

UNCLASSIFIED

NAVSHIPS 0967-031-1000
(Supersedes NAVSHIPS 93440(B))

HANDBOOK

of

MINIATURE PARTS AND
INTEGRATED CIRCUIT DEVICES
FOR
ELECTRONIC EQUIPMENT

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

UNCLASSIFIED

Publication: 15 May 1965

General

This Handbook of Miniature Parts and Integrated Circuit Devices for Electronic Equipment has been prepared to assist Industry and Government by listing and describing those commercial miniature electronic parts and devices which have been developed and are available from suppliers.

The handbook is issued annually on or about 15 April. As soon as new parts and additional categories are developed, cumulative supplements will be issued as necessary during the intervening period to keep the reader posted with up-to-date information. Accordingly, manufacturers are urged to supply suitable information on new or revised parts to Chief, Bureau of Ships.

Extracts from this handbook may be used in the preparation of other Government publications without reference to the Bureau of Ships.

Procurement

Requests from Industry for this handbook, and supplements thereto, should be made to Superintendent of Documents, U. S. Government Printing Office, Washington, 25, D. C. Navy requests should be made to the Naval Supply Depot, Philadelphia, Pa., in accordance with instructions contained in NAVSANDA 2002, Requisitioning Guide and Index of Forms and Publications.

Arrangement

The Handbook of Miniature Parts and Integrated Circuit Devices for Electronic Equipment is divided into two parts. Part I contains the description and illustration of miniature electronic components, such as capacitors, resistors, etc; Part II contains the description and illustration of functional units (circuits), such as amplifiers, oscillators, etc. An explanation of the presentation of material within each part is given at the beginning of each part.

Quality Assurance

Each item listed in this handbook contains a "Quality Assurance" statement to indicate the basis of the claims made concerning the item. Except where special cases require variation, this statement will assume one of the following forms:

- (a) Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.
- (b) Quality Assurance: Per specification MIL _____.
Bureau approval required prior to use.
- (c) Quality Assurance: Per specification MIL _____.
Preferred part per MIL-STD-242.

**PREPARED BY
PHILCO CORPORATION
TECHREP DIVISION
FT. WASHINGTON, PA.**

CONTRACT NO. N600(24)62008

Reference Designations

Miniature Parts are identified by reference designations for convenience in referencing when correspondence concerning these parts is necessary. Each reference designation consists of one or more capital letters followed by a number. The letter portion of the designation indicates the type of part (capacitor, resistor, etc), and the number portion distinguishes the particular part from all other parts of the same type.

A series of 99 reference designations is assigned to each type of parts listed. For example, the series C101 through C199 is assigned to Capacitors, Tubular; and the series C201 through C299 is assigned to Capacitors, Electrolytic.

The table below lists the types of miniature parts covered in this handbook. For a more detailed listing of reference designations, refer to the latest revision of MIL-STD-16.

MINIATURE PART CATEGORIES AND REFERENCE DESIGNATOR INDEX

TYPE OF PART	REFERENCE DESIGNATOR
B	
Battery, Manganese Dioxide	BT100
C	
Capacitor, Tubular	C100
Capacitor, Electrolytic	C200
Capacitor, Disc Type Ceramic	C300
Capacitor, Air Variable	C400
Capacitor, Trimmer	C500
Capacitor, Disc, Porcelain	C600
Capacitor, Var., Ceramic Diel.	C700
Capacitor, Piston, Variable	C800
Capacitor, Pellet, Ceramic	C900
Chopper, Electromechanical	G100
Chopper, Solid State	G200
Circuit Breaker, Magnetic	CB100
Clip, Spring Tension	X300
Connector, Rectangular	J100

TYPE OF PART	REFERENCE DESIGNATOR
Connector, "AN" Type	J200
Connector, Quick-Disconnect	J300
Connector, Printed Circuit	J400
Connector, Coaxial	J500
Connector, Cable	P100
D	
Delay Line	DL100
F	
Frequency Resonator, Tuning Fork	EMP100
Fuse, Electrical	F100
Fuseholder, Non-Indicating	XF100
Fuse Post, Indicating	XF200
G	
Generator, Audible Warning	DS400
H	
Holder, Heat Dissipating	X200
I	
Impedance Matching Network	Z100
Indicator Light, Neon	DS100
Indicator Light, Incandescent	DS200
Indicator, Electromagnetic	DS300
Inductor	L200
K	
Knob, Control	H100
L	
Loudspeaker, PM Type	LS100
M	
Meter, Elapsed Time Indicator	M100

TYPE OF PART	REFERENCE DESIGNATOR	TYPE OF PART	REFERENCE DESIGNATOR
Meter, Side Indicator	M200	Switch, Push Button	S300
Meter, Electrical	M300	Switch, Sensitive	S400
Motor, D-C	B100	Switch, Snap Action	S500
Motor, Fan	B200	Switch, Door Interlock	S600
Motor, A-C	B300	Switch, Lever Type	S700
		Switch, Inertia	S800
	P	Switch, Synchro	S900
Probe and Jack Terminal	E200	Switch, Pressure	S1000
	R	Switch, Gas Density	S1200
Rectifier, Selenium	CR100	Switch, Sealed Limit	S1300
Rectifier, Silicon	CR200	Switch, Magnetic Reed	S1400
Relay, Electromagnetic	K100		
Relay, Thermal	K200		T
Relay, Thermal Time Delay	K300	Test Jack, Printed Circuit	J600
Relay, Instrument Sensitive	K400	Terminal, Standoff	E100
Relay, Reed	K500	Thermostat, Bimetal Disc	S1100
Resistor, Fixed	R100	Transducer, Magnetic Pickup	MT100
Resistor, Potentiometer	R200	Transducer, Pressure	MT200
Resistor, Wirewound	R300	Transfilter	FL100
Resistor, Current Limiting	R400	Transformer, Inverter	T100
	S	Transformer, Power	T200
Shield, Heat Dissipating	E400	Transformer, Pulse	T300
Socket, Resistor	XR100	Transformer, Signal	T400
Socket and Plug	X100	Transformer, Deci-Ouncer	T500
Socket, Crystal Assembly	XCRA200		
Socket, Transistor	XQ100		
Solenoid, Rotary	L100		
Stud, Ground	E300		
Switch, Rotary	S100		
Switch, Toggle	S200		

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PART I**ITEM****BATTERYS**

Manganese Dioxide

CAPACITORS

Tubular

Electrolytic

Disc Type Ceramic

Air Variable Tuning

Trimmer and Padder

Disc Type, Porcelain/Glas,

Variable, Ceramic Dielectric

Piston Variable

Pellet Ceramic

CHOPPERS

Electromechanical

Solid State

Printed Circuit

DC-AC Type

CIRCUIT BREAKERS

Magnetic

CLIPS

Spring Tension

CONNECTORS

Rectangular

"A" Type

Quick Disconnect

Printed Circuit

Coaxial

CONNECTORS, PLUG

Cable Type

DELAY LINES

Micropulse

FREQUENCY RESONATORS

Tuning Fork

FUSES

Electrical Plug-In Type

FUSEHOLDERS

Non-Indicating

Indicating

HOLDERS

Transistor Heat Dissipating

IMPEDANCE MATCHING NETWORKS

Twin-Tee

INDICATORS

Electromagnetic

INDICATOR LIGHTS

Neon

Incandescent

INDUCTORS

High Q

KNOBS

Control

LOUDSPEAKERS

PM Type

METERS

Indicator, Elapsed Time

Panel, Side Indicator

Panel, Electrical Indicating

MOTORS

Motor, DC

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ITEM

Motor, Fan

Motor, AC

PROBE AND JACK TERMINALS

Feed-Through Connector Type

RECTIFIERS

Selenium

Silicon

RELAYS

Electromagnetic

Thermal

Thermal, Time Delay

Instrument Sensitive Type

Reed

RESISTORS

Fixed

Potentionmeter

Wirewound

Current Limiting

SOCKETS

Socket and Plug

Crystal Assembly

Transistor

SOLENOIDS

Rotary

STUDS

Ground

SWITCHES

Rotary

Toggle

Push Button

Sensitive

Snap Action

Door Interlock

Lever Type

Inertia

Synchro

Pressure

Gas Density

Sealed Limit

Magnetic Reed

TERMINALS

Standoff

TEST JACKS

Printed Circuit Type

THERMOSTATS

Bimetal Disc

TRANSDUCERS

Magnetic Pickup

Pressure Type

TRANSFILTERS

Piezoelectric

TRANSFORMERS

Inverter

Power

Pulse

Signal

Deci-Ouncer

WARNING DEVICES

Generator, Audible Signal

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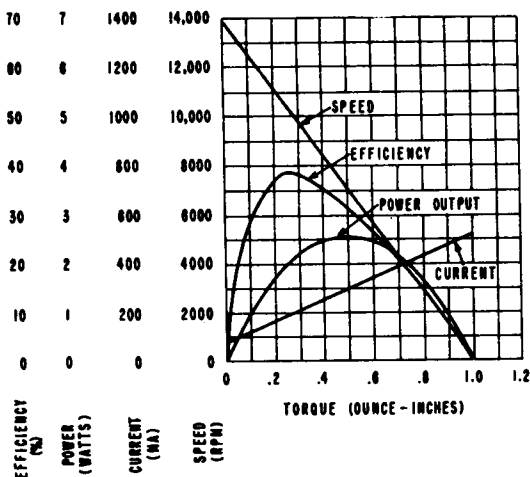
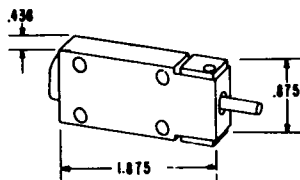
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**B101
MOTOR, D-C, SUBMINIATURE "MOTO-MITE", TYPE VS**

Application: Military and airborne equipment. Industrial and control applications.



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Globe Industries Inc., Dayton, Ohio.

Electrical Characteristics

Oper Voltage: 27 volts. Line voltage units are available; 3 to 50 volts are standard (see Remarks).
 Current Rating: Refer to performance chart.
 Current Type: Direct current.
 Power Rating: Refer to performance chart.
 Duty: Continuous duty where rating does not exceed 1 1/2 watts.
 Winding No-Load Characteristics: Standard windings available can provide no-load speeds of 5000 to 22,000 rpm.
 Armature Winding: Upon request.
 Magnet Type: Permanent magnet.
 Reversibility: Motor reverses when terminal voltage is reversed.

Physical Characteristics

Size: See illustration.
 Weight: 1.7 ounces.
 Housing: Aluminum.
 Construction: Aluminum housing; armature is formvar or teflon insulated.
 Finish: Finishes are selected for max motor protection.
 Terminals: Refer to illustration for location.
 Shaft Material: No. 420 stainless steel, hardened to RC 45-50.
 Bearings: Double-shielded, life-lubricated ball bearings.
 Color Code: Red terminal is positive; black terminal is negative.

Environmental Conditions

Max Temp Range of Oper: Upon request.
 Humidity: Max resistance.
 Salt Spray: Max resistance.
 Fungus: Max resistance.

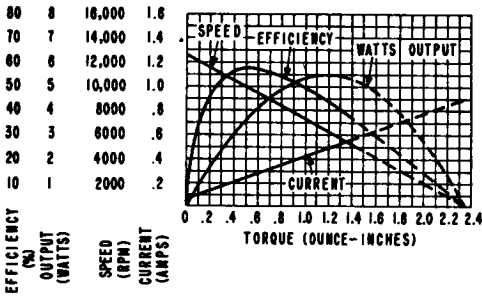
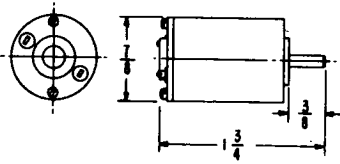
Test Data

Oper Temp Range: Upon request.
 Vibration: Max resistance.
 Torque: Can produce starting torque of 1.0 oz-in.
 Motor Speeds (Under Load): From 5000 to 22,000 rpm.
 Starting Power Consumed: Refer to performance chart.
 Voltage Applied Vs Speed (No Load): See Remarks.
 Efficiency: Refer to performance chart.
 Free Speed: 5000 to 22,000 rpm.
 Armature Inertia: 1.32 gm x cm².
 Typical Performance Chart: Refer to illustration.

Remarks: Various winding types with different input voltages can be supplied to meet consumers' specifications. 3 to 50 volts, dc, are standard; higher and lower voltages are available upon request. Speeds from 5000 to 22,000 rpm are available (no load). Winding chart with voltage range and no-load ranges can be obtained from the manufacturer.

**B102
MOTOR, D-C, SUBMINIATURE "MOTO-MITE", TYPE SS**

Application: Specifically designed as a component for airborne accessory equipment. Suitable for other applications where size and weight are main factors.



Environmental Conditions

Max Temp Range of Oper: Upon request.
 Moisture: Shielding provided.
 Salt Spray: Max resistance.
 Fungus: Max resistance.
 Dust: Shielding provided.

Test Data

Oper Temp Range: Upon request.
 Torque: Refer to performance chart.
 Motor Speeds (Under Load): From 5000 to 22,000 rpm.
 Voltage Applied Vs Speed (No Load): See Remarks.
 Efficiency: See performance chart.
 Free Speed: 5000 to 22,000 rpm.
 Armature Inertia: 1.8 gm-in.
 Typical Performance Chart: See illustration.

Remarks: Various winding types with different input voltages can be supplied to meet consumers' specifications. 3 to 50 volts are standard; higher or lower voltage units are available upon request. Speeds from 5000 to 22,000 rpm are available (no load). Winding chart with voltage ranges and no-load ranges can be obtained from the manufacturer.
 Shielded types provide protection against moisture, dust, fungus, and salt spray.

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Globe Industries Inc., Dayton, Ohio.

Electrical Characteristics

Oper Voltage: 27 volts (other ranges also available; see Remarks).
 Current Rating: Refer to performance chart.
 Current Type: Direct current.
 Power Rating: Refer to performance chart.
 Winding No-Load Characteristics: Standard windings available can provide no-load speeds of 5000 to 22,000 rpm.
 Armature Winding: Upon request.
 Magnet Type: Alinco V permanent magnet type motor.
 Reversibility: Motor reverses speed when terminal voltage is reversed.

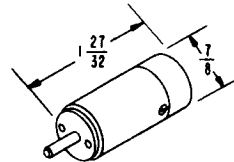
Physical Characteristics

Size: 1 3/8" x 7/8".
 Weight: 2 ounces approx.
 Housing: Aluminum.
 Finish: Chromate.
 Sealing: Prevents corrosion.
 Commutator Construction: Molded type.
 Elect. Connection: Solder connections are furnished; leads may be furnished upon request.
 Leads: May be furnished upon request.
 Shaft Material: No. 420 stainless steel, hardened to RC45-50.
 Bearings: Double-shielded, life-lubricated ball bearings.

B103

MOTOR, D-C, PERMANENT MAGNET SERIES PM-1

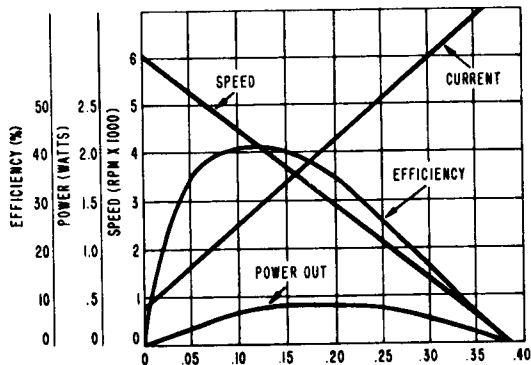
Application: Designed for use in military timing devices, high-speed blowers, remote control actuating motors and satellite recorder drive motors



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Reflectone Electronics, Inc., Stamford, Conn.

Electrical Characteristics



Oper Voltage: Available 4 to 30 volts, dc
 Current Type: Direct current
 Power Rating: 1 watt, max output power. (Special control applications as high as 7 watts output)
 Magnet Type: Permanent magnet

Physical Characteristics

Housing: Steel, totally encloses field and armature providing effective shielding from RF and other outside magnetic fields.
 Field Structure: Cast cylinder of non-oriented ceramic magnetized material
 Armature: Dynamo special steel punchings pressed on a case hardened ground steel shaft
 Brushes: Fine silver graphite
 Weight: 2-1/2 oz.
 Brush Holders: Molded nylon, pre-stressed springs
 Brush Life: Exceeds 1000 hr
 Bearings: Either life time lubricated ball bearings or self-lubricated sleeve bearings
 Leads: 6" length
 Shaft Material: Case hardened ground steel

Mechanical Characteristics

Governor: Double platinum contact type, insures normal speed variations held within 2% under load, and input voltage changes of 20%
 Speed: 20,000 rpm
 Oper Efficiency: 53% (ungoverned motor eff.) 30% with governor
 Torque: Up to 100 oz-in.
 Governed Speeds: ±2% speed regulation over temp range of -50° to +50°C for nominal loading

Environmental Conditions

Temp Range: -55°C to 100°C
 Temp Non-Oper: -80°F, remained stalled at full operate voltage without damage.
 Altitude: From sea level to 70,000 ft as tested per MIL-E-5272A. They can remain in non-operate state over same limits of altitude
 Explosion Proof: Approval received, meets requirements

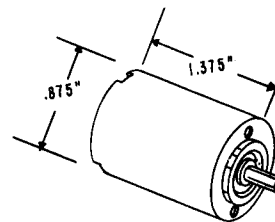
Test Data

Vibration: 40g's in 3 axes, 30 to 2,000 cy, per sec
 Acceleration: 40g's for 5 minutes
 Shock: 50g's peak acceleration with load application rate of 100g's per milli-sec with min conjunction of 5 milli-sec

Remarks: A steel shell totally encloses the motor's ceramic magnetic field structure, thereby, providing a self-shielding protection against radio frequency or other magnetic effects. The armature can be readily assembled or disassembled without affecting the magnetic characteristics of the motor.

B104 MOTOR, D.C. PERMANENT MAGNET, 09-FRAME TYPE

Application: Designed for use for driving devices that cool electronic equipment and for critical missile guidance applications.



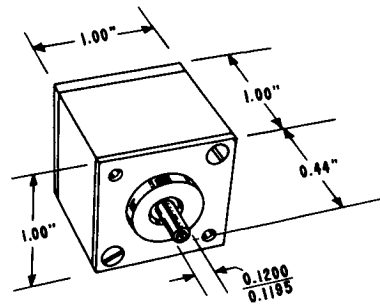
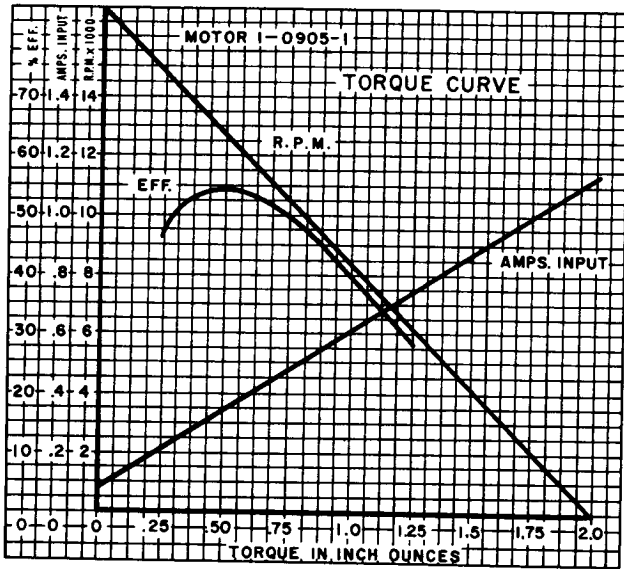
Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Indiana General Corp., Electro-Mechanical Division, Oglesby, Illinois

Electrical Characteristics

Voltage Rating: 27 volts, dc (other voltages available)
 Insulation: Class F
 Current Rating: See graph

pecially suited for both position and speed control null seeking systems where size, weight, and reliability are major considerations.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Inland Motor Corp., A Subsidiary of Kollmorgen Corp., Radford, Va.

Mechanical Characteristics

Output Speed: 5000 to 20,000 rpm
 Efficiency in Percent: See graph
 Torque: See graph
 Life: Determined by duty cy and/or application

Physical Characteristics

Housing: Rugged lightweight, aluminum
 Bearings: Double shield, precision ball bearings
 Magnet Type: IGC alnico permanent magnet
 Shaft Material: Stainless steel, precipitation-hardened
 Brush Rigging: Long life
 Body Finish: Std finish, hard black aluminum
 Leads: Teflon insulated, (optional: shielded leads or terminals)
 Hardware: Housing has holding machine screws, No. 2-56 UNC-2B THD. (2), 7/64 min, full thd.

Environmental Conditions

Design Standards: Per MIL-E-5272 and MIL-M-8609

Remarks: This motor is available with a wide variety of brakes, gears, governors and radio noise filters.

Electrical Characteristics

Volts at Peak Torque (25°C): 26.0 volts, nom.
 Amps at Peak Torque: 1.55 amps, rated
 DC Resistance (25°C): 16.7 ohms, ±12.5%.
 Back EMF: .031 volts/rad/sec, ±10%.
 Inductance: .001 henries, ±30%.
 Power Input, Stalled, at Peak Torque (25°C): 40.2 watts.
 Response: Electrical time constant, 60 μsec; mechanical time constant, 15 millisc.

Mechanical Characteristics

Peak Torque: 7.0 oz-in
 Torque Sensitivity: 4.5 oz-in/amp, ±10%
 Motor Friction Torque: 0.35 oz-in
 Ripple Torque Average to Peak: 10.0%.
 Ripple: 13 cycles/rev.
 Rotor Inertia: .00013 oz-in-sec.²
 Viscous Damping Coeff: Zero impedance source, .0086 oz-in/rad/sec; infinite impedance source, .00039 oz-in/rad/sec.
 Max Theoretical Acceleration: 53,000 rad/sec².
 Max Power Rate: 370,000 oz-in/sec².
 Max No Load Speed: 814 rad/sec.

Physical Characteristics

Weight: 2.93 oz.
 Commutator: Wear-resistant, drum-type.
 Terminals: 2, turret, solder type, ¼" long

Environmental Conditions

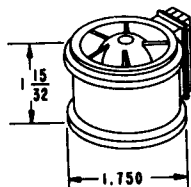
Temp Rise/RMS Watt: 12.0°C, ultimate.
 Max Permissible Winding Temp: 155°C.

B105 MOTOR, D-C, MINIATURE, TORQUE MODEL T-0716A

Application: Designed primarily for use in either open or closed loop servo systems in small precision instruments as well as aircraft and missile instrumentation. It is es-

**B201
MOTOR, FAN AIRFLOW REVERSIBLE, AXIMAX 1**

Application: For use where size and weight must be held to an absolute minimum, and where high heat loads must be dissipated with cooling air.



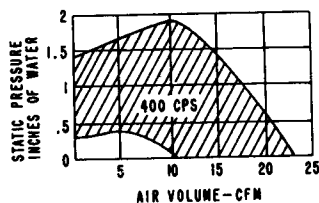
Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Rotron Mfg., Co., Inc., Woodstock, New York.

Electrical Characteristics

Motor		Electrical				
Series	Volts	Phase	No Poles	Cps	Cap μ f	Nominal Rpm
368YS	115	1	2	400	0.25	22,500
415YS	115	1	2	400	0.15	19,000
444YS	115	1	4	800	0.1	21,000
418YS	55	1	4	800*	0.5	21,000
431YS	55	1	4	800*	0.75	21,500
464YS	115	1	4	400	0.15	11,400
483YS	115	1	4	400	—	11,400
367QS	200	3	2	400	—	22,500
395QS	200	3	2	400	—	16,500

*Square Wave Power Supply



Motor Series	Insul Class	Electrical			Air	
		Watt Input At Free Delivery	Line Amp	Max Cfm	Max S. P. At No Delivery	
368YS	H	17	0.17	23	1.3	
415YS	H	17	0.17	19	1.3	
444YS	H	18	0.2	22	1.5	
418YS	H	17	0.4	21	1.3	
431YS	H	31	0.6	21	1.3	
464YS	H	8	0.09	11	0.4	
483YS	H	55	0.06	10	0.4	
367QS	H	17	0.1	23	1.3	
395QS	H	19	0.1	17	1.1	

Oper Voltage: 115 or 200 volts, ac, 10 or 30 amp, 400 CPS

Mechanical Characteristics

Frequency: 12-23 cfm-11,400 to 22,500 rpm

Vanes: The impeller and straightener vanes are of airfoil construction for maximum aerodynamic efficiency and minimum acoustical noise.

Power: Provided by an induction motor which is integral with fan.

Lubrication: On units having winding temperature rises of 50° C or below, the bearings are normally lubricated for a minimum of 1000 hrs of continuous operation in an ambient atmosphere of 14.7 psia and 125° C. Applications requiring more stringent duty must have the fan life specification individually defined.

Mounting: The fan has two "servo" type clamping rims, one on each end of its barrel, and is fastened to the panel with standard servo-motor clamps.

Terminals: Compact, screw-type terminal block.

Barrel assembly: Cast aluminum

Impeller: Cast aluminum

Shaft: Corrosion-resistant steel

Hardware: Corrosion-resistant steel

Impeller: Runs on two high-precision, double-shielded, stainless steel ball bearings.

Stators: All are wound in accordance with specifications for class H insulation.

Environmental Conditions

Oper Conditions: Fans operate in gas densities approximate to that of air.

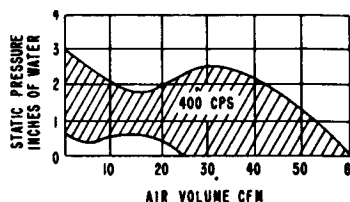
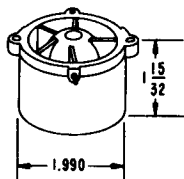
Gas Density: Power inputs, as well as stator and rotor temperatures, change with changes in gas density being operated on. Gas densities and gas minimum and maximum temperatures at fan location should be given to factory when ordering items.

High Altitude: For cooling purpose in high altitudes 3-phase machines should be used.

Remarks: The Aximax 1 is available for both pressurized and nonpressurized applications and is built for single-phase or 3-phase operation.

B202
MOTOR, FAN VANE-AXIAL TYPE, ROTRON AXIMAX 2

Application: This fan has been designed for the air cooling of electronic equipment in ground and airborne applications where line frequencies are high, where size and weight are critical, and where relatively high heat loads must be dissipated through air cooling.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Rotron Mfg. Co., Inc., Woodstock, New York

Electrical Characteristics

Acoustic Noise Level: 75 decibels, generated by 20,000-rpm version of this fan.
Oper Voltage: 115/200 volts, ac, 320/1600 cps, 1 phase or 3 phase.

Chart A

Motor	Electrical				
Series	Volts*	Phase	Poles	Cps	Cap μ f
368YS	115	1	2	400	0.5
414YS	115	1	2	400	0.25
429YS	115	1	2	320/1200	0.2
464YS	115	1	4	400	0.15
475YS	115	1	4	800	0.25
472YS	115	1	4	320/1600	0.2
406YS	115	1	8	1600	0.05
367QS	200	3	2	400	—
398QS	200	3	2	400	—
454QS	115	3	2	400	—
	High Altitude				
415YS	115	1	2	400	0.25
395QS	200	3	2	400	—

*For 3-phase motors all voltages are phase to phase.
Please inquire for applications pertaining to square wave.

Motor Series	Electrical			Air		
	Nominal Rpm	Insulation Class	Full Load Watts	Line Amp	Max Cfm	Max S.P. At No Delivery
368YS	19,500	H	38	0.35	57	2.67
414YS	16,000	H	28	0.25	47	1.85
429YS	8,000	H	15	0.15	24	0.54
464YS	10,000	H	11	0.11	32	0.88
475YS	19,000	H	37	0.32	54	2.6
472YS	8,950	H	17	0.17	25	0.57
406YS	11,000	H	20	0.2	32	0.88
367QS	20,100	H	37	0.14	60	2.98
398QS	16,000	H	25	0.1	47	1.85
454QS	16,000	H	25	0.16	47	1.85
	High Altitude					
415YS	11,500	H	19	0.200	33	0.97
395QS	11,000	H	17	0.100	32	0.92

Mechanical Characteristics

Bearing Life: Units having a winding temperature rise of 50° C or below have a bearing life in excess of 1000 hours of continuous operation when running at 20,000 rpm in an ambient atmosphere of 14.7 psia and 125° C.

Gas Densities: The fans listed in Chart A are designed for operation in gases whose density approximates that of standard air. When ordering fans to operate in other gas densities than the foregoing, the minimum and maximum gas densities, and also the temperatures of these two extremes at the fan location, should be given.

High Altitude: Use 3-phase, altinar varying speed motorized fans.

Physical Characteristics

Weight: 4-1/2 oz

Barrel Assembly: Cast aluminum, black-anodized in accordance with MIL-A-8625, Type II.

Impeller: Cast aluminum, finished in black enamel per MIL-E-5557, Type IV.

Shaft: Stainless steel

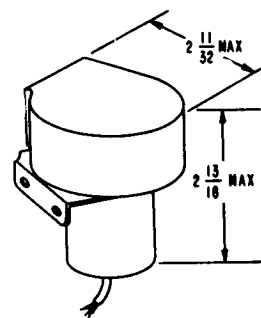
Stators: Wound in accordance with specification for Class H insulation.

Mounting: The 3 mounting holes are visible in the illustration. These holes are on the air intake end of the fan.

Use No. 6 machine screws.

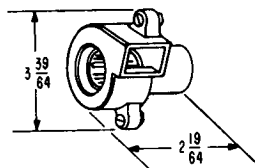
Terminals: Solder type

Remarks: A special aerodynamic feature of the Aximax-2 fan allows it to be used without the usual up-stream bellmouth, without loss of efficiency or performance. Fan can be located down-stream, up-stream, or in a duct.



**B203
MOTOR, FAN, CENTRIFUGAL, DC, TYPE 19A566**

Application: Cooling electronic tubes, circuit components, etc., in confined areas



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr.: Globe Industries Inc., Dayton, Ohio

Electrical Characteristics

Motor Type: SS (Globe Industries Inc., Dayton, Ohio)
Current Rating: 0.225 amp. max. current at 27 volts, d.c.

Mechanical Characteristics

Air Flow: 5 max. c.f.m.

Physical Characteristics

Motor Shielding: Military specification conformance
Rotor: Multi-blade, turbo-type, cadmium plated, steel rotors
Electrical Connection: Solder terminals
Mounting: Nonmagnetic clamp around motor diameter
Weight: 4 oz.
Rotation: Clockwise scroll standard. Counterclockwise scroll available

Environmental Conditions

Max. shielding provided per manufacturer's claims (See B102)

Remarks: Can be radio noise filtered per MIL-I-6181.

**B204
MOTOR, FAN, CENTRIFUGAL BLOWER MODEL
BC910B-1**

Application: Designed for use in airborne electronic equipment for cooling purposes.

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: IMC Magnetic Corp., Westbury, Long Island, New York

Electrical Characteristics

Voltage Rating: 115 volts, ac, $\pm 10\%$, single phase
Supply Frequency: 300/1000, cps
Current Rating: Input, .13 amp at 115 volts, ac, 400 cps input and free delivery
Power Rating: 15 watts at 115 volts, ac 400 cps

Physical Characteristics

Weight: 7 oz
Motor Finish: Black paladin
Housing and Bracket Finish: Black, semi-gloss enamel, Grade I, spec. 3-174, color black #201, Army Spec. 3-1
Lead Wires: Extends out of sleeving 4" min
Sleeving: 4-3/4", long
Shaft: Stainless steel
Impeller: Torrington, 116-020, steel
Impeller Finish: Cadmium plated, chromate dipped
Impeller Hub Bore: .1875 to .1880
Impeller Hub Finish: Aluminum, anodized
Housing: Steel

Mechanical Characteristics

Speed: 7000 rpm, at 400 cps
Output: 10 cfm against .4 in. of water over freq range of 350 to 1000 cy
Duty Cycle: Continuous
Rotation: CCW (as viewed from lead end)

Environmental Conditions

Ambient Temp Range: -40°C to $+70^{\circ}\text{C}$ operating
Humidity: 10 cy, per Method 106 of MIL-STD-202
Insulation Resistance: 1 megohm (winding to frame)

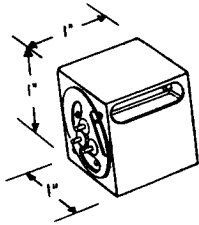
Test Data

Altitude: Up to 30,000 ft
Shock: 15g per MIL-STD-202, Method 202
Life: 1000 hr, first 100 hr at $+70^{\circ}\text{C}$, remainder $+55^{\circ}\text{C}$,

Dielectric Withstanding Voltage: 900 volts, rms for one minute or 1080 volts, rms for 1 sec (between windings and frame)

**B205
MOTOR, FAN SUBMINIATURE BLOWER MODELS
1A AND 2A**

Application: Designed for use in the cooling of electronic packages, defogging of optical equipment, defogging of radomes, cooling klystrons and other electronic tubes while maintaining air circulation in miniaturized airborne packages.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Sanders Associates, Inc., Nashua, New Hampshire

Electrical Characteristics

Input Power: Model 1A, 6.3 volts, 400 cps; Model 2A, 26 volts, 400 cps (both units may be operated from either single or two phase power).

Single Phase: 115 volts, (model 2A only)

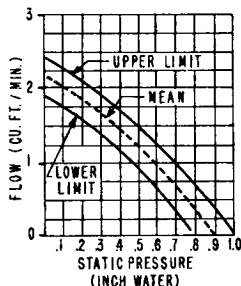
Two Phase: Special network used (115 volts 400 cps) model 2A only

Power Consumption: 3 watts, approx

Operating Life: 500 hrs, min at +110°C

Mechanical Characteristics

Output Rated Air Flow: 2.2 cu ft/min (cfm) at 0" H₂O



FLOW/PRESSURE AT RATED INPUT AND STANDARD AIR DENSITY (.075 #/ FT³)

Physical Characteristics

Weight: 1-1/4 oz.

Case Material: Machined aluminum

Fan Material: Aluminum impeller machined

Case Finish: Black anodize

Terminals: Glass encapsulated pin type

Terminal Length: 7/64"

Mounting: Three holes having 2-56 tap, 7/64" deep.

Environmental Conditions

Temp Range: -55°C to 110°C

Test Data

Vibration: Meets MIL-E-5272A, Para. 5.3.7

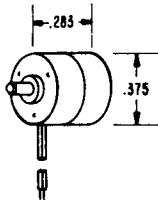
Shock: Meets MIL-E-5272A, Para. 4.15.2.1

Acceleration: 100 g's

Remarks: Where only d-c power is available, the Sanders Model 22 Subminiature Instrument Inverter (d-c to 400 cps) can be used.

B301
MOTOR, A-C, MICROMINIATURE, A19101 SERIES-400 CPS

Application: Designed for use as a driving source for miniature electrical timing devices, electronic indicators and other control devices



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: A. W. Haydon Company, Waterbury 20, Conn.

Electrical Characteristics

Oper. Voltage: 115 volts, ac $\pm 10\%$
 Oper. Freq: 400 cps, $\pm 5\%$
 Power Input: .63 V.A. max at 25°C
 Power: 0.5 watt
 Power Factor: .7 approx
 Impedance: 30,000 ohms approx at 25°C
 Current: 5 milli-amp, max

Physical Characteristics

Weight: 1/8 oz
 Lead Wire: Teflon insulated, #36 (AWG) 7/44, 0.25 max
 O.D. conforming to test specifications of MIL-W-16878C

Mechanical Characteristics

Direction of Rotation: Counterclockwise
 Rotor Speed: 3000 rpm, at 400 cps
 Torque: 0.0002 oz, in. at 3000 rpm (running) at 25°C ,
 0.0004 oz, in. (starting) at 25°C

Environmental Conditions

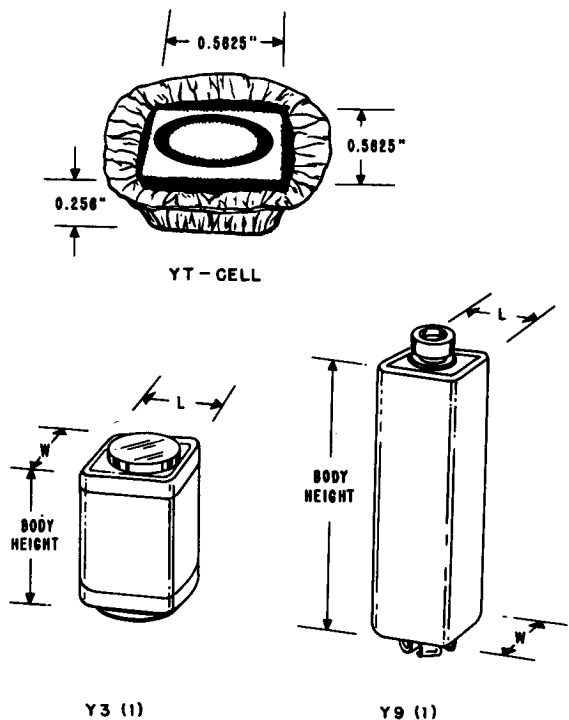
Temp Rise: 50°C max at 25°C ambient
 Temp Range: -54°C to $+125^\circ\text{C}$

Test Data

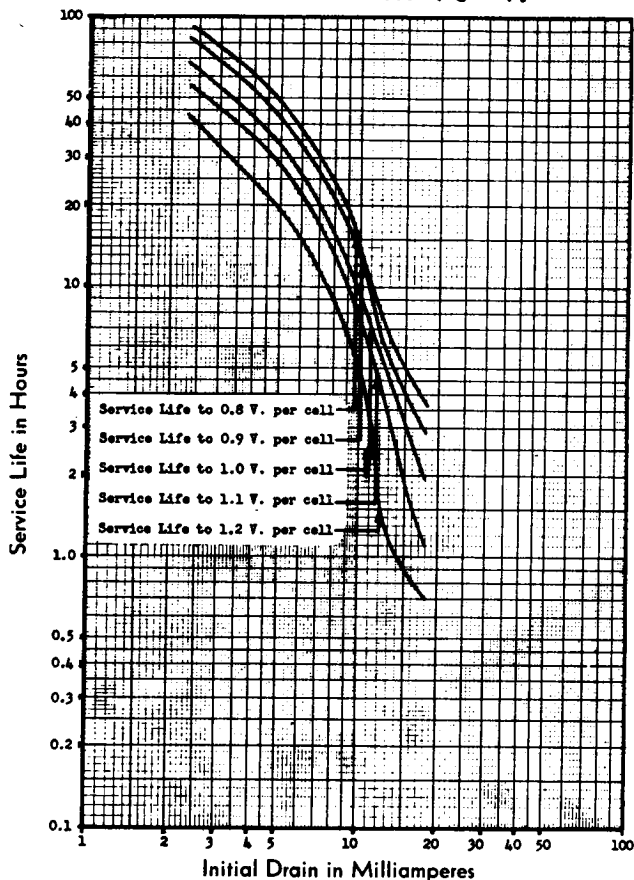
Dielectric Withstanding Voltage: 500 volts, rms, 60 cps for
 1 minute

BT101
BATTERY, MANGANESE DIOXIDE (ARTIFICIAL), WAFER,
ZINC AND CARBON ELECTRODES TYPE YT, Y3, TO Y9

Application: Designed for use in test equipment, transceivers and specialized electronic applications. Especially conceived for electronic design engineers. Also used for transistorized circuitry.



'YT' CELLS
SERVICE LIFE WHEN DISCHARGED
4 HRS. PER DAY AT 70° F.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Burgess Battery Company, Division of Servel,
 Inc., Freeport, Illinois

Electrical Characteristics

Burgess Number	Volts
Y3	4.5
Y4	6.0
Y5	7.5
Y6	9.0
Y7	10.5
Y8	12.0
Y9	13.5

Electrolyte: Artificial Manganese dioxide
Electrodes: Discs of flat zinc and carbon

Physical Characteristics

Sealing: Airtight pliofilm container encloses the cell
Terminals: Silver wax connections assure electrical contact between cells and eliminate open circuit hazard of pressure contacts or soldered connectors
Cell Dimensions: 9/16" long, 9/16" wide 0.256" thick
Volume: 0.065 Cu. in.
Weight (Cell): 0.005 lbs.

Burgess Number	Terminals	Size (inches)		Body	Overall	Weight
		L	W	Height	Height	(lbs)
Y3	Flat	0.6	0.6	0.88	0.94	0.02
Y4	Flat	0.6	0.6	1.14	1.20	0.027
Y5	Flat	0.6	0.6	1.40	1.46	0.033
Y6	Snap	0.6	0.6	1.65	1.90	0.04
Y7	Snap	0.6	0.6	1.90	2.15	0.047
Y8	Snap	0.6	0.6	2.15	2.40	0.053
Y9	Snap	0.6	0.6	2.40	2.65	0.06

Terminals: Snap fastener type, and flat terminals

Test Data

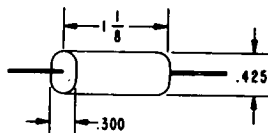
Inspection: Each Wafer cell is individually tested before incorporation into completed product

Remarks: The Burgess Wafer Cell construction has increased the capacity as much as 30% and a longer shelf life has been obtained, which gives impetus to the miniaturization of transistorized products.

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C101
CAPACITOR, TUBULAR, METALIZED
PAPER, TYPE IP2D

Application: Communication



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Hopkins Engineering Company, San Fernando, Calif.

Electrical Characteristics

Cap: 1.0 μf , at 200 vdc.

Environmental Conditions

Max Oper Temp: 100°C.

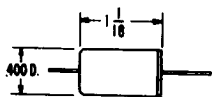
Test Data

Life: Will withstand 125% of the rated voltage for 1000 hr.
 Oper Temp Range: -55°C to 100°C.
 Cap. Stability: 0.07% per °C.
 Cap. Tolerance: $\pm 20\%$.
 Insulation Resistance: 500 megohms $\times \mu f$ for values of capacitance less than 1 μf ; 250 megohms $\times \mu f$ for values greater than 1 μf .

Remarks: One failure in 12 units is allowable.

C102
CAPACITOR, TUBULAR, SUBMINIATURE
PAPER, TYPES JA to SD

Application: Designed to meet the demands for a miniature, high quality, hermetically sealed paper capacitor in applications where these factors are essential.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Sangamo Electric Co., Springfield, Illinois

Electrical Characteristics

Working Voltage: 100 to 1000 vdcw.

Dielect. Withstanding Volts: Will withstand for a max

period of 2 minutes a voltage applied between terminals equal to 200% of the rated d-c voltage.
 Dissipation Factor: 1% max at 1000 cps and 25°C, 0.3% typical
 Cap. Range: 0.001 to 0.0068 μf and 0.01 to 0.22 μf .

Physical Characteristics

Case: Hermetically sealed tubular metal cans.
 Type of Leads: Length, 1 5/8" min.

Environmental Conditions

Temp Coefficient: Refer to Mfr bulletin 2421
 Moisture Resistance: Meets requirements of MIL-C-25C.

Test Data

Life: Will withstand an application of d-c voltage to 1-1/2 times rated voltage for 250 hr at 125°C with no more than one failure in 12 units.
 Oper Temp Range: -40°C to +125°C

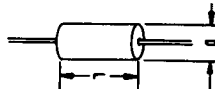
Power Factor Vs Freq: See Power Factor.
 Cap. Tolerance: $\pm 20\%$, $\pm 10\%$, or $\pm 5\%$

Insulation Resistance: Where the case is not a terminal, the minimum resistance to the case at 25°C at least 3000 megohms. For additional data refer to Cat. 2421.

Remarks: Available with working voltage ratings of 100, 200, 300, 400, 600 and 1000 vdcw. Illustration shown is SDA3K04473K.

C103
CAPACITOR, TUBULAR, HI-Q MOLDED CERAMIC
CERAFIL, AEROVOX TYPE MC80A

Application: Designed for automated assembly operations and transistorized circuit applications, this epoxy-encapsulated capacitor is also suited for space-borne equipments having critical space and weight parameters.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Hi-Q Division Aerovox Corp., Olean, New York

Electrical Characteristics

Capacitance (μf)	MC80A Dimensions	
	D +.003 -.005	L +.003 -.005
10 μf thru .001 μf	.087	.315
.005	.117	.495
.01	.157	.495
.02	.197	.495
.05	.237	.645
.1	.277	.745

Ratings: 100 vdc at 85°C, derated to 50 vdc at 125°C
 Temp Coeff Range: -55°C to +85°C, +10% -15% (0 volts applied), +10% -35% (100 volts applied)
 Power Factor: 2.5% max
 Insulation Resistance: 10,000 megohms

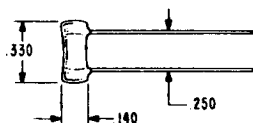
Physical Characteristics

Leads: Tinned copper. All values below .01, #26 gauge; .01 and above, #22 gauge. Axial leads only.
 Size: See listing above.

Remarks: Design and construction features of these capacitors make it possible to obtain extremely high capacitances per unit volume.

**C104
 CAPACITOR, TUBULAR TYPE CERAMIC, RADIAL LEAD, TYPE 375**

Application: Where miniature radial lead ceramic capacitors are needed (Available in temp. compensating and Hi-K types)



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Erie Resistor Corp., Erie, Pa.

Electrical Characteristics

Working Voltage: 200 volts dc at 85°C, 100 volts dc at 125°C Q Factor for T.C. types: Available in both 1000 min factor and 500 min factor types
 Power factor for Hi-K types: 1 .5% max
 T.C. Type: Within tolerance at 1 mc, 0.5 to 5 volts, rms
 Hi-K Type: Within tolerance at 1 kc, 0.5 to 5 volts, rms
 Insulation Resistance:

T.C. Type: 10,000 meg ohm min
 Hi-K Type: 7500 meg ohm min
 Dielectric Withstanding Voltage: 600 volts dc at room temperature for 2 seconds min with 50 ma max charging current
 Life Test: 400 volts dc at 85°C for 1000 hours
 Cap. Range: 47 to 5600 pf

Physical Characteristics

Case: Red phenolic coating supporting a 600 volt dc case breakdown voltage
 Leads: No. 28 AWG, heavy solder coating

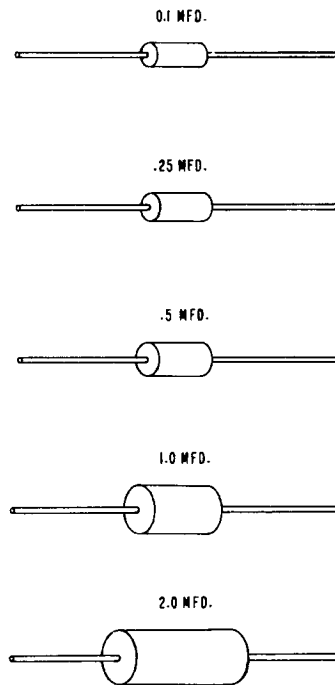
Environmental Test

Temp Coefficient: ± 60 ppm/°C

Remarks: Also available with a white enamel-coated case as type 374. Type 374 does not have a 600 volt dc case breakdown value.

**C105
 CAPACITOR, TUBULAR ROLLED CERAMIC, ULTRA-MINIATURE HI-Q CEROL, TYPE CR 90**

Applications: Designed for general applications in bypass-coupling, filtering and blocking circuits. An additional application, is when a low series resistance at high frequencies in critical decoupling and pulse circuits is required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Aerovox Corp., Hi-Q Division, Olean, New York

Electrical Characteristics

Part Number	Cap Mfd	Dia Max inches	Length Max inches
CR90V104AM	.1	.210	.690
CR90V254AM	.25	.260	.690
CR90V504AM	.5	.350	.690
CR90V105AM	1.0	.480	.690
CR90V205AM	2.0	.400	1.440

Remarks: These Cerol capacitors cover high capacitance range of paper and plastic film dielectrics, but provide these capacities in much smaller physical sizes with improved electrical characteristics. Manufacturer states Cerol capacitors will meet applicable requirements of MIL-C-11015C.

Working Voltage: 100 volts, dc at 85°C derate to 50 volts, dc at 125°C

Insulation Resistance: 1K megohms/ μ fd or 20K megohms min., whichever is smaller.

Series: Less than .20 ohms at 8 to 10 mc

Power Factor: 2%, max

Cap Tolerance: \pm 10%, \pm 20%, +50-20%, and GMV.

Physical Characteristics

Leads: Tinned copper, #22 gauge, 1-1/2" min. length

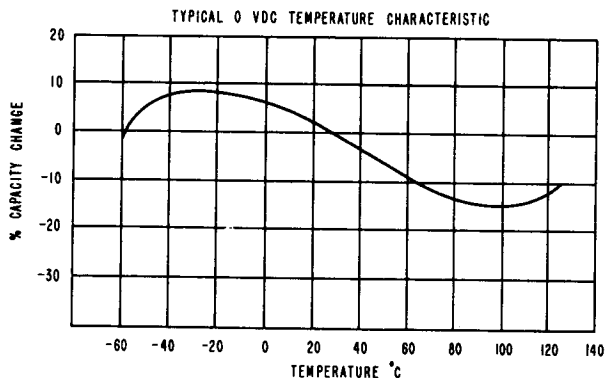
Construction: Rolled ceramic

Environmental Conditions

Temp Coef: (0 Voltage) equals +15% -25% over temp range of -55°C to 125°C

Temp Coef: (50 volts, applied) equals +15% -30% over temp range of -55°C to +125°C

Temp Coef: (100 volts, applied) equals +15% -35% over temp range of -55°C to 85°C

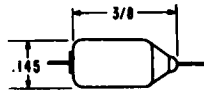


Test Data

Test Voltage: 300 volts, dc

**C201
CAPACITOR, ELECTROLYTIC TANTALUM,
TYPE TNT (POLARIZED)**

Application: Aircraft control communications, hearing aids, printed circuits, small military type radios.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: P.R. Mallory & Co., Inc., Indianapolis, Ind.

Electrical Characteristics
Surge Voltage: 115% of rated voltage at 85°C.
D-C Leakage Current: 1 ma

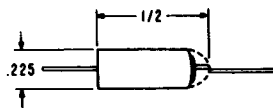
Physical Characteristics
Case Polarity: Negative.
Lead Pull Test: Will withstand axial pull of 3lb for 5 sec.

Environmental Conditions
Max Oper Temp: +85°C.
Temp Coefficient: MIL-STD-202, Method 102.1.
Water Immersion Test: MIL-STD-202, Method 104.1.
Salt Spray: Will withstand 40-hour salt spray test.
Seep & Vibration: MIL-STD-202, Method 201.1.
Barometric Press. Test: Will withstand barometric pressure of 3.4" of Hg at rated voltage for 1 hr.

Test Data
Life: 1000 hr at 85°C at rated voltage.
Oper Temp Range: -55°C to +85°C.
Vibration Test: 83 to 2000 cps at 20 G's (MIL-STD-202, Method 201.1).

**C202
CAPACITOR, ELECTROLYTIC TANTALUM, TYPE TAP**

Application: Aircraft control and communications equipment, hearing aids, small portable radios (military), and printed-circuit assemblies.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: P. R. Mallory & Co., Inc., Indianapolis, Ind.

Electrical Characteristics
Surge Voltage: 11% of rated d-c voltage.

Physical Characteristics
Case: Epoxy-Resin tip.
Type of Leads: Tinned nickel and tinned copper.

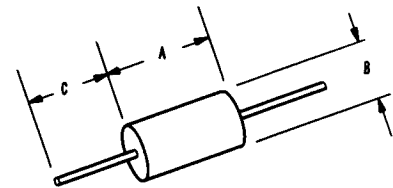
Environmental Conditions
Max Oper Temp: 85°C.
Temp Coefficient: MIL-STD-202, Method 102.1.
Water Immersion Test: MIL-STD-202, Method 104.1.
Corrosion: Will withstand 50-hr salt spray test.
Seep & Vibration: MIL-STD-202, Method 201.1.
Barometric Press. Test: Will withstand barometric pressure of 3.4" of Hg at rated voltage for 1 hr.

Test Data
Life: 1000 hr at 85°C.
Oper Temp Range: -55°C to +85°C.
Vibration Test: 83 to 2000 cps at 20 G's.
Cap. Tolerance: -15% to 75%.

Remarks: 1000-ohm resistor connected to capacitor for surge voltage test.

**C203
CAPACITOR, TANTALUM ELECTROLYTIC, WET ANODE,
TYPE TX**

Application: Type TX units are polarized and intended for use in d-c circuits having low a-c ripple content.



Case Size	Type TX64 Uninsulated Body			Type TX65 Uninsulated Body*	
	C Dim. ±1/4	A Dim. ±1/64	B Dim. ±1/64	A Dim. ±1/32	B Dim. ±1/32
T1	1-1/2	29/64	3/16	35/64	13/64
T2	2-1/4	41/64	9/32	47/64	19/64
T3	2-1/4	49/64	3/8	55/64	25/64

*Dim. are for plastic film sleeve. For rigid tubing, add 1/8" to A and 1/32" to B dim. of Type TX64 and specify that TX64 is desired with rigid tubing.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Cornell-Dubilier Electronics Corp., Newark, N. J.

Electrical Characteristics

Voltage: 6 to 125 VDCW
Capacitance Range: 1.7 μf to 560 μf .
Dissipation Factor (Max): 2 to 15 ohms max. equiv. series resistance (120 cps at +25°C).
Leakage At +25°C: 0.0005 $\mu\text{a}/\mu\text{f-volt}$, average.
Leakage At Max Rated Temp: 0.006 $\mu\text{a}/\mu\text{f-volt}$, average.
% Nominal Capacitance At Lowest Temp: -35%
% Nominal Capacitance At Max Rated Temp: +20%

Physical Characteristics

Case Material: Metallic
Terminal Type: Axial lead.
Terminal Material: Cathode-tinned copper; Anode-tinned nickel. Both #22 AWG.
Mounting: Mounting clips or strap.

Environmental Conditions

Oper Temp: -55°C to +85°C. (See Remarks)

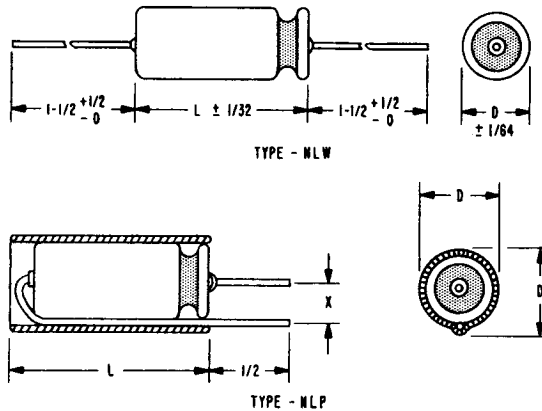
Test Data

Life: 2000 hr. min. at max rated temp.
Shelf Life: Years under normal storage conditions.
Volumetric Efficiency: 57,000 $\mu\text{f-volt}/\text{cu. in.}$, average.
Weight Efficiency: 620 $\mu\text{f-volt}/\text{gram}$, average.
Shock: Meets MIL-C-3965B, Style CL64.
Vibration: Meets MIL-C-3965B, Style CL64.

Remarks: Type TX units are designed primarily for operation up to +85°C at rated DC working voltage. They may be operated up to +100°C by derating voltage 15%.

**C204
CAPACITOR, ALUMINUM ELECTROLYTIC, TYPE NL
"ELECTOMITE"**

Application: Transistor circuits, printed circuits (type NLP) and other compact or miniature low-voltage d-c equipment. Ideal for bypass, filter, and coupling applications.



Case	Type NLW*		Type NLP		Lead Spacing (in.) X
	Nominal Case Dim. (D × L)	Dia. (in.) D	D'	Lgth. (in.) L	
A1	3/16 × 1/2	.203	.228	5/8	.107
B1	1/4 × 1/2	.266	.290	5/8	.138
B2	1/4 × 5/8	.266	.290	3/4	.138
B4	1/4 × 3/4	.266	.290	7/8	.138
C1	5/16 × 5/8	.328	.353	3/4	.169
C3	5/16 × 3/4	.328	.353	7/8	.169
D1	3/8 × 5/8	.391	.415	3/4	.200
D3	3/8 × 3/4	.391	.415	7/8	.200
D5	3/8 × 7/8	.391	.415	1	.200
D7	3/8 × 1	.391	.415	1-1/8	.200
D8	3/8 × 1-1/4	.391	.415	1-3/8	.200
D9	3/8 × 1-1/2	.391	.415	1-5/8	.200

*Dimensions shown for uninsulated NLW units. For insulated NLW 1/16" to dia. and 1/8" to lgth.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Cornell-Dubilier Electronics Corp., Newark, N. J.

Electrical Characteristics

Voltage: 3 to 150 VDCW.
Capacitance Range: 1.0 μf to 450.0 μf .
Dissipation Factor (Max): Equal to or less than 12V:25%; greater than 12V:20% (120 cps at +25°C).
Leakage (+25°C): 1.0 μa at 3V to 13.5 μa at 150V.
Capacitance Tolerance: -10% +150%.
% Nominal Capacitance At Lowest Rated Temp: 30% to 50% depending on voltage.
Ripple Current: 10 to 200 milliamps at 120 cps and max. rated temp.

Physical Characteristics

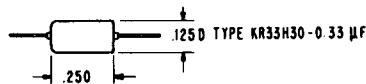
Case Material: Aluminum

Terminal Types: NLW-Axial; MLP-Printed Circuit

Mounting: Lead or strap.

Environmental ConditionsOper Temp: -40°C to $+85^{\circ}\text{C}$ **Test Data**

Life: 1000 hr. at max rated temp.

Shelf Life: 1 yr. at 40°C .Volumetric Efficiency: 3800 μf -volts/cu. in, average.Weight Efficiency: 1236 μf -volts/gram, average.**Remarks:** Standard units furnished with plastic sleeve.**C205****CAPACITOR, ELECTROLYTIC, SOLID TANTALUM CAPACITOR, J SERIES****Application:** Transistor amplifiers, r-c timing circuits, analog computers, triquering circuits, and power supplies.**Quality Assurance:** Per MIL-C-26655A.

Preferred part per MIL-STD-242E.

Mfr: Kemet Co., Division of Union Carbide Corp., Cleveland, Ohio.**Electrical Characteristics**

Surge Voltage: Will withstand d-c voltage applied 1/2 minute every 6 minutes for 1000 cycles at high ambient temperature.

Cap Range: .0047 μf to 330 μf D-C Leakage Current: Less than .01 μamp per μf volt.

Working Voltage: 6 to 125 volts

Physical Characteristics

Type of Leads: 1 1/2" long (2 leads).

Environmental ConditionsMax Oper Temp: $+125^{\circ}\text{C}$.Temp Cycling: -80°C to 125°C .Water Immersion Test: 65°C bath and 0°C bath.

Moisture Resistance: 95% relative humidity for 10 days.

Test Data

Life: Max oper voltage for 10,000 hr or more for continuous duty.

Oper Temp Range: -80°C to $+125^{\circ}\text{C}$.

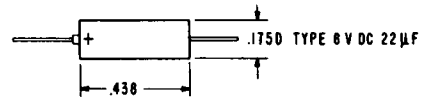
Vibration Test: 10 to 2000 cps at 15 G's.

Shock: Will withstand 40 G's from 10 to 2000 cps without measurable electrical changes.

Cap. Stability: 10% change in capacitance after 1000-hr operation at rated voltage and temp.

Cap. Tolerance: STD, $\pm 20\%$; special, $\pm 10\%$ or $\pm 5\%$.

Lead Pull Test: Will withstand 5 lb pull for 30 sec.

C206**CAPACITOR, ELECTROLYTIC, SOLID TANTALUM "TAN-TI-CAP"****Application:** Transistor equipment, coupling circuits for transistor stages, R-C timing circuits and power supplies.**Quality Assurance:** Manufacturer's claims Bureau approval required prior to use**Mfr:** Texas Instruments, Inc., Dallas, Texas**Electrical Characteristics**

Working Volts: 6 to 35 volts.

Surge Voltage: 130% of rated working voltage.

Cap. Range: 4 to 200 μf .D-C Leakage Current: 0.05 μa per μf per volt at 25°C and 0.2 μa per μf per volt at 85°C .**Physical Characteristics**

Case: Hermetically sealed.

Type of Leads: 2 leads; 0.025" diameter (No. 22 AWG), 1.5" long.

Environmental ConditionsMax Oper Temp: $+85^{\circ}\text{C}$.Temp Coefficient: At -80°C , 95% of cap. at 25°C ; at $+85^{\circ}\text{C}$, 104% of cap. at 25°C .

Moisture Resistance: MIL-STD-202.

Test Data

Life: Long operating and storage life will withstand a 1000-hr life test at rated working voltage and max rated temperature.

Oper Temp Range: -80°C to $+85^{\circ}\text{C}$.

Vibration Test: MIL-STD-202, Method 201.

Shock: MIL-STD-202 A, Method 202A.

Cap. Stability: During test, capacitance will not change more than $\pm 10\%$.Cap. Tolerance: $\pm 20\%$, measured at 120 cps and 25°C .Exposure Test: Acceleration -100 G's for 10 sec.

Lead Pull Test: Will withstand 3-lb pull in any direction for 30 sec.

C207
CAPACITOR, ELECTROLYTIC, TANTALEX
(SOLID ELECTROLYTE), TYPES 150D AND 172D

Application: Transistor equipment and in circuits where stable capacitance and low dissipation factor requirements must be met over a wide temp range.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Sprague Electric Co., North Adams, Mass.

Electrical Characteristics

Surge Voltage: Will withstand surge test voltage applied at rate of 1/2 min on and 4 1/2 min off for 1000 test cycles at 25°C.

Cap. Range: Available in standard ratings; complete data given in Sprague Bulletin No. 3520E and No. 3523.

D-C Leakage Current: With rated voltage applied at 25°C + 5°C for 5 min, leakage will not exceed 0.05 μa per μf per volt or μa, whichever is greater.

Physical Characteristics

Case: Metal, hermetically sealed (subminiature).

Environmental Conditions

Max Oper Temp: +85°C.

Temp Coefficient: At -80°C, between 90 and 96% of cap. at 25°C; at +80°C, between 103 and 112% of cap. at 25°C.

Moisture Resistance: MIL-STD-202, Method 106.

Test Data

Life: Will withstand 1000-hr life test at rated voltage and maximum rated temp.

Oper Temp Range: -80°C to +85°C.

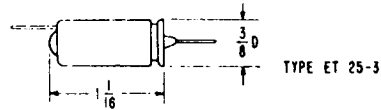
Cap. Tolerance: ±20%.

Dissipation Factor: During test, dissipation factor will not change more than 0.09.

Remarks: Capacitor is available with either a phenolic insulating sleeve or a plastic film insulating sleeve. Type 172D capacitors have identical performance characteristics with those of Type 150D capacitors. Case dimensions however, are approximately one-half those of a comparable Type 150D.

C208
CAPACITOR, ELECTROLYTIC, TYPE ET

Application: Subminiature printed circuit assemblies, transistor networks, and other types of circuits in which size and weight must be an absolute minimum.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Astron Corporation, East Newark, N. J.

Electrical Characteristics

Surge Voltage: At max rated temp, 150-volt units will withstand 200 volts applied for 30 sec through a 1000-ohm resistor 12 times per hr for 120 hr.

Cap. Range: Refer to bulletin AB22.

D-C Leakage Current: With rated voltage applied to capacitor for 5 minutes at 25°C, leakage current will not exceed value given by formula $I = KC + 0.3$, where I = d-c leakage in ma, K = constant listed below, and C = rated cap. in μf.

VDCW	K
3 to 100	0.01
101 to 250	0.02

Physical Characteristics

Case: Aluminum can.

Type of Leads: No. 20 (0.032") tinned wire.

Environmental Conditions

Max Oper Temp: +85°C.

Test Data

Life: 1000 hr at rated voltage and rated maximum operating temp.

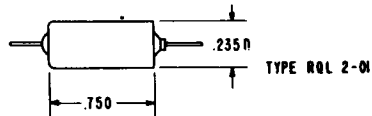
Normal Rating Limits: Meets and exceeds R.E.T.M.A. Standards.

Oper Temp Range: -40°C to +85°C.

Cap. Tolerance: During test, capacitance will not decrease more than 15%, as measured at 25°C.

C209
CAPACITOR, ELECTROLYTIC,
METALIZED MYLAR, TYPE RQL

Application: Critical circuits in which space-saving is important



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Astron Corporation, East Newark, N. J.

Electrical Characteristics

Working Volts: 200, 400, 600, volts, dc.
Dielect. Withstanding Volts: Will withstand a d-c potential of twice the rated voltage for 2 min without permanent breakdown.
Power Factor: 1% max at 25°C. (Capacitors with 0.235" diameter case may have a PF of 1.5%).

Physical Characteristics

Case: Glass to metal seal.

Environmental Conditions

Max Oper Temp: +125°C.
Temp Cycling: MIL-C-18312
Moisture Resistance: MIL-C-18312
Humidity: MIL-C-18312

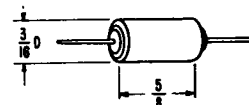
Test Data

Life: Will withstand a test potential of 140% of rated voltage between terminals, or between terminals and case if the case is a terminal, for a period of 250 hrs at 125°C. No more than 1 failure in 12 units tested permitted.
Oper Temp Range: -55°C to +125°C.
Elect. Properties Test: Test voltage must be applied and discharged through a resistor of one ohm per volt.
Insulation Resistance: Min. product of resistance and capacitance is 2000 megohm- μ f at 2.5°C. However, in no case will IR exceed 12,000 megohms.
Lead Pull Test: Will withstand a steady pull of 5 lb applied axially to the leads for 1 minute.

Remarks: RQL are of grounded construction type. For floating types, reference RQLF.

**C210
CAPACITOR, ELECTROLYTIC,
SUBMINIATURE, TYPE SMT**

Application: Printed circuits, transistor circuits low-voltage d-c applications, and applications using miniaturized components where size and weight must be kept to a minimum.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Illinois Condenser Co., Chicago 22, Ill.

Electrical Characteristics

Working Volts: Available from 3 to 350 volts.
Cap. Range: Available from 1 to 2000 μ f.
D-C Leakage Current: 10 μ a in 50- μ f, 25-vdcw units at 85°C.

Physical Characteristics

Case: All aluminum construction, hermetically sealed.
Type of Leads: 0.020" dia x 1 1/2" long.
Dielect. Material: Noncorrosive electrolyte.

Environmental Conditions

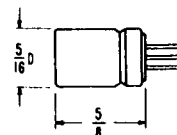
Water Immersion Test: Will withstand immersion cycling for 5 minutes at 85°C.
Moisture Resistance: MIL-C-62.

Test Data

Life: 1000 hr at 65°C.
Oper Temp Range: Standard, -40°C to +65°C; units also available for temp range of -30°C to +85°C.
Vibration Test: Immune to vibration.
Shock: Immune to shock.
Cap. Tolerance: 5% change in capacitance after 1000-hr operation at 65°C.

**C211
CAPACITOR, ELECTROLYTIC, UPRIGHT
SUBMINIATURE TYPE SMTU**

Application: Printed circuits, transistor circuits low-voltage d-c applications and applications using miniaturized components where size and weight must be kept to a minimum.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Quality Assurance: Manufacturer's claims;
Bureau approval required prior to use.

Mfr: Illinois Condenser Co., Chicago 22, Ill.

Mfr: Microcomponents Department, P. R. Mallory and Co.
Inc., Indianapolis 6, Indiana

Electrical Characteristics

Electrical Characteristics

Working Volts: Available from 3 to 350 volts.
Cap. Range: Available from 1 to 2000 μ f.
D-C Leakage Current: 10 μ a in 50- μ f, 25-vdcw units at +85°C.

Capacitance Mfd-Volt Constant	Mfd-Volt Range	Thickness
15	0.5 mfd at 30 volts to 2.5 mfd at 6 volts	0.020"
30	1.0 mfd at 30 volts to 5 mfd at 6 volts	0.030"
150	5.0 mfd at 30 volts to 30.0 mfd at 5 volts	0.080"

Physical Characteristics

Capacitances ranging from 0.4 mfd. to 0.1 mfd at 35 volts are available upon request
Capacity Tol: \pm 20%
D. C. Leakage: 0.5 μ amp per μ f-volt or μ amp, whichever is greater at 125°C

Case: All aluminum construction, hermetically sealed.
Type of Leads: 0.020" dia x 1 1/2" long.
Dielect. Material: Noncorrosive electrolyte.

Environmental Conditions

Dissipation Factor: 125 cps 1000 cps

Water Immersion Test: Will withstand immersion cycling for 5 minutes at 85°C.
Moisture Resistance: MIL-C-62.

Ratings up to	Max at +25°C	5%	20%
30 mfd X volts	Max at -55°C	9%	40%
30 mfd X volts	Max +85°C	5%	20%

Values for 150 mfd not yet established

Test Data

Life: 1000 hr at 65°C.
Oper Temp Range: Standard -40°C to +65°C; units also available for temp range of -30°C to +85°C.

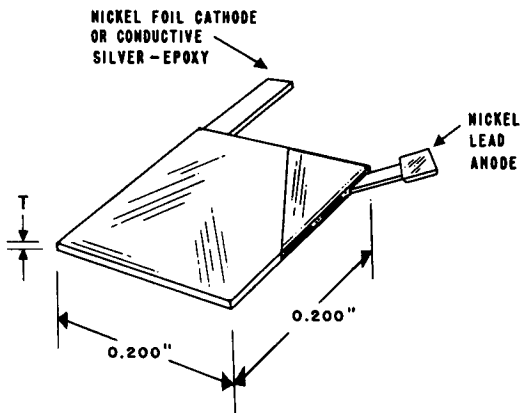
Physical Characteristics

Anode Material: Nickel lead
Cathode Material: Nickel foil or conductive silver-epoxy
Dielectric: Tantalum wafer

Environmental Conditions

Storage Temp: -65°C to +85°C
Oper Temp: -55°C to +85°C (to 125°C with conventional voltage derating)
Cap-Temp Char: 15% max from 25°C to -65°C and from 25°C to +85°C

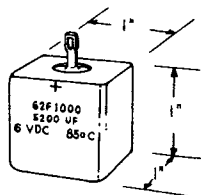
**C212
CAPACITOR, TANTALUM-WAFER (UNMOUNTED) PART
NO. 6928-CWU**



WAFER TANTALUM CAPACITOR (Unmounted)

**C213
CAPACITOR, ELECTROLYTIC, POROUS ANODE TANTALYTIC TYPE 62F1000**

Application: Designed to provide large capacitance values in limited-space applications and in airborne electronic equipment where its low voltage rating compliments transistor applications, such as filtering, coupling and bypass utilization.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: General Electric, Capacitor Dept., Irmo, South Carolina

Electrical Characteristics

Voltage Rating	Capacitance μf at 25°C	D-C Leakage Current Max μ amps		Catalog Number
		25°C	85°C	
6	5200	45	150	62F1000
10	4000	45	150	62F1010
15	2800	45	150	62F1020
30	1600	45	150	62F1030
50	1000	45	150	62F1040
60	800	45	150	62F1050

Max ESR Ohms, 120 cps		Max Impedance Ohms, 120 cps		Catalog Number
25°C	85°C	-55°C	25°C	
.225	.175	6.25	.375	62F1000
.144	.125	6.87	.438	62F1010
.212	.175	7.50	.600	62F1020
.362	.312	8.75	1.06	62F1030
.331	.312	11.25	1.69	62F1040
.294	.294	12.50	2.00	62F1050

CAPACITANCE TOLERANCE

	Volt Rating	Capacitance Tolerance (%)
Standard Tolerance	under 30	-15, +75
25°C, 120 cps	30-60	-15, +50
Close Tolerance (Group No. 2)	All	-15, +20

		Change (%)	
		-55°C	-35°C
Max Percent change in 25°C	6	-90	-70
Capacitance at -55°C and -35°C	10	-88	-65
	15	-85	-60
	30	-80	-50
	50	-70	-35
	60	-65	-30

Max Percent change in 25°C	6-15	+25
Capacitance at 85°C	30	+20
	50-60	+15

The values shown for cap change with temp are max values. The majority of units will exhibit less cap changes over the indicated temprange.

POWER FACTOR

	Volt Rating	PF (%)
25°C, 120 cps	6	60
	10-30	35
	50	20
	60	15

RATED D-C SURGE VOLTAGE

Rated Voltage	Rated Surge Voltage
6	7
10	12
15	18
25	29
30	35
50	58
60	70

A-C Ripple Voltage: Shall be limited to 5% of rated dc voltage at 120 cps or equivalent, because of heating effect.

Physical Characteristics

Construction: Polar
Weight: 65 grams
Sealing: Hermetically sealed (metal to glass)

Electrolyte: Non-acid gel (has rehealing properties of liquid electrolyte systems)

Case: Stainless steel which is solder covered to facilitate making the ground connection

Terminal: Made of weldable metal, and can be soldered

Anode: The anode is terminated thru a metal to glass hermetic seal in a solderable and weldable terminal

Mounting: Stainless steel brackets are constructed to allow the capacitor terminal to be located on any side, top or bottom.

Marking: GE symbol, nom cap. value in μf , working voltage, polarity (+), catalog number and date code

Environmental Conditions

Oper Temp Range: $-55^{\circ}C$ to $85^{\circ}C$

Test Data

Leakage Current: Shall not exceed that shown in Table 1

Terminal Strength (Pull): 5 lb., of mechanical stress with the capacitors firmly secured in a fixed position, a pull of 3 lbs, +2, -0 oz, shall be applied gradually to the terminal in any direction. There shall be no external damage.

Life Test: 200 hrs at rated dc voltage in an ambient temp of $85^{\circ}C$

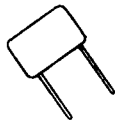
Vibration: 15g, 10 to 2000 cps per MIL-STD-202B, Method 204, Condition B

Shock: 50g per MIL-STD-202B, Method 202A

Remarks: In applying the QSR capacitor, the ac ripple voltage should in no case cause reversal of polarity.

C301 CAPACITOR, DISC TYPE (CERAMIC), "CERA-MITE"

Application: Because of construction, has a wide use at frequencies that fall well into the VHF range.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Sprague Electric Co., North Adams, Mass.

Electrical Characteristics

Working Voltage: Less than 500 volts to 5000 volts.
Dielect. Withstanding Volts: Will withstand the following d-c voltages applied for not less than 1 second nor more than 5 seconds, when charged by a current of not more than 20 ma.

Rated Voltage (Volts)	Test Voltage
500 or less	250% of rated voltage
1000	250% of rated voltage
2000	175% of rated voltage
3000	175% of rated voltage
5000	175% of rated voltage

Surge Volts: See Dielect. Withstanding Volts.

Power Rating: Refer to Sprague Bulletin No. 6000.

Cap. Range: Various sizes; refer to Sprague Engineering Bulletin, Series 6000.

Physical Characteristics

Insulation: Refer to Humidity for insulation specifications.

Environmental Conditions

Temp Coefficient: Type P100 through N330, ± 60 ppm per $^{\circ}\text{C}$ measured at 25°C and 85°C .

Humidity: After exposure for a period of 100 hours to an atmosphere of 95% relative humidity at a temperature of 40°C , capacitors have a minimum insulation resistance of 1000 megohms.

Test Data

Life: Will withstand a temperature of 85°C in a dry oven for a period of 250 hours. Capacitor will have an insulation resistance of not less than 1000 megohms after cooling to room temperature.

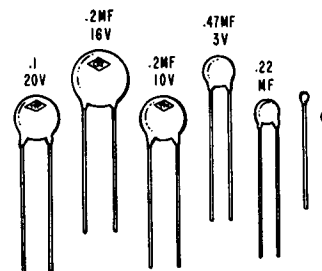
Oper Temp Range: -55°C to $+85^{\circ}\text{C}$.

Dissipation Factor: Does not exceed 2%.

Insulation Resistance: Minimum value of insulation resistance at 25°C will be such that the product of resistance and capacitance will not be less than 700 megohm-microfarads.

C302 CAPACITOR, DISC TYPE (CERAMIC), "ULTRA-KAPS"

Application: Bypass and coupling in low-power electronic circuits.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Centralab, Milwaukee, Wis.

Electrical Characteristics

Working Voltage: 3, 10, 16 and 20 volts, dc max.

Surge Volts: Same as working volts.

Dissipation Factor: Max. 10 for all capacitors except .1, .22, .47, 1.0, and $2.2 \mu\text{f}$ for which DF is 5.

Cap. Range: $.005 \mu\text{f}$ to $2.2 \mu\text{f}$.

Physical Characteristics

Shape: See illustration.

Type of Leads: No. 22, 24 or 26 tin-dipped copper wire, size depending on capacity.

Lead Length: 1-1/2" min.

Load Strength: Will withstand min 2 lb. tensile test.

Sizes: All have max. thickness of .156". Max dias. vary from .120" to .844" depending on capacity.

Insulation: Durez coated and impregnated with a high melting point wax as further protection against humidity.

Environmental Conditions

Temp Coefficient: Wide variation of capacitance with temperature change.

Test Data

Life: Will withstand rated voltage for 250 hr at 85°C .

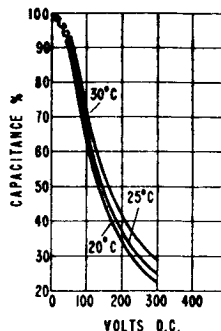
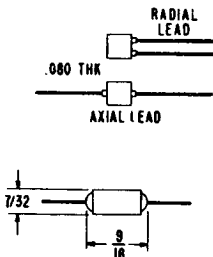
Oper Temp Range: -35°C to $+85^{\circ}\text{C}$.

Insulation Resistance: 1- μf capacitor has insulation resistance of 30,000 ohms at 25°C and 1.5 volts.

Lead Pull Test: Leads permanently attached to electrodes.

C303
CAPACITOR, DISC TYPE (CERAMIC), VOLTAGE SENSITIVE TYPES VSR, VSE, LVSR, LVSE

Application: Designed for circuits in which a change in capacitance by the application of a d-c voltage is desired. Unlimited applications in tuning and frequency control, frequency modulation, harmonic generation, dielectric amplifiers, and many unexplored fields.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Mucon Corporation, Newark, N. J.

Electrical Characteristics

Working Voltage: See Cap. Range.
 Cap. Range: Type VSR-Voltage sensitive at approx 25°C.
 Normal range, 400 μμf to 0.1 μf. Capacitance decreased approx 70% by application of 300 volts, dc. Type LVSR-

TYPE VSR MWF	TYPE VSE MWF	APPROX SIZE
400 TO 2000	300 TO 1500	5/32 SQ
5000	3750	7/32 SQ
10,000	7500	9/32 SQ
20,000	15,000	11/32 SQ

Normal range, 60 μμf to 300 μμf. Capacitance decreased 70% by application of 200 volts, dc.

Type VSE-Voltage sensitive at 70°C. Normal range, 300 μμf to 0.1 μf. Capacitance decreased approx 50% by application of 300 volts, dc.

Type LVSE-Normal range, 60 μμf to 250 μμf. Capacitance decreased 50% by application of 200 volts, dc.

Physical Characteristics

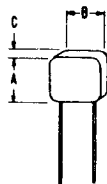
Size: Types VSR and VSE. —Approx 0.080" thick.
 Types LVSR and LVSE —Approx 7/32" dia x 9/16" long.
 Case: Types VSR and VSE —Vacuum wax impregnated phenolic insulation.
 Types LVSR and LVSE —Steatite housing.
 Type of Leads: Type VSR —Axial leads only for values up to 2000 μμf. Radial or axial leads above this range.
 Type VSE—Axial leads only for values up to 1500 μμf. Radial or axial leads above this range. No. 26 gauge tinned wire leads unless otherwise specified.

Test Data

Oper Temp Range: Types VSR and LVSR are voltage-sensitive at approx 25°C.
 Types VSR and LVSE are voltage-sensitive at approx 70°C.

C304
CAPACITOR, DISC TYPE (CERAMIC), TRANSISTOR CIRCUIT CAPACITOR

Application: Transistor circuits



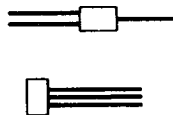
MF	A	B	C
.005	13/64	13/64	.09
.01	9/32	9/32	.09
.02	25/64	25/64	.09
.05	33/64	5/8	.09
.05	27/64	27/64	.11
.1	17/32	21/32	.11

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Mucon Corporation, Newark, N. J.

Electrical Characteristics

Working Voltage: 25 vdcw.
 Surge Volts: 25 vdcw.
 Power Rating: (Power Factor) Less than 2.5%.
 Cap. Range: 0.005 μ f, 0.01 μ f, 0.02 μ f, 0.05 μ f, and 0.1 μ f. Several capacitors may be obtained in one multiple unit to meet specific requirements. Example:



Physical Characteristics

Size: 0.05- μ f capacitor is 33/64" x 5/8" x 0.090" thick.
 For other sizes, refer to illustration.
 Shape: Refer to illustration.
 Type of Leads: Radial (shown); axial.
 Lead Material: #26 gauge tinned copper wire
 Lead Length: 1-1/2" min.
 Coating: Vacuum-wax-impregnated phenolic insulation.

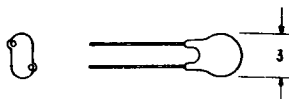
Test Data

Oper Temp Range: -20°C to +85°C.
 Insulation Resistance: Greater than 10,000 megohms.
 After operation for 100 hr at 95% relative humidity, insulation resistance will be greater than 1000 megohms.

Remarks: Mucon subminiature capacitors are available in 13 ceramic materials and a wide variety of capacities.

**C305
 CAPACITOR, DISC TYPE (CERAMIC)**

Application: Ideal for use in miniaturized circuits. The flat plate with unidirectional lead construction ensures minimum self-inductance and, hence, a higher self-resonant frequency than tubular ceramic or molded mica. Excellent for bypass use in the VHF range.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Sprague Electric Co., North Adams, Mass.

Electrical Characteristics

Working Voltage: 50 volts, dc max.
 Flash Rating: 150 volts, dc.

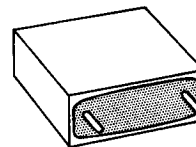
Physical Characteristics

Type of Leads: Tinned wire leads, No. 24 AWG.

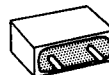
Test Data

Oper Temp Range: -55°C to +85°C.
 Dissipation Factor: Will not exceed 1.5% at 1 kc.
 Insulation Resistance: Minimum value of insulation resistance, as measured at 25°C and 100 volts, dc, is such that the product of the insulation resistance and the capacitance will be not less than 700 megohm-microfarads, except in small-capacity units. In these units the insulation resistance need not exceed 10,000 megohms.

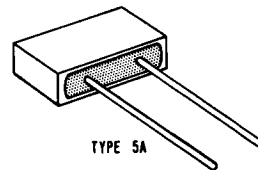
**C306
 CAPACITOR, (CERAMIC), ENCAPSULATED MICA, TYPES
 1A, 1AD, 5A, AND 22A**



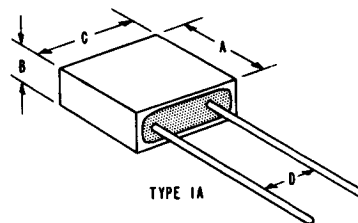
TYPE 1AD



TYPE 22A



TYPE 5A



TYPE 1A

Type	Dimensions (Nom.)			
	A	B	C	D
22A	5/16	7/32	35/64	1/4
5A	15/32	7/32	51/64	3/8
1A	53/64	9/32	53/64	1/2
1AD	53/64	11/32	53/64	1/2

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Cornell-Dubilier Electronics Corp., Newark, N. J.

Electrical Characteristics

Ratings: As follows
100VDCW—Type 22A, 1100 to 1500 μf ; Type 5A, 3900 to 5100 μf ; Type 1A, 16000 to 20000 μf ; Type 1AD, 33000 to 40000 μf .
300VDCW—Type 22A, 510 to 1000 μf ; Type 5A, 2200 to 3600 μf ; Type 1A, 11000 to 15000 μf ; Type 1AD, 16000 to 30000 μf .
500VDCW—Type 22A, 5 to 370 μf ; Type 5A, 5 to 2000 μf ; Type 1A, 560 to 10000 μf ; Type 1D, 1000 to 15000 μf .

Capacitance Tolerance: Available from $\pm 10\%$ to $\pm 1\%$ with a lower limit of $\pm 5 \mu\text{f}$. (Closer tolerance and $\pm 20\%$ also available.)

Physical Characteristics

Construction: Encapsulated in premolded cases.
Terminal Types: Wire leads, 1-1/4" min. lgth.
Terminal Material: Tinned Brass—Type 22A, #22 AWG; Type 5A, #20 AWG; Types 1A and 1AD, #18 AWG.

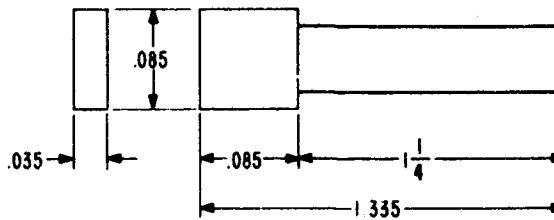
Environmental Conditions

Oper Temp: -55°C to -125°C
Temp Coefficient: In addition to normal characteristics, these units may be supplied in special negative and closely controlled temperature coefficients.

AVAILABILITY CHART
CONTROLLED T. C. UNITS
Tolerance (PPM/ $^{\circ}\text{C}$) where Nominal Value is within limits of +70 to $-50 \text{ PPM}/^{\circ}\text{C}$

Cap. (μf)	Tol. (PPM/ $^{\circ}\text{C}$)	Type
1-33	± 30	5A
34-100	± 20	5A
101-299	± 15	5A
300-2550	± 10	5A
2551-10,000	± 10	1A
10,001-20,000	± 10	1AD

C307
CAPACITOR, PLATE TYPE (CERAMIC) MICRO-MINIATURE. TYPE GL-10.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Glenco Corp., Metuchen, N. J.

Electrical Characteristics

Working Voltage: 50 vdc
Cap. Range: 10 pf to 300 pf (complete series of capacitors)

Cap. pf	Part No.	Cap. pf	Part No.	Cap. pf	Part No.
10	GL10-11M	39	GL10-390M	110	GL10-111M
12	GL10-120M	43	GL10-430M	120	GL10-121M
15	GL10-150M	47	GL10-470M	130	GL10-131M
18	GL10-180M	51	GL10-510M	150	GL10-151M
20	GL10-200M	56	GL10-560M	160	GL10-161M
22	GL10-220M	62	GL10-620M	180	GL10-181M
24	GL10-240M	68	GL10-680M	200	GL10-210M
27	GL10-270M	75	GL10-750M	220	GL10-221M
30	GL10-300M	82	GL10-820M	240	GL10-241M
33	GL10-330M	91	GL10-910M	270	GL10-271M
36	GL10-360M	100	GL10-101M	300	GL10-301M

Letter "M" in part number indicates $\pm 20\%$ tolerance
Use letter "K" to indicate $\pm 10\%$, and letter "J" to indicate $\pm 5\%$
Standard model has radial leads; for axial lead unit add "A" to part number

Physical Characteristics

Types of Leads: No. 30AWG, tinned copper
Size Tolerances: $\pm .015"$.

Environmental Conditions

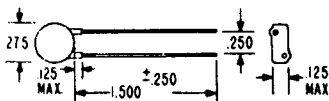
Temperature Range: -55°C to $+85^{\circ}\text{C}$
 -55°C to $+150^{\circ}\text{C}$ when further encapsulated

Test Data

Temperature Characteristics: Capacitance change not to exceed +10% from -55°C to $+85^{\circ}\text{C}$, or $\pm 15\%$ from -55°C to $\pm 150^{\circ}\text{C}$
Life Test: 2x wvdc at $+85^{\circ}$ for 1000 hours.

Remarks: Space limitations prevent marking. Identification on package.

C308
CAPACITOR, DISC TYPE (CERAMIC), TYPE 40



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr.: Sprague Electric Co., North Adams, Mass.

Electrical Characteristics

Working Voltage: 250 volts, d. c.
Dielectric Withstanding Voltage: 625 volts, d. c.
Capacitance: ±20% of nominal rating
Insulation Resistance: 5000 megohms after life test
Life Test: Twice the rated voltage for 250 hours at 85°C.
Dissipation Factor: 2.0% at 25°C. at 1 kc.
Capacitors with the following values are available:
0.001, 0.0012, 0.0015, 0.0018, 0.002, 0.0022, 0.0033,
0.0039, 0.0047, 0.005, 0.0068, 0.0082, 0.01

Physical Characteristics

Lead Wires: No. 22 AWG lead wires standard

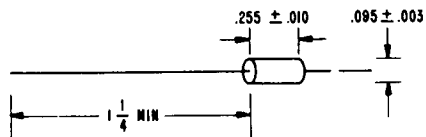
Environmental Conditions

Temp. Range: -55°C. to +85°C.
Humidity Resistance: 1000 megohms min. insulation resistance after exposure to an atmosphere of 95% relative humidity at 40°C. for 100 hours

Remarks: High temperature units (125°C.) also available

C309
CAPACITOR, DISC TYPE (CERAMIC) TYPE CT-10

Application: Requirements for an ultraminiature ceramic capacitor to be machine-installed on .100 inch grid



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr.: Glenco Corp., Metuchen, N. J.

Electrical Characteristics

Capacitances as follows are available with either ±10%, or ±20% tolerances:
1200, 1500, 1800, 2200, 2700, 3300, 3900, 4700, 5600,
6800, 8200, and 10,000 pf
Working Voltage: 50 volts, dc
Insulation Resistance: 100,000 megohms @ 25°C initial
1000 megohms @ 150°C
Dissipation Factor: 2.5% @ 1KC
Life Test: 2 times wvdc @ 150°C for 1000 hours

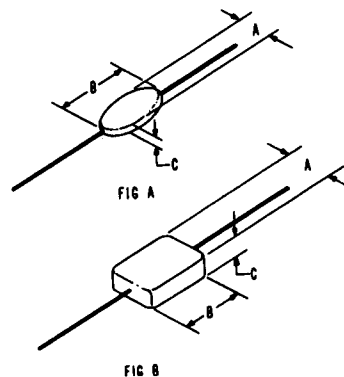
Physical Characteristics

Lead Size: No. 22 AWG (0.025) tinned copper leads,
1-1/4 in. min length
Case: Molded plastic

Environmental Conditions

Temp Range: -55°C to +150° (without derating)
Temp Characteristics: Max capacitance change from 25°C
-55°C to +85°C = ±10%
Max capacitance change
-55°C to 150°C = ±15%
Complies with MIL-C-11015 where applicable

C310
CAPACITOR, CERAMIC, K2A SERIES



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr.: King Electronics Inc., South Pasadena, Calif.

Electrical Characteristics

Oper Voltage: 200 working volts, dc with no derating to 150°C.

Dissipation Factor: Measured at 25°C, less than 2.5% at 1 KC and less than 1.0% at 10 KC.

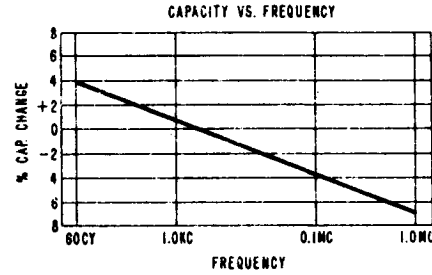
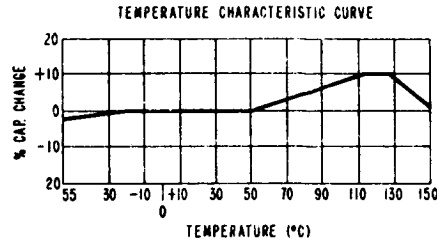
Dielectric Withstanding Voltage: Measured at 800 volts, dc for five (5) secs.

Insulation Resistance: 50,000 megohms at 25°C.

Capacity tolerance measured at room temperature, 6 volts, rms and 1.0 KC.

Table I

Part No.	Fig.	Cap pf	A max.	B max.	C max.
K2A470	A	47	.100	.125	.075
K2A560	A	56	.100	.125	.075
K2A680	A	68	.100	.125	.075
K2A820	A	82	.100	.125	.075
K2A101	A	100	.100	.125	.075
K2A121	A	120	.100	.125	.075
K2A151	A	150	.100	.150	.075
K2A181	A	180	.100	.150	.075
K2A221	A	220	.100	.150	.075
K2A271	A	270	.100	.150	.075
K2A331	A	330	.125	.175	.075
K2A391	A	390	.125	.175	.075
K2A471	A	470	.125	.175	.075
K2A561	A	560	.125	.175	.075
K2A681	A	680	.125	.200	.075
K2A821	A	820	.125	.200	.075
K2A102	A	1,000	.125	.250	.075
K2A122	A	1,200	.125	.275	.100
K2A152	B	1,500	.150	.310	.100
K2A182	B	1,800	.150	.310	.100
K2A222	B	2,200	.200	.330	.100
K2A272	B	2,700	.225	.400	.100
K2A332	B	3,300	.255	.400	.100
K2A392	B	3,900	.250	.400	.100
K2A472	B	4,700	.250	.550	.100
K2A562	B	5,600	.250	.550	.125
K2A682	B	6,800	.300	.550	.125
K2A822	B	8,200	.325	.550	.125
K2A103	B	10,000	.400	.550	.125



Physical Characteristics

Sizes: See table I.

Terminal Lead Wires: #28, AWG, tinned copper wire.

Lead Length: 1.5" min.

Environmental Conditions

Oper Temp Range: -55°C to +150°C

Test Data

Lead Pull: 5 lbs, min.

Vibration: Withstands 2000 cps at 20g with cap mounted by both leads and lead length of .250", result no physical or electrical damage

Spec changes after testing:

Insulation Resistance: After moisture resistance test:

5000 megohm, after temp and immersion cycling: 5000

megohms; after (life test conducted at 400 volts, dc for

1000 hrs at 150°C, one (1) failure permitted in 50 parts).

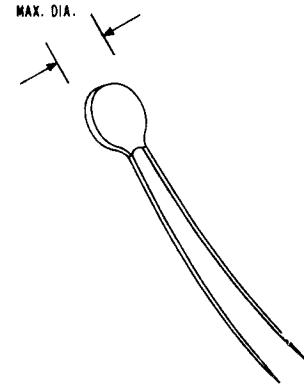
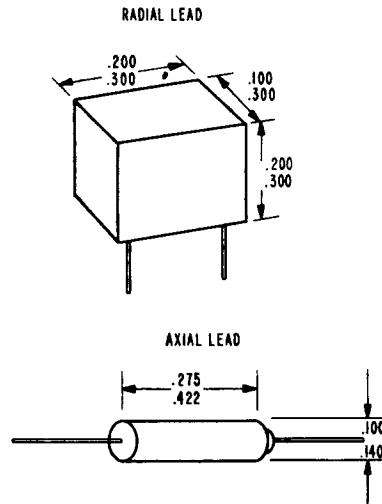
C311

CAPACITOR, CERAMIC, TEMPERATURE STABILIZED, SUBMINIATURE SERIES CK1R, CXX2R, CK1T AND CK2T.

Applications: Designed for use in electronic circuits where compactness, low power factor and high voltage ratings are required. These capacitors are particularly suitable for blocking, bypass and coupling applications.

C312
CAPACITOR, DISC TYPE CERAMIC, MICROMINIATURE,
ULTRA-KAP DA 458-468 SERIES

Application: Designed for use in electronic circuits where a high capacity, low voltage and low power factors are requirements for by-pass and coupling applications.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Chem-Electro Research, Inc., A Subsidiary of Products Research Company, Sun Valley, Calif.

Electrical Characteristics
 Voltage Rating: 200WVDC and 100 WVDC.
 Temp. Coeff: Within 15% of 25°C value over complete temperature range.
 Power Factor: 2.5% at 1KC, 2 volts rms.
 Insulation Resistance: 100,000 megohms or 1000 megohm-microfarads.
 Cap. Reference: 1000 cps ±100 cps at rms of 2 volts, ±0.1, volt with no polarizing voltage.
 Cap Ranges: 10 pf to 100,000 pf.

Physical Characteristics
 Lead Material: Radial Lead-#22 AWG, tinned copper leads spaced .200" ±.015" center to center; Axial Lead-#22 and #26 AWG, tinned copper wire.
 Case: Epoxy

Environmental Conditions
 Temp. Range: -55°C to +125°C.
 Humidity: Per MIL-STD-202, Method 106.
 Altitude: Characteristics remain stable from sea level to 80,000 ft.
 Thermal Shock: Negligible effect on characteristics.

Test Data
 Dielectric Withstanding Voltage: Will withstand a potential of 400% of rated voltage.
 Life: 1000 hr. at max. rated temp and twice rated voltage.
 Vibration: 20g at 5 to 2000 cps.
 Shock: 75 g.

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use

Mfr: Centralab, The Electronics Division of Globe-Union Inc., Milwaukee 1, Wisconsin

Electrical Characteristics

Leakage Resistance and Specifications				
Part No.	Cap Mfd.	Tol-erance	Measured at .3V Min. at 3VDC, RMS Max.	
DA-458-004	.005	GMV	10%	30K
DA-458-005	.01	GMV	10%	30K
DA-458-006	.02	GMV	10%	30K
DA-468-005	.1	GMV	5%	40K

Typical Leakage Resistance at 3 volts vs. Temp. in °C

Part No.	Capacity Mfd.	Temp. in °C		
		-55°C	+25°C	+85°C
DA-458-004	.005	200%	100%	50%
DA-458-005	.01	200%	100%	50%
DA-458-006	.02	200%	100%	50%
DA-468-005	.1	200%	100%	50%

Typical Average Capacity Change

Capacity Mfd.	-55°C	-30°C	+10°C	+25°C	+45°C
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All values	80%	85%	95%	100%	105%
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+65°C +85°C

100%	95%
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Voltage Rating: 3 volts

Physical Characteristics:

Max. Dia: DA-458-002, DA-458-003, DA-458-001 is .120"; DA-468-001 is .220"

Leads: DA-458 Series, #26 tin dipped copper wire

DA-468 Series, #24 tin dipped copper wire

Lead Length: All leads 1-1/2", min

Insulation: Resin coated

Test Data

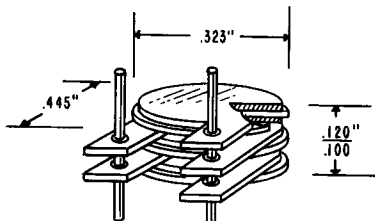
Life: 16% max capacity change in 10,000 hrs.

C313

CAPACITOR, FIXED STACKED TIMM CERAMIC AND METAL TYPE 2-2919

Application: Designed for use in Thermionic Integrated Micro Module circuits at a temperature of 580 ±20°C. It can also be used in lower temperature applications.

Illustration (partially cut-away) of unit composed of 4 sections, all sections not shown.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: General Electric Co., Receiving Tube Dept., Owensboro, Kentucky

Electrical Characteristics

Capacitance Values: 10pf and 20pf in single sections,

combinations of these sections into single units up to 200pf.

THICKNESS OF TYPICAL UNITS

Capacitance in	Number of Sections	Nominal Over-all Thickness
10	1	.030"
20	1	.025"
50	3	.060"
100	5	.085"
200	10	.160"

Working Voltage (DC plus peak): 150 volts

Initial Characteristics Limits:

(Measured at a temp of 580°C and a freq of 1 mc)

Dissipation Factor: 3.0%, max

Capacitance Deviation From Nominal Value: ±10%

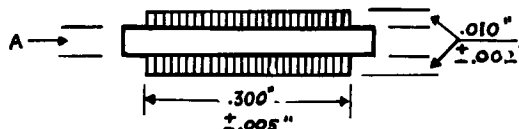
Resonant Frequency: ∅ mc, min (to be determined)

Resistivity: Ohm-cm, 10¹⁰

Physical Characteristics

Dimension A	Capacitance
.010" ± .002"	10 pf
.005" ± .002"	20 pf

This table applies to (Figure 1)



Capacitor Plate Material: Metal electrode

Capacitor Dielectric Material: Forsterite ceramic

Mounting Position: At any axis

Construction: Alternate layers of electrodes and dielectrics, with stack pins holding the package together.

Terminals: Protruding portion of stack pins

Environmental Conditions

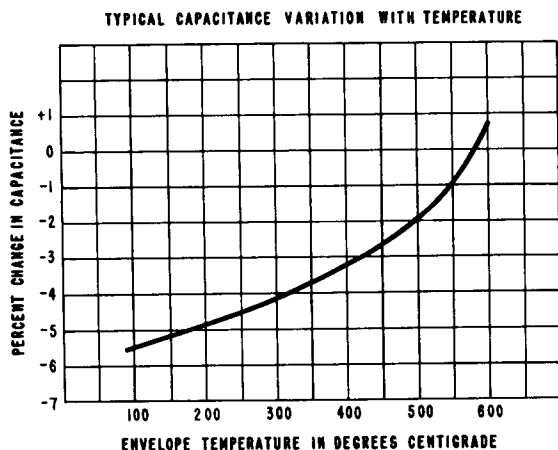
Temp Range: 25°C to 600°C

Cap Change Over Stated Temp Range: 5%

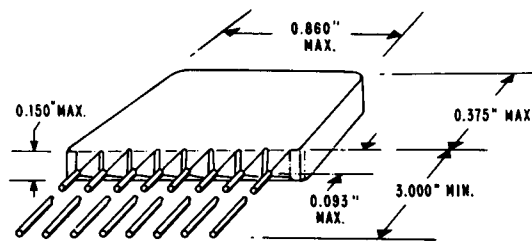
Dielectric Constant: 6.0 at 580°C

Tan δ: 0.02-0.03 at 580°C

Resistivity: Ohm-cm, 10¹⁰ at 580°C



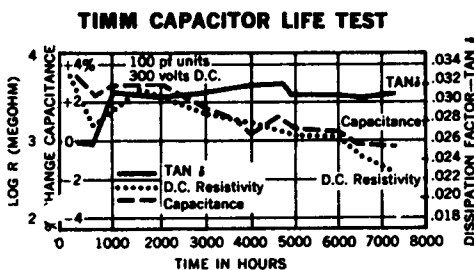
TYPICAL MULTIPLE-SECTION G23 MONOLYTHIC CAPACITORS



TYPE 31C52
ALL CAPACITORS; 0.1 μ F +100, -0%; 20VDC

FIGURE 1.

Test Data



Remarks: Publication of this data does not obligate the General Electric Company to manufacture a device with these characteristics. This item is resistant to nuclear radiation. Refer to NAVSHIPS 94324, Part IV for additional data.

C314
CAPACITOR, CERAMIC MONOLYTHIC HIGH-K TYPES 31C52, 31C53 AND 31C54

Application: Designed for use in electronic equipment where bypass and filtering capacitors having large capacities in a minimum size are required.

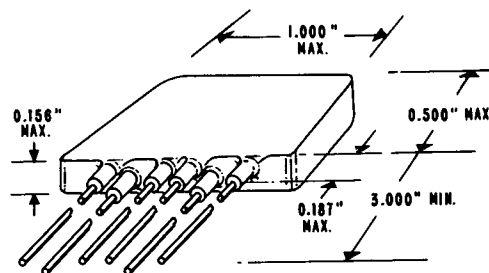
Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Sprague Electric Company, North Adams, Mass.

Electrical Characteristics

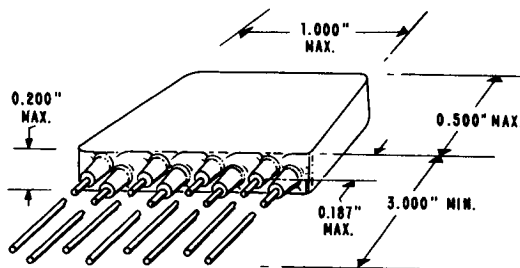
Useful Frequency Range: Because of inherent small inductance factor, can be used in hi-freq, v.h.f., and u.h.f. through 1000 mc; also effective in low-freq, r.f. and audio-freqs.

Inductance Reduction: The inherent self-inductance is reduced by multiple section caps with common ground electrodes.



TYPE 31C53
ALL CAPACITORS; 0.05 μ F +100, -20%; 50 VDC

FIGURE 2.



TYPE 31C54

ALL CAPACITORS; 0.05 μ F +100, -20%; 50 VDC

FIGURE 3.

Test Data

Dielectric Withstanding Voltage: 100 volts, dc for not less than 1 nor more than 5 secs at 25°C for caps rated at 25 volts, dc; caps rated at 50 volts, dc shall withstand at test potential of 150 volts, dc for a period of not less than 1 nor more than 5 secs at 25°C

Life Test: Caps will withstand 150% of rated dc voltage at temp of 85°C for 1000 hrs.

Remarks: These compact high-K ceramic capacitors made in blocks of multiple sections increases the component density for bypassing applications.

Charging Current: 20 ma, max

Cap. Range (Type 31C52): 0.1 μ f + 100, -0%; (Type 31C53, 31C54) 0.05 μ f + 100, -20%

Voltage Rating: Type 31C52, 20 volts, dc; Types 31C53 and 31C54, 50 volts, dc

Physical Characteristics

Lead Size: No. 24, AWG tinned copper wire

Lead Spacing (Grid): Type 31C52, 0.100"; Type 31C53, 0.160"; Type 31C54, 0.110"

Markings: Caps will carry marking SPRAGUE or trademark, rated capacitance; rated voltage; the EIA tolerance designation (M for \pm 20% or Z for +80, -20%).

Construction: Alternately spraying layers of ceramic dielectric material and screening metallic electrodes until the desired capacitance is achieved, result, solid homogeneous blocks, which are then protected against moisture and mechanical damage by a resin coating.

Environmental Conditions

Humidity Resistance: 1000 megohms, min

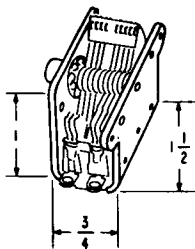
Oper Temp Range: -55°C to +85°C

Insulation Resistance: 2,500 megohm-microfarads

Dissipation Factor: 4.0% max

**C401
CAPACITOR, VARIABLE TUNING,
AIR DIELECTRIC, STYLE 52**

Application: Transistor receivers.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: TRW Electronic Components Div., Des Plaines, Ill.

Electrical Characteristics

Working Voltage: 300 volts ac (hi-pot).
Cap. Range: 180° rotation.

Physical Characteristics

Frame: Brass or steel.
Air Gap: 0.008".
Bearings: Ball bearings in front and single thrust ball in rear.

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: E.F. Johnson Company, Waseca, Minn.

Electrical Characteristics

Capacity Range: 5 thru 32 pf, nominal for single section
3.1 thru 10.8 pf, nominal per section for Butterfly
5 thru 19.6 pf, nominal per section for differential

Insulation: End frame, steatite grade 1-4 or better,
DC200 treated
Capacitor "Q": Greater than 1500 at 1 MC

Physical Characteristics

Air Gap: Standards have .017 spaced plates, with the exception of type 30M8 which has .013 spacing
Mounting: Threaded bushing 1/4" -32, with flats to prevent turning. Mounted nut furnished
Finish (metal parts): Nickel, .0001" thickness
Rotor Contact Spring: Beryllium copper
Plates: Brass, soldered construction
Terminals: Accommodate 2, #17 AWG wires, nickel plated
Bearing: Brass, nickel plated
Shaft Extension: 1/2" projection from mounting surface, slotted for screwdriver adjustment
"L" Dimension: Smallest (all types) 41/64". Add 1/16" per additional plate section. Type "A" max, 1-17/64"; Type "B" and "C" max, 1-11/64".

Mechanical Characteristics

Torque: 1-1/2 to 6 in. oz
Tuning Characteristic: Straight line capacity, linear within 10% of nominal

Environmental Conditions

+20
Temp Coefficient: +30 ppm/°C at 25°C
-30

Ambient Temp: -55°C to approx 175°C. Note: The 50-50 lead-tin solder used in soldering the plates, becomes plastic at 182°C (360°F)

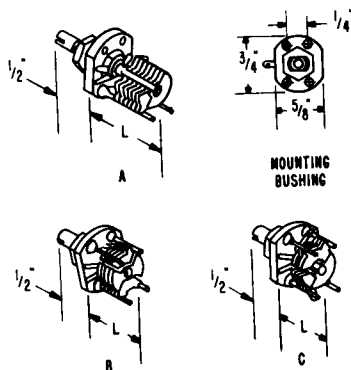
Test Data

Dielectric Withstanding Voltage: .017 spacing -1250 volt, rms, peak, .013 spacing -850 volt, rms, peak
Note: When checking voltage a current limiting resistor is used in series with the applied voltage. This eliminates the possibility of dust or lint causing a flashover, which may sustain itself and permanently damage the plates.

Remarks: These capacitors comply with the general requirements of MIL-C-92A, except the stator terminals are not hot tin dipped and rotor torque may be as low as 1-1/2 in. oz. also complies with rotational life characteristic J. Vibration and shock specification data not presently available.

**C402
CAPACITOR, AIR VARIABLE, TYPE M**

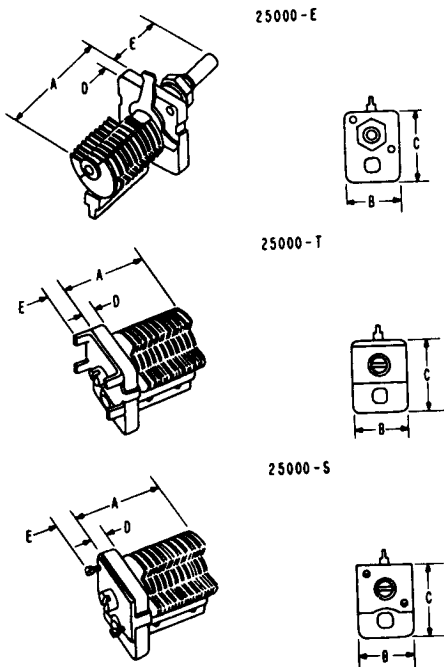
Application: Designed for utilization in compact electronic equipment.



C403
CAPACITOR, AIR VARIABLE TYPE 25000

Application: Designed for utilization in compact electronic equipment where high "Q" is required.

25000-T-four turn-down tabs for printed circuit mounting, bracket furnished
 Finish (Metal Parts): Silver plate with rhodium flash
 Terminals: Stator terminal is an integral part of the extruded brass stator section. Rotor terminal lug is phosphor bronze pressure spring against the extruded brass rotor section
 Bearing: Brass, nickel plated
 Lubrication: Dow Corning silicone grease, #33
 Plates: Brass, silver plated with rhodium flash, machined from solid bars of extruded brass
 Shaft Extension: 25000-E Series has 9/16", projection from mounting surface; 25000-S and 25000-T Series have 1/8", projection from mounting surface and are provided with screw driver slot



Catalog No.	Rotor	Stator	Cap Dimensions				
			A	B	C	D	E
25009E	3	3	13/32	.562	.750	3/32	18/32
25009S	3	3	11/32	.562	.750	3/32	1/8
25009T	3	3	11/32	.562	.750	3/32	.312
25012E	4	4	7/16	.562	.750	3/32	18/32
25012S	4	4	13/32	.562	.750	3/32	1/8
25012T	4	4	13/32	.562	.750	3/32	.312
25015E	5	4	1/2	.562	.750	3/32	18/32
25015S	5	4	7/16	.562	.750	3/32	1/8
25015T	5	4	7/16	.562	.750	3/32	.312
25025E	8	7	5/8	.562	.750	3/32	18/32
25025S	8	7	9/16	.562	.750	3/32	1/8
25025T	8	7	9/16	.562	.750	3/32	.312
25035E	11	10	25/32	.562	.750	3/32	18/32
25035S	11	10	23/32	.562	.750	3/32	1/8
25037T	11	10	23/32	.562	.750	3/32	.312

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: James Millen Mfg. Co., Inc., Malden 48, Mass.

Electrical Characteristics

Capacity Range:
 Type 25015T and 25015S: 2.2 pf to 15.7 pf, nominal
 Type 25025S and 25025T: 3.0 pf to 25.5 pf, nominal
 Type 25035S and 25035T: 4.2 pf to 35.8 pf, nominal
 Type 25009E; 25009S; 25009T: 1.55 pf to 9.3 pf
 Type 25012E; 25012S; 25012T: 1.88 pf to 12.75 pf
 Insulation (End frame): Glass based silicone laminate (manufacturer claims it takes a greater shock than ceramic)
 Capacitor "Q": Greater than 1500 at 1 mc
 Frequency: 3 mc

Physical Characteristics

Air Gap: 0.010", spacing between plates
 Mounting: Three mountings available
 25000-E-Single hole mounting, threaded bushing 12-28, mounting nut and lock washer furnished
 25000-S-two 2-56 screws. Bracket furnished

Mechanical Characteristics

Tuning Characteristics: Straight line capacity

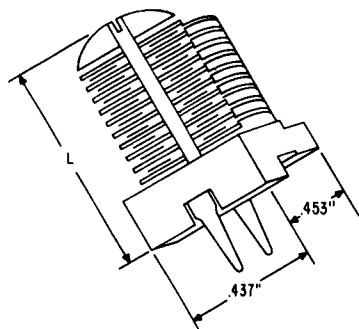
Environmental Conditions

Ambient Temp: -55°C to +180°C
 Dielectric Withstanding Voltage: 350 volts, peak
 Vibration and shock data not presently available.

Remarks: These capacitors are machined from solid bars of extruded brass.

C404
CAPACITOR, VARIABLE AIR DIELECTRIC TRIMMER, SUBMINIATURE TYPE AP-39

Application: Designed for use as an air trimmer capacitor in electronics equipment where space is critical.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use.

Mfr: Teleradio Engineering Corporation, New York 5, N. Y.

Electrical Characteristics

Part No.	Cap. Range Pf Min Max	Total No. of Plates	Air Gap Nom	Test voltage R. M. S. 60 cy	"L" Dimension ± .031"
A-39-4	1.2 3.5	4	.010"	610	.453"
A-39-6	1.3 5.4	6	.010	610	.500
A-39-8	1.4 7.3	8	.010	610	.547
A-39-10	1.5 9.1	10	.010	610	.594
A-39-12	1.7 11.0	12	.010	610	.625
A-39-14	1.8 13.0	14	.010	610	.672

Q Factor: 1500, min at 1 mc
Temp Coef: +35 PPM/°C, max
Air-Gap Spacing: 0.010" nominal
Insulation Resistance: 50,000 megohms, min at 25°C,
between rotor and stator terminal

Physical Characteristics

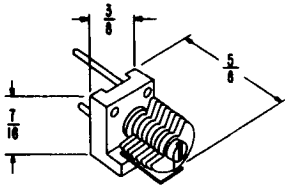
Torque: 2-7 in. -oz, fixed torque
Plating of Rotors and Stators: Silver plated to .0003"
nom, thickness
Marking: Legibly and permanently marked Teleradio
RETMA code "355" embossed in the ceramic base member
and stamped with capacity range.
All Metal Parts: Brass, silver plated
Base Material: Ceramic insulation is processed from
Grade L-4 Steatite and treated for leakage resistance
Construction: Provides terminals for printed circuits
application. The terminals are inserted through two
0.050" dia holes positioned on 0.406" mounting centers
and secured by dip soldering.

Environmental Conditions

Temp Range: -55° to +85°C

C501
CAPACITOR, TRIMMER AND PADDER,
AIR TRIMMER, SERIES 75

Application: Miniaturized printed-wiring boards.
 Designed for tab mounting on dip-soldered printed-wiring boards, or screw mounting on conventional chassis.



Quality Assurance: Manufac. Bureau approval required prior to use

Mfr: TRW Electronic Components Div., Des Plaines, Ill.

Electrical Characteristics

Working Voltage: Available in sizes having peak voltages of 300 and 400 volts, ac.

(A) 875001 — 400v rms 60 cps.

(B) 875002 — 300v rms 60 cps.

(C) 875003 — 300v rms 60 cps.

Cap. Range: (A) 1.2–5 $\mu\mu\text{f}$, (B) 1.2 to 10 $\mu\mu\text{f}$, (C) 1.5 to 15 $\mu\mu\text{f}$.

Physical Characteristics

Case: Molded plastic dust cover is available that fits snugly around capacitor and provides an opening for rotor shaft.

Mounting: Designed for tab mounting.

Frame: Designed for tab mounting made of steatite, per JAN 110, Grade L4.

No. of Plates: (A) 9, (B) 11, (C) 15.

Air Gap: (A) 0.014, (B) 0.008, (C) 0.008.

Insulation: See Frame

Torque: 1.5 to 6 in.-oz.

Rotor Contact: Beryllium-copper, silver plated.

Rotor and Stator Assem: Brass plated, soldered, silver plated.

Environmental Conditions

Temp Coefficient: Approx 50 ppm per $^{\circ}\text{C}$ for 50°C rise.

Temp Cycling: Designed to meet requirements.

Humidity: Designed to meet requirements.

Salt Spray: Designed to meet requirements.

Test Data

Vibration Test: Designed to meet military application.

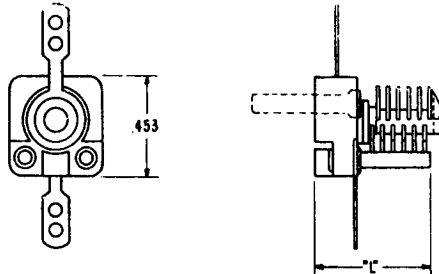
Shock: Designed to meet military application.

Dielect. Constant (k): Air.

Insulation Resistance: 100,000 megohms between rotor and stator at 500 volts, dc, and 25°C .

C502
CAPACITOR, TRIMMER AND PADDER, AIR DIELECTRIC

Application: Electronic equipment.



"L" VARIES ACCORDING TO TYPES

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: E. F. Johnson Company, Waseca, Minn.

Electrical Characteristics

Working Voltage: Available with peak-voltage ratings of 850 to 1300 volts, dc.

Cap. Range (pf): Single section (850 vdcw), 1.2 thru 17.0;

Single section (1300 vdcw), 1.3 thru 8.9; Differential 1.2 thru 13.0; Butterfly, 1.7 thru 8.5.

Capacitor "Q": Greater than 1500 at 1 mc.

Insulation: Steatite grade L-4 or better.

Physical Characteristics

Finish: All metal parts are silver plated.

Rotor and Stator Material: Solid brass.

Types Available: Single section (shown), butterfly and differential.

Mounting: Single section—Loc tab (shown), 2-hole and printed circuit; Butterfly, and differential—printed circuit only.

Air Gap: 850 vdcw—.010" (all types); 1300 vdcw—.016" (single section only).

"L" Dimension: Single section (850 vdcw), 7/16" to

25/32"; Single section (1300 vdcw), 1/2" to 3/4";

Differential, 7/16" to 11/16"; Butterfly, 17/32" to 47/64".

Mechanical Characteristics

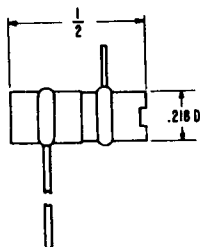
Torque: 2.5 to 10 in. oz.

Environmental Conditions

Temp Coefficient: $+45 \pm 15$ ppm/ $^{\circ}\text{C}$.

**C503
CAPACITOR, TRIMMER AND PADDER,
CERAMIC DIELECTRIC**

Application: Electronic equipment.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Aerovox Corporation, Myrtle Beach, South Carolina.

Electrical Characteristics

Working Voltage: 500 volts, 1000 volts peak.
Power Factor: 0.5% max.

Cap. Range: 0.5-3 $\mu\mu\text{f}$, 1 to 4 $\mu\mu\text{f}$, 4-12 $\mu\mu\text{f}$, 1 to 5.5 $\mu\mu\text{f}$, 2 to 6 $\mu\mu\text{f}$, 0.8 to 6.5 $\mu\mu\text{f}$, 1 to 8 $\mu\mu\text{f}$, 1 to 7.5 $\mu\mu\text{f}$, 1.5 to 8 $\mu\mu\text{f}$.

Physical Characteristics

Case: Steatite.

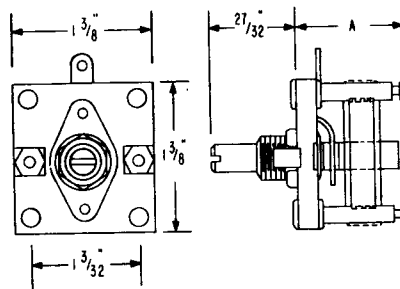
Test Data

Oper Temp Range: -55°C to +85°C.
Insulation Resistance: 7500 megohms.

Remarks: Styles available include VC11, VC12, VC13, VC21, VC22, VC23, VC24, VC31, and VC32.

**C504
CAPACITOR, TRIMMER AND PADDER, TYPE BFC**

Application: Printed-board application. May also be used in VHF application as a series capacitor with no rotor connection.



TYPE	A
BFC-12	29/32
BFC-25	1-13/64
BFC-38	1-1/2
BFC-50	1-51/64

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Hammerlund Mfg. Co., New York, N. Y.

Electrical Characteristics

Cap Range Series: (A) BFC12, 2.2 to 7.6 μf ; (B) BFC25, 2.9 to 14.1 μf ; (C) BFC38, 3.6 to 20.6 μf ; (D) BFC50, 4.3 to 27.1 μf .

Capacity Per Section: (A) BFC12, 3.4 to 14.5 μf ; (B) BFC25, 4.8 to 27.3 μf ; (C) BFC38, 6.2 -40.1 μf ; (D) BFC50, 7.6 to 52.4 μf .

Physical Characteristics

Size: Refer to illustration.

Shape: Refer to illustration.

No. of Plates: (A) 4 in rotor, 3 in stator; (B) 7 in rotor, 6 in stator; (C) 10 in rotor, 9 in stator.

Air Gap: 0.030 nominal.

Positive Mech. Stops: Straight-line capacity-90° rotatio from minimum-capacity position to maximum-capacity position.

Bearings: Nickel-plated brass.

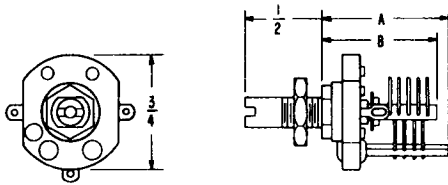
Test Data

Elect. Properties Test: Tested with 1200 volts rms, 60 cycles each applied between rotor and stator.

Remarks: Contact wiper is heavily silver-plated phosphor bronze. High-speed ball bearing models are also available.

**C505
CAPACITOR, TRIMMER AND PADDER, TYPE MAC**

Application: Used as a trimmer in the VHF range.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Hammerlund Mfg. Co., New York, N. Y.

Electrical Characteristics

Cap. Range: (A) MAC-5, 1.3 to 5.4 μf ; (B) MAC-10, 1.5 to 9.6 μf ; (C) MAC-15, 1.9 to 15.8 μf ; (D) MAC-20, 2.2 to 21.5 μf ; (E) MAC-30, 2.5 to 32.0 μf .

Physical Characteristics

Size: A and B dimensions—MAC-5, 45/64 x 39/64; MAC-10, 13/16 x 23/32; MAC-15, 1 x 29/32; MAC-20, 1-11/64 x 1-5/64; MAC-30, 1-17/64 x 1-11/64.

Shape: See illustration.

No. of Plates: MAC-5, 5; MAC-10, 9; MAC-15, 15; MAC-20, 21; MAC-30, 27

Positive Mech. Stops: Straight-line capacity.

Adjustments: Screwdriver.

Air Gap: MAC-5 thru MAC-20—0.017" nominal; MAC-30—0.0135" nominal.

Test Data

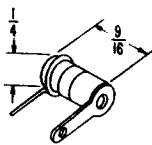
Normal Rating Limits: MAC-5 thru MAC-20 tested at 880 volts rms, 60 cycles; MAC-30 tested at 600 volts rms, 60 cycles.

Remarks: Special manufacturer's types include differential type MAC, butterfly type MAC, and standard type MAC with isolated mounting.

C506

CAPACITOR, TRIMMER AND PADDER SERIES, TYPES VC9G, VC10G, VC31G, VC32G, VC42G, VC43G

Application: Designed for incorporation in printed boards by means of dip soldering and automation techniques.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: J. F. D. Electronics Corp., Brooklyn, N. Y.

Electrical Characteristics

Working Voltage: 750 volts, dc.

Dielect. Withstanding Volts: 1500 volts.

Power Factor: 500.

Linearity: Ultra linear tuning for accurate alignment.

Cap. Range: VC9G, 0.8—8.5 μf ; VC10G, 0.8—4.5 μf ; VC31G, 0.8—12 μf ; VC35G, 0.8—18 μf ; VC42G, 1—21 μf ; VC43G, 0.8—30 μf .

Physical Characteristics

Case: 24-carat gold plating for noise-free tuning and freedom from silver migration.

Case Polarity: Polarized for wiring board plug-in.

Dielect. Material: Glass—also available with quartz.

Environmental Conditions

Temp Coefficient: ± 50 for VC9G or 10G, ± 100 for VC31G, 32G, 42G and 43G.

Temp Cycling: No derating at 125°C.

Dielectric Strength: 1500 volts, dc when measured for 1 min. at 50% r.h. at max. rated capacity.

Test Data

Oper Temp Range: -55°C to $+125^\circ\text{C}$.

Dielect. Absorption: Strength-measured for 5 sec at 50% relative humidity and max capacity.

Cap. Tolerance: Refer to Cap. Range.

Insulation Resistance: 10^6 megohms after application of 500 volts, dc, for 1 minute at a relative humidity of 50%.

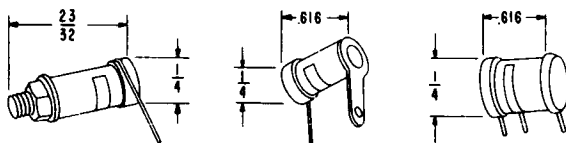
Remarks: Glass and invar construction.

C507

CAPACITOR, TRIMMER AND PADDER, SEALED "SEALCAPS", SERIES SC

Application: Panels and printed circuits.

DIMENSIONS VARY ACCORDING TO TYPE



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: J. F. D. Electronics Corp., Brooklyn, N. Y.

Electrical Characteristics

Working Voltage: SC-131, 141, and 151, 750 volts, DC;
all others in the series, 1250 volts, DC.
Dielect. Withstanding Volts: SC-131, 141, and 151, 1500
volts dc; all others in series 2500 volts, dc (1 min. at 50%
r.h. at max. rated cap.).
Power Factor: 500 at 20 mc.
Linear Tuning: Ultra linear tuning for accurate alignment.

Cap. Range:	Type	Min	Max
	SC 133	0.8	8.5
	SC 136	0.8	18.0
	SC 139	1.0	30.0
	SC 144	0.8	12.0
	SC 146	0.8	18.0

Physical Characteristics

Size: Varies according to unit type
Case: Sealed interior construction locks out all atmosphere
effects.
Dielect. Material: Special process glass dielectric with
excellent electrical properties offers no derating at 125°C.
Also available with quartz dielectric.
Positive Mech. Stops: At both ends of the adjustment.

Environmental Conditions

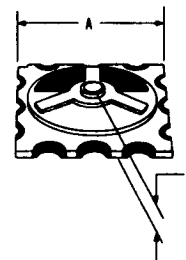
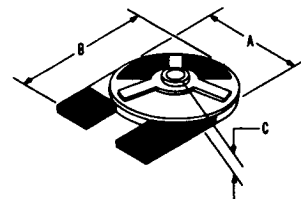
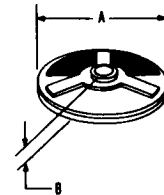
Temp Coefficient: ± 50 ppm/°C for SC-131, -133, -141,
-143, -151, and -153; ± 100 ppm/°C for all others in series.
All values measured at 1 mc ppm/°C -55° to +125°C.
Corrosion: MIL-STD-202.
Salt Spray: MIL-STD-202.
Barometric Press. Test: Sealed interior construction locks
out atmosphere effects.

Test Data

Life: SC-131, -141, and -151 will withstand 1500 volts,
dc, for 1 minute at a relative humidity of 50%. All others
will withstand 2500 volts, dc under same conditions.
Max Voltage @ Breakdown: Encapsulated—in excess of
5000 volts, dc.
Oper Temp Range: -55°C to 125°C. No derating at
125°C.
Power Factor Vs. Freq: See Power Factor.
Dielect. Constant (k): Glass or quartz.
Cap. Tolerance: Refer to Cap. Range.
Corrosive Test: MIL-STD-202.
Insulation Resistance: 2×10^6 megohms for SC-131, -141,
and -151 after application of 500 volts, dc, for 1 minute
at a relative humidity of 50%. All others, 10×10^6 megohms.

C508 CAPACITOR, TRIMMER AND PADDER, MICROMINIATURE CERAMIC STYLE 1,2, AND 3

Application: Designed to serve as key components in
such miniaturized circuits as: computers, rockets, helmet
radios and other specialized devices.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Centralab, The Electronics Division of Globe-Union
Inc., Milwaukee 1, Wisconsin

Electrical Characteristics

Voltage Rating: 100 volts, dcw; 250 volts dc test only
(do not apply 250 volts for continuous use)
Capacitance: Available in three ratings, 1.5 pf to 5 pf
and 3 pf to 10 pf, and 2 pf to 20 pf.

Mechanical Characteristics

Rotor: Compounded of temperature compensating ceramic,
fired-on pure silver conductors. Rotor ground optically
flat after firing
Stator: High-alumina body ground optically flat
Fire-on pure silver conductors

Sizes:

	A	B	C	D
Style one (bottom illust.)	.310	.078	.020	5/64
Style two (middle illust.)	.208	.360	.078	
Style three (top illust.)	.208	.078	.030	

(Style one is a production item. Styles two and three not in production, but indicates design possibilities)

Physical Characteristics

Weight: 1 gram
 Mounting: Style 1 for encapsulation into modules, style 2 soldering at right angles in printed circuits, style 3 for soldering parallel in printed circuits
 Adjustment: an insulated adjusting tool is available for convenience and for accuracy

Environmental Conditions

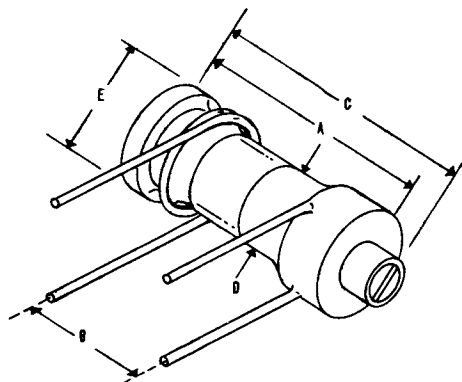
Temp Compensation: Style 1 is based on Char A and B of MIL-C-81
 Temp Comp Limits (Style 1): 1.5 to 5 pf

Temp Range	PPM/°C N130
-55°C to +85°C	±200

3 to 10 pf and 2 to 20 pf:

Temp Range	PPM/°C N280
-55°C to +85°C	±300

Capacitance Drift: ±.75% or ±.5 pf, whichever is greater



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: LRC Electronics, Inc., Horseheads, N. Y.

Electrical Characteristics

Q Factor: As measured on Boonton Radio 260A Q Meter at 50 MC: 500 min
 DC Working Voltage: 500 volts, dc
 Temp Coef of Cap at 1 MC: See Chart
 Insulation Resistance: 10⁹ megohms, min
 Dielectric Constant: Glass 6.7 and a loss factor of 0.8, at 1 MC and at 20°C

Code Type	Cap Range (pf)		Temp Coef. PPM/°C
	Min	Max	
682181	1.0	4.5	±50
682182	1.0	8.5	±50

Mechanical Characteristics

Tuning Control: Precise tuning is made possible by a non-reversing cap change of only .4 pf per turn, using an enclosed, direct traverse tuning mechanism that provides a linear tuning curve.
 Adjustment Torque Range: 1-1/2 in. oz., min; 5 in. oz., max
 Positive Stops: Located at both ends of tuning stroke eliminate risk of breakage during adjustment

Physical Characteristics

Glass Type: CGW Code No. 8161
 Terminal Leads Nearest Adjustment Screw: Diameter No. 20 AWG; hot tinned; other two leads are No. 22 AWG, hot tinned. These leads are soldered on with 60/40 solder.
 Finish For All Parts Except Terminals: Silver plate .0001" thick, min
 Lead Length: 0.6875" approx.

**C509
 CAPACITOR, VARIABLE GLASS DIELECTRIC HERMETICALLY SEALED TRIMMER, DIRECT-TRAVERSE PRINTED CIRCUIT TYPES 682181 AND 682182**

Application: Designed for aerospace communications and instrumentation circuits where capacitance must be accurately trimmed and remain stable under environmental stress.

TYPE	DIMENSIONS				
	A	B	C	D	E
682181	.500"	.250"	.600"	.250"	.312"
682182	.650"	.438"	.750"	.250"	.312"

Environmental Conditions

Oper Temp Range: -55°C to +125°C

Corrosion Resistance: Non-porous silver plating is standard on most types.

Test Data

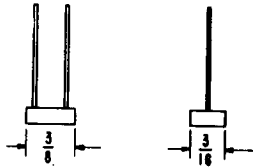
Dielectric Withstanding Voltage (5 sec. at 50% RH): 1000 volts, dc

Shock and Vibration: Per MIL-C-14409

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C601
CAPACITOR, DISC TYPE, PORCELAIN
OR GLASS, STYLE CY13

Application: Electronic equipment



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Vitramon Inc., Bridgeport, Conn.

Electrical Characteristics

Surge Volts: Available in Ratings up to 5000 volts.
 Capacitance Range: 0.5 $\mu\mu\text{f}$ to 300 $\mu\mu\text{f}$.

Test Data

Oper Temp Range: -55°C to $+85^{\circ}\text{C}$.
 Capacitance Tolerance: Available in tolerance of 1%.

Physical Characteristics

Weight: 0.38--1.11 gm.
 Type of Leads: No. 24 AWG (0.020 dia).

Environmental Conditions

Temp Coefficient: $+140 \pm 25$ ppm/ $^{\circ}\text{C}$ from -55°C to $+125^{\circ}\text{C}$ at 100 kc or 1 mc. TC difference between capacitors is less than 10 ppm. Retrace of TC is essentially absolute

Temp Cycling: Meets requirements in MIL-C-11272B.

Moisture Resistance: Meets all requirements of MIL-C-11272B.

X-Radiation Test: Withstands high level of X-radiation without permanent damage or degradation of electrical properties.

Test Data

Life: After 2000 hrs. at 125 C with 150% of full rated voltage capacitance change is less than .5% at 1 mc or 1 kc.

Oper Temp Range: -55°C to $+125^{\circ}\text{C}$.

Capacity Stability: Capacitance drift is less than 0.1% or 0.1 $\mu\mu\text{f}$, whichever is greater.

Dielect. Absorption: Extremely low; percentage of change reappearing after discharge is less than 0.1%.

Capacitance Tolerance: Standard is $\pm 5\%$ or $\pm 0.25 \mu\mu\text{f}$, whichever is greater. Available as 20%, 10%, 2%, 1%, but in no case less than 0.25 $\mu\mu\text{f}$.

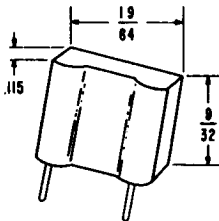
Dissipation Factor: Less than 0.007 at 125°C .

Insulation Resistance: High, over entire operating temp range; at 125°C . I.R. is greater than 500 ohms farads.

Remarks: Manufacturer states these capacitors meet or exceed all requirements of MIL-C-11272B.

C602
CAPACITOR, DISC TYPE, PORCELAIN OR
GLASS, FIXED GLASS, TYPE WL4

Application: Guided Missiles, Nuclear equipment, printed boards, etc.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

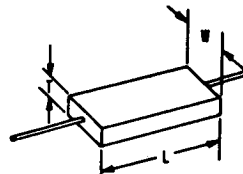
Mfr: Corning Glass Works, Bradford, Pa.

Electrical Characteristics

Working Voltage: 300 volts.
 Capacitance Range: 561 to 1000 $\mu\mu\text{f}$.

C603
CAPACITOR, FIXED GLASS DIELECTRIC,
AXIAL LEAD TYPES CYFM10 AND CYFM15

Application: Designed for use in compact electronics equipment that is exposed to severe environmental stresses.



Quality Assurance: Per specification MIL-C-11272B
 Preferred part per MIL-STD-242

Mfr: Corning Electronics Components, Corning Glass Works, Bradford, Pa.

Electrical Characteristics

Voltage Rating: 300 volts, dcw and 500 volts, dcw
 Cap Range: CYFM-10, 0.5 to 300 pf; CYFM-15, 220 to 1200 pf
 Cap Tolerance: Std is $\pm 5\%$ or ± 0.25 pf whichever is greater. Also available as $\pm 10\%$, $\pm 2\%$, $\pm 1\%$ but in no case less than ± 0.25 pf.

Physical Characteristics

Type	Length in inches L	Width in inches W	Thickness in inches T
CYFM10	11/32 \pm 3/64	11/64 \pm 1/32	5/64 \pm 1/32
CYFM15	15/32 \pm 3/64	17/64 \pm 1/32	7/64 \pm 3/64

Lead Size: No. 24 AWG (0.20 dia.)
 Weight: CYFM10, 0.25-0.50 grams; 0.75-1.25 grams
 Dielectric: Glass
 Construction: Fused, monolithic
 Sealing: Unit element frozen in glass, having a glass to metal seal at the leads
 Leads: Copper-clad nickel-iron, hot solder coated

Environmental Conditions

Temp Coef: $+140 \pm 25$ ppm/ $^{\circ}$ C at 100 KC. TC varies with temp from $+115$ ppm/ $^{\circ}$ C at -55° C to $+165$ ppm/ $^{\circ}$ C at 125° C.
 Cap Drift: Less than 0.1% or 0.1 pf
 Temp Range: -55 to 125° C
 Losses: Low at elevated temp; dissipation factor less than 0.001 at 1 KC and 25° C
 Moisture Resistance: Meets requirements of MIL-C-11272B and MIL-STD-202, Method 106, withstands MIL-STD-202A, Method 106A conditions for 1200 hr; immersion in boiling salt water for 450 hr, saturated in steam at 15 lb gage pressure for 150 hr, without affecting their performance.
 Radiation: Resistant to nuclear radiation, exposures to radiation levels of 10^{18} NVTth result in no significant changes in properties

Test Data

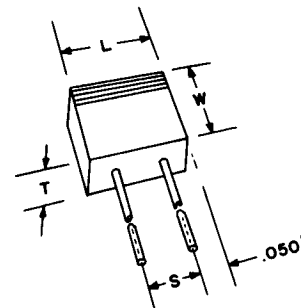
Life: 2000 hr, at 125° C with 150% rated voltage applied, cap change less than .5% at 1mc or 1 KC
 Insulation Resistance: High, over entire operating temp range; at 125° C. I.R. is greater than 500 ohm farads.

Remarks: Manufacturer states these capacitors meet or exceed all requirements of MIL-C-11272B.

C604

CAPACITOR, FIXED, GLASS DIELECTRIC STYLE TY06, TY07 AND TY08

Application: Designed for use in printed circuits or point-to-point wiring in electronic assemblies.



TY06, 07 AND 08

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use.

Mfr: Corning Electronic Components, Corning Glass Works, Raleigh, North Carolina

Electrical Characteristics

Voltage Rating (Working Voltage): 300 volts, dc at -55 to $+125^{\circ}$ C
 Capacitance Range:

Style	Capacitance Range (pf)
TY06	1 to 560
TY07	561 to 1000
TY08	1001 to 2700

Capacitance Tolerance: Std. $\pm 5\%$ or ± 0.25 pf, whichever is greater, also available in $\pm 10\%$, $\pm 2\%$ and $\pm 1\%$ but in no case less than ± 0.25 pf

Insulation Resistance: High over entire oper temp range; at 25° C, insulation resistance is greater than 100,000 megohms; at 125° C, insulation resistance is greater than 10,000 megohms

Losses: Low and remain relatively low at high temps. D.F. less than 0.001 for values greater than 100 pf; .002 for values of 100 pf and below at 1 kc and 25° C

Physical Characteristics

Weight: TY06-0.3 to 0.4 gms; TY07-0.4 to 0.5 gms; TY08-0.7 to 0.8 gms.
 Lead Dia: 0.020", ± 0.002 "

Lead Material: Std. gold plated Dumet, give reliable soldering or welding

Mounting: Flush mounting on circuit boards, rocking factor eliminated

Cap Construction: Proven glass dielectric and foil are fused together to form a single monolithic cap element

Style	L ±0.005"	W ±0.010"	T ±0.005"	S ±0.020"
TY06	.300	.200	.115	.200
TY07	.300	.300	.115	.200
TY08	.500	.300	.115	.400

Lead Length: 1-1/4", min

Environmental Conditions

Temp Coef: T.C. is +140 ±25 ppm/°C at 100 kc. Temp Coef varies with temp from +115 ppm/°C at -55°C to +165 ppm/°C at +125°C. (See figure 1) at any given temp Temp Coef will not deviate from curve by more than 5 ppm.

Cap drift is less than 0.1% or 0.1 pf whichever is greater

Moisture Resistance: Insulation resistance exceeds 10¹⁰ ohms after moisture resistance test per MIL-STD- 202B, Method 106 when measured at 25°C and 50% r.h.

Test Data

Life: At 2000 hrs at 125°C with 150% of full rated voltage capacitance change is less than 0.5% or 0.5 pf whichever is greater; at 125°C dissipation factor is less than 0.007 for values above 100 pf; 0.009 for values of 100 pf and below and insulation resistance is greater than 10¹⁰ ohms.

Remarks: Mfr. states these TY capacitors will meet the environmental and electrical requirements of MIL-C-11272B within the parametric limits described.

PERFORMANCE CHARTS

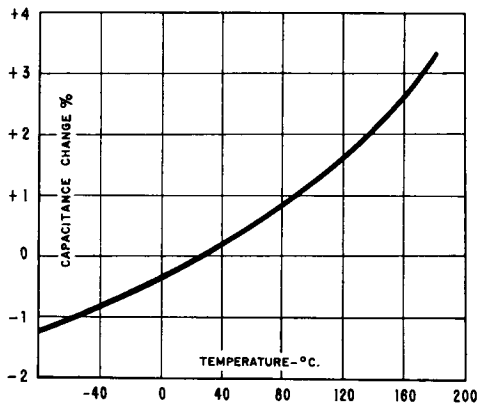


FIGURE 1.

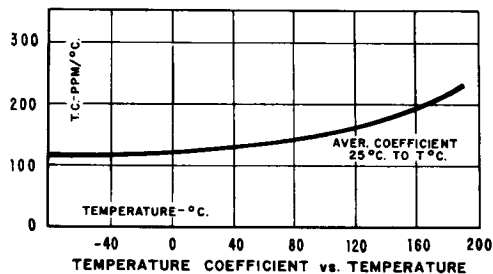


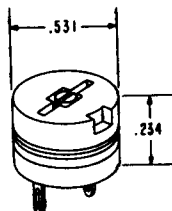
FIGURE 2.

125

C701

**CAPACITOR, VARIABLE, CERAMIC DIELECTRIC, ERIE
STYLE No. 557-051**

Application: Designed for use in compact electronic equipment where light weight and space saving are necessary requirements. Also adaptable for multiple assembly where several variable capacitors are required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Erie Resistor Corp., Erie, Pa.

Electrical Characteristics

Erie Catalog Number	Capacity Min	PF MAX	Temperature Coefficient
557-051U2PO 29R	5.0	30.0	N750
557-051COPO 10R	1.5	7.0	NPO
557-051COPO 17R	3.0	12.0	NPO
557-051COPO 39R	5.0	25.0	NPO
557-051U2PO 34R	8.0	50.0	N750

Working Voltage: 350 volts, dc
Initial Q Factor at 1 MC: 500 min, NPO, N330, N750; 400 min, N1500
Initial Leakage Resistance: 10,000 megohms, min

Physical Characteristics

Materials: Phenolic, Grade PBE-P or better per latest version of MIL-P-3115A, rubber, silicone
Rotor Shaft: Top of rotor shaft does not extend beyond top plane of ceramic rotor
Rotor Adjustment: .032" wide screwdriver slot
Terminal Lead Length: .359"
Rotor: .500" dia, ceramic, lapped and silvered on the under side
Stator: Silvered ceramic dielectric disc, lapped bearing surface
Base Material: Phenolic

Environmental Conditions

Moisture Resistance: Per latest revision of MIL-C-81
Oper Temp Range: -55°C to +85°C

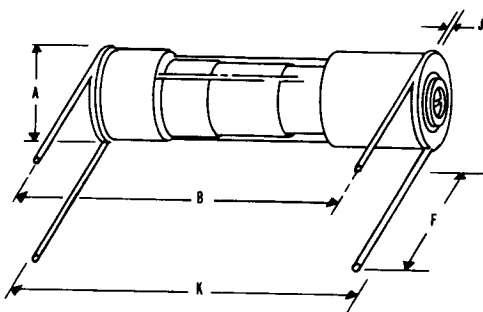
Test Data

Flash Test: 875 volts, dc for 1-5 secs (50 ma charging current)
Life: 700 volts, dc at 85°C for 250 hr at twice rated voltage
Torque: Min of 2 and max of 8 in. oz.

Remarks: The 557 Erie style trimmer is designed for use in printed board assemblies. Qualification specification Erie Spec. No. 500.

**C801
CAPACITOR, PISTON VARIABLE TRIMMER, SERIES
MCD**

Application: Designed for use in airborne, seaborne and missile electronic equipment that use printed circuits.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: JFD Electronics Corp., Components Div., Brooklyn, New York

Electrical Characteristics

Model	Capacitance Range pf Measured at 1MC Per JFD #5177		DC working volts	Q Factor Measured at 20MC Per JFD #5178	Temp Coef. of Cap measured at 1MC PPM/°C -55° to 125°C
	Min	Max			
Mod 661	1.0	14.0	1000	500	± 50
MOD 663	1.0	28.0	1000	350	± 50
MOD 664	1.0	42.0	1000	250	± 50

Rating: No derating from -55°C to 125°C

Inductance Factor: Low inductance and low loss for higher freq use

Mechanical Characteristics

Turning Torque: 1 to 10 in. oz.

Adjustment Screw: Remains fixed thru the adjustment range, permits use of a tuning knob for special panel mount applications

Tuning: Linear tuning with no reversals for accurate alignment

Mech Life: 500 cy

Physical Characteristics

Weight: MCD 661, 5.2 grams; MCD 663, 5.8 grams; MCD 664, 6.4 grams

DIMENSIONS

A	B	F	K	J	
5/16"	61/64"	45/64"	1"	1/32"	MCD 661
5/16	1-3/16	45/64	1-15/64	1/32	MCD 663
5/16	1-23/64	45/64	1-13/32	1/32	MCD 664

Capacity to Unit Volume: High ratio

Plating: New JFD plating allows RF conductivity and noise free tuning, protects all metal parts from corrosion and also improves life of adjustment.

Adjustment Screw: Does not protrude out of the unit.

Mounting Holes: Four No. 64 (.036") dia; four leads for printed board mounting.

Environmental Conditions

Oper Temp Range: -55°C to +125°C

Humidity: Unit sealed, locking out humidity and other atmospheric effects, as well as preventing arcing or corona at high altitudes.

Test Data

Dielectric Withstanding Voltage: 2000 volts, dc measured for 1 minute at 50% RH at max rated cap

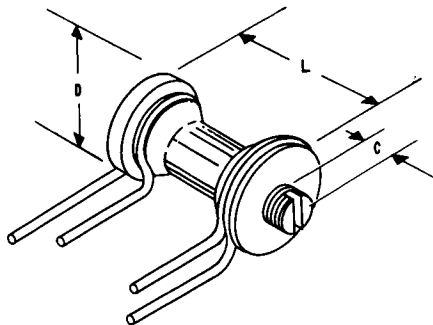
Insulation Resistance: 10⁹ megohms, measured after one minute at 500 volts, dc and 50% RH

Remarks: The sliding travel mechanism is simple, accurate and performs well.

C802

**CAPACITOR, PISTON VARIABLE TRIMMER PRINTED
CIRCUIT, UNITORK DRIVE SERIES MG 805, 809 AND
812**

Application: Designed for use in navigational equipment, fixed frequency receivers and transmitters, missile remote control and microwave equipment whose circuits require accurate tuning and compact assembly of components.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Roanwell Corporation, New York 14, New York

Electrical Characteristics

Model Number	Cap Range		Working Volts DC	Q at 1 MC	Temp Coef PPM/°C	Insulation Resistance
	in pf Min	Max				
MG805	.8	4.5	1000	500	±50	10 ⁶ Megohm
MG809	.8	8.5	1000	500	±50	10 ⁶ Megohm
MG812	.8	12.0	1000	500	+50	10 ⁶ Megohm

Manufacturer states this capacitor will meet applicable requirements of MIL-C-14409A

Mechanical Characteristics

Torque: 1 to 5 in. oz.

Drive: Unitork type offers close torque tolerances and also precludes gold flaking on the thread. Backlash eliminated radially and transversally

Construction: Solid brass, gold plated, electrode bands permits the soldering of components with no effect on capacitance. Unit is more rugged since solid brassbands act as main support for the dielectric

Physical Characteristics

Lead Length: 1", #22 AWG Dumet wire

Adjustment Screw: #3-56 thd, Invar

Type of Solder Used: 1.4 Silver, 62.5 tin, 36.1 lead

Metal Parts Finish: 24K, gold plated

Electrodes: Brass

Dielectric: Glass

Drive Bushing: Invar

Piston: Invar

Model Number	SIZE DIMENSIONS		
	D	L	C
MG805	.281"	5/16"	1/8"
MG809	.281"	19/32"	1/4"
MG812	.281"	27/32"	7/16"

Environmental Conditions

Oper Temp Range: -55° to +125°C

Test Data

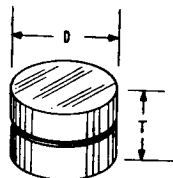
Dielectric Withstanding Voltage: 1250 volts, dc in accordance with MIL-C-14409A

Insulation Resistance: Measured at 1 MC after 1 minute at 500 volts, dc and 50% R.H., 10⁶ megohms

Remarks: These capacitors have special solid metal electrode bands which are preplated so that components can be soldered directly to them. This process allows a compact circuit to be formed in electronic equipment with the capacitor serving a dual function: a mounting surface for other components and serves as the variable capacitor of the circuit.

C901
CAPACITOR, PELLET CERAMIC DIELECTRIC TYPE
6928-CP

Application: Designed for use in modular circuitry where a high capacitance in a small volume is required.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: P.R. Mallory and Co. Inc., Indianapolis 6,
 Indiana

Electrical Characteristics

Cap Range: 2.2 to 820 pf - size dimension: D-.100",
 Thk.-.063"; 1000 to 4700 pf - size dimensions: D-.250",
 Thk.-.063"

Tolerance: 10%

Working Voltage: 50 volts, dc

Insulation Resistance: 7,500 megohms, min

Power Factor (at 1 KC): 3.0%, max

Physical Characteristics

Dielectric Material: Ceramic, high dielectric constant

Circuit Connections: Via conductive epoxy cement or soldering; (weldable capacitor pellets are available on special order.)

Terminals: Faces of ceramic dielectric has silver coating, sandwiched between two solder coated discs whose outer side is the terminal. This leadless feature compliments its use in RF applications where lead inductance is of critical nature.

Mounting: In holes which are drilled through a glass-epoxy or ceramic substrate

Environmental Conditions

Percent Change Cap v. Temp: (-65°C thru 85°C: -56% to +22% cap change (for cap values less than 560 pf); approx ±50% cap change (for cap values greater than 560 pf)

Oper Temp Range: -65°C to +85°C

Reference MIL-C-11015B, Char AW (Style CK61)

Test Data

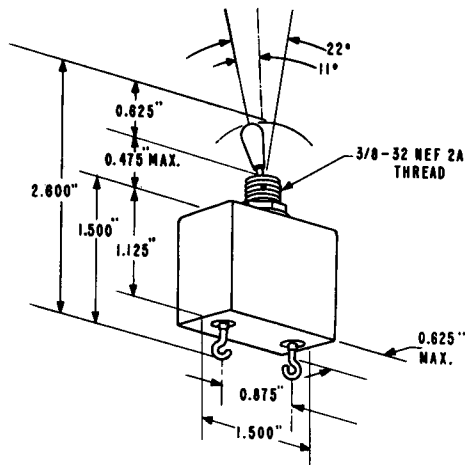
Moisture Resistance: Per MIL-STD-202B, Method 106.

Internal resistance: 3,000 megohms, min; cap within tol
 Dielectric Withstanding Voltage: Working volts, no break-down at 125 volts, dc

Effect of Soldering: No permanent degradation

CB101
CIRCUIT BREAKER, MAGNETIC-HYDRAULIC, TIME
DELAY SUBMINIATURE MODEL SM3

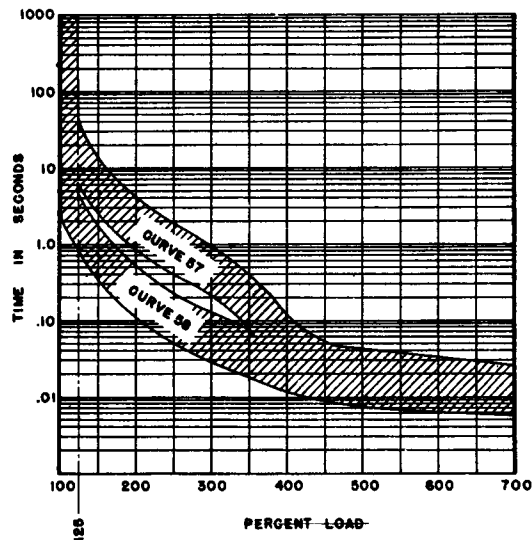
Application: Designed for use in military and industrial electronic equipment that requires a light weight, subminiature size circuit breaker that will operate under severe environmental conditions.



Note: For each of the three currents (60 cy, 400 cy and dc) there are two times delay curves (See illustration of curves)

Curve No. 57 (Slow response): Protects circuitry which has parts that normally draw large inrush currents and may be subjected to more prolonged overloads without damage
 Curve 58 (Fast response): Allows only overloads of short duration to pass. For applications where starting inrushes or transient overloads are neither heavy nor prolonged and equipment must have relatively fast protection
 Tripping Percent: CB shall hold 100% of rated load
 Trip between 101% and 125% of rated load and above, in accordance with time-delay curve specified

60-CYCLE CURVES



Quality Assurance: Manufacturer's claims. Preferred part per MIL-STD-242E.

Mfr: Heinemann Electric Company, Trenton 2, New Jersey

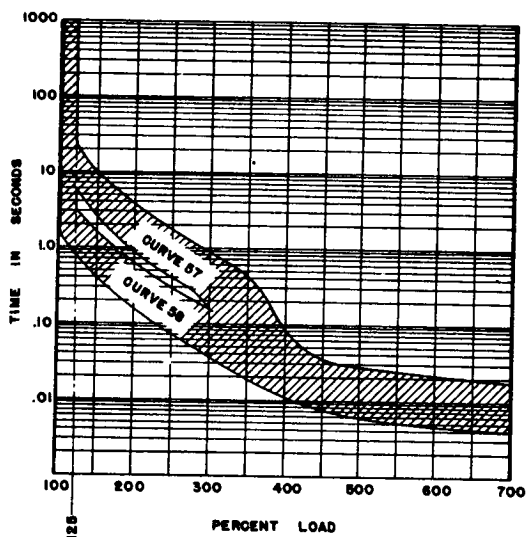
Electrical Characteristics

Ampere Rating	DC Ohms	60 Cycle, AC Impedance	400 Cycle, AC Impedance	Approx. Wattage Loss (Based on DC Resistance)
0.05	442	448	504	1.1
0.25	15.9	16.3	18.7	.99
1.0	0.98	1.0	1.15	.98
2.0	0.25	0.256	0.30	1.0
3.0	0.11	0.114	0.113	.99
5.0	0.0417	0.042	0.048	1.04
10.0	0.0127	0.013	0.0136	1.27
15.0	0.0062	0.0064	0.007	1.39

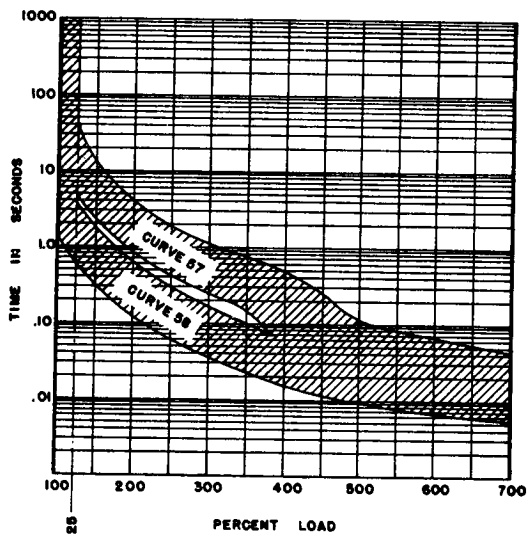
Also comes in 20 amp rating
 Std Max Voltage Ratings: Breakers may be used at any voltage up to and including 230 volts, 60 and 440 cyc, ac; 50 volts dc (all breakers are marked with std max voltage rating unless otherwise specified)
 Interrupting Capacity: 500 amp at 120 volts, 60 or 400 cy, ac; 750 amp at 32 volts, dc

Note: All time delay curves shown are based on the fact that circuit breakers are not pre-loaded. Curves are plotted at an ambient temperature of 77° F. (25°C).

400 - CYCLE CURVES



D.C. — CURVES

**Physical Characteristics**

Weight: 2.1 oz.

Contacts: Silver alloy, self cleaning by wiping action

Sealing: Hermetically sealed

and glass terminal seals

Sealing Materials: Special designed silicone rubber disc;

Resetting: Operates similar to a light switch, it is actuated to OFF position when performing its designed function, to reset, turn handle to ON position

Mounting: By drilling a single panel hole to accommodate the 3/8"-32 NEF thd bushing, held by ring nut

Terminals: Hook type, tinned for easy soldering

Materials: Brass, (lightweight) case, gland bushing and handle, stainless steel

Environmental Conditions

Altitude: Within limits of hermetic sealing

Temp Range: -55°C to + 100°C

Explosion Proof: Per strength of hermetic sealing

Sand and Dust: Per effectiveness of sealing

Fungus: Metal case, hermetic seal safeguards against

Exposure to Salt-Sea Atmosphere: Per QQ-M-151 for 48 hours

Test Data

Temp: High temp, 100°C tested for 2 hrs, Low temp, -55°C tested for 15 hrs

Humidity: Tested per Signal Corps Drawing SC-D-16286, 10 cy (10 days). Insulation resistance no less than 1 megohm during 10 th cy

Vibration: 10 to 55 cps. Amplitude 0.03", total excursion 0.06", traverse time 1 minute. Duration 6 hrs (2 hrs each of three directions) carrying rated current

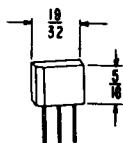
Shock: Per JAN-S-44 machine, 30 impacts at 50 g's (5 each direction, each of three mutually perpendicular planes) carrying rated current 30 minutes prior to and during test

Endurance: 10,000 ON-OFF operations at rated current and voltage

Remarks: Operation of the SM3 circuit breaker is free from false tripping problems due to heat generated within the breaker or from high ambient temperatures. The current rating and trip points are determined by the number of wire turns used in the breaker coil. These current values are unaffected by heat or cold.

**CR101
RECTIFIER, DOUBLE DIODE, SELENIUM, "VAC-U-SEL"**

Application: Designed for use as a horizontal phase detector diode (for printed circuits)



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: General Electric Rectifier Dept., Lynchburg, Va.

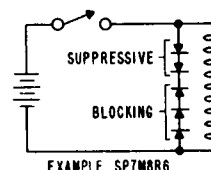
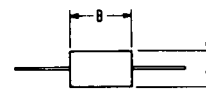
Electrical Characteristics

Max Peak Forward Current: 0.5 ma at 2.0 volts, dc.
Max Reverse Current at - 20 Volts, DC: 5.0 microampere.
Max Capacitance Unbalanced: Internal capacitance per section shall not be greater than 50 μf when a 50-millivolt peak signal is applied to the unit. While biased with 10 volts, dc, maximum unbalance between sections is 5 μf .

Shock: High impact per MIL-S-901.
High-Impact: See shock Specifications.
Torque Test: At a distance of 1/8" from housing, leads withstand 2 in-oz torque.
Pull Test (on leads): See Torque Test.

**CR102
RECTIFIER, SELENIUM (FOR ARC SUPPRESSION)**

Application: Reverse-voltage suppression efficiently eliminates arcing, prevents r-f interference, and protects circuit components against overload.



AC ARC SUPPRESSOR RATINGS

COIL VOLTAGE		MAX COIL CURRENT (MA)	DIMENSIONS		PHEWOLIC CLOSURE	HERMETIC SEAL	DIMENSIONS	
MAX	MIN		A	B			A	B
26	15	100	3/8"	1"	SPTM2R1	SP3M2R1	7/16"	7/8"
26	15	300	37/64"	1"	SPTP2R1	SP3P2R1	19/32"	7/8"
52	27	200	3/8"	1"	SPTM4R2	SP3M4R2	7/16"	7/8"
52	27	600	37/64"	1"	SPTP4R2	SP3P4R2	19/32"	7/8"
78	53	200	3/8"	1"	SPTM6R3	SP3P4R2	7/16"	7/8"
78	53	600	37/64"	1"	SPTP6R3	SP3P6R3	19/32"	7/8"
104	79	200	3/8"	1"	SPTM8R4	SP3M8R4	7/16"	7/8"
104	79	600	37/64"	1"	SPTP8R4	SP3P8R4	19/32"	7/8"
130	105	200	3/8"	1"	SPTM10R5	SP3M10R5	7/16"	7/8"
130	105	600	37/64"	1"	SPTP10R5	SP3P10R5	19/32"	7/8"

Environmental Conditions

Max Oper Temp: 85°C.
Watertightness: Meets all requirements (electrical).
Moisture: Meets all requirements after being subjected to 95% relative humidity at 95°F for 200 hours.
Humidity: Meets all requirements after being subjected to 95% relative humidity at 95°F for 200 hours.
Corrosion: Per MIL-R-18281.
Salt Spray: Per MIL-R-18281.

Test Data

Oper Temp Range: 85°C (max).
Vibration: MIL-STD-167 (Ships).

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Bradley Semiconductor Corp., New Haven, Conn.

Physical Characteristics

Size: Refer to rating chart.
Weight: Upon request.
Case: Refer to illustration.
Sealing: Hermetically sealed.
Shape: See illustration.
Case Polarity: D-C arc suppressors are color-coded with a red dot to indicate the end that connects to the positive side of the coil.

DC ARC SUPPRESSOR RATINGS

COIL VOLTAGE		MAX COIL CURRENT (MA)	DIMENSIONS		PHEENOLIC CLOSURE	HERMETIC SEAL	DIMENSIONS	
MAX	MIN		A	B			A	B
21	15	100	3/8"	1"	SP7M2R1	SP3M2R1	7/16"	7/8"
21	15	300	37/64"	1"	SP7P2R1	SP3P2R1	19/32"	7/8"
42	22	200	3/8"	1"	SP7M3R2	SP3M3R2	7/16"	7/8"
42	22	800	37/64"	1"	SP7P3R2	SP3P3R2	19/32"	7/8"
63	43	250	3/8"	1"	SP7M5R3	SP3M5R3	7/16"	7/8"
63	43	800	37/64"	1"	SP7P5R3	SP3P5R3	19/32"	7/8"
84	64	250	3/8"	1"	SP7M6R4	SP3M6R4	7/16"	7/8"
84	64	800	37/64"	1"	SP7P6R4	SP3P6R4	19/32"	7/8"
105	85	250	3/8"	1"	SP7M7R5	SP3M7R5	7/16"	7/8"
105	85	750	37/64"	1"	SP7P7R5	SP3P7R5	19/32"	7/8"
126	106	250	3/8"	1"	SP7M8R6	SP3M8R6	7/16"	7/8"
126	106	750	37/64"	1"	SP7P8R6	SP3P8R6	19/32"	7/8"
147	127	250	3/8"	1"	SP7M9R7	SP3M9R7	7/16"	7/8"
147	127	750	37/64"	1"	SP7P9R7	SP3P9R7	19/32"	7/8"

Physical Characteristics

Weight: Upon request.
 Encapsulation: Sealed unit.
 Leads: Tinned copper wire (0.032).
 Lead Length: See illustration.

Environmental Conditions

Max Oper Temp: 85°C.

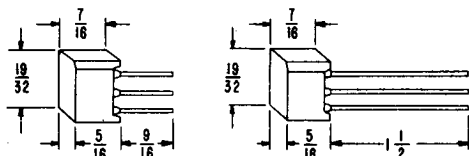
Test Data

Oper Temp Range: Electrical ratings per section in a-c and d-c circuits at 55°C ambient temperature.
 High Impact: Rugged.
 Ability to Withstand Overload: Resists temporary overload.

Remarks: These diodes are mechanically rugged, easily applied to circuit, compact, and low in cost.

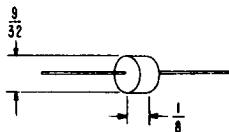
**CR103
 RECTIFIER, SELENIUM DIODE,
 TYPES K1615 AND K1616**

Application: Horizontal phase detectors, oscilloscopes, electronic instruments, and detectors.



**CR104
 RECTIFIER, SINGLE DIODE, TYPES
 1215, 1863, 1864, AND 1865**

Application: Detectors, discriminators, a-v-c circuits d-c blocking circuits, limiters, and a-f-c circuits.



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: T. T.&T. Components Division of International Telephone and Telegraph Corp., Clifton, New Jersey.

Electrical Characteristics

DIODE TYPES	1215	1863	1864	1865
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A-C Application:

Max D-C Forward Current:	0.25 ma	1.0 ma	3.0 ma	5.0 ma
Max D-C Peak Forward Current:	2.5 ma	10.0 ma	30.0 ma	50.0 ma
Max R-M-S Input Voltage, Resis. Ld:	40.0v	40.0v	40.0v	40.0v
Max Peak Inverse Voltage:	56.0v	56.0v	56.0v	56.0v
Max Shunt Cap at 200 KC:	22 μμf	65 μμf	350 μμf	550 μμf

Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: I. T.&T. Components Division of International Telephone and Telegraph Corp., Clifton, New Jersey.

Electrical Characteristics

Max Continuous D-C Voltage: 20 volts.
 Max R-M-S Input Voltage, Resistive Load: 40 volts.
 Max Peak Inverse Voltage, Cap. Load: 68 volts.
 Max Peak Inverse Voltage, Resistive Load: 56 volts.
 Max D-C Output Current: 1 ma.
 Max Pure D-C Current: 1.5 ma.
 Max Reverse Current at 20 Volts, DC: 5 μa.
 Temporary Overload Resistance: Will resist temporary overloads.
 Max Capacity at 1000 cps: 60 μμf.
 Max Capacitance Unbalanced: 10 μμf.

D-C Application:

Max Pure D-C				
Forward Current:	0.37 ma	1.5 ma	4.5 ma	7.5 ma
Max Continuous Inverse Voltage:	30v	30v	30v	30v
Max Reverse Current at 40 volts:	6 μ a	20 μ a	100 μ a	250 μ a

Physical Characteristics

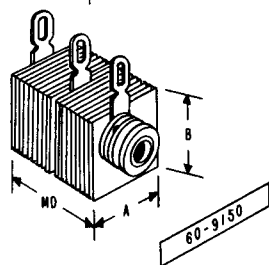
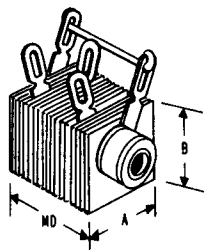
Weight: 0.015 oz (0.42 g) approx.
 Leads: No. 25 AWG tinned copper.
 Lead Length: 1-3/16" (each lead). See illustration.

Test Data

Operating Temperature: 55°C.

**CR105
RECTIFIER, SELENIUM, BRIDGE TYPE**

Application: For use with relays magnetic amplifiers, and other magnetic devices.



TYPE	A	B	MD
D-3575F	21/32	21/32	1-1/4
D-3575M	21/32	21/32	1-1/4
61-2020	1	1	1-1/4
60-9150	21/32	21/32	1-1/4
61-1345	21/32	21/32	1-3/4
61-4037	21/32	21/32	1-7/8

175-volt r-m-s supply.
 Max Continuous D-C Voltage: Types D-3575F and D-3575M with a 3- μ f capacitor will give 120 volts, dc. Refer to rating chart for max output.
 D-C Application: D-3575F, D-3575M, 61-2020, 61-1345, 61-4037 are all single-phase, bridge-type rectifiers. 60-9150 is a voltage-doubler unit.
 Wattage Rating: D-3575M and D-3575F, 9 watts
 61-2020, 16 watts.
 61-1345, 14 watts.
 61-4037, 18 watts.
 60-9150 in a bridge circuit, 18 watts.

TYPE	INPUT VOLTS		OUTPUT			DIMENSIONS			CLEAR HOLE DIA
	RMS MAX	PIV	VOLTS, DC	RES LOAD (MA)	CAP LOAD (MA)	A	B	MD	
D-3575F	130	200	90 120	100	75	21/32"	21/32"	1 1/4"	0.164
D-3575M	130	200	90 120	100	75	21/32"	21/32"	1 1/4"	0.164
61-2020	130	200	90 120	175	130	1"	1"	1 1/4"	0.164
*60-9150	260	400	180 240	100	75	21/32"	21/32"	1 1/4"	0.164
61-1345	260	400	180 240	70	55	21/32"	21/32"	1 3/4"	0.164
61-4037	260	400	180 240	100	75	21/32"	21/32"	1 7/8"	0.164

* 60-9150 IS A DOUBLER STACK. RATINGS ARE FOR TWO STACKS CONNECTED AS A FULL-WAVE BRIDGE. HALF-WAVE AND DOUBLER RATINGS ARE ONE HALF OF THOSE SHOWN IN RATING TABLE

Physical Characteristics

Case Polarity: See illustration for particular model.
 Terminals: See illustration.
 Lead Length: 13/32" approx.
 Clearing Hole Diameter: 0.164" in all cases.

Test Data

P.I.V. Rating: See rating chart for all rectifier types.

**CR106
RECTIFIER, SELENIUM AC AND DC, CONTACT PROTECTOR**

Application: Elimination of arcing and erosion relay, switch and other component contacts in most circuits.

Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: International Rectifier Corp., El Segundo, California.

Electrical Characteristics

Output Voltage: Refer to rating chart. Type 60-9150 used as a voltage doubler will deliver 350 volts, dc, from a

29

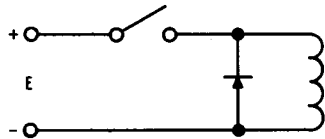
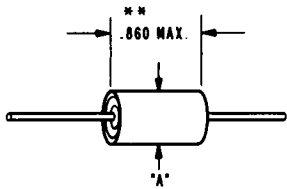


FIG. 1

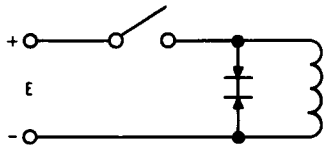


FIG. 2

FIG. 1-FOR DC SUPPLY WHEN DECAY TIME IS UNIMPORTANT

FIG. 2-FOR AC (AND FOR DC WHEN DECAY TIME IS IMPORTANT)

S6Y6H	156	.20	S6V2H	111-132	.25
			S7V2H	133-154	.25
S1Y1H	26	.40	S1Y1H	15-22	.60
S2Y2H	52	.40	S2Y1H	23-44	.60
S3Y3H	78	.40	S3Y2H	45-66	.60
S4Y4H	104	.40	S4Y2H	67-88	.60
S5Y5H	130	.40	S5Y2H	89-110	.60
S6Y6H	156	.40	S6Y2H	111-132	.60
			S7Y2H	133-154	.60
S1Z1H	26	.60	S1Z1H	15-22	.90
S2Z2H	52	.60	S2Z1H	23-44	.90
S3Z3H	78	.60	S3Z2H	45-66	.90
S4Z4H	104	.60	S4Z2H	67-88	.90
S5Z5H	130	.60	S5Z2H	89-110	.90
S6Z6H	156	.60	S6Z2H	111-132	.90
			S7Z2H	133-154	.90
S1X1H	26	.90	S1X1H	15-22	1.4
S2X2H	52	.90	S2X1H	23-44	1.4
S3X3H	78	.90	S3X2H	45-66	1.4
S4X4H	104	.90	S4X2H	67-88	1.4
S5X5H	130	.90	S5X2H	89-110	1.4
S6X6H	156	.90	S6X2H	111-132	1.4
			S7X2H	133-154	1.4
S1W1H	26	1.2	S1W1H	15-22	2.0
S2W2H	52	1.2	S2W1H	23-44	2.0
S3W3H	78	1.2	S3W2H	45-66	2.0
S4W4H	104	1.2	S4W2H	67-88	2.0
S5W5H	130	1.2	S5W2H	89-110	2.0
S6W6H	156	1.2	S6W2H	111-132	2.0
			S7W2H	133-154	2.0

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: International Rectifier Corp., El Segundo, Calif.

Electrical Characteristics

A.C. Types			D.C. Types		
IRC Code No.	Max. Working Volts	Max. Coil Current* (amp)	IRC Code No.	Working Volts Min-Max	Max. Coil Current* (amp)
S1V1H	26	.20	S1V1H	15-22	.25
S2V2H	52	.20	S2V1H	23-44	.25
S3V3H	78	.20	S3V2H	45-66	.25
S4V4H	104	.20	S4V2H	67-88	.25
S5V5H	130	.20	S5V2H	89-110	.25

*Current ratings given are for intermittent operation with a max. of 30 to 40 operations per sec.

Physical Characteristics

"A" Dim (AC): .440" for .20 amp; .535" for .40 amp; .700" for .60 amp; 1.090" for .90 amp; 1.420" for 1.2 amp.
 ** (See illustration): 1.190" for IRC Code No. S6V6H, S6Y6H and S6Z6H; 1.192" for IRC Code No. S6X6H and S6W6H.
 "A" Dim (DC): .440" for .25 amp; .535" for .60 amp; .700" for .90 amp; 1.090" for 1.4 amp; 1.420" for 2.0 amp.
 Construction: Selenium cells in a back-to-back configuration and hermetically sealed within a cartridge.
 Lead Length: 2-1/2" ± 1/4", typical.

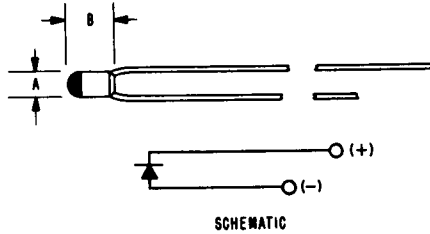
Test Data

Oper Temp: The above ratings are based upon maximum ambient temperature of 35°C.

Remarks: These contact protectors are available in two additional physical configurations; encapsulated diode types which occupy 0.01 cu in. of space, and fibre tube cartridges which are slightly smaller than the hermetically sealed cartridges described above.

**CR107
RECTIFIER, SELENIUM DIODE, SUBMINIATURE, POWER
RECTIFIER**

Application: Ideally suited for such applications as bias supplies, sensitive relays, digital and analog computers, and airborne electronic equipments.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: International Rectifier Corp., El Segundo, Calif.

Electrical Characteristics (at 25°C)

JETEC Type	Input AC (rms) Res. Ld.	Rect. Cap. Ld.	DC Out-put*	Surge, ma. (1 sec.)	PRV Volts	Freq. (kc)
1N125	33	20	250 μ a	5	48	200
1N1626	66	40	250 μ a	5	96	200
1N1625A	33	20	500 μ a	10	48	200
1N1626A	66	40	500 μ a	10	96	200
1N1627	33	20	3.75 ma	80	48	100
1N1628	66	40	3.75 ma	80	96	100
1N1629	99	60	3.75 ma	80	144	100
1N1630	132	80	3.75 ma	80	192	100
1N1631	165	100	3.75 ma	80	240	100
1N1632	198	120	3.75 ma	80	288	100
1N1633	231	140	3.75 ma	80	336	100
1N1634	264	160	3.75 ma	80	384	100
1N1635	33	20	12.5 ma	250	48	25
1N1636	66	40	12.5 ma	250	96	25
1N1637	99	60	12.5 ma	250	144	25
1N1638	132	80	12.5 ma	250	192	25
1N1639	165	100	12.5 ma	250	240	25
1N1640	33	20	28 ma	550	48	10
1N1641	66	40	28 ma	550	96	10
1N1642	99	60	28 ma	550	144	10

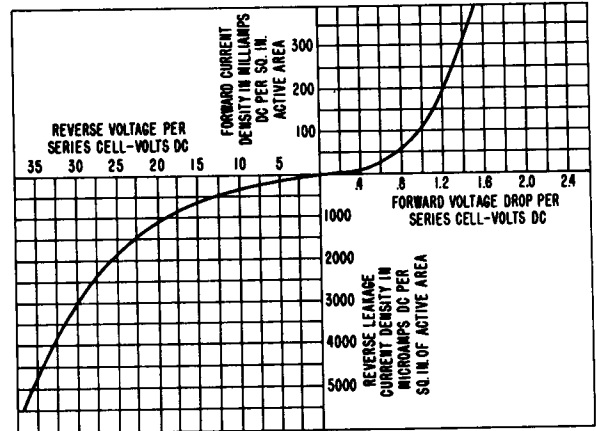
*For capacitive load use 80% of listed DC output current values.

Forward Voltage: 1 to 8 volts.
Forward Current (min): 0.1 to 11.0 ma
Reverse Voltage: 26 volts, min; 208 volts, max.

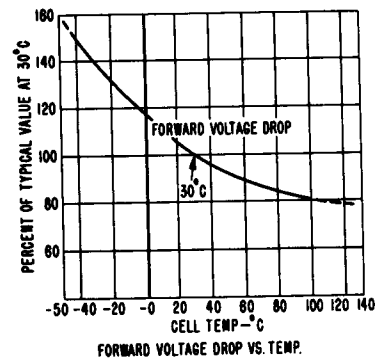
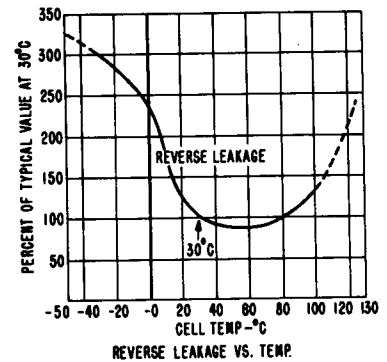
Reverse Current (max): 15 to 240 μ a
Reverse Resistance: Up to 30 megohms at -30 volts.

APPROX. ACTIVE CELL AREAS

CELL TYPE	AREA (SQ. IN.)
1N1625-1N1626A	.003
1N1627-1N1634	.0123
1N1635-1N1639	.049
1N1640-1N1642	.110



STATIC DC CHARACTERISTICS (AT 30°C CELL TEMP.)



Physical Characteristics

Encapsulation: Potted in thermosetting compound.

Leads: Tinned copper wire. 1N1625 thru 1N1634, #22 AWG;
1N1635 thru 1N1642, #22 AWG.

Lead Length (min): One 2" and one 3".

Lead Polarity: Red dot indicates positive lead.

Color Coding: See chart below

Dimensions: See chart below.

JTEC Type	Dimensions		Color Code	
	A (in.)	B (in.)	Body	Tip
1N1625	.165	.225	Yellow	Brown
1N1626	.165	.225	Yellow	Red
1N1625A	.165	.225	Green	Brown
1N1626A	.165	.225	Green	Red
1N1627	.190	.265	Gray	Brown
1N1628	.190	.265	Gray	Red
1N1629	.190	.265	Gray	Orange
1N1630	.265	.265	Gray	Yellow
1N1631	.285	.265	Gray	Green
1N1632	.345	.265	Gray	Blue
1N1633	.345	.265	Gray	Violet
1N1634	.345	.265	Gray	Gray
1N1635, 1N1636	.320	.395	Gray	*
1N1637	.360	.425	Gray	*
1N1638, 1N1639	.395	.425	Gray	*
1N1640, 1N1641, 1N1642	.465	.525	Gray	*

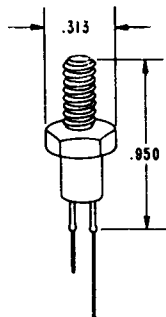
*IRC Pt. No. stamped on body.

Test Data

Oper Temp Range: -50°C to +100°C.

CR201
RECTIFIER, SILICON "THYRODE" CONTROLLED
RECTIFIER, TYPES X1RC2 THROUGH X1RC20

Application: The very rapid firing and recovery times, high temperature operation, long life, and the absence of a power-consuming filament make the controlled rectifier applicable to a wide range of control and switching uses. These uses include motor and generator control, static switching, d-c power regulation, constant current supplies, dynamic braking, and frequency conversion.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: International Rectifier, El Segundo, California

Electrical Characteristics

Repetitive Peak Inverse Voltage: X1RC2, 20V; X1RC3, 30V; X1RC5, 50V; X1RC7, 70V; X1RC10, 100V; X1RC15, 150V; X1RC20, 200V.

R-M-S Input Voltage: X1RC2, 14V; X1RC3, 21V; X1RC5, 35V; X1RC7, 50V; X1RC10, 70V; X1RC15, 105V; X1RC20, 140V

Average Forward Current: Types X1RC2 through X1RC20, 1 amp, dc

Peak Surge Current: Types X1RC2 through X1RC20, 15 amp (1 cycle at 60 cps)

Min Forward Breakover Voltage: X1RC2, 20V; X1RC3, 30V; X1RC5, 50V; X1RC7, 70V; X1RC10, 100V; X1RC15, 150V; X1RC20, 200V

Max Forward and Reverse Leakage: X1RC2 through X1RC15, peak 18 ma, average 3 ma; X1RC20, peak 15 ma, average 2.5 ma

Gate Power: X1RC2 through X1RC20, peak 500 mw, average 50 mw

Gate Current: X1RC2 through X1RC20, peak 500 ma, max to fire 15 ma

Gate Voltage: X1RC2 through X1RC20, peak (forward) 10 volts, max to fire 3 volts

Forward Voltage Drop: X1RC2 through X1RC20, max volts at 1 ampere (full cycle average at 25° C), 1.25 volts.
 Max Internal Thermal Resistance: X1RC2 through X1RC20, max ° C/W 5 ohms

Physical Characteristics

Mounting: Rectifier mounted directly on 2 x 2 x 1/76" copper fin

Contact Area: Lubricated with silicone grease

Fin Spacing: 1" Min

Terminals: #28 AWG wire (TYP)

Stud: #6-32 NC-2A

Case: All units are hermetically sealed, employ all welded construction, and are ruggedized to meet military specifications.

Weight: Approx 1/10 oz

Mounting Torque (on Stud): 4.5 inch-pounds min, 5.5 inch-pounds max

Environmental Conditions

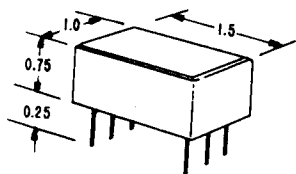
Oper Temp Range: -30° C to +100° C

Storage Temp Range: -30° C to +125° C

Remarks: The three-junction controlled rectifier will block positive anode-to-cathode voltage as does a thyatron. However, when a signal is applied to its third (gate) lead, the device rapidly switches to a conducting state and provides the low forward voltage drop of a typical medium-power silicon rectifier. Current flow may then be halted, if desired, by reversal or removal of the anode voltage.

DL 101
DELAY LINE, MICROPULSE, MINIATURE, TYPE
85005 THRU 85016 (CYLINDRICAL), TYPE 85017 THRU
85028 (RECTANGULAR)

Application: Requirements for a lumped-constant delay line of minimal size and weight



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: R.M. Parsons Co., Pasadena, Cal.

Electrical Characteristics

Delay time: 0.5, 1.0, 1.0 and 3.0 microseconds

Delay Time Tolerance: $\pm 3.0\%$

Impedance: 1000, 500, 300 ohms

Impedance Tolerance: $\pm 10.0\%$

Attenuation: 15.0% or 1.3 db (max)

Rise-Time to Delay-Time Ratio: 6.0%

Distortion: 5.0%

Leakage Resistance: 100 megohms at 500 volts, dc

Physical Characteristics

Weight: Not available

Case: Encapsulated

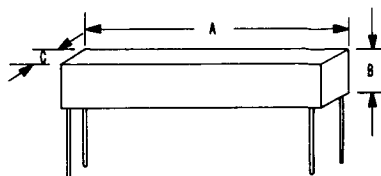
Header: Pin type standard, other types available

Environmental Conditions

Temp. (Delay Stability): 0.05% per degree C over a range of -40°C to $+105^{\circ}\text{C}$

Manufacturer claims shock, vibration, acceleration and humidity characteristics exceed military specifications

Remarks: Two standard configurations; cylindrical for standard tube socket mounting, and rectangular for use in printed circuitry are available



Dimensions

Case	A	B	C
P1	0.75	0.375	0.25
P2	1.25	0.375	0.25
P3	1.75	0.375	0.25
P4	2.25	0.375	0.25
P5	2.75	0.375	0.25
R1	0.75	0.375	0.375
R2	1.25	0.375	0.375
R3	1.75	0.375	0.375
R4	2.25	0.375	0.375
R5	2.75	0.375	0.375
R6	3.25	0.375	0.375
R7	3.75	0.375	0.375

Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Valor Electronics, Inc., Gardena, Calif.

Electrical Characteristics

Test Voltage: 500 volts, dc.

Working Voltage: 200 volts, dc.

Max. Pulse: 50 volts.

Output Overshoot: Less than 5%.

Output Ripple: Less than 3%.

Characteristic Impedance: 100 ohms, $\pm 5\%$.

DL102
DELAY LINE, SUBMINIATURE, LUMPED CONSTANT,
NANOSECOND

Application: Designed for use in printed circuits. Typical applications include calibration in altimeter and radar equipments, pulse train positioning, and advanced computer research and development with typical clock rates of 10 nanoseconds.

 DELAY LINE DATA

Part No.	Delay ±5%	Rise		Resist- ance Max	Attenua- tion Max
		Time Max			
125 MC CUT-OFF					
N2.5P1-1/1	2.5 ns	2 ns	0.5 ohms	1%	
N5P1-2/1	5 ns	3 ns	1 ohms	1%	
N10P1-3/1	10 ns	3 ns	1 ohms	1%	
N15P2-5/1	15 ns	3 ns	2 ohms	2%	
N20P2-5/1	20 ns	4 ns	2 ohms	2%	
N25P3-6/1	25 ns	4 ns	2 ohms	2%	
N30P3-6/1	30 ns	4.5 ns	3 ohms	3%	
N35P4-7/1	35 ns	4.5 ns	3 ohms	3%	
N40P4-8/1	40 ns	4.5 ns	3 ohms	3%	
N45P5-9/1	45 ns	5 ns	3 ohms	3%	
N50P5-10/1	50 ns	5 ns	4 ohms	4%	
N75R4-11/	75 ns	6 ns	4 ohms	4%	
N100R5-15/1	100 ns	6 ns	4 ohms	4%	
TN25P3-6/1	25T*	4 ns	2 ohms	2%	

 65 MC CUT-OFF

N5P1-1/1	5 ns	5 ns	1 ohms	1%
N10P1-2/1	10 ns	6 ns	2 ohms	2%
N20P1-3/1	20 ns	7 ns	3 ohms	3%
N30P2-3/1	30 ns	8 ns	4 ohms	4%
N40P2-5/1	40 ns	8 ns	5 ohms	5%
N50P3-5/1	50 ns	9 ns	5 ohms	5%
N60P3-6/1	60 ns	9 ns	7 ohms	7%
N70P4-7/1	70 ns	9 ns	8 ohms	8%
N80P4-8/1	80 ns	10 ns	8 ohms	8%
N90P5-9/1	90 ns	10 ns	9 ohms	9%
N100P5-10/1	100 ns	10 ns	10 ohms	8%
N100R3-10/1	100 ns	10 ns	10 ohms	8%
N125R4-11/1	125 ns	11 ns	12 ohms	9%
N150R4-13/1	150 ns	11 ns	15 ohms	12%
N200R5-14/1	200 ns	12 ns	20 ohms	15%
TN50P3-5/1	50T**	9 ns	6 ohms	6%

Physical Characteristics

Case: Epoxy moulded.

Lead Dia: .025"

Lead Length: 1" min.

Lead Material: Solerale or weldable nickel.

Densities (Typical): 70 sections/cu. in.

Environmental Conditions

Temp Range: -55°C to +125°C.

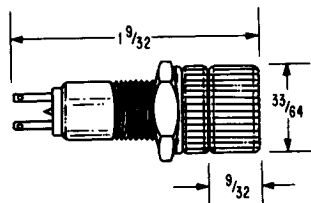
Test Data

Manufacturer claims these units will meet or exceed the requirements of MIL-STD-202 for moisture resistance, vibration, shock, humidity and life.

Remarks: Any of the delay lines listed above may be connected in series to give longer delays. The rise time of two similar units connected in series will be approximately 25% greater than the rise time of one of the units.

**DS101
INDICATOR LIGHT, NEON OR INCANDESCENT,
ULTRAMINATURE**

Application: For data-processing equipment, computers and automation applications.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Eldema Corp., Compton, Calif. Dialight Corp., Brooklyn, N. Y.

Electrical Characteristics

Lamp Type: Accomodates either a neon replaceable cartridge (Eldema Series CG—Dialco Series #38) or an incandescent replaceable cartridge (Eldema Series CF—Dialco #39). See DS107 and DS210.

Physical Characteristics

Case: Aluminum
Mounting Nut: Hex, 1/2" flats.
Internal Tooth Lockwasher: Cadmium plated steel.
Lens Retainer: Collar and knurled ring-black anodized aluminum.
Terminal Insulator: Per MIL-M-14F.
Terminals: Solder cup type, phosphor bronze, gold plated.
Mounting: By 3/8-32-NEF-2A bushing.
Mounting Hole: 3/8"

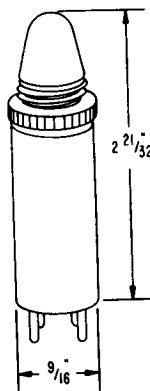
Environmental Conditions (With cartridge installed)

Oper Temp: -55°C to +65°C
Non-Oper Temp: -65°C to +85°C
Altitude (Oper): 10,000 ft.
Altitude (Non-Oper): 50,000 ft.
Salt Spray: MIL-STD-202, Meth. 101, 96 hrs.
Moisture Res: MIL-STD-202, Meth. 106, Cond. A.
Dielectric Strength: MIL-STD-202, Meth. 301, 1000 volts, rms, 60 sec.
Vibration (See Remarks): MIL-STD-202, Meth. 201 Cond. A.
Shock (See Remarks): MIL-STD-202, Meth. 202

Remarks: The shock and vibration specifications as shown, apply to holders with neon cartridges only.

**DS102
INDICATOR LIGHT, NEON BULB, LOW VOLTAGE,
SERIES LVN**

Applications: Designed for use in systems where high voltages are not desired or not available, as in battery operated equipment.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Transistor Electronics Corp., Minneapolis, Minn.

Electrical Characteristics

Lamp: Dark starting NE-2 type neon lamp.
Supply Voltage: 6, 12, 18 or 24 volts dc (±10% standard); others from 3 to 48 volts dc available.
Signal Voltages:

Control Signal (V)	Supply Volt. (6, 12, 18, 24 VDC) Polarity Required	LVN Model
Two term. model fires with appl. of supply voltage.	Either polarity	A
ON: -5 to +7 OFF: -3.5 to -10	Positive	B
ON: -3.5 to -10 OFF: -.5 to +7	Negative	C
ON: +3.5 to +10 OFF: +.5 to -7	Positive	D
ON: +.5 to -7 OFF: +3.5 to +10	Negative	E
ON: +2 to +10 OFF: -1 to -10	Positive	F
ON: -2 to -10 OFF: +1 to +10	Negative	G

Signal Input Impedance (nom.): 6 volts, 1.0K; 12 volts, 3.3K; 18 volts, 3.9K; 24 volts, 4.7K.

Indicator Life: 10,000 hr. min.

Pin Connections: Model A—Pin 1 positive and Pin 2 negative; Model B thru G—Pin 1 signal, Pin 2 supply, and Pin 3 common.

Current Consumption (ma):

Supply Voltage	Model A	Model B	Model C	Model D	Model E	Model F	Model G
6	30	32	30	30	32	30	30
12	9	9	11	11	9	9	9
18	8	8	11	11	8	7	7
24	6	6	10	10	6	5	5

Physical Characteristics

Mounting: Mounted from rear with single-knurled nut and lockwasher in a 3/8" hole on centers as close as 19/32".

Panel Thickness: 1/16" to 1/8" and 9/64" to 3/16".

Terminal Types: Taper pin receptacle, turret lugs, wire-wrap, and solder lug/taper tab.

Terminal Length: Taper pin receptacle—3/8"; turret lug—.200"; wire-wrap—11/16"; and solder lug/taper tab—.200".

Lens Shape: Flat top or spherical (shown).

Lens Color: Transparent red, amber, white and yellow; clear.

Materials: As follows—

Lens: Acetate butyrate plastic per L-P-349.

Body and Nut: 2011-T3 aluminum per QQ-A-365 with anodized finish per MIL-A-8625.

Lockwasher: Steel, cadmium plated per QQ-P-416.

Semiconductor: Complies with MIL-S-19500.

Resistors: Comply with MIL-R-11.

Solder: Complies with QQ-S-571.

Header: With taper pin receptacle, molded diallyl phthalate per MIL-M-14 type SDG. With wire-wrap or solder lug/taper tab, epoxy glass laminate per MIL-P-18177.

Terminals: Taper pin receptacle and turret lug, brass per QQ-B-626, Comp. 2; gold plate per MIL-C-45204, Type II, Class I. Wire-Wrap, hard drawn brass per ASTM-B-134 alloy No. 6; gold plated per MIL-G-45204, Type II, Class I. Solder lug/taper tab, brass per QQ-B-613, Comp. 2; cadmium plate per QQ-P-416.

Environmental Conditions

Temp. Range: Operating and storage, -40°C to +65°C at 95% humidity, max.

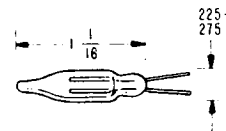
Remarks: Self-contained transistorized circuitry internally generates high voltage AC to fire both electrodes of its neon lamp.

Use TEC wrench, P/N 1418 for knurled nut when lights are mounted on 5/8" or larger centers.

DS103

INDICATOR LIGHT, GLOW LAMP, 5AG-A(NE-76)

Application: Designed for circuit component use in multivibrators, switching circuits, logic matrices and gating circuits.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: General Electric Co., Cleveland 12, Ohio

Electrical Characteristics

Breakdown Voltage: 68-76V

Initial D-C Maintaining Voltage at Design Current:

50 to 60 vdc at .4 milli-amp, dc

Breakdown Voltage Tolerance: ± 4 volts

Hours Oper at Design Current for Indicated Ave Voltage Change:

Voltage to stay within initial (or 100 hour) limits for indicated life: 1000 hr

Maintaining Volts: Change 5-V, hr 2000

Extinguishing Voltage: (In series with .25-megohms or more) of greater than 50-volts.

Physical Characteristics

Leads: 1" and 1-1/2", tinned

Bulb Diameter: .225-.275

Dark Effect: Is reduced by radioactive additive

Quality: Preaged and stabilized

Identification: Red anode dot

Bulb Type: Clear, T-2.

Electrodes: Parallel post (W-11)

Environmental Conditions

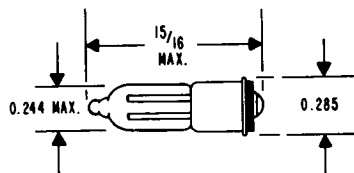
Temp Oper Range: -60°F to +165°F

Leakage Resistance: Exceeds 100-megohm at 80°F and 75% R.H.

DS104

INDICATOR LIGHT, NEON GLOW, TYPE NE-2J(C9A)

Application: Designed for service in electronics equipment where a rugged, high brightness glow lamp is required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: General Electric Company, Cleveland 12, Ohio

Electrical Characteristics

Circuit Voltage Rating: 105—125 volts ac; 150 volts, dc
Design Current: 2.6 milliamps
External Resistor: 22K, ohms (current limiting resistor)
Power Rating: 1/3 watt, nom.
Electrical Life: Average useful life 15,000 hr; min life 5000 hr. (Life on dc is approx 50% of these values)
Striking Voltage: 105 volts, ac; 150 volts, dc
Max Initial Breakdown Volts AC: 95 volts
Max Initial Breakdown Volts DC: 135 volts

Physical Characteristics

Bulb: T-2, approx 2/8" dia, formed tip
Base: Midget flange, single contact
Electrodes: Parallel, W11

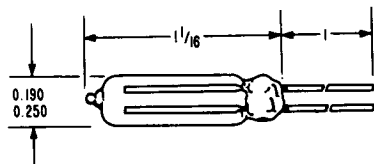
Environmental Conditions

Oper Temp: -60 F to 300°F (not to exceed 300°F)

Remarks: Since the current seldom exceeds 3 milliamperes, a resistor of 1/3 watt would suffice.

DS105 INDICATOR LIGHT, GLOW LAMP, TYPE 5AJ(NE-86)

Application: Designed for circuit component use in multivibrators, switching circuits, logic matrices and gating circuits.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: General Electric Miniature Lamp Dept.,
Nela Park, Cleveland 12, Ohio

Electrical Characteristics

Breakdown Voltage: 55-90 volts, dc
Initial D-C Maintaining Voltage at Design Current:
Avg 57 volts dc at 1.5 milliamp, dc
Hours Oper at Design Current for Indicated Average
Voltage Change:
Breakdown Volts: 5-volts, 2000 hr
Maintaining Volts: 5-volts, 2000 hr
Dark Effect: Reduced by radioactive additive

Physical Characteristics

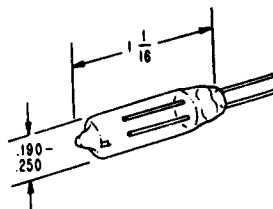
Leads: 1" long, tinned
Bulb: Formed tip
Bulb Diameter: Tubular, approx 1/8" (T-2)
Terminal Leads: Wire
Electrodes: Parallel post (W-11)

Environmental Conditions

Ambient Oper Temp: -60°F to +165°F

DS106 INDICATOR LIGHT, GLOW LAMP, HIGH CURRENT TYPE 5AH(NE-83)

Application: This glow lamp is designed to serve as a circuit component. Manufacturer claims item could be used for voltage regulation in the 1 to 10-milliampere current range.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: General Electric Co., Miniature Lamp Dept.,
Nela Park, Cleveland 12, Ohio

Electrical Characteristics

Initial D-C breakdown Voltage: 60-100 volts

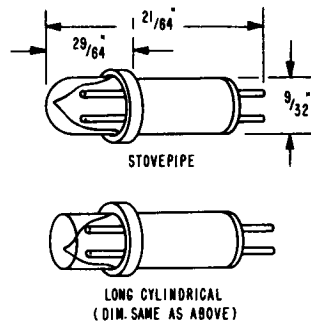
D-C Monitoring Voltage: Avg 61 volts at 10.0 ma
(average after 100 hr, burning at rated current.)
Design Current: 10.0-ma, dc
Hours Operation at Design Current for Indicated
Average Voltage Change, Breakdown Voltage:
5 volts, in 500 hr
Maintaining Voltage: 5 volts, in 500 hr
Dark Effect: Reduced by a mild radioactive additive.
(to reduce breakdown voltage in darkness)
Min. Design Current: 1.5 ma dc

Physical Characteristics

Leads: 1" long, tin plated to permit easier soldering
Bulb: Formed tip
Bulb Type: T-2
Electrodes: Parallel Post (W-11)

DS107 INDICATOR LIGHT, NEON GLOW, REPLACEABLE CARTRIDGE

Application: Designed as a replaceable neon lamp cartridge for DS101 lamp holder.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Dialight Corp., Brooklyn, N. Y.
Eldema Corp., Compton, Calif.

Electrical Characteristics

Wattage: 1/25 watt.
Starting Voltage: 65 volts, ac and 90 volts, dc.
Safe Lamp Current Value: 0.3 ma.
Bulb Type: NE-2E standard; NE-2H high brightness.
Ballast: 1/3 watt external resistance (see recommended resistance values below)
Recommended Resistor Values:

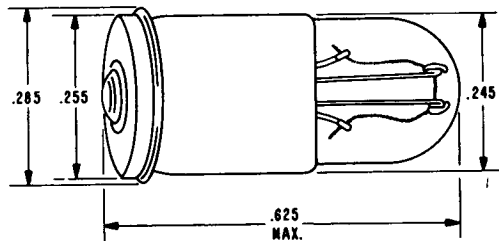
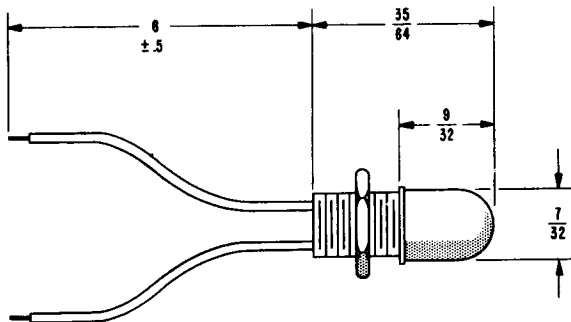
Neon Lamp	Volts	Bright Light	Life Hours	Medium Intensity	Life Hours
NE-2E	105-125 (AC or DC)	56,000 Ohms	5,000	100,000 Ohms	25,000
NE-2H	110-125 (AC only)	22,000 Ohms	5,000	33,000 Ohms	25,000

Physical Characteristics

Body Material: Aluminum, clear anodized finish. Black anodized finish optional.
Lens Material: Plastic
Lens Surface: Transparent
Lens Colors: Red, yellow, white, light yellow, and clear. Green or blue not recommended.
Cartridge Configurations: Stovepipe and Long Cylindrical. (See Illust.)
Terminals: Stainless steel pins mounted in nylon insulation and offset to provide polarization.

**DS201
INDICATOR, LIGHT, INCANDESCENT, SUBMINIATURE
SERIES L10,000**

**DS202
INDICATOR LAMP, INCANDESCENT, TYPES 327X
AND 387**



Quality Assurance: Per specification MS25446.
Bureau approval required prior to use.

Mfr: Control Switch Division, Controls Company of America, Folcroft, Pa.

Electrical Characteristics
Rating: 5 volts dc—.060 amps, 60,000 hrs; 6 volts dc—.07 amps, 10,000 hrs.
Light Output: 1 ±0.25 lumen at 6 volts (before encapsulation).

Physical Characteristics
Case: Stainless steel
Lens: Plastic
Bushing: 10-32 NF-2A thread
Nut: 10-32 NF-2B
Terminals: Two 6" (nom.) leads per MS21985-26
Lens Color: Diffusing—blue, green, red, white, and yellow; Non-diffusing color—non-selective.
Weight: 0.005 lb. max.

Test Data
Torque: Shall withstand a torque of 8 in. lb. applied to the nut.
Shock: Shall meet high-impact shock requirements of MIL-S-901.

Remarks: Application is limited to installations where the wires are protected by electronic or electric equipment housing.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Type 327X—Tung-Sol Electric, Inc., Newark, N. J.
Type 387—General Electric Co., Miniature Lamp Dept., Cleveland, Ohio

Electrical Characteristics
Design Voltage: 28 volts.
Design Current: 0.04 amps.
Candle Power: 0.30, approx.

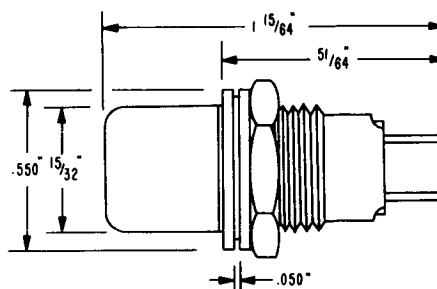
Physical Characteristics
Bulb Type: T-1 3/4.
Base: Single contact, midget flange.
Filament Construction: C-2F

Test Data
Life: Type 327X—2500 hr.; type 387—25,000 hr. (rated avg. lab life at design volts).

Remarks: Due to filament construction, these lamps have good shock and vibration resistance.

**DS203
INDICATOR LIGHT, INCANDESCENT, TYPE LH73**

Application: When 180° light distribution is required for a front panel miniature incandescent indicator light.



Quality Assurance: Per specification MIL-L-3661/5. Preferred part per MIL-STD-242E.

Mfr: Dialight Corp., Brooklyn, N. Y.
Control Switch Div., Controls Co. of America, Folcroft, Pa.

Electrical Characteristics

Voltage Rating: 6-28 volts, dc.
Current Rating: .04-.22 amps.

Physical Characteristics

Lamp Type: Accommodates a T-1 3/4 midget flange base incandescent lamp.
Lens: Style LC 12.
Lens Colors: Nondiffusing—Blue, colorless, green, red, and yellow; translucent—white, red, green, yellow, and blue.
Lens Material: Plastic
Insulation: Terminals are insulated from housing.
Terminals: Flat, 1/8" wide, 7/32" long, 1/4" apart, .047" x .093" oblong hole.
Body: Threaded, 15/32—32NS-2A
Mounting: Nut, MS25082-B8
Terminal Identification: A plus sign is adjacent to terminal connected to center contact.

Test Data

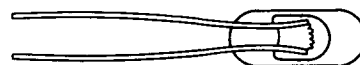
Ampere Rating Design: Average life in excess of 5000 hours.

Remarks: No portion of the bulb is more than 0.125" from the extended lamp base.

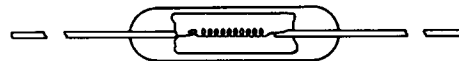
DS205

INDICATOR LIGHT, INCANDESCENT, MICROMINIATURE, "PINLITE"

Application: Due to Pinlites small size, low power requirements and fast response time, they are especially suited to applications such as: converting microwave energy into light for read-out by a photo-electric sensing device, tracking systems and recording devices, and medical-surgical instrumentation.



LENS STYLE

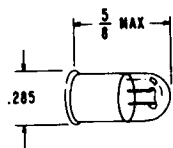


AXIAL LEADED STYLE

DS204

INDICATOR LAMP, INCANDESCENT, TYPE 344

Application: Low current lamp for use in transistor circuits.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use

Mfr: General Electric Miniature Lamp Division, Cleveland, Ohio.

Electrical Characteristics

Max Permissible Applied Voltage: 10 volts.
Total Current Rating: Designed for 0.015 amp, Maximum current is 0.017 amp.
Filament Type: C-2F.

Physical Characteristics

Bulb Type: T-1 3/4.
Flange: Single contact midget type.

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Kay Electric Co., Pinlite Div., Fairfield, N. J.

Electrical Characteristics

Type	Oper Voltage (volts)	Oper Current (milli-amperes)	Pulse Response to 1/2 Bright. (milli-seconds)	Total Light Output (milli-lumens)
Lens Style:				
L12-3	1.25	3	3	2
L12-6	1.25	6	4	6
L12-12	1.25	12	5	45
L15-30	1.5	30	7	160
L15-45	1.5	45	10	220

Axial Leaded Style:

10-10	1.0	10	4	15
13-7	1.35	6	4	12
15-15	1.5	15	5	60
15-45	1.5	45	10	220
30-30	3	30	7	250
60-25	6	25	8	400

Type	Cold Resistance (ohms)	Hot Resistance (ohms)	Life Expectancy (hours)
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Lens Style:

L12-3	86	400	500
L12-6	35	200	750
L12-12	16	100	1000
L15-30	5.5	50	1000
L15-45	4	33	1000

Axial Leaded Style:

10-10	16	100	750
13-7	38	215	500
15-15	13.5	100	800
15-45	4	33	1000
30-30	11	100	1000
60-25	27	240	1000

Physical Characteristics

Lead Material: Platinum

Filament Material: Tungsten

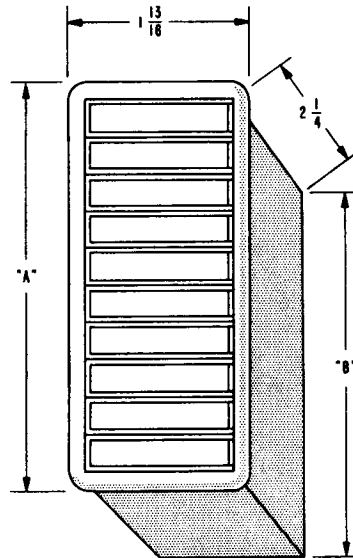
Type	Lgth. of Envelope	Dia. of Envelope	Lgth. of Lead	Dia. of Lead (mils)
L12-3	.080	.030	3/8	4
L12-6	.080	.030	3/8	4
L12-12	.080	.030	3/8	4
L15-30	.080	.030	3/8	4
L15-45	.080	.030	3/8	4
10-10	.070	.016	3/8	3
13-7	.070	.016	3/8	3
15-15	.070	.016	3/8	3
15-45	.125	.030	3/8	5
30-30	.125	.030	3/8	5
60-25	.200	.040	3/8	5

Remarks: Manufacturer states Pinlites comply with Mil. Spec. 5422-E and can undergo shock and vibration tests in excess of 50 g's.

DS206

INDICATOR LIGHT ASSEMBLY, INCANDESCENT, SERIES 100

Application: Designed for use in airborne, seaborne, missile electronic, communications and ground support equipment, and other devices requiring an illuminated fault indicating light.



Style of Indicators	Dim. "A"	Dim. "B"
1	1.050	.520
2	1.515	.985
3	1.980	1.450
4	2.445	1.915
5	2.910	2.380
6	3.375	2.845
7	3.840	3.310
8	4.305	3.776
9	4.770	4.240
10	5.235	4.705

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Master Specialties Co., Gardena, Calif.

Electrical Characteristics

Lamp Type: Accommodates two T1-3/4 midget flanged base incandescent lamps.

Dielectric Withstanding Voltage (Sea Level): 1000 volts rms at 60 cps.

Physical Characteristics

Configurations: Available from 1 thru 10 channel configurations. (See table)
 Mounting: Flush mounted in approx. a 1-1/8" x "B" dim. (See table) hole. Protrudes 1/8" above panel surface.
 Mounting Panel: 1/4" thickness, max.
 Materials: As follows
 Capsules and Bases: Nylon per MIL-P-21105.
 Springs: Beryllium copper per QQ-C-533.
 Screws and Nuts: Brass per QQ-B-626, Com. 22.
 Buss Bars and Terminals: Brass per QQ-B-613
 Brackets: Stainless steel per MIL-S-5059A, Com. 302
 Cond A.

Color: Various replaceable colored filters available.
 Legends: A gate on one side of the rotating lamp capsule provides means for changing legends without removal of the unit or the use of any tools.
 Lamp Capsule: Designed to rotate about a central shaft for ease of relamping from front without the use of tools.

Environmental Conditions

Corrosion: All material used protected against corrosion by suitable finishes.

Test Data

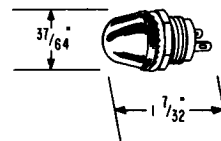
Per MIL-L-3661A.

Remarks: The lamp retaining portion of the indicator-lights housing shall be positively indexed so that the lamp replacement does not require removal of any portion of the indicator light housing.
 When only one of the two lamps is illuminated a shadowing effect appears on the lens face indicating this condition. (See also S306)

**DS207
 INDICATOR LIGHT, INCANDESCENT SUBMINIATURE,
 WATERTIGHT, SERIES 177-8430-931**

Application: Designed for applications where a

watertight, subminiature incandescent indicator light is required.



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Dialight Corp., Brooklyn 37, New York

Electrical Characteristics

Bulb Type: T-1 3/4, midget flange, based lamp

Physical Characteristics

Weight: .25 oz
 Mounting Bushing: Aluminum, black anodized finish per M-A-8625
 Terminals: Brass, hot tinned, with elongated slots
 Internal-Tooth Lockwasher (O.D.): .018" x 19/32"
 Hex Nut: 3/32" x 9/16" across flats
 Body Threads: 15/32", 32 NS, thd
 Mounting Panel Thickness: Max 3/16"
 Projection Back of Panel: 5/8" max
 Lens Cap Thread: 5/16", 32 NEF-2 thd
 Body Flange: 5/64" x 41/64".
 Watertightness: Two retained "O" rings provide watertightness when mounted on face of panel.
 This unit conforms to method 104A of MIL-STD-202. In addition, the unit has been tested at 20 PSI in a 6" head of water
 Lens: Omnidirectional, molded from high heat plastic
 Front Panel Mounting: Use 15/32" clearance hole

Catalog Numbers

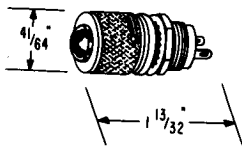
Lens Colors	Complete Assemblies		Lens Cap Assemblies	
	Transparent Colors	Translucent Colors	Transparent Colors	Translucent Colors
Red	177-8430-931	177-8430-971	177-931	177-971
Green	177-8430-932	177-8430-972	177-932	177-972
Yellow				
(Amber)	177-8430-933	177-8430-973	177-933	177-973
Blue	177-8430-934	177-8430-974	177-934	177-974
White				
Translucent	177-8430-935	177-8430-975	177-935	177-975
Light				
Yellow	177-8430-936	177-8430-976	177-936	177-976
Clear				
(Colorless)	177-8430-937		177-937	

Lampholder (without lens cap): 177-8430-9

Remarks: An anti-rotation (locked) construction feature provides for secure locking of the socket terminal assembly in the mounting bushing and of the center terminal to the insulating disc.

**DS208
INDICATOR LIGHT, DIMMER TYPE, WATERTIGHT,
INCANDESCENT, SERIES 174-8430W-131 AND
175-8430W-131**

Application: Designed for application requiring a mechanical dimmer watertight indicator light, with complete or semi-blockout features, as required



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Dialight Corp., Brooklyn 37, New York

Electrical Characteristics

Bulb Type: Accommodates a T-1-3/4 midget flange, based lamp

Physical Characteristics

- Weight: .75 oz.
- Mounting Bushing: Brass, brass nickel finish in accordance with MIL-P-14535.
- Internal-Tooth Lockwasher (O.D.): .018" x 19/32"
- Hex Nut: 3/32" x 9/16" across flats
- Base Body Thread: 15/32", 32 NS thd
- Mounting Panel: 1/4" thickness, max
- Projection Back of Panel: 11/16", max
- Dimmer Cap Flange: 5/64" x 41/64" O.D.
- Dimmer Cap Thread: 5/16", 32 NEF-2thd

Catalog Numbers

Mechanical Dimmer Type	Glass Lens Type	Lens Surface	Complete Assemblies	Lens Cap Assemblies
		unfrosted	174-8430W-131	174-131
Complete	Convex	back	174-8430W-131	174-111

Mechanical Dimmer Type	Glass Lens Type	Lens Surface	Complete Assemblies	Lens Cap Assemblies
Blackout		frosted	111	
		frosted all over	174-8430W-121	174-121
		unfrosted	175-8430W-131	175-131
Semi-Blackout	Convex	back	175-8430W-111	175-111
		frosted	111	
		frosted all over	175-8430W-121	175-121

Watertightness: Achieved by means of retained "O" ring seals. One "O" ring is retained within the back of the lens cap, the other behind the flange of the mounting bushing. A third "O" ring is mounted within the dimmer cap, so positioned as to assure no leakage through the dimmer slot. Watertight only when mounted on face of panel. This unit conforms to Method 104A of MIL-STD-202. In addition, the units have been tested at 20 PSI in a 6" head of water

Lens Color: The final figure in the catalog numbers indicates that the lens is RED. When a color other than red is desired, change this digit to a figure from the listing below. Red-1; Green-2; Yellow-(Amber)-3; Blue-4; White translucent-5; Clear (Colorless)-7

Lampholder (without lens cap): 174-8430W-1; 175-8430W-1

Remarks: These lights have mechanical dimmers consisting of rotatable shutters decreasing the size of three triangular openings from maximum light to complete blackout or semi blackout as specified above. An anti-rotation (locked) construction feature provides for secure locking of the socket terminal assembly in the mounting bushing and of the center terminal to the insulating disc.

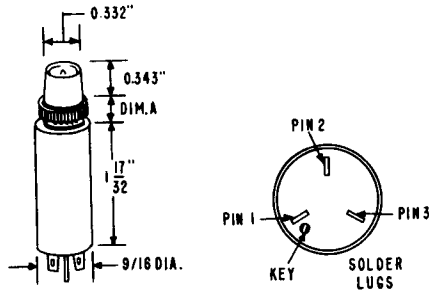
**DS209
INDICATOR LIGHT, INCANDESCENT, TRANSISTOR
CONTROLLED, WITH REPLACEABLE LAMP, SERIES TIL**

Application: Designed for use as a transistor driven incandescent indicator light that operates by application of low current signals which are internally switched on and off. These indicators feature replaceable lamps, provide lamp control circuitry to simplify design problems in computers, data processing and control systems where a variety of lamp types and supply voltages are required.

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Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Transistor Electronics Corp., Minneapolis 26,
Minnesota



PANEL	DIM. A
1/16 TO 1/8	.250
9/64 TO 3/16	.312

PIN CONNECTIONS

PIN #1	PIN #2	PIN #3
SIGNAL	SUPPLY	COMMON

Electrical Characteristics

Lamps: Replaceable types (see Table 1)

Keep Alive Circuit: During non-indicating periods lamp life is increased by keeping filaments warm and allowing the power supply load to be equalized

Mode of Operation: Internal transistor circuitry operates from small signals to control replaceable incandescent lamp

Signal and Supply Voltages: The Signals are referenced to the common terminal enabling signal levels to be shifted up or down by using respectively, a negative or positive external bias voltage on the common terminal. It is also possible to extend the max signal range of the std units. Supply voltages shown (table 1) are also referenced to the common terminal. If external bias is used to change input signal ranges, the supply voltage must either be connected to the common terminal or, if connected to ground, adjusted to compensate for bias effect

Signal Input Impedance: 1000 ohms, nom

Lamp Life: See Table 1

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TABLE 1: SIGNAL AND SUPPLY VOLTAGES

Model	INPUT SIGNALS	Supply Voltage	ON Supply Current	OFF Supply Current	Lamp Type Rated Avg. Life*
A	ON: -4ma min	-6.3	150 ma	45 ma	350
	OFF: +1 to +8 Volts				3000 hrs.
B	ON: +4ma min	+6.3	150 ma	45 ma	350
	OFF: -1 to -8 Volts				3000 hrs.
C	ON: -2ma min	-14.0	80 ma	25 ma	330
	OFF: +1 to +8 Volts				750 hrs.
D	ON: +2ma min	+14.0	80 ma	25 ma	330
	OFF: -1 to -8 Volts				750 hrs.
E	ON: -2ma min	-14.0	80 ma	25 ma	330
	OFF: 0 to +7 Volts				750 hrs.
F	ON: +2ma min	+14.0	80 ma	25 ma	330
	OFF: 0 to -7 Volts				750 hrs
G	ON: -1ma min	-28.0	40 ma	12 ma	327
	OFF: +1 to +8 Volts				1000 hrs.
H	ON: +1ma min	+28.0	40 ma	12 ma	327
	OFF: -1 to -8 Volts				1000 hrs.
J	ON: -1ma min	-28.0	40 ma	12 ma	327
	OFF: 0 to +7 Volts				1000 hrs.
K	ON: +1ma min	+28.0	40 ma	12 ma	327
	OFF: 0 to -7 Volts				

* Operating filament type lamps at 5% to 10% below rated voltage will generally increase life from 2 to 4 times.

Transistor: Complies with MIL-S-19500B

Resistors: Comply with MIL-R-11

Physical Characteristics

Body and Nuts: 2011-T3 aluminum per QQ-A-365

Body and Nut Finish: Anodized per MIL-A- 8625 (Black)

Lens: Acetate Butyrate plastic per FED-L-P-349

Socket: Nickel plated brass per QQ-B-626 Comp. 22

Header: With solder lug terminals, Epoxy glass laminate per MIL-P-18177B

Terminals: Solder lug, brass SAE 70 per QQ-B-613 comp. 2

Labeling: Only model number, panel thickness and terminal type will be labeled on units

Terminals Finish: Solder plated solder lug

Mounting: Mounted from the rear with a single knurled nut and lockwasher in a 3/8" hole on centers as close as 19/32". Designed to fit 1/16" to 1/8" and 9/64" to 3/16" panel thickness

Lens: Flat top or skirted flat top design (Fresnel diffusing rings in transparent colors) see colors listed below. One letter, numeral or symbol up to 3/16" or as many three characters up to 3/32" high can be hot stamped on the lens face in various colors

Lens Color:

- 1- Translucent Red
- 4- Translucent Yellow
- 5- Translucent Green
- 6- Translucent Blue

- 9- Translucent White
- 11- Translucent Orange
- 12- Transparent Green
- 13- Transparent Blue

Watertight Option: TIL Series can be made completely watertight on the front panel side by using skirted flat top lens equipped with an "O" ring plus a gasket used behind the panel between lite body and the panel; specify lens type "W".

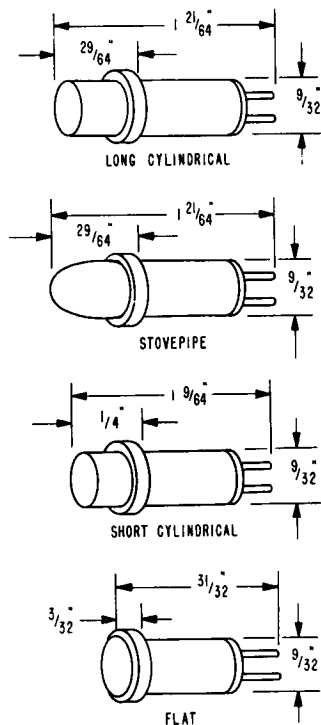
Environmental Conditions

Temp Range: Operating and storage, -40°C to +65°C at 95% humidity, max

Remarks: High currents required to energize incandescent lamps are confined to the indicator itself and thereby, isolated from sensitive logic circuits.

**DS210
INDICATOR LIGHT, INCANDESCENT, REPLACEABLE
CARTRIDGE**

Application: Designed as a replaceable incandescent lamp cartridge for DS101 lamp holder.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Dialight Corp., Brooklyn, N. Y.
Eldema Corp., Compton, Calif.

Electrical Characteristics

Bulb Type: T-1 3/4

Ratings Available: See table below.

Voltage (V)	Current (Amps)	Hourly Rating
*1.35	0.06	500
*2.7	0.06	500
6	0.04	1000
6	0.20	1000
6.3	0.20	3000
*10	0.014	Over 6000
10	0.04	Over 6000
14	0.08	750
18	0.04	1000
28	0.04	1000

*Should not be used with translucent lenses.

Physical Characteristics

Body Material: Aluminum, clear anodized finish. Black anodized finish optional.

Lens Material: Plastic

Lens Surface: Translucent (transparent also avail.—see asterisk at bottom of table above).

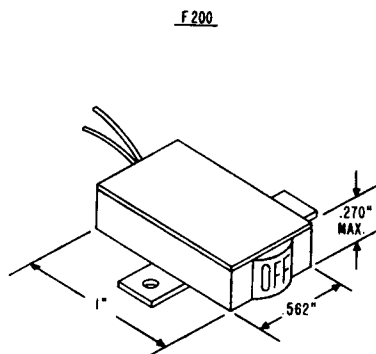
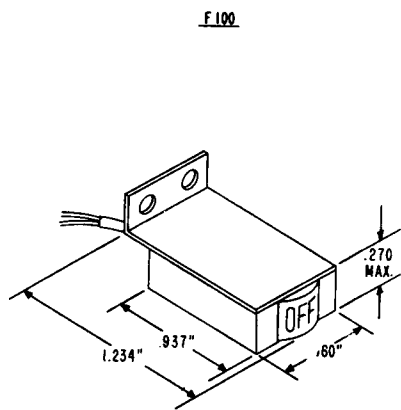
Lens Colors: Red, green, yellow, blue, white, light yellow, and clear transparent.

Cartridge Configurations: Stovepipe, Short Cylindrical, Long Cylindrical, and Flat. (See Illust.)

Terminals: Stainless steel pins mounted in nylon insulation and offset to provide polarization.

**DS301
INDICATOR, ELECTROMAGNETIC, SERIES F100 AND
F200**

Application: Designed for use in electronic circuitry where a visual indicating device is required to convey general information on equipment's operational status.



Electrical Characteristics

Coil Resistance: 450 ohms, +10%; other values available
Voltage Rating: 26.5 volts, dc
Oper Time: .05 secs
Motor Rotation: Energization of a dual coil electro-magnet, causes rotation of the PM rotor, thus changing the position of the dial.

Physical Characteristics

Weight: 0.3 oz.
Displacement: To 70 degrees
Mounting Position: Operates in any position
Case and Base Materials: Black anodized aluminum
Magnetic Parts Material: Armco magnetic ingot iron
Magnetic Parts Finish: Cadmium plated plus a bronze tridite dip
Bobbin Material: Teflon
Magnetic Wire: Phelps Dodge Nyleze
Coil Tape: 3M Mylar
Lead Wires: Stranded, silver plated copper wire with Teflon coating
Lead Wire: 30 AWG, specify length desired; polarity red (+), black (-)
Bracket Mounting Holes: Two holes, .120" dia for both F100 and F200 Series
Letter Height Indicator Face: 3/16"
Dial Marking: Dull black for "ON"; black letters "OFF" on a red fluorescent background, for "OFF".
Other markings available

Environmental Conditions

Temp Range: From -55°C to +125°C
Corrosion: All materials used are protected against corrosion by suitable finishes. Indicator manufactured in accordance with MIL-E-5272.

Test Data

Vibration: 10 g to 1000 cy
Shock: 50 g to 10 ± 1 millisecc

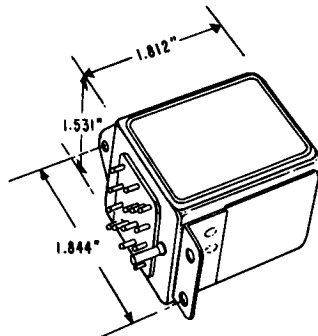
Remarks: Operation is accomplished in a new magnetic circuit, which surrounds a permanent magnet rotor. By energizing a dual coil electromagnet, the PM rotor is caused to rotate, thus changing the position of the dial. Upon removal of coil voltage, the dial returns to the "OFF" position.

Quality Assurance: Manufacturer's claims.
Bureau approval required to prior to use

Mfr: E. V. Naybor Laboratories, Inc., Port Washington,
New York

DS401
GENERATOR, AUDIBLE WARNING SIGNAL PART NO.
AU-0380

Application: Designed as a warning device that is installed in electronic equipment to alert the users that faulty equipment is indicated, or the presence of fire or overheating of equipment is indicated.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Jordan Electronics, Alhambra, California

Electrical Characteristics

Input Voltage: 14 to 32 volts, dc
Outputs: Lamp ckt, flashing at 5 cps (5 std outputs):
 Steady Tone: 250 cps; 18 to 22 db; 200 ohm load
 Interrupted Tone: 250 cps; 22-26 db; 200 ohm load
 Interrupted Tone: 250 cps; 13-18 db; 200 ohm load
 Interrupted Tone: 250 cps; 6-10 db; 200 ohm load

Physical Characteristics

Pins: Gold plated, 12/0.0625" dia; 2/.040" dia
Mounting: Flangemounted, three .147" dia mtg holes
Housing: Light weight metal
Enclosure: Solder sealed
Finish: Black

Environmental Conditions

Temp Oper Range: -54°C to 71°C
Altitude: 55,000 ft.
Humidity: 100%

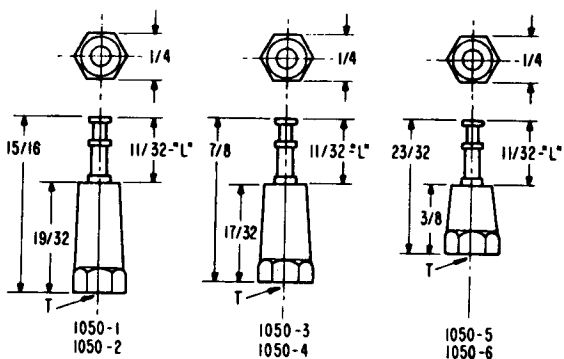
Test Data

Vibration: Meets requirements MIL-E-5272A, Proc 1

Remarks: This audible warning signal generator has solid state circuitry.

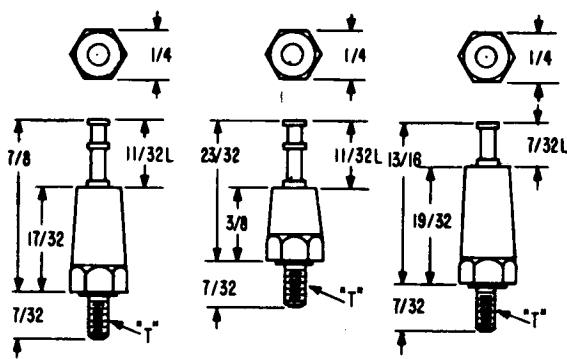
E101
TERMINAL, STANDOFF, TAPPED-INSERT TYPE

TURRET TERMINALS TAPPED INSERT



TYPE	T	L	TYPE	T	L
1050-1	4-40	11/32	1050-4	6-32	11/32
1050-2	6-32	11/32	1050-5	4-40	11/32
1050-3	4-40	11/32	1050-6	6-32	11/32

THREADED STUD



TYPE	T	L	TYPE	T	L
1050-15	4-40	11/32	1050-18	6-32	11/32
1050-16	6-32	11/32	1050-19	4-40	7/32
1050-17	4-40	11/32	1050-20	6-32	7/32

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Continental Connector Corp., Long Island City,
New York.

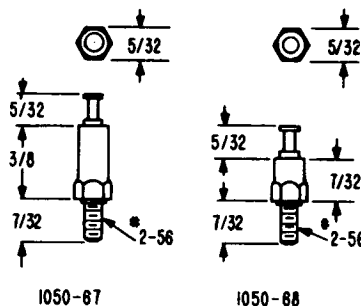
Physical Characteristics

Size: Available in six different sizes.
Mounting Arrangement: Brass, cadmium plated, assembled with a standard No. 4-40 or 6-32 machine screw.
Length of Terminal Shaft: Six different lengths are available.
Insulation Material: Can be supplied in diallyl phthalate glass-fiber filled, flame resistant per Specification MIL-M-19833 Type GDI-30F. Manufacturer's designation for this material is: "ST1050-10 GDF".
Turret Type: Contains a tapped insert

Test Data

Voltage Breakdown at Sea Level: Depends upon body length. Ranges from 7500 volts to 24, 500 volts.

MINIATURE STAND-OFF



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Continental Connector Corp., Long Island City,
New York.

Physical Characteristics

Mounting Arrangement: Brass, cadmium plated, assembled with standard No. 4-40 or 6-32 nut.
Insulation Material: Can be supplied in diallyl phthalate glass-fiber filled, flame resistant per Specification MIL-M-19833 Type GDI-30F. Manufacturer's designation for this material is: "ST1050-10 GDF".

E102
TERMINAL, STANDOFF, THREADED-STUD TYPE

Application: Normal use or extreme miniaturization.

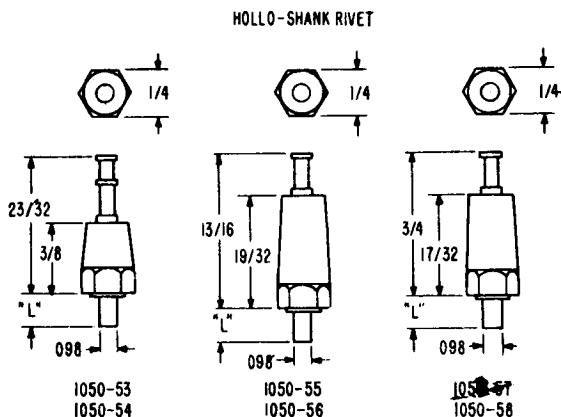
Test Data

Voltage Breakdown at Sea Level: Depends upon body length. Ranges from 7500 volts to 24,500 volts.

Test Data

Voltage Breakdown at Sea Level: Depends upon body length. Ranges from 7500 volts to 24,000 volts.

**E103
TERMINAL, STANDOFF, HOLLOW-SHANK RIVET TYPE**



TYPE	L
1050-53	5/32
1050-54	5/64
1050-55	5/32
1050-56	5/64
1050-57	5/32
1050-58	5/64

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Continental Connector Corp., Long Island City, New York.

Physical Characteristics

Size: Available in six different sizes.
Mounting Arrangement: Hollow shank aluminum rivet with a strain relief on mounting surface.
Length of Terminal Shaft: Terminals have six different lengths.
Insulation Material: Can be supplied in diallyl phthalate glass-fiber filled, flame resistant per Specification MIL-M-19833 Type GDI-30F. Manufacturer's designation for this material is: "ST1050-10 GDF".
Turret Type: Hollow shank rivet.

**E104
TERMINAL, STANDOFF, SINGLE-TURRET TYPE**

PART NO.	L	T
2085-11	.035	1/64
2085-1	.051	1/32
2085-2	.082	1/16
2085-3	.113	3/32
2085-4	.145	1/8

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

MFR: Cambridge Thermionic Corp., Cambridge, Mass.

Physical Characteristics

Size: These solder terminals are available in five different sizes for board thickness from 1/64" to 1/4". The "L" dimension is available in lengths from 0.035" to 0.145". The "T" measurement determines the proper terminal to be used.
Mounting Arrangements: Terminals are mounted by swage methods, using hand swager tools, pressure swager anvils, and pressure swager punches.
Material: Terminals are made of precision machined brass with 0.0003" silver plating; they are also available with special finishes, such as tin lead plate, tin zinc plate, hot tin solder coat tin plate, bright alloy plate, cadmium plate, and gold plate.

**E105
TERMINAL, STANDOFF, DUAL-TURRET TYPE**

PART NO.	L	T	PART NO.	L	T
1558-1	.078	1/32	1597-1	.062	1/32
1558-2	.109	1/16	1597-2	.094	1/16
1558-3	.141	3/32	1597-3	.125	3/32
1558-4	.172	1/8	1597-4	.156	1/8
1558-5	.234	3/16	1597-5	.219	3/16
1558-6	.297	1/4	1597-6	.281	1/4

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

Physical Characteristics

Size: These solder terminals are available in six sizes for board thickness from 1/32" to 1/4". The "L" dimension is available in lengths from 0.062" to 0.297". The "T" measurement determines the proper terminal to be used.

Mounting Arrangements: Terminals are mounted by swage methods, using hand swager tools, pressure swager anvils, and pressure swager punches.

Material: Terminals are made of precision machined brass with 0.0003" silver plating; they are also available with special finishes, such as tin lead plate, tin zinc plate, hot tin soldered coat tin plate, bright alloy plate, cadmium plate, and gold plate.

E107**TERMINAL, STANDOFF, SINGLE TURRET WITH HOLLOW SHAFT**

PART NO.	L	T
2100-11	.025	1/64
2100-1	.045	1/32
2100-2	.094	1/16
2100-3	.125	3/32

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

Physical Characteristics

Size: Hollow shaft solder terminals are available in four sizes for board thickness from 1/64" to 3/32". The "L" dimension is available from 0.025" to 0.125". The "T" measurement determines the proper terminal to be used.

Mounting Arrangements: Terminals are mounted by swage methods, using hand swager tools, pressure swager anvils, and pressure swager punches.

Material: Terminals are made of precision machined brass with 0.0003" silver plating; they are also available with special finishes, such as tin lead plate, tin zinc plate, hot tin solder coat, tin plate, bright alloy plate, cadmium plate, and gold plate.

E106**TERMINAL, STANDOFF, TRIPLE-TURRET TYPE**

PART NO.	L	T
2080-1	.062	1/32
2080-2	.044	1/16
2080-3	.125	3/32
2080-4	.156	1/8
2080-5	.219	3/16

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

Physical Characteristics

Size: Solder terminals are available in five sizes for board thickness from 1/32" to 3/16". The "L" dimension is available in lengths from 0.062" to 0.219". The "T" measurement determines the proper terminal to be used.

Mounting Arrangements: Terminals are mounted by swage methods, using hand swager tools, pressure swager anvils, and pressure swager punches.

Material: Terminals are made of precision machined brass with 0.0003" silver plating; they are also available with special finishes, such as tin lead plate, tin zinc plate, hot tin solder coat tin plate, bright alloy plate, cadmium plate, and gold plate.

E108**TERMINAL, STANDOFF, HOLLOW-SHAFT TURRET TYPE**

PART NO.	L	T
1979-1	.078	1/32
1979-2	.109	1/16
1979-3	.141	3/32
1979-4	.172	1/8
1979-5	.234	3/16
1979-6	.297	1/4

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

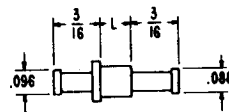
Physical Characteristics

Size: See chart for various sizes and dimensions.
Dimension "L" determines the length of the shaft.
Dimension "T" determines the thickness of the mounting board used.

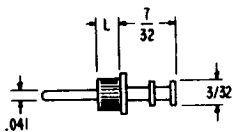
Mounting Arrangements: Terminals are mounted by swage methods, using hand swager tools, pressure swager anvils, and pressure swager punches.

Material: Terminals are made of precision machined brass with 0.0003" silver plating; they are also available with special finishes, such as tin lead plate, tin zinc plate, hot tin solder coat, tin plate, bright alloy plate, cadmium plate, and gold plate.

**E111
TERMINAL, STANDOFF, HOLLOW-SHAFT AND
DOUBLE-ENDED, SINGLE-TURRET TYPE**



**E109
TERMINAL, STANDOFF, DOUBLE-ENDED,
DUAL-TURRET TYPE**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

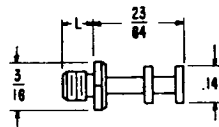
Physical Characteristics
Length of Terminal Shaft: 3/8" x "L" (0.62" to 0.156"
Turret Type: Single or double end with a single or duc
turret.

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

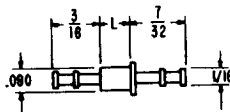
Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

Remarks: Shank or terminal is knurled.

**E112
TERMINAL, STANDOFF, THREADED-TERMINAL,
TURRET TYPE HEX BASE**



**E110
TERMINAL, STANDOFF, DOUBLE-ENDED,
DOUBLE-TURRET TYPE**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

Physical Characteristics
Length of Terminal Shaft: 23/64" x "L" (0.125" to 0.188")
Thread: 4-40

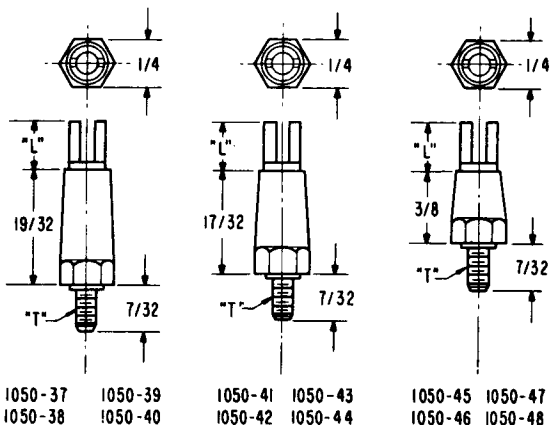
Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

**E113
 TERMINAL, STANDOFF, THREADED-STUD,
 BIFURCATED TYPE**

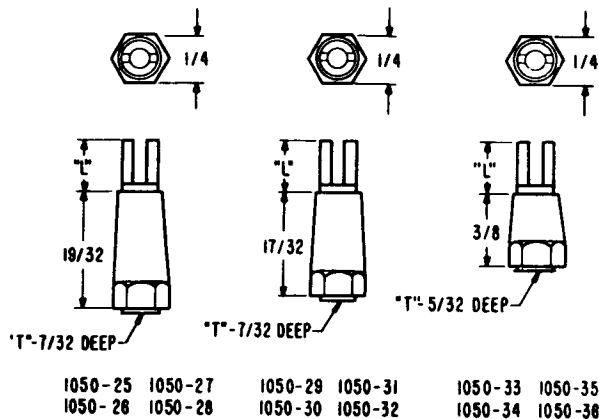
**E114
 TERMINAL, STANDOFF, TAPPED-INSERT,
 BIFURCATED TYPE**

BIFURCATED TERMINALS
 THREADED STUD



TYPE	T	L	TYPE	T	L
1050-37	4-40	1/4	1050-43	6-32	1/4
1050-38	4-40	3/16	1050-44	6-32	3/16
1050-39	6-32	1/4	1050-45	4-40	1/4
1050-40	6-32	3/16	1050-46	4-40	3/16
1050-41	4-40	1/4	1050-47	6-32	1/4
1050-42	4-40	3/16	1050-48	6-32	3/16

TAPPED INSERT



TYPE	T	L	TYPE	T	L
1050-25	4-40	1/4	1050-31	6-32	1/4
1050-26	4-40	3/16	1050-32	6-32	3/16
1050-27	6-32	1/4	1050-33	4-40	1/4
1050-28	6-32	3/16	1050-34	4-40	3/16
1050-29	4-40	1/4	1050-35	6-32	1/4
1050-30	4-40	3/16	1050-36	6-32	3/16

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Continental Connector Corp., Long Island City,
 New York.

Physical Characteristics

Size: Available in three different sizes.
Mounting Arrangement: Brass, cadmium plated, assembled with standard number 4-40 or 6-32 nut.
Length of Terminal Shaft: Terminals have three different lengths.
Insulation Material: Can be supplied in dially phthalate glass-fiber filled, flame resistant per Specification MIL-M-19833 Type GDI-30F. Manufacturer's designation for this material is: "ST1050-10 GDF".
Bifurcated Type: Threaded stud.

Test Data

Voltage Breakdown at Sea Level: Depends upon body length. Ranges from 7500 volts to 24,500 volts.

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Continental Connector Corp., Long Island City,
 New York.

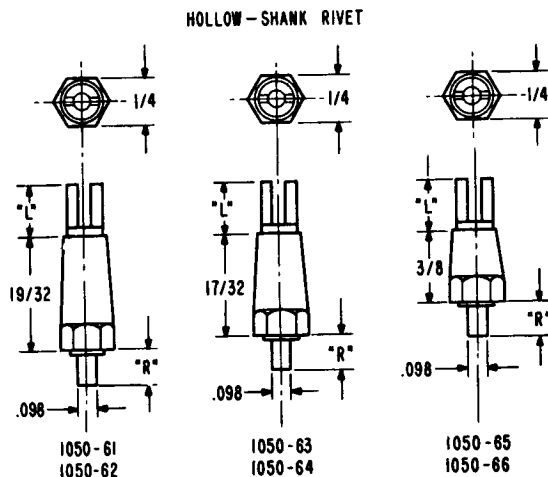
Physical Characteristics

Size: Available in three different sizes.
Mounting Arrangements: Brass, cadmium plated, assembled with a standard number 4-40 or 6-32 machine screw.
Length of Terminal Shaft: Terminals have three different lengths.
Insulation Material: Can be supplied in dially phthalate glass-fiber filled, flame resistant per Specification MIL-M-19833 Type GDI-30F. Manufacturer's designation for this material is: "ST1050-10 GDF".
Bifurcated Type: Tapped insert.

Test Data

Voltage Breakdown at Sea Level: Depends upon body length. Ranges from 7500 volts to 24,500 volts.
Arc Resistance: See Insulation Material.

**E115
TERMINAL, STANDOFF, HOLLOW-SHANK-RIVET,
BIFURCATED TYPE**



TYPE	R	L	TYPE	R	L
1050-61	5-32	1/4	1050-64	5-64	3/16
1050-62	5-64	3/16	1050-65	5-32	1/4
1050-63	5-32	1/4	1050-66	5-64	3/16

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Continental Connector Corp., Long Island City,
New York.

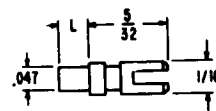
Physical Characteristics

Size: Available in three different sizes.
Mounting Arrangements: Hollow shank aluminum rivet
with a strain relief on mounting surface.
Length of Terminal Shaft: Terminals have three different
lengths.
Insulation Material: Can be supplied in diallyl phthalate
glass-fiber filled, flame resistant per Specification MIL-M-
19833 Type GDI-30F. Manufacturer's designation for this
material is: "ST1050-10 GDF".
Turret Type: Hollow shank rivet.

Test Data

Voltage Breakdown at Sea Level: Depends upon body
length. Ranges from 7500 volts to 24,500 volts.

**E116
TERMINAL, STANDOFF, HOLLOW-SHAFT,
BIFURCATED TYPE**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

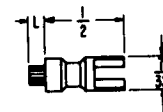
Physical Characteristics

Size: These split terminals are available in 3 different
sizes. The "L" dimension is available in lengths from
0.025" to 0.281" for use on boards from 1/64" to 1/4"
thick.

Mounting Arrangements: Terminals are mounted by swage
methods, using hand swager tools, pressure swager anvils,
and pressure swager punches.

Material: Terminals are made of precision machined brass
with 0.0003" silver plating; they are also available with
special finishes, such as tin lead plate, tin zinc plate,
hot tin solder coat, tin plate, bright alloy plate, cadmium
plate, and gold plate.

**E117
TERMINAL, STANDOFF, KNURLED,
HOLLOW-SHAFT, BIFURCATED TYPE**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Cambridge Thermionic Corp., Cambridge, Mass.

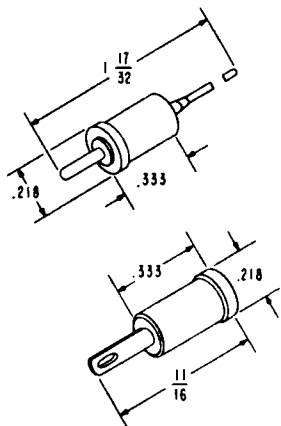
Physical Characteristics

Sizes: These knurled split terminals are available in three
different sizes for use on boards from 1-16" to 1/8"
thick.

Length of Terminal Shaft: The "L" dimension is available
in length from 0.109" to 0.172".

E201
PROBE AND JACK, FEED-THRU CONNECTOR TYPE
FT-M-2L4 AND SKT-1

Application: Designed for use feed-thru, press fit mounting for utility for serving as: test prods, chassis test points and for interconnecting applications in electronic equipment.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Sealectro Corp., Mamaroneck, New York

Electrical Characteristics

Voltage Rating: FT-M-2L4—1000 volts rms, 60 cps (nominal), 3000 volts rms, 60 cps (flashover, sea level); SKT-1—1200 volts rms, 60 cps (nominal), 3500 volts rms, 60 cps (flashover, sea level).
 Current Rating: 5.5 amp, continuous duty

Capacitance (Measured to 0.050" Chassis Thickness):
 FT-M-2L4, 0.85 pf; SKT-1, 0.55 pf.
 Power Factor: Less than .0005 over freq range of 60 cy to 30,000 meqacycles
 Surface Resistivity: Very high, 3.6×10^{12} at 100% relative humidity
 Low Capacitance: Teflon's low dielectric constant and miniaturized luqs, make for a very low cap unit for high-freq applications
 Dielectric Constant (Teflon): 2.0

Physical Characteristics

Insulation Material: Teflon, white
 Terminal Lug: FT-M-2L4, brass, tin plated; SKT-1, beryllium-copper, gold flashover silver plate.
 Color coding: Available in red, blue, yellow, green, brown, orange, gray, violet and black (FT-M-2L4 only)
 Mounting: Press-fit, (plug receives SKT-1 jack diameter of .050")
 Jack Inner Contact: Heat treated beryllium copper

Environmental Conditions

Temp Range: -65°C to 200°C
 Moisture: Zero water absorption

Test Data

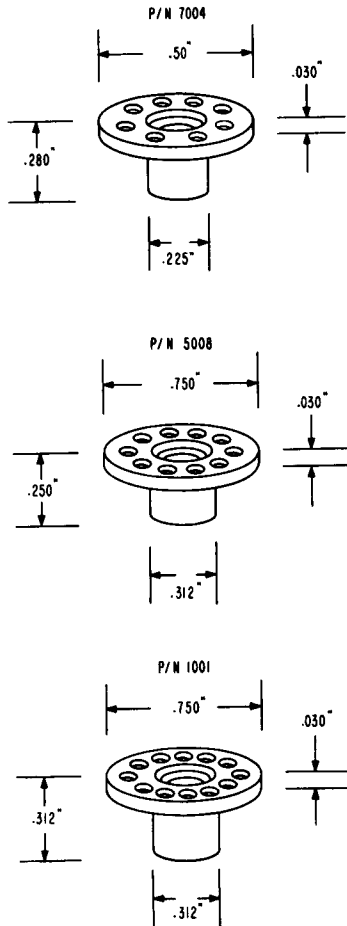
Dielectric Withstanding Voltage: Short time, high, ranging from 1000 to 2000 volts per mil, depending on thickness
 Shock: Manufacturer states, product is immune to mech shock
 Vibration: manufacturer states, product is immune to mech vibration

Remarks: Manufacturer claims teflon insulations used, are unaffected by any known solvents, acids or bases and only slightly affected by molten alkali metals.

**E301
STUDS, GROUND, TYPES P/N 1001, P/N 5008 AND
P/N 7004**

Application: Designed for use in electronic circuits as an equipotential chassis termination for ground leads.

Center Mounting Hole: P/N 1001, P/N 5008—0.191" dia;
P/N 7004—0.153" dia.
Number of Terminal Holes: P/N 1001—12; P/N 5008—10;
P/N 7004—8.
Diameter of Terminal Holes: P/N 1001, P/N 7004—0.0625";
P/N 5008—.078"
Finish: Electro-tin plate per MIL-T-10727A.
Mounting: Stud shank soldered to chassis
Counter-Bored: For convenient vertical stacking
Markings: The manufacturer's name is engraved on the
stud's flange in .0625" high lettering



Test Data

Voltage Drop Tests: Per MIL-STD-202
The ground studs were connected in series by means of No. 18 AWG solid copper, tinned wire soldered into opposing terminal holes on the studs. These wires 1/2 inch in length, 5 in number. Two wires of about six inches in length were then soldered to the outside extremes of the assembly. A total of six (6) wires 4 inches in length were soldered individually to the bottom surface of each ground stud.

Voltage Drop Test—P/N 1001

Sample No.	Between Term. 1 and btm. surface	Between Term. 2 and btm. surface	Between Term. 1 and Term. 2
1	4.3 mv.	4.2 mv.	4.3 mv.
2	4.2	4.3	4.4
3	4.2	4.1	4.4
4	4.3	4.2	4.3
5	4.4	4.4	4.5
6	4.1	4.2	4.3
	4.25 mv.	4.23 mv.	4.37 mv.

Averages:

From Bottom Surface to Terminal:

1.	2.	3.	4.	5.	6.
4.23 mv.	4.21	4.18	4.21	4.22	4.19
7.	8.	9.	10.	11.	12.
4.24 mv.	4.30	4.17	4.40	4.28	4.31

Average: 4.242 mv. Between terminals 1 and 7—4.34 mv
Between Adjacent Terminals 1 and 2—.10 mv.

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Jan Engineering, Santa Monica, California

Physical Characteristics

Weight: P/N 1001—.123 oz.; P/N 5008—0.191 oz.;
P/N 7004—.043 oz.
Material: Brass, half-hard per QQ-B-626, Comp. 22.

Voltage Drop Test-P/N 5008:

Sample No.	Between Term. 1 and btm. surface	Between Term. 2 and btm. surface	Between Term. 1 Term. 2
1	1.6 mv.	1.5 mv.	2.6 mv.
2	1.6	1.7	2.6
3	1.5	1.5	2.7
4	1.6	1.4	2.6
5	1.8	1.5	2.5
6	1.8	1.6	2.8
Averages: 1.65 mv.			2.63 mv.

From Bottom Surface to Terminal:

1.	2.	3.	4.	5.
1.60 mv.	1.55	1.61	1.60	1.62
6.	7.	8.	9.	10.
1.65 mv.	1.53	1.67	1.55	1.68

Average: 1.61 mv.

Between Terminals 1 and 6-1.60 mv.

Between Adjacent Terminals 1 and 2-0.34 mv.

Sample 7 Summary of Test Results: P/N 1001-Voltage Drop Test-32 amp, dc

Average millivolt drop between term. 1 and bottom surface = 4.25 mv.

4.25Calculated Resistance: $32A = 0.1328$ milliohms

Ave. mv drop between terminal 2 and bottom surface = 4.22 mv

4.22Calculated Resistance: $32A = 0.1318$ milliohms

Ave. mv drop between terminal 1 and terminal 2 (Across dia. of stud plate) = 4.37 mv

4.37Calculated Resistance: $32A = 0.1364$ milliohms

Ave. mv drop between terminals 1 to 12 (sample 7) and bottom surface = 4.242 mv

4.242Calculated Resistance: $32A = 0.1325$ milliohms

Millivolt drop between adjacent terminals (sample 7) = 2.10 mv

2.10Calculated Resistance: $32A = 0.656$ milliohms**P/N 5008-Voltage Drop Test-16 amp, dc ave. mv drop between terminal 1 and bottom surface = 1.65 mv**1.65 mvCalculated Resistance: $16A = 0.103$ milliohms

Ave. mv drop between terminal 2 and bottom surface = 1.53 mv

1.53Calculated Resistance: $16A = 0.095$ milliohms

Ave. mv drop between terminal 1 and terminal 2 (across dia of stud plate) = 1.63

1.63Calculated Resistance: $16A = 0.103$ milliohms

Ave. mv drop between terminals 1 to 10 and bottom surface (sample 7) = 1.61 mv

1.61Calculated Resistance: $16A = 0.101$ milliohms

Millivolt drop between adjacent terminals = 0.34 mv

0.34Calculated Resistance: $16A = 0.021$ milliohms

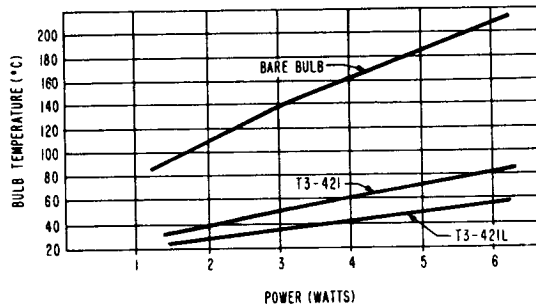
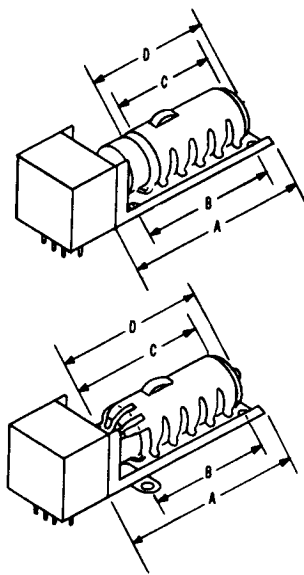
Note: The solder used in making connections was Ersin Multicore, 5-core solder, of 60% tin, 40% lead content.

Remarks: The preceding test data was taken from Jan Engineering Test Report No. 101-62, dated March 14, 1962.

These grounding studs diminish ground loops, noise, pick-up and regenerative feedback caused by differences in chassis ground potentials by serving as a single grounding point in electronic chassis.

**E401
SHIELD, HEAT DISSIPATING, ELECTRON TUBE, IERC,
SERIES 2400**

Application: Designed for low-heat dissipation when using simple metal plate as "heat sink", of sufficient thickness to conduct heat away to the frame or other point in printed circuit applications.



Part No.	Component Name	Material
T3-2421	T3-2491 Sub. Assy.	Silver Shell Bery. Copper Base
	T3-361 Spring	Bery. Copper
T3-2431	T3-2401 Sub. Assy.	Silver Shell Bery. Copper Base
	T3-381 Spring	Bery. Copper
T3-2422-7	T3-2492-7 Sub. Assy.	Silver Shell Bery. Copper Base
	T3-362FP Spring	Bery. Copper
T3-2432-7	T3-2402-7 Sub. Assy.	Silver Shell Bery. Copper Base
	T3-382FP Spring	Bery. Copper

Finish	Weight Grams	IERC Dwq. No.	Tube Size	Socket Used
Silver	8.8	0378	1	A
Silver	10.4	0378	2	A
Silver	9.8	0377	3	B
Silver	11.6	0377	4	B

Quality assurance: Per specification MIL-S-9372 (USAF) Preferred part per MIL-STD-242

Mfr: International Electronic Research Corp., Burbank, Calif.

Physical Characteristics

Installation Force: (Of spring clip) 10 lbs, max
Size:

Part No.	A	B	C	D
T3-2421	1.50	1.200	7/8"	1-1/32" max
T3-2431	1.80	1.500	1-1/4"	1-11/32" max
T3-2422-7	1.60	1.200	1-5/32"	1-1/4" max
T3-2432-7	1.90	1.500	1-17/32"	1-5/8" max

1. T3 round button - under 1.5" bulb length
2. T3 round button - over 1.5" bulb length
3. T3 flat press - under 1.5" bulb length
4. T3 flat press - over 1.5" bulb length

Socket Types: A-8 pin mica-filled phenolic socket with beryllium copper leads. Cinch part No. 132-18-12-037. B-7 pin mica filled phenolic socket with beryllium copper leads. Cinch part No. 46A17630 or equivalent

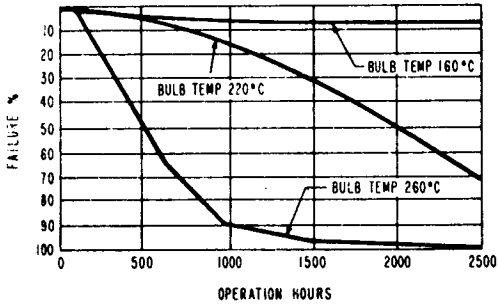
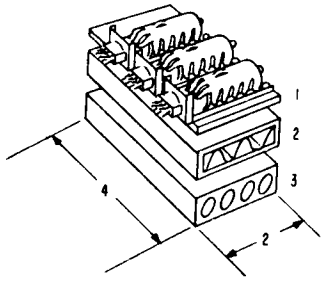
Environmental Conditions

Thermal Resistance: 5°C per watt
Salt Spray: 48 hours per MIL-STD-202, Method 101A
Heat Resistance: 200°C for 48 hours

Test Data

Vibration: 10 to 2000 cy, 15g, per MIL-STD-202, Method 204, Condition B

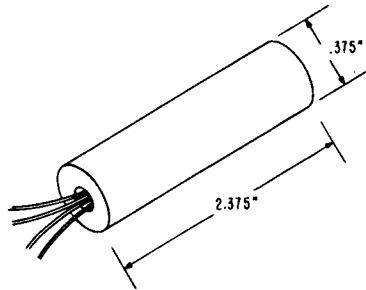
Remarks: Heat Sinks may be of three distinct designs. Number one is mentioned under applications, number two consists of a baffled air duct, and number three consists of thermal paths for the circulation of liquid coolants. (**Note:** Heat sinks are not manufactured by IERC, but are only suggested configurations without specific dimensions).



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EMP101
FREQUENCY RESONATOR, TUNING FORK, TYPE 056,
VMT OR QMT

Application: Designed to provide a precise frequency reference signal from 350 cps to 1800 cps, in calibrating audio frequency equipment requiring precision measurements.



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: The Gyrex Corporation, Santa Monica, California

Electrical Characteristics

Drive Coil: 1700 ohm, nom resistance
 Input Voltage: 10 volts, peak to peak max drive voltage;
 1-2 volts peak to peak usual drive volts
 Pickup Coil: 350 ohms, nom resistance
 Output Signal: .2 to .9 volt peak to peak sine wave at 5
 volt peak to peak input, nominal
 Adaptability: VMT for tube circuitry or QMT for transistor
 circuitry

Physical Characteristics

Finish: Flat black enamel
 Weight: 25 grams, nom (0.8 oz)
 Case: Drawn mild steel
 Size: For some freqs case length is only 1-1/2"
 Header: Hermetic sealed
 Terminals: 4 pigtail leads
 Mountings: By spring clips (cylindrical component holders)

Mechanical Characteristics

Freq. Range: 350 cps to 1800 cps
 Accuracy: To $\pm 0.01\%$
 Termination: Style F only
 Calibration: Unless otherwise specified resonators are
 calibrated with least sensitive axis (Y-axis) vertical.
 Nameplate is up during calibration

Environmental Conditions

Humidity: Withstands 100%
 Salt Spray; sand, dust, fungus will not affect operation of
 hermetically sealed instrument, but units must be protected
 from stray magnetic fields

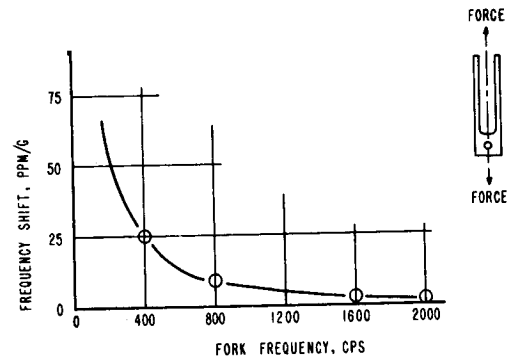
Oper Temp: Operating accuracy $\pm .05\%$ from -55°C to +
 125°C ; $\pm .01\%$ from -20°C to $+71^{\circ}\text{C}$
 Non-operating: -62°C to $+125^{\circ}\text{C}$. Better accuracies are
 available

Altitude: Mfr. claims unlimited as case hermetically
 sealed

Shock: Incident to normal handling

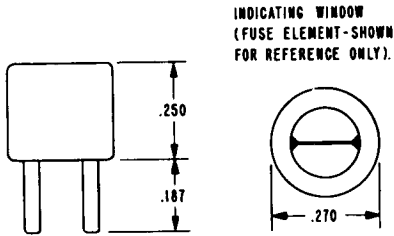
Acceleration: Non-operating Ambient 25 g's any axis
 (See graph)

Vibration: Will operate at 5g or double amplitude equivalent
 from 2 to 65 cps ambient without loss of accuracy



Remarks: This tuning fork can be used for printed circuit applications.

F101
FUSE, MINIATURE, PLUG-IN TYPE, STYLE FM01



Quality Assurance: Per specification MIL-F-23419/1.
 Preferred part per MIL-STD-242E.

Mfr: QPL Vendors MIL-F-23419.

Electrical Characteristics

Current Ratings: 1/100, 1/200, 1/64, 1/32, 1/16, 1/10, 1/8, 2/10, 1/4, 3/10, 4/10, 1/2, 6/10, 3/4, 1, 1-1/2, 2, 3, 4, 5 amps.

Short Cir. Interrupting Rating (28VDC): All 10,000 amps.
 Short Cir. Interrupting Rating (125VDC): Pt. No. M23419/1-001 through M23419/1-006, 3000 amps; M23419/1-007 through M23419/1-012, 1000 amps; M23419/1-013 through M23419/1-020, 300 amps.

Overload Blowing Time (Seconds): See chart.

Part No.	200% (nom.)	300% (nom.)
M23419/1-001	.005-.0008	.0005-.0001
M23419/1-002	.002-.0004	.0005-.0001
M23419/1-003	.001-.0005	.0005-.0001
M23419/1-004	.006-.001	.001-.0003
M23419/1-005	.050-.010	.010-.003
M23419/1-006	.040-.010	.010-.004
M23419/1-007	.050-.010	.012-.004
M23419/1-008	.055-.014	.012-.005
M23419/1-009	.040-.014	.012-.005
M23419/1-010	.037-.013	.012-.005
M23419/1-011	.042-.015	.014-.005
M23419/1-012	.035-.015	.015-.005
M23419/1-013	.090-.020	.018-.008
M23419/1-014	.090-.020	.018-.008
M23419/1-015	.050-.018	.018-.008
M23419/1-016	.050-.020	.020-.008
M23419/1-017	.060-.020	.020-.010
M23419/1-018	.110-.025	.023-.010
M23419/1-019	.300-.040	.033-.015
M23419/1-020	.300-.040	.033-.015

Current Capacity: 100% at Oper. Tem.

Physical Characteristics

Case Material: Ceramic

Construction: Transparent window provides visual indication.

Terminals: Two brass, .187" long, .041" dia. (nom.) on .147" (nom.) centers.

Terminal Finish: 1/100 to 1/32 amp, tin plated; 1/16 to 5 amp, silver plated.

Terminal Strength: 10 lb. force along term. axis; 20 lb. force perpendicular to term. axis.

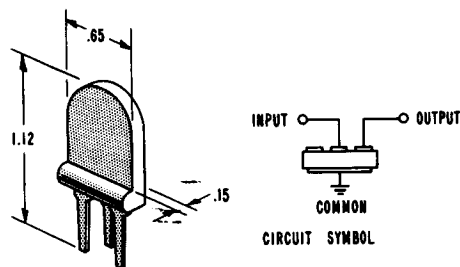
Environmental Conditions

Oper Temp: -55°C to +125°C.

Remarks: Refer to XF101 for applicable fuseholder.

FL 101 TRANSFILTER, CERAMIC, TYPE TO-01

Application: Designed to replace transformer, inductive and capacitive elements used in frequency selective circuits such as i-f stages of radio receivers, discriminators, etc. With appropriate circuit design, it is an excellent interstage coupler/filter for transistor amplifier stages.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Clevite Corp., Bedford, Ohio

Electrical Characteristics

Resonant Freq-Input-Output Capacitance:

TO-01A-455KC-300 pf-1500 pf

TO-01B-465KC-300 pf-1500 pf

TO-01D-470KC-300 pf-1500 pf

TO-01C-500KC-225 pf-1225 pf

Resonant Freq Tolerance: ± 2 KC at 27°C.

Bandwidth: 4 to 7% at 6 db.

Capacitance Tolerance: Input $\pm 15\%$; output $\pm 10\%$

Impedance: Input 1500 ohms, nom; output 300 ohms, nom.

Power Insertion Loss: 2 db max. at 455KC.

Frequency Stability: With time-within $+0.2\%$ for 5 years;
with temperature - total variation less than 0.2% from -20°C
to $+60^\circ\text{C}$.

Physical Characteristics

Construction: A single piezoelectric ceramic fixed-tuned resonator.

Terminals: Three - high impedance input, low impedance output and common.

Terminal Length: 0.37".

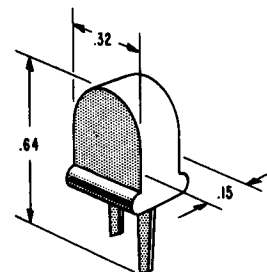
Terminal Width (Typ): Tapered - 0.047" to 0.062".

Terminal Thickness: 0.008".

Remarks: This piezoelectric disc vibrates at the first overtone of its fundamental radial mode. It forms a four-terminal network with a high-impedance and a low-impedance pair of electrodes.

FL 102 TRANSFILTERS, TYPE TF-01

Application: Designed to replace an emitter by-pass capacitor in an i-f stage of a radio receiver. It can also be used in oscillators. It improves selectivity and long range reliability, and simplifies circuit alignment procedure.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Clevite Corp., Bedford, Ohio.

Electrical Characteristics

Resonant Freq-Capacitance:

TF-01A-455KC-600 pf

TF-01B-465KC-550 pf

TF-01D-470KC-540 pf

TF-01C-500KC-490 pf

Resonant Freq Tolerance: ± 2 KC at 27°C.

Capacitance Tolerance: $\pm 15\%$.

Impedance Resonant: Less than 15 ohms.

Maximum Voltage: 1 volt at resonance.

Frequency Stability: With time-within $+0.2\%$ for 5 years
with temperature-total variation less than 0.2% from -20°C
to $+60^\circ\text{C}$.

Physical Characteristics

Construction: Time and temperature stable piezoelectric resonator.

Terminals: Two.

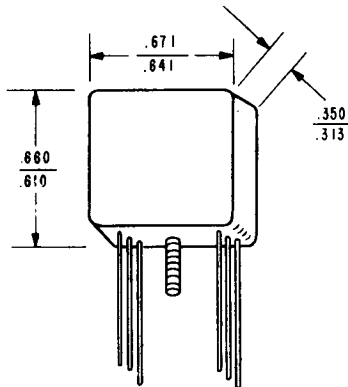
Terminal Length: 0.25".

Terminal Width: Tapered-0.047" to 0.062".

Terminal Thickness: 0.008".

G101
CHOPPER, ELECTROMECHANICAL, SPDT, TYPES
30A AND 40A.

Application: In 6.3 volts, 60 cps (30A) and 400 cps (40A), single phase applications to mechanically modulate information signals with a 60 or 400 cps modified square wave.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Airpax Electronics Inc., Cambridge, Md.

Electrical Characteristics

Drive Volt and Freq: 30A-6.3 volts at 60 cps; 40A-6.3 volts at 400 cps.
 Contact Rating: 10 volts dc at 2 milliamps max current.
 Coil Resistance: 30A-310 ohms; 40A-85 ohms.
 Coil Impedance: 30A-330 ohms; 40A-115 ohms.
 Dissymmetry: 15° max.
 Dwell Time: 30A-155° to 185°; 40A-140° to 185°.
 Transit Time: 30A-2°; 40A-5°.
 Phase Angle: 30A-25° ± 10°; 40A-65° ± 15°.
 Bounce: 4° max.
 Noise: 6 microvolts RMS max. 1 megohm load.
 Life: 2,000 hrs min.

Physical Characteristics

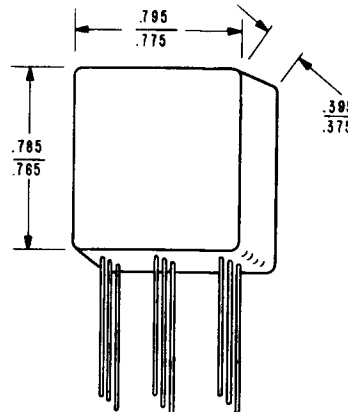
Weight: 9 grams
 Volume: 0.151 cu. in.
 Enclosure: Hermetically sealed.
 Header: Six 1.5 in. terminal leads
 Mounting: Stud mounting
 Contact Action: SPDT, BBM

Environmental Conditions

Temp Range: -65°C to +100°C
 Vibration: 15G, 55 to 2500 cps.
 Shock: 100G

G102
CHOPPER, ELECTROMECHANICAL, DPDT, TYPES
60 AND 80

Application: Ideally suited to synchronous modulator-demodulator functions, stabilized DC instrument amplifiers and co-channel applications.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Airpax Electronics Inc., Cambridge, Mass.

Electrical Characteristics

Drive Volt and Freq: 60-6.3 volts at 400 cps; 80-6.3 volts at 60 cps.
 Contact Rating: 10 volts dc at 1 milliamp max current.
 Coil Resistance: 85 ohms.
 Coil Impedance: 60-140 ohms; 80-100 ohms
 Dissymmetry: 20° max.
 Dwell Time: 60-140° to 185°; 80-150° to 185°.
 Transit Time: 60-5°; 80-2°.
 Phase Angle: 60-65° ± 15°; 80-25° ± 12°
 Bounce: 4° max
 Noise: 3 microvolts RMS max. 100 ohm load.
 Life: 1000 hrs. min.

Physical Characteristics

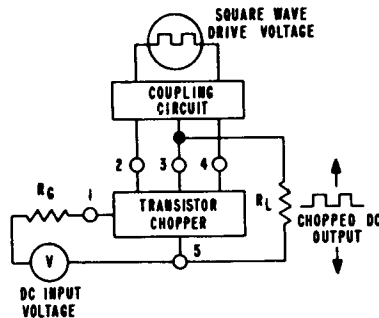
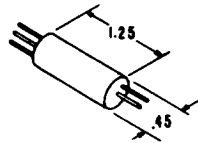
Weight: 15 grams.
 Volume: 0.232 cu. in.
 Enclosure: Hermetically sealed.
 Header: Eight 1.5 in. terminal leads.
 Mounting: Staked pin
 Contact Action: DPDT, BBM

Environmental Conditions

Temp Range: -65°C to +100°C
 Vibration: 10G, 55 to 2000 cps
 Shock: 30G

G201 CHOPPER, SOLID STATE, MODEL 50

Application: Low-level commutators for telemetering Digital meters and portable equipment. Thermocouple instrumentation. Replace less sensitive diode modulators. Chopper (modulator) demodulator. Low-level voltage measurement.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Solid State Electronics Corp., Sepulveda, Calif.

Electrical Characteristics

Driving Voltage: Square wave, 1 to 10 volts peak to peak.
Input Voltage: Dynamic range from fraction of a millivolt to more than 2 volts.
Output Voltage: Equals input voltage.
Load Resistance: R_L greater than $10 R_g$.
Driving Source Resistance: 600 ohms.
Driving Input Resistance: 600 ohms.
Electrical Circuit: See illustration.
Chopping (Driving) Freq: D-C to 100 kc or higher.
Source Resistance: R_g less than 10 ohms for min noise.
Contact Bounce: Not subject to contact bounce.

Physical Characteristics

Weight: 3 ounces.
Encapsulation: Solid embedment in epoxy resin.
Circuit Board Configurations: On request.
Connections: No. 1, d-c input; No. 2 and 4, drive voltage;
No. 3, chopped output; No. 5, common for input and output.

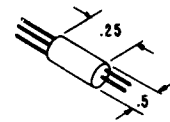
Environmental Conditions

Max Oper Temp: 80° C.
Acceleration: 700 G's.
Vibration: 30 G's at frequencies of 0 to 2000 cps.
Shock: 500 G's for 11 milliseconds.
Oper Temp Range: -40° C to 80° C.

Remarks: Chopper contains two matched transistors. Matched miniature transformer 1/2" x 7/16" x 7/16" can be supplied, if desired, for additional chopper applications.

G202 CHOPPER, SOLID STATE ELECTRONIC, MODEL 60

Application: Chopper (modulator) or demodulator. Low-level voltage measurements. D-C amplifier stabilization and high-speed servos. Replace less sensitive diode modulators. Thermocouple instrumentation. Low-level commutators for telemetering. Carrier for low-frequency signals. Digital meters and portable equipment. Low power source and minimum maintenance equipment.

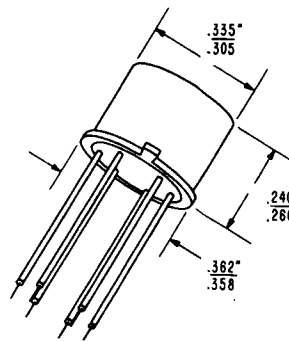
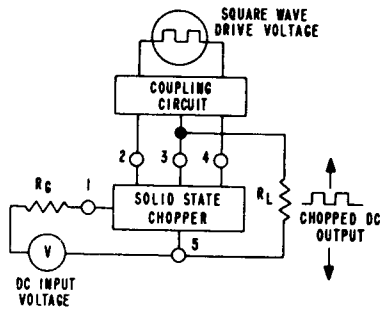


Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Solid State Electronics Corp., Sepulveda, Calif.

Electrical Characteristics

Driving Voltage: Square wave, 1 to 10 volts peak to peak.
Input Voltage: Dynamic range from a fraction of a millivolt to more than 5 volts.
Output Voltage: Equals chopped input voltage.
Input Resistance: Approx $2R_L$.
Output Resistance: Approx $2R_g$.
Load Resistance: R_L greater than $10 R_g$.
Driving Source Resistance: 600 ohms.
Driving Input Resistance: 600 ohms.
Electrical Circuit:



Dynamic Range: Input, fraction of a millivolt to more than 5 volts.

Noise: See illustration for combinations. Approx 100 microvolts or less.

Chopping (Driving) Freq: D-C to 100 kc or higher.

D-C to Max K-C Drive: DC to 100 kc.

Source Resistance: R_g less than 100 ohms for min noise.

Contact Bounce: Not subject to bounce.

Physical Characteristics

Weight: 1 gram.

Volume of Unit: Less than 1/10 of a cubic inch.

Finish: Black.

Encapsulation: Solid embedment in epoxy resin.

Circuit Board Configuration: Upon request.

Environmental Conditions

Max Oper Temp: 80° C.

Oper Temp Range: -40° C to 80° C.

Shock: 5000 G's.

Vibration: 100 G's at frequency of 0 to 2000 cps.

Acceleration: 10,000 G's.

G203 CHOPPER, SOLID STATE, SILICON MICROCHOPPER, MODEL 5

Application: Designed to alternately connect and disconnect a load from a signal source. It may also be used as a synchronous demodulator to convert a.c. signals to d.c. Their immunity to the effects of shock and vibration allow their utilization in military, space vehicle and portable applications; where elimination of maintenance is a necessity.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Solid State Electronics Co., Sepulveda, California

Electrical Characteristics

Driving Voltage: Square wave -5 to 25 volts peak-to-peak

Driving Source Resistance: 600 ohms

Driving Input Resistance: 600 ohms

Input Voltage: Dynamic range from fraction of a millivolt to ± 5 volts

Source Resistance: R_g less than 100 ohms for min noise

High impedance circuits require filtering to minimize electrostatic noise pickup

Input R: Approx R_L

Output Voltage: Equals chopped input voltage

Output R: Approx R_g

Load R: R_L should be greater than 100 ohms for best operation.

Signal Current: 10 ma, max

Linearity: Less than $\pm 0.5\%$ deviation from best straight line

Chopping (Driving) Frequency: D.C. to 100 KC per sec or higher

Unfiltered Output Noise: Approx 100 μ volts, rms for following combinations of max values for R_g and R_L in ohms.

R_g	.1K	.5K	.6K	.8K	1M	Open
R_L	open	100K	10K	1K	.1K	.01K

Mechanical Characteristics

Dimensions: TO-5 outline. Manufacturer states chopper is contamination free due to controlled methods of manufacturer and hermetic sealing.

Weight: Approx 1 gram

Enclosure: Metal case, glass header

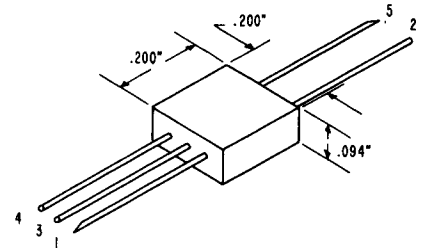
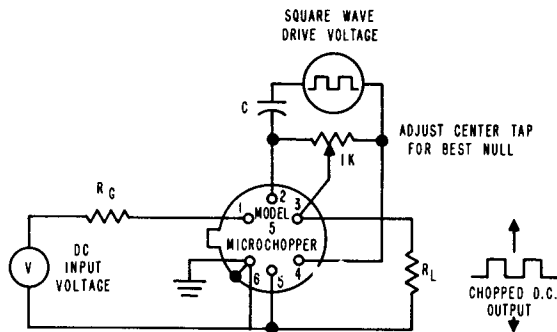
Mounting: Unrestricted direction

Connections: (See test circuit diagram)

1. D.C. input

3. Chopped output

- 2. and 4 Drive voltage
 - 5. Common for input and output
 - 6. Connected to case ground
- (Connect to system ground for electrostatic shielding.)



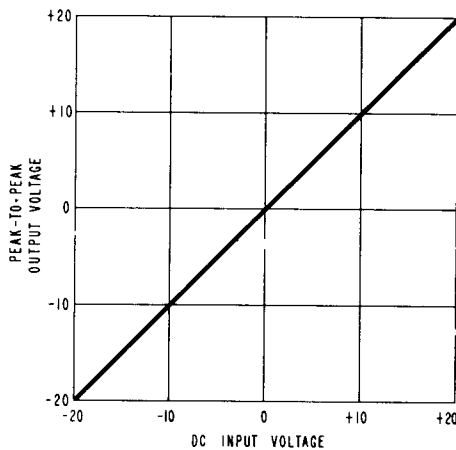
Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Solid State Electronics Co., Sepulveda, California

Electrical Characteristics

- Driving Voltage: Square wave -5 to 25 volts, peak-to-peak
- Driving Source Resistance: 600 ohms
- Driving Input Resistance: 600 ohms
- Input Voltage: Dynamic range from $\pm 20 \mu$ volts to ± 20 volts
- Source Resistance: Rg less than 100 ohms for min noise. High impedance ckts require filtering to minimize electrostatic noise pickup.
- Input Res: Approx RL
- Output Voltage: Equals chopped input voltage
- Output Res: Approx Rg
- Load Res: RL should be greater than 100 ohms for best operation.
- Signal Current: 10 milliamp, max
- Linearity: Less than $\pm 0.5\%$ deviation from best straight line
- Chopping (Driving) Frequency: D.C. to 100 KCS per sec or higher
- Unfiltered Output Noise: Approx 100μ volts, rms for the following combinations of max values for Rg and RL in ohms:

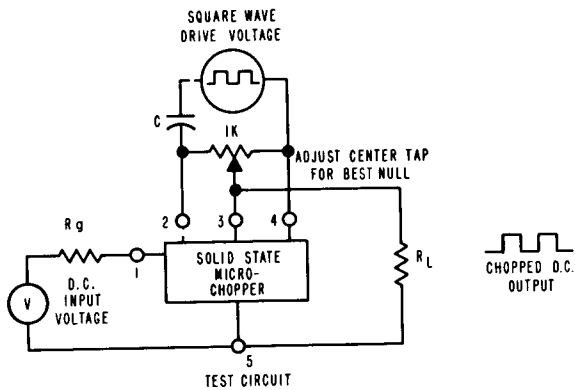
Rg	.1K	.5K	.6K	.8K	1M	Open
RL	Open	100K	10K	1K	.1K	.01K



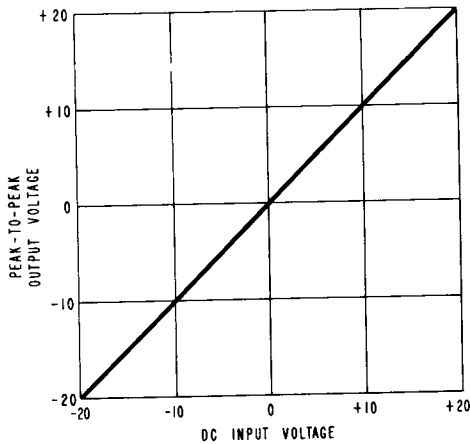
Environmental Conditions

- Oper Temp: -55°C to $\pm 150^{\circ}\text{C}$
- Output Temp Coef: Nominal 5μ volts, rms/ $^{\circ}\text{C}$ at 5 millivolts, rms, 400 cps output signal

Remarks: The silicon Microchopper has an inherently long life and is not subject to contact bounce, wear, pitting or burning.

**Environmental Conditions**Oper Temp: -55°C to $+150^{\circ}\text{C}$ Output Temp Coef: Nominal 5μ volts, rms, $^{\circ}\text{C}$ at 5 millivolts rms, 400 cps output signal

Remarks: This unit is practically immune to the effects of shock and vibration, the manufacturer states, thereby recommending its usage in military, space vehicle and portable applications.

**Physical Characteristics**

Weight: .5 gram, nom

Enclosure: Solid embedment in epoxy resin

Connections (See Circuit Figure 2):

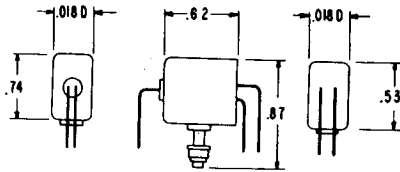
1. D.C. input
3. Chopped output
2. and 4. Drive voltage
5. Common for input and output

Leads: Gold-plated Kovar; .004" max x .020" max, dia

Interconnections (Note): Solder, resistance or ultrasonic welding can be utilized. Apply thermal shunt (cool tweezers or self holding hemostat) if possible, between joining point and transistor. Use small tip soldering iron, 25 to 50 watts (200°C to 250°C) for less than 5 seconds (solder: 60% tin, 40% lead)

Lead Length: .500"

G301
CHOPPER, PRINTED CIRCUIT, MICRO-MINIATURE,
DC-AC TYPE 20



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

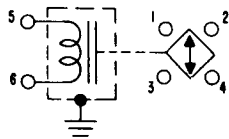
Mfr: Rawco Instruments, Inc., Fort Worth, Texas.

Electrical Characteristics

Driving Voltage: 6.3 volts rms at 400 cps \pm 10% voltage
 \pm 5% freq variation included in phase-angle tolerance.

Coil Resistance: 250 ohms.

Electric Circuit:



Life: Over 2000 hours at rated load.

Noise: Less than 10 microvolts rms across a 1-megohm resistor possible; never greater than 100 microvolts rms.

Dwell Time: Moving contact shorts two each of the four fixed contacts 135° (elect.) with a dwell dissymmetry of less than 10° (elect.).

Insulation Resistance: 100 megohms min between terminals and ground.

Contact Rating: For dry circuit, 10 volts at 1 ma resistive.

Contact Bounce: If present, less than 4° (elect.) per period.

Phase Angle: 55° \pm 15°.

Physical Characteristics

Weight: 1/4 ounce.

Case: Steel with resistance-welded stainless mounting screw, nickel plated inside out.

Finish: Gray epoxy.

Mounting: May be mounted directly to either circuit board or chassis in any position.

Circuit Board Configuration: Upon request.

Sealing: Hermetically sealed.

Terminals: See illustration.

Screws: Stainless steel mounting type.

Thread Type: 2-56.

Environmental Conditions

Max Oper Temp: 125° C.

Above Sea-Level Breakdown Test: Unaffected to 50,000 feet.

Humidity: Hermetically sealed for 100% relative humidity.

Salt Spray: Will withstand 50-hour test.

Oper Temp Range: -65° C to 125° C.

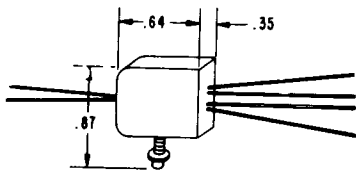
Shock: 50 G's in any direction.

Vibration: Less than 10 electrical degrees of contact derangement when operating with sinusoidal vibrations from 10 to 2500 cps up to 15 G's in any direction.

Remarks: Electrical input and output specifications can be obtained from the manufacturer.

G401 CHOPPER, DC - AC MICROMINIATURE, TYPE 40

Application: Designed for military applications



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Rawco Instruments Inc., Fort Worth 7, Texas

Electrical Characteristics

Coil Resistance: 250 ohms dc

Contact Rating: For dry circuit up to 10 volts, 1 ma resistive

Drive Voltage: 6.3 volts, rms at 400 cycle \pm 10% voltage and \pm 5 % frequency variation included in phase angle tolerance

Dwell Time: Moving contact shorts two each of the four fixed contacts 150 electrical degrees (min) with a dwell dissymmetry of less than 10 electrical degrees

Contact Bounce: If present, less than 4 electrical degrees per period

Phase Angle: $45^\circ \pm 15^\circ$

Insulation Resistance: 100 megohms min between all terminals and ground

Contact Make Noise: Less than 10 micro-volts, rms across 1 megohm, less than 1 micro-volt when selected

Mechanical Characteristics

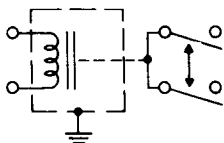
Terminals: Input terminals 1.60" long, output terminals .70" long

Life: Over 200 hr at rated load

Mounting: Can be mounted directly to either circuit board or chassis in any position

Case: Steel with resistance welded stainless mounting screw, nickel plated inside and outside

Case Finish: Gray epoxy



Environmental Conditions

Salt Spray: Case finish withstands 50 hr test

Temp: -65° to greater than $+125^\circ\text{C}$

Vibration: Less than 10 electrical degrees of contact derangement when operating with sinusoidal vibrations from 10 to 2500 cps up to 20g in any direction

Shock: 50g, in any direction without damage

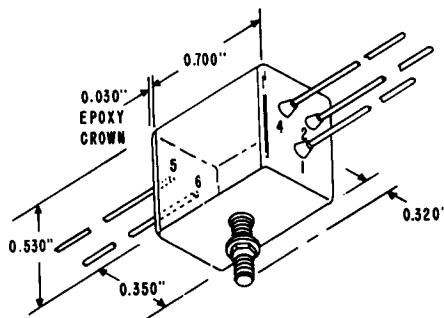
Humidity: Hermetically sealed for 100% R.H.

Altitude: Unaffected by altitude up to 70,000 feet

Remarks: The switching arrangement may be used for conventional S.P.D.T. switching by connecting terminals 1 and 3 or 2 and 4, for use as the pole.

G402 CHOPPER, SOLID STATE TRANSISTOR CHOPPER, TYPE 100A, SPDT

Application: Designed for use in electronic equipments where a chopper featuring a noise balancing circuit is a prime requisite, to establish efficient operation of the unit.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use

Mfr: Rawco, Instruments Inc., Fort Worth 11, Texas

Electrical Characteristics

Drive Voltage: 6.3 ± 0.7 volts (RMS) For 400 cps sine wave.

For square wave and other frequencies see curve.

Drive Frequency: 250 to 100K cps

Drive Coil Resistance: $1500 \pm 10\%$ ohms, dc

Drive Coil Impedance: 2300 ohms at 400 cps

Switch On Resistance: 38 ohms, dc

Switch Off Resistance: 2500 Megohms at 25°C

Switch Off Resistance: 100 Megohms at 125°C

Dwell Time: 175° Nom, 145° min

Phase Angle: $30^\circ \pm 10^\circ$ Phase lead

Signal Input Rating: ± 10 volts, dc, 2 ma

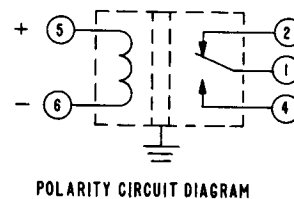
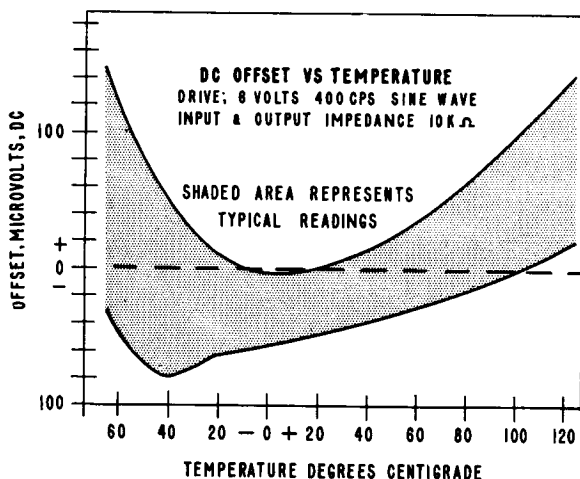
Signal Linearity: $\pm 0.5\%$ to 0.5 volts

Noise at 400 CPS: 20 to 150 μ volts, rms at 10,000 ohms impedance. 2 cps to 180 KC band width
 D.C. Off Set: 50 μ volts at 25°C
 Drift: See Offset vs Temp Curve (Figure 1)

Test Data

Life: Nominal oper life at 10,000 hrs
 Shock: 100 g's in any plane
 Vibration: 50 g's, 10—2,000 cps

Remarks: The Type 100 chopper without phase shift network has a 150° phase lag with one drive polarity or in effect a 30° phase lead with the opposite polarity which is shown in the Polarity Circuit Diagram.



POLARITY CIRCUIT DIAGRAM

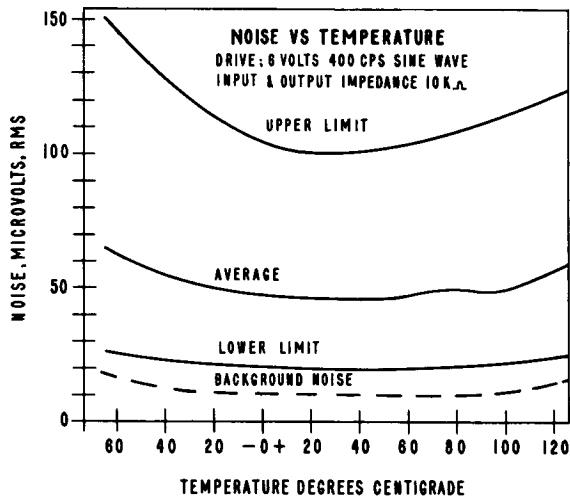
This chopper's noise balancing circuit virtually eliminates the transistor switching spikes and balances DC offset.

Physical Characteristics

Construction: Cadmium plated, irridited steel casement
 Potting: High temp epoxy
 Mounting Stud: Stainless steel, size 2-56 with locknut and washer
 Switching Arrangement: SPDT
 Weight: 8 gms
 Finish: Gray epoxy enamel
 Terminals: Five, numbered case, length 1-1/2'' min

Environmental Conditions

Oper Temp Range: 65°C to 125°C
 Humidity: 95% Relative humidity for 24 hrs



H101 KNOB, CONTROL, ROUND TYPE MS91528-0D1B

Application: For use on electronic equipment, where ruggedness and good appearance are essentials.

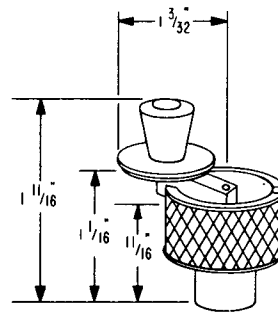
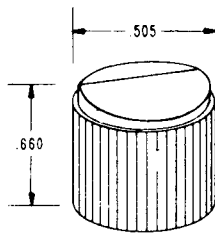


FIG. 1

Quality Assurance: Per MS91528 Preferred part per MIL-STD-242E

Mfr: Procurement document MIL-K-3926

Physical Characteristics

Shaft Hole: 1/8" dia.

Bushing: Aluminum

Set Screw Size: 4-40, UNC, 3A (2) 90° apart

Finish: Lusterless #37038 per Fed. Std. 595

Construction: Round, knurled grip area, 10 to 15 ribs per inch

Color: Black

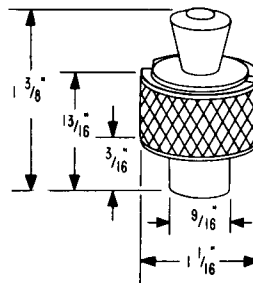


FIG. 2

Environmental Conditions

Humidity: Moisture Resistance, no cracking, swelling, distortion, movement of insert, nor other failure after tested

Oper Temp: -65° ± 2°C to 85°C ± 2°C

Salt Spray: No corrosion shown when set screws were turned with normal torque, shaft was readily inserted into shaft hole

Torque: 25 lb-in.

Remarks: Knobs herein, manufactured in full compliance with MS91528 and MIL-STD-242.

H102 KNOB, CONTROL, CRANK-SELF-CENTER-STOWING, MRL MODEL 101

Application: Designed for use in all low torque, mechanical applications. The center stowing feature has particular value where the facility of a crank knob is desirable but space for one is limited.

Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Missouri Research Laboratories, Inc., St. Louis 3, Missouri

Physical Characteristics

Mounting: Nominal 1/4" dia shaft, other sizes on request

Bushing Material: Aluminum

Set Screw Material: Stainless steel

Set Screw Size: 4-40

Number of Set Screws: 2

Knob Finish: Black, anodize

Construction: Because the crank in the extended position (see figure 1) is some distance from the panel and fuses, lights or switches may be mounted very close to the knob in the unextended position.

Knob Base: Has fine knurl for sure grip

Mechanical Characteristics

Torque: In excess of 50 lb, in.

Control Feature: Knob can be used with its crank in extended position or in its stowed position

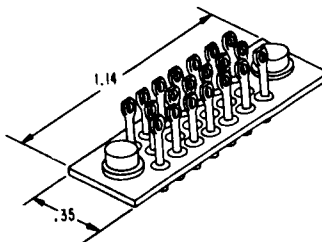
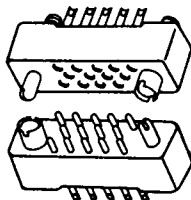
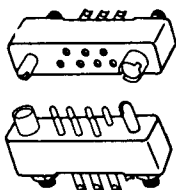
Environmental Conditions

Manufacturer states the Model 101 designed to meet MIL-E-5272C

Remarks: Mechanically, the knob provides facility for both rapid changes requiring many rotations, while retaining its finger-tip control for precise adjustments of only a partial turn.

103

J101
CONNECTOR, RECTANGULAR MICROMINIATURE,
SERIES MM-22



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Continental Connector Corp., Long Island City, N. Y.

Electrical Characteristics

High Potential: Voltage breakdown is 1800 volts rms at sea level, and 450 volts at 60,000 feet.

Physical Characteristics

Insulating Material: Diallyl phthalate, glass filled per MIL-M-19833, Type GDI-30; Melamine, mineral filled per MIL-M-14E, Type MME; Plaskon Alkyd, glass reinforced per MIL-M-14E, Type MAI-60; Orlon filled, diallyl phthalate per MIL-P-4389.

Contact Data: Available with 5, 7, 9, 11, 14, 18, 20, 26, 29, 34 or 44 contacts

Pin and Socket Contacts: Phosphor bronze, gold plated over silver.

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Burndy Escon Inc., Norwalk, Conn.

Electrical Characteristics

Current Rating: 3 amps
 Dielectric Withstanding Voltage: EHMMA-800 volts, a.c.;
 EHMMB-900 volts, ac.

Physical Characteristics

No. of Contacts: 5, 7, 9, 11, 14, 20, 26, 29, 34 or 44 pins available

Contact Terminations: Flattened and pierced, or feed-thru type

Contact Diameter: EHMMA-0.030"; EHMMB-0.025"

Contact Material: Nickel alloy or cold rolled steel

Contact Finish: Gold plate, 0.000050 gold, min over 0.0002 nickel, min

Wire Accommodation: No. 22 AWG

Insulation Material: Glass (compression seal)

Body Material: Cold rolled steel

Body Finish: Gold plate

Polarization: Threaded screwlock pin and socket, or plain guide pin and socket

Environmental Conditions

Max Operating Temp: 500°F.

Leakage Rate: Less than .1 micron per cubic foot per hour at a pressure differential of 1 atmosphere

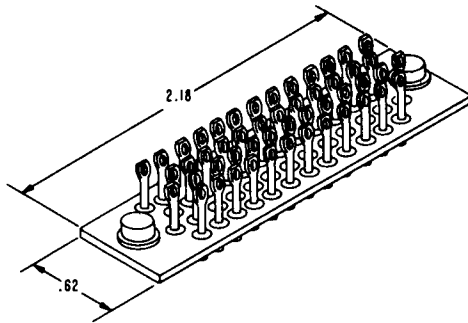
Remarks: Mates with std microminiature connectors employing socket contacts

J102
CONNECTOR, RECTANGULAR, HERMETIC, MICRO-
MINIATURE, TYPE EHMM

Application: Requirements for a very small hermetic connector designed to comply with MIL-C-8384

J103
CONNECTOR, RECTANGULAR HERMETIC, SUB-
MINIATURE, TYPE EHSM

Application: Requirements for a small hermetic connector designed to comply with MIL-C-8384



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Burndy/Escon, Inc., Norwalk, Conn.

Electrical Characteristics

Current Rating: 5 amps
Dielectric Withstanding Voltage: 1600 volts, ac, rms

Physical Characteristics

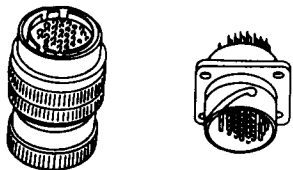
No. of Contacts: 5, 7, 11, 14, 20, 26, 29, 34, 42 or 50 pins available
Contact Diameter: 0.040"
Contact terminations: Solder pot, flattened and pierced types available
Contact Material: Nickel alloy or cold rolled steel
Contact Finish: Gold plate, .000050 gold min over .0002 nickel min
Wire Accommodation: No. 20 AWG
Insulation Material: Glass (compression seal)
Body Material: Cold rolled steel
Body Finish: Gold plate
Polarization: Threaded screwlock pin and socket, or plain guide pin and socket

Environmental Conditions

Max Operating Temp: 700°F
Leakage Rate: Less than .1 micron per cubic foot per hour at a pressure differential of 1 atmosphere

Remarks: Mates with std subminiature connectors employing socket contacts

J201
CONNECTOR, "AN" TYPE, MINNE E



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Amphenol Electronics Corp., Chicago, Illinois

Electrical Characteristics

Current Rating: No. 20 AWG, 7.5 amperes; No. 16 AWG, 17.0 amperes.

High Potential: Sealed connectors will withstand 1500 volts rms, ac, at 70,000 feet.

Resistance of Contacts: MIL-C-5015.

Physical Characteristics

Durability: MIL-C-5015.

Mounting Data: Connectors are circular; plugs are panel-mounted cable receptacles.

Insulating Material: Hard insert dielectric; resilient face seal.

Physical Shock: MIL-S-901.

Coupling Method: Spring-loaded coupling ring, full

Contact Data: Uses a copper alloy hood to restrict possibility of test-produced damage.

Engagement: MIL-C-5015.

Wire Size: No. 16 and 20 AWG.

Environmental Conditions

Max Oper Temp: +155° C.

Temp Cycling: -67° F to 257° F.

Pressure Test: See Pressure Differential.

Moisture Resistance: Exceeds normal military requirements.

Humidity: See Moisture Resistance.

Corrosion: MIL-STD-202, Method 10, Condition B.

Test Data

Temp Range: -55° C to 125° C.

Shock: MIL-S-901.

Vibration: 20 G's at 16 to 2000 cps per MIL-STD-202, Method 20A.

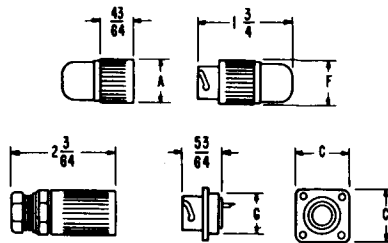
Dielect Strength: MIL-C-5015.

Pressure Differential: Connectors are pressurized units.

Resistance to Arc: MIL-C-5015.

Air Leakage: With a pressure differential of 30 lb per square inch the air leakage will not exceed 1 cubic inch per hour.

J202
CONNECTOR, "AN" TYPE, SERIES 165



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Amphenol Electronics Corp., Chicago, Illinois

Electrical Characteristics

High Potential: MIL-C-19572.

Flash-over DC Max: MIL-C-19572.

Resistance of Contacts: MIL-C-19572.

Physical Characteristics

Size	A	B	C	D	E	F	G
Small	57/64	3/8	1 1/16	25/32	25/64	7/8	13/16
Large	1 9/64	21/32	1 5/16	31/32	31/64	1 1/8	1 1/16

Weight: Average is about 1/3 weight of standard AN connector.

Durability: MIL-C-19572.

Insulating Material: Resilient inserts meet requirements of MIL-R-3065.

Physical Shock: MIL-C-19572.

Coupling Method: Bayonet lock.

Contact Data: Contacts are bronze, gold plated over silver.

Insert Assem: O Ring seal.

Insert Material: Diallyl phthalate meets requirements of MIL-M-14.

Engagement: MIL-C-19572.

Environmental Conditions

Max Oper Temp: +125° C.

Temp Cycling: Meets requirements of MIL-C-19572.

Pressure Test: MIL-C-19572.

Water Test: MIL-C-19572.

Moisture Resistance: MIL-C-19572.

Humidity: MIL-C-19572.

Corrosion: MIL-C-19572.

Potting Construction: Meets MIL specifications.

Fire Proofing: Yes.

Test Data

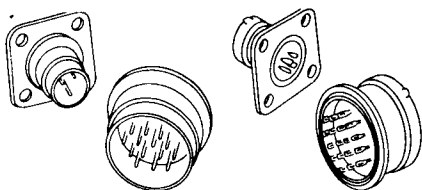
Temp Range: -65° C to 125° C.

Shock: MIL-C-19572.

Vibration: MIL-C-19572.
 Dielect Strength: MIL-C-19572.
 Resistance to Arc: MIL-C-19572.
 Air Leakage: MIL-C-19572.
 Inner Contact-Outer Shell Volts Test: MIL-C-19572.

Remarks: Unit has a built-in cable clamp.

**J203
 CONNECTOR, "AN" RECEPTACLE,
 SERIES DM5600 AND DM5606**



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Deutsch Co., Los Angeles, California

Electrical Characteristics

Voltage Rating: 7.5 amperes at 2 volts, ac. Rating meets requirements of MIL-C-5015, Service A voltage rating.

Current Rating: 7.5 amperes at 2 volts, ac. Rating meets requirements of MIL-C-5015, Service A voltage rating.

High Potential: Over 2000 volts.

Physical Characteristics

Durability: 500 cycles of engagement.

Insulating Material: Compression glass sealed, hard glass insulation.

Physical Shock: Will withstand up to 100 G's.

Coupling Method: Steel shell, cadmium plated for quick disconnection.

Contact Data: 3, 7, 12, 19, 27, and 37-pin shells.

Recessed or extra long eyelets.

Environmental Conditions

Max Oper Temp: 275° F.

Temp Cycling: Will withstand a thermal shock from —166° F to 500° F extreme temperatures to 1000° F.

Pressure Test: Will withstand up to 1000 pounds per square inch.

Test Data

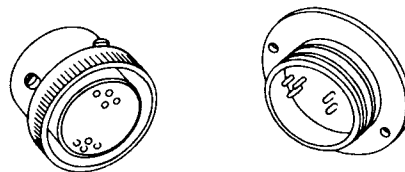
Temp Range: —67° F to 257° F.

Shock: 100 G's.

Air Leakage: Less than 1 micron cubic foot per hour.
 Meets requirements of MIL-C-5015.

Remarks: Units available with standard or square flange units mate with DM6502 rack and panel plugs. DM9605 and DM9605B dust caps can be used on these receptacles.

**J204
 CONNECTOR, "AN" TYPE K**



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Cannon Electric Co., Los Angeles, California.

Electrical Characteristics

Voltage Rating: Will withstand 3 times the rated voltage.

Current Rating: Will withstand 10 times the rated current.

High Potential: MIL-C-5015.

Flash-over DC, Max: 3400 volts.

Resistances of Contacts: MIL-C-5015B.

Physical Characteristics

Size: 0.833" to 1.250" diameter.

Durability: MIL-C-5015.

Insulating Material: Type K, zytel diall.; type KH, glass, high current melamine.

Physical Shock: MIL-C-5015.

Coupling Method: Coupling nut.

Contact Data: Type K uses a copper alloy and is gold plated. Type KH is steel, with tin plate over cadmium.

Thread Type: Acme threaded coupling nut.

End Bell Variations: Straight junction shell, 45° junction shell, or 90° junction shell.

Engagement: 1 to 8 oz.

Environmental Conditions

Max Oper Temp: Type K, 310°F; type KH 500°F.

Temp Cycling: MIL-C-5015.

Pressure Test: Prevents leakage of not more than 1 cubic inch of air per hour when subjected to a pressure differential of 30 lb per square inch.

Moisture Resistance: MIL-C-5015B.

Humidity: MIL-C-5015.

Corrosion: MIL-C-5015.

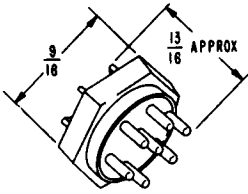
Test Data

Vibration: MIL-C-5015.

Dielect Strength: MIL-C-5015.

Resistance to Arc: MIL-C-5015.

Air Leakage: No leakage in excess of 1 micron cubic foot per hour at a pressure differential of 1 atmosphere.

J205**CONNECTOR, ROUND HERMETIC, MINIATURE, TYPE ERH****Application:** For "black box" and other sealed applications.**Quality Assurance:** Manufacturer's claims

Bureau approval required prior to use

Mfr: Burndy/Escon, Inc., Norwalk, Conn.**Electrical Characteristics**

Current Rating: 5 amps

Dielectric Withstanding Voltage: 2400 volts, ac, rms

Physical Characteristics

No. of Contacts: 5, 7, 9 or 10 pins available

Contact Terminations: Solder pot, flattened and pierced, or double feed types available

Contact Diameter: 0.040"

Contact Material: Nickel alloy or cold rolled steel

Contact Finish: Gold plate, 0.000030 gold, min. over 0.0002 silver, min.

Wire Accommodation: No. 20 AWG

Insulation Material: Glass (compression seal)

Body Material: Cold rolled steel

Body Finish: Gold plate

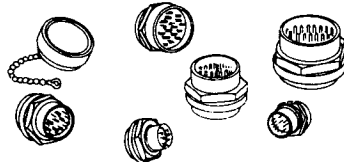
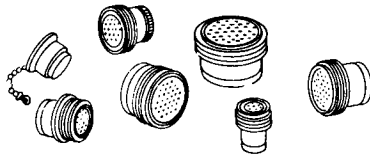
Environmental Conditions

Max Operating Temp: 700°F

Leakage Rate: Less than 0.1 micron cubic foot of helium per hour at a pressure differential of 1 atmosphere

Remarks: Hex shoulder design ensures proper mating with std lock devices

**J301
CONNECTOR, QUICK-DISCONNECT TYPE,
SERIES DM9600**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Deutsch Co., Los Angeles, California.

Electrical Characteristics
High Potential: Over 2000 volts.

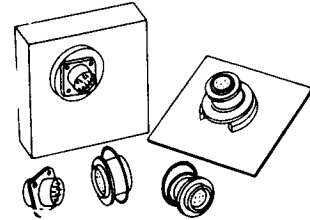
Physical Characteristics
Mounting Data: Jam nut mounting.
Physical Shock: Will withstand 100 G's.
Coupling Method: Quick disconnect, push pull.
Contact Data: Closed entry socket.
Insulating Material: Neoprene inserts.

Environmental Conditions
Max Oper Temp: 275° F.
Humidity: Meets requirements of MIL-C-5015.
Corrosion: Withstands a 50-hour test. Meets requirements of MIL-C-5015.

Test Data
Shock: 100 G's.
Vibration: Exceeds requirements of MIL-E-5272, Procedure II.

Remarks: The DM9601 panel mounting receptacle, which mates with the DM9700 series miniature plugs, is available in 3, 7, 12, 19, 27, 37, and 61-pin or socket arrangements. The DM9606 square flange receptacle, offering the same number of contact arrangements, also mates with the DM9700 series, as well as the DM6502 rack and panel plugs. The same contact arrangement is also available in the DM9608 panel mounting receptacle with cable clamp.

**J302
CONNECTOR, QUICK-DISCONNECT TYPE,
SERIES DM6502**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Deutsch Co., Los Angeles, California.

Electrical Characteristics
Voltage Rating: Meets requirements of the latest revision of MIL-C-5015 for service A voltage rating.
High Potential: Over 2000 volts.

Physical Characteristics
Physical Shock: Will withstand 100 G's.
Coupling Method: Quick disconnect.
Contact Data: Closed entry socket.
Insulating Material: Neoprene inserts.

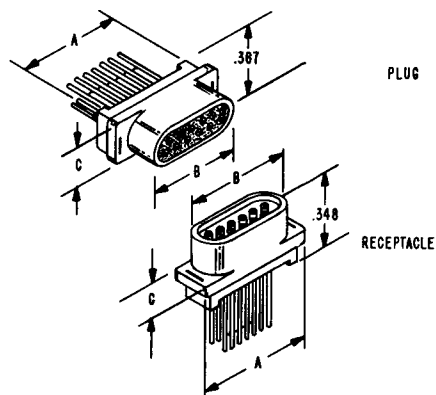
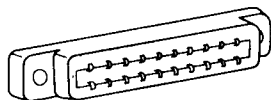
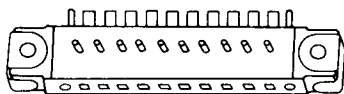
Environmental Conditions
Max Oper Temp: 275° F.
Humidity: Meets requirements of MIL-C-5015.
Corrosion: Will withstand a 50-hour test. Meets requirements of MIL-C-5015.

Test Data
Temp Range: -67° F to 257° F.
Shock: 100 G's.
Vibration: Exceeds requirements of MIL-E-5272, Procedure II.

Remarks: The DM6502 plug mates with DM9606 square flange miniature receptacle in 7, 19, 37, and 61-pin arrangements and with the DM5600 miniature hermetically sealed receptacle in 7, 19, and 37-pin arrangements.

J401
CONNECTOR, PRINTED-CIRCUIT TYPE,
SERIES 133 AND 143

Application: Printed Circuits.



NO. CONT.	PLUG			RECEPTACLE			
	A	B	C	NO. CONT.	A*	B	C*
9	.502	.289	.205	9		.382	
15	.652	.438	.205	15		.512	
21	.802	.588	.205	21		.642	
25	.902	.688	.205	25		.742	
37	1.202	.988	.205	37		1.082	
51	1.152	.838	.248	51		1.012	

* DIM. SAME AS PLUG

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Amphenol Electronics Corp., Chicago, Illinois.

Electrical Characteristics

Test Volts at Sea Level: 5400 volts, dc (flash-over).

Test Volts at 50,000 Ft: 1150 volts, dc (flash-over).

Physical Characteristics

Mounting Data: Will fit any standard 0.055" to 0.073" board. Has two mounting holes 0.142" in diameter.

Insulating Material: Molded body of diallyl phthalate.

Coupling Method: Friction.

Contact Data: Five tail styles of fork-type contacts which are gold flashed over albaloy. Available with 10, 15, 18, and 22 contacts.

Environmental Conditions

Max Oper Temp: +285° F.

Temp Cycling: -80° F to 285° F.

Test Data

Temp Range: -80° F to 285° F.

J402
CONNECTOR, PRINTED-CIRCUIT TYPE, MICRO-D
SERIES

Application: Designed for applications in which an extremely small lightweight plug is required.

Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Cannon Electric Inc., Los Angeles, Calif.

Electrical Characteristics

Current Rating: 3 amps (nominal)

Contact Resistance: 8 millivolt drop (nominal) at 3 amp (.0026 ohms).

Voltage: Minimum flashover voltage (60 cps, rms) at room temp, 1200 volts ac at sea level and 400 volts ac at 70,000 ft.

Physical Characteristics

Body Dielectric: Diallyl phthalate.

Pin Material: Copper alloy with solid copper, gold plated, "pigtail" lead. This lead is constructed of a helically-wound, stress-free cable of spring copper alloy around a reinforcing conductive copper core and terminated with a hemispherical weld.

Mounting Data: Metal panel mounting keys or mounting screw brackets.

Number of Contacts: 9, 15, 21, 25, 37 and 51.

Center/Center Spacing: .050".

Contact Size: .0225" (based on socket bore dia.)

Socket Construction: Closed-entry tubular type, made of gold-plated copper.

Block Construction: Glass filled diallyl phthalate per MIL-M-14F, Type SDG.

Environmental Conditions

Will meet or exceed the applicable requirements of MIL-C-8384B.

Temp Range: -65°F to +300°F.

Test Data

Shock: No damage after twenty 50g shocks.

Vibration: Vibration from 10-2000 cps in 15 min. sweeps at .06 D.A. or $\pm 30g$ (36 sweeps) caused no damage or interruption of electrical continuity in excess of 1 microsecond.

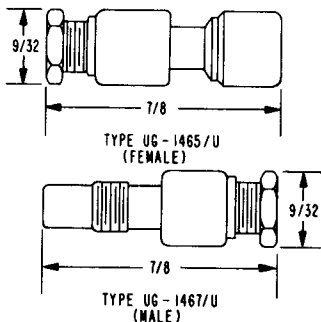
Contact Life: Low initial engagement and separation forces—average 2 ounces per contact; max 4 ounces. After 500 cycles of engagement and disengagement, no appreciable change in contact resistance or engaging and separating force.

Salt Spray: Mated sample subjected to 48 hr salt spray per MIL-STD-202B, Method 101A, Cond B, showed no damage or unacceptable increase in contact resistance.

High Temp: Insulation resistance exceeded 3,000,000 megohms, at 500 volts dc at 200°C for 1/2 hr.

J501**CONNECTOR, PLUG, ELECTRICAL, MINIATURE
(SCREW-ON), TYPE UG-1465/U AND UG-1467/U**

Application: Intended for use in radio frequency applications up to 10,000 mcs. Designed for use with rf cable types RG-188/U and RG-316/U.

**Environmental Conditions**

Corrosion: In accordance with MIL-STD-202, Method 101 (mod).

Thermal Shock: In accordance with MIL-STD-202, Method 107 (mod).

Test Data

Shock: 200 g's

Vibration: In accordance with MIL-STD-202, Method 204.

Remarks: No crimping tools are required to assemble this connector.

Quality Assurance: Per specification MIL-C-22557A.
Bureau approval required prior to use.

Mfr: Microdot, Inc., South Pasadena, Calif.; Sealectro Corp., Mamaroneck, N. Y.; Micon Electronics, Inc., Garden City L. I., N. Y.; Mi-Kro Connector Corp., L. I. City, N. Y.; Applied Engr. Prod. Co., Stamford, Conn.

Electrical Characteristics

Voltage Rating: 500 volts, peak.

Impedance (Nom): 50 ohms.

Frequency Range: 0 to 10,000 mcs.

VSWR: 1.3:1 to 6000 mcs and 1.5:1 to 10,000 mcs.

Contact Resistance (Millivolt Drop): 6 millivolts, max.

Insulation Resistance: 1,000 megohms, min.

Dielectric Withstanding Voltage: 1500 volts rms at sea level, 700 volts rms at 50,000 ft, and 500 volts rms at 70,000 ft. (50% relative humidity and test voltage applied for 1 minute.)

Physical Characteristics

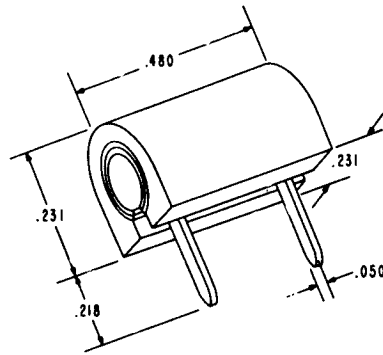
Cable Retention: 25 lb., min.

Mating-Unmating: 500 cycles, min.

Coupling Method: Screw-on, #10-32 UNF-2 threads.

**J601
JACK, TEST, PRINTED CIRCUIT RIGHT ANGLE,
SERIES TJ**

Application: Designed for use with closely spaced printed circuit boards.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Raytheon Co., Industrial Components Division,
Newton 58, Mass.

Electrical Characteristics

Rated Current: 5 amp, max
Oper Voltage: 2000 volts, rms (sea level); 350 volts,
rms (80,000 ft.)
Contact Resistance: Less than 2 milliohms
Capacitance: Less than 10 pf at 1500 kc

Physical Characteristics

Insulator: Polyamide per MIL-P-17091 (Dupont Zytel 101)
Colors: Per MS16108C and MIL-STD-174A (Both based on
Fed. Std. 595)
MODELS

Color	Fed. Std. 595 Designation	Catalog No.
Yellow	13655	TJ-201Y
Brown	10075	TJ-202BR
Red	11105	TJ-203R
Orange	12246	TJ-204OR
Black	17038	TJ-205BL
Green	1. 110	TJ-206GR
Marine Blue	15123	TJ-207MB
White	17875	TJ-208W
Gray	16187	TJ-209G
Violet (purple)	27144	TJ-210V

Contact: Beryllium per QQ-C-533, Condition A
Contact Finish: Underplate of .0002 min, silver per QQ-S-365 Type I or III with .00003 gold overplate
Contact Sleeve: Brass, half hard per QQ-B-613 Composition 2
Contact Sleeve Finish: Same as contact finish
Receptacle Dia: .080"

Mechanical Characteristics

Withdrawal Force: 8 oz, min (.080 ±.001 probe)
Mounting: .300 center to center
Solderability: Per MIL-S-6872

Environmental Conditions

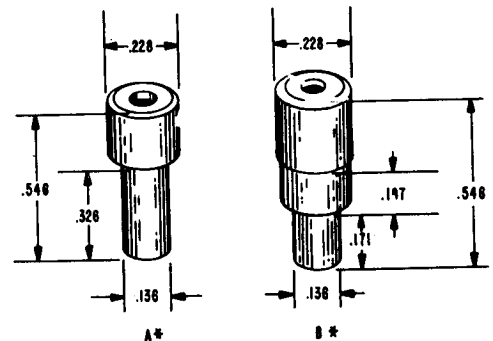
Thermal Shock: MIL-STD-202B, Method 107A, Condition B (-65°C to +125°C)
Salt Spray: MIL-E-5272C, Proc 1 (240 hr)
Humidity: MIL-STD-202B, Method 103A, Condition B, (96 hr)
Fungus: MIL-E-5272C, Proc 1

Remarks: Manufacturer claims that the heavy gold over silver plating applied to all metal surfaces including contact, plating cushions, probe insertion, resists corrosion, offers minimum contact resistance, and forms a solderable base.

Insulation material used in these test jacks conforms to MIL-P-17091 and is classed as self-extinguishing in accordance with Method 2021 of L-P-406b.

**J602
JACK, TEST, PRINTED CIRCUIT**

Application: Designed specifically for convenient checking of printed circuits.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Raytheon Co., Industrial Components Div., Newton 59, Mass.

Electrical Characteristics

Contact Resistance: Less than .0015 ohm at room temp.

Physical Characteristics

Insulator: DuPont Zytel (nylon per MIL-P-17091A).
Contact: Beryllium-copper per QQ-C-533, Cond. A.
Contact Finish: Silver and gold plated per QQ-S-365.
Contact Sleeve: Brass, yellow per QQ-B-626, Comp. 22, half-hard temper.
Contact Sleeve Finish: Silver and gold plated per QQ-S-365.
Receptacle Dia: .080".
Insulator Colors: Natural, yellow, brown, red, orange, black, green, marine blue, white.

Mechanical Characteristics

Mounting: Inserted in hole drilled in circuit board, and then dip-soldered.

Environmental Conditions

Salt Spray: 20% salt spray at 95°F for 50 hr.
Humidity: 95% relative humidity at 40°C for 250 hr.
Temp: -65°C to +85°C.

Remarks: Fig. A--for circuit boards up to 1/4" thick; Fig. B--for circuit boards up to 3/16" thick.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Raytheon Co., Industrial Components Div., Newton 58, Mass.

Electrical Characteristics

Contact Resistance: Less than .0015 ohm at room temp.
Capacitance: 3 mmfd (jack mtd on .052" metal panel).
Voltage Breakdown: Arcing at 10 KVDC (front of jack to panel, mounted on .052" metal panel).

Physical Characteristics

Insulator: DuPont Zytel (nylon per MIL-P-17091B).
Contact: Beryllium-copper per QQ-C-533, Cond. A.
Contact Finish: Silver and gold plated per QQ-S-365.
Contact Sleeve: Brass, yellow per QQ-B-626, Comp. 22, half-hard temper.
Contact Sleeve Finish: Silver and gold plated per QQ-S-365.
Receptacle Dia: .080".
Weight: .002 lb.
Insulator Colors: Natural, yellow, brown, red, orange, black, green, marine blue, white.

Mechanical Characteristics

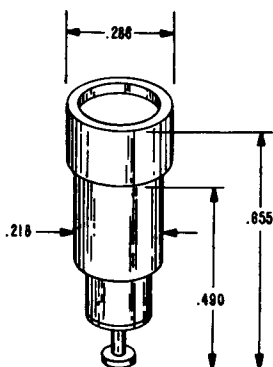
Mounting: Insulator is inserted in hole drilled in panel or chassis and contact assembly is pressed into insulator.
Panel/Chassis Thickness: .031" to .093".

Remarks: MIL.Spec-Army Ordnance Dwg 8644265, BuOrd 8060857, 8060858.

J603

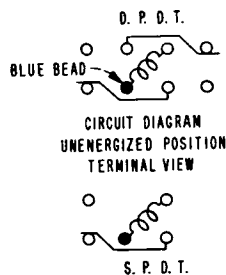
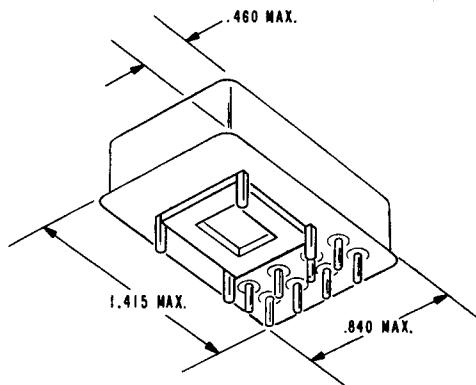
JACK, TEST, SUBMINIATURE FIXED-CONTACT

Application: Suitable for use on standard, miniature, or subminiature electronic equipment.



**K101
RELAY, MICROMINIATURE, PILLBOX SERIES AV**

Application: A low-power relay designed for use in applications where it is necessary to conserve power or where power is limited by circuit components such as transistors.



Nom. Volt.	Res. (ohms ±10% at 25°C)	2-Pole Double-Throw		1-Pole Double-Throw	
		Max. Pull-in Current (25°C) (milli-amps)	Max. Drop-out Current (25°C) (milli-amps)	Max. Pull-in Current (25°C) (milli-amps)	Max. Drop-out Current (25°C) (milli-amps)
1.8	20	45.0	22.4	35.5	17.6
2.2	30	36.5	18.4	29.0	14.4
2.8	50	28.4	14.2	22.5	11.2
3.5	75	23.2	11.5	18.4	9.1
4.0	100	20.0	10.0	15.8	7.9
5.8	200	14.2	7.1	11.2	5.6
7.0	300	11.5	5.8	9.1	4.5
8.0	400	10.0	5.0	7.9	3.9
9.0	500	8.9	4.5	7.1	3.5
12.0	875	6.8	3.4	5.3	2.7
12.6	1000	6.3	3.2	5.0	2.5
14.2	1250	5.7	2.9	4.5	2.2
15.6	1500 ± 15%	5.2	2.6	4.1	2.0
18.0	2000 ± 15%	4.5	2.3	3.5	1.8
20.0	2500 ± 15%	4.0	2.0	3.2	1.6
28.0	5000 ± 15%	2.8	1.4	2.2	1.1
36.0	8000 ± 20%	2.3	1.1	1.8	0.9
40.0	10000 ± 20%	2.0	1.0	1.6	0.8

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

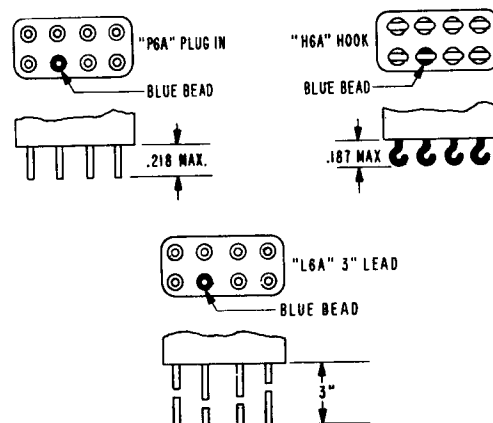
Mfr: Filtors, Inc., East Northport, L. I., New York

Electrical Characteristics

- Pull-In Power: 40 milliwatts.
- Contact Rating: 2 amp resistive; 1 amp inductive (100 millijoules max stored inductive energy, time constant 6 milliseconds); 8 amp overload. Contacts for low-level circuits available.
- Contact Res (max): 0.05 ohm initial, 0.10 ohm after rated life.
- Oper Time (max): 15 milliseconds (rated coil voltage, 25°C).
- Release Time (max): 15 milliseconds
- Contact Arrangements: 1- or 2-pole, double-throw
- Coil Data:

Physical Characteristics

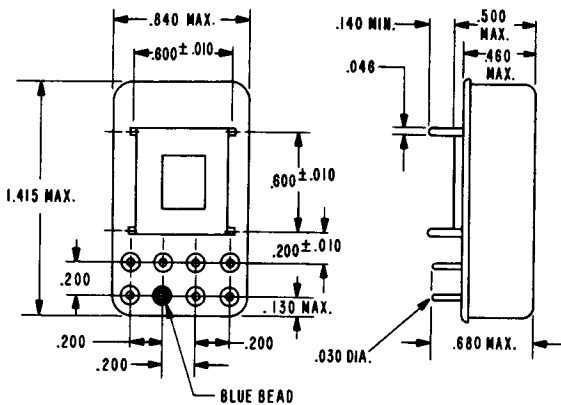
Sealing: Hermetically sealed.
Header: 0.2" grid spacing
Terminal Styles: P6A Plug-in; H6A Hook; L6A 3" leads.



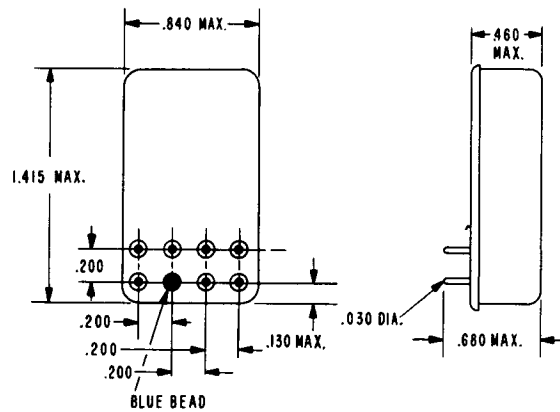
Weight: 1.4 ounces.

Mounting Styles: A1P6A, B1P6A, C1P6A and D1P6A

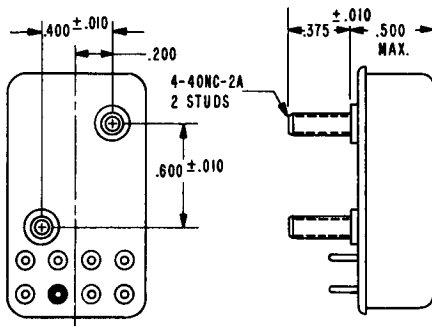
STYLE A1P6A



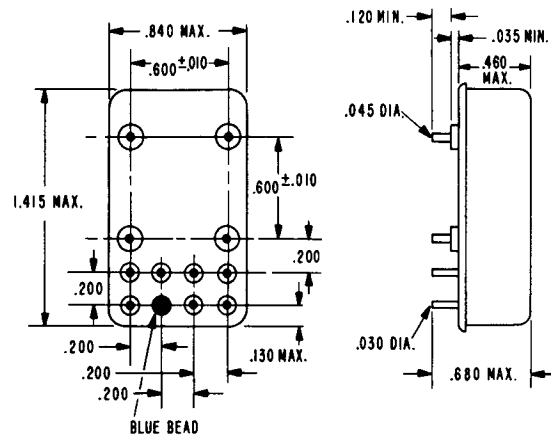
STYLE C1P6A



STYLE B1P6A



STYLE D1P6A



Environmental Conditions

Temp Range: -65°C to $+125^{\circ}\text{C}$.

Test Data

Vibration: 15g's from 5 to 3000 cps.

Shock: 50 g's for 11 milliseconds

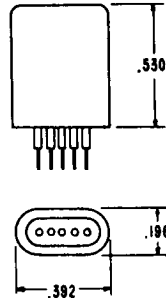
Dielectric Strength: 1000 volts rms, 500 volts between contacts, 350 volts at 80,000 feet.

Insulation Resistance: 1000 megohms minimum (500 volts dc, 25°C , 50% relative humidity max).

Remarks: This relay uses a specially modified design of Filtor's "Sensi-Tork" rotary relay motor.

K102
RELAY, ELECTROMAGNETIC
NEONMITE, NM SERIES

Application: Computers, guided missiles, printed circuits, dry circuit switching.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Phillips-Advance Control Co., Joliet, Ill.

Electrical Characteristics

Drop-out Voltage: 30 to 60% of pick up.
 Contact Rating: 0.25 amp at 28 volts, dc, with resistive load.
 Dielect Withstanding Volts (Sea Level): 500 volts rms.
 Life Expectancy: 100,000 operations at rated load and 85°C.
 Duty: Continuous.
 Operate Time: 4 milliseconds maximum at rated voltage.
 Contact Resistance: 0.05 ohm maximum.
 Release Time: 8 milliseconds, max at rated voltage.
 Coil Oper Power: 100 mw.
 DC Coil Data: See chart

Voltage (volts)	Resistance (ohms) $\pm 10\%$ at 25°C	Pickup Current (MA) max.
4 nom.	50	44
5 max.		
8 nom.	200	22
10 max.		
12 nom.	500	14
15 max.		
16 nom.	1000	10
21 max.		
24 nom.	2000	7
30 max.		

Physical Characteristics

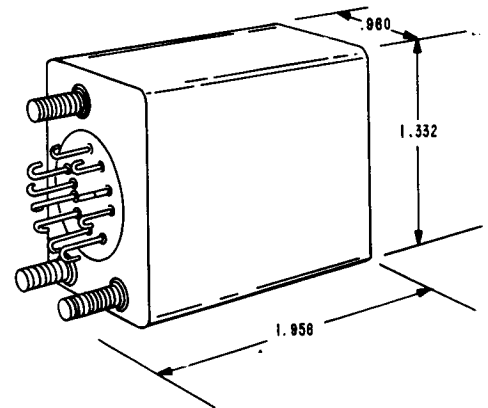
Size (Approx): 0.530" x 0.392" x 0.196".
 Weight: 0.09 oz.
 Enclosure: Hermetically sealed. Evacuated at 2.5 inches HG ABS. Filled with dry nitrogen.
 Contact Arrangement: SPDT, form C.
 Terminal Strength: Will withstand a 3-lb pull test.
 Terminals: Five, .016 dia. wires, 1.5 inches long.
 Volume: Less than 1/20 cu. in.
 Mounting: Screw down bracket—Pt. No. 6B346000; printed circuit bracket—Pt. No. 6B347000.

Environmental Conditions

Normal Temp Range: -55°C to 85°C .
 Shock: 50 g's ± 11 milliseconds
 Vibration: 30g's to 2000 cps when mounted with 6B346000.

K103
RELAY, ELECTROMAGNETIC, MINIATURE MULTIPOLE,
TYPE BHSM

Application: Designed specifically for electronic applications where reliability, small size, and light weight are prime factors. Typical of the many applications are communication equipment, computers, automatic controls, airborne equipment, guidance systems, and automation.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: RBM Div. of Essex Wire Corp., Logansport, Ind.

Electrical Characteristics

Coil Voltage: Up to 130 volts, dc.

Coil Sensitivity: .2 watts min. per pole.
 Coil Dissipation: 3.75 watts max.
 Contact Rating: Max 4PDT, 3 amps at 32 volts dc or 115 volts ac. (Non-Inductive). Special contacts available for low level or dry circuit application.

Physical Characteristics

Weight: 3.25 oz. approx.
 Header: Solder (shown) or plug-in.
 Mounting: Three 4-40 NC-2 threaded mounting studs.
 Sealing: Hermetically sealed.

Environmental Conditions

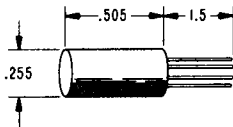
Temp Range: BHSM-HT Type -65°C to +125°C; BHSM Type, -55°C to +85°C.

Test Data

Shock (Oper): 30 g.
 Shock (Non-destruct): 70 g.
 Vibration: 10 g, 500 cycles.

K104 RELAY, ELECTROMAGNETIC, MICROMINIATURE, 1/4-INCH

Application: Where small size, extreme environmental conditions, or dry-circuitry is required.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Miniature Electronic Components Corp., Holbrook, Mass.

Electrical Characteristics

Coil Power (Max. Continuous): 0.315 watt.
 Coil Power (Max. Intermittent): 0.368 watt.
 Pull-In Power: 0.140 watt max.
 Drop-Out Power: 0.024 min.
 Contact Current: 50 milliamp max.
 Contact Voltage: 28 volts non-ind. max.
 Insulation Test: 500 volts dc.
 Insulation Res.: 1,000 megohms (coil to case or contacts).
 Operate Time: Less than 2.5 milliseconds.
 Release Time: Less than 2.5 milliseconds.
 Power At Rated E: 0.280 watt (for standard 6, 12, 24 or 28 volts dc). Other ratings available on special order.

Life: 100,000 cycles at rated load.
 Coil Data: (At room temp.)

	6 vdc	12 vdc	24 vdc	28 vdc
Nominal Res.	130 ohm	520 ohm	1950 ohm	2800 ohm
Max. Continuous E	6.4 v	13 v	25.5 v	30 v
Max. Intermittent E	6.8 v	14 v	27 v	32 v
Max. Pull-In E	4.3 v	9 v	16 v	20 v
Min. Drop-Out E	1.8 v	3.5 v	7 v	8 v
Max. Continuous I	49 ma	25 ma	13 ma	10.5 ma
Max. Intermittent I	53 ma	27 ma	13.8 ma	11.5 ma
Max. Pull-In I	33 ma	17 ma	8.2 ma	7 ma
Min. Drop-Out I	14 ma	7 ma	3.5 ma	3 ma

Physical Characteristics

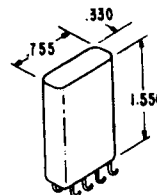
Weight: 0.075 oz.
 Contact Arrangement: Single Form C (SPDT)
 Case Style: Cylindrical
 Header: Glass
 Sealing: Hermetically sealed.
 Leads: Five, .017 dia., tinned.
 Insulation: Teflon, KEL-F, Glass
 Case Material: Epoxy-coated metal
 Contact Materials: Wide variety available.
 Coil Material: Teflon-covered magnet wire.
 Mounting: 5 leads, 60° apart on .120 in dia. circle.

Environmental Conditions

Oper Temp: -65°C to +125°C.
 Shock: 50g, 11 milliseconds.
 Vibration: 20g, 5-2000 cps.

K105 RELAY, ELECTROMAGNETIC, FOR TRANSISTOR CIRCUITS (POLARIZED)

Application: Missile beacons, aircraft service, and ground combat service.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Phillips-Advance Control Co., Joliet, Ill.

Electrical Characteristics

Coil Power, Approx: 100 milliwatts to both coils.
Contact Rating: 1 amp at 30 volts, dc, with resistive load.

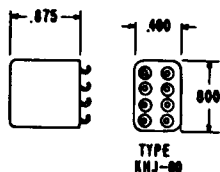
Physical Characteristics

Sealing: Coil assemblies are hermetically sealed in a brass container.
Contact Arrangement: SPDT.

Test Data

Normal Temp Range: -65°C to 125°C .
Shock: 100 G magnitude.
Vibration: 55 to 2000 cps at an acceleration equal to 30 G.
Life Expectancy: 100,000 cycles at 125°C with rated load.
Acceleration: See Vibration.

Remarks: This unit uses permanent magnets which are an integral part of the H-shaped armature and which affect the latch-in armature. Headers have terminals spaced 150 thousandths of an inch between centers. This spacing is compatible with the grid pattern of the printed-circuit wiring.

K106**RELAY, ELECTROMAGNETIC
(KH SERIES), TYPE KHS**

Mfr: Allied Control Company, Inc., New York, N. Y.

Electrical Characteristics

Coil Resistance: Up to 10,000 ohms.
Drop-out Voltage (Contacts): 1 millivolt maximum at low level rating.
Coil Power, Approx: 1.2 watts pull-in power. 240 milliwatts is standard; 100 milliwatts for special units.
Insulating Resistance: 10,000 megohms minimum.
Dielect Strength: 1000 volts rms.
Contact Rating: 2 amp at 29 volts, dc, 1 amp at 115 volts, ac, 400 cps with noninductive load or 0.5 ampere with inductive load. Units also available with rating of 3 amp at 29 volts, dc, 2 amp at 115 volts, ac, 400 cps with noninductive load or 1 amp with inductive load.
Life Expectancy: 100,000 operations minimum at 125°C .

Also available to 100,000 operations at 3 amp or 500,000 operations minimum at 2 amp at 125°C .
Operate Time: 5 milliseconds maximum.
Release Time: 3 milliseconds maximum.
Contact Resistance: 0.05 ohm maximum (initial).
Min Insulation Resistance: 10,000 megohms at 125°C .
Dielect Withstanding Volts (Sea Level): 1000 volts rms.
Dielect Withstanding Volts (High Alt): 500 volts at 70,000 ft; 350 volts at 80,000 ft.

Physical Characteristics

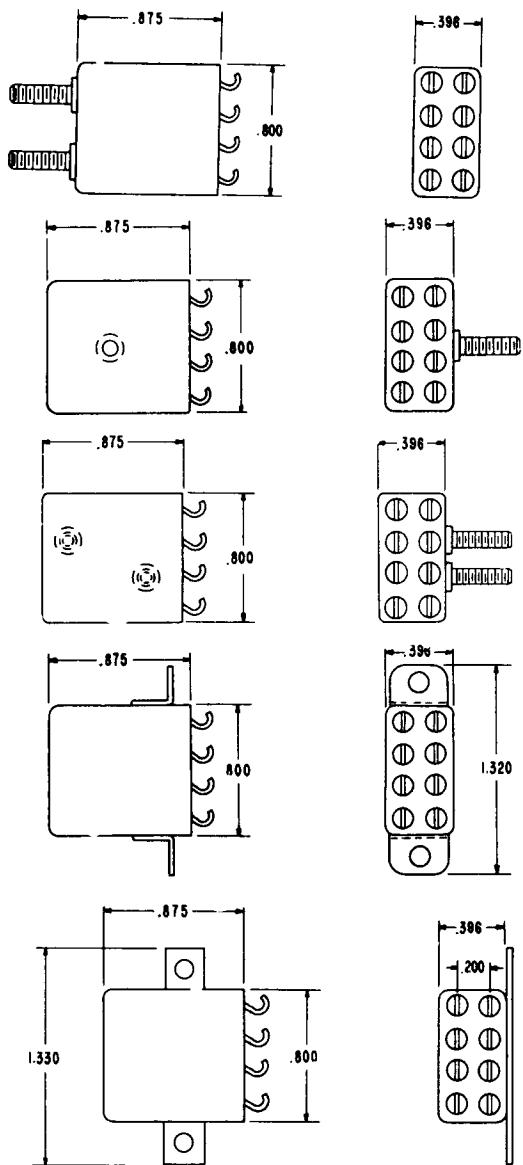
Size (Approx): 0.875" x 0.800".
Weight: 0.5 oz.
Plug-in Type: See illustration.
Contact Arrangement: DPDT.
Terminals: Solder hook or plug-in printed circuit.
Printed Circuit Adapt: Units adaptable to printed circuits upon request.

Environmental Conditions

Max Temp Range: $+125^{\circ}\text{C}$.
Mech Shock: 200 G's.
General Altitude Test: Operation to 80,000 ft.
Normal Temp Range: -65°C to $+125^{\circ}\text{C}$.
Shock: 100 G's.
Vibration: 5 to 10 cps at 0.5 inch double amplitude.
10 to 55 cps at 0.25 inch double amplitude. 55 to 5000 cps at 20 G.

K107**RELAY, ELECTROMAGNETIC, SUBMINIATURE, TYPE F**

Application: Crystal can size relay, 2PDT contacts, hermetically sealed, dry circuit to 3 amps.

**Electrical Characteristics**

Contact Arrangement: 2PDT (2 form C) bifurcated construction.

Contact Resistance: 0.025 ohms typical, 0.050 ohms max at 6 volts 100 ma.

Contact Load Life: High Level—3.0 amp resistive at 28 volts dc 100,000 operations; 1.0 amp resistive at 115 volts ac 100,000 operations.

Low Level—1 million miss-free operations 1 microamp closed circuit, 1 millivolt max open circuit, dynamic contact resistance 100 ohms. Overload—100 operations at 8 amp resistive 28 volts dc.

Max Coil Dissipation: 1.0 watts at 125°C, 1.5 watts at 25°C.

Must-Operate Sensitivity: 250 mw, nom.

Coil Resistance: 35-9100 ohms available.

Nom Voltage: 6.3-115 volts dc.

Operate Time: 3.5 millisecc, nom; 5.0 millisecc max including bounce with rate voltage.

Release Time: 1.0 millisecc, nom; 5.0 millisecc max including bounce.

Dielectric Strength: 1000 volts rms 60 cps (600 volts rms across open contacts) at sea level. 350 volts rms all terminals to case at 80,000 ft.

Insulation Resistance: 1000 megohm min at +125°C between any two terminals, and between all terminals and case.

Mechanical Characteristics

Enclosures: Hermetically sealed.

Mounting: 5 standard mountings shown.

Other styles available.

Stud Length: 3/8 inch standard, others available.

Terminals: 0.2 inch grid spaced. Plug-in (3/16 inch straight), 3 inch straight, or solder hook.

Weight: 0.52 oz. plain case; 0.62 oz. with two studs.

Environmental Conditions

Temp Range: -65°C to +125°C.

Linear Acceleration: 100 g's min.

Shock: 65 g's for 1/2 sine wave 11 ± 1 millisecc pulse.

Vibration: Relays with two ear bracket mounting, 5 to 75 cps at 1/8 inch excursion; 75 to 2000 cps at 20 g's acceleration.

Humidity and Salt Spray: Meets requirements of MIL-R-5757D.

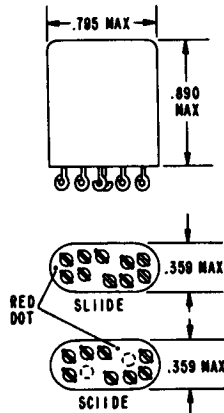
K108**RELAY, MAGNETIC LATCHING, MICROMINIATURE, SERIES SL**

Application: Where small size, extreme environmental conditions, or dry circuitry is required

Quality Assurance: Manufacturer's claims.

Bureau approval required prior to use.

Mfr: C. P. Clare and Co., Chicago, Ill.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Potter and Brumfield, Inc., Princeton, Indiana

Electrical Characteristics

Coil Resistance: 10,000 ohms max (per coil)
Coil Power: Approx 1.0 watt at nominal voltage, at 25° C
Coil Duty: Continuous
Contact Arrangement: DPDT
Contact Rating: 2amp. at 30 volts, dc; 1 amp. at 115 volts 60 cycle, AC (resistive)
Contact Pressure: 20 grams min
Insulation Resistance: 10,000 megohms min between contacts and between switching circuits at 25° C, and between contacts and case
Life: 100,000 operations min at rated load
Dielectric Withstanding Voltage: 1000 volts, rms, 60 cps between coil and case; between contacts and case; between contact sets. 500 volts, rms at 60 cps between open members of same contact set.
Pull-in: Approx 230 mw at 25° C
Operate Time: 3 msec max at nominal voltage, at 25° C
Transfer Time: Approx 0.5 msec

Physical Characteristics

Insulating Material: Teflon, Dupont Zytel 101 and glass
Weight: .5 oz (without mounting bracket)
Terminals: Hook end solder
Mounting: Shoulder brackets even with base

Environmental Conditions

Shock: 100 g's for 11 msec (no contact opening)
Linear Acceleration: 400 g's min (no contact opening)
Vibration: 0.195" max excursions from 10 to 55 cps 30 g's from 55 to 2000 cps

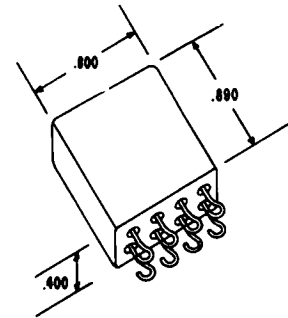
Temp Range: - 65° C to + 125° C
Coil Rise Temp: At max continuous voltage at 125 ° C:
Approx 60° C

Remarks: The SL is a dual coil magnetic latching relay operated by: (1) pulsing each coil alternately observing coil polarity or (2) connecting the coils in series and operating from a reversing (polarized) power source.

K109

RELAY, ELECTROMAGNETIC, MICROMINIATURE, SERIES SC

Applications: Designed for use in compact electronic equipment where its small size, ability to operate under extreme environmental conditions, or operation in dry circuitry is required.



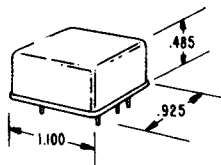
Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Potter and Brumfield, Inc., Princeton, Indiana

Electrical Characteristics

Nominal Coil Voltage, DC: 6 volts, 12 volts, 24 volts, 36 volts
Coil Res in Ohms ($\pm 10\%$ at +25° C): 35 135 550 1250
Coil Res: 20,000, ohms, max
Coil Power: Approx 1 watt, nom at +25° C
Duty: Continuous
Contact Arrangement: DPDT
Contacts Rated Load: 2 amp, at 30 volts, dc; 1 amp at 115 volts, 60 cy, resistive
Life: 100,000 oper, min
Contact Resistance: 50 milliohms before use; 100 milliohms, max after 100,000 oper
Dry Circuit Rating: Life expectancy of no misses in excess of 1 million operations with a contact load of 1 micro amp at 1 milliwatt and 300 ohm rejection level

Pull-In: Approx 260 milliwatts at +25°C
 Coil Rise: At max continuous voltage at +125°C:
 Approx 40°C
 Internal Capacitance: Any contact to contact, or contact to case, less than 3.0 pf
 Insulation Resistance: 10,000 megohms min between contacts and between switching circuits at +25°C and between contacts and case



Timing Characteristics

Oper Time: 3 millisecc, max at nom voltage at +25°C

Drop Out Time: 2.5 millisecc, max at nom voltage at +25°C

Transfer Time: Approx 0.5 millisecc

Physical Characteristics

Weight: .5 oz (without mounting bracket)
 Insulating Material: Teflon, Kel-F and glass
 Terminals: Plug-in pins, hooked solder, 3" flexible leads
 Mounting: Shoulder brackets even with base (not shown in illustration), plug-in studs, and flat plates

Environmental Conditions

Temp Range: -65°C to +125°C

Test Data

Shock: 100g for 11 millisecc (no contact opening)
 Vibration: .195" max excursions from 10 to 55 cps; 30g, from 55 to 2000 cps
 Linear Acceleration: 400g, min
 Dielectric Withstanding Voltage: 1000 volts, rms, 60 cps between coil and case; between contacts and case; between contact sets. 500 volts, rms, 60 cps between open members of same contact set. (at sea level)

Remarks: Polarity is indicated on the relay header by a red dot at the positive terminal.

Manufacturer claims the SC relay meets applicable sections of MIL-R-25018, (MS24250), MIL-R-5757C and ABMA-PD-R-187. The SC relay also incorporates a permanent magnet to generate holding forces necessary to allow operation under 100g shocks and 30g vibrations to 2000 cps.

K110

RELAY, MAGNETIC LATCHING, MICROMINIATURE. SERIES FL

Application: Designed for use in printed circuits where maximum compactness between stacked circuit boards is desired.

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Potter and Brumfield Inc., Princeton, Indiana

Electrical Characteristics

Coil Resistance: 10,000 ohms, max per coil at 25°C
 Coil Power (Nominal at plus 25°C: Approx 0.65 watt, standard; 0.35 watt, special)
 Pull-In: 150 mw, approx (standard) at 25°C, coil temp; 80 mw, approx (sensitive) at 25°C, coil temp
 Insulation Resistance (at 25°C): 10,000 megohms, min between contacts, between switching circuits, and between contacts and case, at 500 volts, dc
 Dielectric Withstanding Voltage (At 25°C at sea level): 1000 volts, rms, 60 cps between coil and case, between contacts and case and between contact sets
 Between open members of the same contact set:
 Standard: 750 volts, rms, 60 cps
 Sensitive: 500 volts, rms, 60 cps
 Internal Capacity: One coil to case 25 pf, max
 Contact to contacts 1 pf, max
 Contacts to case 5 pf, max

Contact Arrangement: DPDT (bifurcated silver-magnesium-nickel)

Contact Rating: Dry circuit to 3 amp, 28 volts, dc, resistive

Contact Life: 100,000 oper at max rated load

Coil Duty: Capable of continuous duty at 125°C

Contact Resistance: .050 ohms, max pin to pin resistance before life, at 25°C, measured per applicable military specifications

Oper Time: 3msec, max at nominal voltage at 25°C, coil temp

Transfer Time: 0.5 msec, max at nominal voltage at 25°C coil temp

Bounce: 250 microsecs, max (measured as per MIL-R-5757D)

Physical Characteristics

Weight: Approx 0.75 oz

Terminals: Plug-in pins, available hermetically sealed only

Mounting: Normally the FL is used without a mount; although it can be supplied with a single stud mount

Insulating Material: Teflon, Kel-F and glass

Environmental ConditionsTemp Range: -65°C to $+125^{\circ}\text{C}$

Vendor claims the FL meets all applicable sections of MIL-R-5757D, MIL-R-6106C and AMBA # PD-4-187

Test Data

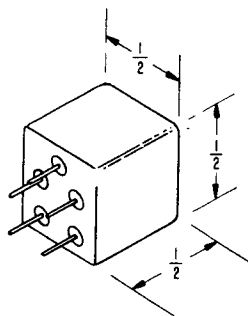
Shock: 100 g's for 11 milliseconds

Linear Acceleration: 400 g's, min

Vibration: .195" max excursions from 10 to 55 cps, 30 g's from 55 to 2000 cps

(No contact openings in either armature position)

Remarks: Operation may be accomplished by either pulsing each coil alternately (observing coil polarity), or connecting the coils in series and operating from a reversing (polarized) source.

Relay will operate on a 3 millisecond pulse at nominal voltage at 25°C .**K111****RELAY, ELECTROMAGNETIC, MICROMINIATURE, 1PDT, DC, TYPE C****Application:** Printed circuits

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Hi - G Inc., Windsor Locks, Conn.**Electrical Characteristics**Coil Data: Standard coil resistance available to 1800 ohms. Standard coil tolerance is $\pm 10\%$

Dielectric Withstanding Voltage: 1000 volts, rms, 60 cps (contacts to case) 500 volts (mutually insulated terminals)

Contact Rating: 2 amp at 30 volts, dc (resistive load); 1 amp at 115 volts, rms (resistive load) 400 cps case grounded.

Contact Life: 100,000 operations min. at rated contact loads

Pull-in: 150 mw at 25°C

Relays with the following voltage characteristics are available:

Nom Coil Voltage	Max Cont Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil R @ 25°C
6	7.2	3.5	.5	80
12	14.4	7	1.0	325
26.5	32	15	2	1500

Oper Time: 4.8 milliseconds (typical at 25°C . with nom. voltage applied)Release Time: 1.4 milliseconds (typical at 25°C . with nom. voltage applied)**Physical Characteristics****Weight:** 0.3 oz.

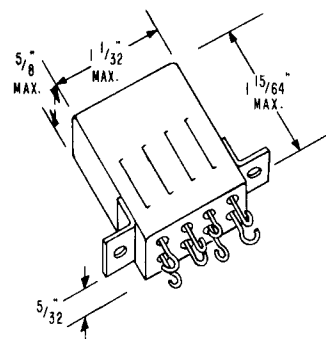
Header Style: Hook, plug-in and 1.5 and 3 in. lead
Enclosure: Enclosure is hermetically sealed and filled with dry nitrogen as standard procedure. Also available filled with nitrogen and helium, or dry air
Mounting: Bracket

Contact Arrangement: 1 PDT**Environmental Conditions**Standard Temp Range: -65°C to $+125^{\circ}\text{C}$

Shock: 50 g's for 11 milliseconds with no contact chatter

Vibration: 10 to 2000 cps, 20g min.

Remarks: Standard contacts suitable for dry circuit use. When so specified, relays will be dry-circuit tested 100% for 5000 operations (run-in tests), and will be stamped with a "D" to indicate that this test has been performed.

K112**RELAY, ELECTROMAGNETIC, D-C POWER, HERMETICALLY SEALED TYPE FC-215****Application:** For use in missiles, piloted aircraft, and other military devices.

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Struthers -Dunn, Inc; Pitman, New Jersey

Electrical Characteristics

Coil Resistance: 300 ohms, nominal
Oper Voltage: 18 volts, dc (must operate at this voltage)
Hold Voltage: Must hold at 14 volts, dc
Release Voltage: Must release at 1 volt, dc
Operating Data: The above voltages and conditions cover any ambient temperature)
Contact Rating: 10 amp resistive at 26.5 volts, dc
Life: 100,000 min, operations with rated load at 125°C
Contact Drop: Less than 100 millivolts at rated current
Open Time: 15 millisecc, max at 26.5 volts, dc
Release Time: 15 millisecc, max at 26.5 volts, dc
Insulation Resistance: 1000 megohms, min at 500 volts

Physical Characteristics

Weight: 2 oz, max
Enclosure: Hermetically sealed
Construction: All internal joints are welded to eliminate contamination from solder flux
Armature: Balanced
Mounting: Standard flange, (mounting flanges may be modified, relocated, omitted or replaced with studs)
Contact Arrangement: DPDT (2 form C)

Environmental Conditions

Temp Range: -65°C to +125°C, ambient

Test Data

Shock: Type II, 50g for 11 millisecc
Vibration: Capable of continuous operation when subjected to 5-2000 cps, 0.5" double amplitude or 20g
Dielectric Withstanding Voltage: 1000 volt, ac at sea level between all mutually insulated terminals, and between all terminals and case

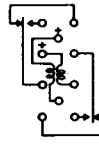
Remarks: Manufacturer claims the aforementioned operating and performance data was determined from the results of testing conducted in accordance with MIL-R-5757D.

**K113
RELAY, ELECTROMAGNETIC, LATCHING, SUB-MINIATURE, TYPE LF (See illustration for Type F (K107) for dimensions and mounting information.)**

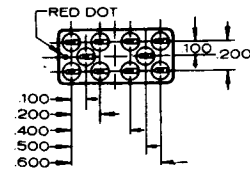
Application: Crystal can size relay, 2PDT contacts, hermetically sealed, dry circuit to 3 amps. Available in one (LF1000) and two (LF2000) coil models.

LF-2000 SERIES (Two-Coil)

Indicated polarity closes contacts as shown



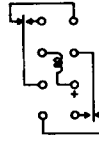
2-coil circuit diagram



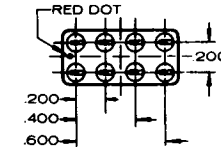
Location 10 terminals of 2-coil relay

LF-1000 SERIES (One-Coil)

Indicated polarity closes contacts as shown



1-coil circuit diagram relay



Location 8 terminals of 1-coil relay

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: C. P. Clare and Co., Chicago, Ill.

Electrical Characteristics

Contact Arrangement: 2PDT (2 form C) bifurcated construction.
Contact Resistance: 0.025 ohms typical, 0.050 ohms maximum at 6 volts 100 ma.
Contact Load Life: High Level—3.0 amp resistive at 28 volts dc 100,000 operations; 1.0 amp resistive at 115 volts ac 100,000 operations. Low Level—1 million miss-free operations 1 microamp closed circuit, 1 millivolt max open circuit, dynamic contact resistance 100 ohms.
Overload—100 operations at 8 amp resistive 28 volts dc.
Max Coil Dissipation: LF1000 series—1.25 watts at +125°C, 2.0 watts at +25°C. LF2000 series—.50 watts per coil at +125°C, .75 watts per coil at +25°C.
Must-Operate Sensitivity: LF1000 series—approx 150 mw
Coil Resistance: LF1000 series—40 to 9100 ohms available. LF2000 series—15/15—4400/4400 ohms available.
Nominal Voltage: LF1000—3.6 to 110 volts dc. LF2000 series—3.6 to 56 volts dc.
Max Operate Time: LF1000 series—8 millisecc. LF2000 series—6 millisecc.
Dielectric Strength: 1000 volts rms, 60 cps (600 volts rms across open contacts) at sea level. 350 volts rms, all terminals to case at 80,000 ft.
Insulation Resistance: 1000 megohms min at +125°C between any two terminals and between all terminals and case.
Type of Duty: Continuous.

Mechanical Characteristics

Enclosures: Hermetically sealed.
 Terminals: 0.2 inch grid spaced. Plug-in (3/16 inch straight), 3 inch straight, or solder hook.
 Weight: 0.54 oz. plain case; 0.62 oz. with two studs.

Environmental Conditions

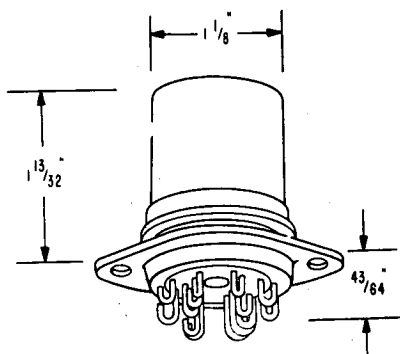
Temp Rang: -65°C to $+125^{\circ}\text{C}$.
 Linear Acceleration: 100 g's min.
 Shock: 100 g's for 1/2 sine wave 11 ± 1 millisecc pulse.
 Vibration: Relays with two ear bracket mounting, 5 to 75 cps at 1/8 inch excursion; 75 to 2000 cps at 20 g's acceleration.
 Humidity and Salt Spray: Meets requirements of MIL-R-5757D.

Remarks: One coil model (LF1000) has eight terminals, two coil model (LF2000) has ten terminals. For the two coil model, other wiring arrangements are available.

195-

**K114
 RELAY, ELECTROMAGNETIC, ROTARY (ARMATURE)
 TYPE, HERMETICALLY SEALED, 4 PDT, 10 AMPERE,
 UNION TYPE H**

Application: The ruggedness of this relays design, permits utilization in airborne and guided missile electronic equipment.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Union Switch and Signal Division of Westinghouse
 Air Brake Co., Pittsburgh 18, Pa.

Electrical Characteristics

Initial Contact Voltage Drop: 175 millivolts
 Contact Rating: 10 amp (res), 5 amp (ind), at 26.5 volts dc
 Contact Bounce: 2.0 millisecc, max

Operate Time: 17 millisecc, at 26.5 volts and 25°C .
 Drop Out: 7 millisecc, max, at 26.5 volts, and 25°C , for 200 ohm (nom) coil relay
 Insulation Resistance: 1000 megohms
 Catalog Indicator: No. 35
 Oper Volts D.C: Min, 25.2 volts; max, 29.2 volts
 Nominal Coil Resistance: 200 ohm (190 to 220 ohms)
 Max Pickup Volts: 13.0 volts; at 25°C .; 16.0 volts at 85°C .; 18.0 volts at 125°C .
 Max Pick-Up Amps: .064 amp
 Max Drop-Out Volts: 10.0 volts at 25°C .; 14.0 volts at 125°C .
 Max Drop-Out Amps: .046 amp
 Min Drop-Out Volts: 1.5 volts at 25°C .; 1.1 volts at -65°C .
 Min Drop-Out Amps: .007 amp

Physical Characteristics

Seal: Hermetically
 Weight: 3.75 oz., in standard case; 5.0 oz long case
 Contacts: Glass-coated cylindrical contact actuators attached to the rotary armature to assure square mating of contact surfaces
 Terminals: Solder lug, tin coated
 Mounting: Header flange mount, type H
 Contact Arrangement: 4 PDT

Environmental Conditions

Temp Range: -65°C to $+125^{\circ}\text{C}$

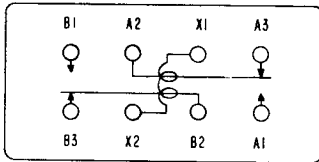
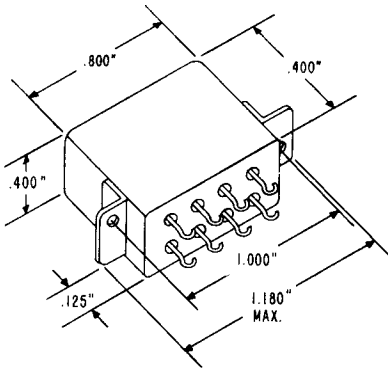
Test Data

Vibration: .06" double amplitude or 20g peak, 10 to 200 cps, 10 microseconds max. contact chatter.
 Shock: 50g for 11 milliseconds.
 Life: 100,000 operations at rated load
 Dielectric Withstanding Voltage: 1000 volts, rms, at sea levels; 500 volts, rms, at 1.3" Hg.

Remarks: The manufacturer claims this relay is designed to meet requirements of MIL-R-6106, MIL-R-5757D and MIL-R-25018. Operation on alternating current when required, is provided by inclusion of rectifiers within the relay.

**K115
 RELAY, ELECTROMAGNETIC, HERMETICALLY
 SEALED, HALF-SIZE CRYSTAL CAN SERIES M255**

Application: Designed for adaptability for printed circuit applications where it can be mounted vertically without increasing the thickness of electronic " sandwich pack-aging".



SCHEMATIC
(UNENERGIZED)

Quality Assurance: Per specification MIL-R-5757/9
(Ships)

Bureau approval required prior to use

Mfr: Leach Corporation, San Marino, California

Electrical Characteristics

Rated Coil Voltage: 6 to 26.5 volts, dc

Rated Duty: Continuous

Typical Operation: at 26.5 volts, dc:

Resistance at 25°C: 700 ohms, ±10%

Pull-In at 125°C: 18.0 volts, dc, max

Drop-out: 14.0 volts, dc, max

Operate Time: 0.004 sec, max

Release Time: 0.004 sec, max

Contact Rating: 2 amp, resistive at 26.5 volts, dc

Contact Life (at rated load): 100,000 cy

Contact Arrangement: DPDT, Two form C

Physical Characteristics

Weight: 0.28 oz. (may vary according to mounting configurations)

Terminals: Terminal type-2, Solder hooks

Mounting Style: "E" (see illustration)

Mounting Holes in Mounting Flange: Two 0.096" dia 2-PL's

X1 Terminal: Shall be identified with a contrasting glass

bead. (See schematic of unenergized circuit)

Terminal Spacing: 0.200"

Mountings: Other styles available

Environmental Conditions

Degreasing: Per MIL-R-5757D, Para 6.5

Ambient Temp: -65°C to +125°C

Test Data

Shock: 50 g's, min no opening of closed contacts in excess of .10 μsecs.

Vibration: 20 g's to 2000 cps

Dielectric Withstanding Voltage: At sea level 1000 volts, rms, 60 cps (across open contacts and coil to ground);

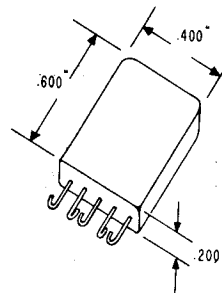
At 80,000 ft: 350 volts, rms, 60 cps

Remarks: Model M255 is the all-welded version of model M250. It features internally welded circuitry and hermetically sealed relay through an electron beam welder process.

K116

RELAY, ELECTROMAGNETIC, SUBMINIATURE MODEL 3100J

Application: Designed for use in electronic circuitry where space is limited.



Quality Assurance: Manufacturer's claims.

Bureau approval required prior to use.

Mfr: Bourns, Inc., Trimpot Division, Riverside, California

Electrical Characteristics

Standard Coil	Voltage Adjusted		Drop-out Voltage		
	Nominal Oper Voltage	Maximum Pull-in Voltage at +25°C	at +125°C	Max	Min
50 ohm	4.2	2.2	2.85	1.3	0.16
120 ohm	6.4	3.4	4.35	1.9	0.24
500 ohm	13.2	7.0	9.0	4.0	0.50
1000 ohm	18.8	10.0	12.8	5.7	0.70
2000 ohm	26.5	14.1	18.0	8.0	1.00

Coil characteristics applicable at +25°C unless otherwise specified

Standard Coil	Current Adjusted			
	Nominal Oper Current Milliamps	Maximum Pull-in Current Milliamps at +25°C	Drop-out Current Milliamps Max Min	
50 ohm	84.0	44.0	26.0	3.2
120 ohm	53.0	28.0	16.0	2.0
500 ohm	26.4	14.0	8.0	1.0
1250 ohm	18.8	10.0	5.7	0.7
2000 ohm	13.3	7.0	4.0	0.5

Resistance Tolerance: ±10%

Pickup Sensitivity: 100 milliwatts, max at 25°C

Over Voltage: Per para 4.7.11 of MIL-R-5757D

Contact Arrangement: SPDT, 1 Form C

Contact Rating:

Standard: 1.0 amps at 26.5 volts dc resistive, 100,000 cy min

Overload: 2.0 amps at 26.5 volts dc resistive, 100 cy min

Operating Times - Nominal Coil Voltage at 25°C

Oper Time Max: 4.0 msec

Release Time Max: 4.0 msec

Contact Bounce Max: 1.0 msec

Contact Resistance: 50 milliohms max at rated load 100 milliohms max after 100,000 cy life measured within 1/8" of the header

Physical Characteristics

Sealing: Hermetically sealed enclosure, filled with nitrogen and trace of helium gas at 1 atmosphere

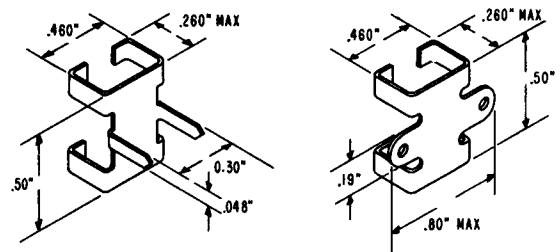
Contact Material: Semi-precious metal (gold plated)

Terminal Strength: 3 lb. pull max, no damage or loosening of terminals

Terminal Type: Solder lug hooks, No. 24, A.W.G. (.0201" dia) tin plated wire

Solder Hook Size: .055 ±.015 dia., inside (typ.)

Mounting Styles: See Bend-over tab bracket H-91 and Bolt-down bracket type H-92 in figure 2.



Weight: Approx 0.10 oz (3 grams) not including mounting bracket

Degassing: All units 100% degassed prior to final hermetic sealing

Environmental Conditions

Oper Temp Range: -65°C (-35°F) to +125°C (+257°F)

Life: 100,000 cy at rated load

Insulation Resistance: 1000 megohms min at 100 volts dc, between all mutually insulated points

Test Data

Dielectric Withstanding Voltage: Sea level, 500 volts, ac, min. between mutually insulated points; 350 volts, ac min. across open contacts. 70,000 altitude: 350 volts, ac min. between all mutually insulated points and across open contacts

Vibration: 40g, 5-3000 cps.

Contact Opening: 10 μsecs max opening

Shock: 150g 11 msec duration

Contact Opening: 10 μsec, max opening

Applicable MIL SPEC: Exceeds MIL-R-5757D

Remarks: Self dampening return spring aids shock and vibration resistance. Manufacturer claims performance meets the requirements of MIL-R-5757D.

K117**RELAY, ELECTROMAGNETIC SUBMINIATURE GEM SERIES**

Application: Designed for use as a general-purpose electro-mechanical relay.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use

Mfr: Hi-Spec Electronics Corp., Van Nuys, California

Electrical Characteristic (@ 25°C)

Standard Coil Resistance: 200 ohm to 15,000 ohm
Oper Power: 200 mw, nom @ 11 volts dc; 250 mw, max @ 26.5 volts, dc
Drop Out: 10% of operate voltage, min
Contact Rating:
Power Switching: 3.0 amp at 28 volts, dc or 115 volts, ac resistive
Signal Switching: 10 μ amp at 10 millivolts, 400 cy, ac, min
Insulation Resistance:
@ +25°C: 10,000 megohms, min
@ +125°C: 1,000 megohms, min
Operate Time: 5 msec, max including bounce
Release Time: 5 msec, max including bounce
Bounce: 1 msec, max

Physical Characteristics

Contract Arrangement: DPDT (2 Form C) hermetically sealed std 28 volts, dc system
Seal: Hermetic, 1.3 inches of HG (71,000 feet altitude)
Weight: 65 oz., max
Terminal Arrangement: .200" x .200" std grid space
Contact Material: Silver magnesium nickel-gold plated
Mounting Methods: Plain cover, ear bracket, side plate, stud and bridged ear bracket

Environmental Conditions

Temp Oper Range: -65°C to +125°C

Test Data

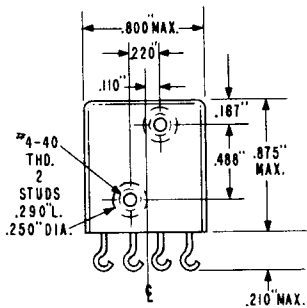
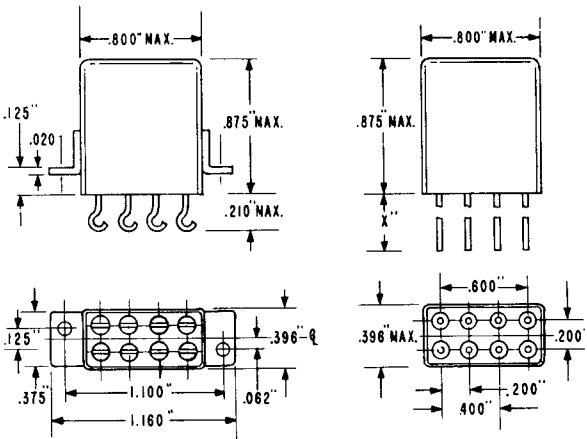
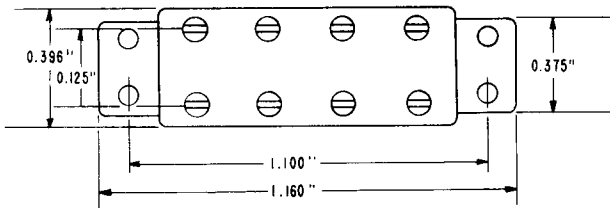
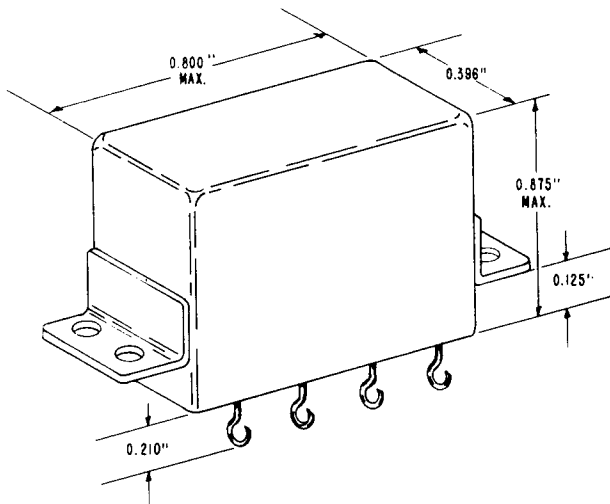
Life: 100,000 consecutive operations under nom coil power and rated contact load at +125°C, min
Shock: 100 g's 11 millisecc duration (contact opening 10 μ sec, max)
Vibration: 30 g's, 10 to 3000 cy (contact opening 10 μ sec, max)
Dielectric Withstanding Voltage: (@ sea level) between open contacts—750 volts, ac, rms, min; between all other mutually insulated points, 1000 volts, ac, min

Remarks: Manufacturer states that all units are serialized during manufacture and a record is maintained of their in-process performance. The above is a quality assurance provision.

K118

RELAY, ELECTROMAGNETIC MICRO-MICROMINIATURE SERIES BR-5

Application: Designed for use in airborne or ground switching and control applications where relays having dry circuit utility to one ampere applications are required.



Insulation Resistance: 10,000 megohm @ 25°C, 1000 megohm, min at 125°C

Life: 100,000 operations at 1 amp. 125°C

Electrical Characteristics

STANDARD COIL RESISTANCES AND OPERATING CHARACTERISTICS

Pull-in (max) at 25°C	at 125°C	Drop-out (min) at 25°C
6.7 vdc	9.5 vdc	.67 volts
6.7 vdc	9.5 vdc	.67 volts
6.7 vdc	9.5 vdc	.67 volts
9.5 vdc	14.0 vdc	.95 volts
9.5 vdc	14.0 vdc	.95 volts
9.5 vdc	14.0 vdc	.95 volts
13.0 vdc	18.0 vdc	1.3 volts
13.0 vdc	18.0 vdc	1.3 volts
13.0 vdc	18.0 vdc	1.3 volts

Contract Rating: 1 amp, resistive at 32 volts, dc, .050 ohm, max

Operate and Release Time: 4 millisecs, max at nom power, 25°C

Adjust. Diff: Dropout 10% of pull-in, min

Pull-in Power: 100 mw, max at 25°C

Contact Bounce: 1.0 millisecc at 25°C

Physical Characteristics

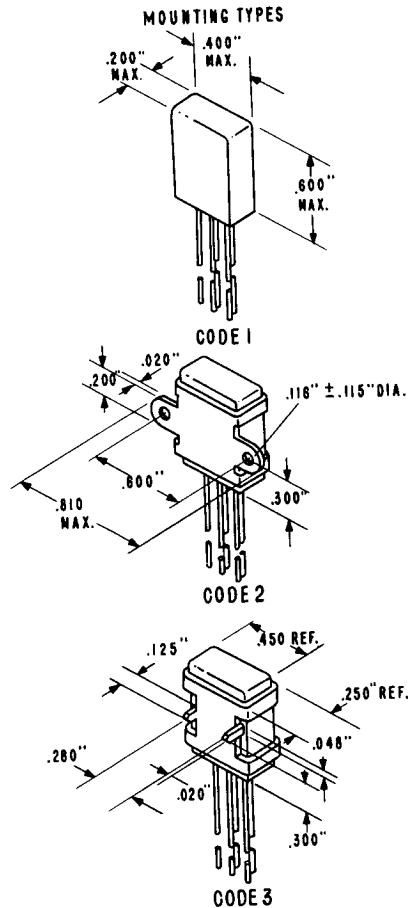
Weight: 0.1 oz. approx

Contact Arrangement: SPDT

Contact Material: Gold plated, silver, magnesium, nickel

Volume Relay: 1/20 cu. in.

Mounting: Code 1: plain can; Code 2: Hole bracket; Code 3: Tab bracket (See Illustrations)



1 of 9

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Babcock Relays, Inc., Costa Mesa, California

Electrical Characteristics

STANDARD COIL RESISTANCES AND OPERATING CHARACTERISTICS

Relay Type	Coil/Mount Code	Nominal Voltage	Coil Res ± 10% at 25°C
BR5	500C1	12V	500 ohm
BR5	500C2	12V	500 ohm
BR5	500C3	12V	500 ohm
BR5	1KC1	18V	1000 ohm
BR5	1KC2	18V	1000 ohm
BR5	1KC3	18V	1000 ohm
BR5	2KC1	26V	2000 ohm
BR5	2KC2	26V	2000 ohm
BR5	2KC3	26V	2000 ohm

Coil/Mount Code	Header	Mounting
500C1	1-1/2" wire leads	plain can
500C2	1-1/2" wire leads	2 hole bracket
500C3	1-1/2" wire leads	2 tab bracket
1KC1	1-1/2" wire leads	plain can
1KC2	1-1/2" wire leads	2 hole bracket
1KC3	1-1/2" wire leads	2 tab bracket
2KC1	1-1/2" wire leads	plain can
2KC2	1-1/2" wire leads	2 hole bracket
2KC3	1-1/2" wire leads	2 tab bracket

Sealing: Hermetically sealed, degassed at 5 microns at 200°C and filled at one atmosphere with 90% dry nitrogen, 10% dry helium

Leakage Rate: 3cc helium per 10 yrs (100% checked on mass spectrometer for leakage of 10-8 cc/sec of helium).

Environmental Conditions

Temp Range: -65°C to +125°C

Altitude: 250 volts, rms at 70,000 ft

Test Data

Vibration: 30g, 40-3000 cps, 0.4" DA at 10-40 cps
 Shock: 125g, 11 millisecond
 Dielectric Withstanding Voltage: 500 volts, rms terminals to case; 300 volts, rms across contact gap at sea level

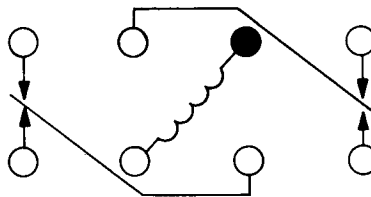
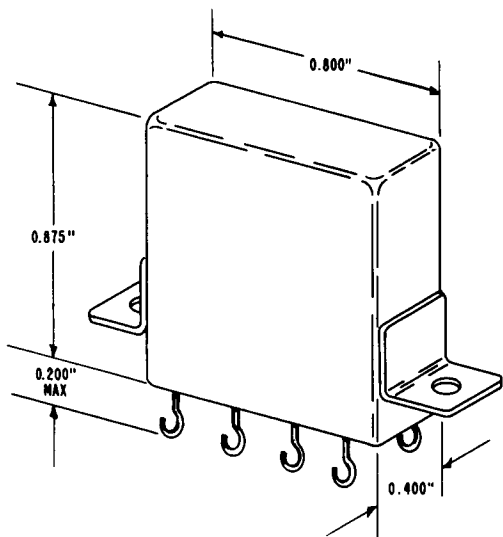
Remarks: Units are available with activated getters for added assurance of contaminant-free operation

Duty Cycle: Continuous
 Insulation Resistance: 1,000 megohms, min
 Coil Oper Data 250 MILLIWATT:

Catalog Number	Coil Resistance	Maximum Pull-in Current	Maximum Drop-out Current	Minimum Drop-out Current
	±10% of 25°C	MA	MA	MA
2R25A350-B	25	93	47	9.3
2R25A360-B	40	74	38	7.5
2R25A370-B	60	60	30	6.0
2R25A380-B	100	48	24	4.8
2R25A390-B	150	39	19	3.8
2R25A400-B	250	30	15	3.0
2R25A410-B	400	24	12	2.4
2R25A420-B	625	19	9.5	1.9
2R25A430-B	1,000	15	7.5	1.5
2R25A440-B	1,500	12	6.0	1.2
2R25A450-B	2,500	9.5	4.8	.95
2R25A460-B	4,000	7.4	3.7	.74
2R25A465-B	5,000	6.6	3.3	.66
2R25A470-B	6,250	6.0	3.0	.60
2R25A475-B	8,000	5.3	2.7	.53
2R25A480-B	10,000	4.7	2.4	.47

K119 RELAY, ELECTROMAGNETIC, (BALANCED ARMATURE) TYPE 2R

Application: Designed primarily for use in missile, aircraft and space fields



SCHEMATIC CIRCUIT DIAGRAM

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Couch Ordnance, Inc., A Subsidiary of S. H. Couch Company, Inc., North Quincy 71, Mass.

Electrical Characteristics

Contact Arrangement: 2 form C (DPDT)
 Contact Operations: Simultaneous operation and simultaneous release
 Contact Resistance: 0.050 ohm, max (100 mv at 2 amp dc)
 Rating (Resistive Load): 2 amp at 30 volts, dc; 1 amp at 115 volts, 60 to 400 cy, ac
 Electrical Life: 100,000 oper, min
 Coil Rating (dc only):
 Pull-In Power: 250 mw approx at 25°C

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Catalog Number	Maximum Pull-In Voltage @ 25°C	Maximum Pull-In Voltage @ 125°C	Suggested Nominal Operating Value $\pm 10\%$ For 125°C Operation
	VOLTS	VOLTS	VOLTS
2R25A350-B	2.6	3.6	5.2
2R25A360-B	3.3	4.5	6.6
2R25A370-B	4.0	5.5	8.0
2R25A380-B	5.3	7.4	10.5
2R25A390-B	6.5	9.0	13.2
2R25A400-B	8.3	11.5	17.0
2R25A410-B	10.6	14.7	21.0
2R25A420-B	13.0	18.0	26.5
2R25A430-B	17.0	23.0	35.0
2R25A440-B	20.0	28.0	42.0
2R25A450-B	26.0	36.0	53.0
2R25A460-B	33.0	46.0	68.0
2R25A465-B	37.0	51.0	76.0
2R25A470-B	42.0	58.0	88.0
2R25A475-B	47.0	65.0	100.0
2R25A480-B	52.0	72.0	110.0

Physical Characteristics

Weight: 19 gm, max
 Seal: Hermetic
 Grid Terminal Spacing: 0.2"
 Terminals: Solder-Hook type
 Insulators: Glass
 Mountings: Flange, Bottom, side, top, Stud (single and double) and other, etc.

Environmental Conditions

Ambient Temp: -65°C to +125°C

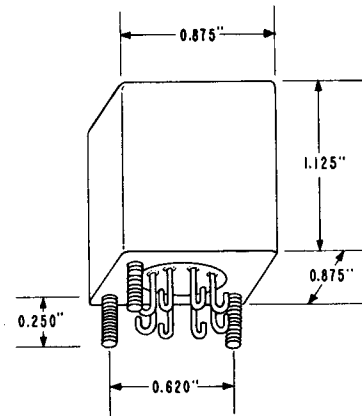
Test Data

Dielectric Withstanding Voltage: 1000 volts, rms, 60 cy, min
 Vibration: 5 to 25 cps, 0.4" peak to peak excursion; 25 to 2,000 cps 30g acceleration. No contact opening, relay energized or de-energized
 Shock: 150g, min, 11 secs min duration
 No contact opening, relay energized or de-energized

Remarks: The balanced-armature rotary motor provides the efficiency to allow three standard levels of adjustment (250 mw, 100 mw and 40 mw) within the same small case size.

K120 RELAY, ELECTROMAGNETIC ROTARY SENSITIVE DC SERIES VGS

Application: Designed for use in electronic equipment where spacing is limited and a diminutive relay is required.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Phillips-Advance Control Co., Joliet, Illinois

Electrical Characteristics

Coil Oper Power:
 Nominal Power: 125 milliwatts at 25°C
 Pull-In Power: 100 milliwatts, max at 25°C
 Drop-Out Power: 5 milliwatts, min at 25°C
 Max Power: 2000 milliwatts at 125°C

Coil Resistance at 25°C (ohms $\pm 10\%$)	Nominal Current -65°C to 125°C (MA)	Nominal Voltage at 25°C (volts)
120	32.2	6
500	15.8	12
2000	7.9	26.5

Other resistances available upon request

Contact Arrangement: 2C (DPDT)
 Contact Rating: 5 amps resistive at 115 volts, ac or 26.5 volts, dc
 Sensitivity: 125 milliwatt

Physical Characteristics

Contact Material: Silver magnesium nickel alloy, gold flashed
 Enclosure: Filled with dry nitrogen. Hermetically sealed after evacuated at 2 inches HG, ABS
 Weight: 1.5 oz, max
 Mounting: 3 mtg. studs #4-40 UNC-2A
 Terminals: Solder hook

Environmental Conditions

Temp Range: -65°C to +125°C

Test Data

Vibration: 10-55 cps, total max excursion of .06",

55-2000 cps, 15 g's

Shock: 50 g's per MIL-R-5757C

Life Expectancy: 100,000 ops, min at 5 amps resistive load per MIL-R-5757C, over four million ops under dry circuit conditions

Insulation Resistance: 100 megohms, min between all mutually insulated terminals at a 500 volt, dc potential
 Dielectric Withstanding Voltage: 500 volts, rms between all non-connected terminals and between coil terminals and ground at sea level, 1000 volts, rms between all other terminals and ground at sea level.

**K121
 RELAY, ELECTROMAGNETIC, HALF-SIZE CRYSTAL-CAN SERIES DJ**

Application: Designed for use in the electronic equipment of missiles and aircraft.

Electrical Characteristics

Coil Data:

Nom. E	Coil Part No.	Res. (ohms ± 10%)	Pull-in E (vdc max)	Pull-in I (ma max)	Drop-out E (vdc max)	Drop-out I (ma max)
6.3	6	42	3.2	76	0.4	10.0
12.6	12	210	6.8	32	0.8	3.8
26.5	26	830	13.5	16.5	1.5	1.8
32.0	32	1300	16.8	13.0	2.2	1.7

Pull-in Power: 200 milliwatts

Contact Resistance (Max): 0.05 ohm initial, 0.10 ohm after rated life

Contact Rating: 2 amp resistive, lamp inductive (100 millijoules max stored inductive energy; time constant 6 milli secs), 8 amps, overload. Contacts from low-level circuits available.

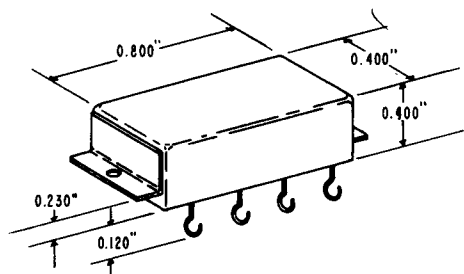
Contact Arrangements: 1 or 2-pole double-throw

Oper Time (max): 5 millisees (rated coil voltage, 25°C)

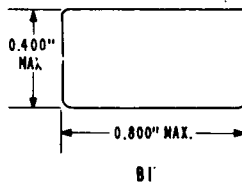
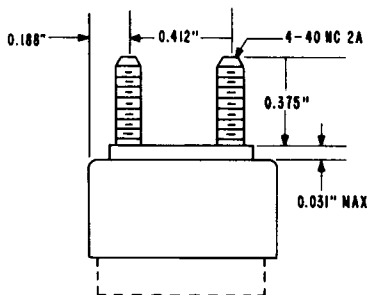
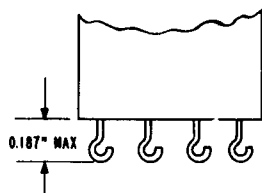
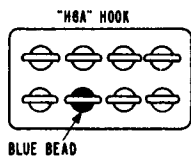
Release Time (max): 5 millisees

Physical Characteristics

Mounting Styles: B1, C1, D1, and E1 (see Figure 1)



HEADER STYLES



Header Style: H6A, 0.2" grid pattern

Terminals: Hook style

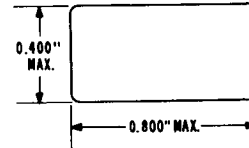
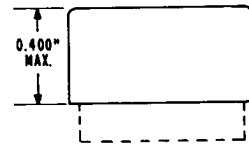
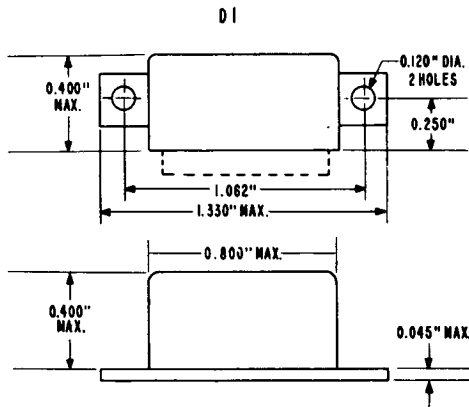
Construction: Welded thruout

Housing: Half size crystal can

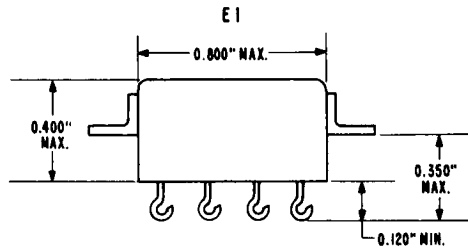
Quality Assurance: Manufacturer's claims.

Bureau approval required prior to use.

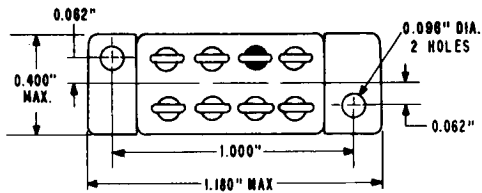
Mfr: Filtrons, Inc., East Northport, Long Island, New York



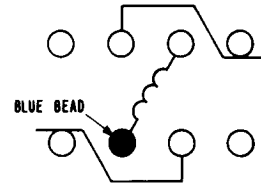
C1



(MILITARY STANDARD MOUNTING)



CIRCUIT DIAGRAM



UNENERGIZED POSITION
TERMINAL VIEW

Environmental Conditions

Ambient Temp Range: -65°C to 125°C

Insulation Resistance: 1000 megohms, min (500 volts, dc, 25°C, 50% relative humidity max)

Test Data

Vibration: 30 g's from 5 to 3000 cps

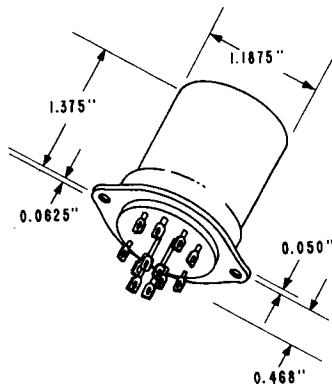
Shock: 150 g's for 11 milliseconds

Dielectric Withstanding Voltage: 1000 volts rms, 500 volts between contacts, and between coil and frame, 350 volts at 80,000 ft

Remarks: This Demi-J relay has a new "Super Mu" rotary relay motor which incorporates a radically new bobbinless coil that makes the relay more efficient than some relays having similar configurations.

K122
RELAY, ELECTROMAGNETIC SUBMINIATURE HERMETICALLY SEALED TYPE FC-410, 4PDT

Application: Designed for use as a power relay in electronic equipment in airborne or ground support equipment. It is also used in guided missiles, piloted aircraft and other military devices where operation under environmental stress is required.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Struthers-Dunn, Inc., Pitman, New Jersey

Electrical Characteristics

Contact Data (Over amb. temp range):

Contact Arrangement: 4PDT (4 Form C contacts).

Contact Rating: 10 amp, at 29 volts, dc or 115 volts, ac, resistance load

Electrical Life: 100,000 ops, min at rated load

Resistance: 100 millivolts, max. initially; 200 millivolts, max, after life

Coil Oper Data (Over amb. temp range):

Voltage Rating (Nominal): 26.5 volts, dc

Pickup Voltage: 18.0 volts, dc, max

Max Cont. Voltage: 32.0 volts, dc

Optional Coil Voltage: 115 Volts, ac, with self-contained rectifier. Other voltages available.

Coil Resistance (at 25°C): 190 ohms, min/220 ohms max for 26.5 volt, dc, ratings. Other coils available

Contact Bounce: 2 millisecs, max when specified

Timing Characteristics

Oper Time: 15 millisecs, max at 29 volts, dc

Release Time: 10 millisecs, max at 29 volts, dc

Physical Characteristics

Weight: 3.5 oz., max

Construction: Balanced, rotary armature

Mounting: Two mounting holes on flange, holes are 0.152" dia (This in std flange type), mounting studs are also available. Other type mountings available upon request.

Headers: Compression seal type, with one blue bead for coil identification is std. Multicolored beads can be furnished for color-coding of terminals.

Terminals: Solder lugs, pierced and flattened. The 6 inside terminals are 0.468" long; the 8 outside terminals, 0.250" long. Hook type or straight wire terminals can be furnished for plug-in, printed circuit, or solder connections (Plug-in terminal headers are frequently gold plated for low resistance between terminal pins and socket inserts.

Contact Materials: Fine silver, gold alloy, gold surface overlaid on silver, palladium and silver cadmium oxide are available.

Contact Adjustment: Contacts are adjusted with torque gauges for uniformity.

Environmental Conditions

Oper Ambient Temp Range: -65°C to +125°C

Test Data

Dielectric Withstanding Voltage: 1000 volts, rms between any switching circuits; between any switching circuits and coils; between all terminals and case

Insulation Resistance: 1000 megohms, min at 500 volts, dc

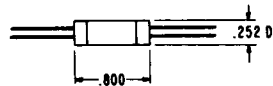
Vibration: 20g to 2000 cy with no chatter

Shock: 50g, 11 millisecs, no contact chatter

Remarks: These relays have been designed for and are tested for compliance with MIL-R-5757D.

K201
RELAY, THERMAL (CURRENT SENSITIVE)-
NORMALLY OPEN

Application: Guided missiles, rockets, supersonic aircraft, computers, and special electronic devices.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Networks Electronic Corp., Chatsworth, California

Electrical Characteristics

Insulating Resistance: After firing, 1000 megohms minimum.
 Dielect Strength: 600 volts rms for 5 seconds at 60 cps.
 Contact Rating: 2 amp.
 Contact Resistance: 0.3 ohm maximum after firing.
 Min Insulation Resistance: 1000 megohms minimum.

Physical Characteristics

Size (Approx): 0.800" x 0.252".
 Case: Pyrex glass.
 Sealing: Hermetically sealed in glass.
 Contact Arrangement: SPST, normally open.

Environmental Conditions

Normal Temp Range: -52°C to $+218^{\circ}\text{C}$.
 Shock: 250 G's for 2 to 4 milliseconds.
 Vibration: 20 to 2000 cps at 40 G's.

K202
RELAY, THERMAL, THERMO-ARMING RELAY

Application: Designed to close a circuit with the application of 3 to 4 volts, ac or dc.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Cook Electric Co., Chicago, Illinois.

Electrical Characteristics

Insulating Resistance: 200 megohms minimum.
 Contact Rating: 5 ma to 5 amp, dc.
 Dielect Withstanding Volts (Sea Level): 500 volts, dc.
 Acceleration: 150 G.
 Min Insulation Resistance: 200 megohms.

Physical Characteristics

Weight: Less than 1 oz.

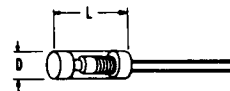
Environmental Conditions

Max Temp Range: $+85^{\circ}\text{C}$.
 General Altitude Test: Operation in excess of 75,000 ft.
 Normal Temp Range: -65°C to $+85^{\circ}\text{C}$.
 Shock: 250 G's, 2 to 4 milliseconds deceleration.
 Vibration: 20 to 2000 cps to 40 G's.

Remarks: Test reports are available upon request.
 Refer to Inland Testing Laboratories, Cook P/N 666-1960

K203
RELAY, THERMAL, TEMPERATURE SENSITIVE

Application: Provides overload protection for rotating electrical equipment and fire protection systems.



	L	D	TERMINAL DIA
50 AMP	1-1/4	5/8	.125
25 AMP	1-1/4	1/2	.084
10 AMP	1.0	3/8	.050
7.5 AMP	1.0	5/16	.040
4 AMP	1.0	1/4	.030

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Networks Electronic Corporation, Chatsworth, California.

Electrical Characteristics

Power Input: 4 to 50 amp.
 Insulating Resistance: 1000 megohms.
 Dielect Strength: 600 volts rms, 60 cps (at sea level).
 Contact Resistance: 0.3 ohm maximum.

Physical Characteristics

Size (Approx): See illustration.

Sealing: Hermetically sealed.

Contact Arrangement: SPST, normally open or normally closed.

Test Data

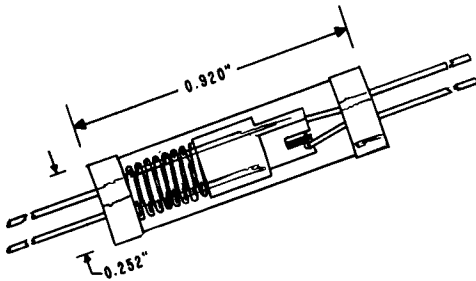
Normal Temp Range: 45° C to 538° C.

Shock: 100 G's for 2 to 40 milliseconds.

Vibration: 20 to 1000 cps at 20 G's (2 planes).

K204**RELAY, THERMAL CURRENT SENSITIVE, NORMALLY CLOSED TYPE SPST, PART NO. M449**

Application: Designed for use as a low-current sensing device, or for use as an overload protective device adaptable to guided missile circuitry and other complex electronic equipment.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Networks Electronic Corporation, Chatsworth, California

Electrical Characteristics

Operation: SPST, normally closed, (one shot)

Fuse Circuit: .230 amp, max continuous current (without burning)

Fuse Firing Current: .350 amp, min

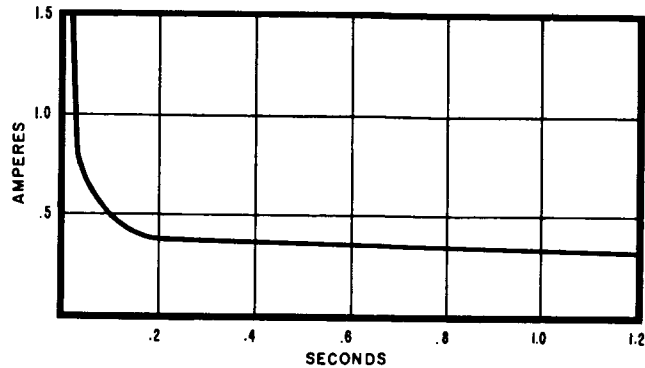
Fuse Firing Time: (see graph)

Fuse Resistance: 7.55 ±15% ohms

Switch Circuit: (Switch Rating): 1 amp, max

Switch Circuit Resistance: .150 ohms, max

Switch Surge Current: 2.5 amps for .050 sec, max

FIRING TIME VS CURRENT**Physical Characteristics**

Weight: 1.5 gram, approx

Color Code: Fuse end, green; switch end orange

Fuse Wire: .002" dia. Karma

Fuse Leads: .020" dia. Kovar

Switch Leads: .025" dia. Kovar

Sealing: Hermetically, bonding metal headers to glass housing; the glass provides interior visibility

Environmental Conditions

Insulation Resistance: 1000 megohms, min

Temp Range: -100°F to +400°F

Test Data

Dielectric Withstanding Voltage (Sea Level): 600 volts, rms, 60 cps

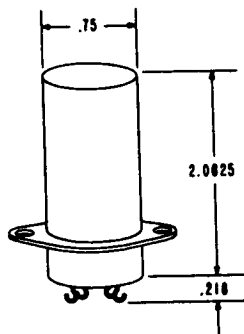
Shock: 100 g's for 2-4 msec

Vibration (Before and after firing): 20 to 2000 cps at 20 g's

Remarks: Operation of this device is based on the "fuse burnout" principal which provides a wide latitude to system designers. Costly transistors and other solid-state devices can be protected with this tiny relay which fires positively at .350 amp, or you can obtain firing times from 1000 to 10 milliseconds by increasing the firing current to a max of 2 amps (see graph).

**K301
RELAY, THERMAL TIME DELAY, HERMETICALLY
SEALED, MODEL 250**

Application: Designed for use in jet aircraft and missiles applications.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Thomas A. Edison Industries, Instrument Division,
West Orange, New Jersey

Electrical Characteristics

Heater Input Power: 4 watts, approx (standard voltages are listed in Table I)

Contact Rating: 3amp, at 115 volts, ac, or 3 amp, at 27.5 volts, dc

Dielectric Withstanding Voltage: 1000 volts, rms, 60 cy between heater circuit, contact circuit and shell

Critical Voltage: Approx 75% of nominal oper voltage

Table I

Normal Operate Time in Secs. Tol. ±10%*	Heater Voltage		
	115	27.5	6.3
5*	B-6001	B-6016	B-6031
10*	B-6002	B-6017	B-6032
20	B-6003	B-6018	B-6033
30	B-6004	B-6019	B-6034
45	B-6005	B-6020	B-6035
60	B-6006	B-6021	B-6036
75	B-6007	B-6022	B-6037
90	B-6008	B-6023	B-6038
105	B-6009	B-6024	B-6039
120	B-6010	B-6025	B-6040
150	B-6011	B-6026	B-6041
180	B-6012	B-6027	B-6042

* Minimum tolerance ±2 seconds; Contacts N/O

Timing Characteristics

Operate Time: See Table I

Timing Tolerance: At extreme ambient temp is ±10% of room temp values

Instantaneous Reoperate Time: Less than 2 secs

Physical Characteristics

Weight: 1.5 oz, max

Mounting: Flanged, 4-solder lug type 6000 series for high frequency vibration. Operates in any position

Sealing: Hermetically, (Manufacturer claims relay can be operated at any altitude) per MIL-E-5272B, Para 4.12.1

Contact Arrangement: SPST, normally open contacts

Mounting Flange: Has (2) .125" dia, holes

Environmental Conditions

Ambient Temp Range: -65°C to +85°C

Salt Spray: Per MIL-E-5272B, Para 4.6

Test Data

Vibration: Flange mount: to 500 cps at 10 g's per MIL-E-5272B, Para 4.7, Proc 1; contact chatter confined to ±10% of operate time without vibration

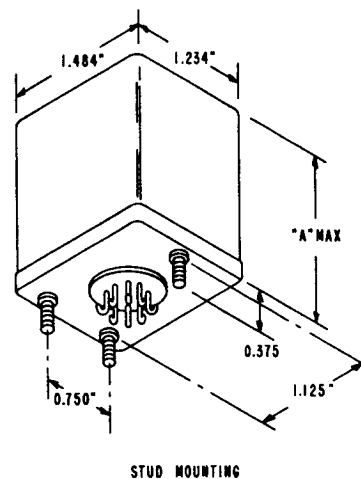
Shock: Per MIL-E-5272B, Para 4.15.1, 4.15.2, 4.15.2.1

Remarks: This relay operates on the principle of linear differential expansion. A bearingless linkage system amplifies motion to provide stability.

K302

**RELAY, THERMAL TIME DELAY, HERMETICALLY
SEALED, TYPE STR**

Application: Designed to operate from a 400 cps source, thereby, eliminating the need for a separate power supply when required with high frequency equipment. Applicable for use in aircraft.



STUD MOUNTING

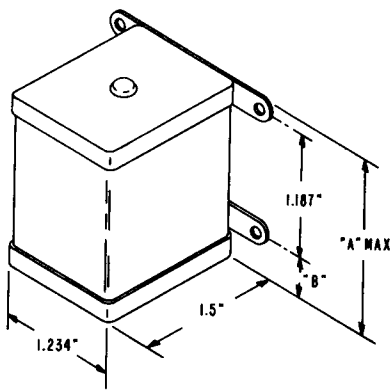


PLATE MOUNTING

Physical Characteristics

Contact Arrangement: SPDT
 Weight: 5 oz. max
 Finish: Gray synthetic enamel
 Base Type: Hooked solder type terminals
 Mounting: Either plate or stud (see Figure 1)

Delay Range	Dimension A	Dimension B
10-90 Sec	1-11/16"	5/16"
91-180 Sec	2-1/16"	13/32"

Mechanical Characteristics

Life: 100,000 ops, min under rated contact load

Environmental Conditions

Temp Compensation: 28 volts, dc; -65°C to +125°C; 115 volts, ac; -55°C to +85°C
 Vibration: 28 volts, dc; 5-500 cps, 10g
 Shock: Chatter free under all operating conditions; 28 volts, dc; 50g; 115 volts, ac; 30g
 Altitude: Hermetically sealed for operation to at least 70,000 feet
 Insulation Resistance: 100 megohms, min at 100 volts, dc
 Dielectric Withholding Voltage: 1000 volts peak between all mutually insulated terminals

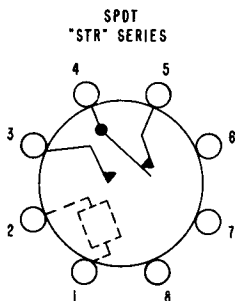
Remarks: The STR relays will reset the instant they are deenergized, providing the same delay period for each succeeding cycle. By employing a special thermal element in conjunction with a pair of magnetic relays in the same package an improved operational advantage is achieved. This component combination utilizes both the heating and cooling intervals to obtain the total time delay period.

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Electronic Fittings Corp., Danbury, Conn.

Electrical Characteristics

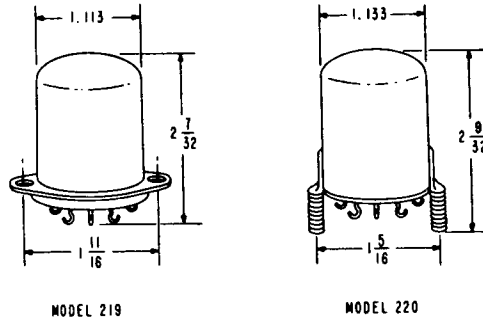
Oper Voltage: 28 volts, dc, nom or 115 volts, ac nom - 400 cps
 Voltage Compensation: Over the range of 22-32 volts, dc or 103-127 volts, ac-400 cps
 Time Delay: Factory preset 10-180 secs
 Reset Time: Resets instantaneously (within 10 msec) providing the full time delay period upon recycling.
 Contact Rating: 2 amp at 28 volts dc, or 115 volts ac, resistive load
 Resistance: 0.1 ohms, max
 Oper Power: During timing-approx 10 watts; after timing, less than 3 watts
 Operating Voltage is applied to terminals 1 and 2 (see Figure 2); Broken lines show internal connections to time delay elements
 Time Delay Tolerance: ±15% at 25°C and nom voltage
 (For operation over the entire temp and voltage range indicated add ±15%.)



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**K401
RELAY, INSTRUMENT SENSITIVE TYPE D.C. MODEL
220 AND 219**

Application: Designed for use in low power electronic circuitry where direct operation of the relay is accomplished from a photo cell output or from a thermocouple. The relay can also be used in plate and grid circuits.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Thomas A. Edison Industries, Instrument Division,
West Orange, New Jersey

Electrical Characteristics

Contact Rating: 350 ma, at 28 volts, dc, resistive load; or 70 ma, at 115 volts, ac (if the load is inductive, an arc-quenching device, RC circuit, resistor or diode, is necessary to minimize contact welding)

Contact Life: At rated contact load and proper arc quenching, contacts will perform 1,000,000 oper, manufacturer claims

Contact Resistance: Approx 2 ohms

Differential Oper: Is possible when net power to coils is between 60 and 350 microwatts

Low Power Oper: 25 to 70 microwatts which corresponds to approx 45 angular degrees of rotation of the moving contact

Stability: Repeatability of the calibrated contact setting ave $\pm 1.5\%$

Coil Rating: Will safely dissipate up to 10,000 times normal power input

Speed of Response: Initial contact in approx 150 millisecs when rated current is applied; at ten times nominal closing current, contact is made in approx 40 millisecs

Fixed Coils' Resistance: Vary from .5 ohm to 23,600 ohms

Mechanical Characteristics

Contact Arrangement: SPST or SPDT, normally open or closed

Mechanism: Fixed coil moving magnet type similar characteristics of a d'Arsonval movement

Physical Characteristics

Weight: .14 lb

Shielding: Magnetic circuit is shielded by a high permeability shield, plus a second external shield cover

Contacts Material: Platinum-iridium wire

Bobbins: Nylon material

Sealing: Model 219 relay is gasket sealed; Model 220 relay, hermetically sealed per USAF Spec MIL-E-005272B, para 5.2.2.

Terminals: Solder Hook, glass to metal seal

Mounting: No. 6-32 studs attached to base of relay, Model 220, flange mounting on Model 219

Environmental Conditions

Oper Temp: To 250 °F per USAF Spec MIL-E-005272B, para 4.1.1; and para 4.2.1, to -85 °F

Humidity: Per USAF Spec MIL-E-005272B, para 4.4.1, Proc. I

Immersion: Model 220 only, USAF Spec MIL-E-005272B, para 4.12.1

Sand and Dust: Per USAF Spec MIL-E-005272B, para 3.1.9.

Salt Spray: Per Federal Spec QQ-M-151

Test Data

Shock: 50 g's in all planes, without evidence of damage

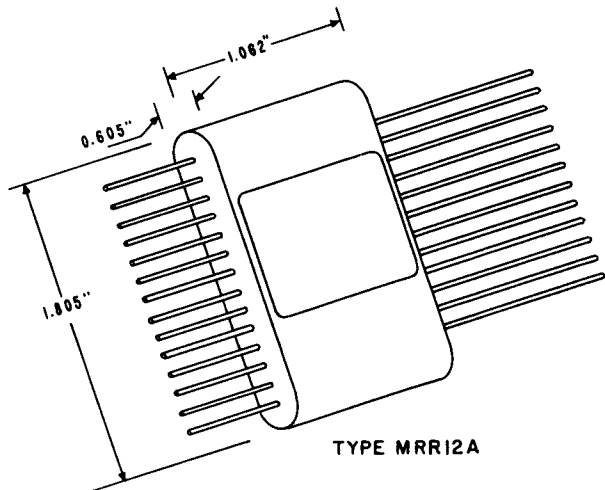
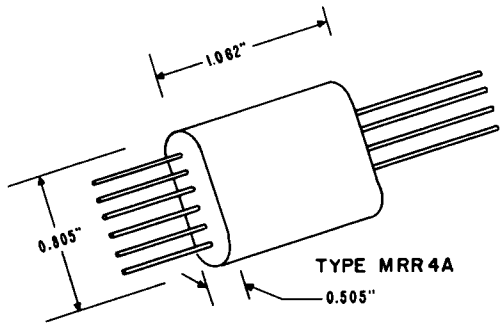
Vibration: 50 g's in all planes, without evidence of damage

Insulation: Passes hi-pot test 500 volts, dc, to ground

Remarks: Manufacturer claims sensitivities down to 1 micro-watt are possible, if ideal conditions are present and the relay is adjusted at the factory for these special conditions.

**K501
RELAY, REED MULTIPLE FORM A, (NORMALLY-OPEN)
CONTACTS TYPE MRR4A and MRR12A**

Application: Designed for use in electronic ground support equipment where long life and efficient contact reliability in dry circuitry and light load switching are paramount factors.



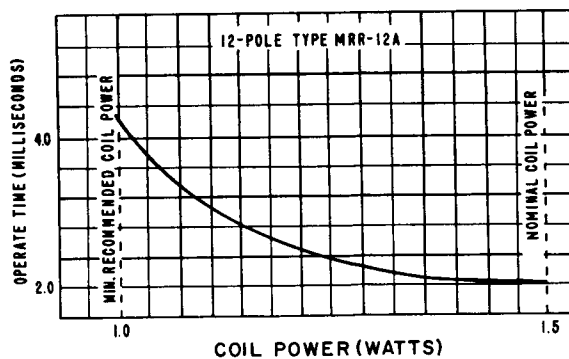
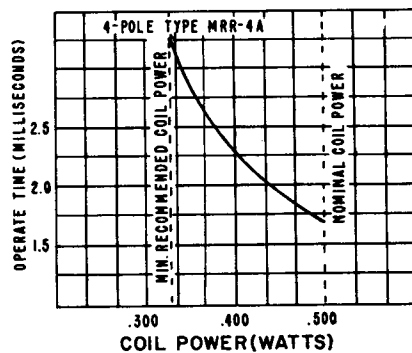
Contact Resistance: 200 milliohms, max
Insulation Resistance: 10,000 megohms
Life Expectancy: 200,000,000 ops at dry circuit loads; 20,000,000 ops at one-half max rating; 3,000,000 ops at max rating

Coil Data: TYPE MRR4A 4 Form A Contacts

Nominal Volts	Minimum Volts, DC	Maximum Volts	Resistance Ohms
6	4.8	7.2	72±7-1/2%
12	9.6	14.4	288±7-1/2%
24	19.2	28.8	1152±7-1/2%
48	38.4	57.6	4608±10%

TYPE MRR12A 12 Form A Contacts

6	4.8	7.2	24±7-1/2%
12	9.6	14.4	94±7-1/2%
24	19.2	28.8	384±7-1/2%
48	38.4	57.6	1536±7-1/2%



Quality Assurance: Manufacturer's claim
Bureau approval required prior to use

Mfr: Struthers-Dunn, Inc., Pitman, New Jersey

Electrical Characteristics

Max Contract Rating: 4 watts, (I x E); 250 volts, max;
125 ma, max

Contact Arrangement: Type MRR4A (4 Form A, N.O.);
Type MRR12A (12 Form A, N.O.)
Oper Coils: Single DC type

Physical Characteristics

Terminal Leads: Insulated straight wire with 0.115" grid spacings, MRR4A—4. Reed terminals .028" dia, 4 reed terminals—.018" x .030" dia
Terminal Coil Leads: MRR4A, 2- #21 GA (.028" dia)
Lead Length: Reed terminal MRR4A (one lead), 1-1/8"; other six leads, 0.546" long, MRR12A, 12 reed terminals, 1-1/8" long; 12 other terminals 0.546" long, two coil leads 0.546" long
Coil Lead Dia: MRR12A, 2 coil leads #21 GA. (0.028" dia)
Terminal Centerline: 0.115"
Mounting: Panel Plastrostrap with metal ends, also directly to terminal studs
Construction: Individual magnetic switches that are hermetically sealed in a glass containing approx one atmosphere of nitrogen. Reeds consist of two nickel-iron alloy reed elements with diffused contacts of gold or silver
Encapsulation: Epoxy resin

Environmental Conditions

Temp Range: -55°C to 85°C

Test Data

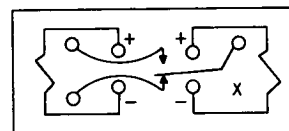
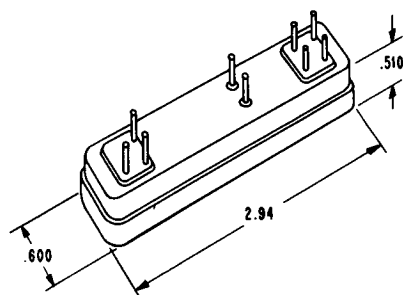
Dielectric Withstanding Voltage: 250 volts, rms
Vibration: 10g to 1,000 cy
Shock: 50g

Remarks: Manufacturer states units are highly resistant to vibration and shock, thereby, making them adaptable to military and aircraft applications.

K502

RELAY, REED, MAGNETIC LATCH, DOUBLE COIL, TYPE RRLMIC102

Application: Designed for memory applications requiring no current drain to hold its contacts in either of two stable states.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Struthers-Dunn, Inc., Pitman, N. J.

Electrical Characteristics

Max Contact Rating: Low level to 10 watts (I X E); 1 amp max; 250 VDC max.
Insulation Resistance: 1,000 megohms.
Dielectric Strength: 250 volts rms.
Oper Coil: Double, DC type.
Coil Power: 300 milliwatts.
Oper Time: 3 milliseconds.
Coil Data:

Nominal Volts	Resistance, Ohms (each coil)
6	120
12	480
24	1920

Physical Characteristics

Mounting: 2 hold wires, .036 dia.
Terminal: .030 dia. pins 1/4" ± 1/16" long.
Terminal Centerline: 0.100".
Construction: Individual magnetic switches that are hermetically sealed in a glass capsule containing approximately one atmosphere of nitrogen. Each switch consists of two nickel-iron alloy reed elements with contact surfaces usually of diffused gold, hard gold, or a combination. The switches are enclosed in a metal can with non-magnetic terminals for utmost magnetic shielding to ensure stable operating characteristics.

Environmental Conditions

Temp Range: 0°C to +50°C.

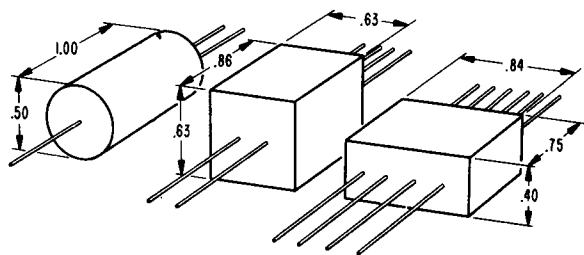
Test Data

Vibration: 20g to 2000 cycles.
 Shock: 20g; 60g, no transfer.
 Life Expectancy: 100,000,000 operations at dry circuit loads.

Nom. Volts	Min. Volts	Max. Volts	Resist. (1 Reed)	Resist. (2 Reed)	Resist. (4 Reed)
6	4	8	150	90	120
12	8	16	600	360	480
24	16	32	2400	1400	1920
32	22	48	4270	2560	3410
48	32	64	9600	5760	7680

**K503
 RELAY, REED, MINIATURE, FORM A CONTACTS,
 SERIES 9000**

Application: Designed to provide improved operation for a large number of applications such as ground support and industrial equipment, especially where long life and reliability are required in low level and dry circuit switching.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Solid State Electronics Corp., Sepulveda, Calif.

Electrical Characteristics

Contact Voltage: 26 volts
 Contact Current: 125 ma
 Contact Breakdown Voltage: 300 volt
 Pull-In Time: 1 millisecond (including bounce)
 Drop-Out Time: 0.1 millisecond
 Contact Min Resonant F: 2,000 cps
 Max DC Resistance: 0.2 ohms
 Min Insulation Resistance: 25,000 megohms (100 volts applied)
 Capacitance (Approx): Contact to contact (test coil grounded), 0.1pf; either contact to test coil, 0.6 pf
 Oper Power (Nominal Milliwatts): 9100 series, 240; 9200 series, 400; 9400 series, 300.
 Coil Data:

Physical Characteristics

Contact Arrangement: SPST, normally open (Form A)
 No Reeds: 9100 series, 1; 9200 series, 2; 9400 series, 4.
 Contact Material: Diffused gold.
 Weight: 9100 series, 10 gms; 9200 and 9400 series, 13 gms.
 Enclosure: Solid epoxy encapsulation.
 Mounting Position: Unrestricted.

Environmental Conditions

Temp Range: -55°C to +125°C

Test Data

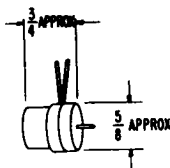
Min Life Expectancy: 3,000,000 cycles (at max dc contact voltage and current)
 Shock: 50g for 11 milliseconds
 Vibration (0 to 2,000 cps): Switch open, to 35g; switch closed, to 50g.

Remarks: Mfr. claims switching speeds are 5 to 20 times faster than those of conventional electromagnetic relays. Power requirements are also substantially reduced.

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**L101
SOLENOID, ROTARY, SERIES 25**

Application: Ideal for operation directly from the output of transistor circuits.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Leetronics, Inc., Brooklyn, N. Y.

Physical Characteristics

Size: See illustration for approx size.

Weight: Upon request.

Material: Anodized aluminum.

Leads: Refer to illustration.

Test Data

Oper Temp Range: Standard, -65°F to 300°F ; special, -65°F to 500°F .

Max Oper Temp: 500°F .

Duty: Continuous or intermittent.

Torque: Upon request.

Operating Voltage: 110 volts, 60 cps, ac. Units operating at other a-c voltages and at d-c are also available.

Rotary Motion: True motion, either left or right hand standard.

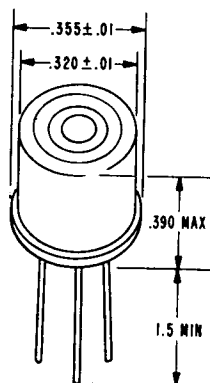
Displacement: Up to 45° standard.

Special Oper Range: Units having special operating voltages and angular displacements can be supplied by the manufacturer.

L201

INDUCTOR, MICROMINIATURE, TYPE 526

Application: Almost any application requiring a high Q microminiature inductor.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Collins Radio Company, Newport Beach, Calif.

Electrical Characteristics (at 25°C)

Designation	Inductance 5% @ 1 Volt RMS	Q _{min}	R _{dc} 20%	Minimum Self. Res. Freq.	I _{max} MA
526-2604-001 MIC-1	1 MH @ 10KC	120 @ 200 KC	2.8	1.5 MC	100
526-2605-001 MIC-2	1.2 MH @ 10KC	120 @ 200KC	3.0	1.35 MC	100
526-2606-001 MIC-3	1.5 MH @ 10KC	120 @ 200KC	4.0	1.25 MC	80
526-2607-001 MIC-4	1.75MH @ 10KC	120 @ 200KC	4.4	1.10 MC	80
526-2608-001 MIC-5	2.0 MH @ 10KC	120 @ 200KC	4.8	1.00 MC	80
526-2609-001 MIC-6	2.4 MH @ 10KC	120 @ 200KC	6.6	920 KC	60
526-2610-001 MIC-7	3.0 MH @ 10KC	120 @ 150KC	7.4	860 KC	60
526-2611-001 MIC-8	3.6 MH @ 10KC	120 @ 150KC	8.2	800 KC	60
526-2612-001 MIC-9	4.3 MH @ 10KC	120 @ 150KC	11.4	750 KC	50
526-2613-001 MIC-10	5.0 MH @ 10KC	120 @ 150KC	12.3	700 KC	50
526-2614-001 MIC-11	6.0 MH @ 10KC	120 @ 150KC	16.7	630 KC	39
526-2615-001 MIC-12	7.2 MH @ 10KC	100 @ 100KC	18.2	570 KC	39
526-2616-001 MIC-13	8.6 MH @ 10KC	100 @ 100KC	20.0	500 KC	39
526-2617-001 MIC-14	10 MH @ 10KC	100 @ 100KC	27.0	460 KC	31
526-2618-001 MIC-15	12 MH @ 10KC	100 @ 100KC	29.0	420 KC	31
526-2619-001 MIC-16	15 MH @ 10KC	100 @ 100KC	32.6	390 KC	31
526-2620-001 MIC-17	17.5 MH @ 10KC	85 @ 70KC	46.0	360 KC	24
526-2621-001 MIC-18	20 MH @ 10KC	85 @ 70KC	50.0	330 KC	24
526-2622-001 MIC-19	24 MH @ 10KC	85 @ 70KC	54.0	300 KC	24
526-2623-001 MIC-20	30 MH @ 10KC	85 @ 70KC	72.0	270 KC	20
526-2624-001 MIC-21	36 MH @ 10KC	85 @ 70KC	80.0	240 KC	20
526-2625-001 MIC-22	43 MH @ 10KC	85 @ 70KC	110	220 KC	16
526-2626-001 MIC-23	50 MH @ 10KC	85 @ 70KC	120	205 KC	16
526-2627-001 MIC-24	60 MH @ 10KC	75 @ 50KC	130	190 KC	16
526-2628-001 MIC-25	72 MH @ 10KC	75 @ 50KC	144	175 KC	16

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Designation	Inductance 5% @ 1 Volt RMS	Qmin	Rdc 20%	Minimum Self. Res. Freq.	I _{max} MA
526-2629-001 MIC-26	86 MH @ 10KC	75 @ 50KC	195	160 KC	12.5
526-2630-001 MIC-27	100 MH @ 10KC	75 @ 50KC	210	150 KC	12.5
526-2631-001 MIC-28	120 MH @ 5KC	75 @ 50KC	230	135 KC	12.5
526-2632-001 MIC-29	150 MH @ KC	50 @ 40KC	257	120 KC	12.5
525-2633-001 MIC-30	175 MH @ 5KC	50 @ 40KC	280	110 KC	12.5
526-2634-001 MIC-31	200 MH @ 5KC	50 @ 40KC	380	100 KC	9.5
526-2635-001 MIC-32	240 MH @ 5KC	50 @ 40KC	410	90 KC	9.5
526-2636-001 MIC-33	300 MH @ 5KC	50 @ 40KC	584	80 KC	7.0
526-2637-001 MIC-34	360 MH @ 5KC	30 @ 30KC	800	70 KC	6.0
526-2638-001 MIC-35	430 MH @ 5KC	30 @ 30KC	875	60 KC	6.0
526-2639-001 MIC-36	500 MH @ 5KC	30 @ 20KC	940	50 KC	6.0

I max as listed in table is based on 200cm/ampere (magnet wire size)

Insulation Res. at 100 volts; dc: 10,000 megohms, min.

Dielectric Strength: 100 volts, RMS.

DC Saturation: Using the value of MA X the square root of MH as a measure of DC saturation effect—Inductance is approx. 5% down when MA X the square root of MH is 100; inductance is approx. 10% down when MA X the square root of MH is 150.

Physical Characteristics

Case: Hermetically sealed in standard transistor case.

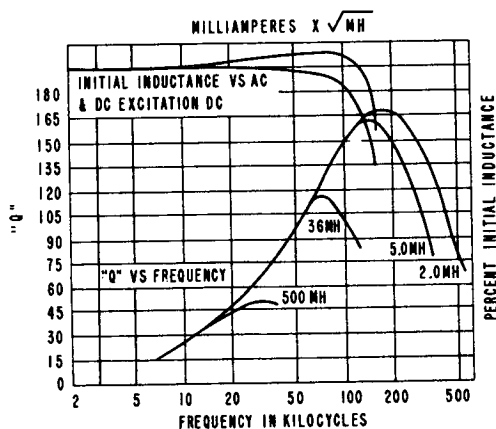
Environmental Conditions

Ambient Temp. Range: -55°C to +85°C.

Test Data

Temp Effect: Inductance change with temperature is ±2% over range of -20°C to +85°C.

Remarks: Essentially no external magnetic field or capacitive coupling to nearby circuitry.



**LS101
SPEAKER, PM TYPE LOUDSPEAKER, TYPE P27502**

Application: Transistor and other electronic equipment where weight and space requirements are restricted.

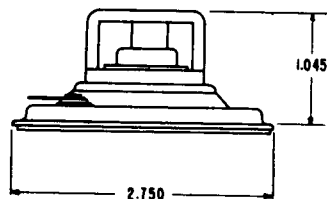
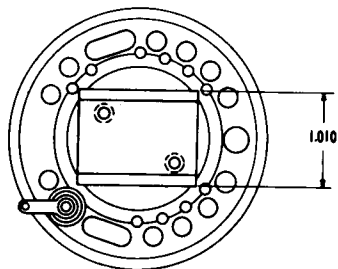
Electrical Characteristics

Power Rating: 150 milliwatts nominal.
Voice Coil Input Impedance: 16 ohms at 1000 cps.
Frequency Response: 250 to 3000 cps.
Gap Energy: .165 millions of ergs
Open Air Resonance: 250 to 350 cps

Test Data

Freq Range: 250 to 3000 cps.
Test Voltage: 1 volt, rms, max sine wave 200 to 5,000 cps
Magnetic Structure: Low reluctance magnetic circuit of optimum design, Alnico V magnet

Remarks: This speaker is designed for simple pressure mounting to front panel or base plate. The two mounting holes are tapped to receive two No 6-32 machine screws. No provision is made for mounting holes on the rim of the speaker.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

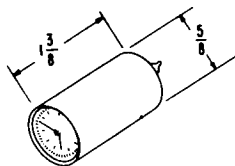
Mfr: Jensen Mfg. Co., Chicago, Illinois.

Physical Characteristics

Over-all Dimensions: See illustration.
Finish: Cadmium plated.
Mounting: Simple pressure mounting to base plate or front panel.
Cone Diameter: 2 3/8".
Mounting Holes: Will accept two #6-32 machine screws, (see Remarks)
Gasket Type: 0.010" thick.
Terminals: Insulated terminal and grounded frame

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M101
INDICATOR, ELAPSED TIME MODEL 95-1000S



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Elgin Micronics, Division of Elgin National Watch
 Co., Elgin, Illinois.

Electrical Characteristics

Motor Operating Voltage: 115 volts, 400cps.
 Power Rating: 1 watt.
 Range: 1000 hours with 1-hour dial increments.

Physical Characteristics

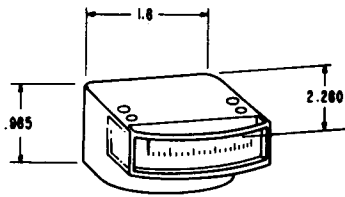
Weight: 1.3 ounces.
 Case: Explosion-proof with solder-pin terminals.
 Finish: Black
 Terminals: Solder-pin type.
 Running Indicator Type: 50 rpm telltale disk.
 Dial Graduation: 1000 hours with 1-hour dial increments.

Environmental Conditions

Oper Temp Range: -40°F to 165°F .
 Vibration: 10G's at 10 to 500cps.
 Shock: 15G's at 11 milliseconds.
 Motor Max Temp Rise: 35°C .

Remarks: 100- and 10,000-hour dial increments also
 available.

M201

METER, SIDE INDICATOR, PANEL TYPE,
MODEL 1120

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: International Instruments, Inc., Orange, Conn.

Electrical Characteristics

Complete Voltage Range: See range chart.

Complete Current Range: See range chart.

Damping Factor: 2 minimum.

Response Time: 2 seconds maximum.

Magnetic Panels: See Remarks.

Accuracy: $\pm 3\%$ of full-scale value for dc; $\pm 5\%$ of full-scale value for ac.

Dielect Strength: 500 volts rms at 60 cps for 1 minute.

Range	Maximum Resis- tance	Range	Maximum Resis- tance
0 - 10 amp	0.01 ohm	0 - 300 V	1000 ohms/V
0 - 15 amp	0.01 ohm	0 - 500 V	1000 ohms/V

Physical Characteristics

Weight: 4 ounces approx.

Mounting: Available for vertical or horizontal mounting position on a vertical panel.

Zero Adjust: Internal; see Remarks.

Terminals: Standard solder lug.

Movement (Swing): Standard movement, with zero at left (zero center or right optional).

Standard Pointer: Lance type, painted black.

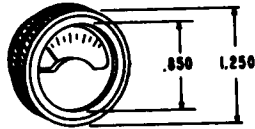
Scale Length: 1.24".

Shielding: Not provided.

Remarks: Model 1120 has been revised. Can be used as a null indicator with a zero center movement. Location of external zero adjuster, when requested, is on top of meter. Calibrated for use on a non-magnetic panel. Meters can be shielded for "back to back" (scales adjacent) when requested.

Range	Maximum Resis- tance	Range	Maximum Resis- tance
D-C Microammeters		D-C Millivoltmeters	
0-100 μ a	1500 ohms	0-50 mv	8 ohms
0-200 μ a	1000 ohms	0-50 mv	25 ohms
0 - 500 μ a	350 ohms	D-C Voltmeters	
D-C Milliammeters		0 - 1 V	1000 ohms/V
0 - 1 ma	40 ohms	0 - 5 V	1000 ohms/V
0 - 3 ma	10 ohms	0 - 10 V	1000 ohms/V
0 - 5 ma	5 ohms	0 - 30 V	1000 ohms/V
0 - 10 ma	4 ohms	0 - 50 V	1000 ohms/V
0 - 15 ma	3 ohms	0 - 100 V	1000 ohms/V
0 - 30 ma	1.5 ohms	0 - 150 V	1000 ohms/V
0 - 50 ma	0.9 ohm	0 - 200 V	1000 ohms/V
0 - 100 ma	0.5 ohm	0 - 300 V	1000 ohms/V
0 - 150 ma	0.4 ohm	0 - 500 V	1000 ohms/V
0 - 200 ma	0.3 ohm	A-C Voltmeters,	
0 - 300 ma	0.2 ohm	Rectifier Type	
0 - 500 ma	0.1 ohm	Self-contained	
D-C Ammeters		0 - 10 V	1000 ohms/V
0 - 1 amp	0.05 ohm	0 - 50 V	1000 ohms/V
0 - 3 amp	0.01 ohm	0 - 100 V	1000 ohms/V
0 - 5 amp	0.01 ohm	0 - 150 V	1000 ohms/V

M301
METER, ELECTRICAL INDICATING, PANEL
TYPE MODEL 100



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: International Instruments Inc., Orange, Conn.

Electrical Characteristics

Complete Voltage Range: Refer to engineering bulletin of manufacturer.

Complete Current Range: Refer to engineering bulletin of manufacturer.

Damping factor: 2 minimum.

Response Time: 2 seconds max.

Accuracy: $\pm 3\%$ of full-scale deflection for dc; $\pm 5\%$ of full-scale deflection for ac.

Dielectric Strength: Model 100W, 1500 volts rms at 60 cps for 1 minute; Model 100C, 500 volts at 60 cps for 1 minute.

Physical Characteristics

Dimensions: 1.250" diameter x 1.250" long (1.00" diameter for Model 100).

Weight: 1-1/2 ounces approx.

Mounting: No mounting screws needed; threaded mounting ring supplied assures mounting on panels up to 1/4".

Zero Adjust: Internal.

Terminals: Solder-lug type.

Movement (switch): Zero at left (zero at center or right optional).

Standard Pointer: Lance type.

Scale Length: 0.760" (90° arc).

Case: Anodized aluminum.

Illumination: Model 100C illuminated meters available with external lamp housing.

Environmental Conditions

Requirements: MIL-M-17275A

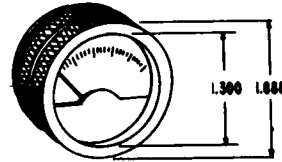
Watertightness: Model 100W is watertight; Model 100C a commercial model, is not watertight.

Moisture Resistance: See watertightness.

Humidity: MIL-M-17275A.

Remarks: Standard scale, with black marking on white background. Meter also contains sapphire jewel.

M302
METER, ELECTRICAL INDICATING, PANEL
TYPE MODEL 150



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: International Instruments, Inc., New Haven, Conn.

Electrical Characteristics

Damping Factor: 2 minimum.

Response Time: 2 seconds maximum.

Instrument Resistance: See range chart.

Standard Ranges and Resistance:

Accuracy: $\pm 3\%$ of full-scale deflection for dc; $\pm 5\%$ of full-scale deflection for ac.

Dielectric Strength: Model 150W, 1500 volts rms at 60 cps for 1 minute; Model 150C, 500 volts rms at 60 cps for 1 minute.

Range	Max Resistance	D-C Millivoltmeters
D-C Microammeters		0 - 10 mv 8 ohms
0 - 100 μ a	1700 ohms	0 - 50 mv 50 ohms
0-200 μ a	800 ohms	D-C Voltmeters
0-500 μ a	250 ohms	0-1V 1000 ohms/V
D-C Milliammeters		0 - 5 V 1000 ohms/V
0 - 1 ma	17 ohms	0 - 10 V 1000 ohms/V
0 - 3 ma	10 ohms	0 - 30 V 1000 ohms/V
0 - 5 ma	5 ohms	0 - 50 V 1000 ohms/V
0 - 10 ma	4 ohms	0 - 100 V 1000 ohms/V
0-15ma	2 ohms	0-200V 1000 ohms/V
0 - 30 ma	1.5 ohms	0 - 300 V 1000 ohms/V
0 - 50 ma	0.9 ohm	0 - 500 V 1000 ohms/V
0 - 100 ma	0.5 ohm	0 - 150 V 1000 ohms/V
0 - 150 ma	0.4 ohm	A-C Voltmeter, Rect. type*
0 - 200 ma	0.3 ohm	0 - 10V 1000 ohms/V

Range	Max Resistance	D-C Millivoltmeters
0 - 300 ma	0.2 ohm	0 - 50V 1000 ohms/V
0 - 500 ma	0.1 ohm	0 - 100V 1000 ohms/V
D-C Ammeters		0 - 150V 1000 ohms/V
0 - 1 amp	0.05 ohm	0 - 300V 1000 ohms/V
0 - 3 amp	0.01 ohm	0 - 5000 V 1000 ohms/V
0-5 amp	0.01 ohm	*Self-contained
0 - 10 amp	0.01 ohm	
0 - 15 amp	0.01 ohm	

Physical Characteristics

Dimensions: 1.688" dia x 1.310" long

(mounts in an 1.500" dia hole).

Weight: 4 ounces approx.

Meter Movement: Standard movement, zero at left

(zero at center or right optional).

Zero Adjust: Internal.

Terminals: Standard solder lug.

Standard Pointer: Lance type.

Scale Length: 1.322" (90° arc).

Remarks: Standard scale with black markings on white background. Produced with same quality and workmanship as meters supplied to meet requirements of MIL-M-3823

Electrical Characteristics

Complete Voltage Range: -20 to 3 VU.

Damping Factor: 67 to 100.

Deflection Time: (0.29 to 0.33 second 99% reading on first swing).

Instrument Resistance: 3900 ohms \pm 5% at 1000 cps. (The meter must be used with 3600-ohm, noninductive Magnetic Panels: See shielding.

Accuracy: At 1000 cps, OVU \pm .25 VU, -20 VU \pm 0.12 volts (\pm 10% voltage at OVU), all other points \pm 0.06 volts (\pm 5% of voltage at OVU) Voltage at OVU points is 1.228 volts.

Pointer Overswing: 1% to 1.5%.

Frequency Response: \pm 1 VU between 25 and 1000 cps. \pm 1 VU between 1000 and 16,000 cps.

Physical Characteristics

Dimensions: 1.375" x 1.750" square.

Weight: 5 oz.

Zero Adjust: Internal.

Terminals: Combination of solder lug and stud.

Standard Pointer: Lance type with black tip.

Scale Length: 1.1". Black marking on white background.

Case: Metal; supplied with a special rubber gasket to effect a watertight seal on the panel.

Shielding: Shielded for use on both magnetic and nonmagnetic panels.

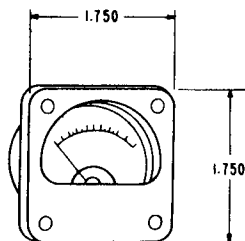
Environmental Conditions

Watertightness: Unit is watertight.

Salt Spray: Meets requirements of QQ-M-151A.

M303

METER, ELECTRICAL INDICATING, PANEL TYPE, RUGGEDIZED VU METER (13MR128SPECR) MODEL 163.



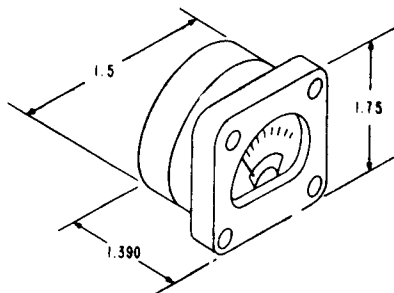
Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: International Instruments, Inc., Orange, Conn.

M304

METER, ELECTRICAL INDICATING, PANEL TYPE RUGGEDIZED, DC, 1-1/2" SERIES 131

Application: Designed for use in environs where a ruggedized meter of compact size is required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: DeJur-Amsco Corp, Electronics Division. Long Island City 1, New York

Electrical Characteristics

D.C. Voltmeters:* From 1 volt and up, 1000 ohms per volt sensitivity

D.C. Milliammeters:* 1-999 ma; 100 millivolt max

D.C. Microammeters:* 50-999 uamp, 150 millivolt max

D.C. Ammeters: All ranges available. For use with external 50 millivolt shunts

Note:* Rectifier types also available

Accuracy: $\pm 3\%$ of full scale

Calibrated: The instruments are calibrated for magnetic and non-magnetic panel mounting

Physical Characteristics

Scale Length: 1"

Scale: Background, white or black; Markings, black, white, Luminous or other

Pointer: Lance type, choice of colors

Zero Adjust: Internal

Terminals: Sealed, solder lugs

Housing Materials: Aluminum flange, steel case

Mounting: Front or rear of panel, 4 holes, 1/8" thru meter flange

Mounting Hardware: 4, No. 4-40 machine screws, hex nuts and lock washers

Construction: Ruggedized to withstand shock, vibration and temp extremes per MIL-M-10304

Movement: Ruggedized minaturized D' Arsonval, with external pivot design, provides accuracy and stability of adjustment.

Magnets: High flux density Alnico

Mounting Flange Finish: Corrosion-resistant matte black

Case: Iridite cadmium plated

Environmental Conditions

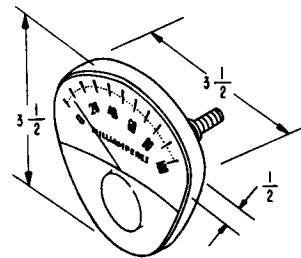
Watertightness: Watertight sealing accomplished by an internal locknut between meter mounting flange and case barrel compressing a heavy duty scale window gasket, uniformly and concentrically.

Terminal studs are similarly sealed.

M305

METER, ELECTRICAL INDICATING, SURFACE MOUNTING PANEL, SERIES S355

Application: The slimness of this meter design facilitates mounting in a small area thereby, making it adaptable for compact electronic equipment



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Parker Electrical Instrument Corporation, Stamford, Connecticut

Electrical Characteristics

Accuracy (at 70°F. ambient): Standard dc, $\pm 2.0\%$ full scale; standard ac, $\pm 3.0\%$ full scale; precision dc, $\pm 0.5\%$ full scale also available.

Insulation: 5000 volts, dc between terminals (mounting screws) and panel

Dampening Factor: 20 min

Movement Overload: Continuous electrical overloads in excess of 100-times full scale (500 milliamps max.) will in no way affect the performance of movement or accuracy of readings.

Shielding: Self-shielded

Physical Characteristics

Weight: Movement only 1 oz; Complete meter 3 oz

Mounting Hardware: Cadmium plated brass with "Spaldite" vulcanized fibre insulation

Pointer: "Tynex" nylon (Dupont) type 3HA,

Pointer Color: BK27, black

Pointer Dia: .019"

Scale Length: 3-1/4"

Case Material: Front, anti-static treated acrylic with anti-glare matte finish; back, high-strength polycarbonate.

Magnet: High-coercive-force Alnico VIII

Mechanical Characteristics

Orientation: Accuracy in all planes is ensured by the balanced movement

Sealed: With "O" ring

Stability: The flat printed circuit coil is exposed to the whole face of the thin ring magnet in a manner that ensures long-term stability

Zero Adjust: $\pm 5\%$

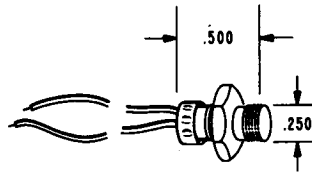
Test Data

Vibration: Per method 201A, of MIL-STD-202B, subjected to a simple harmonic motion with amplitude of 0.03 in., (0.06 in. max total excursion) freq varied uniformly 10 and 55 cps., this range traversed forward and return in one (1) minute, performed in 3 planes, 14 g's
Shock: 15g, 20g, 30g, 40g and 50g, for 11 millisecs, no damage or deviation in accuracy was noted

Remarks: The bearings in this meter are of synthetic sapphire in silicone rubber shock mounts. The pivots are made from low-friction material called "Niva-Point".

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**MT101
TRANSDUCER, MAGNETIC PICKUP, MICROMINIATURE
MODEL 3053**



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Electro Products Laboratories, Inc., Chicago, Ill.

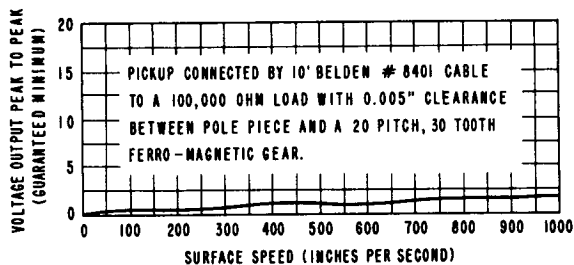
Electrical Characteristics

Test Voltage: 2 to 4 volts pp, 3 volts pp nominal (*see graph)

Resistance: 112 ohms nominal (tentative spec).

Inductance: 2.5 millihenrys nominal (tentative spec)

Polarity: With approach of ferrous metal, white lead will be positive with respect to black lead.



Physical Characteristics

Weight: .096 oz., avg. with lock-nut

Material of Shell and Pole Piece: 416 stainless steel

Leads: Two 6" No. 30 Vinyl insulated.

Mounting: .250-40NS thread with 416 stainless steel lock-nut.

Test Data

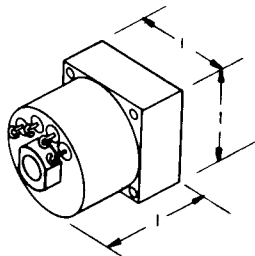
Temp Range: -100°F to +225°F

Insulation Resistance To Shell: 100 megohms, min.

Dielectric Strength To Shell: 500 volts rms min. for 1 minute

MT201
TRANSDUCER, PRESSURE, MINIATURE TYPE 401

Application: Absolute, differential and gage pressures from 0-5 to 0-400 psi, and for differential pressures from ± 3 to ± 200 psi



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Colvin Labs, Inc., E. Orange, N.J.

Electrical Characteristics

Standard Potentiometer Resistance: 5000 ohms. Other resistances available
 Standard Tolerances: $+10\% - 0$. Other tolerances available
 Current Rating: 6 milliamps

Mechanical Characteristics

Pressure Ranges: 0-5 to 0-400 psia, psid and psig, ± 3 to ± 200 psid
 Linearity: $\pm 1\%$ (terminal or best straight line, as specified)
 Resolution: 0.3%
 Repeatability: $\pm 0.5\%$
 Hysteresis: 0.5%
 Friction: 0.5% to 1%, depending on range
 Envelope of resolution, linearity, hysteresis and repeatability: $\pm 2\%$
 End Points: 0-1% and 99-100% to 0-5% and 95-100%, as specified
 Over-pressure: To 110% of range on plus/minus differential units, to 110% or 200% or more of range (as specified) on all other units
 Response Time: 20 millisees (time for output to reach value corresponding to 63% of full range step input)
 Frequency response: Will follow pressures fluctuating $\pm 40\%$ from mid-range pressure at 100 cps, within 10%

Physical Characteristics

Weight: 2.2 oz
 Pressure Ports: 1/8 in. pipe tap
 Electrical Connection: Soldering terminals or pyqmy receptacles

Mounting: Four No. 4-40 tapped holes on .800 in. square
 Finish: Gray enamel standard
 Life: 50,000 full range cycles; $\pm 5\%$ of range

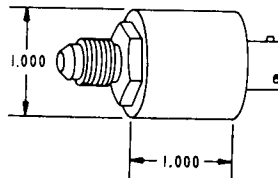
Environmental Conditions

Temp. Range: -55°C to $+105^{\circ}\text{C}$, $\pm 2\%$
 Acceleration: 100 g's, $\pm 1.0\%$
 Vibration: 0.4 in, excursion at double amplitude to 42 cps, ± 35 g's at 42-5000 cps, $\pm 1.0\%$
 Shock: Qualification specification not available

Remarks: Differential units may be used with air or non-corrosive gases; absolute and gage units may be used with liquids, air or non-corrosive gases.

MT202
TRANSDUCER, PRESSURE, HERMETICALLY SEALED
POTENTIOMETER MODEL L-113

Application: Designed for use in missile and space satellite assemblies.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Servonic Instruments, Inc., Costa Mesa, California

Electrical Characteristics

Standard Resistances: 2000, 5000, 7500, and 10,000 ohms.
 Resistance Tolerances: $\pm 5\%$
 Hysteresis: 0.3% to 0.7% full range, depending on range
 Resolution: 0.3% to 0.4% depending on resistance
 Independent Linearity: $\pm 0.85\%$, full scale
 Insulation Resistance: 50 megohms at 250 volts, dc
 Current Rating: 10 milliamp, at 70°F

Mechanical Characteristics

Pressure Range: 0-10 to 0-350 psia or psig.
 Repeatability: ± 1 psia, less than $\pm 1.2\%$ for most ranges
 End Settings: $2.5 \pm 1.5\%$ and $97.5 \pm 1.5\%$
 Response Time: 10 millisees to 63% of applied step
 Proof Pressure: 150% of rated range
 Burst Pressure: 200% of rated range
 Case Pressure: 700 psi
 Life: 100,000 cy

Physical Characteristics

Weight: 1.8 oz.

Fitting End: Per MS3656-4, Style "E"

Connector: PTIH-8-4P(101) Bendix (or equiv) connector

Environmental ConditionsTemp Range: -65° to $+275^{\circ}$ F

Temp Effect: 0.01% per degree F

Humidity: Per MIL-E-5272C

Fungus: Per MIL-E-5272C

Salt Spray: Per MIL-E-5272C

Altitude: Per MIL-E-5272C

Sand and Dust: MIL-E-5272C

Test Data

Vibration: 35g to 2000 cps

Vibration Effect: $\pm 1.0\%$, max any axis

Acceleration: 100g

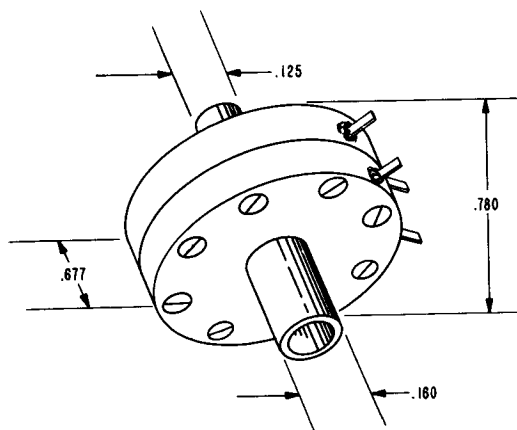
Acceleration Effect: Less than 1.0% of full range

Shock: 100g, 8 ± 3 ms

Remarks: The unit can sense liquid oxygen, conductive, corrosive or non-corrosive fluids or gases, this sensing depends on the type of sensing element.

MT203**TRANSDUCER, PRESSURE, DOUBLE COIL VARIABLE RELUCTANCE DIAPHRAGM, HR SERIES**

Application: Designed for high sensitivity and fast response at low pressure differentials.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Hidyne Instrument & Engr. Co., Tullahoma, Tenn.

Electrical Characteristics

Output: 30, 40, 50, 100, 150, 150 mv. per corresponding range

Linearity: $\pm 1\%$ best straight line

Hysteresis: 1% full scale

Output Impedance: 153 ohms @ 64° phase anglePower Input Impedance: 39 ohms @ 64° phase angle

Capacitance (coil to case): 25 pico farads

Excitation: 5 vrms @ 20 kc

Response: Less than 1 millisecond for 2 psia step

Mechanical Characteristics

Range: 1/10, 1/4, 1/2, 3, 15, 30, psid.

Max Overload: 1 atmosphere for lower ranges, 50 psi all other ranges.

Diaphragm Natural Freq: 1.7 kc for 1/2 psid range (approx).

Physical Characteristics

Weight: 12 grams

Material: 416 stainless steel w/E poxy potting

Pressure Connections: 1/8 in. plastic tubing fittings

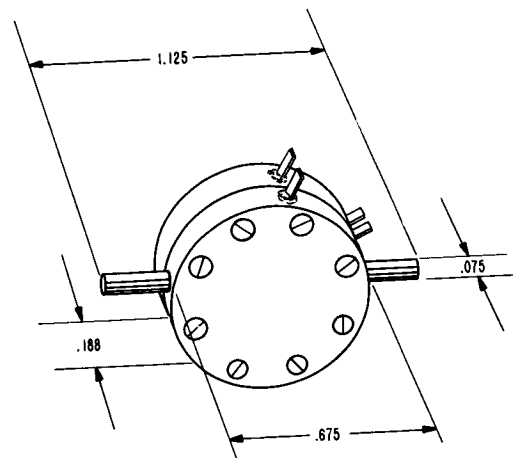
Internal Volume: 0.0027 cubic in.

Environmental ConditionsTemperature Characteristics: Zero shift with temp: 0.01% f.s./ $^{\circ}$ F; sensitivity change: 0.03% f.s./ $^{\circ}$ F.Operating Temperature: -65 to $+220^{\circ}$ F.

Remarks: Pressures as low as 25 microns have been resolved under dynamic conditions.

MT204**TRANSDUCER, PRESSURE, DOUBLE COIL VARIABLE RELUCTANCE DIAPHRAGM, W SERIES**

Application: Designed for high sensitivity and fast response for both static and dynamic pressure measurements.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Hidyne Instrument & Engr. Co., Tullahoma, Tenn.

Electrical Characteristics

Output: 15 mv for 1/4 psid, 25 mv for 1/2 psid, 75 mv for 3 psid, 125 mv for 15 psid, 150 mv for 30 psid (All with 5 volts input @ 20 kc).

Linearity: $\pm 1\%$ best straight line or better.

Hysteresis: 1% of full scale or less.

Output Impedance: 8 ohms nominal.

Power Input Impedance: 220 ohms, approx.

Excitation: 5 volts @ 30-20 kc

Response: 1 millisecond for 2 psia step

Mechanical Characteristics

Range: 1/4, 1/2, 3, 15, 30, psid

Max Overload: 50 psi either side

Diaphragm Natural Freq: 7.5 kc for 1/2 psid transducer (approx).

Physical Characteristics

Weight: 7 grams

Material: 416 stainless steel

Pressure Connection: 1/16 in. plastic tubing fittings

Internal Volume: .001 cubic in.

Environmental Conditions

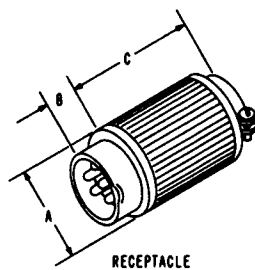
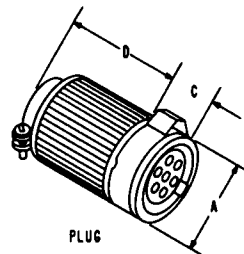
Temperature Characteristics: Zero shift with temp: within 0.01% full scale/ F° ; sensitivity change with temp: within 0.04%/ F° .

Ambient Temperature: -65 to +220 F°

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**P101
CONNECTOR, CABLE ENVIRONMENTAL SNAP-E-LOCK
CIRCULAR SERIES 4A, 7 AND 13**

Application: Designed for use in missile systems, aircraft, telemetering, equipment, computers and precision electronic equipment.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Viking Industries Inc., Canoga Park, California

Electrical Characteristics
Current Rating: 7-1/2 amp

No. of Contacts	Recommended Working Voltage	
	Sea level	At 70,000 ft
Series 4A, 2, 3, 4, 5, 7	1000 volts, dc	1000 volts, dc
Series (4) 2, 3, 4	1000 volts, dc	1000 volts, dc
Series (7), 5, 6, 7	2000 volts, dc	2000 volts, dc
9	800 volts, dc	800 volts, dc
Series 13		
13	2000 volts, dc	2000 volts, dc
19	800 volts, dc	800 volts, dc

Insulation Resistance: 5000 megohms, min

Physical Characteristics

Cable Plug with Grommet, Follower and Hood

Series	No. of Contacts	Part Number	A	C	D
4A	2, 3, 4, 5, 7	VP*/4CE15	.56"	.39"	.84"
**4	2, 3, 4	VP*/2BC15	.56"	.39"	.84"
7	5, 6, 7, 9	VP*/2CE15	.81"	.41"	.95"
13	13, 19	VP*/2CE15	1.06"	.43"	1.25"

*Insert number of contacts desired

**4 series recommended for replacement only - please see new 4A Series

Wire Size: No. 18 AWG, max

Weight (approximate):	Series 4, 4A	7	13
Plug	.27 oz.	.54 oz.	1.05 oz.
Receptacle	.32 oz.	.71 oz.	1.21 oz.

Cable Connector (Receptacle) with Interface Gasket, Grommet, Follower and Hood

Series	No. of Contacts	Part Number	Dimensions		
			A	B	C
4A	2, 3, 4, 5, 7	VR*/4AB15	.50"	.32"	1.08"
**4	2, 3, 4	VR*/2AB15	.50"	.32"	1.08"
7	5, 6, 7, 9	VR*/2AA15	.72"	.34"	1.20"
		VR*/2AD15	.72"	.34"	1.20"
13	13, 19	VR*/2AA15	.96"	.35"	1.56"

*Insert number of contacts desired

** 4 Series recommended for replacement only

Materials and Finishes (Receptacles): With molded plastic insulator

Shell: Stainless steel, passivated

Contacts for Receptacles: Gold plated with .000031" min, thickness

Pins: Copper alloy

Gaskets: Silicone rubber

Materials and Finishes (Plug):

Shell: Aluminum, nickel plated

Insulator Materials for Receptacles and Plugs: Standard is diallyl phthalate GDI-30 per MIL-M-19833; a special material GDI-30F, flame retardant is available upon request

Socket Contacts for Plugs: Gold plated with .000031" min, thickness over copper alloy
 Lock Band: Stainless steel
 Grommet: Silicone rubber
 Grommet Follower: Aluminum anodized
 Hoods: Aluminum, nickel plated
 Note: See tables, hood length P dimension not shown in illustration.

Environmental Conditions

Moisture Resistance: Per MIL-C-5015 para. 4.5.20 will remain waterproof when submerged (15 psig)
 Oper Temp: —67°F to 400°F

Test Data

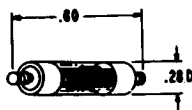
Vibration: No damage to connector or loss of electrical continuity at 5 to 2000 cps at 30g
 Shock: No damage to connector or loss of electrical continuity at 50g deceleration
 Contact Retention: 12 lbs, min, axial load
 Connector Retention Force When Mated: In excess of 100 lbs axial pull, without damage to the locking mechanism

No. of Contacts	Breakdown		Test	
	Sea Level	70,000 ft	Sea Level	70,000 ft
Series 4A				
2, 3, 4, 5, 7	4200 vdc		3500 vdc	3500 vdc
Series 4				
2,3,4,	4200 vdc	4200 vdc	3500 vdc	3500 vdc
Series 7				
5,6,7,	7000 vdc	7000 vdc	5500 vdc	5500 vdc
9	3500 vdc	3500 vdc	2600 vdc	2600 vdc
Series 13				
13	7000 vdc	7000 vdc	5500 vdc	5500 vdc
19	3500 vdc	3500 vdc	2600 vdc	2600 vdc

Remarks: This device is automatically locked when the connector is engaged. The connector is disengaged instantly by pressing the thumb down on the lock-band projection on the plug side and pulling the plug away from the receptacle.

Fig 1

R101
RESISTOR, FIXED, PRECISION, GLASS CASE SEALED



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Networks Electronic Corporation, Chatsworth,
California.

Electrical Characteristics

Std Range: 10 ohms to 800K.
Max Working Voltage: 150 to 800 volts (Standard
Values).
Power Rating: 1/4 to 2 watts.
Tolerance: 1%.

Physical Characteristics

Construction: Glass case-clear with specially an-
nealed glass.
Terminations: Hermetically solder-sealed with glass-
kovar headers.
Lead Wire: Available with log type or flexible leads.
Winding: Noninductive.

Environmental Conditions

Max Oper Temp: Available to 125°C.
Waterproofness: MIL-R-93A.
Moisture Resistance: MIL-R-93A.

Test Data

Shock: 200 G's for 1.3 milliseconds.
Vibration: 20 to 3000 cps at 15 G's.
Stability: 0.1%.
Acceleration: MIL-R-93A.
Temp Rating: 40°C to 105°C. Units available on
special request with rating of -65°C to 125°C.
Temp. Coefficient: ± 0.00002 per °C.

R102
RESISTOR, FIXED, POWER TYPE RS



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Dale Electronics, Inc., Columbus, Nebraska.

Electrical Characteristics

Std Range: 0.05 ohms to 273,000 ohms depending on type.
Max Working Voltage: Dielectric strength is 1000
volts, ac.
Power Rating: 1 to 10 watts, depending on type.
Tolerance: 0.05%, 0.1%, 0.25%, 0.05%, 1%, and 3%.

Physical Characteristics

Construction: Silicone coated.

Environmental Conditions

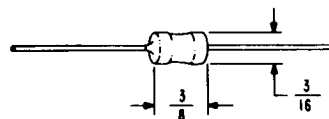
Waterproofness: MIL-R-26C
Corrosion: MIL-R-26C
Humidity Test: MIL-R-26C
Moisture Resistance: 100% impervious to moisture
(MIL-R-26B).
Humidity Test: MIL-R-26B.
Corrosion: MIL-R-26B.

Test Data

Temp Coefficient: ± 30 ppm/°C.

R103
RESISTOR, FIXED "BLUE JACKET" AXIAL LEAD,
TYPE 240E

Application: These resistors are designed for point-to-
point wiring systems. See remarks column.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Sprague Electric Company, North Adams, Mass.

Electrical Characteristics

Power Rating: 2 watts, based on a max temp rise of 300°C above a 40°C ambient at full rated wattage

Catalog No. *	Nominal Ohms	Max Ma	Catalog No.	Nominal Ohms	Max Ma
24OE1R05 1	1414		24OE2005 20		316
24OE1R55	1.5	1153	24OE2505 25		282
24OE2R05	2	1000	24OE3005 30		258
24OE3R05	3	812	24OE4005 40		223
24OE4R05	4	707	24OE5005 50		200
24PE5R05 5	632		24OE7505 75		163
24OE7R55	7.5	509	24OE1015 100		141
24OE1005**	10	447	24OE1515 150		115
24OE1505	15	360	24OE2015 200		100
24OE2515	250	89	24OE1025 1000		44
24OE3015	300	81	24OE1525 1500		36
24OE4015	400	70	24OE2025 2000		31
24OE5015	500	63	24OE2525 2500		28
24OE6015	600	57	24OE2725 2700		26
24OE7015	700	52	24OE3025 3000		25
24OE8015	800	50	24OE3325 3300		24
24OE9015	900	46	24OE3525 3500		23

Catalog numbers shown are for standard resistor having resistance tolerances of ±5%. For other tolerances, change the last digit of the catalog number to 1, 2, or 9 for tolerances of ±1%, ±2% or ±10%, respectively.

Tolerance: Resistors shall be within ±5% tolerance of nominal value from 1 ohm to max ohms and within ±10% tolerance of nominal value from 0.1 ohm to .999 ohms.

Physical Characteristics

Terminal Strength: Withstand 10 lbs, direct pull
Leads: No. 20(AWG), tinned leads, 1½" ± 1/8"
Construction: Ceramic core, and vitreous enamel coating, all welded construction eliminates moisture paths along the leads, and securely anchors the leads to resistor body

Environmental Conditions

Temp Coefficient: %/°C; 25 to 350C - +0.0025, 25° to 275°C - +0.0020, 25° to -55°C - (-0.0010) per MIL-R-26C tests
Max Oper Temp: 300°C
Humidity: Will meet moisture resistance test for uninsulated axial-lead resistors per MIL-R-26C
Corrosion: as per MIL-R-26C

Test Data

Thermal Shock: From rated wattage to air temp at -55°C, resistance change not greater than 2%

Overload: Withstand wattage of 10 times rated wattage for 3 seconds.

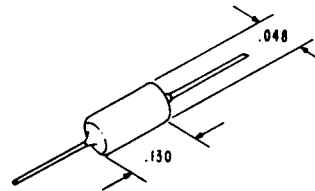
Load Life: With rated power applied for 1½ hrs, then removed for ½ hr consecutively for 500 cycles for 1000 hrs, temp at 25°C, resistance does not change more than ±5% after test

Remarks: These resistors maintain a hot spot of 340°C at full load and caution is to be exercised for mountings, when used in printed circuit networks to prevent charring of boards.

R104

RESISTOR, FIXED METAL FILM, MICROMINIATURE TYPE MF3C

Application: Designed for use in electronic circuitry where close tracking of resistance values of two or more resistors is required, and whose D.C. resistance should not be adversely affected by frequency.

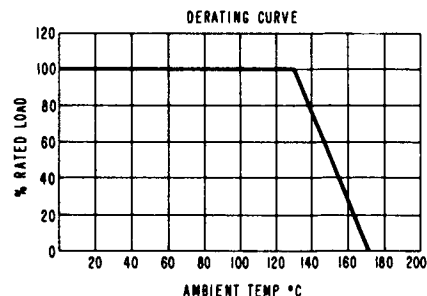


Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Electra Manufacturing Co., Independence, Kansas

Electrical Characteristics

Resistance Range: 30 ohms to 100K, ohms
Tolerance: ±1%
Dissipation At (125 °C): 1/20 watt
Max Rated Voltage: 200 volts



Physical Characteristics

Encapsulation: Electra's R-5 coating
 Axial Leads: No. 26 AWG, alloy coated copper, permits easy solderability
 Lead Length: 1-1/2", ±1/8"
 Coating Color: Blue
 Noise: Level below 0.20 microvolt

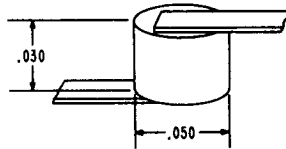
Environmental Conditions

Temp Coef: T-0, ±100 PPM/°C; T-2, ±50 PPM/°C

Temp Coef: ±300 PPM/°C per MIL-STD-202, method 304
 Moisture Resistance: ±1.5% per MIL-STD-202, method 106

R105**RESISTOR, FIXED MICROMINIATURE SOLID CERMET**

Application: Designed for use as inserts into printed circuit boards for extremely micro-miniaturized applications.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: CTS Corp., Elkhart, Indiana

Electrical Characteristics

Resistance Range: 50 ohms to 100K ohms
 Tolerance: ±10% std; ±5% special
 Power Rating: 1/10 watt at 125°C
 Max Voltage: 100 volts
 Short Time Overload: 2.5 times rated voltage but not exceeding max voltage specified, ±1% max
 Load Life: 1,000 hr, at rated voltage, ±3% at 125°C
 Voltage Coef: 0.1% per volt
 Low Temp Oper: Full load at -65°C for 45 minutes, ±5%

Physical Characteristics

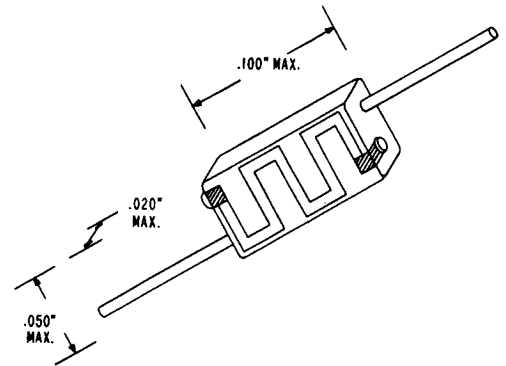
Terminations: Gold, connected in circuit with conductive epoxy (also available as a lead type resistor suitable for welding or soldering)
 Lead Material: Nickel or kovar ribbon, plain or gold plated
 Lead Size: .005" x .010"
 Construction: made of ceramic-metal composition

Environmental Conditions

Temp Range: 125°C to 200°C
 Temp Cycling: Per MIL-STD-202A, Method 102A, Cond C, 5 cy, temp cycle, -65°C to +125°C

R106**RESISTOR, FIXED, MICROMINIATURE RECTANGULAR, ALUMINUM OXIDE MICROMET TYPE MFIC**

Application: Designed for printed circuit and micro-module assembly applications.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Electra Manufacturing Co., Independence, Kansas

Electrical Characteristics

Resistance Range: 10 ohms to 100K ohms
 Resistance Tolerance: 1, 2, 5 and 10%
 Power Rating: .070 watt, at temps from -40°C to +100°C; derated linearly to 0 watts at +150°C

Physical Characteristics

Substrate: Aluminum oxide
 Leads: Type A nickel, electrical grade, per ASTM, Spec. No. F 175
 Note: Leads are physically offset to permit embedding each full length through the alumina substrate.
 To increase strength one end is upset and the other end is reinforced with epoxy cement.
 Sealing: Resistance element is hermetically sealed with a ceramic coating
 Lead Length: .50", min; .007" dia
 Resistance Element: Ceramic film

Environmental Conditions

Temp Coef: +200 PPM/°C
 Voltage Coef: Low resistance range: negligible; high resistance range: .01% per volt, max

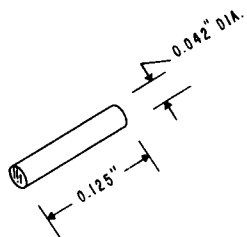
Test Data

Manufacturer claims that Microelectron's ceramic film resistors meet MIL-R-10509B, Char B and MIL-R-10509D, Char C
 Rated Ambient: 100°C
 Maximum Derating: 150°C
 Temp. Coef: +.02 (always plus, uniform throughout resistance range)
 Low Temp Oper: ±.06%
 Temp Cycling: ±.17%
 Short Time Overload: ±.01%
 Load Life: ±.2%, 2000 hrs
 Effect of Soldering: ±.03%
 Note: 100,000 resistor hrs of load life at full rated load at 97°C has been completed with no failures

Remarks: The manufacturer strongly recommends that the special materials and equipment described in Microelectron's drawing No. 1142 be used for making solder connections to micro-miniature electronic parts, such as Microelectron's resistors. These parts are subject to severe damage, if too large a soldering iron is used, or if excessively hot dip-solder baths are used.

**R107
 RESISTOR, FIXED METAL FILM, PRECISION MODULE
 INSERTION TYPE SCE-1/8**

Application: Designed for use where a precision metal film resistor with solderable terminals for direct insertion into miniaturized assemblies or modules is required.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: American Components, Inc., Conshohocken, Pa.

Electrical Characteristics

Power Rating: 250 volts, 1/8 watt in an ambient temp of 100°C and derated to zero load at 150°C
 Resistance Range: 10 ohms to 110K ohms. (10 ohms to 2500 ohm values are also available unspiralled).
 Tolerance: ±1%, ±2%, and ±5%
 Voltage Coef: Ave voltage coef is under ± 10 ppm/volt for all ranges
 Noise Level: Low, are level under 0.20 μvolts/volt

Physical Characteristics

Marking: Individual resistors not marked. The resistors are shipped in plastic tubes which include an identifying tag which gives resistor value in ohms
 Terminals: Precious metal terminations are fired at high temp on a high quality refractory substrate. The tinned copper ends are given a heavy tinning in final step of manufacture.
 Resistance Element: Noble-Met film, another protective film coat is applied to provide first environmental barrier.
 Insulation: Thermo-setting cement and two coats of silicone
 Construction: Spiralling (helixing) to exact ohmage range
 Encapsulation: Can be with negligible effect on resistor

Mechanical Characteristics

Soldering: The SCE-1/8 can be used to bridge a gap in a printed wiring board, can be easily soldered in place. It is suggested that the resistor be held with tweezers and use a small pencil iron to solder the pretinned wiring board to the pretinned SCE-1/8 resistor.

Environmental Conditions

Temp Coef: ± 100 ppm/°C is standard, ± 50 ppm/°C available on special request
 Shelf Life: Aging is less than 0.10% in one year and is independent of range

Test Data

Stability: Storage at 100°C for one month shows aging to be less than 0.15% and independent of range.

PERCENT CHANGES IN RESISTANCE

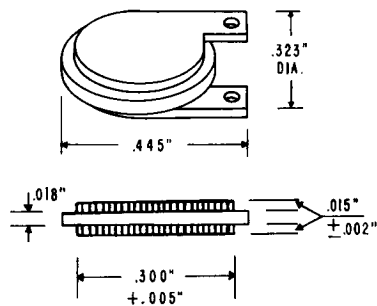
Type of Test	Load Life 1000 hr 100°C	Bell Labs Humidity	Soldering	Short Time Overload	Low Temp Storage *	High Temp Storage **
Max.	0.8%	0.5%	.06%	0.3%	.06%	.1%
Ave.	0.3%	0.2%	.03%	0.1%	.03%	.04%

*12 hrs. at -55°C
 **12 hrs. at +100°C

**R108
 RESISTOR, FIXED CARBON FILM TIMM TYPE Z-2920**

Application: Designed for use in electronic equipment where a resistance change of less than 6% at 1/4 watt in a 580°C ambient environment over a long period of time is required.

291



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: General Electric Company, Receiving Tube
Department, Owensboro, Kentucky

Electrical Characteristics

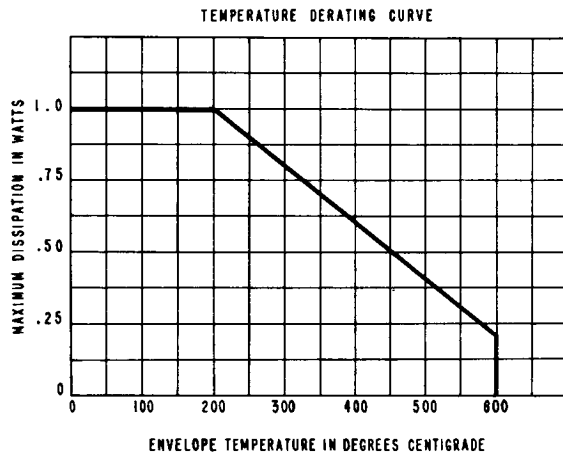
Resistance Values: From 1000 ohms to 100K ohms
Tolerance: 10%, at a temp of 580°C
Gettering: The materials used in the TIMM resistor's construction are of a nature that when the resistor is assembled and evacuated, it is gettered continuously during its operation. This condition prevents the deposited carbon film from being affected by foreign matter, and aids in providing stability of the resistor. Power Rating: 0.25 watt load at (580°C).

Physical Characteristics

Electrodes: Metal, wafer shaped with rectangular projections which have one .040" dia hole bored in each of them.
Resistance Element: A resistive, carbon film that is deposited by evaporation, between two contacts made of heavy layers of carbon film. The ceramic substrate, on which the carbon is deposited, is similar to a saucer, depressed in the center.
Terminals: Heavy carbon which is connected at one end of the resistive film is connected to the lower electrode through a hole marked 'contact.' Solder is used to join the electrode to the ceramic substrate, flows through hole and contacts the carbon terminal. The other carbon terminal contacts the upper electrode at the rim of the ceramic substrate.
Housing: Ceramic and metal
Mounting Position: On any axis

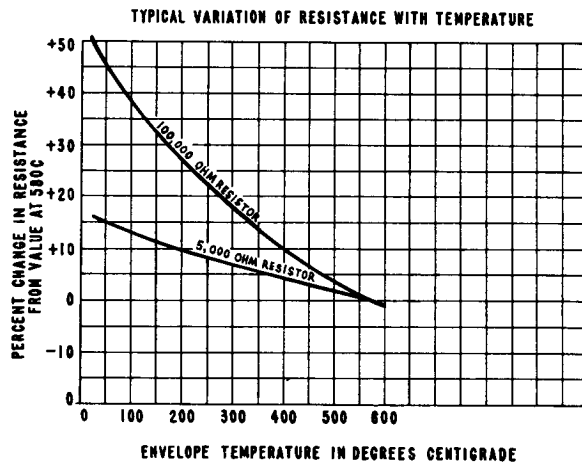
Environmental Conditions

Oper Temp: 580°C



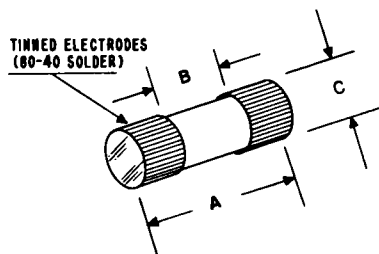
Test Data

Load Life: Under load test this evaporated resistor changes less than 6% at a 0.25 watt in a 580°C ambient temp during a 5,000 hr period. At zero load there is no change. In a circuit where the resistor load would be less than 50 mw, the change is less than 1%.



R109 RESISTOR, FIXED, THIN METAL FILM, MICROMINIATURE ROD TYPE MR SERIES

Application: Designed for use as coupling loop resistors or power dividers in microwave applications



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Filmohm Corporation, New York 10, New York

Electrical Characteristics

Resistance Range: From less than 1 ohm to approx 400 ohms

Resistance Tolerance: $\pm 2\%$ is std, $\pm 1\%$ also available

Power Rating: at 80°C derate to 10% at 150°C

Temp Coef: Less than 350 PPM per degree C

Filmohm Part No.	O.D.*	Length	Film	Base	Wattage Rating
	(inches) C	(inches) A	Length B	Material	
MR020-125-C	.020	.125	.04	Ceramic	0.1
MR020-187-C	.020	.187	.06	Ceramic	0.125
MR040-125	.040	.125	.04	Pyrex	0.1
MR040-187	.040	.187	.06	Pyrex	0.125
MR043-125-C	.043	.125	.04	Ceramic	0.125
MR043-187-C	.043	.187	.06	Ceramic	0.125
MR060-125	.060	.125	.04	Pyrex	0.125
MR060-125-C	.060	.125	.04	Ceramic	0.125
MR060-187	.060	.187	.06	Pyrex	0.125
MR060-187-C	.060	.187	.06	Ceramic	0.125
MR080-187	.080	.187	.06	Pyrex	0.167
MR080-187-C	.080	.187	.06	Ceramic	0.167

Note: Unless fired-silver electrodes are specified, tinned electrodes are supplied.

*Note: Outside diameter (O.D.) listed, is exclusive of electrodes.

Physical Characteristics

Substrate Base Material: Pyrex glass, dielectric constant approx 5

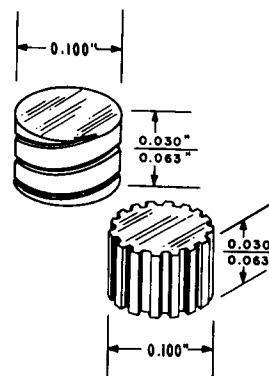
Alternate Substrate Base Material: High density alumina ceramic, dielectric constant, approx 8

Resistance Element: Thin metal film protected by a micro-thin quartz coating

Electrodes: Cylindrical end caps, tinned with 60-40 soft solder. May also be obtained with fixed-silver electrodes

R110 RESISTOR, FIXED PELLET FILM TYPE 6928-FRP

Application: Designed for use in military electronic equipment where stability at high temperature and in severe environmental conditions is required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: P.R. Mallory and Co. Inc., Microcomponents
Dept. Indianapolis 6, Indiana

Electrical Characteristics

Resistance: 50 ohms to 200,000 ohms, size: 0.030" thk; 50 ohms to 500,000 ohms, size: 0.063" thk

Tolerance: $\pm 1\%$, $\pm 5\%$, $\pm 10\%$

Power Rating: 0.1 watt at 125°C (encapsulated)

Max Voltage Rating: 150 volts, dc or rms

Voltage Coef (From 10-100% of E rated): Less than 0.007%/v or 0.4% resistance change

Physical Characteristics

Substrate Resistor Form: Steatite or alumina

Resistance Element: Metal oxide film is deposited over the entire surface of the pellet. By proper selection of film resistivity and subsequent spiralling, the resistor is adjusted to value

Resistance Element Terminations: Metallizing both ends of the pellet

Mounting Method: Pellets are mounted by component packaging technique called unitized component assembly (a board with recess holes, drilled to a depth to accept individual pellet resistors).

Mounting Board Material: Phenolic, epoxy or silicone resin, has double clad copper facing
 Electrical Connections: Between components is printed circuit etched pattern is completed by dots of conductive cement

Environmental Conditions

Temp Range (Oper at Rated Load): -65°C to $+125^{\circ}\text{C}$;
 Storage (No Load): -65°C to $+150^{\circ}\text{C}$
 Resistance Temp Char: 0 to 600 PPM/ $^{\circ}\text{C}$
 Low Temp. Oper (Full load at -65°C): $\pm 1.0\%$ (500 hrs)

Test Data

Load Life: 1000 hrs at rated voltage, $\pm 3\%$ (125°C), encapsulated
 Moisture Resistance: $\pm 1.0\%$ (encapsulated per MIL-STD-202B, Method 106)
 Temp Cycling: -65°C to $+150^{\circ}\text{C}$, $\pm 0.5\%$ (encapsulated)
 Terminal Strength: Axial pull, over 2 lb
 Effect of Soldering: 350°C for 3 secs, less than 0.5%, 240°C

Remarks: Manufacturer states characteristics of this resistor approx MIL-R-10509D, Char B. The two films are a metal oxide film developed by Mallory Company and a metallic base film developed by the Dupont Company.

POWER RATING CURVES

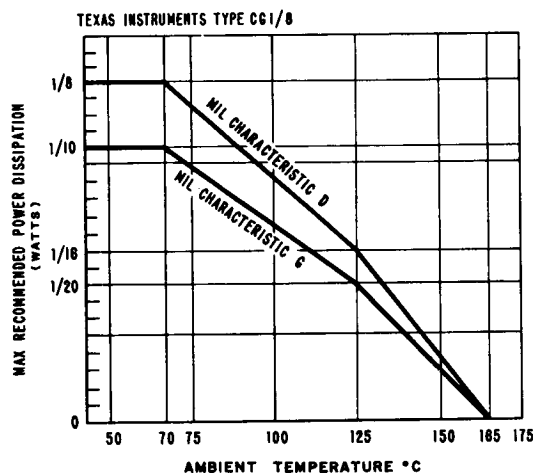
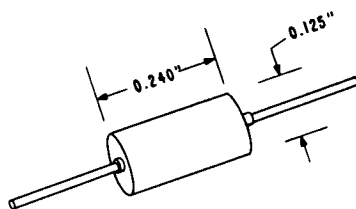


FIGURE 1.

R111 RESISTOR, FIXED, PRECISION CARBON FILM GLASS HERMETIC TYPES CG 1/8

Application: Designed for use in electronic circuitry where conventional type resistors are required for mounting in compact packaging.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Dallas 22, Texas.

Electrical Characteristics

Std Resistance Ranges: CG 1/8 - 10 ohms to 100K, ohms
 Voltage Rating: CG 1/8 - 250 volts

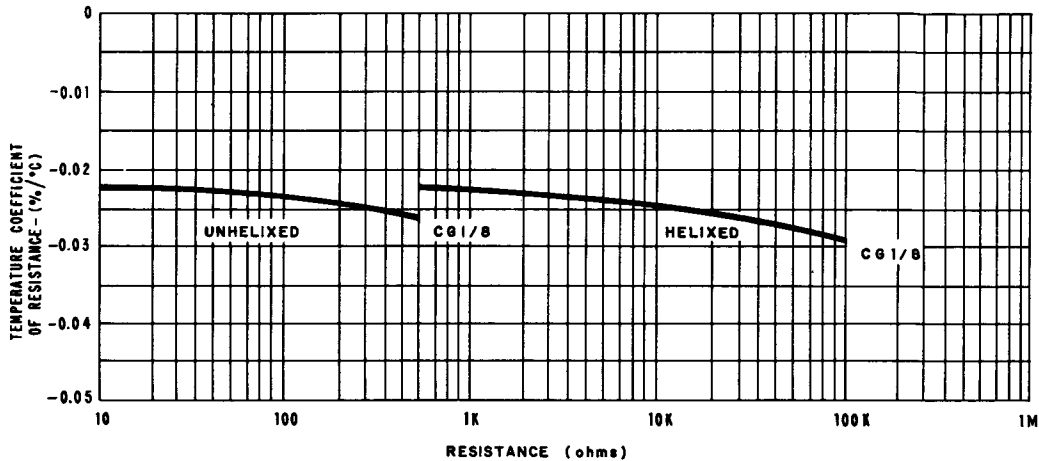
Resistance Tolerance: $\pm 1\%$ 

FIGURE 2.

Physical Characteristics

Weight: CG 1/8, 0.076 lbs, avg weight per 100 unpacked units

Lead Dia: AWG #22

Lead Length: 1.5"

Body Length: L for CG 1/8, 0.240"

Body Dia: D for CG 1/8, 0.125"

Note: Lengths given refer to length of glass package.

Fillets on leads extend 0.035" max beyond glass.

Marking Symbols: Mfr's identification, tolerance and ohmic value (e.g. - TI, 1%, 100K) for the type CG 1/8; Std stock symbolization includes mfr's identification, tolerance, mil-type designation, and ohmic value (e.g. TI, 1%, RN60B 1003F, 100K) Special markings supplied upon request
 End Caps: Alloy high-temp sealed to glass shell
 Terminals: Leads welded to end caps
 Sealing: Hermetic, hard glass
 Resistance Element: Carbon film

Environmental Conditions

Max Res Temp Char: G, PPM/°C, +200, -500; %/°C, +0.02, -0.05

Max Amb Temp at Zero Wattage Derating: G, 165°C

Other characteristics per MIL-R-10509D for Char B, D, and G

Test Data

Shock: Per MIL-STD-202, Method 205

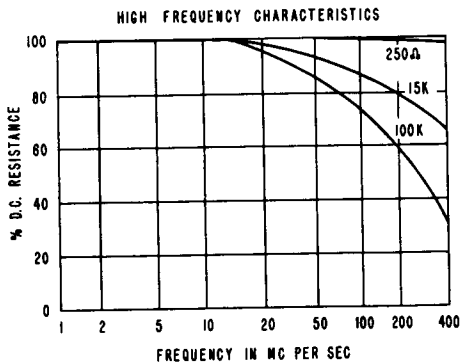
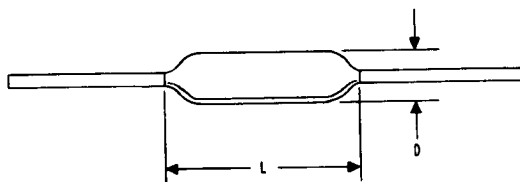
Vibration: Per MIL-STD-202, Method 204

Dielectric Withstanding Voltage: Per MIL-R-10509D, Para 3.13

Remarks: Test data is available.

**R112
RESISTOR, FIXED, METAL FILM, TYPE MMF**

Application: Typical applications are in miniaturizing logid modules or in microwave stripline applications such as power splitters and antenna feeds.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: International Resistance Co., Burlington Div., Burlington, Iowa.

Electrical Characteristics

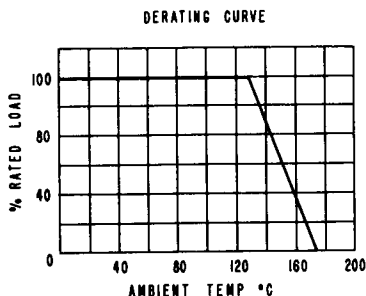
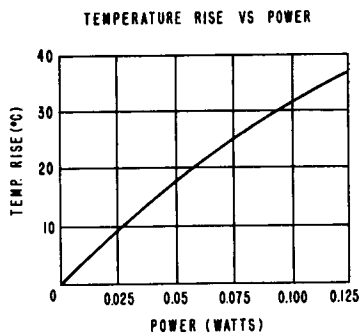
Resistance Range: 100 ohms to 100K.
Wattage at 125°C: 1/20 watt.
Rated Voltage (Max.): 200 volts
Tolerance: ± 1%.

Physical Characteristics

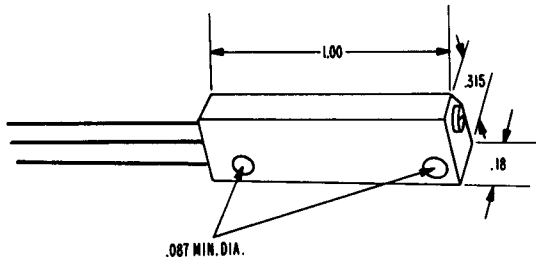
Encapsulation: IRC's M-Coat, provides exceptional moisture resistance; paint coating, for less critical applications.
Leads: Gold-Plated domet.
Lead Length: 1.00" ± 0.062".
Lead Diameter: #26 AWG
Size: M-Coat, L= 0.155 and D= 0.065; paint coating, L= 0.130 and D= 0.045.

Environmental Conditions

Temp Coefficient: T-0, 0 ± 100 PPM/°C; T-2, 0 ± 50 PPM/°C.



R201
RESISTOR, POTENTIOMETER, SUBMINIATURE, HIGH
TEMPERATURE, TRIMMING, STYLE RT-10
(MIL-R-27208A)



Quality Assurance: Per specification MIL-R-27208A Style RT-10. Bureau approval required prior to use.

Mfr: Bourns, Inc., Trimpot Div., Riverside, Calif.

Electrical Characteristics

Resistance Range (ohms): 10, 20, 50, 100, 200, 500, 1K, 2K, 5K, 10K, 20K, 25K, and 30K. Specials available from 100 ohm to 30K.

Resolution, Nominal (%): 1.78, 1.41, 1.02, 1.0, 0.9, 0.7, 0.55, 0.45, 0.35, 0.25, 0.2, 0.2, and 0.20 respectively, with resistance ranges above.

Resistance Tolerance: $\pm 10\%$ Standard.

Absolute Minimum Resistance: 0 to 0.1% or 0 to 1.0 ohm, whichever is greater.

Power Ratings: 1.0 watt at 70°C; 0.5 watt at 125°C; 0 watt at 175°C.

Mechanical Characteristics

Load Life: 1000 hrs per MIL-R-27208A.

Resistance Shift: 2%, max.

Mechanical Life: 500 cycles without discontinuity.

Shaft Torque: 5 oz. in., max.

Mechanical Adjustment: 15 turns, nominal.

Mechanical Stops: Wiper assembly idles.

Weight: 0.06 oz., approx.

Terminals: Model 220L—three 6" teflon insulated standard leads, 7 strands/38 AWG; Model 220W—three 1-1/2" gold plated grade A nickel wire leads, 26 AWG.

Environmental Conditions

Moisture Resistance: 100 megohms min. insulation resistance after removal, MIL-R-27208A.

Fungus: Materials meet MIL-E-5272C.

Salt Spray: Meets MIL-R-27208A.

Sand and Dust: Meets MIL-E-5272C, Proc. 1.

Test Data

Oper Temp Range: -65°C to +175°C.

Temp Coefficient: 0.005%/°C, max. (resistance element only); 0.007%/°C, max. (contact arm on active portion of element, 1K thru 30K).

Vibration: MIL-R-27208A, 30g.

Contact Bounce: 0.1 millisecc, max.

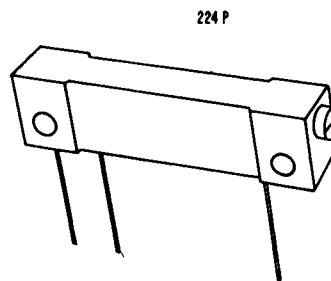
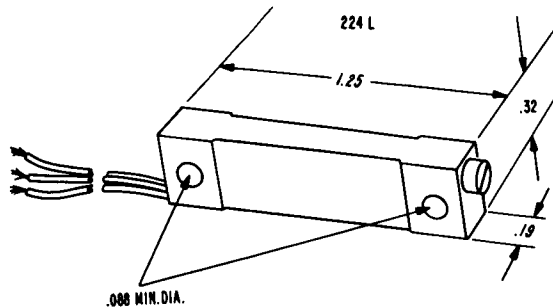
Wiper Shift (max): 0.5% or Resolution (whichever is greater).

Shock: MIL-R-27208A, 100g.

Dielectric Strength: Room cond., 1000 volts ac; 80,000 ft, 400 volts ac. MIL-R-27208A

Remarks: Ceramic resistance element card has thermal expansion coefficient similar to resistance wire, eliminating breakage and strain gage effects. Panel mounting type is also available.

R202
RESISTOR, POTENTIOMETER, TRIMMING, STYLE
RT-12 (MIL-R-27208A)



Quality Assurance: Per specification MIL-R-27208A Style RT-12. Bureau approval required prior to use.

Mfr: Bourns, Inc., Trimpot Div., Riverside, Calif.

Electrical Characteristics

Resistance Range (ohms): 10, 20, 50, 100, 200, 500, 1K, 2K, 5K, 10K, 20K, 25K, 50K, and 100K. Specials available from 10 ohm to 100K.

Resolution, Nominal (%): 2.0, 1.7, 1.2, 1.0, 0.9, 0.7, 0.5, 0.4, 0.35, 0.25, 0.20, 0.20, 0.17, and 0.17 respectively, with resistance ranges above.

Resistance Tolerance: $\pm 5\%$ Standard.

Absolute Minimum Resistance: As follows

10 ohms to 1K: 0 to 0.2% or 0 to 0.5 ohm, whichever is greater.

2K to 50K: 0 to 0.1%

100K: 0 to 5%

Power Ratings: 1.0 watt at 70°C; 0.5 watt at 125°C;

0 watt at 175°C.

Mechanical Characteristics

Load Life: 1000 hrs per MIL-R-27208A.

Resistance Shift: 2%, max.

Mechanical Life: 500 cycles without discontinuity.

Shaft Torque: 5.0 oz. in., max.

Mechanical Adjustment: 22 turns, nominal.

Mechanical Stops: Wiper assembly idles.

Weight: 0.1 oz., approx.

Terminals: Model 224L—three 11-1/2" teflon insulated stranded leads, 7 strands/36 AWG; Model 224P—three gold plated grade A nickel printed circuit pins.

Environmental Conditions

Moisture Resistance: 100 megohms min. insulation resistance after removal, MIL-R-27208A.

Fungus: Materials meet MIL-E-5272C.

Salt Spray: Materials meet MIL-R-27208A.

Sand and Dust: Meets MIL-E-5272C, Proc. 1.

Test Data

Oper Temp Range: -65°C to +175°C.

Temp Coefficient: 0.005%/°C max. (resistance element only); 0.007%/°C, max. (contact arm on active portion of element, 500 ohm thru 100K).

Vibration: MIL-R-27208A, 30g.

Contact Bounce: 0.1 millisecc, max.

Wiper Shift (max): 0.5% or Resolution (whichever is greater).

Shock: MIL-R-27208A, 100g.

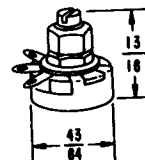
Dielectric Strength: Room cond., 1500 volts ac; 80,000 ft, 500 volts ac. MIL-R-27208A.

Remarks: Ceramic resistance element card has thermal expansion coefficient similar to resistance wire, eliminating breakage and strain gage effects. Panel mounting type is also available.

R203 RESISTOR, POTENTIOMETER, WIRE-WOUND RADIOHMS, CENTRALAB MODEL 3W, GENERAL PURPOSE, LOW TEMPERATURE

Application: This variable resistance has been designed to combine miniaturization with rugged quality for military and industrial applications. It is conservatively

rated at 2 watts. Element of unit is completely enclosed and will allow further sealing on encapsulation necessary for some environmental conditions.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Centralab, The Electronics Division of Globe-Union Inc., Milwaukee 1, Wisconsin.

Electrical Characteristics

Resistance Range: 4 ohms through 30,000 ohms

Tolerance: $\pm 10\%$ standard, closer tolerances available on special order

Wattage Rating: 2 watts at 70°C, derated to 0 watts at 135°C. when tested to MIL-R-39002 (proposed).

Dielectric Withstanding Voltage: 900 volts rms at atmospheric pressure; 450 volts at reduced barometric pressure per MIL-R-19A.

Rotational Life: Resistance change less than 10% when tested to MIL-R-19A

Taper: Linear only

Mechanical Characteristics

Mounting: Bushing: Single clearance hole 1/4"—32 NEF2A THD bushing, plus optional locating lug.

Length: Locking type, 3/8"; plain type, 1/4"

Locating Lug: Left or right position, available in three styles; Standard, .312" radius, .094" wide, projecting .062" post mtg surface; special request (1) .234" radius, .125" wide, projecting .047" post mtg surface; special request (2) .234" radius, .125" wide, projecting .068" post mtg surface. Units also available without locating lug.

Shaft: .125" ± 0.01 " dia stainless steel; furnished round, flatted, or with screwdriver slot as required.

Terminals: Non-ferrous alloy, gold plated. Insulated from shaft and mounting bushing.

Mechanical Rotation: 250° $\pm 3^\circ$

Torque: 0.5 oz. in. nominal.

Stop Strength: 4.0 lb-in on single shaft units.

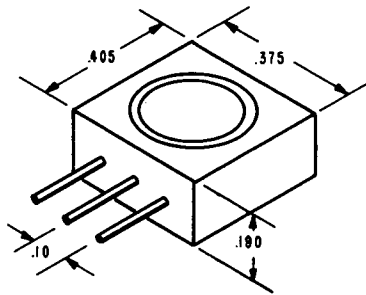
Locking: Meets requirements of MIL-R-19A

Environmental Conditions

Vibration, Moisture Resistance, and Insulation Resistance: Meets requirements of MIL-R-19

**R204
RESISTOR, POTENTIOMETER, SUBMINIATURE
TRIMMER, MODEL 50**

Application: Provides the answers to size, performance and reliability requirements for aircraft and missile computer and guidance systems.

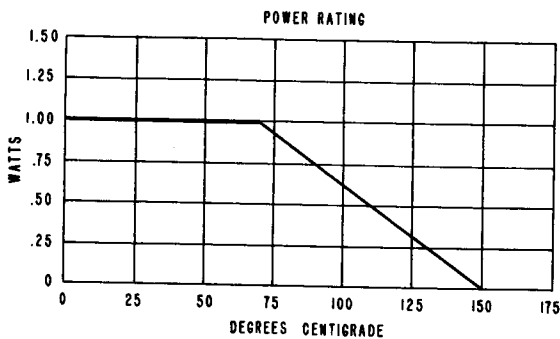


Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Spectrol Electronics Corp., San Gabriel, Calif.

Electrical Characteristics

Tolerance: $\pm 5\%$ ($\pm 1\%$ available).
Temp Coefficient of Resistance: 70 PPM/ $^{\circ}\text{C}$ max. per MIL-R-27208A.
Resistance Range: 10 ohms to 50K ohms, standard.
End Voltage: 0.1% or 0.5 ohm equiv. max., whichever is greater.
End Resistance: 0.25% R_t or 1.0 ohm max, whichever is greater.
Power Rating: 1.0 watt at 70 $^{\circ}\text{C}$ (see chart)



Dielectric Strength: 500 volts per MIL-R-27208A.
Insulation Resistance: 1000 megohms per MIL-R-27208A.
Noise During Adjustment: Per MIL-R-27208A.
Std Resistance and Nom. Resolution:

50 ohms—0.59%	2000 ohms—0.20%
100 ohms—0.47%	5000 ohms—0.15%
200 ohms—0.32%	10,000 ohms—0.12%
500 ohms—0.27%	20,000 ohms—0.09%
1000 ohms—0.29%	50,000 ohms—0.07%

Mechanical Characteristics

No. of Turns: 25 \pm 2
Rotation: Continuous
Shaft Torque: 0.1 oz. in. to 5.0 oz. in.
Life Expectancy: 1,000 full wiper rev., min.

Physical Characteristics

Weight: 1 gram
Case: Machined aluminum.
Contacts: Dual-wiper.
Housing Cover Sealing: Epoxy resin coated gasket.
Adjustment Seal: "O" ring.
Insulation: Teflon.
Mounting: Printed circuit, or panel mount with 10-32 threaded bushing for panel or chassis mounting.
Leads: Printed circuit pin types—Vertical mount, adjust. shaft 90 $^{\circ}$ or 180 $^{\circ}$ (shown) from pins;—Horizontal mount, pins from base. Insulated stranded leads also available.

Environmental Conditions

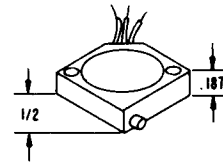
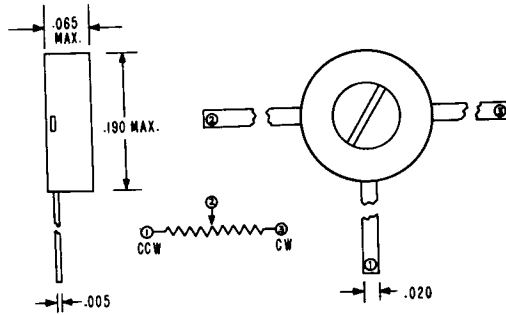
Moisture Resistance: 10 days per MIL-R-27208A.
Humidity: 10 days per MIL-E-5272C.
Acceleration: 50 g per MIL-R-27208A.
Vibration: 20 g to 20,000 cycles per MIL-R-27208A.
Shock: 50 g, 11 millisecc per MIL-R-27208A.
Low Temp Oper: -55 $^{\circ}\text{C}$ per MIL-R-27208A.
High Temp Exposure: +150 $^{\circ}\text{C}$ per MIL-R-27208A.
Load Life: 1,000 hr. per MIL-R-27208A.

Remarks: The unique rectangular-cross-section mandrel configuration provides greater surface contact between the mandrel and case. Thus, superior heat dissipation and high wattage ratings are attained without heat sink mountings.

**R205
RESISTOR, POTENTIOMETER, WIREWOUND,
MICROMINIATURE MODEL 19-M1**

Application: Designed for use with microminiature circuits on wafers or vacuum deposited solid-state circuits.

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Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Maurey Instrument Corp., Chicago 29, Ill.

Electrical Characteristics

Resistance Ranges: 25, 50, 100, 250, 500, and 1000 ohms. (Others available on request.)
 Resistance Tolerance: $\pm 5\%$.
 Power Rating: 0.1 watt at 85°C, derated to zero at 135°C.
 Electrical Travel: 270° nom
 Independent Linearity: $\pm 5\%$.
 Temp. Coefficient of Res. Wire: .000020 ohm/ohm/°C for values of 50 ohms or greater.
 Equivalent Noise Resistance: 100 ohms, max

Mechanical Characteristics

Life: 500 cycles at 40 RPM
 Total Mechanical Travel: 360°
 Rotation: Continuous (no stops).

Physical Characteristics

Leads: 3 gold plated leads 1/2" long (typ), .020" x .005".
 Contact Material: Precious metal.
 Cover Material: Glass filled diallyl phthalate.
 Shaft Material: Stainless steel

Environmental Conditions

Oper Temp Range: -55°C to +135°C.

R206

RESISTOR, POTENTIOMETER, SUBMINIATURE TRIMMER, SERIES 300-00

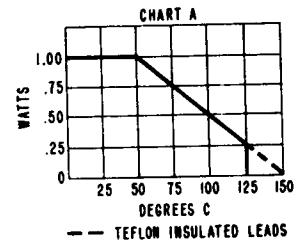
Application: Those variable resistors have been specifically designed to remain stable under extremely rugged conditions of shock, vibration, and temperature.

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use

Mfr: Daystrom, Inc., Potentiometer Division, Archbald, Pa.

Electrical Characteristics

Std Res Tel: $\pm 5\%$.
 Temp Coefficient of Resistance Wire: 20 ppm/°C max, 0° to 150°C.
 Temp Coefficient of Potentiometer: 50 ppm/°C max, 0° to 150°C.
 Stability (as Voltage Divider): 0.2% or 1 resolution max, -55° to +125°C
 Power Rating: 1 watt (see Chart A)



Load Life at Rated Power: 1000 hr min per MIL-R-19A
 Insulation Resistance: 1000 megohms min (500 volts, dc)
 Dielectric Withstanding Voltage: 500 volts, ac, 1 minute
 Usable Resistance Range: 98% min
 Equivalent Noise Resistance: 0.1% or 100 ohms per NAS-710

STD RESISTANCES AND NOM RESOLUTIONS

10 ohms	1.00%	1K	.32%
20 ohms	.77	2K	.23
50 ohms	.65	5K	.20
100 ohms	.52	10K	.125
200 ohms	.50	20K	.096
500 ohms	.36	50K	.086

Mechanical Characteristics

Rotation: Continuous (no stops)
 Adjustment Ratio: 45:1
 Adjustment Screw: Turns for full usable range, 42 turns

Rotational Life: 10,000 screw revolutions min
Torque: 7.5 oz-in. max

Physical Characteristics

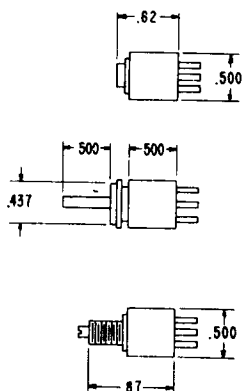
Weight: 2 gm max
Case: Aluminum alloy
Adjustment Screw: Stainless steel
Wiper: Paliney #7
Insulation: Nylon (std)
Leads: #32 A.W.G., 4 in. min length
Lead Insulation: Nylon

Environmental Conditions

Oper Temp: -55° to $+150^{\circ}$ C; exceeds requirements of MIL-E-5272A
Temp Cycling; Exceeds MIL-R-19A
Vibration: Exceeds MIL-R-5272C, Proc. XII.
Shock: Exceeds NAS-710, Proc. III.
Altitude: Exceeds NAS-710.
Sand and Dust: Exceeds MIL-E-5272C
Salt Spray: MIL-E-5272A
Fungus Resistance: All non-nutrient materials
Humidity: MIL-E-5272A, Proc I

Remarks: Stability against temperature change is ensured by use of a circular resistance element that eliminates the effect of differential thermal expansion. The machined aluminum case, which is generally superior to plastics because of its greater heat dissipating characteristics and strength, is standard for all models.

R207
RESISTOR, POTENTIOMETER,
"MITE-E-MITE", MODEL MS 1-500



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: San Fernando Electric Mfg., Co., San Fernando, California.

Electrical Characteristics

Std Range: 100 ohms to 50K special, 50K to 150K.
Power Rating: 2 watts at 85° C; derated to 0 watts at 125° C.
Tolerance: $\pm 5\%$ for standard unit; $\pm 1\%$ for special unit.
Linearity: $\pm 5\%$ for standard unit; $\pm 1\%$ for special unit.
Elect. Rotation: $356^{\circ} \pm 2^{\circ}$.

Mechanical Characteristics

Mech Rotation: Standard unit has continuous rotation; special unit has mechanical stops.

Environmental Conditions

Max Oper Temp: As high as 165° C for special applications.
Water Tightness: MIL-E-5272A.
Moisture Test: MIL-E-5272A.
Humidity Test: Applicable sections of MIL-E-5272A and MIL-E-5400.
Temp Cycling: Applicable sections of MIL-E-5272 and MIL-E-5400.
Corrosion: Applicable sections of MIL-E-5272 and MIL-E-5400.
Salt Spray: Applicable sections of MIL-E-5272 and MIL-E-5400.
Stability at Sea Level: Applicable sections of MIL-E-5400.
Above Sea Level Oper: Applicable sections of MIL-E-5400.
Room Ambient Conditions: Applicable sections of MIL-E-5400.

Test Data

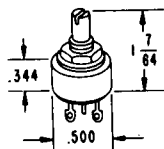
Temp Range: -55° C to $+125^{\circ}$ C. Special range of -55° C to 165° C is available.
Shock: MIL-E-5272A.
Vibration: MIL-E-5272A.

Remarks: The unit weight is 10 grams.

R208
RESISTOR, POTENTIOMETER, SUBMINIATURE, HIGH
TEMPERATURE, DAYSTROM SERIES 314-00

Application: These Series 314-potentiometers are designed to meet the requirements of applications where high temperatures are encountered and space is at a premium.

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Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

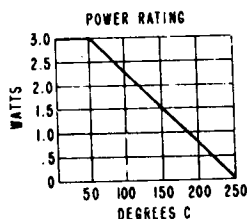
Mfr: Daystrom, Inc., Potentiometer Division, Archbald, Pa.

Electrical Characteristics

*Std Res Values and Resolution:

10 ohms-1.00	1K-0.32%
20 ohms-0.77	2K-0.23
50 ohms-0.65	5K-0.20
100 ohms-0.52	10K-0.125%
200 ohms-0.50	20K-0.096
500 ohms-0.36	50K-0.086

Active Electrical Angle: 320° min
Power Rating: 3w at 40°C (see chart)



*Std Res Tol: ±5%
Temp Coeff of Res Wire: 20 ppm/°C max, 0 to 150°C
*Linearity: 1% standard, 5% best above 5K.
Load Life at Rated Power: 1000 hr min per MIL-R-19
Insulation Resistance: 50 megohms min (500 vdc)
Dielectric Withstanding Voltage: 1000 volts ac, 1 minute
Equivalent Noise Resistance: 0.1% or 100 ohms, per N. A. S.-710

Mechanical Characteristics

Life Expectancy (Rotational): 500,000 cycles at 30 rpm
Mech Rotation: 360° without stops; 334° ±2° with stops
Shaft Torque: 0.1 in.-oz max (servo); 1.0 in.-oz max (panel) 7.0 in.-oz max (panel shaft lock)

Physical Characteristics

Weight: 10 grams max
Case: Stainless steel
Shaft: Stainless steel, G.249 in.
Wiper: Poliney #7
Insulation: High-temperature plastic and glass
Terminals: Gold-flashed
Panel Mount: Sleeve bearing

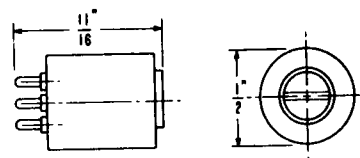
Environmental Conditions

Oper Temp: -55°C to +250°C
Vibration: 20 g's to 2000 cps; exceeds MIL-E-5272A, Proc. I
Shock: 20 g's in 3 axes, 11 msec
Altitude: No breakdowns 250 volts rms at 50,000 ft, MIL-E-5272A, Proc. II
Fungus Resistance: All non-nutrient materials

Remarks: Performance of this resistor, a single turn, wire-wound potentiometer, is stable under most exposure environments.

R209

RESISTOR, POTENTIOMETER, STANDARD 1/2 INCH DIAMETER, WIRE-WOUND, PRINTED-CIRCUIT TRIMMER



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Maurey Instrument Corp., Chicago, Illinois.

Electrical Characteristics

Std Range: 10 ohms to 100K. Special values upon request.
Power Rating: 0.5 watt at 125°C ambient temperature.
Tolerance: ±5%. Closer tolerance upon request.
Ind Linearity: ±3%.

Mechanical Characteristics

Shaft Torque: 3 oz-in nominal.
Mech Rotation: Stops to limit rotation to 325° nominal, electrically continuous.

Environmental Conditions

Humidity Test: MIL-R-19A
Corrosion: MIL-R-19A
Salt Spray: MIL-R-19A

Test Data

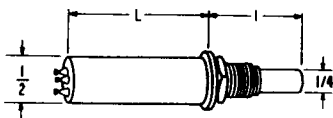
Temp Range: -55°C to 125°C .

Vibration: MIL-E-5272A, procedure 1.

Dielect Strength: 1500 volts, dc, for 5 seconds at 25°C . 1500 volts, ac, for 1 minute at 25°C is available upon request.

Remarks: Base shaft, and pins are of stainless steel. Unit has gold-plated terminal pins.

**R210
RESISTOR, POTENTIOMETER, SUBMINIATURE TYPE
5000**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: International Resistance Co., St. Petersburg Div.,
St. Petersburg, Fla.

Electrical Characteristics

Std Range: Type 5000, 50 to 100K; Type 5005, 25 to 50K.

Power Rating (OT 40C Amb.): Type 5000, 1.5 watts;
Type 5005, 1.0 watts.

Tolerance: Standard $\pm 10\%$; special, up to $\pm 1\%$.

Linearity: Special, to $\pm 0.25\%$.

Ind Linearity: Standard, 1%.

Equiv Noise Resistance: 100 ohms maximum.

Elect. Rotation of Shaft: Type 5000, 3600° ($+4^{\circ}-0^{\circ}$);
Type 5000, 1800° ($+4^{\circ}-0^{\circ}$).

Mechanical Characteristics

Shaft Torque: Starting, 2 oz-in maximum; running, 2
oz-in maximum.

Mech Rotation: Type 5000, 3600° ($+4^{\circ}-0^{\circ}$); Type 5005,
 1800° ($+4^{\circ}-0^{\circ}$).

No. of Turns: Type 5000-10; Type 5005-5.

"L" Dimension: Type 5000, 1-15/32; Type 5005, 1-1/32.

Test Data

Temp Range: -55°C to 100°C .

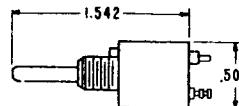
Temp Coefficient: ± 20 ppm per $^{\circ}\text{C}$.

Dielect Strength (Shaft to Terminals): 900 volts rms,
ac.

Insulation Resistance: 1000 megohms minimum at
room ambient condition.

Remarks: Type 5000 weighs 1 oz and type 5005 weighs
 $3/4$ oz.

**R211
RESISTOR, POTENTIOMETER,
SUBMINIATURE, SERIES X500**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Ace Electronics Assoc., Inc., Somerville, Mass.

Electrical Characteristics

Std Range: 10 ohms to 250K.

Tolerance: $\pm 2\%$.

Linearity: $\pm 0.3\%$.

Effective Elect. Angle: $325^{\circ} \pm 2^{\circ}$.

Mechanical Characteristics

Thread Type: 1/4-32 NEF thread.

Environmental Conditions

Max Oper Temp: $+150^{\circ}\text{C}$.

Moisture Test: Sealed, moisture proof.

Corrosion: Anti-fungus treated.

Test Data

Temp Range: -55°C to 150°C .

Temp Coefficient: ± 0.00002 ohm per $^{\circ}\text{C}$.

Load Life: 2 watts for a 60°C rise in units from 10
ohms to 4.5K; 2.5 watts for a 65°C rise in units from
5K up.

Shock: MIL-R-19

Vibration: MIL-R-19

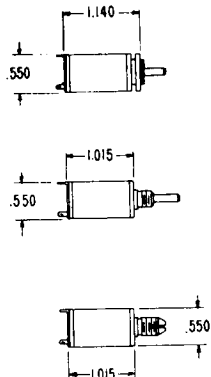
Dielect Strength: See Voltage Breakdown.

Insulation Resistance: Greater than 100 megohms
with 500 volts, dc, applied from terminal to shaft.

Voltage Breakdown: Terminals to shaft will with-
stand 1000 volts, dc.

Remarks: Unit weighs $1/4$ oz. The case is anodized
aluminum. Insulation is thermoset styrene copolymer,
and is rated at 700 vpm.

R212
RESISTOR, POTENTIOMETER,
SUBMINIATURE, SERIES 341



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Daystrom, Inc., Potentiometer Division, Archbald, Pa.

Electrical Characteristics

Standard Res Values and Resolution:

1K-0.041%	20K-0.016%
2K-0.040	50K-0.012
5K-0.027	100K-0.010
10K-0.021	200K-0.008

Tolerance: $\pm 5\%$.

Linearity: 0.5% is standard.

Effective Elect. Angle: $360^\circ + 5^\circ - 0^\circ$.

Mechanical Characteristics

Life Expectancy: 1,000,000 cycles.

Shaft Torque: 0.5 oz-in max with ball bearings; 1.0 oz-in max with sleeve bearings

Mech Angle: $363^\circ \pm 6^\circ$.

No. of Turns: 10.

Thread Type: 1/4 - 32 NEF-2A thread.

Environmental Conditions

Temp Cycling: Exceeds MIL-STD-202, Method 102.

Corrosion (Fungus Resistance): All non-nutrient materials.

Above Seal Level Oper: No breakdown at 50,000 ft with 250 volts rms applied to unit (MIL-E-5272A procedure II).

Test Data

Temp Range: -55°C to 140°C .

Temp Coefficient: 20 ppm per $^\circ\text{C}$ up to 100°C .

Load Life: 1000 hours minimum at the rated power (per MIL-R-19)

Shock: 20 G's for 11 milliseconds.

Vibration: 20 G's at 10 to 2000 cps.

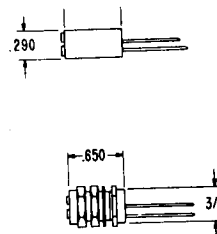
Dielect Strength: 500 volts, ac, for 1 minute.

Insulation Resistance: 50 megohms minimum at 500 volts, dc.

Discontinuity or Shift (Phase Shift): 0.010 maximum at 400 cps; 1.00 maximum at 5000 cps.

Remarks: Unit weight is 10 grams maximum.

R213
RESISTOR, POTENTIOMETER, TYPES 101F AND 101G



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Carter Mfg., Co., Hudson, Mass.

Electrical Characteristics

Std Range: 47 ohms to 15,000 ohms-

Power Rating: 1/4 watt at 95°C , derated to zero at 145°C .

Tolerance: $\pm 10\%$, $\pm 2\%$ special.

Equiv Noise Resistance: Less than 100 ohms between contact and winding.

Mechanical Characteristics

Mech Angle: 320° nominal, limited by stops.

Weight: 101F weighs 2 gm approx; 101G weighs 4.5 gm.

Environmental Conditions

Max Oper Temp: 150°C .

Humidity Test: Exposed to test for 10 days. (Unit is humidityproof.)

Salt Spray: Will withstand a test of 50 hours.

Test Data

Temp Range: -55°C to 150°C .

Temp Coefficient: 0.002% per $^\circ\text{C}$ for wire.

Load Life: 1000 hours.

Shock: 100 G's.

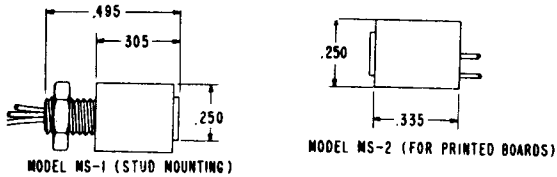
Vibration: 0.2 inch or 20 G's at 2 to 2000 cps.

Dielect Strength: See Breakdown Voltage.

Voltage Breakdown: 1000 volts.

R214
RESISTOR, POTENTIOMETER, MICROMINIATURE
MODELS MS-1 AND MS-2

Application: MS-1 is designed for stud mounting.
 MS-2 is designed for printed boards.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Minelco Miniature Electronic Components
 Corp., Holbrook, Mass.

Electrical Characteristics

Std Range: 20 to 10,000 ohms.
 Power Rating: 0.25 watt, derated to zero at 150°C.
 Tolerance: ±10%, ±5% available.
 Elect Noise: See Vibration.
 End Resistance: 1% or 2 ohms, whichever is greater.
 Electrical Rotation: 270°.

Mechanical Characteristics

No. of Turns: Single.
 Thread Type: 6-40 NF thread.
 Weight: 0.03 oz.
 Case: Anodized aluminum.
 Wiper: Precious metal alloy.
 Shaft: Stainless steel.
 Insulation: Teflon and Mylar.
 Resistance Element: Wire-wound, low TC wire (10 ppm).
 Mechanical Rotation: 300°.

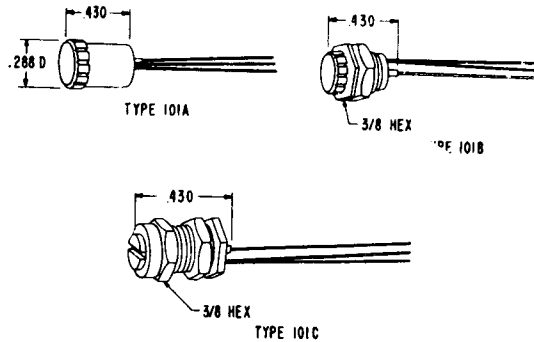
Environmental Conditions

Max Oper Temp: 150°C.
 Humidity Test: See Insulation Resistance.

Test Data

Temp Range: -55°C to 150°C.
 Shock: 50 G's.
 Vibration: 20 G's at 30 to 2000 cps without a change of setting or noise.
 Insulation Resistance: Greater than 100 megohms at 95% relative humidity.
 Resolution: 0.2% to 1%.

R215
RESISTOR, POTENTIOMETER,
TYPES 101A, 101B, AND 101C



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Carter Mfg., Co., Hudson, Mass.

Electrical Characteristics

Std Range: 47 ohms to 15000 ohms. Refer to manufacturer's bulletin. Units having non-standard resistance or resolution or both can be ordered.
 Power Rating: 1/4 watt at temperatures of 95°C; derated to zero at 145°C.
 Tolerance: ±10% to ±2% on special order.
 Equiv Noise Resistance: Less than 100 ohms between contact and winding.

Mechanical Characteristics

No. of Turns: Ranging from 87 to 329 turns, depending on resistance value.
 Thread Type: 5/16-24 modified thread.

Test Data

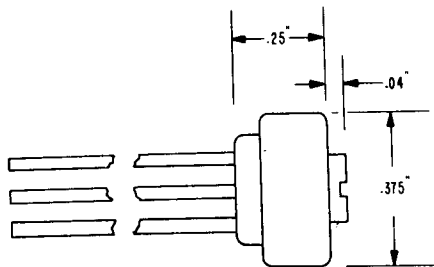
Temp Range: 125°C.
 Temp Coefficient: All values wound with 0.002% per °C wire.
 Load Life: 1000 hours.
 Dielect Strength: See Breakdown Voltage.
 Voltage Breakdown: 1000 volts.
 Resolution (Wire Turns): From 87 to 329 turns; resistance from 47 ohms to 15000 ohms.

Remarks: Terminals are 1-1/2" long and are tinned leads. Sliding contacts are precious metal. Weight varies from 1.1 grams to 2.8 grams.

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R216
RESISTOR, POTENTIOMETER, WIREWOUND, TRIMMER
MODEL 37-M11D

Application: Printed circuits.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Maurey Instrument Corp., Chicago 29, Ill.

Electrical Characteristics

Resistance Ranges: 50, 100, 250, 500, and 1000 ohms.
 (Others available on request.)

Resolution (%): .80, .70, .48, .35, .38, .33 and .32 respectively, with resistance ranges.

Resistance Tolerance: $\pm 5\%$.

Power Rating: .5 watt at 85°C.

Electrical Function Angle: $350^\circ \pm 5^\circ$

Independent Linearity: $\pm 5\%$.

Temp. Coefficient of Res. Wire: .000020 ohm/ohm/°C for values of 50 ohms or greater.

Equivalent Noise Resistance: 100 ohms, max.

Dielectric Strength: 1000 volts rms for 60 sec.

Mechanical Characteristics

Life: 500 cycles at 40 RPM.

Total Mechanical Travel: 360° .

Rotation: Continuous (no stops).

Shaft Rotational Torque: 2 to 10 oz.-in.

Physical Characteristics

Leads: 3 gold plated leads 1.5" long, .032 dia. (20 AWG).

Contact Material: Precious metal.

Cover Material: Epoxy fiberglass.

Shaft and Housing Material: Stainless steel.

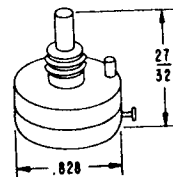
Construction: Sealed.

Environmental Conditions

Oper Temp Range: -55°C to $+135^\circ\text{C}$.

R217
RESISTOR, POTENTIOMETER, TYPE
D860, "TURNQUATE"

Application: Designed for applications where space and weight are important factors.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use

Mfr: Subminiature Instruments Corp, Riverside, California.

Electrical Characteristics

Std. Range: 100 to 200k ohms.

Power Rating: 1.5 watts at 40°C.

Tolerance: $\pm 3\%$.

Linearity: $\pm 0.5\%$.

Elect. Rotation: 352° , $+0^\circ$, -2° .

Available Taps: 9 per segment.

Phasing: Through 360° .

Mechanical Characteristics

Life Expectancy: Guaranteed according to usage.

Shaft Torque: (With seal) Starting, 0.50 oz in.; running, 0.20 oz in.; per segment, 0.10 oz in.

Mech. Rotation: Continuous.

Weight: Servo, 0.38 oz; Bushing, 0.36 oz; plus per segment 0.18 oz.

Environmental Characteristics

Moisture Test: MIL-E-5272A.

Humidity Test: MIL-E-5272A.

Corrosion: No fungus nutrient materials used.

Sand and Dust: Meets requirements of MIL-E-5272A, Proc 1.

Test Data

Temp. Range: -55°C to 150°C .

Temp. Coefficient: (Resistance wire) 0.00002 ppm/°C.

Shock: Exceeds the requirements set forth by MIL-E-5272A.

Vibration: 35 G's, 20 to 2000 cps, 0.5% max error without discontinuity.

Dielect. Strength: 1000 volts, ac, rms, at sealevel.

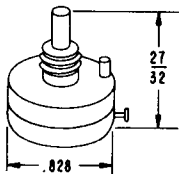
Acceleration: 100 G's, 0.5% max error and without discontinuity.

Noise: (Equivalent resistance) 100 ohms or 0.1% of total variable resistance, whichever is greater.

Remarks: Material on unit front housing is anodized aluminum. The back and segments are Diall FS-5 (blue), meets MIL-M-18794. Shaft is stainless steel. Ten outputs can be ganged by manufacturer on one shaft. Unit has one output per segment.

R218
RESISTOR, POTENTIOMETER, TYPE
D862, "TURNQUATE"

Application: Designed for application where size and weight are important factors.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Subminiature Instruments Corp, Riverside, California.

Electrical Characteristics

Std. Range: Two circuits from 1k to 50k ohms.
 Power Rating: 1.5 watts at 40°C.
 Tolerance: ±3%.
 Linearity: ±0.5%.
 Elect. Rotation: 352°, +0°, -2°.
 Available Taps: 6 per segment.
 Phasing: Through 360°.

Mechanical Characteristics

Life Expectancy: Guaranteed according to usage.
 Shaft Torque: (With seal) Starting, 0.50 oz in.; running, 0.20 oz in.; per segment 0.10 oz in.
 Mech. Rotation: Continuous.
 Weight: Servo, 0.38 oz; Bushing, 0.36 oz; per segment 0.18 oz.

Environmental Characteristics

Humidity Test: MIL-E-5272A.
 Corrosion: No nutrient materials used.
 Sand and Dust: MIL-E-5272A.

Test Data

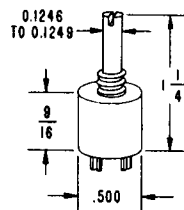
Temp. Range: -55°C to 150°C.
 Temp. Coefficient: (Resistance wire) 0.00002 ppm/°C.
 Shock: MIL-E-5272A.
 Vibration: 35 G's, 20 to 2000 cps, 0.5% max error without discontinuity.

Dielect. Strength: 1000 volts, ac, rms, at sealevel.
 Acceleration: 100 G's, 0.5% max error without discontinuity.

Noise: (Equivalent resistance) 100 ohms or 0.1% of total variable resistance, whichever is greater.

Remarks: Unit has two outputs per segment. Material on the front housing is anodized aluminum. Back and segments are Diall FS-5 (blue) and meets MIL-M-18794. The shaft is stainless steel. Twenty outputs can be ganged by the manufacturer on one shaft.

R219
RESISTOR, POTENTIOMETER, PRECISION,
DEJUR-AMSCO SERIES C-050



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Samarius, Inc., Derby, Conn.

Electrical Characteristics

Power Rating: Dissipation, 1.5 watts with max. temp. rise of 60°C
 Res Tol: ±5% standard to ±1% on order
 Elect. Rotation: Continuous or brush limited to stop on overtravels. Electrical degrees, 310° ±5°.
 Independent Linearity*: ±1% standard to ±.3% on order

Typical Resolution Values:

Ohms	1K	5K	10K	25K	50K
Total Turns	250	450	600	750	850

Mechanical Characteristics

Life Expectancy (Rotational): Over 1,000,000 cycles
 Shaft Torque: 1 inch-ounce per unit, max

Physical Characteristics

Terminals: Gold plated bifurcated end terminals, turret brush terminal
 Contact Materials: Precious metals
 Mounting: 1/4-32 threaded bushing with or without non-turn pin; piloted servo mounting.

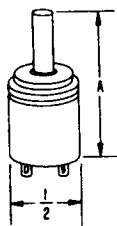
Housing: Precision machined, corrosion resistant, molded cover
 Wire: Various alloys are used depending on particular application. Generally wire with temperature coefficient of 0.00002 is used.
 Shaft: 0.1246-0.1249 dia, ground stainless steel.
 Passivated for max corrosion resistance.

REMARKS: *Independent linearity is the deviation in percent of the total measured resistance of the actual resistance at any point, from the best straight line drawn through the resistance versus rotation curve. The slope and position of the line can be adjusted to make these deviations minimum.

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**R220
 RESISTOR, POTENTIOMETER, PRECISION,
 TYPES APW 1/2 AND WPW 1/2**

Application: Designed for use in circuit applications where compactness is desired under extreme conditions



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Waters Manufacturing Inc, Wayland, Mass.

Electrical Characteristics

Std. Range: 10 to 250 k ohms.

Tolerance: $\pm 5\%$.

Ind. Linearity: Type APW 1/2, $\pm 3\%$; Type WPW 1/2, $\pm 1\%$
 Elect. Rotation: 330° (no stops, standard); 320° $\pm 5\%$ (with stops).

Mechanical Characteristics

Shaft Torque: 1 3/4 oz in., max.

Mech. Rotation: 360° (no stops), 320° $\pm 5^\circ$ (with stops).

Mounting: Bushing (Type APW 1/2), servo (Type WPW 1/2)

Environmental Characteristics

Max. Oper. Temp: Available to 150°C, standard is 125°C.

Water Tightness: MIL-E-5272A.

Moisture Test: Designed to meet the requirements of MIL-E-5272A.

Humidity Test: MIL-E-5272A.

Test Data

Temp. Coefficient: (Wire) 0.00002 ppm/°C.

Dielect. Strength: 900 volts, ac, rms, for 1 minute.

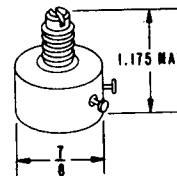
Noise: (Equivalent resistance) 140 ohms, max.

Heat Dissipation: 4 watts. Rated at 60°C ambient temperature. (See remarks.)

Remarks: Ratings listed are maximum ratings. These ratings are limiting values above which the service-ability of the device may be impaired from the viewpoint of life and satisfactory performance. Operation of the potentiometer below the maximum ratings is suggested to increase reliability and length of life. The ratings are based on a 65°C rise in winding temperature. Conservative ratings, such as are recommended for operation under MIL-R-19A load life conditions, require derating these ratings 50%. Standard potentiometers are rated at full power to 60°C and derated to zero at 125°C. High temperature potentiometers, when specified, are rated full power to 85°C and derated to zero at 150°C. Twin "O" rings serve as a shaft seal. Case material is brass, with brass nickle plate. Terminals are solder lug type. Unit is designed to be leak-proof in boiling water. Variations of this unit on special order. Type WPW 1/2 is the servo version of the Type APW 1/2.

**R221
 RESISTOR, POTENTIOMETER, PRECISION, "ACETRIM"**

Application: Used in trimming applications where the miniature size is important.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Ace Electronic Associates Inc, Somerville, Mass.

Electrical Characteristics

Std. Range: 10 to 500k ohms (other values on special order).

Power Rating: 2.5 watts for 60° rise, standard.

Ind. Linearity: $\pm 3\%$.

Elect. Rotation: 325° $\pm 5^\circ$.

Mechanical Characteristics

Mech. Rotation: 330° nominal, continuous or limited by internal stops.

Weight: 3/4 oz max, including lock washer and nut.

Environmental Characteristics

Moisture Test: MIL-E-5272A.

Humidity Test: MIL-E-5272A.

Corrosion: MIL-E-5272A.

Salt Spray: MIL-E-5272A.

Test Data

Temp. Range: -55°C to 125°C, standard -55°C to 165°C, special.

Temp. Coefficient: ± 0.00002 parts per degree C, above 50 ohms.

Load Life: 1000 hours at rated power.

Shock: Withstands 50 G's.

Vibration: 30 G's at 5 to 2000 cps.

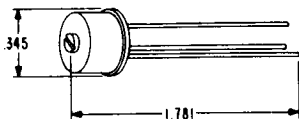
Dielect. Strength: 1000 volts, dc (terminals to shaft).

Insulation Resistance: Greater than 1000 meg at 500 volts, dc.

Remarks: Case is one piece precision machined anodized aluminum. Servo or bushing with shaft locking device is standard. Resistance element is a linear winding on a special high temperature card. Terminals are gold-plated turret type. Brush and slip ring contacts are specially designed and are precious metal (Paliney No. 7). Multiple cups can be ganged either on a single shaft or assembled according to the interchangeable cup design. Cups can be replaced or rephased at will by semi-skilled operators in the field.

R222 RESISTOR, POTENTIOMETER, TRIMMING, TYPE 80

Application: Printed circuits



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Spectrol Electronics Corp., San Gabriel, Calif.

Electrical Characteristics

Standard Resistances and Nom. Resolution: 50—0.91%, 100—0.74%, 200—0.59%, 500—0.48%, 1K—0.38%, 2K—0.33%,

5K—0.29%, 10K—0.21%, 20K—0.15%, and 50K—0.10%.

Resistance Tolerance: $\pm 5\%$

Power Rating: 1.0 watt at 50°C.

Linearity: $\pm 1.0\%$

Noise: 100 ohm, ENR per NAS-710

Voltage Breakdown: 1000 volts rms, 60 cps (any terminal to shaft and/or housing).

Insulation Resistance: 1000 megohms at 500 volts dc (any terminal to shaft and/or housing).

Electrical Rotation: 300° nom.

End Voltages: 0.25% max or 0.5 ohm equiv. whichever is greater.

Physical Characteristics

Configuration: Transistor case (shown); 10—32 threaded bushing; 3/8" x 32 threaded case.

No. Turns: 1

Life Expectancy: 1000 shaft revolutions.

Weight: Transistor type—1 gram; panel mount types—1.5 grams.

Shaft Torque: 0.1 to 5.0 oz. in.

Mech Rotation: End stops (330° nom) standard or continuous rotation optional.

Environmental Conditions

Shock: Per MIL-STD-202B, Method 202A, (30 shocks at 100g), max wiper shift 0.2% or resolution, whichever is greater.

Vibration: Per MIL-E-5272C, Proc. XII (20g to 2000 cps), max wiper shift 0.2% or resolution, whichever is greater.

Salt Spray: Per MIL-E-5272C.

Dielectric Strength: Room and sea level, 500 volts rms, 60 cps; 100,000 ft, 250 volts rms, 60 cps.

Test Data

Load Life: 1000 hr min per MIL-R-19A.

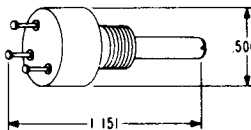
Temp. Coeff. of Resist. Wire: 20PPM/°C to 100°C nom.

Temp Coeff of Potentiometer: 50PPM/°C to 100°C nom.

Remarks: Single turn adjustment from the top

R223 RESISTOR, POTENTIOMETER, TYPE 140

Application: Trimming, control and servo applications where space and environmental conditions are critical



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Spectrol Electronics Corp., San Gabriel, Calif.

Electrical Characteristics

Standard Resistances and Resolutions: 50—.490%, 100—.430%, 200—.390%, 500—.312%, 1K—.254%, 2K—.197%, 5K—.170%, 10K—.116%, 20K—.137%, 50K—.084%, 70K—.076%, and 100K—.075%

Resistance Tolerance: $\pm 5\%$

Power Rating: 2 watts at 70°C

Linearity: Bushing mount— $\pm 1.0\%$; servo mount— $\pm 0.5\%$ standard on servo mount)

Noise: ENR 0.1% or 100 ohms max per MIL-R-12934B.

Voltage Breakdown: 1000 volts rms, 60 cps (any terminal to shaft and/or housing).

Insulation Resistance: 1000 megohms at 500 volts dc (any terminal to shaft and/or housing).

Electrical Rotation: Bushing mount— $325^\circ \pm 3^\circ$; servo mount— $350^\circ + 0^\circ, -4^\circ$. ($320^\circ \pm 5^\circ$ when stops are used)

End Voltages: 0.25% or 0.5 ohm, whichever is greater.

Physical Characteristics

No. Turns: 1

Configuration: Bushing sleeve mount (shown); servo ball bearing mount.

Life Expectancy: Bushing mount—25,000 revolutions of shaft; servo mount—1,000,000 revolutions of shaft.

Weight: Bushing mount—0.15 oz.; servo mount—0.1 oz.

Shaft Torque: Starting—bushing mount, 2 oz. in. max; servo mount, 0.075 oz. in. max. Running—bushing mount, 2 oz. in. max; servo mount, 0.05 oz. in. max. Transversing Dead Space—bushing mount, 2 oz. in. max; servo mount, 0.2 oz. in. max. Optional High Torque—both models, 3 oz. in. min. 12 oz. in. max.

Mech Rotation: Continuous ($330^\circ \pm 5^\circ$ with stops)

Max Terminals: 4

Environmental Conditions

Oper Temp: -55°C to $+150^\circ\text{C}$.

Shock: Per MIL-STD-202B, Method 202A, (30 shocks at 100g), max wiper shift 0.2% or resolution, whichever is greater.

Vibration: Per MIL-STD-202B, Method 204A, Cond. D (20g to 2000 cps), max wiper shift 0.2% or resolution, whichever is greater.

Salt Spray: Per MIL-STD-202B, Method 101A, Cond. A. Dielectric Strength: Sea level, 1000 volts rms, 60 cps; 70,000 ft, 350 volts rms, 60cps.

Test Data

Rotational Load Life: 250,000 cycles per MIL-R-12934B.

Wire Temp Coeff: $\pm 20\text{PPM}/^\circ\text{C}$.

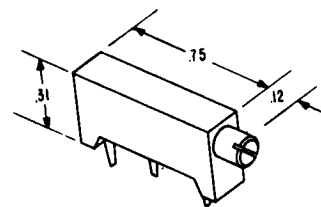
Wire Resistivity: 800 ohms/CMF.

Remarks: Slotted shafts are standard

R224

RESISTOR, POTENTIOMETER, MICROMINIATURE, HIGH TEMP., TRIMPOT MODEL 3000P

Application: Developed for employment in printed circuit board assemblies



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr.: Bourns Trimpot Division, Riverside, Calif.

Electrical Characteristics

Resistance Values: 50 to 20K ohms

Resistance Tolerance: $\pm 10\%$

End Settings: 1 ohm or 1%, whichever is greater

Insulation Resistance: 500 volt, d.c., per MIL-STD-202A, Method 302, Condition B, 1000 megohms min.

Resolution: 0.29 to 1.7%

Power Rating: 0.5 watt at 70°C., 0.2 watt at 125°C., 0 watt at 175°C.

Resistance (ohms)	Part No. 3000P Printed Circuits Pins	Nominal Resolution (percent)
50	3000P-1-500	1.7
100	3000P-1-101	1.3
200	3000P-1-201	1.1
500	3000P-1-501	0.8
1,000	3000P-1-102	0.7
2,000	3000P-1-202	0.6
5,000	3000P-1-502	0.4
10,000	3000P-1-103	0.38
20,000	3000P-1-203	0.29

Physical Characteristics

Weight: 0.06 oz.

Terminals: Gold plated printed circuit pins, dia. 0.008"

Electrical Adjust Control: Dia., 0.110" with 0.025" wide slot

Rotation: Clockwise

Case: All plastic

Precision Element: Low temp. coefficient wire

Mechanical Characteristics

Shaft Torque: 5.0 oz.-in. max.

Mechanical Adjustment: 15 turns, nominal

Mechanical Stops: None (wiper assembly idles)

Environmental ConditionsOper. Temp. Range: -65° to $+175^{\circ}$ C.

Temp. Coefficient:

Temp. Coefficient: Resistance element only (per MIL-R-27208A)— $0.005/^{\circ}$ C, max; with contact arm on active portion of element, 200 thru 20K ohm— $0.010/^{\circ}$ C, max.

Humidity: Per MIL-R-27208A, 100 megohms min insulation resistance after removal from chamber.

Sand and Dust: MIL-E-5272C, Proc 1

Salt Spray: Meets MIL-R-27208A.

Fungus: Meets MIL-E-5272C.

Test Data

Vibration: Exceeds MIL-R-27208A, 30g

Contact Bounce: 0.1 millisecond, max.

Wiper Shift (Max): 1.0% or resolution.

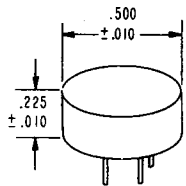
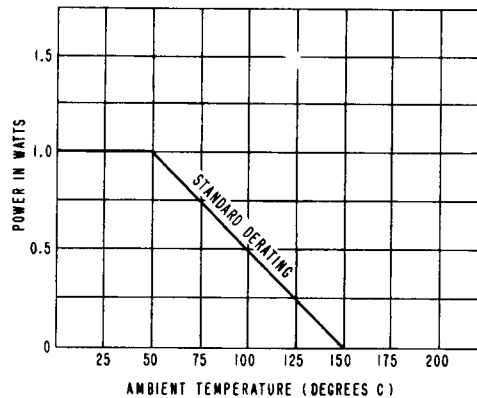
Shock: Exceeds MIL-R-27208A, except 100g

Mechanical Life: 200 cy. without discontinuity

Dielectric Withstanding Voltage: MIL-STD-202A, Method 301, Room condition 1500 volts, a. c. (min.), 80,000 ft., 500 volts, a. c. (min.)

Electrical Characteristics

Standard Resistance Values (Ohms)	Resolution Nominal	
	No. of turns	%
10	104	.96
20	111	.90
50	171	.59
100	215	.47
200	291	.34
500	328	.31
1,000	327	.31
2,000	423	.27
5,000	543	.18
10,000	568	.16
20,000	755	.13
50,000	877	.11

R225**RESISTOR, POTENTIOMETER, SUBMINIATURE PRECISION TRIMMING, SERIES CT-100****Application:** Designed for use in printed circuits.**Quality Assurance:** Manufacturer's claims
Bureau approval required prior to use**Mfr:** International Resistance Co., St. Petersburg, FloridaStandard Tolerance: $\pm 5\%$ Power Rating: 1.0 watt at 50° C

Insulation Resistance: 500 volts, dc, 1000 megohms, min

Usable Resistance Range: 95% (higher available)

Max Noise: 100 ohms

Electrical Rotation: $320^{\circ} \pm 5^{\circ}$ **Physical Characteristics**

Terminals: Printed circuit type

Adjustment: Screwdriver setting

Terminal Dia: .0285"

Terminal Length: .187"

Mechanical CharacteristicsMechanical Rotation: $320^{\circ} \pm 5^{\circ}$ **Environmental Conditions**

Meets or exceeds all requirements of MIL-R-27208

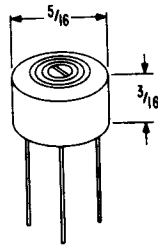
Oper Temp: -55° C to 150° C

Test Data

Thermal Shock: Per MIL-STD-202B, method 107, Cond. B.
 Vibration: Per MIL-STD-202B, method 204, Cond. D.
 Shock: Per MIL-STD-202B, method 205, Cond. C.
 Moisture Res: Per MIL-STD-202B, method 106.
 Altitude: Per MIL-STD-202B, method 105, Cond. C.
 Fungus Res: All non-nutrient materials.
 Salt Spray: Per MIL-STD-202B, method 101A, Cond. A.

R226**RESISTOR, POTENTIOMETER, MICROMINIATURE TRIMMING MODEL 3300P**

Application: This trimmer potentiometer provides the answer to micro-size and weight problems of spacebound electronic equipment.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Bourns, Inc., Trimpot Division, Riverside, California

Electrical Characteristics
Standard Resistances

	Part Number*	
Resistance (ohms)	3300P Printed Circuit Pins	Nominal Resolution (percent)
10	3300P-1-100	1.88
20	3300P-1-200	1.5
50	3300P-1-500	1.15
100	3300P-1-101	0.93
200	3300P-1-201	0.87
500	3300P-1-501	0.69
1,000	3300P-1-102	0.53
2,000	3300P-1-202	0.43
5,000	3300P-1-502	0.32
10,000	3300P-1-103	0.28
20,000	3300P-1-203	0.20

*The last three digits of the part number represent the resistance in standard code.

Resistance Tolerance*: $\pm 5\%$, standard
 End Settings*: 10 thru 20K, 1.0 ohm or 1.0%
 Continuity*: Maintained for full mechanical range
 Noise During Adjustment*: 100 ohms ENR, max.
 Insulation Resistance*: 500 volts, dc, 1000 megohm, min
 Resolution (see chart): 1.88 to 0.20%.
 Effective Electrical Rotation: 280 degrees, nominal,
 Power Ratings: 70°C (158°F) ambient: 0.50 watt
 110°C (230°F.) ambient: 0.25 watt
 175°C (347°F) ambient: 0 watt

*Inspection Note: Applicable 100% and statistical sampling performed to insure foremost quality.

Physical Characteristics

Shaft Torque*: 4.0 oz. in., max
 Markings: Mfr's name, terminal identification resistance, data code, and mfr's part number
 Appearance*: Legible markings, no physical defects
 Mechanical Stops: Solid
 Stop Strength: 6.0 oz.-in.
 Weight: approx .02 oz.
 Terminals: P, gold plated printed circuit pins, No. 26 AWG, 1/2" long

Environmental Conditions

Oper Temp Range: -65 to 175°C (-85 to 347°F)
 Temp Coef:
 Of resistance wire: Max 0.005%/°C
 Of potentiometer: Max. 0.007%/°C
 Humidity: Per MIL-STD-202B, Method 106, 100 megohms, min insulation resistance after removal from chamber
 Sand and Dust: Meets MIL-E-5272C, Proc 1
 Salt Spray: Meets MIL-R-27208A.
 Fungus: Materials meet MIL-E-5272C

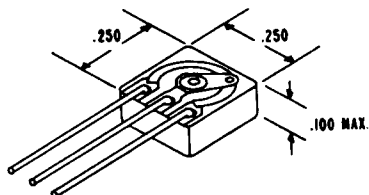
Test Data

Load Life: 1000 hr, per MIL-R-27208A, resistance shift, max 2.0%
 Mechanical Life: 200 cy, without discontinuity
 Dielectric Withstanding Voltage: Per MIL-STD-202B, Method 301, room conditions, 1000 volts, ac (sea level); at 80,000 ft, (0.8" Hg) 400 volts, ac
 Immersion Leak Test: No leaks
 Vibration: Per MIL-R-27208A, 30g
 Contact Bounce: 0.1 millisecond, max.
 Wiper Shift, (max): 1.0% or resolution
 Shock: Per MIL-R-27208A, 100g
 Contact Bounce and Wiper Shift: same as Vibration

Remarks: This item is also available with solder hook terminations with mounting by means of a #10-32 NF-2 bushing (type 3300S). Type 3300W is similar to the 3300P above but provides side adjustment.

R227
RESISTOR, POTENTIOMETER, MICRO MINIATURE
TRIMMER SERIES 3, TYPE 620-1

Application: Designed for use in electronic circuits where a final trimming adjustment is necessary to attain a balance in critical circuitry.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Centralab, The Electronics Division of Globe-Union Inc., Milwaukee 1, Wisconsin

Electrical Characteristics

Resistance Range: 100 ohms to 10 megohms. (High value resistors may exhibit TC characteristics that may vary slightly from those shown here.)

Tolerance: $\pm 30\%$ ($\pm 20\%$ available)

Min End Resistance: Less than 5% of total resistance

Max Voltage Across Element: 200 volts, dc

Wattage: 0.05 watts at 70°C; derated at 0 watts at 90°C

Taper: Linear

Effective Electrical Rotation: 250°.

Physical Characteristics

Leads: No. 28 gauge (.0126") wire

Resistance Track: Carbon composition (printed)

Base Material: Steatite MIL-I-10A grade L5A (dielectric plate)

Connective Circuits: Silver, fired to the steatite base plates

Rotational Torque: 0.3 to 5 oz. in.

Sliding Contact and Eyelet: Non-corrosive, non-magnetic metal

Encapsulation: May be encapsulated after final adjustment without derating

Lead Lengths: 3 leads, 1-1/2" min

Environmental Conditions

Temp Coef (% change from 25°C):

Resistance Value	-15°C	+85°C
100 ohms to 2.4K ohms	+1.0%	-5.0%
2.5 ohms to 99K ohms	+3.0%	-4.0%
100K ohms to 5 meg	+7.0%	-8.0%

Aging: 1 yr, max change $\pm 1.5\%$ exclusive of humidity changes

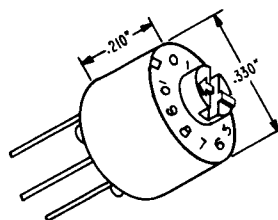
Humidity: Change in resistance after 96 hr at 90-95% relative humidity at 40°C, 12% max change. After 24 hr, (dry at 40°C) less than 2% change

Remarks: A special adjusting tool consisting of a simple plastic rod with one end machined and fitted with a pin is suggested for use with this trimmer. This tool will enable the user to make a finer adjustment of the trimmer, and also prevent possible damage to the resistor's mechanical function.

R228

RESISTOR, POTENTIOMETER, PRINTED CIRCUIT VL/3
DIAL TYPE

Application: Designed for use in electrical equipments having printed circuits and where a dial and shaft with pointer indicates setting of wiper is required.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Waters Manufacturing, Inc., Wayland, Mass.

Electrical Characteristics

Resistance Range: 10 ohms to 15K ohms

Tolerance: $\pm 5\%$

Functional Rotation: 320°, $\pm 10^\circ$ (No overtravel)

Max Value of End Resistance: 3%

Mechanical Characteristics

Mounting Feet: 3 on a .075" radius, .050" dia typical 120° apart.

Type of Taper: A

Shaft Torque: .5 to 3 oz. in.

Stop Torque: 1 in. lb

Mechanical Angle: 320°, $\pm 10^\circ$

Physical Characteristics

Case Material: Nickel plated brass

Shaft and Base Material Insulation: Diallyl Phthalate

Resistance Element: 10 or 20 ohm wire; 50 ohms,

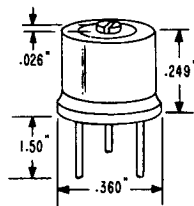
Advance wire; 100 ohms through 15K ohms Karma wire.
 Sealing: "O" ring
 Slot Shaft: .032" wide; by .035" deep
 Numbering on Dial: 0, 1 to 10
 Lead Length: 1.5" min
 Lead Wires: .020" dia, leads are color coded at base per MIL-R-27208 (Std EIA resistance color coding)

Test Data

Moisture Resistance (Humidity): Per MIL-STD-202B, Method 106.
 Max Total Resistance Change: 2.78%
 Minimum Insulation Resistance: 250 megohms
 Dielectric Withstanding Voltage: 250 volts, rms
 Acceleration: The max total resistance change is 0.049%; the max resistance setting change is 0.077%
 Vibration: Per MIL-STD-202B, Method 204A, Test and C
 Results: Max change in total resistance is 0.049%
 Max change of resistance setting is 0.033%
 Shock: Per MIL-R-19A
 Results: The max total resistance change is 0.14%; the max total resistance setting change is 0.17%

**R229
 RESISTOR, POTENTIOMETER, WIREWOUND TRANSITRIM
 MODEL
 510**

Application: Designed for use in electronic equipment where density packaging is critical.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use

Mfr: Daystrom, Inc., Military Electronics Division Archbald, Pa.

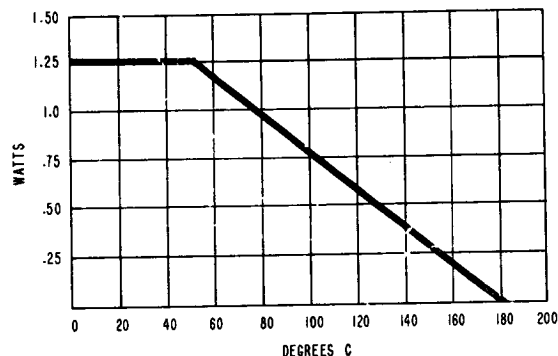
Electrical Characteristics

Resistance Ranges: 500 ohm to 10K, tolerance ±5% - Standard*; 10 ohm to 30K ohm ±5%, complete range
 Temp Coeff (Wire): 20PPM/°C(0° to +175°C)
 Temp Coeff (Potentiometer): ±50PPM/°C(0° to +175°C)
 Resolution:

10 ohm - .97%
 100 ohm - .48%

200 ohm - .37%
 1K ohm - .28%
 5K ohm - .17%
 10K ohm - .13%
 30K ohm - .11%
 Power Rating: 1.25 watts (in still air)
 Load Life at Rated Power: 1000 hrs.
 Insulation Resistance: 1000 megohms min at 500 volts dc.
 Electrical Angle: 320°

Note:* Standard indicates that the above data is applicable through this resistance range. Below the standard range, low temp coef is sacrificed to gain max resolution (see resolution chart). When required, the 50 PPM T. C. can be held in lower resistance values. The improved resolution may also be extended up to the 1K region. Above the standard resistance range, the power dissipation curves must be derated 25%.



Physical Characteristics

Rotation: Continuous
 Weight: 1.5 gram.
 Leads: Silver and gold plated Kovar
 Leads: .017 dia leads oriented on a .200 pitch circle
 Mechanical Adjustment: Slotted shaft for acceptance of screwdriver

Environmental Conditions

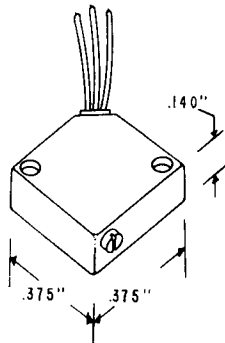
Oper Temp: -55°C to +175°C
 Fungus Resistance: All non-nutrient materials
 Immersion: MIL-R-27208, Para. 3.28
 Humidity: MIL-E-5272C
 Temp Cycling: MIL-STD-202B, Method 107
 Salt Spray: MIL-E-5272C
 Sand and Dust: MIL-E-5272C

Test Data

Rotational Life: 500 cycles
 Shock: 100 g, 30 shocks, 11 millisecs
 Vibration: 20 to 2000 cy at 20g
 Altitude: 100,000 ft., 250 volts, ac
 Dielectric Withstanding Voltage: 500 volts, ac, for 1 minute

R230
RESISTOR, POTENTIOMETER STANDARD SQUARETRIM
SERIES 200

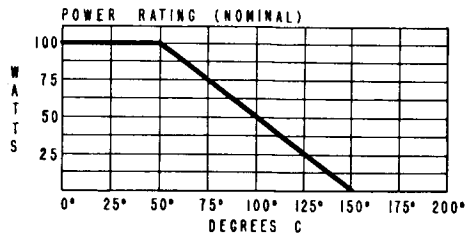
Application: Designed for use in electronic equipment where density packaging is critical and accessibility to adjustment is required.



Potential /20°C

End Resistance: 2% or 1 ohm (whichever is greater)

Equivalent Noise Resistance: 100 ohms, max per NAS 710



Mechanical Characteristics

Rotation-Basic Models: Continuous

Adjustment Ratio: 30:1

Turns for Full Scale Adjustment: 25 nom

Rotational Life: 10,000 screw revolutions

Torque: 7.5 oz./in., max

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Daystrom, Inc., Military Electronics Division,
 Archbald, Pa.

Electrical Characteristics

Resistance Value (ohms)	Resolution Percent
10	.90
20	.69
50	.52
100	.44
200	.35
500	.28
1K	.27
2K	.24
5K	.16
10K	.13
15K	.12
20K	.11

Resistance Tolerance: ±5%

Temp Coef of Resistance Wire: .000020 ohm/ohm/°C
 0° to 150°C (20 PPM)

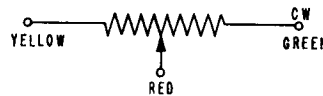
Temp Coef of Potentiometer: .000050 ohm/ohm/°C, 0° to
 150°C (50 PPM)

Stability as Voltage Divider: .2% or one resolution
 max - 55° to 125°C

Power Rating: (see power curve)

Load Life at Rated Power: 1000 hrs, min per MIL-R-19A

Insulation Resistance: 1000 megohms min, at 500 volts,
 dc



Physical Characteristics

Weight: 1 gram

Case Material: Aluminum alloy

Wiper: Platinum alloy

Screw: Stainless steel

Internal Insulation: Kel-F

Lead Insulation: Teflon or Nylon

Lead Dia: 30 or 32 AWG

Lead Length: 4", min.

Adjustment Screw Type: Slotted -200 -66; socket cap-
 200-67

Environmental Conditions

Oper. Temp: -55 to +150°C

Temp Cycling: Per MIL-R-19A

Altitude: N.A.S. 710, Para 3.1.7

Sand and Dust: MIL-E-5272C

Fungus: 100% non-nutrient materials

Corrosion: 100% similar material construction

Salt Spray: MIL-STD-202 Method 101 Cond. B

Salt Spray-Humidity proof Models 200-66H, 200-67H,

MIL-E-5272C, Proc 1

Test Data

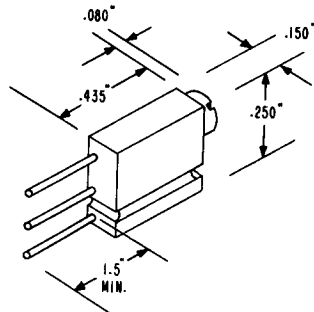
Dielectric Withstanding Voltage: 500 volts, ac for one
 minute

Vibration: 20 g's to 2000 cps, MIL-E-5272C Proc XII

Shock: 30 shocks, 30 g's N.A.S. 710 Para 4.6.16 Proc 111

**R231
RESISTOR, POTENTIOMETER PRECISION WIREWOUND
TRIMMER SERIES 323**

Application: Designed for use in electronic equipment where space allotment is critical and control of more ohms per square inch is required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

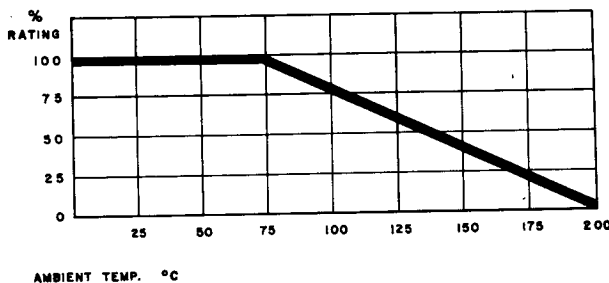
Mfr: Atohm Electronics, Sun Valley, California

Electrical Characteristics

Resistance (ohms)	Resolution (percent)
10	1.85
20	1.92
50	1.33
100	.94
200	1.09
500	1.06
1K	.69

Power Rating: 1 watt, derated as shown on chart (mounted as per MIL-R-19A)

POWER DERATING CHART



Temp Coef of Wire: 0.00002/°C
Temp Coef of Complete Instruments in the Series 323: 0.00002/°C to 0.00005/°C is assured by temp-shocking all windings to at least one shock of -65°C and four shocks of 175°C
Insulation Resistance: (500 volts-1000 megohms, min)
End Resistance: 1% or 1 ohm
Reactive Components as Measured: Cap of winding-to-ground
Plane: 30 pf; Inductance-130 mh, max, inductance-121 mh, min
Note: The max-min values apply to all models in the Series 320 and are dependent on number of turns necessary to make the particular resistance
Load Life: 1000 hrs
Noise: 100 ohms, max

Physical Characteristics

Weight: 0.5 gms, average
Rotational Life: 500 cy, 25,000 revolutions
Continuity: Full winding 8 turns
Lead Material: New alloy 45, gold plated leads
Mounting: The pots are held together with lightweight, low mass, wire clip and also are held to the circuit board by some simple device
Screwhead: Metallized ceramic adjustable
Sealing: High temp epoxy "O" ring seal, heat resistant to 500°F
Wiper: Precious metal
Markings: Part no., date, and code

Environmental Conditions

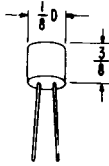
Fungus: All materials non-nutrient
Humidity: Ten days
Oper Temp Range: 65°C to 200°C
Salt Spray: 96 hrs

Test Data

Dielectric Withstanding Voltage: 1000 volts, ac at MSL; 450 volts, ac at 70,000 ft
Acceleration: 50 g's constant
Shock: 100 g's-8 milliseconds
Soldering Effects: None
Terminal Strength: 2 lb pull
Vibration: 20 g's, 10-2000 cps
Immersion: 193°F for 15 to 30 secs
Torque: -7 oz. in., max

**R301
RESISTOR, WIRE-WOUND, ULTRAMINIATURE,
SERIES 200**

Applications: These resistors are for special applications. They will withstand a high temperature and have a high power rating.



TYPE 287 0W

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Consolidated Resistance Company of America,
Yonkers, New York.

Electrical Characteristics

Range: 2 to 1000 ohms.
Power Rating: 2 to 5 watts.
Tolerance: 1%.

Physical Characteristics

Construction: Hermetically encapsulated.
Winding: Inductive.

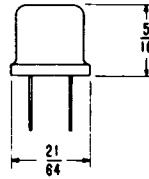
Environmental Conditions

Max Oper Temp: 175°C.
Waterproofness: MIL-R-93A

Test Data

Shock: MIL-R-93A
Vibration: MIL-R-93A
Stability: 0.01%.
Acceleration: MIL-R-93A
Temp Range: -55°C to 125°C.
Temp Coefficient: ±20 ppm is standard. Units having a temperature coefficient of ±5 ppm are available.

**R302
RESISTOR, WIRE-WOUND SUBMINIATURE,
BOBBINLESS, STYLE R-5**



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: General Instruments Corporation, Semiconductor Div.,
Newark, New Jersey

Electrical Characteristics

Range: 0.1 ohm to 750 K.
Max Working Voltage: 500 volts, dc.
Power Rating: 1/3 watt continuous.
Tolerance: ±0.05%.

Physical Characteristics

Construction: Element material is immersed in a viscous medium.
Terminations: Can be welded to header to insure hermetic seal.
Lead Wire: No. 25 AWG dumet lead wire (2).

Environmental Conditions

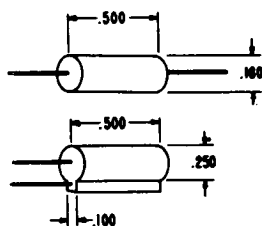
Max Oper Temp: 150°C.
Waterproofness: MIL-R-93B.

Test Data

Shock: MIL-R-93B.
Vibration: MIL-R-93B.
Acceleration: MIL-R-93B.
Temp Range: -55°C to 150°C.
Temp Coefficient: ±20 ppm per °C.
Dielect Strength: 1000 volts, rms.

Remarks: Primary application in printed circuitry.

R303
RESISTOR, WIRE-WOUND, SERIES PH, TYPES 128A(TOP)
AND 128AR(BOTTOM)



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: International Resistance Co., Boone, N. C.

Electrical Characteristics

Range: 0.01 ohm to 50K ohms.
 Power Rating: Refer to the manufacturer.
 Tolerance: Standard is 1%. Tolerances of 0.5%, 0.25%, 0.1%, 0.05%, 0.02%, and 0.01%, are also available.

Physical Characteristics

Construction: Encapsulated.
 Size: Axial lead type, 0.500" x 0.160".
 Size Range: Length, 0.500" to 1.75"; diameter, 0.160" to 0.625".
 Lead Wire: Axial leads, No. 20 AWG 2" long.

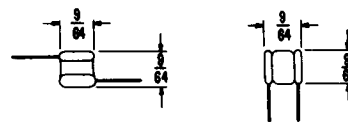
Environmental Conditions

Max Oper Temp: +125°C.
 Waterproofness: MIL-R-93A.
 Salt Spray: MIL-R-93A.
 Differential Pressure: Will withstand reduced pressures equivalent to 80,000 ft.

Test Data

Vibration: MIL-R-93A.
 Acceleration: MIL-R-93A.
 Temp Range: -65°C to 125°C.
 Temp Coefficient: ±0.0022% per °C. Units having a temperature coefficient of 0.4% per °C are also available.

R304
RESISTOR, WIRE-WOUND, TYPE 701



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Bond Electronics Corp., Springfield, N. J.

Electrical Characteristics

Range: Maximum resistance, 15,000 ohms using 0.001" dia wire.
 Power Rating: 0.1 watt.
 Tolerance: 1% to 0.1%.

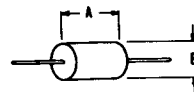
Physical Characteristics

Construction: 0.062" counter sunk mounting hole through center.
 Size: 9/64" x 9/64".
 Lead Wire: No. 30 copper tinned leads.

Test Data

Temp Coefficient: ±20 ppm per °C.

R305
RESISTOR, WIRE-WOUND, TYPES WWA AND MWA



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Dale Electronics, Inc., Columbus, Nebraska.

Electrical Characteristics

Range: MWA, 1 to 125K ohms. WWA, .1 to 4 megohms.
 Max Working Voltage: 27 to 600 volts, depending on type.
 Tolerance: Std 1%, .5%, .25%, .10%, .05%. Tolerances also available to as low as .005%.

Insulation Resistance: 500 megohms dry, min, 100 megohms min after moisture test.
 Short Time Overload: 2X rated power for 10 sec.
 Power Rating (Watts): .1 to .5, depending on type.

Physical Characteristics

Construction: Epoxy encapsulated.
 Size: Type WWA-13, A-3/8, B-1/8; MWA-8, A-1/4, B-5/64; MWA-10, A-5/16, B-5/64.
 Winding: Noninductive, Pi wound.

Environmental Conditions

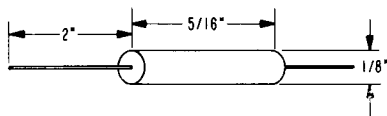
Waterproofness: Completely impervious to the penetrating effects of salt ions, humidity, moisture, and corrosive gases and vapors.

Test Data

Temp Range: -55°C to +145°C.

**R306
 RESISTOR, WIREWOUND, PRECISION, TYPES 1282
 AND R-1290**

Application: Designed to meet today's stringent space device requirements without sacrificing reliability.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: The Daven Co., Livingston, New Jersey.

Electrical Characteristics

Tolerance and Applicable Min. Resistance Value: 1 ohm at 1%, 2 ohm at .5%, 4 ohm at .25%, 10 ohm at .1%, 20 ohm at .05%, 50 ohm at .02%, 100 ohm at .01%.
 Max. Resistance: 16K with .001 wire; 85K with .0006 wire.
 Resistance Tolerance Avail: 0.1% to 1%.
 Power Rating: 0.5 watt to 125°C, derate to zero at 145°C.
 Max. Voltage: 100 volts.

Physical Characteristics

Weight (Approx): .6 gram
 Protective Covering: Epoxy
 Leads: #22 AWG
 Lead Material: Type 1282—for resistance values less than 10 ohms, OFHC tinned copper; for resistance values 10 ohms or greater, tinned alloy (78% copper, 22% nickel).

Winding Method: Reverse PI wound. Type R-1290- for resistance values less than 100 ohms, OFHC tinned copper; for resistance values 100 ohms or greater, tinned alloy (78% copper, 22% nickel).

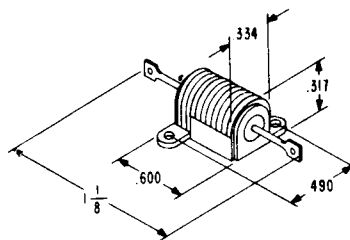
Environmental Conditions

Meets or exceeds environmental requirements of MIL-R-93C.
 Oper Temp: -65°C to +125°C.

Remarks: Manufacturer claims these resistors meet or exceed performance and quality assurance provisions of MIL-R-93C.

**R307
 RESISTOR, WIRE WOUND, PRECISION POWER, DALE
 TYPE RH-5**

Application: Designed for utilization in electronic equipment where its characteristic adaptability for high power environs, efficient heat dissipating (when mounted on chassis) and conformity to a close tolerance in confined spaces.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

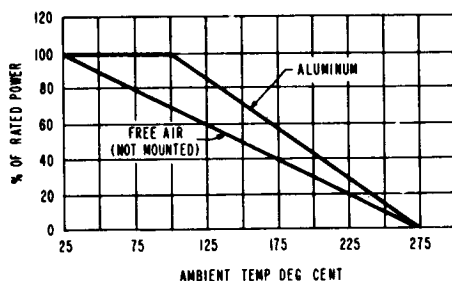
Mfr: Dale Electronics, Inc., Columbus, Nebraska

Electrical Characteristics

Ranges	Max. Working Voltage
Tolerance Resistance	
±0.05%	10-4200 ohms 130
± .1%	5-4200 ohms 130
± .25%	2.5-4200 ohms 130
± .5%	1-4200 ohms 130
± 1%	1-20K ohms 130
± 3%	0.5-20K ohms 130

261

Power Rating: 5 watts at 25°C. ambient when mounted on 4 x 6 x 2 x .040 chassis.



Physical Characteristics

Weight: 2.2 grams

Terminals: Welded construction from terminal to terminal

Housing: Black anodized aluminum, has max. contact area possible with heat sink for optimum cooling, radiator fins provide max. surface area for convection and radiation cooling.

Insulation: Caps and resistance element are entirely sealed in silicon.

Insulation Resistance: Approx. 100 megohms

Terminal Lugs: Solder-coated copper, terminals are silver-soldered to stainless steel end-caps, and are pressure-fitted onto the ceramic cores.

Winding: Nickel-chromium resistance wire, 0.001 inch, dia.

Winding Insulation: Silicone coating

Winding Pitch: Ranges from 200% to 275% of the wire dia., depending on resistance value.

Winding Form: Ceramic, steatite cores, chemically inert and impervious to moisture.

Marking: Resistor type, rating, resistance value, tolerance and date of manufacture are marked clearly on each resistor.

Environmental Conditions

Dielectric Withstanding Voltage: 1000 volt, a. c., r. m. s. applied for 1 minute at atmospheric pressure, between the terminals connected together and the mounting hardware.

At reduced barometric pressure (70,000 ft. altitude) 500 volt, a. c., r. m. s. applied for 1 minute.

Waterproofness: 10 continuous cycles, each of 24 hrs, duration, as described in method 106A in MIL-STD-202A. 50 megohms insulation resistance at end of final cycle.

Max. Oper. Temp.: 275°C.

Temp. Coeff.: 0.00002/degree C.

Power Derating: 75% of rated power at high altitude.

Test Data

Shock: 50g, ten in 3 axes (Condition C of Method 205 of MIL-STD-202A)

Vibration: 10-2000 c. p. s., in 3 planes for 12 hours

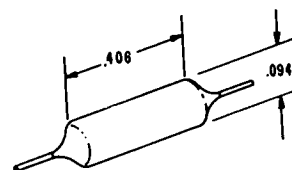
Lead Pull: 5 lb.

Remarks: The RH-5 operates at elevated ambient temperatures when properly derated. It is designed to meet the requirements of the performance and environmental standards of MIL-R-18546C.

R308

RESISTOR, WIREWOUND, IMPERVOHM COATED POWER, SERIES S

Application: Designed for use in electronic equipments where power resistors must have rugged insulation and reliable resistance to moisture environs.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Sage Electronics Corporation, East Rochester, N.Y.

Electrical Characteristics

Style	Rating Watts	Body Length	Body Diameter	Resistance Range, Ohms
S1W	1	.406	.094	.5-10K

Temp Coefficient: Zero \pm 20 ppm/°C

Tolerance: 1%

Physical Characteristics

Resistance Element: Two layer, non-inductive, Evanohm wire, dia .00175

Lead Pull: 10 lb, min

Sealing: Non-porous silicone encapsulant

Test Data

Mechanical Strength: Subjected to a transverse load of 50 lbs, no damage, no change in resistance

Terminal Strength: 10 lb, pull, Resistance change after test was .008% per MIL-R-26C requires \pm 1%

Shock: Per MIL-STD-202A, method 202A, 50 g's for 10 milliseconds, no failures

Vibration: Per MIL-STD-202A, method 204, 10-55-10 cps

Moisture Resistance: Per MIL-R-26C, no damage in 1 minute; 6 hr, vibration test, in 3 planes; to 2000 cps

Load Life: 1000 hr, resistance change .5%

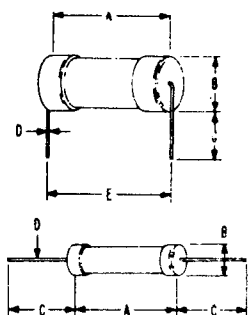
Overload: 5 to 10 times rated wattage depending on style

Dielectric Withstanding Voltage: 1000 volts, rms
Temp Range: -55°C to 350°C

Remarks: These resistors due to their Impervohm coating are also resistant to ultrasonic solvent wash.

**R309
RESISTOR, WIREWOUND NON-INDUCTIVE, PRECISION
POWER SERIES N AND NR, 1/2 TO 3 WATTS**

Application: Designed for use in electronic equipment where ambient temperatures up to 350°C prevail, and where space and weight are critical factors.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Omtronics Mfg., Inc., Omaha 14, Nebraska

Electrical Characteristics

Winding: Non-inductive, (units are multi layer wound)
Power Rating: 1/2 to 3 watts

Table I

Resistance and Tolerance Range:

O.M.I. Type	±3%	±5%	±1%	±0.5%	±0.25%	±0.1%	±0.05%
N-1/2	4 to	4 to	4 to	4 to	4 to	4 to	4 to
NR-1/2	800	800	500	500	500	500	500
	ohm	ohm	ohm	ohm	ohm	ohm	ohm
N-1A	3 to	3 to	3 to	3 to	3 to	3 to	3 to
NR-1A	1000	1000	600	600	600	600	600
	ohm	ohm	ohm	ohm	ohm	ohm	ohm

Table II

O.M.I. Type	Rated Watts	Nominal Dimensions			
		A	B	C	D
N-1/2					#24
NR-1/2	1/2	5/16	5/64	1-1/2	#24
N-1A					#24
NR-1A	1	13/32	3/32	1-1/2	#24

Max Continuous Average

O.M.I. Type	E	Working Voltage dc or ac, rms	Weight (grams)
NR-1/2	.350	55	0.1
NR-1A	.425	75	0.2

Physical Characteristics

Coating: Temp-Cote silicone
Mounting: Flexible solid wire leads, N type (axial), or NR type (radial). See Table II above for lead dia
Weight: See Table II
Enc Caps: Special alloy
Internal Terminations: Electronically welded
Core: Precision graded ceramic

Environmental Conditions

Temp Coef: 20 P.P.M./°C, average
Temp Coef (Special): To 2 P.P.M./°C available
Oper Temp Range: To +350°C
Moisture: Per MIL-R-26
Salt Spray: Per MIL-R-26
Fungus: All materials non-nutrient

Test Data

Dielectric Withstanding Voltage: 1000 volts, ac, V block test
Terminal Strength: 5 lb. in. clockwise and counter-clockwise torque

Remarks: Vendor claims the coating of these resistors is resistant to high temperatures and is abrasion-proof.

R310

RESISTOR, WIREWOUND, BOBBIN TYPE, MOLDED COATING, NON-INDUCTIVE TYPES MWA-8 AND MWA-10

Application: Designed for electronic circuit usage where the density of packaging is critical.

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Nominal Dimensions

	A	B	C
MWA-8	.250"	.078"	1-1/2"
	±.015"	±.015"	± 1/8"
MWA-10	.312"	.078"	1-1/2"
	±.031"	±.015"	± 1/8"

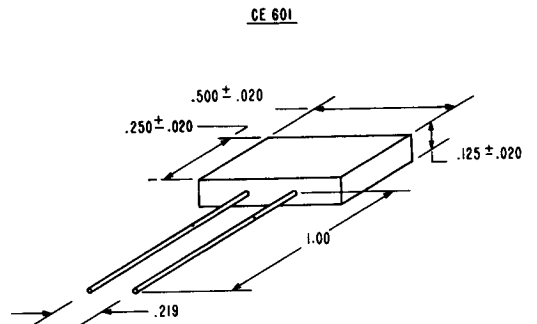
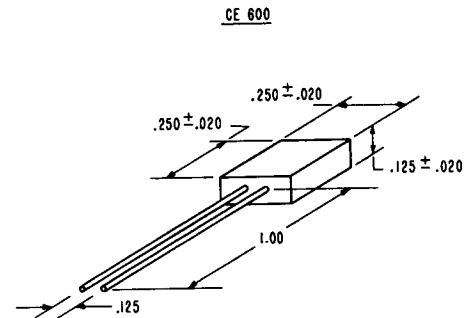
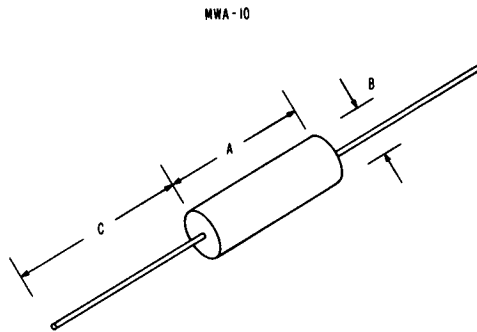
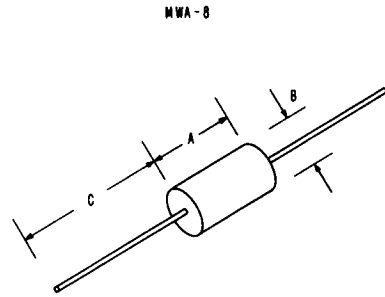
Environmental Conditions

Oper Temp Range: -55°C to 145°C
Temp Coef: ±20 PPM/°C

R311

RESISTOR, WIREWOUND MICROMINIATURE AEROHM "600"

Application: Designed for use in electronic equipment where density packaging is critical.



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Dale Electronics Inc., Columbus, Nebraska

Electrical Characteristics

Resistance Range: 10 ohms to 160K ohms, depending on type

Resistance Tolerance: 0.5%, 1%

Type	Full Watt Rating	Resistance		Maximum Continuous Working Voltage
		Max	Min	
MWA-8	.100	125 Kohms	10 ohms	27 Volts
MWA-10	.125	160Kohms	15 ohms	37 volts

Coating Material: Special molding

Terminals: Axial wire leads, weldable and solderable

Standard: Copperweld .020" dia, #24 AWG

Special: Alloy 180, .020" dia, #24 AWG

Dumet with .000030" gold flash .020", #24 AWG

Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: HI-Q Division, Aerovox Corp. Cinema Plant, Burbank, California

Electrical Characteristics

Max. Voltage: 150 volts, dc

Resistance: Type 600 - .10 megohm; Type 601 - .15 megohm

Tolerances Available: 1% thru .01%

Wattage Rating: Type 600 - .125 watts at -55°C to +125°C;

Type 601 - .250 watts at -55°C to + 125°C Derated to zero at 150°C

Temp Coef: Zero \pm 20 ppm -55°C to + 125°C

Winding: Inductive

Physical Characteristics

Bobbin and Encapsulation: Epoxy

Resistance Wire: Temp coef. "E" is standard (15 to 20 ppm). Available in 8 to 15 ppm

Terminals: Tinned copper wire 1" long

Terminal Gage: No. 20 AWG

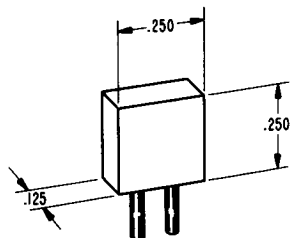
Environmental Conditions

Oper Temp: -65°C to + 150°C

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**R400
RESISTOR, CURRENT LIMITING, MICROMINIATURE
SOLID STATE MODEL P-200**

Application: A solid state device ideal for protection of transistors and diodes. (Refer to XR101 for socket.)



Physical Characteristics

Size: .250" x .250" x .125"

Mounting: Plug-in

Test Data

Shock: 100 G's

Vibration: 10 to 2000 cps @ 100 G's

Acceleration: 200 G's

Humidity: MIL Std. 202

Temp Coefficient: +.25%/°C

Remarks: At overloads up to about 400%, the full overload current is allowed to pass for periods of time as indicated by time-current curves. At overloads above 400%, resistance increases so rapidly that current is limited to a fraction of the available amperage.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Microelectron, Inc., Santa Monica, Calif.

Electrical Characteristics

Rating: 1/32 amp to 3 amp

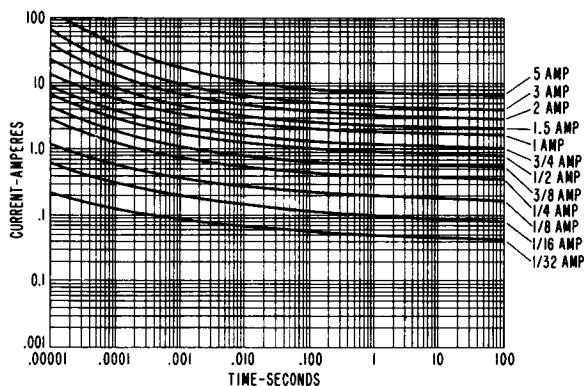
Oper Voltage: 32 volts max

Breakdown Voltage: 1000 volts rms

Resistance before Firing: .054 ohms to 15.8 ohms

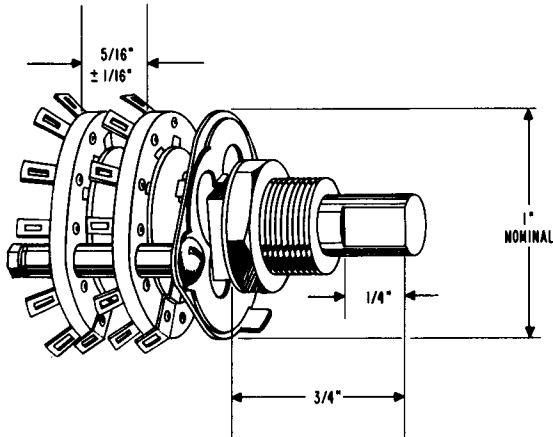
Resistance after Firing: 10,000 megohms

Limit Time: Less than .001 sec @ 316% of rated value



S101 SWITCH, ROTARY, STYLE SR05 (MIL-S-3786A)

Application: Designed for use in electronic equipments where a rugged, temperature-resistant rotary switch is required.



Quality Assurance: Per specification MIL-S-3786A Style SR05.

Preferred part per MIL-STD-242E.

Mfr: QPL Vendors MIL-S-3786A.

Electrical Characteristics

Inductive Load (2.8 henries): 20 ma at 30 volts dc at atmospheric pressure.

Resistive Load (ac or dc): 200 ma at 30 volts or 50 ma at 150 volts at atmospheric pressure; 100 ma at 30 volts or 25 ma at 150 volts at reduced barometric pressure.

Dielectric Withstanding Voltage (RMS): 750 volts at atmospheric pressure; 375 volts at reduced barometric pressure.

Insulation Resistance (min): Ceramic, 10,000 megohms; Plastic, 1,000 megohms.

Initial Contact Resistance (max): 10 milliohms.

Current Rating (max.): 2 amps.

Mechanical Characteristics

Torque: 0.75 to 4 lb.-in. at 20° to 35°C; 0.75 to 6 lb.-in. at -63° to -67°C.

Terminals: Bent at 75°; hole accommodates one wire, 0.032 in. dia.

Terminal Strength: 3 lb.

Torque (Stops): 15 lb.-in.

Contacts: Self-cleaning, shorting or non-shorting

Physical Characteristics

Mounting: By 3/8" -32 NEF-2A bushing, 1/4" dia. shaft, has integral non-turn device.

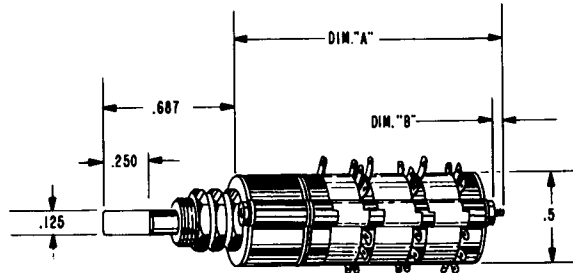
Terminals: Solder type tabs.

Environmental Conditions

Meets requirements of MIL-S-3786A, style SR05.

S102 SWITCH, ROTARY TAP, ULTRA-MINIATURE, SERIES 8

Application: Designed for use in communication and other electronic equipment.



NO. OF DECKS	DIM. "A"	DIM. "B"	WGHT. (GRAMS)	NO. OF DECKS	DIM. "A"	DIM. "B"	WGHT. (GRAMS)
1	.960	.062	12	7	2.818	.312	24
2	1.228	.062	14	8	3.086	.312	26
3	1.496	.062	16	9	3.354	.312	28
4	1.764	.062	18	10	3.622	.312	30
5	2.032	.062	20	11	3.890	.312	32
6	2.550	.312	22	12	4.158	.312	34

Quality Assurance: Manufacturer's claims.

Bureau approval required prior to use.

Mfr: Grayhill, Inc., LaGrange, Illinois

Electrical Characteristics

Rating: Make and break 1/4 amp at 115 volts ac res.; or 4 amps continuous.

Contact Resistance: .010 ohms max initial, at 100 ma, 1.25 volts dc. After 25,000 cycles of operation at rated load, .020 ohms max, .015 ohms typical.

Insulation Resistance: 10,000 megohms min initial, at 100 volts dc, 65°F and 45% relative humidity. 1,000 megohms min after 25,000 cycles of operation at rated load.

Rate of Operation: 10 cycles per minute.

Dielectric Strength: 1,000 volts ac at sea level.

Mechanical Characteristics

Torque: 5 to 2.0 lb.-in., depending on number of decks.

Terminals: Accommodate .030 in. dia. wire.

Terminal Strength: 5 lb. min.

Stop Strength: 12 lb.-in. min.

Mech Life: 25,000 cycles min.
 Angle of Throw: 36°

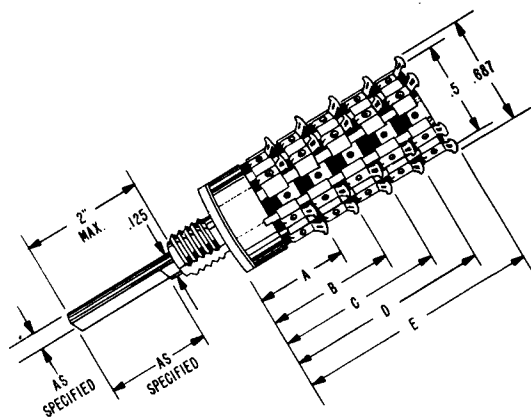
Physical Characteristics

Mounting: 1/4 -32 NEF-2A bushing.
 Decks: 1 to 12 decks, 1 pole per deck, 2 to 10 positions per deck.
 Switch Base: Molded melamine thermosetting plastic per MIL-M-14, type CMG.
 Detent Housing, Deck Separators, Rotor Mtg. Plate, and End Plate: Molded phenolic thermosetting plastic per MIL-M-14, type CFG.
 Detent Spring: Tinned music wire.
 Terminal: Brass, silver plated .003" to .005" thick with .00001" to .00002" gold flash.
 Rotor Contact: Phosphor bronze, silver plated .0003" to .0005" thick with .00001" to .00005" gold flash.
 Mtg. Bushing and Mtg. Nuts: Brass, cadmium plated with yellow chromate per QQ-P-416, Class 2, Type II.

Remarks: Switches of 6 decks or more have .250" min. throughbolt extension for double-end mounting which eliminates any twisting tendency.

**S103
 SWITCH, ROTARY SUBMINIATURE 12 POSITION
 TYPE SERIES 500**

Application: Designed for use in electronic equipment where an extremely compact size rotary switch is required.



Dimension	Length (In.)	No. of Sections
A	19/32	1
B	51/64	2
C	1	3
D	1-3/16	4
E	1-25/64	5

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Oak Manufacturing Co., Crystal Lake, Illinois

Electrical Characteristics

Voltage Rating: 50 volts, dc
 Current Rating: 100 ma (resistive load)
 Insulation Resistance: 10 megohms, min
 Contact Resistance: 15 milliohms, max
 Contact Noise: Negligible
 Circuit Resistance Throughout Rated Life: Negligible
 Dielectric Withstanding Voltage: 500 volts, ac (at sea level)

Mechanical Characteristics

Number of Terminals Per Deck: 12 positions, 11 active one OFF; configurations up to a max of 3 poles per section, with four positions (three active; one OFF).
 Contacts: Double wiping; silver alloy, gold flashed
 Detent Mechanism: Three-ball helical spring loaded
 Torque: 16 in. oz.
 Stop Strength: 5 in. lbs.
 No. of Sections: 5 max
 Terminal Strength: 1 lb. pull

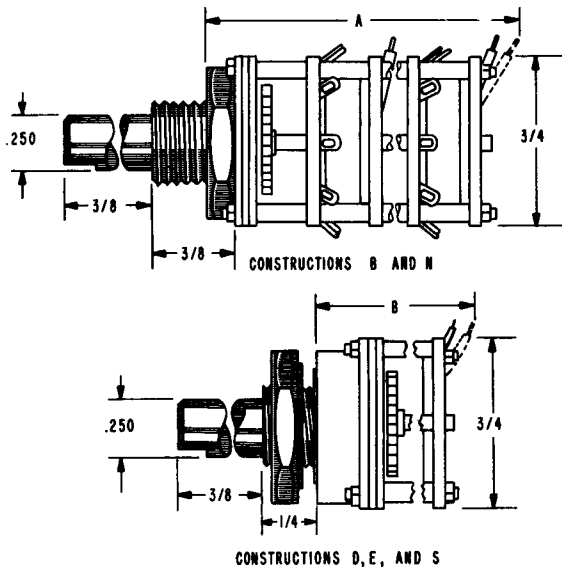
Physical Characteristics

Stators and Spacers Insulation: Diall FS-5 (Diallyl Phthalate)
 Rotor Insulation: Lexan (Polycarbonate Resin)
 Basic Part Materials: Stainless steel and other non-corrodible materials
 Wiring Slots in Terminals: .025" wide, .050" long
 Mounting: 1/4-32 thd bushing within 3/64" of shoulder
 Shoulder: Recessed to accommodate optional panel-sealing washer, .025" thick
 Mounting Hardware (Optional): Nickel-plated brass nut, .093" thick, and nickel-plated phosphor bronze internal-tooth lockwasher, .025" thick

Environmental Conditions

Ambient Temp: -55°C to +85°C
 Salt Spray: Basic parts withstand 50-hr salt spray

S104
SWITCH, ROTARY, STYLE SR08 (MIL-S-3786A)

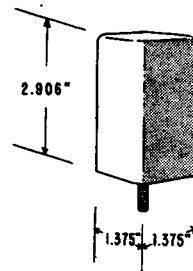


A and B Dimensions (See Illustration):

Section Pairs	Constr. B and N A max.	Constr. D, E and S B max.
1	15/16	1-1/32
2	1-13/32	1-1/2
3	1-7/8	1-31/32
4	2-11/32	
5	2-13/16	

Environmental Conditions: Meets requirements of MIL-S-3786A Style SR08.

S105
SWITCH, ROTARY SELECTOR, HERMETICALLY SEALED, MODEL BD2E



Quality Assurance: Per specification MIL-S-3786A Style SR08.

Bureau approval required prior to use.

Mfr: QPL Vendors MIL-S-3786A.

Electrical Characteristics

Current Rating (max.): 2 amp

Resistive Load: 500 ma at 125 volts at atmospheric pressure.

Dielectric Withstanding Voltage: 600 volts, rms.

Insulation Resistance: Ceramic, 10,000 megohms; Plastic, 1,000 megohms.

Initial Contact Resistance: 10 milliohms.

Moisture Resistance: 0.5 megohm, min.

Mechanical Characteristics

Torque: 0.375 to 3.75 lb.-in. at 20° to 35°C; 0.375 lb.-in. at -63° to -67°C.

Terminals: Bent at 45°, hole accommodates at least two wires 0.040 in. dia. (nom.) each.

Terminal Strength: 3 lb.

Torque (Stops): 25 lb.-in.

Contacts: Self-cleaning, shorting or non-shorting.

Physical Characteristics

Mounting: By 3/8" -32 NEF-2A bushing, 1/4" dia. shaft, has integral non-turn device.

Terminals: Solder-type tabs.

Quality Assurance: Manufacturer's claims.

Bureau approval required prior to use

Mfr: Ledex, Inc., Dayton, Ohio.

Electrical Characteristics

Rating: Wire sizes are available to permit the use of 3 to 300 volts, dc (coil rating).

Power Rating: 28 watts

Switch Circuitry (Control Circuits): 12 position, selective (notch homing) with an interrupter switch, or with an interrupter switch only, for a stepper with a hold-in resistor.

Mechanical Characteristics

Mech Life: 500,000 steps

Contact Design: Silver alloy contacts

No. of Positions: 12

Physical Characteristics

Weight: 3-1/2 oz.

Sealing: Hermetic

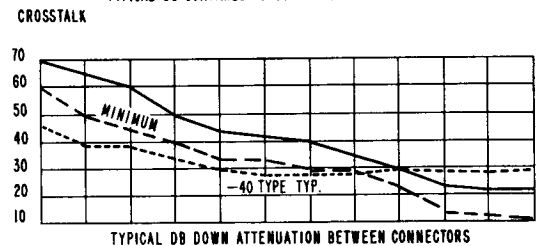
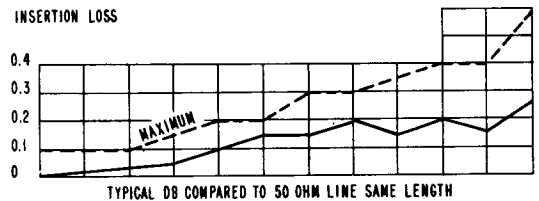
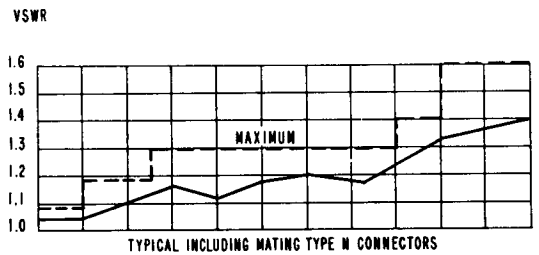
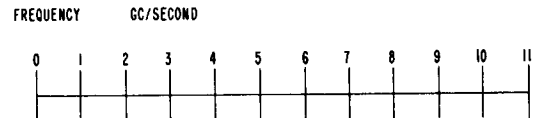
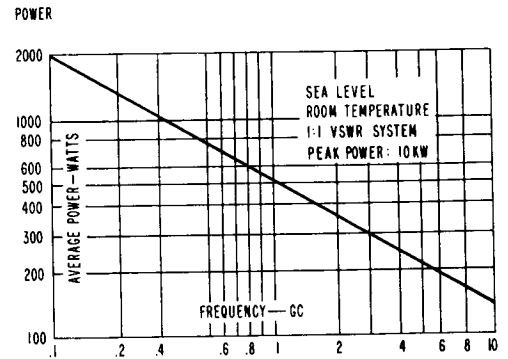
Environmental Conditions

Meets all applicable environmental tests of MIL-S-5272C and MIL-STD-202B
 Corrosion Test: Will withstand a 50-hour salt spray test.
 Temp Range: -55°C to +80°C

Test Data

Dielectric Withstanding Voltage: Coil: 1000 volts, rms;
 Contacts: 500 volts, rms
 Temp Range: -55°C to +80°C
 Vibration: Up to 2000 cps at 10 g's in accordance with MIL-STD-202B
 Shock: 30 g's for 11, ±1 msec in accordance with MIL-STD-202B

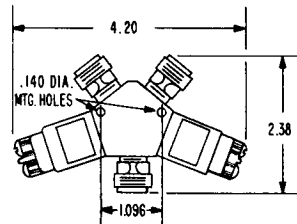
Remarks: Unit is available as a stepping switch or with selective control, plus up to three load switching decks.



S106

SWITCH, ROTARY COAXIAL, TYPE Y, SERIES 11000

Application: Designed to meet the requirement for a small, lightweight coaxial switch having good R.F. characteristics over a broad bandwidth.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Transco Products, Inc., Venice, Calif.

Electrical Characteristics

Bandwidth: To 11GC.
 Actuator Voltage: 28 volts dc. (120 volts dc and 115 volts ac also available.)
 Impedance: 50 ohms nom.
 Switch Circuitry: SPDT (shown), SPST also available.
 *An optional R.F. position indicator circuit is available
 *Indicator Switch Rating: 28 volts dc, 7 amps resistive, 2.5 amps inductive.
 *Indicator Switch Life: 25,000 cycles
 Solenoid Rated Voltage: 18-30 volts dc.
 Solenoid Dropout Voltage: 0.5-10 volts dc.
 Rated Current Per Coil: 0.23 amps at 26 volts.
 Rated Power Per Coil: 7 watts
 Coil Resistance at 70°F: 101-123 ohms.
 Power: See chart below

Mechanical Characteristics

Life: 1,000,000 operations min.
 Oper Time: 10 milliseconds nom.
 No. of Positions: Two independently operated solenoids allow make-before-break or break-before-make operation. R.F. positions can be both on or both off simultaneously. Normally open or normally closed solenoids are available.

Physical Characteristics

Weight: SPDT without indicator—6 oz.; SPST without indicator—4 oz.
 R. F. Connector: Type N.

Environmental Conditions

Oper Time: -65°F to +185°F.

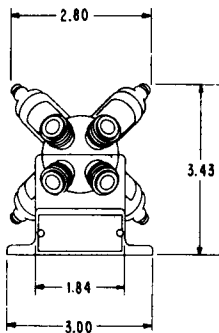
Test Data

Vibration: 10 g's to 500 cps.

Remarks: Meets applicable requirements of MIL-E-5272 and MIL-T-5422.

S107 SWITCH, ROTARY COAXIAL, TYPE A, SERIES 14000

Application: Designed to meet the requirement for a lightweight, multi-position switch having a broad bandwidth.



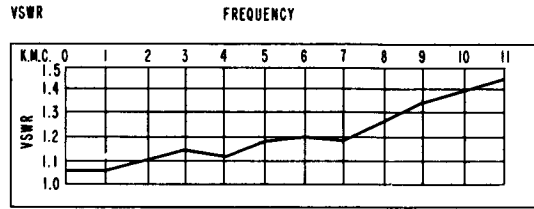
Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Transco Products, Inc., Venice, Calif.

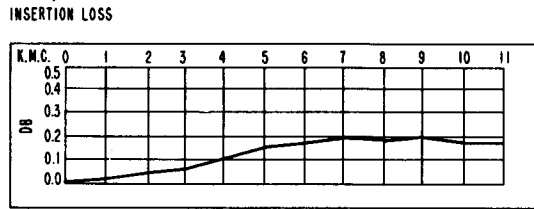
Electrical Characteristics

Bandwidth: To 11GC.
 Actuator Voltage: 28, 90, 120 volts dc and 115 volts ac.
 Actuator Power: 6 watts each coil.
 Impedance: 50 ohms nom.
 Switch Circuitry: SP3T, SP4T (shown)

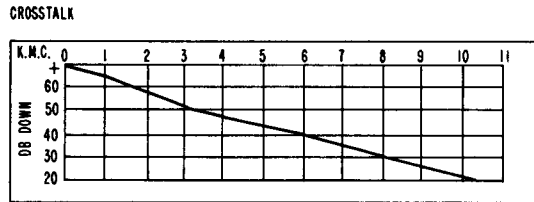
Voltage: 500 volts RF (sea level).
 Power: 500 watts C.W. (3000 MC & Sea Level).



INCLUDING MATING TYPE N CONNECTORS



COMPARED WITH RIGID 50 OHM LINE SAME LENGTH



ATTENUATION BETWEEN CONNECTORS

Mechanical Characteristics

Life: 1,000,000 operations min.
 Oper Time: 12-20 milliseconds
 No. of Positions: Four independently operated solenoids allow complete control over make-before-break or break-before-make operation and contact of all positions simultaneously. Normally open or normally closed solenoids are available.

Physical Characteristics

Weight: SP3T-10 oz., SP4T-12 oz.
 R. F. Connector: Type N.

Environmental Conditions

Oper Temp: -65°F to +185°F.

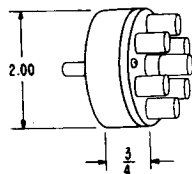
Test Data

Vibration: 10 g's to 500 cps

Remarks: Meets applicable requirements of MIL-E-5272 and MIL-T-5422.

308

S108
SWITCH, ROTARY COAXIAL



Mfr: FXR Div. of Amphenol-Borg Electronics Corp.,
 Danbury, Conn.

Electrical Characteristics

Power Rating: 100 watts.

Mechanical Characteristics

Mech Life: 1,000,000 cycles.
 Contact Design: Unit is available with non-shorting contacts and with BNC or MB connectors.

Types	Connectors
300-11421	4BNC
300-11422	4MB
322-011431-0	5BNC
300-11432	5MB
324-011442-0	7BNC
300-11443	7MB

No. of Positions: 3, 4, and 6 positions are available for manual operation.

Physical Characteristics

Available Circuits: Unit connects 3, 4, or 6 inputs to a common output.
 Shaft Diameter: 0.250".
 Shaft Length: 3/4".

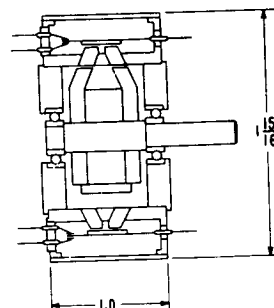
Environmental Conditions

Humidity Test: MIL-S-3928.
 Salt Spray: For 48 hours, meets requirements of MIL-STD-202.

Test Data

Temp Range: -55°C to 85°C.
 Vibration: MIL-STD-202, Test C.

S109
SWITCH, ROTARY MAGNETO TYPE,
LOW-NOISE DESIGN NUMBER 12



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Oak Mfg., Co., Crystal Lake, Illinois

Electrical Characteristics

Elect Life: 2 ma maximum at 15 volts for 10⁹ operations;
 250 ma at 28 volts (resistive load) for 200,000 operations;
 2 ma at 10 volts (resistive load) for 3 x 10⁹ operations.
 Switch Circuitry (Contact Configuration): SPDT or SPST.
 Switching Rate: 1 to 2 milliseconds depending on contact spacing.
 Armature Resonance: Approx 250 cps.

Mechanical Characteristics

No. of Positions: 20.

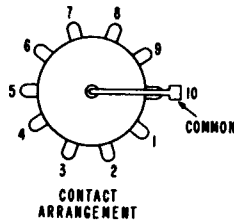
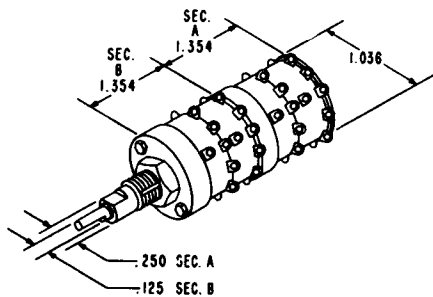
Physical Characteristics

Operation: Sequential with rotation in either direction.

Remarks: Unit is hermetically sealed metal to glass.

S110
SWITCH, ROTARY CONCENTRIC SHAFT, SERIES 36

Application: Designed for use in electronic and communication equipment.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Grayhill, Inc., La Grange, Illinois

Electrical Characteristics

Rating: Rated to break 1 amp at 115 volts, ac, resistive circuit, carry 5 amp

Ratings (make and break): 1/4 amp, 115 volts, ac, inductive; 1/50 amp, 115 volts, dc, inductive; 1/10 amp, 6-28 volts, dc, inductive; 1/10 amp, 115 volts, dc, non-inductive; 1 amp, 6-28 volts, dc, non-inductive

Contact Resistance: For a new switch, approx .003 ohm (measured at 2 vdc and approx 100 milliamps). Max, after a normal mechanical life test of 10,000 cy of oper, is .015 ohms, typical values are in range of .007 ohms.

Insulation Resistance: Between mutually insulated parts, 100,000 megohms (measured at 100 volts, dc)

Dielectric Withstanding Voltage: 500 volts, ac, after most environmental tests; normal applications, will withstand 1000 volts, ac breakdown test between mutually insulated parts.

In-Switch Capacity: 1.2 to 3.4 pf at 1000 cps to 1 megacycle. Applications as high as 10 megacycles have been known.

Mechanical Characteristics

Construction: Switches with 5 decks and over, have studs extended 1/4" at rear to accommodate double ended mounting, thus eliminate any tendency to twist. Stud ends have Glyptal applied to prevent loosening of nuts during operation.

Detent: Entirety in cover, spring loaded ball type, incorporates precision detent action.

Indexing: 36°

Stops: 2 to 10 positions available with built in stops to limit travel to positions specified.

Stop Strength: 12 lb, in, min.

Torque: Varies from 20 to 60 oz, in. depending on number of decks in unit.

Physical Characteristics

Section Shaft Control: Section A, controlled by .250" dia shaft, Section B, controlled by .125" dia shaft.

Deck Lengths: Section A, for one deck .950", ±.030", for each added deck .404", ±.030"; for one deck section B, .950", ±.030", for each added deck, .404" ±.030".

Terminals: Solder type only, with terminal hole of .062" dia.

Wiping Contacts: 500 grams contact force.

Terminal and Contact Rivet: Joint between terminal and contact rivet is soldered as assurance against a high point resistance forming under corrosive conditions.

Switch Base: Molded melamine thermosetting plastic per MIL-M-14, Type CMG.

Cover, Deck Separators, End Plate (Multideck Switch):

Molded phenolic per MIL-M-14, Type CFG.

Laminated Plastic Parts: Nylon fabric based laminated phenolic per MIL-P-15047, Type NPG.

Multideck Switch: Shaft extension and stud nuts 302 stainless steel.

Hardware: Shafts, thrust washer, detent balls, multideck switch coverplate and rear support plate: 303 stainless steel, passivated.

Detent Springs: Tinned music wire.

Solder Lugs (except common): Brass lead-tin plated and fused.

Rotor Contact: Phosphor bronze, silver plated .0003" to .0005" thick.

Base Stator Contacts: Brass with special silver plate of .0003" min thickness.

Non-Turn Washer: Key in mounting hole slides into bushing keyway right angle tab locks into pre-drilled hole on back-side mount panel.

Contact Arrangement: Available with only one or two decks per shaft (total of 4 decks) and 2 to 10 positions per deck.

Common Plate (Including Solder lug for "common"): Brass silver plated .0003" to .0005" thick.

Test Data

Altitude and Temp: 50,000 ft temp -55°C switches operated for 2,500 cy at 10 cpm resistive load of 1 amp 115 volts ac. No breakdown as a result of test. In accordance with USAF, Spec 27500-D, Para 4.3.2.5.

Salt Spray: All metal parts finished to withstand approx 100 hr. exposure to salt spray per QQ-M-15/a.

Vibration: 10 to 500 cps with D.H. of .036 in. or acceleration of ±10g's in each of 3 axes. No resonance occurred per MIL-E-5272, Proc. 1 Para 4.7.1. No damage noted.

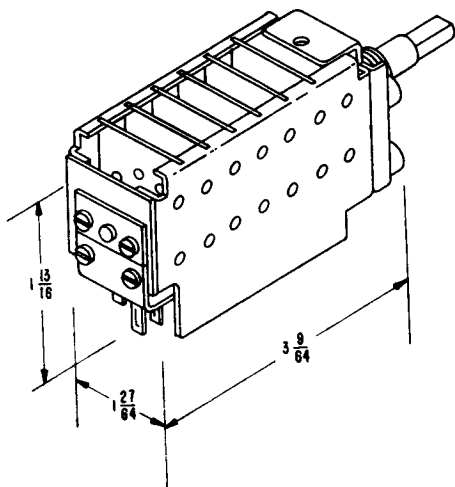
Shock: Five impact shocks of 30g's and 11 millisecs duration per AN-E-19, Para D-2+(3) amend 1.

Humidity: Units subjected to relative humidity 95 to 100% at a temp of 71°C for 6 hr, temp reduced to 35°C for 18 hr without changing total moisture content within chamber. Test potential of 150 volts, rms at 60 cy applied between terminals and other exposed metal parts, leakage did not exceed 0.1 amp at any time, per AN-S-63, Para F-3p. Immersion: Switch submerged in fresh water at 5°C ± 1°C for 12 hr, then in fresh water again at 65°C ± 5°C for 24 hr, after fifth cycle switch dried by air blast not exceeding 20 minutes. Insulation resistance between adjacent contacts and between contacts and ground was not less than 25 megohms. Fungus: Per MIL-T-945A, no growth was evident.

Remarks: This fully enclosed tap switch allows two switches to be mounted in a space normally occupied by one. Each shaft controls from one to three decks, with two to ten shorting or non-shorting positions per deck.

**S111
SWITCH, ROTARY, PRINTED CIRCUIT TYPE, REMOVABLE WAFER, SERIES RS-15**

Application: Designed for use in electronic and communications equipment, wherein, the ease of maintenance is achieved by removing any defective wafers, without any type of tool or major disassembly.



Quality Assurance: Per Specification MIL-S-22710/1 (SHIPS)

Mfr: Chicago Dynamics Industries, Inc., Chicago, Ill.
Tabet Mfg., Co., Norfolk, Va.

Electrical Characteristics

Dielectric Withstanding Voltages: 1000 volts, ac, rms for one minute
Current Carrying Capacity: 2 amp
Insulation Resistance: 200 megohms min
Current Breaking Capacity: 125 ma, at 115 volts inductive
Contact Resistance: .030 ohms, terminal to terminal

Mechanical Characteristics

Contact Design: Shorting or non-shorting
No. of Positions: 10
No. of Wafers: 1 to 12
Mech. Life: 100,000 revolutions

Physical Characteristics

Case Materials: Anodized aluminum and nickel plated brass
Shaft: Stainless steel
Size: As shown in illustration for a 6 wafer switch

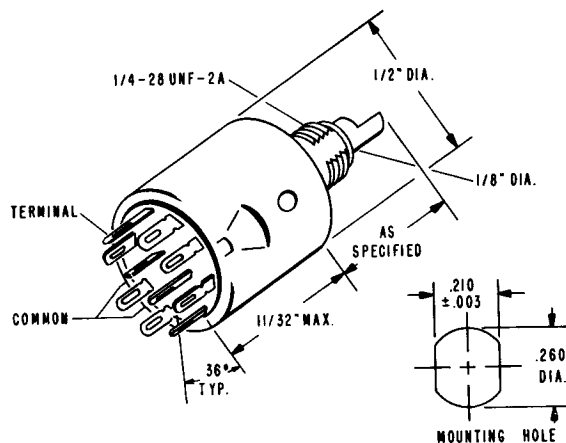
Environmental Conditions

Specification MIL-S-22710

Remarks: Wafers are removable for servicing.

**S112
SWITCH, ROTARY, SUBMINIATURE, 10 POSITION TYPE**

Application: Designed for use in electronic equipment where a compact size rotary switch is required.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: CTS Corporation, Elkhart, Ind.

Electrical Characteristics

Current Ratings (Switching): 25 ma at 300 volts ac, 50 ma at 30 volts dc, 100 ma at 28 volts dc; Lamp load (tungsten)
Current Rating (Carrying): 1 amp at 250 volts dc.
Switching: 10 positions 36° throw. Shorting (make before break)—1 pole, 2 through 10 positions; 2 poles, 2 through 5 positions.
Life Expectancy: 25,000 cycles.
Insulation Resistance: 1,000 megohms min., in humidity chamber; 5,000 megohms min., dry.
Contact Resistance: .010 ohms max.

Mechanical Characteristics

Construction: Enclosed, with or without shaft and panel seals.
Detent Construction: Two balls with compression spring between them, acting against an internal star.
Torque: 8 to 16 in.-oz.
Stop Strength: 10 in.-lb. min.
Tolerance Compensator: Stainless steel spring maintains constant compression of rotor contacts.

Physical Characteristics

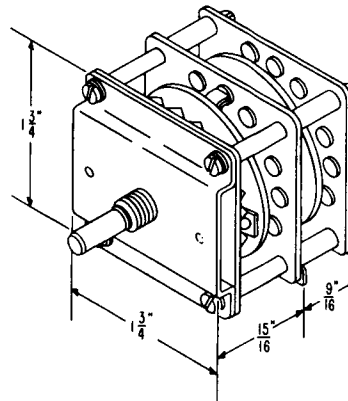
Rotor and Stator Insulation: Glass reinforced diallyl phthalate.
Shaft Material: Stainless steel.
Housing: Brass, nickel plated per QQ-N-290.
Sealing: Shaft and panel water sealed with "O" rings.
Mounting: 1/4-28 UNF-2A bushing with double flats .203" across. Length .250".
Mounting Hardware: .025" thick internal tooth lockwasher and 3/32" thick nut.
Terminal Slots: .030" x .062".
Stator Contacts: Standard-brass heavily silver plated; optional—solid sterling (7.5% copper) silver.
Rotor Contacts: Standard-laminated brass and sterling silver; optional—solid sterling silver spring. Features torsion spring action.

Environmental Conditions

Ambient Temp: -55°C to +125°C.
Salt Spray: Withstands 50 hr. salt spray.

Test Data

Dielectric Withstanding Voltages: 750 volts, ac at sea level; 250 volts, ac at reduced barometric pressure (70,000 ft. altitude).
Terminal Strength: 2 lb. pull.



Quality Assurance: Per specification MIL-S-3786B, Style SR14.
Preferred part per MIL-STD-242E.

Mfr: Pending Qualification—Shallcross Mfg. Co., Selma, North Carolina; Daven Mfg. Co., Livingston, New Jersey

Electrical Characteristics

Current Rating (Max.): 2 amps.
Inductive Load (2.8 henries): 50 ma at 30 volts dc at atmospheric pressure.
Resistive Load: 500 ma at 30 volts dc or 50 ma at 300 volts dc, at atmospheric pressure.
Dielectric Withstanding Voltage (rms): 1000 volts at atmospheric pressure.
Insulation Resistance (Min.): Ceramic, 10,000 megohms; plastic, 1000 megohms.
Initial Contact Resistance: 5 milliohms, max.

Mechanical Characteristics

Max. Torque (5 sections or less): Room temp—6 lb-in; min. temp.—8 lb-in.
Max. Torque (5 sections or more): Room temp—10 lb-in; min temp—13 lb-in.
Terminals: Bent ±15° from plane of section, except four corner terminals on rear section which are bent 45° from plane of section.
Terminal Strength: 5 lb.
Torque (Stops): 50 lb-in.
Type of Shaft: Single shaft (SR14-1); concentric shaft (SR14-2).
Contacts: Self-cleaning, shorting or non-shorting.

Physical Characteristics

Mounting: By 3/8"-32 NEF-2A bushing, 1/4" dia shaft, has integral non-turn device.
Terminals: Solder-type tabs.

Environmental Conditions

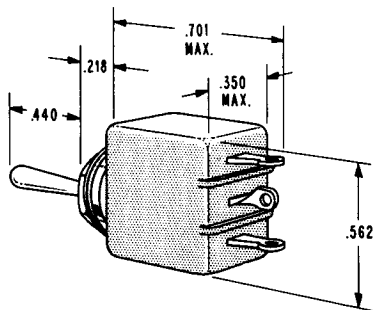
Meets requirements of MIL-S-3786B.

S113

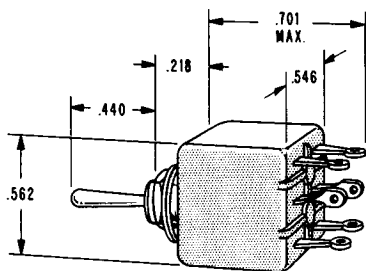
SWITCH, ROTARY, STYLE SR14 (MIL-S-3786B)

Application: Designed for low power, ac or dc switching applications primarily in electronic and communications equipment.

**S201
SWITCH, TOGGLE, MINIATURE, SINGLE POLE AND
DOUBLE POLE, PART NOS. 1402.15 AND 1402.16
(MIL-STD-242E)**



MS24655



MS24656

Quality Assurance: Per specifications MS24655 and MS24656.
Preferred parts per MIL-STD-242E.

Mfr: Cutler-Hammer Inc., Milwaukee, Wisc.

Electrical Characteristics

Switch Circuitry: Single Pole—MS24655; Double Pole—MS24656.
Rating: Resistive circuit—4 amps at 28 volts dc; -3 amp at 115 volts ac.
Rating: Inductive circuit—1 amp at 28 volts dc (with time constant of .020 seconds min.); 1 amp at 115 volts ac.
Min Current Rating (AC and DC): 25µa at 5 mv. (with max. contact resistance of 50 ohms).

Physical Characteristics

Seal: Silicone washer.
Mounting: One MS25082B14 hex. nut and one cadmium-plated steel lockwasher.

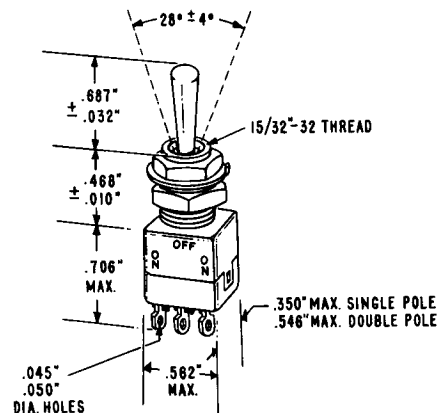
Terminal Strength: 5 lb. normal to mounting plane; 2 lb. in other planes.
Terminal Type: Solder lugs with .045 to .050 dia. holes.
Terminal Plating: .00004" min. gold plated.
Panel Thickness: .062" max.
Actuator Strength: 6 lb., lever pivot and lever stop.
Weight: 5.0 grams, max.—MS24655; 6.5 grams, max.—MS24656.

Test Data

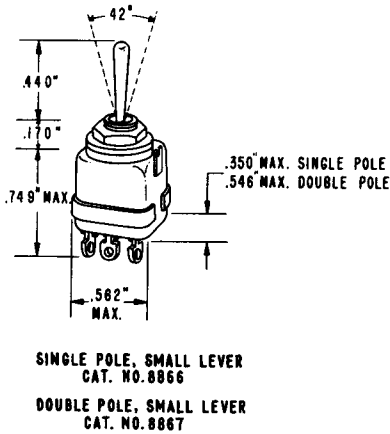
Shock: Per MIL-STD-202, Method 207.

**S202
SWITCH, TOGGLE, TYPES 8866K, 8867K, 8868K AND
8869K**

Application: Designed for use in missile and other electronic equipment.



SINGLE POLE, LARGE LEVER
CAT. NO. 8868
DOUBLE POLE, LARGE LEVER
CAT. NO. 8869



Quality Assurance: Per Specification MIL-S-8834B.
Preferred part per MIL-STD-242E.

Mfr: Cutler-Hammer, Inc., Milwaukee, Wisconsin

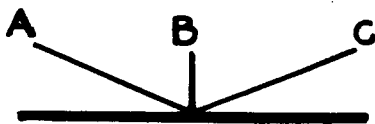
Electrical Characteristics

* CURRENT CAPACITY IN AMPERES-PER POLE		
At 28 Volts DC	At 50 Volts DC	At 115 Volts AC
4 amp	(Resistive Load) 1 amp	3 amp
**1 amp	(Inductive Load) ---	1 amp

*Minimum Rating: 25 μ amps at 5 millivolts or less
** Inductive Rating at altitude of 65,000 ft is based on L/R ratio of .020

Mechanical Characteristics

Positions: See rating chart
Circuit Arrangement:



Keyway On "C" side of switch. Circuit is made on side opposite throw of lever.			Catalog numbers			
			Single Pole		Double Pole	
			.440" lever	.687" lever	.440" lever	.687" lever
On	Off	On	8866-K1	8868-K1	8867-K1	8869-K1
On*	Off	On*	8866-K2	8868-K2	8867-K2	8869-K2
On	Off	On*	8866-K3	8868-K3	8867-K3	8869-K3
On	None	On	8866-K4	8868-K4	8867-K4	8869-K4
On	Off	None	8866-K5	8868-K5	8867-K5	8869-K5
None	Off	On*	8866-K6	8868-K6	8867-K6	8869-K6
On	None	Off	8866-K7	8868-K7	8867-K7	8869-K7
None	On	On*	8866-K8	8868-K8	8867-K8	8869-K8

* Momentary Contact

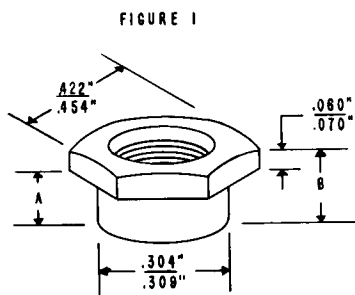
Contact Arrangement: Single or double pole, single or double throw, with or without center "off" position
Momentary contact switches, normally open

Physical Characteristics

Mechanism: The toggle is linked directly to the movable contact member, insuring positive make and break
Bushing Housing: Stainless steel for 8866K and 8867K, nickel-plated brass for 8868K and 8869K
Behind Panel Volume: Single pole--.147 cu. in.; double pole--.230 cu. in.
Contacts Material: Gold plated, open and close with wiping action
Terminals: Gold plated, solder lug type
Encapsulation: Terminals are "potted" to prevent entrance of contaminants, such as dust, solder flux and moisture
Lever Seal: Silicone rubber
Mounting: One hole, bushing length of the 8866K and 8867K, is 0.170", bushing dia 0.250", bushing dia. is 15/32--32 thread for the 8868K and 8869K, face nut, internal tooth lockwasher and locking ring furnished assembled to bushing 8868K and 8869K
Mounting Hardware for 8866K and 8867K: One face nut, internal tooth lockwasher and silicone "O" ring panel seal furnished unassembled.
Mounting Adaptor Nut and Lockwasher: See illustration
Actuator Assembly Design: Contact bounce, extremely low
Weight: Single pole: 8866K, 5.0 gms.; 8868K, 16.26 gms.
Double pole: 8867K, 6.5 gms.; 8869K, 17.64 gms.

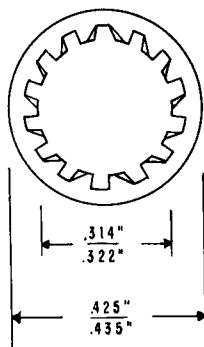
208

Table 2 gives panel thicknesses that can be used when the lockwasher is omitted.



CAT NO. 15-835

FIGURE 2



CAT. NO. 16-1880

ADAPTER NUT DIMENSIONS

Catalog Number	Dim. A	Dim. B	Panel * Thickness TABLE 1	Panel * Thickness TABLE 2
15-835	.067"	.137"	.090"	.107"
	.077"	Nom.	.140"	.157"
15-835-2	.192"	.262"	.215"	.232"
	.202"	Nom.	.265"	.282"
15-835-3	.129"	.199"	.152"	.169"
	.139"	Nom.	.202"	.219"

* Table 1 gives panel thickness that can be used when the metal internal tooth lockwasher (Cat. No. 16-1880) is used in addition to and under the adapter nut.

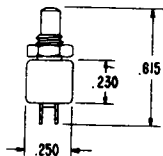
Test Data

- Dielectric Withstanding Voltage: 1000 volts, rms at atmospheric pressure; 500 volts, rms at 70,000 ft alt.
- Moisture Resistance: Method 106 to MIL-STD-202
- Insulation Resistance: Tested to Method 302 of MIL-STD-202, exceeds 100,000 megohms
- Salt Spray: Tested to Method 101, Test cond. B of MIL-STD-202
- Thermal Shock: Tested to Method 107, Test cond. B of MIL-STD-202

Remarks: The types 8868K and 8869K toggle switches incorporate thicker, longer, levers which are designed to enable operators wearing gloves, to more easily manipulate and have more positive control of the switch, than they would have with switches having slimmer and shorter levers.

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S301

SWITCH, PUSH BUTTON, CATALOG NO. 39-1**Application:** Computers, pocket-sized intercoms, etc.**Quality Assurance:** Manufacturer's claims
Bureau approval required prior to use**Mfr:** Grayhill, Inc., La Grange, Illinois.**Electrical Characteristics**

Rating: 100 ma at 110 volts, ac (resistive load); 2.5 amperes at 12 volts, dc (inductive load).

Elect Life: Tested at 1 ampere for 200,000 operations.

Switch Circuitry: SPST (normally open).

Contact Resistance: 0.003 ohm. With a load of 1 ampere for 200,000 operations, there were no failures, the contact resistance after test was within 0.010 ohm, and there was no voltage breakdown or change in insulation resistance.

With an inductive load (starting solenoid) of 2.5 amperes at 12 volts, dc, for 12,000 operations, there were no failures, and the contact resistance after test was 1 ohm.

Mechanical Characteristics

Mech Life: Life expectancy at the rated load is 1,000,000 operations.

Operating Force: 10 oz.

Contact Design: Fine silver alloy

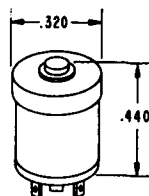
Physical Characteristics

Case: Molded phenolic material per MIL-M-14, Type CFG.

Test Data

Breakdown Voltage: Approx 1500 volts, ac, between terminals or between terminals and case.

Insulation Resistance: 250,000 megohms between terminals or between terminals and case, as measured at 100 volts, dc.

**Quality Assurance:** Manufacturer's claims
Bureau approval required prior to use**Mfr:** Spencer Products, Attleboro, Mass.**Electrical Characteristics**

Rating: 3 amp, 28 volts, dc (resistive).

Mechanical Characteristics

Mech Life: Operation of 10,000 cy min

Release Force: 1 oz min

Pre-Travel: 0.005", approx

Over Travel: 0.003", min

Actuator Force: 12 ± 8 oz

Movement Differential: .002"

Physical Characteristics

Weight: 1 gm

Case: Stainless Steel

Terminals: Solder lug type, tin dipped

Contacts: Fine silver, gold plated.

Environmental Conditions

Sealing: Prior to sealing, Series AT-1 switch is specially processed and filled with a dry, inert gas to insure reliability for "dry circuit" applications.

Hermetically sealed.

Test Data

Temp. Range: -65°F to 275°F

High Ambient Temp: Test: Continuous operation at temperatures as high as +275°F. Precise operations unaffected under rapid cycling from -65°F to 275°F.

Shock: Withstands 100 G's

Vibration: 40 G's, 0-2000 cps

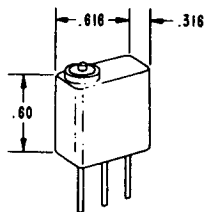
Remarks: The Klixon, Series AT1, is a hermetically sealed, snap-action switch, meeting all requirements of MIL-S-8484A, Class A.

S302

SWITCH, PUSH BUTTON, SUBMINIATURE, SERIES AT1-1, SERIES "KLIXON"**Application:** Unit is especially intended for aircraft, missile, and airborne electronic applications, where a hermetically sealed subminiature switch is required.

S303

SWITCH, PUSH BUTTON, ENVIRONMENTAL SUBMINIATURE, CATALOG NO. 1XE1**Application:** Designed for use with compact devices where space and weight savings are important.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Micro Switch, A Division of Honeywell, Freeport, Ill.

Electrical Characteristics

Rating at 28 Volts, DC: 7 amp resistive; 4 amp, motor load; 2.5 amp, lamp load; 24 amp, max inrush.
Rating at 115/230 VAC, 60 Cycles: 7 amp; 15 amp inrush
Elec Life: 25,000 operations, min

Mechanical Characteristics

Contact Arrangement: SPDT
Oper Force: 5-17 oz
Release Force: 4 oz, min
Pretravel: .05 in., max
Release Travel: .005 in., max
Overtravel: .004 in., min
Oper Position: .425 in. \pm .020 in.

Physical Characteristics

Weight: Switch only, .20 oz; conductor group only, .41 oz per foot
Insulation: The switching unit and lead wires are embedded in epoxy resin.
Case: Aluminum
Seal: An elastomer seal around actuating plunger.

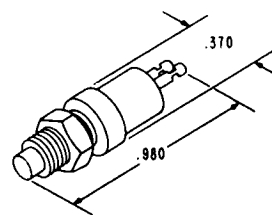
Environmental Conditions

Temp Range: -65° to $+230^{\circ}$ F
Corrosion: Resistant aluminum housing

S304

SWITCH, PUSHBUTTON, SUBMINIATURE, MOMENTARY CONTACT, TYPES 30-1 AND 30-2

Application: Designed for use in digital and analog computers.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Grayhill Inc., La Grange, Illinois

Electrical Characteristics

Rating: Approx 1/10 amp, 115 volts, ac, resistive
Contact Resistance: Approx .003 ohms
Insulation Resistance: Measured at 100 volts, dc:
Terminal to terminal, 900,000 megohms; Terminals to cover,
750,000 megohms
Life Expectancy: 1,000,000 oper at rated load

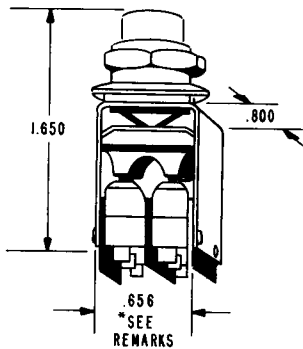
Physical Characteristics

Contact Arrangement: SPST, normally open (red button Type 30-1) or normally closed (black button Type 30-2)
Button Contact: Button travel approx .065"
Actuating Force Required: Approx 10 oz to bottom button
Terminals: Solder type, only
Mounting Hole: 17/64", dia
Bushing Threading: 1/4-32 NEF 2-Thread
Mounting Nut and Cover Bushing: Brass, cadmium plated .0003" to .0005" thick finish
Button and Base Material: Molded of diallyl materials
Shorting Bar: Fine silver alloy
Contact Terminals: Fine silver alloy
Spring: Tinned music wire
Decorative Mounting Nut: Type #30C1023 made of nickel plated brass may be used in lieu of mounting nut
Molded Button Caps: Available in red, black, green, light green, blue, light blue, yellow, pink, white, or gray. (are supplied separately, fastened to switch with adhesive)

Test Data

Dielectric Withstanding Voltage: Terminal to terminal, 3000 volts, ac; terminals to mounting bushing, 3500 volts, ac
Life Test: No failures after 100,000 oper with a load of 1/2 amp, 110 volts, ac inductive (motor load with a peak of approx 2 amp) contact resistance under .010 ohms; insulation resistance and voltage breakdown unchanged
Life Test Condition II: No failures after approx 2 1/2 million oper at twice rated load; contact resistance under .010 ohms, insulation resistance and voltage breakdown unchanged

S305
SWITCH, PUSH BUTTON, PART NOS. 1405.7-1, -2,
AND -3. (MIL-STD-242E)



Quality Assurance: Per specification MIL-STD-242E.

Mfr: Micro Switch Div. of Honeywell Inc., Freeport, Ill.
 Controls Co. of America, Control Switch Div., Folcroft, Pa.
 Milli-Switch Corp., Gladwyne, Pa.

Electrical Characteristics

Switch Circuitry: 1405.7-1, (2) SPDT; 1405.7-2, (3) SPDT;
 1405.7-3, (4) SPDT.

Rating: Resistive -5 amps at 28 volts dc; -5 amps at
 115/200 volts ac.

Rating: Inductive -2.5 amp at 28 volts dc; -5 amp at
 115/200 volts ac.

Mechanical Characteristics

Mech. Life: 25,000 cycles, min.

Actuating Force: 1405.7-1, 30 oz.; 1405.7-2 and -3, 35 oz.

Physical Characteristics

Case: Type SDG-F of MIL-M-14.

Bushing: 15/32 -32 NS thread.

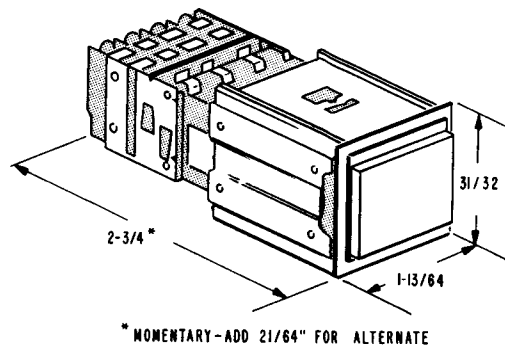
Mounting: One MS25082B8 nut and one stainless steel
 lockwasher.

Terminals: Pierced soldering pins, .058" dia. holes,
 standard. Turret type .188" long by .110" dia, optional.

Buttons: Black, plastic.

Remarks: For Pt. No. 1405.7-2 add .250"; Pt. No.
 1405.7-3 add .527".

as well as other devices requiring a manually operated,
 snap action, illuminated fault push button switch.



Quality Assurance: Per specification MIL-S-22885/9 thru
 12. Bureau approval required prior to use.

Mfr: Master Specialties Co., Gardena, Calif.

Electrical Characteristics

Lamp Type: Accommodates four T1-3/4 midget flanged base
 lamps.

Electrical Ratings (Sea Level)

Load	28 volts dc	115 volts ac
Resistive	4 amp	5 amp
Inductive	2.5 amp	5 amp
Lamp	2 amp	1.5 amp

Physical Characteristics

Mounting: Flush mounted in a .870" x 1.110" hole.

Protrudes 1/8" above panel surface.

Mounting Panel: .031" to .250" thickness

Materials: As follows

Housing Case: Stainless steel per MIL-S-5059A.

Lens Retainer: Stainless steel per MIL-S-5059A.

Retainer Shaft: Stainless steel per MIL-S-5059A.

Return Spring: Stainless steel per QQ-W-423.

Spring Clips: Stainless steel per MIL-S-25043.

Coil Springs: Beryllium copper per QQ-C-53D.

Terminals: Brass per QQ-B-613A.

Lamp Sockets: Brass per QQ-B-626A.

Contact Plate: Brass per QQ-B-613A.

Contact: Brass per QQ-B-626A.

Terminal Board: Nylon per MIL-M-19887.

Front Lens: Acrylic per L-M-500 type V.

S306

SWITCH, PUSH BUTTON, SNAP ACTION,
ILLUMINATED, SERIES 10

Application: Designed for use in airborne, seaborne, missile
 electronic, communications and ground support equipment

Color: Various replaceable colored boots and front lens assemblies.

Lens: Front legend arrangement consists of two pieces, a transparent clear piece and a translucent plate.

Switches: Rear spring clip of the housing assembly will accommodate standard switches as noted in MIL-S-22885/11.

Terminals: Will accept two #20 AWG wire leads.

Switch Action: Momentary or alternate action available.

Environmental Conditions

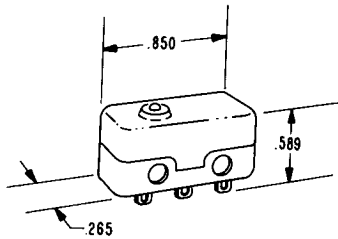
Corrosion: All material protected against corrosion by suitable finishes. All dissimilar metals have been chosen with references as specified in MIL-E-5400.

Test Data

Per MIL-S-22885

Remarks: With slight modification, these units are furnished as an indicator light rather than an illuminated switch light (see DS206).

S401
SWITCH, SENSITIVE, SNAP ACTION,
SUB-MINIATURE SPDT



Quality Assurance: Per specification MIL-S-8805/2A.
 Preferred Part per MIL-STD-242E.

Mfr: QPL Vendors MIL-S-8805.

Electrical Characteristics

Rating:

Load	Sea Level		50,000 Ft. 28VDC
	28VDC	115VAC	
Resist.	4 amp	5 amp	
Induct.	2.5 amp	5 amp	2.5 amp
Lamp	2 amp	1.5 amp	

Electrical Life: 25,000 cycles min.

Mechanical Characteristics

Actuating Force: 5 oz. max.
 Pretravel: .030 inch max.
 Overtravel: .005 inch min.
 Releasing Force: 1 oz. min.
 Movement Differential: .004 inch max.
 Strength of Plunger Pin and Pin Stop: 25 lb.
 Mech Life: 100,000 cycles min. at .006 inch \pm 1 max. overtravel.

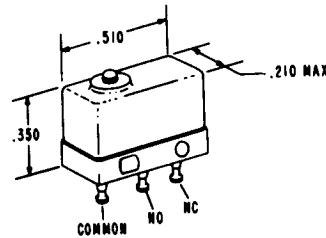
Physical Characteristics

Contact Arrangement: SPDT
 Terminals: Solder or Double Turret.
 Terminal Finish: Plated for soldering.
 Contact Material: Fine silver.
 Enclosure Design: Unsealed.
 Case and Back: Plastic per SDG-F MIL-M-14.
 Mounting Holes: Will accept .087" max. dia. pins or screws on .375" \pm .002" centers.
 Weight: .006 lb. max.

Test Data

Oper Temp: -55°C to +85°C.
 Shock: Type M(50 g).
 Vibration: 10 to 500 cps.

S402
SWITCH, SENSITIVE, SUBMINIATURE SPDT



Quality Assurance: Per specification MIL-S-8805/4B.
 Preferred part per MIL-STD-242E.

Mfr: Unimax Switch Div. of Maxson Electronic Corp., Wallingford, Conn. Micro Switch Div. of Honeywell Inc., Freeport, Ill.

Electrical Characteristics

Rating:

Load	Sea Level		50,000 Ft. 28VDC
	28VDC	115VAC	
Resist.	7 amp	7 amp	
Induct.	4 amp	7 amp	2.5 amp

Mechanical Characteristics

Actuating Force: 5 oz. max.
 Pretravel: .002 inch max.
 Overtravel: .004 inch min.
 Releasing Force: 1 oz. min.
 Movement Differential: .004 inch max.
 Mech Life: 50,000 cycles at .005 \pm .001 in. max. overtravel.

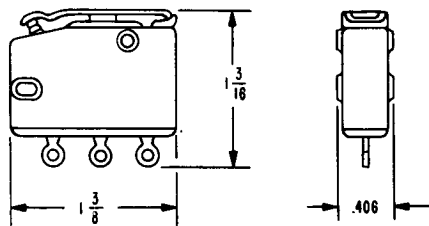
Physical Characteristics

Contact Arrangement: SPDT
 Terminals: Single turret type.
 Enclosure Design: Unsealed
 Cover and Base: Plastic per SDG-F MIL-M-14.
 Mounting Holes: Will accept pins or screws of .087" max. dia. on .188" \pm .002" centers.
 Weight: .003 lb. max.

Test Data

Oper Temp: -55°C +85°C.
 Shock: Type M (50 g).
 Vibration: 10-500 cps.

S403
SWITCH, SENSITIVE, SEALED, SPDT



Quality Assurance: Per specification MIL-S-8805/6.
Bureau approval required prior to use.

Mfr: Metals and Controls Div. of Texas Instruments Inc.,
Attleboro, Mass.

Electrical Characteristics

Rating (Sea Level and 70,000 Ft.):

Load	28VDC	115 VAC (400 cycles)
Resist.	10 amp	10 amp
Induct.	5 amp	5 amp
Lamp	3 amp	3 amp

Altitude Dielectric at 70,000 Ft: 300 volts rms.

Mechanical Characteristics

Actuating Lever Configuration: Standard (shown), Saddle
Lever (for high ambient pressure), and Roller-Saddle Lever.

Actuating Force: Standard or Saddle Lever—16 ± 8 oz;

Roller-Saddle Lever—12 ± 8 oz.

Release Force: 3 oz. min.

Movement Differential: Standard or Saddle Lever—.020 in.
max.; Roller-Saddle Lever—.028 in. max.

Pretravel: Standard or Saddle Lever—.025 in. max.;

Roller-Saddle Lever—.035 in. max.

Overtravel: .015 in. min.

Mech. Life: 25,000 cycles min. (at full overtravel).

Physical Characteristics

Contact Arrangement: SPDT

Terminals: Oval Screw, embedded leads, or solder tabs
(shown).

Enclosure Design: Hermetically sealed.

Weight: 1.2 oz. max.

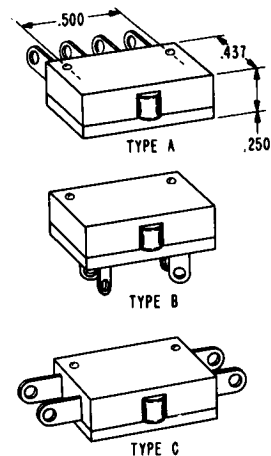
Test Data

Oper Temp: -55°C to +85°C.

Shock: Type M (100 g).

Vibration: 10-2000 cps.

S404
SWITCH, SENSITIVE, SUB-MINIATURE, MOMENTARY,
2 CIRCUIT TYPE



Quality Assurance: Per specification MIL-S-8805/7.
Bureau approval required prior to use.

Mfr: Licon Div., Illinois. Tool Works, Inc., Chicago, Ill.

Electrical Characteristics

Rating at Sea Level:

Load	28VDC NO or NC	28VDC 2 Circuit	115VAC NO or NC	115VAC 2 Circuit
Resist.	10 amp	10 amp	10 amp	10 amp
Induct.	7.5 amp	5 amp	5 amp	5 amp
Lamp	4 amp	3 amp	3 amp	1.5 amp

Rating at 70,000 Ft:

Resist.	10 amp	10 amp
Induct.	3.5 amp	2 amp

Mechanical Characteristics

Actuating Force: 8 oz. max.

Pretravel: .050 inch max.

Overtravel: .012 inch min.

Strength of Actuator: 25 lb.

Contact Gap: .020 inch ± .005.

Mech Life: 1,000,000 cycles at .016 ± .001 in. max.
overtravel.

Physical Characteristics

Terminals: Type A—bottom-solder type; Type B—side-solder type; Type C—end-solder type.

Enclosure Design: Unsealed.

Case Cover and Button Material: Type SDG-F of MIL-M-14.

Weight: 11 oz. max.

Test Data

Oper Temp: -65°C to $+125^{\circ}\text{C}$.

Shock: Type M (50g) $10\mu\text{sec}$ max. contact opening of closed contacts.

Vibration: 10-2000 cps.

Enclosure Design: Hermetically sealed.

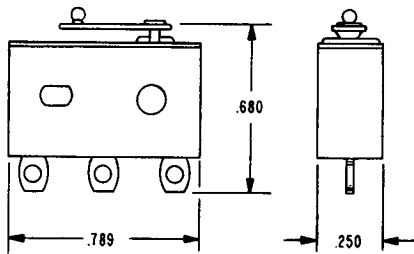
Weight: 0.014 lb.

Test Data

Oper Temp: -65°C to $+125^{\circ}\text{C}$.

Shock: Type M (50 g).

Vibration: 10-2000 cps.

S405**SWITCH, SENSITIVE, SUB-MINIATURE, SEALED, SPDT**

Quality Assurance: Per specification MIL-S-8805/8.
Bureau approval required prior to use.

Mfr: Micro Switch Div. of Honeywell Inc., Freeport, Ill.

Electrical Characteristics

Rating:

Load	Sea Level		70,000 Ft.
	28 VDC	115 VDC	28 VDC
Resist.	5 amp	5 amp	5 amp
Induct.	3 amp	3 amp	3 amp
Motor	4 amp		4 amp

Mechanical Characteristics

Actuating Force: 7 oz. max.

Release Force: 1 oz. min.

Movement Differential: 0.006 in. max.

Pretravel: .030 in. max.

Overtravel: .003 in. min.

Mech. Life: 25,000 cycles at 0.004 in \pm 0.001 max. overtravel.

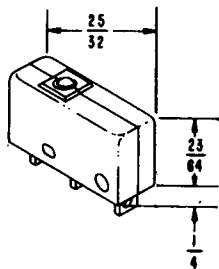
Physical Characteristics

Contact Arrangement: SPDT

Terminals: Solder tabs.

S501
SWITCH, SNAP ACTION, HIGH TEMPERATURE,
SUBMINIATURE, TYPE USM4

Remarks: Terminals are located and shaped to facilitate wiring within the space limitations prevailing in miniaturized apparatus.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Unimax Switch Co., Division of the W. L. Maxson Corp., Wallingford, Conn.

Electrical Characteristics

Rating: 5 amp at 30 vdc (resistive) at sea level; 3 amp at 30 vdc, (inductive) at sea level; 5 amp at 125 vac (resistive) at sea level; 5 amp at 250 vac (resistive) at sea level.

Contact Arrangement: SPDT

Electrical Life: 75,000 operations at 240°C

Mechanical Characteristics

Mech. Life: 100,000 operations

Oper. Force: 7 oz max

Release Force: 2 oz min

Diff Motion: .004" max

Pretravel: .030" max

Overtravel: .005" min

Contact Separation: .010"

Physical Characteristics

Terminals: Solder type

Mounting: Holes provided for ganging

Environmental Conditions

Temp Oper Range: -55°C (-67°F) to 204°C (400°F)

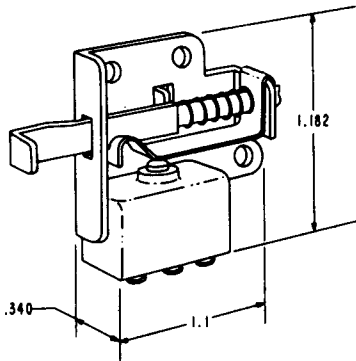
Vibration: 10-55 cps; .060 inches total excursion, 60-1,000 cps at a constant acceleration of 25 g's no contact opening or transfer

Shock: 50 G, no contact opening or transfer

Altitude: Sea level to 50,000 feet

S601
SWITCH, DOOR INTERLOCK, SNAP ACTION, TYPE 17
ACI-T

Application: Safety interlocking of electronic cabinet door panels found on computers, switchboards, radar sets etc. Switch "cuts off" dangerous power if door is opened. Circuit can be checked by manually pulling out plunger. (Refer to safety precautions on specific equipment).



Quality Assurance: Per Military Standard MS16106-4 (Ships) and MIL-STD-242D

Mfr: Micro Switch Div. of Honeywell, Inc., Freeport, Ill. Milli-Switch Corp., Gladwyne, Pa.

Electrical Characteristics

Rating: 250 volts, ac, resistive, sea level, 5 amp; 50,000 ft, 5 amp. 28 volts, dc, resistive, sea level, 5 amp; 50,000 ft, 5 amp. 250 volts, ac, inductive, sea level, 5 amp; 50,000 ft, 5 amp. 28 volts, dc, inductive, sea level, 3 amp; 50,000 ft, 2.5 amp.

Max Inrush: At 28 volts, dc, 24 amp

Electrical Life: 40,000 cy, min at 125 volts, ac

Mechanical Characteristics

Oper Position: 0.220" (from bracket face)

Total Travel (Push): 0.156"

Total Travel (Pull): 0.156"

Oper Force: 2 lb at full travel position

Mechanical Life: 50,000 cy, min

Notch Displacement: Notch in actuator plunger will permit .045 max displacement between end of plunger and hole in bracket

Break Distance: .010", min

Positive Overtravel Stop: Provided on plunger under spring

Operating Sequence: Push to operate, returns automatically when released; Pull to operate (cheat position), remains operable until reset by next full stroke of plunger

Physical Characteristics

Contact Arrangement: SPDT

Weight: .02 lb

Terminals: 3 solder, turrets

Construction Enclosure Material: Switch bracket, plunger and all metal parts are of stainless steel (corrosion resistant)

Mounting: Bracket has 3 threaded holes, 4-48 NF-2B

Environmental Conditions

Oper Temp Range: -65 to 160°F, per MIL-E-5272A

Humidity: 95-100% at 104°F, per MIL-E-5272A

Corrosion Resistance: 100 hr, salt spray per MIL-E-5272A

Test Data

Shock: 50 g's for .007 sec per MIL-S-6743, 6744

Vibration: To 3,300 cy/min at 0.060" displacement

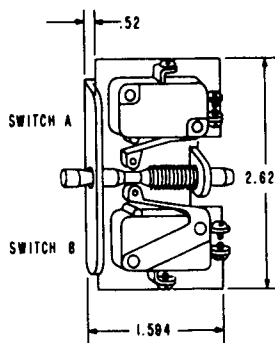
Dielectric Withstanding Voltage: 1000 volts, ac, rms

Remarks: To test circuits with the power "on" the actuating rod can be manually set to a maintained-on position. When the door is closed following test, the actuating rod automatically returns to normal (reset) position so that the next time the door is opened, power is safely cut off.

S602

SWITCH, DOOR INTERLOCK, SENSITIVE SNAP ACTION.
(MS-16106-2 (SHIPS))

Application: Designed for interlock control of two separate circuits on access doors of electronic equipment, wherein power is automatically cut off when the door is opened.



Quality Assurance: Per Military Standard MS16106-2 and MIL-STD-242D

Mfr: Micro Switch Division of Minn. - Honeywell Regulator Co., Freeport, Illinois (Part No. 4AC2) Controls Company of America, Control Switch Division. Chicago 24, Illinois Pt. No. C2-21)

Electrical Characteristics

Volts	Cycles	Amperes Sea Level Resistive Inductive	
28	d.c.	10	10
125	d.c.	.5	.1
250	d.c.	.25	.1
125	a.c.	10	10

Mechanical Characteristics

Max Depressed Position: 0.125"
 Max Pretravel: 0.188"
 Max Free Position: 0.375"
 Break Distance: 0.040" approx
 Total Travel: 0.250" approx, push direction
 0.187" approx pull direction
 Actuator Rod: Notch in actuator rod will permit up to 0.38" displacement between the end of rod and the hole in the bracket on MS16106-2
 Positive Overtravel Stop: Is provided on the rod for operation in either direction
 Push to Operate: Returns automatically to position shown
 Pull to Operate: Remains in operated position until reset for automatic return by next full stroke "push" operation.
 Switch A and B: Operate on pull stroke of actuator rod.
 Switch B: Operates on push stroke of actuator rod

Physical Characteristics

Contact Arrangement: MS16106-2 contains two SPDT sensitive switches in accordance with MS25253-4.
 Switch Housing: Fabricated of a mineral filled phenolic
 All Metal Parts Including Terminals: Are of corrosion-resisting material, plated in accordance with class 2, type II, of Specification QQ-P-416
 Terminals: Screw type
 Weight: 0.125 lbs
 Mounting: (4) 6-32 NC thru holes (2 front and 2 on side)

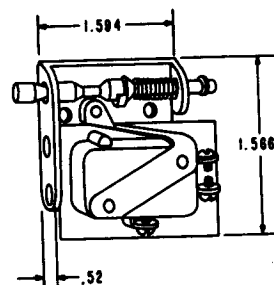
Test Data

Switch conforms to the following tests in the order shown:
 Vibration: Method 201 of Standard MIL-STD-202
 Shock: Method 205 of Standard MIL-STD-202, test condition C
 Corrosion: Method 101 of Standard MIL-STD-202 test condition B
 Actuation: Upon completion of corrosion test the switch will operate 500 times without any mechanical or electrical failure

Sampling: Conforms to MIL-STD-105 with A.Q.L. 2 percent defective

S603 SWITCH, DOOR INTERLOCK, SNAP ACTION, (MS16106-1)

Application: Designed for use as a protective device in electronic equipments, wherein dangerous high voltage circuits are deenergized when service panels are opened.



Quality Assurance: Per Military Standard MS16106-1 (SHIPS) and MIL-STD-242D

Mfr: Micro Switch Division of Minn. - Honeywell Regulator Co., Freeport, Illinois (Pt. No. 2AC6) Controls Company of America, Control Switch Division, Chicago 24, Illinois (Pt. No. C2-10)

Electrical Characteristics

Volts	Cycles	Amperes Sea Level Resistive Inductive	
125	d.c.	.5	.1
28	d.c.	10	10
250	d.c.	.25	.1
125	a.c.	10	10

Mechanical Characteristics

Max Depressed Position: 0.125"
 Max Free Position: 0.375"
 Min Oper Position: 0.203"
 Break Distance: 0.040" approx
 Total Travel: 0.250" approx, push direction
 0.187" approx, pull direction
 Actuator Rod: Notch in actuator rod will permit up to 0.38" displacement between the end of the rod and the hole in the bracket on MS16106-1
 Positive Overtravel Stop: Is provided on the rod for operation in either direction

Push to Operate: Returns automatically to position shown
 Pull to Operate: Remains in operated position until reset
 for automatic return by next full stroke "push" operation

Physical Characteristics

Contact Arrangement: MS16106-1 contains one SPDT sensitive switch in accordance with Standard MS25253
 Switch Housing: Fabricated of a mineral filled phenolic
 All Metal Parts Including Terminals: Are of corrosion-resisting material, plotted in accordance with Class 2, type II, of specification QQ-P-416
 Terminals: Screw type
 Weight: .096 lb
 Mounting: Bracket holes, (4) 6-32 NC holes (2 front, 2 side)

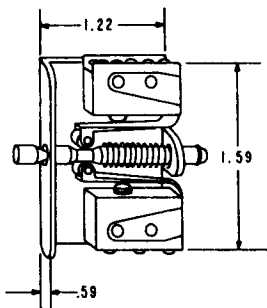
Test Data

Switches conform to the following tests in the order shown:
 Vibration: Method 201 of Standard MIL-STD-202
 Shock: Method 205 of Standard MIL-STD-202, test condition C
 Corrosion: Method 101 of Standard MIL-STD-202 test condition B
 Actuation: Upon completion of corrosion test the switch will operate 500 times without any mechanical or electrical failure.
 Sampling: Conforms to MIL-STD-105 with A.Q.L. 2% defective

S604

SWITCH, DOOR INTERLOCK, SNAP ACTION, TYPE 8AC1

Application: Multi-pole interlock switch mechanisms provides a safety feature whereby four separate SPDT circuits can be controlled at the same time. This door interlock switch can be used where a lamp or other form of warning device is activated when a service door is opened.



Quality Assurance: Per specification MS16106-3
 Preferred part per MIL-STD-242

Mfr: Micro Switch Div. of Honeywell, Inc., Freeport, Ill.
 Milli-Switch Corp., Gladwyne, Pa.

Electrical Characteristics

Resistive	Voltage		Amperes	
	Inductive	Sea level	50,000 feet	
250 volts, ac		5	5	
28 volts, dc		5	5	
	250 volts, ac	5	5	
	28 volts, dc	3	2.5	

Motor Load: 28 volts, dc, (sea level) 4 amp, (50,000 ft) 3.3 amp

Electrical Life: 5,000 cy

Mechanical Characteristics

Oper Position: 0.203" from bracket face
 Total Travel (Push): 0.250"
 (Pull): 0.188"
 Oper Force: 2 lb, approx
 Mechanical Life: 5,000 cy, min
 Positive Overtravel Stop: Is provided on rod under spring
 Operation: Switches do not necessarily operate simultaneously
 Actuator Rod Notch: 0.35 displacement between end of rod and hole in bracket
 Break Distance: 0.010" min
 Oper Sequence: Push to operate, returns automatically when released; Pull to operate, remains in operation until reset by next full stroke of plunger

Physical Characteristics

Contact Arrangement: 4 pole, double throw (available also in 3 pole and 2 pole)
 Weight: 0.120 lb
 Terminals: Solder lug, are plated
 Mounting: (4) 6-32 NC threaded holes (2 front and 2 on side of bracket; push-pull plunger actuator has 0.375" deep threaded hole (to accept plunger extensions)

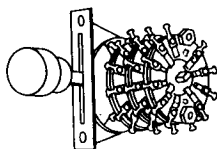
Environmental Conditions

Temp Range: -65° to 160°F
 Humidity: 95 to 100% for .007 sec
 Salt Spray: 100 hr, per MIL-E-5272A

Test Data

Shock: 50 g's for .007 sec
 Vibration: To 3,300 cy/min at 0.060" displacement
 Dielectric Withstanding Voltage: 1000 volts, ac, rms Meets MIL-S-6743, 6744

S701
SWITCH, LEVER TYPE, SERIES L7000



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: J.B.T. Instruments, Inc., New Haven, Conn

Electrical Characteristics

Rating: 1 ampere at 120 volts, dc; 800 ma at 115 volts, ac (non-inductive load).

Current Breaking Capacity: 400 ma in a 50-volt, dc circuit; 300 ma in an 80-volt, dc circuit; 250 ma in a 120-volt dc circuit; 200 ma in a 115-volt, ac circuit (non-inductive load).

Contact Resistance: .006 ohm.

Mechanical Characteristics

Torque: Approx 1-1/2 inch-pounds.

Contact Design: Contacts are of shorting or non-shorting type.

Physical Characteristics

Mounting: Two 4-40 screws, nuts, and lockwashers are grounded.

Wafer Material: Glass melamine laminate; the wafer contacts are silver alloy and are double wiping.

Decks: 1 to 3 decks.

Size: Vertical dimension, 3/4 in.

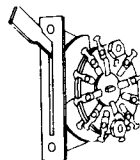
Environmental Conditions

Dielect Strength: 100 volts rms.

Test Data

Insulation Resistance: 100 megohms minimum.

S702
SWITCH, LEVER TYPE, SPRING RETURN,
SERIES SRL7000



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: J.B.T. Instruments, Inc., New Haven, Conn

Electrical Characteristics

Rating: 1 ampere at 120 volts, dc; 800 ma at 115 volts, ac (non-inductive load).

Current Breaking Capacity: 400 ma in a 50-volt, dc circuit; 300 ma in an 80-volt, dc circuit; 250 ma in a 120-volt, dc circuit; 200 ma in a 115-volt, ac circuit (non-inductive).

Contact Resistance: 0.006 ohm.

Mechanical Characteristics

Torque: Approx 1-1/2 inch-pounds.

Contact Design: Wafer contacts are silver alloy with double wiping action, and are of shorting or nonshorting type.

No. of Positions: 3. Center position permits 30° rotation in either direction.

Physical Characteristics

Mounting: Two 4-40 screws, nuts, and lockwashers are provided.

Wafer Material: Glass melamine laminate.

Decks: 1 to 3 decks.

Size: Vertical dimension, 7/8 in.

Environmental Conditions

Dielect Strength: 100 volt rms.

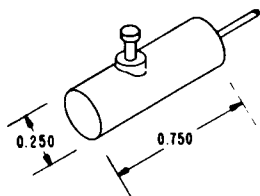
Test Data

Insulation Resistance: 100 megohms minimum.

Remarks: Unit employs two solid wires having a maximum gauge of No. 22 AWG.

S801
SWITCH, INERTIA, SPST, "MILLI-MITE" MODEL
6UO-200

Application: Specifically designed for miniaturized high reliability arming and fuzing devices.



Quality Assurance: Manufacturer's Claims
Bureau approval required prior to use

Mfr: Inertia Switch, Inc., New York, N. Y.

Electrical Characteristics

Rating: 2 amps at 28 volts, dc (resistive load)

Switch Circuitry: SPST, normally open or closed.

Reset Type: Switch automatically resets itself when acceleration is removed

Terminals: One insulated, one case ground

Mechanical Characteristics

Range: 100 to 200 g. Model 6UO-200A up to 2000g.

Accuracy: $\pm 10\%$. Closer tolerance optional.

Response Time: 0.015 seconds

Damping: Undamped

Physical Characteristics

Weight: Approx 0.010 oz

Terminals: Wire leads

Magnet Material: Alnico V

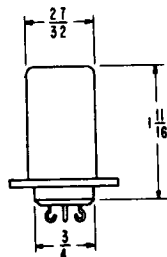
Environmental Condition

Temp. Range: -65°F to $+200^{\circ}\text{F}$

Conforms with MIL-E-5272 where applicable

Remarks: Low cross-axis sensitivity

S901
SWITCH, SYNCHRO PULSE-VOLTAGE, CURRENT-
OPERATED SYNCHRO VERTOR, PART NO.
95908 AND C10L6



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: The Bristol Company, Waterbury, Conn.

Electrical Characteristics

Rating (Coil): 55 ma.
 Oper Voltage: Voltage applied to coil is 6.3 volts, ac.
 Switching Rate: 15 ± 50 is average time.
 Coil Resistance (DC): 85 ohms.

Physical Characteristics

Weight: 1.7 oz.
 Mounting: Unit can be mounted in any position.

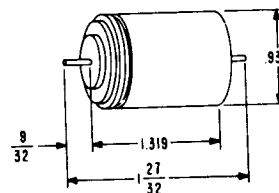
Test Data

Temp Range: -55°C to 100°C .
 Shock: 30 G's.
 Phase Lag: $55^{\circ} \pm 10^{\circ}$.

Remarks: Data given in chart is nominal for operation at 400 cps.

S902
SWITCH, PRECISION SELECTOR

Application: For sampling up to 12 circuits, a pulse generator for precision measurement; for telemetering applications for strain gage purposes, and in other related uses as a chopper or scanner.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Pacific Scientific Co., Los Angeles, Calif.

Electrical Characteristics

Contact Resistance: 0.1 ohm max exclusive of external leads
 0.3 ohm max total including leads
 Minimum Insulation to Ground: 2500 volts, 60 cycles, r.m.s.

Capacitance Between Circuits: 12 pf, standard
 6 pf, with shielded leads
 Dielectric Withstanding Voltage: Minimum Ring to Ring: 1000 volts, 60 cycle, r.m.s

Mechanical Characteristics

Starting Torque: Approx 6 gram/cm for 10 position switch
 Speed: 2000 rpm, with negligible brush bounce
 Life: 30 million revolutions @ 1800 rpm with 50 milli-amps noninductive load (actual test data)

Environmental Conditions

Temperature Range: -55°C to $+100^{\circ}\text{C}$

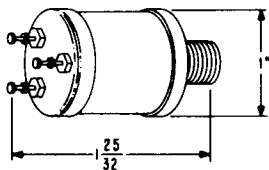
Physical Characteristics

Weight: Approx 20 grams
 Case: Standard No. 10 synchro housing
 Mounting: No. 10 synchro mounting bracket

Remarks: Designed for applications that require an extremely small unit, low friction torque, high degree of accuracy and low electrical noise requirements.

S1001
SWITCH, PRESSURE, MODEL PSG 375-3

Application: Designed for snap action switching sensing of changes of pressures in air, fuel, lubricants etc.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Pamar Electronics Co., Inc., Cresskill, N.J.

Electrical Characteristics

Rating: 7 amperes @ 115/230 volts ac; 7 amperes at 28 volts dc (resistive load); 4 amperes at 28 volts dc (inductive load)
 Switch Circuitry: SPDT

Mechanical Characteristics

Pressure Settings: Factory set
 Proof Pressure: Exceeds 50% of proof pressure
 Burst Pressure: Exceeds 250% of operating pressure
 Operating Ranges Available: to 500 psi @ 300°F
 Repeatable Accuracy: ±0.5% over temperature range
 Differential Pressure: Approx 15% of range

Physical Characteristics

Weight: 1 oz
 Port Connection: 1/8 NPT
 Case: Anodized Aluminum
 Life: 50,000 cycles min

Environmental Conditions

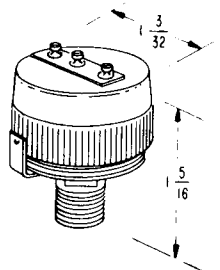
Shock: 100 g's
 Vibration: 2000 cps
 Temperature: -60°F to 300°F
 Meets requirements of MIL-E-5272

Remarks: The following information must be given before ordering.

1. Maximum system pressure
2. Desired actuation point
3. Permissible dead band (pressure differential between actuation point and de-actuation point, expressed in psi)

S1002
SWITCH, PRESSURE, ADJUSTABLE, SUBMINIATURE, SPDT, TYPE C2060

Application: For switching circuits in response to pressure changes in gases and liquids



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: The Bristol Company, Waterbury, Conn.

Electrical Characteristics

Ratings: 5 amps at 125 volts, 60 cycle (inductive or resistive load), 4 amps at 30 volts, dc (resistive load), 2.5 amps at 30 volts dc, (inductive load)
 Dielectric Withstanding Voltage: 500 volts, rms
 Contact Arrangement: SPDT

Mechanical Characteristics

Switches with the following characteristics are available:

Calibration Range	2-15 psia	2-15 psig	5-30 psig	8-50 psig	10-100 psig	20-200 psig
Proof Pressure	18 psia	18 psig	35 psig	55 psig	110 psig	215 psig
Burst Pressure	35 psia	35 psia	70 psig	120 psig	240 psig	450 psig
Operating Diff. (nominal)	1.0 psi	1.0 psi	2.0 psi	3.0 psi	5.0 psi	10.0 psi
Over-all Accuracy	±1/2 psi	±1/2 psi	±1-1/2 psi	±2 psi	±3.5 psi	±7-1/2 psi

Physical Characteristics

Weight: 1.3 oz
 Pressure Connection: 1/8"-27 ANPT, Male
 Pressure Element: Ni-Span-C capsule
 Mounting: Mounts on pressure fitting
 Housing Material: Stainless Steel
 Life at Rated Load: 25,000 cycles, min.

Environmental Conditions

Temp. Range: -65°F to +250°F

Shock: Up to 50 g's (3 axes)

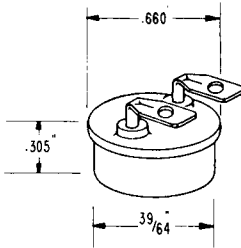
Vibration: 15 g's, 0-500 cps (min)

Conforms with MIL-E-5272 where applicable

Remarks: Desired setting held by means of a ball detent.

**S1101
THERMOSTAT, BIMETAL DISC, SNAP ACTION, TYPE A**

Application: Heater controls and over-temperature protection.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Stevens Manufacturing Co., Inc., Mansfield, Ohio

Electrical Characteristics

Dielectric Withstanding Voltage: 1250 volts rms, 60 cycle, term to grd
Contact Ratings (Resistive):

Operating Voltage	Amperes	No. Operating Cycles
125 ac	4.0	100,000
125 ac	6.5	30,000
125 ac	13.3	6,000
28 dc	4.0	100,000

Mechanical Characteristics

Range of temperature settings, tolerances and mean differentials, as shown below, are available:

(1) With solder seals—

Range	Tolerances		Min. Mean Differentials
	Open	Close	
-20° to 250°F	±5	±5	20°F
-50° to 31°F	±7	±10	30°F
32° to 199°F	±5	±7	20°F
32° to 199°F	±3	±5	20°F
32° to 199°F	±5	±7	15°F
200° to 300°F	±7	±10	30°F
200° to 300°F	±5	±7	30°F

(2) With Heliarc welded seal—

Range	Tolerances		Min. Mean Differentials
	Open	Close	
301° to 350°	±10	±12	40°F.
351° to 450°	±15	±15	50°F.
451° to 500°	±25	±15	70°F.

Physical Characteristics

Weight: Approx 6 grams
Case: Hermetically sealed, solder or heliarc weld
Mounting: Flanged or surface mounting types available
Terminals: Pierced vertical or formed as shown

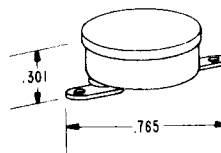
Environmental Conditions

Ambient Temp. Range: Solder seal, -100°F. to 300°F.;
Heliarc weld seal, to 500°F.
Acceleration: 100g's
Shock Resistance: 50 g's
Vibration Resistance: MIL-E-5272C
PROC. XII 5-500 cps, 35 g's
PROC. XIV 10-2000 cps, 35 g's
Also qualified per MIL-E-005272C for salt spray, sealing and explosion

Remarks: Precalibrated at factory; no adjustment possible after assembly

**S1102
THERMOSTAT, BIMETAL DISC, SNAP ACTION, TYPE MX-1**

Application: Designed for use where a compact, snap-acting, and narrow differential for close temperature control is required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Stevens Manufacturing Co., Inc., Mansfield, Ohio

Electrical Characteristics

Dielectric Withstanding Voltage: 900 volts, ac, rms for 1 minute. When one terminal is grounded, (MX-1 is) test is made with contacts open at 50°F above specified opening temp. (model MX-9 from terminal to ground).

Average Electrical Ratings:

Cycles of Operation	Voltage	Amperage (Non-inductive)
25,000	30 volt, ac/dc	3
	115 volt, ac	3
100,000	30 volt, ac/dc	1.5
	115 volt, ac	1.5
250,000	30 volt, ac/dc	1
	115 volt, ac	1

Mechanical Characteristics

Oper Temp Range: 10° to 260°F
 Differential: Standard—2° to 6°F; Special—1° to 4°F

Physical Characteristics

Contacts: Silver, cadmium oxide, standard; palladium, platinum iridium or silver are available
 Case: Hermetically sealed
 Terminals: MX-1, pierced and insulated type, one terminal grounded; MX-9, both terminals insulated.
 Spring: Beryllium-copper alloy
 Case Finish: Tin plated metal
 Terminal Insulation: Glass
 Insulating Ball: Glass
 Disc: Bimetal
 Mounting: Flange or surface bracket mounting types

Environmental Conditions

Ambient Temp Range: -85°F. to 275°F. per MIL-E-005272C.
 High Temp: Requalified per MIL-E-5272C, para. 4.1.2, Proc. II with upgraded temp of 95°F. to 300°F. exposed for 48 hr, no physical or electrical damage, and only slight temp change.
 Low Temp: MX-1 requalified per MIL-E-5272C, para 4.2.1, Proc. I; temp upgraded -65°F. to -100°F. held for 48 hr at reduced temp. No physical or electrical damage and only slight temp change.
 Low Temp (Short Duration): MX-1 held 2 hr at -166°F. with only slight temp change.

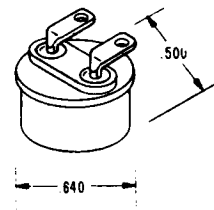
Test Data

Acceleration: Per MIL-E-5272C, Proc III, Para 4.16.3, which is one minute of steady acceleration in three axis at 14g. Test also upgraded to 50g, no mech failures or mal-functions, none of normally closed contacts opened during test
 Vibration: Per MIL-E-005272C, Proc XII, no natural resonance obtained at 10 to 500 cps. No contact bounce noted: 10g
 Explosion Proof: Per MIL-E-5272C, Para 5.4.4.
 Sealing: Per MIL-E-5272C, Proc I, upgraded from 2-1/2 inches Hg. to 1" on type M and 0.5" on types A and MX.
 Shock: Per MIL-E-005272C, Proc V, at 100g, shock duration, 11 milliseconds. Also per MIL-STD-202A, Method 202A.

Remarks: Required bimetal closing temperature must be specified.

**S1103
 THERMOSTAT, BIMETAL DISC, SNAP ACTION, PRECISION
 MODEL M1 AND 11041**

Application: Designed for use as a temperature control or or warning device on electronic equipment.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Metals and Controls, Inc., A Corporate Division of Texas Instruments Inc., Attleboro, Mass.

Electrical Characteristics

Contact (Resistive): .015 ohms max, term to term

30 volts, ac/dc	125 volts, ac		250 volts, ac	Life
	Amperes	Cycles		
5.0	2.0	1.0	100,000	
5.5	3.0	1.5	50,000	
6.0	4.0	2.0	25,000	
6.5	5.0	2.5	10,000	
7.0	6.0	3.0	5,000	

Dielectric Withstanding Voltage: 1250 volts, ac, 60 cy for 1 min, terminal to case

Switch Action: SPST

Contact Resistance: — .012 ohms, max term. to term.

Dry Circuit: Gold plated contacts are furnished for the electrical loads, listed in Table II, to insure reliable circuit making under low wattage conditions: Gold plated contacts are not suitable for heavier loads.

Table II

Voltage	Current
30 volts, ac/dc	500 ma, and below
115 volts, ac	200 ma, and below
230 volts, ac	100 ma, and below

Mechanical Characteristics

Range of temperature settings, tolerances and nominal differentials, as shown below, are available.

Oper Temp Range °F.	Nominal Differential Range °F.	Opening Temp Tolerance °F.	Closing Temp Tolerance °F.
-65 to 10	30 to 40	±10	±8
11 to 200	20 to 125	±5	±5
201 to 300	30 to 125	±8	±6
301 to 350	40 to 125	±12	±10
351 to 450	50 to 150	±15	±15
451 to 500	70 to 200	±25	±25

Narrow Differential Special

10°F to 225°F	9°F to 14°F	±5°F	±4°F
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* Tolerances are based on precision factory calibration and test equipment. When checking tolerances allow for differences in test equipment.

Construction: Snap-acting disc is actuating element made of selected high grade bi-metal.

Contact Design: Snap acting contacts may be closed or opened by temp use, depending on intended function.

Physical Characteristics

Weight: Thermostat, basic unit, 4.8 gram; basic unit with bracket, 5.9 grams; basic unit with overmold and 12" leads, 23 grams

Case: Welded hermetic seal

Case Material: Thin-walled, copper-nickel plated steel cup for fast temp response

Mounting: Flanged or surface mounting brackets, mounting strap, and mounting stud

Terminals: Straight pin, right angle, flattened and pierced terminals, wire leads and overmold

Leads: The 11041 thermostat can be supplied with wire leads welded to straight pin-type terminals, size No. 18, AWG wire (without overmold); leads insulated with silicone rubber overmold, No. 18 wire, length by order

Environmental Conditions

Ambient Temp Exposure Range: -80°F. to +500°F. with or without overmold, -320°F. to +220°F.

Temp Range: -80°F. to +500°F. (factory set).

Test Data

Acceleration: 60 g's

Shock Resistance: 60 g's

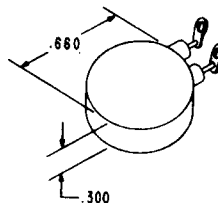
Vibration Resistance: Per MIL-E-5272C, Proc XII, 5-500 cps, 25 g's; Proc XIV, 5-2000 cps, 20 g's

Leakage: Less than 1 x 10⁻⁸ cc helium/sec, per MIL-STD-202, Method 112, Condition C IV

Remarks: Manufacturer claims this thermostat is manufactured to conform with MIL-E-5272C and MIL-T-5574A.

S1104**THERMOSTAT, BIMETAL DISC, SNAP ACTION, HERMETICALLY SEALED, NARROW DIFFERENTIAL, MODEL M-2**

Application: Designed for use as a temperature control for electronic equipment where a precision, environmental free and narrow differential snap action thermostat is required.



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Metals and Controls, Inc., A Corporate Division of Texas Instruments Incorporated, Attleboro, Mass.

Electrical Characteristics

Electrical Life: 250,000 cy at 2 amp on 30 volts dc/120 volt, ac, or 50,000 cy at 3amp on 30 volts dc.

Dielectric Withstanding Voltage: 1250 volts, ac, rms, 60 cy, for 30 seconds between any terminal and ground

Mechanical Characteristics

Contact Design: Snap acting contacts may be closed or opened by temp rise, depending on intended function
Switch Arrangement and Action: SPST, closes on temp rise or temp drop

Temperature Setting Range	Differentials Available	Closing Temperature Tolerance *	
		Standard	Special
0° to 250°F	2°—5°F	±4°F	±3°F
251° to 350°F	3°—7°F.	±5°F	±4°F

*These tolerances are based on precision factory calibration and test equipment. Customers checking tolerances should allow for differences in test equipment. A "funnel" of $\pm 1^\circ\text{F}$ is recommended.

Physical Characteristics

Weight (Of basic thermostat): 5.6 grams

Case: The unit has a thin-walled, copper-nickel plated steel can for fast temp response and a welded hermetic seal

Contacts: Fine silver or gold plated

Mounting: The M2 can be mounted in any position, a surface mounting bracket is available

Terminals: .063" dia holes are provided in terminals; three styles of terminals available: straight, 45 degree, and right angle, have glass to metal seals

Environmental Conditions

Temp Cycling: Unit has a min, nominal differential of 2—5°F between openings and closing temps
Ambient Temp Exposure Range: Continuous —65°F to +450°F

Oper Temp Range: (See table above)

Oper Temp Tolerance: $\pm 4^\circ\text{F}$

Test Data

Vibration: 5 to 500 cps at 10 g's acceleration or .36 D.A. (operating)

Leakage: Less than 1×10^{-8} cc helium/sec per MIL-STD-202, Method 112, Cond. C IV

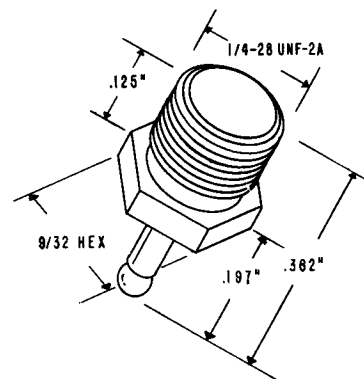
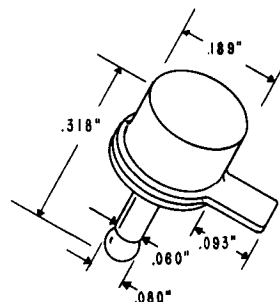
Remarks: The M-2 has welded seams.

S1105

THERMOSTAT, BIMETAL KLIXON SNAP ACTION PRECISION TYPES 3BT2 and 3BT3

Application: Designed for use as a control or warning device on printed circuit boards.

3BT2



3BT3

Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: Metals and Controls Inc., A Corporate Division of Texas Instruments Inc., Attleboro, Mass.

Electrical Characteristics

Oper Voltage: 115 volts, ac; 30 volts, dc

Max Current Rating: 1 amp resistive

Dry Circuit: Contacts can be obtained, gold plated upon request

Mechanical Characteristics

Operation: SPST, open or close on temp rise

Oper Temp Range: 0°F to 350°F

Differential: 30°F, nom

Oper Temp Tol: $\pm 8^\circ\text{F}$

Physical Characteristics

Case Material: Thin gauge drawn steel
Case Finish: Gold plated for improved solderability, electrical conductivity and for increased heat transfer to maximize thermal response. (Inside and out)
Construction: Grounded case
Weight: 0.4 gm, arg. (3BT2)
Elements: Copper-constantan or iron-constantan thermocouples
Mounting: The "Tiny-Stat" is available in two forms: with pin type terminals for speedy assembly on printed circuit boards or as a threaded plug for surface temp sensing
Seal: Resistance welded seam and glass to metal terminal insulator provides hermetic sealing
Terminals: Pin type, and threaded plug types

Environmental Conditions

Moisture Resistance: Per MIL-STD-202 Method 101, 5% solution, 96 hr
Salt Spray: Per MIL-STD-202, Method 101 20% solution 168 hrs
Endurance: 10,000 cy, max (depending on load)

Test Data

Dielectric Withstanding Voltage: 500 volts, ac for 60 secs terminal to case, contacts open per MIL-STD-202, Method 301
Vibration (operating): Per MIL-STD-202, Method 204, 30g, 5-2000 cps
Shock: Per MIL-STD-202, Method 202, 100g
Acceleration: 200g
Calibration: Pre-set at factory

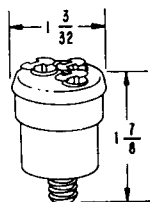
Remarks: The Klixon (R) 3BT "Tiny-Stat" thermostat combines snap-action switching and rapid thermal response in package that is smaller and lighter than the transistors it was designed to protect.

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S1201
SWITCH, GAS DENSITY TYPE SN-98

Remarks: Special ranges available on order. The gases and liquids in the system in which the switch is to be used should also be given.

Application: Pressure monitoring or leak detection in Liquid-Vapor-Gas Systems.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Newark Controls Co., Bloomfield, N.J.

Electrical Characteristics

Rating: 28 volts dc, 110 volts ac, 5 amperes resistive load

Switch Circuitry: SPST, SPDT

Insulation Resistance: 10,000 megohms min at 500 volts dc

Mechanical Characteristics

Gas Density Settings: Factory set

Proof Pressure: 45 psi above system pressure

Operating Ranges Available: To 60 psia total pressure @ 200°F

Accuracy: ± 1.0 psi over temperature range

Differential Pressure: 2 ± 1 psi

Physical Characteristics

Weight: 2 oz

Air or Gas Connection: 1/8 NPT or 3/8-24 NF-2

Electrical Terminals: Glass to Metal Hermetic Solder type seals

Case: Cadmium plated brass

Environmental Operating Conditions

Shock: ± 20 g, 11 milli-secs, 3 axis

Vibration: 5 -15 cps, 0.5" double amplitude; 15-55 cps, 0.060" double amplitude; 55-1000cps, 10 g

Temperature: -65°C to $+93^{\circ}\text{C}$. Switch must be at same temperature as gas being sensed

Meet requirements of MIL-E-5272

Environmental Non-Operating Conditions

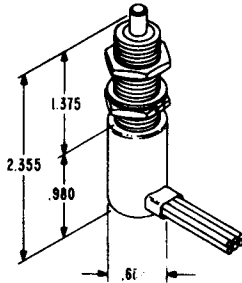
Shock: ± 100 g, 11 milli-secs, 3 axis

Vibration: Same as operating conditions

Temperature: Same as operating conditions

**S1381
SWITCH, SEALED LIMIT, TYPE 402EN1-6**

Application: Designed for use in aircraft; missile, marine and mobile applications wherein a switch that is completely sealed against the effects of adverse environmental conditions and small size is required.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Micro-Switch, A Division of Honeywell Regulator Co., Freeport, Illinois

Electrical Characteristics

at 28vdc:	Sea level to 100,000 ft. (sealed)	100,000 ft (unsealed)*
Inrush	24 amp	24 amp
Resistive	7 amp	7 amp
Inductive	4 amp	1.5 amp
Motor	4 amp	4 amp
Lamp	2.5 amp	2.5 amp

* This rating established unsealed to provide the data required for military purposes.

Mechanical Characteristics

Operating Force: 6-12 lbs
Full Overtravel Force: 30 lbs max
Release Force: 4 lbs, min
Pretravel: .040 in. max
Differential travel: .020 in. max
Overtravel: .250 in. min

Note: Bushing mounting provides for adjustment of the operating point of the switch.

Physical Characteristics

Weight: 2.5 oz (without lead wires)
Contact Arrangement: Two single-pole, double-throw circuits
Lead Wire: Six 6-ft lengths, No. 20 per MIL-W-8777
Housing: 11/16" dia, completely sealed
Plunger: Corrosion resistant steel
Terminals: Glass-to-metal seals

Environmental Conditions

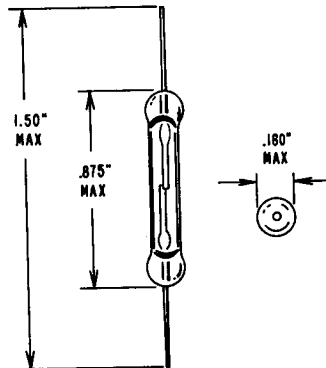
Immersion: Test requirements of MIL-E-5272A, Proc I
Temp Range: -65° to +250°F
Moisture, Dust, Air: See Remarks
Corrosion: Resistant steel

Remarks: The 402EN1-6 Sealed Limit Switch is housed in an air-tight enclosure, when evacuated, it is filled with an inert gas under pressure, providing constant operating characteristics for the switch elements. An "O" ring seal around the actuator shaft, the potted lead wire termination and the glass-to-metal seals, exclude the entry of dust, moisture or air into the switches chamber. To prevent jamming or binding an ice scraper ring on the actuator shaft, when moved, removes ice or mud from the device.

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S1401
SWITCH, MAGNETIC REED, SEALED

Application: Designed for use in the circuits of computers, logic elements, interlocks, scanners, flip-flops, choppers, printed circuit devices, etc.



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: C. P. Clare and Co., Chicago, Ill.; General Electric Co., Cleveland, Ohio

Electrical Characteristics

Operate: 20 to 50 amp turns
Release: 30 to 60% of operate value
Contact Rating: .125 amp, (nominal) may be used up to .5 amp, with adequate protection
Closed Contact Resistance: Initially less than 0.2 ohms, including lead resistance
Contact Capacitance: Less than 0.3 pf
Closure Time of Contacts: Less than .001 sec; 200 to 600 μ secs including bounce, after an application of sufficient magnetic force to cause actuation
Bounce: Varies according to type of operation and operate value from 200 μ secs to 600 μ secs
Natural Frequency of Contacts: 2,000 cps
Open Contact Resistance: 8×10^{12} ohms, min to 85°C

Mechanical Characteristics

Switching Rate: Up to 1000 cps
Life: Up to 1 billion operations, depending on load conditions.

Physical Characteristics

Construction: Two reeds of magnetic material supported as overlapping cantilevers sealed inside of a glass envelope having an inert atmosphere
Contacts: Gold plated, (at ends of magnetic reeds)

Environmental Conditions

Oper Temp: -54° to 85°C (less than 10% variation of pull-in value is exhibited through temp ranges)

Test Data

Operation Test: The contact sets upon being demagnetized are tested in a std coil .350" long with a .213" min inside dia, consisting of 6,000 turns of No. 42 copper wire. A capacitor of 15 μ f min is bridged directly across the coil. Then the coil and capacitor is connected in series with a resistor of 4,000 ohms min. The contact set, centered lengthwise in the test coil with plus or minus 1/16" will function as follows:

- The sealed contact set will operate with .0077 amp.
- The sealed contact set will not operate with .0037 amp.
- The sealed contact set will not release with .0043 amp.
- The sealed contact set will release with .0017 amp.

Resistance Between Terminals of New Contacts: Will not exceed .200 ohm when measured with a current of .100 \pm .025 amp through the contact.

Open Circuit Voltage of Test Circuit: Will be 1.5 ± 0.5 volts.

Life Expectancy: Three million operations to the 1% failure point at max load, 0.125 amp, in a 26 volt resistive circuit.

Vibration: Vibration levels to 35g do not cause closure of open contacts

Shock or Vibration: To 50g levels in any plane will not produce closed contact circuit noise or contact interruption.

Dielectric Withstanding Voltage (Between Normally Open Contacts): 300 volts, rms, 60 cy

Remarks: The glass envelope protects the contacts from external environmental effects such as dirt, corrosive fumes and variations in pressure due to changes in altitude. Manufacturer states that at this present time they are not supplying coils or making these switches in relay form.

S1402

SWITCH, MAGNETIC MINIREED DRY-REED GAS FILLED, GLASS CAPSULE TYPE RE2100

Application: Designed as a magnetically actuated switch for use in the circuits of computers and other electronic equipment where a high speed of switching operation single-pole, single-throw switch with normally open contacts is required.

Sealing: Hermetically in a glass capsule

Leads: The RE2100 is provided with leads which may be formed for easy installation in relays and other switching devices.

Environmental Conditions

Temp Range: —55 to +150°C

Mechanical Contact Noise: Under conditions where mechanical contact noise is an important factor the switch should be sealed into its energizing coil by means of a suitable dampening material such as a silicone or rubber cement.

Temp Effects: The designated values of mmf for actuating or releasing a RE2100 dry-reed switch will not vary more than 10% from its room temp value over the temp range of —55°C to +150°C.

Test Data:

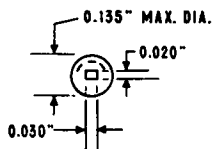
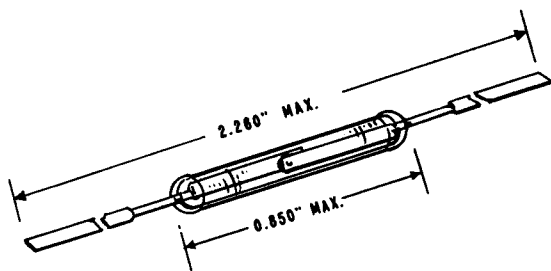
Test Coil (a): The subject switch is energized by a test coil made of 1000 turns of No. 34 wire

(b): The subject switch energized by the test coil subjected to an 85-95 cps square wave with a current rise time of 100 μ sec to produce a force of 75 amp-turns

(c): The subject switch is energized in a test coil with a force of 75 amp-turns. A 26 volt power supply is adjusted with an external series resistor for a current of 100 ma through the switch.

Contact resistance is measured between points on the lead, 0.25" from the glass seals.

(d): Test is conducted with an applied voltage of 100 volts.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: RCA, Electron Tube Division, Harrison, N.J.

Electrical Characteristics

Contacts: DC Voltage 26 volts, max, current 125 ma, max

Peak Breakdown Voltage: 300 volts, max

Actuating (Pull-in) Force (a): 20 amp-turns, min; 42 amp-turns, max

Actuating (Pull-in) Time (b): 1 msec, max including bounce

Release (Drop-out) Force (a): 8 amp-turns, min; 20 amp-turns, max

Release (Drop-out) Time (b): 0.1 msec, max

Max DC Resistance (Including leads, reeds and contacts (c): 0.2 ohm

Insulation Resistance (d): 500 megohms, min

Capacitances (Approx):

Contact to contact, without test coil: 0.2 pf

Contact to contact, test coil grounded: 0.1 pf

Either contact to test coil: 0.6 pf

Min Life Expectancy at Max DC Contact Voltage and Current: 3,000,000 cy (Useful life can be extended if operating the device below max contact ratings).

Reeds: The two metal reeds free ends become oppositely polarized when placed in the axis of a magnetic field and therefore, will be attracted toward each other.

Physical Characteristics

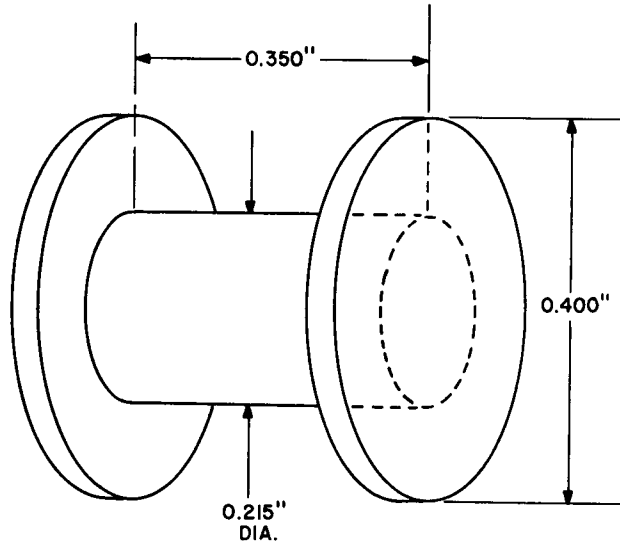
Contact Arrangement: SPST, normally open (Form A)

Max Dimensions: (See illustration)

Contact Material: Diffused gold

Mounting Position: Any

Construction Reeds: Very low reluctance material

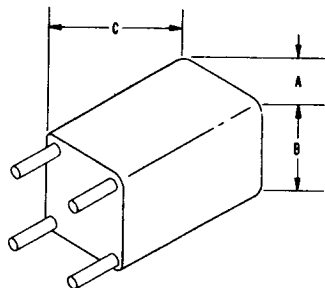


Relative Coupling Efficiency: 100%
Coil Outside Dia: 0.40"
Shock: 50g for 11 msec
Vibration (Switch Open): With no field applied will not close when subjected to vibration at an acceleration of 35g over a frequency range of 50-2000 cps.
Vibration (Switch Closed): 50g min over freq range of 50-2000 cps.

Remarks: In certain applications magnetic shielding may be required to minimize the effects of stray magnetic fields from power transformers, filter chokes, meter magnets or other electrical equipment.

**T101
TRANSFORMER, INVERTER, SERIES H**

Application: For use in high current transistor switching applications.



Primary Voltage: 12 to 14 volts, dc, or 24 to 28 volts, dc.
(See Remarks for 6-volt operation.)

Physical Characteristics

Size: Dependent upon output required of transformer.
Sealing: Hermetically sealed, layer insulated.

CHART B

MIL CASE	A	B	C
AH	1 5/16	1 5/16	1 3/4
AJ	1 5/8	1 5/8	2 3/8
FA	2 5/16	2 17/16	3 1/8

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

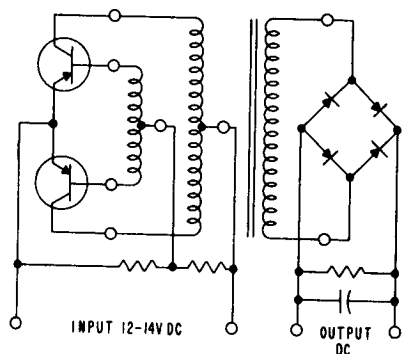
Mfr: United Transformer Corp., New York, N. Y.

Remarks: This inverter transformer is designed for use in conjunction with high switching current transistors. Circuit details are supplied with this transformer. Reduction from a 12-volt input to a 6-volt input halves the output voltage, but the current rating remains unchanged.

Electrical Characteristics

FOR 12/14 OR 24/28 VOLT BATTERY		
TYPE NO.	DC OUTPUT, WHEN USED IN CIRCUIT SHOWN	MIL CASE
H-97	250V-60MA	AH
H-98	375V-100MA	AJ
H-99	425V-175MA	FA
H-100	550V-200MA	GB

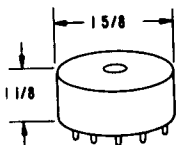
CHART A



234

T201 TRANSFORMER, POWER, TOROIDAL, SERIES 533

Application: Intended for stacking purposes or for printed circuit boards. Can be used for filament, synchro drive, isolation, and plate voltage use.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Arnold Magnetics Corp., Los Angeles 16,
California

Electrical Characteristics

Load: Up to 20 watts
Primary Voltage: 115 volts, ac, 400 cps, single phase
Secondary Voltage: Any voltage from 1 to 1000 volts, ac, 400 cps
Secondary Current: Typical outputs are 6.3 volts at 3.5 amp, 26 volts at 0.90 amp, 115 volts at 0.25 amp, 500 volts c.t. at 0.058 amp, and 1000 volts c.t. at 0.03 amp.

Physical Characteristics

Weight: 3.9 oz, or 107 grams
Case: Long glass-fiber-filled resin, per MIL-M-19833, Type GDI-30
Mounting: Standard mounting for printed circuits; insert, 6-32 thread
Sealing: Encapsulated in epoxy resin
Leads: 0.040" tinned copper pins
No. of Coil Windings: Units with up to 3 windings can be supplied.

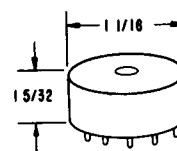
Environmental Conditions

Operating Temp: -55°C to 100°C

Remarks: These units can be stacked on a single screw for chassis mountings.

T202 TRANSFORMER, POWER, TOROIDAL, SERIES 533

Application: Intended for stacking purposes or for printed circuit boards. Standard units are available for filament, synchro drive, isolation, or plate voltage applications.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Arnold Magnetics Corp., Los Angeles 16,
California

Electrical Characteristics

Load: Up to 1.0 watts
Primary Voltage: 115 volts, ac, 400 cps, single phase
Secondary Voltage: Any voltage from 1 to 100 volts, ac, 400 cps
Secondary Current: Typical outputs are 6.3 volts at 180 ma, 26 volts at 62 ma, and 100 volts at 12 ma.

Physical Characteristics

Weight: 0.5 oz, or 17.5 grams
Case: Long glass-fiber-filled resin, per MIL-M-19833, Type GDI-30
Mounting: Standard mounting for printed circuits; insert, 6-32 thread
Sealing: Encapsulated in epoxy resin
Leads: 0.040" tinned copper pins
No. of Coil Windings: Units with up to 3 windings can be supplied.
No. of Pins: 4 (standard)

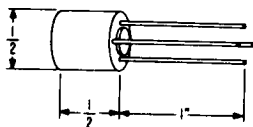
Environmental Conditions

Operating Temp: -55°C to 100°C

Remarks: These units are designed for low-power applications. They can be stacked on a single screw for chassis mounting.

T203 TRANSFORMER, POWER, TYPE TT

Application: Transistor transformers for interstage, output, input, single or push-pull output, reactors, line to base, collector to base or line, collector to speaker and reversible-input to secondary uses.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Arco Electronics, Inc., New York 13, N.Y.

Electrical Characteristics

Representative Values of Nine Transformers of 47
Available types

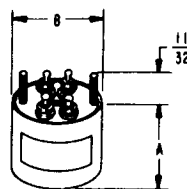
Mil Type	Applica- tion	Pri. Imp.	D.C		MW	
			Ma in Pri	Sec. Imp.	Nom. Pri.	Level at 1 Res. KC
TF5RX13ZZ	Interstage	20,000 30,000	.5 .5	800	850	50
TF5RX17ZZ	Output	500 600	3 3	50 60	60	100
TF5RX16ZZ	Input	200,000	0	1000	8500	25
TF5RX20ZZ	Reactor 3.5 hy, at 2 ma, dc, 1 hy at 5 ma, dc					
TF5RX13ZZ	Output or driver	10,000	1	500CT	800	100
TF5RX13ZZ	Driver	10,000 12,000	1 1	2000CT 2500CT	800	100
TF5RX17ZZ	Single or PP Output	150CT 200CT	10 10	12 16	11	500
TF5RX17ZZ	Output to line	300CT	7	600	19	500
TF5RX17ZZ	Output or line to line	500CT	5.5	600	31	500

Remarks: May be mounted directly on printed circuits

T204

TRANSFORMER, POWER 400 CYCLE, SERIES TW

Application: Designed for use in aircraft electronic equipments where weight and size are critical factors.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Torwico Electronics, Inc. Lakewood, New Jersey

Electrical Characteristics

Primary Voltage: 115 volts, rms, $\pm 10\%$

Primary Frequency: 400 cps $\pm 5\%$

Primary No Load Current: At 115 volts, 400 cps for
1.5 V.A., -1.5 ma (max); 3.0 V.A., -3.0 ma (max); 6.0 V.A.,
-6.0 ma (max); 9.0 V.A., -9.0 ma (max).

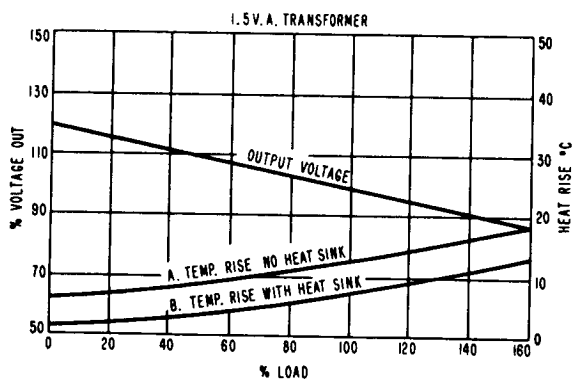
Efficiency (100% load): 76%, for 1.5 V.A.; 84%, 3.0 V.A.;
88%, 6.0 V.A.; 89%, 9.0 V.A.

Phase Shift: 1°, max

Regulation: 1.5 V.A., 100% load, 20%; 3.0 V.A., 15%;

6.0 V.A., 10%; 9.0 V.A., 8%

Secondary Voltage: See graphs



836

Exciting Current: No-load, not exceed 1.0 ma, per V.A. of rating. Measured at 115 volts, rms, 400 cps
 Insulation Resistance: Between windings, between all windings and case, 10,000 megohms, min at 25°C

Physical Characteristics

Construction: Hermetically sealed in drawn steel cases
 Terminals: Teflon-silicone rubber
 Lead Pull: 5 lb
 Weight: 1.5, V.A, 3/4 oz; 3.0, V.A., 1 oz; 6.0, V.A., 1 -1/2 oz; 9.0, V.A., 2 oz
 Volume (excluding mtg Studs and Terminals): 0.37 cu. in.
 -1.5 V.A., 0.46 cu. in., 3.0 V.A.; 0.64 cu. in, 6.0 V.A.; 0.83 cu. in., 9.0 V.A.
 Case Size:

Transformer	Height A	Width B
1.5 V.A.	15/32"	1"
3.0 V.A.	19/32"	1"
6.0 V.A.	13/16"	1"
9.0 V.A.	1-1/16"	1"

Heat Sink: 2 x 2 x 3/16 inches, aluminum plate
 Case Style: D

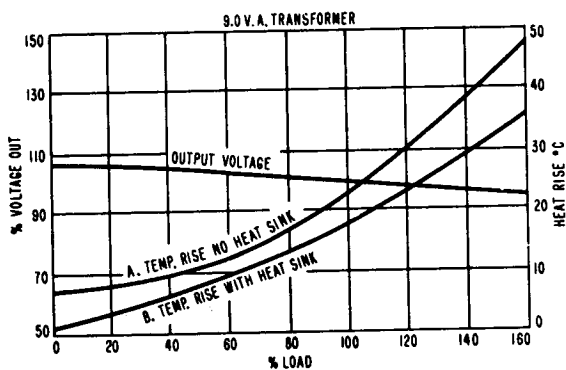
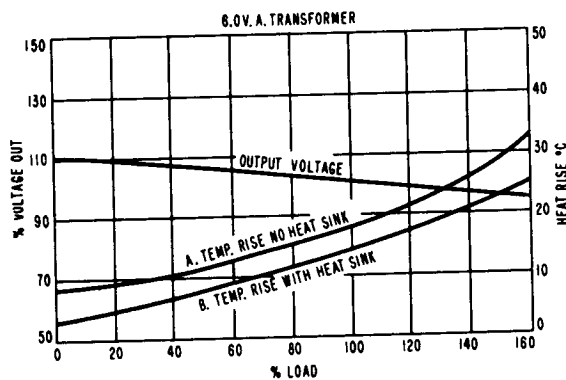
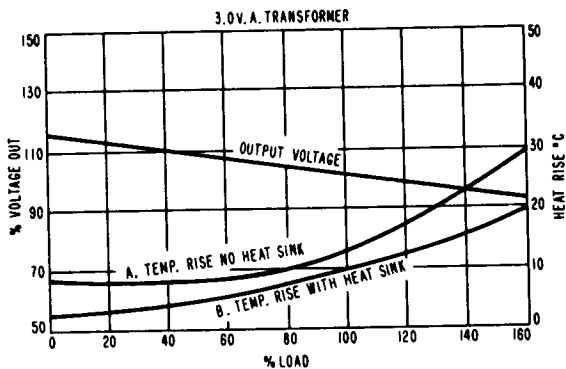
Environmental Conditions

Oper Temp Range: -55°C to +150°C
 Altitude: 70,000 without flashover, from test potential
 300 volts, rms or 1.25 times working voltage, whichever is greater
 Salt Spray: Meets requirements of MIL-STD-202A method 101

Test Data

Shock: 100 g's for 11 millisecs
 Vibration: 10-55 cps at .03" excursion and 55-2000, cps at 20 g's
 Moisture Resistance: Per MIL-STD-202A, method 106
 Immersion: Per MIL-STD-202A, method 104, condition B
 Thermal Shock: between +130°C and -55°C per MIL-T-27A
 Life Expectancy: 10,000 hr, min
 Dielectric Withstanding Voltage: 1000 volts, 60 cps, for 1 minute

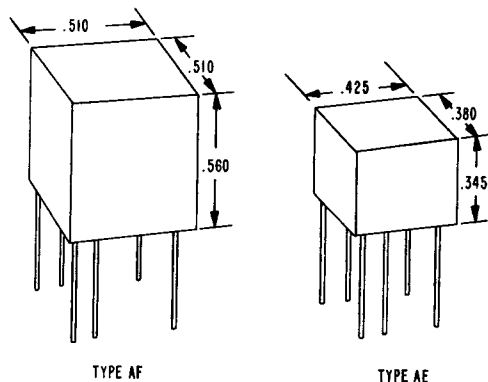
Remarks: Transformers shall meet all requirements of MIL-T-27A, Grade 4, Class S. Life expectancy X.



T301

TRANSFORMER, PULSE, TYPES AE AND AF

Application: Ideally suited for use in computers, telemetry, coupling, blocking oscillators for timing purposes, inverting and impedance matching, and in other general purpose electronics applications.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Valor Electronics, Inc., Gardena, Calif.

Electrical Characteristics

Size	Inductance		Test Voltage 500 VDC	Leakage Inductance In Micro-Henries (Max.)	Interwinding Capacitance (Max.) in PF	Primary Winding	DC Resistance In Ohms (Nom)					
	μ h	Ratio					No. 1		No. 2		DCR	DCR
E	05	11	5	1.0	80	(1-2)	1.5	(3-4)	1.5			
E	05	111	5	5.0	80	(1-2)	1.7	(3-4)	1.7	(5-6)	1.7	
E	05	12	5	5.0	90	(1-2)	1.9	(3-4)	4.5			
E	05	112	5	2.5	90	(1-2)	1.7	(3-4)	1.7	(5-6)	3.4	
E	05	13	5	4.0	95	(1-2)	2.0	(3-4)	5.5			
E	05	123	5	4.0	90	(1-2)	2.5	(3-4)	4.0	(5-6)	6.0	
E	05	15	5	2.5	90	(1-2)	1.9	(3-4)	9.0			
3	05	125	5	2.5	90	(1-2)	4.0	(3-4)	6.0	(5-6)	16.0	
F	20	11	5	2.5	110	(1-2)	2.5	(3-4)	2.5			
F	20	111	5	2.5	100	(1-2)	3.0	(3-4)	3.0	(5-6)	3.0	
F	20	12	5	2.5	300	(1-2)	3.0	(3-4)	5.5			
F	20	112	5	2.5	95	(1-2)	3.0	(3-4)	3.0	(5-6)	5.5	
F	20	13	5	2.5	125	(1-2)	2.5	(3-4)	6.5			
F	20	123	5	4.0	100	(1-2)	2.5	(3-4)	4.5	(5-6)	7.5	
F	20	15	5	4.0	150	(1-2)	2.5	(3-4)	11.0			
F	20	125	5	5.0	150	(1-2)	2.0	(3-4)	4.5	(5-6)	12.0	
F	100	11	5	2.5	275	(1-2)	4.0	(3-4)	4.0			
F	100	111	5	4.0	275	(1-2)	4.5	(3-4)	4.5	(5-6)	4.5	
F	100	12	5	2.5	300	(1-2)	4.5	(3-4)	8.5			
F	100	112	5	15.0	250	(1-2)	4.5	(3-4)	4.5	(5-6)	8.5	
F	100	13	5	2.5	225	(1-2)	4.5	(3-4)	12.0			
F	100	123	5	20.0	275	(1-2)	4.5	(3-4)	8.5	(5-6)	13.0	

Size	Inductance		Test Voltage 500 VDC	Leakage Inductance In Micro-Henries (Max.)	Interwinding Capacitance (Max.) in PF	Primary Winding	DC Resistance In Ohms (Nom)				
	μ h	Ratio					No. 1 DCR	No. 1 Sec.	No. 2 DCR	No. 2 Sec.	DCR
F	100	15	5	5.0	300	(1-2)	4.5	(3-4)	19.0		
F	100	125	5	9.0	300	(1-2)	5.0	(3-4)	9.0	(5-6)	23.0
F	250	11	5	1.5	175	(1-2)	4.0	(3-4)	4.0		
F	250	111	5	2.0	190	(1-2)	4.0	(3-4)	4.0	(5-6)	4.0
F	250	12	5	2.1	167	(1-2)	4.0	(3-4)	8.0		
F	250	112	5	4.0	175	(1-2)	4.0	(3-4)	4.0	(5-6)	8.0
F	250	13	5	5.0	190	(1-2)	4.0	(3-4)	4.0		
F	250	123	5	4.0	175	(1-2)	4.0	(3-4)	7.5	(5-6)	14.0
F	250	15	5	2.5	200	(1-2)	4.0	(3-4)	16.0		
F	250	125	5	15.0	200	(1-2)	5.0	(3-4)	9.5	(5-6)	29.0
F	500	11	5	10.0	250	(1-2)	6.5	(3-4)	6.5		
F	500	111	5	20.0	300	(1-2)	6.5	(3-4)	6.5	(5-6)	6.5
F	500	12	5	10.0	200	(1-2)	6.5	(3-4)	13.0		
F	500	112	5	3.0	275	(1-2)	6.5	(3-4)	6.5	(5-6)	14.0
F	500	13	5	5.0	275	(1-2)	6.5	(3-4)	18.0		
F	500	123	5	40.0	275	(1-2)	6.5	(3-4)	14.0	(5-6)	28.0
F	500	15	5	15.0	250	(1-2)	6.5	(3-4)	40.0		
F	500	125	5	25.0	250	(1-2)	8.0	(3-4)	14.0	(5-6)	44.0

Physical Characteristics

Case: Moulded in diallyl-phthalate.

Construction: Grain-oriented silicon steel laminations throughout.

Leads: Six, 0.37" min. length.

Lead Material: Weldable type 180 non-magnetic nickel wire.

Grid Spacing: 0.1"

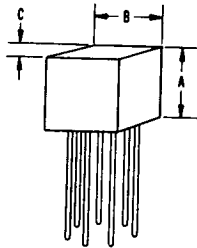
Lead Option: Bilateral leads also available; leads emit from un-numbered sides of case.

Environmental Conditions

Temp Range: -55°C to +130°C.

Remarks: Although the above transformers can be obtained individually, the manufacturer supplies the complete set as Pulse Transformer Kit-A. The kit is an ideal aid to research and experimental projects involving circuit and electronic component design. Manufacturer states all conform to MIL-T-21038B.

T302
TRANSFORMER, PULSE, SERIES PE



Application: Designed for use in blocking-oscillator circuits.

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Chicago Standard Transformer Corp., Chicago 18, Illinois.

Electrical Characteristics

Turns Ratio: 1:1:1 (3 windings).

Physical Characteristics

Weight: 0.01 lbs, approx.

Plug-in Type: Leads are arranged to be clipped and unit plugged into a 7-pin miniature tube socket.

Leads: Can be soldered directly into the applied circuit.

No. of Coil Windings: See turns ratio.

T303
TRANSFORMER, PULSE, TYPE MPT111-1

Application: Designed for printed circuit usage.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: P. C. A. Electronics, Inc., Sepulveda, Calif.

Electrical Characteristics

Primary Current: 15 ma (safe current for test).

Primary D-C Resistance: 8.6 ohms.

Secondary D-C Resistance: $S_1 = 9.5$ ohms, $S_2 = 11.2$ ohms $\pm 20\%$.

Turns Ratio: 1:1:1 $\pm 0-15\%$.

Secondary Current: $S_1 = 15$ ma, $S_2 = 15$ ma (safe current for test).

Freq Range: See Repetition Rate.

Pulse Width: $2.5 \mu\text{sec}$. See Remarks.

Pulse Amplitude: 20 volts on primary.

Pulse Rise Time: $0.035 \mu\text{sec}$.

Repetition Rate: 1000 pps.

High-Potential Test: 1000 volts between windings; 50K megohms at 25°C .

Physical Characteristics

Length: Refer to illustration (total length including leads, about 3 inches).

Case: Impregnation, epoxy.

Sealing: MIL-T-27.

No. of Coil Windings: Upon request.

Environmental Conditions

Max Oper Temp: 125°C .

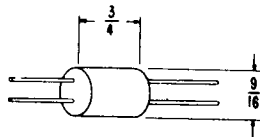
Operating Temperature: 125°C .

Dielectric Withstanding Voltage: 1000 volts between windings, for 1 minute. 50K megohms at 25°C .

Remarks: For 1:1 transformers only, approx pulse width in P.C.A. blocking oscillator circuit is $1 \mu\text{sec}$.

T304
TRANSFORMER, PULSE, TYPE DH-103-2

Application: Designed for printed circuit usage.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: P. C. A. Electronics Corp., Sepulveda, Calif.

Electrical Characteristics

Primary D-C Resistance: 12.5 ohms.
 Primary D-C Current: 15 ma (safe current for test).
 Secondary D-C Resistance: 36 ohms.
 Turns Ratio: 1:3 + 0 - 15%.
 Secondary Current: 15 ma (safe current for test).
 Freq Range: See Repetition Rate.
 Pulse Width: 5.0 μ sec.
 Pulse Rise Time: 0.3 μ sec.
 Repetition Rate: 1000 pps.
 High-Potential Test: 500 volts, dc, between windings.
 D-C Volts Between Windings: See High Potential Test.
 D-C Volts Between Windings and Case: 500 volts.

Physical Characteristics

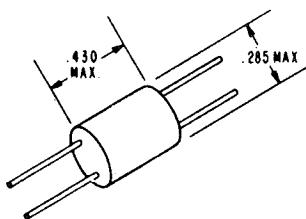
Case: Impregnation, epoxy.
 Sealing: Hermetically sealed in accordance with MIL-T-27.

Environmental Conditions

Moisture Proof: MIL-T-27.
 Humidity: MIL-T-27.
 Corrosion: MIL-T-27.
 Salt Spray: MIL-T-27.
 Operating Temperature: 125°C.
 Dielectric Withstanding Voltage: 500 volts, dc,
 between windings

T305 TRANSFORMER, PULSE, MICROMINIATURE, SERIES 94

Application: Used in coupling and blocking oscillator applications requiring two or three winding double-ended transformers.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Aladdin Electronics, Inc., Nashville, Tenn.

Electrical Characteristics

Peak Working Voltage: 50 volts, max
 Pulse Width: 0.1 μ sec to 13 μ sec
 Pulse Rise Time: 0.02 μ sec to 0.45 μ sec
 Turns Ratio: 1:1 to 1:20
 Load Impedance: 27 to 8200 ohms

Physical Characteristics

Case: Menisci are 1/32" max
 Leads: #24 AWG, tinned copper weld wire, 1-1/2", min
 Construction: Double-ended (see Application)
 Mounting: Transistor, spring metal holder (clip type) or wire leads

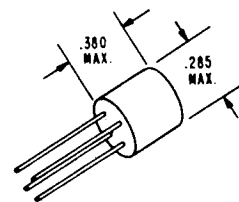
Environmental Conditions

Moisture Proof: Per MIL-T-21038
 Humidity: Per MIL-T-21038
 Corrosion: Per MIL-T-21038
 Salt Spray: Per MIL-T-21038

Remarks: Units are available in a wide range of turns ratios and pulse width.

T306 TRANSFORMER, PULSE, MICROMINIATURE, SERIES 20

Application: Coupling applications requiring two winding transformers.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Aladdin Electronics, Inc., Nashville, Tenn.

Electrical Characteristics

Peak Working Voltage: 50 volts, max
 Pulse Width: 0.1 μ sec to 13 μ sec
 Pulse Rise Time: 0.02 μ sec to 0.45 μ sec
 Turns Ratio: 1:1 to 1:20
 Repetition Rate: Up to 1 mc
 Load Impedance: 27 to 8200 ohms

Physical Characteristics

Case: Meniscus is 1/32" max
 Mounting: Transistor spring metal holder (clip type)
 Sealing: Meets requirements of MIL-T-21038
 Leads: #24 AWG, tinned copper wire, 1-1/2", min, long
 Construction: Single-ended (see Application)

Environmental Conditions

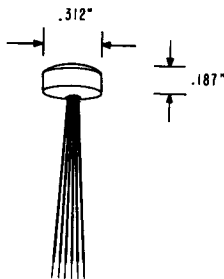
Moisture Proof: Per MIL-T-21038A
 Humidity: Per MIL-T-21038A
 Corrosion: Per MIL-T-21038A
 Salt Spray: Per MIL-T-21038A

Remarks: Units are available for various pulse widths and turns ratio.

**T307
 TRANSFORMER, PULSE TRANSISTOR, HERMETICALLY
 SEALED, "PIP" SERIES 1 THRU 9**

Application: Designed for use in transistor circuitry as blocking oscillator and coupling circuit pulse transformers and to provide maximum component density in electronic equipments.

243



Quality Assurance: Manufacturer's claims Bureau approval required prior to use

Mfr: United Transformer Corp, New York 13, N. Y.

Electrical Characteristics

Lead Colors:	Approx. Direct Current Resistance (ohms)			Width μsec	Rise Time	Blocking Oscillator Pulse		
	1-Brn, 2-Red	3-Org, 4-Yel	5-Grn, 6-Blu			% Over Shoot	Droop %	% Back Swing
PIP-1	.18	.20	.07	.05	.02	0	0	37
PIP-2	.47	.56	.17	.1	.025	0	0	25
PIP-3	1.01	1.25	.37	.2	.030	2	0	15
PIP-4	1.5	1.85	.54	.5	.05	0	0	15
PIP-5	2.45	3.1	.9	1.0	.08	0	0	14
PIP-6	3.0	3.7	1.1	2.0	.10	0	0	15
PIP-7	4.9	6.05	1.8	3.0	.20	0	0	14
PIP-8	8.0	9.7	2.9	5.0	.30	0	0	3
PIP-9	13.1	15.9	4.7	10.0	.35	0	5	12

PIP-100 Transistor pulse transformer kit, consisting of PIP-1 thru PIP-9 in plastic case

Coupling Circuit Characteristics

Type No.	Pulse Width μ sec	Volt Out	Rise Time	% Over Shoot	Droop %	Back Swing	Imp in, out
PIP-1	.05	9	.018	0	0	12	50
PIP-2	.1	8	.02	0	0	5	50
PIP-3	.2	7	.035	0	0	5	100
PIP-4	.5	7	.06	0	0	0	100
PIP-5	1.0	6.8	.15	0	0	5	100
PIP-6	2.0	6.6	.18	0	2	10	100
PIP-7	3.0	6.8	.20	0	2	10	100
PIP-8	5.0	7.9	.22	0	13	25	200
PIP-9	10.0	6.5	.4	0	15	20	200

Ratio: 4:4:1, checked and adjusted in Transistor Test Circuit to give the required pulse width. (see figures 2 and 3).

Physical Characteristics

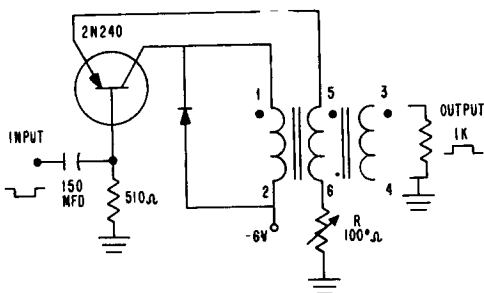
Weight: 1/20 oz.
 Lead Length: 1-7/16", approx, six leads
 Life Expectancy: 10,000 hrs, min
 Type Case: Metal encased

Environmental Conditions

Max Oper Temp: 105°C
 Seal: Hermetically by vacuum molding
 Mfr. states these PIP pulse transformers are manufactured and conform to MIL-T-21038; all units MIL type TP6RX4410CZ

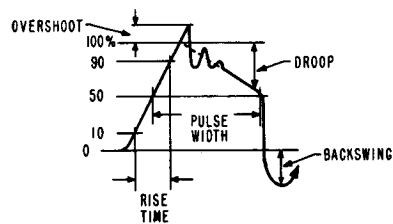
Test Data

Transistor Test Circuit



TRANSISTOR TEST CIRCUIT

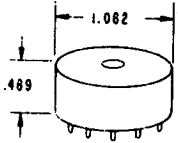
Pulse Dimensions and Curve



Remarks: Transistor test circuit and pulse dimensions are shown in above illustrations to enable readers to interpret tabular data.

T401 TRANSFORMER, SIGNAL, TOROIDAL, SERIES 791

Application: For use at low signal levels where it is desirable to have high impedance, low phase shift, and minimum pickup characteristics



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use

Mfr: Arnold Magnetics Corp., Los Angeles 16,
California

Electrical Characteristics

CHART A

PART* NUMBER	TURNS RATIO (1)	MAX LOW SIDE IMPEDANCE OHMS	MAX HIGH SIDE IMPEDANCE OHMS	MIN INPUT VOLTAGE (2)	PHASE LAG (DEGREES AT 400 CPS)
791-1	1:1	120K	120K	10 μ V	0.1
791-3	1:3	33K	300K	5 μ V	0.1
791-10	1:10	8K	600K	2 μ V	0.1
791-100	1:100	72	720K	0.5 μ V	0.1
791-1000	1:1000	0.72	720K	0.05 μ V	0.1

* TO ORDER UNITS HAVING OTHER TURNS RATIOS, SPECIFY PART NO. 791 FOLLOWED BY RATIO DESIRED

(1) ALL TURNS RATIOS ARE AVAILABLE WITH A STANDARD TOLERANCE OF $\pm 1\%$
(2) THE SATURATION VOLTAGE FOR A UNIT HAVING A 10:1 TURNS RATIO IS APPROXIMATELY 7.0 VRMS (400 CPS) ON THE LOW SIDE

Turns Ratio: All turns ratios are available with a standard tolerance of $\pm 1\%$

Saturation Voltage: For a unit having a 10:1 turns ratio, approximately 7.0 volts rms (400 cps) on the low side

Physical Characteristics

Weight: 0.5 oz, or 17.5 grams

Case: Long glass-fiber-filled resin, per MIL-M-19833

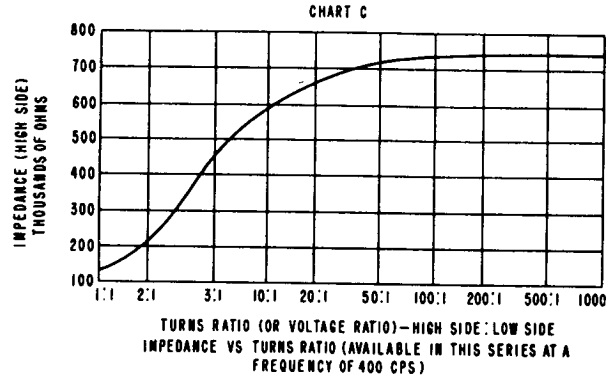
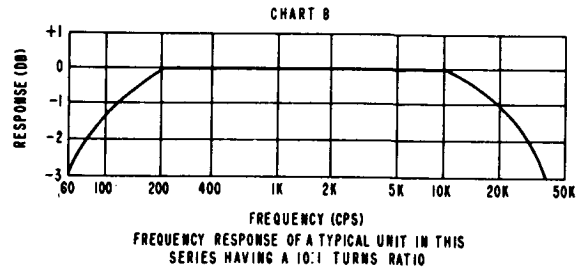
Mounting: Standard mounting for printed circuits; has clearance for a 4-40 screw

Sealing: Encapsulated with epoxy resin

Leads: 0.040" tinned copper pins

Environmental Conditions

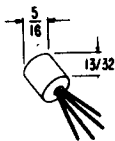
Operating Temp: -55°C to 100°C



Remarks: These units are used with input voltages as low as one-half microvolt. They are also used for transformation of signals, for modulator circuits of the chopper and diode ring type, and for transistor, vacuum tube, and interstage coupling circuits. Another important application is in the summation or ratio division of signals. The toroidal design has the advantage of nearly perfect coupling between primary and secondary, and satisfactorily cancels pickup caused by stray fields.

**T501
TRANSFORMER, DECI-OUNCER**

Application: Designed for transistor application only.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: United Transformer Corp., New York, N. Y.

Electrical Characteristics

TYPE NO.	MIL TYPE	APPLICATION	PRI IMP (OHMS)	DC IN PRI (MA)	SEC IMP (OHMS)	PRI RES	LEVEL (mW)
DO-T1	TF4RX13YY	INTERSTAGE	20,000 30,000	5	800 1200	850	50
DO-T2	TF4RX17YY	OUTPUT	900 600	3	50 80	80	100
DO-T3	TF4RX13YY	OUTPUT	1000 1200	3	50 80	115	100
DO-T4	TF4RX13YY	OUTPUT	600	3	3.2	80	100
DO-T5	TF4RX13YY	OUTPUT	1200	2	3.2	115	100
DO-T6	TF4RX13YY	OUTPUT	10,000	1	3.2	1000	100
DO-T7	TF4RX16YY	INPUT	200K	0	1000	8500	25
DO-T8	TF4RX20YY	REACTOR 2				630	
DO-T9	TF4RX13YY	OUTPUT-DRI	10,000	1	500 CT	800	100
DO-T10	TF4RX13YY	DRIVER	10,000 12,500	1	500 CT 600 CT	800	100
DO-T11	TF4RX13YY	DRIVER	10,000 12,000	1	2000 CT 2500 CT	800	100
DO-T12	TF4RX17YY	SINGLE-PP	150 CT 200 CT	10	12 16	11	500
DO-T13	TF4RX17YY	SINGLE-PP	300 CT 400 CT	7	12 16	20	500
DO-T14	TF4RX17YY	SINGLE-PP	600 CT 800 CT	5	12 16	43	500
DO-T15	TF4RX17YY	SINGLE-PP	800 CT 1070 CT	4	12 16	51	500
DO-T16	TF4RX13YY	SINGLE-PP	1000 CT 1330 CT	3.5	12 16	71	500
DO-T17	TF4RX13YY	SINGLE-PP	1500 CT 2000 CT	3	12 16	108	500
DO-T18	TF4RX13YY	SINGLE-PP	7500 CT 10K CT	1	12 16	505	500
DO-T19	TF4RX17YY	OUTPUT-LINE	300 CT	7	800	19	500
DO-T20	TF4RX17YY	MATCH-LINE	500 CT	5.5	800	31	500
DO-T21	TF4RX17YY	OUTPUT-LINE	900 CT	4	800	86	500
DO-T22	TF4RX13YY	OUTPUT-LINE	1500 CT	3	800	86	500
DO-T23	TF4RX13YY	INTERSTAGE	20K CT 30K CT	0.5	800 CT 1200 CT	850	100
DO-T24	TF4RX18YY	INPUT	200K CT	0	1000 CT	8500	25
DO-T25	TF4RX13YY	INTERSTAGE	10K CT 12K CT	1	1500 CT 1800 CT	800	100
DO-T26	TF4RX20YY	REACTOR 3				2100	
DO-T27	TF4RX20YY	REACTOR 4				100	

2 - INDUCTANCE: 3.5HY AT 2MA, DC; 1HY AT 5MA, DC.

3 - INDUCTANCE: 6HY AT 2MA, DC; 1.5HY AT 5MA, DC.

* - INDUCTANCE: 1.25HY AT 2MA, DC; 0.5HY AT 11MA, DC.

Physical Characteristics

Terminal Test: Will withstand 10-lb pull test.

Weight: 1/10 oz. approx.

Finish: See illustration.

Sealing: Hermetically sealed.

Environmental Conditions

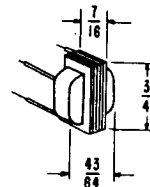
Moisture Proof: MIL-T-27A.

Humidity: MIL-T-27A.

Corrosion: MIL-T-27A.

Salt Spray: MIL-T-27A.

Remarks: Current listed is for single-ended operation (under 5% distortion for 100-milliwatt output at 1 kc). For push-pull operation, the current may consist of balanced components through 0.5-watt transistors (under 5% distortion for 500-milliwatt operation at 1 kc).



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: United Transformer Co., New York, N. Y.

Physical Characteristics

Weight: 0.02 lb approx.

Terminals: Leads, anchored mechanically.

Environmental Conditions

Moisture Proof: Double waterproof sealed.

Humidity: Double waterproof sealed.

Remarks: All units are vacuum processed. Impedance ratio is fixed 1250:1 for SSO-1, etc.

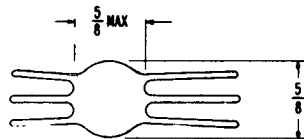
T502 TRANSFORMER, SUB-SUBOUNCER UNIT

TYPE	APPLICATION	MAX LEVEL (DBM)	PRI IMP (OHMS)	UNBAL DC IN PRI (MA)	SEC IMP (OHMS)	PRI RES (OHMS)	SEC RES (OHMS)
SSO-1	INPUT	7	200 50	0	250K 62.5K	13.5	3600
SSO-2	INTERSTAGE 3:1	15	10K	0-25	80K	710	3150
*SSO-3	PLATE TO LINE	20	10K 25K	3 1.5	200 500	2500	34
SSO-4	OUTPUT	20	30K	1.0	50	2875	4.6
SSO-5	REACTOR	50 HY AT 1MA, DC; 4400 OHMS DC RESISTANCE					
SSO-6	OUTPUT	20	100K	0.5	60	3500	3.3
*SSO-7	TRANSISTOR INTERSTAGE	20	20K 30K	0.5	800 1200	800	110
SSO-8	TRANSISTOR TO PP SEC	20	10K	1	2K CT	1200	45
SSO-9	TRANSISTOR TO VOICE COIL	20	10K	2	16	800	2.7
SSO-10	TRANSISTOR TO VOICE COIL	20	10K	2	3.2	800	0.65
*SSO-11	TRANSISTOR OUTPUT	20	500 600	3.5	50 60	50	5
*SSO-12	TRANSISTOR OUTPUT	20	1000 1200	3	50 60	90	5
SSO-13	CRYSTAL TO TRANSISTOR	7	200K	0	1000	4000	190
SSO-14	TRANSISTOR INTERSTAGE	20	10K CT 25K CT	2 1	200 CT 500 CT	650	22
*SSO-15	TRANSISTOR INTERSTAGE	20	20K CT 30K CT	1	800 CT 1200 CT	800	110

*IMPEDANCE RATIO IS FIXED; ANY IMPEDANCE BETWEEN THE VALUES SHOWN MAY BE EMPLOYED.

T503 TRANSFORMER, SUBOUNCER UNIT

Application: Refer to characteristics chart.



TYPE	APPLICATION	MAX LEVEL (DBM)	PRI IMP (OHMS)	UNBAL DC IN PRI (MA)	SEC IMP (OHMS)	PRI RES (OHMS)	SEC RES (OHMS)
*S0-1	INPUT	10	200 50	0	250K 62.5K	18	2500
S0-2	INTERSTAGE 3:1	20	10K	0-0.25	90K	215	1850
*S0-3	PLATE TO LINE	23	10K 25K	3 1.5	200 500	1225	30
S0-4	OUTPUT	23	30K	1.0	50	1850	3.3
S0-5	REACTOR	50MY AT 1MA, DC: 2675 OHMS DC RESISTANCE					
S0-6	OUTPUT	23	100K	0.5	60	3400	3.7
*S0-7	TRANSISTOR INTERSTAGE	23	20K 30K	0.5	800 1200	450	32
S0-8	TRANSISTOR TO PP SEC	23	10K	1	2K CT	1000	40
S0-9	PP TRANSISTOR TO VOICE COIL	24	500 CT	0	3.2	15	0.35
*S0-10	TRANSISTOR OUTPUT TO VOICE COIL	24	2K CT 4K CT	4 2	8 18	290	2

* IMPEDANCE RATIO IS FIXED; ANY IMPEDANCE BETWEEN THE VALUES SHOWN MAY BE EMPLOYED.

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: United Transformer Corp., New York, N. Y.

Physical Characteristics

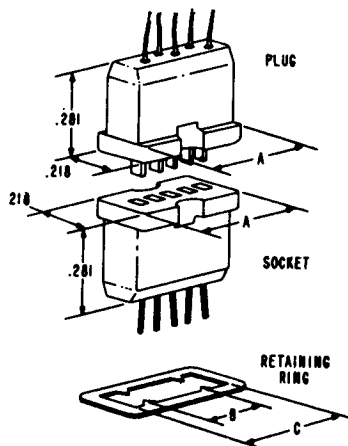
Weight: 0.03 lb approx.

Sealing: Hermetically sealed units available.

Remarks: Unit is fully enclosed.

X101
SOCKET AND PLUG, SUBMINIATURE SERIES PART NUMBERS
131 AND 204

Application: Designed for interconnecting low current circuits in miniaturized electronic assemblies.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: Cinch Mfg., Co., Chicago 24, Illinois

Electrical Characteristics

Max Rated Voltage:

Contact to contact—300 volts, ac, rms

Contact to ground—500 volts, ac, rms

Capacitance: measured from one contact to all other conducting parts, 1.5 pf (max)

Insulation Loss Factor: Max, 0.50 dry

Insulation Resistance: Measured from one contact to all other conducting parts, 50,000 megohms (min)

Contact Resistance: 0.50 ohms, max

Mechanical Characteristics

Initial Insertion and Extraction Force:

3 contact (max) —6 lbs

4 contact (max) —7 lbs

5 contact (max) —8 lbs

6 contact (max) —9 lbs

7 contact (max) —10 lbs

Individual Contact Retension Force:
 Minimum Gauge Weight: 1/2 oz.

Physical Characteristics

Construction Material: Molded, low-loss mica, filled phenolic type MFE per MIL-4-14F

Contacts: Beryllium copper, .00003 min, Sel-Rex gold plated

Part Numbers

	Plug	Receptacle	Retaining Rings
3 contacts	204-92-03-047	131-13-12-095	441-00-11-082 (105)
4 contacts	204-92-04-048	131-14-12-096	441-00-11-082 (105)
5 contacts	204-92-05-049	131-15-12-097	441-00-11-082 (105)
6 contacts	204-92-06-050	131-16-12-098	441-00-11-083 (105)
7 contacts	204-92-07-046	131-17-12-099	441-00-11-084 (105)

Alternate Construction Material: Glass-filled diallylphthalate insulation (type SDG per MIL-M-14F)

Retaining rings

Dimensions

No. of Contacts	Dimensions		
	A	B	C
3	.350 ± .003	.194	.360
4	.350 ± .003	.194	.360
5	.350 ± .003	.194	.360
6	.400 ± .003	.244	.410
7	.450 ± .003	.294	.460

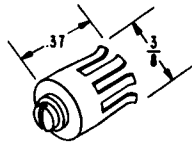
Environmental Conditions

Safe Oper Temp: 80°C, max

Remarks: These plugs and sockets can be cemented into a bakelite chassis, swaged into a metal chassis, mounted with retaining ring or notted.

**X201
HOLDER, HEAT DISSIPATING, TRANSISTOR TYPES
TXBP-032-037 AND TXBP-032-037B (NON-INSULATED)**

Application: Designed for use in compact electronic assemblies where "heat sinks" for circuits transistors are mandatory.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: International Electronic Research Corp, Burbank, Calif.

Physical Characteristics

Dissipator Material: Beryllium copper, per QQ-C-530, heat treat, full hard

Screw Size: 4-40 x 3/16"

Shouldered Washer: Polyamide plastic per MIL-P-20693, Type III, Grade E

Finish (Non-insulated dissipator): Black cadmium plate QQ-P-416, type II, class 2; Insulated dissipator; cadmium plate QQ-P-416, type III, class 2 and insulube #448

Finish (Machine screw): Black cadmium plate QQ-P-416, type II, class 3

Finish (Washer): None

Tolerances: Decimal ±.010, fractional, ±1/64", angular, ±1/2°

Transistor Case Size: TO-5, .305 to .335

Test Data

Heat Dissipation:

Transistor in Free Air

Power (Watts)	Junction Temp	Case Temp	Chassis Temp
.3	74.5°C	67.5°C	
Transistor in TXBP-032-037, mounted on epoxy board			
.3	57.5°C	45.0°C	34.5°C
Transistor in TXBP-032-037B, mounted on epoxy board			
.3	57.3°C	44.3°C	34.3°C
Transistor in TXBP-032-037, mounted on aluminum plate			
.3	40.5°C	30.5°C	29.0°C
Transistor in TXBP-032-037B, mounted on aluminum plate			
.3	36.0°C	29.5°C	29.0°C
Transistor in TXBP-032-037, mounted on heat sink			
.3	28.5°C	27.0°C	24.0°C
Transistor in TXBP-032-037B, mounted on heat sink			
.3	28.5°C	27.0°C	24.0°C

Vibration: 10 to 2000 cps, per MIL-STD-202, Method 204, Condition B, no evidence of damage to dissipators or to the transistor cases

Heat Resistance: No evidence of corrosion or damage to finish of the dissipators, (baked at 200°C for 48 hrs
Salt Spray: Per MIL-STD-202, Method 101, no physical damage noted

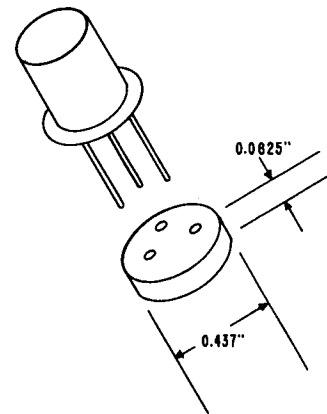
Voltage Breakdown: 500 volts, dc applied between the slug and the chassis, for one minute, the insulube finish withstood test.

Shock: 100g, per MIL-STD-202, Method 202.

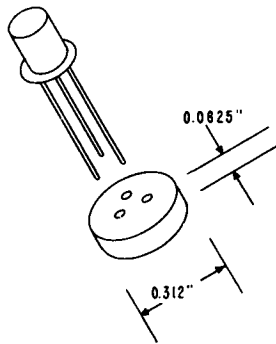
Remarks: A type 2N497 transistor was used in tests.

**X202
HOLDER, HEAT DISSIPATING, TRANSISTOR TYPES
JEDEC-TO-5, -8, AND -18**

Application: Designed for use in compact electronic equipment where the transistors must be "heat sunked" to provide efficient heat dissipation and to also serve as a shock mounted holder.



BTO-5



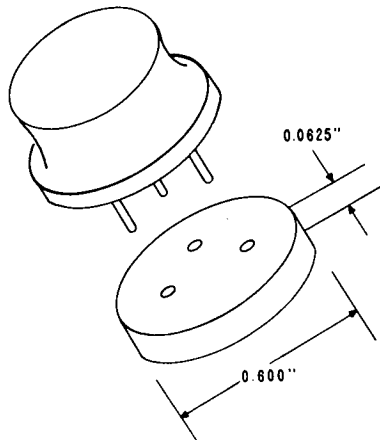
BTO-18

Quality Assurance: Manufacturer's claims; Bureau approval required prior to use.

Mfr: National Beryllia Corporation, Haskell, N.J.

Electrical Characteristics

Dielectric Properties:			
Dielectric Constant		Loss Tangent	
1 MC	25°C	7.0	.0002
	200°C	7.1	.0002
10 MC	25°C	5.8	.0004
	200°C	6.0	.0004
8500 MC	25°C	6.0	.0005
	200°C	6.1	.0005



BTO-8

Electrical Resistivity: 25°C Greater than 10¹⁶ ohm/CM;
 200°C, 10¹⁵ ohm/cm
 Dielectric Withstanding Voltage: Over 300 volts/mil when measured on a 1/8" thickness with an ac power source
 Volume Resistivity: Ceramic, 10¹⁵ ohm-cm measured at 100 volts, dc at room temp with an electric time of 1 minute

Physical Characteristics

THERMAL RESISTANCE VALUES		
Dielectric	Typical Thickness (inches)	Thermal Resistance C/watt
Glass Fabric	.003	0.6
Mica	.0025	0.5
Anodized Aluminum	.022	0.4
Berlox	.156	0.4
Berlox	.062	0.2
Berlox	.031	0.1

Ceramic Density: 2.9 gms/CC
 Chemical Purity: 99 + % Beryllium oxide
 Melting Point: 4650 °F
 Heat Capacity at 350 °F: 0.3 BTU/lb
 Thermal Expansion: 3.2 x 10⁻⁶ /°F
 Thermal Conductivity: 120 BTU/FT² HR °F-FT
 Transverse Strength: 25,000 PSI
 Elastic Modulus: 40 x 10⁶ PSI
 Heat Sink Material: Berlox (Beryllium oxide)
 Electrical Property: High resistivity and low dielectric loss
 Thermal Property: Conductivity equal to aluminum metal

Environmental Conditions

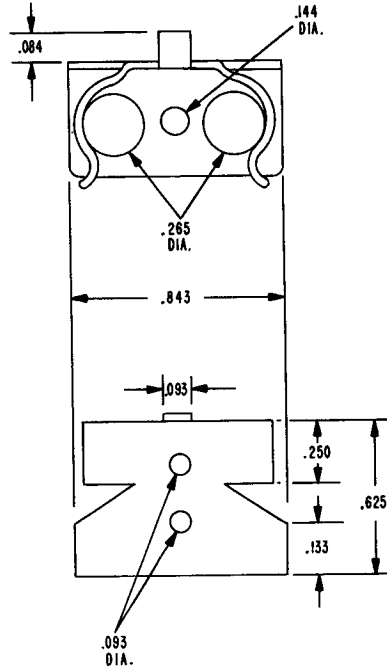
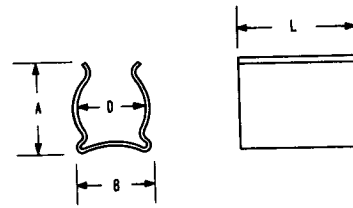
Moisture Absorption: Using ASTM test procedure, less than .01%

Remarks: These heat sinks are resistant to shocks, vibration and moisture.

2-8

X301
CLIP, SPRING TENSION, CRYSTAL HOLDER, PT. NO.
M24066/1-001

Application: Mates with style 0205 ceramic crystal socket (2 contacts) per MIL-S-12883/4.



Quality Assurance: Per specification MIL-C-24066/2 (SHIPS).

Mfr: Augat Inc., Attleboro, Mass.
 Atlee Corp., Winchester, Mass.

Physical Characteristics

Material: Beryllium copper, condition 1/4 hard conforming to Specification QQ-C-533.

Finish: Cadmium plate, class 2, type II of QQ-P-416.

Dimensions:

Part Number	D	L	A	B
M24066/2-001	0.175	0.250	0.250	0.200
M24066/2-002	.195	.250	.270	.220
M24066/2-003	.195	.312	.270	.220
M24066/2-004	.235	.312	.320	.260
M24066/2-005	.260	.250	.340	.280
M24066/2-006	.260	.500	.340	.280
M24066/2-007	.312	.312	.380	.340
M24066/2-008	.375	.375	.450	.400
M24066/2-009	.400	.500	.500	.440
M24066/2-010	.500	.375	.600	.530
M24066/2-011	.562	.375	.690	.600
M24066/2-012	.875	1.000	1.100	.930
M24066/2-013	0.175	0.312	0.250	0.200
M24066/2-014	.175	.625	.250	.200
M24066/2-015	.195	.625	.270	.220
M24066/2-016	.235	.625	.320	.260
M24066/2-017	.260	.500	.340	.280
M24066/2-018	.312	.562	.380	.340
M24066/2-019	.312	.687	.380	.340
M24066/2-020	.312	.750	.380	.340
M24066/2-021	.375	.750	.460	.410
M24066/2-022	.391	.625	.480	.430
M24066/2-023	.400	.750	.500	.440
M24066/2-024	.500	.750	.600	.530
M24066/2-025	.562	.687	.690	.600
M24066/2-026	.562	1.000	.690	.600
M24066/2-027	.670	.500	.800	.700
M24066/2-028	.670	.750	.800	.700
M24066/2-029	.670	.937	.800	.700
M24066/2-030	.750	.750	.900	.790
M24066/2-031	.750	1.000	.920	.810
M24066/2-032	.750	1.250	.920	.810
M24066/2-033	.875	.750	1.100	.930
M24066/2-034	.875	1.125	1.100	.930
M24066/2-035	.875	2.000	1.100	.930

Quality Assurance: Per specification MIL-C-24066/1 (SHIPS) Preferred part per MIL-STD-242E.

Mfr: Augat, Inc., Attleboro, Mass.

Physical Characteristics

Material: Beryllium copper alloy 25 in accordance with Specification QQ-C-533 heat treated 15N-73-79 with anti-rotate tab.

Finish: Cadmium plated, class 2, type II (golden iridite) of Specification QQ-P-416.

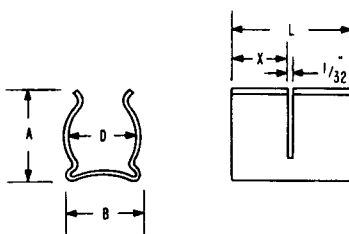
X302
CLIP, SPRING TENSION, SOLID, PT. NO. M24066/2-001
THRU M24066/2-046

Application: Designed for holding cylindrical electronic parts.

Part Number	D	L	A	B
M24066/2-036	1.000	1.000	1.210	1.050
M24066/2-037	0.195	1.125	0.270	0.210
M24066/2-038	.375	1.125	.460	.410
M24066/2-039	.400	1.125	.500	.440
M24066/2-040	.500	1.625	.600	.530
M24066/2-041	.562	1.625	.690	.600
M24066/2-042	.670	1.375	.820	.720
M24066/2-043	.750	2.000	.920	.810
M24066/2-044	1.000	1.875	1.210	1.050
M24066/2-045	1.125	1.375	1.340	1.190
M24066/2-046	1.250	2.000	1.350	1.310

X303
CLIP, SPRING TENSION, SINGLE SLOT, PT. NO.
M24066/3-001 THRU M24066/3-007

Application: Designed for holding cylindrical electronic parts.



Quality Assurance: Per specification MIL-C-24066/3 (SHIPS)

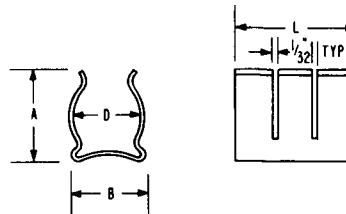
Mfr: Augat Inc., Attleboro, Mass.
 Atlee Corp., Winchester, Mass.

Physical Characteristics
 Material: Beryllium copper, condition 1/4 hard conforming to QQ-C-553.
 Finish: Cadmium plate, class 2, type II of QQ-P-416.
 Dimensions:

Part Number	D	L	A	B	X
M24066/3-001	0.260	0.312	0.340	0.280	0.140
M24066/3-002	.175	.625	.250	.200	.300
M24066/3-003	.312	.750	.380	.340	.360
M24006/3-004	.375	.750	.450	.400	.360
M24006/3-005	.400	.750	.500	.440	.360
M24006/3-006	.562	.625	.690	.590	.300
M24006/3-007	.670	.750	.800	.700	.360

X304
CLIP, SPRING TENSION, DOUBLE SLOT, PT. NO.
M24066/4-001 THRU M24066/4-015

Application: Designed for holding cylindrical electronic parts.



Quality Assurance: Per Specification MIL-C-24066/4. (SHIPS).

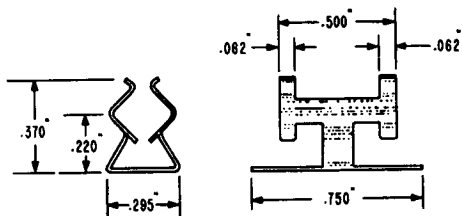
Mfr: Augat Inc., Attleboro, Mass.
 Atlee Corp., Winchester, Mass.

Physical Characteristics
 Material: Beryllium copper, condition 1/4 hard conforming to QQ-C-533.
 Finish: Cadmium plate, class 2, type II of QQ-P-416.
 Dimensions:

Part Number	D	L	A	B
M24066/4-001	0.195	0.625	0.270	0.220
M24066/4-002	.235	.625	.320	.260
M24066/4-003	.400	.875	.490	.420
M24066/4-004	.500	1.031	.610	.530
M24066/4-005	.562	1.062	.690	.590
M24066/4-006	.875	.625	1.016	.930
M24066/4-007	.195	1.187	.270	.210
M24066/4-008	.375	1.000	.450	.400
M24066/4-009	.375	1.187	.450	.400
M24066/4-010	.400	1.000	.490	.420
M24066/4-011	.400	1.125	.490	.420
M24066/4-012	.500	1.625	.600	.530
M24066/4-013	.562	1.625	.690	.600
M24066/4-014	.670	1.375	.820	.720
M24066/4-015	.750	2.000	.920	.810
M24066/4-016	.875	2.000	1.100	.930
M24066/4-017	1.000	1.875	1.220	1.080

X305
CLIP, SPRING TENSION, PT. NO. M24066/5-001

Application: Designed for holding neon lamps.



953

Quality Assurance: Per specification MIL-C-24066/5 (SHIPS).

Mfr: Augat Inc., Attleboro, Mass.

Physical Characteristics

Mounting: Two .903" dia. holes in base spaced .500" apart.

Capability: Will hold a neon lamp .190" to .275" dia.

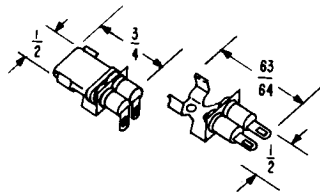
Material Thickness: .008"

Vibration: Amplitude, 15g's.



XCRA201
SOCKET, CRYSTAL ASSEMBLY, SUBMINIATURE,
AUGAT NO. SERIES 8004-1G

Application: Developed for use as a socket assembly for holding the subminiature size crystal (HC-18/U with 0.040 inch diameter pins). Allows easy insertion of crystal and removal of without resorting to adjusting screws on latches.



Test Data

Breakdown Voltage: At 50,000 ft. altitude, 500 volts, a.c.
 Capacity to Ground (contact to holding clip): 0.5 pf at 1 kc.

Contact Resistance (with 0.040" dia. pins inserted):
 0.015 ohm at 30 millivolts

Vibration: With crystal mounted 2000 c. p. s. at 30g's, vibrating in plane parallel to axis of insulators for 1 hr. (no movement of crystal or damage to assembly).

Temp. Range: -65° to +200°C., Result: No loosening of insulators within clip or contacts within insulators

Salt Spray: 20% salt spray at 95°F. for 100 hr., Results: No breakdown of plating or damage to base metals

Remarks: After the crystal has been inserted into the holder, it will not loosen due to severe vibration.

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Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr.: Augat Bros. Inc., Attleboro, Mass.

Physical Characteristics

Augat No.	Contact Plating	Holding Clip Material	Insul. Material	Fig. No.
8004-1G1	Gold over silver	Beryllium copper	Telfon	1
8004-1G5	Cadmium	Steel	Nylon	1
8004-1G2	Gold over silver	Beryllium copper	Telfon	1
8004-1G6	Cadmium	Steel	Nylon	1
8004-1G3	Gold over silver	Beryllium copper	Telfon	2
8004-1G7	Cadmium	Steel	Nylon	2
8004-1G4	Gold over silver	Beryllium copper	Telfon	2
8004-1G8	Cadmium	Steel	Nylon	2

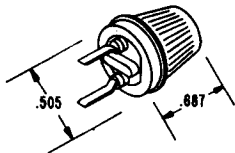
Holding Clip Materials: Beryllium Copper Alloy 25 per QQ-C-533, heat treated to 15N 73-79, Cadmium plated per QQ-P-416A, Class 2, Type 11, Golden Iridite Annealed Carbon Steel SAE 1065, per MIL-S-17919(NAVY) No. 4, heat treated to (15N) 80-83, Cadmium plated per QQ-P-416A, Class 2, Type 11, Golden Iridite
 Weight: 0.003 lb.

Contacts: Phosphor bronze, spring temper per MIL-B-892, silver and gold plated, or cadmium plated (see chart above)

Mounting: Horizontal

XF101
FUSEHOLDER, MINIATURE, TYPE FHN42W

Application: Designed to accommodate a miniature plug-in style FM01 (Refer to F101) fuse.



Quality Assurance: Per specification MIL-F-19207A (SHIPS).
 Preferred part per MIL-STD-242E.

Mfr: QPL Vendors MIL-F-19207A(SHIPS).

Electrical Characteristics

Rating: 5 amps, 125 volts.
 Contact Resistance: 0.004 ohm - 1 amp at 30 volts dc.
 Temp Rise: 45°C max.
 Fuse Accommodation: (Refer to F101) Plug-in style FM01 per MIL-F-23419/1.

Physical Characteristics

Body and Knob Material: Meets or exceeds the arc-resistance, ignition time and burning time characteristics of type MAI-60, MIL-M-14.
 Contact Surfaces: 0.0003 in. min. silver plating per QQ-S-365.
 Max. Panel Thickness: 1/8 in.
 "O"Ring: Per MIL-G-18586, Class 2
 Degree of Enclosure: Watertight.
 Terminal Length: 3/16 in.

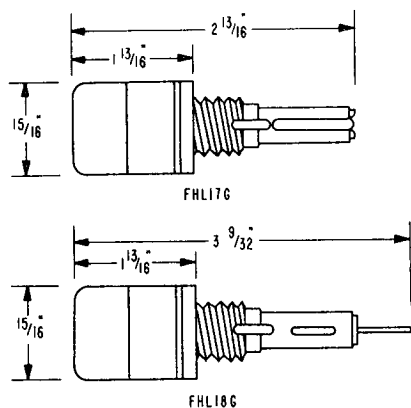
Test Data

Endurance: 500 cycles (cycle - insertion and removal of dummy fuse).
 Thermal Shock: Per MIL-STD-202, Method 107, Cond. B.
 Vibration: Per MIL-STD-202, Method 201A, Cond. C.
 Mechanical Shock: Per MIL-F-19207, Method I.
 Short Circuit Test: 3000 amps at 125 volts ac; 10,000 amps at 28 volts dc.

XF201

FUSE POST, INDICATING, SINGLE, TYPES FHL17G AND FHL18G

Application: Designed for use in electrical circuits where fuse blow is indicated by a glowing neon or incandescent lamp mounted in the fuse post.



Quality Assurance: Per specification MIL-F-19207A (SHIPS). Preferred parts per MIL-STD-242E.

Mfr: QPL Vendors MIL-F-19207A (SHIPS).

Electrical Characteristics

Current Rating (Max): 20 amps
 Indicator Circuit: Type FHL17G, neon lamp; type FHL18G, incandescent lamp.
 Neon Lamp: Type NE-2E, 65 volts, ac—.002 amp.
 Incandescent Lamp: Industry No. 1764, 28 volts—.04 amp.

Style	Voltage Range	Current Range	Resistor
FHL17G	90-250V	1/5000-20A	120K ohm
FHL18G-1	12-22V	2/10-20A	Short. Wire
FHL18G-2	23-33V	1/20-20A	330 ohm
FHL18G-3	34-45V	1/32-20A	700 ohm
FHL18G-4	46-60V	1/32-20A	1200 ohms
FHL18G-5	61-80V	1/100-20A	1750 ohms
FHL18G-6	81-90V	1/100-20A	2000 ohms

Fuse Accomodation: 1-1/4 x 1/4, styles F02 and F03 per MIL-F-15160.

Physical Characteristics

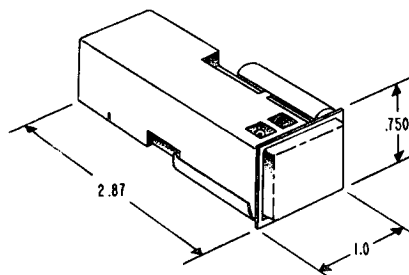
Body and Knob Base Material: Diallyl phthalate, MIL-M-14, Type SDG-F.
 Knob Lens Material: Polycarbonate.
 Knob Color: Type FHL17G, clear; type FHL18G, amber.
 Current Carrying Metal Parts: Per QQ-S-365, Type II, Grade B, .0003" min. silver plate.
 Hex Nut: Steel, .0005" min. zinc and chromate treat.
 Lockwasher: Steel, .0005" min. zinc and chromate treat.
 Gasket: Neoprene.
 "O" Ring: Buna "N".
 Thread: 5/8-18 threads.
 Terminal Shape: Optional
 Mounting Hole: 5/8" dia, flat on one side.
 Max Panel Thickness: 1/8".
 Degree of Enclosure: Dripproof

Remarks: Knob design provides a non-interchangeability feature between the two types of fuse posts.

XF202

FUSEHOLDER, INDICATING, DUAL LAMP, SERIES 70

Application: Designed for use in airborne, seaborne, missile electronic communications and ground support equipment.



Quality Assurance: Per specification MIL-F-19207. Bureau approval required prior to use.

Mfr: Master Specialties Co., Gardena, Calif.

Electrical Characteristics

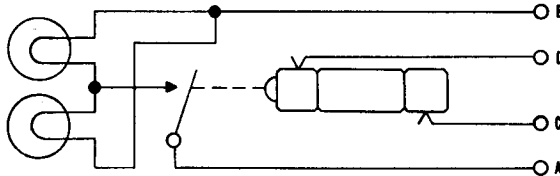
Voltage Rating (DC): 12 to 90 volts
 Voltage Rating (AC): 115 volts
 Current Rating: 20 amp, max.
 Incandescent Lamp: Two T1-3/4 midget flanged base per MS-25237. Master Spec. Code No.-C1, 6 volts; C2, 12 volts; C3, 28 volts.

Neon Lamp: Two per Master Spec. P/N MSC115-3, Code No. -C4, 115 volts ac neon with resistor; C10, 115 volts ac neon without resistor.

Circuitry: Two basic circuits available as follows:

Resistance Limiter: Utilizes the industry standard fuses 1/4" dia. x 1-1/4" lg.

Fuses to 125 volts and up to 20 amps may be used with this circuit.



Current Carrying Parts: Brass per QQ-B-613A or QQ-B-626A, Beryllium Copper per QQ-C-530, Phosphor Bronze per QQ-P-330, Gold Plated per MIL-G-45204.

Other Parts: Stainless Steel per QQ-W-423 or MIL-S-5059A or MIL-S-7720, Passivated per MIL-S-5502.

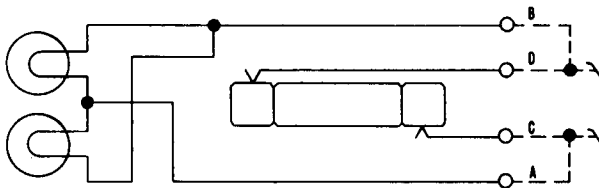
Environmental Conditions

Corrosion: All materials used are protected against corrosion by suitable finishes.

Test Data

Mechanical Shock: Meets requirements of MIL-F-19207, Method II.

Isolated Lamp/Fuse: Uses GLD type "pop-out" fuse, which allows lamp circuit to be completely isolated from fuse circuit. Separate power supplies or different voltages may then be used to provide maximum design flexibility. GLD fuses to 125 volts and from 3/4 to 5 amps may be used with this circuit.



Physical Characteristics

Terminals: Four, pierced soldering tabs.

Terminal Finish: Gold plated per MIL-G-45204.

Acceptable Wire Sizes: Lamp terminals A and B will accept three No. 20 AWG leads; fuse terminals C and D will accept one No. 12 AWG lead.

Fuse Dim.: Will accommodate one 1-1/4" lg. x 1/4" dia. fuse in accordance with MIL-F-15160/02 and /03.

Lenses: Front lens is transparent amber capable of accepting legend wording.

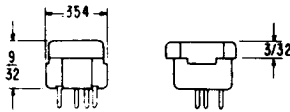
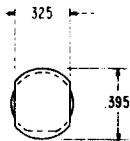
Diffuser: Clear with diffused surfaces.

Materials:

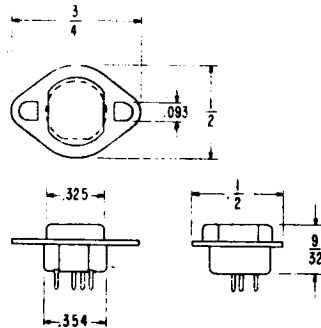
Molded Parts: Molded Lexan meeting flammability test requirements of Fed. Spec. L-P-406b, method No. 2021, Glass Fiber Filled Dialyl Phthalate GDI-30F per MIL-M-19833A.

XQ101 SOCKET, TRANSISTOR, SERIES 05-3300

Application: Multi-purpose sockets designed for 3-pin transistors with in-line pins, or for 3 or 4 pins on a 0.200-inch diameter pin circle, accommodating triangular or round pin config.



SOCKET FOR MOUNTING RING ASSEMBLY



SOCKET WITH FLAT SADDLE

stand-off type mounting also available for use in printed-wiring applications.

Contact Material: Beryllium copper.

Finish: Silver plated with gold flash.

Insulator Material: Mica-filled phenolic per MIL-M-14, type MFE.

Environmental Conditions

Salt Spray: QQ-M-151A.

Test Data

Max Voltage Rating: 1200 volts rms.

Contact Resistance; Max: 0.03 ohm.

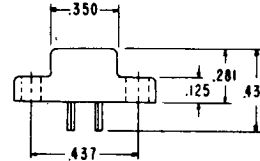
Current Rating: 1 ampere.

Dielect Withstanding Volts: 1200 volts rms at sea level; 400 volts rms at 3.4 inches Hg.

Insulation Resistance (Dry): 1000 megohms min.

XQ102 SOCKET, TRANSISTOR, TYPE 22-11

Application: For use as a device for mounting transistors that have 4 prongs equally spaced around a .20" dia. circle base that includes a base tab for socket alignment.



Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Grayhill, Inc., La Grange, Ill.

Physical Characteristics

Size: Hub, .35 dia x .28 max. socket overall thickness.

Base flange mtg. dimensions is .57 between centers.

Socket Material: Molded mica-filled phenolic per MIL-M-14, type MFE.

Contact Material: Beryllium copper.

Mounting: Mounts with #2 screws or rivets. Under chassis mounting. Fits through 3/8" diameter drilled or punched hole.

Contact Finish: Silver plated with gold flash.

Contact Type: Wrap around.

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use

Mfr: Elco Corp., Phila, Pa.

Physical Characteristics

Contact Length: 3/16".

Mounting: Sockets available for mounting with flat saddle or mounting ring in standard wiring applications;

Environmental Conditions

Max Oper Temp: 250°F

Material: Molded mica-fill.

Test Data

Contact Resistance, Max: 0.0045 ohm.

Min: 0.0035 ohm.

Dielect Withstanding Volts: 3000 volts rms, ac, minimum.

Insulation Resistance: 200,000 megohms.

Remarks: Lead fits on 100 mil grid for printed circuits. Top face has key ribs for alignment with transistor tab.

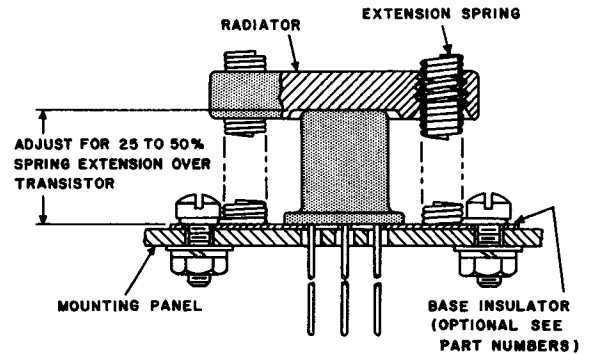


ILLUSTRATION OF ASSEMBLED UNIT

XQ103**HOLDER, TRANSISTOR, UNIVERSAL SPRING HAT TYPES 9005-1G1 and 9005-1G2**

Application: The device serves a dual purpose as a spring-tensioned holder having the properties of "heat sink" action. Designed for use in electronic equipment in circuitry where any of 800 different types of transistors and diodes can be accommodated. This also includes various case sizes in either a round or oval configuration.

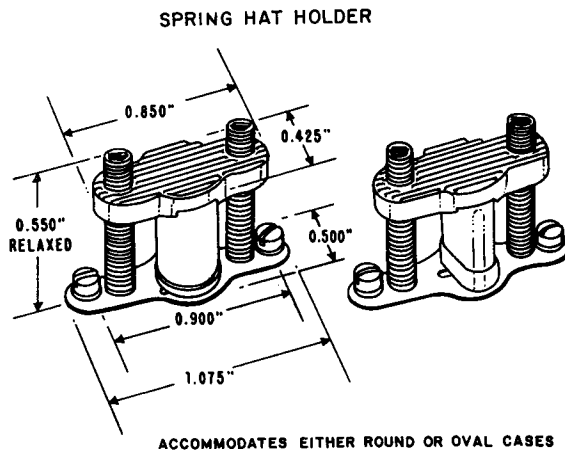
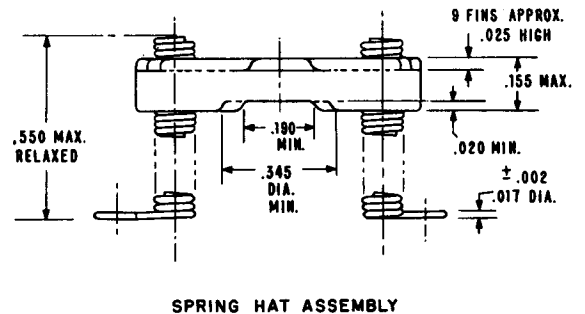


FIGURE 2.



SPRING HAT ASSEMBLY

Quality Assurance: Manufacturer's claims
Bureau approval required prior to use.

Mfr: Auqat Bros. Inc., Attleboro, Mass.

Physical Characteristics

Radiator Material: Aluminum alloy 1100-0 per QQ-A-561

Radiator Finish: Black anodized per MIL-A-8625

Approx Radiating Area: .75 sq. in.

Spring Material: Stainless steel, Comp FS302,

Cond. B, per QQ-W-423, Passivated per MIL-STD-171 (ORD)

Base Insulator Material: Glass-Epoxy Laminate,

Type GEB per MIL-P-18177B (max oper temp of base insulator 475°F)

Transistor or Diode Case: Round or oval

Mounting Hardware: No. 2 machine bolt or rivet 0.086" dia, qty. two (2)

Spring Hat Assembly Without

Base Insulator: Augat No. 9005-1G2

Spring Hat Assembly With

Base Insulator: Augat No. 9005-1-G2

Spring Hat Holder Will Hold: JEDEC Cases, round types: TO-1, TO-2, TO-5, TO-7, TO-9 and TO-12; Oval cases, all cases up to 0.190" max thickness and up to .50" high

Bases: Types E4-13, E3-14, E3-15, E3-18, E4-24, E3-25, E4-31, E3-32, E2-33, E3-38, E3-39, E3-44, E4-48, E3-51, E3-53 and E4-54

Hat Construction (Radiator): Nine fins approx .025" high, which allows more area for dissipating heat

Base Insulator: Provides complete electrical isolation from the chassis for the mounted transistor or diode.

Extension Spring: Adjust for 25 to 50% spring extension over transistor (See Figure 1)

Environmental Conditions

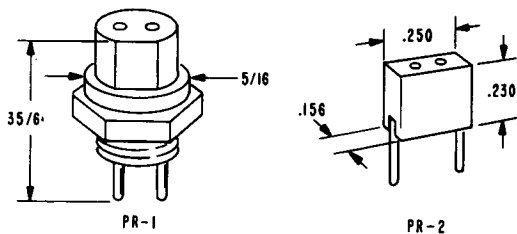
Thermal Conductivity at 25°C: 0.53 cal/CM/CM²/°C/sec

Remarks: The "knee action" spring design enables the technician to replace the transistor without resorting to any disassembly procedures, but careful manual control of removal or insertion of the part should be exercised by the technician to avoid damage to part.

210

XR101
SOCKET, CURRENT LIMITING RESISTOR, TYPE PR-1
AND PR-2

Application: Designed for mounting of P-200 microminiature current limiter. (Refer to R400)



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Microelectron Inc., Santa Monica, Calif.

Physical Characteristics

Size (PR-1): 35/64" L x 5/16" D

Size (PR-2): .230" x .250" x .156"

Material (PR-1): Molded melamine.

Material (PR-2): Glass diallyl phthalate per. MIL-M-19833,
Type GDI-30.

Mounting (PR-1): Panel or chassis (thread base w/nut).

Mounting (PR-2): Printed circuit.

**Z101
TWIN-T NETWORK, PARALLEL-T NETWORK
SERIES F**

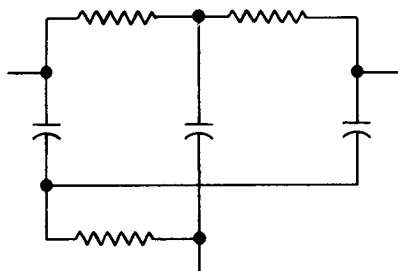
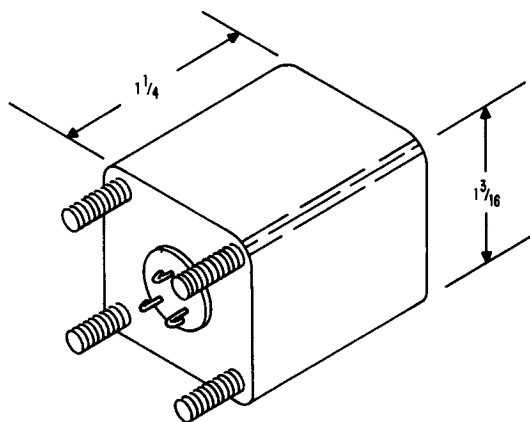
Application: Elimination of harmonics in a demodulator signal. Other uses include sweep frequency marker, low-pass filter, band-pass filter, and power-supply filter.

Physical Characteristics

Weight: Less than 1 ounce.
 Mounting: Stud type or plug-in unit type.
 Mounting Clearance: 7/16".
 Sealing: Hermetically sealed.
 Terminals: Solder type.
 Component Parts: Resistors, deposited carbon; capacitors, Mylar or sivered mica.
 Plug-in Unit Types: Upon request.
 Studs: 6-32 x 11/16.
 Case: Drawn steel.
 Construction: Network is encapsulated in epoxy resin.

Test Data

Feedback Properties: Null frequency is amplified; other frequencies are attenuated.



Remarks:	Style or Model	Null Freq. (CPS)	Formula R, 10 ³ Ohms
	F10	30	53
	F14	60	27
	F20	120	13
	F27	400	4
	F35	800	2

Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use

Mfr: T. T. Electronics, Inc., Culver City, Calif.

Electrical Characteristics

Voltage Rating: 100 volts, dc (standard)
 Network Impedance: See Remarks.
 Source Impedance: See Remarks.
 Attenuation: 63 db min.
 Null Freq: See Remarks.
 Rejection Freq: 30, 60, 120, 400, and 800cps. Other frequencies are also available.

5-7-60

Identification Codes

Integrated Circuit Devices are identified by identification codes for convenience in referencing when correspondence concerning these parts is necessary. Each identification code consists of a capital letter, mnemonic abbreviation, and an arabic number. The capital letter portion of the code indicates the major element/s in the device (V-vacuum tube, Q-transistor, etc), the mnemonic portion indicates the function of the device (AMP-amplifier, OSC-oscillator, etc), and the arabic number distinguishes the device from others of the same type.

The table below lists the types of integrated circuit devices covered in this handbook.

INTEGRATED CIRCUIT DEVICE CATEGORIES AND IDENTIFICATION CODE INDEX

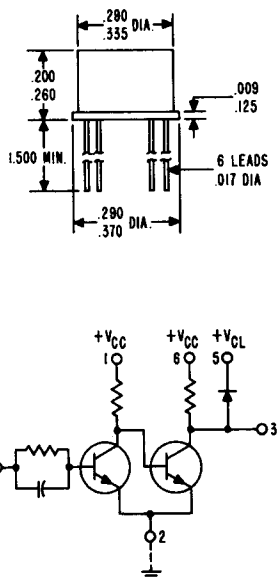
TYPE OF DEVICE	IDENTIFICATION CODE
A	
Amplifier	Q-AMP-1
Amplifier	Q-AMP-2
Amplifier	Q-AMP-3
Amplifier	Q-AMP-4
Amplifier	Q-AMP-5
Amplifier	Q-AMP-6
B	
Bistable Multivibrator (Flip-Flop)	Q-BMV-1
Bistable Multivibrator (Flip-Flop)	Q-BMV-2
D	
Demodulator Chopper	Q-DEM-1
Demodulator Chopper	Q-DEM-2
Demodulator Chopper	Q-DEM-3
Detector, Level	Q-DET-1
E	
Emitter Follower	Q-EF-1
G	
Gate, Steering	X-GTN-1
M	
Monostable Multivibrator	Q-MMV-1
N	
NAND-Gate	Q-NAND-1
NAND (or NOR) - Gate	Q-NAND-2
NOR-Gate	Q-NOR-1
S	
Switch, Low Level	Q-SW-1
Switch, Write	Q-SW-2

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Q-AMP-1
BUFFER AMPLIFIER, SILICON NANOCIRCUIT, NC-12

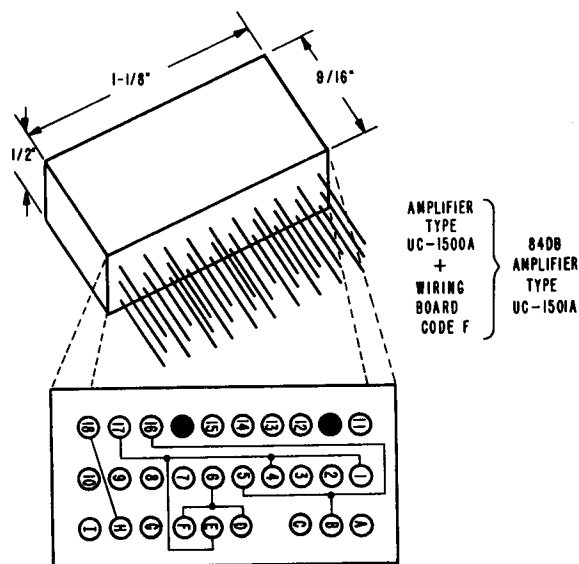
Description: The NC-12 digital Buffer Amplifier is a conventional direct-coupled two-stage amplifier capable of operation up to 12 mc. Featuring a clamped output to define the output voltage, it is widely used in digital logic systems for resetting large numbers of flip-flops and signal busses as well as driving relays, solenoids and highly capacitive loads such as coaxial cables. Employing planar passivated epitaxial microtransistors and microdiodes, as well as planar passivated resistors, the NC-12 Nanocircuit can replace many conventionally packaged buffers and amplifiers.



*Max. Outward Drive Avail: 70 ma at 5 volts
 Max. Inward Drive Avail: 120 ma
 Max. Power Dissipation: 200 milliwatts
 Max. Rep. Rate: 12 megacycles

*With external 100 ohm resistor.

Q-AMP-2
AMPLIFIER, MICROMINIATURE, 84 DB, TYPE UC-1501A



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: General Instrument Semiconductor, Div. of General Instrument Corp., Newark, N. J.

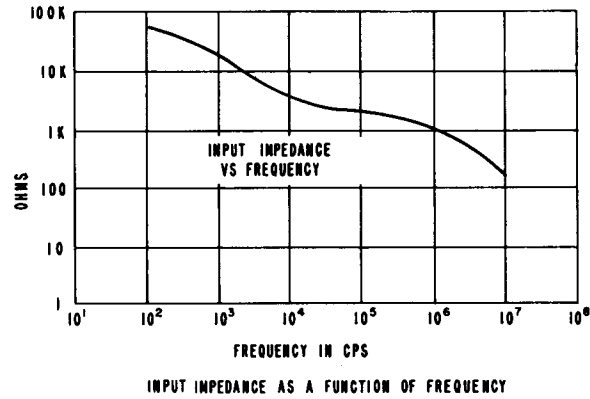
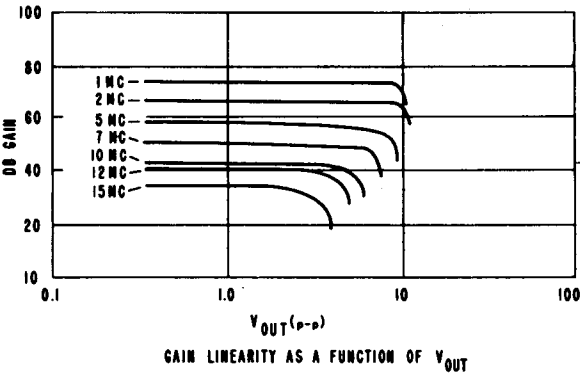
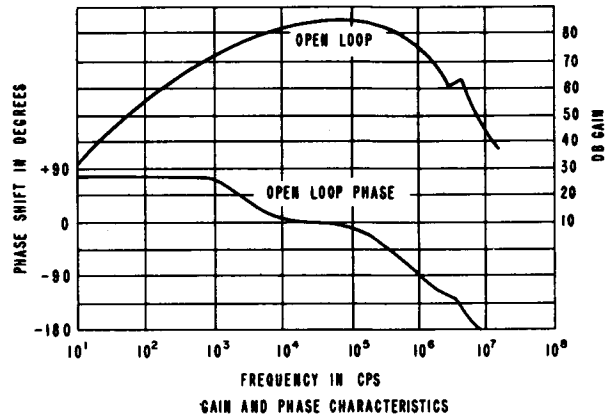
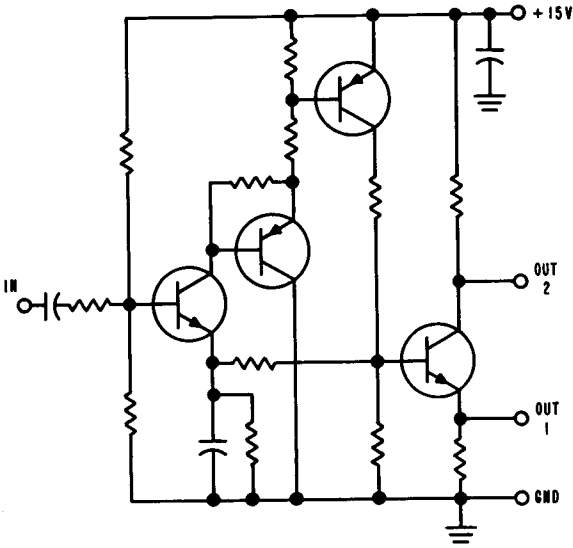
Specifications
 All values are nominal design centers at 25°C.
 VCC: ±12 volts
 VCL: +4.2 volts
 Logic Levels: +0.3 volt and +5 volts

Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Sprague Electric Co., North Adams, Mass.

Electrical Characteristics
 Frequency Response: 3000 cps to 0.25 mc (3 db points).
 Volt Gain (A_v): 84 db at OUT 1; 50 db (inverted) at OUT 2.
 Temp Stability of Gain: +0, -3 db from -55°C to +85°C.
 Max Undistorted Output: 8.5 vpp at 10 kc at OUT 1.
 Input Impedance-Midband: 2 kilohms.
 Output Impedance: 150 ohms max.
 Power Supply: +15 volts +12%, 10 ma unloaded

Total Wideband Noise (rms): 10 microvolts, open circuit input noise voltage; 1×10^{-8} microamps, short circuit input noise current.



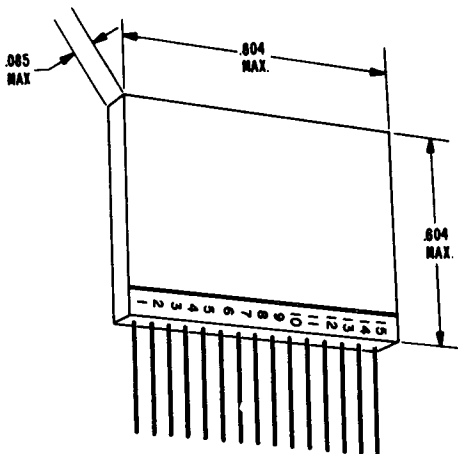
Remarks: The amplifier described above consists of Sprague Type UC-1500A General-Purpose Amplifier and Wiring Board Code F. Nine other standard configurations are possible by combining the general-purpose amplifier Type UC-1500A with one of the coded wiring boards shown below. Other circuit functions are also available upon request.

9966

Type	Amplifier Configuration	Wiring Board Code
UC-1502A	80 DB Phase Splitter	B
UC-1503A	60 DB Amplifier	C
UC-1504A	58 DB Phase Splitter	J
UC-1505A	40 DB Amplifier	D
UC-1506A	39 DB Phase Splitter	E
UC-1507A	34 DB Amplifier	G
UC-1508A	Audio Limiter	A
UC-1509A	22 DB Pulse Distribution Amplifier and Limiter	H
UC-1510A	Unity Gain Pulse Distribution Amplifier and Limiter	I

2167

**Q-AMP-3
AMPLIFIER, MICROCIRCUIT, MODEL 8201**

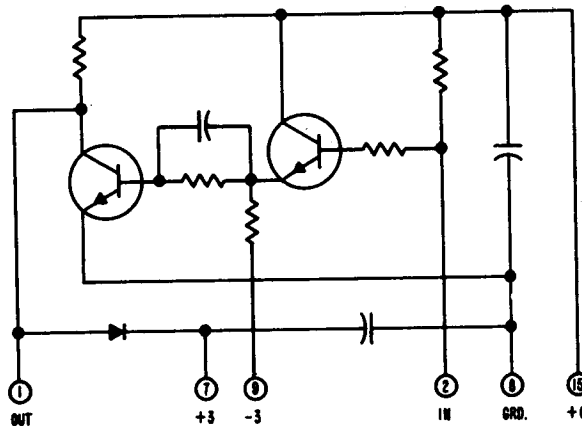


Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Varo, Inc., Garland, Texas.

Electrical Characteristics

Input: 1/5 standard load; .5 volt or less for 3.5 volts output, 3 volts or more for .5 volt output.
 Rise Time: 20 nsec.
 Fall Time: 10 nsec.
 Delay Time: 10 ± 5 nsec.
 Output Amplitude: .5 volt or less to 3.5 volts or more.
 Loading: 4 standard loads.
 Power Requirements: +6 volts at 22 ma, +3 volts at 7 ma, -3 volts at 6 ma.



Physical Characteristics

Case: Epoxy filled Diall.
 Leads: Fifteen, gold-flashed, beryllium copper leads .015 dia. by .3" long.
 Volume: 0.041 cubic inch.

Environmental Conditions

Oper. Temp: -55°C to +125°C.
 Meets applicable portions of MIL-STD-202.

**Q-AMP-4
AMPLIFIER, A-C, MICROCIRCUIT, MODEL 8502**

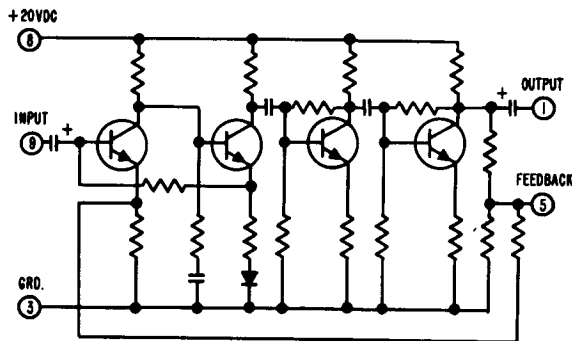
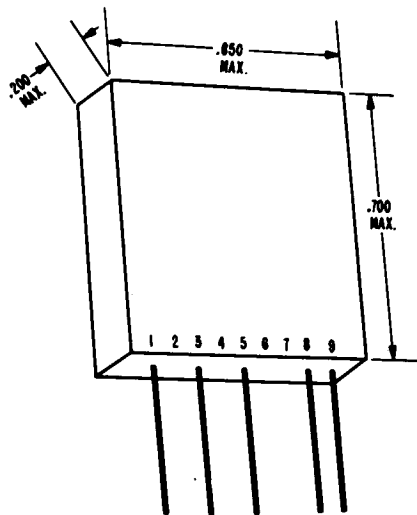
Application: May be utilized as a servo amplifier, control amplifier, linear 400-cps amplifier, linear 60-cps amplifier, and general purpose a-c amplifier.

Frequency Response: Below 20 cps, above 100 kc (3-db points, see curve).

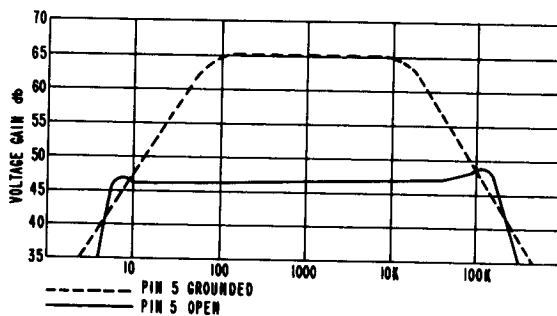
Supply Voltage: 6 to 24 volts, 5 ma at 20 volts.

Max. Output Noise: 2.5 mv, rms, with 1000-ohm source impedance.

Undistorted Output: 2 volts, rms (min. with 20 volt supply).



8928



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Varo, Inc., Garland, Texas.

Electrical Characteristics

- Input Impedance: 10,000 ohms or greater (d-c isolation provided by 1- μ f capacitor).
- Output Impedance: Less than 1000 ohms (d-c isolation provided by 1- μ f capacitor).
- Voltage Gain: 46 db min.
- Gain Stability: 10%

Physical Characteristics

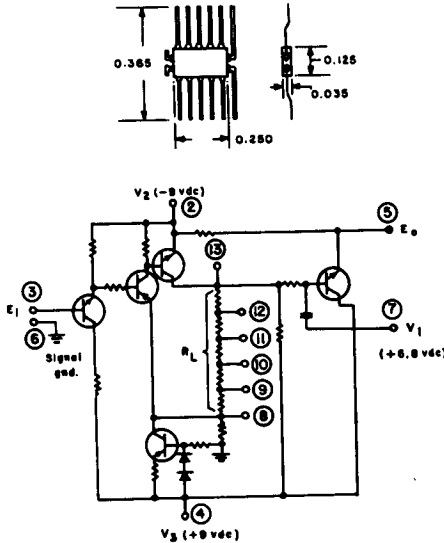
- Case: Epoxy Diall.
- Leads: Nine, .5" min length.
- Volume: 0.091 cubic inch.

Environmental Conditions

Temp. Range: -55°C to +85°C.

Q-AMP-5
READ PREAMPLIFIER, DIFFUSED SILICON, TYPE SN342A

Description: The SN342A Read Preamplifier is a semiconductor network for application in digital computer, data handling, and control systems. It is a voltage amplifier whose nominal gain can be varied by externally altering the value of internal resistor R_L with six taps provided.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Semiconductor-Components Div., Dallas 22, Texas

Specifications (Absolute max. ratings)*

- Output Breakdown Voltage: 9 volts.
- Input Breakdown Voltage: 9 volts.
- Power Dissipation: 200 mw.
- Storage Temp Range: -65°C to $+150^{\circ}\text{C}$.

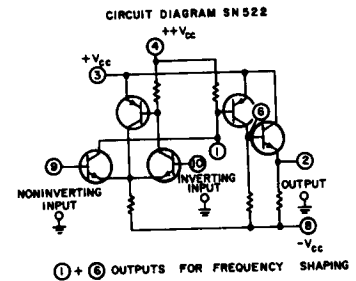
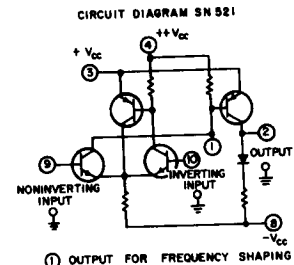
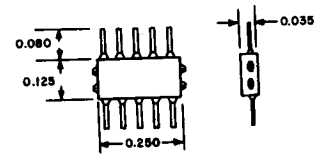
Physical Characteristics

- Construction: Semiconductor network mounted in a glass-to-metal hermetically sealed package.
- Leads: Gold-plated Kovar.
- External Surfaces: Metallic, isolated from leads and circuit.
- Weight: 0.1 gram.

***Remarks:** Absolute maximum ratings are limits, above which, operation and life expectancy may be impaired.

Q-AMP-6
OPERATIONAL AMPLIFIER, DIFFUSED SILICON, TYPES SN521, SN522

Description: The SN521 and SN522 Operational Amplifiers are semiconductor networks, each fabricated within a single block of ultra-pure silicon. Included in the amplifiers are 13 component paths (5 NPN transistors, 2 PNP transistors, and 6 resistors with values from 5000 to 50,000 ohms) used to perform the amplifier functions.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Semiconductor-Components Div., Dallas 22, Texas

Specifications (Absolute max. ratings)*

- Supply Voltages: $++V_{CC}$, +15 volts; $+V_{CC}$, +10 volts; $-V_{CC}$, -15 volts.
- Input Voltage (Common-Mode): ± 4 volts.
- Oper Ambient Temp Range: -20°C to $+85^{\circ}\text{C}$.
- Storage Temp Range: -55°C to $+125^{\circ}\text{C}$.

Operating Characteristics (General)

Open-Loop Voltage Gain: 62 db.

Common Mode Rejection: 60 db.

Dynamic Output Voltage Range: ± 2.5 volts.

Frequency Response: DC to 50 kc.

Supply Voltages: $+V_{CC}$, +10 volts; $+V_{CC}$, 6 volts;

$-V_{CC}$, -9 volts.

Physical Characteristics

Construction: Semiconductor networks mounted in a glass-to-metal hermetically sealed package.

Leads: Gold-plated Kovar, adaptable to either soldering or welding.

Weight: 0.1 gram.

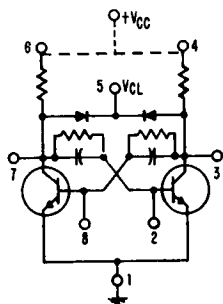
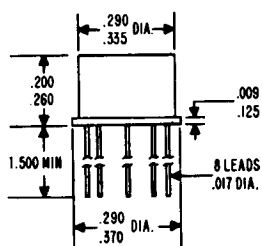
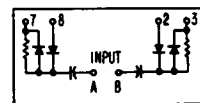
***Remarks:** Manufacturer states this package is designed to exceed military environmental requirements.

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**Q-BMV-1
FLIP-FLOP, SILICON NANOCIRCUIT, NC-8C**

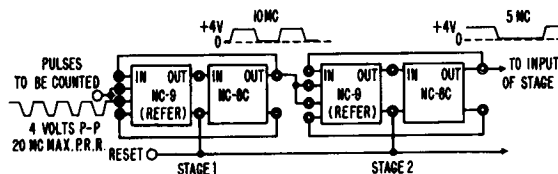
Description: The NC-8C Flip-Flop is a conventional Eccles-Jordan cross-coupled inverter circuit capable of operation up to 20 mc. Featuring clamped outputs to define the output voltages, it is widely used in both storage and logic sections of digital computers and digital instrumentation. Employing planar passivated epitaxial microtransistors and microdiodes, as well as planar passivated resistors, the NC-8C Nanocircuit can replace conventionally packaged flip-flops in numerous existing systems.

Max. Rep. Rate: 20 megacycles; 20 megacycles
 Min. Pulse Width: 25 nano-seconds; 25 nano-seconds
 Typ. Output Rise Time: 30 nano-seconds; 30 nano-seconds
 Typ. Output Fall Time: 20 nano-seconds; 20 nano-seconds
 Max. Fan-Out: 5 NC-10 (refer) NOR gates, or 5 NC-11 (refer) AND gates, or both.
 Oper Temp Range: -55°C to +125°C.
 Adapter for scale-of-two counter or set-reset operation—



- Note 1: For scale-of-two counter operation, tie A to B.
- Note 2: For set-reset operation, feed input A and input B separately.
- Note 3: Upper limit of counting is determined by speed of diodes in adapter.
- Note 4: Characteristics of flip-flop are similar in either counter operation or set-reset operation.
- Note 5: Counter can be driven directly from output of identical flip-flop stage.

TYPICAL BINARY COUNTER APPLICATION



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: General Instrument Semiconductor, Div. of General Instrument Corp., Newark, N. J.

Specifications

All values are nominal design centers at 25°C.
 Vcc: +8 volts; +12 volts
 Vcl: +3.2 volts; +4.2 volts
 Logic Levels: +0.3 volt and +4 volts; +0.3 volt and +5 volts
 Max. Output Drive Avail: 2.5 ma at 4 volts; 5.5 ma at 5 volts
 Max. Power Dissipation: 85 milliwatts; 200 milliwatts
 Min. Ampl. of Input Pulse: 3 volts; 3 volts

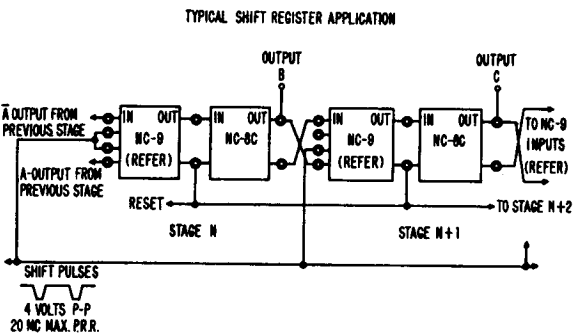
Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: CBS Labs, Stamford, Conn.

Electrical Characteristics

Max. Supply Voltage: 7 volts.
Max. Input Voltage: 7 volts.
Max. Oper. Temp: -55°C to +125°C.
Max. Storage Temp: -55°C to +150°C.

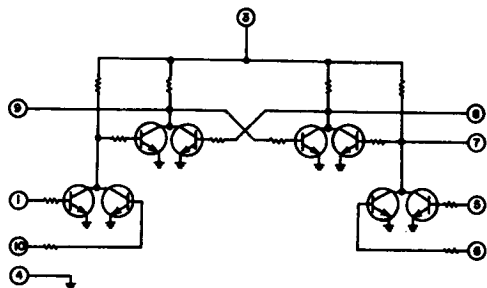
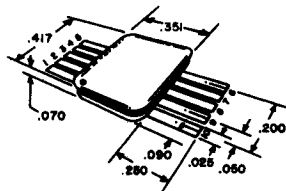
Circuit Parameter	Min.	Typ.	Max.	Units
Pwr. Dissipation				
($T_A = 25^\circ C, V_{CC} = 3V$):	-	180	-	μw
Loading ($T_A = 25^\circ C, V_{CC} = 3V, \text{Note 1}$):				
Fan-in (M)	-	-	1	-
Fan-out (N)	-	-	4	-
Input Voltage ($T_A = 25^\circ C, V_{CC} = 3V$):				
S and C Levels	0.65	-	-	Volts
S and C Levels	-	-	0.30	Volts
Output Voltage ($T_A = 25^\circ C, V_{CC} = 3V$):				
Logic 0 Level				
($N = 4, \text{Note 2}$)	0.65	-	-	Volts
Logic 1 Level (Note 3)				
	-	-	0.30	Volts
Propagation Delay Time				
$(t_{ON} + t_{OFF})/2$:				
$T_A = 25^\circ C, V_{CC} = 3V,$				
$N = 1, f = 40 \text{ kc}, P_A = 1V,$				
$PW = 10 \mu sec$	-	-	5.0	μsec



*RESET shown functionally only; circuit details at option of user.

**Q-BMV-2
FLIP-FLOP, SET-CLEAR, "AND" GATE INPUT, TYPE 13,
SERIES A**

Description: The type 13 circuit is a Set-Clear Flip-Flop designed for use in DCTL-type logic systems where low power dissipation, high packaging density, and reliability are of prime importance.



Note 1: The number of logic input terminals which may be connected to a logic output terminal is limited by the condition that the sum of the Fan-in values of the driven stages must not exceed the Fan-out value of the driving stage.

Note 2: Logic 0 defined as high voltage (most positive).

Note 3: Logic 1 defined as low voltage (least positive).

Physical Characteristics

Construction: Passivated deposited thin-film elements and diffused and epitaxial transistors and diodes form a monolithic structure in a single silicon wafer which is mounted in a ceramic-to-metal hermetically sealed package.

Body: Gold plated.

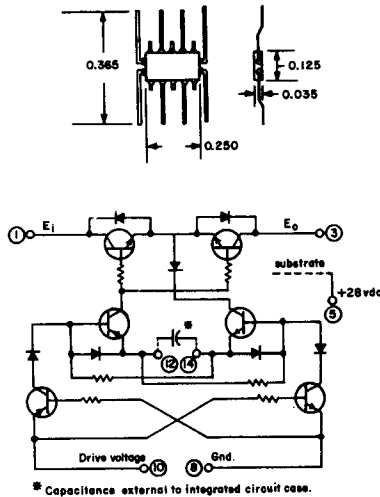
Leads: Gold plated.

Weight: 0.35 gram.

Remarks: Manufacturer states standards, methods, and procedures for quality and reliability are designed to meet or exceed requirements of MIL-Q-9858, NASA-NPC-200-3, and MIL-S-19500.

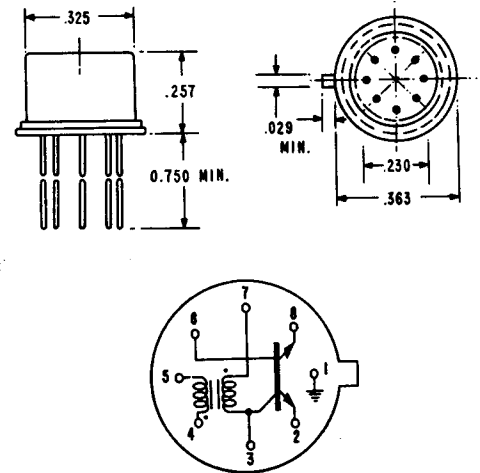
Q-DEM-1
DEMODULATOR CHOPPER DIFFUSED SILICON,
TYPE SN354A

Description: The SN354A Demodulator Chopper is a semiconductor network for use in military and industrial control systems, analog-to-digital converters, and analog computers. It enables a DC or low frequency AC signal, E_i , to modulate a higher frequency AC signal, the Drive Voltage, producing a modulated AC signal, E_o .



Q-DEM-2
DEMODULATOR, CHOPPER, TRANSFORMER ISOLATED,
50KC to 1.5MC, TYPE NS8000

Description: The NS8000 is a complete, transformer-integrated chopper. It contains a miniature toroidal transformer and an integrated chopper. The integrated chopper is a stabilized integrated circuit specifically designed for low level electronic commutating, demodulating, and chopper applications. This series is ideally suited for these applications because of extremely low offset voltage, low leakage currents, low saturated dynamic impedance, and high speed switching characteristics.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Semiconductor-Components Div., Dallas 22, Texas

Specifications (Absolute max. ratings)*

Standoff Voltage: 26 volts.
 Power Dissipation: 80 mw.
 Storage Temp Range: -65°C to $+150^{\circ}\text{C}$.

Physical Characteristics

Construction: Semiconductor network mounted in a glass-to-metal hermetically sealed package.
 Leads: Gold-plated Kovar.
 External surfaces: Metallic, isolated from leads and circuit.
 Weight: 0.1 gram.

***Remarks:** Absolute maximum ratings are limits, above which, operation and life expectancy may be impaired.

Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: National Semiconductor Corp., Danbury, Conn.

Specifications

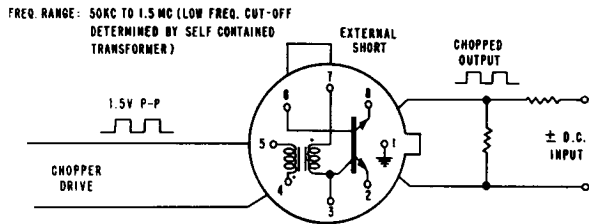
Total Device Dissipation (Max.) – Free Air: 0.5 watt.
 Total Device Dissipation (Max.) – 25°C Case Temp: 2.0 watts.
 Emitter Current (Max.): 10 ma.
 Base Current (Max.): 10 ma.
 Operating Frequency Range: 50kc to 1.5mc.
 Operating and Storage Temp: -55°C to $+125^{\circ}\text{C}$.
 Transformer:

Symbol	Parameter	Test Cond.	Min.	Type	Max.	Unit
N_1/N_2	Turns Ratio		1	—	—	—
L	Inductance	$f = 140\text{kc}$	500	550	—	μh
L	Inductances	$f = 140\text{kc}, T_A = -55^\circ\text{C}$	300	—	—	μh
R	D. C. Res.	$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	—	1	1.4	Ω
L_I	Leakage Ind.	$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	—	10	15	μh
C _{WW}	Interwinding Cap.	$f = 140\text{kc}$	—	3.5	4	pf
f	Oper. Freq.	IPRI = 10ma rms	50	—	—	kc
	D. C. Isolation V	Prim. to all term.	500	—	—	v

Physical Characteristics

Construction: TO - 5 outline package.
 Leads: Eight wire leads .017" dia., 3/4" min. length.

Typical Drive Circuitry

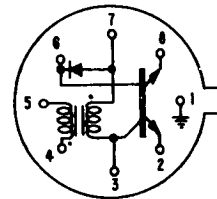
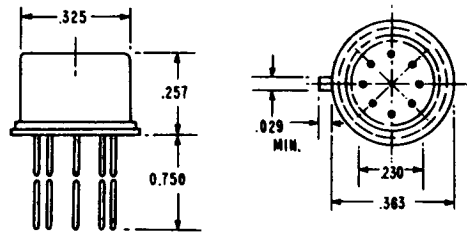
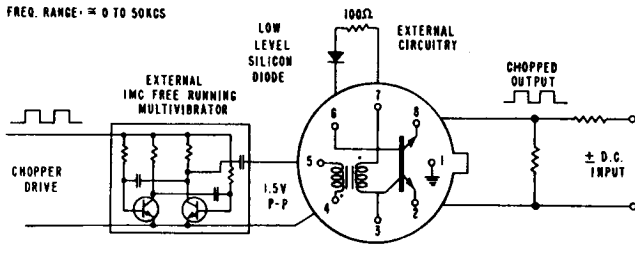


Chopper drive signal gates the lmc clock. Chopper conducts in presence of lmc signal due to rectification by external resistor diode circuit.

**Q-DEM-3
 DEMODULATOR, CHOPPER, TRANSFORMER-ISOLATED,
 0CPS to 50KC, TYPE NS8003**

Description: The NS8003 is a complete, transformer-isolated, integrated chopper. It includes a diode and resistor to provide the rectification necessary for low frequency operation, and is ideally suited for low level commutating, demodulating, and chopper applications.

The chopping frequency range can be extended to essentially 0 cps by use of an external clock and rectifier circuitry as shown below.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

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Mfr: National Semiconductor Corp., Danbury, Conn.

Specifications

Total Device Dissipation (Max.)—Free Air: 0.5 watt.
 Total Device Dissipation (Max.)—25° C Case Temp: 2.0 watts.
 Emitter Current (Max.): 10 ma.
 Base Current (Max.): 10 ma.
 Operating Frequency Range: 0 cps to 50kc (when used with suitable Drive Circuitry).
 Operating and Storage Temp: -55° C to +125° C.

A 75

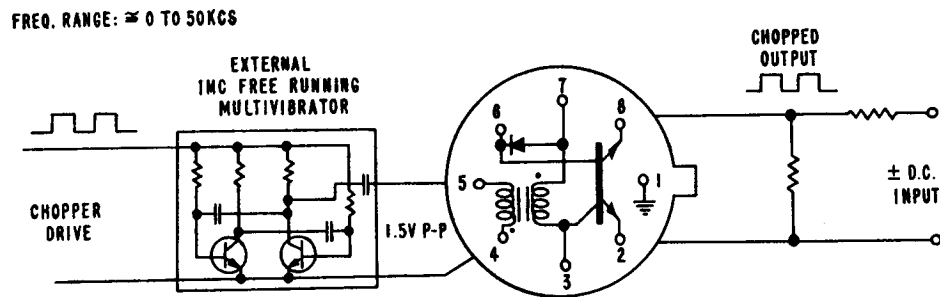
Symbol	Parameter	Test Cond.	Min.	Typ.	Max.	Unit
N_1/N_2	Turns Ratio		1	—	—	—
L	Inductances	$f = 140\text{kc}$	500	550	—	μh
L	Inductances	$f = 140\text{kc}, T_A = -55^\circ\text{C}$	300	—	—	μh
R	D. C. Res.	$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	—	1	1.4	Ω
L _l	Leakage Ind.	$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	—	10	15	μh
C _{WW}	Interwinding Cap.	$f = 140\text{kc}$	—	3.5	4	pf
f	Oper. Freq.	I _{PR} I = 10ma rms	50	—	—	kc
	D. C. Isolation V	Prim. to all term.	500	—	—	v

Physical Characteristics

Construction: TP - 5 outline package.
 Leads: Eight wire leads .017" dia., 3/4" min. length.

Typical Drive Circuitry

The self-contained transformer has a low frequency cut-off at approximately 50 kcs. Operation over the frequency carrier signal which is modulated by the chopper drive. in the circuit shown below a multivibrator is modulated by the drive and provides the required signal



Chopper drive signal gates the lmc clock. Chopper conducts in presence of lmc signal due to rectification by self-contained diode.

Remarks: The chopping frequency range can be extended to 1.5 mc by elimination of the multivibrator and by externally shorting pin numbers 6 and 7.

Q-DET-1
LEVEL DETECTOR, DIFFUSED SILICON, TYPE SN336A

Description: The SN336A Level Detector is a semiconductor network for application in digital computer, data handling, and control systems. It is a multi-stage amplifier using saturated techniques. The input stage is basically a Schmitt trigger which detects +0.62 volts and -0.62 volts. Reference voltages are set by the second stage common-emitter transistor. The output of the second stage is diode coupled back to the input stage for speed-up of the Schmitt action. A reset capability, E_r , is incorporated in the circuit which also has a strobe input, E_s , which allows detection of the output state.

Physical Characteristics

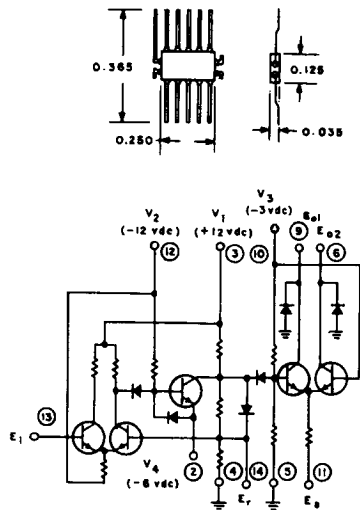
Construction: Semiconductor network mounted in a glass-to-metal hermetically sealed package.

Leads: Gold-plated Kovar.

External Surfaces: Metallic, isolated from leads and circuit.

Weight: 0.1 gram.

***Remarks:** Absolute maximum ratings are limits, above which, operation and life expectancy may be impaired.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Semiconductor-Components
 Div., Dallas 22, Texas

Specifications (Absolute max. ratings)*

Output Breakdown Voltage: 9 volts.

Input Breakdown Voltage: -9 volts.

Input Current: 1 ma.

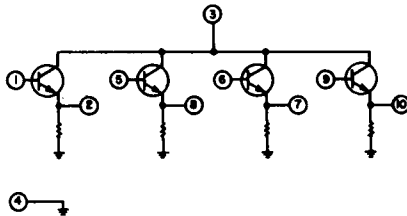
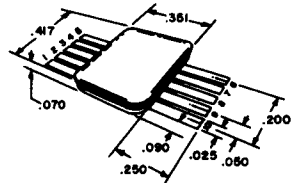
Power Dissipation: 150 mw.

Storage Temp Range: -65°C to +150°C.

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Q-EF-1
EMITTER FOLLOWER GATES, FOUR, TYPE 12, SERIES A

Description: The Type 12 circuit consists of four emitter follower gates for use in DCTL-type logic systems where low power dissipation, high packaging density, and reliability are of prime importance.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: CBS Labs, Stamford, Conn.

Electrical Characteristics

Max. Supply Voltage: 7 volts.
 Max. Oper. Temp: -55°C to +125°C.
 Max. Storage Temp: -55°C to +150°C.

Circuit Parameter	Min.	Typ.	Max.	Units
Pwr. Dissipation (ON Cond., $T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$):				
Per Stage	—	120	—	μw
Total Package	—	480	—	μw
Loading Per Stage				
$T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, Note 1):				
Fan-in (M), Note 2				
Fan-out (N)	—	—	25	—
Input Voltage At Any Input Term. That Will Ensure Logic 0 At Output ($T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, Note 3):	—	—	0.65	Volts

Circuit Parameter	Min.	Typ.	Max.	Units
Input Voltage At Any Input Term. That Will Ensure Logic 1 At Output ($T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, Note 4):	1.40	—	—	Volts
Output Voltage:				
Logic 0 Level ($T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, $V_{in} = 0.65\text{V}$)	—	—	0.30	Volts
Logic 1 Level ($T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, $V_{in} = 1.40\text{V}$, $N = 25$)	0.65	—	—	Volts
Propagation Delay Time ($t_{ON} + t_{OFF}$)/2: ($T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, $N = 1$, $f = 40\text{ kc}$, $PA = 1\text{V}$, $PW = 10\ \mu\text{sec}$)	—	—	4.0	μsec

Note 1: The number of logic input terminals which may be connected to a logic output terminal is limited by the condition that the sum of the Fan-in values of the driven stages must not exceed the Fan-out value of the driving stage.

Note 2: May be driven by unloaded Type 10 (see Q-NAND-2) circuit gate, or Type 11 circuit gate loaded with 1-Type 10 circuit gate or 1-Type 11 circuit gate.

Note 3: Logic 0 defined as low voltage (least positive).

Note 4: Logic 1 defined as high voltage (most positive).

Physical Characteristics

Construction: Passivated deposited thin-film elements and diffused and epitaxial transistors and diodes form a monolithic structure in a single silicon wafer which is mounted in a ceramic-to-metal hermetically sealed package.

Body: Gold plated.

Leads: Gold plated.

Weight: 0.35 gram.

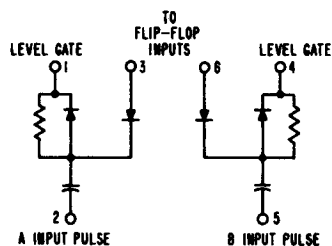
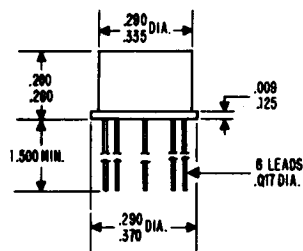
Remarks: Manufacturer states standards, methods, and procedures for quality and reliability are designed to meet or exceed requirements of MIL-Q-9858, NASA-NPC-200-3, and MIL-S-19500.

X-GTN-1 STEERING GATE, FLIP-FLOP, SILICON NANOCIRCUIT, NC-9

Description: The NC-9 is a steering gate which permits proper triggering of the NC-8C (refer) Flip-Flop Nanocircuit up to a maximum rate of 20 mc. It is used together with the NC-8C in binary counter, shift register and all other digital systems employing flip-flops. Employing planar passivated epitaxial microdiodes, as well as planar passivated resistors, the NC-9 Nanocircuit can replace many conventionally packaged steering gates.

TYPICAL BINARY COUNTER APPLICATION (See NC-8C)

TYPICAL SHIFT REGISTER APPLICATION (See NC-8C)



Note 1: For scale-of-two counter operation, tie A to B.

Note 2: For set-reset operation, drive A input and B input separately.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: General Instrument Semiconductor, Div. of General Instrument Corp., Newark, N. J.

Specifications

All values are nominal design centers at 25°C.

Min. Ampl. of Input Pulse: 3 volts (negative going).

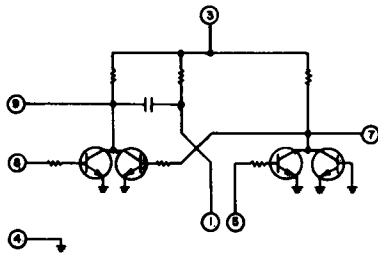
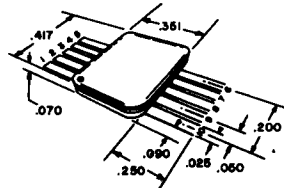
Max. Rep. Rate for Binary Operation: 20 megacycles.

Min. Pulse Width: 25 nano-seconds.

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**Q-MMV-1
MONOSTABLE MULTIVIBRATOR, "SINGLE-SHOT"
ADJUSTABLE TIMING, TYPE 15, SERIES A**

Description: The Type 15 circuit is a "Single-Shot" Monostable Multivibrator designed for use in DCTL-type logic systems where low power dissipation, high packaging density, and reliability are of prime importance.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: CBS Labs, Stamford, Conn.

Electrical Characteristics

- Max. Supply Voltage: 7 volts.
- Max. Input Voltage: 7 volts.
- Max. Oper. Temp: -55°C to +125°C
- Max. Storage Temp: -55°C to +150°C.

Circuit Parameter	Min.	Typ.	Max.	Units
Pwr. Dissipation				
$T_A = 25^\circ C, V_{CC} = 3V$:	—	408	—	μw
Loading ($T_A = 25^\circ C, V_{CC} = 3V$, Note 1):				
Fan-in (M)	—	—	5	—
Fan-out (N)	—	—	25	—
Input Voltage That Will Ensure Logic 0 At Output ($T_A = 25^\circ C, V_{CC} = 3V$, Note 2):				
	—	—	0.30	Volts
Input Voltage That Will Ensure Logic 1 At Output ($T_A = 25^\circ C, V_{CC} = 3V$, Note 3):				
	0.65	—	—	Volts
Output Voltage ($T_A = 25^\circ C, V_{CC} = 3V$):				
Logic 0 Level ($V_{in} = 0.30V$)	—	—	0.30	Volts
Logic 1 Level ($V_{in} = 0.65V, N = 25$)	0.65	—	—	Volts
Output Pulse Width — t_o (Note 4):				
Type 15-1	7	10	13	μsec
Type 15-2	14	20	26	μsec
Type 15-3	21	30	39	μsec

Note 1: The number of logic input terminals which may be connected to a logic output terminal is limited by the condition that the sum of the Fan-in values of the driven stages must not exceed the Fan-out value of the driving stage.

Note 2: Logic 0 defined as low voltage (least positive).
Note 3: Logic 1 defined as high voltage (most positive).

Note 4: The Type 15 circuit is supplied as either 15-1, 15-2, or 15-3 with typical output pulse durations of 10, 20, and 30 microseconds, respectively. Exact pulse durations for particular applications can be obtained by external capacitor and/or trimming. For this purpose, terminals 1, 5, and 9 are utilized. Terminals 1 and 5 must be electrically connected together for circuit operation for internal timing control. For complete external timing control (independent of internal RC time), terminals 3, 5, and 9 are utilized.

Physical Characteristics

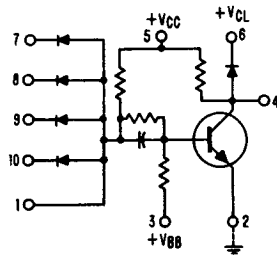
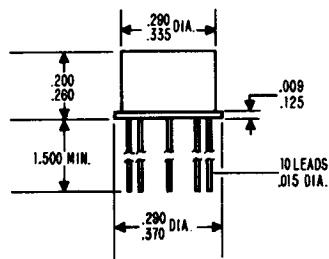
Construction: Passivated deposited thin-film elements and diffused and epitaxial transistors and diodes form a monolithic structure in a single silicon wafer which is mounted in a ceramic-to-metal hermetically sealed package.
Body: Gold plated.
Leads: Gold plated.
Weight: 0.35.

Q-NAND-1
NAND GATE, SILICON NANOCIRCUIT, NC-11

Description: The NC-11 digital NAND-Gate is capable of operation up to 15 mc with a fan-in of four and provision for increased fan-in by an external connection. Featuring a clamped output to define the output level, the NC-11 is widely used in digital logic systems, instrumentation and in general switching service. Employing planar passivated epitaxial microtransistors and microdiodes, as well as planar passivated resistors, the NC-11 can replace many conventionally packaged inverters.

- *Output Falling Slope: 12 nano-seconds
- **Output Rising Slope: 16 nano-seconds
- **Output Falling Slope: 12 nano-seconds
- *Propagation Delay: 8 nano-seconds
- Max. Fan-Out: 4 NC-10 (refer) NOR gates or 5 NC-11 NAND gates.

- *When driven by NC-11 and driving one NC-11 NAND gate.
- **When driven by NC-11 and driving one NC-10 (refer) NOR gate.



8-4-2-1 B.C.D. TO DECIMAL TRANSLATOR MATRIX

LOGIC TABLE

DEC. NO.	BINARY			
	8	4	2	1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

"DON'T CARE" CONDITIONS (SHOWN DOTTED, MAY BE OMITTED AT OPTION OF USER).

Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: General Instrument Semiconductor, Div. of General Instrument Corp., Newark, N.J.

Specifications

All values are nominal design centers at 25°C.

VCC: +12 volts

VCL: +4.2 volts

VBB: -3.0 volts

Logic Levels: +0.3 volt and +5 volts

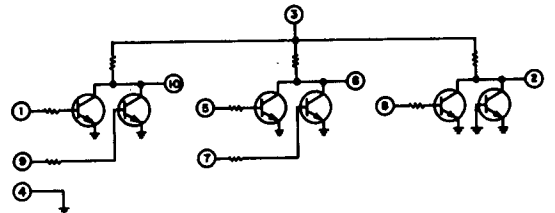
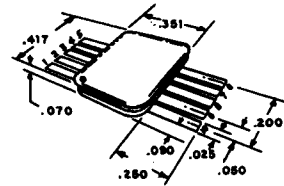
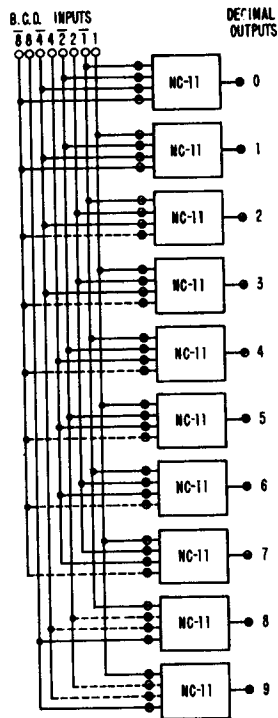
Max. Inward Drive Avail: 15 ma at 0.3 volts

Max. Power Dissipation: 60 milliwatts

*Max. Rep. Rate: 15 megacycles

*Output Rising Slope: 16 nano-seconds

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**Q-NAND-2
NAND (OR NOR) - GATE AND INVERTER, TYPE 10,
SERIES A**

Description: The Type 10 circuit consists of a dual "NAND" or "NOR" gate and inverter gate designed for use in DCTL-type logic systems where low power dissipation, high packaging density, and reliability are of prime importance.

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: CBS Labs, Stamford, Conn.

Electrical Characteristics

- Max. Supply Voltage: 7 volts.
- Max. Input Voltage: 7 volts.
- Max. Oper. Temp: -55°C to +125°C.
- Max. Storage Temp: -55°C to +150°C.

Circuit Parameter	Min.	Typ.	Max.	Units
Pwr. Dissip. (ON Cond., TA = 25°C, VCC = 3V):				
Per Logic Stage	-	60	-	μw
Total Package	-	180	-	μw
Loading/Logic Stage (TA = 25°C, VCC = 3V, Note 1):				
Fan-in (M)	-	-	1	-
Fan-out (N)	-	-	5	-
Input Voltage At Any Term. That Will Ensure Logic 0 At Output (TA = 25°C, VCC = 3V, Note 2):				
	0.65	-	-	Volts
Input Voltage At Any Input Term. That Will Ensure Logic 1 At Output (TA = 25°C, VCC = 3V, Note 3):				
	-	-	0.30	Volts
Output Voltage: Logic 0 Level (TA = 25°C, VCC = 3V, Vin = 0.65V)				
	-	-	0.30	Volts

Circuit Parameter	Min.	Typ.	Max.	Units
Logic 1 Level ($T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, $V_{in} = 0.30\text{V}$, $N = 5$)	0.65	--	--	Volts
Propagation Delay Time ($t_{ON} + t_{OFF}$)/2: ($T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, $N = 1$, $f = 40\text{ kc}$, $P_A =$ 1V , $P_W = 10\ \mu\text{sec}$)	--	--	3.0	μsec

Note 1: The number of logic input terminals which may be connected to a logic output terminal is limited by the condition that the sum of the Fan-in values of the driven stages must not exceed the Fan-out value of the driving stage.

Note 2: Logic 0 defined as low voltage (least positive).

Note 3: Logic 1 defined as high voltage (most positive).

Physical Characteristics

Construction: Passivated deposited thin-film elements and diffused and epitaxial transistors and diodes form a monolithic structure in a single silicon wafer which is mounted in a ceramic-to-metal hermetically sealed package.

Body: Gold plated.

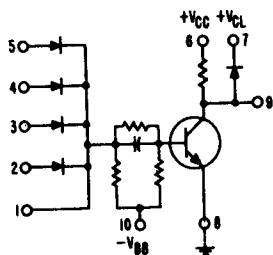
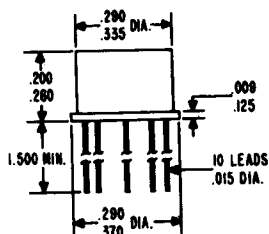
Leads: Gold plated.

Weight: 0.35 gram.

Remarks: Manufacturer states standards, methods, and procedures for quality and reliability are designed to meet or exceed requirements of MIL-Q-9858, NASA-NPC-200-3, and MIL-S-19500.

Q-NOR-1
NOR-GATE, SILICON NANOCIRCUIT, NC-10

Description: The NC-10 digital NOR-Gate is capable of operation up to 12 mc with a fan-in of four and provision for increased fan-in by an external connection. Featuring a clamped output to define the output level, the NC-10 is widely used in digital logic systems, instrumentation and in general switching service. Employing planar passivated epitaxial microtransistors and microdiodes, as well as planar passivated resistors, the NC-10 Nanocircuit can replace many conventionally packaged inverters.

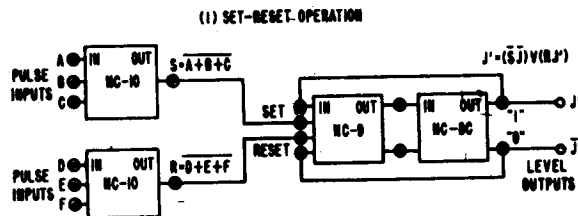


- *Max. Rep. Rate: 12 megacycles
- *Output Rising Slope: 22 nano-seconds
- *Output Falling Slope: 16 nano-seconds
- **Output Rising Slope: 16 nano-seconds
- **Output Falling Slope: 12 nano-seconds
- *Propagation Delay: 8 nano-seconds
- Max. Fan-Out: 4 NC-

*When driven by NC-10 and driving one NC-10 NOR gate.
**When driven by NC-10 and driving one NC-11 (refer) NAND gate.
Oper Temp Range: -55°C to +125°C.

NOR GATE AS FLIP-FLOP DRIVER

The illustrations below illustrate suggested applications of the NC-10 NOR-Gate in a compatible system with the NC-9 (refer) steering gate and the NC-8 (refer) Flip-Flop. Two triggering arrangements are described: (1) Set-Reset Operation and (2) Toggle or Binary Operation.



Positive Logic Convention:

- High, True or "1" states are represented by upper case letter symbols.
- Low, False or "0" states are represented by a Bar drawn above letter symbols.
- J represents the "1" level output of the NC-8C (refer) Flip-Flop before the arrival of any set or reset pulses.
- J̄ represents the "0" level output of the NC-8C (refer) Flip-Flop before the arrival of any set or reset pulses.
- J' represents the "1" level output of the NC-8C (refer) Flip-Flop after having been set.
- J̄' represents the "0" level output of the NC-8C (refer) Flip-Flop after having been set.
- S̄ represents the set pulse (transition from "1" to "0").
- S represents the absence of a set pulse ("1" level).
- R̄ represents the reset pulse (transition from "1" to "0").
- R represents the absence of a reset pulse ("1" level).
- + represents logical "OR".
- V represents the continuance of a prescribed state.

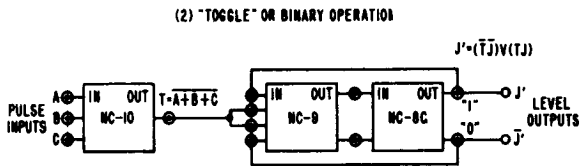
The logical statement describing the output of the Flip-Flop is: - The output will change to a "1" whenever there is a coincidence of a Set pulse ("1" to "0" transition) and an existing "0" level output and will remain in the "1" state until the application of a Reset input (transition from "1" to "0").

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: General Instrument Semiconductor, Div. of General Instrument Corp., Newark, N. J.

Specifications

- All values are nominal design centers at 25°C.
- VCC: +12 volts
- VCL: +4.2 volts
- VBB: -3.0 volts
- Logic Levels: +0.3 volt and +5 volts
- Max. Outward Drive Avail.: 6.5 ma at 5 volts
- Max. Power Dissipation: 170 milliwatts



SET and RESET input terminals of NC-9 (refer) are tied together externally.

\bar{T} represents the Binary input pulse ("1" to "0" transition) which changes the state of the NC-8C (refer) flip-flop each time it is applied.

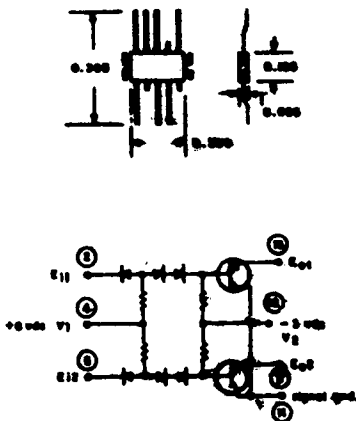
T represents the absence of an input pulse to the NC-9 (refer) ("1" level).

Other symbology same as connection (1).

The logical statement for this is: - The output will change to a "1" whenever there is a coincidence of an input pulse ("1" to "0" transition) and an existing "0" level output and will remain in that "1" state until the application of another input pulse ("1" to "0" transition). Conversely, the output level will change from a "1" to a "0" whenever an input pulse is applied and will remain in the "0" state until the application of another input pulse.

Q-SW-1
LOW LEVEL SWITCH, DIFFUSED SILICON, TYPE SN340A

Description: The SN340A Low Level Switch is a semiconductor network for application in digital computer, data handling, and control systems. It is a dual switching device utilizing diode inputs coupled to common collector NPN output transistors. An input level of +3.0 volts dc causes the corresponding output to be in the conducting or "true" state; an input level of +0.35 volts dc causes the corresponding output to be in the nonconducting or "false" state.



Quality Assurance: Manufacturer's claims
 Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Semiconductor-Components

Specifications (Absolute max. ratings)*

Output Breakdown Voltage: 2 volts.
 Input Breakdown Voltage: 7 volts.
 Output Current: 1 ma.
 Power Dissipation: 50 mw.
 Storage Temp Range: -65°C. to +150°C.

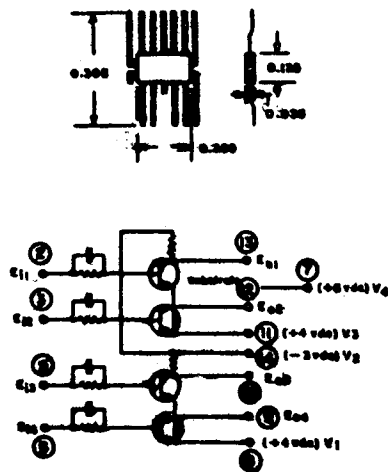
Physical Characteristics

Construction: Semiconductor network mounted in a glass-to-metal hermetically sealed package.
 Leads: Gold-plated Kovar.
 External Surfaces: Metallic, isolated from leads and circuit.
 Weight: 0.1 gram.

***Remarks:** Absolute maximum ratings are limits, above which, operation and life expectancy may be impaired.

Q-SW-2
WRITE SWITCH, DIFFUSED SILICON, TYPE SN345A

Description: The SN345A Write Switch is a semiconductor network for application in digital computer, data handling, and control systems. It has four circuits of one input and output each which can serve as a buffer, driver, or switch. An input of 0 volts causes a corresponding output of +6 volts causes an output of -6.3 volts.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Semiconductor-Components
 Div., Dallas 22, Texas

Specifications (Absolute max. ratings)*

Output Breakdown Voltage: 10.8 volts.
 Input Breakdown Voltage: 9 volts.
 Input Current: 2.4 ma.
 Output Current: 25 ma.
 Power Dissipation: 122 mw.
 Storage Temp. Range: -65°C. to +150°C.

Physical Characteristics

Construction: Semiconductor network mounted in a glass-to-metal hermetically sealed package.
 Leads: Gold-plated Kovar.
 External Surfaces: Metallic, isolated from leads and circuit.
 Weight: 0.1 gram.

***Remarks:** Absolute maximum ratings are limits, above which, operation and life expectancy may be impaired.



UNCLASSIFIED

NAVSHIPS 0967-031-1010

SUPPLEMENT 1 TO NAVSHIPS 0967-031-1000

HANDBOOK

of

MINIATURE PARTS AND
INTEGRATED CIRCUIT DEVICES
FOR
ELECTRONIC EQUIPMENT

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

UNCLASSIFIED

Publication: APRIL 1966

INTRODUCTION

Scope

This supplement to the Handbook of Miniature Parts and Integrated Circuit Devices for Electronic Equipment, NAVSHIPS 0967-031-1000, provides information on many of the latest items which have been developed and are available from suppliers. These items are additions to the handbook.

Extracts from this supplement may be made in the preparation of other Government publications without reference to the Bureau of Ships.

Procurement

Requests from the Navy for the handbook, and supplements thereto, should be made to the Naval Supply Depot, Philadelphia, Pa., in accordance with instructions contained in NAVSANDA 2002, Requisitioning Guide and Index of Forms and Publications. Requests from Industry should be made to Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., 20402.

Arrangement

Arrangement of this supplement is the same as that of the Handbook of Miniature Parts and Integrated Circuit Devices for Electronic Equipment. It is divided into two parts; Part I contains the description and illustration of discrete miniature electronic components, and Part II contains the description and illustration of integrated circuit devices. An explanation of the presentation of material within each part is given at the beginning of each part.

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Motor, DC, P. M.	B107	2
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Capacitor, Trimmer, Ceramic	C511	4
Rectifier, Silicon	CR202	4
Relay, Electromagnetic	K123	6
Relay, Time Delay	K303	6
Relay, Time Delay	K304	7
Relay, Time Delay	K305	9
Relay, Time Delay	K306	9
Relay, Thermal	K307	10
Relay, Reed	K504	11
Relay, Reed	K505	12
Relay, Bi-Reed	K506	12

Quality Assurance

Each item listed contains a "Quality Assurance" statement to indicate the basis of the claims made concerning the item. Except where special cases require variation, this statement will assume one of the following forms:

- (a) Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.
- (b) Quality Assurance: Per specification MIL Bureau approval required prior to use.
- (c) Quality Assurance: Per specification MIL Preferred part per MIL-STD-242.

PART I—MINIATURE PARTS

Reference Designations

Miniature Parts are identified by reference designations for convenience in referencing when correspondence concerning these parts is necessary. Each reference designation consists of one or more capital letters followed by a number. The letter portion of the designation indicates the type of part (capacitor, resistor, etc), and the number portion distinguishes the particular part from all others of the same type.

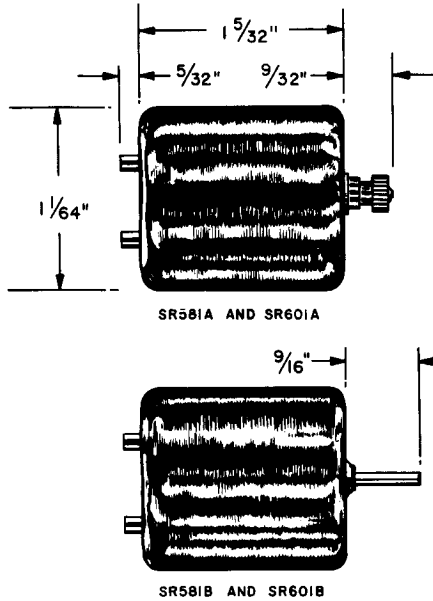
A series of 99 reference designations is assigned to each type of part listed. For example, the series C101 through C199 is assigned to Capacitors, Tubular; and the series C201 through C299 is assigned to Capacitors, Electrolytic.

Type of Part	Reference Designator	Page No.
Indicator, Elapsed Time	M102	13
Meter, Side Indicator	M202	14
Gear Reduction Unit	MP101	14
Gear Reduction Unit	MP102	17
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Switch, Pressure-Alt.	S1003	20
Thermostat, Bimetal Disc	S1106	21
Thermostat, Snap Action	S1107	21
Thermostat, Snap Action	S1108	22

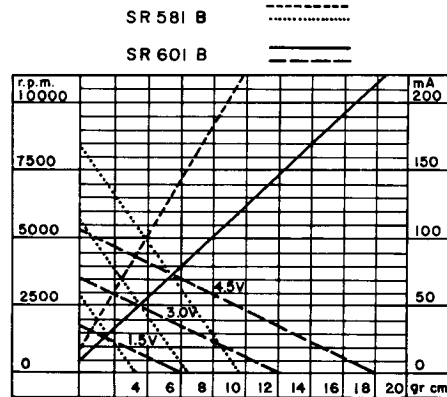
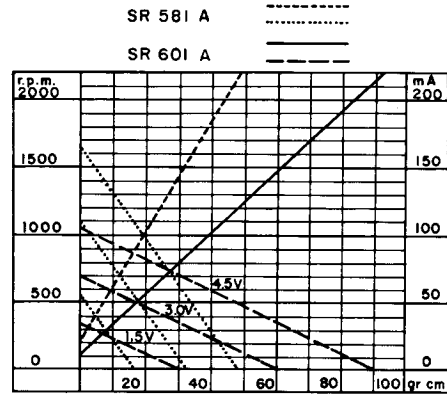
PREPARED BY
PHILCO CORPORATION
TECHREP DIVISION
FT. WASHINGTON, PA.
CONTRACT NO. N600(24)64161

**B106
MOTOR, DC, PERMANENT MAGNET, UNGOVERNED
MODELS SR**

Application: Wherever small size, minimal current consumption, and r.p.m. with moderate voltage are of prime importance. Particularly suitable in power zoom, remote control system, servomechanism, tachometer, and signaling applications.



Power Consumption: Without torque, about 10 mw at 1.5 volts.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Incabloc Corp., Micromotors Div., New York, N. Y.

Electrical Characteristics

Model	SR581A	SR581B	SR601A	SR601B
Supply V	1.5-4.5v	1.5-4.5v	1.5-6v	1.5-6v
Maximum V	6v	7.5v	7.5v	7.5v
No Load Cur.	≤12 ma	≤12 ma	≤8 ma- 4.5v	≤8 ma
Coils Resist.	20-22 ohm	20-22 ohm	20-22 ohm	20-22 ohm
Mom. of Inertia	150g cm ²	6g cm ²	150g cm ²	6g cm ²
Time Constant	0.92 sec	0.92 sec	0.35 sec	0.35 sec
Tacho-generator	2.6v- 1000 rpm	0.55v- 1000 rpm	4.3v- 1000 rpm	0.9v- 1000 rpm

Physical Characteristics

- Stator: Permanent cylindrical magnet with two high-intensity poles.
- Rotor: Inducted without iron by three coils shaped in annular segments assembled in a cylindrical plastic housing.
- Collector Material: Palladium silver.
- Brush Material: Palladium silver.
- Rotation: Clockwise (normally).
- Reductor (A Types): 4.8 to 1 (Others available as an attachment on both types—add 1/2" to housing length.)
- Bearings: Sintered bronze, self oiling.
- Shaft: Steel, black-polished.
- Drive Pinion (A Type): 14 teeth.
- Modulus (A Types): 0.3 involute gear ↯ 20°
- Enclosure: Permanently sealed.

Test Data

Life (Avg.): 3,000 hr. at 3 volts; 5,000 hr. at 1.5 volts.

Physical Characteristics

Stator: Permanent cylindrical magnet with two high-intensity poles.

Rotor: Inducted without iron by three coils shaped in annular segments assembled in a cylindrical plastic housing.

Collector Material: Palladium silver.

Brush Material: Palladium silver.

Rotation: Clockwise (normally).

Reductor (A Types): 4.8 to 1 (Others available as an attachment on both types—add 1/2" to housing length.)

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Shaft: Steel, black-polished.

Drive Pinion (A Type): 14 teeth.

Modulus (A Type): 0.3 involute gear ∇ 20%.

Enclosure: Permanently sealed.

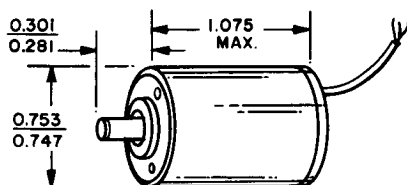
Test Data

Life (Avg.): 3,000 hr. at 3 volts; 5,000 hr. at 1.5 volts.

Remarks: At a given voltage, the rpm is inversely proportional to the torque. The graphs above illustrate the relationship of the rpm to the voltage and the torque.

B108**MOTOR, DC STEPPER, VARIABLE RELUCTANCE TYPE, "KILO-STEPPER" MODEL 8S10D-99**

Application: Ship position plotters, digital tuners for klystrons, tape punching machines, binary/decimal encoders/decoders, scanners...nearly all applications requiring mechanical response to electrical input.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: American Electronics, Inc., Fullerton, Calif.

Electrical Characteristics

Oper Voltage: 28 volts dc (pulses) \pm 10%.

Current: 0.151 amp.

DC Resistance: 186 ohms.

Operation: Employs electromagnetic (low retentivity) rotors which cannot simultaneously align all poles with stator poles.

Radio Interference: None. RFI characteristics resemble that of an AC motor.

Supplement 1—April 1966

Duty Cycle: Continuous, with no more than one winding excited at one time.

Mechanical Characteristics

Torque: 0.74 in.-oz. at 15° displacement between rotor pole and nearest energized field pole.

Rotor Inertia: 0.184 gm cm².

Rotor Configuration: Eight poles at 45° intervals.

Stator Configuration: Twelve poles at 30° intervals.

Step Angle: 15°.

Stepping Rate: 0 to 1,000 steps/sec.

Physical Characteristics

Weight: 1.5 oz.

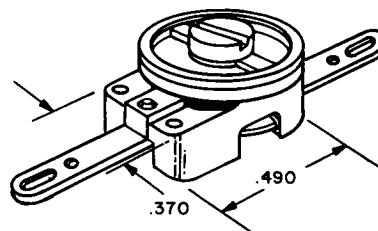
Leads: Four, color-coded.

Lead Length: 12" min.

Remarks: Stepping is achieved by passing current through either winding not aligned with the rotor poles. The direction of rotation is a function of the sequence in which stator poles are energized, not of polarity. Both reed relays and transistors are used to rotate the stator field, but transistors are preferred for the higher speeds.

C510**CAPACITOR, TRIMMER, CERAMIC, MINIATURE STYLE 539**

Application: Designed for point-to-point wiring.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Erie Technological Prod., Inc., Erie, Pa.

Electrical Characteristics

Capacitance and Temp Coeff: NPO—1.5 to 8 pf and 4.0 to 15 pf; N650—4 to 20 pf and 8 to 35 pf; N1500—15 to 60 pf. Initial "Q" at 1 MC: 500 minimum.

Working Voltage: NPO—350 VDCW at 85°C, 200 VDCW at 125°C; N650 and N1500—200 VDCW at 85°C, 100 VDCW at 125°C.

Electrical Characteristics

Absolute Max. Ratings: See table below.

Resistive and Inductive Loads—Single Phase Half Wave 60 cps

	1N3938	1N3939	1N3940
Peak Reverse Voltage	200 v	400 v	600 v
Avalanche Bkdn. Volt. Rge. at 0.05 ma dc and 25°C (Fig. 1)	240–500 v	480–750 v	720–1000 v
RMS Input Voltage	140 v	280 v	420 v
DC Blocking Voltage	200 v	400 v	600 v
Avg. Fwd. Current— at 25°C	2.0 amps	2.0 amps	2.0 amps
(Fig. 2)—at 85°C	1.3 amps	1.3 amps	1.3 amps
—at 150°C	0.5 amp	0.5 amp	0.5 amp
Peak Surge Current—1/2 Cycle Non-recurrent at 25°C—No Load	70 amps	70 amps	70 amps
at 85°C—Superimposed on full load (Fig. 3)	30 amps	30 amps	30 amps

Max. Peak Forward Voltage Drop (6.0 Amps Peak at 25°C): 1.1 volts.

Max. Reverse Current (Full Cycle Average): At 1.3 amps average and 85°C—200 μ a; at 0.5 amps average and 150°C—200 μ a.

Max. DC Reverse Current at Rated DC Blocking Voltage: At 25°C—5 μ a; at 150°C—500 μ a.

Avalanche Voltage Slope— Δ BV (5 μ a to 50 μ a) at 25°C (Fig. 1); Maximum—10 volts; typical—3 volts.

Typical Thermal Impedance (Junction to Air): 85°C per watt.

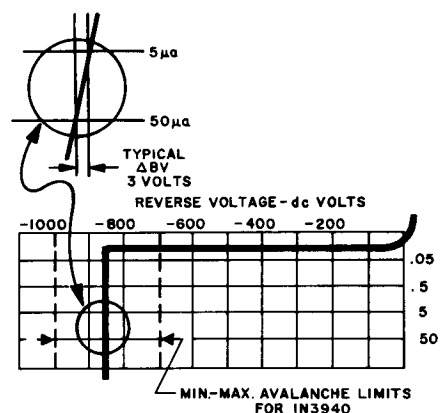


FIG. 1

RATINGS ARE BASED ON CONNECTIONS TO THE DIODE 3/8" TO 1/2" FROM THE DIODE BODY AT A MAXIMUM TEMPERATURE 5°C ABOVE THE AMBIENT TEMPERATURE.

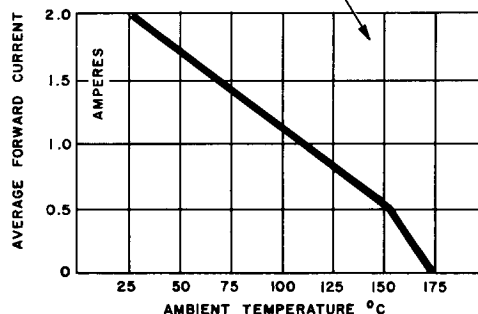


FIG. 2

MAXIMUM FORWARD CURRENT vs AMBIENT TEMP. FOR SINGLE PHASE HALF WAVE 60 CPS, RESISTIVE INDUCTIVE LOAD.

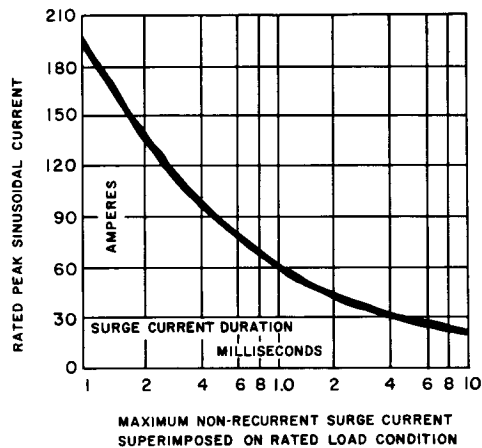


FIG. 3

MAXIMUM NON-RECURRENT SURGE CURRENT SUPERIMPOSED ON RATED LOAD CONDITION

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The chart above describes which values will provide any desired delay period, as well as the adjustability for a given delay.

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Bourns, Inc., Trimpot Div., Riverside, Calif.

Electrical Characteristics

Input Oper Volt Range: 20-30 volts, dc.
 Drop-Out Volt Range: 2-14 volts, dc.
 Current After Pickup, at 30 VDC (Max.): 0.06 amp
 Contact Arrangement: DPDT
 Contact Rating: 1.0 amp resistive at 26.5 volts, dc.
 Contact Resistance, Initial (Max.): 0.200 ohm.
 Release Time: 0.010 sec. max. including bounce
 Insulation Resistance: 1000 megohms min. at 100 volts, dc.
 Dielectric Strength: 500 volts, rms at sea level; 350 volts, rms at 1.3" Hg.
 Transient Protection: Transients up to ±200% of line voltage and of .5 millisecc duration will not affect timing characteristics up to the 90% point of time delay.

Timing Characteristics

Time Delay Range: With the addition of external resistor or resistor-capacitor combination, the following time delays can be achieved:

Range (sec.)	External Comp.	
	*R(ohms)	**C(μf)
0.1 to 1.5	0	None
1.5 to 15	Approx. 28K/sec.	None
15 to 80	Approx. 6.5K/sec.	110
15 to 200	Approx. 2.4K/sec.	350

*External resistors to meet MIL-R-10509D, Char. T-O. Max. recommended external resistance, 500K. (150 PPM/°C, max., 1/10 watt)

**External capacitors to meet MIL-C-3965/4B. (10 working volts at 125°C, tantalum)

Repeat Accuracy: 1.0% max.
 Recycle Error:

Off Time	Delay Error
1 sec.	0 to -5%
0.5 sec.	0 to -10%
0.01 sec.	0 to -25%
20 millisecc	±1%

Physical Characteristics

Weight: 0.8 oz., approx.
 Finish: Meets MIL-R-5757D.

Terminal Types: H— .48" long pins (shown); L—1.48" long wire leads; J—solder hooks.
 Terminal Strength: 3 ± 0.5 lb.
 Internal Adjustment: 25 ± 2 turns.

Environmental Conditions

Oper Temp Range: -55°C to +120°C.
 Salt Spray: Meets MIL-R-5757D.
 Moisture Resistance: MIL-R-5757D
 Insulation Resistance (Moisture): 100 megohms, min.
 Repeatability (Change in delay as result of environmental change): ±5%, max.

Test Data

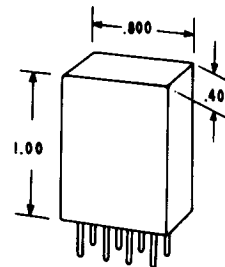
Vibration: 20g, 10 to 2000 cps.
 Contact Opening: 10 microseconds, max.
 Shock: 75g, 11 milliseconds duration.
 Life: 100,000 operations.
 Contact Resistance After Life: 0.35 ohm.

Remarks: Manufacturer claims unit will meet or exceed all applicable electrical and environmental requirements of MIL-R-5757D.

K304 RELAY, TIME DELAY, ADJUSTABLE, SPSTNO SOLID STATE SWITCH, MODEL 3907 TRIMPOT

Application: Provides complete versatility by incorporating the means by which external resistors and capacitors may be added for the desired time delays.

Cut 15



Environmental Conditions

Oper Temp Range: -55°C to $+120^{\circ}\text{C}$.
 Salt Spray: Meets MIL-R-5757D.
 Moisture Resistance: MIL-R-5757D.
 Insulation Resistance (Moisture): 100 megohms, min. after exposure.
 Repeatability (Change in delay as result of environmental change): $\pm 5\%$, max.

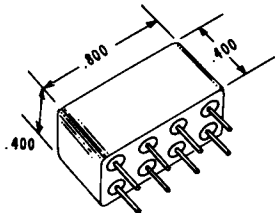
Test Data

Vibration: 20g, 10 to 2000 cps.
 Shock: 150g, 11 milliseconds duration.
 Life: 1,000,000 operations min., mounted to a 4" x 4" x .05" thick heat sink, at 85°C .

Remarks: Remote timing adjustment of unit is possible by installing a Trimpot Potentiometer in its timing circuit.

K305**RELAY, TIME DELAY, SOLID STATE, TYPE QR**

Application: A high speed recovery circuit permits the Type QR to be used in applications where high speed recycling is necessary.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Branson Corp., Whippany, New Jersey

Electrical Characteristics

Oper Voltage: 20-32 volts, dc.
 Time Delay Range (Sec.): 01—.010 to .100; 02—.050 to .500; 03—.500 to 60.
 Time Delay Tolerance: $\pm 10\%$ under most adverse conditions of temperature, voltage, shock, vibration and acceleration ($\pm 5\%$ available on special order).
 Power Requirements: Less than .75 watt exclusive of load to be switched.
 Switching Capacity: Single pole normally open (non-isolated) solid state switch rated at 100 ma, 20 to 32 volts, dc.
 Contact Voltage Drop: 1.5 volt nominal at rated load.
 Insulation Resistance: 100 megohms at 100 volts, dc.

Dielectric Strength: 1000 volts, dc between all terminals and case.
 Recovery Time: 500 milliseconds

Physical Characteristics

Case Styles: A-plain (shown); B-ear bracket.
 Header Styles: A-solder hooks; B-plug-in (shown); C-3" leads.
 Weight: Less than 10 grams.
 Volume: 0.13 cu. in.
 Enclosure: Hermetically sealed.

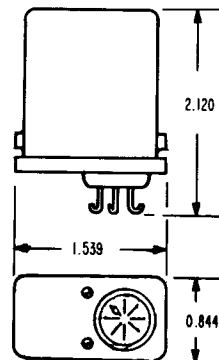
Test Data

Life: In excess of 100,000 operations.
 Vibration: 10 to 2000 cps at 20g.
 Shock: 5g, 11 milliseconds

Environmental Conditions

Temp Range: -55°C to $+100^{\circ}\text{C}$ (-65°C to $+125^{\circ}\text{C}$ available on special order).

Remarks: Manufacturer states timing accuracy over a wide range of temperature and voltage is assured by a built-in regulator and filter which also eliminates triggering and timing errors as a result of normal line transients.

K306**RELAY, TIME DELAY, SUBMINIATURE, TYPE MTRH4**

Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Branson Corp., Whippany, New Jersey

Environmental Conditions

Temp Compensation: Compensated for ambient variations from -55°C to 100°C. For operation over this range the operating tolerance should be increased as indicated in table above.

Vibration: 5-55 cycles, 0.03 in amplitude (total excursion of 0.06 in.).

Shock: 50 g's.

Altitude: To 70,000 ft.

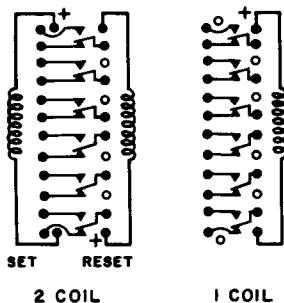
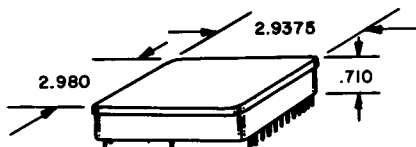
Salt Spray: 50 hr.

Test Data

Dielectric Strength: 1000 volts peak between heater, contacts, and shell; 500 volts peak across open contacts.
Insulation Resistance: 100 megohms, min to 100 volts dc.

Remarks: Thermal time delay relays operate on heating effect and therefore the time delay may be controlled by varying the applied heater voltage. This enables the relay to be used in many special circuit applications. For precise adjustment of time delay or voltage sensing, it is possible to use this characteristic by insertion of a rheostat in series with the heater. In order to obtain the highest reliability and stability of operation, the "S" Series relays are not set to provide time delays in excess of 120% of the time constant except for special application.

**K504
RELAY, REED, MAGNETIC LATCH, 6 POLE, TYPE
RRLM6CM**



Quality Assurance: Manufacturer's claims.
Bureau Approval required prior to use.

Mfr: Struthers-Dunn, Inc., Pitman, New Jersey.

Electrical Characteristics

Coil Voltage: 6, 12, 24 and 48 volts.

Coil Resistance (Ohms): Single coil-48, 192, 768, 3070;
2 coil-20, 80, 320, 1280.

Must Operate (OR Reset) Voltage: 4.8, 9.6, 19.2, 38.4, volts at 25°C.

Must Not Operate (NOR Reset) Voltage: 2, 4, 8, 16, volts at 25°C.

Operate (OR Reset) Time, Including Bounce At Nominal Voltage: 3.5 msec, max at 25°C.

Bounce Time At Nominal Voltage: 1.5 msec, max at 25°C.

Contact Rating: 15 VA max; 1 amp max; 250 volts max.

Contact Life: 10,000,000 at max rating; 20,000,000 at 1/2 max rating; 35,000,000 at low level.

Contact Resistance: Initial-50 milliohms max; end of life-500 milliohms max.

Physical Characteristics

Terminals: 0.030 dia soft copper pins, 3/16" long.

Mounting: Two 0.035 dia hold-down wires.

Grid Spacing: 0.200".

Construction: Encapsulated, magnetically shielded reed switch.

Environmental Conditions

Oper Temp Range: -55°C to +85°C.

Storage Temp Range: -55°C to +125°C.

Test Data

Insulation Resistance (25°C): 1000 megohms min.

Dielectric Withstanding Voltage: 300 volts rms, 60 cps, across open contacts; 500 volts rms, 60 cps, between all other mutually insulated points.

Shock: 20 g's with no contact chatter; 60 g's with no contact transfer.

Vibration: 30 g's to 1200 cps; 20 g's to 200 cps.

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Operate Time-Release: 0.5 msec.
Coil Resistance: See table below.

1PNO	2PNO 1PNC	3PNO 2PNC 1PNO + 1PNC
6V-70 ohms	6V-45 ohms	6V-30 ohms
12V-280 ohms	12V-170 ohms	12V-120 ohms
28V-1500 ohms	28V-900 ohms	28V-640 ohms
48V-4100 ohms	48V-2600 ohms	48V-1900 ohms

4PNO 1PNO + 2PNC 2PNO + 1PNC	5PNO 3PNC 2PNO + 2PNC 3PNO + 1PNC	6PNO 4PNC 1PNO + 3PNC 3PNO + 2PNC 4PNO + 1PNC
6V-23 ohms	6V-19 ohms	6V-16 ohms
12V-94 ohms	12V-77 ohms	12V-65 ohms
28V-500 ohms	28V-410 ohms	28V-350 ohms
48V-1470 ohms	48V-1000 ohms	48V-1025 ohms

Physical Characteristics

Terminals: 0.022 dia. wire leads 0.090" long.
Terminal Spacing: 0.100".
Terminal Finish: Tin plated, standard; unfinished or gold plated, special.
Construction: Magnetically shielded.
Case: Molded epoxy case sealed with epoxy.

Environmental Conditions

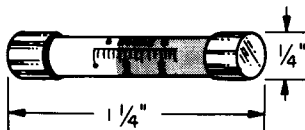
Temp. Range: -55°C to +125°C.

Test Data

Shock: 50 g's, min.
Vibration: 15 g's-2000 cps, min. Coil energized or de-energized.

M102 INDICATOR, ELAPSED TIME, "CHRONISTOR"

Application: Where an indication is required of the total number of hours during which an electronic equipment, or component has been in operation. Space occupied is equivalent to that of a 3AG cartridge fuse.



0967-031-1010

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Bergen Laboratories, Inc., Paterson, N. J.

Electrical Characteristics

Part No.	100-3.4	250-1.36	500-0.68	1000-0.34
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Full Scale Hr.	100	250	500	1000
Series R*	294E	736E	1470E	2940E
Current (ma)	3.4	1.36	0.68	0.34
Avail DC Volts				

	Nearest Standard Series Res. (ohms)			
6	1500	4700	8600	18K
12	3600	8600	18K	36K
26	7500	20K	39K	75K
48	15K	36K	68K	150K
100	30K	75K	150K	300K
115	33K	86K	180K	330K
150	47K	110K	220K	470K
200	56K	150K	300K	560K
250	68K	180K	360K	680K
300	86K	220K	470K	860K
500	150K	360K	750K	1.5M

Part No.	2500-0.136	5000-0.068	10000-0.034
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Full Scale Hr.	2500	5000	10,000
Series R*	7350E	14,700E	29,400E
Current (ma)	0.136	0.068	0.034
Avail DC Volts	Nearest Standard Series Res. (ohms)		
6	47K	86K	180K
12	86K	180K	360K
26	200K	390K	750K
48	360K	680K	1.5M
100	750K	1.5M	3M
115	860K	1.8M	3.3M
150	1.1M	2.2M	4.7M
200	1.5M	3M	5.6M
250	1.8M	3.6M	6.8M
300	2.2M	4.7M	8.6M
500	3.6M	7.5M	15M

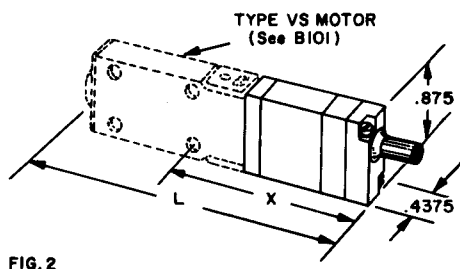
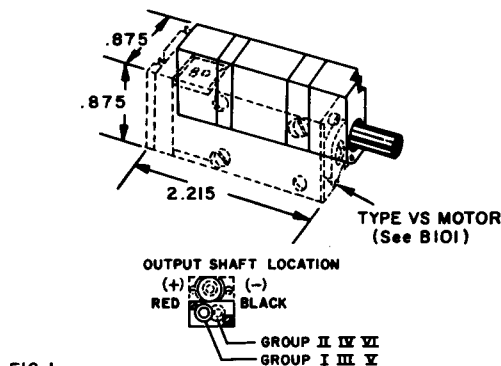
*E Is average value of d-c voltage, neglecting resistance of Chronistor (approx. 200 ohms).

Physical Characteristics

Weight: 0.15 oz.
Tube: Pyrex glass.
Electrodes: Copper, silver plated.
Electrolyte: Aqueous solution.
Marking: Permanent printed scale.
Mounting: Any 3AG fuse holder mounted vertically.
(+ terminal up-2500 to 10,000 hr. models any position.)

**MP101
GEAR REDUCTION UNIT, SPUR TYPE (OPTIONAL TO
TYPE VS D. C. MOTOR—SEE B101)**

Application: Attached to Type VS motor (see B101), this unit provides a gearmotor with up to 35 oz.-in. of continuous duty torque in a package having a frontal area of less than four-tenths of a square inch (end mounting). The gearmotor applications include tuning devices, counters and power switches. (See Remarks NOTE:)



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Globe Industries, Inc., Dayton, Ohio

Mechanical Characteristics

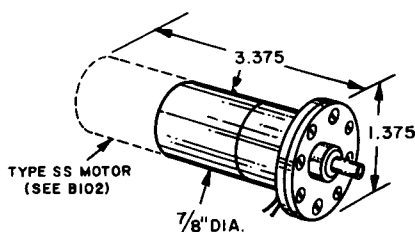
- Gears: Precision cut and case hardened.
- Bearings: Gear reducer input shaft is supported on ball bearings; output shaft supported by precision ground hardened steel bushing.
- Design Feature: Parallel ground and hardened steel gear shafts support 20° P. A. system gears and relatively large pinions.
- Inertia: Negligible.
- Performance: Close control of composite gear error on pinions and gears assures smooth running units.

Gear Ratios: See table below: Selection of 62 ratios in end mounted style and 27 ratios in side mounted style. Side Mounted Style—Ratio and Performance Data:

Group (See Fig. 1—Shaft Location)	Speed Reduction Ratio	Max. Cont. Gear Torque (oz.-in.)	*Shaft Rotation w/ Red Term. "A"
I	26.93:1	2.0	CW
	29.73	2.2	
II	59.26	3.9	CCW
	65.41	4.3	
	72.21	4.8	
III	130.36	7.8	CW
	143.91	8.6	
	158.86	9.5	
	175.36	10.5	
IV	286.80	15.4	CCW
	316.60	17.0	
	349.49	19	
	385.80	21	
	425.88	23	
V	630.96	30	CW
	696.51	34	
	768.88	35	
	848.76	35	
	936.94	35	
	1034.29	35	
VI	1388.11	35	CCW
	1532.33	35	
	1691.53	35	
	1867.27	35	
	2061.28	35	
	2275.43	35	
	2511.84	35	

MP102**GEAR REDUCTION UNIT AND CLUTCH, PLANETARY TYPE (OPTIONAL TO TYPE SS D.C. MOTOR—SEE B102)**

Application: Attached to Type SS motor (see B102), this electromechanical clutch and planetary geartrain may be used for output speeds up to 25 rpm, and for torques to 10 oz.-in. A typical use is to provide immediate clutch engagement when full torque is provided by the motor, eliminating the lag while the motor comes up to speed. (See Remarks NOTE:)



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Globe Industries, Inc., Dayton, Ohio.

Electrical Characteristics

Clutch Coil Current: 160 ma at 27 volts dc, nominal.
Duty Cycle: Unit will operate up to 200 hr. continuous duty at 71°C at speeds to 15 rpm. Intermittent duty cycle will increase life.

Mechanical Characteristics

Clutch Torque: Unit can transmit up to 10 oz.-in. torque at 5.0 ± 0.5 rpm, 27.5 volts dc, 85°C.
Gear Train: Unit can incorporate any 7/8" dia. planetary ratio. Outputs above 25 rpm require special engineering.

Physical Characteristics

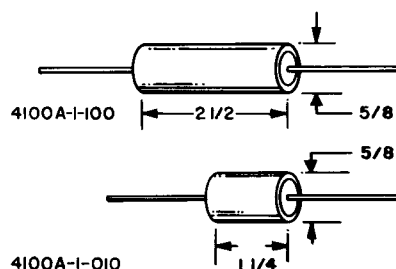
Weight: Gearmotor varies from 5 to 10 oz. depending on ratio. Clutch adds approximately 1-1/2 oz.
Coil Enclosure: Epoxy encapsulation provides moisture protection and insulation.
Bearings: Double-shielded ball bearings, life-lubricated per MIL-G-3278 are standard. Special lubricants can be provided.
Leads: Clutch has standard #26 AWG leads.
Mounting: Pilot and four .144" dia. holes in flange.

Remarks: The de-clutched output shaft turns with a maximum 3 oz.-in. of torque.

NOTE: This device is not supplied as a separate item. It is integral with the Type SS motor (B102) and termed Type SS Gearmotor.

R113**RESISTOR, FIXED, SILICON CARBIDE, EXPONENTIAL, "QUADRATRON" MODEL 4100**

Application: The "Quadratron" Model 4100 provides an accurate means of obtaining a large class of nonlinear mathematical functions when used as an input or feedback element with conventional, high-gain operational DC Amplifiers. Some of the functions are: square, square root, cube, cube root, multiplication, division, sine X and cosine X.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Bourns, Inc., Trimpot Div., Riverside, Calif.

Electrical Characteristics

Peak Input Voltage (Max.): Type 4100A-1-010, ± 10 volts; type 4100A-1-100 ± 100 volts.
Required Signal-Source Current: 1.5 ma, max. (typically less than 1.0 ma).
Squaring Error: 0.2% of peak input voltage, max.
Frequency Response, Squaring*: Measurable phase shift appears at 400 cps.
Frequency Response, Square Root*: Measurable phase shift appears at 50 cps.
Signal Source Impedance Required: Less than 50 ohms.
*Assumes no amplifier-imposed limitations.

Physical Characteristics

Type of Leads: Axial.
Lead Dia: #18 AWG.
Lead Length: 2-1/4", min.
Lead Material: Tinned copper solid wire.
Resistance Element: Silicon carbide.
Weight: Type 4100A-1-010, 1/2 oz; type 4100A-1-100, 1-1/4 oz.
Marking: Each unit is individually calibrated and stamped with the specific amount of resistance (R_s) to be placed in series with it, and the maximum current (I_{max}) which will then flow upon application of an input signal of the appropriate voltage.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: MSI Electronics, Inc., Richmond Hill, N. Y.

Electrical Characteristics

Resistance Range: 50 ohms min. to 250k ohms max.
Resistance Tolerance: $\pm 5\%$, $\pm 10\%$, $\pm 20\%$.
Max. Continuous Rated Voltage: 25 volts.
Wattage: 10 mw at 70°C.
Voltage Coeff: Less than 0.1%/volt.

Physical Characteristics

Lead Type: Axial.
Lead Dia: 0.001".
Lead Length: 3/16".
Lead Material: Platinum.
Soldering Characteristic: Less than 2%.

Environmental Conditions

Temp Coeff: ± 300 PPM/°C.
Moisture Resistance: $\pm 1.5\%$.

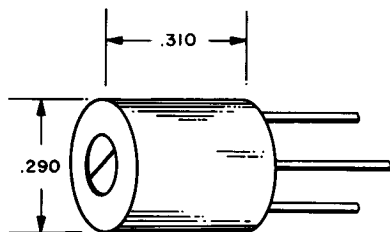
Test Data

Load Life: $\pm 3\%$ (70°C).
Short Time Overload: $\pm 2\%$.

Remarks: Leads are integral parts of the resistor body assuring reliable electrical and mechanical connections.

R232 RESISTOR, POTENTIOMETER, MICROMINIATURE MODEL MP2

Application: Designed for printed-circuit board mounting.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Miniature Electronic Components Corp., Holbrook, Mass.

Electrical Characteristics

Std Resistances: 20, 50, 100, 200, 500, 1K, 2K, and 5K ohms.
Tolerance: $\pm 10\%$.
End Resistance: Less than 1% or 2 ohms, whichever is greater.
Power Rating: 0.25 watts to 50°C; linearly derated to zero at 105°C.

Physical Characteristics

Weight: 0.03 oz.
Seal: "O"-Ring.
Case: High-temperature epoxy.
Turns: Single-360°.
Mounting: Three 0.016" dia. leads 1/2" long.
Resistance Element: 10 ppm wire.
Wiper: Precious-metal alloy.

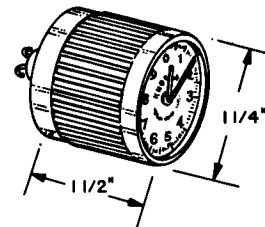
Environmental Conditions

Oper Temp: -55°C to $+105^{\circ}\text{C}$.
Humidity: 100 megohms min. at 95% humidity.

Test Data

Shock: 50 g.
Vibration: 20 g, 30-2000 cps without change of setting or noise.

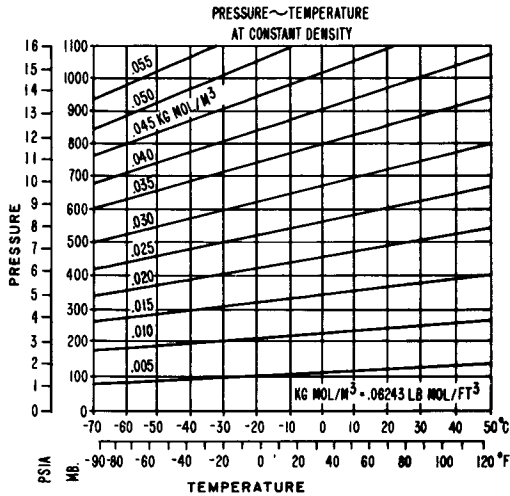
R233 RESISTOR, POTENTIOMETER, CLOCK FACE, "KNOBPOT" MODEL 3640



Cut 33

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Bourns, Inc., Trimpot Div., Riverside, Calif.



Physical Characteristics

Weight: 2 oz.
Case: Cadmium-plated brass.
Electrical Terminals: Glass to metal hermetic seals.
Air Connection: 1/8 NPT or 3/8-24 NF-2

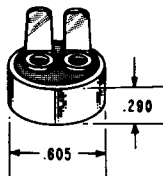
Environmental Conditions

Shock (Oper): ± 20 g, 11 milliseecs, 3 axes.
Shock (Non-Oper): ± 50 g, 11 milliseecs, 3 axes.
Vibration: 5-15 cps at 0.5" double amplitude; 15-55 cps at 0.060" double amplitude; 55-1000 cps at 10 g.
Temp Range: -65°C to +50°C.

Remarks: Other pressure and altitude ranges, pressure differentials, temperature ranges, and vibration and shock spectra are available.

**S1106
THERMOSTAT, BIMETAL DISC, SNAP ACTION,
PRECISION MODEL 3100**

Application: Designed for use where SPST, hermetically sealed construction is required. Ideal for packaging in special enclosures.



Cut 36

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Elmwood Sensors, Inc., Cranston 7, Rhode Island

Electrical Characteristics

Resistive: 6 amps, 125 volts ac or 30 volts ac/dc; 3 amps, 250 volts ac.
Dielectric Strength: 1250 volts rms, 60 cycle for 1 minute.

Mechanical Characteristics

Operation: SPST, open or close on temp rise.
Oper Temp Range: -60°F to 550°F
Std Differential: 12°F
Min Differential: 8°F
Std Oper Temp Tolerance: ±5°F.
Min Oper Temp Tolerance: ±3°F.

Physical Characteristics

Case Material: Cold-rolled steel, plated to customer's specs.
Construction: Ungrounded
Header: Compression glass sealed. Case heliarc welded at opposite end from header.
Weight: Basic unit without bracket, approx. 4 grams.
Terminals: Solder-type, up or right angle.

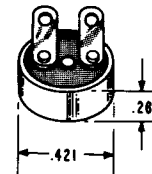
Test Data

Designed to meet MIL-E-5272C and MIL-STD-202.

Remarks: Available with numerous mounting configurations.

**S1107
THERMOSTAT, SNAP ACTION, SENSITIVE, SUB-
MINIATURE MODEL 3305**

Application: Designed for use where a small, sealed, narrow-differential, disc, snap action thermostat is required.



Cut 37

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Elmwood Sensors, Inc., Cranston 7, Rhode Island

PART II—INTEGRATED CIRCUIT DEVICES**Identification Codes**

Integrated Circuit Devices are identified by identification codes for convenience in referencing when correspondence concerning these parts is necessary. Each identification code consists of a capital letter, mnemonic abbreviation,

and an arabic number. The capital letter portion of the code indicates the major element/s in the device (V—vacuum tube, Q—transistor, etc), the mnemonic portion indicates the function of the device (AMP—amplifier, OSC—oscillator, etc), and the arabic number distinguishes the device from all others of the same type.

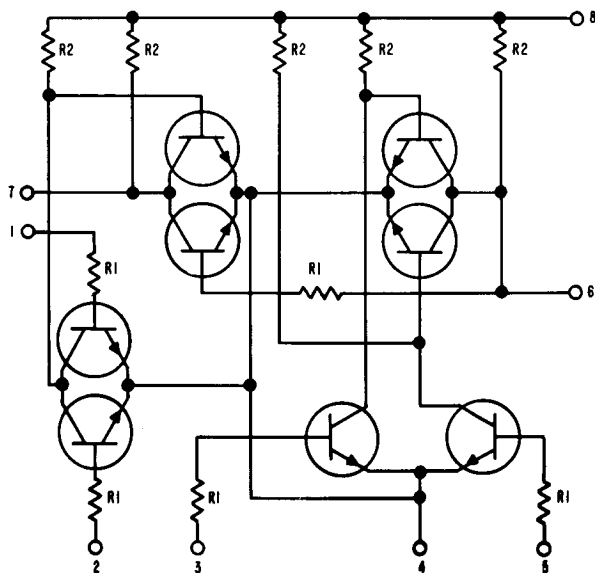
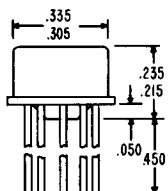
PART II—TABLE OF CONTENTS

Type of Device	Ident. Code	Page No.
Adder	Q-ADD-1	1
Half-Adder	Q-ADD-2	3
Amplifier, Differential	Q-AMP-7	4
Amplifier, Differential	Q-AMP-8	5
Amplifier, Differential	Q-AMP-9	7
Amplifier, High Input Imped.	Q-AMP-10	9
AND/OR Gate, 5-Input	Q-AND-1	10
AND/OR Gate, Dual 2-3 Input	Q-AND-2	11
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Flip-Flop Network	Q-BMV-4	13
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Flip-Flop, Reed Relay	Q-BMV-7	19
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Type of Part	Reference Designator	Page No.
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HAND/NOR Gate	Q-NAND-3	26
HAND/NOR Gate	Q-NAND-4	27
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NOR Or NAND Gate Network	Q-NOR-2	29
NOR Gate, Dual	Q-NOR-3	30
NOR Gate	Q-NOR-4	32
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OR Gate, Four-Input	Q-OR-2	34
Exclusive OR, Dual 2-Input	Q-OR-3	36
Shaper, Pulse	Q-PUS-1	37
Schmitt Trigger	Q-SMT-1	38

**Q-ADD-1
ADDER, MILLIWATT MICROLOGIC, TYPE 908**

Description: The Type 908 Adder element performs the MOD 2 Addition or Exclusive OR function; it also is used to select one of two data streams under control of a single gate signal. See Remarks.



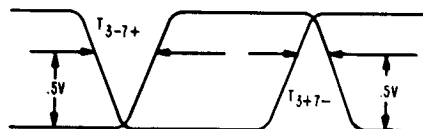
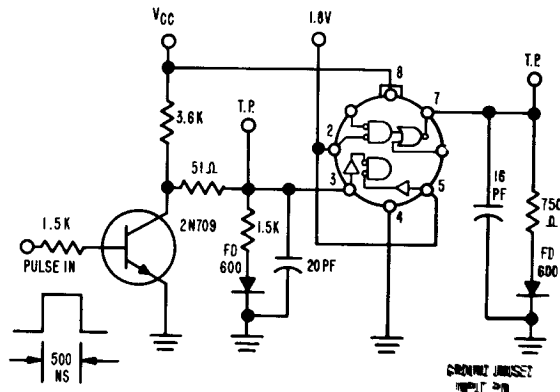
Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Fairchild Semiconductor, Mountain View, Calif.
Philco Corp., Lansdale Div., Lansdale, Pa.

Electrical Characteristics

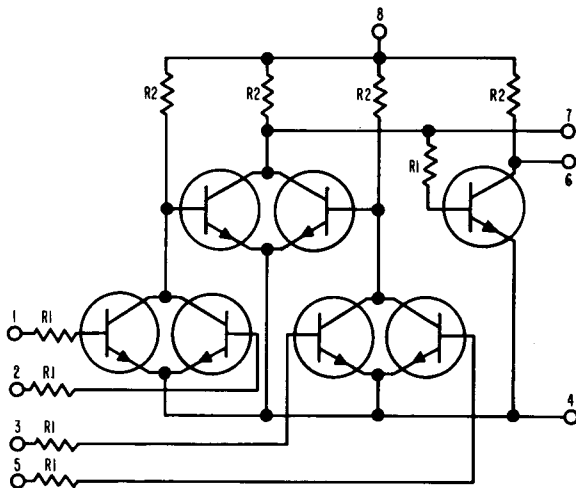
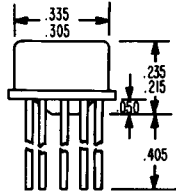
Absolute Max. Ratings (25°C Free Air Temp.)—
 Max. Volt. Applied To Pin 8 (Continuous): 8 volts.
 Max. Volt. Applied To Any Input Pin: ±4.0 volts.
 Max. Power Dissipation: 250 mw.
 Max. Volt. Applied To Pin 8 (Pulsed, ≤1 sec): 12 volts.
 Storage Temp.: -65°C to +150°C.
 Average Power Dissipation (25°C): 10 mw.
 Typical Resistors (See Circuit Diagram Above): R₁ = 1.5K;
 R₂ = 3.6K.

SWITCHING TIME TEST CIRCUIT



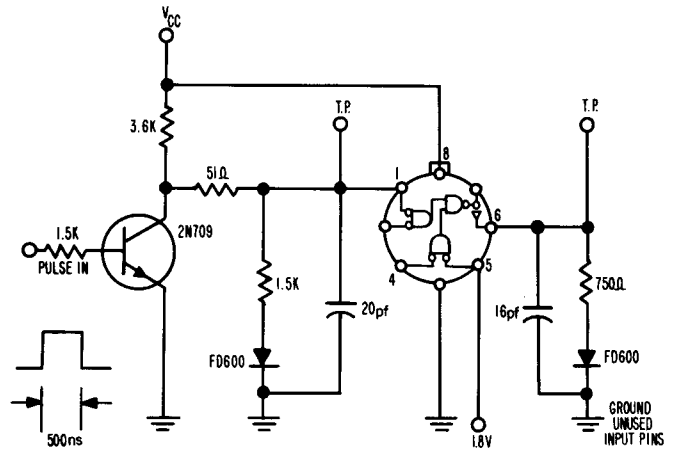
**Q-ADD-2
HALF-ADDER, MILLIWATT MICROLOGIC, TYPE 912**

Description: The Type 912 Half-Adder is a multi-purpose combination of three basic RTL circuits. The configuration is well suited as a complete Half-Adder, an Exclusive OR Gate, or any other similar logic construction.



Electrical Characteristics

Absolute Max. Ratings (25°C Free Air Temp.)—
 Max. Volt. Applied To Pin 8 (Continuous): 8 volts.
 Max. Volt. Applied To Any Input Pin: ±4.0 volts.
 Max. Power Dissipation: 250 mw.
 Max. Volt. Applied To Pin 8 (Pulsed, ≤ 1 sec.): 12 volts.
 Storage Temp: -65°C to +150°C.
 Average Power Dissipation (25°C): 8 mw.
 Typical Resistors (See Circuit Diagram Above): $R_1 = 1.5K$;
 $R_2 = 3.6K$.



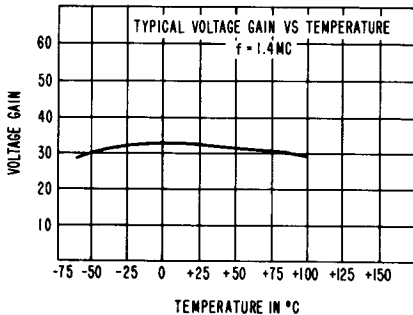
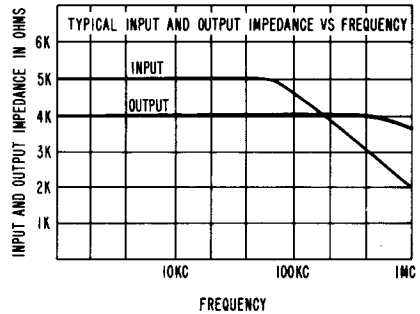
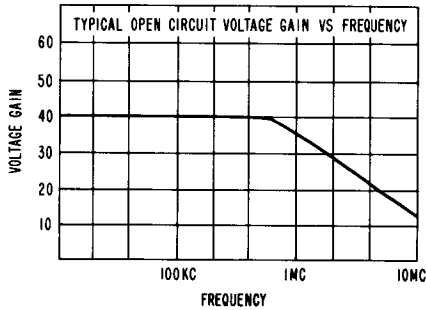
Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Fairchild Semiconductor, Mountain View, Calif.
 Philco Corp., Lansdale Div., Lansdale, Pa.

Electrical Characteristics

Total Device Dissipation (Max.)—Free Air: 0.5 watts.
 Total Device Dissipation (Max.)—25°C Case Temp: 2.0 watts.
 Max. Supply Voltage: ±10 volts.
 Characteristics at 25°C (Except as noted): See table below.
 Bias Conditions: $V_{1-6} = 10v, \pm 5\%$
 $V_{4,6} = -10v, \pm 5\%$

Symbol	Parameter	Test Cond.	Min.	Typ.	Max.	Unit
Z_{in}	Input Impedance	$f = 50 \text{ kc}$	2K	5K		Ω
Z_{out}	Output Impedance	$f = 50 \text{ kc}$		4K	5K	Ω
A_v	Open Circuit Voltage Gain	$R_G = 50\Omega, f = \text{kc}$ $V_{in} = 10 \text{ mv}$	30	40		V/V
A_v	Open Circuit Voltage Gain	$R_G = 50\Omega, f = 1.4 \text{ mc}$ $V_{in} = 10 \text{ mv}, T = -65^\circ\text{C}$	20			V/V
A_{cmm}	Comm. Mode Gain	$f = 1.4 \text{ mc}, V_{in} = 1 \text{ v}$			0.4	V/V
$V_3 - V_7$	Base Offset V			5	10	mV
$\Delta(V_3 - V_7)$	Base Offset V	$T = -65^\circ\text{C to } +100^\circ\text{C}$			20	$\mu\text{V}/^\circ\text{C}$
V_n	Equiv. In. Noise V	Bwdth. = 5 cps to 5 mc		6	20	μV



Physical Characteristics

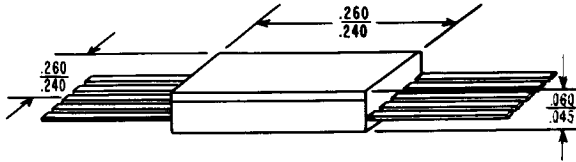
Construction: TO-5 outline package.
 Leads: Eight wire leads, .017" dia., 1-1/2" min. length.

**Q-AMP-8
 AMPLIFIER, DIFFERENTIAL, TYPE D43-000**

Description: Type D43-000 is a low-level Differential Amplifier consisting of five NPN transistors and associated resistors constructed on a single silicon chip. The amplifier design features tight thermal coupling, close beta and VBE match with common-mode feedback. Because of its design, the amplifier exhibits extremely low drift characteristics and excellent stability over a wide temperature range.

Q-AMP-9
AMPLIFIER, DIFFERENTIAL, MICRONET-203

Description: The Micronet-230 is a general purpose, integrated amplifier constructed in a chip of silicon by using the planar process. Typical uses include DC and AC amplification (open and closed loop), wave shaping, and buffering.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Sperry Semiconductor Div., Sperry Rand Corp.,
 Norwalk, Conn.

Electrical Characteristics

Absolute Max. Ratings—

Power Supply Volts ($V_{CC} + V_{EE}$): 25V.

Input Signal Volts ($V_{EE} + V_{in}$): 25V.

Power Dissipation (At or Below 125°C Case Temp): 300 mw.

Oper Temp Range: -55°C to +125°C.

Storage Temp Range: -65°C to +175°C.

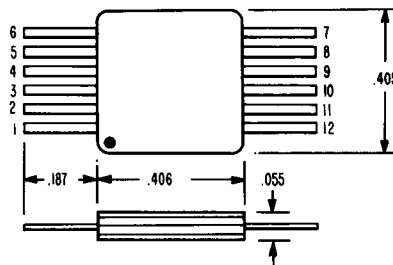
Test Data

Mechanical Shock: Per MIL-S-19500.
 Thermal Shock: Per MIL-S-19500.
 Hermeticity: Per MIL-S-19500.

Physical Characteristics

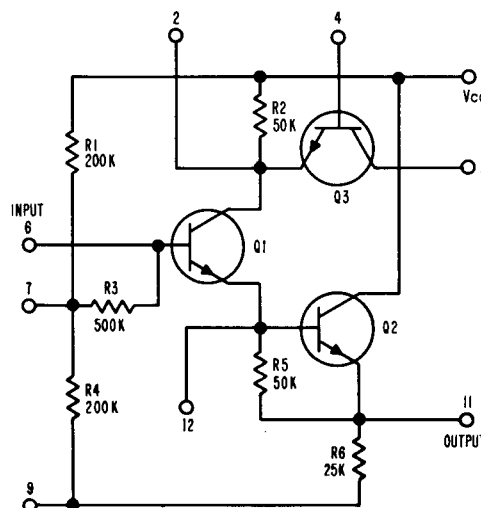
Construction: Monolithic, glass-kovar.
 Package: Flat, others available on special order.
 Leads: Aluminum, ultrasonically bonded.

Remarks: Manufacturer states good phase margin assures stability without the use of external frequency compensation networks. The output emitter followers have been designed to survive accidental short circuits from outputs to the V_{EE} power supply provided they are not of long duration.



**Q-AMP-10
 AMPLIFIER, HIGH INPUT IMPEDANCE, UNITY GAIN,
 TYPE 4JD12X218**

Description: The Type 4JD12X218 Amplifier is a thin film, integrated high input impedance-unity gain amplifier with input impedance greater than 50 megohms up to 25 kc and greater than 10 megohms at 500 kc. It was designed primarily for military aerospace applications, especially those employing impedance transfer. These include some types of infrared sensors and photomultiplier outputs.



Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: General Electric Co., Electronics Park,
 Syracuse, N. Y.

Electrical Characteristics

Max. Supply Voltage (V_{cc}): 45 volts.
 Max. Oper Temp Range: -25°C to $+125^{\circ}\text{C}$.
 Max. Storage Temp Range: -55°C to $+200^{\circ}\text{C}$.
 Electrical Characteristics Table ($V_{cc} = +25\text{v}$, $T = 25^{\circ}\text{C}$,
 $R_g = 10$ megohms, $f = 1$ kc)

Parameter		Min.
Voltage Gain	A_v	.99
Input Impedance (See Test Circuit)	Z_{in}^*	50M ohms
Input Impedance ($f = 500$ kc)	Z_{in}^*	10M ohms
Input Capacitance**	C_{in}	.03 (Typ.) pf
Output Resistance (See Test Circuit)	R_o	1500 ohms

* R_L greater than 100 k.

**Top and bottom plates of package tied to pin #7.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Dallas, Texas

Electrical Characteristics

Max. Supply Voltage: 8 volts.
Max. Input Voltage: 8 volts.
Max. Oper Amb Temp Range: -55°C to +125°C.
Max. Storage Temp: -65°C to +150°C.
Propagation Delay: 5 nsec.
Electrical Characteristics Table ($V_{CC} = 3\text{v to } 4\text{v}$, $T_a = -55^\circ\text{C to } +125^\circ\text{C}$, $V_{EE} = -3.0\text{v} \pm 5\%$, Logical 0 = Low Voltage, Logical 1 = High Voltage)

Parameter	Min.	Typ.	Max.
Oper Supply V (V_{CC})	3.0 v		4.0 v
Network dissipation:			
$T_a = 25^\circ\text{C}$, $N = 0$, 50% duty cycle			
$V_{CC} = 3.0\text{ v}$, $V_{EE} = -3\text{v}$			14 mw
$V_{CC} = 4.0\text{ v}$, $V_{EE} = -3\text{v}$			20 mw
$V_{CC} = 3.0\text{ v}$, $V_{EE} = \text{Open}$			2 mw
$V_{CC} = 4.0\text{ v}$, $V_{EE} = \text{Open}$			4 mw
Loading:			
DC Fan-out $N +$ (See Note)			4
$N -$			4
Voltage drop from input to output for logical 1 condition at any input:			
Fan-out $N + = 5$			
$V_{in} \leq (V_{CC} - 1.9\text{ v})$			0.20 v
$V_{in} \leq (V_{CC} - 1.6\text{ v})$			0.30 v
$V_{in} \leq (V_{CC} - 1.3\text{ v})$			0.40 v
Voltage rise from input to output for logical 0 condition at any input:			
Fan-out $N - = 4$			
$V_{in} 0.3\text{ v}$			0.0 v

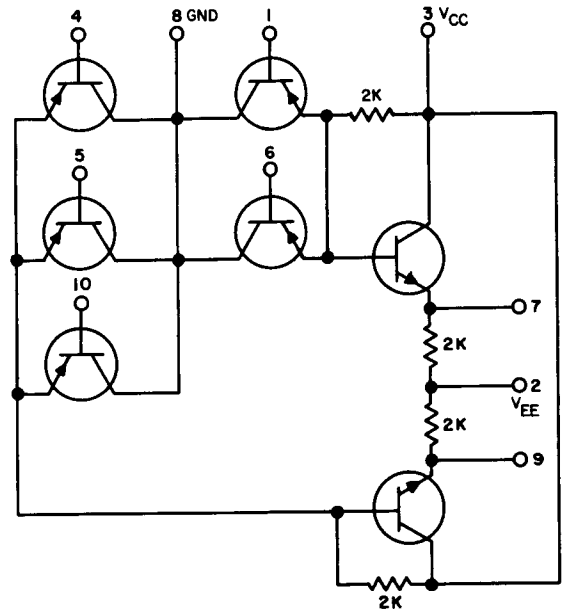
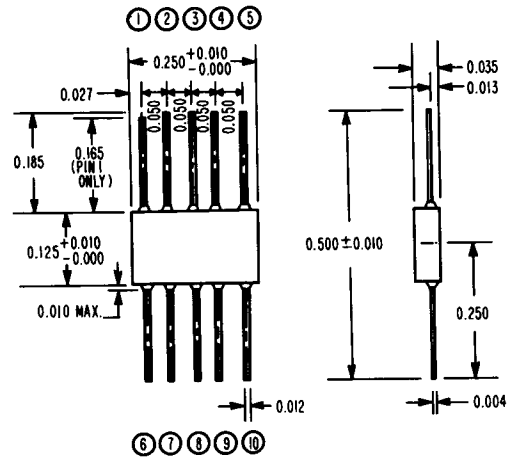
Note: An $N +$ type load requires an output to supply current.
An $N -$ type load requires an output to sink current.

Physical Characteristics

Construction: Semiconductor network mounted in a glass-to-metal hermetically sealed package.
Leads: Ten gold-plated kovar leads, 0.012" x 0.004", spaced typically 0.050" apart.
Insulation: Mylar insulators are available.
Weight: 0.1 gram.

Q-AND-2

AND/OR GATE, DUAL 2-3 INPUT, TYPE SN534



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Dallas, Texas

Parameter	Condition	Typ.	Units
Network Consumption	25°C	65	mw
Fan-Out	+25°C	5FF + 4NANDS	
	+125°C	4FF + 3NANDS	
	-55°C	3FF + 3NANDS	
Input Voltage Sig. Lev.	SET, T _A = +125°C	2.4	volts
	T _A = -55°C	2.5	volts
	RESET, Trig. Lev.	2.3	volts
	T _A = +125°C	2.4	volts
	T _A = 55°C	2.5	volts
Output Voltage Sig. Lev.	ON, V _{in} = 3V	0.4	volts
	OFF, V _{in} = 0V	5.8	volts

Switching Characteristics at 25°C, F. O. = 1

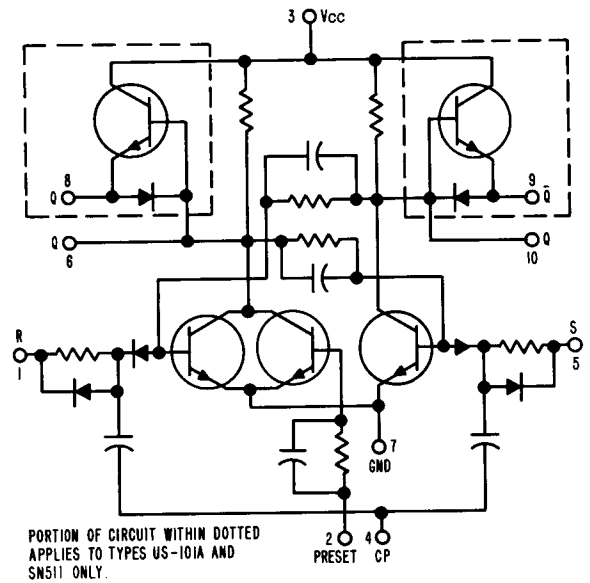
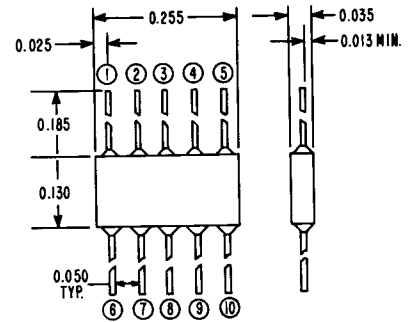
Delay Time	14	nsec
Rise Time	90	nsec
Storage Time	9	nsec
Fall Time	10	nsec
Propagation Delay	13	nsec

Physical Characteristics

Construction: Hybrid thin-film. Encapsulation in an epoxy-filled premolded case.
 Leads: Nine, #28 AWG tinned nickel leads 0.600" min. length.

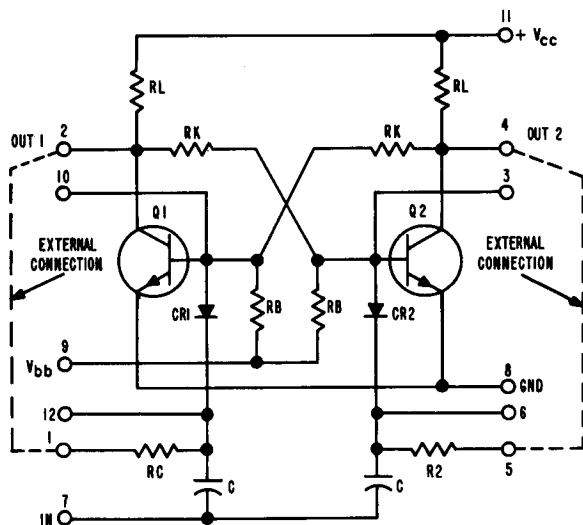
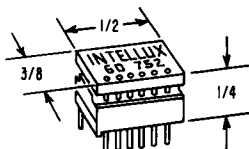
**Q-BMV-4
 FLIP-FLOP NETWORK, SEMICONDUCTOR**

Description: These semiconductor networks are complete bistable logic networks which can be used, without additional circuitry, as set-reset flip-flops, binary counters, or shift registers in synchronous or asynchronous systems. (Sprague—Types US-0100A and US-0101A; Texas Instruments—Types SN510 and SN511)



**Q-BMV-5
FLIP-FLOP, MICROCIRCUIT, IMC, SERIES FF1424
AND FF1524**

Description: Series FF1424 and FF1524 Flip-Flops are rated for performance at 1 mc clock rates in typical digital system applications. Through appropriate connecting sequence, these flip-flops may be employed as delay, set-reset, or as trigger flip-flops.



Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Intellux, Inc., Goleta, Calif.

Electrical Characteristics

D.C. Supply Voltages: Type FF1424—6 to 9 volts; type FF1524—6 to 12 volts.
Power Dissipation (Typ): Type FF1424—45 mw at 6 volts; type FF1524—22 mw at 6 volts.
Fan-Out (Max): 6 each output.
Input Pulse Rep Rate (Nom): 1,000,000 pps

Output Pulse Fall-Time (Typ): Type FF1424—12 nsecs; type FF1524—22 nsecs.
Power Dissipation Range (Type FF1424): See table below.

Supply Volt.	Min.	Max.
6.0 ± 5%	39 mw	58 mw
7.5 ± 5%	60 mw	92 mw
9.0 ± 5%	85.6 mw	133 mw

Power Dissipation Range (Type FF1524): See table below.

Supply Volt.	Min.	Max.
6.0 ± 5%	18.5 mw	29 mw
9.0 ± 5%	41 mw	65 mw
12.0 ± 5%	75 mw	115 mw

Environmental Conditions

Oper Temp Range: -55°C to +125°C.
Storage Temp Range: -65°C to +150°C.
Temp. Cycling: Per MIL-STD-202B, Method 102A, Cond. C.
Moisture Resistance: Per MIL-STD-202B, Method 106A, Fig. 106-2.
Vibration (High Freq.): Per MIL-STD-202B, Method 204A, Cond. C.
Shock (Med Impact): Per MIL-STD-202B, Method 205B, Cond. B.

Physical Characteristics

Construction: Hermetically sealed, hybrid thin film and semiconductor devices.
Size: Standard - 1/2" x 3/8" x 3/8"; Low-Profile (shown) - 1/2" x 3/8" x 1/4".
Weight: Approx. 2 grams.
Leads: Gold plated Dumet, .020" dia. x .300" min. length, spaced on .075" centers.

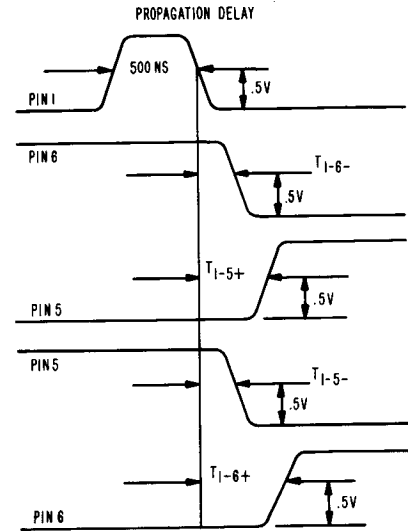
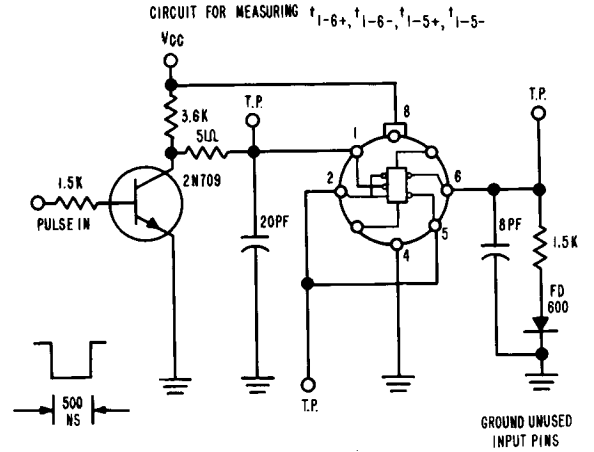
Remarks: The schematic illustration shown above is that of a single-input type flip-flop, 6-9V or 6-12V. Three other circuit configurations are also available in this series with single-input and reset diode, with single input and clamping diodes, and with double input. For applications in which up-down counting is required, an accessory unit is available for steering the single-input flip-flop shown above.

Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Fairchild Semiconductor, Mountain View, Calif.
Philco Corp., Lansdale Div., Lansdale, Pa.

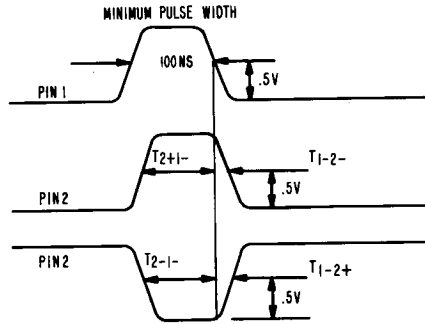
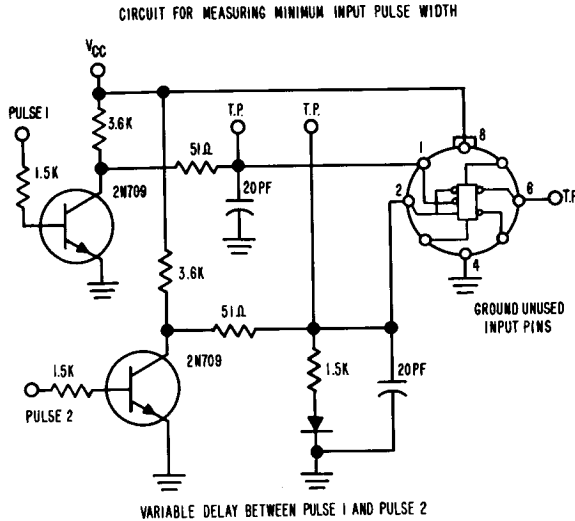
Electrical Characteristics

Absolute Max. Ratings (25°C Free Air Temp)—
 Max. Volt. Applied To Pin 8 (Continuous): 8 volts.
 Max. Volt. Applied To Any Input Pin: ±4.0 volts.
 Max. Power Dissipation: 250 mw.
 Max. Volt. Applied To Pin 8 (Pulsed, ≤1 sec): 12 volts.
 Storage Temp: -65°C to +150°C.
 Average Power Dissipation (25°C): 12 mw.
 Typical Resistors (See Circuit Diagram Above): $R_1 = 1.5K$,
 $R_2 = 3.6k$, $R_4 = 180$ ohms, $R_5 = 480$ ohms.



**Q-BMV-7
FLIP-FLOP, REED RELAY, ELECTROMAGNETIC,
TYPE RRF4A2BM**

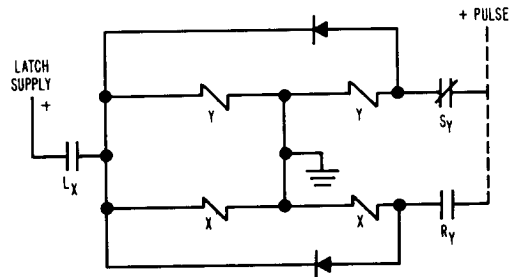
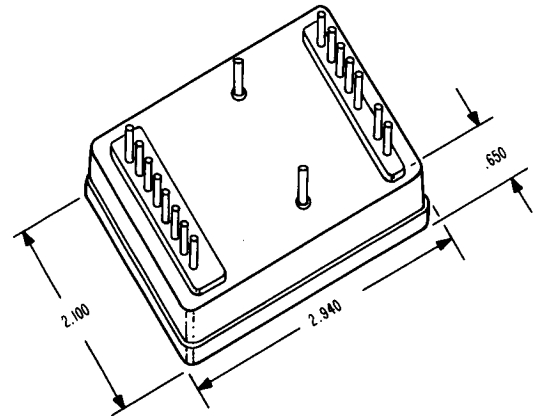
Description: The Type RRF4A2BM Flip-Flop is an electromagnetically operated device designed for use in digital computer applications. Binary counter and shift register functions can be constructed by interconnecting four of these flip-flops.



Physical Characteristics

Package: Similar to TO-5 (shown) or flat pack.
 Construction: All necessary transistors and resistors are diffused into a single silicon wafer. The individual RTL gates within the logic blocks are inter-connected by metal over oxide.
 Leads: TO-5, gold-plated kovar; flat-pack, gold-clad alloy 52.
 Weight: TO-5, 1.12 grams; flat pack, not available.

Remarks: For related Milliwatt Micrologic elements and an explanation of the symbols used in the table above, refer to item Q-ADD-1 "Remarks: ".



S_Y - SET CONTACT CONTROLLED BY Y COILS
 R_Y - RESET CONTACT CONTROLLED BY Y COILS
 L_X - LATCH CONTACT CONTROLLED BY X COILS

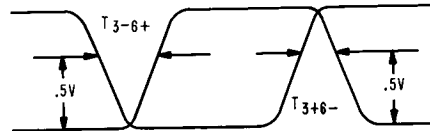
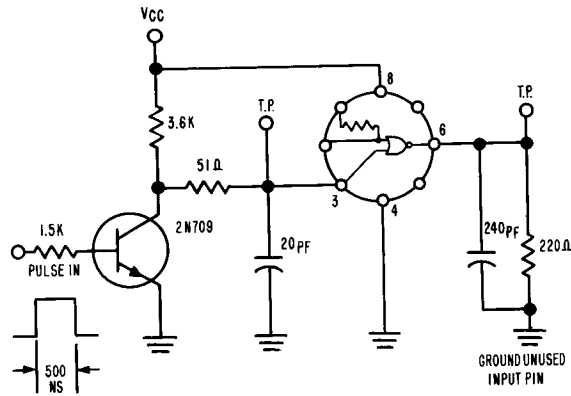
Quality Assurance: Manufacturer's claims.
 Bureau approval required prior to use.

Mfr: Struthers-Dunn, Inc., Pitman, New Jersey

Electrical Characteristics (At 25°C)

Output Contacts Avail: X Coil, 1-Form A; Y Coil, 1 Form A and 1-Form B.
 Set Coil Power: 2.17 watts.
 Hold Coil Power: 2.43 watts.

SWITCHING TIME TEST CIRCUIT



Test Conditions									Limits	
Test	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Min.	Max.
IPin2		Vin	Vbot	GND				Vcc		2 Iin
IPin3		Vbot	Vin	GND				Vcc		2 Iin
VPin6		Voff	Voff	GND		Vin		Vcc	Iab	Vout
VPin6		Von	GND	GND		Vrh		Vcc		Vout
VPin6		GND	Von	GND		Vrh		Vcc		Vce
VPin6		Vin	GND	GND		Vrh		Vcc		Vce
VPin6		GND	Vin	GND		Vrh		Vcc		I1
IPin8		GND	GND	GND				Vcc		I1
t(3+6-)		GND	Pulse in	GND		Pulse out		Vcc		90ns
t(3-6+)		GND	Pulse in	GND		Pulse out		Vcc		70ns

Typical Power Dissipation For Basic RTL Circuit: 40 ns.
 Typical Power Dissipation For Basic RTL Circuit: 2mw.

Test Data

Test Procedures: Per MIL-M-23700 or MIL-S-19500 and MIL-STD-750.

Physical Characteristics

Package: Similar to TO-5 (shown) or flat pack.
 Construction: All necessary transistors and resistors are diffused into a single silicon wafer. The individual RTL

gates within the logic blocks are interconnected by metal over oxide.

Leads: TO-5, gold-plated kovar; flat pack, gold-clad alloy 52.

Weight: TO-5, 1.12 grams; flat pack, not available.

Remarks: For related Milliwatt Micrologic elements and an explanation of the symbols used in the table above, refer to item Q-ADD-1 "Remarks: #".

Input: One standard load. Output is at "0" level when input is at +0.5 volt or less, output is at "1" level when input is at +3 volts or greater.

Output Rise Time: *Less than 10 nsec.

Output Fall Time: *Less than 10 nsec.

Output Delay Time: *15 nsec.

Output Amplitude: +0.5 volt or less to +3.5 volts or more.

Output Loading: 10 standard loads or 30 ma sink or 30 ma source.

Physical Characteristics

Case: Epoxy filled Diall.

Leads: Fifteen, gold-flashed, beryllium copper leads 0.015" dia. by 0.3" long. (Nickel leads avail.)

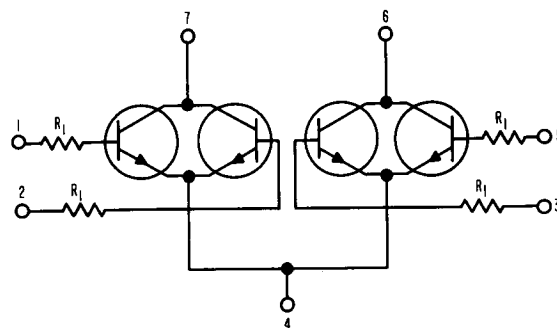
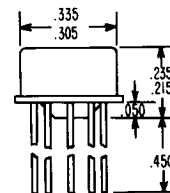
Volume: 0.041 cu. in.

Environmental Conditions

Oper Temp: -55°C to +125°C.

Meets applicable portions of MIL-STD-202.

*When driven from source with rise and fall less than 10 nsec.



Q-EXP-1

EXPANDER, GATE, MILLIWATT MICROLOGIC, TYPE 921

Description: The Type 921 Gate Expander is a double gate without the node resistors. Its output terminals may be connected in parallel to those of a dual gate or a gate to increase the fan-in capability of the circuits. See Remarks.

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Fairchild Semiconductor, Mountain View, Calif. Philco Corp., Lansdale Div., Lansdale, Pa.

Electrical Characteristics

Absolute Max. Ratings (25°C Free Air Temp)-

Max. Volt. Applied To Pin 8 (Continuous): 8 volts.

Max. Volt. Applied To Any Input Pin: ± 4.0 volts.

Max. Power Dissipation: 250 mw.

Max. Volt. Applied To Pin 8 (Pulsed, ≤ 1 sec): 12 volts.

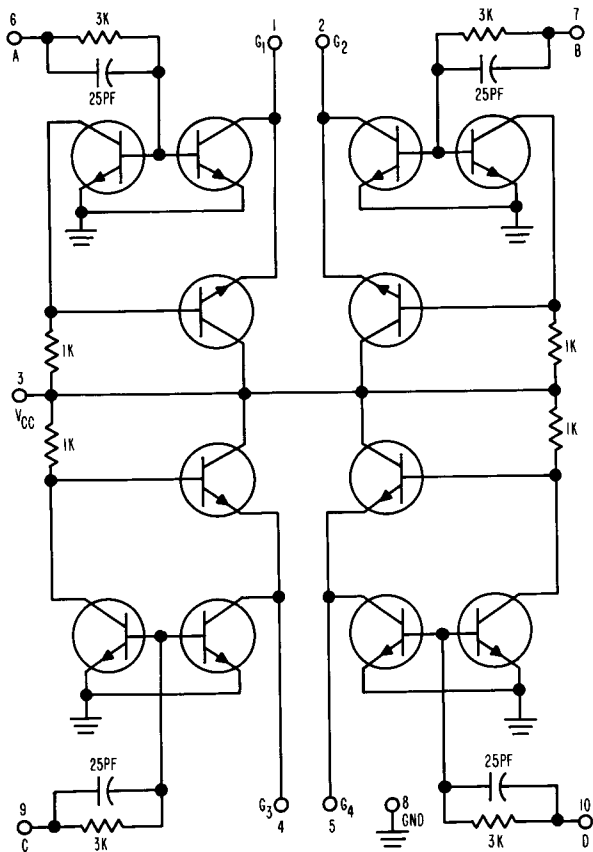
Storage Temp: -65°C to +150°C.

Average Power Dissipation (25°C): No power flowing.

Typical Resistor (See Circuit Diagram Above): $R_1 = 1.5k$.

NOTE: When a dual gate or a gate is used with the expander, the following rules apply-

- 1.) Pin 8 of the Expander must be connected to Vcc.
- 2.) The input load factor of the expanded gate is 1.33.
- 3.) The output drive factor of the expanded gate is decreased by .5 load for every node added.



Parameter	Min.	Typ.	Max.
Oper Supply V (V _{CC})	3.0v		4.0v
Network Dissipation/Inverter (Note 1):			
T _a = 25°C, N = 0, ON condition			
V _{CC} = 3.0v		9mw	
V _{CC} = 4.0v		16mw	
T _a = 25°C, N = 10 (4 c.p. terminals)			
50% duty cycle:			
V _{CC} = 3.0v		11mw	
V _{CC} = 4.0v		22mw	
Loading/Inverter:			
DC Fan-out N + (Note 2)			10
N -			10
Loading for 4 inverters in parallel:			
DC Fan-out N + (Note 2)			40
N -			40
Input voltage that will insure Logical 0 at output:	1.5v		
Input voltage that will insure Logical 1 at output:			0.3v
Output Voltage:			
Logical 1 (off level) (V _{in} = 0.3v)	(V _{CC} -		
DC Fan-out N + = 10 or I (load) = 5 ma		1.3v	
Logical 0 (on level) (V _{in} = 1.5v)			
DC Fan-out N - = 10 or:			
I (sink) = 2.5 ma at T _a = -55°C			0.3v
I (sink) = 1.9 ma at T _a = +125°C			0.3v

Note 1: Network power dissipation is the power supplied from the V_{CC} supply.

Note 2: An N+ load requires the output to supply current. An N- load requires the output to sink current.

Physical Characteristics

Construction: Semiconductor network mounted in a glass-to-metal hermetically sealed package.

Leads: Ten gold-plated kovar leads, 0.012" x 0.004", spaced typically 0.05" apart.

Insulation: Mylar insulators are available.

Weight: 0.1 gram.

Quality Assurance: Manufacturer's claims. Bureau approval required prior to use.

Mfr: Texas Instruments, Inc., Dallas, Texas

Electrical Characteristics

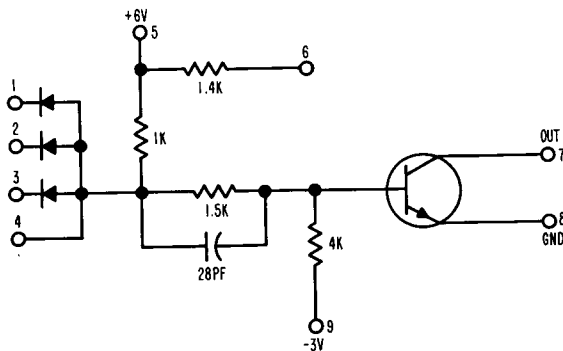
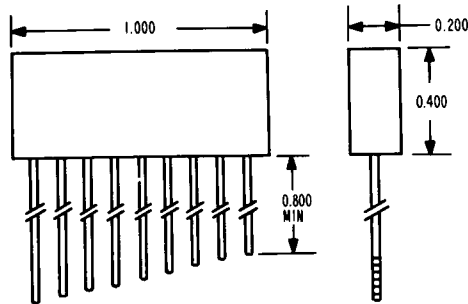
Max. Supply Voltage: 8 volts.

Max. Input Voltage: 8 volts.

Max. Oper Amb Temp Range: -55°C to +125°C.

Max. Storage Temp: -65°C to +150°C.

Electrical Characteristics Table (V_{CC} = 3v to 4v, T_a = -55°C to +125°C, Logical 0 = Low Voltage, Logical 1 = High Voltage)



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Sprague Electric Co., North Adams, Mass.

Electrical Characteristics

Max Supply Voltages: +15, -8 volts.
Max Input Voltage: 8 volts.
Max Oper Amb Temp Range: -55°C to +125°C.
Pwr Consumption: 35 mw.
Propagation Delay: 12 nsec.
Logic: Diode transistor.
Fan-In: 15
Fan-Out: 4
Noise Voltage Margin: ± 0.5 volt with F.O. = 4
Max Storage Temp: -55°C to +150°C.

Parameter	Condition	Typ.	Units	
Network Consumption	ON, N = 0	36	mw	
	N = 4	42	mw	
	50% Duty Cycle, N = 0	N = 0	33	mw
		N = 4	36	mw
Fan-Out	25°C	8		
	-55°C to +125°C	4		
Signal Levels	-55°C to +125°C	In	Out	
	N = 1 Logical 1	>+1.4	<+0.4	volts
	N = 4	>+1.8	<+0.4	volts
	N = 1 Logical 0	<+1.0	>+5.8	volts
	N = 4	<+1.4	>+5.8	volts

Switching Characteristics at 25°C

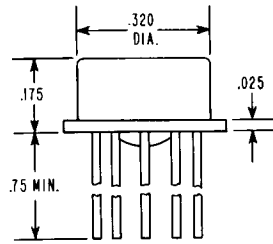
Delay Time	N = 1	10	nsec
	N = 4	11	nsec
Rise Time	N = 1	55	nsec
	N = 4	50	nsec
Storage Time	N = 1, N = 4	5	nsec
Full Time	N = 1	9	nsec
	N = 4	19	nsec
Propagation Delay	N = 1, N = 4	10	nsec

Physical Characteristics

Construction: Hybrid thin-film. Encapsulation in an epoxy-filled premolded case.
Leads: Nine, #28 AWG tinned nickel leads 0.600 min. length.

Q-NAND-4 NAND/NOR-GATE, TYPE B-12001

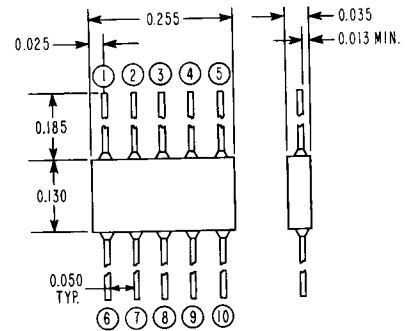
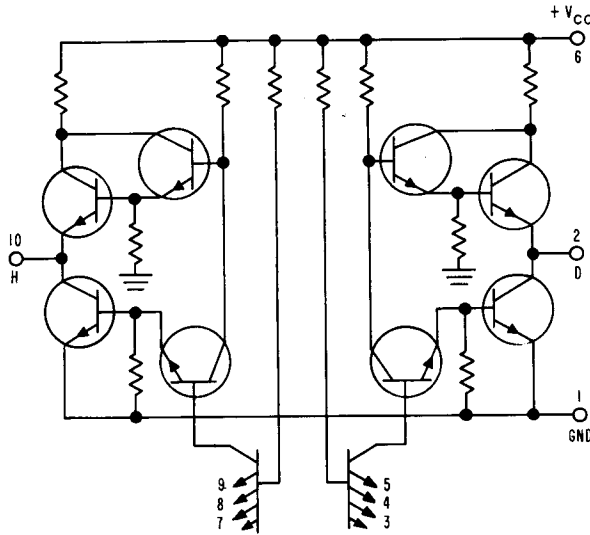
Description: The Type B-12001 is a low power DTL NAND/NOR element featuring a high speed-to-power ratio with high noise immunity over the temperature range.



is the ten-pin TO-5 header and cap (shown above). High-density packages are also available; low-profile square unit with stubby pins on one side only, low-profile cold welded unit with stubby pins on one side only, and the low-profile square unit with stubby pins arranged axially on opposite edges.
Leads: Gold-plated dumet.

**Q-NOR-2
NOR OR NAND GATE, NETWORK, SEMICONDUCTOR**

Description: These semiconductor networks are high fan-in RCTL gates designed to function as either a positive NOR gate or a negative NAND gate. (Sprague—Types US-0102A and US-0103A; Texas Instruments—Types SN512 and SN513). The type US-0103A/SN513 is a high fan-out device capable of driving up to 25 loads.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

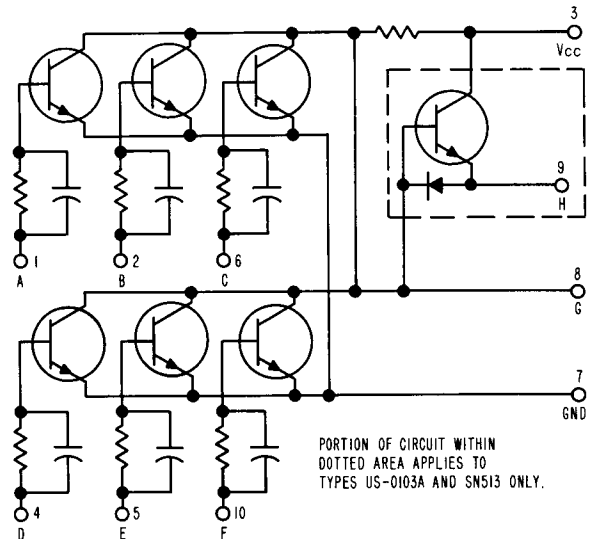
Mfr: Hoffman Semiconductor, El Monte, Calif.

Electrical Characteristics

- Power Supply Voltage (Absolute Max. Rating): $V_{CC} = +8V$.
- Input Signals (Absolute Max. Rating): $+6V$.
- Oper Temp (Absolute Max. Rating): $-55^{\circ}C$ to $+125^{\circ}C$.
- Storage Temp (Absolute Max. Rating): $-55^{\circ}C$ to $+150^{\circ}C$.
- Power Dissipation: 25 mw at $V_{CC} = +5.5V$.
- Operating Power Supply Voltage: $+4V$ to $+6V$.
- Average Propagation Delay: 25 nsecs at $V_{CC} = +5.5V$.
- Oper Frequency: 0 to 10 mc at $125^{\circ}C$.
- Typical "Zero" (Low) Level Voltage: 0.35V at $N = 10$, and $V_{CC} = +5.5V$.
- Typical "One" (High) Level Voltage: 3.5V at $N = 10$, and $V_{CC} = +5.5V$.

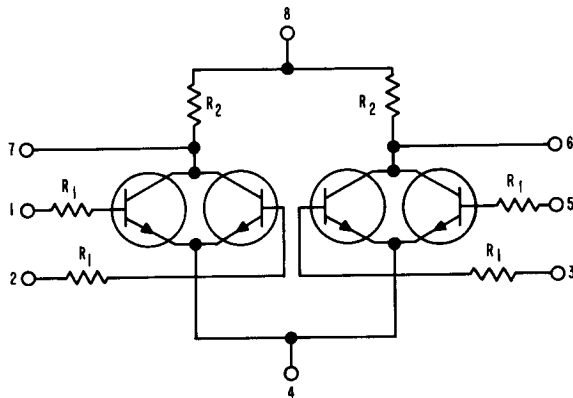
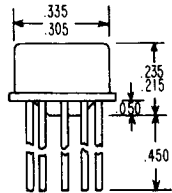
Physical Characteristics

Construction: Fabricated on a monolithic silicon substrate using planar epitaxial techniques. Standard unit package



PORTION OF CIRCUIT WITHIN DOTTED AREA APPLIES TO TYPES US-0103A AND SN513 ONLY.

the Type 921 Expander (see Q-EXP-1) to increase its fan-in capacity. See Remarks.

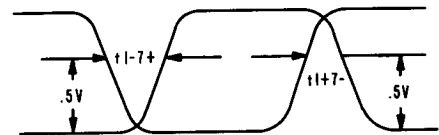
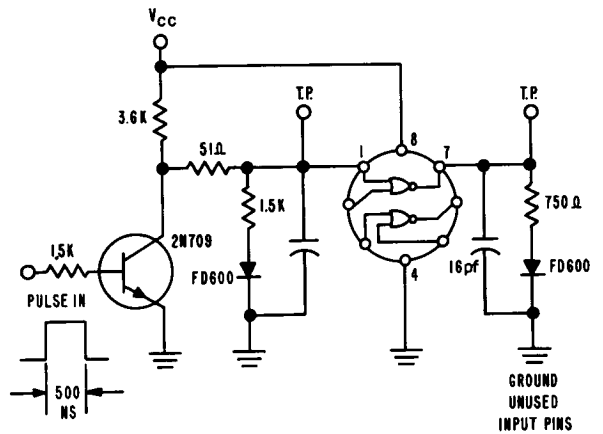


Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Fairchild Semiconductor, Mountain View, Calif.
Philco Corp., Lansdale Div., Lansdale, Pa.

Electrical Characteristics

Absolute Max. Ratings (25°C Free Air Temp)—
 Max. Volt. Applied To Pin 8 (Continuous): 8 volts.
 Max. Volt. Applied To Any Input Pin: ± 4.0 volts.
 Max. Power Dissipation: 250 mw.
 Max. Volt. Applied To Pin 8 (Pulsed, ≤ 1 sec): 12 volts.
 Storage Temp: -65°C to $+150^\circ\text{C}$.
 Average Power Dissipation (25°C): 4mw.
 Typical Resistors (See Circuit Diagram Above): $R_1 = 1.5\text{K}$;
 $R_2 = 3.6\text{K}$.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Varo, Inc., Garland, Texas

Electrical Characteristics

R: 47,000 ohms. (See Remarks)
Rc: 10,000 ohms. (See Remarks)
Ecc: +20 volts.
E bias: -6 volts.
Vin: 15 volts (at 0.1 μ sec rise and fall time).
Collector Load: 47,000 ohms returned to ground.
NOTE: Under the above test conditions, the circuit will operate as follows:

0°C to +100°C	-55°C to +100°C
Vout 16V	Vout 16V
Max. rise time 1 μ sec	Max. rise time 1 μ sec
Max. fall time 0.5 μ sec	Max. fall time 1 μ sec

Physical Characteristics

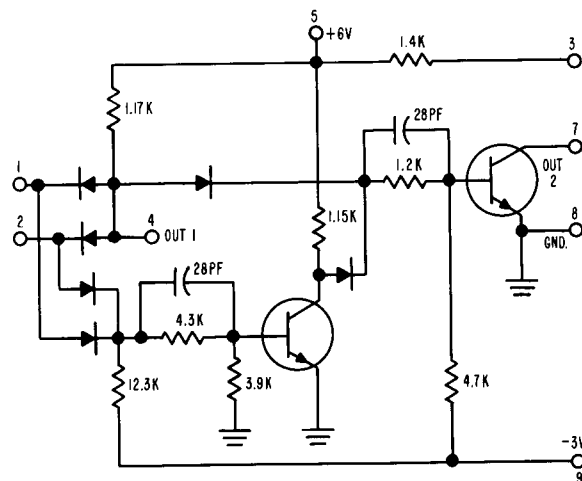
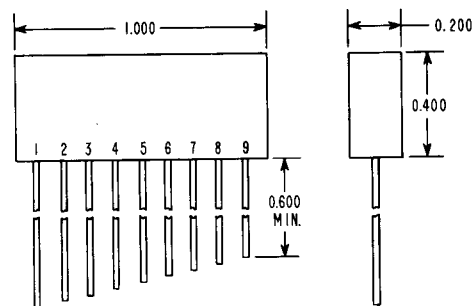
Case: Epoxy filled Diall
Leads: Nine, gold-flashed, beryllium copper leads 0.015" dia. by 0.3" long. (Nickel leads avail.)
Volume: 0.03 cu. in.

Environmental Conditions

Oper Temp: -55°C to +125°C
Meets applicable portions of MIL-STD-202.

Remarks: Values for R and Rc may be provided within a wide range of resistances to suit the voltage, current, temperature, and speed requirements of systems which require NOR circuits.

Q-OR-1 EXCLUSIVE OR/HALF ADDER, TYPE UC-1004B



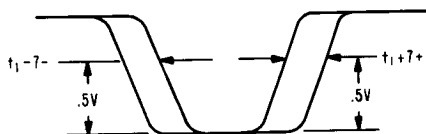
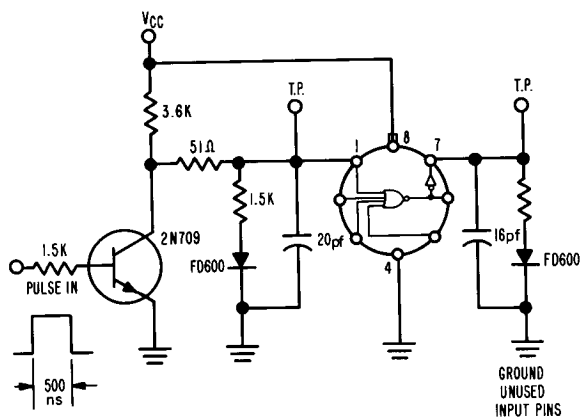
Quality Assurance: Manufacturer's claims.
Bureau Approval required prior to use.

Mfr: Sprague Electric Co., North Adams, Mass.

Electrical Characteristics

Max Supply Voltages: +15, -8 volts.
Max Input Voltage: 8 volts.
Max Oper Amb Temp Range: -55°C to +125°C.
Pwr Consumption: 130 mw, max.
Propagation Delay: 20 nsec.
Logic: Diode transistor.
Fan-Out: 5
Noise Voltage Protection: 0.5 volt.
Max Storage Temp: -55°C to +150°C.

SWITCHING TIME TEST CIRCUIT



Test	Test Conditions								Limits	
	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Min.	Max.
IPin1	Vin	Vbot	Vbot	GND	Vbot			Vcc		Iin
IPin2	Vbot	Vin	Vbot	GND	Vbot			Vcc		Iin
IPin3	Vbot	Vbot	Vin	GND	Vbot			Vcc		Iin
IPin5	Vbot	Vbot	Vbot	GND	Vin			Vcc		Iin
IPin6	Voff	Voff	Voff	GND	Voff	Vin		Vcc	Ia3	
IPin7	GND	GND	GND	GND	GND	Voff	Vin	Vcc	Ia4	Iom
VPin6	Von	GND	GND	GND	GND			Vcc		Vout
VPin6	GND	Von	GND	GND	GND			Vcc		Vout
VPin6	GND	GND	Von	GND	GND			Vcc		Vout
VPin6	GND	GND	GND	GND	Von			Vcc		Vout
VPin6	Vin	GND	GND	GND	GND			Vcc		Vce
VPin6	GND	Vin	GND	GND	GND			Vcc		Vce
VPin6	GND	GND	Vin	GND	GND			Vcc		Vce
VPin6	GND	GND	GND	GND	Vin			Vcc		Vce
VPin7	GND	GND	GND	GND	GND	Von		Vcc		Vout
VPin7	GND	GND	GND	GND	GND	Vin		Vcc		Vce
IPin8	GND	GND	GND	GND	GND			V11		I1
t(1-7-)	Pulse in	GND	GND	GND	GND		Pulse out	Vcc		70ns
t(1+7+)	Pulse in	GND	GND	GND	GND		Pulse out	Vcc		90ns

Typical Propagation Delay For Basic RTL Circuit: 40ns.
 Typical Power Dissipation For Basic RTL Circuit: 2mw.

Parameter	Condition	Min.	Typ.	Max.
Network Consumption			3	
Fan-Out, Exclusive OR				5
Fan-Out Aux. Outputs				4
In. V to Ensure Turn-On	T _a = 125C	1.15		
	T _a = -55C	1.6		
In. V to Ensure Turn-Off	T _a = 125C			0.22
	T _a = -55C			0.40
OFF Level Out. V				
Aux. Outputs	T _a = 125C, N = 0	2.2		
	T _a = 125C, N = 4	1.15		
Exclusive OR Output	T _a = 125C, N = 0	2.5		
	T _a = 125C, N = 5	1.15		
ON Level Out. V	T _a = 125C			0.22
	T _a = -55C			0.40

Physical Characteristics

Construction: Diffused silicon monolithic. Hermetically-sealed in glass-to-metal flat package.

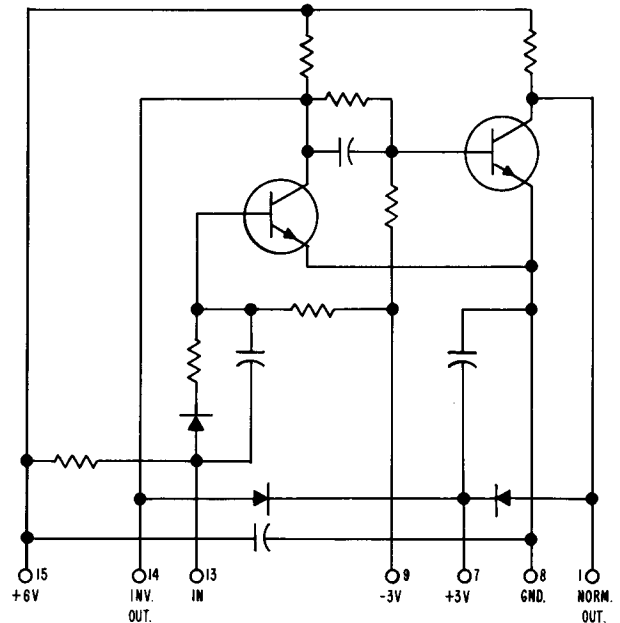
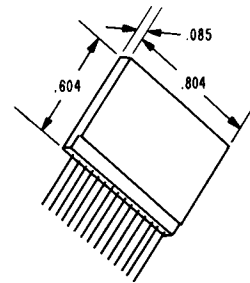
Leads: Ten gold-plated kovar leads spaced typically 0.050" apart.

Weight: Approx. 0.1 gram.

Remarks: The network above (Sprague Type US-0105 and Texas Instruments Type SN515) has three different output functions available. A positive input on lead 1 or 2 results in a negative output on lead 6. The same condition exists for input leads 4 or 5 and output lead 10. If a positive level exists on lead 1 or 2 and also on lead 4 or 5, then the output at lead 8 will be positive. This output will be negative for all other combinations of inputs.

Q-PUS-1 SHAPER, PULSE, MODEL 8205

Description: The Model 8205 Pulse Shaper utilizes thin-film technology combined with silicon planar epitaxial devices operating in a saturated mode to provide fast rise and fall pulse shaping. Normal and inverted outputs are provided.



Quality Assurance: Manufacturer's claims.
Bureau approval required prior to use.

Mfr: Varo, Inc., Garland, Texas

Electrical Characteristics

Power Requirements: +6 volts at 21 ma; +3 volts at -7 ma; -3 volts at 1 ma.

Input: 1 standard load, +0.5 volt or less to +3.5 volts or more.

Output Amplitude: +0.5 volt or less to +3.5 volts or more.

Output Loading: 4 standard loads (normal output); 3 standard loads (inverted output).

Physical Characteristics

Case: Epoxy filled Diall.

