Reed Relay Handbook

first edition

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ACKNOWLEDGMENTS

Few technical handbooks such as this are the work of one person alone. Usually they are the embodiment of ideas, suggestions, recommendations, and criticisms of many. Publication of this handbook would not have been possible without the combined assistance of the Sigma Engineering Department and the National Association of Relay Manufacturers to whom we are deeply indebted for their outstanding support.

R. A. Didriksen
Marketing Manager
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Switching Division

I How Reed Relays Work

The term *reed relay* covers dry reed relays and mercury-wetted contact relays, all of which use hermetically sealed reed switches. In both types, the reeds (thin, flat blades) serve multiple functions — as conductor, contacts, springs, and magnetic armatures.

Dry reed relays. Because of the tremendous increases in low-level logic switching, computer applications, and other business machine and communication applications, dry reed relays have become an important factor in the relay field. They have the great advantage of being hermetically sealed and are thus impervious to atmospheric contamination. They are very fast in operation and when operated within their rated contact loads, they have a very long life. They can be manufactured automatically and therefore are relatively inexpensive. A typical dry reed switch capsule is shown in Fig. 1.

Fig. 1. Construction of Switch Capsule of a Typical Dry Reed Relay (Form A)

In this basic design, two opposing reeds are sealed into a narrow glass capsule and overlap at their free ends. At the contact area, they are plated with rhodium over gold to produce a low contact resistance when they meet. The capsule, surrounded by an electromagnetic coil, is made of glass and filled with a dry inert gas. When the coil is energized in the basic form A contact combination, the normally open contacts are brought together; when the field is removed, the reeds separate by their own spring tension. Some may contain permanent magnets for magnetic biasing to achieve normally closed contacts (Form B). Single-pole, double-throw contact combinations (form C) are also available. Current rating, which is dependent upon the size of the reed and the type and amount of plating, may range from low level to 1 ampere. Effective contact protection is essential in most applications unless switching is done dry.

Relay packages using up to four form C and six form A dry reed switches are common, providing multipole switching arrangements. The reed relay may be built for a large variety of operational modes such as: pulse relay, latch relay, crosspoint relay, and logic relay. These relays may also be supplied with electrostatic or magnetic shields.

Mercury-wetted contact relays. Mercury-wetted contact relays are a form of reed relays consisting of a glass-encapsulated reed with its base immersed in a pool of mercury and the other end capable of moving between one or two stationary contacts. The mercury flows up the reed by capillary action and wets the contact surface of the moving end of the reed as well as the contact surfaces of the stationary contacts. Thus a mercury-to-mercury contact is maintained in a closed position. The mercury-wetted relay is usually actuated by a coil around the capsule.

Fig. 2. Miniature Mercury-Wetted Contact Switch (Form C)

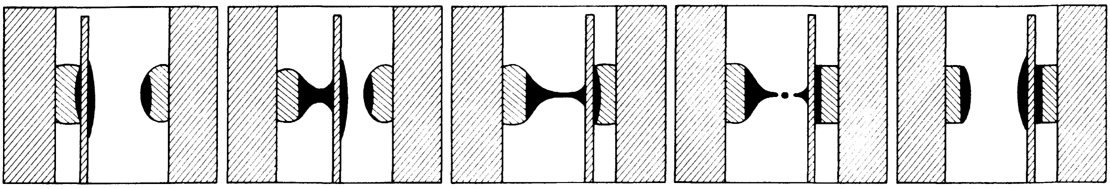
Aside from being extremely fast in operation and having relatively good load-carrying capacity, mercury-wetted contact relays have extemely long life since the mercury films are re-established at each contact closure and contact erosion is eliminated. Since the films are "stretchable", there is no contact bounce (see Fig. 3). Contact interface resistance is extremely low.

The disadvantages of this type of reed relays are the freezing point of mercury (−38.8°C), poor resistance to shock and vibration and the need to mount in a near vertical position.

These relays are available in a compact form for printed-circuit board mounting. Multi-pole versions can be provided by putting additional capsules inside the coil. They are used for a great variety of switching applications such as are found in computers, business machines, machine tool control systems, and laboratory instruments.

Recent mercury-wetted switch development has progressed to the point where there is now available a non-position sensitive, mercury-wetted, reed relay which combines the desirable features of both dry reed and mercury-wetted capsules. This new switch allows the user to place the reed relay in any position and is capable of withstanding shock and vibration limits usually associated with dry reed capsules. On the other hand, they retain the principal advantages of other mercury-wetted switches — no contact bounce, low and stable contact resistance.

Operation of this non-position sensitive switch is made possible by the elimination of the pool of mercury at the bottom of the capsule. Its unique design captures and retains the mercury on contact and blade surfaces only. Due to the limited amount of mercury film, this switch should be restricted for use at low level loads. For further details and contact rating refer to page 69 in this handbook.



1 2 3 4 5

Fig. 3. Mercury-Wetted Contact Action Seen in High-Speed Pictures (1) the mercury (shown in black) covers armature and contact points; (2) and (3)*as the armature moves from open to closed position, mercury filament joins both contacts momentarily; (4) the ruptured mercury surfaces accelerate away from each other, providing rapid breaking action; (5) as the contact surfaces join, mercury wetting dampens rebound, eliminates electrical chatter, and provides contact reliability.

*Picture 3 illustrates momentary bridging which occurs at high speed operation.

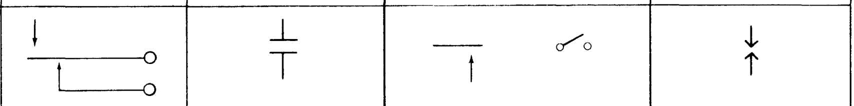
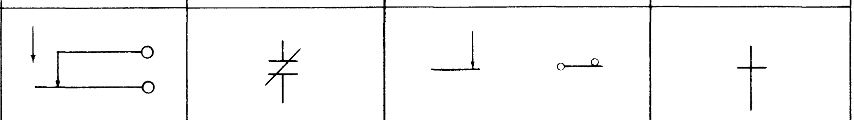
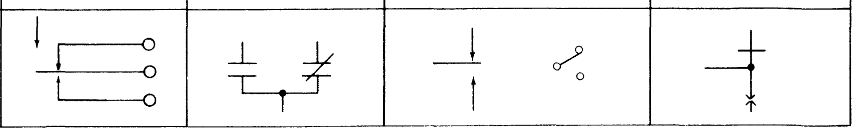
Form	Description	USASI Symbol	IEC, JIC, and NMTBA Symbols	Other IEC Symbols	Mod. Tel. Symbols
A	Make or SPSTNO				
B	Break or SPSTNC				
C	Break, Make, or SPDT (B-M), or Transfer				

Fig. 4 Symbols for reed relay contact combinations

II Applying Dry Reed Relays

Reed relays are those having either the dry or mercury-wetted switching elements defined previously. Because these switches share many characteristics, the discussion is primarily in terms of dry reeds, with distinguishing aspects of mercury-wetted devices presented later.

Though reed switches are relatively new, a number of designs have been developed to take advantage of these unique characteristics:

(1) A high degree of reliability stemming from their controlled contact environment.
(2) Consistency of performance resulting from a minimization of parts.
(3) Long operational life.
(4) Ease of packaging as a relay.
(5) Relatively high speed operation.
(6) Small size.
(7) Low cost.

CONTACT FORMS

Switches used in dry reed relays provide form A, B, or C contact action.

The form A corresponds with the basic switch capsule design (Fig. 1. page 1).

The form B results from the combination of the form A switch and a permanent magnet strong enough to close it, which may also be obtained by using the normally closed half of the form C switch, but the magnetically biased form A version is more frequently employed.

In the typical "true" form C switch design, the armature is mechanically tensioned against the normally closed contact, and is moved to the normally open contact upon application of a magnetic field. Form C can also be achieved by joining a form A with an appropriately adjusted form B.

Latching contacts, defined as contacts which remain in the position to which they were last driven although coil power is removed, are also frequently provided in dry reed relays. Using the form A switch, this is accomplished by biasing with a permanent magnet similar to that used for form B action. The difference is that the magnet is weaker, strong enough to hold the contact closed, but not strong enough to close it when open. All that is required is appropriate adjustment of the magnet.

Latching action is also possible with the "true" form C switches. In those which derive normally closed contact force from armature tension, the approach is essentially the same as with the form A switch.

RELAY CONFIGURATION

The simplicity of adding a coil to a dry reed switch to create a relay, coupled with the small size of some of the switches, has led to a proliferation of relay package designs.

Designs for use on printed circuit boards have proved most popular, comment here must therefore be limited to only their general characteristics. Many other designs are available to match the mechanical and electrical requirements of specific applications.

Printed circuit relays. Relays for printed circuit board use are, in general, of a "flat pack" configuration. Where multiple reeds (or reeds and magnets) are included in the package, they are set in a row and enclosed in an oval coil. Terminals are usually on a 0.1 in. or 0.15 in. grid pattern. Other manufacturers may have a product differing greatly. The user must be aware of the lack of standards.

Heights of printed board relays have been dictated, in part, by center-to-center board spacing in users' assemblies. Maximum acceptable relay height is usually 0.150 in. less than board spacing.

GENERAL PACKAGE CHARACTERISTICS

Number of switches. There appears to be no limit to the number of switches which can be actuated by a common coil. However, as the number increases, coil efficiency decreases and power input increases. This can lead to a practical limitation. On the other hand, the increase in power required to operate one more switch capsule is usually less than the total required if the assembly were split in two. Most frequently used is the relay with a single switch, but even relays with four or more switches in a single coil are quite common.

Assemblies. Dry reed relay structures can be categorized as open, potted, or molded assemblies.

Among printed board relays, the open assembly is frequently used because of cost consideration. The basic structure, typically molded of an electrical grade plastic, functions as a coil bobbin and provides a means of supporting the reed switches and relay terminals.

The same structure is often placed in a metal or plastic cover which is then filled with a potting material. These assemblies offer improved resistance to environmental or handling stresses.

Molded relays are similar to the potted relays, but differ in materials used. In these assemblies, the molding material provides the primary mechancial support for the switches and coil and also produces the finished external surfaces.

Changes in both temperature and relative humidity can cause dimensional shifts in the supporting structure not compatible with switch characteristics. Similar effects can result from shrinkage of potting or potting materials as they set.

Therefore, assemblies and materials are carefully chosen to offer proper support and protection to the reed switches and to minimize external or internal stresses which could cause fracture of the glass enclosures of the switches. Materials are also selected to withstand the effects of solvents used in cleaning the electrical assemblies in which the relays are used. Due to the wide variety of cleaning solvents presently available, and their effect on coil wire insulation and other relay parts (particularly in the case of open style reed relays), it is wise to consult the factory and discuss the cleaning solvent used.

In general, dry reed devices can be characterized as quite susceptible to the influences of external magnetic fields. For this reason, and to improve magnetic coupling of the coil to the switches, many relays incorporate some form of magnetic shielding. Metal cases serve this function, as do internal wraps or plates affixed to the coil. In some instances, the magnetic shield is connected to a terminal which may be grounded to provide electrostatic shielding, but in most cases the electrostatic shield is non-ferrous and separate from the magnetic shield.

SPECIALIZED APPLICATIONS

High standoff voltage. Dry reed switches are rather limited in their ability to withstand high voltages across their open contacts. Standard switches are rated at 250 VAC, with the high voltage switches rated at 600 and 1200 VAC typical. Dielectric strength across contacts varies with switch sensitivity. Terminal spacing is modified as required to withstand the voltages.

Power. Reed switches capable of handling power in excess of the typical 10VA rating of the standard switch capsule are available. Relays incorporating these switches are defined as "power relays".

High insulation resistance. Reed switches manufactured under carefully controlled processes provide an insulation resistance between contacts in excess of 10^{12} ohms. While most standard relay assemblies provide shunting paths which appreciably lower insulation resistance, special structures using appropriate materials and processes can preserve the basic high insulation resistance capability of the switch.

Low thermal voltage. Relays typically produce a voltage between contact terminals as a result of differing temperatures between the junctions of materials in the assembly. Changing ambient temperatures or heat produced by the relay coil cause temperature gradients within the relay. Relays incorporating materials and assembly techniques which minimize these effects are available.

Low noise. The cantilever reed members in a switch continue to move for a few milliseconds following contact closure. This motion can produce a variation in contact resistance, and it does cause a voltage to be generated between switch terminals. Relays using reeds and structural techniques which minimize the latter effect are called "low noise" relays, and are available (consult factory).

Low capacitance. Since the contact overlap area of most reed switches is small, capacitance between contacts is small. When the switch is installed in a coil, this capacitance is paralleled by the comparatively large capacitance of individual reed blades to the coil. The resulting increased capacitance across contacts and the capacitive coupling from coil to reeds can be objectionable in some applications.

By interposing an electrostatic shield between the reed switch and the coil, the paralleling capacitances can be greatly reduced with the capacitance across contacts approaching basic switch capacitance. In multipole relays, the electrostatic shield can be interposed between the switch group and the coil, or can also be interposed between individual switches.

Cross point. Relays used in matrix applications are called cross point relays. Reed relays adapt readily to the various schemes of "no response to one input-response to two inputs" and have been used extensively in matrices.

Logic devices. Reed relays readily adapt to the performance of logic functions through the addition or subtraction of magnetic fluxes produced by multiple coils.

Memory devices. Designs using a remanent structure external to the switch exist, as do switch designs in which the reeds themselves are of a remanent material. The more commonly used combination of a permanent magnet and a form A or form C reed switch described earlier fulfills the memory function.

ELECTRICAL CHARACTERISTICS

Contact ratings. Ratings of our dry reed relays are presented in some detail in the catalog section of this handbook.

Sensitivity. Power input required to operate dry reed relays is determined by the sensitivity of the particular reed switch used, by the number of switches operated by the coil, by the permanent magnet biasing (if used), and by the efficiency of the coil and the effectiveness of its coupling to the reeds. Minimum input required to effect closure ranges from the very low milliwatt level for a single capsule "sensitive" unit to several watts for a multipole relay.

Operate time. Coil time constant, overdrive, and the characteristics of the reed switch determine operate time. With maximum overdrive, reed relays will operate in approximately 200 microseconds. Drive at rated voltage usually results in a one millisecond operate time.

Release time. With the relay coil unsuppressed, dry reed switch contacts release in a fraction of a millisecond. Form A contacts open in as little as 50 microseconds. Magnetically biased form

B contacts and normally closed contacts of form C switches reclose in from 100 microseconds to one millisecond respectively.

If the relay coil is suppressed, release times are increased. Diode suppression can delay release for several milliseconds, depending on coil characteristics, drive level, and reed release characteristics.

Bounce. As with the other hard contact switches, dry reed contacts bounce on closure. The duration of bounce is typically quite short, and is in part dependent on drive level. In some of the faster devices, the sum of operate time and bounce is relatively constant as drive is increased, operate time decreasing and bounce increasing.

While normally closed contacts of a form C switch, bounce more than normally open contacts, magnetically biased form B contacts exhibit essentially the same bounce as form A's. For typical bounce specification see catalog section.

Contact resistance. Because the reeds in a dry reed switch are made of a magnetic material which has a high volume resistivity, terminal-to-terminal resistance is somewhat higher than in some other types of relays. Typical specification limits for initial resistance of form A reed relay is 0.200 ohm max.

Insulation resistance. A dry reed switch made with a properly controlled internal atmosphere will have an insulation resistance of 10^{12} to 10^{13} ohms or greater. When it is assembled into a relay, parallel insulation paths reduce this to typical values of 10^9 ohms. Depending on the particular manner of relay construction, exposure to high humidity or contaminating environments can appreciably lower final insulation resistance.

With specific care in assembly and with proper choice of materials, the basic insulation resistance capability of the switch capsule can be preserved. Relays having an insulation resistance 10^{13} ohms have been produced.

Capacitance. Reed capsules typically have low terminal-to-terminal capacitance. However, in the usual relay structure where the switch is surrounded by a coil, capacitances from each reed to the coil act to increase basic capacitance many times. If the increased capacitance is objectionable, it can be reduced by placing a grounded electrostatic shield between the switch and coil.

Typical capacitance values for relays are listed in the catalog section of this handbook.

Dielectric strength. With the exception of the high-voltage dry reed switches (those which are pressurized or evacuated), the dielectric strength limitation of relays is determined by the ampere turn sensitivity of the switches used. A typical limit is 200 VAC.

Dielectric strength between switch and coil terminals is usually 500 VAC.

When high voltage reeds are employed, relay structures must be modified to withstand the requirements of the application.

Thermal emf. Since thermally generated voltages result from thermal gradients within the relay assembly, relays built to minimize this effect often use sensitive switches to reduce required coil power and thermally conductive materials to reduce temperature gradients. Latching relays, which may be operated by short duration pulses, are often used if the operational rate is such that the benefit of reduced duty cycle can be realized.

Noise. In reed relays, noise is defined as a voltage appearing between terminals of a switch for a few milliseconds following closure. It occurs because the reeds are moving in a magnetic field and because voltages are produced within them by magnetostrictive effects. From an application standpoint, noise is important if the signal switched by the reed is to be used in the few milliseconds immediately following closure.

When noise is critical in an application, a peak-to-peak limit must be established, with measurement made a specified number of milliseconds following application of coil power. Measurement techniques, including filters which are to be used must also be specified.

ENVIRONMENTAL CHARACTERISTICS

Reed relays are used in essentially the same environments as other types of relays. Factors influencing their ability to function in these environments and construction techniques employed to enhance their capabilities are similar to those used elsewhere. However, the cantilever reed structure and the glass envelope do influence certain characteristics sufficiently to warrant discussion.

Vibration. The reed switch structure, with so few elements free to move, has a better defined response to vibration than other relay types. Assuming no particular influences from the relay assembly, the frequencies which will produce a response in the reeds are well defined. With vibratory inputs reasonably separated from the resonant frequency, the relay will withstand relatively high inputs, 20 g's or more. At resonance of the reeds, the typical device will fail at very low level inputs.

Typical resonant frequency is 2000 hz.

Shock. Dry reed relays withstand relatively high levels of shock. Form A contacts are usually rated as able to pass 30 to 50 g's, 11 msec, half sine wave shock, without false operation of contacts. Switches exposed to a magnetic field tending to close them, such as in the biased latching form, demonstrate somewhat lower resistance to shock. Normally closed contacts of mechanically biased form C switches may also fail at somewhat lower levels.

Temperature. Differential expansion or contraction of reed switches and materials used in relay assemblies can lead to fracture of the switches.

Proper choices of materials and of assembly methods minimize these effects. While reed relays are capable of withstanding temperature cycling or temperature shock over a range of at least −50°C to +100°C, limits of each application should be defined to ensure compliance.

Moisture. The primary effect of exposure to moisture is a probability of reduced insulation resistance. Here, proper selection of materials and assembly methods provides very satisfactory results.

APPLICATION NOTES

In general, the application of dry reed relays follows the pattern of other relay types. A few additional notes are presented here.

Magnetically biased relays. Any of the reed relays incorporating permanent magnets are polarity sensitive. These include:

(1) The typical form B.
(2) The latching form.

If driven by the wrong polarity, the form B does not operate. The latching form, on the other hand, transfers to the contact appropriate for the applied polarity.

The latching form and the form B, when driven by the polarity which causes switch opening, is subject to false operation if overdriven.

Flagging. When form A switches are released or when form B switches are operated, the reeds do not immediately assume their static position. Rather, they oscillate about their static position for a few milliseconds. In some applications this action can cause unexpected effects.

If a relay is operated at a rate such that the switch open time is not sufficient for the "flagging" of the reeds to cease, variation in reclosure time will probably be observed. This occurs because reed motion either aids or opposes the effect of the applied field. If open time is varied while observing contact action on an oscilloscope, this variation will be observed to maximize and minimize at a frequency determined by the "beat" between reed oscillation and coil drive. Some, in observing the variation in closure time, have misinterpreted the oscilloscope presentation as bounce.

As the reeds move, they cause changes in coil inductance with resultant changes in coil current (diode suppression assumed). If, as two reeds approach each other, they are given additional energy by an increase in coil current, they may reclose for a few microseconds. In multipole relays the probability of reclosure of a given switch is increased by the effects of the other switches on coil inductance and on flux paths in the assembly.

Flagging in a latching reed (a form A reed combined with a magnet) can lead to false closure. If the coil input which causes the switch contact to open is terminated while flagging is above a given level, the field produced by the permanent magnet will cause the reeds to re-latch when they approach each other. A similar effect can occur in a relay combining magnetically biased form B's (and form A's if the permanent magnet field of the A is above hold level,) or can occur with form B's if they are subjected to an overdrive. Flagging is most likely to occur during repetitive high speed operation (i.e., Q.C. inspection, life testing, etc.).

Some reed switch manufacturers have largely overcome the effects of flagging by incorporating means of limiting reed motion. However, the techniques are not applicable to all switch designs.

Ladder effect. In multipole relays operate times of individual switches are observed to be spread over a broader range than might be expected. As each switch closes, it increases inductance, causing a reduction in coil current and in flux available to close other switches. A similar effect is observed on release times if the relay coil is diode suppressed.

Contact Protection. A necessity for maximum contact life, when loads are other than pure DC resistive.

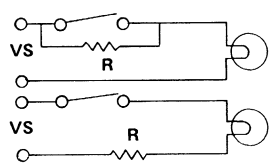


Figure 5. Tungsten Lamp Loads
Initial turn-on current is generally 10 times higher than the rated operating current of the lamp. A current limiting resistor in series with the load or a "bleeder" resistor across the contacts suppresses the inrush current surge.

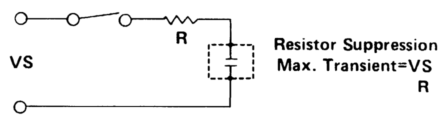


Figure 6. Capacitive Loads
Suppressed by use of a current limiting resistor placed in series with the contact load.

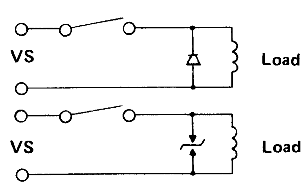


Figure 7. DC Inductive Loads
Suppression calls for either a diode, or a thyristor to be placed across the load.

Tungsten lamp, inductive and capacitive discharge type loads are extremely detrimental to reed switches and reduce life considerably. Illustrated above are typical suppression circuits which are necessary for maximum contact life. For additional information along with formulas to calculate proper values of suppression networks see page 8.

III Applying Mercury Wetted Reed Relays

Mercury wetted reed relays are a distinct segment of the reed relay family. They are different from the dry reed relays in the fact that contact between switch elements is made via a thin film of mercury.

The most frequently used mercury-wetted relay is described and illustrated on previous pages.

SPECIAL CHARACTERISTICS:

All relays classified as mercury wetted demonstrate unique capabilities. To simplify the discussion we have listed some of their major advantages.

(1) Contact resistance is essentially constant from operation to operation throughout life.

(2) Contacts do not exhibit bounce. The amount of mercury at the contacts is great enough to both cushion the impact of the underlying members and to electrically bridge any mechanical bounce that remains.

(3) Life is measured in billions of operations, due to constant contact surface renewal.

(4) Contacts are versatile. The same contacts, properly applied, can handle relatively high power and low level signals.

(5) Electrical parameters are constant. With contact wear eliminated, operating characteristics remain the same through billions of operations.

To preserve the characteristics described, rate of change of voltage across contacts as they open must be limited to preclude damage to the contact surface under the mercury. For this reason, suppression should be specified for all but low level applications. (See application notes)

Contact Forms. Mercury-wetted reed switches provide form A, B, and C contact action.

Relay Packages. The mercury-wetted reed switches bear mechanical similarity to dry reed switches and are packaged in much the same manner. There is one restriction. Position sensitive types are oriented in a package so that they must be operated in a near vertical position.

ELECTRICAL CHARACTERISTICS

While dry reed and mercury-wetted contact switches share many electrical characteristics, there are some notable differences. Only those parameters where the difference is worthy of comment are discussed here.

Contact ratings. Most mercury-wetted switches, because of their unique self-replenishing contacts, are rated at higher levels than their dry counterparts. (See catalog section for contact ratings.)

Operate and release time. All the mercury wetted devices are slightly slower to operate and release than the dry reeds. This is explained by the fact that the contact gap is purposely larger to cause the mercury to separate from the mating contact.

Insulation resistance. Mercury-wetted reed relays and dry reed relays provide similar insulation resistance values.

Capacitance. Capacitance between contact and between contact and coil is similar to dry reed relays.

Electrostatic shielding is effective in reducing capacitance between contacts and the relay coil.

Dielectric strength. Most mercury-wetted contact switches will withstand appreciably higher voltages without breakdown than will the dry reed switches. Many have greater contact gaps, and all have a higher internal pressure. Minimum breakdown voltage is 1000 VAC across contacts.

ENVIRONMENTAL CHARACTERISTICS

Shock and vibration. Since mercury-wetted switch and relay structures are so similar to their dry reed counterparts, their basic ability to withstand nonoperational shock and vibration without damage is not radically different. From an operational standpoint, however, position sensitive types have very limited capability due to the presence of the mercury pool.

Temperature. A limitation shared by all mercury-wetted switches is the freezing point of mercury (−38.8°C). This is an operational limit only and the relays are not adversely affected if stored at lower temperatures. Where operation at temperatures below the freezing point is required, environmental ambient temperature adjustments must be made.

APPLICATION NOTES

Servicing. Mercury-wetted relays are occasionally damaged or cause damage to other components when equipment is serviced with power on. Under these conditions, if a unit carrying these relays is inverted, shorting of the contacts can produce effects never envisioned in circuit design.

Mounting position. To ensure that distribution of mercury to the relay contacts is proper, position sensitive types should be mounted with switches oriented vertically. It is generally agreed that deviation from vertical by as much as 30° will have some effect on performance. The non-position sensitive mercury-wetted relay is not affected by these limitations.

Bounce. Mercury-wetted relays do not bounce if operated within appropriate limits. However, if drive rates are increased, resonant effects in the switch may cause rebound to exceed the level which can be bridged by the mercury. Electrical bounce will result. Altered distribution of mercury to the contacts, caused by the high rate of operation, may contribute to this effect.

Contact Resistance. Mercury-wetted relays have a terminal-to-terminal contact resistance which is somewhat lower than dry reed relays. Typical specification limit for the contact resistance is .150 ohm max.

Contact Protection. High inrush, inductive, and capacitance discharge type loads are extremely detrimental to reed switches and reduce life considerably. Arc suppression can take many forms; resistor-capacitor networks, zener diodes, nonlinear voltage sensing resistors and diodes. Switching values as printed in the catalogue should not be exceeded either in switching or transient conditions. Once the suppression has been selected, it is recommended that you view the switch on an oscilloscope to adjust the suppression for best results. Generally we recommend the following:

High inrush loads. A capacitor being charged or discharged through contacts by a circuit without proper current limiting constitutes a momentary short circuit. A lamp load can have a cold filament inrush of 10 times steady state current. A reed switch under these conditions will be switching peak load at the instant of closure and bounce. Under these conditions the initial closure is at high resistance; high current switching causes localized heating, enough to vaporize the contact material and cause microscopic welds. These welds, if sufficient, will allow contacts to stick or will cause base metal breakthrough and high contact resistance. Series resistance should be added to the circuit, to limit current flow.

Inductive loads. Switching loads that contain inductive surges produce high transient voltages that will dissipate in an arc across opening contacts unless an alternate means of energy absorption is provided. Various methods may be employed to protect switch contacts from inductive kickback. The simplest is a semiconductor diode connected in parallel with the switch or the load. It conducts a reverse current surge readily when the switch is open. Another alternate involves paralleling the inductor with a resistor. Contact protection will "smooth" the inductive spike and improve switch performance. A suppression network can be placed across either the switch or the load. The network can consist of a resistor and diode or a capacitor and resistor in series. For AC loads a thyrector diode and resistor should be used. Use the following nomograph to determine values for R & C in resistor capacitor networks. Typical circuit diagrams may be found on page 6.

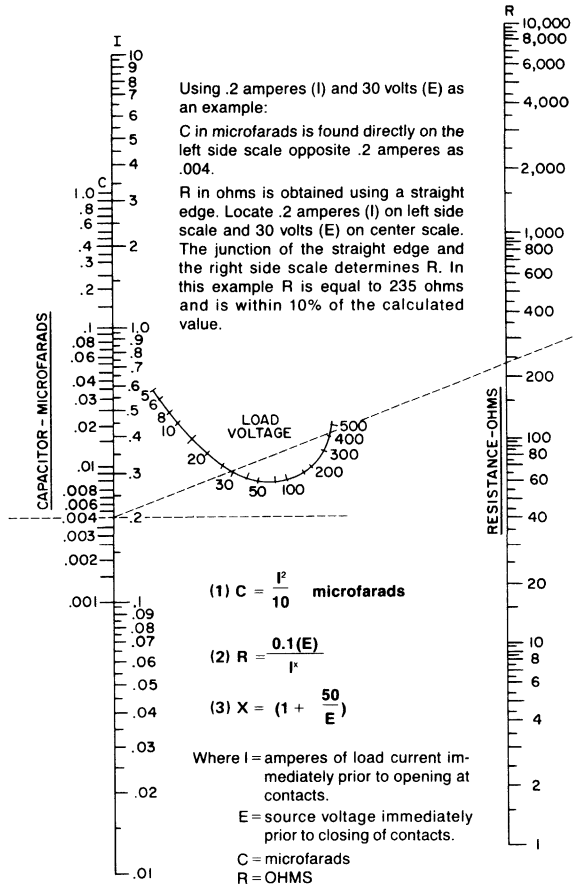


Fig. #8A Nomagraph for Contact Protection. (Courtesy Hamlin Inc.)

IV TESTING PROCEDURES

The following procedures do not cover all facets of testing reed relays. The intention of these comments is to cover those areas where misunderstanding and problems of correlation most frequently occur.

OPERATING CHARACTERISTICS

1. Pickup and Dropout.

1.1 General: This test method specifies the procedures to be used in testing reed relays for pickup and dropout when operated by direct current.
Contact loads for these measurements shall be 5 Vdc, 10mA maximum for all contacts. Lamps with high inrush currents shall not be employed. Meter accuracy of these measurements shall be ±3% of full scale. See Fig. 8B.

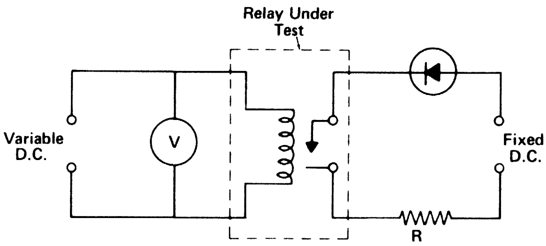


Fig. 8B— Test Circuit.

1.2 Requirements: The following requirements shall be specified:

1.2.1 Pickup, dropout, and nominal values as listed in the catalog section.

1.2.2 When testing Form B and latching biased configurations, care must be taken not to exceed the nominal coil voltage, and proper polarity must also be observed.

1.3 Procedure:

1.3.1 When testing Form A, B, or C relays with or without internal diode, the following sequence shall be used:
(a) A soak value at nominal voltage shall be applied for a minimum of 1 sec.
(b) The voltage shall be decreased to zero.
(c) The voltage shall be increased at a slow rate until the last contact pair has attained its fully operated condition. This voltage is the pickup voltage.
(d) The voltage shall be increased to the specified nominal value.
(e) The voltage shall be decreased at a slow rate until the last contact pair returns to its nonoperated condition. This voltage is the drop out voltage.

1.3.2 When testing single Form A or Form C latching relays, single or dual coil, the following sequence shall be used:
(a) Nominal voltage shall be applied to the reset coil for a minimum of 1 sec. and then decreased to zero.
(b) The voltage applied to the set coil shall be increased at a slow rate until the contact pair attains its fully operated condition. This voltage is the set value.
(c) The voltage shall be increased to the specified nominal voltage.
(d) The voltage shall be decreased to zero. The contact pair shall remain in its closed (set) condition.
(e) The voltage applied to the reset coil shall be increased at a slow rate until the contact pair returns to its initial condition. This voltage is the reset voltage.
(f) The reset voltage shall be increased to the specified nominal. The contact pair shall remain in the open (reset) condition.
(g) The voltage shall be decreased to zero. The contacts shall remain in the open (reset) condition.
(h) Coil polarity must be observed when making these tests. Refer to catalog specifications.

Notes: All measurements will be taken at +25°C. Compensation for changes in coil resistance at other temperature levels must be made based on the copper resistance constant. The test leads and their clips must be nonmagnetic. Magnetic fields and materials should be isolated from the relay under test.

2. Timing, Pickup, Dropout, and Bounce.

2.1 General: This test method specifies the procedure to be used in the measurement of pickup, dropout, and bounce time of the reed relay using an oscilloscope. See Figure 9A.

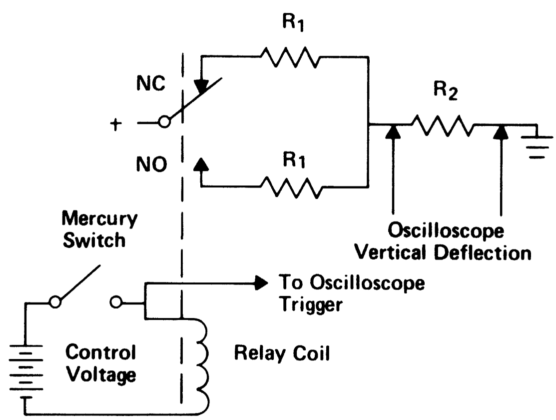


Fig. 9A — Circuit used for pickup (operate) and dropout (release) times.

2.2 Procedure:

2.2.1 The following parameters shall apply: contact load shall be 5 Vdc, 10mA. Coil voltage shall be the rated nominal voltage at 20 P.P.S. with a 50% duty cycle.

2.2.2 Operate Time: The oscilloscope time base is set to trigger on the leading edge of the coil-drive pulse. Operate time is measured from the instant of coil energization to the instant of the first contact closure of the last contact to function, not including bounce time. For Form A, see Fig. 9 B1; Form B, see Fig. 9 B2; Form C, see Fig. 9 B3.

2.2.3 Release Time: The oscilloscope time base is set to trigger on the trailing edge of the coil-drive pulse. Release time is measured from the instant of coil de-energization to the instant of the last contact to function, not including bounce time. For Form A, see Fig. 9 B4; Form B, see Fig. 9 B5; Form C, see Fig. 9 B6.

2.2.4 Operate Bounce Time: The oscilloscope time base is set to trigger on the leading edge of the coil-drive pulse. Bounce time is measured after the first closure of each contact. All uncontrolled openings and closures are contact bounce. For Form A, see Fig. 9 B1; For Form C, see Fig. 9 B3.

2.2.5 Release Bounce Time: The oscilloscope time base is set to trigger on trailing edge of the drive pulse. Bounce time is measured after the first closure of each contact. All uncontrolled openings and closures are contact bounce. For Form B, see Fig. 9B5, for Form C, see Fig. 9 B6.

3. Coil Resistance

3.1 Purpose: This test is to determine whether specified-coil-resistance values are met.

3.2 Requirements:

3.2.1 The coil resistance must meet the specified resistance value with a tolerance of ±10%.

3.2.2 The measurement shall be made with the coil at 25°C ambient temperature, or the values shall be corrected to this temperature.

3.3 Procedure: Coil resistance shall be measured by one of the following methods:

3.3.1 A Wheatstone bridge, Kelvin bridge (for low-resistance windings), or equivalent instrumentation capable of the required precision shall be used. The ambient temperature shall be measured and recorded.

3.3.2 Precautions: Prior to measuring resistance, the coil must be at room temperature. To avoid heating the coil, the measuring current shall be small relative

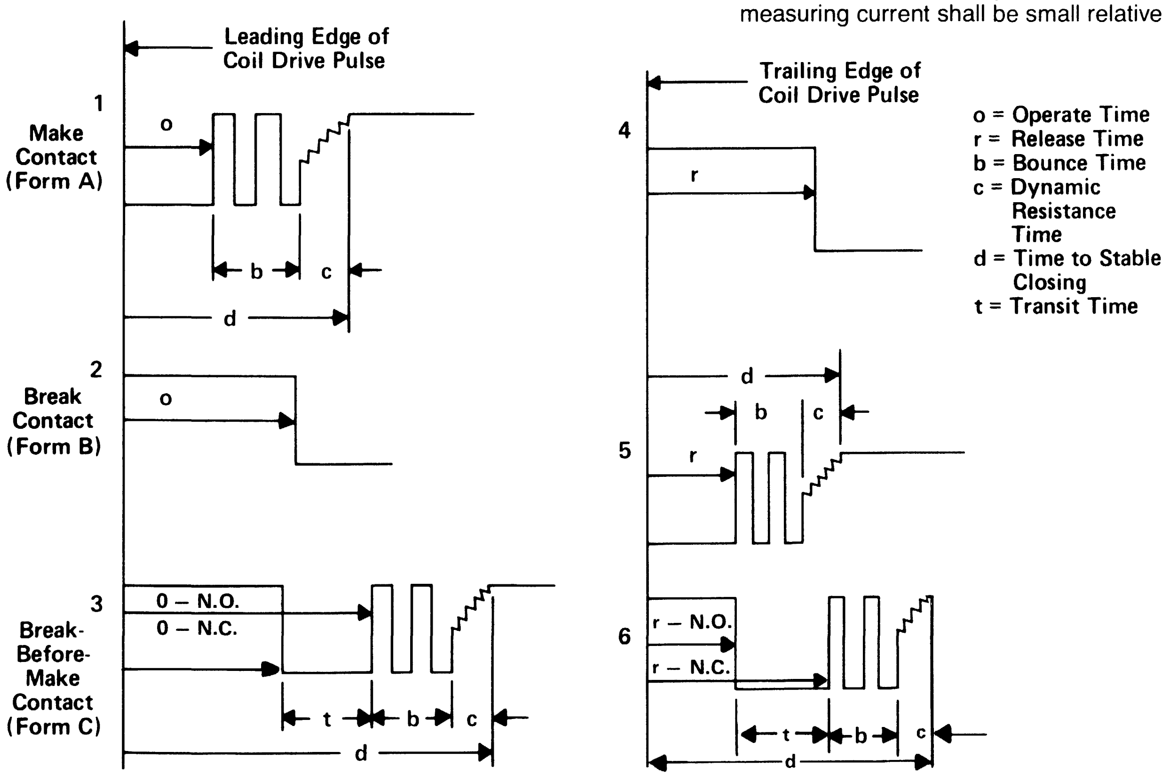


Fig. 9B — Typical contact response as observed on oscilloscope.

to operating current and shall be applied for a short interval. The measurement shall be made at the external winding terminals of the relay.

4. Static Contact Resistance

4.1 General: This test method specifies the procedure to be used in testing reed relay contact resistance. The measured value includes the fixed or terminal resistance as well as the variable or constriction resistance. Since the reed blade material forms a significant part of this measurement, the point of measurement must be carefully considered. (See Par. 4.2.1)

The measurement for normally-open contacts is made with nominal-coil-drive power applied. The latching and normally-closed-contact resistance is measured with no power applied to the coil at the time of measurement. This test technique is intended to measure the quiescent condition of the contacts, 50 milliseconds minimum after contact closure. The contacts must be in a static state to exclude magnetostrictive and noise characteristics inherent in reed contact. Measurements shall be made using the voltmeter-ammeter technique. Kelvin, or four-wire connections shall be used. See Fig. 10.

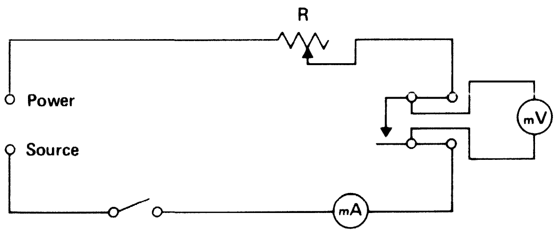


Fig. 10 — Measuring contact resistance.

Contacts shall be measured with 10 mA from a 5 volt source. The source shall provide or be adjusted to provide constant current. The accuracy of the source and measuring equipment shall be better than ±2%.

4.2 Procedure:

4.2.1 Connect test leads per Figure 10 with the current probes approximately 0.050 inch (1.25 mm) from the standoff base of the relay.

4.2.2 Apply nominal coil power to the relay and adjust the current in the contact-detection circuit to 10 mA. (For latching forms the coil power shall be removed prior to contact resistance tests. For Form B and the normally-closed-contact pairs of Form C configurations, the coil power is not applied.) Measure the voltage drop across the contact set.

4.2.3 The contact current shall be applied after the contacts have closed and be removed prior to opening of the contacts.

4.2.4 From measured voltage drop across the contact set calculate the contact resistance using ohms law.

4.2.5 Maximum terminal to terminal contact resistance is .200 ohms for dry reed relay and .150 ohms for mercury-wetted relays.

5. Dielectric Withstanding Voltage

5.1 Purpose: It is the purpose of this test to determine that the specified voltage can be applied between specified points without damage, arcing, breakdown, or excessive leakage current.

5.2 Requirements: Dielectric withstanding voltage requirements should specify:

5.2.1 Voltage at which test is to be performed. (Refer to catalog section)

5.2.2 Barometric pressure shall be sea level.

5.2.3 Time that the voltage is to be applied.

5.2.4 Specified point where voltage should be applied.

5.3 Procedure:

5.3.1 Testing Equipment: The voltage source shall be sinusoidal, 60 Hz ±2 Hz, with less than five percent distortion. The voltage shall not drop more than five percent when the load is increased from zero to 1 mA. The indicator used to detect failures shall have a response time of 25 milli seconds maximum at a current of 1 mA. It shall be adjusted to operate when the leakage current is 1 mA or greater, but shall not operate at a current of 0.75 mA or less.

5.3.2 Inspection Testing: Relays shall be measured in the condition in which they are shipped. No cleaning shall be performed prior to measurement. Unless otherwise specified, the test voltage shall be applied for 1 second minimum.

5.3.3 Precautions: Suitable safety precautions shall be taken to avoid exposing personnel to high voltage. In applying or removing voltage, transients in excess of the specified voltage shall be avoided.

6. Insulation Resistance

6.1 Purpose: This test method specifies procedures for the measurement of insulation resistance during inspection and production testing.

6.2 Requirements:

6.2.1 Voltage at which the measurement is to be performed shall be 100VDC.

6.2.2 Between open contacts and mutually insulated terminals insulation resistance shall be 1000 megohms min.

6.3 Procedure: A megohmmeter or megohm bridge shall be used for these measurements. Instructions furnished by the instrument manufacturer shall be followed. The accuracy of measurement, including effects of parallel leakage paths in the wiring and test fixtures, shall be within ±10 percent of the measured value.

6.3.1 The standard reference conditions for this measurement during inspection shall be 25°C ±5°C and 20-60 percent relative humidity. The specified voltage shall be applied for a minimum of 2 seconds; the lowest reading observed after 2 seconds shall be considered a measure of the insulation resistance.

7. Solderability

7.1 General: The purpose of this test method is to determine the solderability of reed relay terminals. This determination is made on the basis of the ability of these terminals to be wetted by a new coat of solder.

7.2 Requirements:

7.2.1 Flux: liquid, Rosin base, unactivated

7.2.2 Solder: 60% tin, 40% lead

7.2.3 Heat: 450° ±10°F (230° ±5°C)

7.2.4 Time: 5 ±½ sec.

7.2.5 Visual Examination. (under 10X magnification)

7.3 Test Procedure:

7.3.1 Preparation of Terminations: No wiping, cleaning, or scraping, of the leads shall be performed.

7.3.2 Application of Flux: The flux shall be liquid, Rosin base. No activated or corrosive fluxes shall be used. Leads shall be immersed in the flux, which is at room ambient temperature, to within 0.05 inch of the body of the part. The surface to be tested shall be immersed in the flux for a period of from 5 to 10 seconds.

7.3.3 Solder Dip: The solder shall be composed of 60% Tin and 40% Lead by weight. The dross and burned flux shall be skimmed from the surface of the molten solder. The molten solder shall then be stirred with a clean, stainless steel paddle to assure that it is a uniform temperature of (450° ±10°F) 230° ±5°C. The surface of the molten solder shall be skimmed again just prior to immersing the terminations in the solder. The dwell time in the solder bath shall be 5 ±½ seconds. After the dipping process, the part shall be allowed to cool in air. Residue flux shall be removed from the terminations by dipping in clean isopropyl alcohol. If necessary, a soft damp cloth moistened with clean isopropyl alcohol may be used to remove all remaining flux.

7.3.4 Visual Examination: The surface which has been solder dipped shall be examined under 10X magnification. If any view of the tested surface shows less than 95 percent coverage, the specimen shall be considered as having failed the test.

7.4 Precaution: During handling, care shall be exercised to prevent the surface to be tested from being abraided or contaminated by grease, perspirants, etc.

V Definitions of Reed Relay Terms

The following terms and definitions were selected because they are commonly used when discussing reed relay types, construction and operating characteristics. We hope their inclusion in this Sigma Handbook will help your understanding and successful application of Sigma reed relays.

Ambient temperature – The temperature of the medium (usually air) surrounding the relay and into which the heat from electrical and magnetic losses in the relay is dissipated.

Ampere turn(s) – The product of the number of turns in an electromagnetic coil and the current in amperes passing through the coil.

Arc, contact – The electrical (current) discharge that occurs between mating contacts when the circuit is being disestablished.

Armature – The moving magnetic member of an electromagnetic relay structure that converts electrical energy into mechanical work.

Bias, electrical – An electrically produced force tending to move the armature towards a given position.

Bias, magnetic – A steady magnetic field applied to the magnetic circuit of a relay.

Bifilar winding – Two windings with the wire of each winding alongside the other, matching turn for turn. (See also Coil, parallel wound.)

Bobbin – A spool upon which a coil is wound.

Break – The opening of closed contacts to interrupt an electrical circuit.

Break-before-make contacts – See Contacts.

Break contacts – See Contacts.

Bridging – The undesired closing of open contacts, resulting from contact bounce or caused by a metallic bridge or protrusion developed by arcing.

Chatter, armature – The undesired vibration of the armature due to external shock and vibration.

Chatter, contact – The undesired vibration of mating contacts during which there may or may not be actual physical contact opening. If there is no actual opening but only a change in resistance, it is referred to as dynamic resistance.

Close-differential relay – A relay having its dropout value specified close to its pickup value.

Coil – An assembly consisting of one or more magnet wire windings, usually wound on a bobbin.

Coil, concentrically wound – A coil with two or more insulated windings, wound one over the other.

Coil, parallel wound – A coil having two windings wound simultaneously with the turns of each winding being contiguous (see Bifilar winding).

Coil, tandem wound – A coil having two or more windings, one behind the other, along the longitudinal axis.

Coil covering – A protective layer of insulating material over the outermost (surface) turns of wire.

Coil terminal – A device, such as a solder lug, tab, binding post, or similar fitting, on which the coil winding lead is terminated and to which the coil power supply is connected.

Coil tube – An insulated tube on which a coil is wound.

Coil winding – An electrically continuous length of insulated wire wound on a bobbin, spool, or form.

Coil (winding) power dissipation – The electrical power (watts) consumed by the energized winding or windings of a coil.

Coil (winding) final power dissipation – The electrical power consumed by a winding or windings when thermal equilibrium is reached.

Coil (winding) resistance – The total terminal-to-terminal resistance of a coil at a specified temperature. A tolerance of measured value from a nominal specified resistance is usually allowed.

Compliant (contact) spring – A contact spring that can, and is intended to, move appreciably when contacted by a mating contact spring.

Contacts – The surfaces of current-carrying members at which electrical circuits are opened or closed.

Contacts, bistable – A contact arrangement in which the movable contact remains in the last operated position on de-energization of the operating winding.

Contacts, break-make – A contact combination in which one contact opens its connection to another contact and then closes its connection to a third contact.

Contacts, double throw – A contact combination having two positions.

Contacts, dry circuit – (1) Contacts that neither break nor make current. (2) Erroneously used for low level contacts. See Contacts, low level.

Contacts, dry reed – Glass-enclosed contact using reeds as the contacting members.

Contacts, low level – Contacts that control only the flow of relatively small currents in relatively low-voltage circuits.

Contacts, nonbridging – A contact arrangement in which the opening contact opens before the closing contact closes.

Contacts, normally closed – A contact pair which is closed when the relay is in its unoperated position.

Contacts, normally open – A contact pair that is open when the relay is in its unoperated position.

Contact bounce – The intermittent and undesired opening of closed contacts. See Chatter, Contact.

Contact force – The force exerted by a movable contact against a fixed contact when the contacts are closed. Also referred to as contact pressure incorrectly.

Contact gap – The distance between a pair of mating relay contacts when the contacts are open; same as contact separation.

Contact load – The electrical power demands encountered by a contact set in any particular application. (See also Contact Rating.)

Contact rating – The electrical power handling capability of relay contacts under specified environmental conditions and for a prescribed number of operations as defined by the manufacturer.

Contact resistance – The electrical resistance of operated contacts as measured at their associated contact terminals.

Contact(ing) sequence – The order in which contacts open and close in relation to other contacts.

Contact transfer time – The interval between opening of the closed contact and closing of the open contact of a contact combination.

Contact weld – A contacting failure due to fusing of contacting surfaces under load conditions to the extent that the contacts fail to separate when expected to do so.

Contact wipe – The scrubbing action between mating contacts resulting from contact over-travel or follow.

Continuous-duty relay – A relay that may be energized with maximum rated power indefinitely without exceeding specified temperature limitations.

Crosstalk – The electrical coupling between a closed contact circuit and other open or closed contacts on the same relay or switch, expressed in decibels down from the signal level.

Current (sensing) relay – A current (sensing) relay is one that functions at a predetermined value of current.

De-energization – The removal of power from a relay coil.

Double-wound coil – A coil consisting of two windings on the same bobbin.

Dropout, measured – The current or voltage at which the relay restores to its unoperated position.

Dropout, specified – The specified maximum current or voltage at which the relay must restore to its unoperated position. Sometimes referred to as minimum dropout.

Dry circuit – See Contacts, dry circuit.

Dry reed relay – A reed relay with dry (non-mercury-wetted) contacts.

Duty cycle – A statement of energized and de-energized time in repetitious operation, for example, 2 seconds on, 6 seconds off, and the like.

Dynamic contact resistance – See Chatter, Contact.

Electromagnetic relay – A relay whose operation depends upon the electromagnetic effects of current flowing in an energizing winding.

Electrostatic shield – A metallic shield or foil, usually grounded, used between reed switches, between a reed switch and coil, or between adjacent relays to minimize crosstalk effects, or induced voltages.

Energization – The application of power to a coil winding of a relay. With respect to an operating coil winding, use of the word commonly assumes enough power to operate the relay fully.

Final actuation time – The time interval from coil energization to the complete functioning of the last contact combination to be operated on pickup, or the last combination to be restored to normal on dropout.

Fixed contacts – The stationary contacts of a relay, disengaged by moving contacts to make or break circuits.

Header – The subassembly that supports and insulates the leads passing through the walls of a sealed relay.

High-voltage relay – A relay designed to handle elevated voltages on its contacts, coil, or both.

Impregnated coils – Coils that have been permeated with a phenolic varnish or other protective material to protect them from mechanical vibration, handling, fungus, and moisture.

Inductance — The property of an electric circuit whereby it resists any change of current during the building up or decaying of a self-induced magnetic field, and hence introduces a delay in current change with resulting operational delay. For convenience and standardization, rather than any technical significance, winding inductance is measured at a stated frequency, usually 1000 cycles (Hz), with the armature held in its operated position unless otherwise specified. True inductance at any instant is very much affected by the degree of magnetic saturation, the presence of any steady current component, the armature position at instant of consideration, and the like.

Insulation resistance (of a device) – Resistance of insulation measured (in ohms) at a specified d-c voltage and under ambient conditions, after current becomes constant. The resistance to leakage current of an intended insulator.

Latch relay – A relay that maintains its contacts in the last position assumed without the need of maintaining coil energization.

Low level relay – A term used to designate a relay with contacts capable of functioning in a low level circuit. See Contacts, low level.

Magnetic field – A condition in the vicinity of a remanent magnet or an electrically energized coil of wire which manifests itself as a force on magnetic objects within that space. In a relay the magnetic field energizes the armature and causes its operation.

Magnetic latching relay – A relay that remains operated from remanent magnetism until reset electrically.

Make – The closure of open contacts to complete an electrical circuit.

Make contact – A normally open contact.

Mercury contact relays – Mercury wetted contact relay – A form of reed relay in which the reeds and contacts are glass enclosed and are wetted by a film of mercury obtained by capillary action from a mercury pool in the base of a glass capsule vertically mounted.

Nominal voltage – See Rated coil voltage.

Noncompliant (contact) spring – A contact spring that cannot, and is not intended to, move appreciably when contacted by a mating contact spring.

Normal position – The usual de-energized position of contacts, open or closed.

Operating characteristics – Pickup, dropout, voltage or current, the operate and release time(s) of the relay, and the contact bounce comprise the operating characteristics.

Overdrive – A term used to indicate use of greater than rated coil current and/or voltage, and usually employed in obtaining abnormally fast operate time.

Pole – A combination of mating contacts: normally open, normally closed, or both.

Pole, double – A term applied to a contact arrangement to denote that it includes two separate contact combinations, that is, two single pole contact assemblies.

Pole, multi – A term applied to a contact arrangement to denote that it includes two or more separate contact combinations.

Pole, single – A term applied to a contact arrangement to denote that all contacts in the arrangement connect in one position or another to a common contact.

Pull-in – Sometimes referred to as pickup.

R.F. switching relay – A relay designed to switch frequencies that are higher than commercial power frequencies with low loss.

Rated coil current – The steady-state coil current on which the relay is intended to operate for the prescribed duty cycle.

Rated coil voltage – The coil voltage on which the relay is intended to operate for the prescribed duty cycle.

Rating – The designated capability of a relay's coil and/or contacts under definite conditions. (1) The coil is usually rated for maximum voltage and/or current that can be tolerated for a specified time. (See Rated coil current and Rated coil voltage.) (2) The contacts are usually rated according to the type of maximum load to be handled. At maximum power requirements, the nature of the load as well as the voltage and current values to be handled must be specified. These include Resistive, Inductive, Capacitive, Motor and Lamp loads, and the characteristics of each, such as inrush current, steady state, or running current, degree of inductance, power factor, frequency, etc. Other requirements to be considered may include Dry Circuit, Low Level, and Intermediate or Minimum Current capabilities.

Reed relay — A relay using glass-enclosed, magnetically operated reeds as the contact members. Some forms are mercury-wetted.

Release – Sometimes referred to as drop-out.

Saturation – The condition attained in a magnetic material when an increase in field intensity produces no further increase in flux density.

Sensitive relay – A relay that operates on comparatively low input power, commonly defined as 100 milliwatts or less.

Sensitivity – Pickup, specified, expressed in milliwatts.

Sequential relay – A relay that controls two or more contact combinations in a predetermined sequence.

Soak – the conditioning of a relay by approximately saturating its magnetic circuit.

Temperature correction – The act of converting a measured value of coil resistance at a known temperature to a calculated resistance value at some other temperature.

Throw, double (FORM C) — A term applied to a contact arrangement to denote that contacting is effected in both the operated and nonoperated position, for example, a contact form such as a break-make or transfer.

Throw, single (FORM A and B) — A term applied to a contact arrangement to denote that contacting is effected in only one position and not the other, for example, a normally closed or normally open contact.

Time, contact bounce – The time interval from initial actuation of a contact to the end of bounce brought about during pickup or dropout or from external causes.

Time, operate – The time interval from coil energization to the functioning time of the last contact to function. Excluding contact bounce time.

Time, release – The time interval from coil de-energization to the functioning time of the last contact to function. Excluding contact bounce time.

Time, transfer – The time interval between opening the closed contact and closing the open contact (and vice versa) of a break-make contact combination.

Voltage standing wave ratio (VSWR) – In a relay, the contacts of which handle radio frequency (r-f), the power loss due to the mismatch introduced into the line by the coaxial relay contacts, expressed as a ratio of the highest voltage to the lowest voltage found in the r-f line.

Wire, magnet – Any coated conductor used to wind an electromagnetic coil in order to develop and maintain a magnetic field under prescribed conditions.

VI PRODUCT DATA INFORMATION

Relay Type Index

Dry Reed Relays

Molded Miniature Size

Standard Miniature Size

Special Purpose Miniature Size

Mercury Wetted Relays

Molded Miniature Size

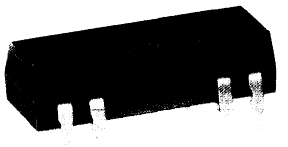
Standard Miniature Size

Numerical Index by Series No.

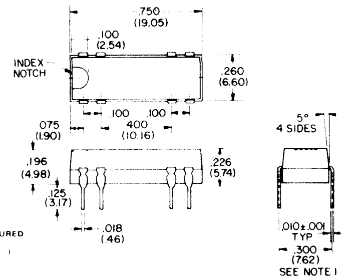
Series 191
DIP Reed Relay

- SPST • DPST • SPDT
- LOW PROFILE .226 HIGH

The Series 191TE offers .226 low profile height and the ability to be machine inserted in printed circuit boards. Design features include high isolation, with exceptional stability and resistance to shock, acceleration, and temperature variations. The SPST versions provide reliable, long life switching up to 10 VA at 0.5 amperes. SPDT versions offer 8 VA switching capability and employ the Sigma patented snap-action Form C capsule. The DPST versions are rated at 3 VA switching capability.



Mechanical Data



NOTES
1. DIMENSION TO BE MEASURED AT BENDS
2. DIMENSIONS SHOWN IN ( ) ARE IN MILLIMETERS

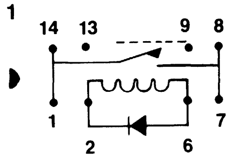
- **Dual-in-line 8 terminals**
- **10 VA rating Form A, 8 VA Form C, 3 VA 2 Form A**
- **Indexed for automatic insertion**
- **Molded Construction**
- **Power requirements as low as 50 mw**

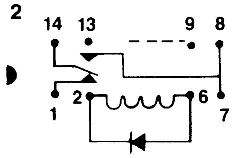
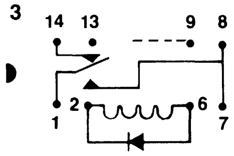
ELECTRICAL CHARACTERISTICS (Values at 25°C)

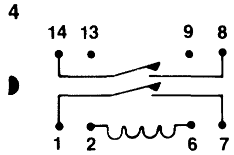
Contact Form	1 Form A SPST-NO	2 Form A DPST-NO	1 Form C SPDT
Contact Rating (max) Switching Volts (max) Switching Current (max) Carry Current	10 VA 100 VDC 0.5 Amp 1.5 Amp	3 VA 30 VDC 0.1 Amp 0.5 Amp	8 VA 100 VDC 0.5 Amp 1.5 Amp
Contact Resistance (Initial)	0.20 OHM (max)		
Dielectric Strength Across open cont. Contacts to coil	200 VAC 1000 VAC		
Insulation Resistance OHMs (test at 100 VDC)	10^9 OHM (min)		
Capacitance across open contacts Contacts to Coil	.3 pf typical 2.0 pf typical		

GENERAL CHARACTERISTICS

	Form A	Form C
Operate Time Normally open Normally closed	500 μs max —	500 μs max 400 μs max
Operate Time Normally open (including bounce)	1000 μs max —	1000 μs max —
Release Time Normally open Normally closed	400 μs max —	400 μs max 500 μs max
Release Time Normally closed (including bounce)	—	1300 μs max
Coil Resistance Rise Due to Temperature	Coil resistance will rise 0.4% per one Degree °C of Temperature Increase	
Pick up Voltage (max)	80% of Nominal Coil Voltage	
Drop out Voltage (min.)	10% of Actual Pick-up Voltage	
Shock (non operate)	50G's 11 ms ½ Cycle	
Vibration	20 G's 0-5000 Hz operating	10 G's 0-2000 Hz operating
Operate Temp. Range	−45°C to +85°C	
Storage Temp. Range	−60°C to +105°C	
Life At Rated Load	10 million operations	
Life Low Level	100 million operations	
Enclosure	Molded Epoxy	
Terminals	Nickel Iron-Tin Plated	
Weight	0.05 oz (1.4g)	

1 FORM A SPST-NO	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
1 	8 PIN	1A1	1A2	1A5	1A6

1 FORM C SPDT	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
2 	8 PIN	1C1	1C2	1C5	1C6
3 	8 PIN	1C1M	1C2M	1C5M	1C6M

2 FORM A DPST-NO	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
4 	8 PIN	2A1	N/A	N/A	N/A

◗ Index notch
*E.S. Electrostatic shield

STANDARD COIL DATA CHART — TABLE B

1 FORM A SPST-NO		1 FORM C SPDT		2 FORM A DPST-NO	
Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)
5S	500	5S	200	5G	200
5G	200	5G	150	6G	200
6S	500	6S	200	12G	500
6G	200	6G	150	24L	1200
12G	1250	12G	500		
12L	500	24L	1250		
24W	1250				

IN STOCK FOR IMMEDIATE DELIVERY— SERIES 191

PART NO. (including coil voltage)	CONTACTS Arrange-ment	CONTACTS Schematic Diagram	OPTIONS*	COIL RESISTANCE (OHMS)
SPST				
191TE1A1-5S	1A	1	N	500
191TE1A1-5G	1A	1	N	200
191TE1A1-6S	1A	1	N	500
191TE1A1-6G	1A	1	N	200
191TE1A1-12G	1A	1	N	1,250
191TE1A1-12L	1A	1	N	500
191TE1A1-24W	1A	1	N	1,250
191TE1A2-5S	1A	1	D	500
191TE1A2-12G	1A	1	D	1,250
191TE1A2-24W	1A	1	D	1,250
191TE1A5-5S	1A	1	ES	500
191TE1A5-12G	1A	1	ES	1,250
191TE1A5-24W	1A	1	ES	1,250
191TE1A6-5S	1A	1	D & ES	500
191TE1A6-12G	1A	1	D & ES	1,250
191TE1A6-24W	1A	1	D & ES	1,250
SPDT				
191TE1C1-5S	1C	2	N	200
191TE1C1-5G	1C	2	N	150
191TE1C1-6S	1C	2	N	200
191TE1C1-6G	1C	2	N	150
191TE1C1-12G	1C	2	N	500
191TE1C1-24L	1C	2	N	1,250
191TE1C1M-5S	1C	3	N	200
191TE1C1M-5G	1C	3	N	150
191TE1C1M-6S	1C	3	N	200
191TE1C1M-6G	1C	3	N	150
191TE1C1M-12G	1C	3	N	500
191TE1C1M-24L	1C	3	N	1.250
SPDT (cont.)				
191TE1C2-5S	1C	2	D	200
191TE1C2-12G	1C	2	D	500
191TE1C2-24L	1C	2	D	1,250
191TE1C2M-5S	1C	3	D	200
191TE1C2M-12G	1C	3	D	500
191TE1C2M-24L	1C	3	D	1,250
191TE1C5-5S	1C	2	ES	200
191TE1C5-12G	1C	2	ES	500
191TE1C5-24L	1C	2	ES	1,250
191TE1C5M-5S	1C	3	ES	200
191TE1C5M-12G	1C	3	ES	500
191TE1C5M-24L	1C	3	ES	1,250
191TE1C6-5S	1C	2	D & ES	200
191TE1C6-12G	1C	2	D & ES	500
191TE1C6-24L	1C	2	D & ES	1,250
191TE1C6M-5S	1C	3	D & ES	200
191TE1C6M-12G	1C	3	D & ES	500
191TE1C6M-24L	1C	3	D & ES	1,250
DPST				
191TE2A1-5G	2A	4	N	200
191TE2A1-6G	2A	4	N	200
191TE2A1-12G	2A	4	N	500
191TE2A1-24L	2A	4	N	1,200

*N = None; D = Diode; ES = Electrostatic Shielding

ORDERING INFORMATION

191 TE 1C 1 M — 5S

- 191 — BASIC MODEL NUMBER
- TE — ENCLOSURE MOLDED
- 1C —

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1C	SPDT
2A	DPST-NO

- 1 —

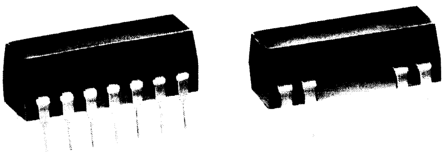
CODE	OPTIONS
1	NONE
2	DIODE
5	ELECTROSTATIC SHIELDING
6	DIODE & ELECTROSTATIC SHIELDING

- M — OPTIONAL SCHEMATIC FORM C ONLY SEE TABLE A
- 5S — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

Series 195 TE DIP Reed Relay

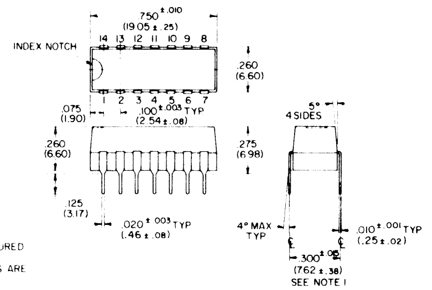
SPST • SPDT • DPST • DPDT • IC COMPATIBLE • .275 HIGH

The Series 195 TE is a family of reed relays which combine exceptional stability, high isolation resistance in a compact, rugged, dual in-line package capable of being immersed and cleaned with other electronic products during their automatic wave soldering process. These molded reed relays are designed for harsh environments yet are excellent for low level switching. Almost endless varieties of contact combinations offer the design engineer versatility, reliability, small size, and low cost.



- Dual-in-line 8 & 14 terminals
- Dry Circuit to 0.5 Amps
- Up to 2 Form C.
- Power Requirements as low as 50 mw
- Molded Construction

Mechanical Data



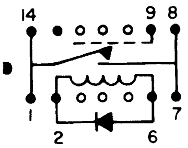
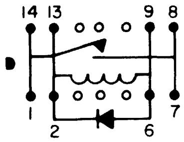
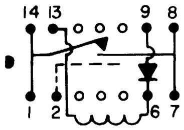
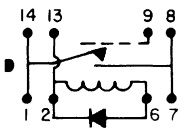
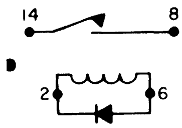
NOTES
1. DIMENSIONS TO BE MEASURED AT BENDS
2. NUMBERS ON TERMINALS ARE FOR REFERANCE ONLY

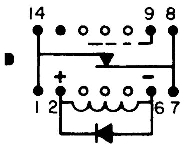
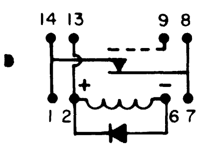
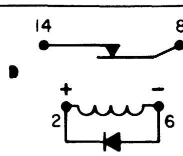
ELECTRICAL CHARACTERISTICS (Values at 25°C)

Contact Form	Form A SPST-NO, DPST-NO	1 Form B SPST-NC	1 Form C SPDT	2 Form C DPDT
Contact Rating (max)	10VA		8VA	
Switching Volts (max)	100VDC		100VDC	
Switching Current (max)	0.5 Amp		0.25 Amp	
Carry Current	1.5 Amp		0.5 Amp	
Contact Resistance (Initial)	0.20 OHM (max)			
Dielectric Strength Across open cont.	200 VAC			
Contacts to coil	1000 VAC			
Insulation Resistance OHMs (test at 100VDC)	10^9 OHM (min)			
Capacitance across open contacts	.3pf typical		.3pf typical	
Contacts to Coil	2.0pf typical		3.0pf typical	

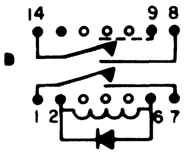
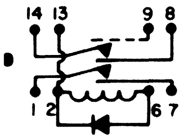
GENERAL CHARACTERISTICS

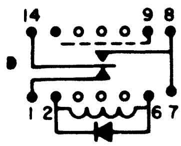
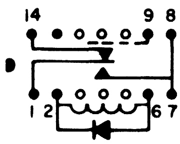
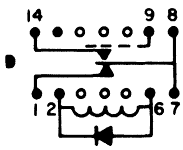
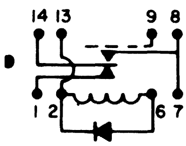
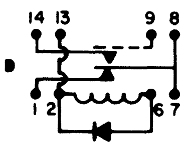
Characteristic	Form A	1 Form B	1 Form C / 2 Form C
Operate Time Normally open	500 μs max	—	500 μs max
Normally closed	—	400 μs max	400 μs max
Operate Time Normally open (including bounce)	1000 μs max —	—	1000 μs max —
Release Time Normally open	400 μs max	—	400 μs max
Normally closed	—	500 μs max	500 μs max
Release Time Normally closed (including bounce)	—	1000 μs max —	1300 μs max —
Coil Resistance Rise Due to Temperature	Coil resistance will rise 0.4% per one Degree °C of Temperature Increase		
Pick up Voltage (max)	80% of Nominal Coil Voltage		
Drop out Voltage (min.)	10% of Actual Pick up Voltage		
Shock (non operate)	50 G's 11 ms ½ cycle		
Vibration	20 G's 0-5000 HZ operating		10 G's 0-2000 HZ operating
Operate Temp. Range	−45°C to +85°C		
Storage Temp. Range	−60°C to +105°C		
Life At Rated Load	10 million operations		
Life Low Level	100 million operations		
Enclosure	Molded Epoxy		
Terminals	Nickel Iron – Tin Plated		
Weight	.07 oz. (2.2g)		

1 FORM A SPST — NO	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
1 	8 PIN	IAIE	IA2E	IA5E	IA6E
	14 PIN	IAIF	IA2F	IA5F	IA6F
2 	8 PIN	IAIG	IA2G	N/A	N/A
	14 PIN	IAIH	IA2H	N/A	N/A
3 	8 PIN	IAIJ	IA2J	IA5J	IA6J
	14 PIN	IAIK	IA2K	IA5K	IA6K
4 	8 PIN	IAIN	IA2N	IA5N	IA6N
5 	4 PIN	IAIL	IA2L	N/A	N/A

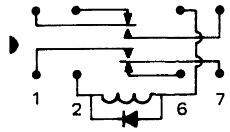
1 FORM B SPST — NC	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
6 	8 PIN	IBIE	IB2E	IB5E	IB6E
	14 PIN	IBIF	IB2F	IB5F	IB6F
7 	8 PIN	IBIG	IB2G	IB5G	IB6G
8 	4 PIN	IBIJ	IB2J	N/A	N/A

▮ Index notch
*E.S. Electrostatic Shield

2 FORM A DPST — NO.	Termination	OPTIONS None	Diode	E.S. *	E.S. & Diode
9 	8 PIN	2AIE	2A2E	2A5E	2A6E
	14 PIN	2AIF	2A2F	2A5F	2A6F
10 	8 PIN	2AIG	2A2G	2A5G	2A6G

1 FORM C SPDT	Termination	OPTIONS None	Diode	E.S.*	E.S. & Diode
11 	8 PIN	ICIE	IC2E	IC5E	IC6E
	14 PIN	ICIF	IC2F	IC5F	IC6F
12 	8 PIN	ICIG	IC2G	IC5G	IC6G
	14 PIN	ICIH	IC2H	IC5H	IC6H
13 	8 PIN	ICIJ	IC2J	IC5J	IC6J
	14 PIN	ICIK	IC2K	IC5K	IC6K
14 	8 PIN	ICIL	IC2L	IC5L	IC6L
15 	8 PIN	ICIM	IC2M	IC5M	IC6M

■ Index notch
*E.S. Electrostatic Shield

2 FORM C DPDT	Termination	OPTIONS None	Diode	E.S.*	E.S. & Diode
16 	8 PIN	2 CIE	2 C2E	N/A	N/A

▶ Index Notch *E.S. Electrostatic Shield

STANDARD COIL DATA CHART — TABLE B

1 FORM A SPST-NO		1 FORM B SPST-NC		2 FORM A DPST-NO		1 FORM C SPDT		2 FORM C DPDT	
Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)
5W	150	5G	200	5G	200	5G	150	5G	46
5L	200	5S	500	5S	235	5S	200	12G	266
5G	360	6G	200	6G	200	6G	200	24G	1066
5S	500	6S	500	6S	360	6S	360		
6W	200	12G	500	12G	500	12W	500		
6L	360	12S	1200	12S	650	12G	800		
6G	500	24G	1635	24G	1635	12S	1000		
6S	800	24S	2200	24S	2200	24W	1870		
12W	500					24G	2200		
12L	800					24S	3200		
12G	1000								
12S	1870								
24W	1000								
24L	1870								
24G	2200								
24S	3200								

IN STOCK FOR IMMEDIATE DELIVERY — SERIES 195 TE

Part Number (including coil voltage)	CONTACTS Arrange-ment	Wiring Diagram	Options	Coil Resistance (OHMS)
195TEIAIG-5G	IA	2	N	360
195TEIAIG-5S	IA	2	N	500
195TEIAIG-12W	IA	2	N	500
195TEIAIG-12S	IA	2	N	1870
195TEIAIG-24G	IA	2	N	2200
195TEIAIG-24S	IA	2	N	3200
195TEIA2G-5G	IA	2	D	360
195TEIA2G-12W	IA	2	D	500
195TEIA2G-24G	IA	2	D	2200
195TE2AIE-5S	2A	9	N	235
195TE2AIE-12G	2A	9	N	500
195TE2AIE-24S	2A	9	N	2200
195TE2A2E-5S	2A	9	D	235
195TE2A2E-12G	2A	9	D	500
195TE2A2E-24S	2A	9	D	2200
195TEIBIG-5S	IB	7	N	500
195TEIBIG-12S	IB	7	N	1200
195TEIBIG-24S	IB	7	N	2200

Part Number (including coil voltage)	CONTACTS Arrange-ment	Wiring Diagram	Options	Coil Resistance (OHMS)
195TEIB2G-5S	IB	7	D	500
195TEIB2G-12S	IB	7	D	1200
195TEIB2G-24S	IB	7	D	2200
195TEICIG-5S	IC	12	N	200
195TEICIG-12G	IC	12	N	800
195TEICIG-24G	IC	12	N	2200
195TEIC2G-5S	IC	12	D	200
195TEIC2G-12G	IC	12	D	800
195TEIC2G-24G	IC	12	D	2200
195TE2CIE-5G	2C	16	N	46
195TE2CIE-12G	2C	16	N	266
195TE2CIE-24G	2C	16	N	1066
195TE2C2E-5G	2C	16	D	46
195TE2C2E-12G	2C	16	D	266
195TE2C2E-24G	2C	16	D	1066

N = none; D = diode;

ORDERING INFORMATION

195 TE IA I E – 5G

195 — BASIC MODEL NUMBER

TE — ENCLOSURE MOULDED

IA —

CODE	QUANTITY AND TYPE OF SWITCH
1 A	SPST NO.
I B	SPST-NC
I C	SPDT
2 A	DPST-NO
2 C	DPDT

I —

CODE	OPTIONS
1	NONE
2	DIODE
5	ELECTRO STATIC SHIELDING
6	DIODE AND ELECTRO STATIC SHIELDING

E — SCHEMATIC SEE TABLE A

5G — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

*DPDT not available with Electrostatic Shield

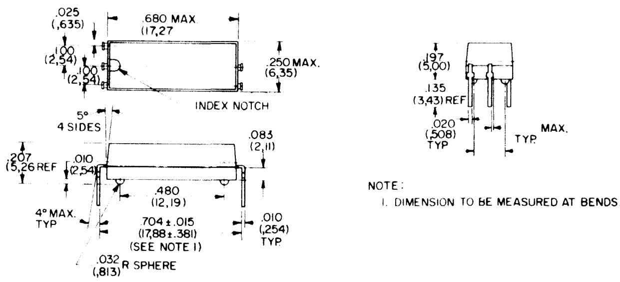
Series 197 Subminiature Reed Relay

•SPST-NO • SPDT

The Series 197 features subminiature size, epoxy-molded construction for immersion resistance and power requirements as low as 50 mw. This family of dry reed relays employs rigid terminals placed on .700 x .100 spacing with high reliability Sigma-built reed capsules capable of switching 10VA SPST and 8VA SPDT. They are ideal for circuits requiring high density packaging and direct interface with RTC, DTC, TTL, and HTL logic.

- **Molded Construction**
- **IC Compatible**
- **Power Requirements as low as 50 mw**
- **.100" x .700 PCB mounting**

Mechanical Data



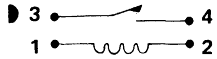
ELECTRICAL CHARACTERISTICS (Values at 25°C)

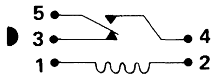
Contact Form	**1 Form A SPST-NO**	**1 Form C SPDT**
Contact Rating (max) **Switching Volts** **Switching Current** **Carry Current**	**10VA** **100VDC** **0.5 Amp** **1.5 Amp**	**8VA** **100VDC** **0.5 Amp** **1.0 Amp**
Contact Resistance (Initial)	**0.20 OHM (max)**	
Dielectric Strength **Across open cont.** **Contacts to coil**	**200 VAC** **1000 VAC**	
Insulation Resistance **OHMs (test at 100VDC)**	**10^9 OHM (min)**	
Capacitance across open contacts **Contacts to Coil**	**.3pf typical** **2.0pf typical**	**.3pf typical** **3.0pf typical**

GENERAL CHARACTERISTICS

Operate Time Normally open **Normally closed**	**500 μs max** **—**	**500 μs max** **400 μs max**
Operate Time Normally open (including bounce)	**1000 μs max.**	**1000 μs max**
Release Time Normally open **Normally closed**	**400 μs max** **—**	**400 μs max** **500 μs max**
Release Time Normally closed (including bounce)		**1300 μs max**
Coil Resistance Rise Due to Temperature	**Coil resistance will rise 0.4% per one Degree °C of Temperature Increase**	
Pick up Voltage (max)	**80% of Nominal Coil Voltage**	
Drop out Voltage (min)	**10% of Actual Pick up Voltage**	
Shock (non operate)	**50 G's** **11 ms** **½ cycle**	
Vibration	**20 G's** **0-5000 HZ operating**	**10 G's** **0-2000 HZ operating**
Operate Temp. Range	**−45°C to +85°C**	
Storage Temp. Range	**−60°C to +105°C**	
Life At Rated Load	**10 million operations**	
Life Low Level	**100 million operations**	
Enclosure	**Molded Epoxy**	
Terminals	**Nickel Iron – Tin Plated**	
Weight	**0.05 oz. (1.4g)**	

SCHEMATICS TABLE A Top view with notch to the left

1 FORM A SPST-NO	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
1 	4 PIN	1A1	N/A	N/A	N/A

1 FORM C SPDT	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
2 	5 PIN	1C1	N/A	N/A	N/A

◗ Index Notch
*E.S. Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO		1 FORM C SPDT	
Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)
5S	500	5G	200
5G	200	6G	200
6S	500	12G	500
6G	200		
12G	1250		
12L	500		

IN STOCK FOR IMMEDIATE DELIVERY SERIES 197

Part Number (Including Coil Voltage)	CONTACTS		Options	Coil Resistance (OHMS)
	Arrange-ment	Wiring Diagram		
197TE1A1-5S	1A	1	N	500
197TE1A1-6G	1A	1	N	200
197TE1A1-12G	1A	1	N	1250
197TE1C1-5G	1C	2	N	200
197TE1C1-12G	1C	2	N	500

ORDERING INFORMATION

197 TE 1A 1 – 5G

- 197: BASIC MODEL NUMBER
- TE: ENCLOSURE MOLDED
- 1A:

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1C	SPDT

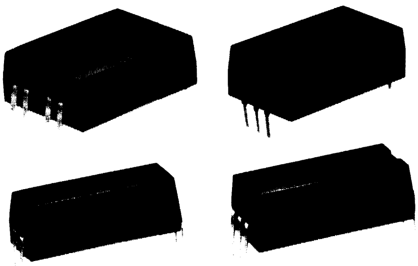
- 1:

CODE	OPTIONS
1	NONE

- 5G: COIL VOLTAGE AND SENSITIVITY SEE TABLE B

SERIES 198

- **MOLDED CONSTRUCTION**
- **1 TO 4 SWITCH CAPACITY**
- **1C COMPATIBLE**



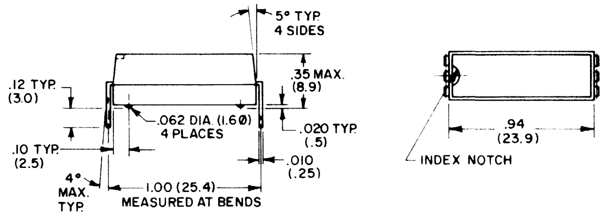
- **1" x .100 and 1" x .150 pin spacing**
- **Immersion Resistant**
- **Power Requirements as low as 50 mw**
- **Optional Electrostatic Shielding and Clamping Diode**

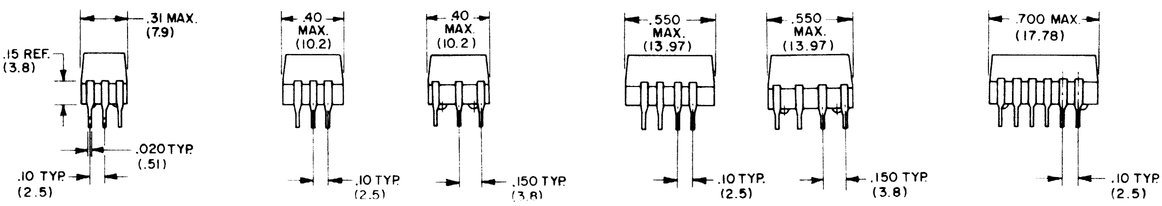
The Series 198TE reed relay features single and multi-pole switching capability in the popular 1.0" x .100" or 1.0" x .150" pin spacing centers. Its compact molded construction provides immersion resistance to cleaning solvents with direct interchangeability to other open style reed relays.

The Series 198TE may be ordered with an internal clamping diode for suppression of voltage transients or electrostatic shield.

These relays establish new industry standards for economical, high reliability in dry reed switching.

Mechanical Data





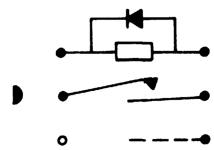
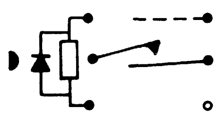
ELECTRICAL CHARACTERISTICS (Values at 25°C)

Contact Form	Form A SPST-NO Through 4PST-NO	Form B SPST-NC	Form C SPDT, DPDT
Contact Rating (max) Switching Volts (max) Switching Current (max) Carry Current	10 VA 100 VDC 0.5 Amp 1.5 Amp		8 VA 100 VDC 0.5 Amp 1.0 Amp
Contact Resistance (Initial)	0.20 OHM (max)		
Dielectric Strength Across open cont. Contacts to coil	 200 VAC 1000 VAC		
Insulation Resistance OHMs (test at 100VDC)	 10^9 OHM (min)		
Capacitance across open contacts Contacts to Coil	 .3pf typical 2.0pf typical		 .3pf typical 3.0pf typical

GENERAL CHARACTERISTICS

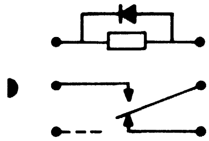
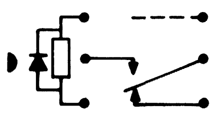
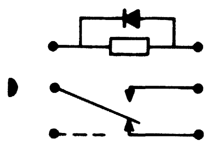
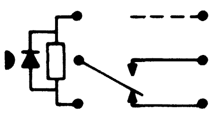
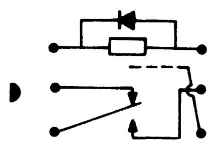
Contact Form	Form A SPST-NO Through 4 PST-NO	Form B SPST-NC	Form C SPDT, DPDT
Operate Time Normally open Normally closed	500μs max —	— 500μs max	500μs max 400μs max
Operate Time Normally open (including bounce)	1000μs max	—	1000μs max
Release Time Normally open Normally closed	400 μs max —	— 500μs max	400μs max 500μs max
Release Time Normally closed (including bounce)	—	1000μs max	1300μs max
Coil Resistance Rise Due to Temperature	Coil resistance will rise 0.4% per one Degree °C of Temperature Increase		
Pick up Voltage (max)	80% of Nominal Coil Voltage		
Drop out Voltage (min.)	10% of Actual Pick up Voltage		
Shock (non operate)	50G's 11 ms ½ cycle		
Vibration		20 G's 0-5000 HZ operating	10 G's 0-2000 HZ operating
Operate Temp. Range	−45°C to + 85°C		
Storage Temp Range	−60°C to +105°C		
Life at Rated Load	10 million operations		
Life Low Level	100 million operations		
Enclosure	Molded Epoxy		
Terminals	Nickel Iron-Tin Plated		
Weight	Size I .17 oz. (4.8g) — Size II .18 oz. (5.1g) — Size III .23 oz. (6.5g) — Size IV .30 oz. (8.5g)		

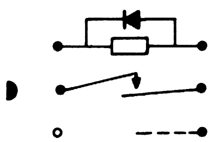
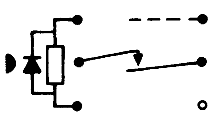
SCHEMATICS TABLE A Top view with notch to the left

1 FORM A SPST-NO SIZE I	Grid Spacing	OPTIONS None	Diode	E.S.*	E.S. & Diode
1 	.100	1A1D	1A2D	1A5D	1A6D
2 	.100	1A1F	1A2F	1A5F	1A6F

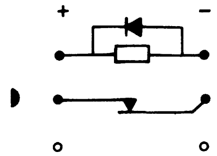
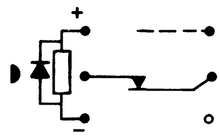
◗ Index Notch
*E.S. Electrostatic Shield

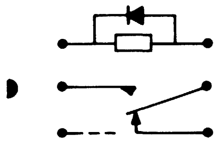
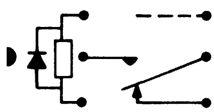
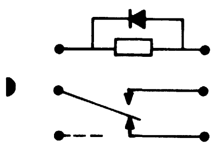
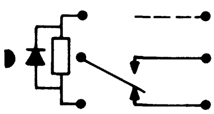
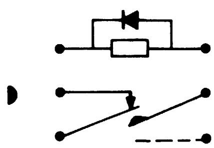
SCHEMATICS TABLE A (cont.) Top view with notch to the left

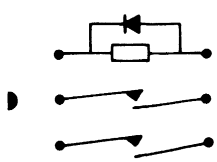
1 FORM C SPDT SIZE I	Grid Spacing	OPTIONS			
		None	Diode	E.S. *	E.S. & Diode
3 	.100	1C1D	1C2D	1C5D	1C6D
4 	.100	1C1F	1C2F	1C5F	1C6F
5 	.100	1C1H	1C2H	1C5H	1C6H
6 	.100	1C1K	1C2K	1C5K	1C6K
7 	.100	1C1M	1C2M	1C5M	1C6M

1 FORM A SPST-NO SIZE II	Grid Spacing	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
8 	.150	1A1E	1A2E	1A5E	1A6E
9 	.150	1A1G	1A2G	1A5G	1A6G

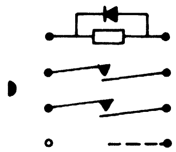
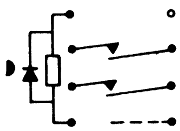
◗ Index Notch
*E.S. Electrostatic Shield

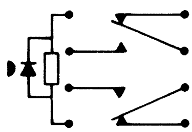
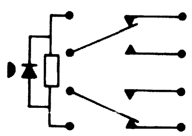
1 FORM B SPST-NC SIZE II	Grid Spacing	None	Diode	E.S.*	E.S. & Diode
10 	.100	IB1D	IB2D	IB5D	IB6D
	.150	IB1E	IB2E	IB5E	IB6E
11 	.100	IB1F	IB2F	IB5F	IB6F
	.150	IB1G	IB2G	IB5G	IB6G

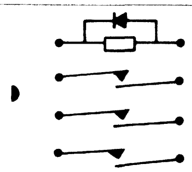
1 FORM C SPDT SIZE II	Grid Spacing	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
12 	.150	1C1E	1C2E	1C5E	1C6E
13 	.150	1C1G	1C2G	1C5G	1C6G
14 	.150	1C1J	1C2J	1C5J	1C6J
15 	.150	1C1L	1C2L	1C5L	1C6L
16 	.150	1C1N	1C2N	1C5N	1C6N

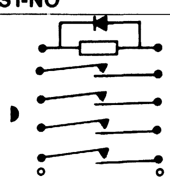
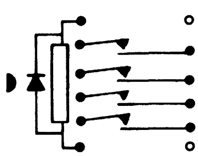
2 FORM A DPST-NO SIZE II	Grid Spacing	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
17 	.100	2A1D	2A2D	N/A	N/A
	.150	2A1E	2A2E	N/A	N/A

◗ Index Notch
*E.S. Electrostatic Shield

2 FORM A DPST-NO SIZE III	Grid Spacing	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
18 	.100	2A1H	2A2H	2A5H	2A6H
	.150	2A1J	2A2J	2A5J	2A6J
19 	.100	2A1K	2A2K	2A5K	2A6K
	.150	2A1L	2A2L	2A5L	2A6L

2 FORM C DPDT SIZE III	Grid Spacing	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
20 	.100	2C1D	2C2D	N/A	N/A
	.150	2C1E	2C2E	N/A	N/A
21 	.100	2C1F	2C2F	N/A	N/A
	.150	2C1G	2C2G	N/A	N/A

3 FORM A 3 PST-NO SIZE III	Grid Spacing	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
22 	.100	3A1M	3A2M	N/A	N/A
	.150	3A1N	3A2N	N/A	N/A

4 FORM A 4 PST-NO SIZE IV	Grid Spacing	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
23 	.100	4A1D	4A2D	N/A	N/A
24 	.100	4A1E	4A2E	N/A	N/A

◗ Index Notch
*E.S. Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO		1 FORM C SPDT		2 FORM A DPST-NO		2 FORM C DPDT		1 FORM B SPST-NC		3 FORM A 3PST-NO		4 FORM A 4PST-NO	
Coil Voltage and Adjustment	Coil Resis. (OHMS)	Coil Voltage and Adjustment	Coil Resis. (OHMS)	Coil Voltage and Adjustment	Coil Resis. (OHMS)	Coil Voltage and Adjustment	Coil Resis. (OHMS)	Coil Voltage and Adjustment	Coil Resis. (OHMS)	Coil Voltage and Adjustment	Coil Resis. (OHMS)	Coil Voltage and Adjustment	Coil Resis. (OHMS)
5G	250	5G	250	5G	150	5G	106	5G	250	5G	80	5G	63
5S	500	5S	340					5S	500				
12G	1400	12G	900	12G	600	12G	600	12G	1000	12G	460	12G	362
24G	3400	24G	3400	24G	2500	24G	2500	24G	2500	24G	1840	24G	1450

IN STOCK FOR IMMEDIATE DELIVERY — SERIES 198

Part Number (Including Coil Voltage)	CONTACTS Arrangement	CONTACTS Wiring Diagram	Term. Grid Spacing	Package Width	Options	Coil Resistance (OHMS)
198TE1A1D-5S	1A	1	.100	.310	N	500
198TE1A1D-12G	1A	1	.100	.310	N	1400
198TE1A1D-24G	1A	1	.100	.310	N	3400
198TE1A2D-5S	1A	1	.100	.310	D	500
198TE1A2D-12G	1A	1	.100	.310	D	1400
198TE1A2D-24G	1A	1	.100	.310	D	3400
198TE1A1F-5S	1A	2	.100	.310	N	500
198TE1A1F-12G	1A	2	.100	.310	N	1400
198TE1A1F-24G	1A	2	.100	.310	N	3400
198TE1C1F-5S	1C	4	.100	.310	N	340
198TE1C1F-12G	1C	4	.100	.310	N	900
198TE1C1F-24G	1C	4	.100	.310	N	3400
198TE1C1H-5S	1C	5	.100	.310	N	340
198TE1C1H-12G	1C	5	.100	.310	N	900
198TE1C1H-24G	1C	5	.100	.310	N	3400

N = None D = Diode

ORDERING INFORMATION

198 TE 4A 1 D - 12G

- **198** — BASIC MODEL NUMBER
- **TE** — ENCLOSURE MOLDED
- **4A** — QUANTITY AND TYPE OF SWITCH:

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1B	SPST-NC
1C	SPDT
2A	DPST-NO
2C	DPDT
3A	3PST-NO
4A	4PST-NO

- **1** — OPTIONS:

CODE	OPTIONS
1	NONE
2	DIODE
5	ELECTROSTATIC SHIELDING
6	DIODE AND ELECTRO STATIC SHIELDING

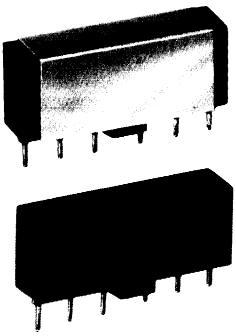
- **D** — SCHEMATIC SEE TABLE A
- **12G** — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

Series 187 SIP Reed Relay

- SPST-NO • SPST-NC
- DPST-NO • SPDT

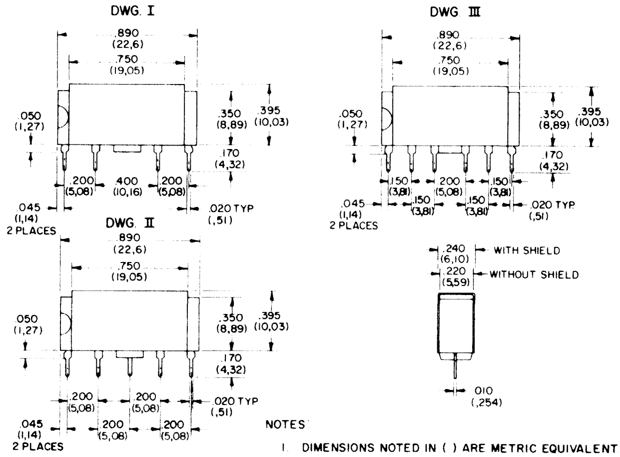
The Series 187TS is a low cost, high reliability, single-in-line reed relay. It is designed for high density packaging permitting mounting of two double pole, single throw relays side by side within a single DIP socket. Optional magnetic shielding minimizes interaction between adjacent relays and other electronic components.

The Series 187TS features compact, molded construction providing immersion resistance to cleaning solvents and may be ordered with an internal clamping diode for suppression of voltage transients.



- **Designed for high density packaging**
- **1 to 2 switch capacity**
- **Optional magnetic shielding**
- **Optional clamping diode**
- **Molded construction**

Mechanical Data



NOTES
1. DIMENSIONS NOTED IN ( ) ARE METRIC EQUIVALENT

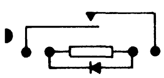
ELECTRICAL CHARACTERISTICS (Values at 25°C)

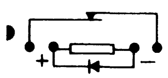
Contact Form	Form A SPST-NO, DPST-NO	Form B SPST-NC	Form C SPDT
Contact Rating (max) Switching Volts Switching Current Carry Current	10VA 100VDC 0.5 Amp 1.5 Amp		8VA 100VDC 0.5 Amp 1.0 Amp
Contact Resistance (Initial)	0.20 OHM (max)		
Dielectric Strength Across open cont. Contacts to coil	200 VAC 1000 VAC		
Insulation Resistance OHMs (test at 100VDC)	10^9 OHM (min)		
Capacitance across open contacts Contacts to Coil		.3pf typical 2.0pf typical	.3pf typical 3.0pf typical

GENERAL CHARACTERISTICS

Contact Form	Form A SPST-NO, DPST-NO	Form B SPST-NC	Form C SPDT
Operate Time Normally open Normally closed	500 μs max —	— 400 μs max	500 μs max 400 μs max
Operate Time Normally open (including bounce)	1000 μs max	—	1000 μs max
Release Time Normally open Normally closed	500 μs max —	— 500 μs max	400 μs max 500 μs max
Release Time Normally closed (including bounce)	—	1000 μs max	1300 μs max
Coil Resistance Rise Due to Temperature	Coil Resistance will rise 0.4% per one Degree °C of Temperature Increase		
Pick up Voltage (max)	80% of Nominal Coil Voltage		
Drop out Voltage (min)	10% of Actual Pick-up		
Shock (non operate)	50 G's 11 ms ½ cycle		
Vibration	20 G's 0-5000 Hz operating		10 G's 0-2000 Hz operating
Operate Temp. Range	−45°C to +85°C		
Storage Temp. Range	−60°C to +105°C		
Life at Rated Load	10 million operations		
Life Low Level	100 million operations		
Enclosure	Molded Epoxy		
Terminals	Nickel Iron – Tin Plated		
Weight	.12 oz (3.4g)		

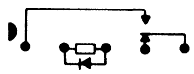
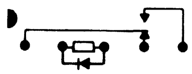
SCHEMATICS TABLE A Top View with notch to the left

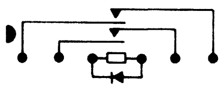
1 FORM A SPST-NO DWG. I	Termination		OPTIONS		
		None	Diode	M.S.†	M.S. & Diode
1 	4 PIN	1A1	1A2	1A3	1A4

1 FORM B SPST-NC DWG. I	Termination		OPTIONS		
		None	Diode	M.S.†	M.S. & Diode
2 	4 PIN	1B1	1B2	1B3	1B4

◗ Index Notch
† M.S. Magnetic Shield

SCHEMATICS TABLE A Top View (cont.)

1 FORM C SPDT DWG. II	Termination	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
3 	5 PIN	1C1	1C2	1C3	1C4
4 	5 PIN	1C1M	1C2M	1C3M	1C4M

2 FORM A DPST-NO DWG. III	Termination	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
5 	6 PIN	2A1	2A2	2A3	2A4

◗ Index Notch

† M.S. Magnetic Shield

STANDARD COIL DATA CHART — TABLE B

1 FORM A SPST-NO		1 FORM B SPST-NC		1 FORM C SPDT		2 FORM A DPST-NO	
Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)
5G	200	5G	360	5G	200	5G	104
5S	330	—	—	—	—	—	—
12G	600	12G	720	12G	600	12G	600
24G	2000	24G	1440	24G	2000	24G	2400

IN STOCK FOR IMMEDIATE DELIVERY SERIES 187

Part Number (Including Coil Voltage)	CONTACTS Arrange-ment	CONTACTS Wiring Diagram	Options	Coil Resistance (OHMs)
187TS1A3-5S	1A	1	M.S.	330
187TS1A3-12G	1A	1	M.S.	600
187TS1A3-24G	1A	1	M.S.	2000
187TS1B3-5G	1B	2	M.S.	360
187TS1B3-12G	1B	2	M.S.	720
187TS1B3-24G	1B	2	M.S.	1440
187TS1C3-5G	1C	3	M.S.	200
187TS1C3-12G	1C	3	M.S.	600
187TS1C3-24G	1C	3	M.S.	2000
187TS1C3M-5G	1C	4	M.S.	200
187TS1C3M-12G	1C	4	M.S.	600
187TS1C3M-24G	1C	4	M.S.	2000
187TS2A3-5G	2A	5	M.S.	104
187TS2A3-12G	2A	5	M.S.	600
187TS2A3-24G	2A	5	M.S.	2400

M.S. Magnetic Shield

ORDERING INFORMATION

187 TS 1A 1 M – 5S

- **187** — BASIC MODEL NUMBER
- **TS** — ENCLOSURE MOLDED
- **1A** — QUANTITY AND TYPE OF SWITCH:

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1B	SPST-NC
1C	SPDT
2A	DPST-NO

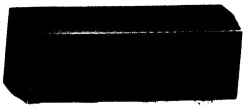
- **1** — OPTIONS:

CODE	OPTIONS
1	NONE
2	DIODE
3	MAGNETIC SHIELD
4	DIODE AND MAGNETIC SHIELD

- **M** — SCHEMATIC SEE TABLE A
- **5S** — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

Series 195TS SIP Reed Relay

• SPST-NO • SPST-NC
• IC COMPATIBLE • .260 HIGH



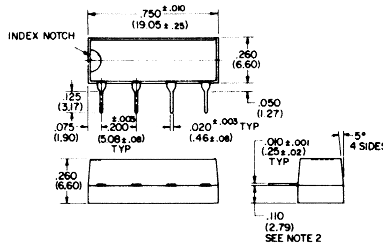
- **Designed for high density packaging**
- **Power requirements as low as 50 mw**
- **Dry circuit to 0.5 amp.**
- **Optional clamping diodes**
- **Molded Construction**

The Series 195TS is a low cost, high reliability, single in-line reed relay. It is designed for high density packaging. Unique termination and small size makes it possible to mount two relays side by side within a single DIP socket. The rugged epoxy molded case protects the internal parts and allows the device to be subjected to harsh environments and immersion cleaning with other electronic components during automatic wave soldering.

The high sensitivity of the Series 195TS makes it an excellent companion for logic circuits and interfacing with microprocessors.

Mechanical Data

NOTES
1. .110 DIM. FROM BOTTOM EDGE OF LEAD FRAME AT EXIT
2. NUMBERS ON TERMINALS ARE FOR REFERANCE ONLY

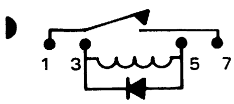


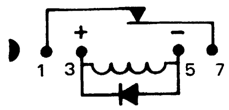
ELECTRICAL CHARACTERISTICS (Values at 25°C)

Contact Form	1 Form A SPST-NO	1 Form B SPST-NC
Contact Rating (max) Switching Volts (max) Switching Current (max) Carry Current	10 VA 100 VDC 0.5 Amp 1.5 Amp	
Contact Resistance (Initial)	0.20 OHM (max)	
Dielectric Strength Across open cont. Contacts to coil	 200 VAC 1000 VAC	
Insulation Resistance OHMs (test at 100VDC)	10^9 OHM (min)	
Capacitance across open contacts Contacts to Coil	 .3 pf typical 2.0 pf typical	

GENERAL CHARACTERISTICS

Operate Time Normally open Normally closed	500 μs max —	— 500 μs max
Operate Time Normally open (including bounce)	1000 μs max —	—
Release Time Normally open Normally closed	400 μs max —	— 500 μs max
Release Time Normally closed (including bounce)		1000 μs max
Coil Resistance Rise Due to Temperature	Coil resistance will rise 0.4% per one Degree °C of Temperature Increase	
Pick up Voltage (max)	80% of Nominal Coil Voltage	
Drop out Voltage (min.)	10% of Actual Pick-up Voltage	
Shock (non operate)	50 G's 11 ms ½ Cycle	
Vibration	20 G's 0-5000 Hz operating	
Operate Temp. Range	−45°C to +85°C	
Storage Temp Range	−60°C to +105°C	
Life At Rated Load	10 million operations	
Life Low Level	100 million operations	
Enclosure	Molded Epoxy	
Terminals	Nickel Iron-Tin Plated	
Weight	.06 oz. (1.7g)	

1 FORM A SPST-NO	Termination	OPTIONS None	Diode	E.S.*	E.S. & Diode
1 	4 PIN	1A1M	1A2M	N/A	N/A

1 FORM B SPST-NC	Termination	OPTIONS None	Diode	E.S.*	E.S. & Diode
2 	4 PIN	1B1H	1B2H	N/A	N/A

◗ Index notch
*E.S. Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO		1 FORM B SPST-NC	
Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)
5W	150	5G	200
5L	200	5S	500
5G	360	6G	200
5S	500	6S	500
6W	200	12G	500
6L	360	12S	1200
6G	500	24G	1635
6S	800	24S	2200
12W	500		
12L	800		
12G	1000		
12S	1870		
24W	1000		
24L	1870		
24G	2200		
24S	3200		

IN STOCK FOR IMMEDIATE DELIVERY SERIES 195TS

Part Number (including coil voltage)	CONTACTS Arrange-ment	Wiring Diagram	Options	Coil Resistance (OHMS)
195TS1A1M-5S	1A	1	N	500
195TS1A1M-12G	1A	1	N	1000
195TS1A1M-24G	1A	1	N	2200
195TS1A2M-5S	1A	1	D	500
195TS1A2M-12G	1A	1	D	1000
195TS1A2M-24G	1A	1	D	2200
195TS1B1H-5S	1B	2	N	500
195TS1B1H-12G	1B	2	N	500
195TS1B1H-24G	1B	2	N	1635
195TS1B2H-5S	1B	2	D	500
195TS1B2H-12G	1B	2	D	1635
195TS1B2H-24G	1B	2	D	2200

Note: D = Diode
N = None

ORDERING INFORMATION

195 TS 1A 2 M — 5S

- 195 — BASIC MODEL NUMBER
- TS — ENCLOSURE MOLDED
- 1A — CONTACT STYLE

CODE	TYPE OF SWITCH
1A	SPST-NO
1B	SPST-NC

- 2 — OPTIONS

1	NONE
2	DIODE

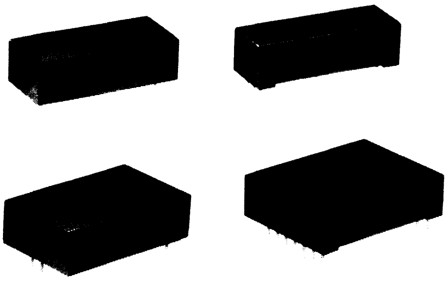
- M — SCHEMATIC: SEE TABLE "A"
- 5S — COIL VOLTAGE AND SENSITIVITY: SEE TABLE B

Series 193 Miniature Reed Relay

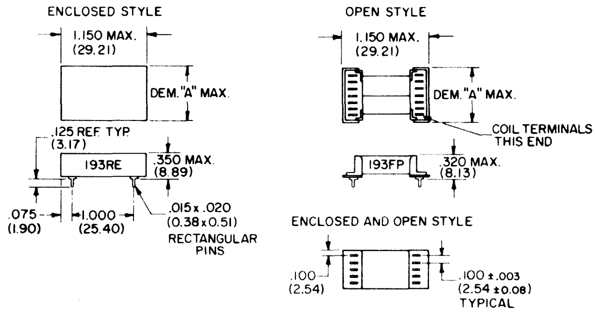
• CHOICE OF 16 SWITCHING STYLES IN FOUR CASE SIZES

The Series 193 reed relay employs various combinations of Form A and Form C capsules to provide highly reliable, multicircuit switching in a small package. Up to 6 Form A switches and 4 Form C switches are available in a single package. Any combination of A's and C's is available as open, enclosed, and encapsulated styles with terminals placed on popular 1" centers with grid spacing of .100.

These relays are extremely versatile, and a variety of options not shown here are available. If your application calls for increased sensitivity, sequential operation, alternate pinout arrangements, electrostatic shield, or diode coil suppression, please consult the factory.



Mechanical Data



CASE WIDTH DIMENSION "A"			
SIZE I	SIZE II	SIZE III	SIZE IV
400 (10.16)	500 (12.70)	700 (17.78)	900 (22.86)

DIMENSIONS SHOWN IN ( ) ARE MILLIMETERS

- **Open, enclosed and encapsulated models**
- **10 Watt rating on Form A switches**
- **Standard 1" x .100 pin spacing**
- **TTL compatable for single pole**

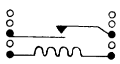
ELECTRICAL CHARACTERISTICS (Values at 25°C)

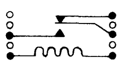
Contact Form	**Form A** **SPST-NO through 6PST-NO**	**Form C** **SPDT through 4PDT**
Contact Rating (max) **Switching Volts (max)** **Switching Current (max)** **Carry Current**	**10VA** **100VDC** **0.5 Amp** **1.5 Amp**	**8VA** **100VDC** **0.5 Amp** **1.0 Amp**
Contact Resistance (Initial)	**0.20 OHMS (max)**	
Dielectric Strength **Across open cont.** **Contacts to coil**	 **200 VAC** **500 VAC**	
Insulation Resistance **OHMs (test at 100VDC)**	 **10^9 OHM (min)**	
Capacitance across **open contacts** **Contacts to Coil**	 **.3pf typical** **2.0pf typical**	 **.3pf typical** **3.0pf typical**

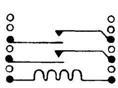
GENERAL CHARACTERISTICS

Contact Form	Form A SPST-NO through 6PST-NO	Form C SPDT through 4PDT
Operate Time Normally open Normally closed	500 μs max —	500 μs max 400 μs max
Operate Time Normally open (including bounce)	1000 μs max	1000 μs max
Release Time Normally open Normally closed	400 μs max —	400 μs max 500 μs max
Release Time Normally closed (including bounce)	—	1300 μs max
Coil Resistance Rise Due to Temperature	Coil resistance will rise 0.4% per one Degree °C of Temperature Increase	
Pick up Voltage (max)	80% of Nominal Coil Voltage	
Drop out Voltage (min)	10% of Actual Pick up Voltage	
Shock (non operate)	50 G's 11 ms ½ cycle	
Vibration	20 G's 0-5000 HZ operating	10 G's 0-2000 HZ operating
Operate Temp. Range	−45°C to +85°C	
Storage Temp. Range	−60°C to +105°C	
Life At Rated Load	10 million operations	
Life Low Level	100 million operations	
Enclosure (Optional)	Thermoplastic (Polyester)	
Bobbin	Thermoplastic (Polyester)	
Terminals	Copper Nickel – Tin Plated	
Weight RE Style	Size I 0.14 oz. (4.0g) — Size II 0.18 oz. (5.0g) — Size III 0.21 oz. (6.0g) — Size IV 0.35 oz. (10.0g)	

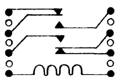
SCHEMATICS TABLE A Top View

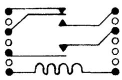
1 FORM A SPST-NO SIZE I	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
1 	.100	1A1	N/A	1A3	N/A

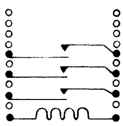
1 FORM C SPDT SIZE I	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
2 	.100	1C1	N/A	1C3	N/A

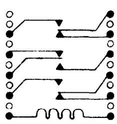
2 FORM A DPST-NO SIZE II	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
3 	.100	2A1	N/A	2A3	N/A

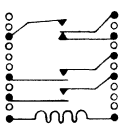
† M.S. Magnetic Shield

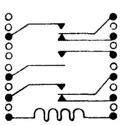
2 FORM C DPDT SIZE II	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
4 	.100	2C1	N/A	2C3	N/A

1 FORM A & FORM C SPST-NO & SPDT SIZE II	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
5 	.100	1A1C1	N/A	1A1C3	N/A

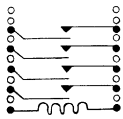
3 FORM A 3PST-NO SIZE III	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
6 	.100	3A1	N/A	3A3	N/A

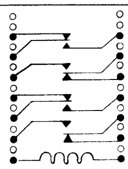
3 FORM C 3PDT SIZE III	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
7 	.100	3C1	N/A	3C3	N/A

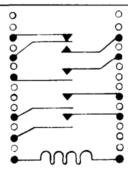
2 FORM A & 1 FORM C DPST-NO & SPDT SIZE III	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
8 	.100	2A1C1	N/A	2A1C3	N/A

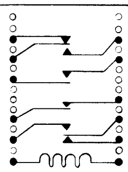
1 FORM A & 2 FORM C SPST-NO & DPDT SIZE III	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
9 	.100	1A2C1	N/A	1A2C3	N/A

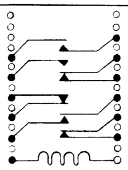
† M.S. Magnetic Shield

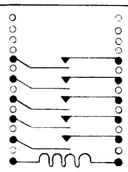
4 FORM A 4PST-NO SIZE III	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
10 	.100	4A1	N/A	4A3	N/A

4 FORM C 4PDT SIZE IV	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
11 	.100	4C1	N/A	4C3	N/A

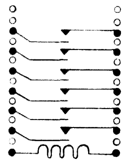
3 FORM A & 1 FORM C 3PST-NO & SPDT SIZE IV	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
12 	.100	3A1C1	N/A	3AIC3	N/A

2 FORM A & 2 FORM C DPST-NO & DPDT SIZE IV	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
13 	.100	2A2C1	N/A	2A2C3	N/A

1 FORM A & 3 FORM C SPST-NO & 3PDT SIZE IV	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
14 	.100	1A3C1	N/A	IA3C3	N/A

5 FORM A 5PST-NO SIZE IV	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	M.S. & Diode
15 	.100	5A1	N/A	5A3	N/A

† M.S. Magnetic Shield

6 FORM A 6PST-NO SIZE IV	Grid Spacing	OPTIONS			
		None	Diode	M.S.†	E.S. & Diode
16 	.100	6A1	N/A	6A3	N/A

† M.S. Magnetic Shield

STANDARD COIL DATA TABLE B

Coil Voltage and Adjustment	COIL RESISTANCE (OHMS)				
	SIZE I		SIZE II	SIZE III	SIZE IV
	1 Form A SPST-NO	1 Form C SPDT	(All Arrgmt's)	(All Arrgmt's)	(All Arrgmt's)
5S	495	350	—	—	—
6G	100	100	70	50	35
12G	420	420	280	210	140
24G	2300	2300	1500	1150	770

IN STOCK FOR IMMEDIATE DELIVERY — SERIES 193

PART NUMBER (including coil voltage)		CONTACTS		Package Width	Coil Resistance (OHMS)
Enclosed Models	Open Models	Arrange-ment	Wiring Diagram		
SINGLE POLE					
193RE1A3-5S	193FP1A1-5S	1A	1	.400	495
193RE1A3-6G	193FP1A1-6G	1A	1	.400	100
193RE1A3-12G	193FP1A1-12G	1A	1	.400	420
193RE1A3-24G	193FP1A1-24G	1A	1	.400	2,300
193RE1C3-5S	193FP1C1-5S	1C	2	.400	350
193RE1C3-6G	193FP1C1-6G	1C	2	.400	100
193RE1C3-12G	193FP1C1-12G	1C	2	.400	420
193RE1C3-24G	193FP1C1-24G	1C	2	.400	2,300
DOUBLE POLE					
193RE2A3-6G	193FP2A1-6G	2A	3	.500	70
193RE2A3-12G	193FP2A1-12G	2A	3	.500	280
193RE2A3-24G	193FP2A1-24G	2A	3	.500	1,500
193RE2C3-6G	193FP2C1-6G	2C	4	.500	70
193RE2C3-12G	193FP2C1-12G	2C	4	.500	280
193RE2C3-24G	193FP2C1-24G	2C	4	.500	1,500
3 POLE					
193RE3A3-6G	193FP3A1-6G	3A	6	.700	50
193RE3A3-12G	193FP3A1-12G	3A	6	.700	210
193RE3A3-24G	193FP3A1-24G	3A	6	.700	1,150
193RE3C3-6G	193FP3C1-6G	3C	7	.700	50
193RE3C3-12G	193FP3C1-12G	3C	7	.700	210
193RE3C3-24G	193FP3C1-24G	3C	7	.700	1,150
4 POLE					
193RE4A3-6G	193FP4A1-6G	4A	10	.700	50
193RE4A3-12G	193FP4A1-12G	4A	10	.700	210
193RE4A3-24G	193FP4A1-24G	4A	10	.700	1,150
193RE4C3-6G	193FP4C1-6G	4C	11	.900	35
193RE4C3-12G	193FP4C1-12G	4C	11	.900	140
193RE4C3-24G	193FP4C1-24G	4C	11	.900	770

193 RE 3C 3 – 24G

BASIC MODEL NUMBER
- 193

ENCLOSURE
- FP — OPEN
- RE — ENCLOSED
- TE — ENCAPSULATED

QUANTITY AND TYPE OF SWITCH SEE TABLE A FOR SCHEMATICS

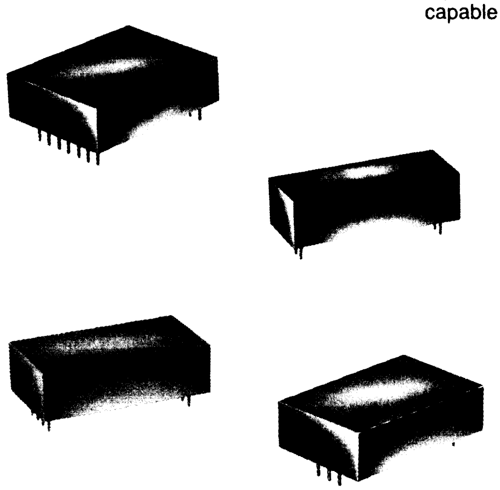
1A	1C	1A1C
2A	2C	1A2C
3A	3C	1A3C
4A	4C	2A1C
5A		3A1C
6A		2A2C

OPTIONS
- 1 — NONE
- 3 — MAGNETIC SHIELDING

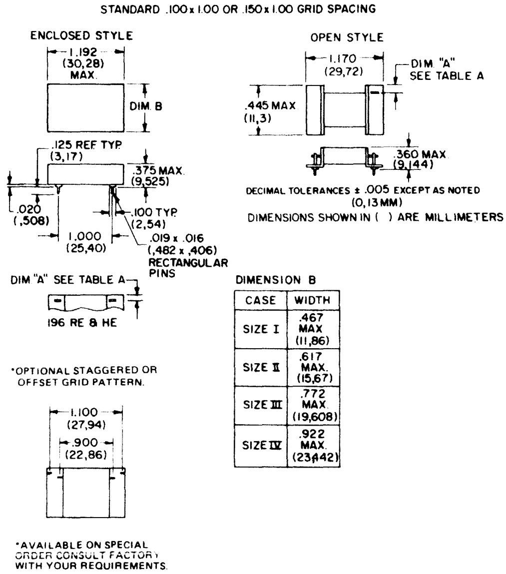
COIL VOLTAGE AND SENSITIVITY SEE TABLE B

Series 196
Low Level to 0.5 Amp
• 1 TO 4 SWITCH CAPACITY

The Series 196 reed relay employs combinations of Form A and Form C capsules to provide highly reliable multicircuit switching in a miniature package.
These relays are available with a wide variety of options including staggered terminals providing almost infinite variation of grid spacing, latching styles, magnetic shield, electrostatic shield and encapsulated versions capable of withstanding harsh atmosphere.



Mechanical Data



DIMENSION B

CASE	WIDTH
SIZE I	.467 MAX (11,86)
SIZE II	.617 MAX. (15,67)
SIZE III	.772 MAX (19,608)
SIZE IV	.922 MAX. (23,42)

- **IC compatible**
- **Latching styles**
- **.100 and .150 grid spacing**
- **Staggered terminals**
- **Magnetic shield**
- **Electrostatic shield**

ELECTRICAL CHARACTERISTICS (Values at 25°C)

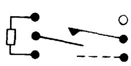
Contact Form	Form A SPST-NO through 4PST-NO	Form B SPST-NC, DPST-NC	Form C SPDT through 4PDT
Contact Rating (max) Switching Volts Switching Current Carry Current	10VA 100VDC 0.5 Amp 1.5 Amp		8VA 100VDC 0.5 Amp 1.0 Amp
Contact Resistance (Initial)	0.20 OHMS (max)		
Dielectric Strength Across open cont. Contacts to coil	 200 VAC 500 VAC		
Insulation Resistance OHMs (test at 100VDC)	10^9 OHMS (min)		
Capacitance across open contacts Contacts to Coil	 .3pf typical 2.0pf typical		 .3pf typical 3.0pf typical

GENERAL CHARACTERISTICS

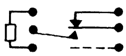
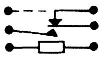
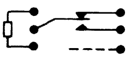
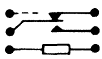
Contact Form	Form A SPST-NO through 4PST-NO	Form B SPST-NC, DPST-NC	Form C SPDT through 4PDT
Operate Time Normally open Normally closed	500 μs max —	— 500 μs max	500 μs max 400 μs max
Operate Time Normally open (including bounce)	1000 μs max	—	1000 μs max
Release Time Normally open Normally closed	400 μs max —	— 500 μs max	400 μs max 500 μs max
Release Time Normally closed (including bounce)	—	1000 μs max	1300 μs max
Coil Resistance Rise Due to Temperature		Coil Resistance will rise 0.4% per one Degree °C of Temperature Increase	
Pick up Voltage (max)		80% of Nominal Coil Voltage	
Drop out Voltage (min)		10% of Actual Pick-up	
Shock* (non operate)		50 G's 11 ms ½ cycle	
Vibration*		20 G's 0-5000 HZ operating	10 G's 0-2000 HZ operating
Operate Temp. Range		−45°C to +85°C	
Storage Temp. Range		−60°C to +105°C	
Life at Rated Load		10 million operations	
Life Low Level		100 million operations	
Enclosure		Cold Roll Steel Zinc Plated	
Bobbin		Glass Filled Nylon	
Terminals		Nickel Iron – Tin Plated	
Weight RE Style	Size I .23 oz (6.52g) — Size II .29 oz (8.22g) — Size III .43 oz (12.19g) — Size IV .49 oz (13.84g)		

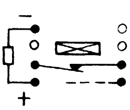
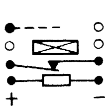
*For latching styles consult factory with application information

SCHEMATICS Table A Top View

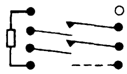
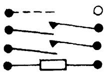
1 FORM A SPST-NO SIZE I	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.*	E.S.*	E.S. & M.S.
1 	.100	.134 (3.40)	.123 (3.13)	1A1D	1A3D	1A5D	1A7D
	.150	.084 (2.13)	.073 (1.85)	1A1E	1A3E	1A5E	1A7E
2 	.100	.134 (3.40)	.123 (3.13)	1A1F	1A3F	1A5F	1A7F
	.150	.084 (2.13)	.073 (1.85)	1A1G	1A3G	1A5G	1A7G

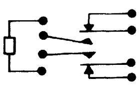
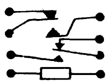
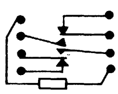
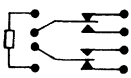
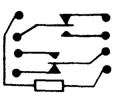
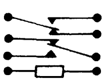
† M.S. Magnetic Shield *E.S. Electrostatic Shield

1 FORM C SPDT SIZE I	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
3 	.100	.134 (3.40)	.123 (3.13)	1C1D	1C3D	1C5D	1C7D
	.150	.084 (2.13)	.073 (1.85)	1C1E	1C3E	1C5E	1C7E
4 	.100	.134 (3.40)	.123 (3.13)	1C1F	1C3F	1C5F	1C7F
	.150	.084 (2.13)	.073 (1.85)	1C1G	1C3G	1C5G	1C7G
5 	.100	.134 (3.40)	.123 (3.13)	1C1K	1C3K	1C5K	1C7K
	.150	.084 (2.13)	.073 (1.85)	1C1L	1C3L	1C57	1C7L
6 	.100	.134 (3.40)	.123 (3.13)	1C1M	1C3M	1C5M	1C7M
	.150	.084 (2.13)	.073 (1.85)	1C1N	1C3N	1C5N	1C7N

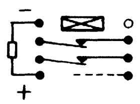
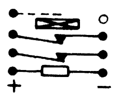
1 FORM B SPST-NC SIZE II	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
7 	.100	.159 (4.01)	.145 (3.68)	1B1D	1B3D	1B5D	1B7D
	.150	.084 (2.13)	.070 (1.78)	1B1E	1B3E	1B5E	1B7E
8 	.100	.159 (4.01)	.145 (3.68)	1B1F	1B3F	1B5F	1B7F
	.150	.084 (2.13)	.070 (1.78)	1B1G	1B3G	1B5G	1B7G

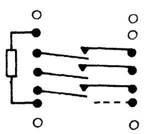
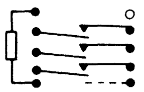
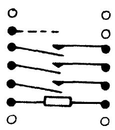
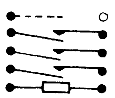
† M.S. Magnetic Shield *E.S. Electrostatic Shield

2 FORM A DPST-NO SIZE II	Grid Spacing	Dimension A Mech. Data		OPTIONS			
		RE/HE	FP	NONE	M.S.†	E.S.*	E.S. & M.S.
9 	.100	.159 (4.01)	.145 (3.68)	2A1D	2A3D	2A5D	2A7D
	.150	.084 (2.13)	.070 (1.78)	2A1E	2A3E	2A5E	2A7E
10 	.100	.159 (4.01)	.145 (3.68)	2A1F	2A3F	2A5F	2A7F
	.150	.084 (2.13)	.070 (1.78)	2A1G	2A3G	2A5G	2A7G

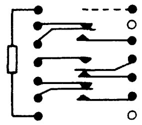
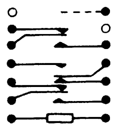
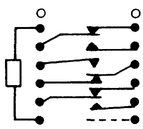
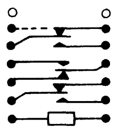
2 FORM C DPDT SIZE II	Grid Spacing	Dimension A Mech. Data		OPTIONS			
		RE/HE	FP	NONE	M.S.†	E.S.*	E.S. & M.S.
11 	.100	.159 (4.01)	.145 (3.68)	2C1D	2C3D	N/A	N/A
	.150	.084 (2.13)	.070 (1.78)	2C1E	2C3E	N/A	N/A
12 	.100	.159 (4.01)	.145 (3.68)	2C1F	2C3F	N/A	N/A
	.150	.084 (2.13)	.070 (1.78)	2C1G	2C3G	N/A	N/A
13 	.100	.159 (4.01)	.145 (3.68)	2C1H	2C3H	N/A	N/A
	.150	.084 (2.13)	.070 (1.78)	2C1J	2C3J	N/A	N/A
14 	.100	.159 (4.01)	.145 (3.68)	2C1K	2C3K	N/A	N/A
	.150	.084 (2.13)	.070 (1.78)	2C1L	2C3L	N/A	N/A
15 	.100	.159 (4.01)	.145 (3.68)	2C1Q	2C3Q	N/A	N/A
	.150	.084 (2.13)	.070 (1.78)	2C1R	2C3R	N/A	N/A
16 	.100	.159 (4.01)	.145 (3.68)	2C1M	2C3M	N/A	N/A
	.150	.084 (2.13)	.070 (1.78)	2C1N	2C3N	N/A	N/A

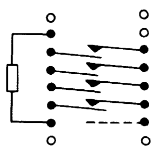
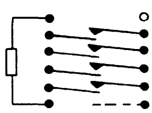
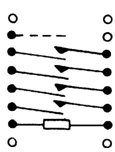
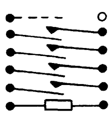
†M.S. Magnetic Shield *E.S. Electrostatic Shield

2 FORM B DPST-NC SIZE II	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
17 	.100	.159 (4.01)	.145 (3.68)	2B1D	2B3D	2B5D	2B7D
	.150	.084 (2.13)	.070 (1.78)	2B1E	2B3E	2B5E	2B7E
18 	.100	.159 (4.01)	.145 (3.68)	2B1F	2B3F	2B5F	2B7F
	.150	.084 (2.13)	.070 (1.78)	2B1G	2B3G	2B5G	2B7G

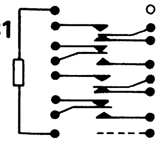
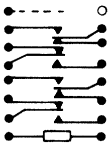
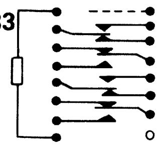
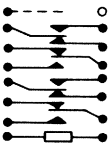
3 FORM A 3PST-NO SIZE III	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
19 	.100	.186 (4.72)	.173 (4.39)	3A1D	3A3D	3A5D	3A7D
20 	.150	.086 (2.18)	.073 (1.85)	3A1E	3A3E	3A5E	3A7E
21 	.100	.186 (4.72)	.173 (4.39)	3A1F	3A3F	3A5F	3A7F
22 	.150	.086 (2.18)	.073 (1.85)	3A1G	3A3G	3A5G	3A7G

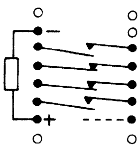
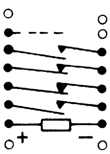
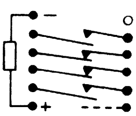
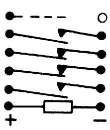
† M.S. Magnetic Shield *E.S. Electrostatic Shield

3 FORM C 3PDT SIZE III	Grid Spacing	Dimension A Mech. Data		OPTIONS			
		RE/HE	FP	NONE	M.S.†	E.S.*	E.S. & M.S.
23 	.100	.086 (2.18)	.073 (1.85)	3C1D	3C3D	3C5D	3C7D
24 	.100	.086 (2.18)	.073 (1.85)	3C1F	3C3F	3C5F	3C7F
25 	.100	.086 (2.18)	.073 (1.85)	3C1K	3C3K	3C5K	3C7K
26 	.100	.086 (2.18)	.073 (1.85)	3C1M	3C3M	3C5M	3C7M

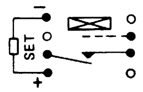
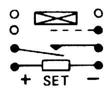
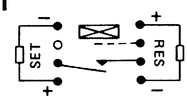
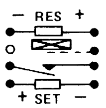
4 FORM A 4PST-NO SIZE IV	Grid Spacing	Dimension A Mech. Data		OPTIONS			
		RE/HE	FP	NONE	M.S.†	E.S.*	E.S. & M.S.
27 	.100	.211 (5.36)	.198 (5.03)	4A1D	4A3D	4A5D	4A7D
28 	.150	.086 (2.18)	.073 (1.85)	4A1E	4A3E	4A5E	4A7E
29 	.100	.211 (5.36)	.198 (5.03)	4A1F	4A3F	4A5F	4A7F
30 	.150	.086 (2.18)	.073 (1.85)	4A1G	4A3G	4A5G	4A7G

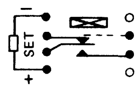
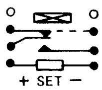
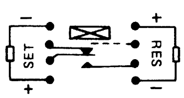
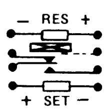
† M.S. Magnetic Shield *E.S. Electrostatic Shield

4 FORM C 4PDT SIZE IV	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
31 	.100	.111 (2.82)	.098 (2.49)	4C1D	4C3D	4C5D	4C7D
32 	.100	.111 (2.82)	.098 (2.49)	4C1F	4C3F	4C5F	4C7F
33 	.100	.111 (2.82)	.098 (2.49)	4C1K	4C3K	4C5K	4C7K
34 	.100	.111 (2.82)	.098 (2.49)	4C1M	4C3M	4C5M	4C7M

2 FORM A, 2 FORM B DPST-NO, DPST-NC SIZE IV	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
35 	.100	.211 (5.36)	.198 (5.03)	2A2B1D	2A2B3D	2A2B5D	2A2B7D
36 	.100	.211 (5.36)	.198 (5.03)	2A2B1F	2A2B3F	2A2B5F	2A2B7F
37 	.150	.086 (2.18)	.073 (1.85)	2A2B1E	2A2B3E	2A2B5E	2A2B7E
38 	.150	.086 (2.18)	.073 (1.85)	2A2B1G	2A2B3G	2A2B5G	2A2B7G

†M.S. Magnetic Shield *E.S. Electrostatic Shield

*** 1 FORM A LATCHING SPST-NO SIZE II	Grid Spacing	Dimension A Mech. Data RE/HE	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
39 	.100	.159 (4.01)	N/A	1P3D	N/A	1P7D
	.150	.084 (2.13)	N/A	1P3E	N/A	1P7E
40 	.100	.159 (4.01)	N/A	1P3F	N/A	1P7F
	.150	.084 (2.13)	N/A	1P3G	N/A	1P7G
41 	.100	.159 (4.01)	N/A	1P3D--D**	N/A	1P7D--D**
	.150	.084 (2.13)	N/A	1P3E--D**	N/A	1P7E--D**
42 	.100	.159 (4.01)	N/A	1P3F--D**	N/A	1P7F--D**
	.150	.084 (2.13)	N/A	1P3G--D**	N/A	1P7G--D**

*** 1 FORM C LATCHING SPDT SIZE II	Grid Spacing	Dimension A Mech. Data RE/HE	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
43 	.100	.159 (4.01)	N/A	1Z3D	N/A	1Z7D
	.150	.084 (2.13)	N/A	1Z3E	N/A	1Z7E
44 	.100	.159 (4.01)	N/A	1Z3F	N/A	1Z7F
	.150	.084 (2.13)	N/A	1Z3G	N/A	1Z7G
45 	.100	.159 (4.01)	N/A	1Z3D--D**	N/A	1Z7D--D**
	.150	.084 (2.13)	N/A	1Z3E--D**	N/A	1Z7E--D**
46 	.100	.159 (4.01)	N/A	1Z3F--D**	N/A	1Z7F--D**
	.150	.084 (2.13)	N/A	1Z3G--D**	N/A	1Z7G--D**

† M.S. Magnetic Shield *** For All Latch Relays View Shown is with Contacts in the Re-Set Postion
** Letter D Designates Dual Coil, Follows Coil Voltage Value When Calling Out Part Number. See Ordering Information.
*E.S. Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

Coil Voltage and Adjustment	COIL RESISTANCE APPLIES TO ALL CONTACT CONFIGURATIONS				
	Case Size I (OHMS)	Case Size II (OHMS)	Case Size III (OHMS)	Case Size IV (OHMS)	Latching Form A & C Single & Dual Coil (OHMS)
5G	500	200	125	107	500
6G	245	200	125	107	720
12G	965	525	425	195	2880
24G	4200	1520	1330	795	2880††
48G	7385	5730	4300	3460	2880††

††External Resister of Appropriate Value Must Be Added. Consult Factory For Assistance.

NOTE: All Coil Resistance ± 10% @ 25°C

NOTE: On Single Coil Latch Relay Polarity Shown Will **Close** Contacts. Reverse Polarity To Open Contacts.

IN STOCK FOR IMMEDIATE DELIVERY SERIES 196

Part Number (including coil voltage)	Coil Resist-ance (ohms)	Contact Arrange-ment	Schematic
SINGLE POLE .467″ W			
196RE1A3D-5G	500	1A	1
196RE1A3D-6G	245	1A	1
196RE1A3D-12G	965	1A	1
196RE1A3D-24G	4200	1A	1
196RE1C3K-5G	500	1C	5
196RE1C3K-6G	245	1C	5
196RE1C3K-12G	965	1C	5
196RE1C3K-24G	4200	1C	5
DOUBLE POLE .617″ W			
196RE2A3D-5G	200	2A	9
196RE2A3D-6G	200	2A	9
196RE2A3D-12G	525	2A	9
196RE2A3D-24G	1520	2A	9
196RE2C3K-5G	200	2C	14
196RE2C3K-6G	200	2C	14
196RE2C3K-12G	525	2C	14
196RE2C3K-24G	1520	2C	14
3 POLE .772″ W			
196RE3A3D-5G	125	3A	19
196RE3A3D-6G	125	3A	19
196RE3A3D-12G	425	3A	19
196RE3A3D-24G	1330	3A	19
196RE3C3K-5G	125	3C	25
196RE3C3K-6G	125	3C	25
196RE3C3K-12G	425	3C	25
196RE3C3K-24G	1330	3C	25
LATCHING STYLE (SINGLE COIL) .617″ W			
196RE1P3F-12G	2880	1A	40
196RE1Z3F-12G	2880	1C	44
LATCHING STYLE (DUAL COIL) .617″ W			
196RE1P3F-12G-D	2880	1A	42
196RE1Z3F-12G-D	2880	1C	46

ORDERING INFORMATION

196 RE 1P 3 E 12G — D

196 — BASIC MODEL NUMBER

RE

	ENCLOSURE
RE	DUST COVER
HE	POTTED
FP	OPEN

1P

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1C	SPDT
1B	SPST-NC
2A	DPST-NO
2C	DPDT
2B	DPST-NC
3A	3PST-NO
3C	3PDT
4A	4PST-NO
4C	4PDT
2A2B	DPST-NO DPST-NC
1P	SPST-NO (LATCH)
1Z	SPDT (LATCH)

3

CODE	SHIELD OPTIONS SEE TABLE A
1	NONE
3	MAGNETIC
5	ELECTROSTATIC
7	MAGNETIC AND ELECTROSTATIC

E

PIN SPACING AND SCHEMATIC
SEE TABLE A

12G — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

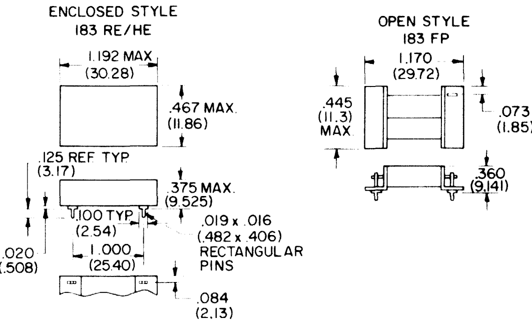
D — USE ONLY WHEN DUAL COIL IS SPECIFIED

Series 183 Miniature High Voltage Reed Relay

• SPST-NO • 1200 VAC BREAKDOWN

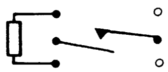
The Series 183 is a miniature size, printed circuit, high voltage reed relay capable of switching up to 500 volts and offering dielectric strength of 1200 VAC between all mutually conductive parts. Terminals are placed on popular 1" centers with grid spacing of .150" or .300". This rugged and reliable relay is available in a low cost open style or with a steel dust cover for added protection and magnetic shielding. Other options include epoxy-filled versions which completely seal coil and other internal parts from harsh atmospheres.

Mechanical Data



- **Optional Magnetic Shield**
- **.150" x 1.00" or .300" x 1.00" Grid Spacing**
- **Low Cost Open Style**

ELECTRICAL CHARACTERISTICS (Values at 25°C)	
Contact Form	1 Form A SPST-NO
Contact Rating (max) Switching Volts (max) Switching Current (max) Carry Current	10 VA 500 VDC 0.5 Amp 1.5 Amp
Contact Resistance (Initial)	0.20 OHM (max)
Dielectric Strength Across open cont. Contacts to coil	 1200 VAC 1200 VAC
Insulation Resistance OHMs (test at 100 VDC)	10^{10} OHM (min)
Capacitance across open contacts Contacts to Coil	 .3 pf typical 2.0 pf typical
GENERAL CHARACTERISTICS	
Operate Time Normally open (including bounce)	1000 μs max
Release Time Normally open	500 μs max
Coil Resistance Rise Due to Temperature	Coil resistance will rise 0.4% per one Degree °C of Temperature Increase
Pick up Voltage (max)	80% of Nominal Coil Voltage
Drop out Voltage (min.)	10% of Actual Pick-up Voltage
Shock (non operate)	50G's 11 ms ½ Cycle
Vibration	20 G's 0-5000 Hz operating
Operate Temp. Range	−45°C to +85°C
Storage Temp. Range	−60°C to +105°C
Life at Rated Load	10 million operations
Life Low Level	100 million operations
Enclosure (optional)	Cold Roll Steel Zinc Plated
Terminals	Nickel Iron-Tin Plated
Bobbin	Glass Filled Nylon
Weight RE Style	.245 oz (6.9g)

1 FORM A SPST-NO	Grid Spacing	OPTIONS			
		None	M.S.†	E.S.*	M.S. & Diode
1 	.150	1AIE	1A3E	N/A	N/A
2 	.300	1AIG	1A3G	N/A	N/A

† M.S. Magnetic Shield. * E.S. Electrostatic Shield.

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO	
Coil Voltage and Adjustment	Coil Resistance (OHMS)
5G	500
6G	245
12G	965
24G	4200
48G	7385

IN STOCK FOR IMMEDIATE DELIVERY SERIES 183

Part Number (Including Coil Voltage)	CONTACTS		Options	Coil Resistance (OHMS)
	Arrange-ment	Wiring Diagram		
183RE1A3G-5G	1A	1	M.S.	500
183RE1A3G-12G	1A	1	M.S.	965
183RE1A3G-24G	1A	1	M.S.	4200
183RE1A3G-48G	1A	1	M.S.	7385

M.S. = Magnetic Shielding

ORDERING INFORMATION

183 RE 1A 3 E — 12G

183 — BASIC MODEL NUMBER

RE — ENCLOSURE

ENCLOSURE	
RE	DUST COVER
HE	POTTED
FP	OPEN

1A

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO

3

CODE	OPTIONS
1	NONE
3	MAGNETIC SHIELD

E — SCHEMATIC SEE TABLE A

12G — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

Series 186 High Voltage DIP Reed Relay

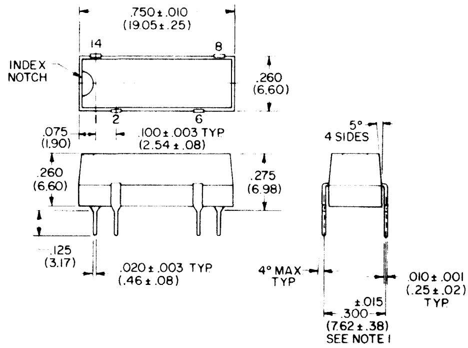
- SPST-NO • .275 HIGH
- 600 VAC BREAKDOWN

The Series 186TE is a high voltage, dual In-line reed relay designed for applications needing high voltage, low current switching. These molded reed relays are designed for harsh environments and exposure to cleaning solvents, but are excellent for low level to 0.5 ampere switching. Specially constructed reed capsule and offset terminal placement provide isolation of 600 volts AC between contacts and 1000 volts AC between other mutually conductive parts.

The Series 186TE is particularly well-suited for applications requiring protection against high voltage line transients.

- Dual-in-line 4 terminals
- Low Level to 0.5 Amp
- Molded Construction

Mechanical Data



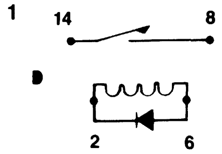
NOTES:
1. DIMENSION TO BE MEASURED AT BENDS.
2. DIMENSIONS SHOWN IN ( ) ARE IN MILLIMETERS.

ELECTRICAL CHARACTERISTICS (Values at 25°C)

Contact Form	1 Form A SPST-NO
Contact Rating (max) Switching Volts (max) Switching Current (max) Carry Current	10 VA 200 VDC 0.5 Amp 1.5 Amp
Contact Resistance (Initial)	0.20 OHM (max)
Dielectric Strength Across open cont. Contacts to coil	 600 VAC 1000 VAC
Insulation Resistance OHMs (test at 100 VDC)	10^9 OHM (min)
Capacitance across open contacts Contacts to Coil	 .3 pf typical 2.0 pf typical

GENERAL CHARACTERISTICS

Operate Time Normally open (including bounce)	1000 μs max
Release Time Normally open	500 μs max
Coil Resistance Rise Due to Temperature	Coil resistance will rise 0.4% per one Degree °C of Temperature Increase
Pick up Voltage (max)	80% of Nominal Coil Voltage
Drop out Voltage (min.)	10% of Actual Pick-up Voltage
Shock (non operate)	50 G's 11 ms ½ Cycle
Vibration	20 G's 0-5000 Hz operating
Operate Temp. Range	−45°C to +85°C
Storage Temp. Range	−60°C to +105°C
Life at Rated Load	10 million operations
Life Low Level	100 million operations
Enclosure	Molded Epoxy
Terminals	Nickel Iron-Tin Plated
Weight	0.05 oz (1.4g)

1 FORM A SPST-NO	Termination	OPTIONS			
		None	Diode	*E.S.	E.S. & Diode
	4 PIN	1A1L	1A2L	N/A	N/A

◗ Index Notch
*E.S. Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO	
Coil Voltage and Adjustment	Coil Resistance (OHMS)
5G	205
6G	340
12G	780
24G	1870

IN STOCK FOR IMMEDIATE DELIVERY SERIES 186

Part Number (including coil voltage)	CONTACTS		Options	Coil Resistance (OHMS)
	Arrange-ment	Wiring Diagram		
186TE1A1L-5G	1A	1	N	205
186TE1A1L-12G	1A	1	N	780
186TE1A1L-24G	1A	1	N	1870
186TE1A2L-5G	1A	1	D	205
186TE1A2L-12G	1A	1	D	780
186TE1A2L-24G	1A	1	D	1870

N = None. D = Diode

ORDERING INFORMATION

186 TE 1A 2 L – 5G

- 186: BASIC MODEL NUMBER
- TE: ENCLOSURE MOLDED
- 1A:

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO

- 2:

CODE	OPTIONS
1	NONE
2	DIODE

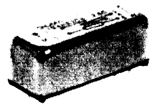
- L: SCHEMATIC SEE TABLE A
- 5G: COIL VOLTAGE AND SENSITIVITY SEE TABLE B

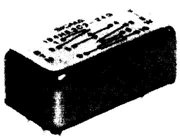
Series 194 Miniature MIL Certified Dry Reed Relay

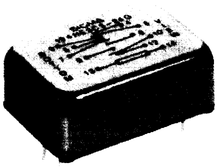
- 1 TO 4 SWITCH CAPACITY

The Series 194 reed relay comprises various combinations of miniature reed capsules that provide multi-circuit switching with high reliability in small space. Standard units include many switch combinations of both SPST-NO and/or SPDT contact arrangements. Welded connections between the terminal and capsule leads are made with flexible metal ribbon, insuring constant, low contact resistance and minimal mechanical stresses which could affect the behavior of the capsules.

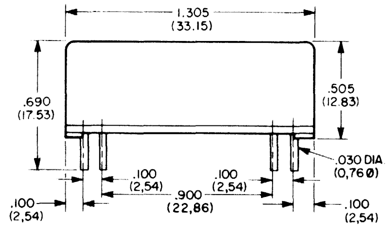
Special versions of the Series 194 have been granted MIL certification under MIL-R-5757/29. Military designations are indicated under Table C.

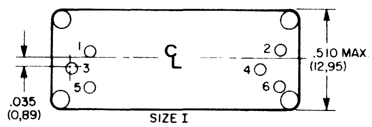


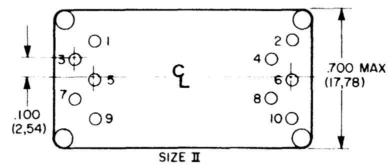


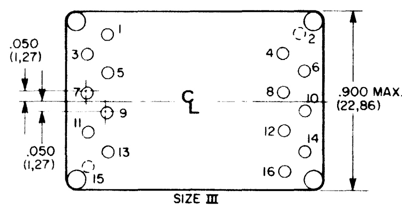


Mechanical Data









- **MIL certified to MIL-R-5757/29**
- **High reliability operating characteristics**
- **Choice 14 contact combinations**
- **Magnetically shielded**

ELECTRICAL CHARACTERISTICS (Values at 25°C)

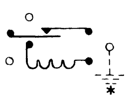
Contact Form	Form A SPST-NO through 4PST-NO	Form C SPDT through 4PDT
Contact Rating (max)	10VA	8VA
Switching Volts (max)	100VDC	100VDC
Switching Current (max)	0.5 Amp	0.5 Amp
Carry Current	1.5 Amp	1.0 Amp
Contact Resistance (Initial)	0.20 OHM (max)	
Dielectric Strength		
Across open cont.	200 VAC	
Contacts to coil	500 VAC	
Insulation Resistance OHMs (test at 100VDC)	10^{10} OHM (min)	
Capacitance across		
open contacts	.3pf typical	.3pf typical
Contacts to Coil	2.0pf typical	3.0pf typical

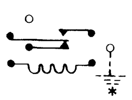
GENERAL CHARACTERISTICS

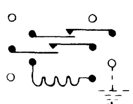
Contact Form	Form A SPST-NO through 4PST-NO	Form C SPDT through 4PDT
Operate Time Normally open Normally closed	500 μs max —	500 μs max 400 μs max
Operate Time Normally open (including bounce)	1000 μs max	1000 μs max
Release Time Normally open Normally closed	400 μs max —	400 μs max 500 μs max
Release Time Normally closed (including bounce)	—	1300 μs max
Coil Resistance Rise Due to Temperature	Coil Resistance will rise 0.4% per one Degree °C of Temperature Increase.	
Pick up Voltage (max)	80% of Nominal Coil Voltage	
Drop out Voltage (min)	10% of Actual Pick up Voltage	
Shock (non operate)	50 G's 11 ms ½ cycle	
Vibration	20 G's 0-5000 HZ operating	10 G's 0-2000 HZ operating
Operate Temp. Range	−45°C to +85°C	
Storage Temp. Range	−60°C to +105°C	
Life At Rated Load	10 million operations	
Life Low Level	100 million operations	
Enclosure	Cold Rolled Steel – Hot Tin Dipped	
Base	Diallyl Phthalate Glass Filled	
Bobbin	Nylon	
Terminals	Nickel Iron – Tin Plated	

Weight				
	1 Pole .42 oz (12.0g)	2 Pole .63 oz (18.0g)	3 Pole .77 oz (22.0g)	4 Pole .84 oz (24.0g)

SCHEMATICS Top View Table A

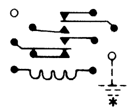
FORM A SPST-NO SIZE I	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
1 	.510 MAX	1A3	N/A	1A7	N/A

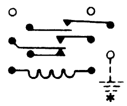
FORM C SPDT SIZE I	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
2 	.510 MAX	1C3	N/A	1C7	N/A

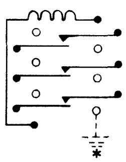
2 FORM A DPST-NO SIZE II	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
3 	.700 MAX	2A3	N/A	2A7	N/A

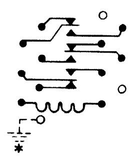
* **IMPORTANT:** When electrostatic shielding is provided, connection is made to the ground-pin indicated in these diagrams.

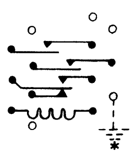
†M.S. Magnetic Shield E.S. Electrostatic Shield

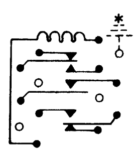
2 FORM C DPDT SIZE II	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
4 	.700 MAX	2C3	N/A	2C7	N/A

1 FORM A & 1 FORM C SPST-NO & SPDT SIZE II	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
5 	.700 MAX	1A1C3	N/A	1A1C7	N/A

3 FORM A 3PST-NO SIZE III	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
6 	.900 MAX	3A3	N/A	3A7	N/A

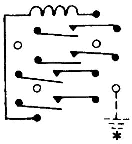
3 FORM C 3PDT SIZE III	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
7 	.900 MAX	3C3	N/A	3C7	N/A

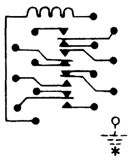
2 FORM A & 1 FORM C DPST-NO & SPDT SIZE III	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
8 	.900 MAX	2A1C3	N/A	2A1C7	N/A

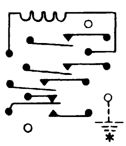
1 FORM A & 2 FORM C SPST-NO & DPDT SIZE III	Package Width	OPTIONS			
		M.S.†	Diode	M.S. & E.S.	E.S. & Diode
9 	.900 MAX	1A2C3	N/A	1A2C7	N/A

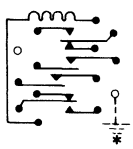
* **IMPORTANT:** When electrostatic shielding is provided, connection is made to the ground-pin indicated in these diagrams.

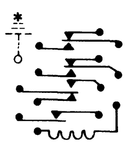
†M.S. Magnetic Shield E.S. Electrostatic Shield

4 FORM A 4PST-NO SIZE III	Package Width	OPTIONS			
		M.S. †	Diode	M.S. & E.S.	E.S. & Diode
10 	.900 MAX	4A3	N/A	4A7	N/A

4 FORM C 4PDT SIZE III	Package Width	OPTIONS			
		M.S. †	Diode	M.S. & E.S.	E.S. & Diode
11 	.900 MAX	4C3	N/A	4C7	N/A

3 FORM A & 1 FORM C 3PST-NO & SPDT SIZE III	Package Width	OPTIONS			
		M.S. †	Diode	M.S. & E.S.	E.S. & Diode
12 	.900 MAX	3A1C3	N/A	3A1C7	N/A

2 FORM A & 2 FORM C DPST-NO & DPDT SIZE III	Package Width	OPTIONS			
		M.S. †	Diode	M.S. & E.S.	E.S. & Diode
13 	.900 MAX	2A2C3	N/A	2A2C7	N/A

1 FORM A & 3 FORM C SPST-NO & 3 PDT SIZE III	Package Width	OPTIONS			
		M.S. †	Diode	M.S. & E.S.	E.S. & Diode
14 	.900 MAX	1A3C3	N/A	1A3C7	N/A

* **IMPORTANT:** When electrostatic shielding is provided, connection is made to the ground-pin indicated in these diagrams.
†M.S. Magnetic Shield E.S. Electrostatic Shield

STANDARD COIL DATA – TABLE B

Coil Voltage and Adjustment	COIL RESISTANCE (OHMS)			
	1 Pole	2 Pole	3 Pole	4 Pole
6G	100	70	50	35
12G	420	280	210	140
24G	2350	1540	1150	770

SERIES 194 MIL CERTIFIED VERSIONS – TABLE C

Number of Poles (Capsules)	Number and Type of Capsules		Sigma Part Number*	Qualified to MIL-R-5757/29 Dash Number**	Schematic Number See Table A	Coil Resistance (OHMS)	Case Size
	FORM A	FORM C					
1	1	0	194HE1A-22001	M5757 / 29-001	1	2350	SIZE I
	0	1	194HE1C-22002	M5757 / 29-002	2	1450	
2	2	0	194HE2A-22003	M5757 / 29-003	3	925	SIZE II
	1	1	194HE1A1C-22004	M5757 / 29-004	5	925	
	0	2	194HE2C-22005	M5757 / 29-005	4	925	
3	3	0	194HE3A-22006	M5757 / 29-006	6	650	SIZE III
	2	1	194HE2A1C-22007	M5757 / 29-007	8	650	
	1	2	194HE1A2C-22008	M5757 / 29-008	9	650	
	0	3	194HE3C-22009	M5757 / 29-009	7	650	
4	4	0	194HE4A-22010	M5757 / 29-010	10	460	SIZE III
	3	1	194HE3A1C-22011	M5757 / 29-011	12	460	
	2	2	194HE2A2C-22012	M5757 / 29-012	13	460	
	1	3	194HE1A3C-22013	M5757 / 29-013	14	460	
	0	4	194HE4C-22014	M5757 / 29-014	11	460	

* 22001 Through 22014 Are 26.5 VDC
** Consult Factory For Information On 22015 Through 22042 Also MIL Certified.

ORDERING INFORMATION SERIES 194 (FOR MIL TYPE SEE TABLE C)

194 HE 2A1C 7 – 6G

194 – BASIC MODEL NUMBER

HE – ENCLOSURE

ENCLOSURE	
HE	POTTED

2A1C – QUANTITY AND TYPE OF SWITCH

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1C	SPDT
2A	DPST-NO
2C	DPDT
1A1C	SPST-NO-SPDT
3A	3PST-NO
2A1C	DPST-NO-SPDT
4A	4PST-NO
4C	4PDT
3A1C	3PST-NO-SPDT
2A2C	DPST-NO-DPDT
1A3C	SPST-NO-3PDT

7 – OPTIONS

CODE	OPTIONS
3	MAGNETIC SHIELD
7	ELECTROSTATIC SHIELD & MAGNETIC SHIELD

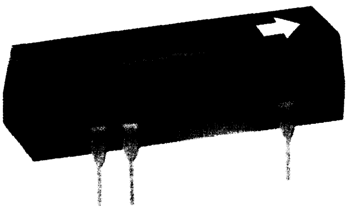
6G – COIL VOLTAGE AND SENSITIVITY

SEE TABLE B FOR STANDARD COIL DESIGNATIONS

Series 184 Mercury Wetted Dip Reed Relay

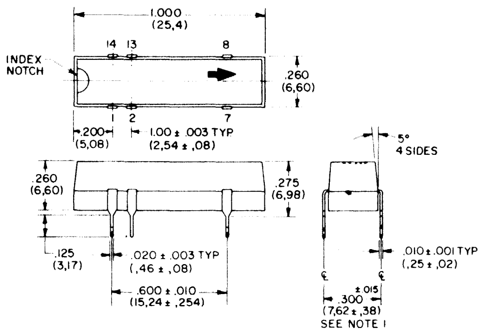
• SPST-NO • SPDT

The Series 184 position sensitive, mercury-wetted reed relay combines high current, no bounce switching, and exceptional long life in a compact molded dual-in-line package capable of being immersed and cleaned with other products during their automatic wave soldering process.
These rugged reed relays are designed for harsh environment, yet provide versatile signal handling capability for low level switching applications.



- **Dual-in-Line 6 Terminals**
- **No Contact Bounce**
- **Position Sensitive**
- **Low Level to 2.0 Amp**
- **High Dielectric Strength**
- **Low Stable Contact Resistance**
- **Molded Construction**

Mechanical Data



NOTES:
1. DIMENSION TO BE MEASURED AT BENDS.
2. DIMENSIONS SHOWN IN ( ) ARE IN MILLIMETERS.
3. NUMBERS ON TERMINALS ARE FOR REFERENCE ONLY.

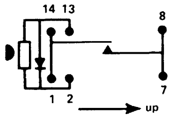
ELECTRICAL CHARACTERISTICS (Values at 25°C)

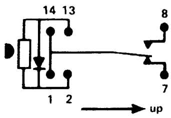
Contact Form	Form A SPST-NO	Form C SPDT
Contact Rating (max)	50W	28W
Switching Volts	500VDC	200VDC
Switching Current	1.0 Amp	1.0 Amp
Carry Current	2.0 Amp	1.5 Amp
Contact Resistance (Initial)	0.15 OHM (max)	
Dielectric Strength		
Across open cont.	1500 VAC	
Contacts to coil	1000 VAC	
Insulation Resistance OHMs (test at 100VDC)	10^{11} OHM (min)	
Capacitance across open contacts	0.2pf Typical	1.2pf Typical

GENERAL CHARACTERISTICS

Operating Position	Must Be Mounted Upright Within 30° of Vertical	
Operate Time	2.0 ms (max)	
Release Time	1.0 ms (max)	2.0 ms (max)
Coil Resistance Rise Due to Temperature	Coil Resistance Will Rise 0.4% Per One Degree °C of Temperature Increase.	
Pick up Voltage (max)	80% of Nominal Coil Voltage	
Drop out Voltage (min)	10% of Actual Pick up Voltage	
Shock (non operate)	5G's 11 ms, ½ cycle	
Operate Temp. Range	−35°C to 100°C	
Storage Temp. Range	−60°C to 105°C	
Life @ Rated Load with Appropriate Contact Protection	50 Million Operations	
Life Low Level	100 million Operations	
Enclosure	Molded Epoxy	
Terminals	Nickel Iron — Tin Plated	
Weight	0.1 oz. (2.8g)	

SCHEMATICS Table A Top view with notch to the left

1 FORM A SPST-NO	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
1 	6 PIN	1A1E	1A2E	N/A	N/A

1 FORM C SPDT	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
2 	6 PIN	1C1J	1C2J	N/A	N/A

▶ Index Notch
*E.S. Electrostatic Shield

STANDARD COIL DATA CHART— TABLE B

1 FORM A SPST-NO		1 FORM C SPDT	
Coil Voltage and Adjustment	Coil Resistance (OHMS)	Coil Voltage and Adjustment	Coil Resistance (OHMS)
5G	72	5G	67
12G	415	12G	384
24G	1660	24G	1536

IN STOCK FOR IMMEDIATE DELIVERY SERIES 184

Part Number (Including Coil Voltage)	CONTACTS		Options	Coil Resistance (OHMS)
	Arrange-ment	Wiring Diagram		
184TE1A1E-5G	1A	1	N	72
184TE1A1E-12G	1A	1	N	415
184TE1A1E-24G	1A	1	N	1660
184TE1C1J-5G	1C	2	N	67
184TE1C1J-12G	1C	2	N	384
184TE1C1J-24G	1C	2	N	1536

N = None

ORDERING INFORMATION

184 TE 1A 1 E — 5G

- 184: BASIC MODEL NUMBER
- TE: ENCLOSURE MOLDED
- 1A:

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1C	SPDT

- 1:

CODE	OPTIONS
1	NONE
2	DIODE

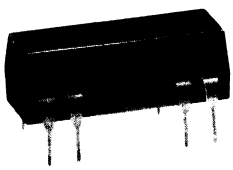
- E: SCHEMATIC SEE TABLE A
- 5G: COIL VOLTAGE AND SENSITIVITY SEE TABLE B

Series 185 Mercury Wetted Dip Reed Relay

• SPST-NO

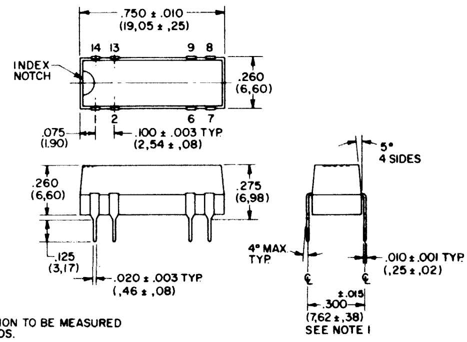
The Series 185TE is a non-position, sensitive dual-in-line mercury-wetted reed relay designed for applications needing no bounce contact characteristics plus the capability of being physically mounted in any plane.

Specially constructed single pole, single throw reed capsules provide reliable, long life switching up to 3VA at 0.1 ampere. These molded reed relays are designed for harsh environments and are capable of being immersed and cleaned with other electronic products during their automatic wave soldering process.



- **Non Position Sensitive**
- **No Contact Bounce**
- **Low Level to 0.1 Amp**
- **Dual-in-Line 8 Terminals**
- **Molded Construction**

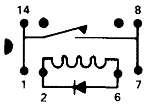
Mechanical Data



NOTES:

1. DIMENSION TO BE MEASURED AT BENDS.
2. DIMENSIONS SHOWN IN ( ) ARE IN MILLIMETERS.
3. NUMBERS ON TERMINALS ARE FOR REFERENCE ONLY.

ELECTRICAL CHARACTERISTICS (Values at 25°C)	
Contact Form	Form A SPST-NO
Contact Rating (max) Switching Volts Switching Current Carry Current	3 VA 28 VDC 0.1 Amp 1.0 Amp
Contact Resistance (Initial)	0.15 OHM (max)
Dielectric Strength Across open cont. Contacts to coil	 1000 VAC 1000 VAC
Insulation Resistance OHMs (test at 100VDC)	10^{11} OHM (min)
Capacitance across open contacts	0.3pf
GENERAL CHARACTERISTICS	
Operating Position	Any
Operate Time	1.0 ms (max)
Release Time	0.5 ms (max)
Coil Resistance Rise Due to Temperature	Coil Resistance Will Rise 0.4% Per One Degree °C of Temperature Increase.
Pick up Voltage (max)	80% of Nominal Coil Voltage
Drop out Voltage (min)	10% of Actual Pick up Voltage
Shock (non operate)	10G's 10 ms, ½ cycle
Operate Temp. Range	−35°C to +85°C
Storage Temp. Range	−65°C to +125°C
Life @ Rated Load with Appropriate Contact Protection	30 Million Operations
Life Low Level	50 Million Operations
Enclosure	Molded Epoxy
Terminals	Nickel Iron — Tin Plated
Weight	0.08 oz. (2.3g)

1 FORM A SPST-NO	Termination	OPTIONS			
		None	Diode	E.S.*	E.S. & Diode
1 	8 PIN	1A1E	1A2E	N/A	N/A

▶ Index Notch
*E.S. Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO	
Coil Voltage and Adjustment	Coil Resistance (OHMS)
5G	85
6G	122
12G	488
24G	1952

IN STOCK FOR IMMEDIATE DELIVERY SERIES 185

Part Number (Including Coil Voltage)	CONTACTS		Options	Coil Resistance (OHMS)
	Arrange-ment	Wiring Diagram		
185TE1A1E-5G	1A	1	N	85
185TE1A1E-12G	1A	1	N	488
185TE1A1E-24G	1A	1	N	1952

N = None

ORDERING INFORMATION

185 TE 1A 1 E — 5G

- 185: BASIC MODEL NUMBER
- TE: ENCLOSURE MOLDED
- 1A:

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO

- 1:

CODE	OPTIONS
1	NONE
2	DIODE

- E: SCHEMATIC SEE TABLE A
- 5G: COIL VOLTAGE AND SENSITIVITY SEE TABLE B

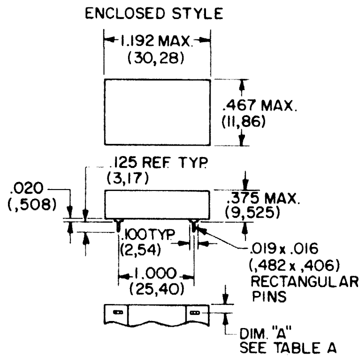
Series 181 Mercury Wetted Reed Relay

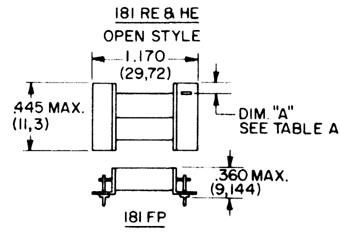
• SPST-NO • SPDT

The Series 181 is a miniature, position sensitive, mercury-wetted reed relay designed for applications requiring long life, bounce-free contact operation. Terminals are placed on popular 1″ centers with grid spacing of .100″ or .150″. This rugged and reliable relay is available in a low cost, open style, or with a steel dust cover for added protection and magnetic shielding.

Other options include epoxy-filled versions which completely seal the coil and internal parts from harsh atmospheres.

Mechanical Data



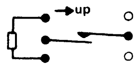
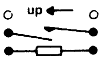


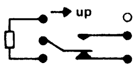
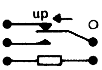
DECIMAL TOLERANCES ± .005 EXCEPT AS NOTED (0,13)

DIMENSIONS SHOWN IN ( ) ARE MILLIMETERS

- **No contact bounce**
- **Position sensitive**
- **Low level to 2.0 amp**
- **1″ × .100 and 1″ × .150 pin spacing**
- **Low stable contact resistance**

ELECTRICAL CHARACTERISTICS (Values at 25°C)		
Contact Form	Form A SPST-NO	Form C SPDT
Contact Rating (max) Switching Volts Switching Current Carry Current	50W 500 VDC 1.0 Amp 2.0 Amp	28W 200 VDC 1.0 Amp 1.5 Amp
Contact Resistance (Initial)	0.15 OHM (max)	
Dielectric Strength Across open cont. Contacts to coil	1000 VAC 1000 VAC	
Insulation Resistance OHMs (test at 100VDC)	10^{11} OHM (min)	
Capacitance across open contacts	0.3pf typical	0.8pf typical
GENERAL CHARACTERISTICS		
Operating Position	Must Be Mounted Upright Within 30° of Vertical	
Operate Time Normally open (including bounce) Normally closed	2.0 ms (max) —	2.0 ms (max) 1.0 ms (max)
Release Time Normally open (including bounce) Normally closed	1.0 ms (max) —	1.0 ms (max) 2.0 ms (max)
Coil Resistance Rise Due to Temperature	Coil Resistance will rise 0.4% per one Degree °C of Temperature Increase.	
Pick up Voltage (max)	80% of Nominal Coil Voltage	
Drop out Voltage (min)	10% of Actual Pick up Voltage	
Shock (non operate)	5G's 11 ms ½ cycle	
Operate Temp. Range	−35°C to +80°C	
Storage Temp. Range	−60°C to +105°C	
Life @ Rated Load with Appropriate Contact Protection	50 million operations	
Life Low Level	100 million operations	
Enclosure (Optional)	Cold Roll Steel – Zinc Plated	
Terminals	Nickel Iron – Tin Plated	
Bobbin	Glass Filled Nylon	
Weight RE Style	0.25 oz (6.9g)	

1 FORM A SPST-NO	Grid Spacing	Dimension A Mech. Data		OPTIONS			
		RE/HE	FP	NONE	M.S.†	E.S.*	E.S. & M.S.
1 	.100	.134 (3.40)	.123 (3.13)	1A1D	1A3D	N/A	N/A
	.150	.084 (2.13)	.073 (1.85)	1A1E	1A3E	N/A	N/A
2 	.100	.134 (3.40)	.123 (3.13)	1A1F	1A3F	N/A	N/A
	.150	.084 (2.13)	.073 (1.85)	1A1G	1A3G	N/A	N/A

1 FORM C SPDT	Grid Spacing	Dimension A Mech. Data		OPTIONS			
		RE/HE	FP	NONE	M.S.†	E.S.*	E.S. & M.S.
3 	.100	.134 (3.40)	.123 (3.13)	1C1D	1C3D	N/A	N/A
	.150	.084 (2.13)	.073 (1.85)	1C1E	1C3E	N/A	N/A
4 	.100	.134 (3.40)	1.23 (3.13)	1C1F	1C3F	N/A	N/A
	.150	.084 (2.13)	.073 (1.85)	1C1G	1C3G	N/A	N/A

†M.S. Magnetic Shield *Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO & 1 FORM C SPDT	
Coil Voltage and Adjustment	Coil Resistance (OHMS)
5G	86
6G	130
12G	500
24G	1880
48G	7385

IN STOCK FOR IMMEDIATE DELIVERY—SERIES 181

Part Number (including coil voltage)	CONTACTS		Options	Coil Resis-tance (OHMS)
	Arrange-ment	Wiring Diagram Table A		
181RE1A3D-5G	1A	1	M.S.	86
181RE1A3D-12G	1A	1	M.S.	500
181RE1A3D-24G	1A	1	M.S.	1880
181RE1C3D-5G	1C	3	M.S.	86
181RE1C3D-12G	1C	3	M.S.	500
181RE1C3D-24G	1C	3	M.S.	1880

M.S. Magnetic Shield

181 RE 1A 3 D – 5G

181 — BASIC MODEL NUMBER

RE — ENCLOSURE

ENCLOSURE	
RE	DUST COVER
HE	POTTED
FP	OPEN

1A

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO
1C	SPDT

3

CODE	OPTIONS
1	NONE
3	MAGNETIC SHIELD

D — SCHEMATIC SEE TABLE A

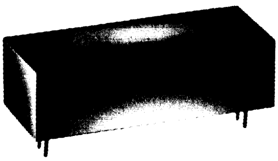
5G — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

Series 182 Mercury Wetted Reed Relay

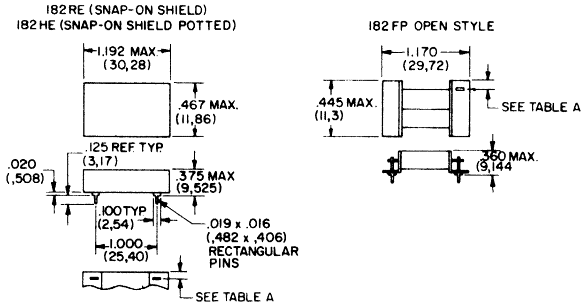
- SPST-NO
- NON-POSITION SENSITIVE

The Series 182 is a miniature, non-position sensitive, mercury-wetted reed relay featuring no bounce contact operation and is capable of being mounted in any plane. Enclosure options include a steel dust cover for added protection and magnetic shielding.

Other styles include epoxy-filled versions which completely seal the coil and internal parts from harsh atmospheres. Terminals are placed on the popular 1" centers with grid spacing of .100" or .150."



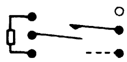
Mechanical Data



- No contact bounce
- Low level to 0.1 amp
- Low stable contact resistance
- 1." × .100 and 1." × .150 pin spacing

ELECTRICAL CHARACTERISTICS (Values at 25°C)	
Contact Form	Form A SPST-NO
Contact Rating a (max) Switching Volts Switching Current Carry Current	3W 28VDC 0.1 Amp 1.0 Amp
Contact Resistance (Initial)	0.15 OHM (max)
Dielectric Strength Across open cont. Contacts to coil	 1000 VAC 1000 VAC
Insulation Resistance OHMs (test at 100VDC)	10^{11} OHM (min)
Capacitance across open contacts	0.3pf
GENERAL CHARACTERISTICS	
Operating Position	ANY
Operate Time	1.0 ms (max)
Release Time	0.5 ms (max)
Coil Resistance Rise Due to Temperature	Coil Resistance will rise 0.4% per one Degree °C of Temperature Increase
Pick up Voltage (max)	80% of Nominal Coil Voltage
Drop out Voltage (min)	10% of Actual Pick-up
Shock (non operate)	10G's 10 ms ½ cycle
Operate Temp. Range	− 35°C to + 80°C
Storage Temp. Range	−65°C to + 125°C
Life @ Rated Load with Appropriate Contact Protection	30 million operations
Life Low Level	50 million operations
Enclosure	Cold Roll Steel — Zinc Plated
Terminals	Nickel Iron — Tin Plated
Bobbin	Glass Filled Nylon
Weight RE Style	0.25 oz. (6.9g)

SCHEMATICS TABLE A Top View

1 FORM A SPST-NO	Grid Spacing	Dimension A Mech. Data RE/HE	FP	OPTIONS NONE	M.S.†	E.S.*	E.S. & M.S.
1 	.100	.134 (3.40)	.123 (3.13)	1A1D	1A3D	1A5D	1A7D
	.150	.084 (2.13)	.073 (1.85)	1A1E	1A3E	1A5E	1A7E
2 	.100	.134 (3.40)	.123 (3.13)	1A1F	1A3F	1A5F	1A7F
	.150	.084 (2.13)	.073 (1.85)	1A1G	1A3G	1A5G	1A7G

† M.S. Magnetic Shield * E.S. Electrostatic Shield

STANDARD COIL DATA CHART TABLE B

1 FORM A SPST-NO	
Coil Voltage and Adjustment	Coil Resistance (OHMS)
5G	190
6G	245
12G	965
24G	4200
48G	7385

IN STOCK FOR IMMEDIATE DELIVERY—SERIES 182

Part Number (including coil voltage)	CONTACTS Arrange-ment	Wiring Diagram Table A	Options	Coil Resis-tance (OHMS)
182RE1A3D-5G	1A	1	M.S.	190
182RE1A3D-12G	1A	1	M.S.	965
182RE1A3D-24G	1A	1	M.S.	4200

M.S.Magnetic Shield.

ORDERING INFORMATION

182 RE 1A 3 D — 6G

182 — BASIC MODEL NUMBER

RE — ENCLOSURE

ENCLOSURE	
RE	DUST COVER
HE	POTTED
FP	OPEN

1A

CODE	QUANTITY AND TYPE OF SWITCH
1A	SPST-NO

3

CODE	OPTIONS
1	NONE
3	MAGNETIC SHIELD
5	ELECTROSTATIC SHIELD
7	MAGNETIC AND ELECTROSTATIC SHIELD

D — SCHEMATIC SEE TABLE A

6G — COIL VOLTAGE AND SENSITIVITY SEE TABLE B

REED RELAY APPLICATION FORM

CUT ALONG DOTTED LINE

COMPANY ______________________________

STREET ADDRESS ______________________________

STATE ______________ ZIP ______________ TEL. ______________

NAME ______________________________ TITLE ______________

Sigma Relay Series
or Competitive Type

Contact Form Desired	Contact Load Voltage	Contact Load Current
Nature of Load Type of Load	Resistive ☐ Capacitive ☐ Inductive ☐	
Life Required (Number of Cycles)	Duty Cycle	☐ Continuous ☐ Intermittent
Nominal Coil Voltage	Maximum Pull-in Voltage or Current	Minimum Drop-out Voltage or Current (if needed)
Coil Resistance ±10%	Ambient Temperature Extremes	
Operate Time	Release Time	

Enclosure	Molded	Dust Cover	Open	Potted
	☐	☐	☐	☐

Preferred Terminal Spacing	Max. Dimensions	Sample Req. Qty. ☐
Special Features		

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