

SECTION 3



Expanded Beam

Expanded Beam Solutions

F739, F746, F730



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Introduction

EXPANDED BEAM SOLUTIONS

Radiall offers a wide range of interconnect solutions based on Expanded Beam (EB) technology. Experience and expertise allow Radiall to provide high quality products in support of demanding applications. Expanded beam is a flexible solution that brings reliable optical performance in harsh environments, especially when ease of cleaning, maintenance or a high number of matings is required.

MARKETS AND APPLICATIONS

Aerospace Defense Industrial



Aerospace

Avionics, data link high speed digital transmissions

Military

Field deployable communication, mobile shelters, marine and battlefield environments

Geophysical

Oil and gas, mining, seismic exploration systems

Other Applications

Broadcast, robotics, transportation, sensors



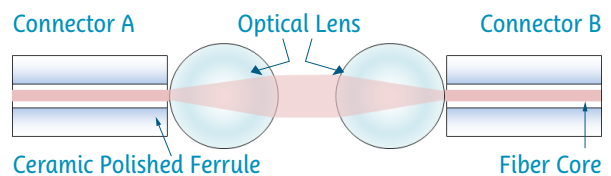
- MIL-DTL-83526/20 and MIL-DTL-83526/21
- RoHS compliant
- AS 6250



Introduction

EXPANDED BEAM TECHNOLOGY

Expanded Beam technology uses a precision lens on one mating end (connector A) to collimate and expand the emerging light beam, before a matching lens on the other mating end (connector B) refocuses the light back into the fiber core.



EB technology offers a contactless connection which increases the number of mating cycles compared to connectors based on Physical Contact technology. Due to the signal being expanded, the connection is also less sensitive to particular contamination and supports an easier cleaning process. This makes it the ideal choice for demanding applications requiring ease of maintenance in highly contaminated environments.

The diagram compares a Standard Beam and an Expanded Beam. The Standard Beam is small and has a small core, making it highly sensitive to dust and lateral misalignment. The Expanded Beam is significantly larger, which makes it much less sensitive to these issues. Labels include 'Dust' pointing to a speck on the standard beam, 'Misalignment' pointing to a vertical offset between the beams, and 'STANDARD BEAM' and 'EXPANDED BEAM' labels at the bottom.

- Lateral misalignment has less effect on transmission loss when the light beam is expanded.
- Particulate contamination has less effect on transmission loss when the light beam is expanded.

Reliable Connection

- Contactless connection increasing operational longevity and reliability
- Less sensitivity to lateral misalignment and particulate contamination

Field Optimized Technology

- Easy cleaning
- Resistance to mechanical shock and vibration

Versatile Solution

- Compatible with MultiMode and SingleMode fibers
- Adapted to various cable configurations
- Wide range of Expanded Beam interconnect solutions

Introduction

PRODUCT RANGE OVERVIEW

Radiall offers a variety of custom cable assemblies featuring Expanded Beam technology, in 3 series:

EB Tactical Cable Assemblies - F739 Series:

Ruggedized and easy to deploy and maintain in the field, cable assemblies equipped with Expanded Beam Tactical connectors are well adapted to outdoor and demanding applications in the field.



EB-LuxCis® Product Range - F746 Series:

EB-LuxCis® product range combines the benefits of the LuxCis® ARINC 801 fiber optic contact and Expanded Beam technology where multipin connectors are widely used.



EB Contact in Multipin Connectors - F730 Series:

The EB contact provides benefits similar to individual termini with all the advantages of the Expanded Beam technology: easy insertion/extraction manipulation, easy part replacement and use of standard cavities.



EB Tactical Cable Assemblies - F739 Series



Radiall designs, manufactures and supplies cable assemblies equipped with EB Tactical connectors to withstand the most demanding environments. These rugged cable assemblies feature high robustness with ease of deployment and low maintenance in the field.

EXPANDED BEAM TECHNOLOGY - KEY BENEFITS:

Reliable Connection

- Contactless connection increasing operational longevity and reliability
- Less sensitivity to lateral misalignment and particulate contamination

Field Optimized Technology

- Easy cleaning
- Resistance to mechanical shock and vibration

Versatile Solution

- Compatible with MultiMode and SingleMode fibers
- Adapted to various cable configurations
- Wide range of Expanded Beam interconnect solutions

EB TACTICAL CABLE ASSEMBLIES - KEY BENEFITS:

Field Optimized

- Hermaphroditic (genderless) design for fast and easy connection, enabling mistake-proof tactical field deployment and daisy chaining (concatenation) configurations to address longer links in the field.

Flexible Configuration

- Different operating wavelengths available (850 nm/1300 nm dual wavelengths, 1310 nm or 1550 nm wavelengths)
- Expanded Beam receptacles available in square flange and jam nut (D-hole)
- EB Tactical connectors are available with up to 4 channels

Ruggedized Solution

- Robust construction with very high mating cycle capability: up to 3000 cycles

EB Tactical Cable Assemblies - F739 Series

The EB Tactical connectors are designed to MIL-DTL-83526/20 & /21 mechanical interface standards.

OPTICAL CHARACTERISTICS

	MultiMode PC 1300 nm	SingleMode PC 1310 nm
Insertion Loss* (Typical)	0.7 dB	0.7 dB
Insertion Loss (Maximum)	1.5 dB	2 dB
Return Loss**		>34 dB

*When tested with reference quality launch/receive cable assemblies

**RL tested unmated

MECHANICAL CHARACTERISTICS

Vibration, sinusoidal	10–500 Hz, 3 directions, 0.75 mm amplitude, 10 G acceleration
Bumps	4000 bumps, 3 directions, 40 G acceleration
Free fall on concrete, severity 1.2 m	500 falls
Mating endurance	Up to 3000 mating cycles

Operating temperature range	-40°C/+85°C
Storage temperature	-55°C/+85°C
Humidity (damp heat)	95% RH
Water immersion	15 m depth

MATERIALS

Shell	Aluminum
Plating	Clear hard anodized
Plug Boot	EPDM rubber (high resistance to tearing and damage, ideal for outdoor exposure)

Expanded Beam connectors are optimized for the following operating wavelengths:

- MM 850 nm
- MM 1300 nm
- SM 1310 nm
- SM 1550 nm

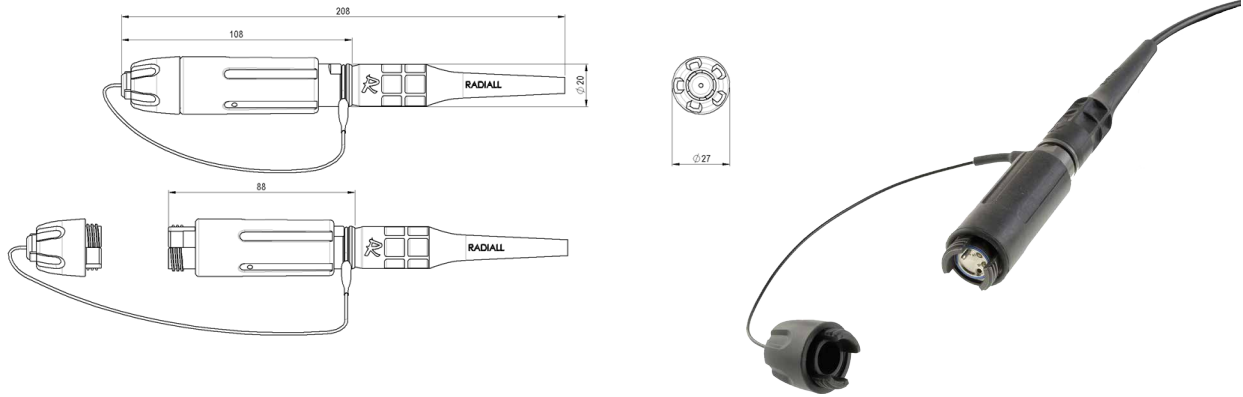
Other wavelengths can be used as well (for WDM applications for example).

For other wavelengths or materials such as Nickel Aluminum Bronze connectors for naval applications, please contact your local Radiall representative.

EB Tactical Cable Assemblies - F739 Series

CONNECTOR DIMENSIONS

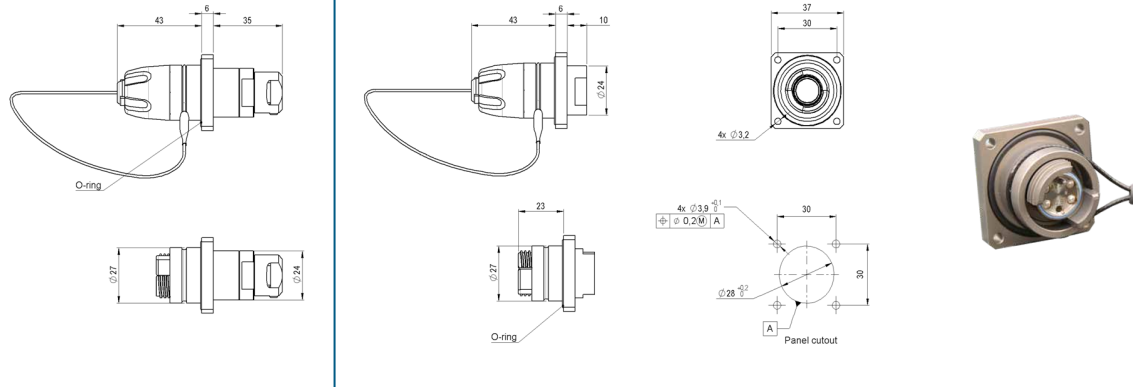
Expanded Beam Tactical Plug



Expanded Beam Tactical Square Flange Bulkhead

For Multi-fiber cable

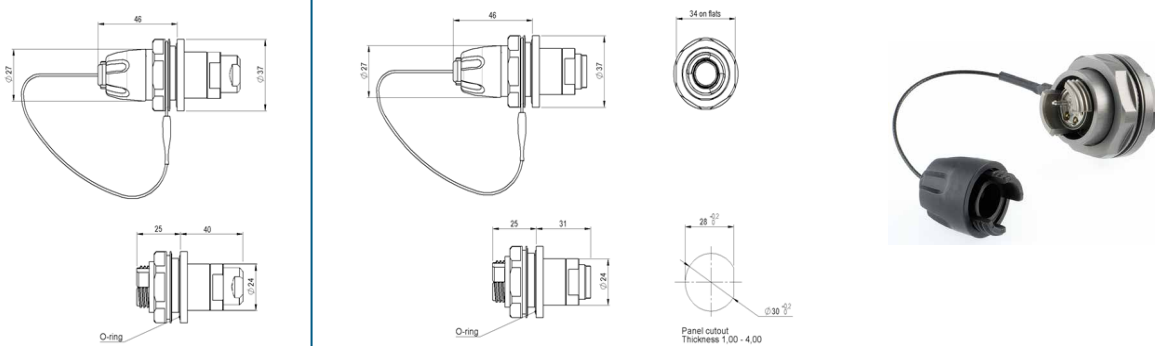
Low profile, to be assembled with up to 4 individual cables, max diameter 1.6 mm



Expanded Beam Tactical Jam Nut (D-Hole) Bulkhead Receptacle

For Multi-fiber cable

Low profile, to be assembled with up to 4 individual cables, max diameter 1.6 mm

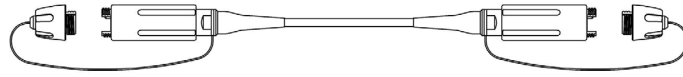


Dimensions in mm

EXPANDED BEAM

EB Tactical Cable Assemblies - F739 Series

Use this configurator to define a part number for standard tactical cable assemblies using Expanded Beam Junior size tactical connectors. EB Junior size tactical connectors are designed to MIL-DTL-83526/20 & /21 mechanical interfaces standards.



F739 0 0 4 2 1 1 M 100

F739 Series: EB tactical cable assembly

End 1: Junior size EB tactical connector

- 0: Plug
- 2: D-hole receptacle low profile, fan-out type for 1.6 to 1.8 mm simplex cable
- 3: D-hole receptacle, for 5 to 6 mm tactical cable
- 5: Square flange receptacle low profile, fan-out type for 1.6 to 1.8 mm simplex cable
- 6: Square flange receptacle, for 5 to 6 mm tactical cable

End 2:

- 0: Junior size EB plug
- 2: Free end
- 3: LC PC connector
- 4: LC APC connector
- 5: ST PC connector
- 6: SC PC connector
- 7: LuxCis® ARINC 801 APC contact
- 8: FC PC connector
- 9: LuxCis® ARINC 801 PC contact

Number of channels: 2 or 4

Optimal wavelength:

- 2: SingleMode 1310 nm
- 3: SingleMode 1550 nm
- 4: MultiMode 850 nm & 1300 nm with 50/125 µm OM3 fiber
- 5: MultiMode 850 nm & 1300 nm with 50/125 µm fiber
- 6: MultiMode 850 nm & 1300 nm with 62.5/125 µm fiber

Cable type:

- 1: Multi-fiber cable, diameter 5 to 6 mm, for plug and standard receptacle
- 4: Multi-fiber cable, diameter 5 to 6 mm, anti-rodent with bittering agent, for plug and standard receptacle
- 5: Simplex fiber, diameter 1.6 to 1.8 mm for fan-out receptacle (low-profile) only
- 6: Multi-fiber armored cable, for plug and standard receptacle

Reel:

- 0: No cable reel (applicable for cable up to 20 m length)
- 1: Field deployable reel
- 5: Reel for backpack (applicable for cable up to 900 m cable length)
- 6: Disposable reel

Length unit:

- C: Centimeter
- M: Meter

Length of the cable (3 digits)

Each cable assembly is labeled with a heat shrink sleeve with Radiall PN and date code.

For any other cable assembly configuration or specific requirements (additional testing, specific labeling, additional protection or different type of cable), please contact your local Radiall representative and we will provide a technical datasheet for validation.

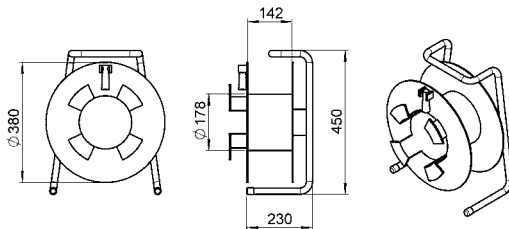
EB Tactical Cable Assemblies - F739 Series

REELS RANGE

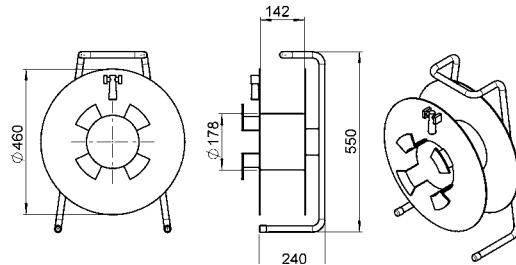
Radiall provides cable assemblies with various field orientated accessories such as reels and backpack reels.

Standard cable drums are available in 2 sizes:

Gantry Reel – size A



Gantry Reel – size B



Gantry drum, with braking device and handle crank

	Size A	Size B
Color	Black	
Weight	5.90 kg	8.20 kg
Cable assembly max. length	Up to 280 m (with a 6 mm cable)	Up to 450 m (with a 6 mm cable)



RANGE EXTENSION

Not all accessories are displayed in this catalog.

Radiall is also designing other Expanded Beam solutions that provide:

- Smaller size with the mini insert (shrunk version of the Junior insert)
- More channels
- Hybrid configurations
- Environment specific designs

For any additional information, please contact your local Radiall representative.

EB-LuxCis® Product Range - F746 Series



Radiall's product line also features the EB-LuxCis® product range, bringing the benefits of the LuxCis® ARINC 801 fiber optic contact and Expanded Beam technology where multipin connectors are widely used.

The EB-LuxCis® product range combines the widely used LuxCis® ARINC 801 fiber optic contact inserted in a 2 or 4 channel (MM or SM) Expanded Beam insert, which can be used in various circular or rectangular connectors.

It is the ideal solution for demanding applications requiring ease of maintenance in highly contaminated environments.



FEATURES AND BENEFITS

EXPANDED BEAM TECHNOLOGY - KEY BENEFITS:

Reliable Connection

- Contactless connection increasing operational longevity and reliability
- Less sensitivity to lateral misalignment and particulate contamination

Field Optimized Technology

- Easy cleaning
- Resistance to mechanical shock and vibration

Versatile Solution

- Compatible with MultiMode and SingleMode fibers
- Adapted to various cable configurations
- Wide range of Expanded Beam interconnect solutions

EB-LUXCIS® - KEY BENEFITS:

Improved Field Maintenance

- Combined with standard LuxCis® ARINC 801 contacts, a standardized interface
- Easy insertion and extraction of the contacts using standard tools

Flexible Configuration

- Non-hermaphroditic and hermaphroditic inserts available
- Wide product range available: MIL-DTL-38999, EPX®, NSX ARINC 600, EN 4165

Ruggedized Solution

- Robust construction based on widely used multipin connectors in harsh environments
- Scoop proof inserts available
- Interfacial seal and O-ring system to ensure a good sealing level

EB-LuxCis® Product Range - F746 Series

CHARACTERISTICS AND PERFORMANCE

OPTICAL CHARACTERISTICS

Test	Standard	EB-LuxCis® EN4165 Rack & Panel or D38999 Connector	
		SingleMode PC 1310-1550 nm	MultiMode PC 850 nm
Insertion Loss (maximum)	EN2591-601	2 dB	2 dB
Return Loss	EN2591-605	>30 dB	>20 dB

MECHANICAL CHARACTERISTICS

Test	Standard	EB-LuxCis® EN4165 Rack & Panel or D38999 Connector
Vibration	EN2591-6403 Method B	up to 16 Grms
Shocks	EN2591-6402 Method A 3 directions	100 G
Durability (mating/unmating)	EN2591-6406	500 cycles
Cable retention 1.8 mm diameter		68 N

ENVIRONMENTAL CHARACTERISTICS

Test	Standard	EB-LuxCis® EN4165 Rack & Panel or D38999 Connector
Operating temperature	EN2591-6305	-55°C/+125°C (cable dependent)
Temperature endurance	EN2591-6301 Method B	1000 h at 125°C (cable dependent)
Altitude immersion at low pressure	EN2591-6314	65,000 feet

Note: The EB-LuxCis® has passed a full qualification. Not all the tests performed are described in the tables above. Request for information on a test not mentioned in the table or harsher conditions shall be addressed to your local Radiall representative.

EXPANDED BEAM

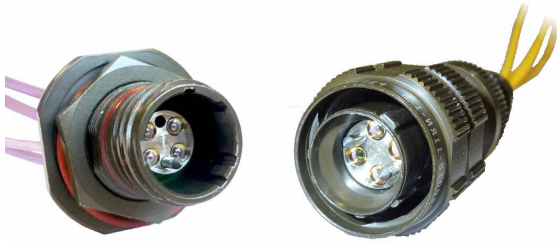
EB-LuxCis® Product Range - F746 Series

PRODUCT RANGE

Radiall designs, manufactures and delivers harnesses equipped with EB-LuxCis® interconnect solutions for demanding applications requiring ease of maintenance in highly contaminated environments.

The EB-LuxCis® can accommodate either MultiMode or SingleMode fibers and up to 4 cable assemblies equipped with LuxCis® ARINC 801 contacts. It is available in hermaphroditic (for easier mating possibility) and non-hermaphroditic versions (male/female to avoid channels inversion).

MIL-DTL-38999 size 11 connector



EN4165 module



RANGE EXTENSION

EPX® connector

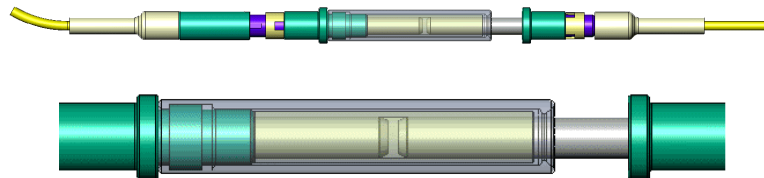


The EB-LuxCis® is also available for other tactical and multipin connectors, such as NSX ARINC 600 connectors. For any additional information, please contact your local Radiall representative.

EB Contact in Multipin Connectors - F730 Series



Radiall provides and assembles EB contacts within multipin connectors. The EB contact is available in male and female configurations, fitting into standard size 16 cavities. Maintaining the same form factor as the MIL-PRF-29504/4 & /5 envelope, the EB contact upgrades the MIL-DTL-38999 with Expanded Beam technology. Using the proven alignment technique with a ceramic ferrule, this EB contact solution withstands the most extreme environmental conditions and provides reduced sensitivity to contamination, vibration and temperature changes.



FEATURES AND BENEFITS

EXPANDED BEAM TECHNOLOGY - KEY BENEFITS:

Reliable Connection

- Contactless connection increasing operational longevity and reliability
- Less sensitivity to lateral misalignment and particulate contamination

Field Optimized Technology

- Easy cleaning
- Resistance to mechanical shock and vibration

Versatile Solution

- Compatible with MultiMode and SingleMode fibers
- Adapted to various cable configurations
- Wide range of Expanded Beam interconnect solutions

EB CONTACT - KEY BENEFITS:

Highest Density EB Solution

- Small form factor for high density connections and effortless manipulation

Flexible Solution

- Interchangeable with electrical contacts
- Designed to fit into standard size 16 cavities of MIL-DTL-38999 connectors
- Available in pin and socket for SingleMode and MultiMode fibers (62.5/125 μm and 50/125 μm)

Reduced Maintenance

- Easy part replacement: rear release and rear removable with standard insertion/extraction tools

EB Contact in Multipin Connectors - F730 Series

CHARACTERISTICS AND PERFORMANCE

OPTICAL CHARACTERISTICS

	MultiMode PC	SingleMode PC
Insertion loss, typical	0.4 dB	0.8 dB
Insertion loss, maximum (against reference patchcord)	1.0 dB	1.5 dB
Return loss	>20 dB	

MECHANICAL CHARACTERISTICS

Vibrations	28 G
Mating endurance	500 matings (connector dependent)

ENVIRONMENTAL CHARACTERISTICS

Operating temperature range	-40° C/+125° C (cable dependent)
Temperature shock (TIA-455-71)	-55° C/+165° C (cable dependent)
Temperature life 1000 h (TIA-455-4)	+165° C (cable dependent)
Storage temperature	-55° C/+85° C

MATERIALS

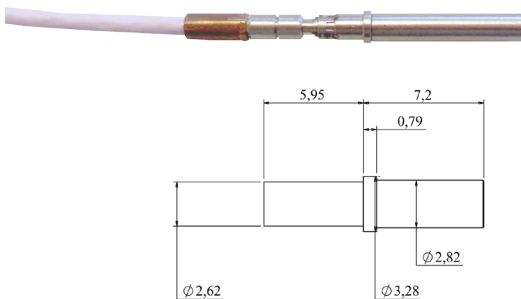
The EB contact is RoHS compliant



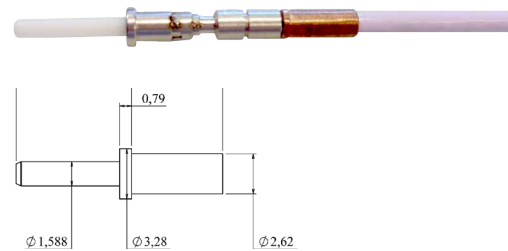
Body	Metal
Sleeve	Ceramic (Zirconia)

DIMENSIONS

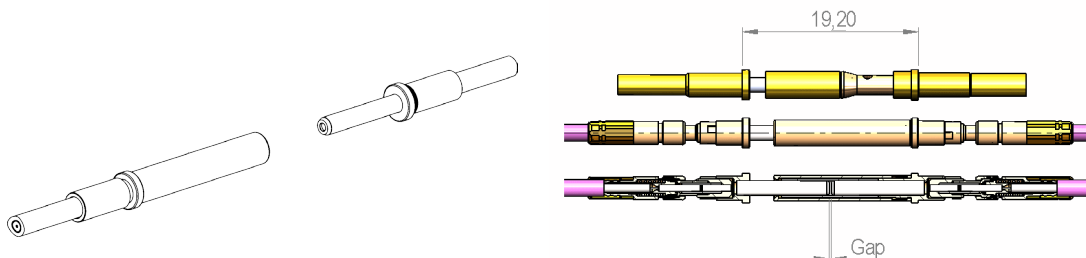
Female EB contact 29504/5 size 16



Male EB contact 29504/4 size 16



Mated EB contacts



EB Contact in Multipin Connectors - F730 Series

PRODUCT RANGE

F730 product range includes EB contacts for the following configurations:

- For MIL-DTL-38999 connectors
- Male contact MIL-PRF-29504/4 size 16 and female contact MIL-PRF-29504/5 size 16
- MultiMode or SingleMode fiber



RANGE EXTENSION



EB contacts are also available for other multipin connectors. For any additional information, please contact your local Radiall representative.

Notes
