

# BDA

## Bi-Directional Amplifier System

### General

Farenhyt offers all the components required for design and installation of the Emergency Radio Communication Enhancement Systems (ERCES): signal boosters/Bi-Directional Amplifiers (BDA), batteries and battery enclosures, donor antennas, Distributed Antenna Systems (DAS), coaxial cables, connectors and lightning arrestors, power dividers and hybrid couplers, design services and training.

### Signal Boosters/Bi-Directional Amplifiers (BDA)

Farenhyt Class B BDAs are high gain, high power band-selective signal boosters/bi-directional amplifiers that can be designed and customized to meet all public safety frequency band ranges. It is intended to provide reliable two-way radio signal coverage inside buildings, tunnels and other structures. The band selective design delivers a reliable performance in even the most challenging RF environments.

State of the art design delivers high reliability and excellent performance in a small, lightweight, and economical package. Farenhyt Class B BDAs have been tested and evaluated in accordance with UL2524 requirements for In-building 2-Way Emergency Radio Communication Enhancement Systems, NFPA and IBC/IFC standards compliance—making it the best choice for public safety and other mission-critical applications.



BDA

Annunciator

## FEATURES & BENEFITS

<ul style="list-style-type: none"> <li>All public safety frequency bands supported, various models available for:  UHF: SKF-BDA400-1B, SKF-BDA400-2B  VHF: SKF-BDA150-1B  800 MHz: SKF-BDA800-1B  700 MHz: SKF-BDA700-1B  700MHz and 800MHz: SKF-BDA7800-2B</li> <li>UL, CSFM, NFPA, IFC Compliance:</li> </ul> <p>All-inclusive and fully-integrated signal booster</p>	<p>/ BDA with UL2524 In-building 2-Way Emergency Radio Communication Enhancement Systems Listing, CSFM Listing, NFPA 72 2010 Edition, NFPA 1221 2016 Edition and IFC 2018 compliance. Does not require external DC power supplies, chargers or alarm interfaces or feeds.</p> <p>Integrated dual power supply system with two independent AC circuit breakers.</p> <p>Integrated battery charger function.</p>	<p>Integrated intelligent battery monitoring and diagnostics with automatic load testing.</p> <p>24 hour Battery Backup with the standard battery backup package.</p> <p>Integrated Farenhyt Addressable Monitor Module IDP-MONITOR-10 in order to connect to Farenhyt's SLC loop for monitoring of the BDA at the fire alarm control panel.</p> <p>Additional six alarm relay outputs for the supervised BDA monitoring Panel / Annunciator.</p>	<p>Includes a supervised, dedicated annunciator panel with 6 status lights – Normal AC Power, Loss of AC power, BDA Trouble, Antenna Trouble, Battery Charger Trouble, and Low Battery. The panel mounts on the standard electrical 2-gang box and it does not require external power</p> <p>Full Diagnostics – Each module is monitored for temperature, voltage, current and any malfunctions.</p> <p>Donor antenna line integrity with the included RF EOL termination.</p>	<p>Events Logged On a SD Card – integrated SD card logger records all trouble conditions and warning messages with a time stamp into a standard text file.</p> <p>Optional Auxiliary Alarm.</p> <p>LCD Displays BDA/ Power Supply Unit (PSU) Status.</p> <p>Alarm Test Function – Easily activate the individual troubles to test BDA annunciator connections.</p> <p>Red NEMA-4 Type (UL Type-4) Approved Enclosure.</p>
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### **High Reliability**

Built using the highest quality components and the latest RF semiconductors by major US Manufacturers.

Designed and manufactured using state of the art manufacturing processes, Country of Origin: USA.

Two high-efficiency power supplies are included for redundancy

Each module has an internal microcontroller that continuously monitors its operation and measures the voltage, temperature, current and other parameters.

Multiple ALC (Automatic Level Control) circuits prevent RF power overload and RF interference.

Oscillation Detection Circuit prevents amplifier feedback and oscillations.

Automatic Uplink Squelch: Completely eliminates uplink noise from the BDA by shutting off uplink amplifier while it is idle achieving no transmissions from within the building and eliminating risk of interrupting public safety radio network.

### **Excellent RF Performance:**

Band/Channel-Selective modules provide high rejection of unwanted, interfering signals. Multiple channels/bands are possible within the same amplifier.

High performance bandpass cavity-type duplexers minimize out of band interference.

High Gain of up to 92dB on both uplink and downlink ensures the high coverage area capacity even with very weak signals.

High Power – capable of producing up to 32dBm of RF power, sufficient to cover very large indoor areas.

High Linearity Amplifiers deliver signals with very low distortion and low IM products.

Highly Resilient to strong RF inputs – ensures optimal, intermod-free performance even in a highly congested.

Reliable performance even in high RF environments with signals as strong as -20dBm.

Very low signal delay of <9us means no delay-produced RF distortion in the signal overlap areas.

Low noise figure ensures that even the weakest signals of under -120dBm are amplified and boosted well above the noise floor.

Optimized not only for FM and phase 1 P25 but also for TDMA and phase 2 P25 modulations.

Adjustable RF gain on both LNA (Low Noise Amplifier) and ALC modules.

Adjustable maximum power level.

Multiple ALC/OLC (Output Level Control) circuits maintain the set power limit and prevent the power amplifier overload.

### **Optimal Form Factor:**

Small and light, fully-integrated signal booster.

The heavy-gauge aluminum NEMA-4 type (UL type-4) approved enclosure is lightweight and has excellent heat dissipating and corrosion resistance properties.

Welded mounting tabs for easy wall-mounting.

Includes ½” Conduit cutouts on the underside of the enclosure.

Welded Padlock tabs are included.

### **Ease of Use and Deployment:**

No field tuning or programming required. Unit ships tuned and tested from the factory.

Easy to use gain and power settings.

Graphical LCD displays the BDA and PSU status and trouble conditions along with basic system diagnostics.

Simple ALC LED light indication of signal strength.

Includes two circuit breakers with screw terminals directly above the AC power conduits for easy connection of AC power circuits.

Convenient quick-disconnect terminals for fire alarm and dedicated monitoring panel connections.

Built-in EOL resistors are selectable with the DIP-switch, if needed.

### **Serviceability:**

Modular Design with easy to swap and easy to test modules.

Each module has a status indication LED light for easy troubleshooting and status monitoring.

### **Clean, clutter-free design with easily accessible components**

Easily accessible RF connectors.

Replacement modules are typically in stock and available for quick shipment from the factory.

3 year warranty (excluding battery).

### **Expandability:**

Modular Design allows for easy updates and frequency band changes.

Multiple boosters can be combined on the same antenna system for multi-band operation.

## Electrical Specifications

Specification	SKF-BDA400-1B, SKF-BDA400-2B	SKF-BDA150-1B	SKF-BDA800-1B	SKF-BDA700-1B	SKF-BDA7800-2B
Frequency Range	450-490MHz UHF	150-174MHz VHF	806-815MHz Uplink 851-860MHz Downlink	793-805 MHz Uplink 763-775 MHz Downlink	793-815MHz Uplink 851-860MHz & 763-775 MHz Downlink
Passband	100KHz -3MHz <sup>1</sup>	-	-	-	-
Maximum Bandwidth, each band	3MHz	-	-	-	-
Maximum Gain (adjustable)	92dB max. (90dB typ.)	92dB max. (90dB typ.)	92dB (Typ)		
Gain Adjustment, 1 dB attenuator increments	50dB to 92dB = 42dB total adjustment range				
Maximum Composite Output Power (i.e. single carrier max. power)	32dBm	30dBm	30dBm	30dBm	28dBm
Power Limiter Adjustment, 1 dB attenuator increments	32dBm to 18dBm	30dBm to 16dBm	30dBm to 16dBm	30dBm to 16dBm	28dBm to 14dBm
Impedance	50 Ohm				
Maximum RF Signal Input Level for FCC spurious limits compliance	-20dBm				
Absolute Maximum Input RF Signal Level	0dBm continuous, +10dBm peak				
Noise Figure	<6.5dB typ.8dB max.	<6.5dB typ.8dB max.	<6.5dB typ.8dB max.	<6.5dB typ.8dB max.	<6.0dB typ. 7dB max.
Trouble indications	Two Form C relays for each of the troubles: AC Power Status, Charger Status, Low Battery Capacity, BDA Trouble, Antenna Trouble and Aux Alarm. Second relay contact set provided for a LED annunciator panel.				
Event Logger	Standard SD Card up to 16GB. Mini SD with adapter. Real- time clock time stamp included.				
AC Power Supply	Two independent power supplies with 110-240VAC/2.1A 50/60Hz each.				
Power Supply Efficiency	91% (Typ.)				
DC Power Supply	Requires two (2) 75Ah 12V AGM Sealed L.A. batteries in series for Secondary power. Maximum Current Draw: 2.5A @24VDC				
Run Time with standard 2x75Ah 60% de-rated Battery Backup	24 Hours under full load				
Battery Charging with the Built-in Charger <sup>2</sup>	Charging Current Limited to 5A max.				
Operating Temperature <sup>3</sup>	-4°F to +77° F (-20°C to +25°C)				
FCC ID	2AHVPSB400M1A 2AHVPSB400M2A	2AHVPSB150M2A	2AHVPSB800M2A	2AHVPSB700M2A	2AHVPSB7800M2A
FCC Certifications	FCC Title 47 Part 90, FCC Title 47 Part 15b				

<sup>1</sup>Multiple channels can be combined within the 3MHZ duplexer band-pass. Multiple bands can be combined in the same enclosure. Other channel bandwidths may be available, please inquire with your specific requirements.

<sup>2</sup>Only use approved lead-acid batteries supplied by Farenhyt along with the Signal Booster.

<sup>3</sup>This system meets NFPA requirements for operation at -20 to 25° C / -4 to 77° F and at a relative humidity. However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15-25° C/60-77° F.

MECHANICAL SPECIFICATIONS	
Dimensions	NEMA-4 (UL Type-4) Enclosure: 20.55"Wx24"Hx8.32"D Total Width Including Heatsinks: 23.23" Total Height Including Mounting Tabs: 26.22"
Signal Booster Enclosure Type	NEMA-4 (UL Type-4) Sealed Enclosure, Aluminum with Powder Coat. Enclosure color: Red.
Weight – Standard Enclosure, Single Band Configuration, NFPA Compliant Version with two power supplies	<59lbs
RF Connectors	N-Female
Battery Enclosure Color	Red, includes louvered vents on both sides
Backup Battery Enclosure	NEMA-3R Type (UL Type-3R) Approved. 23"W x 13"H x 8.3"D
Connections	Four ½" trade size cutouts provided for conduit or strain relief fittings for power, battery backup and communication wiring. For unused cutouts, use UL Type-4 rated 1/2 conduit hub plugs.

### Batteries and battery enclosure

- NEMA-3R, UL Listed Vented Battery Enclosure for 2x 75Ah Batteries. Steel with Red powder coat finish.
- 12V / 75Ah battery, two are required for each BDA.

### Donor Antennas

- Installed on the Roof of the building.
- Pointing to the public safety radio repeater site, line of sight not required.
- High gain, high directivity Yagi Antennas for various frequency bands.

### DAS Antennas

- Installed in-building based on the design to achieve coverage.
- Fiberglass and Low Profile antennas for various frequency bands.

### Coaxial Cable

- Plenum Rated, ½" diameter with low insertion loss.
- Red cable color to differentiate for Public Safety BDA use.

### Connectors and Lighting Arrestors

- Various types of connectors, cable jumpers for ½" cable.
- Coaxial surge protector, UL listed.
- Cable jumper and Antenna Sensor / EOL termination for Donor Antenna.

### Power Dividers and Hybrid Couplers

- 2/3/4-way power dividers for various frequency bands.
- Directional couplers for various dB and Frequency bands.

### Services

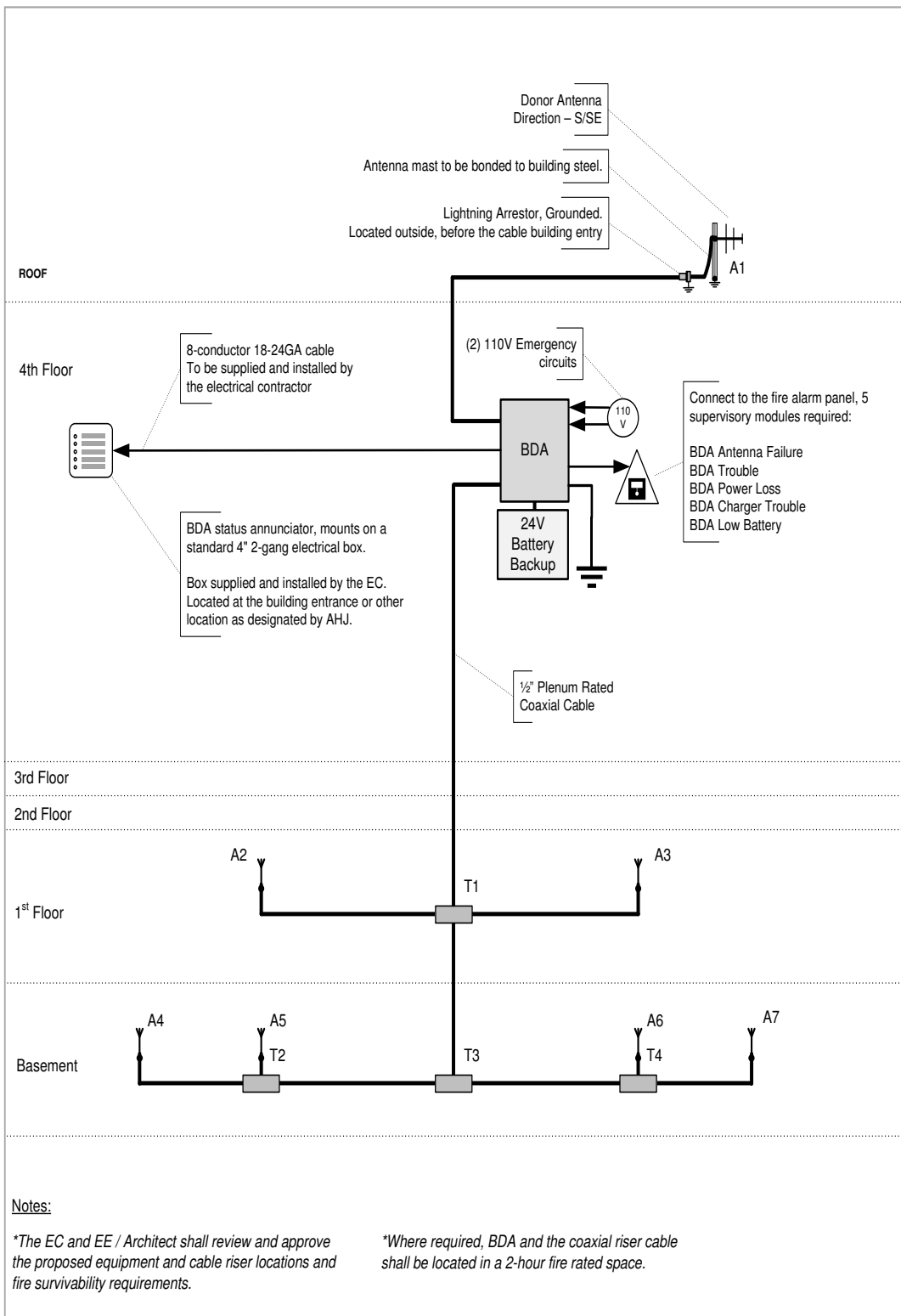
- Services for BDA System Design, Drawings, BOM.

- Services for AHJ Requirements Review and Project management BDA Trainings.
- Services for BDA System - iBwave.

### AGENCY LISTINGS AND APPROVALS

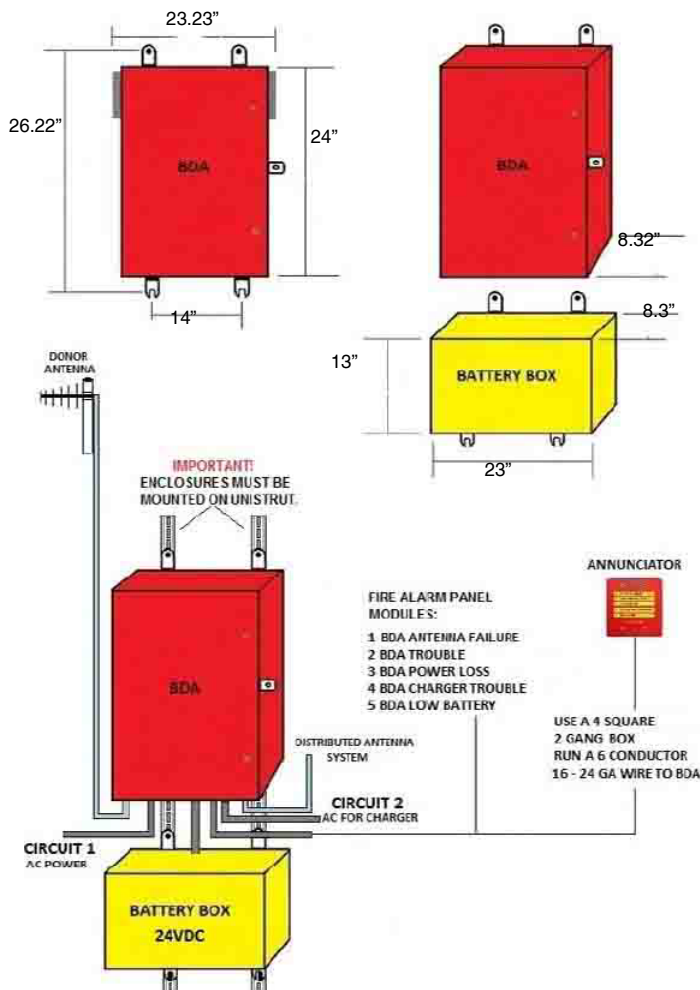
These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- UL2524: S36080.
- CSFM: 7300-0559:0514.
- NFPA 72 Compliance.
- NFPA 1221 Compliance.
- IFC Compliance.
- FCC Title 47 Part 90.
- FCC Title 47 Part 15b.



**Typical BDA System Riser Diagram**

## BDA dimensions and connections



## Ordering Information

### Signal Boosters / Bi-Directional Amplifiers (BDA)

**SKF-BDA400-1B:** 450-490MHz, Single UHF sub-band, Class B BDA, Farenhyt

**SKF-BDA400-2B:** 450-490MHz, Dual UHF sub-band, Class B BDA, Farenhyt

**SKF-BDA150-1B:** 150-174MHz, Single VHF sub-band, Class B BDA, Farenhyt

**SKF-BDA800-1B:** Full 800 MHz Public Safety Band, Class B BDA, Farenhyt

**SKF-BDA7800-2B:** Full 700 & 800MHz PS, Dual band, Class B BDA, Farenhyt

**SKF-BDA700-1B:** Full 700 MHz Public Safety Band, Class B BDA, Farenhyt

### Batteries and Battery Enclosure

**BDA-BENCL-10-UL3R:** NEMA-3R, UL Listed, Battery Enclosure for 2 x 75Ah Batteries. Steel with Red powder coat finish. Vented.

**BDA-BB-75-10:** Battery, 12V/75Ah each. (two are required for each BDA/signal booster).

**BDA-SBR-10-UL3R:** Seismic bracket kit for BDA battery enclosure. Includes a pair of brackets for two 75Ah batteries and the mounting hardware.

### Cable, Connectors, and Lightning Arrestors

**BDA-CABLE-10A-250:** 250 ft. Cable, Red Jacket, Imprinted, 1/2" Corrugated Alum Plenum Air Dielectric, 50 Ohm Coaxial.

**BDA-CABLE-10A-500:** 500 ft. Cable, Red Jacket, Imprinted, 1/2" Corrugated Alum Plenum Air Dielectric, 50 Ohm Coaxial.

**BDA-CABLE-15A-250:** 250 ft. Cable - Black Jacket, Imprinted, 1/4" Corrugated Copper Foam Dielectric, 50 Ohm Coaxial.

**BDA-CABLE-15A-500:** 500 ft. Cable - Black Jacket, Imprinted, 1/4" Corrugated Copper Foam Dielectric, 50 Ohm Coaxial.

**BDA-NMC-10:** N-Male Connector for 1/2" cable.

**BDA-NFC-11:** N-Female Connector for 1/2" cable.

**BDA-NMC-20:** N-Male Connector for 1/2" cable, RFS Omni-fit.

**BDA-NFC-21:** N-Female Connector for 1/2" cable, RFS Omni-fit.

**BDA-NMC-30A:** N-Male connector for 1/4" Cable, Commscope.

**BDA-NFC-31A:** N-Female connector for 1/4" Cable, Commscope.

**BDA-NMC-40A:** N-Male connector for 1/4" Cable.  
**BDA-NFC-41A:** N-Female connector for 1/4" Cable.  
**BDA-EOL-10:** Antenna Sensor / End of the line termination.  
**BDA-JMPRG-10:** Coaxial Cable Jumper NM-NM RG58, 18" long.  
**BDA-JMPRG-11:** Coaxial Cable Jumper NM-NM RG58, 37" long.  
**BDA-LA-P8AX-6G:** Coaxial surge protector, UL listed.  
**BDA-JMPRG-12:** Coaxial Cable Jumper NM-NM Flexible RG8, 24" long, For Donor Antenna.  
**BDA-ADP-RA-1:** Right Angle N Male to N Female Adapter.  
**BDA-GKCK-10:** Coaxial Cable Grounding Kit.

### **Power Dividers and Hybrid Couplers**

**BDA-PD2-4588-1:** 2-way power divider/combiner, 450-880MHz, 50W, Wilkinson type.  
**BDA-PD3-4588-1:** 3-way power divider/combiner, 450-880MHz, 50W, Wilkinson type.  
**BDA-PD4-4588-1:** 4-way power divider/combiner, 450-880MHz, 50W, Wilkinson type.  
**BDA-PD2-1552-1:** 2-way power divider/combiner, 150-520MHz, 50W, Wilkinson type.  
**BDA-PD3-1552-1:** 3-way power divider/combiner, 150-520MHz, 50W, Wilkinson type.  
**BDA-PD4-1552-1:** 4-way power divider/combiner, 150-520MHz, 50W, Wilkinson type.  
**BDA-DC6-3588-1:** Directional Coupler 6dB, 350-880MHz  
**BDA-DC10-3588-1:** Directional Coupler 10dB, 350-880MHz  
**BDA-DC15-3588-1:** Directional Coupler 15dB, 350-880MHz  
**BDA-DC20-3588-1:** Directional Coupler 20dB, 350-880MHz  
**BDA-DC6-1317-1:** Directional Coupler 6dB, 136-174MHz  
**BDA-DC10-1317-1:** Directional Coupler 10dB, 136-174MHz  
**BDA-DC15-1317-1:** Directional Coupler 15dB, 136-174MHz

### **DAS Antennas**

**BDA-FA-450470-1:** DAS Antenna, Fiberglass 450-470MHz  
**BDA-FA-465490-1:** DAS Antenna, Fiberglass 470-490MHz  
**BDA-FA-150175-1:** DAS Antenna, Fiberglass 150-175MHz  
**BDA-FA-700-1:** DAS Antenna, Fiberglass 763-805MHz  
**BDA-FA-800-1:** DAS Antenna, Fiberglass 806-869MHz  
**BDA-FA-7800-1:** DAS Antenna, Fiberglass 763-869MHz  
**BDA-FA-7800-2:** DAS Antenna, Fiberglass 763-869MHz  
**BDA-LPA-4502700-1:** DAS Antenna, Low Profile, Ultra Broadband, 450-2700MHz

**BDA-LPA-150175-1:** DAS Antenna, Low Profile 150-175MHz  
**BDA-LPA-7800-1:** DAS Antenna, Low Profile 763-869MHz  
**BDA-DP-7800-2:** DAS Antenna, Directional Panel 763-869MHz  
**BDA-DP-400-2:** DAS Antenna, Directional Panel UHF

### **Donor Antennas**

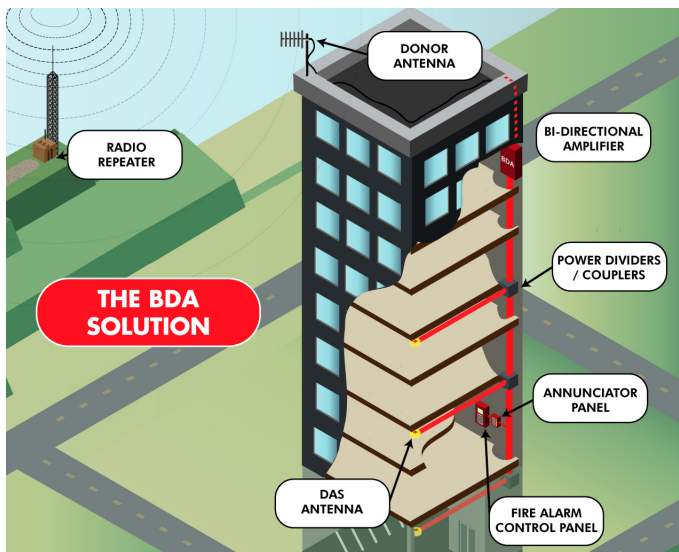
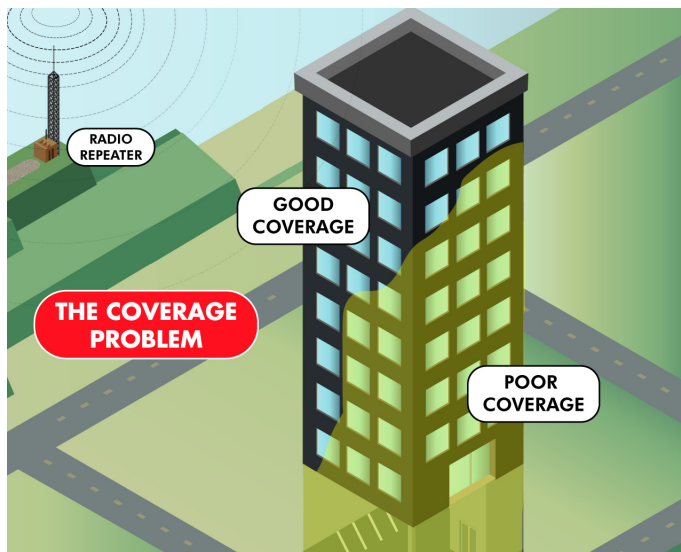
**BDA-DA-450470-1:** Donor Antenna, Yagi Directional 450-470MHz  
**BDA-DA-465490-1:** Donor Antenna, Yagi Directional 470-490MHz  
**BDA-DA-150175-1:** Donor Antenna, Yagi Directional 150-175MHz  
**BDA-DA-800-1:** Donor Antenna, Yagi Directional 806-869MHz  
**BDA-DA-700-1:** Donor Antenna, Yagi Directional 763-805MHz  
**BDA-DA-7800-1:** Donor Antenna, Yagi Directional 763-869MHz  
**BDA-DA-LP582700-1:** Donor Antenna, Log-Periodic Directional Broadband 580-2700MHz, High FB Ratio

### **Services**

**BDA-SVC-10:** BDA System Design, Drawings, BOM (Unit Ea.)  
**BDA-SVC-11:** AHJ Requirements Review, Project management (Unit Ea.)  
**BDA-TRAINING-1DAY:** BDA Training, 1 DAY Unit  
**BDA-SVC-IBWAVE:** BDA System - iBwave Services (Unit Ea.)

# BDA Technical Specifications

## Building with Insufficient Public Radio Coverage - Non-compliant to Code



## Building with sufficient Public Radio Coverage - Code compliant

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This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

**Honeywell Fire Solutions**  
1985 Douglas Drive North  
Golden Valley, MN 55442  
203.484.7161

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