

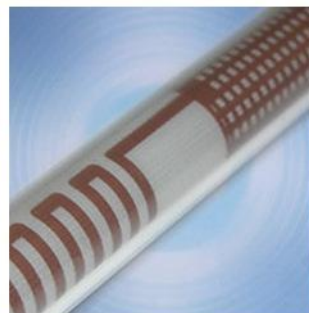


# User's Manual

CONTROL STATION COMBINER  
Standard SN Series  
VHF, UHF and 746-869MHz.



Document Number: INS40962-1



## Company Overview

RFI has been serving the needs of the wireless communications market for over 30 years. First founded in 1979 as a manufacturer of antenna systems, RFI has grown to be a key player in the development, manufacturing and distribution of wireless technology and energy products.

Today RFI is Australia's leading privately owned communications equipment vendor with a highly skilled workforce in excess of 200 employees internationally.

The cornerstones of the success of the company over such a sustained period of time are two fundamental business objectives:

“Retain our existing customers and attract new customers with superior service offered with trust, respect, creativity, integrity and a clear conscience”

“Provide a strong and supportive employment environment whilst remaining environmentally sensitive in all aspects of our business”

These underpinning objectives have driven a company wide team culture of loyalty and respect among not only our staff but our long term customer base.

RFI operates from 5 state offices across Australia as well as offices in New Zealand, the UK, and North America delivering specialist RF communications services to the following sectors;

- Public Safety
- Land Mobile Radio
- Cellular Infrastructure
- Mining and Industrial

RFI's capabilities include the design and manufacture of both active and passive communications equipment, distribution of in excess of 6000 product lines and the design and installation of both solar photovoltaic electricity generation systems and in-building communications systems for both industry and government.

With the continued dynamic leadership, investment in our people and drive to be the best in our chosen fields, RFI will remain at the forefront of this continually evolving and fast paced industry.



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## General Description

RFI's range of Standard SN Series Control Station Combiners combine shared Tx output / Rx input (T/R) ports from control station radios separating them into two separate RF paths which can be terminated via a band pass duplexer to a single antenna or alternatively connected to separate receiver and transmitter antennas.

Where only a single antenna is the preferred option, a band pass duplexer couples the Rx input and Tx output from the CSC providing the required additional Tx to Rx isolation. Where separate Tx and Rx antennas are required and the separation between the two antennas does not provide sufficient Tx to Rx isolation, optional band pass filters in both the Tx and Rx paths can be used.

The CSC provides predictable co-located control station transceiver to transceiver isolation and frequency agility.

Compatible with both analog and digital communication systems the CSC is modular in construction providing easy expansion accommodating from 4 up to 32 channels.

Designed for 19 inch rack mounting, these units are compact and robust maximizing heat dissipation for relatively high per channel duty cycles.

Primarily used to reduce the number of antennas and manage co-location interference on a communications site, the Standard SN Series CSC uses no active amplification in either the transmit or receive paths.

The Control Station Combiner significantly reduces tower clutter and removes the need to find adequate space on an antenna mounting platform such as a tower or roof-top and hence reduce wind loading considerations, as well as greatly simplify coaxial feeder cabling installations at control center facilities.

General Electrical Specifications for the CSC Standard SN version are listed in **Table 1**. The rear view of a typical 4Ch CSC Standard SN Series unit is shown in **Figure 1** with the corresponding interconnect drawing shown in **Figure 2**.

A functional block diagram for a 4Ch CSC Standard SN version is illustrated in **Figure 3**. The CSC interfaces the single antenna port of the control station radio to a separate transmit or receive antenna depending on the control stations active mode of operation at the time.

During receive operation the CSC will provide a path from the receive antenna via the pre-selector filter to the control station radio as illustrated in **Figure 4**. During transmit operation the CSC will provide a path from the control station radio to the transmit antenna via the post filter as illustrated in **Figure 5**. Both paths are provided without switching.

The transmit signal path through the CSC includes a circulator, isolator, and hybrid coupler. The circulator couples signals in a circular fashion. It is a three port device that couples signals from the first port (connected to control station radio) to the second port which is connected to transmit antenna. The next stage is an isolator which is used to dissipate any reflected transmit energy from the antenna/filter or duplexer. The hybrid couplers are then used to combine all of the control station transmit signals into a single TX port.

Receive signals from the RX antenna via the pre-selector filter or duplexer are fed into a splitter network, then routed to the third respective port of each channels circulator. The circulator allows signals applied to the third port (connected to receive antenna) to circulate to the first port which in turn is connected to the control station radio with little insertion loss.

Models are available in several bands including; 132 to 150 MHz, 150 to 174 MHz, 380 to 450 MHz, 450 to 520MHz, and 746 to 869MHz. Within each band standard configurations of either 4, 8, 12, 16, or 32 channel capacities are available. There is also a 24 channel configuration available in the 746 to 869 MHz band.

**Table 2** lists all of the models available as well as their insertion loss and required rack height. For ease of installation the CSC is constructed in modular shelves of 1 RU each.

## General Electrical Specifications – Standard SN Series

Minimum Tx to Tx Frequency Separation (MHz)	0MHz
Transmit RF Power (per channel)	50Watts
TX - TX Isolation (typical)	60dB
Antenna - TX Isolation (typical)	55dB
TX - RX Isolation (typical)	60dB
RX - RX Isolation (typical)	60dB
Return Loss (typical)	> 14dB
Operating Temperature	14 to 122°F / -10 ~ +50°C
Termination Connectors	N (Female)

**Table 1**

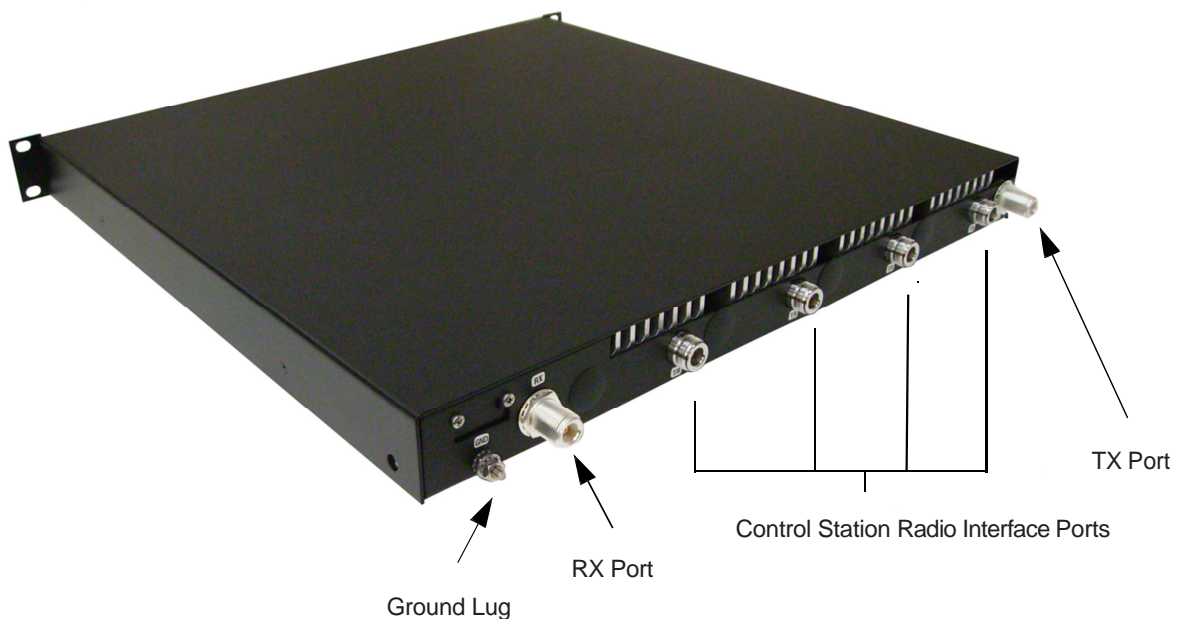
### Unpacking

The Control Station Combiner is packaged and shipped after factory final-testing and QA inspection. On receipt of the product, inspect and report any visible damage to the delivery carrier immediately. It is the customer's responsibility to file damage claims with the carrier within a short period of time after delivery.

Factory test results are packaged with the unit and should be retained by the customer for future reference.

### Installation

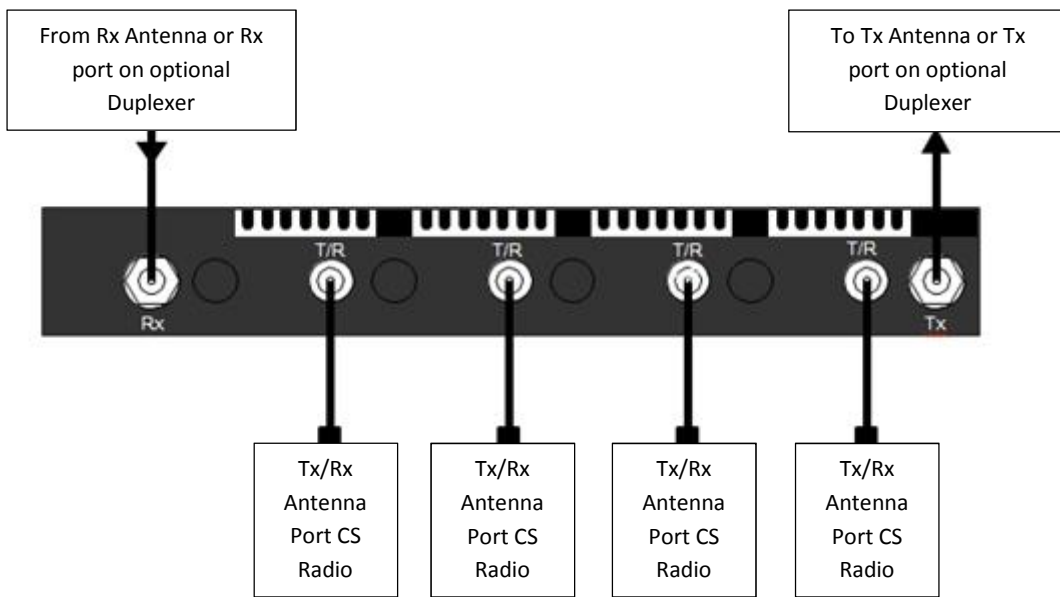
The system is designed to be mounted in a standard EIA 19" rack. Due to the weight of the individual units, it is recommended to support the rear of each unit. A pair of rear support brackets are provided for this purpose. Interconnect diagrams for the VHF and UHF 8, 12, 16, and 32 channel configurations are shown in **Figures 6 and 7**. Interconnect diagrams for 746 to 869 MHz systems are shown in **Figures 8 thru 10**.



**Figure 1:**

Rear view of the VHF or UHF 4 channel CSC Standard SN Series





**Figure 2:**

Typical port connections VHF or UHF 4 channel CSC Standard SN Series.

After fitting the respective 1RU shelf (or shelves depending on the number of channels) into the 19" rack frame or cabinet the control station radios can be connected directly to the respective Tx/Rx input ports on the CSC. We recommend the use of either a braided double shield or solid sheathed low loss 50 Ohm coaxial cable for connection to the control station radios and connecting to the respective Rx and Tx ports of the CSC via the filters/duplexer from the antenna/s. All the RF coaxial termination ports provided on the CSC are of the N female type and therefore N male gender connectors will be needed for the coaxial cables. For optimized performance all RF coaxial feeder cables should be kept as short as possible. All coaxial cables used to interconnect more than one shelf in multi-channel configurations are supplied with the CSC shelves.

Please refer to the connectivity illustrations further in this User's Manual for channel connectivity required for more than a single 4 or 8Ch 1RU unit

Ensure that the optional duplexer or band pass filters are suited to the required Tx and Rx frequency spans.

Although its not functionally important to terminate any un-used Tx/Rx ports with 50Ohm termination loads, this is considered good practice.

When making any measurements requiring disconnection of the cabling to the CSC or removal of the termination connectors to the CSC for inspection and maintenance purposes, it is important to disable the control station radios to prevent transmissions that may result in control station radio damage.

It is important to note the maximum power rating of the Tx/Rx input ports and ensure that this is not exceeded.



Model Number	Description	I.L. (typ)	Height	Installation Diagram
CS1315-0405-SN	132-150 MHz, 4 Channel	8 dB	1 RU	Figure 2
CS1315-0805-SN	132-150 MHz, 8 Channel	11 dB	3 RU	Figure 6
CS1315-1205-SN	132-150 MHz, 12 Channel	14 dB	4 RU	Figure 6
CS1315-1605-SN	132-150 MHz, 16 Channel	14 dB	5 RU	Figure 6
CS1315-3205-SN	132-150 MHz, 32 Channel	18 dB	11 RU	Figure 7
CS1517-0405-SN	150 - 174 MHz, 4 Channel	8 dB	1 RU	Figure 2
CS1517-0805-SN	150 - 174 MHz, 8 Channel	11 dB	3 RU	Figure 6
CS1517-1205-SN	150 - 174 MHz, 12 Channel	14 dB	4 RU	Figure 6
CS1517-1605-SN	150 - 174 MHz, 16 Channel	14 dB	5 RU	Figure 6
CS1517-3205-SN	150 - 174 MHz, 32 Channel	18 dB	11 RU	Figure 7
CS3845-0405-SN	380 - 450 MHz, 4 Channel	8 dB	1 RU	Figure 2
CS3845-0805-SN	380 - 450 MHz, 8 Channel	11.5 dB	3 RU	Figure 6
CS3845-1205-SN	380 - 450 MHz, 12 Channel	14 dB	4 RU	Figure 6
CS3845-1605-SN	380 - 450 MHz, 16 Channel	14 dB	5 RU	Figure 6
CS3845-3205-SN	380 - 450 MHz, 32 Channel	17 dB	11 RU	Figure 7
CS4552-0405-SN	450 - 520 MHz, 4 Channel	8 dB	1 RU	Figure 2
CS4552-0805-SN	450 - 520 MHz, 8 Channel	11.5 dB	3 RU	Figure 6
CS4552-1205-SN	450 - 520 MHz, 12 Channel	14 dB	4 RU	Figure 6
CS4552-1605-SN	450 - 520 MHz, 16 Channel	14 dB	5 RU	Figure 6
CS4552-3205-SN	450 - 520 MHz, 32 Channel	17 dB	11 RU	Figure 7
CS7486-0405-SN	746 - 869 MHz, 4 Channel	8.5 dB	1 RU	Figure 8
CS7486-0805-SN	746 - 869 MHz, 8 Channel	11.5 dB	1 RU	Figure 8
CS7486-1205-SN	746 - 869 MHz, 12 Channel	15 dB	3 RU	Figure 9
CS7486-1605-SN	746 - 869 MHz, 16 Channel	15 dB	3 RU	Figure 9
CS7496-2405-SN	746 - 869 MHz, 24 Channel	15 dB	4 RU	Figure 10
CS7496-3205-SN	746 - 869 MHz, 32 Channel	18.5 dB	5 RU	Figure 10
<b>Table 2: Control Station Combiner, Standard SN Series Models</b>				

### Operation

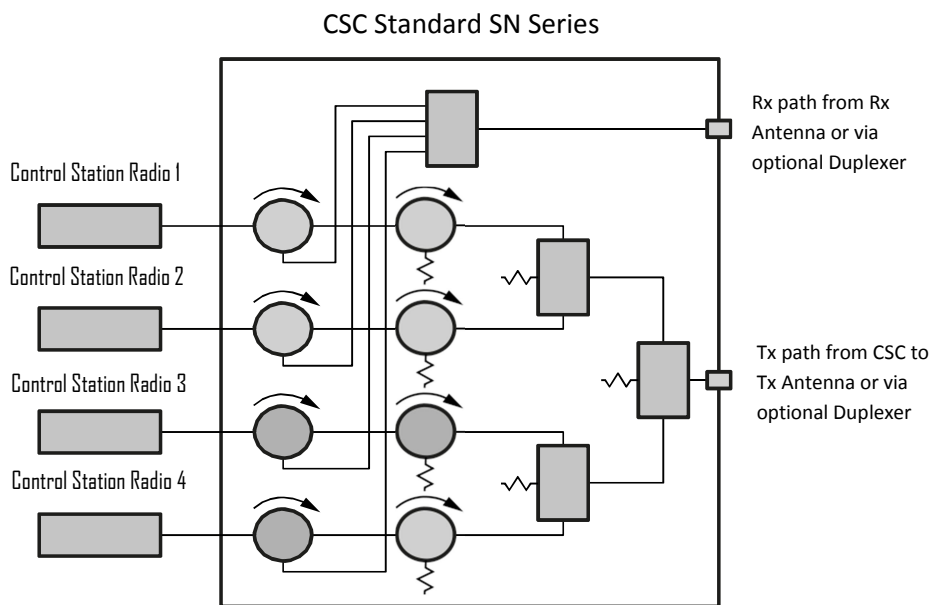
After connecting the control stations and filters/ duplexer and antennas the system is ready for operation.

The combiner is a passive device requiring no AC or DC external power.

### Maintenance

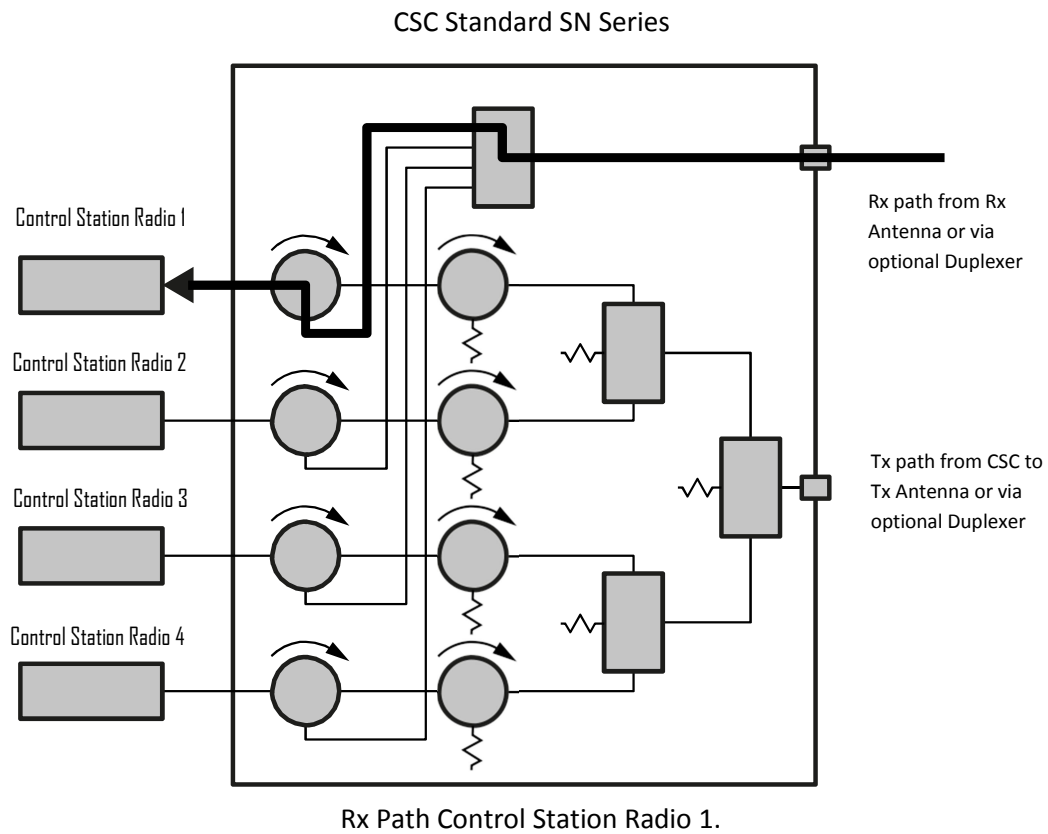
No special or periodic maintenance is required for the combiner. This is a passive device of rugged mechanical and electrical design. Check for loose or corroded connectors on the interconnect cables whenever an inspection is performed on other station equipment. Remove any dust or debris and insure adequate air flow around the unit.

Because the combiner is a passive, and non-tunable device, field repairs are not required. Field repair is limited to the replacement or repair of damaged cables. Failure of the unit is usually due to excessive transmit power levels or lightning damage. Damaged units should be returned to the factory for repair.

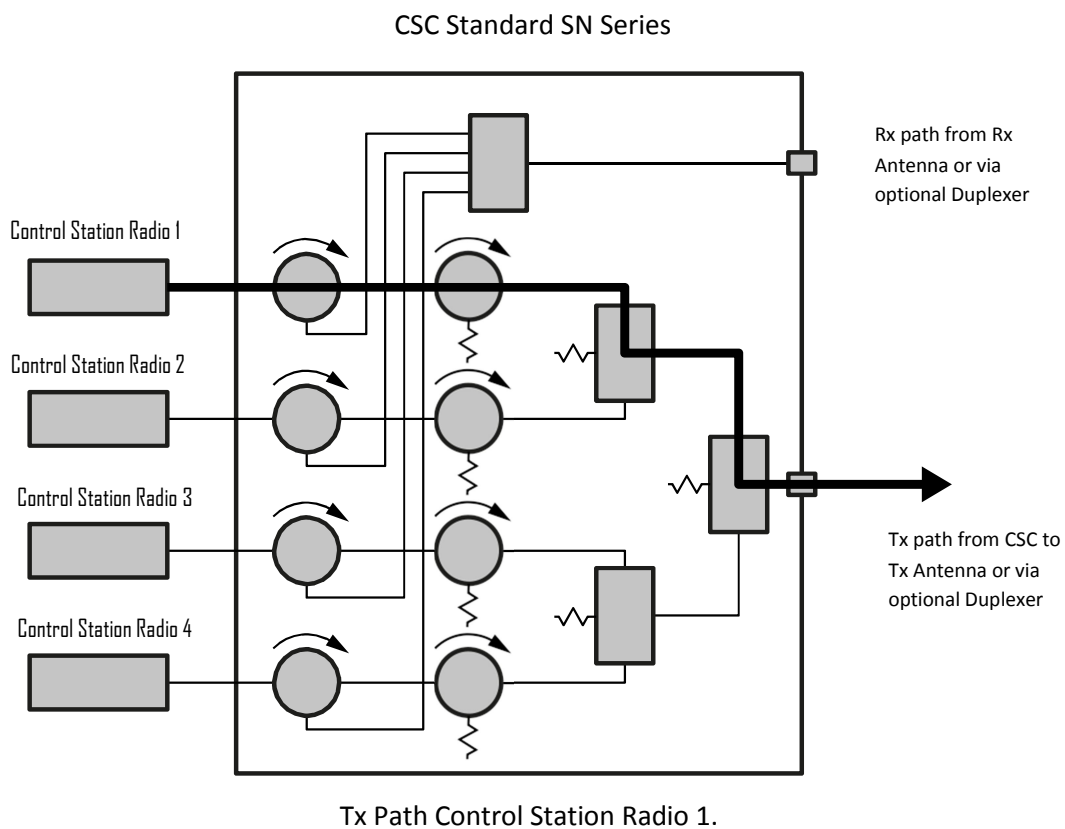


**Figure 3:**

Functional block diagram example; 4Ch CSC Standard SN Series.

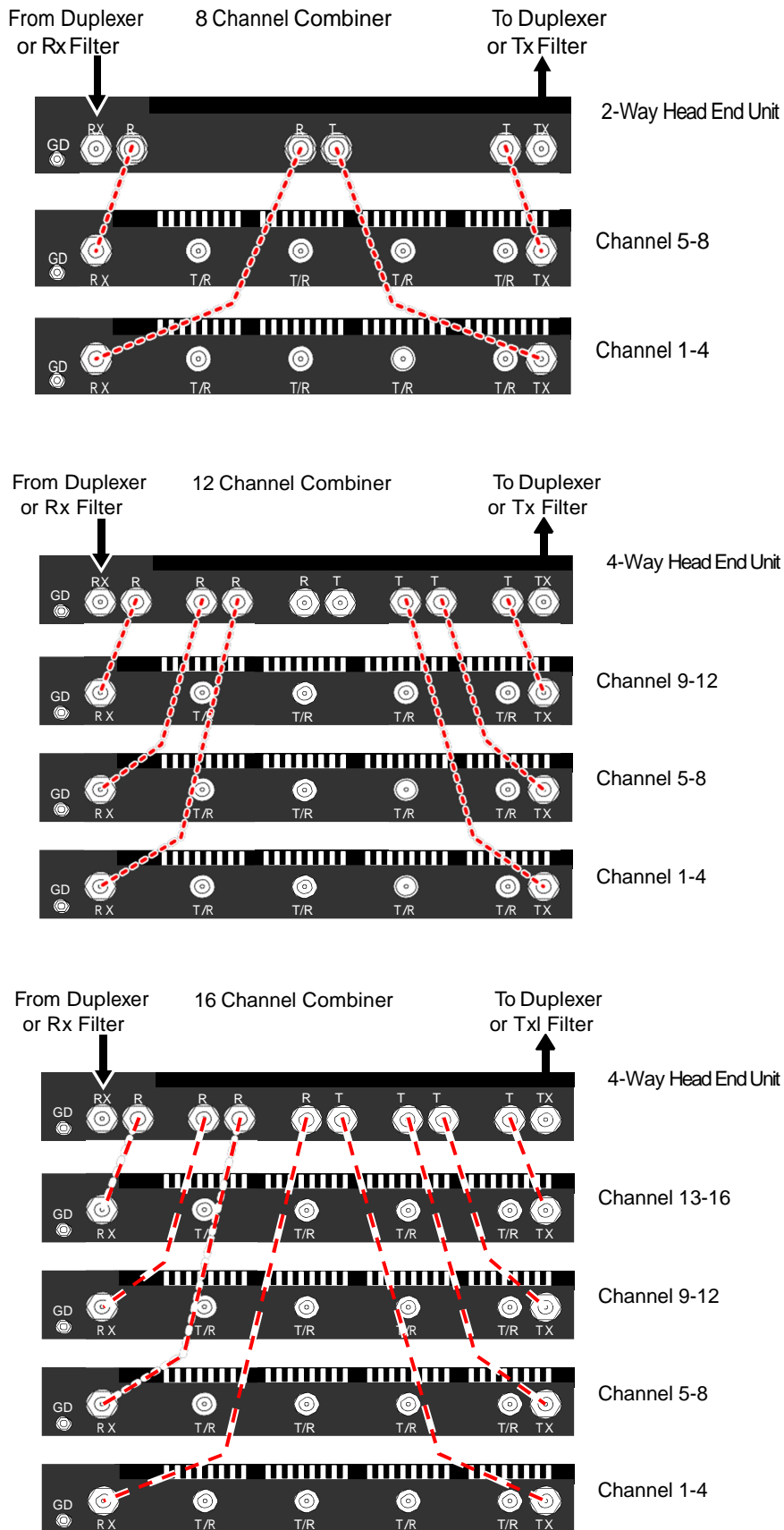


**Figure 4:**



**Figure 5:**

**Interconnect diagrams for VHF and UHF 8, 12, 16 & 32Ch Control Station Combiners, Standard SN Series.**



**Figure 6**

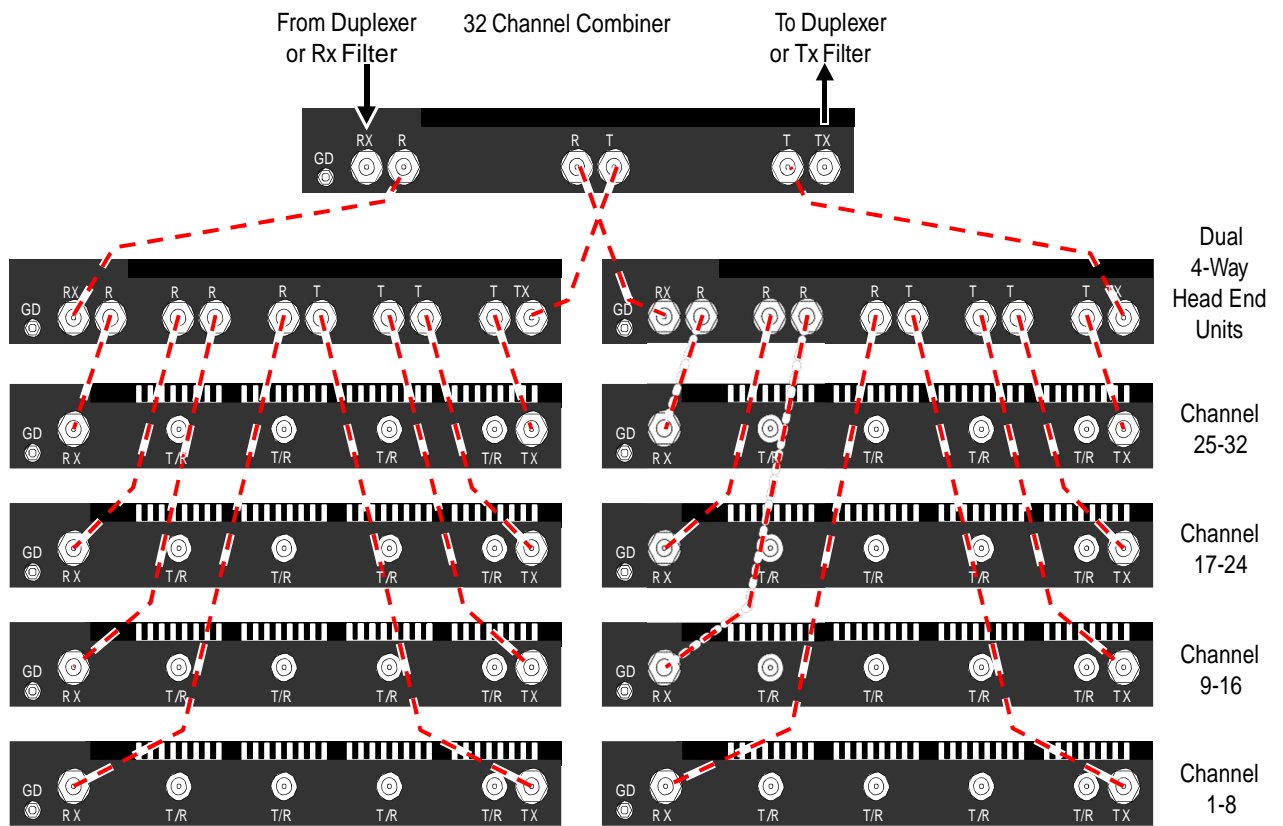


Figure 7

**Interconnect diagrams for 746-869MHz 4, 8, 12, 16, 24 & 32Ch Control Station Combiners, Standard SN Series**

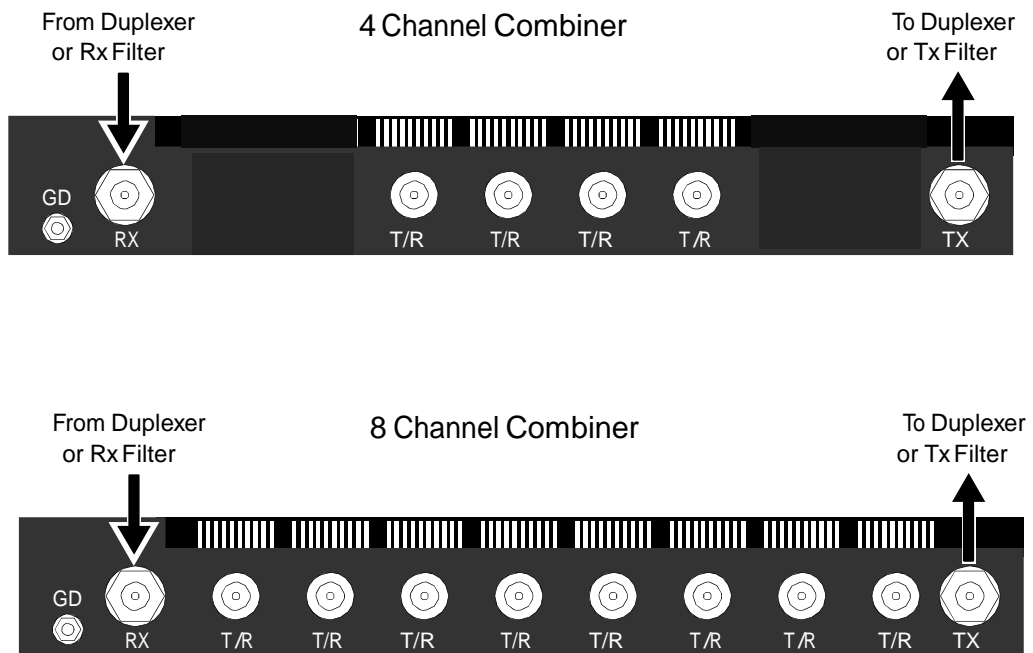
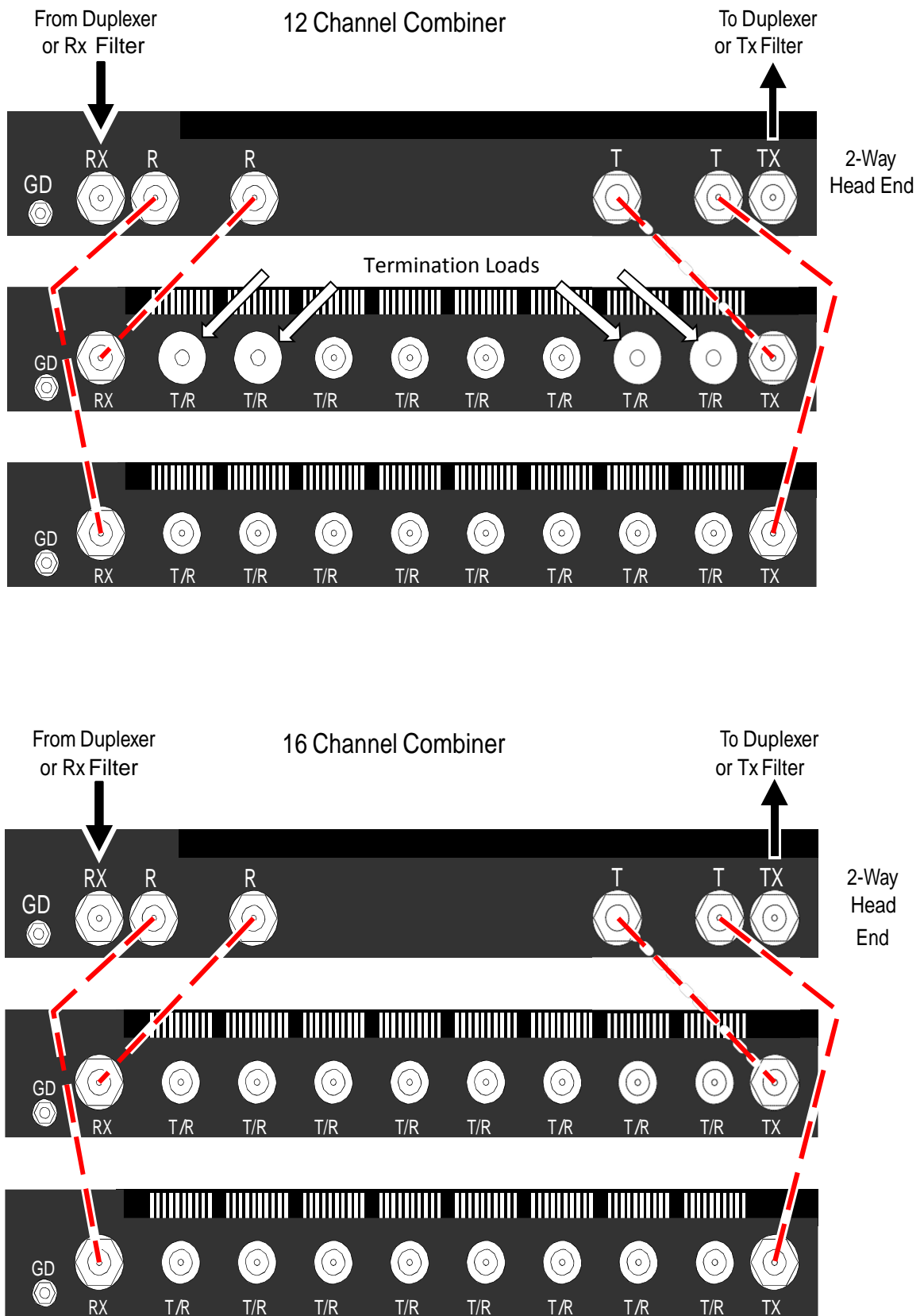


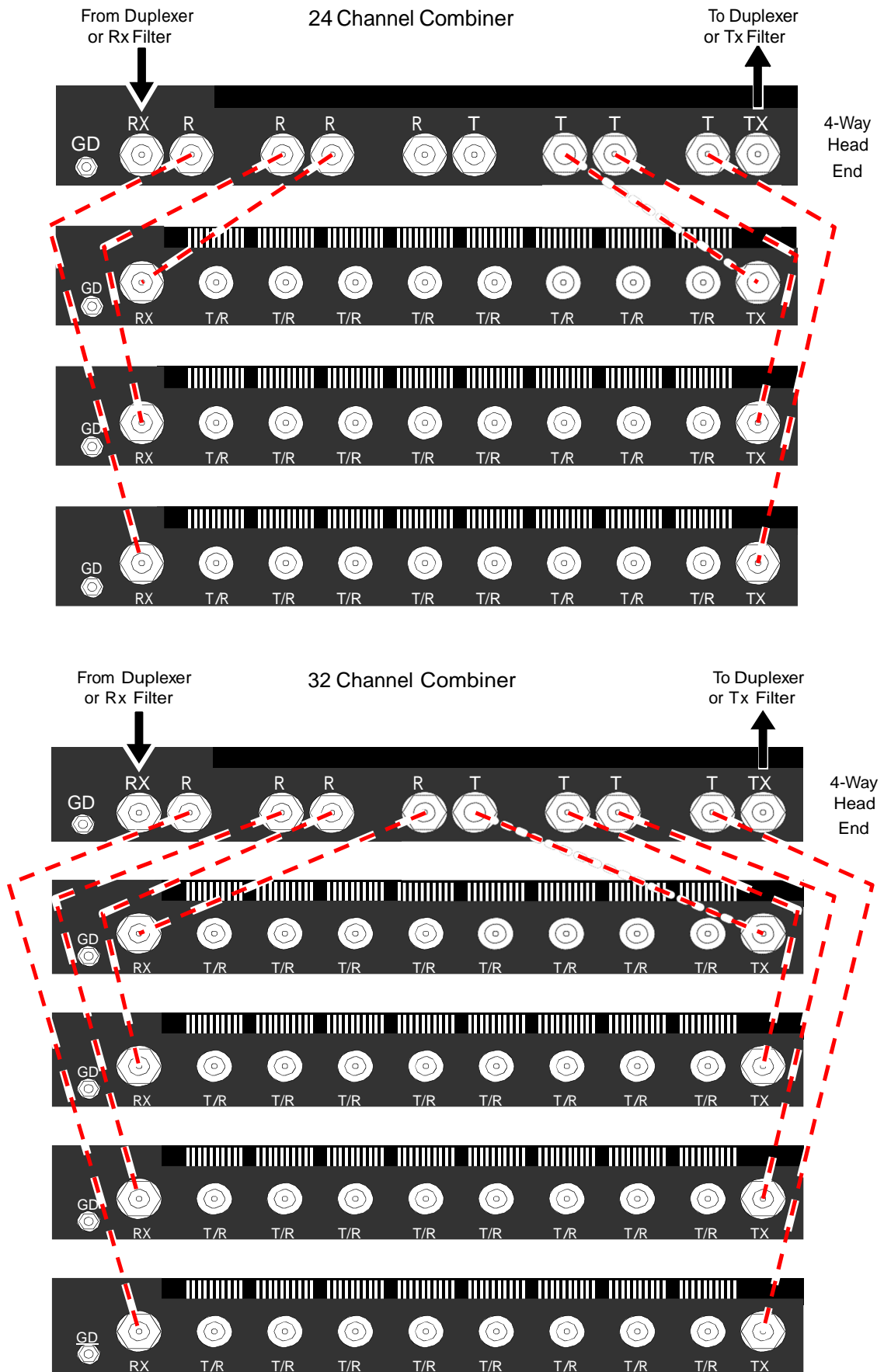
Figure 8:

Interconnect diagrams for 4 and 8 channel (746 to 869MHz) CSC Standard SN Series.



**Figure 9:**

Interconnect diagrams for 12 and 16 channel (746 to 869MHz) CSC Standard SN Series.



**Figure 10:**  
Interconnect diagrams for 24 and 32 channel (746 to 869MHz) CSC Standard SN Series.



**Notes:**



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