



**220 MHz**

**Antenna Systems Offerings**

## Celwave Introduces New Stationmaster Antennas For Emerging 220 MHz Band

Celwave Stationmaster Broadband Fiberglass Collinear Antenna are now available in the 220-222 MHz frequency band for the newly approved systems introduced to alleviate congestion while providing enhanced systems range and performance. The tried and proven Stationmaster Antennas have been used in the 150 & 450 MHz frequency bands for over three decades. This technology is now being configured for the emerging requirements in the 220 MHz frequency band.

Their noise-free design allows operation over the entire channel plan and can operate @ Tx 220-221 MHz and Rx 221-222 MHz for use in Trunked Systems, Nationwide Systems and for Individual Systems licensees.

The Stationmaster Series Antennas provide a true 5.25 dBd gain (3.0 dBd optional) while not exceeding the FAA height restrictions. The flexible fiberglass design sheds ice with ease, and bends without breaking in winds up to 100 mph (over PD620 Heavy Duty Super Stationmaster will with stand winds up to 175 mph).

Special downtilt (6°) and an offset pattern versions (with 6.7dBd & 7.5dBd gain) have been configured for the unique requirements. For further details, please refer to our Product Selection Guide #191, pages 49 & 50. Key specifications are detailed below:

ELECTRICAL SPECIFICATIONS	PD220-8 (**92.0101)	PD220DT	93.0024*	PD220-8*	PD220-8*
Frequency Range -MHz	216-225	220-222	220-222	220-222	220-222
Gain-dBd	5.25	5.0	3.0	7.5	6.7
Bandwidth-MHz	9.0	2.0	2.0	2.0	2.0
Vertical-1/2 Power Pts.	14°	14°	14°	14°	14°
Horizontal-1/2 Power Pts.	360°	360°	360°	230°	280°
Max. Power Input-Watts	500	500	500	500	500
Lightning Protection			Direct Ground		
Downtilt Angle-Degrees	0	6	0	0	0
Termination-All Antennas			UHF-Female Conn.		
			18" RG8A/U Cable w/N-Male Conn. Attached		

MECHANICAL SPECIFICATIONS	PD220-8* (**92.0101)	PD220DT	93.0024*	PD220-8*	PD220-8*
Overall Length-ft.	19.0	19.0	11.2	19.0	19.0
Element Housing Length-ft.	16.8	16.8	9.8	16.8	16.8
Support Pipe Diameter-in.	2.75	2.75	2.75	2.75	2.75
Wind Loading Flat Plate Equivalent - ft. <sup>2</sup>	1.98	1.98	1.5	1.98	1.98
Rated Wind Velocity-mph	100	100	100	100	100
Weight-lbs	23	23	16	23	23

### \* Preliminary Specifications

\*\* Note: Use # 92.0101 for type N-Female termination on the base of the PD220-8 Stationmaster Antenna.  
JC 10/93 Rev.1

## Celwave

2 Ryan Road, Marlboro, NJ 07748-1899 • (908) 462-1880

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## 220 MHz Duplexed Trunking System 719110

This integrated system is designed for close frequency spacing while maintaining superb frequency stability for 200 MHz trunking applications. This duplexed trunking system serves several functions that allow two or more transmitters to be combined into a single coax, provides isolation between transmitters, and provide filtering against intermodulation and potential interference.

This system consists of a TJD220-5T Trunking Combiner, Duplexer, 2-Pole Receive Filter, and a Receiver Multicoupler. The TJD220-5T Transmitter Combiner employs a combination of ferrite isolators and cavity resonators to obtain low insertion loss and high isolation between transmitters. This combiner has two isolators per channel and 5 Channels for use in the 220 MHz trunking band. The minimum channel spacing at which this unit is used is 150 KHz at 220 MHz.

The receive portion of the Duplexer consists of six PD1604B cavities used as resonators mounted on a 15 3/4" x 19" panel. The 2-Pole Filter consists of two PD1604B cavities on a 7" x 19" panel. The Tx portion of the Duplexer also consists of six PD1604B cavities on a 15 3/4" x 19" Panel. The RMC Tray contains an amplifier, power divider, and a power supply.

### System Specifications

Frequency Range - MHz	220 - 222
Tx Passband - MHz	220 - 220.6
Return Loss (TYP) - dB	>14.0
Rx Passband - MHz	221 - 221.6
Return Loss (TYP) - dB	>14.0
System Noise Figure -	6.8 dB @ 221 MHz
Attenuation @ 211.25 MHz	>48.0
Rx Multicoupler Gain	6.0 dB @ 221 MHz
System Gain @ 221 MHz (TYP) - dB	3.6
System Gain @ 221.6 MHz (TYP) - dB	4.7
Insertion Loss (TYP) - dB	4.5
Insertion Loss (MAX) - dB	5.1 @ 220.6 MHz
Tx Input Return Loss - dB	>19.0
Average Power Input/Channel - Watts	100

### Mechanical Specifications

Height - in.(mm)	68.25(1733.5)
Width - in.(mm)	19.0(482.6)

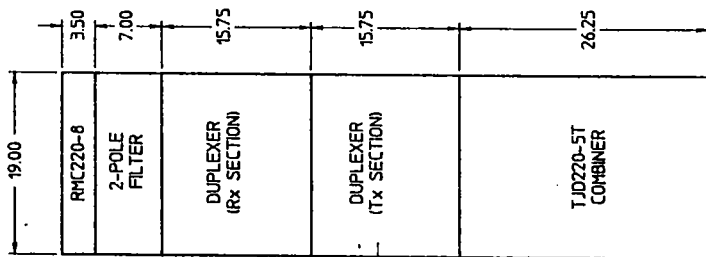
JC 4/94

## Celwave

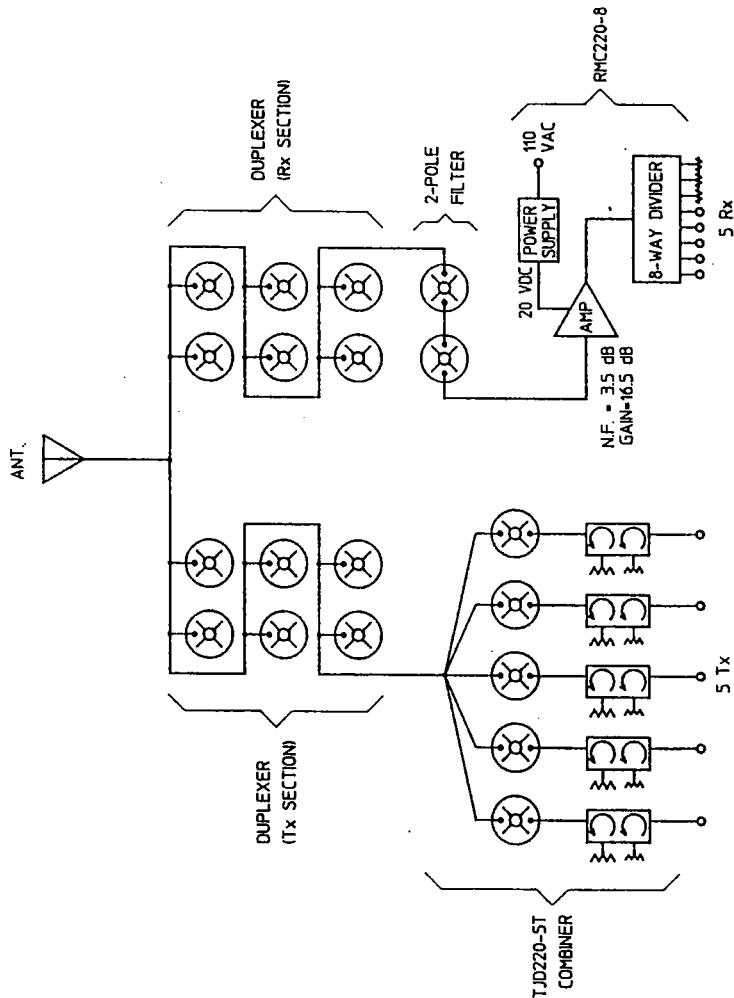
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**BACK SPACE REQUIREMENTS**



**ELECTRICAL LAYOUT**



**SPECIFICATIONS**

- Tx PASSBAND 220 - 220.6 MHz
- RETURN LOSS (TYP) ... > 14 dB
- Rx PASSBAND 221 - 221.6 MHz
- RETURN LOSS (TYP) ... > 14 dB
- SYSTEM NOISE FIGURE ... 6.8 dB @ 221 MHz
- ATTENUATION @ 211.25 MHz ... > 48 dB
- Rx MULTICOPLER GAIN ... 6.0 dB @ 221 MHz
- SYSTEM GAIN @ 221 MHz (TYP) ... 3.6 dB
- SYSTEM GAIN @ 221.6 MHz (TYP) ... 4.7 dB
- INSERTION LOSS (TYP) ... 4.5 dB
- INSERTION LOSS (MAX) ... 5.1 dB @ 220.6 MHz
- Tx INPUT RETURN LOSS ... > 19 dB
- AVERAGE POWER INPUT/CHANNEL ... 100 WATTS

Q	REVISION
1	KAA 3-15-93 DUPLEXER SECTION WAS 1975' TALL (2)
2	KAA 3-19-93 MODIFIED SPECIFICATIONS

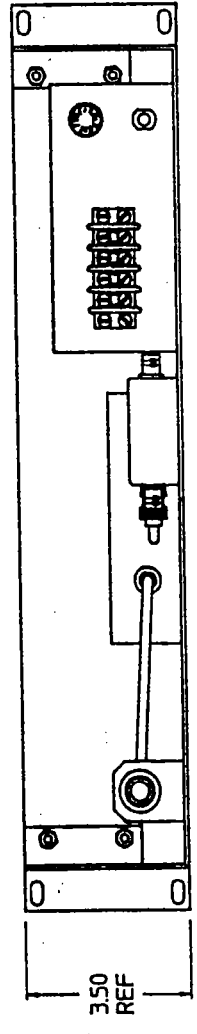
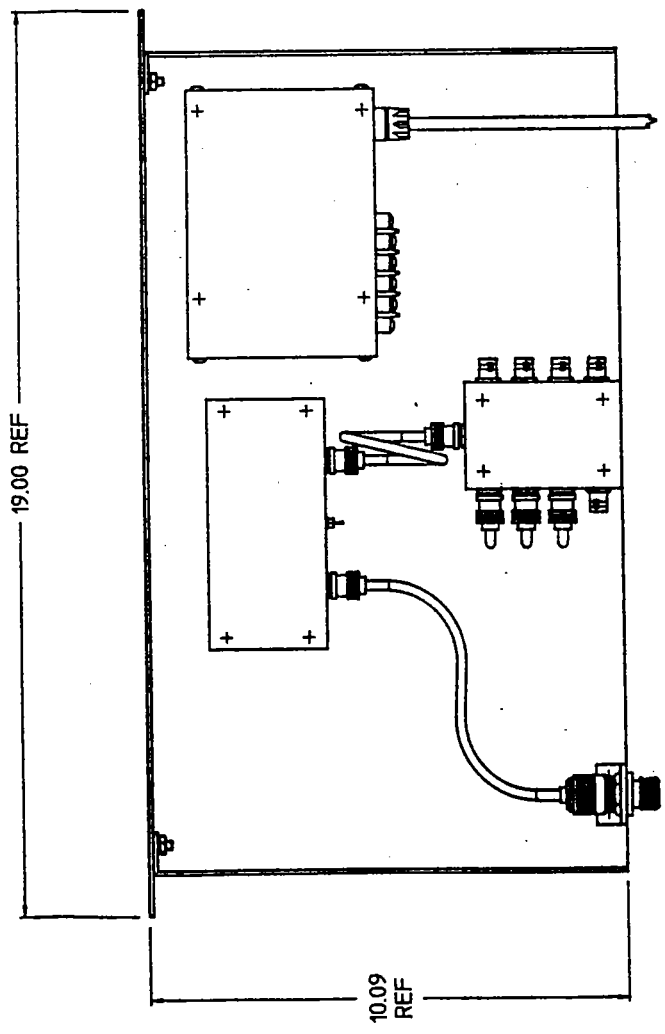
DIMENSIONAL TOLERANCES		TITLE	DRAWING NO.
BASIC	FRACTIONAL	220 MHz DUPLEXED TRUNKING SYSTEM	B-71911
0" - 1"	± .010	DRAWN BY	APPROVED BY
1" - 6"	± .005	ADDRESS	DATE
6" - 24"	± .008		
ALL ANGLES = 1°		 MARLBORO, N.J.      PHOENIX, AZ.	

**USED ON**

Unless otherwise specified -  
 All dimensions are in inches and little block tolerances apply.  
 All thread dimensions to be met after plating where applicable and are to be gauge checked. Break all sharp edges .010-.015 after finish machining.  
 All machined surfaces shall be smooth within 63 micro inches.

**PROPRIETARY NOTE:** THE INFORMATION CONTAINED ON THIS DOCUMENT IS CONSIDERED TO BE CONFIDENTIAL MATERIAL, PROPRIETARY TO CELWAVE AND IS PROVIDED SOLELY FOR INFORMATION PURPOSES. THIS INFORMATION SHALL NOT BE USED BY ANYONE OTHER THAN CELWAVE TO DESIGN OR CONSTRUCT ANY OF THE ITEMS DEPICTED, NOR SHALL IT BE DISCLOSED, DUPLICATED OR COPIED FOR ANY PURPOSE, NOR MADE AVAILABLE TO ANY THIRD PARTY WITHOUT THE PRIOR WRITTEN CONSENT OF A CELWAVE OFFICIAL.

0	REVISION
1	KAA 3-19-93 MODIFIED SPECIFICATIONS J/V



**SPECIFICATIONS**

FREQUENCY RANGE (TYP) ... 2210 - 2216 MHz  
 DIVIDER LOSS (NORMAL) ... 10 dB  
 AMPLIFIER RANGE (PF892A) ... 175 - 225 MHz  
 AMPLIFIER NOISE FIGURE ... 3.4 dB @ 200 MHz  
 INPUT VSWR (MAX) ... 1.1 dB @ 175 MHz  
 OUTPUT VSWR (MAX) ... 1.1 dB @ 175 MHz  
 3<sup>RD</sup> ORDER INTERCEPT PT ... +36.9 dBm  
 INPUT FREQUENCY ... 195 & 205 MHz  
 OUTPUT FREQUENCY ... 215 MHz  
 DC VOLTAGE ... 20.0 V @ 173 mA

SCALE: 3/8" = 1"

USED ON

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Unless otherwise specified -

All dimensions are in inches and title block tolerances apply.

All thread dimensions to be met after plating where applicable and are to be gauge checked. Break all sharp edges .010-.015 after finish machining.

All machined surfaces shall be smooth within 63 micro inches.

DIMENSIONAL TOLERANCES	
BASIC	FRACTIONAL DECIMAL
0" - 1"	± .010 ± .003
1" - 6"	± 1/64 ± .008
6" - 24"	± 1/32 ± .008
ALL ANGLES = 1°	

TITLE

RMC220-8 Rx  
MULTICOPLER ASSY

DRAWING NO. B-73761

DRAWN BY APPROVED BY

**CELWAVE**  
DIVISION OF RAYONTECH SYSTEMS

MARLBORO, N.J.

PHOENIX, AZ.

## Preliminary Specifications PD5042-2 Duplexer

5/93Rev.0

**Description:** The PD5042-2 is a compact 6 cavity duplexer designed for operations in the 221 MHz band. These cavities provide a dual notch response allowing either a lowpass or highpass response.

### Electrical Specifications

Frequency- MHz

@ 1 MHz Tx-Rx Separation

Insertion Loss - dB

Return Loss - dB

Isolation - dB

Connectors

Power - Watts

Temperature

### PD5042-2

216 - 226

1.5

17

80

N- Female

100

-30°C to +60°C

### Mechanical Specifications

Height - inches

Width - inches

Depth - inches

Weight - lbs.

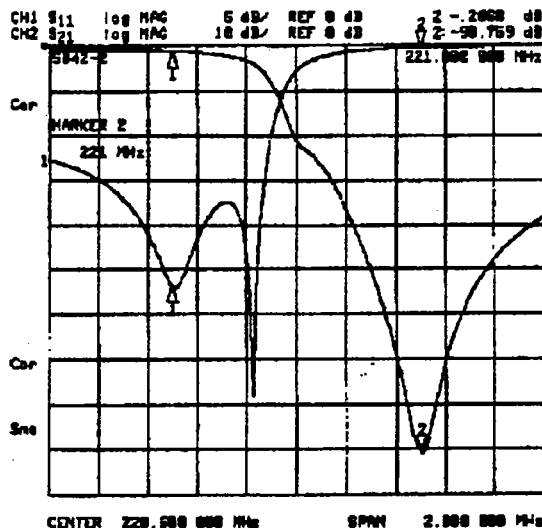
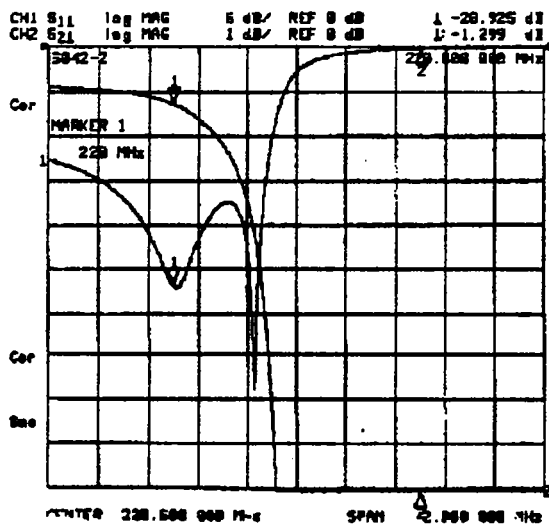
### PD5042-2

4.625

19.000

19.750

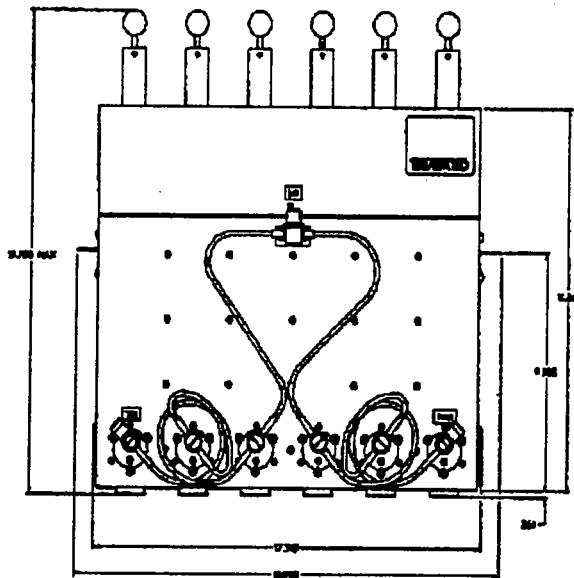
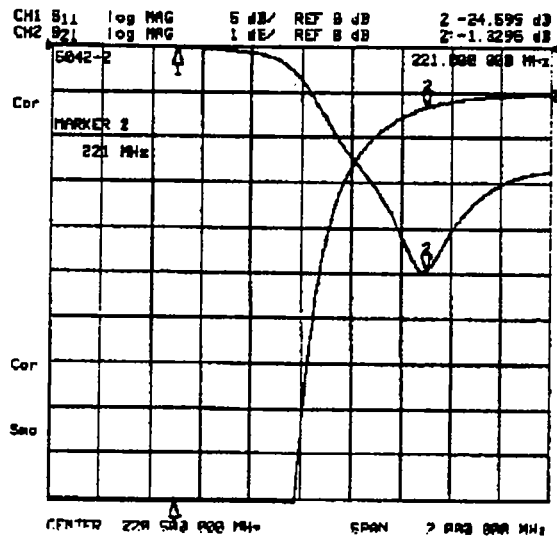
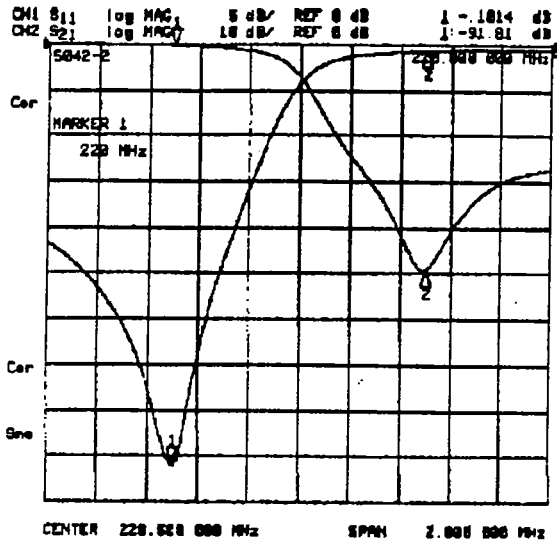
22.000



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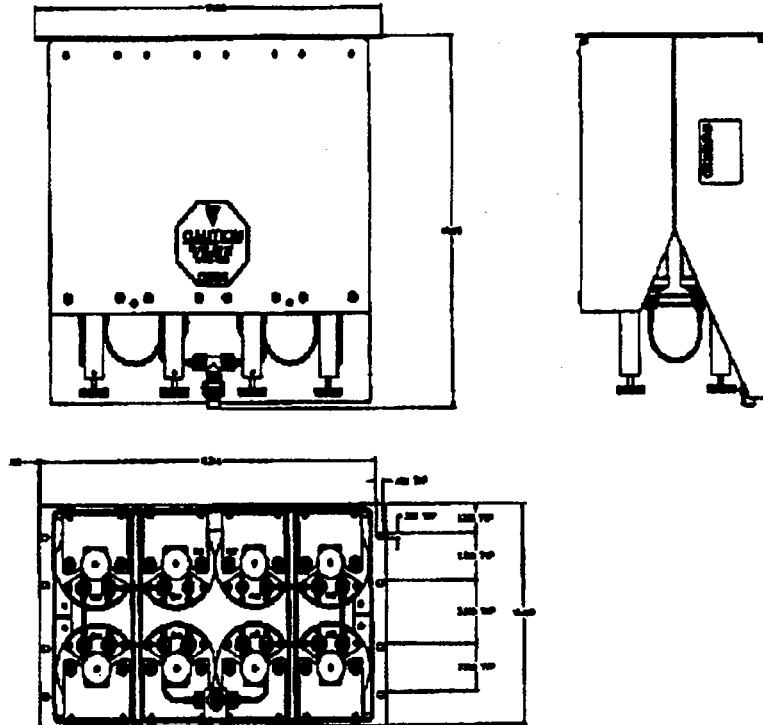
## Preliminary Specifications PD5280 Duplexer

5/93Rev.0

**Description:** The PD5280 is a series of duplexers composed of PD5279 dual notch cavities.

Electrical Specifications @ 1 MHz Tx-Rx Separation	PD5280-1	PD5280-2	PD5280-3
Number of Cavities	4	6	8
Insertion Loss - dB	1.2	1.8	2.3
Return Loss - dB	15	15	15
Isolation - dB	65	90	> 110
Connectors	Type N-Female		
Temperature	-30°C to +60°C		

Mechanical Specifications	PD5280-1	PD5280-2	PD5280-3
Height - inches	5.250	10.500	10.500
Width - inches	19.000	19.000	19.000
Depth - inches	17.675	17.675	17.675
Weight - lbs.	25	35	45



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## Preliminary Specifications PD1602 Lowpass Filter

5/93Rev.0

**Description:** The 1602 is a 7 pole lowpass filter designed to pass the 221 Mhz band and provide second and third harmonic rejection.

### Electrical Specifications

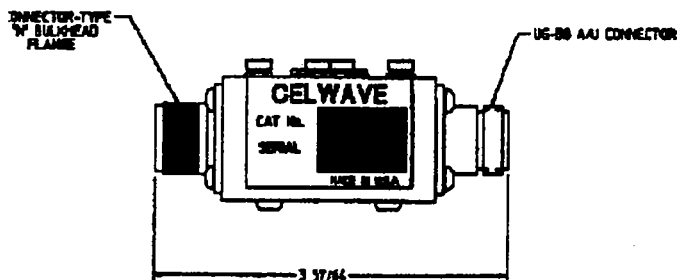
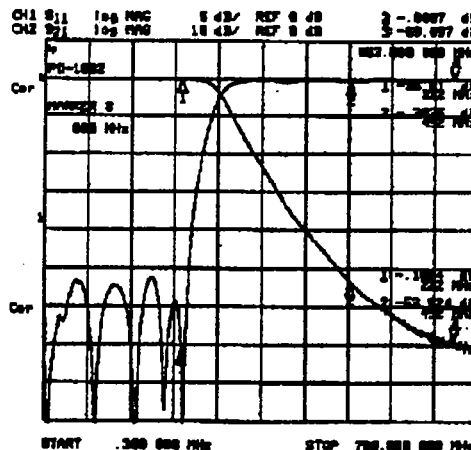
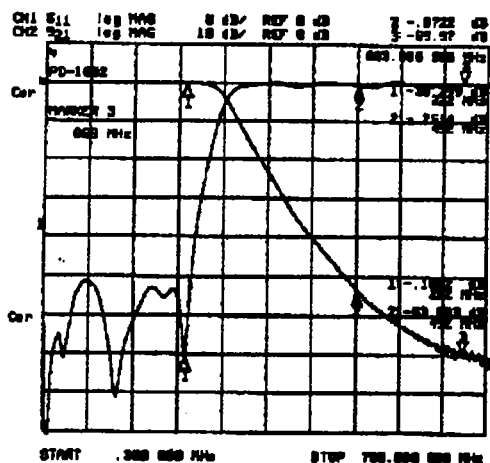
Passband - Mhz  
 Insertion Loss - dB  
 Return Loss - dB  
 Attenuation - dB  
 Connectors  
 Power - Watts  
 Temperature

**PD1602**  
 220-222  
 .25 max.  
 20 min.  
 40 min. @ 440-700 Mhz  
 N-Female, N-Male  
 100  
 -30°C to +60°C

### Mechanical Specifications

Height - inches  
 Width - inches  
 Length - inches  
 Weight - lbs.

**PD1602**  
 1.500  
 1.380  
 3.890  
 .250



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## Preliminary Specifications PD506-2A Duplexer

5/93Rev.0

**Description:** The PD506-2A is a four cavity duplexer designed for operations in the 221 MHz band. The construction utilizes four PD506-2A cavities with RG400 intercavity cabling.

### Electrical Specifications

Frequency - MHz

@ 1 MHz Tx-Rx Separation

Insertion Loss - dB

Return Loss - dB

Isolation - dB

Connectors

Power- Watts

Temperature

### PD506-2A

216-226

1.5

17

80

Type N-Female

250

-30°C to +60°C

### Mechanical Specifications

Height - inches

Width - inches

Length - inches

Weight - lbs.

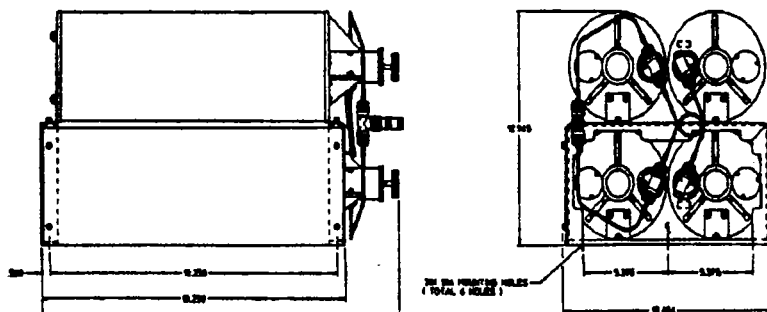
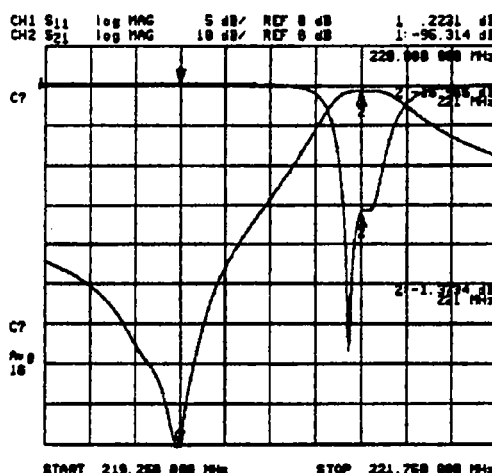
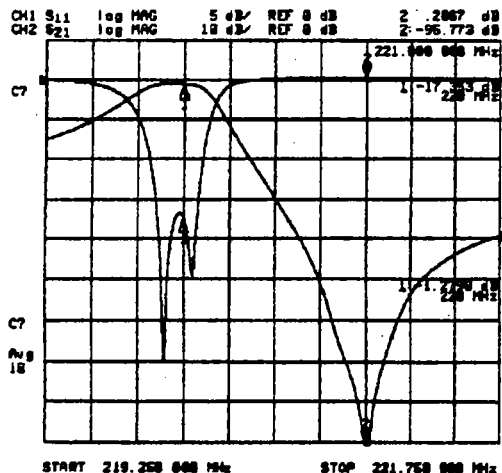
### PD506-2A

13.000

13.500

23.500 Max.

40.0



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## Preliminary Specifications PD5091-2A Dual Notch Cavity 5/93Rev.0

**Description:** The PD5091-2A is a 6 inch diameter dual notch coaxial cavity designed to operate in the 220-226 MHz band. The rotatable couplings allows variable insertion loss settings for varying notch depth and pass notch spacings. This unit is constructed of a high conductivity copper. Special temperature compensation provides frequency stability over a wide operating temperature range. The pass notch response may be modified to a bandpass response by replacing the coupling loop assemblies with those of the 5090-2A.

### Electrical Specifications

Frequency- MHz

Insertion Loss - dB

Unloaded Q

Attenuation @ 1 Mhz separation  
with .5 insertion loss - dB

Connectors

Temperature

### PD5091-2A

216 - 226

Variable .25 - 1.5

6500

38

N- Female (silverplated, gold center pin)  
-30°C to +60°C

### Mechanical Specifications

Diameter - inches

Length - inches

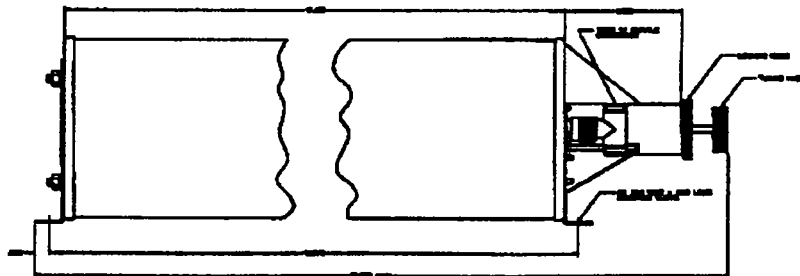
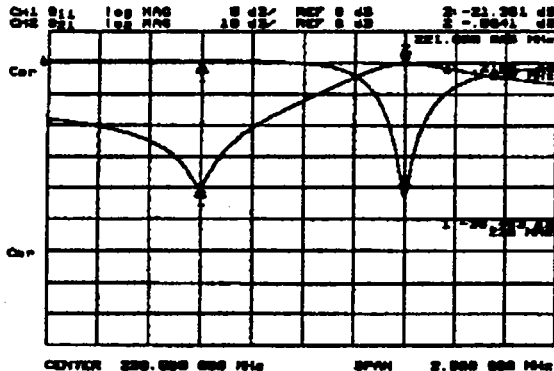
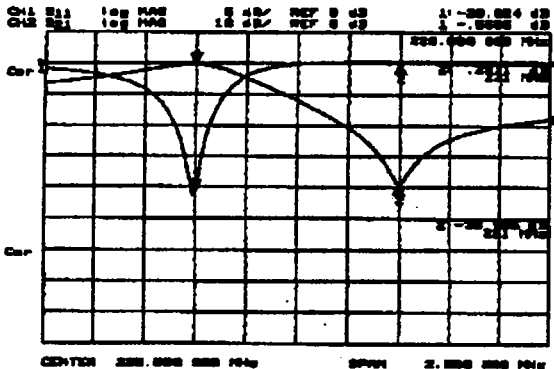
Weight - lbs.

### PD5091-2A

6.125

23.000 Max.

6.500



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## Preliminary Specifications PD5090-2B/3 Bandpass Filter 5/93Rev.0

**Description:** The 5090-2B/3 is a three resonator bandpass filter designed for operation in the 221 MHz band.

### Electrical Specifications

Bandwidth - MHz  
 Insertion Loss - dB  
 Return Loss - dB  
 Attenuation @ -2.5 MHz - dB  
 Connectors  
 Temperature

### PD5090-2B/3

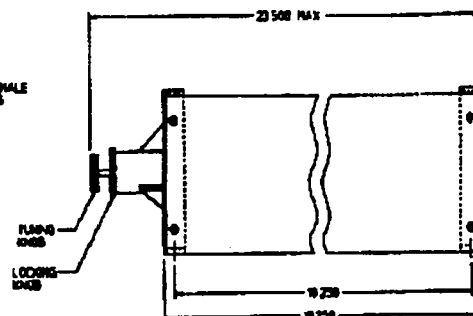
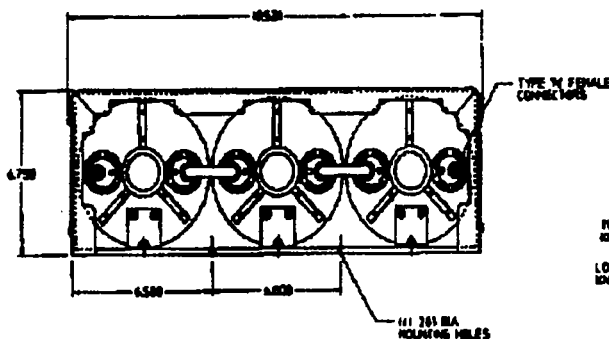
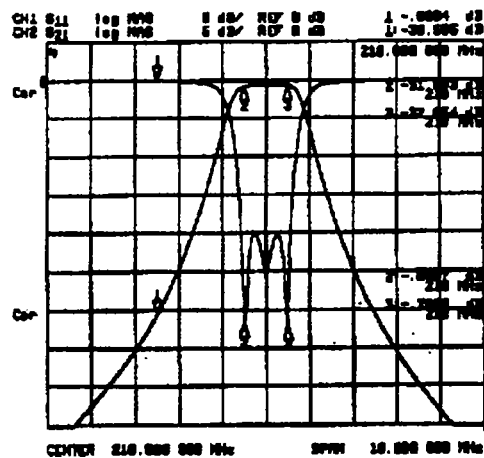
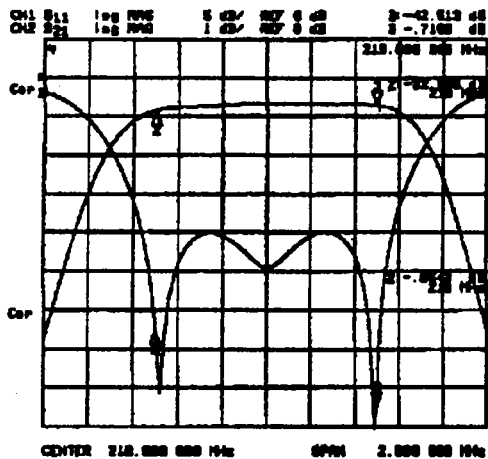
1  
 1.0  
 15  
 30  
 N-Female  
 -30°C to +60°C

### Mechanical Specifications

Height - inches  
 Width - inches  
 Length - inches  
 Weight - lbs.

### PD5090-2B/3

6.750  
 19.531  
 23.500 Max.  
 32.0



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## Preliminary Specifications PD5090-2A Bandpass Cavity 5/93Rev.0

**Description:** The PD5090-2A is a 6 inch diameter bandpass cavity designed to operate in the 220-221 MHz band. The rotatable coupling loops allow variable insertion loss (selectivity) settings. This unit is constructed of high conductivity copper. Special temperature compensation provides frequency stability over a wide operating temperature range. The bandpass response may be modified to a dual notch response by replacing the coupling loop assemblies with those of the 5091-2A.

### Electrical Specifications

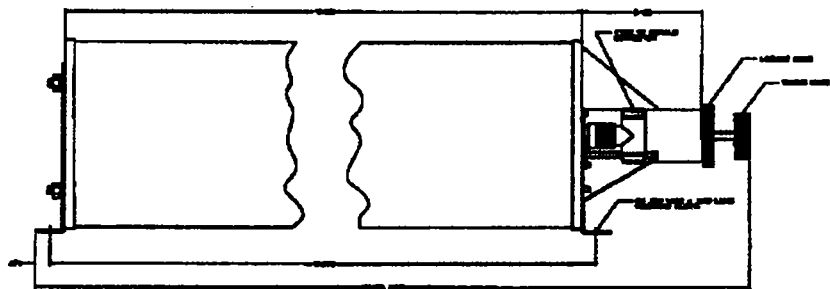
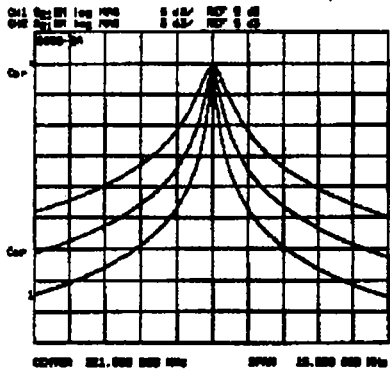
Frequency- MHz  
Insertion Loss - dB  
Unloaded Q  
Connectors  
Temperature

**PD5090-2A**  
216 - 226  
Variable .25 - 2.0  
6500  
N- Female (silverplated, gold center pin)  
-30°C to +60°C

### Mechanical Specifications

Diameter - inches  
Length - inches  
Weight - lbs.

**PD5090-2A**  
6.125  
23.000 Max.  
6.500



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713796-005  
GROUND STRAP  
FOR 7/8" CABLE

220-8 (92.0101 W/N TERMINATION)  
220-222 MHz  
SUPER STATIONMASTER  
BASE ANTENNA

18" N MALE JUMPER  
(SUPPLIED W/ ANTENNA)

738842 N  
FEMALE CONNECTOR  
FOR 7/8" CABLE

910307 HOIST GRIP  
FOR 7/8" CABLE

"X" FT 810921-001 7/8" LOW LOSS FOAM CABLE

"X" 920981-007 CABLE HANGERS (1) EVERY 3 FT (TYPICAL)

"X" 514542-004 ROUND MEMBER HOSE CLAMP 4.5"

**CELWAVE**  
DIVISION OF RADIO FREQUENCY SYSTEMS

TYPICAL 5 CH TRUNKED 220 MHz  
DUPLEXED ANTENNA SYSTEM  
(OVER 150 FT TRANSMISSION  
LINE RUNS)

**SYSTEM #1**

B-719110 FULLY INTERGRATED 220 MHz  
DUPLEXED TRUNKED SYSTEM

930027 LIGHTNING  
PROTECTOR

10091-96 8 FT  
LL FLEX JUMPER

920433-000 7/8"  
WALL FEED THRU

713796-005  
GROUND STRAP  
FOR 7/8" CABLE

738742 N FEMALE  
CONNECTOR FOR  
7/8" CABLE

Rx MULTICOUPLER

2 POLE FILTER

DUPLEXER

TJD220-5  
COMBINER

220-8 (92.0101 W/N TERMINATION)  
220-222 MHz  
SUPER STATIONMASTER  
BASE ANTENNA

713796-004  
GROUND STRAP  
FOR 1/2" CABLE

18" N MALE JUMPER  
(SUPPLIED W/ ANTENNA)

738801 N  
FEMALE CONNECTOR  
FOR 1/2" CABLE

91303 HOIST GRIP  
FOR 1/2" CABLE

"X" FT 810918-001 1/2" LOW LOSS FOAM CABLE

"X" 920981-010 CABLE HANGERS (1) EVERY 3 FT (TYPICAL)

"X" 514542-004 ROUND MEMBER HOSE CLAMP 4.5"

**CELWAVE** RFS  
DIVISION OF RADIO FREQUENCY SYSTEMS

TYPICAL 5 CH TRUNKED 220 MHz  
DUPLXED ANTENNA SYSTEM  
(UNDER 150 FT TRANSMISSION  
LINE RUNS)

**SYSTEM #2**

B-719110 FULLY INTERGRATED 220 MHz  
DUPLXED TRUNKED SYSTEM

930027 LIGHTNING  
PROTECTOR

10091-96 8 FT  
LL FLEX JUMPER

920432-002 1/2"  
WALL FEED THRU

713796-004  
GROUND STRAP  
FOR 1/2" CABLE

738801 N FEMALE  
CONNECTOR FOR  
1/2" CABLE

Rx MULTICOUPLER

2 POLE FILTER

DUPLXER

TJD220-5  
COMBINER

220-8 (92.0101 W/N TERMINATION)  
 220-222 MHz  
 SUPER STATIONMASTER  
 BASE ANTENNA

713796-004  
 GROUND STRAP  
 FOR 1/2" CABLE

18" N MALE JUMPER  
 (SUPPLIED W/ ANTENNA)

738801 N  
 FEMALE CONNECTOR  
 FOR 1/2" CABLE

910303 HOIST GRIP  
 FOR 1/2" CABLE

"X" FT 810918-001 1/2" LOW LOSS FOAM CABLE

"X" 920981-010 CABLE HANGERS (1) EVERY 30 FT (TYPICAL)

"X" 514542-004 ROUND MEMBER HOSE CLAMP 4.5"

220-8  
 220-222 MHz  
 SUPER STATIONMASTER  
 ANTENNA

503 SIDE MOUNT

MOUNT ANTENNA 70"  
 FROM TOWER (MIN)

713796-004  
 GROUND STRAP  
 FOR 1/2" CABLE

18" N MALE JUMPER  
 (SUPPLIED W/ ANTENNA)

738801 N  
 FEMALE CONNECTOR  
 FOR 1/2" CABLE

910303 HOIST GRIP  
 FOR 1/2" CABLE

930027 LIGHTNING  
 PROTECTOR

(2) 10091-96 8 FT  
 LL FLEX JUMPER

920432-002 1/2"  
 WALL FEED THRU

713796-004  
 GROUND STRAP  
 FOR 1/2" CABLE

738801 N FEMALE  
 CONNECTOR FOR  
 1/2" CABLE

**CELWAVE**  
 DIVISION OF RADIO FREQUENCY SYSTEMS

TYPICAL 5 CH TRUNKED 220 MHz  
 ANTENNA SYSTEM  
 SEPERATE Tx & Rx ANTENNAS  
 (UNDER 150 FT TRANSMISSION  
 LINE RUNS)

**SYSTEM #3**

NOTE:

48 dB MINIMUM ISOLATION IS REALIZED BY 22  
 OF ANTENNA TIP TO BOTTOM SEPERATION.

719650 FILTER SYSTEM FOR  
 SEPERATE Tx & Rx ANTENNAS

Rx MULTICOUPLER

2 POLE Rx FILTER

Rx FILTER

Tx FILTER

TJD220-5  
 COMBINER

