

# 6 Existing to be Removed



## V7C-665

### 65° Azimuth Beam, 72.0 inches

Directing our energies for you.

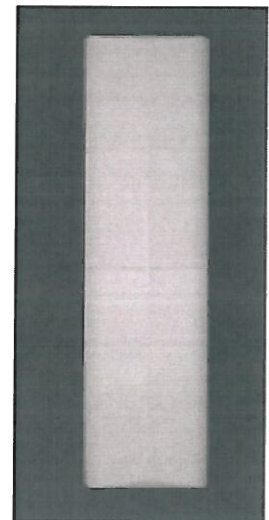
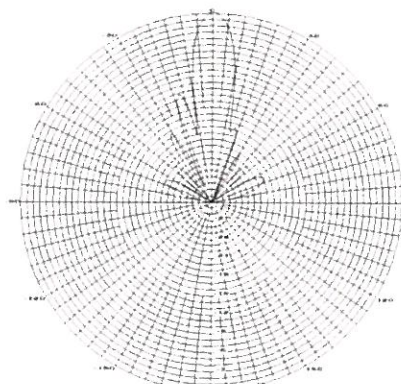
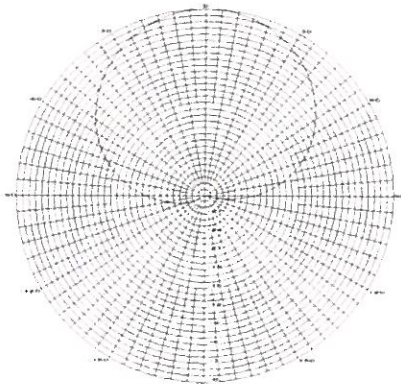
698-896 MHz Vpol

### Electrical Specifications

Frequency	698-896 MHz
Polarization	Vertical
Gain @ 698 MHz	13.2 dBd
Gain @ 752 MHz	13.5 dBd
Gain @ 782 MHz	13.7 dBd
Gain @ 896 MHz	14.3 dBd
Horizontal Beam (3dB Points)	65°
Vertical Beam (3dB Points)	10°
Elect. Downtilt Range, 2° Increments	0-10°
VSWR / Return Loss	<1.40:1 / 15.6 dB
VSWR Opt "i" / Return Loss	<1.50:1 / 14.0 dB
Front-to-Back at Horizon	>30 dB
Upper Side Lobe Suppression	<-18 dB
Impedance	50 Ohms
Power Input Per Connector	500 CW at 800 MHz
Intermodulation (2x20W)	<-150 dBc

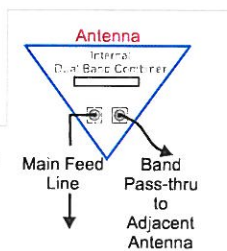
### Mechanical Specifications

Input Connector (female)	Back 7/16 DIN (silver finish) or w/bot. opt.
Antenna Dimensions (LxWxD)	72.0 x 12.5 x 7.1 in. (1829 x 318 x 180mm)
*Antenna Weight	27.4 lbs
Bracket Weight	13.2 lbs
Lightning Protection	Direct Ground
RF Distribution	Printed Microstrip Substrate
Radome	Ultra High-Strength Luran
Weatherability	UV Stabilized, ASTM D1925
Radome Water Absorption	ASTM D570, 0.45%
Environmental	MIL-STD-810E
Wind Survival	150 mph
Front Wind Load @ 100MPH	177.4 lbs
Equivalent Flat Plate @ 100MPH	3.6 sq-ft. (c=2)
Mounting Brackets	Fits 3.5 Inch Max. O.D. Pipe
Mechanical Downtilt Range	0-12°
Clamps/Bolts	Hot Dip Galvanized Steel/Stainless Steel



### Available with Opt "i"

- The Opt "i" antenna option provides Integrated Diplexers that reduce mainline cables and eliminate separate external devices.



Return Loss at pass-thru port into 50Ω load  $\geq 17.7$  dB

## 5 Year Warranty

### Ordering Information & Options

- V7C-665-x      "-x" is a placeholder for the built-in fixed electrical downtilt in degrees, set to 0, 2, 4, 6, 8 or 10
- V7C-665-xi    to add the Opt "i" option for integrated diplexers, add "i" to model number
- V7C-665-xi-bot    for bottom mounted connectors, add "-bot" (otherwise antenna comes standard with back mounted connectors)
- V7C-665-xi-bot-j#    add a "-j#" to add a 1/2" RF cable, where "#" is the cable length, "j2" is 2 meters, "j4" is 4 meters, "j6" is 6 meters...

\*Antenna Weight may vary slightly with options such as back or bottom connector and integrated diplexers.

3 Existing to Remain  
3 Existing to be Removed



X7C-665

65° Azimuth Beam, 72.0 inches

Directing our energies for you.

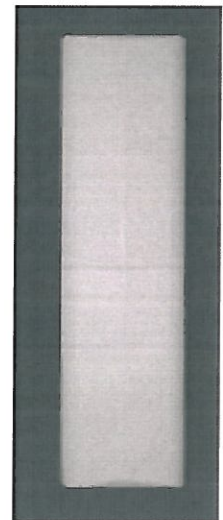
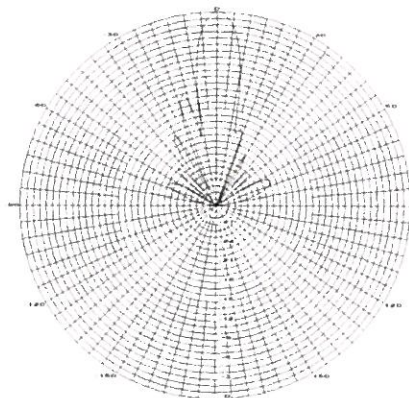
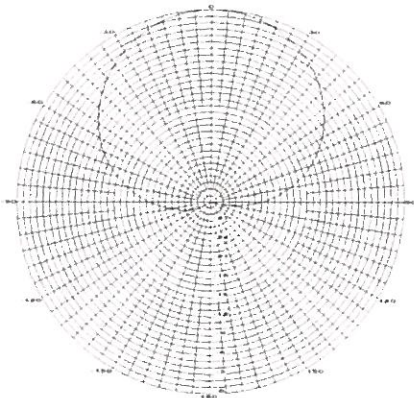
698-896 MHz Xpol

**Electrical Specifications**

Frequency	698-896 MHz
Polarization	Slant +/- 45
Gain @ 698 MHz	13.2 dBd
Gain @ 752 MHz	13.5 dBd
Gain @ 782 MHz	13.7 dBd
Gain @ 896 MHz	14.3 dBd
Horizontal Beam (3dB Points)	65°
Vertical Beam (3dB Points)	10°
Elect. Downtilt Range, 2° Increments	0-10°
VSWR / Return Loss	<1.40:1 / 15.6 dB
VSWR Opt "i" / Return Loss	<1.50:1 / 14.0 dB
Front-to-Back at Horizon	>30 dB
Upper Side Lobe Suppression	<-18 dB
Impedance	50 Ohms
Power Input Per Connector	500 CW at 800 MHz
Isolation	< -26 dB
Intermodulation (2x20W)	<-150 dBc

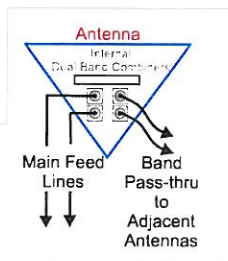
**Mechanical Specifications**

Input Connector (female)	Back 7/16 DIN (silver finish) or w/bol. opt.
Antenna Dimensions (LxWxD)	72.0 x 12.5 x 7.1 in. (1829 x 318 x 180mm)
*Antenna Weight	30.0 lbs
Bracket Weight	13.2 lbs
Lightning Protection	Direct Ground
RF Distribution	Printed Microstrip Substrate
Radome	Ultra High-Strength Luran
Weatherability	UV Stabilized, ASTM D1925
Radome Water Absorption	ASTM D570, 0.45%
Environmental	MIL-STD-810E
Wind Survival	150 mph
Front Wind Load @ 100MPH	177.4 lbs
Equivalent Flat Plate @ 100MPH	3.6 sq-ft. (c=2)
Mounting Brackets	Fits 3.5 Inch Max. O.D. Pipe
Mechanical Downtilt Range	0-12°
Clamps/Bolts	Hot Dip Galvanized Steel/Stainless Steel



**Available with Opt "i"**

➤ The Opt "i" antenna option provides Integrated Diplexers that reduce mainline cables and eliminate separate external devices.



Return Loss at pass-thru port into 50Ω load ≥17.7 dB

**5 Year Warranty**

**Ordering Information & Options**

- X7C-665-x                    "-x" is a placeholder for the built-in fixed electrical downtilt in degrees, set to 0, 2, 4, 6, 8 or 10
- X7C-665-xi                 to add the Opt "i" option for integrated diplexers, add "i" to model number
- X7C-665-xi-bol           for bottom mounted connectors, add "-bol" (otherwise antenna comes standard with back mounted connectors)
- X7C-665-xi-bol-j#       add a "-j#" to add a 1/2" RF cable, where "#" is the cable length, "j2" is 2 meters, "j4" is 4 meters, "j6" is 6 meters...

\*Antenna Weight may vary slightly with options such as back or bottom connector and integrated diplexers.





# 3 Existing to Remain



## AXP18-60

60° Azimuth Beam, 48 inches

Directing our energies for you.

1710-2170 MHz Band

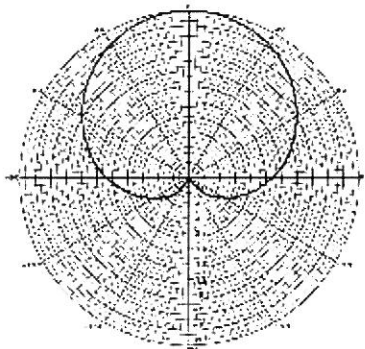
### Electrical Specifications

Frequency	1710-2170 MHz
Polarization	Slant +/- 45
Gain @ 1710 MHz	17.1 dBi
Gain @ 1920 MHz	17.4 dBi
Gain @ 2170 MHz	17.8 dBi
Horizontal Beam (3dB Points)	60°
Vertical Beam (3dB Points)	7°
Electrical Downtilt Options	0, 2, 4 or 6°
VSWR	<1.40:1
Front-to-Back at Horizon	>30 dB
Upper Side Lobe Suppression	<-18 dB
Impedance	50 Ohms
Power Input Per Connector (W CW)	250 Watts
Isolation	< -28 dB
Intermodulation (2x20W)	typ -150 dBc

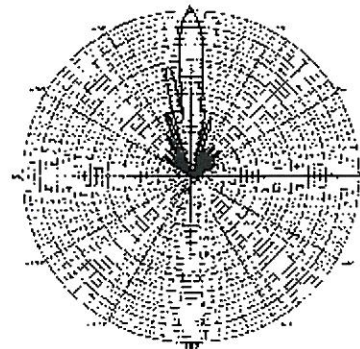
### Mechanical Specifications

Input Connector (female)	Back Mounted 7/16 DIN (silver finish)
Antenna Dimensions (inches)	48 x 6.7 x 4
Antenna Weight	10 lbs
Bracket Weight	13.4 lbs
Lightning Protection	Direct Ground
RF Distribution	Printed Microstrip Substrate
Radome	Ultra High-Strength Luran
Weatherability	UV Stabilized, ASTM D1925
Radome Water Absorption	ASTM D570, 0.45%
Environmental	MIL-STD-810E
Wind Survival	150 mph
Front Wind Load at 100 mph	63.5 lbs
Front Flat Plate Equivalent	1.35 sq-ft. (c=2)
Mounting Brackets	Fits 2.5 to 3 Inch Schedule 40 Pipe
Mechanical Downtilt Range	0-12°
Clamps/Bolts	Hot Dip Galvanized Steel/Stainless Steel

Typical Horizontal Beam

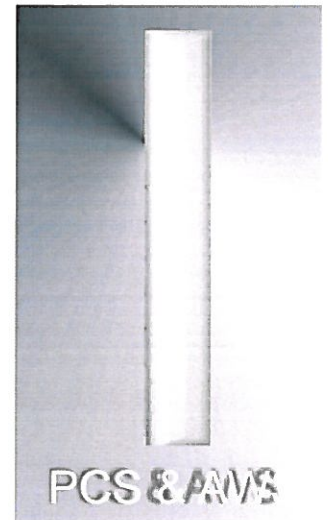
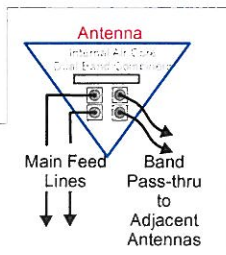


Typical Vertical Beam



#### Available with Opt "i"

- ▶ The Opt "i" antenna option provides Integrated Diplexers that reduce mainline cables and eliminate separate external devices. Add 1" to the antenna depth for Opt "i".



5 Year Warranty

### Ordering Information & Options

AXP18-60-x	"-x" is a placeholder for the built-in fixed electrical downtilt in degrees, set to 0, 2, 4 or 6
AXP18-60-xi	to add the Opt "i" option for integrated diplexers, add "i" to model number
AXP18-60-xi-b	for bottom mounted connectors, add "-b" (otherwise antenna comes standard with back mounted connectors)
AXP18-60-xi-b-j#	add a "-j#" to add a 1/2" RF cable, where "#" is the cable length, "j2" is 2 meters, "j4" is 4 meters, "j6" is 6 meters...

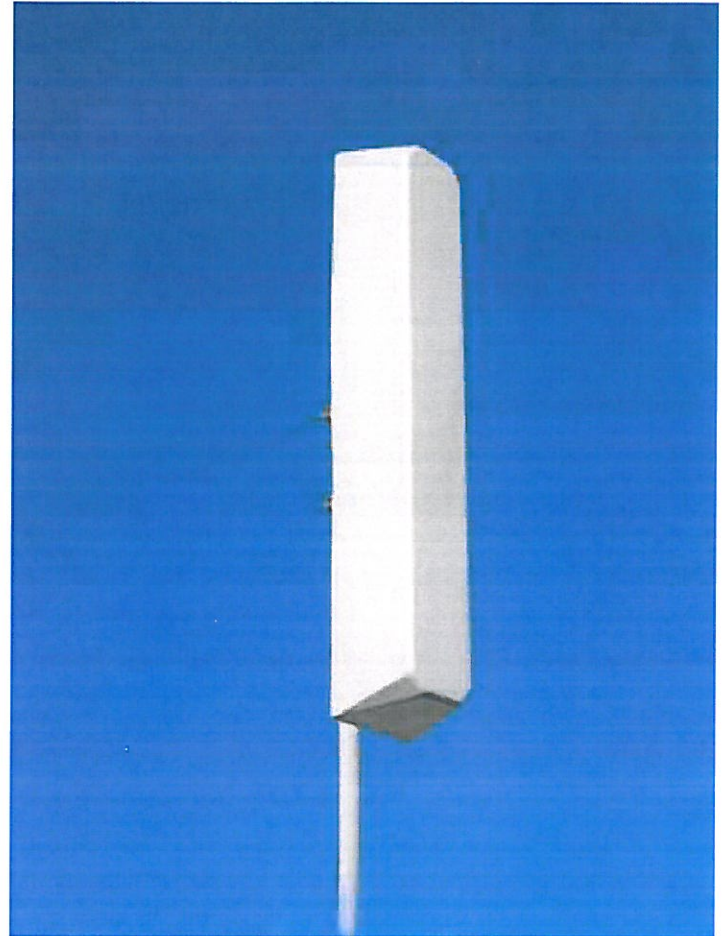
# 3 Proposed

## SWCP 2x5515

698 - 896 MHz Dual (2x) CP log-periodic antenna

### Features

- Transmit Diversity Gain
- Can be configured to combine space & polarization diversity
- Outstanding performance over the entire band (698 - 896 MHz)
- Excellent Axial Ratio
- Optimized for 4G & 3G systems
- Low intermodulation
- Improved Side-to-side rejection
- Fading reduction
- Excellent isolation between ports



### Electrical specifications

Frequency range:	<b>698 - 896 MHz</b>
Impedance:	<b>50 ohm</b>
Connector type:	<b>7/16 Din</b>
Return loss:	<b>18 dB</b>
Polarization:	<b>Circular</b>
Gain ea. port [Circular]:	<b>2x15 dBdC</b>
Gain ea. port [Linear]:	<b>2x12 dBdL</b>
Axial Ratio:	<b>2 dB</b>
Isolation between ports (TX band):	<b>30 dB</b>
Front-to-back ratio:	<b>30 dB</b>
Intermodulation (2x20W):	<b>IM3 150 dB</b>
	<b>IM5 160 dB</b>
	<b>IM7/9 170 dB</b>
Power rating:	<b>2x 500 W</b>
H-plane (-3 dB point):	<b>2x 55°</b>
V-plane (-3 dB point):	<b>2x 11°</b>
Lightning protection:	<b>DC grounded</b>

### Mechanical specifications

Overall height:	<b>76.7 in</b>	<b>[1948 mm]</b>
Width:	<b>14 in</b>	<b>[356 mm]</b>
Depth:	<b>11.3 in</b>	<b>[287 mm]</b>
Weight (excluding brackets):	<b>30 lbs</b>	<b>[13.5 Kg]</b>
Wind load measured up to:	<b>150 mph</b>	<b>[240 Km/h]</b>
Wind area (front of antenna):	<b>7.46 sq. ft.</b>	<b>[0.69 sq.m]</b>
Lateral thrust at 113 mph/ 180 Km/h (worst case):	<b>381 lbs</b>	<b>[1694 N]</b>

### Materials

Radiating Elements:	<b>Aluminum</b>
Transformer (Power distribution)	<b>Ceramic PCB</b>
Chassis:	<b>Aluminum</b>
Radome:	<b>Grey Fiberglass/PVC</b>
Mounting bolts:	<b>Stainless steel</b>

*The SWCP 2x5515 is made in the U.S.A.*



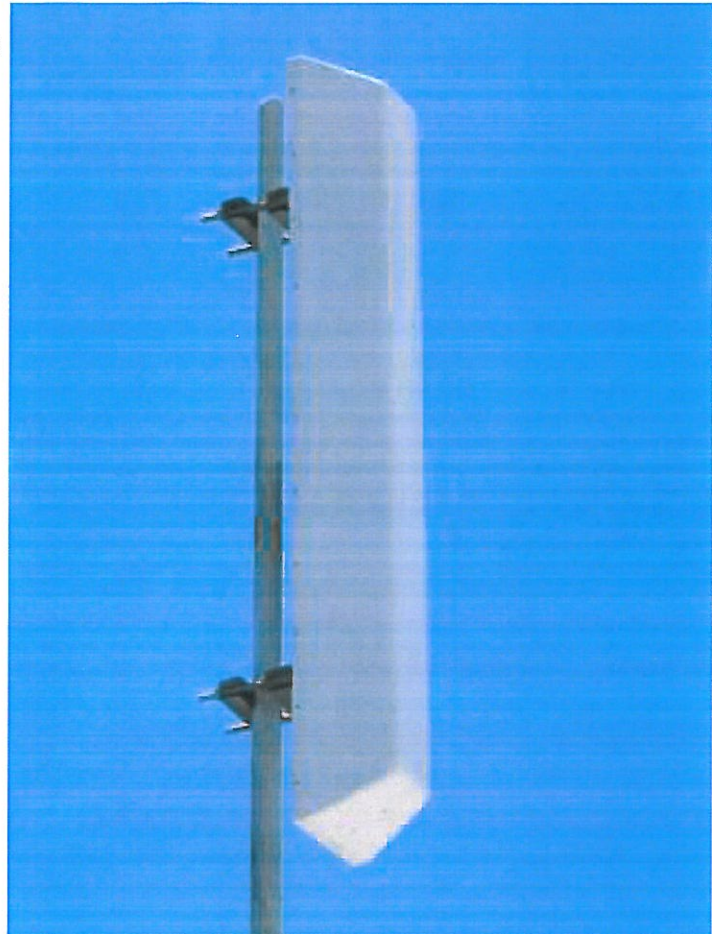
# 3 Proposed

## SACP 2x5516

1710 -2170 MHz Dual (2x) CP log-periodic antenna

### Features

- Transmit Diversity Gain
- Can be configured to combine space & polarization diversity
- Outstanding performance over the entire band (1710 - 2170 MHz)
- Excellent Axial Ratio
- Optimized for 4G & 3G systems
- Low intermodulation
- Improved Side-to-side rejection
- Fading reduction
- Excellent isolation between ports



### Electrical specifications

Frequency range:	1710-2170 MHz
Impedance:	50 ohm
Connector type:	7/16 Din
Return loss:	18 dB
Polarization:	Circular
Gain ea. port [Circular]:	2x16 dBdC
Gain ea. port [Linear]:	2x13 dBdL
Axial Ratio:	2 dB
Isolation between ports (TX band):	28 dB
Front-to-back ratio:	30 dB
Intermodulation (2x20W):	IM3 150 dB
	IM5 160 dB
	IM7/9 170 dB
Power rating:	2x 300 W
H-plane (-3 dB point):	2x 55°
V-plane (-3 dB point):	2x 7°
Lightning protection:	DC grounded

### Mechanical specifications

Overall height:	56 in	[1422 mm]
Width:	9.7 in	[246 mm]
Depth:	6.5 in	[165 mm]
Weight (excluding brackets):	16 lbs	[7.2 Kg]
Wind load measured up to:	150 mph	[240 Km/h]
Wind area (front of antenna):	3.76 sq. ft.	[0.35 sq.m]
Lateral thrust at 113 mph/ 180 Km/h (worst case):	192 lbs	[855 N]

### Materials

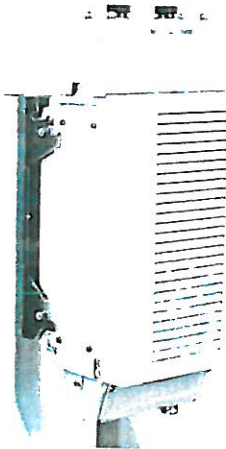
Radiating Elements:	Silver plated brass
Transformer (Power distribution)	Ceramic PCB
Chassis:	Aluminum
Radome:	Grey Fiberglass/PVC
Mounting bolts:	Stainless steel

*The SACP 2x5516 is made in the U.S.A.*

# 3 Proposed

## Alcatel-Lucent RRH2x40-AWS REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low

capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

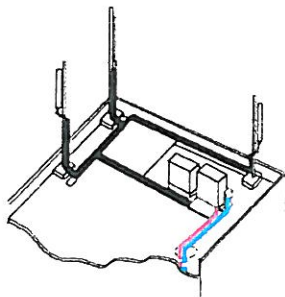
### Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.



## Excellent RF performance

Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.



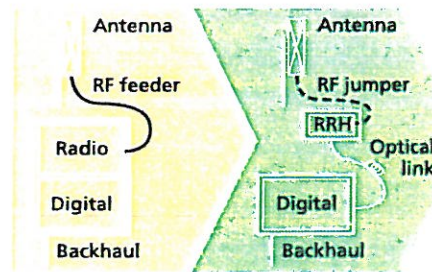
Macro

## Features

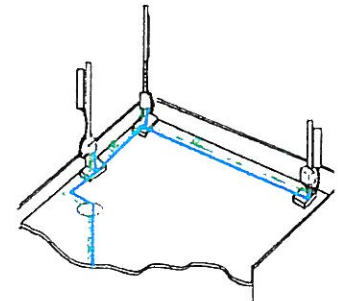
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

## Benefits

- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



RRH for space-constrained cell sites



Distributed

## Technical specifications

### Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170mm (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

### Power

- Power supply: -48VDC

### Operating environment

- Outdoor temperature range:
  - With solar load: -40°C to +50°C (-40°F to +122°F)
  - Without solar load: -40°C to +55°C (-40°F to +131°F)

- Passive convection cooling (no fans)
- Enclosure protection
  - IP65 (International Protection Rating)

### RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - TMA and Remote electrical tilt (RET) support via AISG v2.0

### Optical characteristics

#### Type/number of fibers

- Single-mode variant
  - One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - Single mode dual fiber (SM/DF)
- Multi-mode variant
  - Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

### Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

### Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

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# 1 Proposed

## DATA SHEET

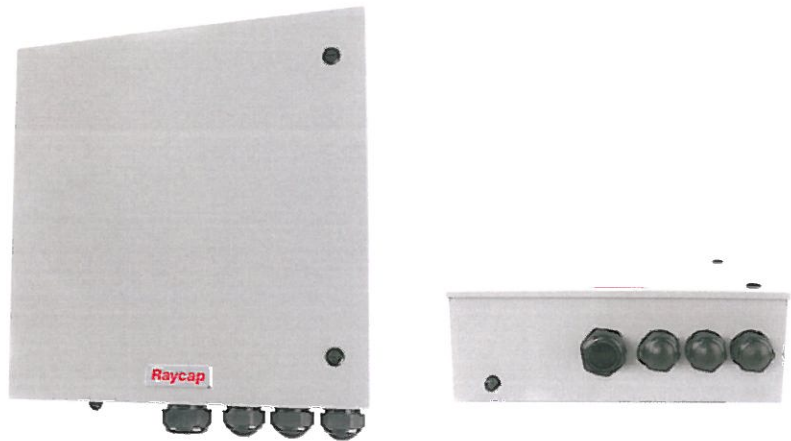
### DC Surge Protection for RRHs

**RDC-6730-PF-48 • RDC-6637-PF-48 • RDC-4276-PF-48**

Overvoltage Protection & Fiber Management Junction Box

The deployment of Remote Radio Head (RRH) architecture poses unique challenges to the mobile telecom industry.

Raycap's innovative RRH protection solutions mitigate the risk of damage due to lightning and provide high levels of availability and reliability to radio equipment.

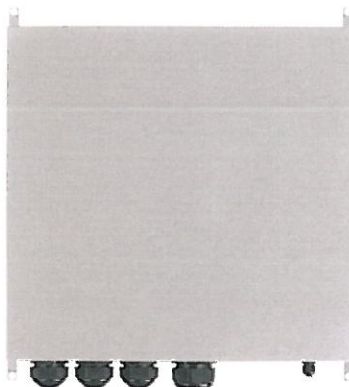


#### Features

- Employs the Strikesorb® 30-V1-HV Surge Protective Device (SPD) specifically designed for the Remote Radio Head (RRH) installation environment and certified for use in DC applications and at low DC operating voltages (48V).
- The Strikesorb 30-V1-HV is a Class I SPD, certified by VDE per the IEC 61643-1 standard as suitable for installation in areas where direct lightning exposure is expected. Strikesorb 30-V1-HV is able to withstand direct lightning currents of up to 5kA (10/350) and induced surge currents of up to 60kA (8/20).
- Provides very low let through / clamping voltage - unique for a Class I product - as it does not employ spark gaps or other switching elements. Strikesorb offers unique protection levels to the RRH equipment as well as the Base Band Units.
- Fully recognized to the UL 1449 3rd Edition Safety Standard.
- Patent pending design in a non-metallic enclosure.

#### Benefits

- Offers unique maintenance-free protection against direct lightning currents.
- Protects up to 6 Remote Radio Heads and connects up to 8 fiber pairs.
- Utilizes a NEMA 4X rated enclosure, allowing for indoor or outdoor installation on a roof or tower top.
- Configurable cable ports are designed to accommodate varying diameters of hybrid (combined power and fiber optic) or standard cables with diameters up to 2+ inches depending upon port configuration.



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G02-00-215 120702

**Raycap**

[www.raycapsurgeprotection.com](http://www.raycapsurgeprotection.com)



## SPECIFICATIONS

### DC Surge Protection for RRHs

**RDC-6730-PF-48 • RDC-6637-PF-48 • RDC-4276-PF-48**

Overvoltage Protection & Fiber Management Junction Box

#### Electrical

Model Numbers	RDC-6730-PF-48	RDC-6637-PF-48	RDC-4276-PF-48
Nominal Operating Voltage	48 VDC	48 VDC	48 VDC
Nominal Discharge Current [ $I_n$ ]	N/A	20 kA 8/20 $\mu$ s	20 kA 8/20 $\mu$ s
Maximum Surge Current [ $I_{max}$ ]	N/A	60 kA 8/20 $\mu$ s	60 kA 8/20 $\mu$ s
Maximum Impulse (Lightning) Current per IEC 61643-1	N/A	5 kA 10/350 $\mu$ s	5 kA 10/350 $\mu$ s
Maximum Continuous Operating Voltage [ $U_c$ ]	N/A	75 VDC	75 VDC
Voltage Protection Rating (VPR) per UL 1449 3rd Edition	N/A	400V	400V
Protection Class as per IEC 61643-1	N/A	Class I	Class I
Strikesorb Module Type	No Strikesorb modules installed	30-V1-HV Strikesorb modules installed to protect 3 Remote Radio Heads	30-V1-HV Strikesorb modules installed to protect 6 Remote Radio Heads

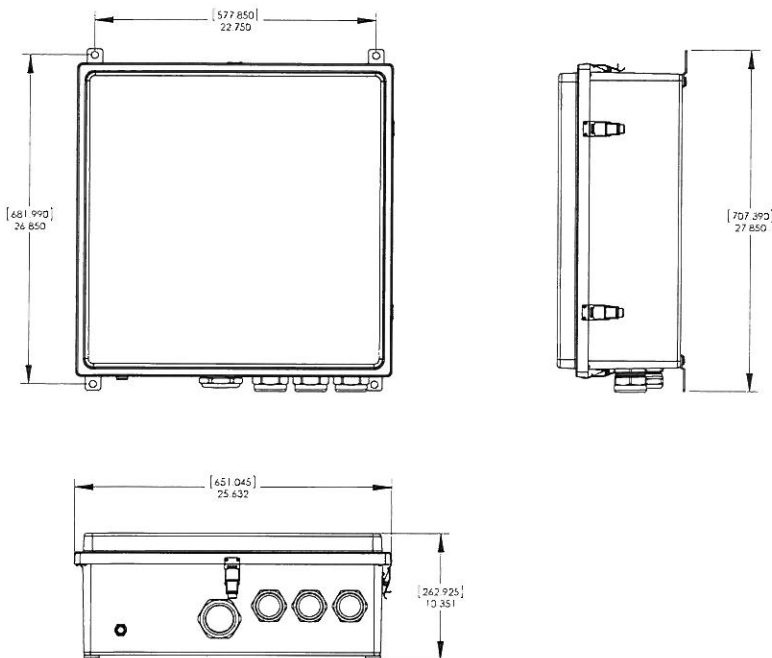
#### Mechanical

Suppression Connection Method	Compression lug, #14 - #2/0 AWG (2.1 mm <sup>2</sup> - 53.5 mm <sup>2</sup> ) Copper; #12 - #2/0 AWG (3.3 mm <sup>2</sup> - 53.5 mm <sup>2</sup> ) Aluminum
Fiber Connection Method	LC-LC Single mode
Environmental Rating	NEMA 4X
Operating Temperature	-40° C to +80° C
UV Resistant	Yes
Weight	System: 34 lbs (15.42 kg)

Strikesorb modules are compliant to the following Surge Protective Device (SPD) Standards

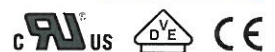
Standards	ANSI/UL 1449 3rd Edition
	IEEE C62.41
	NEMA LS-1, IEC 61643-1:2005 2nd Edition (Class I Protection)
	IEC 61643-12
	EN 61643-11:2002 (including A11:2007)

#### Product Diagram



[mm]  
inches

AWG=American Wire Gauge



**Raycap**

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