# INTRODUCTION TO RELAY COMPONENTS

## GENERAL

Over 800 released relay and contactor part numbers are presently available for applications such as power sequencing, motor starting, and switching low power devices (indicator lights and other relays).

### Major Classifications of Relays Used at IBM

**General Purpose Relays** - By IBM definition, low power relays are general purpose relays capable of handling contact loads less than 3 amperes. Medium power relays have contacts rated from 3 to 10 amperes. High power relays handle loads greater than 10 amperes. Most low, and medium power relays are clapper type relays.

High speed relays are also classified as general purpose. Exactly what classifies a high speed relay is not clearly defined, but relays designed to operate at high speeds are often magnetically biased and are characterized by light armature construction and small armature travel.

**Contactors** - Contactors are high power relays capable of handling large loads. There is no clear distinction between a contactor and a power relay. In general, a device that is solenoid-actuated and has a multiple pole, single throw contact system would be classified as a contactor. A device with clapper-type construction with a double throw contact system would generally be classified as a relay.

A mercury-plunger relay is also a member of the contactor family. Mercury-plunger or mercury-displacement relays are high-power solenoid actuated devices. When actuated, a plunger displaces mercury in an enclosed tube causing the mercury level to rise and make contact with an electrode, thus closing the circuit. This type contactor requires less physical space than conventional contactors.

**Motor Starting Relays** - Two types of motor starting relays exist. One type is typically connected to the terminals of a motor and acts as an across-the-line starter. It is normally considered a general purpose relay or contactor. The second type of motor starting relay is commonly used to switch the starting winding of a single-phase motor in or out of the circuit. This type of relay is usually a single pole/single throw (SPST) device with a coil that is very sensitive to current or voltage.

**Time Delay Relays** - The time delay relays are designed to permit a time lag of some predetermined value between the time the coil is energized and the time the movable contacts switch from their normal position to their actuated position. Time delay relays are designed in a variety of ways and most commonly employ a mechanical, thermal, or electronic means of delaying the relay's operation.

**Reed Relays** - Reed relays are small, fast acting devices which consist of one or more glass encapsulated reed switches surrounded by a magnetic coil.

A special form of reed relay is the mercury wetted contact relay. Mercury, enclosed in a tube along with the contact system, flows up the movable reed and wets both the movable and stationary contacts.

**Solid State Relays** - Solid state relays are hybrid modules composed of semiconductor and passive components. Input/output isolation may be provided by a reed relay, an opto-isolator, or transformer coupling. A triac or two SCR's in an inverse parallel arrangement are generally employed for load current switching.

## DEFINITIONS

**Relays** - A relay is an electrically controlled device that opens and closes contacts to effect the operation of other devices in the same or other circuits.

**Actuator** - The part of the relay system that converts electrical energy into mechanical work.

**Ampere Turns** - The product of the number of turns in an electromagnetic coil, and the current in amperes passing through the coil.

**Contacts** - The surface of the current-carrying member at which electrical circuits are open or closed.

**Contact Chatter** - Undesired vibration when contacts mate. Actual physical contact opening could occur.

**Single Pole (SP)** - All contacts in the arrangement connect in one position or another to a common contact.

**Double Pole (DP)** - A two pole contact.

**Single Throw (ST)** - Single throw contact combinations have a pair of contacts open in one relay position and closed in the other.

**Double Throw (DT)** - Double throw contact sets have three contacts. The middle one is in contact with the second, but not with the third, in one position of the relay, and reverses this connection in the other relay position.

**Normally Opened and Normally Closed** - The combination in which the contacts are open in the normal or unoperated position of the relay is designated, normally open (NO) or Form A. The combination in which the contacts are closed in the normal or unoperated position is designated, normally closed (NC) or Form B.

**Double Make and Double Break** - These contact combinations have two independent contacts both connected to a third contact in one position of the relay. They are designated, double make (DM) when normally open, and double break (DB) when normally closed.

**SPST NO** - Single Pole/Single Throw - Normally Open

**SPST NC** - Single Pole/Single Throw - Normally Closed

**SPDT B-M** - Single Pole/Double Throw - Break before Make

**SPDT M-B** - Single Pole/Double Throw - Normally Closed - Double Break

**SPST NCDB** - Single Pole/Single Throw - Normally Closed - Double Break

**SPST NODM** - Single Pole/Double Throw - Normally Open - Double Make

**Life Expectancy** - The number of operations has a greater effect on the life of a relay or contactor than the power-on hours; therefore relays and contactors do not normally express a failure rate in %/1K hours. The life expectancy (number of operations) is shown in their parameter tables in each product family. However, an ELAL algorithm has been developed that can be used to calculate failure rate in %/1K hours for specific applications conditions.

**Magnetomotive Force (mmf)** - The force that establishes the magnetic flux in the magnetic circuit.

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

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

**Reluctance** - The resistance that a magnetic material offers to the establishment of a magnetic field. It is numerically equal to the magnetomotive force divided by the magnetic flux.

**Shading Ring** - A shorted turn which surrounds a portion of the pole of an alternating current electromagnet. It produces by mutual inductance, a delay in the change of the magnetic field in that part of the pole and tends to prevent chatter and reduce hum.

**Zero Voltage Switching (Synchronous Switching)** - A property of solid state relays. The name is derived from the fact that the control voltage does not turn on the relay until the ac voltage across the load passes through zero. This reduces EM and RF interference, the incidence of false triggering, and noise injection into the logic circuits and prevents the high instantaneous in-rush currents with lamp loads or voltage breakdown with capacitance loads.

## DESCRIPTION AND PRESENTATION

A relay in its simplest form (see Figure 8-1) consists of a coil, a magnetic circuit, a spring, and one or more pairs of contacts. The magnetic circuit consists of a stationary portion and a movable portion, or armature. Each pair of contacts includes one movable contact, which is activated by the armature, and one stationary contact.

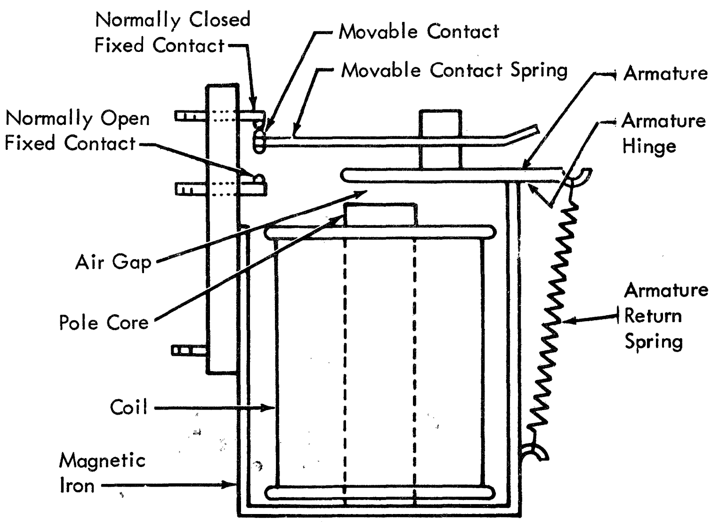



Figure 8-1. Typical Relay Construction

When the coil is energized, a magnetomotive force is induced across the air gap between the armature and the rest of the magnetic circuit. This force attracts the armature and changes the position of the movable contacts, relative to the stationary contacts, causing one or more circuits to be closed or opened. When the coil is de-energized the armature, which is spring-loaded, and the movable contact return to their original position.

Relays used in IBM systems have coil input requirements of 3 volts to 100 volts dc, or 24 volts to 440 volts ac at frequencies of 50 Hz or 60 Hz. The contact load requirements vary from a few milliamperes at low voltages to 50 amperes at 48 volts dc, or 100 amperes at 600 volts ac.

When designing a relay, the first consideration should be the contact system. The type of load, the magnitude of the load current, the frequency of operation, and the expected life will dictate the contact size, shape, mass and material.

### The Contact System

It is essential that the contact mass and thermal conductivity be such that the heat can be conducted away fast enough to prevent excessive temperatures and eventual destruction of the contacts. This is especially important where the frequency of operation is great.

When heavy loads are involved, arcing takes place at the instant the contacts are closing or opening. This results in temperatures high enough to cause melting of the contact material at the point of contact which, in turn, increases the area of contact and reduces the contact resistance. When this state is reached, the contact voltage drop does not increase with a further increase in load current. The voltage at which this phenomenon takes place is known as the softening voltage, is in the millivolt range, and varies with the material used and the ambient temperature. Circuits in which arcing does not take place are known as dry or low level circuits.

The contact problems encountered with heavy loads are material erosion and transfer, while high contact resistance due to organic films or contamination is a problem encountered in low level (voltage and current) circuits. Silver, silver-cadmium oxide, tungsten, and molybdenum are materials typically used for high voltage and/or current applications, while gold, palladium, and rhodium contacts have low contact resistance and are typically used where low energy contacts are required.

The magnitude of the load voltage and potential transient or surge voltages, as well as the contact geometry, material, and surface texture, will determine the length of the air gap between the contact pairs in the open position.

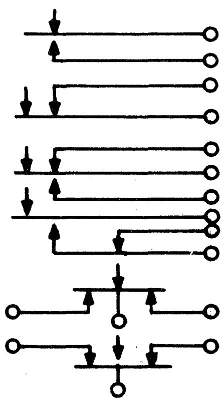
In a typical relay, the movable contacts are attached to a flexible strip of metal called the movable contact spring. This spring is attached to or activated by the armature and should have sufficient over-travel in both the operate and release positions. The over-travel compensates for alignment differences in multiple pole relays and also for long term contact wear and erosion. Over-travel also provides wiping action which is a lateral movement of the movable contract across the surface of the stationary contact. The wiping action helps to eliminate high resistance contacts due to environmental impurities such as dust, and also tends to keep the contact surfaces smooth.

The armature and movable contacts are held in the non-actuated position by the armature return spring. The spring must have sufficient force to overcome the residual magnetism in the magnetic circuit, to provide sufficient over-travel and contact force for contacts in the normally closed position, and to overcome the gravitational force of the armature and contacts.

Contact systems are available in a variety of mechanical configurations designed to perform specific functions. These configurations have been assigned alphabetic identities by the U.S. Standards Institute to eliminate the necessity of completely describing the system. Identification of the more common combinations are tabulated in Table 8-1.

Table 8-1. Standard Form Configurations and Symbols

| Form | Description | Symbol |
|---|---|---|
| A | SPSTNO | |
| B | SPSTNC | |
| C | SPDT-B-M | |
| D | SPDT M-B | |
| X | SPST NODM | |
| Y | SPST NCDB | |



A multiple pole configuration is referred to as 2 form A, 3 form C, etc.

## The Actuator System

The typical actuator system consists of a coil and a permeable-iron magnetic circuit, which consists of a stationary portion and an armature. The coil may be energized by either ac or dc. Although ac sources are more accessible, ac coils are less efficient than dc coils.

The magnetic force developed in the actuator system must be sufficient to overcome the counter force of the armature return spring, the force of friction due to armature movement, and the wiping action of the contacts.

The magnetic force produced when the coil is energized is directly proportional to the square of the ampere turns $(NI)^2$, and is an inverse function of the length of the air gap in the magnetic circuit and of the reluctance of the iron portion of the magnetic circuit. A large portion of the magnetomotive force (mmf) produced when the coil is first energized is used up in the air gap. In a dc relay, the force attracting the armature increases appreciably as the air gap decreases, because N and I are constant (after the coil is fully energized) throughout the stroke; the reluctance starts to increase only if the iron's saturation point is reached. In an ac coil, the reduction in air-gap length also results in an increase in the attractive force, but the reduction in air gap is accompanied by a reduction in the exciting current due to the increased inductive reactance of the total magnetic circuit. Therefore, to do the same amount of work as a dc relay, the cross-sectional area of the magnetic circuit or the coil must be larger in an ac relay.

Due to the reversal of current every half cycle in ac systems, the ac relays must be designed to eliminate or minimize chatter. This is accomplished by means of copper shading coil. The shading coil is a shorted turn which loops a portion of the magnetic circuit at the core pole face. This loop produces a counter emf which causes the flux in that portion of the magnetic circuit to lag the flux in the non-looped portion of the circuit. This results in sufficient flux in the air gap to hold the armature, even though the current passes through zero twice each cycle.

Any voltage source will have some tolerance. The actuator system must, therefore, be capable of pulling in the armature at some value below the minimum possible voltage, and also must be able to operate at the maximum possible voltage without overheating. The ampere-turns required to hold the armature in the actuated position are much less than those required to overcome the inertia of the armature and contact system. As stated earlier, the current in an ac coil automatically reduces as the air gap is reduced, but the current in a dc coil is unaffected by the air gap. Consequently, high power dc relays are designed frequently with a two-section winding. One section of the coil consists of a few turns of relatively heavy wire, while the other section contains a greater number of turns of finer wire. When the armature is in the non-actuated position, a microswitch shorts out the high resistance section of the coil. When a voltage is applied to the coil, the low resistance of the pull-in section allows a high initial current, which in turn produces a high mmf to pull in the armature. When the armature pulls in, the normally-closed microswitch opens, and the high resistance coil is connected in series with the pull-in coil. This appreciably reduces the ampere-turns and the $I^2R$ loss in the coil.

Standard practice is to design the magnetic circuit so that a small air gap exists, even when the armature is fully actuated, to reduce residual magnetism which would tend to hold the armature in the actuated position after the coil is de-energized.

The parameters which are often defined in the selection of any relay are:

1. Type of Input - (ac or dc)
2. Coil Voltage and Current
3. DC Resistance
4. Minimum Operating Voltage
5. Maximum Release Voltage
6. Maximum Operate and Release Times
7. Contact Configuration
8. Magnitude and Nature of the Contact Load
9. Contact Resistance
10. Contact Force

11. Insulation Resistance

12. Dielectric Strength

## RELAY SPECIFICATIONS

In addition to the generic engineering and quality specifications noted for each produce family the following engineering specifications apply:

1. General Specifications

| | | |
|---|---|---|
| 860681 | - | Positional Dimensioning Interpretation |
| 873589 | - | General Quality, Purchased Components |
| 873444 | - | Suppliers Shipping |
| 2413138 | - | Flammability, Purchased Components |
| 873506 | - | Electrical Components, General Requirement |
| 890350 | - | Abridge Engineering |
| Part I | - | Standards |

2. Generic Specifications

| | | |
|---|---|---|
| Reed Relays: | 866496 | - Engineering |
| | 866497 | - Quality |
| Reed Switch: | 2412350 | - Engineering |
| | 2412360 | - Quality |
| Solid State: | 873748 | - Engineering |
| | 873749 | - Quality |
| Contactors and all other relays: | 868403 | - Engineering |
| | 873724 | - Quality |

3. The following DCS codes apply:

| | |
|---|---|
| Contactors | - 2-3401 |
| General Purpose Relays | - 2-3411 |
| Reed Relays | - 2-3421 |
| Solid State Relays | - 2-3431 |
| Reed Switches | - 2-3441 |
| Motor Start Relays | - 2-3451 |
| Time Delay Relays | - 2-3461 |
| Mercury Wetted Relays | - 2-3471 |
| Stepping Relays | - 2-3489 |

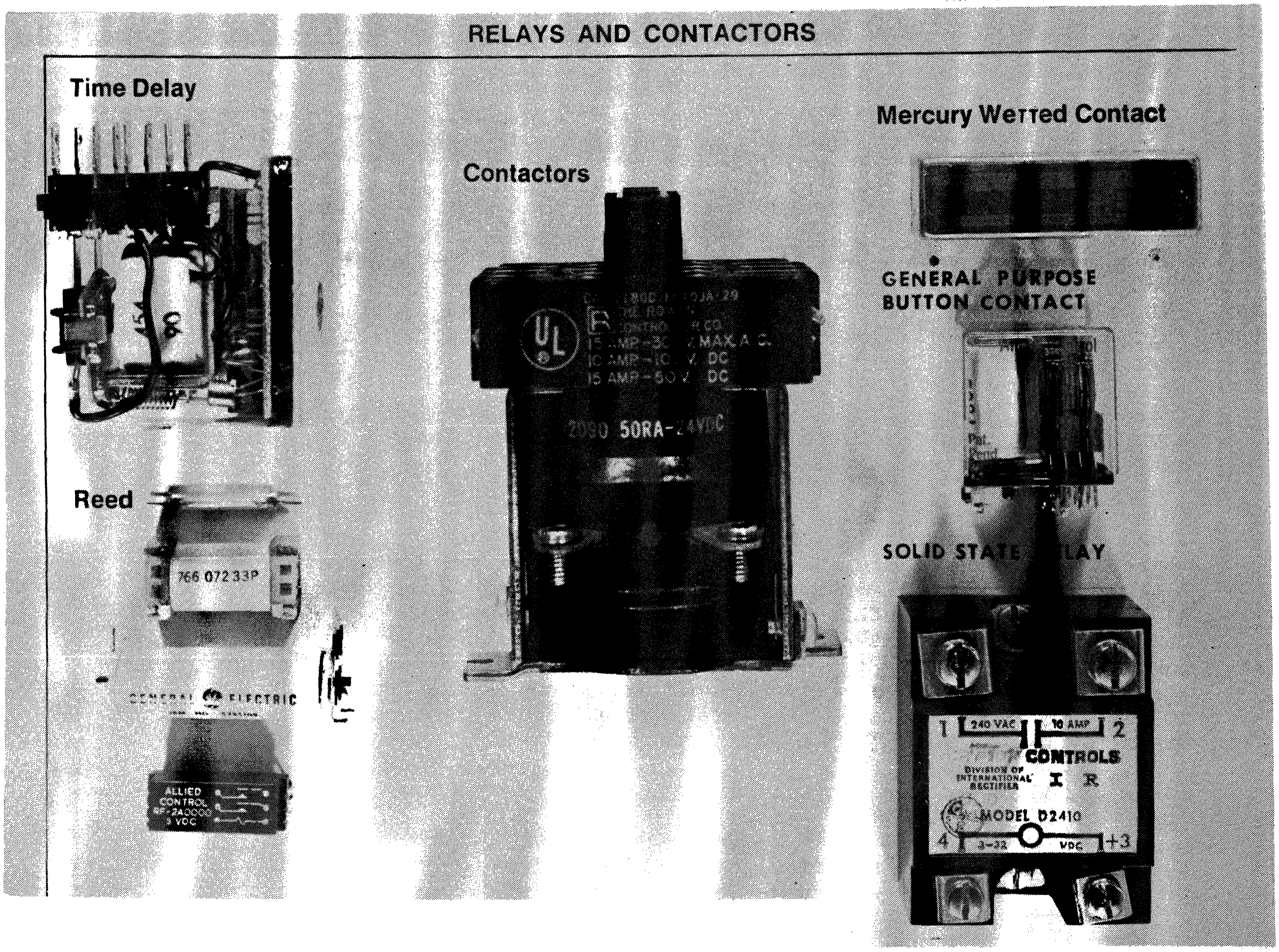



Figure 8-2. Examples of Relay Type Switching Products Covered in this Section

## GENERAL PURPOSE RELAYS

General purpose relays are used typically in low, medium, and high power applications such as power interrupt circuits, and switching of low power devices such as indicator lamps or other relays. They are available with either ac or dc coils with a wide variety of voltage ratings and include many contact systems capable of handling up to 25 amperes.

General purpose relays usually employ clapper type construction. The magnetic circuit in a clapper type relay consists of a heavy L-shaped strip, a cylindrical pole core which is surrounded by the coil, and an armature in the form of a thick flat strip of iron which is hinged to the L-shaped piece and is pulled toward the face of the pole core when the coil is energized.

These relays are available with a wide variety of mounting arrangements and may have solder, screw, compression, or bayonet type terminals. Some are available with dust covers, also.

Multiple-pole, general purpose relays frequently employ card lift-off actuation. This construction employs a slotted card, usually made of phenolic, which is attached to the end of, and perpendicular to, the armature. The movable contact springs extend out beyond the contacts through slots in the card. All of the movable contacts are thus actuated by movement of the card. When the coil is de-energized, the armature is returned to the open-gap position by the combined force of all of the movable contact springs and the armature return spring. An advantage of card lift-off actuation is that it greatly reduces the possibility of contacts welding or sticking because of the combined force of the other movable contact springs acting to return to their normal position.

Table 8-2 presents the typical parameter capabilities and to-user costs of the low, medium, and high power general purpose relays.

Typical physical outline drawings for a low, medium, and high power general purpose relay are shown in Figures 8-3 through 8-5; however, other sizes exist and will be considered for applications requests.

The so-called high speed relay is a special member of the general purpose relay family.

There is no established value of operate or release time that would qualify a relay as a high speed relay. Operate times as low as one millisecond can be obtained in some relays; reed relays can be designed to operate even faster.

Factors which contribute to high speed operation are a light-weight armature and contact system, low armature travel, high coil voltage (overdrive), and coils with a low L/R ratio. Some high speed relays have resistance added to the coil to reduce the time constant and thus increase the operating speed. Another method of obtaining high speed operation is to magnetically bias the coil so that a small increment of mmf is sufficient to actuate the armature.

Some of the factors that enhance the operating speed of a relay, such as a low mass armature system and a small L/R ratio, also decrease the release time of the relay. Other aids to high operating speed, such as high coil voltage and magnetic biasing, act to reduce the release speed of the relay. Other than read relays, the high speed relays are not used extensively in IBM applications.

Table 8-2. Typical General Purpose Relay Parameters and Costs

| | Low Power | Medium Power | High Power |
|---|---|---|---|
| Contact Rating: | 1 to 3 amps at 115 Vac/28 Vdc | 5 A/240 Vac 10 A/115 Vac/28 Vdc | 10-25 A/250 Vac 28 Vdc |
| Contact Resistance: | 50 to 100 mΩ max | - | - |
| Operating Time: | 15 msec max | 20 msec max | 25 msec max |
| Release Time: | 8 msec max | 10 msec max | 15 msec max |
| Life Expectancy: | $10^6$ operations min | $10^5$ Operations min | $10^5$ operations min |
| To-User Cost: | $2 to $4 | $2 to $4 | $3 to $10 |

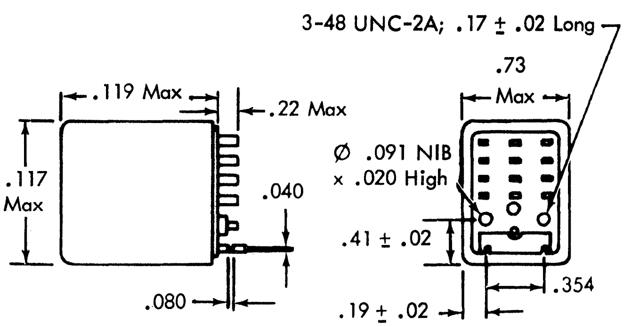



Figure 8-3. Typical Low Power General Purpose Relay

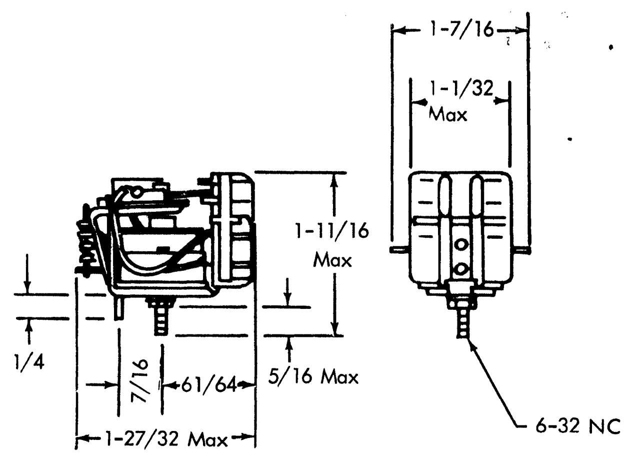



Figure 8-4. Typical Medium Power General Purpose Relay

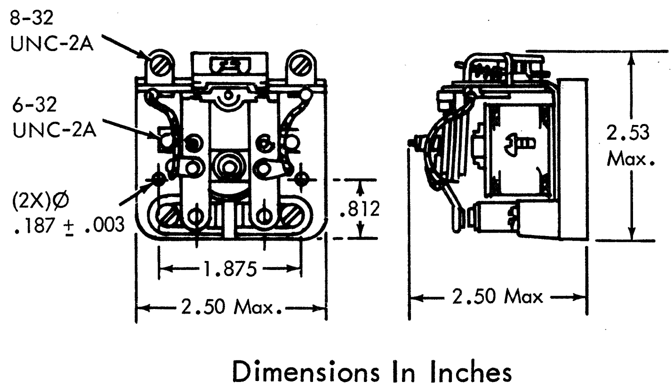



Figure 8-5. Typical High Power General Purpose Relay

## CONTACTORS

A contactor is typically a high current (>25 amps) relay whose prime application is to "make or break" the system's main power line. Contactors are also used extensively as "across-the-line" starters for large motors, and for switching heavy loads in applications such as resistance heating.

The type of construction and the contact system seem to be the prime factors which manufacturers use to determine whether a device is a relay or a contactor. If a device has a laminated magnetic circuit, is of solenoid-actuated construction, and is a single-throw device, it will probably be called a contactor, regardless of the ratings of the contacts. Conversely, if a device uses a clapper type construction and is a double-throw device, it will probably be called a relay by the manufacturer, even if the contacts are rated above 25 amps at 115 volts ac.

In the solenoid-actuated construction, both the stationary portion of the magnetic circuit and the armature are usually constructed of E-shaped laminations. This type of construction is efficient and provides a high pull-in force due to the existence of a magnetic path on both sides of the coil, and the major air gap inside the coil rather than above the coil, as it is in the clapper type relay.

The contacts in a contactor are invariably double make or double break contacts. In this type of contact system, one stationary contact is connected to the line, while the other is connected to the load. This arrangement is especially suited for high voltage loads due to the large total air gap between contacts in the open position.

Typically, contactors have a normally-open, single-throw, multiple-pole contact system. Frequently a contactor may have three of four main poles for switching three-phase power, and one or more auxiliary contacts may be used to activate a low energy device such as a pilot light or another relay. The auxiliary contacts may be a part of the regular contact system with the contacts made of a different material than is suited for low energy circuits. They may also be provided by means of a microswitch mounted to the side of the contactor and mechanically actuated by a pin or similar protrusion attached to the armature.

Contactors purchased by IBM have contact systems which vary from two normally-open main poles to eight normally-open and eight normally-closed main poles. Some contactors have as many as six auxiliary poles in addition to the main poles.

In order to reduce noise and mechanical wear, some contactors have a cushion of rubber, or similar material, between the mounting plate and the bottom of the magnetic core.

Mercury displacement contactors are a special member of the contactor family. They are high power devices with a solenoid-actuated construction, and are composed of a sealed tube (backfilled with gas), a pool of mercury, a contact system, and a magnetic plunger with teflon bearings surrounded by a coil.

In one type of construction, two tungsten or molybdenum electrodes are sealed into the bottom of the glass or stainless steel tube. One electrode extends up into the mercury, and the other extends up into a mercury-filled ceramic cup which extends up above the level of the mercury pool. When the coil is energized, the plunger displaces mercury in the pool which causes the mercury to rise above the top of the ceramic cup and make contact with the mercury pool in the cup. When the coil is de-energized, the plunger rises, and the level of the mercury pool falls below the top of the cup, breaking the contact.

Another version of the above design has one electrode sealed into the bottom of the tube to make contact with the mercury pool, while the other is sealed into the top of the tube. The contact that is sealed into the top extends down into a pool of mercury which is inside a deep ceramic cup attached to the top of the plunger. When the coil is energized, the mercury in the bottom of the pool is displaced by the plunger, rises above the level of the cup, and makes contact with the top electrode. When the coil is de-energized, the plunger and ceramic cup return to their normal position above the level of the mercury pool.

Mercury displacement relays are also available with form B contact systems. In this type of device, the plunger is weighted so that it submerges in the pool when the coil is not energized, and is pulled up into the open position when the coil is energized. This type of contactor will withstand large surge currents without damage to the system due to the large contact area and the flow properties of the mercury, which presents a "new" contact surface each time the relay is actuated.

The advantages of mercury displacement relays are long life, high current carrying capability, virtually bounce-free operation, and ability to withstand hostile environments. Disadvantages of these devices are slow operate and release times, the necessity of vertical mounting, and their susceptibility to shock and vibration.

Time-delay mercury displacement relays are available with operate or release time delays up to several minutes. The delays are obtained by special design of the ceramic cup containing the smaller pool of mercury.

Table 8-3 presents the typical parameter capabilities and to-user costs of contactors and mercury displacement contactors.

The typical physical outlines for contactors and mercury displacement contactors are shown in Figures 8-6 and 8-7, however, other sizes exist and will be considered for applications requests.

Table 8-3. Typical Contactor Parameter and Costs

| | Contactors | Mercury Displacement Contactors |
|---|---|---|
| Contact Rating: | 15 to 100 amps/600 Vac | 10 to 100 amps/240 Vac |
| Contact Voltage Drop: | 0.15 V to 0.40 Volts | - |
| Operate Time: | 40 msec max | -100 msec |
| Release Time: | 30 msec max | -100 msec |
| Life Expectancy: | $10^5$ operations min | $>10^6$ operations min |
| To-User Cost: | $6 to $80 | $15 to $40 |

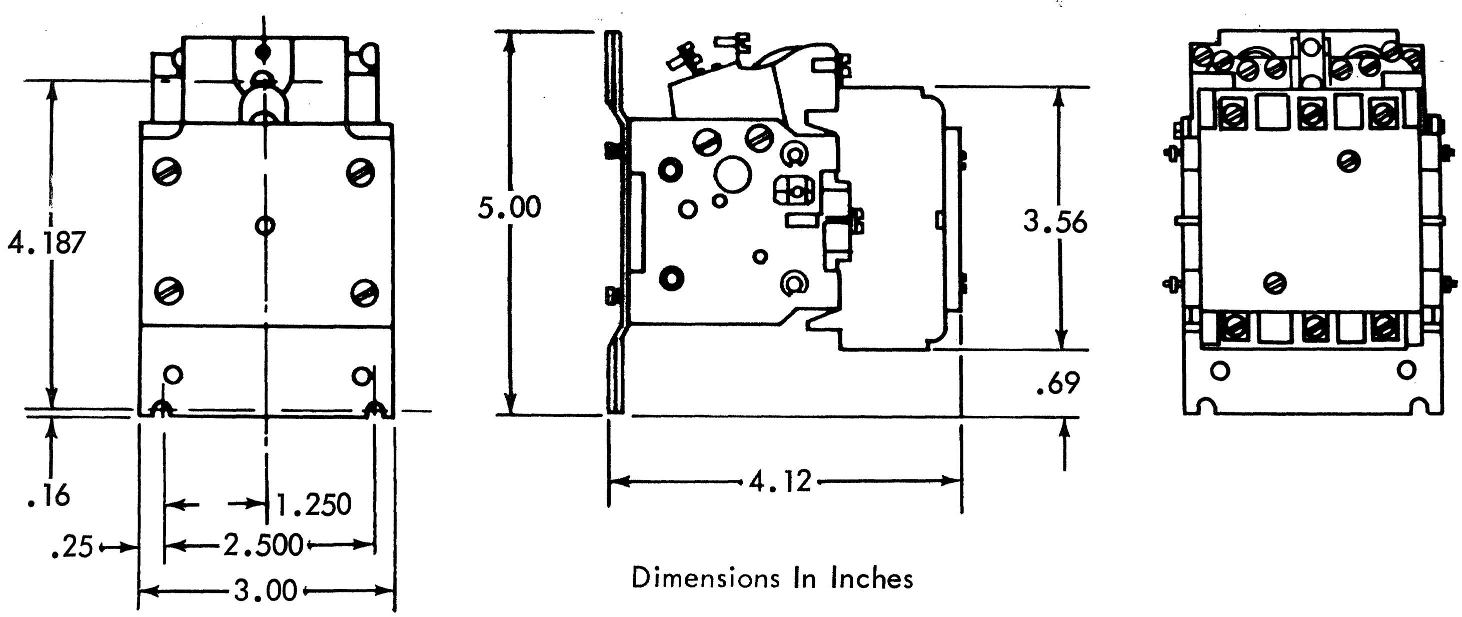
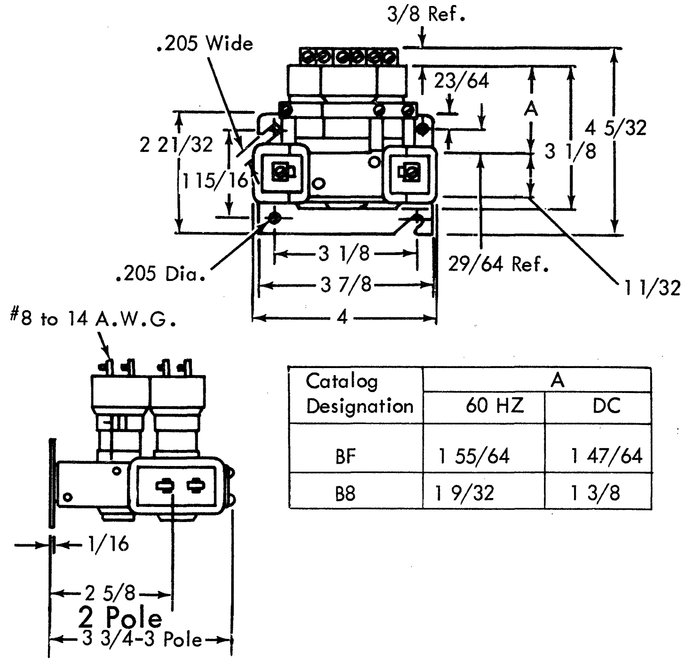



Figure 8-6. Typical Contactor




| Catalog Designation | A | |
|---|---|---|
| | 60 HZ | DC |
| BF | 1 55/64 | 1 47/64 |
| B8 | 1 9/32 | 1 3/8 |

Figure 8-7. Typical Mercury Displacement Contactor

## REED RELAYS AND SWITCHES

Reed relays consist of a coil and one or more reed switches. When the relay has normally closed contacts, it will also include one or more permanent magnets. The major applications of reed relays at IBM are in low speed logic circuits, as drivers of medium power devices such as solenoids, lamps, and other relays, and in analog switching applications. Also, reed relays containing normally closed contacts are used to provide connection paths during power-off conditions in fail safe and emergency shutdown equipment. The construction and function of the reed switch is uniquely different than that of the switching members (contacts) of other types of relays. The reed switch is composed of two complaint reeds or thin strips of magnetic material plated with gold, rhodium, silver, or combinations thereof, to provide low contact resistance under low energy conditions. The reed switch is hermetically sealed in a small glass tube which is either evacuated or filled with an inert gas. The switch is so constructed that the reeds overlap at the middle of the glass tube and are separated by a small air gap. The other ends of the reeds extend through opposite ends of the glass tube and serve as terminals.

In addition to serving as contacts and terminals, the reeds act as contact return springs and as part of the magnetic circuit. When the coil which envelops the switch is energized, the mmf produced in the air gap between the reeds causes the reeds to make contact. When the coil is de-energized, the reeds return to their normally-open position.

Relays with normally-closed contacts contain a permanent magnet which is positioned to hold the contacts closed. When the coil is energized, a counter mmf is produced which results in a new mmf insufficient to keep the contacts closed. If this type of relay is sufficiently overdriven, the net mmf produced will be sufficient to reclose the contacts. Reed relays with form B (normally closed) contacts have polarity-sensitive coils. Those with form A (normally open) contacts do not. All reel relays have dc coils.

Reed relays are also available with form C (single pole, double throw) contacts. This arrangement has a switch that is constructed somewhat differently than the standard reed switch. In the form C switch, one complaint magnetic reed is centered between two stationary contacts. The switch is then biased with a permanent magnet appropriately located so as to force the end of the reed into contact with one of the stationary contacts, which thus becomes the normally-closed contact. When the coil is energized with a dc potential of proper polarity and sufficient magnitude, an mmf, greater than and opposite to that of the permanent magnet, forces the reed away from the normally closed position and causes it to make contact with the normally-open contact.

Reed switches are manufactured in a variety of sizes ranging from 0.070" to 0.220" in diameter, and 0.375" to 2.10" in length, not including leads. The smaller devices are limited to loads of 1/2 ampere or less and to open-circuit voltages on the order of 50 to 300 volts dc. Some of the larger devices are capable of switching currents up to 3 amperes at voltages up to 500 Vdc.

In general, reed relays are characterized by small size, high speed (<1 msec operate and release time), and long life ($>10^8$ operations at moderate loads). Because of the very small air gaps between reed relay contacts, contact erosion can seriously impair the operation of the device. Therefore, the contacts should always be protected by suppression circuits when inductive loads are involved, and by a series inductor or resistor when the load is capacitive. Figure 8-8 shows the physical outline for a typical reed relay; however, other sizes exist and will be considered for application requests.

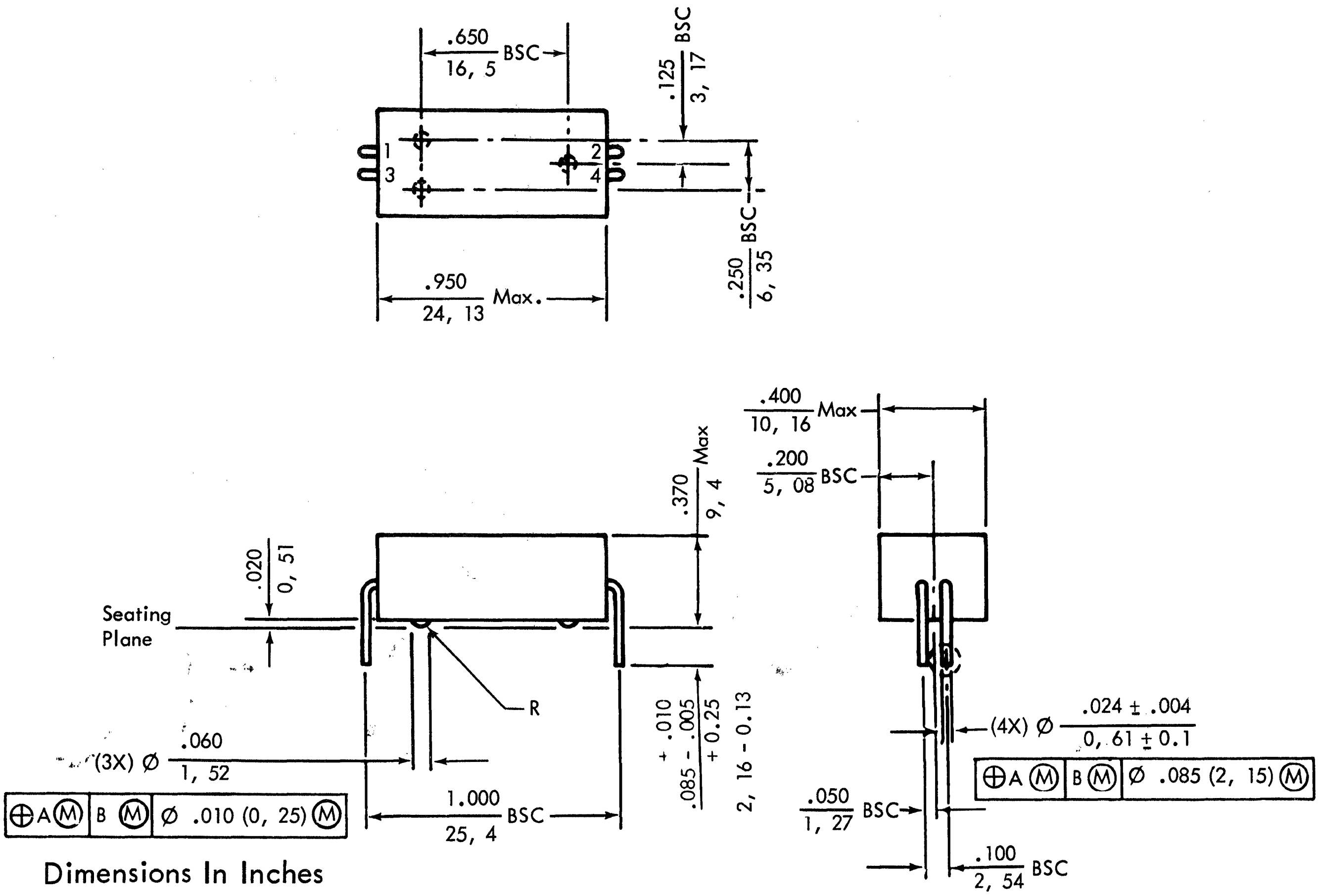



Figure 8-8. Typical Reed Relay

The mercury-wetted relay is a special form of reed relay. It is used, in IBM, normally when noise due to contact bounce cannot be tolerated, or when a very large number of operations are required. Mercury-wetted contact relays are available with form A or B contact configurations, but the more common constructions are basically form C or D.

The main components of a mercury-wetted relay are a coil and a hermetically-sealed glass tube containing the contact system, and a pool of mercury at the bottom of the tube. The two most common constructions are the mechanically-biased and magnetically-biased relays.

In the mechanically-biased relay, the armature consists of a thin reed made of a magnetic alloy which is welded at the bottom to a strip of storing steel which extends down into the pool of mercury and is attached to the bottom terminal. The spring holds the reed in the normally-closed position against one of the stationary contacts at the top of the envelope. The normally-open stationary contact extends down further into the tube than the normally-closed contact. When the armature is in the non-actuated position, the wires supporting the normally-open contacts are closer to the magnetic portion of the armature than the normally closed contact wires. Consequently, when the coil is energized, a better flux path is provided between the armature and the normally-open contact wires, and the movable contact makes with the normally-open stationary contacts.

The magnetically-biased construction employs a magnetic reed with the bottom submerged in a pool of mercury and with two platinum contacts bonded to opposite surfaces at the top. Two fixed platinum contacts are mounted to identical supporting magnetic lead wires sealed into the end of the glass on either side of the armature. The relay is then biased with a permanent magnet placed in an appropriate position so as to close one set of contacts. When the coil is energized with a current of proper polarity and sufficient magnitude, the resulting mmf overcomes the force of the permanent magnet, and the normally-open contacts close.

In a mercury-wetted contact relay, the mercury at the bottom of the tube flows up the reed by capilliary action and wets both the stationary and movable contacts. The mercury rather than the contact material thus acts as the interface between contacts. Since the mercury is "stretchable", it provides a large area, low resistance contact and eliminates contact erosion and contact bounce; therefore, a mercury-wetted contact relay is capable of handling heavier currents than a dry reed relay of comparable size. Since no contact erosion occurs if the contacts are protected against excessive surges, mercury-wetted contact relays are capable of billions of operations.

The mechanically-biased relay is capable of handling loads up to 5 amps and 250 Vac; the magnetically-biased relays are restricted to 2 amps and 100 Vac.

At rated coil voltage, the operate time of the mechanically-biased relay is about 6 milliseconds. Because of its lighter construction, the magnetically-biased relay is about twice as fast.

Mercury-wetted contact relays, because of the hermetically-sealed switch, can function reliably in hostile environments; however, they must be mounted in a near vertical position and are susceptible to shock and vibration.

In addition to the standard form C and D relays, mercury-wetted contact relays are available as latching relays or with double coils. The latching, or memory relay, employs a permanent magnet to hold the reed in the actuated position once it has been actuated and after the coil is de-energized. The double coil relays, also called cross point relays, are AND logic type devices which respond to two inputs, but not to one.

Mercury-wetted contact relays are available with both octal socket mounting and PC card mounting.

Table 8-4 presents the parameter capabilities and to-user costs of reed and mercury-wetted relays. Figure 8-9 shows the physical outline for a typical mercury-wetted relay; however, other sizes exist and will be considered for applications requests.

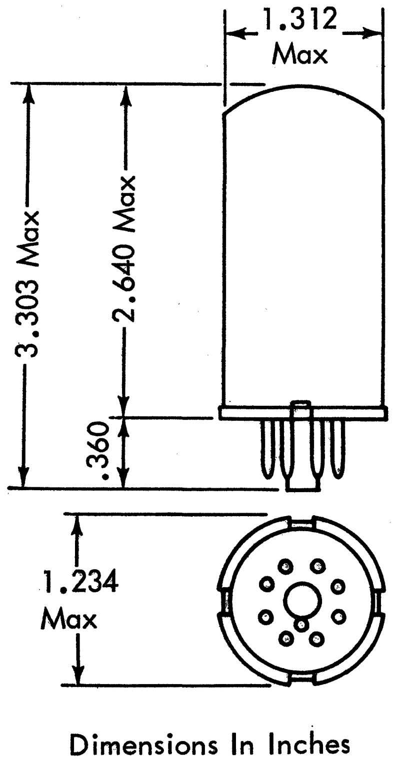



Figure 8-9. Typical Mercury-Wetted Relay

Table 8-4. Typical Reed and Mercury-Wetted Relay Parameters and Costs

| | Reed | Mercury-Wetted |
|---|---|---|
| Contact Ratings: | From 3 Vac (Form C) to 10 Vac (Form A or B) | 0.5 amps at 500 Vac to 5.0 amps at 50 Vac |
| Contact Resistance: | 200 milliohms max | 20 to 50 milliohms |
| Operate Time: | 250 μsec to 2 msec | 0.5 msec to 5 msec |
| Release Time: | 150 μsec to 500 μsec | 1 to 3 msec |
| Life Expectancy: | $5 \times 10^6$ to $5 \times 10^8$ operations | $10^{10}$ operations |
| To-User Cost: | $1.00 to $10.00 | $6.00 to $18.00 |

## SPECIAL RELAYS

### MOTOR START

The motor start relay is generally a small SPST device used for starting single-phase capacitor start, or split-phase ac motors. Motor start relays are designed to be either voltage or current sensitive.

The coil of the voltage-sensitive relay is connected in parallel with the motor start winding. As the motor increases to its maximum operating speed, the voltage across the relay coil also increases. The relay, which normally has closed contacts, picks and disconnects one end of the start winding from the line. The voltage across the start winding then drops appreciably, but the voltage induced in the winding and the voltage across the relay coil remain high enough to hold the contacts in the open position. The voltage-sensitive motor starting relay is designed to have a close tolerance pick (operate) voltage and a high pick to release voltage ratio.

The current-sensitive motor start relay has a SPST normally-open contact system. It is usually a three terminal device with one end of the relay coil and one of the contacts sharing a common terminal which connects to one side of the line, as shown in Figure 8-10. The relay contacts are connected in series with the starting winding of the motor; the relay coil is connected in series with the motor's main winding; the other ends of both motor windings are connected to the other side of the line. When the voltage is first applied, the high current drawn by the series combination of the relay coil and the main winding causes the relay to pick, thereby connecting the start winding in the circuit. As the start winding brings the motor up to speed, the current reduces, the relay releases, and the main winding takes over the motor operation.

This type of motor start relay is very current sensitive. The values of pick and release current are usually within 20% of each other. The typical coil of this type of relay consists of a few turns of relatively heavy wire. It has a low resistance and, depending on the rating of the motor, may be designed to pick at anywhere from a fraction of an ampere to 25 amperes.

Table 8-5 presents typical specified parameter capabilities and to-use costs.

The typical physical outlines for motor start relays are shown in Figure 8-11.

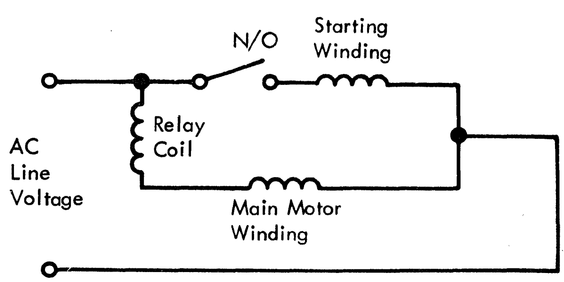
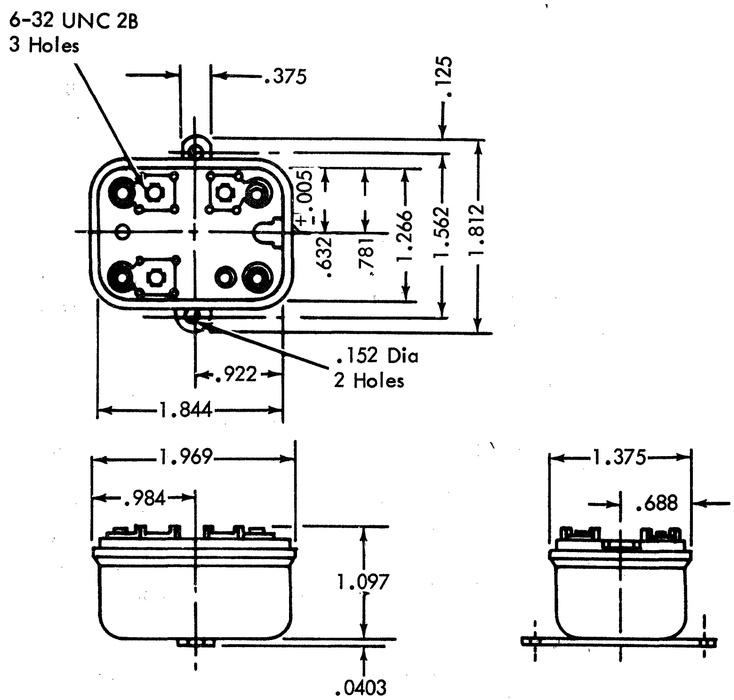



Figure 8-10. Electrical Schematic of a Motor Start Relay Application




Dimensions (Inches)

Figure 8-11. Typical Motor Start Relay

Table 8-5. Typical Motor Start Relay Parameters and Cost

| | |
|---|---|
| Pick Up Current/Voltage: | 1.05 A at 230 V/60 Hz to 13.7 A at 115 V/60 Hz |
| Drop Out Current/Voltage: | 0.90 A at 230 V/60 Hz to 11.5 A at 115 V/60 Hz |
| Life Expectancy: | $10^5$ operations min |
| To-User Cost | \$1.00 to \$4.00 |

## Time-Delay

In the operation of any relay, some finite amount of time elapses between the time the coil is first energized and the time the armature is fully actuated. Similarly, there is some elapsed time before the contacts return to their normal position after current to the coil is interrupted. In some applications it is desirable to have a time delay before the relay operates or releases. Relays specifically designed to provide such a delay are called time-delay relays.

Time-delay relays are typically used by IBM in power sequencing applications. The three types of time-delay relays used in IBM are thermal, dashpot (mechanical), and electronic. The thermal and dashpot type relays can be designed to introduce a delay on either the pull-in or release times. Electronic time-delay relays are normally designed to provide delay in the operate time, but they may be designed also to release at some specified time after the armature has been actuated.

The thermal relays use a heating coil which causes a relay to make or break by the deflection of a bimetal strip, or by linear expansion of a wire or metal strip. This action results in a mechanical movement of the contracts. Thermal time delays usually are not as accurate as the electronic time-delay relays, but they are relatively inexpensive. (See Figure 8-12.)

Mechanical time-delay relays usually employ a pneumatic or hydraulic device called a dashpot to control the time delay. The dashpot, which consists of a cylinder and piston, is coupled to the armature. The speed at which the relay operates is controlled by an adjustable orifice in the dashpot cylinder. A check valve allows the cylinder to fill or evacuate quickly on the return stroke. Figure 8-13 shows a typical dashpot time-delay relay.

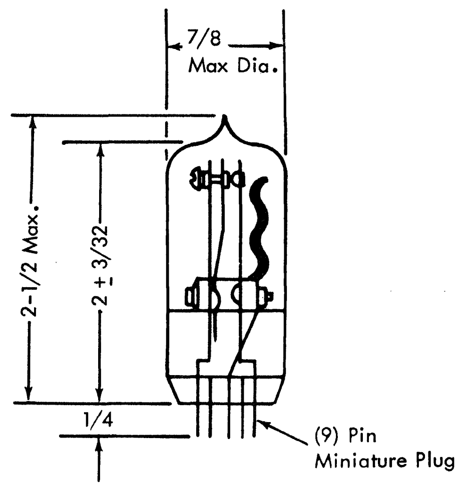
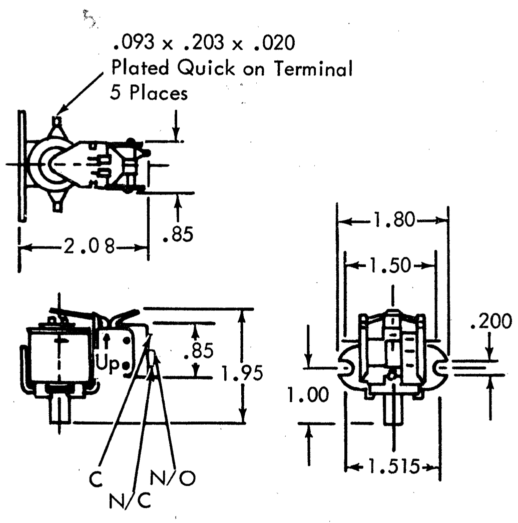



Figure 8-12. Typical Thermal Time-Delay Relay




Note: Unless otherwise specified, all dimensions with 2 decimal places have a tolerance of ±0.06; with 3 decimal places, ±0.010. (inches)

Figure 8-13. Typical Dashpot Time-Delay Relay

A second form of a mechanical time-delay relay employs a bellows or diaphragm to control the time delay.

A third type is the movable core. A spring-loaded magnetic core is contained inside of a cylinder filled with a liquid of selected viscosity. When the coil is energized, the core moves toward the armature against the face of the spring and the liquid. When the gap between the movable core and the armature becomes sufficiently small, the armature closes.

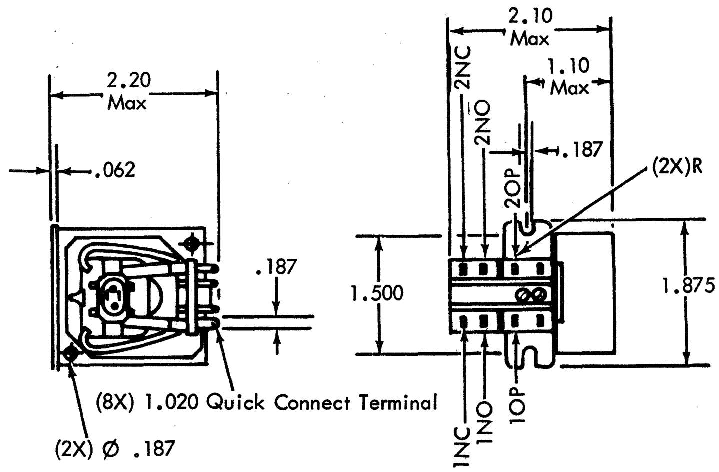
The electronic time-delay relay is more extensively used in IBM machines than the other types of time-delay relays. It is more expensive than the others, but it is physically smaller than the mechanical time delay and can be designed to provide delays from milliseconds up to several minutes. Electronic time-delay relays, also called hybrid or solid state time-delay relays, consist of a standard clapper type relay and a timing circuit. The basic elements of the circuit are a resistor and capacitor - the values of which determine the delay time - and a switch which may be a transistor or an SCR. There are a variety of circuits used to provide time delay. In one common circuit a capacitor is charged through a resistor. When the voltage across the capacitor is sufficiently high, it fires an unijunction transistor that triggers an SCR which is connected in series with the relay coil.

Some electronic time-delay relays use a two-section coil. The coil is so wound that when voltage is applied, the net mmf is essentially zero, and the armature does not pull in. The capacitor, which is charged through the relay coils, and a resistor fire an unijunction transistor which triggers an SCR in parallel with one of the coil windings. The winding is essentially shorted out and the mmf produced by the other coil actuates the relay. Table 8-6 presents typical parameter capabilities and to-user costs of time-delay relays.

Figure 8-14 is a typical physical outline of an electronic time-delay relay; however, other sizes exist and will be considered for applications requests.

Table 8-6. Typical Time-Delay Relay Parameters and Costs

| | Thermal | Dashpot | Electronic |
|---|---|---|---|
| Delay Time: | up to 2 min | up to 2 min | up to 3 min |
| Tolerance: | ±30% to ±75% | ±50% to ±75% | ±20% |
| Reset Time: | 2 min | 15% of delay time | 100 msec |
| Life Expectancy: | $2.5 \times 10^5$ operations | $3 \times 10^4$ operations | $>10^5$ operations |
| To-User Cost: | $1.50 to $2.00 | $6.00 to $10.00 | $7.00 to $12.00 |




Note: Unless otherwise specified, all dimensions are nominal and are presented for reference (inches).

Figure 8-14. Typical Electronic Time-Delay Relay

## SOLID STATE RELAYS

## DESCRIPTION

There are two types of solid state relays presently being used in IBM. One is a transformer coupled device in a dual-in-line package. (See Figure 8-15.) The other, which has much larger usage, is an optically isolated zero voltage switching solid state relay. (See Figure 8-17.)

The DIP solid state relay consists basically of an oscillator circuit and a triac for switching the ac load. A schematic diagram of this relay is shown in Figure 8-16. The input circuit oscillates at approximately 3 MHz. The time varying current through Lp induces a voltage across the transformer secondary, Ls, which provides a gate signal to the triac.

With the exception of the toroidal transformer, the components in the DIP SSR are chips which are mounted to a standard 14 pin lead frame. The total circuit is then molded in epoxy.

A schematic diagram of the optically isolated, zero voltage switching SSR is shown in Figure 8-18. The operation of this circuit is as follows: the ac voltage across the load and output terminals is rectified on alternate half cycles by D1 and D2. With no input signal, T2 is properly biased to turn on by current through the combinations of C1 and R1 and C2 and R2. When T2 turns on it clamps the gate of SCR1 which then can not turn on. With SCR1 in the off mode no gate signal is applied to SCR2 and SCR3 and they remain off.

When an input signal is applied, T2 is clamped by T1 and can not turn on. SCR1 is then turned on by current supplied to the gate through R2. SCR2 and SCR3 are then properly biased through D3 and D4 to turn-on the alternate half cycles.

The values of R3 and R4 are such that T3 will turn on at some low level, but above the level required to turn on the SCR's. If the input voltage is turned on when the instantaneous value of the line voltage is above the value of the turn on voltage for T3, it will turn on and clamp SCR1. Consequently, the relay will turn on only when the instantaneous value of the line voltage is near zero.

The power switching SCR's in the optically isolated relays are mounted to an alumina substrate which in turn is bonded to the aluminum base. The other devices are discrete components mounted to a printed circuit board. The whole circuit including screw-type terminals is molded in epoxy.

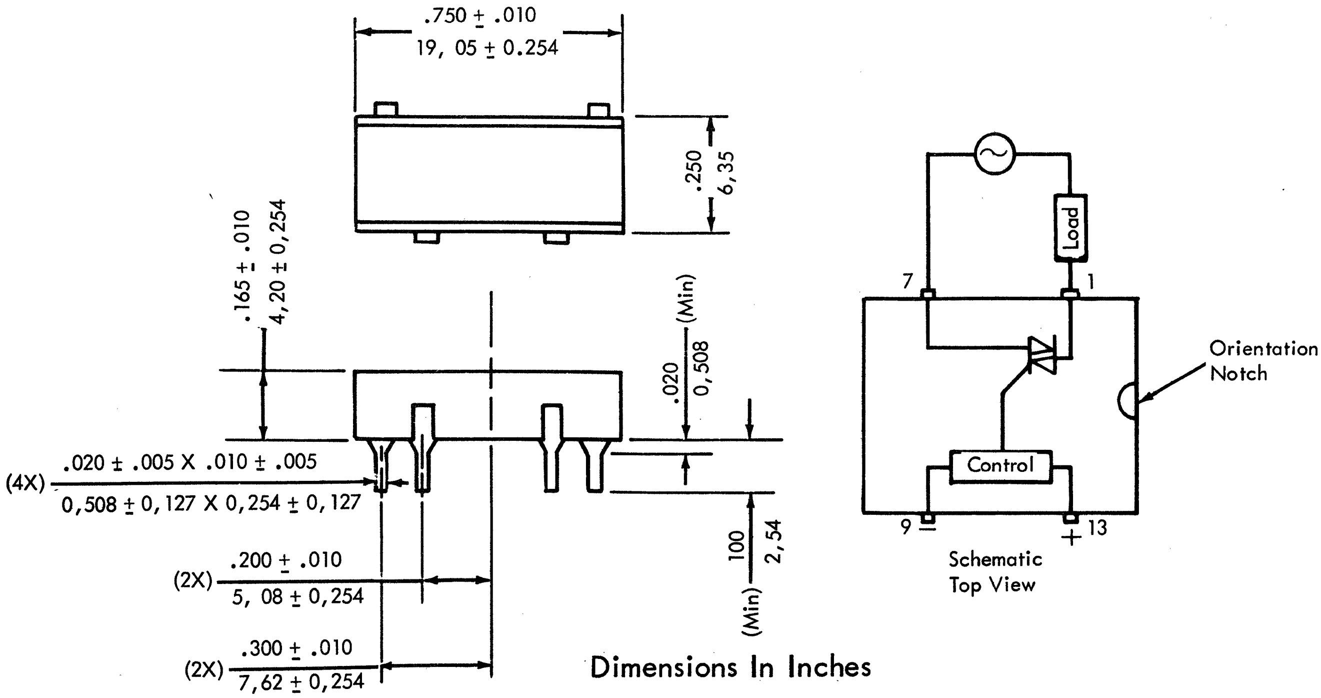



Figure 8-15. Dual-in-Line Solid State Relay

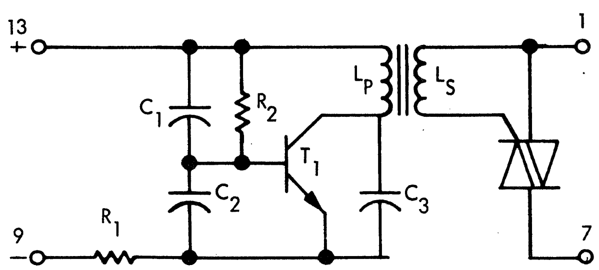



Figure 8-16. DIP Solid State Relay

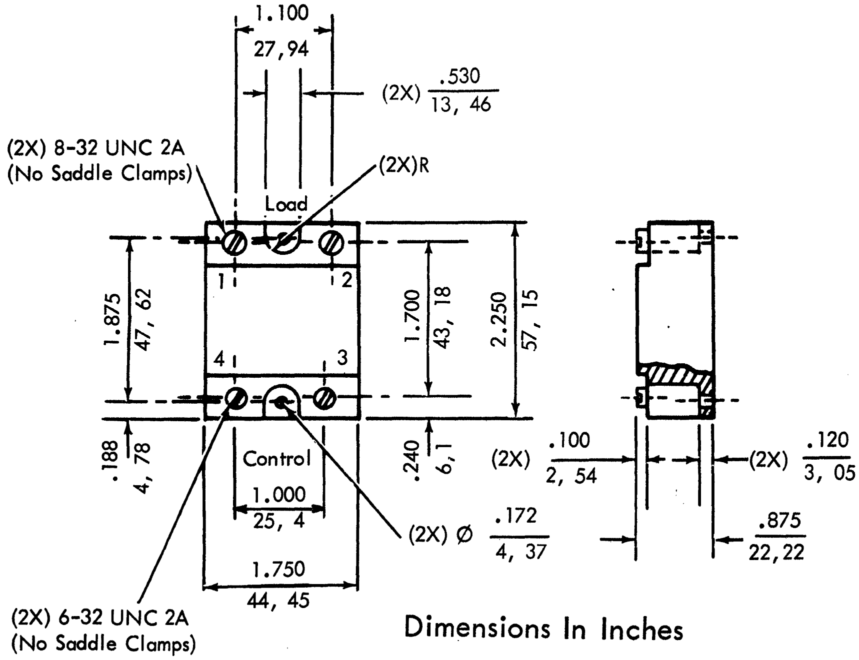



Figure 8-17. Optically Isolated High Power Solid State Relay

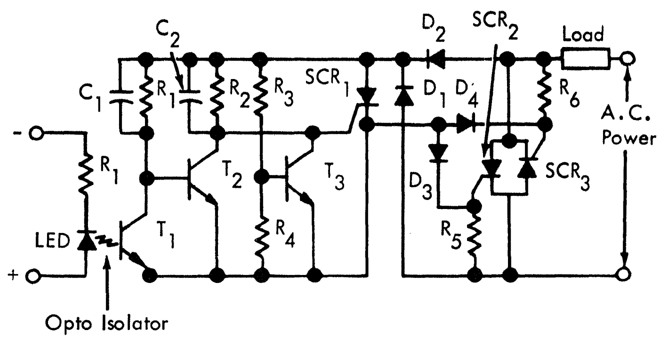



Figure 8-18. Optically Isolated, Zero Voltage Switching Solid State

## AVAILABLE TYPES

All of the solid state relays used in IBM are SPSTNO devices with dc inputs that control ac loads only. The DIP package will control 0.5 amps max with no heat sink and 1.0 amp max with a commercially available heat sink. This device is available in either 120 or 240 V ac ratings and has 2500 V RMS isolation between input and output.

The optically isolated relays are available with either 120 V or 240 V ac ratings at 2.5, 10, 25 or 40 amperes when mounted to suitable heat sinks. Parts released for 60 Hz applications have 1500 V RMS isolation between input and output while the 50 Hz versions have 2500 V isolation. Load current versus temperature parameters for these ratings are shown in Figures 8-19 through 8-22. Surge current ratings are shown in Figures 8-23 and 8-24.

Both families of solid state relays are UL recognized.

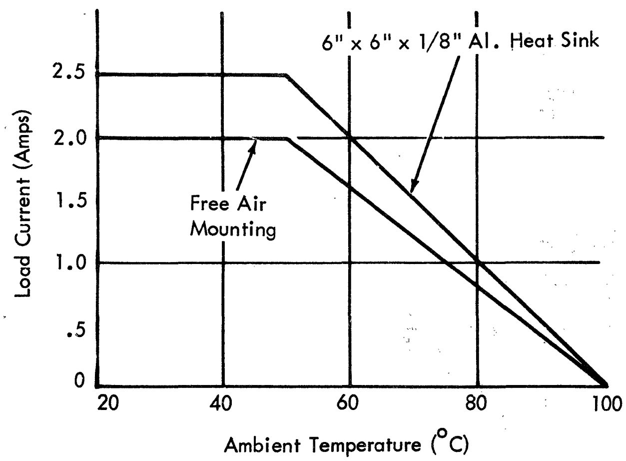



Figure 8-19. Load Current versus Temperature for 25 Amp SSR

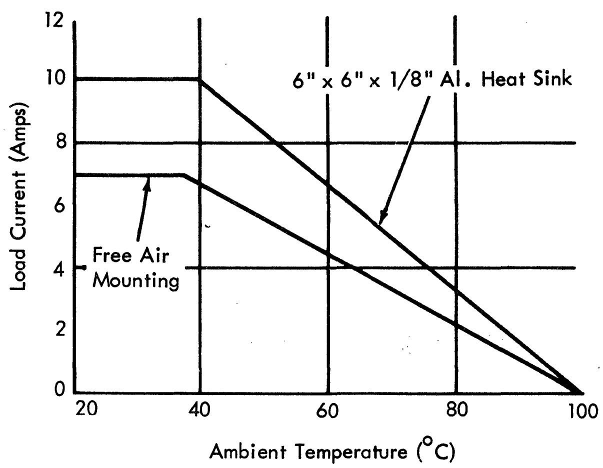



Figure 8-20. Load Current versus Temperature for 10 Amp SSR

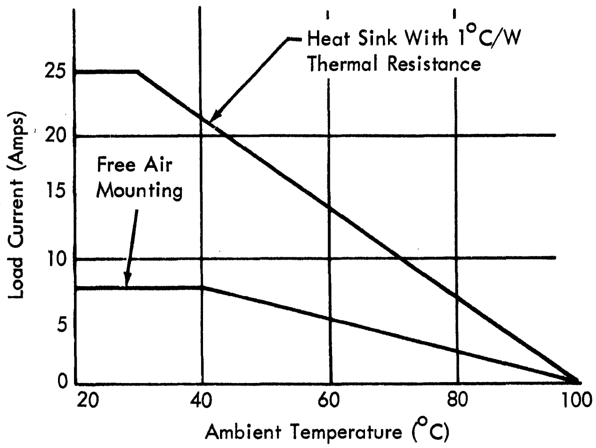



Figure 8-21. Load Current versus Temperature for 25 Amp SSR

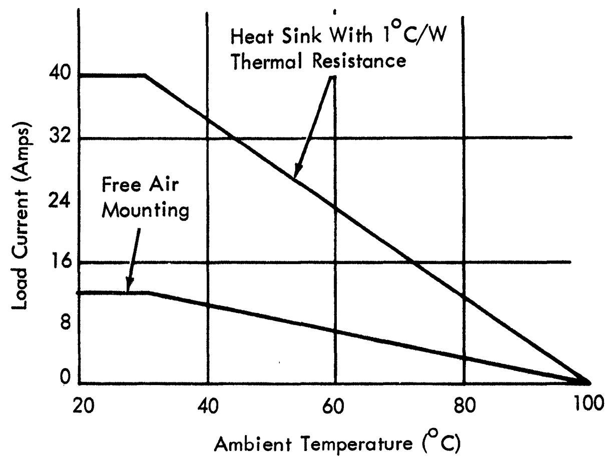



Figure 8-22. Load Current versus Temperature for 40 Amp SSR

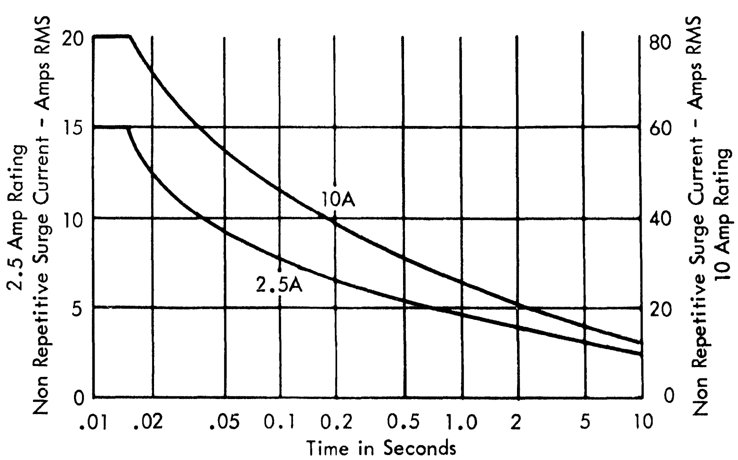



Figure 8-23. Surge Current versus Time

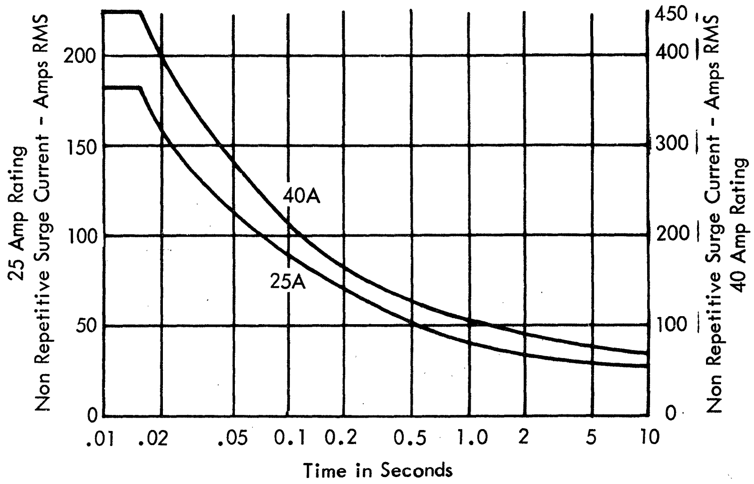



Figure 8-24. Surge Current versus Time

## PERFORMANCE CHARACTERISTICS

Performance characteristics of the two types of solid state relays are shown in Tables 8-7 and 8-8.

Table 8-7. Dual-in-Line SSR Operating Characteristics

| Input Requirements | Minimum | Maximum | Units | Notes |
|---|---|---|---|---|
| Input Voltage | 4 | 10 | Vdc | |
| Input Current @ 5 Vdc | | 15 | mA | |
| Turn On Voltage | | 4 | Vdc | |
| Turn Off Voltage | 0.5 | | Vdc | |
| I.R. Input/Output | $10^9$ | | OHMS | |
| D.S. Input/Output | 2500 | | VRMS | |
| Output Requirements | | | | |
| Frequency Range | 0.1 | 70 | Hz | |
| Voltage | 0 | 240 | VRMS | |
| Load Current, No Heat Sink | 0.01 | 0.5 | AMPS | |
| Load Current, With Heat Sink | 0.01 | 1.0 | AMPS | |
| Surge Current, Non Repetitive | | 5.0 | AMPS | 20 ms Max |
| Contact Voltage Drop | | 1.5 | VRMS | |
| Off State Leakage @ R.V. & 100°C | | 1.0 | mA | |
| dv/dt (Linear) | 100 | | V/µs | Each Direction |
| Turn On Time @ 60 Hz | | 20 | µs | |
| Turn Off Time @ 60 Hz | | 8.3 | ms | |
| Operating Temperature | 0 | 100 | °C | |

Table 8-8. Performance Characteristics of Optically Isolated Zero Voltage Switching Solid State Relays

| Input Requirements | Minimum | Maximum | Units | Notes |
|---|---|---|---|---|
| Input Voltage | 3 | 32 | Vdc | |
| Input Current @ 5 Vdc | | 5 | mA | |
| Turn On Voltage | | 3 | Vdc | |
| Turn Off Voltage | 1 | | Vdc | |
| I.R. Input/Output | $10^{10}$ | | OHMS | |
| D.S. Input/Output | 1500 or 2500 | | VRMS | |
| **Output Requirements** | | | | |
| Frequency | 47 | 63 | Hz | |
| Voltage (120 V Part) | 90 | 140 | Vac | |
| (240 V Part) | 180 | 280 | Vac | |
| Load Current | 0.02 | (Fig. 5-8) | AMPS | |
| Surge Current | | | | |
| Contact Voltage Drop | | 1.6* | VRMS | |
| Off State Leakage @ R.V. & 100°C | | 5 | mA | |
| dv/dt (Linear) | 100 | | V/µs | |
| Turn On Time @ 60 Hz | | 8.3 | ms | |
| Turn Off Time @ 60 Hz | | 8.3 | ms | |

## APPLICATION CONSIDERATIONS

Solid state relays are used primarily in motor control applications in machines where the electrical noise generated by electromechanical relays can not be tolerated. These relays are also well suited for use in hostile environments, and since they contain no moving parts can withstand high levels of vibration or mechanical shock.

Solid state relays are susceptible to transients and may turn on accidentally or fail to turn off unless a snubber circuit consisting of a resistor and capacitor of suitable values is connected across the contacts. When controlling an inductive load, it is essential that the phase angle by which the current lags the voltage does not exceed the phase angle within which the relay is allowed to turn on. Consequently, a suitable snubber should be used to act as a phase shifter. Without a snubber, the relay may conduct in one direction only resulting in a half-wave dc load current.

The solid state relay is more suitable than the electromechanical relay in applications where millions of operations are required, but it is restricted to ac loads, and in the case of the zero voltage switching device, will operate properly only in a fairly narrow voltage range.

*3.5 V for 2.5 Amp Rating

When mounted to a heat sink the solid state relay, with the exception of the DIP SSR has no size advantage over its E.M.R. counterpart, and in multiple pole applications it is much more expensive.

## Reliability

The condition wherein the relay is off but the line voltage potential is still across the contacts can contribute appreciably to degradation of the thyrestors and possible eventual catastrophic failure. This is especially true in high temperature environments. Failure rates are available from Engineering Specification 866451 or the component data bank.

Some present applications employ contactors in series with the SSR's. The contactor is turned on before and off after the solid state relays. This arrangement can considerably reduce the SSR failure rate because there is no potential across the SSR contacts when it is off.

## SPECIFICATIONS

Specifications which apply to solid state relays are:

| | |
|---|---|
| Engineering Specification | - 873748 |
| Quality Specification | - 873749 |
| Flammability | - 2413138 |

## GENERAL PURPOSE RELAYS

## COMPONENT DATA BANK - P/N CATALOG

DCS CODE
--- ----

23411

PG. 1 06/30/82 23:36 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23411 PN TECH RLY/PAR1 SEQ/LH RLY/TYPE,RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0338415 | C | | | | | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 0352209 | C | | | | 1000 | .0 | | .00 | .00 | | | | | NODATA | .00 | | .35 | 6 | |
| 0483361 | A | | | | | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | 500 | |
| 0532975 | C | | | | | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 0765967 | B | | | | | .0 | | .00 | .00 | | | | | ASMBLY | .00 | | .00 | | |
| 0766062 | B | | | | | .0 | | .00 | .00 | | | | | ASMBLY | .00 | | .00 | | |
| 0766215 | A | | | | | .0 | | .00 | .00 | | | | | ASMBLY | .00 | | .00 | | |
| 0769092 | B | | | | | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 4481619 | C | | 6 | DC | 250 | 4.5 | | .00 | .00 | | | | | 4C | 2.00 | 115 | 2.00 | 28 | YES |
| 2111448 | C | | 48 | DC | | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 2262666 | C | | 48 | DC | | .0 | | .00 | .00 | | | | | 4C | 5.00 | 115 | .00 | | NO |
| 2114655 | C | | 230 | 50/60 | | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 0767004 | C | A | 3 | DC | 14 | 2.2 | | .00 | .00 | 15 | 8 | | | 2C | 1.00 | 115 | 2.00 | 24 | YES |
| 2173223 | C | A | 3 | DC | 18 | 2.3 | | .00 | .00 | | | | | 1C | 5.00 | 115 | .00 | | NO |
| 2195640 | C | A | 3 | DC | 10 | 2.3 | | .00 | .00 | | | | | 2C | 3.00 | 50 | 1.00 | 48 | NO |
| 5213415 | A | A | 3 | DC | 14 | 2.4 | | .00 | .00 | 15 | 8 | | | 4C | 3.00 | 115 | 5.00 | | YES |
| 1589302 | C | A | 5 | DC | 26 | 3.8 | | .00 | .00 | | | | | 4C | 2.00 | 28 | 2.00 | 28 | NO |
| 4429936 | C | A | 5 | DC | 26 | 3.9 | | .00 | .00 | | | | | 4C | 2.00 | 128 | 2.00 | 28 | NO |
| 4430090 | C | A | 5 | DC | 21 | 3.8 | | .00 | .00 | 15 | | | | 6C | 1.00 | 120 | 1.00 | 60 | NO |
| 8279274 | C | A | 5 | DC | 50 | 3.7 | | .00 | .00 | | 4 | 30 | | 2C | .00 | | 1.00 | 28 | NO |
| 0441092 | C | A | 6 | DC | 32 | .0 | | .00 | .00 | | | | | 3C | 5.00 | 115 | .00 | | YES |
| 0754605 | A | A | 6 | DC | 32 | 4.5 | | .00 | .00 | | | | | 1C | 5.00 | 115 | .00 | | YES |
| 0765548 | C | A | 6 | DC | 75 | .0 | | .00 | .00 | 15 | 8 | | | 4C | 1.00 | 120 | 2.00 | 24 | YES |
| 0828279 | C | A | 6 | 50/60 | 6 | 6.0 | | .00 | .00 | | | | | 3C | 5.00 | 115 | .00 | | YES |
| 0854890 | A | A | 6 | DC | 32 | 4.5 | | .00 | .00 | | | | | 3C | 5.00 | 120 | 5.00 | 28 | YES |
| 1582621 | C | A | 6 | DC | 250 | 4.5 | | .00 | .00 | | | | | 4C | 2.00 | 115 | 2.00 | 28 | YES |
| 2125512 | C | A | 6 | DC | 40 | .0 | | .00 | .00 | | | | | 4C | 2.00 | 50 | 1.00 | 48 | NO |
| 2184065 | A | A | 6 | DC | 40 | 4.8 | | .00 | .00 | | | | | 4C | 3.00 | 50 | 1.00 | 48 | NO |
| 2195639 | C | A | 6 | DC | 40 | 4.5 | | .00 | .00 | | | | | 2C | 3.00 | 50 | 1.00 | 48 | NO |
| 4429628 | C | A | 6 | DC | 200 | 4.5 | | .00 | .00 | 6 | 3 | | | 2C | .00 | | 1.00 | 28 | NO |
| 5258016 | C | A | 6 | DC | 32 | 4.8 | | .00 | .00 | | | | | 2C | 5.00 | 115 | .00 | | YES |
| 5271294 | A | A | 6 | DC | 25 | 4.8 | | .00 | .00 | 15 | 8 | | | 6C | 3.00 | 115 | 5.00 | 30 | NO |
| 5318969 | A | A | 6 | DC | 52 | 4.8 | | .00 | .00 | 15 | 8 | | | 4C | 3.00 | 115 | 5.00 | 30 | YES |
| 5364164 | A | A | 6 | DC | 52 | 4.2 | | .00 | .00 | 15 | 8 | | | 2C | 3.00 | 115 | 5.00 | 30 | YES |
| 5615760 | C | A | 6 | 60 | | 5.0 | | .00 | .00 | | | | | 3C | 10.00 | 120 | .00 | | YES |
| 8278941 | C | A | 6 | DC | 48 | 4.5 | | .00 | .00 | 15 | 15 | | | 4C | 1.00 | 120 | 1.00 | 60 | NO |
| 0252622 | A | A | 12 | DC | 140 | 9.0 | | .00 | .00 | | | | | 4C | 5.00 | 120 | .00 | | NO |
| 0441091 | A | A | 12 | DC | 120 | 9.2 | | .00 | .00 | | | | | 3C | 5.00 | 115 | .00 | | YES |
| 0555156 | C | A | 12 | 50/60 | | .0 | | .00 | .00 | | | | | 2C | 5.00 | 120 | .00 | | YES |
| 0754606 | C | A | 12 | DC | 120 | 9.6 | | .00 | .00 | | | | | 1C | 5.00 | 115 | .00 | | YES |
| 0854891 | A | A | 12 | DC | 120 | 9.0 | | .00 | .00 | | | | | 2C | 5.00 | 115 | 5.00 | 28 | YES |
| 1143478 | A | A | 12 | DC | 120 | 9.0 | | .00 | .00 | | | | | 3C | 5.00 | 120 | .00 | | YES |
| 1582512 | C | A | 12 | DC | 800 | 9.0 | | .00 | .00 | 15 | 8 | | | 2C | 2.00 | 115 | 2.00 | 28 | YES |
| 2122194 | C | A | 12 | DC | 160 | .0 | | .00 | .00 | | | | | 4C | 3.00 | 50 | 1.00 | 48 | NO |
| 2128691 | C | A | 12 | DC | 144 | .0 | | .00 | .00 | | | | | 2C | 2.00 | 115 | 2.00 | 28 | NO |
| 2154866 | C | A | 12 | DC | 120 | 9.6 | | .00 | .00 | | | | | 1A2C | 5.00 | 120 | 2.00 | 50 | YES |
| 2248070 | C | A | 12 | DC | 120 | 9.6 | | .10 | .00 | | | | | 2C | 10.00 | 115 | .00 | | NO |
| 5213135 | C | A | 12 | DC | 1000 | 8.5 | | 8.50 | 2.50 | 20 | 8 | | | 2C | 1.00 | 115 | 1.00 | 29 | NO |

PG. 2 06/30/82 23:36 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23411 PN TECH RLY/PAR1 SEQ/LH RLY/TYPE,RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5213449 | C | A | 12 | DC | 185 | 9.6 | | .00 | .00 | 15 | 8 | | | 4C | 3.00 | 115 | 5.00 | | NO |
| 5214702 | C | A | 12 | DC | 185 | 9.6 | | .00 | .00 | 15 | 8 | | | 4C | 1.00 | 115 | 2.00 | 30 | YES |
| 5258008 | C | A | 12 | DC | 120 | 9.6 | | .00 | .00 | | | | | 2C | 5.00 | 115 | .00 | | YES |
| 5616065 | C | A | 12 | | 120 | 9.0 | | .00 | .00 | | | | | 3C | 10.00 | 120 | .00 | | YES |
| 5616736 | C | A | 12 | DC | 120 | 9.0 | | .00 | .00 | | | | | 2C | 15.00 | 240 | 15.00 | 28 | YES |
| 5617008 | C | A | 12 | DC | 120 | 9.0 | | .00 | .00 | | 30 | | | 1A | 10.00 | 240 | 10.00 | 28 | YES |
| 6832311 | C | A | 12 | DC | 120 | 9.0 | | .00 | .00 | | 30 | | | 2A1C | 15.00 | 120 | 15.00 | 28 | YES |
| 5276325 | C | A | 18 | DC | 230 | 14.4 | | .00 | .00 | 15 | 8 | | | 6C | 3.00 | 115 | 5.00 | 30 | NO |
| 5364161 | C | A | 18 | DC | 430 | 14.4 | | .00 | .00 | 15 | 8 | | | 4C | 3.00 | 115 | 5.00 | 30 | NO |
| 0828626 | C | A | 20 | DC | 330 | 16.0 | | .00 | .00 | | | | | 3C | 5.00 | 115 | .00 | | YES |
| 2154887 | C | A | 20 | DC | 330 | .0 | | .00 | .00 | | | | | 1A2C | 10.00 | 115 | 3.00 | 50 | NO |
| 5271785 | C | A | 20 | DC | 520 | 14.0 | | .00 | .00 | 15 | 8 | | | 4C | 3.00 | 115 | 5.00 | 30 | NO |
| 5617074 | C | A | 20 | DC | 520 | 16.0 | | .00 | .00 | | | | | 4C | 3.00 | 115 | 5.00 | 30 | |
| 0252617 | C | A | 24 | 60 | | 18.5 | | .00 | .00 | | | | | 4C | 5.00 | 115 | .00 | | NO |
| 0441093 | C | A | 24 | DC | 472 | .0 | | .00 | .00 | | | | | 1C | 5.00 | 115 | .00 | | YES |
| 0441094 | C | A | 24 | 50/60 | 75 | 20.4 | | .00 | .00 | | | | | 3C | 5.00 | 120 | .00 | | YES |
| 0442976 | C | A | 24 | 50/60 | 75 | .0 | | .00 | .00 | | | | | 2C | 5.00 | 120 | .00 | | YES |
| 0765500 | C | A | 24 | DC | 288 | 4.5 | | .00 | .00 | | | | | 4C | 5.00 | 115 | .00 | | YES |
| 0767003 | C | A | 24 | DC | 1275 | 18.0 | | .00 | .00 | 15 | 8 | | | 6A | .00 | | 2.00 | 30 | YES |
| 0767031 | C | A | 24 | DC | 1275 | 18.0 | | .00 | .00 | 15 | 8 | | | 4C | 1.00 | 115 | 2.00 | 24 | YES |
| 0767037 | C | A | 24 | DC | 1275 | 18.0 | | .00 | .00 | 15 | 8 | | | 2C | 1.00 | 115 | 2.00 | 24 | YES |
| 0767089 | N | A | 24 | DC | 700 | 18.0 | | .00 | .00 | 15 | 8 | | | 10A | 1.00 | 115 | 2.00 | 28 | YES |
| 0824339 | A | A | 24 | DC | 700 | 20.0 | | .00 | .00 | | | | | 6A | 3.00 | 120 | 5.00 | 30 | NO |
| 0842428 | A | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 3C | 5.00 | 115 | .00 | | YES |
| 1582577 | C | A | 24 | DC | 700 | 18.0 | | .00 | .00 | 15 | 8 | | | 4D | 1.00 | 115 | 2.00 | 24 | YES |
| 1582980 | C | A | 24 | DC | 700 | 20.0 | | .00 | .00 | 15 | 8 | | | 3C | 2.00 | 115 | 2.00 | 28 | YES |
| 1589157 | C | A | 24 | DC | 800 | 14.0 | | .00 | .00 | | | | | 6C | 3.00 | 115 | 3.00 | 28 | YES |
| 1589212 | C | A | 24 | DC | 430 | 18.0 | | .00 | .00 | | | | | 6C | 5.00 | 115 | 5.00 | 28 | YES |
| 1589235 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | 30 | | | 3A | 10.00 | 240 | 10.00 | 28 | YES |
| 1589428 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | 30 | | | 3A | 10.00 | 240 | 10.00 | 28 | YES |
| 2125514 | A | A | 24 | DC | 650 | 19.2 | | .00 | .00 | | | | | 4C | 2.00 | 50 | 1.00 | 48 | NO |
| 2128689 | C | A | 24 | DC | 472 | 19.2 | | .00 | .00 | | | | | 3C | 5.00 | 120 | .00 | | YES |
| 2128696 | C | A | 24 | 50/60 | | .0 | | .00 | .00 | | | | | 3C | 5.00 | 120 | .00 | | YES |
| 2131739 | C | A | 24 | 50/60 | | .0 | | .00 | .00 | | | | | 2A | 10.00 | 230 | .00 | | NO |
| 2145046 | A | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 3C | 10.00 | 120 | .00 | 28 | YES |
| 2154688 | C | A | 24 | 50/60 | 85 | 20.4 | | .00 | .00 | | | | | 1A2C | 5.00 | 115 | 2.00 | 50 | NO |
| 2158694 | C | A | 24 | 50/60 | | 20.4 | | .00 | .00 | | | | | 1A2C | 10.00 | 115 | .00 | | YES |
| 2158826 | C | A | 24 | 50/60 | 160 | .0 | | .00 | .00 | | | | | 4C | 3.00 | 50 | 1.00 | 48 | NO |
| 2172104 | C | A | 24 | 50/60 | 160 | .0 | | .00 | .00 | | | | | 4C | 3.00 | 50 | 1.00 | 48 | NO |
| 2175847 | C | A | 24 | 50/60 | 24 | .0 | | .00 | .00 | | | | | | .00 | | .00 | | |
| 2184064 | C | A | 24 | DC | 650 | .0 | | .00 | .00 | | | | | 4C | 3.00 | 50 | 1.00 | 48 | NO |
| 2184096 | C | A | 24 | 50/60 | | 19.2 | | .00 | .00 | | | | | 4C | 3.00 | 50 | 1.00 | 48 | NO |
| 2242319 | C | A | 24 | 50/60 | 72 | 20.0 | | .00 | .00 | | | | | 3C | 10.00 | 115 | 10.00 | 28 | YES |
| 2242321 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 3C | 10.00 | 120 | .00 | | YES |
| 2246045 | C | A | 24 | 50/60 | | 18.5 | | .00 | .00 | | | | | 4C | 5.00 | 115 | .00 | | NO |
| 2274350 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 3C | 10.00 | 240 | 10.00 | 28 | YES |
| 2274372 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 2C | 10.00 | 240 | 10.00 | 28 | YES |
| 2278519 | C | A | 24 | DC | 650 | 19.2 | | .00 | .00 | | | | | 4C | 2.00 | 50 | 3.00 | 30 | NO |

PG. 3 06/30/82 23:36 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23411 PN TECH RLY/PAR1 SEQ/LH RLY/TYPE,RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2278766 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 3C | 5.00 | 240 | .00 | | YES |
| 2283000 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 3C | 5.00 | 240 | .00 | | YES |
| 2396815 | C | A | 24 | DC | 700 | 18.0 | | .00 | .01 | 15 | 8 | | | 2C1D | 2.00 | 115 | 2.00 | 24 | NO |
| 2396967 | C | A | 24 | DC | 430 | 20.0 | | .00 | .00 | | | | | 6C | 1.00 | 115 | 2.00 | 30 | NO |
| 2410080 | C | A | 24 | DC | 430 | 18.0 | | .00 | .00 | 15 | 8 | | | 2A1B4C | .00 | | 2.00 | 30 | YES |
| 2410081 | C | A | 24 | DC | 700 | 17.0 | | .00 | .00 | 15 | 8 | | | 2A1B4C | .00 | | 2.00 | 30 | YES |
| 2410157 | C | A | 24 | DC | 472 | 19.2 | | .00 | .00 | | | | | 2A | 10.00 | 240 | 10.00 | 28 | YES |
| 2512157 | C | A | 24 | DC | 288 | 18.0 | | .00 | .00 | | | | | 2C | 10.00 | 115 | .00 | | YES |
| 2513155 | A | A | 24 | DC | 700 | 20.0 | | .00 | .00 | | | | | 2C | 1.00 | 115 | 2.00 | 24 | YES |
| 2574157 | C | A | 24 | DC | 700 | 17.0 | | .00 | .00 | 15 | 8 | | | 6A2C | .00 | | 2.00 | 30 | YES |
| 4430091 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | | | | | 2C | 10.00 | 240 | 10.00 | 28 | YES |
| 4481527 | C | A | 24 | DC | 2445 | 18.0 | 1 | .00 | .00 | | | | | 1A | 1.00 | 120 | 2.00 | 28 | NO |
| 4481528 | C | A | 24 | DC | 2445 | 18.0 | 1 | .00 | .00 | | | | | 1B | 1.00 | 120 | 2.00 | 28 | NO |
| 4481827 | C | A | 24 | DC | 650 | 17.8 | | .00 | .00 | | | | | 4C | 3.00 | 115 | 3.00 | 30 | NO |
| 5213820 | C | A | 24 | 50/60 | 24 | 19.2 | | .00 | .00 | | | | | 4C | 10.00 | 115 | .00 | | NO |
| 5214423 | C | A | 24 | 50/60 | 112 | 18.7 | | .00 | .00 | 15 | 8 | | | 2C | 1.00 | 115 | 2.00 | 30 | NO |
| 5248817 | C | A | 24 | 60 | 26 | .0 | | .00 | .00 | | | | | 4C | 10.00 | 115 | 10.00 | 28 | NO |
| 5258009 | C | A | 24 | 50/60 | | 20.4 | | .00 | .00 | | | | | 2C | 5.00 | 230 | .00 | | NO |
| 5276326 | A | A | 24 | DC | 700 | 18.0 | | .00 | .00 | 15 | 8 | | | 2C | 3.00 | 115 | 5.00 | 30 | YES |
| 5311846 | C | A | 24 | DC | 472 | .0 | | .00 | .00 | | | | | 2C | 5.00 | 115 | .00 | | YES |
| 5318968 | A | A | 24 | DC | 700 | 20.0 | | .00 | .00 | 15 | 8 | | | 4C | 3.00 | 115 | 5.00 | 30 | YES |
| 5351156 | A | A | 24 | DC | 430 | 20.0 | | .00 | .00 | | | | | 6C | 5.00 | 115 | 5.00 | 30 | YES |
| 5616677 | C | A | 24 | DC | 700 | 9.0 | | .00 | .00 | | | | | 4C | 10.00 | 115 | 10.00 | 28 | YES |
| 5724103 | C | A | 24 | DC | 472 | 18.0 | | .00 | .00 | 15 | 10 | | | 3C | 5.00 | 115 | .00 | | NO |
| 5799065 | C | A | 24 | DC | 430 | 18.0 | | .00 | .00 | 15 | 8 | | | 2A1B4C | .00 | | 2.00 | 30 | YES |
| 8493577 | C | A | 24 | DC | 700 | 18.0 | | .00 | .00 | | | | | 3A | 2.00 | 115 | 2.00 | 28 | YES |
| 8493635 | C | A | 24 | DC | 472 | 19.2 | | .00 | .00 | | | | | 2A | 10.00 | 240 | 10.00 | 28 | YES |
| 8493636 | C | A | 24 | DC | 320 | 19.2 | | .00 | .00 | | | | | 2A | 10.00 | 240 | 10.00 | 28 | YES |
| 8493785 | C | A | 24 | DC | 1275 | 18.0 | | .00 | .00 | | | | | 2A4B | 3.00 | 115 | 3.00 | 28 | YES |
| 8493965 | C | A | 24 | DC | 1275 | 18.0 | | .00 | .00 | | | | | 4C | 1.00 | 115 | 2.00 | 24 | YES |
| 2154687 | C | A | 36 | DC | 1050 | 28.8 | | .00 | .00 | | | | | 1A2C | 5.00 | 115 | 2.00 | 50 | NO |
| 2218668 | C | A | 36 | DC | 1000 | .0 | | .00 | .00 | | | | | 3C | 5.00 | 115 | .00 | | YES |
| 0223642 | C | A | 48 | DC | 1150 | 36.0 | | .00 | .00 | | | | | 2C | 10.00 | 120 | 10.00 | 24 | YES |
| 1176893 | A | A | 48 | DC | 1800 | 36.0 | | .00 | .00 | | | | | 1A | 5.00 | 120 | .00 | 28 | YES |
| 1582528 | C | A | 48 | DC | 2500 | 38.4 | | .00 | .00 | 15 | 8 | | | 4C | 2.00 | 115 | 2.00 | 30 | YES |
| 1582578 | C | A | 48 | DC | 1150 | 36.0 | | .00 | .00 | | | | | 2C | 10.00 | 115 | .00 | | YES |
| 1582977 | C | A | 48 | DC | 2500 | 38.4 | | .00 | .00 | 15 | 8 | | | 4C | 2.00 | 115 | 2.00 | 30 | YES |
| 1589008 | C | A | 48 | DC | 3200 | 38.0 | | .00 | .00 | | | | | 3C | 5.00 | 240 | 5.00 | 28 | YES |
| 1589218 | A | A | 48 | 60 | | 36.0 | | .00 | .00 | | | | | 2C | 2.00 | 115 | 2.00 | 28 | YES |
| 2114882 | C | A | 48 | DC | 600 | .0 | | .00 | .00 | | | | | 2A | 10.00 | 230 | .00 | | NO |
| 2124703 | C | A | 48 | DC | 3200 | 36.0 | | .00 | .00 | | | | | 3C | 10.00 | 115 | .00 | | YES |
| 2199251 | C | A | 48 | DC | 1900 | .0 | | .00 | .00 | | | | | 3C | 10.00 | 115 | 2.00 | 50 | YES |
| 2247810 | C | A | 48 | DC | 1800 | .0 | | .00 | .00 | | | | | 3C | 5.00 | 120 | .00 | | YES |
| 2256735 | C | A | 48 | DC | 2015 | .0 | | .00 | .00 | | | | | 3C | 2.00 | 115 | 2.00 | 28 | NO |
| 2513174 | A | A | 48 | DC | 2500 | 38.4 | | .00 | .00 | | | | | 4C | 5.00 | 115 | 5.00 | 30 | YES |
| 4718648 | C | A | 48 | DC | 3200 | 38.0 | | .00 | .00 | | | | | 3C | 5.00 | 240 | 5.00 | 28 | YES |
| 5213965 | C | A | 48 | DC | 1550 | 38.0 | | .00 | .00 | 15 | 8 | | | 3D | 3.00 | 120 | 5.00 | 30 | NO |
| 5214058 | A | A | 48 | DC | 1800 | 36.0 | | .00 | .00 | | | | | 3C | 5.00 | 120 | .00 | 28 | YES |

PG. 4 06/30/82 23:36 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23411 PN TECH RLY/PAR1 SEQ/LH RLY/TYPE,RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5214686 | C | A | 48 | DC | 2500 | 38.4 | | .00 | .00 | 15 | 8 | | | 4C | 3.00 | 115 | 5.00 | 30 | NO |
| 5258017 | C | A | 48 | DC | 1800 | 38.4 | | .00 | .00 | | | | | 2C | 5.00 | 115 | .00 | | NO |
| 5312423 | C | A | 48 | DC | 1150 | .0 | | .00 | .00 | | | | | 2C | 5.00 | 230 | .00 | | YES |
| 5364163 | C | A | 48 | DC | 1550 | 38.0 | | .00 | .00 | 5 | 8 | | | 6C | 3.00 | 115 | 5.00 | 30 | NO |
| 0362488 | C | A | 50 | DC | 1300 | .0 | | .00 | .00 | | | | | 2C | 10.00 | 110 | 10.00 | 24 | YES |
| 0352623 | C | A | 110 | DC | 6050 | 82.5 | 20 | .00 | .00 | | | | | 2C | 10.00 | 115 | .00 | | YES |
| 0591914 | C | A | 110 | DC | 9999 | 85.0 | | .00 | .00 | | | | | 2C | 5.00 | 115 | .00 | | NO |
| 5258018 | A | A | 110 | DC | 9999 | 88.0 | | .00 | .00 | | | | | 2C | 5.00 | 115 | .00 | | YES |
| 8493202 | C | A | 110 | 50/60 | 9999 | 82.0 | | .00 | .00 | | | | | 2C | 10.00 | 240 | 10.00 | 28 | YES |
| 8493203 | C | A | 110 | 50/60 | 9999 | 82.5 | | .00 | .00 | | | | | 3C | 5.00 | 240 | 5.00 | 28 | YES |
| 8493329 | C | A | 110 | DC | 9999 | 82.5 | | .00 | .00 | | | | | 2C | 10.00 | 240 | 10.00 | 28 | YES |
| 0510602 | C | A | 115 | 50/60 | | .0 | | .00 | .00 | | | | | 2C2D | 4.00 | 120 | 4.00 | 28 | NO |
| 2114051 | C | A | 115 | 50/60 | 2250 | 102.0 | | .00 | .00 | | | | | 3C | 5.00 | 120 | .00 | | YES |
| 5615473 | C | A | 115 | 60 | 9000 | 98.0 | 30 | .00 | .00 | | 30 | | | 2C | 2.00 | 115 | 2.00 | 28 | YES |
| 0322613 | C | A | 120 | 50/60 | | .0 | | .00 | .00 | | | | | 3C1D | 5.00 | 120 | 5.00 | 28 | NO |
| 0587254 | A | A | 120 | 50/60 | 2250 | 102.0 | | .00 | .00 | | | | | 2C | 5.00 | 120 | .00 | 28 | YES |
| 1176606 | A | A | 120 | 50/60 | 2250 | 102.0 | | .00 | .00 | | | | | 2C | 5.00 | 120 | .00 | 28 | YES |
| 1582789 | A | A | 120 | 50/60 | 1700 | 90.0 | | .00 | .00 | | | | | 3C | 10.00 | 240 | 10.00 | 28 | YES |
| 4429691 | C | A | 120 | 50/60 | 2250 | 102.0 | | .00 | .00 | | 30 | | | 1A | 10.00 | 240 | 10.00 | 28 | YES |
| 0252620 | A | A | 230 | 50/60 | - | 180.0 | | .00 | .00 | | | | | 2A | 5.00 | 115 | .00 | | NO |
| 0526688 | A | A | 230 | 50/60 | | .0 | | .00 | .00 | | | | | 1C | 5.00 | 120 | .00 | | YES |
| 2195205 | C | A | 230 | 50/60 | | .0 | | .00 | .00 | | | | | 3C | 10.00 | 115 | .00 | | YES |
| 0587252 | A | A | 240 | 50/60 | 9110 | .0 | | .00 | .00 | | | | | 2C | 5.00 | 120 | .00 | 28 | YES |
| 1582790 | A | A | 240 | 50/60 | 7200 | 180.0 | | .00 | .00 | | | | | 3C | 10.00 | 240 | 10.00 | 28 | YES |
| 4429692 | C | A | 240 | 50/60 | 9110 | 204.0 | | .00 | .00 | | 30 | | | 1A | 10.00 | 240 | 10.00 | 28 | YES |
| 5367452 | C | B | 24 | DC | 310 | 20.0 | | .00 | .00 | 20 | 15 | | | 2C | 5.00 | 120 | .00 | 30 | YES |
| 0764920 | C | E | 24 | DC | | 21.6 | | .00 | .00 | | | 300 | 20 | 2C | 1.00 | 120 | 2.00 | 98 | NO |
| 0509614 | C | H | 6 | 50/60 | 1 | .0 | | .00 | .00 | | | | | 1A | 25.00 | 240 | .00 | | YES |
| 0589091 | C | H | 12 | DC | 71 | .0 | | .15 | .00 | | | | | 2A | 25.00 | 115 | .00 | | YES |
| 0589092 | C | H | 12 | 60 | 32 | .0 | | .82 | .00 | | | | | 2A | 25.00 | 115 | .00 | | YES |
| 1589181 | A | H | 12 | DC | 71 | 9.0 | | .00 | .00 | | | | | 2A | 25.00 | 240 | 25.00 | 28 | YES |
| 1589275 | A | H | 12 | DC | 71 | 9.0 | | .00 | .00 | | | | | 1A | 25.00 | 240 | 25.00 | 28 | YES |
| 0765442 | C | H | 24 | DC | 132 | 19.2 | | .00 | .00 | | 25 | | | 4C | 25.00 | 230 | 25.00 | 28 | YES |
| 0827960 | A | H | 24 | DC | 288 | .0 | | .00 | .00 | | | | | 2C | 25.00 | 230 | .00 | | YES |
| 1589254 | C | H | 24 | DC | 288 | 18.0 | | .00 | .00 | | | | | 2A | 20.00 | 277 | 20.00 | 28 | YES |
| 2204760 | A | H | 24 | 50/60 | 5 | .0 | | .00 | .00 | | 25 | | | 4C | 25.00 | 230 | 25.00 | 28 | YES |
| 2274351 | C | H | 24 | DC | 250 | .0 | | .00 | .00 | | | | | 2C | 25.00 | 240 | 25.00 | 24 | YES |
| 2396617 | C | H | 24 | DC | 132 | 19.2 | | .00 | .00 | | | | | 4C | 25.00 | 230 | 25.00 | 28 | YES |
| 2410164 | C | H | 24 | DC | 288 | 19.2 | | .00 | .00 | | | | | 2A | 30.00 | 240 | 30.00 | 28 | YES |
| 4429939 | C | H | 24 | DC | 288 | 18.0 | | .00 | .00 | | | | | 2A | 20.00 | 277 | 20.00 | 28 | YES |
| 4430070 | C | H | 24 | DC | 288 | 18.0 | | .00 | .00 | | | | | 2A | 30.00 | 240 | .00 | | YES |
| 5337062 | C | H | 24 | 60 | 12 | .0 | | .00 | .00 | | | | | 2A | 25.00 | 115 | .00 | | YES |
| 8493380 | A | H | 24 | DC | 288 | 18.0 | | .00 | .00 | | | | | 2A | .00 | | 35.00 | 48 | NO |
| 2267994 | C | H | 36 | DC | 190 | 25.0 | | .00 | .00 | 10 | | | | 2A | 18.00 | 230 | .00 | | YES |
| 2152814 | C | H | 48 | DC | 526 | 38.4 | 14 | .00 | .00 | | 25 | | | 4C | 25.00 | 230 | 25.00 | 28 | YES |
| 5237000 | C | H | 48 | DC | 1000 | 36.0 | | .00 | .00 | | | | | 1X | .00 | | 60.00 | 28 | NO |
| 5323485 | C | H | 48 | DC | 1150 | 36.0 | | .00 | .00 | | | | | 2C | 10.00 | 115 | 10.00 | 24 | YES |
| 0856325 | C | H | 50 | DC | 830 | .0 | | .00 | .00 | | | | | 1C | 12.50 | 115 | .00 | | NO |

PG. 5 06/30/82 23:36 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23411 PN TECH RLY/PAR1 SEQ/LH RLY/TYPE,RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1589041 | C | H | 110 | DC | 6050 | 82.0 | | .00 | .00 | | | | | 2C | 5.00 | | 10.00 | 125 | YES |
| 4481980 | C | H | 110 | DC | 6050 | 82.5 | | .00 | .00 | | | | | 1C | .00 | | 7.50 | 365 | NC |
| 0242618 | C | H | 115 | 60 | 725 | .0 | | .00 | .00 | | | | | 2C | 12.50 | 120 | .00 | 28 | NO |
| 0512056 | C | H | 115 | 50/60 | 290 | .0 | | .00 | .00 | | | | | 2A | 15.00 | 240 | .00 | | YES |
| 5616073 | C | H | 120 | 50/60 | 290 | 97.0 | | .00 | .00 | | | | | 2A | 30.00 | 240 | .00 | | YES |
| 5616071 | C | H | 140 | 50/60 | | 85.0 | | .00 | .00 | | | | | 2A | 30.00 | 240 | .00 | | NO |
| 0596865 | C | H | 230 | 50/60 | 1200 | .0 | | .00 | .00 | | | | | 2A | 25.00 | 230 | .00 | | YES |
| 0242374 | C | H | 240 | 50/60 | | 196.0 | | .00 | .00 | | | | | 2C | 12.50 | 120 | .00 | | NO |
| 5616072 | C | H | 275 | 50/60 | | 170.0 | | .00 | .00 | | | | | 2A | 30.00 | 240 | .00 | | NO |
| 0765563 | C | K | 115 | 50/60 | 2250 | 97.0 | | .00 | .00 | | | | | 1C | .00 | | 1.35 | 48 | YES |

TOTAL RECORDS 202

## CONTACTORS

## COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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Contactors 23401

PG. 1 06/30/82 23:37 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CON ALL/CON CON/PAR1 TECH DCS NO/LIMIT.

| PART NUMBER | COIL VOLTAGE VOLTS | FREQ OR VOLT | PICK RESIS OHMS | HOLD RESIS OHMS | PICK VOLT. VOLTS | MAX/PICK TIME MS | MAX/REL TIME MILSEC | POWER POLES | I AC AMPS | V AC VOLTS | I DC AMPS | V DC VOLTS | LOW ENERGY CONTACT | AUXIL CONTACT | UL APP | TUC | DCS CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0222827 | 240 | 50/60 | .0 | 730 | 176.0 | | | 4X | 30 | 600 | | | | | YES | C | 23401 |
| 0254844 | 115 | 60 | .0 | | .0 | | | 3X | 25 | 440 | | | | | YES | C | 23401 |
| 0316174 | 230 | 60 | .0 | | .0 | | | 3X | 100 | 550 | | | | 1X | YES | C | 23401 |
| 0316183 | 40 | DC | 310.0 | 310 | .0 | | | 4X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0316215 | 48 | DC | 310.0 | 310 | .0 | | | 3X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0322497 | 115 | 60 | .0 | | .0 | | | 3X | 30 | 550 | | | | 1X | YES | C | 23401 |
| 0322499 | 115 | 60 | .0 | | .0 | | | 3X | 50 | 550 | | | | 1X | YES | C | 23401 |
| 0352224 | 220 | 60 | .0 | | .0 | | | | | | | | NO | DATA | YES | C | 23401 |
| 0363753 | 24 | 50/60 | .0 | | .0 | | | 8X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0367976 | 20 | DC | 60.0 | 60 | .0 | | | 3X3Y | 15 | 240 | 15 | 50 | 1X1Y | | YES | A | 23401 |
| 0369221 | 115 | 50/60 | .0 | | .0 | | | 3X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0369222 | 115 | 50/60 | .0 | | .0 | | | 4X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0369224 | 220 | 50/60 | .0 | | .0 | | | 3X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0369225 | 48 | DC | 311.0 | 311 | .0 | | | 3X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0369227 | 115 | 50/60 | .0 | | .0 | | | 3X3Y | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0369233 | 240 | 60 | .0 | | .0 | | | 4X4Y | 15 | 240 | 15 | 100 | | | YES | A | 23401 |
| 0369237 | 48 | DC | 250.0 | 310 | 40.8 | | | 3X3Y | 15 | 240 | 15 | 50 | | | YES | A | 23401 |
| 0369238 | 48 | DC | 310.0 | 310 | .0 | | | 4X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0369243 | 20 | DC | 60.0 | 60 | 16.0 | | | 3X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0369244 | 20 | DC | 60.0 | 60 | .0 | | | 3X3Y | 15 | 240 | 15 | 100 | | | YES | A | 23401 |
| 0369246 | 20 | DC | 60.0 | 60 | .0 | | | 4X4Y | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0437414 | 208 | 60 | .0 | | .0 | | | 4X | 15 | 240 | | | | | YES | C | 23401 |
| 0442933 | 110 | 50/60 | .0 | | .0 | | | 2X | 30 | 600 | | | NO | DATA | YES | C | 23401 |
| 0442937 | | | .0 | | .0 | | | | | | | | NO | DATA | | C | 23401 |
| 0480445 | 24 | 50/60 | .0 | | .0 | | | 4X | 25 | 230 | | | | | YES | C | 23401 |
| 0508059 | | | .0 | | .0 | | | | | | | | NO | DATA | | C | 23401 |
| 0509291 | 110 | 60 | .0 | | .0 | | | 5X | 30 | 300 | | | | | NO | C | 23401 |
| 0510656 | 115 | 50/60 | .0 | | .0 | | | 3X | 30 | 600 | 30 | 48 | | | YES | C | 23401 |
| 0518634 | 115 | 60 | .0 | | .0 | | | 4X | 30 | 300 | | | | | NO | C | 23401 |
| 0522868 | 115 | 50/60 | .0 | | .0 | | | 4X | 30 | 600 | 30 | 60 | | | NO | C | 23401 |
| 0526086 | 230 | 50/60 | .0 | | .0 | | | 3X | 30 | 600 | 30 | 48 | | | YES | C | 23401 |
| 0526352 | 230 | 50/60 | .0 | | .0 | | | 3X | 30 | 600 | 30 | 60 | | 2X | YES | C | 23401 |
| 0532522 | 110 | 50/60 | .0 | | .0 | | | 3X | 75 | 600 | 75 | 45 | | 1X1Y | YES | C | 23401 |
| 0538713 | 48 | DC | 23.0 | 760 | 40.8 | | | 3X | 25 | 600 | | | | 1X1Y | YES | C | 23401 |
| 0538714 | 48 | DC | 23.0 | 760 | 40.8 | | | 6X2Y | 10 | 600 | | | | | YES | C | 23401 |
| 0538715 | 48 | DC | 23.0 | 760 | .0 | | | 5X1Y | 10 | 230 | | | | | YES | C | 23401 |
| 0538717 | 48 | DC | 430.0 | 430 | .0 | | | 1X1Y | 10 | 240 | | | | | YES | C | 23401 |
| 0538718 | 48 | DC | 23.0 | 760 | 40.8 | | | 8X | 10 | 230 | | | | | NO | C | 23401 |
| 0538719 | 48 | DC | 23.0 | 760 | .0 | | | 3X1Y | 10 | 230 | | | | | YES | C | 23401 |
| 0538722 | 110 | 50/60 | .0 | | .0 | | | 6X | 10 | 230 | | | | | YES | C | 23401 |
| 0538723 | 110 | 50/60 | .0 | | .0 | | | 3X | 25 | 600 | | | | 2X | YES | C | 23401 |
| 0545940 | 48 | DC | 23.0 | 760 | 40.8 | | | 3X | 30 | 650 | 30 | 50 | | 2X | YES | C | 23401 |
| 0552778 | 24 | 50/60 | .0 | | .0 | | | 4X | 30 | 600 | | | | | YES | C | 23401 |
| 0588396 | 24 | 50/60 | 8.6 | | .0 | | | 3X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 0596814 | 208 | 60 | .0 | | .0 | | | 4X2Y | 10 | 550 | | 125 | | | YES | C | 23401 |
| 0603166 | 60 | DC | .0 | | .0 | | | 4X3Y | 15 | 250 | | | | | YES | C | 23401 |
| 0603243 | 12 | DC | .0 | | .0 | | | 2X | 15 | 250 | | | | | YES | C | 23401 |
| 0610278 | 24 | 50/60 | 8.9 | | .0 | | | 2X | 25 | 230 | | | | | YES | C | 23401 |

PG. 2 06/30/82 23:37 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CON ALL/CON CON/PAR1 TECH DCS NO/LIMIT.

| PART NUMBER | COIL VOLTAGE VOLTS | FREQ OR VOLT | PICK RESIS OHMS | HOLD RESIS OHMS | PICK VOLT. VOLTS | MAX/PICK TIME MS | MAX/REL TIME MILSEC | POWER POLES | I AC AMPS | V AC VOLTS | I DC AMPS | V DC VOLTS | LOW ENERGY CONTACT | AUXIL CONTACT | UL APP | TUC | DCS CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0725001 | 60 | DC | 730.0 | 730 | .0 | | | 4X | 15 | 240 | 15 | 100 | | | YES | C | 23401 |
| 0730308 | 24 | 50/60 | 11.4 | | .0 | | | 6X | 15 | 250 | | | | | YES | C | 23401 |
| 0733062 | 24 | 50/60 | 8.6 | | 20.0 | | | 4X | 15 | 250 | 15 | 50 | | | YES | C | 23401 |
| 0737094 | 24 | 50/60 | .0 | | 20.4 | | | 3X | 60 | 600 | | | | | YES | C | 23401 |
| 0760261 | 24 | 50/60 | .0 | | .0 | | | 3X | 60 | 600 | | | | | YES | C | 23401 |
| 0760262 | 115 | 50/60 | .0 | | .0 | | | 3X | 60 | 600 | | | | | YES | C | 23401 |
| 0764515 | 20 | DC | 60.0 | 60 | 16.0 | | | 2X | 15 | 240 | 15 | 50 | 1X | | YES | C | 23401 |
| 0765549 | 230 | 50/60 | .0 | | 176.0 | | | 3X | 40 | 600 | | | | 1C | YES | C | 23401 |
| 0765637 | 24 | DC | 122.0 | 122 | 19.2 | | | 7X | 15 | 240 | 15 | 50 | 1X | | YES | C | 23401 |
| 0824366 | 24 | DC | 5.3 | 280 | 19.2 | | | 3X | 30 | 600 | 15 | 50 | | | YES | C | 23401 |
| 0825785 | 24 | DC | 122.0 | 122 | 19.2 | | | 4X | | | 2 | 125 | 4X | | YES | C | 23401 |
| 0825971 | 24 | DC | 122.0 | 122 | 19.2 | | | 4X | 10 | 250 | 10 | 125 | 2X | | YES | A | 23401 |
| 0839190 | 20 | DC | 60.0 | 60 | 16.0 | | | 6X | 15 | 250 | 15 | 100 | | | YES | A | 23401 |
| 1589209 | 24 | DC | 4.3 | 150 | 19.2 | 40 | 25 | 3X | 30 | 600 | | | | | YES | C | 23401 |
| 1589262 | 24 | DC | 114.0 | | 19.2 | | | 4X | 10 | 250 | 10 | 125 | | 1X | YES | C | 23401 |
| 1589429 | 24 | DC | 114.0 | 114 | 19.2 | | | 4X | 15 | 300 | 15 | 50 | 1X | | YES | C | 23401 |
| 2111972 | 220 | 60 | .0 | | .0 | | | 6X | | | | | | | YES | C | 23401 |
| 2122231 | 24 | 50/60 | 7.7 | | .0 | | | 3X | 40 | 600 | 40 | 52 | | 2X | YES | C | 23401 |
| 2122232 | 24 | 50/60 | .0 | | .0 | | | 3X | 25 | 600 | 25 | 50 | | 2X | YES | C | 23401 |
| 2122233 | 24 | 50/60 | 8.5 | | .0 | | | 6X | 15 | 240 | 15 | 100 | | | YES | C | 23401 |
| 2128748 | 24 | DC | 5.3 | 285 | 19.2 | | | 3X | 40 | 600 | | | | | YES | A | 23401 |
| 2128749 | 24 | 50/60 | 7.7 | | .0 | | | 2X | 40 | 600 | | | | | YES | C | 23401 |
| 2130090 | 24 | 50/60 | 7.7 | | .0 | | | 3X | 25 | 600 | | | | 3X1Y | YES | C | 23401 |
| 2130334 | 24 | 50/60 | 7.7 | | .0 | | | 3X | 40 | 600 | | | | | YES | C | 23401 |
| 2130335 | 230 | 50/60 | .0 | | .0 | | | 3X | 60 | 600 | 60 | 50 | | | YES | C | 23401 |
| 2192508 | 24 | 50/60 | 7.7 | | .0 | | | 3X | 40 | 600 | 40 | 52 | | 2Y | YES | C | 23401 |
| 2274380 | 24 | DC | 117.0 | 117 | 18.0 | | | 2X | 18 | 230 | | | | | YES | C | 23401 |
| 2396633 | 24 | DC | 5.3 | 280 | 19.2 | | | 4X | 40 | 600 | | | | | YES | A | 23401 |
| 2396762 | 24 | DC | 5.3 | 280 | 19.2 | | | 4X | 30 | 600 | | | | 1X1Y | YES | C | 23401 |
| 2396789 | 24 | DC | 114.0 | 114 | 19.2 | 40 | | 3X | 15 | 240 | | | | | YES | C | 23401 |
| 2396790 | 24 | DC | 114.0 | 114 | 19.2 | 40 | | 2X | 10 | 250 | | | 2X | | YES | C | 23401 |
| 2396869 | 24 | DC | 52.0 | 52 | 19.2 | 99 | 20 | 3X | 30 | 240 | 25 | 125 | | | YES | C | 23401 |
| 2396936 | 24 | DC | 4.3 | 730 | 19.2 | 40 | 25 | 4X | 75 | 600 | | | | 1X | YES | C | 23401 |
| 2396943 | 24 | DC | 5.3 | 280 | 19.2 | 40 | 25 | 3X | 40 | 600 | | | | 2X | YES | A | 23401 |
| 2514446 | 230 | 50/60 | .0 | | .0 | | | 3X | 30 | 600 | 60 | 50 | | 1C | YES | C | 23401 |
| 2561149 | 24 | DC | 5.7 | 289 | .0 | | | 4X | 25 | 600 | | | | | YES | A | 23401 |
| 2574125 | 24 | DC | 4.3 | 730 | 19.2 | | | 3X | 60 | 600 | | | | 1A | YES | C | 23401 |
| 2590115 | 24 | DC | 5.3 | 280 | 19.2 | 40 | 25 | 3X | 25 | 600 | | | | | YES | C | 23401 |
| 5202333 | 48 | DC | 430.0 | 430 | .0 | | | 8X | 15 | 250 | | | | | YES | C | 23401 |
| 5213302 | 24 | 60 | .0 | 205 | 20.4 | | | 2A | 10 | 440 | | | | | YES | C | 23401 |
| 5213322 | 24 | 50/60 | 7.7 | | 20.0 | 40 | 20 | 6X | 10 | 600 | | | | | YES | C | 23401 |
| 5213421 | 24 | DC | 134.0 | | 19.2 | 40 | | 4X | 15 | 250 | | | | | YES | C | 23401 |
| 5213566 | 24 | DC | 4.3 | 730 | 19.2 | 40 | 25 | 3X | 75 | 600 | | | | 2X | YES | C | 23401 |
| 5214059 | 24 | DC | 134.0 | | 19.2 | 40 | | 6X | 15 | 250 | | | | | YES | C | 23401 |
| 5214306 | 24 | DC | 4.8 | 797 | 19.2 | 40 | 25 | 3X | 75 | 600 | | | | 1X1Y | YES | A | 23401 |
| 5214323 | 24 | 50/60 | 8.6 | | 20.0 | 40 | | 1X2Y | 15 | 240 | | | | | YES | C | 23401 |
| 5214344 | 24 | 50/60 | 7.7 | | 20.0 | 40 | 25 | 3X | 40 | 600 | | | | 1X1Y | YES | C | 23401 |
| 5214578 | 24 | DC | 19.2 | 151 | 4.3 | | | 3X | 30 | 600 | | | | 2X | YES | C | 23401 |

PG. 3 06/30/82 23:37 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CON ALL/CON CON/PAR1 TECH DCS NO/LIMIT.

| PART NUMBER | COIL VOLTAGE VOLTS | FREQ OR VOLT | PICK RESIS OHMS | HOLD RESIS OHMS | PICK VOLT. VOLTS | MAX/PICK TIME MS | MAX/REL TIME MILSEC | POWER POLES | I AC AMPS | V AC VOLTS | I DC AMPS | V DC VOLTS | LOW ENERGY CONTACT | AUXIL CONTACT | UL APP | T U C | DCS CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5214646 | 230 | 60 | 18.0 | | 177.0 | 40 | 40 | 3X | 100 | 600 | | | | | YES | C | 23401 |
| 5214647 | 220 | 50 | 4.3 | 151 | 187.0 | 40 | 40 | 4X | 100 | 600 | | | | | NO | C | 23401 |
| 5235374 | 24 | 60 | 1.3 | | .0 | | | 3X | 75 | 550 | | | | | YES | C | 23401 |
| 5257559 | 24 | 50/60 | .0 | | 20.0 | 40 | 20 | 3X | 30 | 600 | | | | | YES | C | 23401 |
| 5257568 | 24 | 50/60 | 7.7 | | 20.0 | 40 | 20 | 3X | 40 | 600 | | | | 1X | YES | C | 23401 |
| 5261448 | 24 | DC | 5.3 | 280 | 19.2 | 40 | 25 | 3X | 40 | 600 | | | | 2Y | YES | C | 23401 |
| 5270579 | 24 | DC | 4.3 | 150 | 19.2 | 30 | 25 | 3X | 30 | 600 | | | | 1X1Y | YES | C | 23401 |
| 5270586 | 24 | DC | 4.8 | 797 | 19.2 | 40 | 25 | 3X | 75 | 600 | | | | 1X | YES | C | 23401 |
| 5270587 | 24 | DC | 134.0 | | 19.2 | 35 | | 3X3Y | 15 | 240 | | | | | YES | C | 23401 |
| 5270761 | 24 | DC | 5.8 | 168 | 19.2 | 40 | 25 | 2X2Y | 25 | 600 | | | | | YES | C | 23401 |
| 5270766 | 24 | DC | 4.3 | 730 | 19.2 | | | 4X | 60 | 600 | | | | | NO | C | 23401 |
| 5276329 | 24 | DC | 5.3 | 150 | 19.2 | 40 | 25 | 3X | 30 | 600 | | | | 1X1Y | YES | C | 23401 |
| 5276701 | 24 | DC | 59.0 | | 19.2 | | | 2X | 15 | 250 | | | | | YES | C | 23401 |
| 5276703 | 24 | DC | 6.3 | 151 | 19.2 | 40 | 25 | 3X | 30 | 600 | | | | | YES | C | 23401 |
| 5313076 | 24 | 50/60 | 7.7 | | .0 | | | 3X | 30 | 600 | | | | 2X | YES | C | 23401 |
| 5327743 | 24 | 50/60 | .0 | | .0 | | | 3X | 75 | 550 | | | | 2X | YES | C | 23401 |
| 5351155 | 24 | DC | 122.0 | | 19.2 | | | 8X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 5351162 | 24 | DC | 122.0 | | 19.2 | | | 4X | 15 | 240 | 15 | 50 | | | YES | C | 23401 |
| 5362031 | 48 | | 252.0 | | .0 | | | 8X | | | | | | | | C | 23401 |
| 5364165 | 24 | DC | 5.3 | 280 | 19.2 | 40 | 25 | 3X | 40 | 600 | | | | 1X1Y | YES | C | 23401 |
| 5367451 | 24 | DC | 3.6 | 650 | 19.2 | 40 | 40 | 3X | 100 | 600 | | | | 1X | YES | C | 23401 |
| 5373743 | 240 | 50/60 | 94.0 | | 176.0 | 40 | 20 | 4X | 60 | 600 | | | | | YES | C | 23401 |
| 5374771 | 28 | 50/60 | .0 | | .0 | | | 3X | 30 | 600 | | | | | YES | C | 23401 |
| 5374772 | 28 | 50/60 | .0 | | .0 | | | 3X | 30 | 600 | | | | 2X | YES | C | 23401 |
| 5475828 | 6 | DC | 7.2 | 7 | 4.8 | 40 | 25 | 3X | 10 | 250 | 10 | 50 | | | YES | C | 23401 |
| 5615380 | 24 | DC | 59.0 | | 19.2 | 35 | | 2X | 15 | 240 | | | 1X1Y | | YES | C | 23401 |
| 5709979 | 24 | 50/60 | 1.3 | | 20.0 | 40 | 25 | 3X | 75 | 600 | | | | 1X1Y | YES | C | 23401 |
| 5786909 | 48 | DC | 310.0 | | 38.4 | | | 8X | 10 | 250 | | | | | YES | C | 23401 |
| 8493191 | 24 | DC | 2.2 | 80 | 19.2 | | | 3X | 120 | 600 | | | | 1X1Y | YES | C | 23401 |
| 8493299 | 48 | DC | 16.5 | 1150 | 40.8 | | | 3 | 100 | 600 | | | | 1X1Y | YES | C | 23401 |
| 8493463 | 24 | DC | 147.5 | | 19.2 | | | 3X | 25 | 600 | | | | | YES | C | 23401 |
| 8493576 | 48 | DC | 16.5 | 1150 | 40.8 | | | 3X | 100 | 600 | | | | 1Y | YES | C | 23401 |

TOTAL RECORDS 128

## REED RELAYS AND SWITCHES

## COMPONENT DATA BANK - P/N CATALOG

DCS CODES
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Reed Relays 23421
Reed Switches 23441

PG. 1 06/30/82 23:37 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RR DCS#N EQ 2342$ PN TECH RR/PAR1 SEQ/LH RR/COIL PN GT 767513 NO/LIMIT.

| PART NUMBER | TUC | COIL VOLT | RESISTANCE OHMS | MUST PICK VOLT | SUPPRESS DIODE | CONTACT FORM | RESISTANCE MIL-O | CONTACT VA | MAX DC VOLT | CURRENT MILA | PICK TIME MSEC | REL. TIME MSEC | MAX LGTH MILS | MAX WDTH MILS | MAX HGHT MILS | TERMINAL | PIN SPACE MILS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5214536 | C | 1.0 | 5 | .7 | NO | 1A | | 10 | 50 | 200 | 2.0 | .3 | 2000 | 510 | 510 | RADIAL PIN | 500 |
| 5785114 | C | 1.0 | 3 | .8 | NO | 1A | 50 | 10 | 50 | 999 | 2.0 | 1.0 | 1950 | 560 | 620 | RADIAL PIN | 200 |
| 5785115 | C | 3.0 | 18 | 2.4 | NO | 1A | 50 | 10 | 50 | 999 | 2.0 | 1.0 | 1950 | 560 | 620 | RADIAL PIN | 200 |
| 5785109 | C | 4.2 | 35 | 3.4 | NO | 1A | 50 | 10 | 50 | 999 | 2.0 | 1.0 | 1950 | 560 | 620 | RADIAL PIN | 200 |
| 1582682 | C | 5.0 | 240 | 3.7 | YES | 1B | 200 | 10 | 200 | 500 | 1.0 | 1.0 | 1140 | 400 | 370 | RADIAL PIN | 100 |
| 1582683 | C | 5.0 | 334 | 3.5 | NO | 1A | 200 | 10 | 200 | 500 | 1.5 | 1.0 | 1140 | 400 | 370 | RADIAL PIN | 100 |
| 1582751 | C | 5.0 | 80 | 4.0 | YES | 2C | 200 | 3 | 28 | 125 | 1.5 | 1.0 | 1140 | 570 | 370 | RADIAL PIN | 100 |
| 1589128 | C | 5.0 | 200 | 3.8 | NO | 2C | 200 | 3 | 28 | 25 | 1.5 | 1.0 | 1140 | 425 | 350 | RADIAL PIN | 100 |
| 1589179 | C | 5.0 | 250 | 4.0 | NO | 1A | 200 | 10 | 200 | 500 | 1.0 | .5 | 1140 | 750 | 360 | RADIAL PIN | 300 |
| 2396870 | C | 5.0 | 165 | 4.0 | NO | 2A | 200 | 10 | 200 | 500 | 1.5 | 1.0 | 1140 | 400 | 370 | RADIAL PIN | 100 |
| 2396871 | C | 5.0 | 165 | 4.0 | NO | 2B | 200 | 10 | 200 | 500 | 1.0 | 1.0 | 1140 | 560 | 370 | RADIAL PIN | 100 |
| 2396872 | C | 5.0 | 185 | 4.0 | YES | 1C | 200 | 3 | 28 | 125 | 1.5 | 1.0 | 1140 | 400 | 370 | RADIAL PIN | 100 |
| 2396873 | C | 5.0 | 240 | 3.7 | YES | 1B | 200 | 10 | 200 | 500 | 1.0 | 1.0 | 1140 | 400 | 370 | RADIAL PIN | 100 |
| 4481469 | C | 5.0 | 175 | 4.0 | YES | 2C | 200 | 3 | 28 | 125 | .0 | .0 | 1140 | 570 | 360 | RADIAL PIN | 100 |
| 4481579 | C | 5.0 | 80 | 4.0 | YES | 2C | 200 | 3 | 28 | 125 | .0 | .0 | 1140 | 560 | 360 | RADIAL PIN | 100 |
| 4481594 | C | 5.0 | 500 | 3.8 | NO | 2A | 200 | 10 | 200 | 500 | .0 | .0 | 1175 | 505 | 390 | RADIAL PIN | 100 |
| 4481628 | C | 5.0 | 165 | 4.0 | YES | 2A | 200 | 10 | 200 | 500 | .0 | .0 | 1140 | 500 | 370 | RADIAL PIN | 100 |
| 5252649 | C | 5.0 | 334 | 3.5 | NO | 1A | 200 | 10 | 200 | 500 | 1.5 | 1.0 | 1140 | 400 | 370 | RADIAL PIN | 100 |
| 5615429 | C | 5.0 | 52 | 3.5 | YES | 1A1B | 200 | 10 | 50 | 500 | .0 | .0 | 1140 | 550 | 360 | | 100 |
| 5615430 | C | 5.0 | 500 | 3.8 | NO | 1A | 200 | 10 | 200 | 500 | .0 | .0 | 1140 | 500 | 350 | 2IDENTCOILS | 100 |
| 5615984 | C | 5.0 | 250 | 4.0 | YES | 1A | 200 | 10 | 50 | 500 | .0 | .0 | 1140 | 750 | 360 | RADIAL PIN | 300 |
| 8493231 | C | 5.0 | 334 | 3.5 | NO | 1A | 200 | 10 | 200 | 500 | .0 | .0 | 1000 | 400 | 360 | RADIAL PIN | 100 |
| 8493269 | C | 5.0 | 80 | 4.0 | NO | 2C | 200 | 3 | 28 | 125 | .0 | .0 | 1000 | 560 | 360 | RADIAL PIN | 100 |
| 5785116 | C | 6.0 | 75 | 4.8 | NO | 1A | 50 | 10 | 50 | 999 | 2.0 | 1.0 | 1950 | 560 | 620 | RADIAL PIN | 200 |
| 4481467 | C | 9.0 | 330 | 6.8 | NO | 2A | 200 | 10 | 200 | 500 | .0 | .0 | 1140 | 1575 | 370 | RADIAL PIN | 150 |
| 4481468 | C | 9.0 | 105 | 6.8 | NO | 6A | 200 | 10 | 200 | 500 | .0 | .0 | 1140 | 1205 | 370 | RADIAL PIN | 150 |
| 2186430 | C | 12.0 | 1152 | 9.6 | NO | 1A | 999 | 10 | 50 | 500 | 1.0 | .5 | 1250 | 500 | 500 | AXIAL | 100 |
| 2397086 | C | 12.0 | 950 | 8.0 | NO | 1A | 200 | 10 | 200 | 500 | 1.5 | 1.0 | 1140 | 750 | 370 | RADIAL PIN | 100 |
| 4429626 | C | 12.0 | 968 | 7.3 | NO | 1A | 200 | 10 | 200 | 500 | .0 | .0 | 1140 | 390 | 370 | RADIAL PIN | 150 |
| 5214685 | C | 12.0 | 270 | 7.8 | NO | 1B | | 10 | 50 | 200 | 2.0 | .3 | 2000 | 510 | 510 | RADIAL PIN | 200 |
| 2397046 | C | 24.0 | 1800 | 16.0 | NO | 1A | 200 | 10 | 200 | 500 | 1.5 | 1.0 | 1140 | 400 | 370 | RADIAL PIN | 100 |
| 2410197 | C | 24.0 | 560 | 19.2 | YES | 1A1B | 200 | 10 | 50 | 500 | 1.5 | 1.0 | 1140 | 750 | 360 | RADIAL PIN | 100 |
| 4429627 | C | 24.0 | 4210 | 12.6 | NO | 1A | 200 | 10 | 200 | 500 | .0 | .0 | 1140 | 390 | 370 | RADIAL PIN | 150 |
| 5615777 | C | 24.0 | 1800 | 16.0 | NO | 1B | 200 | 10 | 50 | 500 | .0 | .0 | 1140 | 400 | 360 | | 100 |
| 5617110 | C | 24.0 | | 18.0 | YES | 2C | 200 | 3 | 28 | 125 | .0 | .0 | 1140 | 750 | 370 | PCB | 100 |

TOTAL RECORDS 35

CDB/RS DCS#N EQ 23441 ALL/RS RS/PAR1 NO/LIMIT.

| PART NUMBER | MIN PICK NI | MAX PICK NI | PICK TIME MSEC | MIN REL NI | MAX REL NI | REL TIME MSEC | CON TACT FORM | RESIS TANCE MIL-O | MAX LOAD VA | MAX VOLT DC | MAXIMUM CURRENT MIL-AMP | OVERAL LGTH MILS | BODY LGTH MILS | BODY DIAM MILS | LEAD SHAPE | TERMINAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0736525 | | | .0 | | | .00 | | | | | | | | | NO DATA | |
| 0736535 | | | .0 | | | .00 | | | | | | | | | NO DATA | |
| 0765581 | | | .0 | | | .00 | | | | | | | | | ASSEMBLY | |
| 0765766 | 43 | 59 | .1 | 20 | 38 | .01 | 1A | 100 | 10 | 50 | 500 | 973 | 825 | 100 | STRAIGHT | AXIAL |
| 0765793 | | | .0 | | | .00 | | | | | | | | | NO DATA | |
| 0765830 | 28 | 42 | .1 | 11 | 25 | .01 | 1A | 100 | 10 | 50 | 500 | 2165 | 825 | 100 | STRAIGHT | AXIAL |
| 0765842 | 28 | 42 | .1 | 11 | 25 | .01 | 1A | 100 | 10 | 50 | 500 | 1075 | 825 | 100 | BENT | FORMED LEAD |
| 0765963 | 44 | 54 | .1 | 18 | 37 | .01 | 1A | 100 | 10 | 50 | 500 | 1195 | 825 | 100 | STRAIGHT | AXIAL |
| 0765971 | | | .0 | | | .00 | | | | | | | | | NO DATA | |
| 0765972 | | | .0 | | | .00 | | | | | | | | | NO DATA | |
| 0765987 | 38 | 50 | .1 | 18 | 32 | .01 | 1A | 70 | 10 | 50 | 500 | 1195 | 825 | 100 | STRAIGHT | AXIAL |
| 0766238 | | | .0 | | | .00 | | | | | | | | | NO DATA | |
| 0766239 | 38 | 50 | .1 | 18 | 32 | .01 | 1A | 100 | 1 | 12 | 100 | 1195 | 825 | 100 | STRAIGHT | AXIAL |
| 0766252 | | | .0 | | | .00 | | | | | | | | | ASSEMBLY | |
| 0766285 | 38 | 50 | .1 | 18 | 32 | .01 | 1A | 70 | 10 | 50 | 500 | 1195 | 825 | 100 | STRAIGHT | AXIAL |
| 1582976 | 38 | 50 | .1 | 18 | 32 | .50 | 1A | 100 | 10 | 50 | 500 | 1195 | 800 | 90 | STRAIGHT | AXIAL |
| 4429935 | 39 | 46 | .0 | 20 | 27 | .00 | | 100 | 10 | 50 | 500 | 1195 | 825 | 96 | STRAIGHT | AXIAL |

TOTAL RECORDS 17

## SPECIAL RELAYS

## COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23451

PG. 1 06/30/82 23:38 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23451 PN TECH RLY/PAR1 NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0189939 | C | B | | 60 | | .0 | | 6.90 | 5.80 | | | | | 1A | .00 | 230 | .00 | | NO |
| 0305267 | C | B | 220 | 50/60 | | .0 | | 5.45 | 4.35 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0311907 | A | B | 220 | 60 | | .0 | | 13.70 | 11.60 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0312477 | C | B | 220 | 50/60 | | .0 | | 2.75 | 2.20 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0313593 | C | B | 220 | 50/60 | | .0 | | 1.40 | 1.20 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0314234 | C | B | 220 | 25 | | .0 | | 4.00 | 3.40 | | | | | ASMBLY | 8.00 | 120 | .00 | | NO |
| 0342769 | C | B | 220 | 60 | | .0 | | 1.05 | .90 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0344202 | C | B | 220 | 50/60 | | .0 | | .75 | .64 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0344253 | C | B | 220 | 50/60 | | .0 | | 2.81 | 2.25 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0344304 | C | B | 220 | 50/60 | | .0 | | 1.32 | 1.05 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 0363344 | C | B | 230 | 50/60 | | 288.0 | 35 | .00 | .00 | | | | | 1B | 35.00 | 230 | .00 | | NO |
| 0363458 | C | B | 115 | 50/60 | | 149.0 | 20 | .00 | .00 | | | | | 1B | 50.00 | 120 | .00 | | NO |
| 0740734 | C | B | 230 | 50/60 | | .0 | | 3.25 | 2.50 | | | | | 1A | .00 | 230 | .00 | | YES |
| 0749784 | C | B | 115 | 50/60 | | .0 | | 3.45 | 2.75 | | | | | 1A | 5.00 | 230 | .00 | | YES |
| 0755480 | C | B | 115 | 60 | | .0 | | 12.70 | 11.00 | | | | | 1A | .00 | | .00 | | NO |
| 2133002 | C | B | 220 | 50/60 | | .0 | | 8.00 | 6.80 | | | | | 1A | 10.00 | 115 | .00 | | YES |
| 2175165 | C | B | 115 | 50/60 | | .0 | | 4.00 | 3.20 | | | | | 1A | 5.00 | 230 | .00 | | YES |
| 2199297 | C | B | 230 | 50/60 | | .0 | | 2.45 | 2.10 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 2204165 | C | B | 115 | 50/60 | | .0 | | 1.20 | 1.00 | | | | | 1A | 5.00 | 230 | .00 | | YES |
| 2204166 | C | B | 230 | 50/60 | | .0 | | 1.95 | 1.65 | | | | | 1A | 10.00 | 115 | .00 | | YES |
| 2219074 | C | B | 230 | 50/60 | | .0 | | 4.00 | 3.20 | | | | | 1A | 10.00 | 115 | .00 | | NO |
| 2219075 | C | B | 230 | 50/60 | | .0 | | 2.10 | 1.80 | | | | | 1A | 10.00 | 115 | .00 | | NO |
| 2410082 | C | B | 220 | 50/60 | | .0 | | 1.88 | 1.50 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 2593402 | C | B | 230 | 50/60 | | .0 | | 12.50 | 10.00 | | | | | 1A | 15.00 | 115 | .00 | | YES |
| 2594269 | C | B | 230 | 50/60 | | .0 | | 5.44 | 4.35 | | | | | 1A | 5.00 | 230 | .00 | | NO |
| 4481856 | C | B | 240 | 50/60 | | .0 | | 2.43 | 2.02 | | | | | 1X | 25.00 | 240 | .00 | | YES |
| 5152999 | C | B | 230 | 50/60 | | .0 | | 4.45 | 3.70 | | | | | 1Y | 25.00 | 220 | .00 | | NO |
| 5214954 | C | B | | 60 | | .0 | | 1.95 | 1.65 | | | | | 1A | 5.00 | 230 | .00 | | YES |
| 5616573 | C | B | 230 | 50/60 | | .0 | | 1.94 | 1.60 | | | | | 1A | 5.00 | 230 | .00 | | YES |
| 8519139 | C | B | 200 | 50/60 | | .0 | | 5.45 | 4.35 | | | | | 1A | 5.00 | 230 | .00 | | YES |
| 8519140 | C | B | 220 | 50/60 | | .0 | | 2.81 | 2.25 | | | | | 1A | 5.00 | 230 | .00 | | YES |
| 8519141 | C | B | 220 | 50/60 | | .0 | | 1.94 | 1.60 | | | | | 1A | 5.00 | 230 | .00 | | YES |

TOTAL RECORDS 32

## SPECIAL RELAYS

## COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23461

PG. 1 06/30/82 23:38 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23461 PN TECH RLY/PAR1 SEQ/LH RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2102500 | C | C | | | | .0 | | .00 | .00 | | | 5 | | 1C | .00 | | .00 | | NO |
| 0338246 | C | C | 6 | AC/DC | | .0 | | .00 | .00 | | | 60 | 15 | 1C | 3.00 | 120 | 3.00 | 28 | NO |
| 0422603 | C | C | 6 | AC/DC | | .0 | | .00 | .00 | | | 120 | 25 | 1A | 2.00 | 115 | .00 | | NO |
| 0749013 | C | C | 6 | AC/DC | | .0 | | .00 | .00 | | | 20 | 15 | 2A | 5.00 | 125 | 1.00 | 48 | NO |
| 0744556 | C | C | 12 | DC | | .0 | | .00 | .00 | | | 2 | 75 | 1B | 2.00 | 50 | 2.00 | 50 | NO |
| 0744557 | C | C | 12 | DC | | .0 | | .00 | .00 | | | 30 | 33 | 1A | 2.00 | 50 | 2.00 | 50 | NO |
| 5213406 | C | D | 12 | DC | 50 | .0 | | .00 | .00 | | | 2 | 50 | 2C | 5.00 | 250 | 5.00 | 30 | NO |
| 5213967 | C | E | 18 | DC | | 13.0 | | .00 | .00 | | | 60 | 30 | 2C | .00 | | 5.00 | 12 | NO |
| 0763390 | C | D | 24 | DC | 250 | .0 | | .00 | .00 | | | 2 | 70 | 2C | 1.00 | 120 | 1.00 | 50 | NO |
| 0765562 | C | D | 24 | DC | 84 | .0 | | .00 | .00 | | | 600 | | 2C | 15.00 | 120 | 15.00 | 30 | NO |
| 0824347 | C | D | 24 | DC | 250 | .0 | | .00 | .00 | | | 2 | 70 | 2C | 5.00 | 115 | .00 | | NO |
| 0825851 | C | D | 24 | DC | 250 | .0 | | .00 | .00 | | | 8 | 70 | 2C | 5.00 | 115 | .00 | | NO |
| 1981452 | C | D | 24 | DC | 250 | .0 | | .00 | .00 | | | 120 | 70 | 2C | 5.00 | 115 | .00 | | NO |
| 2158744 | C | C | 24 | AC/DC | 48 | .0 | | .00 | .00 | | | 300 | 10 | 2A | 5.00 | 125 | 1.00 | 48 | NO |
| 2160999 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | 12 | 15 | 1 | 75 | 1C | 5.00 | 250 | 5.00 | 30 | NO |
| 2173220 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | | | 10 | 75 | 2C | 5.00 | 250 | 1.00 | 150 | NO |
| 2173221 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | | | 2 | 75 | 2C | 5.00 | 250 | 1.00 | 150 | NO |
| 2207260 | C | E | 24 | AC/DC | | 21.6 | | .00 | .00 | | | 20 | 20 | 2C | 5.00 | 115 | .96 | 12 | YES |
| 2207276 | C | E | 24 | AC/DC | | 21.6 | | .00 | .00 | | | 10 | 20 | 2C | 5.00 | 115 | .00 | | NO |
| 2207277 | C | E | 24 | AC/DC | | 21.6 | | .00 | .00 | | | 5 | 20 | 2C | 5.00 | 115 | .00 | | YES |
| 2207462 | C | E | 24 | AC/DC | | 21.6 | | .00 | .00 | | | 1 | 20 | 2C | 5.00 | 115 | .00 | | YES |
| 2278517 | B | E | 24 | DC | | 21.6 | | .00 | .00 | | | 75 | 15 | 2C | 5.00 | 115 | .00 | | YES |
| 2278518 | B | E | 24 | DC | | 21.6 | | .00 | .00 | | | 180 | 15 | 2C | 5.00 | 115 | .00 | | YES |
| 2396555 | C | E | 24 | DC | | 21.6 | | .00 | .00 | | | 30 | 15 | 2C | 5.00 | 115 | .00 | | NO |
| 2396808 | C | E | 24 | AC/DC | | 21.6 | | .00 | .00 | | | 2 | 20 | 2C | 5.00 | 115 | .00 | | NO |
| 5213373 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | | | 120 | 10 | 1Z | 10.00 | 115 | 10.00 | 20 | YES |
| 5213623 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | | | 4 | 50 | 2C | 5.00 | 115 | 5.00 | 30 | NO |
| 5213691 | C | C | 24 | AC/DC | | .0 | | .00 | .00 | | | 5 | 10 | 1A1B | 5.00 | 125 | 1.00 | 32 | NO |
| 5213692 | C | C | 24 | AC/DC | | .0 | | .00 | .00 | | | 30 | 10 | 1A1B | 5.00 | 125 | 1.00 | 32 | NO |
| 5213729 | C | D | 24 | DC | | 20.0 | | .00 | .00 | | | 60 | 10 | 2C | 5.00 | 115 | .00 | | NO |
| 5213961 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | | | 600 | | 2C | 15.00 | 120 | 15.00 | 30 | NO |
| 5214266 | C | C | 24 | AC/DC | | .0 | | .00 | .00 | | | 2 | 15 | 1B | 5.00 | 125 | 1.00 | 32 | NO |
| 5261377 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | | | | 15 | 2C | 5.00 | 250 | 5.00 | 30 | NO |
| 5266038 | C | D | 24 | DC | 100 | .0 | | .00 | .00 | | | 30 | 10 | 2C | 10.00 | 115 | .00 | | NO |
| 5327723 | C | D | 24 | 50/60 | | .0 | | .00 | .00 | | 50 | 2 | 50 | 2C | 5.00 | 230 | 5.00 | 30 | NO |
| 5712326 | C | C | 24 | DC | | .0 | | .00 | .00 | | | 25 | 15 | 1A | 5.00 | 125 | 1.00 | 32 | NO |
| 5712399 | C | C | 24 | DC | | .0 | | .00 | .00 | | | 10 | 15 | 1A | 5.00 | 125 | 1.00 | 32 | NO |
| 5783342 | C | C | 24 | DC | 200 | .0 | | .00 | .00 | | | 180 | 50 | 1C | .00 | | .50 | 125 | NO |
| 5783599 | C | E | 24 | DC | | .0 | | .00 | .00 | | | 2 | 15 | 2C | .00 | | 10.00 | 28 | NO |
| 0442524 | C | C | 26 | 50/60 | | .0 | | .00 | .00 | | | 3 | 33 | 1A | 2.00 | 115 | .00 | | NO |
| 0476919 | C | C | 26 | AC/DC | 340 | .0 | | .00 | .00 | | | 2 | 50 | 1A | 3.00 | 115 | .00 | | NO |
| 2574788 | C | C | 26 | AC/DC | | .0 | | .00 | .00 | | | 30 | 33 | 1B | 2.00 | 50 | 2.00 | 50 | NO |
| 5795969 | C | C | 26 | DC | | .0 | | .00 | .00 | | 2 | | | 1B | .00 | | 1.00 | 32 | NO |
| 0529948 | C | C | 48 | DC/AC | | .0 | | .00 | .00 | | | 10 | 10 | 1A1B | 5.00 | 125 | 1.00 | 48 | NO |
| 0732025 | C | C | 48 | AC/DC | | .0 | | .00 | .00 | | | 30 | 15 | 1A1B | 5.00 | 120 | 1.00 | 48 | NO |
| 1166351 | A | E | 48 | DC | | .0 | | .00 | .00 | | | 120 | 20 | 2C | 10.00 | 115 | .96 | 12 | YES |
| 2122688 | C | D | 48 | DC | | .0 | | .00 | .00 | | | 30 | 25 | 2C | 3.00 | 120 | 1.00 | 50 | NO |
| 2204173 | C | E | 48 | DC | | .0 | | .00 | .00 | | | 100 | 25 | 2C | 5.00 | 115 | .00 | | NO |

PG. 2 06/30/82 23:38 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23461 PN TECH RLY/PAR1 SEQ/LH RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2256282 | C | D | 48 | DC | 500 | 38.0 | 4 | .00 | .00 | | | 30 | 10 | 2C | .00 | | 10.00 | 30 | NO |
| 0352212 | C | D | 115 | 50/60 | 375 | .0 | | .00 | .00 | | | | | 1B | 5.00 | 115 | .50 | 115 | NO |
| 0593897 | C | C | 115 | 50/60 | | .0 | | .00 | .00 | | | 20 | 20 | 1A | 2.00 | 120 | .00 | | NO |
| 0636113 | C | D | 115 | 60 | | .0 | | .00 | .00 | | | 2 | 70 | 2C | 5.00 | 230 | .00 | | NO |
| 0734551 | C | D | 115 | 60 | | .0 | | .00 | .00 | | | 2 | 70 | 2C | .00 | | 3.00 | 48 | NO |
| 0125935 | C | C | 120 | 60 | | .0 | | .00 | .00 | | | 15 | 20 | 1A | .00 | 115 | .00 | | NO |
| 0532989 | C | D | 120 | 60 | | .0 | | .00 | .00 | | | 5 | 5 | 2C | 2.00 | 120 | 5.00 | 30 | NO |
| 5213477 | C | D | 120 | 60 | | .0 | | .00 | .00 | | | 3 | | 1Z | 5.00 | 230 | 10.00 | 32 | YES |
| 0636112 | C | D | 220 | 50 | | .0 | | .00 | .00 | | | 2 | 70 | 2C | 5.00 | 230 | .00 | | NO |
| 0737836 | C | D | 220 | 50 | | .0 | | .00 | .00 | | | 2 | 70 | 2C | .00 | | 3.00 | 48 | NO |

TOTAL RECORDS 58

## SOLID STATE RELAYS

## COMPONENT DATA BANK - P/N CATALOG

DCS CODES
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23471
23485

PG. 1 06/30/82 23:39 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23471 PN TECH RLY/PAR1 SEQ/LH RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0483228 | C | G | | | 415 | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 0762709 | C | G | | DC | 4000 | 5.0 | | 1.25 | .25 | | | | | 1D | 2.00 | 50 | 2.00 | 50 | NO |
| 2100859 | C | G | | DC | 4000 | 33.0 | | .00 | .00 | | | | | 1D | 5.00 | 50 | 5.00 | 50 | NO |
| 2103288 | C | G | | DC | 1250 | 30.0 | | .00 | .00 | | | | | 2D | 5.00 | 50 | 5.00 | 50 | NO |
| 2198342 | C | G | | DC | 350 | 1.4 | | .00 | .00 | | | | | 1C | 2.00 | 50 | 2.00 | 50 | NO |
| 2262667 | C | G | | DC | 1100 | 2.2 | | .00 | .00 | | | | | 1D | 1.00 | 100 | 2.00 | 50 | NO |
| 2262668 | C | G | | DC | 4000 | 8.8 | | .00 | .00 | | | | | 1D | 1.00 | 100 | 2.00 | 50 | NO |
| 5052394 | C | G | | DC | 900 | 4.4 | | .00 | .00 | | 2 | | | 1D | .00 | | 2.00 | 50 | NO |
| 2256432 | C | G | 6 | DC | 185 | 2.9 | | .00 | .00 | 2 | | | | 1C | 1.00 | 100 | 1.00 | 100 | NO |
| 5213871 | C | G | 6 | DC | 50 | 5.3 | | .00 | .00 | 6 | 4 | | | 1D | 5.00 | 50 | 5.00 | 50 | NO |
| 2182513 | C | G | 12 | DC | 5200 | .0 | | .00 | .00 | 3 | 2 | | | 2C | 2.00 | 50 | 2.00 | 50 | NO |
| 5214651 | C | G | 24 | DC | 450 | 18.0 | | .00 | .00 | 6 | 4 | | | 1D | 5.00 | 250 | 5.00 | 50 | NO |
| 5615407 | L | G | 28 | DC | 190 | 3.8 | | .02 | .00 | 2 | 2 | | | 1C | .00 | | 2.00 | 500 | NO |
| 2262654 | C | G | 31 | DC | 490 | 3.1 | | .00 | .00 | 2 | | | | 1C | 1.00 | 100 | 1.00 | 100 | NO |
| 0483225 | C | G | 34 | DC | 935 | .0 | | .00 | .00 | 20 | 18 | | | NODATA | .00 | | 3.02 | 38 | |
| 0483227 | A | G | 54 | DC | 2400 | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 5615406 | L | G | 54 | DC | 2400 | 25.0 | | .01 | .00 | 2 | 2 | | | 1C | .00 | | 2.00 | 500 | NO |
| 2396942 | C | G | 92 | DC | 4275 | 9.2 | | .00 | .00 | | | | | 1C | 2.00 | 50 | 2.00 | 500 | NO |
| TOTAL RECORDS | | | 18 | | | | | | | | | | | | | | | | |
| 5616801 | E | J | 5 | DC | 61 | 3.5 | | .00 | .00 | | | | | 2C | .00 | | .50 | 28 | NO |
| 5616802 | E | J | 26 | DC | 2000 | 18.0 | | .00 | .00 | | | | | 2C | .00 | | .50 | 28 | NO |
| 1166232 | C | J | 48 | DC | 1200 | 40.0 | | .00 | .00 | 30 | | | | 2C | 2.00 | 230 | .00 | | NO |
| 2173219 | C | J | 48 | DC | 1170 | .0 | | .00 | .00 | | | | | 4C | 5.00 | 50 | 2.00 | 48 | NO |
| TOTAL RECORDS | | | 4 | | | | | | | | | | | | | | | | |

## SOLID STATE RELAYS

## COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23489

PG. 1 06/30/82 23:40 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/RLY DCS#N EQ 23489 PN TECH RLY/PAR1 SEQ/LH RLY/COIL/V NO/LIMIT.

| PART NUMBER | TUC | IBM TYPE | COIL VOLT. VOLTS | FREQ OR VOLT | COIL RESIS OHMS | PICK VOLT. VOLTS | RELEASE VOLTAGE VOLTS | PICK CURRENT AMPS | RELEASE CURRENT AMPS | PICK TIME MILSEC | RELEASE TIME MILSEC | TIME DELAY SECS. | TOL % | CONTACT | MAX/AC LOAD AMPS | MAX/AC VOLT. VOLTS | MAX DC LOAD AMPS | MAX DC VOLTAG VOLTS | UL LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0301728 | C | K | | | 200 | .0 | | .00 | .00 | | | | | 1C | .00 | | .00 | | NO |
| 0358623 | C | K | | | 100 | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 0358624 | C | K | | | 100 | .0 | | .00 | .00 | | | | | NODATA | .00 | | .00 | | |
| 0736650 | C | K | 3 | DC | 65 | 2.2 | | .00 | .00 | | | | | 1C | 1.00 | 120 | 1.00 | 28 | YES |
| 5766265 | C | K | 3 | DC | | .0 | | .00 | .00 | | | | | 4C | .00 | | .00 | | NO |
| 0210874 | C | K | 6 | DC | 72 | 4.0 | | .00 | .00 | | | | | 2C | .00 | | 5.00 | 20 | NO |
| 5766266 | C | K | 6 | DC | | .0 | | .00 | .00 | | | | | 4C | .00 | | .00 | | NO |
| 0615421 | C | K | 12 | DC | 160 | .0 | 9 | .00 | .00 | 15 | 10 | | | 4C | 3.00 | 50 | 1.00 | 48 | NO |
| 0730138 | C | K | 18 | DC | 110 | .0 | | .00 | .00 | | | | | 1C | 12.50 | 115 | .00 | | NO |
| 0471715 | C | K | 20 | DC | 9999 | .0 | 2 | .00 | .00 | | | | | 1C | 2.00 | 115 | 2.00 | 28 | YES |
| 0646950 | C | K | 20 | DC | 2300 | 12.2 | | .00 | .00 | | | | | 1C | 1.00 | 120 | 1.00 | 28 | NO |
| 0092767 | C | K | 24 | 60 | 48 | 19.2 | | .00 | .00 | | | | | 2A | .00 | | .00 | | NO |
| 0441058 | C | K | 24 | 60 | 100 | 19.0 | | .00 | .00 | | | | | 2C | 10.00 | 220 | .00 | | NO |
| 0637351 | C | K | 24 | DC | 5000 | 16.5 | | .00 | .00 | | | | | 1C | 2.00 | 120 | 2.00 | 28 | YES |
| 0765425 | C | K | 24 | DC | 472 | 19.2 | | .00 | .00 | | | | | 1C1D | 5.00 | 115 | 2.00 | 50 | NO |
| 2191870 | C | K | 24 | 50/60 | 52 | .0 | | .00 | .00 | | | | | 1C1D | 5.00 | 115 | 2.00 | 50 | NO |
| 2410111 | C | K | 24 | DC | 245 | .0 | | .00 | .00 | | | | | 1X | .00 | | 60.00 | 28 | NO |
| 5213849 | C | K | 24 | 50/60 | | 19.2 | | .00 | .00 | 15 | | | | 2C | 5.00 | 115 | .00 | | NO |
| 5214696 | C | K | 24 | DC | 2500 | .0 | | .00 | .00 | | | | | 1C | 2.50 | 230 | .00 | | NO |
| 5214697 | C | K | 24 | DC | 2500 | .0 | | .00 | .00 | | | | | 1B | 2.50 | 230 | .00 | | NO |
| 5414543 | C | K | 24 | DC | 310 | 20.0 | | .00 | .00 | 20 | 15 | | | 3C | 10.00 | 115 | .00 | | YES |
| 6832319 | C | K | 24 | DC | 400 | 18.0 | | .00 | .00 | | | | | 1X | 50.00 | 120 | 50.00 | 28 | NO |
| 2160789 | C | K | 36 | DC | 170 | 23.5 | | .00 | .00 | | | | | 2A | 25.00 | 230 | .00 | | NO |
| 0286500 | C | K | 40 | DC | 14 | .0 | | .00 | .00 | 26 | 16 | | | 1C | .00 | | .06 | 24 | NO |
| 0598324 | C | K | 40 | DC | 1300 | .0 | | .00 | .00 | | | | | 3A3B1C | 3.00 | 50 | 3.00 | 28 | NO |
| 0532520 | C | K | 48 | DC | 1000 | 36.0 | | .00 | .00 | 25 | 5 | | | 1X | .00 | | 60.00 | 28 | NO |
| 0532521 | C | K | 48 | DC | 1600 | 36.0 | | .00 | .00 | 40 | 20 | | | 1D | .00 | | 5.00 | 48 | NO |
| 0730137 | C | K | 50 | DC | 830 | .0 | | .00 | .00 | | | | | 1C | 12.50 | 115 | .00 | | NO |
| 0352202 | C | K | 85 | DC | 4350 | 64.0 | | .00 | .00 | 25 | 11 | | | 4C | 5.00 | 115 | 5.00 | 28 | NO |
| 0352211 | C | K | 115 | 50/60 | 7000 | .0 | | .01 | .00 | 25 | 60 | | | 4C | 5.00 | 115 | 5.00 | 28 | NO |
| 0586313 | C | K | 115 | 50/60 | | .0 | | .00 | .00 | | | | | 1B | .50 | 120 | .00 | | NO |
| 0532957 | C | K | 120 | 50/60 | 185 | 102.0 | | .00 | .00 | 25 | 20 | | | 6A2B | 3.00 | 120 | 3.00 | 28 | NO |
| 1203014 | A | K | 120 | 50/60 | 2250 | 102.0 | | .00 | .00 | | | | | 1A | .00 | | 1.35 | 48 | NO |
| 0765564 | C | K | 220 | 50/60 | 9110 | 187.0 | | .00 | .00 | | | | | 1C | .00 | | 1.35 | 48 | YES |
| 1203985 | A | K | 230 | 50/60 | 9110 | 187.0 | | .00 | .00 | | | | | 1A | .00 | | 1.35 | 48 | NO |

TOTAL RECORDS 35

## SOLID STATE RELAYS

## COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23431

PG. 1 06/30/82 23:41 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/SSR ALL/SSR SSR/PAR1 NO/LIMIT.

| PART NUMBER | MAX INPUT (V)DC | MUST OPER (V)DC | MUST REL. (V)DC | CON-TACT FORM | MAX LOAD VOLT | MIN LOAD VOLT | MAX T/ON VOLT | MAX I AMPS | MAX SURGE AMPS | DROP VOLT | LEAK AGE MA | ISOL-ATION VOLTS | RECOG NIZED U/L | BODY DIAM MILS | BODY LGTH MILS | BODY WDTH MILS | TERMINAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1582893 | 32 | 3.0 | 1.0 | 1A | 140 | 90 | 35 | 2.5 | 15 | 3.5 | 8.0 | 2500 | YES | 1300 | 2250 | 1750 | SCREW |
| 1588900 | | .0 | .0 | | | | | .0 | | .0 | .0 | | | | | | NO DATA |
| 1589231 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 40.0 | 400 | 1.6 | 9.9 | 2500 | YES | 1300 | 2250 | 1750 | SCREW |
| 1589232 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 40.0 | 400 | 1.6 | 9.9 | 2500 | YES | 1300 | 2250 | 1750 | SCREW |
| 1589495 | 10 | 4.0 | .5 | 1A | 240 | | | .5 | 5 | 1.5 | 1.0 | 2500 | YES | | 750 | 250 | PIN |
| 2396894 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 2.5 | 15 | 3.5 | 9.9 | 1500 | YES | 1300 | 2250 | 1750 | SCREW |
| 2396895 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 10.0 | 80 | 1.6 | 9.9 | 1500 | YES | 1300 | 2250 | 1750 | SCREW |
| 2397010 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 25.0 | 175 | 1.6 | 9.9 | 1500 | YES | 1300 | 2250 | 1750 | SCREW |
| 2410093 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 2.5 | 15 | 3.5 | 9.9 | 2500 | YES | 1300 | 2250 | 1750 | SCREW |
| 2410094 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 10.0 | 80 | 1.6 | 9.9 | 2500 | YES | 1300 | 2250 | 1750 | SCREW |
| 2410095 | 32 | 3.0 | 1.0 | 1A | 280 | 180 | 70 | 25.0 | 175 | 1.6 | 9.9 | 2500 | YES | 1300 | 2250 | 1750 | SCREW |
| 2410110 | 32 | 3.0 | 1.0 | 1A | 140 | 90 | 35 | 10.0 | 80 | 1.6 | 8.0 | 1500 | YES | 1300 | 2250 | 1750 | SCREW |
| 2410194 | 32 | 3.0 | 1.0 | 1A | 140 | 90 | 35 | 2.5 | 15 | 3.5 | 8.0 | 1500 | YES | 1300 | 2250 | 1750 | SCREW |

TOTAL RECORDS 13