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## **Public Safety/Municipal 800 MHz City Wide Radio System Project Proposal**

**Prepared for:**

**Gia Shaw  
Public Safety Communications Manager  
Margate Fire Department  
1835 Banks Road  
Margate, Florida 33063  
Office: 954-935-5427  
Mobile: 954-803-3947**

**Prepared by:**

**Jonathan Franklin,  
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Signal Communications, LLC,  
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**December 29, 2022  
Updated January 13, 2023**

**This proposal valid for 30 Days**

## Introduction

This Scope of Work (SOW) and Proposal describes the products and services requested by Gia Shaw of The City of Margate (Customer) to provide a public safety/municipal 800 MHz city wide radio system.

This SOW outlines the tasks to be performed by Signal Communications LLC (Signal) and by the Customer.

## Overview

The purpose of this project is to install a seven (7) channel Motorola 800 MHz radio and antenna system at the Customer's tower located at Fire Station 18 located at 5785 Park Dr, Margate, FL 33063. This project will include all hardware, software and professional services needed to document, permit, install, optimize and deploy the system in its entirety, subject to the details below.

## Signal's Scope of Work Details

All equipment and services listed will be provided

### PROFESSIONAL SERVICES

- Produce signed, sealed construction drawings (CDs) for permitting
- Detailed tower survey and structural analysis as is required for permitting (see Appendix 1 below)
- Permitting services for County and City as required (AHJ permit fees NOT included and will be bill at cost plus 15% if paid by Signal)
- Installation and grounding of all equipment at tower equipment shelter
- Tower climb and required tower materials/equipment and tower installation services
- Complete system optimization
- Coordinate and attend all inspections
- Complete system project management
- Provide system specific customer training (train the trainer)
- Post installation, third party, independent R56 audit and report

### FIXED END EQUIPMENT

- Seven (7) Motorola SLR8000, 100 watt, 100% continuous duty cycle repeaters
- Custom transmit combiner and receive multicoupler antenna system (see Appendix 2 below)
- Two (2) 9db omni directional tower mounted antennas and mounting hardware
- Required transmission line, connectors,
- Equipment racks with cable management system
- Lightning protection and grounding hardware for R56 installation
- Motorola APX radio accessories as requested and listed below

### **Customer's Responsibilities Details (IF NOT SPECIFICALLY PROVIDED ABOVE)**

- Provide grounding for fixed end equipment within 6 feet of equipment racks
- Any modification or replacement of original building permits after initial permit is issued
- Provide acceptable working hours for installation crew
- Provide access to all required areas for installation crew during agreed upon working hours (any lost time due to access issues is billed at \$150.00 per man hour)
- Assist with negotiation of any site leases or access with third parties if required

### **Other Assumptions**

- **This proposal is contingent on a permit being issued by the AHJ or any other governing agency required for the project to be started and completed**
- Pricing and installation for all trades is subject to change if the Authority Having Jurisdiction (AHJ) or any other governing agency changes their requirements
- System installation will begin when all equipment has been received, all required equipment/site tests have been performed, permits have been issued, and site leases/access have been finalized
- Any substitute equipment must be submitted via official change order and be approved by Signal
- The project will be considered completed at final permit closure or beneficial use of the system, whichever comes first

- Performance bond or similar not included
- Prevailing wage and certified payroll not included
- Cost of insurance beyond Signal's current limits is not included
- After hours, weekend or night work is not included
- Assumes that Signal Communications crews will be allowed at least an 8 hour uninterrupted work day for each visit on site
- **Sales tax or any other fees or taxes are not included unless specially listed, to be billed on final invoice**

### **Here's why you should work with Signal Communications on this project:**

- Signal has been successfully designing, installing and deploying systems of this type for over 3 decades, working closely with public safety agencies and municipalities
- Signal's long standing relationships with leading industry manufacturers such as Motorola, Tessco, dbSpectra and others, along with local "boots on the ground" radio frequency (RF) engineers, technicians and installation professionals is the specific combination of resources needed for projects of this complexity
- Signal has been in business for 32 years, since 1991, by making sure projects like this deploy properly and technically correct
- Great customer references are available at your request

### **Pricing:**

<b>CATEGORY</b>	<b>DESCRIPTION</b>	<b>PRICE</b>
FCC Licensing	\$16,985.00 has already been invested by Margate in this project to date for all associated 800 MHz FCC licensing services including acquiring additional 800 frequencies, relocation of all frequencies to Station 18 and a required construction notice deadline extension	\$ 0.00

Permitting Services	Signed, Sealed Construction Drawings, Tower Survey, Permit Acquisition	\$38,667.00
Equipment	Fixed End Equipment, 7 Motorola SLR8000 Repeaters BSO/Broward Contract Price \$9,102.00 each	\$63,714.00
Equipment	Other Fixed End Equipment, Custom Antenna System, Transmission Line, Connectors, Lightning and Grounding Protection	\$79,369.00
Installation Services	All Fixed End Equipment and Tower Climb	\$76,680.00
R56 Audit	Third Party Post Installation Audit	\$ 4,700.00
APX Portable Radio Accessory	Qty 50, NAR6595A 1/4 wave antennas BSO/Broward Contract Price \$24.12 each	\$ 1,206.00
APX Portable Radio Accessory	Qty 5, NNTN8897A, Multi Unit Chargers BSO/Broward Contract Price \$914.76 each	\$ 4,573.80
APX Portable Radio Accessory	Qty 100, PMNN4486A Batteries BSO/Broward Contract Price \$144.97 each	\$14,497.00
<b>Total:</b>		<b>\$283,406.80</b>

### Warranty and Support Pricing:

The Motorola SLR8000 repeaters ship with a 5 year Motorola repair depot warranty but includes no on site support. Signal recommends one of the on site support agreements below:

Option 1: Monday - Friday, 8am - 5pm same or next business day on site support. Covers all repairs and maintenance other than physical damage or acts of God. Tower climbs are not included. \$13,850.00 per year.

Option 2: 24/7/365 same day on site support. Covers all repairs and maintenance other than physical damage or acts of God. Tower climbs are not included. \$16,850.00 per year.

## Payment Terms

50% with Purchase Order or Notice to Proceed, 30% prior to mobilization, 20% at completion of installation or beneficial use, whichever is first.

Customer Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Signal Signature: \_\_\_\_\_ *Jonathan Franklin* \_\_\_\_\_ Date: \_\_1/13/23\_\_



# MOTOTRBO™ SLR 8000 BASE STATION / REPEATER



**For better safety and efficiency throughout your organization, you need reliable voice and data communications that connect everyone and everything. The MOTOTRBO SLR 8000 repeater delivers high performance, high reliability two-way radio service, optimised for your workplace.**

The SLR 8000 is engineered for high performance, reliability and flexibility and represents the next generation in repeaters.

Versatile and powerful, MOTOTRBO combines the best of two-way radio functionality with the latest digital technology. It integrates voice and data seamlessly, offers advanced features that are easy to use and delivers increased capacity to meet your communication needs from the field to the factory floor.

Whether you need the simplicity of a single site conventional system, the coverage of IP Site Connect, or the powerful trunking capabilities of Capacity Plus, Capacity Max or Connect Plus, the SLR 8000 delivers the power of digital two-way radio to your workforce. It can also operate as an analogue repeater (conventional or MPT 1327), or as a mixed mode analogue/digital repeater while you transition away from a legacy analogue system.





GENERAL SPECIFICATIONS		
	VHF	UHF BAND 1
Frequency Range	136-174 MHz	400-470 MHz
Channel Spacing	12.5 / 20 / 25 kHz	
Channel Step Size	5 Hz	
Frequency Stability	0.5 ppm	
Channel Capacity	64	
RF Output Power	1-100 W	
Dimensions (H x W x D)	89 x 483 x 438 mm (3.5 x 19 x 17.25 in)	
Weight	14.1 kg (31 lbs)	
Input Voltage (AC)	100-240 Vac, 47-63 Hz	
Current (standby), 110 / 240 V	0.25 / 0.3 A	
Current (transmitting at 100 W), 110 / 240 V	2.1 / 1.1 A (typical)	2.0 / 1.1 A (typical)
Input Voltage (DC)	12 V (11.0-15.5 V) / 24 V (21.6-32.0 V)	
Current (standby), 24 V	0.5 A	
Current (transmitting at 100 W), 24 V	8.6 A (typical)	8.2 A (typical)
Input Power Modes	AC only, DC only, AC with Battery Revert	
Operating Temperature Range	-30 to +60 °C (-22 to +140 °F)	
Humidity	RH of 95%, Non-condensing at 50 °C (122 °F)	
Max Duty Cycle	100%	
Digital Vocoder Type	AMBE+2™	
Battery Charger Capacity (12 / 24 V)	5 A	
Connectivity, front panel	USB B Receptacle, Microphone (RJ45), Speaker (integrated)	
Connectivity, rear panel	Tx (N female), Rx (BNC female), USB A Receptacle, 2x Ethernet, DB25 Accessory Connector, External Reference (BNC Female)	
External Reference	5 / 10 MHz (Auto-detect)	
Supported System Types	Digital Conventional, IP Site Connect, Capacity Plus, Capacity Max, Connect Plus Analogue Conventional, Analogue Conventional Voting, MPT 1327	
Audio Types	Input: Balanced (600 ohms and Country-specific Impedances), Unbalanced (1000 ohms), Microphone Accessory Port. Output: Balanced (600 ohms and Country-specific Impedances), Unbalanced (600 ohms), Integrated Speaker.	
Audio Levels	Input: Balanced: +10 to -30 dBm, Unbalanced: Adjustable, 80 mV rms nominal for 60% RSD. Output: Balanced: +7 to -30 dBm, Unbalanced: Adjustable, 330 mV rms nominal @ 60% RSD.	
FCC Emission Designators	11K0F3E, 16K0F3E, 7K60FXD, 7K60F7D, 7K60FXE, 7K60F7E, 7K60F7W	
FCC Type Acceptance	ABZ99FT3095	ABZ99FT4098
IC Description	109AB-99FT3095	109AB-99FT4098



## RECEIVER

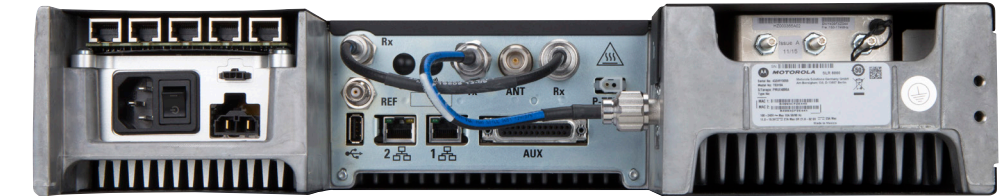
	VHF	UHF
Frequency Range	136-174 MHz	400-470 MHz
Sensitivity, 12dB SINAD	0.3 uV (0.22 uV typical)	
Sensitivity, 5% BER	0.25 uV (0.18 uV typical)	
Selectivity (TIA603D), 25 / 20 / 12.5 kHz	83 / 83 / 52 dB	78 / 78 / 52 dB
Selectivity (TIA603), 25 / 20 / 12.5 kHz	83 / 83 / 75 dB	80 / 80 / 75 dB
Intermodulation Rejection (TIA603D/ETSI)	85 / 73 dB (87 / 78 dB typical)	
Spurious Rejection (TIA603D/ETSI)	85 / 75 dB (95 / 90 dB typical)	
Audio Distortion	< 3% (<1.5% typical)	
Hum and Noise, 25 / 20 / 12.5 kHz	-50 / -50 / -45 dB (-56 / -56 / -52 dB typical)	
Blocking	110 dB (113 dB typical)	

## TRANSMITTER

	VHF	UHF
Frequency Range	136-174 MHz	136-174 MHz
RF Output Power	DC (24 V) or AC 1-100 W DC (12 V) 1-50 W	
Max Duty Cycle	55 dB	
Intermodulation Attenuation	5W	4W
Adjacent Channel Power (TIA603D), 25 / 20 / 12.5 kHz	75 / 75 / 60 dB	
Adjacent Channel Power (ETSI), 25 / 20 / 12.5 kHz	-40 dB @ 12.5 kHz / -45 dB @ 25 kHz	
Conducted Spurious Emissions	75 / 75 / 60 dB (78 / 78 / 62 dB typical)	
Adjacent Channel Power	40 dBm < 1 GHz, -30 dBm > 1 GHz	
Audio Response	TIA603D	
Audio Distortion	< 3% (<1% typical)	
Hum and Noise, 25 / 20 / 12.5 kHz	-50 / -50 / -45 dB (-55 / -55 / -52 dB typical)	
Rated System Deviation, 25 / 20 / 12.5 kHz	±5.0 / ±5.0 / ±2.5 kHz	

## NOTES

Availability is subject to individual country law and regulations.  
All specifications shown are typical unless otherwise stated and are subject to change without notice.  
Specifications are for unit excluding options, unless otherwise stated.



\*\*Images show product equipped with optional modules

## PRODUCT MEETS

- ETSI 300-086
- ETSI 300-113
- TIA/EID603D
- CE Marked
- RoHS2-Compliant
- UL Listed
- Digital Protocol ETSI TS 102 361-1, -2, -3, -4 (DMR Tier II and III)



## NEXT GENERATION MOTOTRBO REPEATER

The SLR 8000 represents a huge leap forward in design and technology. Based on a wealth of field experience, customer feedback and technological innovation, the product delivers outstanding performance and reliability for your business two-way radio system. From an efficient modular design to flexible installation options, the SLR 8000 is truly the next generation in repeaters.

## HIGH PERFORMANCE

With its 100 W transmitter output and high sensitivity receiver, the SLR 8000 delivers radio coverage to an enormous area. With its excellent performance characteristics, it is also ideally suited for congested sites, where tighter specifications are required.

The SLR 8000 supports the full MOTOTRBO feature set, and is compatible with all the MOTOTRBO system architectures: single site conventional, IP Site Connect, Capacity Plus, Capacity Max and Connect Plus. The IP interface allows you to build applications and consoles directly into your system.

To help you build your system for top performance, MOTOTRBO RF Planning and IP Integration Services are available for purchase.

## HIGH RELIABILITY

The SLR 8000 offers round-the-clock reliable operation, even at its continuous full transmit power of 100W. The high-quality design has been validated through Motorola's Accelerated Life Testing (ALT) program, and meets stringent quality criteria. The product has a next-generation receiver design, with high sensitivity and improved noise blocking, so you can be confident of clear voice quality, even in the worst conditions.

The unit has internal monitoring circuitry, allowing you to measure parameters such as input voltage and current, output power, module temperatures and VSWR. This can be accessed through the front panel maintenance interface, or through a remote management application such as RDAC.

The standard warranty is 2 years, and can be enhanced with Service from the Start: a full service support program that protects your hardware investment with prioritised expert repair, proactive technical support, software updates and more.

## TOTAL FLEXIBILITY

The SLR 8000 can be customised to suit your operation. There are options for an internal preselector and antenna relay module, offering you a true one-box installation. You can also opt for an internal wireline card if you need tone control capabilities, 4wire audio and additional external inputs.

Power can be supplied as 110-240 Vac, 12-24 Vdc, or AC with battery fallback: there is even a built-in 5 A battery charger. The 2U unit can be mounted efficiently in a rack, with no requirement for ventilation space above or below. And serviceability is improved by the local voice capability: there is an internal speaker and volume control, with provision for an external microphone.

## MOTOTRBO SLR 8000

With excellent performance, high reliability and a flexible design in a slim and efficient unit, the SLR 8000 repeater is at the heart of a top-quality MOTOTRBO professional two-way radio system.

For more information on how to make your business more efficient and better connected, visit [www.motorolasolutions.com/MOTOTRBO](http://www.motorolasolutions.com/MOTOTRBO)

Motorola Solutions Ltd. Nova South, 160 Victoria Street, London, SW1E 5LB, United Kingdom.

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**MOTOROLA SOLUTIONS**

December 26, 2022

Re: Professional Services Agreement  
Investigation and Structural Analysis of Cell Tower at Margate Fire Station #18  
5785 Park Dr, Margate, FL 33063 (26.2411, -80.2058)  
180' ± Self Supporting Pole Structure (Monopole)

Kimley-Horn and Associates, Inc. ("Kimley-Horn" or "Consultant") is pleased to submit this letter agreement (the "Agreement") for The City of Margate 800 MHz Project ("Client") for providing professional engineering services related to the above-mentioned telecommunication tower.

### **Scope of Services**

Kimley-Horn will provide the services specifically set forth below.

#### Task 1 – Tower Investigation

The consultant will coordinate a physical climb of the structure in order to map out and measure existing structural members. Any linear attachments or non-structural loading shall be documented for inclusion in the global structural analysis. Photographs and notes will be taken while on-site and a mapping deliverable will be prepared in AutoCAD and issued to the client in PDF format.

#### Task 2 – Foundation Investigation

Consultant will coordinate a foundation mapping in accordance with the TIA-222 standard. For the foundation mapping, the crew will determine whether the foundation is a deep or shallow foundation system. Non-destructive testing methods (minor hand excavation, probing, and the use of pulse-echo) data collection methods will be used to determine the in-situ foundation dimensions. This foundation mapping will not include destructive testing methods to determine the size and quantity of vertical rebar & ties.

#### Task 3 – Geotechnical Investigation

Consultant will coordinate a geotechnical investigation in accordance with the TIA-222 standard. The geotechnical report will be based on a minimum depth of auger refusal or 50-feet. Boring location will be selected near the tower site by the driller.

#### Task 4 – Structural Analysis

Consultant will execute a structural analysis of the tower for the additional load imparted on the structure due to the equipment adjustments. This structural analysis shall be completed in accordance with the TIA-222 standard referenced in the building code adopted by the governing jurisdiction.

#### Task 5 – Periodic Maintenance Inspection (TIA)

An inspection will be completed to review the condition of the tower in accordance with Annex J, TIA-222. The Consultant will generate a report of repair recommendations to address maintenance issues observed during a site visit.

#### Task 6 – Post-Repair Closeout Letter

The consultant will review closeout documentation (in progress & complete) provided by the repair contractor to verify final repair configuration is in compliance with the requirements of the contract documents (Task 5). Our findings will be compiled into a comprehensive letter and provide corrective

action items (if required) to bring any incomplete repair items into compliance.

## **Additional Services**

Any services not specifically provided for in the above scope will be billed as additional services and fees will be provided ahead of completion for approval. Additional services we can provide include, but are not limited to, the following:

### Task 7 – Construction Drawings

The consultant will prepare a set of drawings to aid in the equipment adjustments at the site. The plans will be limited to provide to pertinent civil, structural, and electrical details.

### Task 8 – Post Construction Inspection

The consultant will execute a physical climb of the structure to verify final repair configuration is in compliance with the requirements of the contract documents (Task 5). Our findings will be compiled into a comprehensive letter and provide corrective action items (if required) to bring any incomplete repair items into compliance.

### Task 9 – Repair Coordination from Periodic Maintenance Inspection (TIA)

The consultant will oversee the execution of repair work identified during the Periodic Maintenance Inspection (TIA). A comprehensive report showing that the structure is in compliance with TIA-222 will be issued upon completion.

## **Information Provided By Client**

We shall be entitled to rely on the completeness and accuracy of all information provided by the Client or the Client's consultants or representatives. The Client shall provide all information requested by Kimley-Horn during the project, including but not limited to the following: original design documents, controlling loading for each carrier (i.e. max of lease loading vs. installed loading), proposed loading changes, and historical documentation pertinent to the project.

## **Schedule**

We will provide our services as expeditiously as practicable with the goal of meeting the following schedule:

Task 1 – Tower Investigation	<u>15-20 business days</u>
Task 2 – Foundation Investigation	<u>20-25 business days</u>
Task 3 – Geotechnical Investigation	<u>30-45 business days</u>
Task 4 – Structural Analysis <sup>1</sup>	<u>10-15 business days</u>
Task 5 – Periodic Maintenance Inspection (TIA)	<u>20-25 business days</u>
Task 6 – Post-Repair Closeout Letter <sup>1</sup>	<u>5-7 business days</u>

### **Notes:**

Services are dependent on other services therefore cycle times begin upon completion of preceding task(s).

## SPD3177 800 MHz Hybrid-TTA RFDS for Tessco

Created for:

**Mark Rice**



### ***Ordering Information:***

#### **SPD3177A-1 800 MHz RF Distribution System, comprised of:**

- \* Special 8-Channel combiner HC10200-08-type with 4.3-10 output connector
- \* MWF8AM-D 800 MHz TX filter with DIN connectors
- \* DS7TMA17C 799-816 MHz Compact low-noise TTA with N connectors
- \* DSX7PDU08-A6 800 MHz 8-Channel multicoupler/PDU (AC power)
- \* Two-post equipment rack (color Black) with ground bar

**Assembled, tuned, and shipped in rack on pallet per customer instructions**



## Revision History

Revision A 12/21/2022 original Issue

## System Design Criteria

### RF Distribution System



- Designed per dbSpectra best commercial practice for RF distribution to outdoor antenna systems
- TX-RX antenna isolation assumed  $\geq 45$  dB.
- Transmit combiner, transmit filter, and TX-RX antenna isolation will provide  $> 90$  dB isolation at RX frequencies.
- Receive multicoupler, TTA window filter, and TX-RX antenna isolation will provide  $> 90$  dB isolation at TX frequencies.
- No Intermodulation interference is predicted for 3<sup>rd</sup>-11<sup>th</sup> order..
- Transmit antenna system including lightning protector and feedline should incorporate components PIM-rated  $< -150$  dBc.

## Caveats and Design Notes

- Design details are subject to change during final design and assembly as may be required to meet System Design Criteria above.
- Stated RF Insertion Loss values are  $\pm 1$  dB.
- dbSpectra is not responsible for site-local noise, co-channel interference, or intermodulation interference at or after installation but will advise customer and provide limited assistance to help resolve issues that may arise.

# SPD3177A-1 800 MHz RF Distribution

## Frequency Plan and Intermodulation Study Results

### Frequency Plan

TX Separation		
Name	F(MHz)	Δ(MHz)
T1	856.93750	null
T2	857.93750	1.00000
T3	858.93750	1.00000
T4	859.93750	1.00000
T5	861.43750	1.50000
T6	861.46250	0.02500
T7	861.48750	0.02500

PB 4.55000

RX Separation		
Name	F(MHz)	Δ(MHz)
R1	811.93750	null
R2	812.93750	1.00000
R3	813.93750	1.00000
R4	814.93750	1.00000
R5	816.43750	1.50000
R6	816.46250	0.02500
R7	816.48750	0.02500

Transmit/Receive Frequency Spacing (MHz)								
		RX						
		R1	R2	R3	R4	R5	R6	R7
		811.93750	812.93750	813.93750	814.93750	816.43750	816.46250	816.48750
TX	T1 856.93750	-45.0000	-44.0000	-43.0000	-42.0000	-40.5000	-40.4750	-40.4500
	T2 857.93750	-46.0000	-45.0000	-44.0000	-43.0000	-41.5000	-41.4750	-41.4500
	T3 858.93750	-47.0000	-46.0000	-45.0000	-44.0000	-42.5000	-42.4750	-42.4500
	T4 859.93750	-48.0000	-47.0000	-46.0000	-45.0000	-43.5000	-43.4750	-43.4500
	T5 861.43750	-49.5000	-48.5000	-47.5000	-46.5000	-45.0000	-44.9750	-44.9500
	T6 861.46250	-49.5250	-48.5250	-47.5250	-46.5250	-45.0250	-45.0000	-44.9750
	T7 861.48750	-49.5500	-48.5500	-47.5500	-46.5500	-45.0500	-45.0250	-45.0000

### Intermodulation Study Results

3rd Order IM
3rd order IM: 0 total
3rd order IM: 0 direct hits

5th Order IM
5th order IM: 0 total
5th order IM: 0 direct hits

7th Order IM
7th order IM: 0 total
7th order IM: 0 direct hits

9th Order IM
9th order IM: 0 total
9th order IM: 0 direct hits

11th Order IM
11th order IM: 0 total
11th order IM: 0 direct hits

1. No Intermodulation interference predicted for 3<sup>rd</sup> -11<sup>th</sup> order.
2. Satisfies design criteria

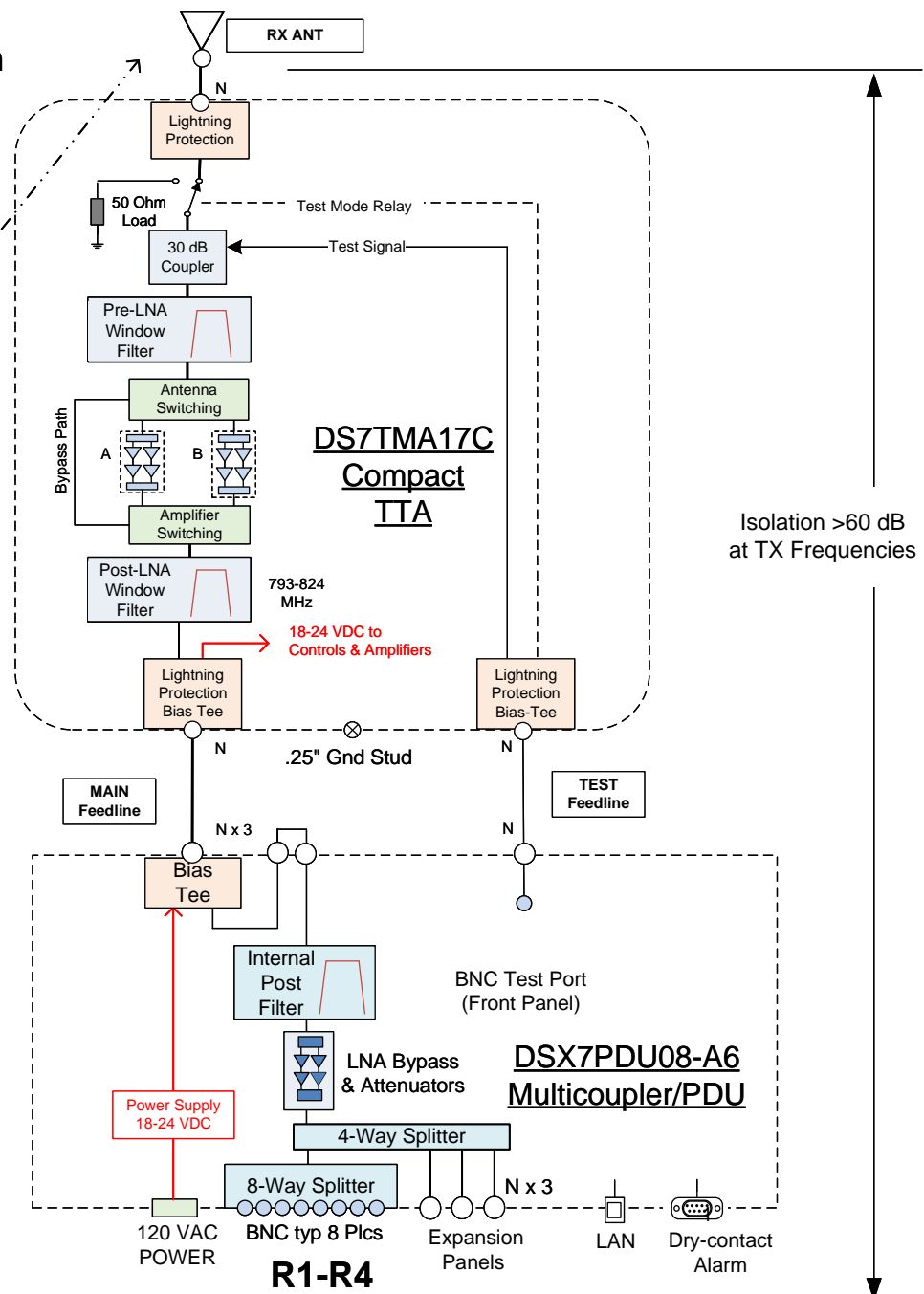
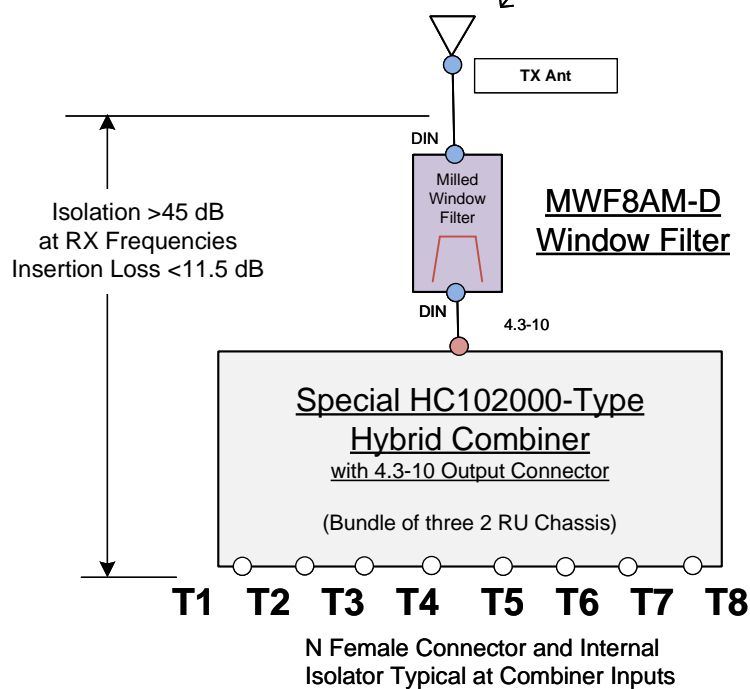
# SPD3177A-1 800 MHz RF Distribution System

SPD3177

Transmit Combiner Specifications	
Type	Hybrid
Model	Special HC10200-08 (4.3-10 Output)
Frequency Range	850-960 MHz
No. of Channels	8
Channel Power Rating	100W
Frequency Separation	No Minimum
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB
Internal TX Isolators Dual Stage	
TX-TX Isolation	70
Ant-TX Isolation	50

Transmit Window Filter Specifications	
Type	Milled Window Filter
Model	MWF8AM-D
Frequency Range	851-869 MHz
Bandwidth	18 MHz
Channel Power Rating	500W
Peak Inst Power	23,500W
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB

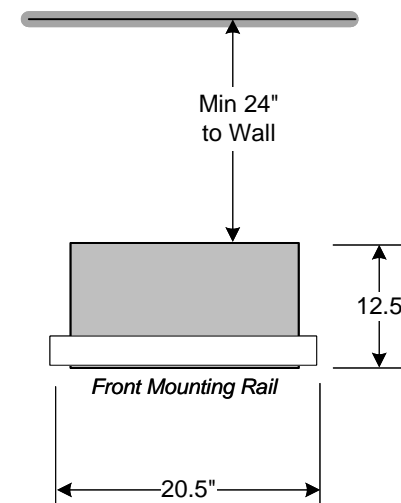
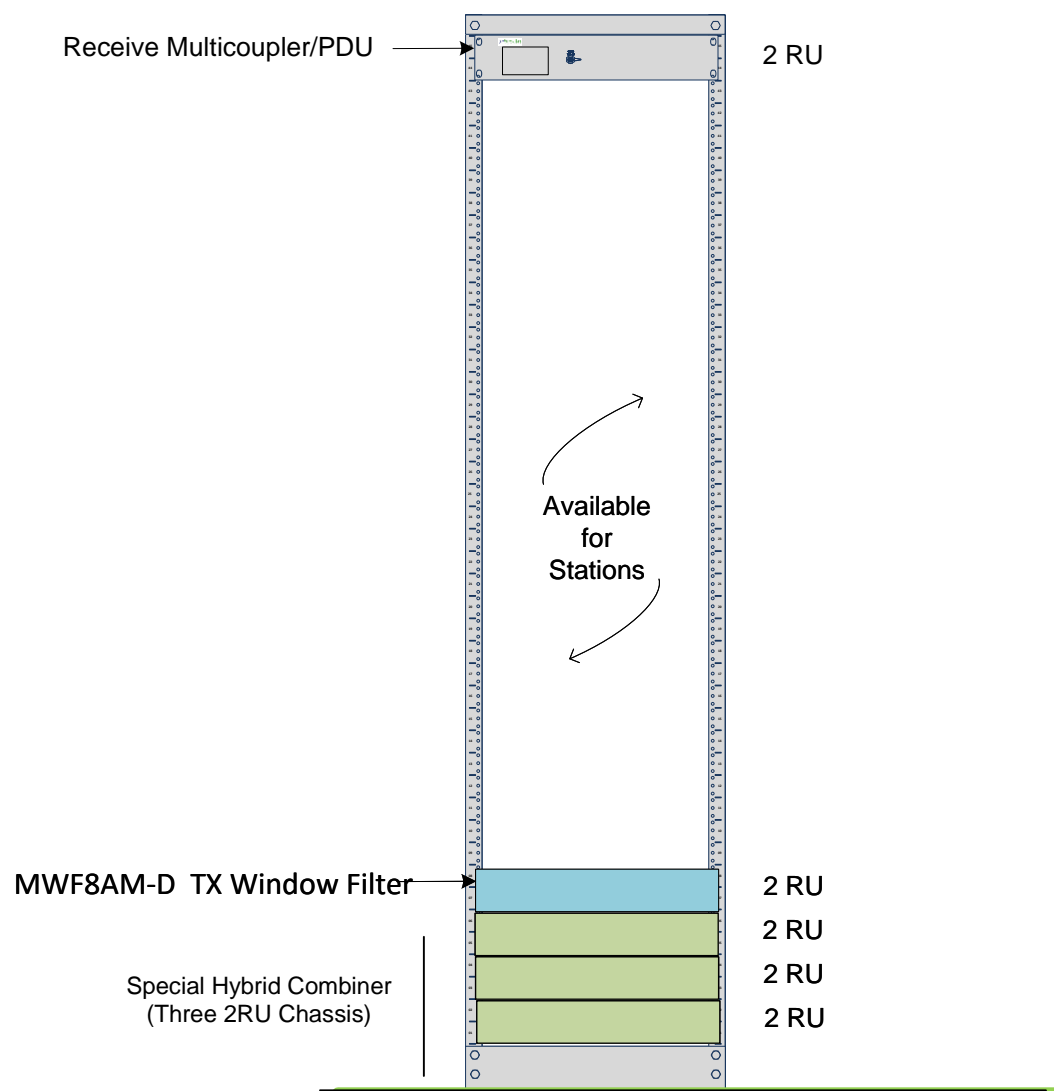
Design Requirement: TX-RX  
Antenna Isolation must be >45 dB  
(>2-Ft Vertical Tip-to-Base  
OR 50-Ft Horizontal)



For TTA and Multicoupler specifications,  
see pages 9 and 10

# SPD3177A-1 800 MHz RF Distribution System

45 RU 2-Post Rack Included / TTA not shown



## Plan View of Installed Rack

Showing Approximate Extension of Equipment  
from Front Mounting Rail

Preliminary Design – Dimensions may change  
during Detail Design

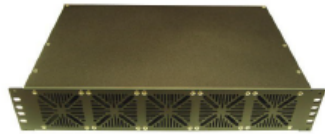
dbSpectra

DLC 12/21/2022 Revision A

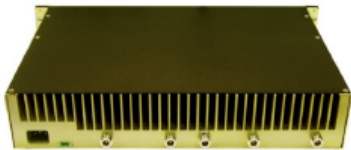


## HC10x-Series Hybrid Transmitter Combiner (150-960 MHz) 2-4 and 8-Channel Models

dbSpectra



2-4 Channel Hybrid Combiner Front Panel (Fan Intake)



Rear View showing Connectors (8-channel model similar but 6RU –see next page.)

### Features and Benefits

- ❖ Hybrid combiner enables combining of very closely spaced transmitter frequencies on one transmit antenna.
- ❖ No transmitter frequency spacing limitation. No factory nor field tuning required.
- ❖ Built-in fans are thermally activated. Fan Power LED, Fan Test pushbutton and dual power inputs are provided.
- ❖ Dual-stage TX isolators provide high TX-TX isolation.

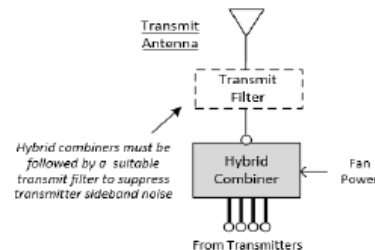
### Ordering Information / Insertion Loss Table

Frequency Band - MHz	Transmit Channels	Model 110-240VAC/12 VDC	Model 48 VDC	Insertion Loss dB
150-174	2	HC10500-02J	HC10500-02J4	4.50
	4	HC10500-04J	HC10500-04J4	8.00
380-420	4	HC10700-04J	HC10700-04J4	7.50
	2	HC10400-02J	HC10400-02J4	4.50
400-475	3	HC10400-03J	HC10400-03J4	7.50
	4	HC10400-04J	HC10400-04J4	7.50
450-512	4	HC10600-04J	HC10600-04J4	7.50
850-870	4	HC10300-04J	HC10300-04J4	7.80
	2	HC10200-02J	HC10200-02J4	4.30
	3	HC10200-03J	HC10200-03J4	6.80
	4	HC10200-04J	HC10200-04J4	7.90
	8	HC10200-08J	HC10200-08J4	11.00

### Specifications

Electrical Specifications	
Power Limit	100 Watts (avg.) per input
Number of Channels	2, 3, 4, 8-channel models
Frequency Separation	No min./max. limitations
Frequency Range and Insertion Loss	See Ordering Information
Isolation	
TX-TX	70 minimum/75 typical
ANT-TX	50 minimum/55 typical
Input Return Loss	>14 dB
Mechanical Specifications	
Construction/Finish	Aluminum / protective finishes
Mounting	EIA 19-inch rack
Operating Temperature Range	-30° C to +60° C
Input Connectors	N Female
Power Requirement – AC Models (2-4 Ch., X3 for 8 Ch.)	90-240 VAC 50/60 Hz (<25 Watts) Or 12 VDC (nominal at <2 A)
Power Requirement – DC Models (2-4 Ch., X3 for 8 Ch.)	48 VDC at <0.5 A (<24 Watts) (136-72 VDC isolated)
Dimensions and Weight	
Width (Panel)	19.0 in. (483 mm)
Height 2,3,4-Channel models:	3.5 in. (89 mm) (2RU)
Height 8-Channel model:	10.5 in. (267 mm) (6RU)
Depth	12.5 in. (318 mm)
Net/Ship Weight – 2-4 Ch.	34 lbs. (15 kg) / 45 lbs. (20 kg)
Net/Ship Weight – 8 Ch.	100 lbs. (45 kg) / 120 lbs. (54 kg)

### Application

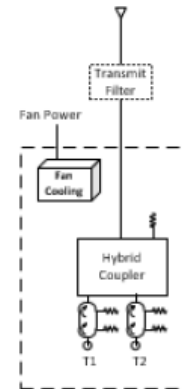


## HC10x-Series Hybrid Transmitter Combiner (150-960 MHz) 2-4 and 8-Channel Models

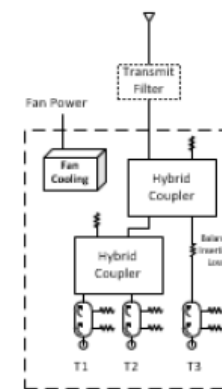
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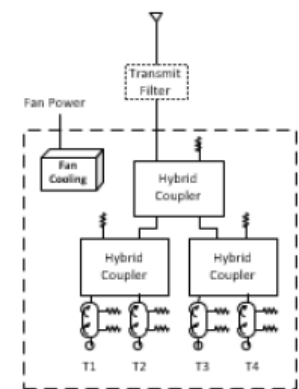
**Important Note:** Hybrid Combiners must be followed by a suitable transmit filter to suppress transmitter sideband noise.



-02J 2-Channel Models

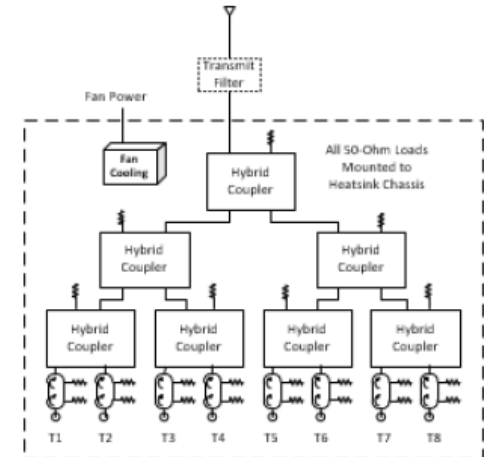
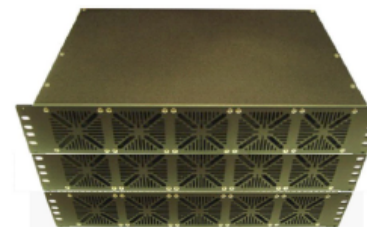


-03J 3-Channel Models



-04J 4-Channel Models

### All 50-Ohm Loads Mounted to Heatsink Chassis



-08J 8-Channel Models

Special HC102000-Type Hybrid Combiner  
with 4.3-10 Output Connector

(Bundle of three 2 RU Chassis)

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## MWF7AM-D, MWF8AM-D, and MWF9AM-D High-Power Transmitter Window Filter (700, 800, 900 MHz)

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Rear View with 7/16 DIN female connectors.

### Features and Benefits

- ❖ Single band transmitter window filter systems enhances isolation of transmitter carrier and sideband noise from system receivers – great for sites with horizontally separated antennas.
- ❖ *Isolation at Receiver Frequencies* quoted in table should be added to isolation provided by the companion transmitter combiner.
- ❖ 500 Watt continuous duty power rating will handle peak voltage for Peak Instantaneous Power (PIP) from ten P25 Phase 2 trunk channels, each 50 W at filter input.
- ❖ Milled aluminum construction provides outstanding selectivity characteristics in a rugged and compact package – only 2 RU and 11.0" depth.

### Ordering Information

Model	Band	Passband
MWF7AM-D	700 MHz	14 MHz
MWF8AM-D	800 MHz	18 MHz
MWF9AM-D	900 MHz	6 MHz

### High Power Transmitter Window Filter

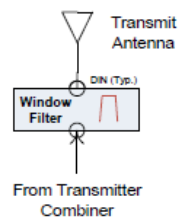
#### Notes:

1. Filter must be factory tuned. Please provide frequency information at time of order.
2. Rear brackets for 4-post mounting provided. For 2-post mounting order P/N MWF2PKIT.

### Specifications

Electrical Specifications	
Maximum RF Power	500 Watts Continuous
Peak Instantaneous Power	19,000 Watts
Frequency Range	700 MHz model: 800 MHz model: 900 MHz model:
	762-776 MHz 851-869 MHz 935-941 MHz
Bandwidth	700 MHz model: 800 MHz model: 900 MHz model:
	14 MHz 18 MHz 6 MHz
Isolation at Receive Frequencies	700 MHz model: 800 MHz model: 900 MHz model:
	>45 dB >45 dB >60 dB
Insertion Loss	700 MHz model: 800 MHz model: 900 MHz model:
	<0.3 dB <0.3 dB <0.5 dB
Return Loss (all ports)	>19 dB
Mechanical Specifications	
Construction/Finish	Aluminum with protective finishes
Connectors	7/16" DIN female
Mounting	EIA 19-inch rack
Temperature Range	-30° C to +60° C
Dimensions and Weight	
Width	19.0 in. (483 mm)
Height	3.5 in. (89 mm) 2 RU
Depth	11.0 in. (279 mm)
Weight / Shipping Weight	17 lb. (8 kg) / 25 lb. (11 kg)

### Typical Application

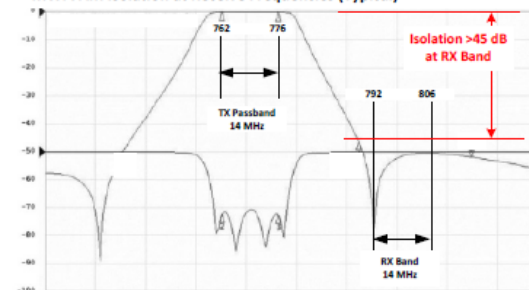


## MWF7AM-D, MWF8AM-D, and MWF9AM-D High-Power Transmitter Window Filter (700, 800, 900 MHz)

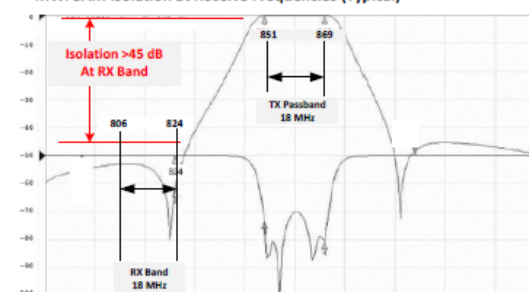
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### Response Curves

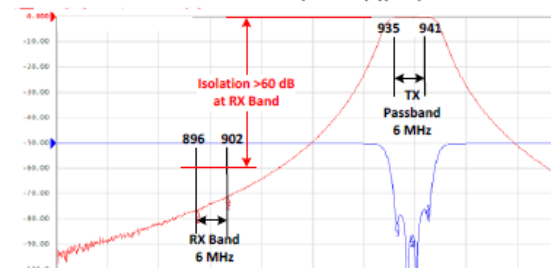
#### 700 MHz Model MWF7AM Isolation at Receive Frequencies (Typical)



#### 800 MHz Model MWF8AM Isolation at Receive Frequencies (Typical)



#### 900 MHz Model MWF9AM Isolation at Receive Frequencies (Typical)



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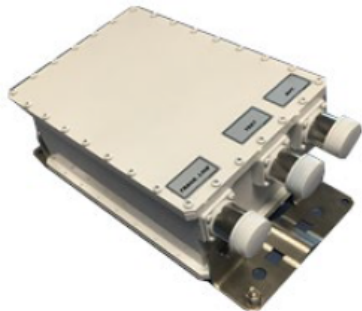
MWF8AM-D 800 MHz TX Window Filter

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## DS7TM Compact Tower Top Dual Amplifier (799-816 MHz)

Use with DSX7PDU Receiver Multicoupler/Power Distribution Unit (Ordered separately.)

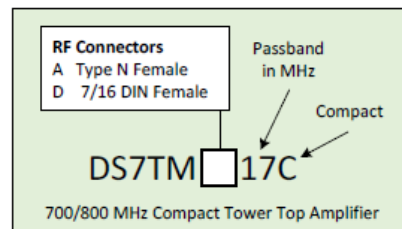


Model with 7/16 DIN Connectors Shown

### Features and Benefits

- ❖ Built-in window filter provides >60 dB of system isolation at transmit frequencies. This TTA and the DSX7PDU Multicoupler/PDU together provide >110 dB of TX/RX isolation at 700/800 MHz bands.
- ❖ TTA includes dual redundant quadrature-coupled Low Noise Amplifiers (LNAs) that provide low noise figure of 2.0 dB or less.
- ❖ Test port connection from Multicoupler/PDU enables accurate receiver sensitivity testing and ability to switch between the antenna and load.
- ❖ Redundant LNA and automatic amplifier bypass during alarm event or loss of power.
- ❖ Compact, corrosion resistant and stable weatherproof housing.

### Ordering Information

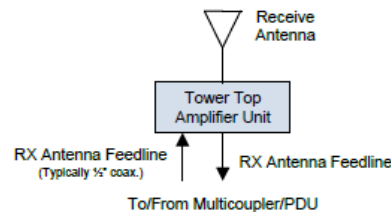


### Specifications

Electrical Specifications	
Frequency Range	799 – 816 MHz
Passband	17 MHz
TTA Filter Isolation	>60 dB at 763-776 MHz and 851-869 MHz
Gain	>22 dB
Noise Figure	<2.0 dB
Input IP3	+15 dBm
Test Port Coupling	30 dB ± 1 dB
Return loss, all ports	>14 dB
Input DC Power	Transmission Line: 18/24 VDC Test Port: 6 VDC
Operating Current	Transmission Line: < 150 mA Test Port: <100 mA during Test only
Surge Protection	20 KA ANSI C62.1, 8/20 µs waveform, 110 joules *
LNA Amplifier Type	Quadrature Coupled
LNA Redundancy	Two independent amplifiers with automatic switching between A & B
LNA Bypass	Automatic bypass of amplifiers in case of alarm or loss of power
Mechanical Specifications	
Temperature Range	-30 to + 60°C
Connectors (all ports)	See Ordering Information
Housing	Aluminum milled filter construction
Mounting Brackets	1/8" Stainless steel brackets with two 7/16" wide band clamps for up to 3.5" mast members
Dimensions	10.75 in. x 6.5 in. x 4.0 in. (273 X 165 X 102 mm) (without mounting brackets)
Weight	10 lb. (4.5 kg)
Shipping Weight	13 lb. (5.9 kg)

\* Industry standard coaxial lightning protectors and grounding required at the radio shelter entrance.

### Application

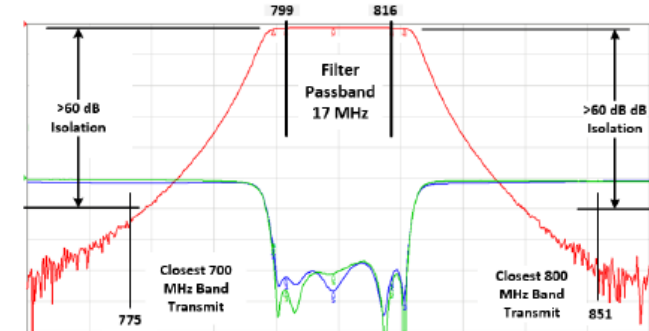


## DS7TM Compact Tower Top Dual Amplifier (799-816 MHz)

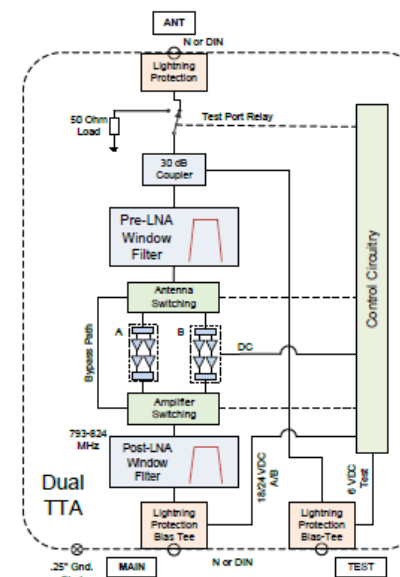
Use with DSX7PDU Receiver Multicoupler/Power Distribution Unit (Ordered separately.)



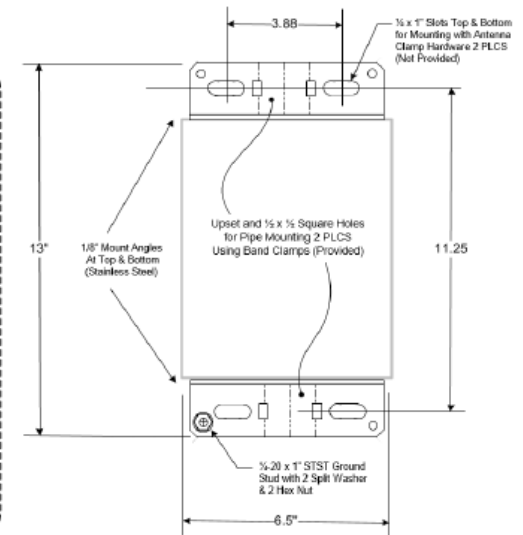
### Window Filter Characteristics



### Block Diagram



### Mounting Pattern



Note: Band clamps supplied for strap mounting.

## DS7TMA17C 800 MHz Compact Low-noise TTA



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## DSX7PDU-Series (700/800 MHz)

SMART Receiver Multicoupler/Power Distribution Unit 8-32 channels  
Use with DS7 or 8TM-Series Tower Top Amplifier (Ordered separately.)

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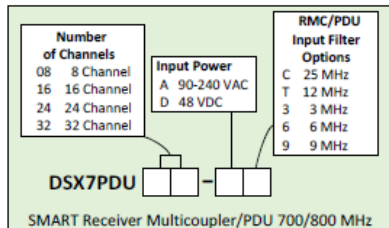


DSX7PDU-Series Front Panel and Display

### Features and Benefits

- ❖ 8-to-32 channels in a 2 RU chassis (field expandable in 8 channel increments).
- ❖ Standard internal input window filter provides 60 dB of extra system isolation at TX band. The Multicoupler/PDU and DS7TM-series TTA will provide >120 dB of TX/RX isolation at 700/800 MHz bands, easing need for antenna separation.
- ❖ Includes provision for connection of external post-filter for additional selectivity if needed.
- ❖ TTA Test Port connection at Multicoupler/PDU facilitates accurate receiver sensitivity testing.
- ❖ Self-terminating splitter outputs. No loads necessary on unused output ports.
- ❖ Built-in IP network Interface for remote monitoring and configuration; includes TLS Security Layer, SNMP v2c/v3 alarm traps for alarm management and form "C" dry-contacts.

### Ordering Information



\*For Field Expansion: Order DSX7PDUEXP8 8-Channel Expansion Kit—May be installed remotely from RMC/PDU (near receivers).

### Specifications

Electrical Specifications	
Frequency Range	799-824 MHz
Number of Channels	8-32 Channels
Internal Filter Passband	See Ordering Information
Isolation (From edge of filter Passband, see Page 2.)	Standard Filter: >60 dB at 25 MHz from 25 MHz Passband Optional Filters: >15 dB at 3 MHz from 3 MHz Passband >20 dB at 6 MHz from 6 MHz Passband >25 dB at 9 MHz from 9 MHz Passband >25 dB at 12 MHz from 12 MHz Passband
Insertion Loss (Of multicoupler input filters.)	Standard Filter: <2.5 dB at 25 MHz Passband Internal Post Filter: <2.0 dB at 3 MHz Passband <1.5 dB at 6 MHz Passband <1.2 dB at 9 MHz Passband <1.0 dB at 12 MHz Passband
Gain (With 799-824 MHz standard filter and minimum attenuator settings.)	Splitter Outputs: 799-818 MHz: 8 dB (±1 dB) 818-824 MHz: 8 dB (±1.5 dB) Expansion Ports: 20 dB minimum
Noise Figure (Minimum attenuator settings.)	6.8 dB maximum (Includes post filter loss.)
Input / Output Return Loss	14 dB in passband
Input IP3	+15 dBm
Low Noise Amplifier	Quadrature Coupled
Test Port Connection	Front Panel BNC
Post-LNA Filter Connections	Available on Rear Panel
Pre and Post-LNA Adjustable Attenuators	Electronic, 1 – 15 dB, 0.5 dB steps
RX – RX Port Isolation	>20 dB
Power Requirement – AC Model	90-240 VAC 50/60 Hz (<31 Watts)
Power Requirement – DC Model	48 VDC at <0.5 A (<31 Watts) (+36-72 VDC isolated)
Output DC Voltages to TTA	Transmission Line Port: 18 / 24 VDC Test Port: 6 VDC
User Interface	Web browser or front panel touchscreen.
IP Interface	IPv4, TLS Security Layer, SNMP v2c/v3 Alarm Traps

### Mechanical Specifications

RF Connectors	
RF Input/Test Port Out	N Female (rear)
RF Outputs	BNC Female (rear)
Test Port (Test Eq.)	BNC Female (front)
External Filter	N Female (rear)
IP Interface Connector	RJ45
Alarm Connector	Pluggable Terminal Block Type
Mounting	19" x 3.5", 2 RU Panel, depth 11.5" (383 X 89 X 292 mm)
Grounding Provision	¼-20 x 1 inch stud at rear
Temperature Range	0° to +50° C (No degradation)
Net / Shipping Weight	8 lb. (3.6 kg) / 12 lb. (5.4 kg)

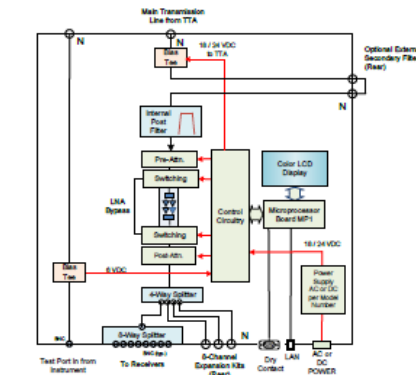
Note: Use with DS7 or 8TM Series tower top amplifiers: either canister or compact types.

## DSX7PDU-Series (700/800 MHz)

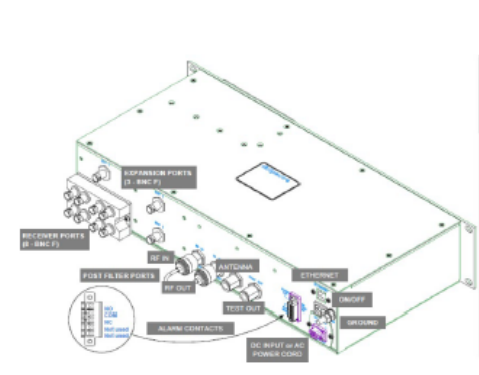
SMART Receiver Multicoupler/Power Distribution Unit 8-32 channels  
Use with DS7 or 8TM-Series Tower Top Amplifier (Ordered separately.)

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### Block Diagram

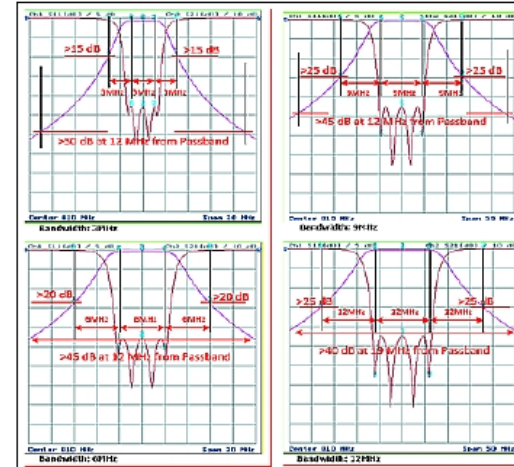


### Rear Detail

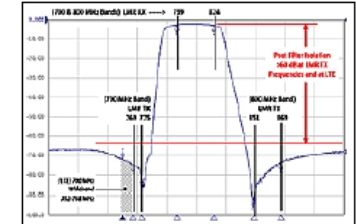


### Internal Post Filter Response Curves

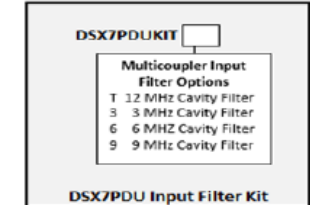
(Isolation at selected passband.)



Optional Internal Filters (With tighter passbands.)



Standard 25 MHz passband filter response.



For field installation of optional filters, select from the kits above.

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## DSX7PDU08-A6 Multicoupler/PDU

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