

InterReach® In-building Coverage Solution

800 ESMR, 850 Cellular, 1900 PCS



InterReach® ICS – ADC's Digital Advantage for Improving Wireless Capacity and Coverage

The InterReach In-building Coverage Solution (ICS) is used to extend wireless coverage to specific areas within a building, multiple buildings, or throughout a campus environment. This digital distributed antenna system (D-DAS) solution features unique, patented technology that distributes wireless coverage digitally over optical fiber, enabling InterReach ICS to deliver superior signal quality, flexibility, and overall performance. Its digitized optical RF transport also future-proofs in-building wireless infrastructure for higher data rate services. The InterReach product family offers service providers a flexible, scalable, all-digital platform to improve customer retention and offer enhanced services to meet increasing subscriber demands.

Features

- Highly scalable solution features elements that can be daisy-chained to accommodate large installations; elements also can be added when coverage extension is required.
- Configure-to-order, plug-in transceiver design lowers initial installation costs and allows pay-as-you-grow approach to indoor coverage.
- Accommodates both single-mode and multi-mode fiber for maximum utilization of existing fiber and flexibility in fiber distribution.
- Digital transport maintains superior signal quality even over long distance fiber runs.
- Flexible design supports technologies such as free space optics (FSO), wave division multiplexing (WDM), etc.
- High dynamic range increases capability for data throughput, enabling higher data rate broadband services.
- Universal air interface is transparent to modulation technology.

SPEC SHEET



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In-Building Market Trends

With the increased proliferation of mobile wireless devices, subscribers expect to have wireless coverage in any place they go. Providing seamless coverage everywhere can be challenging, particularly inside buildings.

Carriers implement indoor coverage solutions to increase customer acquisition and retention. A key explanation subscribers give for switching carriers is unsatisfactory network quality. Most often, the highest value subscribers are business users. Providing indoor coverage at business locations can improve subscriber satisfaction, extend service contracts and prevent costly churn. There is clearly an opportunity for wireless service providers to improve profitability by creating a superior network that includes indoor coverage. Nowhere else are mobile voice and data users able to so closely scrutinize the quality of their providers network performance.

The onset of higher speed data services requires service providers to design their networks differently, resulting in an increased priority for indoor coverage. Data users often use their mobile devices within office buildings and will not tolerate dropped calls or inadequate service for transfers of data. In addition, third generation services will result in smaller cell sizes, causing the macro network coverage to be insufficient for thoroughly penetrating buildings, particularly new construction materials with high RF attenuation properties. A dedicated indoor coverage solution can improve macro network coverage because it offloads capacity from the macro network.

In-building needs are everywhere, including corporate campuses, traffic corridors such as tunnels and subways, coverage holes, capacity hotspots, and public spaces such as airports, hospitals, government centers and shopping malls. With increased attention on public safety, more cities and counties are passing ordinances that require buildings of a certain size to have coverage systems in place for the communication systems of public safety officials (Fire/Police/EMT). In such applications, often 150,000 square feet or larger, the economics of passive solutions become less attractive.

There are many alternatives for providing indoor coverage at different price points. Beyond the initial price, it is critical to consider long-term cost, benefits, and the limitations of each. Given the constant changes in today's wireless landscape, the best choice is the most flexible, scalable, reliable, and quality solution available.



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Digitized RF

InterReach ICS distributes wireless coverage digitally over optical fiber, which makes it the best choice for signal quality, architectural flexibility, and overall performance.

Fiber is completely immune to reception or generation of electromagnetic interference, making it easy to install alongside other wiring without fear of noise or crosstalk. By using digital optics, either single-mode or multi-mode fiber can be used without degrading signal quality. This allows users to utilize any dark fiber that may already be in place within the building and flat polished LC connectors.

Digital RF transport over fiber also offers the lowest possible noise level, regardless of the length of fiber. Digital transport is unaffected by long cable runs, splices and signal splits. Digital RF transport over fiber also enables complete flexibility of design. Digital RF transport systems split and add signals digitally, so the architecture of fiber cable runs can be optimized for each application, minimizing installation costs and time.

Coverage areas can be expanded by adding, or even daisy-chaining, system components. Multiple areas, floors, or even multiple buildings can be covered with uniform digital quality signals delivered to even the most remote antenna. Additional components can simply be plugged in. If the RF parameters have not changed, no additional optimization is required. Furthermore, digital RF transport provides greater flexibility for converging indoor and macro networks.

Description

InterReach ICS, offered for 800 ESMR, 850 Cellular, and 1900 PCS applications, transports 18-25MHz of contiguous bandwidth.

The InterReach ICS system components include: a Digital Host Unit (DHU), optional Digital Expansion Units (DEU), and Digital Remote Units (DRU). A DHU can feed either DRUs or DEUs. Digital Expansion Units can be daisy chained without affecting system performance*.

Each DHU and DEU is configurable with up to six single-mode or multi-mode optical transceivers. Because the optical ports are independent of one another, single-mode and multi-mode fiber may be mixed and matched as needed between elements. For example, a host unit may feed five remotes with multi-mode fiber, and feed the sixth remote via single-mode fiber due to distance or to utilize available fiber in a facility. As requirements change and future growth is needed, additional transceivers and DRUs can be ordered and easily installed onsite. This modular approach provides optimum design flexibility, reduces the initial cost of an indoor wireless solution, and delays further investment until it is justified by growth. Likewise, any unused ports may simply be turned off without affecting any part of the system performance.

The DHU and DEU are AC powered. The DRUs are CAT3/5 powered. For distances greater than 500 meters, ADC offers a local power supply for remote power.

*The number of DEUs that can be daisy chained is limited only by the Noise Figure, which can be calculated using the formula $8 \text{ dB} + (10 \log N)$.



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Digital Host Unit

The DHU provides the input interface for RF signals from a base transceiver station (BTS), or a bi-directional amplifier (BDA). The DHU converts the RF signal into a digital format and distributes the digitized signal over fiber to multiple output ports, either Digital Expansion Units or Digital Remote Units. The DHU also performs power and alarming functions for the system. Alarms are accessible via dry contact closures. The DHU also has alarm status LEDs. The DHU is typically wall- or rack-mounted in a basement or other point of entry within a building requiring coverage.



Digital Expansion Unit

The DEU is used when more than six remotes are required to serve a building. The DEU receives the digitized signals from the DHU and distributes them over fiber to multiple digital outputs. These outputs can be Digital Remote Units or additional Digital Expansion Units. The DEU has alarm LED indicators. The DEU is typically wall- or rack-mounted in a wiring closet within the building requiring coverage.



Digital Remote Unit

The DRU receives the digitized signals from the DHU or intermediate DEU, converts the signals back into RF, and interfaces with the antennas to amplify the RF signals throughout the building. The Digital Remote Unit is a compact module that is typically mounted above ceiling tile.



Total Solution Support

ADC offers turnkey EF&I services for in-building applications and can provision all ancillary equipment needed to support various applications. In addition, the company can provide infrastructure such as fiber, CAT5, connectors, and patch panels. From its skilled wireless systems engineering staff to its Professional Services, ADC supports in-building wireless applications end-to-end from system design through optimization and post-sale support.



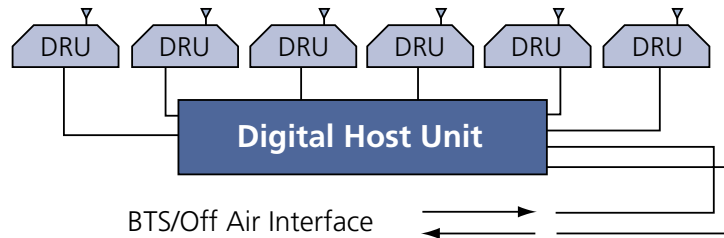
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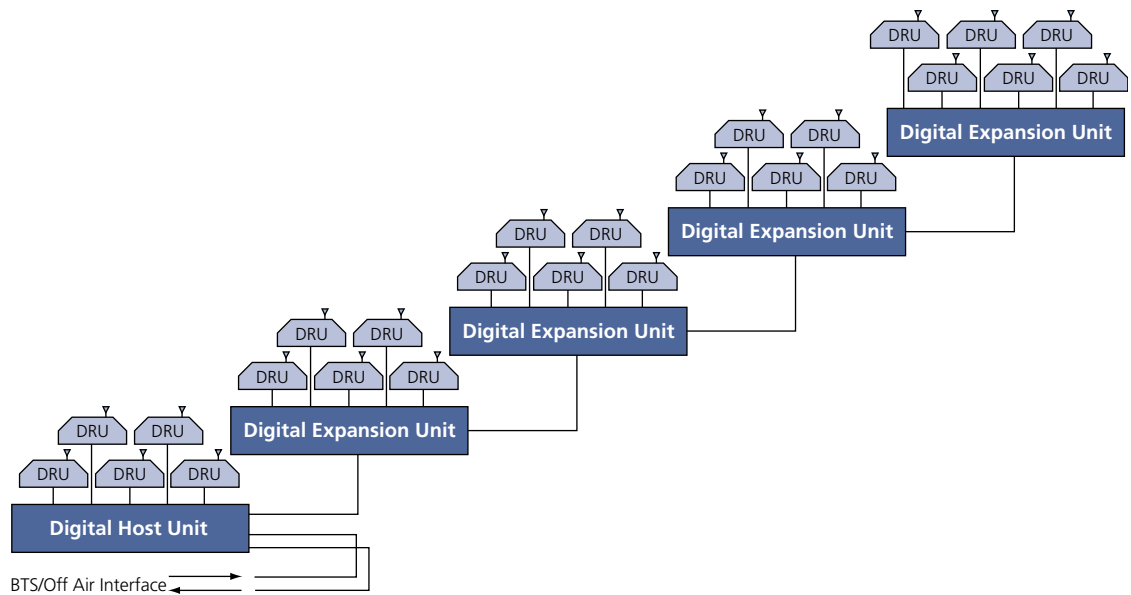
InterReach ICS Configurations

The InterReach ICS is flexible enough to fit almost any size indoor application.

Small Facility Installation



Large Facility Installation



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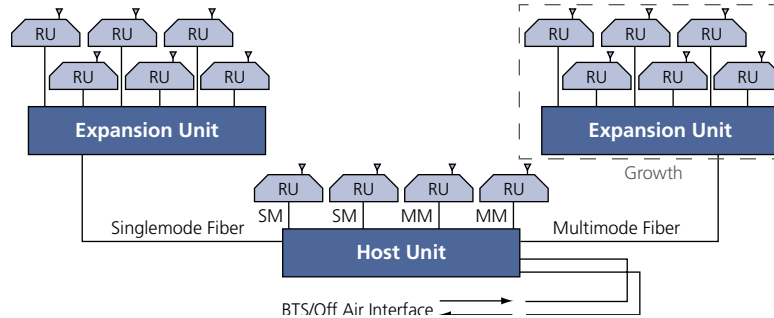


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Multiple Fiber Types

InterReach ICS accommodates any combination of single-mode and multi-mode fibers between elements host, expansion, and remote units.



Free Space Optics (FSO) Installation

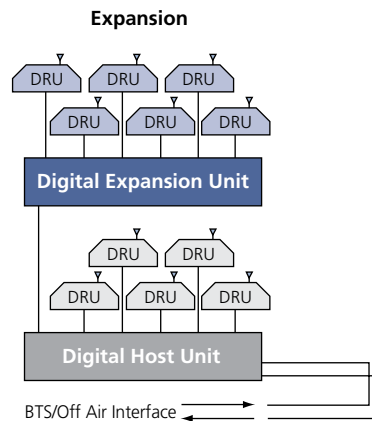
Only digital transport can utilize free space optics for building-to-building links where fiber is either not available or cannot be deployed in a timely or cost-effective manner. Free space optics distances are determined by service level availability, but are typically in the range of 500 meters to 1 kilometer.

Wave Division Multiplexing (WDM)

InterReach ICS typically is transported over dedicated strands of fiber (a pair of fiber for transmit and receive paths.) Because of the digital transport, ICS can utilize WDM technology, essentially combining two waves to one, reducing the required fiber count by half. Optical budgets will be dependent on the added losses with WDM (the passive modules and added connectors) and the selection of the SFP transceivers.

Pay As You Grow

Expansion units can be added as growth or capacity needs change by simply adding additional transceivers, expansion units or remote units. Expanding the InterReach ICS system does not require adding splitters at the host location or re-optimization as long as the RF parameters remain the same. Conversely, non-utilized ports can simply be shut off without affecting system performance.



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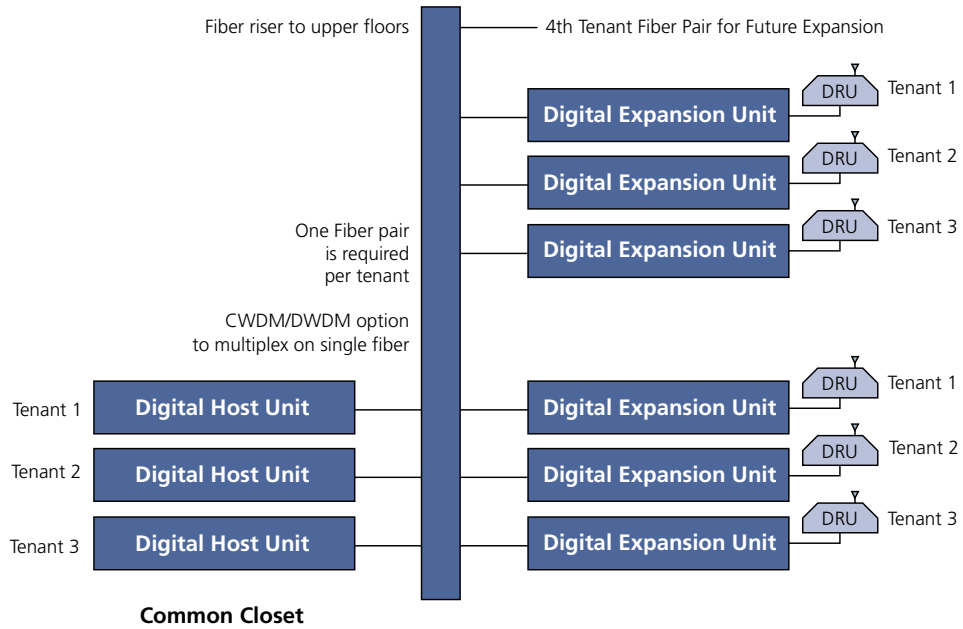
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Multiple Service Providers

The InterReach ICS system can be configured to serve multiple service providers. Each system supports 18-25MHz contiguous bandwidth. Fiber infrastructure may be shared by tenants.

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Typical Specifications

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PHYSICAL SPECIFICATIONS

Digital Host Unit

Dimensions (HxWxD):	3.5" x 19" x 15.25" (89 x 483 x 388 mm)
Weight:	18.5 lbs (8.4 kg)
Color:	Putty White
Input Voltage:	120 - 240 VAC; 50 - 60 Hz
Output Voltage:	+48 Vdc nominal
Connectors	
RF:	N female
Optical:	LC
DC Output:	RJ-45
Alarm Interface:	Link OK/NOK LED at each port; unit OK/NOK LED (one per unit) Two Form C contact closures (for combined minor and combined major alarms) Overdrive alarm on DHU

Digital Expansion Unit

Dimensions (HxWxD):	3.5" x 19" x 15.25" (89 x 483 x 388 mm)
Weight:	18.5 lbs (8.4 kg)
Color:	Putty White
Input Voltage:	120-240 VAC; 50-60 Hz
Output Voltage:	+48 Vdc nominal
Connectors	
Optical:	LC
DC Output:	RJ-45
Alarm Interface:	Link OK/NOK LED; OK/NOK LED at each port

Digital Remote Unit

Dimensions (HxWxD):	2.25" x 7" x 8" (57.15 x 178 x 204 mm)
Weight:	1.5 lbs (<1 kg)
Color:	Putty White
Input Voltage:	+38 to +40 Vdc
Connectors	
RF:	SMA female
Optical:	LC
DC Input:	RJ-45 (maximum 500 meters with CAT-5)

ENVIRONMENTAL

Operating Temperature:	0° to 50° C
Storage Temperature:	-30° to +70° C
Water Resistance/	
Operator Protection:	NEMA (National Electrical Manufacturer's Association) Type 1— Indoor installation only

AGENCY APPROVALS

FCC Acceptance:	ESMR Part 90 - Cell part 22, PCS part 24
UL Compliance:	UL60950
"Plenum Rating" (DRU Only):	NEC 300-22; Section C
CUL Compliance:	CUL60950
"Plenum Rating" (DRU Only):	CEC, Part 1, C22.1; Sections 2-128, 12-101(3) and 12-100
Industry Canada:	RSS-131

QUALITY

Reliability:	MTBF 80,000 hours; manufactured under ISO 9001 quality system
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Typical Specifications

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800 ESMR RF SPECIFICATIONS

Forward Path

System Bandwidth:	18 MHz
Frequency Range:	851-869 MHz
Output Power:	18.5 dBm iDEN, typical composite power single carrier
Input Level (at main hub):	-20 dBm to 0 dBm max
Gain:	+33 dB nominal @ room temp
Gain Variation:	≤6 dB (over frequency, temperature and unit to unit) 1.5 dB variation per 1.25 MHz CDMA channel
OIP3:	+35 dBm
CDMA ACPR1:	>-45 dBc
Spurious Output:	<-30 dBm

Reverse Path

System Bandwidth:	18 MHz
Frequency Range:	806-824 MHz
Gain:	10 dB (independent of fiber length)
Gain Variation:	≤6 dB (over frequency, temperature and unit to unit) <1.5 dB variation per 1.25 MHz CDMA channel
Automatic Level Control	Provides overdrive protection for composite input ≥ -40 dBm
Noise Figure:	<9 dB + 10 log N (N = number of DRUs)

850 CELLULAR RF SPECIFICATIONS

Forward Path

System Bandwidth:	25 MHz
Frequency Range:	869-894 MHz
RF Output Power:	composite power/single carrier in dBm, typical* GSM 25.5 EDGE 24.5 AMPS 25 TDMA 22 CDMA 15
Input Level (at main hub):	*Power per carrier values are dependent on access protocol peak-to-average and channel loading. -20 dBm to 0 dBm max
Gain:	+33 dB nominal @ room temp.
Gain Variation:	≤6 dB (over frequency, temperature and unit to unit) 1.5 dB variation per 1.25 MHz CDMA channel
OIP3:	+35 dBm
CDMA ACPR1:	>-45 dBc
Spurious Output:	<-35 dBm

Reverse Path

System Bandwidth:	25 MHz
Frequency Range:	824-849 MHz
Gain:	10 dB (independent of fiber length)
Gain Variation:	≤6 dB (over frequency, temperature and unit to unit) <1.5 dB variation per 1.25 MHz CDMA channel
Automatic Level Control:	Provides overdrive protection for composite input ≥ -40dBm
Noise Figure:	8 dB midband (1 DHU + 1 DRU) 8 dB + 10 log N (N = number of DRUs)



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Typical Specifications

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1900 PCS RF SPECIFICATIONS

Forward Path

System Bandwidth:

25 MHz

Frequency Range:

1930-1990 MHz*

AD: 1930-1950 MHz

DBE: 1945-1970 MHz;

BEF: 1950-1975 MHz

EFC: 1965-1990 MHz

Output Power:

Composite power/single carrier in dBm, typical**

GSM 24

EDGE 24

TDMA 23

CDMA 16.5

W-CDMA 16.5

**Power per carrier values are dependent on access protocol peak-to-average and channel loading.

2X's Input Level (at main hub):

Gain:

-20 dBm to 0 dBm max

Gain Variation:

+36 dB nominal @ room temp.

≤6 dB (over frequency, temperature and unit to unit)

1.5 dB variation per 1.25 MHz CDMA channel

OIP3:

+35 dBm

CDMA ACPR1:

>-45 dBc

Spurious Output:

<-30 dBm

Reverse Path

System Bandwidth:

25 MHz

Frequency Range:

1850-1910 MHz*

AD: 1850-1870 MHz

DBE: 1865-1890 MHz

BEF: 1870-1895 MHz

EFC: 1885-1910 MHz

Gain:

14 dB (independent of fiber length)

Gain Variation:

≤6 dB (over frequency, temperature and unit to unit)

<1.5 dB variation per 1.25 MHz CDMA channel

Automatic Level Control:

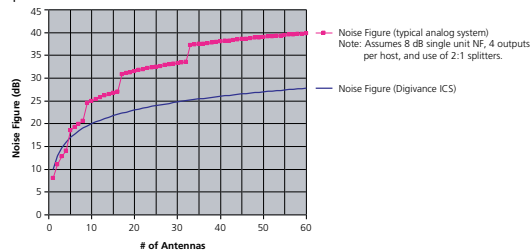
Provides overdrive protection for composite input ≥-40 dBm

Noise Figure:

10 dB (1 DHU + 1 DRU)

10 dB + 10 log N (N = number of DRUs)

*Dip Switch selectable



Optical

Fiber Requirement:

2 Multi-mode or single mode fibers per link

Maximum Distance:

≤500 m (62.5 micron core)

≤750 m (50 micron core)

≤10 km (9 micron core)

Optical Connector:

LC, Small Form Factor Transceiver

Output Power:

-10 dBm min

+4 dBm max

Optical Wavelength:

850 nm nominal for multi-mode

1310 nm nominal for single-mode



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Ordering Information

Description	Catalog Number
850 Cellular MHz Primary Equipment	
850 MHz Cellular Digital Host Unit with N (f) RF connector, no SM or MM optical transceivers	DGVIH1110000000000
850 MHz Cellular Digital Remote Unit with N (f) RF connector, no SM or MM optical transceivers	DGVIR1300000000000
1900 PCS MHz Primary Equipment	
1900 MHz PCS Digital Host Unit with N (f) RF connector, no SM or MM optical transceivers	DGVIH3110000000000
1900 MHz PCS Digital Remote Unit with N (f) RF connector, no SM or MM optical transceivers	DGVIR3300000000000
800 ESMR Primary Equipment	
800ESMR Digital Host Unit with N (f) RF connector, no SM or MM optical transceivers	DGVIH2110000000000
800ESMR Digital Remote Unit with N (f) RF connector, no SM or MM optical transceivers	DGVIR2300000000000
Universal Expansion Unit	
Universal Digital Expansion Unit no SM or MM optical transceivers	DGVIE0010000000000
Optical Transceivers	
Multi-mode 980nm Optical Transceiver (order 2 per DRU and 2 per DEU)	DGVI-112000XVR
Single-mode 1310nm Optical Transceiver (order 2 per DRU and 2 per DEU)	DGVI-212000XVR
Indoor Antennas	
850 MHz Omni Antenna	DGVI-111000ANT
850 MHz Corner/Wall Directional	DGVI-131000ANT
850 MHz Hallway Antenna	DGVI-141000ANT
850 MHz High-ceiling Omni Antenna	DGVI-161000ANT

Ordering Information

Description	Catalog Number
Indoor Antennas	
1900 MHz Omni Antenna	DGVI-311000ANT
1900 MHz Corner/Wall Directional	DGVI-351000ANT
1900 MHz Hallway Antenna	DGVI-341000ANT
1900 MHz High-ceiling Omni Antenna	DGVI-361000ANT
850/1900 MHz Omni Antenna	DGVI-811000ANT
ESMR Omni Antenna	DGVI-211000ANT
ESMR Hallway Antenna	DGVI-241000ANT
ESMR Corner/Wall Directional	DGVI-251000ANT
ESMR High-ceiling Omni Antenna	DGVI-261000ANT
Wireless Repeaters	
Single Band 850 Cellular Repeater, 13dBm, 60dB gain and Accessory Kit	RPT-SBBAA12000
Single Band 1900MHz PCS Repeater, 13dBm, 60dB gain and Accessory Kit	RPT-SHAAA12000
Accessory Items	
DRU Alternate AC/DC Power	DGVI-100000PWR
Replacement Fan - DEU and DHU	DGVI-100000FAN
Replacement Fan - Interface Units	DGVI-200000FAN

Fiber, Optical Connectors, CAT3/5, and other infrastructure is also available from ADC.

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