



# Series D195 Octave-Band PIN Diode Attenuator/Modulators

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Application Notes for [Microwave Attenuator](#)

The Series D195 voltage-controlled linearized attenuator/modulators are integrated assemblies consisting of a Series 195 unit and a hybridized driver circuit which provides a nominal transfer function of 10 dB per volt. (See figure 1 below.)

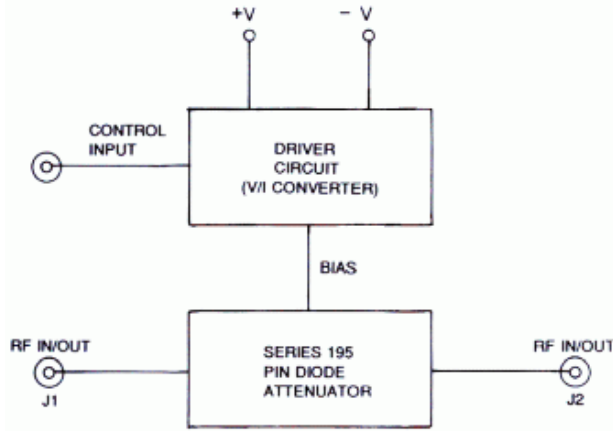
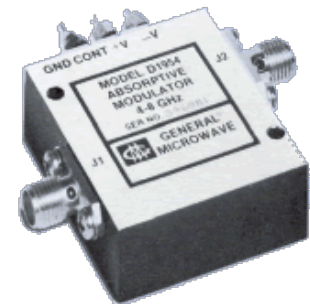
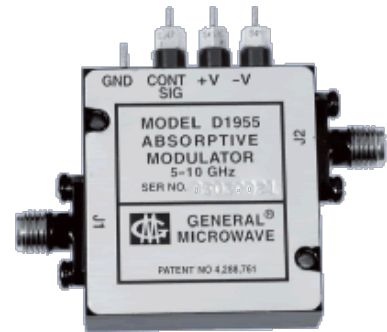


Fig. 1-Series D195, block diagram

All of the Series D195 units except the D1950A\* exhibit fall times of 20 nsec max and rise times of 1.5  $\mu$ sec max for attenuation steps of 10 dB or more. For smaller excursions, the fall times can increase to several hundred nsec, while the rise times remain essentially unchanged. In applications where a rapid return to insertion loss from any level of attenuation is required, Option 59 is available. With this option, an external pulse is applied to trigger a high-speed reset circuit, and recovery times of 200 nsec max are obtained. Where use of an external reset pulse as described above is not feasible, an internal reset option (Option 58) is available which will automatically reset the unit to insertion loss within 200 nsec for a step of 50 dB or more. The fall and rise time specifications for the D1950A\* are 500 nsec max and 10  $\mu$ sec max, respectively. Options 58 and 59 are not available for this model.

\*Model D1950A is a special-order product. Consult factory before ordering.

- Absorptive
- Linearized
- Frequency range: 0.5 to 18 GHz
- High performance MIC quadrature hybrid design
- High speed



**ALL UNITS  
IN THIS SERIES  
ARE EQUIPPED  
WITH INTEGRATED DRIVERS**

MODEL	FREQUENCY RANGE (GHz)	MAX. INSERTION LOSS (dB)	MAX. VSWR	MAX. FLATNESS ( $\pm$ dB) AT MEAN ATTENUATION LEVELS UP TO				
				10 dB	20 dB	40 dB	60 dB	80 dB
D1950A*	0.5 - 1.0	1.5	2.0	0.3	1.0	1.7	3.0	3.6
D1951	1.0 - 2.0	1.7	1.5	0.3	1.0	1.5	1.6	
	0.75 - 2.25 <sup>(1)</sup>	1.8	2.0	0.5	1.4	3.0	3.5	
	2.0 - 4.0	2.0	1.5	0.3	1.0	1.5	1.6	

<b>D1952</b>	1.5 - 4.5 <sup>(1)</sup>	2.1	2.0	0.5	1.4	3.0	3.5
	2.6 - 5.2	2.2	1.6	0.3	1.0	1.5	1.8
<b>D1953</b>	1.95 - 5.85 <sup>(1)</sup>	2.3	2.1	0.5	1.4	3.0	3.5
	4.0 - 8.0	2.6	1.7	0.3	1.0	1.5	1.6
<b>D1954</b>	3.0 - 9.0 <sup>(1)</sup>	2.7	2.2	0.5	1.4	3.0	3.5
	5.0 - 10.0	2.8	1.7	0.5	1.0	1.5	1.6
<b>D1955</b>	3.75 - 11.25 <sup>(1)</sup>	2.9	2.2	0.7	1.4	3.0	3.5
	6.0 - 12.0	2.9	1.8	0.7	1.0	1.5	1.6
<b>D1956</b>	4.5 - 13.5 <sup>(1)</sup>	3.0	2.2	0.9	1.5	3.0	3.5
	8.0 - 18.0	3.0 <sup>(2)</sup>	1.8 <sup>(2)</sup>	0.7	1.0	1.5	1.6
<b>D1958</b>	6.0 - 18.0 <sup>(1)</sup>	3.0 <sup>(2)</sup>	1.8 <sup>(2)</sup>	0.9	1.5	3.0	3.5

\*Model 1950A is a special-order product. Consult factory before ordering.

(1) Specifications for the extended frequency ranges are typical.

(2) Except from 16 - 18 GHz where insertion loss is 4.0 dB max and VSWR is 2.0 max.

### PERFORMANCE CHARACTERISTICS

#### Mean Attenuation Range

D1950A\* ..... 80 dB  
 All other units ..... 60dB

#### Accuracy of Attenuation

0 to 30dB ..... ±0.5 dB  
 > 30 to 50 dB ..... ±1.0 dB  
 > 50 to 60 dB ..... ±1.5 dB  
 > 60 to 80 dB ..... ±2.0 dB  
 (D1950A\*only)

**Monotonicity** ..... Guaranteed

**Phase Shift** ..... [See Application Note](#)

**Temperature Coefficient** ..... ±0.025 dB/ C

#### Power Handling Capability

Without Performance Degradation

D1950A\*,D1951 ..... 10 mW cw or peak  
 All other units ..... 100 mW cw or peak

Survival Power (from -65°C to +25°C;  
 see Fig. 2 for higher temperatures)

All units ..... 1 W average 25W peak (1 µsec max pulse width)

#### Switching Characteristics

Off Time

D1950A\* ..... 600 nsec max  
 All other units ..... 100 nsec max

On Time

D1950A\* ..... 10 µsec max  
 All other units ..... 1.6 µsec max

Fall Time

D1950A\* ..... 500 nsec max  
 All other units ..... 30 nsec max

Rise Time

D1950A\* ..... 10 µsec max  
 All other units ..... 1.5 µsec max

#### Nominal Control Voltage Characteristics Range

	<u>Operating</u>	<u>Maximum</u>	
D1950A*	0 to +	8V	± 15V
All Other Units	0 to +	6V	± 15V

**Transfer Function** ..... 10 dB / volt

**Input Impedance** ..... 10 Kohms

#### Modulation Bandwidth

Small Signal

D1950A\* ..... 25 kHz  
 All other units ..... 500 kHz

Large Signal

D1950A\* ..... 5 kHz  
 All other units ..... 50 kHz

**Power Supply** ..... +12V 5%, 100 mA

**Requirements** ..... -12V 5%, 50 mA

**Power Supply** ..... Less than 0.1 dB / volt change in

**Rejection** ..... either supply

\*Model 1950A is a special-order product. Consult factory before ordering.

### ENVIRONMENTAL RATINGS

#### Operating Temperature

Range ..... -54°C to + 110°C

### AVAILABLE OPTIONS

#### Option No.

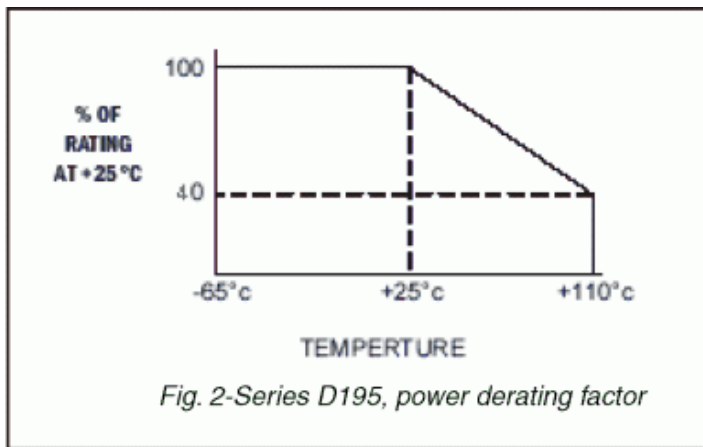
#### Description

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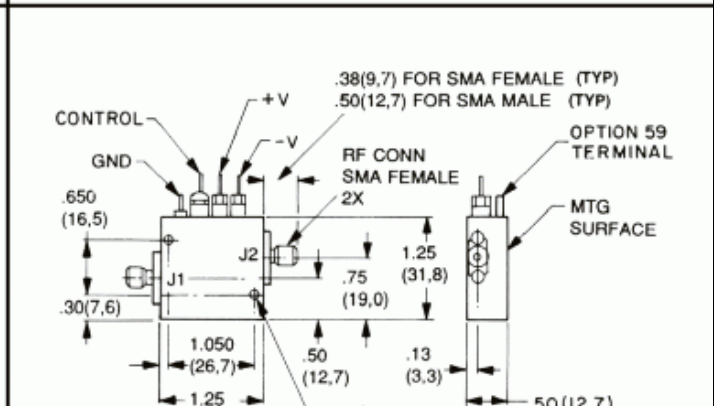
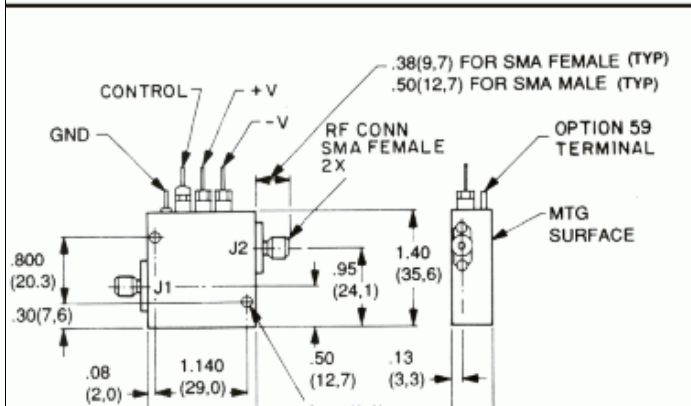
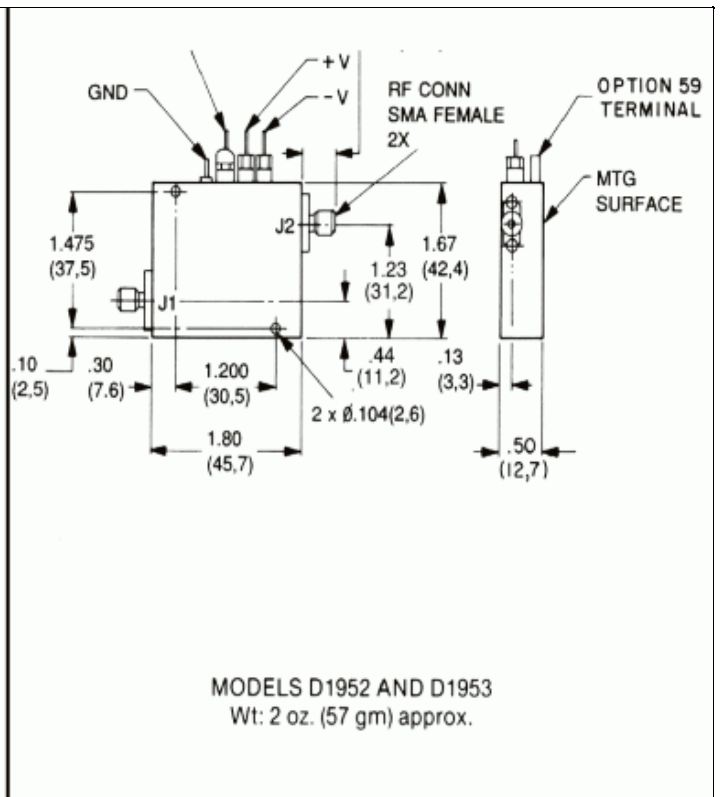
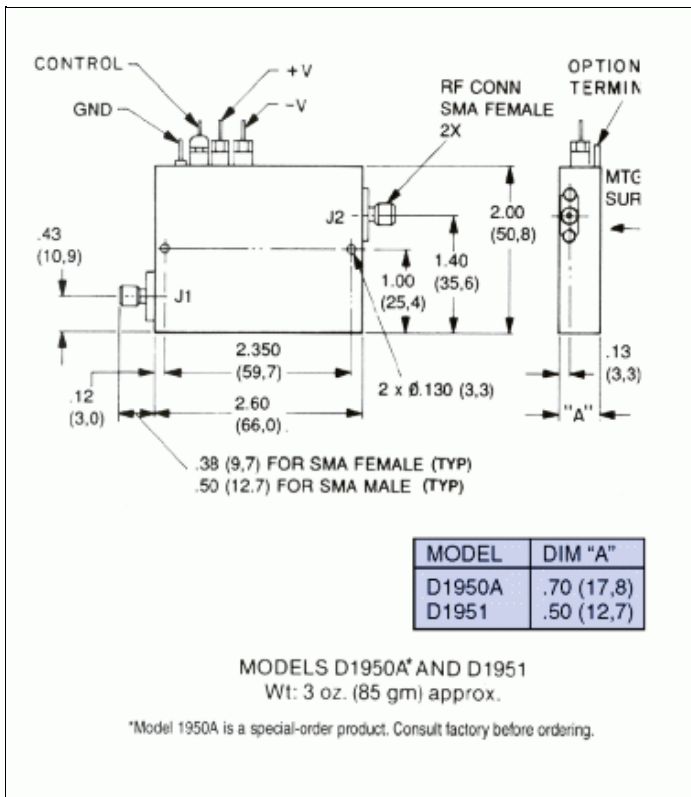
SMA female control connector

<b>Non-Operating</b>			
<b>Temperature Range</b> .....	-65°C to + 125°C	<b>7</b>	Two SMA male rf connectors
<b>Humidity</b> .....	MIL-STD-202F, Method 103B, Cond. B (96 hrs. at 95%)	<b>10</b>	One SMA male (J1) and one SMA female (J2) RF connector
<b>Shock</b> .....	MIL-STD-202F, Method 213B, Cond. B (75G, 6 msec)	<b>58</b>	Internally-generated reset to insertion loss (not available on D1950A)(1)
<b>Vibration</b> .....	MIL-STD-202F, Method 204D, Cond. B (.06" double amplitude or 15G, whichever is less)	<b>59</b>	Externally-triggered reset to insertion loss (not available on D1950A*)(2)(3)
<b>Altitude</b> .....	MIL-STD-202F, Method 105C, Cond. B (50,000 ft.)	<b>61</b>	20 dB / volt transfer function with 0 to +3V control signal input (+4V for the D1950A*)
<b>Temp. Cycling</b> .....	MIL-STD-202F, Method 107D, Cond. A, 5 cycles	<b>62</b>	± 15 volt operation
		<b>64</b>	SMC male control connector
		<b>64A</b>	SMB male control connector

- (1) Where use of an Option 59 external reset pulse (see note 2 below) is not feasible, this option is available which will automatically sense the slope and magnitude of the control signal and reset the unit to the insertion loss state within 200 nsec for a stop of 50 dB or more.
- (2) An external terminal is provided for the user to apply a fast (10 nsec, max rise time) positive-going 3-volt pulse at least 0.5 µsec wide to accelerate the return of the attenuator to the insertion loss state with the simultaneous lowering of the control signal to the zero voltage level. This reset can be accomplished within 200 nsec.
- (3) The input impedance of units equipped with Option 59 is a circuit equivalent to approximately 50 pF in series with a parallel combination of 100 pF and 1000 ohms.



**Dimensions and Weights**



<p>MODELS D1954, D1955 AND D1956 Wt: 1 oz. (28 gm) approx.</p>	<p>MODEL D1958 Wt: 1 oz. (28 gm) approx.</p>
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Dimensional Tolerances, unless otherwise indicated: .XX ±.02; .XXX ±.005

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