RFI
TECHNOLOGY SOLUTIONS

MiniSystem Combiner

Application Note

About RFI

RFI is a global technology solutions company, specialising in wireless coverage. RFI has one of the largest, most innovative and experienced wireless solutions teams with dedicated engineers, product managers, deployment engineers, logistics, distribution and R&D staff.

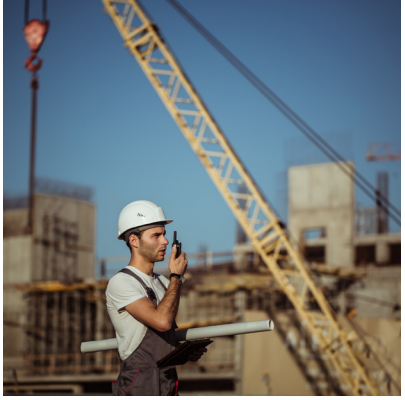
Our network of international sales offices means that all customers get the attention and advice they require, providing local support on a global scale. This includes our 16,000 ft² American office and distribution center with local product stock and engineering services for the Americas region.

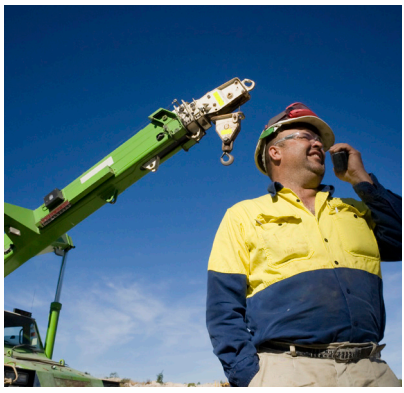
RFI develops, manufactures and distributes world-class, high performance, wireless products including; antenna systems, rebroadcast & monitoring equipment, power systems and cabling and connectors. RFI is recognised as a market leader in wireless products and offers the best products backed with outstanding technical support.

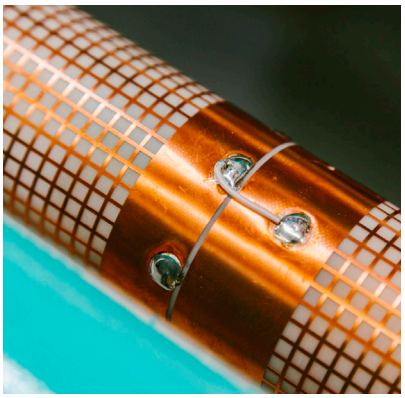
RFI is continually strengthening its technology solutions portfolio, including the recent acquisition of Maxon Australia, allowing us to offer industry leading M2M solutions.

Award Winning Manufacturing

RFI is proud to be an award winning manufacturer with wireless coverage products that perform on a global stage. RFI Technology solutions are manufactured in Australia and exported to 80 + countries. RFI operates manufacturing sites in Victoria and South Australia, both with a proud history in quality, safety and environmental performance. Our two sites include Australia's largest antenna manufacturing facility, producing world class Antenna and Multicoupling Systems for both Domestic and International Markets and the only Australian manufacturing site producing frequency translating repeater systems.





MiniSystem Combiner

The MiniSystem Combiner (MSC) is an innovative solution that simplifies the design, quotation, procurement, installation and maintenance of RF combining for applications requiring 1-4 RF channels. Catering for most standard frequency sub-bands, channel spacing's and Tx-Rx frequency separations, MSCs are compatible for use with analogue and digital technologies in a wide range of two-way radio, telemetry, linking and other wireless network applications. The MSC uses generic 19inch rack mounting providing a compact RF combining "building block" for wireless networks that is convenient to use. The MSC is available in VHF, UHF and 800MHz frequency ranges.

Overview

The MiniSystem Combiner (MSC) comprises a transmitter combiner using dual-stage isolators and innovative hybrid combining techniques to provide excellent Tx-Tx isolation and to minimise intermodulation (IM). An integral receive multicoupler uses a low-noise preamplifier featuring user-selectable gain and excellent 3OIP performance to ensure optimum system receive sensitivity is available.

High quality band pass filtering provides Rx preselectivity and Tx-Rx system isolation performance. Form-C relay alarm outputs provide alarm notification of DC power or Rx LNA amplifier failure. The MSC is designed to cater for a wide range of in-building and network site applications

MSCs are supplied with;

- 2 channel or 4 channel capacity
- 50W Tx input power (per channel)
- 100% Tx Duty Cycle
- Open-circuit antenna port VSWR protection
- Low-noise receiver preamplifier (LNA)
- User-selectable Rx gain
- DC Power and Rx LNA Fail alarm monitoring
- Compact 19in rack mounting

RFI can supply the balance of the items required to complete the installation of a MSC - with a selection from our industry-leading range of products including base station antennas, antenna systems monitoring, lightning protection, cable and connectors, power systems (mains, UPS, battery or solar), and associated installation hardware and tools.

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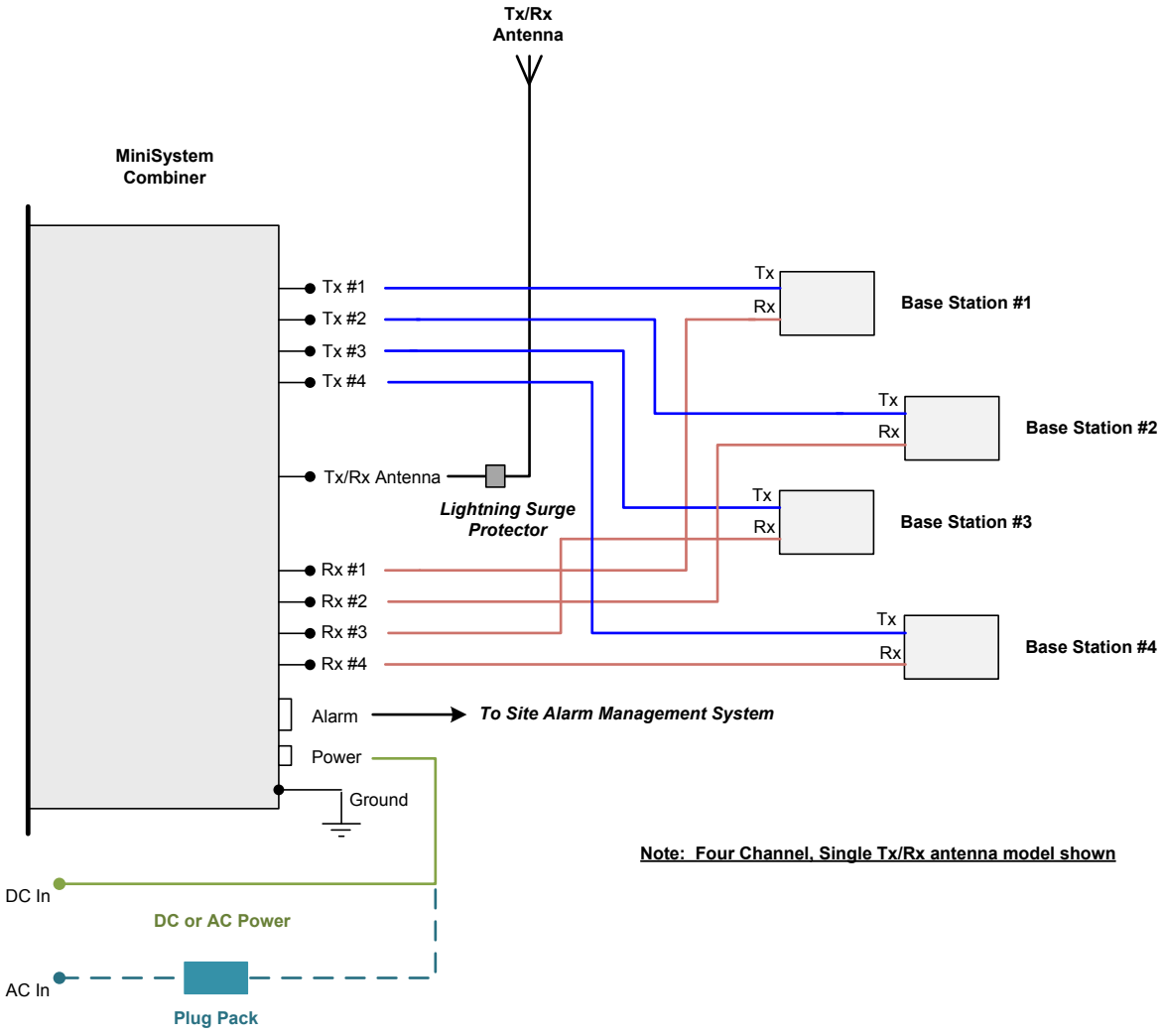
Application Diagram



The MiniSystem Combiner (MSC) is suited for use in a diverse range of wireless network technologies and applications. These include;

- PMR, DMR, APCO P25 Phase 1 and Phase 2, DPMR, TETRA, and many others ..

MSCs can be deployed for use in outdoor coverage sites, in-building, in-plant and campus systems, links and many other applications. Their flexibility allows them to be included into network designs for conventional radio and trucking systems, or into other applications such as telemetry, data, or linking.

The innovative hybrid combining technique used in the transmit path of the MSC has no restrictions on minimum Tx-Tx channel spacing, with adjacent channels being able to be connected if required. As a result, challenging frequency assignments can be deployed using these MiniSystem Combiners.

The compact size of the MiniSystem Combiner (MSC) enables the most efficient use of available 19inch rack space, and easily accessible rear panel connectors assist in the layout of interconnecting rack cabling.

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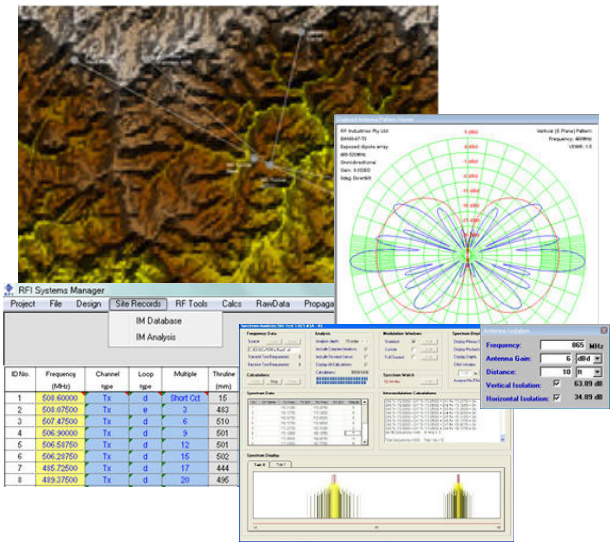
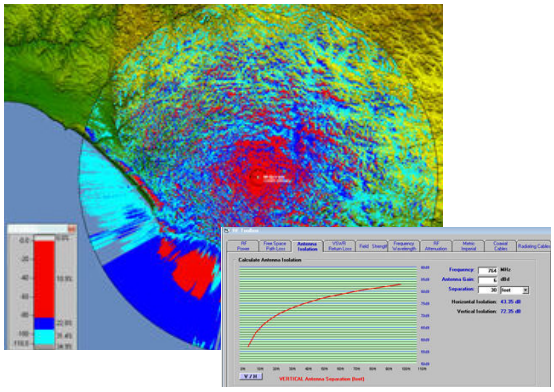
MSC Benefits

Design

The MSC simplifies system design by providing a "building block" RF combining solution that caters for most standard frequency sub-bands, channel spacing's and Tx-Rx frequency separations. It's flexibility and ease of integration into a network site's design minimizes the effort and cost expended in designing a network – particularly if a budgetary or initial cost design is all that is required for the preparation and submission of proposal. This flexibility is provided by a combiner design using broadband dual-stage isolators that provide excellent Tx-Tx isolation and minimizing intermodulation (IM), while high quality band pass filtering maintains Tx-Rx isolation and suppresses any Tx broadband noise. A low-noise high performance receiver preamplifier with user-adjustable gain ensures maximum sensitivity is available to the network's base stations.





The MSC's compatibility with both analoge and digital technologies also provides future-proofing within the combining design, supporting a migration path for any future network technology change. The combination of this flexibility, and the future-proofing of multi-technology compatibility, means that the MSC can be quickly and easily included in a design as an 'RF combining building block' – without the requirement for detailed design consuming valuable engineering and quotation labor.

Quotation

The flexibility of the MSC allows the RF combining portion of system quotations to become 'standardised', with quotations being able to be completed and costed with minimal effort. The concept of applying 'typical' modular RF combining configurations within bids, using the MSC's flexible specifications as quotation 'conditions', allows pricing to be compiled quickly - and easily multiplied to apply to larger multi-site bids.

Associated installation, commissioning, maintenance and spares costing can also be quickly determined 'per-site', and also multiplied for multi-site designs. The ability to create standardized costings allows these bid preparation benefits to then be conveniently re-used – realizing ongoing improvements in bid preparation time and effort costs within the business.

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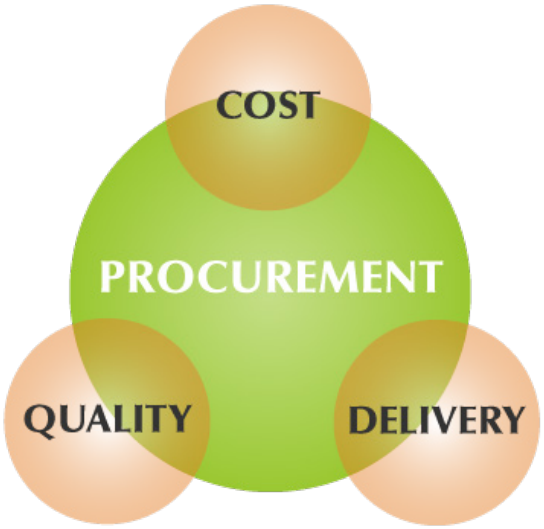
Procurement

The MSC assists the procurement process too. Reducing the number of 'standard' model numbers that need to be set up and processed for ordering simplifies the effort for a system supplier to source their combining. Having fewer model numbers allows units to be more readily stocked – reducing network supply lead times to end-user customers. An innovative design approach using the latest technologies reduces product costs, bringing real benefits to network suppliers and end-user customers alike. The flexibility of the MSC products also enables network suppliers to carry their own stocks locally, to provide delivery of complete systems to their customers – reducing ordering, manufacturing and shipping lead times.



Installation

Installation activities can also realise benefits by using the MSC. Their compact size reduces the required rack space on network sites. Using common connector types for coaxial, DC and alarm connections ensures readily available stocks of cost-effective installation materials can be used. A convenient rear panel layout on the MSC allows installations to be easily performed, with tidy cable routing being practical to achieve. The layout commonality shared between MSC models allows standard installation practises and construction formats to be developed and implemented. This can provide further benefits through installation labour efficiencies and consistency of workmanship and build quality. There are further benefits that can be realised across a network's build - including standardising acceptance testing, commissioning, and periodic maintenance inspection and documentation activities in a network's deployment program.

Maintenance

The benefits of using MSCs also continue through the network's ongoing operational life. Network maintenance activities can also benefit as a result of the implementation of standard maintenance procedures and the reduced investment in spare parts holdings. Maintenance technicians' develop a more thorough knowledge of the network as a result of a reduction in the number of build variations across a network, realised by using an overall network combining design architecture using the MSC 'building block'.

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Applications

In-building

For a typical in-building, in-plant or campus communications system, a MiniSystem Combiner provides a flexible, compact and cost effective RF combining solution. Its small rack mount footprint compliments many similarly compact network base stations, allowing complete network installations to be implemented in locations with limited available space – such as under stairs, inside cable risers, in roof cavities or in equipment or storage rooms.

Outdoor Sites

In many communications networks, particularly those using TDMA systems, the capacity provided by multiple timeslots means less RF carriers are likely to be required at network sites, allowing 2 channel MSCs to be deployed in smaller networks. If future expansion of network capacity is possible, then it may be beneficial to initially deploy a 4 channel MSC, with unused ports terminated for use for network expansions at a later date. This approach provides an easily activated future expansion path, with the existing channels not being impacted by outages, additional combining losses, or other impacts when such expansions are implemented.

Temporary and Transportable Sites

The rugged construction of a MiniSystem Combiner also suits transportable/trailer, short-term rental, and other temporary deployment requirements. Their compact size, ruggedness, convenience of installation, and flexibility to suit a wide range of communications technologies suits the challenges of temporary and transportable network sites.

The frequency flexibility of the MiniSystem Combiner provides convenience for repeated deployments for applications such as short-term rental and event radio systems. A unit can be stored “on the shelf” and deployed rapidly if the range of likely operating frequencies is already known. The compact size of the combiner would allow a “field case” of terminals, repeater(s) and the MSC to be packed and ready to deploy.

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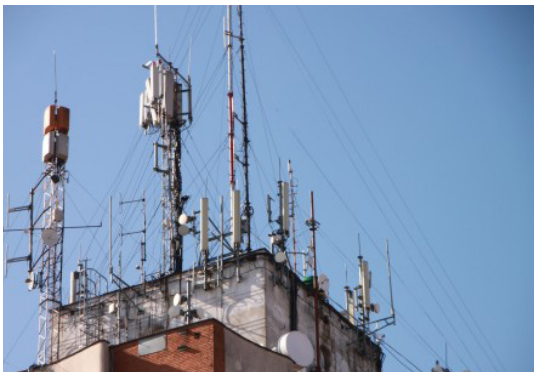
Frequency and Technology Capability

MiniSystem Combiners are compatible with analogue and digital technologies, and can be used with any combination of channel bandwidths and spacing's within the tuned transmit and receive passbands of its integral filtering. There is no minimum transmit-to-transmit separation requirement for combined channels, with immediately adjacent channels as easily accommodated as channels some distance apart.

In addition, even two base stations of the same frequency could be connected, with a hot/standby control determining which of the two is operational at any one time – providing an easily implementation of main/ standby redundancy for critical communications channels.

Radio Link Combining

The architecture of the MiniSystem Combiner suits applications such as combining multiple point-to-point and point-to-multipoint radio links. Often there are multiple links between prime radio sites, resulting in multiple antennas, feeders and the associated tower space and loading impacts these incur at a network site. The use of a MiniSystem Combiner would allow such multiple link installations to be rationalized – reducing the number of antennas and coaxial cable feeders installed on a tower, reducing tower loadings, and ensuring prime positions at the top of tower can be better utilized.

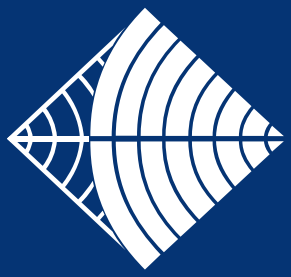


Other Applications

The MiniSystem Combiner can be used in many different applications. Their compact size, ruggedness, convenience of installation, and flexibility to suit a wide range of communications technologies makes the MiniSystem Combiner an excellent combining solution choice.

Summary

The MiniSystem Combiner (MSC) is an innovative and exciting new RF combining solution in the RFI product range. It provides high performance specifications, with the added benefits to users of simplifying the design, quotation, procurement, installation and maintenance efficiencies, and suits a wide range of analogue and digital technologies and deployment applications.



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