GENERAL DYNAMICS
Mission Systems

GPSS Operations Enabled

MS12

GPS 1X2 Military Qualified Splitter

Description

The MS12 is a military qualified one-input two-output ruggedized GPS splitter. The MS12 can be configured to pass DC from any device connected to the RF output port (J2) to the antenna input port (J1) in order to also power an active GPS antenna. The remaining RF outputs (J2 thru J3) feature a 200Ω DC resistive load to ground to simulate a typical antenna current for any receiver connected to that output. The MS12 can also be configured with external DC input (either MIL-STD-704 for aircraft 28V DC or MIL-STD-1275 for ground vehicle 28V DC). Since this is an externally powered configuration, all of the outputs are DC Blocked with 200 ohm loads with either external DC input. The input voltage can be specified to power any active GPS antenna.

Features

- Designed and Manufactured to Military Specifications
- Passes GPS (including M Code), Galileo, GLONASS L1/L2
- Excellent Gain Flatness (Gain |L1 - L2 | < 2dB)
- Amplified and Passive Options

The MS12 is designed for ruggedized applications and environments where high reliability and signal availability is required.

It has been designed to meet the following MIL standards:

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

Options

- Amplified and Custom Gain Options
- Various Connector and Power Options

Please contact GPS Source via phone, email, or visit the website for further information on product options and specifications.

1 MS12 Specifications

Table 1-1: Electrical Specifications

Operating temperature -40°C to 85°C

Parameter			Conditions	Min	Typ.	Max	Units
Frequency Range			Ant: Any Port; Unused Ports: 50 Ω	1		1.7	GHz
Gain	Standard	Amplified	Ant: Any Port; Unused Ports: 50 Ω	14	15	16	dB
	Custom	Amplified	As Specified (xdB, from 0 to 14dB)	X-1	X	X +1	
Loss-Passive			Ant: Any Port; Unused Ports: 50 Ω	3.5	4	5	dB
Input SWR			All Ports: 50 Ω			2.0:1	—
Output SWR			All Ports: 50 Ω			2.0:1	—
Noise Figure	10dB Gain	Amplified	Ant: Any Port; Unused Ports: 50 Ω			3	dB
Gain Flatness		Amplified	[L1 – L2] Ant: Any Port; Unused Ports: 50 Ω			2	dB
		Passive				1	
Amp. Balance			(J2 – J5) Ant: Any Port: Unused Ports: 50 Ω			0.5	dB
Phase Balance			Phase (J2 – J5) Ant: Any Port; Unused Ports: 50 Ω			1.0	Degree
Group Delay Flatness			Td,max - Td,min; J2 – J1 (Ant)			1	ns
Isolation	Normal 15dB Gain	Amp/Pass	Opposite Ports: Ant – 50 Ω	16			dB
	High 3dB Gain	Amplified	Opposite Ports: Ant – 50 Ω 1MHz Tone Spacing	27			
Input I_{p3}	Amplified		Ant: Any Port; Unused Ports: 50 Ω 1MHz Tone Spacing		6		dBm
Input P_{1dB}	Amplified		Ant: Any Port; Unused Ports: 50 Ω		-7		dBm
Current ($I_{internal}$)			Current Consumption of device (excludes Draw)		50	75	mA
Draw Current	Pass DC		Non-Powered Configuration, DC Input on J2			250	mA
	Powered		Powered, Military or Quick Connect Option			75	
Max RF Input		Amplified	Max RF Input Without Damage			20	dBm
		Passive				40	

Table 1-2: DC IN and OUT Specifications

Parameter		Conditions	Min	Typ.	Max	Units
DC In	Pass DC	Pass DC Non-powered configuration, DC Input at the J2 output port passes inline bias voltage via the input J1 port			12	VDC
	Block DC	All DC Blocked output ports include 200 ohm resistive load to ground standard		Any		
	Powered	Powered 2-pin/3-pin Mil DC connector (MIL-STD-704 & MIL-STD-1275 28V DC surge suppression	20	28	33	
DC Out[2]	Powered	Output voltage at the J1 input port, 5.0, 7.5, 9.0, BDC (Block DC)	5		9	VDC

(2) See MIL-STD-704 for 28V DC input for aircraft surge suppression and MIL-STD-1275 for 28V DC input for ground vehicle surge suppression

Power Connector Options PMS-1275/XX and PMS-704/XX

PIN	Description	PMS-1275/XX and PMS-704/XX Options[3]
A	Positive	
B	Ground	

[3] Image is not to scale

Power Connector Options PMS38999-1275/XX and PMS38999-704/XX

Input	Description	PMS38999-1275/XX and PMS38999-704/XX Options[4]
A	Positive	
B	Ground	
C	No Connect	

[4] Image is not to scale

General Specifications

Description		Measurement
Weight		0.600 lbs (272 grams)
Mean Time Between Failure (MTBF)[5]	Passive Configuration	389,029 at 29°C
		350,812 at 71°C
	Active Configuration	386,259 at 29°C
		316,877 at 71°C

[5] Calculation derived using Airborne Inhabited Cargo parameters per MIL-STD-217F

2 Performance Data

MS12 — Passive

2.1 MS14 — Passive

Figure 2-1. Passive MS14 Splitter: Gain vs. Frequency

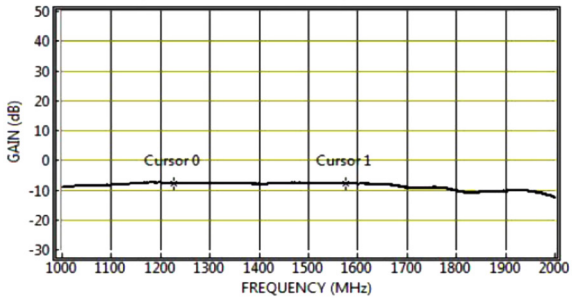
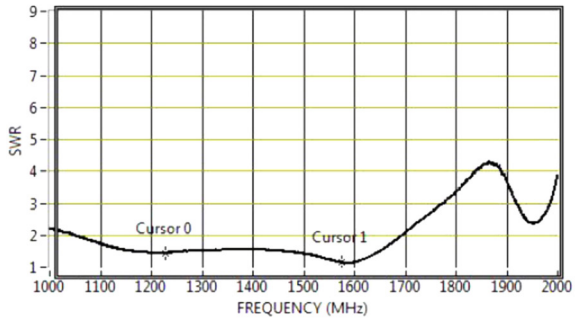


Figure 2-2. Passive MS14 Splitter: SWR vs. Frequency



2.2 MS12—Active

Figure 2-3. Active MS14 Splitter: Gain vs. Frequency

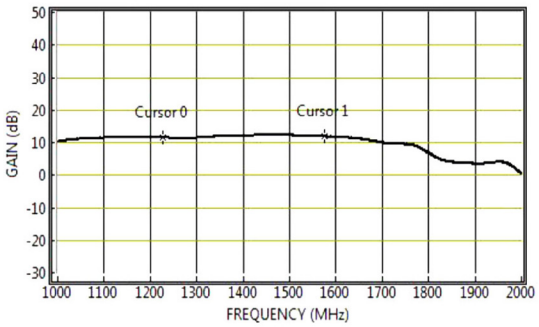
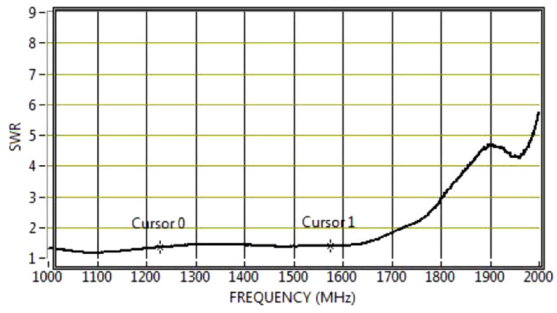


Figure 2-4. Active MS14 Splitter: SWR vs. Frequency



3 Environmental Requirements

3.1 Temperature and Altitude

The MS12 complies with the temperature-altitude tests per MIL-STD-810C, Method 504, Procedure 1 Equipment Category 5.

3.2 Temperature Shock

The MS12 is designed to withstand without degradation (while not operating) Method 503.1, Procedure I of MILSTD-

810C.

3.3 Explosive Atmosphere

The MS12 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 -1,800ft to 50,000ft. The MS12 does not produce surface temperatures or heat in excess of 400 F. The MS12 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 MS12 meets 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 x 10-7cc/s are exempt from this requirement.

3.4 Decompression

The MS12 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 feet) from an airplane flight altitude of 50,000 feet within 15 seconds. The MS12 will remain operating for five minutes at 50,000 feet before being returned to normal cabin pressure.

3.5 Overpressure

MS12 is capable of withstanding for 10 minutes while not operating. A 12.1 PSI compartment pressure with no physical distortion or permanent set RTCA-DO-160E PARA 4.6.3. The MS12 will operate satisfactorily upon return to normal pressure.

3.6 Salt Fog

The MS12 is designed to meet the requirements of Salt Fog conditions per Paragraph 3.2.24.9 of MIL-E-5400 and MIL-STD-810C Method 509.1. The MS12 is designed to withstand a salt concentration of five percent at a temperature of 35 C for 48 hours without degradation.

3.7 Fungus

The MS12 is designed to meet 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.

3.8 Humidity

The MS12 is capable of meeting the requirements of a ten-day humidity test conducted per MIL-STD-810C, Method 507.1; Procedure I. MS12 is designed to withstand exposure to 95% relative humidity at a temperature of 30 C for 28 days.

3.9 Sand and Dust

The MS12 is capable of meeting the requirements of Sand and Dust conditions of method 510 of MIL-STD-810C, for a temperature of 145 F for a duration of 22 hours.

3.10 Flammability

The MS12 is self-extinguishing or nonflammable and is designed to meet the Requirements of Paragraph 5.2.4 of MIL-STD-1587 and Requirement 3 of MIL-HDBK-454.

3.11 Finish and Colors

All case surfaces of the MS12 are treated with chemical film per MIL-DTL-5441, TYPE II, CLASS 3. The MS12 bottom contact surface is free of paint or non-conductive finishes. The MS12 bottom contact surfaces are protected rom 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: bottom and connector surfaces are free of paint).

3.12 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.

3.13 Electromagnetic Interference and Compatibility Test

MS12 performs its intended function and 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 compatibiity testing. The MS12 is designed and tested to meet the requirements of MIL-STD-461F:

Table 3-1 Test Requirements & Procedures

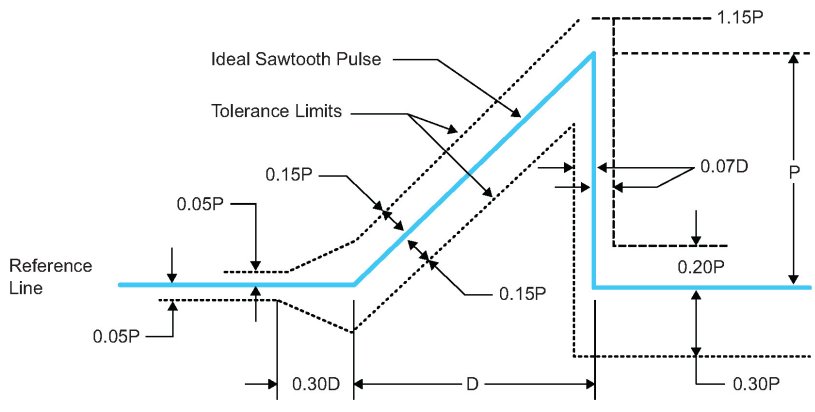
Test	Description	
CE102	Conducted Emissions Power Leads	10kHz to 10MHz
CE106	Conducted Emissions Antenna Terminal	10kHz to 31.5GHz
CS101	Conducted Susceptibility Power Leads	30Hz to 150kHz
CS103	Conducted Susceptibility Antenna Port	Intermodulation
CS105	Conducted Susceptibility Antenna Port	Cross-Modulation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

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

3.14 Shock

The MS12 is designed to withstand the shock levels specified in the saw tooth shock pulse parameter specified in **Figure 3-1** and **Table 3-2.** It is designed to meet the requirements of MIL-STD-810C Method 516.2 Proc. III.

Figure 3-1. Peak Shock Levels



Shock

The MS12 is designed to withstand the shock levels specified in the saw tooth shock pulse parameter specified in Figure 3-1 and Table 3-3. It is designed to meet the requirements of MIL-STD-810C Method 516.2 Proc. III.

Figure 3-1. Peak Shock Levels

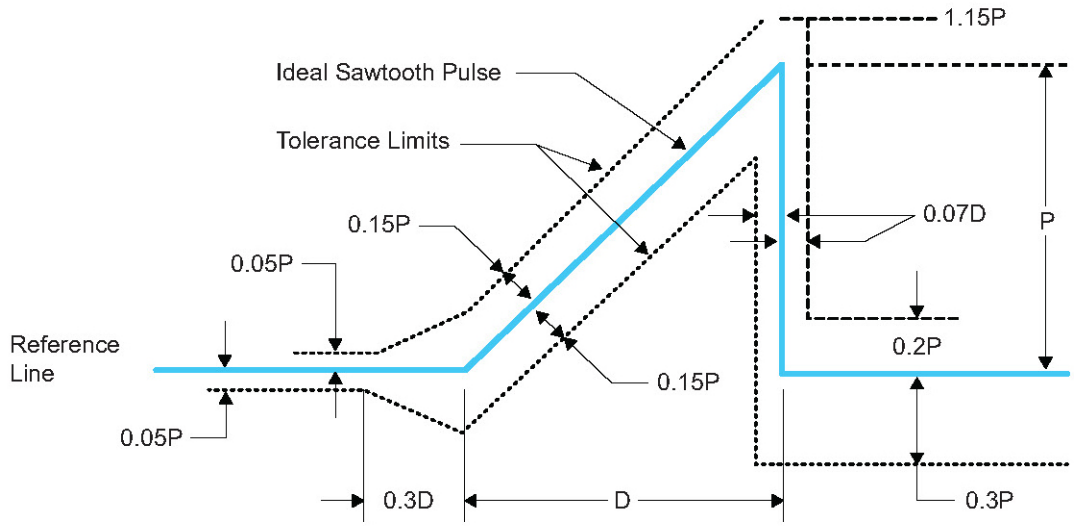


Table 3-3: Peak Shock Levels

Test	Flight Vehicle Equipment	
	Minimum Peak Value (P)	Nominal Duration (D)
Functional	20 g-force	11 ms
Crash Safety	40 g-force	11 ms

Vibration

The MS12 is designed to meet the requirements of random vibration per conditions (MIL-STD-810C, Method 514.2, Procedure 1A) to the levels defined below. Acceleration Power Spectral Density (PSD) for the random vibration envelope is shown in Figure 3-2. Amplitudes for the functional levels and endurance level requirements are as shown in Table 3-4.

Figure 3-2: Zone 3 and 4 Broadband Random Vibration

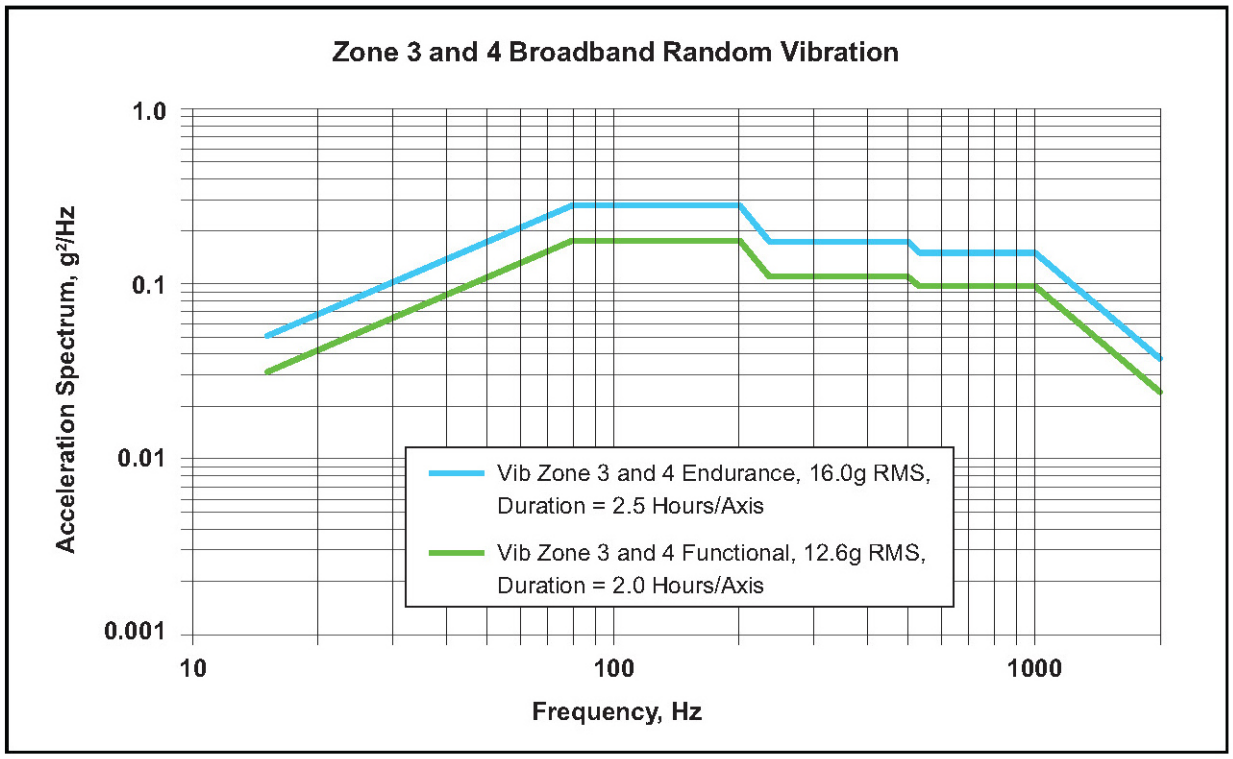


Table 3-4: Vibration Zone 3 and 4

Vibration Zone 3 and 4 Functional, 12.6g RMS Duration = 2 Hours/Axis	
Freq. Hz	**g^2/Hz**
15	.0033
80	0.177
200	0.177
234	0.111
500	0.111
535	0.097
1000	0.097
2000	0.024

4 Product Options

Electrostatic Sensitive Device (ESD)

Remove electrostatic protection at use or in a protected area.
Resuse packaging materials for the unserviceable item. See DOD-HDBK-263 for protective handling or testing measures for this item.

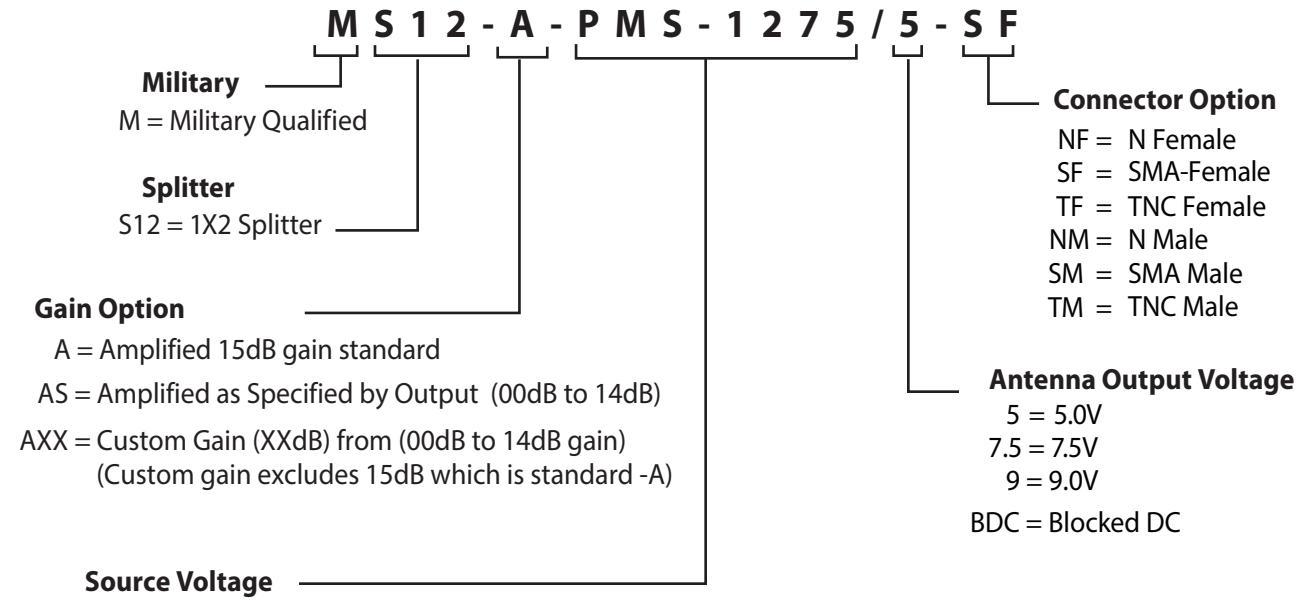
Table 4-1: MS12 Available Options

Power Supply		
Source Voltage	**Voltage Input**	**Type**
	DC 20-33VDC	Military Style Connector
Output Voltage	DC Voltage Out	
	5.0, 7.5, 9.0, Block DC	
RF Connector		
Connector	**Connector Type**	**Limitations**
	N (Female/Male)	N/A
	SMA (Female/Male)	N/A
	TNC (Female/Male)	N/A
Port		
Pass DC[1]	Input passes inline bias voltage received on J2	
DC Blocked	Standard Configuration J2, J3 DC Blocked with 200 ohm resistive load to ground	

Note 1: Input may be configured to Block DC via -S Special Configuration.

For assistance with non-standard or special configurations please contact GPS Source via phone (719-421-7300) or email **GPSS-Sales@gd-ms.com**

5 Product Code Decoder



Military
M = Military Qualified

Splitter
S12 = 1X2 Splitter

Gain Option
A = Amplified 15dB gain standard
AS = Amplified as Specified by Output (00dB to 14dB)
AXX = Custom Gain (XXdB) from (00dB to 14dB gain)
(Custom gain excludes 15dB which is standard -A)

Source Voltage
PMS-1275 = 2-pin MIL DC Connector MIL-STD-1275 Compliant (20-33V DC) Input, PM mating connector included standard
PMS-704 = 2-pin MIL DC Connector MIL-STD-704 Compliant (20-33V DC) Input, PM mating connector included standard
PMS38999-1275 = 3-pin Mil DC Connector MIL-STD-1275 Compliant (20-33V DC) Input, PM mating connector not included
PMS38999-704 = 3-pin Mil DC Connector MIL-STD-704 Compliant (20-332V DC) Input, PM mating connector not included
Blank = Pass DC output 1 (J2) to input (J1), Block DC J3

Antenna Output Voltage
5 = 5.0V
7.5 = 7.5V
9 = 9.0V
BDC = Blocked DC

Connector Option
NF = N Female
SF = SMA-Female
TF = TNC Female
NM = N Male
SM = SMA Male
TM = TNC Male