

# A Solution For The Testing of 'Complex Passives'

**B.J.Frost** CEng MIEE  
Applied Relay Testing Ltd England



[www.appliedrelaytesting.co.uk](http://www.appliedrelaytesting.co.uk)



# Examples of complex passives



- Multiple relays within one housing such as those for ATE matrix applications, automotive window control and redundant safety circuits.
- Relays with in-built over-voltage protection for contacts and / or coils provided by varistors or diodes.
- Connectors with in-built filtering components, for example to limit EMC transmission.

# Why complex passives are becoming popular



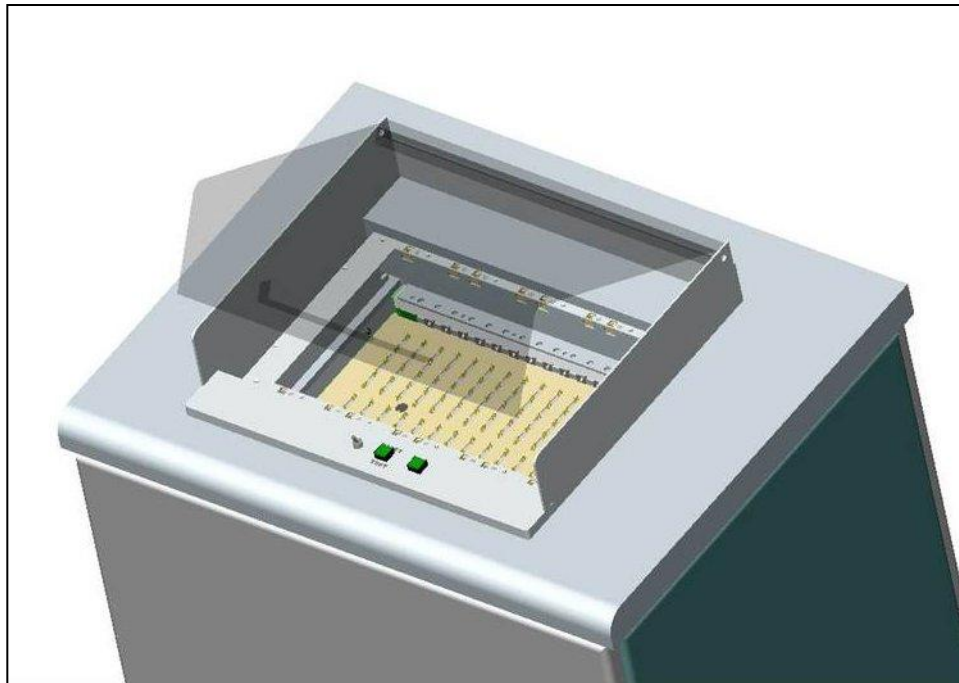
- Improves the modularity and reliability of the system within which it is a part.
- Often improves electrical performance over other solutions – ‘tighter’ environment.
- Has added value attraction for manufacturer and cost efficiency for system designer.
- Can be used to retrofit added capability to existing systems in the field.

# But manufacturing complex passives demands flexibility.



- Manufacturing methods need to be flexible to accommodate higher pin counts, more complex assemblies and probable lower volumes.
- Lead times need to be kept short to respond to customer demands and remain competitive.
- A test capability must be in place that is flexible in both test capability and fixturing to handle these devices.

# ART is introducing a tester for complex passives, the Reflex 950



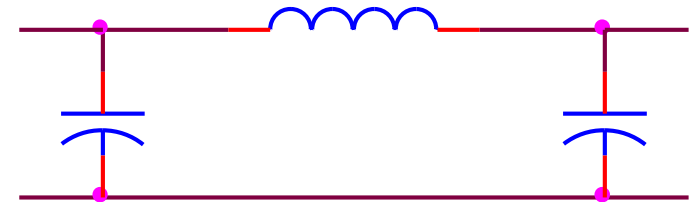
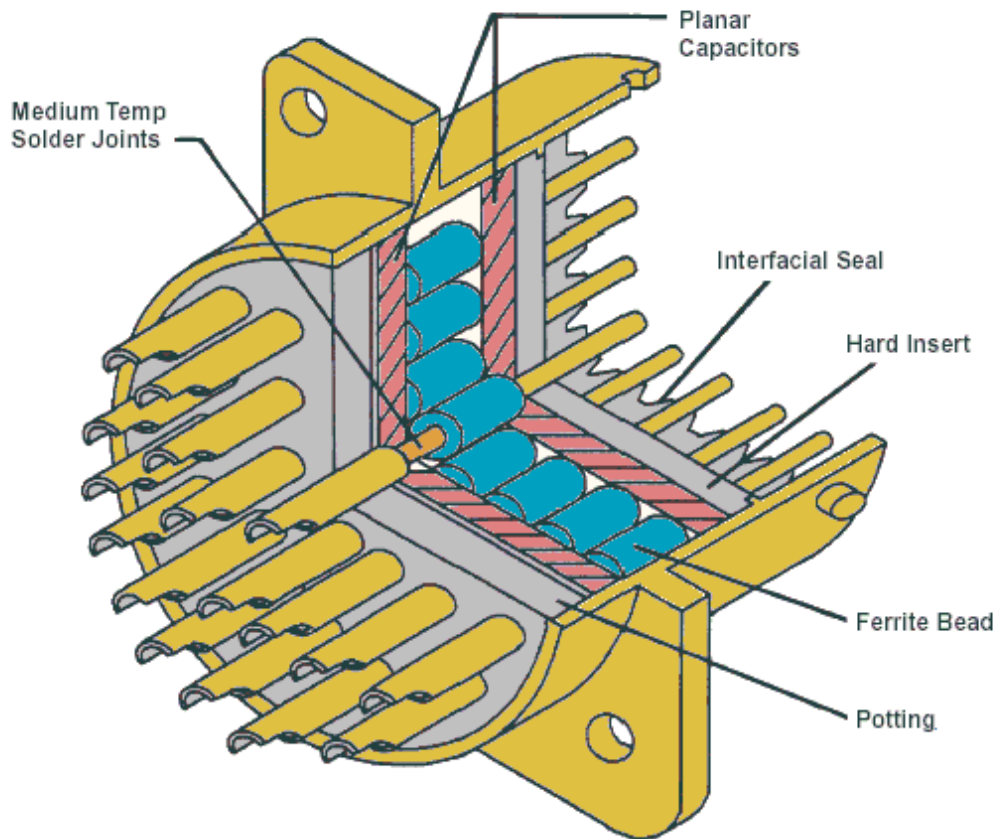
- Up to 160 fully Kelvin pins.
- Wide range of electrical tests.
- Excellent low-voltage performance
- HV tests to >2kV



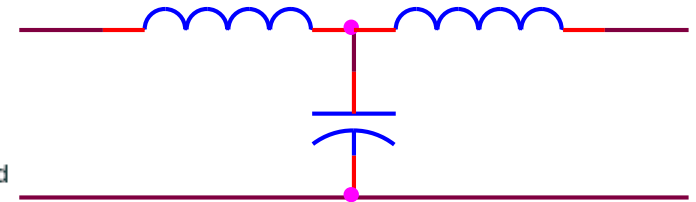
# Reflex 950 main features

- HV tests for Hipot (breakdown) and leakage current (I.R) to +/- 2kV DC, 1500VAC .
- Low-voltage tests for Capacitance, DF, resistance.
- Voltage clamp test (e.g. zener devices).
- Internal GPIB bus for test expansion.
- Integrated zero-force fixture insert for tight electrical environment.

# Reflex 950 test application study – a filtered connector

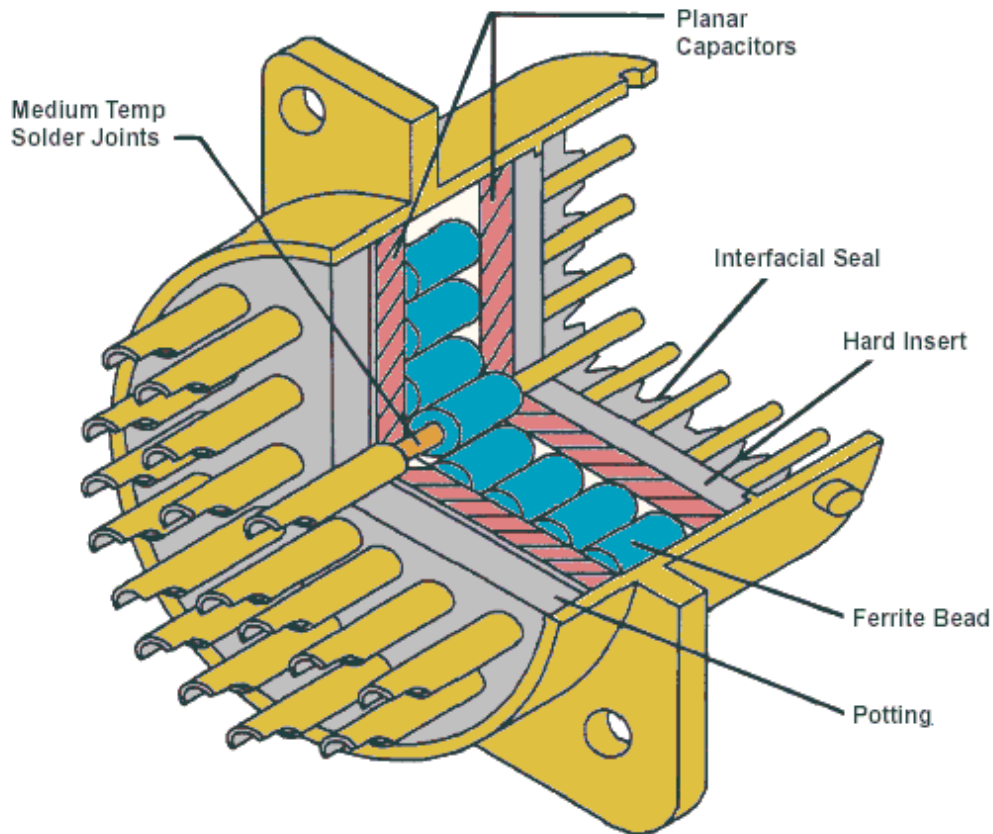


'Pi' Filter



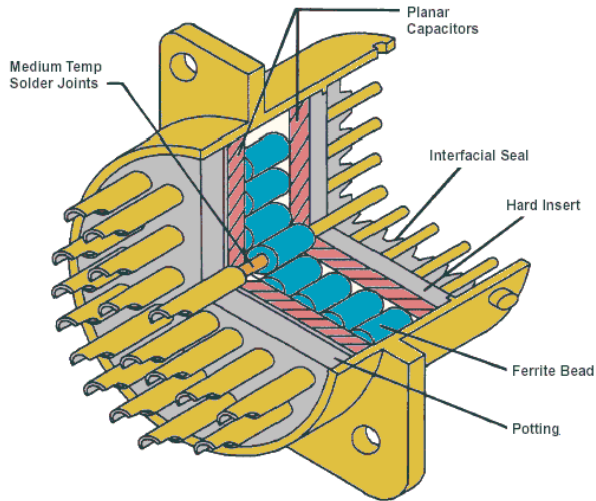
'T' Filter

# Filter connector construction



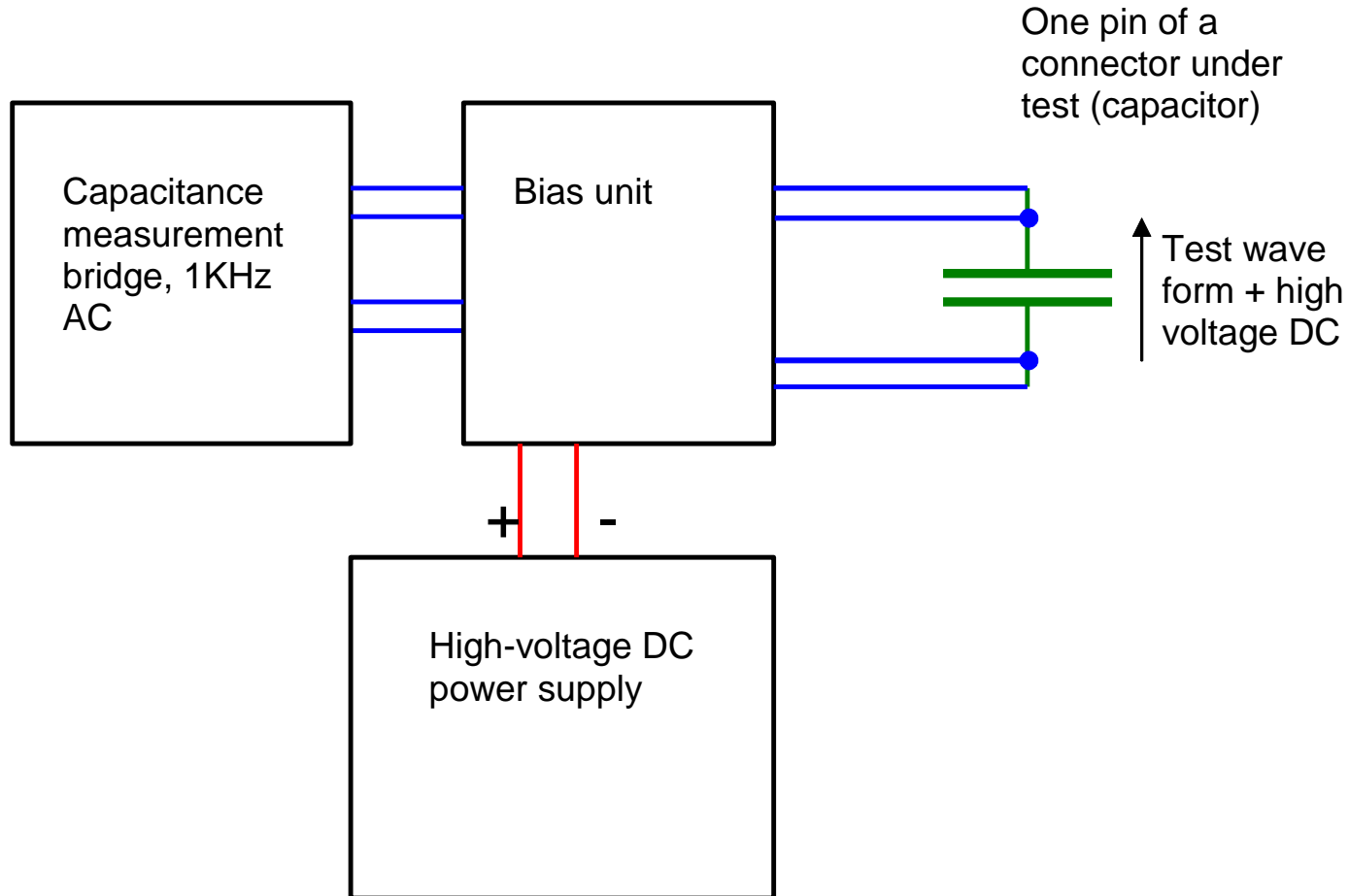


# Electrical tests required on a filter connector



- Leakage (I.R.) between pins and pins-shell.
- Through resistance (a few milliohms).
- Cap / DF of filter.
- Maybe clamping devices (tranzorb / zener ).
- ...so is similar to relay electrical tests.

# Making capacitance relevant – measure at working voltage

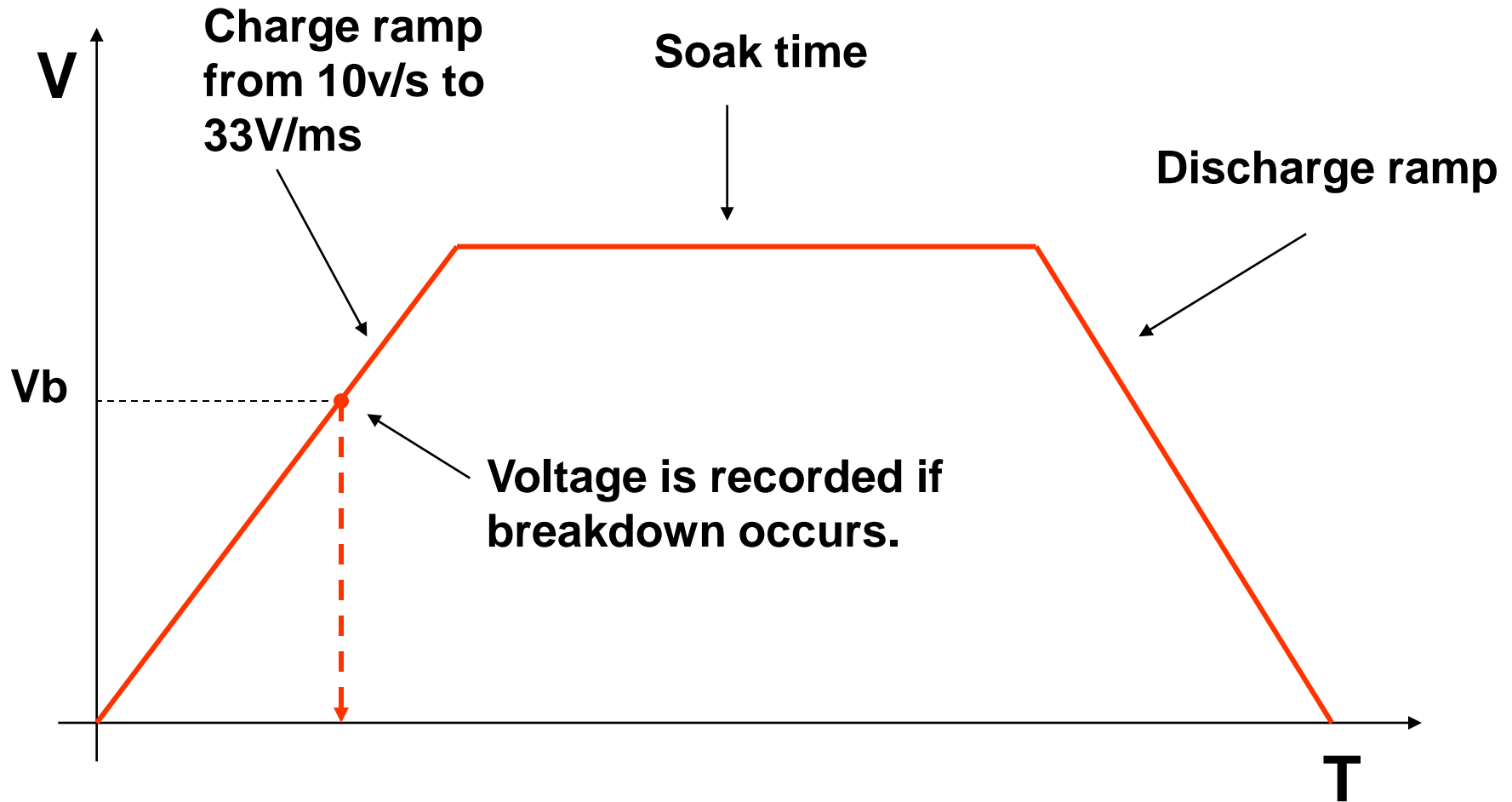


# H.V testing is flexible to permit engineering investigation



- Newer parts are more dense leading to reduced electrical clearances.
- Reduced clearances must be more carefully assessed.
- The Reflex 950 can measure actual breakdown voltage on every test route - not just pass and fail.

# Using H.V test flexibility for investigation.



# High pin count parts require flexible connection management



- Editing the connection details of high pin count parts can be error-prone.
- A visual connection editor can help.
- Visual connection techniques can be used to assist test program designer and also for test progress and failure indication.

# A high pin count connector test route display



Reflex950 software (Designer) Offline

View

Home page

Test data

Choose a test

Reporting

Device pin map

Full pin reporting

Engineering

Home page

Run

Start batch

Operate fixture

Edit device UID

DPM155PinConnector

SHELL

Pass

Tested 1  
Passed 1 100.0%  
Failed 0 0.0%

Narm demo  
Part number --  
Batch --

Full pin report

Device report

Test sequence

✓ 0	Batch definition	Narm demo	
✓ 1	Fuse resistances	9 routes, 1.627 R to 1.953 R (325.09 mR)	
✓ 2	Capacitance measurement	9 routes, 346.899 nF to 555.699 nF (208.80 nF)	
3	Link resistances	----	
4	IR, unfused	----	
5	DWV, unfused	----	

Ready

# Editing large numbers of pin connections



**Edit pin conditions**

9 Routes

Ref	High	Low	Ground
1	111	SHELL	114-115
2	126	SHELL	114-115
3	133	SHELL	114-115
4	136	SHELL	114-115
5	143	SHELL	114-115
6	64	SHELL	114-115
7	72	SHELL	114-115
8	87	SHELL	114-115
9	88	SHELL	114-115

DPM155PinConnector

High  111,126,133,136,143,64,72,87,88

Low  SHELL

Ground  114-115,121,125,132,135,137,142,144-146,151-152,96

Scan method: High stepped to low  Generate ranges  Show all routes

OK Cancel Clear all Swop H-L Help

# Test routes can be shown on any device



Reflex950 software (Designer) Offline

Offline

### Home page

Run

Start batch

Operate fixture

Edit device UID

### Narm relay demo

86 30 85 87 87A  
Coil Com Coil N.O. N.C.

Tested 1  
Passed 1 100.0%  
Failed 0 0.0%

Narm demo  
Part number --  
Batch --

Full pin report

Device report

Test sequence	
✓ 0 Batch definition	Narm demo
✓ 1 Fuse resistances	9 routes, 1.584 R to 1.963 R (379.663 mR)
✓ 2 Capacitance measurement	2 routes, 502.40 nF to 536.669 nF (34.269 nF)
3 Link resistances	----
4 IR, unfused	----
5 DWV, unfused	----

Engineering

Ready



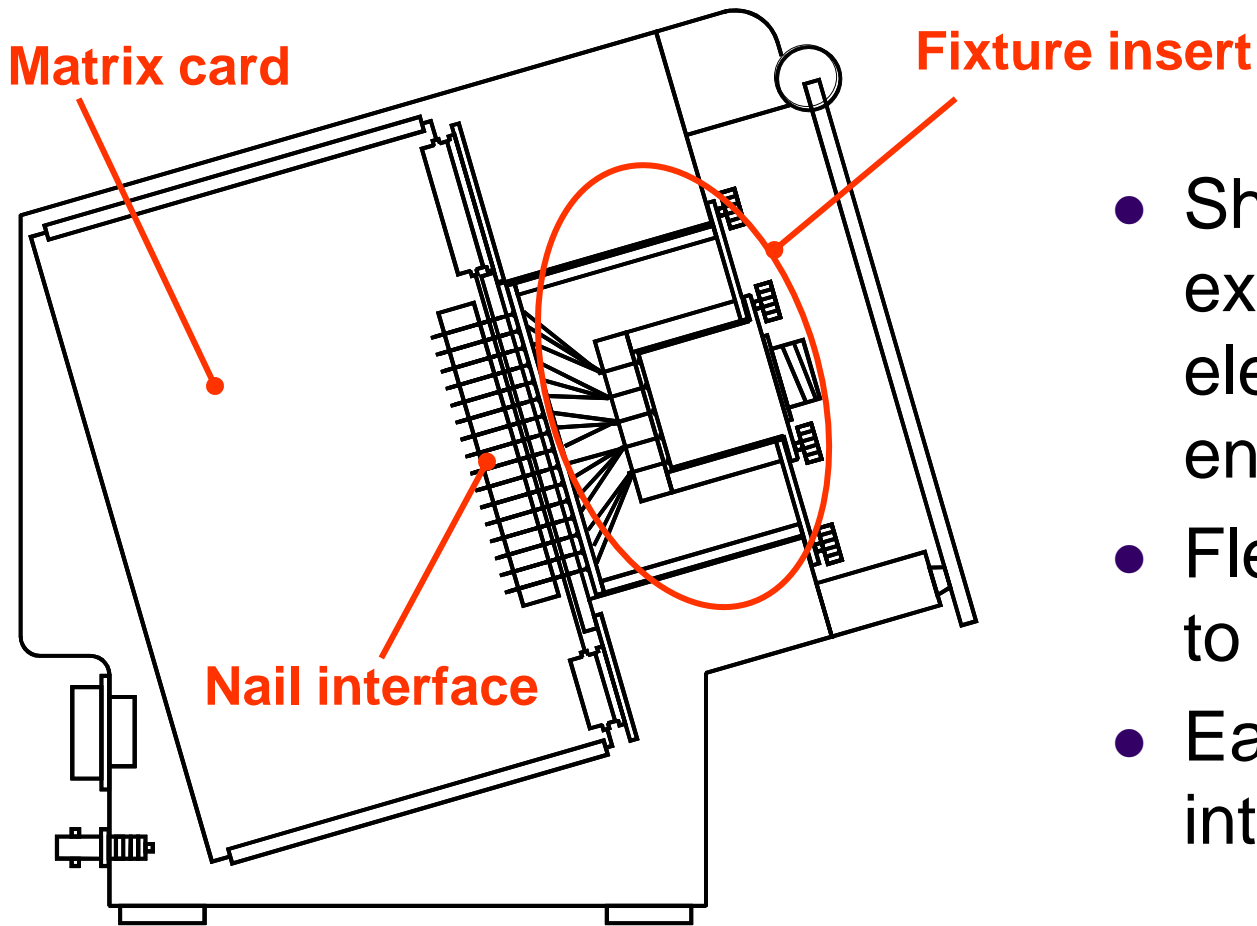
# Flexible fixturing is vital when testing parts with many pins.



- High pin count parts may be low in volume, resulting in frequent test fixture interchange.
- Device should be very close to test electronics otherwise many wires required resulting in electrical test degradation.
- The best solution is an integrated fixture assembly.

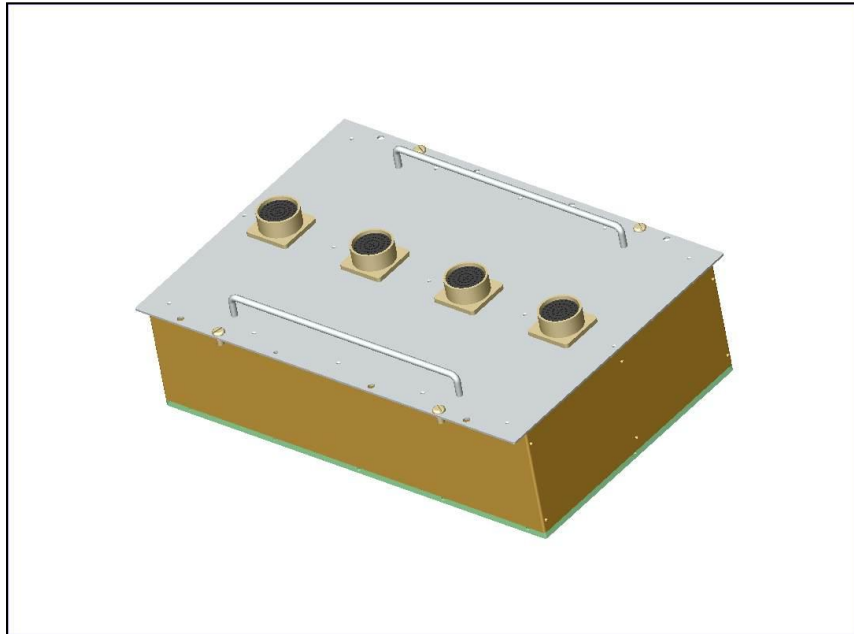


# Integrated fixture principle



- Short wiring – excellent electrical environment.
- Flexible mapping to device.
- Easily interchanged

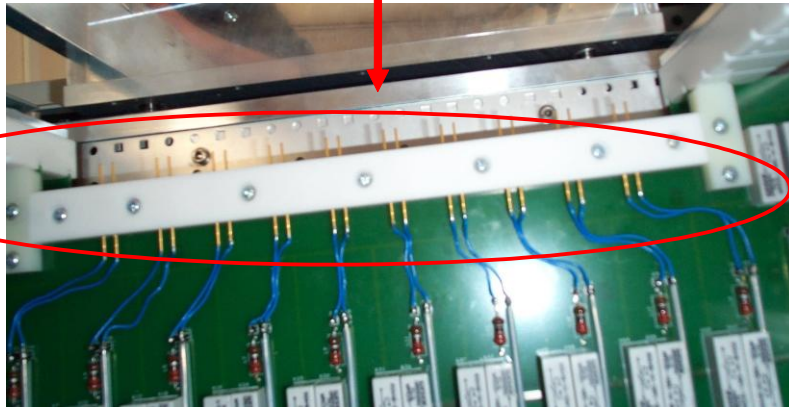
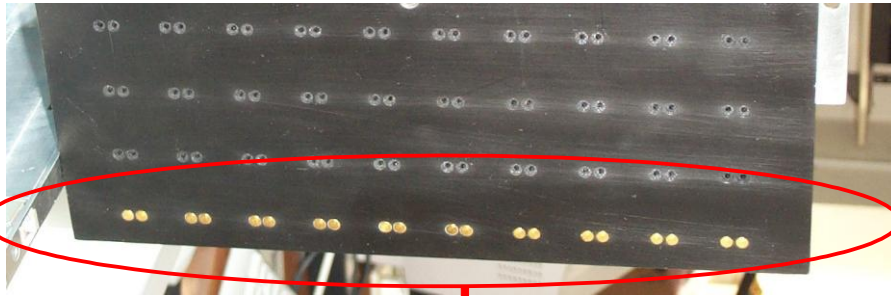
# Test fixture insert design



4-way fixture insert

- 1, 2 and 4-section styles.
- Interchanged in seconds.
- Suits almost any part.
- Fully Kelvin with HV to 4kV+

# Fixture interface with test system



- Gold spring probes mate matrix card to fixture insert.
- Excellent electrical interface
- Mated I.R better than  $10^{14} \Omega$



# Reflex 950 test applications

- Connector testing – filtered devices, individual connectors or harnesses.
- Any multiple passive components - resistor or capacitor arrays.
- Complex relay devices - multiple devices within a package e.g. matrix relays.



# In summary

- Complex passive devices are increasing, opening added-value, niche markets.
- Responding to these parts requires flexible manufacturing and test methods.
- The Reflex 950 complex-passive tester has been introduced as a solution for the flexible testing of these parts.

