

Microwave

2186/87 5 & 20 GHz Programmable Attenuators

AEROFLEX
A passion for performance.



Wide range GPIB programmable attenuator with outstanding accuracy for bench top, automatic and standards applications

- Attenuation from 0 to 130 dB
- 1 dB steps
- DC to 20 GHz frequency range (2187)
- 1 W power rating (50 W pulsed)
- IEEE-488.2 interface fitted as standard
- External relay driving capability
- Calibration data to international standards
- User calibration facility

The 2186 and 2187 are microwave attenuators covering the frequency range DC to 5 GHz (2186) and DC to 20 GHz (2187) with an attenuation range of 0 to 130 dB in 1 dB steps.

Microprocessor control provides simple and rapid operation either by direct keyboard operation or via the IEEE-488.2 interface which is fitted as standard.

The 2186 and 2187 are ideally suited to ATE applications with rear panel input and output versions available as options.

Calibration Data to International Standards

Calibration data, traceable to international standards, are internally stored for each attenuator element as a function of frequency, allowing attenuation settings to be corrected to achieve increased accuracy.

At the specified frequency the actual attenuation is calculated and can be displayed or read over the GPIB interface. A corrected attenuation mode can be used which results in the instrument selecting the setting closest to the required attenuation value.

User Calibration

User calibration data for each attenuator element can be stored in non-volatile memory and the information used to reduce test system uncertainties. For calibration and test purposes individual pads of the attenuator can be controlled.

Programming

An IEEE-488.2 program interface is provided as standard. Ease of use is ensured by careful selection of mnemonics. For example if attenuation, frequency and step size are to be set to 45 dB, 2.7 GHz and 5 dB respectively and one upward step in attenuation is required then the GPIB message is:-

```
ATTN 45DB;FREQ 2.7GHZ;STEP
```

```
5.0DB;ATUP<EOM>
```

Relay Driving

A programmable auxiliary output on the rear panel provides a facility for driving relays commonly used in ATE systems for switching signal paths. A total of 16 control lines, each capable of sinking 0.5 A, are provided - saving the cost and additional complexity of a separate switch controller. The outputs can be configured for static or pulsed operation to allow the lines to be used with biased or bistable switches.

SPECIFICATION

FREQUENCY

Range

2186 : DC to 5 GHz

2187 : DC to 20 GHz

ATTENUATION

Range

0 dB to 130 dB

Resolution

1 dB from 3 dB to 127 dB

Absolute Accuracy

DC : 0.3 dB \pm 1.5% of setting

DC to 2.7 GHz : 0.45 dB \pm 2% of setting

Calibration Accuracy

At 23 \pm 2°C

Attenuation	DC to 2.7 GHz	2.7 to 5 GHz (2186) 2.7 to 8 GHz (2187)	8 to 18 GHz (2187 only)
Up to 16 dB	0.15 dB	0.35 dB	0.6 dB
Up to 36 dB	0.30 dB	0.70 dB	1.2 dB
Up to 56 dB	0.45 dB	1.05 dB	1.8 dB
Up to 76 dB	0.60 dB	1.40 dB	2.4 dB
Up to 100 dB	0.75 dB	1.75 dB	3.0 dB

Spot Calibration

Software allows storage of 10 user defined calibrations

Repeatability

Typically better than 0.03 dB

Temperature Coefficient

Less than 4×10^{-5} dB/dB set/°C

INPUT IMPEDANCE

50 Ω Nominal

MAXIMUM POWER

1 W at 55°C ambient

VSWR

1.25:1 from DC to 2.7 GHz

1.5:1 from 2.7 GHz to 5 GHz - 2186

1.5:1 from 2.7 GHz to 6 GHz - 2187 only

2.0:1 from 6 to 18 GHz - 2187 only

INSERTION LOSS

Typically 0.2 dB +0.25 dB/GHz

CONNECTORS

Precision N-type female

EXTERNAL SWITCH CONTROL

Rear panel 37 way D type connector provides 16 control lines each capable of sinking 0.5 A and withstanding 35 V. A diode clamp system is provided to protect the outputs and can be configured for static or

pulse operation. The pulse duration can be internally set to 10 ms, 20 ms, 30 ms, 40 ms or 50 ms. The state of each line can be viewed from the front panel or via the GPIB.

GPIB INTERFACE

Designed in accordance with IEEE Std. 488.2. All functions except supply switch are remotely programmable.

Capabilities

Complies with subsets

SH1, AH1, T6, L4, SR1, RL1, PPO, DC1, DT0, CO and E2 as defined in IEEE Std. 488.1.

Switching Speed

100 ms - Normal mode

160 ms - Corrected mode

Switching Rate

Nominally 5 per second at 23°C. Derating to 1 per second at 55°C.

ELECTROMAGNETIC COMPATIBILITY

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

IEC/EN61326-1, RF Emission Class B, Immunity Table 1, Performance Criteria B

SAFETY

Conforms with the requirements of EEC Council Directive 73/23/EEC (as amended) and the product safety standard IEC/EN 61010-1 for class 1 portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an installation category 2 supply.

RATED RANGE OF USE (over which full specification is met)

Temperature

0 to 55°C

Humidity

Up to 93% relative humidity at 40°C

CONDITIONS OF STORAGE AND TRANSPORT

Temperature

-40 to +70°C

Humidity

Up to 93% relative humidity at 40°C

Altitude

Up to 4600 m (15000 ft)

POWER REQUIREMENTS

AC Supply

Four settings covering:	100 V (Limit 90 - 115 V) 120 V (Limit 105 - 132 V) 220 V (Limit 188 - 242 V) 240 V (Limit 216 - 264 V)
Frequency	50 - 400 Hz (Limit 45 - 440 Hz)
Power	80 VA max

DIMENSIONS AND WEIGHT

Including handles

Height	Width	Depth	Weight
108 mm	256 mm	355 mm	4.0 kg
4.25 in	10.25 in	14 in	8.8 lb

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers

Versions

2186	DC to 5 GHz Programmable Attenuator
2187	DC to 20 GHz Programmable Attenuator

Options

Option 001	Rear Panel Input and Output
Option 100	Single fused supply input

Supplied With

AC Supply Lead
Instruction Manual

Accessories

54311/092	Coaxial Adapter N male to BNC female
59999/163	Precision Coaxial Adapter N male to SMA female
43129/189	GPIB Lead Assembly, 1 m, IEEE Connectors
46883/408	IEEE/IEC Adapter Block for GPIB Connectors
46884/501	Rack Mounting Kit (Double Unit 3U high)
46884/500	Rack Mounting Kit (Single Unit 2U high)

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