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INSTRUMENTS OF QUALITY

Continuously Variable Passive Filters
Spectrum Equalizers
Spectrum Analyzers
Modular Amplifiers
Random Noise Sources
Automatic Inspection Units
Multiple Oscillators
Instrumentation Modules
Custom Instrumentation

VARIABLE FILTERS

wide dynamic range
no internal noise
flat pass bands
steep continuous attenuation
negligible ringing effect

SERIES 2

The Model 2 Series are variable passive network filters with independent high cutoff and low cutoff sections. Each section has a range switch that changes the cutoff in octave steps with a vernier dial that tunes over a range of one octave. The attenuation rate is 30 dB per octave and they may be cascaded for increased attenuation. Two filters give 60–70 dB per octave. The smooth pass band is flat ±1 dB over 80% of the pass band. It may be tuned to a bandwidth as narrow as 1/3 octave. The maximum input voltage is 2 volts. The input and output impedance is 600 ohms.

Size: 7·l i" high, 7·l i' deep, 17·l i" wide.

Rack model is mounted on a 7" panel with 6·1 i' deep.

MODEL RANGE SH. WGT. PRICE
2AB 15-20,000 cps 24$ $495
2B 60-20,000 cps 26$ $395
2C 3-672 cps 18$ $375
2D 250 cps-400 cps 19$ $385

Rack mount is the same price and shipping weight for all models.

Add 15% of the standard unit price for hermetically sealed capacitors.

The new Model 201 extends into the sub-audio range while retaining all of the desirable characteristics of the 2 series, such as excellent transient handling capability, ability to handle small signal parameters and no active elements. The low noise, low distortion and good transient handling capacities of this filter make it excellent for studies of low level transient phenomena, such as encountered in heart studies, geophysical work, thermocouples and low frequency vibrations. With high cutoff only, the filter will pass DC to the cutoff frequency.

A chart is provided on the panel for reading the multiplier dial directly into cps.

Low cutoff section 1 to 328 cps
High cutoff section 2 to 256 cps

Size: 7·l i' high, 7·l i' deep, 17·l i' wide.

201 Sh. Wgt. 35$ $725
201 R Rack Mount Sh. Wgt. 35$ $725

Hermetic Capacitors Not Available
Model 420

Typical Filter

Designed as an inexpensive general purpose filter for laboratory and production use, the 420 is very simple to operate and is direct reading with a single knob control for each section covering a range from 20 to 20,000 cps. A selector is provided for switching the filter out, low cutoff only, high cutoff only, or band pass mode of operation. There is 20 db or more attenuation per octave for the first octave, with attenuation outside the pass band exceeding 25 db at all frequencies beyond an octave away from cutoff frequency. Minimum bandwidth — approximately ½ octave. Maximum input — 2 volts. Impedance — 600 ohms. Portable — excluding knobs and handle: (shown) 17" long, 5½" deep, 8" high.

Available also in rack mount case with 7" x 19" panel and 5½" behind the panel.

TYPICAL CURVES

<table>
<thead>
<tr>
<th>MODEL</th>
<th>FREQUENCY</th>
<th>PRICE</th>
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Individual filters by quotation

See also 1/3 octave analyzer, page 8

IMPEDEANCE MATCHING TRANSFORMERS

These units are used for applications where it is inconvenient to match impedances of 600 ohms. The AL-483 Input Transformer is an autotransformer designed to work from approximately 10,000 ohms to the 600 ohm circuit of the filter. The AL-484 Output Transformer is designed to match the 600 ohms impedance of the filter into the grid of a vacuum tube or a VTVM. The output transformer has an impedance ratio of 600 to 45,000 ohms. A terminating resistor is built into the transformer to properly terminate the filter.

Each transformer is encased in a metal case and a grounded steel case.

In the event that high impedance inputs are required in frequencies above or below the above limits, refer to the Model 659 amplifier. These units have input impedance of 40,000 ohms and match the filter using a 600 ohm series resistor. The frequency coverage can be extended in this manner from 10 cps to 500 kcps.

TYPICAL CURVES ALL FILTERS

Fixed 1/3 octave filters having excellent uniform response. Each model consists of 1 decade of 10 filters, case complete with power supply. These are passive networks using solid state isolation and amplification.

Standard filters are on ASA preferred center frequencies. Special filters may be ordered to other frequencies and down to 5% bandwidth. Individual filters are also available cased or uncased as desired.
RANDOM NOISE SOURCES

**MODEL 650**

A superior random noise source for general use. Using the Model 655 Module as a source it provides references and controls. Filters are also provided for equal energy per octave (Pink) noise, 12 db/octave roll off above 1000 cps and a 100 to 300 cps narrow band. The unit is non microphonic and has a maximum output of 1.5 vms in the equal energy per cycle setting. This is widely used as a signal source for shake tables, acoustic testing, etc. Available also in rack-mount case on a 3½" x 19" panel x 6½".

**MODEL 655**

An extremely useful noise module for many applications. Commonly internally mounted for test and calibration signals in various instruments. Requires only 22.5 VDC to produce random noise having good Gaussian distribution of amplitudes and uniform spectral density. A silicon diode furnishes the signal source for a germanium transistorized amplifier. Frequency response is 5cps to 30kcps and typically produces 2 volts rms into 10K ohm load. Temperature stability is approximately ±3db over 0° to 50°C.

**MODEL 685**

Same size and power requirements as the 655 but is all silicon construction. Outstanding for temperature stability, within 2db from 0° to 60°C.

**MODEL 681**

Again same size and construction as Model 655 except frequency response from 10cps to 1 mcpp. Lower voltage out.

**MODEL 657**

High temperature device having all silicon active elements plus tantalum capacitors. Performance 5cps to 100kcps over temperature range of -20° C to +85°C.

**OCTAVE BAND EQUALIZERS AND SPECTRUM SHAPERS**

**MODELS 318-19-48-49**

These newly redesigned instruments present a series of octave band filters sets for many uses. They may contain 8 or 9 octave bands on the new preferred frequency centers starting at 31.5cps and up to 16k cps. All filters are fed in parallel on the input and have individual new slide type attenuators to control the level in each band. The Models 318 and 319 are complete filters sets for use with any signal source.

Models 348 and 349 are similar to the above two models but in addition have a random noise source plus input and output amplifiers. This provides a complete shaped spectrum signal for driving shake tables, high level acoustic test facilities, and many other applications.

**MODEL 322**

This new instrument is a continuation of the 300 series at left. The use of new slide attenuators plus excellent 1/3 octave bands give greater definition to shaped spectrums over the center frequencies from 20 cps to 250 kcps. A maximum of 22 filters may be included in this range such as 20cps to 2500cps. The complete 1/3 octave series are in decades starting with 25, 31.5, 40, 50, 63, 80, 100, 125, 160 and 200cps. Centers above and below may be obtained as a factor of 10, 100 or 1000 above or below these frequencies. A random noise source is included in this instrument plus its associated power supplies, amplifiers and circuitry. This makes a complete signal source for shaped spectrums. For typical filter curves, see page 4.

**PRICES**

<table>
<thead>
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<th>Mode</th>
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<td>319A</td>
<td>9 Band Filter w/ noise generator</td>
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<td>348A</td>
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<td>322</td>
<td>12½&quot;X19&quot; rack panel 19&quot; behind the panel,</td>
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MODELS 358–359

These are simultaneous octave band analyzers having either 8 or 9 octave band filters. The filters are fed in parallel and each channel is provided with a meter circuit on the output. The meters read in decibels the energy in each octave of the spectrum. Specifically damped meter circuits have good response to complex signals such as random noise. The instantaneous readout may be recorded from individual outputs or photographed. Octave bands are on preferred frequency centers over the range of 31.5 cps to 16,000 cps. Any 8 or 9 bands may be selected.

PRICES
Model 358R $2635
Model 359R $2990

MICROPHONE ACCESSORY MODEL 533

The Model 533 Accessory Kit consists of a very stable and reliable dynamic microphone, tripod, cable and input transformer. This arrangement permits the Model 532 to be used as a sound level meter for sound pressure levels above 65 dB. The kit has a 25 foot cable furnished and a 100 foot extension is available. The combination 532 and 533 will make industrial sound survey and analysis simple and accurate.

WEIGHT: 4 lb
PRICE: $135.00
100' EXTENSION CABLE 18.75

OCTAVE BAND ANALYZER MODEL 532

The Allison 532 Octave Band Analyzer is a small lightweight spectrum analyzer that is exceedingly easy to operate. The instrument consists of a complete analyzing circuit including attenuator and meter. Used with a sound level meter it will measure signal components in octave bands 60 dB below the overall signal level. Used with the Model 533 shown at the right, it will measure and analyze sound from 65 to 130 db sound pressure level. The 532 is also suitable for use with recorders and microphone preamplifiers and similar equipment. It is useful for the octave band analysis of environmental noises, complex audio signals, production line testing, noise level acceptance and speech interference levels.

SIZE: 6-3/4 x 6-3/4 x 9”, WEIGHT: 7 lb
PRICE: $425.00

MODEL 540

The Allison Model 540 is a new and exciting instrument for 1/3 octave spectrum analysis with many applications. The extreme flexibility of filter selection over a range of 2.5 cps to 200 kcps makes it suitable for standard or special purpose tests. A repetitive 1 second display of the spectrum allows high speed testing of product or immediate evaluation of design changes and adjustments.

The input signal is fed to a bank of 1/3 octave passive network bandpass filters. The individual filter output is rectified and stored in a capacitor. Each capacitor is sampled consecutively 10 times per second by a motor driven commutator switch. The switch output is amplified logarithmically and the signal is displayed on the calibrated oscilloscope screen shown above. Simultaneously calibration signals are displayed to show instrument accuracy during the test. The filters are continuously open and all signals are received, integrated and stored for display.

The Model 540 shown above covers the range of 25 cps to 20,000 cps. Filters are Allison standard Models 241, 242 and 243 (Page 4). The newness of this instrument prevents a previous background of applications; however, the basic versatility of the unit shows that uses are limited mainly by the frequency range, voltage range and the imagination of the user. It will display the analysis of any repetitive simple or complex waveform or pulses within the above limitations. Many accessories to the standard device can adapt it to various test situations such as a microphone for acoustic input, an accelerometer for vibration pickup, etc. Revisions to the standard model can be made to adapt it to a variety of situations such as narrow band filters or a combination of standard 1/3 and 1/6 octave filters to increase resolution of certain areas, linear rectification only for expanded scale close tolerance measurements, multiple speed scanning motors for recording requirements, special outputs per channel to operate go–no go apparatus. Calibration references permit readout in voltage, decibels re 1 millivolt or sound pressure level.

WEIGHT: 15 lb
PRICE: $7250.00

STANDARD GRATICULE

SIZE: 22” wide x 30” high x 18” deep.
WEIGHT: 300 lbs.
PRICE: $135.00

Typical Curves

1/3 OCTAVE SPECTRUM ANALYZER

STANDARD GRATICULE
MULTIPLE FREQUENCY OSCILLATOR
MODEL 541

The Model 541 provides a long felt need for a simultaneous multiple frequency test signal. Variations of packaging can provide from 2 to 50 frequencies in the range from 2.5 cps to 200 kcps. Individual amplitude controls allow shaping of the spectrum as desired. Switches and meters may be added to give the individual or overall reference level.

Primarily designed as a known, controllable test signal for the Model 540 it is adaptable by changing frequencies or number of oscillators. Other uses include shaker table drive signal, programmable oscillator, etc. The 541 features all solid state circuitry and self contained power supply. Output is .15 Vrms per frequency and approximately .8 Vrms for 30 oscillators.

WEIGHT: 20v
SIZE: 3½" x 19" x 14" deep
PRICE: (30 Oscillators) $950.00

AUTOMATIC INSPECTION UNIT
MODEL 601A

The 601A is an improved solid state instrument for rapid automatic inspection of sound or vibration in any product. It consists of an optional transducer, amplifiers, variable filter, attenuator, meter and relay circuits to signal acceptance or rejection of the product under test. The high cutoff, low cutoff or band pass filters cover the range of 60 cps to 20 kcps. When set to pass objectional frequencies it will measure level and operate go-no-go indicators or separating devices. This unit is used extensively on gears, bearings and similar products. The instruments may be made with 2 channels of filter and indicating circuits.

SIZE: 10-1/4" x 22" x 6-1/4"
WEIGHT: (Single channel) 33v
PRICE: Write giving your requirements for quotation.

INSTRUMENTATION MODULES
MODEL 660

Welded and encapsulated modules are easily adapted to your circuitry whether breadboard or production. The Model 660 is a very low noise flexible preamplifier having adjustable gain and bandwidth. Using only 1 MA of 13.5 to 22.5 VDC it saves space and power. The feedback loop is brought out to pins on the top of the module. This allows customer selection of feedback value for gain and resulting bandwidth. Turned circuits may also be inserted for selective amplification. Molds in 6 to 32 inserts simplify mounting. Transistors are readily serviced since sockets are also molded in.

GAIN AT 1 KCPs 20 to 40 db.
GAIN STABILITY ±.5 db O°c to 50°c.
INPUT IMPEDANCE 40,000 ohms.
AVERAGE CURRENT 85 db.
FREQUENCY RESPONSE 30db 10 cps to 1 mcs.

$33.00

MODEL 659 (class B)

Another welded and encapsulated module designed to be used in filter driver applications. An output of 6 volts into 600 ohms with an input impedance of 40,000 ohms makes it suitable for many other circuits. Again, as in the Model 660, it has an open feedback loop for variation of gain and bandwidth. Used in conjunction with the Model 660 and 671 meter system it forms a transistorized voltmeter with sensitivity to .001 volts rms.

GAIN AT 1 KCPs 30 to 40 db.
GAIN STABILITY 5.5 db 0°c to 50°c.
INPUT IMPEDANCE 40,000 ohms.
AVERAGE CURRENT 2 to 17 MA.
FREQUENCY RESPONSE 30db 10 cps to 400 kcps

PRICE 1-9: $40.00

MODEL 658 (class A)

For multiple channel use from common power source use Model 658. Same performance on constant 12 MA.

VARIABLE GAIN KIT
MODEL 661

Provides self mounted variable control as well as shielding when used in multiples for high gain applications.

PRICE: $8.50

MODEL 659 (class B)
The Allison Model 666 regulated power supply is a solid state dual module device. Designed primarily for the operation of various Allison modules, it may be used for many other instrumentation applications.

The two unit design offers a variation of mounting arrangements for minimum space and convenience. It also allows variation on the transformer when somewhat larger or smaller power requirements occur.

The 666 will produce 100 milliamps of well regulated 25 volts for operation of as many as 6 Model 659, 8 Model 658, 10 Model 660 or combinations of these.

**SPECIFICATIONS**

**INPUT POWER:** 110-130 50-60 cps 5 V.A.

**OUTPUT VOLTAGE:** 24 VDC ±2V

**CURRENT OUTPUT:** 100 Millamps DC Max.

**OUTPUT RIPPLE:** 3 Millivolts.

**SIZE:** 1-13/16" x 1-1/2" x 2-1/2" / 1 x 2-1/8 x 2-1/8

**WEIGHT:** 8 oz.

**PRICE:** $52.50

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This model offers an extremely simple method of monitoring AC voltages or decibels in systems or instrumentation. The full wave bridge rectifier is welded and encapsulated for easy mounting either adjacent or remotely from the meter. Used with the Models 660 and 658, it forms a transistorized voltmeter with .001 volts sensitivity and frequency response from 10 cps to 50 kcps. Meters are available with either or both AC volts and decibels. The meter used is a 2-1/2" standard 3 screw mounting type. Indication is quasi rms. An extra terminal is provided for either slow or fast meter damping for measurement of constant or fluctuating voltages.

**SPECIFICATIONS**

**SENSITIVITY:**

0.0 db = .66 volts

+10 db = 2.1 volts

**FREQUENCY RESPONSE:** -5 db at 20 cps & 600 kcps

**INPUT IMPEDANCE:** 19 k ohms

**PRICE:** $45.00 (Standard scale)

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NEW ALL SILICON 60 MILLIWATT AMPLIFIER

**MODEL 683 (class A)**

The use of newly developed PNP silicon transistors in push pull circuitry makes this new module possible. Compact and highly reliable, it has excellent specifications for noise, variable gain, distortion, stability and other characteristics. This operates full Class A with a constant current of 12 milliamps at 22.5VDC. Frequency response of -1db at 10cps and 240kcps. Output 6 volts into 600 ohms.

**MODEL 684 (class B)**

The Class B counterpart of the above unit for use where minimum current usage is a requirement.

Most all specifications the same except average current is 2.4 milliamps with no signal.

**CONTINUOUSLY VARIABLE INDUCTOR MODEL 195**

A brand new aid to designers is a continuously variable inductor with a range of 10,000 to 1. (1 millihenry to 10 henries). Compact and simple in operation, it has the full range in 8 steps in a 1-3.2, 3.2-10 series.

The inductor has many applications including equalizers, filters, oscillators, adjustable delay networks and adjustable phase shift networks, plus many others.

Tuning is accomplished by the patented Allison variable inductor which has proved itself in many years of fine performance in our continuously variable filters.

Write for specifications and curves of inductance, Q, frequency response and other characteristics.

**SIZE:** 5/16" W x 8/16" H x 5 D

**PRICE:** $95.00 each

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PRELIMINARY ANNOUNCEMENT OF NEW PRODUCTS

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11
LINEAR RECTIFIER
MODEL 677

A solid state rectifier having a 40 db linear range. This unit produces a linear analog of AC voltage presented to it over the range of .05 to 5 volts. Complex voltages are converted on a quasi rms basis. Input frequency range is 20 cps to 20 kcps ±.5 db. Input impedance is approximately 600 ohms and is designed to work from a low impedance output such as the Model 659. Output DC voltage is approximately twice the AC input and the output impedance is 10,000 ohms and designed to work into a load of 100,000 ohms or more.

SIZE: 1-1/4" x 1" x 1-1/4"
WEIGHT: 3 oz.
PRICE
We expect the price to be $36.75

SPECIAL INSTRUMENTS
CONSTRUCTED WITH
ALLISON MODULES

Above are two examples of special instruments designed and produced by Allison Labs. The complete familiarity with our building blocks and their application makes it possible for us to save you many engineering and test hours. Send your problems in the area of filtering, amplification, rectification, analysis, etc.

We cover the full frequency range between a fraction of 1 cps to 1 megacycle in control, amplification, rectification. Filters range from 1 cps to 1000 kcps. The use of welded solid state circuitry prevents microphonics and provides minimum maintenance with maximum reliability.

If you haven't seen just what you need — write giving your specifications. We may be able to adapt a standard unit to your application or have what you want in development.
IN DEVELOPMENT

Allison Labs is constantly searching for new instruments and instrumentation components to broaden our coverage of the sub audio, audio and low RF range. We are particularly working on filtering, signal conditioning and analysis equipment. In addition to increasing the number and variety of off-the-shelf equipment available to you, we welcome your special applications which may require new methods and techniques or special adaptations of our standard equipment. Many special filters have been made by combining or dividing our stock type instruments.

Items now in development which may solve some of your problems are:

1. New low frequency amplifiers to be welded and encapsulated will join the module family. Response to .05 cps and out to 600 kcps in one unit. Probable 2 models differentiated by input and output impedance requirements.

2. Two more additions to the Random Noise Source similar to the Model 655. One low frequency which will use the above amplifier and produce a good random signal down to .05 cps. The second to extend the range to at least 1 megacycle on the upper end.

3. A new meter system to provide wide range measurements (100 - 1) of either AC voltage or db for sinusoidal or complex wave forms. The meter will be calibrated in linear DB (40) and logarithmic volts RMS. With expanded range much decade range switching will be avoided.

4. Higher power modular amplifiers with bandwidths from 5 cps to 500 kcps and power to 30 watts which will be combinable to produce 60 watts. Small package and good thermal stability will be additional features.

5. New applications for the excellent 1/3 octave filters in equalizer-analyzer applications. Spectrum shapers with ranges from 2.5 cps to 200 kcps. Featuring slide attenuators for ease of setting and reading.

6. A new package for our long proved variable inductor. Just the inductor but with range of as much as 10,000 to 1 variation in 1 package. (1 millihenry to 10 henrys). A very handy tool in the laboratory.

7. Additional modular power supplies similar to the model 666 which will supply power to our new power amplifiers.

Again if you haven’t seen what you need in this, please write — it may be possible in our bag of tricks.

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### DECIBEL TO PERCENT CONVERSION CHART

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### TABLE OF PREFERRED FILTER CENTER FREQUENCIES AND THEIR HIGH CUTOFF AND LOW CUTOFF FREQUENCIES. PREFERRED CENTER FREQUENCIES ARE SPECIFIED IN ASA SPECIFICATION S1.6-1960. FOR HIGHER OR LOWER FREQUENCIES MULTIPLY OR DIVIDE BY FACTORS OF 10.

#### OCTAVES

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#### 1/3 OCTAVES

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ASA STANDARDS MAY BE PROCURED FROM: AMERICAN STANDARDS ASSOCIATION INC., 10 E. 40th St., NEW YORK 16, NEW YORK
NETWORKS CAUSING AN INSERTION LOSS OF...

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* THESE VALUES HAVE BEEN MULTIPLIED BY 10^A

** THIS CHART BASED ON 1 OHM CIRCUITS. THIS DATA MAY BE USED TO CALCULATE PADS OF ANY IMPEDANCE BY MULTIPLYING EACH OF THE VALUES BY THE DESIRED IMPEDANCE.

*** FOR PADS OF GREATER THAN 50 DB USE TWO PADS IN SERIES IN A SHIELD TO PREVENT ELECTROSTATIC PICKUP AND FEED THRU.
If you are in an area without present reps, please contact the factory in writing or call collect to 213-691-0132 or 697-7698. We will provide representatives for trial in these areas just as our reps do in their territories.

**UNITED STATES**

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- Anchorage, Alaska
- Broadway 2-6733

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- 1608 E. Earl
- Phoenix, Arizona
- 277-7858

**California (northern):**
- Dynamic Associates
- 344-2521
- Williams Associates
- 277-7858
- Alaska:
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- Williams - Associates
- 3221 Silver Avenue, S. E.
- Albuquerque, New Mexico
- 255-9632

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- 2245 Warrensville Center Road
- Cleveland 18, Ohio
- 497-7851

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- Denver 16, Colorado
- 380-4391

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- 541 McCloy Street
- Honolulu, Hawaii
- 993-149

**Illinois, Indiana, Iowa, Kentucky and Eastern Wisconsin:**
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- 5681 W. Lake Street
- Chicago, Illinois 60644
- 379-7200 (312)

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- 4917 Jackson Street
- Denver 16, Colorado
- 380-4391

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- 541 McCloy Street
- Honolulu, Hawaii
- 993-149

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- Waltham 54, Massachusetts
- TMinook 4-1555

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- Detroit 11, Michigan
- 943-1911

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- 9701 Western Avenue
- Circle Pines, Minnesota
- 781-6568

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- 3221 Silver Avenue, S. E.
- Albuquerque, New Mexico
- 255-9632

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- 510 So. Fulton Avenue
- Mt. Vernon, New York
- MOUNT Vernon 4-7530

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- Albuquerque, New Mexico
- 255-9632

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- 2031 W. 55th Avenue
- Portland 1, Oregon
- CAPITA 2-7337

**Oregon:**
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- 362 Pierpoint Avenue
- Salt Lake City 1, Utah
- 329-3101

**Pennsylvania (Philadelphia area):**
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- 222 Long Lane
- Upper Darby, Pennsylvania
- JACKSON 8-6080

**Utah:**
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- 362 Pierpoint Avenue
- Salt Lake City 1, Utah
- 329-3101

**Washington, Idaho and western Montana:**
- Arva, Inc.
- 1320 Prospere Street
- Seattle 9, Washington
- MAIN 2-0117

**FOREIGN REPRESENTATIVES**

**Australia:**
- Ronald J. T. Payne Pty. Ltd.
- 383-385 Bridge Rd., Richmond
- Victoria, Australia

**Canada:**
- Electrodex
- 9124 St. Lawrence Blvd.
- Montreal, 11, Canada
- DUPONT 9-5914

**France:**
- B. Freudenberg, Inc.
- 50 Rockefeller Plaza
- New York 20, New York

**India:**
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- Via L. Anelli, 13
- Milano, Italy

**Japan:**
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- Kozato Kaikan Bldg.
- 12-2-Chome, Shinb-Tamura-Cho
- Minato-Ku, Tokyo, Japan

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- Spokane 10, Washington
- FA 5-2557

**Washington D.C., Maryland, Delaware and northern Virginia:**
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- 8218 Wisconsin Avenue
- Washington 16, D.C.
- OLIVER 4-6400

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- Minato-Ku, Tokyo, Japan

**The Netherlands:**
- Henvooy. n. v.
- Remensstraat 13
- Amsteln, Holland

**Norway:**
- British Imports A S
- Majorsbuveen 35
- Oslo, Norway

**Sweden:**
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- Vartavagen 57
- Stockholm, Sweden

**Switzerland, Germany & Austria:**
- Elektronik
- Postcheck-KTO: 14155 575
- Scharn FL, Switzerland

**Austrian Gmbh:**
- Vienna, Austria
**NOTES**

*THESE VALUES HAVE BEEN MULTIPLIED BY 10^5* 

\[
a = \frac{(e^A - 1)}{(e^{2A} - 1)} \quad f = \frac{2A}{(2A)^2} \quad c = e^{2A} + 1 \quad d = 1 - e^{-A}
\]

WHERE \( e = \log_{10} \) \( DB \) AND \( e^{2A} = \log_{10} \)

THE ITERATIVE IMPEDANCES OF THE NETWORKS IN FIGS A, B, C & D ARE 1 OHM (=ZK1).  
IN FIGURE E \( ZK2 = e^{2A} \) OHMS AND IN FIG. F, \( ZK3 = e^a \) OHMS

**FOR PADS OF GREATER THAN 50 DB USE TWO PADS IN SERIES IN A SHIELD TO PREVENT ELECTROSTATIC PICKUP AND FEED THRU.**