

# Microwave

## Accessories for Microwave Scalar and System Analyzers

**AEROFLEX**  
A passion for performance.



The following optional accessories are designed for use with the 6200B series of Microwave Test Sets, the 6820 series Scalar Analyzers and the 6840 series Microwave System Analyzers.

The 6230A series of scalar detectors provides excellent linearity and flatness from a built-in EEPROM that allows near power meter performance. Diode linearity correction provides improved performance over a wide dynamic range.

The 6240 series of fault locators provides measurement of both return loss (VSWR) and fault location (distance to fault) from a single measuring port but where tighter specifications are required a range of autotesters with better directivity and 40 GHz frequency range is available.

Ratio measurements require a power splitter to be used and a range is available for frequencies up to 40 GHz.

Power dividers can be used for simple power division or can be operated with a scalar detector and the 6800 series to generate a low cost fault location system.

The 6146 and 6147 pulse modulators provide for external pulse modulation of all of the 6200B series and the 6820 and 6840 series. The 6146 is a high performance active pulse modulator providing fast rise and fall times with 70 dB on/off ratio over a frequency range of 500 MHz to 18 GHz. The 6147 operates from 70 MHz to 40 GHz but is a passive pulse modulator with lower on/off ratio and slower rise/fall time performance.

# 6230A/L series

## Scalar Detectors



The 6230A and 6230L series of scalar detectors have EEPROM correction for improved frequency response. Users can achieve swept power measurements with accuracy close to that achieved with a power sensor.

The 6230A series scalar detectors have typically 85 dB dynamic range (-65 dBm to +20 dBm) and are used when best sensitivity and maximum dynamic range are required. The 6230L series scalar detectors (-59 dBm to +26 dBm typically) have integral input attenuators. This provides improved input match and greater power handling capability. The 6230L series detectors should be used when measuring low loss devices, such as semi-rigid cables or when measuring high power devices such as amplifiers.

### Scalar Detectors (with EEPROM correction)

Ordering Number	Version
6230A series	Standard Detectors (-65 dBm to +20 dBm) typical
6230A	10 MHz to 20 GHz, N type (m)
6232A	1 MHz to 3 GHz, N Type (m)
6233A	10 MHz to 26.5 GHz, 3.5 mm (m)
6234A	10 MHz to 46 GHz, 2.92 mm (m)
6230L series	Low VSWR Detectors (-59 dBm to +26 dBm) typical
6230L	10 MHz to 20 GHz, N type (m)
6233L	10 MHz to 26.5 GHz, 3.5 mm (m)
6234L	10 MHz to 46 GHz, 2.92 mm (m)
<b>Supplied Accessories</b>	
43139/099	1.5 m DC Cable
<b>Optional Accessories</b>	
43139/100	3 m DC Cable
43139/101	10 m DC Cable
43139/102	25 m DC Cable
43139/103	50 m DC Cable

Typical specifications are non-warranted.

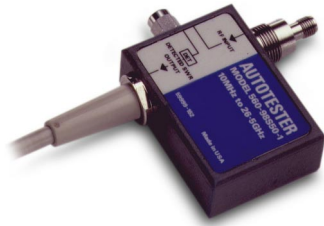
## SPECIFICATION

	6230A	6230L	6232A	6233A	6233L	6234A	6234L
Frequency Range	10 MHz to 20 GHz	10 MHz to 20 GHz	1 MHz to 3 GHz	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz	10 MHz to 46 GHz	10 MHz to 46 GHz
Dynamic range							
AC detection:	-65 dBm to +20 dBm, typical -60 dBm to +20 dBm, guaranteed	-59 dBm to +26 dBm, typical -54 dBm to +26 dBm, guaranteed	-65 dBm to +20 dBm, typical -60 dBm to -50 dBm to +20 dBm, guaranteed	-65 dBm to +20 dBm, typical 60 dBm to +20 dBm, guaranteed	-59 dBm to +26 dBm, typical -54 dBm to +20 dBm, guaranteed	-65 dBm to +20 dBm, typical -60 dBm to +26 dBm, guaranteed	-59 dBm to +26 dBm, typical -54 dBm to +26 dBm, guaranteed
DC detection:	-50 dBm to +20 dBm, guaranteed +20 dBm	-44 dBm to +26 dBm, guaranteed +26 dBm	-50 dBm to +20 dBm, guaranteed +20 dBm	50 dBm to +20 dBm, guaranteed +20 dBm	-44 dBm to +26 dBm, guaranteed +26 dBm	-50 dBm to +20 dBm, guaranteed +20 dBm	-44 dBm to +26 dBm, guaranteed +26 dBm
Maximum RF input VSWR							
1 to 10 MHz	-----	-----	1.43	-----	-----	-----	-----
10 to 40 MHz	1.4	1.4	1.14	1.4	1.4	1.58	1.58
40 to 100 MHz	1.15	1.1	1.14	1.15	1.1	1.15	1.15
0.1 to 2 GHz	1.12	1.1	1.14 (to 2.7 GHz)	1.12	1.1	1.12	1.1
2 to 5 GHz	1.17	1.1	1.2 (to 3 GHz)	1.17	1.1	1.33	1.1
5 to 18 GHz	1.29	1.15	-----	1.29	1.15	1.33	1.15
18 to 20GHz	1.5†	1.22†	-----	1.5	1.22	1.5	1.22
20 to 26.5 GHz	-----	-----	-----	1.5	1.22	1.5	1.22
26.5 to 33 GHz	-----	-----	-----	-----	-----	1.5	1.31
33 to 40 GHz	-----	-----	-----	-----	-----	1.95	1.31
Linearity	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total
Frequency Response (EEPROM corrected)	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB (±0.4 dB >26.5 GHz)	±0.2 dB (±0.4 dB >26.5 GHz)
Connector	Precision Type N (m)	Precision Type N (m)	Type N (m)	Precision 3.5 mm (m)	Precision 3.5 mm (m)	Precision 2.92 mm (m)	Precision 2.92 mm (m)
Length	89 mm	89 mm	73 mm	80 mm	80 mm	88.5 mm	88.5 mm
Width	33.5 mm	33.5 mm	33.5 mm	33.5 mm	33.5 mm	33.5 mm	33.5 mm
Weight	151 g	151 g	180 g	151 g	151 g	149 g	149 g

† Specifications involving Type N connectors above 18 GHz are not traceable to national standards as these do not exist at present.

†† Specifications involving 2.92 mm connectors above 40 GHz are not traceable to national standards as these do not exist at present.

# Return Loss Bridges and Autotesters



For measurement of return loss (or VSWR) with a scalar analyzer an autotester is the best solution. An autotester is an RF bridge with a built in detector. An RF bridge needs to be used with a 6230 series detector for the measurement of return loss. An autotester with the correct type and sex of test port connector should be used because

test port adapters seriously degrade directivity and hence measurement accuracy.

## Ordering Number

59999/151  
59999/158  
59999/159  
59999/152  
59999/166  
59999/168  
59999/169

## Version

10 MHz to 18 GHz 7 mm  
10 MHz to 18 GHz N (m)  
10 MHz to 18 GHz N (f)  
10 MHz to 26.5 GHz 3.5 mm WSMA (m)  
10 MHz to 26.5 GHz 3.5 mm WSMA (f)  
10 MHz to 40 GHz 2.92 mm (m)  
10 MHz to 40 GHz 2.92 mm (f)

## Supplied With

Open/Short Circuit  
Autotester adapter cable  
Return Loss Bridge 5 MHz to 2 GHz N (f)

## Optional Accessories

1.5 m Autotester adapter cable

43137/604

59999/170

43139/107

## SPECIFICATION

Model/Test Port Connector Characteristic	59999/151 GPC-7	59999/158 N (m) 59999-159 N (f)	59999/152 WSMA (m) 59999/166 WSMA (f)	59999/168 2.92 mm (m) 59999/169 2.92 mm (f)	59999/170
Frequency range	10 MHz to 18 GHz	10 MHz to 18 GHz	10 MHz to 26.5 GHz	10 MHz to 40 GHz	5 MHz to 3 GHz
Directivity					
0.01 to 18 GHz	40 dB	38 dB	40 dB	35 dB	5 MHz to 50 MHz >25 dB
18 to 26.5 GHz	N/A	N/A	38 dB	32 dB	50 MHz to 3 GHz >40 dB
26.5 to 40 GHz	N/A	N/A	N/A	30 dB	
Frequency sensitivity	±1.2 dB	±1.5 dB	±2.0 dB	±3.0 dB	
Accuracy <sup>1</sup>					
0.01 to 8 GHz	0.010 +0.06ρ <sup>2</sup>	0.013 +0.08ρ <sup>2</sup>	0.010 +0.10ρ <sup>2</sup>	0.018 +0.15ρ <sup>2</sup>	
8 to 18 GHz	0.010 +0.10ρ <sup>2</sup>	0.013 +0.12ρ <sup>2</sup>	0.010 +0.10ρ <sup>2</sup>	0.018 +0.15ρ <sup>2</sup>	
18 to 26.5 GHz	N/A	N/A	0.013 +0.12ρ <sup>2</sup>	0.025 +0.15ρ <sup>2</sup>	
26.5 to 40 GHz	N/A	N/A	N/A	0.032 +0.18ρ <sup>2</sup>	
Insertion loss <sup>2</sup>	6.5 dB Nominal	6.5 dB Nominal	6.5 dB Nominal	6.5 dB Nominal	<7.5 dB Nominal
Maximum input power	+27 dBm	+27 dBm	+27 dBm	+27 dBm	+31 dBm
Input connector	N (f)	N (f)	2.92 mm (f)	2.92 mm (f)	N (f)
Size <sup>3</sup>	76 x 50 x 28 mm	76 x 50 x 28 mm	54 x 38 x 19 mm	54 x 38 x 19 mm	115 x 51 x 29 mm
Weight	340 g	340 g	198 g	198 g	680 g

<sup>1</sup>Where ρ = measured reflection coefficient - includes directivity and test port reflection effects over the specified frequency range.

<sup>2</sup> Nominal value from input port to test port

<sup>3</sup> Excluding connectors and cable

# Power Splitters/Dividers



Three different power splitters are available with N type, 3.5 mm or 2.92 mm connectors. Power splitters are primarily intended to be used in scalar measuring systems, in a ratioing arrangement, where a reference channel is used to improve source match. Power dividers can be used as a simple accessory for single Autotesters and Bridges input fault location measurements. This technique offers less accuracy than a Test Head or Fault Locator but is an economical measurement technique.

## Power Splitters/Dividers

54311/123 Power Splitter DC to 18 GHz, Type N  
54311/124 Power Splitter DC to 26.5 GHz, 3.5 mm  
54311/161 Power Splitter DC to 40 GHz, 2.92 mm  
54311/187 Power Divider DC to 18 GHz, Type N  
54311/188 Power Divider DC to 26.5 GHz, 3.5 mm

# 6240 Series Fault Locators

The 6240 series Fault Locators provide a quick and convenient method of measuring return loss, VSWR and fault location from a single test port. Fault locators are compact and rugged making them ideal for field measurements.

Typical applications include antenna and antenna feeder testing of mobile communications base stations and waveguide feeds on microwave towers.

When used with the 6820 scalar analyzer or 6840 series microwave system analyzers the display can show simultaneously on two channels, return loss and fault location traces.

As both measurements are made from a single test port, setup time is reduced and a system can be completely characterized without the need to make repetitive reconnections.



## Fault Locators

### Ordering Numbers Versions

6242F	10 MHz to 3 GHz, N (f)
6242M	10 MHz to 3 GHz, N (m)
6240F	10 MHz to 20 GHz, N (f)
6240M	10 MHz to 20 GHz, N (m)
6243F	10 MHz to 26.5 GHz, 3.5 mm (f)
6243M	10 MHz to 26.5 GHz, 3.5 mm (m)
6241	10 MHz to 20 GHz, 7 mm

### Supplied Accessories

43138/663	1.5 m DC Cable (2 off) Open/Short Circuit (Not 6242) 50 Ω Termination
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### Optional Accessories

43138/664	3.0 m DC Cable (2 off necessary, for use with 3.0 m RF or microwave cable)
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### RF Ruggedized Cables for Fault Locators

54311/199	1.5 m, 3 GHz, N (m) to Right Angle N (m)
54311/200	3.0 m, 3 GHz, N (m) to Right Angle N (m)

### Microwave Ruggedized Cables for Fault Locators

54311/197	1.5 m, 20 GHz, N (m) to Right Angle N (m)
54311/198	3.0 m, 20 GHz, N (m) to Right Angle N (m)
54311/201	1.5 m, 26.5 GHz, 3.5 mm (m) to Right Angle 3.5 mm (m)
54311/202	3.0 m, 26.5 GHz, 3.5 mm (m) to Right Angle 3.5 mm (m)

## SPECIFICATION

	6242F (Female Test Port) 6242M (Male Test Port)	6240F (Female Test Port) 6240M (Male Test Port)	6241 (7 mm Test Port)	6243F (Female Test Port) 6243M (Male Test Port)
Frequency Range				
Fault Location	10 MHz to 3 GHz	10 MHz to 20 GHz	10 MHz to 20 GHz	10 MHz to 26.5 GHz (usable to 40 GHz)
Return Loss	10 MHz to 3 GHz	10 MHz to 18 GHz	10 MHz to 18 GHz	10 MHz to 26.5 GHz
Test Port Connector	Type N	Type N	7 mm	3.5 mm
Input Connector	Type N female	Type N female	Type N female	3.5 mm female
Test Port Return Loss				
10 MHz to 3 GHz	20 dB	20 dB	20 dB	20 dB
3 GHz to 18 GHz	—	20 dB	20 dB	20 dB
18 GHz to 26.5 GHz	—	—	—	15 dB
Directivity				
10 MHz to 50 MHz	35 dB	35 dB	35 dB	35 dB
50 MHz to 3 GHz	38 dB	38 dB	38 dB	38 dB
3 GHz to 8 GHz	—	35 dB	35 dB	35 dB
8 GHz to 18 GHz	—	34 dB	35 dB	32 dB
18 GHz to 26.5 GHz	—	—	—	32 dB
Accuracy of return loss <sup>1</sup>				
10 MHz to 50 MHz	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>
50 MHz to 3 GHz	0.013 + 0.1 ρ <sup>2</sup>	0.013 + 0.1 ρ <sup>2</sup>	0.013 + 0.1 ρ <sup>2</sup>	0.013 + 0.1 ρ <sup>2</sup>
3 GHz to 8 GHz	—	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>
8 GHz to 18 GHz	—	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.025 + 0.1 ρ <sup>2</sup>
18 GHz to 26.5 GHz	—	—	—	0.025 + 0.18 ρ <sup>2</sup>
Insertion Loss	7 dB Nominal	7 dB Nominal	7 dB Nominal	7 dB Nominal
Max input power	+26 dBm	+26 dBm	+26 dBm	+26 dBm
Size	79 x 73 x 34 mm	79 x 73 x 34 mm	79 x 73 x 34 mm	79 x 73 x 34 mm
Weight	358 g	358 g	362 g	315 g

<sup>1</sup> Where ρ = measured reflection coefficient - includes directivity and test port reflection effects over the specified frequency range.

# 6146 and 6147

## Pulse Modulators



The 6146 Pulse Modulator is ideal for modulating RF and Microwave signals to enable testing of radar systems. Its wide frequency range of 70 MHz to 20 GHz means it can test both the RF and IF performance of the radar.

Fast rise and fall times coupled with >70 dB ON/OFF ratio ensures that the 6146 can be used to test the majority of modern radars. Modulation is controlled by a TTL input. Any suitable pulse generator can be used to drive the 6146. An integral amplifier gives the 6146 an insertion gain of 5 dB. This enhances the ability to measure the dynamic range of a radar compared with traditional pulse modulators that typically have an insertion loss up to 10 dB.

The 6146 is a small lightweight and rugged package. It can be connected directly onto the output of a signal source and has type N connectors. When used with the 6840 series Microwave System Analyzer it is powered with the accessory power supply.

The combination of a 6146 and a 6840 fitted with an internal attenuator forms the basis of an excellent solution for testing radar systems. The fundamental radar tests of minimum discernible signal, 1 dB compression and subclutter rejection are made simple.

## SPECIFICATIONS

### 6146

#### Frequency Range

500 MHz to 18 GHz  
useable from 70 MHz to 20 GHz

#### ON/OFF Ratio

>70 dB from 500 MHz to 18 GHz  
>35 dB 70 MHz to 200 MHz  
>60 dB 200 MHz to 500 MHz

#### Rise/Fall Time

<5 ns

#### Delay Time

≤20 ns

#### Minimum Pulse Width

50 ns

#### Maximum PRF

20 MHz

#### Pulse Width Compression

≤10 ns

#### Video Breakthrough

<150 mV pk-pk 500 MHz to 18 GHz  
<200 mV pk-pk 70 MHz to 500 MHz

#### Switch Generated RF

<-35 dBm from 70 MHz to 500 MHz  
<-50 dBm from 500 MHz to 1 GHz  
<-70 dBm from 1 GHz to 18 GHz

#### Reverse Power Damage Level

+20 dBm, ±42 V DC

#### Harmonics

≤-15 dBc for >10 dBm output power

#### Power Accuracy

±1 dB after user calibration

#### Insertion Gain at +23°C

>5 dB 500 MHz to 18 GHz  
Gain temperature coefficient, -0.05/°C typical

#### Minimum Output Power at +23°C

(with +5 dBm input power)  
≥+8 dBm 500 MHz to 18 GHz

#### Input Damage Level

+20 dBm, ±42 V DC

#### Modulation Input Type

Standard TTL levels. BNC input for RF ON when logic level low

#### Modulation Input Impedance

>10 kΩ

#### RF Input

Connector  
Type N (m) 50 Ω  
Return loss  
>5 dB 70 MHz to 200 MHz Typical  
>8 dB 200 MHz to 18 GHz Typical

#### RF Output

Connector  
Type N (f) 50 Ω  
Return loss  
>10 dB 200 MHz to 6 GHz Typical  
>6 dB 6 GHz to 18 GHz Typical

#### Electromagnetic Compatibility

Conforms with the protection requirements of the EEC Council Directive 89/336/EEC

#### Complies with the limits specified in the following standards:

EN55011 Class B CISPR 11

EN50082-1 IEC 801-2,3,4

#### Safety

Complies to IEC 348

#### Rated Range of Use

#### Temperature

0 to +50°C

#### Humidity

Up to 93 % humidity at 40°C

#### Conditions of Storage and transport

#### Temperature

-40 to +70°C

#### Humidity

Up to 93 % humidity at 40°C

#### Altitude

Up to 4,600 meters (15,000 feet)

#### Dimensions and Weight

148 mm x 86 mm x 41 mm

400 g

#### Supply Voltages

+18 to 36 V DC, 500 mA

Available from the optional AC adapter.

### 6147

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#### Frequency Range

70 MHz to 40 GHz

#### ON/OFF Ratio

>23 dB

#### Rise/Fall Time

<150 ns

#### Pulse Width Compression

<150 ns

#### Minimum Pulse Width

500 ns

#### Maximum PRF

1 MHz

#### Insertion Loss

<10 dB

#### Minimum Output Power

(with +5 dBm input power)  $\geq$  -5 dBm

#### Reverse Power Damage Level

+20 dBm,  $\pm$ 42 VDC

#### Input Damage Level

+20 dBm,  $\pm$ 42 VDC

#### Modulation Input Type

Standard TTL, BNC input for RF ON when logic level low

#### Modulation Input Impedance

>10 k $\Omega$

#### Input/Output Return Loss

7 dB typ

#### RF Input/Output Connectors

2.92 mm (f)

#### Electromagnetic Compatibility

Conforms with the protection requirements of the EEC Council Directive 89/336/EEC. Conforms with the limits specified in the follow standards.

IEC/EN61326-1: 1997 Conducted emission Class A

Radiated emission Class B. Immunity Table 1 Performance Criterion B

#### Safety

Conforms with the requirements of EEC Council Directive 73/23/EEC (as amended) and the product safety standard IEC / EN 61010-1 : 2001 + C1 : 2002 + C2 : 2003 for class 1 (or 3) portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an Installation Category 2 (or / and 1) supply.

#### Operating Temperature

0°C to +50°C

#### Dimensions and Weight

112 mm x 86 mm x 41 mm, 450g

#### Supply Voltages

+12 V DC 400 mA & -12 V DC 70 mA

Available from the optional AC adapter

### ACCESSORIES - PART NUMBER LIST

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When ordering please quote the full ordering number information.

#### Ordering numbers

6146 500 MHz to 18 GHz Pulse Modulator

6147 70 MHz to 40 GHz Pulse Modulator

54441/019 AC Power Supply (for 6146 & 6147)

#### 6230A/L SCALAR DETECTORS

6230A series Standard Detectors (-65 dBm to +20 dBm) typical

6230A 10 MHz to 20 GHz, N type (m)

6232A 1 MHz to 3 GHz, N Type (m)

6233A 10 MHz to 26.5 GHz, 3.5 mm (m)

6234A 10 MHz to 46 GHz, 2.92 mm (m)

6230L series Low VSWR detectors (-59 dBm to +26 dBm) typical)

6230L 10 MHz to 20 GHz, N type (m)

6233L 10 MHz to 26.5 GHz, 3.5 mm (m)

6234L 10 MHz to 46 GHz, 2.92 mm (m)

#### AUTOTESTERS AND RF BRIDGE

Autotesters

59999/151 10 MHz to 18 GHz 7 mm

59999/158 10 MHz to 18 GHz N (m)



54421/023	N (m) Fixed Load		
54421/024	N (f) Fixed Load	54311/170	Miscellaneous Electrical Cables
	Precision Adapters	54311/112	Positive Voltage Measurement Cable
54311/175	N (m) to N (m)	43129/189	Negative Voltage Measurement Cable
54311/167	N (m) to N (f)	43139/042	GPIB Cable
54311/174	N (f) to N (f)	46884/560	BNC (m) to BNC (m) 1.5 m
54311/176	N (f) to 3.5 mm (f)	43137/604	Parallel Printer Interface Cable
54311/177	N (m) to 3.5 mm (f)	43139/107	Autotester Adapter Cable 0.5 m
54311/178	N (m) to 3.5 mm (m)		Autotester Adapter Cable 1.5 m
54311/185	N (f) to 3.5 mm (m)	54351/022	Standard Microwave Cables
54311/137	N (m) to TNC (f)	54351/025	0.5 m, 18 GHz, N (m) to N (m)
54311/138	N (m) to TNC (m)	54351/027	0.5 m, 26.5 GHz, 3.5 mm (m) to 3.5 mm (m)
54311/139	N (f) to TNC (f)		0.5 m, 40 GHz, 2.92 mm (m) to 2.92 mm (m)
54311/186	N (f) to TNC (m)		Attenuators
54311/203	7 mm to N (f)	56534/901	Precision Fixed Coaxial Attenuator 3 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/204	7 mm to TNC (m)	56534/902	Precision Fixed Coaxial Attenuator 6 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/205	7 mm to TNC (f)	56534/903	Precision Fixed Coaxial Attenuator 10 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/136	TNC (m) to TNC (m)	56534/904	Precision Fixed Coaxial Attenuator 20 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/107	3.5 mm (f) to 3.5 mm (f)		Software Support
54311/165	3.5 mm (m) to 3.5 mm (f)	59000/327	MIPlot Software Pack
54311/164	3.5 mm (m) to 3.5 mm (m)		<b>MISCELLANEOUS</b>
54311/162	2.92 mm (m) to 2.92 mm (m)	54152/001	3.5 mm Torque Wrench
54311/206	2.92 mm (m) to 2.92 mm (f)	54211/008	Compact Keyboard
54311/207	2.92 mm (f) to 2.92 mm (f)	52388/900	1.25 GHz Active Probe
	Standard Adapters	54441/012	Power supply for 2388
54311/133	N (f) to SMA (f)		
54311/134	N (m) to SMA (f)		
54311/135	TNC (m) to SMA (m)		

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

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