



**Figure 12: View of Unit Side, A5 Receiver and Front Panel Removed, Showing A4 Power Supply/Modulator Assembly**

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**Figure 13: View of Unit Side, A4 Power Supply/Modulator Assembly Removed, Showing A1 Interconnect Assembly**

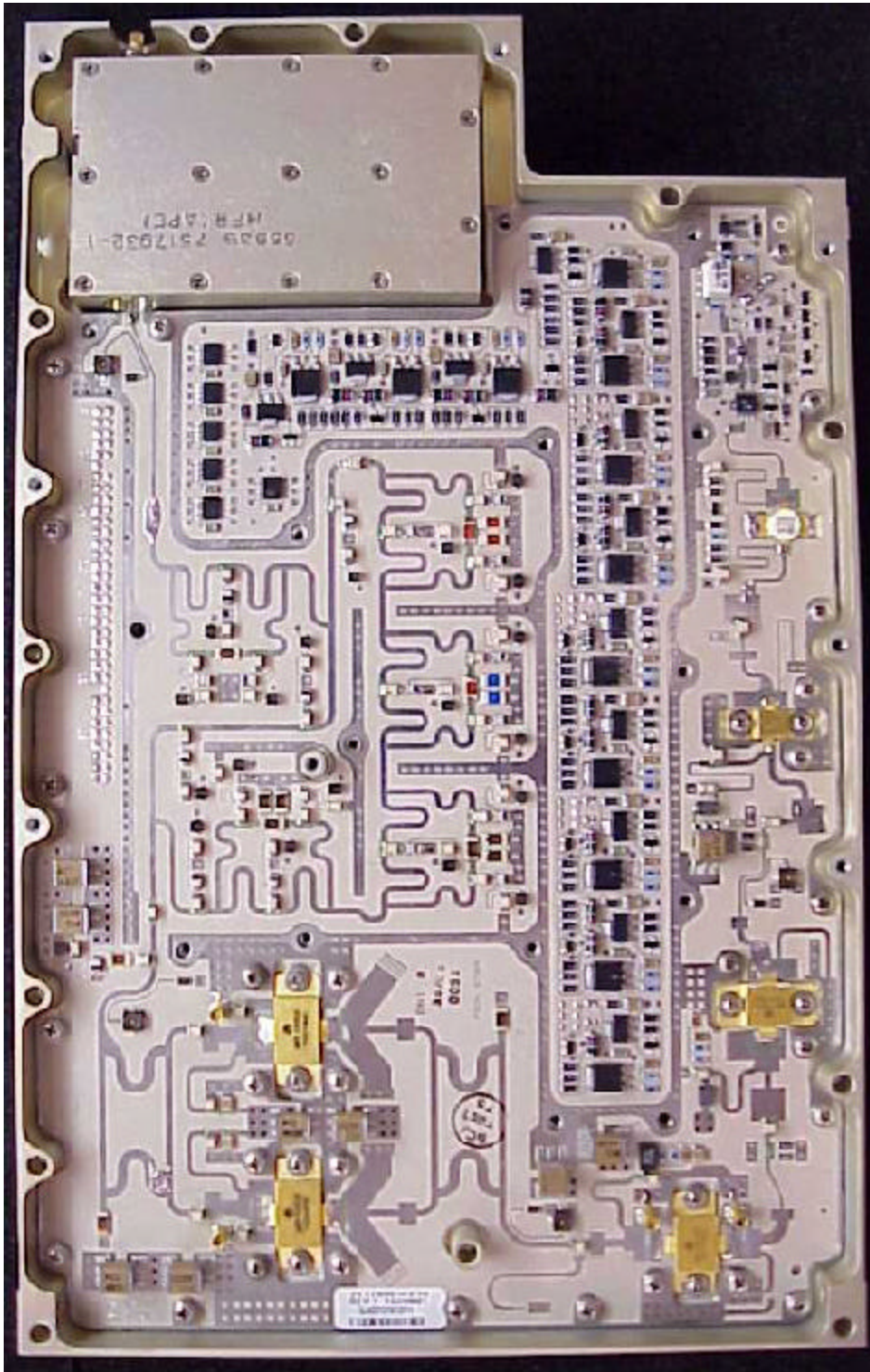


Figure 14: View of A3 Transmitter Assembly With Shield Removed

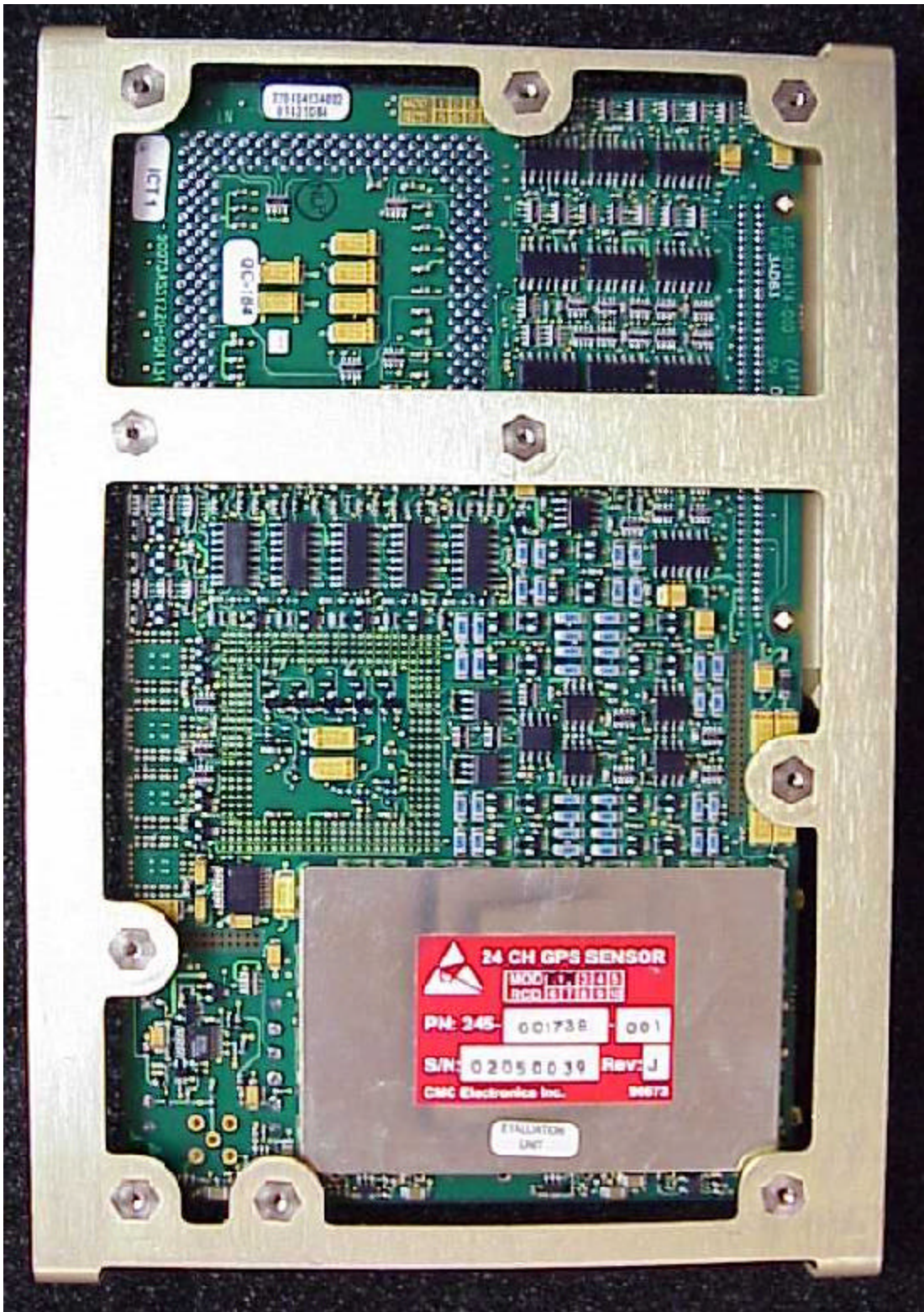


Figure 15: A8 GPS Card With Bracket Attached

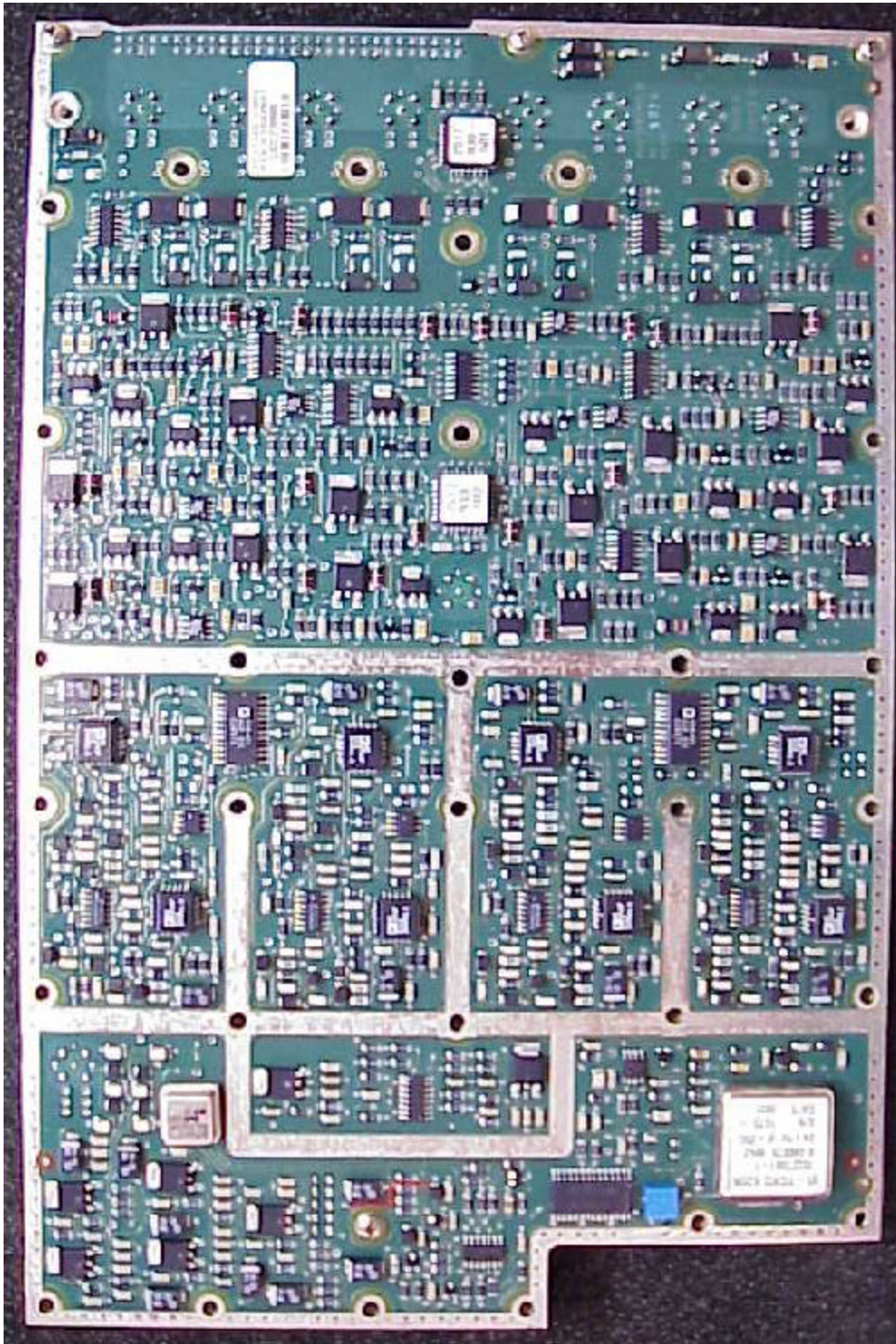


Figure 16: View of A5 Receiver – I/O Assembly with Shield Removed. Side A

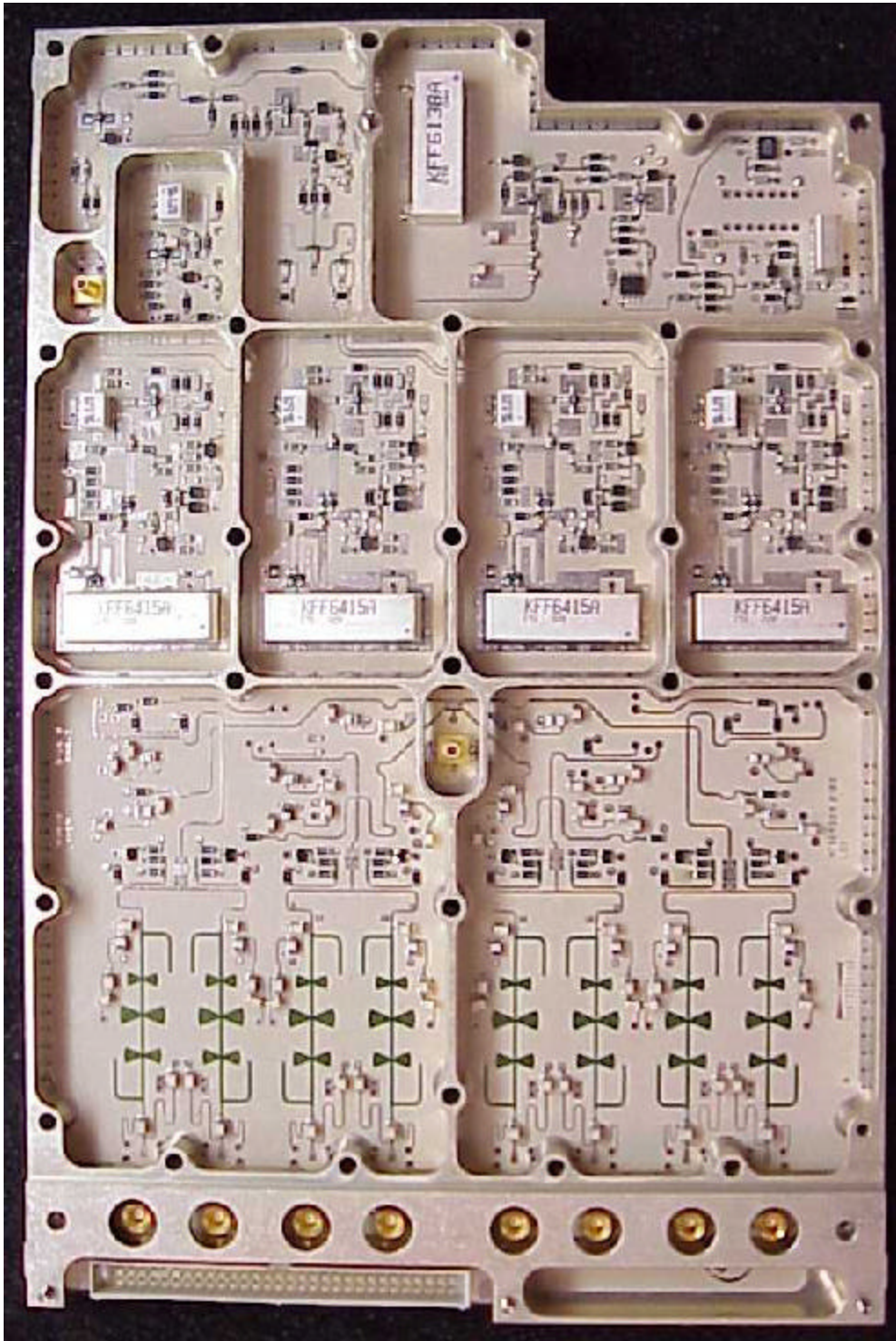
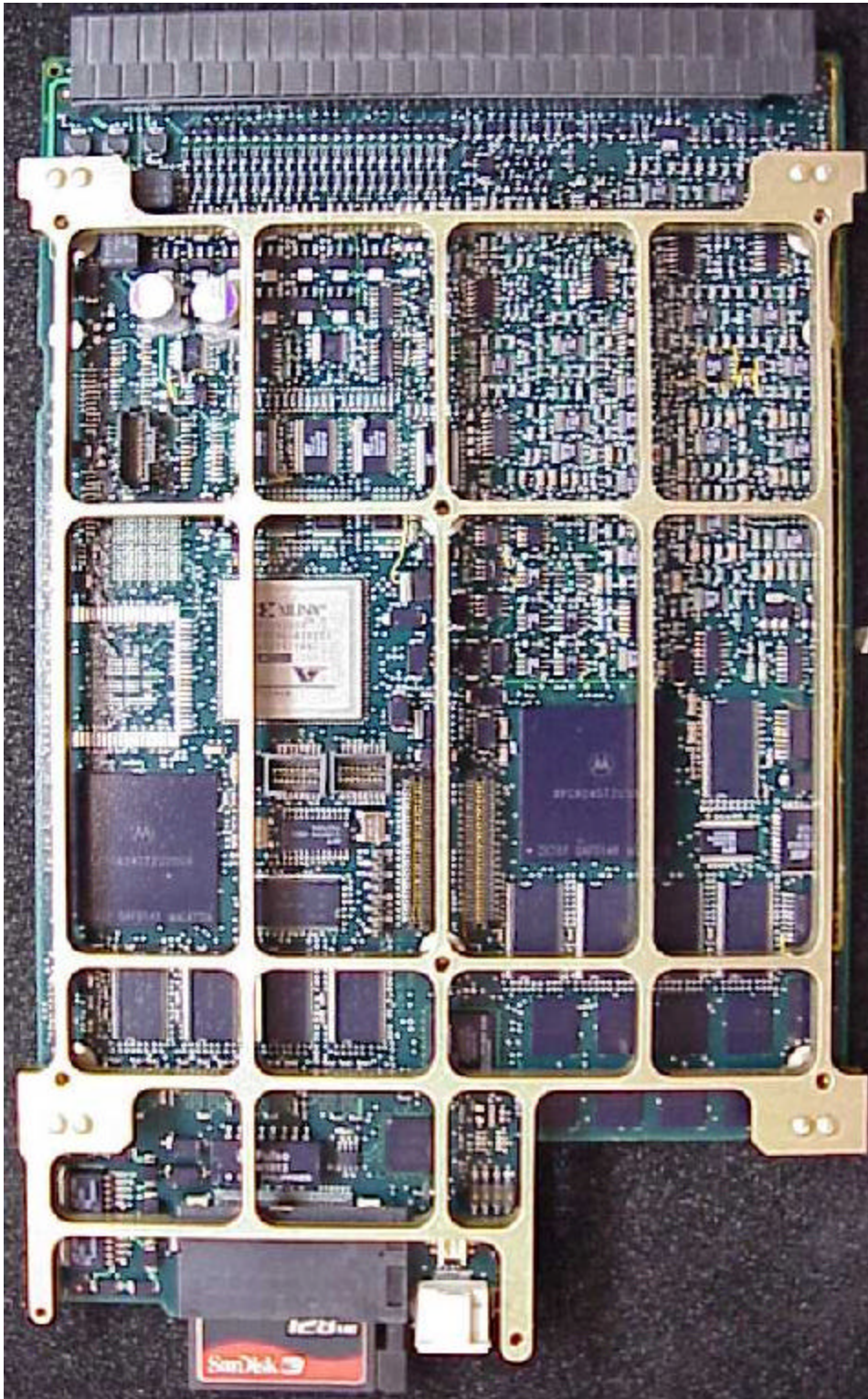


Figure 17: View of A5 Receiver – I/O Assembly with Cover Removed. Side B



**Figure 18: View of A7 TAWS Processor With Bracket Attached**

## 6 FCC COMPLIANCE TEST PLAN

### 6.1 FCC Compliance Overview

The Code of Federal Regulations, Title 47, Volume 1, Part 2, Subpart J (47CFR2.xxxx) provides procedures for radio frequency equipment to be authorized by the FCC. Certification is an equipment authorization issued by the commission, based on representations and test data submitted by the applicant. Certification attaches to all units subsequently marketed by the grantee which are identical (see section 6.1.2) to the sample tested except for permissive changes or other variations authorized by the commission.

#### 6.1.1 FCC Identifier

47CFR2.924 states that equipment, which has been authorized by the FCC, bears an FCC Identifier. Equipment, which has been authorized, may be marketed under different model/type numbers or trade names without additional authorization from the commission, provided that such devices are electrically identical and the equipment bears an FCC Identifier validated by a grant of equipment authorization.

#### 6.1.2 Changes in Certified Equipment

47CFR2.907, 8 defines Identical as either being units whose variances fall within those expected to arise as a result of quantity production techniques, or those that have been changed where the change meets the criteria of a *permissive change*.

47CFR2.1043 states that changes to the basic frequency determining and stabilizing circuitry (including clock or data rates), frequency multiplication stages, basic modulator circuit or maximum power or field strength ratings shall not be performed without application for and authorization of a new grant of certification.

Variations in electrical or mechanical construction, other than the above indicated items, are permitted provided the variations either do not affect the characteristics required to be reported to the commission or are made in compliance with other provisions in 47CFR2.1043

Two classes of permissive changes may be made in certified equipment without requiring a new application for and grant of certification. Neither class of change shall result in a change of identification.

- A Class I permissive change includes those modifications in the equipment that do not degrade the characteristics reported by the manufacturer and accepted by the commission when certification is granted (i.e., power, frequency, etc.). *No filing with the commission is required for a Class I permissive change.*
- A Class II permissive change includes those modifications that degrade the performance characteristics as reported to the commission at the time of initial certification.



## 6.2 T<sup>2</sup>CAS Units Similarity to Predecessor TCAS-2000 Unit

The T<sup>2</sup>CAS units evolved from the predecessor TCAS-2000 unit. The T<sup>2</sup>CAS units utilize the same TCAS circuit boards and TCAS circuit board software that the predecessor TCAS-2000 units utilize. These TCAS circuit boards have been previously certified with the FCC in the predecessor TCAS 2000 unit. In addition to the TCAS circuit boards, all three T<sup>2</sup>CAS models also incorporate a TAWS circuit board and the model TT-952 contains a GPS circuit board (see Table 1). Two T<sup>2</sup>CAS models may be powered by either AC or DC power, and the third T<sup>2</sup>CAS model is powered exclusively from a DC power source.

## 6.3 T<sup>2</sup>CAS Model to be Subjected to FCC Compliance Testing

The T<sup>2</sup>CAS model TT-952 unit will be subjected to the full suite of FCC compliance tests with the resulting data submitted to the FCC for certification.

## 6.4 All Three T<sup>2</sup>CAS Models Considered Identical

For purposes of FCC compliance testing and certification, both T<sup>2</sup>CAS models (TT-950 and TT-952) are considered to meet the FCC definition of "Identical." Photographs of the T<sup>2</sup>CAS unit illustrating the assembly drawings, including markings, are shown in Figures 3 – 18. All original photographs are available for inspection. Differences exist between the two T<sup>2</sup>CAS models, however these differences fall within the definition of a Class I permissive change because the items which provide the transmit and receive functions (the TCAS circuit boards and their software) are the same in both T<sup>2</sup>CAS models.

### 6.4.1 Conclusion

The full suite of FCC compliance tests was performed on a T<sup>2</sup>CAS model TT-952 unit. TT-952 and TT-950 models are considered identical per the FCC definition. Test data from the TT-952 FCC compliance test will be submitted to the FCC to apply for a new certification and FCC identifier for the T<sup>2</sup>CAS family of units.

**7 TEST DATA AND FACILITIES**

<u>Paragraph</u>	<u>Description</u>
8.1	Power Output.....
8.2	Modulation Characteristics .....
8.3	Occupied Bandwidth and in Close Spurious .....
8.4.1	Spurious Emissions (Conducted) ..... 0-2000 MHz
8.4.2	Spurious Emissions (Conducted) ..... 2000 MHz - 113300 MHz
8.4.3	Spurious Emissions (Conducted) ..... L.O. Leakage 1030 MHz
8.5	Spurious Emissions (Radiated) .....
8.6.1	Frequency Stability (Temperature) .....
8.6.2	Frequency Stability (Primacy Power Variation).....

**LOCATION OF TEST FACILITIES**

All FCC testing were performed at the following facility:

National Technical Systems (NTS)  
1536 E. Valencia Drive  
Fullerton, California 92831-4797

## 8 FCC COMPLIANCE TESTS

47CFR2.1041 states that for equipment operating under parts 15 & 18, the measurement procedures are specified in the rules governing the particular device for which certification is requested. For equipment operating in the authorized radio services, measurements are required as specified in sections 2.1046 (RF Power Output), 2.1047 (Modulation Characteristics), 2.1049 (Occupied Bandwidth), 2.1051 (Spurious Emissions at Antenna Terminals), 2.1053 (Field Strength of Spurious Radiation), 2.1055 (Frequency Stability), 2.1057 (Frequency Spectrum to be Investigated).

### 8.1 RF Power Output

47CFR Reference:

2.1046, RF Power Output

87.135, Power and Emissions

#### 8.1.1 RF Power Output Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model	Asset#	Cal Date
A	T2CAS Computer	ACSS	RT-952	NA	
B	TCAS 2000 System Panel	ACSS	9000121-001	NA	
C	Attenuator	Narda	765-20	NA	
D	Attenuator	Narda	765-20	NA	
E	Peak Power Analyzer	Hewlett-Packard	HP8990A	418	23/7/03
F	Spectrum Analyzer	Hewlett-Packard	HP8592L	1025	6/11/03

Table 7: RF Power Output Test Equipment Required

#### 8.1.2 RF Power Output Test Setup

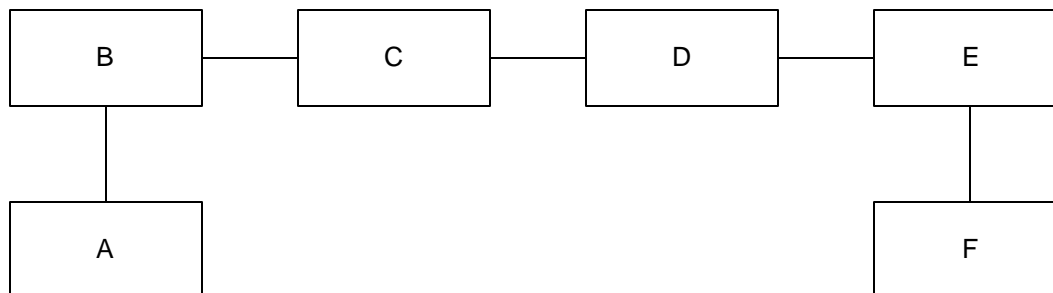


Figure 19: RF Power Output Test Setup

#### 8.1.3 RF Power Output Test Procedure

1. Connect the equipment as shown in Figure 19 above.
2. Configure the TCAS 2000 System Panel to invoke Test Mode 2 (Mode S, Long P6, DPSK Modulation, Test Mode Program switches on System Panel to DDUD) and then

Test Mode 4 (Mode C only all-call interrogation, Test Mode Program switches on System Panel to UDUU).

3. Record the measured output power and frequency as measured on the Peak Power Analyzer and Spectrum Analyzer.

#### 8.1.4 RF Power Output Test Data

Peak power output & frequency measured at top 0 degree antenna port		
Modulation Characteristic	Measured Power Output (dBm)	Measured Frequency (Ghz)
Mode S DPSK Modulation	54.98	1.029,999,800
Mode C Only All Call	55.16	1.029,998,900

Peak power output & frequency measured at bottom 0 degree antenna port		
Modulation Characteristic	Measured Power Output (dBm)	Measured Frequency (Ghz)
Mode S DPSK Modulation	54.99	1.029,999,000
Mode C Only All Call	55.08	1.029,999,200

**Table 8: Peak power output and frequency measured at bottom antenna 0 degree port**

## 8.2 Modulation Characteristics

47CFR Reference:

2.1047, Modulation Characteristics

87.141c, Modulation Requirements

### 8.2.1 Modulation Characteristics Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model	Asset#	Cal Date
A	T2CAS Computer	ACSS	RT-952	NA	
B	TCAS 2000 System Panel	ACSS	9000121-001	NA	
C	Attenuator	Narda	765-20	NA	
D	Attenuator	Narda	765-20	NA	
E	Peak Power Analyzer	Hewlett-Packard	HP8990A	418	23/7/03

**Table 9: Modulation Characteristics Test Equipment Required**

## 8.2.2 Modulation Characteristics Test Setup

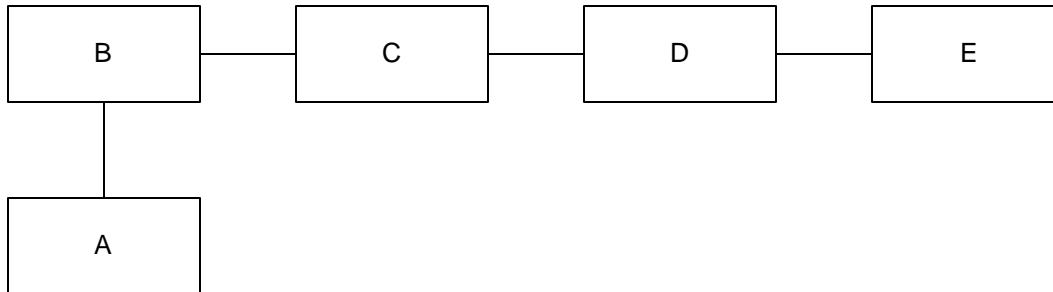


Figure 20: Modulation Characteristics Test Setup

## 8.2.3 Modulation Characteristics Test Procedure

1. Connect the equipment as shown in Figure 20 above.
2. Configure the TCAS 2000 System Panel to invoke Test Mode 2 (Mode S, Long P6, DPSK Modulation, Test Mode Program switches on System Panel to DDUD).
3. Record the modulation characteristics on the Peak Power Analyzer. Capture pictures of the following data to be shown in the test report:
  - Typical ATCRBS or Mode S interrogation pulse showing rise and fall times.
  - Mode S interrogation with DPSK modulation
  - Close up of Mode S interrogation preamble and sync phase reversal
  - ATCRBS Mode C interrogation

### 8.2.4 Modulation Test Data

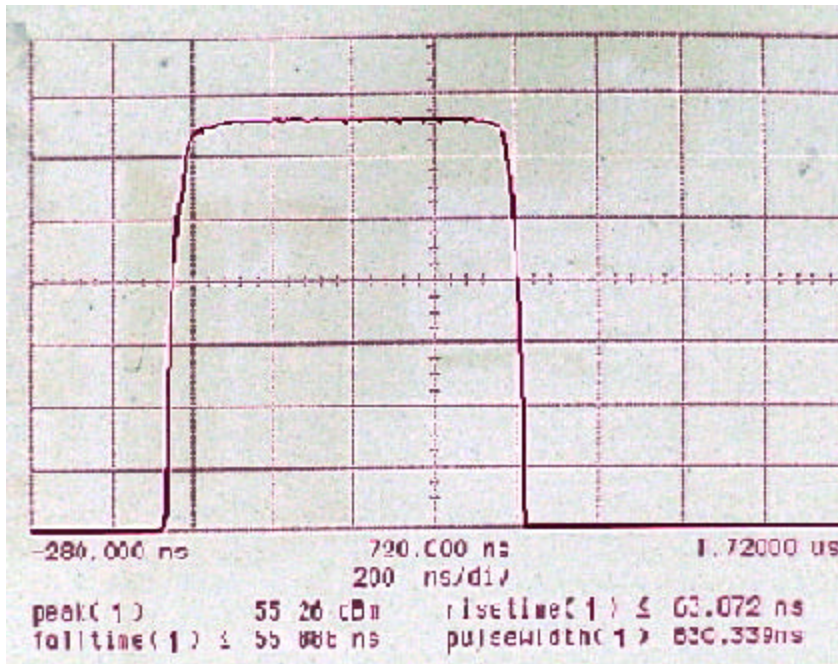


Figure 21: Typical ATCRBS or Mode S Interrogation Pulse Showing Rise and Fall Times

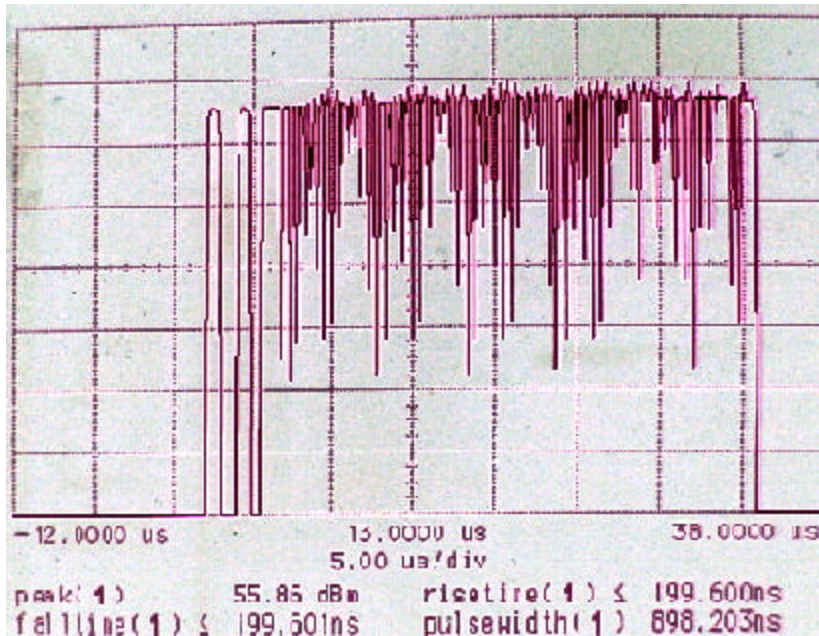


Figure 22: Mode S Interrogation With DPSK Modulation

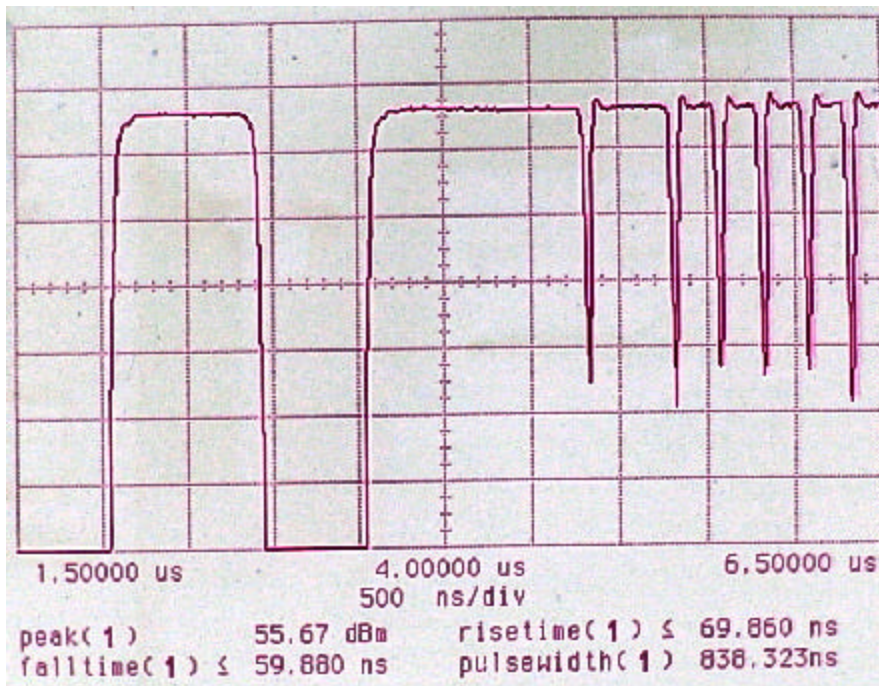


Figure 23: Close Up of Mode S Interrogation Preamble and Sync Phase Reversal

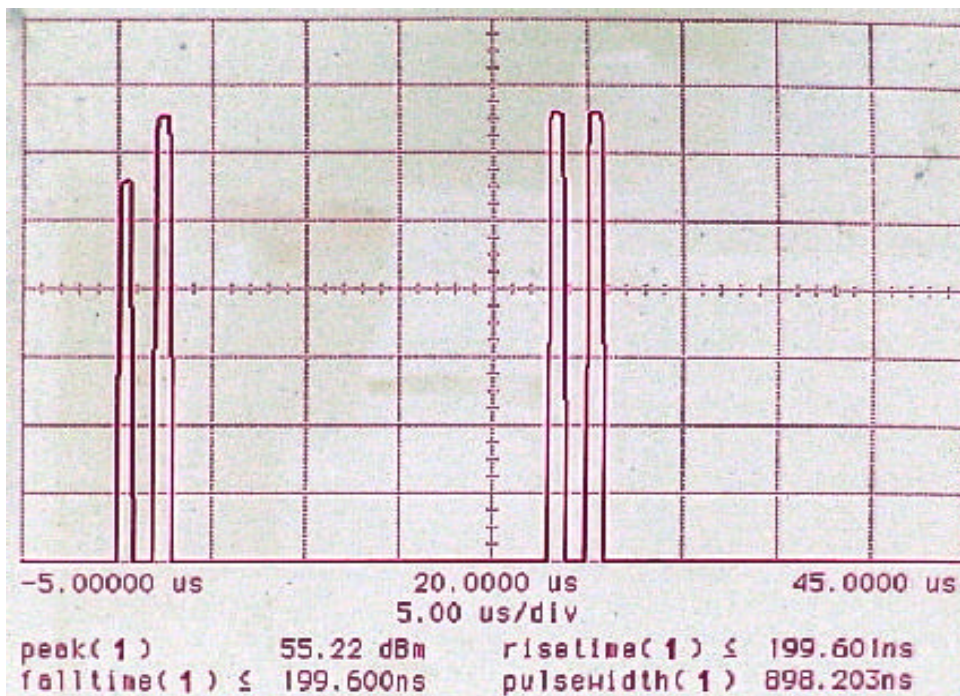


Figure 24: ATCRBS Mode C Interrogation