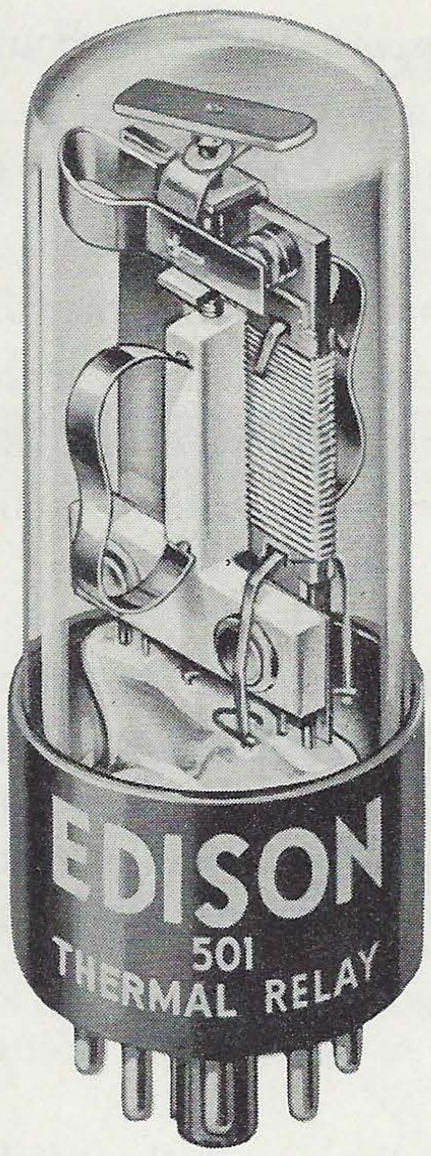
EDISON

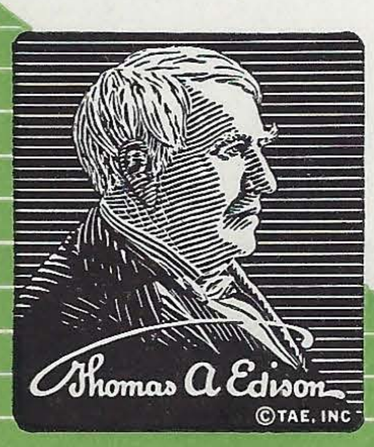


Model 501

Thermal Time Delay Relay

IT HAS LONG BEEN RECOGNIZED that a Thermal Relay is the simplest, least expensive, and most trouble-free way to introduce a delay period into an electric circuit. The advanced design of the EDISON Model 501 enables circuit designers to realize these advantages with complete confidence in the stability and long life of the relay. In addition, the inherent operating characteristics of the device provide an ideal way of solving many circuit problems not primarily concerned with timing.

- **Hermetically Sealed** — Explosion-proof; non-corrosive; non-arcing with contact currents to 6 amps.
- **Chatter-Proof** — 50 to 80 gram contact pressure applied when contacts close.
- **Tamper-Proof** — Pre-set adjustment within the glass envelope. *(Patent No. 2102407.)*
- **Vibration and Shock Resistant** — Withstands vibration of 1/16" overall amplitude at 55 cps and impact of 50 g.
- **Light Weight** — 1½ to 2¼ oz.
- **Built for Long Life** — Large contacts (.153" dia.); riveted and spot welded construction; heaters operate at low temperature (275° C. max.); fungus-resistant micanol base; 500,000 minimum operations under rated load conditions.
- **Wide Range of Delay Periods Available** — From 2 seconds to 5 minutes.
- **Operates in any Position.**
- **Ambient Compensated** —60 to +85° C.
- **Quick Mounting** — Fits standard intermediate octal socket.



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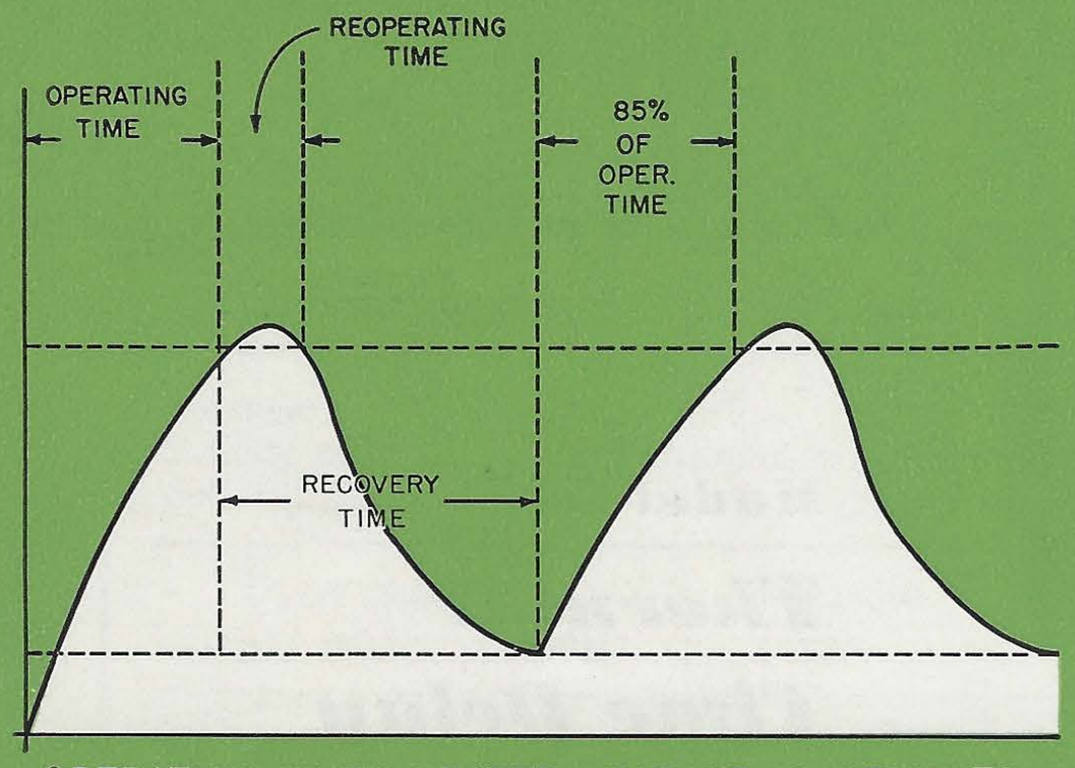


OPERATION WHEN HEATER VOLTAGE IS REMOVED IMMEDIATELY AFTER CONTACT OPERATION

How It Works

THE MECHANISM of the EDISON Model 501 Thermal Relay consists of two bimetal strips, each rigidly supported at one end and carrying a contact at the other. An electrical heater is wound around the primary bimetal which is deflected by the application of heater current to mate with the contact mounted on the other bimetal strip. The use of the second bimetal, which supports the preloaded spring contact, provides compensation for ambient temperatures from —60 to +85° C.

FULL CONTACT PRESSURE APPLIED ALMOST INSTANTANEOUSLY

One contact is mounted on a spring attached to the compensating bimetal. This spring is restrained until the primary bimetal is deflected sufficiently to cause contact. After the contacts close, the spring lifts from its restraining support and applies full force to hold the contacts firmly together. Factors controlling the deflection of the bimetal are stable, and the original setting of the contacts permanently fixes the timing characteristics of the relay.

VIBRATION RESISTANT

The 501 Relay will withstand shocks and vibration such as those normally found in aircraft, without damage. However, its timing integrity may be affected while operating during extreme vibration unless satisfactorily mounted. If any doubt exists, trial under simulated operating conditions is recommended.

Operating Values

In addition to the voltage and current ratings usually associated with relays, a thermal relay also includes the following values among its operating characteristics. For normally open relays these are:

A— **OPERATING TIME:** the interval, in seconds, between the application of heater voltage and relay contacts closure.

B— **REOPERATING TIME*:** the interval, between removal of heater voltage and opening of relay contacts.

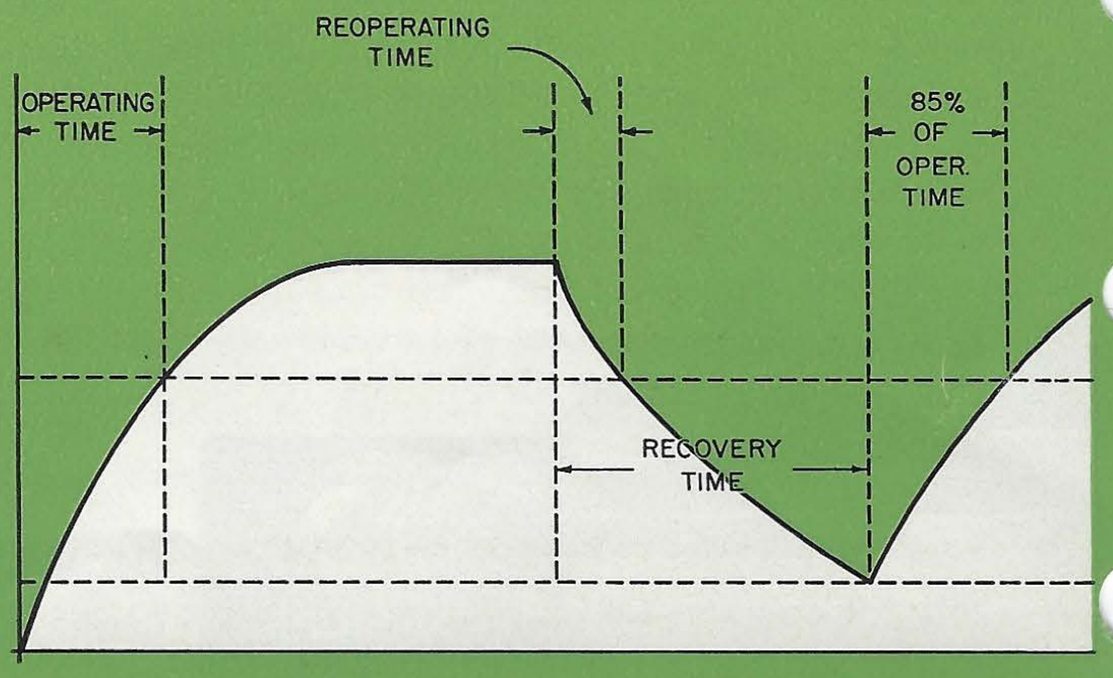
C— **RECOVERY TIME*:** the time interval between removal of heater voltage and restoration of 85% of the Operating Time. (The figure of 85% has been arbitrarily selected in order to define this value more accurately because of the asymptotic nature of the heating and cooling curves.)

D— **CRITICAL VOLTAGE:** the minimum heater potential that will cause contact closure.

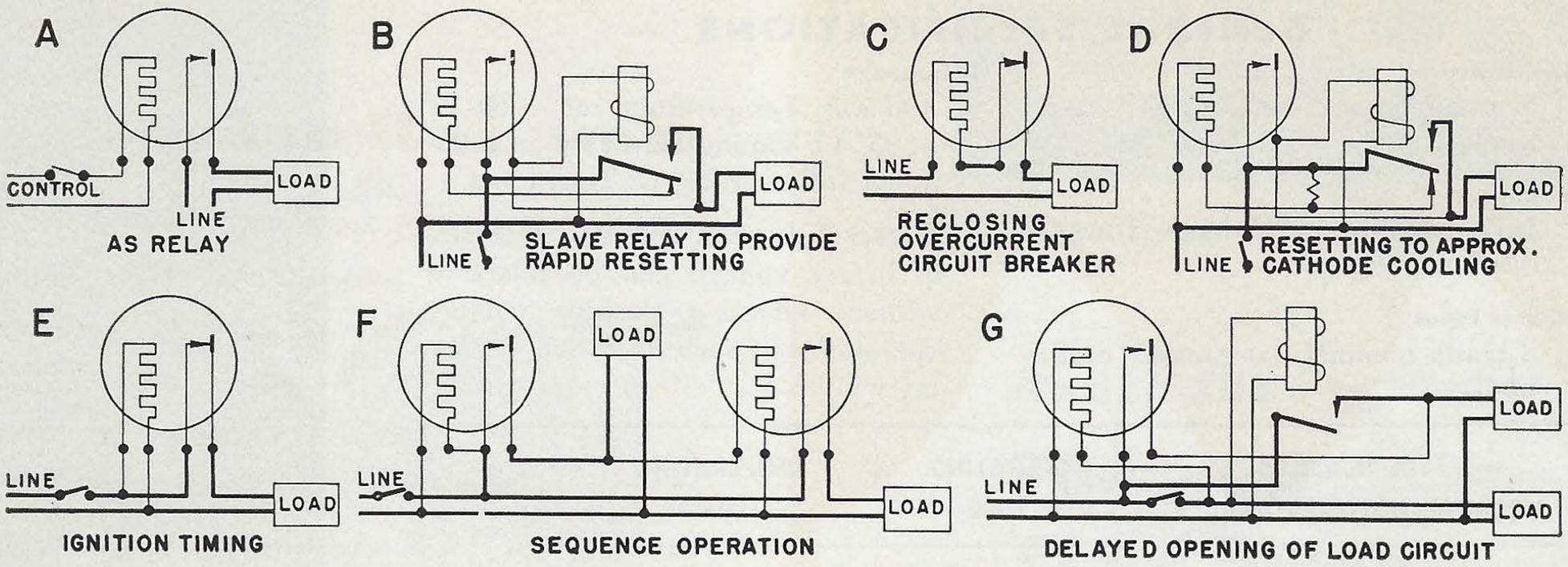
***NOTE:** *INSTANTANEOUS VALUES are those obtained by opening heater circuit the instant contacts operate.*

SATURATED VALUES are those obtained by opening the heater circuit after the heater has been energized long enough to thermally saturate the entire structure. The saturation time varies from 3 minutes for the short time relays to 1 hour for the long time relays.

Values for these characteristics are provided for each standard type listed on page four.



OPERATION WHEN HEATER VOLTAGE IS MAINTAINED UNTIL BIMETALS REACH SATURATION TEMPERATURE



Typical Applications

THERMAL RELAYS are singularly applicable to certain fields. A few typical examples are described below, using the several basic circuits shown above. Innumerable variations and modifications are possible to fit specific control functions.

FOR GENERAL CONTROL USE

Short-interval Thermal Relays are useful for many applications in which magnetic relays have been used. Freedom from maintenance, reduction in size and weight, independence from atmospheric pressure, and the complete silence of the Relay are features which are gained. Figure A is typical of this usage.

CATHODE PROTECTION

The satisfactory life of certain thermionic tubes requires the delay of application of plate voltage until the cathode has reached operating temperature. The Thermal Relay is ideally suited to this application. Its delay characteristic varies with line voltage in the same manner as the heating characteristic of the cathode, thereby providing greater protection than a purely time-operated device. Figures A, B, and D have all been used for this purpose. The circuit of Figure D is particularly noteworthy since it gives adequate tube protection for intermittent equipment operation without excessive loss of operating time.

SUSTAINED OVER-CURRENT OR OVER-VOLTAGE PROTECTION

Since it operates by heat input, which is proportional to the square of the heater current, and there is no pull-in drop-out differential, the Relay serves as a sensitive indicator or control of over- or under-current or voltage. Because of the Relay's delay function, surges are ignored and operation occurs only when the condition persists. A circuit such as shown in Figure C can be used or the Thermal Relay contacts may be connected in a control or alarm circuit.

MOTOR STARTING

The characteristics of the Relay adapt it to switching in motor starting circuits, in addition to its obvious use as an overload protection device.

IMPROVING SENSITIVE CONTACT OPERATION

Frequently the contacts of a control device will intermittently make or break before firmly closing. The use of an EDISON Thermal Relay instead of a magnetic relay for controlling the load will eliminate relay chatter and the resultant false starting of the load. It improves sensitive instrument contact operation by presenting a resistive load with no surges to produce contact welding.

INTEGRATION

The EDISON Model 501 will integrate pulses or intermittent current into accumulated heat energy which will operate its contacts after a predetermined rate of input has been reached.

"HOLDOVER" CIRCUITS

In many electrical circuits, it is desirable to continue the operation of certain elements after the main circuit has been broken. This is readily accomplished by using the inherent cooling interval of a normally open Relay as indicated in Figure G.

Standard Relays

GENERAL SPECIFICATIONS

Switch Action

Normally open, single pole, single throw.

Mounting

Intermediate octal base, fungus-resistant micanol.

Heater Input

5 watts nominal, continuous excitation.

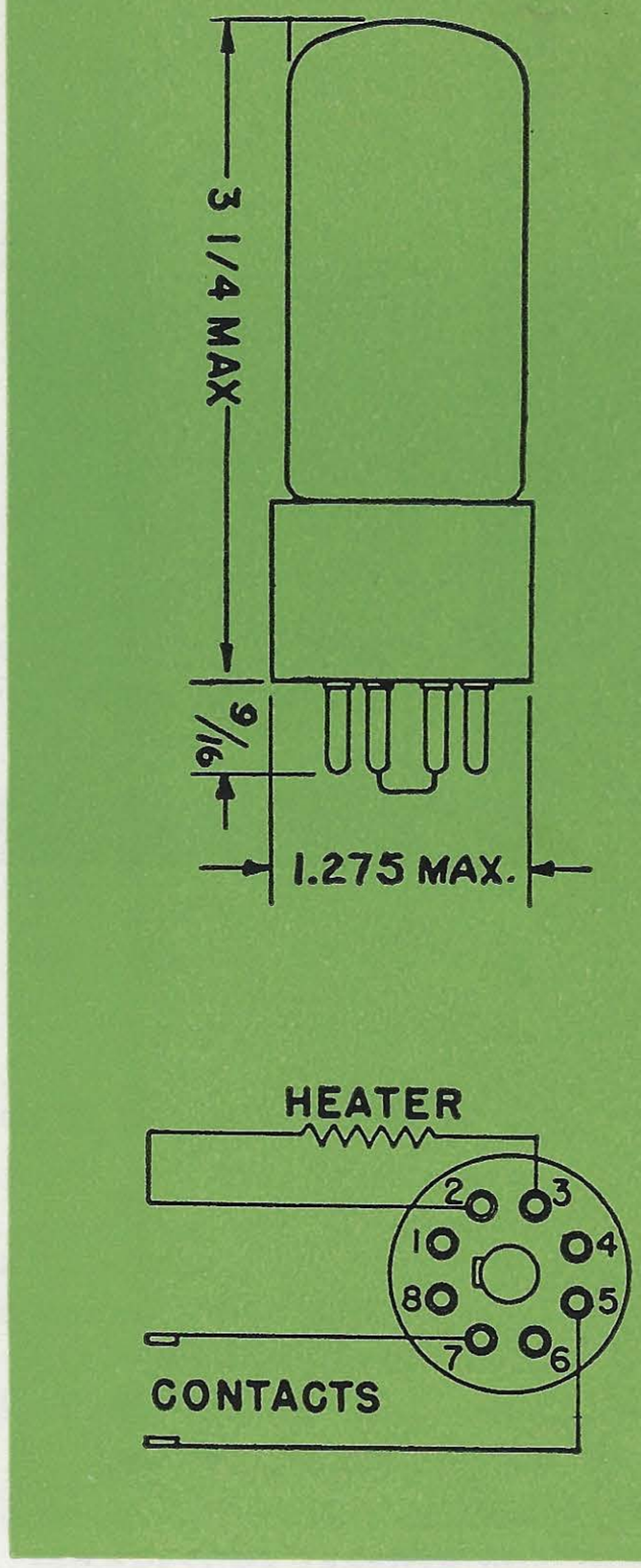
Tolerances

Ambient Temperature. at −60 or +85° C. Timing may vary an additional 10% over 25° C. Tolerances.

Heater Voltage. A variation of ± 10% in heater voltage can be tolerated without affecting positive contact operation but some variation in timing will occur.

TYPE NUMBERS NOMINAL HEATER VOLTAGES*			OPERATING TIME		REOPERATING TIME**		CONTACT RATING ***
117V.	26.5V.	6.3V.	Nom. Sec.	Tol. ± Sec.	Instant. Sec. ± 20%	Saturated Sec. ± 20%	
B2050	B2051	B2052	2	0.5	3.5	45	
B2101	B2011	B2021	5	1	5	50	3.0
B2102	B2012	B2022	10	2	2.5	25	AMP
B2103	B2013	B2023	20	3	6.5	45	150 v.
B2104	B2014	B2024	30	5	4.5	30	D.C. or
B2105	B2015	B2025	45	7	4	40	250 v.
B2131	B2034	B2037	60	9	3.5	35	A.C.
B2106	B2016	B2026	75	12	1.5	20	
B2140	B2041	B2042	90	14	75	110	
B2107	B2017	B2027	105	16	35	70	3.0
B2132	B2035	B2038	120	18	30	60	AMP
B2108	B2018	B2028	150	23	65	175	450 v.
B2133	B2036	B2039	180	27	40	135	D.C. or
B2109	B2019	B2029	210	32	35	125	450 v.
B2110	B2020	B2030	300	45	55	185	A.C.

*For heater voltages above 117 volts the use of a series dropping resistor is recommended.
**At nominal voltage and 25° C.
***Special contacts rated at 6.0 amps., at same voltages shown above, can be furnished on special order.



Special Types

Customers are urged to use the standard type relays wherever possible to gain the advantage of lower price and better delivery. However, relays can be made in quantity orders to similar specifications which will be reviewed without obligation.

Inquiries concerning special type relays should mention the type number of the most nearly acceptable standard relay and should then specify *only the necessary* variations and tolerances among the following characteristics in specifications:

- *Contacts normally open or closed*
- *Heater voltage*
- *Contact voltage and current*
- *Operating time*
- *Reoperating time, instantaneous or saturated*
- *Recovery time, instantaneous or saturated*
- *Type of Mounting*

It is strongly recommended that the standard intermediate octal base in micanol be used for all new installations. Most tube clamps which fit small octal will also fit above bases. Although obsolescent, small 4-pin, small octal, or wafer octal base with relay in a metal shell can be furnished on special order.

Note: For data on Miniature Time Delay Relay sealed in T-5½ glass envelope, ask for Bulletin No. 3027.

OTHER EDISON INSTRUMENT DIVISION PRODUCTS

Sensitive Magnetic Relays
Sealed Thermostats
Temperature Monitors
Aircraft Engine Gages
Electrical Temperature Indicators and Resistance Bulbs
Temperature Indicating and Alarm Systems
Fire Detection Systems

Publication No. 3007C

Printed in U.S.A.