TEMPERATURE COMPENSATED DIGITALLY CONTROLLED

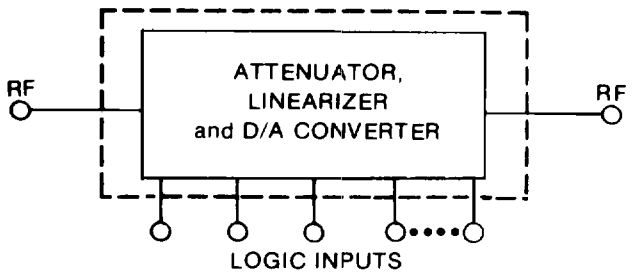
ATTENUATORS, PIN DIODE SERIES GA-TT/TR

(ABSORPTIVE DIODE TYPE)

GENERAL INFORMATION: Digitally controlled analog attenuators built by KDI/Triangle are controlled by TTL binary logic. Standard units have 8 logic inputs (bits) and therefore can produce 256 discrete values of attenuation. These units are easily modified to accommodate 10 or 12 logic input bits. Order with a -10 or -12 added to Model Number. (e.g., GA-10 TR-10). Two digit BCD logic is available on request.

KDI/Triangle's attenuators are built in a matched configuration and thus have excellent frequency flatness and VSWR characteristics. Because the units are temperature compensated they maintain their attenuation accuracy vs. frequency over a greater temperature range than the non-temperature compensated units.

The unit is shown schematically below.



FREQUENCY RANGE: 0.25 to 18.0 GHz.

RF IMPEDANCE: 50 OHMS.

DC VOLTAGE: ±15 volts at ±50 mA max.

LOGIC: TTL compatible.

NO. OF BITS = 8 L.S.B. = .25 dB ATTENUATION: 63.75 dB

BIT SIZE	.25	.5	1	2	4	8	16	32	
LOGIC	0	0	0	0	0	0	0	0	= REF. (INS. LOSS)
LOGIC	0	0	0	1	0	1	0	0	= 10 dB
LOGIC	0	0	0	0	1	0	1	0	= 20 dB
LOGIC	0	0	0	1	1	1	1	0	= 30 dB
LOGIC	0	0	0	0	0	1	0	1	= 40 dB
LOGIC	0	0	0	1	0	0	1	1	= 50 dB
LOGIC	0	0	0	0	1	1	1	1	= 60 dB
LOGIC	1	1	1	1	1	1	1	1	= 63.75 dB

NOTE: Least Sig. Bit for 32 dB unit is .125 dB. Most Sig. Bit is 16 dB.

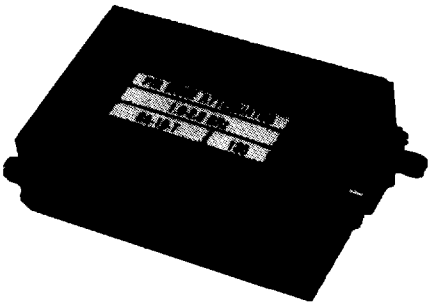
RF POWER: To prevent self biasing, the attenuator should be operated at less than 100 mW CW 60 watts peak. Units will not be damaged by application of 1 watt CW 100 watts peak.

TEMPERATURE INFORMATION: GA-TT Series are compensated over the temperature range of −55°C to +85°C. GA-TR Series are compensated over the temperature range of 0°C to +70°C.

SWITCHING SPEED: Standard models can be changed from any value of attenuation to any other value in 10 microsec. Units can be provided with switching speed to 200 nanosec. on request. Speed is related to max attenuation required. That is, 32 dB models are faster than 64 dB models. Insertion Loss will increase by a factor of 1.6 on higher speed models.

ENVIRONMENT: MIL-E-5400, MIL-STD-202, MIL-E-16400, MIL-STD-883 (Special request only).

CONNECTORS: SMA standard, others on request. A mating multipin connector is supplied with the unit; ITT Cannon DA-15S or equiv.



NOTES:

1. Harmonic Distortion: Approximately −50 dBc for $P_{in} \leq 0$ dBm at a frequency of 1.0 GHz for most units. This value improves by approximately 10 dB per octave as the frequency increases; however, since this value is dependent on bandwidth of the unit, power input, and switching speed required, the factory should be consulted if harmonic content is an important system requirement.
2. Two Tone Intermodulation Products: Second and third order products approximately 50 dBC for $P_{in} \leq 0$ dBm (each signal) at all attenuation settings.
3. If a narrow frequency bandwidth is required, KDI/Triangle can supply a unit that is electrically optimized for that bandwidth. Mechanical dimensions will remain the same as the standard unit, and the price will generally be lower. Specify the frequency range when ordering a narrow bandwidth model, and a special part number will be assigned.
4. Add 1.5 dB to all accuracy numbers for models GA-50-T and GA-51-T.
5. Attenuation vs. temperature only is ±0.02 dB/°C typical (64 dB).
6. When ordering, add suffix indicating required temperature compensation range to the model number. i.e., the GA-32-T, compensated over the temperature range −55°C to +85°C, would be ordered as GA-32-TT. If compensation from 0°C to +70°C is required, the model number would be GA-32-TR. (See "attenuation accuracy vs. frequency and temperature" tables for specifications.)
7. Monotonicity guaranteed for all models.

ATTENUATION ACCURACY vs FREQUENCY AND TEMPERATURE
over the −55° C to +85° C temperature range Series GA-TT

OCTAVE MODELS (2:1 FREQUENCY)	GREATER THAN OCTAVE MODELS
±0.75 dB to 10 dB	±1.0 dB to 10 dB
±1.2 dB to 20 dB	±1.5 dB to 20 dB
±1.5 dB to 30 dB	±2.0 dB to 30 dB
±2.0 dB to 40 dB	±2.5 dB to 40 dB
±3.0 dB to 64 dB	±4.0 dB to 64 dB

[See Note 4]

ATTENUATION ACCURACY vs FREQUENCY AND TEMPERATURE
over the 0° C to +70° C temperature range Series GA-TR

OCTAVE MODELS (2:1 FREQUENCY)	GREATER THAN OCTAVE MODELS
±0.6 dB to 10 dB	±0.8 dB to 10 dB
±1.0 dB to 20 dB	±1.5 dB to 20 dB
±1.3 dB to 30 dB	±1.7 dB to 30 dB
±1.7 dB to 40 dB	±2.2 dB to 40 dB
±2.4 dB to 64 dB	±3.5 dB to 64 dB

[See Note 4]

Attenuation accuracy given above assumes 0.1% regulation of power supply voltages.

KDI/triangle ELECTRONICS
31 Farinella Drive • East Hanover, NJ 07936 • Phone: (201) 884-1423
TWX: (710) 986-8202 • FAX: (201) 884-0445

TEMPERATURE COMPENSATED DIGITALLY CONTROLLED

ATTENUATORS, PIN DIODE

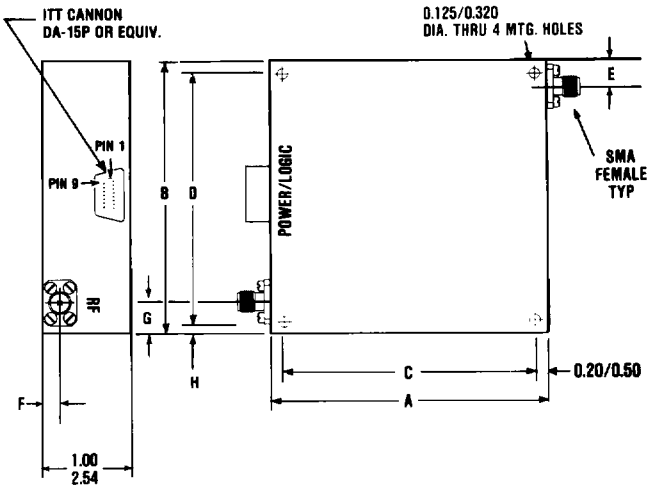
SERIES GA-TT/TR

(ABSORPTIVE DIODE TYPE)

SERIES GA-T
ELECTRICAL PERFORMANCE

Model* No.	Freq. GHz	Max. VSWR	Max. Ins. Loss dB	Atten. Range Min. dB	Out-line
GA-10-T	0.25-0.5	1.5	1.15	32	1
GA-11-T	0.25-0.5	1.5	1.40	64	1
GA-13-T	0.50-1.0	1.5	1.15	32	2
GA-14-T	0.50-1.0	1.5	1.40	64	2
GA-16-T	0.50-2.0	1.75	2.20	32	3
GA-17-T	0.50-2.0	1.75	2.40	64	3
GA-19-T	1.0-2.0	1.5	1.20	32	4
GA-20-T	1.0-2.0	1.5	1.60	64	4
GA-22-T	1.0-4.0	1.75	2.60	32	5
GA-23-T	1.0-4.0	1.75	3.10	64	5
GA-25-T	2.0-4.0	1.5	1.70	32	4
GA-26-T	2.0-4.0	1.5	1.80	64	4
GA-28-T	2.0-8.0	1.8	3.00	32	6
GA-29-T	2.0-8.0	1.8	3.70	64	6
GA-30-T	4.0-8.0	1.75	3.00	32	6
GA-31-T	4.0-8.0	1.75	3.40	64	6
GA-32-T	4.0-12.0	1.9	3.20	32	6
GA-33-T	4.0-12.0	1.9	4.00	64	6
GA-34-T	5.0-15.0	2.0	3.50	32	6
GA-35-T	5.0-15.0	2.0	4.00	64	6
GA-37-T	6.0-18.0	2.2	3.70	32	6
GA-38-T	6.0-18.0	2.2	4.20	64	6
GA-39-T	8.0-12.4	2.1	3.00	32	6
GA-40-T	8.0-12.4	2.3	3.30	64	6
GA-41-T	8.0-18.0	2.2	3.25	32	6
GA-42-T	8.0-18.0	2.2	3.75	64	6
GA-43-T	12.0-18.0	2.0	3.25	32	6
GA-44-T	12.0-18.0	2.0	3.75	64	6
GA-50-T (4)	2.0-18.0	2.2	4.65	32	6
GA-51-T (4)	2.0-18.0	2.5	5.00	64	6

*Add "T" or "R" suffix (see temperature information).

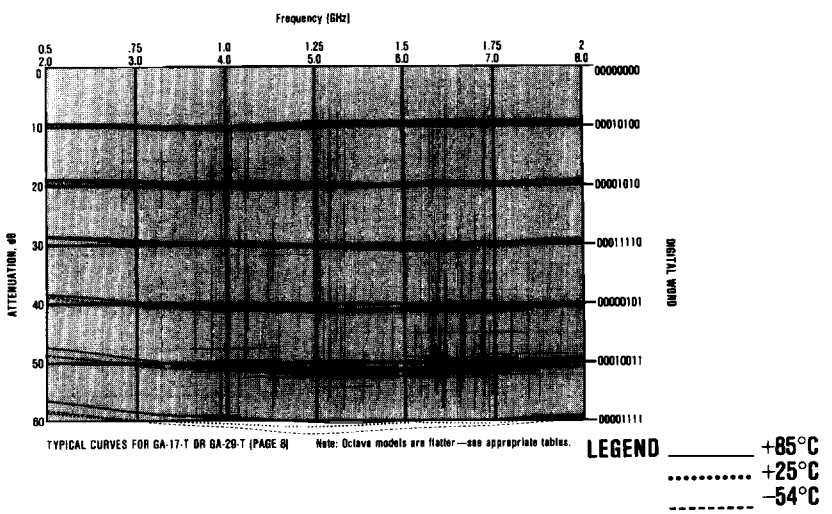


MECHANICAL OUTLINES

KEY: INCHES/CENTIMETERS XX ±.03 XXX ±.010/XX ±.08 XXX ±.025

Out-line	A In./cm.	B In./cm.	C In./cm.	D In./cm.	E In./cm.	F In./cm.	G In./cm.	H In./cm.
1	5.00/12.70	3.00/7.62	4.600/11.680	2.750/6.990	0.75/1.91	0.19/0.48	0.75/1.91	0.13/0.32
2	5.00/12.70	2.50/6.35	4.600/11.680	2.250/5.720	0.32/0.81	0.19/0.48	0.32/0.81	0.13/0.32
3	3.00/7.62	3.00/7.62	2.600/6.600	2.750/6.990	0.38/0.97	0.25/0.64	0.35/0.89	0.13/0.32
4	3.50/8.89	1.75/4.45	3.100/7.810	1.550/3.940	0.40/1.02	0.19/0.48	0.35/0.89	0.10/0.25
5	2.50/6.35	2.50/6.35	2.100/5.330	2.250/5.720	0.32/0.81	0.25/0.64	0.32/0.81	0.13/0.32
6	2.50/6.35	2.00/5.08	2.100/5.330	1.750.4.450	0.50/1.27	0.25/0.64	0.50/1.27	0.13/0.32

TEMPERATURE COMPENSATED DIGITALLY CONTROLLED ANALOG PIN DIODE ATTENUATORS SERIES GA-T



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