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	Title: ***TP, STX 165 Transmitter CCA***		

REVISION LIST

REVISION	DATE	DESCRIPTION	BY/APPROVAL
1	20090318	Initial Draft	FEF68926

PURPOSE

This document describes the procedures to test the STX 165 transmitter board, 305689-XX-B.

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1 INTRODUCTION

Circuit Card Assembly 305689-XX-B is one of the CCA's used to make up the STX 165 & 165R. This procedure pre-tests the hardware assembly of this CCA.

1.1 TEST EQUIPMENT

The following is a list of equipment required to test the 305689-XX-B CCA. Equivalent equipment is items that can perform the same functions with equal or greater accuracy than the item used.

- 2 Digital Multi-Meters, Fluke 26III or equivalent
- Two adjustable DC power supplies. One Capable of at least 1 amp at +50Vdc and another capable of .5 amp at +5.8VDC. Note: A single DC power supply capable of .5 amp 11-33 volts and a known working STX 165 power supply 305691-XX-C can be substituted.
- Dual Channel Oscilloscope.
- HP8594E Spectrum Analyzer
- HP4538 Analog Power Meter
- Agilent 33220A Function Generator
- HP 8752 Network Analyzer
- RF adapter Kit
- 10 Watt 30dB RF Attenuator

2 Testing Caution

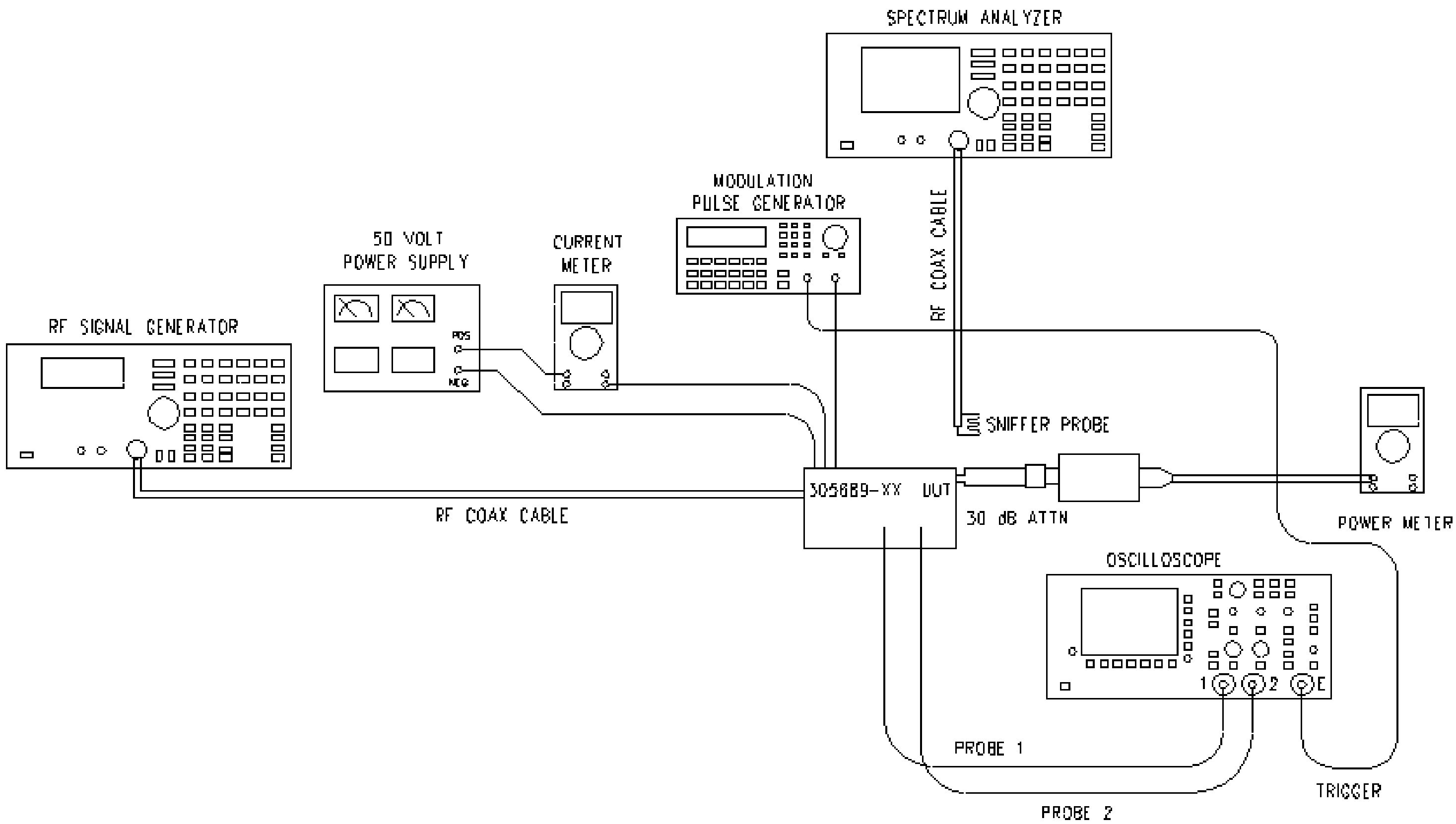
Devices of the 305689-XX-B CCA are ESD (Electro Static Discharge) sensitive. Test personnel shall observe manufacturing ESD procedures whenever servicing the 305689-XX-B CCA. Additionally, when picking up the circuit card assembly, try to ground your body to the ground of the circuit card assembly by holding the shell of the SMA connector. This ensures that your body and circuit ground are similar before touching components of the circuit card assembly.

3 Test equipment set-up, calibration and CCA pre-set

3.1 Setup

Setup the UUT to the test equipment as shown below.

Figure 1: Basic Test Setup



3.1.1 Understanding analog power measurements of pulsed RF signals

Pulsed RF is bursts (pulses) of RF with no RF present between pulses. The most general case of pulsed RF consists of pulses of a fixed pulse width (PW) which come at a fixed time interval, or period (T). Pulses at a fixed interval of time arrive at a rate or frequency referred to as the pulse repetition frequency (PRF) of so many pulses per second. Pulse repetition interval (PRI) and PRF are reciprocals of each other.

PRF=1/T=1/PRI

The actual power in pulsed RF occurs during the pulses, so in order to measure with an analog power meter, it shall be necessary to obtain an average value of power. The average value is defined as the level where the pulse area above the average is equal to area below average between pulses. The average area is equal to the average value of power multiplied by the pulse period.

P(avg) X T= P(peak) X PW

or

P(avg)/P(peak) = PW/T = PW X PRF = PW/PRI = duty cycle

The ratio of the average power to the peak pulse power is the duty cycle and represents the percentage of time the power is present.

To express the duty cycle as a percentage, multiply the value obtained by 100 and add the percent symbol.

Example: Pulse width of 300nS and a pulse period of 130uS.

300nS/130uS=.00231 X 100 = .231% duty cycle ratio

Duty cycle (dB) = 10log(duty cycle ratio) 10log(.231) = -26.36dB.

In order to use an analog power meter to measure a pulsed RF signal, it is necessary to convert the duty cycle to dB. Duty cycle (dB) = 10log(duty cycle ratio) Ex. 10log(.231) = -26.36dB. Thus, the average power would be 26.36 dB less than the peak for the given example.

3.1.2 Calibration

Note: A 30 dB attenuator on the output of the transmitter board is necessary to protect the power meter from overload and potential damage.

Before any RF measurement can be performed, it shall be necessary to establish actual attenuator loss used for the test. With a HP 8752 Network Analyzer or equivalent, set-up for a transmission measurement and test 30 dB attenuator for loss. Ex. 30dB attenuator actual loss = 29.1dB@1090Mhz.

Per the example above, by adding the actual attenuator loss plus the duty cycle in dB will give the equivalent level of power required to achieve 0dB as measured with the analog power meter.

Attenuator loss + Duty cycle = 0DB = 29.1dB + 26.36dB = +55.46dBm = 351.56W

3.1.3 Test Equipment Connections & Settings

Adjust 33220A function generator as follows: Set waveform for a pulse period of 130uS and a pulse width of 300nS. Set duty cycle to .231%. Set peak to peak amplitude to +3.3v with reference to ground. Connect 3320A function generator to the modulation input P9-3 & ground respectively. **Turn output off**

Connect 4538 power meter with 30 db attenuator to output connector (J1) of 305689 transmitter pcb with appropriate adapters. Set scale to 0dB.

Set spectrum analyzer to a center frequency of 1090 MHz and a frequency span of 100 MHz respectively. Connect sniffer probe with coax and place in the vicinity of Q1 without contact of the pcb (verify stability during test—-no spurs or oscillations).

Connect oscilloscope channel 1 to junction of Q3 pin 2 (drain) and L3. Connect channel 2 of oscilloscope to junction of Q6 pin 2 (drain) and L1. Connect oscilloscope external trigger input to 33220A function generator and use external triggering for oscilloscope.

Connect 50volt power supply with current meter to P9-5 & ground. **Make sure it is off before proceeding.**

Connect RF signal generator to J8 on 305689 transmitter pcb and set to 1090 Mhz CW no modulation with +5dBm signal. **Switch RF power off on generator**

3.1.4 CCA Pre-sets

See Figure 3 and perform the following:

Solder jumper pads of R26 together for duration of tests.

Pre-adjust C7, C8, C9 and C15 to midrange.

Pre-adjust R13 fully counterclockwise.

4 Power Supplies

Set the external Power supply to 50.0V ±.75V.

Verify that the Power Switch to the UUT is in the OFF Position. Connect the UUT as shown in Figure 1. Power the UUT by turning the power supply switch on and assure that the current draw of the UUT is within XXmA ±10mA. Next, measure the following voltages and verify that they are within the tolerance specified.

4.1 Main 5Vdc Supply

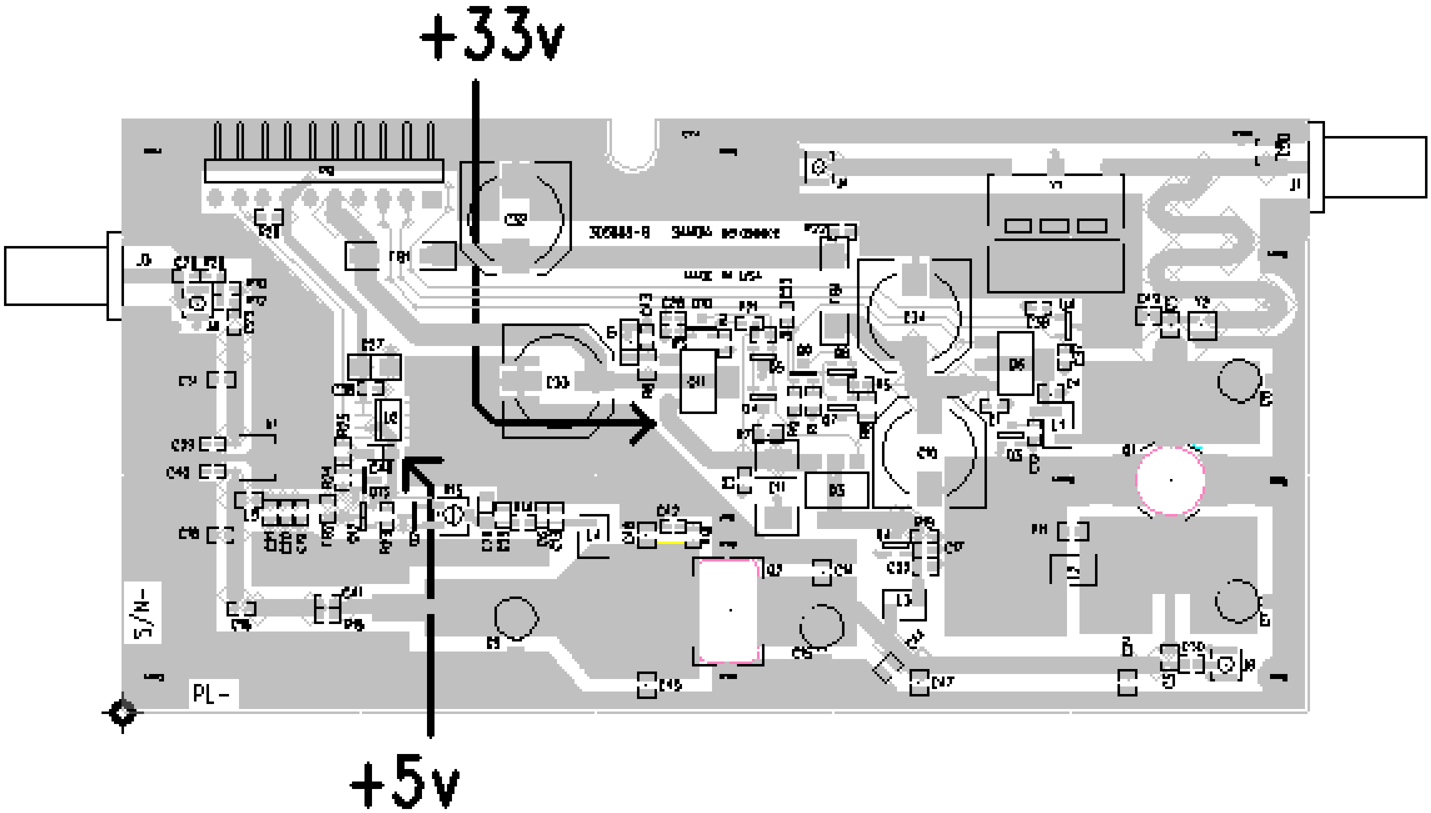
Measure voltage with DMM at junction of U2 pin 3 and C48. Record results on TDS. 5Vdc ± 50mV.

4.2 33Vdc Supply

Measure voltage with DMM at junction of Q11 emitter and C11. Record results on TDS. 33Vdc ± .75V.

Note: See Figure 2 for location of measurement.

Figure 2: Power Supply Test Points



5 Transmitter alignment

See Figure 3 for remainder of tests.

5.1 Q2 gate bias

Observe channel 1 on oscilloscope while adjusting R13 until pulse width equals approximately .5uS. Measure DC voltage at junction of R13 & R14. Record the results on TDS.

5.2 RF signal generator

Next turn-on RF signal generator RF. Verify RF sniff probe is in proximity of Q1 (without contacting any circuitry) and for the remainder of the alignment, pay close attention to transmitter instability on spectrum analyzer & oscilloscope.

5.3 Power meter setting

Set RF power meter at lowest setting -25 dBm.

5.4 Tuning

Starting with C9 and following with C15, C7, C8 tune for max power as observed on power meter. As power increases, it shall be necessary to change scale on power meter. Repeat tuning of C9.C15,C7 & C8 as many times as necessary until no further power gain is observed.

5.5 Increase RF input

Slowly increase RF level on RF signal generator while once again observing RF spectrum on spectrum analyzer & oscilloscope for instability. If no instability is observed, continue to raise RF level on signal generator to +11dBm in.

Note: If instability occurs, determine cause before proceeding.

5.6 RF final tune

Repeat step 5.4.

5.7 RF stability

While observing for instability, adjust RF input on signal generator between +5 dBm and +13 dBm. If no instability is observed, leave RF input level at +13dBm. Record results on TDS.

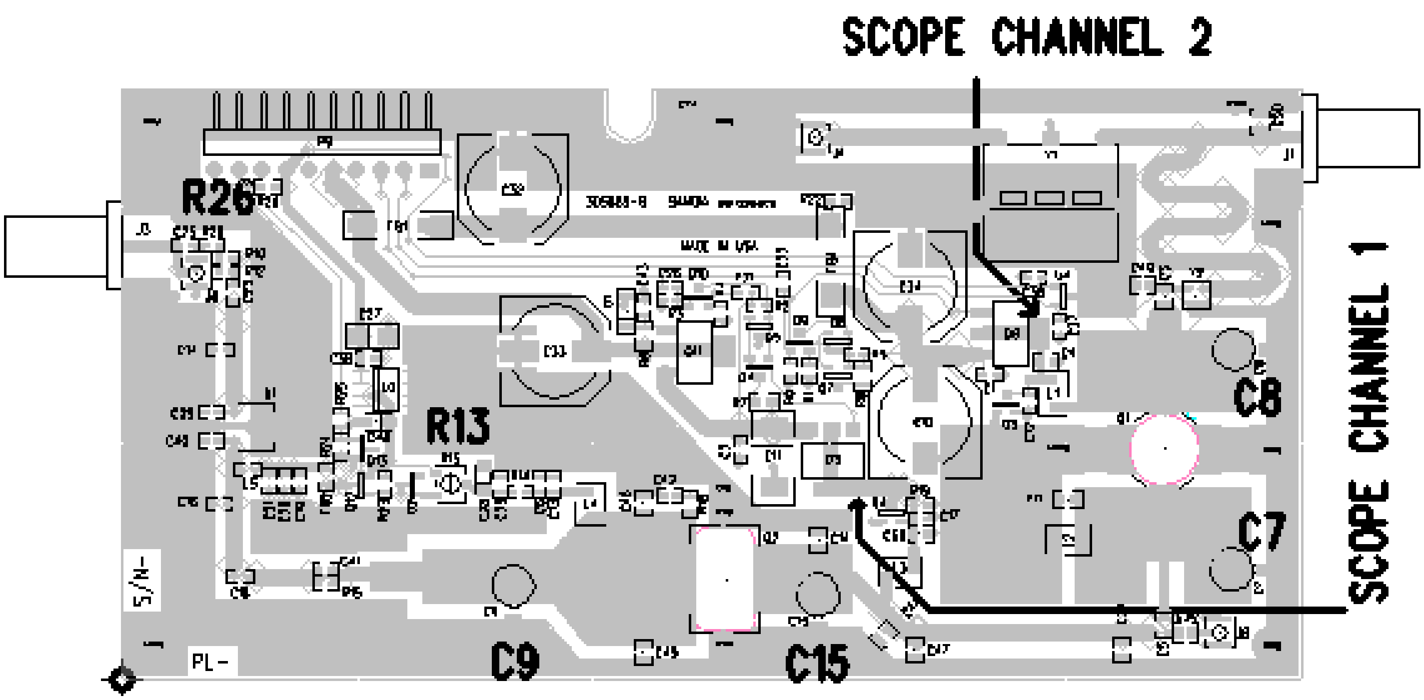
5.8 RF power output

With power meter set to 0dBm level, measure and record results of power on TDS . Minimum

6 Jumper removal

Remove solder jumper from R26. Record removal on TDS.

Figure 3: Set-up & Tuning Components



7 Functional Test Data Sheet

CCA Serial Number:__________________________
Test Date:_____________ Test Initials:___________________

Test Data	Result	Tolerance	Test Paragraph	Result	Tolerance
4 Current Draw		XXmA ±10mA	5.1 Q2 Gate Bias Voltage		3.5Vdc ±500mV
4.1 5.0Vdc Supply		5.0Vdc ±50mV	5.7 RF Stability		PASS/FAIL
4.2 33Vdc Supply		33.0Vdc ±750mV	5.8 RF Power		53.98dBm ±1dBm

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