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Relay is an electrical device such that current flowing through it in one circuit can switch on and off a current in a second circuit. It is a kind of automatic switching component with isolation function, applied in telecommunication, automotive, general and home appliance purpose of machinery and electrification, electric and electronic equipments.

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Contact Protection Circuit

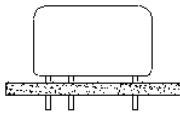
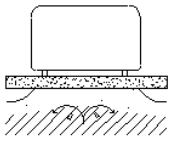
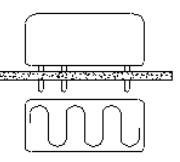
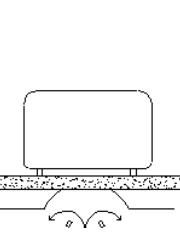
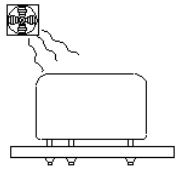
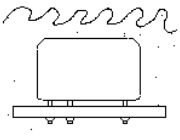
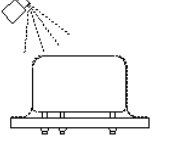
Use of contact protective devices or protection circuits can suppress the counter EMF to a low level . Please note that incorrect use will result in an adverse effect. Typical contact protection circuits are given in the table below.

Circuit example		Applicability		Circuit	Selection of elements
		AC	DC		
RC Circuit		O	⊕	If the load is a timer, leakage current flows through the RC circuit causing faulty operation. ⊕ If used with AC voltage ., be sure the impedance of the load is sufficiently smaller than that of the RC circuit.	Optimum C and R values are: C : 1 to 0.5μF for 1A contact current. R : 0.5 to Ω for 1V contact voltage. These values do not always agree with the optimum values due to the nature of the load and the dispersion in the relay characteristics. Confirm optimum values experimentally.
		O	O	If the load is a relay or solenoid, the release time lengthens. Effective when connected to both contacts if the power supply voltage is 24 or 48V and the voltage across the load is 100 to 200V.	Capacitor C suppresses discharge when the contacts are opened, while resistor R limits the current applied when the contacts are closed the next time. Generally, employ a capacitor C whose dielectric strength is 200 to 300 V. If the circuit is powered by an AC power source, employ an AC capacitor (non-polarized).
Diode & Zener diode		×	O	This circuit effectively shortens release time in applications where the release time of a diode protection circuit proves to be too slow.	The zener diode breakdown voltage should be about the same as the supply voltage.
Diode Circuit		×	O	The diode connected in parallel causes the energy stored in the coil to flow to the coil in the form of current and dissipates it as joule heat at the resistance component of the inductive load. This circuit further delays the release time compared to the RC circuit.	By using a diode with a reverse breakdown voltage at least 10 times the circuit voltage and a forward current at least as large as the load current. In electronic circuits where the circuit voltages are not so high, a diode can be used with a reverse breakdown voltage of about 2 to 3 times the power supply voltage.
Varistor Circuit		O	O	By using the stable voltage characteristics of the varistor, this circuit prevents excessively high voltages from being applied across the contacts. This circuit also slightly delays the release time. Effective when connected to both contacts if the power supply voltage is 24V or 48V and the voltage across the load is 100 to 200V	-----

Relay Soldering and Washing

The following list the processes required for mounting the relay onto a PCB and the points to be noted in each process.

1. Mounting of Relay

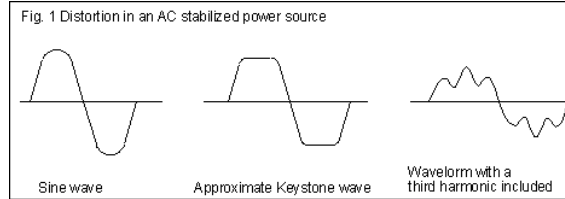
	<ul style="list-style-type: none">■ Avoid bending the terminals to make the relay self-clinching. Relay performance can not be ensure if the terminals are bent. Self-clinching terminal types are available depending on the type of relay■ Stick packaging for automatic mounting is available depending on the type of relay.	
2. Flux Application		
	<ul style="list-style-type: none">■ Adjust the position of the PC board so that flux does not overflow onto the top of it.■ Use rosin-based non-corrosive flux.■ Do not use Automatic Flux Coating Method to dust-cover type relays.■ Do not overflow onto the top of PC Board, in such a case , the flux may even penetrate a flux-resistant type relay.	
3. Preheating		
	<ul style="list-style-type: none">■ Be sure to preheat before using automatic soldering.■ When soldering , preheating acts to prevent the penetration of flux into the relay■ According to the following conditions<ul style="list-style-type: none">○ Temperature : 120°C 248°F or less○ Time : Approx. within 1 min. <p>Note : The long exposure to high temperatures (ex. Due to a malfunctioning unit) may affect relay characteristics.</p>	
4. Soldering		
	<p>Automatic Soldering</p> <ul style="list-style-type: none">■ Flow solder is the choice method for soldering.■ Adjust the level of solder so that it does not overflow onto the top of the PC board■ Unless otherwise specified, solder under the following conditions.<ul style="list-style-type: none">○ Solder Temperature :Approx. 260°C 500°F○ Solder Time : Within approx. 5 seconds○ Solder :JIS Z3282 , H60 or H63	<p>Hand Soldering</p> <ul style="list-style-type: none">■ Keep the tip of the soldering iron clean.<ul style="list-style-type: none">○ Soldering Iron :30W to 60W○ Iron Tip Temperature :Approx. 350°C 662°F.○ Soldering Time :Approx. within 3 seconds○ Solder :JIS Z3282 , H60 or H63
5. Cooling		
	<p>Automatic Soldering</p> <ul style="list-style-type: none">■ Immediate air cooling is recommended to prevent deterioration of the relay and surrounding parts due of soldering heat.■ Although the environmentally sealed type relay (plastic sealed type, etc.) can be cleaned , avoid immersing the relay into cold liquid (such as cleaning solvent). Doing so may deteriorate the sealing performance.	<p>Hand Soldering</p> <p>-----</p>
6. Washing		
	<ul style="list-style-type: none">■ Do not wash dust-cover type relays and flux-resistant type relays by immersion. Washing careless may cause cleaning solvent to penetrate the relay.■ Plastic sealed type relays can be washed by immersion. Use of other washing solvents may damage the relay case and cover, and also cause washing solvent to penetrate the relay.■ Washing with the boiling methods is recommended. Avoid ultrasonic cleaning may cause breaks in the coil or slight sticking of contacts due to the ultrasonic energy.	
7. Coating		
	<ul style="list-style-type: none">■ If the PC board is to be coated to prevent the insulation of the PC board from deteriorating due to corrosive gases and high temperature, note the following.■ Do not coat dust-cover type relays and flux-resistant type relays, since the coating material may penetrate the relay and cause contact failure.■ Depending on the type, some coating materials may have an adverse affect on relays , select coating materials carefully.	
Type	Suitability for Relays	Features
Epoxy-base	Good	· Although slightly difficult to apply , does not affect relay contacts.
Urethane-base	Caution	· Solvent may damage case. Check before use.
Silicon-base	Caution	· Silicon gas becomes the cause of contact failure. · Do not use on dust-cover type relays and flux-resistant type relays. Can be used on only metallic hermetic sealed type relays.

Relay Coil Input

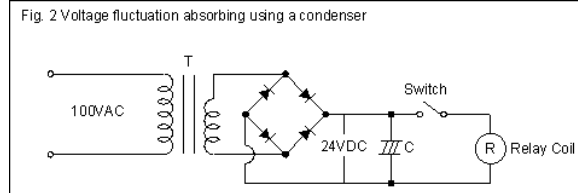
To guarantee accurate and stable relay operation, The first and foremost condition to be satisfied is the application of the rated voltage to the relay. Additionally, details concerning the type of the power source, voltage fluctuation, and changes in coil resistance due to temperature rise, the rated voltage must also be considered. If a voltage higher than the rated maximum voltage is applied to the coil for a long time, layer short-circuiting and damage to the coil by burning may take place.

Impressed voltage of AC coil

In order to have stable operation of the relay, the impressed voltage should be basically within the range between +10% and -15% of the rated voltage. It is necessary that the waveform of the voltage impressed on the coil be a sine wave. There is no problem if the power source is commercially provided power, but when a stabilized AC power source is used, there is a waveform distortion due to that equipment, and there is the possibility of abnormal overheating. By means of a shading coil for the AC coil, humming is stopped, but with a distorted waveform, that function is not displayed. Below shows an example of waveform distortion.

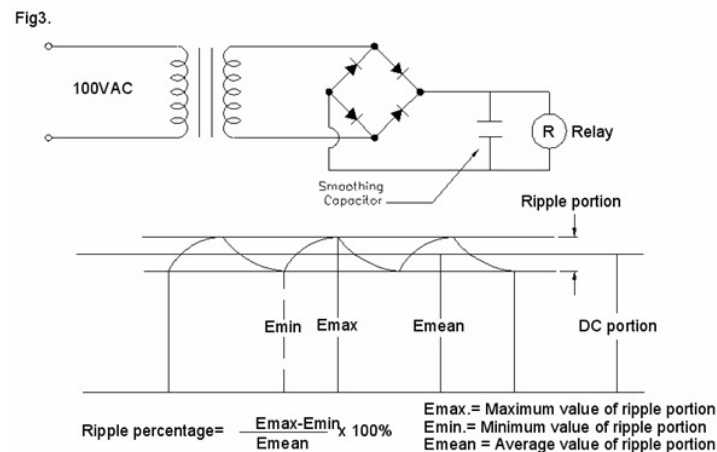


If the power source for the relay operating circuit is connected to the same line as motors, solenoids, transformers, and other loads, when these loads operate, the line voltage drops, the relay contacts suffer the effect of vibration and subsequent burn damage. In particular, if a small type transformer is used and its capacity has no margin of safety, when there is long wiring, or in the case of household used or small sales shop use where the wiring is slender, it is necessary to take precautions because of the normal voltage fluctuations combined with these other factors. When trouble develops, a survey of the voltage situation should be made using a synchroscope or similar means, and the necessary counter-measures should be taken and together with this determine whether a special relay with suitable excitation characteristics should be used. Or make a change in the DC circuit as shown in below in which a capacitor is inserted to absorb the voltage fluctuations.



Power source for DC input

Power source for the DC type relay, a battery or either a half wave or full wave rectifier circuit with a smoothing capacitor is used. This characteristics with regard to the excitation voltage of the relay will change depending on the type of power source, in order to display stable characteristics, the most desirable method is perfect DC. In the case of ripple included in the DC power source, particularly in the case of half wave rectifier circuit with a smoothing capacitor, if the capacity of the capacitor is too small, due to the influence of the ripple, humming develops and an unsatisfactory condition is produced. With the actual circuit to be used, it is absolutely necessary to confirm the characteristics. See below.



Relay DC coil protection method:

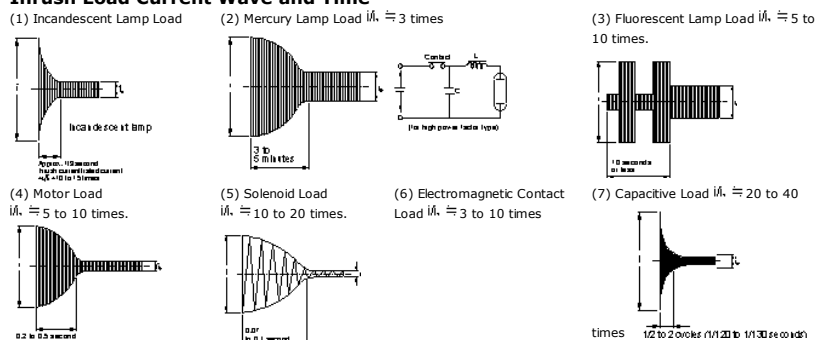
A clamping diode connect in parallel with the relay dc coil is a common way, be sure installed with the correct polarity and functions properly.

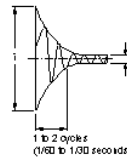
Load Type

The type of load and its inrush current characteristics with the switching frequency are important factors which cause contact welding. As for loads with inrush currents, measure the steady state current and inrush current and select a relay which provides an ample margin of safety. The table on the below shows Typical loads and their inrush currents.

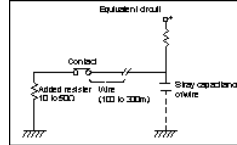
Load type	Inrush current
Resistive load	Steady state current
Solenoid load	10 to 20 times the steady state current
Motor load	5 to 10 times the steady state current
Incandescent lamp load	10 to 15 times the steady state current
Transformer load	5 to 15 times the steady state current
Capacitive load	20 to 40 times the steady state current
Sodium vapor lamp load	1 to 3 times the steady state current
Mercury lamp load	Approx. 3 times the steady state current

Inrush Load Current Wave and Time



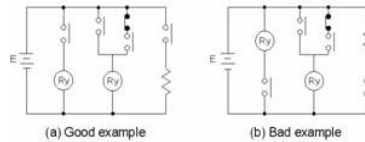


When Using Long Wires



If long wires (100 to 300m) are to be used in a relay contact circuit, inrush current may become a problem due to the stray capacitance existing between wires. Add a resistor (approx. 10 to 50Ω) in series with the contacts. See the drawing right.

Connection of load and contacts

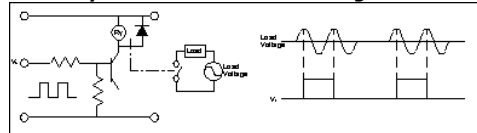


(a) Good example

(b) Bad example

Connect the load to one side of the power supply as shown below (a). Connect the contacts to the other side. This prevents high voltages from developing between contacts. If contacts are connected to both side of the power supply as shown in below (b), there is a risk of shorting the power supply when relatively close contacts short.

Phase Synchronization of Switching AC loads



In switching the relay contacts is synchronized with the phase of the AC power, reduced electrical life, welded contacts or a locking phenomenon (incomplete release) due to contact material transfer may occur. Check the relay while it is operating in the actual system. If problems develop, control the relay using an appropriate phase. See below drawing.

All devices should be according to engineer advice or spec description of GOOD SKY to use, client or user should avoid electric-shock, water, solution and fire, the devices must accord to the safety stipulation of relevant country, e.g. CCEE of China, UL of America, CSA of Canada, VDE and TUV of Germany etc. Not all the relays should reach all the requests. It should depend upon the technical requests differ from the different application conditions. The user or client had better to clearly know their demand and asked the best support.

If you wish to know more or any help, please kindly contact by
e-mail: info@goodsky.com.tw

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