Application Note #1

Transportation, Storage, Handling, Assembly and Testing of AXICOM THT Relays

Electromechanical relays are one of the most robust and most reliable electronic components. In order to achieve and guarantee the excellent performance of AXICOM relays, some precautions must be taken during transportation, storage, handling and assembly and testing of the relays.

Following this guideline enables proper treatment of the relays during the critical phase in the relay life.

A. Transport

In transit, care has to be taken to avoid excessive shock and vibration. Mechanical stress can lead to changes in operating characteristics or to internal damage of the relay (see vibration and shock resistance). If mechanical stress is suspected, the relay should be checked and tested before use. Whenever relays arrive in **damaged boxes** at customer sides, there is a potential risk of transportation damage.



Fig. 1: Proper packing of relays for transportation

B. Packaging

Different packaging is used depending on the relay type and with regard to any specific requirements during shipment or production. THT relays are packed in plastic tubes with stoppers on both sides of the tubes.
Plugs on both sides shall be removed – especially after long storage time – in order to prevent firstly sticking of the relay on the plug and then falling down to the pick place.

C. Handling

Modern relays are high precision components that are sensitive to mechanical stress and abusive handling. Care must be taken when handling the relay during all stages of production. Especially care must be taken, that relays are **not dropped to the floor**. Dropped relays shall not be used anymore and shall be scraped.

D. Storage

Relays should be stored in a clean area within the specified temperature limits. Extreme humidity and condensation can cause corrosion of the metal parts on the inside as well as the outside of the relay. THT relays do not reach the same temperature level as SMT relays and are therefore not considered to be moisture sensitive devices.
Increasing contact resistance over a time period, due to the formation of oxides and other layers, is to be expected for most contact materials. This degradation is dependent on the ambient atmosphere and is more rapid at high temperatures. Special care has to be taken if relays are tested or used with low contact loads after being stored for prolonged periods. Deterioration of contact resistance during storage is reduced in the case of plastic or hermetically sealed relays.

E. Testing

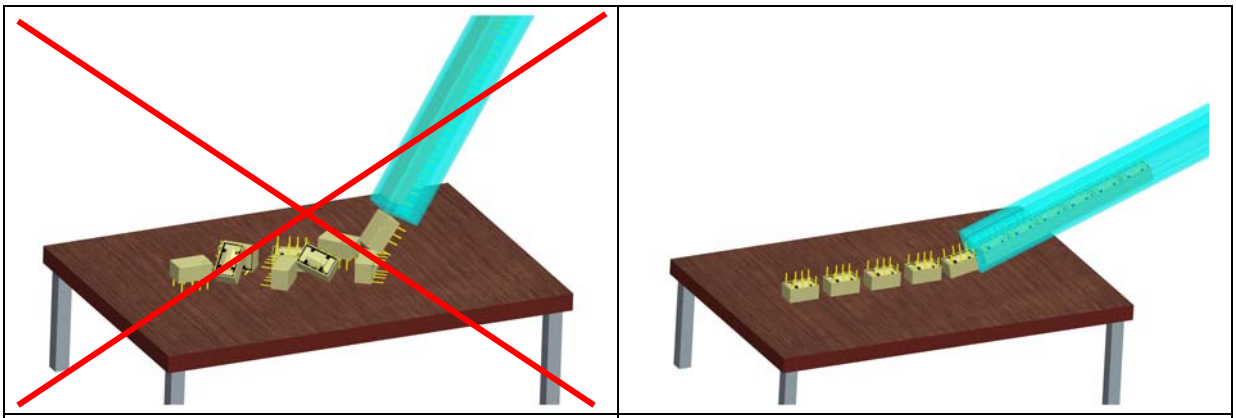
During incoming inspection, special care has to be taken not to bend the relay terminals. Internal failure (e.g. breaking of coil wires) or the degradation of sealing properties could be the consequence.

F. Automatic handling

The handling pressure or force of automatic feeders or robots has to be adjusted to avoid mechanical damage such as cracking the relay case. The design of the relay should be such that when held by its case or inserted into a socket, it does not become detached.
Due to the reduced size of modern Telecom and Signal Relays, they can be placed by pick and place machines with a speed similar to passive PCB components. It is possible to use a mechanical as well as vacuum picker.

G. Manual handling

When relays are manually placed on PCB's, relays shall not dropped into a bin or on a hard table. They shall directly be picked from the tube, in order to prevent bent terminals and excess mechanical shock.
Relays which were dropped to the floor or from a height of more than 250 mm are potentially damaged. After long storage at high temperature it might happen that relays are picking on the plug and are suddenly released. This might cause a major mechanical shock and might destroy the relay.



Do not pour relays from tube not orientated to a hard table	Relays shall be placed carefully on a plate and the plate should be covered with some soft material

Fig. 2: Proper and improper release of relays from the tube.

H. Insertion

When inserting the relay into the PCB, do not press or use undue force on the pins as this may compromise the pin seal or affect the integrity of the coil connections.

I. Clinching

Terminals should not be bent to hold the relay in place on the PCB to aid flow soldering. Bending or cutting the pins after insertion generates extreme mechanical stress, especially in the case of rectangular PCB terminals. Neither the relay performance nor sealing of flux resistant and plastic or hermetically sealed relays can be guaranteed if the terminals have been bent.

J. Fluxing

Fluxing has to be carefully considered depending on the type of relay. Unsealed relays should be hand soldered to avoid flux contamination of the relay. Flux should be used sparingly and evenly and joints examined after soldering. If flow soldering is used however, the flux level should be set so that it cannot flood onto the PCB. This is particularly critical if the PCB is dual tracked and there are unused holes under the *body* of the unsealed relay. Flux resistant and sealed relays may be used with most fluxing procedures due to the seal between the pins and the relay base. The PCB should not be flooded as normally only the pins are sealed and flux could possibly penetrate the relay by capillary action between the relay cover and base. If there is any doubt about the fluxing process, fully sealed relays (plastic or hermetically sealed) should be used.

K. Preheating

Before flow soldering, the entire PCB should be preheated. This is to dry the flux and prevent it from penetrating the relay during soldering. Also, better quality solder joints are achieved as a result of more uniform temperature distribution. Preheating should be carried out at 100°C for approximately 1 minute. Excessive exposure to high temperatures may affect the relays characteristics.

L. Wave soldering

The automated soldering process has to be controlled carefully in order not to impair the performance of the relays. Flux resistant and sealed relays can be used with most dip or wave soldering processes. The solder bath temperature should be 265°C maximum and the soldering time should not exceed 5 seconds. The solder level has to be adjusted so that it does not flood the printed circuit board surface.

M. Hand soldering

If the relays are soldered by hand, the process should be completed as quickly as possible. The same temperature and time limits apply as for wave soldering – A tip temperature of 300°C and a soldering time of 3 s shall not be exceeded.

N. Chemical cleaning

In modern PCB assembly less and less cleaning is used as many no clean fluxes are already available on the market. If cleaning is necessary, certain precautions have to be taken.

Unsealed relays: Only the base of the PCB should be cleaned to prevent penetration of solvent and dissolved flux into the relay. Any other cleaning method involving potential contamination of unsealed relays should be avoided.

Flux resistant relays: Immersion cleaning is not possible with these types of relays. Only the soldered side should be washed and care has to be taken not to allow washing solution to flood the PCB surface.

Sealed relays: Only fully sealed relays should be immersion cleaned. Even then the PCB should be allowed to cool before the washing process in order not to damage the seal due to thermal shock or pressure differential. When using high pressure cleaning processes, special care has to be taken to avoid any ingress into the relay. Liquids under high pressure can damage the seal of the relay.

Ultrasonic cleaning is not recommended as this can cause friction welding of the contacts, especially in the case of gold-plated contacts. If ultrasonic cleaning cannot be avoided, it should be completed as quickly as possible.

Modern cleaning equipment uses water, alcohol or alkaline solutions, which are more environmentally friendly than CFC's. If other cleaning solvents are used, ensure that the chemicals are suitable for the relay. The use of unsuitable solvents can cause cracking or discoloring of the plastic parts.
Suitable solvents include isopropyl alcohol (alcohol-based solvents), water with wetting agents.
Unsuitable solvents are acetone, ethyl acetate, aqueous alkalines, phenolic combinations, thinner-based solvents, chlorosene-based solvents, trichlene-based solvents and chlorine. Fluor-based cleaning solvents like Freon are forbidden today.

Special care must be taken on the temperature of the cleaning and rinsing liquid. The temperature of the washing and rinsing liquid shall be similar and not deviate by more than 10 °C.

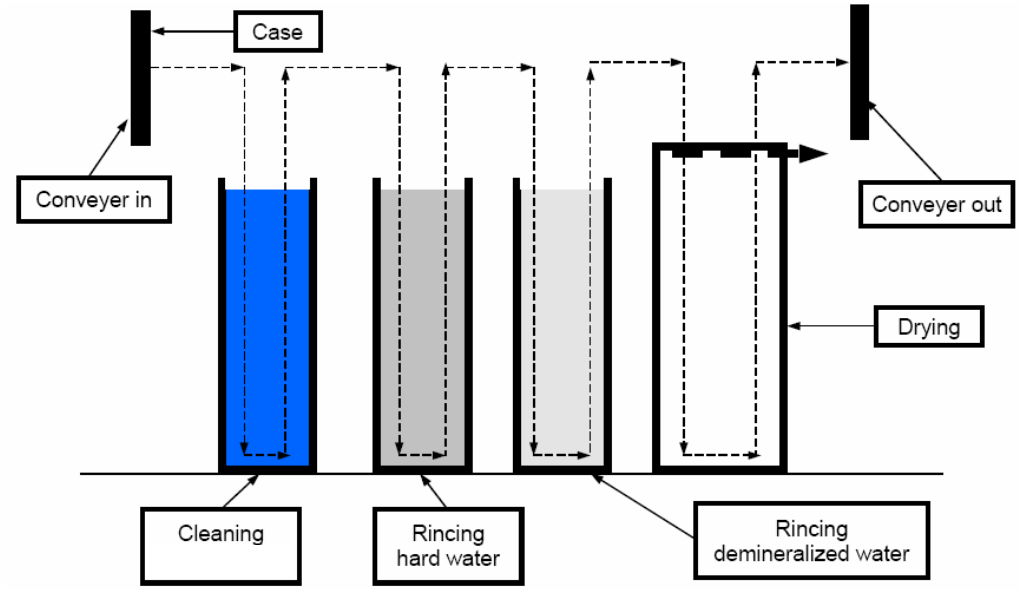


Fig. 3: Cleaning of PCB's. It is most essential to keep the temperature level during cleaning, rincing and drying constant. The temperature shall not deviate by more than ±10°C.

Ultrasonic cleaning is strongly not recommended for signal relays, as this might result in cold welding of the gold contacts.

O.Coating

Coating of relays on PCB's is basically possible. Only relays which are at least wash tight (RTIII) can be coated. In case relays with less protection are coated, there is a high risk that resin will enter the relay and destroy the relay.

Suitable are Epoxy, Urethane and Fluorine coatings. **Absolutely forbidden** are Silicone coatings.

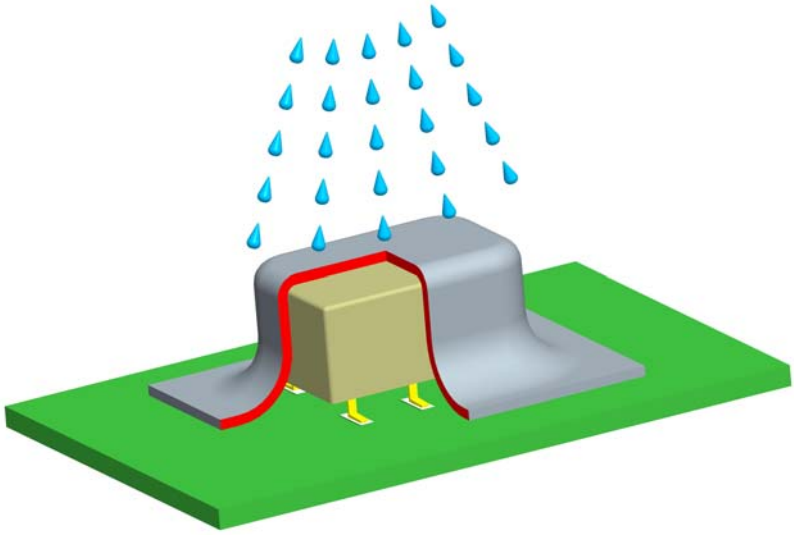


Fig. 4: Coating of relays on PCB's

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TE Connectivity:

3430B2F51RTDF 2377783-2 936348-1 CPF0402B37K4E1 SBCHE64R7K 1-794222-0 141991-2 2005330-1
3631B101LL TE50BR39J MPT100C18RF SBCHE154R7K 1-962915-1 1393431-1 1743455-2 917696-1
CRGCQ2010J3K3 U5254-000005-030PA 1969656-1 2-292161-3 ROX05SJ18R 1903112-2 2310537-1
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