

# DAVEN



*Attenuators  
Switches  
Resistors  
Laboratory Equipment*

•• FOR BROADCAST • SOUND • LABORATORY • TELEVISION • INDUSTRY





# FOREWORD

**I**N preparing this catalog, we have tried to anticipate the needs and problems of our customers from an engineering and purchasing viewpoint. To minimize the search for technical material, pertinent engineering data is offered relative to our various products. The information presented consists of basic facts plus the answers to salient questions that have been received over a period of years. To facilitate ordering, we have provided illustrations, descriptions, recommended uses and detailed tabulations for all of our standard units.

Daven attenuators, measuring equipment, precision wire wound resistors and rotary switches, as they are offered today, are the products of many years of specialization, research and practical experience. In this catalog, we have listed units as standard because of their popularity or adaptability in the industry.

The Daven Company welcomes engineering criticism and suggestions. It is this friendly and helpful cooperation of the engineering staffs of our customers that has contributed materially to the development and improvement of this line of products.

As this catalog goes to press, newly improved designs are being studied and tested in accordance with our policy of producing quality equipment to meet the most current needs. If the units listed herein do not adequately fill your requirements, we will be pleased to receive your further inquiries or specifications.



# GENERAL INTRODUCTION TO ATTENUATORS

The following section on attenuators lists Daven step-type gain 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 gain controls in audio program circuits. However, due to their reliability, we have had many requests to modify the design of these units in order to meet the requirements of special applications. We have listed a wide variety of controls including radio frequency attenuators, special units for precision measuring equipment, tone compensating attenuators and stereophonic controls. Since these units are discussed separately, the following sections deal only with our conventional controls for use in audio circuits.

## 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

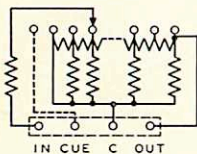
stating here our interpretation of several of the terms used below. In this catalog, a low level mixer controls the signal between the source and the pre-amplifier, a high level mixer controls the signal between the preamplifier and the main amplifier. Low impedance circuits are those having impedances below 1,000 ohms.

## SUGGESTED USES:

### UNBALANCED OR ASYMMETRICAL NETWORK

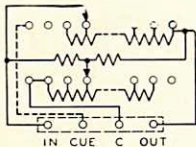
Circuit or Type      Suggested Applications

#### Ladder



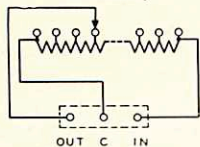
1. Low impedance high level mixer.
2. Main gain.

#### "T"



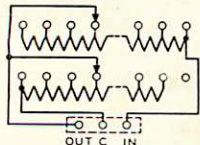
1. Low impedance low or high level mixer.
2. Main gain.
3. Measuring equipment.
4. Meter multiplier.

#### Potentiometer (Potential Divider)



1. High impedance main gain.
2. Measuring equipment.

#### "L"

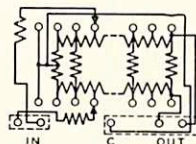


1. Measuring equipment.

### BALANCED OR SYMMETRICAL NETWORK

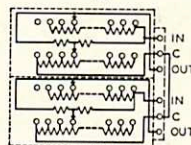
Circuit or Type      Suggested Applications

#### Balanced Ladder



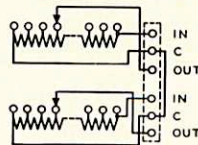
1. Low impedance high level mixer.
2. Main gain.

#### Balanced "H"



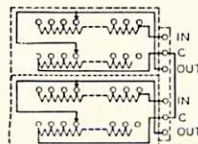
1. Low impedance low or high level mixer.
2. Main gain.
3. Measuring equipment.

#### Balanced Potentiometer



1. High impedance main gain.
2. Measuring equipment.

#### Balanced "L"



1. Measuring equipment.



# GENERAL INTRODUCTION TO ATTENUATORS

## MIXER DESIGN CONSIDERATIONS:

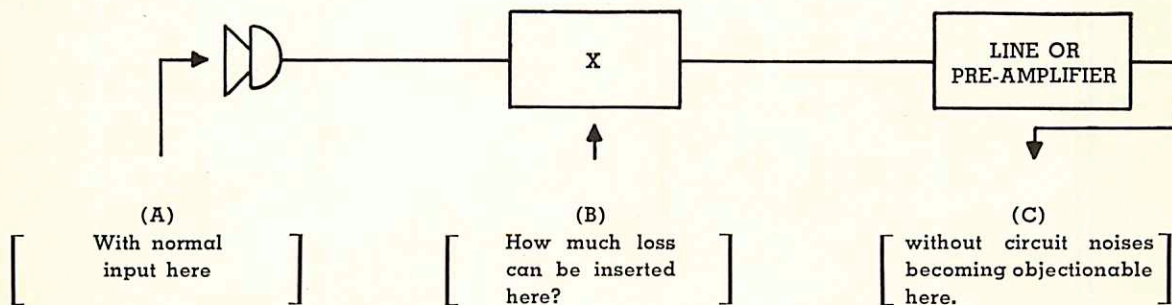
In addition to balanced or unbalanced considerations, in selecting an attenuator for a particular application, the output level and impedance of the signal source, band width and required output level and impedance must be carefully considered. Circuit noises (thermal shock and hum pick-up) originating 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		18.0
3	9.5	15.5		21.5
4	12.0	18.0		24.0
5	14.0	20.0		26.0
6	15.6	21.6		27.6
7	16.9	22.9		28.9
8	18.1	24.1		30.1
			NO ADDITIONAL LOSS	

If the number of required channels are 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 pre-amplifiers 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 here. If a master is used it should be a "T."

NOTE: Other types of mixer circuits are illustrated on page 4. The parallel type has been considered, since this is the most popular type.

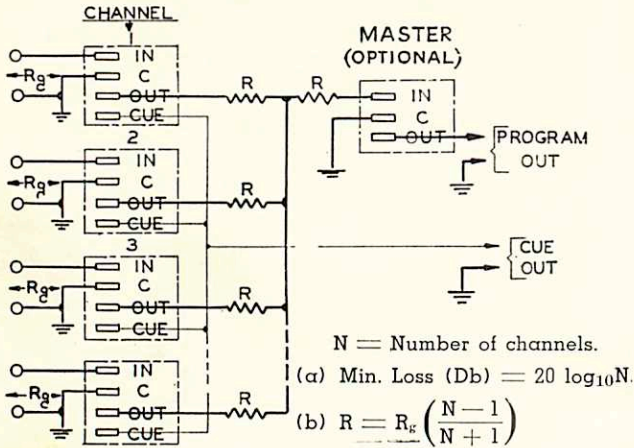


# SUGGESTED MIXER CIRCUITS

## DESIGN NOTES:

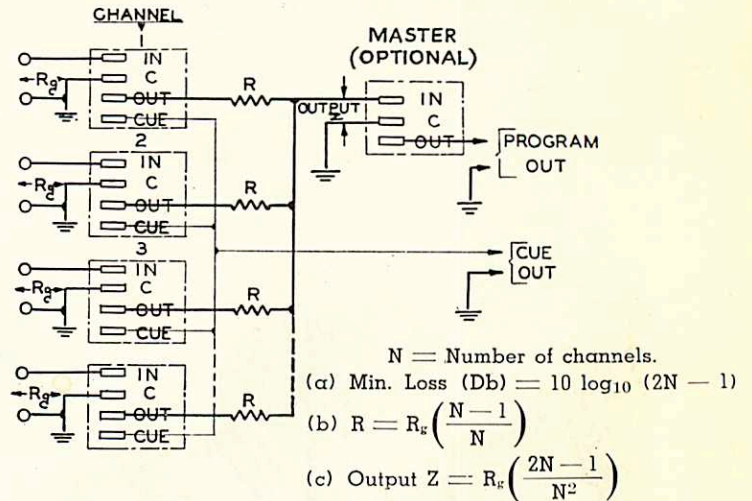
1. For individual channels we recommend tapered controls without detents. For Master Gain, we suggest a linear control with detents.
2. Ground the "C" of each individual channel.
3. When using 1:1 ratio Ladders in each channel add 6 Db to Min. Loss tabulated below. When using a ladder also for a Master 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)



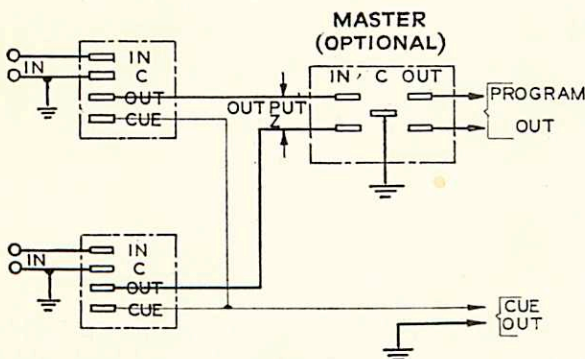
(c) No. of channels	2	3	4	5	6	7	8
Min. Loss Db	6.0	9.5	12.0	14.0	15.6	16.9	18.1
(see design note 3)							
R	$\frac{R_k}{3}$	$\frac{R_k}{2}$	$\frac{3R_k}{5}$	$\frac{2R_k}{3}$	$\frac{5R_k}{7}$	$\frac{3R_k}{4}$	$\frac{7R_k}{9}$
	200	300	360	400	430	450	467

Fig. 2—Unequal Z Ratio Unbalanced Parallel Type Mixer  
(Cue circuit shown in light lines optional)



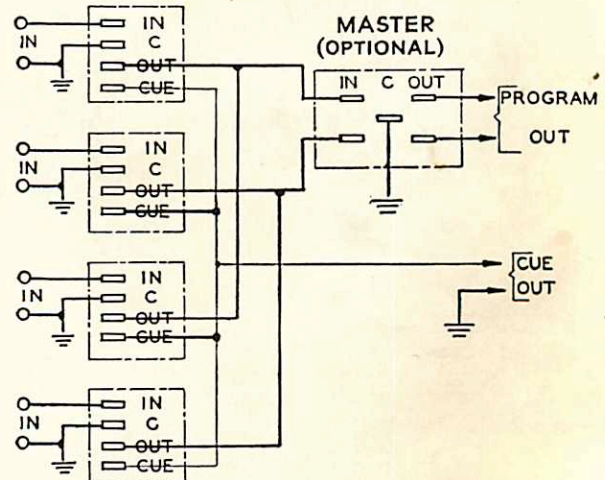
(d) No. of channels	2	3	4	5	6	7	8
Min. Loss Db	4.8	7.0	8.4	9.5	10.4	11.1	11.8
(see design note 3)							
R	$\frac{R_k}{2}$	$\frac{2R_k}{3}$	$\frac{3R_k}{4}$	$\frac{4R_k}{5}$	$\frac{5R_k}{6}$	$\frac{6R_k}{7}$	$\frac{7R_k}{8}$
	200	400	450	480	500	514	525
Output Z	$\frac{3R_k}{4}$	$\frac{5R_k}{9}$	$\frac{7R_k}{16}$	$\frac{9R_k}{25}$	$\frac{11R_k}{36}$	$\frac{13R_k}{49}$	$\frac{15R_k}{64}$
(Master or Repeat Coil)	450	333	262.5	216	187.5	160	140

Fig. 3—Two Channel Series Mixer  
(Cue circuit shown in light lines optional)



- (a) Output Z =  $2 \times$  input Z
- (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.  
(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)



# FACTS ABOUT LADDER ATTENUATORS

**DEFINITION:**

The term *Ladder Attenuator* refers to that group of volume controls consisting of consecutive " $\pi$ " 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:**

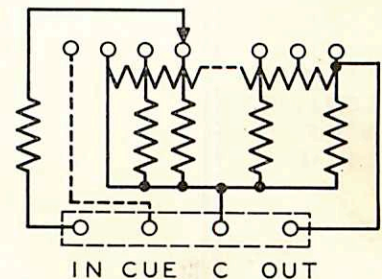
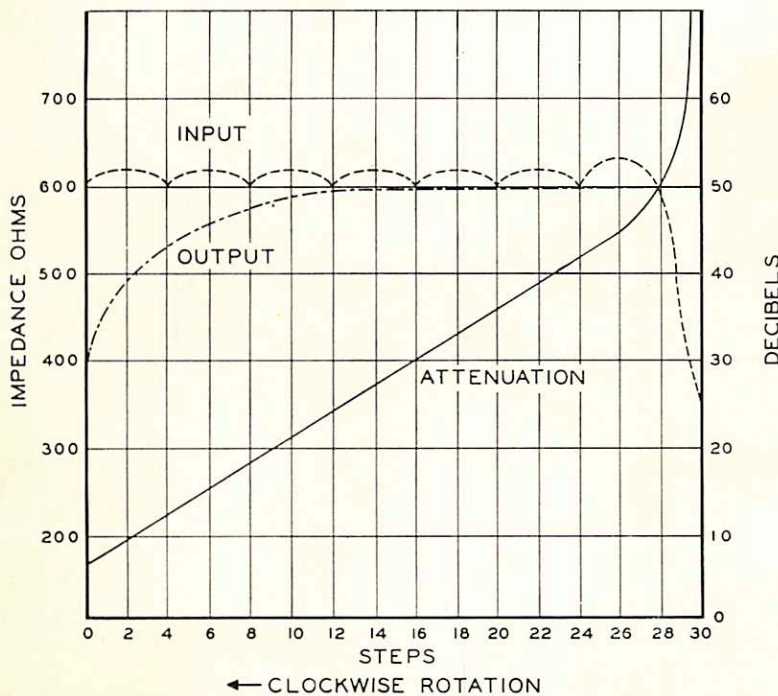
An unbalanced network is recommended if one side of the circuit is at ground potential or may be grounded. Circuits in which both sides of the line are at equal potential above ground require balanced networks. The circuit of a balanced ladder is essentially two unbalanced networks coupled together on 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)

**USE:**

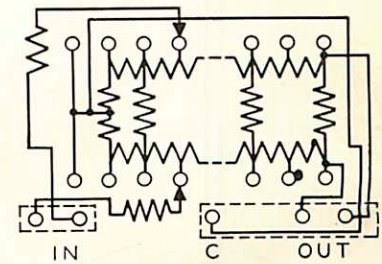
Ladder attenuators may be used as volume controls in both low and high level multi-channel mixers, and in special types of measuring equipment. However, their chief use is as individual channel controls in high level mixers. Caution should be exercised in laying out the circuits when using this type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



↑ Above—Circuit of Unbalanced ladder with dotted in cueing position.

← Typical characteristics of a ladder network.

↓ Below—Circuit of Balanced ladder.

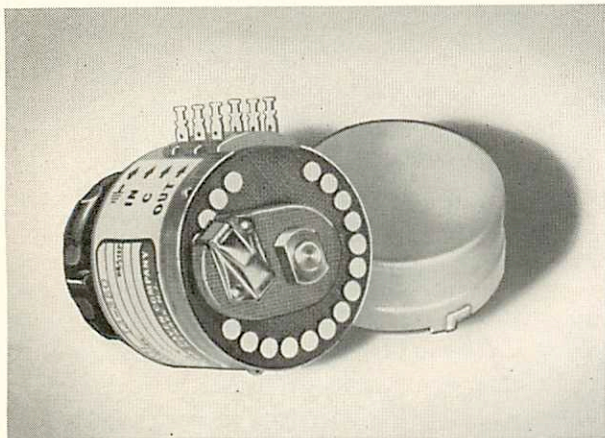




\$8.50

# UNBALANCED LADDER NETWORKS

SERIES LA-350 \$8.50 - \$9.00 w/DETENTS 20 STEPS



\$8.50

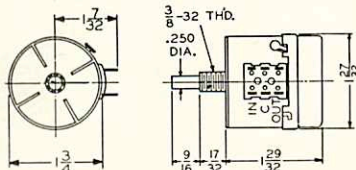
The Daven LA-350 series are low impedance controls for use in broadcast equipment and public address systems. Because of the compact design of these units, they are very well suited for use in portable equipment or in installations where limited mounting space is a factor. Due to the low price of these attenuators, they may readily be adapted as mixer or master gain controls in popular priced equipment.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, LAQ-350-G would be a 600/600 ohm ladder with a cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a LAQ-350-EF, 250/500Ω, cannot be used as a LAQ-350-FE, 500/250Ω, as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
LA-350-A	30/30	20 steps, 2 DB per step. Tapered on last steps to cut-off. (Infinity) No Detents	LA-352-A	30/30	20 steps, 2 DB per step. No taper, last step cut-off. (Infinity) Detents Attached
LA-350-B	50/50		LA-352-AH	30/60	
LA-350-BJ	50/100		LA-352-B	50/50	
LA-350-C	125/125		LA-352-BJ	50/100	
LA-350-K	150/150		LA-352-C	125/125	
LA-350-KF	150/500		LA-352-K	150/150	
LA-350-KG	150/600		LA-352-KF	150/500	
LA-350-D	200/200		LA-352-KG	150/600	
LA-350-E	250/250		LA-352-D	200/200	
LA-350-EF	250/500		LA-352-E	250/250	
LA-350-F	500/500	LA-352-F	500/500		
LA-350-G	600/600	LA-352-G	600/600		
LA-351-A	30/30	20 steps, 1.5 DB per step. No taper, last step cut-off. (Infinity) Detents Attached	LA-353-A	30/30	20 steps, 2 DB per step, 40 DB total. Detents Attached
LA-351-AH	30/60		LA-353-AH	30/60	
LA-351-B	50/50		LA-353-B	50/50	
LA-351-BJ	50/100		LA-353-BJ	50/100	
LA-351-C	125/125		LA-353-C	125/125	
LA-351-K	150/150		LA-353-K	150/150	
LA-351-KF	150/500		LA-353-KF	150/500	
LA-351-KG	150/600		LA-353-KG	150/600	
LA-351-D	200/200		LA-353-D	200/200	
LA-351-E	250/250		LA-353-E	250/250	
LA-351-F	500/500	LA-353-F	500/500		
LA-351-G	600/600	LA-353-G	600/600		

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

CONTACT SPACING: 15 degrees between centers.



TOTAL DEGREE OF ROTATION: 300 degrees.

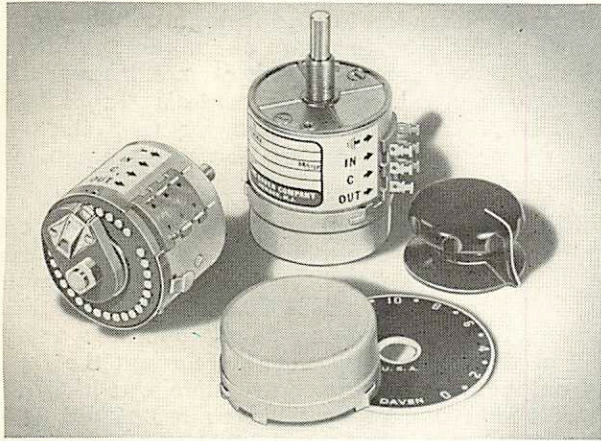
For complete specifications on this series see page 51.



# UNBALANCED LADDER NETWORKS

## SERIES LA-130

## 30 STEPS



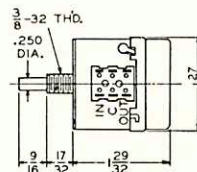
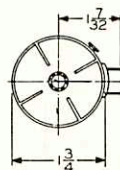
In compact high quality systems where limited mounting space is available, the LA-130 series furnishes a wide range of control in a 1 3/4" diameter housing. This series is physically interchangeable with the LA-350 series, and provides ten additional steps of attenuation.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, LAQ-130-G would be a 600/600Ω ladder network with a cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a LAQ-130-EF, 250/500Ω, cannot be used as a LAQ-130-FE, 500/250Ω, as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
LA-130-A	30/30	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	LA-132-A	30/30	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
LA-130-B	50/50		LA-132-B	50/50	
LA-130-C	125/125		LA-132-C	125/125	
LA-130-K	150/150		LA-132-K	150/150	
LA-130-KF	150/500		LA-132-KF	150/500	
LA-130-KG	150/600		LA-132-KG	150/600	
LA-130-D	200/200		LA-132-D	200/200	
LA-130-E	250/250		LA-132-E	250/250	
LA-130-EF	250/500		LA-132-EF	250/500	
LA-130-F	500/500		LA-132-F	500/500	
LA-130-G	600/600	LA-132-G	600/600		
LA-131-A	30/30	30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	LA-133-A	30/30	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
LA-131-B	50/50		LA-133-B	50/50	
LA-131-C	125/125		LA-133-C	125/125	
LA-131-K	150/150		LA-133-K	150/150	
LA-131-KF	150/500		LA-133-KF	150/500	
LA-131-KG	150/600		LA-133-KG	150/600	
LA-131-D	200/200		LA-133-D	200/200	
LA-131-E	250/250		LA-133-E	250/250	
LA-131-F	500/500		LA-133-F	500/500	
LA-131-G	600/600		LA-133-G	600/600	

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

CONTACT SPACING: 11 1/4 degrees  
between centers.



TOTAL DEGREE OF ROTATION:  
337 1/2 degrees.

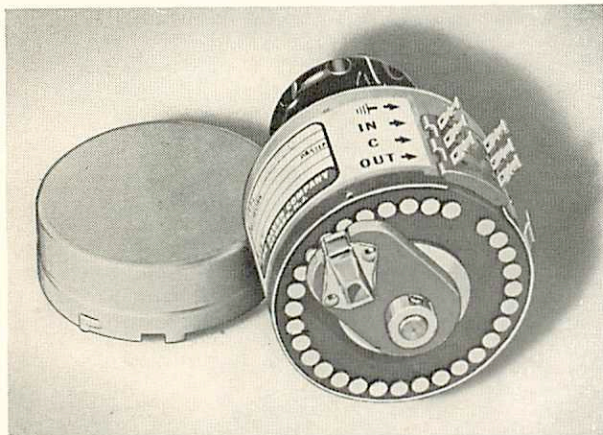
For complete specifications on this series see page 51.



# UNBALANCED LADDER NETWORKS

## SERIES LA-730

## 30 STEPS



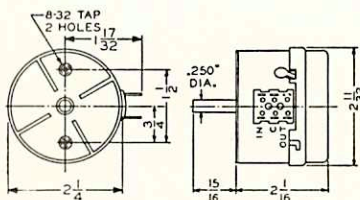
The LA-730 series provides 30 steps of attenuation and is recommended for use in high quality equipment requiring a wide range of control. The LA-730 and LA-731 are provided with a smooth taper and are recommended as mixer controls. The LA-732 and LA-733 are recommended for use either as master gain controls or for measuring equipment application.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, LAQ-730-G would be a 600/600Ω ladder with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a LAQ-730-EF, 250/500Ω cannot be used as a LAQ-FE, 500/250Ω as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
LA-730-A	30/30	SUGGESTED MIXER 30 steps, 1.5 DB per step. Tapered on last steps to cut-off. (Infinity) No Detents.	LA-732-A	30/30	SUGGESTED MASTER 30 steps, 1.5 DB per step. No taper, last step cut-off. (Infinity) Detents Attached.
LA-730-B	50/50		LA-732-B	50/50	
LA-730-C	125/125		LA-732-C	125/125	
LA-730-K	150/150		LA-732-K	150/150	
LA-730-KF	150/500		LA-732-KF	150/500	
LA-730-KG	150/600		LA-732-KG	150/600	
LA-730-D	200/200		LA-732-D	200/200	
LA-730-E	250/250		LA-732-E	250/250	
LA-730-EF	250/500		LA-732-F	500/500	
LA-730-F	500/500		LA-732-G	600/600	
LA-730-G	600/600				
LA-731-A	30/30	SUGGESTED MIXER 30 steps, 2 DB per step. Tapered on last steps to cut-off. (Infinity) No Detents.	LA-733-A	30/30	SUGGESTED MASTER 30 steps, 2 DB per step. No taper, last step cut-off. (Infinity) Detents Attached.
LA-731-B	50/50		LA-733-B	50/50	
LA-731-C	125/125		LA-733-C	125/125	
LA-731-K	150/150		LA-733-K	150/150	
LA-731-KF	150/500		LA-733-KF	150/500	
LA-731-KG	150/600		LA-733-KG	150/600	
LA-731-D	200/200		LA-733-D	200/200	
LA-731-E	250/250		LA-733-E	250/250	
LA-731-F	500/500		LA-733-F	500/500	
LA-731-G	600/600		LA-733-G	600/600	

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

CONTACT SPACING:  $11\frac{1}{4}$  degrees between centers.



TOTAL DEGREE OF ROTATION:  $337\frac{1}{2}$  degrees.

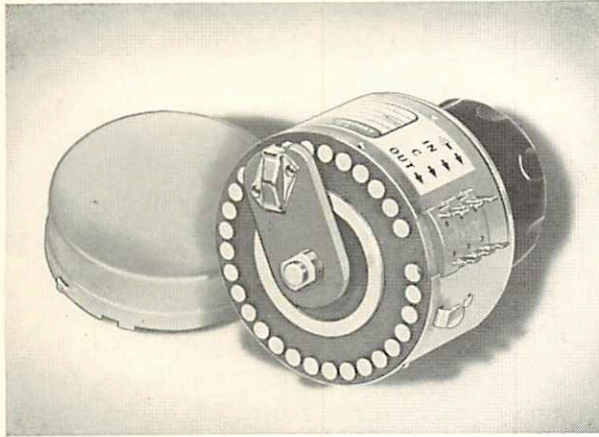
For complete specifications on this series see page 51.



# UNBALANCED LADDER NETWORKS

## SERIES LA-220

## 30 STEPS



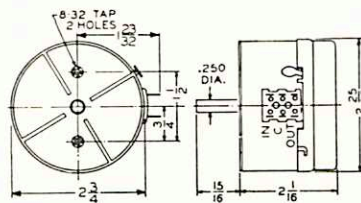
From the standpoint of popularity, we consider the Series LA-220 ladder network the leader in its field. Its velvet smooth control, noise-free operation and large number of steps makes this sturdy control extremely useful in high level multi-channel studio mixers.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, LAQ-220-G would be a 600/600Ω ladder with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a LAQ-220-EF, 250/500Ω cannot be used as a LAQ-220-FE, 500/250Ω, as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
LA-220-A	30/30	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	LA-222-A	30/30	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
LA-220-B	50/50		LA-222-B	50/50	
LA-220-K	150/150		LA-222-K	150/150	
LA-220-KF	150/500		LA-222-KF	150/500	
LA-220-KG	150/600		LA-222-KG	150/600	
LA-220-D	200/200		LA-222-D	200/200	
LA-220-E	250/250		LA-222-E	250/250	
LA-220-EF	250/500		LA-222-EF	250/500	
LA-220-F	500/500		LA-222-F	500/500	
LA-220-G	600/600		LA-222-G	600/600	
LA-221-A	30/30	30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	LA-223-A	30/30	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
LA-221-B	50/50		LA-223-B	50/50	
LA-221-C	125/125		LA-223-C	125/125	
LA-221-K	150/150		LA-223-K	150/150	
LA-221-KF	150/500		LA-223-KF	150/500	
LA-221-KG	150/600		LA-223-KG	150/600	
LA-221-D	200/200		LA-223-D	200/200	
LA-221-E	250/250		LA-223-E	250/250	
LA-221-F	500/500		LA-223-F	500/500	
LA-221-G	600/600		LA-223-G	600/600	

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

CONTACT SPACING: 11¼ degrees between centers.



TOTAL DEGREE OF ROTATION: 337½ degrees.

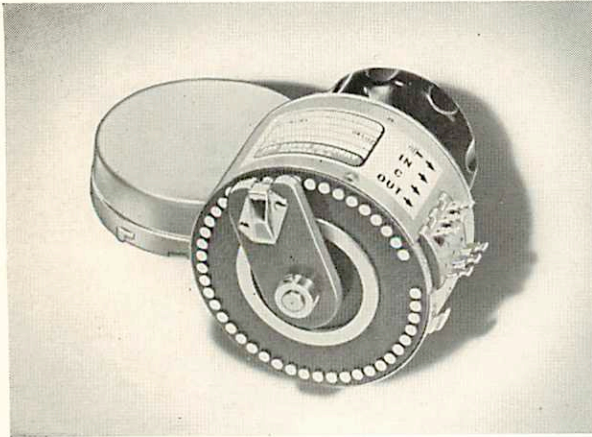
For complete specifications on this series see page 51.



# UNBALANCED LADDER NETWORKS

## SERIES LA-745

## 45 STEPS



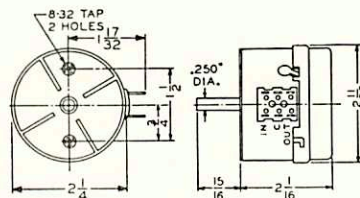
The increased number of steps offered in Series LA-745 and LA-345 ladder attenuators offer a means of obtaining appreciable total attenuation in relatively small DB steps, without any increase in the overall dimensions.

For usual applications a 20 or 30 step unit provides smooth control. However, in high quality sound and film recording and broadcast control work, an abrupt change in signal level during a sustained note may superimpose an objectionable transient disturbance. In this type of work, a large range of total attenuation before signal cut-off is also necessary. To meet this type of service, the Series LA-745 and LA-345 are offered. (Continued on following page.)

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
LA-745-A	30/30	45 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents	LA-747-A	30/30	45 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached
LA-745-B	50/50		LA-747-B	50/50	
LA-745-C	125/125		LA-747-C	125/125	
LA-745-K	150/150		LA-747-K	150/150	
LA-745-KF	150/500		LA-747-KF	150/500	
LA-745-KG	150/600		LA-747-KG	150/600	
LA-745-D	200/200		LA-747-D	200/200	
LA-745-E	250/250		LA-747-E	250/250	
LA-745-EF	250/500		LA-747-EF	250/500	
LA-745-F	500/500	LA-747-F	500/500		
LA-745-G	600/600	LA-747-G	600/600		
LA-746-A	30/30	45 steps, 1 DB per step. Tapered on last steps to cut-off (infinity). No Detents	LA-748-A	30/30	45 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached
LA-746-B	50/50		LA-748-B	50/50	
LA-746-C	125/125		LA-748-C	125/125	
LA-746-K	150/150		LA-748-K	150/150	
LA-746-KF	150/500		LA-748-KF	150/500	
LA-746-KG	150/600		LA-748-KG	150/600	
LA-746-D	200/200		LA-748-D	200/200	
LA-746-E	250/250		LA-748-E	250/250	
LA-746-F	500/500		LA-748-F	500/500	
LA-746-G	600/600	LA-748-G	600/600		

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

SPACING:  $7\frac{1}{2}$  degrees between centers.



TOTAL DEGREE OF ROTATION:  
 $337\frac{1}{2}$  degrees.

For complete specifications on this series see page 51.



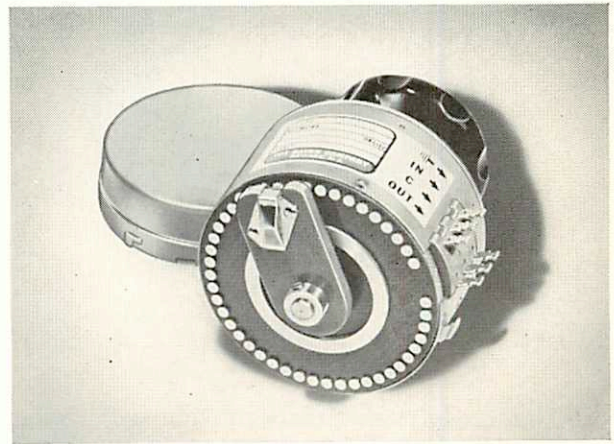
# UNBALANCED LADDER NETWORKS

## SERIES LA-345

## 45 STEPS

(For description of LA-345, see preceding page.)

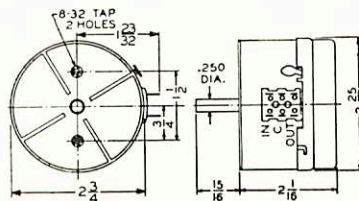
**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this and the preceding page, add the letter "Q" after the type letters. For example, a LAQ-745-G would be a 600/600 ohm ladder with cueing position. The LAQ-345-G would also be a 600/600 ohm ladder with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a LAQ-745-EF, 250/500 cannot be used as a LAQ-745-FE, 500/250Ω; and a LAQ-345-EF, 250/500Ω cannot be used as a LAQ-345-FE, 500/250Ω, as this would move the cueing operation to the output side.



TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
LA-345-A	30/30	45 steps, 1.5 DB per step. Tapered on last steps to cut-off. (Infinity) No Detents	LA-347-A	30/30	45 steps, 1.5 DB per step. No taper, last step cut-off. (Infinity) Detents Attached
LA-345-B	50/50		LA-347-B	50/50	
LA-345-C	125/125		LA-347-C	125/125	
LA-345-K	150/150		LA-347-K	150/150	
LA-345-KF	150/500		LA-347-KF	150/500	
LA-345-KG	150/600		LA-347-KG	150/600	
LA-345-D	200/200		LA-347-D	200/200	
LA-345-E	250/250		LA-347-E	250/250	
LA-345-EF	250/500		LA-347-F	500/500	
LA-345-F	500/500		LA-347-G	600/600	
LA-345-G	600/600				
LA-346-A	30/30	45 steps, 1 DB per step. Tapered on last steps to cut-off. (Infinity) No Detents	LA-348-A	30/30	45 steps, 2 DB per step. No taper, last step cut-off. (Infinity) Detents Attached
LA-346-B	50/50		LA-348-B	50/50	
LA-346-C	125/125		LA-348-C	125/125	
LA-346-K	150/150		LA-348-K	150/150	
LA-346-KF	150/500		LA-348-KF	150/500	
LA-346-KG	150/600		LA-348-KG	150/600	
LA-346-D	200/200		LA-348-D	200/200	
LA-346-E	250/250		LA-348-E	250/250	
LA-346-F	500/500		LA-348-F	500/500	
LA-346-G	600/600		LA-348-G	600/600	

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

CONTACT SPACING:  $7\frac{1}{2}$  degrees between centers.

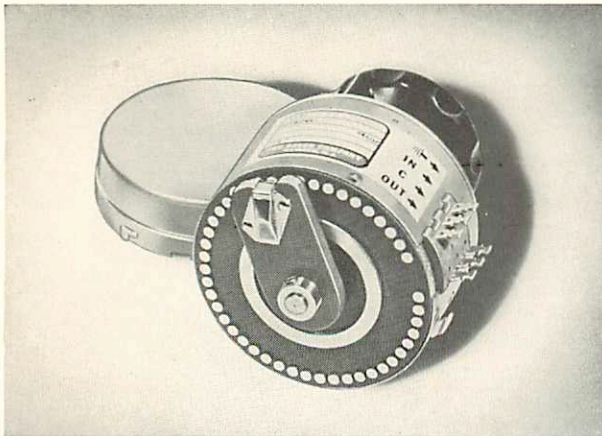


TOTAL DEGREE OF ROTATION:  $337\frac{1}{2}$  degrees.

For complete specifications on this series see page 51.



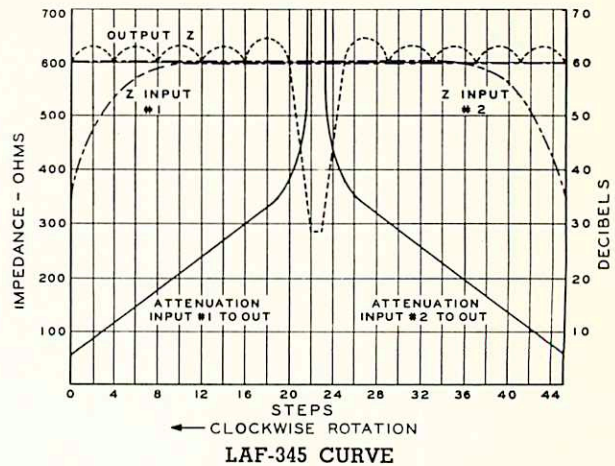
# FADERS FOR DUAL TURNTABLES



SERIES LAF-345

These Ladder Network Faders provide a convenient means of fading from one pick-up to another by means of a single knob.

The circuit has two inputs feeding into a single output which makes it particularly suited for dual turntable use. The signal cut-off (infinity) occurs at the center contact which has a positive detent or indexing position. Rotating the knob clockwise from the center position increases the signal from one pick-up and rotating counter-clockwise from the



center position increases the signal from the other pick-up. Each half of the contacts have a gradual smooth taper to infinity to completely fade a single recording. The Series LAF-220 has 15 steps on each side and the Series LAF-345 has 22 steps on each side of the center position to accomplish the fading.

**CUEING:** To obtain controls with the cueing position, add the letter "Q" after the type. For example, LAFQ-220-G would be a 600/600/600 ohm LAF-220-G fader with a cueing position.

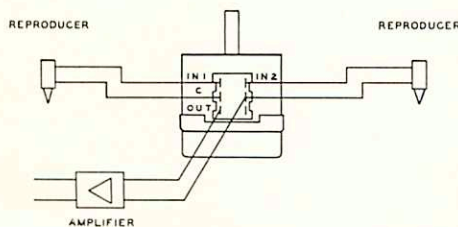
## SERIES LAF-220

TYPE	TERMINAL IMPEDANCE	ATTENUATION
LAF-220-K	150/150/150	31 steps total, 15 steps, 2 DB per step on each half of the control tapered towards the center to cut-off (infinity) position. Clockwise and counter-clockwise.
LAF-220-D	200/200/200	
LAF-220-E	250/250/250	
LAF-220-F	500/500/500	
LAF-220-G	600/600/600	
LAF-220-EC	250/250/125	
LAF-220-FE	500/500/250	
LAF-221-K	150/150/150	31 steps total, 15 steps, 3 DB per step on each half of the control tapered towards the center to cut-off (infinity) position. Clockwise and counter-clockwise.
LAF-221-D	200/200/200	
LAF-221-E	250/250/250	
LAF-221-F	500/500/500	
LAF-221-G	600/600/600	
LAF-221-EC	250/250/125	
LAF-221-FE	500/500/250	

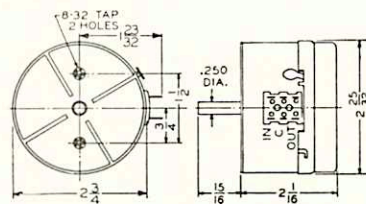
## SERIES LAF-345

TYPE	TERMINAL IMPEDANCE	ATTENUATION
LAF-345-K	150/150/150	45 steps total, 22 steps, 2 DB per step on each half of the control tapered towards the center to cut-off (infinity) position. Clockwise and counter-clockwise.
LAF-345-D	200/200/200	
LAF-345-E	250/250/250	
LAF-345-F	500/500/500	
LAF-345-G	600/600/600	
LAF-345-EC	250/250/125	
LAF-345-FE	500/500/250	
LAF-346-K	150/150/150	45 steps total, 22 steps, 3 DB per step on each half of the control tapered towards the center to cut-off (infinity) position. Clockwise and counter-clockwise.
LAF-346-D	200/200/200	
LAF-346-E	250/250/250	
LAF-346-F	500/500/500	
LAF-346-G	600/600/600	
LAF-346-EC	250/250/125	
LAF-346-FE	500/500/250	

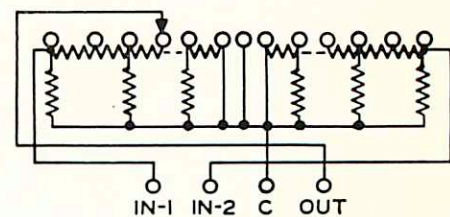
Special impedances or decible steps other than those shown are available.



SERIES LAF-220  
CONTACT SPACING: 11.25 degrees  
between centers.



SERIES LAF-345  
CONTACT SPACING: 7.5 degrees  
between centers.



SERIES LAF-220 & LAF-345  
TOTAL DEGREE OF ROTATION:  
337.5 degrees.

For complete specifications on this series see page 51.



# BALANCED LADDER NETWORKS

## SERIES BAL-255

## 20 STEPS



The Type BAL-255 is recommended for use in locations where space is a major consideration. Electrically this series is interchangeable with the BAL-320, but requires much less panel mounting space,

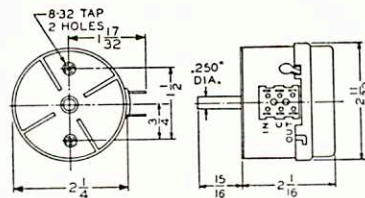
due to the smaller diameter. The number of steps of attenuation, degree of rotation and accuracy are the same as the larger unit. Since the BAL-255 is tapered to infinity, no detents are supplied. The types BAL-256, 257 and 258 may be used as master gain controls and are supplied with detents.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters—for example, BALQ-255. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, BALQ-255-EF, 250/500Ω cannot be used as a BALQ-255-FE, 500/250Ω. There are 6 insulated terminals available, and when the cueing position is used on these controls, the "C" terminal is grounded to the case and brought to a grounded case lug. The terminals are then 2 for "OUT", 2 for "IN" and 2 for "CUE".

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BAL-255-A	30/30	20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	BAL-257-A	30/30	20 steps 2 DB per step. No taper, 40 DB total. Detents Attached.
BAL-255-B	50/50		BAL-257-B	50/50	
BAL-255-K	150/150		BAL-257-K	150/150	
BAL-255-KF	150/500		BAL-257-KF	150/500	
BAL-255-KG	150/600		BAL-257-KG	150/600	
BAL-255-D	200/200		BAL-257-D	200/200	
BAL-255-E	250/250		BAL-257-E	250/250	
BAL-255-EF	250/500		BAL-257-EF	250/500	
BAL-255-F	500/500		BAL-257-F	500/500	
BAL-255-G	600/600		BAL-257-G	600/600	
BAL-256-A	30/30	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	BAL-258-A	30/30	20 steps, 1.5 DB per step. No taper, 30 DB total. Detents Attached.
BAL-256-B	50/50		BAL-258-B	50/50	
BAL-256-K	150/150		BAL-258-K	150/150	
BAL-256-KF	150/500		BAL-258-KF	150/500	
BAL-256-KG	150/600		BAL-258-KG	150/600	
BAL-256-D	200/200		BAL-258-D	200/200	
BAL-256-E	250/250		BAL-258-E	250/250	
BAL-256-F	500/500		BAL-258-F	500/500	
BAL-256-G	600/600		BAL-258-G	600/600	

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

CONTACT SPACING: 15 degrees  
between centers.



TOTAL DEGREE OF ROTATION:  
300 degrees.

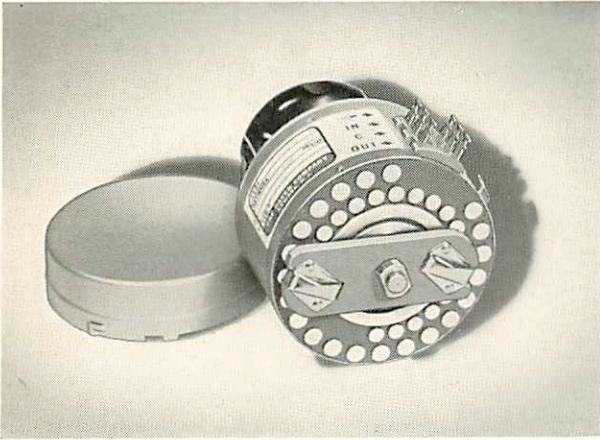
For complete specifications on this series see page 51.



# BALANCED LADDER NETWORKS

## SERIES BAL-320

## 20 STEPS



We recommend using the Series BAL-320 for use in circuits where both sides of the line are at equal potential above ground. These controls are essentially two unbalanced ladder networks inserted in

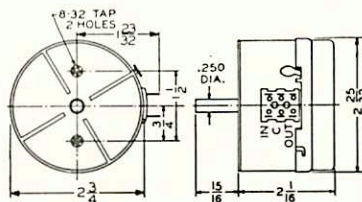
each side of the line and coupled together on a common shaft. The BAL-322 is an excellent mixer, supplying steps of 2 decibels, tapered on the last few steps to a smooth cut-off. The BAL-320 or BAL-321 may be used as master gain controls to follow a number of BAL-322 mixers.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters—for example, BALQ-322. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, BALQ-322-EF, 250/500Ω, cannot be used as a BALQ-322-FE, 500/250Ω. There are 6 insulated terminals available, and when the cueing position is used on these controls, the "C" terminal is grounded to the case and brought to a grounded case lug. The terminals are then 2 for "IN", 2 for "OUT" and 2 for "CUE".

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BAL-320-A	30/30	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	BAL-322-A	30/30	20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
BAL-320-B	50/50		BAL-322-B	50/50	
BAL-320-K	150/150		BAL-322-K	150/150	
BAL-320-KF	150/500		BAL-322-KF	150/500	
BAL-320-KG	150/600		BAL-322-KG	150/600	
BAL-320-D	200/200		BAL-322-D	200/200	
BAL-320-E	250/250		BAL-322-E	250/250	
BAL-320-EF	250/500		BAL-322-EF	250/500	
BAL-320-F	500/500	BAL-322-F	500/500		
BAL-320-G	600/600	BAL-322-G	600/600		
BAL-321-A	30/30	20 steps, 2 DB per step. No taper, 40 DB total. Detents Attached.	BAL-323-A	30/30	20 steps 1.5 DB per step. No taper, 30 DB total. Detents Attached.
BAL-321-B	50/50		BAL-323-B	50/50	
BAL-321-C	125/125		BAL-323-C	125/125	
BAL-321-K	150/150		BAL-323-K	150/150	
BAL-321-KF	150/500		BAL-323-KF	150/500	
BAL-321-KG	150/600		BAL-323-KG	150/600	
BAL-321-D	200/200		BAL-323-D	200/200	
BAL-321-E	250/250		BAL-323-E	250/250	
BAL-321-F	500/500	BAL-323-F	500/500		
BAL-321-G	600/600	BAL-323-G	600/600		

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

CONTACT SPACING: 15 degrees  
between centers.



TOTAL DEGREE OF ROTATION:  
300 degrees.

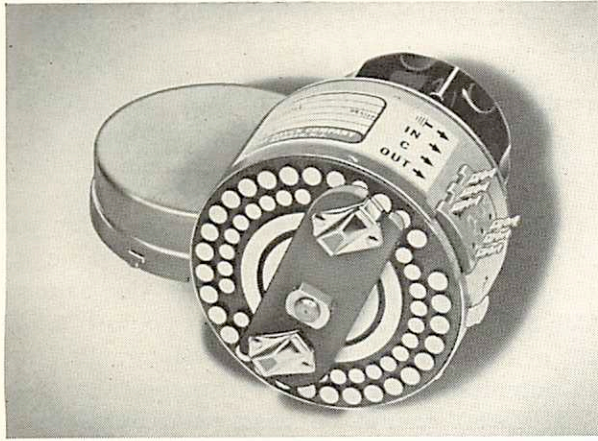
For complete specifications on this series see page 51.



# BALANCED LADDER NETWORKS

## SERIES BAL-730

## 30 STEPS



In compact high quality systems where limited mounting space is available, the BAL-730 series supplies a wide range of attenuation in a 2 1/4" diameter housing. This series is physically inter-

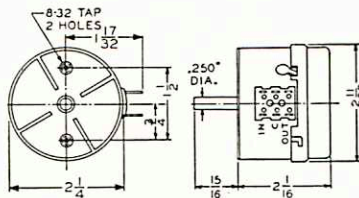
changeable with the BAL-255 series, and provides ten additional steps of control.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, BALQ-730-G would be a 600/600Ω balanced ladder network with a cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a BALQ-730-EF, 250/500Ω, cannot be used as a BALQ-730-FE, 500/250Ω, as this would move the cueing operation to the output side. There are 6 insulated terminals available, and when the cueing position is used on these controls, the "C" terminal is grounded to the case and brought to a grounded case lug. The terminals are then 2 for "IN," 2 for "OUT" and 2 for "CUE."

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BAL-730-A	30/30	{ 30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	BAL-732-A	30/30	{ 30 steps, 1.5 DB per step. No taper, 45 DB total. Detents Attached.
BAL-730-B	50/50		BAL-732-B	50/50	
BAL-730-K	150/150		BAL-732-K	150/150	
BAL-730-KF	150/500		BAL-732-KF	150/500	
BAL-730-KG	150/600		BAL-732-KG	150/600	
BAL-730-D	200/200		BAL-732-D	200/200	
BAL-730-E	250/250		BAL-732-E	250/250	
BAL-730-EF	250/500		BAL-732-EF	250/500	
BAL-730-F	500/500		BAL-732-F	500/500	
BAL-730-G	600/600		BAL-732-G	600/600	
BAL-731-A	30/30	{ 30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached	BAL-733-A	30/30	{ 30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
BAL-731-B	50/50		BAL-733-B	50/50	
BAL-731-C	125/125		BAL-733-C	125/125	
BAL-731-K	150/150		BAL-733-K	150/150	
BAL-731-KF	150/500		BAL-733-KF	150/500	
BAL-731-KG	150/600		BAL-733-KG	150/600	
BAL-731-D	200/200		BAL-733-D	200/200	
BAL-731-E	250/250		BAL-733-E	250/250	
BAL-731-F	500/500		BAL-733-F	500/500	
BAL-731-G	600/600		BAL-733-G	600/600	

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

CONTACT SPACING: 11 1/4 degrees between centers.



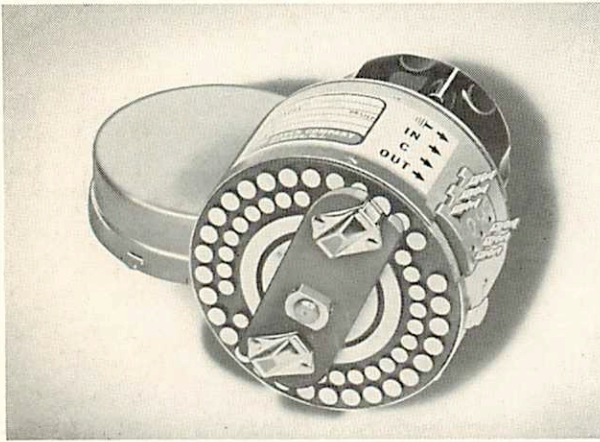
TOTAL DEGREE OF ROTATION: 337 1/2 degrees.

For complete specifications on this series see page 51.



# BALANCED LADDER NETWORKS

SERIES BAL-330 ~~\$27.50~~ - \$28 w/DETENT 30 STEPS



The Daven Series BAL-330 offers more steps of control than the BAL-320, without an increase in the dimensions. It is recommended for use in high quality broadcasting and recording systems, where

a greater control range or small Db steps are needed.

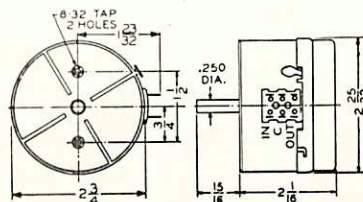
Essentially, these controls are two unbalanced 30 step ladder networks, inserted in each side of the line and coupled together on a common shaft.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters—for example, BALQ-330. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example: BALQ-330-EF, 250/500Ω cannot be used as a BALQ-330-FE, 500/250Ω. There are only 6 insulated terminals available. When the cueing position is used on these controls, the "C" terminal is grounded to the case and brought to a grounded case lug. The terminals are then 2 for "IN", 2 for "OUT" and 2 for "CUE".

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BAL-330-A	30/30	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	BAL-332-A	30/30	30 steps, 1.5 DB per step. No taper, 45 DB total. Detents Attached.
BAL-330-B	50/50		BAL-332-B	50/50	
BAL-330-K	150/150		BAL-332-K	150/150	
BAL-330-KF	150/500		BAL-332-KF	150/500	
BAL-330-KG	150/600		BAL-332-KG	150/600	
BAL-330-D	200/200		BAL-332-D	200/200	
BAL-330-E	250/250		BAL-332-E	250/250	
BAL-330-EF	250/500		BAL-332-EF	250/500	
BAL-330-F	500/500	BAL-332-F	500/500		
BAL-330-G	600/600	BAL-332-G	600/600		
BAL-331-A	30/30	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.	BAL-333-A	30/30	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
BAL-331-B	50/50		BAL-333-B	50/50	
BAL-331-C	125/125		BAL-333-C	125/125	
BAL-331-K	150/150		BAL-333-K	150/150	
BAL-331-KF	150/500		BAL-333-KF	150/500	
BAL-331-KG	150/600		BAL-333-KG	150/600	
BAL-331-D	200/200		BAL-333-D	200/200	
BAL-331-E	250/250		BAL-333-E	250/250	
BAL-331-F	500/500	BAL-333-F	500/500		
BAL-331-G	600/600	BAL-333-G	600/600		

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

CONTACT SPACING:  $11\frac{1}{4}$  degrees between centers.



TOTAL DEGREE OF ROTATION:  $337\frac{1}{2}$  degrees.

For complete specifications on this series see page 51.

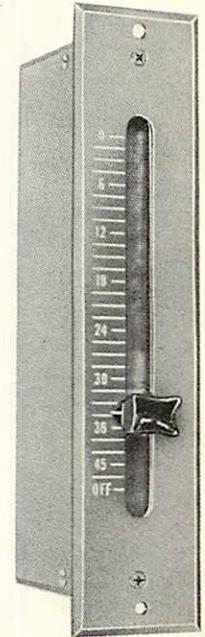


# VERTICAL SLIDE ATTENUATORS

## SERIES 825 & 835 SLIDE ATTENUATORS

Outstanding features are as follows:

1. Knob moves in a straight line.
2. Maximum of 4 ounces of pressure required to move knob.
3. Daven quiet, time-proven, long-life, silver alloy contacts and wiper arms are used.
4. Takes little panel and cabinet space — 1 1/4" wide, 6" long, and 2" deep.
5. Escutcheons (dials) are available that provide a simple mounting method and which require a low tolerance rectangular opening in a panel of any thickness. The escutcheon mounts the attenuator and trims the panel opening. Escutcheons (dials) are available for mounting 1, 2, 3 or 4 units adjacent to each other. Escutcheons carry dial markings in steps.
6. Units are protected against dirt and foreign objects.
7. Available in any input and output impedance.
8. Available in balanced and unbalanced ladders and in T-type network attenuators. Also as single and dual potentiometers.
9. Available with or without tapers.
10. Available with a "Cue" position, excepting potentiometers.
11. Available in 20 and 30 steps.
12. Supplied with connector in rear of unit, for ease of connection or disassembly.
13. Supplied with Finger Fitting Knob.
14. A removable side plate permits access to contacts.



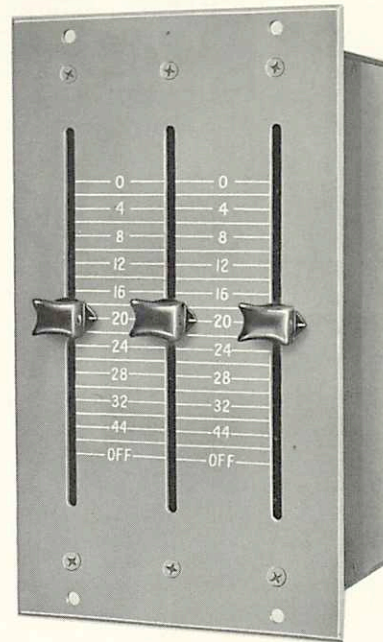
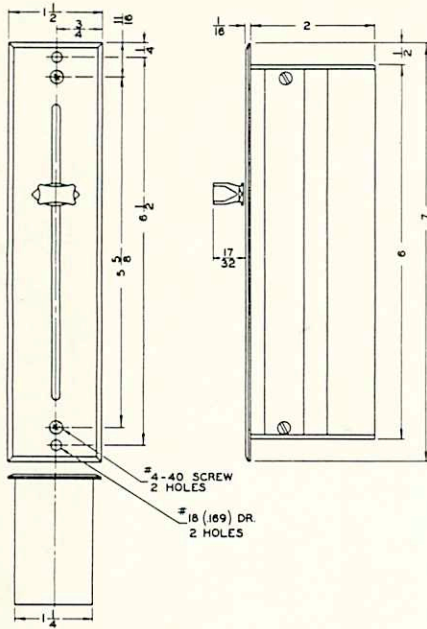
LADDER NETWORKS SERIES LA-825 & LA-835		BALANCED LADDER NETWORKS SERIES BAL-825 & BAL-835		"T" NETWORKS SERIES T-825 & T-835		ATTENUATION
TYPE	TERMINAL IMPEDANCE	TYPE	TERMINAL IMPEDANCE	TYPE	TERMINAL IMPEDANCE	
LA-825-K	150/150	BAL-825-K	150/150	T-825-K	150/150	20 steps 2 DB per step. No taper, last step cut-off. (Infinity)
LA-825-D	200/200	BAL-825-D	200/200	T-825-D	200/200	
LA-825-E	250/250	BAL-825-E	250/250	T-825-E	250/250	
LA-825-F	500/500	BAL-825-F	500/500	T-825-F	500/500	
LA-825-G	600/600	BAL-825-G	600/600	T-825-G	600/600	
LA-826-K	150/150	BAL-826-K	150/150	T-826-K	150/150	20 steps 2 DB per step. Tapered to infinity.
LA-826-D	200/200	BAL-826-D	200/200	T-826-D	200/200	
LA-826-E	250/250	BAL-826-E	250/250	T-826-E	250/250	
LA-826-F	500/500	BAL-826-F	500/500	T-826-F	500/500	
LA-826-G	600/600	BAL-826-G	600/600	T-826-G	600/600	
LA-835-K	150/150	BAL-835-K	150/150	T-835-K	150/150	30 steps 2 DB per step. No taper, last step cut-off. (Infinity)
LA-835-D	200/200	BAL-835-D	200/200	T-835-D	200/200	
LA-835-E	250/250	BAL-835-E	250/250	T-835-E	250/250	
LA-835-F	500/500	BAL-835-F	500/500	T-835-F	500/500	
LA-835-G	600/600	BAL-835-G	600/600	T-835-G	600/600	
LA-836-K	150/150	BAL-836-K	150/150	T-836-K	150/150	30 steps 1 1/2 DB per step. Tapered to infinity.
LA-836-D	200/200	BAL-836-D	200/200	T-836-D	200/200	
LA-836-E	250/250	BAL-836-E	250/250	T-836-E	250/250	
LA-836-F	500/500	BAL-836-F	500/500	T-836-F	500/500	
LA-836-G	600/600	BAL-836-G	600/600	T-836-G	600/600	

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

Cueing positions are available on all ladder, balanced ladder, and "T" attenuators shown in this series.



# VERTICAL SLIDE ATTENUATORS



Available singly  
or with 2,  
3 or 4 units  
side by side

## SINGLE AND DUAL POTENTIOMETERS

### POTENTIOMETERS SERIES CP-825 & CP-835

### DUAL POTENTIOMETERS SERIES DCP-825 & DCP-835

TYPE	← IMPEDANCE →	TYPE	ATTENUATION
CP-825-S	50,000	DCP-825-S	{ 20 steps, 2 DB per step. No taper, last step cut-off (infinity).
CP-825-T	100,000	DCP-825-T	
CP-825-W	200,000	DCP-825-W	
CP-825-X	250,000	DCP-825-X	
CP-825-Y	500,000	DCP-825-Y	
CP-826-S	50,000	DCP-826-S	{ 20 steps, 2 DB per step. Tapered to infinity.
CP-826-T	100,000	DCP-826-T	
CP-826-W	200,000	DCP-826-W	
CP-826-X	250,000	DCP-826-X	
CP-826-Y	500,000	DCP-826-Y	
CP-835-S	50,000	DCP-835-S	{ 30 steps, 2 DB per step. No taper, last step cut-off (infinity).
CP-835-T	100,000	DCP-835-T	
CP-835-W	200,000	DCP-835-W	
CP-835-X	250,000	DCP-835-X	
CP-835-Y	500,000	DCP-835-Y	
CP-836-S	50,000	DCP-836-S	{ 30 steps, 2 DB per step. Tapered to infinity.
CP-836-T	100,000	DCP-836-T	
CP-836-W	200,000	DCP-836-W	
CP-836-X	250,000	DCP-836-X	
CP-836-Y	500,000	DCP-836-Y	

Special impedances or decibel steps other than shown are available.



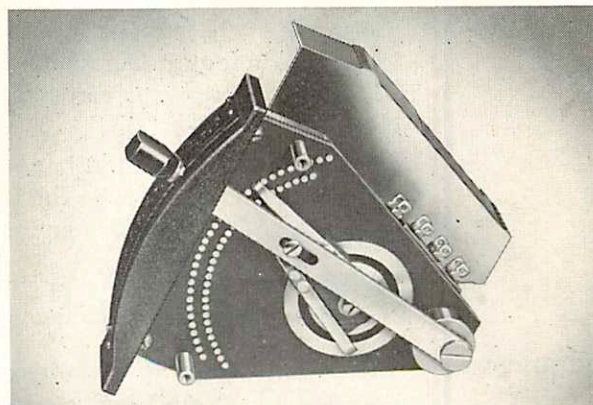
# VERTICAL LEVER TYPE ATTENUATORS

## SERIES 820 & 830

### LEVER TYPE ATTENUATORS SERIES 820 & 830

Outstanding mechanical features are as follows:

1. A two piece shield is used, one section to protect the resistances, and the other section covers the switch rotor mechanism and contacts.
2. The switch rotor is not attached to the lever, enabling it to move freely by remote control without disturbing its equalized positive contact pressure or velvet smooth movement.
3. Silver alloy is used for the contacts, collector rings and switch rotor to insure low contact resistance.
4. The bezel or mounting plate is cast aluminum finished with baked fine crackled black paint.
5. Lever slot has protective plate preventing small objects from entering the unit.
6. As many as 11 units can be mounted upon a standard 5 1/4" x 19" panel.
7. Controls can be removed from front of panel.
8. Twenty or thirty step units are available.
9. Practical volume controls for use in television studios, sound film studios and for turntables.
10. Attenuation increases downward when mounted vertically.



#### LADDER NETWORKS SERIES LA-820 & LA-830

TYPE	TERMINAL IMPEDANCE
LA-820-K	150/150
LA-820-D	200/200
LA-820-E	250/250
LA-820-F	500/500
LA-820-G	600/600
LA-821-K	150/150
LA-821-D	200/200
LA-821-E	250/250
LA-821-F	500/500
LA-821-G	600/600
LA-830-K	150/150
LA-830-D	200/200
LA-830-E	250/250
LA-830-F	500/500
LA-830-G	600/600
LA-831-K	150/150
LA-831-D	200/200
LA-831-E	250/250
LA-831-F	500/500
LA-831-G	600/600

#### BALANCED LADDER NETWORKS SERIES BAL-820 & BAL-830

TYPE	TERMINAL IMPEDANCE
BAL-820-K	150/150
BAL-820-D	200/200
BAL-820-E	250/250
BAL-820-F	500/500
BAL-820-G	600/600
BAL-821-K	150/150
BAL-821-D	200/200
BAL-821-E	250/250
BAL-821-F	500/500
BAL-821-G	600/600
BAL-830-K	150/150
BAL-830-D	200/200
BAL-830-E	250/250
BAL-830-F	500/500
BAL-830-G	600/600
BAL-831-K	150/150
BAL-831-D	200/200
BAL-831-E	250/250
BAL-831-F	500/500
BAL-831-G	600/600

#### "T" NETWORKS SERIES T-820 & T-830

TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-820-K	150/150	20 steps 2 DB per step. No taper, last step cut-off. (Infinity)
T-820-D	200/200	
T-820-E	250/250	
T-820-F	500/500	
T-820-G	600/600	
T-821-K	150/150	20 steps 2 DB per step. Tapered to infinity.
T-821-D	200/200	
T-821-E	250/250	
T-821-F	500/500	
T-821-G	600/600	
T-830-K	150/150	30 steps 2 DB per step. No taper, last step cut-off. (Infinity)
T-830-D	200/200	
T-830-E	250/250	
T-830-F	500/500	
T-830-G	600/600	
T-831-K	150/150	30 steps 1 1/2 DB per step. Tapered to infinity.
T-831-D	200/200	
T-831-E	250/250	
T-831-F	500/500	
T-831-G	600/600	

Note: The above units are also available in Potentiometer and Dual Potentiometer Networks.

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

For complete specifications on this series see page 51.



# FACTS ABOUT "T" AND BALANCED "H" ATTENUATORS

**DEFINITION:** Under this group of volume controls, 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 reflection losses. For unequal impedance ratios controls unless specified, the minimum loss for tapered "T" or "H" networks is employed. (See Table 3, Column 3, Appendix "C" Table 3 for minimum loss values.)

For example, if the input impedance is 600 ohms and output impedance is 150 ohms, the ratio of these values is 4. The minimum loss for an impedance ratio of 4 is 11.43 Db per Appendix "C" Table 3 mentioned above.

As the name implies, the "T" is made up of resistors connected to form a "T" and the "H" is made up of resistors connected to form an "H".

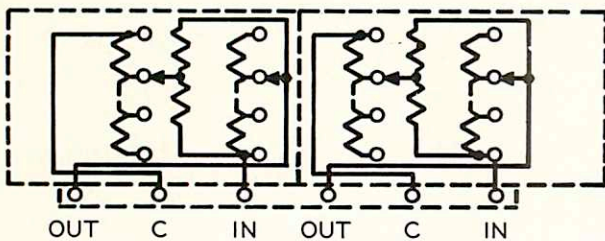
**DESCRIPTION:** The Daven Company offers two types of "T" attenuators, the "Bridged T" and the "T". Since both types are electrically and mechanically interchangeable, in the circuit, we list them all as "T" controls. The "Bridged T" consists of two variable and two fixed resistors and requires two 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 of network, employing two or three sets of variable resistors, and a corresponding number of rows of contacts for each section.

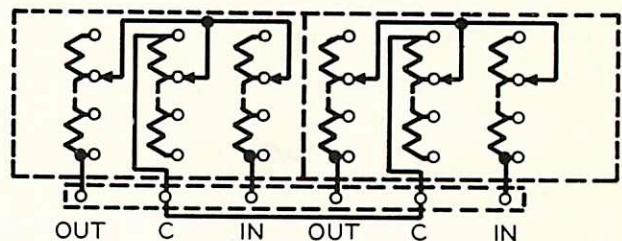
**CUEING:** These networks may be used as volume controls in low and high level multi-channel mixers, and be obtained with a built-in cueing circuit. In these controls provision is made at the extreme attenuation position for connecting the incoming signal to a cue circuit before "FADING IN" the signal. 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 to increase the range of volume level indicating instruments, and all types of measuring equipment where precision control is required.

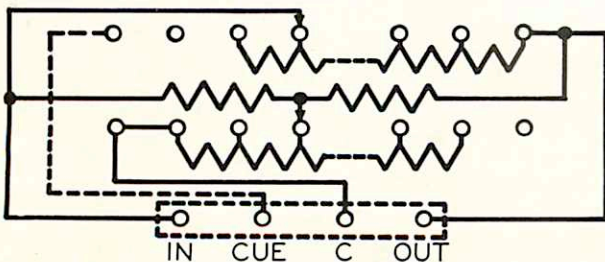
BRIDGED "H"



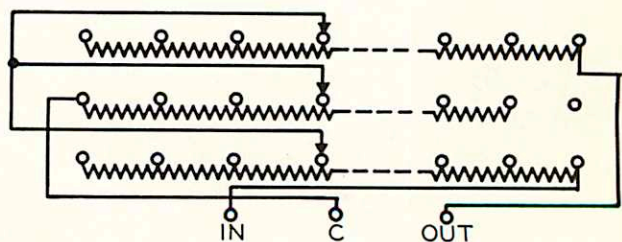
BALANCED "H"



BRIDGED "T"



STRAIGHT "T"

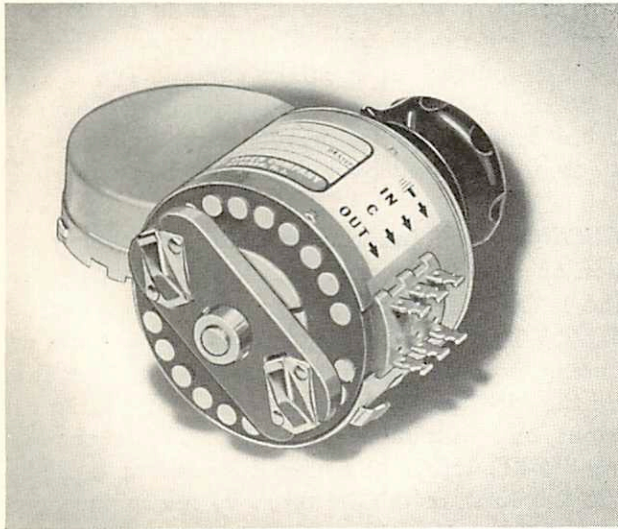




# "T" ATTENUATORS

## SERIES T-250

## 10 STEPS



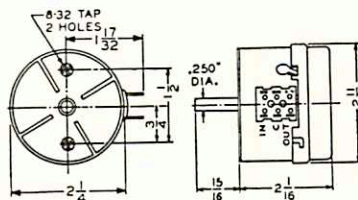
The Series T-250 volume control is limited to 10 steps of attenuation, and is recommended for use in locations where large steps of control, or small overall range is desired. This control is not offered as a mixer to fade out a program. It may be employed to advantage as a master gain control, or in measuring equipment where a limited number of steps are desired. The advantage of this unit is the simplicity of design, small size and popular price. The circuit in this unit is a "Bridged T".

In addition to the types tabulated below, standard units are available in 5 Db Steps, 50 Db total.

TYPE		TERMINAL IMPEDANCE	ATTENUATION	TYPE		TERMINAL IMPEDANCE	ATTENUATION
T-250-B	SUGGESTED MASTER	50/50	10 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	T-253-B	SUGGESTED DECADE	50/50	10 steps, 1 DB per step. No taper, 10 DB total. Detents Attached.
T-250-K		150/150		T-253-K		150/150	
T-250-D		200/200		T-253-D		200/200	
T-250-E		250/250		T-253-E		250/250	
T-250-F		500/500		T-253-F		500/500	
T-250-G		600/600		T-253-G		600/600	
T-251-B	SUGGESTED MASTER	50/50	10 steps 2 DB per step. No taper, 20 DB total. Detents Attached.	T-254-B	SUGGESTED DECADE	50/50	10 steps, 0.1 DB per step. No taper, 1 DB total. Detents Attached
T-251-K		150/150		T-254-K		150/150	
T-251-D		200/200		T-254-D		200/200	
T-251-E		250/250		T-254-E		250/250	
T-251-F		500/500		T-254-F		500/500	
T-251-G		600/600		T-254-G		600/600	
T-252-B	SUGGESTED MASTER	50/50	10 steps, 1.5 DB per step. No taper, 15 DB total. Detents Attached.	TO-254-B	SUGGESTED MASTER	50/50	10 steps, 3 DB per step. No taper, 30 DB total. Detents Attached
T-252-K		150/150		TO-254-K		150/150	
T-252-D		200/200		TO-254-D		200/200	
T-252-E		250/250		TO-254-E		250/250	
T-252-F		500/500		TO-254-F		500/500	
T-252-G		600/600		TO-254-G		600/600	

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

CONTACT SPACING: 15 degrees  
between centers.



TOTAL DEGREE OF ROTATION:  
150 degrees.

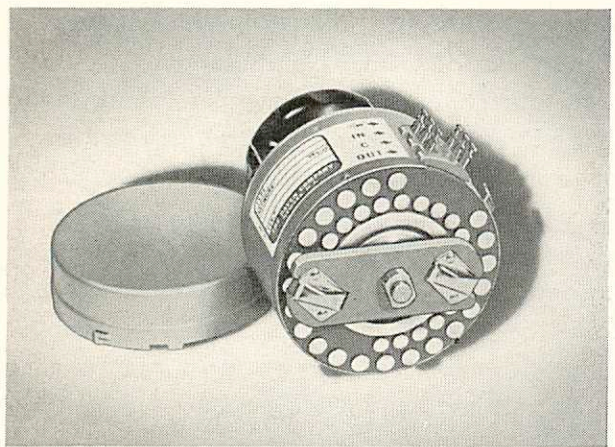
For complete specifications on this series see page 51.



\$17.50

# "T" ATTENUATORS

SERIES T-255 \$17.50 - \$18.00 w/DETENTS. 20 STEPS



The Series T-255 volume control is a compact 20 step "Bridged T" unit, recommended for use as a substitute for our Series T-320, in locations where mount-

ing space is at a premium. This is an excellent control for use in portable equipment. The type T-255 is offered as a mixer control. Types T-256, T-257 and T-258 may be used as main gain controls, or in measuring equipment when equal decibel steps are required over the complete range.

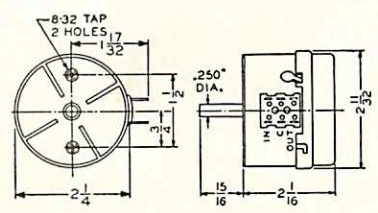
**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, TQ-255-G would be a 600/600 ohm "T" network with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a TQ-255-KF, 150/500Ω cannot be used as a TQ-255-FK, 500/150Ω, as this would move the cueing operation to the output side.

\$17.50

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-255-A	30/30	20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	T-257-A	30/30	20 steps, 2 DB per step. No taper, 40 DB total. Detents Attached.
T-255-B	50/50		T-257-B	50/50	
T-255-C	125/125		T-257-C	125/125	
T-255-K	150/150		T-257-K	150/150	
T-255-KF	150/500		T-257-KF	150/500	
T-255-KG	150/600		T-257-KG	150/600	
T-255-D	200/200		T-257-D	200/200	
T-255-E	250/250		T-257-E	250/250	
T-255-F	500/500		T-257-F	500/500	
T-255-G	600/600		T-257-G	600/600	
T-256-A	30/30	20 steps, 2 DB per step. No taper, last step cut-off. Detents Attached.	T-258-A	30/30	20 steps, 1.5 DB per step. No taper, 30 DB total. Detents Attached.
T-256-B	50/50		T-258-B	50/50	
T-256-C	125/125		T-258-C	125/125	
T-256-K	150/150		T-258-K	150/150	
T-256-KF	150/500		T-258-KF	150/500	
T-256-KG	150/600		T-258-KG	150/600	
T-256-D	200/200		T-258-D	200/200	
T-256-E	250/250		T-258-E	250/250	
T-256-F	500/500		T-258-F	500/500	
T-256-G	600/600		T-258-G	600/600	

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

CONTACT SPACING: 15 degrees between centers.



TOTAL DEGREE OF ROTATION: 300 degrees.

NOTE: Circuit patented.

For complete specifications on this series see page 51.



\$17.50

# "T" ATTENUATORS

SERIES T-320 \$17.50 - \$18.00 w/DETENTS 20 STEPS

This volume control is a sturdy, dependable twenty step "Bridged T" network offered 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. The Series T-320, T-322 and T-323 are offered as main gain controls. The Series T-321 is supplied with a taper on the last three steps before cut-off, and is an excellent twenty step mixing control. Series T-324, T-325 and T-326 were developed for use in laboratory measuring equipment. The cueing feature may be obtained on all these units.

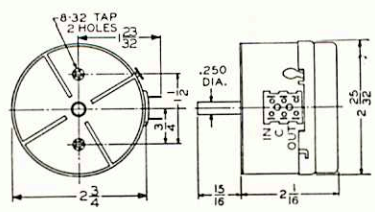


\$17.50

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-320-A	30/30	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	T-322-A	30/30	20 steps, 2 DB per step. No taper, 40 DB total. Detents Attached.
T-320-C	125/125		T-322-B	50/50	
T-320-K	150/150		T-322-C	125/125	
T-320-KF	150/500		T-322-K	150/150	
T-320-KG	150/600		T-322-KF	150/500	
T-320-D	200/200		T-322-KG	150/600	
T-320-E	250/250		T-322-D	200/200	
T-320-EF	250/500		T-322-E	250/250	
T-320-F	500/500		T-322-F	500/500	
T-320-G	600/600		T-322-G	600/600	
T-321-A	30/30	20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	T-323-A	30/30	20 steps, 1.5 DB per step. No taper, 30 DB total. Detents Attached.
T-321-B	50/50		T-323-B	50/50	
T-321-C	125/125		T-323-C	125/125	
T-321-K	150/150		T-323-K	150/150	
T-321-KF	150/500		T-323-KF	150/500	
T-321-KG	150/600		T-323-KG	150/600	
T-321-D	200/200		T-323-D	200/200	
T-321-E	250/250		T-323-E	250/250	
T-321-F	500/500		T-323-F	500/500	
T-321-G	600/600		T-323-G	600/600	
T-324-K	150/150	20 steps, 1 DB per step. No taper, 20 DB total. Detents Attached.	T-326-K	150/150	20 steps, 0.1 DB per step. No taper, 2 DB total. Detents Attached.
T-324-D	200/200		T-326-D	200/200	
T-324-E	250/250		T-326-E	250/250	
T-324-F	500/500		T-326-F	500/500	
T-324-G	600/600		T-326-G	600/600	
T-325-K	150/150	20 steps, 0.5 DB step. No taper, 10 DB total. Detents Attached.	T-328-K	150/150	20 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached.
T-325-D	200/200		T-328-D	200/200	
T-325-E	250/250		T-328-E	250/250	
T-325-F	500/500		T-328-F	500/500	
T-325-G	600/600		T-328-G	600/600	

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

CONTACT SPACING: 15 Degrees between centers.



TOTAL ROTATION: 300 Degrees.

For complete specifications on this series see page 51.

NOTE: Circuit patented.



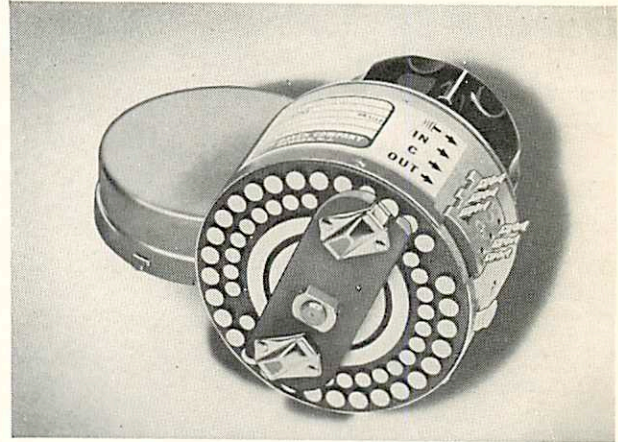
# "T" ATTENUATORS

## SERIES T-730

## 30 STEPS

Series T-730 is a sturdy, compact attenuator and provides a wide range of control in a limited space.

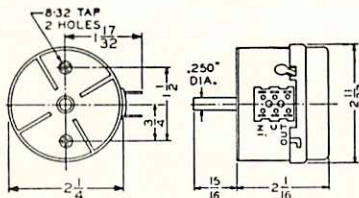
**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, TQ-730-G would be a 600/600Ω "T" network with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a TQ-730-KF, 150/500Ω, cannot be used as a TQ-730-FK, 500/150Ω, as this would move the cueing operation to the output side.



TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-730-A	30/30	{ 30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.                 }	T-731-A	30/30	{ 30 steps, 1.5 DB step. No taper, last step cut-off (infinity). Detents Attached.                 }
T-730-C	125/125		T-731-B	50/50	
T-730-K	150/150		T-731-C	125/125	
T-730-KF	150/500		T-731-K	150/150	
T-730-KG	150/600		T-731-KF	150/500	
T-730-D	200/200		T-731-KG	150/600	
T-730-E	250/250		T-731-D	200/200	
T-730-EF	250/500		T-731-E	250/250	
T-730-F	500/500		T-731-F	500/500	
T-730-G	600/600		T-731-G	600/600	
T-732-A	30/30	{ 30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.                 }	T-733-A	30/30	{ 30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.                 }
T-732-B	50/50		T-733-B	50/50	
T-732-C	125/125		T-733-C	125/125	
T-732-K	150/150		T-733-K	150/150	
T-732-KF	150/500		T-733-KF	150/500	
T-732-KG	150/600		T-733-KG	150/600	
T-732-D	200/200		T-733-D	200/200	
T-732-E	250/250		T-733-E	250/250	
T-732-F	500/500		T-733-F	500/500	
T-732-G	600/600		T-733-G	600/600	
T-734-K	150/150	{ 30 steps, 1 DB per step. No taper, 30 DB total. Detents Attached.                 }	T-735-K	150/150	{ 30 steps, 0.5 DB per step. No taper, 15 DB total. Detents Attached.                 }
T-734-D	200/200		T-735-D	200/200	
T-734-E	250/250		T-735-E	250/250	
T-734-F	500/500		T-735-F	500/500	
T-734-G	600/600		T-735-G	600/600	
T-736-K	150/150	{ 30 steps, 0.1 DB per step. No taper, 3 DB total. Detents Attached.                 }	T-738-K	150/150	{ 30 steps, 1 DB per step. No taper, last step cut-off (infinity). Detents Attached.                 }
T-736-D	200/200		T-738-D	200/200	
T-736-E	250/250		T-738-E	250/250	
T-736-F	500/500		T-738-F	500/500	
T-736-G	600/600		T-738-G	600/600	

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

CONTACT SPACING:  $11\frac{1}{4}$  degrees between centers.



TOTAL DEGREE OF ROTATION:  $337\frac{1}{2}$  degrees.

NOTE: Circuit Patented

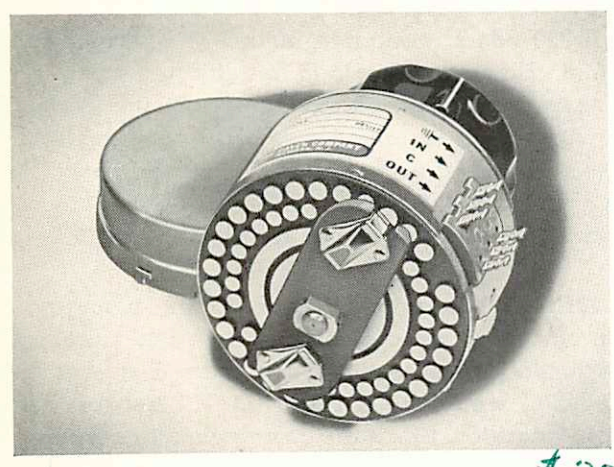
For complete specifications on this series see page 51.



\$20.50

# "T" ATTENUATORS

SERIES T-330 \$20.50 \$21.00 w/DETENTS 30 STEPS

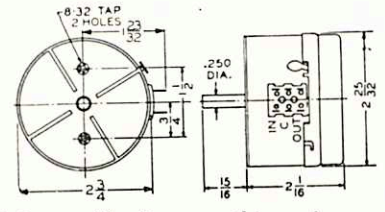


The Daven Series T-330 is our most popular "T" type mixing control. Like the Series T-320, it is a "Bridged T" but provides ten additional steps of attenuation. These additional steps may be used to reduce the attenuation per step, or extend the overall range. For example, in mixer applications, the type T-330 has a reduction of attenuation per step. The type T-333 is an example of extending the attenuation range. For the main gain position, types T-331 and T-332 are offered. Types T-334, T-335, T-336 and T-338 are for use in measuring equipment. The cueing feature may be obtained on any of the Series T-330 units.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-330-A	30/30	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents	T-331-A	30/30	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached
T-330-B	50/50		T-331-B	50/50	
T-330-K	150/150		T-331-C	125/125	
T-330-KF	150/500		T-331-K	150/150	
T-330-KG	150/600		T-331-KF	150/500	
T-330-D	200/200		T-331-KG	150/600	
T-330-E	250/250		T-331-D	200/200	
T-330-F	500/500	T-331-E	250/250		
T-330-G	600/600	T-331-F	500/500		
			T-331-G	600/600	
T-332-A	30/30	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached	T-333-A	30/30	30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents
T-332-B	50/50		T-333-B	50/50	
T-332-C	125/125		T-333-C	125/125	
T-332-K	150/150		T-333-K	150/150	
T-332-KF	150/500		T-333-KF	150/500	
T-332-KG	150/600		T-333-KG	150/600	
T-332-D	200/200		T-333-D	200/200	
T-332-E	250/250	T-333-E	250/250		
T-332-F	500/500	T-333-F	500/500		
T-332-G	600/600	T-333-G	600/600		
T-334-A	30/30	30 steps, 1 DB per step. No taper, 30 DB total. Detents Attached	T-335-K	150/150	30 steps, 0.5 DB per step. No taper, 15 DB total. Detents Attached
T-334-B	50/50		T-335-KF	150/500	
T-334-K	150/150		T-335-KG	150/600	
T-334-KF	150/500		T-335-E	250/250	
T-334-KG	150/600		T-335-F	500/500	
T-334-D	200/200		T-335-G	600/600	
T-334-E	250/250				
T-334-F	500/500				
T-334-G	600/600				
T-336-K	150/150	30 steps, 0.1 DB per step. No taper, 3 DB total. Detents Attached	T-338-K	150/150	30 steps, 1 DB per step. No taper, last step cut-off (infinity). Detents Attached
T-336-KF	150/500		T-338-KF	150/500	
T-336-KG	150/600		T-338-KG	150/600	
T-336-E	250/250		T-338-E	250/250	
T-336-F	500/500		T-338-F	500/500	
T-336-G	600/600		T-338-G	600/600	

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

CONTACT SPACING: 11 1/4 degrees between centers.



TOTAL DEGREE OF ROTATION: 337 1/2 degrees.

NOTE: Circuit patented.

For complete specifications on this series see page 51.

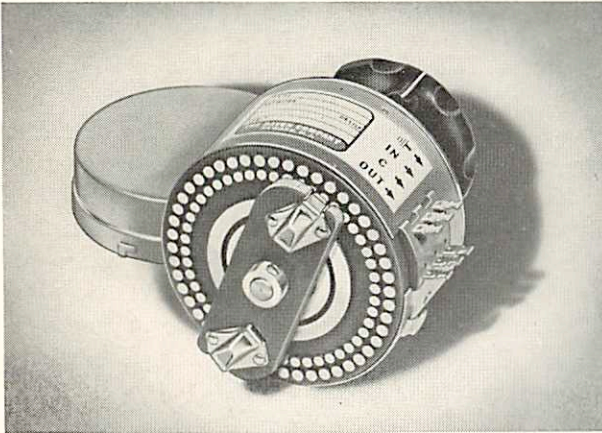
\*Patent Pending.



# "T" ATTENUATORS

## SERIES T-345

## 45 STEPS



The large number of steps of attenuation provided in this series, offers a means of obtaining appreciable total attenuation in relatively small steps. For normal audio applications the Daven Series T-320

or T-330 offers a suitable means of controlling the signal. However, for high quality recording and broadcast control work, an abrupt change in signal level during a sustained note may superimpose an objectionable transient disturbance. To meet this type of service, the Daven Series T-345 is recommended. The circuit of this unit is "Bridged T".

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, TQ-345-G would be a 600/600Ω "T" network with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a TQ-345-KF, 150/500Ω, cannot be used as a TQ-345-FK, 500/150Ω, as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-345-B	50/50	45 steps, 0.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
T-345-C	125/125	
T-345-K	150/150	
T-345-KF	150/500	
T-345-KG	150/600	
T-345-D	200/200	
T-345-E	250/250	
T-345-EF	250/500	
T-345-F	500/500	
T-345-G	600/600	

SUGGESTED MIXER

TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-347-B	50/50	45 steps, 1 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
T-347-C	125/125	
T-347-K	150/150	
T-347-KF	150/500	
T-347-KG	150/600	
T-347-D	200/200	
T-347-E	250/250	
T-347-EF	250/500	
T-347-F	500/500	
T-347-G	600/600	

SUGGESTED MIXER

TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-346-B	50/50	45 steps, 0.75 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
T-346-C	125/125	
T-346-K	150/150	
T-346-KF	150/500	
T-346-KG	150/600	
T-346-D	200/200	
T-346-E	250/250	
T-346-EF	250/500	
T-346-F	500/500	
T-346-G	600/600	

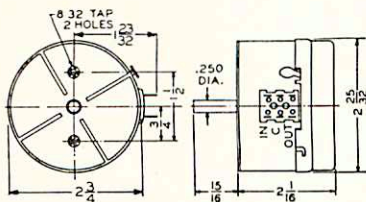
SUGGESTED MIXER

TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-348-B	50/50	45 steps, 0.5 DB per step. No taper, 22.5 DB total. Detents Attached.
T-348-C	125/125	
T-348-K	150/150	
T-348-KF	150/500	
T-348-KG	150/600	
T-348-D	200/200	
T-348-E	250/250	
T-348-EF	250/500	
T-348-F	500/500	
T-348-G	600/600	

SUGGESTED VERNIER

TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-349-B	50/50	45 steps, 1 DB per step. No taper, 45 DB total. Detents Attached.
T-349-C	125/125	
T-349-K	150/150	
T-349-KF	150/500	
T-349-KG	150/600	
T-349-D	200/200	
T-349-E	250/250	
T-349-EF	250/500	
T-349-F	500/500	
T-349-G	600/600	

SUGGESTED MASTER



CONTACT SPACING:  $7\frac{1}{2}$  degrees between centers.  
 TOTAL DEGREE OF ROTATION:  $337\frac{1}{2}$  degrees.

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

NOTE: Circuit Patented

For complete specifications on this series see page 51.



# PRECISION "T" NETWORKS $\pm 1\%$



These controls consist of the three variable resistors to form the "T" Networks having a resistance accuracy of  $\pm 1\%$ . These networks have constant impedance both "in" and "out" and zero initial loss. The T-520 and T-530 Series are mechanically interchangeable and electrically equivalent to the Bridged "T" controls listed under standard attenuators in this catalog. However, these attenuators are designed for precision measuring equipment or wherever 1% accuracy is required. The Series T-530 has ten more steps of attenuation than the Series T-520, both having the same dimensions.

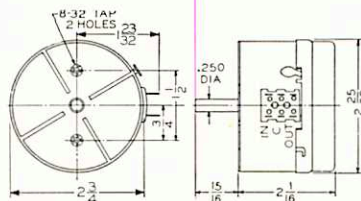
## SERIES T-520 20 STEPS

## SERIES T-530 30 STEPS

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
T-520-B	50/50	20 steps, 2 DB per step. No taper, 40 DB total.	T-530-B	50/50	30 steps, 2 DB per step. No taper, 60 DB total.
T-520-K	150/150		T-530-K	150/150	
T-520-D	200/200		T-530-D	200/200	
T-520-E	250/250		T-530-E	250/250	
T-520-F	500/500		T-530-F	500/500	
T-520-G	600/600		T-530-G	600/600	
T-521-B	50/50		20 steps, 1.5 DB per step. No taper, 30 DB total.	T-531-B	
T-521-K	150/150	T-531-K		150/150	
T-521-D	200/200	T-531-D		200/200	
T-521-E	250/250	T-531-E		250/250	
T-521-F	500/500	T-531-F		500/500	
T-521-G	600/600	T-531-G		600/600	
T-522-B	50/50	20 steps, 1 DB per step. No taper, 20 DB total.		T-532-B	50/50
T-522-K	150/150		T-532-K	150/150	
T-522-D	200/200		T-532-D	200/200	
T-522-E	250/250		T-532-E	250/250	
T-522-F	500/500		T-532-F	500/500	
T-522-G	600/600		T-532-G	600/600	
T-523-B	50/50		20 steps, 0.5 DB per step. No taper, 10 DB total.	T-533-B	50/50
T-523-K	150/150	T-533-K		150/150	
T-523-D	200/200	T-533-D		200/200	
T-523-E	250/250	T-533-E		250/250	
T-523-F	500/500	T-533-F		500/500	
T-523-G	600/600	T-533-G		600/600	
T-524-B	50/50	20 steps, 0.1 DB per step. No taper, 2 DB total.		T-534-B	50/50
T-524-K	150/150		T-534-K	150/150	
T-524-D	200/200		T-534-D	200/200	
T-524-E	250/250		T-534-E	250/250	
T-524-F	500/500		T-534-F	500/500	
T-524-G	600/600		T-534-G	600/600	

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

SERIES T-520: Detents Attached.  
CONTACT SPACING: 15 degrees between centers.  
TOTAL DEGREE OF ROTATION: 300 degrees.



T-520 & T-530 SERIES

SERIES T-530: Detents Attached.  
CONTACT SPACING: 11.25 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337.5 degrees.



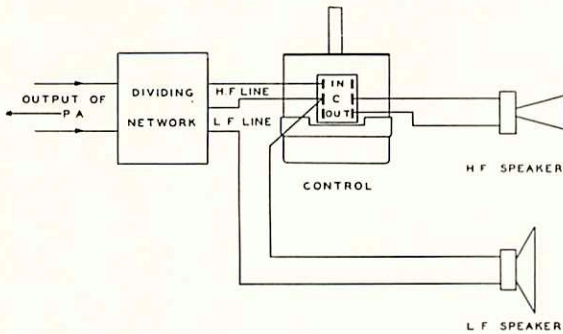
# POWER "T" NETWORK ATTENUATORS

The following attenuators are offered for use in circuits where the power handling requirements are appreciable. The "T" networks offered below, represent only a partial listing. Any practical circuit, wattage, impedance, loss per step and number of steps can be supplied upon short notice. These controls have perforations for ventilation.

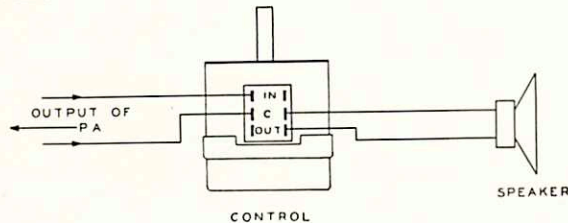
The maximum wattage listed on these controls is the continuous rating. This value may be exceeded when used to control an audio program. The amount to which this rating may be exceeded depends upon the type of signal to be attenuated, ranging from zero on a steady tone to 100% or greater on some musical programs.

Typical applications requiring power type attenuators are:

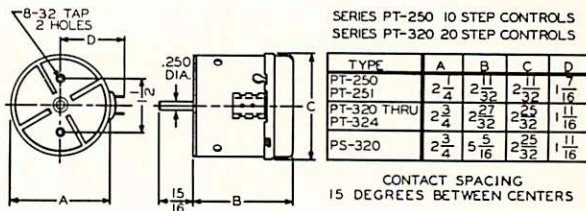
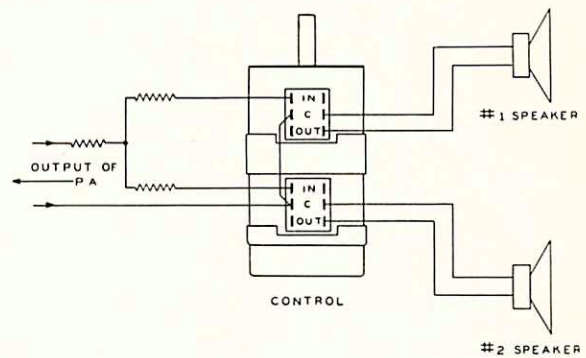
I. High frequency speaker control in multi-channel system. This allows for compensation in the difference in efficiency of the low and high frequency speakers, as well as an effective tone control.



II. Individual speaker control in a single channel system.



III. Stereophonic applications — transferring power from one group of speakers to another group of speakers with no perceptible power loss. Thus, the apparent source of sound may be moved about by the operation of a single control (Series PS-320 below).



TERMINAL IMPEDANCE	TYPE	ATTENUATION	TYPE	ATTENUATION	TERMINAL IMPEDANCE	TYPE	ATTENUATION
8/8	PT-250-M	6 Watts, 10 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	PT-320-M	10 Watts, 20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	8/8	PT-324-M	10 Watts, 20 steps, 1 Db per step. No taper, 20 Db total. Detents Attached.
15/15	PT-250-N		PT-320-N		15/15	PT-324-N	
150/150	PT-250-K		PT-320-K		150/150	PT-324-K	
200/200	PT-250-D		PT-320-D		200/200	PT-324-D	
250/250	PT-250-E		PT-320-E		250/250	PT-324-E	
500/500	PT-250-F		PT-320-F		500/500	PT-324-F	
600/600	PT-250-G		PT-320-G		600/600	PT-324-G	
8/8	PT-251-M	6 Watts, 10 steps, 3 Db per step. Tapered on last steps to cut-off (infinity). Detents Attached.	PT-321-M	10 Watts, 20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). Detents Attached.	8/8	PS-320-M	10 Watts, 20 steps per deck, stereophonic taper. (Double deck unit.) Detents Attached.
15/15	PT-251-N		PT-321-N		15/15	PS-320-N	
150/150	PT-251-K		PT-321-K		150/150	PS-320-K	
200/200	PT-251-D		PT-321-D		200/200	PS-320-D	
250/250	PT-251-E		PT-321-E		250/250	PS-320-E	
500/500	PT-251-F		PT-321-F		500/500	PS-320-F	
600/600	PT-251-G		PT-321-G		600/600	PS-320-G	

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

CONTACT SPACING: 15 degrees between centers.

TOTAL DEGREE OF ROTATION: Series 250, 150 degrees. Series 320, 300 degrees.

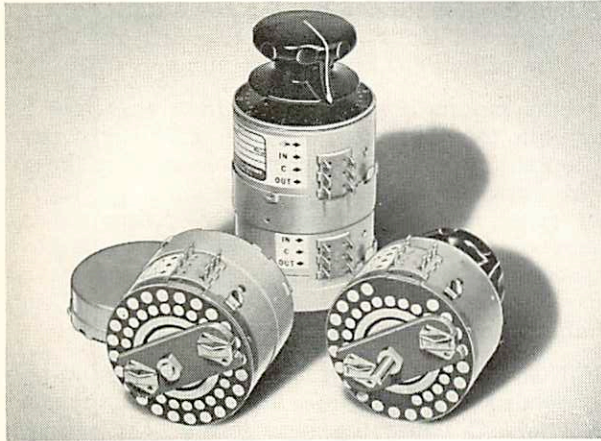
For complete specifications on this series see page 51.



# BALANCED "H" NETWORKS

## SERIES BH-255

## 20 STEPS



This series consists of two Bridged "T" units in tandem, having a 2 1/4" diameter. They are offered as master gain controls for general sound control applications. These units have zero initial loss with con-

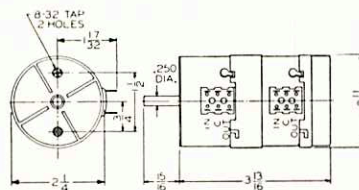
stant impedance in and out at all steps of the control. A simple, efficient means of securing front and rear sections, of these units, is assured by means of two spring type locks. By depressing the release springs located on the side of the case adjacent to the terminal strip, the rear dust cover, or complete rear section can be released from the front section.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, BHQ-255-G would be a 600/600 ohm BH-255-G with a cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, BHQ-255-KF, 150/500Ω cannot be used as a BHQ-255-FK, 500/150Ω, as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BH-255-A	30/30	20 steps, 2 DB per step. No taper, 40 DB total. Detents Attached.	BH-257-A	30/30	20 steps, 1 DB per step. No taper, 20 DB total. Detents Attached.
BH-255-B	50/50		BH-257-B	50/50	
BH-255-C	125/125		BH-257-C	125/125	
BH-255-K	150/150		BH-257-K	150/150	
BH-255-KF	150/500		BH-257-KF	150/500	
BH-255-KG	150/600		BH-257-KG	150/600	
BH-255-D	200/200		BH-257-D	200/200	
BH-255-E	250/250		BH-257-E	250/250	
BH-255-F	500/500		BH-257-F	500/500	
BH-255-G	600/600		BH-257-G	600/600	
BH-256-A	30/30	20 steps, 1.5 DB per step. No taper, 30 DB total. Detents Attached.	BH-258-A	30/30	20 steps, 0.5 DB per step. No taper, 10 DB total. Detents Attached.
BH-256-B	50/50		BH-258-B	50/50	
BH-256-C	125/125		BH-258-C	125/125	
BH-256-K	150/150		BH-258-K	150/150	
BH-256-KF	150/500		BH-258-KF	150/500	
BH-256-KG	150/600		BH-258-KG	150/600	
BH-256-D	200/200		BH-258-D	200/200	
BH-256-E	250/250		BH-258-E	250/250	
BH-256-F	500/500		BH-258-F	500/500	
BH-256-G	600/600		BH-258-G	600/600	

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

CONTACT SPACING: 15 degrees  
between centers.



TOTAL DEGREE OF ROTATION:  
300 degrees.

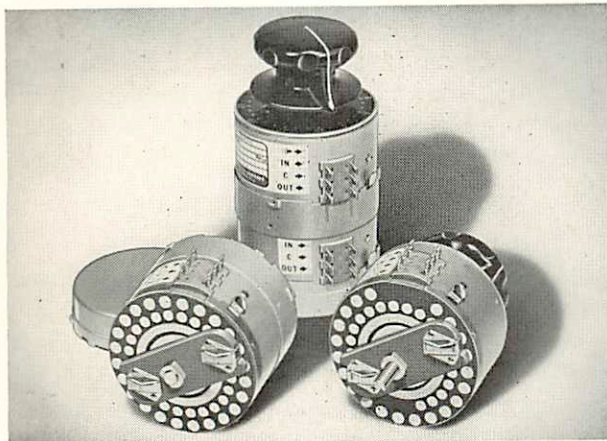
For complete specifications on this series see page 51.



# BALANCED "H" NETWORKS

## SERIES BH-320

## 20 STEPS



Structurally the Series BH-320 attenuator is two "Bridged T" networks mounted on a common shaft. Each deck is a complete unbalanced "T" attenuator which in use, is connected to each side of the balanced transmission line. Each "T" is designed having

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.

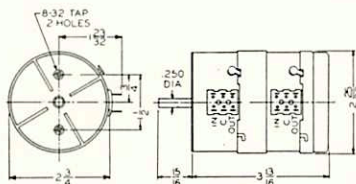
A secure means is provided for fastening front and rear units together in a totally enclosed dust cover. By depressing the release springs located on the side of the case adjacent to the terminal strip, the rear dust cover can be removed for cleaning the rear contacts; or the entire rear section can 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.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, BHQ-320-G would be a 600/600 ohm control with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, BHQ-320-KF, 150/500Ω cannot be used as a BHQ-320-FK, 500/150Ω as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BH-320-A	30/30	{ 20 steps, 2 DB per step. No taper, 40 DB total. Detents Attached.	BH-322-A	30/30	{ 20 steps, 1 DB per step. No taper, 20 DB total. Detents Attached.
BH-320-B	50/50		BH-322-B	50/50	
BH-320-C	125/125		BH-322-C	125/125	
BH-320-K	150/150		BH-322-K	150/150	
BH-320-KF	150/500		BH-322-KF	150/500	
BH-320-KG	150/600		BH-322-KG	150/600	
BH-320-D	200/200		BH-322-D	200/200	
BH-320-E	250/250		BH-322-E	250/250	
BH-320-F	500/500		BH-322-F	500/500	
BH-320-G	600/600		BH-322-G	600/600	
BH-321-A	30/30	{ 20 steps, 1.5 DB per step. No taper, 30 DB total. Detents Attached.	BH-323-A	30/30	{ 20 steps, 0.5 DB per step. No taper, 10 DB total. Detents Attached.
BH-321-B	50/50		BH-323-B	50/50	
BH-321-C	125/125		BH-323-C	125/125	
BH-321-K	150/150		BH-323-K	150/150	
BH-321-KF	150/500		BH-323-KF	150/500	
BH-321-KG	150/600		BH-323-KG	150/600	
BH-321-D	200/200		BH-323-D	200/200	
BH-321-E	250/250		BH-323-E	250/250	
BH-321-F	500/500		BH-323-F	500/500	
BH-321-G	600/600		BH-323-G	600/600	

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

CONTACT SPACING: 15 degrees between centers.



TOTAL DEGREE OF ROTATION: 300 degrees.

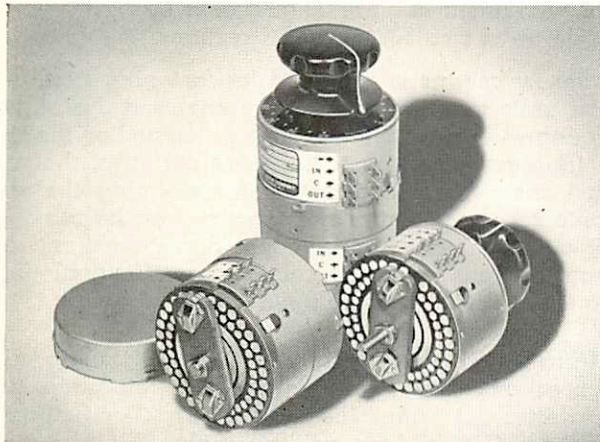
For complete specifications on this series see page 51.



# BALANCED "H" NETWORKS

## SERIES BH-730

## 30 STEPS



This series is the same as the Daven BH-330 series, with the exception that these units have a 2¼" diameter. The BH-730 series will find application in those installations where there is limited mounting space. Since these units have zero insertion loss and

constant impedance in and out they are very well suited for both low and high level mixing.

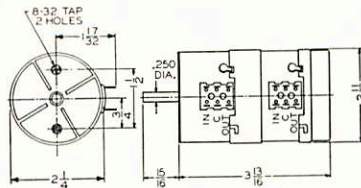
A secure means is provided for securing front and rear units together in a totally enclosed dust cover. By depressing the release springs located on the side of the case adjacent to the terminal strip, the rear dust cover, or complete rear section can be released from the front section. Thus, ready access is provided to the contacts and switch mechanism in each deck. Since the front and rear sections form a continuous electrical case, excellent electrical shielding is also attained.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, BHQ-730-G would be a 600/600Ω BH-730-G with a cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a BHQ-730-KF, 150/500Ω cannot be used as a BHQ-730-FK, 500/150Ω, as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BH-730-B	50/50	30 steps, 2 DB per step. No taper, 60 DB total. Detents Attached.	BH-732-B	50/50	30 steps, 1 DB per step. No taper, 30 DB total. Detents Attached.
BH-730-C	125/125		BH-732-C	125/125	
BH-730-K	150/150		BH-732-K	150/150	
BH-730-KF	150/500		BH-732-KF	150/500	
BH-730-KG	150/600		BH-732-KG	150/600	
BH-730-D	200/200		BH-732-D	200/200	
BH-730-E	250/250		BH-732-E	250/250	
BH-730-F	500/500	BH-732-F	500/500		
BH-730-G	600/600	BH-732-G	600/600		
BH-731-B	50/50	30 steps, 1.5 DB per step. No taper, 45 DB total. Detents Attached.	BH-733-B	50/50	30 steps, 0.5 DB per step. No taper, 15 DB total. Detents Attached.
BH-731-C	125/125		BH-733-C	125/125	
BH-731-K	150/150		BH-733-K	150/150	
BH-731-KF	150/500		BH-733-KF	150/500	
BH-731-KG	150/600		BH-733-KG	150/600	
BH-731-D	200/200		BH-733-D	200/200	
BH-731-E	250/250		BH-733-E	250/250	
BH-731-F	500/500	BH-733-F	500/500		
BH-731-G	600/600	BH-733-G	600/600		

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

CONTACT SPACING: 11¼ degrees between centers.



TOTAL DEGREE OF ROTATION: 337½ degrees.

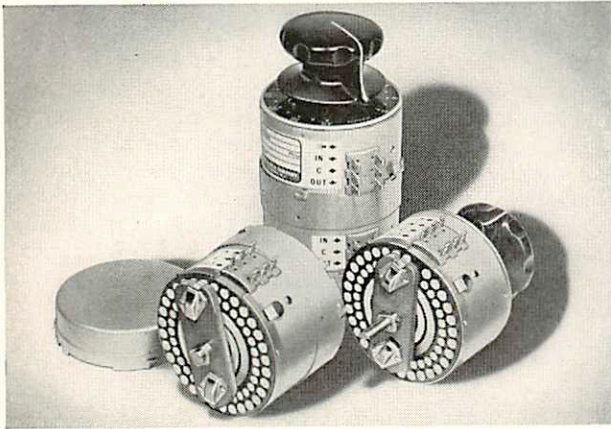
For complete specifications on this series see page 51.



# BALANCED "H" NETWORKS

## SERIES BH-330

## 30 STEPS



Structurally the Series BH-330 attenuator is two "Bridged T" networks mounted on a common shaft. Each deck is a complete unbalanced "T" attenuator which in use, is connected to each side of the balanced transmission line. Each "T" is designed having 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.

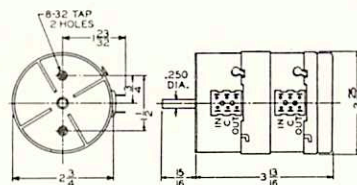
A secure means is provided for fastening front and rear units together in a totally enclosed dust cover. By depressing the release springs located on the side of the case adjacent to the terminal strip, the rear dust cover can be removed for cleaning the rear contacts; or the entire rear section can 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.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, BHQ-330-G would be a 600/600 ohm "Balanced H" control with cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, BHQ-320-KF, 150/500Ω cannot be used as a BHQ-330-FK, 500/150Ω as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BH-330-B	50/50	{ 30 steps, 2 DB per step. No taper, 60 DB total. Detents Attached.	BH-332-B	50/50	{ 30 steps, 1 DB per step. No taper, 30 DB total. Detents Attached.
BH-330-C	125/125		BH-332-C	125/125	
BH-330-K	150/150		BH-332-K	150/150	
BH-330-KF	150/500		BH-332-KF	150/500	
BH-330-KG	150/600		BH-332-KG	150/600	
BH-330-D	200/200		BH-332-D	200/200	
BH-330-E	250/250		BH-332-E	250/250	
BH-330-F	500/500	BH-332-F	500/500		
BH-330-G	600/600	BH-332-G	600/600		
BH-331-B	50/50	{ 30 steps, 1.5 DB per step. No taper, 45 DB total. Detents Attached.	BH-333-B	50/50	{ 30 steps, 0.5 DB per step. No taper, 15 DB total. Detents Attached.
BH-331-C	125/125		BH-333-C	125/125	
BH-331-K	150/150		BH-333-K	150/150	
BH-331-KF	150/500		BH-333-KF	150/500	
BH-331-KG	150/600		BH-333-KG	150/600	
BH-331-D	200/200		BH-333-D	200/200	
BH-331-E	250/250		BH-333-E	250/250	
BH-331-F	500/500	BH-333-F	500/500		
BH-331-G	600/600	BH-333-G	600/600		

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

CONTACT SPACING:  $11\frac{1}{4}$  degrees  
between centers.



TOTAL DEGREE OF ROTATION:  
 $337\frac{1}{2}$  degrees.

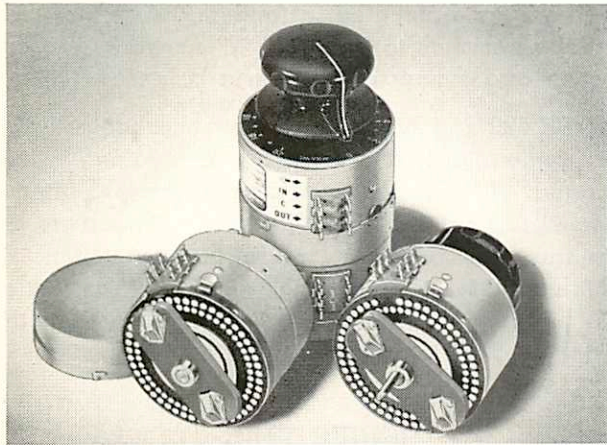
For complete specifications on this series see page 51.



# BALANCED "H" NETWORKS

## SERIES BH-345

## 45 STEPS



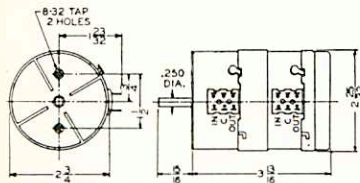
This series consists of two Daven T-345 series units ganged on a common shaft. The large number of steps in these units enables an appreciable total attenuation in relatively small steps. For this reason,

this unit is particularly adapted for high quality control work where better than ordinary results are desired.

A simple, efficient means of securing front and rear sections of these units is assured by means of two spring type locks. By depressing either of two springs located on the side of the case adjacent to the terminal strip, the rear dust cover, or complete rear section can be released from the front section.

**CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, BHQ-345-G would be a 600/600Ω BH-345-G with a cueing position. Since the cueing circuit operates on the "IN" of the control, do not interchange the input and output when wiring. For example, a BHQ-345-FK, 150/500Ω, cannot be used as a BHQ-345-KF, 500/150Ω, as this would move the cueing operation to the output side.

TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BH-345-B	50/50	45 steps, 0.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	BH-347-B	50/50	45 steps, 1 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
BH-345-C	125/125		BH-347-C	125/125	
BH-345-K	150/150		BH-347-K	150/150	
BH-345-KF	150/500		BH-347-KF	150/500	
BH-345-KG	150/600		BH-347-KG	150/600	
BH-345-D	200/200		BH-347-D	200/200	
BH-345-E	250/250		BH-347-E	250/250	
BH-345-EF	250/500		BH-347-EF	250/500	
BH-345-F	500/500		BH-347-F	500/500	
BH-345-G	600/600		BH-347-G	600/600	
BH-346-B	50/50	45 steps, 0.75 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	BH-348-B	50/50	45 steps 0.5 DB per step. No taper, 22.5 DB total. Detents Attached.
BH-346-C	125/125		BH-348-C	125/125	
BH-346-K	150/150		BH-348-K	150/150	
BH-346-KF	150/500		BH-348-KF	150/500	
BH-346-KG	150/600		BH-348-KG	150/600	
BH-346-D	200/200		BH-348-D	200/200	
BH-346-E	250/250		BH-348-E	250/250	
BH-346-EF	250/500		BH-348-EF	250/500	
BH-346-F	500/500		BH-348-F	500/500	
BH-346-G	600/600		BH-348-G	600/600	
			BH-349-B	50/50	45 steps, 1 DB per step. No taper, 45 DB total. Detents Attached.
			BH-349-C	125/125	
			BH-349-K	150/150	
			BH-349-KF	150/500	
			BH-349-KG	150/600	
			BH-349-D	200/200	
			BH-349-E	250/250	
			BH-349-EF	250/500	
			BH-349-F	500/500	
			BH-349-G	600/600	



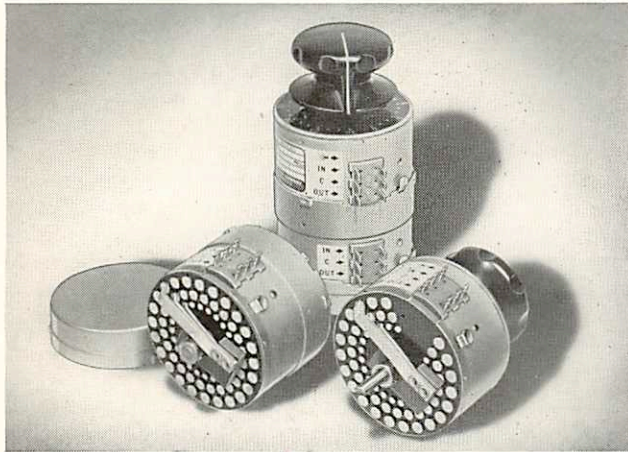
CONTACT SPACING: 7½ degrees between centers.  
TOTAL DEGREE OF ROTATION: 337½ degrees.

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

For complete specifications on this series see page 51.



# PRECISION BALANCED "H" NETWORKS $\pm 1\%$



The Balanced "H" networks are comprised of two "T" type units mounted in tandem, using the three variable resistors to form the "T" networks in each section and connected to form a Balanced "H".

The BH-520 and BH-530 series are mechanically interchangeable and electrically equivalent to the bridged "H" controls listed under standard attenuators in this catalog. However, these attenuators are designed for precision measuring equipment or wherever 1% accuracy is required. The series BH-530 has ten more steps of attenuation than the series BH-520. Both having the same dimensions.

## SERIES BH-520 20 STEPS

## SERIES BH-530 30 STEPS

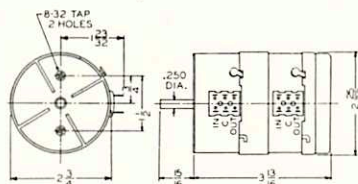
TYPE	TERMINAL IMPEDANCE	ATTENUATION	TYPE	TERMINAL IMPEDANCE	ATTENUATION
BH-520-B	50/50	20 steps, 2 DB per step No taper, 40 DB total.	BH-530-B	50/50	30 steps, 2 DB per step. No taper, 60 DB total.
BH-520-K	150/150		BH-530-K	150/150	
BH-520-D	200/200		BH-530-D	200/200	
BH-520-E	250/250		BH-530-E	250/250	
BH-520-F	500/500		BH-530-F	500/500	
BH-520-G	600/600		BH-530-G	600/600	
BH-521-B	50/50	20 steps, 1.5 DB per step. No taper, 30 DB total.	BH-531-B	50/50	30 steps, 1.5 DB per step. No taper, 45 DB total.
BH-521-K	150/150		BH-531-K	150/150	
BH-521-D	200/200		BH-531-D	200/200	
BH-521-E	250/250		BH-531-E	250/250	
BH-521-F	500/500		BH-531-F	500/500	
BH-521-G	600/600		BH-531-G	600/600	
BH-522-B	50/50	20 steps, 1 DB per step. No taper, 20 DB total.	BH-532-B	50/50	30 steps, 1 DB per step. No taper, 30 DB total.
BH-522-K	150/150		BH-532-K	150/150	
BH-522-D	200/200		BH-532-D	200/200	
BH-522-E	250/250		BH-532-E	250/250	
BH-522-F	500/500		BH-532-F	500/500	
BH-522-G	600/600		BH-532-G	600/600	
BH-523-B	50/50	20 steps, 0.5 DB per step. No taper, 10 DB total.	BH-533-B	50/50	30 steps, 0.5 DB per step. No taper, 15 DB total.
BH-523-K	150/150		BH-533-K	150/150	
BH-523-D	200/200		BH-533-D	200/200	
BH-523-E	250/250		BH-533-E	250/250	
BH-523-F	500/500		BH-533-F	500/500	
BH-523-G	600/600		BH-533-G	600/600	
BH-524-B	50/50	20 steps, 0.1 DB per step. No taper, 2 DB total.	BH-534-B	50/50	30 steps, 0.1 DB per step. No taper, 3 DB total.
BH-524-K	150/150		BH-534-K	150/150	
BH-524-D	200/200		BH-534-D	200/200	
BH-524-E	250/250		BH-534-E	250/250	
BH-524-F	500/500		BH-534-F	500/500	
BH-524-G	600/600		BH-534-G	600/600	

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

SERIES BH-520: Detents Attached.

CONTACT SPACING: 15 degrees between centers.

TOTAL DEGREE OF ROTATION: 300 degrees.



BH-520 & BH-530 SERIES

SERIES BH-530: Detents Attached.

CONTACT SPACING: 11.25 degrees between centers.

TOTAL DEGREE OF ROTATION: 337.5 degrees.



# FACTS ABOUT DAVEN POTENTIOMETERS

## (POTENTIAL DIVIDERS)

**DEFINITION:** The term potentiometer has been adopted by the electronics and radio industry to mean the simple potential divider. For this reason, the potentiometers referred to in this section are not voltage measuring devices, but simple 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 2.) 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. Units can be supplied, however, to operate into a given load, on request.

**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 laminated 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 a 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 the Daven Miniature Switch (see page 51, figure 2 for complete details), or by special arrangement of the contacts.

**TYPES:** In each of the following series, it will be noted there is one type of potentiometer having carbon or composition resistors, and another having precision wire wound resistors. If the unit is the wire wound kind, the type of winding employed should be taken into consideration. Please specify the frequency range.

**FORM OF WINDING:** There are two types of precision wire wound resistors—the "Mica Card" type and the spool or bobbin. For low and medium values, the windings are of the "Mica Card" type. For high resistance values, spool or bobbin type windings are used.

**ADVANTAGES OF CARBON OR WIRE WOUND RESISTORS:**

### CARBON OR COMPOSITION RESISTORS (DESIGNATED "CP")

1. In a small space higher values can be supplied than in the wire wound type.
2. The cost is less than the wire wound type.
3. The frequency error is less than the wire wound type.

### PRECISION WIRE WOUND RESISTORS (DESIGNATED "P")

1. Greater precision than the carbon type.
2. More stable with large temperature variations.
3. More constant with age.



\$8.50

**CARBON RESISTOR . . . . POTENTIOMETERS . . . . SINGLE UNITS**

**SERIES CP-350** *\$8.50 - NO DETENTS*  
**20 STEPS** *\$9.00 w/DETENT*

**SERIES CP-130**  
**30 STEPS**

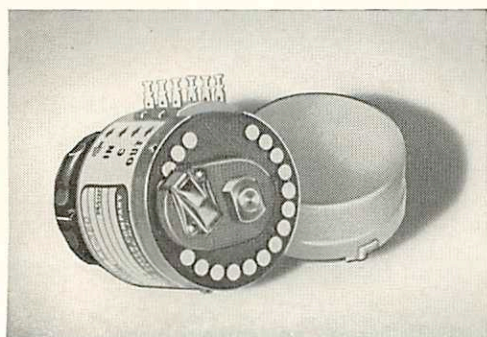
The CP-350 series are popular priced potential dividers recommended for use in portable equipment. The compact design of these controls make them suitable for small mounting space.

This control is physically interchangeable with the CP-350 series. However, because of the ten additional steps of attenuation, it is possible to obtain a wide range of control or smaller decibel steps.

\***CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, a CPQ-354-Y would be a CP-354-Y with a cueing position.

TYPE	ATTENUATION	← IMPEDANCE →	TYPE	ATTENUATION								
CP-350-M CP-350-P CP-350-R CP-350-S CP-350-T CP-350-W CP-350-X CP-350-Y	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached	10,000 20,000 25,000 50,000 100,000 200,000 250,000 500,000	CP-130-M CP-130-P CP-130-R CP-130-S CP-130-T CP-130-W CP-130-X CP-130-Y	30 steps, 2 DB per step, No taper, last step cut-off (infinity). Detents Attached								
CP-352-M CP-352-P CP-352-R CP-352-S CP-352-T CP-352-W CP-352-X CP-352-Y		20 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached	10,000 20,000 25,000 50,000 100,000 200,000 250,000 500,000		CP-132-M CP-132-P CP-132-R CP-132-S CP-132-T CP-132-W CP-132-X CP-132-Y	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached						
CP-353-M CP-353-P CP-353-R CP-353-S CP-353-T CP-353-W CP-353-X CP-353-Y			20 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached		10,000 20,000 25,000 50,000 100,000 200,000 250,000 500,000		CP-133-M CP-133-P CP-133-R CP-133-S CP-133-T CP-133-W CP-133-X CP-133-Y	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents				
CP-354-M CP-354-P CP-354-R CP-354-S CP-354-T CP-354-W CP-354-X CP-354-Y					20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents		10,000 20,000 25,000 50,000 100,000 200,000 250,000 500,000		CP-134-M CP-134-P CP-134-R CP-134-S CP-134-T CP-134-W CP-134-X CP-134-Y	30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents		
CP-355-S CP-355-T CP-355-W CP-355-X CP-355-Y							20 steps, 5 DB per step, 100 DB total. Detents Attached		50,000 100,000 200,000 250,000 500,000		..... ..... ..... ..... .....	..... ..... ..... ..... .....

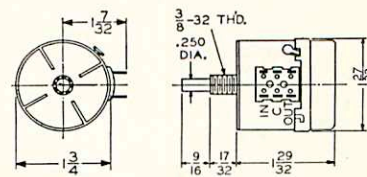
Special impedances or decibel steps other than those shown are available.



SERIES CP-350

Series CP-350:  
**CONTACT SPACING:** 15 degrees between centers.  
**TOTAL DEGREE OF ROTATION:** 300 degrees.  
 Series CP-130:  
**CONTACT SPACING:** 11.25 degrees between centers.  
**TOTAL DEGREE OF ROTATION:** 337.5 degrees.

\*Patent Pending.



SERIES CP-350 & CP-130

For complete specifications on this series see page 51.



# CARBON RESISTOR .... POTENTIOMETERS ..... SINGLE UNITS

## SERIES CP-730 30 STEPS

This series of controls offers a large number of steps of control in a 2 1/4" diameter unit. In high quality studio and laboratory equipment, where space is a consideration, we recommend the use of this series. These units are interchangeable with our P-730 series, which are wire wound.

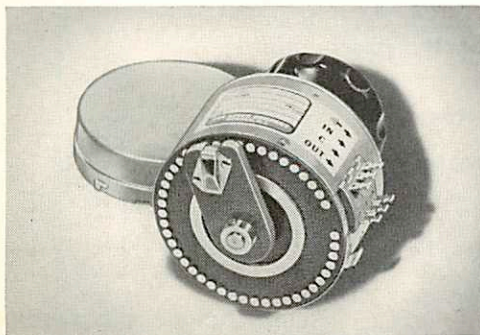
## SERIES CP-745 45 STEPS

The increased number of steps available in the CP-745 series, provide a means of obtaining appreciable total attenuation, in relatively small decibel steps. In critical recording and special studio control work, a wide range in small decibel steps is an absolute necessity.

\***CUEING**: When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, a CPQ-734-Y would be a CP-734-Y with a cueing position. A CPQ-748-Y would be a CP-748-Y with a cueing position.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
CP-730-M CP-730-P CP-730-R CP-730-S CP-730-T CP-730-W CP-730-X CP-730-Y	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached	10,000	CP-745-M	45 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached
		20,000	CP-745-P	
		25,000	CP-745-R	
		50,000	CP-745-S	
		100,000	CP-745-T	
		200,000	CP-745-W	
		250,000	CP-745-X	
		500,000	CP-745-Y	
CP-733-M CP-733-P CP-733-R CP-733-S CP-733-T CP-733-W CP-733-X CP-733-Y	30 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached	10,000	CP-747-M	45 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached
		20,000	CP-747-P	
		25,000	CP-747-R	
		50,000	CP-747-S	
		100,000	CP-747-T	
		200,000	CP-747-W	
		250,000	CP-747-X	
		500,000	CP-747-Y	
CP-734-M CP-734-P CP-734-R CP-734-S CP-734-T CP-734-W CP-734-X CP-734-Y	30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents	10,000	CP-748-M	45 steps, 0.75 DB per step. Tapered on last steps to cut-off (infinity). No Detents
		20,000	CP-748-P	
		25,000	CP-748-R	
		50,000	CP-748-S	
		100,000	CP-748-T	
		200,000	CP-748-W	
		250,000	CP-748-X	
		500,000	CP-748-Y	
CP-735-M CP-735-P CP-735-R CP-735-S CP-735-T CP-735-W CP-735-X CP-735-Y	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents	10,000	CP-749-M	45 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents
		20,000	CP-749-P	
		25,000	CP-749-R	
		50,000	CP-749-S	
		100,000	CP-749-T	
		200,000	CP-749-W	
		250,000	CP-749-X	
		500,000	CP-749-Y	

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

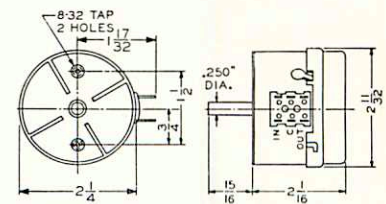


SERIES CP-745

**SERIES CP-730:**  
CONTACT SPACING: 11.25 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337.5 degrees.

**SERIES CP-745:**  
CONTACT SPACING: 7.5 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337.5 degrees.

\*Patent Pending.



SERIES CP-730 & CP-745

For complete specifications on this series see page 51.



# CARBON RESISTOR . . . POTENTIOMETERS . . . DUAL UNITS SINGLE DECK

## SERIES DCP-255 20 STEPS

The DCP-255 series utilizes two separate potentiometers concentrically located on a single deck. Since there is little shielding between the two potentiometers, this type of unit is recommended for use in controlling push-pull grids.

Note: 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.

Note: The terminal impedances listed below 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.

## SERIES DCP-730 30 STEPS

These controls are physically interchangeable with the DCP-255 series, but have ten additional steps of attenuation. Because of the concentric mounting of the two potentiometers comprising this unit there is little shielding between them. This type of unit is recommended for use in controlling push-pull grids.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
DCP-255-L	20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	5,000	DCP-730-L	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
DCP-255-M		10,000	DCP-730-M	
DCP-255-P		20,000	DCP-730-P	
DCP-255-R		25,000	DCP-730-R	
DCP-255-S		50,000	DCP-730-S	
DCP-255-T		100,000	DCP-730-T	
DCP-255-W		200,000	DCP-730-W	
DCP-255-X		250,000	DCP-730-X	
DCP-255-Y		500,000	DCP-730-Y	
DCP-255-Z		1,000,000	DCP-730-Z	
DCP-256-L	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	DCP-731-L	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
DCP-256-M		10,000	DCP-731-M	
DCP-256-P		20,000	DCP-731-P	
DCP-256-R		25,000	DCP-731-R	
DCP-256-S		50,000	DCP-731-S	
DCP-256-T		100,000	DCP-731-T	
DCP-256-W		200,000	DCP-731-W	
DCP-256-X		250,000	DCP-731-X	
DCP-256-Y	500,000	DCP-731-Y		
DCP-257-L	20 steps, 2 DB per step. No taper, 40 DB total. Detents Attached.	5,000	DCP-732-L	30 steps, 1.5 DB per step. No taper, 45 DB total. Detents Attached.
DCP-257-M		10,000	DCP-732-M	
DCP-257-P		20,000	DCP-732-P	
DCP-257-R		25,000	DCP-732-R	
DCP-257-S		50,000	DCP-732-S	
DCP-257-T		100,000	DCP-732-T	
DCP-257-W		200,000	DCP-732-W	
DCP-257-X		250,000	DCP-732-X	
DCP-257-Y	500,000	DCP-732-Y		
DCP-258-L	20 steps, 1.5 DB per step. No taper, 30 DB total. Detents Attached.	5,000	DCP-733-L	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
DCP-258-M		10,000	DCP-733-M	
DCP-258-P		20,000	DCP-733-P	
DCP-258-R		25,000	DCP-733-R	
DCP-258-S		50,000	DCP-733-S	
DCP-258-T		100,000	DCP-733-T	
DCP-258-W		200,000	DCP-733-W	
DCP-258-X		250,000	DCP-733-X	
DCP-258-Y	500,000	DCP-733-Y		

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



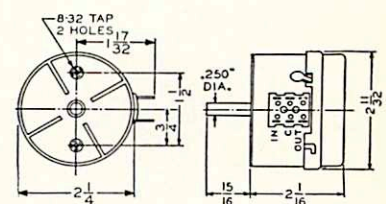
SERIES DCP-255

### Series DCP-255:

CONTACT SPACING: 15 degrees between centers.  
TOTAL DEGREE OF ROTATION: 300 degrees.

### Series DCP-730:

CONTACT SPACING: 11.25 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337.5 degrees.



SERIES DCP-730 & DCP-255

For complete specifications on this series see page 51.



# CARBON RESISTORS POTENTIOMETERS DUAL UNITS SINGLE DECK

## SERIES DCP-320 20 STEPS

The series DCP-320 utilizes two rows of contacts with two corresponding slip rings, concentrically mounted on a single deck of switch panel. These controls are offered primarily for use in controlling push-pull grids. Because of the proximity of the contacts and absence of shielding between resistor sections, caution must be exercised in using this type of control in single and multi-stage applications, where high gain circuits are required.

Note: 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.

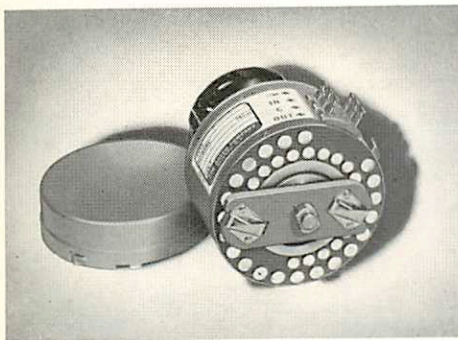
The terminal impedances listed below indicate the impedance per circuit. For example, a DCP-320-L consists of two 5,000Ω potentiometers and a DCP-330-M consists of two 10,000Ω potentiometers.

## SERIES DCP-330 30 STEPS

The DCP-330 series is constructed mechanically and electrically the same as the DCP-320 series, with the exception of the increased number of steps. We offer these units for use in equipment requiring a wide range of control, or other special applications where a large number of steps are desired.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
DCP-320-M	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	10,000	DCP-330-M	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
DCP-320-R		25,000	DCP-330-R	
DCP-320-S		50,000	DCP-330-S	
DCP-320-T		100,000	DCP-330-T	
DCP-320-W		200,000	DCP-330-W	
DCP-320-X		250,000	DCP-330-X	
DCP-320-Y		500,000	DCP-330-Y	
DCP-320-Z		1,000,000	DCP-330-Z	
DCP-322-M	20 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.	10,000	DCP-332-M	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
DCP-322-R		25,000	DCP-332-R	
DCP-322-S		50,000	DCP-332-S	
DCP-322-T		100,000	DCP-332-T	
DCP-322-W		200,000	DCP-332-W	
DCP-322-X		250,000	DCP-332-X	
DCP-322-Y		500,000	DCP-332-Y	
DCP-322-Z		1,000,000	DCP-332-Z	
DCP-323-L	20 Steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	5,000	DCP-333-L	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
DCP-323-M		10,000	DCP-333-M	
DCP-323-R		25,000	DCP-333-R	
DCP-323-S		50,000	DCP-333-S	
DCP-323-T		100,000	DCP-333-T	
DCP-323-W		200,000	DCP-333-W	
DCP-323-X		250,000	DCP-333-X	
DCP-323-Y		500,000	DCP-333-Y	
DCP-323-Z	1,000,000	DCP-333-Z		

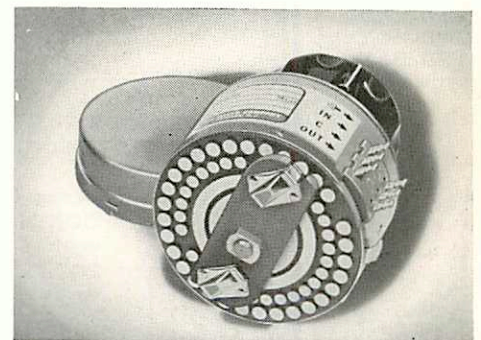
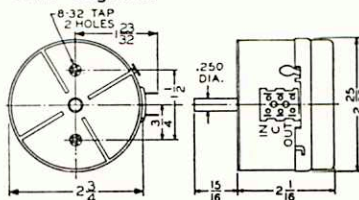
Special impedances or decibel steps other than those shown are available.



SERIES DCP-320

SERIES DCP-320  
CONTACT SPACING: 15 degrees  
between centers.  
TOTAL DEGREE OF ROTATION:  
300 degrees.

SERIES DCP-330  
CONTACT SPACING: 11.25 de-  
grees between centers.  
TOTAL DEGREE OF ROTATION:  
337.5 degrees.



SERIES DCP-330

For complete specifications on this series see page 51.



# CARBON RESISTOR... POTENTIOMETERS ... DUAL UNITS IN TANDEM

## SERIES CPD-350 20 STEPS

The Series CPD-350 and CPD-130 have the same mechanical and electrical characteristics with the exception that the CPD-130 has ten more steps of attenuation than the CPD-350. Each of these series is a double ganged potentiometer, individually shielded. Although primarily designed for the control of push-pull grids, due to their shielded construction, each of the decks may also be used as an

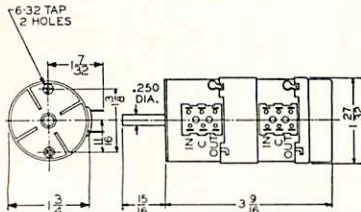
## SERIES CPD-130 30 STEPS

unbalanced potentiometer in separate amplifier stages. Only balanced decks are listed on this page, however, different impedances or decibel steps are available on each deck, upon request. A unique coupling feature enables quick easy separation of the rear from the front deck, for inspection or servicing.

Note: The terminal impedances listed below indicate the impedance per deck.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
CPD-350-L	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	CPD-130-L	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
CPD-350-M		10,000	CPD-130-M	
CPD-350-P		20,000	CPD-130-P	
CPD-350-R		25,000	CPD-130-R	
CPD-350-S		50,000	CPD-130-S	
CPD-350-T		100,000	CPD-130-T	
CPD-350-W		200,000	CPD-130-W	
CPD-350-X		250,000	CPD-130-X	
CPD-350-Y		500,000	CPD-130-Y	
CPD-350-Z		1,000,000	CPD-130-Z	
CPD-351-L	20 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	CPD-132-L	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
CPD-351-M		10,000	CPD-132-M	
CPD-351-P		20,000	CPD-132-P	
CPD-351-R		25,000	CPD-132-R	
CPD-351-S		50,000	CPD-132-S	
CPD-351-T		100,000	CPD-132-T	
CPD-351-W		200,000	CPD-132-W	
CPD-351-X	250,000	CPD-132-X		
CPD-351-Y	500,000	CPD-132-Y		
CPD-353-L	20 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	CPD-133-L	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
CPD-353-M		10,000	CPD-133-M	
CPD-353-P		20,000	CPD-133-P	
CPD-353-R		25,000	CPD-133-R	
CPD-353-S		50,000	CPD-133-S	
CPD-353-T		100,000	CPD-133-T	
CPD-353-W		200,000	CPD-133-W	
CPD-353-X	250,000	CPD-133-X		
CPD-353-Y	500,000	CPD-133-Y		
CPD-354-L	20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	5,000	CPD-134-L	30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
CPD-354-M		10,000	CPD-134-M	
CPD-354-P		20,000	CPD-134-P	
CPD-354-R		25,000	CPD-134-R	
CPD-354-S		50,000	CPD-134-S	
CPD-354-T		100,000	CPD-134-T	
CPD-354-W		200,000	CPD-134-W	
CPD-354-X		250,000	CPD-134-X	
CPD-354-Y		500,000	CPD-134-Y	

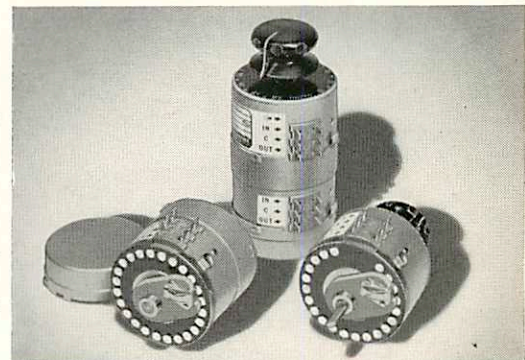
Special impedances or decibel steps other than those shown are available.



SERIES CPD-350 & CPD-130

Series CPD-350:  
CONTACT SPACING: 15 degrees between centers.  
TOTAL DEGREE OF ROTATION: 300 degrees.

Series CPD-130:  
CONTACT SPACING: 11.25 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337.5 degrees.



SERIES CPD-350

For complete specifications on this series see page 51.



# CARBON RESISTOR . POTENTIOMETERS . DUAL UNITS IN TANDEM

## SERIES CPD-730 30 STEPS

These two series are both the same size physically, having a 2 1/4" diameter. The CPD-745 has 15 more steps of attenuation than the CPD-730 series, and except for this difference, these two series have the same characteristics. Each of these units consists of two potentiometers ganged on a common shaft. Due to the completely shielded construction, each of the

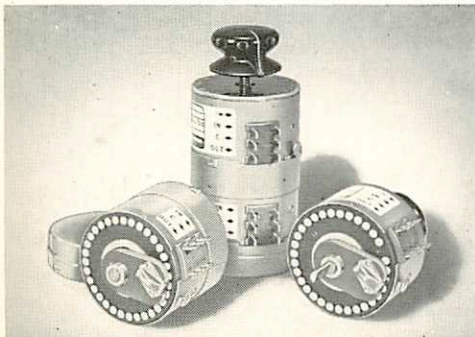
## SERIES CPD-745 45 STEPS

decks may be used as an unbalanced potentiometer in separate amplifier stages, or for the control of push-pull grids. The parts of these units are easily accessible due to a special coupling device, which enables the easy separation of the rear of the unit from the front.

Note: The terminal impedances listed below indicate the impedance per deck.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
CPD-730-M	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached	10,000	CPD-745-M	45 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached
CPD-730-P		20,000	CPD-745-P	
CPD-730-R		25,000	CPD-745-R	
CPD-730-S		50,000	CPD-745-S	
CPD-730-T		100,000	CPD-745-T	
CPD-730-W		200,000	CPD-745-W	
CPD-730-X		250,000	CPD-745-X	
CPD-730-Y	500,000	CPD-745-Y		
CPD-732-M	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached	10,000	CPD-746-M	45 steps, 1 DB per step. No taper, last step cut-off (infinity). Detents Attached
CPD-732-P		20,000	CPD-746-P	
CPD-732-R		25,000	CPD-746-R	
CPD-732-S		50,000	CPD-746-S	
CPD-732-T		100,000	CPD-746-T	
CPD-732-W		200,000	CPD-746-W	
CPD-732-X		250,000	CPD-746-X	
CPD-732-Y	500,000	CPD-746-Y		
CPD-733-M	30 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached	10,000	CPD-747-M	45 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached
CPD-733-P		20,000	CPD-747-P	
CPD-733-R		25,000	CPD-747-R	
CPD-733-S		50,000	CPD-747-S	
CPD-733-T		100,000	CPD-747-T	
CPD-733-W		200,000	CPD-747-W	
CPD-733-X		250,000	CPD-747-X	
CPD-733-Y	500,000	CPD-747-Y		
CPD-734-M	30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents	10,000	CPD-748-M	45 steps, 0.75 DB per step. Tapered on last steps to cut-off (infinity). No Detents
CPD-734-P		20,000	CPD-748-P	
CPD-734-R		25,000	CPD-748-R	
CPD-734-S		50,000	CPD-748-S	
CPD-734-T		100,000	CPD-748-T	
CPD-734-W		200,000	CPD-748-W	
CPD-734-X		250,000	CPD-748-X	
CPD-734-Y	500,000	CPD-748-Y		
CPD-735-M	30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents	10,000	CPD-749-M	45 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents
CPD-735-P		20,000	CPD-749-P	
CPD-735-R		25,000	CPD-749-R	
CPD-735-S		50,000	CPD-749-S	
CPD-735-T		100,000	CPD-749-T	
CPD-735-W		200,000	CPD-749-W	
CPD-735-X		250,000	CPD-749-X	
CPD-735-Y	500,000	CPD-749-Z		

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

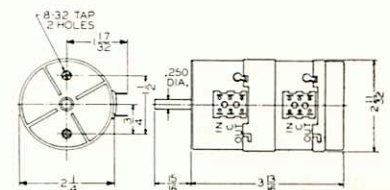


Series CPD-730:  
CONTACT SPACING: 11.25 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337.5 degrees.

Series CPD-745:  
CONTACT SPACING: 7.5 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337.5 degrees.

\*Patent Pending.

← CPD-730



SERIES CPD-730 & CPD-745

For complete specifications on this series see page 51.



# WIRE WOUND . . . POTENTIOMETERS . . . SINGLE UNITS

## SERIES P-350 20 STEPS

These are popular priced potential dividers recommended for use in portable equipment. The compact design of these controls make them extremely useful in equipment where mounting space is at a premium.

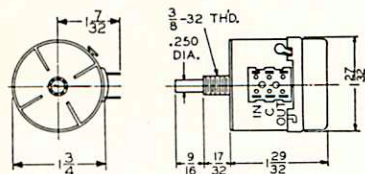
\* **CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, a PQ-354-L would be a P-354-L with a cueing position. A PQ-254-L would be a P-254-L with a cueing position. The resistance accuracy of these precision wire wound potentiometers are within  $\pm 2\%$ . More accurate controls are available upon request.

## SERIES P-250 20 STEPS

The P-250 series are medium sized high impedance potentiometers. These controls are extremely sturdy and are recommended in preference to smaller controls where mounting space is available.

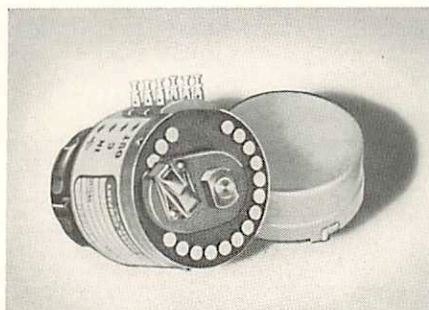
TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
P-350-L P-350-M P-350-P P-350-R P-350-S	{ 20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	P-250-L	{ 20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
.....		10,000	P-250-M	
.....		20,000	P-250-P	
.....		25,000	P-250-R	
.....		50,000	P-250-S	
.....		100,000	P-250-T	
.....		200,000	P-250-W	
Not recommended for values over 50,000Ω.		250,000	P-250-X	
		500,000	P-250-Y	
P-351-L P-351-M P-351-P P-351-R P-351-S	{ 20 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	P-251-L	{ 20 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
.....		10,000	P-251-M	
.....		20,000	P-251-P	
.....		25,000	P-251-R	
.....		50,000	P-251-S	
.....		100,000	P-251-T	
.....		200,000	P-251-W	
Not recommended for values over 50,000Ω.		250,000	P-251-X	
		500,000	P-251-Y	
P-353-L P-353-M P-353-P P-353-R P-353-S	{ 20 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	P-253-L	{ 19 steps. Voltage ratio steps: 1, 1.5, 2, 3, 5, 7, 10, 15, 20, 30, 50, 70, 100, 150, 200, 300, 500, 700, 1000 and off. Accuracy $\pm 1\%$ . Detents Attached.
.....		10,000	P-253-M	
.....		20,000	P-253-P	
.....		25,000	P-253-R	
.....		50,000	P-253-S	
.....		100,000	P-253-T	
.....		200,000	P-253-W	
Not recommended for values over 50,000Ω.		250,000	P-253-X	
		500,000	P-253-Y	
P-354-L P-354-M P-354-P P-354-R P-354-S	{ 20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	5,000	P-254-L	{ 20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
.....		10,000	P-254-M	
.....		20,000	P-254-P	
.....		25,000	P-254-R	
.....		50,000	P-254-S	
.....		100,000	P-254-T	
.....		200,000	P-254-W	
Not recommended for values over 50,000Ω.		250,000	P-254-X	
		500,000	P-254-Y	

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

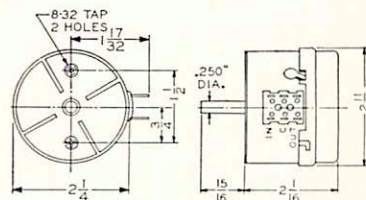


SERIES P-350

CONTACT SPACING: 15 degrees between centers.



SERIES P-350 & P-250



SERIES P-250

TOTAL DEGREE OF ROTATION: 300 degrees.

\*Patent Pend.

For complete specifications on this series see page 51.



# WIRE WOUND . . . . . POTENTIOMETERS . . . . . SINGLE UNITS

## SERIES P-730 30 STEPS

This series of Potentiometers offers a large number of steps of control in a 2 1/4" diameter unit. In high quality studio and laboratory equipment, where space is a consideration, we recommend the use of this series.

These units are physically interchangeable with the CP-730 series.

**\*CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, a PQ-730-L would be a P-730-L with a cueing position. A PQ-345-L would be a P-345-L with a cueing position.

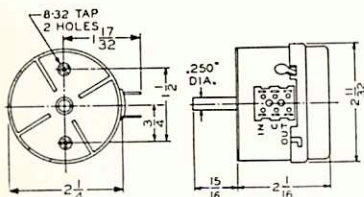
The resistance accuracy of these wire wound potentiometers are within  $\pm 2\%$ . More accurate controls are available upon request.

## SERIES P-345 45 STEPS

The increased number of steps available in the P-345 series, provide a means of obtaining appreciable total attenuation, in relatively small decibel steps. In critical recording and special studio control work, a wide range in small decibel steps is an absolute necessity. To meet such requirements this series is offered.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION						
P-730-L P-730-M P-730-P P-730-R P-730-S P-730-T P-730-W P-730-X P-730-Y	30 steps, 2 DB per step. No taper. last step cut-off (infinity). Detents Attached	5,000	P-345-L P-345-M P-345-P P-345-R P-345-S P-345-T P-345-W P-345-X P-345-Y	45 steps, 2 DB per step. No taper. last step cut-off (infinity). Detents Attached						
P-732-M P-732-P P-732-R P-732-S P-732-T P-732-W P-732-X P-732-Y		30 steps, 1.5 DB per step. No taper. last step cut-off (infinity). Detents Attached	10,000 20,000 25,000 50,000 100,000 200,000 250,000 500,000		P-346-M P-346-P P-346-R P-346-S P-346-T P-346-W P-346-X P-346-Y	45 steps, 1 DB per step. No taper. last step cut-off (infinity). Detents Attached				
P-734-M P-734-P P-734-R P-734-S P-734-T P-734-W P-734-X P-734-Y			30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents		10,000 20,000 25,000 50,000 100,000 200,000 250,000 500,000		P-347-M P-347-P P-347-R P-347-S P-347-T P-347-W P-347-X P-347-Y	45 steps, 1.5 DB per step. No taper. last step cut-off (infinity). Detents Attached		
P-735-M P-735-P P-735-R P-735-S P-735-T P-735-W P-735-X P-735-Y					30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents		10,000 20,000 25,000 50,000 100,000 200,000 250,000 500,000		P-349-M P-349-P P-349-R P-349-S P-349-T P-349-W P-349-X P-349-Y	45 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents

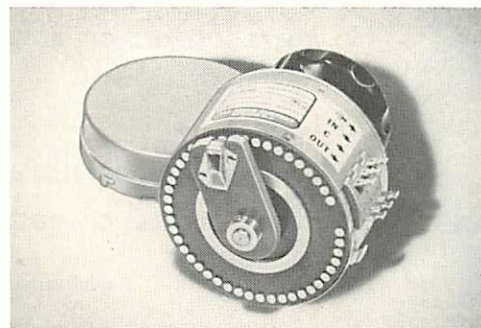
*Special impedances or decibel steps other than those shown are available.*



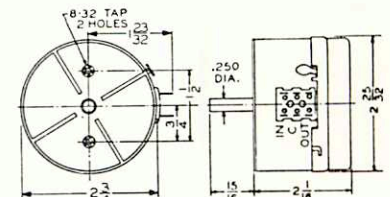
SERIES P-730

CONTACT SPACING: 11.25 degrees between centers.

TOTAL DEGREE OF ROTATION: 337.5 degrees.



SERIES P-345



SERIES P-345

CONTACT SPACING: 7.5 degrees between centers.

TOTAL DEGREE OF ROTATION: 337.5 degrees.

For complete specifications on this series see page 51.



# WIRE WOUND . . . . POTENTIOMETERS . . . . SINGLE UNITS

## SERIES P-620 20 STEPS

For studio equipment, where mounting space is not at a premium, we recommend the P-620 series. Due to the increased diameter, we are able to utilize larger contacts in this series than in smaller units.

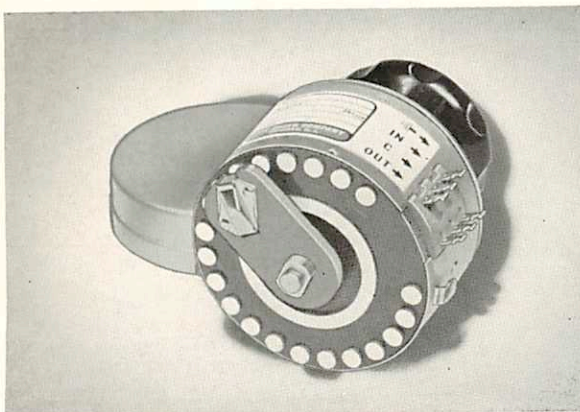
\***CUEING:** When ordering, to obtain the cueing position on any of the controls listed on this page, add the letter "Q" after the type letters. For example, a PQ-620-L would be a P-620-L with a cueing position. A PQ-630-L would be a P-630-L with a cueing position.

## SERIES P-630 30 STEPS

This series offers ten additional steps of attenuation in the same size unit as the P-620 series. These controls are suitable for use in studio equipment and will enable smooth volume regulation.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
P-620-L P-620-M P-620-P P-620-R P-620-S P-620-T P-620-W P-620-X	{ 20 steps, 2 DB per step. No taper. last step cut-off (infinity). Detents Attached.	5,000	P-630-L	{ 30 steps, 2 DB per step. No taper. last step cut-off (infinity). Detents Attached.
		10,000	P-630-M	
		20,000	P-630-P	
		25,000	P-630-R	
		50,000	P-630-S	
		100,000	P-630-T	
		200,000	P-630-W	
		250,000	P-630-X	
P-621-L P-621-M P-621-P P-621-R P-621-S P-621-T P-621-W P-621-X	{ 20 steps, 2 DB per step. No taper. last step 40 DB. Detents Attached.	5,000	P-632-L	{ 30 steps, 1.5 DB per step. No taper. last step cut-off (infinity). Detents Attached.
		10,000	P-632-M	
		20,000	P-632-P	
		25,000	P-632-R	
		50,000	P-632-S	
		100,000	P-632-T	
		200,000	P-632-W	
		250,000	P-632-X	
P-622-L P-622-M P-622-P P-622-R P-622-S P-622-T P-622-W P-622-X P-622-Y	{ 20 steps, 1.5 DB per step. No taper. last step cut-off (infinity). Detents Attached.	5,000	P-635-L	{ 30 steps, 1.5 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
		10,000	P-635-M	
		20,000	P-635-P	
		25,000	P-635-R	
		50,000	P-635-S	
		100,000	P-635-T	
		200,000	P-635-W	
		250,000	P-635-X	
		500,000	P-635-Y	
P-623-L P-623-M P-623-P P-623-R P-623-S P-623-T P-623-W P-623-X P-623-Y	{ 20 steps, 1.5 DB per step. No taper. last step 30 DB. Detents Attached.	5,000	P-634-L	{ 30 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
		10,000	P-634-M	
		20,000	P-634-P	
		25,000	P-634-R	
		50,000	P-634-S	
		100,000	P-634-T	
		200,000	P-634-W	
		250,000	P-634-X	
		500,000	P-634-Y	

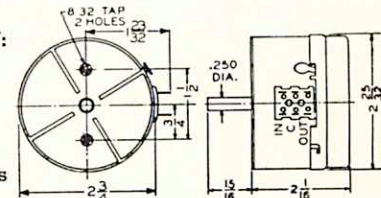
*Special impedances or decibel steps other than those shown are available.*



SERIES P-620

**SERIES P-620**  
CONTACT SPACING: 15 degrees  
between centers.  
TOTAL DEGREE OF ROTATION:  
300 degrees.

**SERIES P-630**  
CONTACT SPACING: 11.25 degrees  
between centers.  
TOTAL DEGREE OF ROTATION:  
337.5 degrees.



SERIES P-620 & P-630

Resistance Accuracy within  $\pm 2\%$ .

For complete specifications on this series see page 51.

\*Patent Pend.



# WIRE WOUND . . . POTENTIOMETERS . . . DUAL UNITS SINGLE DECK

## SERIES DSP-320 20 STEPS

The DSP-320 and DSP-330 are both 2 3/4" diameter units, with the same overall dimensions. The DSP-330 series has ten additional steps of attenuation, making possible either a wider range of attenuation or smaller decibel steps than the DSP-320 series. With this exception, these two series are the same.

## SERIES DSP-330 30 STEPS

These units consist of two separate potentiometers mounted on a single deck having two rows of silver alloy contacts and two slip rings. The resistors are the precision wire wound type having an accuracy of  $\pm 2\%$ . Since there is little shielding between the two potentiometers, these units are recommended for use in controlling push-pull grids.

Note: 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 below indicate the impedance per circuit. For example, a DSP-320-L consists of two 5,000 $\Omega$  potentiometers, and a DSP-330-P consists of two 20,000 $\Omega$  potentiometers.

TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
DSP-320-L DSP-320-M DSP-320-P DSP-320-R DSP-320-S DSP-320-T	20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	DSP-330-L	30 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
		10,000	DSP-330-M	
		20,000	DSP-330-P	
		25,000	DSP-330-R	
		50,000	DSP-330-S	
		100,000		
DSP-321-L DSP-321-M DSP-321-P DSP-321-R DSP-321-S DSP-321-T	20 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	DSP-331-L	30 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
		10,000	DSP-331-M	
		20,000	DSP-331-P	
		25,000	DSP-331-R	
		50,000	DSP-331-S	
		100,000		
DSP-322-L DSP-322-M DSP-322-P DSP-322-R DSP-322-S DSP-322-T	20 steps, 1 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	DSP-332-L	30 steps, 1 DB per step. No taper, last step cut-off (infinity). Detents Attached.
		10,000	DSP-332-M	
		20,000	DSP-332-P	
		25,000	DSP-332-R	
		50,000	DSP-332-S	
		100,000	DSP-332-T	
DSP-323-L DSP-323-M DSP-323-P DSP-323-R DSP-323-S DSP-323-T	20 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	DSP-333-L	30 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached.
		10,000	DSP-333-M	
		20,000	DSP-333-P	
		25,000	DSP-333-R	
		50,000	DSP-333-S	
		100,000		



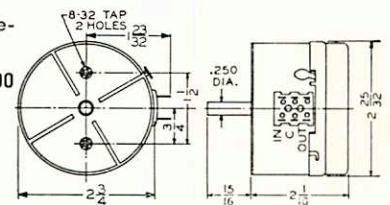
Special impedances or decibel steps other than those shown are available.

### Series DSP-320:

CONTACT SPACING: 15 degrees between centers.  
TOTAL DEGREE OF ROTATION: 300 degrees.

### Series DSP-330:

CONTACT SPACING: 11 1/4 degrees between centers.  
TOTAL DEGREE OF ROTATION: 337 1/2 degrees.



SERIES  
DSP-320 & DSP-330

For complete specifications on this series see page 51.



# WIRE WOUND . . . . . POTENTIOMETERS . . . . . DUAL UNITS

## SERIES DSP-255 20 STEPS SINGLE DECK

This series utilizes two rows of silver alloy contacts with two corresponding slip rings, concentrically mounted on a single deck. These controls are offered primarily for use in controlling push-pull grids. Because of the proximity of the contacts and absence of shielding between resistor sections, caution must be exercised in using this type of control in single ended multistage applications, where high gain circuits are required.

Note: 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.

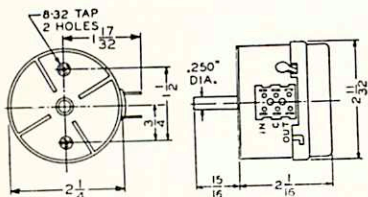
The resistance accuracy of these precision wire wound potentiometers are within  $\pm 2\%$ . More accurate controls are available upon request.

## SERIES DP-350 20 STEPS DOUBLE DECK

In this series of units, we have assembled two series 350 controls in tandem, to make a compact 20 step dual potentiometer. Each deck is individually shielded and balanced to ground. Although these potentiometers are primarily designed to control push-pull grids, each deck may be used in successive stages of a single ended amplifier system.

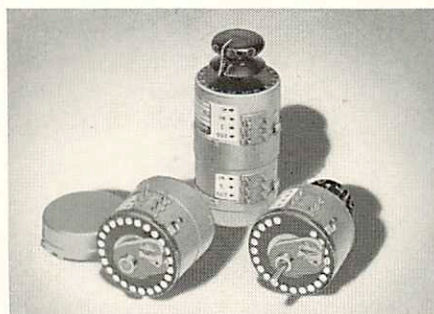
TYPE	ATTENUATION	← TERMINAL IMPEDANCE →	TYPE	ATTENUATION
DSP-255-L	{ 20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	5,000	DP-350-L	{ 20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.
DSP-255-M		10,000	DP-350-M	
DSP-255-P		20,000	DP-350-P	
DSP-255-R		25,000	DP-350-R	
DSP-255-S		50,000	DP-350-S	
DSP-256-L	{ 20 steps, 2 DB per step. No taper, last step cut-off (infinity). Detents Attached.	5,000	DP-351-L	{ 20 steps, 1.5 DB per step. No taper, last step cut-off (infinity). Detents Attached.
DSP-256-M		10,000	DP-351-M	
DSP-256-P		20,000	DP-351-P	
DSP-256-R		25,000	DP-351-R	
DSP-256-S		50,000	DP-351-S	
DSP-257-L	{ 20 steps, 2 DB per step. No taper, 40 DB total. Detents Attached.	5,000	DP-353-L	{ 20 steps, 3 DB per step. No taper, last step cut-off (infinity). Detents Attached.
DSP-257-M		10,000	DP-353-M	
DSP-257-P		20,000	DP-353-P	
DSP-257-R		25,000	DP-353-R	
DSP-257-S		50,000	DP-353-S	
DSP-258-L	{ 20 steps, 1.5 DB per step. No taper, 30 DB total. Detents Attached.	5,000	DP-354-L	{ 20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.
DSP-258-M		10,000	DP-354-M	
DSP-258-P		20,000	DP-354-P	
DSP-258-R		25,000	DP-354-R	
DSP-258-S		50,000	DP-354-S	

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

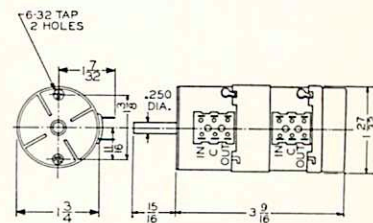


OUTLINE DIAGRAM  
SERIES DSP-255

CONTACT SPACING: 15 degrees between centers.



SERIES DP-350



OUTLINE DIAGRAM  
SERIES DP-350

TOTAL DEGREE OF ROTATION: 300 degrees.

For complete specifications on this series see page 51.



# WIRE WOUND . . . POTENTIOMETERS . . . DUAL UNITS IN TANDEM

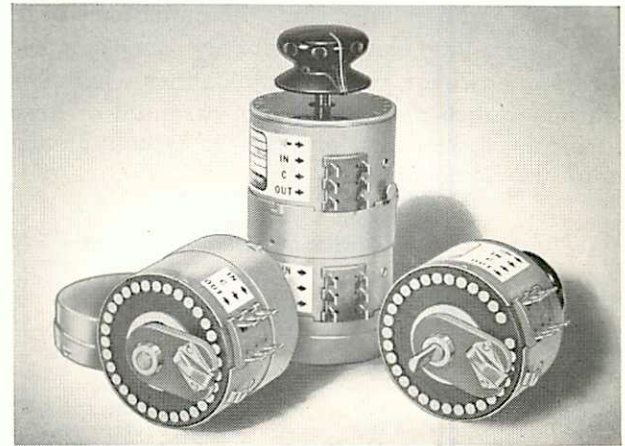
## SERIES DP-250 20 STEPS

The DP-250 series and the DP-730 series are physically interchangeable with the exception that the 730 series has ten additional steps of attenuation. Each of these series consists of two ganged potentiometers, with each section completely shielded. Although primarily designed for control of push-pull grids, due to the shielded construction, each of the decks may be used as an unbalanced potentiometer in separate amplifier stages. A unique coupling feature enables quick, easy separation of the rear from the front deck, for inspection or servicing. The resistors in these units are precision wire wound with an accuracy of  $\pm 2\%$ .

The cueing feature may be obtained on all these units.

Note: The terminal impedances listed below indicate the impedance per deck.

## SERIES DP-730 30 STEPS

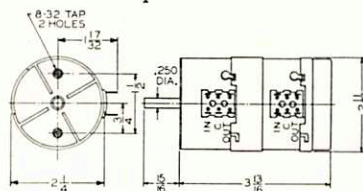


TYPE	ATTENUATION	← TERMINAL IMPEDANCE → PER DECK	TYPE	ATTENUATION
DP-250-L	20 steps, 2 DB per step. No taper. last step cut-off (infinity). Detents Attached.	5,000	DP-730-L	30 steps, 2 DB per step. No taper. last step cut-off (infinity). Detents Attached.
DP-250-M		10,000	DP-730-M	
DP-250-P		20,000	DP-730-P	
DP-250-R		25,000	DP-730-R	
DP-250-S		50,000	DP-730-S	
DP-250-T		100,000	DP-730-T	
DP-250-W		200,000	DP-730-W	
DP-250-X		250,000	DP-730-X	
DP-250-Y		500,000	DP-730-Y	
DP-251-L		20 steps, 1 DB per step. No taper. last step cut-off (infinity). Detents Attached.	5,000	
DP-251-M	10,000		DP-732-M	
DP-251-P	20,000		DP-732-P	
DP-251-R	25,000		DP-732-R	
DP-251-S	50,000		DP-732-S	
DP-251-T	100,000		DP-732-T	
DP-251-W	200,000		DP-732-W	
DP-251-X	250,000		DP-732-X	
DP-251-Y	500,000		DP-732-Y	
DP-252-L	20 steps, 1.5 DB per step. No taper. last step cut-off (infinity). Detents Attached.		5,000	DP-734-L
DP-252-M		10,000	DP-734-M	
DP-252-P		20,000	DP-734-P	
DP-252-R		25,000	DP-734-R	
DP-252-S		50,000	DP-734-S	
DP-252-T		100,000	DP-734-T	
DP-252-W		200,000	DP-734-W	
DP-252-X		250,000	DP-734-X	
DP-252-Y		500,000	DP-734-Y	
DP-254-L		20 steps, 2 DB per step. Tapered on last steps to cut-off (infinity). No Detents.	5,000	DP-735-L
DP-254-M	10,000		DP-735-M	
DP-254-P	20,000		DP-735-P	
DP-254-R	25,000		DP-735-R	
DP-254-S	50,000		DP-735-S	
DP-254-T	100,000		DP-735-T	
DP-254-W	200,000		DP-735-W	
DP-254-X	250,000		DP-735-X	
DP-254-Y	500,000		DP-735-Y	

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

Series DP-250:  
CONTACT SPACING: 15 degrees between centers.

TOTAL DEGREE OF ROTATION: 300 degrees.



Series DP-730:  
CONTACT SPACING: 11.25 degrees between centers.

TOTAL DEGREE OF ROTATION: 337.5 degrees.

\*Patent Pending.

For complete specifications on this series see page 51.



# "L" NETWORKS & RHEOSTATS

## "L" NETWORKS

"L" type attenuators are not normally used as gain controls in audio circuits, since the impedance of the network remains constant in only one direction. There are, however, certain applications where constant impedance matching is not essential or desirable. Under these conditions, the "L" type attenuator can be used satisfactorily.

The DAVEN Company manufactures two general types of "L" attenuators—Type "LL" with constant impedance at the series resistor, and Type "LR" with constant impedance at the shunt resistor end. In the "LL" type network, the output impedance approaches zero, while in the "LR" network, the output impedance approaches infinity as attenuation is increased.

TYPE	INPUT IMPEDANCE	OUTPUT IMPEDANCE	← ATTENUATION →	TYPE	INPUT IMPEDANCE	OUTPUT IMPEDANCE
LL-250-K	150	Variable approaches zero	10 steps, 2 DB per step.	LR-250-K	150	Variable approaches infinity as loss increases.
LL-250-D	200	as loss increases.	20 DB total.	LR-250-D	200	
LL-250-E	250		Detents Attached.	LR-250-E	250	
LL-250-F	500			LR-250-F	500	
LL-250-G	600			LR-250-G	600	
LL-320-K	150	Variable approaches zero	20 steps, 2 DB per step.	LR-320-K	150	Variable approaches infinity as loss increases.
LL-320-D	200	as loss increases.	40 DB total.	LR-320-D	200	
LL-320-E	250		Detents Attached.	LR-320-E	250	
LL-320-F	500			LR-320-F	500	
LL-320-G	600			LR-320-G	600	
LL-330-K	150	Variable approaches zero	30 steps, 2 DB per step.	LR-330-K	150	Variable approaches infinity as loss increases.
LL-330-D	200	as loss increases.	60 DB total.	LR-330-D	200	
LL-330-E	250		Detents Attached.	LR-330-E	250	
LL-330-F	500			LR-330-F	500	
LL-330-G	600			LR-330-G	600	

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

## RHEOSTATS

THE DAVEN COMPANY will supply upon short notice step type rheostats for special circuit applications. These rheostats are assembled on standard attenuator switch mechanisms and offer the same excellence and reliability as DAVEN low level mixing controls.

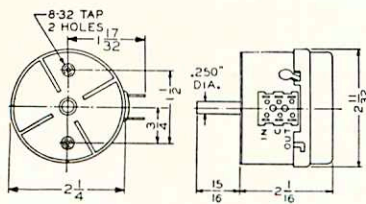
The following is a partial listing of possible applications of this type of control.

1. As an equalizer control for varying the degree of equalization.
2. As a special mixing control.
3. As a meter multiplier network.
4. As ratio and percentage arms in bridge circuits.
5. As a filament control.
6. As a plate and bias voltage control.
7. As a motor speed regulator.

TYPE	MAXIMUM NO. OF STEPS	DIAMETER	DEPTH	TYPE OF RESISTANCE	MAXIMUM RESISTANCE ATTAINABLE
R-350	20	1 3/4"	1 3/4"	wire wound	200,000
CR-350	20	1 3/4"	1 3/4"	carbon	1 Meg.
R-250	20	2 1/4"	2 1/16"	wire wound	500,000
CR-250	20	2 1/4"	2 1/16"	carbon	1 Meg.
R-330	30	2 3/4"	2 1/16"	wire wound	500,000
CR-330	30	2 3/4"	2 1/16"	carbon	1 Meg.
R-345	45	2 3/4"	2 1/16"	wire wound	500,000
CR-345	45	2 3/4"	2 1/16"	carbon	1 Meg.

Since the loss in a series circuit control depends upon the source and the load characteristics, it is not possible to supply a step type rheostat having definite steps of attenuation without taking these factors into account. Because of these factors no

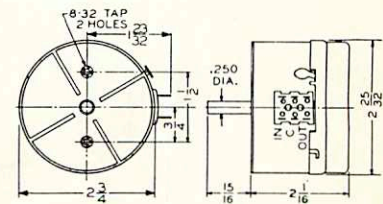
definite resistance values are listed. It is suggested that when ordering rheostat type controls, either resistance values per step, or full circuit details accompany the order.



SERIES 250

CONTACT SPACING: Types 250 and 320 — 15° between centers.

CONTACT SPACING: Type 330 — 11.25° between centers.



SERIES 320 & 330



# VU METER MULTIPLIER NETWORKS

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 illustrates the conventional method of using the 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.

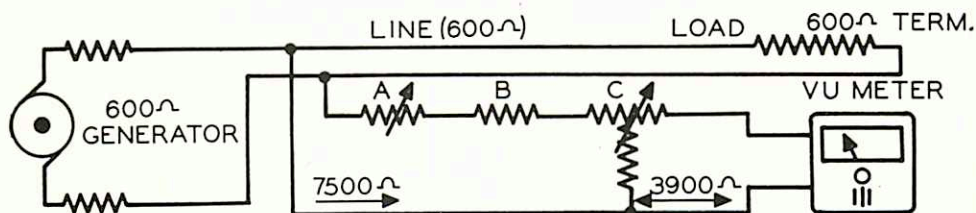


Figure I

TYPE	NO. OF STEPS	DB PER STEP	DECIBEL RANGE	IMPEDANCE	NOTES
991	11	0.1	± 0.5 DB	880Ω	Zero adjuster required.
991-2	11	0.15	± 0.75	1320Ω	Zero adjuster required.
T-994-1	12	2	1MW +4 to +24 & off.	7100/3900	Zero adjust rheostat required. Type 991.
T-994-2	12	2	1MW +4 to +24 & off.	7500/3900	No zero adjust rheostat required.
T-994-3	12	2	+4 to +26 and off.	3900/3900	External 3600Ω series resistor required.
T-994-4	12	2	+4 to +26 and off.	7100/3900	Zero adjust rheostat required. Type 991.
T-994-5	12	2	+4 to +26 and off.	7500/3900	No zero adjust rheostat required.
\$21.00 TA-1000-1	20	2	1MW +4 to +40 & off.	7100/3900	Zero adjust rheostat required. Type 991.
TA-1000-2	20	2	1MW +4 to +40 & off.	7500/3900	No zero adjust rheostat required.
TA-1000-3	20	2	1MW +4 to +40 & off.	6900/3900	Zero adjust rheostat required. Type 991-2
TA-1000-4	20	2	+4 to +42 & off.	7100/3900	Zero adjust rheostat required. Type 991.
TA-1000-5	20	2	+4 to +42 & off.	3900/3900	External 3600Ω series resistor required.
TA-1000-6	20	2	+4 to +42 & off.	7500/3900	No zero adjust rheostat required.

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

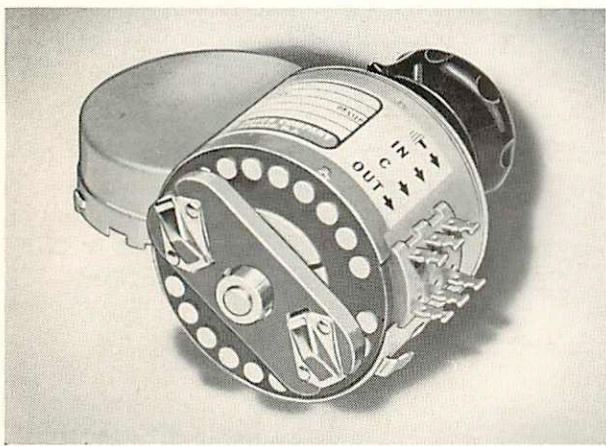
Note: Clockwise rotation is standard for increased attenuation in the above networks.



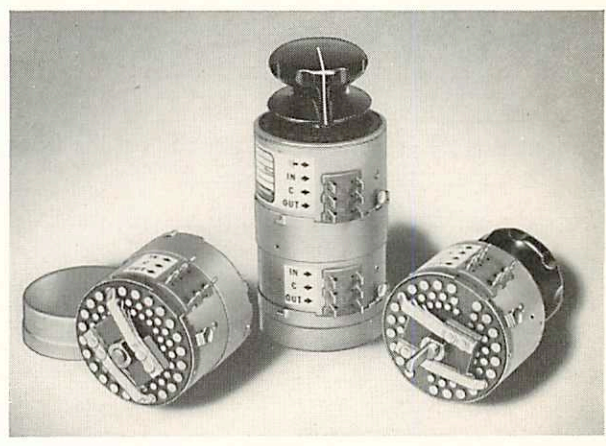
PRICE BELOW

# DECADE ATTENUATORS

Series 2500 Zero to 50 Kc  
Resistor Accuracy  $\pm 1\%$



"T" NETWORK



BALANCED "H" NETWORK

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 Boxes.

All the controls in this series have ten steps of attenuation. The frequency characteristics are flat from zero to 50 kc. Positive, accurate detents are supplied on all units. The mechanical construction

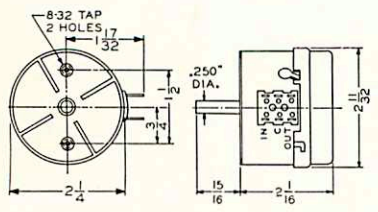
of these networks, is the same high quality as supplied on all Daven attenuators.

Electrically, these units are offered in three circuit types—Potentiometers, "T" and Balanced "H". Resistors are of the precision, non-inductive, wire wound type calibrated to an accuracy of  $\pm 1\%$ . 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.

0.1 DB STEPS, 1 DB TOTAL		
TYPE	CIRCUIT	IMPEDANCE
2500	Potentiometer	50,000
2501	Potentiometer	100,000
2502	Potentiometer	200,000
\$16.50 { 2509	"T"	600
2510	"T"	500
2521	"T"	150
2515	Balanced "H"	600
2516	Balanced "H"	500
2524	Balanced "H"	150

1.0 DB STEPS, 10 DB TOTAL		
TYPE	CIRCUIT	IMPEDANCE
2503	Potentiometer	50,000
2504	Potentiometer	100,000
2505	Potentiometer	200,000
2511 } \$16.50	"T"	600
2512 } \$16.50	"T"	500
2522 } \$16.50	"T"	150
2517	Balanced "H"	600
2518	Balanced "H"	500
2525	Balanced "H"	150

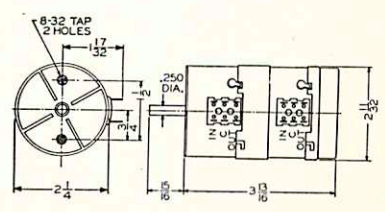
10 DB STEPS, 100 DB TOTAL		
TYPE	CIRCUIT	IMPEDANCE
2506	Potentiometer	50,000
2507	Potentiometer	100,000
2508	Potentiometer	200,000
2513 } \$19.50	"T"	600
2514 } \$19.50	"T"	500
2523 } \$19.50	"T"	150
2519	Balanced "H"	600
2520	Balanced "H"	500
2526	Balanced "H"	150



SIZE OF 0.1 & 1.0 DB STEP UNITS

CONTACT SPACING: 15 degrees between centers.  
TOTAL DEGREE OF ROTATION: 150 degrees.

For complete specifications on this series see page 51.



SIZE OF 10 DB STEP UNITS

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



# IMPEDANCE MATCHING NETWORKS

## SERIES 3200

Impedance matching networks comprise a series of tapered "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.

Illustrated below in Fig. 1 and Fig. 2 are suggested methods of utilizing these networks in simple measuring circuits. Please note, if correctly used with a carefully shielded and balanced repeat coil, the "BH" will function as a "T" if one side of the output is grounded; as an "H" if neither side is grounded, or as a "BH" if the center point is grounded. See Figure 3, below. Note: Letters "BH" denotes balanced "H" networks.

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

NOTE: The resistance accuracy of the above controls is  $\pm 1\%$ .

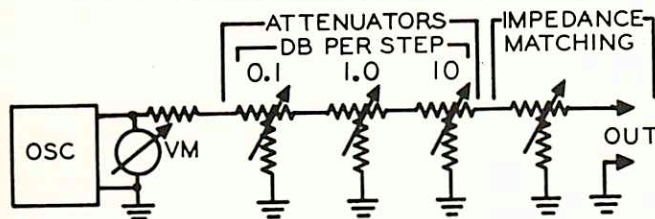


Fig. 1

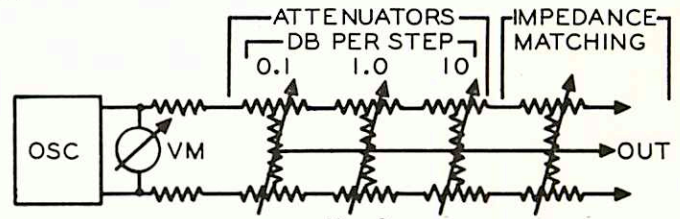


Fig. 2

### DIMENSIONS

"T" NETWORKS: Diameter  $2\frac{3}{4}$ " x  $2\text{-}1/16$ " depth.  
 "BH" NETWORKS: Diameter  $2\frac{3}{4}$ " x  $3\text{-}3/16$ " depth.  
 MOUNTING: Two 6-32 Tapped Holes,  $1\frac{1}{2}$ " apart.  
 CONTACT SPACING: 15 degrees between centers.  
 TOTAL DEGREE OF ROTATION: 120 degrees.

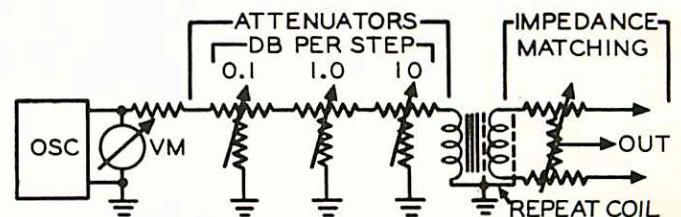


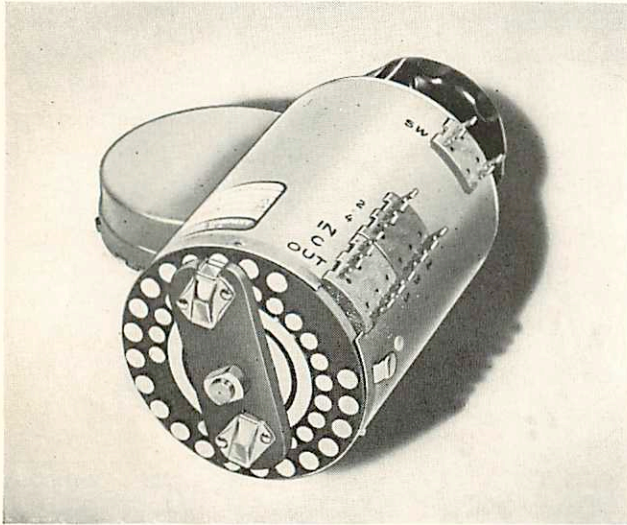
Fig. 3

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

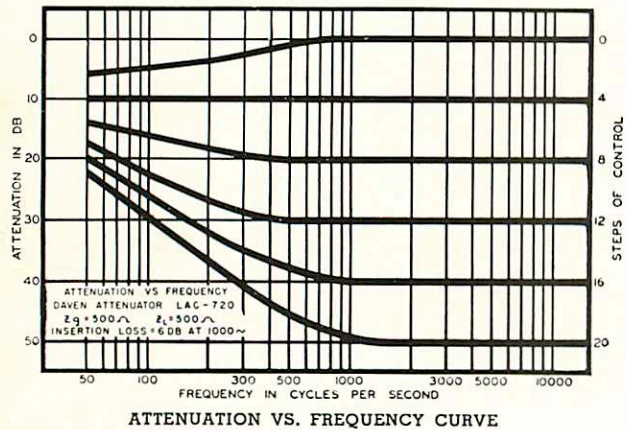
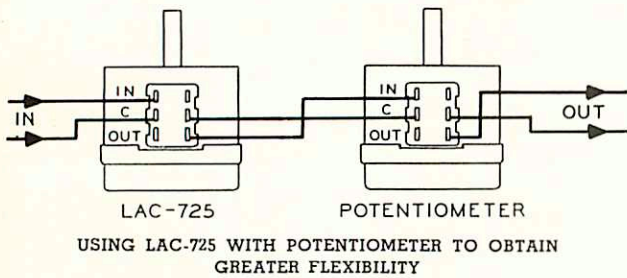


# TONE COMPENSATING ATTENUATORS

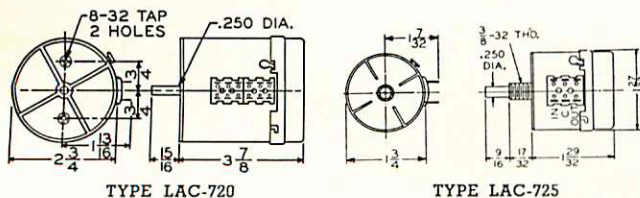
## SERIES LAC-720 and LAC-725



SERIES LAC-720



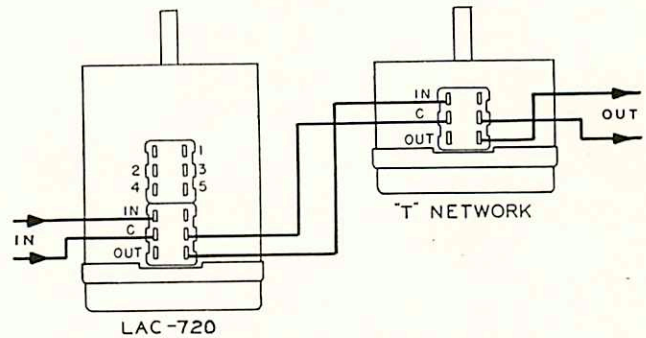
ATTENUATION VS. FREQUENCY CURVE



Tone Compensating Attenuators differ from all other types of DAVEN controls in that they are designed to supply unequal attenuation over the audio frequency band. These controls are for use as volume controls in high quality monitoring amplifiers where the volume level from the speaker must be varied without perceptible change in tonal quality of the program. When the volume is reduced by means of an ordinary linear control the low frequency notes drop off rapidly in volume to the point that the program sounds harsh.

The purpose of DAVEN Tone Compensating Attenuators is to attenuate the middle range of frequencies while only slightly reducing the low frequencies, thus holding the program quality essentially constant as the volume is changed. The networks are carefully designed to follow very closely the perception sensitivity curves of the human ear.

Although not essential to the operation, it is suggested that the tone compensated controls be used in conjunction with a conventional linear attenuator. With this combination an extremely wide range of characteristics can be obtained without the use of auxiliary switches or circuit changes. See diagrams below for suggested circuit.



USING LAC-720 WITH "T" NETWORK TO OBTAIN GREATER FLEXIBILITY.

### SPECIFICATIONS

#### SERIES LAC-720 AND SERIES LAC-725

TYPES: LAC-720-F, 500/500Ω AND LAC-720-G, 600/600Ω.

**CHARACTERISTICS:** 20 steps, 2.5 DB per step, 50 DB total. By connecting the control from the IN, OUT, and COMMON terminals, the attenuator will function in accordance with curve above. However, by externally wiring the 5 additional lugs, this unit can be converted to a straight ladder of 2.5 DB per step with a flat frequency response. By selecting several combinations of these terminals, a whole series of curve characteristics can be obtained to meet individual requirements.

TYPE: LAC-725-T, 100,000Ω.

**CHARACTERISTICS:** 20 steps, 2.5 DB per step, 50 DB total. The LAC-725 is similar in circuit to the LAC-720 but is designed for use directly in the grid circuit of audio amplifiers. When used in this manner, the output should be loaded with a resistance of 100,000Ω in addition to the grid of the tube. However, since the output must be loaded, a DAVEN potentiometer type CP-350-T can be used to provide this output load. Thus a wide selection of tone compensation can be obtained by merely adjusting the settings of the LAC-725 and the CP-350.



# ORDERING INFORMATION FOR SPECIAL CONTROLS

We recognize the fact that our standard units may not always fill the requirements of a manufacturer. We, therefore, are prepared to supply units made to specifications. We can equip our attenuators with special shafts, bushings, decibels per step, impedance, number of steps of attenuation, etc. When ordering a non-standard control, please furnish us

with as much of the following information as possible. By so doing, we can quote prices accurately, and speed delivery of the unit.

May we suggest that standard products be ordered when feasible, since many are carried in stock and can be delivered quickly.

## 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 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:**
  - (a) Left and right hand ears of terminals 1, 2 or 3 can be separated internally upon assembly to form 3, 4, 5 or 6 lug 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 operating of signal light or relay, in separate shielded compartment at shaft end of switch. This does not increase the over-all dimensions of the unit. (See Fig. 2.) Specify position of operation of switch, if special. Standard practice is to switch between last and next to last contact in extreme counter-clockwise position. Specify if required.
5. **MOUNTING:**
  - Either two hole or single hole mounting is available on all units. For  $1\frac{3}{4}$ " dia. units  $J = 1\frac{3}{8}$ ",  $K = 6/32$  thd. For all other units  $J = 1\frac{1}{2}$ ",  $K = 8/32$  thd. Please use the following diagrams and outline as a guide when specifying.

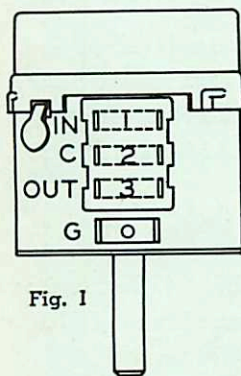


Fig. 1

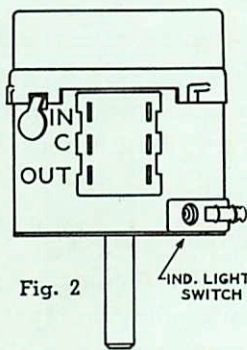


Fig. 2

IND. LIGHT SWITCH

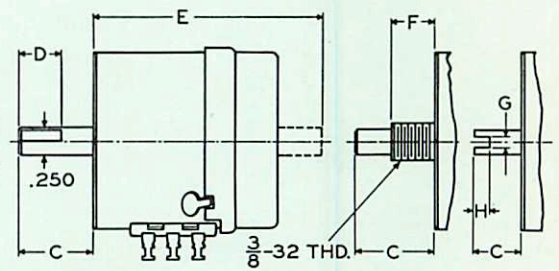
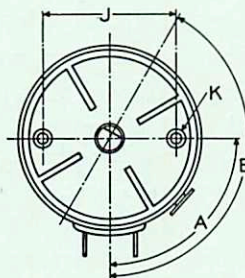


Fig. 3

Two Hole Mounting  
Note—"C" 15/16" for stock length

Single Hole Mounting  
Note—"F" 15/32" for stock length

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

← 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 mid position, if possible. If this cannot be done, specify location of switch arm.



# GENERAL CHARACTERISTICS OF ALL DAVEN ATTENUATORS

1. **ACCURACY:** Individual resistors are calibrated to an accuracy of  $\pm 5\%$ , unless otherwise specified. Closer tolerance may be had on request.
2. **TYPE OF WINDING:** Ladder and "T" networks card type (non-inductive) on flat insulators. Potentiometers—wire wound (non-inductive) spools or composition resistors. (See individual pages for specific types.)
3. **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.
4. **INSERTION LOSS:** (a). Ladders—for 1:1 impedance ratio the initial loss is 6 DB. For 1:2 impedance ratios, the initial loss is 2 DB. (b). "T" and Balanced "H" networks—zero insertion loss. (c). Potentiometers—zero insertion loss when properly terminated.
5. **IMPEDANCE CHARACTERISTICS:** (a). Ladders—the input is constant and the output falls on the first steps. (b). "T" and Balanced "H" networks—the input and output impedance is constant. (c). Potentiometers—the input is constant and the output is variable.
6. **SWITCH NOISE LEVEL:** No indication above associated circuit and tube noises when switch is operated at extremely low levels (—130 DB or less).
7. **DIRECTION OF ROTATION:** For increasing attenuation, counter clockwise is standard and will be supplied unless specifically requested otherwise.
8. **SWITCH CONSTRUCTION:** Heavy duty solid silver alloy contacts, enclosed laminated switch rotor, and slip ring return. Each leaf of the enclosed switch arms employ separate pressure springs to provide self alignment, KNEE-ACTION and equalized pressure, to insure low and uniform contact resistance. The KNEE-ACTION rotor is of tamper-proof construction.
9. **SHAFT:** 0.250 diameter ground and polished stainless steel. If non-standard shaft is required, please list on order.
10. **BEARINGS:** Shaft bearings are FREE TURNING.
11. **SHIELD:** Totally enclosed dustproof two piece construction. Indexing and stop mechanism in shielded front compartment. Rear cover positive lock-on type with permanently connected push-to-release spring. This spring-lock withstands vibration tests.
12. **DIAL AND KNOB:** Distinctive and durable black aluminate dial, and sturdy black bakelite knob are available. Knob is fluted for ease of operation.
13. **MOUNTING:** See preceding page.
14. **GOVERNMENT SPECIFICATIONS:** Standard or special attenuators may be secured upon request to conform with Government Requirements.

**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.



**ATTENUATOR  
INFORMATION  
INSIDE OF THIS FOLD**

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**ATTENUATOR  
INDEX**

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**LADDER NETWORKS  
PAGES 5 to 12**

---

**BALANCED LADDER UNITS  
PAGES 13 to 17**

---

**VERTICAL LEVER UNITS  
PAGE 17**

---

**"T" NETWORKS  
PAGES 18 to 26**

---

**BALANCED "H" NETWORKS  
PAGES 27 to 32**

---

**POTENTIOMETERS  
PAGES 33 to 46**

---

**METER MULTIPLIERS  
PAGE 47**

---

**DECADE ATTENUATORS  
PAGE 48**

---

**IMPEDANCE MATCHING UNITS  
PAGE 49**

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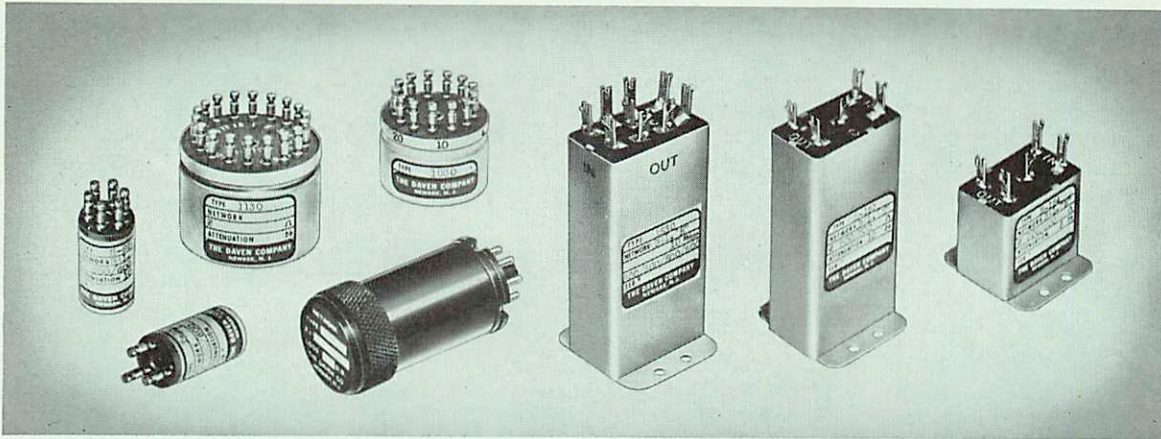
**TONE COMPENSATING UNITS  
PAGE 50**

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**THE DAVEN COMPANY  
NEWARK • NEW JERSEY**



# FACTS ABOUT 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 card-type 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. (The photograph above illustrates the relative sizes of the various units.) The dimensions of each type of pad are shown on the individual pages of the following section.

## 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 pre-amplifier. In switching a line must be shorted. To keep from interrupting the program on one line, while the other is being switched, a 600/600  $\Omega$  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.



# FACTS ABOUT DAVEN FIXED ATTENUATORS

## USES: (Cont'd)

4. To change an indicating meter (V. I.) from one reference level to another.  
Example—Level over line is +10 DB, reference 6 MW across 500Ω. To monitor with a V. I. meter which reads zero Db reference 1 MW across 600Ω, pad required is 7500/3900Ω, with a loss of 16.98 DB.
5. To change impedance.  
Example—Line impedance is 500Ω. To change to 600Ω insert a 500/600Ω fixed pad.
6. 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 10 DB.  
Example—Three incoming 600Ω lines to combine into one outgoing 600Ω line. Pad required is same as above turned around.
7. 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.
8. As a laboratory standard of fixed attenuation.  
Example—Fixed pads can be substituted for more expensive attenuation boxes 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", "U", "O", "π", Ladder 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  $R^2 = \text{impedance ratio or } \frac{Z_1}{Z_2}$   
and  $N = \text{decibel loss}$

For example a pad having a 600Ω input and a 1200Ω output will have a minimum loss of 7.655 DB. Consult Appendix "C" tables for rapid calculations.

## 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  $R^2 = \text{impedance ratio and } N = \text{decibel loss}$

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

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

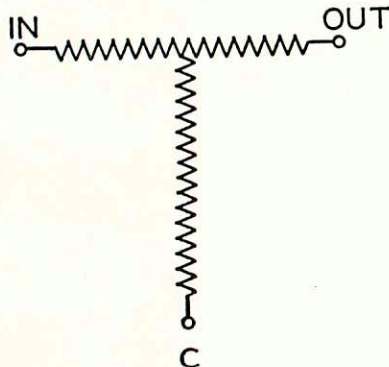
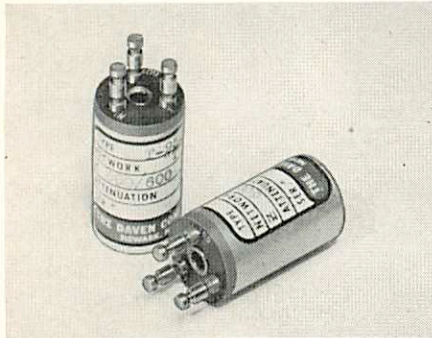


# FIXED ATTENUATORS

(PADS)

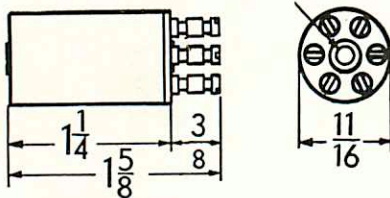
TYPE T-950

"TEE" NETWORK



"T" NETWORK

#6 SCREW



ACCURACY:  $\pm 2\%$

MAXIMUM DISSIPATION: 0.6 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

## Range of Db. Loss Values Available

IMPEDANCE			DECIBEL LOSS	
In-put	Out-put		Mini-mum	Maxi-mum
30	30	May be obtained from	0	to 50Db
30	50	" " " "	6.47	to 55Db
30	150	" " " "	12.53	to 60Db
30	200	" " " "	13.91	to 60Db
30	250	" " " "	14.95	to 65Db
30	500	" " " "	18.11	to 65Db
30	600	" " " "	18.92	to 65Db
<hr/>				
50	30	May be obtained from	6.47	to 55Db
50	50	" " " "	0	to 55Db
50	150	" " " "	9.96	to 60Db
50	200	" " " "	11.44	to 65Db
50	250	" " " "	12.54	to 65Db
50	500	" " " "	15.79	to 65Db
50	600	" " " "	16.63	to 70Db
<hr/>				
150	30	May be obtained from	12.53	to 60Db
150	50	" " " "	9.96	to 60Db
150	150	" " " "	0	to 65Db
150	200	" " " "	4.74	to 70Db
150	250	" " " "	6.47	to 70Db
150	500	" " " "	10.52	to 70Db
150	600	" " " "	11.43	to 75Db
150	3,000	" " " "	18.92	to 80Db
<hr/>				
200	30	May be obtained from	13.91	to 60Db
200	50	" " " "	11.44	to 65Db
200	150	" " " "	4.74	to 70Db
200	200	" " " "	0	to 70Db
200	250	" " " "	4.18	to 70Db
200	500	" " " "	8.96	to 75Db
200	600	" " " "	9.95	to 75Db
<hr/>				
250	30	May be obtained from	14.95	to 65Db
250	50	" " " "	12.54	to 65Db
250	150	" " " "	6.47	to 65Db
250	200	" " " "	4.18	to 70Db
250	250	" " " "	0	to 70Db
250	500	" " " "	7.65	to 75Db
250	600	" " " "	8.73	to 75Db
<hr/>				
500	30	May be obtained from	18.11	to 65Db
500	50	" " " "	15.79	to 65Db
500	150	" " " "	10.52	to 70Db
500	200	" " " "	8.96	to 75Db
500	250	" " " "	7.65	to 75Db
500	500	" " " "	0	to 75Db
500	600	" " " "	3.76	to 80Db
<hr/>				
600	30	May be obtained from	18.92	to 65Db
600	50	" " " "	16.63	to 70Db
600	150	" " " "	11.43	to 75Db
600	200	" " " "	9.95	to 75Db
600	250	" " " "	8.73	to 75Db
600	500	" " " "	3.76	to 80Db
600	600	" " " "	0	to 80Db

When ordering, please specify type number, impedance and decibel loss.



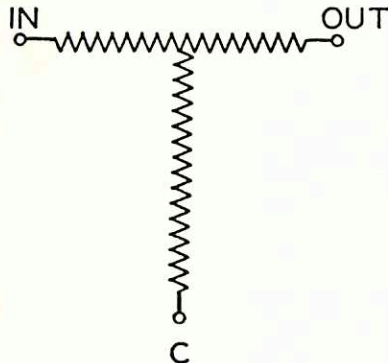
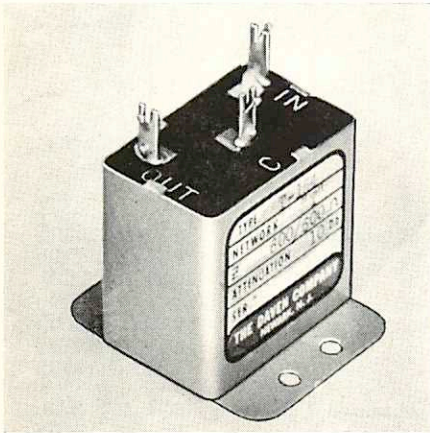
# FIXED ATTENUATORS

( P A D S )

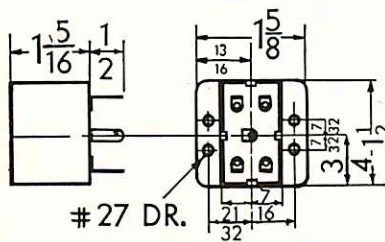
TYPE T-154

"TEE" NETWORK

Range of Db. Loss Values Available



"T" NETWORK



# 27 DR.

ACCURACY:  $\pm 2\%$

MAXIMUM DISSIPATION: 1.0 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

IMPEDANCE			DECIBEL LOSS	
In-put	Out-put		Mini- mum	Maxi- mum
30	30	May be obtained from	0	to 100Db
30	50	" " " "	6.47	to 100Db
30	150	" " " "	12.53	to 100Db
30	200	" " " "	13.91	to 100Db
30	250	" " " "	14.95	to 100Db
30	500	" " " "	18.11	to 100Db
30	600	" " " "	18.92	to 100Db
50	30	May be obtained from	6.47	to 100Db
50	50	" " " "	0	to 100Db
50	150	" " " "	9.96	to 100Db
50	200	" " " "	11.44	to 100Db
50	250	" " " "	12.54	to 100Db
50	500	" " " "	15.79	to 100Db
50	600	" " " "	16.63	to 100Db
150	30	May be obtained from	12.53	to 100Db
150	50	" " " "	9.96	to 100Db
150	150	" " " "	0	to 100Db
150	200	" " " "	4.74	to 100Db
150	250	" " " "	6.47	to 100Db
150	500	" " " "	10.52	to 100Db
150	600	" " " "	11.43	to 100Db
150	3,000	" " " "	18.92	to 100Db
200	30	May be obtained from	13.91	to 100Db
200	50	" " " "	11.44	to 100Db
200	150	" " " "	4.74	to 100Db
200	200	" " " "	0	to 100Db
200	250	" " " "	4.18	to 100Db
200	500	" " " "	8.96	to 100Db
200	600	" " " "	9.95	to 100Db
250	30	May be obtained from	14.95	to 100Db
250	50	" " " "	12.54	to 100Db
250	150	" " " "	6.47	to 100Db
250	200	" " " "	4.18	to 100Db
250	250	" " " "	0	to 100Db
250	500	" " " "	7.65	to 100Db
250	600	" " " "	8.73	to 100Db
500	30	May be obtained from	18.11	to 100Db
500	50	" " " "	15.79	to 100Db
500	150	" " " "	10.52	to 100Db
500	200	" " " "	8.96	to 100Db
500	250	" " " "	7.65	to 100Db
500	500	" " " "	0	to 100Db
500	600	" " " "	3.76	to 100Db
500	5,000	" " " "	15.79	to 100Db
500	10,000	" " " "	18.92	to 100Db
500	20,000	" " " "	21.98	to 100Db
600	30	May be obtained from	18.92	to 100Db
600	50	" " " "	16.63	to 100Db
600	150	" " " "	11.43	to 100Db
600	200	" " " "	9.95	to 100Db
600	250	" " " "	8.73	to 100Db
600	500	" " " "	3.76	to 100Db
600	600	" " " "	0	to 100Db
600	5,000	" " " "	14.94	to 100Db
600	10,000	" " " "	18.11	to 100Db
600	20,000	" " " "	21.18	to 100Db

When ordering, please specify type number, impedance and decibel loss.



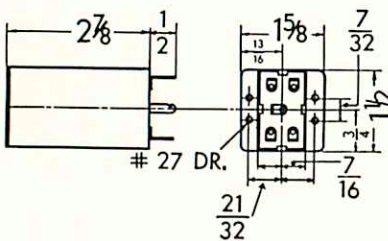
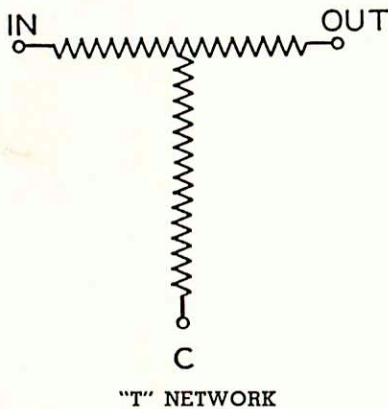
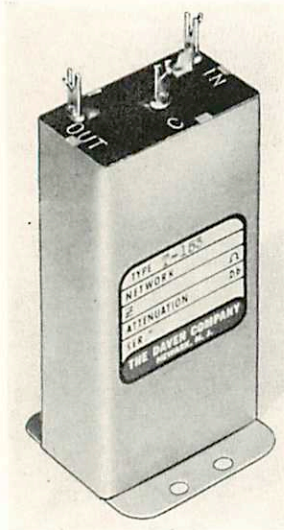
# FIXED ATTENUATORS

(PADS)

TYPE T-153

"TEE" NETWORK

Range of Db. Loss Values Available



ACCURACY:  $\pm 2\%$

MAXIMUM DISSIPATION: 1.0 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

IMPEDANCE			DECIBEL LOSS	
In-put	Out-put		Mini- mum	Maxi- mum
30	30	May be obtained from	0	to 100Db
30	50	" " " "	6.47	to 100Db
30	150	" " " "	12.53	to 100Db
30	200	" " " "	13.91	to 100Db
30	250	" " " "	14.95	to 100Db
30	500	" " " "	18.11	to 100Db
30	600	" " " "	18.92	to 100Db
<hr/>				
50	30	May be obtained from	6.47	to 100Db
50	50	" " " "	0	to 100Db
50	150	" " " "	9.96	to 100Db
50	200	" " " "	11.44	to 100Db
50	250	" " " "	12.54	to 100Db
50	500	" " " "	15.79	to 100Db
50	600	" " " "	16.63	to 100Db
<hr/>				
150	30	May be obtained from	12.53	to 100Db
150	50	" " " "	9.96	to 100Db
150	150	" " " "	0	to 100Db
150	200	" " " "	4.74	to 100Db
150	250	" " " "	6.47	to 100Db
150	500	" " " "	10.52	to 100Db
150	600	" " " "	11.43	to 100Db
150	3,000	" " " "	18.92	to 100Db
<hr/>				
200	30	May be obtained from	13.91	to 100Db
200	50	" " " "	11.44	to 100Db
200	150	" " " "	4.74	to 100Db
200	200	" " " "	0	to 100Db
200	250	" " " "	4.18	to 100Db
200	500	" " " "	8.96	to 100Db
200	600	" " " "	9.95	to 100Db
<hr/>				
250	30	May be obtained from	14.95	to 100Db
250	50	" " " "	12.54	to 100Db
250	150	" " " "	6.47	to 100Db
250	200	" " " "	4.18	to 100Db
250	250	" " " "	0	to 100Db
250	500	" " " "	7.65	to 100Db
250	600	" " " "	8.73	to 100Db
<hr/>				
500	30	May be obtained from	18.11	to 100Db
500	50	" " " "	15.79	to 100Db
500	150	" " " "	10.52	to 100Db
500	200	" " " "	8.96	to 100Db
500	250	" " " "	7.65	to 100Db
500	500	" " " "	0	to 100Db
500	600	" " " "	3.76	to 100Db
500	5,000	" " " "	15.79	to 100Db
500	10,000	" " " "	18.92	to 100Db
500	20,000	" " " "	21.98	to 100Db
<hr/>				
600	30	May be obtained from	18.92	to 100Db
600	50	" " " "	16.63	to 100Db
600	150	" " " "	11.43	to 100Db
600	200	" " " "	9.95	to 100Db
600	250	" " " "	8.73	to 100Db
600	500	" " " "	3.76	to 100Db
600	600	" " " "	0	to 100Db
5,000	5,000	" " " "	0	to 100Db
10,000	10,000	" " " "	0	to 100Db
20,000	20,000	" " " "	0	to 100Db

When ordering, please specify type number, impedance and decibel loss.

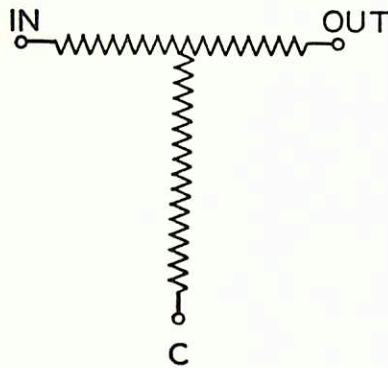


# FIXED ATTENUATORS

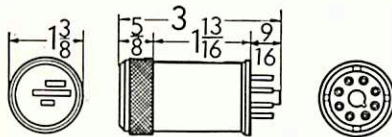
( P A D S )

TYPE T-691

"TEE" NETWORK



"T" NETWORK



ACCURACY:  $\pm 1\%$

MAXIMUM DISSIPATION: 1.0 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

## Range of Db. Loss Values Available

IMPEDANCE				DECIBEL LOSS	
In-put	Out-put			Mini-um	Maxi-um
30	30	May be obtained from		0	to 50Db
30	50	"	"	6.47	to 55Db
30	150	"	"	12.53	to 60Db
30	200	"	"	13.91	to 60Db
30	250	"	"	14.95	to 65Db
30	500	"	"	18.11	to 65Db
30	600	"	"	18.92	to 65Db
50	30	May be obtained from		6.47	to 55Db
50	50	"	"	0	to 55Db
50	150	"	"	9.96	to 60Db
50	200	"	"	11.44	to 65Db
50	250	"	"	12.54	to 65Db
50	500	"	"	15.79	to 65Db
50	600	"	"	16.63	to 70Db
150	30	May be obtained from		12.53	to 60Db
150	50	"	"	9.96	to 60Db
150	150	"	"	0	to 60Db
150	200	"	"	4.74	to 70Db
150	250	"	"	6.47	to 70Db
150	500	"	"	10.52	to 70Db
150	600	"	"	11.43	to 75Db
150	3,000	"	"	18.92	to 80Db
200	30	May be obtained from		13.91	to 60Db
200	50	"	"	11.44	to 65Db
200	150	"	"	4.74	to 70Db
200	200	"	"	0	to 70Db
200	250	"	"	4.18	to 70Db
200	500	"	"	8.96	to 75Db
200	600	"	"	9.95	to 75Db
250	30	May be obtained from		14.95	to 65Db
250	50	"	"	12.54	to 65Db
250	150	"	"	6.47	to 65Db
250	200	"	"	4.18	to 70Db
250	250	"	"	0	to 70Db
250	500	"	"	7.65	to 75Db
250	600	"	"	8.73	to 75Db
500	30	May be obtained from		18.11	to 65Db
500	50	"	"	15.79	to 65Db
500	150	"	"	10.52	to 70Db
500	200	"	"	8.96	to 75Db
500	250	"	"	7.65	to 75Db
500	500	"	"	0	to 75Db
500	600	"	"	3.76	to 80Db
500	5,000	"	"	15.79	to 85Db
500	10,000	"	"	18.92	to 90Db
500	20,000	"	"	21.98	to 90Db
600	30	May be obtained from		18.92	to 65Db
600	50	"	"	16.63	to 70Db
600	150	"	"	11.43	to 75Db
600	200	"	"	9.95	to 75Db
600	250	"	"	8.73	to 75Db
600	500	"	"	3.76	to 80Db
600	600	"	"	0	to 80Db
600	5,000	"	"	14.94	to 90Db
600	10,000	"	"	18.11	to 90Db
600	20,000	"	"	21.18	to 95Db

When ordering, please specify type number, impedance and decibel loss.



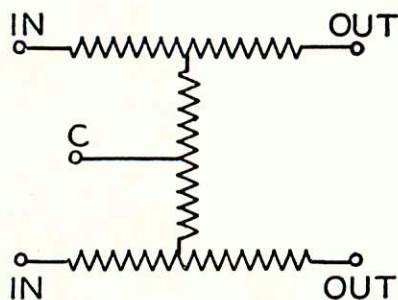
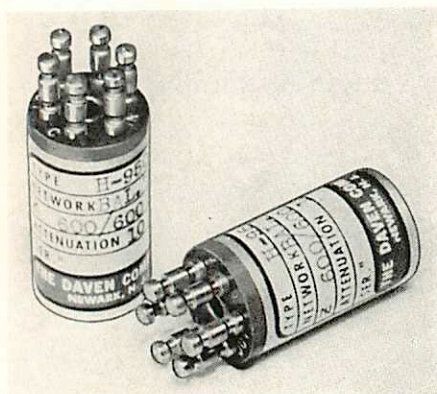
# FIXED ATTENUATORS

( P A D S )

TYPE H-950

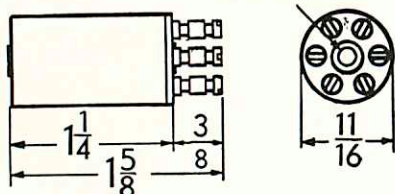
BALANCED "H" NETWORK

Range of Db. Loss Values Available



BALANCED "H" NETWORK

#6 SCREW



ACCURACY:  $\pm 2\%$

MAXIMUM DISSIPATION: 0.6 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

IMPEDANCE		DECIBEL LOSS
In-put	Out-put	
30	30	May be obtained from 0 to 50Db
30	50	6.47 to 50Db
30	150	12.53 to 55Db
30	200	13.91 to 55Db
30	250	14.95 to 55Db
30	500	18.11 to 60Db
30	600	18.92 to 60Db
50	30	May be obtained from 6.47 to 50Db
50	50	0 to 50Db
50	150	9.96 to 55Db
50	200	11.44 to 60Db
50	250	12.54 to 60Db
50	500	15.79 to 60Db
50	600	16.63 to 60Db
150	30	May be obtained from 12.53 to 55Db
150	50	9.96 to 55Db
150	150	0 to 60Db
150	200	4.74 to 60Db
150	250	6.47 to 65Db
150	500	10.52 to 65Db
150	600	11.43 to 65Db
150	3,000	18.92 to 75Db
200	30	May be obtained from 13.91 to 55Db
200	50	11.44 to 60Db
200	150	4.74 to 60Db
200	200	0 to 65Db
200	250	4.18 to 65Db
200	500	8.96 to 65Db
200	600	9.95 to 70Db
250	30	May be obtained from 14.95 to 55Db
250	50	12.54 to 60Db
250	150	6.47 to 65Db
250	200	4.18 to 65Db
250	250	0 to 65Db
250	500	7.65 to 70Db
250	600	8.73 to 70Db
500	30	May be obtained from 18.11 to 60Db
500	50	15.79 to 60Db
500	150	10.52 to 65Db
500	200	8.96 to 65Db
500	250	7.65 to 70Db
500	500	0 to 70Db
500	600	3.76 to 70Db
600	30	May be obtained from 18.92 to 60Db
600	50	16.63 to 60Db
600	150	11.43 to 65Db
600	200	9.95 to 70Db
600	250	8.73 to 70Db
600	500	3.76 to 70Db
600	600	0 to 75Db

When ordering, please specify type number, impedance and decibel loss.



\$4.50 ea.

# FIXED ATTENUATORS

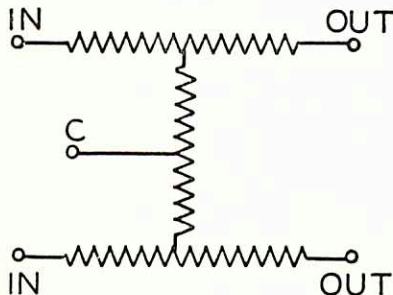
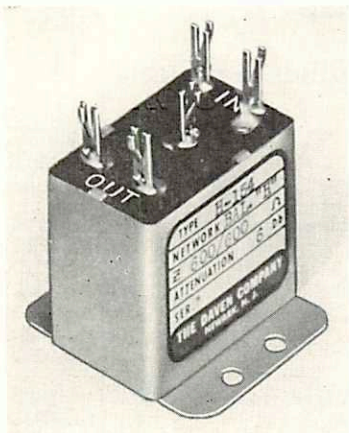
(PADS)

\$4.50 ea.

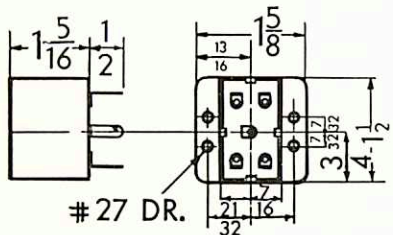
TYPE H-154

BALANCED "H" NETWORK

Range of Db. Loss Values Available



BALANCED "H" NETWORK



ACCURACY:  $\pm 2\%$

MAXIMUM DISSIPATION: 1.0 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

IMPEDANCE			DECIBEL LOSS	
In-put	Out-put		Mini- mum	Maxi- mum
30	30	May be obtained from	0	to 50Db
30	50	" " " "	6.47	to 50Db
30	150	" " " "	12.53	to 55Db
30	200	" " " "	13.91	to 55Db
30	250	" " " "	14.95	to 55Db
30	500	" " " "	18.11	to 60Db
30	600	" " " "	18.92	to 60Db
50	30	May be obtained from	6.47	to 50Db
50	50	" " " "	0	to 50Db
50	150	" " " "	9.96	to 55Db
50	200	" " " "	11.44	to 60Db
50	250	" " " "	12.54	to 60Db
50	500	" " " "	15.79	to 60Db
50	600	" " " "	16.63	to 60Db
150	30	May be obtained from	12.53	to 55Db
150	50	" " " "	9.96	to 55Db
150	150	" " " "	0	to 60Db
150	200	" " " "	4.74	to 60Db
150	250	" " " "	6.47	to 65Db
150	500	" " " "	10.52	to 65Db
150	600	" " " "	11.43	to 65Db
150	3,000	" " " "	18.92	to 75Db
200	30	May be obtained from	13.91	to 55Db
200	50	" " " "	11.44	to 60Db
200	150	" " " "	4.74	to 60Db
200	200	" " " "	0	to 65Db
200	250	" " " "	4.18	to 65Db
200	500	" " " "	8.96	to 65Db
200	600	" " " "	9.95	to 70bD
250	30	May be obtained from	14.95	to 55Db
250	50	" " " "	12.54	to 60Db
250	150	" " " "	6.47	to 65Db
250	200	" " " "	4.18	to 65Db
250	250	" " " "	0	to 65Db
250	500	" " " "	7.65	to 70Db
250	600	" " " "	8.73	to 70Db
500	30	May be obtained from	18.11	to 60Db
500	50	" " " "	15.79	to 60Db
500	150	" " " "	10.52	to 65Db
500	200	" " " "	8.96	to 65Db
500	250	" " " "	7.65	to 70Db
500	500	" " " "	0	to 70Db
500	600	" " " "	3.76	to 70Db
500	5,000	" " " "	15.79	to 80Db
500	10,000	" " " "	18.92	to 85Db
500	20,000	" " " "	21.98	to 85Db
600	30	May be obtained from	18.92	to 60Db
600	50	" " " "	16.63	to 60Db
600	150	" " " "	11.43	to 65Db
600	200	" " " "	9.95	to 70Db
600	250	" " " "	8.73	to 70Db
600	500	" " " "	3.76	to 70Db
600	600	" " " "	0	to 75Db
600	5,000	" " " "	14.94	to 80Db
600	10,000	" " " "	18.11	to 85Db
600	20,000	" " " "	21.18	to 90Db

When ordering, please specify type number, impedance and decibel loss.



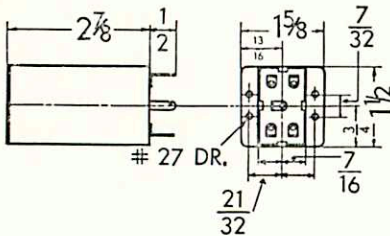
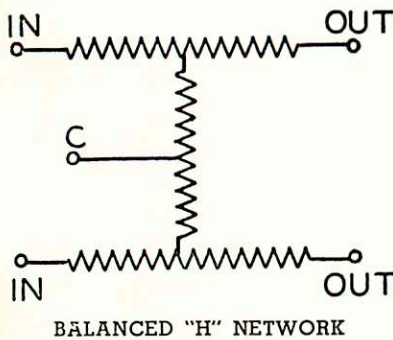
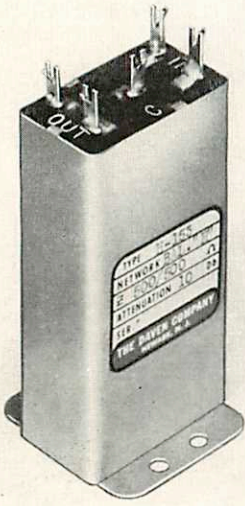
# FIXED ATTENUATORS

(PADS)

TYPE H-153

BALANCED "H" NETWORK

Range of Db. Loss Values Available



ACCURACY:  $\pm 2\%$

MAXIMUM DISSIPATION: 1.0 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

IMPEDANCE		May be obtained from	DECIBEL LOSS	
In-put	Out-put		Mini-mum	Maxi-mum
30	30	May be obtained from	0	to 100Db
30	50	" " " "	6.47	to 100Db
30	150	" " " "	12.53	to 100Db
30	200	" " " "	13.91	to 100Db
30	250	" " " "	14.95	to 100Db
30	500	" " " "	18.11	to 100Db
30	600	" " " "	18.92	to 100Db
50	30	May be obtained from	6.47	to 100Db
50	50	" " " "	0	to 100Db
50	150	" " " "	9.96	to 100Db
50	200	" " " "	11.44	to 100Db
50	250	" " " "	12.54	to 100Db
50	500	" " " "	15.79	to 100Db
50	600	" " " "	16.63	to 100Db
150	30	May be obtained from	12.53	to 100Db
150	50	" " " "	9.96	to 100Db
150	150	" " " "	0	to 100Db
150	200	" " " "	4.74	to 100Db
150	250	" " " "	6.47	to 100Db
150	500	" " " "	10.52	to 100Db
150	600	" " " "	11.43	to 100Db
150	3,000	" " " "	18.92	to 100Db
200	30	May be obtained from	13.91	to 100Db
200	50	" " " "	11.44	to 100Db
200	150	" " " "	4.74	to 100Db
200	200	" " " "	0	to 100Db
200	250	" " " "	4.18	to 100Db
200	500	" " " "	8.96	to 100Db
200	600	" " " "	9.95	to 100Db
250	30	May be obtained from	14.95	to 100Db
250	50	" " " "	12.54	to 100Db
250	150	" " " "	6.47	to 100Db
250	200	" " " "	4.18	to 100Db
250	250	" " " "	0	to 100Db
250	500	" " " "	7.65	to 100Db
250	600	" " " "	8.73	to 100Db
500	30	May be obtained from	18.11	to 100Db
500	50	" " " "	15.79	to 100Db
500	150	" " " "	10.52	to 100Db
500	200	" " " "	8.96	to 100Db
500	250	" " " "	7.65	to 100Db
500	500	" " " "	0	to 100Db
500	600	" " " "	3.76	to 100Db
500	5,000	" " " "	15.79	to 100Db
500	10,000	" " " "	18.92	to 100Db
500	20,000	" " " "	21.98	to 100Db
600	30	May be obtained from	18.92	to 100Db
600	50	" " " "	16.63	to 100Db
600	150	" " " "	11.43	to 100Db
600	200	" " " "	9.95	to 100Db
600	250	" " " "	8.73	to 100Db
600	500	" " " "	3.76	to 100Db
600	600	" " " "	0	to 100Db
5,000	5,000	" " " "	0	to 100Db
10,000	10,000	" " " "	0	to 100Db
20,000	20,000	" " " "	0	to 100Db

When ordering, please specify type number, impedance and decibel loss.



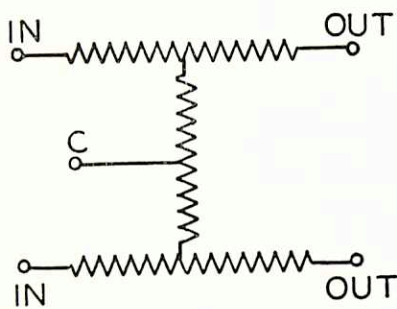
# FIXED ATTENUATORS

( P A D S )

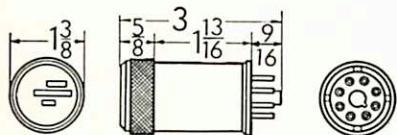
TYPE H-691

BALANCED "H" NETWORK

Range of Db. Loss Values Available



BALANCED "H" NETWORK



ACCURACY:  $\pm 1\%$

MAXIMUM DISSIPATION: 1.0 Watt

STOCK ITEMS: Pads are stocked in multiples of 5 DB up to 50 DB, viz. 5 DB, 10 DB, 15 DB, etc.

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.

IMPEDANCE			DECIBEL LOSS	
In-put	Out-put		Mini-mum	Maxi-mum
30	30	May be obtained from	0	to 50Db
30	50	" " " "	6.47	to 50Db
30	150	" " " "	12.53	to 55Db
30	200	" " " "	13.91	to 55Db
30	250	" " " "	14.95	to 55Db
30	500	" " " "	18.11	to 60Db
30	600	" " " "	18.92	to 60Db
50	30	May be obtained from	6.47	to 50Db
50	50	" " " "	0	to 50Db
50	150	" " " "	9.96	to 55Db
50	200	" " " "	11.44	to 60Db
50	250	" " " "	12.54	to 60Db
50	500	" " " "	15.79	to 60Db
50	600	" " " "	16.63	to 60Db
150	30	May be obtained from	12.53	to 55Db
150	50	" " " "	9.96	to 55Db
150	150	" " " "	0	to 60Db
150	200	" " " "	4.74	to 60Db
150	250	" " " "	6.47	to 65Db
150	500	" " " "	10.52	to 65Db
150	600	" " " "	11.43	to 65Db
150	3,000	" " " "	18.92	to 75Db
200	30	May be obtained from	13.91	to 55Db
200	50	" " " "	11.44	to 60Db
200	150	" " " "	4.74	to 60Db
200	200	" " " "	0	to 65Db
200	250	" " " "	4.18	to 65Db
200	500	" " " "	8.96	to 65Db
200	600	" " " "	9.95	to 70Db
250	30	May be obtained from	14.95	to 55Db
250	50	" " " "	12.54	to 60Db
250	150	" " " "	6.47	to 65Db
250	200	" " " "	4.18	to 65Db
500	500	" " " "	0	to 65Db
250	500	" " " "	7.65	to 70Db
250	600	" " " "	8.73	to 70Db
500	30	May be obtained from	18.11	to 60Db
500	50	" " " "	15.79	to 60Db
500	150	" " " "	10.52	to 65Db
500	200	" " " "	8.96	to 65Db
500	250	" " " "	7.65	to 70Db
500	500	" " " "	0	to 70Db
500	600	" " " "	3.76	to 70Db
500	5,000	" " " "	15.79	to 80Db
500	10,000	" " " "	18.92	to 85Db
500	20,000	" " " "	21.98	to 85Db
600	30	May be obtained from	18.92	to 60Db
600	50	" " " "	16.63	to 60Db
600	150	" " " "	11.43	to 65Db
600	200	" " " "	9.95	to 70Db
600	250	" " " "	8.73	to 70Db
600	500	" " " "	3.76	to 70Db
600	600	" " " "	0	to 75Db
600	5,000	" " " "	14.94	to 80Db
600	10,000	" " " "	18.11	to 85Db
600	20,000	" " " "	21.18	to 90Db

When ordering, please specify type number, impedance and decibel loss.



# POWER FIXED ATTENUATORS

## (PADS)

The fixed pads itemized below are the power type designed to dissipate 5, 10, 15 and 20 watts. High wattage resistors in the input circuit to handle the power are mounted in a ventilated metal container.

Two typical applications requiring power fixed pads are:

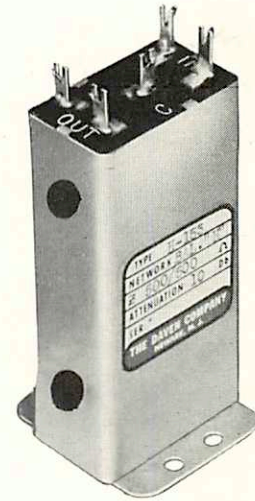
1. Accurate reduction of power output of a source without changing the impedance.
2. Equalization of outputs to speakers.

There are two important differences between the standard type 153 pads which normally dissipate 0.6 watt and the power type 153 pads; namely,

1. The input and output of the power pads are not interchangeable since the high wattage resistors are only in the input circuit.
2. The frequency error above 20 KC is greater than in the standard type 153 pads.

ACCURACY:  $\pm 2\%$ . Size: Same As Standard Type 153 Fixed Pads.

Note: The maximum and minimum decibel loss values indicated for each pair of impedances represent the limits within which this type of pad can be made. The input and output terminals of these networks are not reversible.



### "T" NETWORK

TYPE	WATTAGE
TA-153	5
TB-153	10
TC-153	15
TD-153	20

### BALANCED "H" NETWORK

TYPE	WATTAGE
HA-153	5
HB-153	10
HC-153	15
HD-153	20

Range of DB. Loss Values Available.				Range of DB. Loss Values Available.				
IMPEDANCE		DECIBEL LOSS		IMPEDANCE		DECIBEL LOSS		
Input	Output	Minimum	Maximum	Input	Output	Minimum	Maximum	
150	150	May be obtained from	0 to 100 DB	↔	150	150	May be obtained from	0 to 100 DB
150	200	"	4.74 to 100 DB	↔	150	200	"	4.74 to 100 DB
150	250	"	6.47 to 100 DB	↔	150	250	"	6.47 to 100 DB
150	500	"	10.52 to 100 DB	↔	150	500	"	10.52 to 100 DB
150	600	"	11.43 to 100 DB	↔	150	600	"	11.43 to 100 DB
200	150	May be obtained from	4.74 to 100 DB	↔	200	150	May be obtained from	4.74 to 100 DB
200	200	"	0 to 100 DB	↔	200	200	"	0 to 100 DB
200	250	"	4.18 to 100 DB	↔	200	250	"	4.18 to 100 DB
200	500	"	8.96 to 100 DB	↔	200	500	"	8.96 to 100 DB
200	600	"	9.95 to 100 DB	↔	200	600	"	9.95 to 100 DB
250	150	May be obtained from	6.47 to 100 DB	↔	250	150	May be obtained from	6.47 to 100 DB
250	200	"	4.18 to 100 DB	↔	250	200	"	4.18 to 100 DB
250	250	"	0 to 100 DB	↔	250	250	"	0 to 100 DB
250	500	"	7.65 to 100 DB	↔	250	500	"	7.65 to 100 DB
250	600	"	8.73 to 100 DB	↔	250	600	"	8.73 to 100 DB
500	150	May be obtained from	10.52 to 100 DB	↔	500	150	May be obtained from	10.52 to 100 DB
500	200	"	8.96 to 100 DB	↔	500	200	"	8.96 to 100 DB
500	250	"	7.65 to 100 DB	↔	500	250	"	7.65 to 100 DB
500	500	"	0 to 100 DB	↔	500	500	"	0 to 100 DB
500	600	"	3.76 to 100 DB	↔	500	600	"	3.76 to 100 DB
600	150	May be obtained from	11.43 to 100 DB	↔	600	150	May be obtained from	11.43 to 100 DB
600	200	"	9.95 to 100 DB	↔	600	200	"	9.95 to 100 DB
600	250	"	8.73 to 100 DB	↔	600	250	"	8.73 to 100 DB
600	500	"	3.76 to 100 DB	↔	600	500	"	3.76 to 100 DB
600	600	"	0 to 100 DB	↔	600	600	"	0 to 100 DB

Note: When ordering, please specify type number, input and output impedance and decibel loss.

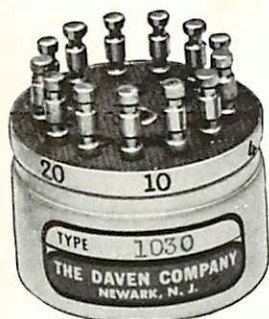
Special impedances other than those shown above are available.



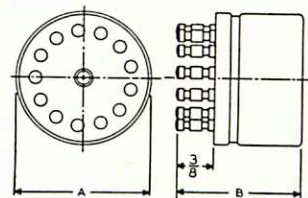
# TAPPED FIXED NETWORKS

## SERIES 1030, 1230 & 1530

### TAPPED FIXED NETWORKS SERIES 1030 & 1230

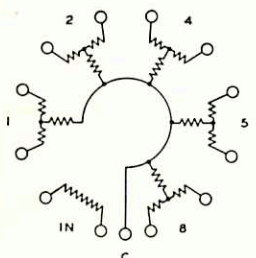


The primary function of the Series 1030 and 1230 Networks are to provide a tamper proof method of adjusting or setting the gain by means of soldered connections. These tapped type of units are useful in accurately tracking equipment in production and for re-tracking equipment in the field after the replacement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

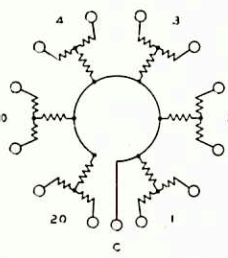


Series 1030 = A = 1 3/8" B = 1 3/8"  
Series 1230 = A = 1 3/4" B = 1 5/8"

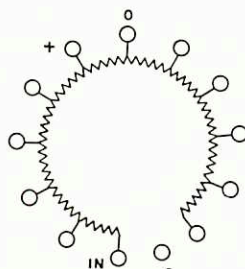
TYPE	NETWORK	DESCRIPTION	TYPE	NETWORK	DESCRIPTION
1030-K	150/150Ω	"T" { 0 to 40 DB in 1 DB Steps as follows: 1, 2, 3, 4, 10 and 20 DB Fixed Loss Networks. Carbon or Composition (±5%) Resistors are used.	1030-KW	150/150Ω	"T" { 0 to 40 DB in 1 DB Steps as follows: 1, 2, 3, 4, 10 and 20 DB Fixed Loss Networks. Precision Wire Wound (±2%) Resistors are used.
1030-F	500/500Ω		1030-FW	500/500Ω	
1030-G	600/600Ω		1030-GW	600/600Ω	
1230-K	150/150Ω	"H" { 0 to 40 DB in 1 DB Steps as follows: 1, 2, 3, 4, 10 and 20 DB Fixed Loss Networks. Precision Wire Wound (±2%) Resistors are used.	1230-KW	150/150Ω	"H" { 0 to 40 DB in 1 DB Steps as follows: 1, 2, 3, 4, 10 and 20 DB Fixed Loss Networks. Precision Wire Wound (±2%) Resistors are used.
1230-F	500/500Ω		1230-FW	500/500Ω	
1230-G	600/600Ω		1230-GW	600/600Ω	
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. Carbon or Composition (±5%) Resistors are used.		1031A	Electrically the same as the 1031 but has greater stability due to the wire wound resistors. Range from +4 to +24 VU, in one VU steps. Precision wire wound (±2%) Resistors are used.	
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. Precision wire wound (±2%) Resistors are used.		1033	Same as Type 1032 but has in addition a 3900/3900Ω fixed loss network for converting the 6 MW 500Ω level and the 12.5 MW 500Ω level to the standard at 1 MW 600Ω. Precision wire wound (±2%) Resistors are used. Please specify decibel loss required.	



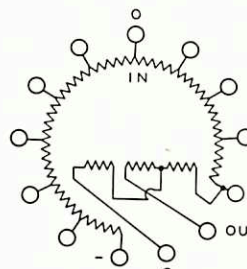
TYPE 1030 & 1031A



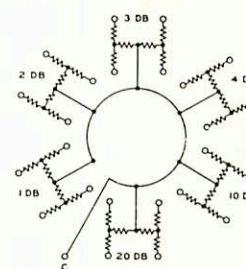
TYPE 1030 & 1031A



TYPE 1032



TYPE 1033



TYPE 1230

### MULTIPLE OUTPUT FIXED PADS SERIES 1530

These fixed networks have a single input and three output circuits, each having the same impedance and 9.5 DB loss from the input to each output circuit. They are used to divide a single incoming program

line into several outgoing lines or several incoming lines to a single outgoing line. Both the "T" and Balanced "H" networks are obtainable. The accuracy is ±2% and maximum dissipation 0.6 watt.

TYPE	CIRCUIT	IMPEDANCE		TYPE	CIRCUIT	IMPEDANCE	
		INPUT	OUTPUT			INPUT	OUTPUT
T-1533	"T"	600	600-600-600	H-1532	"H"	600	600-600-600
T-1531	"T"	500	500-500-500	H-1530	"H"	500	500-500-500
T-1537	"T"	250	250-250-250	H-1536	"H"	250	250-250-250
T-1535	"T"	200	200-200-200	H-1534	"H"	200	200-200-200
T-1539	"T"	150	150-150-150	H-1538	"H"	150	150-150-150

Note: Stabilized composition resistors within an accuracy of ±1% may be supplied in any of the above Fixed Networks. Prices and delivery upon request. Physical dimensions are the same as shown on page 62.

Special impedances or decibel losses may be obtained on request.



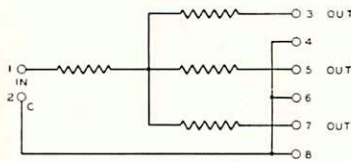
# MULTIPLE INPUT & OUTPUT NETWORKS

## SERIES 1130 BRANCHING NETWORKS

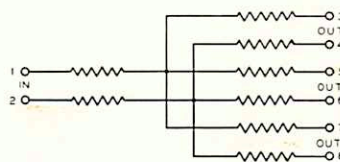
The networks in this series may be obtained with a single input and multiple output, or a multiple input and a single output. "T" and "H" circuits are available for each type listed below. All units are designed for minimum loss. The resistors are of the

precision wire wound type having an accuracy of  $\pm 2\%$ . The maximum level of these pads is + 24 VU. The series 1130 multiple networks is a trifle larger than the series 1530 which enables us to give a greater number of dividing networks.

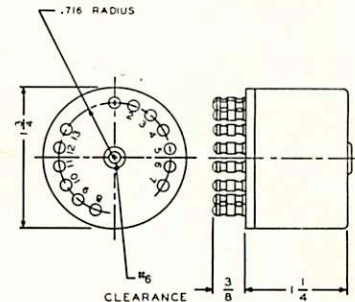
Other equal (1:1) impedances are obtainable



TYPICAL "T" CIRCUIT



TYPICAL "H" CIRCUIT



### SINGLE INPUT MULTIPLE OUTPUT PADS: Impedance 600/600Ω

TYPE	CIRCUIT	NUMBER OF INPUTS	NUMBER 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*

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

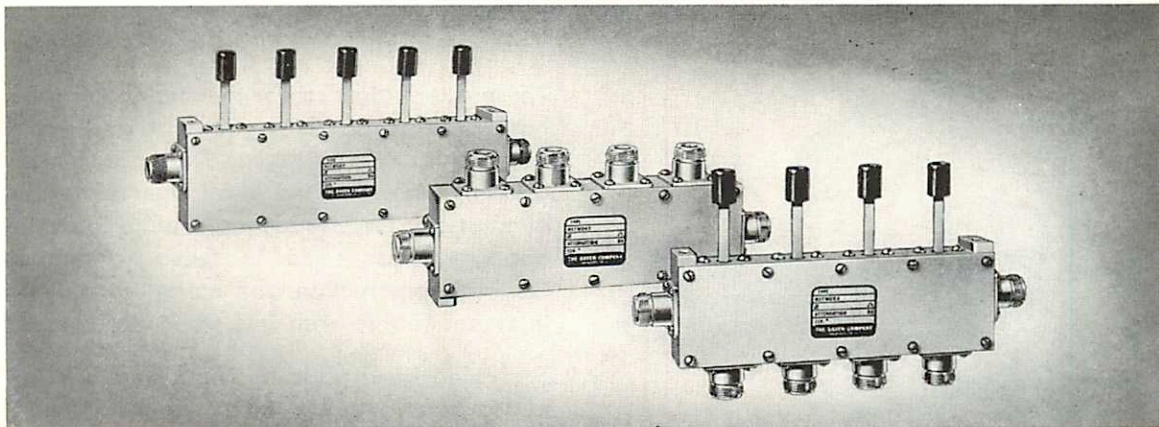
### MULTIPLE INPUT SINGLE OUTPUT PADS: Impedance 600/600Ω

TYPE	CIRCUIT	NUMBER OF INPUTS	NUMBER 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.



# FACTS ABOUT VIDEO AND R. F. ATTENUATORS



**DEFINITION:**

In this section the Daven Company offers fixed and variable attenuators to cover an extremely wide range of frequencies. These attenuators are resistive and will function accurately from D.C. to maximum frequency without unwanted reactive effects. They are particularly suited for pulse and other wide band applications.

**DESCRIPTION:**

Two frequency ranges are offered: the Video range—D.C. to 10 MC and the R.F. range—D.C. to 225 MC.

The Video range attenuators utilize precision Daven rotary "knee-action" switches. The top range (10 MC) is limited by the physical construction of the shield, switch layout and type of resistors employed. Three types of terminals are available, series "BNC" (UG-185/U), series "N" connectors and conventional solder lug type terminal board.

The R.F. attenuators employ selected resistors, rigidly mounted in an accurately machined metal shield. The network cavities and associated switches are designed to offer the correct surge impedance with the network either in or out of the circuit. Unlike the Video attenuators, the R.F. group do not use rotary switches but employ push button switches for adjusting the attenuation. Two types of receptacles are available, series "N" (UG-58/U), and series "BNC" (UG-185/U).

**USES:**

See the individual pages on Video and R.F. variable attenuators for suggested applications.

There are also numerous applications for fixed attenuators of this type. Below is a partial listing of the more common uses:—

1. To isolate one section of a line from another:  
Example—Output impedance of a signal generator varies with frequency. To isolate this from the load use a 10 to 20 db pad between the generator output and the load. The output impedance of the pad presented to the load will not change with frequency.
2. To change impedance:  
Example—Line impedance is 50 ohms, to change to 73 ohms, insert a 50/73 ohm fixed pad.
3. 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 50 ohms, to divide into three outgoing 50 ohm lines. Pad required is a 50Ω input, three 50Ω outputs, each with a 10 db loss.
4. As a standard of attenuation:

**CIRCUIT:**

The unbalanced networks used have a constant impedance for the input and output.

**MINIMUM LOSS PADS:**

For each ratio of impedance, there is a definite minimum loss, below which a network cannot be made. This minimum loss can be calculated by the equation—

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

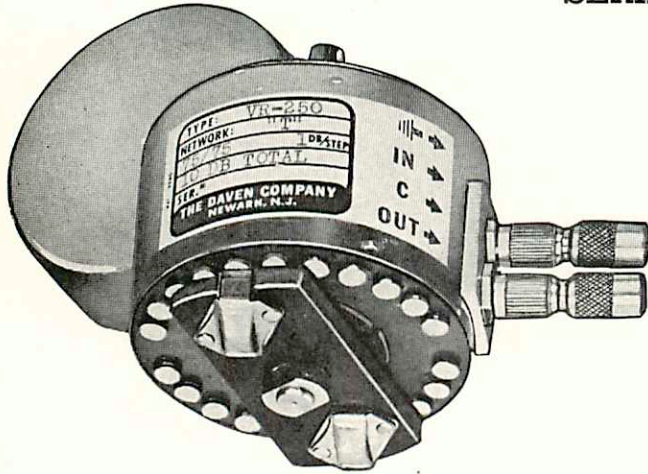
where  $R^2 = \text{impedance ratio or } \frac{Z_1}{Z_2}$ , and  $N = \text{decibel loss}$

For example a pad having a 60Ω input and a 120Ω output will have a minimum loss of 7.655 db. Consult appendix "C", table 3 for rapid calculations.



# VIDEO VARIABLE ATTENUATORS

## SERIES V-250



These attenuators are recommended for use in wide band equipment where precision and dependability are of prime importance. The same sturdy switch construction employed in all Daven step type audio attenuators for broadcast studio and laboratory applications is used in these wide band units. General construction and mounting dimensions are interchangeable with our standard attenuators.

For video fixed pads, multiple networks and push-button attenuators, refer to pages 67 and 68.

SERIES	NUMBER OF STEPS	DECIBEL PER STEP	CHARACTERISTIC	DECIBEL TOTAL	STANDARD IMPEDANCE
V-250	10	1	Linear	10	75Ω
V-251	10	2	Linear	20	75Ω
V-252	20	1	Linear	20	75Ω
V-253	20	2	Linear	40	75Ω
V-254	20	0.5	Linear	10	75Ω
V-255	45	0.2	Linear	9	75Ω

TYPE	RECEPTACLES SUPPLIED	CABLE PLUGS REQUIRED
VA-250	*MC-60	*MC-50
VB-250	**UG-185/U	**UG-260/U
VC-250	Standard lug terminal board supplied.	
VA-251	*MC-60	*MC-50
VB-251	**UG-185/U	**UG-260/U
VC-251	Standard lug terminal board supplied.	
VA-252	*MC-60	*MC-50
VB-252	**UG-185/U	**UG-260/U
VC-252	Standard lug terminal board supplied.	

TYPE	RECEPTACLES SUPPLIED	CABLE PLUGS REQUIRED
VA-253	*MC-60	*MC-50
VB-253	**UG-185/U	**UG-260/U
VC-253	Standard lug terminal board supplied.	
VA-254	*MC-60	*MC-50
VB-254	**UG-185/U	**UG-260/U
VC-254	Standard lug terminal board supplied.	
VA-255	*MC-60	*MC-50
VB-255	**UG-185/U	**UG-260/U
VC-255	Standard lug terminal board supplied.	

\*Indicates I.P.C. type number.

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

### SPECIFICATIONS

IMPEDANCE: 75 ohms. CIRCUIT: "T" Network.

SWITCH: Same type of rotary step-type construction as used in the standard Daven attenuators.

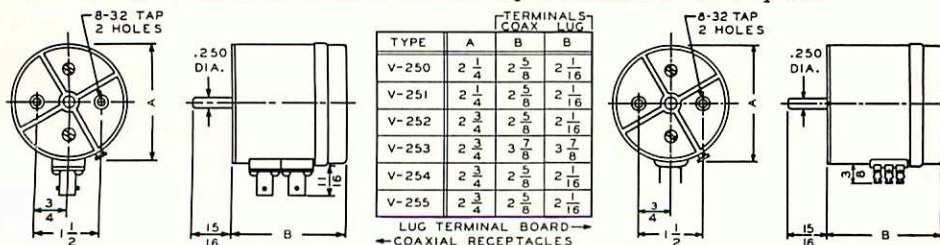
TERMINAL IMPEDANCE ACCURACY: Within  $\pm 2\frac{1}{2}\%$ .

FREQUENCY CHARACTERISTICS: Essentially flat from 0 to 10 MC.

CONNECTORS: If types other than those specified above are required, please indicate when ordering. Receptacles are supplied. Cable plugs are available at a slight additional cost.

Note: See types RF-540 and RF-550 for controls having a greater total decibel loss than 40 DB. on page 67.

Special impedances or decibel losses may be obtained on request.



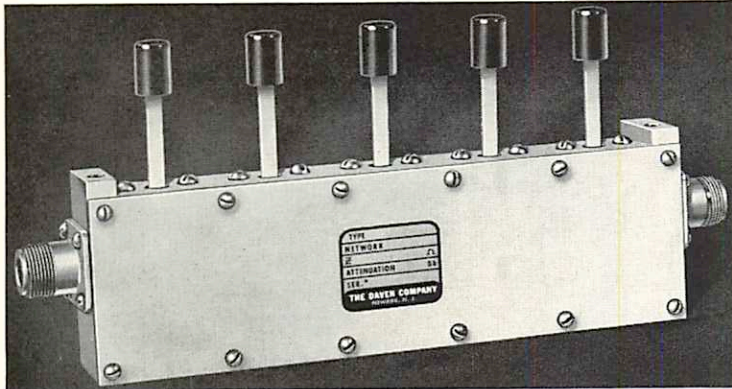
### SUGGESTED APPLICATIONS

- In television video circuits where a wide frequency range without change of impedance is of special importance.
- Wide-band amplifiers.
- Pulse amplifiers.
- Atomic and nucleonic research.
- Attenuation of signals over the range 0 to 10 MC.
- Laboratory standards.

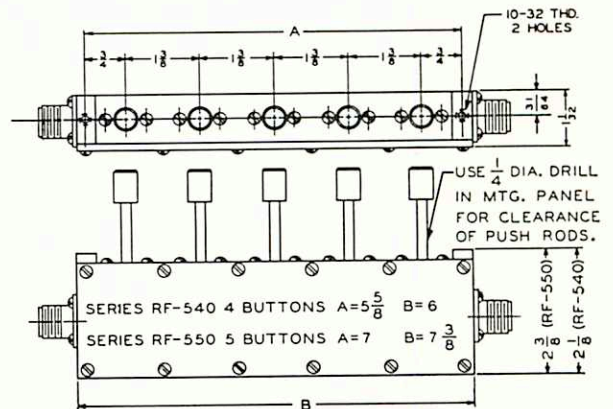


# RADIO FREQUENCY ATTENUATORS

## SERIES RF-540 & RF-550 (VARIABLE)



SERIES 550



TYPE	LOSS	TOTAL DB	STANDARD IMPEDANCES
RFA & RFB 540	1,2,3,4 DB	10	50/50Ω and 73/73Ω
RFA & RFB 541	10,20,20,20 DB	70	50/50Ω and 73/73Ω
RFA & RFB 542	2,4,6,8 DB	20	50/50Ω and 73/73Ω
RFA & RFB 543	20,20,20,20 DB	80	50/50Ω and 73/73Ω
RFA & RFB 550	1,2,3,4,10 DB	20	50/50Ω and 73/73Ω
RFA & RFB 551	10,10,20,20,20 DB	80	50/50Ω and 73/73Ω
RFA & RFB 552	2,4,6,8,20 DB	40	50/50Ω and 73/73Ω

TYPE	Z	RECEPTACLES SUPPLIED (ARMY-NAVY TYPES)	CABLE PLUGS REQUIRED (ARMY-NAVY TYPES)
RFA-540-50	50 ohms	UG-58/U	UG-21A/U
RFB-540-50		UG-185/U	UG-88/U
RFA-541-50	50 ohms	UG-58/U	UG-21A/U
RFB-541-50		UG-185/U	UG-88/U
RFA-540-73	73 ohms	UG-58/U	UG-21A/U
RFB-540-73		UG-185/U	UG-260/U
RFA-541-73	73 ohms	UG-58/U	UG-21A/U
RFB-541-73		UG-185/U	UG-260/U
RFA-542-50	50 ohms	UG-58/U	UG-21A/U
RFB-542-50		UG-185/U	UG-88/U
RFA-543-50	50 ohms	UG-58/U	UG-21A/U
RFB-543-50		UG-185/U	UG-88/U
RFA-542-73	73 ohms	UG-58/U	UG-21A/U
RFB-542-73		UG-185/U	UG-260/U
RFA-543-73	73 ohms	UG-58/U	UG-21A/U
RFB-543-73		UG-185/U	UG-260/U

TYPE	Z	RECEPTACLES SUPPLIED (ARMY-NAVY TYPES)	CABLE PLUGS REQUIRED (ARMY-NAVY TYPES)
RFA-550-50	50 ohms	UG-58/U	UG-21A/U
RFB-550-50		UG-185/U	UG-88/U
RFA-551-50	50 ohms	UG-58/U	UG-21A/U
RFB-551-50		UG-185/U	UG-88/U
RFA-550-73	73 ohms	UG-58/U	UG-21A/U
RFB-550-73		UG-185/U	UG-260/U
RFA-551-73	73 ohms	UG-58/U	UG-21A/U
RFB-551-73		UG-185/U	UG-260/U
RFA-552-50	50 ohms	UG-58/U	UG-21A/U
RFB-552-50		UG-185/U	UG-88/U
RFA-552-73	73 ohms	UG-58/U	UG-21A/U
RFB-552-73		UG-185/U	UG-260/U

Note: By using Types 540 and 541 in series, it is possible to obtain 80 DB total in steps of 1 DB. By using Types 542 and 543 in series, it is possible to obtain 100 DB total in steps of 2 DB. By using Types 550 and 551 in series, it is possible to obtain 100 DB total in steps of 1 DB.

### SPECIFICATIONS

FREQUENCY RANGE: D.C. to 225 MC.

NUMBER OF STEPS: 4 push-button steps for Series 540 and 5 push-button steps for Series 550.

IMPEDANCE ACCURACY: Terminal impedance of loss network is essentially flat from 0 to 225 MC.

IMPEDANCE: Standard impedances are 50 and 73 ohms.

RESISTOR ACCURACY: Within  $\pm 2\%$  at D.C.

CIRCUIT: Constant input and output impedance (unbalanced).

CONNECTORS: Receptacles are supplied. Cable plugs, if required, will be supplied at a slight additional cost. Connector type UG-58/U is also known as Series "N" and type UG-185/U is also known as Series "BNC".

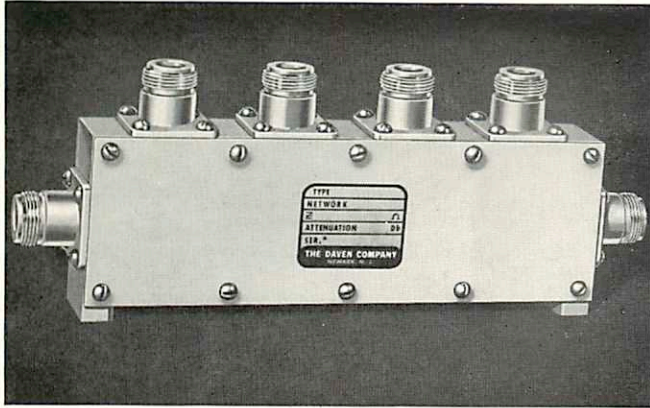
*Special impedances or decibel losses may be obtained on request.*



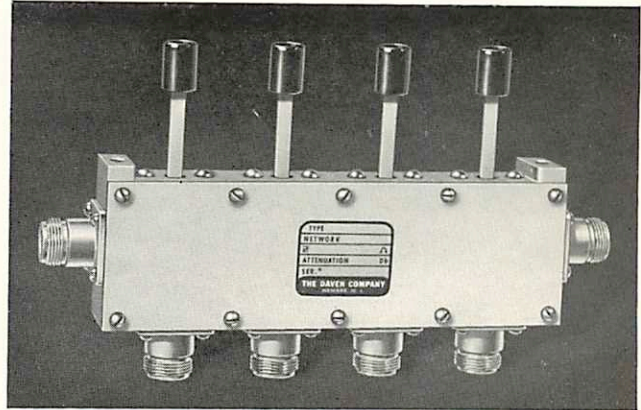
# RF & VIDEO FIXED ATTENUATORS

## RF DIVIDING, COMBINING & FIXED NETWORKS

### SERIES RF-155, RF-156, RF-157 & RF-158



**SERIES RF-157**



**SERIES RF-158**

Series—155 have one cavity, one Input and one Output available from one to 20 Db. loss. Series—156 have multiple cavities with one Input and one Output available from one to 20 Db. per cavity or a maximum total loss of 80 decibels. Series—157 is a special type of RF fixed attenuator providing one Input and two or more Outputs (Dividing), or two or more Inputs and one Output (Combining). "Dummy Loads" must be substituted in place of the

unused Input or Output lines. Series—158 are adaptations of the Series—157 controls excepting a switch for cutting off a line and substituting this "Dummy Load" is provided in each cavity. Convenient push-button controls are provided for rapidly adding or removing a line without introducing unwanted impedance mismatch with the undesirable accompanying reflections.

#### SERIES RF-157 (without switches)

TYPE	"Z"	NO. OF OUTPUTS	MINIMUM DB LOSS
RF-157-2A-50	50	2	6.0
RF-157-3A-50	50	3	9.5
RF-157-4A-50	50	4	12.0
RF-157-5A-50	50	5	14.0
RF-157-2B-50	50	2	6.0
RF-157-3B-50	50	3	9.5
RF-157-4B-50	50	4	12.0
RF-157-5B-50	50	5	14.0
RF-157-2A-73	73	2	6.0
RF-157-3A-73	73	3	9.5
RF-157-4A-73	73	4	12.0
RF-157-5A-73	73	5	14.0
RF-157-2B-73	73	2	6.0
RF-157-3B-73	73	3	9.5
RF-157-4B-73	73	4	12.0
RF-157-5B-73	73	5	14.0

#### SERIES RF-158 (with switches)

TYPE	"Z"	NO. OF OUTPUTS	MINIMUM DB LOSS
RF-158-2A-50	50	2	6.0
RF-158-3A-50	50	3	9.5
RF-158-4A-50	50	4	12.0
RF-158-5A-50	50	5	14.0
RF-158-2B-50	50	2	6.0
RF-158-3B-50	50	3	9.5
RF-158-4B-50	50	4	12.0
RF-158-5B-50	50	5	14.0
RF-158-2A-73	73	2	6.0
RF-158-3A-73	73	3	9.5
RF-158-4A-73	73	4	12.0
RF-158-5A-73	73	5	14.0
RF-158-2B-73	73	2	6.0
RF-158-3B-73	73	3	9.5
RF-158-4B-73	73	4	12.0
RF-158-5B-73	73	5	14.0

#### SERIES RF-155 & RF-156

TYPE	"Z"	DECIBEL LOSS
RFA-155-50	50	5
RFA-155-50	50	10
RFA-155-50	50	15
RFA-155-50	50	20
RFB-155-73	73	5
RFB-155-73	73	10
RFB-155-73	73	15
RFB-155-73	73	20
RFA-156-50	50	5
RFA-156-50	50	10
RFA-156-50	50	15
RFA-156-50	50	20
RFB-156-73	73	5
RFB-156-73	73	10
RFB-156-73	73	15
RFB-156-73	73	20

FREQUENCY RANGE: DC to 225 MC.  
 IMPEDANCE ACCURACY: Terminal impedance of loss network essentially flat from 0 to 225 MC.  
 RESISTOR ACCURACY: Within  $\pm 2\%$  at D. C.  
 IMPEDANCE: Standard impedances are 50 and 73.  
 CIRCUIT: Constant input and output impedance (unbalanced).  
 CONNECTORS: Types RFA-155, 156, 157 and 158 have UG-58/U receptacles. Types RFB-155, 156, 157 and 158 have UG-185/U receptacles.

Types other than those specified are available.

Cable plugs are optional, and will be supplied at additional cost. Connector Type UG-58/U is also known as Series "N" and Type UG-185/U is also known as Series "BNC."

ORDERING INFORMATION: When ordering special controls, specify type number, receptacle ("A" or "B"), impedance, number of outputs or inputs and the decibel loss between input(s) and output(s).

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



# IMPEDANCE MATCHING NETWORKS VIDEO & RF

## SERIES 1797-1798-1799

These Impedance Matching Networks utilize tapered "BH", "T" or " $\pi$ " circuits and introduce a known insertion loss, depending upon the matching ratio.

These types of networks do not introduce objectionable phase shift, unwanted frequency discrimination or pickup strays in low level circuits. They provide an ideal method of matching impedances in wide band equipment.

Two types are offered: Video, covering the frequency range 0 to 10 Mc. and R.F. covering the range 0 to 225 mc.

VIDEO—The elements in the Video networks are made up of precision non-inductive wire wound resistors adjusted to an accuracy of  $\pm 0.25\%$ . The switches are heavy duty rotary type utilizing silver

contacts and laminated rotor blades. The networks are mounted in a round drawn brass case designed to provide adequate shielding between input and output.

RADIO FREQUENCY—The R.F. units utilize selected resistors to an accuracy of  $\pm 2\%$ , push-button type switches, and a precision machined multiple cavity aluminum case designed to provide adequate shielding and correct cavity volume. The tabulation lists one input and a choice of several output impedances, however, the input and output can be inter-changed to provide a series of inputs and a single output impedance.

Specifications are the same as for series 1790 Decade Attenuator Units shown on adjacent page 71.

### VIDEO IMPEDANCE MATCHING NETWORKS

Lug Terminals	Terminals		Network	Input Impedance	Output Impedance						Db. Loss	
	"N"	"BNC"			30	50	75	150	250	500		600
VT-1797-H	VT-1798-H	VT-1799-H	"T"	75	10	6	0	10	15	15	15	Db. Loss
VT-1797-K	VT-1798-K	VT-1799-K	"T"	150	15	10	10	0	10	15	15	Db. Loss
VT-1797-F	VT-1798-F	VT-1799-F	"T"	500	20	20	15	15	10	0	5	Db. Loss
VT-1797-G	VT-1798-G	VT-1799-G	"T"	600	20	17	15	12	10	5	0	Db. Loss
VH-1797-H	VH-1798-H	VH-1799-H	Balanced "H"	75	10	6	0	10	15	20	20	Db. Loss
VH-1797-K	VH-1798-K	VH-1799-K	Balanced "H"	150	15	10	10	0	10	15	15	Db. Loss
VH-1797-F	VH-1798-F	VH-1799-F	Balanced "H"	500	20	20	15	15	10	0	5	Db. Loss
VH-1797-G	VH-1798-G	VH-1799-G	Balanced "H"	600	20	17	15	12	10	5	0	Db. Loss

### RF IMPEDANCE MATCHING NETWORKS

#### Attenuator Button Pressed Down Making Contact

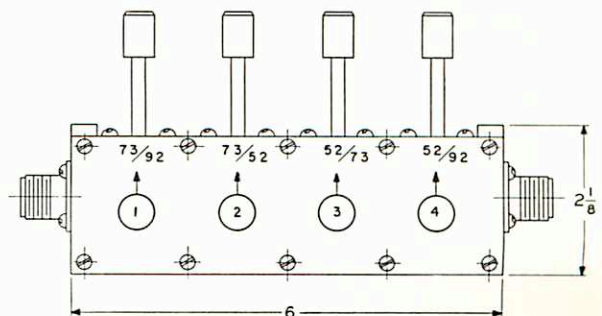
Type	Type	Button Number				
		1	2	3	4	
RF-1797 with "N" Connector	RF-1798 with "BNC" Connector	Input	73 $\Omega$	73 $\Omega$	52 $\Omega$	52 $\Omega$
		Output	93 $\Omega$	52 $\Omega$	73 $\Omega$	92 $\Omega$
		Decibel Loss	10 Db.	10 Db.	10 Db.	10 Db.

Note: Each cavity or section has a 10 Db. Loss. With buttons 1, 2, 3 and 4 out there is no loss in the unit, and can be used between 52 ohms and 92 ohms. When loaded on output, the input sees the load

Specifications are the same as for Series 540 and 550 RF Attenuator Units shown on page 67.

Each switch and associated network is mounted in a shielded compartment with no mechanical interlock between sections.

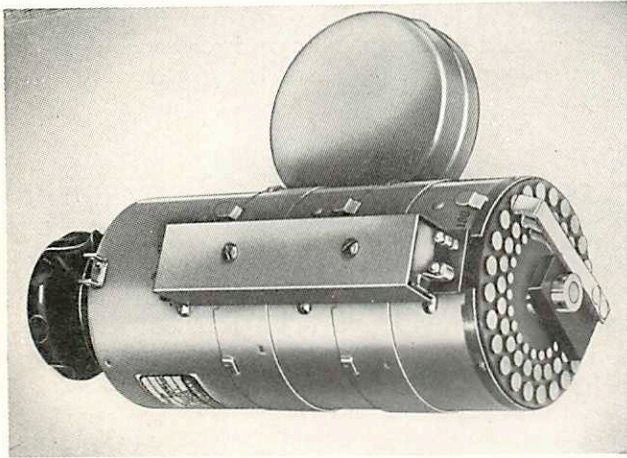
When the attenuator is in use, only one button at a time should be depressed; all other buttons should be out.



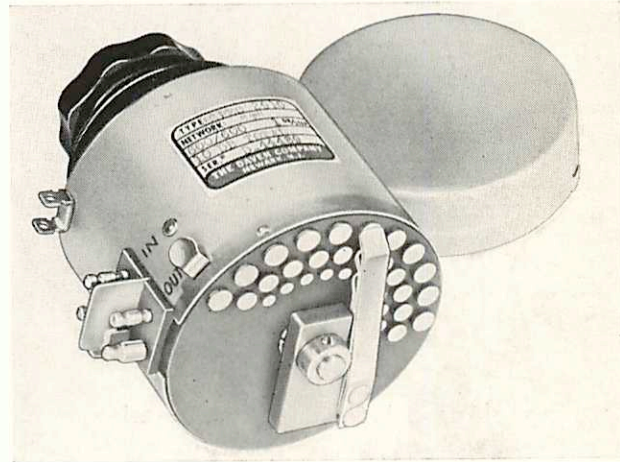


# DECADE ATTENUATOR UNITS — VIDEO & RF

## SERIES 1790



BALANCED "H" NETWORKS



"T" NETWORKS

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 drawn 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 low loss dielectric, scientifically designed switches using solid silver 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.

Outstanding features are:

Accuracy over a range extending into the low radio frequency spectrum.

Wide range of attenuation available in small decibel steps.

The stops and detents on the individual decade are positive and prevent over-travel.

Both Balanced "H" and "T" networks are available. Decades are individually shielded.

Scientifically designed low-stray capacity silver alloy 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.

### 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



# DECADE ATTENUATOR UNITS — VIDEO & RF

(Cont'd)

## SERIES 1790

### SPECIFICATIONS

IMPEDANCE: See tabulation.

RESISTOR ACCURACY:  $\pm 0.25\%$ .

ATTENUATION ACCURACY: The maximum error is  $\pm 0.1$  Db at 1000 CPS when terminated by a pure resistance.

FREQUENCY ERROR: For Series 1790 and 1791, maximum error up to 10 Mc.  $\pm 0.2$  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  $\pm 0.5$  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: One watt.

SWITCHES: Heavy duty solid silver alloy is used for the contacts, laminated 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 and vibration-proof brass case.

TERMINALS: Jack-top binding posts,  $\frac{3}{4}$ " spacing. Common terminal of "T" units grounded to chassis. Common terminal of "H" units ungrounded.

DIMENSIONS:

Type	Diam.	Depth
VT-1790, VH-1790, VH-1791	2 $\frac{3}{4}$ "	2- 1/16"
VT-1791	2 $\frac{3}{4}$ "	2-13/16"
VT-1792, VH-1792	2 $\frac{3}{4}$ "	6- 5/16"

Type	0.1 Db. Steps—1 Db. Total	
	Network	Impedance
VT-1790-B	"T"	50/50
VT-1790-H	"T"	75/75
VT-1790-K	"T"	150/150
VT-1790-F	"T"	500/500
VT-1790-G	"T"	600/600
VH-1790-B	Balanced "H"	50/50
VH-1790-H	Balanced "H"	75/75
VH-1790-K	Balanced "H"	150/150
VH-1790-F	Balanced "H"	500/500
VH-1790-G	Balanced "H"	600/600

Type	1.0 Db. Steps—10 Db. Total	
	Network	Impedance
VT-1791-B	"T"	50/50
VT-1791-H	"T"	75/75
VT-1791-K	"T"	150/150
VT-1791-F	"T"	500/500
VT-1791-G	"T"	600/600
VH-1791-B	Balanced "H"	50/50
VH-1791-H	Balanced "H"	75/75
VH-1791-K	Balanced "H"	150/150
VH-1791-F	Balanced "H"	500/500
VH-1791-G	Balanced "H"	600/600

Type	10. Db. Steps—100 Db. Total	
	Network	Impedance
VT-1792-B	"T"	50/50
VT-1792-H	"T"	75/75
VT-1792-K	"T"	150/150
VT-1792-F	"T"	500/500
VT-1792-G	"T"	600/600
VH-1792-B	Balanced "H"	50/50
VH-1792-H	Balanced "H"	75/75
VH-1792-K	Balanced "H"	150/150
VH-1792-F	Balanced "H"	500/500
VH-1792-G	Balanced "H"	600/600

Special Impedances or Decibel Steps Other Than Those Shown are Available.



# ATTENUATION NETWORKS 0 TO 10 MC.

## SERIES 790 & 795

These decades are direct reading precision non-inductively wound attenuation networks designed for operation over the range 0 to 1 Mc. This frequency range may be extended to 10 Mc. provided proper precautions are taken in shielding the external leads. For this extended range the accuracy is slightly reduced. (See specifications below.)

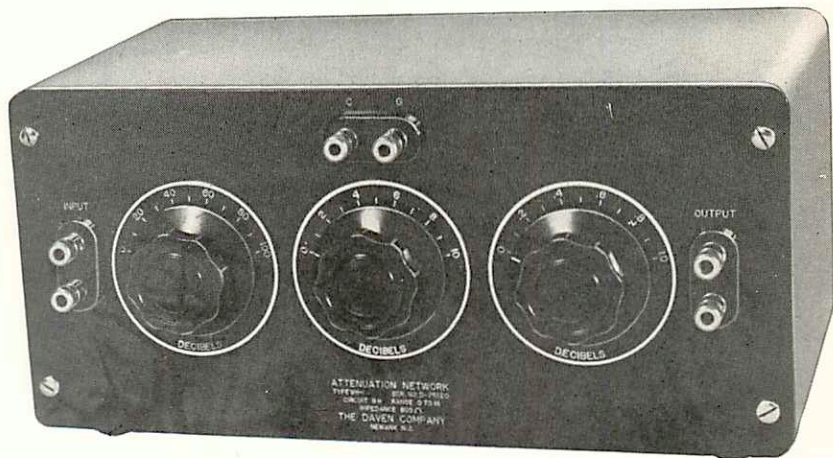
The type 790 and 795 Decade Attenuators are particularly useful in gain or loss measurements on filters, transformers, amplifiers and associated transmission equipment, for both the audio and video range.

Type 790 provides a range 0 to 110 Db in steps of 1.0 Db. Type 795 provides a range 0 to 111 Db in 0.1 Db steps. Both types are assemblies of Series 1790 Decade Attenuator units mounted in series on a metal panel and housed in an attractive metal cabinet. Each decade dial provides 11 positions or 10 steps of attenuation.

Outstanding features are:

Accuracy over a range extending into the low radio frequency spectrum.

Wide range of attenuation in small decibel steps.



Stops and detents on the individual decade are positive and prevent over-travel.

Both Balanced "H" and "T" networks are available. Decades are individually shielded.

Scientifically designed low-stray capacity and low-loss silver alloy switch blades and contacts are employed to insure 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.

## SPECIFICATIONS

### ATTENUATION RANGE:

Type 790—Zero to 110 Db in 1.0 Db steps.

Type 795—Zero to 111 Db in 0.1 Db steps.

IMPEDANCE: 500/500  $\Omega$  and 600/600  $\Omega$  are standard. Other impedances are available.

RESISTOR ACCURACY:  $\pm 0.25\%$ .

ATTENUATION ACCURACY: The maximum error is  $\pm 0.1$  Db at 1000 cps when terminated by a pure resistance.

FREQUENCY CHARACTERISTICS: 10 Db per step dial maximum error  $\pm 0.5$  Db up to 0.5 MC. For loss setting of 90 Db, maximum error  $\pm 0.5$  Db up to 1 MC. Lower values of attenuation can be used from zero to 10 MC. without appreciable error.

The 1 Db per step and 0.1 Db per step dials maximum error  $\pm 0.2$  Db up to 10 MC. maximum error for complete network is the sum of errors listed for individual dials.

### CIRCUIT:

VT-790 and VT-795 have a "T" network.

VH-790 and VH-795 have a Balanced "H" network.

MAXIMUM INPUT POWER: 1 Watt.

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

MOUNTING: The decade units are mounted on an alumited panel in a metal cabinet. Each individual decade is shielded in a brass case, and all decades are grounded to the panel.

TERMINALS: Jack-top binding posts  $\frac{3}{4}$ " spacing. Common terminal of "T" units grounded to chassis. Common terminal of balanced "H" units is ungrounded.

### DIMENSIONS:

VT-790 and VH-790—5½" w x 10" x 7¼" h.

VT-795 and VH-795—5½" w x 12" x 7¼" h.

### NET WEIGHT:

VT-790 and VT-795—10¾ lbs.

VH-790 and VH-795—15½ lbs.

### "T" NETWORK

TYPE	IMPEDANCE	DIALS	ATTENUATION
VT-790-F	500 ohms	2	110 Db in 1.0 Db steps
VT-790-G	600 ohms	2	110 Db in 1.0 Db steps
VT-795-F	500 ohms	3	111 Db in 0.1 Db steps
VT-795-G	600 ohms	3	111 Db in 0.1 Db steps

### BALANCED "H" NETWORK

TYPE	IMPEDANCE	DIALS	ATTENUATION
VH-790-F	500 ohms	2	110 Db in 1.0 Db steps
VH-790-G	600 ohms	2	110 Db in 1.0 Db steps
VH-795-F	500 ohms	3	111 Db in 0.1 Db steps
VH-795-G	600 ohms	3	111 Db in 0.1 Db steps



# RADIO FREQUENCY ATTENUATION NETWORK

## SERIES 640 & 650



SERIES 640

The Series 640 and 650 attenuation networks are designed for both laboratory and production radio frequency measurements. They are compact and flexible having 8 or 10 push-button steps of attenuation in either one or two decibel steps having a total loss of 80, 100 or 120 DB. The networks used have a constant impedance both for the input and output.

These networks are an assembly of Series RF-540 or RF-550 variable radio frequency attenuators mounted in series. The Series 640 and 650 are mounted on an alumilited panel in a hand rubbed walnut box. Series 640R and 650R are mounted on an alumilited panel for rack mounting.

## SPECIFICATIONS

FREQUENCY RANGE: DC to 225 MC up to 100 DB total. DC to 30 MC above 100 DB total.

SHIELDING: All units are individually shielded.

ATTENUATION RANGE: Series 640 zero to 80 DB in 1 DB steps or zero to 100 DB in 2 DB steps.

Series 650 zero to 100 DB in 1 DB steps or zero to 120 DB in 2 DB steps.

IMPEDANCE: 50 and 73 ohms.

CIRCUIT: Constant input and output impedance (unbalanced).

IMPEDANCE ACCURACY: Essentially flat from 0 to 225 MC up to 100 DB, and 0 to 30 MC above 100 DB.

RESISTOR ACCURACY: Within  $\pm 2\%$  at DC.

LEVEL OF OPERATION: Plus 24 DB ( $\frac{1}{4}$  watt) maximum input.

NUMBER OF STEPS: Series 640 eight (8) push button switches. Series 650 ten (10) push button switches.

MOUNTING: Series 640 and 650 Black Alumilited Panel mounted in a hand rubbed walnut cabinet. Series 640R or 650R mounted on a standard rack panel Black Alumilited finish.

DIMENSIONS: Series 640 and 650, 5" x 10" x 5". Series 640R and 650R 5 $\frac{1}{4}$ " x 19" long.

TYPE	"Z"	RECEPTACLES	PUSH BUTTONS	DECIBELS PER STEP	TOTAL
640-50	50	UG-58/U	8	1	80
641-50	50	UG-185/U	8	1	80
642-50	50	UG-58/U	8	2	100
643-50	50	UG-185/U	8	2	100
640-73	73	UG-58/U	8	1	80
641-73	73	UG-185/U	8	1	80
642-73	73	UG-58/U	8	2	100
643-73	73	UG-185/U	8	2	100
650-50	50	UG-58/U	10	1	100
651-50	50	UG-185/U	10	1	100
652-50	50	UG-58/U	10	2	120
653-50	50	UG-185/U	10	2	120
650-73	73	UG-58/U	10	1	100
651-73	73	UG-185/U	10	1	100
652-73	73	UG-58/U	10	2	120
653-73	73	UG-185/U	10	2	120

TYPE	"Z"	RECEPTACLES	PUSH BUTTONS	DECIBELS PER STEP	TOTAL
640R-50	50	UG-58/U	8	1	80
641R-50	50	UG-185/U	8	1	80
642R-50	50	UG-58/U	8	2	100
643R-50	50	UG-185/U	8	2	100
640R-73	73	UG-58/U	8	1	80
641R-73	73	UG-185/U	8	1	80
642R-73	73	UG-58/U	8	2	100
643R-73	73	UG-185/U	8	2	100
650R-50	50	UG-58/U	10	1	100
651R-50	50	UG-185/U	10	1	100
652R-50	50	UG-58/U	10	2	120
653R-50	50	UG-185/U	10	2	120
650R-73	73	UG-58/U	10	1	100
651R-73	73	UG-185/U	10	1	100
652R-73	73	UG-58/U	10	2	120
653R-73	73	UG-185/U	10	2	120

Receptacles Type UG-58/U is also known as Series "N" and Type UG-185/U as Series "BNC".

Cable Plugs are available for all of the above types at slight additional cost.

Special impedances or decibel losses may be obtained on request.



# ATTENUATION NETWORKS

## SERIES 690



The Series 690 Attenuation Networks are designed for use in general laboratory and production testing where ruggedness, flexibility and reliability are of prime importance. It is for this reason, THE DAVEN COMPANY offers these types as Secondary Attenuation Standards because extreme accuracy is not essential for this work. These networks consist of "plug-in" (patent pending) impedance adjusting networks, and either two or three attenuation controls, combined in compact assemblies. The "plug-in" impedance Matching Networks may be obtained in a wide range of impedance and loss.

### PORTABLE MODELS

### RACK MODELS

Type No.	Base Z	Range	No. of Dials	Circuit	Type No.
T-690-A	500	0-110 Db., Steps of 1 Db.	2	T	T-690-AR
H-690-B	500	0-110 Db., Steps of 1 Db.	2	BH	H-690-BR
T-690-C	600	0-110 Db., Steps of 1 Db.	2	T	T-690-CR
H-690-D	600	0-110 Db., Steps of 1 Db.	2	BH	H-690-DR
T-692	500	0-111 Db., Steps of 0.1 Db.	3	T	T-692-R
H-692	500	0-111 Db., Steps of 0.1 Db.	3	BH	H-692-R
T-693	600	0-111 Db., Steps of 0.1 Db.	3	T	T-693-R
H-693	600	0-111 Db., Steps of 0.1 Db.	3	BH	H-693-R

### SPECIFICATIONS

**ATTENUATION RANGE:** 2 dial models—Zero to 110 decibels in steps of one decibel. 3 dial models—Zero to 111 decibels in steps of 0.1 decibel.

**IMPEDANCE:** Input and output impedance may be changed to any value by interchanging "plug-in" pads of the type designed for the particular instrument.

**TYPE OF NETWORK:** "T" or Balanced "H".

**TYPE OF WINDING:** Card type, non-inductive.

**FREQUENCY RANGE:** Zero to 50,000 cycles. May be used for frequencies up to 50 kc. with small decrease in accuracy.

**ACCURACY:** Resistor units calibrated  $\pm 1\%$ .

**LEVEL OF OPERATION:** Plus 20 Db. (0.6 watts) maximum input.

**FEATURES:** Silver alloy is used for the contacts, slip-rings, and the Daven patented "knee-action" switch rotors.

**MOUNTING:** Portable models are mounted in walnut cabinets, and rack models upon standard black 5¼" x 19" panels.

**SIZE:** 2 Dial boxes—10" long, 5" wide, 5" high.

3 Dial boxes—11½" long, 6" wide, 5" high.

Rack—19" long, 3½" wide.

### IMPEDANCE MATCHING PADS FOR SERIES 690 ATTENUATION NETWORKS

SERIES 6800 INPUT PADS				Base Impedance		600 OHMS OUTPUT PADS		SERIES 6900 INPUT PADS				Base Impedance		500 OHMS OUTPUT PADS	
"T"	Bal. "H"	Z	Db. Loss	"T"	Bal. "H"	"T"	Bal. "H"	"T"	Bal. "H"	Z	Db. Loss	"T"	Bal. "H"	"T"	Bal. "H"
6811	6831	500	3.77	6851	6871	6911	6931	600	3.77	6951	6971				
6812	6832	500	5.00	6852	6872	6912	6932	600	5.00	6952	6972				
6813	6833	600	0	6853	6873	6913	6933	500	0	6953	6973				
6814	6834	250	8.74	6854	6874	6914	6934	250	7.65	6954	6974				
6815	6835	250	10.00	6855	6875	6915	6935	250	10.00	6955	6975				
6816	6836	200	9.96	6856	6876	6916	6936	200	8.97	6956	6976				
6817	6837	200	10.00	6857	6877	6917	6937	200	10.00	6957	6977				
6820	6840	50	16.63	6860	6880	6920	6940	50	15.79	6960	6980				
6821	6841	50	20.00	6861	6881	6921	6941	50	20.00	6961	6981				

*Special Impedances or Decibel Losses Other Than Those Shown Are Available.*



# ATTENUATION NETWORKS

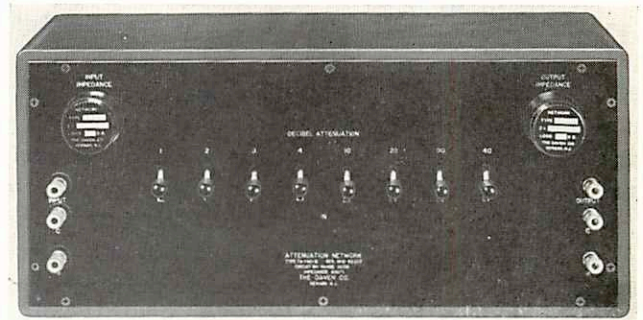
## SERIES 740 AND 742

The DAVEN Series 740 Attenuation Networks are designed primarily as laboratory standards of attenuation, and have been carefully engineered to retain their accuracy and reliability over long periods of time. The assembly consists of a combination of constant impedance pads completely shielded capable of supplying losses from zero to 110 decibels in steps of one decibel, and Series 7300 or Series 7400 input and output impedance adjusting networks of the "Plug-In", fixed pad type. This permits use of the assembly for a wide variety of standard impedance applications by selection of input and output impedance matching pads of proper value.

These plug-in Impedance Matching Networks are available in a wide range of impedance and decibel losses either with "T" or "Balanced H" network.

The Type 740 utilizes eight key switches for obtaining losses of 1, 2, 3, 4, 10, 20, 30 and 40 decibels each, a total of 110 decibels loss in steps of one decibel.

The Type 742 utilizes Daven patented "knee-action" silver alloy rotary switches and contacts.



### SPECIFICATIONS

**ATTENUATION RANGE:** 0 to 110 decibels in steps of one decibel.

**IMPEDANCE:** Series 740 available in base impedance of either 500 or 600 ohms as specified. Input and output impedance may be changed to a wide variety of values by selection of the proper Series 7300 or 7400 networks.

**TYPE OF NETWORKS:** Shielded "T" or Balanced "H".

**FREQUENCY RANGE:** Zero to 50,000 cycles. May be used for frequencies up to 50 KC with small decrease in accuracy.

**ACCURACY:** Resistor networks calibrated to  $\pm 0.5\%$ .

**LEVEL OF OPERATION:** Plus 20 Db (0.6 watts) maximum input.

**MOUNTING:** Engraved black alumilited aluminum panel, mounted in walnut cabinet.

**SIZE:** 15" long, 6½" wide, 6½" high.

**WEIGHT:** 9 lbs., 10 ozs.

TYPE	CIRCUIT	BASE IMPEDANCE	RANGE	SWITCH
TA-740-A	"T"	500	0-110 Db. in 1 Db. Steps	Key
TB-742-A	"T"	500	0-110 Db. in 1 Db. Steps	Rotary
HA-740-A	"BH"	500	0-110 Db. in 1 Db. Steps	Key
HB-742-A	"BH"	500	0-110 Db. in 1 Db. Steps	Rotary
TA-740-B	"T"	600	0-110 Db. in 1 Db. Steps	Key
TB-742-B	"T"	600	0-110 Db. in 1 Db. Steps	Rotary
HA-740-B	"BH"	600	0-110 Db. in 1 Db. Steps	Key
HB-742-B	"BH"	600	0-110 Db. in 1 Db. Steps	Rotary

Attenuation Boxes supplied complete with one set of zero Db loss networks, unless otherwise specified.

### IMPEDANCE ADJUSTING PADS FOR TYPES 740 & 742 NETWORKS

These convenient "plug-in" networks are listed in 500 and 600 ohm base impedances to match the impedance of the in-

struments listed above. Both INPUT and OUTPUT Types have  $\pm 0.5\%$  resistor accuracy.

SERIES 7400				500 OHMS	
INPUT PADS		BASE IMPEDANCE		OUTPUT PADS	
"T"	Bal. "H"	Impedance	Db. Loss	"T"	Bal. "H"
7411	7431	600	3.77	7451	7471
7412	7432	600	5.00	7452	7472
7413	7433	500	0.	7453	7473
7414	7434	250	7.65	7454	7474
7415	7435	250	10.00	7455	7475
7416	7436	200	8.97	7456	7476
7417	7437	200	10.00	7457	7477
7420	7440	50	15.79	7460	7480
7421	7441	50	20.00	7461	7481
7422	7442	30	18.11	7462	7482
7423	7443	30	20.00	7463	7483

SERIES 7300				600 OHMS	
INPUT PADS		BASE IMPEDANCE		OUTPUT PADS	
"T"	Bal. "H"	Impedance	Db. Loss	"T"	Bal. "H"
7311	7331	500	3.77	7351	7371
7312	7332	500	5.00	7352	7372
7313	7333	600	0.	7353	7373
7314	7334	250	8.74	7354	7374
7315	7335	250	10.00	7355	7375
7316	7336	200	9.96	7356	7376
7317	7337	200	10.00	7357	7377
7320	7340	50	16.63	7360	7380
7321	7341	50	20.00	7361	7381
7322	7342	30	18.92	7362	7382
7323	7343	30	20.00	7363	7383

Special Impedance or Decibel Losses Other Than Those Shown Are Available.



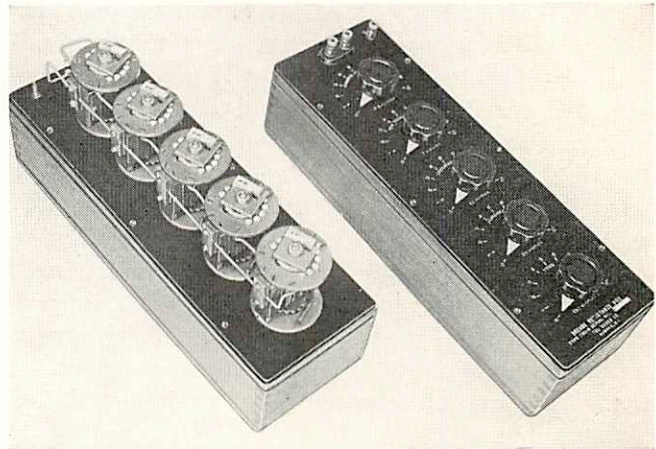
# DECADE RESISTANCE BOXES

## SERIES 750

The Daven Type 750 Resistance Boxes are complete assemblies of two or more Type 275 Decade Units, mounted on a black alumilited panel and enclosed in a shielded walnut cabinet. The cabinet shielding consists of a full copper lining making electrical contact with the metal panel for complete isolation of the resistive elements. There is no electrical circuit between the shield and resistance elements. Three terminals are provided, two for the resistance circuit and the third as a ground connection to the shield.

These precision boxes may be used as Laboratory Standards, as direct reading resistor elements in bridge circuits, as shunt or series elements in transmission networks, as dummy loads, or other applications where accurate, stable, adjustable resistance elements are applicable.

Many distinctive design features have been incorporated in the DAVEN Decade Resistance Boxes to insure maximum accuracy and reliability. Sturdy construction to withstand the Armed Forces vibration tests, silver alloy contacts, switches and col-



lector rings and extreme accuracy of the Daven Decade Resistance Boxes make them equally suitable for the college or industrial laboratory and for production test circuits and other applications. Although more widely used in the past in direct current or audio frequency work, they are suitable for many applications in the radio frequency range up to 10 MC when properly applied.

### SPECIFICATIONS

**ACCURACY:** All resistance units are within 0.1% between resistance card terminals, except the 1.0 ohm steps which are within 0.25% and the 0.1 ohm steps which are within 1.0%.

**MAXIMUM CURRENT:** See specifications on page 78 for Type 275 Decade Resistance Units.

**TYPE OF WINDING:** For 0.1 ohm steps Bifilar, for 1.0, 10, and 100 ohm steps Ayrton-Perry, and for higher resistance values mica card or slotted bobbins for windings.

**FREQUENCY CHARACTERISTICS:** There is no appreciable error below 50 Kc for the 0.1, 1, 10, and 100 ohm steps. Due to lead capacity and type of windings employed, higher values of resistances are subject to a resistive and reactive correction at radio frequencies.

In using Decade Resistance Boxes for radio frequencies up to 10 MC or above, fundamental facts should be considered. As a resistor approaches zero in value the percentage of inductive reactance to resistance rises. The 0.1 ohm or 1.0 ohm steps may be expected to have a high +j component at the higher frequencies. As the resistance is increased, the +j component becomes less so that the 10 ohm and 100 ohm steps are predominantly resistive. In using the 1,000

ohm or higher steps of resistance at radio frequencies, considerable error may be introduced by the equivalent circuit capacity shunting the resistors. Formulas for computation of such errors are contained in most radio text-books.

**SWITCH RESISTANCE:** Resistance of each switch or decade at zero setting is less than 0.003 ohm.

**TEMPERATURE CO-EFFICIENT:** Less than  $\pm 0.002\%$  per degree "C" at room temperature.

**SWITCH:** The Daven patented "KNEE ACTION" tamper-proof switch forms a short direct low resistance path between contact and insulated collector ring. The switch consists of three independent silver alloy "U" blade brushes having independent spring wiping (off-set) action to insure positive and uniform contact over the maximum contact area.

**RESISTANCE FEATURES:** Resistance elements are securely mounted, rather than merely suspended by connecting leads, to insure continued accuracy under shock and severe vibration conditions.

**VIBRATION FEATURES:** These decades are constructed to withstand the Armed Forces vibration tests.

(Cont'd)



# (Cont'd) DECADE RESISTANCE BOXES

## SERIES 750

**SHAFT:** Quarter inch ground and polished stainless steel shaft is used and is at ground potential, separate from electrical circuit. Will not warp, bind or nick-up with age.

**DETENTS:** Positive detents (indexing) utilizing spring-loaded, free turning, long wearing roller and cam assembly.

**SWITCH ROTOR STOPS:** Switch stops are part of the metal cam (gear), which is securely staked to the stainless steel shaft.

**MOUNTING:** Decade units are mounted on a black aluminited panel and enclosed in a fully copper-lined walnut cabinet to provide complete physical and electrical protection of the elements.

**DIMENSIONS:** All types are 5" wide and 5" high overall. Lengths for the 2 dial box 7 $\frac{3}{4}$ "; 3 dial box 10 $\frac{3}{8}$ "; 4 dial box 13"; and 5 dial box 15 $\frac{5}{8}$ ".

**WEIGHT:** Two dial box 4 lbs.; 3 dial box 4 $\frac{3}{4}$  lbs.; 4 dial box 5 $\frac{1}{2}$  lbs.; and 5 dial box 6 $\frac{1}{4}$  lbs.

TYPE	NO. OF DIALS	RESISTANCE	
		OHMS PER STEP	TOTAL OHMS
750-A	2	0.1	11
750-B	2	1.0	110
750-D	3	0.1	111
750-E	3	1.0	1,110
750-F	3	10.0	11,100
750-G	4	0.1	1,111
750-H	4	1.0	11,110
750-J	4	10.0	111,100
750-N	4	100.0	1,111,000
750-K	5	0.1	11,111
750-L	5	1.0	111,110
750-M	5	10.0	1,111,100

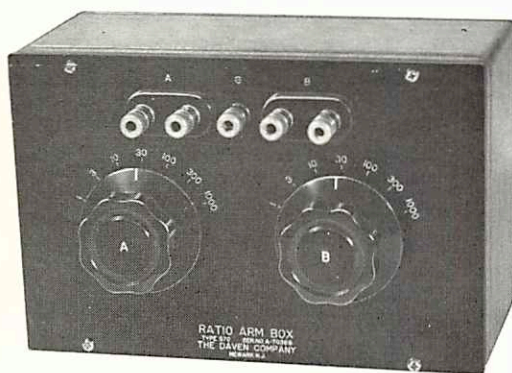
## RATIO ARM BOXES TYPES 470 & 570

These units are designed for use in precision bridge assemblies for setting the ratios between the Standard and the Unknown. They comprise the two fixed, or ratio arms of the fundamental bridge circuit, and may be employed in almost any type of resistance or reactance bridge networks. The addition of a source, standard, and an indicator completes the network; thus forming a complete bridge.

Two Basic types are offered. Type 570 consists of two units similar to DAVEN Type 275 Decades mounted in a shielded cabinet. By means of these two con-

trols ratios of .001 to 1000 may be obtained. Type 470 is a single unit mounted in a shielded cabinet. By means of this single control ratios .001 to 1000 may be obtained.

In using the single dial control some slight flexibility, accuracy and sensitivity is sacrificed, however, for most applications the added advantage of the single control offsets these disadvantages. For precision laboratory set-ups requiring the measurement of resistors over a great range of values the Type 570 is recommended. For production testing and routine measurements the Type 470 is recommended.



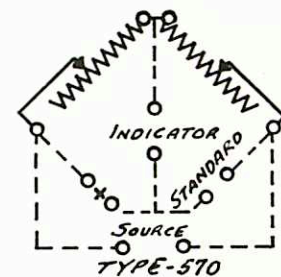
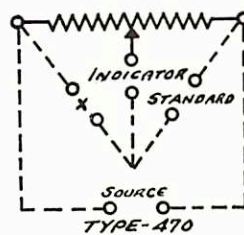
### SPECIFICATIONS

**Accuracy:** For one ohm resistance  $\pm 0.25\%$ , for other values  $\pm 0.1\%$ .

**Switches:** Heavy duty "knee action", similar to DAVEN Type 275 Decade Switches.

**Mounting:** Units mounted on an engraved metal panel with suitable jack type binding posts for external connections. Cabinet is hand rubbed walnut, 5" wide, 7 $\frac{3}{4}$ " long and 5" high.

**Net Weight:** Types 570—3 lbs. 6 ozs. Type 470—2 lbs. 8 ozs.



BASIC BRIDGE CIRCUITS  
SHOWING APPLICATIONS OF RATIO ARM BOX

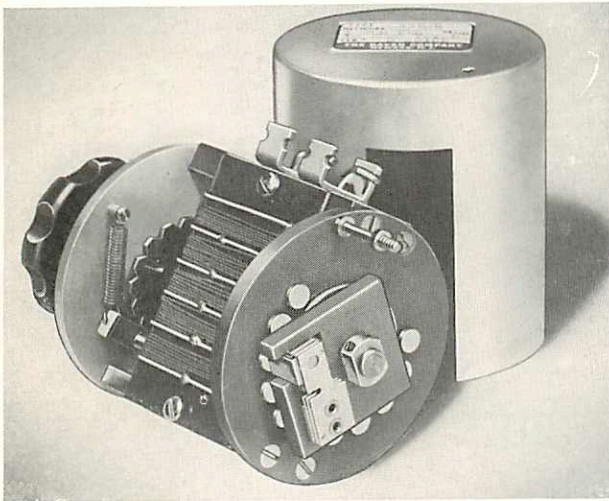
TYPE	DESCRIPTION
570	Two Dial Box, Ratios from .001 to one up to 1000 to one.
571	Single Units as Used in Type 570 Box.
470	One Dial Ratio Arm Box.
471	Unit as Used in Type 470 Box.



# DECADE RESISTOR UNITS

## TYPE 275

### FOR PRECISION LABORATORY STANDARDS



The Type 275 Decade Unit is a precision type resistor designed for use in equipment where a complete Decade Box is not required. These decades are identical to those assembled in the Type 750 Decade Boxes with the exception that they have a complete individual shield, two holes for mounting, dial and knob.

Many distinctive design features have been incorporated in the DAVEN Decade Resistance Units to insure maximum accuracy and reliability. Sturdy construction to withstand the Armed Forces vibration tests, silver alloy contacts, switches and collector rings and extreme accuracy make them equally suitable for the college or industrial laboratory. Although more widely used in the past in direct current or audio frequency work, they are suitable for many applications in the radio frequency range up to 10 MC when properly applied.

### SPECIFICATIONS

**ACCURACY:** All resistance units are within 0.1% between resistance card terminals, except the 1.0 ohm steps which are within 0.25% and the 0.1 ohm steps which are within 1.0%.

**TYPE OF WINDING:** for 0.1 ohm steps Bifilar, for 1.0, 10, and 100 ohm steps Ayrton-Perry, and for higher resistance values mica card or slotted bobbins for windings.

**FREQUENCY CHARACTERISTICS:** There is no appreciable error below 50 KC for the 0.1, 1, 10, and 100 ohm steps. Due to lead capacity and type of windings employed, higher values of resistances are subject to a resistive and reactive correction at radio frequencies.

In using Decade Resistance Boxes for radio frequencies up to 10MC or above, fundamental facts should be considered. As a resistor approaches zero in value the percentage of inductive reactance to resistance rises. The 0.1 ohm or 1.0 ohm steps may be expected to have a high  $+j$  component at the higher frequencies. As the resistance is increased, the  $+j$  component becomes less so that the 10 ohm and 100 ohm steps are predominantly resistive. In using the 1,000 ohm or higher steps of resistance at radio frequencies, considerable error may be introduced by the equivalent circuit capacity shunting the resistors. Formulas for computation of such errors are contained in most radio text-books.

**SWITCH RESISTANCE:** Resistance of each switch or decade at zero setting is less than 0.003 ohm.

**TEMPERATURE COEFFICIENT:** Less than  $\pm .002\%$  per degree contact and insulated collector ring.

**SWITCH:** The Daven patented "KNEE ACTION" tamper-proof switch forms a short direct low resistance path between contact and insulated collector ring. The switch consists of three independent silver alloy "U" blade brushes having independent spring wiping (off-set) action to insure positive and uniform contact over the maximum contact area.

**RESISTANCE FEATURES:** Resistance elements are securely mounted, rather than merely suspended by connecting leads, to insure continued accuracy under shock and severe vibration conditions.

**VIBRATION FEATURES:** These decades are constructed to withstand the Armed Forces vibration tests.

**SHAFT:** Quarter inch ground and polished stainless steel shaft is used and is at ground potential, separate from electrical circuit. Will not warp, bind or nick-up with age.

**DETENTS:** Positive detents (indexing) utilizing spring-loaded, free turning, long wearing roller and cam assembly.

**SWITCH ROTOR STOPS:** Switch stops are part of the metal cam (gear), which is securely staked to the stainless steel shaft.

**DIMENSIONS:**  $2\frac{1}{2}$ " diameter x 3" depth.

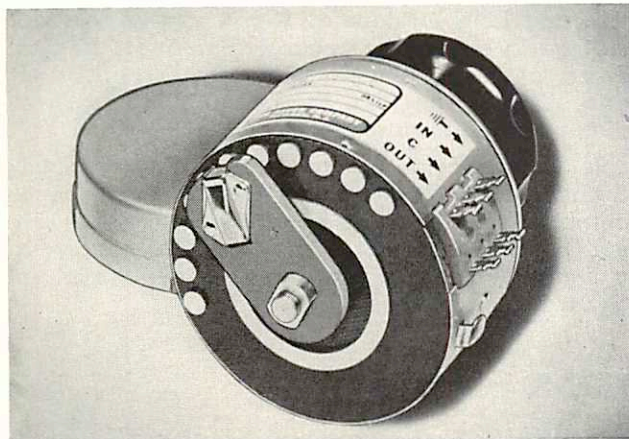
TYPE	RESISTANCE PER STEP	TOTAL RESISTANCE	ACCURACY %	MAXIMUM POWER PER STEP 40° C. RISE
275-A	0.1	1.0	1.0	0.25 watt
275-B	1.0	10.0	0.25	0.6 watt
275-C	10.0	100.0	0.1	0.6 watt
275-D	100.0	1000.0	0.1	0.6 watt
275-E	1000.0	10,000.0	0.1	0.6 watt
275-F	10,000.0	100,000.0	0.1	0.6 watt
275-G	100,000.0	1,000,000.0	0.1	0.6 watt



# DECADE RESISTOR UNITS

## SERIES 375

### FOR SECONDARY LABORATORY STANDARDS



TYPE 375

The Type 375 Decade unit is a compact type resistor designed for use in portable and rack type equipment where size is of prime importance. This Decade is not a precision type, however, the accuracy and reliability is sufficient for use in line equalizers and secondary laboratory equipment. Each unit is completely shielded.

The Decade Units are mounted in a brass dust proof shield with a snap-on dust cover to withstand the Armed Forces vibration tests. Silver alloy is used in the contacts, slip rings, and the Daven patented "knee-action" tamper proof switch rotors.

Type 375 Decade units are supplied covering the range from 0.1 ohms per step to 10,000 ohms per step.

### SPECIFICATIONS

**ACCURACY:** Resistors are wire wound on treated forms, artificially aged and adjusted to within 1% between resistance card terminals.

**TYPES OF WINDINGS:** For 0.1, 1.0, 10 and 100 ohms step, mica card type windings on treated bakelite strips. For 1,000 and 10,000 ohms per step reverse type spool winding.

**FREQUENCY CHARACTERISTICS:** For 0.1, 1.0, 10 and 100 ohm steps there is no appreciable error below 25 Kc. Due to lead capacity and type of windings employed, higher values of resistances are subject to a resistive and reactive correction at radio frequencies.

**SWITCH RESISTANCE:** Resistance of each switch or decade at zero setting is less than 0.003 ohms.

**TEMPERATURE CO-EFFICIENT:** Less than  $\pm 0.002\%$  per degree "C" at room temperature.

**SWITCH:** The Daven patented "KNEE ACTION" tamper-proof switch forms a short direct low resistance path between contact and separate collector ring. The switch consists of independent silver alloy "U" blade brushes having independent spring wiping (off-set) action to insure posi-

tive and uniform contact over the maximum contact area.

**RESISTANCE FEATURES:** The resistance elements are securely mounted. The low resistance steps are bifilar or unifilar wound. The higher resistance steps are wound on low loss bobbins.

**VIBRATION FEATURES:** The shields of these decades are constructed to withstand the Armed Forces vibration tests.

**SHAFT:** Quarter inch ground and polished stainless steel shaft is used and is at ground potential, separate from electrical circuit. Will not warp, bind or nick-up with age.

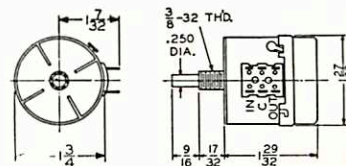
**DETENTS:** Positive detents (indexing) utilizing spring-loaded, free turning, long wearing roller and cam assembly.

**SWITCH ROTOR STOPS:** Switch stops are part of the metal cam (gear), which is securely staked to the stainless steel shaft.

**CONTACT SPACING:** 15 degrees between centers.

**DIMENSIONS:** 1 3/4" diameter, 1-29/32" depth.

TYPE	RESISTANCE PER STEP	TOTAL RESISTANCE
375-A	0.1	1
375-B	1.0	10
375-C	10.0	100
375-D	100.00	1,000
375-E	1,000.0	10,000
375-F	10,000.0	100,000





# DECADE VOLTAGE DIVIDER

## TYPE 187



The Daven Type 187 Decade Voltage Divider is designed to supply accurate voltage ratios between .001 and 1.000 in steps of .001. It is used to reduce voltage in accurately calibrated steps for measurements on audio amplifiers and other high impedance circuits. The Type 187 is available in a variety of constant input impedances.

This instrument is an assembly of three special decade units which provide means of varying the output voltage over the specified range while holding the input impedance constant. The decades are mounted on a metal panel marked with direct voltage ratio calibrations.

### SPECIFICATIONS

**RANGE:** Voltage ratios in steps of .001 from .001 to 1.000.

**INPUT IMPEDANCE:** Constant at all settings of the controls. See table below for values available.

**OUTPUT IMPEDANCE:** Variable. Unit is designed to work into an infinite impedance.

**ACCURACY:** Resistors adjusted to an accuracy of  $\pm 0.25\%$  for 1 ohm steps. All other resistors adjusted to within  $\pm 0.1\%$ . No errors due to thermal emf are encountered in direct-current readings due to the special alloy materials used.

**FREQUENCY CHARACTERISTICS:** No appreciable error over the range zero to 50,000 cycles.

**MAXIMUM WATTAGE:** Will safely dissipate 0.6 watts.

**TEMPERATURE CO-EFFICIENT:** Less than  $\pm .002\%$  per degree "C" at normal room temperatures.

**TERMINALS:** Jack-type binding posts with standard  $\frac{3}{4}$ " spacing.

**MOUNTING:** Standard rack type panel or cabinet type on engraved metal panel in copper shielded walnut cabinet.

**DIMENSIONS:** Cabinet type 6-1/16" x 11-9/16" x 6". Rack type 19" x 5 1/4" x 5 1/2" deep.

**NET WEIGHT:** Cabinet type 6 lbs. Rack type 8 lbs.

TYPE NO.	INPUT IMPEDANCE OHMS	MOUNTING
187-A	1,000	Cabinet
187-B	10,000	Cabinet
187-C	100,000	Cabinet
187-D	1,000	Rack type
187-E	10,000	Rack type
187-F	100,000	Rack type

## DECADE VOLTAGE DIVIDER UNITS

### SERIES 1870

In many cases it is desirable to have additional Decade Units available in the laboratory for special circuit set-ups or non-standard combinations of decades. The electrical characteristics of the individual units are the same as those in the Type 187 Decade Voltage Divider.

DECADE UNITS	OHMS PER STEP	OHMS TOTAL	DECADE UNITS	OHMS PER STEP	OHMS TOTAL
1870-A	0.1	1.0	1871-A	0.1	0.9
1870-B	1.0	10.0	1871-B	1.0	9.0
1870-C	10.0	100.0	1871-C	10.0	90.0
1870-D	100.0	1,000.0	1871-D	100.0	900.0
1870-E	1,000.0	10,000.0	1871-E	1,000.0	9,000.0
1870-F	10,000.0	100,000.0	1871-F	10,000.0	90,000.0



# VOLUME LEVEL INDICATOR

## SERIES 910 & 911

The DAVEN series 910 and 911 Volume Level Indicator is designed to indicate audio levels in broadcasting, sound recordings, and allied fields where precise monitoring is important.

The indicating meter is a copper-oxide type instrument possessing nearly ideal characteristics for monitoring purposes. The adjustment is such that the pointer will indicate 99% normal deflection at zero vu in approximately 0.3 seconds. Overswing is not more than 1 to 1½%. The meter scale is calibrated in vu and percent. It is large, clearly marked and carefully designed to minimize eye fatigue.

Two meter controls are provided; one a small decade with screw driver adjustment for zero level setting of the meter pointer; the other a constant impedance "T" type network for extending the range of the instrument in steps of 2 Db.

Because of the length of the meter scale, small differences in pointer indications are easily noticed. For this reason the screw-driver type vernier is provided. All V.U. meters can thus be adjusted to the same scale reading. This is particularly convenient in complex installations where several V.U. meters must be read by one operator, or in coordinating the various meters at different points in a network.

The Type 910 unit is completely self-contained, requiring no batteries or external power supply. The indicator is sensitive to low power levels, rugged and dependable.

Type No.	Range	Scale
910-A	+ 4 to 42 vu off	A
910-B	+ 4 to 42 vu off	B
910-C	+ 4 to 26 vu off	A
910-D	+ 4 to 26 vu off	B
910-E*	+ 4 to 42 vu off	A
910-F*	+ 4 to 42 vu off	B
910-G*	+ 4 to 26 vu off	A
910-H*	+ 4 to 26 vu off	B
911-A	+ 4 to 42 vu off	A
911-B	+ 4 to 42 vu off	B
911-C	+ 4 to 26 vu off	A
911-D	+ 4 to 26 vu off	B

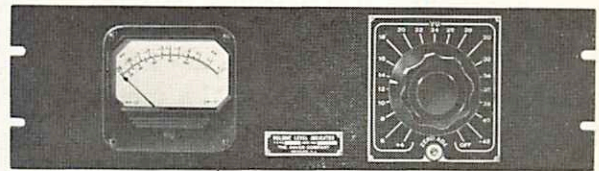
\*Note: These types have illuminated scale.

### METERS FOR 910 SERIES VOLUME VU LEVEL INDICATORS

Type No.	Scale Type	
912-A	Without Illumination	A
912-B		B
913-A	With Illumination	A
913-B		B

SCALE A: VU on upper scale, PER CENT on lower scale.

SCALE B: PER CENT on upper scale, VU on lower scale.



SERIES 910—RACK MODEL

### SPECIFICATIONS

**Input Impedance:** 7500 ohms constant on all steps of meter range switch.

**Zero Level:** 1 mw. at 600 Ω reference.

**Volume Level-Range:** See table.

**Frequency Range:** Less than 0.2 Db. variation up to 10,000 CPS; less than 0.5 variation up to 15,000 CPS.

**Scale Reading:** Meter calibrated -20 to +3 vu. and 0 to 100%. Type "A" scale, for sound level work is marked in vu on the upper scale. Type "B" scale for broadcasting work is marked in percent on the upper scale.

**Indicating Meter:** Copper-oxide-type adjusted for deliberate pointer action, with a large clearly marked scale.

**Meter Range Control:** Heavy duty "T" network with 7500/3900 ohms impedance, in steps of 2 Db.

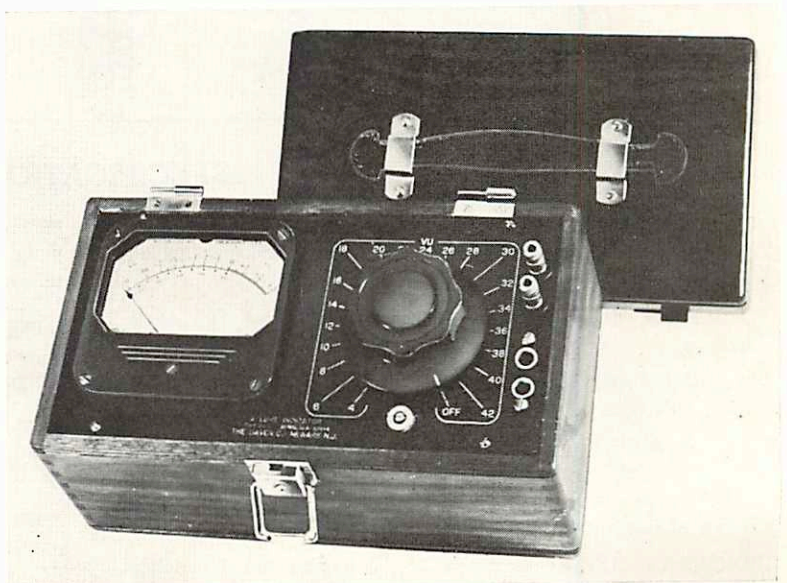
**Meter Adjustment Control:** Miniature step-by-step decade type unit. Designed for fine adjustment of the zero level reading over a range of ±0.5 Db.

**Mounting:** Series 910—standard relay mounting panel 5¼" x 19"—Series 911—Metal panel enclosed in portable walnut box 11" x 6" x 6¼".

**Finish:** Black alumilited panels. Special colors for panels are available.

**Weight:** Type 910—4½ lbs. net. Type 911—5½ lbs. net.

TYPE 911—PORTABLE MODEL

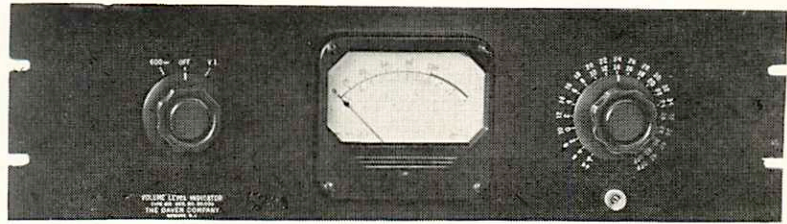




# VOLUME LEVEL INDICATOR

## TYPE 915

The 915 Volume Level Indicator may be used as either a terminating or a bridging instrument. In the former case the input impedance is 600 ohms, and the meter range is from  $-6$  vu. In the bridging position the input impedance is 7500 ohms and the meter range is from  $+4$  vu. (at 100% utilization, zero vu.).

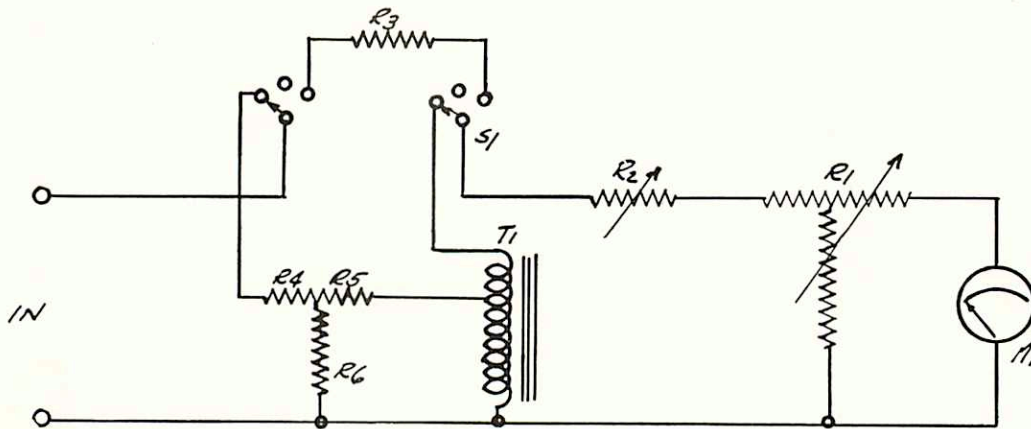


A switch is provided on the panel for the selection of these two ranges. Two separate colored scales are provided on the meter range switch to reduce the possibility of an error in readings.

The advantage of this type of instrument is that it will measure a lower range of signal level, and at the same time, provide accurate line termination. It may also be used as a bridging instrument (standard VI) in cases where the line is already terminated. The 915 VI is a special adaptation of the DAVEN 910 Volume Level Indicator. The same selection of meters and meter multipliers are available as on the Type 910. For general details on the indicator scale, meter damping, and zero adjuster refer to the Type 910 Volume Level Indicator. (See page 81.)

TYPE NO.	RANGE OF CONTROL		METER SCALE
	TERMINATED	BRIDGING	
915A	$-6$ to $+32$ vu off	$+4$ to $+42$ vu off	A
915-B	$-6$ to $+32$ vu off	$+4$ to $+42$ vu off	B
915-C	$-6$ to $+16$ vu off	$+4$ to $+26$ vu off	A
915-D	$-6$ to $+16$ vu off	$+4$ to $+26$ vu off	B
915-E*	$-6$ to $+32$ vu off	$+4$ to $+42$ vu off	A
915-F*	$-6$ to $+32$ vu off	$+4$ to $+42$ vu off	B
915-G*	$-6$ to $+16$ vu off	$+4$ to $+26$ vu off	A
915-H*	$-6$ to $+16$ vu off	$+4$ to $+26$ vu off	B

An off position is provided on all the above ranges.  
\* Types E, F, G and H supplied with illuminated scale.



## SPECIFICATIONS

**INPUT IMPEDANCE:** 600 ohms in "terminated" and 7500 ohms in "bridging" position. These impedances are constant for all operating steps of the meter range switch.

**VOLUME LEVEL RANGES:** Standard 1 MW. at 600 ohms reference.

**FREQUENCY RANGE:** Less than 0.2 Db variation up to 10,000 cycles; less than 0.5 Db variation up to 15,000 cycles.

**SCALE READING:** Meter calibrated  $-20$  to  $+3$  vu. and 0 to 100%. Type "A" scale for sound level work is marked in vu. on the upper scale; Type "B" scale for broadcasting work is marked in percent on the upper scale.

**INDICATING METER:** Copper-oxide-type adjusted for deliberate pointer action with a large clearly-marked scale.

**METER RANGE CONTROL:** Heavy duty "T" network, impedance 3,900 ohm input and output. The control is variable in steps of 2 Db.

**METER ADJUSTMENT CONTROL:** Miniature step type control providing meter adjustment in steps of 0.1 Db over a range 0.5 Db.

**TERMINALS:** Screw type lugs.

**MOUNTING:** Standard relay rack mounting panel  $5\frac{1}{4}$ " x 19".

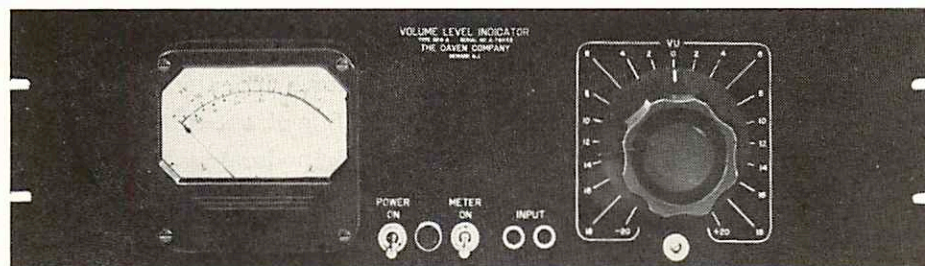
**FINISH:** Black alumilited finish. Special finish panels are available.

**NET WEIGHT:**  $7\frac{1}{2}$  lbs.



# VOLUME LEVEL INDICATOR

## SERIES 920



Volume Level Indicators utilizing only standard VU meters, impedance matching coils, and resistive multipliers are limited on low signals by the sensitivity of the VU meter. The Series 920 Volume Level Indicator has been designed particularly to extend the range downward to cover signal levels too low to be measured without amplification.

The equipment consists of a wide band audio am-

plifier, calibrated range control, and self-contained, regulated power supply.

Two types of input circuits are offered, bridging (for monitoring 600 ohm circuits without disturbing the signal), and terminating (input impedance 600 ohms).

The range control is an accurate step type potentiometer calibrated in steps of 2 decibels.

TYPE	INPUT	VU METER RANGE		METER SCALE
		ZERO VU	INCLUDING METER	
920-A	Bridging	-20 to +20	-40 to +23	A } without B } illumination
920-B	Bridging	-20 to +20	-40 to +23	
920-C	Bridging	-20 to +20	-40 to +23	A } with B } illumination
920-D	Bridging	-20 to +20	-40 to +23	
922-A	Bridging	-40 to +26	-60 to +29	A } without B } illumination
922-B	Bridging	-40 to +26	-60 to +29	
922-C	Bridging	-40 to +26	-60 to +29	A } with B } illumination
922-D	Bridging	-40 to +26	-60 to +29	
923-A	Bridging	-30 to +30	-50 to +33	A } without B } illumination
923-B	Bridging	-30 to +30	-50 to +33	
923-C	Bridging	-30 to +30	-50 to +33	A } with B } illumination
923-D	Bridging	-30 to +30	-50 to +33	
924-A	Bridging Range	-20 to +20	-40 to +23	A } without B } illumination
924-B	Terminating Range	-40 to +20	-60 to +23	
924-C	Bridging Range	-20 to +20	-40 to +23	A } with B } illumination
924-D	Terminating Range	-40 to +20	-60 to +23	

### SPECIFICATIONS

**INPUT IMPEDANCE BRIDGING:** Type 922 is 7500 ohms, all other types are 12,500 ohms. See note.\*

**TERMINATING:** 600 ohms (Type 924 only). See note.\*

**VOLUME LEVEL RANGE:** Standard 1 MW into 600 ohms reference. See tabulation for overall range.

**FREQUENCY RANGE:** Within  $\pm 0.5$  Db, 30 cycles to 15,000 cycles.

**SCALE READING:** Meter calibrated -20 to +3 VU and 0 to 100%. Type "A" scale, for sound level work is marked in VU on the upper scale; Type "B" scale for broadcasting work is marked in percent on the upper scale.

\* NOTE: Type 924 has both bridging and terminating inputs selected by means of two sets of input jacks.

**INDICATING METER:** Copper-oxide-type adjusted for deliberate pointer action. Large clearly marked scale.

**METER RANGE CONTROL:** Heavy duty step type potentiometer variable in steps of 2 Db.

**MOUNTING:** Rack Types 920, 922, 924 — standard relay rack mounting panel 5 $\frac{1}{4}$ " x 19". Type 924 in portable hand-rubbed walnut box, complete with slip-on hinged cover and carrying handle. Dimensions 15 $\frac{1}{2}$ " long, 8 $\frac{3}{8}$ " wide, 7 $\frac{7}{8}$ " high overall including cover.

**PANEL FINISH:** Black aluminite finish. Standard WE, RCA, or Hammertone Gray available upon request at slight additional cost.



# TRANSMISSION MEASURING SETS

## INTRODUCTION

Daven Transmission Sets are accurately designed precision instruments for the measurement of the transmission characteristics of audio systems.

Due to the wide range of requirements it would be complex and expensive to incorporate all the functions in one assembly. For this reason we offer several types of instruments, each designed for service in a particular field of work as follows:

<i>Daven Type No.</i>	<i>Applications</i>
7A	Telephone or Wire Line
8A	Telephone or Wire Line
10B	} Studio, Laboratory, Sound Wire Transmission, Sound Motion Picture. Broadcast Stations, (AM or FM), Television and Public Address Systems
11A	
12A	Telephone or Wire Line
34B	Telephone or Wire Line

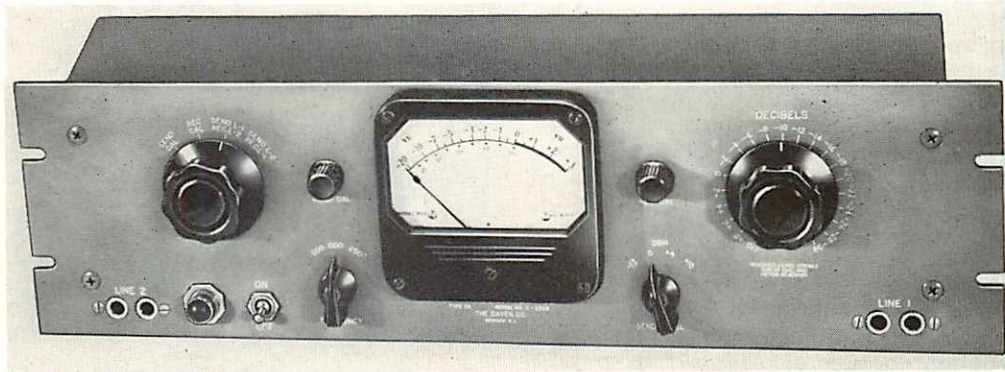
The following is a brief description of the sets:

- 7-A Rack mounted instrument, consisting of calibrated oscillator, receiving amplifier and associated power supply. Limited range instrument used chiefly for Telephone Transmission Measurements.
- 8-A Portable, battery operated instrument consisting of calibrated oscillator and receiving amplifier, complete with internal batteries. Limited range instrument for Telephone Transmission Measurements.
- 10-B Rack Mounted Precision instrument—consisting of accurately calibrated Loss Networks, Impedance Matching Transformers and Matching Networks. Requires external oscillator. Accurate, Wide Range, Flexible, Direct Reading. Designed for Radio Broadcasting (AM or FM), Sound Motion Picture Studio, Sound Wire Transmission, Television, and general laboratory work.
- 11-A Rack Mounted Precision instrument consisting of accurately calibrated Loss and Impedance Matching Networks. Requires external oscillator. Accurate, Wide Range, Direct Reading. Designed for Radio Broadcasting and Sound Studios. Similar to 10-B but not as flexible in operations. Has one meter and switch for transferring between input and output.
- 12-A Rack Mounted Instrument, consisting of calibrated oscillator, receiving amplifier, Telephone Line Weighting Networks, Noise Measuring Circuit, Distortion Measuring Circuit, and associated regulated power supply. Designed chiefly for Telephone Transmission Measurements.
- 34-B Portable, battery operated instrument consisting of high gain audio amplifier with calibrated gain control. Line and Receiver Weighting Networks, Repeat Coils, and associated loss and Impedance Matching Networks. Designed primarily for the measurement of noise on telephone circuits. Can also be used for the measurement of acoustical noise.



# TRANSMISSION MEASURING SET

## TYPE 7-A



The Type 7-A Transmission Measuring Set is a self contained, A.C. operated, rack mounted instrument, designed for the measurement of the transmission characteristics of communication systems. The circuit consists of an internal audio oscillator or "Source" section, and a calibrated amplifier or "Receive" section.

The transmission or "Source" section provides frequencies of 500, 1000 and 2500 cycles at levels of -13, 0, +4 and +10 DBM. The output impedance is 600 ohms.

The "Receive" section provides a range of -10 Db to +30 Db in steps of 2 Db at zero meter reading. Additional levels to -30 Db can be read by utilizing the full meter scale. The frequency response is

within  $\pm 1$  Db from 50 to 15,000 cycles. The input impedance is 600 ohms.

Jacks are provided for both "Source" and "Receive" outputs. These are marked L1 and L2. A switch is located on the front panel for connecting the "Source" to L1 and the "Receive" to L2, or for rapidly reversing this and connecting the "Source" to L2 and the "Receive" to L1. This rapid transfer switch is provided for "Line Repeater" measurements.

The apparatus comprising this equipment is mounted on a standard 5 $\frac{1}{4}$ " x 19" rack type panel. All controls are available from the front of the panel. A metal dust cover removable from the rear, is provided.

### SPECIFICATIONS

#### *Transmission Section*

##### GENERATED FREQUENCIES:

500, 1000, 2500 cycles per second.

##### OUTPUT LEVEL:

-13, 0, +4 and +10 DBM. (1 MW in 600 ohms)

##### OUTPUT IMPEDANCE:

600 ohm  $\pm 5\%$  from 50 to 15,000 C.P.S.

##### WAVEFORM:

Total harmonic distortion is at least 28 Db below fundamental frequency.

##### POWER SUPPLY:

105-125 (or 210-250) volts 50-60 cycles AC.

#### *Receiving Section*

##### FREQUENCY RESPONSE:

Within 1 Db from 50 to 15,000 CPS.

##### AMPLIFICATION RANGE:

-10 to +30 Db in 2 Db Steps.

##### INPUT IMPEDANCE:

600 ohm  $\pm 5\%$  from 50 to 15,000 C.P.S.

##### VACUUM TUBE COMPLIMENT:

1 type 6x5  
1 type VR-150  
1 type 6SN7  
1 type 6AG7

##### DIMENSIONS:

Panel, 19" x 5 $\frac{1}{4}$ ", depth 6 $\frac{3}{8}$ ".

##### NET WEIGHT:

22 $\frac{1}{2}$  lbs.



# TRANSMISSION MEASURING SET

## TYPE 8-A

The type 8-A Transmission Measuring Set is a portable, dry battery operated instrument, designed to provide a rapid and convenient means of checking the transmission of communication systems. This equipment may be directly applied to measure gains or losses through amplifiers, repeaters, attenuating networks or communication lines and will give the overall transmission characteristics through a system embodying all of the above mentioned equipment.

The circuit consists of a transmission section and a receiving section. The transmission section provides an oscillator coupled to a metering circuit. The receiving section consists of a high gain amplifier, the output side of which is terminated by a metering circuit. A signal voltage at a frequency of 1000 cycles is generated in the transmission section and is applied at a selected output power level to the system under test. The output voltage of the system is then applied to the receiving section of the equipment where the power level of the system output may be accurately determined.

Two output power levels may be obtained from the transmission section. These are 0 and -20 DBM. Zero level is here defined as a power dissipation of 1 milliwatt in 600 ohms. Binding posts are available for connection to an external oscillator where measurements at frequencies of other than 1000 cycles are required.

The received level may be varied over the range -30 to +10 Db in 2 Db steps. For the measurement



of systems having a loss greater than 30 Db an additional range of 20 Db may be covered on the meter scale at a reduced accuracy.

Voice frequency power levels may be directly monitored by bridging the receiving amplifier across a line with the proper setting of the panel controls.

### SPECIFICATIONS

#### TRANSMISSION SECTION:

##### GENERATED FREQUENCY:

1000 cycles; adjustable internally from 930 to 1070 CPS.

##### OUTPUT LEVEL:

0 and -20 DBM (0 = 1 MW in 600  $\Omega$ )

##### OUTPUT IMPEDANCE:

600  $\Omega$   $\pm$ 5% at 1000 CPS

600  $\Omega$   $\pm$ 10% from 100 to 10,000 CPS

#### RECEIVING SECTION:

##### FREQUENCY RESPONSE:

$\pm$ 0.5 Db from 100 to 10,000 cycles

##### AMPLIFICATION RANGE:

-10 Db to +30 Db in 2 Db steps

##### INPUT IMPEDANCE:

600  $\Omega$   $\pm$ 5% at 1000 CPS

600  $\Omega$   $\pm$ 10% from 100 to 10,000 CPS

Input impedance is approximately 6300 ohms when used to bridge a line.

##### WAVEFORM:

The total harmonic distortion is at least 28 Db below the fundamental frequency.

##### VACUUM TUBE COMPLIMENT:

- |   |     |
|---|-----|
| 1 | 1U4 |
| 2 | 3Q4 |

##### BATTERY COMPLIMENT:

- |   |  |
|---|--|
| 1 | 67.5 V. B. battery<br>(Burgess type XX-45)<br>(Everready type 467) |
| 3 | 1.5 V. A. Cells<br>(Burgess type 2-R)<br>(Everready type 950)      |

Batteries  
Are Not  
Supplied

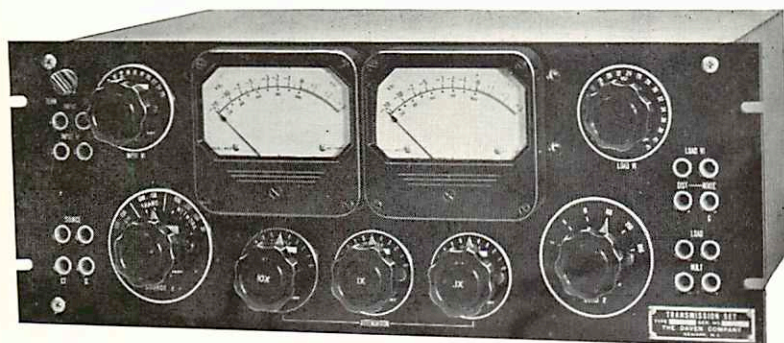
DIMENSIONS: 9 $\frac{3}{8}$ " high x 12 $\frac{7}{8}$ " wide x 6 $\frac{1}{2}$ " deep

NET WEIGHT: 14 lbs.



# TRANSMISSION MEASURING SET

## TYPE 10B



Suggested applications are:

1. Audio gain measurements.
2. Audio loss measurements.
3. Complex circuit measurements.
4. Measurements of matching and bridging devices.
5. Measuring mismatch loss.
6. Frequency response measurements.
7. Two separate Volume Level Indicators.
8. Provision for feeding Noise-Distortion meters over frequency range of 50 to 45,000 cycles, from "Load" to "Distortion-Noise" jacks.

The type 10B gain set has been designed for the accurate and rapid measurement of the transmission characteristics of audio systems and their components. It is a direct reading instrument eliminating laborious intricate calculations and complex "set-ups", thus materially reducing errors in measurements in addition to the time-saving factor.

The circuit consists of a combination of resistive loss and impedance matching networks and shielded isolation coils. In this set no electronic tubes are employed, and no external power source is required. Negligible distortion and noise is thus introduced by its use. A good external source of audio signal is required for the operation of this equipment.

Either grounded (unbalanced) or ungrounded (balanced) circuits may be measured without affecting the accuracy of measurements as the internal measuring circuits are isolated from the external oscillator and equipment to be measured by completely shielded isolation transformers.

The circuit is arranged so that the meters and their associated range controls can be independently used as VU meters in program monitoring or other applications.

Unit type assembly is employed with each section terminated in front panel jacks or internal terminal blocks for permanent external connection. The "Input" section comprises the Oscillator input jacks, the oscillation coil, VU Meter jacks, turn key for disconnecting internal signal for noise measurements, a Meter Range control and VU Meter. The "Attenuation" section contains the decade attenuator units of .01, 1.0 and 10 decibels per step or a total of 111 Db. The "Source" section includes the Source jacks, an isolation coil, terminating loads, and impedance matching networks, with other jacks for ground and center tap of the Source isolation coil.

A switch is provided for the selection of (a) 600 and 150 ohms internally terminated for measuring bridging devices; (b) 600 and 150 ohms unterminated or transformer out; (c) 600 $\Omega$ , 250 $\Omega$ , 150 $\Omega$  and 30 ohms network for use in measuring equipment which re-

quires excitation from a pure resistive generator. The network inserts a 20 Db loss which is automatically compensated for on the 10 Db per step dial by means of an interlock. This makes the instrument direct reading. A turn key is provided for cutting off the input signal and terminating the set for rapid noise measurements. The "Load" section comprises "Load" and "Load Multiple" jacks and Distortion-Noise Measuring jacks for connecting to an external Distortion-Noise Meter, Load Switch for selecting 4, 8, 16, 150, 250 and 600 ohm loads, Isolation coil, Meter Range control and VU Meter.

### SPECIFICATIONS

**ATTENUATION RANGE:** Transmission Section: -107 Db to +26 Db in steps of 0.1 Db for zero VU meter indication.

Load Section: +4 Db to +42 Db in steps of 2 Db for zero VU meter indication.

**REFERENCE LEVEL:** 1 mw into 600 ohms.

**FREQUENCY CHARACTERISTICS:**  $\pm 0.1$  DB from 50 to 15,000 CPS.

**INPUT IMPEDANCE:** 600 ohms.

Accuracy independent of level over the range +26 to -100 DBM.

Attenuation steps of 111 DB in steps of 0.1 DB.

**METER RANGE CONTROLS:**

INPUT V. I.: +4 Db to +26 DB in steps of 2 DB.

OUTPUT V. I.: +4 Db to +42 DB in steps of 2 DB.

**SOURCE IMPEDANCE:**

600-150 TERMINATED.

600-150 TRANSFORMER.  $\pm 2\%$  at 1000 cycles and within  $\pm 2\%$  of this value from 50 to 15,000 CPS.

600-250-150-30 NETWORK.  $\pm 1\%$  at 1000 cycles and within  $\pm 1\%$  of this value from 50 to 15,000 CPS.

**LOAD IMPEDANCE:** 600-250-150-16-8-4  $\pm 2\%$  at 1000 cycles and within  $\pm 2\%$  of this value from 50 to 15,000 CPS.

**FREQUENCY RESPONSE:**  $\pm 0.1$  DB 50 cycles to 15 KC.

**METERS:** Scale calibrated -20 VU to +3 VU and 0 to 100%.

**MOUNTING:** Standard rack type black alumilited panel 7" x 19" x 10 $\frac{5}{16}$ " deep.



# TRANSMISSION MEASURING SET

## TYPE 11A

The Daven Type 11A Transmission (gain) Measuring Set has been designed for those who desire a simplified, moderate priced instrument, having sufficient accuracy for measurements to meet FCC regulations.

The Type 11A, like the Type 10B, is a direct reading instrument containing no electronic tubes designed to eliminate lengthy calculations and intricate set-ups. A single VU meter is used in the 11A and is switched from the "Source Section" to the "Load Section" by means of a shielded lever key.

In addition to the single meter, the fundamental differences between this set and the Type 10-B are:

- (a) Elimination of the input isolation coil, thus one side of the external oscillator is grounded.
- (b) Elimination of the load coil, thus different load impedances require different power inputs.

One of the many distinctive features of this set is an interlock arrangement between the "Load Meter" multiplier dial and the "Load Impedance" control. This arrangement eliminates confusion caused by a changing minimum level for different impedances. Zero on the VU meter scale corresponds to the level indicated on the meter multiplier dial regardless of the impedance across which the meter is connected. This compensation is performed automatically.

## SPECIFICATIONS

**ATTENUATION RANGE:** Source section —121 Db. to +4 Db. in steps of 0.1 Db. for zero VU meter indication.

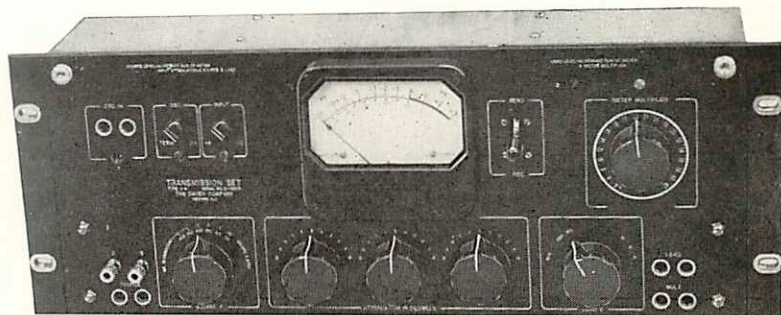
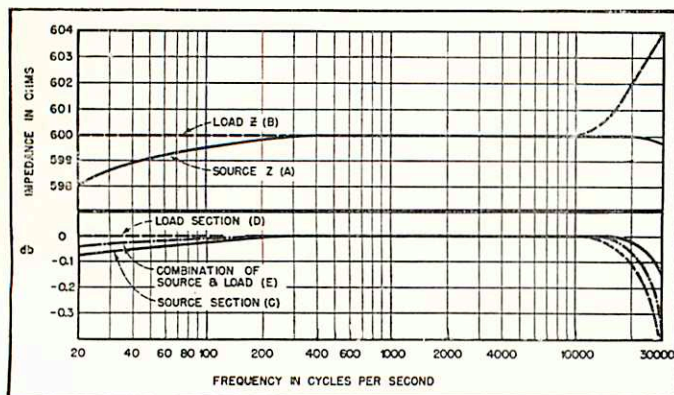
Load section: +4 Db. to +42 Db. in 2 Db. steps for zero VU meter indication.

**REFERENCE LEVEL:** 1 milliwatt into 600 ohms.

**INPUT IMPEDANCE:** 600 ohms.

**ACCURACY:**

- (a) Frequency Response—Within  $\pm 0.1$  Db. from 20 cycles to 20,000 cycles.



This unit is ideally suited for both general purpose and specialized measurements in broadcast and television stations, universities, colleges, sound recording studios and industrial laboratories. Its applications are widespread; several of these are audio gain and loss measurements, complex circuit measurements, telephone transmission work, checking matching and bridging devices, frequency mismatch loss, and frequency response measurements. The instrument also may be used as an independent volume level indicator. The 11A has proved almost indispensable in broadcast stations where an accurate, inexpensive piece of equipment is necessary to make FCC measurements.

The front panel hinges forward for easy access to all components.

- (b) Source impedance: Within  $\pm 2\%$  of dial indications over the entire range of 20-20,000 cycles.
- (c) Load impedance: Within  $\pm 2\%$  of dial indications over the entire range of 20-20,000 cycles.
- (d) Resistors of networks: All calibrated to within  $\pm 1.0\%$ .
- (e) Accuracy remains constant within  $\pm 0.1$  Db. over the entire frequency range with any change in level from +4 Db. to -110 Db.

**SOURCE IMPEDANCE:** 600 $\Omega$  and 150 ohms terminated.

600 $\Omega$  250 $\Omega$ , 150 $\Omega$ , and 30 ohms unterminated.

**LOAD IMPEDANCE:** 600 $\Omega$ , 250 $\Omega$ , 150 $\Omega$ , 16 $\Omega$ , 8 $\Omega$  and 4 ohms.

Resistive load, neither side grounded.

**LOAD METER RANGES:** +4 to +42 Db. in 2 Db. steps.

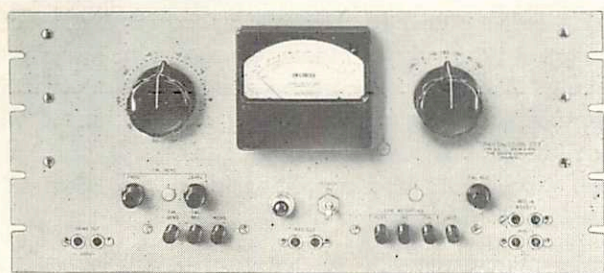
**MOUNTING:** Standard rack type panel 7" x 19" with dust cover. Assembly sections of set individually mounted on panel with own terminal blocks for ease of servicing. Hinged front panel may be tilted forward for easy access to all components.

**WEIGHT:** 25½ lbs. net.



# TRANSMISSION MEASURING SET

## TYPE 12A



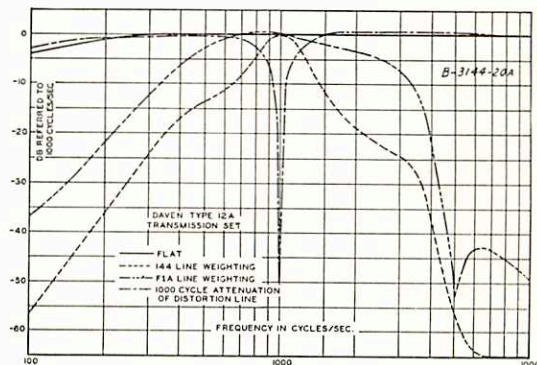
The Type 12A Transmission Measuring or Gain Set is an AC operated rack mounted instrument designed for the measurement of voice transmission systems. Source output and Receive input are 600 ohm balanced circuits provided with D.C. blocking capacitors so that the equipment will not interfere with the normal operation of modern dial systems.

The major components are:

- A. Calibrated 1000 cycle low distortion oscillator, frequency variable over the range 970 to 1030 cycles. Output level  $-35$  to  $+10$  DBM in calibrated steps of 1 Db.
- B. Calibrated high gain amplifier providing:
  - (1) Flat response
  - (2) 144 Line Weighting
  - (3) F1A Line Weighting
  - (4) 1000 cycle elimination
  - (5) Amplifier Level Range  $+20$  to  $-80$  DBM in calibrated steps of 10 Db.
- C. Knife Edge Type specially damped indicating Db meter.
- D. Limiting circuit to protect meter from line surges.
- E. Regulated Power Supply.
- F. Provision for rapidly checking and re-calibrating level of oscillator and amplifier.

The oscillator consists of a 1000 cycle low distortion feed back type R-C oscillator and buffer and associated power amplifier. The output impedance is 600 ohms resistive. The output level is  $+10$  to  $-35$  Db adjustable in 1 Db steps. The distortion and noise out is approximately 45 Db below signal level and is held at a constant ratio regardless of the output level. The output volume control is a 45 step 600 ohm "Balanced Ladder" type network inserted between the output transformer and the output jacks. A small knob is provided on the front panel for adjusting the 1000 cycle frequency  $\pm 30$  cycles. A small knob is also provided for adjusting the oscillator output to the red line of the meter. DC blocking capacitors are provided in the oscillator output leads.

The Receive Section consists of a high gain, wide range amplifier. Two balanced inputs are provided, 600 ohms terminating and 600 ohms bridging (6000 ohms). DC blocking capacitors are provided in the input circuit. The range of the amplifier is variable from  $+20$  to  $-60$  Db full scale meter reading, in steps of 10 Db. By utilizing the meter scale the range is from  $+20$  to  $-80$  Db. Four frequency response curves are available. (See curves below.) The filters which provide these curves are located at the "front end" of the amplifier so as to eliminate the possibility of errors due to internal distortion in the tube circuits.



## SPECIFICATIONS

**OSCILLATOR:** Type R-C, low distortion feed back, 1000 cycle with buffer and associated power supply. Output Impedance: 600 ohms resistive. Output Level:  $+10$  Db to  $-35$  Db in 1 Db steps. Distortion and Noise Output: Approximately 45 Db below signal level and is held at a constant ratio regardless of the output level. Adjustments: Knob provided for adjusting the 1000 cycle frequency over a range of  $\pm 30$  cycles, and another knob for adjusting the oscillator level output to the red line of the meter.

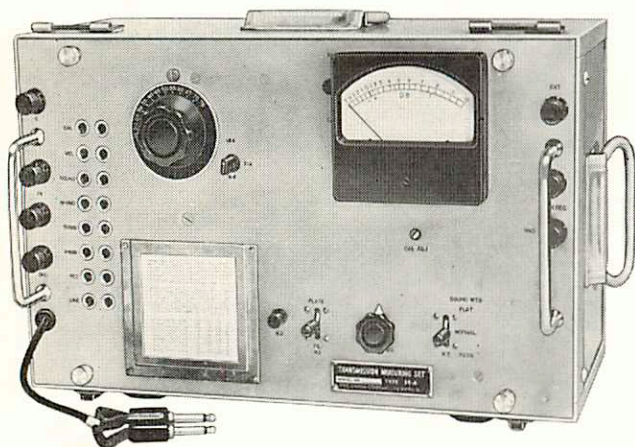
**RECEIVE SECTION:** Amplifier: High gain, wide range variable from  $+20$  to  $-60$  Db full scale reading in steps of 10 Db. By utilizing the meter scale the range is from  $+20$  to  $-80$

Db. Inputs: Two balanced inputs, 600 ohms terminating and 600 ohms bridging (6000 ohms). DC blocking capacitors are provided in the input circuit. Frequency response: Four curves are available (see curves above). Meter: Quick acting D.C. microammeter used in a full wave bridge rectifier circuit. The scale is calibrated zero (full scale) to  $-20$  Db. Circuit: A full wave biased clipper or limiter circuit is used to limit peak power to meter. Power Supply: Operates on 105-125 volts, 50 to 70 cycles. Electronic regulation is provided on the "B" supply voltage. Jacks: "Receive in" both terminating and bridging. "Receive out" for monitoring externally the received signal.



# NOISE MEASURING SET

## TYPE 34-B



### SPECIFICATIONS

**RANGE OF MEASUREMENTS:** Range varies with the Input Jacks, Circuit Connected, Weighting. See the following tabulation for sample values.

INPUT JACKS	INPUT	WEIGHTING	RANGE OF MEASUREMENT
Line	Balanced 600 $\Omega$	144 Line	10 to 85 dba
		F1A Line	17 to 92 dba
		Flat	6 to 69 dbRN
	Balanced 2000 $\Omega$	144 Receive	10 to 85 dba
		144 Receive	15 to 90 dba
		HAI Receive	17 to 92 dba
Program	Balanced 600 $\Omega$	Program	10 to 85 dbRN
Bridging	Balanced 6000 $\Omega$	144 Line	21 to 96 dba
		F1A	28 to 103 dba
		Program	21 to 96 dbRN
		Flat	5 to 80 dbRN
N-Ground	Un- balanced 100 K	144 Line	10 to 85 dba
		F1A Line	17 to 92 dba
		Program	10 to 85 dbRN
		Flat	-6 to 69 dbRN
Sound	Un- balanced 600 $\Omega$	40 db Sound	-7 to 68 dbRN
		70 db Sound	-7 to 68 dbRN
		Flat	-7 to 68 dbRN
Volume	500 K	Flat	-23 to 37 VU

**FREQUENCY RANGE:** Range varies with Weighting used. See table above for listing.

**POWER SUPPLY:** Internal batteries supplied. 1½ Volt A, 135 Volt B supply.

**METER SCALE:** Sound Level calibrated -7 db to +10 db. Provision for measuring "A" and "B" voltage.

**VACUUM TUBES:** Three 1U4.

**ACCESSORIES:** One Monitor Receiver.  
Four Dummy Plugs.

**DIMENSIONS:** 18" long, 10" high, 11½" deep overall.  
Hinged detachable cover.

The Daven Noise Measuring Set Type 34B is a portable, self contained battery operated instrument designed primarily to measure noise over telephone circuits. The 34B can also be used for the measurement of acoustic sound levels. In addition it will function as a Transmission Measuring Set, and as a high gain calibrated amplifier for audio frequency measurements.

Noise measurements of different frequencies are measured in terms of their interfering effects on speech as heard by the ear. The dynamic characteristics of the meter are such that its response approximates the speed of appreciation of sounds by the ear. Circuits (weighting) which simulate the action of the ear are also incorporated between the "Noise Input" and the indicating meter.

In measuring the effects of noise in telephone circuits, the characteristics of the different types of receivers or transmitters, as well as the non-linearity of the ear must be considered.

The 34B Noise Measuring Set is equipped with the different "weighting" characteristics to simulate these conditions.

Three "weighting" networks are available for measurement of acoustic sound levels. "Normal" for measurements of moderate sounds about 40 db above the threshold of hearing -70 Db for fairly loud acoustical sounds, and "flat" for flat audio response.

Electrical circuit noises are referred to a zero or reference power of one micro-microwatt (-90 Db with reference to 1 mw. into 600 ohms). The instrument is direct reading, the circuit noise being the sum of the attenuator and meter indication.

In addition to the normal functions of the set the 34B provides the following:

- (a) Internal oscillator and screwdriver operated amplifier gain control for calibrating the set.
- (b) Provision for measuring "B" voltage.
- (c) Provision for measuring, and rheostat for adjusting the "A" voltage.

The complete equipment, including batteries, is contained in a portable metal case. A removable cover is provided for protection of the front panel. In this cover are located dummy plugs and receiver for monitoring the signal out.



# DISTORTION & NOISE METER

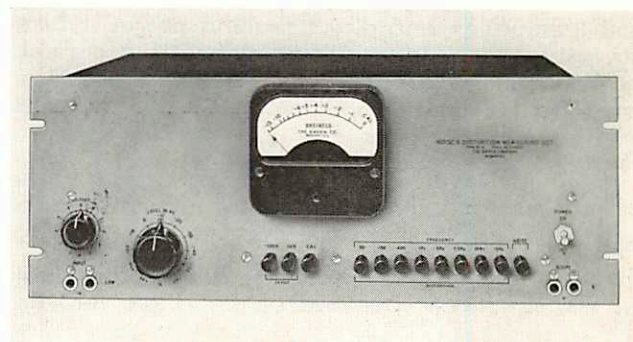
## TYPE 35-A

The Type 35-A Distortion and Noise Meter provides a rapid and accurate means of measuring distortion, noise and hum level in audio frequency equipment.

This type of Meter should not be confused with those employing null networks requiring careful frequency and phase adjustments at each reading. The fundamental circuit of the Type 35-A Distortion and Noise Meter comprises a series of eight fixed band rejection filters covering the range 50 cycles to 15 Kc., followed by a stable high quality wide range (50 cycles to 45 Kc.) high gain amplifier. There are no tube circuits or other sources of inherent distortion between the input of the 35-A and the filter network input, hence extremely low levels of distortion can be accurately measured over a wide level range. Each filter rejects uniformly a band  $\pm 3\%$  of the indicated frequency, and passes uniformly the harmonics of this frequency, hence accurate frequency and phase adjustments are not necessary.

Two amplifier gain controls are provided—one an accurate step type covering the range +40 Db to -60 Db in steps of 10 Db; the other a continuously variable control covering the range of  $\pm 10$  Db. A calibrating voltage is provided internally for accurately adjusting the meter to read Dbm.

The indicating meter covers the range from 0 to -15 Db. The range of the 35-A is +40 Db to -60 Db



full scale meter reading or +40 Db to -75 Db utilizing the meter scale. The range of the noise and distortion that can be measured depends upon the level of the source being investigated. At a level of -15 Dbm the limit is 60 Db below or 0.1% distortion.

The output of the amplifier is protected by an electronic limiter which limits the output to full scale meter deflection.

A pair of output jacks are provided for connecting an external scope in place of the output meter. A scope provides a simple means of determining the relative amplitudes of the harmonics or nature of the hum and noise indicated on the output meter.

### SPECIFICATIONS

**DISTORTION MEASUREMENTS**—Filters provided for 50, 100, 400, 1000, 5 Kc, 7.5 Kc, 10 Kc and 15 Kc with cut off of -70 Db. Distortion from 30% to 0.1% full scale with zero level input.

**NOISE MEASUREMENTS**—With zero Dbm input limit is -75 Dbm. At +40 input limit is -115 Db below input.

**AMPLIFIER FREQUENCY RANGE**—50 cycles to 45 Kc.

**LEVEL RANGE**—+40 to -75 Dbm. Instrument is a bridging type and levels are based on 1 mw into 600 ohms as zero Db. Max. input voltage is 77.5 volts RMS. Minimum input voltage can be as low as .00775 volts.

**ACCURACY**—Filters are down 70 Db at fundamental frequencies, and within 0.5 Db of flat at the second harmonic. Absolute accuracy of measurement can be depended upon to be within  $\pm 5\%$ .

**RESIDUAL DISTORTION**—No tube circuits or non-linear devices between input of set and filter input.

**RESIDUAL NOISE LEVEL**—Below -75Db at gain control full on. Multiple gain control employed so

that residual noise drops to -85 Db when gain control is set at -30 Db, -95 Db when gain control is set at -20 Db, etc.

**INPUT IMPEDANCE**—10,000 ohms balanced or unbalanced and 100,000 ohms unbalanced.

**METER**—Large meter with single Db scale, illuminated. Scale calibrated 0 (full scale) to -15 Db.

**TUBES SUPPLIED**—

- 3 — 12 AY7
- 1 — 6AL5
- 1 — 6C4
- 1 — 6X4
- 1 — 0A2

**POWER SUPPLY**—Input 105—125 volts 50-60 cycles. Input power 35 watts. Power supply and internal calibrating voltage is regulated.

**MOUNTING**—Standard 7" x 19" relay rack type panel.

**PANEL FINISH**—Standard is black alumilite. Other finishes available upon request.

**DIMENSIONS**—Panel 7" x 12", overall depth back of panel 10½".



# DAVEN OUTPUT POWER METERS

## ACCURATE, RELIABLE, POWER IMPEDANCE MEASUREMENTS

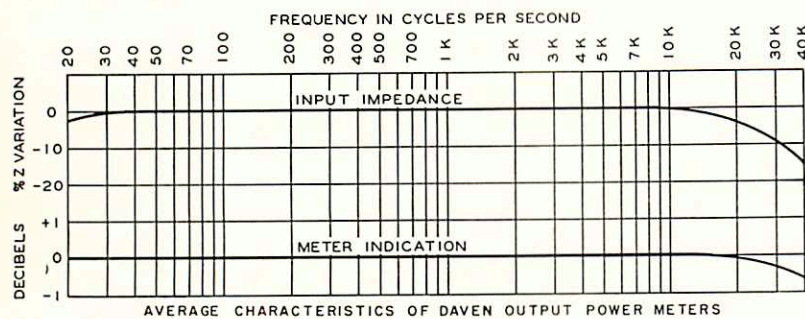
The Daven Output Power Meter is a combination load termination and direct reading power indicating instrument. The input impedance is accurately set by means of a single control. The power dissipated in this load is indicated, directly in watts, by the meter.

A patented Daven circuit is employed which provides a substantially flat input impedance over the range of 20 cycles to 40,000 cycles.

Although primarily designed for direct power output measurements, because of the single dial im-

pedance control, wide frequency range and direct reading meter, these instruments are admirably suited to other applications, namely:

1. Determination of Characteristic Impedance of an A.C. Source.
2. Effects of Load Variation on a Signal System.
3. Transmission Line Equalization Measurements.
4. Measurement of Insertion Loss in Multi-channel Mixer and other complex circuits.
5. Filter and Transformer Measurements.
6. Radio Receiver Measurements.



The Operation of the Output Power Meter is extremely simple. A single switch is used to vary the impedance over the full range and a second switch to change the range of the meter scale. In order to read power output of a system, connect the terminals of the meter to the output, set the impedance scale at the proper value and read the result in either decibels or milliwatts.

Several types of Output Power Meters are offered. Among them are: the OP-182 having a range up to 5 watts; the OP-961 with a range up to 50 watts; and the OP-962 with a range up to 100 watts.

## TYPE OP-182 POWER 5 WATTS

The DAVEN Type OP-182 Output Power Meter is admirably suited for measuring the power output of a signal system, determining the characteristic impedance or effect of load variation on an A.C. source, and many other applications where load and impedance are to be determined. It is useful for checking noise pick-up level in radio receivers and as an output meter in measurements of radio receiver fidelity, band-width, sensitivity and selectivity. It will measure power up to 5 watts. The impedance can be varied from 2.5 ohms to 20,000 ohms in 40 convenient steps.

The circuit is designed to maintain the impedance calibration constant over a frequency range of 20 to 40,000 cycles. This means that the instrument will read true power output of an audio system regardless of frequency within the specified limits. The indicating meter is a rectifier type A.C. meter with little frequency variation over the audio range.

## SPECIFICATIONS

**IMPEDANCE RANGE:** 40 selected impedances from 2.5 ohms to 20,000 ohms. Remains essentially resistive over frequency range of 20 to 40,000 cycles.

**POWER RANGE:** 0.1 mw. to 5 watts in steps of 0.1 mw.

**INDICATING METER:** Calibrated from 0 to 50 milliwatts and from 0 to 17 db. Zero level: 1 mw.

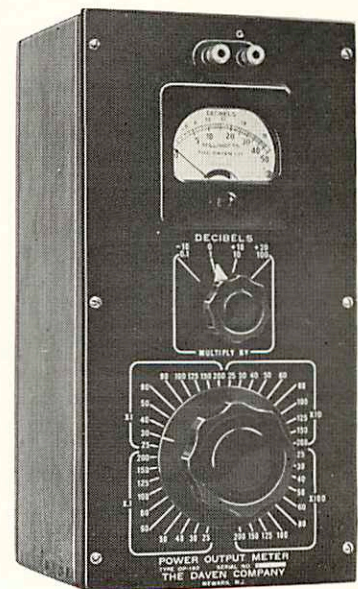
**ACCURACY:** At 1,000 cycles, all impedance steps are within  $\pm 5\%$  of the indicated value, and the power readings at full scale are accurate to within  $\pm 0.5$  Db. The power readings and the impedances are within  $\pm 5\%$  of the 1000 cycle

value from 20 to 15,000 cycles. Above 15 Kc, the power and impedance accuracy of the individual steps varies, however, the average accuracy remains within  $\pm 5\%$  of the 1000 cycle value up to 40 Kc.

**METER MULTIPLIER:** Will change reading of indicating meter by ratios of 0.1:1, 1:1, 10:1, 100:1, or decibel readings by  $-10, 0, +10, +20$ .

**MOUNTING:** Black aluminized panel mounted in a hand-rubbed walnut cabinet.

**SIZE:** 12" long, 6" wide, 6 $\frac{1}{4}$ " high.

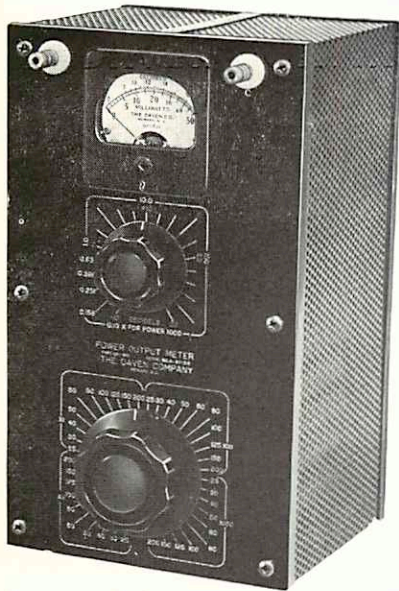




# OUTPUT POWER METER

## TYPE OP-961 POWER 50 WATTS

### FOR ACCURATE MEASUREMENT OF POWER AND IMPEDANCE



Patented

The DAVEN type OP-961 Output Power Meter can be used in audio signal systems with a maximum power output of 50 watts. It is capable of measuring that power accurately, determining the characteristic impedance or effect of load variation on the system, and many other applications involving the measurement of power and impedance.

With an input impedance adjustable over a range of 40 steps from 2.5 ohms to 20,000 ohms, the instrument will measure 50 watts in steps of 0.1 milliwatts. It is also calibrated to measure decibels, from -10 db. to plus 47 db.

Over a range of 20 to 15,000 cycles, the readings can be relied upon within 2%. This may be attributed to the characteristics of the impedance changing network, which remains essentially resistive at audio frequencies, and the meter multiplier network, which has a constant impedance at all frequencies. The indicating meter will therefore read power or impedance accurately at all impedances over the audio frequency range.

### SPECIFICATIONS

**IMPEDANCE RANGE:** 40 selected impedances 2.5 ohms to 20,000 ohms. Remains essentially resistive over frequency range of 20 to 40,000 cps.

**POWER RANGE:** 0.1 milliwatts to 50 watts in steps of 0.1 milliwatts.

**INDICATING METER:** Calibrated from 1 to 50 milliwatts and from 0 to 17 decibels. Zero level 1 mw.

**ACCURACY:** Both the impedance and power readings at mid-scale are within 2% at 1000 cycles. The power readings

at mid-scale and the impedances are within  $\pm 2\%$  of the 1000 cycle value from 20 to 15,000 cycles. Above 15 Kc, the power and impedance accuracy of the individual steps varies, however, the average accuracy remains within  $\pm 2\%$  of the 1000 cycle value up to 40 Kc.

**METER MULTIPLIER:** Extends the power reading of the indicating meter from 0.1x to 10,000x scale value, or the db, reading from -10 to +30 db. in steps of 2 db.

## OUTPUT POWER METER TYPE OP-962 POWER 100 WATTS

The Daven Type OP-962 Output Power Meter has been designed for measurements of audio signal systems with power outputs of up to 100 watts. The impedance can be varied over a range from 2.5 ohms to 20,000 ohms in 40 convenient steps. The instrument will measure power from 0.1 mw. to 100 watts in steps of 0.1 mw. By use of an external amplifier, the power range may be extended below 0.1 milliwatt. Provision is made for connecting this external amplifier.

The accuracy and flexibility of the Type OP-962 Power Output Meter make it suitable for many applications involving the measurement of power and impedance.

Special features in the design include a large meter with resultant ease and accuracy of reading, provision for the use of a calibrated external amplifier to extend the power range below 0.1 mw.; provision for connecting an oscilloscope in the circuit to observe the wave shape of the signal. A panel switch is provided for selection of the external amplifier or oscilloscope.

The extreme accuracy of this instrument is largely due to the Daven patented impedance changing network which remains predominantly resistive at audio frequencies, and the meter multiplier network which has a constant impedance at all frequencies.

### SPECIFICATIONS

**IMPEDANCE RANGE:** 40 selected impedances 2.5 ohms to 20,000 ohms. Remains essentially resistive over frequency range of 20 to 40,000 cps.

**POWER RANGE:** 0.1 mw. to 100 watts in 0.1 mw. steps. Range may be extended below 0.1 mw. by use of external amplifier for which provision is made.

**INDICATING METER:** Calibrated from .01 to 1 watt and from -10 to +10 decibels. Zero level 1 mw.

**Impedance Accuracy:** The impedances are within  $\pm 2\%$  of the indicated value from 20 to 15,000 cycles; within  $\pm 2.5\%$  to 20 Kc; within  $\pm 5\%$  to 30 Kc and within  $\pm 9\%$  to 40 Kc. The average im-

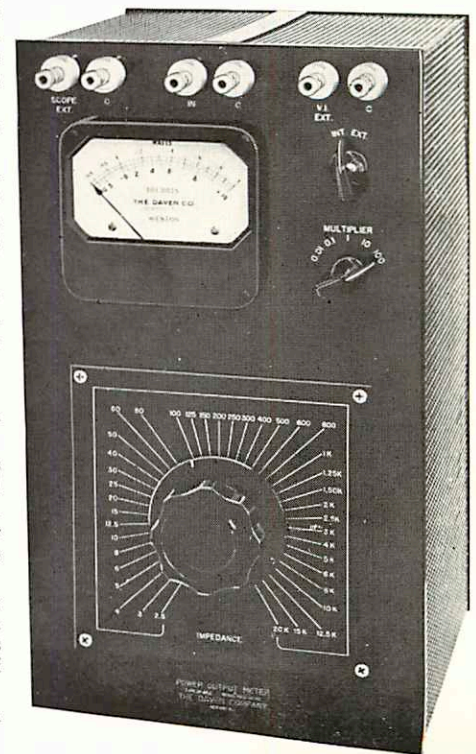
pedance accuracy is within  $\pm 5\%$  from 20 to 40 Kc.

**Power Accuracy:** The power readings are accurate within  $\pm 0.25$  Db at full scale from 20 to 10 Kc and within  $\pm 0.75$  Db to 15 Kc. The average power accuracy is within  $\pm 1$  Db from 20 to 30,000 cycles.

**METER MULTIPLIER:** Extends the power reading of the indicating meter from 0.01x to 100x scale value. It extends the Db range by 40 Db in steps of 10 Db.

**MOUNTING:** Black aluminized panel in ventilated metal box.

**SIZE:** 15 $\frac{1}{4}$ " long, 8 $\frac{3}{8}$ " wide, 7 $\frac{1}{4}$ " deep.  
**WEIGHT:** 20 lbs.





# ELECTRONIC VOLTMETER

## TYPE 170

### WIDE RANGE — HIGH IMPEDANCE

The Daven Type 170 Electronic Voltmeter is designed to accurately measure A.C. sinusoidal voltages over a frequency range from 10 to 250,000 cycles, and a voltage range from .001 to 100 volts. The low effective input capacitance and high input impedance make this instrument particularly useful when accurate voltage readings are required in circuits where a minimum of circuit loading is desired.

Provision is made to also use this unit as a wide-range, high-gain amplifier. The relatively small size, built-in A.C. power supply, and convenient carrying handle combine to make this instrument ideal for general laboratory and production use.

All controls and components are mounted on the panel. There is a fine adjustment control for the amplifier output and the amplifier output jack which, when in use, automatically disconnects the meter. The meter scale has both voltage and decibel ranges. The voltage range is logarithmic from 1 to 10 and the decibel scale linear from 0 to 20. The multiplier control varies the meter range in five decade steps to cover the complete range from .001 to 100 volts. The meter used in the instrument has an illuminated scale which also acts as the pilot light.

### SPECIFICATIONS

POWER SOURCE: 110-120 volt, 60 cycle A.C.

FREQUENCY RANGE: 10 to 250,000 cycles.

VOLTAGE RANGE: .001 to 100 volts in five ranges.

Meter multiplier control provides full-scale readings of .01, 0.1, 1.0, 10 and 100 volts.

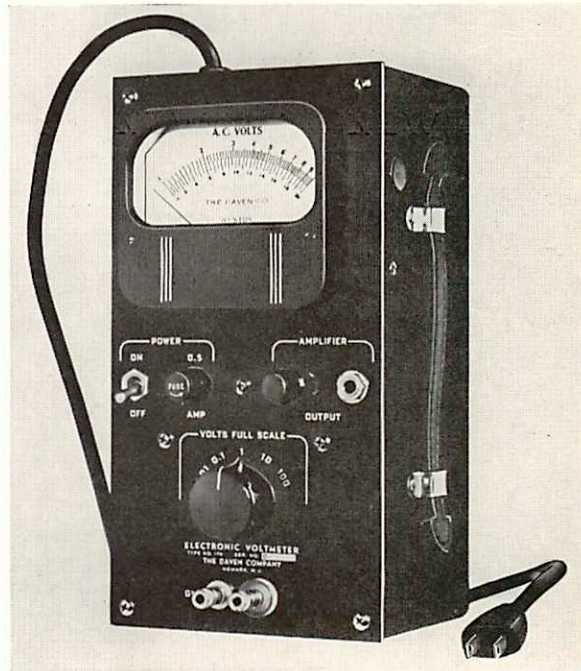
DECIBEL RANGE: Meter scale 0-20 Db. Multiplier control provides four additional ranges of 20 Db.

INPUT IMPEDANCE: 500,000 ohms shunted by 15 mmfd on .01 volt range and shunted by 6 mmfd on all other ranges.

AMPLIFIER OUTPUT IMPEDANCE: Variable with setting of A.C. output control. Maximum is approximately 20,000 ohms.

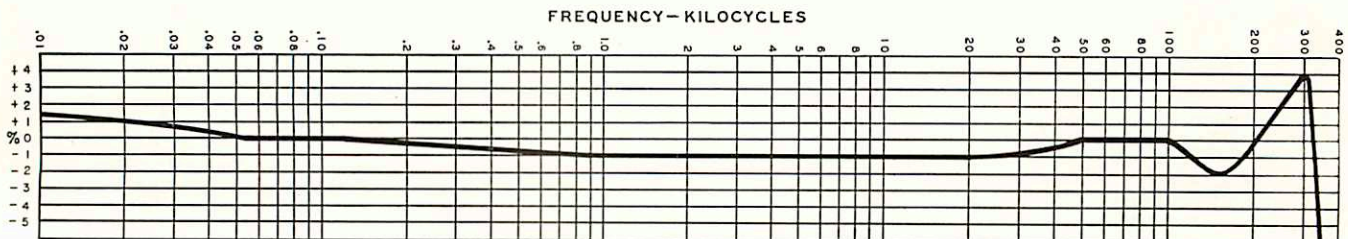
VACUUM TUBES: Four 6BH6 tubes; one 6AL5; one 6X4.

SIZE: 5-11/16" x 11-3/16" x 4-1/4" depth.



### FEATURES

- Wide voltage range—from .001 Volt to 100 Volts.
- Large, easy-to-read illuminated meter scale.
- All readings may be made on only one meter scale.
- Frequency range—10 cycles to 250 kc.
- High input impedance; cathode follower input provides effective input capacity as low as 6 mmfd.
- Accuracy  $\pm 2\%$  over entire frequency range.
- Output jack and separate volume control for using Voltmeter as wide-range, high-gain amplifier.
- High stability circuit with internal regulated power supply to make readings independent of normal power line variations.
- Speed and accuracy of measurement assures ease of operation.



Meter Accuracy (%) vs Frequency in KC



# DECADE AMPLIFIER

## TYPE 176

The Type 176 Decade Amplifier is a self contained a.c. operated, wide band amplifier, supplying accurately calibrated gains of 10 X and 100 X. This equipment was designed primarily to increase the sensitivity of the Daven Type 170 Electronic Voltmeter, however, it can be used in many applications where a stable, quiet, wide range amplifier is required. When used in conjunction with the Daven Type 170 Electronic Voltmeter, the sensitivity of the voltmeter is extended downward from .001 volt minimum to .00001 volt minimum.

A cathode coupler is employed in the input to provide a high impedance input to duplicate the loading of the Type 170 Voltmeter. Thus the amplifier can be substituted for the voltmeter without change of conditions. The input is 15 mmf shunted by a half megohm resistor.

This low level amplifier is entirely self contained, and operates on 110-120 volt, 60 cycles. No internal batteries are required for its operation. The internal power supply consists of a multi-shielded power transformer, regulated plate supply, filament rectifier and associated filters. Since the heaters of the amplifier tubes are supplied with d.c., no hum balancing resistors are required and no special adjustments necessary when changing tubes.

The amplifier tubes are "shock mounted" to reduce microphonics. The equipment can be readily serviced by releasing the panel mounting screws and sliding the complete assembly from the case.



TYPE 176

## SPECIFICATIONS

POWER SOURCE: 110-120 volt, 60 cycle, a.c.

FREQUENCY RANGE: 10 to 250,000 cycles.

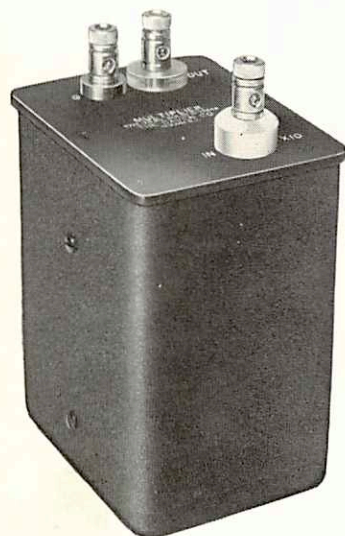
GAIN: 10 X and 100 X. Front panel switch provided for selecting the range.

VACUUM TUBES: 2—12AY7, 1—6X4, 1—OA2.

INPUT IMPEDANCE: 500,000 ohms shunted by 15 mmf.

OUTPUT IMPEDANCE: Cathode coupled output, internal impedance approximately 600 ohms. Output designed to operate into input of Daven Type 170 Electronic Voltmeter and will have correct gain when loaded with the voltmeter.

DIMENSIONS: 5 $\frac{1}{16}$ " x 11 $\frac{3}{16}$ " x 4 $\frac{3}{8}$ " deep (not including rubber feet and panel controls).



TYPE 170 MU

## METER MULTIPLIER

### TYPE 170 MU

The top range of the Daven Type 170 Electronic Voltmeter is 100 volts R.M.S. The Type 170 MU Meter Multiplier has been designed to extend this range by a ratio of 10 to provide a full scale reading of 1000 volts R.M.S.

The input impedance is four megohms, shunted by 8 mmf. Three binding posts are provided, one input, one output, and one "C." The input post is mounted on a ceramic stand-off insulator, the output and "C" are mounted "in line" to correspond to the spacing of the input posts of the Type 170 Electronic Voltmeter.

All internal resistors and capacitors are mounted on the top panel. The complete assembly may be readily removed from the shielded metal case for inspection and servicing. The top panel is black alumilite. The case is drawn aluminum 3 $\frac{5}{8}$ " x 2 $\frac{7}{8}$ " x 4 $\frac{7}{16}$ " high. The finish is black wrinkle. The net weight is one pound.

*Special ratios of Type 170 MU are available upon request.*



# AUDIO EFFECTS FILTER

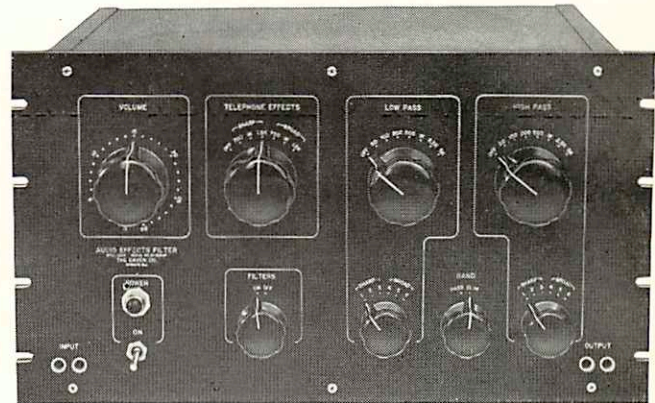
## TYPE 37-A

The Daven Audio Effects Filter is designed for use in broadcast, motion picture recording and sound studios. The purpose of this equipment is to alter the characteristics of a given audio signal or program to produce desired sound effects. The instruments consist essentially of a low pass filter, a high pass filter, a telephone effects equalizer and a high quality audio amplifier with a self contained power supply. All the necessary controls are located on the front panel, which is arranged for relay rack mounting.

The input and output impedance of the instrument is 600 ohms either balanced or unbalanced. The input and output impedance may be changed to 150 ohms by changing cross connections on input and output transformers. The amplifier gain is adjustable over a range of 30 Db in steps of 1 Db. The filter ON-OFF switch in the off position takes the filters and the telephone effects equalizer out of the circuit and provides straight through connections.

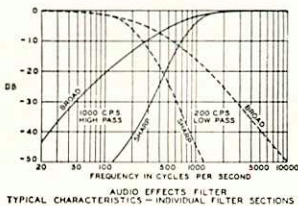
Both the high pass and low pass filters have cut-off frequencies of 50, 100, 200, 500, 1000, 2500 and 5000 cycles per second. (See curve "A" for typical filter). The maximum drop-off rate after cut-off is approximately 18 Db per octave. Switches are provided in both the low pass and high pass filter circuits for altering the drop-off rate. A switch is provided to connect the filters in series to obtain band pass or in parallel to obtain band elimination. (See Curve "B" and "C").

The telephone effects equalizer consists essentially of three sharply peaked band pass filters at 700,

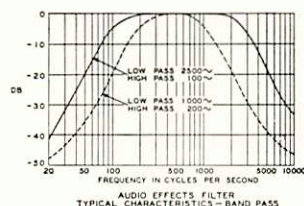


1000 and 1500 cycles. (See Curve "D"). The switch which selects the peak frequencies also has positions to broaden the characteristics of each to about double the band pass width. The switch which controls the telephone effects equalizer is arranged so that when the telephone effects equalizer is in use the filters are disconnected from the circuit.

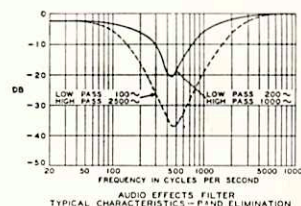
The instrument is designed to operate on input levels from minus 40 to zero VU. The insertion loss is dependent on the setting of the amplifier which allows adjustment from a slight insertion gain down to an insertion loss of approximately 30 Db. Input and output connections are made by means of double jacks on the front panel and terminals at the rear for rack wiring. The jacks are arranged so that when a plug is inserted, the terminals at the rear are disconnected.



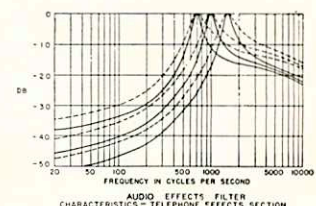
Curve "A"



Curve "B"



Curve "C"



Curve "D"

## SPECIFICATIONS

Power Supply: 115/230 volts, 50-60 cycles.

Mounting: Rack mounted; shielded construction; 10½" x 19".

Input Impedance: 150 or 600 ohms (balanced or unbalanced).

Output Impedance: 150 or 600 ohms (balanced or unbalanced).

Terminals: Input and output terminals are double jacks on front panel. Connections are also brought out to a rear terminal strip.

Input Level: -40 VU to zero VU.

Individual High Pass Filters: 50, 100, 200, 500, 1000, 2500 and 5000 cycles.

Individual Low Pass Filters: 50, 100, 200, 500, 1000, 2500 and 5000 cycles.

Filter Drop Off Rate After Cut Off: 18 Db maximum. Adjustable with six position front panel controls.

Filter Combinations Available:

1. Low Pass
2. High Pass
3. Band Pass (High Pass Filter and Low Pass Filter in series)
4. Band Elimination (High Pass Filter and Low Pass Filter in Parallel)

Telephone Effects Section: Three sharply peaked Band Pass Filters at 700, 1000

and 1500 cycles. Broad and sharp characteristics provided.

Insertion Loss: Zero Db.

Amplifier: Self contained audio amplifier with attenuator control of 30 Db total in 1 Db steps which permits setting zero level for any setting of filters.

By Pass Switch: Provided to permit use of preset characteristic by connecting output to input except in operating position.

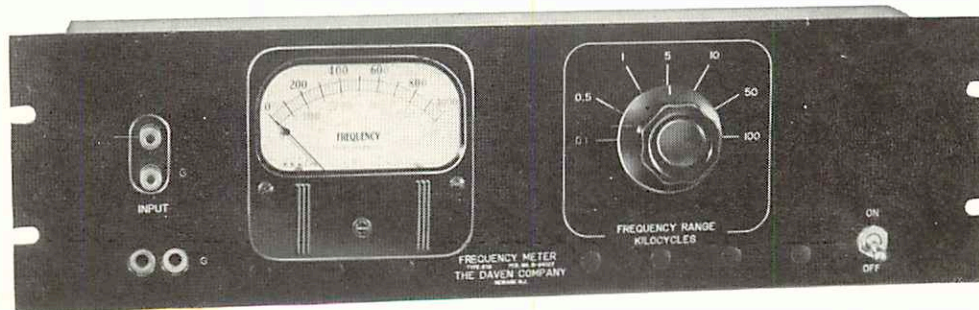
Controls: All controls and switches are high quality, low noise level Daven units requiring minimum of maintenance.

Size: 10½" x 9½" x 19".



# ELECTRONIC FREQUENCY METER

## TYPE 838-A



Type 838-A Electronic Frequency Meter is a direct reading frequency meter for use throughout the range from 20 to 100,000 cycles per second. The accuracy of the instrument is substantially independent of waveform, input voltage and power supply voltage changes. This makes it ideally suited in laboratory and industrial applications as a general purpose instrument for occasional or continuous frequency measurement or for determining the frequency of an unknown source. In addition to indicating frequency, there are numerous other measurements where the Type 838-A Electronic Frequency Meter may be used to advantage. It may be used in place of an interpolation oscillator in rapidly checking radio frequencies. In crystal grinding work, the crystal in process may be connected in an oscillator circuit and its frequency beat against that of a standard crystal and the resulting frequency deviation determined by use of the 838-A Frequency Meter. In conjunction with circuits which change the variation to be measured into a variation in the frequency of a signal, the meter may be used as a tachometer and in all kinds of telemetering work.

The circuit consists of a regulated power supply, an input amplifier, a cycle counting stage and an illuminated indicating meter with direct reading scales. A frequency range switch permits the selection of any one of seven ranges which are so arranged that all frequencies above 50 cycles per second may be read on the upper half of the meter scale where readings are most accurate. Individual scale calibration adjustments are provided for each range and are available at the front panel of the instrument. Two sets of input terminals, binding posts and jacks, are provided on the panel and a set of input terminals at the rear is available for more permanent connections. Plugging into the input jacks automatically disconnects the rear input terminals from the circuit. A jack is provided, at the rear of the instrument, for connecting to an external recording milliammeter in applications where a continuous graphic frequency record is required. The frequency meter is designed so that it will operate recording milliammeters having a full scale sensitivity of from 1 to 5 ma inclusive.

### SPECIFICATIONS

**RANGE:** 20 — 100,000 cycles per second in seven ranges. Full-scale values are 100, 500, 1000, 5000, 10,000 and 100,000 cycles.

**ACCURACY:**  $\pm 2\%$  of full scale for all ranges.

**INPUT VOLTAGES:** 0.5 — 150 volts R.M.S. on all but upper portion of 100,000 cycle range where the minimum is 1 volt.

**INPUT IMPEDANCE:** 500,000  $\Omega$ . (One side grounded.)

**INPUT WAVEFORM:** Indication substantially independent of waveform provided that the amplitude of the fundamental is at least equal to the total amplitude of the harmonics.

**POWER SUPPLY:** 105 — 125 (or 210 — 250) volts, 50-60 cycles.

**TUBES:** Supplied with instrument.

1 — 6SJ7

1 — 6V6

1 — 6SN7

1 — OD-3/VR-150

1 — 6X5

**MOUNTING:** Standard 19 inch relay rack panel; for conversion to bench use a walnut case is available at additional cost.

**PANEL FINISH:** Standard is black aluminite. Other finishes are available.

**DIMENSIONS:** Panel 19" x 5 1/4" x 7" in depth.

**NET WEIGHT:** 16 pounds.

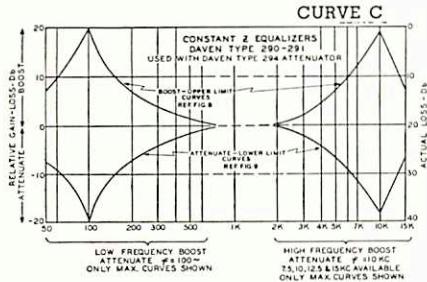






# CONSTANT IMPEDANCE EQUALIZERS (Contd.)

**Type 294**—T network, 20 steps of 2 DB. This network, in conjunction with the Resonant Circuit Assemblies and a turn key for the selection of either boost or attenuate provides a series of equalization curves as shown on curve "C". In this type of network two T circuits are utilized, one increases attenuation—both sides of center point—, the other



increases attenuation from extreme boost to center point (20 DB), then remains constant over the remainder of the range. Note that two equalizers are illustrated on curve "C"—Low Frequency and High Frequency. Only the curves for the extremes of equalization are shown—a series of curves are

available between the limits shown. To obtain the "Boost Curves" the schematic is as illustrated in Fig. 7.

Fig. 8 illustrates the circuit for the attenuation Curves. An external switch or turn key can be wired to change from the circuit shown in Fig. 7 to that shown in Fig. 8.

TYPE	DESCRIPTION
290 A	Low Frequency Resonant Circuit Assembly. Direct Panel Mount.
290 B	High Frequency Resonant Circuit Assembly. Direct Panel Mount.
291 A	Low Frequency Resonant Circuit Assembly. Attaches to rear of attenuator.
291 B	High Frequency Resonant Circuit Assembly. Attaches to rear of attenuator.
292	"T" Resistive Network for use with 290 A, 290 B, 291 A, 291 B and provide curves shown on Curve "A".
293	"T" Resistive Network for use with 290 A, 290 B, 291 A, 291 B and provide curves shown on Curve "B".
294	"T" Resistive Network for use with 290 A, 290 B, 291 A, 291 B and provide curves shown on Curve "C". Auxiliary switch must be used to switch from Boost to Attenuate Curves.

## PROGRAM LINE EQUALIZER, TYPE 286 Impedance 600 Ohms

This shunt type equalizer consists of a parallel network and calibrated step type series control, designed to improve the frequency response of communications circuits. The parallel network is accurately tuned to the frequency of equalization. The calibrated attenuator connected in series with this network controls the degree of equalization. Curve "D" illustrates the range and shape of the characteristics available.

FIG. 9

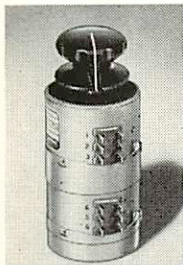
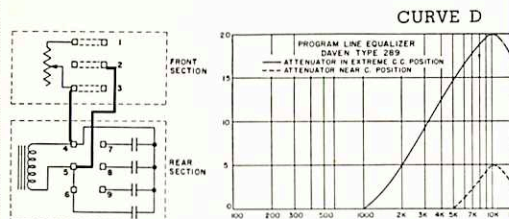


FIG. 10



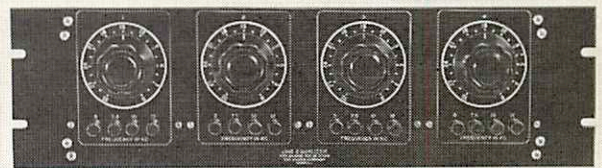
In use the Type 286 Equalizer is connected across the line, and the calibrated control set to the degree of equalization required.

Four points of equalization, 5, 7.5, 10 and 12.5 KC, are readily available by selecting the proper terminals. Fig. 9 illustrates the complete 286 Equalizer.

Fig. 10 shows the fundamental electrical circuit.

The Daven Type 286 Program Line Equalizer is available in compact multi-channel assemblies consisting of 1, 2, 3 or 4 equalizers and associated frequency selection switches mounted on a standard 5 1/4 x 19" relay rack type panel. These assemblies are equipped with dust cover, terminal blocks, and are completely wired ready for use.

Type	No. of Lines	Range
289 A	1	0-20 DB in steps of 1 DB
289 B	2	0-20 DB in steps of 1 DB
289 C	3	0-20 DB in steps of 1 DB
289 D	4	0-20 DB in steps of 1 DB



Type 289-D

## CONSTANT IMPEDANCE EQUALIZERS Impedance 600 Ohms

Constant Impedance Equalizers are also available in multi-channel assemblies consisting of 1, 2, 3 or 4 equalizers and associated selection switches mounted on a standard 5 1/4 x 19" relay rack type panel. These assemblies can be supplied on special order using Daven Type 291-A or 291-B assemblies mounted on Type 292, 293 or 294 Networks. Upon request, additional information will gladly be supplied on these special panels. Please specify combination required. See photo of panel.



# LOGARITHMIC RESISTOR

## TYPE LR-501

### CONVENIENT LOADING NETWORK

The type 501 Logarithmic Resistor is a convenient arrangement of elements, mounted on two standard DAVEN decade switches, offering a range of resistance values from 100 ohms to 100 megohms. This equipment is adaptable to a wide variety of uses as an approximate loading network or logarithmic voltage divider for quick laboratory "set ups." All terminals are available from the panel for convenient circuit arrangements.

### SPECIFICATIONS

**ACCURACY:** Between 100 ohms and 2000 ohms  $\pm 0.1\%$ ; between 5000 ohms and 1.0 megohms  $\pm 0.25\%$ ; 2 megohms to 20 megohms  $\pm 5\%$ ; 50 megohms and 100 megohms  $\pm 10\%$ .

**RANGE:** 0 to 100.1 megohms in logarithmic steps on each decade.

**FREQUENCY CHARACTERISTICS:** Up to 50 Kc there is no appreciable error on the low resistance steps. Above 20,000 ohms resistors are subject to a resistive and reactive correction at radio frequencies.

**MAXIMUM VOLTAGE:** 500 volts maximum at full resistance setting.

**POWER DISSIPATION:** 0.5 watt dissipation up to 500 ohms; 1 watt above 500 ohms.



**MOUNTING:** Decade units and terminals are mounted on a black alumilited panel with terminals electrically isolated from panel in a walnut cabinet.

**DIMENSIONS:** Length 7 $\frac{3}{4}$ " ; width 5" ; height 5" overall.

**NET WEIGHT:** 4 $\frac{1}{2}$  lbs.

# OUTPUT METER

## TYPE D-180

### HIGH IMPEDANCE VOLTMETER

The Type D-180 Output Meter is a combination of a high impedance voltmeter and a constant impedance output meter for measurement in the audio frequency range. The high impedance voltmeter range is particularly convenient in measuring transformer secondary voltages and as a bridging indicator where a high impedance is required. The constant impedance range is useful as a null detector and as a beat indicator in the comparison of two frequencies.

The indicating element is a copper oxide rectifier voltmeter calibrated to read directly in volts. The multiplier is a network providing a meter range of 1, 2, 5, 10, 20, 50 and 100 times meter scale reading. On the left of the vertical center line this multiplier changes the input impedance to keep resistance equal to 10,000 ohms per volt. On the right of the vertical center line the impedance remains constant at 20,000 ohms. The ability to increase the input impedance is particularly desirable when measuring between 50 and 200 volts.

### SPECIFICATIONS

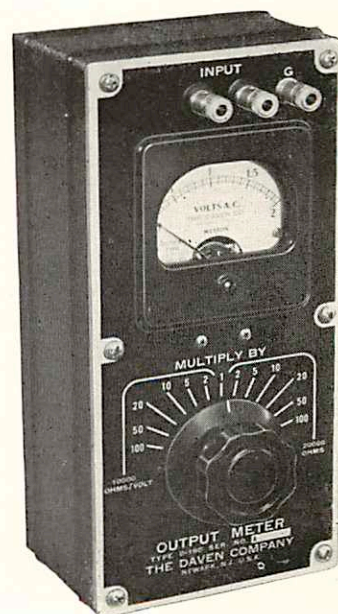
**Range:** Indicating meter calibrated at 2 volts full scale. Multiplier extends this range by 1, 2, 5, 10, 20, 50 and 100 times full scale.

**Input Impedance:** On constant impedance scale—20,000 ohms. On constant ohms per volt scale—20,000, 40,000, 100,000, 200,000, 400,000, 1 megohm and 2 megohm.

**Accuracy:**  $\pm 5\%$  of full scale over the range 30 to 5000 cycles. A correction of approximately 3% per kc is required above 5000 cycles.

**Mounting:** Indicating meter and multiplier mounted on a metal panel which is mounted upon a metal case.

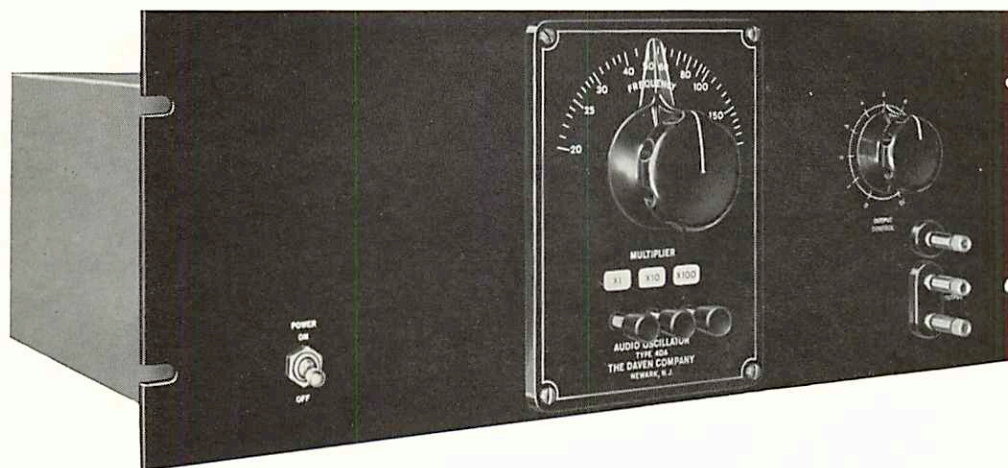
**Size:** 9" long, 4 $\frac{1}{2}$ " wide, 4" high.





# AUDIO OSCILLATOR

## TYPE 40A



The Type 40A Audio Oscillator is a source of low distortion, noise free audio for general laboratory and production testing. The frequency range is 20 to 20,000 cycles in three ranges; 20 to 200, 200 to 2,000 and 2,000 to 20,000 cycles. The same frequency scale is used for these ranges with convenient push buttons providing 1X, 10X and 100X scale reading. The frequency scale and range switches are white on black background plexiglas and are internally illuminated for ease of operation in both bright or dimly lit test locations.

Due to the special circuit employed, ranges can be changed without momentary overshoot. This is especially valuable in broadcast work or when utilizing sensitive meters when a quick momentary signal increase cannot be tolerated. When changing bands, the level momentarily falls, then rapidly returns to normal value. Over the range 20 to 20,000 cycles the output remains essentially constant. The output impedance is approximately 600 ohms. An output

transformer is employed. The oscillator will function equally well into either balanced or unbalanced loads.

Due to the inherent frequency stability, no zero adjustments are required. The combined Noise-Hum-Distortion components in the output are down approximately 55 Db from an output level of zero VU. The distortion at 125 MW is less than 0.2%, at 250 MW less than 0.25% and at 500 MW less than 0.5% over the complete frequency band from 20 to 20,000 cycles, when operated into 600 ohms.

This instrument is entirely self-contained and operates from 115 volt, 60 cycle source. All components are mounted on a steel chassis, secured to a black etched alumilite front panel. The Type 40A Audio Oscillator is normally supplied for Relay Rack type mounting. A cabinet is available for portable or bench operation and will be supplied upon request at a slight additional cost.

### SPECIFICATIONS

FREQUENCY RANGE: 20 to 20,000 cycles.

FREQUENCY STABILITY: With  $\pm 10\%$  line voltage variation, within  $\pm 0.2\%$  at 1,000 cycles.

OUTPUT IMPEDANCE: 600 ohms, balanced or unbalanced.

OUTPUT LEVEL: Up to 500 mw. into 600 ohm load.

OVERSHOOT WITH CHANGE OF RANGE: Zero.

OUTPUT STABILITY: With  $\pm 10\%$  line voltage variation zero.

INPUT POWER: 115 volts 60 cycles, approximately 65 watts.

HUM VOLTAGE: Less than 0.1% of output at zero VU out.

DISTORTION: At 125 mw less than 0.2%  
At 250 mw less than 0.25%  
At 500 mw less than 0.5%  
Over entire range 20 to 20,000 cycles.

FREQUENCY SCALE: Internal illumination white scale against black background. Scale clearly readable in dark room.

MOUNTING:  $5\frac{1}{4}$ " x 19" relay rack panel.  
Depth back of panel 10".

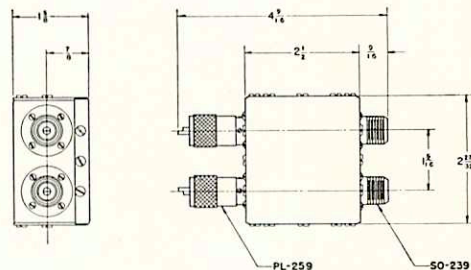
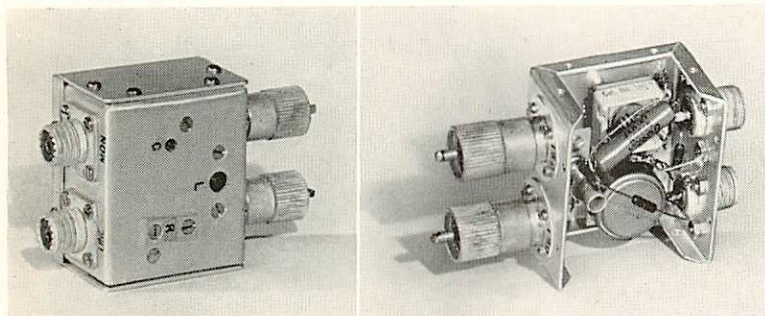
PANEL: Black alumilite finish.  
Table model available at slight increase in cost.

WEIGHT: 22 pounds.



# VIDEO COMPONENTS

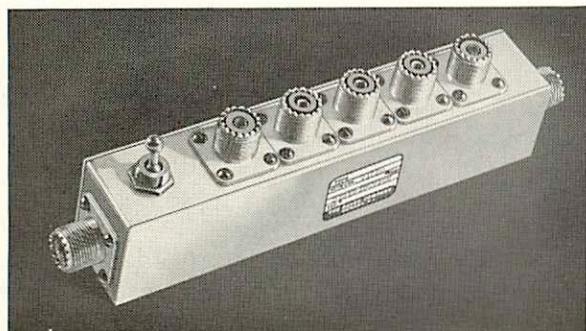
## VIDEO LINE PAD TYPE V-102



This network is designed to feed from a 73 ohm source to a 73 ohm line with zero loss, and at the same time provide a branch circuit containing 14 DB of isolation, for the connection of a high impedance monitor. It provides a simple method for the direct monitoring of the outgoing signal between the output of the line amplifier and the line without disturbing the transmission characteristics. At the same time this network provides sufficient isolation so

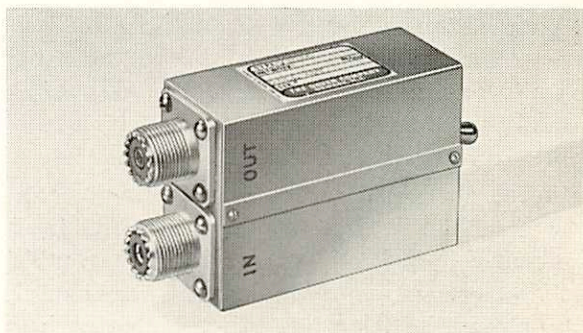
that the line characteristics do not influence the quality of the connected monitor. The Video Line Pad Type V-102 is provided with connectors for connecting one or two line amplifier outputs, line input, and monitor input. Screw driver type controls are provided for compensating for the shunt capacities encountered in the monitor input cables, for band width adjustment, and amplitude calibration.

## VIDEO DISTRIBUTION NETWORK TYPE V-101



This network provides a ready means of dividing the output of a single source into one to five bridging amplifiers for video program distribution. In operation the network is inserted in the line between the source and the load. Connectors are provided at each end for readily inserting the network into the program line. Connectors are also provided on the side of the network for the connection of from one to five video amplifiers for program distribution. An internal variable capacitor is provided on each output channel for the adjustment of any appreciable change of capacity introduced by the addition of channels. A switch is provided for terminating the source with an internal adjustable 73 ohm resistive load. This termination can be readily set for zero reflection by means of a screw driver adjustment. The impedance is 73 ohms. The unit is housed in a shielded case with holes for adjusting "R" and "C".

## VIDEO ROLL OFF NETWORK TYPE V-103



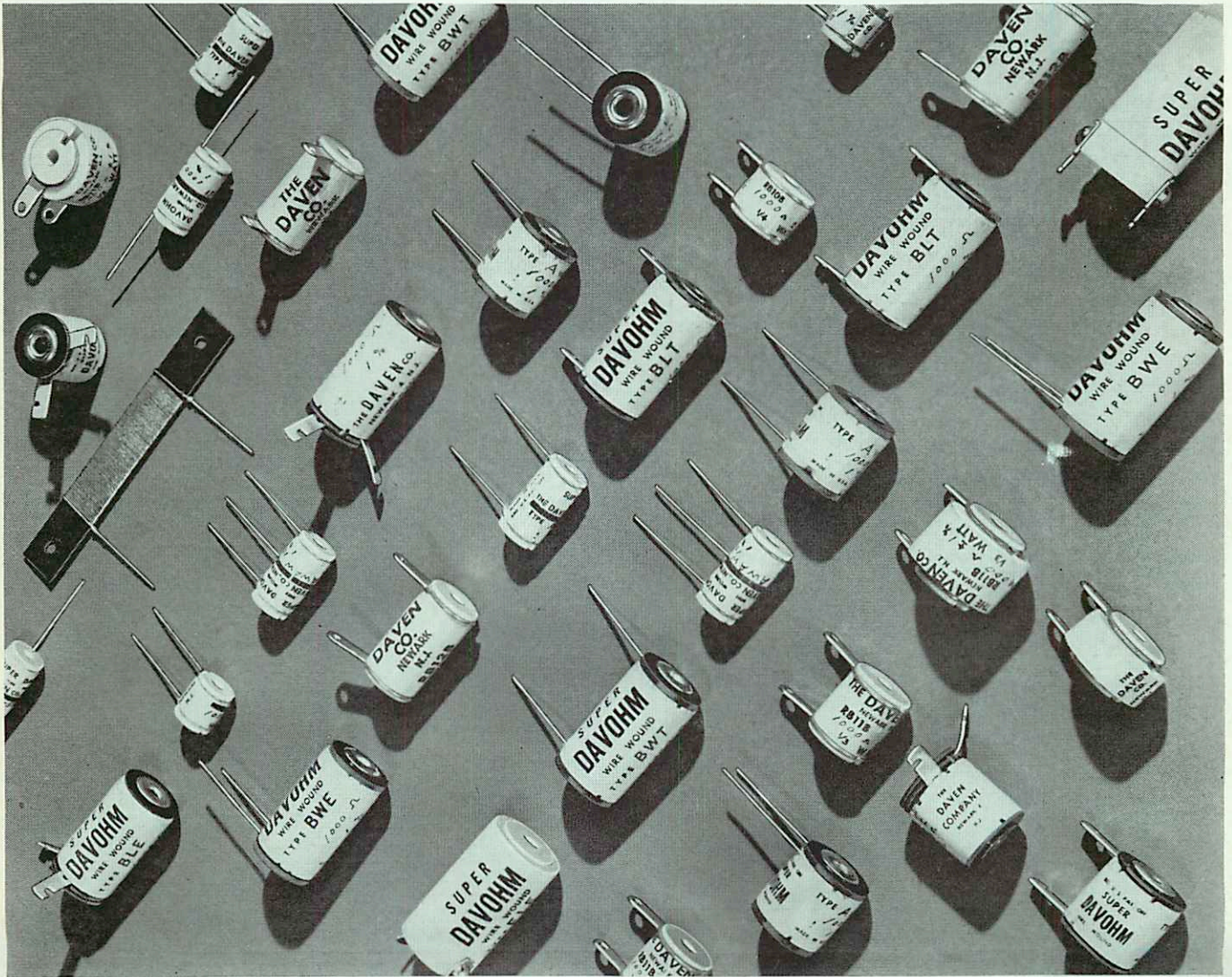
Wide band scopes used in television measurements usually provides greater band width than encountered in video systems. When utilizing the scope for operating comparison measurements it is necessary to alter its frequency characteristics to conform to the equipment which will later replace the scope. The Video Roll Off Network Type V-103 is designed to provide the standardized band width when performing operating measurements. This unit meets the standards on television methods of measurements. The frequency characteristic provides a 6 DB roll off at 3 megacycles with reference to the low frequencies. The circuit provides a rise time of approximately 0.175 micro-seconds without overshoot. The circuit is a three mesh, 73 ohm constant impedance network. A suitable switch is provided for "Straight Through" operation which removes the network and restores the original wide band characteristics of the scope.



# SUPER DAVOHM

*Precision Wire Wound*

# RESISTORS



THE DAVEN COMPANY • NEWARK • NEW JERSEY

Section R



# SUPER DAVOHM RESISTORS

## PRECISION WIRE WOUND

More than a generation ago, the Daven Company originated the first pie type wire wound resistor. Since that time, Daven has designed and manufactured precision wire wound resistors of all types to meet the increasing demands of the electronics industry. No other type of resistor possesses the inherent stability and accuracy of a good wire wound resistor. Today's applications require resistors to be accurate under severe conditions of temperature cycling, humidity exposure, shock and vibration. In addition, these applications often require closer tolerances of resistance value, better control of temperature coefficients, and more compact design than have previously been obtained in production quantities. Now, due to Daven's advanced engineering and manufacturing techniques, their resistors are in demand for both military and commercial applications.

### AVAILABLE TYPES

Listed here are the standard Super Davohm wire wound resistors. Miniature resistors are now available for use where previously, because of space limitations, only composition resistors could be mounted. Standard types have either wire leads or solder lugs. In addition, there is shown a line of Seald-Ohm hermetically sealed resistors, built to withstand salt water immersion, severe vibration and shock.

### TYPE CONSTRUCTION

#### a. Spool

All resistors are wound on ceramic spools of a superior grade of Steatite, with high mechanical strength and low electrical losses. The material is in accordance with current Armed Services specifications. Spools are silicone-treated to be moisture-proof. Water will not adhere to the spool surface.

#### b. Terminals

Wire leads are tinned copper wires. Lug type terminals are tinned. The special Daven lugs on the 1140 type resistors are rigidly attached to the spool and will withstand relatively rough usage.

TABLE I  
RESISTANCE WIRE CHARACTERISTICS

TYPE WIRE	I	II	III	IV	V	VI
Manufacturer's Trade Name	Nichrome V or Tophet A		Manganin	Advance or Constan-tan	Karma or Evan-ohm	Jelliff 1000
Alloy Composition	Ni60%-Cr16% Balance Fe	Ni80%-Cr20%	Mn13%-Balance Cu	Ni43%-Balance Cu	Ni73%-Cr20% + Al + Fe	Ni - Cr Special
Rated Temperature coefficient $\Omega/\Omega/^\circ\text{C} \times 10^{-4}$	+1.7	+1.3	$\pm 0.15$ (15° to 35° C)	$\pm 0.20$	$\pm 0.20$	$\pm 0.20$
Thermal EMF vs. copper Microvolts/ $^\circ\text{C}$	1.0	3.5	1.5	43.0	2.0	7.0
Specific Resistance at 20° C $\Omega/\text{cir. mil. ft.}$	675	650	290	294	800	1000

Note: Unless wire type is specified, resistors are normally wound with Type II wire for normal resistance values and with Type III or Type IV wire for low resistance values.

TABLE II  
TYPICAL RESISTANCE vs. TEMPERATURE CHARACTERISTICS

Temp. in degrees C	PERCENTAGE CHANGE OF RESISTANCE					
	Type I Wire	Type II Wire	Type III Wire	Type IV Wire	Type V Wire	Type VI Wire
70	.50	.37	-.24	-.02	.06	-.10
60	.40	.30	-.12	-.01	.04	-.07
50	.30	.22	-.04	-.01	.02	-.05
40	.20	.15	0	0	0	-.04
30	.10	.07	0	0	0	-.02
20	0	0	0	0	0	0
10	-.10	-.07	-.02	0	0	+.02
0	-.20	-.15	-.04	0	-.02	+.04
-10	-.30	-.22	-.09	-.01	-.04	+.05
-20	-.41	-.31	-.16	-.02	-.06	+.06
-30	-.51	-.40	-.23	-.03	-.08	+.06
-40	-.62	-.50	-.33	-.05	-.10	+.07
-50	-.73	-.60	-.48	-.06	-.12	+.09



# SUPER DAVOHM RESISTORS

## PRECISION WIRE WOUND

### c. Impregnation

Resistors are impregnated with several coats of an excellent varnish, which has a high electrical dielectric strength and is also very resistant to moisture.

### d. Labels

Labels are laminated of two thicknesses of acetate tape. The printed label information is protected between the layers. The tape used has high dielectric strength, good insulation resistance, and excellent moisture resistance.

### e. Resistance Wire

Daven has gained a reputation with the wire industry of being a pioneer in consistently raising the stringency of standards. Table I lists the characteristics of the most frequently used resistance wire alloys. Table II shows percentage resistance variation for typical Daven resistors. Resistors can be made with other alloys; or, specific temperature coefficients can be had by using combinations of two different alloys.

Daven resistor wire is usually furnished with a double Formvar enamel coating. Daven's standard Type II alloy wire is a selected grade of Nichrome V.

### FREQUENCY CHARACTERISTICS

All Daven Super Davohm resistors, except some miniature types (as indicated), are non-inductively wound by winding each adjacent pie section of the spool in opposite directions. This makes the resistors essentially non-inductive and keeps the distributed capacity of the winding to a minimum. Lower values of resistors are non-inductive up to about 20 KC. If inductance of the resistor is a critical factor, units can be designed and wound to meet specific requirements.

### STABILITY

To remove any internal stresses in the resistance wire and stabilize the resistor, all resistors are conditioned at a high temperature prior to final calibration. Resistance value changes, due to aging or temperature cycling, are negligible.

### TOLERANCES AVAILABLE

Normal resistance tolerance is  $\pm 1\%$ . However, tolerances of  $\pm 0.5\%$ ,  $0.25\%$ ,  $0.10\%$  and  $0.05\%$  can be furnished. Since the cost of a resistor is dependent on tolerance, it is not advisable to specify any closer tolerance than is required. Matched pairs can be furnished within  $\pm 0.02\%$  of each other.

### OHM STANDARD

All resistors will be furnished calibrated in the new standard Absolute Ohm system. The old standard was the International Ohm. The conversion factor is:

$$1.0 \text{ International Ohm} = 1.000495 \text{ Absolute Ohm}$$

### ORDERING INFORMATION

In ordering resistors, please specify:

1. Daven Type or style
2. Resistance value
3. Per cent allowable tolerance
4. Watts rating
5. Wire alloy type (if essential)
6. Current Armed Services specifications (if applicable)
7. Any other applicable data, such as special temperature coefficients or special testing requirements.



# SUPER DAVOHM RESISTORS

## PRECISION WIRE WOUND

### SUPER DAVOHM MINIATURE RESISTORS

Type	Watts	Dia.	Length	Center hole screw clearance	Max. Volts	
1100	0.10	1/4	1/4	#0	80	INDUCTIVE
1101	0.15	1/4	13/32	#0	100	
1102	0.15*	1/4	23/32	#0	100*	
1110	0.15	3/8	1/4	#4	150	
1111	0.25	3/8	7/16	#4	250	NON-INDUCTIVE
1112	0.5	3/8	3/4	#4	400	
1113	0.5	3/8	1	#4	550	
1114	1.0	3/8	13/16	#4	600	INDUCTIVE
1115	1.0	3/8	13/8	#2	600	
1116	0.25*	3/8	3/4	#4	200*	
1117	0.25*	3/8	15/32	#4	200*	

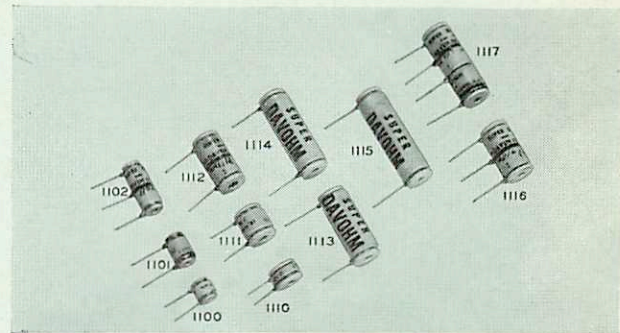
\*per section—Types 1102 and 1116 are tapped to have 2 resistor sections, and Type 1117 is tapped to have 3 resistor sections.

1. All leads are tinned copper wire 2" long. Normally, leads are brought out radially as shown; but leads on all single section resistors can be axial if required.
2. Resistors can be mounted by screw through center hole or by leads.

### SUPER DAVOHM STANDARD COMMERCIAL TYPES

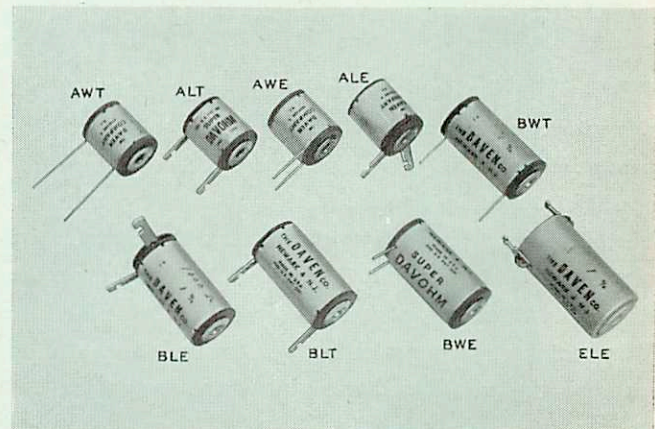
Type	Watts	Bobbin Diam.	Bobbin Lgth.	Max. Volts	Type of Terminal
ALE	1	5/8	3/4	400	Lugs (same end)
AWE	1	5/8	23/32	400	#20 AWG wire (same end)
AWT	1	5/8	23/32	500	#20 AWG wire (at each end)
ALT	1	5/8	3/4	500	Lugs (at each end)
BLE	2	5/8	13/16	400	Lugs (same end)
BWE	2	5/8	13/16	400	#20 AWG wire (at same end)
BLT	2	5/8	13/16	600	Lugs (at each end)
BWT	2	5/8	13/16	600	#20 AWG wire (at each end)
ELE	2	3/4	15/16	400	Lugs (same end, axial)

All of these types have a center mounting hole with clearance for a #6 screw.



Type	MAXIMUM RESISTANCE (Megohms)				
	0.001" dia. wire			0.0009" dia. wire	
	Type III	Type II	Type V or Type VI	Type II	Type V or Type VI
1100	0.02	0.05	0.07	0.06	0.09
1101	0.04	0.1	0.14	0.12	0.18
1102	0.04*	0.1*	0.14*	0.12*	0.18*
1110	0.05	0.12	0.18	0.15	0.23
1111	0.1	0.24	0.36	0.30	0.45
1112	0.25	0.65	0.96	0.80	1.2
1113	0.4	0.9	1.4	1.2	1.8
1114	0.5	1.3	1.9	1.6	2.4
1115	0.5	1.5	2.1	1.8	2.6
1116	0.1*	0.24*	0.36*	0.3*	0.45*
1117	0.1*	0.32*	0.5*	0.4*	0.6*

\*Megohms per section.





# SUPER DAVOHM RESISTORS

## PRECISION WIRE WOUND

Type		Watts	Dia.	Length	Max. Volts
with wire leads	with solder lugs				
1120	1140	0.33	1/2	7/16	300
1121	1141	0.50	1/2	9/16	300
1122	1142	0.50	1/2	5/8	400
1123	1143	1.0	1/2	1	800
1124	1144	0.33	1 1/16	7/16	300
1125	1145	0.5	3/4	1 1/16	300
1126	1146	1.0	25/32	7/8	600
1127	1147	1.5	3/4	1 1/4	1000
1128	1156	2.0	3/4	2 1/8	2000

Type		Maximum Resistance (Megohms)				
with wire leads	with solder lugs	.001" dia. wire			.0009" dia. wire	
		Type III	Type II	Type V or Type VI	Type II	Type V or Type VI
1120	1140	0.2	0.4	0.6	0.5	0.8
1121	1141	0.3	0.6	1.0	0.8	1.2
1122	1142	0.4	1.0	1.4	1.2	1.8
1123	1143	0.6	1.6	2.4	2.0	3.0
1124	1144	0.4	0.8	1.2	1.0	1.6
1125	1145	0.8	2.0	2.8	2.5	3.6
1126	1146	1.0	2.8	4.0	3.5	5.0
1127	1147	1.5	4.0	6.5	5.0	8.0
1128	1156	3.0	8.0	12.0	10.0	15.0

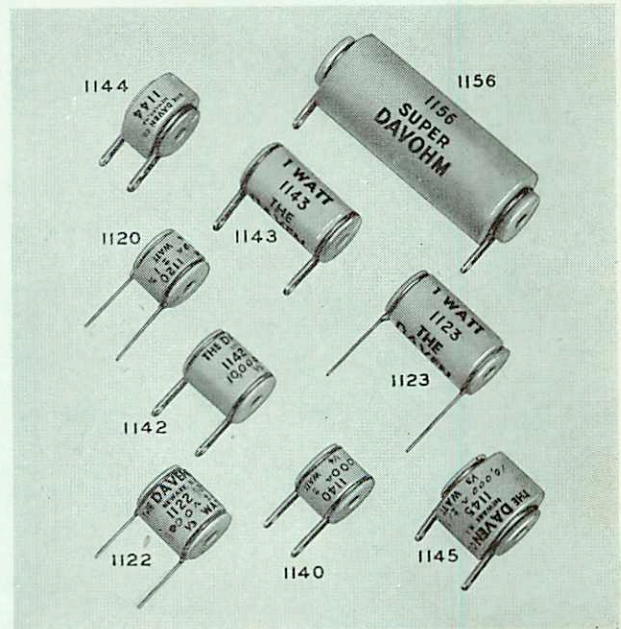
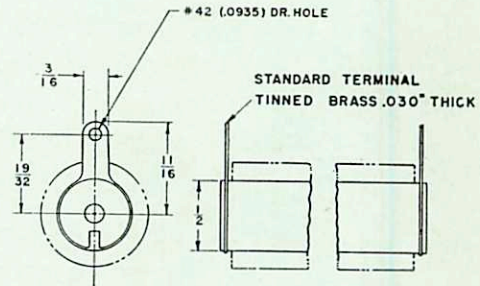
1. All wire leads — #20 AWG tinned copper wires 2 1/2" long. Leads brought out radially, but can be axial if specified.
2. All these resistors have center mounting hole with clearance for #6 screw.
3. Resistors should be mounted between insulating washers.
4. All resistors non-inductive.

### SUPER DAVOHM JAN-R-93 Types JAN-R-93 Ratings\*

Type	JAN-R-93 Type	Minimum Resistance (Ohms)	Maximum Resistance 0.0015" dia. wire (Megohms)	Maximum JAN Volts for tolerance			JAN Watts
				C (± 0.25%)	D (± 0.5%)	F (± 1%)	
1140A	RB10B	0.1	0.185	152	186	215	0.25
1141A	RB11B	0.1	0.30	224	274	316	0.33
1142A	RB11B	0.1	0.30	224	274	316	0.33
1143A	RB12B	0.1	0.30	274	335	387	0.5
1144A	RB10B	0.1	0.185	152	186	215	0.25
1145A	RB11B	0.1	0.30	224	274	316	0.33
1146A	RB12B	0.1	0.30	274	335	387	0.5
1147A	RB13B	0.1	0.75	433	530	612	0.5
1156A	RB14B	0.1	4.0	1414	1732	2000	1.0

These resistors have same physical dimensions as standard types listed without "A" added to type number. Daven ratings of wattage and maximum resistance are same as for standard types.

\* JAN-R-93 may be superseded by MIL-R-93 which may allow use of .001" dia. wire and higher resistance values. Also, in some military procurements where minimum size and weight are essential, use of .0009" dia. wire has been approved. Tolerances of ±0.1% and ±0.05% can be obtained.





# SEALD-OHM RESISTORS

## HERMETICALLY SEALED TYPES

These resistors are completely hermetically sealed to withstand the severest conditions of humidity, fungus, salt water immersion, and high altitude. Their strong metallic structure, with the resistors rigidly supported, will withstand the vibration and shock testing encountered in military applications.

Several resistor elements can be enclosed in one Seald-Ohm. Besides resulting in greater compactness and economy, this has the additional advantage of matched circuits of greater relative accuracy than can be obtained by substituting individual elements in the field.

The same type resistors as listed previously are mounted inside the Seald-Ohms. For ratings, refer to the referenced equivalent individual spools. Normally, the units are furnished with dry air inside. Wax filled units will increase the wattage ratings to 166% of normal and oil filled to 250% of normal.

Breakdown test voltage to ground is 1500 volts

for types 1160, 1161 and 1162, and 1000 volts for types 1163, 1164 and 1165.

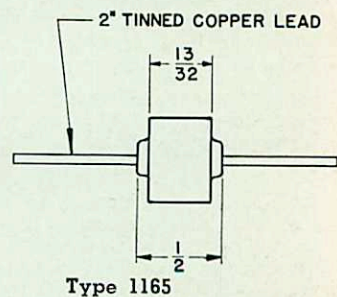
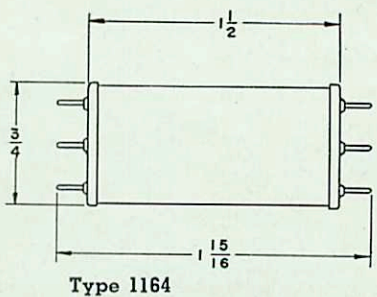
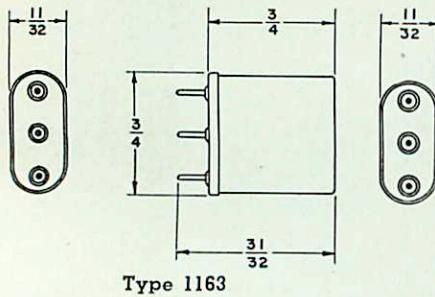
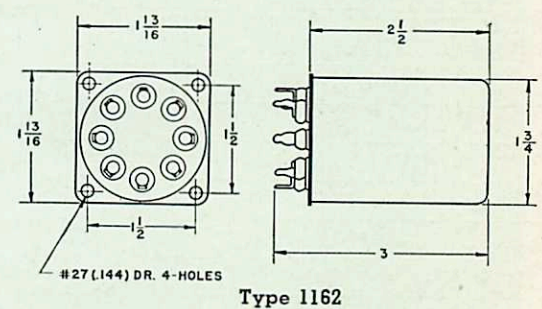
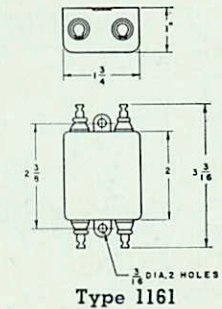
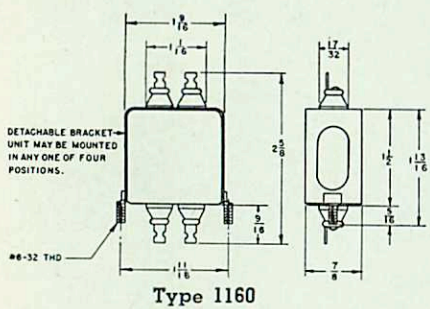
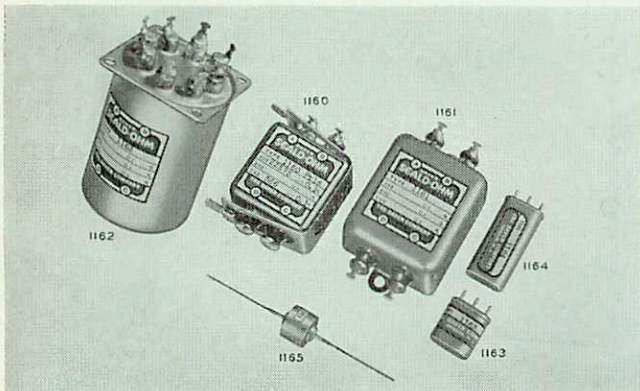
In ordering Seald-Ohms, specify type, number of terminals, internal circuit and ohmic value, tolerance, wattage, and wire type of each resistor element.

The type 1160 can be mounted in any of four positions by means of its detachable bracket. Types 1161 and 1162 can be mounted against a chassis by screws inserted through the clearance holes. Types 1163 and 1164 can be mounted by clamping to a chassis or by using a 3-prong crystal locktkt socket. Type 1165 can be mounted by its leads (similar to a composition resistor) or by using a fuse clip type of mounting.

Other size enclosures can be provided. Units can be furnished with capacitors and inductors for special circuit applications such as in "Bridge Tee" or phase shift networks.

### HERMETICALLY SEALED RESISTORS

Type	Fig.	Max. No. of terminals	Max. No. of resistors	Equivalent type of internal resistors (for electrical ratings)
1160	1	4	2	1122
			4	1120
1161	2	6	5	1122
			10	1120
1162	3	8	7	1122
			14	1120
1163	4	3	1	1101
			2	1100
1164	5	6	4	1102
			8	1100
1165	6	2	1	1101





# Precision SWITCHES

Daven Switches are high quality, smooth operating, precision rotary step type. Although these switches were originally designed for use in precision laboratory equipment, due to their reliability under extreme service conditions, they have found increasing uses in many other fields. The following is a partial listing of the general types of apparatus in which Daven Switches are now employed.

ATTENUATORS	IMPEDANCE MATCHING	SINE, COSINE, RESISTORS
AUDIOMETERS	NETWORKS	STRAIN GAUGES
BRIDGES	METER SWITCHING	TELEMETERING
DECADES	MONITORING	TEST EQUIPMENT
ELECTRICAL COMPUTERS	PROGRAM SELECTORS	THERMOCOUPLE SELECTORS
EQUALIZERS	PULSE GENERATORS	TIMERS
FILTER NETWORKS	RANGE COMPUTERS	TRANSMISSION
IGNITION ANALYZERS		MEASURING SETS

The outstanding features of Daven Rotary Switches are: Sturdy, dependable construction; large silver alloy contacts and slip rings; enclosed (knee action) silver alloy multi-leaf rotor blades; high grade, accurately machined dielectric; accurate contact position indexing (detents) and switch stops independent of rotors.

## STURDY, DEPENDABLE CONSTRUCTION

In addition to large contact surfaces, Daven Switches are constructed to withstand continuous use over long periods of time under extreme climatic conditions. Typical switches have been used many millions of times without appreciable rotor and contact wear.

## LARGE SILVER ALLOY CONTACTS AND SLIP RINGS

Continuous current capacity (not break or make) is 10 amperes. Switches are smooth operating selector rotary type, not snap action, and are not recommended for breaking or making heavy currents and inductive loads. Switch contact resistance remains extremely uniform and is in the order of .002 ohms (total) for the heavier switches. The smaller types have contact resistance of .004 ohms (total). The capacitance between switch contacts, and between switch contacts and return slip rings, varies from 0.4 mmf to 2.5 mmf depending on the switch configuration.

## ENCLOSED, KNEE ACTION, MULTI-LEAF BLADES

Each leaf of the enclosed switch arms employ separate pressure springs to provide self alignment, "KNEE-ACTION" and equalized pressure, to insure low and uniform contact resistance. The "KNEE-ACTION" rotor is of tamperproof construction.

With the exception of the 1 $\frac{3}{8}$ " diameter switch all Daven Standard Switches listed in the following section employ enclosed "KNEE-ACTION" blades.

## HIGH GRADE ACCURATELY MACHINED DIELECTRIC

Switch contacts, slip rings and rotary blades are securely mounted in high grade, low moisture absorption type dielectric. Under normal service conditions, the leakage between contacts remains in the thousands of megohms.

## ACCURATE CONTACT POSITIONING (DETENTS)

Positioning, if required, is obtained by spring loaded free turning roller and large accurately fabricated stainless steel cam or gear, permanently swaged to the stainless steel shaft.



## SWITCH STOPS INDEPENDENT OF SWITCH BLADES

Stops, if required, are heavy duty, accurately placed positive stops mounted directly to the switch shafts to prevent possible damage. Switch hubs and blades are not used for switch stops.

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

**BEARINGS:** Shaft bearings are of the type which require no attention. Ball bearings are also available.

**SWITCH NOISE LEVEL:** No indication above associated circuit and tube noises when switch is operated at extremely low levels (-130 DB or less).

### COMBINATIONS AVAILABLE

Due to the design of the switch panels and rotary members, a large selection of positions and poles are available. In some instances, especially in cases of close contact spacing and great number of steps, the size or bulk of the cable leading from the switch is the limiting factor and should be considered by the design engineer. The size of conductors may also be a limiting factor. In many cases, certain contacts may be strapped together to materially reduce the size of cable leading from the switch. Another limiting factor is the turning torque required as the number of poles and diameter of the switch is increased.

### SPECIAL SWITCHES

The following section lists standard switches utilizing standard contact arrangements, standard dimensions for spacing between decks, mounting method, and shaft diameter and length. If any variations of these arrangements or dimensions are required we shall be glad to supply price and delivery information. Standard depths, or space between decks, are listed. Non-standard spacing is available. Normally, single deck switches are provided on round panels with contact faces at the rear of the switch. Single deck units can be provided on square or rectangular panels with solder lug terminals at the rear of the switch. Switches equipped with pre-wired terminal boards are also available. May we suggest that listed switches be ordered wherever possible. Normally, delivery will be better on standard items.

### MOTOR DRIVEN ROTARY SWITCHES

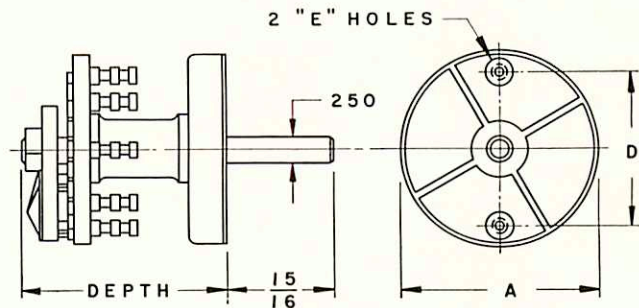
Daven can provide many types of rotary switches suitable for motor driven applications. The number of steps and combinations are too varied to list. For example, various ratios of on-off time, angular spacing of live contacts, speed of operation, and other special requirements can be supplied. Recommendations and quotations will be submitted upon request. The torque required to rotate the shaft depends upon the switch rotor blade pressure, radius of rotary arm and number of poles.

## PRINTED SWITCHES AND ASSOCIATED CIRCUITS

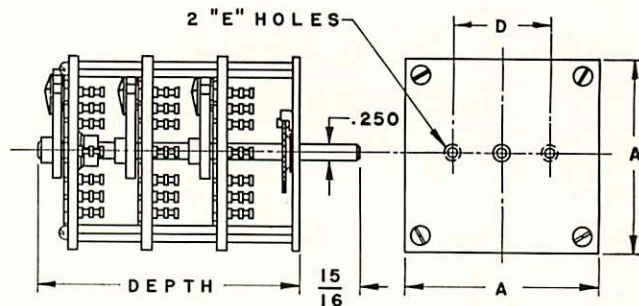
In addition to Daven Standard, and special versions of these standard switches, heavy duty printed switches and associated printed wiring are also available. Methods have been developed enabling us to supply complex contact sizes and shapes, return slip rings, and complex printed wiring to these switch conductors. Dependable operation, low contact resistance, self cleaning action and long life can be obtained with these printed switches.

**GOVERNMENT SPECIFICATIONS:** Standard or special switches may be secured upon request to conform with Government Requirements.

**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.



OUTLINE OF SINGLE DECK SWITCHES



OUTLINE OF MULTIPLE DECK SWITCHES

MOUNTING DIMENSIONS FOR ALL TYPES OF SWITCHES

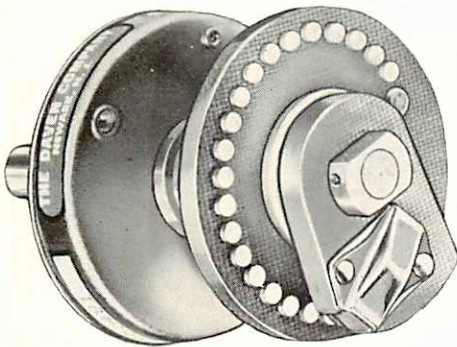
Size	E	D	Size	E	D
1 3/8"	6-32	1"	2 1/4"	8-32	1 1/2"
1 3/4"	6-32	1 1/8"	2 3/4"	8-32	1 1/2"



## AVERAGE BREAK DOWN VOLTAGES OF DAVEN SWITCHES

The following tabulation are results obtained on the various types or Series of Daven single deck shorting (make-before-break) type switches. Tests were made on new switches at 72° F., 50% relative humidity, atmospheric pressure 14.7 lbs. per square inch. These results should be de-rated in accordance with actual operating conditions. For example, if the de-rating method is taken as double voltage plus 1000, and it is intended to use a Daven Series 12-EM switch, it could be used at 500 volts between adjacent contacts. All of the voltage readings shown are "peak volts".

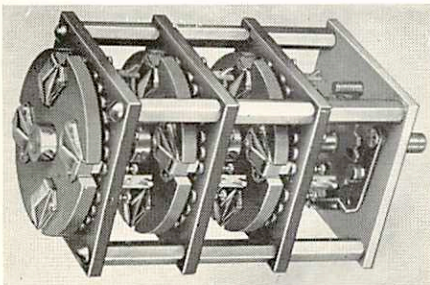
These results are also typical of multiple deck shorting (make-before-break) type switches. Non-shorting (break-before-make) switches will stand considerable higher voltage between live contacts, however, the breakdown voltage is reduced to the values of the corresponding shorting type during the interval of switching. This momentary reduction in insulation between adjacent contacts can be materially increased by substituting an insulated button (contact) for the unused metallic contact.



TYPICAL SINGLE POLE SWITCH WITH ONE ROW OF CONTACTS.



TYPICAL FOUR POLE SWITCH WITH TWO ROWS OF CONTACTS



TYPICAL MULTIPLE DECK SWITCH WITH "KNEE ACTION" SWITCH ROTORS.

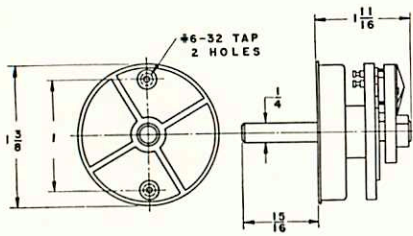
DAVEN SERIES NUMBER	BREAKDOWN VOLTS BETWEEN SWITCH CONDUCTORS					
	Outer Row Contacts	Inner Row Contacts	Outer and Inner Row of Contacts	Contacts and Nearest Slip Ring	Between Slip Rings	Nearest Slip Ring and Shaft
11-BM { 21-BM {	3000			3000		4000
11-CM { 21-CM {	3500			3000		5000
12-CM { 22-CM {	3000			3000		5000
11-DM { 21-DM {	3200			3000		5000
31-DM { 41-DM {	3000			7500		5000
27-DM { 37-DM { 47-DM {	3000	2500	3500	2000	2500	1500
12-DM { 22-DM { 32-DM { 42-DM {	3000			3000		7500
26-DM { 36-DM { 46-DM {	3000	2500	3500	3000	2500	1500
13-DM { 23-DM {	2000			7500		5000
33-DM { 43-DM {	2000			7500		5000
45-DM	2000	1500	3500	3000	2500	1500
11-EM { 21-EM { 31-EM { 41-EM {	4000			7500		7500
27-EM { 37-EM { 47-EM {	4000	3000	3000	3000	2500	5000
12-EM { 22-EM { 32-EM { 42-EM {	2000			7500		7500
26-EM { 36-EM { 46-EM {	2000	1500	3000	3000	2500	5000
13-EM { 23-EM { 33-EM { 43-EM {	2000			7500		7500
25-EM { 35-EM { 45-EM {	2000	1500	2500	3000	2500	5000



# SWITCHES

## SINGLE POLE • SINGLE DECK • SHORTING

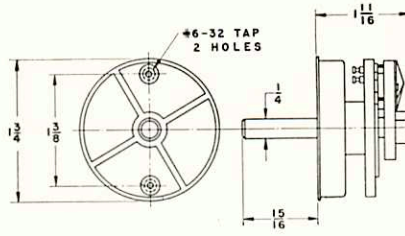
SERIES: 11-BM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 1 3/8" Dia. x 1 11/16" Depth  
 SPACING: 15° Between Positions



POSITIONS	TYPE
3	11-BM-3
4	11-BM-4
5	11-BM-5
6	11-BM-6
7	11-BM-7
8	11-BM-8
9	11-BM-9
10	11-BM-10
11	11-BM-11
12	11-BM-12
13	11-BM-13
14	11-BM-14
15	11-BM-15
16	11-BM-16
17	11-BM-17
18	11-BM-18
19	11-BM-19
20	11-BM-20
21	11-BM-21
22	11-BM-22
23	11-BM-23
*24	11-BM-24

\* CONTINUOUS ROTATION

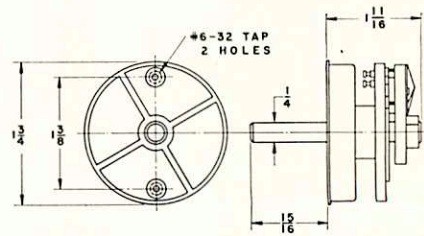
SERIES: 11-CM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 1 3/4" Dia. x 1 11/16" Depth  
 SPACING: 15° Between Positions



POSITIONS	TYPE
3	11-CM-3
4	11-CM-4
5	11-CM-5
6	11-CM-6
7	11-CM-7
8	11-CM-8
9	11-CM-9
10	11-CM-10
11	11-CM-11
12	11-CM-12
13	11-CM-13
14	11-CM-14
15	11-CM-15
16	11-CM-16
17	11-CM-17
18	11-CM-18
19	11-CM-19
20	11-CM-20
21	11-CM-21
22	11-CM-22
23	11-CM-23
*24	11-CM-24

\* CONTINUOUS ROTATION

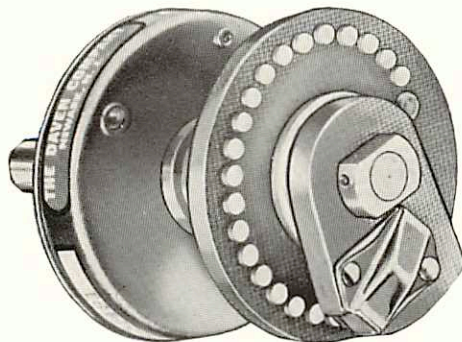
SERIES: 12-CM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 32  
 DIMENSION: 1 3/4" Dia. x 1 11/16" Depth  
 SPACING: 11 1/4° Between Positions



POSITIONS	TYPE
3	12-CM-3
4	12-CM-4
5	12-CM-5
6	12-CM-6
7	12-CM-7
8	12-CM-8
9	12-CM-9
10	12-CM-10
11	12-CM-11
12	12-CM-12
13	12-CM-13
14	12-CM-14
15	12-CM-15
16	12-CM-16
17	12-CM-17
18	12-CM-18
19	12-CM-19
20	12-CM-20
21	12-CM-21
22	12-CM-22
23	12-CM-23
24	12-CM-24
25	12-CM-25
26	12-CM-26
27	12-CM-27
28	12-CM-28
29	12-CM-29
30	12-CM-30
31	12-CM-31
*32	12-CM-32

\* CONTINUOUS ROTATION

TYPICAL SINGLE POLE,  
 SINGLE DECK SWITCH  
 WITH "KNEE ACTION"  
 SWITCH ROTOR.



SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## SINGLE POLE • SINGLE DECK • SHORTING

SERIES: 11-DM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 2 1/4" Dia. x 1 15/16" Depth  
 SPACING: 15° Between Positions

POSITIONS	TYPE
2 to 4 Positions Are Available	
5	11-DM-5
6	11-DM-6
7	11-DM-7
8	11-DM-8
9	11-DM-9
10	11-DM-10
11	11-DM-11
12	11-DM-12
13	11-DM-13
14	11-DM-14
15	11-DM-15
16	11-DM-16
17	11-DM-17
18	11-DM-18
19	11-DM-19
20	11-DM-20
21	11-DM-21
22	11-DM-22
23	11-DM-23
*24	11-DM-24

\* Continuous Rotation

SERIES: 12-DM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 32  
 DIMENSION: 2 1/4" Dia. x 1 15/16" Depth  
 SPACING: 11 1/4° Between Positions

POSITIONS	TYPE
2 to 12 Positions Are Available	
13	12-DM-13
14	12-DM-14
15	12-DM-15
16	12-DM-16
17	12-DM-17
18	12-DM-18
19	12-DM-19
20	12-DM-20
21	12-DM-21
22	12-DM-22
23	12-DM-23
24	12-DM-24
25	12-DM-25
26	12-DM-26
27	12-DM-27
28	12-DM-28
29	12-DM-29
30	12-DM-30
31	12-DM-31
*32	12-DM-32

\* Continuous Rotation

SERIES: 13-DM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 48  
 DIMENSION: 2 1/4" Dia. x 1 15/16" Depth  
 SPACING: 7 1/2° Between Positions

POSITIONS	TYPE
2 to 28 Positions Are Available	
29	13-DM-29
30	13-DM-30
31	13-DM-31
32	13-DM-32
33	13-DM-33
34	13-DM-34
35	13-DM-35
36	13-DM-36
37	13-DM-37
38	13-DM-38
39	13-DM-39
40	13-DM-40
41	13-DM-41
42	13-DM-42
43	13-DM-43
44	13-DM-44
45	13-DM-45
46	13-DM-46
*47	13-DM-47
*48	13-DM-48

\* Continuous Rotation

SERIES: 11-EM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 2 3/4" Dia. x 1 15/16" Depth  
 SPACING: 15° Between Positions

POSITIONS	TYPE
2 to 4 Positions Are Available	
5	11-EM-5
6	11-EM-6
7	11-EM-7
8	11-EM-8
9	11-EM-9
10	11-EM-10
11	11-EM-11
12	11-EM-12
13	11-EM-13
14	11-EM-14
15	11-EM-15
16	11-EM-16
17	11-EM-17
18	11-EM-18
19	11-EM-19
20	11-EM-20
21	11-EM-21
22	11-EM-22
23	11-EM-23
*24	11-EM-24

\* Continuous Rotation

SERIES: 12-EM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 32  
 DIMENSION: 2 3/4" Dia. x 1 15/16" Depth  
 SPACING: 11 1/4° Between Positions

POSITIONS	TYPE
2 to 12 Positions Are Available	
13	12-EM-13
14	12-EM-14
15	12-EM-15
16	12-EM-16
17	12-EM-17
18	12-EM-18
19	12-EM-19
20	12-EM-20
21	12-EM-21
22	12-EM-22
23	12-EM-23
24	12-EM-24
25	12-EM-25
26	12-EM-26
27	12-EM-27
28	12-EM-28
29	12-EM-29
30	12-EM-30
31	12-EM-31
*32	12-EM-32

\* Continuous Rotation

SERIES: 13-EM  
 POLES: Single (1)  
 OPERATION: Shorting  
 POSITIONS: 2 to 48  
 DIMENSION: 2 3/4" Dia. x 1 15/16" Depth  
 SPACING: 7 1/2° Between Positions

POSITIONS	TYPE
2 to 28 Positions Are Available	
29	13-EM-29
30	13-EM-30
31	13-EM-31
32	13-EM-32
33	13-EM-33
34	13-EM-34
35	13-EM-35
36	13-EM-36
37	13-EM-37
38	13-EM-38
39	13-EM-39
40	13-EM-40
41	13-EM-41
42	13-EM-42
43	13-EM-43
44	13-EM-44
45	13-EM-45
46	13-EM-46
*47	13-EM-47
*48	13-EM-48

\* Continuous Rotation

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## TWO POLE • SINGLE DECK • SHORTING

SERIES: 21-BM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 11  
 DIMENSION: 1 $\frac{3}{8}$ " dia. x 1 $\frac{11}{16}$ " depth  
 SPACING: 15° Between Positions

Series 21-BM has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	21-BM-2
3	21-BM-3
4	21-BM-4
5	21-BM-5
6	21-BM-6
7	21-BM-7
8	21-BM-8
9	21-BM-9
10	21-BM-10
11	21-BM-11

SERIES: 21-CM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 11  
 DIMENSION: 1 $\frac{3}{4}$ " dia. x 1 $\frac{11}{16}$ " depth  
 SPACING: 15° Between Positions

Series 21-CM has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	21-CM-2
3	21-CM-3
4	21-CM-4
5	21-CM-5
6	21-CM-6
7	21-CM-7
8	21-CM-8
9	21-CM-9
10	21-CM-10
11	21-CM-11

SERIES: 22-CM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 15  
 DIMENSION: 1 $\frac{3}{4}$ " dia. x 1 $\frac{11}{16}$ " depth  
 SPACING: 11 $\frac{1}{4}$ ° Between Positions

Series 22-CM has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	22-CM-2
3	22-CM-3
4	22-CM-4
5	22-CM-5
6	22-CM-6
7	22-CM-7
8	22-CM-8
9	22-CM-9
10	22-CM-10
11	22-CM-11
12	22-CM-12
13	22-CM-13
14	22-CM-14
15	22-CM-15

SERIES: 21-DM and 27-DM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 2 $\frac{1}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 15° Between Positions

Series 21-DM has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	21-DM-2
3	21-DM-3
4	21-DM-4
5	21-DM-5
6	21-DM-6
7	21-DM-7
8	21-DM-8
9	21-DM-9
10	21-DM-10
11	21-DM-11

Series 27-DM has Two Concentric Rows of Positions and Slip Rings  
 2 to 11 Positions Are Available

12	27-DM-12
13	27-DM-13
14	27-DM-14
15	27-DM-15
16	27-DM-16
17	27-DM-17
18	27-DM-18
19	27-DM-19
20	27-DM-20
21	27-DM-21
22	27-DM-22
23	27-DM-23
*24	27-DM-24

\* Continuous Rotation

SERIES: 22-DM and 26-DM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 32  
 DIMENSION: 2 $\frac{1}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 11 $\frac{1}{4}$ ° Between Positions

Series 22-DM has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	22-DM-2
3	22-DM-3
4	22-DM-4
5	22-DM-5
6	22-DM-6
7	22-DM-7
8	22-DM-8
9	22-DM-9
10	22-DM-10
11	22-DM-11
12	22-DM-12
13	22-DM-13
14	22-DM-14
15	22-DM-15

Series 26-DM has Two Concentric Rows of Positions and Slip Rings  
 2 to 22 Positions Are Available

23	26-DM-23
24	26-DM-24
25	26-DM-25
26	26-DM-26
27	26-DM-27
28	26-DM-28
29	26-DM-29
30	26-DM-30
31	26-DM-31
*32	26-DM-32

\* Continuous Rotation

SERIES: 23-DM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 23  
 DIMENSION: 2 $\frac{1}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 7 $\frac{1}{2}$ ° Between Positions

Series 23-DM has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	23-DM-2
3	23-DM-3
4	23-DM-4
5	23-DM-5
6	23-DM-6
7	23-DM-7
8	23-DM-8
9	23-DM-9
10	23-DM-10
11	23-DM-11
12	23-DM-12
13	23-DM-13
14	23-DM-14
15	23-DM-15
16	23-DM-16
17	23-DM-17
18	23-DM-18
19	23-DM-19
20	23-DM-20
21	23-DM-21
22	23-DM-22
23	23-DM-23

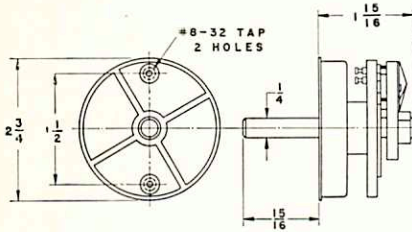
SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## TWO POLES • SINGLE DECK • SHORTING

SERIES: 21-EM and 27-EM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions



Series 21-EM has One Row of Positions and One Slip Ring

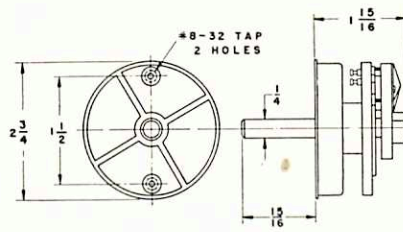
POSITIONS	TYPE
2	21-EM-2
3	21-EM-3
4	21-EM-4
5	21-EM-5
6	21-EM-6
7	21-EM-7
8	21-EM-8
9	21-EM-9
10	21-EM-10
11	21-EM-11

Series 27-EM has Two Concentric Rows of Positions and Slip Rings

2	27-EM-2
3	27-EM-3
4	27-EM-4
5	27-EM-5
6	27-EM-6
7	27-EM-7
8	27-EM-8
9	27-EM-9
10	27-EM-10
11	27-EM-11
12	27-EM-12
13	27-EM-13
14	27-EM-14
15	27-EM-15
16	27-EM-16
17	27-EM-17
18	27-EM-18
19	27-EM-19
20	27-EM-20
21	27-EM-21
22	27-EM-22
23	27-EM-23
*24	27-EM-24

\* Continuous Rotation

SERIES: 22-EM and 26-EM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 32  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 11 1/4° Between Positions



Series 22-EM has One Row of Positions and One Slip Ring

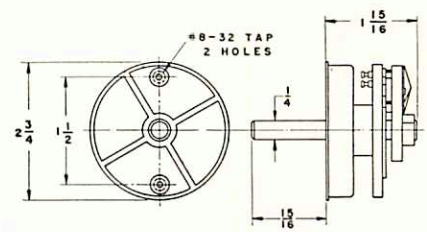
POSITIONS	TYPE
2	22-EM-2
3	22-EM-3
4	22-EM-4
5	22-EM-5
6	22-EM-6
7	22-EM-7
8	22-EM-8
9	22-EM-9
10	22-EM-10
11	22-EM-11
12	22-EM-12
13	22-EM-13
14	22-EM-14
15	22-EM-15

Series 26-EM has Two Concentric Rows of Positions and Slip Rings  
 2 to 14 Positions Are Available

15	26-EM-15
16	26-EM-16
17	26-EM-17
18	26-EM-18
19	26-EM-19
20	26-EM-20
21	26-EM-21
22	26-EM-22
23	26-EM-23
24	26-EM-24
25	26-EM-25
26	26-EM-26
27	26-EM-27
28	26-EM-28
29	26-EM-29
30	26-EM-30
31	26-EM-31
*32	26-EM-32

\* Continuous Rotation

SERIES: 23-EM and 25-EM  
 POLES: Two (2)  
 OPERATION: Shorting  
 POSITIONS: 2 to 48  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 7 1/2° Between Positions



Series 23-EM has One Row of Positions and One Slip Ring

POSITIONS	TYPE
2	23-EM-2
3	23-EM-3
4	23-EM-4
5	23-EM-5
6	23-EM-6
7	23-EM-7
8	23-EM-8
9	23-EM-9
10	23-EM-10
11	23-EM-11
12	23-EM-12
13	23-EM-13
14	23-EM-14
15	23-EM-15
16	23-EM-16
17	23-EM-17
18	23-EM-18
19	23-EM-19
20	23-EM-20
21	23-EM-21
22	23-EM-22
23	23-EM-23

Series 25-EM has Two Concentric Rows of Positions and Slip Rings  
 2 to 40 Positions Are Available

39	25-EM-39
40	25-EM-40
41	25-EM-41
42	25-EM-42
43	25-EM-43
44	25-EM-44
45	25-EM-45
46	25-EM-46
*47	25-EM-47
*48	25-EM-48

\* Continuous Rotations

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## THREE POLES • SINGLE DECK • SHORTING

SERIES: 31-DM and 37-DM  
 POLES: Three (3)  
 OPERATION: Shorting  
 POSITIONS: 2 to 11  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions

Series 31-DM has one row of Positions and Slip Ring

POSITIONS	TYPE
2	31-DM-2
3	31-DM-3
4	31-DM-4
5	31-DM-5
6	31-DM-6
7	31-DM-7

Series 37-DM has two concentric rows of Positions and Slip Rings

2	37-DM-2
3	37-DM-3
4	37-DM-4
5	37-DM-5
6	37-DM-6
7	37-DM-7
8	37-DM-8
9	37-DM-9
10	37-DM-10
11	37-DM-11

SERIES: 32-DM and 36-DM  
 POLES: Three (3)  
 OPERATION: Shorting  
 POSITIONS: 2 to 15  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 11 1/4° Between Positions

Series 32-DM has one row of Positions and Slip Ring

POSITIONS	TYPE
2	32-DM-2
3	32-DM-3
4	32-DM-4
5	32-DM-5
6	32-DM-6
7	32-DM-7
8	32-DM-8
9	32-DM-9

Series 36-DM has two concentric rows of Positions and Slip Rings

2 to 9 Positions Are Available

10	36-DM-10
11	36-DM-11
12	36-DM-12
13	36-DM-13
14	36-DM-14
15	36-DM-15

SERIES: 33-DM  
 POLES: Three (3)  
 OPERATION: Shorting  
 POSITIONS: 2 to 15  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 7 1/2° Between Positions

Series 33-DM has one row of Positions and Slip Ring

POSITIONS	TYPE
2	33-DM-2
3	33-DM-3
4	33-DM-4
5	33-DM-5
6	33-DM-6
7	33-DM-7
8	33-DM-8
9	33-DM-9
10	33-DM-10
11	33-DM-11
12	33-DM-12
13	33-DM-13
14	33-DM-14
15	33-DM-15

SERIES: 31-EM and 37-EM  
 POLES: Three (3)  
 OPERATION: Shorting  
 POSITIONS: 2 to 11  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions

Series 31-EM has one row of Positions and Slip Ring

POSITIONS	TYPE
2	31-EM-2
3	31-EM-3
4	31-EM-4
5	31-EM-5
6	31-EM-6
7	31-EM-7

Series 37-EM has two concentric rows of Positions and Slip Rings

2	37-EM-2
3	37-EM-3
4	37-EM-4
5	37-EM-5
6	37-EM-6
7	37-EM-7
8	37-EM-8
9	37-EM-9
10	37-EM-10
11	37-EM-11

SERIES: 32-EM and 36-EM  
 POLES: Three (3)  
 OPERATION: Shorting  
 POSITIONS: 2 to 15  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 11 1/4° Between Positions

Series 32-EM has one row of Positions and Slip Ring

POSITIONS	TYPE
2	32-EM-2
3	32-EM-3
4	32-EM-4
5	32-EM-5
6	32-EM-6
7	32-EM-7
8	32-EM-8
9	32-EM-9

Series 36-EM has two concentric rows of Positions and Slip Rings

2 to 8 Positions Are Available

9	36-EM-9
10	36-EM-10
11	36-EM-11
12	36-EM-12
13	36-EM-13
14	36-EM-14
15	36-EM-15

SERIES: 33-EM and 35-EM  
 POLES: Three (3)  
 OPERATION: Shorting  
 POSITIONS: 2 to 23  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 7 1/2° Between Positions

Series 33-EM has one row of Positions and Slip Ring

POSITIONS	TYPE
2 to 10 Positions Are Available	
11	33-EM-11
12	33-EM-12
13	33-EM-13
14	33-EM-14
15	33-EM-15

Series 35-EM has two concentric rows of Positions and Slip Rings

2 to 14 Positions Are Available

15	35-EM-15
16	35-EM-16
17	35-EM-17
18	35-EM-18
19	35-EM-19
20	35-EM-20
21	35-EM-21
22	35-EM-22
23	35-EM-23

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## FOUR POLES • SINGLE DECK • SHORTING

SERIES: 41-DM and 47-DM  
 POLES: Four (4)  
 OPERATION: Shorting  
 POSITIONS: 2 to 11  
 DIMENSION: 2 1/4" Dia. x 1 15/16" Depth  
 SPACING: 15° Between Positions

Series 41-DM has one row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	41-DM-2
3	41-DM-3
4	41-DM-4
5	41-DM-5

Series 47-DM has two concentric  
 rows of Positions and Slip Rings  
 2 to 4 Positions Are Available

5	47-DM-5
6	47-DM-6
7	47-DM-7
8	47-DM-8
9	47-DM-9
10	47-DM-10
11	47-DM-11

SERIES: 42-DM and 46-DM  
 POLES: Four (4)  
 OPERATION: Shorting  
 POSITIONS: 2 to 15  
 DIMENSION: 2 1/4" Dia. x 1 15/16" Depth  
 SPACING: 11 1/4° Between Positions

Series 42-DM has one row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	42-DM-2
3	42-DM-3
4	42-DM-4
5	42-DM-5
6	42-DM-6
7	42-DM-7

Series 46-DM has two concentric  
 rows of Positions and Slip Rings  
 2 to 8 Positions Are Available

9	46-DM-9
10	46-DM-10
11	46-DM-11
12	46-DM-12
13	46-DM-13
14	46-DM-14
15	46-DM-15

SERIES: 43-DM and 45-DM  
 POLES: Four (4)  
 OPERATION: Shorting  
 POSITIONS: 2 to 23  
 DIMENSION: 2 1/4" Dia. x 1 15/16" Depth  
 SPACING: 7 1/2° Between Positions

Series 43-DM has one row  
 of Positions and Slip Ring

POSITIONS	TYPE
2 to 6 Positions Are Available	
7	43-DM-7
8	43-DM-8
9	43-DM-9
10	43-DM-10
11	43-DM-11

Series 45-DM has two concentric  
 rows of Positions and Slip Rings  
 2 to 16 Positions Are Available

17	45-DM-17
18	45-DM-18
19	45-DM-19
20	45-DM-20
21	45-DM-21
22	45-DM-22
23	45-DM-23

SERIES: 41-EM and 47-EM  
 POLES: Four (4)  
 OPERATION: Shorting  
 POSITIONS: 2 to 11  
 DIMENSION: 2 3/4" Dia. x 1 15/16" Depth  
 SPACING: 15° Between Positions

Series 41-EM has one row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	41-EM-2
3	41-EM-3
4	41-EM-4
5	41-EM-5

Series 47-EM has two concentric  
 rows of Positions and Slip Rings  
 2 to 5 Positions Are Available

6	47-EM-6
7	47-EM-7
8	47-EM-8
9	47-EM-9
10	47-EM-10
11	47-EM-11

SERIES: 42-EM and 46-EM  
 POLES: Four (4)  
 OPERATION: Shorting  
 POSITIONS: 2 to 15  
 DIMENSION: 2 3/4" Dia. x 1 15/16" Depth  
 SPACING: 11 1/4° Between Positions

Series 42-EM has one row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	42-EM-2
3	42-EM-3
4	42-EM-4
5	42-EM-5
6	42-EM-6
7	42-EM-7

Series 46-EM has two concentric  
 rows of Positions and Slip Rings  
 2 to 8 Positions Are Available

9	46-EM-9
10	46-EM-10
11	46-EM-11
12	46-EM-12
13	46-EM-13
14	46-EM-14
15	46-EM-15

SERIES: 43-EM and 45-EM  
 POLES: Four (4)  
 OPERATION: Shorting  
 POSITIONS: 2 to 23  
 DIMENSION: 2 3/4" Dia. x 1 15/16" Depth  
 SPACING: 7 1/2° Between Positions

Series 43-EM has one row  
 of Positions and Slip Ring

POSITIONS	TYPE
2 to 6 Positions Are Available	
7	43-EM-7
8	43-EM-8
9	43-EM-9
10	43-EM-10
11	43-EM-11

Series 45-EM has two concentric  
 rows of Positions and Slip Rings  
 2 to 16 Positions Are Available

17	45-EM-17
18	45-EM-18
19	45-EM-19
20	45-EM-20
21	45-EM-21
22	45-EM-22
23	45-EM-23

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## SINGLE DECK • SHORTING

### FIVE (5) POLES

SERIES: 57-EM  
 POLES: Five (5)  
 OPERATION: Shorting  
 POSITIONS: 2 to 7  
 DIMENSION: 2 $\frac{3}{4}$ " Dia. x 1 $\frac{5}{16}$ " Depth  
 SPACING: 15° Between positions

Series 57-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2	57-EM-2
3	57-EM-3
5	57-EM-5
4	57-EM-4
6	57-EM-6
7	57-EM-7

### FIVE (5) POLES

SERIES: 56-EM  
 POLES: Five (5)  
 OPERATION: Shorting  
 POSITIONS: 2 to 9  
 DIMENSION: 2 $\frac{3}{4}$ " Dia. x 1 $\frac{5}{16}$ " Depth  
 SPACING: 11 $\frac{1}{4}$ ° Between Positions

Series 56-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2 to 4 Positions Are Available	
5	56-EM-5
6	56-EM-6
7	56-EM-7
8	56-EM-8
9	56-EM-9

### FIVE (5) POLES

SERIES: 55-EM  
 POLES: Five (5)  
 OPERATION: Shorting  
 POSITIONS: 2 to 15  
 DIMENSION: 2 $\frac{3}{4}$ " Dia. x 1 $\frac{5}{16}$ " Depth  
 SPACING: 7 $\frac{1}{2}$ ° Between Positions

Series 55-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2 to 10 Positions Are Available	
11	55-EM-11
12	55-EM-12
13	55-EM-13
14	55-EM-14
15	55-EM-15

### SIX (6) POLES

SERIES: 67-EM  
 POLES: Six (6)  
 OPERATION: Shorting  
 POSITIONS: 2 to 7  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 15° Between Positions

Series 67-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2	67-EM-2
3	67-EM-3
4	67-EM-4
5	67-EM-5
6	67-EM-6
7	67-EM-7

### SEVEN (7) POLES

SERIES: 77-EM  
 POLES: Seven (7)  
 OPERATION: Shorting  
 POSITIONS: 2 to 5  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 15° Between Positions

Series 77-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2	77-EM-2
3	77-EM-3
4	77-EM-4
5	77-EM-5

### EIGHT (8) POLES

SERIES: 87-EM  
 POLES: Eight (8)  
 OPERATION: Shorting  
 POSITIONS: 2 to 5  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 15° Between Positions

Series 87-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2	87-EM-2
3	87-EM-3
4	87-EM-4
5	87-EM-5

### SIX (6) POLES

SERIES: 66-EM  
 POLES: Six (6)  
 OPERATION: Shorting  
 POSITIONS: 2 to 9  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 11 $\frac{1}{4}$ ° Between Positions

Series 66-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2 to 4 Positions Are Available	
5	66-EM-5
6	66-EM-6
7	66-EM-7
8	66-EM-8
9	66-EM-9

### SEVEN (7) POLES

SERIES: 76-EM  
 POLES: Seven (7)  
 OPERATION: Shorting  
 POSITIONS: 2 to 7  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 11 $\frac{1}{4}$ ° Between Positions

Series 76-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2	76-EM-2
3	76-EM-3
4	76-EM-4
5	76-EM-5
6	76-EM-6
7	76-EM-7

### EIGHT (8) POLES

SERIES: 86-EM  
 POLES: Eight (8)  
 OPERATION: Shorting  
 POSITIONS: 2 to 7  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
 SPACING: 11 $\frac{1}{4}$ ° Between Positions

Series 86-EM has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2	86-EM-2
3	86-EM-3
4	86-EM-4
5	86-EM-5
6	86-EM-6
7	86-EM-7

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## SINGLE POLE • SINGLE DECK • NON-SHORTING

SERIES: 11-BB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 12  
 DIMENSION: 1 $\frac{3}{8}$ " dia. x 1 $\frac{11}{16}$ " depth  
 SPACING: 30° Between Positions

POSITIONS	TYPE
2	11-BB-2
3	11-BB-3
4	11-BB-4
5	11-BB-5
6	11-BB-6
7	11-BB-7
8	11-BB-8
9	11-BB-9
10	11-BB-10
11	11-BB-11
*12	11-BB-12

\* Continuous Rotation

SERIES: 11-DB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 12  
 DIMENSION: 2 $\frac{1}{4}$ " dia. x 1 $\frac{15}{16}$ " depth  
 SPACING: 30° Between Positions

POSITIONS	TYPE
2	11-DB-2
3	11-DB-3
4	11-DB-4
5	11-DB-5
6	11-DB-6
7	11-DB-7
8	11-DB-8
9	11-DB-9
10	11-DB-10
11	11-DB-11
*12	11-DB-12

\* Continuous Rotation

SERIES: 11-EB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 12  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{15}{16}$ " depth  
 SPACING: 30° Between Positions

POSITIONS	TYPE
2	11-EB-2
3	11-EB-3
4	11-EB-4
5	11-EB-5
6	11-EB-6
7	11-EB-7
8	11-EB-8
9	11-EB-9
10	11-EB-10
11	11-EB-11
*12	11-EB-12

\* Continuous Rotation

SERIES: 11-CB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 12  
 DIMENSION: 1 $\frac{3}{4}$ " dia. x 1 $\frac{11}{16}$ " depth  
 SPACING: 30° Between Positions

POSITIONS	TYPE
2	11-CB-2
3	11-CB-3
4	11-CB-4
5	11-CB-5
6	11-CB-6
7	11-CB-7
8	11-CB-8
9	11-CB-9
10	11-CB-10
11	11-CB-11
*12	11-CB-12

\* Continuous Rotation

SERIES: 12-DB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 16  
 DIMENSION: 2 $\frac{1}{4}$ " dia. x 1 $\frac{15}{16}$ " depth  
 SPACING: 22 $\frac{1}{2}$ ° Between Positions

POSITIONS	TYPE
2 to 5 Positions Are Available	
6	12-DB-6
7	12-DB-7
8	12-DB-8
9	12-DB-9
10	12-DB-10
11	12-DB-11
12	12-DB-12
13	12-DB-13
14	12-DB-14
15	12-DB-15
*16	12-DB-16

\* Continuous Rotation

SERIES: 12-EB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 16  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{15}{16}$ " depth  
 SPACING: 22 $\frac{1}{2}$ ° Between Positions

POSITIONS	TYPE
2 to 5 Positions Are Available	
6	12-EB-6
7	12-EB-7
8	12-EB-8
9	12-EB-9
10	12-EB-10
11	12-EB-11
12	12-EB-12
13	12-EB-13
14	12-EB-14
15	12-EB-15
*16	12-EB-16

\* Continuous Rotation

SERIES: 12-CB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 16  
 DIMENSION: 1 $\frac{3}{4}$ " dia. x 1 $\frac{11}{16}$ " depth  
 SPACING: 22 $\frac{1}{2}$ ° Between Positions

POSITIONS	TYPE
2 to 6 Positions Are Available	
7	12-CB-7
8	12-CB-8
9	12-CB-9
10	12-CB-10
11	12-CB-11
12	12-CB-12
13	12-CB-13
14	12-CB-14
15	12-CB-15
*16	12-CB-16

\* Continuous Rotation

SERIES: 13-DB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 2 $\frac{1}{4}$ " dia. x 1 $\frac{15}{16}$ " depth  
 SPACING: 15° Between Positions

POSITIONS	TYPE
2 to 13 Positions Are Available	
14	13-DB-14
15	13-DB-15
16	13-DB-16
17	13-DB-17
18	13-DB-18
19	13-DB-19
20	13-DB-20
21	13-DB-21
22	13-DB-22
23	13-DB-23
*24	13-DB-24

\* Continuous Rotation

SERIES: 13-EB  
 POLES: One (1)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 24  
 DIMENSION: 2 $\frac{3}{4}$ " dia. x 1 $\frac{15}{16}$ " depth  
 SPACING: 15° Between Positions

POSITIONS	TYPE
2 to 14 Positions Are Available	
15	13-EB-15
16	13-EB-16
17	13-EB-17
18	13-EB-18
19	13-EB-19
20	13-EB-20
21	13-EB-21
22	13-EB-22
23	13-EB-23
*24	13-EB-24

\* Continuous Rotation

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## TWO POLES • SINGLE DECK • NON-SHORTING

**SERIES:** 21-BB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 6  
**DIMENSION:** 1 $\frac{3}{8}$ " dia. x 1 $\frac{1}{16}$ " depth  
**SPACING:** 30° Between Positions

Series 21-BB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	21-BB-2
3	21-BB-3
4	21-BB-4
5	21-BB-5
6	21-BB-6

**SERIES:** 21-DB and 27-DB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 12  
**DIMENSION:** 2 $\frac{1}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
**SPACING:** 30° Between Positions

Series 21-DB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	21-DB-2
3	21-DB-3
4	21-DB-4
5	21-DB-5
6	21-DB-6

Series 27-DB Has Two Concentric Rows of Positions and Slip Rings  
 2 to 7 Positions Are Available

8	27-DB-8
9	27-DB-9
10	27-DB-10
11	27-DB-11
*12	27-DB-12

\* Continuous Rotation

**SERIES:** 21-EB and 27-EB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 12  
**DIMENSION:** 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
**SPACING:** 30° Between Positions

Series 21-EB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	21-EB-2
3	21-EB-3
4	21-EB-4
5	21-EB-5
6	21-EB-6

Series 27-EB Has Two Concentric Rows of Positions and Slip Rings  
 2 to 7 Positions Are Available

8	27-EB-8
9	27-EB-9
10	27-EB-10
11	27-EB-11
*12	27-EB-12

\* Continuous Rotation

**SERIES:** 21-CB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 6  
**DIMENSION:** 1 $\frac{3}{4}$ " dia. x 1 $\frac{1}{16}$ " depth  
**SPACING:** 30° Between Positions

Series 21-CB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	21-CB-2
3	21-CB-3
4	21-CB-4
5	21-CB-5
6	21-CB-6

**SERIES:** 22-DB and 26-DB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 16  
**DIMENSION:** 2 $\frac{1}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
**SPACING:** 22 $\frac{1}{2}$ ° Between Positions

Series 22-DB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	22-DB-2
3	22-DB-3
4	22-DB-4
5	22-DB-5
6	22-DB-6
7	22-DB-7
8	22-DB-8

Series 26-DB Has Two Concentric Rows of Positions and Slip Rings  
 2 to 13 Positions Are Available

14	26-DB-14
15	26-DB-15
*16	26-DB-16

\*-Continuous Rotation

**SERIES:** 22-EB and 26-EB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 16  
**DIMENSION:** 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
**SPACING:** 22 $\frac{1}{2}$ ° Between Positions

Series 22-EB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	22-EB-2
3	22-EB-3
4	22-EB-4
5	22-EB-5
6	22-EB-6
7	22-EB-7
8	22-EB-8

Series 26-EB Has Two Concentric Rows of Positions and Slip Rings  
 2 to 13 Positions Are Available

14	26-EB-14
15	26-EB-15
*16	26-EB-16

\* Continuous Rotation

**SERIES:** 22-CB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 8  
**DIMENSION:** 1 $\frac{3}{4}$ " dia. x 1 $\frac{1}{16}$ " depth  
**SPACING:** 22 $\frac{1}{2}$ ° Between Positions

Series 22-CB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	22-CB-2
3	22-CB-3
4	22-CB-4
5	22-CB-5
6	22-CB-6
7	22-CB-7
8	22-CB-8

**SERIES:** 23-DB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 11  
**DIMENSION:** 2 $\frac{1}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
**SPACING:** 15° Between Positions

Series 23-DB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	23-DB-2
3	23-DB-3
4	23-DB-4
5	23-DB-5
6	23-DB-6
7	23-DB-7
8	23-DB-8
9	23-DB-9
10	23-DB-10
11	23-DB-11

**SERIES:** 23-EB and 25-EB  
**POLES:** Two (2)  
**OPERATION:** Non-Shorting  
**POSITIONS:** 2 to 24  
**DIMENSION:** 2 $\frac{3}{4}$ " dia. x 1 $\frac{5}{16}$ " depth  
**SPACING:** 15° Between Positions

Series 23-EB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	23-EB-2
3	23-EB-3
4	23-EB-4
5	23-EB-5
6	23-EB-6
7	23-EB-7
8	23-EB-8
9	23-EB-9
10	23-EB-10
11	23-EB-11

Series 25-EB Has Two Concentric Rows of Positions and Slip Rings  
 2 to 23 Positions Are Available

*24	25-EB-24
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\* Continuous Rotation

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## THREE POLES • SINGLE DECK • NON-SHORTING

SERIES: 31-DB and 37-DB  
 POLES: Three (3)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 6  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 30° Between Positions

Series 31-DB Has One Row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	31-DB-2
3	31-DB-3
4	31-DB-4

Series 37-DB Has Two Concentric  
 Rows of Positions and Rings

2	37-DB-2
3	37-DB-3
4	37-DB-4
5	37-DB-5
6	37-DB-6

SERIES: 32-DB and 36-DB  
 POLES: Three (3)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 8  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 22 1/2° Between Positions

Series 32-DB Has One Row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	32-DB-2
3	32-DB-3
4	32-DB-4
5	32-DB-5

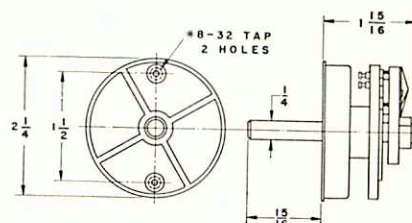
Series 36-DB Has Two Concentric  
 Rows of Positions and Slip Rings

2	36-DB-2
3	36-DB-3
4	36-DB-4
5	36-DB-5
6	36-DB-6
7	36-DB-7
8	36-DB-8

SERIES: 33-DB  
 POLES: Three (3)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 8  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions

Series 33-DB Has One Row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	33-DB-2
3	33-DB-3
4	33-DB-4
5	33-DB-5
6	33-DB-6
7	33-DB-7
8	33-DB-8



SERIES: 31-EB and 37-EB  
 POLES: Three (3)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 6  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 30° Between Positions

Series 31-EB Has One Row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	31-EB-2
3	31-EB-3
4	31-EB-4

Series 37-EB Has Two Concentric  
 Rows of Positions and Slip Rings

2	37-EB-2
3	37-EB-3
4	37-EB-4
5	37-EB-5
6	37-EB-6

SERIES: 32-EB and 36-EB  
 POLES: Three (3)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 8  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 22 1/2° Between Positions

Series 32-EB Has One Row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	32-EB-2
3	32-EB-3
4	32-EB-4
5	32-EB-5

Series 36-EB Has Two Concentric  
 Rows of Positions and Slip Rings

2	36-EB-2
3	36-EB-3
4	36-EB-4
5	36-EB-5
6	36-EB-6
7	36-EB-7
8	36-EB-8

SERIES: 33-EB and 35-EB  
 POLES: Three (3)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 12  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions

Series 33-EB Has One Row  
 of Positions and Slip Ring

POSITIONS	TYPE
2	33-EB-2
3	33-EB-3
4	33-EB-4
5	33-EB-5
6	33-EB-6
7	33-EB-7
8	33-EB-8

Series 35-EB Has Two Concentric  
 Rows of Positions and Slip Rings  
 2 to 5 Positions Are Available

6	35-EB-6
7	35-EB-7
8	35-EB-8
9	35-EB-9
10	35-EB-10
11	35-EB-11
12	35-EB-12

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## FOUR (4) POLES • SINGLE DECK • NON-SHORTING

SERIES: 41-DB and 47-DB  
 POLES: Four (4)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 6  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 30° Between Positions

Series 41-DB Has One Row of Positions and One Slip Ring

POSITIONS	TYPE
2	41-DB-2
3	41-DB-3

Series 47-DB Has Two Concentric Rows of Positions and Slip Rings

2	47-DB-2
3	47-DB-3
4	47-DB-4
5	47-DB-5
6	47-DB-6

SERIES: 42-DB and 46-DB  
 POLES: Four (4)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 8  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 22 1/2° Between Positions

Series 42-DB Has One Row of Positions and One Slip Ring

POSITIONS	TYPE
2	42-DB-2
3	42-DB-3
4	42-DB-4

Series 46-DB Has Two Concentric Rows of Positions and Slip Rings

2 to 4 Positions Are Available

5	46-DB-5
6	46-DB-6
7	46-DB-7
8	46-DB-8

SERIES: 43-DB and 45-D  
 POLES: Four (4)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 6  
 DIMENSION: 2 1/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions

Series 43-DB Has One Row of Positions and One Slip Ring

POSITIONS	TYPE
2	43-DB-2
3	43-DB-3
4	43-DB-4
5	43-DB-5
6	43-DB-6

## FOUR (4) POLES • SINGLE DECK • NON-SHORTING

SERIES: 41-EB and 47-EB  
 POLES: Four (4)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 6  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 30° Between Positions

Series 41-EB Has One Row of Positions and One Slip Ring

POSITIONS	TYPE
2	41-EB-2
3	41-EB-3

Series 47-EB Has Two Concentric Rows of Positions and Slip Rings

2	47-EB-2
3	47-EB-3
4	47-EB-4
5	47-EB-5
6	47-EB-6

SERIES: 42-EB and 46-EB  
 POLES: Four (4)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 8  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 22 1/2° Between Positions

Series 42-EB Has One Row of Positions and One Slip Ring

POSITIONS	TYPE
2	42-EB-2
3	42-EB-3
4	42-EB-4

Series 46-EB Has Two Concentric Rows of Positions and Slip Rings

2	46-EB-2
3	46-EB-3
4	46-EB-4
5	46-EB-5
6	46-EB-6
7	46-EB-7
8	46-EB-8

SERIES: 43-EB and 45-EB  
 POLES: Four (4)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 12  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions

Series 43-EB Has One Row of Positions and One Slip Ring

POSITIONS	TYPE
2	43-EB-2
3	43-EB-3
4	43-EB-4
5	43-EB-5
6	43-EB-6

Series 45-EB Has Two Concentric Rows of Positions and Slip Rings

2 to 7 Positions Are Available

8	45-EB-8
9	45-EB-9
10	45-EB-10
11	45-EB-11
12	45-EB-12

## FIVE (5) POLES • SINGLE DECK • NON-SHORTING

SERIES: 57-EB  
 POLES: Five (5)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 4  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 30° Between Positions

Series 57-EB Has Two Concentric Rows of Positions and Slip Rings

POSITIONS	TYPE
2	57-EB-2
3	57-EB-3
4	57-EB-4

SERIES: 52-EB and 56-EB  
 POLES: Five (5)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 5  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 22 1/2° Between Positions

Series 52-EB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	52-EB-2
3	52-EB-3

Series 56-EB Has Two Concentric Rows of Positions and Slip Rings

2	56-EB-2
3	56-EB-3
4	56-EB-4
5	56-EB-5

SERIES: 53-EB and 55-EB  
 POLES: Five (5)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 8  
 DIMENSION: 2 3/4" dia. x 1 15/16" depth  
 SPACING: 15° Between Positions

Series 53-EB Has One Row of Positions and Slip Ring

POSITIONS	TYPE
2	53-EB-2
3	53-EB-3
4	53-EB-4

Series 55-EB Has Two Concentric Rows of Positions and Slip Rings

2 to 6 Positions Are Available

7	55-EB-7
8	55-EB-8

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## SIX (6) POLES • SINGLE DECK • NON-SHORTING

SERIES: 67-EB  
 POLES: Six (6)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 4  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 30° Between Positions

Series 67-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	67-EB-2
3	67-EB-3
4	67-EB-4

SERIES: 66-EB  
 POLES: Six (6)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 5  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 22<sup>1</sup>/<sub>2</sub>° Between Positions

Series 66-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	66-EB-2
3	66-EB-3
4	66-EB-4
5	66-EB-5

SERIES: 65-EB  
 POLES: Six (6)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 8  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 15° Between Positions

Series 65-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2 to 5 Positions Are Available	
6	65-EB-6
7	65-EB-7
8	65-EB-8

## SEVEN (7) POLES • SINGLE DECK • NON-SHORTING

SERIES: 77-EB  
 POLES: Seven (7)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 3  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 30° Between Positions

Series 77-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	77-EB-2
3	77-EB-3

SERIES: 76-EB  
 POLES: Seven (7)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 4  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 22<sup>1</sup>/<sub>2</sub>° Between Positions

Series 76-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	76-EB-2
3	76-EB-3
4	76-EB-4

SERIES: 75-EB  
 POLES: Seven (7)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 6  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 15° Between Positions

Series 75-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	75-EB-2
3	75-EB-3
4	75-EB-4
5	75-EB-5
6	75-EB-6

## EIGHT (8) POLES • SINGLE DECK • NON-SHORTING

SERIES: 87-EB  
 POLES: Eight (8)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 3  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 30° Between Positions

Series 87-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	87-EB-2
3	87-EB-3

SERIES: 86-EB  
 POLES: Eight (8)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 4  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 22<sup>1</sup>/<sub>2</sub>° Between Positions

Series 86-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	86-EB-2
3	86-EB-3
4	86-EB-4

SERIES: 85-EB  
 POLES: Eight (8)  
 OPERATION: Non-Shorting  
 POSITIONS: 2 to 6  
 DIMENSION: 2<sup>3</sup>/<sub>4</sub>" dia. x 1<sup>15</sup>/<sub>16</sub>" depth  
 SPACING: 15° Between Positions

Series 85-EB Has Two Concentric Rows of Positions and Slip Rings

<u>POSITIONS</u>	<u>TYPE</u>
2	85-EB-2
3	85-EB-3
4	85-EB-4
5	85-EB-5
6	85-EB-6

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • SHORTING SINGLE POLE PER DECK

### SIZE: 1 3/8" x 1 3/8" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 24 Each Deck  
OPERATION: Shorting  
SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
211-BM	2	2	1 3/8" x 1 3/8" x 2 3/8"
311-BM	3	3	1 3/8" x 1 3/8" x 3 3/32"
411-BM	4	4	1 3/8" x 1 3/8" x 4 3/16"
511-BM	5	5	1 3/8" x 1 3/8" x 5 3/32"

### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 24 Each Deck  
OPERATION: Shorting  
SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
211-CM	2	2	1 3/4" x 1 3/4" x 2 3/8"
311-CM	3	3	1 3/4" x 1 3/4" x 3 3/32"
411-CM	4	4	1 3/4" x 1 3/4" x 4 3/16"
511-CM	5	5	1 3/4" x 1 3/4" x 5 3/32"

### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 32 Each Deck  
OPERATION: Shorting  
SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
212-CM	2	2	1 3/4" x 1 3/4" x 2 3/8"
312-CM	3	3	1 3/4" x 1 3/4" x 3 3/32"
412-CM	4	4	1 3/4" x 1 3/4" x 4 3/16"
512-CM	5	5	1 3/4" x 1 3/4" x 5 3/32"

### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 24 Each Deck  
OPERATION: Shorting  
SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
211-DM	2	2	2 1/4" x 2 1/4" x 2 15/16"
311-DM	3	3	2 1/4" x 2 1/4" x 4"
411-DM	4	4	2 1/4" x 2 1/4" x 5 1/16"
511-DM	5	5	2 1/4" x 2 1/4" x 6 1/8"

### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 32 Each Deck  
OPERATION: Shorting  
SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
212-DM	2	2	2 1/4" x 2 1/4" x 2 15/16"
312-DM	3	3	2 1/4" x 2 1/4" x 4"
412-DM	4	4	2 1/4" x 2 1/4" x 5 1/16"
512-DM	5	5	2 1/4" x 2 1/4" x 6 1/8"

### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 48 Each Deck  
OPERATION: Shorting  
SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
213-DM	2	2	2 1/4" x 2 1/4" x 2 15/16"
313-DM	3	3	2 1/4" x 2 1/4" x 4"
413-DM	4	4	2 1/4" x 2 1/4" x 5 1/16"
513-DM	5	5	2 1/4" x 2 1/4" x 6 1/8"

### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 24 Each Deck  
OPERATION: Shorting  
SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
211-EM	2	2	2 3/4" x 2 3/4" x 2 15/16"
311-EM	3	3	2 3/4" x 2 3/4" x 4"
411-EM	4	4	2 3/4" x 2 3/4" x 5 1/16"
511-EM	5	5	2 3/4" x 2 3/4" x 6 1/8"

### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 32 Each Deck  
OPERATION: Shorting  
SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
212-EM	2	2	2 3/4" x 2 3/4" x 2 15/16"
312-EM	3	3	2 3/4" x 2 3/4" x 4"
412-EM	4	4	2 3/4" x 2 3/4" x 5 1/16"
512-EM	5	5	2 3/4" x 2 3/4" x 6 1/8"

### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: One (1) Each Deck  
POSITIONS: 2 to 48 Each Deck  
OPERATION: Shorting  
SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
213-EM	2	2	2 3/4" x 2 3/4" x 2 15/16"
313-EM	3	3	2 3/4" x 2 3/4" x 4"
413-EM	4	4	2 3/4" x 2 3/4" x 5 1/16"
513-EM	5	5	2 3/4" x 2 3/4" x 6 1/8"

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example: 511-EM-⑦ Number of Positions

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the required number of decks.

For example you may require a switch having 10 decks, one pole per deck, 10 poles total with 7 positions on each deck, 2 3/4" x 2 3/4" having 15° spacing between positions. Your order should read as follows:

Number of decks ⑩ 11-EM-⑦ Number of Positions.

Depth increases 2/32" per deck for the 1 3/8" and 1 3/4", and 1/16" for the 2 1/4" and 2 3/4" switches.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • SHORTING

### TWO POLES PER DECK

#### SIZE: 1 3/8" x 1 3/8" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
221-BM	4	2	1 3/8" x 1 3/8" x 2 3/8"
321-BM	6	3	1 3/8" x 1 3/8" x 3 3/32"
421-BM	8	4	1 3/8" x 1 3/8" x 4 3/16"
521-BM	10	5	1 3/8" x 1 3/8" x 5 3/32"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 24 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
227-DM	4	2	2 1/4" x 2 1/4" x 2 15/16"
327-DM	6	3	2 1/4" x 2 1/4" x 4"
427-DM	8	4	2 1/4" x 2 1/4" x 5 1/16"
527-DM	10	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 24 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
227-EM	4	2	2 3/4" x 2 3/4" x 2 15/16"
327-EM	6	3	2 3/4" x 2 3/4" x 4"
427-EM	8	4	2 3/4" x 2 3/4" x 5 1/16"
527-EM	10	5	2 3/4" x 2 3/4" x 6 1/8"

#### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
221-CM	4	2	1 3/4" x 1 3/4" x 2 3/8"
321-CM	6	3	1 3/4" x 1 3/4" x 3 3/32"
421-CM	8	4	1 3/4" x 1 3/4" x 4 3/16"
521-CM	10	5	1 3/4" x 1 3/4" x 5 3/32"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 32 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
226-DM	4	2	2 1/4" x 2 1/4" x 2 15/16"
326-DM	6	3	2 1/4" x 2 1/4" x 4"
426-DM	8	4	2 1/4" x 2 1/4" x 5 1/16"
526-DM	10	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 32 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
226-EM	4	2	2 3/4" x 2 3/4" x 2 15/16"
326-EM	6	3	2 3/4" x 2 3/4" x 4"
426-EM	8	4	2 3/4" x 2 3/4" x 5 1/16"
526-EM	10	5	2 3/4" x 2 3/4" x 6 1/8"

#### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
222-CM	4	2	1 3/4" x 1 3/4" x 2 3/8"
322-CM	6	3	1 3/4" x 1 3/4" x 3 3/32"
422-CM	8	4	1 3/4" x 1 3/4" x 4 3/16"
522-CM	10	5	1 3/4" x 1 3/4" x 5 3/32"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 23 Each Pole  
 OPERATION: Shorting  
 SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
223-DM	4	2	2 1/4" x 2 1/4" x 2 15/16"
323-DM	6	3	2 1/4" x 2 1/4" x 4"
423-DM	8	4	2 1/4" x 2 1/4" x 5 1/16"
523-DM	10	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 48 Each Pole  
 OPERATION: Shorting  
 SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
225-EM	4	2	2 3/4" x 2 3/4" x 2 15/16"
325-EM	6	3	2 3/4" x 2 3/4" x 4"
425-EM	8	4	2 3/4" x 2 3/4" x 5 1/16"
525-EM	10	5	2 3/4" x 2 3/4" x 6 1/8"

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example: 527-EM-⑦ number of positions.

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the

required number of decks. For example you may require a switch having 10 decks, 2 poles per deck, 20 poles total with 7 positions on each pole, 2 3/4" x 2 3/4" having 15° spacing between positions. Your order should read as follows:

Number of decks ⑩ 27-EM-⑦ Number of positions.  
 Depth increases 2 3/32" per deck for the 1 3/8" and 1 3/4", and 1 1/16" for the 2 1/4" and 2 3/4" switches.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • SHORTING

### THREE POLES PER DECK

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Three (3) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
237-DM	6	2	2 1/4" x 2 1/4" x 2 15/16"
337-DM	9	3	2 1/4" x 2 1/4" x 4"
437-DM	12	4	2 1/4" x 2 1/4" x 5 1/16"
537-DM	15	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Three (3) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
236-DM	6	2	2 1/4" x 2 1/4" x 2 15/16"
336-DM	9	3	2 1/4" x 2 1/4" x 4"
436-DM	12	4	2 1/4" x 2 1/4" x 5 1/16"
536-DM	15	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Three (3) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
233-DM	6	2	2 1/4" x 2 1/4" x 2 15/16"
333-DM	9	3	2 1/4" x 2 1/4" x 4"
433-DM	12	4	2 1/4" x 2 1/4" x 5 1/16"
533-DM	15	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Three (3) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
237-EM	6	2	2 3/4" x 2 3/4" x 2 15/16"
337-EM	9	3	2 3/4" x 2 3/4" x 4"
437-EM	12	4	2 3/4" x 2 3/4" x 5 1/16"
537-EM	15	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

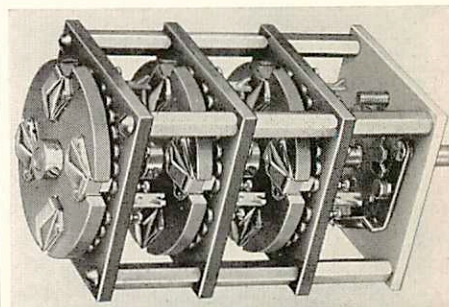
POLES: Three (3) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
236-EM	6	2	2 3/4" x 2 3/4" x 2 15/16"
336-EM	9	3	2 3/4" x 2 3/4" x 4"
436-EM	12	4	2 3/4" x 2 3/4" x 5 1/16"
536-EM	15	5	2 3/4" x 2 3/4" x 6 1/8"

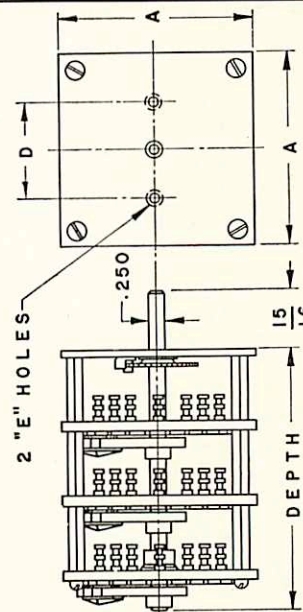
SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Three (3) Each Deck  
 POSITIONS: 2 to 23 Each Pole  
 OPERATION: Shorting  
 SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
235-EM	6	2	2 3/4" x 2 3/4" x 2 15/16"
335-EM	9	3	2 3/4" x 2 3/4" x 4"
435-EM	12	4	2 3/4" x 2 3/4" x 5 1/16"
535-EM	15	5	2 3/4" x 2 3/4" x 6 1/8"



TYPICAL MULTIPLE DECK SWITCH



Depth increases 1 1/16" per deck.

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example:

537-EM-⑦ Number of Positions.

More decks than shown on this page are available. When ordering more decks than those itemized on this page, change only the first number of the series required to conform with the required number of decks.

For example, you may require a switch having 10 decks, 3 poles per deck, 30 poles total with 7 positions on each pole, 2 3/4" x 2 3/4" having 15° spacing between positions. Your order should read as follows:

Number of Decks ⑩ 37-EM-⑦  
 Number of Positions.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • SHORTING

### FOUR (4) POLES PER DECK

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
247-DM	8	2	2 1/4" x 2 1/4" x 2 15/16"
347-DM	12	3	2 1/4" x 2 1/4" x 4"
447-DM	16	4	2 1/4" x 2 1/4" x 5 1/16"
547-DM	20	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
246-DM	8	2	2 1/4" x 2 1/4" x 2 15/16"
346-DM	12	3	2 1/4" x 2 1/4" x 4"
446-DM	16	4	2 1/4" x 2 1/4" x 5 1/16"
546-DM	20	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
243-DM	8	2	2 1/4" x 2 1/4" x 2 15/16"
343-DM	12	3	2 1/4" x 2 1/4" x 4"
443-DM	16	4	2 1/4" x 2 1/4" x 5 1/16"
543-DM	20	5	2 1/4" x 2 1/4" x 6 1/8"

### FOUR (4) POLES PER DECK

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
247-EM	8	2	2 3/4" x 2 3/4" x 2 15/16"
347-EM	12	3	2 3/4" x 2 3/4" x 4"
447-EM	16	4	2 3/4" x 2 3/4" x 5 1/16"
547-EM	20	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
246-EM	8	2	2 3/4" x 2 3/4" x 2 15/16"
346-EM	12	3	2 3/4" x 2 3/4" x 4"
446-EM	16	4	2 3/4" x 2 3/4" x 5 1/16"
546-EM	20	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 23 Each Pole  
 OPERATION: Shorting  
 SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
245-EM	8	2	2 3/4" x 2 3/4" x 2 15/16"
345-EM	12	3	2 3/4" x 2 3/4" x 4"
445-EM	16	4	2 3/4" x 2 3/4" x 5 1/16"
545-EM	20	5	2 3/4" x 2 3/4" x 6 1/8"

### FIVE (5) POLES PER DECK

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Five (5) Each Deck  
 POSITIONS: 2 to 7 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
257-EM	10	2	2 3/4" x 2 3/4" x 2 15/16"
357-EM	15	3	2 3/4" x 2 3/4" x 4"
457-EM	20	4	2 3/4" x 2 3/4" x 5 1/16"
557-EM	25	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Five (5) Each Deck  
 POSITIONS: 2 to 9 Each Pole  
 OPERATION: Shorting  
 SPACING: 11 1/4° Between Positions

Series	Total Poles	Total Decks	Dimensions
256-EM	10	2	2 3/4" x 2 3/4" x 2 15/16"
356-EM	15	3	2 3/4" x 2 3/4" x 4"
456-EM	20	4	2 3/4" x 2 3/4" x 5 1/16"
556-EM	25	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Five (5) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 7 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
255-EM	10	2	2 3/4" x 2 3/4" x 2 15/16"
355-EM	15	3	2 3/4" x 2 3/4" x 4"
455-EM	20	4	2 3/4" x 2 3/4" x 5 1/16"
555-EM	25	5	2 3/4" x 2 3/4" x 6 1/8"

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example: 547-EM-⑦ Number of Positions.

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the required number of decks.

For example, you may require a switch having 10 decks, 4 poles per deck, 40 poles total with 7 positions on each pole, 2 3/4" x 2 3/4" having 15° spacing between positions.

Your order should read as follows:

Number of decks ⑩ 47-EM-⑦ Number of positions.

Depth increases 1 1/16" per deck.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • SHORTING

### SIX (6) POLES PER DECK

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Six (6) Each Deck  
 POSITIONS: 2 to 7 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
267-EM	12	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
367-EM	18	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
467-EM	24	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
567-EM	30	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Six (6) Each Deck  
 POSITIONS: 2 to 9 Each Pole  
 OPERATION: Shorting  
 SPACING: 11<sup>1</sup>/<sub>4</sub>° Between Positions

Series	Total Poles	Total Decks	Dimensions
266-EM	12	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
366-EM	18	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
466-EM	24	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
566-EM	30	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Six (6) Each Deck  
 POSITIONS: 2 to 15 Each Pole  
 OPERATION: Shorting  
 SPACING: 7<sup>1</sup>/<sub>2</sub>° Between Positions

Series	Total Poles	Total Decks	Dimensions
285-EM	12	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
365-EM	18	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
465-EM	24	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
565-EM	30	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

### SEVEN (7) POLES PER DECK

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Seven (7) Each Deck  
 POSITIONS: 2 to 5 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
277-EM	14	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
377-EM	21	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
477-EM	28	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
577-EM	35	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Seven (7) Each Deck  
 POSITIONS: 2 to 7 Each Pole  
 OPERATION: Shorting  
 SPACING: 11<sup>1</sup>/<sub>4</sub>° Between Positions

Series	Total Poles	Total Decks	Dimensions
276-EM	14	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
376-EM	21	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
476-EM	28	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
576-EM	35	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Seven (7) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 7<sup>1</sup>/<sub>2</sub>° Between Positions

Series	Total Poles	Total Decks	Dimensions
275-EM	14	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
375-EM	21	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
475-EM	28	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
575-EM	35	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

### EIGHT (8) POLES PER DECK

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Eight (8) Each Deck  
 POSITIONS: 2 to 5 Each Pole  
 OPERATION: Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
287-EM	16	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
387-EM	24	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
487-EM	32	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
587-EM	40	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Eight (8) Each Deck  
 POSITIONS: 2 to 7 Each Pole  
 OPERATION: Shorting  
 SPACING: 11<sup>1</sup>/<sub>4</sub>° Between Positions

Series	Total Poles	Total Decks	Dimensions
286-EM	16	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
386-EM	24	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
486-EM	32	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
586-EM	40	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

SIZE: 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" SQUARE

POLES: Eight (8) Each Deck  
 POSITIONS: 2 to 11 Each Pole  
 OPERATION: Shorting  
 SPACING: 7<sup>1</sup>/<sub>2</sub>° Between Positions

Series	Total Poles	Total Decks	Dimensions
285-EM	16	2	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x2 <sup>15</sup> / <sub>16</sub> "
385-EM	24	3	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x4"
485-EM	32	4	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x5 <sup>1</sup> / <sub>16</sub> "
585-EM	40	5	2 <sup>3</sup> / <sub>4</sub> "x2 <sup>3</sup> / <sub>4</sub> "x6 <sup>1</sup> / <sub>8</sub> "

NOTE: Advise the number of positions required by placing the numeral after the letters of the Series you choose.

For example: 577-EM-③ Number of Positions.

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the required number of decks.

For example, you may require a switch having 7 decks, 7 poles per deck, 49 poles total with 3 positions on each pole, 2<sup>3</sup>/<sub>4</sub>" x 2<sup>3</sup>/<sub>4</sub>" having 15° spacing between positions.

Your order should read as follows:

Number of Decks ⑦ 77-EM-③ Number of Positions.

Depth increases 1<sup>1</sup>/<sub>16</sub>" per deck.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • NON-SHORTING

### SINGLE POLE PER DECK

#### SIZE: 1 3/8" x 1 3/8" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
217-BB	2	2	1 3/8" x 1 3/8" x 2 3/8"
317-BB	3	3	1 3/8" x 1 3/8" x 3 3/32"
417-BB	4	4	1 3/8" x 1 3/8" x 4 3/16"
517-BB	5	5	1 3/8" x 1 3/8" x 5 3/32"

#### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
217-CB	2	2	1 3/4" x 1 3/4" x 2 3/8"
317-CB	3	3	1 3/4" x 1 3/4" x 3 3/32"
417-CB	4	4	1 3/4" x 1 3/4" x 4 3/16"
517-CB	5	5	1 3/4" x 1 3/4" x 5 3/32"

#### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 16 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
216-CB	2	2	1 3/4" x 1 3/4" x 2 3/8"
316-CB	3	3	1 3/4" x 1 3/4" x 3 3/32"
416-CB	4	4	1 3/4" x 1 3/4" x 4 3/16"
516-CB	5	5	1 3/4" x 1 3/4" x 5 3/32"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
217-DB	2	2	2 1/4" x 2 1/4" x 2 15/16"
317-DB	3	3	2 1/4" x 2 1/4" x 4"
417-DB	4	4	2 1/4" x 2 1/4" x 5 1/16"
517-DB	5	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 16 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
216-DB	2	2	2 1/4" x 2 1/4" x 2 15/16"
316-DB	3	3	2 1/4" x 2 1/4" x 4"
416-DB	4	4	2 1/4" x 2 1/4" x 5 1/16"
516-DB	5	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 24 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
215-DB	2	2	2 1/4" x 2 1/4" x 2 15/16"
315-DB	3	3	2 1/4" x 2 1/4" x 4"
415-DB	4	4	2 1/4" x 2 1/4" x 5 1/16"
515-DB	5	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
217-EB	2	2	2 3/4" x 2 3/4" x 2 15/16"
317-EB	3	3	2 3/4" x 2 3/4" x 4"
417-EB	4	4	2 3/4" x 2 3/4" x 5 1/16"
517-EB	5	5	2 3/4" x 2 3/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 16 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
216-EB	2	2	2 3/4" x 2 3/4" x 2 15/16"
316-EB	3	3	2 3/4" x 2 3/4" x 4"
416-EB	4	4	2 3/4" x 2 3/4" x 5 1/16"
516-EB	5	5	2 3/4" x 2 3/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: One (1) Each Deck  
 POSITIONS: 2 to 24 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
215-EB	2	2	2 3/4" x 2 3/4" x 2 15/16"
315-EB	3	3	2 3/4" x 2 3/4" x 4"
415-EB	4	4	2 3/4" x 2 3/4" x 5 1/16"
515-EB	5	5	2 3/4" x 2 3/4" x 6 1/8"

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example: 511-EB-⑦ Number of Positions.

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the required number of decks.

For example you may require a switch having 10 decks one pole per deck, 10 poles total with 7 positions on each pole, 2 3/4" x 2 3/4" having 30° spacing between positions. Your order should read as follows:

Number of decks ⑩ 11-EB-⑦ Number of Positions.

Depth increases 2 3/32" per deck for the 1 3/8" and 1 3/4", and 1 1/16" per deck for the 2 1/4" and 2 3/4" switches.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • NON-SHORTING

### TWO POLES PER DECK

#### SIZE: 1 3/8" x 1 3/8" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 6 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
227-BB	4	2	1 3/8" x 1 3/8" x 2 3/8"
327-BB	6	3	1 3/8" x 1 3/8" x 3 3/32"
427-BB	8	4	1 3/8" x 1 3/8" x 4 3/16"
527-BB	10	5	1 3/8" x 1 3/8" x 5 3/32"

#### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 6 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
227-CB	4	2	1 3/4" x 1 3/4" x 2 3/8"
327-CB	6	3	1 3/4" x 1 3/4" x 3 3/32"
427-CB	8	4	1 3/4" x 1 3/4" x 4 3/16"
527-CB	10	5	1 3/4" x 1 3/4" x 5 3/32"

#### SIZE: 1 3/4" x 1 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 8 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
225-CB	4	2	1 3/4" x 1 3/4" x 2 3/8"
326-CB	6	3	1 3/4" x 1 3/4" x 3 3/32"
426-CB	8	4	1 3/4" x 1 3/4" x 4 3/16"
526-CB	10	5	1 3/4" x 1 3/4" x 5 3/32"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
227-DB	4	2	2 1/4" x 2 1/4" x 2 15/16"
327-DB	6	3	2 1/4" x 2 1/4" x 4"
427-DB	8	4	2 1/4" x 2 1/4" x 5 1/16"
527-DB	10	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 16 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
226-DB	4	2	2 1/4" x 2 1/4" x 2 15/16"
326-DB	6	3	2 1/4" x 2 1/4" x 4"
426-DB	8	4	2 1/4" x 2 1/4" x 5 1/16"
526-DB	10	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
225-DB	4	2	2 1/4" x 2 1/4" x 2 15/16"
325-DB	6	3	2 1/4" x 2 1/4" x 4"
425-DB	8	4	2 1/4" x 2 1/4" x 5 1/16"
525-DB	10	5	2 1/4" x 2 1/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
227-EB	4	2	2 3/4" x 2 3/4" x 2 15/16"
327-EB	6	3	2 3/4" x 2 3/4" x 4"
427-EB	8	4	2 3/4" x 2 3/4" x 5 1/16"
527-EB	10	5	2 3/4" x 2 3/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 16 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
226-EB	4	2	2 3/4" x 2 3/4" x 2 15/16"
326-EB	6	3	2 3/4" x 2 3/4" x 4"
426-EB	8	4	2 3/4" x 2 3/4" x 5 1/16"
526-EB	10	5	2 3/4" x 2 3/4" x 6 1/8"

#### SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Two (2) Each Deck  
 POSITIONS: 2 to 24 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
225-EB	4	2	2 3/4" x 2 3/4" x 2 15/16"
325-EB	6	3	2 3/4" x 2 3/4" x 4"
425-EB	8	4	2 3/4" x 2 3/4" x 5 1/16"
525-EB	10	5	2 3/4" x 2 3/4" x 6 1/8"

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example: 527-EB-⑦ number of positions.

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the

required number of decks. For example you may require a switch having 10 decks, 2 poles per deck, 20 poles total with 7 positions on each pole, 2 3/4" x 2 3/4" having 30° spacing between positions. Your order should read as follows:

Number of decks ⑩ 27-EB-⑦ Number of positions.

Depth increases 2 3/32" per deck for the 1 3/8" and 1 3/4", and 1 1/16" per deck for the 2 1/4" and 2 3/4" switches.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • NON-SHORTING THREE POLES PER DECK

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Three (3) Each Deck  
POSITIONS: 2 to 6 Each Pole  
OPERATION: Non-Shorting  
SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
237-DB	6	2	2 1/4" x 2 1/4" x 2 15/16"
337-DB	9	3	2 1/4" x 2 1/4" x 4"
437-DB	12	4	2 1/4" x 2 1/4" x 5 1/16"
537-DB	15	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Three (3) Each Deck  
POSITIONS: 2 to 8 Each Pole  
OPERATION: Non-Shorting  
SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
236-DB	6	2	2 1/4" x 2 1/4" x 2 15/16"
336-DB	9	3	2 1/4" x 2 1/4" x 4"
436-DB	12	4	2 1/4" x 2 1/4" x 5 1/16"
536-DB	15	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Three (3) Each Deck  
POSITIONS: 2 to 8 Each Pole  
OPERATION: Non-Shorting  
SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
235-DB	6	2	2 1/4" x 2 1/4" x 2 15/16"
335-DB	9	3	2 1/4" x 2 1/4" x 4"
435-DB	12	4	2 1/4" x 2 1/4" x 5 1/16"
535-DB	15	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Three (3) Each Deck  
POSITIONS: 2 to 6 Each Pole  
OPERATION: Non-Shorting  
SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
237-EB	6	2	2 3/4" x 2 3/4" x 2 15/16"
337-EB	9	3	2 3/4" x 2 3/4" x 4"
437-EB	12	4	2 3/4" x 2 3/4" x 5 1/16"
537-EB	15	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

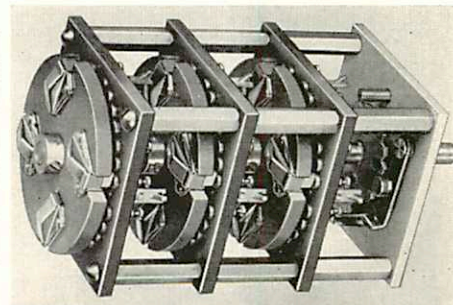
POLES: Three (3) Each Deck  
POSITIONS: 2 to 8 Each Pole  
OPERATION: Non-Shorting  
SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
236-EB	6	2	2 3/4" x 2 3/4" x 2 15/16"
336-EB	9	3	2 3/4" x 2 3/4" x 4"
436-EB	12	4	2 3/4" x 2 3/4" x 5 1/16"
536-EB	15	5	2 3/4" x 2 3/4" x 6 1/8"

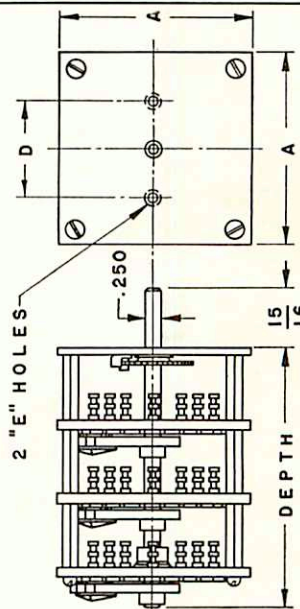
SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Three (3) Each Deck  
POSITIONS: 2 to 12 Each Pole  
OPERATION: Non-Shorting  
SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
235-EB	6	2	2 3/4" x 2 3/4" x 2 15/16"
335-EB	9	3	2 3/4" x 2 3/4" x 4"
435-EB	12	4	2 3/4" x 2 3/4" x 5 1/16"
535-EB	15	5	2 3/4" x 2 3/4" x 6 1/8"



TYPICAL MULTIPLE DECK SWITCH



Depth increases 1 1/16" per deck.

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example:

537-EB-⑦ Number of Positions.

More decks than shown on this page are available. When ordering more decks than those itemized on this page, change only the first number of the series required to conform with the required number of decks.

For example, you may require a switch having 10 decks, 3 poles per deck, 30 poles total with 7 positions on each pole, 2 3/4" x 2 3/4" having 30° spacing between positions. Your order should read as follows:

Number of Decks ⑩ 37-EB-⑦  
Number of Positions.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • NON-SHORTING

### FOUR (4) POLES PER DECK

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 6 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
247-DB	8	2	2 1/4" x 2 1/4" x 2 15/16"
347-DB	12	3	2 1/4" x 2 1/4" x 4"
447-DB	16	4	2 1/4" x 2 1/4" x 5 1/16"
547-DB	20	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 8 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
246-DB	8	2	2 1/4" x 2 1/4" x 2 15/16"
346-DB	12	3	2 1/4" x 2 1/4" x 4"
446-DB	16	4	2 1/4" x 2 1/4" x 5 1/16"
546-DB	20	5	2 1/4" x 2 1/4" x 6 1/8"

SIZE: 2 1/4" x 2 1/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 6 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
245-DB	8	2	2 1/4" x 2 1/4" x 2 15/16"
345-DB	12	3	2 1/4" x 2 1/4" x 4"
445-DB	16	4	2 1/4" x 2 1/4" x 5 1/16"
545-DB	20	5	2 1/4" x 2 1/4" x 6 1/8"

### FOUR (4) POLES PER DECK

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 6 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
247-EB	8	2	2 3/4" x 2 3/4" x 2 15/16"
347-EB	12	3	2 3/4" x 2 3/4" x 4"
447-EB	16	4	2 3/4" x 2 3/4" x 5 1/16"
547-EB	20	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 8 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
246-EB	8	2	2 3/4" x 2 3/4" x 2 15/16"
346-EB	12	3	2 3/4" x 2 3/4" x 4"
446-EB	16	4	2 3/4" x 2 3/4" x 5 1/16"
546-EB	20	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Four (4) Each Deck  
 POSITIONS: 2 to 12 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
245-EB	8	2	2 3/4" x 2 3/4" x 2 15/16"
345-EB	12	3	2 3/4" x 2 3/4" x 4"
445-EB	16	4	2 3/4" x 2 3/4" x 5 1/16"
545-EB	20	5	2 3/4" x 2 3/4" x 6 1/8"

### FIVE (5) POLES PER DECK

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Five (5) Each Deck  
 POSITIONS: 2 to 4 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
257-EB	10	2	2 3/4" x 2 3/4" x 2 15/16"
357-EB	15	3	2 3/4" x 2 3/4" x 4"
457-EB	20	4	2 3/4" x 2 3/4" x 5 1/16"
557-EB	25	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Five (5) Each Deck  
 POSITIONS: 2 to 5 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
256-EB	10	2	2 3/4" x 2 3/4" x 2 15/16"
356-EB	15	3	2 3/4" x 2 3/4" x 4"
456-EB	20	4	2 3/4" x 2 3/4" x 5 1/16"
556-EB	25	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Five (5) Each Deck  
 POSITIONS: 2 to 8 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
255-EB	10	2	2 3/4" x 2 3/4" x 2 15/16"
355-EB	15	3	2 3/4" x 2 3/4" x 4"
455-EB	20	4	2 3/4" x 2 3/4" x 5 1/16"
555-EB	25	5	2 3/4" x 2 3/4" x 6 1/8"

NOTE: Advise the number of positions required by placing the numeral after the letters of the series you choose.

For example: 547-EB-③ Number of Positions.

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the required number of decks.

For example, you may require a switch having 10 decks, 4 poles per deck, 40 poles total with 3 positions on each pole, 2 3/4" x 2 3/4" having 30° spacing between positions.

Your order should read as follows:

Number of decks ⑩ 47-EB-③ Number of positions.

Depth increases 1 1/16" per deck.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SWITCHES

## MULTIPLE DECK • NON-SHORTING

### SIX (6) POLES PER DECK

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Six (6) Each Deck  
 POSITIONS: 2 to 4 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
267-EB	12	2	2 3/4" x 2 3/4" x 2 15/16"
367-EB	18	3	2 3/4" x 2 3/4" x 4"
467-EB	24	4	2 3/4" x 2 3/4" x 5 1/16"
567-EB	30	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Six (6) Each Deck  
 POSITIONS: 2 to 5 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
266-EB	12	2	2 3/4" x 2 3/4" x 2 15/16"
366-EB	18	3	2 3/4" x 2 3/4" x 4"
466-EB	24	4	2 3/4" x 2 3/4" x 5 1/16"
566-EB	30	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Six (6) Each Deck  
 POSITIONS: 2 to 8 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
265-EB	12	2	2 3/4" x 2 3/4" x 2 15/16"
365-EB	18	3	2 3/4" x 2 3/4" x 4"
465-EB	24	4	2 3/4" x 2 3/4" x 5 1/16"
565-EB	30	5	2 3/4" x 2 3/4" x 6 1/8"

### SEVEN (7) POLES PER DECK

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Seven (7) Each Deck  
 POSITIONS: 2 to 3 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
277-EB	14	2	2 3/4" x 2 3/4" x 2 15/16"
377-EB	21	3	2 3/4" x 2 3/4" x 4"
477-EB	28	4	2 3/4" x 2 3/4" x 5 1/16"
577-EB	35	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Seven (7) Each Deck  
 POSITIONS: 2 to 4 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
276-EB	14	2	2 3/4" x 2 3/4" x 2 15/16"
376-EB	21	3	2 3/4" x 2 3/4" x 4"
476-EB	28	4	2 3/4" x 2 3/4" x 5 1/16"
576-EB	35	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Seven (7) Each Deck  
 POSITIONS: 2 to 6 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
275-EB	14	2	2 3/4" x 2 3/4" x 2 15/16"
375-EB	21	3	2 3/4" x 2 3/4" x 4"
475-EB	28	4	2 3/4" x 2 3/4" x 5 1/16"
575-EB	35	5	2 3/4" x 2 3/4" x 6 1/8"

### EIGHT (8) POLES PER DECK

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Eight (8) Each Deck  
 POSITIONS: 2 to 3 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 30° Between Positions

Series	Total Poles	Total Decks	Dimensions
287-EB	16	2	2 3/4" x 2 3/4" x 2 15/16"
387-EB	24	3	2 3/4" x 2 3/4" x 4"
487-EB	32	4	2 3/4" x 2 3/4" x 5 1/16"
587-EB	40	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Eight (8) Each Deck  
 POSITIONS: 2 to 4 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 22 1/2° Between Positions

Series	Total Poles	Total Decks	Dimensions
586-EB	16	2	2 3/4" x 2 3/4" x 2 15/16"
386-EB	24	3	2 3/4" x 2 3/4" x 4"
486-EB	32	4	2 3/4" x 2 3/4" x 5 1/16"
586-EB	40	5	2 3/4" x 2 3/4" x 6 1/8"

SIZE: 2 3/4" x 2 3/4" SQUARE

POLES: Eight (8) Each Deck  
 POSITIONS: 2 to 6 Each Pole  
 OPERATION: Non-Shorting  
 SPACING: 15° Between Positions

Series	Total Poles	Total Decks	Dimensions
285-EB	16	2	2 3/4" x 2 3/4" x 2 15/16"
385-EB	24	3	2 3/4" x 2 3/4" x 4"
485-EB	32	4	2 3/4" x 2 3/4" x 5 1/16"
585-EB	40	5	2 3/4" x 2 3/4" x 6 1/8"

NOTE: Advise the number of positions required by placing the numeral after the letters of the Series you choose.

For example: 577-EB-③ Number of Positions.

More decks than those shown above are available. When ordering more decks than those itemized above, change only the first number of the series required to conform with the required number of decks.

For example, you may require a switch having 7 decks, 7 poles per deck, 49 poles total with 3 positions on each pole, 2 3/4" x 2 3/4" having 30° spacing between positions.

Your order should read as follows:

Number of Decks ⑦ 77-EB-③ Number of Positions.

Depth increases 1/16" per deck.

SEE PAGES S-1 TO S-3 FOR COMPLETE SPECIFICATIONS



# SECTION T—TABLE I

## 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 a given Power 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			Decibel (Power) Loss			Decibel (Voltage) Gain			Decibel (Power) Gain		
.0	1.0000	1.000	.0	5.0	.5623	1.778	.50	10.0	.3162	3.162	5.00
.1	.9886	1.012	.05	.1	.5559	1.799	.55	.1	.3126	3.199	.05
.2	.9772	1.023	.10	.2	.5495	1.820	.60	.2	.3090	3.236	.10
.3	.9661	1.035	.15	.3	.5433	1.841	.65	.3	.3055	3.273	.15
.4	.9550	1.047	.20	.4	.5370	1.862	.70	.4	.3020	3.311	.20
.5	.9441	1.059	.25	.5	.5309	1.884	.75	.5	.2985	3.350	.25
.6	.9333	1.072	.30	.6	.5248	1.905	.80	.6	.2951	3.388	.30
.7	.9226	1.084	.35	.7	.5188	1.928	.85	.7	.2917	3.428	.35
.8	.9120	1.096	.40	.8	.5129	1.950	.90	.8	.2884	3.467	.40
.9	.9016	1.109	.45	.9	.5070	1.972	.95	.9	.2851	3.508	.45
1.0	.8913	1.122	.50	6.0	.5012	1.995	3.00	11.0	.2818	3.548	.50
.1	.8810	1.135	.55	.1	.4955	2.018	.05	.1	.2786	3.589	.55
.2	.8710	1.148	.60	.2	.4898	2.042	.10	.2	.2754	3.631	.60
.3	.8610	1.161	.65	.3	.4842	2.065	.15	.3	.2723	3.673	.65
.4	.8511	1.175	.70	.4	.4786	2.089	.20	.4	.2692	3.715	.70
.5	.8414	1.189	.75	.5	.4732	2.113	.25	.5	.2661	3.758	.75
.6	.8318	1.202	.80	.6	.4677	2.138	.30	.6	.2630	3.802	.80
.7	.8222	1.216	.85	.7	.4624	2.163	.35	.7	.2600	3.846	.85
.8	.8128	1.230	.90	.8	.4571	2.188	.40	.8	.2570	3.890	.90
.9	.8035	1.245	.95	.9	.4519	2.213	.45	.9	.2541	3.936	.95
2.0	.7943	1.259	1.00	7.0	.4467	2.239	.50	12.0	.2512	3.981	6.00
.1	.7852	1.274	.05	.1	.4416	2.265	.55	.1	.2483	4.027	.05
.2	.7762	1.288	.10	.2	.4365	2.291	.60	.2	.2455	4.074	.10
.3	.7674	1.303	.15	.3	.4315	2.317	.65	.3	.2427	4.121	.15
.4	.7586	1.318	.20	.4	.4266	2.344	.70	.4	.2399	4.169	.20
.5	.7499	1.334	.25	.5	.4217	2.371	.75	.5	.2371	4.217	.25
.6	.7413	1.349	.30	.6	.4169	2.399	.80	.6	.2344	4.266	.30
.7	.7328	1.365	.35	.7	.4121	2.427	.85	.7	.2317	4.315	.35
.8	.7244	1.380	.40	.8	.4074	2.455	.90	.8	.2291	4.365	.40
.9	.7161	1.396	.45	.9	.4027	2.483	.95	.9	.2265	4.416	.45
3.0	.7079	1.413	.50	8.0	.3981	2.512	4.00	13.0	.2239	4.467	.50
.1	.6998	1.429	.55	.1	.3936	2.541	.05	.1	.2213	4.519	.55
.2	.6918	1.445	.60	.2	.3890	2.570	.10	.2	.2188	4.571	.60
.3	.6839	1.462	.65	.3	.3846	2.600	.15	.3	.2163	4.624	.65
.4	.6761	1.479	.70	.4	.3802	2.630	.20	.4	.2138	4.677	.70
.5	.6683	1.496	.75	.5	.3758	2.661	.25	.5	.2113	4.732	.75
.6	.6607	1.514	.80	.6	.3715	2.692	.30	.6	.2089	4.786	.80
.7	.6531	1.531	.85	.7	.3673	2.723	.35	.7	.2065	4.842	.85
.8	.6457	1.549	.90	.8	.3631	2.754	.40	.8	.2042	4.898	.90
.9	.6383	1.567	.95	.9	.3589	2.786	.45	.9	.2018	4.955	.95
4.0	.6310	1.585	2.00	9.0	.3548	2.818	.50	14.0	.1995	5.012	7.00
.1	.6237	1.603	.05	.1	.3508	2.851	.55	.1	.1972	5.070	.05
.2	.6166	1.622	.10	.2	.3467	2.884	.60	.2	.1950	5.129	.10
.3	.6095	1.641	.15	.3	.3428	2.917	.65	.3	.1928	5.188	.15
.4	.6026	1.660	.20	.4	.3388	2.951	.70	.4	.1905	5.248	.20
.5	.5957	1.679	.25	.5	.3350	2.985	.75	.5	.1884	5.309	.25
.6	.5888	1.698	.30	.6	.3311	3.020	.80	.6	.1862	5.370	.30
.7	.5821	1.718	.35	.7	.3273	3.055	.85	.7	.1841	5.433	.35
.8	.5754	1.738	.40	.8	.3236	3.090	.90	.8	.1820	5.495	.40
.9	.5689	1.758	.45	.9	.3199	3.126	.95	.9	.1799	5.559	.45

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



## SECTION T—TABLE 2

In the following tabulation is recorded the relation between the new VU, and the old 6 mw. reference levels. Although there is a definite repetition of figures, values from -20 to +40 VU. 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.

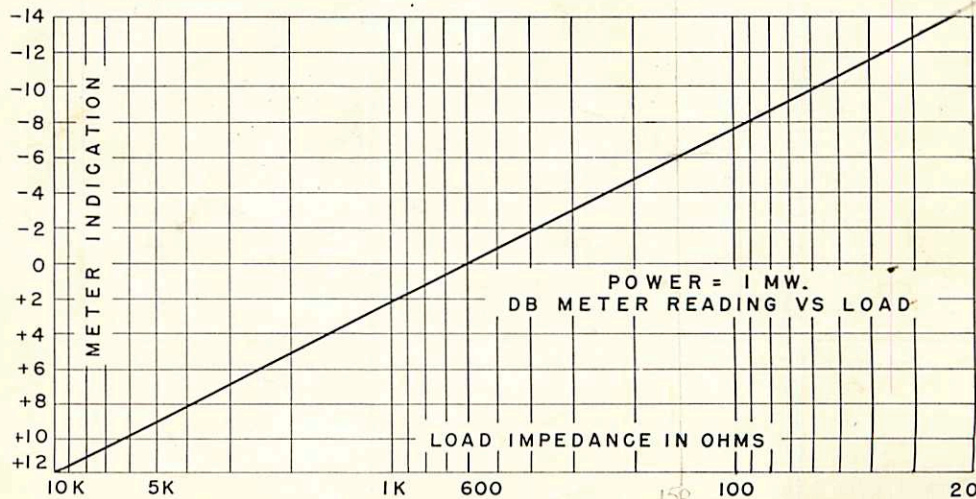
Given 6 mw. in 500 ohm reference to obtain:

- (a) Level of 1 mw. in 600 ohms add 6.9897 db.
- (b) Level of 6 mw. in 600 ohms subtract 0.7918 db.

REFER- ENCE LEVEL .001 w. in 600Ω			REFERENCE LEVEL .006 w. in 500Ω		REFER- ENCE LEVEL .001 w. in 600Ω			REFERENCE LEVEL .006 w. in 600Ω	
Decibels	R.M.S. Volts	Watts	Decibels	Decibels	Decibels	Volts	Watts	Decibels	Decibels
-20	.07746	.000010	-26.9897	-27.7815	+11	2.7485	0.01259	+ 4.0103	+ 3.2185
-19	.08691	.0000126	-25.9897	-26.7815	12	3.0838	0.01585	5.0103	4.2185
-18	.09752	.0000158	-24.9897	-25.7815	13	3.4742	0.01995	6.0103	5.2185
-17	.10949	.0000199	-23.9897	-24.7815	14	3.8823	0.02512	7.0103	6.2185
-16	.12275	.0000251	-22.9897	-23.7815	15	4.3557	0.03162	8.0103	7.2185
-15	.13773	.0000316	-21.9897	-22.7815	16	4.8873	0.03981	9.0103	8.2185
-14	.15454	.0000398	-20.9897	-21.7815	17	5.4838	0.05012	10.0103	9.2185
-13	.17323	.0000501	-19.9897	-20.7815	18	6.1531	0.06310	11.0103	10.2185
-12	.19458	.0000631	-18.9897	-19.7815	19	6.9036	0.07943	12.0103	11.2185
-11	.21830	.0000794	-17.9897	-18.7815	20	7.7460	0.10000	13.0103	12.2185
-10	.24495	.0001000	-16.9897	-17.7815	+21	8.6913	0.12589	+14.0103	+13.2185
-9	.27485	.0001259	-15.9897	-16.7815	22	9.7519	0.1585	15.0103	14.2185
-8	.30838	.0001585	-14.9897	-15.7815	23	10.949	0.1995	16.0103	15.2185
-7	.34742	.0001995	-13.9897	-14.7815	24	12.275	0.2512	17.0103	16.2185
-6	.38823	.0002512	-12.9897	-13.7815	25	13.773	0.3162	18.0103	17.2185
-5	.43557	.0003162	-11.9897	-12.7815	26	15.454	0.3981	19.0103	18.2185
-4	.48873	.0003981	-10.9897	-11.7815	27	17.323	0.5012	20.0103	19.2185
-3	.54838	.0005012	-9.9897	-10.7815	28	19.458	0.6310	21.0103	20.2185
-2	.61531	.0006310	-8.9897	-9.7815	29	21.830	0.7943	22.0103	21.2185
-1	.69036	.0007943	-7.9897	-8.7815	30	24.495	1.0000	23.0103	22.2185
0	.77460	.0010000	-6.9897	-7.7815	+31	27.485	1.2589	+24.0103	+23.2185
+1	.86913	.001259	-5.9897	-6.7815	32	30.838	1.5849	25.0103	24.2185
2	.97519	.001585	-4.9897	-5.7815	33	34.742	1.9953	26.0103	25.2185
3	1.0949	.001995	-3.9897	-4.7815	34	38.823	2.5119	27.0103	26.2185
4	1.2275	.002512	-2.9897	-3.7815	35	43.557	3.1623	28.0103	27.2185
5	1.3773	.003162	-1.9897	-2.7815	36	48.873	3.9811	29.0103	28.2185
6	1.5454	.003981	-0.9897	-1.7815	37	54.838	5.0119	30.0103	29.2185
7	1.7323	.005012	+ 0.0103	-0.7815	38	61.531	6.3096	31.0103	30.2185
8	1.9458	.006310	+ 1.0103	+ 0.2185	39	69.036	7.9433	32.0103	31.2185
9	2.1830	.007943	+ 2.0103	+ 1.2185	40	77.460	10.000	33.0103	32.2185
10	2.4495	0.01000	+ 3.0103	+ 2.2185					

TABLE 4

Since the standard VU meter is a voltmeter calibrated in DB, it indicates level correctly only when bridged across 600 ohms. The following curve indicates the correction necessary when the power into the load is 1 mw and the meter is bridged across other impedances. This curve is calculated using the meter impedance as shunting the load — for example 7500 ohms represents the meter bridged across an open circuit.





$S = \sqrt{\frac{Z_1}{Z_2}}$  SEE p. 53

## SECTION T—TABLE 3

### IMPEDANCE vs. DECIBEL LOSS

Column 1 Ratio Z/Z = S <sup>2</sup>				Column 2 Impedance Mismatch DB = $10 \log_{10} \left( \frac{1+S^2}{2S} \right)$				Column 3 Minimum Loss DB = $20 \log_{10} (S + \sqrt{S^2 - 1})$				Column 4 Bridging Loss DB = $10 \log_{10} S^2$			
1.0	.0	.0	.0	8.0	4.025	14.77	9.031	25.0	8.300	19.91	13.98				
.1	.00993	2.705	.4139	.1	4.085	14.83	9.085	.5	8.380	20.00	14.07				
.2	.0364	3.770	.7918	.2	4.105	14.88	9.138	26.0	8.460	20.10	14.15				
.3	.0778	4.548	1.139	.3	4.160	14.92	9.191	.5	8.540	20.17	14.23				
.4	.1223	5.180	1.461	.4	4.200	14.97	9.243	27.0	8.630	20.24	14.31				
.5	.172	5.723	1.761	.5	4.255	15.05	9.294	.5	8.680	20.30	14.39				
.6	.240	6.190	2.041	.6	4.285	15.10	9.345	28.0	8.760	20.40	14.47				
.7	.308	6.615	2.304	.7	4.320	15.15	9.395	.5	8.845	20.49	14.55				
.8	.366	6.990	2.553	.8	4.360	15.20	9.445	29.0	8.920	20.55	14.62				
.9	.440	7.340	2.788	.9	4.400	15.25	9.494	.5	8.970	20.63	14.70				
2.0	.510	7.665	3.010	9.0	4.440	15.30	9.542	30.0	9.040	20.70	14.77				
.1	.570	7.955	3.222	.1	4.480	15.36	9.590	.5	9.095	20.78	14.84				
.2	.660	8.235	3.424	.2	4.510	15.40	9.638	31.0	9.160	20.87	14.91				
.3	.732	8.490	3.617	.3	4.550	15.44	9.685	.5	9.250	20.94	14.98				
.4	.804	8.740	3.802	.4	4.600	15.50	9.731	32.0	9.320	21.00	15.05				
.5	.883	8.970	3.979	.5	4.640	15.54	9.777	.5	9.360	21.07	15.12				
.6	.962	9.185	4.150	.6	4.660	15.60	9.823	33.0	9.440	21.13	15.19				
.7	1.030	9.388	4.314	.7	4.700	15.67	9.868	.5	9.480	21.21	15.25				
.8	1.088	9.580	4.472	.8	4.740	15.70	9.912	34.0	9.560	21.28	15.31				
.9	1.168	9.775	4.624	.9	4.780	15.74	9.956	.5	9.600	21.34	15.38				
3.0	1.244	9.960	4.771	10.0	4.800	15.79	10.00	35.0	9.660	21.40	15.44				
.1	1.312	10.01	4.914	.1	4.880	15.87	10.09	.5	9.710	21.46	15.50				
.2	1.387	10.30	5.052	.2	4.950	15.95	10.17	36.0	9.770	21.51	15.56				
.3	1.468	10.47	5.185	.3	5.010	16.05	10.25	.5	9.840	21.57	15.62				
.4	1.527	10.62	5.315	.4	5.090	16.13	10.33	37.0	9.890	21.67	15.68				
.5	1.598	10.76	5.441	.5	5.150	16.22	10.41	.5	9.940	21.73	15.74				
.6	1.670	10.90	5.563	.6	5.220	16.31	10.49	38.0	10.00	21.77	15.80				
.7	1.733	11.04	5.682	.7	5.290	16.38	10.57	.5	10.05	21.83	15.85				
.8	1.807	11.18	5.798	.8	5.340	16.47	10.64	39.0	10.10	21.90	15.91				
.9	1.868	11.31	5.911	.9	5.410	16.53	10.72	.5	10.17	21.93	15.97				
4.0	1.938	11.43	6.021	11.0	5.470	16.63	10.79	40.0	10.21	21.97	16.02				
.1	2.000	11.56	6.128	.1	5.545	16.70	10.86	.5	10.28	22.07	16.07				
.2	2.070	11.68	6.232	.2	5.600	16.77	10.93	41.0	10.31	22.11	16.13				
.3	2.130	11.80	6.335	.3	5.650	16.84	11.00	.5	10.37	22.15	16.18				
.4	2.200	11.88	6.434	.4	5.700	16.92	11.07	42.0	10.42	22.20	16.23				
.5	2.266	12.02	6.532	.5	5.750	17.00	11.14	.5	10.47	22.26	16.28				
.6	2.318	12.13	6.628	.6	5.820	17.03	11.21	43.0	10.51	22.32	16.33				
.7	2.391	12.23	6.721	.7	5.875	17.12	11.27	.5	10.57	22.36	16.38				
.8	2.431	12.33	6.812	.8	5.930	17.18	11.33	44.0	10.60	22.40	16.43				
.9	2.490	12.43	6.902	.9	5.990	17.25	11.40	.5	10.66	22.47	16.48				
5.0	2.550	12.53	6.990	12.0	6.050	17.32	11.46	45.0	10.69	22.51	16.53				
.1	2.607	12.63	7.076	.1	6.093	17.38	11.52	.5	10.77	22.54	16.58				
.2	2.667	12.72	7.160	.2	6.150	17.43	11.58	46.0	10.81	22.60	16.63				
.3	2.725	12.83	7.243	.3	6.205	17.50	11.64	.5	10.83	22.67	16.67				
.4	2.778	12.91	7.324	.4	6.248	17.57	11.70	47.0	10.88	22.70	16.72				
.5	2.837	13.00	7.404	.5	6.300	17.63	11.76	.5	10.93	22.73	16.77				
.6	2.893	13.08	7.482	.6	6.420	17.78	11.90	48.0	10.97	22.77	16.81				
.7	2.932	13.17	7.559	.7	6.420	17.78	11.90	.5	11.02	22.83	16.86				
.8	2.997	13.26	7.634	.8	6.420	17.78	11.90	49.0	11.05	22.90	16.90				
.9	3.050	13.33	7.708	.9	6.420	17.78	11.90	.5	11.10	22.93	16.95				
6.0	3.090	13.41	7.782	13.0	6.300	17.63	11.76	50.0	11.14	22.96	16.99				
.1	3.155	13.48	7.853	.1	6.550	17.92	12.04	.5	11.55	23.38	17.40				
.2	3.208	13.57	7.924	.2	6.666	18.05	12.17	60.0	11.83	23.56	17.78				
.3	3.240	13.65	7.993	.3	6.790	18.18	12.30	.5	12.23	24.11	18.13				
.4	3.293	13.71	8.062	.4	6.890	18.32	12.43	70.0	12.55	24.44	18.45				
.5	3.341	13.79	8.129	.5	7.010	18.43	12.55	.5	12.84	24.74	18.75				
.6	3.400	13.87	8.195	.6	7.110	18.57	12.67	80.0	12.97	25.02	19.03				
.7	3.453	13.92	8.261	.7	7.220	18.68	12.79	.5	13.37	25.12	19.29				
.8	3.490	14.00	8.325	.8	7.340	18.80	12.90	90.0	13.62	25.53	19.54				
.9	3.540	14.07	8.388	.9	7.425	18.92	13.01	95.0	13.81	25.77	19.78				
7.0	3.600	14.13	8.451	14.0	7.510	19.02	13.12	100.0	14.07	25.99	20.00				
.1	3.630	14.20	8.513	.1	7.600	19.13	13.22								
.2	3.683	14.27	8.573	.2	7.700	19.22	13.32								
.3	3.735	14.32	8.633	.3	7.795	19.33	13.42								
.4	3.778	14.40	8.692	.4	7.895	19.42	13.52								
.5	3.810	14.46	8.750	.5	7.980	19.52	13.62								
.6	3.853	14.51	8.808	.6	8.055	19.62	13.71								
.7	3.908	14.58	8.865	.7	8.140	19.73	13.80								
.8	3.948	14.65	8.921	.8	8.213	19.83	13.89								
.9	3.985	14.70	8.976	.9											

19.98  
38

Note: For unequal Ratio Bridging Pads add Column 3 and Column 4 to obtain total loss.



## TYPE NUMBER INDEX

TYPE OR SERIES	ITEM	PAGE	TYPE OR SERIES	ITEM	PAGE	TYPE OR SERIES	ITEM	PAGE
7A	Transmission Measuring Set	85	320-BAL	Attenuator	14	730-CP	Potentiometer	35
8A	Transmission Measuring Set	86	320-BH	Attenuator Bal. "H"	28	730-CPD	Potentiometer, Dual	39
10B	Transmission Measuring Set	87	320-DCP	Potentiometer, Dual	37	730-DCP	Potentiometer, Dual	36
11A	Transmission Measuring Set	88	320-DSP	Potentiometer, Dual	43	730-DP	Potentiometer, Dual	45
12A	Transmission Measuring Set	89	320-LL, LR	Attenuator	46	730-LA	Attenuator	8
34B	Noise Measuring Set	90	320-PS	Stereophonic Attenuator	26	730-P	Potentiometer	41
35A	Distortion & Noise Meter	91	320-PT	Attenuator "T"	26	730-T	"T" Attenuator	22
37A	Audio Effects Filter	96	320-T	Attenuator "T"	21	740-TA, TB	Attenuation Box	75
40A	Audio Oscillator	101	330-BAL	Attenuator	16	742-TA, TB	Attenuation Box	75
101-V	Video Distribution Network	102	330-BH	Attenuator Bal. "H"	30	745-CP	Potentiometer	35
102-V	Video Line Pad	102	330-CR	Rheostat	46	745-CPD	Potentiometer, Dual	39
103-V	Video Roll-Off Network	102	330-DCP	Potentiometer, Dual	37	745-LA	Attenuator	10
130-CP	Potentiometers	34	330-DSP	Potentiometer, Dual	43	750	Decade Box	76, 77
130-CPD	Potentiometers	38	330-LL, LR	Attenuator	46	790	Video Attenuation Network	72
130-LA	Attenuators	7	330-R	Rheostat	46	795	Video Attenuation Network	72
153-H	Fixed Pads	60	330-T	Attenuator, "T"	23	820	Vertical Attenuators	17
153-HA, HB	Fixed Pads	62	345-BH	Attenuator	31	830	Vertical Attenuators	17
153-HC, HDF	Fixed Pads	62	345-CR	Rheostat	46	838-A	Frequency Meter, Electronic	97
153-T	Fixed Pads	56	345-LA	Attenuator	11	910	VU Meter	81
153-TA, TB	Fixed Pads	62	345-LAF	Dual Fader	12	911	VU Meter	81
153-TC, TD	Fixed Pads	62	345-P	Potentiometer	41	912	VU Meter	81
154-H	Fixed Pads	59	345-R	Rheostat	46	913	VU Meter	81
154-T	Fixed Pads	55	345-T	Attenuator "T"	24	915	VI Meter	82
155-RF	RF & Video Fixed Attenuators	68	350-CP	Potentiometer	34	920	VI Meter	83
156-RF	RF & Video Fixed Attenuators	68	350-CPD	Potentiometer, Dual	38	950-H	Fixed Pad	58
157-RF	RF & Video Fixed Attenuators	68	350-CR	Rheostat	46	950-T	Fixed Pad	54
158-RF	RF & Video Fixed Attenuators	68	350-DP	Potentiometer, Dual	44	961-OP	Power Output Meter	93
170	Vacuum Tube Voltmeter	94	350-LA	Attenuator	6	962-OP	Power Output Meter	93
170-MU	Meter Multipliers	95	350-P	Potentiometer	40	991	Meter Adjuster	47
176	Decade Amplifier	95	350-R	Rheostat	46	994-T	Meter Multiplier	47
180-D	Output Meter	100	375	Decade Unit	79	1000-TA	Meter Multiplier	47
182-OP	Power Output Meter	92	470	Ratio Arm Box	77	1030	Fixed Pad, Tapped	63
187	Decade Voltage Divider	80	471	Ratio Arm Box Unit	77	1031	Fixed VU Multiplier	63
220-LA	Attenuator	9	501-LR	Logarithmic Resistor	100	1032	Fixed VU Zero Adjusting	63
220-LAF	Dual Fader	12	520-BH	Bal. "H" Attenuator	32	1100 to	Resistors	R-4
250-CR	Rheostat	46	520-T	Attenuator "T"	25	1117	Resistors	R-4
250-DP	Potentiometer, Dual	45	530-BH	Bal. "H" Attenuator	32	1120 to	Resistors	R-5
250-LL, LR	Attenuator	46	530-T	Attenuator "T"	25	1128	Resistors	R-5
250-P	Potentiometer	40	540-RFA	Attenuators	67	1130	Fixed Pads, Multiple	64
250-PT	Power "T" Attenuator	26	540-RFB	Attenuators	67	1140 to	Resistors	R-5
250-R	Rheostat	46	550-RFA	Attenuators	67	1147	Resistors	R-5
250-T	"T" Attenuator	19	550-RFB	Attenuators	67	1140A to	Resistors	R-5
250-V	Video Attenuator	66	570	Ratio Arm Box	77	1147A	Resistors	R-5
255-BAL	Attenuator	13	571	Ratio Arm Box Unit	77	1156	Resistors	R-5
255-BH	Bal. "H" Attenuator	27	620-P	Potentiometer	42	1156-A	Resistors	R-5
255-DCP	Potentiometer	36	630-P	Potentiometer	42	1160 to	Resistors	R-6
255-DSP	Potentiometer	44	640	"RF" Attenuation Networks	73	1165	Resistors	R-6
255-T	Attenuator	20	650	"RF" Attenuation Networks	73	1230	Fixed Pad, Tapped	63
275	Decade Unit	78	690-H	Attenuation Networks	74	1530	Fixed Pad, Multiple	63
286	Line Equalizer	98, 99	690-T	Attenuation Networks	74	1790	Video & RF Attenuators	70, 71
289	Line Equalizer	98, 99	693-H	Attenuation Networks	74	1797	Video & RF Attenuators	69
290	Line Equalizer	98, 99	693-T	Attenuation Networks	74	1798	Video & RF Attenuators	69
291	Line Equalizer	98, 99	720-LAC	Tone Compensating	50	1799	Video Attenuators	69
292	Line Equalizer	98, 99	725-LAC	Tone Compensating	50	1870	Decade Voltage Unit	80
293	Line Equalizer	98, 99	730-BAL	Attenuator	15	1871	Decade Voltage Unit	80
294	Line Equalizer	98, 99	730-BH	Attenuator	29	2500	Decade Attenuators	48
						3200	Imp-Matching Attenuators	49
						6811 to	Fixed Pads	74
						6881	Fixed Pads	74
						6911 to	Fixed Pads	74
						6981	Fixed Pads	74
						7311 to	Fixed Pads	75
						7383	Fixed Pads	75
						7411 to	Fixed Pads	75
						7483	Fixed Pads	75



## ITEM INDEX

ITEM	PAGE	ITEM	PAGE	ITEM	PAGE
Attenuation Networks, Audio	74, 75	ATTENUATORS: FIXED PADS		Network, Attenuation Audio	74, 75
Attenuation Networks, RF and Video	72, 73	"T" Network	54, 55, 56	Network, Attenuation RF	73
Attenuators: Balanced "H" Network		"T" Network	57, 62	Network, Attenuation Video	72
20 steps	27, 28, 32	"T" Network Power	62	Noise Measuring Set	90
30 steps	29, 30, 32	Tapped	63		
45 steps	31	Video	68	Ordering Information	51
Attenuators: Decade, Audio	48	Audio Effects Filter	96	Oscillator, Audio	101
Attenuators: Decade, RF and Video	70, 71	Audio Oscillator	101	Output Meter	100
Attenuators: Fader, Dual for Turntable	12	Balanced "H" Fixed Pads	58 to 62	Output Power Meters	92, 93
Attenuators: Impedance Matching, Audio	49	Balanced "H" Attenuators	27 to 32	Potentiometers	33 to 45
RF and Video	69	Balanced "H" Attenuators "RF"	70, 71	Potentiometers, Dual	See Attenuators
Attenuators: "L" Network	46	Balanced Ladder Attenuators	13 to 17	Power "T" Attenuators	26
Attenuators: Ladder Network		Controls	See Attenuators	Power Fixed Attenuators (Pads)	62
20 steps	6, 17	Decade Amplifier	95	Power Output Meters	92, 93
30 steps	7, 8, 9	Decade Attenuators	48, 70, 71	Precision Resistors,	
45 steps	10, 11	Decade Resistance Box	76, 77	Hermetically-sealed	Section R
Vertical	17	Decade Resistance Unit	78, 79	Wire wound	Section R
Attenuators: Ladder Network, Balanced, 20 steps	13, 14, 17	Decade Switch	Section S		
Balanced, 30 steps	15, 16	Decade Voltage Divider	80	Ratio Arm Box	77
Balanced, Vertical	17	Distortion and Noise Meter	91	Ratio Arm Unit	77
Attenuators: Meter Multiplier	47	Electronic Frequency Meter	97	Resistance, Decade Box	76, 77
Attenuators: Meter Rheostat For VU Adjustment	47	Electronic Voltmeter	94	Resistance, Decade Units	78, 79
Attenuators: Potentiometer		Equalizers, Line	98, 99	Resistors,	
20 steps	34, 40, 42	Faders, Dual for Turntables	12	Hermetically-Sealed	Section R
30 steps	34, 35, 41, 42	Filters, Audio Effects	96	Logarithmic	100
45 steps	35, 41	Fixed Attenuators (Pads)	52 to 64	Precision Wire wound	Section R
Attenuators: Potentiometer, Dual		Fixed Attenuators RF	68	RF Attenuators	67
Composition Resistors		Fixed Attenuators Video	68	RF Attenuation Networks	73
20 steps	36, 37, 38	Frequency Meter, Electronic	97	RF Fixed Attenuators	68
30 steps	36, 37, 38, 39	Gain Sets (Transmission)	84 to 90	RF Impedance Matching Attenuators	69
45 steps	39	General Information	51	RF Tapped Attenuators	68
Attenuators: Potentiometer, Dual, Wire Wound Resistors		Impedance Matching Attenuator, (Networks)		Rheostats	46, 47
20 steps	43, 44, 45	Audio	49	Sealed-Ohm Resistors	Section R
30 steps	43, 45	RF	69	Stereophonic Attenuator	26
Attenuators: Radio Frequency	67	Video	69	Super-Davohm Resistors	Section R
Attenuators: Rheostat	46, 47	Indicator, Volume Level	81, 92, 83	Switches	Section S
Attenuators: Stereophonic	26	Indicator, VU Level	81	Switches, Decade	Section S
Attenuators: "T" Network		"L" Network Attenuator	46	"T" Network Attenuators	17 to 26
10 steps	19	Ladder Network Attenuator	5 to 11	Technical Data	T-1
20 steps	17, 20, 21, 25	Ladder Network Vertical Attenuator	17	Tone Compensating Attenuators	50
30 steps	22, 23, 25	Lever Type Vertical Attenuator	17	Transmission Measuring Sets	84 to 90
45 steps	24	Line Equalizers	98, 99		
Vertical	17	Logarithmic Resistor	100	Vacuum Tube Voltmeter	94
Power 6 and 10 watts	26	Meter, Distortion and Noise	91	Vertical (Lever) Attenuators	17
Attenuators: Tone Compensating	50	Meter, Electronic Frequency	97	Video Attenuators	66
Attenuators: Video	66	Meter, Multipliers	47, 95	Video Attenuation Networks	72
Attenuators: Fixed Pads		Meter, Output	100	Video Decade Attenuator	70, 71
Balanced "H"	58, 59, 60	Meter, Output, Power	92, 93	Video Distribution Network	102
Balanced "H"	61, 62	Meter, Volume Level	81, 82, 83	Video Fixed Attenuator	68
Bal. "H" Power	62	Meter, VU	81	Video Impedance Matching Attenuator	69
Branching	64	Mixers	See Attenuators	Video Line Pad	102
Multiple Output	63	Multipliers, Meter	47	Video Roll-Off Network	102
Radio Frequency	68	Multiplier, Electronic Voltmeter	95	Voltage Divider, Decade	80
				Voltmeter, Vacuum Tube	94
				Volume Controls	See Attenuators
				Volume Level Indicator	81, 82, 83
				VU Meter	81
				VU Meter Multipliers	47