

OPTIMIZATION, INC.

G E N E R A L C A T A L O G

P R E C I S I O N A C I N S T R U M E N T S

7243 atoll avenue, north hollywood, california

RCD SERIES OSCILLATORS

FEATURES

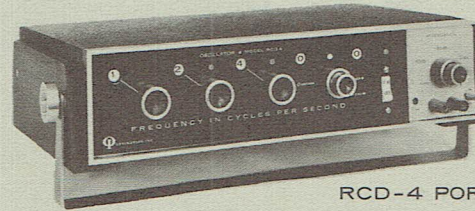
- * STABLE AMPLITUDE .01%
- * ULTRA LOW DISTORTION .01%
- * POLYPHASE OUTPUTS
- * POWER OUTPUT TO 25VA
- * FREQUENCY .1 TO 100,000 CPS

STATE-OF-THE-ART performance is provided in Optimation RCD series oscillators by a highly reliable and simple circuit consisting of five transistors and one tube in most models. This unique circuitry (patent pending), provides optimum performance without the usual complex multiple feed-back loops and compensating networks found in other oscillators. Engineered simplicity assures long term reliability and freedom from continuous calibration or adjustment to maintain specifications.

Model RCD oscillators are available having amplitude instability less than .01%, output distortion less than .01%, frequency accuracy of .1% and frequency setability to 4 decimal digits plus vernier. Standard frequency stability is within .01%. Frequency drift less than .0005% per hour, in a constant temperature environment, is available as an option. This excellent frequency stability approaches that of fixed frequency tuning fork or crystal controlled oscillators.



RCD-2R RACK MOUNTING



RCD-4 PORTABLE

Power oscillator models with zero output impedance and 15 or 25VA power capability are available.

RCD series oscillators can be furnished with either two or three phase outputs having fixed or adjustable phase angles.

Optimation oscillators are ideal for use in primary standards laboratories as well as calibration or secondary laboratories and yet are priced to allow use on the production line. Precision gyro testing and calibration of wattmeters, varimeters, phase angle voltmeters, etc., is facilitated by optional polyphase outputs.

Wherever stable amplitude, stable frequency and pure waveform in the frequency range to 100KC are essential, Optimation RCD oscillators are the ideal choice.

SPECIFICATIONS

MODEL	FREQUENCY RANGE	FREQUENCY ACCURACY	OUTPUT			FREQUENCY		PRICE	
			DISTORTION	VOLTAGE	RESOLUTION	POWER	SELECTION	PORTABLE	RACK 3 1/2" x 19"
									ORDER - 1R 2R ETC.
RCD - 1	0.1-99,900~	1%	.02%	0-5V	.1%	10MW	3 DIGIT	\$625	\$595.
RCD - 2R	0.1-99,990~	.1%	.02%	0-5V	.1%	10MW	4 DIGIT	*NA	\$695.
RCD - 4	0.1-99,900~	1%	.01%	0-5V	.002%	10MW	3 DIGIT	\$880	\$850.
RCD - 5R	0.1-99,990~	.1%	.01%	0-5V	.002%	10MW	4 DIGIT	*NA	\$990.
RCD - 6R	0.1-99,900~	1%	.05%	0-15V	.002%	15VA	3 DIGIT	*NA	\$1290.
RCD - 7R	0.1-99,990~	.1%	.05%	0-15V	.002%	15VA	4 DIGIT	*NA	\$1430.

OPTIONAL FEATURES

	RCD-1, 2, 4, 5	RCD-6, 7
10V Floating output	ADD \$75.	*NA
Frequency instability <.0005% @ Constant temperature; T. C. <.002%/°C, RCD - 2R, 5R, & 7R only.....	ADD \$300.	ADD \$300.
Output power 25VA, (Single phase only).....	*NA	ADD \$120.
Polyphase outputs:		
2 phase, 0° & 90°, 10 to 10,000~	ADD \$250.	ADD \$550.
2 phase, 0° & adjustable 0° to 180°, 10 to 10,000~	ADD \$300.	ADD \$600.
3 phase, 0°, 60°, & 120°, 10 to 10 000~	ADD \$275.	*NA
3 phase, 0°, 120°, & 240°, 10 to 10,000~	ADD \$325.	*NA

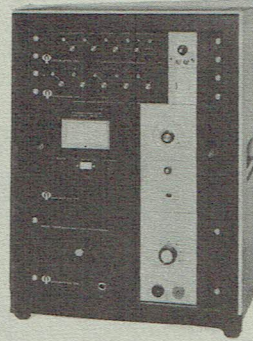
For detail data request specific product data sheet from Optimation or your nearest factory representative.

*NA — not available.

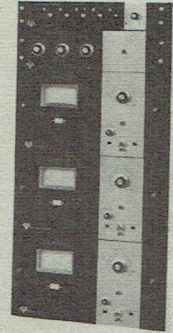
AC POWER SOURCES -- CALIBRATION & POLYPHASE

FEATURES

- * STABLE AMPLITUDE .01%
- * LOW DISTORTION .05%
- * HIGH POWER TO 250VA
- * STABLE FREQUENCY TO .0005%
- * WIDE FREQUENCY RANGE 10 TO 100,000 CPS



AC 101A



AC 112

LABORATORY SOURCES

Optimization laboratory power sources, models AC-101 through AC-104, feature amplitude instability less than .01% and distortion under .1% at 200VA power output.

Excellent amplitude stability is achieved by utilizing a highly stable oscillator driving an amplifier with gain stability independent of component variations due to aging, line voltage variations, etc. Typical short term amplitude instability less than .005% allows AC transfer measurements to be made to a higher degree of accuracy than has been possible heretofore.

The AC-101A provides a 5 digit ratio transformer between the oscillator and amplifier. Very low amplitude instability, .01%/hour, allows the user to standardize the output at a nominal voltage and then dial-in precise ratios of that voltage with the ratio transformer. This feature facilitates rapid calibration of instruments such as AC differential voltmeters and AC digital voltmeters.

The AC-103 2-phase AC source consists of an AC-101 with a split phase oscillator output driving a second 250VA amplifier. This unit can be utilized to calibrate wattmeters, varmeters, phasemeter amplitude calibration, etc.

POLYPHASE SOURCES

The AC-112, 750VA 3-phase source offers the same excellent amplitude stability and low distortion of the laboratory power sources. It has adjustable load regulation that can be set to zero or even negative values to compensate for output lead impedance. This excellent regulation plus high frequency capability offers performance for gyro and other polyphase applications that has not been available in the past.

The AC-113, 60VA 3-phase source features an all silicon solid state 3-phase amplifier with load regulation adjustable to zero and line regulation of less than .01%. This source is ideal for driving low to medium power gyros.

SPECIFICATIONS

MODEL	OUTPUT MAXIMUM			FREQUENCY			AMPLITUDE INSTABILITY	FULL LOAD DISTORTION	SIZE			PRICE
	VOLTAGE	CURRENT	POWER	BASIC	EXTENDED	INSTABILITY			H	W	D	
AC-101	1,500V	20A	200VA	20~20KC	10~100KC	.01%	.01%/HOUR	.1%	31½	23	15	\$2950.
AC-101A W/RATIO XFMR.	1,500V	20A	200VA	20~20KC	10~100KC	.01%	.01%/HOUR	.1%	31½	23	15	\$3600.
AC-102	150V	10A	250VA	20~20KC	10~100KC	.01%	.01%/HOUR	.05%	19	23	13	\$1990.
AC-103 2φ SOURCE	φ1-1,500V φ2-150V	φ1-20A φ2-10A	200VA/φ	20~20KC	10~100KC	.01%	.01%/HOUR	.1%	42	23	18	\$4220.
AC-104	1,000V	20A	200VA	45~80KC	20~100KC	.01%	.02%/HOUR	.1%	31½	23	15	\$3450.
AC-112 3φ SOURCE	150V	8A	750VA 250VA/φ	20~10KC	10~100KC	.01%	.02%	.1%	38½	19	10	\$3750.
AC-113 3φ SOURCE	15 to 150V*	2A/φ	60VA 20VA/φ	*DC-10KC	*DC-100KC	.01%	.01%	.05%	7	19	13	\$1990.

OPTIONAL FEATURES

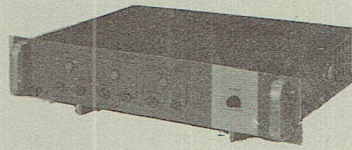
4 Digit frequency setability, all models.....	ADD \$140.
HIGH STABILITY FREQUENCY — 4 Digit setability; frequency instability <.001%/8 hours, <.0005% short term at constant temperature; vernier frequency resolution .0003%.	
AC-112 & AC-113.....	ADD \$950.
POWER FACTOR CORRECTION PANEL 0-15mfd each φ, 5¼" X 19" — AC-112 & AC-113.....	ADD \$400.
CABINET	ADD \$340.
AC-112	
AC-113	ADD \$150.

*AC-113 available with output transformers providing voltages to 150V — frequency range 45~ to 100 KC.

POWER AMPLIFIERS

FEATURES

- * LOW DISTORTION .05%
- * STABLE VOLTAGE GAIN .01%
- * ABSOLUTE LOAD STABILITY
- * ZERO OUTPUT IMPEDANCE
- * WIDE POWER BANDWIDTH
- * ALL SOLID STATE (SOME MODELS)



PA 33



PA 250AC

PA250 SERIES

Optimation PA250 series amplifiers feature ultra low distortion — 0.05%, and a high degree of gain stability — 0.01%. Power capability is 250VA over a basic frequency range from 20 to 20,000 cps or 40 to 80,000 cps. At reduced power, frequency response extends from 5 to 200,000 cps.

The PA250 amplifiers have absolute load stability and will not oscillate under any load condition including inductive or capacitive loads. Therefore, no derating of output is necessary for leading or lagging power factor loads.

Constant voltage operation with output impedance adjustable through zero to negative values provides zero load regulation including the resistance of output leads. Model PA250AC has constant current output in addition to constant voltage — switch selectable.

Optimum use of semi-conductors and vacuum tubes in a unique (patented and patent pending) circuit provide the excellent performance. Conservative design, precision com-

ponents and extensive testing and inspection insure long term reliability.

Applications include AC instrument calibration, vibration shaker driver, sonar transducer driver and other applications that require high quality high power amplification.

ALL SOLID STATE

Optimation all solid-state amplifiers approach the ideal amplifier — a wire with gain. Input impedance is high and output impedance is zero. Distortion is low, well under .05% at full output. Gain stability is within .01% including variations of line, load and ambient temperature.

All silicon semiconductors, conservative design plus short circuit protection insure excellent reliability.

Full power output from 15 to 50VA is available over the frequency range from DC to 100,000 cps. Polyphase versions are available. 2 and 3 phase versions of this solid state amplifier together with an Optimation RCD polyphase oscillator make an ideal precision gyro power supply.

SPECIFICATIONS

MODEL	OUTPUT MAXIMUM			FREQUENCY		FULL LOAD DISTORTION	MATCHED LOAD IMPEDANCE	INPUT VOLTAGE	PANEL HEIGHT RACK MOUNTING	PRICE
	POWER	VOLTAGE	CURRENT	BASIC	EXTENDED					
PA 15 SOLID STATE	15VA	15 to 150V*	2A	*DC-20KC	*DC-100KC	.05%	5 to 12Ω	2½V	3½" HALF RACK	\$490.
PA 25 SOLID STATE	25VA	15 to 150V*	3A	*DC-20KC	*DC-100KC	.05%	3 to 8Ω	2½V	3½" HALF RACK	\$590.
PA 33 SOLID STATE	3φ 15VA/PHASE	15 to 150V*	2A/φ	40 ~-10KC	10 ~-100KC	.05%	5 to 12Ω	2½V	3½"	\$950.
PA 50 SOLID STATE	50VA	15 to 150V*	7A	*DC-20KC	*DC-100KC	.05%	1½ to 4Ω	2½V	3½"	\$750.
PA 250AB	250VA	150V	10A	20 ~-20KC	5 ~-100KC	.05%	3.75, 15, OR 60Ω	1¼V	10½"	\$890.
PA 250AC	250VA	150V	10A	20 ~-20KC	5 ~-100KC	.05%	3.75, 15, OR 60Ω	1¼V	10½"	\$950.
PA 250H	250VA	300V	5A	45 ~-80KC	10 ~-200KC	.05%	15, 60, OR 240Ω	2½V	10½"	\$990.

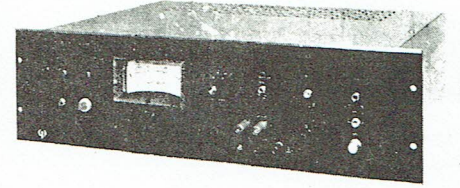
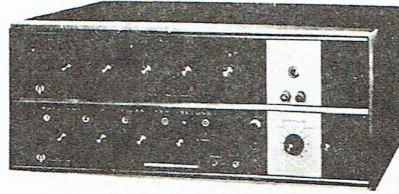
*For power response to DC, Optimation solid state amplifiers provide 15V maximum output. Output transformers are available for 150V output with power response down to 45~. Request specific product data sheet.

OPTIONAL FEATURES

Front panel mounted matched load impedance selector switch, PA250AB, AC, PA 250H ADD \$125.
 C-12 Cabinet for PA250AB, AC, H (with space for Optimation RCD oscillator) ADD \$150.

PRODUCT SUMMARY 1975

PRECISION AC/DC INSTRUMENTS FOR CALIBRATION AND TESTING



- ABSOLUTE CALIBRATORS FOR:**
 Ammeters—Voltmeters—Wattmeters—
 Phasemeters—Digital Multimeters
- PROGRAMMABLE MODELS
 - HIGHEST ACCURACY AVAILABLE
 - DC TO 1 MHz
 - COMPACT AND LIGHTWEIGHT
 - COMPLETE SYSTEMS AVAILABLE

PRECISION SOURCES

- STABLE AMPLITUDE—LESS THAN 20 ppm VARIATION
- LOW DISTORTION—UNDER 0.05%
- HIGH POWER OUTPUT—UP TO 200 VA
- STABLE FREQUENCY—LESS THAN 0.01% VARIATION
- WIDE FREQUENCY RANGE—TO 100 KHz AT 1000V
- CONSTANT VOLTAGE/CURRENT TO 1500V: TO 40 AMPS

POWER AMPLIFIERS

- LOW DISTORTION—UNDER 0.05%
- STABLE VOLTAGE GAIN—TO 1ppm
- WIDE FREQUENCY RANGES—DC TO 2MHz
- ADJUSTABLE OUTPUT IMPEDANCE
- ABSOLUTE STABILITY REGARDLESS OF LOAD
- VOLTAGE OR CURRENT REGULATION

ABSOLUTE CALIBRATORS					
MODEL	OUTPUT RANGE	ACCURACY DC	AC*	FREQUENCY RANGE	FEATURES
AC125/PA225	10NV to 1211.11V		0.02%	10Hz to 1.1 MHz	Fixed Amplitude Quadrature Output
AC126/PA226	10NV to 1211.11V	.002%	0.01%	10Hz to 1.1 MHz	Highly Stable Source of Both Bi-polar DC and AC Voltage
AC127	10NV to 121.111V		0.02%	10Hz to 1.1 MHz	120V to 1 MHz
AC-128	10NV to 121.111V		0.02%	10Hz to 1.1MHz	Fully Programable 120V to 1MHz
AC129	10NV to 121.111V		0.02%	10Hz to 1.1 MHz	Fully Programmable
AC130/PA226	10NV to 1211.11V	.002%	0.01%	10Hz to 1.1 MHz	Fully Programmable AC/DC
AC160	0—600V 0—10amp		0.05% 0.05%	25Hz to 10KHz	Calibrates Volt, Amp and Watt Meters—Variable Phase Absolute Power Factor
CS110	1 μ a to 1.1amp		0.02%	10Hz to 100 KHz	Wide band — Low Distortion
CS112	1 μ a to 2.2amp	.005%	0.02%	10Hz to 100 KHz	Bi-polar DC
CS130	1 μ a to 1.1amp	.005%	0.02%	10Hz to 100 KHz	Bi-polar DC —PROGRAMMABLE
QCS110	1 μ a to 1.1amp		0.02%	10Hz to 100 KHz	Phase Calibrated From 0—360° \pm 0.05°
PA270	1amp to 110amp		0.02%	10Hz to 100 KHz	High Current — Self Calibrating
RCD709	0 to 5V RMS			10Hz to 100 KHz	Absolute Phase Standard \pm .05°

*TYPICAL MIDBAND

PRECISION SOURCES							
MODEL	VOLTAGE	CURRENT	RESOLUTION	FREQUENCY RANGE	DISTORTION	STABILITY	FEATURES
AC50CAL	500V	10A	10 ppm	10 Hz to 100 KHz	< .05%	\pm 20 ppm	High Performance at Low Cost
AC104	1500V	20A	10 ppm	10 Hz to 100 KHz	< .05%	\pm 20 ppm	Full power output from 45 Hz to 100 KHz
AC105	1500V	20A	10 ppm	10 Hz to 100 KHz	< .05%	\pm 20 ppm	Full power output from 25 Hz to 30 KHz

POWER AMPS							
MODEL	POWER (VA)	VOLTAGE	CURRENT	BAND WIDTH		DISTORTION	FEATURES
				FULL POWER	EXTENDED		
PA25	25	150		DC—1 MHz	DC to 2 MHz	< .02%	Sine/Pulse — 1500 μ S
PA50	50	15		DC—20 KHz	DC to 100 KHz	< .05%	Wide band
PA50T	45	150		45Hz—20KHz	10Hz to 100KHz	< .05%	Voltage Regulated
PA50T/10A	45		10amps	45Hz—2KHz	10Hz to 100KHz	< .05%	Current Regulated
PA50T/500	45	500	10amps	55Hz—10KHz	10Hz to 100KHz	< .05%	High Voltage
PA250 K	200	37	30	25Hz—10KHz	15Hz to 15KHz	< 0.1%	High Current
PA250L	250	150	10amps	25Hz—20KHz	15Hz to 40KHz*	< .05%	Adjustable output Impedance
PA250M	250	300	5amps	20Hz—10KHz	10Hz to 100KHz	< .05%	Absolute Load Stability
PA260	200	1200	200MA	DC—100KHz	DC—200KHz	< .03%	.15% response—1 ppm linearity—3000 μ S

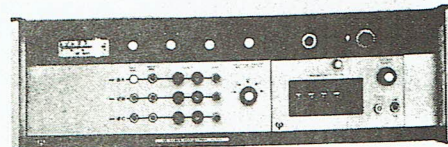
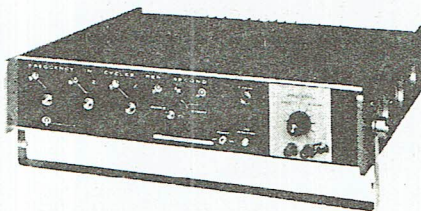
* Half Power

*** LISTED SELECTED ITEMS ARE REPRESENTATIVE OF PRODUCT LINE. FULL PRODUCT LINE CONTAINS IN EXCESS OF 2000 STANDARD ITEMS IN ADDITION TO FULL COMPLEMENT OF OPTIONS AND ACCESSORIES.



OPTIMIZATION, INC. 9259 independence avenue, chatsworth, california 91311 882-6490
 SUBSIDIARY OF JULIE RESEARCH LABORATORIES, INC.

PRECISION AC/DC INSTRUMENTS FOR CALIBRATION AND TESTING



PRECISION OSCILLATORS

- ABSOLUTE AMPLITUDE ACCURACY— $\pm 0.05\%$
- AMPLITUDE STABILITY $\pm 0.01\%$ MONTH
- OUTPUT FROM 11 VOLTS TO 100 MILLIAMPERES
- REMOTE SENSING AVAILABLE
- QUADRATURE PHASE ACCURACY— 0.05°
- FREQUENCY RANGE—10Hz TO 1MHz
- FREQUENCY ACCURACY TO 0.1%

POWER OSCILLATORS

- ACCURATE DIGITAL FREQUENCY SELECTION
- STABLE AMPLITUDE—LESS THAN 0.01% VARIATION
- STABLE FREQUENCY—10ppm AVAILABLE
- LOW DISTORTION—LESS THAN 0.05%
- WIDE FREQUENCY RANGE—UP TO 110KHz
- ABSOLUTE STABILITY REGARDLESS OF LOAD
- UP TO 50VA OUTPUT

PRECISION POLYPHASE OSCILLATORS/ POWER OSCILLATORS

- HIGH POWER TO 50VA PER PHASE
- LOW DISTORTION TO LESS THAN 0.02%
- FIXED OR VARIABLE STABLE FREQUENCY
- ADJUSTABLE LOAD REGULATION
- 2 PHASE AND 2/3 PHASE UNITS AVAILABLE
- SQUARE WAVE OUTPUTS AVAILABLE
- PERFECTLY SUITED FOR GYRO TESTING

PRECISION OSCILLATORS

MODEL	FREQUENCY RANGE	FREQUENCY ACCURACY	OUTPUT VOLTAGE	OUTPUT CURRENT	FREQUENCY RESPONSE	FEATURES
RCD-900	10Hz-100KHz	1.0%	0-5			Digital Frequency Selection
RCD-901	10Hz-100KHz	0.1%	0-5			Accurate Frequency
RCD-902	10Hz-1MHz	1.0%	0-5			Wide Band
RCD-903	10Hz-100KHz	1.0%	0-11.11 absolute	100MA	$\pm 0.05\%$	Remote Sensing
RCD-904	10Hz-1MHz	0.1%	0-11.11 absolute	100MA	$\pm 0.05\%$	Remote Sensing

POWER OSCILLATORS

MODEL	POWER VA	FREQUENCY RANGE	VOLTAGE	FEATURES
AC15	15	0.1 Hz to 100 KHz	15	Precision Medium Power
AC50	50	0.1 Hz to 100 KHz	15	Precision High Power
AC609	15	100Hz to 110 KHz	50	Sine or Square — AC coupled output — .5 db response

PRECISION POLYPHASE OSCILLATORS/POWER OSCILLATORS

MODEL	PHASES	POWER/ ϕ	OUTPUT V/ ϕ	$1/\phi$	REGULATION	FREQUENCY RANGE	AMPLITUDE STABILITY	DISTORTION	FEATURES
AC-152	2	45	150	2a	adj. to Zero	10Hz to 10KHz	100PPM	.05%	Wide Range
AC-153	2/3	45	150	2a	adj. to Zero	10Hz to 10KHz	100PPM	.05%	Switchable 2 or 3 phase
AC-154	2/3	45	150	2a	adj. to Zero	10Hz to 10KHz	200PPM	.05%	Sine or square phase
AC-2023	2/3	50	30/60			10Hz to 10KHz	10PPM	.05%	Ultimate Precision
AC-2029	2/3	35	600V	10a	100PPM	20Hz to 1KHz	100PPM	.05%	Phase Variable 0-180°
RCD-11	2/3		5			.01Hz to 10KHz	100PPM	.02%	General purpose oscillator

* OPTIONS ARE AVAILABLE TO EXTEND V+I RANGES OF ALL POWER OSCILLATORS AND AMPLIFIERS

*** LISTED SELECTED ITEMS ARE REPRESENTATIVE OF PRODUCT LINE. FULL PRODUCT LINE CONTAINS IN EXCESS OF 2000 STANDARD ITEMS IN ADDITION TO FULL COMPLEMENT OF OPTIONS AND ACCESSORIES:

CALIBRATION SOURCES

AC-50CALR	Voltage, 45-20KHz to 500V/10A (Opt. Avail: A)	\$2,530.00 (1)
AC-104	Voltage/Current, 35-100KHz to 1500V/50 A (Opt. Avail: A, A-2, B, P, Q)	6,270.00
AC-105	Voltage/Current, 15-30 KHz to 1500V/20A (Opt. Avail: A, A-2, B, P, Q)	6,040.00
AC-125	Absolute AC Voltage Calibrator, 12V to 1MHz, 121V to 100KHz	5,495.00
AC-127/PA-220	Absolute AC Voltage Calibrator, 121V to 1MHz	7,695.00
AC-128/PA-220	Programmable AC-127/PA-220	9,075.00
AC-129	Programmable AC-125	7,275.00
AG-160	1 \emptyset Volt, Amp and Wattmeter Calibrator 0.05%	10,995.00
CS-112	DC-100KHz Current Source, 2 Amp (formerly CS-110/2066)	2,875.00
CS-129	Programmable Current Source (Ranges Only)	3,250.00
QCS-110	Variable Phase Current Source, 10 to 100KHz	4,295.00

POWER AMPLIFIERS

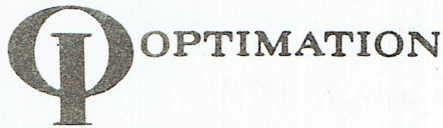
PA-25A	DC- 1MHz 25VA to 125 Volts	1,995.00
PA-50	DC- 100KHz 50VA to 15 Volts	1,775.00(2)
PA-50T	45Hz-100KHz to 150 Volts 45VA	1,950.00(2)
PA-50T/10A	Current Reg. 45VA to 10 amps	2,200.00(2)
PA-50T/500	45Hz to 20KHz 45VA to 500 Volts	1,950.00(2)
PA-225	1KV Amplifier (AC-125)	3,850.00
PA-250AC	25Hz to 20KHz Voltage or Current Reg. to 150 volts/ 10 amps, 250VA	2,050.00
PA-250H	250VA Voltage or Current Reg. to 300V/5A 45Hz to 60KHz	2,050.00
PA-250L	200VA adj. output Z (similar to AC) High Stability	2,275.00
PA-250M	200VA adj. output Z (similar to H) High Stability	2,275.00
PA-260	1KV Amplifier DC-100KHz	4,400.00
PA-270	10/100 Amp Amplifier	4,500.00(1)

POWER OSCILLATORS

AC-50R	50VA Sine 10-100KHz to 15V (Opt. Avail: B, D, G, H, J, S, T)	1,975.00(1)
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POLYPHASE OSCILLATORS

RCD-11AR	2/3 \emptyset .01 to 10KHz	1,995.00(1)
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PRICE LIST
(Effective July 1, 1976)

RCD-709R	Precision Calibrated 2 \emptyset 10-110KHz (Opt. Avail: 01,02,03)	\$4,395.00
RCD-2038	2 \emptyset .01Hz-10KHz	1,950.00

GYRO SUPPLIES

AC-153/3VSF	2/3 \emptyset 10-10KHz (Opt. Avail: T-5,W) 45VA/ \emptyset	4,495.00
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PRECISION OSCILLATORS

RCD-900R	10Hz-110KHz 1.0% Freq. 5 volt 100ppm Amplitude Stability	1,320.00(1)
RCD-901R	10Hz-110KHz 0.1% Freq. 5 volt 100ppm Amplitude Stability	1,550.00(1)
RCD-902R	10Hz-1MHz 1.0% Freq. 5 volt 100ppm Amplitude Stability	1,450.00(1)
RCD-903R	10Hz-100KHz 1.0% Freq. 11 volts 50ppm Stability Absolute Calibration	1,995.00(1)
RCD-904R	10Hz-1MHz 0.1% Freq. 11 volts 50ppm Stability Absolute Calibration	2,310.00(1)

COMPUTER DISPLAYS

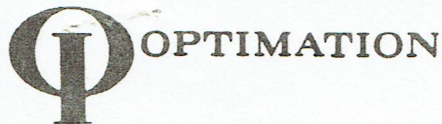
CDO-6300	DC to 20 MHz Bandwidth Video Amp	5,495.00
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TRANSFORMERS

T-1011A	Extends PA-50 to 500 Volts	440.00
T-1190	100:1 Stepdown Lowers 903/904 to 100mV Full Scale	825.00

OPTIONS AVAILABLE

A	Ratio Transformer	985.00
A-2	Ratio Transformer for Phase 2	985.00
B	0.1% Frequency Accuracy	400.00
D	High Resolution Frequency Vernier (Avail w/ B Opt Only)	85.00
G	External Frequency Sync	50.00
H	High Resolution Amplitude Control	200.00
J	Frequency Counter Monitor	50.00
P	2nd Phase (37V/10A, 75V/4A, 150V/2A)	2,800.00
Q	2nd Phase (Same as Phase 1)	4,485.00
S	Square Wave Output	250.00
T	150 Volt Output Transformer	200.00
T-5	5 Tap Output Transformer	400.00



OPTIMATION

PRICE LIST

(Effective July 1, 1976)

W	Current Meters	\$ 350.00
01	Phase Lock	350.00
02	High Resolution Amplitude Verniers	300.00
03	10 Volt Output Amplifiers	600.00

CABINETS (height x depth)

200006	7"H x 20 1/2"D (AC-50CAL)	250.00
200008	17"H x 20 1/2"D (AC-125/129)	350.00
200010	26 1/4"H x 17"D (AC-104/105)	350.00
200020	14"H x 17"D (PA-250)	250.00
200023	17 1/2"H x 20 1/2"D (AC-125/129, w/CS)	350.00
200024	22 3/4"H x 20 1/2"D (AC-127/129, w/CS)	375.00
200040	63"H x 24"D (AC-104/105, w/P orQ)	950.00
200042	19 3/4"H x 20 1/2"D (AC-127/128)	350.00
200030	21"H x 20 1/2"D (AC-160)	375.00

TUBES AND ASSEMBLIES

#550047	(set of 8 matched) 8417 Tubes	120.00
#550011	(set of 8 matched) 6CA7/EL34 Tubes	120.00
#550026	(matched pair) 6GW8 Tubes	22.50
#901181	Amplitude Stability Assembly	72.30

NOTES

- (1) Normally rack- for bench add \$50.00 and delete "R" suffix
- (2) Bench mount- rack mounting adapter available at \$25.00

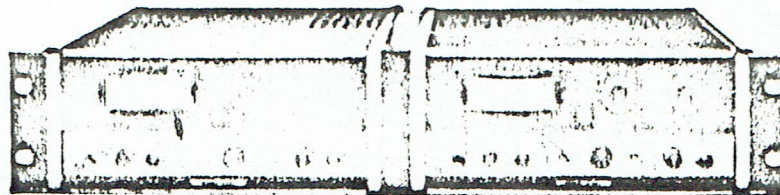
Prices subject to change without notice
U.S. Dollars

F.O.B. New York City, New York
TWX: 710-581-5138

Terms: 1% 10 days, net 30 days
Telephone: (212) 245-2727



50 VA POWER AMPLIFIER



Two PA50's with dual rack adapter

FEATURES

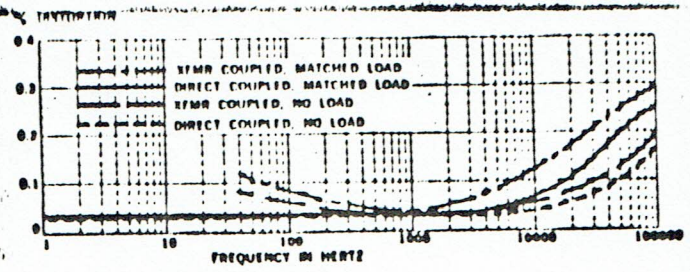
- * **WIDE FREQUENCY RANGE** DC to 100,000 Hz is provided by the temperature compensated operational amplifier featuring all silicon solid state circuitry.
- * **LOW DISTORTION** .05% at any power output to 50VA from 20Hz to 5kHz is assured by 60db feedback around a stable amplifier.
- * **OVERLOAD PROTECTION** provided with indicator to prevent transistor damage due to overload or short circuit on output terminals.
- * **BUILT-IN OUTPUT METER** monitors output voltage or current, switch selectable, plus test positions — DC balance & collector current.
- * **OUTPUT VOLTAGE** to 500V open circuit, available with optional output transformer — frequency range 45 Hz to 20 kHz. Direct coupled output voltage to 15V.

SPECIFICATIONS

INPUT, Single ended	
IMPEDANCE	11,000 to 25,000 ohms
GAIN, Voltage, adjustable	0 to 10
OUTPUT, Grounded or Floating (PA 50T only)	
POWER, RMS, Direct coupled, DC to 20,000 Hertz, @ nominal line voltage (-20% @ DC) ..	50 VA \pm 10%
Transformer coupled, 45 to 20,000 Hertz	45 VA \pm 10%
VOLTAGE RANGE, Direct coupled, no load	0-15V RMS
Direct coupled, 50 VA load	0-12V RMS
See optional features for transformer voltage ranges.	
GAIN INSTABILITY	0.01%
REGULATION, LINE, 10% variation	within 0.01%
LOAD, No load to full load	adjustable through zero
DISTORTION, Direct coupled, DC to 5000 Hertz, 50VA \pm 10% (-20% @ DC)	0.05%
Transformer coupled, 100 to 5000 Hertz 45VA \pm 10%	0.1%
HUM AND NOISE, % rated output	0.01%
POWER REQUIREMENTS, 105-125 VAC or 210-250 VAC, 50 to 400 Hertz	125 Watts
SIZE, Bench-mounting	3½H x 8W x 13D

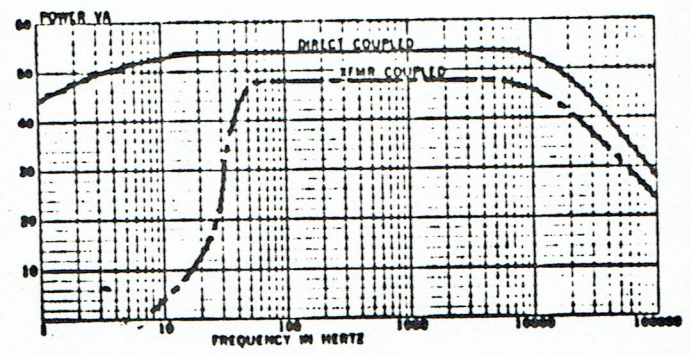
DISTORTION at full power and no load for both direct and output transformer coupled amplifier versions is maintained to a very low value over the entire frequency range.

To achieve these results it is necessary to use a signal source with less than 0.02% distortion. Optimization RCD series oscillators are ideal as a source for this amplifier.



POWER OUTPUT over the frequency range from 1Hz to 100kHz is illustrated for both direct and transformer coupled amplifiers. (option T only)

These curves assume optimum or matched load impedance. To find maximum power and voltage for any given value of load impedance, see the curves below. These curves are plotted at 1kHz. They will also hold true for other frequencies at which the power output does not drop off per the POWER OUTPUT curve.



APPLICATION NOTES

1. **AMPLIFY LOW FREQUENCY or DC FUNCTIONS** — Frequency response to DC on PA 50 provides power amplification for low frequency functions such as triangular, ramp, sine, or other waveforms. The PA 50 may be used as a precision DC power amplifier.
2. **METER CALIBRATION** — When driven by a stable amplitude, low distortion oscillator (Optimization RCD series) the transformer coupled PA-50T provides voltages to 150V, stable within 0.01% for precision voltmeter calibration.
3. **COMPONENT AND SYSTEM TESTING** — provides clean, stable output power to test transformers, filters, amplifiers, transducers, etc. on both the pro-

- duction line and test stand. PA-50, 50T has excellent square wave response.
4. **DRIVE REACTIVE LOADS** — inductive loads such as motors or capacitive loads such as piezo-electric vibration shakers can be driven by the PA-50 or PA-50T. No derating from 50VA with 0.1 leading or lagging power factor loads.
5. **GYRO or SERVO POWER SOURCE** — PA-50 or 50T amplifiers may be used singly or in multiples together with an Optimization RCD single or poly-phase oscillator to provide precision AC power — stable amplitude and regulation within 0.01%.

Rack mount adapters—3½" H x 19" W.
 Single: Part number 901801
 Dual: Part Number 901800
 Combination: Bench mounting stand and carrying handle: Part number 901802

OPTIONAL FEATURES

OUTPUT TRANSFORMER with voltages to 150 VRMS including a rear mounted tap selector switch. Three taps with 0-37, 0-75, or 0-150 volts open circuit/30, 60, or 120 volts matched load Full power (45VA) frequency range 45-20,000 Hz.

OPTION
T
T-500

OUTPUT TRANSFORMER with voltages to 500 VRMS, including a rear mounted tap selector switch—four taps with 0-1, 0-10, 0-100, or 0-500 V voltage ranges. Full power (45VA) frequency range 55-10,000 Hz. 500 VRMS is available from 50-20,000 Hz. One volt tap limited to 10 amp current.

* Performance data shows typical amplifier performance. PA 50, 50T may be ordered to specifications listed on front of data sheet.

WARRANTY
 Optimization instruments are manufactured and tested under an exacting quality control program. Conservatively rated, premium components are used in our instruments to insure long reliable operation within specifications. We warrant each instrument to be free from defects in material and workmanship. We will adjust, service and/or replace any defective parts (tubes excepted). In instruments returned to us, for 1 year after delivery, to the original buyer.

REPRESENTED BY:

Prices and specifications subject to change without notice.



HIGH VOLTAGE

2 YEAR GUARANTEE

ADJUSTABLE POWER SUPPLIES AC or DC, Regulated or Unregulated, "Multi-Range" Constant Power. Ratings to 1 Megavolt. Powers to 250 KW. **BULLETIN No. DCA-1000**

DC INSULATION TESTERS Non-Destructive Quantitative Testing with ratings to 1 Megavolt. Portable or Mobile. Burn Currents also available. "Thumper" for reducing fault resistance by high current pulsing. **BULLETIN No. DCI-2000**

AC INSULATION TESTERS Ratings to 400 KV/1000 KVA. Features Memory Meter which indicates voltage breakdown, high speed overload. Options include Corona Free, Automatic Voltage Sequencing, Constant Power, Variable Speed Control. **BULLETIN No. ACI-3000**

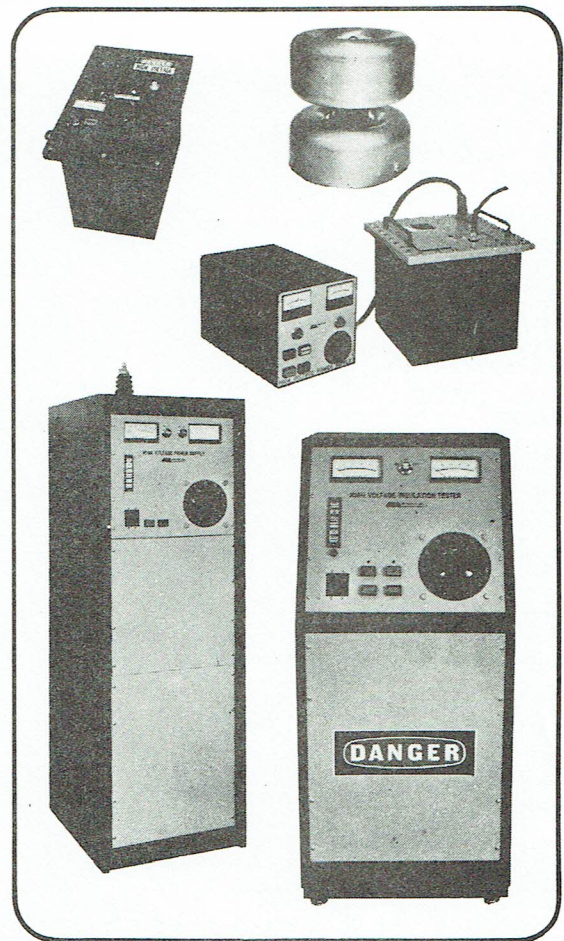
DIVIDERS Accuracies of 0.01%, 0.1%, 1.0%. DC/ACP, DC, AC RMS, PULSE. Traceable to NBS. **BULLETIN No. DCP-4000**

CUSTOM ACCESSORIES Transformers, Reactors, Multipliers. Low Corona Oil Filled Bushings, Anti Corona Spheres and Toroids. Shielded Cables to 600 KV, Shorting and Disconnect Switches, Series Limiting Resistors.

TYPICAL APPLICATIONS Dielectric Heating • Electro Static Cooling • Carbon Deposition • Beam Separator • X-Ray Thickness Gauge • Pulse Charging Lines • Capacitor Charging • Air Purifying • Paint Spraying • Fiber Flocking • Mineral Separation • Grain Cleansing • Recovery of Precious Metal Dust • Electron and Field Ion Microscopy • Testing Large Rotating Machinery • Cloud Chamber • Vacuum Arc Experiments • Removal of Liquid Fuel Contaminants • Killing Bacteria • Electron Beam Welding and Machining • Zone Heating • Testing Liquid and Solid Dielectrics • Processing Razor-Blades • Processing Vegetables • Spectroscopy • Spark Chamber • Processing Synthetic Rubber • Charging Electrostatic Antennae for Cloud Study • Ion Propulsion Engines • Injection and Focusing Devices on High Energy Accelerators • Sparking of Cathode Ray Tubes • Life Testing and Processing of Vacuum Tubes • Energizing Laser Devices • Charging Paper for Xerography Printing • Radar • Image Intensifier • Sputtering Processes • Impulse Testing • Explosive Forming • Electrophoresis.

WIDEST LINE OF HV EQUIPMENT FOR RESEARCH AND INDUSTRY

Contact Harry Tekel for quotations.



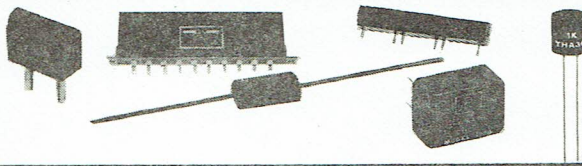
- 200 Standard Models with Voltage Ranges to 1 Megavolt and Powers to 250 KW.
- Completely Solid State, Self Protecting.
- Safe Simple, Foolproof Operation.
- Maximum Personnel and Equipment Protection.
- Standard Models Easily Modified for Custom Design.



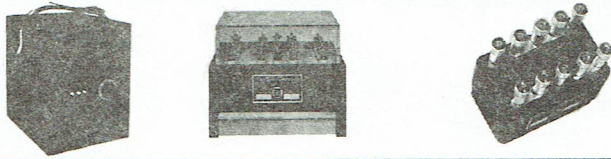
MEGAVOLT, INC.
Subsidiary of Julie Research Laboratories, Inc.

211 West 61st Street, New York, N.Y. 10023 (212) 245-2727

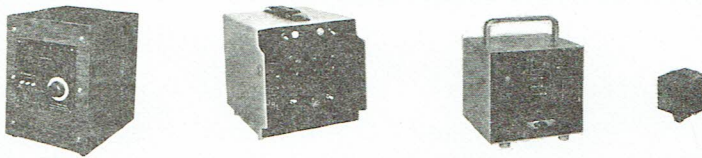
PRODUCTION
RESISTORS



RESISTANCE &
RATIO
STANDARDS



VOLTAGE
STANDARDS &
ZENER
REFERENCES



PRECISION
DIVIDERS
& DECADES



DIGITAL
METERS &
CALIBRATORS



JULIE RESEARCH

WIDE PERFORMANCE CAPABILITY

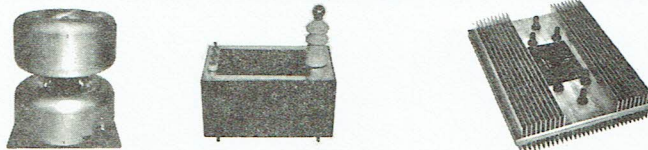
0.1% / 0.0001% / 0.00003%

(212) 633-6625 1/95

RESISTANCE
BRIDGES &
POTENTIOMETERS



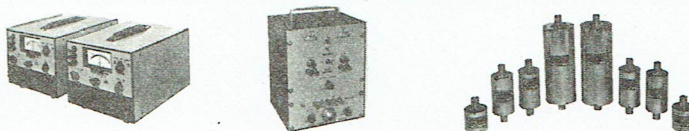
HIGH VOLTAGE
HIGH CURRENT
CALIBRATORS



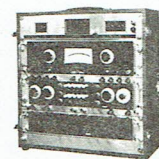
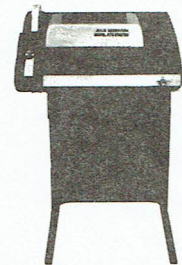
ULTRA STABLE
CURRENT/
VOLTAGE
SOURCES



AC/DC
DIFFERENTIALS
& TRANSFER
STANDARDS



AUTOMATIC
TEST SYSTEMS
& SCANNERS

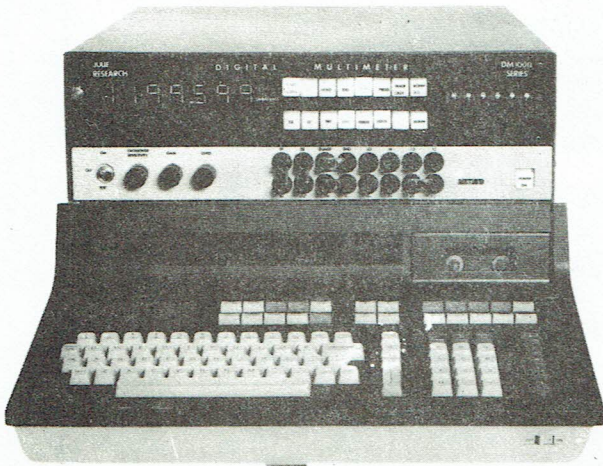


HERE'S THE
INFORMATION
YOU REQUESTED!

JULIE AUTOMATED/PROGRAMMABLE SYSTEMS

LOCOST

MODEL DA-106 DATA ACQUISITION SYSTEM



DESCRIPTION

Featuring the highest available accuracy and resolution for a wide range of electrical and transducer test and measurement parameters the LOCOST Model DA-106 provides a universal data logging and programmed test capability. The DA-106 utilizes the JRL Model DM-1060 1 ppm accurate Digital Multimeter, the JRL LOCOST-106 ATE System interfaces and software and a modified HP computer calculator to provide a compact flexible data measuring, data processing, data formatting and recording system.

The DA-106 Data Acquisition System also functions as a computer (tape cassette) programmed tester, supplying 6 1/2 digit voltage and current stimuli from 1 microvolt to 12 volts and 10 picoamperes to 25 milliamperes for calibrating measuring or recording devices. The computer with JRL master program cassette software controls the measurement sequence, selecting modes of operation and ranges, and then recording, formatting and processing data with results stored on tape cassettes or optionally displayed or recorded on peripheral devices.

Data can be outputted to ASR teletype, high speed thermal printer or JRL I/O writer (Selectric). It can be analyzed as to statistical characteristics—arithmetic mean, standard deviation, etc. Plots in the form of BAR Charts, Histograms, and graphic plots are generated from processed data by the DA-106 using JRL master cassette programs.

FEATURES

- High Accuracy DM-1060 Measuring System
- Programmed Tester and V/I Source
- Data Logging, Processing and Formatting in one Instrument
- Master Program Software - no computer expertise required
- Computer Coupling Directly to many peripheral devices including ASR Teletype, high speed thermal line printer, plotting board, Selectric Typewriter, CRT Terminal, Mass Memory
- High-Level language (Extended BASIC)
- 20 Special Function Keys defined by Software
- Simplified Editing and debugging
- Temperature, Pressure, Flow rate, Strain, X-Y Position Data inputted from external Transducers

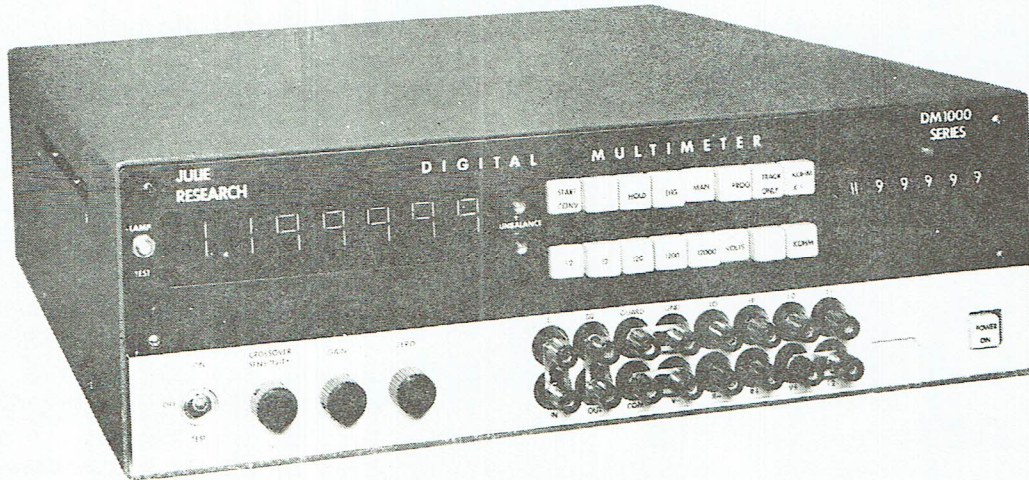
APPLICATIONS

- Data acquisition and processing including Matrix multiplication, Formatting, averaging, standard deviation, etc.
- Plotting of BAR Charts, Histograms and graphic plots.
- Parameters measured and devices sampled include:
 - Resistance and Resistance Networks
 - Standard Cell and Zener Voltage
 - Decade Boxes and Voltage Dividers
 - Voltage to 1200V, resolution 1 ppm
 - Current to 12 Amps, resolution 1 ppm
 - Ohms to 12 Megohms
 - Ohms 4 wire, resolution 100 micro ohms
 - AC Voltage and Current*
 - X, Y Position Coordinates*
 - Temperature, Pressure, Flow rate, Strain*

*with transducers

JULIE RESEARCH

SERIES DM1000 MULTIMETERS



PROGRAMMABLE AC/DC MULTIMETERS AND PRODUCTION CALIBRATORS DM-1000 SERIES DIGITAL MULTIMETERS TO 1 PPM ACCURACY/RESOLUTION/STABILITY

JULIE RESEARCH, for 15 years the pioneer in the manufacture of Precision Standards, now leads the way in providing Multimodel automatic precision calibrators. The new approach to production measurements with three sigma certainty reduces test equipment costs and testing time. The DM-1000 Multimeter doubles as a Ratiometer and Voltage Source in addition to measuring Voltage, Resistance and Current to 1 ppm. Just a few of this amazing instrument's uses are:

- CALIBRATING DVM's AND DMM's—2½ digits to 5½ digits, with full confidence.
- CALIBRATING A/D AND D/A CONVERTERS—8-bit to 20-bit binary resolution.
- CALIBRATING ANALOG TRANSDUCERS—to unprecedented orders of precision.
- MEASURING ZENER DIODES AND STANDARD CELLS—1% to 0.0001%, automatically.

- MEASURING RESISTORS AND NETWORKS—both absolute resistances and ratios.
- CALIBRATING POTENTIOMETERS AND ATTENUATORS—both linear and nonlinear.
- MEASURING POWER-SUPPLY CHARACTERISTICS—absolute output, regulation, tracking, stability.
- CALIBRATING AC SIGNALS AND GAINS—over 30Hz-5KHz, with excellent linearity.
- STANDARDIZING CURRENT SOURCES—over wide ranges, to unprecedented accuracy.
- MONITORING PROCESS VARIABLES—electrical parameters, temperature, strain, pressure, etc.

These new calibrators are the ultimate in accurate D.C. measurements offering numerous benefits which yield the most reliable and flexible operation ever. Some of the more obvious benefits are low parts count for reliability, ease of programmable application for quality measurements with isolated data output with BCD input, and output options.

MODEL	VOLTAGE-RATIO RANGES	DC VOLTAGE RANGES	RESISTANCE RANGES	DC CURRENT RANGES	UNIT PRICE	AVAILABLE OPTIONS		
						DESCRIPTION	DENOTED	ADD-ON COST
DM1000	0.000000 to 1.199999 F.S. (1 range)	Obtainable with external EMF std: ±11.99999V F.S.	—	—	\$6,490.			
DM1010	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. and ±11.99999V F.S.	—	—	\$6,820.	Digitally Programmable	Suffix P	Inc. on all units
DM1020	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. to ±1199.999V F.S. (4 ranges)	—	—	\$7,525.	Manual Balancing	Suffix M	Inc. on all units
DM1030	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. and ±11.99999V F.S.	119.9999 Ω F.S. to 11.99999 Meg Ω F.S. (6 ranges)	—	\$7,755.	Systems Option (Remote Programming) includes /D and /AP	/S	\$700.00
DM1040	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. to ±1199.999V F.S. (4 ranges)	119.9999 Ω F.S. to 11.99999 Meg Ω F.S. (6 ranges)	—	\$8,470.	Datalog Option includes /AP	/D	\$350.00
DM1050	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. and ±11.99999V F.S.	—	±1.199999mA F.S. to ±11.99999A F.S. (5 ranges)	\$7,370.	Autopolarity Option	/AP	\$200.00
DM1060	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. to ±1199.999V F.S. (4 ranges)	119.9999 Ω F.S. to 11.99999 Meg Ω F.S. (6 ranges)	±1.199999mA F.S. to ±11.99999A F.S. (5 ranges)	\$9,020.	Deviation Option (Programmable)	/DV	\$650.00

JULIE AUTOMATED/PROGRAMMABLE SYSTEMS

COMPUTER CALCULATOR CONTROLLED PRECISION TEST SYSTEM — LOCOST 106*



DESCRIPTION AND APPLICATIONS

From the leading manufacturer of precision standards and measuring instrumentation, Julie Research, a new computer controlled test system is available at a low cost to fit into the budgets of even small calibration and testing laboratories.

LOCOST* features a combination of computer, data terminal, high speed thermal printer, programming cassette memory and a programming calculator which can be operated by lab technicians with little or no computer and programming experience. It uses BASIC language, has an alphanumeric keyboard and an interactive 32-character display, as well as a built-in 15K byte main-line memory. Cassette memory is 32,000 words. Capability of the calculator is equivalent to a 10K or 12K mini-computer.

A unique, labor saving feature of LOCOST* is its unique programmed software which makes it possible to generate, store, and carry-out test programs for new instruments efficiently. Simple questions concerning the specifications of the instrument under test are asked by the calculator and the operator answers these questions by typing specifications such as full-scale accuracy, etc. When completed, these specifications are then stored on cassette memory for future reference and use by the system's preprogrammed meter test routine. Programming costs are 80 to 90% lower than for conventional computer controlled systems.

A complete array of programmable DC and AC test instrumentation is available to satisfy even the most demanding testing and calibration applications. Sources and measuring instruments that are available include:

SYSTEM FEATURES

- Fully Automatic or manually operated modes of operation
- Computer Controlled System
- Programmable Calculator Capability
- BASIC Language for simplified programming
- Compact Portable Packaging
- Complete Array of AC/DC Standards & Measuring Instrumentation available
- Full Library of software test routines available

JRL and Optimization Instruments
 DM 1000 1ppm Digital Multimeter
 RVD 126 Six Digit Relay Divider
 ACS 106 Precision DC Current Source
 AVS 106 Precision DC Voltage Source
 PRS 106 Resistance Standard

AC 129L Absolute AC Voltage Calibrator
 PA 1182 1 KV AC Power Amplifier
 CS 129L Current Source
 S260GT Random Access Scanner (100 pos., 2-pole)
 BA 106 x1 and x10 gain Buffer Amplifier
 BA 107, 108 x100, x1000 gain Buffer Amplifiers

System can include pulse/function generators, frequency synthesizers, distortion analyzers, vector voltmeters, phasemeters. Peripherals available for complete oscilloscope testing.
 *LABOR OPTIMIZED COMPUTER OPERATED SYSTEM TEST

COMPUTER CONTROLLED PRECISION TEST SYSTEM — LOCOST 1106

LOCOST 1106 SYSTEM FEATURES

- PDP-11/35 Digital Computer
- 16 K Core Memory
- 2.5 M Disk Memory

- High Accuracy
- Multi-Terminal Work Stations
- Uniquely Powerful User-Oriented Software System



AUTOMATIC AND PROGRAMMABLE DC VOLTAGE, CURRENT AND RESISTANCE MEASUREMENTS TO 20 PPM ACCURACY, 1 PPM RESOLUTION

LOCOST 1106

The most complete, highest-speed configuration in the standard LOCOST family. Comprises a PDP-11/35 digital computer, supported by high-speed photo-electric perforated tape reader, magnetic-tape cassette unit, CRT terminal with keyboard, high-speed thermal printer, 2.4 Megaword disc memory, plus any required combination of the instruments, sources, and accessories described above. Optionally, may be equipped with time-sharing controller, for multiple work stations.

MODEL	PROGRAMMABLE	RANGE	ACCURACY
AVS-106	Voltage Source	0 ±1200v	.0015%
ACS-106	Current Source	0 ±12A	.005%
RVD-126	Divider	0 ±700v	.0001%
S106M or S106F	Scanner	100 Pts.	0001%

LOCOST 106 DATA ACQUISITION SYSTEM — MODEL DA-106

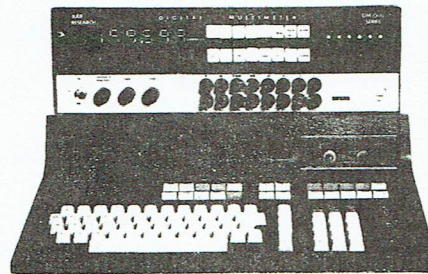
DESCRIPTION AND APPLICATIONS

DA-106 features high accuracy and resolution for a wide range of electrical and transducer test and measurement parameters. Utilizes the JRL Model DM-1060 1 PPM ACCURACY DIGITAL MULTIMETER, LOCOST 105 ATE System interfaces and software, and a modified HP computer calculated to provide a compact flexible data measuring data processing data formatting and recording system. Also functions as a computer (tape cassette) programmed tester, supplying voltage and current stimuli for calibrating measuring or recording devices.

System Features —

- High Accuracy DM-1060 Measuring System
- Universal Data Logging Processing and Formatting
- Programmed Tested and V/I Source
- Master Program Software (No Computer Expertise Required)
- Computer Coupling Directly to Many Peripheral Devices
- Simplified Editing and Debugging

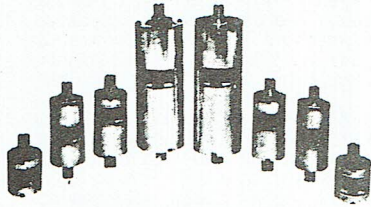
Computers with JRL master program cassette controls measurement sequence, selects modes of operation and ranges and then records, formats and processes data with results stored on tape cassettes or optionally displayed on peripheral devices.



HIGH-RELIABILITY MULTIPLE-STATION SYSTEM 106N. Up to 4 dedicated LOCOST 106 workstation complements may be interconnected so as to share a 2.4 megaword mass memory, and provide an order of magnitude higher reliability to the test line. This superior alternative to the 1106 is faster and more flexible, without significant sacrifice of application range.

JULIE PRECISION MEASURING SYSTEMS

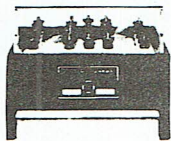
AC-DC THERMAL VOLTAGE TRANSFER STANDARDS



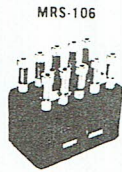
MODEL TNB-102 SERIES COAXIAL AC/DC TRANSFER STANDARDS

TNB-102 Series — Coaxial Type (Complete Set)\$1770.
 This set of two Thermoelement Modules (2.5 ma and 5 ma) and six Resistor Modules provide highest available transfer accuracy from 0.5 v to 1000 v up to 50 KHz.

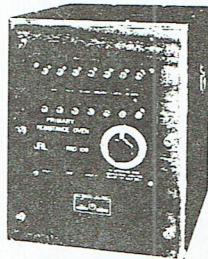
RESISTANCE REFERENCE



DMR



MRS-106

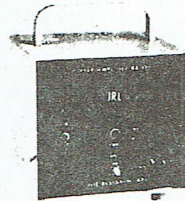


PRO-106

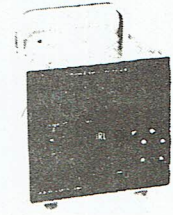
Model	Absolute Resistance Values	Accuracy (ppm)	Room Temp. Effect (ppm/°C)	Approximate Size (inches)
PRO-106*	10 ohms to 1 Meg	8	.1(0-28°C)	10 x 14 x 15
PRO-106L*	.001 ohms to 10 ohms	50-100	.1(0-28°C)	10 x 14 x 15
MRS-106	100 ohms to 1 Meg	15	2.5/°C	4 x 2 x 4
MRS-105	.1 ohms to 100 ohms	30-100	2.5/°C	4 x 2 x 4
DMR Series	10 ohms to 1 Meg	15	2.5/°C	5 x 4 x 3
RCO-105/7E	10 K	15	.05/°C	10 x 12 x 8
DTR Series	1 ohm to 100 K	15	2.5/°C	10 x 3 x 2
RCS-105/7	1 ohm to 10 Meg	15-100	2.5-5/°C	10 x 12 x 8
BMR Series	29,996,131,071 ohms	15-50	5/°C	5 x 4 x 3
BDR Series	100,000 ohms Max.	15	5/°C	5 x 4 x 3

* Ovenized. NOTE: Inquire about detailed specifications.

BUFFER AMPLIFIER



BA106



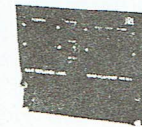
BA107, BA108

LINE OPERATED HIGH PERFORMANCE FLOATING AMPLIFIER

	BA106	BA107	BA108
Gain	1.0 ± 1.5 PPM 10.0 ± 1 PPM	100 ± 1 PPM	1000 ± 1 PPM
Max. Output	±12 Volts	±12 Volts	±12 Volts
Price	\$595.00	\$1145.00	\$1145.00

BA106C with ± 25 ma output

MINI SCANNER



MS-106

- (1) Only .1 to .2 μV thermals, (can be used in 1 PPM accuracy systems)
- (2) Manual and complete on line (computer) capabilities
- (3) 10 test positions plus 2 mutually exclusive dual form A closures
- (4) Random or sequential access
- (5) Manually settable or programmable lower limit and manually settable upper limit in the sequential mode
- (6) I/O, standard positive BCD code, TTL levels
- (7) Illuminated test position display
- (8) Automatic stop and hold position or repeat previous scan pattern capabilities.

AC/DC HIGH VOLTAGE DIVIDERS



MODEL HV-100 SERIES AC/DC HIGH VOLTAGE DIVIDER

The HVA Series Dividers are designed to be used primarily as calibration standards of DC and 60 Hz voltages up to 300 KV. The HVA Series can be sent to the National Bureau of Standards in Washington, DC for testing. To date, all tested units have been found to be safely within ±0.05% on 60 Hz and ±0.01% on DC. Yearly stability is specified as better than 0.005%. Input resistance is 1000 ohms per volt and output taps can be provided for connection to readout instruments such as DVM's, Differential Voltmeters and other high impedance DC or AC/DC instrumentation.

MINI DECADE BOX

MDR116



Max. Res. 1,111,110Ω
 Ohms Per Step 10
 Decade Ranges 6
 Enclosure 3 1/2" x 4" x 5" Metal Case
 MDR11601% Accuracy \$310
 MDR116005% Accuracy \$425
 MDR1160025% Accuracy \$485

ACCURACY: 0.01% of setting ±1 milliohm
 (inquire about accuracies to .0025%)

Model	DR-113	DR-114	DR-115	DR-116	DR-117	DR-118
Total Resis.	1.11 K	11.1 K	111 K	1.11 M	11.1 M	111.1 M

MINIDIVIDER

MVD306



6 Reading Switches — Ratios from .000001 to .999999 —
 Over Range Switch to 1.100000 Ratio
 Enclosure 3 1/2" x 4" x 6"
 MVD306 2.5 PPM Accuracy \$465
 MVD306 5 PPM Accuracy \$380
 MVD306 10 PPM Accuracy \$320

FOR HIGH PRECISION AC CALIBRATION OPTIMIZATION SUBSIDIARY
 FOR HIGH VOLTAGE - HIGH POWER MEGAVOLT SUBSIDIARY

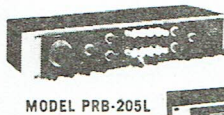
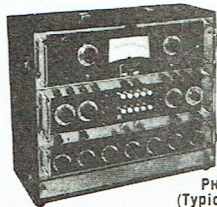
JULIE RATIOMETRIC® SYSTEMS

PRECISION RESISTANCE MEASURING SYSTEMS

Through the use of the RESISTANCE PLUG-INS, the multivider system is made into various precision resistance measuring systems.

When the PRB-205C bridge and range extenders PRB-205L and PRB-205H are used with the basic multivider detector and divider, the system is identified as the PRB-205S, and is capable of measuring resistance values from 0 to 10^{12} ohms. Zero offset circuitry establishes the true zero point and eliminates all test lead and fixture effects. Direct reading deviation dials permit measurement of deviation from 0 to ± 1200 PPM in 0.1 PPM steps, with an accuracy of 0.1% of observed deviation or 0.2 PPM, whichever is larger. Resistance measurement accuracies obtained are tabulated below. All required resistance standards with NBS traceability are included. Model PRB-205C Plug-in includes Model MRS-106 Reference Resistor set, and the PRB-205L includes Model MRS-105 Reference Resistor set. See specifications in the resistance reference section.

When the Model DRRS-108 plug-in is used, the Multivider system is made into a Direct Reading Ratio Set, capable of measuring the Thomas pattern 1 ohm resistor with an accuracy and precision of .1 PPM. It also permits making 1:1, 1:9 and 1:10 comparisons of 2 and 4 terminal standard resistors.



MODEL PRB-205H



PRB-205C PLUG-IN,		PRB-205H EXTENDER,	
0-1000	± 1 ppm Setting ± 1 ppm f.s.	0-100 Meg	$\pm 0.04\%$ ± 1 ppm f.s.
0-10K	± 1 ppm Setting ± 1 ppm f.s.	0-1 K Meg	$\pm 0.09\%$ ± 1 ppm f.s.
0-100K	± 1 ppm Setting ± 1 ppm f.s.	0-10 K Meg	$\pm 0.19\%$ ± 1 ppm f.s.
0-1 Meg	± 2 ppm Setting ± 1 ppm f.s.	0-100 K Meg	$\pm 0.4\%$ ± 1 ppm f.s.
0-10 Meg	± 3 ppm Setting ± 1 ppm f.s.		
DRRS-108 DIRECT READING RATIO SET, PLUG-IN,		PRB-205L EXTENDER,	
Used for resistance comparison to accuracy of 0.1 ppm when ratio is 1:1 or 1:9 or 1:10.		0-1	± 3 ppm Setting ± 1 ppm f.s.
		0-1	± 2 ppm Setting ± 1 ppm f.s.
		0-10	± 2 ppm Setting ± 1 ppm f.s.
		0-100	± 1 ppm Setting ± 1 ppm f.s.

Note: For System Accuracy add values shown to accuracy of reference resistor used.

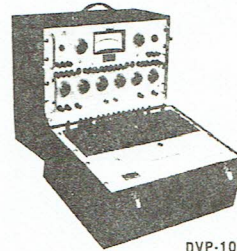
PRECISION VOLTAGE POTENTIOMETERS

Through the use of POTENTIOMETER Plug-ins, the Multivider system is made into various precision voltage measuring systems. (Systems listed in the table below include null detector and voltage divider).

PVP-110C Single Range Potentiometer Plug-in with 0.0002% \pm digit accuracy, 0-1.1 VDC:

PVP-1000C Potentiometer/Voltbox Plug-in with ranges to 1000 volts and with accuracy as shown below for PVP-1000S:

PVP-1001J Universal Potentiometer Plug-in is used in the PVP-1001JS and DVP-108JS systems listed below:



PVP-1001J (Plug-in)

Range volts	PVP-1000S Accuracy (w/self cal.)	PVP-1001JS Accuracy (w/self cal.)	DVP-108JS System Accuracy
1000	8 ppm ± 1 ppm f.s.	—	—
300	8 ppm ± 1 ppm f.s.	—	—
100	8 ppm ± 1 ppm f.s.	—	—
30	8 ppm ± 1 ppm f.s.	—	—
12	—	1 ppm ± 1 uv	.5 ppm + .05 uv
10	5 ppm ± 1 ppm f.s.	—	—
3	5 ppm ± 1 ppm f.s.	—	—
1.2	—	1 ppm ± 1 uv	.5 ppm + .05 uv
1.1	± 1 uv (cell compar.)	—	—
1.0	2 ppm ± 1 ppm f.s.	—	—
.12	—	2 ppm $\pm .02$ uv	.75 ppm + .01 uv
.012	—	3 ppm $\pm .3$ nv	1 ppm + .005 uv
.0012	—	4 ppm ± 1 nv	2 ppm + .001 uv

JULIE PRECISION MEASURING SYSTEMS

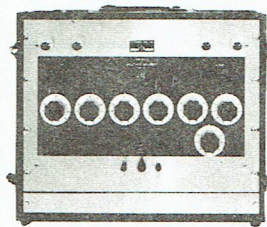
In Julie approach, use is made of very accurate resistance and voltage references. A voltage divider is used with associated circuitry, switches and a null detector, to interpolate and extrapolate the values of these references. Total measurement errors are reduced, very simply, to those produced by the voltage divider (usually 1 ppm f.s. at worst), switching and hook-up (usually 1 or 2 ppm) and reference voltage or resistance (1 ppm to typically 10 ppm for resistance).

The key to the Ratiometric™ approach is the stable Kelvin-Varley voltage divider. (See the table that follows.) Although the Kelvin-Varley divider was

invented over 100 years ago, it was not used in high precision applications because of accuracy limitations. With the radical improvement in the accuracy of the Kelvin-Varley divider by Loebe Julie, founder of Julie Research Laboratories, Inc., the previously unrealized advantages of this divider were harnessed. Background information is available for the asking from the Julie Research home office in New York City.

These pages list only a basic sampling of Julie products. We welcome your request for detailed information.

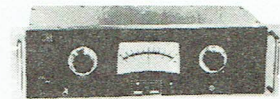
VOLTAGE DIVIDERS



Model	Accu. (ppm)	Lin. Resol. (ppm)	Stability (ppm/yr.)	Resistance (Kohms)	Max. Volts	Mode of Operation
DVD-108J	1 (5 yr.)	.01	.2	100/110/120	1000	Manual
VDR-106/7	1 (5 yr.)	.1	.2	100	300	Manual
VDR-307	1 (5 yr.)	.1	1	100	700	Manual
VDR-327J	1	.1	1	100/110/120	700	Manual
*RVD-106	1	1	1	100	300	Prog./Manual
*RVD-126J	1	1	1	100/110/120	300	Prog./Manual

* All RVD Programmable Dividers are available with BCD input/output.

NULL DETECTORS



Model	Ranges	Sensitivity	Dimensions
ND-106	(9) 3 uv to 30 mv	.1 uv	19 x 5 1/4 x 8
ND-107	(3) 10 nv to 1000 nv	.3 nv	9 1/2 x 3 1/2 x 5

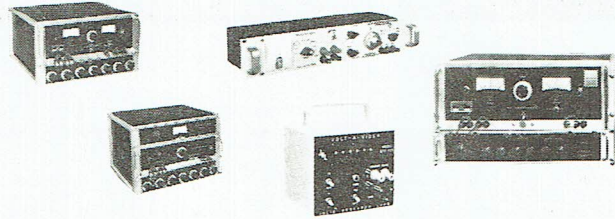
OPERATIONAL AMPLIFIERS OA-601, output ± 10 ma, 0-1000 ohms load

CALIBRATION SERVICES — a wide variety of Julie and other quality electronic instruments and standards can be maintained to within original NBS requirements.

JULIE PRECISION MEASURING SYSTEMS

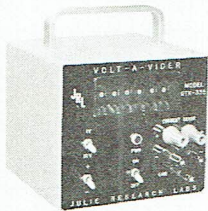
DC VOLTAGE AND CURRENT SOURCES

Julie precision voltage and current sources are the most accurate and most stable available. Many standard models are available as tabulated below. The Julie Engineering team is always pleased to design special configurations when special applications demand custom units. In general, highest quality precision sources are comprised of a stable voltage reference (such as ZVR-512), a 100K Kelvin-Varley divider (such as VDR-307H) for output control, and an ultra stable, low noise operational amplifier (such as OA-600 Series). All three basic modules are available from Julie and can be assembled as required.



Model	Outputs	Accuracy	Stability
DVS-106	0 to $\pm 12, 120, 1200$ v at 35 ma, 7 digits	2 ppm	2 ppm/day
DCS-105	0 to $\pm 1.2, 12, 120$ ma; 1.2, 12 Amps	10 ppm	3 ppm/day
GTX Series	1 v and 10 v with 6 digits, 25 ma	10 ppm-50 ppm	3 ppm/day
NVS Series	1 nv to 1.1 v	.04%	30 day Acc.

DIALABLE PRECISION D.C. VOLTAGE SOURCES



Model	Accuracy
GTX-331	0.001%
GTX-332	0.0025%
GTX-335	0.005%

The GTX-300 Series is a high quality, compact, portable voltage source. Output settings on this 1 PPM resolution instrument range from 1 micro-volt to 10 volts D.C. and can be made simply by dialing the desired value. Accuracies of from 0.001% to 0.005% can be ordered. Loads requiring up to 25 mA can be tolerated without accuracy deterioration. An output stability of ± 3 PPM/24 hours is standard on all units.

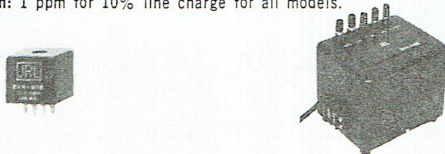
SOLID STATE REFERENCES — ZENERS

SOLID STATE REFERENCES — ZENERS

Output: +1.018, +1.0 and -5.0 volts all models except ZVR-500 Series.

Room Temp. Effect: 5 ppm Total ($-^{\circ}\text{C}$ to 50°C) for ZRO-106 Series, 0.3 ppm/ $^{\circ}\text{C}$ (20°C to 30°C) for ZVR-106 Series and 0.2 ppm/ $^{\circ}\text{C}$ (20°C to 30°C) for ZVR-500 Series.

Line Regulation: 1 ppm for 10% line change for all models.



Model	Size
ZVR-106B	6" x 6" x 4"
ZVR-106MV (10V, 1V, .1V, .01V)	6" x 6" x 4"
ZVR-506 (6.3V)	.84" x .84" x .75"
ZVR-512 (12.6V)	—
ZVR-518 (18.9V)	—
ZTS-106	1.000, 1.018 + Delta, 1.019 + Delta VDC, 0 to 1000 μV (Delta); ± 2 PPM Accur.; 1 μV Resol.; ± 3 PPM/Mo. Stable

VOLTAGE REFERENCES

SATURATED STANDARD CELL OVENS

The best voltage reference possible must meet two basic critical requirements —

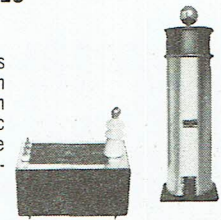
1. Time performance; the three saturated cells used must have minimum output voltage change with time.
2. The enclosure must maintain its nominal temperature with time.



Stability Specs*	Temperature	Time
SCO-106 cells oven	.64 ppm/ $^{\circ}\text{C}$.01 $^{\circ}\text{C}$ /day max	1 ppm/yr. max. .05 μV /yr. max.

HIGH VOLTAGE DIVIDERS/VOLT BOXES

The Julie High Voltage Dividers and Volt Boxes on the table below are used to "drop" high voltages to a level that traditional precision potentiometers and high impedance electronic voltmeters can safely measure (such as the Julie models PVP-1000S, PVP-1001JS, the DVD-108J and the TDV-1000).



Model	No.	Input Ranges Lowest Highest	Input Imped.	Output Taps	Acc. (%)	1 Year Stab. (%)
DV-1500	11	1 v 1500 v	1 Kohm/v	1/1.5 v	.001	.001
DV-1000	7	1 v 1000 v	1 Kohm/v	1/1.5 v	.001	.001
DV-1000B	7	1 v 1000 v	1 Kohm/v	1 v	.001	.001
HV-100/w	1	100 Kv 100 Kv	1 Kohm/v	1 v	.05	.0015
HV-100	1	100 Kv 100 Kv	4 Kohm/v	1 v	.05	.1
KV-50/.01	1	50 Kv 50 Kv	1 Kohm/v	1/10 v	.01	.0015
KV-25/.01	1	25 Kv 25 Kv	1 Kohm/v	1/10 v	.01	.0015
KV-10/.01	1	10 Kv 10 Kv	1 Kohm/v	1/10 v	.01	.0015
KV-10R	1	10 Kv 10 Kv	1 Kohm/v	1/10 v	.01	.0015
KV-VB/10	1	10 Kv 10 Kv	2 Kohm/v	10 v	.05	.005

UPB-100 UNIVERSAL POTENTIOMETER/BRIDGE

A durable and economical potentiometer/bridge system designed for use in the college classroom as well as in industry.

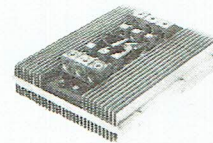


The basic system is used to measure voltage, resistance, current, and ratio. A 10% educational discount is available, where applicable.

For added convenience, optional accessories are available. These include a Lead Kit, specially written instruction book for theory, experiments, and answers, Student Manual, a Binary Series Resistor Set (16 Binary Bits) and a Binary Coded Decimal Resistor Set (5 decade).

CURRENT SHUNTS

High quality shunts are high quality 4-terminal resistors especially designed to operate at relatively higher current levels without suffering appreciable resistance change. Most high ranges (50 A for example) are the finned heat-sink type. Most lower ranges are available in single and multiple-range (oil-filled) units. Accuracies up to .0025% are available although .05% or .01% are most typical. Yearly stabilities of .01% are typical and temperature coefficients are 5 ppm/ $^{\circ}\text{C}$ or better. Ask for data sheet.



JULIE RESEARCH

PRECISION WIREWOUND RESISTORS

PRECISION RESISTORS FOR EVERY APPLICATION

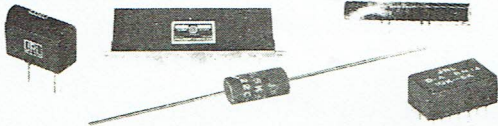
Precision Resistors for every application imaginable; high quality, low priced precision resistors are available for your every design need and at delivery schedules (1-2 weeks) even distributors can't beat!! JULIE RESEARCH resistors are guaranteed for a lifetime performance in almost every value, tolerance and stability.

Available as individual, ratio or network assemblies, these expertly manufactured and trimmed resistors assist you in eliminating countless hours of Production Test time from your design. In addition, the use of these very stable resistors contribute to reliable design and reduced component count. Specify a Julie Resistor. Better yet, call us and we will assist in helping you get the best price-performance unit your application and budget will allow.

JUST A FEW OF THE PROVEN APPLICATIONS FOR THESE LOW REACTANCE HIGH PERFORMANCE RESISTORS ARE:

- Transducer Calibrating Networks
- Current Metering
- Gyro Torquing
- AC and DC Precision Bridge Elements
- Amplifier Summing Elements
- D/A Converters
- Reference Divider
- Precision Multiplier
- Resistive Divider Networks
- Shunting
- AC or DC Ratio
- High Performance MIL Spec
- Zener Trimming Networks

RESISTOR STYLES



SPECIFICATIONS

Range: Individual Resistors, 0.1 ohm to 5 megohms. Ratio Sets, 1:1 to 10%:1 depending on total resistance required.
Accuracy: Standard accuracy of resistors, 0.005% for values from 1000 ohms to 5 megohm. Standard accuracy of ratio sets, 0.0025% for ratios near 1:1. Accuracies from 0.002% to 0.1% are available (at corresponding prices) on special order.
Stability: Resistors, 0.002% per year for standard ranges.
Accuracy Over Military Temperature Range: ±0.02% from -45°C to +85°C.
Matching Over Military Temperature Range: ±0.005% from -45°C to +85°C.
Retrace Over Military Environmental Conditions: 0.002%.
Temperature Coefficient: Resistors, 5 ppm/°C standard. (Available as low as 1.0 ppm/°C). Ratio sets, 2.5 ppm/°C standard. (Available as low as 0.7 ppm/°C).
 Note: Temperature Coefficient can be altered, in manufacture, over wide ranges.
Thermal Transients: All thermal-induced transient effects, e.g.: self-heating, Seebeck and Peltier effects, are less than 0.0015% at rated power dissipation. Self-heating and time constants of thermal transients are reduced to 10% of normal values in air.
Current Capability: To 2 Amperes.
Voltage: Between Terminals, 300 volts maximum. Terminals to Case, 500 volts maximum.

SPECIFICATIONS

Range: Individual Resistors, 1 ohm to 10 megohms. Ratios, 1:1 to 10%:1, depending on total resistance required.
Accuracy: Standard accuracy of resistors, 0.01%, for values from 100 ohms to 5 megohm. Standard accuracy of ratios, 0.005%, for ratios near 1:1. Intermediate accuracies of 0.05% and up and higher accuracies to .0025% are available on special order.
Stability: Resistors 0.003% per year for standard ranges.
Accuracy Over Military Temperature Range: 0.02% from -30°C to +85°C.
Matching Over Military Temperature Range: to 0.005% from -45°C to +85°C.
Retrace Over Military Environmental Conditions: 0.003%.
Temperature Coefficient: Resistors, 5 ppm/°C standard. (available as low as 1.0 ppm/°C). Ratios, 2.5 ppm/°C standard. (available as low as 0.7 ppm/°C).
 Note: Temperature Coefficient can be altered, in manufacture, over wide ranges.

SPECIFICATIONS

Range: Individual Resistors, 1 ohm to 100 ohms.
Accuracy: Standard accuracy of resistors, 0.01%, for values from 1.0 ohm to 100 ohms. (R:1XG) 0.05% (CH).
Stability: Resistors 0.003% per year for standard ranges.
Accuracy Over Military Temperature Range: 0.02% from -30°C to +85°C.
Retrace Over Military Environmental Conditions: 0.003%.
Temperature Coefficient: Resistors, 5 ppm/°C standard. (available as low as 2.5 ppm/°C).
 Note: Temperature Coefficient can be altered, in manufacture, over wide ranges.
Voltage and Power Ratings: See chart
Construction: See charts.
Group Encapsulation: Special techniques permit group encapsulation of high-accuracy units on a high-yield basis, enabling better accuracies at competitive costs. (See JRL Bulletin B-11.)

SPECIFICATIONS

The DIP resistor is available with 7 resistance values in a 14 pin DIP or 8 resistance values in a 16 pin DIP.
Resistance Range: 100Ω to 100KΩ **Ratio Accuracy:** Up to .003%
Absolute Acc.: .01% **Accuracy Over MIL Environmental Conditions:** .0025% ABS .002% Ratio
Tc: 5 PPM/°C **Dimensions:** 3 3/4" x 1 1/2" x 3/16"
Delivery: 3-4 weeks

LOWEST, LOW REACTANCE OIL FILLED AND ENCAPSULATED THA-H, CH, HCH, RESISTORS AXIAL WIRE LEAD CONSTRUCTION

Style	Size	AWG Leads	Max. Res.	Volt	Power	MIL R-93
H32	3/8 x 1 1/2	20	250 K	250	1/2 W	—
H33	3/8 x 3/4	20	350 K	450	1/3 W	RB 53
H34	3/8 x 1	20	500 K	500	1/2 W	RB 52
H42	1/2 x 1 1/2	18	750 K	250	1/2 W	—
H44	1/2 x 1	18	2 Meg	500	1 W	RB 57
H46	1/2 x 1 1/2	18	3 Meg	750	1 1/2 W	RB 58
H48	1/2 x 2	18	5 Meg	1000	2 W	RB 59
HCH32	3/8 x 1 1/2	20	150 K	—	3/4 W*	—
HCH33	3/8 x 3/4	20	250 K	—	1 W*	—
HCH34	3/8 x 1	20	350 K	—	1.5 W*	—
HCH35	3/8 x 1 1/4	20	500 K	—	1.8 W*	—
HCH42	1/2 x 1 1/2	18	375 K	—	1.5 W*	—
HCH44	1/2 x 1	18	750 K	—	3 W*	—
HCH46	1/2 x 1 1/2	18	1.5 M	—	4.5 W*	—
HCH48	1/2 x 2	18	1.5 M	—	6 W*	—
CH-32	3/8 x 1 1/2	20	300 K	—	3/4 W*	—
CH-34	3/8 x 3/4	20	500 K	—	1 W*	—
CH-33	3/8 x 1	20	700 K	—	1.5 W*	—
CH-34	3/8 x 1 1/4	20	1 Meg	—	1.8 W*	—
CH-35	3/8 x 1 1/2	20	1.5 Meg	—	1.5 W*	—
CH-42	1/2 x 1 1/2	18	750 K	—	3.0 W*	—
CH-44	1/2 x 1	18	1.5 M	—	4.5 W*	—
CH-46	1/2 x 1 1/2	18	2 M	—	6 W*	—
CH-48	1/2 x 2	18	5 M	—	—	—
THA-36	3/8 x 1 1/2	18	1 M	100	—	RB 53
THA-38	3/8 x 3/4	18	1 M	100	—	RB 53

*When mounted on heat sink.

SUPER ACCURATE, SUPER STABLE ENCAPSULATED, MINIATURE PRECISION R, XG, RS, L, GL RESISTORS

TYPE R-AXIAL WIRE LEAD-CONSTRUCTION

Style	Size	AWG Leads	Max. Res.	Volt	Power	MIL R-93
R-22	1/4 x 3/16	22	500 K	125	1/8 W	—
R-23	1/4 x 3/4	22	750 K	125	1/4 W	RB 54
R-24	3/8 x 1	22	1 Meg	350	1/4 W	—
R-32	3/8 x 1/2	22	750 K	125	1/4 W	—
R-33	3/8 x 3/4	20	1 Meg	125	1/3 W	RB 53
R-34	3/8 x 1	20	1.5 Meg	250	1/2 W	RB 52
R-35	3/8 x 1 1/4	20	2 Meg	250	5/8 W	—
R-42	1/2 x 1 1/2	18	1.5 Meg	125	1/2 W	—
R-44	1/2 x 1	18	4 Meg	250	1 W	RB 57
R-46	1/2 x 1 1/2	18	7.5 Meg	250	1 1/2 W	RB 58
R-48	1/2 x 2	18	10 Meg	250	2 W	RB 59

TYPE L AND RB-RADIAL LUG CONSTRUCTION

Style	Size	Construction	Max. Res.	Volt	Power	MIL R-93
L-10A	5/8 x 7/16	Solder Lug	1.5 Meg	125	1/2 W	RB 16
L-HB	5/8 x 1 1/4	Solder Lug	4 Meg	250	1 W	RB 18
RB 19	1 x 2 1/2	Solder Lug	10 Meg	300	2 W	RB 19
RB 17	1 1/2 x 1	Solder Lug	1.5 Meg	125	3/4 W	RB 17

TYPE XG-RADIAL WIRE LEAD CONSTRUCTION

Style	Size	AWG Leads	Max. Res.	Volt	Power	MIL R-93
R-32 XG	3/8 x 9/16	22	500 K	125	1/4 W	—
R-42 XG	1/2 x 3/4	20	1 Meg	125	1/2 W	—
R-44 XG	1/2 x 1 1/2	20	3.5 Meg	250	1 W	—
R-46 XG	1/2 x 1 3/8	20	5 Meg	250	1 1/2 W	—
R-48 XG	1/2 x 2 1/4	20	10 Meg	250	2 W	—
R-52 XG	5/8 x 1 1/2	20	1 Meg	125	3/4 W	—

TYPE RS-TOP HAT CONSTRUCTION

Style	Size	AWG Leads	Max. Res.	Volt	Power	MIL R-93
RS-36	1 1/2 x 1 1/2	22	750 K	125	1/4 W	—
RS-26	1 1/2 x 1 1/2	22	250 K	125	1/8 W	—

LOW OHM, LONG TERM STABILITY, OIL FILLED AND ENCAPSULATED 4-TERMINAL CH46-T4, R-46-T4, R46xG-T4 AXIAL AND RADIAL CONSTRUCTION

Style	Size	AWG Leads	Max. Res.	Current	Power
R-46-T4	1/2 x 1 1/2	18	100 Ohms	2 Amps	1 1/2 W
R-46xG-T4	1/2 x 1 1/2	20	100 Ohms	2 Amps	1 1/2 W
CH46-T4	1/2 x 1 1/2	18	100 Ohms	2 Amps	3 W*

*When mounted on heat sink.

