Electric Hinge Troubleshooting Guide

BEST
dormakaba Group

ELECTRIC HINGE TROUBLE SHOOTING GUIDE

I. General

A. This guide is written so that you can correctly make a technical analysis, trouble shoot an electric hinge, and quickly determine if they have failed, or if the trouble lies elsewhere.

This guide is broken down into 4 sections:

I. General information
II. Test equipment required for checking electric hinges.
III. Proper procedure for checking "CE" electric hinges.
IV. Proper procedure for checking "CS" electric hinges.

As with all electric hinges, it is very important that the application procedure packed with each hinge be fully understood before attempting to do any checking. it should not be assumed that the installer has read these instructions, as in most cases he has not.

Upon receiving a field complaint of a faulty hinge, several steps should be taken before making any checks.

1. Make an appointment to personally visit the job with your customer.
2. include a representative of either the architect, contractor, or both on new installations. include the maintenance man on existing jobs.
3. Be sure to take along all required tools for checking as well as all instruction sheets. (see Section II)
4. Determine pertinent information about the job. (This is important if you must contact the factory for further guidance.)
   a. Name of job, location, etc.
   b. Names of all people involved with the job or at the site with you.
   c. Determine types of hinges installed, sizes, material, etc.
   d. Determine approximate age of job, and how long the hinges have been installed.
   e. Find out the operating voltage and current being applied to the hinges.
   f. Determine what is being operated by the electric hinges such as lights, bells, security system. (List type of security system the hinges are wired into. if lights are connected directly to these hinges rather than using a relay which in turn is connected to these hinges, determine make, type, and voltage.)
   g. Determine size and weight of doors and if hinge stiles are square or beveled. Determine if beveled ⅛" in 2" (3½°) or greater.

II. Test Equipment Required for Electric Hinge Checking

A. Tools required:

1. Meter with leads.
2. Screwdrivers (1 only #3 Phillips and 1 only for slotted screws).
3. Shims (see technical brochure H1399)
4. Door bevel gauge (combination square)
5. Test magnet

B. Use of the test meter.

1. A volt/ohm multitester is an instrument used to read electric voltage (volts) or the amount of resistance in a wire (ohms). For electric hinge checks, you will only be concerned with the ohms, or resistance portion of this meter. (see sketch page 3)
2. Each meter is supplied with a red lead and a black lead. An alligator clip should be slipped onto the longer pin pack. The opposite end is inserted into either ohms (Ω) receptacle of the meter.
3. Before using test meter, you will need to know the following terms:
   a. **Leads** - Wires used to connect meter to electric hinges, one black lead and one red lead supplied with "alligator" clips for one end.
   b. **Alligator Clips** - Are spring loaded clamps used on red or black leads to attach wires from electric hinges to leads.
   c. **Pin Jack** - Pointed ends adapted for inserting into meter receptacle.

   Test meter definitions and preparation: (see picture of test meter on page 3).

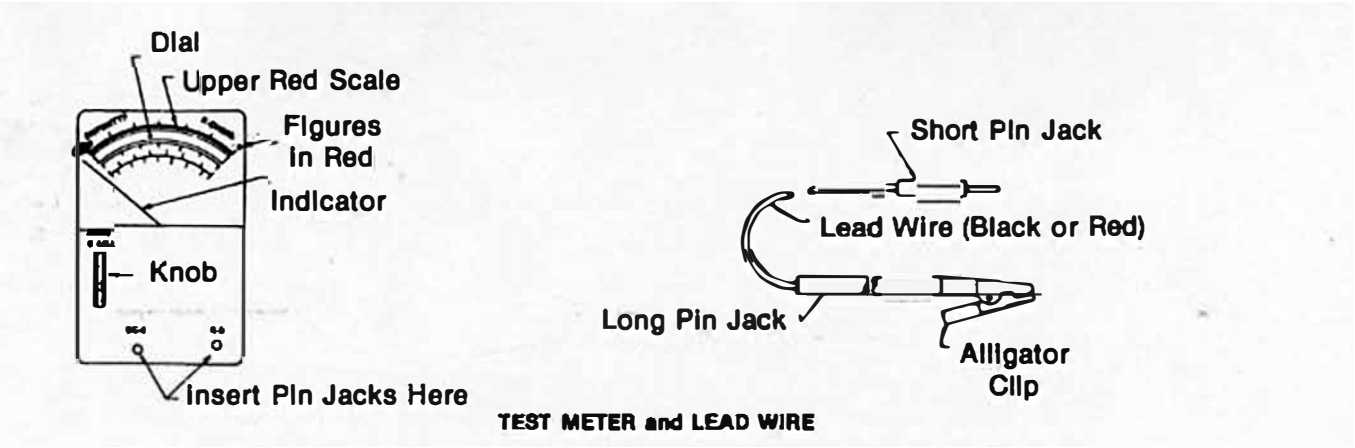
   d. **Ohm Symbol** - Ω/symbol for measuring the amount of resistance in a wire.
   e. **Infinity Symbol ∞** - Reading at far left end of the upper red scale on the meter dial which the indicator points to when measuring maximum resistance. As in the case of a completely broken wire, no electrical current will flow through the wire because of the infinite resistance between both ends of the broken wire.
   f. **Open Circuit** - Another way of expressing maximum resistance. (infinity reading)
   g. **0 Symbol** - Reading at the right end of the red scale on the meter dial which the indicator points to when measuring low or zero (0) resistance. As in the case of measuring the resistance of a piece of unbroken wire, electrical current will flow through the wire because there is little or no resistance to stop it.
   h. **Closed Circuit or Short Circuit** - Other ways of expressing zero resistance.
   i. **DC-Ω** - Receptacle on the meter where one pin jack (either red or black) is inserted for reading resistance.
   j. **K-Ω** - Other receptacle on the meter where other pin jacks (either red or black) is inserted for reading resistance.

   NOTE: Steps I and j connect the internal battery into the meter circuit. Therefore the leads should be removed when all resistance checking is completed to prolong the life of the battery.

   k. **Zero 0 Adjust** - With leads attached to the meter as outlined above, clip the two alligator clips together. indicator should go to the zero 0 ohms side of the upper red scale. if the indicator does not go all the way to zero ohms, rotate the zero adjust knob until the indicator reads on zero 0. if indicator goes beyond zero 0 ohms, rotate knob in the opposite direction until indicator dial reads on zero 0 ohms.

   (exact zeroing not essential)

YOU ARE NOW READY TO MAKE ELECTRIC HINGE CHECKS.



TEST METER and LEAD WIRE

III. Proper Procedures for Checking "CE" Electric Hinges

A. General notes prior to checking the hinges.

1. Do **NOT** attempt to remove pin from the "CE" hinge. It is permanently assembled.
2. Be sure all external voltage to the hinge has been turned off.
3. While removing hinge from door and frame, care must be taken not to scrape wires on access hole edges in reinforcement plate.
4. Gently remove one wire at a time. There may be wire connectors or soldered joints on each lead connecting the hinge wires to the building wiring. (This should be done by an electrician.)
5. Be sure to properly block up door to keep it from sagging after hinge is removed.

B. Checking "CE" Electric Hinges.

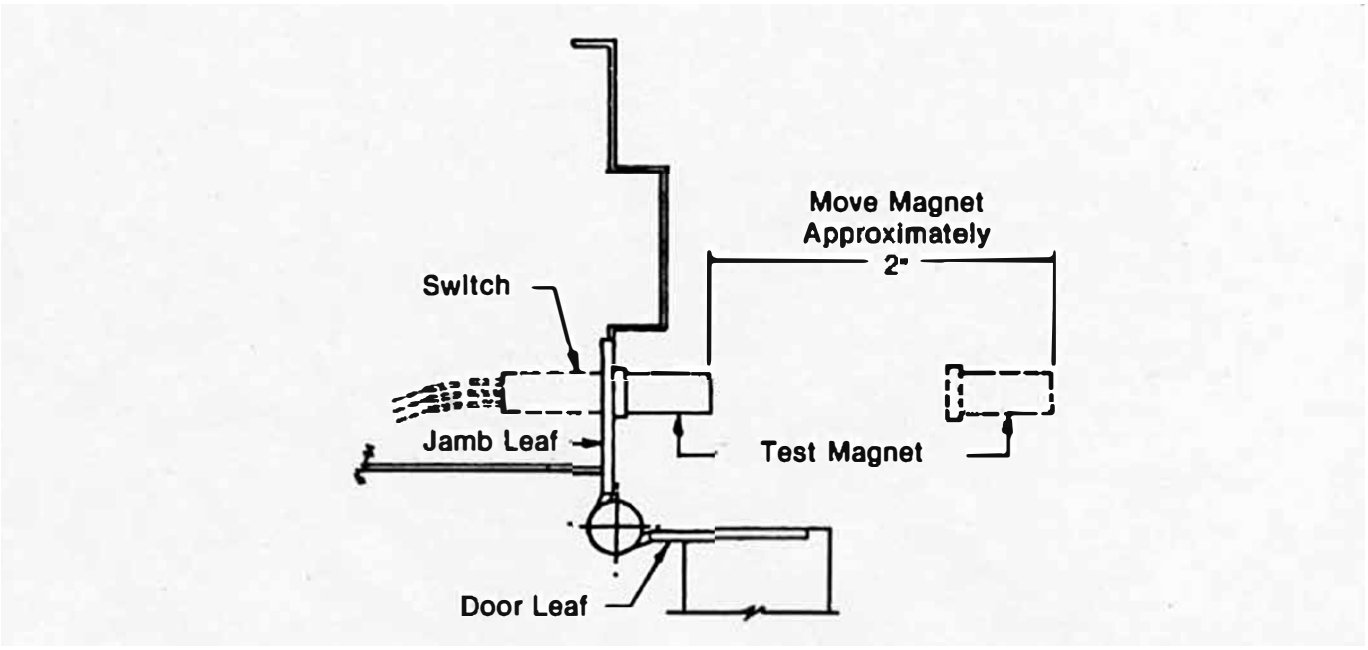
1. Make a visual check of each wire on hinge watching for breaks in the wire, especially where the wire comes out at the back of the hinge leaf. If the colored insulation is broken and the copper wires can be seen, this can cause failure symptoms; therefore the hinge should be replaced. (This condition can be caused by careless wiring during installation.)
2. Hinge wiring should be free of paint, cement or any foreign matter as these can cause insulation to dry up and crack causing future problems.
3. Also check hinge for damage during installation (e.g. attempts to remove pin or signs of field swaging).
4. With test meter prepared as in Section II above, check each hinge wire independently. Connect alligator clip of one meter lead to one colored wire on hinge jamb leaf (ex. black). Be sure the clip is attached to the bared end portion of the wire exposing the copper wires. Then connect the alligator clip from the second meter lead to the same colored wire (ex. black) on the door leaf side of the hinge.
5. If the wire is good, and is not broken, the indicator on the test meter will read zero 0 ohms. Continue this procedure until all hinge wires are checked, always being sure that the same colored wires are connected to test meter leads from the jamb leaf side to the door leaf side of the hinge.
6. If a wire is broken, the reading on the test meter will be infinity ∞. In this case the hinge will have to be replaced.
7. If all checks are good, the electrician can reconnect wires and replace hinge. Further checks to system wiring should be made by others concerned.
8. If there is a failure of any one wire, it should be pointed out that all wiring that is exposed on the hinge is braided (twisted) and taped prior to leaving the factory per Underwriters Laboratories, Inc. requirements. It should also be mentioned that wire access holes in reinforcement plates must be adequate size, and free of burrs, to make wiring easy and to accept wire connectors.
9. **NOTE: All hinges are checked visually and electrically 100% at the factory for continuity per U.L. requirements.**

IV. Proper Procedure for Checking "CS" Electric Hinges

A. General notes

1. Some typical customer complaints on "CS" hinges.
   a. When door is opened and closed the light or buzzer on the monitor panel does not come on or go off.
   b. Bell worked properly for the first few times the door was opened, and now it does not work at all.
   c. Light or buzzer on monitor panel works properly but is erratic. A slight jiggle of the door and the indication will change.
   d. Hinge works good when not installed. As soon as installed, a problem similar to a. above exists.
   e. Customer has installed 30 to 40 hinges yet only 3 or 4 are operational.
2. The above are a few typical complaints you may encounter but these and other problems can be easily solved by making some visual checks of the actual application before removing any hinges.
   a. First check to see if the switch portion of the hinge is functional. With a person checking the monitor console, open the door to at least 90°. Hold a test magnet near the switch on face of hinge on jamb leaf only. As the magnet is moved away (at least 2"), and then brought back to the face of the hinge in the area of the switch, check with person at the console to see if a light for that door changed mode (that is, changed from green to red or some other color), or if a buzzer went on or off.

      (See sketch below illustrating how to make this check.) Any indication of properly operating lights or buzzers means that the switch portion of the hinge is functional.



   b. If the switch is functional, then check the magnet side of the hinge on the door leaf. Close door and check the space between the jamb leaf and the door leaf on the "CS" hinge to see if it is excessive. This is done as outlined in Section I-e of the Application Procedure packed with each hinge. If the resulting gap exceeds ¼", then shimming is necessary. Follow shimming procedures outlined in H1399.
   c. If shimming does not correct faulty switching conditions, the problem may be with the magnet portion of the hinge leaf. The magnet may have been tampered with. It may be either removed entirely or backed out in housing so far as to have no effect on the switch. Check the bevel on the door at this point with a combination square.

Bevel should be 3½° for a ⅛" in 2" door bevel. If it is excessive such as 5 or 6 degrees, additional shimming to the door leaf is required. Method of shimming is shown in the first illustration on shimming in H1399.

d. If after checks a, b, and c are made and faulty switching still exists, then a more detailed check of the "CS" hinge is required.

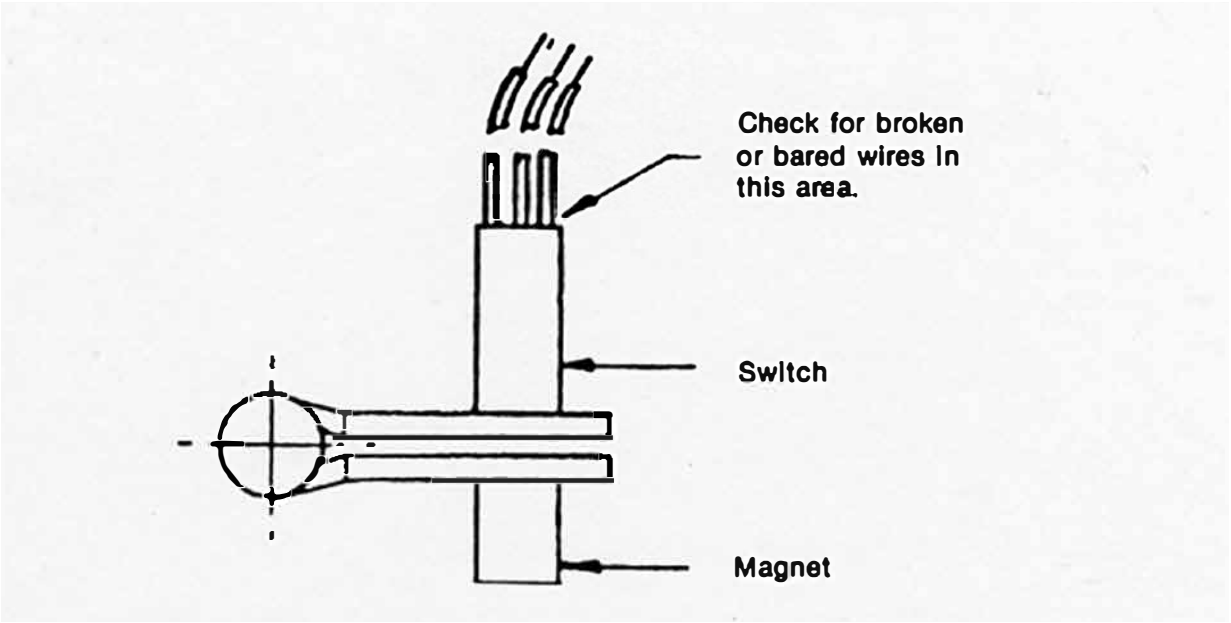
e. The next step will be to remove the electric hinge from the door and frame.

CAUTION: Before removing any electric hinge from door and frame, be sure that all electricity to the hinge is off.

f. To remove the hinge, open the door 90° or more if possible. After all mounting screws on the hinge have been removed, gently remove the leaves from their cutouts in door and frame. Pull leaves straight forward until the switch and magnet housings are free of the reinforcements.

On the jamb leaf, care must be taken not to scrape the switch lead wires as they clear this hole in frame reinforcement. Disconnect all switch wires from the building wiring by removing wire connectors or taped connections. (This should be done by an electrician or maintenance man.)

g. Make a visual check of the condition of the hinge. First, check to see if all wiring is intact and not broken off. Check for any bared wires at the point on the housing where the switch wires are exposed. (See sketch)



Check to see if magnet has been removed and not replaced.

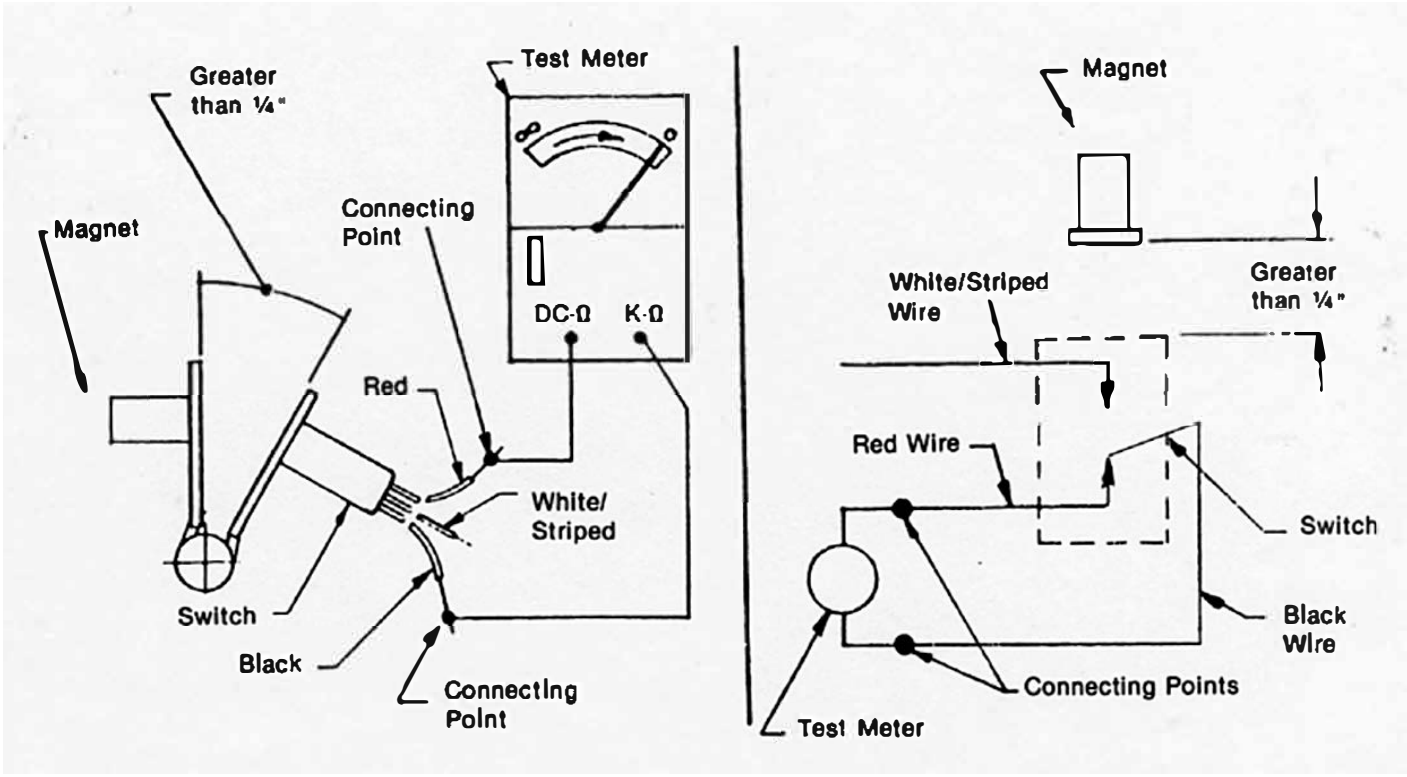
Check to see if the magnet is bottomed in the housing. Engage a screw driver in the slot of the magnet and tum clockwise until it is firmly seated on the bottom of the housing. Do not tap to drive the magnet down as this can damage the magnet.

Check the condition of the housings. If there are scrape marks around the periphery, this could indicate too small a hole in the reinforcements or possible misalignment between the holes in the door and jamb reinforcements. Housings may be bent and distorted or may even be popped out, exposing the housing on the face of the hinge. This condition could be caused by excessive pressure applied at the time of hinge mounting.

Check for indications of field swaging, distorted leaves, or evidence of hammer blows to the hinge leaves. (Any of these conditions can damage the switch and magnet causing the hinge to be non-functional.)

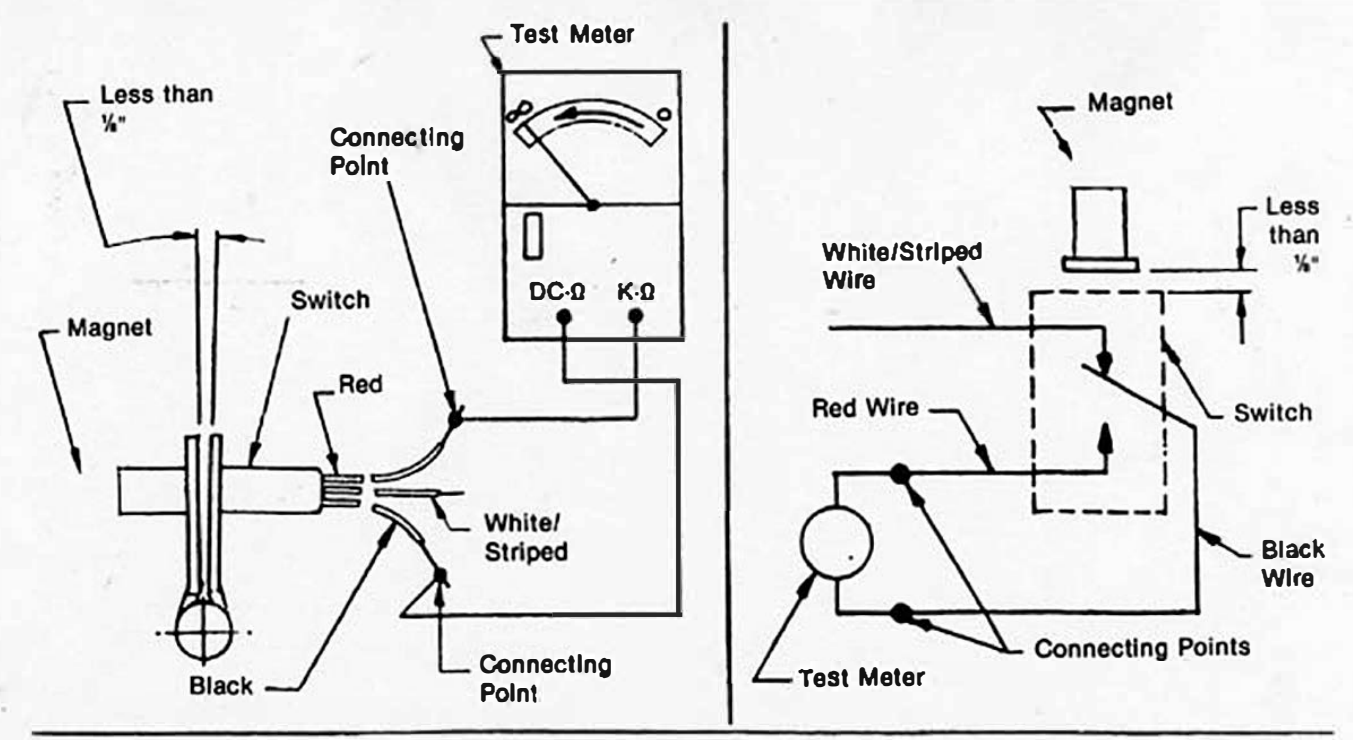
h. If all visual checks are good, continue on with the electrical check of the hinge. If there are existing conditions as outlined in g. above, you may still want to run through an electrical check of the hinge.

Prepare the test meter as described in the section on "Use of the Test Meter" (Section II, Paragraph B). Connect alligator clip on one meter lead (either red or black) to the bared wire portion of the black switch wire. This switch wire is known as the "common wire" of the switch, and will remain hooked up to the test meter when checking the other two switch wires. (See sketches below and on page 7). Connect the alligator clip of the second meter lead to the bared wire portion of the red switch wire. Watch the meter indicator and dial. (Refer to sketches). Open hinge leaf more than ¼" and meter indicator should read zero 0 ohms. This is an indication that the switch has closed and if the hinge was wired into a security system properly, a buzzer or light will indicate an open door condition. Close hinge leaf below a ⅛" position and the meter indicator should read infinity ∞. This is an indication that the switch has opened and the door is virtually closed. In this condition, a buzzer or light on a monitor panel of a security system will indicate a closed door position.



CONDITION WITH HINGE LEAVES OPENED

Condition of switch (note switch is closed because magnet has been pulled away by hinge leaves being opened.)



CONDITION WITH HINGE LEAVES CLOSED

Condition of switch (note switch is opened because magnet has come close and moved contact over. This happened when hinge leaves closed.)

The black wire (common) and the white/striped wire can also be checked. Follow similar procedure as in sketches on pages 6 & 7. Test meter readings will be opposite those noted in the sketches. When hinge is opened, the meter will read infinity ∞. When hinge is closed the meter will read zero 0 ohms. Making both checks to the red and white/striped wires will confirm the condition of both circuits of the switch.

i. If when checks made in h. above, the meter reads as described, then it is reasonable to assume the hinge is operable and that there are other electrical problems which should be checked out by others.

If when checks are made the test meter remains in either zero 0 position or the infinity ∞ position and does not change as the hinge leaves are closed (to parallel condition) or opened to at least 90°, then it means that the switch is defective and that the switch contacts are either burnt out or welded in one position.

This condition of a defective switch probably occurred because there was no electrical protection for the switch as outlined in the Application Manual Section IV.

For example: If the switch is to operate a 6 volt bulb, the initial current to turn the bulb on may be as high as 10 to 20 times the normal operating current. This high current is known as "surge current" and can be described by the analogy, that it takes more energy to move a freight train from a stopped position than it does to keep it moving. Therefore, current limiters as described in Section IV of the Application Manual are necessary. This point should be brought to the attention of all concerned as the life of the switch depends on it.

If the switch is defective, a new hinge must be installed. Need for current and voltage limiters must be considered, or replacement hinges also may be damaged.

j. Reporting Results. You have probably made enough convincing tests and observations to indicate whether the electric hinges are functioning properly or not.

STANLEY "CS" TYPE HINGE APPLICATION PROCEDURE

DO NOT ATTEMPT TO ADJUST HINGE UNTIL ALL INSTRUCTIONS ARE THOROUGHLY READ.

I. INSTALLATION PROCEDURE

a. The jamb must be securely anchored to prevent it from twisting and affecting the switching operation as the door is opened.

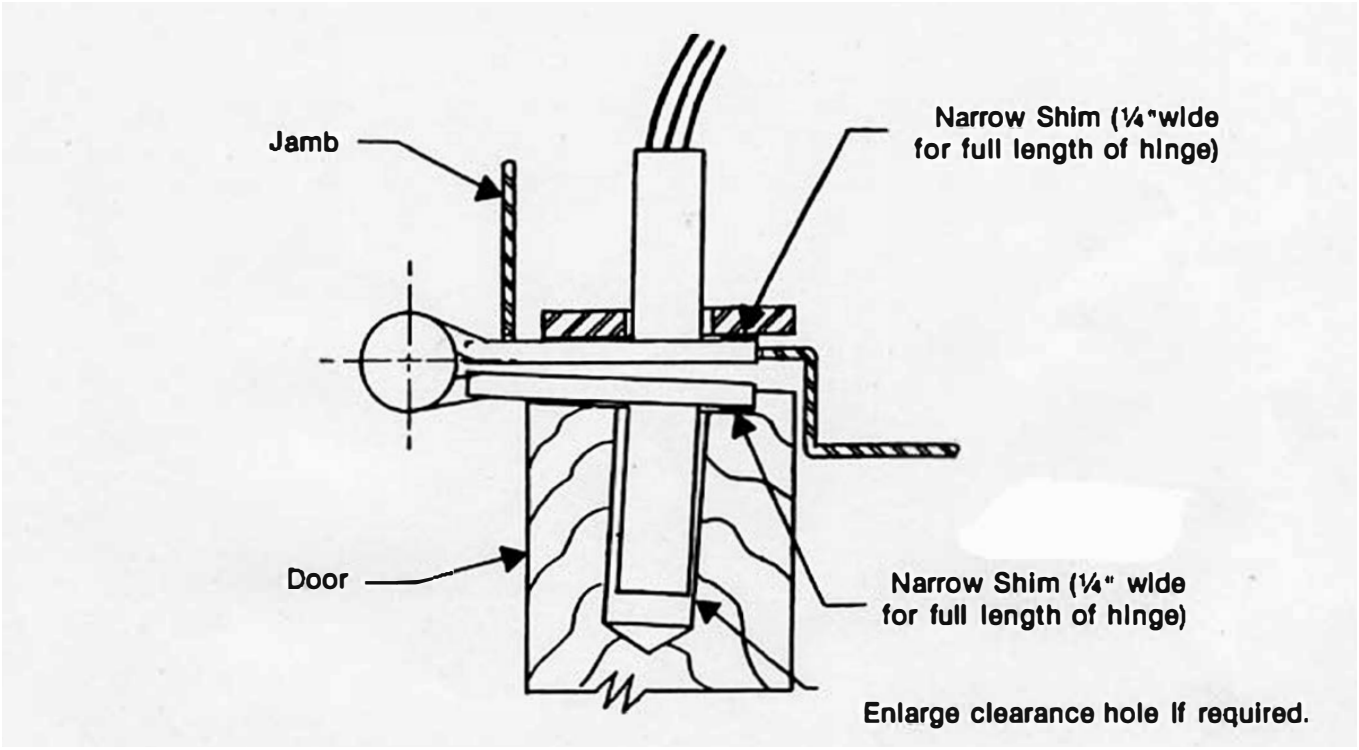
b. The door leaf houses the magnet in the housing **without** wires. The jamb leaf houses the switch and has 3 wires extending from the housing. It is suggested that this hinge be mounted in the center or lower position on the door where it is less affected by door and jamb variations.

c. Housing clearance holes in frame hinge reinforcements of at least ¾" diameter are recommended. Clearance holes should be free of burrs and sharp edges that could damage wires. For proper location and size of clearance holes for magnet see template drawing for the specific hinge being used.

d. Before installing any hinges they should all be unpinned, and the individual leaves installed in their respective mortises (this instruction does not apply to CECS hinges.) The **jamb LEAF** of the "CS" hinge should be electrically connected as described in the electrical sections II thru IV page 9. The housing and wiring must be inserted into the clearance hole in the hinge reinforcement, and hinge leaf should then be firmly anchored in its mortise. Tighten all screws, hang door and repin hinges.

e. The switch alarm circuit should operate before the door has opened 2" (gap between jamb and door at lock edge). If the door opens more than 2" before alarm operation, the distance can be reduced by adjusting the position of the magnet in the housing. To do this, remove all screws from the door leaf of the hinge. Swing the door leaf out of its mortise; exposing the magnet and housing.

f. To adjust the magnet, insert a screwdriver into housing so as to engage slot in the magnet end. Carefully turn magnet to the left (counter clockwise) about ½ turn. (IT IS NOT NECESSARY TO REMOVE THE MAGNET COMPLETELY OUT OF THE HOUSING). Reinstall the door leaf and screws, and retest for alarm operation as the door is opened.



g. If all hinges are installed on door and jamb, it is found that the switch remains in the alarm condition when the door is closed (the switch has not reset), the space between the jamb leaf and door leaf may be excessive. By inserting a piece of soft modeling clay (or similar material) between the hinge leaves (at their vertical edges) while the door is open, and then completely closing door, the space at the leaf edges can be determined. Open the door and check the thickness of the clay. If the resulting thickness exceeds ¼", proper shimming is necessary.

h. Shimming as shown on the sketch below will reduce the space between leaves. Caution: Recheck alignment of all hinge barrels after all shimming adjustments have been made.

i. If the switch does not operate properly after shimming as above, remove the hinge from the door. Connect an ohmeter across the black and red wires. The meter should read zero (Ø) with the hinge open and infinity (∞) with the hinge closed.

II. ELECTRICAL RATINGS

a.

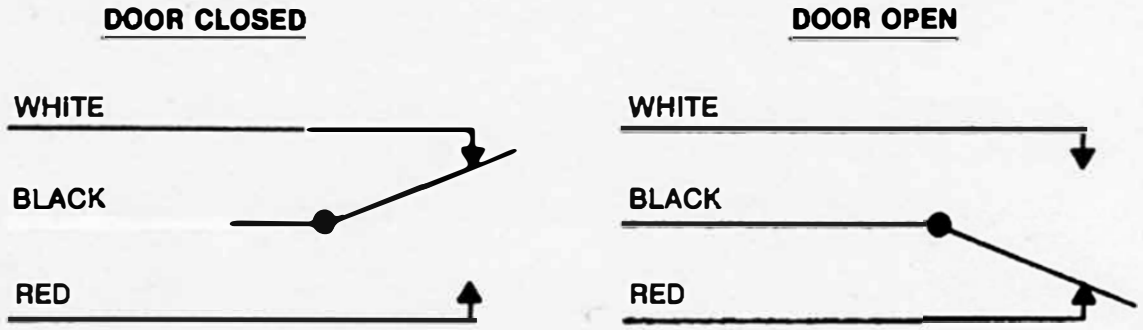
VOLTAGE	MAX. RESISTIVE CURRENT	MAX. INDUCTIVE CURRENT
6VDC or AC	0.300A	0.300A
12VDC or AC	0.250A	0.250A
24VDC or AC	0.200A	0.150A
48VDC or AC	0.150A	0.120A
115VAC	0.05A	0.05A

b. Breakdown Voltage - 250 VDC

III. CONTACTS

a. Form "C" - Single Pole - Double Throw - break before make.

b. Switch contact positions with door properly adjusted:



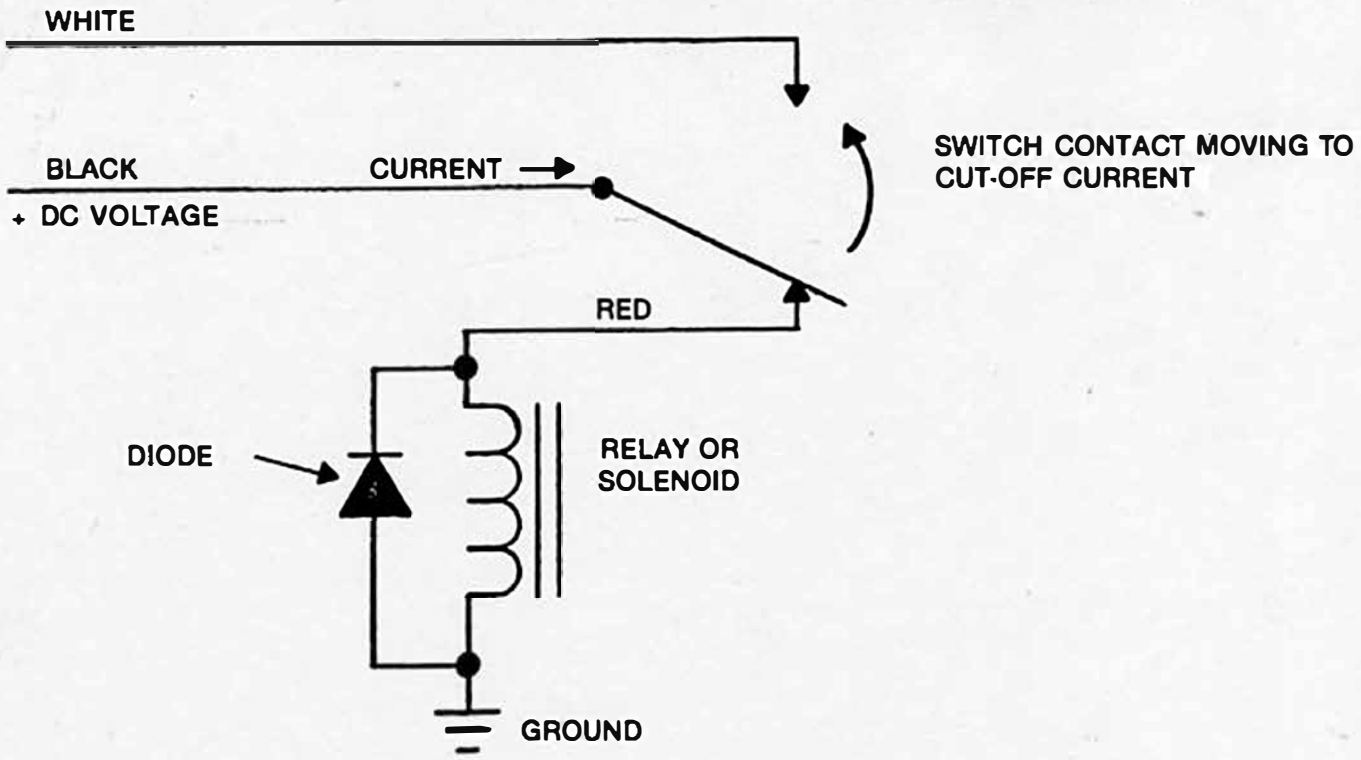
IV. ELECTRICAL PROTECTION OF THE MAGNETIC SWITCH

a. Over current - current that exceeds the electrical ratings (Part ii) can shorten the life of the switch and in extreme cases burn out the switch contacts. A current limiting resistor in series with the black wire (common), sized to limit the current within the electrical ratings, will prevent this condition.

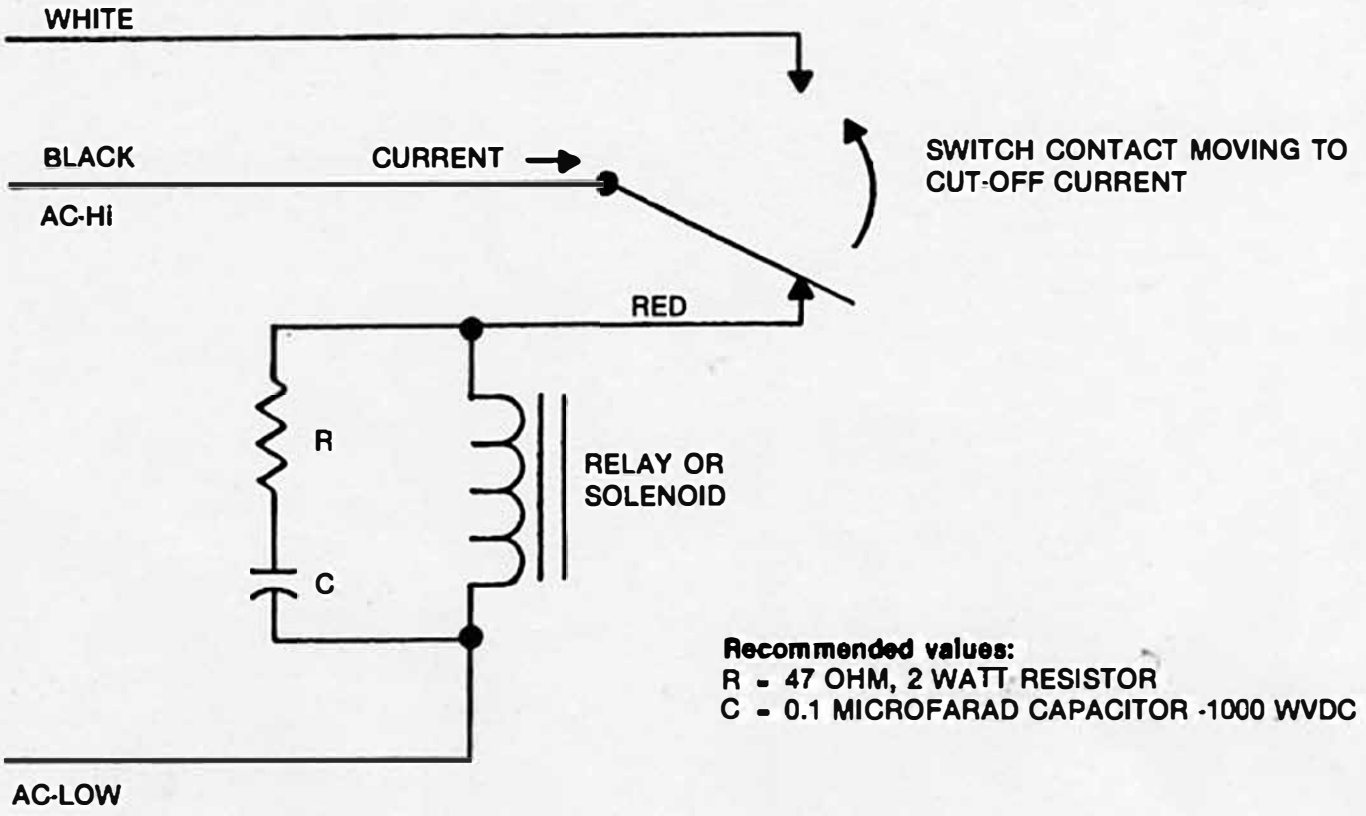
b. The magnetic switch was not intended to supply current to large relays, large solenoids, or large light bulbs. It is suggested that in those instances the switch be used to control a small primary relay, which in turn can supply larger currents to large relays, large solenoids, or large light bulbs.

c. Inductive current thru relay coils or solenoids can generate a very high voltage when it is suddenly stopped (switch changing contacts). The voltage generated can easily exceed the 250V breakdown voltage limit of the switch. The result could be the welding in one position or vaporization of the switch contacts. To protect the switch, it is suggested that the generated voltage be suppressed, as follows:

DC SUPPRESSION Diode placed across coil.
Caution: Polarity is important.)

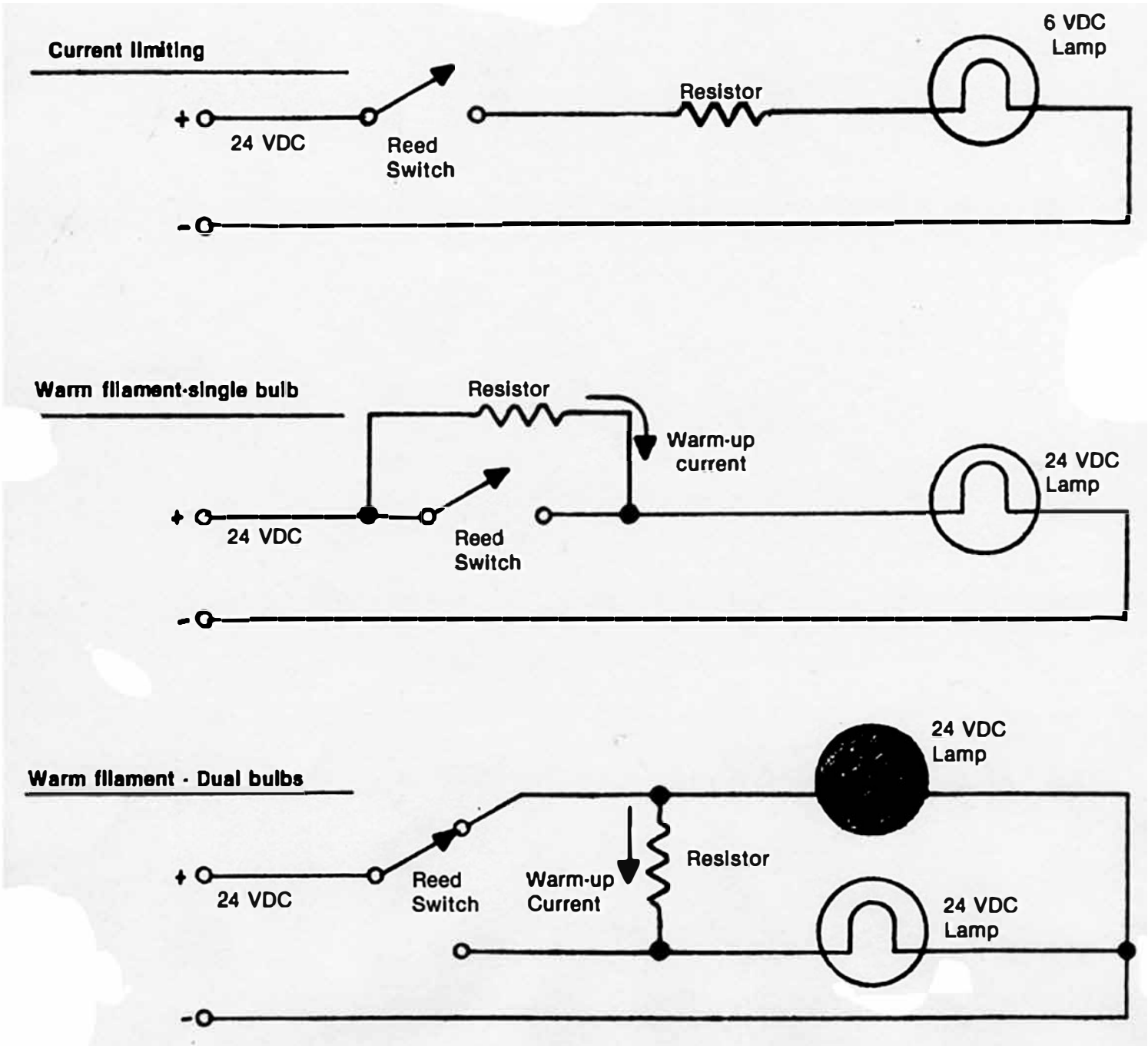


AC SUPPRESSION (Resistor and Capacitor across coil.)



Recommended values:
R - 47 OHM, 2 WATT RESISTOR
C - 0.1 MICROFARAD CAPACITOR -1000 WVDC

Initial lamp (Tungsten Filament Bulbs) current is from 10 to 20 times normal operating current because of the low resistance of the cold filament. This high initial lamp current can weld the reed switch contacts. There are two solutions to the problem (1) limit the initial lamp current with a resistor or (2) keep the filament warm (but not enough to glow). Illustrations show 24VDC, but the range could be from 6 volts AC or DC to 48 volts AC or DC using the corresponding appropriate lamps.



GLOSSARY OF TERMS

VOLT - A unit used in measuring electrical pressure — (as in pounds in a water system).

AMPERE - A unit used in measuring electrical rate of flow — (as in gallons per minute in a water system).

WATT - A unit which shows current drain with both voltage and amperage considered.

OHM - A unit of electrical resistance.

AMMETER - An instrument for measuring electric current in amperes.

AC - An electric current that reverses its direction flow at periodic intervals called cycles.

DC - An electric current flowing in one direction only, and substantially constant in value.

RESISTOR - A device that offers electrical resistance, and is used in a circuit for protection or current control.

SUPPRESSOR - A device used to reduce the flow of current.

REED SWITCH - A relay using glass-enclosed, magnetically closed reeds as the contact members.

SHIM - A thin piece of material used to fill in space, to support, to level, or adjust.