

# MS14

## Military Qualified 1x4 GPS Splitter

### Features

- ❖ Designed & Manufactured to Military Specifications
- ❖ Amplified & passive Versions Available
- ❖ Passes GPS (including M Code), Galileo & GLONASS L1/L2
- ❖ Excellent Gain Flatness  
Gain | L1 – L2 | < 2 dB



### Description

The military qualified MS14 GPS splitter is a one-input, four-output GPS device. This product typically finds application where an input from an active GPS roof antenna is split evenly between four receiving GPS units. The MS14 can be configured to pass DC from an RF output (J2) to the antenna input port (J1) in order to power an active GPS antenna on that port. The remaining RF outputs (J3, J4, and J5) would feature a 200 Ohm DC load to simulate an antenna DC current draw for any receiver connected to that port. Alternatively, the MS14 can be configured with a MIL-STD-704 or MIL-STD-1275 compliant 28 VDC Power Supply that will power the active GPS antenna connected to J1.

The MS14 splitter comes with many available options to meet your specific needs. Please call, fax, email (sales@gpssource.com), or visit our website (www.gpssource.com) for further information on product options and specifications. This device is designed for military applications and environments where high reliability is required.

This device has been designed and/or tested to the following MIL standards.



|              |               |
|--------------|---------------|
| MIL-STD-810  | MIL-E-5400    |
| MIL-STD-1472 | MIL-HDBK-454  |
| MIL-STD-202  | MIL-STD-1587  |
| MIL-STD-883  | MIL-STD-461F  |
| MIL-STD-704  | MIL-STD-1275B |

## Electrical Specifications, Operating Temperature -40<sup>0</sup> to 85<sup>0</sup> C

| Parameter                           | Conditions   | Min  | Typ | Max               | Units |
|-------------------------------------|--|--|-----|-------------------|-------|
| Freq. Range                         | Ant – Any Port, Unused Ports - 50 $\Omega$                                   | 1  |     | 1.7               | GHz   |
| Gain                                |  |  |     |                   |       |
| -Amplified (Normal)                 | Ant – Any Port, Unused Ports - 50 $\Omega$                                   | 9  | 10  | 11                | dB    |
| -Amplified (Custom)                 | As Specified (xdB, 0 to 10dB)  | X-1  | X   | X+1               | dB    |
| Loss-Passive                        | Ant-Any Port, Unused Ports - 50 $\Omega$                                     | 6.5  | 7.5 | 8.5               | dB    |
| Input SWR                           | All Ports 50 $\Omega$  |  |     | 2.0:1             | -     |
| Output SWR                          | All Ports 50 $\Omega$  |  |     | 2.0:1             | -     |
| Noise Figure-Amplified              | Ant-Any Port, Unused Ports – 50 $\Omega$ , Gain = 10dB                       |  |     | 3                 | dB    |
| Gain Flatness                       | L1 - L2 , Ant - Any Port, Unused Ports - 50 $\Omega$                         |  |     | 2                 | dB    |
| -Amplified:                         |  |  |     | 1                 |       |
| -Passive:                           |  |  |     |                   |       |
| Amp. Balance                        | J2 – J3 , Ant-Any Port, Unused Ports - 50 $\Omega$                           |  |     | 0.5               | dB    |
| Phase Balance                       | Phase (J2 – J3), Ant - Any Port, Unused Ports - 50 $\Omega$                  |  |     | 1.0               | Deg   |
| Group Delay Flatness                | T <sub>d,max</sub> - T <sub>d,min</sub> , J2 – J1 (Ant)                      |  |     | 1                 | Ns    |
| Isolation                           |  |  |     |                   |       |
| -Amp/Pass(Norm)                     | Adjacent Ports Ant - 50 $\Omega$   | 16   |     |                   | dB    |
| (Gain =10dB)                        | Opposite Ports: Ant - 50 $\Omega$  | 24   |     |                   |       |
| -Amplified (Hi Iso.)                | Adjacent Ports Ant - 50 $\Omega$   | 27   |     |                   |       |
| (Gain=3dB)                          | Opposite Ports: Ant - 50 $\Omega$  | 31   |     |                   |       |
| Output IP <sub>3</sub> (Amplified)  | Ant-Any Port, Unused Ports - 50 $\Omega$ , Gain = 10dB, Tone spacing = 1 MHz |  | 18  |                   | dBm   |
| Output P <sub>1dB</sub> (Amplified) | Ant-Any Port, Unused Ports - 50 $\Omega$ , Gain = 10dB                       |  | 4   |                   | dBm   |
| DC IN                               | DC Blk   | Any DC Blocked Port with a 200 $\Omega$ Load               |     | 14                | VDC   |
|                                     | Pass DC  | Non-Powered Config., DC Input on J2, J3 or J4              |     |                   |       |
|                                     | -Amplified   | 5  |     | 7.5               | VDC   |
|                                     | -Passive   | 3.3  |     | 16                |       |
|                                     | Powered  | 16   | 28  | 32 <sup>(1)</sup> | VDC   |
|                                     |  | (Normal & Emergency conditions as defined by MIL-STD-704F) |     |                   |       |
| DC out (Powered) <sup>(2)</sup>     | Amplified, Powered, Mil. Conn., Ant thru current = 75mA                      | 5  |     | 7.5               | VDC   |
| Current(I <sub>internal</sub> )     | Current Consumption of device, excludes Ant. Cur.                            |  | 45  | 50                | mA    |
| Ant/Thru Current                    | Pass DC  |  |     | 250               | mA    |
|                                     | Powered  |  |     | 75                | mA    |
| Max RF Input                        | Max RF input without damage  |  |     | 20                | dBm   |
| -Amplified                          |  |  |     | 40                |       |
| -Passive                            |  |  |     |                   |       |

Notes:

1. By design 1275B spike & surge protection assumes a 28 volt system, 33.3 V or greater will trigger over voltage protection circuitry.
2. DC output voltage to the antenna port (J1) may be specified by customer: 5V or 7.5V (default is 5V).
3. Available power connector options.

|  |  |   |  |
|--|--|---|--|
| <p>Pin A = Positive<br/>Pin B = GND</p> <p>Available with options:<br/>-PMS-1275/XX<br/>-PMS-704/XX</p>                          |  |   |  |
| <p>Pin A = Positive<br/>Pin B = GND<br/>Pin C = NC</p> <p>Available with options:<br/>-PMS38999-1275/XX<br/>-PMS38999-704/XX</p> |  |  |  |

## General Specifications

### Weight

The weight of MS14 is .624 pounds (283 grams).

### MTBF

Mean Time Between Failure (MTBF) for GPS Source's 1x4 (MS14) military spec splitter (Passive configuration) is 389,029 hours at 29°C and 350,812 hrs at 71°C.

Mean Time Between Failure (MTBF) for GPS Source's 1x4 (MS14) military spec splitter (Active configuration) is 386,259 hours at 29°C and 316,877 hrs at 71°C.

## Environmental Specifications:

### Temperature and Altitude

The MS14 complies with the temperature-altitude tests per MIL-STD-810C, Method 504, Procedure 1 Equipment Category 5.

### Explosive Atmosphere

The MS14 is designed for operation in the presence of explosive mixtures of air and jet fuel without causing explosion or fire at atmospheric pressures corresponding to altitudes from -1,800 feet to 50,000 feet. The MS14 does not produce surface temperatures or heat in excess of 400°F. The MS14 does not produce electrical discharges at an energy level sufficient to ignite the explosive mixture when the equipment is turned on or off or operated. The MS14 is designed to meet the requirements of MIL-STD-810C, Method 511.1, and Procedure II. Hermetically sealed equipment meeting the Requirements of MIL-STD-202, Method 112D, or MIL-STD-883, Method 1014.7 (as applicable), and not exceeding a Helium leakage rate of  $1 \times 10^{-7}$  cc/sec, are exempt from this requirement.

### Salt Fog

The MS14 meets the requirements of Salt Fog conditions per Paragraph 3.2.24.9 of MIL-E-5400 Method 509.1. The MS14 can withstand a salt concentration of 5 percent at a temperature of 35°C for 48 hours without degradation.

### Fungus

The MS14 meets the requirements of Fungus conditions per Paragraph 3.2.24.8 of MIL-E-5400 i.e. fungus inert materials per requirement 4 of MIL-HDBK-454.

### Humidity

The MS14 is capable of meeting the requirements of a ten-day humidity test conducted per MIL-STD-810C, Method 507.1; Procedure I. MS14 can withstand exposure to 95% relative humidity at a temperature of 30°C for 28 days.

### Sand & Dust

The MS14 meet be capable of meeting the requirements of Sand and Dust conditions of method 510 of MIL-STD-810C, for a temperature of 145°F for duration of 22 hours.

### Vibration

The MS14 meets the requirements of random vibration per conditions (MIL-STD-810C, Method 514.2, and Procedure 1A) to the levels defined below. Acceleration power spectral density (PSD) for the random vibration envelope is shown in Figure 1. Amplitudes for the functional levels and endurance level requirements are as shown in Table 1.

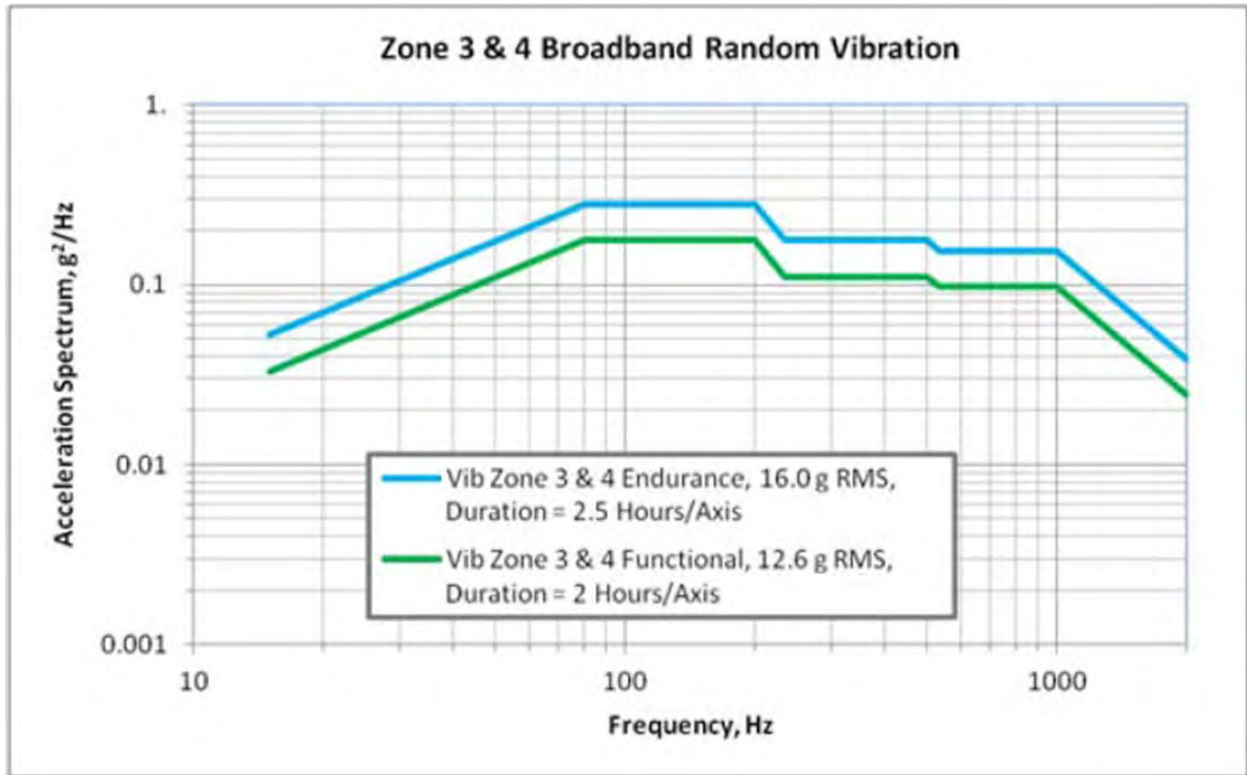


Figure 1

| Vib Zone 3 & 4<br>Functional, 12.6 g RMS,<br>Duration = 2 Hours/Axis |          |
|--|----------|
| Freq, Hz   | $g^2/Hz$ |
| 15   | 0.033    |
| 80   | 0.177    |
| 200  | 0.177    |
| 234  | 0.111    |
| 500  | 0.111    |
| 535  | 0.097    |
| 1000   | 0.097    |
| 2000   | 0.024    |

Table 1

## Shock

The MS14 is designed to withstand the shock levels specified in the saw tooth shock pulse parameter specified in Figure 2. It is tested to MIL-STD-810C Method 514.2 Proc. 1A.

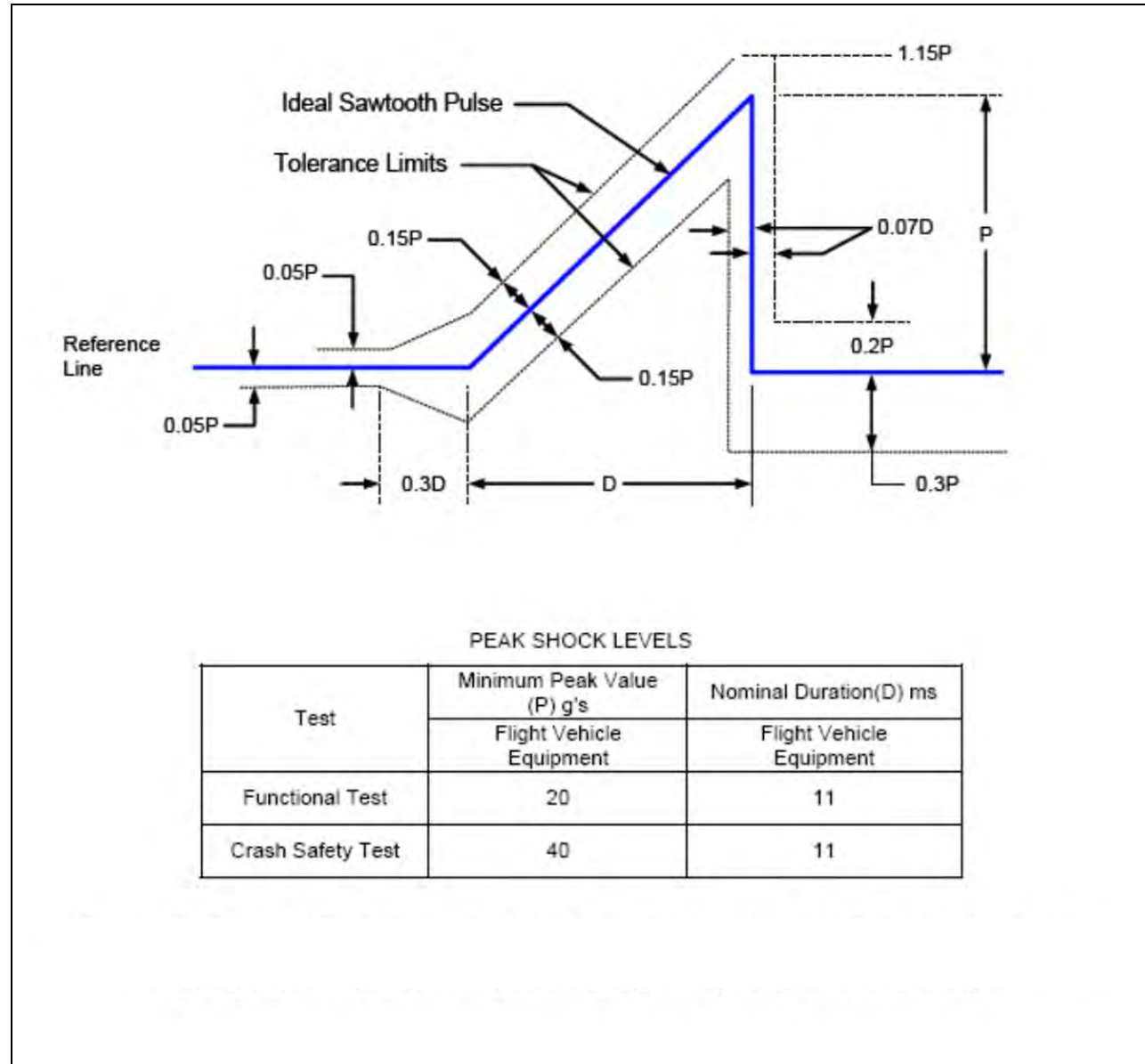


Figure 2

**Decompression**

The MS14 is designed to meet the performance standards per RTCA-DO-160E para 4.6.2 cat D during and following a rapid and complete loss of normal cabin compartment pressurization (10,000 ft.) from an airplane flight altitude of 50,000 feet within 15 seconds. The MS14 will remain operating for 5 minutes at 50,000 feet before being returned to normal cabin pressure.

**Overpressure**

MS14 is capable of withstanding, for 10 minutes, while not operating, a 12.1 psi compartment pressure with no physical distortion or permanent set. The MS14 will operate satisfactorily upon return to normal pressure.

**Temperature Shock**

The MS14 will withstand without degradation (while not operating) Method 503.1, Procedure I of MIL-STD-810C.

**Flammability**

The MS14 is self-extinguishing or nonflammable and meets the Requirements of Paragraph 5.2.4 of MIL-STD-1587 and requirement 3 of MIL-HDBK-454.

**Finish and Colors**

All case surfaces of the MS14 are treated with chemical film per MIL-DTL-5441, TYPE II, CLASS 3. The MS14 bottom contact surface is free of paint, or non-conductive finishes. The MS14 bottom contact surfaces are protected from corrosion by a conductive coating (MIL-DTL-5541). All other surfaces, except connector mating surfaces are primed per MIL-PRF-23377, TYPE 1 CLASS C and painted per MIL-PRF-85285, TYPE 1 COLOR NUMBER (26231), military gray (not lusterless variety) per FED-STD-595 (exceptions are bottom and connector surfaces are free of paint).

**Human Factors**

Human Engineering principles and criteria (including considerations for human capabilities and limitations) using MIL-STD-1472 in all phases of design, development, testing, and procedures development. The design is free of all sharp edges, according to MIL-STD-1472.



### Electromagnetic Interference and Compatibility Test

Electromagnetic compatibility requires that the GPS MS14 perform its intended function and that its operation does not degrade the performance of other equipment or subsystems. The following table defines the test requirements and test procedures for conducting the required electromagnetic compatibility testing.

The MS14 is designed to meet the following requirements of MIL-STD-461F:

| Test                              | Description   |
|-----------------------------------|---|
| CE102                             | Conducted Emissions, Power Leads, 10 kHz to 10 MHz  |
| CE106                             | Conducted Emissions, Antenna Terminal, 10 kHz to 31.5 GHz   |
| CS101                             | Conducted Susceptibility, Power Leads, 30 Hz to 150 kHz   |
| CS103                             | Conducted Susceptibility, Antenna Port, Intermodulation   |
| CS105                             | Conducted Susceptibility, Antenna Port, Cross-Modulation  |
| CS114                             | Conducted Susceptibility, Bulk Cable Injection, 10 kHz to 200 MHz   |
| RE102                             | Radiated Emissions, Electric Field, 10 kHz to 18 GHz  |
| RS103                             | Radiated Susceptibility, Electric Field, 2 MHz to 18 GHz  |
| Indirect Lightning <sup>(1)</sup> | Damped Sinusoidal transients, RF Leads, 10kHz to 100 MHz<br>Damped Sinusoidal transients, Power Leads, 10kHz to 100 MHz |

Notes: 1. For additional detail regarding Indirect Lightning, contact GPS Source.

### Electrical Power Service Conditions

The MS14 is able to accommodate the +28 VDC aircraft power. Consequently, it must perform its intended function when supplied with the Normal, Emergency and Starting Operation types of electrical power defined by MIL-STD-704F. The transfer operation, as defined by MIL-STD-704F, shall not change the operating mode or damage the MS14.

The MS14 is designed to meet the following test requirements of MIL-STD-704F:

| Paragraph                       | Description  |
|---------------------------------|--|
| MIL-STD-704F, 5.3.2             | DC Full Performance Characteristics, 28 VDC system             |
| MIL-STD-704F, 5.3.2.1           | Normal Operation   |
| MIL-STD-704F, 5.3.2.2           | Abnormal Operation   |
| MIL-STD-704F, 5.3.2.3 & 5.3.2.4 | DC Steady State Voltage in the Emergency or Starting Operation |



Performance Data:

MS14 – Passive

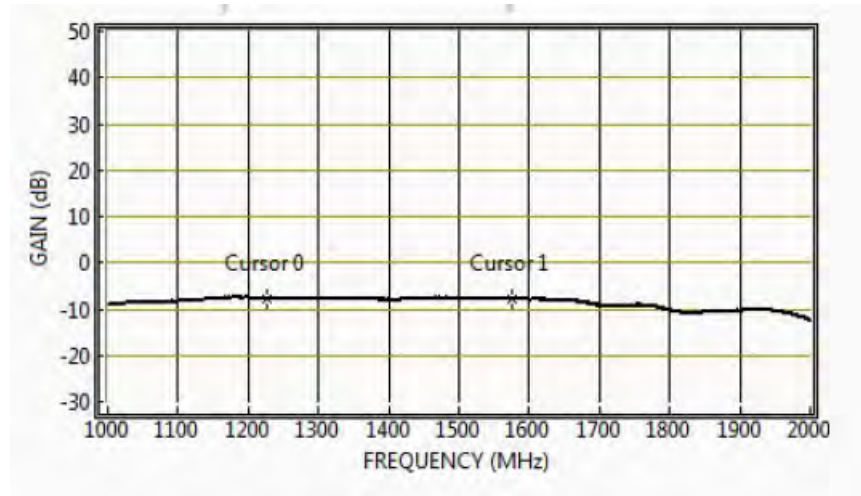


Figure 3. Gain vs. Frequency for Passive MS14 Splitter

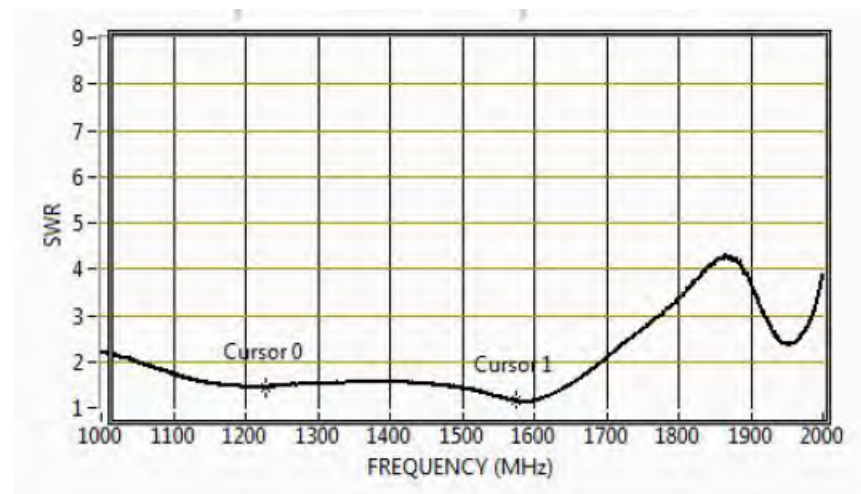


Figure 4. SWR vs. Frequency Plot for Passive MS14 Splitter

# MS14 – Active

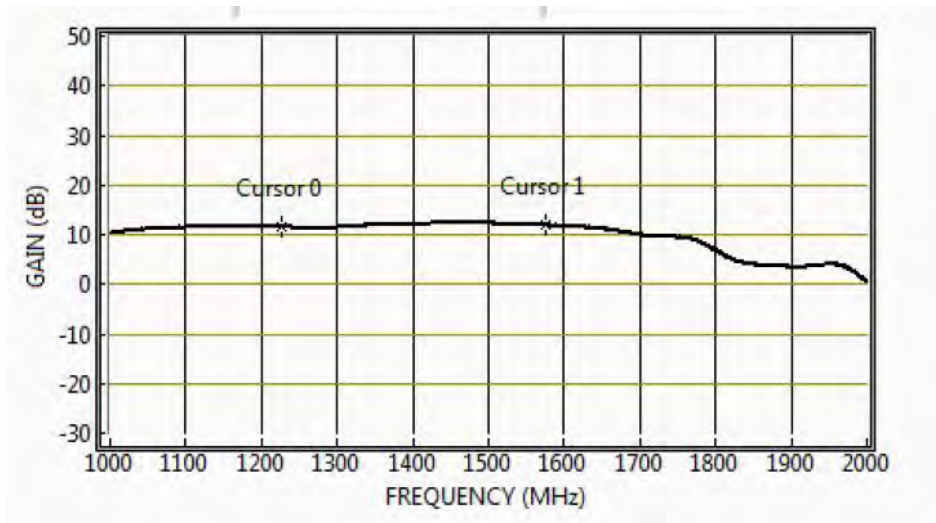


Figure 5. Gain vs. Frequency Plot for Active MS14 Splitter

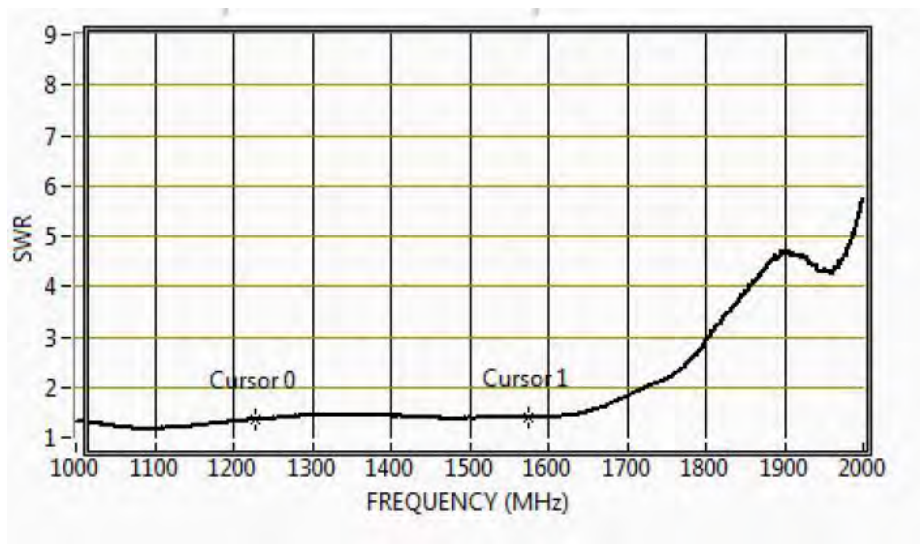


Figure 6. SWR vs. Frequency Plot for Active MS14 Splitter

## Available Options:

| Power Supply Options:                 |  |                          |
|---------------------------------------|--|--------------------------|
| Source Voltage Options                | Voltage Input  | Type                     |
|                                       | DC 16-32 VDC   | Military Style Connector |
| Output Voltage Options <sup>(1)</sup> | DC Voltage Out   |                          |
|                                       | 3.3 (Passive Only)   |                          |
|                                       | 5  |                          |
|                                       | 7.5  |                          |
| RF Connector Options:                 |  |                          |
| Connector Options                     | Connector Type   | Limitations              |
|                                       | N (Female/Male)  | N/A                      |
|                                       | SMA (Female/Male)  | N/A                      |
|                                       | TNC (Female/Male)  | N/A                      |
| Port Options:                         |  |                          |
| Pass DC <sup>(1)</sup>                | All Ports Pass DC  |                          |
| DC Blocked <sup>(1)</sup>             | J3,J4,J5 is DC Blocked & 200Ω Load, DC is passed J2 to ANT(J1) |                          |

## More Notes:

1. With source voltage option, any or all RF ports (input or output) can be DC Blocked or can pass the powered DC voltage



**“CAUTION” --- “ELECTROSTATIC SENSITIVE DEVICE REMOVE ELECTROSTATIC PROTECTION AT USE OR IN PROTECTED AREA REUSE PACKAGING MATERIALS FOR THE UNSERVICEABLE ITEM SEE DOD-HDBK-263 FOR PROTECTIVE HANDLING OR TESTING MEASURES FOR THIS ITEM “**

Part Number:

MS14 – A – PMS / 5 – SF

Product: \_\_\_\_\_  
 Military Qualified  
 1x4 Splitter  
 (Pass DC J2-Ant (J1), Block DC- J3, J4, J5)

Gain Option: \_\_\_\_\_  
 A – Amplified  
 AS – Amplified Custom Gain by Port  
 AXX – Custom Gain (XXdB)  
 Blank – Passive

Source Voltage: \_\_\_\_\_  
 PMS-1275 – Military Connector (User supplies DC  
 & 1275B Compliant)  
 PMS-704 – Military Connector (User supplies DC  
 & 704F Compliant)  
 PMS38999-1275 - Military 38999 Connector  
 & 1275B Compliant  
 PMS38999-704 – Military 38999 Connector  
 & 704F Compliant  
 Blank – Pass DC J2-Ant (J1),Block DC-J3,J4,J5

Output Voltage: \_\_\_\_\_  
 (3.3V Passive Only), 5V, 7.5V

Connector Options: \_\_\_\_\_  
 NF – N, Female  
 SF – SMA, Female  
 TF – TNC, Female  
 NM – N, Male  
 SM – SMA, Male  
 TM – TNC, Male

For help in creating the part number to meet your exact needs, contact us at [Sales@gpssource.com](mailto:Sales@gpssource.com) or visit our website at [www.gpssource.com](http://www.gpssource.com).

