



CONTROL STATION COMBINER DESIGN GUIDE

May 7, 2013
Revised July 18, 2017

INTRODUCTION

RFI Control Station Combiners (CSC) enable customers to conveniently combine multiple control stations at a dispatch facility to a common or separate transmit and receive antennas. This eliminates the need for separate antennas for each station and also provides improved isolation between the various stations.

This design guide will cover the operation of both the standard and short haul CSC's and present a number of examples of specialized applications. Standard configurations of the CSC's are provided in the CSC User Manuals.

DEFINITION OF A CONTROL STATION

A control station is a radio which is generally located at a dispatch point and provides that location with an RF link into a repeater system, either conventional or trunked. The radio is essentially a fixed mobile radio. The radios are not duplex and are equipped with a single antenna connector which is used for both transmit and receive. When multiple repeater systems require access, or multiple dispatchers each require radio communications, control stations provide an effective solution.

CONTROL STATION COMBINER TYPES

The two types of Control Station Combiners are "Standard" and "Short Haul". The standard models are essentially hybrid combiners and their insertion loss, on both transmit and receive, correlates well with similarly sized, high power hybrid combiners.

Short haul combiners are designed for applications where the control stations and repeaters are in relatively close proximity to each other. These models have a significantly higher insertion loss. Short haul combiners, however, require no duplexer and have a single antenna output connector for both transmit and receive.

APPLICATIONS

As tower and rooftop antenna locations are generally limited, it becomes impractical to dedicate an antenna to each individual control station. Using individual antennas generally results in less than optimum isolation between the various stations. The control station combiner allows combining of the control station radios while maintaining a high degree of RF isolation, 60 dB minimum TX – TX and TX - RX, between them.

The standard CSC has a single input port for each station and separate TX and RX output ports. The TX and RX output ports may be combined onto a single antenna through the use of an appropriate duplexer, or separate antennas may be used. When separate antennas are used, it is generally beneficial to incorporate some bandpass filtering in each antenna line (TX and RX) to improve the T-R isolation.

DESIGN CONSIDERATIONS

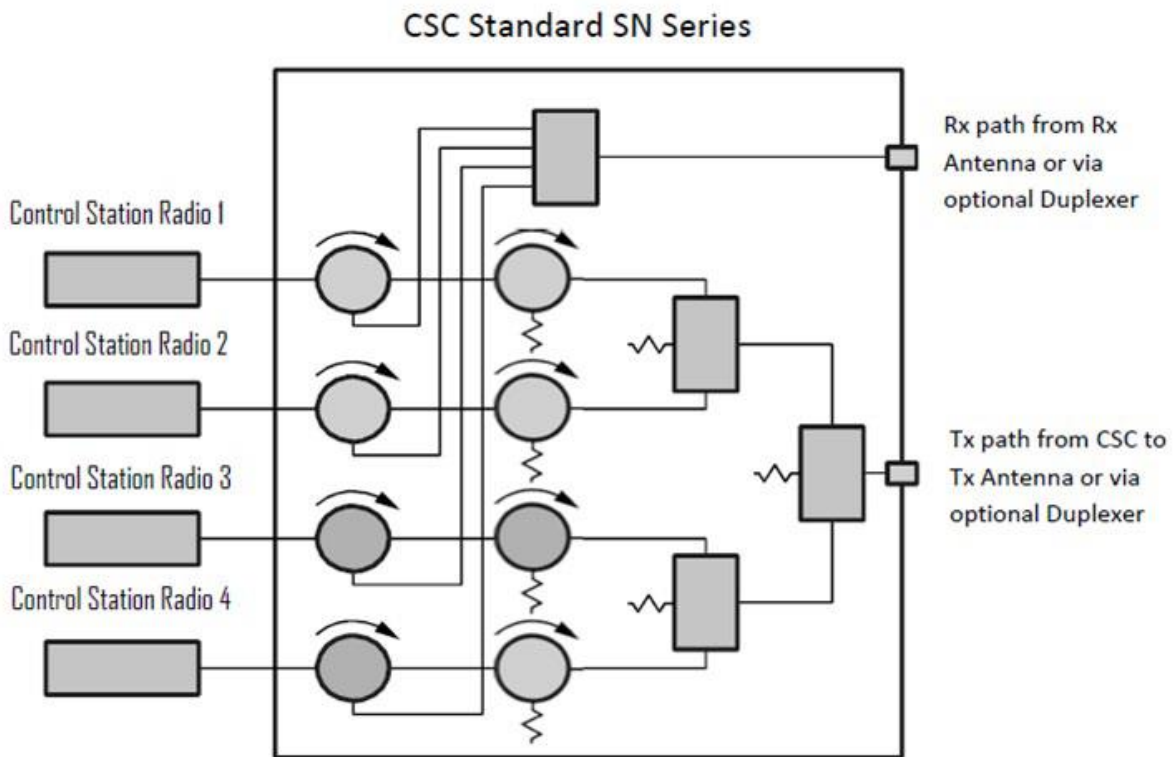
A key design consideration when implementing control station combiners is the overall system link analysis. The link analysis evaluates the overall gains and losses between the control point and the repeater site. A complete analysis will confirm the received level of the control station at the repeater receiver and the received level of the repeater transmitter at the control station receiver. Sufficient level, along with a comfortable design margin, must be obtained in order to guarantee system reliability. The Motorola link analysis spreadsheet is found in Appendix “A”.

As with any transmit combiner or receiver multicoupler, a thorough IM analysis needs to be performed to ensure that the control stations and any other on-site transmitters do not produce any IM products which could degrade any on-site receivers. This is especially important at control points where there are control stations for multiple repeater systems.

TECHNICAL DESCRIPTIONS

STANDARD CONTROL STATION COMBINER

As previously mentioned, the standard control station combiner is essentially a hybrid combiner on the transmit side. On the receive side, the RX Antenna port is routed to a splitter which then feeds each control station. A functional block diagram for a four port combiner is shown below:



In the transmit direction, each control station feeds into two circulators and then onto a -3 dB hybrid coupler. The output from the two hybrids is then fed to a final -3 dB hybrid and then out to the TX antenna port. The circulators and hybrid couplers provide the TX to TX isolation between the input ports of the combiner. TX to TX isolation is specified as 60 dB.

In the receive direction, the incoming signals are routed to a 4-way (-6 dB) splitter. The outputs of the splitter are then fed to the third port of the first circulator for each input port. Since the RF applied to the third port “rotates” in a clockwise direction, it exits the first circulator towards the control station with minimal loss.

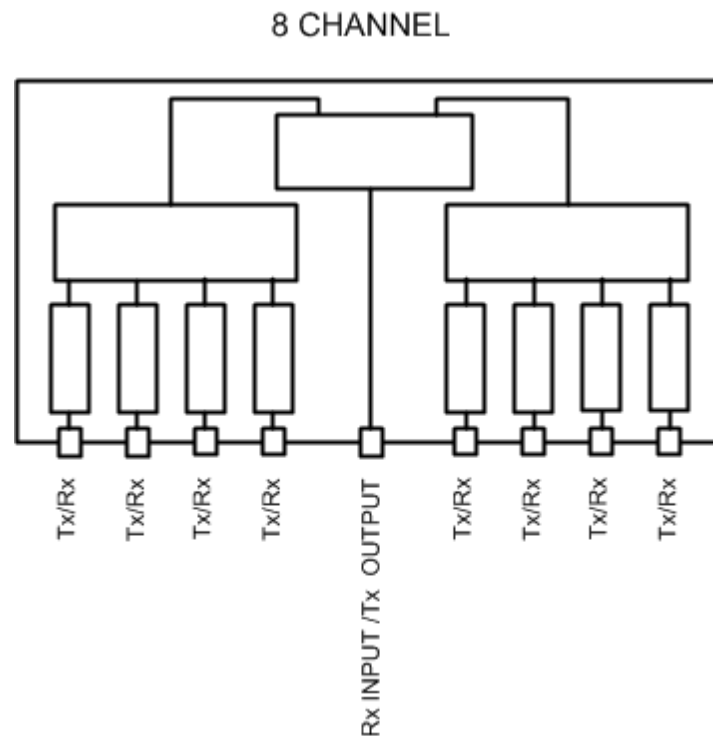
With this configuration, the TX to RX isolation is essentially equal to the insertion loss of the RX splitter plus the TX insertion loss of the combiner and the external TX to RX antenna isolation. The external isolation is the determining factor. Since antenna isolation is difficult to achieve,

these control station combiners are generally used with external duplexers connected to the TX and RX ports and then to a single, common antenna. If two antennas are to be used, filtering should be used on both the TX and RX antenna lines to improve the TX to RX isolation and minimize the amount of extraneous RF appearing at the control station receiver inputs. The goal is to minimize any desensitization of a control station receiver by a control station transmitter.

As the number of control stations increases, multiple CSC's can be combined to achieve the desired number of ports, up to 32. Note that the insertion losses increase as the number of ports increases. Typical losses, excluding any external duplexer or filtering, vary from 8 dB for a 4 port combiner to 18 dB for a 32 port combiner. Note that these combiners are band and sub-band specific due to bandwidth limitations on the circulators. Models exist to cover the LMR bands and sub-bands where necessary. See CSC specifications in Appendix "B".

SHORT HAUL CONTROL STATION COMBINER

In applications where the control stations are located relatively close to the associated repeater sites, a cost effective option may be to utilize a Short Haul Control Station Combiner. These units utilize resistive pads and splitters / combiners and are therefore broadband in nature. The Short Haul combiners have an operating frequency range of 40 – 960 MHz and can therefore be used to combine control stations from multiple bands. Due to their design, they are extremely lossy in both the transmit and receive directions ($27.5 \text{ dB} \pm 1.5 \text{ dB}$ for 4 ports to $38.5 \text{ dB} \pm 2.5 \text{ dB}$ for 32 ports). With a single antenna port, no duplexer is required.



The isolation between the control station ports is specified as 60 dB minimum.

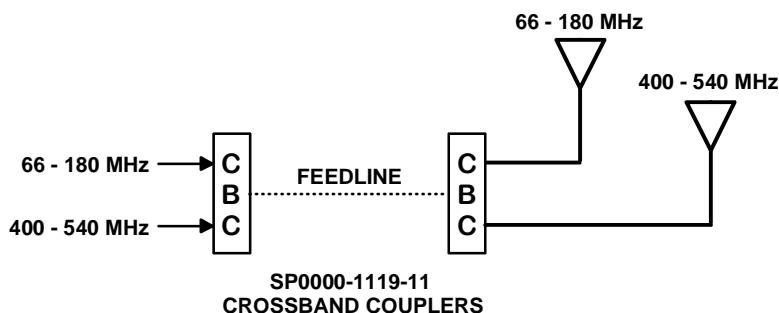
Since these can be used in multi-band applications, an IM study is critical to ensure that there are no significant mix products which fall on any of the control station receive frequencies.

Note also that the Short Haul combiner can handle simplex stations using the same frequency for both transmit and receive. See Short Haul CSC specifications in Appendix "C".

CUSTOM APPLICATIONS

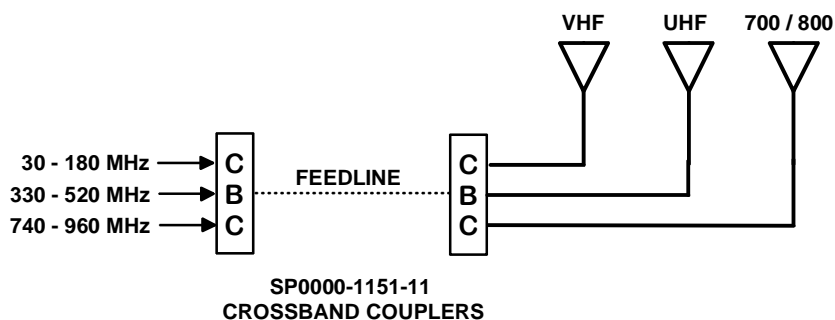
MULTI-BAND OPERATION

As previously mentioned, the standard models are band specific. That, however, does not preclude the interconnection of multiple combiners on separate bands to save on feedline and installation costs. Through the use of crossband couplers, multiple bands can be combined onto a feedline at the base and then split out to multiple antennas on the tower or rooftop. Several examples of crossband coupling are illustrated here:



In the above example, VHF and UHF can be combined onto a single feedline using the specified crossband couplers.

In the following example, VHF, UHF and 700/800 MHz are combined onto a single feedline:



Using other couplers, most combinations of frequency bands can be achieved. Specifications for a number of couplers are contained in Appendix D.

Specifications for a number of available duplexers for standard Control Station Combiners are contained in Appendix E.

For custom applications, please contact Technical Support / Applications Engineering at:

RFI Americas
2023 Case Parkway
Twinsburg, OH 44087
(330) 486-0706
www.rfiamericas.com

CONTROL STATION COMBINER DESIGN GUIDE

APPENDIX “A”

LINK ANALYSIS

The link analysis is the critical factor which determines which type of combiner, standard or short haul, is applicable to a particular situation. The more accurate the analysis, the more reliable the system performance will be.

Information required for the link analysis includes:

- Distance between the repeater site(s) and the control station location
- Output power into the repeater transmit antenna line
- Repeater transmit feedline loss
- Repeater transmit antenna gain
- Repeater receive antenna gain
- Receive antenna system reserve gain (discussed later)
- Desired receive level at repeater receiver
- Control station antenna gain
- Control station antenna feedline loss
- Control station duplexer loss (if equipped)
- Control station transmit power
- Desired receive level at control station receiver
- "Blockage" loss between control station and repeater for non line of sight paths
- Desired system design margin
- Control Station Combiner loss

All of the above parameters are utilized in the Motorola Control Station Combiner design spreadsheet along with all required Motorola design margins and signal level requirements. Control stations are selected via drop-down menus by model and frequency band. The control station combiner models are also selected via drop down menus and both standard and short haul models are included so that both types can be evaluated for a given system.

RFI Americas technical support can assist you with navigating the program. Sample screen shots are on the following pages.

Control_Station_Combiner_v5.0.0 - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins

Clipboard Font Alignment Number Styles Cells Editing

C9 CSC Location

Control Station Combiner Design Sheet v5.0.0

Infrastructure Site Setup

Distance Calculation Type

CSC Location Latitude Longitude

Tower Site Locations

	Latitude	Longitude	Distance
Tower 1			Mi
Tower 2			Mi
Tower 3			Mi
Tower 4			Mi
Tower 5			Mi
Tower 6			Mi

NOTE: Accepted coordinate Formats: +/- D0.D0000

Locations CSC Site Tower Sites Revision History Part Cross Reference

MAIN PAGE

Control_Station_Combiner_v5.0.0 - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins

Normal Page Layout Custom Views Full Screen Ruler Formula Bar Gridlines Headings Zoom 100% Zoom to Selection New Window Arrange All Freeze Panes Split View Side by Side Synchronous Scrolling Save Workspace Switch Windows Macros

D6

Control Station Combiner Design Sheet v5.0.0

System Configuration Specifications

System Band

System Modulation

Receiver C/N

Control Station Specifications

Control Station

Transmit Power

Receiver Sensitivity

Receiver Noise Floor

Control Station Combiner Specifications

Control Station Combiner

Number of Ports

TX Insertion Loss

RX Insertion Loss

Internal Port Isolation

Control Station Antenna Setup

TX/RX Antenna Gain dB

TX/RX Cable Loss dB

Calculate

RX Antenna Gain dB

RX Cable Loss dB

Calculate

Duplexer/Triplexer Duplexer Insertion Loss dB

Triband Coupler

Use Antenna Isolation

Antenna Separation

Antenna Separation Orientation

Calculated Antenna Isolation dB

Measured Antenna Isolation dB

Total External Isolation dB

Degradation Values

Good	Average	Bad	Band
<=1	1 to 2	>2	800/700
<=3	3 to 6	>6	UHF (380 to 520)
<=5	5 to 10	>10	VHF (136 to 175)

System Calculations

Total System Isolation dB

TX Power at Other Ports dB

CSC ERP dBm

CSC ERS dBm

Fade Margin dB

Conversion Factor (3rd Order) dB

TX IM ERP (3rd Order) dBm

Control Station Location Definition

CSC Antenna Height ft

CSC Site Elevation ft

Locations CSC Site Tower Sites Revision History Part Cross Reference

CSC SITE PAGE

Control Station Combiner v5.0.0 - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins

Normal Page Layout Page Break Preview Custom Views Full Screen

Workbook Views

Gridlines Headings Show

Zoom 100% Zoom to Selection

New Window Arrange All Freeze Panes

Split View Side by Side Synchronous Scrolling Reset Window Position

Save Workspace Switch Windows

Macros

D13

Control Station Combiner Design Sheet v5.0.0

Infrastructure Site Setup

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Site Name	Tower 1	Tower 2	Tower 3	Tower 4	Tower 5	Tower 6
Infrastructure Antenna Height						
Infrastructure Tower Elevation						
Use Free Space or Path Loss						
Distance to CSC Site						
Radio Horizon						
Free Space Loss (Calculated)						
Path Loss (Hydra)						
Path Loss (Measured)						
CSC Power At INF Receiver						
INF Power at CSC Location						
Power into CSC (Calculated)						
Power into CSC (Measured)						
Transmitter ERP						
Receive Antenna Gain						
Infrastructure RX Cable Loss						
Infrastructure RX Reserve Gain						
Infrastructure ERS						
Site Receiver Noise Floor						

Degradation Values

Good	Fair	Bad	Band
<=1	1 to 2	>2	800/700
<=3	3 to 6	>6	UHF (380 to 520)
<=5	5 to 10	>10	VHF (136 to 175)

Locations CSC Site Tower Sites Revision History Part Cross Reference

Ready

TOWER SITES AND RESULTS SUMMARY PAGE

CONTROL STATION COMBINER DESIGN GUIDE

APPENDIX “B”

STANDARD CSC SUMMARY SPECIFICATIONS

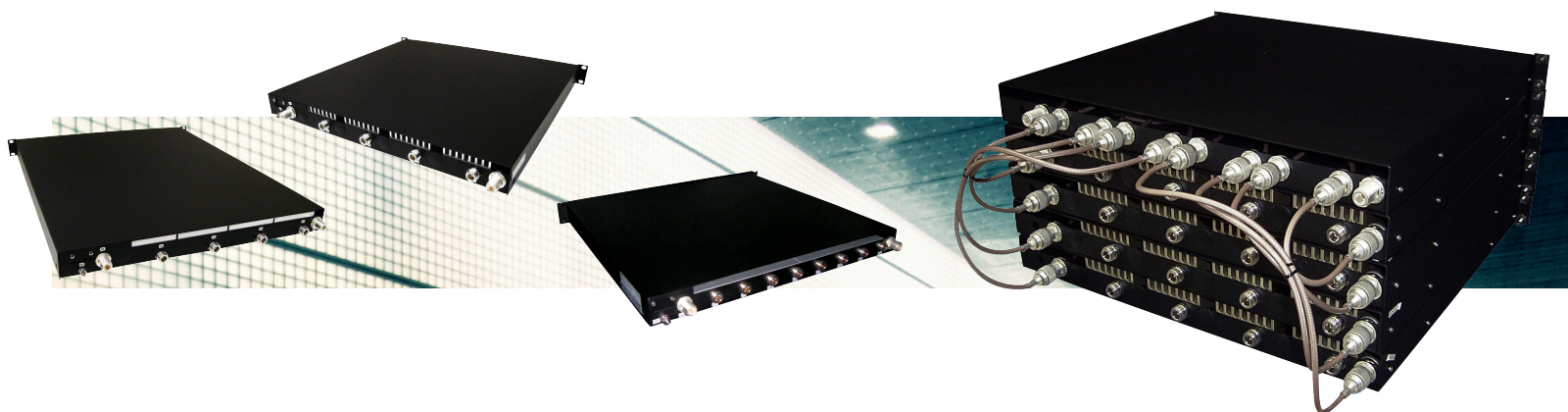
Control Station Combiner

Standard SN Series

132 - 869 MHz



Model Number						CS1517-xx05-SN					CS3845-xx05-SN					CS4552-xx05-SN					CS7486-xx05-SN							
Model number derivative	04	08	12	16	32	04	08	12	16	32	04	08	12	16	32	04	08	12	16	32	04	08	12	16	24	32		
Number of channels	4	8	12	16	32	4	8	12	16	32	4	8	12	16	32	4	8	12	16	32	4	8	12	16	24	32		
Frequency range	132-150MHz					150-174MHz					380-450MHz					450-520MHz					746-869MHz							
Minimum Tx to Tx frequency separation between channels	0MHz																											
Input power per channel <i>(maximum)</i>	50W																											
Insertion Loss <i>(typical +/-1dB)</i>	8dB	11dB	14dB	14dB	18dB	8dB	11dB	14dB	14dB	18dB	8dB	11.5dB	14dB	14dB	17dB	8dB	11.5dB	14dB	14dB	17dB	8.5dB	11.5dB	15dB	15dB	18.5dB	18.5dB		
Antenna to Tx Isolation <i>(typical)</i>	55dB																											
Tx to Tx Isolation <i>(typical)</i>	60dB																											
Tx to Rx Isolation <i>(typical)</i>	60dB																											
Input port Return Loss / VSWR	>14dB / <1.5:1																											
Impedance	50 Ohm																											
Termination connectors	N (F)																											
Finish	Painted Black																											
Depth	22.12"										17.8"										16.5"							
Total 19 inch Rack Units <i>(height)</i>	1RU	3RU	4RU	5RU	11RU	1RU	3RU	4RU	5RU	11RU	1RU	3RU	4RU	5RU	11RU	1RU	3RU	4RU	5RU	11RU	1RU	1RU	3RU	3RU	4RU	5RU		
Temperature Range	14°F to 122° F																											



RFI

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CONTROL STATION COMBINER DESIGN GUIDE

APPENDIX “C”

SHORT HAUL CSC SUMMARY SPECIFICATIONS

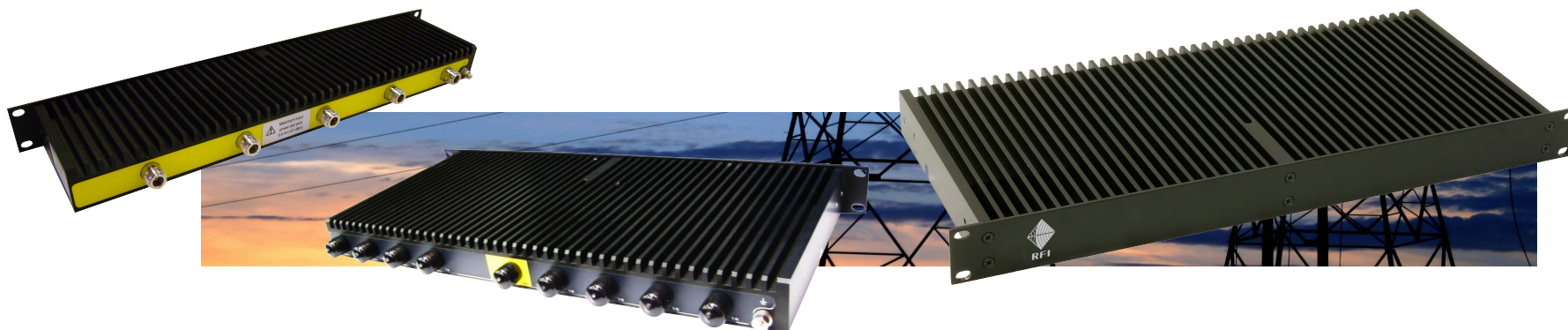
Control Station Combiner

Broad Band Series

40 - 960 MHz



Model Number	CS0496-0405-31	CS0496-0805-31	CS0496-1605-31	CS0496-2405-31	CS0496-3205-31
Channel Capacity	1-4	1-8	1-16	1-24	1-32
Frequency Range	40-960MHz				
Insertion Loss T/R to Antenna Port (<i>typical</i>)	27.5dB +/- 1.5dB	31dB +/- 1.5dB	35dB +/- 2.5dB	38.5dB +/- 2.5dB	38.5dB +/- 2.5dB
Antenna Port to T/R Port Isolation (<i>typical</i>)	27.5dB	31dB	35dB	38.5dB	38.5dB +/- 2.5dB
T/R Port to T/R Port Isolation	> 60dB				
T/R Port Return Loss	> 20dB				
Antenna Port Return Loss	> 14dB				
Input power rating per channel (<i>maximum</i>)	50W (note1)				
Temperature range - operational (<i>operational</i>)	-22° to +122°F				
RF Termination Connectors	N (F)				
Depth Dimensions mm / inches - Approx (<i>excl conn</i>)	4"	8.5"			
Rack Unit Height requirement	1RU	1RU	2RU	4RU	5RU
Weight kg / lbs (<i>approx</i>)	6.6lbs	11.66lbs	23.9lbs	42lbs	53.7lbs
Grounding	M6 Eath Stud				



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CONTROL STATION COMBINER DESIGN GUIDE

APPENDIX “D”

CROSSBAND COUPLERS

Crossband Couplers

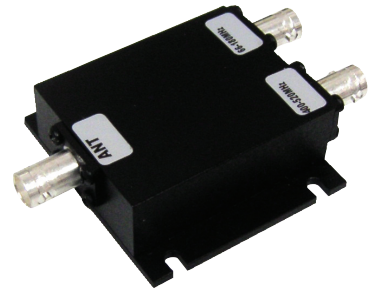
50-520 / 746-2500MHz

SP0000-1123-11



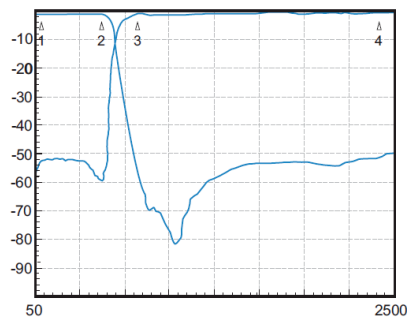
These crossband couplers are ideal for low and medium power applications requiring VHF, FM Broadcast or UHF signals to be combined with 700/800/900MHz radio, Cellular or WLAN frequencies. Typical applications include the combining or separating of signals for use with signal distribution systems including Bi-Directional Amplifiers (BDAs) and Radiating Cable systems.

These models feature small size, low insertion loss, high isolation between bands and excellent temperature stability. Silver-plated connectors are utilised to improve multi-carrier Passive Intermodulation (PIM) performance. Models are available to suit other frequency band combinations, or to provide "cascaded" combining of multiple frequency bands from 50MHz to 2500MHz thereby providing for the combining or separation of VHF, UHF, Cellular and WLAN services.



Features:

- Compact Package Size
- Ideal for Radiating Cable Systems
- Suits Mobile Applications
- Rugged Construction Style



Electrical

Model Number	SP0000-1123-11
Frequency <i>MHz</i>	50-520 / 750-2500
Insertion Loss <i>dB</i>	<0.6 (typ)
Return Loss <i>dB</i>	>20
Isolation <i>dB</i>	>50
Power Rating <i>W</i>	50
Impedance Ω	50

Mechanical

Construction		Milled aluminium, painted black
Dimensions <i>mm/ inches</i>	H	23 / 1
	W	95 / 3.7
	L	118 / 4.6
Weight <i>kg/lb</i>		0.5 / 1.1
Connectors		Silver plated N female
Temperature		-20 to +60°C / -4 to +140°F

Crossband Couplers

60-110 / 140-180 MHz

SP0000-1121-11



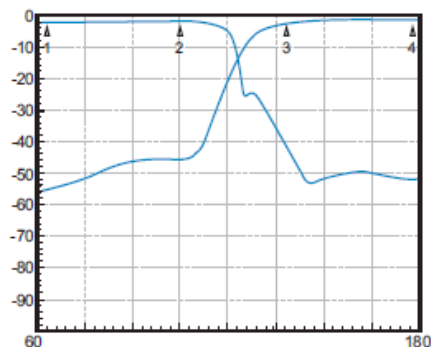
These crossband couplers are ideal for low and medium power applications requiring 66-88MHz or FM Broadcast 88-108MHz to be combined with VHF Hiband 144-174MHz. Typical applications include the combining or separating of signals for use with dual-band mobile radios or antennas, or for signal distribution systems including Bi-Directional Amplifiers (BDAs) and Radiating Cable systems.

These models feature small size, low insertion loss, high isolation between bands and excellent temperature stability. Silver-plated connectors are utilised to improve multi-carrier Passive Intermodulation (PIM) performance. Models are available to suit other frequency band combinations, or to provide "cascaded" combining of multiple frequency bands from 60MHz to 2500MHz thereby providing for the combining or separation of VHF, UHF, Cellular and WLAN services.



Features:

- Compact Package Size
- Ideal for Radiating Cable Systems
- Suits Mobile Applications
- Rugged Construction Style



Electrical

Model Number	SP0000-1121-11
Frequency <i>MHz</i>	60-110/140-180
Insertion Loss <i>dB</i>	<0.6 (typ)
Return Loss <i>dB</i>	>20
Isolation <i>dB</i>	>40
Power Rating <i>W</i>	50
Impedance Ω	50

Mechanical

Construction		Milled aluminium, painted black
Dimensions <i>mm/ inches</i>	H	23 / 1
	W	105.5 / 4.1
	L	78.5 / 3
Weight <i>kg/lb</i>		0.35 / 0.77
Connectors		Silver plated N female
Temperature		-20 to +60°C / -4 to +140°F

UHF Crossband Couplers

66-180 / 400-540 MHz

SP0000-1119-11



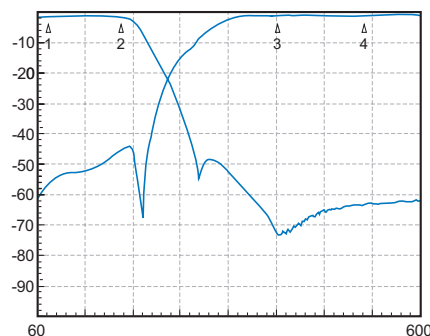
These crossband couplers are ideal for low and medium power applications requiring 66-88MHz, FM Broadcast 88-108MHz or VHF Hiband 132-174MHz to be combined with UHF. Typical applications include the combining or separating of signals for use with dual-band mobile radios or antennas, or for signal distribution systems including Bi-Directional Amplifiers (BDAs) and Radiating Cable systems.

These models feature small size, low insertion loss, high isolation between bands and excellent temperature stability. Silver-plated connectors are utilised to improve multi-carrier Passive Intermodulation (PIM) performance. Models are available to suit other frequency band combinations, or to provide "cascaded" combining of multiple frequency bands from 60MHz to 2500MHz thereby providing for the combining or separation of VHF, UHF, Cellular and WLAN services.



Features:

- Compact Package Size
- Ideal for Radiating Cable Systems
- Suits Mobile Applications
- Rugged Construction Style



Electrical

Model Number	SP0000-1119-11
Frequency <i>MHz</i>	60-180/400-540
Insertion Loss <i>dB</i>	<0.3 (typ)
Return Loss <i>dB</i>	>20
Isolation <i>dB</i>	>40
Power Rating <i>W</i>	50
Impedance Ω	50

Mechanical

Construction		Milled aluminium, painted black
Dimensions <i>mm/ inches</i>	H	23 / 1
	W	65 / 2.6
	L	65 / 2.6
Weight <i>kg/lb</i>		0.3 / 0.66
Connectors		Silver plated N female (optional BNC Female)
Temperature		-20 to +60°C / -4 to +140°F

Cross-Band Coupler

Tri-band / Triplexer

30-180MHz / 330-520MHz / 740-960MHz

SP0000-1151-11



The three banded compact cross-band coupler provides low insertion loss and high port-to-port isolation for the desired VHF, UHF and 7/8/900MHz frequency bands. Designed for indoor and outdoor use, the cross-band coupler is provided with stainless steel mounting brackets suitable for either flat surface or pole mounting requirements. Suited for use where a single feeder cable is required to connect to banded antennas or coupling onto a single coaxial feeder in multi-banded systems.

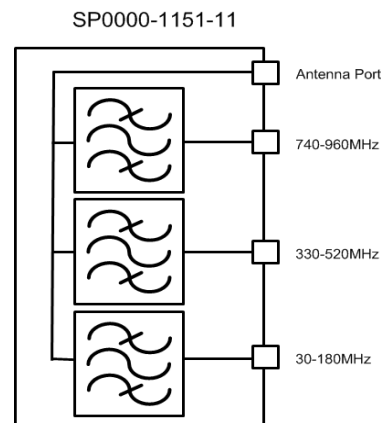
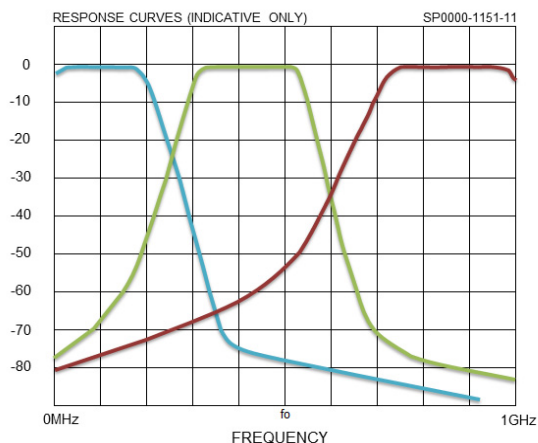
Features:

- Covers full VHF, UHF and 7/8/900MHz commercial bands
- Provided with wall or pole mount stainless steel mounting bracket
- 30W (CW) power rating per frequency banded port
- Low insertion loss across respective pass bands
- > 45dB isolation across ports
- Suitable for both indoor and outdoor environments - IP66



Specifications

Model Number	SP0000-1151-11			
Type	Cross-Band Coupler / Triplexer			
Ports	ANT	1	2	3
Frequency Range	30-960MHz	30-180MHz	330-520MHz	740-960MHz
Pass Bandwidth	930MHz	150MHz	190MHz	220MHz
Insertion Loss	$\leq 1.2\text{dB}$	$\leq 1.2\text{dB}$	$\leq 1.2\text{dB}$	$\leq 1.2\text{dB}$
Pass Band Ripple	$\leq 0.8\text{dB}$	$\leq 0.8\text{dB}$	$\leq 0.8\text{dB}$	$\leq 0.8\text{dB}$
Stop Band attenuation	N/A	$\geq 45\text{dB@ } 330\text{-}960\text{MHz}$	$\geq 45\text{dB@ } 30\text{-}180\text{MHz}$ $\geq 45\text{dB@ } 740\text{-}960\text{MHz}$	$\geq 45\text{dB@ } 30\text{-}520\text{MHz}$
Power rating (CW)	18dB / 1.29:1	30W	30W	30W
Return Loss	$\geq 18\text{dB}$			
Impedance	50 Ω			
Environmental protection	IP66			
Termination Connectors	N (F)			
Mounting	Pole or Wall (flat surface)			
Finish	Painted Black with S/S Mounting Bracket			
Cross-band coupler dimensions (excl connectors and brkt)	H 182mm (7.2") x W 127mm (5") x D 20mm (1.2")			
Weight - approx (including mounting brackets)	1.3kg / 2.9lbs			
Temperature Range	-30 to + 60deg C / -22 to + 140deg F			

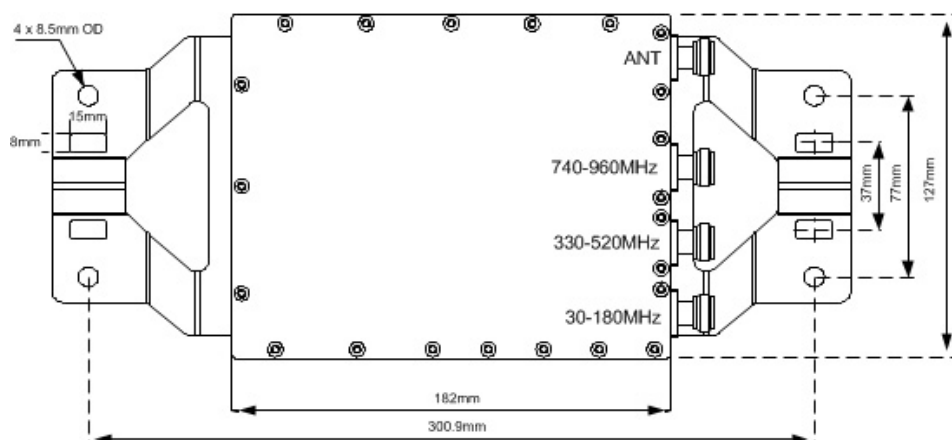


Cross-Band Coupler

Tri-band / Triplexer

30-180MHz / 330-520MHz / 740-960MHz

SP0000-1151-11



Mechanical mounting dimensions

Ordering Information	Description
SP0000-1151-11	Cross-Band Coupler, Tri-band 30-180MHz/330-520MHz/740-960MHz, 30W N(F)

CONTROL STATION COMBINER DESIGN GUIDE

APPENDIX “E”

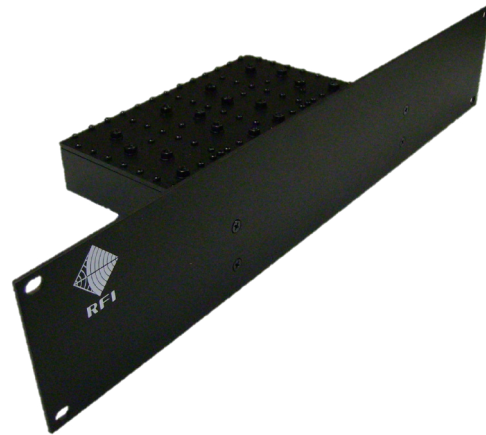
DUPLEXERS (700/800 MHz)

Contact RFI Americas for VHF and UHF duplexers

RFI's range of compact multi-resonator milled aluminium band pass duplexers are ideal for use where space is restricted or at a premium. The relatively broad pass band characteristic, good duplex port to port isolation, high power and multi-carrier capability make these ideal duplexers for either single carrier or combined multicarrier systems. The temperature stable resonators provide a wide operational temperature range ensuring important electrical specifications such as insertion loss and Tx port to Rx port isolation are maintained.

Features:

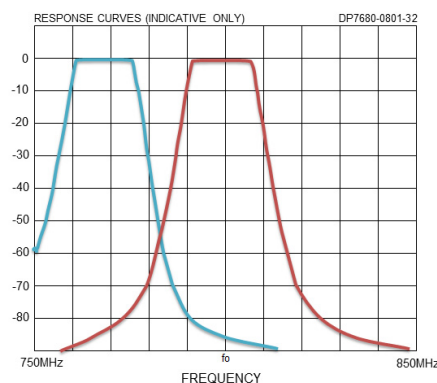
- 14MHz Pass Band low & high ports
- 30MHz Tx to Rx duplex split
- 100W (CW) Power rating
- Low insertion loss and pass band ripple
- 100W (CW) per port power rating
- 2RU 19" Rack mount front panel
- Compact temperature stable design



Specifications

Model Number	DP7680-0801-32
Type	Band Pass
Frequency range - Low Pass Port	762-776MHz
Frequency range - High Pass Port	792-806MHz
Pass Band - High and Low Ports	14MHz
Tx to Rx Separation	30MHz
Low & High Pass Port Insertion Loss - typical.	≤1.5dB
Low & High Pass Port - ripple	≤0.4dB
Port to Port Isolation - typical	≥80dB
Input Power (single carrier CW) - max	100W*
Impedance	50Ω
Return Loss / VSWR	≥19dB / ≤1.25:1
Termination Connectors	N (F)
Mounting Option	2RU 19" Rack mount front panel
Finish	Painted Black
Duplexer only dimensions (mm/inches excl connectors)	H 45 (1.7") x W 124 (4.9") x D 153 (6.0")
Duplexer with panel dimensions (mm/inches excl connectors)	H 89 (3.5") x W 483 (19") x D 156 (6.14")
Weight - approx	1.9kg / 4.18lbs
Temperature Range	-30° to +60° C / -22° to +140° F

* Please refer to RFI for multi-carrier power ratings



Ordering Information	Description
DP7680-0801-32	Duplexer B.P 762-806MHz 14MHz PB, 30MHz T/R, 100W, 2RU

RFI's range of compact multi-resonator milled aluminium band pass duplexers are ideal for use where space is restricted or at a premium. The relatively broad pass band characteristic, good duplex port to port isolation, high power and multi-carrier capability make these ideal duplexers for either single carrier or combined multicarrier systems. The temperature stable resonators provide a wide operational temperature range ensuring important electrical specifications such as insertion loss and Tx port to Rx port isolation are maintained.

Features:

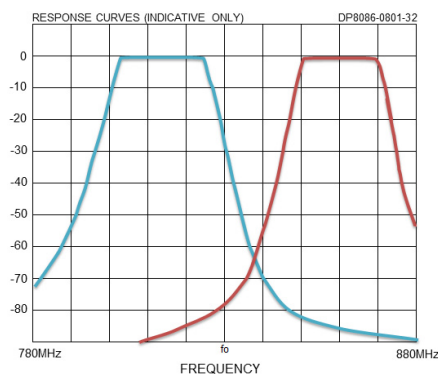
- 18MHz Pass Band low & high ports
- 45MHz Tx to Rx duplex split
- 100W (CW) Power rating
- Low insertion loss and pass band ripple
- 2RU 19" Rack mount front panel
- Compact temperature stable design



Specifications

Model Number	DP8086-0801-32
Type	Band Pass
Frequency range - Low Pass Port	806-824MHz
Frequency range - High Pass Port	851-869MHz
Pass Band - High and Low Ports	18MHz
Tx to Rx Separation	45MHz
Low & High Pass Port Insertion Loss - typical.	≤ 1.5dB
Low & High Pass Port - ripple	≤ 0.4dB
Port to Port Isolation - typical	≥ 80dB
Input Power (single carrier CW) - max	100W*
Impedance	50Ω
Return Loss / VSWR	≥ 19dB / ≤ 1.25:1
Termination Connectors	N (F)
Mounting Option	2RU 19" Rack mount front panel
Finish	Painted Black
Duplexer only dimensions (mm/inches excl connectors)	H 45 (1.7") x W 124 (4.9") x D 153 (6.0")
Duplexer with panel dimensions (mm/inches excl connectors)	H 89 (3.5") x W 483 (19") x D 156 (6.14")
Weight - approx	1.9kg / 4.18lbs
Temperature Range	-30° to +60° C / -22° to +140° F

* Please refer to RFI for multi-carrier power ratings



Ordering Information	Description
DP8086-0801-32	Duplexer B.P 806-869MHz 18MHz PB, 45MHz T/R, 100W, 2RU

Triplexer

1 + 1 Port Dual Pass Band

762-776 / 851-869, 792-824MHz

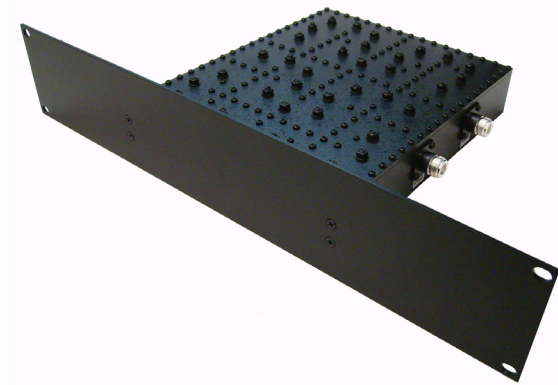
DP767985-0801-32



RFI's range of compact multi-resonator aluminium triplexers are ideal for use where space is restricted or at a premium. The pass bands are designed for specific applications or markets where low insertion loss and ripple with excellent port to port isolation characteristics provide ideal solutions for multi-band systems. The power rating and multi-carrier capability make these Triplexers ideal for either single carrier or combined multi-carrier systems. The temperature stable resonators provide a wide operational temperature range.

Features:

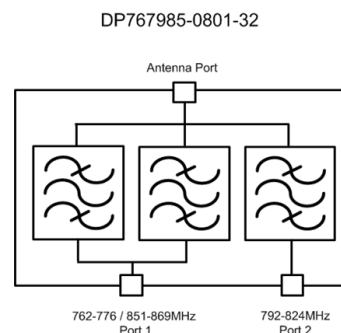
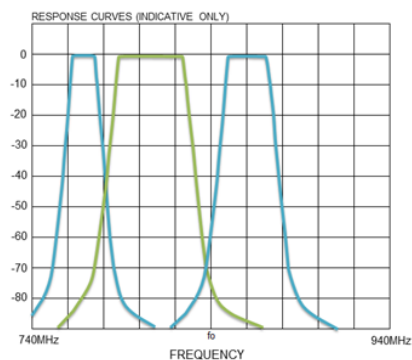
- 2 Port Triplexer - 3 Pass Bands
- 1.5dB Insertion Loss (typical, all pass bands)
- Low pass band insertion loss ripple
- >70dB Port 1 to Port 2 Isolation
- 100W (CW) per port power rating
- Compact temperature stable design
- 2RU 19" Rack mount front panel



Specifications

Model Number	DP767985-0801-32
Type	Triplexer
Port 1 Pass Bands	762-776MHz / 851-869MHz
Port 2 Pass Band	792-824MHz
Port 1 Insertion Loss - typical	≤ 1.5dB
Port 2 Insertion Loss - typical	≤ 1.5dB
Port 1 & Port 2 Pass band ripple - typical	≤ 0.5dB
Port 1 to Port 2 Isolation - typical	≥ 70dB
Input Power (single carrier CW) - max per port	100W*
Impedance	50Ω
Return Loss / VSWR - all ports	≥ 19 dB / ≤ 1.25:1
Termination Connectors	N (F)
Mounting	2RU 19" Rack Mount Front Panel
Finish	Painted Black
Triplexer only dimensions (mm/inches excl connectors)	H 65 (2.5") x W 207 (8.15") x D 260 (10.23")
Triplexer with 2RU panel dimensions (mm/inches excl connectors)	H 89 (3.5") x W 483 (19") x D 263 (10.35")
Weight - approx	3.6kg / 7.92lbs
Temperature Range	-30° to +60° C / -22° to +140° F

* Please refer to RFI for multi-carrier power ratings



Ordering Information	Description
DP767985-0801-32	Triplexer 762-776/851-869MHz, 792-824MHz PB, 100W, N (F) 2RU