

| | |
|-------------------|--------------------------------|
| CTI.ComTec | PLA-800 Power Amplifier |
| | Serial Number 1010 |
| CTI.ComTec | PSL-1000 Power Supply |
| | Serial Number 1010 |

**Test Report for Grant of Certification
For Use in Part 97 Amateur Service Under
The Rules of the Federal Communications
Commission**

March 16, 2002

Submitted by:

CTI.ComTec, Inc.
1 Classic Court, North
Palm Coast, Florida 32137
386-445-5545

Table of Contents

| | |
|---|----|
| 1. Introduction | 4 |
| 1. Description of Amplifier | 4 |
| 1.1.General Features | 4 |
| 1.1.1. Special Design Features | |
| 1.1.1. Minimal gain at 27 MHz | |
| 1.1.1. Gain in Band | |
| 1.1.1. Spurious Emissions | |
| 1.1.1. Safety Features | |
| 1. Test Results | 6 |
| 1.1.In Band Gain Table | 7 |
| 1.1.1. Test Procedure | |
| 1.1.1. Results | |
| 1.1.1. Conclusions | |
| 1.1.Out of Band Gain | 9 |
| 1.1.1. Test Procedure | |
| 1.1.1. Results | |
| 1.1.1. Conclusions | |
| 1.1.Conducted Emissions | 9 |
| 1.1.Radiated Emissions | 10 |
| 1.1.1. Test Procedure | |
| 1.1.1. Results | |
| 1.1.1. Conclusions | |
| 1. Other Compliance Information | 11 |
| 1.1.FCC ID | 11 |
| 1. Summary | 12 |
| 1. Appendix A-1 Part 97 Compliance Matrix | 13 |
| 1. Appendix A-2 Part 2 Compliance Matrix | 14 |
| 1. Appendix B Amplifier Block Diagram | 15 |

| | |
|---|----|
| 1. Appendix C Copy of Setup and Operating Instructions..... | 16 |
| 1. Appendix D Drawing of Equipment ID Plate..... | 33 |
| 1. Appendix E Schematics | 34 |
| 1. Appendix F PLA-800 Photos | 40 |
| 1. Appendix G PLA-800 Setup Photos | 45 |

1.0 Introduction

This report details the results of the test performed to demonstrate compliance of the design and manufacturing configuration of the CTI.ComTec PLA-800 Linear Amplifier with the applicable portions of the FCC regulations pertaining to this class of equipment.

Two compliance matrices listing the applicable FCC regulations and the corresponding section of the test report that address these roles are provided as Appendices A-1 and A-2 to this report.

The applicant/manufacture under the FCC rules is:

CTI.ComTec, Inc.
1 Classic Court North
Palm Court, Florida 32137
FCC Grantee Code: PHD

The applicant's point of contact for questions regarding this report is:

Robert L. Piselli, President of CTI
Home phone: 386-445-5545
Fax: 386-446-0964
Email address: info@cticomtec.com

1.0 Descriptions of Amplifier

.1 General Features

The PLA-800 is an external linear power amplifier designed to be operated in the class AB1 mode, using a pair of 4CX250B's in amateur service.

The 4CX250B's have a control screen grid. The voltage and regulated current for the screens are supplied by the PSL1000 Power Supply. Using screen voltage regulation, the grids have the advantage of self-limiting the current flow to the plates of the tubes. As a result, the tubes cannot be driven into saturation causing distortion. The maximum allowable screen current is regulated by the power supply. Once that point of current demand is reached, the screen limits the plate current flow to its maximum. Therefore, an ALC circuit, to prevent driver overload, is not required.

The maximum plate and cathode current flow is measured by the 0-500 ma. meter on the front panel. The screen current only, is measured by the 0-50 ma. meter located also on the front panel.

Both the amplifier and power supply are inter-locked for safety. The removal of the FOUR (4) thumbscrews will allow one to slide the units forward and out of their respective enclosures. NEVER open either unit with the AC and DC power applied. As an added safety feature, the power supply has a mechanical shorting rod, which, upon sliding the unit out of the enclosure beyond 1/4 of an inch, will ground the high voltage capacitor bank. This is done for safety and should NOT be defeated.

Build into the PSL1000 power supply is a maximum current overload circuit. If more than 600 ma. is delivered to the load, the circuit will activate, opening the plate relay and removing the high voltage.

Under normal loading conditions, the PLA800 will deliver 600 watts key down or 1200 watts PEP output. However, the key down power level should not be maintained for more than 10 seconds. In cases where RTTY or AM is used, the amplifier should be operated at 1/2 (one-half) power level. 1200 watts PEP can be operated at any time.

.1.1 Special Design Considerations

Care has been taken in the design of the CTI.ComTec PLA-800 to ensure compliance with the applicable FCC requirements set forth in Part 97 and Part 2 of the Commission rules.

.1.1 Minimal Gain at 27 MHz

Because of the lack of any tank circuitry, the RF input is presented a very poor impedance match seen by the driving source. Most modern solid-state transmitters and transceivers will shut down or severely reduce their output power when presented with a poor match of this magnitude.

.1.1 In Band Gain

Gain in the intended bands of 80 through 15 meters is in the order of 9 dB to 12 dB.

.1.1 Spurious Emissions

Typical two tone third order intermodulation is 20 dB below the full (PEP) output power. There is no computer, crystal oscillator, switch mode power supply or other source of spurious non-harmonically related to the driving RF sources. The tube circuitry has been designed in accordance with well-established procedures, including the use of a parasitic choke to ensure that the tubes will not oscillate by themselves at any frequency. No features are provided which facilitate operation in other than the Amateur service.

.1.1 Safety Features

Both the PLA-800 and the PSL-1000 power supplies are inter-locked for safety. The removal of the FOUR (4) thumbscrews will allow you to slide the units forward and out of their respective enclosures. NEVER open either unit with the AC and DC power applied. As an added safety feature, the power supply has a mechanical shorting rod, which, upon sliding the unit out of the enclosure beyond 1/4 of an inch, will ground the high voltage capacitor bank. This is done for safety and should NOT be defeated.

1.0 Test Results

| Equipment | Manufacture/Model | Unit Serial Number |
|--------------------------|--------------------------|---------------------------|
| Spectrum Analyzer | HP 8591E | 242091B |
| Output Watt Meter | Bird 43P | 1052 |
| Watt Meter Sense Element | 250H | N/A |
| Input Watt Meter | Bird 43P | 2827 |
| Watt meter Sense Element | 1000H | N/A |
| RF Source | Icom 746 | 02518 |
| Coaxial Signal Sampler | Microlab XFR | HZ-10H |
| RF Dummy Load 50 ohm | Lear Seigler 50 ohm | 1662 |
| Plotter | HP-7440A | 144319Z |

Table 3.0-1 Test Equipment

The tests were conducted in four broad categories.

- In Band Gain
- Out of Band Gain
- Conducted Emissions
- Radiated Emissions

The test methodology and results from each test is described separately as follows.

.1 In Band Gain

The FCC requirement is to demonstrate that the amplifier will not produce more than 1500 watts output when driven by less than 50 watts input. The test method used was to adjust the amplifier to deliver maximum output into a 50 ohm, one kilowatt resistive dummy load. The test setup is shown in figure 3.1-1

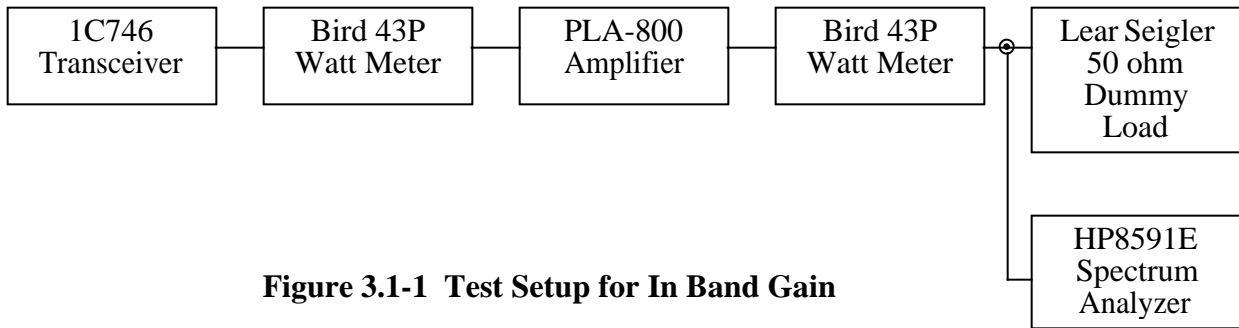


Figure 3.1-1 Test Setup for In Band Gain

The drive source for this test is a currently available Amateur Radio transceiver manufactured by Icom, the Model IC-746. It has adjustable output power up to about 100 watts across the 1.8-144.00 MHz bands. For RF power measurement the Bird Model 43P direction at watt meter was used for both input and output power measurements.

.1.1 Test Procedure

The amplifier was tuned up for maximum output. RF output was measured by the Bird Model 43P wattmeter at the upper and lower frequencies for each band 80-15 meters. The RF input drive Power was measured by a Bird Model 43P. The HP spectrum Analyzer was also connected at the coaxial signal sampler to ensure the spectrum was clean, and the amplifier was not being tuned to an oscillator or other spurious output.

.1.1 Test Results

Appendices A-1 and A-2 summarize the applicable certification requirements set forth in 47 CFR Section 2.1060 and CFR 97 of the Commission rules that the CTI.ComTec PLA-800 Amplifier meet in order to be certified for service under Part 97. Appendix A-1 deals with the requirements set forth in Part 97, Sections 307 and 317.

The specific amplifier used in all testing is the Model CTI.ComTec PLA-800 Serial number 02518. This amplifier was built to the design specifications to which the final (FCC Certified) Product will be manufactured. Production materials used in the test unit are those which will be used in the production version. No changes to the design of the production version is anticipated.

All of the certification tests were performed by CTI.ComTec, Inc., the manufacturer of the PLA-800. The test equipment used for all testing is provided in Table 3.0-1.

.1.1 Results

The data taken is presented below in Table 3.1.2-1.

| Frequency (Mhz) | Input Drive (Watts) | RF Output (Watts) | Amplifier Gain (dB) |
|----------------------------|--------------------------------|------------------------------|--------------------------------|
| 3.5 | 50 | 620 | 10.9 |
| 4.0 | 50 | 440 | 9.4 |
| 7.0 | 50 | 750 | 11.8 |
| 7.3 | 50 | 720 | 11.6 |
| 14.0 | 50 | 460 | 9.6 |
| 14.35 | 50 | 440 | 9.4 |
| 18.068 | 50 | 460 | 9.6 |
| 18.168 | 50 | 520 | 10.2 |
| 21.0 | 50 | 510 | 10.08 |
| 21.45 | 50 | 525 | 10.21 |

Table 3.1.2-1 In Band Drive Power, Related Amplifier Output and Gain

The input-output power relationship data shown indicates the minimum drive (50 watts) specified by the FCC regulations. Clearly, 50 watts of drive is required, any less drive and the output would diminish.

.1.4 Conclusion

The CTI.ComTec PLA-800 passes the FCC requirements in this area at all frequencies on which it is intended to operate since: 1) The amplifier requires at least 50 watts of drive to produce the designed output power. 2) The amplifier gain does not exceed 15 dB. 3) Since the amplifier is linear, it will be proportionally less than 1500 watts (allowed) at lower input drive levels.

3.2 Out of Band Gain

The FCC requirement is that a power amplifier shall exhibit less than 6 dB of gain from 24-26 MHz; less than 0dB of gain from 26-28 MHz; and less than 6 dB of gain from 28-35 MHz. The test set up was identical to that used for the In Band Gain measurement, and is shown in Figure 3.1-1

3.2.1 Test Procedure

The amplifier was set to its operational mode, and the IC-746 Driver was adjusted to give the maximum drive power it could into the amplifier. Due to poor input SWR presented by the PLA-800 in the frequency range of 24.890-24.990 and 28.0-29.7 MHz, the SWR protection circuits limited the drive power to less than 10 watts.

3.2.1 Results

RF output of the amplifier was very low, in the -15 to 25 dBm range.

3.2.1 Conclusion

The CTI.ComTec PLA-800 complies with the strict FCC requirement for minimal gain over the frequency range of 24-35 MHz.

3.2 Conducted Emissions Not Applicable

3.2 Radiated Emissions

Any radiated emissions are required to be at least 40 dB below the mean power of the fundamental emissions for those transmitters or RF Power Amplifier transmitting on a frequency below 30 MHz.

3.2.1 Test Setup

The test setup is the same as used for the In Band test. See Figure 3.1-1.

3.2.1 Test Procedure

The spectrum analyzer was programmed to read the peak of the fundamental frequency and the peak of the second harmonic frequency. It displayed the difference between the two in dBm.

| Frequency (MHz) | Power In (watts) | Power Out (watts) | Second Harmonic (MHz) | Measured Difference (dBm) |
|----------------------------|-----------------------------|------------------------------|--------------------------------------|--|
| 3.5 | 50 | 620 | 7 | -42 |
| 4.0 | 50 | 440 | 8 | -41.5 |
| 7.0 | 50 | 750 | 14.0 | -43.56 |
| 7.3 | 50 | 720 | 14.6 | -42.7 |
| 14.0 | 50 | 460 | 28 | -41.34 |
| 14.35 | 50 | 440 | 28.7 | -45.52 |
| 18.068 | 50 | 460 | 36.136 | -61.73 |
| 18.168 | 50 | 520 | 36.336 | -52.57 |
| 21.0 | 50 | 510 | 42.0 | -56.36 |
| 21.45 | 50 | 520 | 42.9 | -60.86 |

Table 3.4.3-1 Radiated Emissions

3.2.1 Conclusions

The PLA-800 passes no spurious radiated signals that violate the FCC requirements. In all cases the spurious output is at least 40 dB down from the fundamental.

4 Other Compliance Information

4.1 CTI.ComTec FCC Equipment ID Plate

Note: Drawings are not to scale. They are shown in expanded view for clarification purposes only.

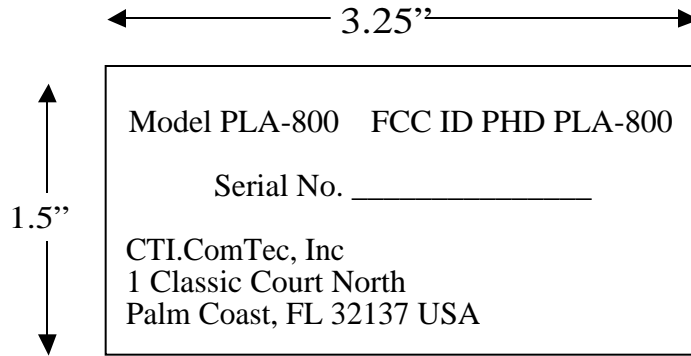


Figure 4.1-1 Details of CTI.ComTec FCC ID Equipment Label

The proposed FCC ID Label is PHD PLA-800. The details of the label are shown in Figure 4.1-1 above.

The FCC ID will be printed in black block lettering on the anodized chassis in font size of eight point (or greater).

The FCC ID number located on the outside of the rear panel of the amplifier in the proximity to the RF input and RF output connections (both S0-239) is shown in Figure 4.1-2 on the next page.

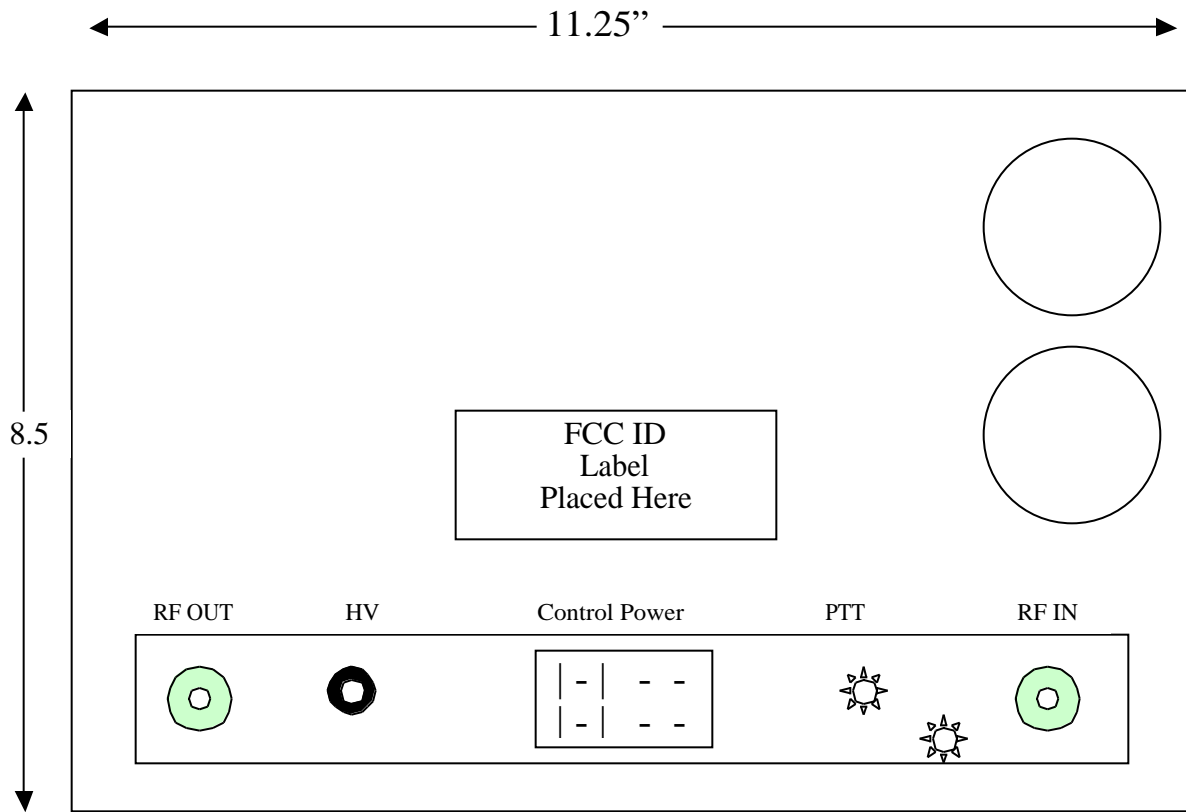


Figure 4.1-2 Details of CTI.ComTec FCC ID Number on Outside Rear Panel

5 Summary

All applicable certification requirements are met or exceeded by the PLA-800 Amplifier.

APPENDIX A-1

PART 97 COMPLIANCE MATRIX

| Controlling Parameter | Standby/Off w/50 watts drive | At Max Gain with less than 50 watt drive | At Full Output w/50 watt drive | Part 97 Reference | Test Report Reference |
|---|------------------------------------|--|--------------------------------------|----------------------------|--------------------------|
| Limits on spurious emissions (radiated and conducted) | 40 dB | N/A | N/A | 97.317(a)(2), 97.307(d) | Sec.3.3, Sec 3.4 |
| Limits on spurious emissions (radiated and conducted) | N/A | N/A | -40 dB | 97.317(a)(1) 97.307(d) | Sec 3.3 Sec 3.4 |
| Max gain allowable between 24-26 MHz | N/A | N/A | +6 dB | 97.317(b)(1) | Sec 2.1.2 Sec 3.2 |
| Max gain allowable between 26-28 MHz | N/A | N/A | +0 dB | 97.317(b)(2) | Sec 2.1.2 Sec 3.2 |
| Max gain allowable between 28-35 MHz | N/A | N/A | +6 dB | 97.317(b)(1) | Sec 2.1.2 Sec 3.2 |
| Must be no user-accessible methods to mod amp to exceed specs | Yes | Yes | Yes | 97.317© | Sec 2.1.4 |
| Must not exceed 1500 watts out with 50 watts drive | N/A | N/A | Yes | 97.317©(6)(i) | Sec 3.1 |
| Must not amplify drive signal by more than 15 dB | N/A | N/A | Yes | 97.317©(6)(ii) | Sec 3.1 |
| Must not exceed 1500 watts out with less than 50 watts drive | N/A | Yes | N/A | 97.317©(6)(iii) | Sec 3.1 |
| Must be capable of sustained operation at max power level | N/A | N/A | Yes | 97.317©(6)(iv) | Sec 2.1 |
| Must not have attenuation at the input level that if removed or modified would permit the amplifier to reach max gain at less than 50 watts drive | N/A | Yes | N/A | 97.317©(7) | Sec 2.1.4 |
| Must not possess any features that would permit operation in other than amateur service | N/A | Yes | Yes | 97.317©(8) | Sec 2.1.4 |

APPENDIX A-2
PART 2 COMPLIANCE MATRIX

| Required Report Information | FCC Part 2 Application Reference | Test Report Reference |
|---|---|-----------------------------------|
| Name and Address of Applicant and Manufacturer | 2.1033(C)(1) | Sec 1.0 |
| Proposed FCC Identifier | 2.1033 (C)(2) | Sec 4.1, Appendix D |
| Copy of Installation and Operation Instruction | 2.1033 (C) | Appendix C |
| Type(s) of Emissions | 2.1033 (C) | Sec 2.1 |
| Frequency Range | 2.1033 (C) | Sec 2.1.3 |
| Range of operating power values and description of means of varying output levels | 2.1033 (C) (6) | Sec 2.1 Sec 3.1 |
| Maximum power rating | 2.1033 (C) (7) | Sec 2.1 |
| Measured DC Voltages and Currents at various stages of circuit | 2.1033 (C) (8) | Appendix C |
| Tune up procedures | 2.1033 (C) (9) | Appendix C (Draft User Manual) |
| Complete set of Schematics and detailed circuit description | 2.1033 (C) (10) | Appendix C, E |
| Photo or drawing of equipment ID plate showing the information to be placed thereon | 2.1033 (C) (11) | Appendix D Sec 4.1 |
| Photos of the equipment showing construction detail | 2.1033 (C) (12) | Appendix F |
| FCC Identifier Markings must be clear and legible on product | 2.295 | Appendix D Sec 4.1 |

APPENDIX B AMPLIFIER BLOCK DIAGRAM

