

Tuning and Test Procedure RTC5-800 and RTC5-400 RA/RB/RC/LL



Figure 1 - The RTC5-800R (*) Trunking Combiner

1. Related Documents

Specification, assembly drawing and product specification sheet for specific unit.

2. Responsibility

It is the responsibility of the tester to ensure that the device under test meets all test procedure criteria.

3. Special Tools and Test Equipment

HP8752A Network Analyzer or equivalent, associated cables, Res-lok T Connector, Short-circuit connector, SMA T-Connector, 50 Ohm test loads.

4. Safety Warnings

Standard shop safety practices are to be followed.
Note: Never tune a Combiner under transmitter power.

5. Device Description

The RTC(*) 800 (*) series is a Transmitter Combiner utilizing dual isolator in a configuration that assures easy expandability and field tuning utilizing test ports provided. The RTC series combiners are available in 5, 10, 15 and 20 channel versions.

6. Standard Test Conditions

This procedure is written for qualified technical personnel familiar with the test equipment and devices under test.

Test procedure approval is performed by Sinclair Engineering and/or Quality Assurance depts.

In the event of a failure, removal or repairing of the device under test, the tests which were being performed when and before the failure occurred shall be repeated. (Complete re-test is usually required)

7. Special Test Instructions

Verify that the specified frequency, insertion loss and isolation are within specification.

Test personnel will set up the device under test and test equipment in accordance with appropriate test method. The test setup will use parts, cable and components as indicated in the instructions.

8. Test Method and Specification

The combiner under test shall be connected to an appropriate matched signal source at the desired frequency or frequency range through a return loss measuring device (network analyzer) that has the characteristic impedance equal to that of the transmission line.

Visually inspect all connections and cables.
Ensure the test equipment has valid calibration.

Record and verify or make note of as required the model number, serial number and frequency range of the unit under test.

This test will verify:

- a) Isolation dB
- b) Return Loss (output) dB
- c) Return Loss (Input) dB
- d) Insertion Loss dB
- e) Tuned operating frequency and bandwidth as specified.
- f) Tx input isolation.
- g) Tx to test port attenuation

9. Initial Preliminary Tuning Procedure.

Prepare For Tuning

With reference to Figure 2 (a) identify the 5 Tuning Rods, 4 coupling loops through holes, 1 Tuning capacitor, 2 output (O/P) connectors, all located on the top panel. All input (I/P) loops are located on the side of each cavity.

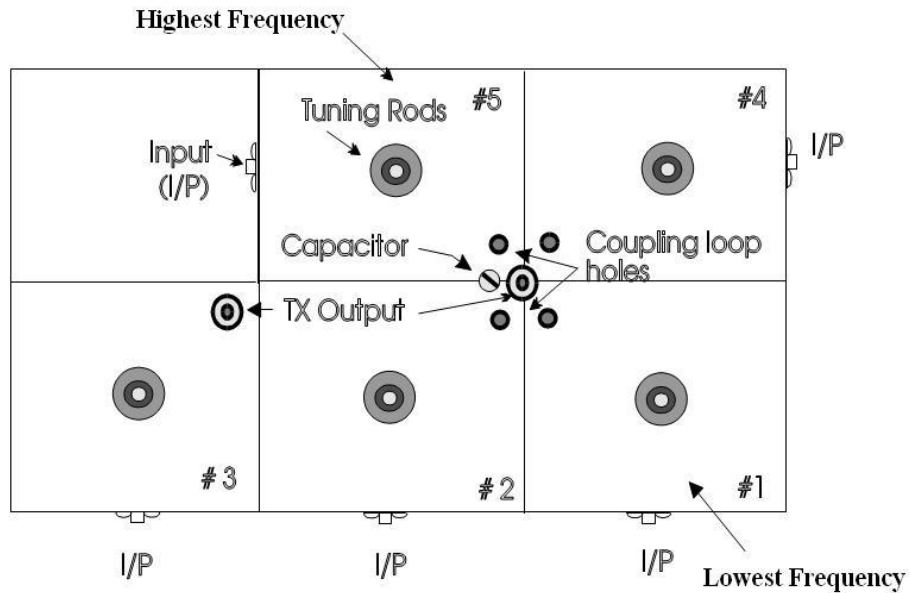


Figure 2(a) RTC Cavities Top View

Approximate mechanically the input side-loop setting as shown in Figure 2(b).

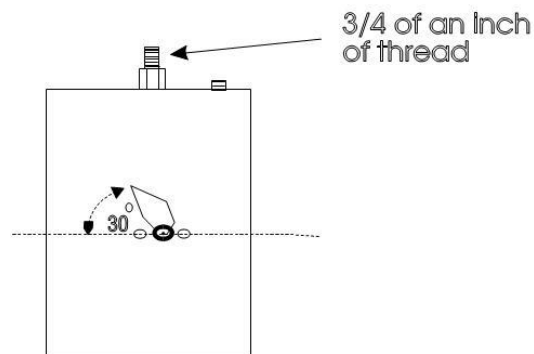


Figure 2 (b) - Approximate side loop and rod settings

Single Cavity Tuning Procedure (Cavity #3)

1. Approximate mechanically the input side-loop setting as shown in Figure 2 (b).
2. Set up analyzer for null measurement. Refer to Figure 3 (a), with the Res-lok T connector and Short Circuit Termination, tune cavity #3 to its frequency. Rotate the O/P loop and set null to the desired depth as recommended in the Cavity Setup Chart.
3. Refer to Figure 3 (b) install the SMA "T" connector on the input port and short circuit termination on output port of cavity #3, Rotate the I/P loop and set null to the desired depth as recommended in the Cavity Setup Chart.
4. Setup as Figure 3 (c), check insertion loss, return loss and bandwidth against the Chart, make necessary adjustments to the null settings to achieve desired results. Balance I/P and O/P return loss.

HP Network Analyzer

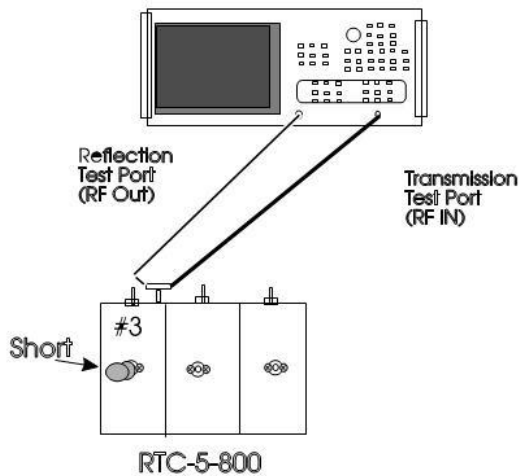


Figure 3 (a) - Top loop null setting

HP Network Analyzer

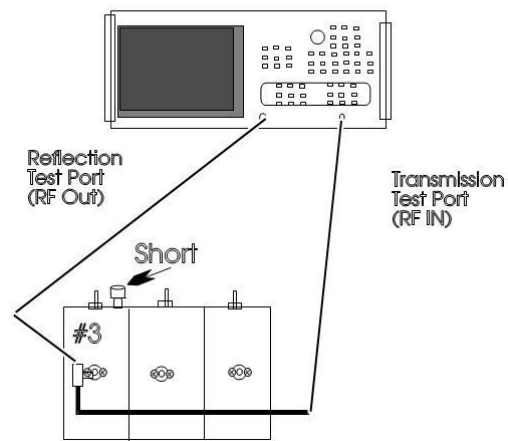


Figure 3 (b) - Side-loop null setting

HP Network Analyzer

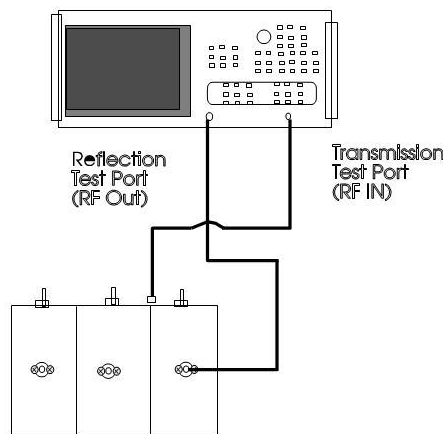


Figure 3 (C) - Insertion loss and return loss check.

Four-Pack Cavity Tuning Procedure (cavities 1,2,4 and 5)

Note: When a cavity of the four pack is under initial testing and tuned to its passing frequency, it is necessary to de-tune other three cavities approximately 5 MHz away from the frequency being tuned to avoid any interference they may cause.

5. Adjust the tuning capacitor at the output port all the way up.
6. Set up the input loop as in a single cavity tuning procedure, see steps 1 & 2.
7. With setup as in Figure 3(c), adjust the loop at the output port (through hole on top plate) so the input and output return is balance.
8. Check insertion loss and bandwidth against the chart; make necessary adjustments to the null settings to achieve desired results. Ensure input and output return is balanced at all time.
9. Repeat steps 6 thru 8 for the other three cavities.
10. With setup as in Figure 4, install harness and tune all cavities to frequency by reading the output return loss. Balance the return loss curve by adjusting the capacitor.
11. Check input return loss, refer to the cavity setup chart for specification. Adjust the output port loops slightly to achieve the desired input return loss figure.
12. Ensure the both input and output return loss is 14 dB or better.
13. Install isolators, test port cables and RF detector on tested unit.

HP Network Analyzer

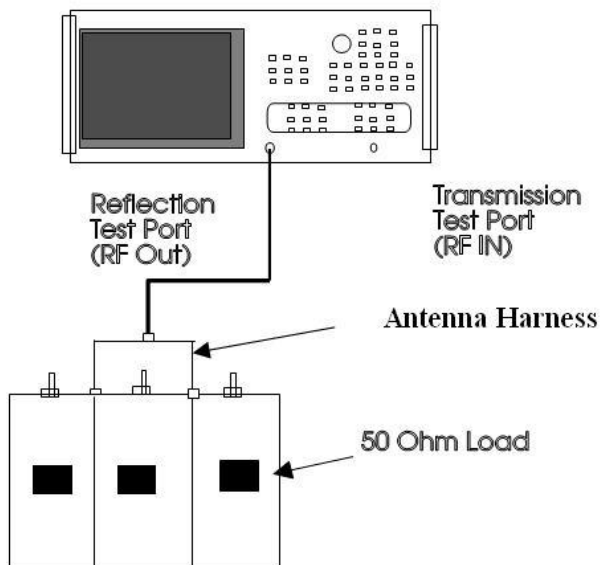


Figure 4 - Output return loss with antenna harness installed

HP Network Analyzer

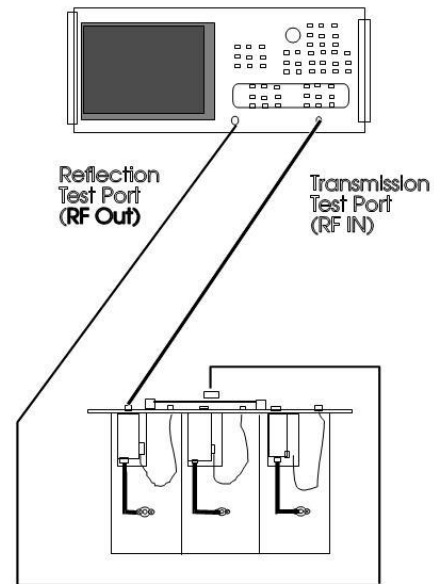


Figure 5 - System test with antenna harness and isolator installed

10. Final Tuning Procedure

1. Set up and calibrate the network analyzer to facilitate spec measurements.
2. Connect the combiner to the test setup as shown in Figure 5.
3. Verify tuning by checking the output return loss response curve. Minor tuning and balancing may be necessary by adjusting the tuning rods and capacitor. Return loss figure should be over 10 dB at all tuned frequencies.
4. Check for reverse power isolation of each input port (60 dB minimum).
5. Reverse test lead connections; minimize insertion loss of all five ports by fine adjustment of the corresponding tuning rod.
6. Check Isolations between Tx inputs for > 70 dB. Check Input to Test Port for approximately 30 dB attenuation.
7. In the case of 10, 15 or 20 channel units install proper antenna junction harness and repeat steps 1 thru 7 for all ports of each combiner.
8. Secure all tuning nuts, screws, cables and connectors. Verify all specifications are met. Adhere all required labels and document test results.

RTC5-800RALL					RTC5-800RBL				
<i>Loop Setting Null</i>		<i>RL</i>	<i>IL</i>	<i>6dB BW</i>	<i>Loop Setting Null</i>		<i>RL</i>	<i>IL</i>	<i>6dB BW</i>
TOP	SIDE	23.5	0.75	1140 KHz	TOP	SIDE	16.5	1.40	700 KHz
16	16.9		↓		0.81	12.1		12.8	

RTC5-800RCLL					
<i>Loop Setting Null</i>		<i>RL</i>	<i>IL</i>	<i>6dB BW</i>	
TOP	SIDE	14.7	1.73	628 KHz	
6.6	8.4		↓		

RTC5-400RC				RTC5-400RB					
<i>Loop Setting Null</i>		<i>RL</i>	<i>IL</i>	<i>6dB BW</i>	<i>Loop Setting Null</i>		<i>RL</i>	<i>IL</i>	<i>6dB BW</i>
TOP	SIDE	15.3	1.73	575 KHz	TOP	SIDE	17.5	1.3	618 KHz
6.75	6.7		↓		1.75	8.4			

Cavity Setup Chart