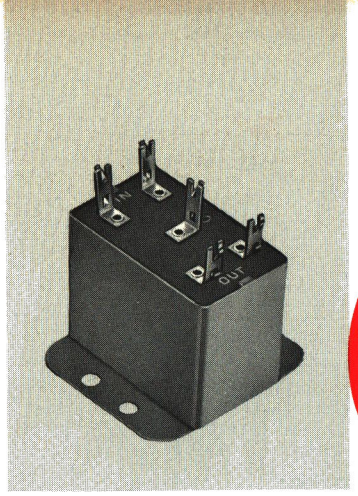
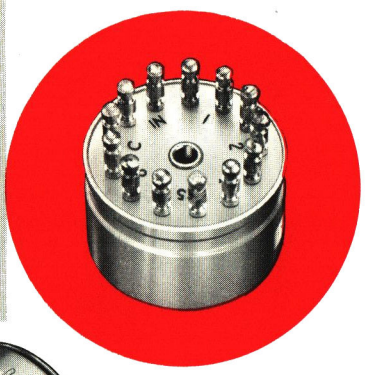
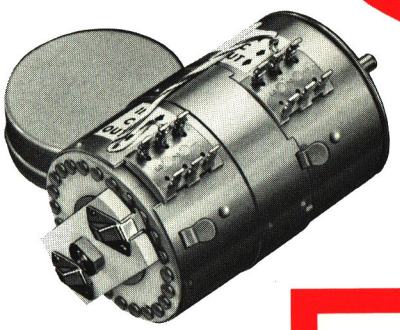
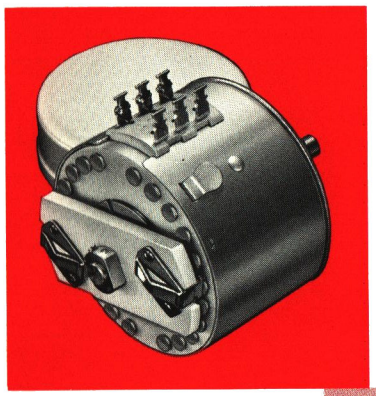
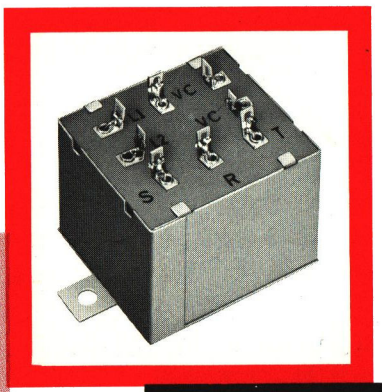
CAT. NO. A-15

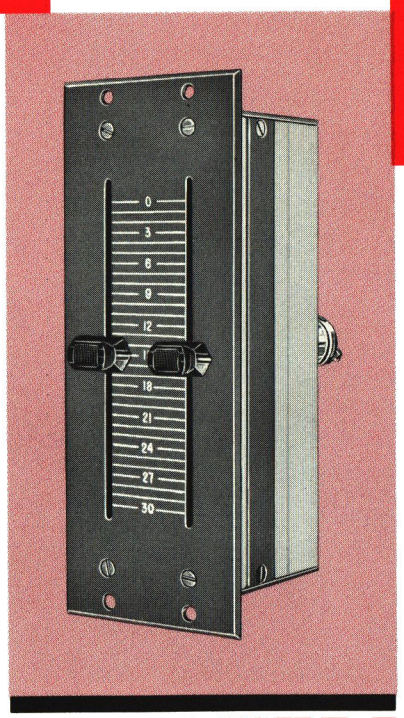








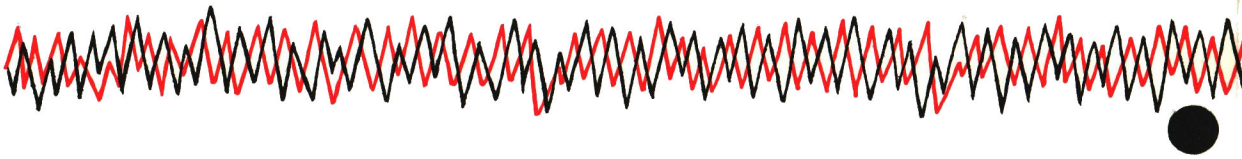




DAVEN

DIVISION OF THOMAS A. EDISON INDUSTRIES

ATTENUATORS AND ATTENUATION NETWORKS



INDEX

GUIDE FOR ORDERING SPECIAL CONTROLS

DAVEN CAN SUPPLY CONTROLS MADE TO SPECIFICATIONS

Attenuators having special shafts, bushings, decibels per step, impedances, steps of attenuation, etc. can be furnished when specific customer requirements dictate a "non-standard" attenuator. To facilitate ordering, pricing and delivery the following "Guide" is supplied.

INFORMATION REQUIRED TO ORDER A SPECIAL UNIT

1. CIRCUIT VARIATIONS:

CIRCUIT: Send sketch of circuit, list resistors or state problem.
DECIBEL LOSS: Decibel per step, total decibel loss, linear or tapered to infinity.
IMPEDANCE: Both input and output.
ACCURACY: Specify requirements.

NOTE: Please advise any special requirements. For example: Frequency range, wattage, special accuracies, or direction of rotation for increasing attenuation.

2. NON-STANDARD ACCESSORIES:

DIAL: Is a dial required? If required and not standard supply sketch.
KNOB: Is a knob required?

DETENTS: Is an indexing device required? If required and not standard please supply necessary information.

SHAFT: Special length, shape or style may be secured.

3. TERMINAL ARRANGEMENT:

Left and right hand ears of terminals 1, 2 or 3 can be separated internally to make available a 3, 4, 5 or 6 terminal board. (See Fig. 1 for dotted links which can be separated.)
Shield ground lug available upon request. (See Fig. 1.)

4. INDICATOR LIGHT SWITCH:

Single pole double throw for operation of signal light or relay, mounted on rear cover of attenuator. This increases the over-all depth of the unit by approx. ⅜". Specify if switch is required. Standard practice is to switch between last and next to last contact in extreme counter clockwise position. If special, specify position of operation of switch.

5. MOUNTING:

Either two hole or single hole mounting is available on all units. For 1⅜" and 1½" diameter controls single hole mounting is standard. For 1¾" diameter controls single hole mounting is standard in single deck controls and two hole mounting is standard in multi-deck controls. In all other controls two hole mounting is standard. When two hole mounting is supplied the following J and K dimensions apply: for 1⅜" dia. units J = 1" and K = 6-32 thd; for 1½" and 1¾" dia. units J = 1⅜" and K = 6-32 thd; for all other units J = 1½" and K = 8-32 thd.

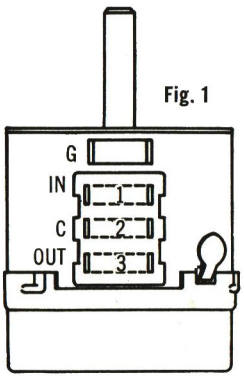


Fig. 1

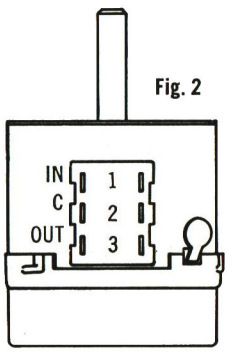
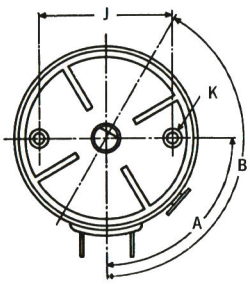


Fig. 2



Standard: ∢ A = 90°

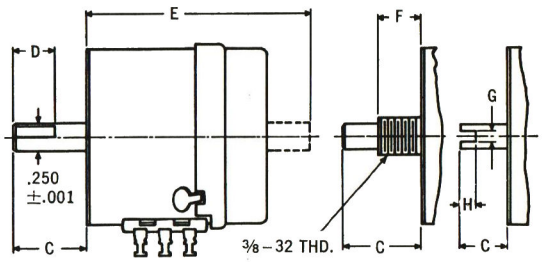


Fig. 3

Two Hole Mounting Note — Standard "C" is 15/16" and "D" is omitted.

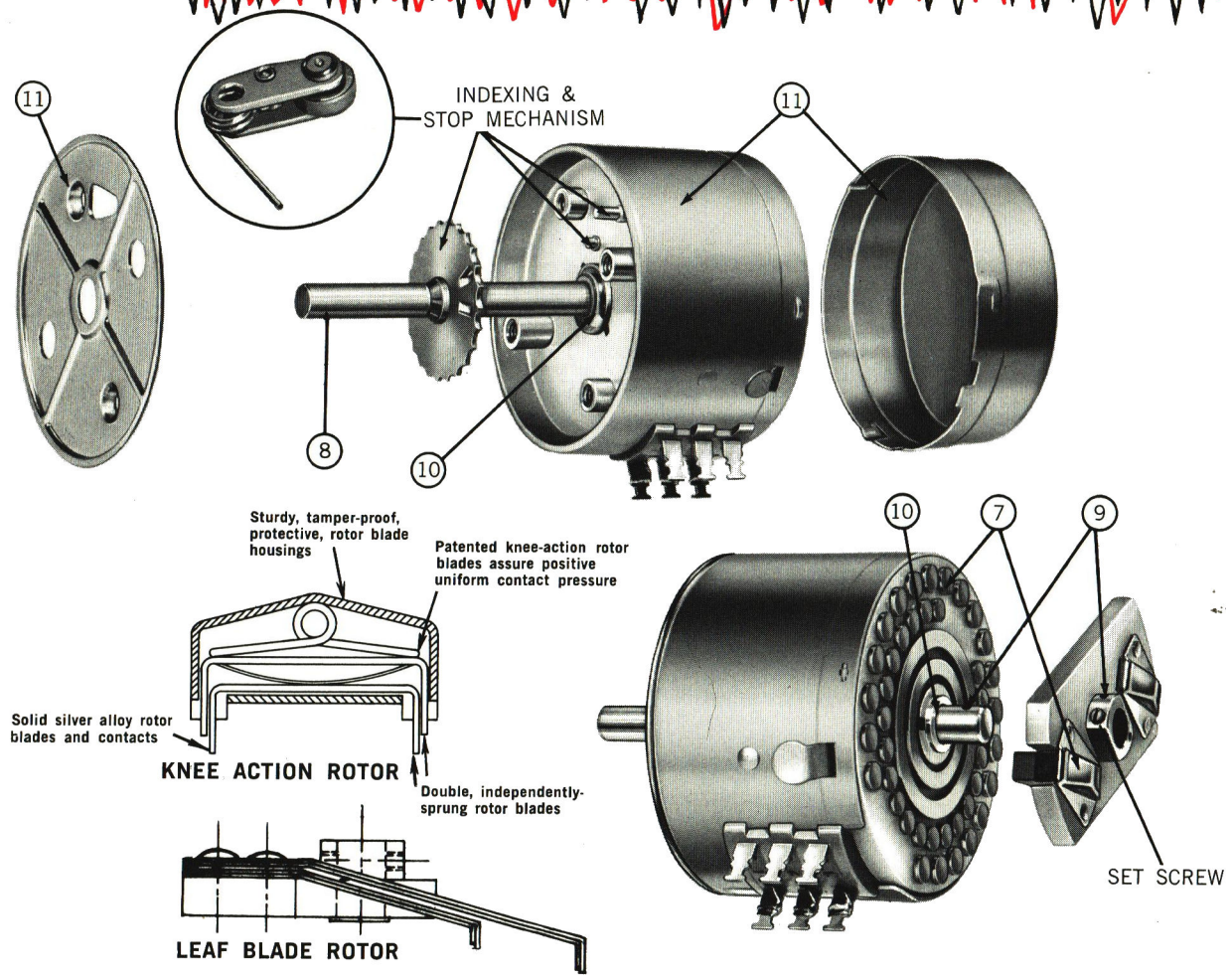
Single Hole Mounting Note — Standard "F" is 17/32" and "C" is 1-3/32". "G" and "H" are not included.

Fig. No.	A	B	C	D	E	F	G	H	J

Please supply information in this order, including tolerances.

Note 1. Omit dimension if it does not apply. For example, if no flat is required leave B and D blank.

Note 2. Locate dimension B with switch arm in C.C.W. position, if possible. If this cannot be done, specify location of switch arm.



GENERAL FEATURES OF ALL DAVEN ATTENUATORS

1. ACCURACY: Individual resistors are calibrated to an accuracy of ±5%, unless otherwise specified. Closer tolerance may be had on request.

2. FREQUENCY RESPONSE: For attenuators designed for audio frequency applications there is no appreciable change in db attenuation or variation in terminal impedance over the range 0 to 20 kc. Frequency characteristics of wider range radio frequency attenuators are listed on the individual pages.

3. INSERTION LOSS: Ladders—for 1:1 impedance ratio the initial loss is 6 db. For 1:2 impedance ratios, the initial loss is 2 db. "T" and Balanced "H" networks—for 1:1 impedance ratio the insertion loss is zero. For unequal impedances the insertion loss depends upon impedance ratio. Potentiometers—zero insertion loss when properly terminated.

4. IMPEDANCE CHARACTERISTICS: Ladders—see curves on page 9. "T" and Balanced "H" networks—the input and output impedance is constant. Potentiometers — the input is constant when properly terminated and the output is variable.

5. SWITCH NOISE LEVEL: No indication above associated circuit and tube noises when switch is operated at extremely low levels.

6. DIRECTION OF ROTATION: For increasing attenuation, counter clockwise is standard and will be supplied unless specifically requested or unless otherwise specified on individual pages.

7. SWITCH CONSTRUCTION: Heavy duty solid silver alloy contacts, multi-leaf switch blades, and slip ring return. Each leaf of the enclosed switch arms employs separate pressure springs to provide self-alignment, KNEE-ACTION and equalized pressure. This insures low and uniform contact resistance. The KNEE-ACTION rotor is of tamper-proof construction. Leaf blade rotors are supplied when use of the KNEE-ACTION rotor is not possible. For specialized construction see Daven Printed Circuit Attenuators page 26.

8. SHAFT: 0.250 diameter ground and polished stainless steel. If non-standard shaft is required, please list on order.

9. ROTOR LOCK: Metal pin assures rotor remains locked even if set screw should become loose.

10. BEARINGS: Shaft bearings are FREE TURNING sleeve type.

11. SHIELD: Totally enclosed dustproof construction. Indexing and stop mechanism in front compartment. Rear cover positive lock-on type with permanently connected push-to-release spring. This spring-lock withstands vibration tests. For specialized construction see Daven Printed Circuit Attenuators page 26.

12. MOUNTING: See page 2.

13. GOVERNMENT SPECIFICATIONS: Standard or special attenuators may be secured upon request to conform with most Government environmental requirements.

14. DIAL AND KNOB: Distinctive and durable black alumilite dial, and sturdy black phenolic skirt knob are available. Knob is fluted for ease of operation. Dials & knobs are not supplied unless specifically ordered.

When ordered—the following diameter dials and knobs are supplied unless otherwise specified.

ATTN. DIA.	1⅜"	1½"	1¾"	2¼"	2¾"
DIAL DIA.	2¼"	2¼"	2¼"	2¾"	2¾"
KNOB SKIRT DIA.	1⅛"	1⅛"	1⅛"	2⅛"	2⅛"

Note: A 1$\frac{3}{32}$" knob can be supplied for use without dial. Please specify.

NOTE: Many of the distinctive features of the apparatus shown herein are covered by issued U.S.A. Patents or have applications for patents pending.

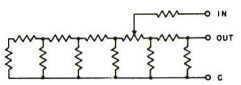
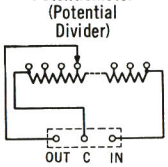
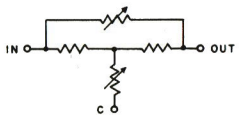
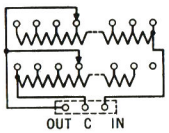
GENERAL INTRODUCTION TO ATTENUATORS

The following section on attenuators lists Daven step-type controls for applications where dependability is of prime importance. The outstanding features of these units are extremely low switch noise level (below circuit noises), velvet-smooth control and a wide range of attenuation. These attenuators have received universal acceptance in broadcasting, recording and sound motion picture control installations. Many types are also employed in the research laboratories of leading universities, technical schools and industrial organizations.

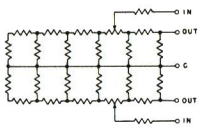
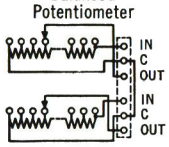
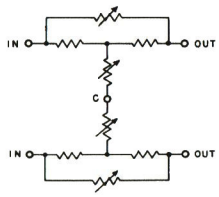
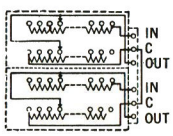
Daven attenuators were first introduced as level controls in audio program circuits. Many design modifications have been furnished to meet special application requirements. We have listed a wide variety of controls including video attenuators and special units for precision measuring equipment. Since these units are discussed separately, the following sections deal only with our conventional controls for use in audio circuits.

SUGGESTED USES:

UNBALANCED OR ASYMMETRICAL NETWORK

Circuit or Type	Suggested Applications
Ladder 	1. Low impedance high level mixer. 2. Main gain.
Potentiometer (Potential Divider) 	1. High impedance main gain. 2. Measuring equipment.
Bridged "T" 	1. Low impedance low or high level mixer. 2. Main gain. 3. Measuring equipment. 4. Meter multiplier.
"L" 	1. Measuring equipment.

BALANCED OR SYMMETRICAL NETWORK

Circuit or Type	Suggested Applications
Balanced Ladder 	1. Low impedance high level mixer. 2. Main gain.
Balanced Potentiometer 	1. High impedance main gain. 2. Measuring equipment.
Bridged Balanced "H" 	1. Low impedance low or high level mixer. 2. Main gain. 3. Measuring equipment.
Balanced "L" 	1. Measuring equipment.

ATTENUATOR CIRCUITS:

There are two general classifications in this section:

(1) Those designed for use in unbalanced circuits (one side of the line is at zero or ground potential).

(2) Those designed for balanced circuits (both sides of the line are above ground).

Under each of these general groups (unbalanced and balanced), attenuators are listed by circuit types, e.g., "T", "Ladder", "Balanced H", "Balanced Ladder", etc. Each classification and circuit has a particular application for which it is best suited. In the following table, we have listed the recommended uses for each type of unit. To avoid confusion, we are stating here our interpretation of several of the terms used. In this catalog, a low level mixer controls the signal between the source and the preamplifier, a high level mixer controls the signal between the preamplifier and the main amplifier. Low impedance circuits are those having impedances below 1,000 ohms.

MIXER DESIGN CONSIDERATIONS:

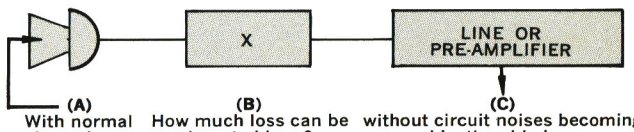
In addition to balanced or unbalanced considerations, in selecting an attenuator for a particular application, the output level and impedance of the signal source, band width and required output level and impedance must be carefully considered. Circuit noises (thermal shock and hum pick-up) originating in the first stages of amplification must be far below the signal voltage. How far above these circuit noises the input signal should be, depends upon the quality of the system. For a high quality system, at least 40 to 60 db program peaks above background noise is desirable. In addition, the wider the band (50 to 15,000 cycles for high quality) the higher the background noise.

For the above reasons, it is not possible to set a hard and fast rule and say that "T" networks should be used for low level mixing, and Ladder networks for high level mixing. However, when the output of the source, volume range, frequency band, number of channels to be mixed, output desired, etc., are known for a particular application, then the best type of control can be selected.

The following tabulation on parallel type mixers and block diagram are given to illustrate a suggested method of deciding whether to use low level or high level mixing, and the type of controls to select:

NO. OF CHANNELS	DB LOSS IN MIXERS		TOTAL DB LOSS IF MASTER IS USED	
	"T"	LADDER	"T"	LADDER
2	6.0	12.0	6.0	18.0
3	9.5	15.5	9.5	21.5
4	12.0	18.0	12.0	24.0
5	14.0	20.0	14.0	26.0
6	15.6	21.6	15.6	27.6
7	16.9	22.9	16.9	28.9
8	18.1	24.1	18.1	30.1

If the number of required channels is known, then consider the following:



FOR EXAMPLE:

If (B) is found or estimated to be 20 db and an 8 channel mixer is required, then low level mixing is questionable, and it is recommended that preamplifiers be used for each channel (high level mixing).
If, however, only a 6 channel mixer is required, then low level mixing will be satisfactory, provided "T" networks are used. For 4 or less channels, Ladders can be used. If a master is used it should be a "T."

NOTE: Various mixer circuits are illustrated on page 5.
The parallel type has been considered above, since this is the most popular type.

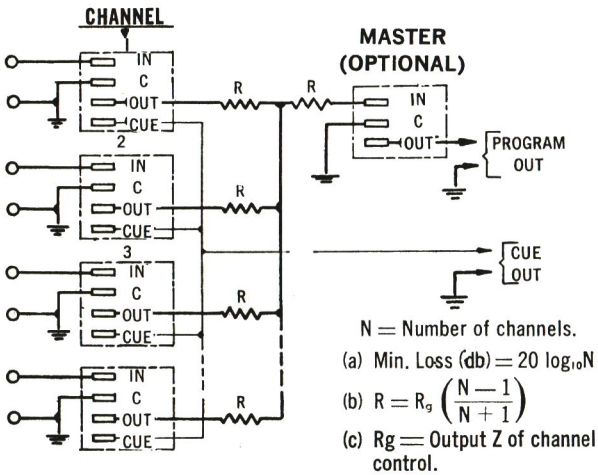
SUGGESTED MIXER CIRCUITS

DESIGN NOTES:

1. For individual channels we recommend tapered controls without detents. For master gain, we suggest a linear control with detents.
2. Ground the "C" of each individual channel.
3. When using 1:1 ratio ladders in each channel add 6 db to min. loss tabulated below. When using a ladder also for a master gain add 12 db to min. loss tabulated below.

Fig. 1—1:1 Z Ratio Unbalanced Parallel Type Mixer

(Cue circuit shown in light lines optional)



N = Number of channels.

(a) Min. Loss (db) = $20 \log_{10} N$

(b) $R = R_g \left(\frac{N-1}{N+1}\right)$

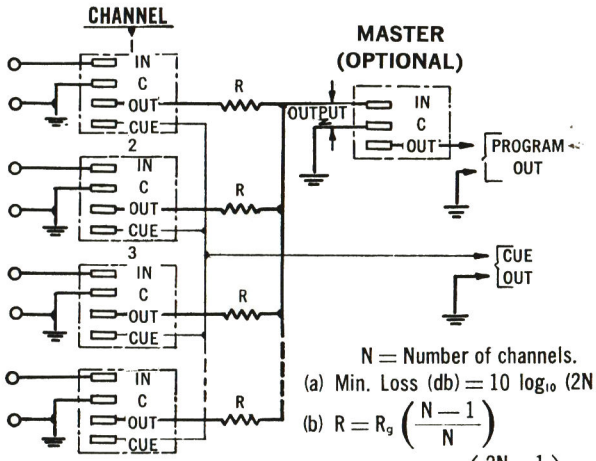
(c) Rg = Output Z of channel control.

(d)

No. of channels →	2	3	4	5	6	7	8
Min. Loss db → (see design note 3)	6.0	9.5	12.0	14.0	15.6	16.9	18.1
R →	$\frac{R_g}{3}$	$\frac{R_g}{2}$	$\frac{3R_g}{5}$	$\frac{2R_g}{3}$	$\frac{5R_g}{7}$	$\frac{3R_g}{4}$	$\frac{7R_g}{9}$

Fig. 2—Unequal Z Ratio Unbalanced Parallel Type Mixer

(Cue circuit shown in light lines optional)



N = Number of channels.

(a) Min. Loss (db) = $10 \log_{10} (2N-1)$

(b) $R = R_g \left(\frac{N-1}{N}\right)$

(c) Output $Z = R_g \left(\frac{2N-1}{N^2}\right)$

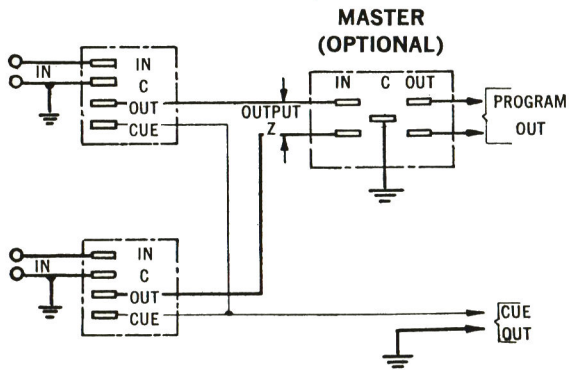
(d) Rg = Output Z of channel control.

(e)

No. of channels →	2	3	4	5	6	7	8
Min. Loss db → (see design note 3)	4.8	7.0	8.4	9.5	10.4	11.1	11.8
R →	$\frac{R_g}{2}$	$\frac{2R_g}{3}$	$\frac{3R_g}{4}$	$\frac{4R_g}{5}$	$\frac{5R_g}{6}$	$\frac{6R_g}{7}$	$\frac{7R_g}{8}$
Output Z (Master or Repeat Coil)	$\frac{3R_g}{4}$	$\frac{5R_g}{9}$	$\frac{7R_g}{16}$	$\frac{9R_g}{25}$	$\frac{11R_g}{36}$	$\frac{13R_g}{49}$	$\frac{15R_g}{64}$

Fig. 3—Two Channel Series Mixer

(Cue circuit shown in light lines optional)



(a) Output Z = 2 × output Z of channel control.

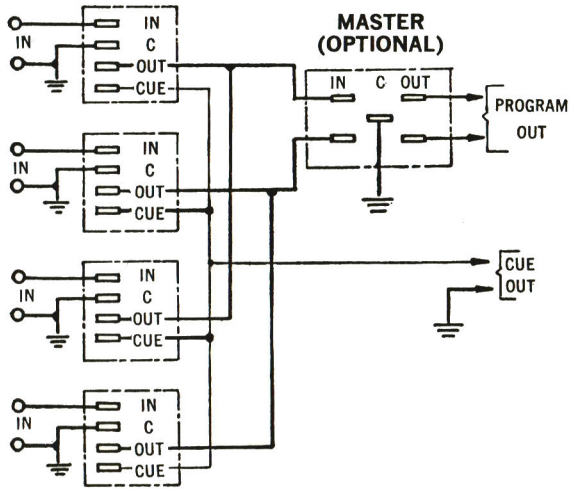
(b) If master is used it must be balanced

(c) To ground the "C" of each control do not use over two channels

(d) Min. loss referred back to input Z = 3 db with 1:1 Z controls. (see design note 3)

Fig. 4—1:1 Z Ratio Four Channel Parallel Series Mixer

(Cue circuit shown in light lines optional)



(a) If master is used it must be balanced

(b) Min. loss = 6 db (see design note 3)

TABLE 1

Relation Between Decibels and Current, Voltage and Power Ratios.

(a) To find current or voltage loss or gain ratio equivalent to a given number of decibels, find required number of decibels in decibel (voltage) column and read corresponding ratio in loss or gain column.

(b) To find power loss or gain ratio equivalent to a given number of decibels, find required number of decibels in decibel (power) column and read corresponding ratio in loss or gain column.

(c) To find the number of decibels equivalent to a given loss or gain, find the required ratio in the loss or gain column and read the corresponding number of decibels in the decibel (voltage) column.

(d) To find the number of decibels equivalent to given voltage loss or gain, find the required ratio in the loss or gain column and read the corresponding number of decibels in the decibel (power) column.

$$N \text{ (decibels)} = 10 \log_{10} (P_1/P_2)$$

If the two voltages or currents under consideration are at the same impedance:

$$N \text{ (decibels)} = 20 \log_{10} (E_1/E_2)$$

DECIBEL (VOLTAGE)	LOSS	GAIN	DECIBEL (POWER)	DECIBEL (VOLTAGE)	LOSS	GAIN	DECIBEL (POWER)	DECIBEL (VOLTAGE)	LOSS	GAIN	DECIBEL (POWER)	DECIBEL (VOLTAGE)	LOSS	GAIN	DECIBEL (POWER)
.0	1.0000	1.000	.0	5.0	.5623	1.778	.50	10.0	.3162	3.162	5.00	15.0	.1778	5.623	.50
.1	.9886	1.012	.05	.1	.5559	1.799	.55	.1	.3126	3.199	.05	.1	.1758	5.689	.55
.2	.9772	1.023	.10	.2	.5495	1.820	.60	.2	.3090	3.236	.10	.2	.1738	5.754	.60
.3	.9661	1.035	.15	.3	.5433	1.841	.65	.3	.3055	3.273	.15	.3	.1718	5.821	.65
.4	.9550	1.047	.20	.4	.5370	1.862	.70	.4	.3020	3.311	.20	.4	.1698	5.888	.70
.5	.9441	1.059	.25	.5	.5309	1.884	.75	.5	.2985	3.350	.25	.5	.1679	5.957	.75
.6	.9333	1.072	.30	.6	.5248	1.905	.80	.6	.2951	3.388	.30	.6	.1660	6.026	.80
.7	.9226	1.084	.35	.7	.5188	1.928	.85	.7	.2917	3.428	.35	.7	.1641	6.095	.85
.8	.9120	1.096	.40	.8	.5129	1.950	.90	.8	.2884	3.467	.40	.8	.1622	6.166	.90
.9	.9061	1.109	.45	.9	.5070	1.972	.95	.9	.2851	3.508	.45	.9	.1603	6.237	.95
1.0	.8913	1.122	.50	6.0	.5012	1.995	3.00	11.0	.2818	3.548	.50	16.0	.1585	6.310	8.00
.1	.8810	1.135	.55	.1	.4955	2.018	.05	.1	.2786	3.589	.55	.1	.1567	6.383	.05
.2	.8710	1.148	.60	.2	.4898	2.042	.10	.2	.2754	3.631	.60	.2	.1549	6.457	.10
.3	.8610	1.161	.65	.3	.4842	2.065	.15	.3	.2723	3.673	.65	.3	.1531	6.531	.15
.4	.8511	1.175	.70	.4	.4786	2.089	.20	.4	.2692	3.715	.70	.4	.1514	6.607	.20
.5	.8414	1.189	.75	.5	.4732	2.113	.25	.5	.2661	3.758	.75	.5	.1496	6.683	.25
.6	.8318	1.202	.80	.6	.4677	2.138	.30	.6	.2630	3.802	.80	.6	.1479	6.761	.30
.7	.8222	1.216	.85	.7	.4624	2.163	.35	.7	.2600	3.846	.85	.7	.1462	6.839	.35
.8	.8128	1.230	.90	.8	.4571	2.188	.40	.8	.2570	3.890	.90	.8	.1445	6.918	.40
.9	.8035	1.245	.95	.9	.4519	2.213	.45	.9	.2541	3.936	.95	.9	.1429	6.998	.45
2.0	.7943	1.259	1.00	7.0	.4467	2.239	.50	12.0	.2512	3.981	6.00	17.0	.1413	7.079	.50
.1	.7852	1.274	.05	.1	.4416	2.265	.55	.1	.2483	4.027	.05	.1	.1396	7.161	.55
.2	.7762	1.288	.10	.2	.4365	2.291	.60	.2	.2455	4.074	.10	.2	.1380	7.244	.60
.3	.7674	1.303	.15	.3	.4315	2.317	.65	.3	.2427	4.121	.15	.3	.1365	7.328	.65
.4	.7586	1.318	.20	.4	.4266	2.344	.70	.4	.2399	4.169	.20	.4	.1349	7.413	.70
.5	.7499	1.334	.25	.5	.4217	2.371	.75	.5	.2371	4.217	.25	.5	.1334	7.499	.75
.6	.7413	1.349	.30	.6	.4169	2.399	.80	.6	.2344	4.266	.30	.6	.1318	7.586	.80
.7	.7328	1.365	.35	.7	.4121	2.427	.85	.7	.2317	4.315	.35	.7	.1303	7.674	.85
.8	.7244	1.380	.40	.8	.4074	2.455	.90	.8	.2291	4.365	.40	.8	.1288	7.762	.90
.9	.7161	1.396	.45	.9	.4027	2.483	.95	.9	.2265	4.416	.45	.9	.1274	7.852	.95
3.0	.7079	1.413	.50	8.0	.3981	2.512	4.00	13.0	.2239	4.467	.50	18.0	.1259	7.943	9.00
.1	.6998	1.429	.55	.1	.3936	2.541	.05	.1	.2213	4.519	.55	.1	.1245	8.035	.05
.2	.6918	1.445	.60	.2	.3890	2.570	.10	.2	.2188	4.571	.60	.2	.1230	8.128	.10
.3	.6839	1.462	.65	.3	.3846	2.600	.15	.3	.2163	4.624	.65	.3	.1216	8.222	.15
.4	.6761	1.479	.70	.4	.3802	2.630	.20	.4	.2138	4.677	.70	.4	.1202	8.318	.20
.5	.6683	1.496	.75	.5	.3758	2.661	.25	.5	.2113	4.732	.75	.5	.1189	8.414	.25
.6	.6607	1.514	.80	.6	.3715	2.692	.30	.6	.2089	4.786	.80	.6	.1175	8.511	.30
.7	.6531	1.531	.85	.7	.3673	2.723	.35	.7	.2065	4.842	.85	.7	.1161	8.610	.35
.8	.6457	1.549	.90	.8	.3631	2.754	.40	.8	.2042	4.898	.90	.8	.1148	8.710	.40
.9	.6383	1.567	.95	.9	.3589	2.786	.45	.9	.2018	4.955	.95	.9	.1135	8.811	.45
4.0	.6310	1.585	2.00	9.0	.3548	2.818	.50	14.0	.1995	5.012	7.00	19.0	.1122	8.913	.50
.1	.6237	1.603	.05	.1	.3508	2.851	.55	.1	.1972	5.070	.05	.1	.1109	9.016	.55
.2	.6166	1.622	.10	.2	.3467	2.884	.60	.2	.1950	5.129	.10	.2	.1096	9.120	.60
.3	.6095	1.641	.15	.3	.3428	2.917	.65	.3	.1928	5.188	.15	.3	.1084	9.226	.65
.4	.6026	1.660	.20	.4	.3388	2.951	.70	.4	.1905	5.248	.20	.4	.1072	9.333	.70
.5	.5957	1.679	.25	.5	.3350	2.985	.75	.5	.1884	5.309	.25	.5	.1059	9.441	.75
.6	.5888	1.698	.30	.6	.3311	3.020	.80	.6	.1862	5.307	.30	.6	.1047	9.550	.80
.7	.5821	1.718	.35	.7	.3273	3.055	.85	.7	.1841	5.433	.35	.7	.1035	9.661	.85
.8	.5754	1.738	.40	.8	.3236	3.090	.90	.8	.1820	5.495	.40	.8	.1023	9.772	.90
.9	.5689	1.758	.45	.9	.3199	3.126	.95	.9	.1799	5.559	.45	.9	.1012	9.886	.95

DECIBEL (VOLTAGE)	LOSS	GAIN	DECIBEL (POWER)	DECIBEL (VOLTAGE)	LOSS	GAIN	DECIBEL (POWER)
20.0	.1000	10.00	10.00	60.0	.001	1.000	30.00
	USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT ONE STEP TO THE LEFT. THUS SINCE 10 DB = .3162 30 DB = .03162	USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT ONE STEP TO THE RIGHT. THUS SINCE 10 DB = 3.162 30 DB = 31.62	THIS COLUMN REPEATS EVERY 10 DB INSTEAD OF EVERY 20 DB		USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT THREE STEPS TO THE LEFT. THUS SINCE 10 DB = .3162 70 DB = .0003162	USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT THREE STEPS TO THE RIGHT. THUS SINCE 10 DB = 3.162 70 DB = 3162.	THIS COLUMN REPEATS EVERY 10 DB INSTEAD OF EVERY 20 DB
40.0	.01	100	20.00	80.0	.0001	10,000	40.00
	USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT TWO STEPS TO THE LEFT. THUS SINCE 10 DB = .3162 50 DB = .003162	USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT TWO STEPS TO THE RIGHT. THUS SINCE 10 DB = 3.162 50 DB = 316.2	THIS COLUMN REPEATS EVERY 10 DB INSTEAD OF EVERY 20 DB		USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT FOUR STEPS TO THE LEFT. THUS SINCE 10 DB = .3162 90 DB = .00003162	USE THE SAME NUMBERS AS 0-20 DB, BUT SHIFT POINT FOUR STEPS TO THE RIGHT. THUS SINCE 10 DB = 3.162 90 DB = 31620.	THIS COLUMN REPEATS EVERY 10 DB INSTEAD OF EVERY 20 DB
				100.0	.00001	100,000	50.00

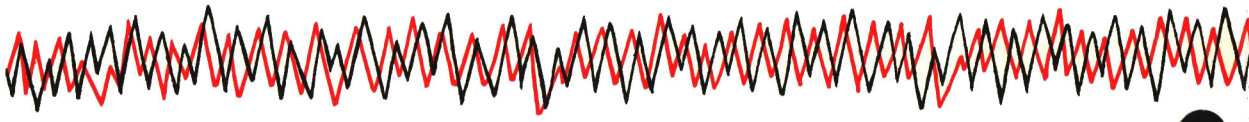


TABLE 2

In the following tabulation is recorded the relation between the new VU, the old 6 mw and 12.5 mw reference levels. Although there is a definite repetition of figures, values are given in order to eliminate calculations. Values not listed in this table may be obtained as follows:

Given VU. to obtain:

(a) Level of 6 mw at 500 ohms subtract 6.9897 db.
(b) Level of 6 mw at 600 ohms subtract 7.7815 db.
(c) Level of 12.5 mw at 500 ohms subtract 10.1771 db.
(d) Level of 12.5 mw at 600 ohms subtract 10.9688 db.

Given 6 mw. in 500 ohm reference to obtain:

(a) Level of 1 mw in 600 ohms add 6.9897 db.
(b) Level of 6 mw in 600 ohms subtract 0.7918 db.
(c) Level of 12.5 mw in 500 ohms subtract 3.1874 db.
(d) Level of 12.5 mw in 500 ohms subtract 3.9791 db.

REFERENCE LEVEL			REFERENCE LEVEL		REFERENCE LEVEL	
.001 W. IN 600 OHMS DECIBELS	R.M.S. VOLTS	WATTS	.006 W. IN 500 OHMS DECIBELS	.006 W. IN 600 OHMS DECIBELS	.0125 W. IN 500 OHMS DECIBELS	.0125 W. IN 600 OHMS DECIBELS
−10	.24495	.0001000	−16.9897	−17.7815	−20.1771	−20.9688
− 9	.27485	.0001259	−15.9897	−16.7815	−19.1771	−19.9688
− 8	.30838	.0001585	−14.9897	−15.7815	−18.1771	−18.9688
− 7	.34742	.0001995	−13.9897	−14.7815	−17.1771	−17.9688
− 6	.38823	.0002512	−12.9897	−13.7815	−16.1771	−16.9688
− 5	.43557	.0003162	−11.9897	−12.7815	−15.1771	−15.9688
− 4	.48873	.0003981	−10.9897	−11.7815	−14.1771	−14.9688
− 3	.54838	.0005012	− 9.9897	−10.7815	−13.1771	−13.9688
− 2	.61531	.0006310	− 8.9897	− 9.7815	−12.1771	−12.9688
− 1	.69036	.0007943	− 7.9897	− 8.7815	−11.1771	−11.9688
0	.77460	.0010000	− 6.9897	− 7.7815	−10.1771	−10.9688
+ 1	.86913	.001259	− 5.9897	− 6.7815	− 9.1771	− 9.9688
2	.97519	.001535	− 4.9897	− 5.7815	− 8.1771	− 8.9688
3	1.0949	.001995	− 3.9897	− 4.7815	− 7.1771	− 7.9688
4	1.2275	.002512	− 2.9897	− 3.7815	− 6.1771	− 6.9688
5	1.3773	.003162	− 1.9897	− 2.7815	− 5.1771	− 5.9688
6	1.5454	.003981	− 0.9897	− 1.7815	− 4.1771	− 4.9688
7	1.7323	.005012	+ 0.0103	− 0.7815	− 3.1771	− 3.9688
8	1.9458	.006310	1.0103	+ 0.2185	− 2.1771	− 2.9688
9	2.1830	.007943	2.0103	1.2185	− 1.1771	− 1.9688
10	2.4495	0.01000	3.0103	2.2185	− 0.1771	− 0.9688
+11	2.7485	0.01259	+ 4.0103	+ 3.2185	+ 0.8229	+ 0.0312
12	3.0838	0.01585	5.0103	4.2185	1.8229	1.0312
13	3.4742	0.01995	6.0103	5.2185	2.8229	2.0312
14	3.8823	0.02512	7.0103	6.2185	3.8229	3.0312
15	4.3557	0.03162	8.0103	7.2185	4.8229	4.0312
16	4.8873	0.03981	9.0103	8.2185	5.8229	5.0312
17	5.4838	0.05012	10.0103	9.2185	6.8229	6.0312
18	6.1531	0.06310	11.0103	10.2185	7.8229	7.0312
19	6.9036	0.07943	12.0103	11.2185	8.8229	8.0312
20	7.7460	0.1000	13.0103	12.2185	9.8229	9.0312
+21	8.6913	0.1259	+14.0103	+13.2185	+10.8229	+10.0312
22	9.7519	0.1585	15.0103	14.2185	11.8229	11.0312
23	10.949	0.1995	16.0103	15.2185	12.8229	12.0312
24	12.275	0.2512	17.0103	16.2185	13.8229	13.0312
25	13.773	0.3162	18.0103	17.2185	14.8229	14.0312
26	15.454	0.3981	19.0103	18.2185	15.8229	15.0312
27	17.323	0.5012	20.0103	19.2185	16.8829	16.0312
28	19.458	0.6310	21.0103	20.2185	17.8229	17.0312
29	21.830	0.7943	22.0103	21.2185	18.8229	18.0312
30	24.495	1.0000	23.0103	22.2185	19.8229	19.0312
+31	27.485	1.2589	+24.0103	+23.2185	+20.8229	+20.0312
32	30.838	1.5849	25.0103	24.2185	21.8229	21.0312
33	34.742	1.9953	26.0103	25.2185	22.8229	22.0312
34	38.823	2.5119	27.0103	26.2185	23.8229	23.0312
35	43.557	3.1623	28.0103	27.2185	24.8229	24.0312
36	48.873	3.9811	29.0103	28.2185	25.8229	25.0312
37	54.838	5.0119	30.0103	29.2185	26.8229	26.0312
38	61.531	6.3096	31.0103	30.2185	27.8229	27.0312
39	69.036	7.9433	32.0103	31.2185	28.8229	28.0312
40	77.460	10.000	33.0103	32.2185	29.8229	29.0312
+41	86.913	12.589	+34.0103	+33.2185	+30.8229	+30.0312
42	97.519	15.849	35.0103	34.2185	31.8229	31.0312
43	109.49	19.953	36.0103	35.2185	32.8229	32.0312
44	122.75	25.119	37.0103	36.2185	33.8229	33.0312
45	137.73	31.623	38.0103	37.2185	34.8229	34.0312
46	154.54	39.811	39.0103	38.2185	35.8229	35.0312
47	173.23	50.119	40.0103	39.2185	36.8229	36.0312
48	194.58	63.096	41.0103	40.2185	37.8229	37.0312
49	218.30	79.433	42.0103	41.2185	38.8229	38.0312
50	244.95	100.000	43.0103	42.2185	39.8229	39.0312

TABLE 3

The following table shows the loss obtained in resistive networks when changing from one impedance to another.

In column "1" is recorded the impedance ratios. An example of this would be, a 500 to 1000 ohm ratio would be considered as 2.0, or a 1000 to 500 would also be considered as 2.0.

In column "2" is recorded the minimum loss possible if the impedance is matched in both directions.

In column "3" is recorded the loss caused from improper termination. An example of this is the loading of a 500 ohm line with 1000 ohms.

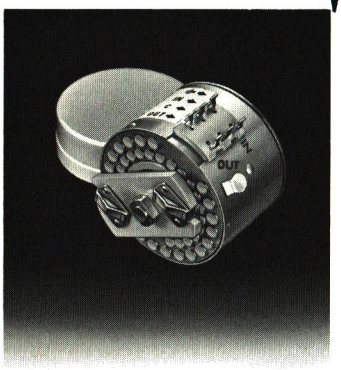
Losses for values of ratios not shown in this table may be obtained as follows:

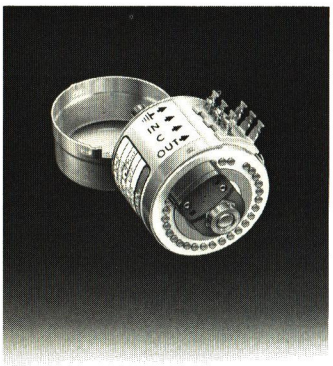
Let R^2 = impedance ratio
Let N = decibel loss

For Min. Loss "T" Matching
$N = 20 \log_{10} (R + \sqrt{R^2 - 1})$

For Impedance Mismatch Loss
$N = 20 \log_{10} \left(\frac{R^2 + 1}{2R} \right)$

COLUMN 1 RATIO Z/Z	COLUMN 2 MINIMUM LOSS "T" MATCHING	COLUMN 3 IMPEDANCE MISMATCH LOSS	COLUMN 1 RATIO Z/Z	COLUMN 2 MINIMUM LOSS "T" MATCHING	COLUMN 3 IMPEDANCE MISMATCH LOSS	COLUMN 1 RATIO Z/Z	COLUMN 2 MINIMUM LOSS "T" MATCHING	COLUMN 3 IMPEDANCE MISMATCH LOSS
1.0	**0.**	**.0**	**8.0**	**14.77**	**4.025**	22.0	19.33	7.795
.1	2.705	.0098	.1	14.83	4.085	.5	19.42	7.895
.2	3.770	.0360	.2	14.88	4.105	23.0	19.52	7.980
.3	4.548	.0778	.3	14.92	4.160	.5	19.62	8.055
.4	5.180	.1223	.4	14.97	4.200	24.0	19.73	8.140
.5	5.723	.172	.5	15.05	4.255	.5	19.83	8.213
.6	6.190	.240	.6	15.10	4.285			
.7	6.615	.308	.7	15.15	4.320	**25.0**	**19.91**	**8.300**
.8	6.990	.366	.8	15.20	4.360	.5	20.00	8.380
.9	7.340	.440	.9	15.25	4.400	26.0	20.10	8.460
2.0	**7.656**	**.510**				.5	20.17	8.540
.1	7.955	.570	**9.0**	**15.30**	**4.440**	27.0	20.24	8.630
.2	8.235	.660	.1	15.36	4.480	.5	20.30	8.680
.3	8.490	.732	.2	15.40	4.510	28.0	20.40	8.760
.4	8.740	.804	.3	15.44	4.550	.5	20.49	8.845
.5	8.970	.883	.4	15.50	4.600	29.0	20.55	8.920
.6	9.185	.962	.5	15.54	4.640	.5	20.63	8.970
.7	9.388	1.030	.6	15.60	4.660			
.8	9.580	1.088	.7	15.67	4.700	**30.0**	**20.70**	**9.040**
.9	9.775	1.168	.8	15.70	4.740	.5	20.78	9.095
3.0	**9.960**	**1.244**	.9	15.74	4.780	31.0	20.87	9.160
.1	10.01	1.312				.5	20.94	9.250
.2	10.30	1.387	**10.0**	**15.79**	**4.800**	32.0	21.00	9.320
.3	10.47	1.468	.2	15.87	4.880	.5	21.07	9.360
.4	10.62	1.527	.4	15.95	4.950	33.0	21.13	9.440
.5	10.76	1.598	.6	16.05	5.010	.5	21.21	9.480
.6	10.90	1.670	.8	16.13	5.090	34.0	21.28	9.560
.7	11.04	1.733				.5	21.34	9.600
.8	11.18	1.807	**11.0**	**16.22**	**5.150**			
.9	11.31	1.868	.2	16.31	5.220	**35.0**	**21.40**	**9.660**
4.0	**11.43**	**1.938**	.4	16.38	5.290	.5	21.46	9.710
.1	11.56	2.000	.6	16.47	5.340	36.0	21.51	9.770
.2	11.68	2.070	.8	16.53	5.410	.5	21.57	9.840
.3	11.80	2.130				37.0	21.67	9.890
.4	11.88	2.200	**12.0**	**16.63**	**5.470**	.5	21.73	9.940
.5	12.02	2,266	.2	16.70	5.545	38.0	21.77	10.00
.6	12.13	2.318	.4	16.77	5.600	.5	21.83	10.05
.7	12.23	2.391	.6	16.84	5.650	39.0	21.90	10.10
.8	12.33	2.431	.8	16.92	5.700	.5	21.93	10.17
.9	12.43	2.490						
5.0	**12.53**	**2.550**	**13.0**	**16.97**	**5.750**	**40.0**	**21.97**	**10.21**
.1	12.63	2.607	.2	17.03	5.820	.5	22.07	10.28
.2	12.72	2.667	.4	17.12	5.875	41.0	22.11	10.31
.3	12.83	2.725	.6	17.18	5.930	.5	22.15	10.37
.4	12.91	2.778	.8	17.25	5.990	42.0	22.20	10.42
.5	13.00	2.837				.5	22.26	10.47
.6	13.08	2.893	**14.0**	**17.32**	**6.050**	43.0	22.32	10.51
.7	13.17	2.932	.2	17.38	6.093	.5	22.36	10.57
.8	13.26	2.997	.4	17.43	6.150	44.0	22.40	10.60
.9	13.33	3.050	.6	17.50	6.205	.5	22.47	10.66
6.0	**13.41**	**3.090**	.8	17.57	6.248			
.1	13.48	3.155				**45.0**	**22.51**	**10.69**
.2	13.57	3.208	**15.0**	**17.63**	**6.300**	.5	22.54	10.77
.3	13.65	3.240	.5	17.78	6.420	46.0	22.60	10.81
.4	13.71	3.293				.5	22.67	10.83
.5	13.79	3.341	**16.0**	**17.92**	**6.550**	47.0	22.70	10.88
.6	13.87	3.400	.5	18.05	6.666	.5	22.73	10.93
.7	13.92	3.453				48.0	22.77	10.97
.8	14.00	3.490	**17.0**	**18.18**	**6.790**	.5	22.83	11.02
.9	14.07	3.540	.5	18.32	6.890	49.0	22.90	11.05
7.0	**14.13**	**3.600**				.5	22.93	11.10
.1	14.20	3.630	**18.0**	**18.43**	**7.010**			
.2	14.27	3.683	.5	18.57	7.110	**50.0**	**22.96**	**11.14**
.3	14.32	3.735				55.0	23.38	11.55
.4	14.40	3.778	**19.0**	**18.68**	**7.220**	60.0	23.56	11.83
.5	14.46	3.810	.5	18.80	7.340	65.0	24.11	12.23
.6	14.51	3.853				70.0	24.44	12.55
.7	14.58	3.908	**20.0**	**18.92**	**7.425**	75.0	24.74	12.84
.8	14.65	3.948	.5	19.02	7.510	80.0	25.02	12.97
.9	14.70	3.985				85.0	25.12	13.37
			21.0	**19.13**	**7.600**	90.0	25.53	13.62
			.5	19.22	7.700	95.0	25.77	13.81
						100.0	25.99	14.07





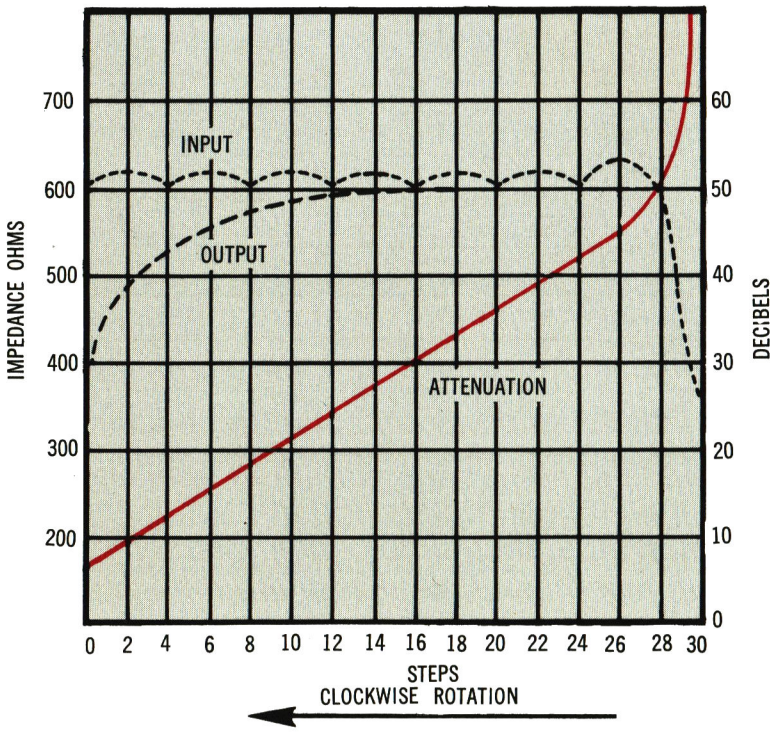
LADDER ATTENUATORS

DEFINITION: The term Ladder Attenuator refers to that group of volume controls consisting of consecutive "π" resistor sections combined to supply the required terminal impedances and reduction in volume. The advantage of this type of control is its mechanical simplicity.

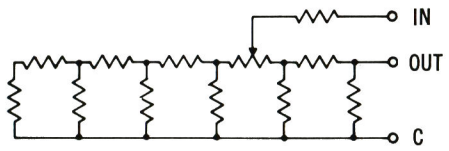
CIRCUITS: An unbalanced network is recommended if one side of the circuit is at ground potential or may be grounded. Circuits in which both sides of the line are at equal potential above ground require balanced networks. The circuit of a balanced ladder is essentially two unbalanced networks coupled together on a common shaft. One single or unbalanced ladder is inserted in each side of the line and the center point, or "C", may be grounded.

CUEING: In addition to the normal attenuation function, Daven ladder controls may be obtained with a built-in cueing circuit. In these controls, provision is made at the extreme attenuation position for connecting the incoming signal to a cue circuit before FADING IN the signal. By this means, a program can be smoothly BROUGHT IN at the right time without the operation of any additional switches. A lug on the terminal board is provided for connecting to the cueing system (Patented). In the attenuator terminal board there are six terminals available. A balanced ladder attenuator requires seven terminals. In balanced ladder attenuators with the cueing feature the required seventh terminal is made available by internally grounding the center point (common) to the frame and providing a case ground terminal in the location shown in Figure 1, Page 2. Since the cueing circuit operates from the input side of the control, do not interchange the input (IN) and output (OUT) terminals when wiring the control into the circuit. To order an attenuator with the cueing feature add the letter Q between the type letters and the control number. For example an LA-350-G with the cueing feature would become an LAQ-350-G.

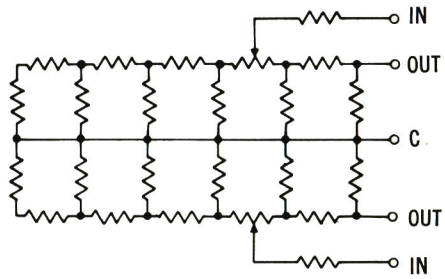
USE: Ladder attenuators may be used as volume controls in both low and high level multi-channel mixers, and in special types of measuring equipment. However, their chief use is as individual channel controls in high level mixers. Caution should be exercised in laying out the circuits when using this type of control in high quality speech equipment because of the insertion loss of 6 db and variable output impedance on the first few steps.



TYPICAL CHARACTERISTICS OF A LADDER NETWORK.



CIRCUIT OF UNBALANCED LADDER



CIRCUIT OF BALANCED LADDER.

BALANCED LADDER ATTENUATORS

USE	TYPE	TERMINAL IMPEDANCE											ATTENUATION				CONTACT SPACING	DEGREE OF ROTATION
		A	B	C	K	KU	KG	D	E	EF	F	G	NO. OF STEPS	DB PER STEP	TAPER	DETENTS		
When space is a major consideration. BAL-255: mixer controls. BAL-256, 257, 258: master gain controls.	BAL-255	■	■	□	■	■	■	■	■	■	■	■	20	2	Last Steps To Cut-off	No	15° Between Centers	300°
	BAL-256	■	■	□	■	■	■	■	■	□	■	■		2 (off pos.)	No	Attached		
	BAL-257	■	■	□	■	■	■	■	■	■	■	■		2 (no off pos.)				
	BAL-258	■	■	□	■	■	■	■	■	□	■	■		1.5 (no off pos.)				
Same as series BAL-255 but with 10 additional steps of attenuation.	BAL-730	■	■	□	■	■	■	■	■	■	■	■	30	1.5	Last Steps To Cut-off	No	11.25° Between Centers	337.5°
	BAL-731	■	■	■	■	■	■	■	■	□	■	■		1.5 (off pos.)	No	Attached		
	BAL-732	■	■	□	■	■	■	■	■	■	■	■		1.5 (no off pos.)				
	BAL-733	■	■	■	■	■	■	■	■	□	■	■		2 (off pos.)				
In high quality broadcasting and recording systems where greater control range or small db steps are needed.	BAL-330	■	■	□	■	■	■	■	■	■	■	■	30	1.5	Last Steps To Cut-off	No	11.25° Between Centers	337.5°
	BAL-331	■	■	■	■	■	■	■	■	□	■	■		1.5 (off pos.)	No	Attached		
	BAL-332	■	■	□	■	■	■	■	■	■	■	■		1.5 (no off pos.)				
	BAL-333	■	■	■	■	■	■	■	■	□	■	■		2 (off pos.)				

UNBALANCED LADDER ATTENUATORS

USE	TYPE	TERMINAL IMPEDANCE													ATTENUATION				CONTACT SPACING	DEGREE OF ROTATION
		A	AH	B	BJ	C	K	KU	KG	D	E	EF	F	G	NO. OF STEPS	DB PER STEP	TAPER	DETENTS		
Low impedance controls for broadcast and public address systems. Small size for portable equipment. LA-350: mixer controls. LA-351, 352, 353: master gain controls.	LA-350	■	□	■	■	■	■	■	■	■	■	■	■	■	20	2	Last Steps To Cut-off	No	15° Between Centers	300°
	LA-351	■	■	■	■	■	■	■	■	■	■	□	■	■		1.5 (off pos.)	No	Attached		
	LA-352	■	■	■	■	■	■	■	■	■	■	□	■	■		2 (off pos.)				
	LA-353	■	■	■	■	■	■	■	■	■	■	□	■	■		2 (no off pos.)				
Same as series LA-350 but provides 10 additional steps of attentuation.	LA-130	■	□	■	□	■	■	■	■	■	■	■	■	■	30	1.5	Last Steps To Cut-off	No	11.25° Between Centers	337.5°
	LA-131	■	□	■	□	■	■	■	■	■	■	□	■	■		2				
	LA-132	■	□	■	□	■	■	■	■	■	■	■	■	■		1.5 (off pos.)	No	Attached		
	LA-133	■	□	■	□	■	■	■	■	■	■	□	■	■		2 (off pos.)				
High quality equipment requiring a wide range of control. LA-730, 731: mixer controls. LA-732, 733: master gain controls or measuring equipment.	LA-730	■	□	■	□	■	■	■	■	■	■	■	■	■	30	1.5	Last Steps To Cut-off	No	11.25° Between Centers	337.5°
	LA-731	■	□	■	□	■	■	■	■	■	■	□	■	■		2				
	LA-732	■	□	■	□	■	■	■	■	■	■	■	■	■		1.5 (off pos.)	No	Attached		
	LA-733	■	□	■	□	■	■	■	■	■	■	□	■	■		2 (off pos.)				
Smallest attenuator available. Portable amplifiers and tape recorders where size and weight are important.	LA-120	■	□	■	■	■	■	■	■	■	■	■	■	■	20	2	Last Steps To Cut-off	No	15° Between Centers	300°
	LA-122	■	□	■	■	■	■	■	■	■	■	□	■	■		2 (off pos.)	No	Attached		

KEY TO AVAILABILITY & TERMINAL IMPEDANCES

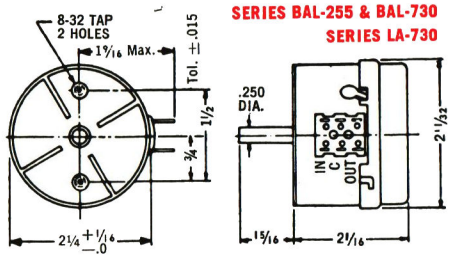
■ Standard □ Available as special order

LETTER CODE	A	AH	B	BJ	H	C	K	KU	KG	D	E	EF	F	G
TERMINAL IMPEDANCE	30/30	30/60	50/50	50/100	75/75	125/125	150/150	150/300	150/600	200/200	250/250	250/500	500/500	600/600
INSERTION LOSS	6	2	6	2	6	6	6	2	9.7	6	6	2	6	6

Special impedances or decibel steps other than those shown are available

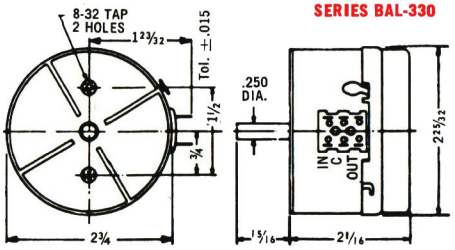
RESISTOR ACCURACY: ±5% CONTINUOUS RATING: 0.6 watts
PEAK AUDIO RATING: Up to 2.5 watts

SERIES BAL-255 & BAL-730
SERIES LA-730



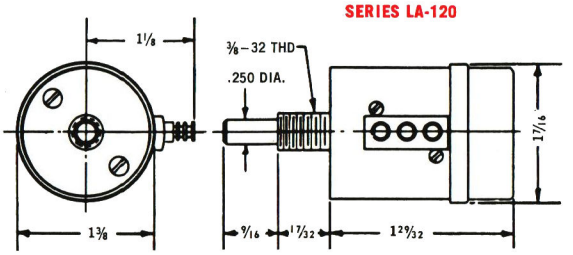
Tol. Dec. ±.001 Fractions ±1/32

SERIES BAL-330



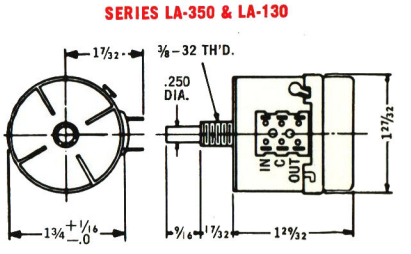
Tol. Dec. ±.001 Fractions ±1/32

SERIES LA-120

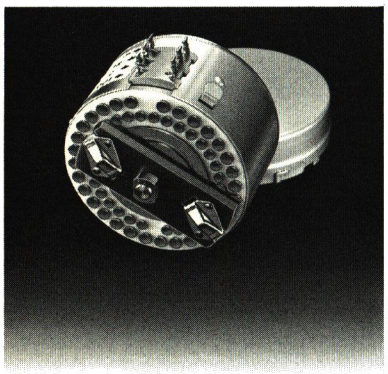


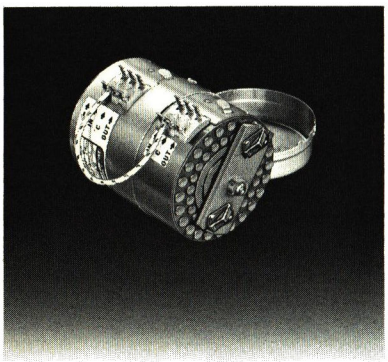
Tol. Dec. ±.001 Fractions ±1/32

SERIES LA-350 & LA-130



Tol. Dec. ±.001 Fractions ±1/32





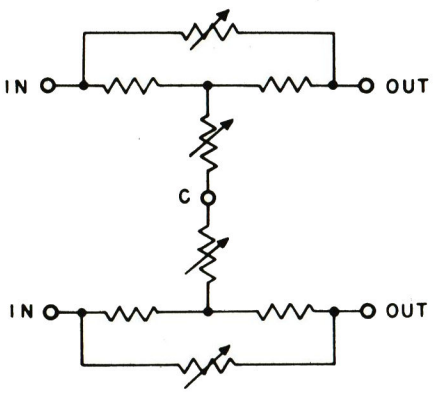
"T" AND BALANCED "H" ATTENUATORS

DEFINITION: Under this group we list those types which have zero insertion loss for 1:1 impedance ratios and constant impedance, both in and out on all steps of control. These networks may be inserted in a transmission system without introducing insertion losses. For unequal impedance ratio controls an insertion loss greater than zero is necessary. The amount depends upon the impedance ratio. The "T" control is used where one side of the line is grounded and the "H" where neither side of the line is grounded. They will not operate properly otherwise.

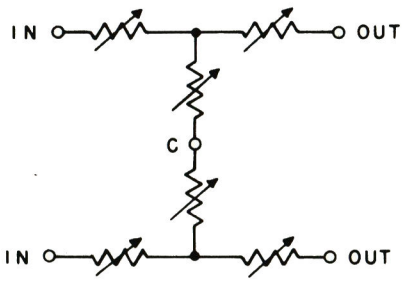
DESCRIPTION: The Daven Company offers two types of "T" attenuators, the "Bridged T" and the "T". Since both types are electrically and mechanically interchangeable, in the circuit, we list them all as "T" controls. The "Bridged T" consists of two variable and two fixed resistors and requires two rows of contacts. Over a certain range of attenuation and impedance, due to its electrical simplicity, this type offers advantages over the "T". The "T" employs three variable resistors and requires three rows of contacts. In the case of the "H" type network, we also offer the "Bridged H" and "H" form employing two or three sets of variable resistors, and a corresponding number of rows of contacts for each section.

CUEING: These networks may be obtained with a built-in cueing circuit. In these controls provision is made at the extreme attenuation position for connecting the incoming signal to a cue circuit before "FADING IN" the signal. By this means, a program can be smoothly "BROUGHT IN" at the right time without the operation of any additional switches. A lug on the terminal board is provided for connecting to the cueing system.

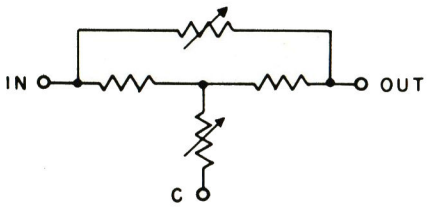
USE: These networks may be used as volume controls in low and high level multi-channel mixers and all types of measuring equipment where precision control is required.



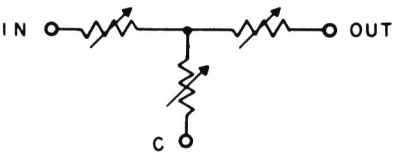
BRIDGED "H"



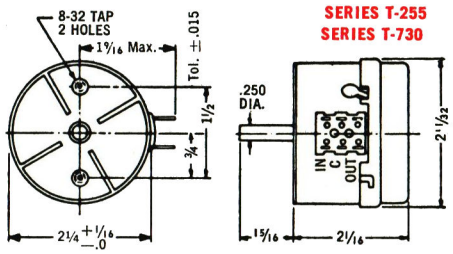
BALANCED "H"



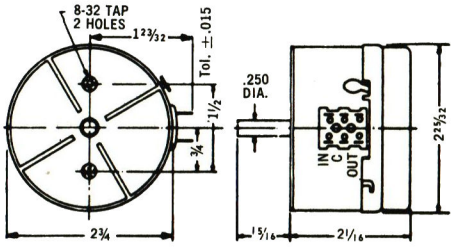
BRIDGED "T"



STRAIGHT "T"



Tol. Dec. ±.001 Fractions ±1/32



SERIES T-320
SERIES T-330
SERIES T-345
SERIES T-520 & T-530

"T" ATTENUATORS

USE	TYPE	TERMINAL IMPEDANCE A	B	C	K	KU	KF	KG	D	E	EF	F	G	ATTENUATION NO. OF STEPS	DB PER STEP	TAPER	DETENTS	CONTACT SPACING	DEGREE OF ROTATION
Compact 20 step "Bridged T" unit for locations where mountings space is at a premium, i.e., portable equipment. Type T-255 is a mixer control. Types, T-256, T-257 and T-258 are used as main gain controls, or in measuring equipment when equal decibel steps are required over the complete range.	T-255*	■	■	■	■	■	□	■	■	■	□	■	■	20	2	Last Steps To Cut-off	No	15° Between Centers	300°
	T-256*	■	■	■	■	■	□	■	■	■	□	■	■		2 (off pos.)	No	Attached		
	T-257	■	■	■	■	■	□	■	■	■	□	■	■		2 (no off pos.)				
	T-258	■	■	■	■	■	□	■	■	■	□	■	■		1.5 (no off pos.)				
For general sound control work. Since it has zero insertion loss and constant impedance in and out, it is ideally suited for both low and high level mixing. Series T-320, T-322 and T-323 are main gain controls. Series T-321 is supplied with a taper on the last three steps before cutoff, and is a twenty step mixing control.	T-320*	□	□	■	■	□	■	■	■	■	■	■	■	20	2 (off pos.)	No	Attached	15° Between Centers	300°
	T-321*	■	■	■	■	□	■	■	■	■	□	■	■		2	Last Steps To Cut-off	No		
	T-322	■	■	■	■	□	■	■	■	■	□	■	■		2 (no off pos.)	No	Attached		
	T-323	■	■	■	■	□	■	■	■	■	□	■	■		1.5 (no off pos.)				
	T-324	□	□	□	■	□	□	□	■	■	□	■	■		1 (no off pos.)				
	T-325	□	□	□	■	□	□	□	■	■	□	■	■		0.5 (no off pos.)				
	T-326	□	□	□	■	□	□	□	■	■	□	■	■		0.1 (no off pos.)				
	T-328	□	□	□	■	□	□	□	■	■	□	■	■		3 (off pos.)				
Sturdy compact attenuator for wide range of control in a limited space.	T-730*	■	□	■	■	■	□	■	■	■	■	■	■	30	1.5	Last Steps To Cut-off	No	11.25° Between Centers	337.5°
	T-731*	■	■	■	■	■	□	■	■	■	□	■	■		1.5 (off pos.)	No	Attached		
	T-732	□	□	□	■	□	□	□	■	■	□	■	■		2 (off pos.)				
	T-733	■	■	■	■	■	□	■	■	■	□	■	■		2	Last Steps To Cut-off	No		
	T-734	□	□	□	■	□	□	□	■	■	□	■	■		1 (no off pos.)	No	Attached		
	T-735	□	□	□	■	□	□	□	■	■	□	■	■		0.5 (no off pos.)				
	T-736	□	□	□	■	□	□	□	■	■	□	■	■		0.1 (no off pos.)				
	T-738	□	□	□	■	□	□	□	■	■	□	■	■		1 (off pos.)				
Provides ten additional steps of attenuation which may be used to reduce the attenuation per step, or extend the overall range. For example, in mixer applications, type T-330 has a reduction of attenuation per step. Type T-333 is an example of extending the attenuation range. For main gain position, types T-331 and T-332 are used. Types T-334, T-335, T-336 and T-338 are used in measuring equipment. The large number of steps of attenuation provided in this series, offers a means of obtaining appreciable total attenuation in relatively small steps.	T-330*	■	■	□	■	■	□	■	■	■	□	■	■	30	1.5	Last Steps To Cut-off	No	11.25° Between Centers	337.5°
	T-331*	■	■	■	■	■	□	■	■	■	□	■	■		1.5 (off pos.)	No	Attached		
	T-332	■	■	■	■	■	□	■	■	■	□	■	■		2 (off pos.)				
	T-333	■	■	■	■	■	□	■	■	■	□	■	■		2	Last Steps To Cut-off	No		
	T-334	■	■	□	■	■	□	■	■	■	□	■	■		1 (no off pos.)	No	Attached		
	T-335	□	□	□	■	■	□	■	□	■	□	■	■		0.5 (no off pos.)				
	T-336	□	□	□	■	■	□	■	■	■	□	■	■		0.1 (no off pos.)				
	T-338	□	□	□	■	■	□	■	■	■	□	■	■		1 (off pos.)				
Used in high quality recording and broadcast control work where an abrupt change in signal level during a sustained note may superimpose an objectionable transient disturbance.	T-345	□	■	■	■	■	□	■	■	■	■	■	■	45	0.5	Last Steps To Cut-off	No	7.5° Between Centers	337.5°
	T-346	□	■	■	■	■	□	■	■	■	■	■	■		0.75				
	T-347	□	■	■	■	■	□	■	■	■	■	■	■		1				
	T-348	□	■	■	■	■	□	■	■	■	■	■	■		0.5 (no off pos.)	No	Attached		
	T-349	□	■	■	■	■	□	■	■	■	■	■	■		1 (no off pos.)				

PRECISION "T" ATTENUATORS

USE	TYPE	TERMINAL IMPEDANCE B	K	D	E	F	G	ATTENUATION NO. OF STEPS	DB PER STEP	TAPER	DETENTS	CONTACT SPACING	DEGREE OF ROTATION
Designed for precision measuring equipment or wherever 1% accuracy is required.	T-520	■	■	■	■	■	■	20	2	No (no off pos.)	Attached	15° Between Centers	300°
	T-521	■	■	■	■	■	■		1.5				
	T-522	■	■	■	■	■	■		1				
	T-523	■	■	■	■	■	■		0.5				
	T-524	■	■	■	■	■	■		0.1				
Same as series T-520 but with 10 additional steps of attenuation.	T-530	■	■	■	■	■	■	30	2	No (no off pos.)	Attached	11.25° Between Centers	337.5°
	T-531	■	■	■	■	■	■		1.5				
	T-532	■	■	■	■	■	■		1				
	T-533	■	■	■	■	■	■		0.5				
	T-534	■	■	■	■	■	■		0.1				

RESISTOR ACCURACY: "T" Attenuators ±5%; Precision "T" Attenuators ±1%
CONTINUOUS RATING: 0.6 watts PEAK AUDIO RATING: Up to 2.5 watts

KEY TO AVAILABILITY & TERMINAL IMPEDANCES
■ Standard □ Available as special order

LETTER CODE	A	AH	B	BJ	H	C	K	KU	KG	D	E	EF	F	G
TERMINAL IMPEDANCE	30/30	30/60	50/50	50/100	75/75	125/125	150/150	150/300	150/600	200/200	250/250	250/500	500/500	600/600
INSERTION LOSS	0	7.7	0	7.7	0	0	0	7.7	11.4	0	0	7.7	0	0

Special impedances or decibel steps, other than those shown are available

BALANCED "H" ATTENUATORS

USE	TYPE	TERMINAL IMPEDANCE A	B	C	K	KU	KG	D	E	F	G	ATTENUATION NO. OF STEPS	DB PER STEP	TAPER	DETENTS	CONTACT SPACING	DEGREE OF ROTATION
Two "Bridged T" networks mounted on a common shaft. Each deck is a complete unbalanced "T" attenuator which is connected to each side of the balanced transmission line. Each "T" is designed to have one half the impedance but the same attenuation as the "Balanced H". For example, a 600 ohm "H" is made up of two 300 ohm "T" sections. Since these units have zero insertion loss and constant impedance in and out they are suited for low and high level mixing.	BH-320	■	■	■	■	■	■	■	■	■	■	20	2	No (no off pos.)	Attached	15° Between Centers	300°
	BH-321	■	■	■	■	■	■	■	■	■	■		1.5				
	BH-322	■	■	■	■	■	■	■	■	■	■		1				
	BH-323	■	■	■	■	■	■	■	■	■	■		0.5				
	BH-330	□	■	■	■	■	■	■	■	■	■	30	2	No (no off pos.)	Attached	11.25° Between Centers	337.5°
	BH-331	□	■	■	■	■	■	■	■	■	■		1.5				
	BH-332	□	■	■	■	■	■	■	■	■	■		1				
	BH-333	□	■	■	■	■	■	■	■	■	■		0.5				
	BH-730	□	■	■	■	■	■	■	■	■	■	30	2	No (no off pos.)	Attached	11.25° Between Centers	337.5°
	BH-731	□	■	■	■	■	■	■	■	■	■		1.5				
	BH-732	□	■	■	■	■	■	■	■	■	■		1				
	BH-733	□	■	■	■	■	■	■	■	■	■		0.5				

*Used in installations where there is limited mounting space.

PRECISION BALANCED "H" ATTENUATORS

USE	TYPE	TERMINAL IMPEDANCE A	B	C	K	KU	KG	D	E	F	G	ATTENUATION NO. OF STEPS	DB PER STEP	TAPER	DETENTS	CONTACT SPACING	DEGREE OF ROTATION
Designed for precision measuring equipment or wherever 1% accuracy is required.	BH-520	□	■	□	■	□	□	■	■	■	■	20	2	No (no off pos.)	Attached	15° Between Centers	300°
	BH-521	□	■	□	■	□	□	■	■	■	■		1.5				
	BH-522	□	■	□	■	□	□	■	■	■	■		1				
	BH-523	□	■	□	■	□	□	■	■	■	■		0.5				
	BH-524	□	■	□	■	□	□	■	■	■	■		0.1				
Same as series BH-520 but with 10 more steps of attenuation.	BH-530	□	■	□	■	□	□	■	■	■	■	30	2	No (no off pos.)	Attached	11.25° Between Centers	337.5°
	BH-531	□	■	□	■	□	□	■	■	■	■		1.5				
	BH-532	□	■	□	■	□	□	■	■	■	■		1				
	BH-533	□	■	□	■	□	□	■	■	■	■		0.5				
	BH-534	□	■	□	■	□	□	■	■	■	■		0.1				

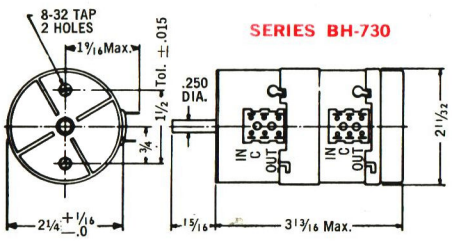
RESISTOR ACCURACY: Balanced "H"—±5%: Precision Balanced "H"—±1%.
CONTINUOUS RATING: 0.6 watts PEAK AUDIO RATING: Up to 2.5 watts

KEY TO AVAILABILITY & TERMINAL IMPEDANCES
■ Standard □ Available as special order

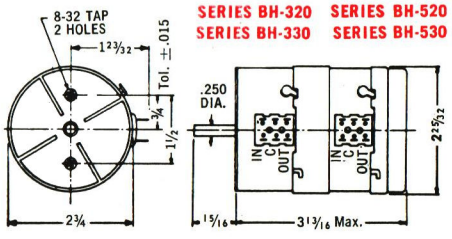
LETTER CODE	A	AH	B	BJ	H	C	K	KU	KG	D	E	EF	F	G
TERMINAL IMPEDANCE	30/30	30/60	50/50	50/100	75/75	125/125	150/150	150/300	150/600	200/200	250/250	250/500	500/500	600/600
INSERTION LOSS	0	7.7	0	7.7	0	0	0	7.7	11.4	0	0	7.7	0	0

Special impedances or decibel steps other than those shown are available.

NOTE: A secure means is provided for fastening front and rear units together in a totally enclosed dust cover. By depressing the release springs located on the side of the case adjacent to the terminal strip, the rear dust cover can be removed for cleaning the rear contacts; or the entire rear section can be removed for access to the front section. Since the front and rear sections form a continuous electrical unit, excellent electrical shielding is also attained.



Tol. Dec. ±.001 Fractions ±1/32



Tol. Dec. ±.001 Fractions ±1/32

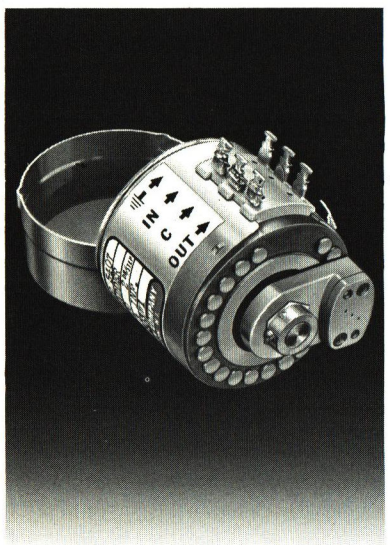
DAVEN POTENTIOMETERS (POTENTIAL DIVIDERS)

DEFINITION: The term potentiometer has been adopted by the electronics and radio industry to mean the potential divider. For this reason, the potentiometers referred to in this section are not voltage measuring devices, but step type potential dividers.

CIRCUIT: The potentiometer circuit consists of a number of calibrated resistors in series, the extremes of which are connected to the terminals designated "IN" and "C". The slider arm of the circuit is connected to the terminal marked "OUT" (For a circuit diagram see page 4). If a fixed voltage is impressed between "IN" and "C" required ratios of this fixed voltage appear between "OUT" and "C". In the potentiometers listed in the following section, all resistor steps have been calculated on the basis of operating the output into an open circuit, such as the grid of a Class A amplifier tube.

DESCRIPTION AND USE: It is not the intention of the Daven Company to formulate the circuit design. However, since our potentiometers are calibrated to operate into an open circuit, we should like to offer the following suggestions:

1. Check to see what the grid input impedance is at the top frequency. For example, for high gain triodes this is apt to be so low that a low impedance potentiometer would be required.
2. Check to see that the capacity to ground on both "IN" and "OUT" leads are at a minimum. If possible, have these leads short.
3. Check to see that no grid current is flowing. There may be only a few micro amps in the circuit, but this is enough to cause the control to appear noisy.



All Daven potentiometers are step type, employing heavy duty silver alloy contacts, slip rings and self-cleaning multi-leaf switch blades. Two general types of potentiometers are offered—the unbalanced or standard potentiometer, and the balanced or dual type. The former type has one row of contacts, and one slip ring, and is usually employed in the grid circuit of single ended amplifiers. The dual type utilizes either two rows of contacts and two slip rings on either single or a double decked unit, and is generally used as a grid control in push-pull or balanced circuits. This type is also occasionally used in two progressive stages of amplification in single ended amplifiers.

CUEING: Since the variable arm of the potentiometer is connected to the "OUT" position instead of the "IN" position of the circuit, the regular "built-in" cueing feature, available on other Daven controls, will not function in this circuit. Therefore, if the cueing feature is required, it can be provided by utilizing an added miniature switch or by special arrangement of the contacts.

POTENTIOMETERS — RESISTOR ACCURACY: ± 5%

USE	TYPE	TERMINAL IMPEDANCE L	M	P	R	S	T	W	X	Y	Z	ATTENUATION NO. OF STEPS	DB PER STEP	TAPER	DETENTS	CONTACT SPACING	DEGREE OF ROTATION
Smallest step type attenuators available. Portable, lightweight equipment. No cueing position.	CP-120		■	■	■	■	■	■	■	■		20	2 (off pos.)	No	Attached	15° Between Centers	300°
	CP-124		■	■	■	■	■	■	■	■			2	Last Steps To Cut-off	No		
Potential dividers in portable equipment. Compact design makes them suitable for small mounting space.	CP-350		■	■	■	■	■	■	■	■		20	2 (off pos.)	No	Attached	15° Between Centers	300°
	CP-352		■	■	■	■	■	■	■	■			1.5 (off pos.)				
	CP-353		■	■	■	■	■	■	■	■			3 (off pos.)				
	CP-354		■	■	■	■	■	■	■	■			2	Last Steps To Cut-off	No		
	CP-355					■	■	■	■	■			5 (no off pos.)	No	Attached		
Same as series CP-350 but with 10 additional steps of attenuation.	CP-130		■	■	■	■	■	■	■	■		30	2 (off pos.)	No	Attached	11.25° Between Centers	337.5°
	CP-132		■	■	■	■	■	■	■	■			1.5 (off pos.)				
	CP-133		■	■	■	■	■	■	■	■			1.5	Last Steps To Cut-off	No		
	CP-134		■	■	■	■	■	■	■	■			2				
Two separate potentiometers concentrically located on single deck. Because there is little shielding between the two, unit is recommended for controlling push-pull grids.	DCP-255	■	■	■	■	■	■	■	■	■	■	20	2	Last Steps To Cut-off	No	15° Between Centers	300°
	DCP-256	■	■	■	■	■	■	■	■	■			2 (off pos.)	No	Attached		
	DCP-257	■	■	■	■	■	■	■	■	■			2 (no off pos.)				
	DCP-258	■	■	■	■	■	■	■	■	■			1.5 (no off pos.)				
Same as series DCP-255 but with 10 additional steps of attenuation.	DCP-730	■	■	■	■	■	■	■	■	■	■	30	1.5	Last Steps To Cut-off	No	11.25° Between Centers	337.5°
	DCP-731	■	■	■	■	■	■	■	■	■			1.5 (off pos.)	No	Attached		
	DCP-732	■	■	■	■	■	■	■	■	■			1.5 (no off pos.)				
	DCP-733	■	■	■	■	■	■	■	■	■			2 (off pos.)				
Double ganged potentiometers, individually shielded. Designed for control of push-pull grids. Each deck also may be used as an unbalanced potentiometer in separate amplifier stages.	CPD-350	■	■	■	■	■	■	■	■	■	■	20	2 (off pos.)	No	Attached	15° Between Centers	300°
	CPD-351	■	■	■	■	■	■	■	■	■			1.5 (off pos.)				
	CPD-353	■	■	■	■	■	■	■	■	■			3 (off pos.)				
	CPD-354	■	■	■	■	■	■	■	■	■			2	Last Steps To Cut-off	No		
Same as series CPD-350 but with 10 additional steps of attenuation.	CPD-130	■	■	■	■	■	■	■	■	■	■	30	2 (off pos.)	No	Attached	11.25° Between Centers	337.5°
	CPD-132	■	■	■	■	■	■	■	■	■			1.5 (off pos.)				
	CPD-133	■	■	■	■	■	■	■	■	■			1.5	Last Steps To Cut-off	No		
	CPD-134	■	■	■	■	■	■	■	■	■			2				

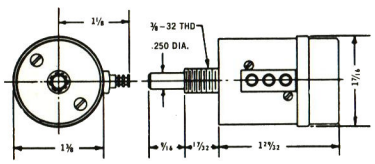
Special impedances or decibel steps other than those shown are available.

KEY TO AVAILABILITY & TERMINAL IMPEDANCES

■ Standard ▨ Available as special order

LETTER CODE	L	M	P	R	S	T	W	X	Y	Z
TERMINAL IMPEDANCE	5,000	10,000	20,000	25,000	50,000	100,000	200,000	250,000	500,000	1,000,000

SERIES CP-120



Tol. Dec. ±.001 Fractions ±1/32

NOTE: SERIES DCP-255 & DCP-730—There are two rows of three terminals available, six in all. Three in one row are wired to one side of the balanced potentiometer, the three in the other row are wired to the other side of the balanced potentiometer. Unless otherwise specified, the two "C" terminals will be internally connected.

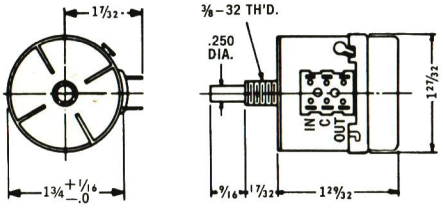
The terminal impedances listed indicate the impedance per circuit. For example, a DCP-255-L consists of two 5,000Ω potentiometers, and a DCP-730-P consists of two 20,000Ω potentiometers.

NOTE: SERIES CPD-350 & CPD-130—The terminal impedances listed above indicate the impedance per deck.

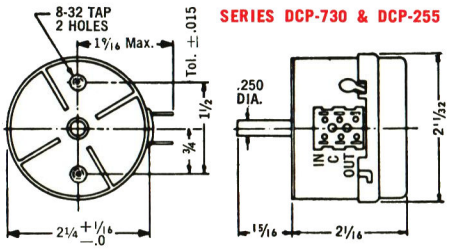
CONTINUOUS RATING: 0.6 watts, provided voltage does not exceed 100 volts.

PEAK AUDIO RATING: Up to 2.5 watts, provided voltage does not exceed 200 peak volts.

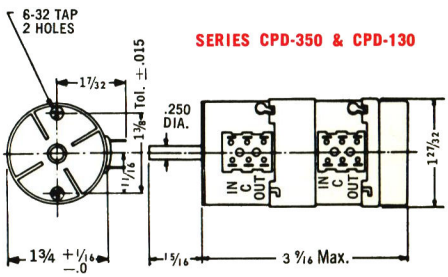
SERIES CP-350 & CP-130



SERIES DCP-730 & DCP-255



SERIES CPD-350 & CPD-130

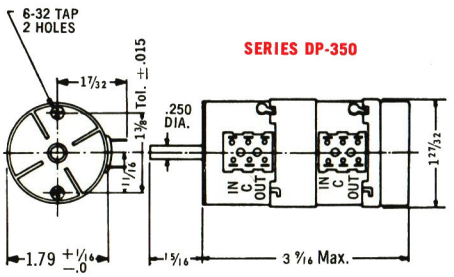


Tol. Dec. ±.001 Fractions ±1/32

POTENTIOMETERS — RESISTOR ACCURACY: ± 2%

USE	TYPE	TERMINAL IMPEDANCE L	M	P	R	S	T	W	X	Y	NO. OF STEPS	DB PER STEP	TAPER	DETENTS	CONTACT SPACING	DEGREE OF ROTATION
Portable equipment. Extremely useful where mounting space is at a premium.	P-350	■	■	■	■	■					20	2	No (off pos.)	Attached	15° Between Centers	300°
	P-351	■	■	■	■	■						1.5				
	P-353	■	■	■	■	■						3				
	P-354	■	■	■	■	■						2	Last Steps To Cut-off	No		
Studio equipment for smooth volume regulation.	P-630		■	■	■	■	■	■	■	■	30	2	No (off pos.)	Attached	11.25° Between Centers	337.5°
	P-632		■	■	■	■	■	■	■	■		1.5				
	P-635	■	■	■	■	■	■	■	■	■		1.5	Last Steps To Cut-off	No		
	P-634	■	■	■	■	■	■	■	■	■		2				
Two separate potentiometers mounted on single deck having two rows of silver alloy contacts and two slip rings. Because of little shielding, these units are recommended for controlling push-pull grids.	DSP-330			■	■	■	■	■	■	■	30	2	No (off pos.)	Attached	11.25° Between Centers	337.5°
	DSP-331				■	■	■	■	■	■		1.5				
	DSP-332				■	■	■	■	■	■		1				
	DSP-333	■	■	■	■	■						3				
Same as series DSP-330 except 10 less steps. Caution must be exercised in using this type of control in single-ended multi-stage applications, where high gain circuits are required.	DSP-255		■	■	■	■	■				20	2	Last Steps To Cut-off	No	15° Between Centers	300°
	DSP-256		■	■	■	■	■					2 (off pos.)	No	Attached		
	DSP-257		■	■	■	■	■					2 (no off pos.)				
	DSP-258		■	■	■	■	■					1.5 (no off pos.)				
Two series controls in tandum. Each deck individually shielded and balanced to ground. Used to control push-pull grids. Each deck can also be used in successive stages of a single ended amplifier system.	DP-350		■	■	■	■	■				20	2	No (off pos.)	Attached	15° Between Centers	300°
	DP-351		■	■	■	■	■					1.5				
	DP-353		■	■	■	■	■					3				
	DP-354		■	■	■	■	■					2	Last Steps To Cut-off	No		

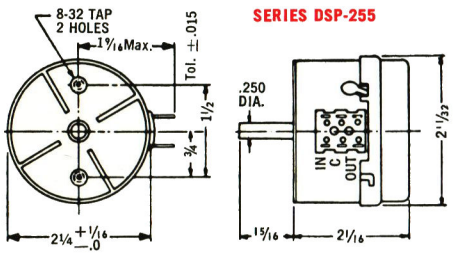
Special impedances or decibel steps other than those shown are available.



NOTE: SERIES DSP-330

There are two rows of three terminals available, six in all. Three in one row are wired to one side of the balanced potentiometer, the three in the other row are wired to the other side of the balanced potentiometer. Unless otherwise specified, the two "C" terminals will be internally connected.

The terminal impedances listed indicate the impedance per circuit. For example, a DSP-330-P consists of two 20,000Ω potentiometers.

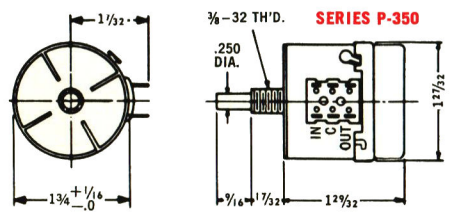


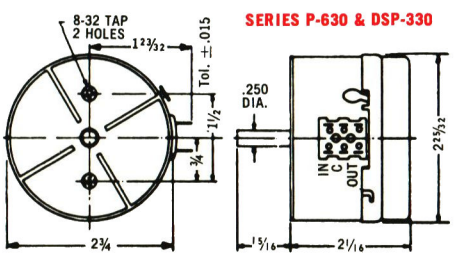
NOTE: SERIES DSP-225 & DP-350

There are two rows of three terminals available, six in all used in series DSP-255. Three in one row are wired to one side of the balanced potentiometer, the three in the other row are wired to the other side of the balanced potentiometer. Unless otherwise specified, the two "C" terminals will be internally connected. Series DP-350 have three individual terminals for each potentiometer.

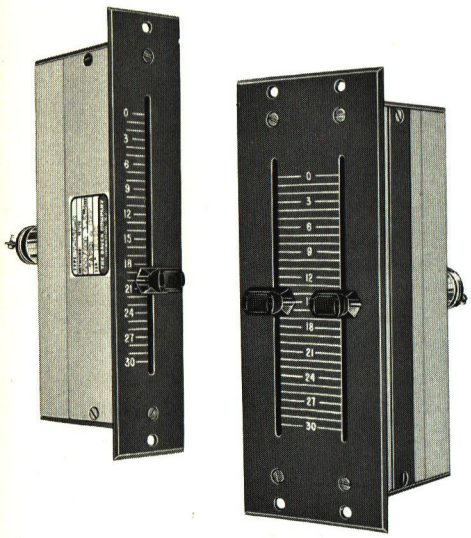
CONTINUOUS RATING: 0.6 watts, provided voltage does not exceed 100 volts.

PEAK AUDIO RATING: Up to 2.5 watts, provided voltage does not exceed 200 peak volts.





Tol. Dec. ±.001 Fractions ±1/32



SLIDE ATTENUATORS

- Finger fitting knob moves in a straight line
- Maximum of 4 ounces of pressure required to move knob
- Velvet smooth slide action
- Long life silver alloy contacts and wiper arms used
- Units protected against dirt and foreign objects
- Requires little panel and cabinet space

Daven Slide Attenuators are used in program mixing where the operator has to control multiple units with one hand. They are available in any input and output impedance and supplied with a rear connector for ease of connection and disassembly. A removable side plate permits access to contacts.

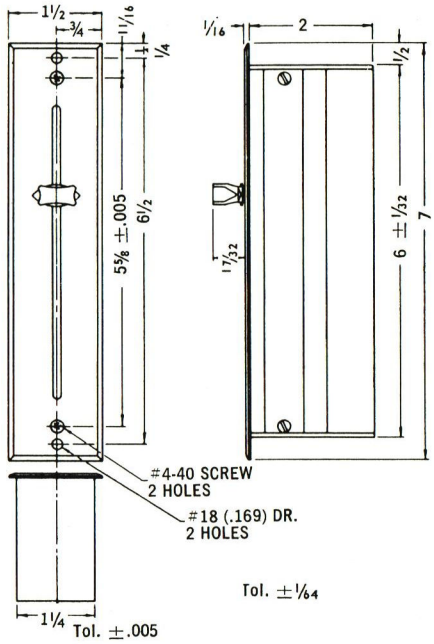
Escutcheons (dials) which require a low tolerance rectangular opening and can be easily mounted are available. The escutcheon mounts the attenuator and trims the panel opening. Special dials for mounting 1, 2, 3 and 4 units adjacent to each other are also available.

TYPE				TERMINAL IMPEDANCE					ATTENUATION
LADDER	UNBALANCED LADDER	"T"	STEREO LADDERS	K	D	E	F	G	
LA-825	BAL-825	T-825	2LA-825						20 steps 2 db per step. No taper, last step cut-off (infinity).
LA-826	BAL-826	T-826	2LA-826						20 steps 2 db per step. Tapered to infinity.
LA-835	BAL-835	T-835	2LA-835						30 steps 2 db per step. No taper, last step cut-off (infinity).
LA-836	BAL-836	T-836	2LA-836						30 steps 1½ db per step. Tapered to infinity.

Cueing positions are available on all attenuators in this series.

TYPE		TERMINAL IMPEDANCE					ATTENUATION
POTENTIOMETER	DUAL POTENTIOMETER	S	T	W	X	Y	
CP-825	DCP-825						20 steps, 2 db per step. No taper, last step cut-off (infinity).
CP-826	DCP-826						20 steps, 2 db per step. Tapered to infinity.
CP-835	DCP-835						30 steps, 2 db per step. No taper, last step cut-off (infinity).
CP-836	DCP-836						30 steps, 2 db per step. Tapered to infinity.

CONTINUOUS RATING: 0.6 watt PEAK AUDIO RATING: Up to 2.5 watts RESISTOR ACCURACY: ±5%



KEY TO TERMINAL IMPEDANCES

LETTER CODE	K	D	E	F	G	S	T	W	X	Y
TERMINAL IMPEDANCE	150/150	200/200	250/250	500/500	600/600	50,000	100,000	200,000	250,000	500,000

Special impedances or decibel steps other than those shown are available.

VU METER MULTIPLIER NETWORKS

SERIES T-994 AND TA-1000

The VU meter is the accepted standard for program monitoring. In operation this meter is bridged across the 600Ω line with an appropriate attenuator and fixed resistor inserted between the line and meter. The use of an attenuator is recommended to extend the applications of the meter as follows:

1. Extension of meter range.
   In practice, the signal level is such that the range of the meter has to be exceeded.
2. Impedance varies with voltage across meter terminals.
   The meter alone, is a non-linear device and unless it is isolated by a resistive network, it will add distortion to the program.
3. Ballistic characteristics vary with connected load. For correct pointer action, the meter load impedance should be 3900Ω.
4. Direct measurement of power level.
   The db dial reading of the attenuator plus scale reading of the meter is a measurement of the level being transmitted.

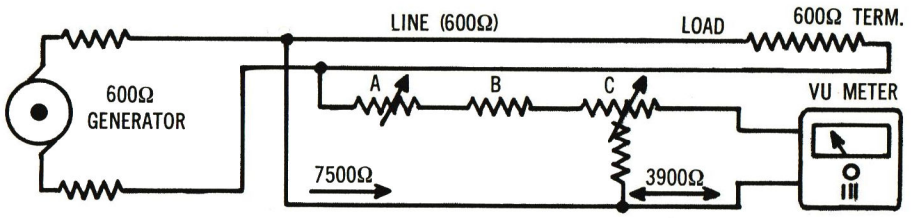


FIGURE I. CONVENTIONAL METHOD OF USING VU METER AND ATTENUATOR

"A" is a zero adjuster approximately 800 to 1000Ω, set near the center position. "B" is a fixed resistor, approximately 3200Ω, selected so that with "A" at mid position, "A" + "B" equals 3600Ω. "C" is the meter multiplier, 3900Ω input and 3900Ω output impedance.

TYPE	NO. OF STEPS	DB PER STEP	CONTACT SPACING	DECIBEL RANGE	IMPEDANCE	NOTES
T-994-1	12	2	12°	1mw + 4 to +24 & off.	7100/3900	Zero adjust rheostat required.
T-994-2				1mw + 4 to +24 & off.	7500/3900	No zero adjust rheostat required.
T-994-3				+4 to +26 and off.	3900/3900	External 3600Ω series resistor required.
T-994-4					7100/3900	Zero adjust rheostat required.
T-994-5					7500/3900	No zero adjust rheostat required.
TA-1000-1	20		15°	1mw + 4 to +40 & off.	7100/3900	Zero adjust rheostat required.
TA-1000-2					7500/3900	No zero adjust rheostat required.
TA-1000-3					6900/3900	Zero adjust rheostat required.
TA-1000-4				+4 to +42 and off.	7100/3900	Zero adjust rheostat required.
TA-1000-5					3900/3900	External 3600Ω series resistor required.
TA-1000-6					7500/3900	No zero adjust rheostat required.

Special meter multipliers for non-standard meters will be supplied to your specifications.

NOTE: Clockwise rotation for increased attenuation is standard in the above networks.

CONTINUOUS RATING: 0.6 watts.

RESISTOR ACCURACY: ± 1%

PEAK AUDIO RATING: Up to 2.5 watts.

DIMENSIONS

	DIA.	DEPTH
Series T994	2¼" +1/16", −0"	2 1/16" ± 1/32"
Series TA-1000	2¾" ± 1/32"	

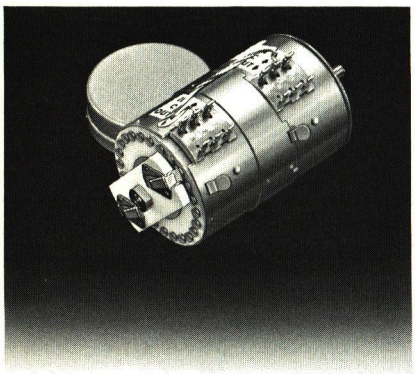
DECADE ATTENUATORS

SERIES 2500

The Series 2500 Decade Attenuator units are step type precision networks, designed for use in measuring equipment. These units are particularly adaptable for use in noise meters, audiometers, transmission measuring sets and attenuation networks.

All the controls in this series have ten steps of attenuation. The frequency characteristics are essentially flat from zero to 50 kc. Positive, accurate detents are supplied on all units. The mechanical construction of these networks, is the same high quality as supplied on all Daven attenuators.

Electrically, these units are offered in three circuit types—Potentiometers, "T" and Balanced "H". Resistors are calibrated to an accuracy of ±1%. For best results, it is recommended that the power input be limited to 0.5 watt or less. If a higher level input is required, please specify this information when ordering.

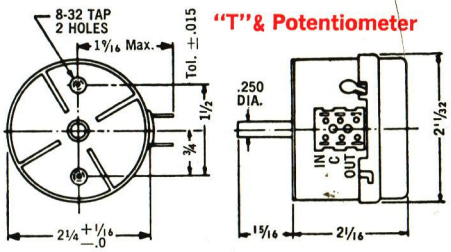


10 DB STEPS 100 DB TOTAL	1.0 DB STEPS 10 DB TOTAL	0.1 DB STEPS 1 DB TOTAL	CIRCUIT	IMPEDANCE
2506	2503	2500	Potentiometer	50,000
2507	2504	2501		100,000
2508	2505	2502		200,000
2513	2511	2509	"T"	600
2514	2512	2510		500
2523	2522	2521		150
2519	2517	2515	Balanced "H"	600
2520	2518	2516		500
2526	2525	2524		150

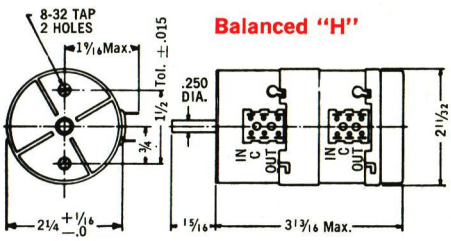
Special impedances or decibel steps other than those shown are available

CONTACT SPACING: 15° between centers
TOTAL DEGREE OF ROTATION: 150°

"T"& Potentiometer



Balanced "H"



Tol. Dec. ±.001 Fractions ±1/32"

IMPEDANCE MATCHING NETWORKS

SERIES 3200

Impedance matching networks comprise a series of "T" or "BH" networks offering a constant input and series of output impedances. These networks may be used as a series of input and a constant output impedance by reversing the "IN" and "OUT" leads. Two forms are herein listed—one in which the db loss is constant, and one in which the db loss is the next highest multiple of 5 db above the minimum possible loss.

Since this type of network does not introduce objectionable phase shift, unwanted frequency discrimination, and does not pick up strays in low level circuits between 0 and 50 kc or higher, it is an ideal method of matching impedances in transmission measuring sets and other forms of precision test equipment.

DIMENSIONS

	DIA.	DEPTH
"T" NETWORKS	2 3/4"	2 1/16"
"BH" NETWORKS		3 13/16"

MOUNTING: Two 8-32 tapped holes, 1½" apart.

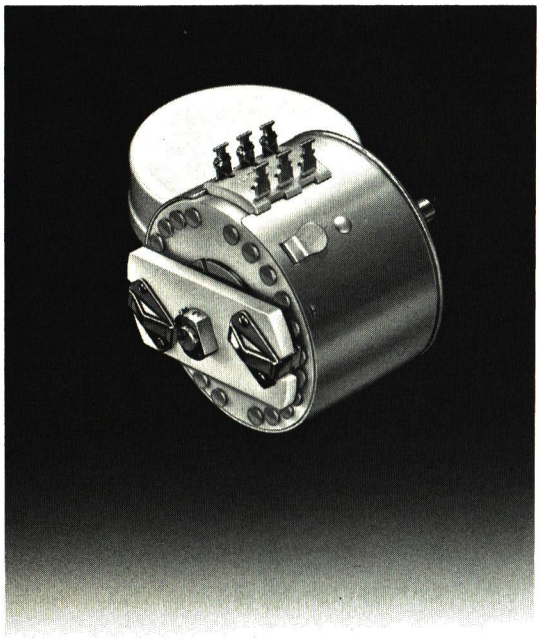
TYPE	CIRCUIT	INPUT IMPEDANCE	OUTPUT IMPEDANCE 30	50	125	150	200	250	500	600		RESISTOR ACCURACY
3202	T	600	20	20	15	15	10	10	5	0	DB LOSS	±1%
3203	T	600	20	20	20	20	20	20	20	20		
3200	T	500	20	20	15	15	10	10	0	5		
3201	T	500	20	20	20	20	20	20	20	20		
3208	T	300	20	15	10	10	10	5	10	10		
3209	T	300	20	20	20	20	20	20	20	20		
3212	T	150	15	10	5	0	5	10	15	15		
3213	T	150	15	15	15	15	15	15	15	15		
3206	BH	600	20	20	15	15	10	10	5	0		
3207	BH	600	20	20	20	20	20	20	20	20		
3204	BH	500	20	20	15	15	10	10	0	5		
3205	BH	500	20	20	20	20	20	20	20	20		
3210	BH	300	20	15	10	10	10	5	10	10		
3211	BH	300	20	20	20	20	20	20	20	20		
3214	BH	150	15	10	5	0	5	10	15	15		
3215	BH	150	15	15	15	15	15	15	15	15		

Special impedances or decibel steps other than those shown are available

CONTACT SPACING: 15° between centers TOTAL DEGREE OF ROTATION: 105°.

VIDEO VARIABLE ATTENUATORS

SERIES V-250



Precise and dependable these attenuators are recommended for use in wide band equipment, television video circuits where a wide frequency range without change of impedance is of special importance and in laboratory standards. The same sturdy switch construction found in all Daven step type audio attenuators is used in these wide band units. General construction and mounting dimensions are interchangeable with our standard attenuators.

SPECIFICATIONS

CIRCUIT: "T" network
SWITCH: Rotary step type
TERMINAL IMPEDANCE ACCURACY: Within ± 2½%
FREQUENCY CHARACTERISTICS: Essentially flat from 0 to 10 mc

CONNECTORS

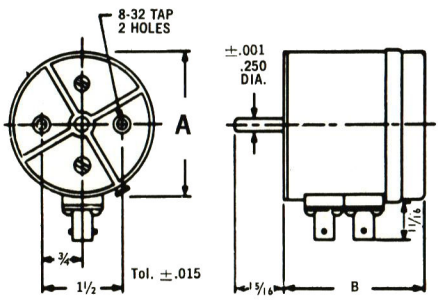
TYPE	RECEPTACLES SUPPLIED	CABLE PLUGS REQUIRED
VA	MC-60 *	MC-50 *
VB	UG-185/U **	UG-260/U **
VC	Standard lug terminal board supplied	

When ordering indicate type desired—
Example: VA-250 indicates MC-60 receptacle supplied, MC-50 cable plugs required.
Receptacles are supplied—cable plugs available at slight additional cost.
Types other than those specified supplied upon request.

* Indicates commercial type number
** Indicates Army-Navy type number series "BNC."

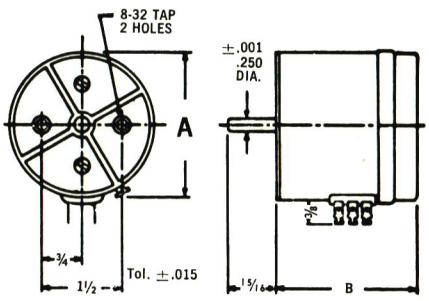
SERIES	NUMBER OF STEPS	DB PER STEP	CHARACTERISTIC	DB TOTAL	STANDARD IMPEDANCE	CONTACT SPACING
V-250	10	1		10		15°
V-251	10	2		20		15°
V-252	20	1		20		7.5°
V-253	20	2	LINEAR	40	75	7.5°
V-254	20	0.5		10		7.5°
V-255	45	0.2		9		7.5°
V-256	45	0.1		4.5		7.5°
V-257	20	0.1		2.0		7.5°

Special impedances or decibel losses may be obtained on request.



TYPE	A	TERMINALS COAX B	TERMINALS LUG B
V-250	2¼	2⅝	2 1/16
V-251	2¼	2⅝	2 1/16
V-252	2¾	2⅝	2 1/16
V-253	2¾	3⅞	3⅞
V-254	2¾	2⅝	2 1/16
V-255	2¾	2⅝	2 1/16
V-256	2¾	2⅝	2 1/16
V-257	2¾	2⅝	2 1/16

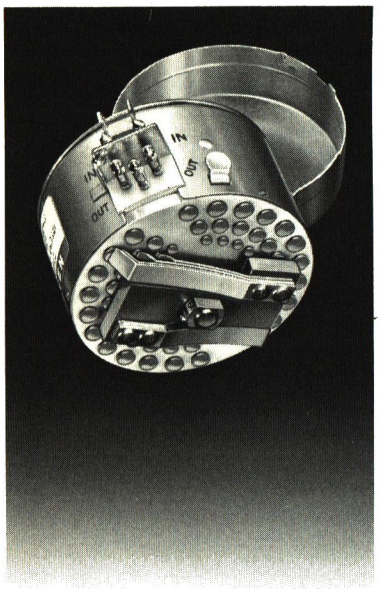
LUG TERMINAL BOARD
COAXIAL RECEPTACLES



Fractions 1/32" except "A" dimension on V-250 & V-251 which is +1/16, –0

DECADE ATTENUATOR UNITS — VIDEO

SERIES 1790



FEATURES

- Accuracy over a range extending into the low radio frequency spectrum.
- Wide range of attenuation available in small decibel steps.
- The detent is positive, and the stops prevent over-travel.
- Decades are individually shielded.
- Scientifically designed switch blades and contacts are employed to insure low contact resistance and continued accuracy.
- The use of precision non-inductive resistors and a carefully designed circuit reduces frequency discrimination to a minimum.
- Networks are available for various impedance requirements.

The Series 1790 Decade Units are the same as the individual controls employed in the Series 790 and 795 Attenuation Networks.

Each unit provides 10 steps of attenuation, and is offered in 0.1, 1.0 and 10.0 db steps. Both "T" and Balanced "H" circuits are available.

These controls are enclosed in a brass case which provides R.F. shielding. A ground lug is located adjacent to the terminal board for grounding the shields of the external leads.

The electrical circuit employs scientifically designed switches using low loss dielectric, solid silver alloy contacts and low stray capacity self-wiping silver blades. The use of precision non-inductive resistors and a carefully designed circuit reduces frequency discrimination to a minimum.

The Series 1790 Decade Units may be built into precision measuring equipment for use over the audio-video range. Their use is particularly recommended where definitely known amounts of attenuation at a constant impedance are required.

RESISTOR ACCURACY: ±0.25%.

ATTENUATION ACCURACY: The maximum error is ±0.1 db at 1000 cps when terminated by a pure resistance.

FREQUENCY ERROR: For Series 1790 and 1791, maximum error up to 10 mc is ±0.2 db. Adequate shielding must be provided on the input and output leads for higher frequency work.

For Series 1792, 10 db. per step units (100 db total) maximum error is ±0.5 db up to 0.5 mc. Lower values of attenuation can be used on frequencies between 0 and 10 mc without appreciable error.

CIRCUIT: "T" network or Balanced "H" network.

MAXIMUM INPUT POWER: 1 watt.

SWITCHES: Heavy duty solid silver alloy is used for the contacts, multi-leaf switch rotor, and slip ring return. Each leaf of the switch arms employ separate pressure to provide self alignment and equalized pressure, to insure low and uniform contact resistance.

MOUNTING: Each decade unit is completely shielded in a dust-proof brass case.

ROTATION: Clockwise rotation increases attenuation

DIMENSIONS

TYPE	DIAM.	DEPTH
VT-1790, VH-1790, VH-1791	2¾"	2 1/16"
VT-1791	2¾"	2 13/16"
VT-1792, VH-1792	2¾"	6 5/16"

KEY TO TERMINAL IMPEDANCES

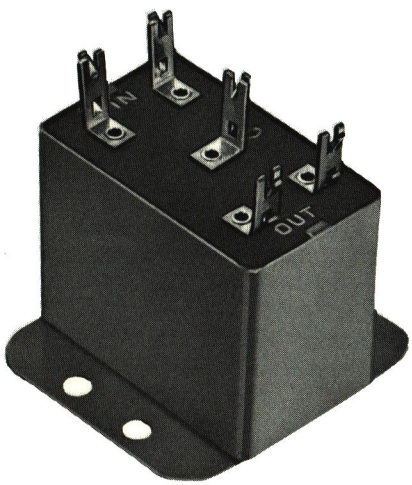
LETTER CODE	B	H	K	F	G
TERMINAL IMPEDANCE	50/50	75/75	150/150	500/500	600/600

TYPE	TERMINAL IMPEDANCE B	H	K	F	G	ATTENUATION NO. OF STEPS	DB PER STEP	NETWORK	CONTACT SPACING
VT-1790						10	0.1	"T"	15°
VT-1791							1.0		
VT-1792							10		
VH-1790							0.1	Balanced "H"	
VH-1791							1.0		
VH-1792							10		

LABORATORY MEASUREMENTS OF A TYPICAL PRODUCTION UNIT—TYPE VT-1792-G, 10 DB STEPS, 100 DB TOTAL

DIAL READING IN DB	± DB ERROR AT FREQUENCY 1 KC	10 KC	50 KC	200 KC	500 KC	1 MC
0	0	0	0	0	0	0
10	.015	.015	.015	.030	.020	.110
20	.020	.020	.020	.070	.020	.200
30	.025	.025	.025	.125	.220	.225
40	.030	.030	.030	.140	.220	.220
50	.040	.040	.040	.160	.230	.230
60	.050	.050	.050	.180	.240	.235
70	.060	.060	.060	.200	.300	.240
80	.065	.065	.065	.230	.350	.350
90	.075	.075	.075	.260	.400	.500
100	.080	.080	.080	.280	.500	1.500

DAVEN FIXED ATTENUATORS



DEFINITION: The term fixed attenuator or "pad" refers, in this section, to that group of resistive networks having fixed impedances and loss. This group differs from the variable attenuators in that the loss is fixed, and there is no switch mechanism or other moving parts.

DESCRIPTION: Daven fixed attenuators employ accurately calibrated non-inductive resistors, rigidly mounted inside a metal shield. Six types of cases are offered, covering a variety of mountings and a wide range of sizes. In each of these cases several circuit types are available, with a wide range of impedance and loss.

USES: There are numerous applications for fixed attenuators in the communications field. Below is a partial listing of the more common uses:

1. To equalize incoming signal levels.
   Example—Four inputs to a multi-channel mixer, #1 at a level of −70, #2 at a level of +10, #3 at a level of −40, and #4 at a level of −60. To operate the mixer controls over their correct range an 80 db, a 30 db, and a 10 db loss pad should be used in #2, #3 and #4 input circuits.
2. To bridge a program line for monitoring purposes.
   Example—Program line impedance of 600 ohms, level of +4. To monitor, use bridging pad across line having input impedance of 10,000 to 20,000 ohms, and output impedance of 600 ohms.
3. To isolate one section of a line from another.
   Example—Two 600 ohm lines from output of preamplifier. In switching a line must be shorted. To keep from interrupting the program on one line, while the other is being switched, a 600/600Ω isolation pad of 12 to 20 db may be used in each line. If the output of either pad is shorted, the other program will not be interrupted.
4. To change impedance.
   Example—Line impedance is 500Ω. To change to 600Ω insert a 500/600Ω fixed pad.
5. To combine two or more incoming lines into a single outgoing line, or to divide one incoming line into two or more outgoing lines.
   Example—Incoming line 600 ohms, to divide into three outgoing 600Ω lines. Pad required should have one 600Ω input, and three 600Ω outputs, each with a loss of 9.5 db.
   Example—Three incoming 600Ω lines to combine into one outgoing 600Ω line. Pad required is same as above.
6. To equalize the outputs of several speakers connected to a common source.
   Example—Total power output equals 10 watts at 4 ohms. Connect this across four 16Ω speakers, three to have an output of 2.5 watts each, but the fourth to be a monitor speaker with an output of only 0.5 watt. Pad required is 16/16Ω with a loss of 7 db.
7. As a laboratory standard of fixed attenuation.
   Example—Fixed pads can be substituted for more expensive attenuation networks in locations where the loss is to be held constant.

CIRCUITS: In the following fixed attenuator section, "T" and "BH" circuits are listed. In addition to these circuits, "H", "L", "O", "π", and other types of networks are available upon request. Since a "T" or "BH" is equivalent to the remaining types of circuits for most applications, we have concentrated on these networks.

MINIMUM LOSS PADS: Included in the following section is a listing of minimum loss networks. For each ratio of impedance input to impedance output, there is a definite minimum loss, below which a network cannot be made. This minimum loss can be calculated by the equation—

$$N = 20 \log_{10} (R + \sqrt{R^2 - 1})$$

where R^2 = impedance ratio or $\frac{Z_1}{Z_2}$

and N = decibel loss

For example a pad having a 600Ω input and a 1200Ω output will have a minimum loss of 7.655 db.

BRIDGING PADS: Bridging type pads are also listed in this section. These not only have a minimum loss caused by an impedance change, but an added bridging loss which can be calculated by the equation—

$$N = 10 \log_{10} R^2$$

where R^2 = impedance ratio and N = decibel loss

For example, in selecting a pad for bridging use, having a high input impedance and low output impedance, the total loss is—

$$N = 20 \log_{10} (R + \sqrt{R^2 - 1}) + 10 \log_{10} R^2$$

FIXED ATTENUATORS

IMPEDANCE		DB LOSS MINIMUM	DB LOSS MAXIMUM					
Input	Output	ALL TYPES	T-950	T-154	T-691	H-950	H-154	H-691
30	30	0	50	100	50	50	50	50
30	50	6.47	55	100	55	50	50	50
30	150	12.54	60	100	60	55	55	55
30	200	13.91	60	100	60	55	55	55
30	250	14.95	65	100	65	55	55	55
30	500	18.11	65	100	65	60	60	60
30	600	18.92	65	100	65	60	60	60
50	30	6.47	55	100	55	50	50	50
50	50	0	55	100	55	50	50	50
50	150	9.96	60	100	60	55	55	55
50	200	11.44	65	100	65	60	60	60
50	250	12.54	65	100	65	60	60	60
50	500	15.79	65	100	65	60	60	60
50	600	16.63	70	100	70	60	60	60
150	30	12.54	60	100	60	55	55	55
150	50	9.96	60	100	60	55	55	55
150	150	0	65	100	60	60	60	60
150	200	4.77	70	100	70	60	60	60
150	250	6.47	70	100	70	65	65	65
150	500	10.52	70	100	70	65	65	65
150	600	11.44	75	100	75	65	65	65
150	3,000	18.92	80	100	80	75	75	75
200	30	13.91	60	100	60	55	55	55
200	50	11.44	65	100	65	60	60	60
200	150	4.77	70	100	70	60	60	60
200	200	0	70	100	70	65	65	65
200	250	4.18	70	100	70	65	65	65
200	500	8.96	75	100	75	65	65	65
200	600	9.96	75	100	75	70	70	70
250	30	14.95	65	100	65	55	55	55
250	50	12.54	65	100	65	60	60	60
250	150	6.47	65	100	65	65	65	65
250	200	4.18	70	100	70	65	65	65
250	250	0	70	100	70	65	65	65
250	500	7.65	75	100	75	70	70	70
250	600	8.73	75	100	75	70	70	70
500	30	18.11	65	100	65	60	60	60
500	50	15.79	65	100	65	60	60	60
500	150	10.52	70	100	70	65	65	65
500	200	8.96	75	100	75	65	65	65
500	250	7.65	75	100	75	70	70	70
500	500	0	75	100	75	70	70	70
500	600	3.77	80	100	80	70	70	70
500	5,000	15.79		100	85		80	80
500	10,000	18.92		100	90		85	85
500	20,000	21.97		100	90		85	85
600	30	18.92	65	100	65	60	60	60
600	50	16.63	70	100	70	60	60	60
600	150	11.44	75	100	75	65	65	65
600	200	9.96	75	100	75	70	70	70
600	250	8.73	75	100	75	70	70	70
600	500	3.77	80	100	80	70	70	70
600	600	0	80	100	80	75	75	75
600	5,000	14.94		100	90		80	80
600	10,000	18.11		100	90		85	85
600	20,000	21.18		100	95		90	90

STANDARD OCTAL SOCKET TERMINAL ARRANGEMENT

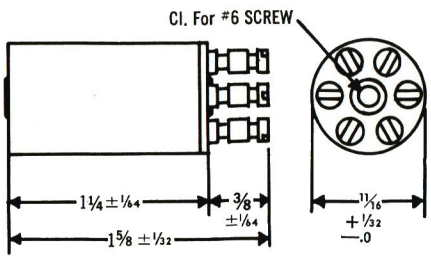
T-691	H-691
#1—term. case ground	#1—term. case ground
#2—open	#2—open
#3—output	#3 & 6—output
#4—input	#4 & 5—input
#5—open	#7 & 8—Common
#6—open	
#7 & 8—"C"	

NOTE: Special impedances other than those shown may be secured at no additional cost. The maximum and minimum loss values indicated for each pair of impedances represent the limits within which this type of pad can be made.

The input & output terminals of these networks are reversible. For example a 600/150 ohm pad may be used as a 150/600 ohm pad.

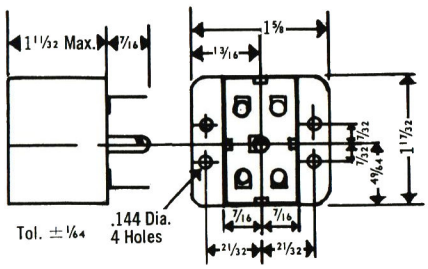
NOTE: It is necessary to externally connect the two "C" terminals together on the H-950 series.

TYPE T-950 & H-950



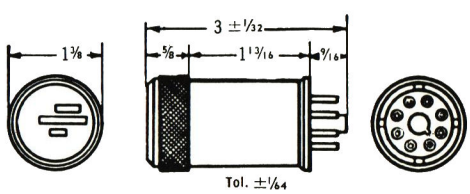
Circuit: T-950 — "T" Network
H-950 — Balanced "H" Network
Accuracy: ± 2% Maximum Dissipation: 0.6 Watt

TYPE T-154 & H-154

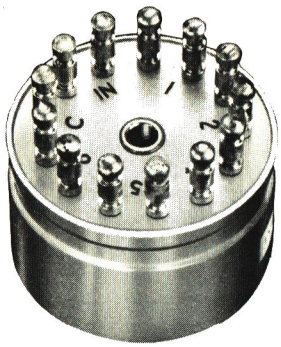


Circuit: T-154 — "T" Network
H-154 — Balanced "H" Network
Accuracy: ± 2% Maximum Dissipation: 1.0 Watt

TYPE T-691 & H-691



Circuit: T-691 — "T" Network
H-691 — Balanced "H" Network
Accuracy: ± 1% Maximum Dissipation: 1.0 Watt



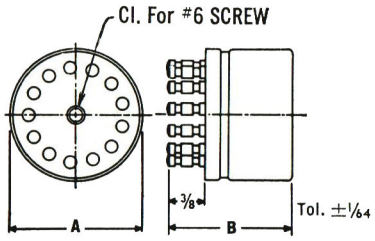
TAPPED FIXED NETWORKS

SERIES 1030 & 1230

The primary function of the Series 1030 and 1230 Networks is to provide a tamper proof method of adjusting or setting the level by means of soldered connections. These tapped type units are useful in accurately tracking equipment in production and for re-tracking equipment in the field after the replacement of a major component.

TYPE	IMPEDANCE K	IMPEDANCE F	IMPEDANCE G	CIRCUIT	RESISTOR ACCURACY*	DESCRIPTION
1030	■	■	■	"T"	±5%	0 to 40 db in 1 db steps as follows: 1, 2, 3, 4, 10 and 20 db fixed loss networks.
1030-KW, FW, GW	■	■	■	"T"	±2%	0 to 40 db in 1 db steps as follows: 1, 2, 3, 4, 10 and 20 db fixed loss networks.
1230	■	■	■	"H"	±5%	0 to 40 db in 1 db steps as follows: 1, 2, 3, 4, 10 and 20 db fixed loss networks.
1230-KW, FW, GW	■	■	■	"H"	±2%	0 to 40 db in 1 db steps as follows: 1, 2, 3, 4, 10 and 20 db fixed loss networks.
1031	VU meter multiplier network consisting of a combination of a 3600Ω resistor and fixed 3900/3900Ω "T" networks for extending the range of the type 30 VU meter from +4 to +24 VU, in one VU steps. Resistor accuracy ±5%.					
1031-A	Electrically the same as 1031 except ±2% resistors are used for greater accuracy.					
1032	Zero adjusting network containing the series resistor required for the VU meter, together with ten adjustable taps for adjusting the meter ±0.5 db in 0.1 db steps. Resistor accuracy ±2%.					

*Resistor accuracies of ±1% can be supplied—prices upon request.

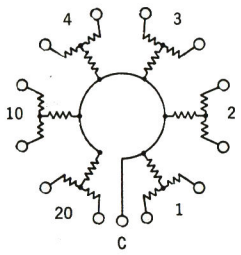


Series 1030 = A = 1⅜" B = 1⅜" Max.
Series 1230 = A = 1¾" B = 1⅝" ±1/32

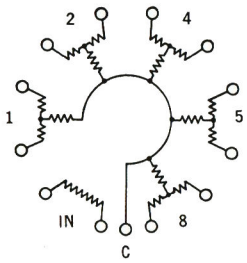
KEY TO TERMINAL IMPEDANCES

LETTER CODE	K	F	G
TERMINAL IMPEDANCE	150/150	500/500	600/600

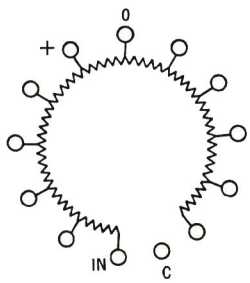
Special impedances or decibel losses may be obtained on request.



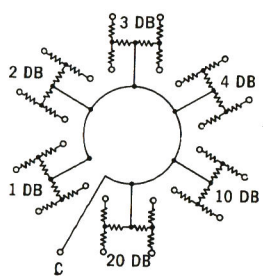
TYPE 1030



TYPE 1031 & 1031A



TYPE 1032

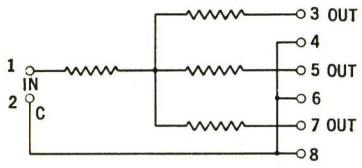


TYPE 1230

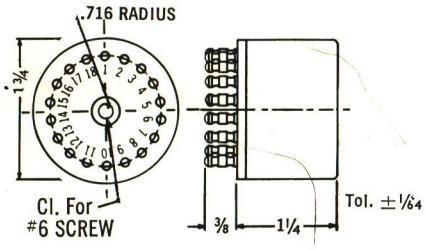
MULTIPLE INPUT & OUTPUT NETWORKS

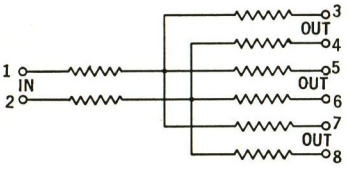
SERIES 1130 BRANCHING NETWORKS

The networks in this series may be obtained with a single input and multiple output, or a multiple input and a single output. "T"and "H" circuits are available for each type listed below. All units are designed for minimum loss. The maximum level of these pads is +24 VU.



TYPICAL "T" CIRCUIT





TYPICAL "H" CIRCUIT

SINGLE INPUT MULTIPLE OUTPUT PADS

TYPE	CIRCUIT	NO. OF INPUTS	NO. OF OUTPUTS	DB LOSS	TERMINAL NUMBERS	
					INPUT	OUTPUT
1130-1	"H"	1	2	6.0	1-2	3-4, 5-6
1130-2	"H"	1	3	9.5	1-2	3-4, 5-6, 7-8
1130-3	"H"	1	4	12.0	1-2	3-4, 5-6, 7-8, 9-10
1130-4	"H"	1	5	14.0	1-2	3-4, 5-6, 7-8, 9-10, 11-12
1130-5	"H"	1	6	15.6	1-2	3-4, 5-6, 7-8, 9-10, 11-12, 13-14
1130-6	"H"	1	8	18.1	1-2	3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18
1130-7	"H"	1	10	20.0	1-2	3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22
1130-8	"T"	1	2	6.0	1-2	3, 5*
1130-9	"T"	1	3	9.5	1-2	3, 5, 7*
1130-10	"T"	1	4	12.0	1-2	3, 5, 7, 9*
1130-11	"T"	1	5	14.0	1-2	3, 5, 7, 9, 11*
1130-12	"T"	1	6	15.6	1-2	3, 5, 7, 9, 11, 13*
1130-13	"T"	1	8	18:1	1-2	3, 5, 7, 9, 11, 13, 15, 17*

MULTIPLE INPUT SINGLE OUTPUT PADS

TYPE	CIRCUIT	NO. OF INPUTS	NO. OF OUTPUTS	DB LOSS	TERMINAL NUMBERS	
					INPUT	OUTPUT
1130-14	"H"	2	1	6.0	1-2, 3-4	5-6
1130-15	"H"	3	1	9.5	1-2, 3-4, 5-6	7-8
1130-16	"H"	4	1	12.0	1-2, 3-4, 5-6, 7-8	9-10
1130-17	"H"	5	1	14.0	1-2, 3-4, 5-6, 7-8, 9-10	11-12
1130-18	"H"	6	1	15.6	1-2, 3-4, 5-6, 7-8, 9-10, 11-12	13-14
1130-19	"H"	8	1	18.1	1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16	17-18
1130-20	"H"	10	1	20.0	1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20	21-22
1130-21	"T"	2	1	6.0	1, 3*	5
1130-22	"T"	3	1	9.5	1, 3, 5*	7
1130-23	"T"	4	1	12.0	1, 3, 5, 7*	9
1130-24	"T"	5	1	14.0	1, 3, 5, 7, 9*	11
1130-25	"T"	6	1	15.6	1, 3, 5, 7, 9, 11*	13
1130-26	"T"	8	1	18.1	1, 3, 5, 7, 9, 11, 13, 15*	17

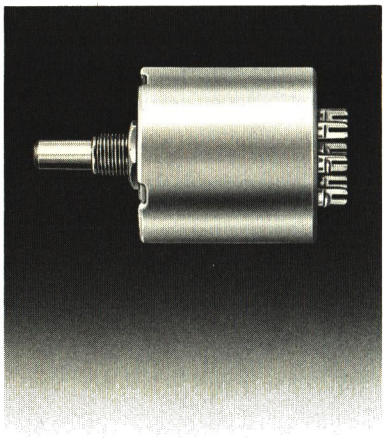
***Even number terminals are connected together for use as common ("C") terminal.**

Terminal impedance: 600/600Ω. Other impedances are obtainable.

RESISTOR ACCURACY: ±2%.

PRINTED CIRCUIT ATTENUATOR

- **Extremely low torque with no detent**
- **Printed circuit for uniformity of operation**
- **Sealed unit—dust-free atmosphere**
- **Gold-plated contacts for low noise and long life**



Daven Type 1020 Printed Circuit Attenuators are low impedance controls for use in broadcast equipment and public address systems. A specific application would be as mixer or master controls in broadcast or recording consoles. Because of their compact design they are ideal for use in portable equipment or installations where limited mounting space is a factor.

SPECIFICATIONS

Accuracy: Individual resistors are calbrated to an accuracy of ±5%.

Frequency Response: No appreciable change in db attenuation or variation in terminal impedance over the range of 0 to 20 kc.

Insertion Loss: (ladder only) For 1:1 impedance ratio the initial loss is 6 db. For 1:2 impedance ratio the initial loss is 2 db

Impedance Characteristics: (ladder only) The input is constant except near off position and the output falls on the first few steps (See curve on Page 9).

Switch Noise Level: No indication above associated circuit and tube noise when switch is operated at extremely low levels.

Direction of Rotation: For increasing attenuation, counter clockwise.

Shaft: 0.250 Dia. ±.001 Stainless Steel.

Bearings: Shaft bearings are free turning.

Shield: Totally enclosed and dust-proof.

Mounting: Single hole mounting. Two hole mounting bracket available.

Contact Spacing: 15 degrees between centers.

Rotation: Total degree of rotation 300 degrees.

Continuous Rating: 0.6 watts provided voltage does not exceed 100 volts.

Peak Audio Rating: Up to 2.5 watts provided voltage does not exceed 200 volts.

DUAL DECK

TYPE			ATTENUATION
UNBALANCED LADDER	BALANCED LADDER	"T"	
LA-1020-K, KU, G, UG*	BAL-1020-A, B, K, KU, KG, D, E, EF, F, G	T-1020-A, B, C, K, KU, KG, D, E, F, G	20 steps, 2 db per step. Tapered on last steps to cut-off (infinity). No detents.
LA-1022-K, KU, G, UG*	BAL-1021-A, B, K, KU, KG, D, E, F, G	T-1021-A, B, C, K, KU, KG, D, E, F, G	20 steps, 2 db per step. No taper, last step cut-off (infinity). Detents.

*Available for stereo use in double deck units. When ordering add 2 in front of Cat. No. i.e., 2LA-1020-K

The above attenuators are available with cueing position. Add letter "Q" after the type letters, for example, LAQ-1020-G would be a 600/600 ohm ladder with a cueing position.

Impedances or decibel steps other than those shown can be made available if the quantity is sufficient.

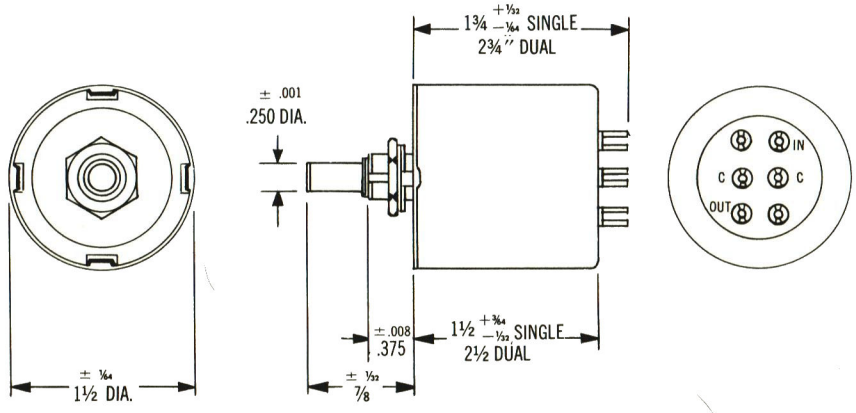
TYPE		
POT	TERMINAL IMPEDANCE	ATTENUATION
CP-1020-T*	100,000	20 steps, 2 db per step. No taper, last step cut-off (infinity). Detents.
CP-1024-T*	100,000	20 steps, 2 db per step. Tapered on last steps to cut-off (infinity). No detents.

*Available for stereo use in double deck units. When ordering add 2 in front of Cat. No. i.e., 2CP-1020-T

Not Available With Cueing Position

Impedances or decibel steps other than those shown are available if the quantity is sufficient.

Knob and Indicator Plate furnished upon request at slight additional cost.



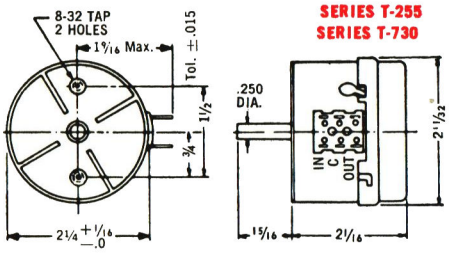
STEREO ATTENUATORS — "T" AND "LA" UNBALANCED LADDERS

USE	TYPE	TERMINAL IMPEDANCE A	B	C	K	KU	KF	KG	D	E	EF	F	G	ATTENUATION NO. OF STEPS	DB PER STEP	TAPER	DETENTS	CONTACT SPACING BETWEEN CENTERS	DEGREE OF ROTATION
Low impedance controls for broadcast and public address systems.	2LA-350		■		■					■	■	■	■	20	2	Last Steps To Cut-off	No	15°	300°
	2LA-352		■		■					■	■	■	■	20	2 (off pos.)	No	Attached		
Same as 2LA-350, but with 10 additional steps of attenuation.	2LA-130		■		■					■	■	■	■	30	1.5	Last Steps To Cut-off	No	11.25°	337.5°
	2LA-133		■		■					■	■	■	■	30	2 (off pos.)	No	Attached		
Same as 2LA-350, but with "X" terminal for resistor tie point.	LA-11290				■					■		■	■	20	2	Last Steps To Cut-off	No	15°	300°
Compact Bridged "T" for use where space is at a premium.	2T-255				■					■		■	■	20	2	Last Steps To Cut-off	No	15°	300°
	2T-256				■					■		■	■	20	2 (off pos.)	No	Attached		
General Sound work. Suited for both low and high level mixing.	2T-320				■					■		■	■	20	2 (off pos.)	No	Attached	15°	300°
	2T-321				■					■		■	■	20	2	Last Steps To Cut-off	No		
Provides 10 extra steps which may be used to reduce the attenuation/step or increase overall range.	2T-330				■					■		■	■	30	1.5	Last Steps To Cut-off	No	11.25°	337.5°
	2T-331				■					■		■	■	30	1.5 (off pos.)	No	Attached		
Sturdy, compact — for a wide range of control in a limited space.	2T-730				■					■		■	■	30	1.5	Last Steps To Cut-off	No	11.25°	337.5°
	2T-731				■					■		■	■	30	1.5 (off pos.)	No	Attached		

KEY TO AVAILABILITY & TERMINAL IMPEDANCES

■ Standard ▨ Available as special order

LETTER CODE	A	AH	B	BJ	H	C	K	KV	KG	D	E	EF	F	G
TERMINAL IMPEDANCE	30/30	30/60	50/50	50/100	75/75	125/125	150/150	150/300	150/600	200/200	250/250	250/500	500/500	600/600
INSERTION LOSS UNBALANCED LADDERS	6	2	6	2	6	6	6	2	9.7	6	6	2	6	6
INSERTION LOSS "T" ATTENUATORS	0	7.7	0	7.7	0	0	0	7.7	11.4	0	0	7.7	0	0

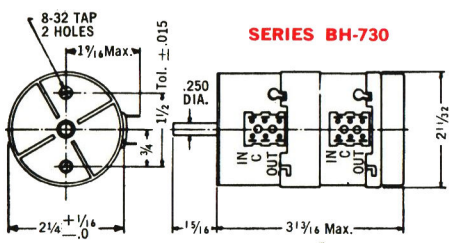


Tol. Dec. ±.001 Fractions ±1/32

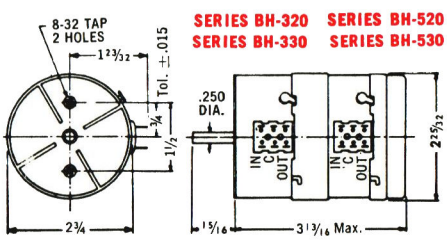
DEFINITION: Under this group we list those types which have been designed for stereo use. The "T" attenuators have a zero insertion loss for 1:1 impedance ratios and constant impedance, both in and out on all steps of control. The "Unbalanced Ladders" offer consecutive resistor sections. These are recommended if one side of the circuit is at ground potential or may be grounded.

CUEING: In addition to the normal attenuation function, Daven stereo controls may be obtained with a built-in cueing circuit. In these controls, provision is made at the extreme attenuation position for connecting the incoming signal to a cue circuit before FADING IN the signal. To order add the letter Q after the type letters. For example a 2LA-350-G with cueing feature is type 2LAQ-350-G.

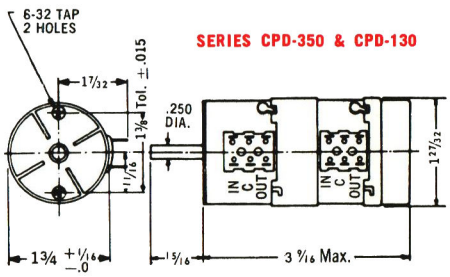
CIRCUITS: For specific circuit information please refer to page 9 on the type 2LA- units listed, and to page 11 for the type 2T- units.

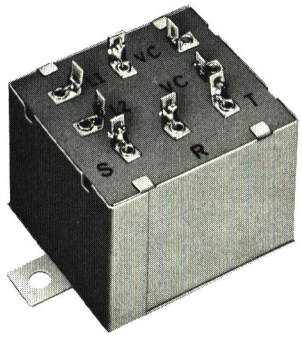


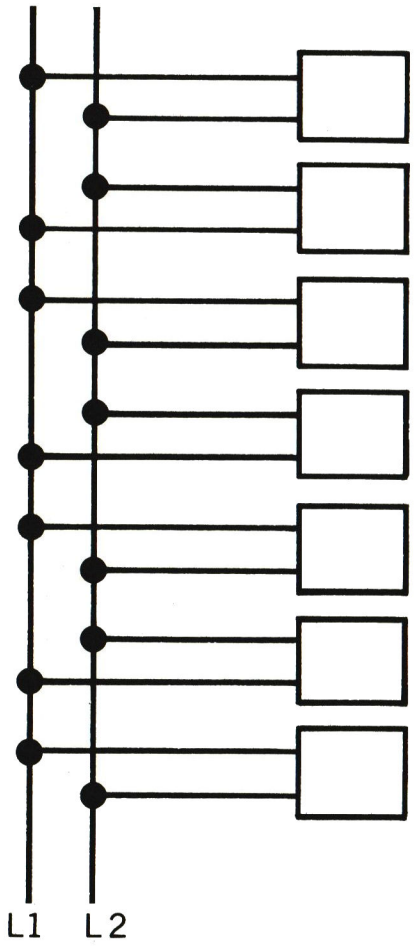
Tol. Dec. ±.001 Fractions ±1/32



Tol. Dec. ±.001 Fractions ±1/32







INTERPHONE AMPLIFIERS

MODELS 90D & 90C

GENERAL: The Model 90D and 90C transistorized interphone amplifiers are designed to meet the most stringent audio communications requirements. They replace the Western Electric Type 101A induction coils commonly used in interphone systems. Each has terminals for fixed or variable sidetone and level control and operates independent of 24 Volt "talk" bus polarity to protect against burnout. Both the 90C and 90D are designed to operate with a Western Electric Type 52A Telephone Headset or equivalent.

TYPICAL VOLTAGES CONFERENCE CONNECTED WITH ONE COIL

	90D AMPLIFIER			90C AMPLIFIER		
No. of Stations	AC Volts Output	DC Volts L1/L2	DC Volts on Amp.	AC Volts Output	DC Volts L1/L2	DC Volts on Amp.
2	4.2	10	8.5	1.0	8.0	6.5
4	4.0	9.5	8.0	.98	8.0	6.5
6	4.0	9.5	8.0	.96	8.0	6.5
8	3.8	9.0	7.5	.95	7.5	6.0
10	3.8	9.0	7.5	.94	7.5	6.0
15	3.6	8.7	7.25	.9	7.5	6.0
20	3.4	8.5	7.0	.87	7.0	5.5
25	3.2	8.4	6.5	.85	7.0	5.5
30	3.0	8.0	6.5	.8	6.5	5.0
35	2.8	8.0	6.5			
50	2.5	7.5	5.5			
75	2.0	6.5	5.0			
100	1.6	5.5	4.3			
200	.6	4.0	2.5			

SPECIFICATIONS:

	Model 90D	Model 90C
Gain:	28 db maximum.	20 db maximum.
Frequency Range:	±2 db 400 — 5000 Hz.	±2 db 400 — 5000 Hz.
Sidetone Level:	−20 db min. from received level at sidetone null.	−20 db min. from received level at sidetone null.
Sidetone Control:	Provision for external fixed or adjustable sidetone null control, 0 to 500 ohms.	Provision for external fixed or adjustable sidetone null control, 0 to 500 ohms.
Number of Conference Connected Units	Up to 200.	Maximum 32
Operating Voltage:	Recommended 5 to 10V D.C. "talk bus" L1 to L2 (either polarity).	Recommended 5 to 10V D.C. "talk bus" L1 to L2 (either polarity).
Operating Current:	30 milliamperes per amplifier at 7.5V D.C. (15V max.)	50 milliamperes per amplifier at 7.5V D.C.
Level Control:	Provision for fixed or variable external level control, 0 to 250 ohms.	Provision for fixed or variable external level control, 0 to 250 ohms.
Size:	1¾" lg. x 1½" wd. x 1¼" ht.	1¾" lg. x 1½" wd. x 1¼" ht.
Weight:	2.5 oz.	2.5 oz.
Headsets:	Designed to operate with a Western Electric Type 52A Telephone headset, or equivalent.	Designed to operate with a Western Electric Type 52A Telephone headset, or equivalent.
Source Voltage:	±24V D.C. through one WE274R Retardation coil.	±24V D.C. through one WE274R Retardation coil for every ten stations on the line.
Loudspeaker:	Approx. 45 ohms voice coil impedance.	
Retardation Coil:	WE274R or 412AR (ADC Products, Minn.).	WE274R or 412AR (ADC Products, Minn.).

ATTENUATION NETWORKS

AUDIO FREQUENCY / MODEL NO. 690 & 693 SERIES

- **Decade Type—Direct Reading**
- **Selectable Input and Output Impedance**
- **Usable to 50 KC**
- **0 to 111 DB in 1 DB Steps or 0 to 110 DB in 0.1 DB Steps**
- **"T" and Balanced "H" Versions Available**
- **Portable or Rack Mounted**

690

Models 690 and 693 Series Attenuation Networks are decade type, direct reading units providing reliable performance throughout the audio frequency spectrum.

Used as secondary attenuation standards, they are especially useful in the performance of general laboratory or production tests where extreme accuracy is secondary. They are used for low level testing at audio frequencies, and can be used at frequencies up to 50,000 cycles with very little decrease in accuracy.

An outstanding feature of these attenuation networks is flexibility; input and output impedances may be changed by means of convenient plug-in pads, available in a broad range of values. Both "T" and Balanced "H" versions of the 690 and 693 series are available as standard units.

They are available as portable or rack mounted units.

Input and output impedance adjusting pads are conveniently located and removable from the front panel.

Series 690 networks come with either balanced (Balanced "H") or unbalanced ("T") networks. The two dial models have a range of 0 to 110 db in steps of 1 db. The three dial models have a range of 0 to 111 db in steps of 0.1 db. The models with balanced networks are arranged so they may be used as unbalanced networks with the same attenuation range, but with one-half the base impedance.

SPECIFICATIONS:

Specifications shown are standard. Variations to fit individual customer requirements are available on request.

MODEL DESCRIPTION					STANDARD IMPEDANCE MATCHING PADS					
					INPUT		OUTPUT		IMPED	LOSS
Portable	Rack Mounting	Basic Imped.	Circuit	Range	T	Bal H	T	Bal H	(ohms)	(db)
T-690-C	T-690-CR	600/600	T	0-110 db in 1 db steps	6811 6812 6813*	6831 6832 6833**	6851 6852 6853*	6871 6872 6873**	500 500 600	3.77 5.00 0
H-690-D	H-690-DR	600/600	Bal. H	0-110 db in 1 db steps	6814 6815	6834 6835	6854 6855	6874 6875	250 250	8.74 10.00
T-693	T-693-R	600/600	T	0-111 db in 0.1 db steps	6816 6817	6836 6837	6856 6857	6876 6877	200 200	9.98 10.00
H-693	H-693-R	600/600	Bal. H	0-111 db in 0.1 db steps	6820 6821	6840 6841	6860 6861	6880 6881	50 50	16.63 20.00

*Standard in "T" models unless otherwise specified. **Standard in Balanced "H" models unless otherwise specified.
Other impedances available upon request.

	Model 690	Model 693
Attenuation Range:	0-110 db	0-111 db

Impedance: 600/600 ohms
Input and output impedances may be changed by changing plug-in pad.
±1% at 1,000 cps ±2% 0 to 20,00 cps
Range may be extended to 50,000 cps with small decrease in accuracy

Power Input: 28 dbm (0.6 watt)

Switches: Heavy duty silver alloy contacts, multi-leaf rotor and slip ring return, positive wiping with individually sprung switch arm leaves

Terminals: Jack-top binding posts

Construction: All metal, two-tone grey cabinet. Also available for rack mounting

AUDIO VIDEO FREQUENCY / MODEL NO. 790 & 795

- **Decade Type—Direct Reading**
- **Wide Frequency Range: 0 to 10 MC**
- **600 Ohms Impedance**
- **0 to 111 DB in 1 DB Steps or 0 to 110 DB in 0.1 DB Steps**
- **Positive Detent—Silver Alloy Switch Contacts**
- **Portable—Rugged**
- **Both "T" and Balanced "H" Units Available**

795

Model 790 and 795 Attenuation Networks are portable, ruggedly constructed, decade type, direct reading units providing accurate performance into the low radio frequency spectrum.

The instruments cover a range from 0 to 10 mc. They have positive detent action and mechanical stops incorporated into each decade.

Stray capacitance and frequency discrimination are minimized through precision design. Silver alloy switch blades and contacts guarantee reliable long term operation.

These attenuator networks are general purpose instruments for use in laboratories, quality control departments and test facilities. They are particularly useful for making accurate measurements of gain or loss on filters, transformers, amplifiers and other equipment.

Both models are equipped with jack-top binding posts.

SPECIFICATIONS:

Variations to fit individual customer requirements are available on request.

	Model 790	Model 795
Attenuation Range:	0-110 db in 1 db steps	0-111 db in 0.1 db steps
Weight:	10¾ lbs	15½ lbs
Impedance:	600 ohms	600 ohms
Resistor Accuracy:	±0.25%	±0.25%
Attenuation Accuracy:	±0.1 db at 1000 cps when terminated in a resistive load	
Frequency Characteristics:	0.1 db per step and 1 db for step decades—±0.2 db, 0 to 10 mc 10 db per step—±0.5 db, 0 to 0.5 mc (with 90 db setting ± 0.5 db at 1 mc Lower values within this tolerance up to 10 mc	

Power Input: 30 dbm (1 watt)

Switches: Heavy duty solid silver alloy contacts and multi-leaf switch rotor. Each leaf of the switch arm is individually sprung to provide self alignment and equalized pressure, assuring low and uniform contact resistance

Terminals: Jack-top binding posts, ¾" spacing. Common terminal of "T" units grounded to chassis
Common terminal of "H" units floating

Construction: All metal two-tone gray cabinet

Model 790	Model 795
5½" x 10" x 7¼"	5½" x 12" x 6-13/16"

Rack mounting available on special order

RADIO FREQUENCY / MODEL NO. 640 & 650

• High Frequency: DC to 225 MC • Constant Impedance: 50 or 73 Ohm • Type "N" or "BNC" Connectors

RF Attenuators 640/650 series are designed for both laboratory and production use.

Compact and flexible, available in 8 or 10 steps of attenuation; either 1 or 2 decibel steps with a total loss of 80 or 100 db, these networks have constant impedance for input and output.

Model 640 and 650 are mounted in a metal case while series 640R and 650R are available for rack mounting.

SPECIFICATIONS:

Frequency Range: DC to 225 mc, up to 100 db total

Shielding: All units are individually shielded

Impedance: 50 or 73 ohms (other impedances are available upon request, and will be shown by the dash number after the type number)

Circuit: Constant input and output impedance, unbalanced

Impedance Accuracy: Essentially flat from 0-225 mc up to 100 db

Resistor Accuracy: Within ±2% at DC

Level of Operation: +24 db (¼ watt) maximum input

Mounting: Series 640/650 are portable type equipments contained in a gray metal case 10″ lg x 5″ wide x 5″ deep

Series 640R/650R are designed to mount on a standard 19″ wide relay rack

Dimensions: Series 640 and 650—5″ x 10″ x 5″

Series 640R and 650R—5¼″ x 19″ For rack mounting

Connectors: Receptacles are supplied. Cable plugs required (not furnished)

640

ATTENUATION

MODEL	IMPEDANCE	RECEPTACLE	PUSH BUTTONS	DB PER STEP	TOTAL LOSS
640-50	50 ohms	"N"	8	1	80
641-50	50	"BNC"	8	1	80
650-50	50	"N"	10	1	100
651-50	50	"BNC"	10	1	100
650-73	73	"N"	10	1	100
651-73	73	"BNC"	10	1	100

RADIO FREQUENCY / MODEL NO. 540 & 550

• High Frequency: DC to 225 MC • Push Button, Additive • Impedance 50 or 75 Ohms
• Type "N" or "BNC" Connectors

R F Attenuators 540/550 series are designed for inserting accurate amounts of loss into a circuit without altering other characteristics of the circuit.

They consist of groups of pi type networks with each individual network controlled by a push-button switch.

The push-buttons permit any combination of buttons to be selected and locked at one time.

Model 540 has four (4) push-button switches, and model 550 has five (5) push-button switches. RFA models are furnished with N or UG/58-U receptacles, while RFB models are furnished with BNC or UG/185-U receptacles on each end.

Typical V.S.W.R.

MODEL	70 MC	150 MC	225 MC
RFB-540-50	1.25:1 max	1.35:1 max	2.0:1 max
RFA-550-50	1.25:1 max	1.35:1 max	2.0:1 max
RFB-540-73	1.1:1 max	1.2:1 max	1.25:1 max

SPECIFICATIONS:

Impedance: Standard impedances are 50 ohm or 73 ohm. Indicated by —50 or —73 after type number shown in table

Essentially flat from 0 to 225 mc

Circuit: Constant input and output impedance, unbalanced

Resistor Accuracy: Within ±2% at D.C.

Connectors: Receptacles are supplied

Cable plugs required are as follows:

Attenuator	Cable Plug
RFA Series	UG-21 A/U
RFB Series, 50 ohms	UG-88/U
RFB Series, 73 ohms	UG-260/U

Frequency Range: DC to 225 mc

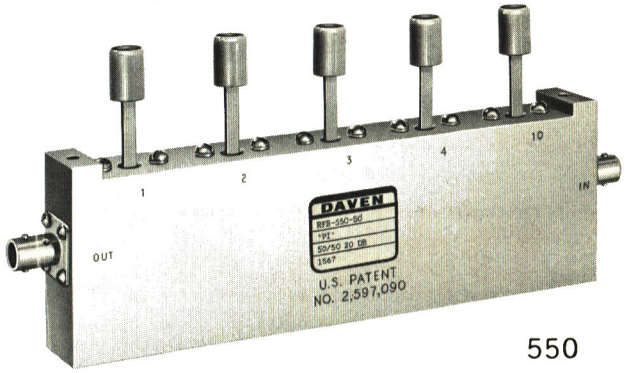
Impedance Accuracy: Terminal impedance of loss network is essentially flat from 0 to 225 mc

Mounting: Series—540 two #10-32 screws on 5⅝″ centers

Series 550—two #10-32 screws on 7″ centers

Holes for push rods should be ¼″ diameter

Push rods are on 1⅜″ centers with the end push rods ¾″ from the mounting hole center



550

Type	No. of Buttons	Loss per button	Total Loss
RFA and RFB—540	4	1, 2, 3, 4 db	10
RFA and RFB—541	4	10, 20, 20, 20 db	70
RFA and RFB—542	4	2, 4, 6, 8 db	20
RFA and RFB—543	4	20, 20, 20, 20 db	80
RFA and RFB—550	5	1, 2, 3, 4, 10 db	20
RFA and RFB—551	5	10, 10, 20, 20, 20 db	80
RFA and RFB—552	5	2, 4, 6, 8, 20 db	40

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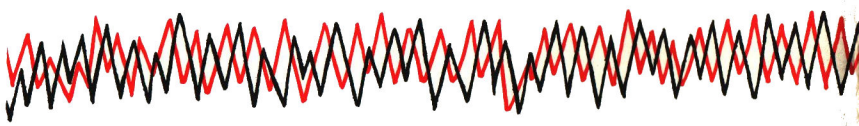

11-67 - 10M DRW/SPR

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