

**From:** Rodriguez, Eduardo P  
**Sent:** Thursday, May 25, 2006 9:36 AM  
**To:** raymond.degiorgio [REDACTED]  
**Cc:** Gonzalez, Juan C (DMS); Gracia, Carlos; Rivera Alvarez, Jose; Montesdeoca, Jorge; Coniff, John B; Chavez, Jesus; Lin, George J  
**Subject:** Delta process & quality changes in production Line

**Attachments:** Delta Assembly Process and Quality - GM Ray final.ppt  
Ray:

This is the information You requested on our last PDT meeting.  
Attach you will find a description of the process changes that Mechatronics implemented to avoid having problems with contact fingers bent.

According last meeting with GM because the rejection issue of 6 switches, Dan Fernandez wants to return aprox 16,000 switches in stock after PCB and Plunger implementation on 6/30. He will see this issue with his supervisors to know if this can be done and get approvals. Probably in next meeting no one will touch this point until they have an answer from supervisors.  
Jose Rivera copy you in the Meeting next Wed 5/31.

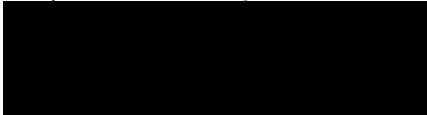
Please, if you need more information or need more details let us know to provide them to you.



Delta Assembly  
Process and Qua...

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Eduardo Rodríguez Pequeño  
Present Product Engineer  
Delphi Mechatronic Systems



# Delta Assembly Process

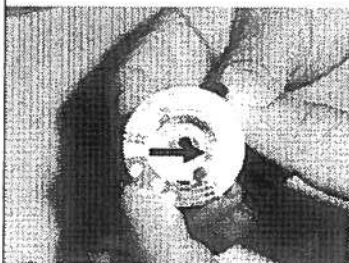
## Old Process

- Manual alignment between rotor and anti-theft sleeve
- Manual assembly of rotor/anti theft sleeve with base and PCB.
- Manual assembly allows the operator to move the rotor creating the possibility that contact fingers could touch the key-in plunger.
- Possible deformation of contact finger affecting Key-In and Run/Crank circuit

## New Process

- Fixture to align rotor and anti-theft sleeve
- Fixture aligns rotor/anti theft sleeve with base and PCB
- Fixture avoids contact fingers deformation with the key-in plunger. This condition is not possible in assembly.
- Contact fingers never touches the key-in plunger, so there is not going to be deformation on the production line.
- Force tester in line to check contact force at working height

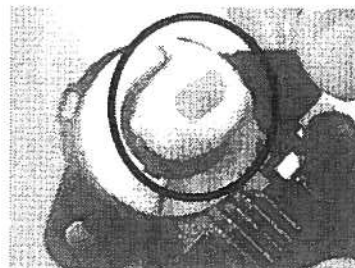
## Old Process



Operator aligns rotor and anti-theft sleeve with hands as shown. The position of anti-theft sleeve is in a slot that the rotor has between the contactors.



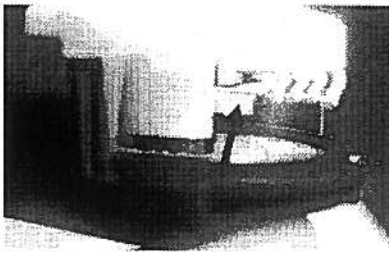
Leg of anti-theft sleeve must enter in the cut out of the PCB as picture. In this process rotor can be moving around the anti theft sleeve, so operator needs to hold rotor steady at the time of the assembly



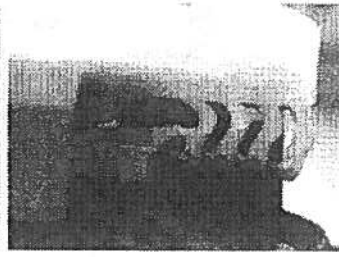
Operator inserts rotor rotor and anti-theft sleeve in the PCB and Base assembly. The Rotor and Anti-theft are not align at this time.



Operator align anti-theft sleeve. In this operation the rotor should not be moving, only the anti-theft sleeve till the mechanical stop.

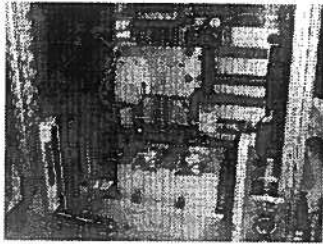


During assembly, the Rotor can be moving around the anti-theft sleeve creating the risk of the Key-In plunger touching the inside contact finger.

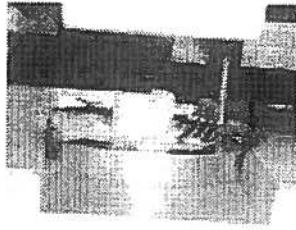


Operator can push the subassembly and produce permanent deformation of the contactor. This can be detected in the EOLT and GP12. But depends on the lock cylinder and Tiers actuation of the switch.

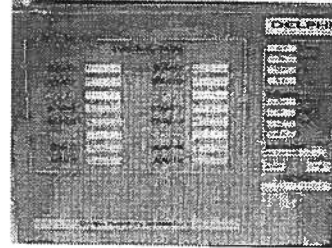
## NEW Process



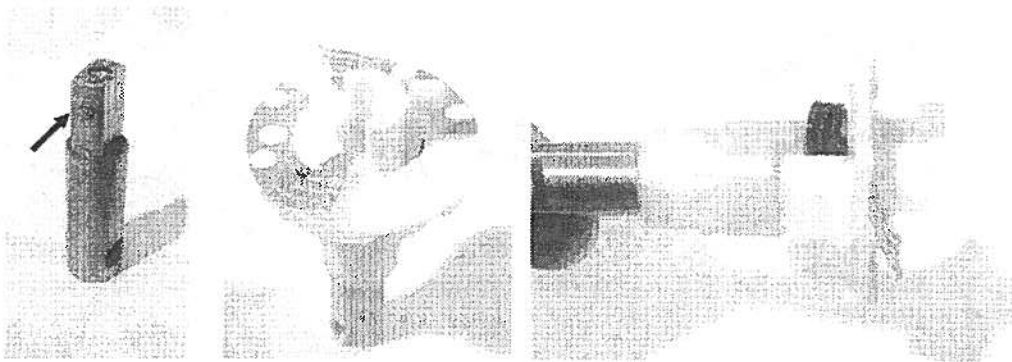
Mechatronics is adding a Force Tester to measure contact force on all the fingers.



Tester checks individual contactor gram force at 2.90mm which is the working height of the switch.



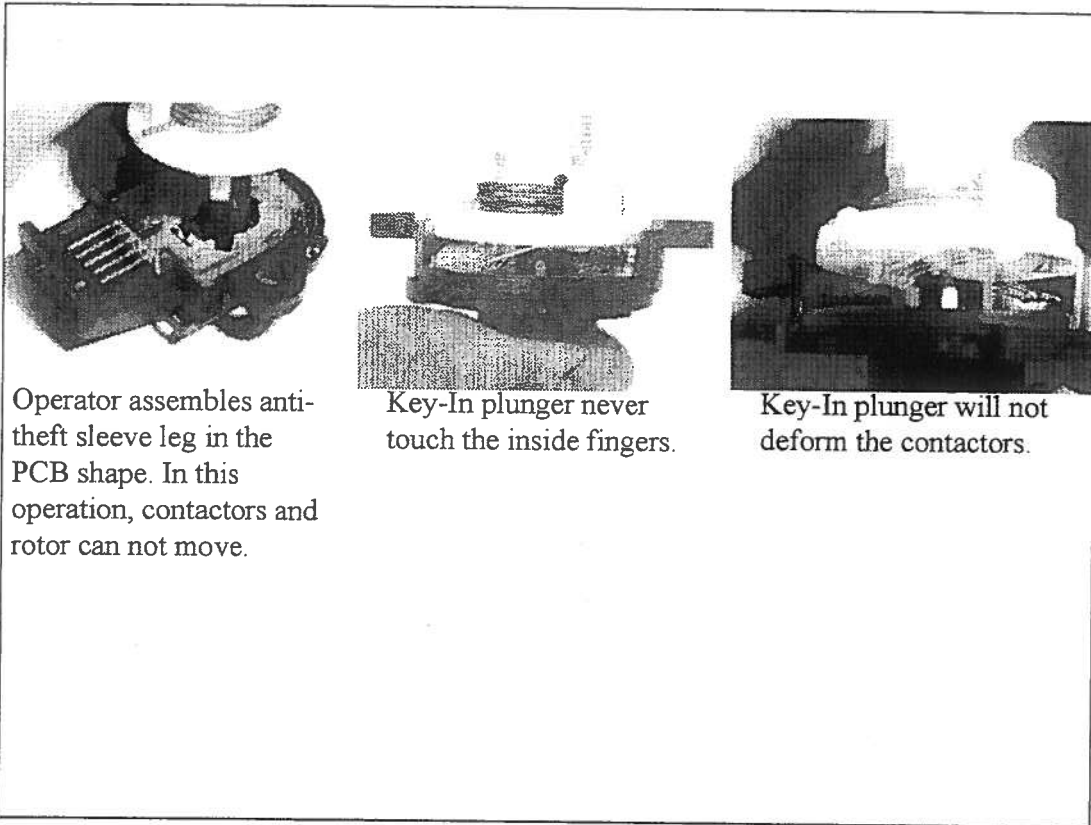
Operator sees the screen and passes or rejects the Contact and rotor assembly.



Operator uses a new fixture to align rotor and anti-theft sleeve. Fixture has a spring to put pressure on rotor to keep it without movement.

Fixture aligns rotor and anti-theft sleeve, position of anti-theft sleeve is set at it's assembled position.

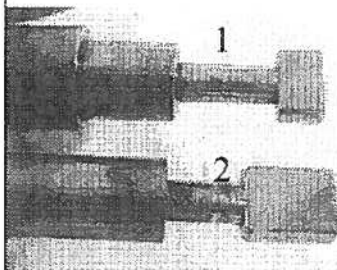
Rotor can not move around the anti-theft sleeve during while the assembly, so contacts fingers are always in the same position in the assembly. Spring inside the fixture is holding the rotor.



Operator assembles anti-theft sleeve leg in the PCB shape. In this operation, contactors and rotor can not move.

Key-In plunger never touch the inside fingers.

Key-In plunger will not deform the contactors.



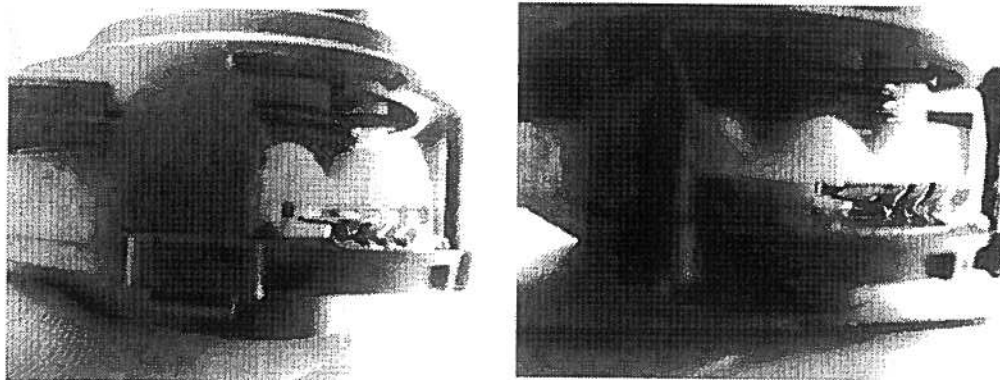
Mechatronics is adding new Dummy Keys for the actuation of the switches before EOLT and scope tester.

- 1.- Old keys
- 2.-New keys

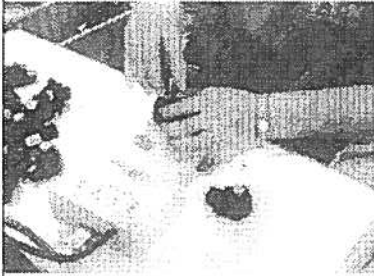
Actuation before EOLT. This key is preventing the actuation of the switch with the KEY-IN PLUNGER extended, which can damage and deform the contactors.

Actuation during GP12 scope tester. New key in this step assures the KEY-IN PLUNGER is always pushed in during actuation.

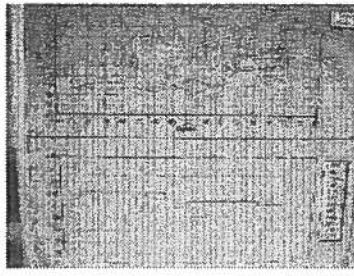




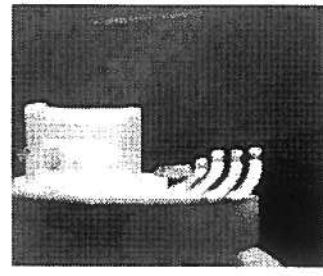
Delta Ignition Switch can be actuated with dummy keys with or without the Key in plunger pushed. This depends on the length of the Key. If it is short, the key can be moving inside and in some cases you can actuate switch without pushing the Key-In plunger.



GP12 Continuity tester do not have the new KEYs because it needs to check the key-in function is working properly. Operator push key several times to see if the function is turning on/off. Certify operation



EOLT is also tracking bounces.



This is what we found in switches rejected from GM last 2 weeks. The contact finger that is close to the Key-In Plunger shows permanent deformation. This affects Key in and run/crank circuits