Device Programming Guide

A) Countermeasure for electrostatic damage source

Worker

Avoid touching ICs if possible.
Use anti- static wrist strap and earth it, but prevent electric shock.
Put on anti- static working cloths, gloves, work shoes.

Conductor

Make an earth for working machines.
Make an earth manufacturing systems if its leakage resistance is more than 1,000ohm.
Make an earth metallic objects to avoid charging electrostatic.
Make an earth facilities around high voltage power line.
Reduce leakage resistance under 108ohm for moving objects by using conducting material.

Nonconductor

It is not possible to make an earth for nonconductors.
So, it requires indirect countermeasure.

Substitute conducting material if possible.
Use anti- static processed object.
Avoid to charge electrostatic by using anti- static material.
Control humidity by using humidifier.
Remove electrostatic by using ionizing tool.

B) Countermeasure for electrostatic damage in workroom

Reducing electrostatic charging environment in workroom.
Maintenance countermeasure of anti- static.
Check the environment of IC storage and transport methods.
Training workers about electrostatic.

Avoid directly touching metallic objects or machines to conducting flooring material.
Use insulated flooring material and make an earth.

Working environment guidance (MIL_STD, DOD- HDBK, AMCR, ANSI/ESD/EOS, UL, NFPA)
- Ionizer / blower (Decay time < 3sec, Ion balance = 10nA)
- Anti- static work cloth (R_v = 105 ~ 108ohm)
- Wrist strap (R_g = 1Mohm +- 10%)
- Dissipative Mat (R_s = 105 ~ 108ohm / sqare)
- Conducting shoes (R_g = 105 ~ 108ohm)
- Flooring material (R_s, R_g = 2.5 x 104 ~ 106ohm)

ESD CONRTOL WORKSTATION
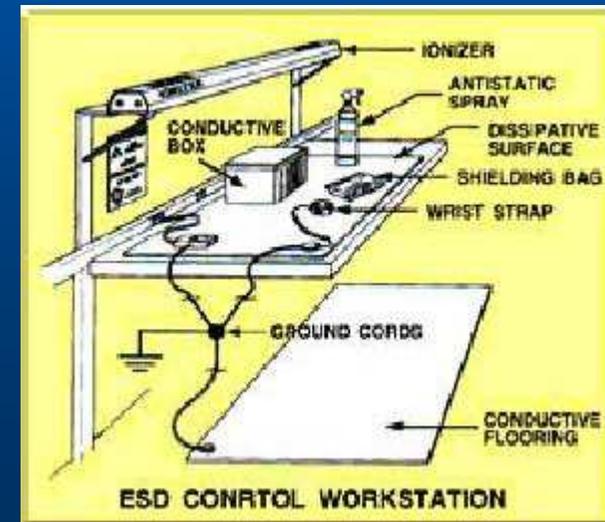
C) Prevent mistakes during device programming

Device confirmation
        IC type) device name, manufacturer, etc.
        IC direction) plugging wrong direction destroy ICs permanently.

Code confirmation
        Check hexa code, checksum is matched or not.

Device configuration confirmation
        If this is not matched, device will not be work properly.

Distinguish devices the front and the rear of programming process
        It prevent to install blank devices to user system.
        If blank chip is installed, system will not be work.

Check programming result
        Check PASS or FAIL devices.
        If FAIL chip is installed, system will not be work.

Check socket 's cleanliness
        if socket is contaminated, programming failure rate is increased.
        Clean sockets with alcoholic acid.
        socket is consumables, and its life time is guaranteed by its manufacturer.
        (< 20,000 times)

A) Destroy devices at a moment

Electrostatic damage is a trouble of electrostatic discharging.

IC is prevented by insulator (oxide silicon).
Electrostatic discharge destroy the insulator.
As a result electro circuit is destroyed permanently.

Destroyed area is too small to see.
Anyway, device will not work properly.

MOS devices are weak from electrostatic discharge.
If discharging voltage is more than 3KV, device will be damaged.

Worker have to care electrostatic charged objects in work room

B) Electrostatic charge in work room

To prevent electrostatic discharging, to prevent electrostatic charging first.
But, it is nearly impossible, because electrostatic charging is occurred by touch or separate each objects.

The first cause of electrostatic charging is human in work room.
Worker is electrostatic charged easily, because of he moves here and there.
Charged voltage is bigger than thousands volt.

Weak device will be damaged when electrostatic charged worker touch a PCB.
At this time, worker does not feel anything, device appearance is not changed too.
Later time, worker find his system is not worked properly.

Metallic objects will be charged during it is not earthed.
And more, semiconductor devices, tweezers, tools are self charged during work.
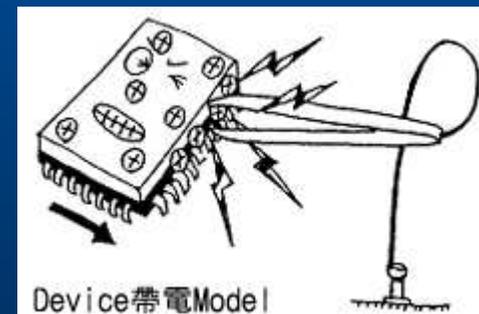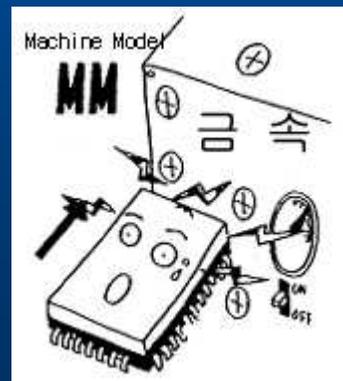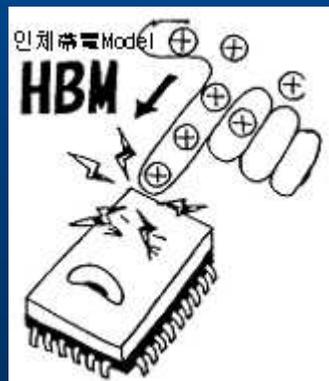
C) Hazard of hidden electrostatic discharge

Friction of objects generates frictional electricity.
Detaching objects makes electrostatic charge.
So, worker must be careful to prevent frictional electricity and electrostatic charge.

IC device adopted protection circuit inside, but this is not enough to protect.
The more integrated and small size, the more risk from electrostatic discharge.
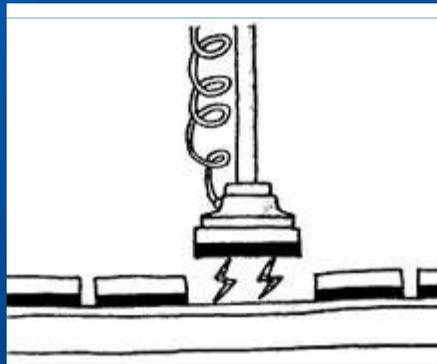
Absorption makes
electrostatic discharge.
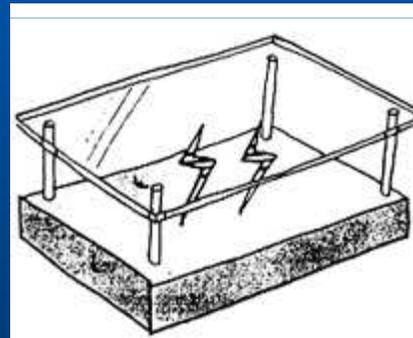
Glass panel makes
electrostatic discharge.

Electrostatic discharging
from worker to PCB during
production.