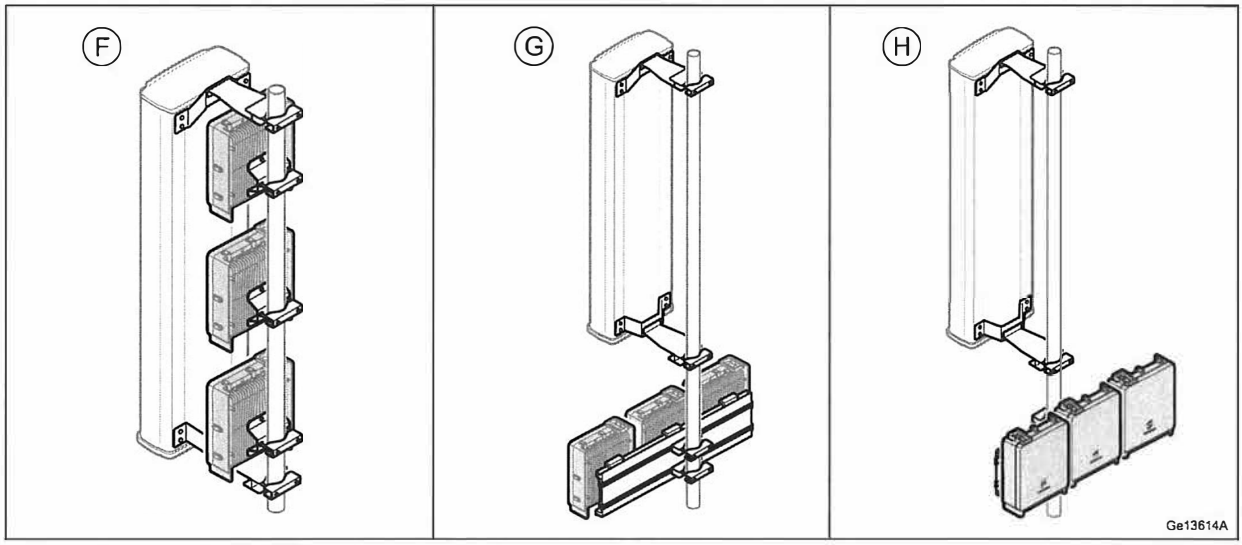


Figure 7 Installation Alternatives 2 (3)

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 ≥ R5)(1)
G, H	Radio Mounted Below the Antenna (R-state ≥ 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 variants that support the installation, see Table 4.

Table 4 Radio Variants that Support Installation in the RBS Cabinet

Unit	Product Number	R-state
Radio 4415 B1	KRC161635/1	R4B, R5B, R5B/A, R5C, R5D
Radio 4415 B1	KRC161635/2	R5B, R5B/A, R5C, R5D
Radio 4415 B2B25	KRC161636/1	R1B, R1B/A, R2B/A, R2D, R5C, R5C/1, R5D, R5E, R5F
Radio 4415 B2B25	KRC161636/3	R1B, R1B/A, R5C, R5C/1, R5D, R5E, R5F
Radio 4415 B3	KRC161637/1	R1C, R1D, R5D, R5E, R5G, R5H, R5H/A, R5K, R5K/A, R5M
Radio 4415 B3	KRC161637/2	R1C, R1D, R5D, R5F, R5F/A, R5K, R5K/A, R5M
Radio 4415 B3B	KRC161771/2	R5A, R5A/1, R5B
Radio 4415 B7	KRC161495/1	R1C, R1C/A, R1C/B, R5B, R5C
Radio 4415 B7	KRC161495/2	R1A, R1B, R1B/A, R5B, R5C
Radio 4415 B7A	KRC161676/1	R1A, R1B

Unit	Product Number	R-state
Radio 4415 B66A	KRC161644/1	R1E, R1F, R5B, R5B/A, R5C
Radio 4415 B66A	KRC161644/3	R1E, R1F, R5B, R5B/A, R5C
Radio 4415 B70	KRC161760/3	R5B, R5C

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 it 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.

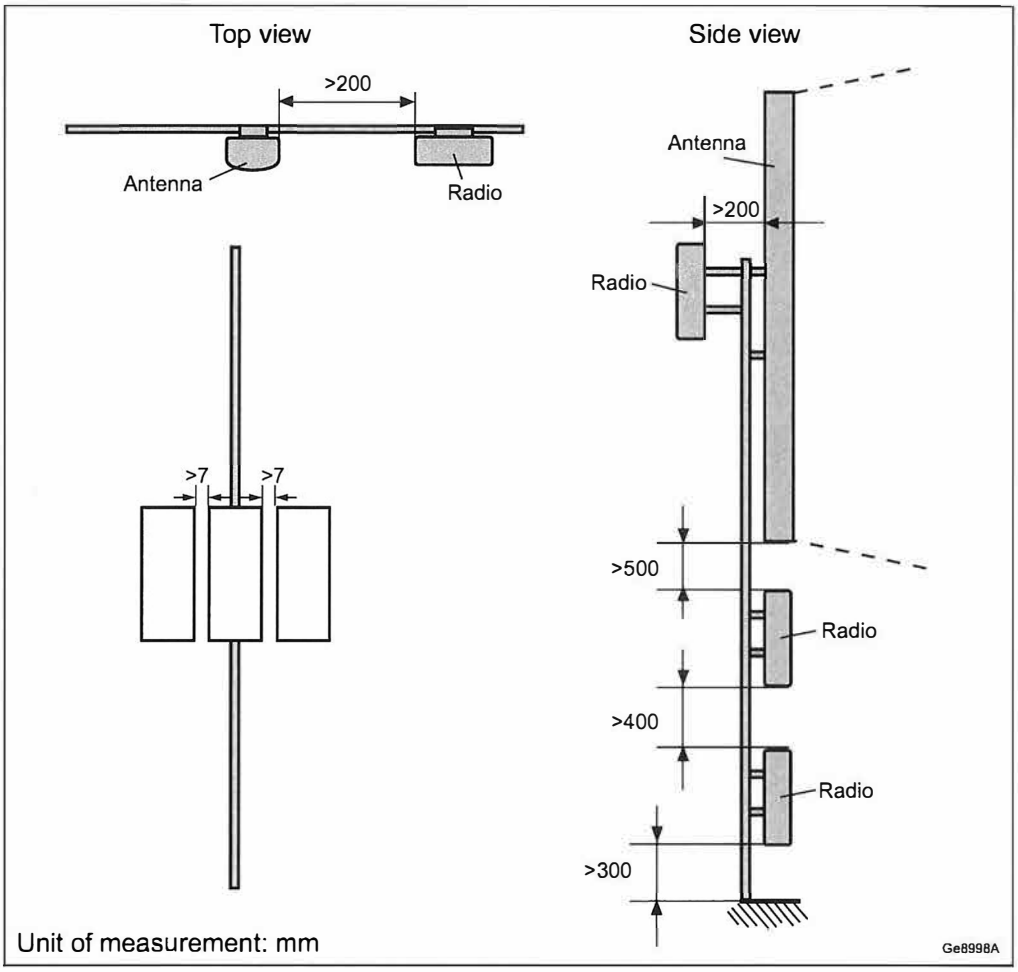


Figure 9 Radio Pole Installation Requirements (R-state < R5 or R-state ≥ R5 with fan)

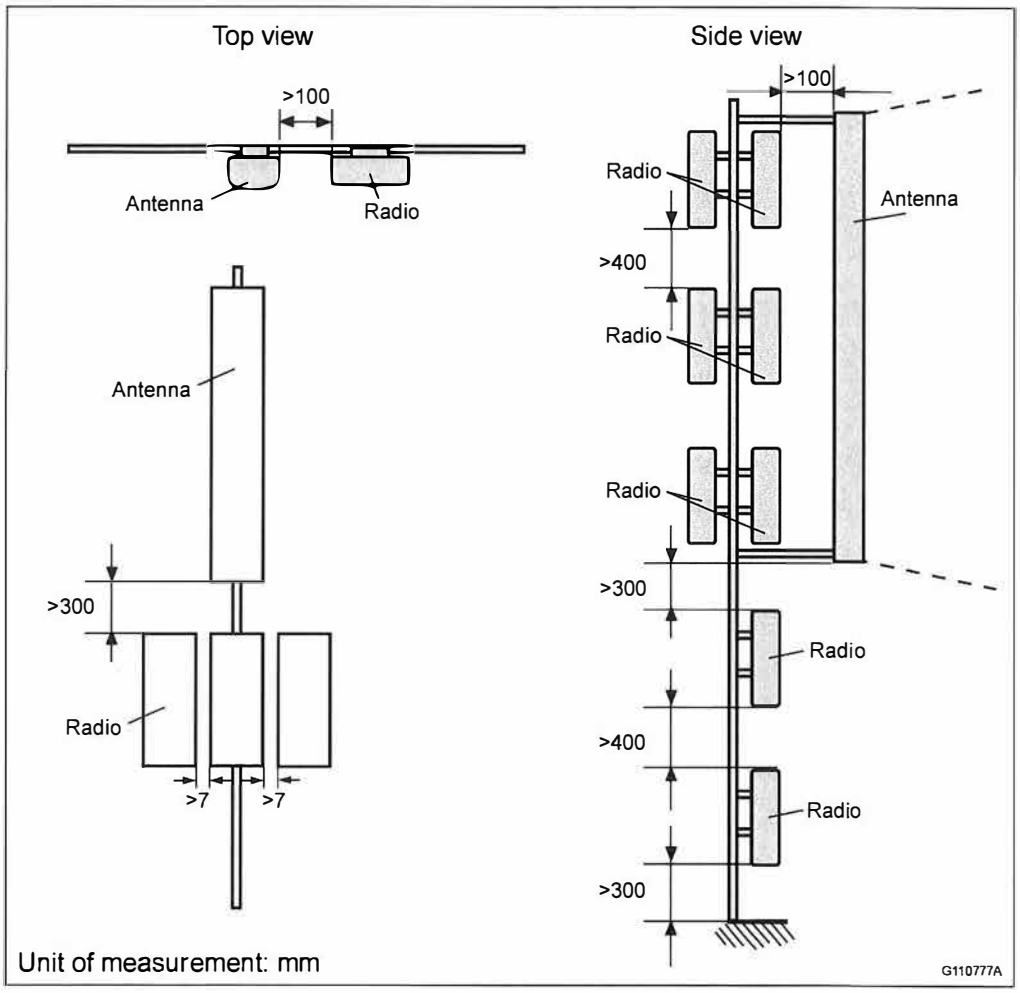


Figure 10 Radio Pole Installation Requirements (R-state ≥ R5 without fan)

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 ≥ R5 with fan) or 300 mm (R-state ≥ 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.

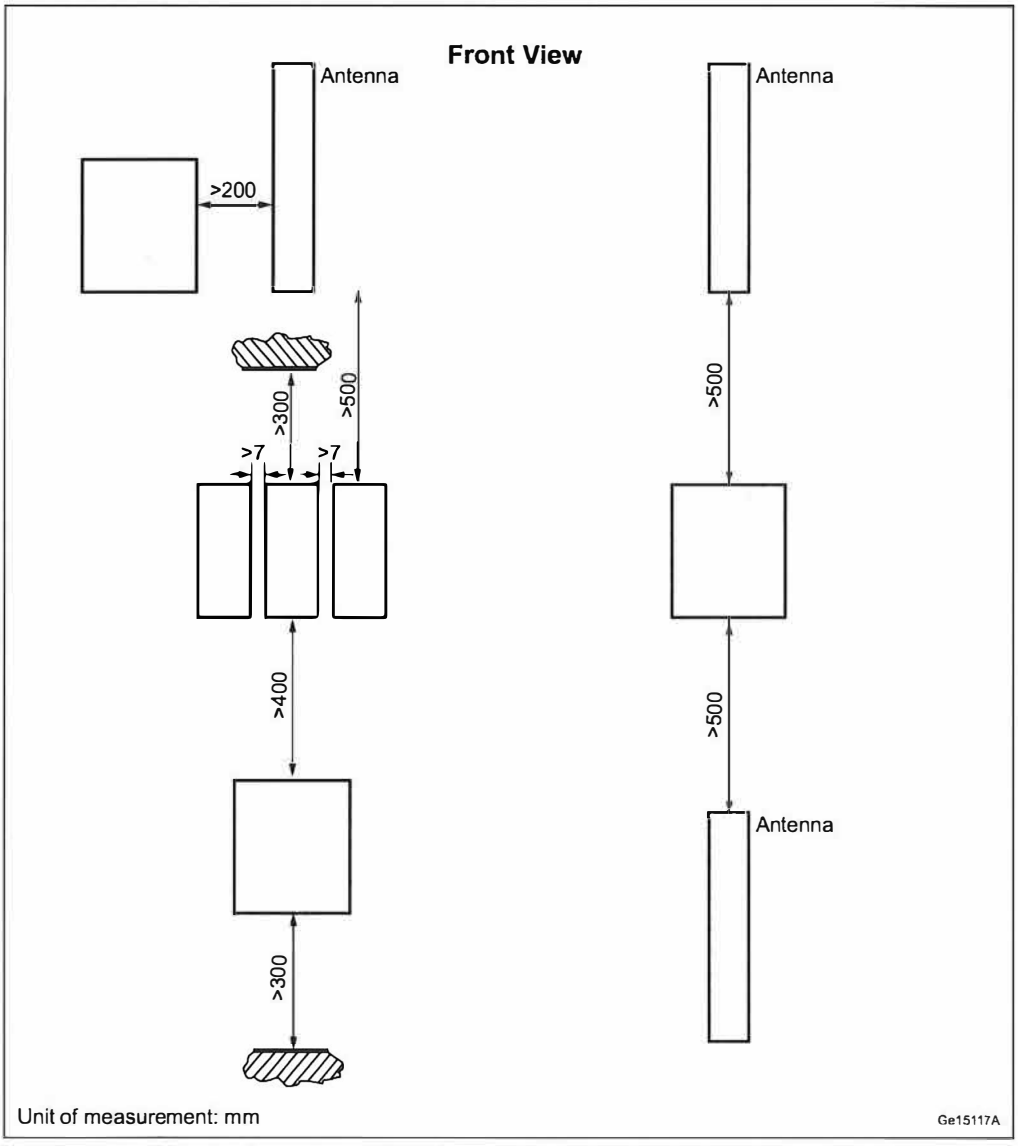


Figure 11 Radio Outdoor Wall Installation Requirements (R-state < R5 or R-state ≥ R5 with fan)

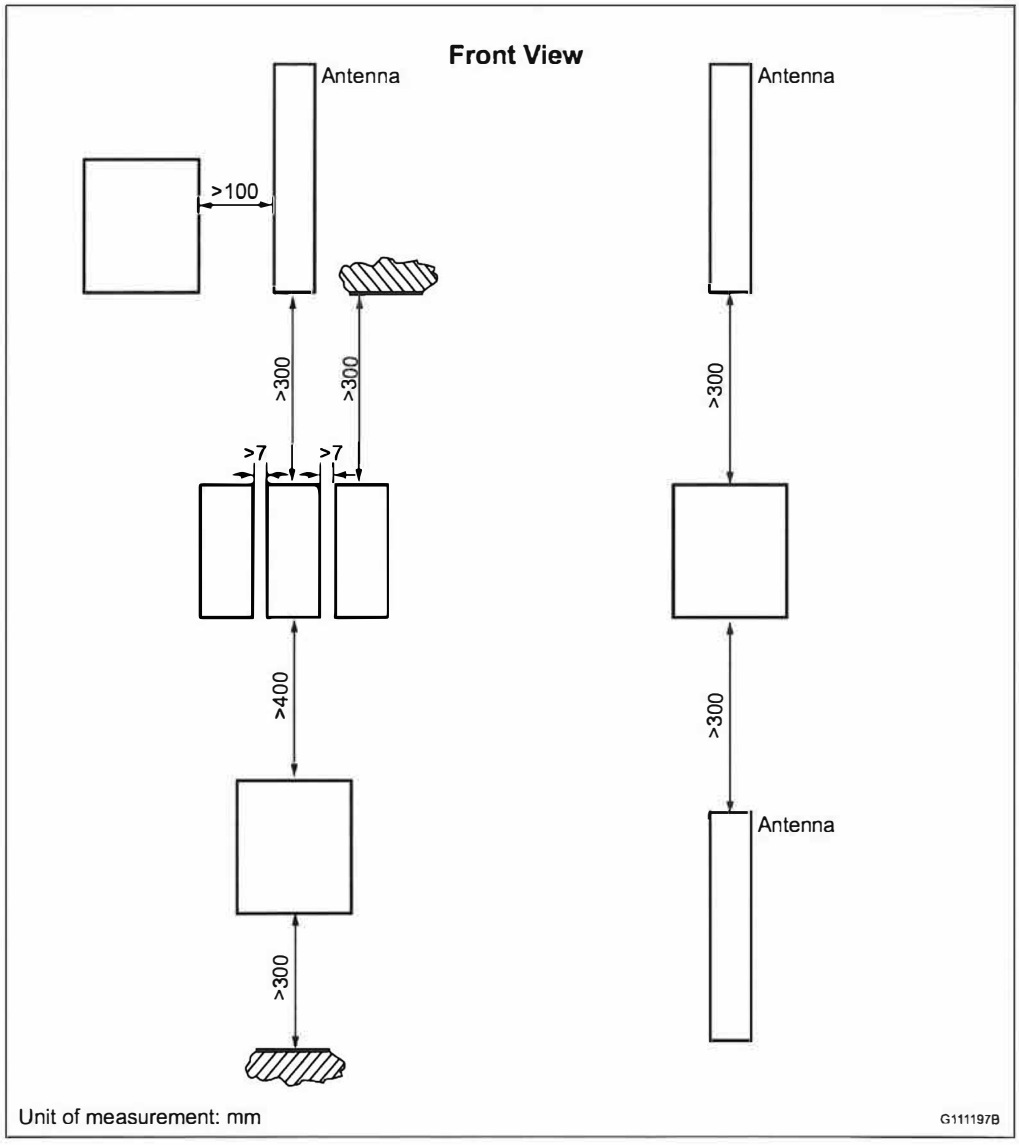


Figure 12 Radio Outdoor Wall Installation Requirements (R-state ≥ R5 without fan)

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 ≥ R5 with fan) or 300 mm (R-state ≥ 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

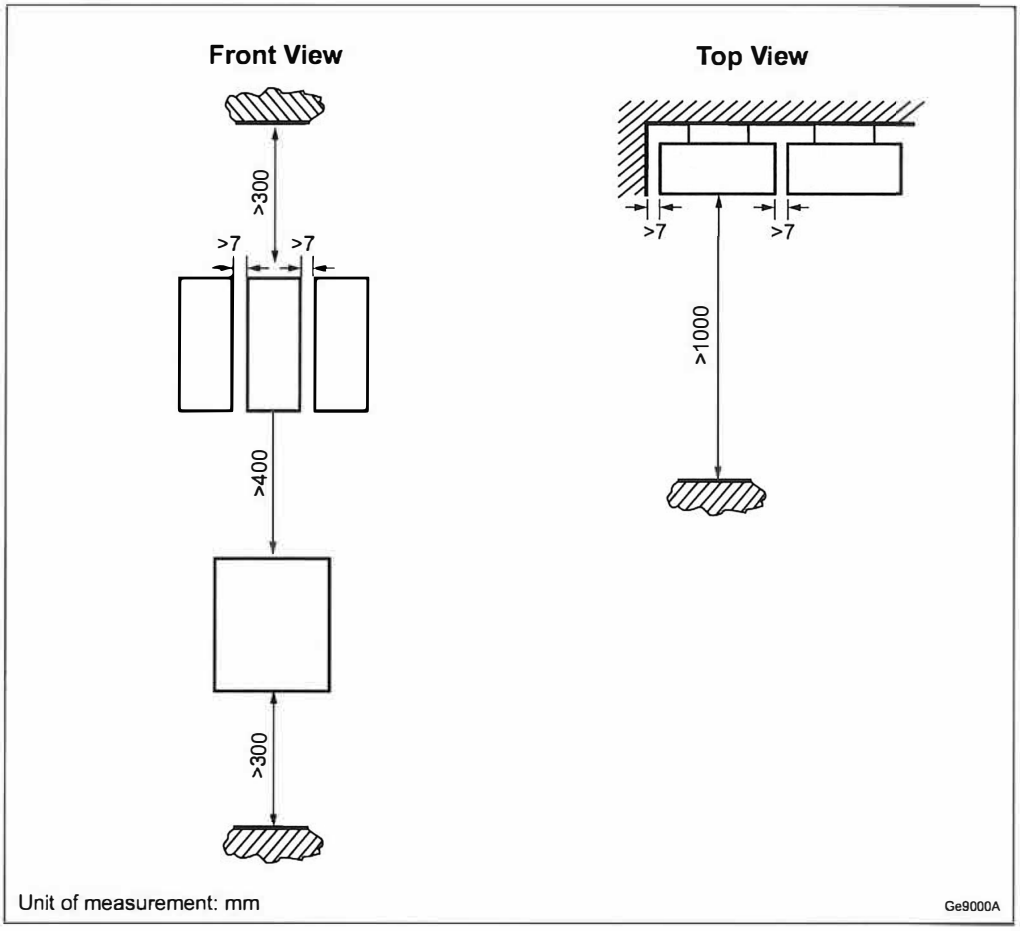


Figure 13 Radio Indoor Wall Installation Requirements

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 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	≤ 1,120 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 50 m/s (pole installed single case)	260 N (front)

(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
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 37.

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.

For information about radio access specific compliance boundaries for electromagnetic exposure, see Radio Frequency Electromagnetic Exposure.

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 RBS 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 9.

For a description of the supported radio configurations, refer to RBS Configurations.

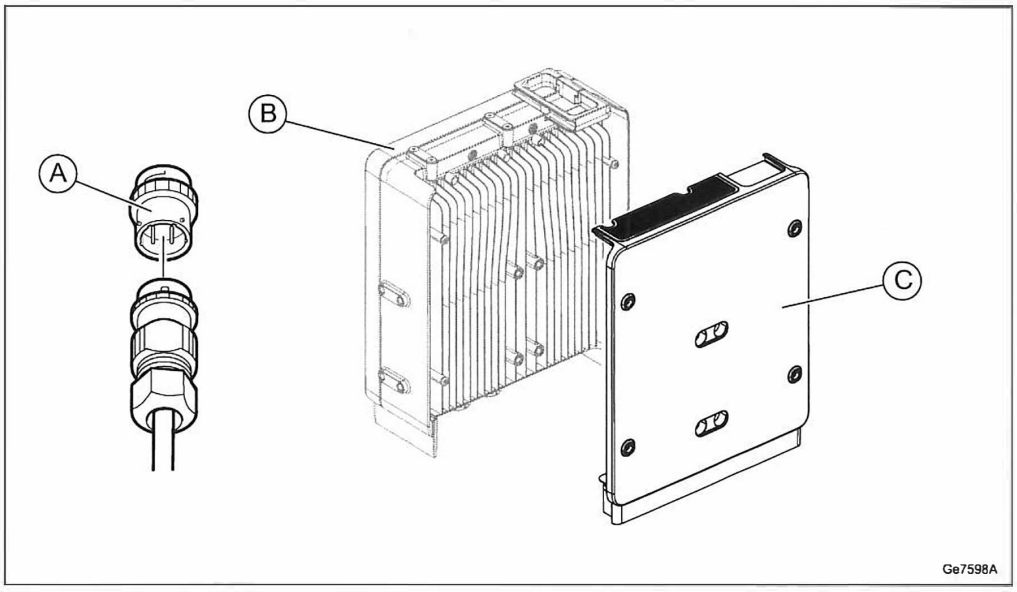


Figure 14 DC Adapter and Radio Components

Table 9 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.

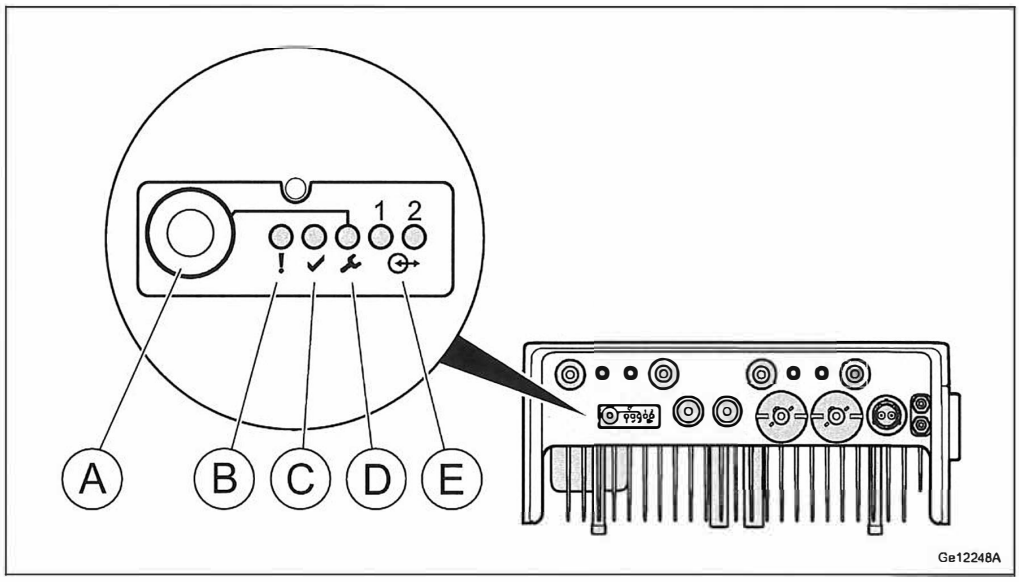


Figure 15 Radio Optical Indicators and Buttons

Table 10 Description of Radio Optical Indicators and Buttons

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

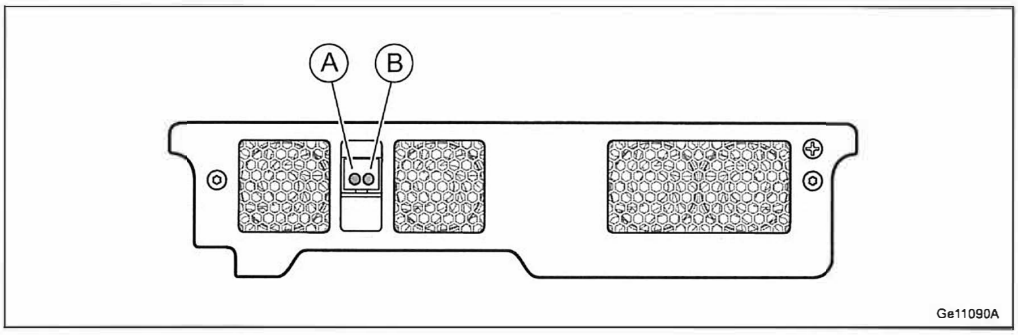


Figure 16 Fan Unit Optical Indicators

Table 11 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

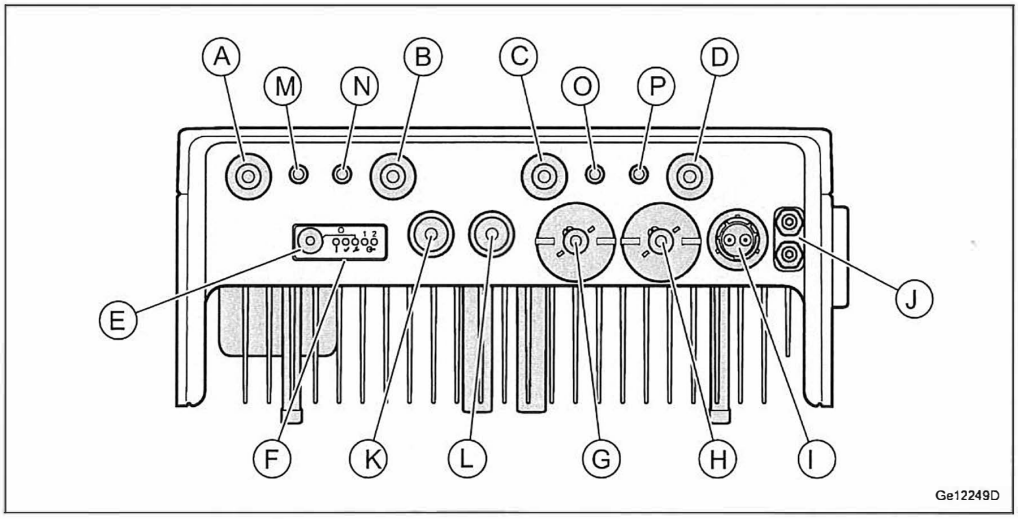


Figure 17 Radio 4415 Connection Interfaces (R-state < R5)

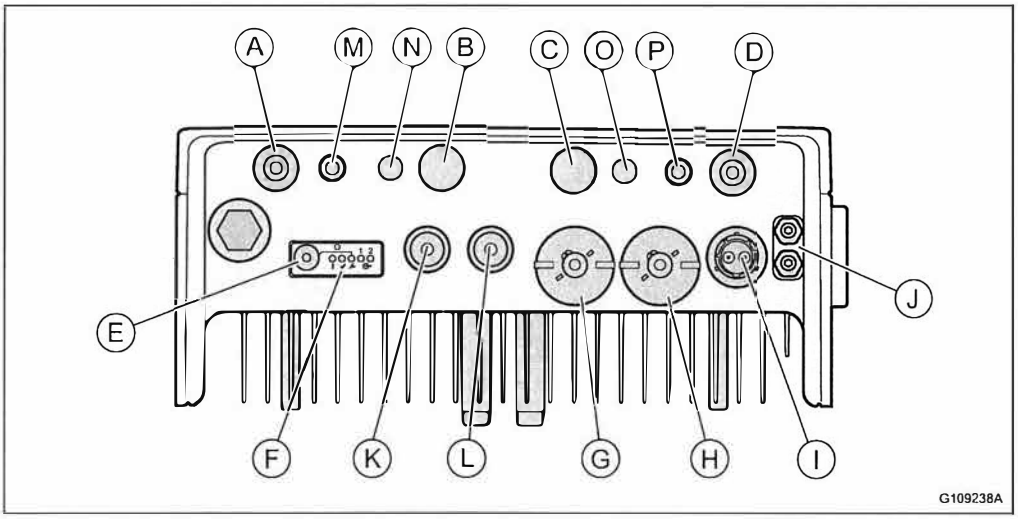
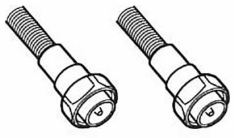
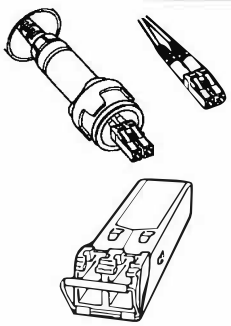
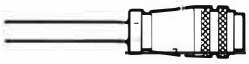
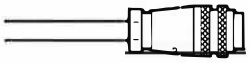


Figure 18 Radio 4415 Connection Interfaces (R-state ≥ R5)

Table 12 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 × M6 bolt	
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.

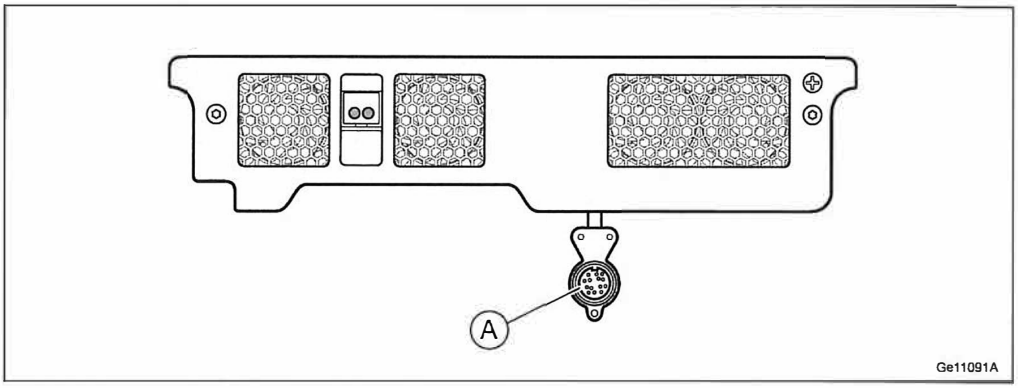


Figure 19 Fan Unit Connection Interface

Table 13 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 14 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 15 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 Main-Remote 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 Main-Remote 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 an M6 dual cable 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 16 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

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.

Federal Communications Commission

Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: AT&T MOBILITY SPECTRUM LLC

ATTN: CECIL J MATHEW
AT&T MOBILITY SPECTRUM LLC
208 S. AKARD ST., RM 1015
DALLAS, TX 75202

Call Sign	File Number
WPXD983	0008671998
Radio Service	
WZ - 700 MHz Lower Band (Blocks C, D)	

FCC Registration Number (FRN): 0014980726

Grant Date	Effective Date	Expiration Date	Print Date
07-30-2019	07-30-2019	06-13-2029	07-31-2019

Market Number	Channel Block	Sub-Market Designator
CMA027	C	0

Market Name
San Jose, CA

1st Build-out Date	2nd Build-out Date	3rd Build-out Date	4th Build-out Date
06-13-2019			

Waivers/Conditions:

If the facilities authorized herein are used to provide broadcast operations, whether exclusively or in combination with other services, the licensee must seek renewal of the license either within eight years from the commencement of the broadcast service or within the term of the license had the broadcast service not been provided, whichever period is shorter in length. See 47 CFR §27.13(b).

Operation of the facilities authorized herein, are subject to the condition that harmful interference may not be caused to, but must be accepted from UHF TV transmitters in Canada and Mexico as identified in existing and any future agreements with those countries.

Conditions:

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

This license may not authorize operation throughout the entire geographic area or spectrum identified on the hardcopy version. To view the specific geographic area and spectrum authorized by this license, refer to the Spectrum and Market Area information under the Market Tab of the license record in the Universal Licensing System (ULS). To view the license record, go to the ULS homepage at http://wireless.fcc.gov/uls/index.htm?job=home and select "License Search". Follow the instructions on how to search for license information.

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: WPXD983 **File Number:** 0008671998 **Print Date:** 07-31-2019

License renewal granted on a conditional basis, subject to the outcome of FCC proceeding WT Docket No. 10-112 (see FCC 10-86, paras. 113 and 126).

This license is subject to compliance with the conditions set forth in the Commission's Order of Modification, WT Docket No. 12-69, DA 14-43, released January 16, 2014.

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: WPXD983 **File Number:** 0008671998 **Print Date:** 07-31-2019

700 MHz Relicensed Area Information:

Market	Market Name	Buildout Deadline	Buildout Notification	Status

Federal Communications Commission

Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: AT&T MOBILITY SPECTRUM LLC

ATTN: CECIL J MATHEW
AT&T MOBILITY SPECTRUM LLC
208 S. AKARD ST., RM 1015
DALLAS, TX 75202

Call Sign	File Number
KNLG542	
Radio Service CW - PCS Broadband	

FCC Registration Number (FRN): 0014980726

Grant Date	Effective Date	Expiration Date	Print Date
04-07-2017	09-21-2018	04-28-2027	

Market Number	Channel Block	Sub-Market Designator
BTA404	D	1

Market Name
San Francisco-Oakland-San Jose

1st Build-out Date	2nd Build-out Date	3rd Build-out Date	4th Build-out Date
04-28-2002			

Waivers/Conditions:

This authorization is subject to the condition that, in the event that systems using the same frequencies as granted herein are authorized in an adjacent foreign territory (Canada/United States), future coordination of any base station transmitters within 72 km (45 miles) of the United States/Canada border shall be required to eliminate any harmful interference to operations in the adjacent foreign territory and to ensure continuance of equal access to the frequencies by both countries.

License renewal granted on a conditional basis, subject to the outcome of FCC proceeding WT Docket No. 10-112 (see FCC 10-86, paras. 113 and 126).

Conditions:

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

This license may not authorize operation throughout the entire geographic area or spectrum identified on the hardcopy version. To view the specific geographic area and spectrum authorized by this license, refer to the Spectrum and Market Area information under the Market Tab of the license record in the Universal Licensing System (ULS). To view the license record, go to the ULS homepage at http://wireless.fcc.gov/uls/index.htm?job=home and select "License Search". Follow the instructions on how to search for license information.

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: KNLG542 **File Number:** **Print Date:**

This authorization is subject to the condition that the remaining balance of the winning bid amount will be paid in accordance with Part 1 of the Commission's rules, 47 C.F.R. Part 1.

This license is conditioned upon compliance with the provisions of Applications of AT&T Wireless Services, Inc. and Cingular Wireless Corporation For Consent to Transfer Control of Licenses and Authorizations, Memorandum Opinion and Order, FCC 04-255 (rel. Oct. 26, 2004).

Commission approval of this application and the licenses contained therein are subject to the conditions set forth in the Memorandum Opinion and Order, adopted on December 29, 2006 and released on March 26, 2007, and revised in the Order on Reconsideration, adopted and released on March 26, 2007. See AT&T Inc. and BellSouth Corporation Application for Transfer of Control, WC Docket No. 06-74, Memorandum Opinion and Order, FCC 06-189 (rel. Mar. 26, 2007); AT&T Inc. and BellSouth Corporation, WC Docket No. 06-74, Order on Reconsideration, FCC 07-44 (rel. Mar. 26, 2007).

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: KNLG542 **File Number:** **Print Date:**

700 MHz Relicensed Area Information:

Market	Market Name	Buildout Deadline	Buildout Notification	Status

Federal Communications Commission

Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: AT&T MOBILITY SPECTRUM LLC

ATTN: CECIL J MATHEW
AT&T MOBILITY SPECTRUM LLC
208 S. AKARD ST., RM 1015
DALLAS, TX 75202

Call Sign	File Number
WPSL625	
Radio Service	
CW - PCS Broadband	

FCC Registration Number (FRN): 0014980726

Grant Date	Effective Date	Expiration Date	Print Date
06-09-2015	08-29-2018	06-23-2025	

Market Number	Channel Block	Sub-Market Designator
MTA004	B	18

Market Name
San Francisco-Oakland-San Jose

1st Build-out Date	2nd Build-out Date	3rd Build-out Date	4th Build-out Date

Waivers/Conditions:

License renewal granted on a conditional basis, subject to the outcome of FCC proceeding WT Docket No. 10-112 (see FCC 10-86, paras. 113 and 126).

Commission approval of this application and the licenses contained therein are subject to the conditions set forth in the Memorandum Opinion and Order, adopted on December 29, 2006 and released on March 26, 2007, and revised in the Order on Reconsideration, adopted and released on March 26, 2007. See AT&T Inc. and BellSouth Corporation Application for Transfer of Control, WC Docket No. 06-74, Memorandum Opinion and Order, FCC 06-189 (rel. Mar. 26, 2007); AT&T Inc. and BellSouth Corporation, WC Docket No. 06-74, Order on Reconsideration, FCC 07-44 (rel. Mar. 26, 2007).

Conditions:

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

This license may not authorize operation throughout the entire geographic area or spectrum identified on the hardcopy version. To view the specific geographic area and spectrum authorized by this license, refer to the Spectrum and Market Area information under the Market Tab of the license record in the Universal Licensing System (ULS). To view the license record, go to the ULS homepage at http://wireless.fcc.gov/uls/index.htm?job=home and select "License Search". Follow the instructions on how to search for license information.

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: WPSL625 **File Number:** **Print Date:**

700 MHz Relicensed Area Information:

Market	Market Name	Buildout Deadline	Buildout Notification	Status

Federal Communications Commission
Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: AT&T MOBILITY SPECTRUM LLC

ATTN: CECIL J MATHEW
AT&T MOBILITY SPECTRUM LLC
208 S. AKARD ST., RM 1015
DALLAS, TX 75202

Call Sign	File Number
WPVC980	
Radio Service CW - PCS Broadband	

FCC Registration Number (FRN): 0014980726

Grant Date	Effective Date	Expiration Date	Print Date
06-09-2015	08-29-2018	06-23-2025	

Market Number	Channel Block	Sub-Market Designator
MTA004	A	3

Market Name
San Francisco-Oakland-San Jose

1st Build-out Date	2nd Build-out Date	3rd Build-out Date	4th Build-out Date
06-23-2000	06-23-2005		

Waivers/Conditions:

License renewal granted on a conditional basis, subject to the outcome of FCC proceeding WT Docket No. 10-112 (see FCC 10-86, paras. 113 and 126).

This license is conditioned upon compliance with the provisions of Applications of AT&T Wireless Services, Inc. and Cingular Wireless Corporation For Consent to Transfer Control of Licenses and Authorizations, Memorandum Opinion and Order, FCC 04-255 (rel. Oct. 26, 2004).

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

This license may not authorize operation throughout the entire geographic area or spectrum identified on the hardcopy version. To view the specific geographic area and spectrum authorized by this license, refer to the Spectrum and Market Area information under the Market Tab of the license record in the Universal Licensing System (ULS). To view the license record, go to the ULS homepage at http://wireless.fcc.gov/uls/index.htm?job=home and select "License Search". Follow the instructions on how to search for license information.

FCC 601-MB
October 2017

Commission approval of this application and the licenses contained therein are subject to the conditions set forth in the Memorandum Opinion and Order, adopted on December 29, 2006 and released on March 26, 2007, and revised in the Order on Reconsideration, adopted and released on March 26, 2007. See AT&T Inc. and BellSouth Corporation Application for Transfer of Control, WC Docket No. 06-74, Memorandum Opinion and Order, FCC 06-189 (rel. Mar. 26, 2007); AT&T Inc. and BellSouth Corporation, WC Docket No. 06-74, Order on Reconsideration, FCC 07-44 (rel. Mar. 26, 2007).

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: WPVC980 **File Number:** **Print Date:**

700 MHz Relicensed Area Information:

Market	Market Name	Buildout Deadline	Buildout Notification	Status

Federal Communications Commission
Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: AT&T MOBILITY SPECTRUM LLC

ATTN: CECIL J MATHEW
AT&T MOBILITY SPECTRUM LLC
208 S. AKARD ST., RM 1015
DALLAS, TX 75202

Call Sign	File Number
WQJU446	0008675429
Radio Service	
WY - 700 MHz Lower Band (Blocks A, B & E)	

FCC Registration Number (FRN): 0014980726

Grant Date	Effective Date	Expiration Date	Print Date
07-31-2019	07-31-2019	06-13-2029	08-01-2019

Market Number	Channel Block	Sub-Market Designator
CMA027	B	0

Market Name
San Jose, CA

1st Build-out Date	2nd Build-out Date	3rd Build-out Date	4th Build-out Date
12-13-2016	06-13-2019		

Waivers/Conditions:

If the facilities authorized herein are used to provide broadcast operations, whether exclusively or in combination with other services, the licensee must seek renewal of the license either within eight years from the commencement of the broadcast service or within the term of the license had the broadcast service not been provided, whichever period is shorter in length. See 47 CFR §27.13(b).

License renewal granted on a conditional basis, subject to the outcome of FCC proceeding WT Docket No. 10-112 (see FCC 10-86, paras. 113 and 126).

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

This license may not authorize operation throughout the entire geographic area or spectrum identified on the hardcopy version. To view the specific geographic area and spectrum authorized by this license, refer to the Spectrum and Market Area information under the Market Tab of the license record in the Universal Licensing System (ULS). To view the license record, go to the ULS homepage at http://wireless.fcc.gov/uls/index.htm?job=home and select "License Search". Follow the instructions on how to search for license information.

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: WQJU446 **File Number:** 0008675429 **Print Date:** 08-01-2019

This license is subject to compliance with the conditions set forth in the Commission's Order of Modification, WT Docket No. 12-69, DA 14-43, released January 16, 2014.

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: WQJU446 **File Number:** 0008675429 **Print Date:** 08-01-2019

700 MHz Relicensed Area Information:

Market	Market Name	Buildout Deadline	Buildout Notification	Status

Federal Communications Commission

Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: AT&T MOBILITY SPECTRUM LLC

ATTN: CECIL J MATHEW
AT&T MOBILITY SPECTRUM LLC
208 S. AKARD ST., RM 1015
DALLAS, TX 75202

Call Sign	File Number
KNLF209	
Radio Service CW - PCS Broadband	

FCC Registration Number (FRN): 0014980726

Grant Date	Effective Date	Expiration Date	Print Date
06-10-2015	09-21-2018	06-23-2025	

Market Number	Channel Block	Sub-Market Designator
MTA004	B	49

Market Name
San Francisco-Oakland-San Jose

1st Build-out Date	2nd Build-out Date	3rd Build-out Date	4th Build-out Date
06-23-2000	06-23-2005		

Waivers/Conditions:

License renewal granted on a conditional basis, subject to the outcome of FCC proceeding WT Docket No. 10-112 (see FCC 10-86, paras. 113 and 126).

Spectrum Lease associated with this license. See Spectrum Leasing Arrangement Letter dated 12/07/2004 and File No. 0001757186.

Spectrum Leasing Arrangement associated with file number 0001757186 was extended to 01/05/2009. See file number 0002157744.

Conditions:

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

This license may not authorize operation throughout the entire geographic area or spectrum identified on the hardcopy version. To view the specific geographic area and spectrum authorized by this license, refer to the Spectrum and Market Area information under the Market Tab of the license record in the Universal Licensing System (ULS). To view the license record, go to the ULS homepage at http://wireless.fcc.gov/uls/index.htm?job=home and select "License Search". Follow the instructions on how to search for license information.

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: KNLF209 **File Number:** **Print Date:**

Commission approval of this application and the licenses contained therein are subject to the conditions set forth in the Memorandum Opinion and Order, adopted on December 29, 2006 and released on March 26, 2007, and revised in the Order on Reconsideration, adopted and released on March 26, 2007. See AT&T Inc. and BellSouth Corporation Application for Transfer of Control, WC Docket No. 06-74, Memorandum Opinion and Order, FCC 06-189 (rel. Mar. 26, 2007); AT&T Inc. and BellSouth Corporation, WC Docket No. 06-74, Order on Reconsideration, FCC 07-44 (rel. Mar. 26, 2007).

Licensee Name: AT&T MOBILITY SPECTRUM LLC

Call Sign: KNLF209 **File Number:** **Print Date:**

700 MHz Relicensed Area Information:

Market	Market Name	Buildout Deadline	Buildout Notification	Status

From: [redacted]
To: City Council
Subject: Fwd: [los-altos-neighbors] AT&T & Verizon Appeal Cell Towers
Date: Thursday, October 10, 2019 4:05:50 PM

Dear Sir/Madam,
Please do not approve more cell towers.
Thanks

---------- Forwarded message ---------
From: **Los Altan** [redacted]
Date: Thu, Oct 10, 2019 at 3:42 PM
Subject: [los-altos-neighbors] AT&T & Verizon Appeal Cell Towers
To: Los Altos Neighbors [redacted]>

Dear Los Altos Neighbors,

Both AT&T and Verizon have submitted appeals to the City of Los Altos stating that their 13 cell towers should receive an exception despite the stringent urgency ordinance that was passed on August 5th.

The appeals will be discussed at the Los Altos City Council meeting held on October 29th, 2019 (time TBD).

I would encourage you to make an appearance at the city council meeting to voice your opinion as well as write to your city council (council@losaltosca.gov) encouraging them to hold steadfast.

Carey

--

From: [redacted]
To: City Council
Subject: 5g cell towers
Date: Thursday, October 10, 2019 4:53:14 PM

Please hold firm to our stance on no 5g cell towers in our town and neighborhoods. From research we have seen, we firmly believe they are harmful. But even if you don't believe that yourselves, please do not allow any 5 g towers until additional testing can be concluded with unequivocal results, one way or the other.
Thank you.
Dorothy Metcalf
Sent from my iPhone

From: [redacted]
To: City Council
Subject: Cell Towers
Date: Thursday, October 10, 2019 9:37:34 PM

To our esteemed representatives:
I encourage you to oppose the appeals of the cell phone companies until we have much more data on this issue. I don't want myself or my family to become a statistic in which other towns learn from. Let's go slowly and wisely into this new technology.
Thank you,
Erin Sobota
[redacted]

From: [redacted]
To: City Council
Subject: AT&T + Verizon cell tower appeals.
Date: Friday, October 11, 2019 9:04:41 AM

Dear Council Members,

It is my understanding that both AT&T and Verizon have submitted appeals to the City of Los Altos stating that their 13 cell towers should receive an exception despite the stringent urgency ordinance that was passed on August 5th.

I urge you to PLEASE hold steadfast and do not cave to their exemption appeals. The health of our residents is far more than the extra dollars they hope to put in their pockets!

Sincerely,
Joan McNulty

From: [redacted]
To: City Council
Subject: Appeals by AT&T and Verizon.
Date: Friday, October 11, 2019 12:03:05 PM

I am a resident of Los Altos. I am writing to urge you to adhere to your original decision regarding the cell phone towers and not cave to the appeals by AT&T and Verizon.

Thank you
Tali
Sent from my iPhone

From: [redacted]
To: City Council
Subject: AT&T and Verizon appeals
Date: Friday, October 11, 2019 2:08:02 PM

Hello,

I understand that AT&T and Verizon are appealing your decision regarding cell tower installations and are asking for an exception. I urge you to hold to the urgency ordinance that was passed on August 5 to continue protecting the Los Altos community and not allow exceptions.

Thank you for your continuing support,
Carol Whiteley

From: [redacted]
To: City Council
Cc: [redacted]
Subject: ATT & Verison request for exception to Cell Tower Ordinance
Date: Friday, October 11, 2019 5:28:44 PM

As a father of a 9yr old (Almond Student), I applaud the city council's prudent passing of the recent cell tower ordinance to limit the new 5G deployment. I don't think Los Altos has to be the proving grounds for new technology with unknown possible health risks from RF radiation. Let's wait for a few years to see if other communities that allow dense cell tower deployment experience adverse health affects before relaxing our ordinance.

Please do NOT grant the exceptions sought by ATT & Verison to the newly passed ordinance.

Thank you,
Keith Onodera
[redacted]
Los Altos, CA 94024

From: [redacted]
To: City Council
Subject: No 5G cell towers
Date: Saturday, October 12, 2019 2:55:36 PM

Hello,

I vehemently oppose the installation of 5G towers in Los Altos (and everywhere else). 5G technology involves from 30 and even up to 300 GHz frequencies, whereas 4G involves frequencies of up to only 6 GHz. There have been **zero** studies on the long-term health effects of 5G frequency on humans. 5G will require numerous closely spaced towers, close to homes, that will be in closer proximity to the ground than current cell towers. A number of countries have already banned 5G technology, and more countries are considering the same.

Ripon, California is an example of a cancer cluster in children attending a school on which a 4G cell tower is located. Exposure to 5G frequency would be exponentially worse. The U.S. Army uses crowd control weaponry with a radio frequency in the 96 GHz range, which causes an instant intolerable sensation of body heat that effectively disperses crowds. The dangerous health effects of 5G technology, including DNA damage, neurotoxicity, cancer, and other damaging health effects, will have the greatest impacts on fetuses, babies, children, and the elderly. Radio wave frequency exposure is cumulative, and the results of long-term high level exposure could place the human population in a health crisis of unprecedented proportions.

The companies promoting 5G technology clearly do not consider the dangerous health effects of 5G on humans; as usual, it is **Profits Over People**, and unfortunately, politicians and government leaders speak the same language. 5G companies plan to spend billions on promoting 5G technology, and regrettably, money usually wins. While 5G would provide speedier Internet and other services, it would also lead to speedier disease and death.

No on 5G.

Sincerely,

Toni Halliwell, RN, PHN
Los Altos resident

From: [redacted]
To: City Council
Subject: Oppose Cell Node Carrier Appeals
Date: Sunday, October 13, 2019 7:11:45 AM

Dear Council,

There are two very important reasons to oppose the ATT and Verizon cell node appeals.

1) Cell nodes are unsightly and do not fit into Los Altos rural nature. Personally view the 5G nodes adjacent to LA High School, and decide if you would want to see these on most telephone poles in Los Altos.

Also, once you agree to install cell nodes, you set a precedent that will be very difficult to reverse. You will be opening the door to future cell node installations, and can hardly say that cell node aesthetics are an issue in Los Altos.

2) Approving a 4G cell node is likely approving a 5G cell node. Once a carrier 'owns' a pole and has a cell node installed, they can likely just upgrade that cell node from 4G to 5G without city approval. That is exactly what they are doing in Europe - see third paragraph under 'Referendum ?'

https://techxplore.com/news/2019-09-health-prompt-swiss-5g-revolt.html

Please stand strong on the emergency ordinance, and it is applicable to these appeals as the likely end result would be 5G cell nodes being installed in Los Altos.

regards -- Roger Heyder

From: Chris Jordan
To: Vency Woo; Dennis Hawkins
Subject: Fwd: Small Cell Nodes
Date: Friday, October 18, 2019 6:33:25 PM

Sent from my iPhone

Begin forwarded message:

From: JT Ginn [redacted]
Date: October 18, 2019 at 5:13:55 PM PDT
To: City Council <council@losaltosca.gov>
Subject: Small Cell Nodes

Hello,

We have owned property at [redacted] since 1993. My wife an I will be visiting family in North Carolina on the date of the meeting to review cell node applications. Therefore I am writing to let the city council know that we believe it is necessary for the town to allow adequate cell reception. In the 21st century this is not a luxury but a necessity.

JT Ginn
[redacted]

Observations

We Have No Reason to Believe 5G Is Safe

The technology is coming, but contrary to what some people say, there could be health risks

By Joel M. Moskowitz on October 17, 2019

Credit: Bill Oxford *Getty Images*

The telecommunications industry and their experts have accused many scientists who have researched the effects of cell phone radiation of "fear mongering" over the advent of wireless technology's 5G. Since much of our research is publicly-funded, we believe it is our ethical responsibility to inform the public about what the peer-reviewed scientific literature tells us about the health risks from wireless radiation.

The chairman of the Federal Communications Commission (FCC) recently announced through a press release that the commission will soon reaffirm the radio frequency radiation (RFR) exposure limits that the FCC adopted in the late 1990s. These limits are based upon a behavioral change in rats exposed to microwave radiation and were designed to protect us from short-term heating risks due to RFR exposure.

Yet, since the FCC adopted these limits based largely on research from the 1980s, the preponderance of peer-reviewed research, more than 500 studies, have found harmful biologic or health effects from exposure to RFR at intensities too low to cause significant heating.

Citing this large body of research, more than 240 scientists who have published peer-reviewed research on the biologic and health effects of nonionizing electromagnetic fields (EMF) signed the International EMF Scientist Appeal, which calls for stronger exposure limits. The appeal makes the following assertions:

"Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life."

The scientists who signed this appeal arguably constitute the majority of experts on the effects of nonionizing radiation. They have published more than 2,000 papers and letters on EMF in professional journals.

The FCC's RFR exposure limits regulate the intensity of exposure, taking into account the frequency of the carrier waves, but ignore the signaling properties of the RFR. Along with the patterning and duration of exposures, certain characteristics of the signal (e.g., pulsing, polarization) increase the biologic and health impacts of the exposure. New exposure limits are needed which account for these differential effects. Moreover, these limits should be based on a biological effect, not a change in a laboratory rat's behavior.

The World Health Organization's International Agency for Research on Cancer (IARC) classified RFR as "possibly carcinogenic to humans" in 2011. Last year, a $30 million study conducted by the U.S. National Toxicology Program (NTP) found "clear evidence" that two years of exposure to cell phone RFR increased cancer in male rats and damaged DNA in rats and mice of both sexes. The Ramazzini Institute in Italy replicated the key finding of the NTP using a different carrier frequency and much weaker exposure to cell phone radiation over the life of the rats.

Based upon the research published since 2011, including human and animal studies and mechanistic data, the IARC has recently prioritized RFR to be reviewed again in the next five years. Since many EMF scientists believe we now have sufficient evidence to

consider RFR as either a probable or known human carcinogen, the IARC will likely upgrade the carcinogenic potential of RFR in the near future.

Nonetheless, without conducting a formal risk assessment or a systematic review of the research on RFR health effects, the FDA recently reaffirmed the FCC's 1996 exposure limits in a letter to the FCC, stating that the agency had "concluded that no changes to the current standards are warranted at this time," and that "NTP's experimental findings should not be applied to human cell phone usage." The letter stated that "the available scientific evidence to date does not support adverse health effects in humans due to exposures at or under the current limits."

The latest cellular technology, 5G, will employ millimeter waves for the first time in addition to microwaves that have been in use for older cellular technologies, 2G through 4G. Given limited reach, 5G will require cell antennas every 100 to 200 meters, exposing many people to millimeter wave radiation. 5G also employs new technologies (e.g., active antennas capable of beam-forming; phased arrays; massive multiple inputs and outputs, known as massive MIMO) which pose unique challenges for measuring exposures.

Millimeter waves are mostly absorbed within a few millimeters of human skin and in the surface layers of the cornea. Short-term exposure can have adverse physiological effects in the peripheral nervous system, the immune system and the cardiovascular system. The research suggests that long-term exposure may pose health risks to the skin (e.g., melanoma), the eyes (e.g., ocular melanoma) and the testes (e.g., sterility).

Since 5G is a new technology, there is no research on health effects, so we are "flying blind" to quote a U.S. senator. However, we have considerable evidence about the harmful effects of 2G and 3G. Little is known the effects of exposure to 4G, a 10-year-old technology, because governments have been remiss in funding this research. Meanwhile, we are seeing increases in certain types of head and neck tumors in tumor registries,

which may be at least partially attributable to the proliferation of cell phone radiation. These increases are consistent with results from case-control studies of tumor risk in heavy cell phone users.

5G will not replace 4G; it will accompany 4G for the near future and possibly over the long term. If there are synergistic effects from simultaneous exposures to multiple types of RFR, our overall risk of harm from RFR may increase substantially. Cancer is not the only risk as there is considerable evidence that RFR causes neurological disorders and reproductive harm, likely due to oxidative stress.

As a society, should we invest hundreds of billions of dollars deploying 5G, a cellular technology that requires the installation of 800,000 or more new cell antenna sites in the U.S. close to where we live, work and play?

Instead, we should support the recommendations of the 250 scientists and medical doctors who signed the 5G Appeal that calls for an immediate moratorium on the deployment of 5G and demand that our government fund the research needed to adopt biologically based exposure limits that protect our health and safety.

The views expressed are those of the author(s) and are not necessarily those of Scientific American.

ABOUT THE AUTHOR(S)

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Joel M. Moskowitz, PhD, is director of the Center for Family and Community Health in the School of Public Health at the University of California, Berkeley. He has been translating and disseminating the research on wireless radiation health effects since 2009 after he and his colleagues published a review paper that found long-term cell phone users were at greater risk of brain tumors. His Electromagnetic Radiation Safety website has had more than two million page views since 2013. He is an unpaid advisor to the International EMF Scientist Appeal and Physicians for Safe Technology.

From: Chris Jordan
To: Vency Woo; Dennis Hawkins
Subject: Fwd: Small Cell Nodes
Date: Friday, October 18, 2019 6:33:25 PM

Sent from my iPhone

Begin forwarded message:

> **From:** JT Ginn <jtginn@msn.com>
> **Date:** October 18, 2019 at 5:13:55 PM PDT
> **To:** City Council <council@losaltosca.gov>
> **Subject: Small Cell Nodes**
>
> Hello,
>
> We have owned property at 174 Frederick CT since 1993. My wife an I will be visiting family in North Carolina on the date of the meeting to review cell node applications. Therefore I am writing to let the city council know that we believe it is necessary for the town to allow adequate cell reception. In the 21st century this is not a luxury but a necessity.
>
> JT Ginn
> 415-531-5120