New Thinking in Wireless Technology

RENAISSANCE
ELECTRONICS CORPORATION

power dividers/combiners

2004 catalog

2 WAY, 20W, N

3 WAY, 20W, NF

4 WAY, 20W, N

6 WAY, 20W, N

9 WAY, 20W, N

12 WAY,20W,N

16 WAY, 20W,N

2 WAY, 20W, SMA

3 WAY,20W,SMA

4 WAY,20W,SMA

6 WAY,20W, SMA

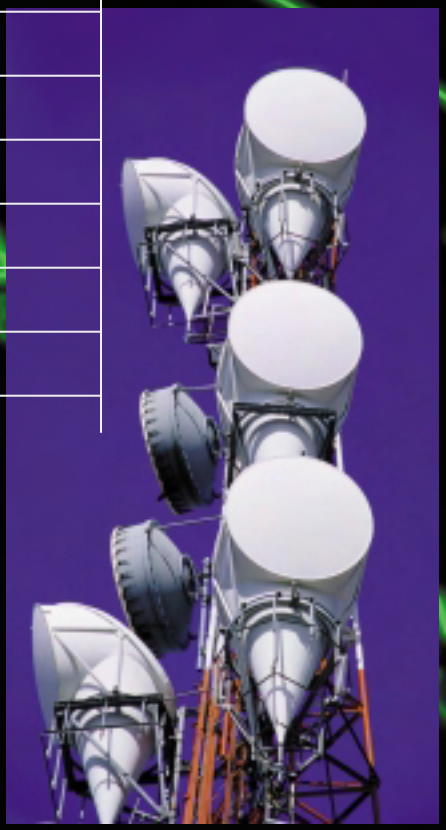
8 WAY,20W,SMA

9 WAY, 20W, SMA

12 WAY,20W,SMA

16 WAY,20W,SMA

HIGH POWER COMBINER



400 MHz to 26.5 GHz

forward...

Renaissance Electronics Corporation

As an experienced RF and Microwave subsystems and component design and manufacturing company, Renaissance Electronics is ideally structured to support a variety of commercial and military markets.

Since 1991, Renaissance Electronics has consistently established itself as a technology innovation leader for both off-the-shelf and custom-engineered products. With over 200 years of combined engineering experience in RF and Microwave technology, our design methods are proven.

Renaissance Electronics has been designing and manufacturing Power Combiners; Power Dividers; Transmitter Combiners; Receiver Multi-Couplers since 1996. Our primary frequency range for this Product Group is 400 MHz to 26.5 GHz. Our subsystem design approach incorporates the spectrum of microwave techniques; coax, microstrip, stripline and waveguide topologies. Many of our Combiner Group products are used in Defense; Industrial and Telecommunications applications. Renaissance Electronics has provided several customers with unique solutions which incorporate our Combiner Group products with components/subsystems from other product groups, thereby providing customers with full-rack solutions.

An ISO-9001:2000 facility, strict quality control adherence begins at the design stage and is carried through the materials control, manufacturing and shipping processes.

Visit Renaissance Electronics' web site, http://www.rec-usa.com Product Search Engine to view some of our existing designs for Combiners and Dividers.

Renaissance Electronics make a variety of RF and Microwave Subsystems and components other than Combiner products. These include;

- Ferrite Circulators/Isolators
- Electro-Mechanical Switches
- Attenuators
- Switches Matrices
- MEMS Switches

To discuss your particular application, please contact the factory or one of our field sales engineers in your local area. For a list of field sales engineers, visit our web site at http://www.rec-usa.com/contact.htm.

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400 MHz to 26.5 GHz

combiner/divider

2 Way, 20W, N Connector

Features:

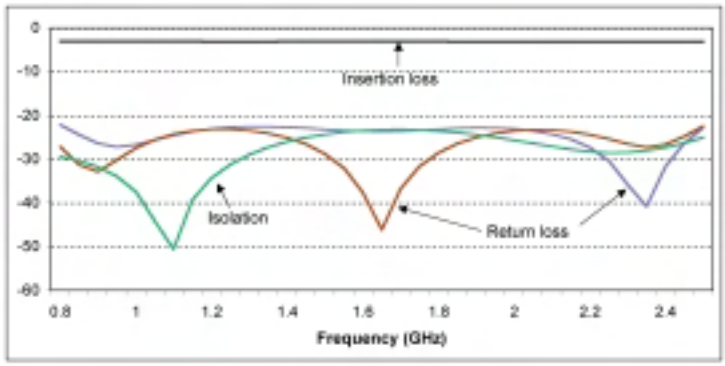
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

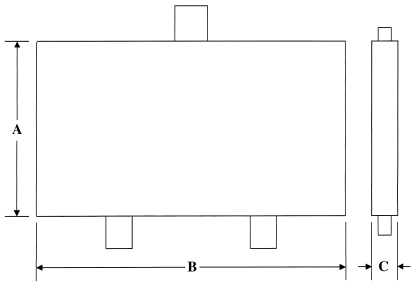
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

2 WAY, 20W, N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
				max				
10A2BF-2N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NM-2N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BW-2N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAO-2N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BA-2N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4NP-2N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	2
10A5BE-2N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BW-2N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	2.3"	x	2.2"	x	1.15"
Outline 2	1.75"	x	2.20"	x	1.15"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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combiner/divider

3 Way, 20W, N Connector

Features:

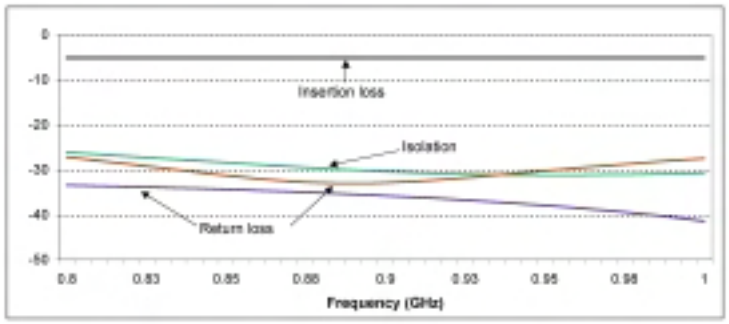
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

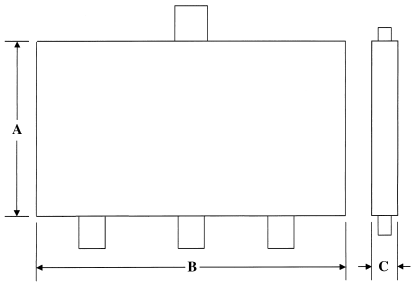
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

3 WAY, 20W, N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BG-3N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NO-3N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BX-3N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAP-3N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BB-3N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NQ-3N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BF-3N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	1
10A5BX-3N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	1



	A	x	B	x	C
Outline 1	3.0"	x	3.15"	x	1.15"



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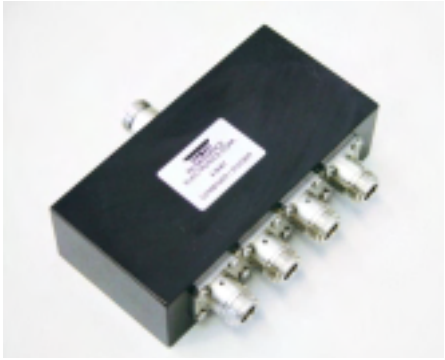
4 Way, 20W, N Connector



Features:

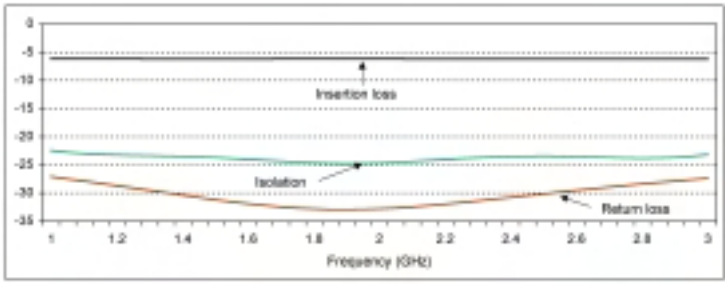
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

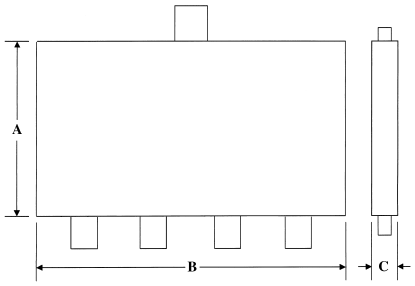
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

4 WAY, 20W, N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BH-4N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NP-4N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BY-4N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAQ-4N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BC-4N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NR-4N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BG-4N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	1
10A5BY-4N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	1



	A	x	B	x	C
Outline 1	2.5"	x	4.5"	x	1.15"



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6 Way, 20W, N Connector

Features:

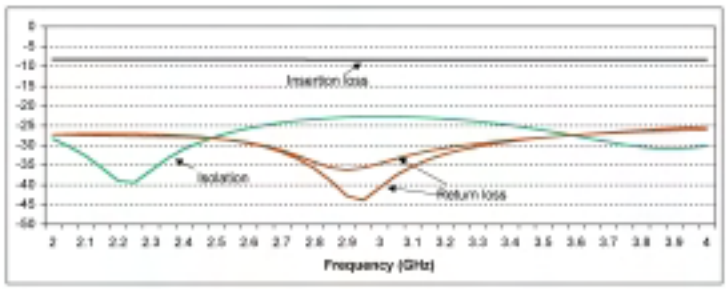
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

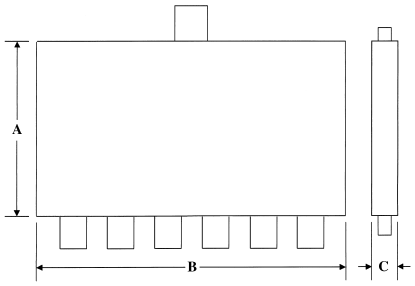
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

6 WAY, 20W, N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
				max				
10A2BJ-6N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NQ-6N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BZ-6N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAR-6N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BD-6N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NS-6N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BH-6N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	1
10A5BZ-6N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	1



	A	x	B	x	C
Outline 1	2.5"	x	6.5"	x	1.15"



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8 Way, 20Ww, N Connector

Features:

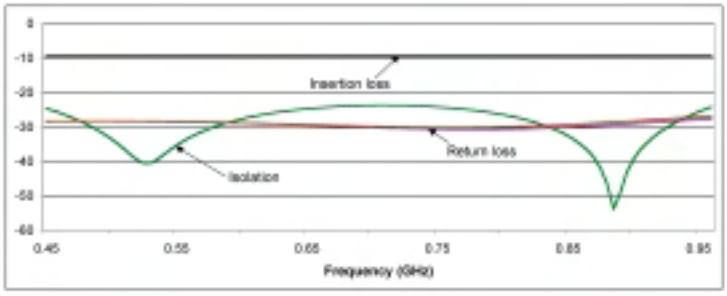
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

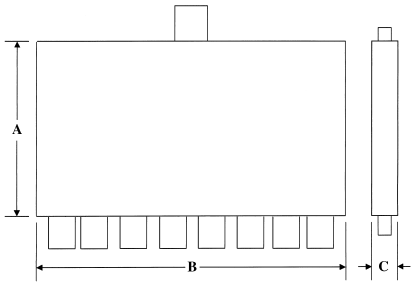
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

8 WAY, 20W, N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BK-8N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NR-8N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAA-8N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAS-8N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BE-8N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NT-8N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BJ-8N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	1
10A5BAA-8N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	1



	A	x	B	x	C
Outline 1	3.0"	x	8.5"	x	1.15"



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9 Way, 20W, N Connector

Features:

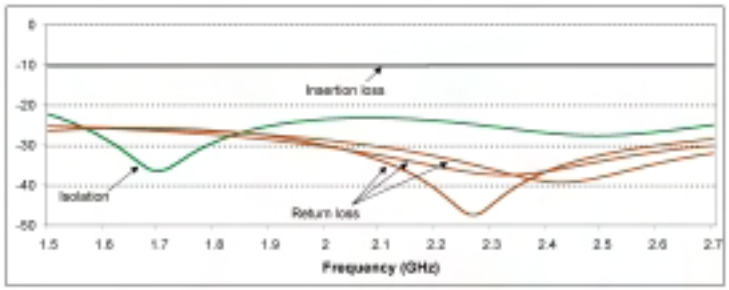
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

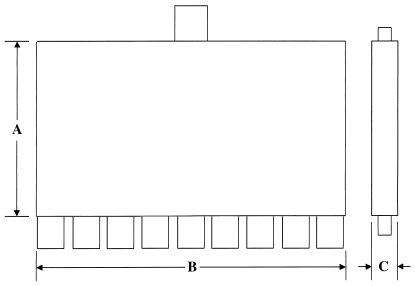
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

9 WAY, 20W, N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BM-9N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NS-9N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAB-9N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAT-9N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BF-9N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NU-9N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BK-9N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	1
10A5BAB-9N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	1



	A	x	B	x	C
Outline 1	4.0"	x	9.5"	x	1.15"



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12 Way, 20W, N Connector

Features:

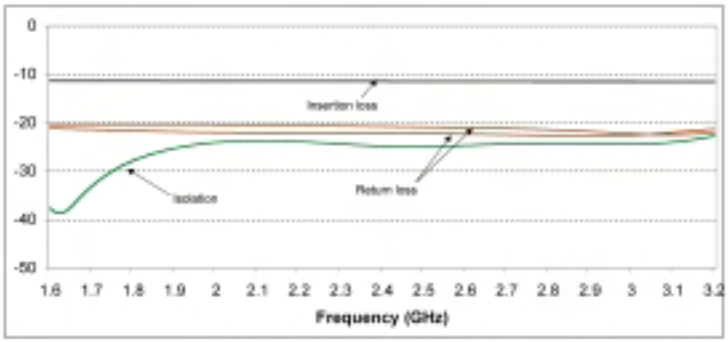
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

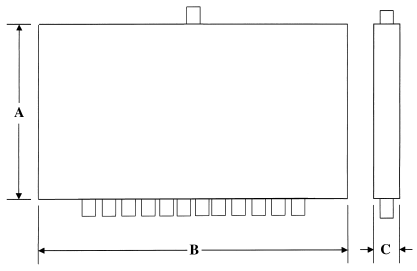
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

12 WAY,20W,N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BP-12N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NT-12N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAC-12N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAU-12N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4BG-12N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NV-12N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BM-12N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAC-12N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	4.25"	x	12.5"	x	1.15"
Outline 2	5.0"	x	12.5"	x	1.15"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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16 Way, 20W, N Connector

Features:

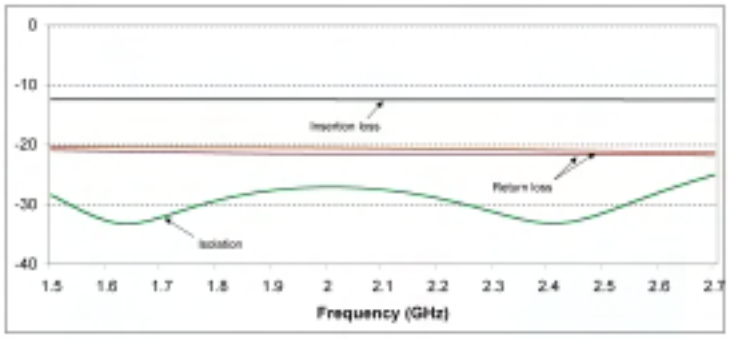
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

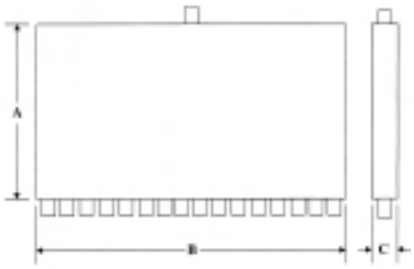
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

16 WAY, 20W,N CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BQ-16N	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NU-16N	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAD-16N	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	2
10A3BAV-16N	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4BH-16N	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4NW-16N	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BN-16N	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAD-16N	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	3.5"	x	16.5"	x	1.15"
Outline 2	4.5"	x	16.5"	x	1.15"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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2 Way, 20W, SMA Connector

Features:

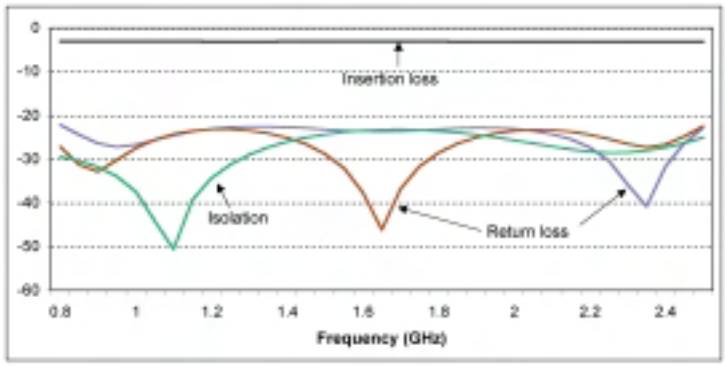
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

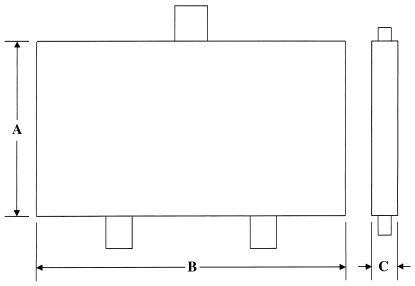
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

2 WAY, 20W, SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input max	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BR-2S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NV-2S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAE-2S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAW-2S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BJ-2S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4NX-2S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	2
10A5BO-2S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAE-2S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	2.2"	x	1.75"	x	0.4"
Outline 2	1.75"	x	1.75"	x	0.4"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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3 Way, 20W, SMA Connector

Features:

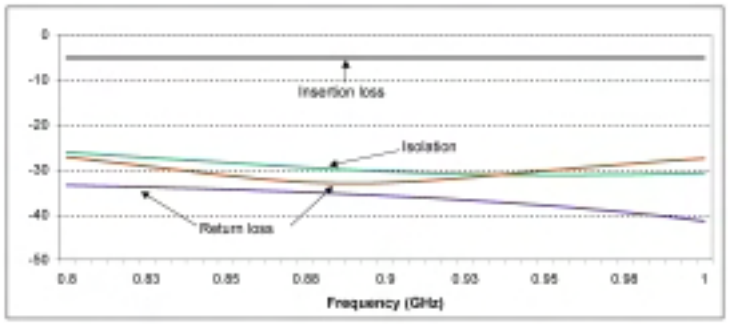
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

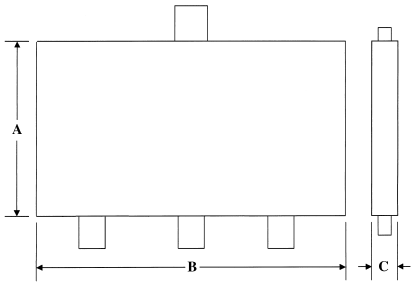
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

3 WAY,20W,SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BS-3S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NW-3S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAF-3S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	2
10A3BAX-3S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4BK-3S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4NY-3S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BP-3S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAF-3S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	2.3"	x	2.2"	x	0.4"
Outline 2	3.0"	x	2.75"	x	0.4"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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4 Way, 20W, SMA Connector

Features:

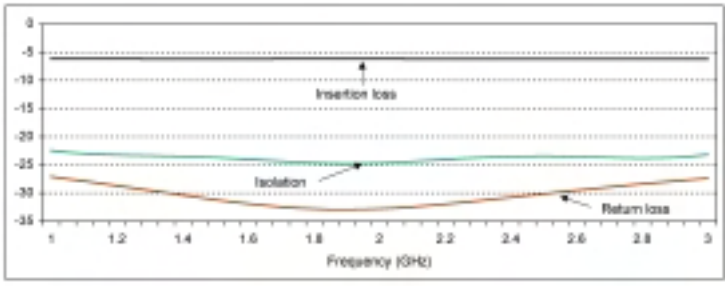
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

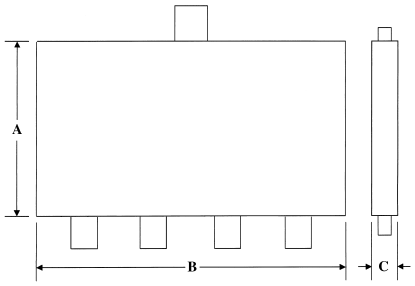
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

4 WAY,20W,SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BT-4S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NX-4S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAG-4S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	2
10A3BAY-4S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4BM-4S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4NZ-4S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BQ-4S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAG-4S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	3.2"	x	2.7"	x	0.4"
Outline 2	2.75"	x	2.75"	x	0.4"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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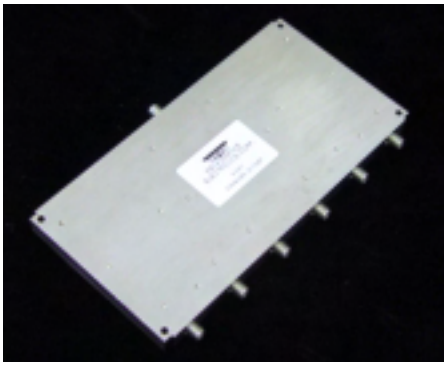
6 Way, 20W, SMA Connector



Features:

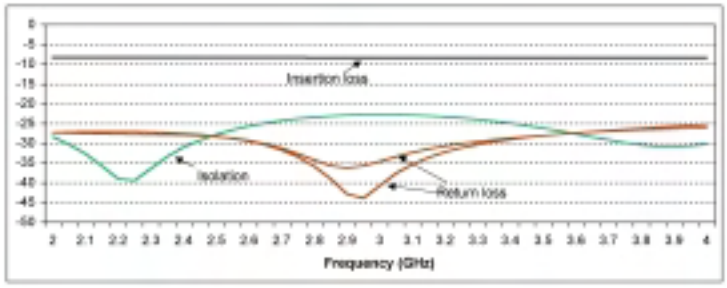
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

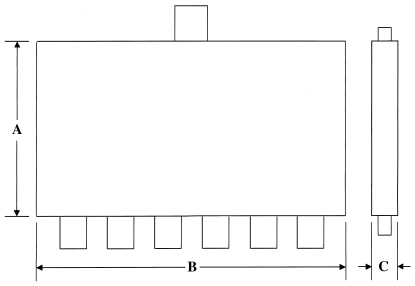
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

6 WAY,20W, SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BU-6S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NY-6S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAH-6S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BAZ-6S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4BN-6S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4NAA-6S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BR-6S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAH-6S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	2.25"	x	3.75"	x	0.4"
Outline 2	3.5"	x	3.5"	x	0.4"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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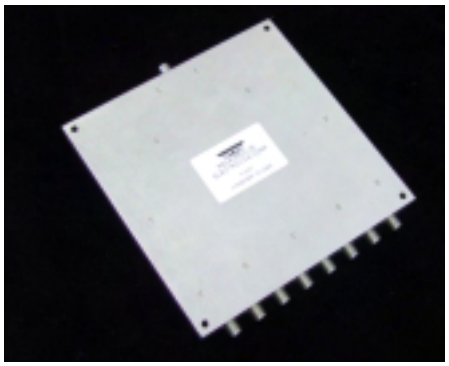
8 Way, 20W, SMA Connector



Features:

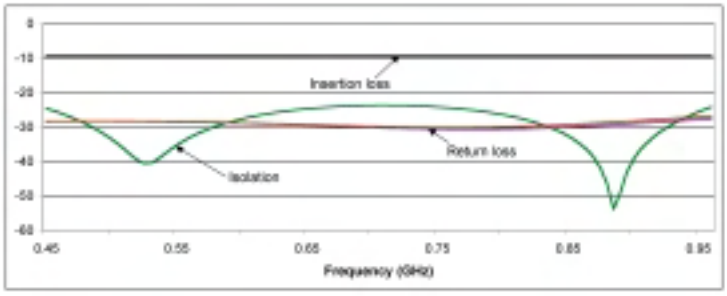
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

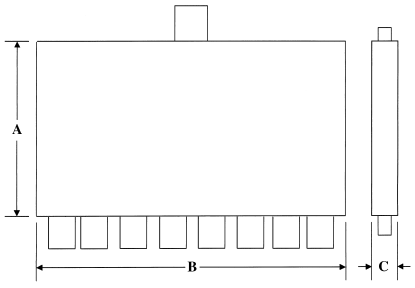
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

8 WAY,20W,SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BV-8S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NZ-8S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAJ-8S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BBA-8S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BO-8S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NAB-3S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BS-8S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAJ-8S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	4.5"	x	4.5"	x	0.4"
Outline 2	2.5"	x	4.5"	x	0.4"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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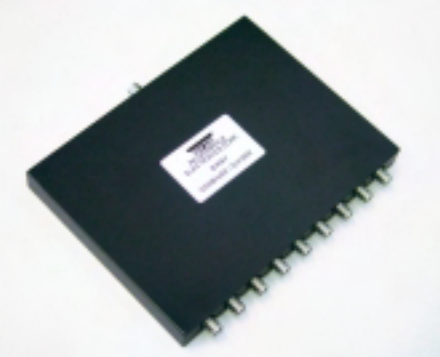
9 Way, 20W, SMA Connector



Features:

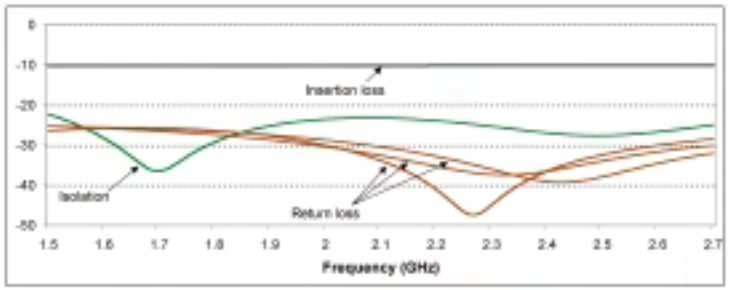
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

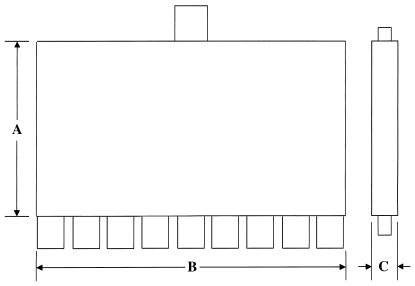
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

9 WAY, 20W, SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
				max				
10A2BW-9S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NAA-9S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAK-9S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BBB-9S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4BP-9S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NAC-9S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BT-9S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAK-9S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	3.75"	x	5.0"	x	0.4"
Outline 2	3.25"	x	5.0"	x	0.4"



Notes:

Power Handling capability of divider/ combiner:

The power handling capability of a power divider or a combiner is governed by the isolation resistors. In a power divider application, these resistors will dissipate reflections coming back from the output ports. On the other hand in a power combiner application, for non-coherent signals, the isolation resistors will dissipate 3 dB from each signal. Being reciprocal in nature, the same device will handle higher power levels as a divider than a combiner. In other words compared to a combiner, a divider requires less power handling resistor. Please note that for coherent signals, there would not be a 3 dB loss per signal and so the power rating of the device will be more.

1. Power ratings available from 1W up to 70W
2. Insertion loss above theoretical power divider split.
3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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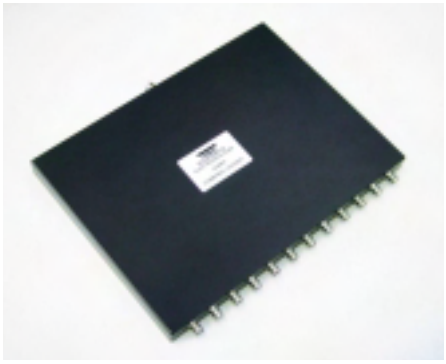
12 Way, 20W, SMA Connector



Features:

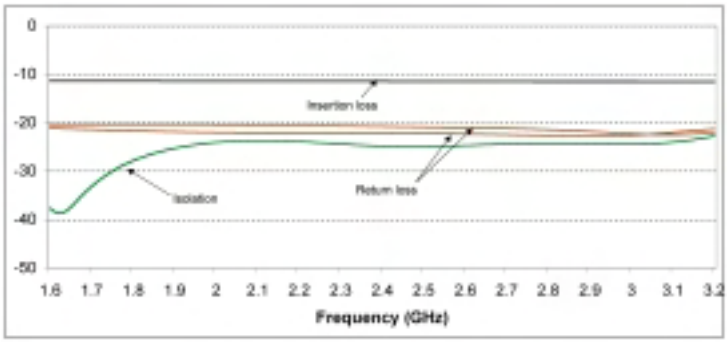
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

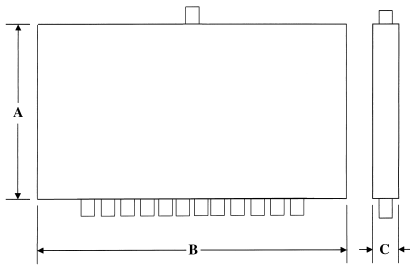
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

12 WAY,20W,SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output max	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
10A2BX-12S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NAB-12S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAM-12S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	2
10A3BBC-12S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4BQ-12S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4NAD-12S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BU-12S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAN-12S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	5.25"	x	7.0"	x	0.4"
Outline 2	4.75"	x	7.0"	x	0.4"



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3. All output ports are in-phase.
4. Normal operating temperature, -40 to +85 deg C
5. Standard impedence 50 Ohms
6. Higher frequency, up to 26.5GHz available in power rating up to 70W per input channel.
7. Custom designs with different connector and housing configurations available upon request.

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16 Way, 20W, SMA Connector

Features:

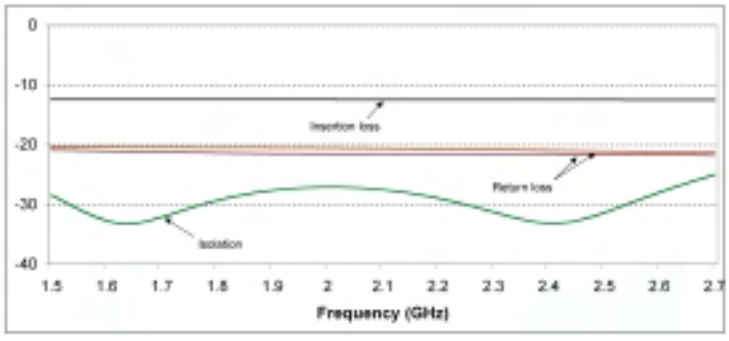
- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

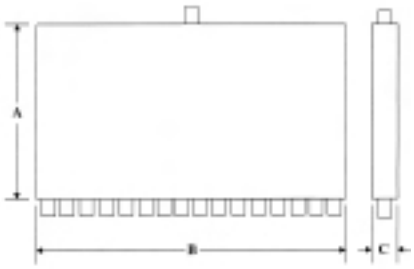
- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

16 WAY,20W,SMA CONNECTOR

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input	VSWR Output	Amplitude Balance dB, max	Phase Balance deg., max	Standard Outline
				max				
10A2BY-16S	0.450 - 0.960	24	0.3	1.20:1	1.15:1	0.2	3	1
10A2NAC-16S	0.800 - 1.000	25	0.3	1.20:1	1.15:1	0.2	3	1
10A3BAN-16S	0.800 - 2.500	20	0.5	1.25:1	1.20:1	0.2	3	1
10A3BBD-16S	1.000 - 3.000	20	0.5	1.25:1	1.20:1	0.2	3	2
10A4BR-16S	1.500 - 2.700	20	0.5	1.25:1	1.20:1	0.2	3	1
10A4NAE-16S	1.700 - 1.990	24	0.3	1.15:1	1.10:1	0.2	3	1
10A5BV-16S	1.600 - 3.200	20	0.5	1.25:1	1.20:1	0.2	3	2
10A5BAP-16S	2.000 - 4.000	20	0.5	1.25:1	1.20:1	0.2	3	2



	A	x	B	x	C
Outline 1	5.0"	x	9.0"	x	0.4"
Outline 2	4.5"	x	9.0"	x	0.4"



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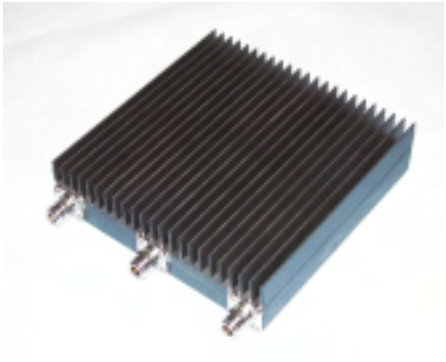
high power combiner

High Power Combiner



Features:

- High Isolation,
- Excellent phase and amplitude balance
- Low insertion loss
- Higher power handling capability
- Compact in size and low in weight
- Wider bandwidth

Benefits:

- Better signal clarity
- Low non-linear signal distortion
- Reduce the number of amplifiers & lower Investment.
- Lower cost
- Single unit can replace several split band units.

HIGH POWER COMBINER

Model Number	Frequency Range GHz	Isolation dB min	Insertion Loss, dB max	VSWR Input max	Input Power Watts	No of Channels	Connector	Size, inches A x B x C
9A2NAJ	0.470 - 0.860	17	3.6	1.30:1	330	2	N	6.5 x 4.9 x 1.43
9A2NAK	0.470 - 0.860	20	5.3	1.30:1	120	3	N	6.5 x 4.9 x 1.43
9A2NBA	0.935 - 0.960	50	6	1.25:1	50	3	SMA	5.95 x 5.0 x 1.92
9A2NBG	0.935 - 0.960	50	3.6	1.30:1	50	2	SMA	5.95 x 5.0 x 1.92
9A2NBI	0.865 - 0.960	50	3.6	1.30:1	50	2	SMA	5.95 x 5.0 x 1.92
9A2NP	0.850 - 0.870	55	6.5	1.30:1	80	4	N	10.0 X 7.03 X 1.92
9A2NQ	0.850 - 0.870	55	6	1.25:1	60	3	N	6.90 X 5.10 X 1.92
9A2NU	0.850 - 0.870	55	4	1.25:1	40	2	N	6.0 X 4.0 X 1.92
9A4NM	1.805 -1.880	50	6.2	1.30:1	50	3	SMA	5.95 X 5.0 X 0.91
9A4NL	1.930 - 1.990	50	6	1.25:1	50	3	SMA	5.95 X 5.0 X 1.92
9A4NP	1.805 - 1.880	50	4.2	1.30:1	50	2	SMA	5.95 X 5.0 X 1.92
9A4NQ	1.930 - 1.990	50	4.2	1.30:1	50	2	SMA	5.95 X 5.0 X 1.92
9A4NR	1.805 - 1.990	50	3.8	1.30:1	50	2	SMA	5.95 X 5.0 X 1.92

Notes:

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return loss versus VSWR

TABLE OF RETURN LOSS VERSUS VOLTAGE STANDING WAVE RATIO

Return Loss (db)	VSWR	Return Loss (dB)	VSWR	Return loss (dB)	VSWR	Return Loss (dB)	VSWR	Return Loss (dB)	VSWR
46.064	1.01	13.842	1.51	9.485	2.01	7.327	2.51	5.999	3.01
40.086	1.02	13.708	1.52	9.428	2.02	7.294	2.52	5.970	3.02
36.607	1.03	13.577	1.53	9.372	2.03	7.262	2.53	5.956	3.03
34.151	1.04	13.449	1.54	9.317	2.04	7.230	2.54	5.935	3.04
32.256	1.05	13.324	1.55	9.262	2.05	7.198	2.55	5.914	3.05
30.714	1.06	13.201	1.56	9.208	2.06	7.167	2.56	5.893	3.06
29.417	1.07	13.081	1.57	9.155	2.07	7.135	2.57	5.872	3.07
28.299	1.08	12.964	1.58	9.103	2.08	7.105	2.58	5.852	3.08
27.318	1.09	12.849	1.59	9.051	2.09	7.074	2.59	5.832	3.09
26.444	1.10	12.736	1.60	8.999	2.10	7.044	2.60	5.811	3.10
25.650	1.11	12.625	1.61	8.949	2.11	7.014	2.61	5.791	3.11
24.943	1.12	12.518	1.62	8.899	2.12	6.984	2.62	5.771	3.12
24.289	1.13	12.412	1.63	8.849	2.13	6.954	2.63	5.751	3.13
23.686	1.14	12.308	1.64	8.800	2.14	6.925	2.64	5.732	3.14
23.127	1.15	12.207	1.65	8.752	2.15	6.896	2.65	5.712	3.15
22.607	1.16	12.107	1.66	8.705	2.16	6.867	2.66	5.693	3.16
22.120	1.17	12.009	1.67	8.657	2.17	6.839	2.67	5.674	3.17
21.664	1.18	11.913	1.68	8.611	2.18	6.811	2.68	5.654	3.18
21.234	1.19	11.818	1.69	8.565	2.19	6.783	2.69	5.635	3.19
20.828	1.20	11.725	1.70	8.519	2.20	6.755	2.70	5.617	3.20
20.443	1.21	11.634	1.71	8.474	2.21	6.728	2.71	5.598	3.21
20.079	1.22	11.545	1.72	8.430	2.22	6.700	2.72	5.579	3.22
19.732	1.23	11.457	1.73	8.386	2.23	6.673	2.73	5.561	3.23
19.401	1.24	11.370	1.74	8.342	2.24	6.646	2.74	5.542	3.24
19.005	1.25	11.285	1.75	8.299	2.25	6.620	2.75	5.524	3.25
18.783	1.26	11.202	1.76	8.257	2.26	6.594	2.76	5.506	3.26
18.493	1.27	11.120	1.77	8.215	2.27	6.567	2.77	5.488	3.27
18.216	1.28	11.039	1.78	8.173	2.28	6.541	2.78	5.470	3.28
17.949	1.29	10.960	1.79	8.138	2.29	6.516	2.79	5.452	3.29
17.690	1.30	10.881	1.80	8.091	2.30	6.490	2.80	5.435	3.30
17.445	1.31	10.804	1.81	8.051	2.31	6.465	2.81	5.417	3.31
17.207	1.32	10.729	1.82	8.011	2.32	6.440	2.82	5.400	3.32
16.977	1.33	10.654	1.83	7.972	2.33	6.415	2.83	5.383	3.33
16.755	1.34	10.581	1.84	7.933	2.34	6.390	2.84	5.365	3.34
16.540	1.35	10.509	1.85	7.894	2.35	6.366	2.85	5.348	3.35
16.332	1.36	10.437	1.86	7.856	2.36	6.341	2.86	5.331	3.36
16.131	1.37	10.367	1.87	7.818	2.37	6.317	2.87	5.315	3.37
15.936	1.38	10.298	1.88	7.781	2.38	6.293	2.88	5.298	3.38
15.747	1.39	10.230	1.89	7.744	2.39	6.270	2.89	5.281	3.39
15.563	1.40	10.163	1.90	7.707	2.40	6.246	2.90	5.265	3.40
15.385	1.41	10.097	1.91	7.671	2.41	6.223	2.91	5.248	3.41
15.211	1.42	10.032	1.92	7.635	2.42	6.200	2.92	5.232	3.42
15.043	1.43	9.968	1.93	7.599	2.43	6.177	2.93	5.216	3.43
14.879	1.44	9.904	1.94	7.564	2.44	6.154	2.94	5.200	3.44
14.719	1.45	9.842	1.95	7.529	2.45	6.131	2.95	5.184	3.45
14.412	1.46	9.780	1.96	7.494	2.46	6.109	2.96	5.168	3.46
14.264	1.47	9.720	1.97	7.460	2.47	6.086	2.97	5.152	3.47
14.120	1.48	9.660	1.98	7.393	2.49	6.042	2.99	5.121	3.49
13.979	1.50	9.542	2.00	7.360	2.50	6.021	3.00	5.105	3.50

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power conversion/VSWR charts

POWER CONVERSION

dBm	mW	dBm	mw/Watts	dBm	Watts
-20	0.010	+7	5.010	+34	2.550
-19	0.012	+8	6.300	+35	3.160
-18	0.016	+9	7.940	+36	3.910
-17	0.020	+10	10.00	+37	5.010
-16	0.025	+11	12.60	+38	6.310
-15	0.032	+12	15.80	+39	7.940
-14	0.040	+13	19.90	+40	10.00
-13	0.050	+14	25.10	+41	12.60
-12	0.063	+15	31.60	+42	15.80
-11	0.079	+16	39.80	+43	20.00
-10	0.1 00	+17	50.10	+44	25.10
-9	0.130	+18	63.10	+45	31.60
-8	0.160	+19	79.40	+46	39.80
-7	0.200	+20	0.100 (W)	+47	50.10
-6	0.250	+21	0.120 (W)	+48	63.10
-5	0.316	+22	0.159 (W)	+49	79.40
-4	0.398	+23	0.200 (W)	+50	100.0
-3	0.501	+24	0.251 (W)	+51	126.0
-2	0.630	+25	0.316 (W)	+52	158.0
-1	0.794	+26	0.398 (W)	+53	200.0
0	1.000	+27	0.501 (W)	+54	251.0
+1	1.250	+28	0.631 (W)	+55	316.0
+2	1.580	+29	0.794 (W)	+56	398.0
+3	2.000	+30	1.000 (W)	+57	501.0
+4	2.510	+31	1.260 (W)	+58	631.0
+5	3.160	+32	1.590 (W)	+59	794.0
+6	3.980	+33	2.000 (W)	+60	1K

EFFECT ON VSWR ON TRANSMITTED POWER

VSWR	Return Loss (dB)	Trans. Loss (dB)	Volt. Refl. COEF.	Power Refll. (%)	Power Trans. (%)
1.00	∞	0.000	0.00	0.0	100.0
1.01	46.1	0.000	0.00	0.0	100.0
1.02	40.1	0.000	0.01	0.0	100.0
1.03	36.6	0.001	0.01	0.0	100.0
1.04	34.2	0.002	0.02	0.0	100.0
1.05	32.3	0.003	0.02	0.1	99.9
1.06	30.7	0.004	0.03	0.1	99.9
1.07	29.4	0.005	0.03	0.1	99.9
1.08	28.3	0.006	0.04	0.1	99.9
1.09	27.3	0.008	0.04	0.2	99.8
1.10	26.4	0.010	0.05	0.2	99.8
1.11	25.7	0.012	0.05	0.3	99.7
1.12	24.9	0.014	0.06	0.3	99.7
1.13	24.3	0.016	0.06	0.4	99.6
1.14	23.7	0.019	0.07	0.4	99.6
1.15	23.1	0.021	0.07	0.5	99.5
1.16	22.6	0.024	0.07	0.5	99.5
1.17	22.1	0.027	0.08	0.6	99.4
1.18	21.7	0.030	0.08	0.7	99.3
1.19	21.2	0.033	0.09	0.8	99.2
1.20	20.8	0.036	0.09	0.8	99.2
1.25	19.1	0.054	0.11	1.2	98.8
1.30	17.7	0.075	0.13	1.7	98.3
1.40	15.6	0.122	0.17	2.8	97.2
1.50	14.0	0.177	0.20	4.0	96.0
1.60	12.7	0.238	0.23	5.3	94.7
1.70	11.7	0.302	0.26	6.7	93.3
1.80	10.9	0.370	0.29	8.2	91.8
1.90	10.2	0.440	0.31	9.6	90.4
2.00	9.50	0.512	0.33	11.1	88.9
3.00	6.00	1.240	0.50	25.0	75.0
4.00	4.40	1.930	0.60	36.0	64.0
5.00	3.50	2.550	0.67	44.4	55.6
10.0	1.70	4.800	0.82	66.9	33.1
20.0	0.90	7.410	0.90	81.9	18.1

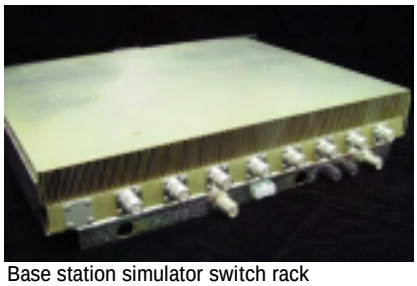
Additional Renaissance Electronics products

Base station cell site simulator equip.

Isolators / circulators

Multi-function test box assemble

Receiver multicoupler and combiner



Base station simulator switch rack

Switch product group

RENAISSANCE ELECTRONICS CORPORATION – ISO 9001 CERTIFIED
Tel: 978 772-7774 Fax: 978 772-7775 www.rec-usa.com sales@rec-usa.com

terms and conditions of sale

1. GENERAL: The quotation and proposal including any technical data contained therein, is furnished by Renaissance Electronics hereinafter called Seller, solely for the exclusive use of the Purchaser and on the condition that the information contained therein will not be distributed to any other party by the Purchaser. Furthermore, the Seller hereby reserves the right not to disclose to the Purchaser any technical data developed exclusively at the Seller's expense, either in conjunction with the proposed work or with any other prior contract.

2. PRICES: All prices are F.O.B Harvard, Massachusetts, and subject to change without notice at any time prior to formal acknowledgment of order by Seller. These prices supersede all previous prices. Prices do not include taxes, freight, or insurance.

3. TAXES: Any tax, duty, or other charges how or hereafter levied upon the sale, use, or shipment of material and equipment ordered or sold is not included in Seller's price and will be charged to and paid for the by Purchaser.

4. DELIVERY: Shipment date is computed from date of acknowledgment of order, or in the case of special or custom products from the date all necessary information is received. Shipment date is estimated and is subject to change due to causes not under the Seller's control, including but not limited to strikes and other labor difficulties, material shortages, fires, accidents, orders or requests of government authorities and delays of subcontractors. Seller shall have no liability for loss or damage resulting from delay in a scheduled delivery. In no circumstance shall Seller have any liability for loss of use or for any incidental or consequential damages due to change of delivery schedule.

5. ACCEPTANCE: Acceptance of this offer is expressly limited to the exact terms contained herein. If Purchaser's order form is used for acceptance of this order it is expressly understood and agreed that the terms and conditions of such order from shall not apply unless agreed to by the Seller in writing.

6. CANCELLATION/TERMINATION: Purchase order may be terminated or cancelled by Purchaser only on the express consent of the Seller. Purchaser shall pay Seller the actual costs and expenses for work in process and material committed and a reasonable profit thereon. All orders submitted for cancellation within 30 days of scheduled ship date will be subject to 100 % cancellation cost. Purchase order may be cancelled without penalty by Seller. If purchaser fails to comply with terms and conditions of order or becomes bankrupt of insolvent, Seller assumes no responsibility for cost of reprocurement by Purchaser.

7. WARRANTY: Seller warrants each of its products to be free from defects in materials and in workmanship. The limit of liability under this warranty is to repair or replace any products or part thereof which shall within one year after delivery to the original user be returned, shipping costs prepaid and insured, to Seller, and which shall have been found to be defective upon examination by Seller. This warranty shall be limited to the repair or replacement of Seller's products and shall not extend to any incidental or consequential damages there from. Disassembly of any product by anyone other than an authorized representative of the Seller voids the obligations to repair or replace any products disassembled. In addition, Seller assumes no responsibility for goods returned without Seller's written authorization.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXCEPT THAT OF TITLE, WHETHER WRITTEN, ORAL, OR IMPLIED, IN FACT OR IN LAW (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE).

8. LIMITATION OF LIABILITY: In no event shall Seller or its suppliers be liable the Purchaser or any third party in contract, lot (including negligence), warranty or otherwise for any special, indirect, incidental, or consequential damages. Seller's liability will be limited to repair, replacement, or issuance of credit for the purchase price at the seller's option. Purchaser agrees to indemnity Seller for all costs in connection with such claims. The remedies of Purchaser set forth in this order shall be exclusive.

9. RISK OF LOSS OR DAMAGE: Risk or loss of, or damage to, the furnished equipment, or any other portion thereof, from any cause whatever shall pass to the Purchaser upon delivery of the equipment or any portion thereof, to the carrier f.o.b. point of shipment.

10. TERMS OF PAYMENT: The terms of payment are net thirty (30) days after each shipment. Partial shipments may be made at Seller's option and each such shipment is subject to immediate invoicing. Seller will charge 1 fi percent interest per month (18 percent per annum) on all balances not paid within designated terms.

11. INSPECTION: Inspections and/or tests to be witnessed by Purchaser or its designated Representative(s) shall be specified at time or order placement. If no inspections are specified, Seller may proceed with tests and/or shipment in accordance with Seller's standard practices. Seller does not assume costs for disassembly for inspection purposes should the Purchaser's inspector not arrive within the specified testing time.

12. DRAWINGS AND PROCEDURES: The purchaser shall promptly furnish seller with all data that has been reviewed for full operating conditions, information, instructions, procedures, and drawings requisite to the execution to the order requirements. Seller shall furnish purchaser the outlining drawings only for the products as necessary. The above mentioned documents shall be furnished in accordance with the order requirements. Where, required Purchaser shall promptly return one (1) set of those documents marked with his approval.

13. PATENTS: Seller shall defend at its own expense any suit or action brought against Purchaser based on claim that the equipment or any part thereof, furnished thereunder, constitutes an infringement of any patent of the United States. If notified promptly in writing and given authority, information, and assistance for the defense of same, and Seller shall pay all damages and costs awarded therein against the Purchaser. In case the furnished equipment or any part thereof is held to constitute and infringement and its use is enjoined, Seller shall, at its own expense, either procure for Purchaser the right to continuing use of the equipment or modify it so it becomes non-infringing, or replace it with non-infringing equipment, or as a last resort, remove said equipment or any part thereof and refund price of the equipment or the part.

14. LAWS, PERMITS, REGULATIONS AND CODES: Provided Purchaser furnished Seller with applicable laws, ordinances, codes, or regulations prior to award of order, Seller shall comply unless otherwise noted. The date of Seller's proposal shall be considered the limiting date in effect for such laws, ordinances, codes, or regulations.

The laws of the state of Massachusetts shall apply to this order.

15. GOVERNMENT CONTRACTS: In the case of a government contract designation, Federal Acquisition Regulations (FAR) will apply to any contract resulting from this offer. Such applications FAR clauses and provisions as govern the Purchaser's contract with its customer will "flow-thru" to the seller. The FAR clauses, in combination with the provisions of this Form will constitute the entire agreement of the commercial terms between Seller and Purchaser.

In order to make the context of FAR clauses applicable to any order, the terms "Government" or equivalent phrases and "Contracting Officer" or equivalent phrases shall mean Purchaser; the "Contractor" shall mean Seller.

16. ORDER OF PRECEDENCE: In the event of an inconsistency between the FAR provisions and the provisions contained herein, FAR provisions will take precedence.

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