PRODUCT SUBMITTALS - Distributed Antenna System

To:	**Ruslan Matev**	**From:**	operations@dasconnexion.net
Project:	**Pierce College STEM Building**	**Date:**	**March 20, 2023**
Project number:	**State Project: 2020-148G (4-1)**	**Contract Number:**	
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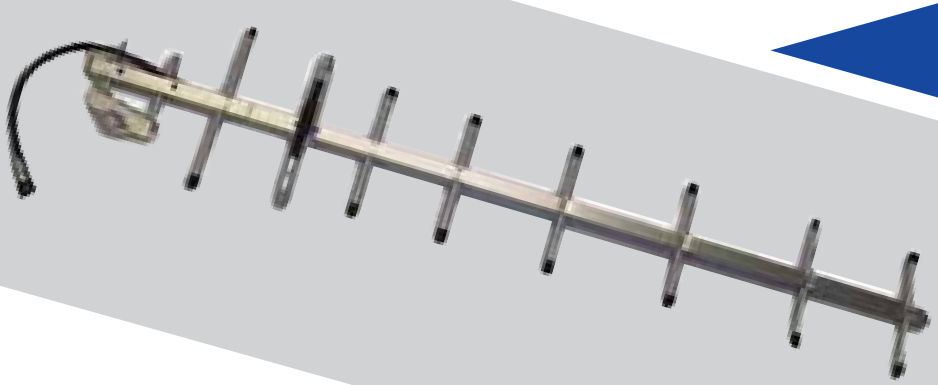
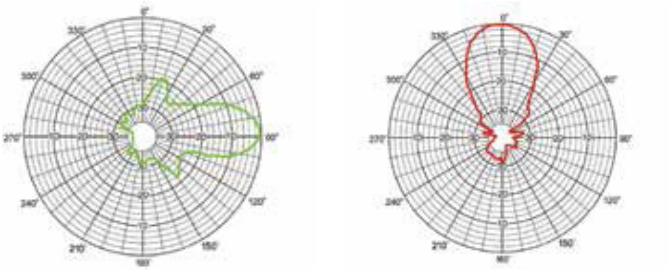
746-896 MHz
Yagi Antenna (11 dBi)



Model Numbers
CSI-AY/746-896/11
Frequency Range
746-896 MHz
Features & Benefits
11 dBi Gain
8 Elements
Hermetically Sealed Driven Element
Rugged Lightweight Design
Stainless Steel Hardware
Broad Bandwidth

Radiation Patterns



Electrical Specifications	
Gain	11 dBi
VSWR	<1.7:1
Horizontal Beamwidth	48°
Vertical Beamwidth	42°
Polarization	Vertical
Maximum Input Power	100 Watts
Electrical Downtilt	0°
Front-back Ratio	>16 dB

Mechanical Specifications	
Number of Elements	8
Connector	N-Female
Lightning Protection	Direct Ground
Rated Wind Speed	134 mph (200 kph)
Dimensions	33.1 x 8 x 2.2 in
Antenna Weight	1.76 lbs
Mounting Hardware	U-Bolt
Included Mounting Hardward Fits 1 7/8" OD Pipe	

Specifications subject to change without notice.

System RF Parameters		
System Bandwidth	150 - 2700 MHz	
System Gain	+ 25 dB max	Adjustable in 1 dB steps
Single Band gain flatness	±2 dB	In any 100 MHz band
Wideband gain flatness	±5 dB	Over full frequency range
Downlink		
RF input power	0 dBm Typ, +15 dBm max	Working input power
RF output power	+18 dBm for services approved to CE +20 dBm for services approved to FCC	
Wideband Spurious emissions	-112 dBm/Hz	At RU maximum output power
Uplink		
RF hub output power	-10 dBm	

Fibre Optic Specifications	
Number of Optical Ports	Up to 8 transceivers in modular format on hub; 1 transceiver on fibre RU; SC connectors
Wavelength	1310nm
Fibre types supported	Singlemode (SM) cable 9/125 m
Fibre distance	±5 dB
Laser safety classification	Class 1
Connectivity	
Hub Unit	Service connection: N-Type female connectors (back of unit) Hub Interconnect: Fibre SC Duplex connectors, patch cords are required and can be supplied with any required connector type RU connect: Fibre SC Duplex connector (patch cords are required and can be supplied with any required connector type)
Remote Unit - Fibre	Antenna connection: 2 N-Type female connectors Hub connection: Fibre SC Duplex/power connector, patch cords are required and can be supplied with any required connector type

Physical, Electrical and Environmental Specifications	
Hub Unit	443mm (W) x 125mm (H) x 435mm (D) 20.5 kg 110 Volts ,50/60 Hz 50-200 Watts (depending on hub configuration) Operating temperature (Ambient noncondensing)- 5 to +45°C
Remote Unit - Fibre	220mm(W)x 211mm(H)x 92mm(D) 2.7kg Powered from a remote or a local power supply 45°C
Standards & Approvals	
EMC Regulatory & safety requirements	EN 55022/CISPR22; FCC Part 15 Class A; European EMC directive 89/336/EEC
Electrical safety	IEC 60950-1
Laser safety	BS EN 60825-1:2003 Safety of laser products

SG12-12B2U

SureGround® Grounding Kit for 1/2 in coaxial cable

Product Classification

Brand	SureGround®
Product Type	Grounding kit

Dimensions

Nominal Size	1/2 in
Bonding Conductor Length	1219.2 mm | 48 in
Cable Jacketing Removal Length, maximum	38.1 mm | 1 1/2 in
Cable Jacketing Removal Length, minimum	38.1 mm | 1 1/2 in
Compatible Diameter, maximum	16.510 mm | 0.650 in
Compatible Diameter, minimum	15.494 mm | 0.610 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling Test Method	MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Weatherproofing Method	Butyl and electric tape

General Specifications

Grounding Kit Type	SureGround® Grounding Kits
Cable Type	Corrugated | Smoothwall
Ordering Note	CommScope® standard product in the United States and Canada
Color	Black
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	6 gauge
Bonding Conductor Jacketing Material	PVC
Grounding Strap Material	Tinned copper

Includes	Grounding kit | Hardware | Lug | One roll of 2 in PVC tape | One roll of 24 in butyl rubber tape
Locking Bail Material	Stainless steel
Lug Attachment	Field attached
Lug Type	Two-hole lug
Package Quantity	1
Rivet Material	Tinned copper

Mechanical Specifications

Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
Thread Size	3/8 in
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214

Packed Dimensions

Height	447.0 mm | 17.6 in
Length	177.8 mm | 7.0 in
Shipping Weight	0.59 kg | 1.30 lb
Width	395.2 mm | 15.6 in

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

Included Products

9905-71 — Black 2 in PVC Tape, 20 ft

42615-10 — Butyl Rubber Tape, 24 in

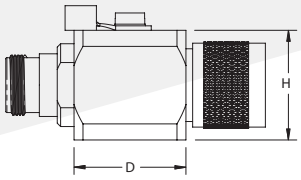
* Footnotes

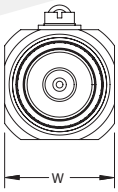
Grounding, Bonding and Shielding Test Method	Military Standard for Grounding, Bonding, and Shielding: Bond Resistance Requirement of a Maximum dc resistance of 0.001 ohm

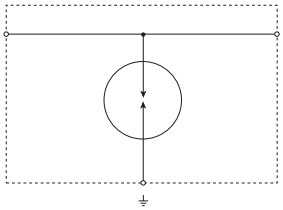
Lightning Protection Test Method	Protection Against Lightning Electromagnetic Impulse, Table 1—Protection Level III–IV, 1995-02

Coaxial Surge Protector

- **Simple plug-in installation**
- **Supplied with mounting bracket and flying lead ground**
- **Low insertion and return loss**
- **Wide operating frequency spectrum**





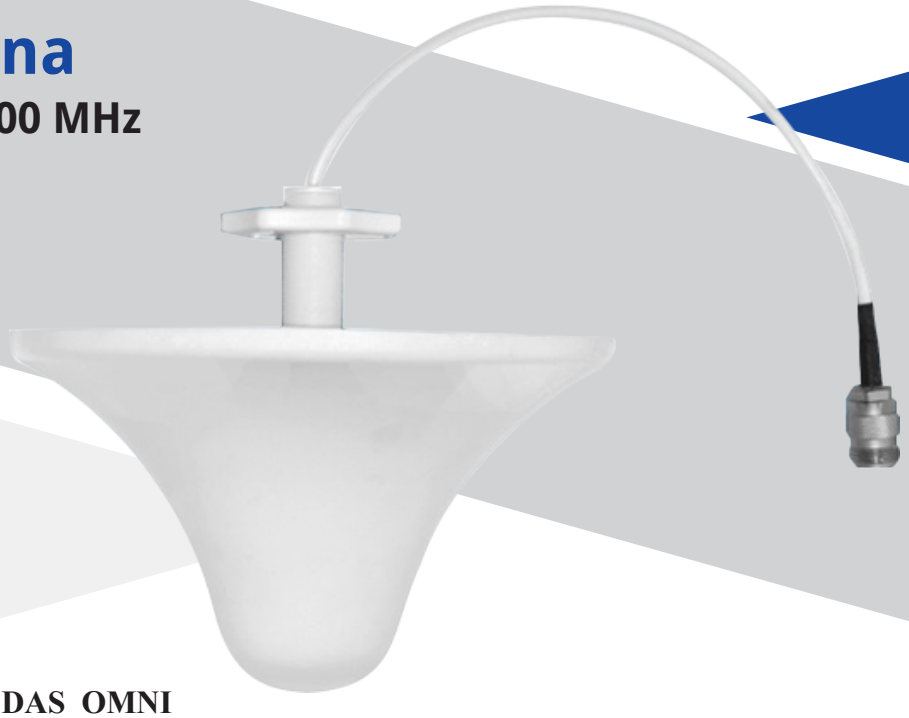


Product Specifications

Part Number	CSP1NB90
Max Discharge Current (Imax), Per Mode	20 kA 8/20 µs
Frequency	0 – 3 GHz
Capacitance	1.5 pF
Insulation Resistance	10 GΩ
Impulse Life	400 @ 500 A 10/1000 µs
Enclosure Material	Metal
Enclosure Rating	IP 20 NEMA®-1
Temperature	-40 to 194 °F
Connection Type	N-Type, Female/Female

Spark-Over Voltage @ 100 V/µs	450 V
Spark-Over Voltage @ 100 V/s	72 – 108 V
Depth (D)	1”
Height (H)	0.984”
Width (W)	0.984”
Unit Weight	0.294 lb
Certifications	CE UL
Standard Packaging Quantity	1 pc
UPC	78285669072
EAN-13	8711893105582

Omni
In-building Antenna
140–960 MHz and 1710–2700 MHz



General Specifications

Antenna Type	Omni
Application	Indoor
Operating Frequency Band	1710 – 2700 MH 140 – 960 MHz
Mount Type	Thru-hole ceiling mount (optional)
Package Quantity	1
Pigtail Cable	KSR195, plenum rated

Mechanical Specifications

Color	White
Pigtail Length	315.0 mm | 12.4 in
Radome Material	ABS, UV resistant
RF Connector Interface	N Female

Environmental Specifications

Operating Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Relative Humidity	Up to 100%

Dimensions

Height	85.00 mm | 3.35 in
Outer Diameter	186.0 mm | 7.3 in
Net Weight	0.3 kg | 0.7 lb

Packed Dimensions

Height	135.00 mm | 5.31 in
Length	195.0 mm | 7.7 in
Width	195.0 mm | 7.7 in
Shipping Weight	0.4 kg | 0.9 lb

DAS_OMNI

Electrical Specications				
Frequency Band, MHz	140-502	698–800	800–960	1710–2700
Gain, dBi	.2	2.0	2.0	-5.0
Beamwidth, Horizontal, degrees	360	360	360	360
VSWR | Return Loss, dB	1.8 | 10.9	1.8 | 10.9	1.5 | 14.0	-1.5 | 14.0
Input Power per Port, maximum, watts	50	50	50	-15.6±0.8
Polarization	Vertical	Vertical	Vertical	Vertical
Impedance	50 ohm	50 ohm	50 ohm	50 ohm

Regulatory Compliance/Certifications	
Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Directional In-building Antenna

HELIAX® Plenum Rated Air Dielectric Coaxial Cable, corrugated aluminum, 1/2 in, white PVC jacket

Product Specifications

General Specifications

Antenna Type	Directional
Application	Indoor
Operating Frequency Band	1710 – 2700 MHz | 698 – 960 MHz
Brand	DAS Connexion
Mount Type	4-hole wall mounting plate and hardware (included)
Package Quantity	1
Pigtail Cable	RG85U, plenum rated

Mechanical Specifications

Color	White
Pigtail Length	260.0 mm | 10.2 in
Radome Material	ABS, UV resistant
RF Connector Interface	N Female

Environmental Specifications

Operating Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Relative Humidity	Up to 100%

Dimensions

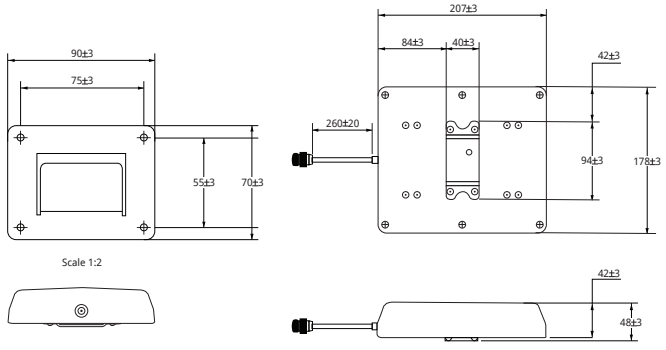
Depth	44.0 mm | 1.7 in
Length	210.0 mm | 8.3 in
Width	180.0 mm | 7.1 in
Net Weight	0.4 kg | 1.0 lb

Packed Dimensions

Depth	55.0 mm | 2.2 in
Length	250.0 mm | 9.8 in

CELLMAX-D-CPUSE

Width	190.0 mm | 7.5 in
Shipping Weight	0.6 kg | 1.3 lb



Electrical Specifications				
Frequency Band, MHz	**698–800**	**800–960**	**1710–2170**	**2200–2700**
Gain, dBi	5.0	5.0	8.0	6.0
Beamwidth, Horizontal, degrees	110	90	90	90
Beamwidth, Vertical, degrees	100	65.0	65.0	65.0
VSWR | Return Loss, dB	1.8 | 10.9	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
Input Power per Port, maximum, watts	50	50	50	50
Polarization	Vertical	Vertical	Vertical	Vertical
Impedance	50 ohm	50 ohm	50 ohm	50 ohm

COAXIAL CABLE (AL4RPV-50)

HELIAX® Plenum Rated Air Dielectric Coaxial Cable, corrugated aluminum, 1/2 in, white PVC jacket

Product Specifications

Construction Materials

Jacket Material	PVC
Dielectric Material	PE spline
Flexibility	Standard
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Off-white
Outer Conductor Material	Corrugated aluminum

Dimensions

Nominal Size	1/2 in
Cable Weight	0.21 kg/m | 0.14 lb/ft
Diameter Over Jacket	15.748 mm | 0.620 in
Inner Conductor OD	4.5720 mm | 0.1800 in
Outer Conductor OD	14.046 mm | 0.553 in

Electrical Specifications

Cable Impedance	50 ohm ±2 ohm
Capacitance	76.0 pF/m | 23.0 pF/ft
dc Resistance, Outer Conductor	1.570 ohms/km | 0.480 ohms/kft
dc Resistance, Inner Conductor	1.570 ohms/km | 0.480 ohms/kft
dc Test Voltage	4000 V
Inductance	0.190 µH/m | 0.058 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	5000 V
Operating Frequency Band	1 – 6000 MHz
Peak Power	40.0 kW
Power Attenuation	2.325
Pulse Reflection	0.5%
Velocity	88%

Environmental Specifications

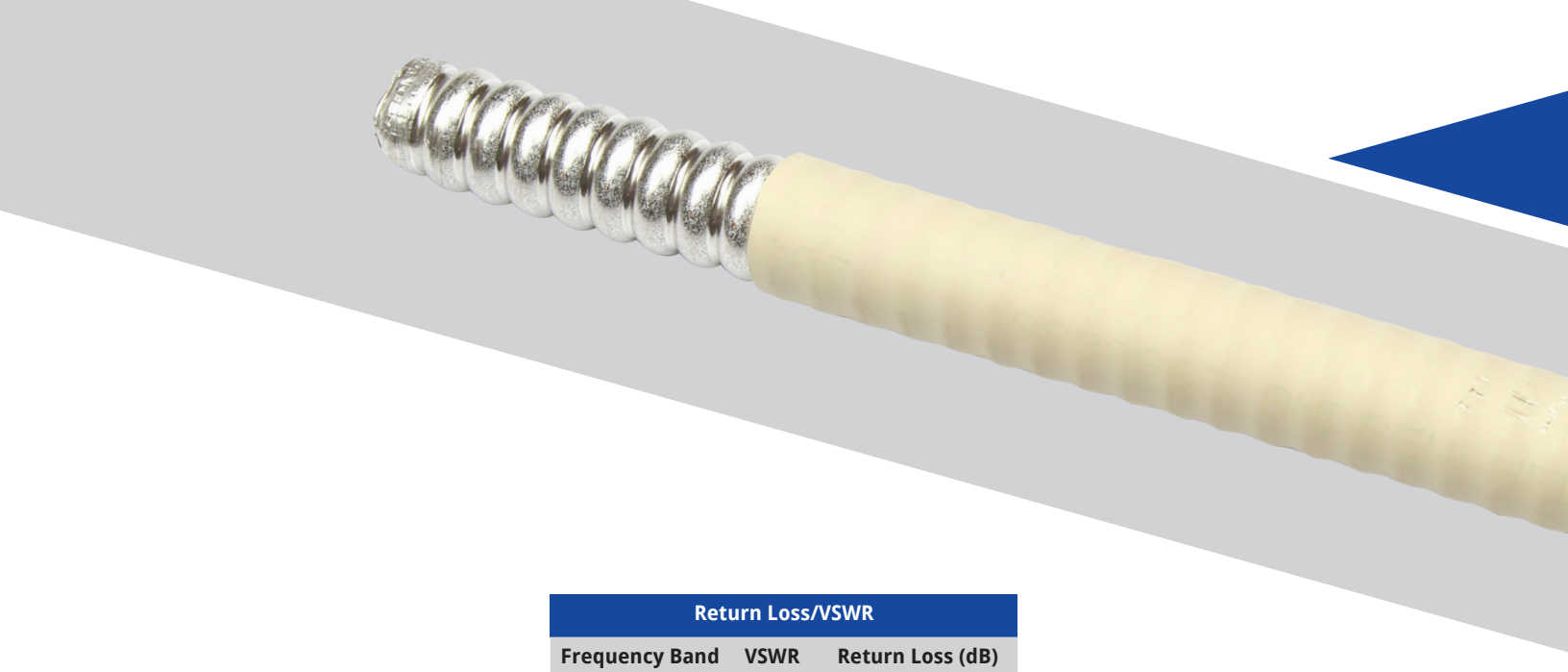
Installation Temperature	-5 °C to +60 °C (+23 °F to +140 °F)
Storage Temperature	-20 °C to +85 °C (-4 °F to +185 °F)
Operating Temperature	-20 °C to +85 °C (-4 °F to +185 °F)

Mechanical Specifications

Bending Moment	6.8 N-m | 5.0 ft lb
Fire Retardancy Test Method	NFPA 262/CATVP/CMP
Flat Plate Crush Strength	1.4 kg/mm | 80.0 lb/in
Minimum Bend Radius, Multiple Bends	127.00 mm | 5.00 in
Minimum Bend Radius, Single Bend	64.00 mm | 2.50 in
Number of Bends, minimum	15
Tensile Strength	79 kg | 175 lb
Performance Note	Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C | 68 °F
Average Power, Ambient Temperature	40 °C | 104 °F
Average Power, Inner Conductor Temperature	100 °C | 212 °F



Return Loss/VSWR		
Frequency Band	**VSWR**	**Return Loss (dB)**
806–960 MHz	1.25	19.00
1700–2200 MHz	1.25	19.00

Attenuation			
Frequency (MHz)	**Attenuation (dB/100 m)**	**Attenuation (dB/100 ft)**	**Average Power (kW)**
150	2.821	0.86	2.70
174	3.054	0.931	2.50
450	5.134	1.565	1.49
600	6.032	1.839	1.26
700	6.583	2.007	1.16
800	7.105	2.166	1.07
824	7.227	2.203	1.06
1700	11.053	3.369	0.69
1800	11.439	3.487	0.67
2500	13.975	4.259	0.55

Values typical, guaranteed within 5%

Regulatory Compliance/Certifications	
Agency	**Classification**
RoHS 2011/65/EU	Compliant
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system
ETL Certification	CATVP/CMP

LDF4RK-50A

Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black non-halogenated, fire retardant polyolefin jacket

Construction Materials	
Jacket Material	Non-halogenated, fire retardant polyolefin
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black
Dimensions	
Nominal Size	1/2 in
Cable Weight	0.17 lb/ft | 0.25 kg/m
Diameter Over Dielectric	12.954 mm | 0.510 in
Diameter Over Jacket	16.002 mm | 0.630 in
Inner Conductor OD	4.8260 mm | 0.1900 in
Outer Conductor OD	13.970 mm | 0.550 in
Electrical Specifications	
Cable Impedance	50 ohm ±1 ohm
Capacitance	23.1 pF/ft | 75.8 pF/m
dc Resistance, Inner Conductor	0.450 ohms/kft | 1.480 ohms/km
dc Resistance, Outer Conductor	0.820 ohms/kft | 2.690 ohms/km
dc Test Voltage	4000 V
Inductance	0.190 µH/m | 0.058 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	5000 V
Operating Frequency Band	1 – 8800 MHz
Peak Power	40.0 kW
Velocity	88%
Environmental Specifications	
Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Storage Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Mechanical Specifications	
Bending Moment	3.8 N-m | 2.8 ft lb

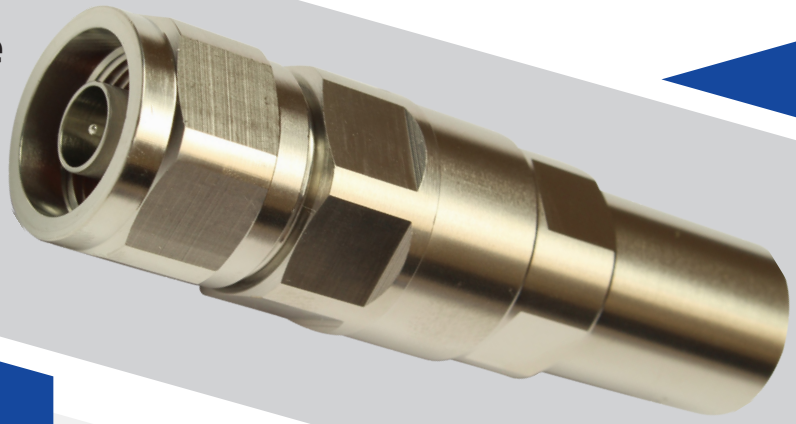
Product Specifications		
Fire Retardancy Test Method	UL 1666/CATVR/CMR	
Flat Plate Crush Strength	110.0 lb/in | 2.0 kg/mm	
Minimum Bend Radius, Multiple Bends	127.00 mm | 5.00 in	
Minimum Bend Radius, Single Bend	50.80 mm | 2.00 in	
Number of Bends, minimum	15	
Number of Bends, typical	50	
Smoke Index Test Method	IEC 61034	
Tensile Strength	113 kg | 250 lb	
Toxicity Index Test Method	IEC 60754-1 | IEC 60754-2	
Note		
Performance Note	Values typical, unless otherwise stated	
Standard Conditions		
Attenuation, Ambient Temperature	20 °C | 68 °F	
Average Power, Ambient Temperature	40 °C | 104 °F	
Average Power, Inner Conductor Temperature	100 °C | 212 °F	
Return Loss/VSWR		
Frequency Band	680–800 MHz	800–960 MHz
VSWR	1.13	1.13
Return Loss (dB)	24.30	24.30

Attenuation			
Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
150	2.673	0.815	2.85
174	2.887	0.88	2.64
200	3.103	0.946	2.46
204	3.135	0.956	2.43
300	3.835	1.169	1.99
400	4.462	1.36	1.71
450	4.749	1.447	1.61
500	5.021	1.53	1.52
512	5.085	1.55	1.50
600	5.533	1.686	1.38
700	6.009	1.831	1.27
800	6.456	1.968	1.18
824	6.56	1.999	1.16
894	6.855	2.089	1.11
960	7.124	2.171	1.07
1000	7.284	2.22	1.05
1218	8.11	2.472	0.94
1250	8.226	2.507	0.93
1500	9.093	2.771	0.84
1700	9.744	2.97	0.78
1800	10.058	3.066	0.76
2000	10.666	3.251	0.72
2100	10.961	3.341	0.70

Regulatory Compliance/Certifications	
Agency	Classification
UL/ETL Certification	CATVR/CMR
RoHS 2011/65/EU	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

CONNECTOR

Type N Male for 1/2 inch cable



Product Specifications

General Specifications

Interface	N Male
Body Style	Straight
Brand	DAS Connexion

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Average Power	0.6 kW @ 900 MHz
Peak Power, maximum	10.00 kW
Insertion Loss, typical	0.05 dB
Shielding Effectiveness	-130 dB

Mechanical Specifications

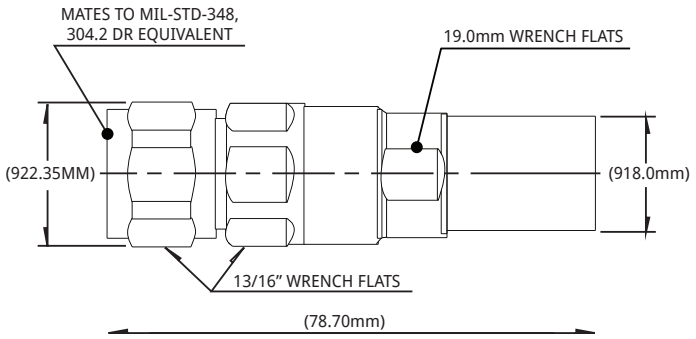
Outer Contact Attachment Method	Ring-flare
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Attachment Durability	25 cycles
Connector Retention Tensile Force	890 N | 200 lbf
Connector Retention Torque	5.42 N-m | 48.00 in lb
Coupling Nut Retention Force Method	MIL-C-39012C-3.25, 4.6.22

Dimensions

Nominal Size	1/2 in
Diameter	22.35 mm | 0.88 in
Length	76.70 mm | 3.02 in
Weight	94.71 g | 0.21 lb

Environmental Specifications

Storage Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Immersion Depth	1 m
Immersion Test Mating	Unmated
Immersion Test Method	IEC 60529:2001, IP68
Water Jetting Test Mating Water	Unmated
Jetting Test Method Moisture	IEC 60529:2001, IP66
Resistance Test Method	MIL-STD-202F, Method 106F
Mechanical Shock Test Method	MIL-STD-202, Method 213, Test Condition I
Thermal Shock Test Method	MIL-STD-202F, Method 107G, Test Condition A-1, Low Temperature -55 °C
Vibration Test Method Corrosion	IEC 60068-2-6
Test Method	MIL-STD-1344A, Method 1001.1, Test Condition A



Return Loss/VSWR		
Frequency Band	**VSWR**	**Return Loss (dB)**
45–1000 MHz	1.02	39.00
1010–2200 MHz	1.03	37.00
2210–3000 MHz	1.05	33.00

Regulatory Compliance/Certifications	
Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

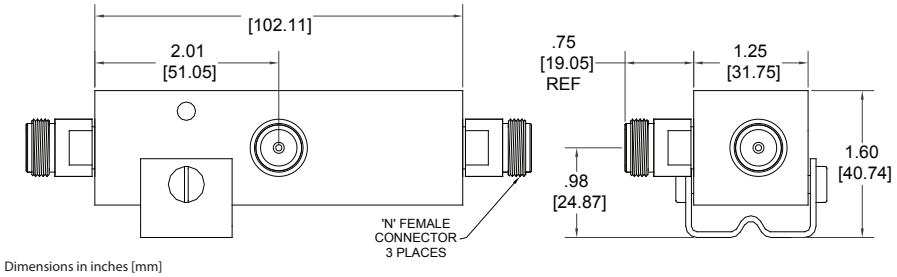
Tappers, DN-x1FN series

- **Split ratios from 100:1 to 2:1**
- **Covers all Public Safety bands: VHF, UHF and 700-900 MHz bands**
- **Low Specified PIM**
- **500 W Avg Power Rating**
- **Minimal RF Insertion Loss**
- **RoHS compliant**
- **High Reliability, IP67**

Public Safety, Unequal Splitters
147 - 960 MHz, N connectors
Rev. A

DAS Connexion Tappers unevenly split high power RF signals in fixed ratios from 100:1 to 2:1 with minimal reflections or loss. The Tappers cover VHF, UHF, TETRA, and 700 - 900 MHz Public Safety bands. The innovative asymmetric design ensures an excellent input VSWR and coupling flatness across the specified bands.

The lightweight design allows easy attachment to a wall using the supplied bracket. Designed with only a few solder joints and an air dielectric, loss is minimized and reliability enhanced. See DN-x4 series for similar Tappers with broader bandwidth and multiple connector options.



Dimensions in inches [mm]

Note: Specifications are subject to change without prior notification.

Frequency Bands:	Bands specified below
Dissipative Loss:	<0.1 dB (main line)
Power Rating:	500W avg., 3 kW peak
Impedance:	50Ω nominal
Intermod. (PIM):	-161 dBc (2 tones at +43 dBm)
Environment:	IP67, -35°C to +75°C
Connectors:	N(f) trimetal
Housing Finish:	Passivated Aluminum
Weight, nom:Mounting:	14 oz (380 g) Bracket supplied

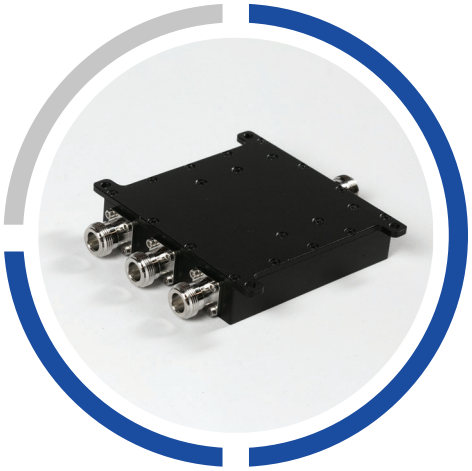
	Ratio, nom.	Output Split	Coupling to Branch arm, dB					Input VSWR Max	
Model Number	(dB Inequality between Outputs)	Main/Branch dB	147-200 MHz	200-250 MHz	250-380 MHz	380-520 MHz	698-960 MHz	147-380 MHz	380-960 MHz
DN-31FN	2:1/3.0dB	-1.8/-4.8	-6.3±0.7	-5.8±0.6	-5.4±0.6	-5.1±0.6	-4.8±0.5	1.40:1	1.30:1
DN-51FN	4:1/6.0dB	-1.0/-7.0	-8.1±0.7	-7.6±0.6	-7.3±0.6	-7.0±0.6	-6.5±0.5	1.30:1	1.25:1
DN-71FN	10:1/10dB	-0.4/-10.4	-11.0±0.8	-10.7±0.7	-10.3±0.7	-10.1±0.7	-9.9±0.5	1.20:1	1.20:1
DN-91FN	30:1/15dB	-0.1/-15.1	-16.0±0.8	-15.6±0.8	-15.5±0.8	-15.2±0.8	-15.4±0.5	1.20:1	1.20:1
DN-01FN	100:1/20dB	-0.1/-20.1	-20.3±1.0	-20.1±1.0	-20.0±1.0	-20.1±1.0	-20.1±0.8	1.20:1	1.20:1

Splitters 150-960MHz, N-Female

Specifications:

PRODUCT CODE	SPL-YXX	Y=N or 4.3-10 Connector, X=02,03,04 Way	
Configurations	1.2	1.3	1.4

Electrical Specifications			
Frequency	150 - 960Mhz		
Split Loss	3.0 dB	4.8 dB	6.0 dB
Insertion Loss	0.3 dB	0.5 dB	0.7 dB
Isolation	20 dB		
VSWR	≤1.25		
Power Capacity	100 W		
Impedance	50 Ω		
Intermodulation	≤-130 dBc		



CONTACT US FOR 150-350 SPECIFICATIONS

Environment Specifications	
Operating Temp.	-35°F to + 150°F
Relative humidity	0~95%
Application	IP65

Mechanical Specifications			
Dimensions (inch)	4.89 x 3.47 x .87	6.89 x 4.61 x .87	6.81 x 5.79 x .87
Weight (lb.)	0.67	1.40	1.72
RF Connector	N Female or 4.3		

CriticalPoint™ Version 3 / Next Generation Public Safety Solution

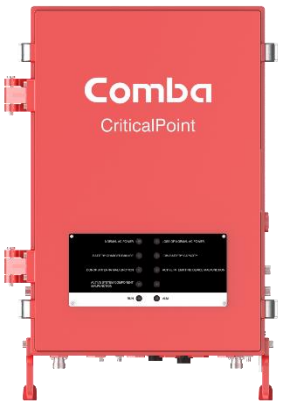
Public Safety 700/800MHz Class A/B 27/33dBm Bi-directional Amplifier and Battery Backup Unit

Features

Public Safety Standards Compliance

- Compliance with IFC / NFPA / UL2524
- FCC Class A: PX8RX78V2F-A / Class B: PX8RX78V2F-B
- UL 2524 Standard Certified – SGS Certificate No.: TBD
- ISED (IC): TBD
- UL50E Type 4 / NEMA 4 enclosure for BDA / BBU

Bi-directional Amplifier



- Supports P25 P1/P2, digital and conventional analog communications simultaneously
- Built-in cavity filtering to protect the unit from interference from FirstNet and other neighbor bands
- Up to 64 channels per band on single band models; up to 96 channels shared across bands on dual band models (maximum of 64 on individual band) (Class A)
- Channelized Auto Level Control (ALC) supported (Class A)
- Channelized Downlink and Uplink squelch supported (Class A)
- Uplink PA shutdown during no traffic periods to minimize noise being introduced to the network (Class A)
- Built-in mandatory isolation test to prevent BDA oscillation
- Auto shutdown with alarm upon oscillation detection
- Expandable to 700/800MHz V3/NG fiber system
- Web based GUI for intelligent configuration, SNMP supported
- Integrated Battery Charger Unit, Comba BBU V2 / BBU V3/NG supported
- License based switching between Class A or Class B, Single band or Dual band, 0.5W or 2W configurations
- NFPA / IFC / UL 2524 compliant dry contact alarms, with LED displays
- External Comba Annunciator Panel supported

Battery Backup Unit

- Optional dedicated Battery Backup Solution for BDA V3/NG platform
- Supports Lithium Iron Phosphate (LiFePO4) batteries
- Supports 12 hours backup power with 30AH battery option
- Supports 24 hours backup power with 60AH battery option
- Provides connections for EPO (Emergency Power Off) switch
- Provides AC convenience outlet inside BBU

Specifications - BDA

BDA		700MHz	800MHz
Passband (Downlink / Uplink)	MHz	Configuration S0 – 700MHz: 758-775 / 788 – 805, 800MHz: 851-861 / 806-816 Configuration S1 – 700MHz: 769-775 / 799 – 805, 800MHz: 851-851 / 806-816 Configuration C0 – 700MHz: 768-776 / 798 – 806, 800MHz: 851-869 / 806-824	
Total Output Power, Uplink	dBm	27	
Total Output Power, Downlink	dBm	27 / 33	27 / 33
Maximum System Gain (Uplink / Downlink)	dB	90	90
Gain Adjustment Range (1dB step) *	dB	60-90 / 35-65 / 10-40 (Under different gain limit modes)	60-90 / 35-65 / 10-40 (Under different gain limit modes)
Pass Band Ripple, p-p (Uplink / Downlink)	dB	S0: ≤3, S1: ≤7	S0: ≤3, S1: ≤7
Uplink Noise Figure	dB	<5 (90dB Uplink Gain), <9 (67dB Uplink Gain)	
Intermodulation	dBm	≤ -13	≤ -13
Spurious	dBm	FCC Compliance	FCC Compliance
Maximum RF Input Level without Damage	dBm	0	0
Maximum RF Input Level without Overdrive	dBm	-10	-10
Input VSWR		≤ 2	≤ 2
Impedance	Ω	50	50

Class A / Class B Specialized Filtering			
Number of Filters Downlink			64 per band
Number of Filter Uplink			96 Shared between 700/800MHz
Filter Bandwidth		KHz	12.5/25/75 (Class A) 75/100/150 (Class B Specialized Filtering) Additional 10MHz (LTE) for FirstNet
Filter	Bandwidth (kHz)	Delay(μs)	Out-of-Band Suppression
High rejection Filter Set	12.5	≤48	≥ 60dBc @ filter edge + 30KHz
	25	≤30	≥ 60dBc @ filter edge + 50KHz
	75	≤18	≥ 60dBc @ filter edge + 130KHz
	75 LD	≤15	≥ 60dBc @ filter edge + 200KHz
Low Delay Filter Set	12.5	≤30	≥ 60dBc @ filter edge + 65KHz
	25	≤27	≥ 60dBc @ filter edge + 75KHz
	37.5	≤26	≥ 60dBc @ filter edge + 75KHz
	50	≤26	≥ 60dBc @ filter edge + 100KHz
	75	≤15	≥ 60dBc @ filter edge + 200KHz
	100	≤14	≥ 60dBc @ filter edge + 200KHz
	150	≤13	≥ 60dBc @ filter edge + 205KHz

*Actual delay number is various according to version

Class B Wide Band		
Filter Bandwidth	MHz	0.6-10
Number of Filters		3
System Group Delay	μsec	≤ 14
Out-of-Band Suppression	dBc	≥ 60 @ filter edge + 1MHz

Mechanical - BDA

BDA				
Dimensions, H x W x D		mm / in	330 x 490 x 199 / 13.0 x 19.3 x 7.8	
Weight (without bracket)		kg / lbs	25 / 55.1	
Power Supply Input		VAC	100-240V / 50-60Hz / 0-4.5A	
Power Supply Output		VDC	40-60V (Typical: 53.5V) / 0-7.5A	
Maximum Charging Current		A	5	
Power Consumption		W	27 dBm	33 dBm
	Single Band		<75	<90
	Dual Band		<85	<100
Enclosure Cooling			Convection	
RF Connectors * 2			N-Female (MT, DT), SMA-Female (FOU DL, FOU UL)	
Test Port * 2			SMA-Female (DT-Test, MT-Test)	
LED * 10			Dry Contact Alarm LED 1 - 8, ALM/RUN	
Communication port *2			RJ45 (LAN, OMT)	
Reserved knock outs			3/4-inch hole x 1, 1/2-inch hole x 3, 1-inch hole x2	
Operating Temperature		°C	-40 to +55	
Operating Humidity			≤ 95%	
Environmental Class			UL50E Type 4 / NEMA 4	
MTBF		Hr	100,000	

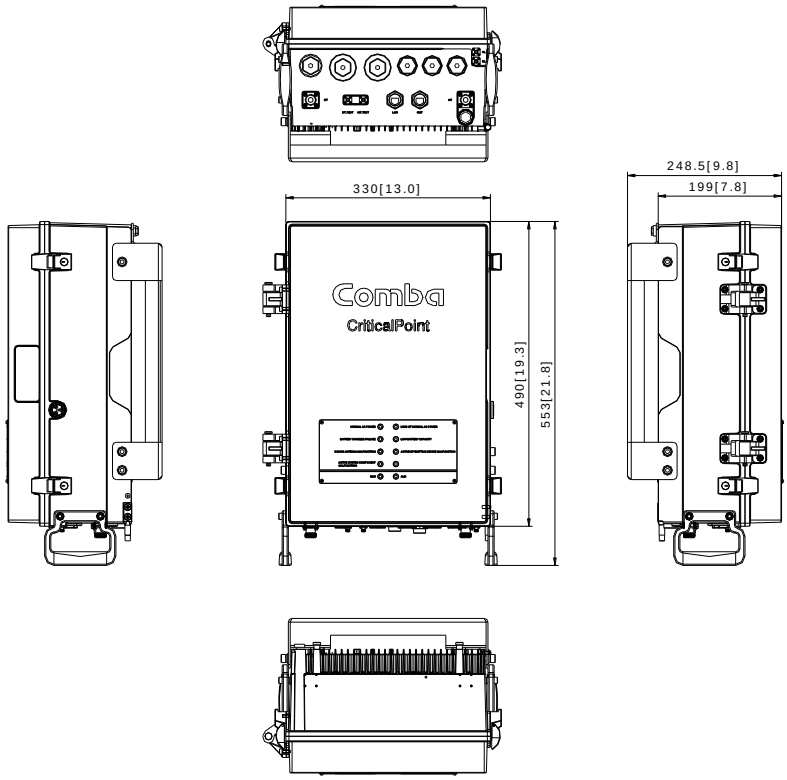
Battery Backup Unit

BBU				
Dimensions, H x W x D		mm / in	605 x 500 x 272.9 / 23.8 x 19.7 x 10.7	
Weight (without battery)		Kg / lbs	26 / 57.3	
LiFePO4 Output		VDC	Per Battery	
LiFePO4 Battery Communication Port			Serial port (RS485)	
Knockouts			3/4-inch hole x 4, 1/2-inch hole x 6	
Operating Temperature		°F (°C)	32 to 104 (0 to 40)	
Operating Humidity			≤ 95%	
Enclosure Environmental Class			UL50E Type 4 / NEMA 4	

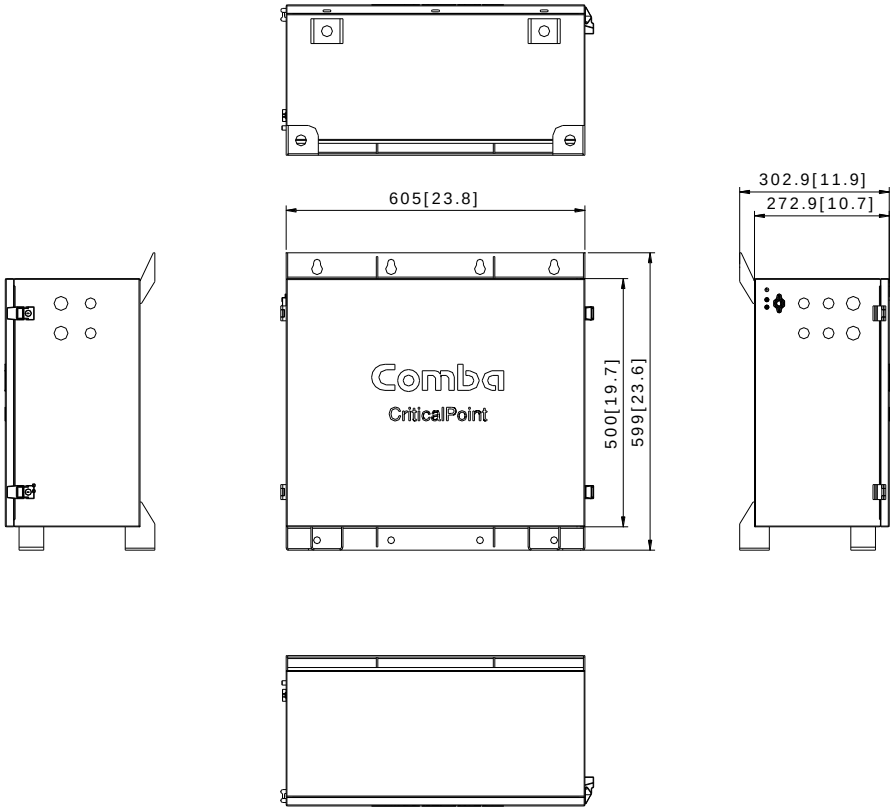
Battery				
Battery Type		(Lithium Iron Phosphate) LiFePO4		
System Required Quantity	pcs	1	1	1
Amp/Hour (Discharge at XC)		30AH	60AH	100AH
Nominal Voltage		51.2V	51.2V	51.2V
Battery Weight	lb(kg)	52.9 (24)	79.8 (36.2)	123.5 (56)
Battery Electrolyte Counts		0.456 Gallons / 4.6 lbs	0.913 Gallons / 9.1 lbs	1.758 Gallons / 17.6 lbs

Note: Gain adjusts down to 10dB total gain but is no longer FCC compliant for NF at that level
Note: Typical specifications at room temperature

Outline Drawing



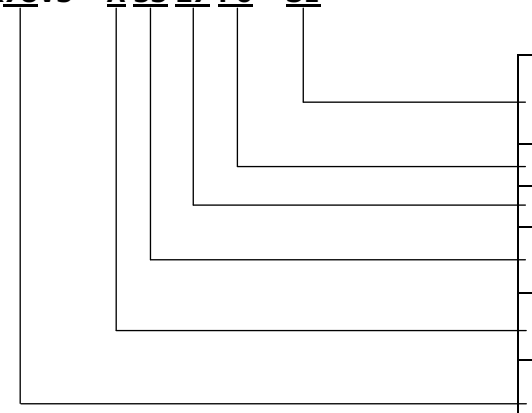
BDA V3 NG



BBU V3 NG

Part Numbers

RX78V3 – A 33 27 P0 – S1



BDA Band Configuration	S0 = 700MHz NB, 800MHz NB, FirstNet, ESMR S1 = 700MHz NB, 800MHz NB, High Rejection Duplexers C0 = Canada Version
BDA Power Supply	P0 = AC input with internal Charger
BDA UL Power	27 = 27dBm
BDA DL Power	33 = 33dBm 27 = 27dBm
BDA Class	A = Class A B = Class B
BDA Authorized Band	07 = 700MHz single band 08 = 800MHz single band 78 = 700MHz and 800MHz dual band

BDA Part Numbers	Band	Class	DL PWR	Duplexer Configuration
RX78V3-A3327P0-XX	700/800MHz	Class A	33dBm	XX=S1/S0/C0
RX07V3-A3327P0-XX	700MHz	Class A	33dBm	XX=S1/S0/C0
RX08V3-A3327P0-XX	800MHz	Class A	33dBm	XX=S1/S0/C0
RX78V3-A2727P0-XX	700/800MHz	Class A	27dBm	XX=S1/S0/C0
RX07V3-A2727P0-XX	700MHz	Class A	27dBm	XX=S1/S0/C0
RX08V3-A2727P0-XX	800MHz	Class A	27dBm	XX=S1/S0/C0
RX78V3-B3327P0-XX	700/800MHz	Class B	33dBm	XX=S1/S0/C0
RX07V3-B3327P0-XX	700MHz	Class B	33dBm	XX=S1/S0/C0
RX08V3-B3327P0-XX	700MHz	Class B	33dBm	XX=S1/S0/C0
RX78V3-B2727P0-XX	700/800MHz	Class B	27dBm	XX=S1/S0/C0

BBU Part Numbers	Battery Type	Capacity	Backup Hours
BBUV3-LFP48030	Lithium iron phosphate	30AH	>12H for 110W
BBUV3-LFP48060	Lithium iron phosphate	60AH	>24H for 110W, 12H for 220W
BBUV3-LFP48100	Lithium iron phosphate	100AH	>48H for 110W, 24H for 220W

License Part Numbers	Configuration	
RX78V3-L-2733AASS	27dBm to 33dBm upgrade license	27dBm to 33dBm upgrade license, for Single Band, Class A units
RX78V3-L-2733AADD		27dBm to 33dBm upgrade license, for Dual Band, Class A units
RX78V3-L-2733BBSS		27dBm to 33dBm upgrade license, for Single Band, Class B units
RX78V3-L-2733BBDD		27dBm to 33dBm upgrade license, for Dual Band, Class B units
RX78V3-L-3333AASD	Single Band to Dual Band upgrade license	Single band to Dual Band upgrade license, for 33dBm, Class A units
RX78V3-L-3333BBSD		Single band to Dual Band upgrade license, for 33dBm, Class B units
RX78V3-L-2727AASD		Single band to Dual Band upgrade license, for 27dBm, Class A units
Not Available		Single band to Dual Band upgrade license, for 27dBm, Class B units
RX78V3-L-3333BASS	Class B to Class A upgrade license	Class B to Class A upgrade license, for 33dBm, Single Band units
RX78V3-L-3333BADD		Class B to Class A upgrade license, for 33dBm, Dual Band units
RX78V3-L-2727BASS		Class B to Class A upgrade license, for 27dBm, Single Band units
RX78V3-L-2727BADD		Class B to Class A upgrade license, for 27dBm, Dual Band units

Acceptance Test Plan

Upon completion of system and prior to issuance of a Certificate of Occupancy, DAS Connexion will test to ensure that two-way communications coverage on each floor of the building meets the specified performance requirements.

Proof of Performance and Testing Methodology:

1) Test requirements specified in this document shall be successfully completed prior to issuance of a Certificate of Occupancy should be performed yearly thereafter. Also, testing with a successful result shall occur whenever a design change is made to the system, which changes the technical performance or coverage of the system.

2) The test data provided shall include measured data for each point for all PSN communications systems (channels).

3) Each floor of the structure that is a component of this project shall be divided into 20 grids of equal area. The center point of each grid shall then be pre-designated a test location. Additional test points shall be located at the Fire Command Center(s), Police Command Center(s), the mechanical rooms (heating, ventilation or air conditioning) internal to the structure and passenger and service elevators control (or equipment) rooms. On each floor of each structure only one test location may fail the tests specified and still consider the test to have passed for the system. All public safety radio systems specified above shall be tested at each test location. The failure of any test location on any of the public safety radio systems shall be considered a failure of that location.

4) Testing will be conducted under the direct supervision of a person holding a valid General Radio Operators License (GROL), as issued by the Federal Communications Commission. The resulting test report will be signed by that person and the Serial Number of their FCC License will be included with the signature.

5) The test receiver or field strength meter used to provide measurements during testing shall bear evidence of calibration within the last 12 months.

6) The AHJ may request system testing whenever the AHJ believes system performance has degraded to unacceptable levels. The building owner shall make the facility available for testing upon request during normal business hours.

7) The system must be tested annually beginning one (1) year from the date of final acceptance testing. The cost of future annual testing will be borne by the respective premises/system owner.

DAS Connexion will make any corrections needed to meet the specified performance requirements.

FCC form 758-EC
February 1986

NOTICE TO LICENSEE

Sign this license immediately upon receipt. It **is not valid** until **signed.**

This is a lifetime license. **Protect it against damage and loss. Lamination in plastic is recommended.**

r

EMMANUEL J. MARCEL

9 CUMMINGS RD.

MERRIMACK, NH 03054-4323

L

7

J

CUT ALONG LINE

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION
GENERAL RADIOTELEPHONE
OPERATOR LICENSE
(General Radiotelephone Certificate)

Endorsement

☐ Ship Radar

☒ None

☐ Other

(See attachment)

INVALID IF MORE THAN ONE BLOCK MARKED

(SEE OVER)

Name: EMMANUEL J. MARCEL

Date of Birth: 02/28/45

Issuance Date: 08/13/86

License Number: PG-1-17584

Signature: Emmanuel J Marcel

INVALID UNLESS SIGNED

CUT ALONG LINE

Serial !lumber	Grant Date	Expiration Date	File Number	Print Date	Effective Date
PG00063209	08-15-2019		0008766151	08-16-2019	08-15-2019

Date of Birth
04-13-1973

FCC Registration Number (FRN)
0028736866

FOUCAULT I, J R
1730 OSBBORN **DR**
CLARKSTON, WA 99403

General Radiotelephone Operator License

FCC 605-FRC - May 2007

Here

THIS LICENSE IS NOT TRANSFERABLE

Special Conditions / Endorsements:
Ship Radar Endorsement.

(Licensee's Signature)
FEDERAL COMMUNICATIONS COMMISSION

DAS ConneXion

This is to certify that

Manny Marcel

Has successfully completed the required training and is certified to design and install DAS Connexion's Distributed Antenna Systems.

Approved by:

Ryan Foucault President

August 14, 2019

Date:

Comba

keeps you connected

CERTIFICATE OF COMPLETION

Awarded to

Ryan Foucault

for successfully completing the

700/800MHz Public Safety BDA Certification Training

course and is certified to install and commission
the above Comba product line.

Augustin Chang, President

May 11, 2021

Date

WARRANTY

Certificate

This certificate provides a limited warranty to the original purchaser of the Distributed Antenna System to be free of manufacturing defects in materials and manufacturing described below for a period of 1 year. This warranty covers the repair or replacement of the defective unit at our discretion.

Approved by:

Ryan Foucault President

Date:

DAS ConneXion

Sample Warranty Only

Certificate of Calibration

Certificate #: 56486

Company: Connexion LLC
Address: 515 4th St
Clarkston, WA 99403
Phone: 425-999-5874

Instrument Identification

Make: Signal Hound
Model #: USB-SA44B
Serial #: 19358755
Description: Spectrum Analyzer 1Hz - 4.4GHz

Certification Information

As Found: Out of Tolerance
As Left: In Tolerance

Cal Date: May 28, 2020
Due Date: May 28, 2021

Adjustments: N/A
Repairs: N/A

Environment: 23 °C, 42 % RH
Procedure: Field Calibration Software

Remarks: Recommend keeping historical calibration certificates to determine appropriate calibration interval for specific application.

Standards Used

Description	Model	Serial Number	Manufacturer	Due Date
Signal Generator	83732B	US37101070	Hewlett Packard	2020-11-06
Function Generator	33120A	MY40019518	Hewlett Packard	2020-06-24
Power Meter	E4418B	MY40511403	Hewlett Packard	2020-08-12
Spectrum Analyzer	HP8564E	3711A00776	Hewlett Packard	2020-06-11
Power Sensor	E9304A H18	MY41496576	Hewlett Packard	2021-08-23
Power Splitter	11667B	50814	Hewlett Packard	2020-06-24
10 dB Attenuator	8493C	00401	Hewlett Packard	2021-04-21
GPS Rubidium Freq. Std.	LPRO-101	18630	Silicone Forest Solutions	Intrinsic

Signal Hound certifies that this instrument has been compared in accordance with the above referenced procedure, using the listed standards, which have accuracies traceable to the National Institute of Standards and Technology. The accuracy of these standards is either derived from physical constants, ratio measurements, or consensus standards. The results contained herein relate only to the item calibrated. A test uncertainty ratio (TUR) of at least 4:1 is maintained unless otherwise stated.

Jason Roest
Metrology Technician