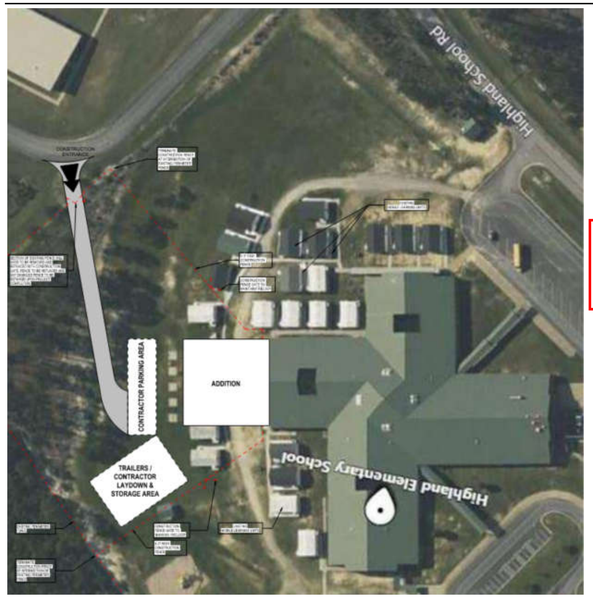
SITE NAME: HIGHLAND ELEMENTARY ADDITION & RENOVATION

PROJECT: EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM (ERCES)

BUILDING ADDRESS: 1915 BUFFALO LAKE ROAD, SANFORD, NC 27332

ADT Commercial

BUILDING



Reviewed for Fire Code Compliance
Harnett County North Carolina
Leslie Jackson
01/25/2024 5:22:08 AM

PROJECT LOCATION

PROJECT DESCRIPTION

DESIGN AND INSTALLATION OF AN EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM (ERCES). THIS SYSTEM WILL PROVIDE ADEQUATE TWO-WAY RADIO COVERAGE THROUGHOUT THE PROJECT SPACE (CLASSROOM ADDITION ONLY). ERCES WILL BE SCABLABLE FOR FUTURE EXPANSION.

THE ERCES WILL HAVE AN EXTERIOR DIRECTIONAL ANTENNA POINTED AT PUBLIC SAFETY NETWORK PSN COMMUNICATIONS TOWER. THIS SIGNAL WILL BE AMPLIFIED BY THE BI-DIRECTIONAL AMPLIFIER (BDA) AND DISTRIBUTED THROUGHOUT THE FACILITY VIA PASSIVE NETWORK OF SPLITTERS, DIRECTIONAL COUPLERS, AND ANTENNAS TO PROVIDE COVERAGE THROUGHOUT THE PROJECT SPACE.

THIS SYSTEM WILL HAVE AUTOMATIC SUPERVISORY SIGNALS THAT WILL BE MONITORED AND ANNUNCIATED AT THE FACP.

THE PRIMARY POWER SOURCE FOR THE SYSTEM WILL BE A DEDICATED BRANCH CIRCUIT DERIVED FROM AN EM PANEL, IF AVAILABLE. SECONDARY POWER WILL BE PROVIDED BY THE BATTERY BACKUP UNIT (BBU). KNOX GATE KEY SWITCH WILL BE PROVIDED FOR EMERGENCY POWER OFF (EPO)

ACCEPTANCE TESTING WILL BE DONE IN ACCORDANCE WITH APPLICALBLE FIRE CODE AND/OR AHJ PROVIDED RADIO POLICY.

WALLS LEGEND

- 1 HOUR RATED FIRE BARRIER
- 2HR HOUR RATED FIRE BARRIER

NOTE: WALL TYPES SHOWN IN THESE DRAWINGS ARE BASED ON ARCHITECT PROVIDED G-, LS-, OR A-SHEETS AND INCLUDED HEREIN FOR REFERENCE ONLY. ONLY WALLS THAT HAVE RELEVANCE TO ROUTING OF ERRCS CABLES ARE SHOWN.

CABLES LEGEND

- 1/2" PLENUM COAX
- 1/2" COAX
- COAX JUMPER
- 1/2" RADIATING COAX
- 1/2" 2HR PLENUM COAX - UL2196
- 1/2" PLENUM COAX W/ METAL CLAD
- CATEGORY- TWISTED PAIR
- FIBER OPTIC CABLE - PLENUM ARMORED

DEVICE NAMING CONVENTION

[LAYOUT PLAN] . [LEVEL] . [DEVICE TYPE & ID]

R1.01.AO4

DEVICE TYPE ABBREVIATION	DEVICE TYPE
AO	ANTENNA - OMNI
AD	ANTENNA - DIRECTIONAL
SP	SPLITTER / DIRECTIONAL COUPLER
RA	RADIO AMPLIFIER (BDA)
MU	MASTER RADIO UNIT
RU	REMOTE RADIO UNIT
BU	BATTERY BACKUP UNIT
LS	LIGHTNING SUPPRESSOR
FO	FIBER DISTRIBUTION PANEL (FDP)
EO	EMERGENCY POWER OFF (EPO)
AN	REMOTE ANNUNCIATOR
OE	OPTICAL EXPANSION UNIT (OEU)

GENERAL NOTES

1. PLANS ARE TO BE A DIAGRAMMATIC OUTLINE ONLY, UNLESS NOTED OTHERWISE. THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
2. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY INDICATED OTHERWISE OR WHERE LOCAL CODES OR REGULATIONS TAKE PRECEDENCE.
3. SEAL PENETRATIONS THROUGH FIRE RATED AREAS WITH U.L. LISTED AND FIRE CODE APPROVED MATERIALS TO MAINTAIN EXISTING FIRE RATING. SEE ARCHITECTURALS OR LIFE SAFETY PLANS FOR LOCATIONS.
4. DETAILS ARE INTENDED TO SHOW END RESULT OF DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS, AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND INSPECTIONS REQUIRED FOR CONSTRUCTION.
6. CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.
7. IF SLAB IS POST TENSION CONSTRUCTION, LOCATE AND AVOID ANY REINFORCEMENT PRIOR TO DRILLING. SEE ARCHITECTURALS.
8. COORDINATE WITH THE MECHANICAL, ELECTRICAL & PLUMBING DRAWINGS FOR EQUIPMENT INSTALLED UNDER OTHER DIVISIONS OF THE DOCUMENTS.
9. COORDINATE LOCATION OF CEILING-MOUNTED EQUIPMENT WITH THE MECHANICAL AND ELECTRICAL DEVICES INSTALLED IN OR ON THE CEILING.
10. ALL CABLING ROUTED IN PLENUM SPACE AND RISERS SHALL BE PLENUM-RATED.
11. ALL COAX TO BE INSTALLED PER MANUFACTURE SPECIFICATIONS, SUPPORTED AT A MINIMUM OF EVERY 4'-0" IN PROPERLY SIZED BLOCKS OR OTHER COAX SUPPORTS U.N.O
12. MAINTAIN MINIMUM BEND RADIUS AND SUPPORT CABLE AS NEEDED TO PROTECT CABLES FROM SAGGING, KINKING OR BEING CAUGHT.
13. WATERPROOF ALL EXTERIOR CONNECTIONS AND ANY OTHER CONNECTIONS EXPOSED TO MOISTURE OR CONDENSING ENVIRONMENTS WITH SELF AMALGAMATING BUYTAL TAPE WITH MINIMUM 1/2" OVERLAP.

DRAWING INDEX

SHEET	DESCRIPTION	SHEET	DESCRIPTION
R0.00	COVER SHEET	R2.00	FIRESTOPPING DETAILS
R0.01	ONE-LINE DIAGRAM	R2.01	INSTALLATION DETAILS
R0.02	CALCULATIONS	R2.02	GROUNDING DETAILS
R1.01	LEVEL 1		

ERCES SYSTEM SUMMARY

RADIO SYSTEM NAME:	NORTH CAROLINA VIPER		
SITE NAME:	SPOUT SPRINGS		
COORDINATES:	35.27722°	-79.07083°	
ADDRESS:	HP-1266, SPOUT SPRINGS 2305 NC87 SOUTH		
AZIMUTH:	218°		
DISTANCE(MI):	2.6		
FREQUENCIES:	851.5875 851.9000 852.3625 853.1250 853.5000 853.7500 **853.975c 854.2375c**		
NUMBER OF CH'S:	8		
BDA OEM:	COMBA		
BDA CLASS:	CLASS B		
BDA OUTPUT POWER:	GAIN RANGE(dB):	30	
	DOWNLINK (dBm):	27	
	UPLINK (dBm):	27	
BDA FREQUENCY RANGE (MHz):	BAND:	700	800
	DOWNLINK:	768 - 775	851 - 861
	UPLINK:	798 - 805	806 - 816
	FILTER BANDWIDTH:	OFF	10
SERVING ANTENNA QTY:	3		
FLOORS W/ ANTENNAS:	FIRST FLOOR		
STANDBY TIME:	24		
FACP SUPERVISORY SIGNALS:	POWER SUPPLY:	1. BDA - AC FAIL 2. BDA - BATTERY LOW 3. BDA - CHARGER FAIL	
	SYSTEM:	1. BDA - DONOR ANTENNA MALFUNCTION 2. BDA - SYSTEM COMPONENT FAIL 3. BDA - SIGNAL BOOSTER FAIL	

CODE ANALYSIS

JURISDICTION:	SANFORD FIRE DEPARTMENT	
RADIO POLICY:	NONE	
GOVERINING CODE:	IBC:	2018
	IFC:	2018
	NFPA 1225, CHAPTER 18:	2022
	NFPA 70 (NEC):	2019
	NFPA 780:	2020
CONSTRUCTION TYPE:		II-B
OCCUPANCY GROUP:		EDUCATIONAL
FULLY SPRINKLERED:		YES
BUILDING HEIGHT:		36' 6"
NUMBER OF STORIES IN BUILDING:	ABOVE:	1
	BELOW:	0
TOTAL FLOOR AREA (SF):		18,336

DESIGN CRITERIA

SIGNAL STRENGTH:		DAQ
DIGITAL AUDIO QUALITY (DAQ) AND/OR SIGNAL INTERFERENCE NOISE (SINR):	DAQ	3.0
	SINR	22dB
AREA COVERAGE REQUIRMENTS:	GENERAL	90%
	CRITICAL	99%
EMERGENCY GENERATOR:		NO
BATTERY BACKUP TIME:	GENERATOR:	2-HOURS
	NO GENERATOR:	12-HOURS
MONITORING BY FIRE ALARM CONTROL PANEL:	TYPE	SUPERVISIORY
	QTY	6
BACKBONE CABLING ENCLOSURE:	FIRE RATING (HRS):	0
CONDUIT REQUIREMENTS:	RISER:	NO
	FEEDER:	NO

SYMBOL LEGEND

- 1 1/4"Ø EMT CONDUIT
- 2"Ø EMT CONDUIT
- 1 1/4"Ø / 2"Ø VERTICAL SLEEVE
- 1 1/4"Ø / 2"Ø SLEEVE W/ FIRESTOP
- BALLAST MOUNT
- 18"X18"X6" J-BOX - U.N.O.
- 12"X12"X6" J-BOX W/ OMNI ANTENNA
- OMNI ANTENNA
- DIRECTIONAL ANTENNA
- YAGI ANTENNA
- DIRECTIONAL COUPLER
- 2-WAY SPLITTER
- 3-WAY SPLITTER
- 4-WAY SPLITTER
- BI-DIRECTIONAL AMPLIFIER (BDA)
- BATTERY BACKUP UNIT (BBU)
- LIGHTNING SUPPRESSOR
- REMOTE ANNUNCIATOR
- FIBER DISTRIBUTION PANEL (FDP)
- EMERGENCY POWER OFF (EPO)
- KNOX GATE AND KEY SWITCH

ELECTRICAL CONTRACTOR NOTES

1. AC POWER SHALL BE LANDED WITHIN BBU (BATTERY BACKUP UNIT) CABINET LOCATED IN CLOSE PROXIMITY TO THE BDA (BI-DIRECTIONAL AMPLIFIER AKA HEADEND) AND, IF APPLCIABLE, REMOTE BDA LOCATIONS.
2. AC POWER SHALL BE DEDICATED 120V 20A CIRCUIT WITH LOCKING BREAKER CONNECTED TO EMERGENCY POWER WHEN AVAILABLE. RECEPTACLE TYPE SHALL BE SINGLE NEMA 5-20R WITH LOCKING END USE COVER.
3. DRY CONTACT CONNECTIONS TO BE MONITORED BY FACP ARE LOCATED WITHIN THE BBU CABINET.
4. ALL CONDUIT PENETRATIONS INTO THE BBU CABINET SHALL HAVE R/T FITTINGS.
5. ACCEPTABLE GROUNDING SOURCE SHALL BE PROVIDED FOR BDA AT HEADEND AND, IF APPLICABLE, REMOTE BDA LOCATIONS.
6. CONDUIT RACEWAY AND J-BOXES SHALL BE INSTALLED WHERE COAX PATHWAY AND SPLITTER JUNCTIONS ARE EXPOSED.
7. SPLITTER JUNCTIONS LOCATED ABOVE HARDLID CEILINGS SHALL REQUIRE A 12"X12" ACCESS PANEL.
8. MINIMUM SIZE CONDUIT 1-1/4"; SINGLE RUNS OF 1/2" COAX SHALL REQUIRE 1-1/4" CONDUIT AND 2 RUNS OF 1/2" COAX SHALL REQUIRE 2" CONDUIT.
9. ALL RACEWAYS SHALL BE TERMINATED WITH A PLASTIC ANTI-SHORT BUSHING.
10. ALL CONDUIT RUNS SHALL HAVE LESS THAN 270 DEGREES TOTAL BEND BETWEEN PULL POINTS, AND FURNISHED WITH PULL STRING.
11. IF REQUIRED, PULL POINT J-BOXES SHALL BE 18"X18"X6", IF CONDUIT ENTRANCE AND EXIT ARE ON OPPOSING SIDES FOR STRAIGHT THROUGH PULL, 6"X6"X24" WIRE TROUGH IS PREFERRED.
12. IF COAX RUNS ARE PLACED IN CONDUIT, SPLITTER JUNCTIONS SHALL REQUIRE AN 18"X18"X6" J-BOX. SEE LAYOUT PLANS FOR SPLITTER LOCATIONS. SPLITTER JUNCTIONS LOCATED WITHIN TELECOM ROOMS SHALL NOT REQUIRE A J-BOX.
13. ROOF PENETRATION REQUIRED FOR DONOR ANTENNA FEEDLINE SHALL BE 2" CONDUIT WITH WEATHERHEAD. (BY OTHERS)

PROJECT CONTACTS

ERRCS CONTRACTOR
ADT COMMERCIAL
CASEY MCKENNA
1501 YAMATO RD
BOCA RATON, FL 33431
PHONE: 732.921.6373

Revision history

Rev	Date	Author
0	11/18/2023	JD
SHOP DRAWINGS 100%		

Project name
HIGHLAND ELEMENTARY ADDITION & RENOVATION

Address
1915 BUFFALO LAKE RD
SANFORD NC
27332

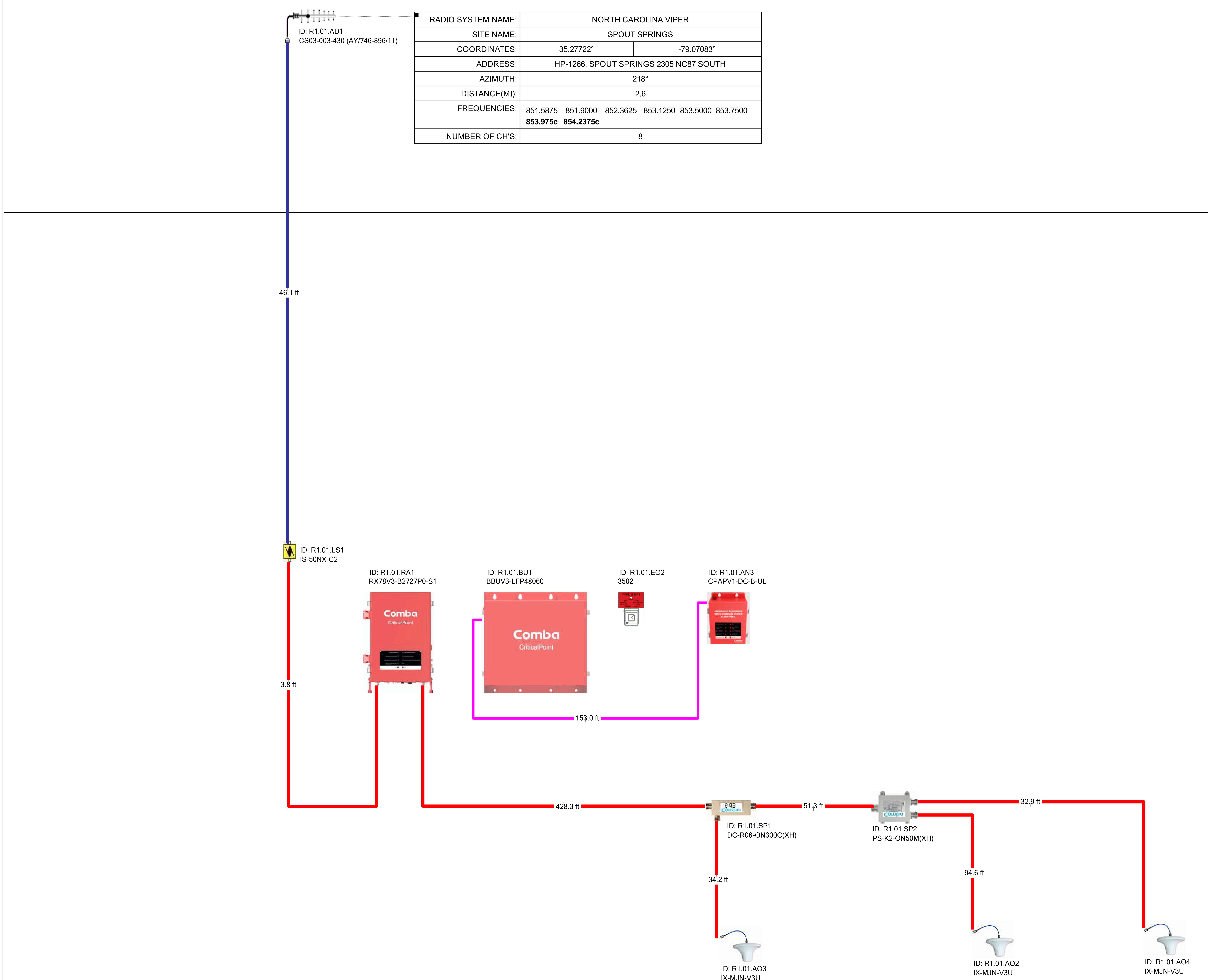
Designer name
JD

R0.00

COVER SHEET

11/18/2023

RADIO SYSTEM NAME:	NORTH CAROLINA VIPER	
SITE NAME:	SPOUT SPRINGS	
COORDINATES:	35.27722°	-79.07083°
ADDRESS:	HP-1266, SPOUT SPRINGS 2305 NC87 SOUTH	
AZIMUTH:	218°	
DISTANCE(MI):	2.6	
FREQUENCIES:	851.5875 851.9000 852.3625 853.1250 853.5000 853.7500 **853.975c 854.2375c**	
NUMBER OF CH'S:	8	



ADT Commercial

Revision history

Rev	Date	Author
0	11/18/2023	JD
SHOP DRAWINGS 100%		

Project name

HIGHLAND ELEMENTARY ADDITION & RENOVATION

Address

1915 BUFFALO LAKE RD
SANFORD NC

27332

Designer name

JD

R0.01

ONE-LINE DIAGRAM

11/18/2023

Battery Calculation for Radio Amplification

BDA Nominal Voltage	48	VDC		
Code-requried Backup	24	hours	Generator	No

Battery System (Main BDA)

Power Consumption

Equipment Make	Model	Description	Watts	Qty	Power (Watts)
Comba	RX78V3-B2727P0-XX	700/800MHz, Class B, 27dBm, XX=S1/S0/C0	85	1	85
Comba	CPAPV1-DC-B-UL	Dedicated Annunciator Panel	3	1	3
			0		0
			0		
Other 48V loads					10
				Total Power (Watts)	98
				Total Current (Amps)	2.04
				Battery Backup Required (Amp-Hours, nominal)	49.0
				Battery Backup Safety Factor	1.1
				Battery Backup Required (Amp-Hours, with safety factor)	**53.9**

Battery Suitability

Make	Model	Output Voltage	Max Continuous Load (Amps) for 12 hrs	Max Continuous Load (W) for 12 hrs	Max Continuous Load (Amps) for 24 hrs	Max Continuous Load (W) for 24 hrs
Comba	BBUV3-LFP48060	48	5.00	240	2.50	120
					Provides 60 Amp-Hrs	
					Provides 27 Hrs	

1 - BATTERY CALCULATIONS

Antennas Report

Project name: HIGHLAND ELEMENTARY ADDITI(**Design company:** ADT COMMERCIAL
Project creation date: 11/18/2023 **Designer:** JD

Antenna EiRP report

Antenna ID	Ant. Model	System ID	Antenna gain * (dBi)	Total loss/gain (dB)	Antenna EiRP (dBm) Power/channel	Composite power	RSCP/RSRP
ID: R1.01.A02	IX-MJN-V3U	800 MHz - SMR - P25 - Sector N/A	2.2	39.5	-10.0	-0.9	-
ID: R1.01.A03	IX-MJN-V3U	800 MHz - SMR - P25 - Sector N/A	2.2	41.3	-8.2	0.9	-
ID: R1.01.A04	IX-MJN-V3U	800 MHz - SMR - P25 - Sector N/A	2.2	41.0	-8.5	0.6	-

Antenna EiRP Statistics (Power / Channel)

System ID	Average (dBm)	Std. dev. (dB)	Minimum (dBm) Antenna ID	Minimum (dBm) EiRP	Maximum (dBm) Antenna ID	Maximum (dBm) EiRP
800 MHz - SMR - P25 - Sector N/A	-8.9	1.0	ID: R1.01.A02	-10.0	ID: R1.01.A03	-8.2

System legend

NC VIPER / P25 / 800 MHz - SMR / NPSPAC / Nb. of channels: 8 / Nb. of sources: 1

2 - ANTENNAS REPORT

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION

General Radiotelephone Operator License

DOYLE, JACOB C
13457 MONROE ST
THORNTON, CO 80241

FCC Registration Number (FRN): 0030491484

Special Conditions / Endorsements

Ship Radar Endorsement.

Grant Date	Effective Date	Print Date	Expiration Date
01-27-2021	01-27-2021	01-28-2021	

File Number	Serial Number	Date of Birth
0009391695	PG00068340	05-28-1982

THIS LICENSE IS NOT TRANSFERABLE

(Licensee's Signature)

FCC 605-FRC - May 2007

3 - GENERAL RADIO OPERATORS LICENSE (GROL)

ADT Commercial

Public Safety Radio Enhancement System RF Link Budget

Performed by ADT Commercial
Saturday, November 18, 2023

Venue address: Highland ES - Addition & Renovation

Radio Donor Site Parame	
Base Station TX Power	51dBm
Base Station Feeder Line	0dB
Base Station Antenna Gai	0dBi
Donor Site-to-Venue Dista	2.6miles
Frequency, UL	810MHz
Frequency, DL	850MHz
Qty of RF channels	8channels
Base Station UL Rx Target	-110dBm

Portable Radio Paramete	
Portable Radio Transmit P	34dBm
Mobile Distance Near	10feet
Mobile Distance Far	60feet
Mobile DL Rx Target	-100dBm

RES System Parameters	
Donor Antenna Gain	14.1dBi
Donor Feeder Loss (from computer mode	-2dB
Donor Line Fixed Attenuation	0dB
BDA DL Power (max)	27dBm
BDA UL Power (max)	27dBm
BDA Gain (max)	65dB
BDA Gain (min)	35dB
Passive DAS Losses (from computer mo	-13dB
In-building Coverage Environment	Medium

Abbreviations:

BDA: Bi-directional Amplifier
DAS: Distributed Antenna System
DL: Downlink
EIRP: Effective Isotropic Radiated Power
RES: Radio Enhancement System
RSL: Received Signal Level
UL: Uplink

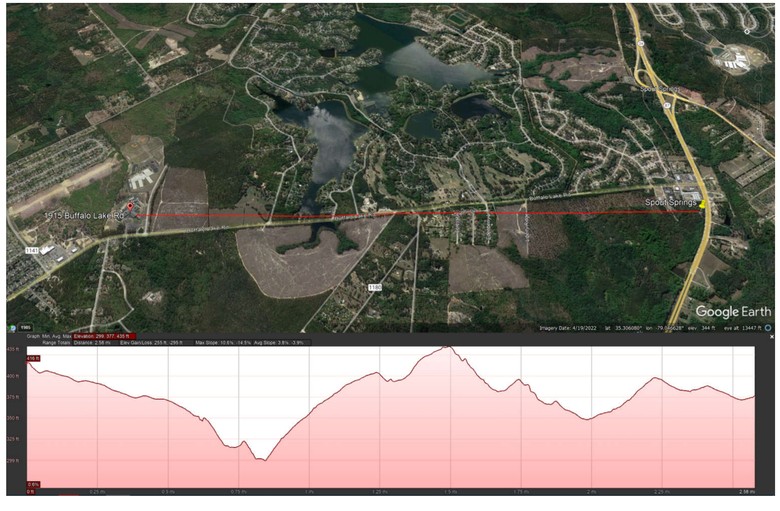
Uplink Budgets Near- and Far-field

	Uplink Link Budget - Near Field Calculation			Uplink Link Budget - Far Field Calculation		
1	34.0	dBm	Portable Radio Transmit Power	34.0	dBm	Portable Radio Transmit Power
2	-49.6	dB	In-Building propagation losses @ Near	-67.8	dB	In-Building propagation losses @ Far
3	-13.0	dB	Passive DAS loss, includes antenna gain	-13.0	dB	Passive DAS loss, includes antenna gain
4	-28.6	dBm	Signal Strength input to BDA (1+2+3)	-46.8	dBm	Signal Strength input to BDA (1+2+3)
5	45.0	dB	BDA UL Gain	45.0	dB	Adjusted BDA UL Gain
6	16.4	dBm	BDA Max UL Output Power (4+5)	-1.8	dBm	BDA UL Output Power (4+5)
7	0.0	dB	Donor Line Fixed Attenuation	0.0	dB	Donor Line Fixed Attenuation
8	-2.0	dB	Feedline loss to Donor Antenna	-2.0	dB	Feedline loss to Donor Antenna
9	14.1	dBi	Donor Antenna Gain	14.1	dBi	Donor Antenna Gain
10	-103.1	dB	Free Space Loss to Base Station	-103.1	dB	Free Space Loss to Base Station
11	0.0	dBi	Base Station Antenna Gain	0.0	dBi	Base Station Antenna Gain
12	0.0	dB	Base Station Feedline Loss	0.0	dB	Base Station Feedline Loss
	-74.5	dBm	RSL at Base Station Receiver (add 6-12)	-92.7	dBm	RSL at Base Station Receiver (add 6-12)

Downlink Budget

	Downlink - Link Budget		
1	51.0	dBm	Donor Site Tx Power (EIRP)
2	-103.5	dB	Free Space Loss to Venue
3	14.1	dBi	Donor Antenna Gain
4	-2.0	dB	Donor Feedline Loss
5	0.0	dB	Donor Fixed Attenuation
6	9.0	dB	Composite Power Factor (Channel Qty)
7	-31.4	dBm	Composite Input Power to BDA (add 1-6)
8	50.0	dB	BDA DL Gain
9	18.6	dBm	BDA Max DL Output Power
10	-13.0	dB	Passive DAS loss, includes antenna gain
11	-3.4	dB	Serving Antenna EIRP, per channel
12	-67.8	dB	In-Building propagation losses @ Far field
	-71.2	dBm	RSL into Mobile @ Far-field

4 - LINK BUDGET



5 - DONOR SITE/PATH 2D/3D

Comba
keeps you connected

THIS IS TO CERTIFY THAT

Jacob Doyle

HAS SUCCESSFULLY COMPLETED THE REQUIRED TRAINING,
AND IS CERTIFIED TO INSTALL AND COMMISSION
COMBA CRITICALPOINT™ BDA NG PUBLIC SAFETY EQUIPMENT

Matt Lunny, General Manager — 10/12/2023 Date

6 - OEM CERTIFICATION

Revision history

Rev	Date	Author
0	11/18/2023	JD

SHOP DRAWINGS 100%

Project name
HIGHLAND ELEMENTARY ADDITION & RENOVATION

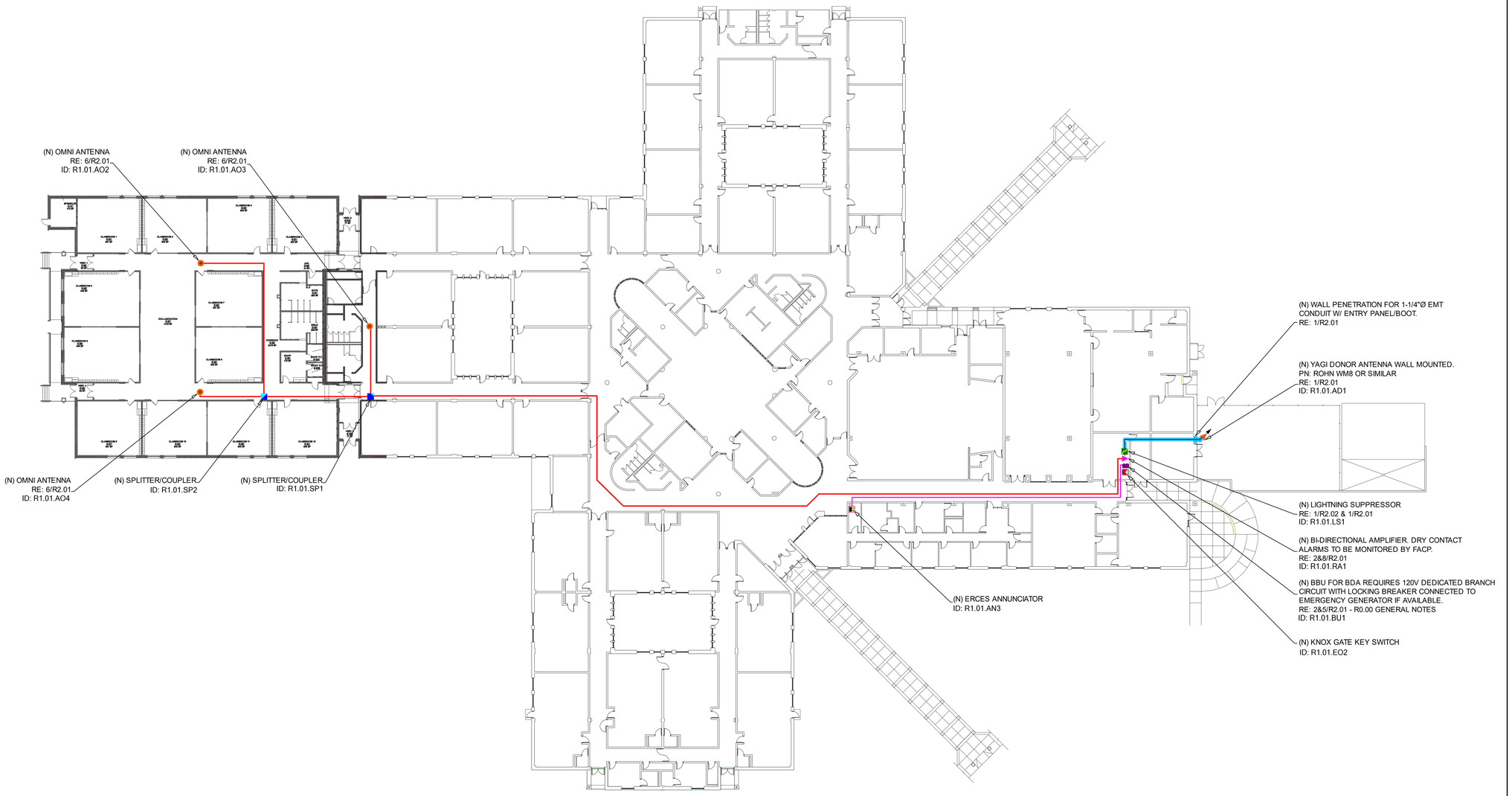
Address
1915 BUFFALO LAKE RD
SANFORD NC
27332

Designer name
JD

R0.02

CALCULATIONS

11/18/2023



WALLS LEGEND

- 1 HOUR RATED FIRE BARRIER
- 2HR HOUR RATED FIRE BARRIER

CABLES LEGEND

- 1/2" PLENUM COAX
- 1/2" COAX
- COAX JUMPER
- 1/2" RADIATING COAX
- 1/2" 2HR PLENUM COAX - UL2196
- 1/2" PLENUM COAX W/ METAL CLAD
- CATEGORY- TWISTED PAIR
- FIBER OPTIC - PLENUM ARMORED

SYMBOL LEGEND

- 1 1/4"Ø EMT CONDUIT
- 2"Ø EMT CONDUIT
- 1 1/4"Ø / 2"Ø VERTICAL SLEEVE
- 1 1/4"Ø / 2"Ø SLEEVE W/ FIRESTOP
- BALLAST MOUNT
- 18"X18"X6" J-BOX - U.N.O.
- 12"X12"X6" J-BOX W/ OMNI ANTENNA
- OMNI ANTENNA
- DIRECTIONAL ANTENNA
- YAGI ANTENNA
- DIRECTIONAL COUPLER
- 2-WAY SPLITTER
- 3-WAY SPLITTER
- 4-WAY SPLITTER
- BI-DIRECTIONAL AMPLIFIER (BDA)
- BATTERY BACKUP UNIT (BBU)
- LIGHTNING SUPPRESSOR
- REMOTE ANNUNCIATOR
- FIBER DISTRIBUTION PANEL (FDP)
- EMERGENCY POWER OFF (EPO)
- KNOX GATE AND KEY SWITCH

64.0 ft

ADT Commercial

Revision history

Rev	Date	Author
0	11/18/2023	JD

SHOP DRAWINGS 100%

Project name

HIGHLAND ELEMENTARY ADDITION & RENOVATION

Address

1915 BUFFALO LAKE RD
SANFORD NC
27332

Designer name

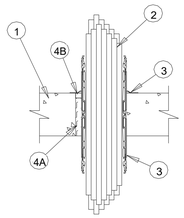
JD

R1.01

11/18/2023

System No. C-AJ-3285

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F RATING — 3 HR	F RATING — 3 HR
T RATINGS — 1, 1-1/2 AND 3 HR (SEE ITEM 2)	FT RATINGS — 1, 1-1/2 AND 3 HR (SEE ITEM 2)
L RATING AT AMBIENT — LESS THAN 1 CFM (SEE ITEMS 2 AND 4)	FH RATING — 3 HR
L RATING AT 400 F — LESS THAN 1 CFM (SEE ITEMS 2 AND 4)	FTH RATINGS — 1, 1-1/2 AND 3 HR (SEE ITEM 2)
	L RATING AT AMBIENT — LESS THAN 1 CFM (SEE ITEMS 2 AND 4)
	L RATING AT 400 F — LESS THAN 1 CFM (SEE ITEMS 2 AND 4)



1. FLOOR OR WALL ASSEMBLY -- REINFORCED LIGHTWEIGHT OR NORMAL WEIGHT (100-150 PCF OR 1600-2400 KG/M3) CONCRETE. MIN 4-1/2 IN. (114 MM) THICK FLOORS AND MIN 5 IN. (127 MM) THICK WALLS. WALL MAY ALSO BE CONSTRUCTED OF ANY UL CLASSIFIED CONCRETE BLOCKS*. FLOOR MAY ALSO BE CONSTRUCTED OF ANY MIN 6 IN. (152 MM) THICK UL CLASSIFIED HOLLOW-CORE PRECAST CONCRETE UNITS*. OPENING IN FLOOR OR WALL TO BE MAX 3 IN. (76 MM) DIAM FOR 2 IN. (51 MM) DEVICE AND MAX 5 IN. (127 MM) DIAM FOR 4 IN. (102 MM) DEVICE.

   SEE CONCRETE BLOCKS (CAZT) AND PRECAST CONCRETE UNITS (CFTV) CATEGORIES IN THE FIRE RESISTANCE DIRECTORY FOR NAMES OF MANUFACTURES.

2. CABLES --- WITHIN THE LOADING AREA FOR EACH FIRESTOP DEVICE, THE CABELS MAY REPRESENT A 0 TO 100 PERCENT VISUAL FILL. CABLES TO BE TIGHTLY BUNDLED WITHIN THE DEVICE AND RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. ANY COMBINATION OF THE FOLLOWING TYPES OF CABLERS MAY BE USED:
   A. MAX 100 PAIR NO. 24 AWG (OR SMALLER) COPPER CONDUCTOR TELECOMMUNICATIONS CABLE WITH POLYVINYL CHLORIDE (PVC) JACKETING AND INSULATION.
   B. MAX 7/C NO. 12 AWG COPPER CONDUCTOR CONTROL CABLE WITH PVC OR XPLE JACKET AND INSULATION.
   C. MAX 4/0 AWG TYPE RRH GROUND CABLE.
   D. MAX FOUR PAIR NO. 22 AWG CAT 6 COMPUTER CABLES.
   E. MAX RG 6/U COAXIAL CABLE WITH FLUORONATED ETHYLENE INSULATION AND JACKETING.
   F. FIBER OPTIC CABLE WITH POLYVINYL CHLORIDE (PVC) OR POLYETHYLENE (PE) JACKET AND INSULATION HAVING A MAX DIAM OF 1/2 IN. (13 MM)
   G. MAX 20/C NO.22 AWG SHIELDED PRINTER CABLE WITH PVC JACKET.
   H. THROUGH-PENETRATING PRODUCT*-TWO COPPER CONDUCTORS NO.18 AWG (OR SMALLER) POWER OR NON POWER LIMITED FIRE ALARM CABLE WITH OR WITHOUT A JACKET UNDER A METAL ARMOR. MAX 1/4 IN. (6 MM) DIAM S-VIDEO CABLE CONSISTING OF TWO MAX NO.24 AWG 75 OHM COAX OR TWISTED PAIR CABLE WITH PE INSULATION AND PVC JACKET.

   THE HOURLY, FT, AND FTH RATINGS FOR BLANK OPENING (NO CABLES) ARE 3 HR. THE HOURLY, FT, AND FTH RATINGS FOR OPENING WITH CABLES ARE 1-1/2 HR EXCEPT THAT, WHEN CABLE TYPE 2A, 2B, 2C, 2E, OR 2H IS USED, THE T, FT, AND FTH RATINGS ARE 1 HR. SEE TABLE BELOW FOR L RATINGS.

3. FIRESTOP DEVICE*--- FIRESTOP DEVICE CONSISTS OF A CORRUGATED STEEL TUBE WITH AN INNER PLASTIC HOUSING, INTUMESCENT MATERIAL RINGS, TIGHTLY TWISTED INNER FABRIC SMOKE SEAL, FLANGES AND GASKET MATERIAL (NOT SHOWN). FIRESTOP DEVICE TO BE INSTALLED IN ACCORDANCE WITH THE ACCOMPANYING INSTALLATION INSTRUCTIONS. DEVICE SLID INTO FLOOR OR WALL SUCH THAT ENDS PROJECT AN EQUAL DISTANCE FROM THE APPROXIMATE MOTOROLA R56 OF THE ASSEMBLY. AS AN OPTION, IN FLOORS, STEEL SLEEVE OF DEVICE MAY BE INSTALLED FLUSH WITH THE BOTTOM OF FLOOR. THE ANNULAR SPACE BETWEEN THE DEVICE AND THE PERIPHERY OF THE OPENING SHALL BE MIN 0 IN. (POINT CONTACT). DEVICE PROVIDED WITH FLANGE(S) THAT ARE SPUN CLOCKWISE ONTO DEVICE THREADS, OVER GASKET MATERIAL BUTTING TIGHTLY TO TOP SIDE OF FLOOR OR BOTH SIDES OF FLOOR OR WALL. IN FLOORS, WHEN ONE DEVICE FLANGE IS USED, DEVICE FLANGE TO BE SECURED TO FLOOR WITH MIN TWO 1-1/4 IN. (32 MM) LONG MASONRY SCREWS OR ANCHORS. AS AN ALTERNATE TO GASKET MATERIAL, SEALANT (ITEM 4B) MAY BE USED.HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC ---- CP 653 2" SPEED SLEEVE AND CP 653 4" SPEED SLEEVE
4. FIRESTOP SYSTEM ---- THE FIRESTOP SYSTEM SHALL CONSIST OF THE FOLLOWING:
   A. PACKING MATERIAL ---- MIN 4 IN. (102 MM) THICKNESS OF MIN 4 PCF (64 KG/M3) MINERAL WOOL BATT INSULATION FIRMLY PACKED INTO ANNULAR SPACE BETWEEN FIRESTOP DEVICE AND OPENING AS A PERMANENT FORM. PACKING MATERIAL TO BE INSTALLED FLUSH WITH BOTTOM OF FLOOR AND RECESSED FROM TOP SURFACE OF FLOOR OR FROM BOTH SURFACES OF WALL TO ACCOMMODATE THE REQURED THICKNESS OF FILL MATERIAL.
   B. FILL, VOID OR CAVITY MATERIAL* --- SEALANT --- AS AN ALTERNATE TO GASKET MATERIAL (SEE ITEM 3), MIN 1/2 IN. (13 MM) THICKNESS OF FILL MATERIAL APPLIED WITHIN THE ANNULUS, FLUSH WITH TOP SURFACE OF FLOOR OR WITH BOTH SURFACES OF WALL. FOR L RATINGS WHEN SEALANT IS USED, AN ADDITIONAL 1/4 IN. (6 MM) BEAD OF FILL MATERIAL IS REQUIRED AT THE DEVICE/FLOOR OR DEVICE/WALL INTERFACE ON TOP SIDE OF FLOOR OR BOTH SIDES OF WALL ASSEMBLY PRIOR TO INSTALLING FLANGE(S).

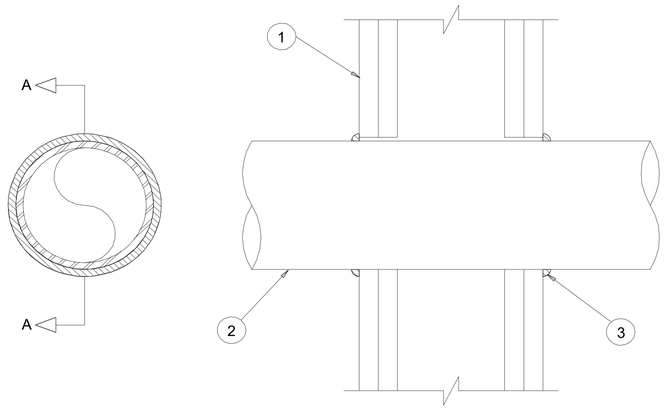
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC ---- CP601S SEALANT, CP604 SEALANT, CP 606 SEALANT, CFS-S SIL GG, CFS-S SIL SL (FLOORS ONLY), FS-ONE SEALANT OR FS-ONE MAX INTUMESCENT SEALANT.

   * INDICATES SUCH PRODUCTS SHALL BEAR THE UL OR CUL CERTIFICATION MARK FOR JURISDICTIONS EMPLOYING THE UL OR CUL CERTIFICATION (SUCH AS CANADA), RESPECTIVELY.

5 - FIRESTOPPING DETAIL @ FIBER

4 - NOT USED

System No. W-L-1304
F Ratings -- 1 and 2 Hr (See Item 1)
T Rating -- 0 Hr
L Rating at Ambient -- Less than 1 CFM/Sq Ft
L Rating at 400° F -- Less than 1 CFM/Sq Ft



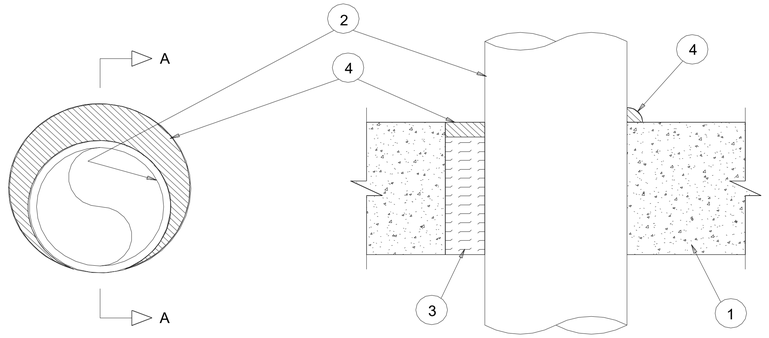
SECTION A-A

1. Wall Assembly -- The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features.
   A. Studs -- Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.
   B. Gypsum Board* -- Nom 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the Fire Resistance Directory. Max diam of opening is 5 in. The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through Penetrant -- One metallic pipe, conduit or tubing installed concentrically or eccentrically within the firestop system. Pipe, conduit or tube to be rigidly supported on both sides of wall assembly. The annular space between the pipe or tube and periphery of the opening shall be min 0 in (point contact) to max 1/2 in. The following types and sizes of metallic pipes, conduit or tube may be used:
   A. Steel Pipe -- Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.
   B. Iron Pipe -- Nom 4 in. diam (or smaller) cast or ductile iron pipe.
   C. Conduit -- Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or steel conduit.
3. Fill, Void or Cavity Material* - Sealant -- Min 1/2 in. thickness of fill material (not shown) applied within the annulus, flush with both surfaces of wall. At the point contact location, or when the annulus is 1/8 in. or less, between pipe and wall, a min 1/4 in.diam bead of fill material shall be applied at the pipe/wall interface.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC -- CP606 Flexible Firestop Sealant
   *Bearing the UL Classification Mark

   ALTERNATIVE: EZ PATH SERIES 22 FIRE RATED PATHWAY 2 HOUR RATED (UL1479) SUBMITTALS PROVIDED BY CONTRACTOR

3 - FIRESTOPPING DETAIL @ STUD WALL

System No. C-AJ-1149
F Rating -- 2 Hr
T Rating -- 0 Hr
L Rating At Ambient -- Less Than 1 CFM/sq ft
L Rating At 400 F -- 4 CFM/sq ft
W Rating -- Class I (See Item 4)



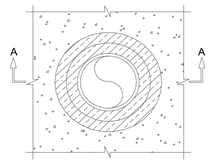
SECTION A-A

1. FLOOR OR WALL ASSEMBLY -- MIN 4-1/2 IN. THICK REINFORCED LIGHTWEIGHT OR NORMAL WEIGHT (100-150 PCF) CONCRETE. WALL MAY ALSO BE CONSTRUCTED OF ANY UL CLASSIFIED CONCRETE BLOCKS *. MAX DIAM OF OPENING IS 12 IN.
   SEE CONCRETE BLOCKS (CAZT) CATEGORY IN THE FIRE RESISTANCE DIRECTORY FOR NAMES OF MANUFACTURERS.
2. THROUGH PENETRANTS -- ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED WITHIN THE FIRESTOP SYSTEM. PIPE, CONDUIT OR TUBING TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE ANNULAR SPACE SHALL BE 0 IN. (POINT CONTACT) TO MAX 1-1/4 IN. THE FOLLOWING TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED.
   A. STEEL PIPE -- NOM 10 IN. DIAM (OR SMALLER) SCHEDULE 10 (OR HEAVIER) STEEL PIPE.
   B. IRON PIPE -- NOM 10 IN. DIAM (OR SMALLER) CAST OR DUCTILE IRON PIPE.
   C. CONDUIT -- NOM 4 IN. DIAM (OR SMALLER) STEEL ELECTRICAL METALLIC TUBING OR STEEL CONDUIT.
   D. COPPER TUBING -- NOM 4 IN. DIAM (OR SMALLER) TYPE L (OR HEAVIER) COPPER TUBING.
   E. COPPER PIPE -- NOM 4 IN. DIAM (OR SMALLER) REGULAR (OR HEAVIER) COPPER PIPE.
3. PACKING MATERIAL -- MIN 3 IN. THICKNESS OF MIN 4 PCF MINERAL WOOL BATT INSULATION FOR NOM 4 IN. DIAM (AND SMALLER) PIPES, CONDUITS OR TUBING'S AND A MIN 4 IN. THICKNESS OF MIN 4 PCF MINERAL WOOL BATT INSULATION FOR PIPE GREATER THAN NOM 4 IN. DIAM, FIRMLY PACKED INTO OPENING AS A PERMANENT FORM. PACKING MATERIAL TO BE RECESSED FROM TOP SURFACE OF FLOOR OR FROM BOTH SURFACES OF WALL AS REQUIRED TO ACCOMMODATE THE REQUIRED THICKNESS OF FILL MATERIAL.
4. FILL, VOID OR CAVITY MATERIAL* -- SEALANT -- MIN 1/2 IN. THICKNESS OF FILL MATERIAL APPLIED WITHIN THE ANNULUS, FLUSH WITH THE TOP SURFACE OF FLOOR OR BOTH SURFACES OF WALL. AT THE POINT OF CONTACT LOCATION BETWEEN PIPE AND CONCRETE, A MIN 1/2 IN. DIAM BEAD OF FILL MATERIAL SHALL BE APPLIED AT THE CONCRETE/PIPE INTERFACE ON THE TOP SURFACE OF FLOOR AND ON BOTH SURFACES OF WALL. W RATING APPLIES ONLY WHEN CP601S OR CP604 SEALANT IS USED.
   HILTI CONSTRUCTION CHEMCALS, DIV OF HILTI INC -- CP601S, CP604, CP606 OR FS-ONE SEALANT
   *BEARING THE UL CLASSIFICATION MARK
   ALTERNATIVE: EZ PATH SERIES 22 FIRE RATED PATHWAY 2 HOUR RATED (UL1479) SUBMITTALS PROVIDED BY CONTRACTOR

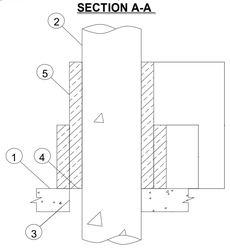
2- FIRESTOPPING DETAIL @ CONCRETE/CMU WALL

UL/cUL SYSTEM NO., F-A-1105
METAL PIPE THROUGH CONCRETE FLOOR ASSEMBLY
F-RATING - 2-HR.
T-RATING = 2-HR.
L-RATING AT AMBIENT = LESS THAN 1 CFM / SQ. FT
L-RATING AT 400° = 4 CFM/SQ FT.
W-RATING - CLASS I (SEE NOTE NO. 4 BELOW)

TOP VIEW



SECTION A-A



1. CONCRETE FLOOR ASSEMBLY (2-HR. FIRE-RATING):
   A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR (MINIMUM 4-1/2" THICK).
   B. STEEL FLOOR UNIT/FLOOR ASSEMBLY (UL/cUL D700, D800, OR D900 SERIES) - LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR (MINIMUM 2-1/2" THICK) OVER METAL DECKING.
2. PENETRATING ITEM TO BE ONE OF THE FOLLOWING:
   A. MAXIMUM 10" NOMINAL DIAMETER STEEL PIPE (SCHEDULE 40 OR HEAVIER).
   B. MAXIMUM 109" NOMINAL DIAMETER CAST OR DUCTILE IRON PIPE.
   C. MAXIMUM 6" NOMINAL DIAMETER STEEL CONDUIT.
   D. MAXIMUM 4" NOMINAL DIAMETER EMT.
3. MINIMUM 2" THICKNESS MINERAL WOOL (MINB. 4 PCF DENSITY) TIGHTLY PACKED.
4. MINIMUM 1/2" DEPTH HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT OR HILTI CP 604 SELF-LEVELING FIRESTOP SEALANT, HILTI CFS-S SIL GG FIRESTOP SILICONE SEALANT, OR HILTI CFS-S SIL SL FIRESTOP SILICONE SEALANT (SEE NOTE NO. 3 BELOW)
5. DUCT WRAP (NOMINAL 1-1/2" OR 2" THICK FIREWRAP DUCT INSULATION OR FIREWRAP DUCT 1.5 INSULATION (MANUFACTURED BY THERMAL CERAMICS)) WRAPPED AROUND PENETRANT, EXTENDING 24" ABOVE THE FLOOR(FOR PENETRANTS OF MINIMAL 4' DIAMETER OR SMALLER) OR 36" ABOVE THE FLOOR (FOR PENETRANTS GREATER THAN A NOMINAL 4" DIAMETER). AN ADDITIONAL LAYER OF DUCT WRAP TIGHTLY WRAPPED AROUND THE FIRST LAYER OF DUCT WRAP, EXTENDING 12" ABOVE FLOOR. SEAMS TO OVERLAP MINIMUM 1"

NOTES :
1. 1. MAXIMUM DIAMTER OF OPENING = 12-3/4".
2. ANNULAR SPACE = MINIMUM 0", MAXIMUM 2".
3. WHEN HILTI CP 604 SELF-LEVELING FIRESTOP SEALANT, HILTICFS-S SIL GG FIRESTOP SILICONE FIRESTOP SEALANT, OR HILTI CFS-S SILF SL FIRESTOP SILICONE SEALANT IS USED, MINIMUM THICKNESS OF MINERAL WOOL IS 4" AND MINIMUM THICKNESS OF FLOOR IS 4-1/2".
4. W-RATING APPLIES ONLY WHEN HILTI CP 604 SELF-LEVELING FIRESTOP SEALANT, HILTI CFS-S GG FIRESTOP SILICONE FIRESTOP SEALANT, OR HILTI CFS-S SIL SL FIRESTOP SILICONE SEALANT IS USED.

CONTRACTOR IS TO COORDINATE WITH DEN WITH REGARDS TO SCHEDULING THE X-RAYING OF FLOOR. LOCATE REBAR AND TENDONS AND ENSURE THAT THESE ITEMS WILL NOT BE DRILLED INTO, CUT, OR DAMAGED UNDER ANY CIRCUMSTANCES. PATCH AND REPAIR FLOOR AS REQUIRED PER DEN SPECIFICATIONS.

1 - FIRESTOPPING DETAIL @ CONCRETE

ADT Commercial

Revision history

Rev	Date	Author
0	11/18/2023	JD

SHOP DRAWINGS 100%

Project name
HIGHLAND ELEMENTARY ADDITION & RENOVATION

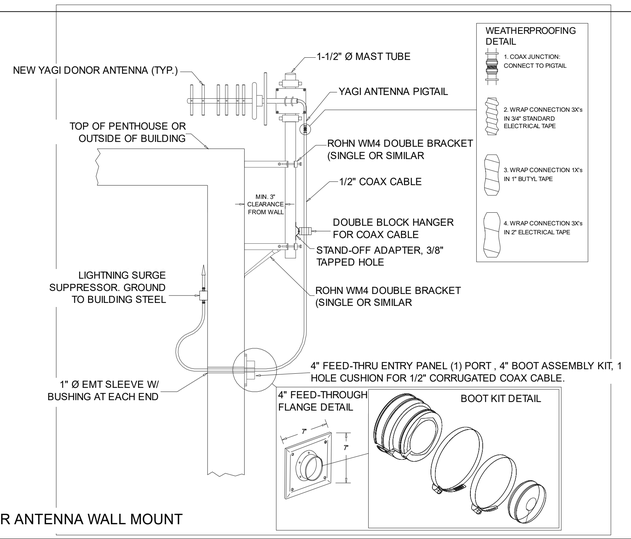
Address
1915 BUFFALO LAKE RD
SANFORD NC
27332

Designer name
JD

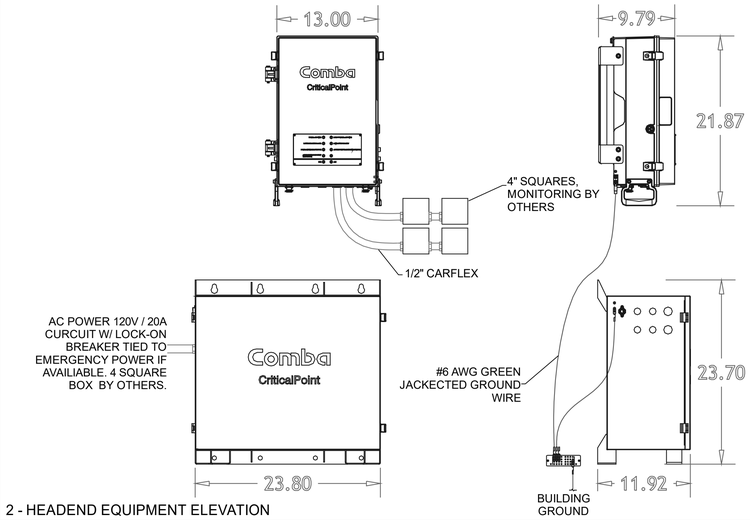
R2.00

FIRE-STOPPING DETAILS

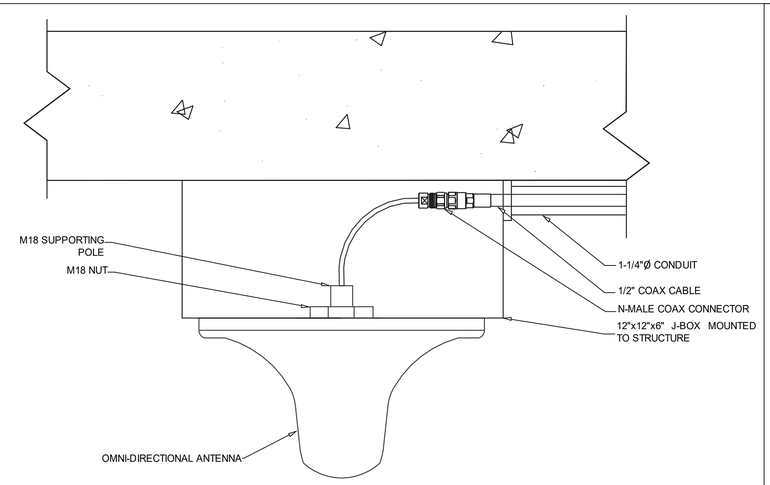
11/18/2023



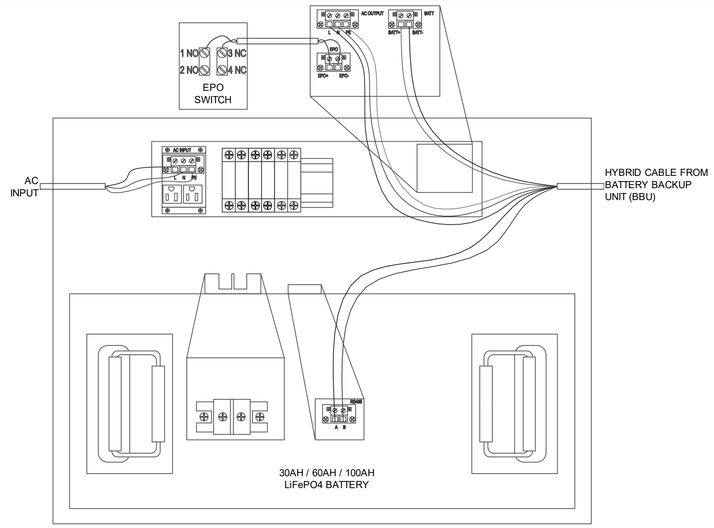
1 - DONOR ANTENNA WALL MOUNT

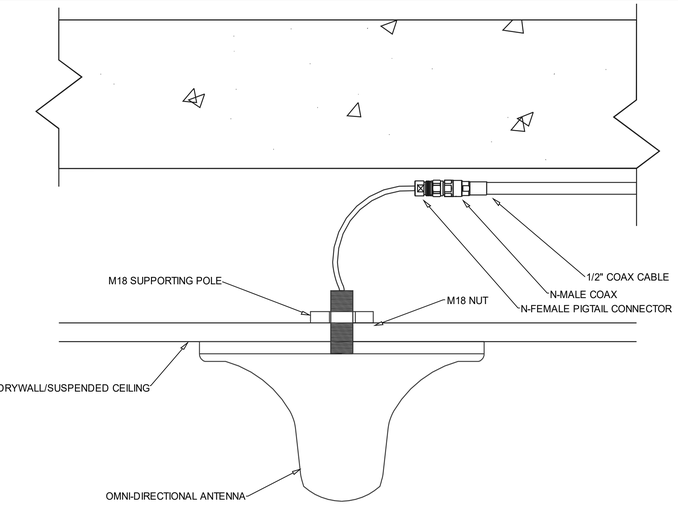


2 - HEADEND EQUIPMENT ELEVATION

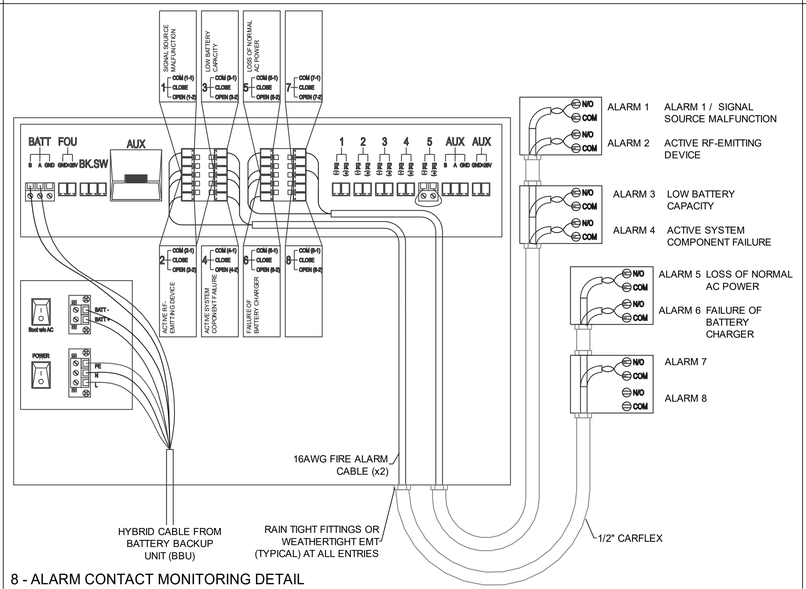


3 - OMNI ANTENNA MOUNTED TO CEILING J-BOX

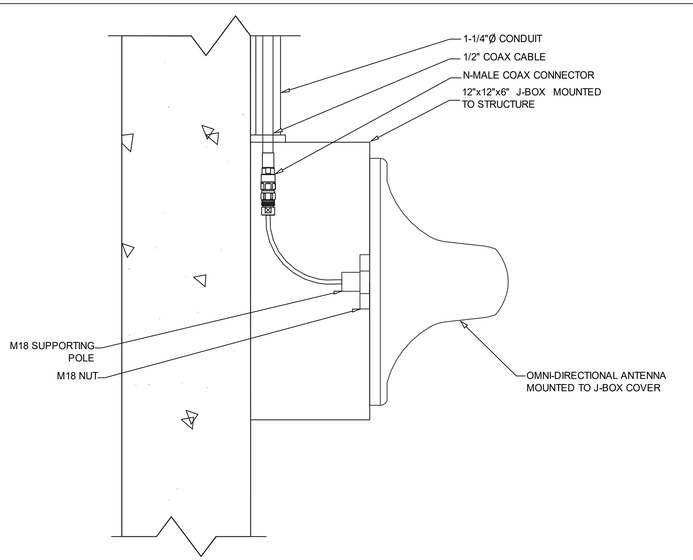




6 - ANTENNA DRYWALL/SUSPENDED CEILING MOUNTING DETAIL



8 - ALARM CONTACT MONITORING DETAIL



9 - OMNI ANTENNA WALL MOUNTED (STAIRWELL ONLY)

ADT Commercial

Revision history

Rev	Date	Author
0	11/18/2023	JD

SHOP DRAWINGS 100%

Project name

HIGHLAND ELEMENTARY ADDITION & RENOVATION

Address

1915 BUFFALO LAKE RD
SANFORD NC
27332

Designer name

JD

R2.01

MOUNTING DETAILS

11/18/2023

4 - NOT USED

3 - GROUNDING NOTES

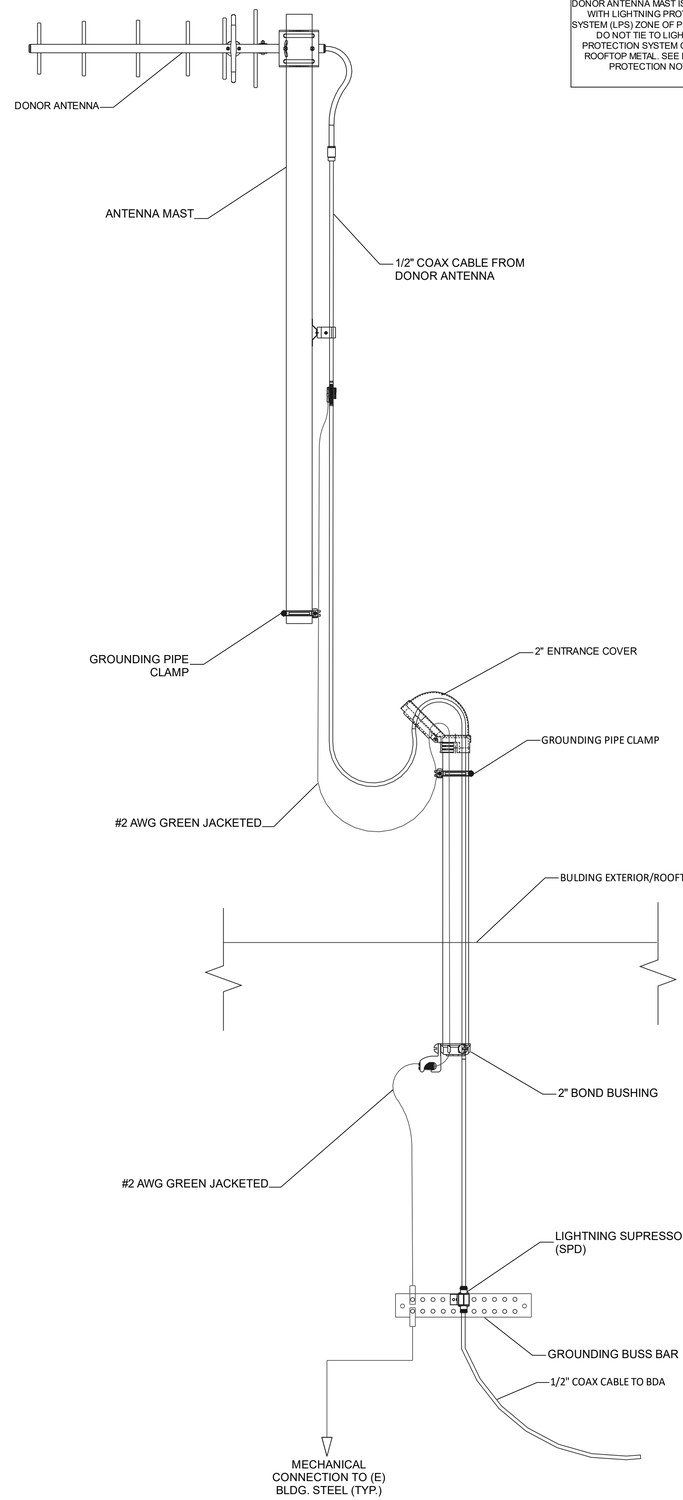
1. REFER TO NFPA 780 STANDARD FOR THE INSTALLATION OF LIGHTNING PROTECTION SYSTEMS (LPS) FOR ALL LPS REQUIREMENTS
2. ERCES DRAWINGS AND SPECIFICATIONS SHOULD BE REVIEWED BY THE LPS CONTRACTOR.
3. WHERE PRACTICABLE SYSTEM COMPONENTS LOCATED ON THE ROOF SHOULD BE INSTALLED IN THE ZONE OF PROTECTION AND ISOLATED FROM THE LPS.
4. WHERE PRACTICABLE SYSTEM COMPONENTS SHOULD NOT BE LOCATED WITHIN 6 FEET OF AN LPS STRIKE TERMINATION DEVICE.
5. IF ANY SYSTEM COMPONENT IS WITHIN 6' OF THE LPS OR OUTSIDE THE ZONE OF PROTECTION AREA THE LPS MAY REQUIRE MODIFICATONS, SUCH AS BONDING AND/OR ADDING A ZONE OF PROTECTION.
6. ANTENNA MASTS SHOULD NOT BE USED AS STRIKE TERMINATION DEVICES.
7. ANY MODIFICATION OR BONDING TO A LPS SYSTEM IS TO BE PERFORMED BY THE LPS CONTRACTOR.
8. SURGE PROTECTION DEVICES (SPD'S) SHALL BE INSTALLED AT THE COAX ENTRANCE INTO THE BUILDING AND SHALL NOT BE GROUNDED THROUGH A DOWN CONDUCTOR OF LPS.
9. ALL ACTIVE DEVICES SHALL BE GROUNDED PURSUANT TO NFPA 780 UNLESS OTHERWISE DIRECTED HEREIN.

2 - LIGHTNING PROTECTION

1. REFER TO MOTOROLA R56 GROUNDING SPECIFICATIONS FOR ALL GROUNDING REQUIREMENTS.
2. BOND AND GROUND ANY PROPOSED STRUCTURAL STEEL, CONCRETE REINFORCING AND OTHER METALLIC BUILDING ELEMENTS, REFER TO MOTOROLA R56 SPECIFICATIONS FOR EXACT REQUIREMENTS.
3. THE ELECTRICAL CONTRACTOR SHALL PERFORM ALL BONDING AND GROUNDING TO THE SITE'S OUTER GROUNDING SYSTEM DURING THE CONSTRUCTION PHASE OF THE BUILDING.
4. CONTRACTOR IS TO CONDUCT FREQUENT INSPECTIONS DURING THE CONSTRUCTION PHASE TO ENSURE THAT ALL GROUNDING ARRANGEMENTS ARE MADE ACCORDING TO THE GROUNDING DESIGN SPECIFICATIONS.
5. DO NOT RETROFIT (OR UPGRADE) ESTABLISHED SITES THAT DO NOT MEET ALL THE REQUIREMENTS OF MOTOROLA R56 GROUNDING STANDARD UNLESS THERE ARE DOCUMENTED OCCURRENCES OF EQUIPMENT DAMAGES AND/OR SERVICE AFFECTING CONDITIONS.
6. USE ONLY MOTOROLA R56-APPROVED MATERIALS SUCH AS COPPER FOR MOST ELECTRICAL WORK AND ALUMINUM FOR CERTAIN APPLICATIONS FOR SITE GROUNDING SYSTEM, ELECTRICAL PROTECTION COMPONENTS AND AC WIRING.
7. USE THE SAME METAL THROUGHOUT THE GROUND SYSTEM WHEN POSSIBLE
8. IF DIFFERENT METALS MUST BE CONNECTED, BOND THEM BY EXOTHERMICALLY WELDING THEM TOGETHER.
9. USE TINNED COPPER WHEN CONNECTING TO GALVANIZED STEEL.
10. DO NOT BOND COPPER AND ALUMINUM TOGETHER UNLESS USING SPECIFICALLY DESIGNED EXOTHERMIC MATERIALS DESIGNED FOR THIS APPLICATION ARE USED OR A BIMETALLIC TRANSITIONAL CONNECTION IS UTILIZED.
11. MAKE ALL BONDING ATTACHMENTS TO CLEAN, UNPAINTED METAL SURFACES OR USE APPROVED PAINT PIERCING WASHERS.
12. PAINTED SURFACES MUST BE SCRAPED, CLEANED, AND LIGHTLY COATED WITH THE APPLICABLE COMPOUND.
13. ALL INDOOR OR OUTDOOR POWER OR GROUNDING CONNECTIONS SHALL BE PROTECTED AGAINST CORROSION BY USE OF A THIN COATING OF ANTI-OXIDATION COMPOUND. A COPPER COSMOLINE GREASE BASED COMPOUND (NO OX-ID) SHALL BE USED ON ALL COPPER TO COPPER CONNECTIONS. A ZINC BASED (GREY COLORED) COMPOUND SHALL BE USED ON ALL COPPER TO STEEL CONNECTIONS. WHERE OTHER COMPOUNDS SUCH AS KOPPER-SHIELD ETC EXIST, THEY MAY BE 'GRANDFATHERED' IN PLACE. PENTROX GREASE OR AN APPROVED EQUAL SHALL BE USED ON ALUMINUM CONNECTIONS.
14. DO NOT WELD GROUNDING CONDUCTORS TO THE STRUCTURAL MEMBERS OF TOWERS, INCLUDING DOWN GUYS AND ANCHOR RODS.
15. BOND ALL METALLIC OBJECTS (SUCH AS WATER PIPES, CONDUITS, METAL FUEL TANKS WITHOUT CATHODIC PROTECTION, METAL FENCES, HVAC, ETC.) THAT ARE WITHIN 6 FEET (1.8 M) OF THE GROUND RING, OR FROM ANY OTHER GROUNDED CONDUCTOR, TO GROUND RING OR TO THE GROUNDED CONDUCTOR HARDWARE
16. ALL OUTDOOR HARDWARE (BOLTS, SCREWS, NUTS, WASHERS) SHALL BE 18-8 STAINLESS STEEL TYPE GRADE. INDOORS, GRADE 5 STEEL HARDWARE MAY BE USED. CHOOSE BOLT LENGTH TO ALLOW THE EXPOSURE OF AT LEAST TWO THREADS.
17. DO NOT WELD GROUNDING CONDUCTORS TO THE STRUCTURAL MEMBERS OF TOWERS, INCLUDING DOWN GUYS AND ANCHOR RODS.
18. BOND ALL METALLIC OBJECTS (SUCH AS WATER PIPES, CONDUITS, METAL FUEL TANKS WITHOUT CATHODIC PROTECTION, METAL FENCES, HVAC, ETC.) THAT ARE WITHIN 6 FEET (1.8 M) OF THE GROUND RING, OR FROM ANY OTHER GROUNDED CONDUCTOR, TO GROUND RING OR TO THE GROUNDED CONDUCTOR HARDWARE
19. ALL OUTDOOR HARDWARE (BOLTS, SCREWS, NUTS, WASHERS) SHALL BE 18-8 STAINLESS STEEL TYPE GRADE. INDOORS, GRADE 5 STEEL HARDWARE MAY BE USED. CHOOSE BOLT LENGTH TO ALLOW THE EXPOSURE OF AT LEAST TWO THREADS.
20. WHEN BONDING TO A METALLIC OBJECT WHERE ACCESS IS LIMITED TO ONLY ONE SURFACE, USE DRILLING & TAPPING OR SELF DRILLING SCREWS. DO NOT USE SHEET METAL SCREWS.
21. ALL GROUNDING CONDUCTORS SHOULD PRESERVE A DOWNWARD TO HORIZONTAL COURSE AND BE AS STRAIGHT AS POSSIBLE AND AVOID SHARP TURNS.
22. DO NOT USE U-SHAPED GROUNDING CONDUCTOR RUNS (U-TURNS IN THE WIRING) OR BONDING LAYOUTS TO REDUCE ARC-OVERS
23. ALL INTERIOR GROUNDING CONDUCTORS MUST BE RUN IN NONMETALLIC CONDUIT. ROUTE ALL CONDUCTORS THROUGH NONMETALLIC SLEEVES WHEN PENETRATING FLOORS, CEILINGS, AND WALLS.
24. IF THE USE OF METALLIC CONDUIT CANNOT BE AVOIDED, BOND BOTH ENDS OF THE CONDUIT TO THE GROUNDING CONDUCTOR BEING ROUTED THROUGH THE CONDUIT
25. KEEP LENGTHS OF CONDUCTORS TO A MINIMUM
26. THE MINIMUM INSIDE BENDING RADIUS IS:
    A. 6 INCHES (0.15M) FOR CONDUCTORS UP TO #6 GAUGE.
    B. 12 INCHES (0.3M) FOR CONDUCTORS #6 TO #4/0 GAUGE.
    C. 24 INCHES (0.6M) FOR CONDUCTORS #4/0 GAUGE AND LARGER.
27. GROUND CONDUCTORS MUST NEVER BE ENCIRCLED WITH FERROUS METAL CLAMPS, PLACED THROUGH METAL WALLS, METAL PLATES, OR SHORT SECTIONS OF METAL CONDUIT, AND MUST NEVER BE PLACE IN THE SAME CABLE RACK AS DC POWER CABLES, HIGH FREQUENCY CABLES, ETC.
28. WHEN ATTACHING PVC CONDUITS TO ANY SURFACE UTILIZE NONCONDUCTIVE FASTENERS OR NONFERROUS FASTENERS ONLY.
29. IF CONNECTIONS BETWEEN ALUMINUM CONDUCTORS AND STEEL OBJECTS MUST BE MADE, TINNED LUGS AND PENTROX SHALL BE USED. WHERE THERE ARE CONCERNS THAT THE PENTROX MAY NOT PROVIDE ADEQUATE INTERFACING, THEN A BIMETAL SPLICE BETWEEN THE ALUMINUM CONDUCTOR AND A SHORT LENGTH OF COPPER CONDUCTOR MAY BE USED.
30. ALL OF THE BONDING AND GROUNDING CONDUCTORS SPECIFIED FOR ROOFTOP CELL AND MICROWAVE SYSTEMS IS BARE WIRE. INSULATED WIRE SHALL NOT BE SPECIFIED OR SUBSTITUTED FOR THE BONDING AND GROUNDING CONDUCTORS OF ROOFTOP INSTALLATIONS.

1 - DONOR ANTENNA GROUNDING DETAIL

NOTE:
GROUNDING DETAIL ASSUMES THE DONOR ANTENNA MAST IS INSTALLED WITH LIGHTNING PROTECTION SYSTEM (LPS) ZONE OF PROTECTION. DO NOT TIE TO LIGHTNING PROTECTION SYSTEM OR OTHER ROOFTOP METAL. SEE LIGHTING PROTECTION NOTES



ADT Commercial

Revision history		
Rev	Date	Author
0	11/18/2023	JD
SHOP DRAWINGS 100%		

Project name
HIGHLAND ELEMENTARY ADDITION & RENOVATION

Address
1915 BUFFALO LAKE RD
SANFORD NC
27332

Designer name
JD

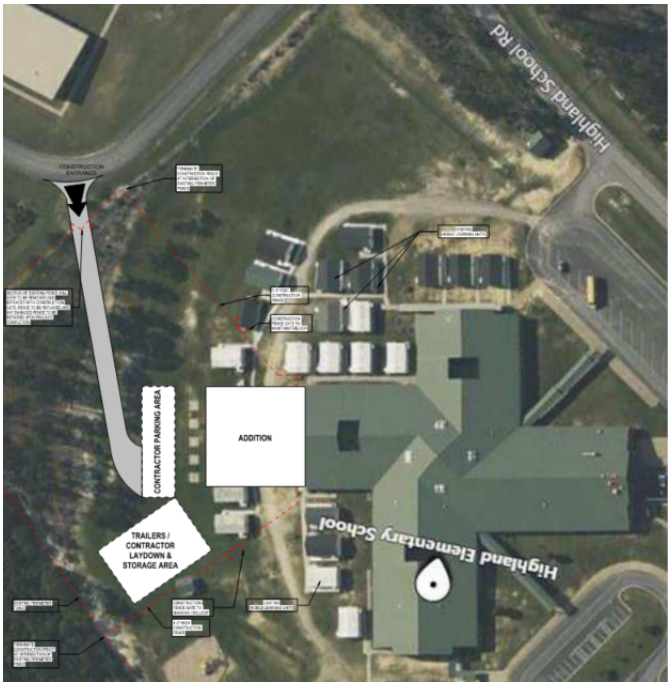
R2.02

GROUNDING DETAILS

11/18/2023

Product Data:
Emergency Responder Radio Communications System
Highland Elementary School
Addition and Renovation

November 18, 2023



ERCES Contractor:

ADT Commercial
Jacob Doyle
3821 Powhatan Road
Clayton, NC 27520
email: jacobdoyle@adt.com

Table of Contents

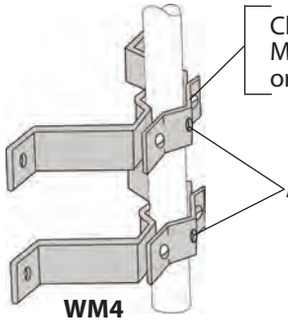
Project Description

Project name:	Highland Elementary – Addition and Renovation	
Project address:	1915 Buffalo Lake Road, Sanford, NC 27332	
Venue description:	Classroom addition to existing elementary school.	
Applicable Fire Code:	*IBC:*	*2018*
	IFC:	*2018*
	NFPA 1225, CHAPTER 18:	*2022*
	NFPA 70 (NEC):	*2019*
	NFPA 780:	*2020*
Specifications section:	*Not specified, although required by IFC*	

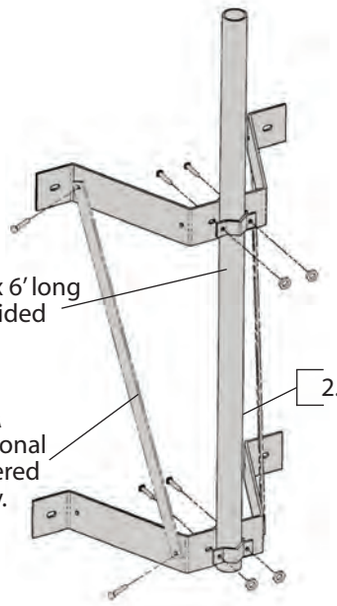
Signal Source Equipment

WM4

The WM4 mount provides 3" clearance to the wall. The WM4 is hot-dip galvanized for corrosion protection. Masts are held in place with a unique "Anti-Twist" locking clamp. This mount includes (4) 1/4" dia. x 2" long lag screws for mounting.



WM4



WM212

WM212

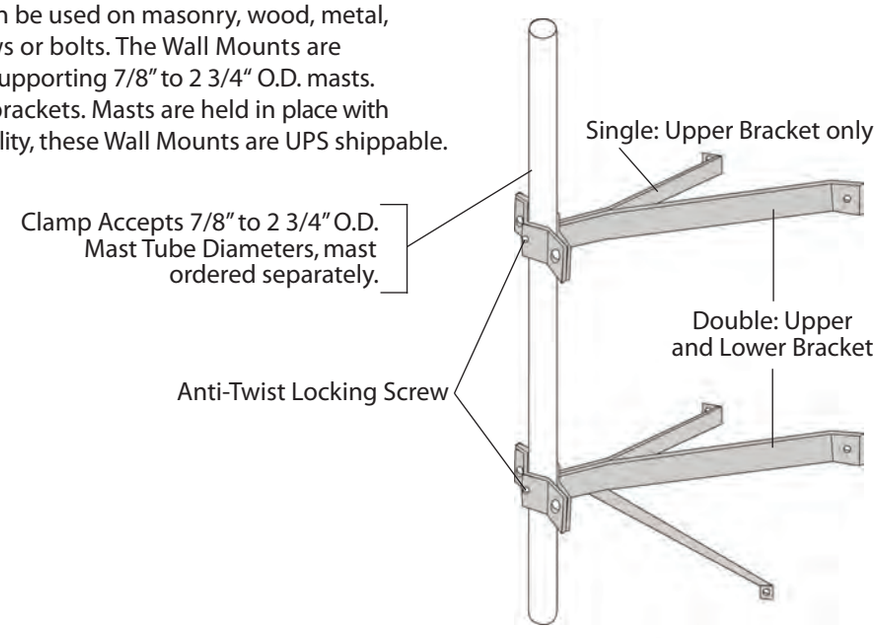
The WM212 mount provides 12" clearance to the wall. The WM212 is hot-dip galvanized for corrosion protection. Optional WMB12A diagonal is available to provide extra strength. Mount is pre-drilled to accept 1/2" dia. connectors.

EXTENDED WALL MOUNT ASSEMBLIES

Single and double extended wall mount assemblies can be used on masonry, wood, metal, and other types of walls using up to 1/4" dia. lag screws or bolts. The Wall Mounts are versatile, coming in a variety of stand off lengths and supporting 7/8" to 2 3/4" O.D. masts. The mounts are available as single brackets or double brackets. Masts are held in place with a unique "Anti-Twist" locking clamp. Galvanized for durability, these Wall Mounts are UPS shippable.

Single:	Wall Clearance
WM6S	6" clearance
WM8S	8" clearance
WM12S	12" clearance
WM18S	18" clearance
WM24S	24" clearance
Double:	**Wall Clearance**
WM8D	8" clearance
WM12D	12" clearance
WM18D	18" clearance
WM24D	24" clearance

NOTE: Connectors to wall not included.



Westell® | 746-896 MHz Yagi Antenna

General Information

Westell's 746-896 MHz Yagi Antenna is excellent for Public Safety applications. The eight-element construction provides exceptional performance and durability and is useful for directional point-to-point, or point-to-multipoint applications.

Product Highlights

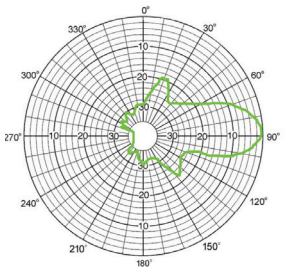
- 11 dBi Gain
- 746-896 frequency range
- 8 elements
- Hermetically sealed driven element
- Rugged anodized aluminum lightweight design
- Stainless-steel mounting hardware

746-896 MHz Yagi Antenna, 11 dBi

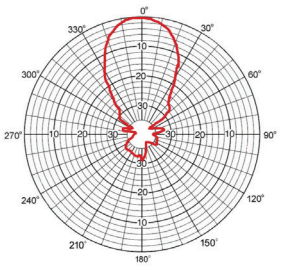
Ordering information

Part Number	Descriptions
CS03-003-430	CSI-AY/746-896/11

Radiation Patterns



Vertical



Horizontal

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

Specifications subject to change without notice.

Mechanical Specifications

Number of elements	8
Connector	N-Female
Lightning protection	Direct ground
Rated wind speed	134 mph
Frontal wind load	11.2 lbf
Lateral windload	8.2 lbf
Dimensions	33.1 x 8 x 2.2 in
Antenna weight	1.76 lbs
Mounting hardware	U-Bolt
Included mounting hardware fits 1.18"-2.36" inch OD pipe	

Product Specifications

SG12-12B2U

SureGround™ Grounding Kit for 1/2 in coaxial cable

CHARACTERISTICS

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

General Specifications

Cable Type	Corrugated | Smoothwall
Grounding Kit Type	SureGround™ Grounding Kits
Brand	SureGround™
Color	Black
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	6 gauge
Bonding Conductor Jacketing Material	PE
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
Weatherproofing Method	Butyl and electric tape

Product Specifications

SG12-12B2U

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
Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
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

Included Products

9905-71

Black 2 in PVC Tape, 20 ft

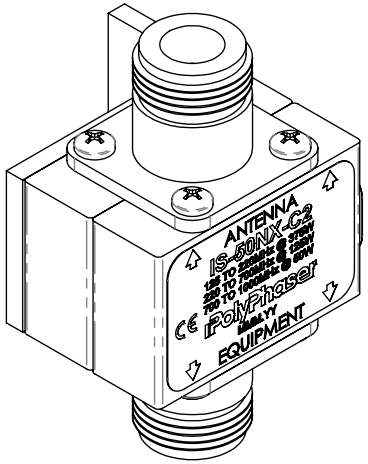
42615-10

Butyl Rubber Tape, 24 in

* Footnotes

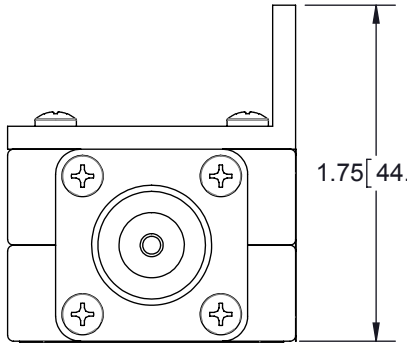
Grounding, Bonding and Shielding Test Method	Military Standard for Grounding, Bonding, and Shielding: Bond Resistance Requirement of a Maximum dc resistance of 0.001 ohms
Lightning Protection Test Method	Protection Against Lightning Electromagnetic Impulse, Table 1—Protection Level III–IV, 1995-02

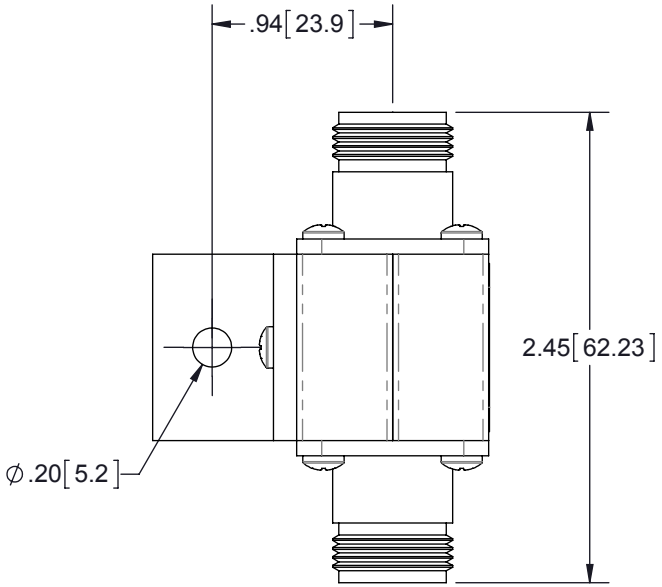
REVISIONS				
REV.	DESCRIPTION	ECN	DATE	APPROVED
G	REFER TO ECN	11902	8/9/13	JLJ

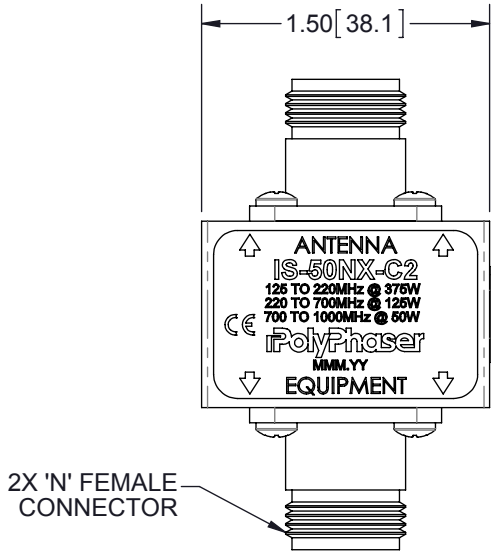


HARDWARE KIT INCLUDES:

QTY	DESCRIPTION
1	SCREW 10-32 X .50 SLOT F PAN 4-10 SS
1	SCREW 10-32x.50 SLOT MS PAN 18-8 SS
1	NUT 10-32 HEX 18-8 SS
2	WASHER 10 EXT TOOTH SS STAINLESS STEEL







MAXIMUM CHARACTERISTICS

APPLICATION:
TWO WAY RADIO AND SCADA APPLICATIONS
NON-WEATHERIZED, FLANGE MOUNT
SURGE:
50kA IEC 61000-4-5 8/20µs WAVEFORM (TESTED)
20kA (RATED)
TURN-ON:
600Vdc ±20%
TURN-ON TIME:
2.5ns FOR 2kV/ns
FREQUENCY RANGE:
125MHz TO 1GHz
VSWR:
≤1.1:1 OVER FREQUENCY RANGE
INSERTION LOSS:
≤0.1dB OVER FREQUENCY RANGE
MAX POWER:
375W @ 125MHz TO 220MHz
125W @ 220MHz TO 700MHz
50W @ 700MHz TO 1000MHz
THROUGHPUT ENERGY:
≤220µJ FOR 3kA, 8/20µs WAVEFORM
TEMPERATURE:
STORAGE: -55°C TO +85°C
OPERATING: -50°C TO +50°C
VIBRATION:
1G UP TO 100Hz
CE COMPLIANT
RoHS COMPLIANT

CUSTOMER APPROVAL: _____ DATE: _____

ALL DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.

UNLESS OTHERWISE SPECIFIED LEADING DIMENSIONS ARE INCHES DIMENSIONS IN [ ] ARE MILLIMETERS

TOLERANCES:
FRACTIONS=± 1/32 .XX=± .03
ANGLES=± 1 ° .XXX=± .010

THIRD-ANGLE PROJECTION

DRAWN	J. CALLISTER	9/21/93
ENG APPD	J. JONES	4/12/95
PRODUCT MGR		
MARKETING APPD	R. MATHEUS	4/12/95
PROJECT NO.		
DOCUMENT NAME	IS-50NX-C2-C	

PolyPhaser®

SHEET 1 OF 1
SCALE 1:1

TITLE
BROADBAND 125-1000MHz R50
T.O. 600Vdc N FEM
CUSTOMER SPECIFICATION

SIZE	CAGE	PROD CAT	PART NUMBER	REV
A	61114	RFP	IS-50NX-C2	G

Product Specifications

UGBKIT-0210

Copper Ground Buss Bar, 1/4 in x 2 in x 10 in (6.4 mm x 50.8 mm x 254.0 mm)

CHARACTERISTICS

Dimensions

Height	50.80 mm | 2.00 in
Length	254.00 mm | 10.00 in
Hole Size	7/16 in | 7/16 in x 5/8 in

General Specifications

Material Type	Copper
Hole Distance, center to center	19.05 mm | 3/4 in
Includes	Angle adapters | Grounding bar | Insulators | Mounting brackets | Universal hardware
Package Quantity	1

Mechanical Specifications

Material Thickness	6.350 mm | 1/4 in

Packed Dimensions

Height	406.4 mm | 16.0 in
Length	63.5 mm | 2.5 in
Shipping Weight	1.81 kg | 4.00 lb
Width	381.0 mm | 15.0 in

Product Specifications

LDF4-50A

LDF4-50A, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black PE jacket

Construction Materials

Jacket Material	PE
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	0.15 lb/ft | 0.22 kg/m
Diameter Over Dielectric	12.954 mm | 0.510 in
Diameter Over Jacket	15.875 mm | 0.625 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)	8000 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	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

General Specifications

Brand	HELIAX®
Ordering Note	CommScope® standard product (Global)

Mechanical Specifications

Bending Moment	3.8 N-m | 2.8 ft lb
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
Tensile Strength	113 kg | 250 lb

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	VSWR	Return Loss (dB)
680–800 MHz	1.13	24.30
800–960 MHz	1.13	24.30
1700–2200 MHz	1.13	24.30
2300–2700 MHz	1.13	24.30

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.149	0.045	40.00
1	0.211	0.064	36.11
1.5	0.259	0.079	29.46
2	0.299	0.091	25.50
10	0.672	0.205	11.35
20	0.954	0.291	7.99
30	1.172	0.357	6.51
50	1.521	0.463	5.02
85	1.995	0.608	3.82
88	2.031	0.619	3.76
100	2.169	0.661	3.52
108	2.256	0.688	3.38
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
2200	11.251	3.429	0.68
2300	11.535	3.516	0.66
2500	12.09	3.685	0.63
2700	12.627	3.849	0.60
3000	13.407	4.086	0.57
3400	14.401	4.389	0.53
3700	15.118	4.608	0.50
4000	15.815	4.82	0.48
5000	18.01	5.489	0.42
6000	20.055	6.113	0.38
8000	23.826	7.262	0.32
8800	25.244	7.694	0.30

** Values typical, guaranteed within 5%*

Regulatory Compliance/Certifications

Agency	Classification
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

ADT Commercial

Headend Radio Equipment

CriticalPoint™ Version 3 / Next Generation Public Safety Solution

Public Safety 700/800MHz Class A/B 27/33dBm Fiber DAS and Battery Backup Unit

Public Safety Standards Compliance

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

Fiber DAS System

- Supports P25 P1/P2, digital and conventional analog communications simultaneously
- Built-in cavity filtering to protect the unit from interference from FirstNet Band 14 and other neighbor bands
- Support up to 32 Remote Units
- Both Master Unit and Remote Units have the same output power for coverage
- 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 (Class A) / Wideband Auto Level Control (ALC) supported
- Downlink and Uplink squelch supported
- NetProtect™ Uplink PA shutdown during no traffic periods to minimize noise being introduced to the network
- Built-in mandatory isolation test to prevent system oscillation
- Auto shutdown with alarm upon oscillation detection
- 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 and built-in visual / audio annunciator
- Additional external Comba Annunciator Panel supported

Master Unit **Remote Unit**

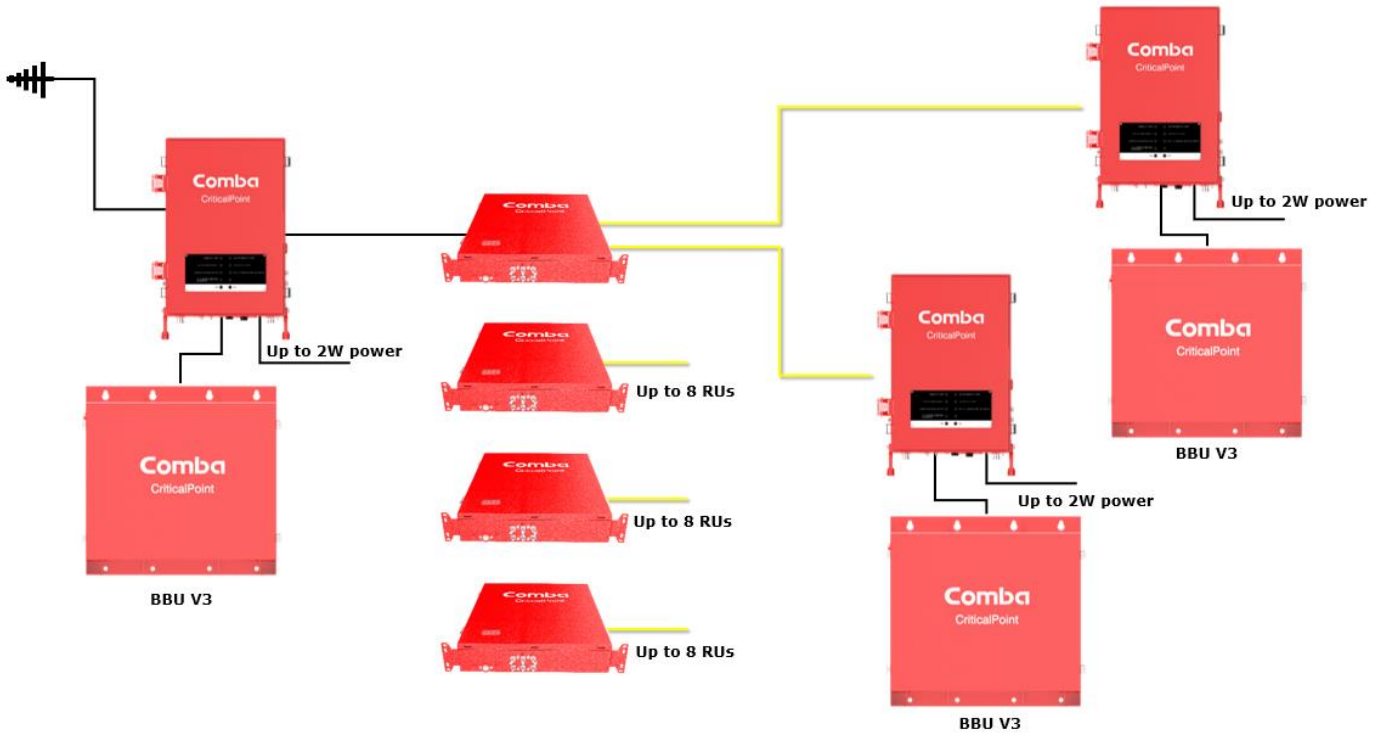
Fiber Optical Unit

Battery Backup Unit

- Optional dedicated Battery Backup Solution for BDA & DAS V3/NG platform
- Powered by Lithium Iron Phosphate (LiFePO4) batteries
- Provides 12 hours backup time with 30AH battery option
- Provides 24 hours backup time with 60AH battery option
- Provides 48 hours backup time with 100AH battery option
- Provides connections for EPO (Emergency Power Off) switch
- Provides AC convenience outlet inside BBU

Battery Backup Unit

Typical System Block Diagram



Specifications – Fiber Optic Unit

Frequency Band	MHz	758 - 869
Optical Wavelength Uplink	nm	1310
Optical Wavelength Downlink	nm	1550
Optical Connector Type		SC-APC
Optical Fiber Type		Single Mode, WDM (single strand of fiber per Remote Units)
VSWR		≤ 1.5
Number of RU supported per FOU		Up to 4 or 8 RU per FOU
Number of FOU supported per MU		Up to 4
Number of RU supported per MU		Up to 32

Mechanical Specifications – Fiber Optic Unit

Dimensions, H x W x D		in(mm)	18.5 x 15.8 x 3.4 (470 x 400 x 87)
Weight (without bracket)	4 Port	lb(kg)	25.4 (11.5)
	8 Port	lb(kg)	27.6 (12.5)
Power Consumption (approx.)	4 Port	W	15
	8 Port	W	20
Power Supply		VDC	+28 (From Master Unit)
Enclosure Cooling			Convection
Operating Temperature		ºF (ºC)	-40 to +131 (-40 to +55)
Operating Humidity			≤ 95%
Enclosure Class			UL50E Type 4 / NEMA 4

Note: Typical specifications at room temperature

RF Specifications – System (MU and RU)

		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: 851-861 / 806-816 Configuration C0 – 700MHz: 768-776 / 798 – 806, 800MHz: 851-869 / 806-824	
Total Output Power, Uplink	dBm	27 (Master Unit Only)	
Total Output Power, Downlink	dBm	27 / 33 (Master and Remote Units)	27 / 33 (Master and Remote Units)
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

*Gain adjusts down to 10dB total gain but is no longer FCC compliant for NF at that level

Class A and Specialized Filtering			
Number of Filters Downlink			64 Max per single band 96 Max (shared both bands) for 700/800MHz dual band
Number of Filter Uplink			64 Max per single band 96 Max (shared both bands) for 700/800MHz dual band
Filter Bandwidth		KHz	12.5/25/37.5/50/75/100/150**
Filter	Bandwidth (kHz)	Delay(μs)*	Out-of-Band Suppression
High rejection Filter Set	12.5	≤50 (MU Only: ≤48)	≥ 60dBc @ filter edge + 30KHz
	25	≤32 (MU Only: ≤30)	≥ 60dBc @ filter edge + 50KHz
	75	≤20 (MU Only: ≤18)	≥ 60dBc @ filter edge + 130KHz
	75 LD	≤17 (MU Only: ≤15)	≥ 60dBc @ filter edge + 200KHz
Low Delay Filter Set	12.5	≤32 (MU Only: ≤30)	≥ 60dBc @ filter edge + 65KHz
	25	≤29 (MU Only: ≤27)	≥ 60dBc @ filter edge + 75KHz
	37.5	≤28 (MU Only: ≤26)	≥ 60dBc @ filter edge + 75KHz
	50	≤28 (MU Only: ≤26)	≥ 60dBc @ filter edge + 100KHz
	75	≤17 (MU Only: ≤15)	≥ 60dBc @ filter edge + 200KHz
	100	≤16 (MU Only: ≤14)	≥ 60dBc @ filter edge + 200KHz
	150	≤15 (MU Only: ≤13)	≥ 60dBc @ filter edge + 205KHz

*Actual delay number is various according to version, system delay (MU+RU, including 1m of Fiber)
**BDA does not comply with FCC Class A regulation if any filters that are wider than 75KHz are used. Users must use a Class B FCC Label and register the BDA on FCC's WEB Site. Contact Comba Customer Service for support.

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

Mechanical Specification - MU

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	
DC Output for external devices			Typical 53.5V, Floating DC output, Max 100W	
Maximum Charging Current		A	5	
Power Consumption			27 dBm	33 dBm
	Single Band	W	<75	<90
	Dual Band		<85	<100
Enclosure Cooling			Convection	
Main RF Connectors			N-Female (MT, DT)	
RF Connectors for Fiber DAS expansion			SMA-Female (FOU DL, FOU UL)	
RF Test Port			SMA-Female (DT-Test, MT-Test), -28dB coupling	
Dry Contact Alarm Visual Annunciation			Dry Contact Alarm LED 1-8, ALM, RUN (LED test supported)	
Dry Contact Alarm Audible Annunciation			Buzzer (Mute and Lamp Test supported)	
Communication port			RJ45 (LAN, OMT)	
Dry Contact Alarm Output			8	
External Alarm Input			5 (#5 is pre-configured for Door Open Alarm)	
Reserved Knockouts			3/4-inch hole x 1, 1/2-inch hole x 3, 1-inch hole x2	
Operating Temperature and Humidity		ºC	-40 to +55, ≤ 95%	
Environmental Class			UL50E Type 4 / NEMA 4	
MTBF		Hr	100,000	

Mechanical Specification - RU

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	
DC Output for external devices			Typical 53.5V, Floating DC output, Max 100W	
Maximum Charging Current		A	5	
Power Consumption			27 dBm	33 dBm
	Single Band	W	<75	<90
	Dual Band		<85	<100
Enclosure Cooling			Convection	
Main RF Connectors			N-Female (MT)	
RF Test Port			SMA-Female (MT-Test), -28dB coupling	
Dry Contact Alarm Visual Annunciation			Dry Contact Alarm LED 1-8, ALM, RUN (LED test supported)	
Dry Contact Alarm Audible Annunciation			Buzzer (Mute and Lamp Test supported)	
Communication port			RJ45 (LAN, OMT)	
Dry Contact Alarm Output			8	
External Alarm Input			5 (#5 is pre-configured for Door Open Alarm)	
Reserved Knockouts			3/4-inch hole x 1, 1/2-inch hole x 3, 1-inch hole x2	
Operating Temperature and Humidity		ºC	-40 to +55, ≤ 95%	
Environmental Class			UL50E Type 4 / NEMA 4	
MTBF		Hr	100,000	

Mechanical Specification - Battery Backup Unit

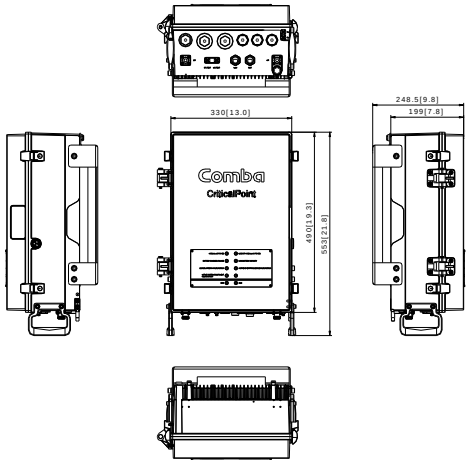
Dimensions, H x W x D	mm / in	605 x 500 x 272.9 / 23.8 x 19.7 x 10.7
Weight (without battery)	Kg / lbs	26 / 57.3
Reserved Knockouts		3/4-inch hole x 4, 1/2-inch hole x 6
Operating Temperature	°F (°C)	32 to 104 (0 to 40)
Operating Humidity		≤ 95%
Enclosure Environmental Class		UL50E Type 4 / NEMA 4

Specification - Battery

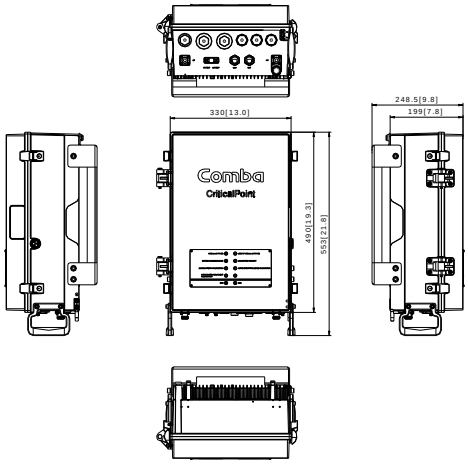
Battery Type		(Lithium Iron Phosphate) LiFePO4		
System Required Quantity	pcs	1	1	1
Capacity, Discharge @ 0.33C	AH	30	60	100
Nominal Voltage	VDC	51.2	51.2	51.2
Charging@2A, from 30%	Hour	10.5	21	35
Backup Hours		51.2 * 30 / Load	51.2 * 60 / Load	51.2 * 100 / Load
Battery Weight	lb(kg)	52.9 (24)	79.8 (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
BMS Comm. Port		Serial port (RS485)		

*Typical specifications at room temperature

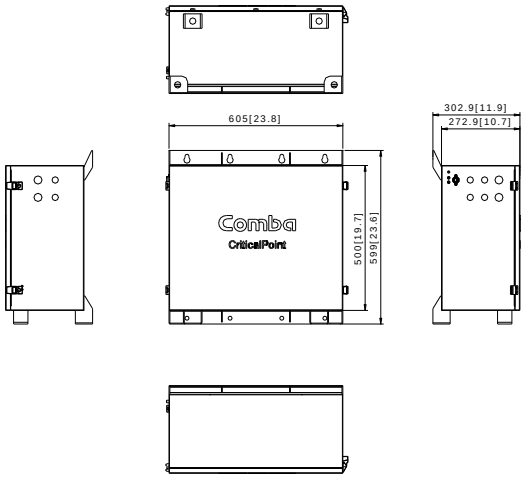
Outline Drawing



Master Unit V3 NG



Remote Unit 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
Master Unit / Remote Unit	RX = Master Unit RH = Remote Unit

Master Unit V3 NG

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	800MHz	Class B	33dBm	XX=S1/S0/C0
RX78V3-B2727P0-XX	700/800MHz	Class B	27dBm	XX=S1/S0/C0

Remote Unit V3 NG

BDA Part Numbers	Band	Class	DL PWR	Duplexer Configuration
RH78V3-A3300P0-XX	700/800MHz	Class A	33dBm	XX=S1/S0/C0
RH07V3-A3300P0-XX	700MHz	Class A	33dBm	XX=S1/S0/C0
RH08V3-A3300P0-XX	800MHz	Class A	33dBm	XX=S1/S0/C0
RH78V3-A2700P0-XX	700/800MHz	Class A	27dBm	XX=S1/S0/C0
RH07V3-A2700P0-XX	700MHz	Class A	27dBm	XX=S1/S0/C0
RH08V3-A2700P0-XX	800MHz	Class A	27dBm	XX=S1/S0/C0
RH78V3-B3300P0-XX	700/800MHz	Class B	33dBm	XX=S1/S0/C0
RH07V3-B3300P0-XX	700MHz	Class B	33dBm	XX=S1/S0/C0
RH08V3-B3300P0-XX	800MHz	Class B	33dBm	XX=S1/S0/C0
RH78V3-B2700P0-XX	700/800MHz	Class B	27dBm	XX=S1/S0/C0

FOU Part Numbers	Description
RHFOUV2F-E04UL	Critical Point Fiber Optical Unit for platform V2F and V3 NG, 4 port, UL 2524 Standard Certified
RHFOUV2F-E08UL	Critical Point Fiber Optical Unit for platform V2F and V3 NG, 8 port, UL 2524 Standard Certified

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

Master Unit V3 NG Licenses

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

Remote Unit V3 NG Licenses

License Part Numbers	Configuration	
RH78V3-L-2733AASS	27dBm to 33dBm upgrade license	27dBm to 33dBm upgrade license, for Single Band, Class A units
RH78V3-L-2733AADD		27dBm to 33dBm upgrade license, for Dual Band, Class A units
RH78V3-L-2733BBSS		27dBm to 33dBm upgrade license, for Single Band, Class B units
RH78V3-L-2733BBDD		27dBm to 33dBm upgrade license, for Dual Band, Class B units
RH78V3-L-3333AASD	Single Band to Dual Band upgrade license	Single band to Dual Band upgrade license, for 33dBm, Class A units
RH78V3-L-3333BBSD		Single band to Dual Band upgrade license, for 33dBm, Class B units
RH78V3-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
RH78V3-L-3333BASS	Class B to Class A upgrade license	Class B to Class A upgrade license, for 33dBm, Single Band units
RH78V3-L-3333BADD		Class B to Class A upgrade license, for 33dBm, Dual Band units
RH78V3-L-2727BASS		Class B to Class A upgrade license, for 27dBm, Single Band units
RH78V3-L-2727BADD		Class B to Class A upgrade license, for 27dBm, Dual Band units

KNOX GATE & KEY SWITCH™

Eliminate perimeter barriers that delay emergency response with the Knox Gate & Key Switch. Override electronic gates and lower voltage equipment to allow emergency access into communities, apartment complexes, parking garages, pedestrian gates, industrial receiving areas and much more.

Dual Gate & Key Switch on Mounting Plate
Model #3503

Single Gate & Key Switch on Mounting Plate
Model #3502

Single Gate & Key Switch
Model #3501

FEATURES

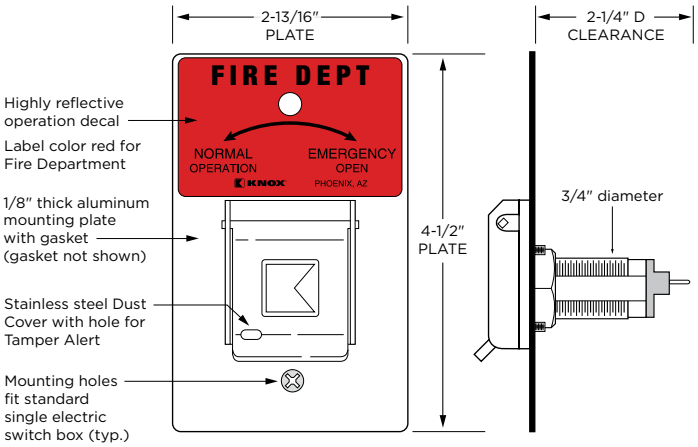
- One position, two position or momentary switch
- Face plate and lock cover ensure weather resistant operation
- Dual locks enable shared access with other agencies

BENEFITS

- Gain rapid access through electronic gates without forced entry
- Overrides electronic gates, motorized doors, electrical switches
- Can share access with multiple agencies
- Utilizes Knox Master Key solution

OPTIONS

- Single or dual key switch
- Fire, EMS, security or law enforcement identification labels



ELECTRICAL DATA

- Switch: SPDT or DPDT
- 7 A resistive, 4 A inductive, (sea level), 28 VDC
- 7 A resistive, 2.5 A inductive, (50,000 ft.), 28 VDC
- 7 A resistive or inductive, 115 VAC, 60 Hz
- UL® and CSA listed: 7 A, 250 VAC
- Temperature tolerance up to +180° F

ORDERING SPECIFICATIONS

To insure procurement and delivery of the Knox Gate & Key Switch, it is suggested that the following specification paragraph be used:

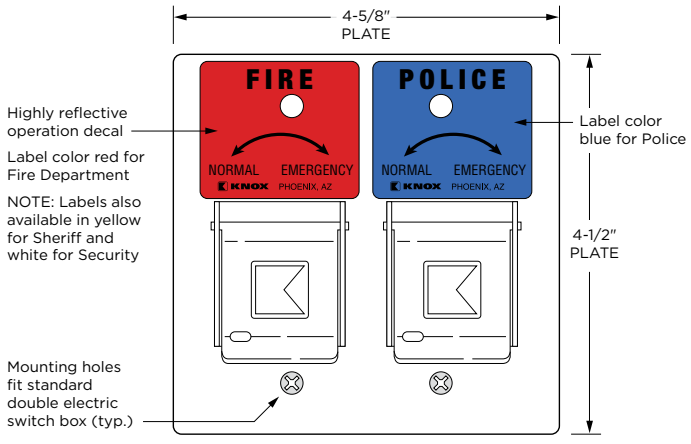
Dimensions: Requires 2 1/4" recessed depth x 3/4" diameter

Switch: SPDT or DPDT; 7 A resistive, 4 A inductive, key removable two position

Mounting: Key switch is designed to be recess mounted

P/N: 3500 Series Knox Gate & Key Switch (mfr's cat. ID)

Mfr's Name: KNOX COMPANY



ABOUT KNOX COMPANY

Over forty years ago, a unique concept in rapid access for emergency response was born. The KnoxBox®, a high-security key lock box, was designed to provide rapid access for emergency responders to reduce response times, minimize injuries and protect property from forced entry.

Today, one revolutionary lock box has grown into a complete system providing rapid access for public safety agencies, industries, military, and property owners across the world. The Knox Company is trusted by over 14,000 fire departments, law enforcement agencies, and governmental entities.

1601 W. DEER VALLEY RD. PHOENIX, AZ 85027 | T. 800-552-5669 | F. 623-687-2290 | INFO@KNOXBOX.COM | KNOXBOX.COM

CriticalPoint™ Public Safety Annunciator Panel

CPAPV1

UL 2524 Standard Certified

Features

- Dedicated external Annunciator Panel for Comba Public Safety systems
  Works with Comba V1/V2 Battery Backup Units and V3 BDA/Fiber BDA
- Can be powered directly from Comba Battery Backup Unit
- Long distance installation supported (based on RS485 standard)
- Provides visual and audio annunciation for UL 2524 standard alarms:
  - ✓ AC Input normal
  - ✓ Loss of normal AC power
  - ✓ Battery charger failure
  - ✓ Loss of battery capacity
  - ✓ Active RF emitting device malfunction
  - ✓ System component malfunction
  - ✓ Donor antenna disconnection
  - ✓ Donor antenna malfunction
- UL50E Type 4 enclosure
- Supports optional Dry Contact alarm outputs to FACP (Fire Alarm Control Panel)
- Operates on +12 ~ +60VDC
- Easy to install and commission
- **UL2524 2nd Edition Listing with SGS, Nationally Recognized Testing Laboratory (NRTL) approved by OHSA for UL2524 Standard Certified – SGS Certificate No.: SGSNA/21/GZ/00021**

Specifications

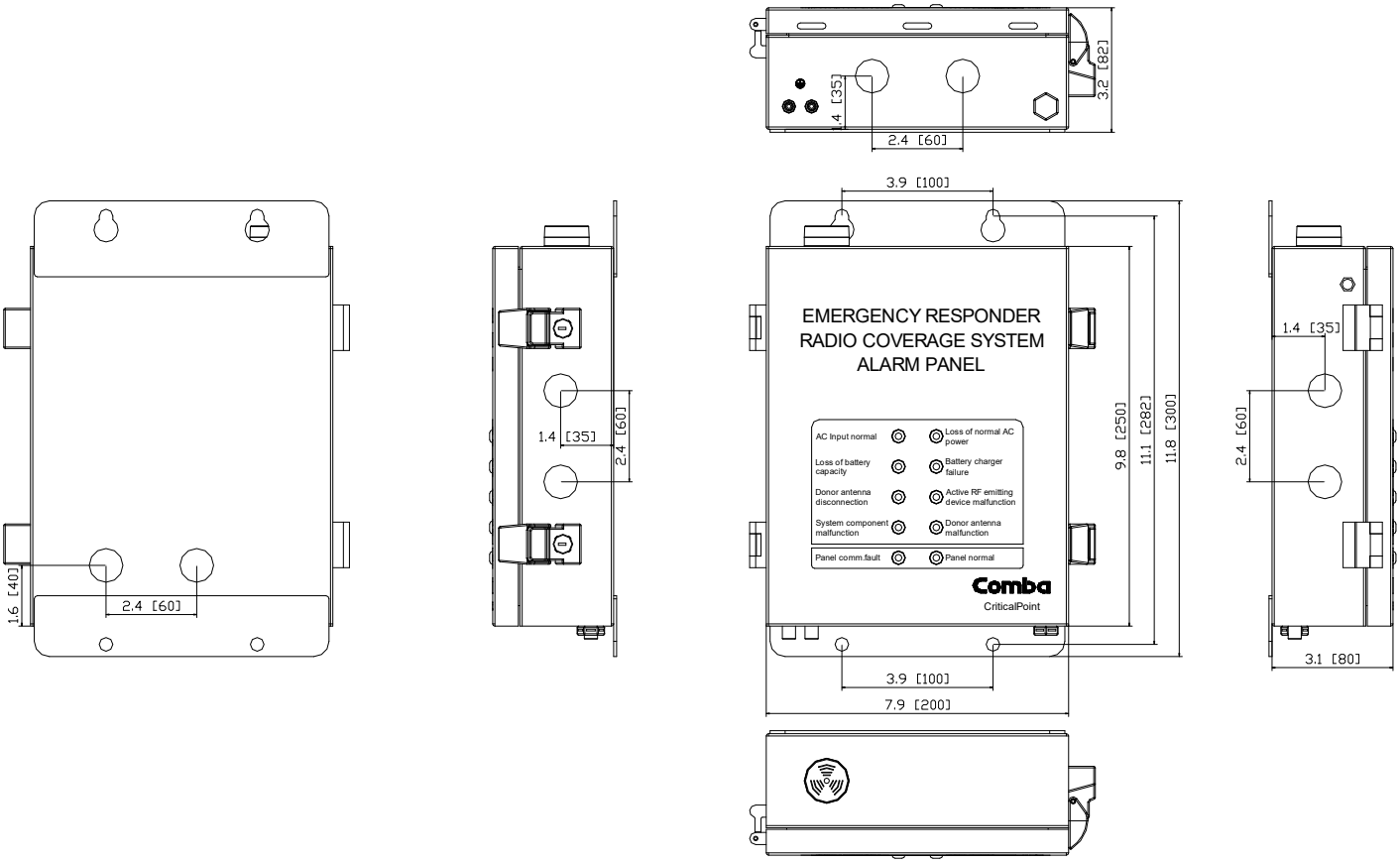
Mechanical and Electrical		
Dimensions, H x W x D	In(mm)	11.8 x 7.9 x 4.4 (300 x 200 x 112)
Weight	lb(kg)	11 (5)
Power Supply	DC	+12 ~ +60VDC
Power Consumption	W	3
Mount Type		Wall Mount
Max Cable Distance, 24ga wire	Feet	2000
Max Cable Distance, 18ga wire	Feet	4000
Number of Conductors Required		5 (3 x RS485 Standard, 2 x DC Standard)
Number of Knockouts		8 (2 on bottom, 2 on back, 4 on sides)

Part Numbers

Part Number	Description
CPAPV1-DC-B-UL	Annunciator Panel, DC, Supports Dry Contact Alarm output, UL 2524 Standard Certified

DS-Control: 0-0-6 / 0523

Outline Drawing



ADT Commercial

Coaxial Cabling

AL4RPV-50, HELIAX® Plenum Rated Air Dielectric Coaxial Cable, corrugated aluminum, 1/2 in, Red PVC jacket

- This product is part of the CommScope Wired for Wireless® Solution

Product Classification

Brand	HELIAX®
Product Series	AL4-50
Product Type	Air coaxial cable

Construction Materials

Jacket Material	PVC
Dielectric Material	PE spline
Flexibility	Standard
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Red
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, Inner Conductor	1.570 ohms/km | 0.480 ohms/kft
dc Resistance, Outer 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)
Operating Temperature	-20 °C to +85 °C (-4 °F to +185 °F)
Storage Temperature	-20 °C to +85 °C (-4 °F to +185 °F)

General Specifications

Ordering Note	CommScope® standard product (Global)

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

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	VSWR	Return Loss (dB)
700–894 MHz	1.13	24.30
806–960 MHz	1.13	24.30
1700–2200 MHz	1.13	24.30

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.152	0.046	40.00
1	0.216	0.066	35.37
1.5	0.264	0.081	28.84
2	0.306	0.093	24.95
10	0.691	0.211	11.04
20	0.985	0.3	7.75
30	1.213	0.37	6.29
50	1.581	0.482	4.83
85	2.087	0.636	3.66
88	2.126	0.648	3.59
100	2.274	0.693	3.35
108	2.368	0.722	3.22
150	2.821	0.86	2.70
174	3.054	0.931	2.50
200	3.292	1.003	2.32
204	3.327	1.014	2.29
300	4.104	1.251	1.86
400	4.808	1.466	1.59
450	5.134	1.565	1.49
500	5.445	1.659	1.40
512	5.517	1.682	1.38
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
894	7.574	2.308	1.01
960	7.892	2.405	0.97
1000	8.081	2.463	0.94
1218	9.068	2.764	0.84
1250	9.207	2.806	0.83
1500	10.256	3.126	0.74
1700	11.053	3.369	0.69
1794	11.416	3.48	0.67
1800	11.439	3.487	0.67
2000	12.192	3.716	0.63
2100	12.559	3.828	0.61
2200	12.92	3.938	0.59
2300	13.276	4.046	0.57
2500	13.975	4.259	0.55
2700	14.656	4.467	0.52
3000	15.649	4.77	0.49
3400	16.928	5.159	0.45
3700	17.859	5.443	0.43
4000	18.768	5.72	0.41
5000	21.671	6.605	0.35

6000	24.42	7.443	0.31

** 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
c(ETL)us Certification	CATVP/CMP

Heavy duty, Non-Metallic QuickLATCH™

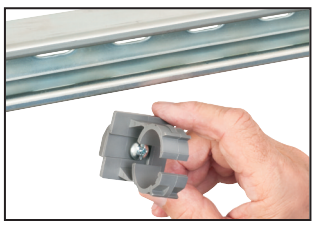
Made in USA

NEW! more on reverse

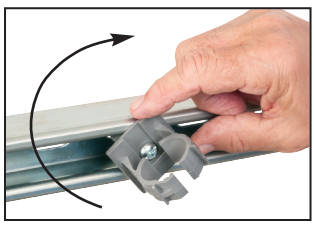
Installed Strut Clip • For RIGID and EMT

Fast, Easy Installation!

Saves 20 seconds per installation

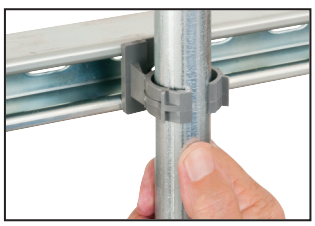


1 Insert QuickLatch into strut. The strut clip is already attached so you *save time*.



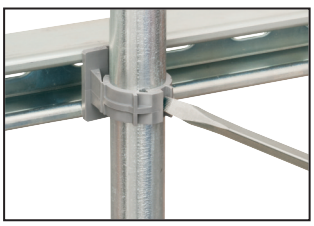
2 Twist QuickLatch to seat clip in strut.

3 Tighten screw for secure installation on strut.

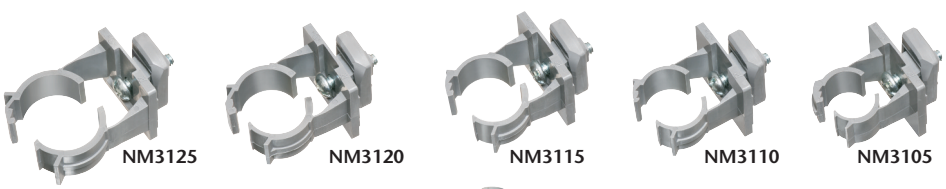


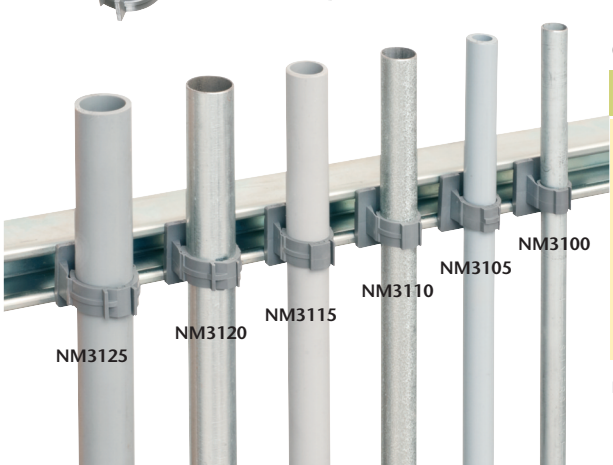
4 Push conduit into QuickLatch to snap in place.

5 Secure installation of conduit to strut.



Easy screwdriver removal



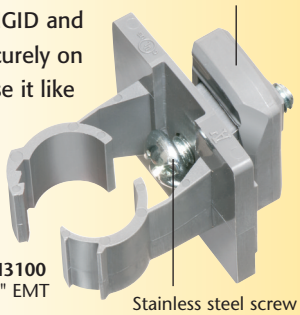


QUICKLATCH™ PIPE HANGER

CATALOG NUMBER	UPC/DEI/NAED MFG. #018997	RIGID, IMC PVC SIZE	EMT SIZE	STD PKG
NM3100	54027	---	1/2"	100
NM3105	54028	1/2"	---	100
NM3110	54029	---	3/4"	100
NM3115	54030	3/4"	--	100
NM3120	54031	---	1"	100
NM3125	54032	1"	---	100

Includes 1/4"-20 stainless steel screw and strut clip (installed)

Arlington's heavy duty NM3100 series QuickLatch™ with *installed strut clip* holds RIGID and EMT securely on strut. Use it like a pipe hanger.



One-piece QuickLatch saves time, about 20 seconds per installation... over 33¢ each at $60.00 per hour labor rate.

Fast and easy to install. Insert the hanger into the strut, twist to lock the pre-installed clip in place then tighten screw to secure QuickLatch to strut. Push RIGID or EMT into the hanger to lock it in place.

- UV rated, corrosion resistant for outdoor use
- Stainless steel screw
- Mounts vertically or horizontally
- Screwdriver removal, reusable
- Listed for use in environmental air handling spaces per 2020 NEC, article 300.22(c)

See reverse for even more QuickLatch products!

Patent pending

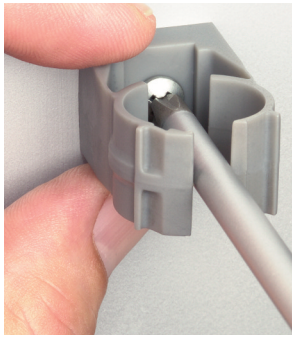
Arlington®

1 Stauffer Industrial Park
Scranton, PA 18517
800/233.4717 • Fax 570/562.0646
www.aifittings.com

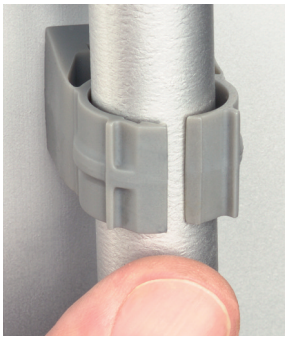
UV Rated • Non-metallic QuickLATCH™

Made in USA

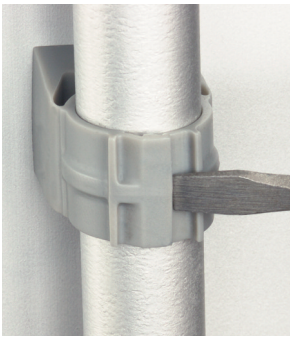
Works just like a Pipe Hanger • Easy to Install



Mount to surface with a screw.



Press down on pipe to lock it firmly in place.



Removable Use screwdriver to lift tab.

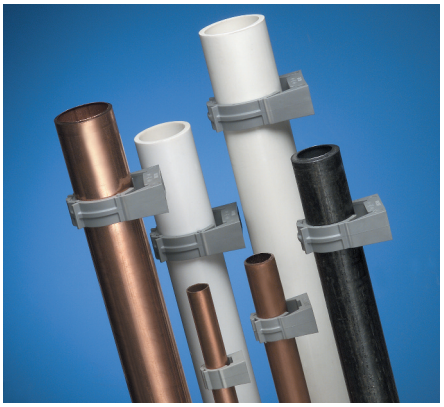
Fast and easy to install, one-piece, non-metallic **QuickLATCH**™ mounts to walls, metal strut and studs, and threaded rod up to 1/4-20...works with Arlington's Strut Clip™ too. *Strut Clip holds pipe hangers securely on strut.*

It fits 1/2" to 4" EMT, RIGID, IMC and PVC. The larger 2-1/2" to 4" sizes have an extra opening for the optional securing of tie wire or cable tie.

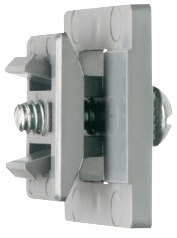
- Corrosion resistant
- Horizontal or vertical mounting
- Integral slot keeps nut from spinning

Catalog Number	UPC/DEI/NAED Mfg. #018997	RIGID, IMC PVC sizes	EMT size	LT size	Flex size	ENT size	Copper Tubing	Copper Pipe	Std Pkg
NM1900	54514	---	---	5/16	---	---	1/2	---	100
NM2000	54515	---	1/2	3/8	---	---	---	3/8	100
NM2005	54525	1/2	---	1/2	1/2	1/2	---	1/2	100
NM2010	54516	---	3/4	---	---	---	3/4	---	100
NM2015	54526	3/4	–	3/4	3/4	3/4	---	3/4	100
NM2020	54517	---	1	---	---	---	1	---	100
NM2025	54518	1	---	1	1	1	---	1	100
NM2030	54528	---	1-1/4	---	---	---	1-1/4	---	100
NM2040	54519	1-1/4	1-1/2	---	---	---	1-1/2	1-1/4	100
NM2045	54544	1-1/2	---	1-1/2	1-1/2	---	---	1-1/2	100
NM2150	54547	---	---	---	---	---	2	---	50
NM2050	54520	2	2	2	2	---	2	---	50
NM2060	54521	2-1/2	2-1/2	2-1/2	2-1/2	---	----	---	50
NM2070	54522	3	3	3	3	---	---	---	25
NM2080	54523	3-1/2	3-1/2	3-1/2	3-1/2	---	---	---	25
NM2090	54524	4	4	4	4	---	---	---	10

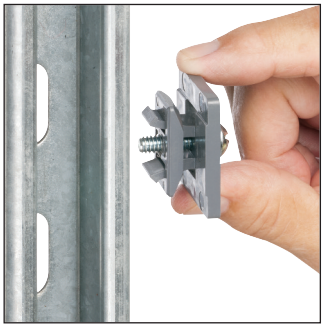
2-1/2" to 4"
Press pipe into QuickLatch, up to the first notch to lock it in place. Then squeeze tabs together for a super-secure hold.



Catalog Number	UPC/DEI/NAED Mfg. #018997	Description STRUT CLIP™	Unit/Std Pkg
NM1000	54615	UV rated, non-metallic clip Holds pipe hangers and/or conduit secure on strut	100
		Includes 1/4"-20 screw (installed)	



NM1000
STRUT CLIP
Strut Conduit Support



Our QuickLatch™ Pipe Hanger installs on Strut Clip™

TM

UL LISTED

CSA

Arlington®

1 Stauffer Industrial Park
Scranton, PA 18517
800/233.4717 • Fax 570/562.0646
www.aifittings.com

Distributed by

Patented

QuickLatch REV1119/15M

Product Specifications

L4TNM-PSA

Type N Male Positive Stop™ for 1/2 in AL4RPV-50, LDF4-50A, HL4RPV-50 cable

- This product is part of the CommScope Wired for Wireless® Solution

Product Classification

Brand	HELIAX® | Positive Stop™
Product Type	Wireless and radiating connector

General Specifications

Interface	N Male
Body Style	Straight
Brand	HELIAX® | Positive Stop™
Harmonized System (HS) Code	854420 (Coaxial cable and other coaxial electric conductors)
Mounting Angle	Straight
Ordering Note	CommScope® standard product (Global)

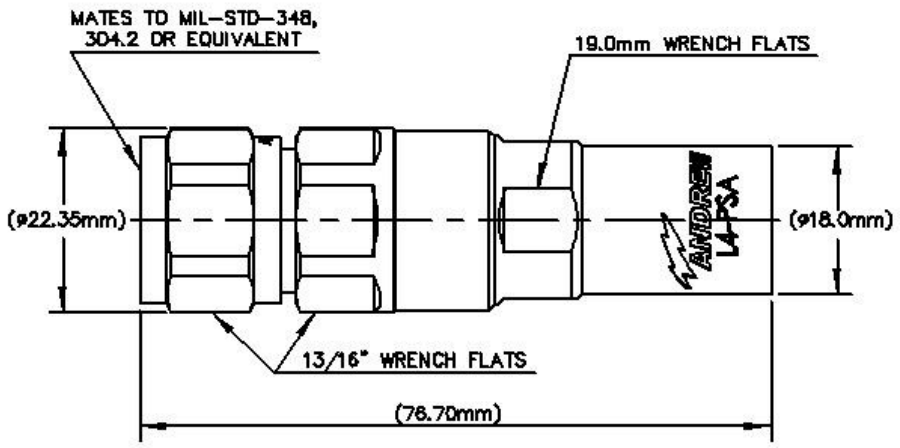
Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 910 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707.00 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact Resistance, maximum	2.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Average Power	0.6 kW @ 900 MHz
Peak Power, maximum	10.00 kW
Insertion Loss, typical	0.05 dB
Shielding Effectiveness	-130 dB

Product Specifications

L4TNM-PSA

Outline Drawing



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
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	890 N | 200 lbf
Connector Retention Torque	5.42 N-m | 48.00 in lb
Insertion Force	66.72 N | 15.00 lbf
Insertion Force Method	MIL-C-39012C-3.12, 4.6.9
Coupling Nut Proof Torque	4.52 N-m | 40.00 in lb
Coupling Nut Retention Force	444.82 N | 100.00 lbf
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

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Immersion Depth	1 m

Product Specifications

L4TNM-PSA

Immersion Test Mating	Unmated
Immersion Test Method	IEC 60529:2001, IP68
Water Jetting Test Mating	Unmated
Water Jetting Test Method	IEC 60529:2001, IP66
Moisture 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	IEC 60068-2-6
Corrosion 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
3010–4000 MHz	1.09	27.00
4010–6000 MHz	1.25	19.00
6010–8000 MHz	1.33	17.00

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

* Footnotes

Immersion Depth	Immersion at specified depth for 24 hours
Insertion Loss, typical	$0.05\sqrt{\text{freq (GHz)}}$ (not applicable for elliptical waveguide)

L4TNF-PSA

Type N Female Positive Stop™ for 1/2 in AL4RPV-50, LDF4-50A, HL4RPV-50 cable

Product Classification

Product Type	Wireless and radiating connector
Product Brand	HELIAX® | Positive Stop™
Ordering Note	CommScope® standard product (Global)

General Specifications

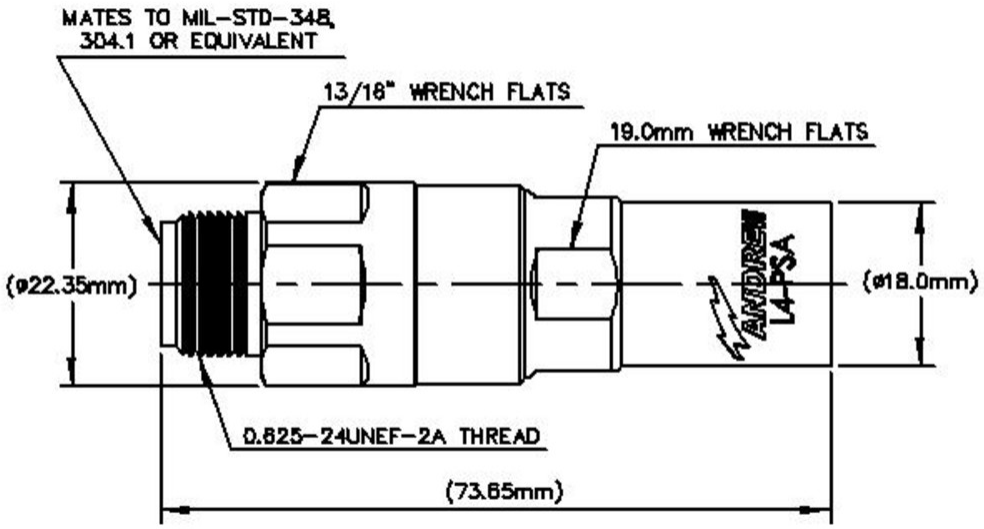
Body Style	Straight
Cable Family	AL4-50
Harmonized System (HS) Code	854420 (Coaxial cable and other coaxial electric conductors)
Inner Contact Attachment Method	Captivated
Inner Contact Plating	Silver
Interface	N Female
Mounting Angle	Straight
Outer Contact Attachment Method	Ring-flare
Outer Contact Plating	Trimetal

Dimensions

Length	73.66 mm | 2.9 in
Diameter	22.35 mm | 0.88 in
Nominal Size	1/2 in

Outline Drawing

L4TNF-PSA



Electrical Specifications

3rd Order IMD at Frequency	-116 dBm @ 910 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
Insertion Loss, typical	0.05 dB
Average Power at Frequency	0.6 kW @ 900 MHz
Cable Impedance	50 ohm
Connector Impedance	50 ohm
dc Test Voltage	2000 V
Inner Contact Resistance, maximum	2 mOhm
Insulation Resistance, minimum	5000 MOhm
Operating Frequency Band	0 – 8800 MHz
Outer Contact Resistance, maximum	0.3 mOhm
Peak Power, maximum	10 kW
RF Operating Voltage, maximum (vrms)	707 V
Shielding Effectiveness	-130 dB

VSWR/Return Loss

Frequency Band	VSWR	Return Loss (dB)
50–1000 MHz	1.03	39

1010–2200 MHz	1.03	37
2210–3000 MHz	1.05	33
3010–4000 MHz	1.08	29
4010–6000 MHz	1.12	25

Mechanical Specifications

Attachment Durability	25 cycles
Connector Retention Tensile Force	889.64 N | 200 lbf
Connector Retention Torque	5.42 N-m | 47.998 in lb
Insertion Force	66.72 N | 15 lbf
Insertion Force Method	MIL-C-39012C-3.12, 4.6.9
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Mechanical Shock Test Method	MIL-STD-202, Method 213, Test Condition I

Environmental Specifications

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

Packaging and Weights

Weight, net	88.46 g | 0.195 lb

Regulatory Compliance/Certifications

Agency	Classification
CHINA-ROHS	Above maximum concentration value

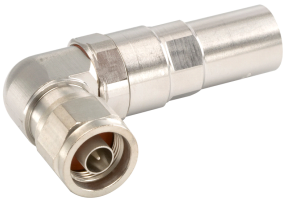
L4TNF-PSA

ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
REACH-SVHC	Compliant as per SVHC revision on www.commscope.com/ProductCompliance
ROHS	Compliant/Exempted

* Footnotes

Insertion Loss, typical	0.05v¯freq (GHz) (not applicable for elliptical waveguide)
Immersion Depth	Immersion at specified depth for 24 hours

Product Specifications



L4NR-PS

Type N Male Right Angle Positive Stop™ for 1/2 in LDF4-50A cable

Product Classification

Brand	HELIAX® | Positive Stop™
Product Type	Wireless and radiating connector

General Specifications

Interface	N Male
Body Style	Right angle
Brand	HELIAX® | Positive Stop™
Mounting Angle	Right angle
Ordering Note	CommScope® standard product (Global)

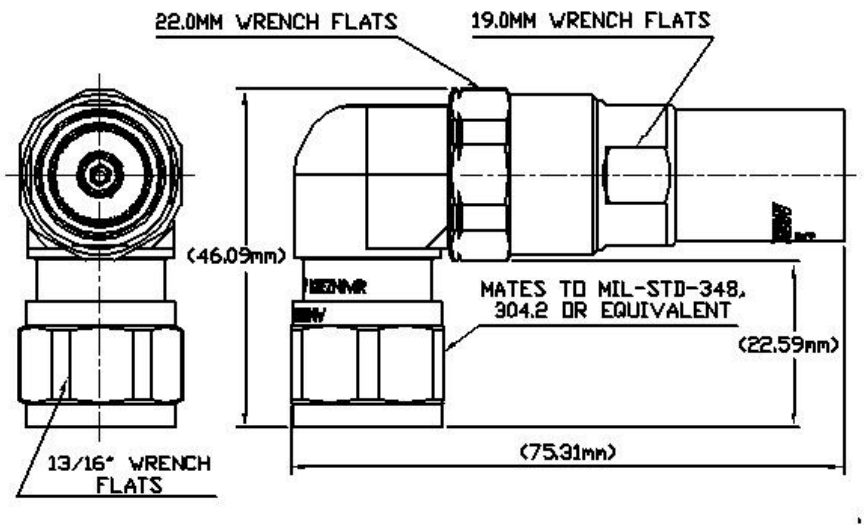
Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 910 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707.00 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact Resistance, maximum	2.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Average Power	0.6 kW @ 900 MHz
Peak Power, maximum	10.00 kW
Insertion Loss, typical	0.05 dB
Shielding Effectiveness	-110 dB

Product Specifications

L4NR-PS

Outline Drawing



Mechanical Specifications

Outer Contact Attachment Method	Self-flare
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Gold | Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-4:9.5
Connector Retention Tensile Force	890 N | 200 lbf
Connector Retention Torque	5.42 N-m | 48.00 in lb
Pressurizable	No
Coupling Nut Proof Torque	4.52 N-m | 40.00 in lb
Coupling Nut Retention Force	444.82 N | 100.00 lbf
Coupling Nut Retention Force Method	MIL-C-39012C-3.23, 4.6.22

Dimensions

Nominal Size	1/2 in
Height	46.09 mm | 1.81 in
Length	75.31 mm | 2.96 in
Right Angle Length	22.60 mm | 0.89 in
Weight	133.10 g | 0.29 lb
Width	23.50 mm | 0.93 in

Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Immersion Depth	1 m

Product Specifications

L4NR-PS

Immersion Test Mating	Unmated
Immersion Test Method	IEC 60529:2001, IP68
Water Jetting Test Mating	Unmated
Water Jetting Test Method	IEC 60529:2001, IP66
Moisture Resistance Test Method	MIL-STD-202F, Method 106F
Mechanical Shock Test Method	MIL-STD-202F, Method 213B, Test Condition C
Thermal Shock Test Method	MIL-STD-202F, Method 107G, Test Condition A-1, Low Temperature -55 °C
Vibration Test Method	MIL-STD-202F, Method 204D, Test Condition B
Corrosion Test Method	MIL-STD-1344A, Method 1001.1, Test Condition A

Standard Conditions

Attenuation, Ambient Temperature	20 °C | 68 °F
Average Power, Ambient Temperature	40 °C | 104 °F

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
50–1000 MHz	1.02	-39.00
1000–1900 MHz	1.04	-34.00
1900–2200 MHz	1.05	-32.00
2200–2700 MHz	1.08	-28.00
2700–3600 MHz	1.10	-26.00
3600–6000 MHz	1.12	-25.00
6000–8800 MHz	1.29	-18.00

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

* Footnotes

Immersion Depth	Immersion at specified depth for 24 hours
Insertion Loss, typical	0.05$\sqrt{}$freq (GHz) (not applicable for elliptical waveguide)

Passive Distribution Components

Wideband Directional Coupler

DC-Rxx-ON300C(XH)

Low PIM(-153dBc), 698-2700MHz, N-Female, 300W

- Wideband design covering 698-2700MHz
- Available 5, 6, 7, 8, 10, 13, 15, 20, 30 & 40dB values
- Suitable for indoor/outdoor environment
- High Reliability and Low Insertion Loss

Electrical Specification

Product Model	DC-R05-ON300C (XH)	DC-R06-ON300C (XH)	DC-R07-ON300C (XH)	DC-R08-ON300C (XH)	DC-R10-ON300C (XH)	DC-R13-ON300C (XH)	DC-R15-ON300C (XH)	DC-R20-ON300C (XH)	DC-R30-ON300C (XH)	DC-R40-ON300C (XH)
Frequency (MHz)	698-2700									
Coupling (dB)	5.0	6.0	7.0	8.0	10.0	13.0	15.0	20.0	30.0	40.0
Coupling Tolerance (dB)	± 0.8	± 0.8	± 0.8	± 0.8	± 0.8	± 1.0	± 1.0	± 1.2	± 1.5	± 1.5
Loss (dB)	≤ 2.1	≤ 1.7	≤ 1.4	≤ 1.2	≤ 0.7	≤ 0.5	≤ 0.4	≤ 0.3	≤ 0.2	≤ 0.2
Isolation (dB)	≥ 25	≥ 26	≥ 27	≥ 28	≥ 30	≥ 33	≥ 35	≥ 40	≥ 45	≥ 55
VSWR @ Input port	≤ 1.25									
PIM (dBc)	<-153 @ 2 x 43dBm									
Average Power, max (W)	300									
Peak Power, max (W)	1000									
Impedance (ohm)	50									

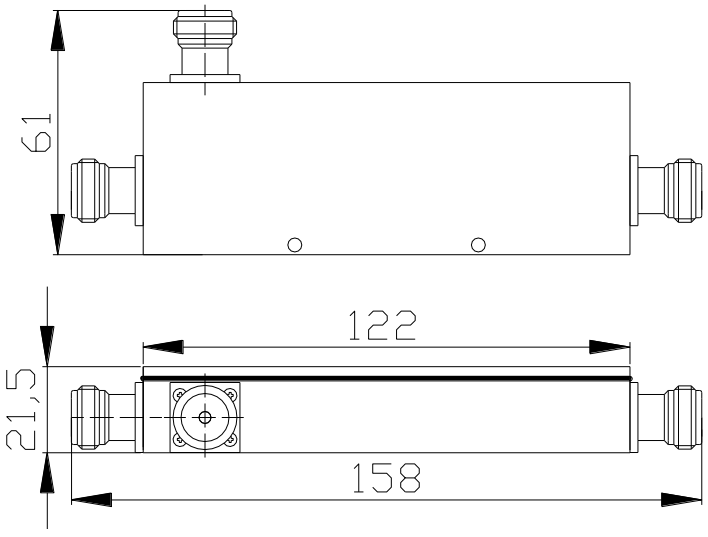
Mechanical Specification

Dimension (in/mm)	6.2x2.4x0.8 / 158x61x21.5
Weight (lb/kg)	0.75 / 0.34
Connector	N-Female

Environment & Compliance

Application	Outdoor / Indoor
Operating Temperature	-40°C to +80°C
Environment	IP65
Relative Humidity	Up to 95%
RoHS	Compliant

Outline Drawing



Comba Telecom Inc. 235 Charcot Avenue, San Jose, CA 95131. http://www.combausa.com/
Tel: +1 866 802 7961, combausa@comba-telecom.com, Fax: +1 408 526 0181

Indoor Omni Antenna Ceiling Mounted

IX-MJN-V3U

Low PIM(-153dBc), 698-2700MHz, N-Female

- Wideband design covering 698-2700MHz
- Suitable for indoor application
- Compact and cost-effective design
- Supporting flammability UL-94-V0 rating

Electrical Specification

Product Model		IX-MJN-V3U	
Frequency (MHz)	698-806	806-960	1695-2700
Gain (dBi)	1.8 ± 0.5	2.0 ± 0.5	3.0 + 1.0
Polarization		Vertical	
Beamwidth Horizontal (°)		360	
Beamwidth Vertical(°)	90	70	35
VSWR	≤ 1.8. typical ≤ 1.5	≤ 1.5	≤ 1.5
PIM (dBc)		< -153 @ 2 x 43dBm	
Average Power, max (W)		50	
Impedance (ohm)		50	

Mechanical Specification

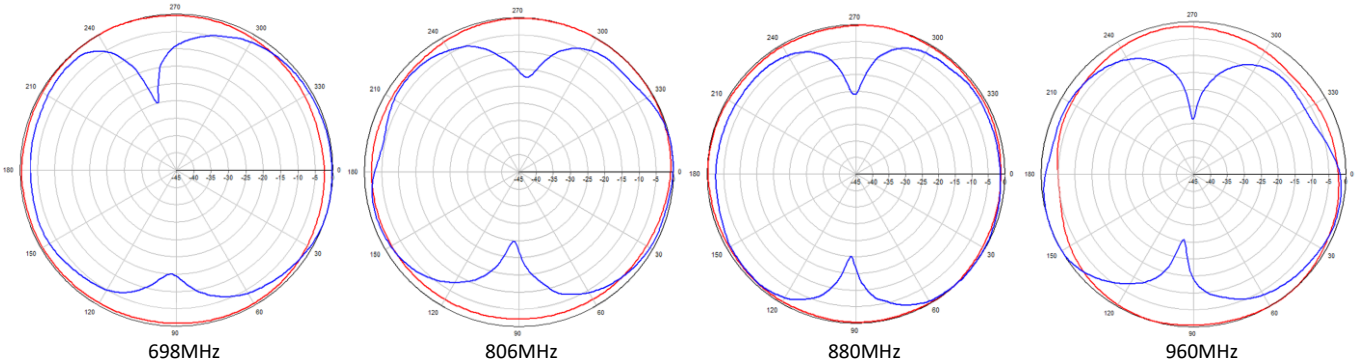
Dimension Diameter, height (in/mm)	∅ 8.0 x 4.5 / ∅ 204.0x 115.0
Weight (lb./kg)	1.10 / 0.40
Shipping Dimension(in/mm)	7.09x7.09x7.09 / 180.0x180.0x180.0
Shipping Weight(lb./kg)	1.46 /0.66
Radome Material & color	ABS, White, RAL9003
Flammability	UL-94-V0
Mounting/Connector type	Ceil Mount, N-female Option1: Hard Ceiling mount bracket (MT-DA-01) Option2: High Ceiling or Joist mount bracket (MT-ND-HC)

Environment & Compliance

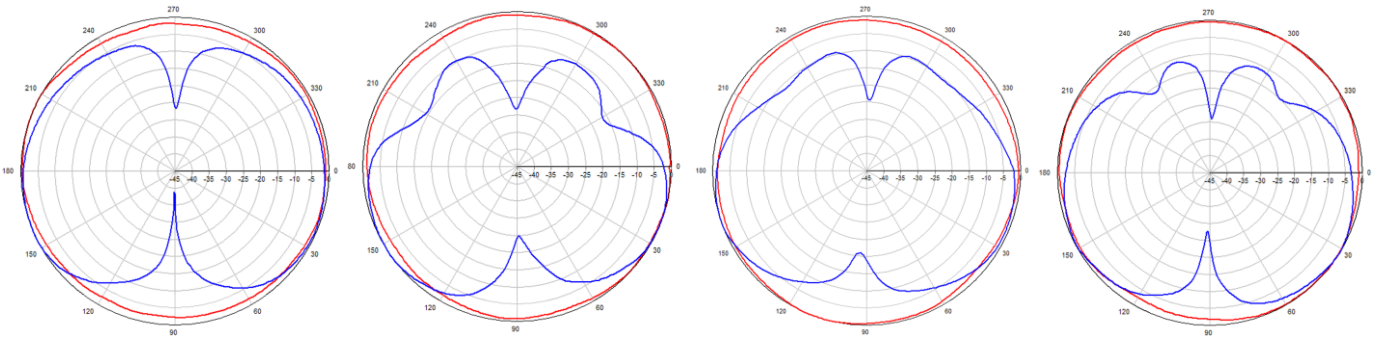
Application	Indoor
Operating Temperature	-40°C to +70°C
Relative Humidity	Up to 95%
RoHS	Compliant
Environment	

Antenna Pattern

Horizontal Vertical



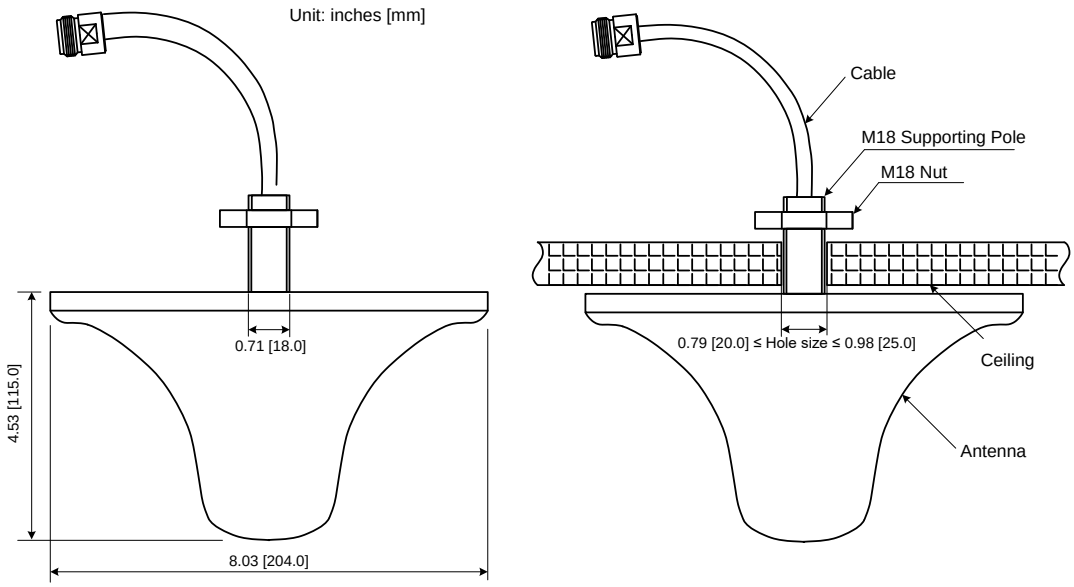
698MHz 806MHz 880MHz 960MHz



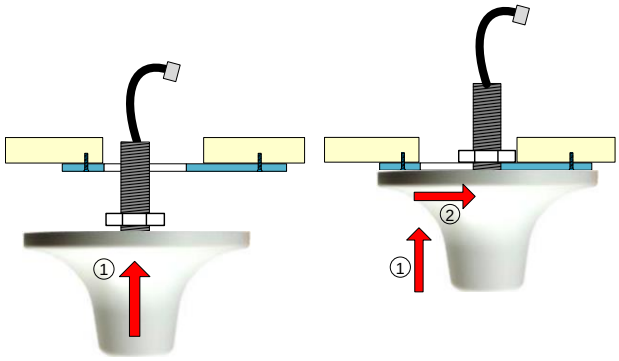
1710MHz 2170MHz 2300MHz 2700MHz

Comba Telecom Inc. 568 Gibraltar Drive, Milpitas, CA 95035. http://www.combausa.com/
Tel: +1 408 526 0180, combausa@comba-telecom.com, Fax: +1 408 526 0181

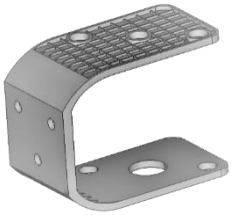
1. Standard Ceiling Mounting

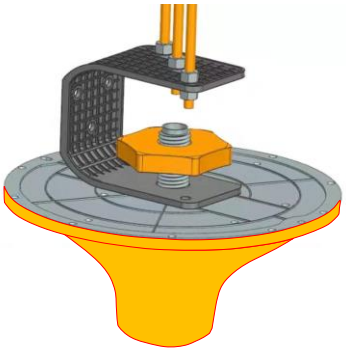


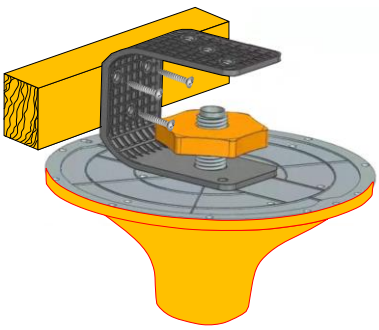
2. Hard Ceiling Mounting
   Mounting Bracket: MT-DA-01. Please refer MT-DA-01 Installation instruction



3. High Ceiling Mounting / Joist Mounting
   Mounting Bracket: MT-ND-HC. Please refer MT-ND-HC Installation instruction







High Ceiling Mounting Joist Mounting

Comba Telecom Inc. 568 Gibraltar Drive, Milpitas, CA 95035. http://www.combausa.com/
Tel: +1 408 526 0180, combausa@comba-telecom.com, Fax: +1 408 526 0181