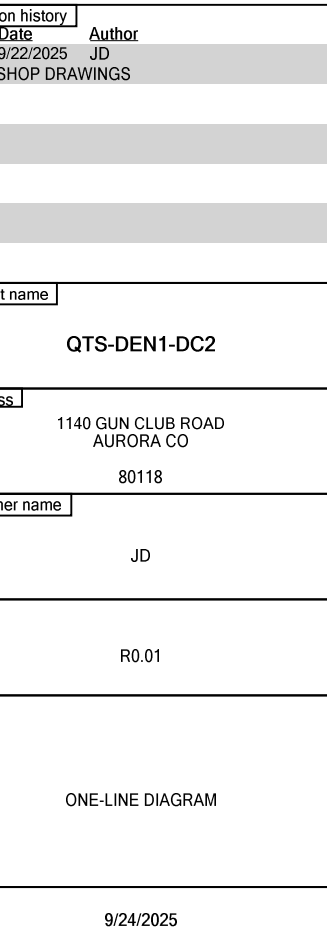




Battery Calculation for Radio Amplification					
BDA Nominal Voltage	48	VDC			
Code-required Backup	12	hours	Generator	No	
Battery System (Main BDA)					
Power Consumption					
Equipment Make	Model	Description	Watts	Qty	Power (Watts)
Comba	RX08V3-A3327P0-XX	800MHz, Class A, 33dBm, XX=S1/S0/C0	90	1	90
	None			0	0
Comba	APV3-BDA	Annunciator	3	1	3
Total Power (Watts)					93
Total Current (Amps)					1.94
Battery Backup Required (Amp-Hours, nominal)					23.3
Battery Backup Safety Factor					1.1
Battery Backup Required (Amp-Hours, with safety factor)					25.575
Battery Suitability					
Make	Model	Output Voltage	Max Continuous Load (Amps)	Max Continuous Load (W)	Max Continuous Load (Amps)
			for 12 hrs		for 24 hrs
Comba	BBUV3-LFP48030	48	2.50	120	1.25
			Provides 30 Amp-Hrs		
			Provides 15 Hrs		



City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chost*
Date: **Apr 03, 2026**
2021 INTERNATIONAL CODES & 2023 NEC

1 - BATTERY CALCULATIONS

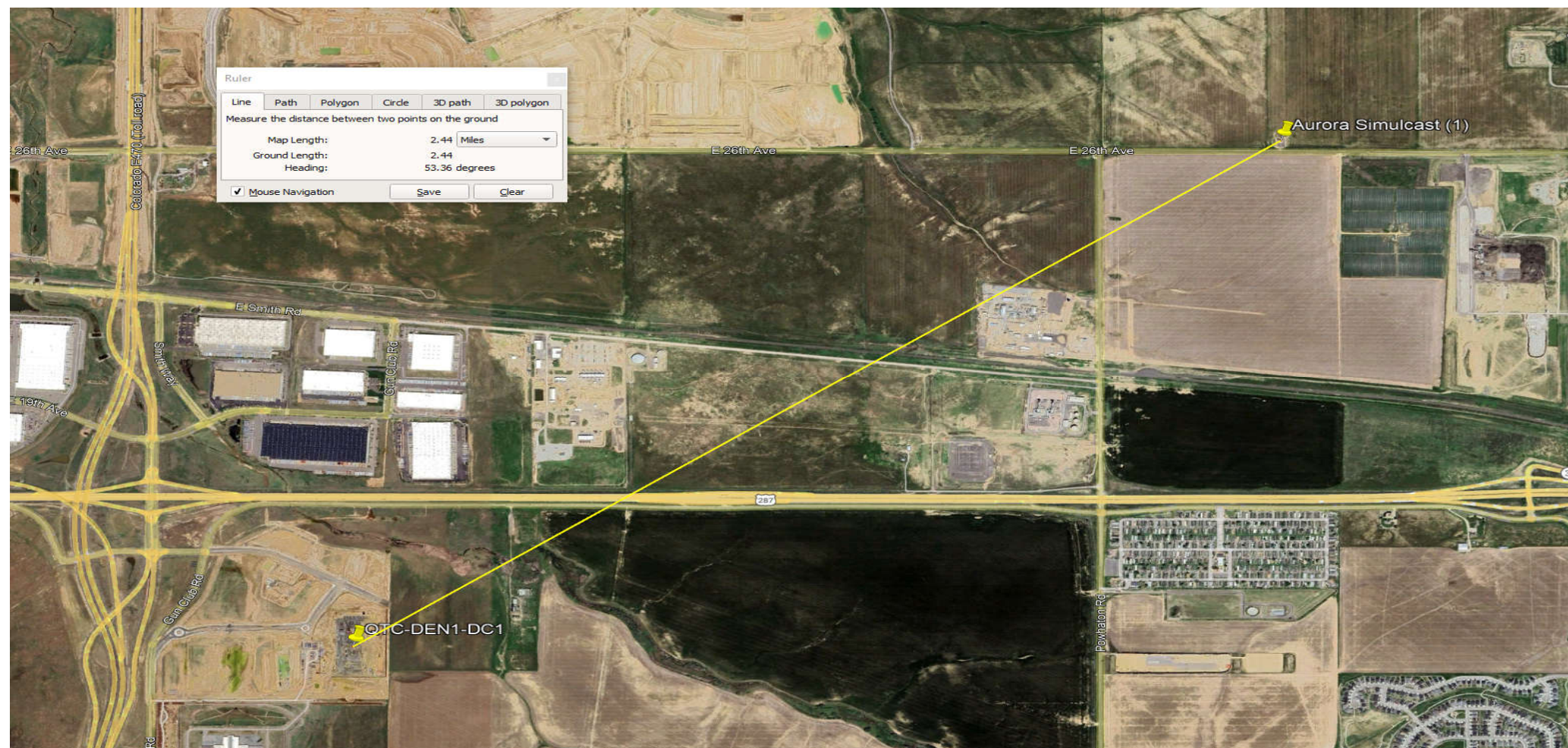
Public Safety Radio Enhancement System RF Link Budget		
Performed by ADT Commercial		
Tuesday, January 6, 2026		
Venue Name:	QTS DATA CENTER	Venue Address: 1164 N GUN CLUB ROAD, AURORA, CO
Donor Site Parameters		
Donor ERP	50dBm	
Donor Site-to-Venue Distance	2.44miles	
Frequency, UL	811MHz	
Frequency, DL	856MHz	
Free Space Path Loss to Venue	103.0dB	
Qty of RF channels	20channels	
Composite Power Factor	13.01dBm	
Base Station UL Rx Target	-95dBm	
RES System Parameters		
Donor Antenna Gain	11dBi	
Donor Feeder Loss (from computer model)	-1.8dB	
Donor Line Fixed Attenuation	0dB	
BDA DL Power (max)	33dBm	
BDA UL Power (max)	27dBm	
BDA Gain (max)	85dB	
BDA Gain (min)	50dB	
Passive DAS Losses (from computer model)	-23.7dB	
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	
Portable Radio Parameters		
Portable Radio Transmit Power	24.5dBm	
Mobile Distance Near	10feet	
Mobile Distance Far	70feet	
Mobile DL Rx Target	-95dBm	

Uplink Link Budget - Near Field Calculation		
1	24.5dBm	Portable Radio Transmit Power
2	-49.6dB	In-Building propagation losses @ Near
3	-23.7dB	Passive DAS loss, includes antenna gain
4	-48.8dB	Signal Strength input to BDA (1+2+3)
5	75.0dB	BDA UL Gain
6	26.2dBm	BDA Max UL Output Power (4+5)
7	0.0dB	Donor Line Fixed Attenuation
8	-1.8dB	Feedline loss to Donor Antenna
9	11.0dBi	Donor Antenna Gain
10	-102.5dB	UL Free Space Loss to Base Station
13	-67.1dBm	RSL @ Base Station Receive Antenna (6-12)
Uplink Link Budget - Far Field Calculation		
1	24.5dBm	Portable Radio Transmit Power
2	-69.3dB	In-Building propagation losses @ Far
3	-23.7dB	Passive DAS loss, includes antenna gain
4	-68.8dBm	Signal Strength input to BDA (1+2+3)
5	75.0dB	Adjusted BDA UL Gain
6	6.5dBm	BDA UL Output Power (4+5)
8	0.0dB	Donor Line Fixed Attenuation
7	-1.8dB	Feedline loss to Donor Antenna
9	11.0dBi	Donor Antenna Gain
10	-102.5dB	UL Free Space Loss to Base Station
13	-86.9dBm	RSL @ Base Station Receive Antenna (6-12)
Downlink - Link Budget		
1	50.0dBm	Donor Site Tx Power (EIRP)
2	-103.0dB	Free Space Loss to Venue
3	11.0dBi	Donor Antenna Gain
4	-1.8dB	Donor Feedline Loss
5	0.0dB	Donor Fixed Attenuation
6	13.0dB	Composite Power Factor (Channel Qty)
7	-30.8dBm	Composite Input Power to BDA (add 1-6)
8	57.0dB	BDA DL Gain
9	26.2dBm	BDA Max DL Output Power
10	-23.7dB	Passive DAS loss, includes antenna gain
11	-10.5dB	Serving Antenna EIRP_per channel
12	-69.3dB	In-Building propagation losses @ Far field
13	-79.8dBm	RSL into Mobile @ Far-field

4 - LINK BUDGET

Antenna EIRP report					
Antenna ID	Ant. Model	System ID	Antenna gain * (dBi)	Total loss/gain (dB)	Antenna EIRP (dBm)
ID: R1.21.AO1	IX-MJN-V3U	800 MHz - SMR - P25	2.2	34	-10.9
ID: R1.21.AO2	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.9	-11.9
ID: R1.21.AO3	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.6	-12.2
ID: R1.21.AO4	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.3	-14.5
ID: R1.21.AO5	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.5	-13.4
ID: R1.21.AO6	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.9	-11
ID: R1.21.AO7	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.8	-12
ID: R1.21.AO8	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.5	-12.3
ID: R1.21.AO9	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.6	-12.2
ID: R1.21.AO10	IX-MJN-V3U	800 MHz - SMR - P25	2.2	34.2	-10.6
ID: R1.21.AO11	IX-MJN-V3U	800 MHz - SMR - P25	2.2	35.7	-9.2
ID: R1.21.AO12	IX-MJN-V3U	800 MHz - SMR - P25	2.2	34.7	-10.1
ID: R1.21.AO13	IX-MJN-V3U	800 MHz - SMR - P25	2.2	34.6	-10.2
ID: R1.21.AO14	IX-MJN-V3U	800 MHz - SMR - P25	2.2	34.7	-10.1
ID: R1.21.AO15	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.1	-11.7
ID: R1.21.AO16	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.5	-12.4
ID: R1.21.AO17	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.5	-12.3
ID: R1.21.AO18	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.7	-12.1
ID: R1.21.AO19	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.7	-14.1
ID: R1.21.AO20	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.2	-13.6
ID: R1.21.AO21	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.3	-12.6
ID: R1.21.AO22	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.7	-14.1
ID: R1.21.AO23	IX-MJN-V3U	800 MHz - SMR - P25	2.2	29.9	-14.9
ID: R1.21.AO24	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.1	-14.7
ID: R1.21.AO25	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.8	-13
ID: R1.21.AO26	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.9	-12.9
ID: R1.21.AO27	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.4	-11.4
ID: R1.21.AO28	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.3	-12.5
ID: R1.21.AO29	IX-MJN-V3U	800 MHz - SMR - P25	2.2	34.1	-10.8
ID: R1.21.AO30	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.3	-12.5
ID: R1.21.AO31	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.8	-12.1
ID: R1.21.AO32	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.9	-11.9
ID: R1.21.AO33	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.9	-10.9
ID: R1.21.AO34	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.8	-12
ID: R1.21.AO35	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31	-13.8
ID: R1.21.AO36	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.2	-13.6
ID: R1.21.AO37	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.1	-12.8
ID: R1.22.AO1	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.2	-12.6
ID: R1.22.AO2	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.8	-11
ID: R1.22.AO3	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.6	-12.2
ID: R1.22.AO4	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.6	-12.2
ID: R1.22.AO5	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.8	-12.1
ID: R1.22.AO6	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.9	-12.9
ID: R1.22.AO7	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.6	-14.3
ID: R1.22.AO8	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.2	-14.7
ID: R1.22.AO9	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30	-14.8
ID: R1.22.AO10	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.6	-13.2
ID: R1.22.AO11	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.8	-13
ID: R1.22.AO12	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.6	-13.2
ID: R1.22.AO13	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31	-13.9
ID: R1.22.AO14	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.3	-14.5
ID: R1.22.AO15	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.1	-11.8
ID: R1.22.AO16	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.9	-12.9
ID: R1.22.AO17	IX-MJN-V3U	800 MHz - SMR - P25	2.2	29.9	-15
ID: R1.22.AO18	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.8	-14
ID: R1.22.AO19	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.9	-13
ID: R1.22.AO20	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.7	-14.1
ID: R1.22.AO21	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.2	-12.6
ID: R1.22.AO22	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32	-12.9
ID: R1.22.AO23	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.3	-11.5
ID: R1.22.AO24	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.6	-12.2
ID: R1.22.AO25	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.6	-11.2
ID: R1.22.AO26	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.8	-12.1
ID: R1.22.AO27	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.3	-13.5
ID: R1.22.AO28	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.5	-13.3
ID: R1.22.AO29	IX-MJN-V3U	800 MHz - SMR - P25	2.2	33.1	-11.7
ID: R1.22.AO30	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.4	-14.5
ID: R1.22.AO31	IX-MJN-V3U	800 MHz - SMR - P25	2.2	30.8	-14.1
ID: R1.22.AO32	IX-MJN-V3U	800 MHz - SMR - P25	2.2	32.2	-12.7
ID: R1.22.AO33	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.1	-13.8
ID: R1.22.AO34	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.8	-13
ID: R1.22.AO35	IX-MJN-V3U	800 MHz - SMR - P25	2.2	31.4	-13.5

2 - ANTENNAS REPORT



5 - DONOR SITE PATH

	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
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		

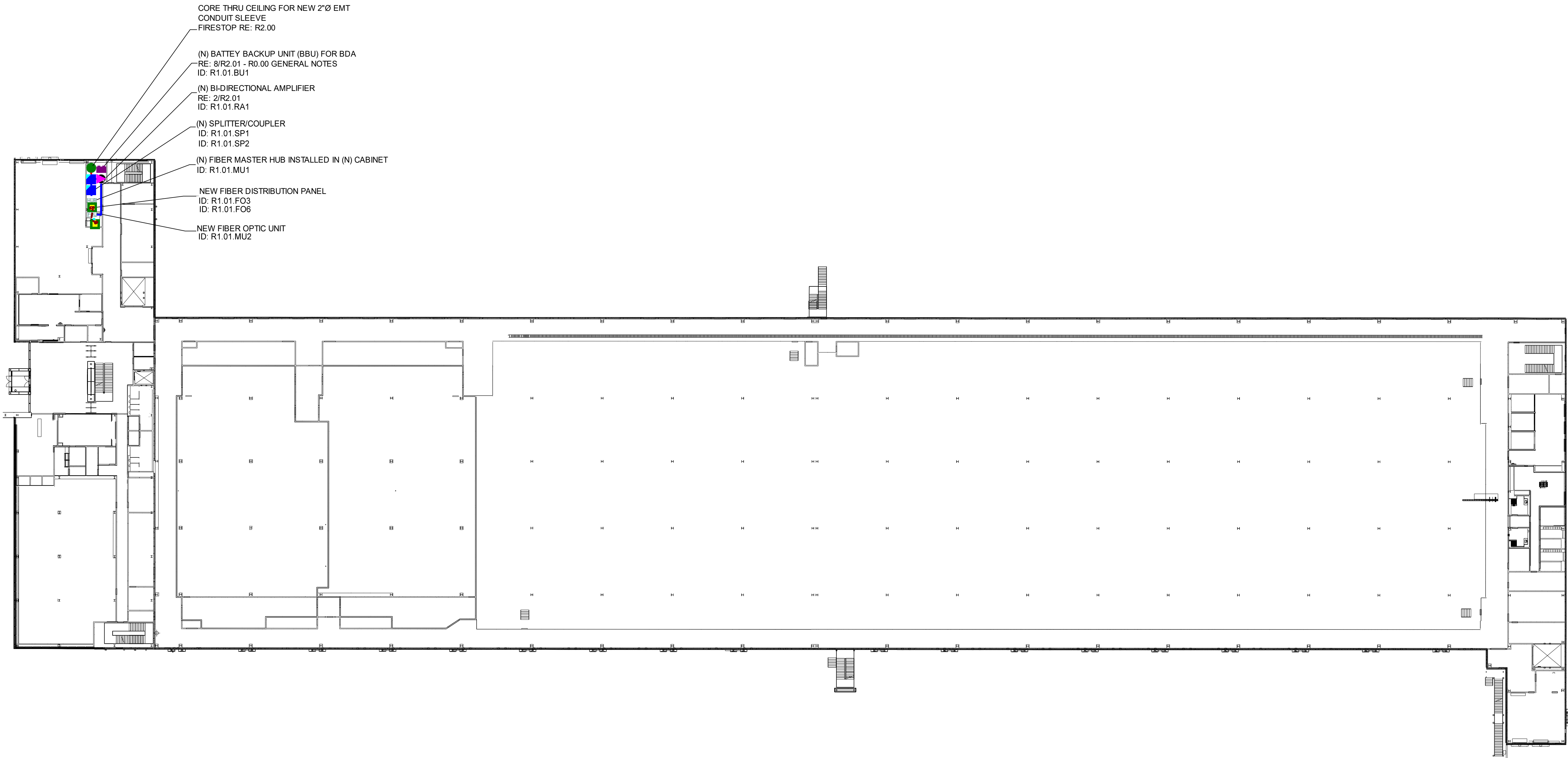
3 - GENERAL RADIO OPERATORS LICENSE (GROL)



6 - NICET LEVEL III - OEM CERTIFICATION

Revision History	Rev	Date	Author
	1	11/11/2025	JD
			100% SHOP DRAWINGS
			100% SHOP DRAWINGS
			100% SHOP DRAWINGS
Project name			
QTS-DEN1-DC2			
Address			
1160 N GUN CLUB ROAD AURORA CO			
Designer name			
JD			
R0.02			
CALCULATIONS			
1/6/2026			

DC1 HEADEND SHOWN FOR CLARITY



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

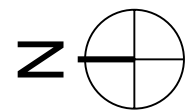
- 1 1/4"Ø EMT CONDUIT
- 2"Ø EMT CONDUIT
- 1 1/4"Ø / 2"Ø VERTICAL SLEEVE
- 1 1/4"Ø / 2"Ø SLEEVE W/ FIRESTOP
- BALLAST MOUNT
- 18"X18"X6" J-BOX - U.N.O.
- 12"X12"X6" J-BOX W/ OMNI ANTENNA
- OMNI ANTENNA
- DIRECTIONAL ANTENNA
- YAGI ANTENNA
- DIRECTIONAL COUPLER
- 2-WAY SPLITTER
- 3-WAY SPLITTER
- 4-WAY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

SHEET NOTES

- PROVIDE 12" CONDUIT SWEEPS FOR 3/4" CONDUIT RUNS
- BBU FOR BDA REQUIRES 120V DEDICATED BRANCH CIRCUIT WITH LOCKING BREAKER CONNECTED TO EMERGENCY GENERATOR IF AVAILABLE. DRY CONTACT ALARMS TO BE MONITORED BY FACP.
RE: 8/R2.01 - R0.00 GENERAL NOTES

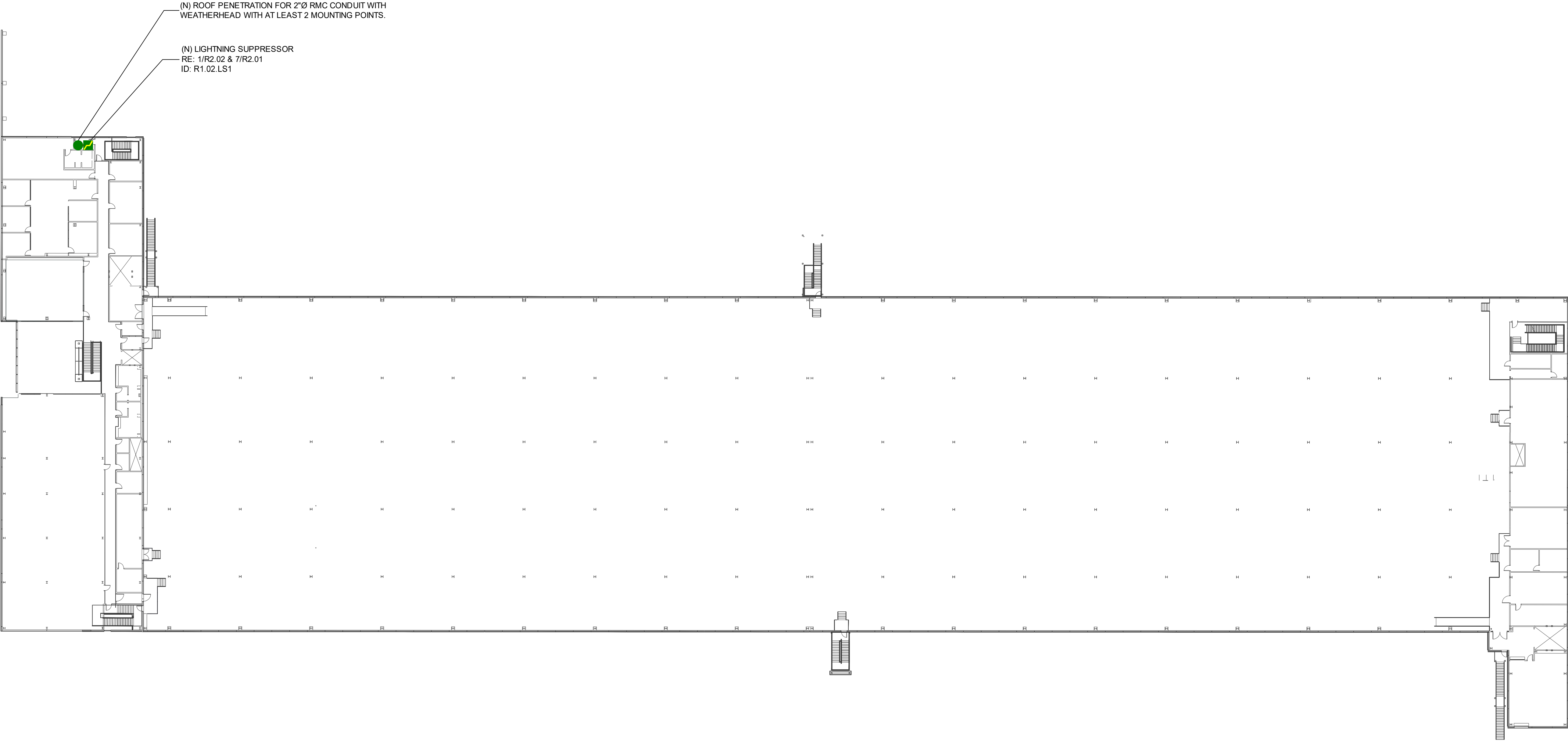


City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: **Apr 03, 2026**
2021 INTERNATIONAL CODES & 2023 NEC



Revision History		
Rev	Date	Author
01	9/22/2025	JO
100% SHOP DRAWINGS		
Project name		
QTS-DEN1-DC2		
Address		
1140 GUN CLUB ROAD AURORA CO 80118		
Designer name		
JO		
R1.01		
FIRST FLOOR		
9/24/2025		

DC1 RISER SHOWN FOR CLARITY



- 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 PANEL
 - FIBER DISTRIBUTION PANEL (FDP)
 - EMERGENCY POWER OFF (EPO)
 - KNOX GATE AND KEY SWITCH

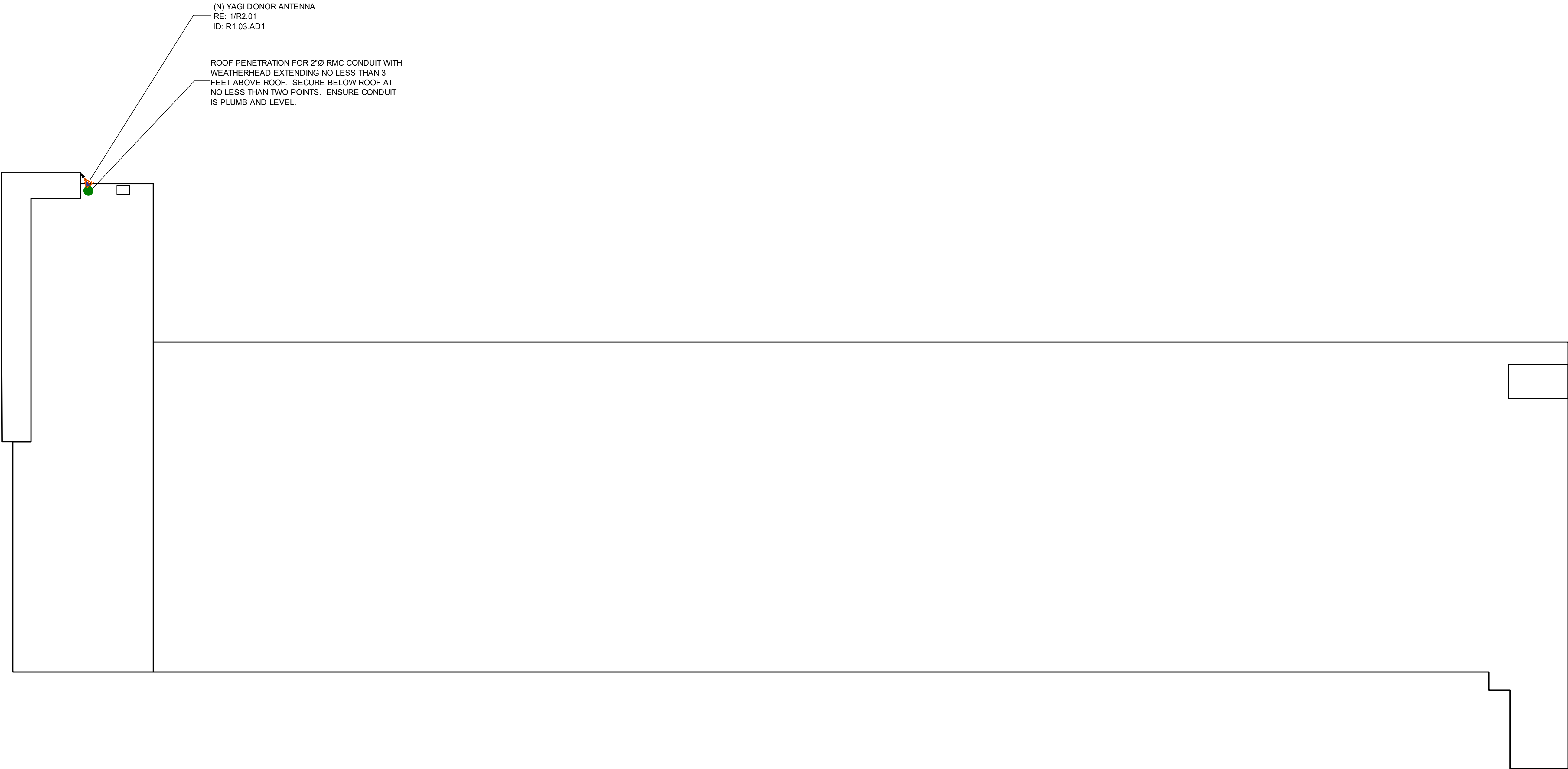
- SHEET NOTES**
- PROVIDE 12"X12"X4" J-BOX FOR EVERY ANTENNA LOCATION IN CONTROLLED COMPARTMENTS
 - PROVIDE 12" CONDUIT SWEEPS FOR 3/4" CONDUIT RUNS
 - ERCES COAX SHALL BE RUN IN PLENUM IN CORRIDOR AREAS WITH DROP CEILINGS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: **Apr 03, 2026**
2021 INTERNATIONAL CODES & 2023 NEC

80.00 ft

Revision History		
Rev	Date	Author
01	9/22/2025	JO
100% SHOP DRAWINGS		
Project name		
QTS-DEN1-DC2		
Address		
1140 GUN CLUB ROAD AURORA CO 80118		
Designer name		
JO		
R1.02		
SECOND FLOOR		
9/24/2025		

DC1 ROOF PENETRATION SHOWN FOR CLARITY



- 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 PANEL
 - FIBER DISTRIBUTION PANEL (FDP)
 - EMERGENCY POWER OFF (EPO)
 - KNOX GATE AND KEY SWITCH



Revision History		
Rev	Date	Author
0	9/22/2025	JO
100% SHOP DRAWINGS		
Project name		
QTS-DEN1-DC2		
Address		
1140 GUN CLUB ROAD AURORA CO 80118		
Designer name		
JO		
R1.03		
ROOF		
9/24/2025		



City of Aurora Building Division

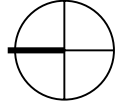
Reviewed for Code Compliance

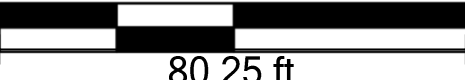
Approved as Noted:*chorst*

Date:*Apr 03, 2026*

2021 INTERNATIONAL CODES & 2023 NEC

Z





80.25 ft

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
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LIGHTNING SUPPRESSOR
REMOTE ANNUNCIATOR PANEL
FIBER DISTRIBUTION PANEL (FDP)
EMERGENCY POWER OFF (EPO)
KNOX GATE AND KEY SWITCH

SHEET NOTES

1. DEDICATED ANNUNCIATOR SHALL BE CO-LOCATED WITH BUILDING FACP.

Revision History		
Rev	Date	Author
R1	9/24/2025	JD
100% SHOP DRAWINGS		
Project name		
QTS-DEN1-DC2		
Address		
1140 GUN CLUB ROAD AURORA CO 80118		
Designer name		
JD		
R1.21		
LEVEL 1 - DC2		
9/24/2025		



City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: **Apr 03, 2026**
2021 INTERNATIONAL CODES & 2023 NEC



WALLS LEGEND

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

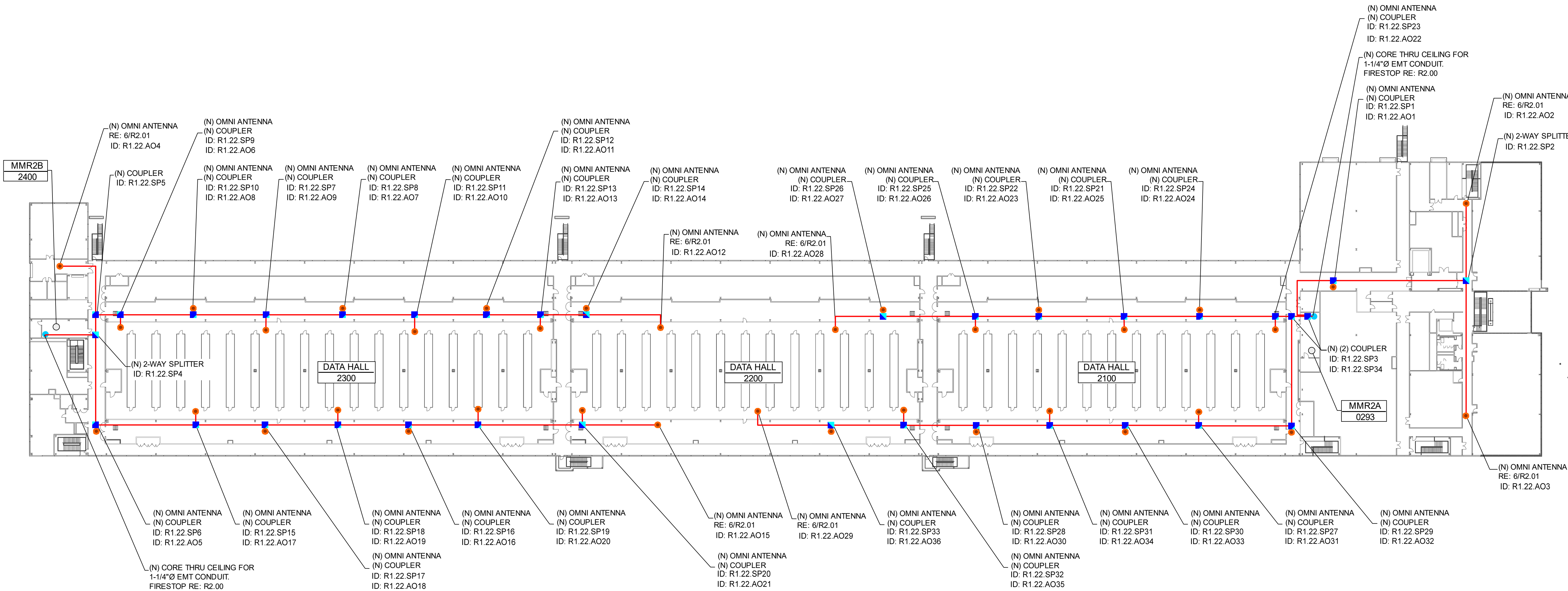
CABLES LEGEND

- 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

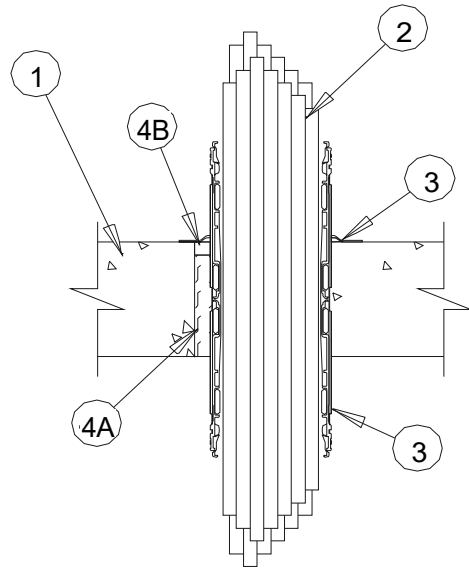
- 1 1/4"Ø EMT CONDUIT
2"Ø EMT CONDUIT
1 1/4"Ø / 2"Ø VERTICAL SLEEVE
1 1/4"Ø / 2"Ø SLEEVE W/ FIRESTOP
BALLAST MOUNT
18"X18"X6" J-BOX - U.N.O.
12"X12"X6" J-BOX W/ OMNI ANTENNA
OMNI ANTENNA
DIRECTIONAL ANTENNA
YAGI ANTENNA
DIRECTIONAL COUPLER
2-WAY SPLITTER
3-WAY SPLITTER
4-WAY SPLITTER
BI-DIRECTIONAL AMPLIFIER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

SHEET NOTES



Revision History		
Rev	Date	Author
01	9/22/2025	JO
100% SHOP DRAWINGS		
Project name		
QTS-DEN1-DC2		
Address		
1140 GUN CLUB ROAD AURORA CO 80118		
Designer name		
JO		
R1.22		
LEVEL 2 - DC2		
9/24/2025		

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 REQUIRED 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).

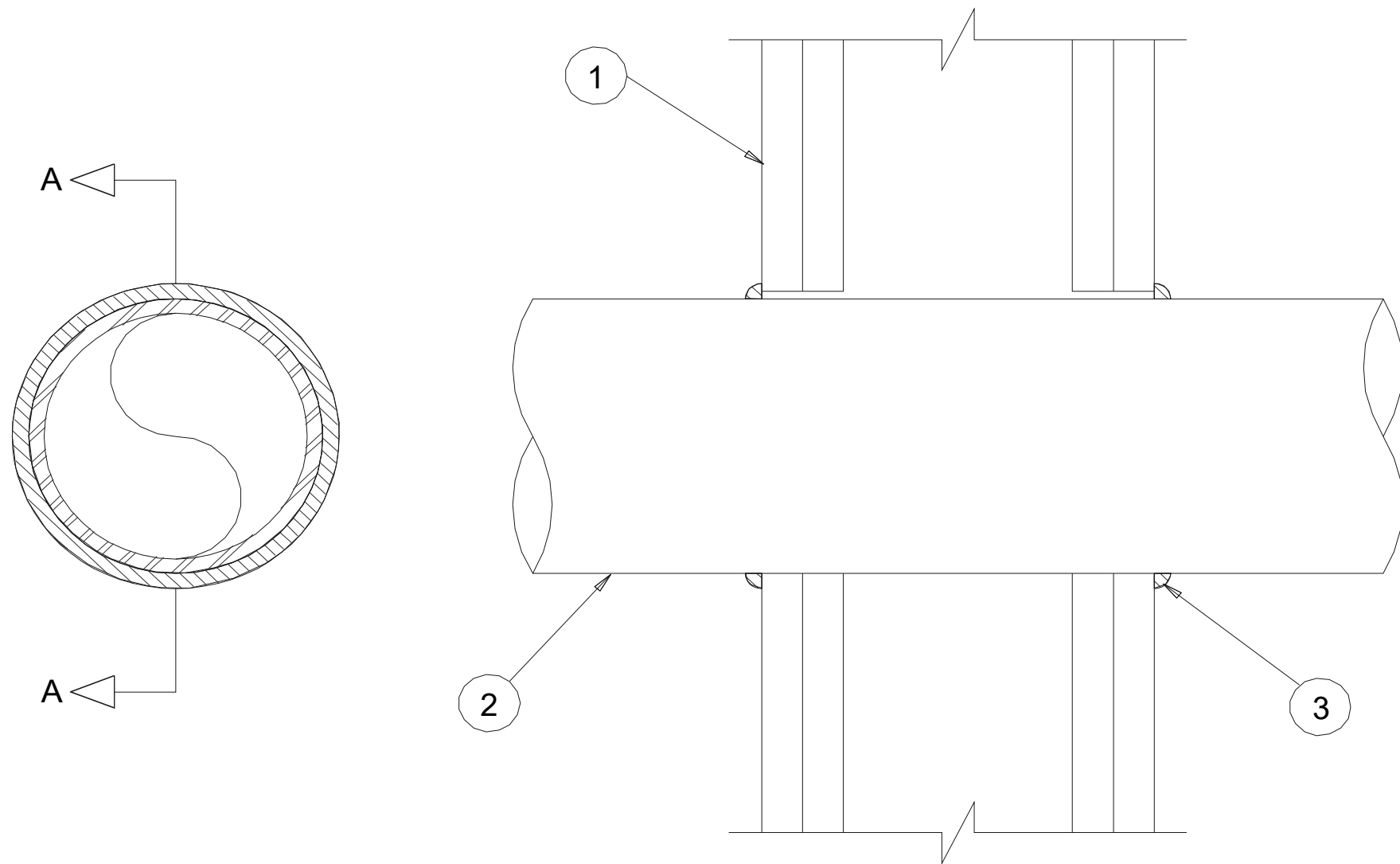
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC --- CP601S SEALANT, CP604 SEALANT, CP 606 SEALANT, CFS-S SIL GG, CFS-S SIL SL (FLOORS ONLY), FS-ONE SEALANT OR FS-ONE MAX INTUMESCENT SEALANT.

* 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

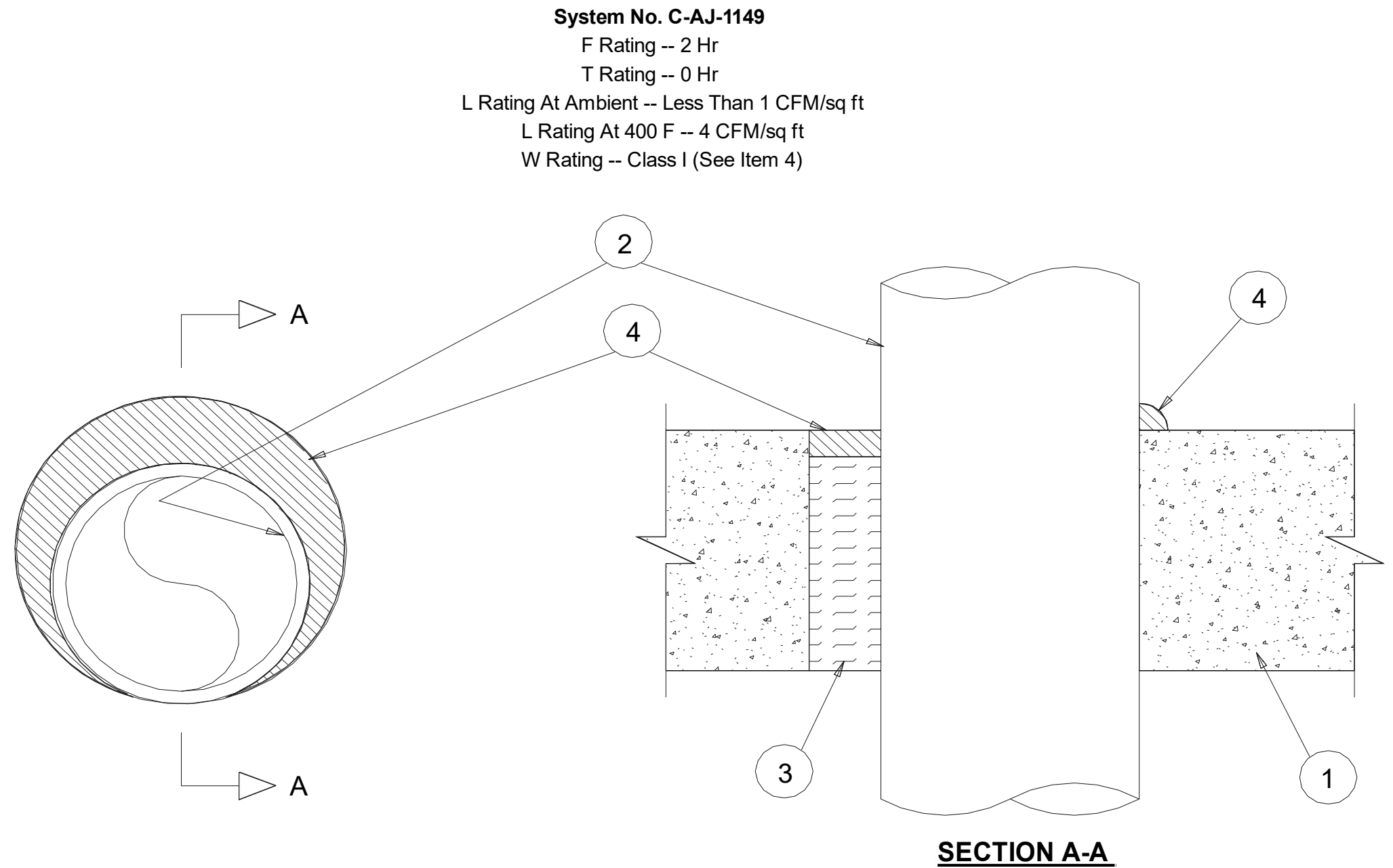


SECTION A-A

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

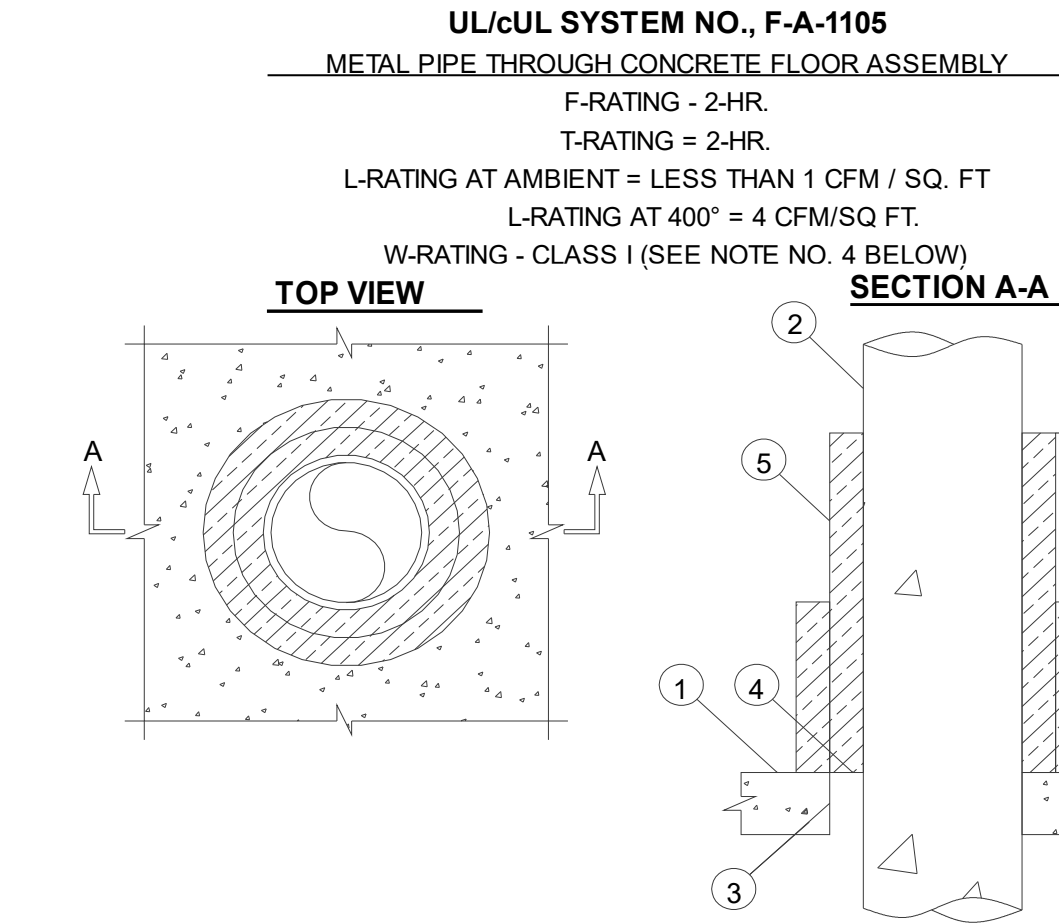
3 - FIRESTOPPING DETAIL @ STUD WALL



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 CAVTY 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 CHEMICALS, 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



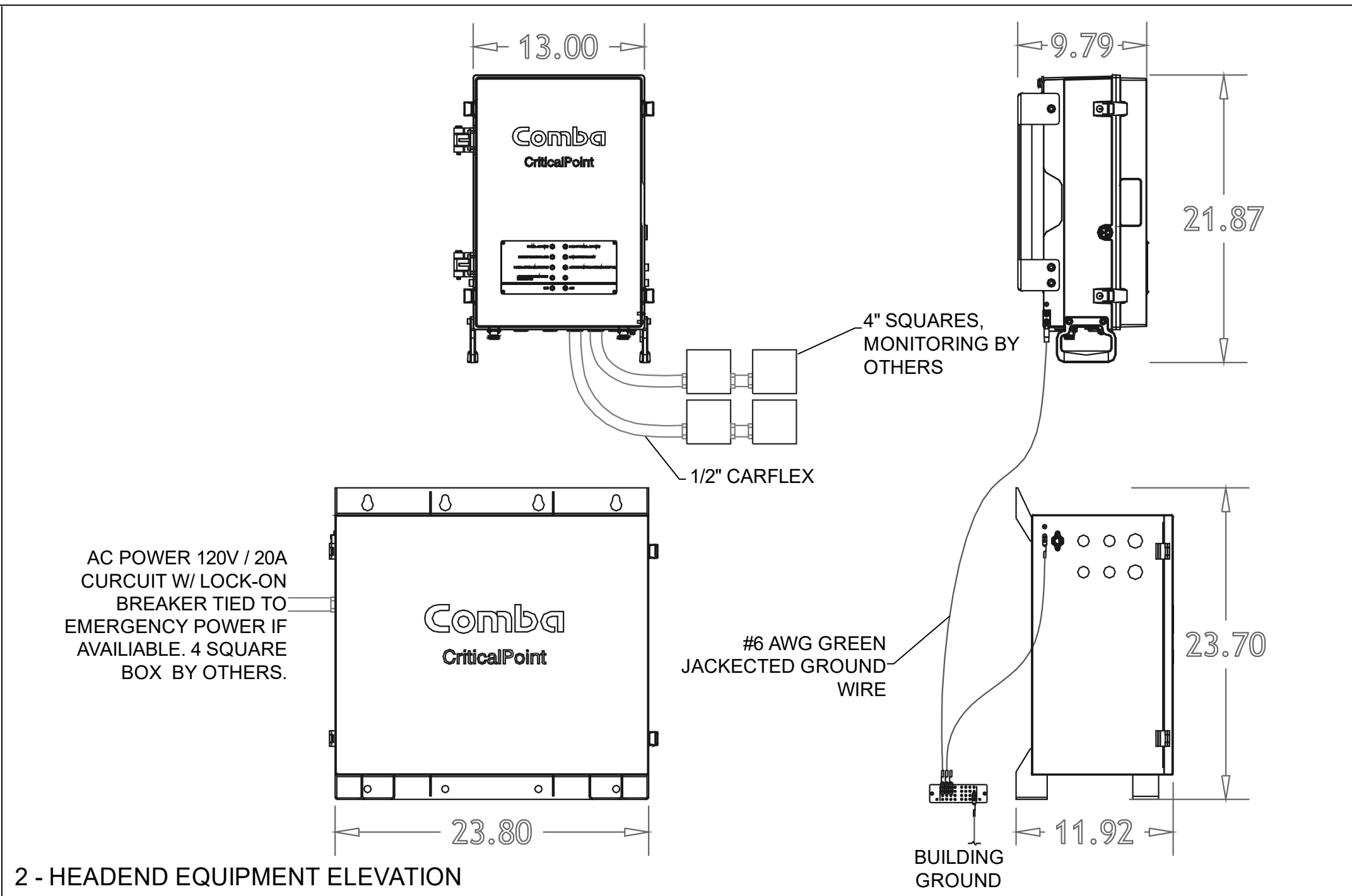
1. CONCRETE FLOOR ASSEMBLY (2-HR. FIRE-RATING):
- A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR (MINIMUM 4-1/2" THICK).
 - B. STEEL FLOOR UNIT/FLOOR ASSEMBLY (UL/CUL D700, D800, OR D900 SERIES) - LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR (MINIMUM 2-1/2" THICK) OVER METAL DECKING.
2. PENETRATING ITEM TO BE ONE OF THE FOLLOWING:
- A. MAXIMUM 10" NOMINAL DIAMETER STEEL PIPE (SCHEDULE 40 OR HEAVIER).
 - B. MAXIMUM 10 9/16" 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. MAXIMUM DIAMETER OF OPENING = 12-3/4".
 - 2. ANNULAR SPACE = MINIMUM 0", MAXIMUM 2".
 - 3. WHEN HILTI CP 604 SELF-LEVELING FIRESTOP SEALANT, HILTI CFS-S SIL GG FIRESTOP SILICONE FIRESTOP SEALANT, OR HILTI CFS-S SIL 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.

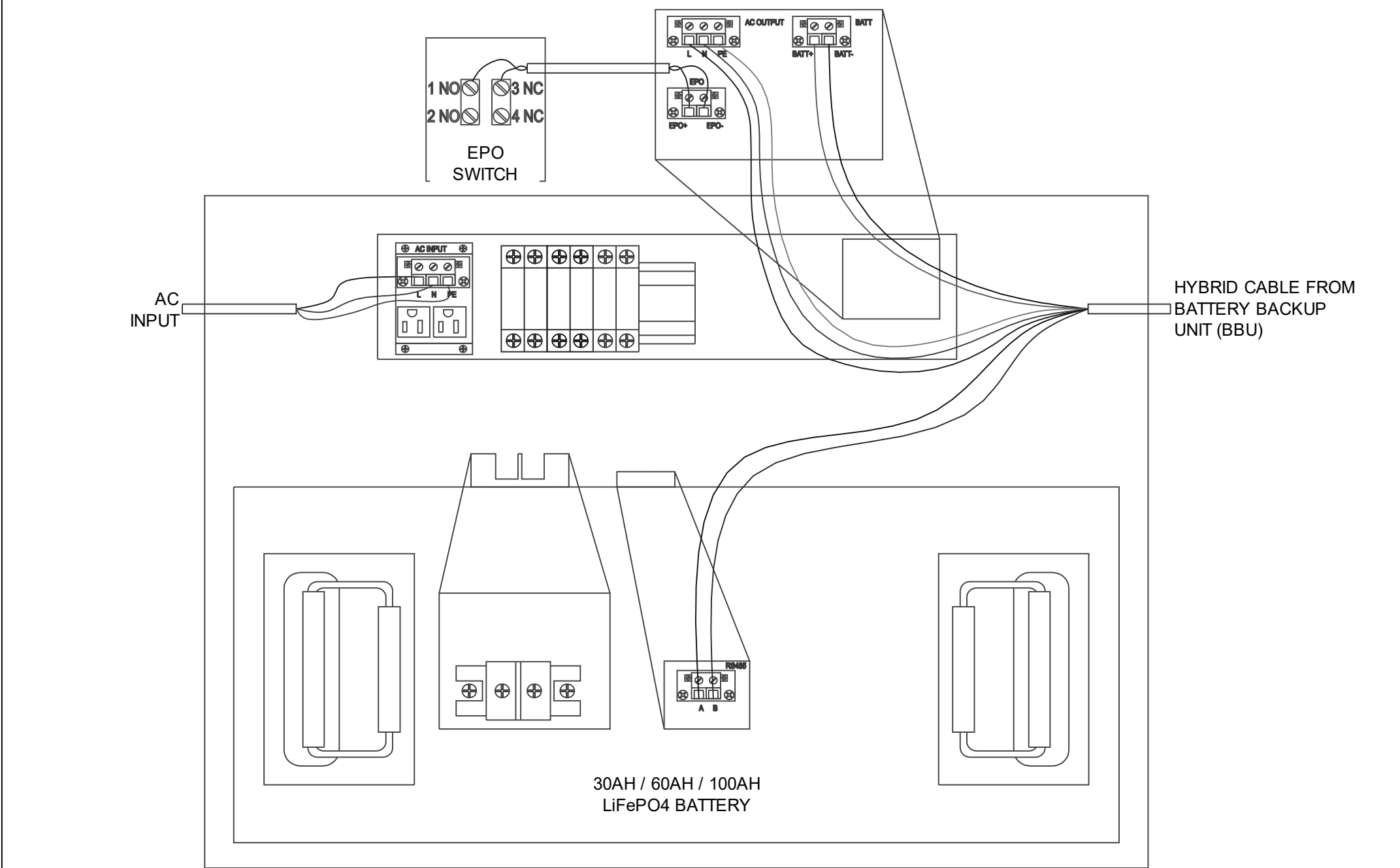
CONTRACTOR IS TO COORDINATE WITH DEN WITH REGARDS TO SCHEDULING THE X-RAYING OF FLOOR. LOCATE REBAR AND TENDONS AND ENSURE THAT THESE ITEMS WILL NOT BE DRILLED INTO, CUT, OR DAMAGED UNDER ANY CIRCUMSTANCES. PATCH AND REPAIR FLOOR AS REQUIRED PER DEN SPECIFICATIONS.

1 - FIRESTOPPING DETAIL @ CONCRETE

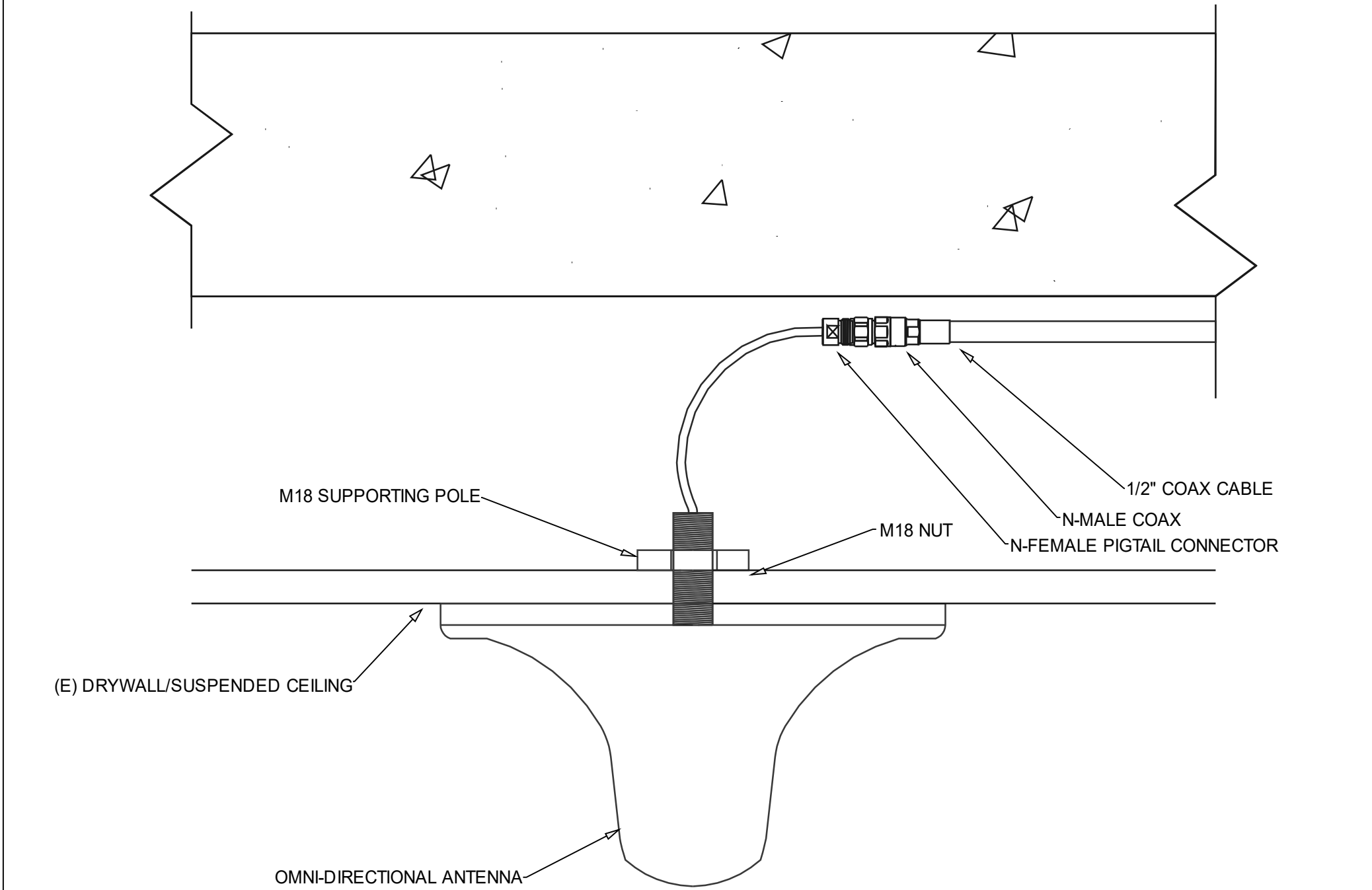
Revision History		
Rev	Date	Author
01	9/24/2025	JD
100% SHOP DRAWINGS		
Project name		
QTS-DEN1-DC2		
Address		
1140 GUN CLUB ROAD AURORA CO 80118		
Designer name		
JD		
R2.00		
FIRE-STOPPING DETAILS		
9/24/2025		



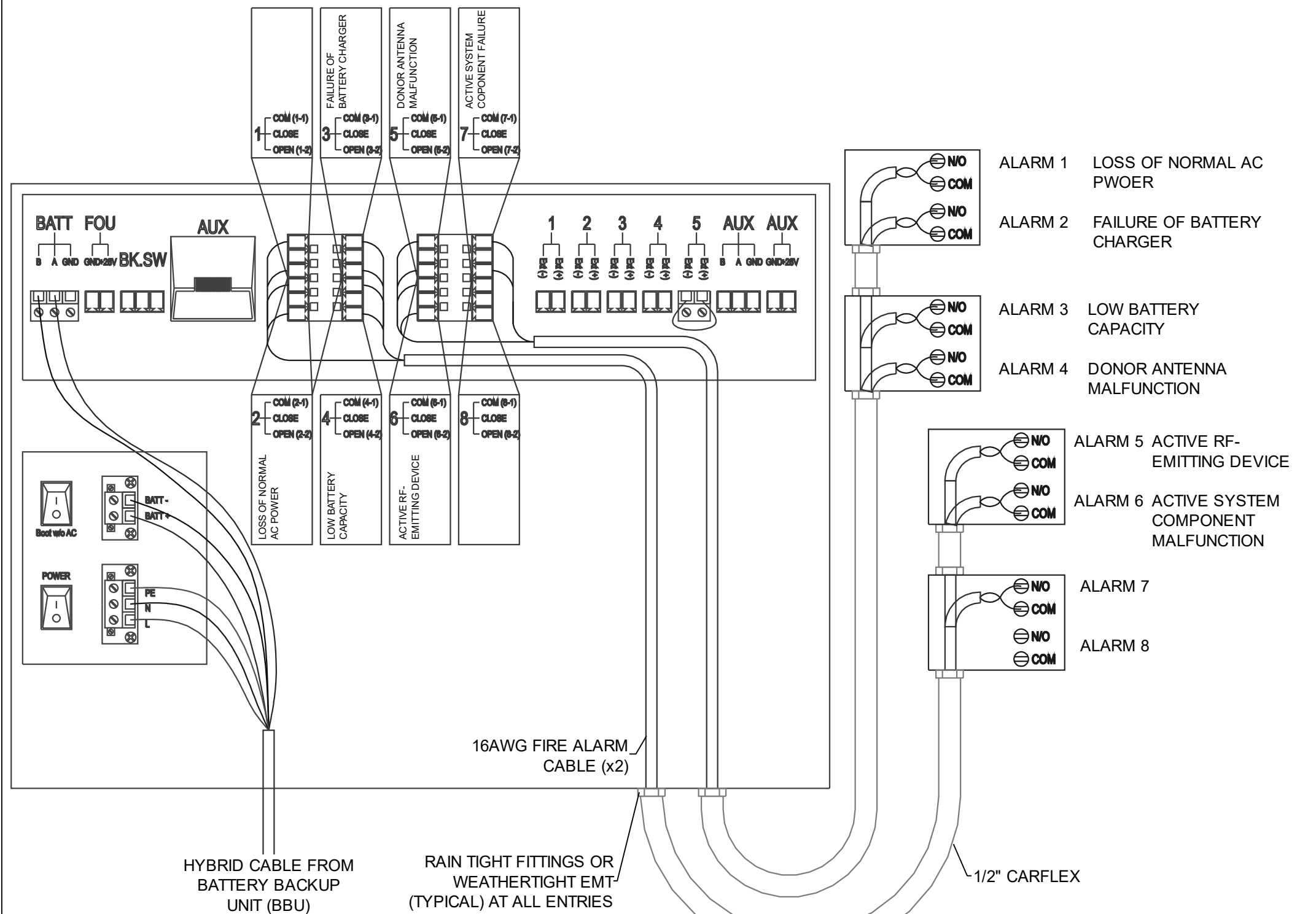
2 - HEADEND EQUIPMENT ELEVATION



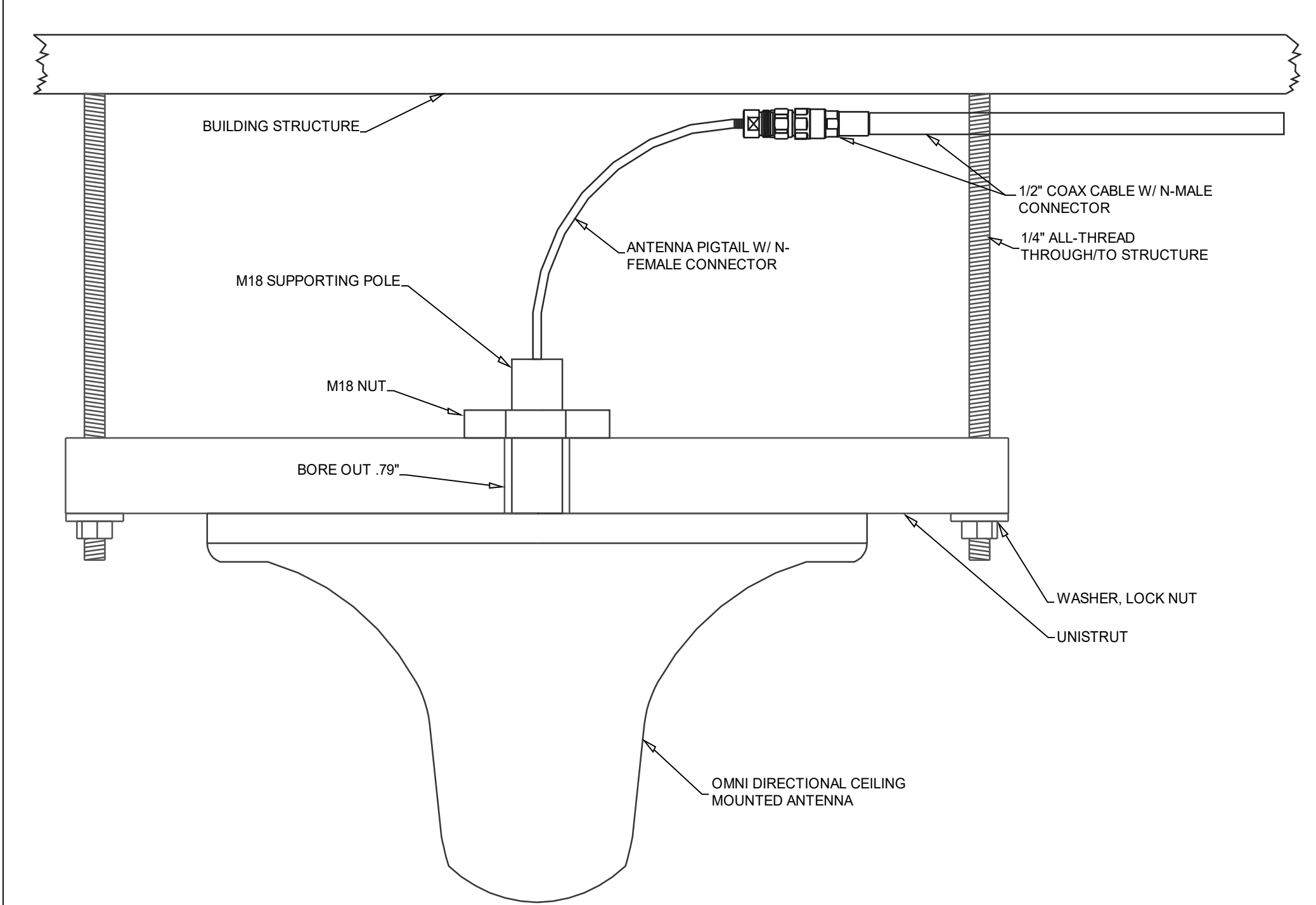
5 - BBU WIRING DIAGRAM



6 - ANTENNA DRYWALL/SUSPENDED CEILING MOUNTING DETAIL



8 - ALARM CONTACT MONITORING DETAIL



9 - OMNI ANTENNA CEILING MOUNT TO STRUCTURE

Revision History		
Rev	Date	Author
01	9/22/2025	JO
100% SHOP DRAWINGS		
Project name		
QTS-DEN1-DC2		
Address		
1140 GUN CLUB ROAD AURORA CO 80118		
Designer name		
JO		
R2.01		
MOUNTING DETAILS		
9/24/2025		

- [illegible]

2 - LIGHTNING PROTECTION		
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- The diagram shows a vertical grounding assembly. At the top, a #2 AWG green jacketed conductor enters from the left and connects to a grounding pipe clamp. Below this, another #2 AWG green jacketed conductor runs vertically. A 2" bond bushing is installed on this conductor. To the right, a lightning suppressor (SPD) is connected to a horizontal grounding buss bar. A 1/2" coax cable leads from the buss bar down towards the bottom right, labeled "1/2\" COAX CABLE TO BDA". On the left side, a label points to a "MECHANICAL CONNECTION TO (E) BLDG. STEEL (TYP.)".

Rev	Date	Author
0	8/22/2025	JD

100% SHOP DRAWINGS

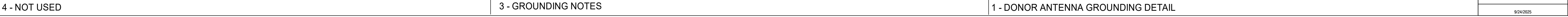
Project name
QTS-DEN1-DC2

Address
1140 GUN CLUB ROAD AURORA CO 80118

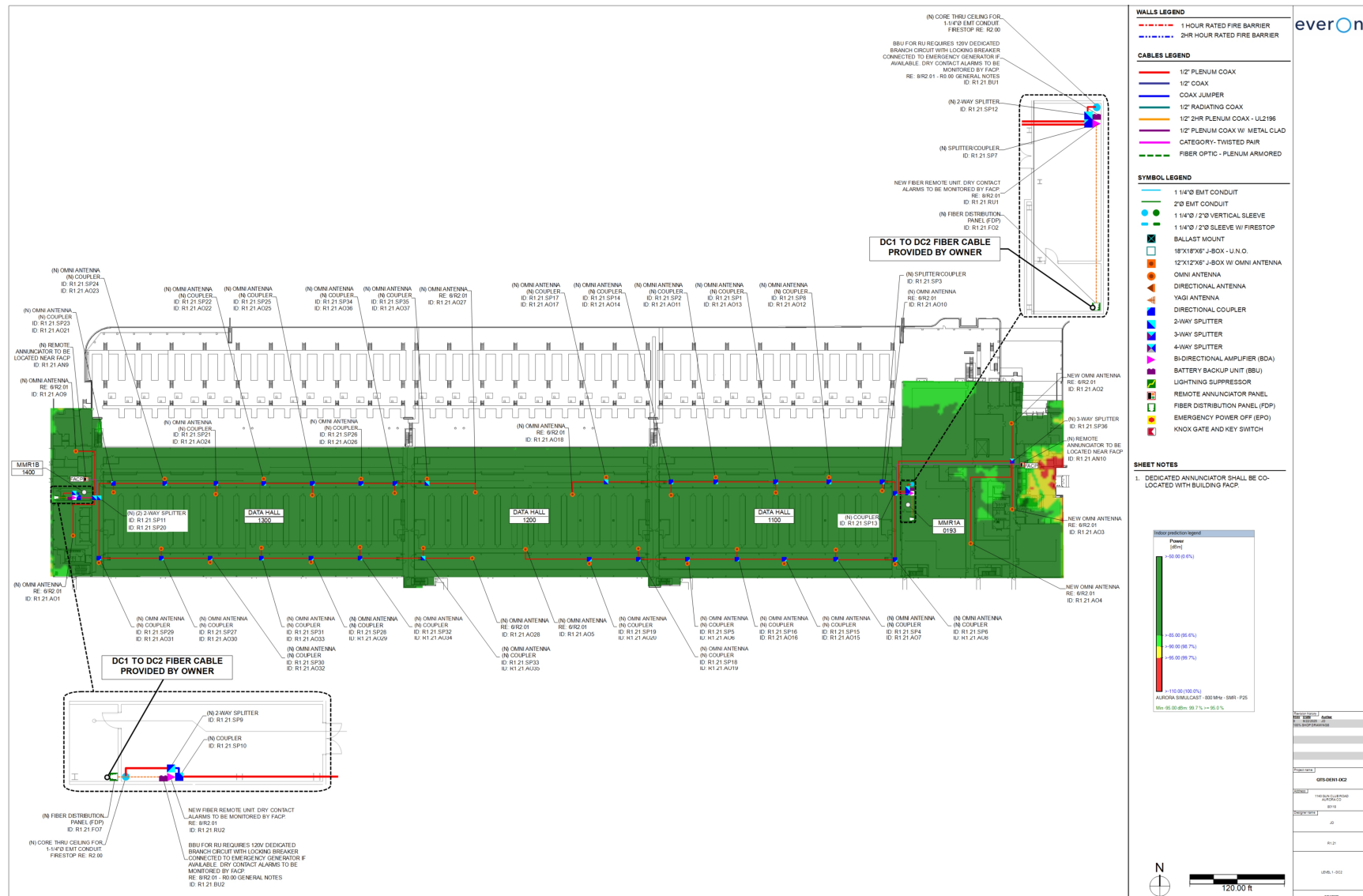
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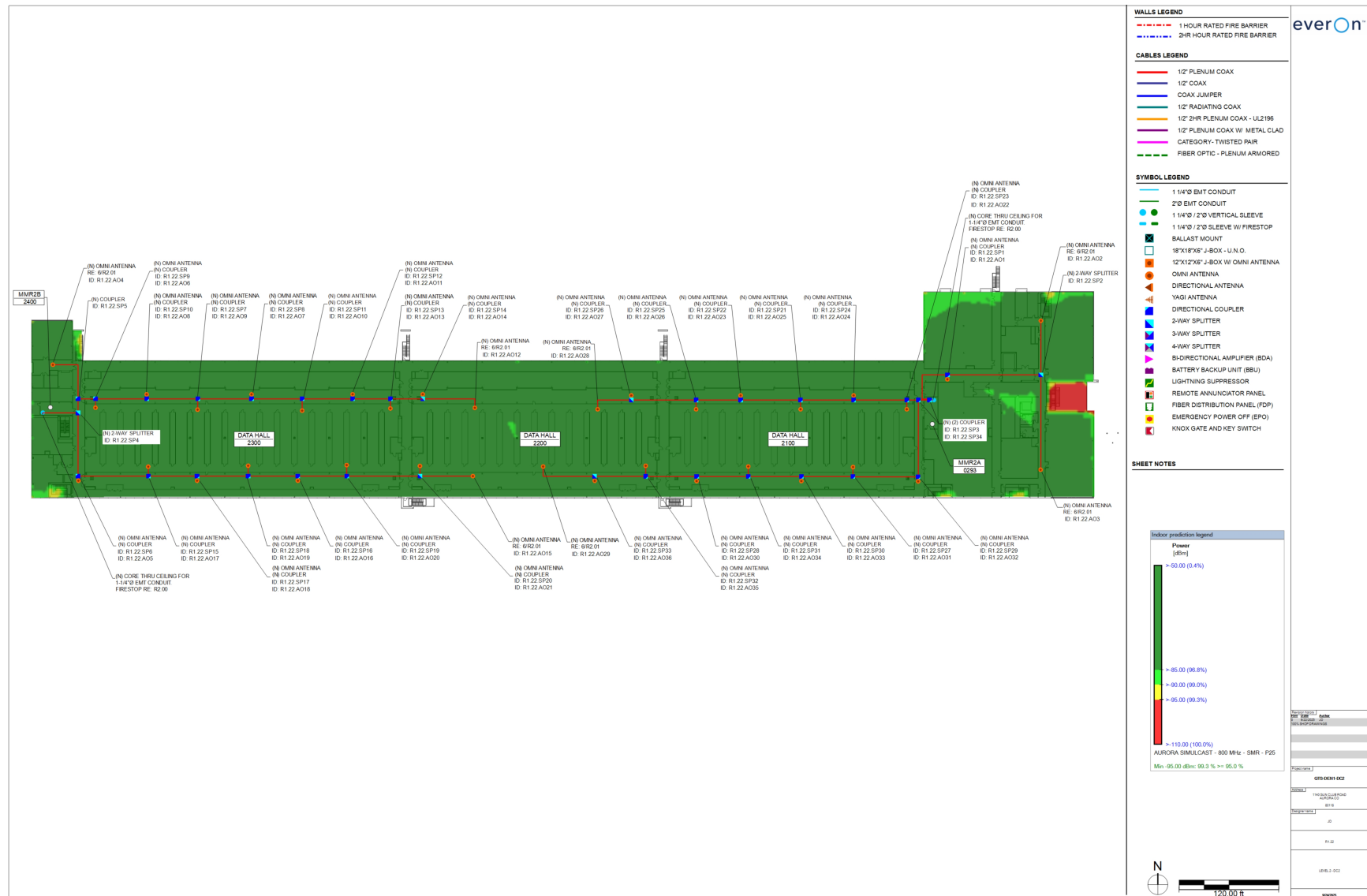
R2.02

GROUNDING DETAILS



everOn™





Product Data:
Emergency Responder Communication Enhancement System
QTS - DEN1 – DC2
1140 Gun Club Rd, Aurora, Co 80018
September 24, 2025



ERCES Contractor:

Everon
Jacob Doyle
6510 Franklin St
Denver, CO 80229
Phone: (303) 994-4735
E-mail: jacobdoyle@everonsolutions.com

ERCES ENGINEERING

TeleMtn Engineering
Khristopher Scott, PE
PO Box 1453
Salida, Co 801201
E-mail: kscott@telemtn.com

Table of Contents

- Project Description
- Signal Source Equipment
- Headend Radio Equipment
- Fiber Optic Cabling and Hardware
 - Coaxial Cabling
- Passive Distribution Components

Project Description

Project name:	QTS – DEN1 – DC2		
Project address:	1140 GUN CLUB, AURORA, CO 80018		
Venue description:	TWO STORY DATA CENTER		
Applicable Fire Code:	IBC:		2021
	IFC:		2021
	NFPA 1221:		2019
	NFPA 70 (NEC):		2020
	NFPA 780:		2020

Specifications section: *Not specified, although required by IFC*

Headend Radio Equipment

CriticalPoint™ Version 3 / Next Generation Public Safety Solution

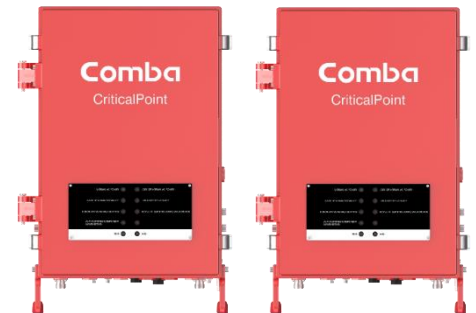
Public Safety 700/800MHz Class A/B 27/33dBm Fiber DAS and Battery Backup Unit

Public Safety Standards Compliance

- Complies with IFC / NFPA / UL2524
- FCC Class A: **PX8RH78V3-A** / Class B: **PX8RH78V3-B**
- UL 2524 Standard Certified – SGS Certificate:
 - Remote Unit: **SGSNA/23/GZ/00246X**
 - BBU: **SGSNA/23/GZ/00235X**
 - System: **SGSNA/23/GZ/00244X**
- ISED (IC) **Class A: 11919A- RH78V3A** / **Class B: 11919A- RH78V3B**
- 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
- 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
(BDA)

Remote Unit



Fiber Optical Unit

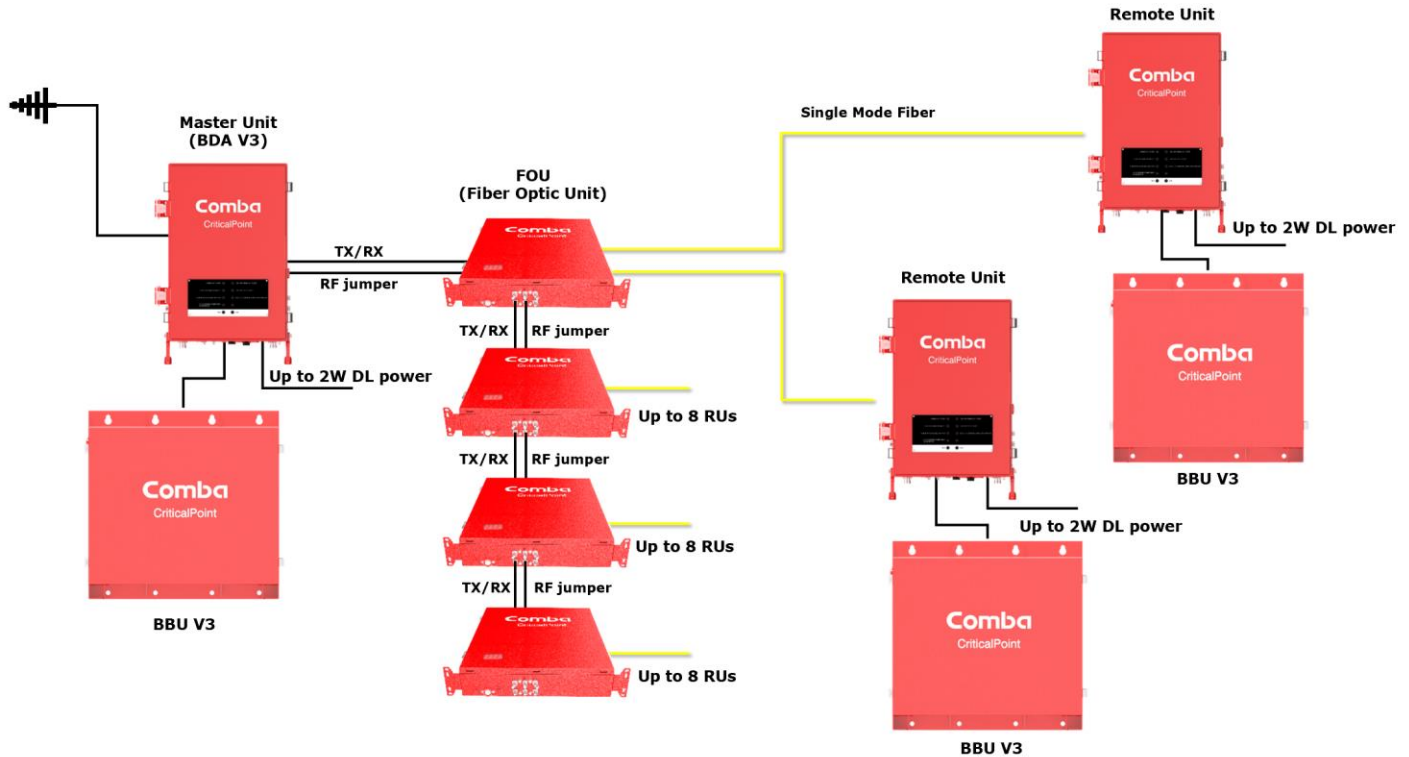
Battery Backup Unit

- 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	°F (°C)		-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

**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*	≤ 7
Out-of-Band Suppression	dBc	≥ 60 @ filter edge + 1MHz

*Actual delay number is various according to firmware version, system delay (MU+RU, including 1m of Fiber)

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 / 4.5A Max	
		VDC	51.2V / 8A Max	
DC Output Voltage to External Device, Nominal		VDC	+51.2VDC (1 Port), +28VDC (2 Ports)	
External Device Maximum Power Draw		W	105	
Maximum Charging Current		A	5	
Power Consumption	Single Band	W	<75 (27dBm)	<90 (33dBm)
	Dual Band		<85 (27dBm)	<100 (33dBm)
Enclosure Cooling			Convection	
Heat Dissipation		BTU/Hr	<480 (with Master Unit only, 2A Charging) <580 (Full Load)	
Main RF Connectors / RF Test Port			N-F (DT, MT) / SMA-F (DT-Test, MT-Test), -28dB coupling	
RF Connectors for Fiber DAS expansion			SMA-F (FOU DL, FOU UL)	
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		°F (°C)	-40 to 131 (-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 / 4.5A Max	
		VDC	51.2V / 8A Max	
DC Output Voltage to External Device, Nominal		VDC	+51.2VDC (1 Port), +28VDC (2 Port)	
External Device Maximum Power Draw		W	105	
Maximum Charging Current		A	5	
Power Consumption	Single Band	W	<75 (27dBm)	<90 (33dBm)
	Dual Band		<85 (27dBm)	<100 (33dBm)
Enclosure Cooling			Convection	
Heat Dissipation		BTU/Hr	<480 (with Remote Unit only, 2A Charging) <580 (Full Load)	
Main RF Connectors / RF Test Port			N-F (MT) / SMA-F (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 (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		°F (°C)	-40 to 131 (-40 to +55), ≤ 95%	
Environmental Class			UL50E Type 4 / NEMA 4	
MTBF		Hr	100,000	

Mechanical Specification - Battery Backup Unit

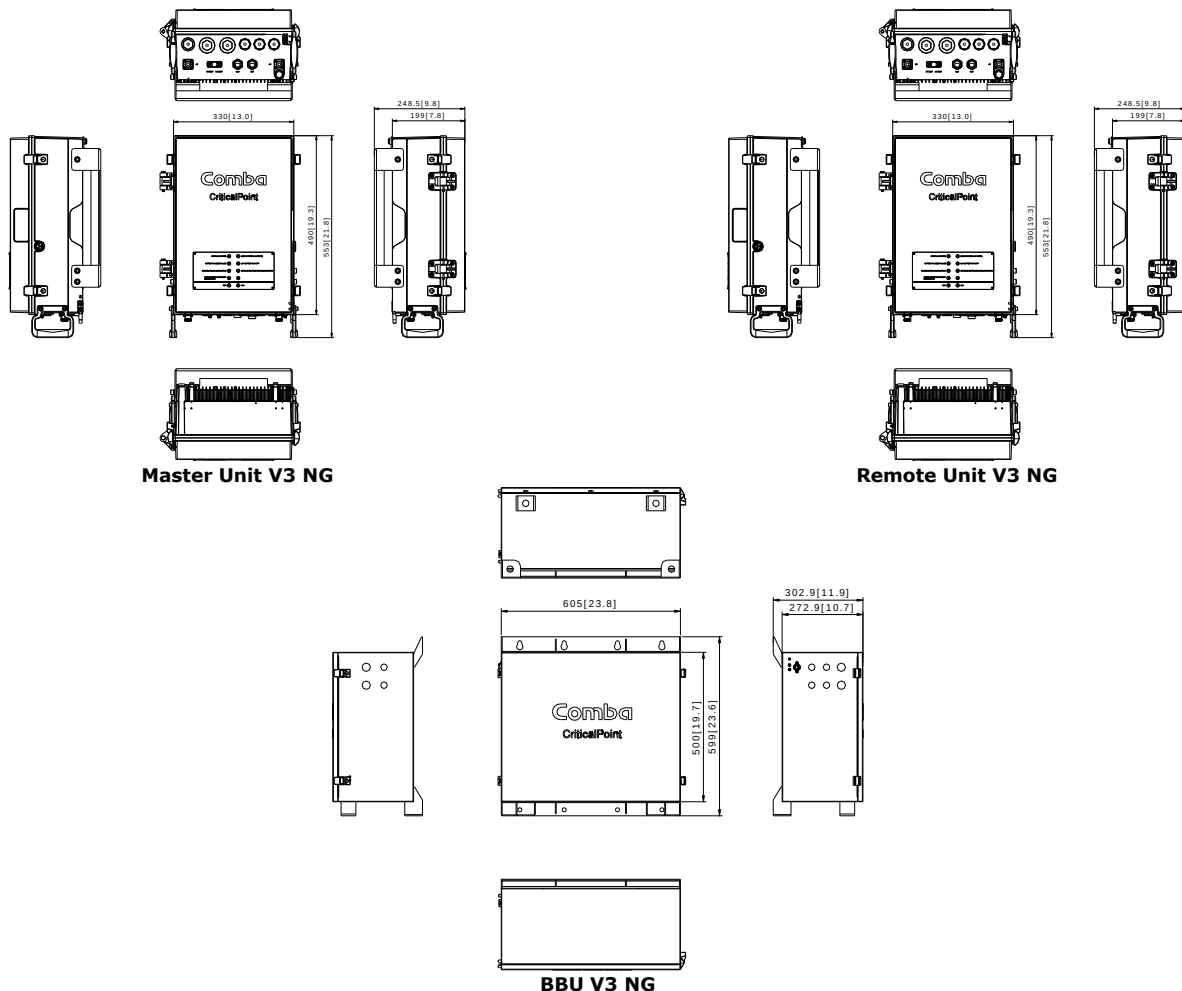
Dimensions, H x W x D	mm / in	605 x 500 x 272.9 / 23.8 x 19.7 x 10.7
Weight (without battery)	Kg / lbs	26 / 57.3
Reserved Knockouts		3/4-inch hole x 4, 1/2-inch hole x 6
Heat Dissipation	BTU/Hr	<100 (with 30AH, 60AH, or 100AH battery)
Operating Temperature and Humidity	°F (°C)	32 to 104 (0 to 40), ≤ 95%
Enclosure Environmental Class		UL50E Type 4 / NEMA 4
MTBF	Hr	100,000

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		48.1 * 30 / Load	48.1 * 60 / Load	48.1 * 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



Part Numbers

RH78V3 - 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 / BDA 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-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
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-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-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
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-2727BADD		Class B to Class A upgrade license, for 27dBm, Dual Band units

CriticalPoint™ Public Safety Annunciator Panel

APV3 Series

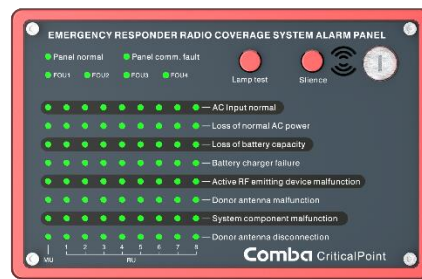
UL 2524 Standard Certified

Features

- Dedicated external Annunciator Panel for Comba Public Safety BDA V3.
- Dedicated external Annunciator Panel for Comba Public Safety DAS V3 showing individual alarms from each MU and RU.
- Swappable plates for various alarm standards (matches swappable panels on BDA V3 / DAS V3).
- Provides visual and audio annunciation, supports lamp testing and alarm muting.
- Operates on +12 ~ +42.4VDC; can be powered directly from Comba BDA V3 / DAS V3 or can be powered by local AC adaptor.
- Long distance (2000ft, 24ga wire) supported.
- Light weight and small footprint, easy to install and commission.
- **UL2524 2nd Edition Listing with SGS, Nationally Recognized Testing Laboratory (NRTL) approved by OSHA for UL2524 Standard Certified - SGS Certificate No.: DSS_SGSNA_24_GZ_00199 (BDA Version) / DSS_SGSNA_24_GZ_00200 (DAS Version)**

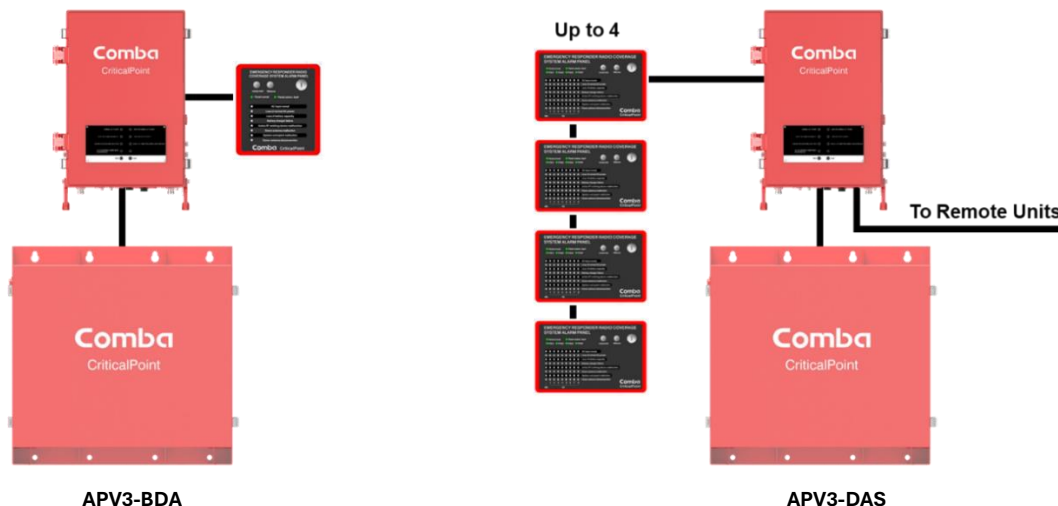


APV3-BDA



APV3-DAS

System Diagram



APV3-BDA

APV3-DAS

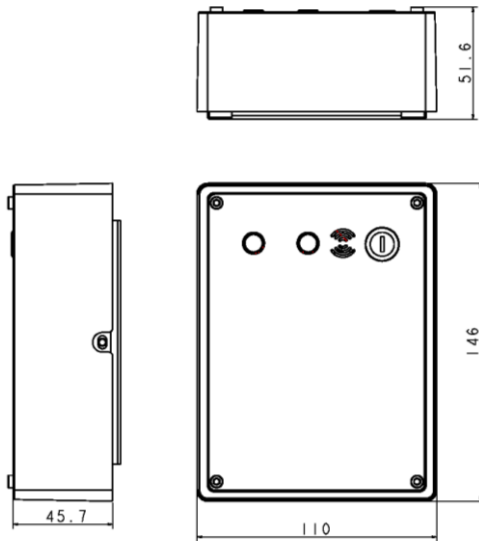
Specifications

Annunciator Panel BDA Version		
NFPA/IFC/UL2524 Alarm Indicators		8 Alarms, synchronized with BDA V3/DAS V3
Other Alarm Indicators		Panel Normal / Comm Alarm
Max. Number of AP supported by V3 platform		4
DAS Support (For individual alarms from RUs)		N/A
Dimensions, H x W x D	In(mm)	5.75 x 4.33 x 1.81 (146 x 110 x 46)
Weight BDA	lb(kg)	0.9 (0.41)
Power Consumption	W	0.6
Annunciator Panel DAS Version		
NFPA/IFC/UL2524 Alarm Indicators		8 Alarms, synchronized with BDA/DAS, 1 MU and 8 RU supported per panel
Other Alarm Indicators		Panel Normal / Comm Alarm / FOU 1 ~ 4 Alarm
Max. Number of AP supported by V3 platform		4
DAS Support (For individual alarms from RUs)		Up to Master Unit and 32 Remote Units alarm annunciation from 4 cascaded APs
Dimensions, H x W x D	In(mm)	7.20 x 4.65 x 1.42 (183 x 118 x 36)
Weight DAS	lb(kg)	1.2 (0.54)
Power Consumption	W	2
Common Specifications		
Audio Annunciation / Buzzer Muting		Available
Lamp Test		Available
Limited Access for Operation (Alarm Muting)		Key Operated
Dry Contact Input		N/A
Dry Contact Output		N/A
Common Mechanical and Electrical Specifications		
DC Input	VDC	+12 ~ +42.4
Mounting		4" x 4" Junction Box / Wall
Max Cable Distance	Feet	2000 (24ga wire)
Connection with BDA/DAS		DC + RS485 (1x Cat. 5 Cable provided for quick connection)
IP / NEMA / Environment Class		IP30
Operating Temperature and Humidity	°F/°C	-27.4 ~ +131 (-33 ~ +55)

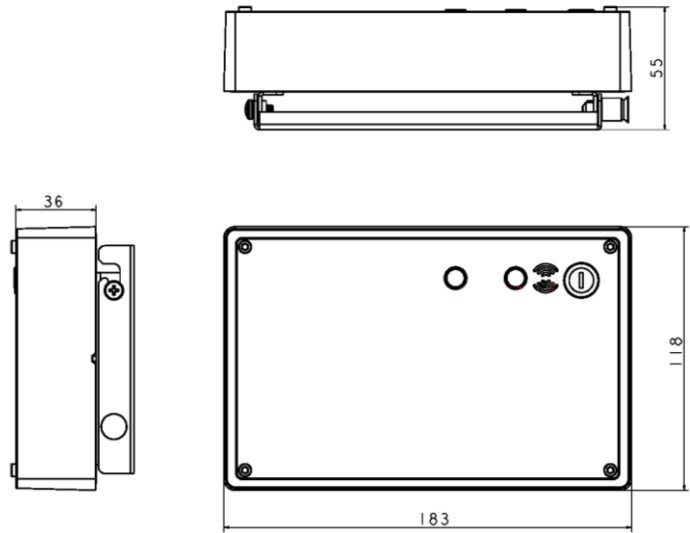
Part Numbers

Part Number	Description
APV3-BDA	Annunciator Panel V3 for BDA V3 or individual DAS Remote Units V3, UL 2524 Standard Certified
APV3-DAS	Annunciator Panel V3 for DAS V3, Individual Alarm Annunciation for entire system, UL 2524 Standard Certified
APV3-BDA-3804MX	Flushing Mounting Kit for APV3-BDA
APV3-DAS-3804MX	Flushing Mounting Kit for APV3-DAS

Outline Drawing

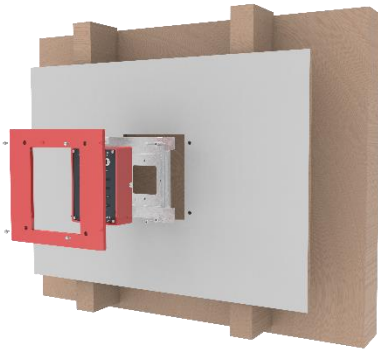


APV3-BDA

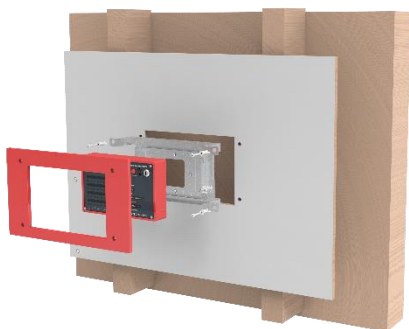
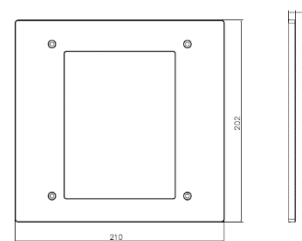


APV3-DAS

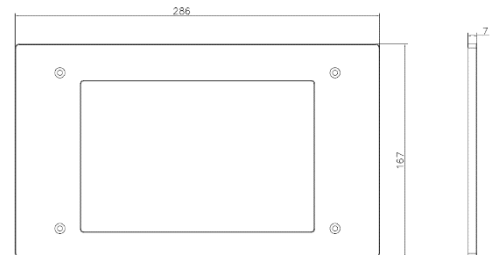
Flush Mounting Kit



APV3-BDA, Flush Mounting



APV3-DAS, Flush Mounting



Coaxial Cabling

Product Specifications

COMMSCOPE®



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

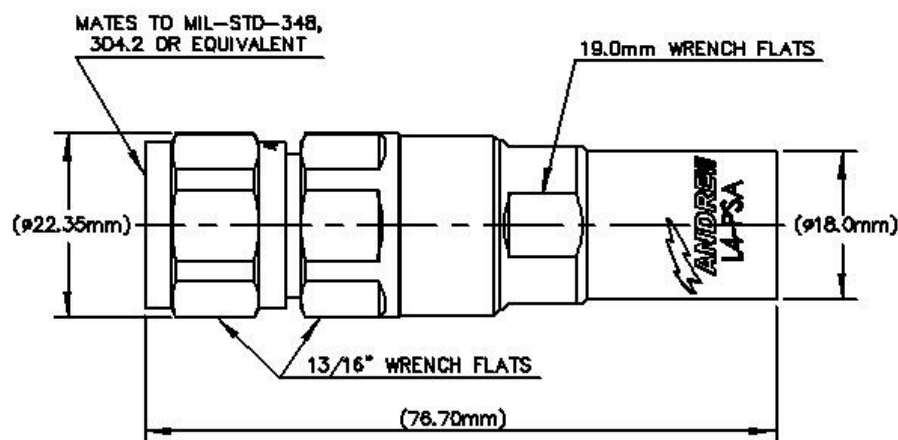
Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 910 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707.00 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact 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

COMMSCOPE®

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

COMMSCOPE®

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

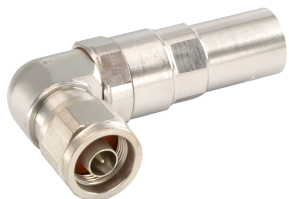


* Footnotes

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

Product Specifications

COMMSCOPE®



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

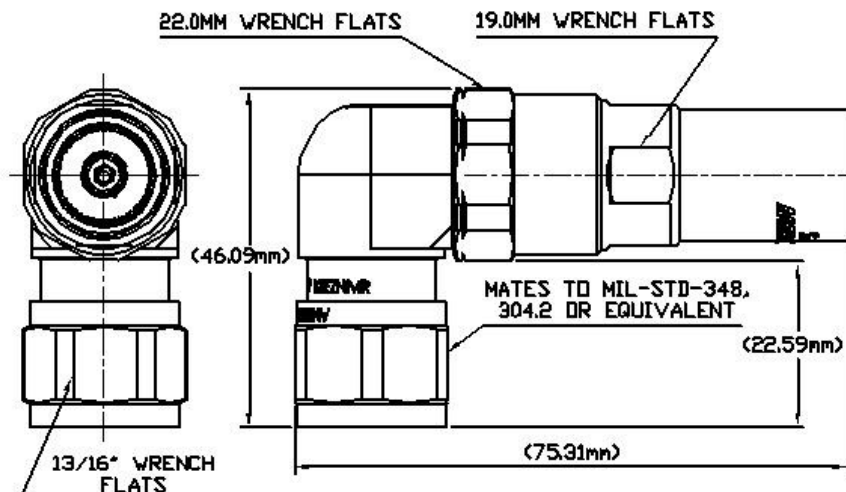
Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 910 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707.00 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact 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

COMMSCOPE®

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

COMMSCOPE®

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	0.05v̄ 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

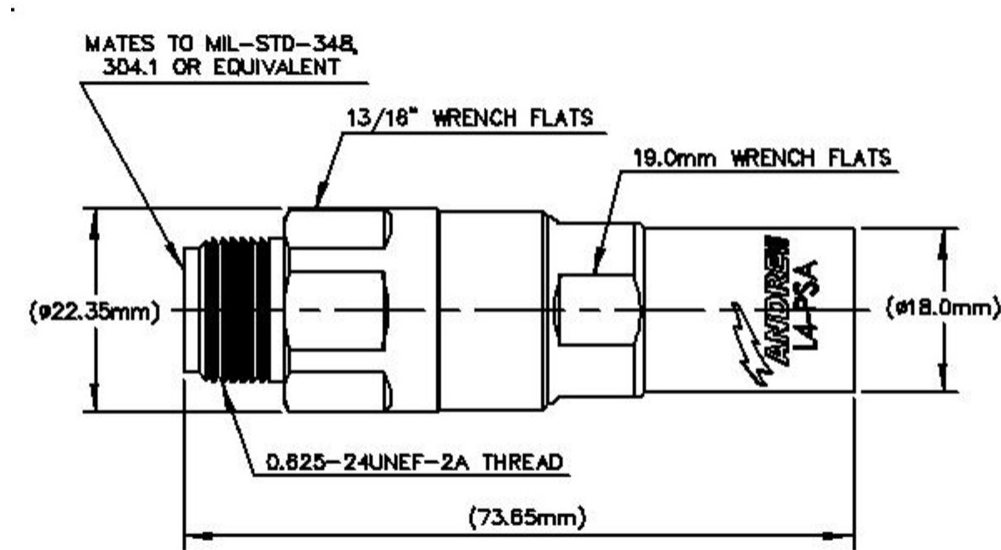
Body Style	Straight
Cable Family	AL4-50
Harmonized System (HS) Code	854420 (Coaxial cable and other coaxial electric conductors)
Inner Contact Attachment Method	Captivated
Inner Contact Plating	Silver
Interface	N Female
Mounting Angle	Straight
Outer Contact Attachment Method	Ring-flare
Outer Contact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

L4TNF-PSA

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
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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

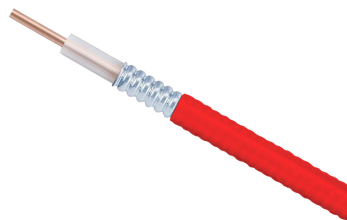


* Footnotes

Insertion Loss, typical 0.05v~freq (GHz) (not applicable for elliptical waveguide)

Immersion Depth Immersion at specified depth for 24 hours

AL4RPV-50R



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

Product Type	Air coaxial cable
Product Brand	HELIAX®
Product Series	AL4-50
Ordering Note	CommScope® standard product (Global)

General Specifications

Flexibility	Standard
Jacket Color	Red

Dimensions

Diameter Over Jacket	15.748 mm 0.62 in
Inner Conductor OD	4.572 mm 0.18 in
Outer Conductor OD	14.046 mm 0.553 in
Nominal Size	1/2 in

Electrical Specifications

Cable Impedance	50 ohm $\pm$ 2 ohm
Capacitance	75.459 pF/m 23 pF/ft
dc Resistance, Inner Conductor	1.575 ohms/km 0.48 ohms/kft
dc Resistance, Outer Conductor	1.575 ohms/km 0.48 ohms/kft
dc Test Voltage	4000 V
Inductance	0.19 μ H/m 0.058 μ H/ft
Insulation Resistance	100000 MOhms-km
Jacket Spark Test Voltage (rms)	5000 V
Operating Frequency Band	1 – 6000 MHz
Peak Power	40 kW
Power Attenuation	2.325

AL4RPV-50R

Pulse Reflection 0.5%

Velocity 88 %

VSWR/Return Loss

Frequency Band	VSWR	Return Loss (dB)
700–894 MHz	1.13	24.3
806–960 MHz	1.13	24.3
1700–2200 MHz	1.13	24.3

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
1.0	0.216	0.066	35.37
1.5	0.264	0.081	28.84
2.0	0.306	0.093	24.95
10.0	0.691	0.211	11.04
20.0	0.985	0.3	7.75
30.0	1.213	0.37	6.29
50.0	1.581	0.482	4.83
85.0	2.087	0.636	3.66
88.0	2.126	0.648	3.59
100.0	2.274	0.693	3.35
108.0	2.368	0.722	3.22
150.0	2.821	0.86	2.7
174.0	3.054	0.931	2.5
200.0	3.292	1.003	2.32
204.0	3.327	1.014	2.29
300.0	4.104	1.251	1.86
400.0	4.808	1.465	1.59
450.0	5.134	1.565	1.49
460.0	5.197	1.584	1.47
500.0	5.445	1.659	1.4
512.0	5.517	1.682	1.38
600.0	6.032	1.839	1.26
700.0	6.583	2.007	1.16
800.0	7.105	2.166	1.07

AL4RPV-50R

824.0	7.227	2.203	1.06
894.0	7.574	2.308	1.01
960.0	7.892	2.405	0.97
1000.0	8.081	2.463	0.94
1218.0	9.068	2.764	0.84
1250.0	9.207	2.806	0.83
1500.0	10.256	3.126	0.74
1700.0	11.053	3.369	0.69
1794.0	11.416	3.48	0.67
1800.0	11.439	3.487	0.67
2000.0	12.192	3.716	0.63
2100.0	12.559	3.828	0.61
2200.0	12.92	3.938	0.59
2300.0	13.276	4.046	0.57
2500.0	13.975	4.259	0.55
2700.0	14.656	4.467	0.52
3000.0	15.649	4.77	0.49
3400.0	16.928	5.159	0.45
3600.0	17.551	5.349	0.43
3700.0	17.859	5.443	0.43
3800.0	18.164	5.536	0.42
3900.0	18.467	5.628	0.41
4000.0	18.768	5.72	0.41
4100.0	19.066	5.811	0.4
4200.0	19.363	5.902	0.39
4300.0	19.658	5.991	0.39
4400.0	19.951	6.081	0.38
4500.0	20.241	6.169	0.38
4600.0	20.531	6.257	0.37
4700.0	20.818	6.345	0.37
4800.0	21.104	6.432	0.36
4900.0	21.388	6.519	0.36
5000.0	21.671	6.605	0.35
6000.0	24.42	7.443	0.31

Material Specifications

AL4RPV-50R

Dielectric Material	PE spline
Jacket Material	PVC
Inner Conductor Material	Copper-clad aluminum wire
Outer Conductor Material	Corrugated aluminum

Mechanical Specifications

Minimum Bend Radius, multiple Bends	127 mm 5 in
Minimum Bend Radius, single Bend	63.5 mm 2.5 in
Number of Bends, minimum	15
Tensile Strength	79 kg 174.165 lb
Bending Moment	5 ft lb 6.779 N-m
Flat Plate Crush Strength	1.429 kg/mm 80 lb/in

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)
Attenuation, Ambient Temperature	68 °F 20 °C
Average Power, Ambient Temperature	104 °F 40 °C
Average Power, Inner Conductor Temperature	212 °F 100 °C
Fire Retardancy Test Method	NFPA 262/CATVP/CMP

Packaging and Weights

Cable weight	0.208 kg/m 0.14 lb/ft
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Regulatory Compliance/Certifications

Agency	Classification
c(ETL)us Certification	CATVP/CMP
ETL Certification	CATVP/CMP
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system



LDF4RK-50A



LDF4-50, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black non-halogenated, fire retardant polyolefin jacket B2ca-s1a-d1,a1 (CPR testing is conducted annually please reference the website for latest classification)

Product Classification

Product Type	Coaxial wireless cable
Product Brand	HELIAX® SureFlex®
Product Series	LDF4-50A
Ordering Note	CommScope® standard product in Asia Pacific CommScope® standard product in Europe, the Middle East, and Africa

General Specifications

Flexibility	Standard
Jacket Color	Black
Performance Note	Attenuation values typical, guaranteed within 5%

Dimensions

Diameter Over Dielectric	12.954 mm 0.51 in
Diameter Over Jacket	16.002 mm 0.63 in
Inner Conductor OD	4.826 mm 0.19 in
Outer Conductor OD	13.97 mm 0.55 in
Nominal Size	1/2 in

Electrical Specifications

Cable Impedance	50 ohm $\pm$ 1 ohm
Capacitance	75.8 pF/m 23.104 pF/ft
dc Resistance, Inner Conductor	1.48 ohms/km 0.451 ohms/kft
dc Resistance, Outer Conductor	2.69 ohms/km 0.82 ohms/kft
dc Test Voltage	4000 V
Inductance	0.19 μ H/m 0.058 μ H/ft

LDF4RK-50A

Insulation Resistance	100000 MOhms-km
Jacket Spark Test Voltage (rms)	5000 V
Operating Frequency Band	1 – 8800 MHz
Peak Power	40 kW
Velocity	88 %

VSWR/Return Loss

Frequency Band	VSWR	Return Loss (dB)
680–800 MHz	1.13	24.3
800–960 MHz	1.13	24.3
1700–2000 MHz	1.13	24.3
2300–2700 MHz	1.13	24.3

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
1.0	0.211	0.064	36.11
1.5	0.259	0.079	29.46
2.0	0.299	0.091	25.5
10.0	0.672	0.205	11.35
20.0	0.954	0.291	7.99
30.0	1.172	0.357	6.51
50.0	1.521	0.463	5.02
85.0	1.995	0.608	3.82
88.0	2.031	0.619	3.76
100.0	2.169	0.661	3.52
108.0	2.256	0.688	3.38
150.0	2.673	0.815	2.85
174.0	2.887	0.88	2.64
200.0	3.103	0.946	2.46
204.0	3.135	0.956	2.43
300.0	3.835	1.169	1.99
400.0	4.462	1.36	1.71
450.0	4.749	1.447	1.61
460.0	4.804	1.464	1.59
500.0	5.021	1.53	1.52

LDF4RK-50A

512.0	5.085	1.55	1.5
600.0	5.533	1.686	1.38
700.0	6.009	1.831	1.27
800.0	6.456	1.968	1.18
824.0	6.56	1.999	1.16
894.0	6.855	2.089	1.11
960.0	7.124	2.171	1.07
1000.0	7.284	2.22	1.05
1218.0	8.11	2.472	0.94
1250.0	8.226	2.507	0.93
1500.0	9.093	2.771	0.84
1700.0	9.744	2.97	0.78
1794.0	10.039	3.06	0.76
1800.0	10.058	3.066	0.76
2000.0	10.666	3.251	0.72
2100.0	10.961	3.341	0.7
2200.0	11.251	3.429	0.68
2300.0	11.535	3.516	0.66
2500.0	12.09	3.685	0.63
2700.0	12.627	3.849	0.6
3000.0	13.407	4.086	0.57
3400.0	14.401	4.389	0.53
3600.0	14.882	4.536	0.51
3700.0	15.118	4.608	0.5
3800.0	15.353	4.679	0.5
3900.0	15.585	4.75	0.49
4000.0	15.815	4.82	0.48
4100.0	16.042	4.889	0.48
4200.0	16.268	4.958	0.47
4300.0	16.492	5.027	0.46
4400.0	16.714	5.094	0.46
4500.0	16.934	5.161	0.45
4600.0	17.153	5.228	0.44
4700.0	17.37	5.294	0.44
4800.0	17.585	5.36	0.43

LDF4RK-50A

4900.0	17.798	5.425	0.43
5000.0	18.01	5.489	0.42
6000.0	20.055	6.113	0.38
8000.0	23.826	7.262	0.32
8800.0	25.244	7.694	0.3

Material Specifications

Dielectric Material	Foam PE
Jacket Material	Non-halogenated, fire retardant polyolefin
Inner Conductor Material	Copper-clad aluminum wire
Outer Conductor Material	Corrugated copper

Mechanical Specifications

Minimum Bend Radius, multiple Bends	127 mm 5 in
Minimum Bend Radius, single Bend	50.8 mm 2 in
Number of Bends, minimum	15
Number of Bends, typical	50
Tensile Strength	113 kg 249.122 lb
Bending Moment	3.8 N-m 33.633 in lb
Flat Plate Crush Strength	2 kg/mm 111.995 lb/in

Environmental Specifications

Installation temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Storage Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Attenuation, Ambient Temperature	68 °F 20 °C
Average Power, Ambient Temperature	104 °F 40 °C
Average Power, Inner Conductor Temperature	212 °F 100 °C
EN50575 CPR Cable EuroClass Fire Performance	B2ca
EN50575 CPR Cable EuroClass Smoke Rating	s1a
EN50575 CPR Cable EuroClass Droplets Rating	d1
EN50575 CPR Cable EuroClass Acidity Rating	a1
Fire Retardancy Test Method	IEC 60332-1-2 NFPA 130-2010 UL 1666/CATVR/CMR

LDF4RK-50A

Smoke Index Test Method	IEC 61034
Toxicity Index Test Method	IEC 60754-1 IEC 60754-2

Packaging and Weights

Cable weight	0.25 kg/m 0.168 lb/ft
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Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 compliant, Declaration of Performance (DoP) available
CHINA-ROHS	Below maximum concentration value
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
UK-ROHS	Compliant
UL/ETL Certification	CATVR/CMR



TFT™

Low PIM Coaxial Cables

ISO 9001 Certified

Flexible, Low PIM, Plenum Rated Jumper Cable Assemblies

- -160 dBc PIM for optimal system performance
- UL listed, type CMP (plenum)
UL file #E-170516
- Flat Braid outer conductor construction for optimal flexibility
- Durable FEP outer jacket is suitable For both indoor and outdoor use

**Major
Carrier
Approved!**



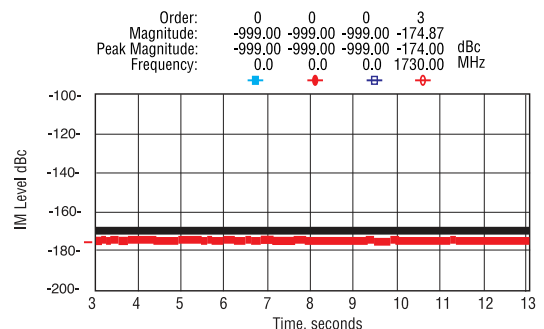
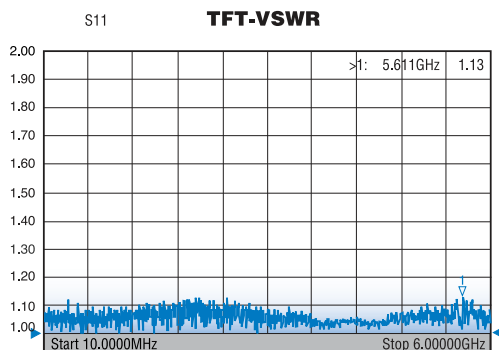
TFT-401 (0.265") & TFT-402 (0.160") 50 Ohm low PIM cable assemblies

- Available in any required connector configuration and length
- Large selection of standard configurations for quick delivery
- Check inventory at [StockCheck](#) on our website
- Available connector interfaces: SMA, N, 7-16 DIN, 4.1/9.5, 4.3/10.0 DIN
- 100% tested for static and dynamic PIM, VSWR and inserion loss
- Marker band includes Serial Number PIM, VSWR & IL test data which is retained and accessible on the Times website
- 10 year warranty

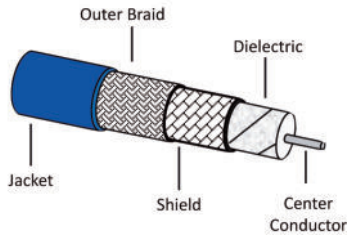
Typical VSWR

TFT401NMNM5.0M

Dynamic PIM Test Results



TFT™ Low PIM Coaxial Cables



Cable Construction

Center Conductor: Silver plated copper

Dielectric: Taped PTFE

Shield: Silver plated flat braid

Outer Braid: Silver plated copper

Jacket: Blue FEP

Connectors

Low PIM connectors are available with interfaces of N, SMA, 7-16 DIN, 4.1/9.5 mini DIN and 4.3/10.0 mini DIN. Please consult Times Microwave Systems with your requirements.

Cable Assemblies

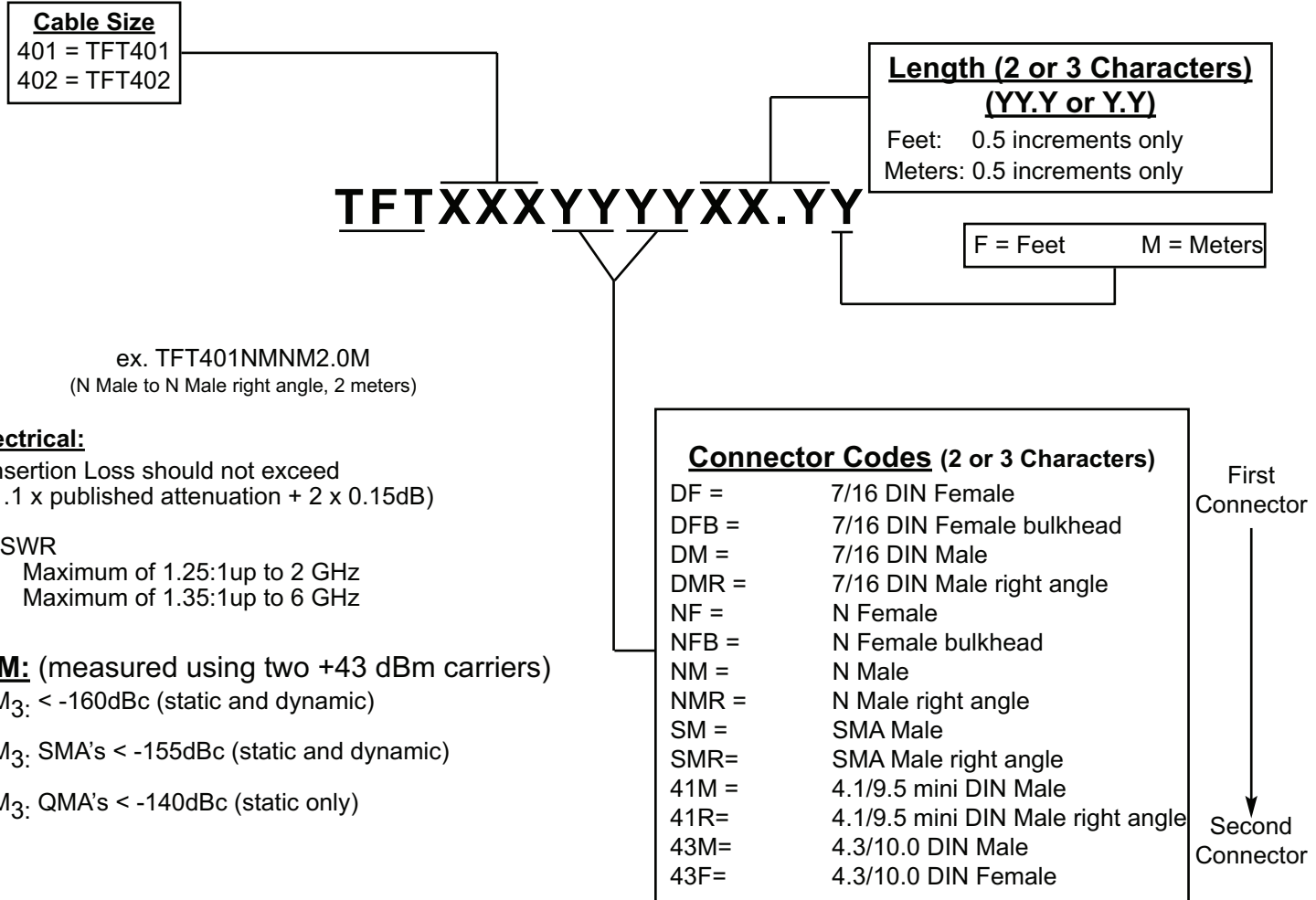
TFT™ cable assemblies of standard configuration are available in stock, and are factory tested for dynamic and static PIM, IL and VSWR. In addition, Times Microwave Systems also provides customized TFT™ cable assemblies according to the special requirements.

- **Jumpers available in any length with most popular connector combinations.**
- **iBwave VEX files available at www.iBwave.com**

Physical Specifications		TFT-401		TFT-402	
AA Drawing Number:		AA-11410		AA-11408	
Dimensions:		in	(mm)	in	(mm)
Center Conductor:		0.0641	1.628	0.037	0.93
Dielectric:		0.208	5.28	0.113	2.87
Shield:		0.218	5.53	0.121	3.07
Outer Braid:		0.240	6.09	0.138	3.51
Jacket:		0.265	6.73	0.160	4.06
Mechanical Specifications					
Bend Radius:		0.75	19.05	0.75	19.05
Weight:		78 lbs/1000 ft		31 lbs/1000 ft	
Operating Temperature Range °C/°F		-55 to +150° C		-55 to +150° C	
Electrical Specifications					
Velocity of Propagation: %		72%		76%	
Impedance: Ohms		50 Ohms		50 Ohms	
Capacitance: pF/ft (pF/m)		28.2 pF/ft		26.7 pF/ft	
Shielding Effectiveness: dB		-80 dB		-80 dB	
Nominal Attenuation: dB/100 ft (100m) (Power kW)					
	450 MHz	4.8	(15.8)	0.95	7.4
	700 MHz	6.1	(22.2)	0.75	9.2
	850 MHz	6.8	(22.2)	0.68	10.2
	1900 MHz	10.5	(34.4)	0.44	15.4
	2100 MHz	11.1	(36.3)	0.41	16.2
	2300 MHz	11.6	(38.2)	0.39	16.9
	2400 MHz	11.9	(39.1)	0.38	17.3
	4900 MHz	17.9	(58.7)	0.25	25.0
	5800 MHz	19.7	(64.7)	0.25	27.3
N Male Straight		TC-TFT401-NM-LP (3190-2943BLK)		TC-TFT402-NM-LP (3190-2943BLK)	
N Male Right Angle		TC-TFT401-NM-RA-LP (3190-3057BLK)		TC-TFT402-NM-RA-LP (3190-3015BLK)	
N Female		TC-TFT401-NF-LP (3190-3060BLK)		TC-TFT402-NF-LP (3190-3004BLK)	
N Female Bulkhead				TC-TFT402-NF-BH-LP (3190-3013BLK)	
7-16 DIN Male Straight		TC-TFT401-716M-LP (3190-2944BLK)		TC-TFT402-716M-LP (3190-2942BLK)	
7-16 DIN Male Right Angle		TC-TFT401-716M-RA-LP (3190-3058BLK)		TC-TFT402-716M-RA-LP (3190-2967BLK)	
7-16 DIN Female Straight				TC-TFT402-716F-LP (3190-3003BLK)	
SMA Male Straight		TC-TFT401SM-LP (3190-2941BLK)		TC-TFT402-SM-LP (3190-2903BLK)	
SMA Male Right Angle		TC-TFT401-SM-RA-LP (3190-3059BLK)		TC-TFT402SM-RA-LP (3190-3059BLK)	
4.1/9.5 mini DIN Male Straight		TC-TFT401-4195M-LP 3190-3008BLK		TC-TFT402-4195M-LP (3190-3009BLK)	
4.1/9.5 mini DIN Male Right Angle		TC-TFT401-4195M-RA-LP (3190-6127BLK)			
4.1/9.5 mini DIN Female		TC-TFT401-4195MF-LP (3190-6126BLK)		TC-TFT402-4195F-LP (3190-6184BLK)	
4.3/10.0 DIN Male Straight		TC-TFT401-4310M-LP (3190-6171BLK)		TC-TFT405-4310M-LP (3190-6125BLK)	
4.3/10.0 DIN Male Right Angle		TC-TFT401 4310M-RS-LP (3190-6172BLK)		TC-TFT402-4310M-RA-LP (3190-6173BLK)	
4.1/9.5 mini DIN Female				TC-TFT402-4310F-LP (3190-6195)	
4.1/9.5 mini DIN Female Bulkhead				TC-TFT402-4310F-BH-LP (3190-6196BLK)	

TFT™ Low PIM Coaxial Cables

Smart Part Number Key for TFT Low PIM Jumpers



**Many assembly configurations are available from stock.
Refer to the on-line [StockCheck](#) for specific configurations.**

TFT™ *Low PIM Coaxial Cables*

About TIMES MICROWAVE SYSTEMS

Times Microwave Systems, was founded in 1948 as the Times Wire and Cable Company. Today, the company specializes in the design and manufacture of high performance flexible, semi-flexible and semi-rigid coaxial cable, connectors and cable assemblies. With over 60 years of leadership in the design, development, and manufacture of coaxial products for defense microwave systems, Times Microwave Systems is the acknowledged leader, offering high tech solutions for today's most demanding applications.

Cable assemblies from Times Microwave Systems are used as interconnects for microwave transmitters, receivers, and antennas on airframes, missiles, ships, satellites, and ground based communications systems, and as leads for test and instrumentation applications.

As a highly specialized and technically focused company, Times Microwave Systems has been able to continually meet the challenges of specialty engineered transmission lines for both the military and commercial applications, drawing upon our:

- Thousands of unique cable and connector designs
- Exceptional RF and microwave design capability
- Precise material and process controls
- Unique in-house testing capabilities including RF shielding/leakage, vibration, moisture/vapor sealing, phase noise and flammability
- Years of MIL-T-81490, MIL-C-87104, and MIL-PRF-39012 experience
- ISO 9001 Certification
- AS-9100 Certification

In 2010, Times Microwave Systems introduced its Times-Protect™ line of lightning and surge protection solutions to address the challenging needs of wireless systems in the 21st century.

With over 60 years of Times Microwave Systems aerospace cable and connector technology experience and unparalleled design expertise, Times Microwave Systems' staff of Field Applications Engineers can help to provide the right solution for your interconnect applications.



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TFT 06/18

Fiber Optic Cabling and Hardware

Passive Distribution Components

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

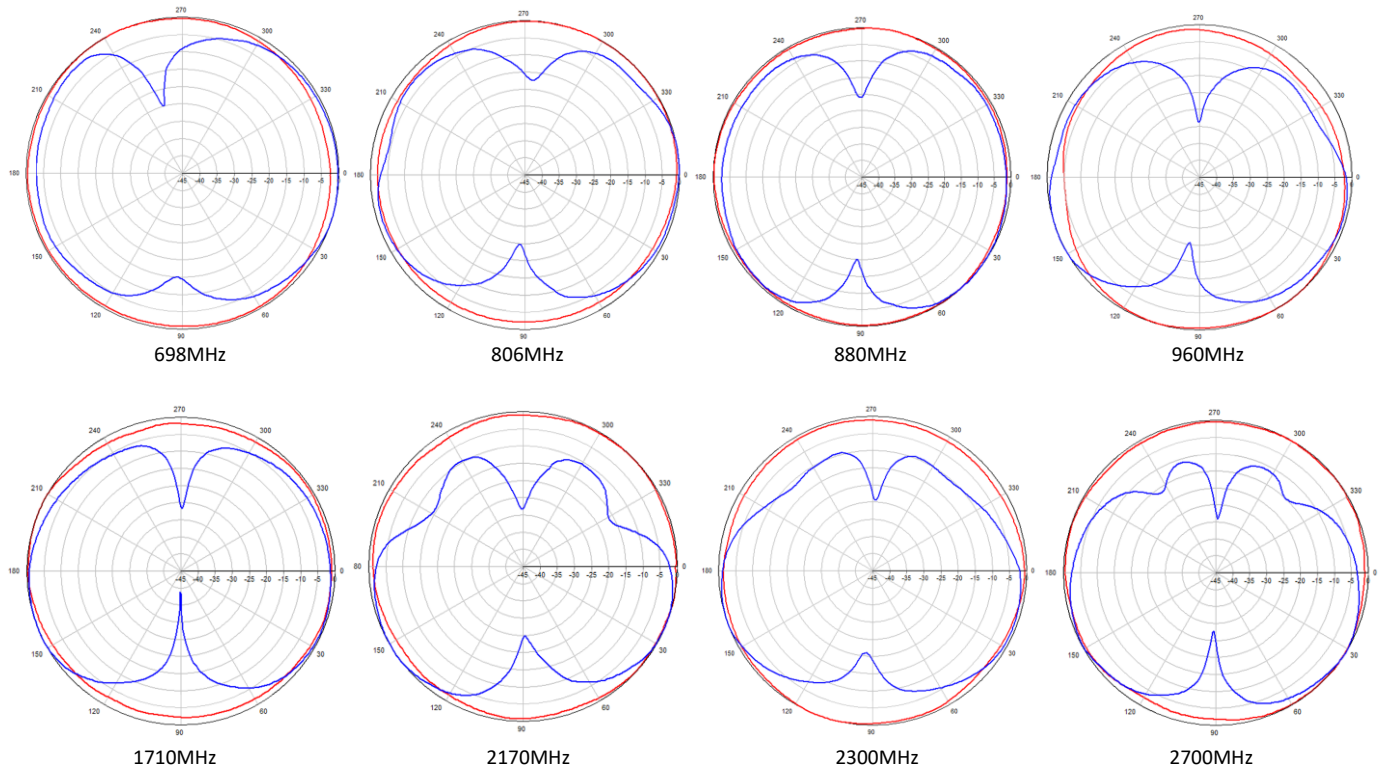
Dimension Diameter, height (in/mm)	Ø 8.0 x 4.5 / Ø 204.0x 115.0
Weight (lb./kg)	1.10 / 0.40
Shipping Dimension(in/mm)	7.09x7.09x7.09 / 180.0x180.0x180.0
Shipping Weight(lb./kg)	1.46 / 0.66
Radome Material & color	ABS, White, RAL9003
Flammability	UL-94-V0
Mounting/Connector type	Ceiling Mount, N-female 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



Wideband Power Splitter

PS-K2-ON50M(XH)/PS-K3-ON50M(XH)/PS-K4-ON50M(XH)

2/3/4Way, Low PIM(-153dBc), 555-2700MHz, N Female, 50W

- Wilkinson power splitter
- Wideband design covering 555-2700MHz
- Suitable for indoor/outdoor environment
- High reliability and low insertion loss



Electrical Specification

Product Model	PS-K2-ON50M(XH)	PS-K3-ON50M(XH)	PS-K4-ON50M(XH)
	2-Way	3-Way	4-Way
Frequency (MHz)	555-2700		
Split Loss (dB)	3.0	4.8	6.0
Insertion Loss (dB)	≤ 0.5	≤ 0.7	≤ 0.8
Isolation (dB)	≥ 20	≥ 18	≥ 18
VSWR @ all ports	≤ 1.2	≤ 1.3	≤ 1.3
PIM (dBc)	≤ -153 @ 2 x 43dBm		
Average Power, max (W)	50		
Impedance (ohm)	50		

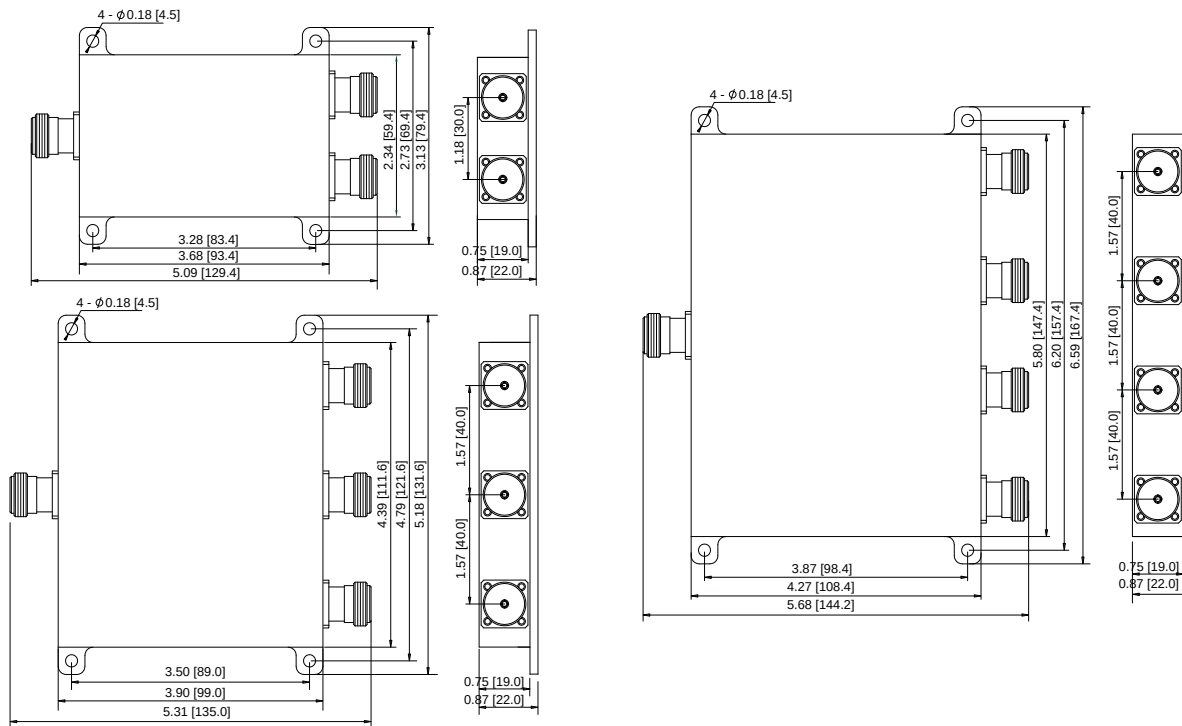
Mechanical Specification

Dimension (in/mm)	3.13x5.09x0.87 / 79.4x129.4x22.0	5.18x5.31x0.87 / 131.6x135.0x22.0	6.59x5.68x0.87 / 167.4x144.2x22.0
Weight (lb/kg)	0.64 / 0.29	1.28 / 0.58	1.72 / 0.78
Connector Type	N Female	N Female	N Female

Environment & Compliance

Application	Indoor / Outdoor	Operating Temperature	-25°C to +85°C
Environment	IP65	Relative Humidity	Up to 100%
RoHS	Compliant		

Outline Drawing



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

