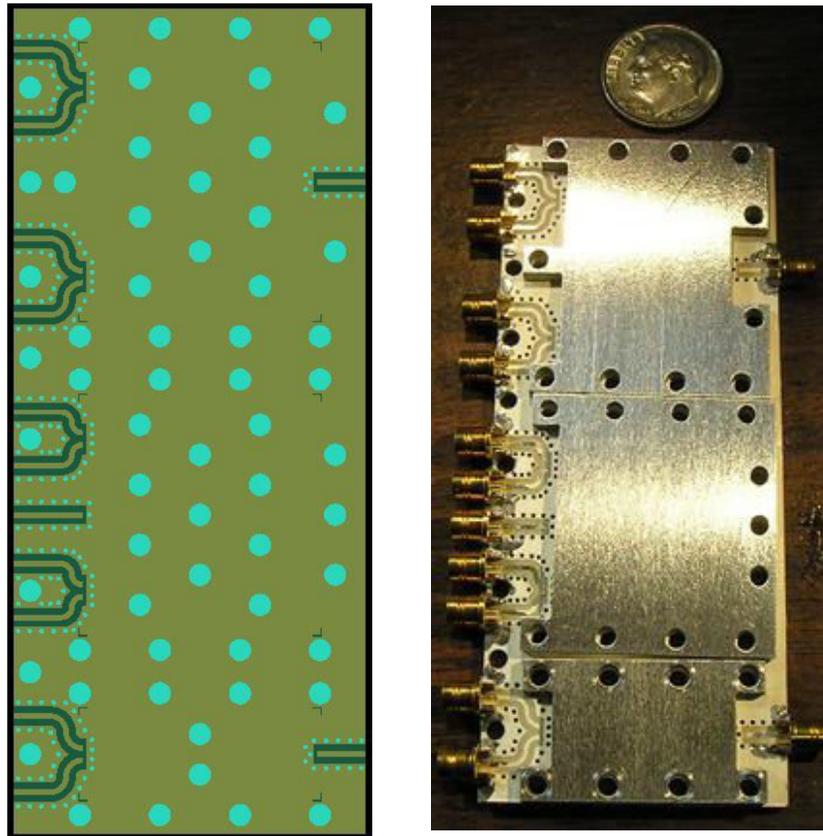




BBTLine's 2-Way And 4-Way Splitter-Combiner-Power-Divider Evaluation Board Cautions

Shown in Plot 1 below is [BBTLine's Evaluation Board](#) For evaluating three different Surface Mount (SMT) RF Splitters:
a) 2-Way, b) 4-Way Version 1, and c) 4-Way Version 2.



Plot 1 - On the left is shown the bare gerber artwork for the evaluation board. On the right is shown the fully assembled evaluation board. The evaluation board has 13 SMP Male Smooth Bore Connectors. The Evaluation Board also has “Pressure Plates” which allow the user to test the Splitters without having to solder the ground planes. The “Pressure Plates” also provide heat-sinking for high power applications. The actual RF Splitters are not shown since they reside underneath the “Pressure Plates”.

CAUTION #1:

If removing and/or installing BBTLine's RF Splitters from the Evaluation Board, only personnel with years of extensive Surface Mount (SMT) re-work experience should undertake this effort.

CAUTION #2:

The dielectric material use on this Evaluation Board is Rogers 3003. **This is a very soft dielectric.** It is very easy to damage the Evaluation Board RF Traces - even with very little pressure from soldering iron tips. When working with the Evaluation Board (and Splitters), minimize the contact pressure between soldering iron tips and the Evaluation Board.

CAUTION #3:

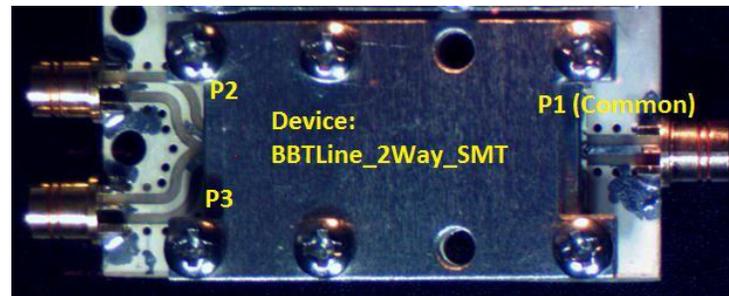
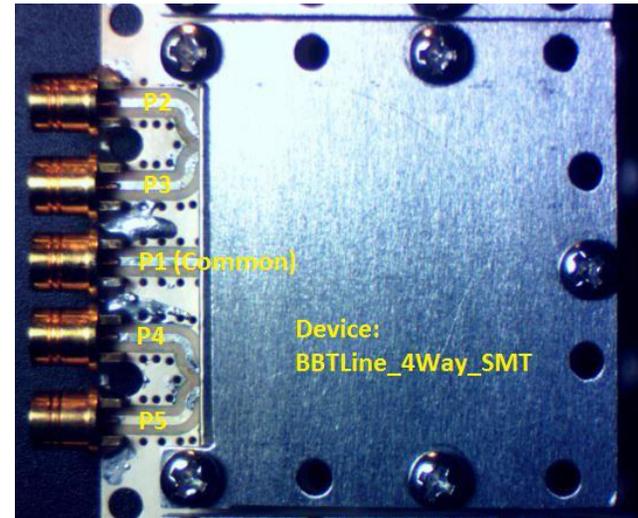
A very fine Surface Mount soldering iron station with associated fine soldering iron tips should be used during all re-work stages. An example soldering station from JBC is shown in Plot 2 below. Tweezer soldering iron tips should also be used (not shown below). Example soldering iron tip part numbers from JBC are : **C105-101** (round tip - 0.1 mm - tips for tweezer tips), **C105-108** (chisel tip - 0.6 X 0.3 mm)



Plot 2 - A JBC “Nano” Soldering Iron Station offers the “fine” soldering capability that is important to work on BBTLine’s Evaluation Boards

CAUTION #4:

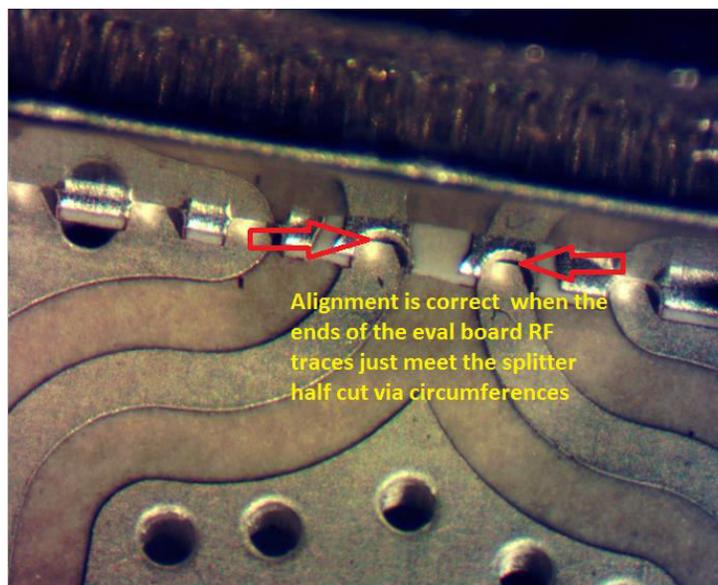
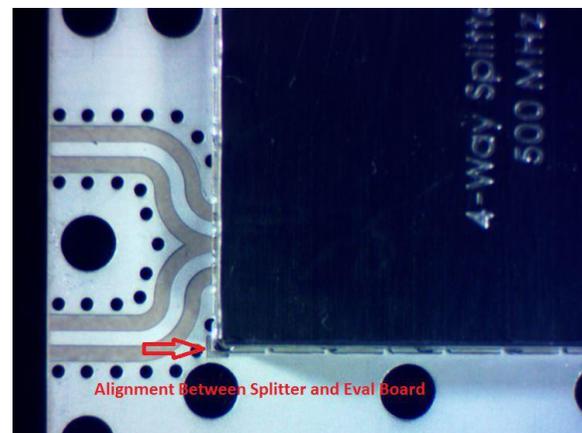
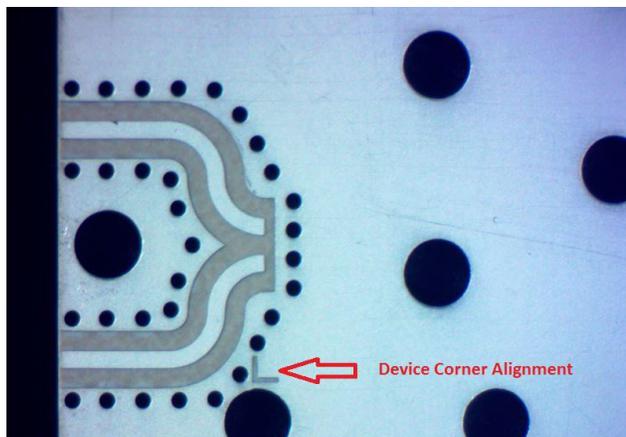
As shown in Plot 3 below, normal 2-56 screws and nuts are used to fasten the “Pressure Plates” to the Evaluation Board. The “Pressure Plates” apply downward pressure to the RF Splitter Shield Cans. This results in intimate, RF-quality, ground contact between the Splitter ground planes and the Evaluation Board ground plane. There are two “Pressure Plates” for each Splitter - one above the Splitter Shield Can and one below the Evaluation Board (not shown). **DO NOT OVERTIGHTEN THE “PRESSURE PLATE” SCREWS** - ensure that a slow, even, and random approach is taken to tightening the various 2-56 screws - this will ensure even pressure over the entire Splitter Shield Can surface.



Plot 3 - BBTLine’s RF Splitters Shown On the Evaluation Board With “Pressure Plates” Applied

CAUTION #5:

As shown in the images of Plot 4 below, precise alignment between the RF Splitter Half-Cut Vias and the Evaluation Board RF Traces is required to ensure optimal overall Splitter RF performance. As shown, the Evaluation Board has alignment features to aid with initial rough positioning of the RF Splitter on the Evaluation Board. The finer alignment check is made by verifying that the Splitter Half-Cut Signal Vias are aligned right to the edges of the Evaluation Board RF Traces as shown below.



Plot 4 - Critical Alignment of BBTLine's RF Splitters Is Required To Ensure Optimal RF Performance

CAUTION #6:

To ensure optimal RF performance from BBTLLine's Splitters, an **absolute minimum amount of solder** should be used at the Half-Cut-Via/RF-Trace junctions. Use very fine solder wick (30 mils wide) from Chemtronics (part number Chem-Wik 2-100L) to remove any excess solder. Also, use Isopropyl alcohol to clean up any flux residue. Use best practices and good judgement for optimal solder joints. Any parasitic capacitance, due to excess solder, will degrade the measurements of the RF Splitters. Note that after Isopropyl Alcohol is applied to the Rogers 3003 material, one should wait at least one hour before making RF S-Parameter measurements (since the Alcohol will have a noticeable affect upon the Rogers 3003 dielectric).

CAUTION #7:

Measuring RF Splitter phase and amplitude balance down to the level that these devices are specified is not trivial. The connectors on the Evaluation Board are Male SMP Smooth Bore style. The SMP Smooth Bore connectors are great from a wear-and-tear standpoint. Due to the smooth mating action, they offer hundreds, if not thousands, of mating cycles before needing to be replaced. However, a Male Smooth Bore connector does not "grab" the Female SMP Cable connector as well as a Full Detente version of the SMP connector would. This means that it is quite easy for misalignment to occur between the Evaluation Board SMP connectors and SMP cables used during measurement.

In order to minimize measurement errors, ensure that a network analyzer SMP calibration is performed at the ends of the SMP Female connectors using an SMP calibration kit. Then, with every effort to minimize cable deformation (from the original network analyzer calibration cable conditions), connect the Female SMP cable connectors to the Evaluation Board Male SMP connectors. Ensure that the SMP connection is flush and straight - you may have to strain relieve the measurement cables in some manner (for example, taping the cables to a lab benchtop) to ensure the stability of this connection.

Cables such as **Huber-Suhner MiniBend LSR** style are very valuable for such an application. They offer a fairly good compromise between cable flexibility and measurement stability for an SMP environment (given that great care is taken to minimize cable deformation right after calibration).

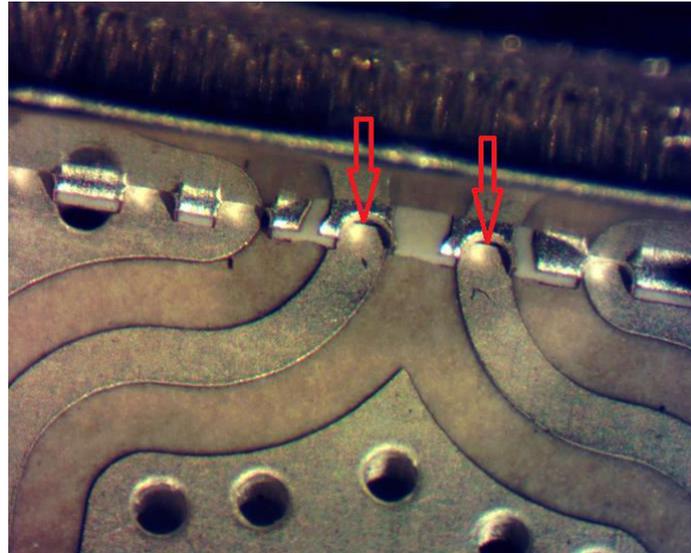
Also, ensure that any ports with female SMP 50 ohm terminations on them have their terminations well-seated.

CAUTION #8:

If removing a Splitter from the evaluation board, use very fine solder wick (Chemtronics Chem-Wik 2-100L). First, wick away as much solder as possible from all Half-Cut-Via/RF-Trace junctions. Note that wicking away solder from the junctions does not guarantee that the Splitter junction is free and unattached from the Evaluation Board - most of the time, the Splitter Half-Cut-Vias will still “stick” to the Evaluation Board RF Traces. **Be very cautious here**...it is very easy to either damage the Half-Cut-Vias or rip up the Evaluation Board RF Traces.

The recommendation here is to apply tweezer-style soldering iron tips to both locations shown in Plot 5 below while also simultaneously providing a **light** upward force on the Splitter (either by using an exacto blade pried underneath the Splitter or fingers pulling up on the Splitter Shield Can). Apply the light upward force and the tweezers until it is noticed that the two junctions are free from the Evaluation Board RF Traces. Keep in mind that the other junctions are still attached to the Evaluation Board RF Traces and that damage may result to other RF Traces if you still keep applying the upward force. Great care and practice is needed here.

Repeat these steps for all other junctions until all Splitter Half-Cut-Vias are free from all Evaluation Board RF Traces.



Plot 5 - Apply Soldering Iron Tweezer Tips At These Locations To Free The Splitter Half-Cut-Vias From The Evaluation Board RF Traces