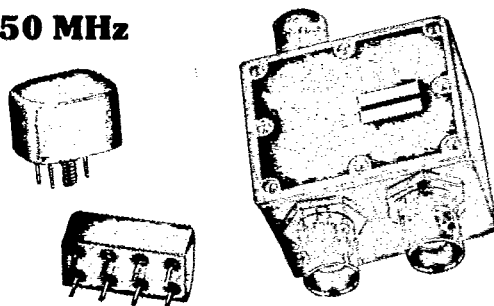


ELECTRONIC VARIABLE ATTENUATORS

MODELS VA-417A/418A
VA-419B/420B

2 to 350 MHz



FEATURES

- Wide Bandwidth
- Low Signal Distortion
- Wide Attenuation Range
- Wide Modulation Range
- Low Phase Shift with Attenuation
- Matched Attenuation Characteristics
- High Rejection of Controlling Signal
- Precision Phase Reversal
- Wide Choice of Case Styles

APPLICATIONS

The variable attenuators have an extremely large range of applications wherever precise control of RF levels or stage gains is required while maintaining signal fidelity in both the amplitude and phase domains. These applications include the following:

- **RADIO DIRECTION FINDER (RDF) Systems:** In RDF systems, to provide precise gain tracking of independent channels with extremely small phase change as a function of attenuation.
- **LOW DISTORTION SYSTEMS:** To control signal levels in wideband, critical systems where intermodulation distortion must be minimized.
- **SIGNAL LEVELING:** Where tight, linear leveling control is required with excellent phase characteristics.
- **PHASE MODULATORS:** In conjunction with a quadrature hybrid, to produce linear phase modulation.
- **RECEIVER GAIN CONTROL:** To provide overall receiver gain control, AGC and manual, with a few variable attenuators at RF, IF or both; permits other critical receiver stages to be operated at optimized fixed gain.

GENERAL SPECIFICATIONS, ALL MODELS

Nominal Impedance, Ports A and B 50 ohms (min. attenuation only). Attenuation achieved by mismatch.

Resistance, Port S Resistance varies from 28 ohms at 30 mA to 270 K ohms at 1.0 μ A.

Noise Figure Within 1 dB of attenuation value.

Temperature Range -65°C to $+105^{\circ}\text{C}$, operating and non-operating.

Effect of temperature on
Attenuation, Typical (S Port
Current Held Constant)

Attenuation	0-10 dB	10-30 dB	30-50 dB
$T = 25^{\circ}\text{C} \pm 10^{\circ}\text{C}$	± 0.5 dB	± 0.8 dB	± 1 dB
$T = 25^{\circ}\text{C} \pm 20^{\circ}\text{C}$	± 0.8 dB	± 1.5 dB	± 2 dB

Range of Port S Control Current 30 mA to 1.0 μ A nominal.

Humidity All units hermetically sealed and unaffected by humidity.

RF Shielding To MIL-I-6181D and other EMI specifications.

Maximum Ratings Port S (Control Port) must not exceed 60 mA; Port A or B (RF in and out), continuous power $+26$ dBm max. at $+25^{\circ}\text{C}$, or $+20$ dBm max. at $+105^{\circ}\text{C}$.

Connectors PC pins or BNC Standard; SMA and TNC available by adding -S or -T to model designation, e.g., VA-418A-T.

DESCRIPTION

Lorch Electronics Variable Attenuators Models VA-417A/418A and VA-419B/420B are miniature solid state components designed to control the level of RF signals at frequencies from 2 to 350 MHz, by means of a dc current, over a wide attenuation range with low distortion and phase shift. Attenuation may be varied, or modulated, at rates from dc to 1 MHz. The phase of the RF output signal may be changed precisely 180 degrees by reversing the polarity of the dc control current.

Models VA-417A/418A cover the frequency range 2 to 150 MHz with modulation rates to 200 KHz, while Models VA-419B/420B operate in the 100 to 350 MHz range and may be modulated at rates as high as 1.0 MHz.

The variable attenuators use special diodes, coupled by broadband ferrite transmission line networks having low loss and excellent balance. When a positive dc current of about 30 mA is allowed to flow in the S port to ground, the insertion loss between RF input port A and RF output port B is low: reducing the dc current causes a progressive increase in the insertion loss, a maximum occurring at zero current. If the current is then reversed in polarity and increased, the insertion loss will return to a low value, with a 180° reversal in phase. Illustration 1 shows the attenuation as a function of dc current.

Operation of these variable attenuators is similar in principle to that of a double balanced mixer used as a current-controlled attenuator, but the variable attenuator yields greatly superior performance with respect to compression, intermodulation distortion and phase shift, particularly in the range of higher attenuation.

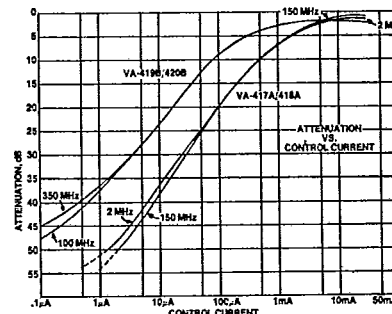


Illustration 1

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ELECTRONIC VARIABLE ATTENUATORS

T-74-11-01

PERFORMANCE DATA

Model No.	Pin Package	VA-417A			VA-419B
	Connector Version	VA-418A			VA-420B
Frequency Range	Port A, Port B	2-150 MHz			100-350 MHz
	Port S (Control)	dc-200 KHz			dc-1.0 MHz
Insertion Loss (Port S, 30 mA)		2-32 MHz : 1.5 dB 2-150 MHz : 2.5 dB			150-300 MHz : 2 dB 100-350 MHz : 3 dB
Maximum Attenuation (Port S, 0.1 μ A)		2-32 MHz : 50 dB 2-150 MHz : 45 dB			100-250 MHz : 45 dB 250-350 MHz : 40 dB
Compression Level (Input level for 2 dB departure from linearity)	Min. Atten.	2-150 MHz : +20 dBm			100-350 MHz : +16 dBm
	30 dB Atten.	2-32 MHz : +10 dBm 32-150 MHz : +15 dBm			100-350 MHz : 0 dBm
Maximum phase shift over 30 dB attenuation range		2-32 MHz : $\pm 5^\circ$ 32-150 MHz : $\pm 10^\circ$			100-250 MHz : $\pm 25^\circ$ 250-350 MHz : $\pm 15^\circ$
Phase reversal accuracy		2-32 MHz : $\pm 0.5^\circ$ 32-150 MHz : $\pm 1^\circ$			100-250 MHz : $\pm 2^\circ$ 250-350 MHz : $\pm 5^\circ$
Electrical length, minimum attenuation		1.5 nS, max.			1.2 nS, max.
Third Order Intercept Point	Min. Atten.	2-10 MHz	10-32 MHz	32-150 MHz	100-350 MHz
	30 dB Atten.	+30 dBm	+42 dBm	+37 dBm	+35 dBm
VSWR (RF In & Out)	Min. Atten.	+22 dBm*	+32 dBm	+35 dBm	+30 dBm
Case Styles		Fig. 1			Fig. 1
Preferred Available	Pin	Fig. 4			Fig. 4
	Connector	Fig. 2, 3, 5			Fig. 2, 3, 5

* 2-5 MHz : +15 dBm; 5-10 MHz : +22 dBm

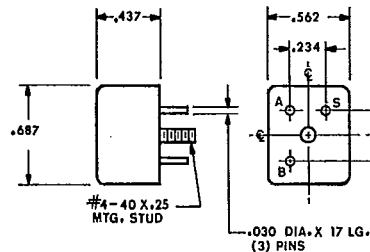


FIG. 1

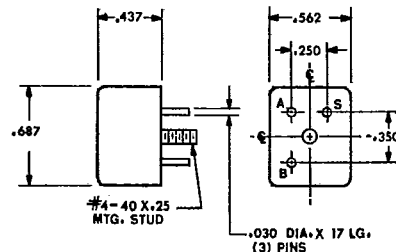


FIG. 2

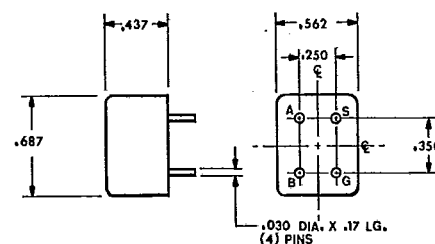


FIG. 3

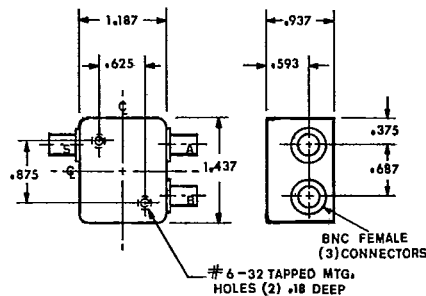


FIG. 4

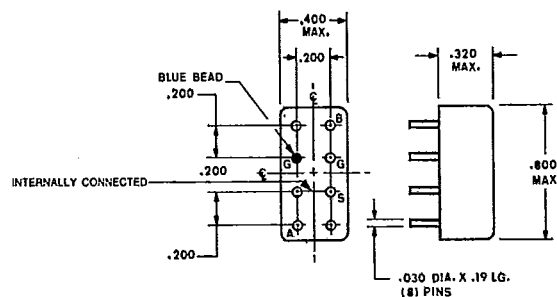


FIG. 5

All dimensions are in inches.

Tolerances: Mounting hole dimensions $\pm .010$ Outline dimensions $\pm .020$ All other dimensions, unless marked maximum, are $\pm .025$ **LORCH ELECTRONICS****VERNITRON
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