



WINS Active System Components

Bi-Directional Amplifier System Overview

Band Specific Repeaters



RFS has the total package for cost-effective in-building solutions. Key elements of our ClearFILL RF Distribution Networks are band specific repeaters providing low cost coverage improvement in convention centers, airports, shopping malls, subways and other RF shielded environments.

The basic band specific repeater (BSR) is optimized for weather protected installations, thus reducing the cost significantly compared to similar repeater products. However, unlike low cost in-building signal boosters, the BSR has ultrahigh dynamic range to prevent overdrive and interference. All models are certified by the FCC and Industry Canada for analog and digital modulations.

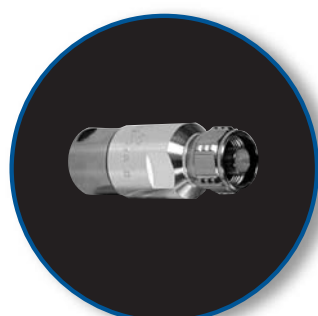
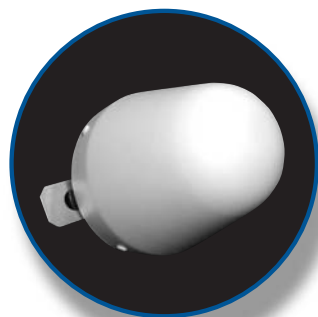
The models 48710 and 48920 are designed for use in the 800 MHz SMR/public safety band, the 48722 and 48930 for use in the 900 MHz SMR/public safety band. The models 48760 and 48960 are designed for SMR800/900 dual-band applications. The 48910 is 800 MHz Cellular band specific, the 48750 and 48751 are A and B Cellular band specific respectively. The 48810A and 48810B are designed for use in the A/B/C and D/E/F blocks of the PCS 1900 band respectively.

The 48700 series can cover up to 50,000 m² (1/2 million sq. ft.) with multiple indoor antennas. Multiple BSRs can be used for larger installations. The RFS ClearFILL approach is to use all passive RF distribution networks for low cost and high reliability.

ClearFILL BSRs are fast and easy to install. Hand held performance monitors for local diagnostics and a remote performance monitoring system are available.

BSRs from RFS are highly reliable thanks to our 30 years of experience in amplifier manufacturing and to the application of an industry leading cooling technique.

RFS offers the total package of technical support services, from product operation and maintenance training to complete network design and installation.



Wireless Indoor Solutions

Intermodulation in Linear Amplifiers

Intermodulation distortions are an important factor of power amplifiers for Wireless Distributed Communication Systems. The characteristic curve between the input signal and the output signal of a linear amplifier is a linear transfer function.

For example, an increase of the input signal by 5dB results in an increase by 5dB of the output signal as well. The output signal level (in dBm) equals the input signal level (in dBm) amplified by the amplifier gain (in dB).

This linear transfer function is limited by the saturation effect of the amplifier. While increasing the input signal, the output level approaches a limit which is typical for each amplifier. In this region of non-linear characteristics the amplifier generates harmonics at multiple frequencies of the input signal.

From single carrier to multi carrier applications

More than one input signal applied to the amplifier leads to intermodulation (IM) products. These unwanted output signals represent spurious emissions when falling into other frequency channels or bands of operation. The IM products can lead to severe distortions and signal degradation especially in the receive path of other channels.

When increasing the input power of an amplifier, the undesired IM products grow more rapidly than the linearly amplified input signals. The so-called '3rd order intercept point' (IP3) denotes the output power of a linear amplifier where, theoretically, the 3rd order IM products generated by amplification of two input signals would equal the wanted output signals.

Consequently, the actual output power of a linear amplifier shall be below a certain limit in order not to exceed a maximum level of spurious emissions i.e. to meet a specified intermodulation reduction. This output power limit is dependent on the IP3 value of the amplifier and on the numbers of input signals i.e. carriers.

The table below provides the maximum output power levels of RFS WDCS multi carrier amplifiers for various numbers of carriers and for three typically tolerated levels of spurious emissions (-13dBm, -30dBm, -36dBm).

IP3 LEVEL # of carriers	54 dBm	50 dBm	44 dBm	40 dBm	27 dBm
2	32/26/24 dBm	29/23/21 dBm	25/19/17 dBm	22/16/14 dBm	14/8/6 dBm
4	29/23/21 dBm	26/20/18 dBm	22/16/14 dBm	19/13/11 dBm	11/5/3 dBm
8	26/20/18 dBm	23/17/15 dBm	19/13/11 dBm	16/10/8 dBm	8/2/0 dBm
16	24/18/16 dBm	21/15/13 dBm	17/11/9 dBm	14/8/6 dBm	6/0/-2 dBm

Output power level for multi carrier amplifiers and remote units. This look-up table shows the max. carrier level based on available IP3 level and max. tolerated spurious emissions (-13/-30/-36 dBm)

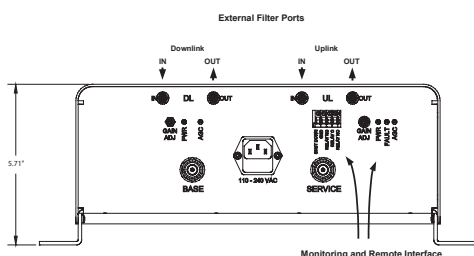


WINS Active System Components

I-BDA 48900 series

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- High reliability/no maintenance
- High dynamic range
- Fast and easy set up
- Supports hundreds of analog and / or digital subscribers.
- Output limiting circuitry
- Maintains low IMD and prevents oscillation.
- External filter ports
- Remote monitoring option.



SYSTEM INTEGRATION

Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs

PERFORMANCE

Composite Output Power, DL/UL dBm	23 / 23
3rd Intercept Point, DL/UL, dBm	> 42 / > 42
Gain, DL/UL, dB	35 - 65 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 4 at max. gain DL / UL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48910	CELLULAR	824-849	869-894
I-BDA-48920	SMR 800	806-821	851-866
I-BDA-48930	SMR 900	896-902	935-941



48900 Series BDA

External filter ports allow for the connection of externally mounted filtering. The external filter modifies the pass band and can be field changed as needed.

The 48900 series BDAs include Power, AGC Active and Fault LEDs for visual diagnostics and a NC/NO fault relay, with remote shut down for remote monitoring. The RPM900 remote monitor provides dial out on fault condition over POTS line to preprogrammed pager or ASCII terminal. The RPM900 can be polled via DTMF and will shut down the 48900 BDA on command.

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	36
Cooling	Convection
MTBF	> 43,680 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	394x293x145 (15.5x11.54x5.7)
Weight, kg (lb)	< 7.65 (17)
Operation Temperature, °C (°F)	-10 to +45 (+14 to + 113)
Humidity, %	90, non condensing

MONITORING

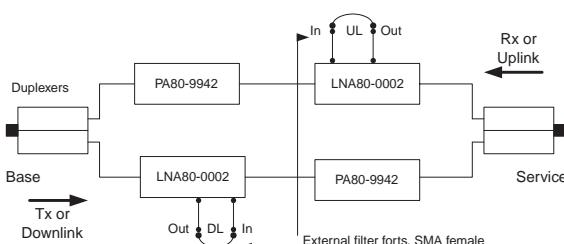
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts, normally closed

WINS Active System Components

I-BDA 48000 series for SMR 800/900

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- External filter ports to customize the pass band in the field
- High dynamic range to support hundreds of analog and / or digital subscribers
- Output limiting circuitry - maintains low IMD and prevents oscillation
- Low on-going cost of use - fast set up, high MTBF and no maintenance
- Modular components replaced in minutes with a screwdriver for easy field repair



SYSTEM INTEGRATION

Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	6 BDAs

PERFORMANCE

Composite Output Power, DL/UL dBm	30 / 30
3rd Intercept Point, DL/UL, dBm	> 45 / > 45
Gain, DL/UL, dB	60 - 80 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 3 at max. gain DL / UL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48710	SMR 800	806 - 824	851 - 869
I-BDA-48722	SMR 900	896 - 902	935 - 941



48000 Series BDA

External filter ports allow for the connection of externally mounted filtering. The external filter modifies the pass band and can be field changed as needed.

High visibility power and fault LEDs are located on the faceplate of the BDA. Additionally, the PM800 performance monitor connects to the 15-pin test port for detailed diagnostics. The PM800 can be permanently mounted near the BDA via a 10-foot extension cable (included) or up to 100 feet away with optional extension cables. For remote surveillance, the RPM800 will dial out on alarms and provide remote shutdown over a POTS line.

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	115
Cooling	Convection
MTBF	> 100,000 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 12.6 (28)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)
Humidity, %	90, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	TTL

WINS Active System Components

I-BDA 48000 series for dualband SMR 800/900

The 48760 RF signal booster is designed to improve 800/900 SMR band radio coverage in RF isolated areas. The 48760 has one set of RF ports, one for the base donor antenna and one for the service area antenna(s). Internally, the 48760 filters and amplifies both the downlink (DL) and uplink (UL) signals for 800 and 900 SMR. Isolation is provided between the DL and UL of both bands as well DL to DL and UL to UL.

- SMR800 and SMR900
- High Reliability: industry leading fan-less cooling technique results in a MTBF of better than 10 years.
- AGC circuitry automatically prevents interference from strong signals or oscillation.
- No Maintenance: no tuning or maintenance required.
- Set up is fast and easy using the performance monitor (no computer is required).
- Modular components and auto-balance control circuitry make field repair a snap
- All models include a PM800 performance monitor and 3.3 m (10 ft) extension cable.
- High dynamic range.



48760 Dual-Band BDA

SYSTEM INTEGRATION

Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs

PERFORMANCE

Composite Output Power, DL/UL dBm	26 / 26
3rd Intercept Point, DL/UL, dBm	> 44 / > 44
Gain, DL/UL, dB	59 - 79 variable, manually
Return Loss, dB	> 10
Noise figure, dB	< 5 at max. gain DL / UL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48760	SMR 800/900	806 - 824, 896 - 902	851 - 869, 935 - 941
I-BDA-48960	SMR 800/900	806 - 824, 896 - 902	851 - 869, 935 - 941

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	90
Cooling	Convection
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 19.5 (43)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)

MONITORING

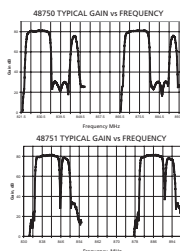
Remote Monitoring	Optional
Alarm Interface	TTL

WINS Active System Components

I-BDA 48000 series for Cellular 800 A/B

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- Band-specific filtering
- Full band with best out-of-band rejection.
- High dynamic range
- Supports hundreds of analog and / or digital subscribers.
- Output limiting circuitry
- Maintains low IMD and prevents oscillation.
- Low on-going cost of use
- Fast set up, high MTBF and no maintenance.
- Field repairable – modular components replace in minutes with a screwdriver.



48000 Series BDA

Band-specific filtering in the 48750, 48751, and 48810A and 48810B provides full use of the desired spectrum with superior out-of-band rejection. This simplifies set-up and reduces maintenance while minimizing interference.

High visibility power and fault LEDs are located on the faceplate of the BDA. Additionally, the PM800 performance monitor connects to the 15-pin test port for detailed diagnostics. The PM800 can be permanently mounted near the BDA via a 10-foot extension cable (included) or up to 100 feet away with optional extension cables. For remote surveillance, the RPM800 will dial out on alarms and provide remote shutdown over a POTS line.

SYSTEM INTEGRATION

Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs

PERFORMANCE

Composite Output Power, DL/UL dBm	30 / 30
3rd Intercept Point, DL/UL, dBm	> 45 / > 45
Gain, DL/UL, dB	60 - 80 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 9 at max. gain DL / UL

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	184
Cooling	Convection
MTBF	> 85,200 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 16.3 (36)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)
Humidity, %	90, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	TTL

ORDERING INFORMATION

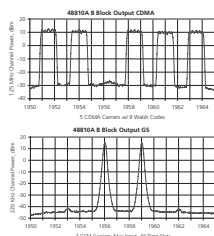
Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48750	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
I-BDA-48751	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894

WINS Active System Components

I-BDA 48000 series for PCS 1900

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- Band-specific filtering
- Full band with best out-of-band rejection.
- High dynamic range
- Supports hundreds of analog and / or digital subscribers.
- Output limiting circuitry
- Maintains low IMD and prevents oscillation.
- Low on-going cost of use
- Fast set up high MTBF and no maintenance.
- Field repairable – modular components replace in minutes with a screwdriver.



SYSTEM INTEGRATION

Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs

PERFORMANCE

Composite Output Power, DL/UL dBm	15 / 15
3rd Intercept Point, DL/UL, dBm	> 42 / > 42
Gain, DL/UL, dB	60 - 80 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 4 at max. gain DL / UL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48810A	PCS 1900	15 MHz A, B or C Block Selectable	15 MHz A, B or C Block Selectable
I-BDA-48810B	PCS 1900	5 MHz D, E, or F Block Selectable	5 MHz D, E, or F Block Selectable



48000 Series BDA

Band-specific filtering in the 48750, 48751, and 48810A and 48810B provides full use of the desired spectrum with superior out-of-band rejection. This simplifies set-up and reduces maintenance while minimizing interference.

High visibility power and fault LEDs are located on the faceplate of the BDA. Additionally, the PM800 performance monitor connects to the 15-pin test port for detailed diagnostics. The PM800 can be permanently mounted near the BDA via a 10-foot extension cable (included) or up to 100 feet away with optional extension cables. For remote surveillance, the RPM800 will dial out on alarms and provide remote shutdown over a POTs line.

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	120
Cooling	Convection
MTBF	> 85,200 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 14.9 (33)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)
Humidity, %	90, non condensing

MONITORING

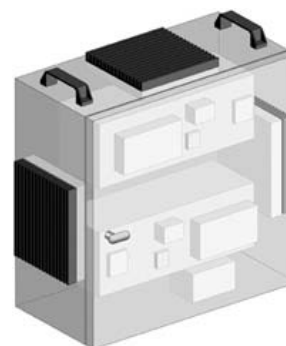
Remote Monitoring	Optional
Alarm Interface	TTL

WINS Passive System Components

T-BDA series

When a tunnel is too long for proper coverage, then the RF signals have to be regenerated – in both directions, for uplink and downlink. This can be done with a bi-directional amplifier (BDA). It is an amplifying device operating on single frequency bands for multi carriers. Up to a maximum of 6 BDAs can be cascaded, i.e. the common coverage length could be extended by a factor of 7.

- Designed for rough tunnel environment
- High reliability
- Band selective operation
- Multi-carrier
- Built-in soft redundancy for all amplifier modules
- Low noise amplification
- Low intermodulation products
- Up to 6 BDAs in line
- Individual adjustment of the required gain for each path, UL and DL
- Built-in alarm interface for remote monitoring
- Convection cooling
- Maintenance friendly



Bi-directional amplifier (BDA) for tunnels



Cascaded BDAs

SYSTEM INTEGRATION

Application	Tunnel
Number of Carriers	Multi Carrier
Amplifying System	Cascaded, bi-directional
Max. Cascading	6 BDAs
Redundancy	Soft redundancy for all amplifier modules

PERFORMANCE

Note	See page 466 for Output Power information.
Composite Output Power, DL/UL dBm	24 / 15
3rd Intercept Point, DL/UL, dBm	> 50/40
Gain, DL/UL, dB	> 40/40, in 2 dB steps manually adjustable
Return Loss, dB	> 14 for each RF port
Noise figure, dB	< 6 in DL and UL at max. gain

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
T-BDA-TETRA380	TETRA 380	380 - 385	390 - 395
T-BDA-SMR800	SMR 800	806 - 824	851 - 869
T-BDA-CDMA800	CDMA 800	824 - 835	869 - 880
T-BDA-CELLA800	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
T-BDA-CELLB800	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894
T-BDA-GSM900	GSM 900	935 - 960	890 - 915
T-BDA-GSM1800	GSM 1800	1710 - 1785	1805 - 1880
T-BDA-PCS1900	PCS 1900	1850 - 1910	1930 - 1990
T-BDA-UMTS2100	UMTS 2100	1920 - 1980	2110 - 2170

Additional frequency bands available upon request.

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	< 250
Cooling	Convection
MTBF	> 80,000 h
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, with front door
Sealing	IP 65
Color	Semi gloss, grey, RAL 7032
Dimensions, W x H x D, mm (in)	720x730x260 (28.3x28.7x10.2), incl. heat sinks
Weight, kg (lb)	< 56 (123)
Operation Temperature, °C (°F)	-20 to +45 (-4 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts,

WINS Active System Components

T-RU series

Wireless distributed communication systems require the installation of repeaters in longer tunnel sections. One method is the use of a fiber optic backbone system. The high power Remote Unit converts the analogue optical DL signal into RF and amplifies it - and vice versa for the UL. The Remote Unit is a single band multicarrier unit which is available for all common frequency bands used for digital mobile radio.

- Designed for rough tunnel environment
- Up to 20 km (12.5 miles) of tunnel coverage
- Optical transmitter and receiver integrated
- High reliability
- Band selective operation
- Multi carrier
- Available for various frequency bands
- Built-in soft redundancy for all amplifier modules
- Low noise amplification
- Low intermodulation products
- Individual adjustment of the required gain for each path, UL and DL
- Built-in alarm interface for remote monitoring
- Convection cooling
- Maintenance friendly

SYSTEM INTEGRATION

Application	Tunnel
Number of Carriers	Multi Carrier
Amplifying System	Fiber optical backbone
Max. Backbone Length, km (miles)	20 (12.5)
Redundancy	Soft redundancy for all amplifier modules

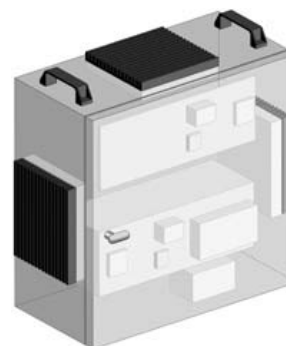
PERFORMANCE

Note	See page xxx for Output Power information.
Composite Output Power, DL/UL dBm	24 / 15
3rd Intercept Point, DL/UL, dBm	> 50/40
Gain, DL/UL, dB	> 60/40, in 2 dB steps manually adjustable
Return Loss, dB	> 14
Noise figure, dB	< 6 in DL and UL at max. gain

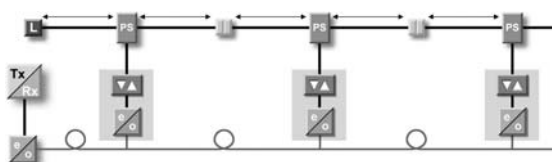
ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
T-RU-TETRA380	TETRA 380	380 - 385	390 - 395
T-RU-SMR800	SMR 800	806 - 824	851 - 869
T-RU-CDMA800	CDMA 800	824 - 835	869 - 880
T-RU-CELLA800	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
T-RU-CELLB800	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894
T-RU-GSM900	GSM 900	935 - 960	890 - 915
T-RU-GSM1800	GSM 1800	1710 - 1785	1805 - 1880
T-RU-PCS1900	PCS 1900	1850 - 1910	1930 - 1990
T-RU-UMTS2100	UMTS 2100	1920 - 1980	2110 - 2170

Additional frequency bands available upon request.



Remote unit for tunnels



Block diagram of the optical backbone link

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	< 250
Cooling	Convection
MTBF	> 50,000 h
RF Ports	1 connector, N-female, 50 ohms, to radiating network or antenna
Housing	Metal casing, coated, with front door
Sealing	IP 65
Color	Semi gloss, grey, RAL 7032
Dimensions, W x H x D, mm (in)	720x730x260 (28.3x28.7x10.2), incl. heat sinks
Weight, kg (lb)	< 56 (123)
Operation Temperature, °C (°F)	-20 to +45 (-4 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts,

WINS Active System Components

I-RFU series

Wireless distributed communication systems for in-building applications. The RF Unit (together with the optical backbone) extends the coverage in large buildings. It is designed to amplify DL and UL signals frequency band wise for multi carrier applications.

- Extension for RFS's in-building system
- Suitable for all main digital frequency bands
- Band selective operation
- Multi-carrier
- Built-in soft redundancy for all amplifier modules
- Low noise amplification
- Low intermodulation products
- For optical backbone
- Low noise, high reliability
- State-of-the-art, modular design in 19" technology
- Maintenance friendly



RF Unit for in-building

SYSTEM INTEGRATION

Application	In-building
Number of Carriers	Multi Carrier
Amplifying System	Fiber optical backbone
Redundancy	Soft redundancy for all amplifier modules

PERFORMANCE

Note	See page 466 for Output Power information.
Composite Output Power, DL/UL dBm	24 / 15
3rd Intercept Point, DL/UL, dBm	> 50/40
Gain, DL/UL, dB	> 50/50, in 2 dB steps manually adjustable
Return Loss, dB	> 14 for each RF port
Noise figure, dB	< 6 in DL and UL at max. gain

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-RFU-TETRA380	TETRA 380	380 - 385	390 - 395
I-RFU-SMR800	SMR 800	806 - 824	851 - 869
I-RFU-CDMA800	CDMA 800	824 - 835	869 - 880
I-RFU-CELLA800	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
I-RFU-CELLB800	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894
I-RFU-GSM900	GSM 900	935 - 960	890 - 915
I-RFU-GSM1800	GSM 1800	1710 - 1785	1805 - 1880
I-RFU-PCS1900	PCS 1900	1850 - 1910	1930 - 1990
I-RFU-UMTS2100	UMTS 2100	1920 - 1980	2110 - 2170

Additional frequency bands available upon request.

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	< 100
Cooling	Fan
MTBF	> 200,000 h excl. fan, > 40,000 h incl. fan
RF Ports	3 connectors, SMA-female, 50 ohms
Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 4 units in height
Weight, kg (lb)	15 (33)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts,

WINS Active System Components

I-PSU-800

Wireless distributed communication systems for in-building applications. The Power Supply Unit delivers the necessary power for up to four RF Units at the backend site of the in-building system.

- Extension for RFS' in-building system
- Provides power for up to four RF units
- Individual ON/OFF switches for each of the DC output ports
- High reliability
- Modular design in 19" technology
- Maintenance friendly



Power Supply Unit for in-building

SYSTEM INTEGRATION	
Application	In-building
Amplifying System	Fiber optical backbone
POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 900
Cooling	Fan
MTBF	> 200,000 h excl. fan, > 50,000 h incl. fan
Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 3 units in height
Weight, kg (lb)	9 (20)
Operation	0 to +45 (+32 to + 113)
Temperature, °C (°F)	
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts, normally closed, Sub D 25 female

ORDERING INFORMATION

Model Number

I-PSU-800

WINS Active System Components

I-MOU-19

Wireless distributed communication systems for in-building applications. The Monitoring Unit collects all alarm signals of up to four RF units, the power unit, and the optical unit. Summary alarms can be provided by an internal wiring structure. The unit operates as a passive alarm interface.

- Collects the alarm signals of up to four RF Units, the Power Supply Unit and the optical unit
- High reliability through passive structure
- Summary alarm can be provided by internal wiring option



Monitoring Unit for in-building

SYSTEM INTEGRATION

Application	In-building
Amplifying System	Fiber optical backbone

POWER/MECHANICAL SPEC./ENVIRONMENT

Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 1 unit in height
Weight, kg (lb)	3 (7)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Alarm Interface	Sub D 9 pol for OSR-19, Sub D 25 pol for I-RFU series and I-PSU-800
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ORDERING INFORMATION

Model Number

I-MOU-19

WINS Active System Components

OSR-19

Wireless distributed communication systems for in-building and tunnel applications. The 19" sub-rack is designed to take in the converters for the fiber optical backbone system.

- Ready to plug-in one or two power supply modules (OPS) and up to 8 modules either optical transmitters (OTM) or optical receivers (ORM)



19" sub-rack for e/o conversion

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone
Redundancy	Provided for hot standby power supply

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	< 50, fully assembled
Housing	19" sub-rack with back panel, slots for max. 2 x power supply and 4 x optical transmitter and 4 x optical receiver (other configurations optional)
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 3 units in height
Weight, kg (lb)	3 (7)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts, normally closed, Sub D 9 female

ORDERING INFORMATION

Model Number

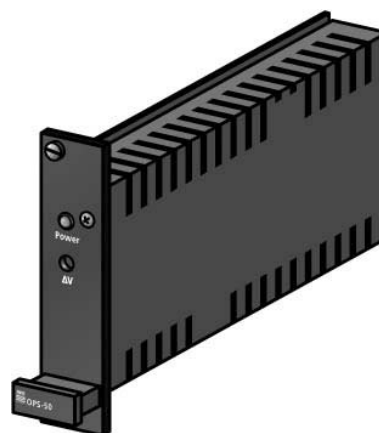
OSR-19

WINS Active System Components

OPS-50

Wireless distributed communication systems for in-building and tunnel applications. The power supply is designed as plug-in module and fits into the 19" sub-rack OSR-19. It powers the electric-optical converters. A second OPS-50 can be plugged in order to provide redundancy.

- High reliability
- Long lifetime



Power supply plug-in module for e/o conversion

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	< 50
MTBF	> 500,000 h
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	6 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	Potential free relay contact, normally closed

ORDERING INFORMATION

Model Number

OPS-50

WINS Active System Components

OTM-FC/APC

Wireless distributed communication systems for in-building and tunnel applications. The optical transmitter is designed as plug-in module and fits into the 19" sub-rack OSR-19. It converts an electrical RF signal into an optical analog signal.

- Designed for analog RF signals
- Independent on RF modulation
- High linearity
- DFB laser
- Low noise



Electrical-optical converter (transmitter)

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone
Max. Backbone Length, km (miles)	20 (12.5)

PERFORMANCE

Composite Output Power, DL/UL dBm	3 (typical optical output power)
3rd Intercept Point, DL/UL, dBm	> 27

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	< 5
MTBF	> 200,000 h
RF Ports	1 connector, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	Potential free relay contact, normally closed

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
OTM-FC/APC	N/A	50 ... 2400	50 ... 2400

WINS Active System Components

ORM-FC/APC

Wireless distributed communication systems for in-building and tunnel applications. The optical receiver is designed as plug-in module and fits into the 19" sub-rack OSR-19. It reconverts an optical analog signal into an electrical RF signal.

- Designed for multi carrier application using extremely linear and low noise 30 dB broad band amplifier
- High dynamic range



Optical-electrical converter (receiver)

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone
Max. Backbone Length, km (miles)	20 (12.5)

PERFORMANCE

3rd Intercept Point, DL/UL, dBm	> 27
Gain, DL/UL, dB	30
Noise figure, dB	< 2

POWER/MECHANICAL SPEC./ENVIRONMENT

Power Consumption, VA	< 5
MTBF	> 400,000 h
RF Ports	1 connector, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

MONITORING

Remote Monitoring	Optional
Alarm Interface	Potential free relay contact, normally closed

ORDERING INFORMATION

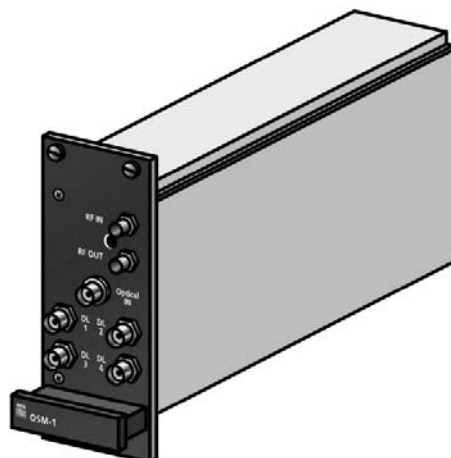
Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
ORM-FC/APC	N/A	50 ... 2400	50 ... 2400

WINS Active System Components

OSM Series

Wireless distributed communication systems for in-building and tunnel applications. The optical splitter module is designed as plug-in module and fits into the 19" sub-rack OSR-19. It splits one optical signal into 4 signals. In addition a RF signal can be looped through for level adjustments.

- Splits equally one optical signal into 4 optical signals
- Additionally, the common RF signal can be manually adjusted by 20 dB
- Module fits into the 19" sub-rack OSR-19
- SMA connectors for RF In and Out
- FC/APC connectors for the 5 optical ports



Optical splitter unit

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

PERFORMANCE @ 20°C (68°F)

Return Loss, dB	> 9 (S11, RF output port), > 9 (S22, RF path)
Attenuation variation, dB	0 - 20 ±2

OPTICAL SPECIFICATION

Wave Length, nm	1310
Optical Interface	5 x FC/APC

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
OSM-1		380 - 960

POWER/MECHANICAL SPEC./ENVIRONMENT

RF Ports	2 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	10 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

WINS Active System Components

OPP-FC/APC

Wireless distributed communication systems for in-building and tunnel applications. The patch panel comprises a splicing cassette for up to 8 splices and provides 8 optical FC/APC ports for distribution to the electrical-optical converters.

- 8 optical ports
- FC/APC connectors, pigtails inside for splicing (mono mode, 9/125/900 μm , 2m (6.5 ft) long), gland at the front side for fiber cable of 10 mm (0.4 in) in diameter



19" patch panel

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

OPTICAL SPECIFICATION

Optical Interface	8 x FC/APC to the converters, 8x pigtails to the fiber optical cable
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POWER/MECHANICAL SPEC./ENVIRONMENT

Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 1 unit in height
Weight, kg (lb)	4 (9)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number

OPP-FC/APC

WINS Active System Components

SCAM2* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 2 RF signals

- Attenuates 2 RF signals
- Splits/Combines 2 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out



RF splitter/combiner module

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

PERFORMANCE @ 20°C (68°F)

Return Loss, dB	> 12
Attenuation variation, dB	0 - 20 ±2

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
SCAM2-380/1000	380 - 1000	380 - 1000

POWER/MECHANICAL SPEC./ENVIRONMENT

RF Ports	3 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

WINS Active System Components

SCAM4* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 4 RF signals

- Attenuates 4 RF signals
- Splits/Combines 4 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out



RF splitter/combiner module

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

PERFORMANCE @ 20°C (68°F)

Return Loss, dB	> 12
Attenuation variation, dB	0 - 20 ±2

POWER/MECHANICAL SPEC./ENVIRONMENT

RF Ports	5 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
SCAM4-380/1000	380 - 1000	380 - 1000



WINS Active System Components

SCM2* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 2 RF signals

- Splits/Combines 2 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out



RF splitter/combiner module

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

PERFORMANCE @ 20°C (68°F)

Return Loss, dB	> 12 (380 - 1000 MHz), > 17 (1000 - 2500 MHz)
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ORDERING INFORMATION

Model Number	Frequency Range	Frequency Range
	UL, MHz	DL, MHz
SCM2-380/2500	380 - 2500	380 - 2500

POWER/MECHANICAL SPEC./ENVIRONMENT

RF Ports	3 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	6 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

WINS Active System Components

SCM4* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 4 RF signals

- Splits/Combines 4 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out



RF splitter/combiner module

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

PERFORMANCE @ 20°C (68°F)

Return Loss, dB	> 12 (380 - 1000 MHz), > 17 (1000 - 2500 MHz)
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POWER/MECHANICAL SPEC./ENVIRONMENT

RF Ports	5 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	6 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to +113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range	Frequency Range
	UL, MHz	DL, MHz
SCM4-380/2500	380 - 2500	380 - 2500

WINS Active System Components

AM Series

Wireless distributed communication systems for in-building and tunnel applications. The RF attenuator module is designed as plug-in module and fits into a 19" sub-rack. It attenuates 2 RF signals individually.

- Attenuates 2 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out
- RF Broadband



AM2 Attenuator

SYSTEM INTEGRATION

Application	Tunnel, In-building
Amplifying System	Fiber optical backbone

PERFORMANCE @ 20°C (68°F)

Return Loss, dB	> 18 (380 - 1000 MHz), > 12 (1000 - 2500 MHz)
Attenuation variation, dB	0 - 29 ±2 in 1 dB steps

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
AM2-380/2500	380 - 2500	380 - 2500

POWER/MECHANICAL SPEC./ENVIRONMENT

RF Ports	4 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	12 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing