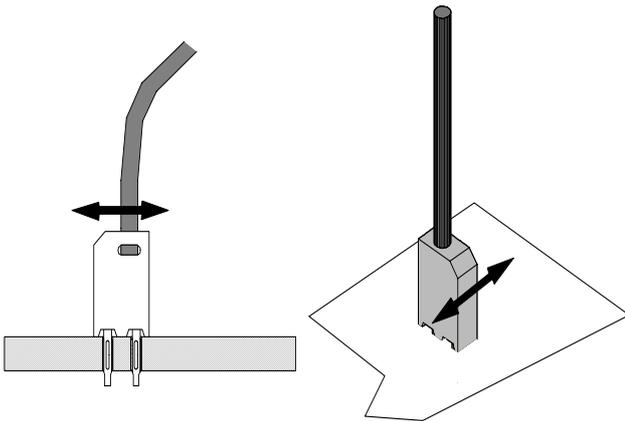


**General:**

Compliant type press fit pin (compliant pin hereafter) is very basic technology for high pin count connector field. Employing compliant pin for press fit coaxial jumper requires several considerations to achieve reliable mechanical/electrical interconnection with only two pins. This memo describes principle of operation of the compliant pin with dual press fit zones used for CJP series Coaxial Jumper Cable.

**Required performance of press fit pin for CJP series coaxial jumper cable:**

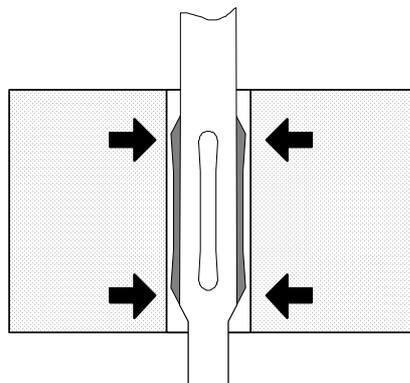
Two press fit pins support each other when pressure is applied in vertical direction, however this mutual supporting mechanism does not work for pressure in horizontal direction. So the pressure of horizontal direction will directly affect press fit zone of the pin. This will result repeating stress, which may cause increase of contact resistance, or other mechanical malfunctions.



The retention force of the two pins should be large enough so that one cannot pull out from through hole by bare hand and remove reliability problem in vibrating environment such as handler interface application. So design target is set to 30N as minimum retention force.

**Press fit pin with dual press fit zones for CJP series coaxial jumper cable:**

To achieve above design target and strain relief against pressure in horizontal direction, press fit pin with dual press fit zone was developed. In this design, two press fit zones are located 2mm apart within each pin. This setup provides strain relief effect to bottom side press fit zone by the top side press fit zone when pressure is applied in horizontal direction. Dividing press fit zone also helped in reducing insertion force without reducing retention force and lowers potential of damaging the through hole. Having two press fit zones emphasize lower contact resistance also. The retention force was measure as 60N to 80N when the pin was press fitted to  $\Phi$  0.8 hole of 3mm thick board. This is well within design target with 2:1 safety factor. The press fit pins are electro plated with gold over Ni.



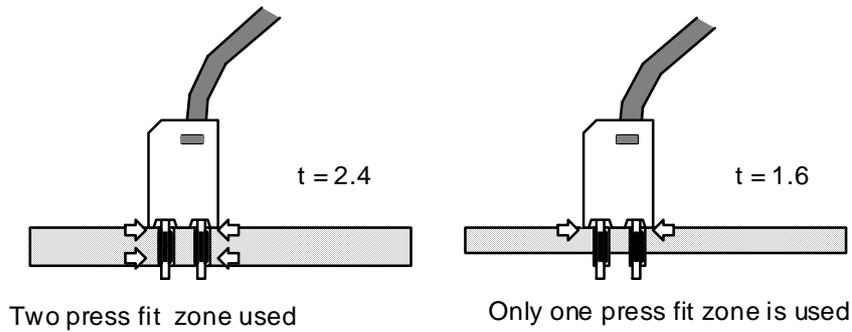
PIN WITH DUAL PRESS FIT ZONES



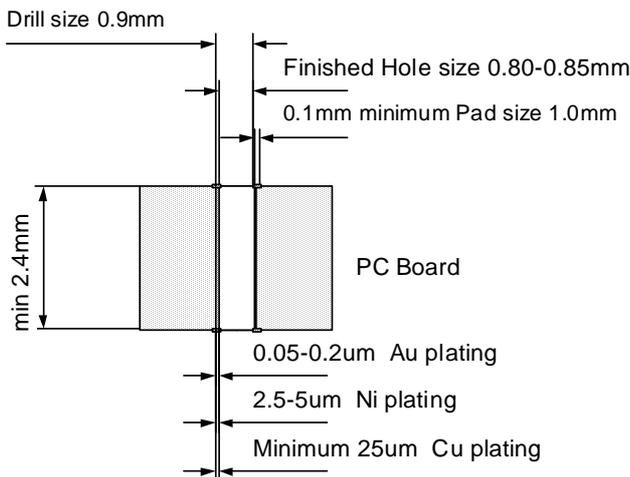
PRESS FIT PIN CLOSE UP VIEW

**PC Board thickness**

Because of the distance between two press fit zones is set to 2mm. Minimum board thickness is 2.4mm(-10%) to use for press fitting as an assembly method. This was assumed as reasonable restriction as tester DUT interface board with thickness more than 2mm is common, as it requires mechanical strength. Boards with thickness less than 2.4mm needs to use soldering method to install coaxial jumper cable.



**PCB Through hole size**

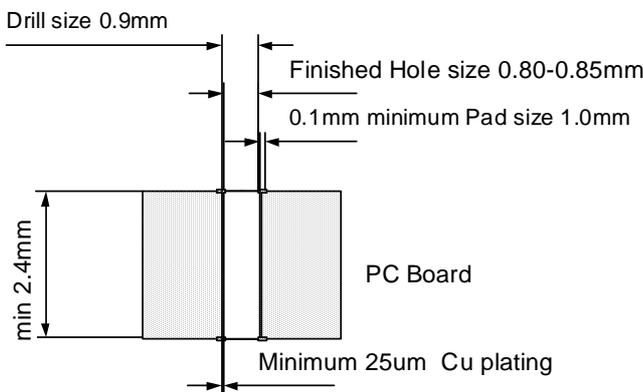


Diameter of the through hole for CJP series jumper cable is  $\Phi$  0.8 mm (0.80-0.85) in diameter.

PCB fabrication process can be any of followings.

- Gold over Ni plating -- Recommended
- Bare Cu. Plating -- Recommended
- Tin plating
- Sn plating

Solder Leveler process (Dip PCB into melted solder bath and blast surface with pressed air) however need close observation of finished hole size as it often catches too much solder in the through hole. Use pin gage for hole size check.



Tin-plating process has reheating stage to remelt the plated solder. This remelting sometimes causes an excess accumulation of Tin in the center of the through hole up to or more than 30um. This irregularity is known as meniscus effect. The press in zone cuts the superfluous tin at the contact area and pushes it into the hole. In worst case, silver of tin may appear at the rim of the plated through hole. Today's modern PCB production techniques have eliminated the problem of uneven distribution of tin. However it is worth mentioning that this type of problem existed.

If the through hole is made with  $\Phi$  0.9mm in diameter, press fit pin will stays in place with enough retention force to avoid slippage during flow solder process.

### **Benefits of compliant pin design over solid pin:**

- Because the press fit zone of pin compresses, the plating of the drilled through hole is saved from possible damage of the through connection to the circuit paths
- The compliant pin allows a larger tolerance of through plated holes
- Reduction of insertion force
- Multiple pressing of pins into the same hole is possible

### **Benefits of compliant pin design over soldering:**

- Eliminates thermal stress which is unavoidable using soldering method
- No contamination by the solder flux and free from solder lugs which cause short circuit
- No deviation of stray capacitance due to the amount of solder applied to the joint
- Lower ecological load (Reduction of lead usage, No need for cleaning solvent)
- Low assembly cost

### **Benefits of compliant pin design for coaxial jumper cable:**

- Elimination of heat stress during press fit process; less heat tolerant coaxial cable can be used safely. CJP series cable is using irradiated formed polyolefin, which is high speed yet very economical.
- Termination of the cable is done with precision forced by the molding process. This will yield consistent performance of the cable.
- Compliant pin internal structure can be designed to minimize impedance discontinuity.
- Compliant pin termination allows accurate testing of cable Tpd and rise time.
- It can be used for very thick board which soldering is extremely difficult.

### **Needs of coaxial jumper cable as a component:**

When operation speed of the circuit was few hundred megahertz, performance of coaxial cable has lot of head margin so that designer did not need to worry about its performance especially when it's length are short. Also as long as cables are directly soldered to PCB, desired performance could be achieved with some reasonable care. However device speed became close to or more than 1GHz, impedance discontinuity between PCB and cable starts to play significant roll of degradation of the waveforms. Even small variation of how the cables are soldered to PCB may show up un-wanted performance variation. CJP series coaxial jumper cable is an attempt to offer cable as a component of which performance is clearly defined in terms of Tpd and rise time.

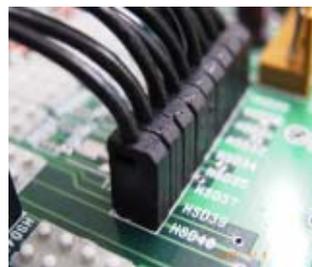
We have developed 64-channel high speed (In terms of rise time) DTDR relay scanner with maximum 25pS of skew. With special adapter, 50 pieces of cables can be tested Tpd by TDT method with single scan.



CJP IN USE 1



CJP IN USE 2



CJP IN USE 3



TPD TEST  
ADAPTOR