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February 25, 1993

RODNEY L. JOYCE
(202) 637-9005

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Dr. Thomas P. Stanley, Chief Engineer
Office of Engineering and Technology
Federal Communications Commission
2025 M Street, N.W., Room 7002
Washington, DC 20054

Re: Application of In-Flight Phone Corp. for
Pioneer's Preference
ET Dkt. No. 92-100
PP-_____

Dear Dr. Stanley:

The enclosures which accompany this letter demonstrate technical characteristics of the multi-channel audio programming service that In-Flight has developed for airline passengers and are submitted as a supplement to In-Flight's pending application for a "pioneer's preference" in the licensing of this new service.[1] The enclosures provide substantial additional evidence that In-Flight qualifies for a licensing preference under Commission rules awarding preferences to those who demonstrate that they have made a "significant investment"[2] in developing an innovative communications service that will be provided by "a new technology. . . [which] significantly improve[s] spectrum efficiency. . . ."[3]

Respectfully submitted,

Rodney L. Joyce
Counsel for In-Flight Corp.

Enclosures

1/ The application for pioneer's preference was filed with the Commission on October 30, 1992, but the Commission has not yet assigned it a file number.

2/ Report and Order in GEN Dkt. No. 90-217, 6 FCC Rcd. 3488, 3494 (1991).

3/ Id., 6 FCC Rcd. at 3492.

No. of Copies rec'd 0+4
List ABCDE

Description of Data Items Enclosed

1. Description of ABN Flight Testing Status

2. Plot of Transmit RF Spectrum. This is a measured plot of the Quadrature Amplitude Modulation (QAM) RF spectrum at 941 MHz. Nine channels of digitized audio are contained within the 81 kHz RF bandwidth. This plot shows the digitized audio data modulated using QAM and upconverted to the PCS band for transmission to aircraft.

3. High Power Amplifier Linearity Data. These are measured plots of the RF output versus input to the ABN High Power Amplifier (HPA) to be used at each ABN Ground Station. Data for both the 902MHz and 941MHz bands are included. Of significance is the high linearity of the HPA, required to successfully transmit the QAM waveform with little distortion.

4. Measured RF Front End Parameters. This measured data shows the performance of the ABN Airborne Low Noise Amplifier/Band-Pass Filter (LNA/BPF) front end of the Airborne receiver. Each of the six ABN 81.3 kHz bands was measured to prove that frequency and phase linearity, interferer rejection and noise figure performance is sufficient for the QAM waveform. Particularly, the spectrally adjacent air telephone service signal rejection is critical to system performance.

5. RF Downconverter Intermodulation Products. These measured data show the effect of a nearby signal on the intermodulation products generated by the RF Downconverter in the Airborne Receiver. This test shows that the spectrally adjacent air telephone service has been sufficiently rejected at the IF frequency (10.7 MHz) so as to not degrade detection of the ABN signal.

6. Digital Data Link Bit Error Rate Curves. These curves show the QAM waveform bit-error-rate performance for three different demodulators in the Airborne Receiver. The results indicate better-than-specification operation of the system in transferring digital audio data from ground to air.

7. Photographs:

1. ABN Ground Station High Power Amplifier
2. ABN Ground Station RF Band Pass Filters
3. ABN Ground Station RF Notch Filters
4. ABN Airborne Low Noise Amplifier/Band-Pass Filter Subassemblies (Two versions shown).
5. ABN Airborne Receiver Electronics Enclosure, shown open and populated with receiver subassemblies.
6. ABN Airborne RF Downconverter Subassembly
7. ABN Airborne QAM Demodulator Subassembly
8. ABN Airborne Diversity Switch Subassembly
9. ABN Airborne Audio Processor Subassembly
10. ABN Airborne Control Processor Subassembly
11. ABN Airborne Power Supply Module
12. ABN Airborne Enclosure sitting in Aircraft Electronics Bay Tray

Item 1

ABN Flight Testing Status and Description

24 February 93

Mike Keen, ABN System Engineer

Flight testing of the ABN system began February 16, 1993 in Melbourne, Florida. To date, approximately 6 hours of test time have been accumulated towards an expected total time of about 40 hours. Testing has shown the Diversity Switching algorithm and hardware to be intact, successful closure of the ground-to-air RF link and successful communication of the nine channels of digital audio.

A brief description of the testing configuration follows.

Purpose of Testing: Test 9 channels of live audio on board a flying airplane. Key features to be tested include audio processing, 9 channels, audio quality, switching between more than one ground station, airborne hardware configuration, ground station hardware configuration, studio sourcing of audio material.

Test System Layout:

The test system will consist of the following components (reference map below):

ABN Studio at Harris facilities, Palm Bay, Florida consisting of the following

Audio Sources: Tape machines and such that generate the 9 channels of audio.
Satellite Uplink: 256 kbps digital audio distribution source
Satellite Transponder

First ABN Ground Station at Harris Corporation facilities in Palm Bay, Florida. Equipment Consists of

Satellite Downlink receive equipment
Dual Diversity Ground Station Ground-to-Air equipment transmitting on ABN channels B and D.

Second ABN Ground Station at St. Simon's Island, Georgia. Equipment Consists of

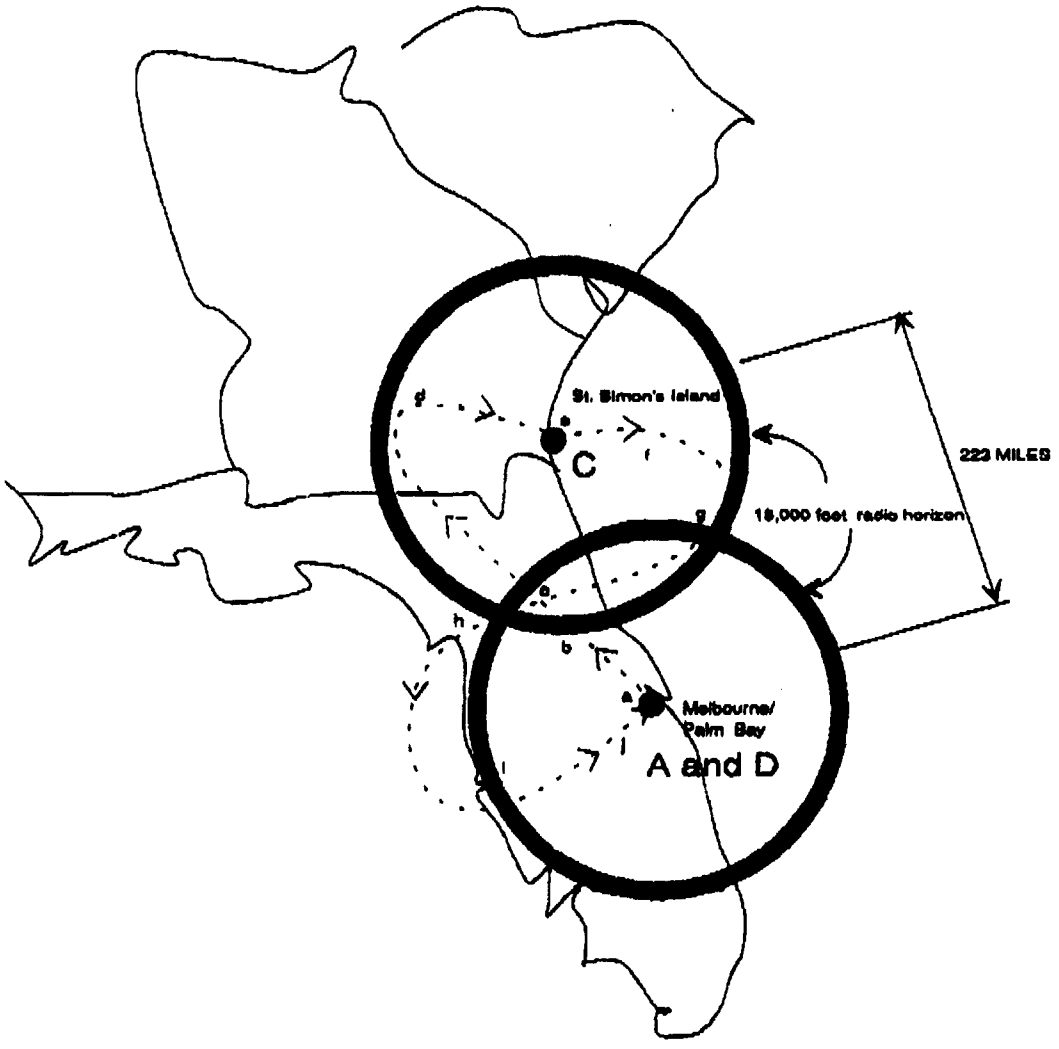
Satellite Downlink receive equipment:
Single Diversity Ground Station Ground-to-Air equipment transmitting on channel C.

Airborne ABN receive equipment consisting of

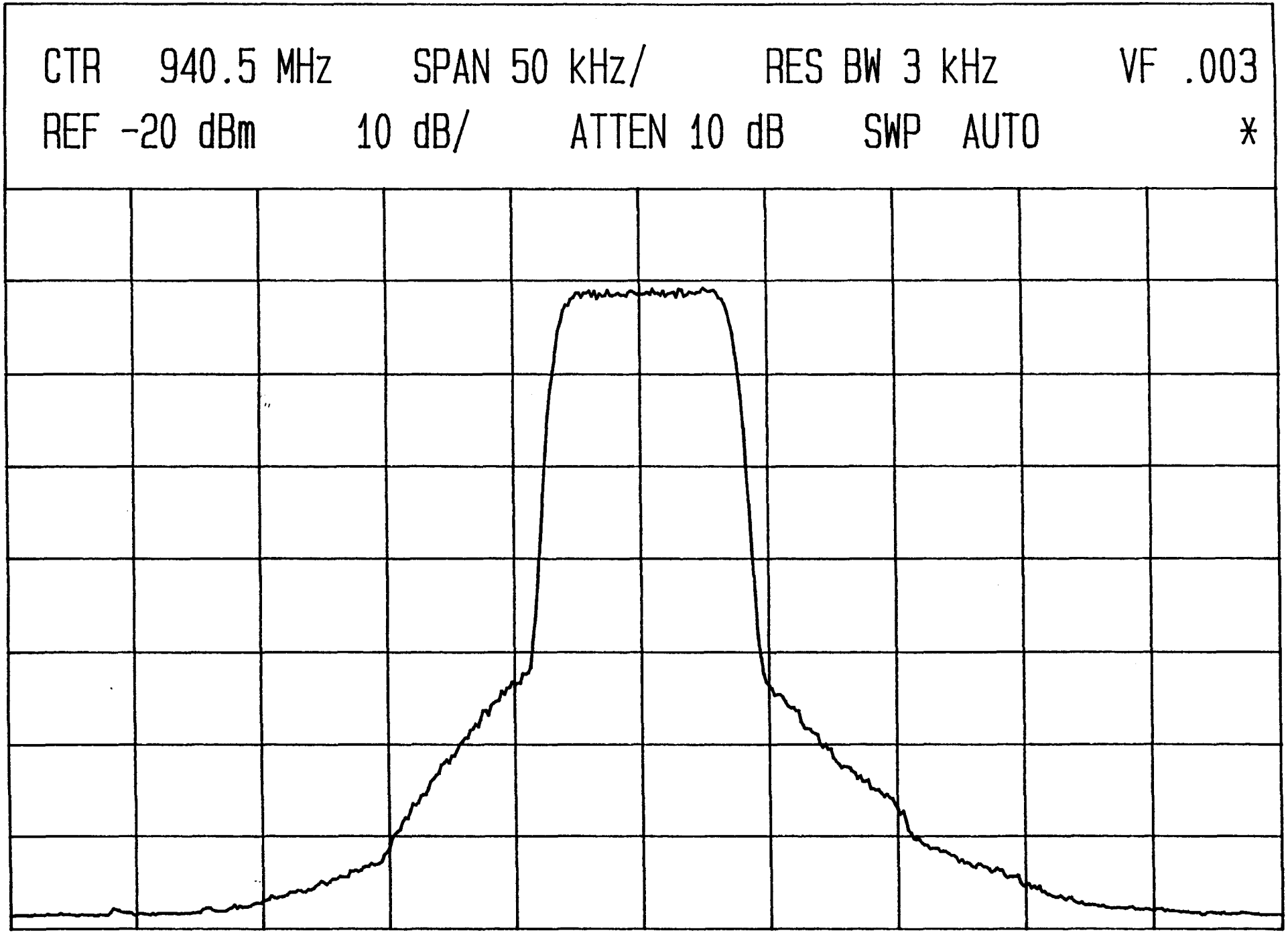
Receive Blade Antenna installed on plane.
Receiver Electronics: The ABN LNA/BPF and ARINC Box
9-channel Stereo Audio Switchbox.
Headphone breakout box with multiple sets of headphones.
PC terminal to monitor receiver functions.

Data Collection

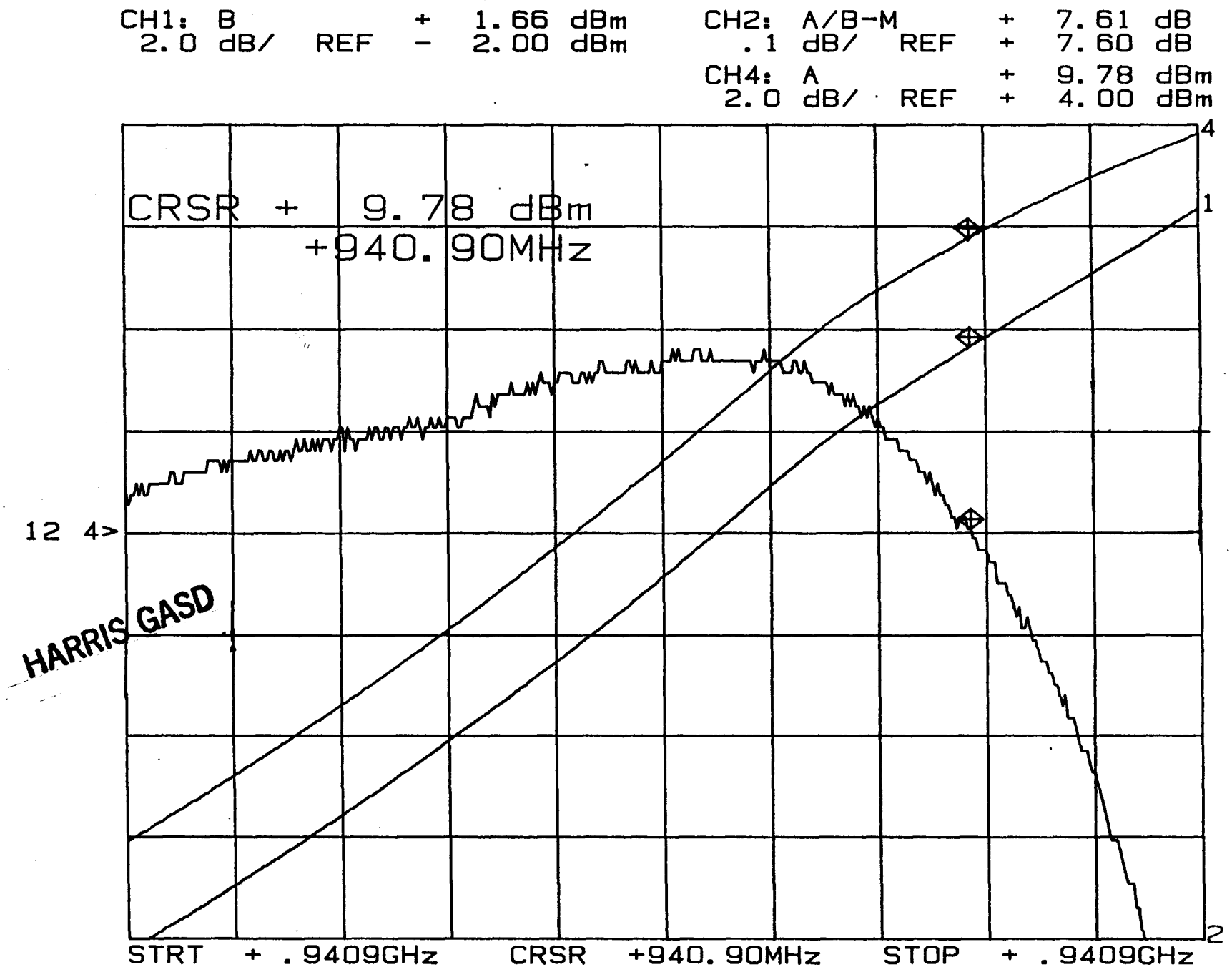
During the flight, the ABN Airborne Receiver will report status to a laptop computer which will display and record that data, along with a time-tag, to hard disk. Also, GPS data will be recorded so that the events during the test can be analyzed.


St. Simon's Island
C
222 MILES
18,000 feet radio horizon
Melbourne/
Palm Bay
A and D

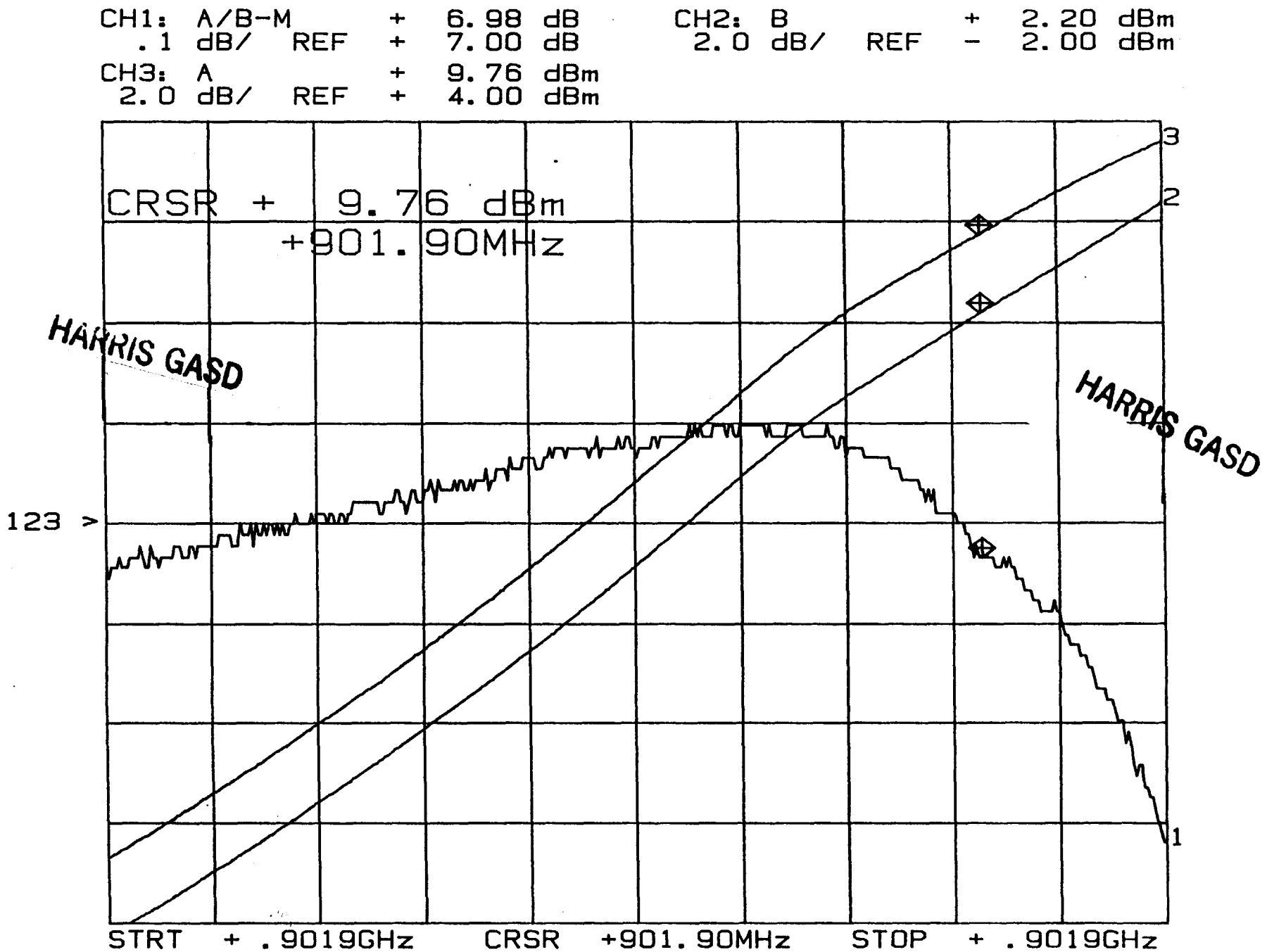
1-11-93



Item 2. Plot of Transmit RF Spectrum.



Item 3a. **<u>High Power Amplifier Linearity Data.</u>**



Item 3b. <u>High Power Amplifier Linearity Data.</u>

Item 4. Measured RF Front End Parameters.

COLEMAN MICROWAVE CO.

P.O. BOX 247 EDINBURG. VIRGINA 22824 703-984-8848

HARRIS GASD

CUSTOMER: HARRIS

SERIAL NO: 34203

SPEC NO: G-LPR-001 DATED 10/20/92

CMC PART NO: 305675

PURCHASE ORDER NO: 0244-2804057

S.O. NO: 6376

PARAMETER	FREQ(MHz)	SPEC LIMIT	DATA
AMPLITUDE FLATNESS	901-903 940-942	±0.1dB MAX/83 KHz	± 0.01 dB ± 0.01 dB
PHASE LINEARITY	901-903 940-942	±0.2 DEGREES MAX/83 KHz	± 0.03 DEGREES ± 0.02 DEGREES
INSERTION LOSS	901-903 940-942	0.7dB MAX 0.3dB MAX	0.52 dB 0.18 dB
VSWR	901-903 940-942	1.35:1 MAX	1.28:1 1.19:1
ATTENUATION	@ 1500 @ 2000 @ 3000	-40dB MIN -50dB MIN -50dB MIN	-58 dB -84 dB -84 dB
REJECTION	894-896	-30dB MIN	-31 dB

HARRIS GASD

TECH: D. Brandwa

APPROVAL: David Durst

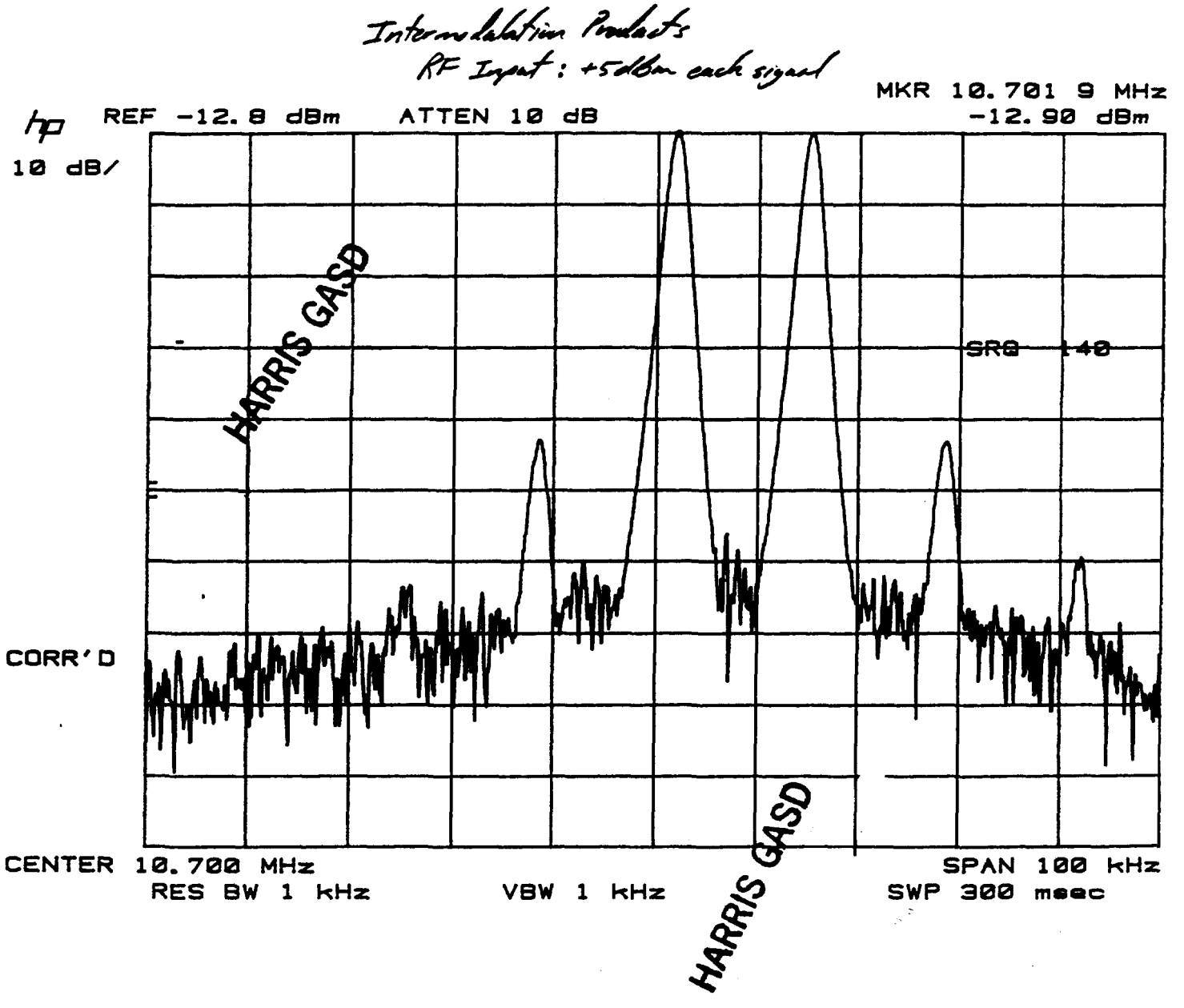
INSP 91

DATE: 12/22/92

DATE: DEC 22 1992

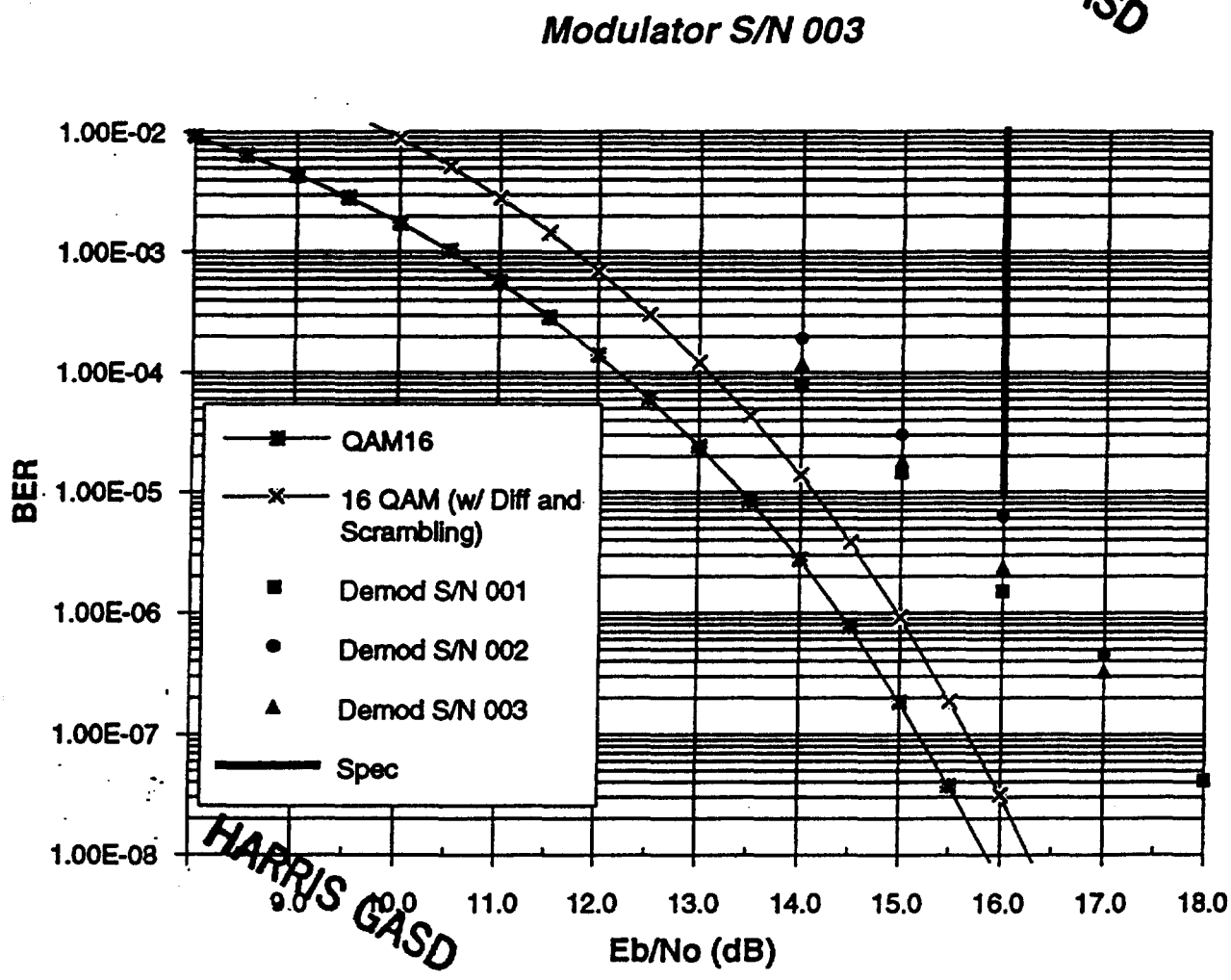
0099

Item 5. RF Downconverter Intermodulation Products



Item 6. Digital Data Link Bit Error Rate Curves.

HARRIS GASD



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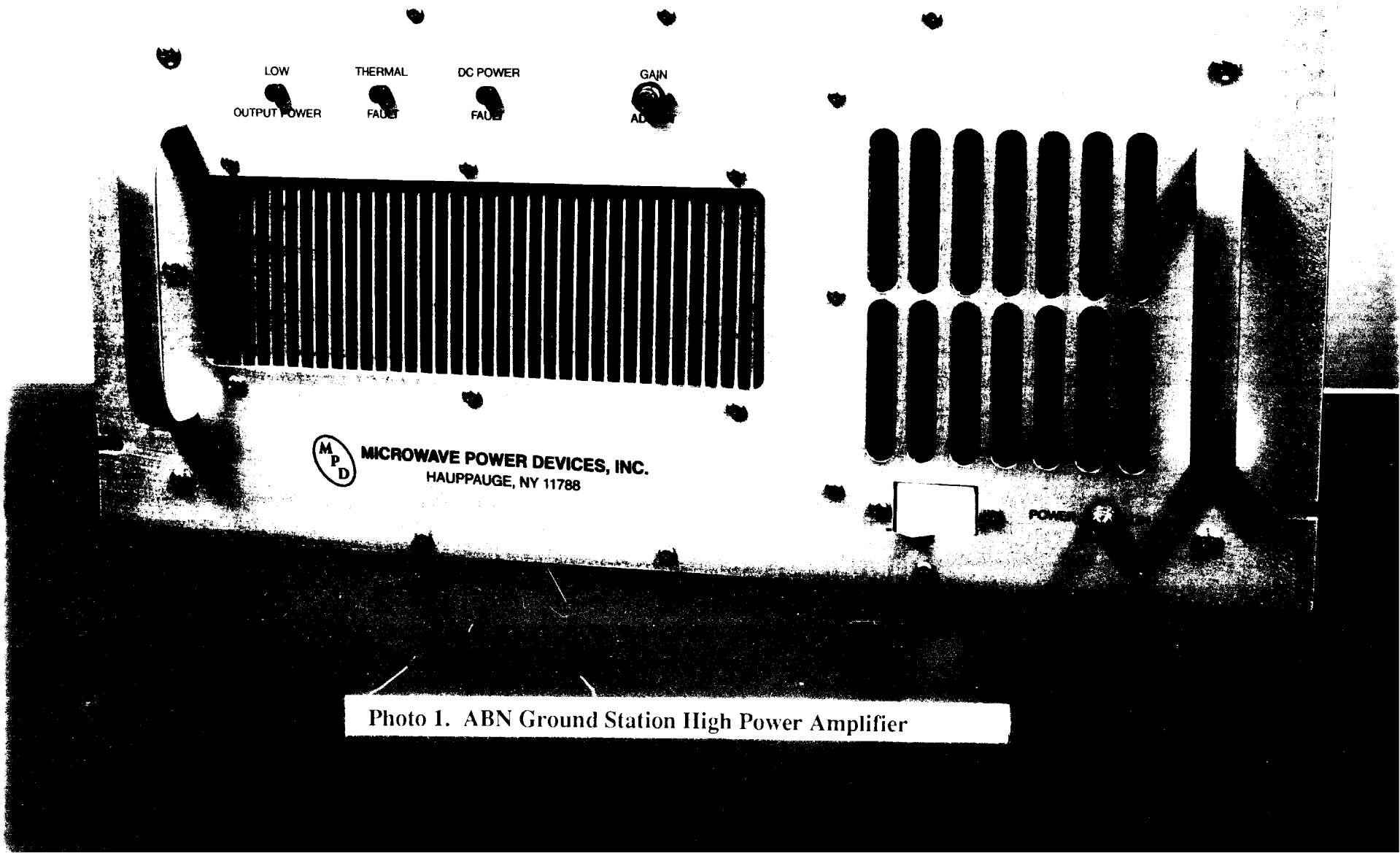


Photo 1. ABN Ground Station High Power Amplifier

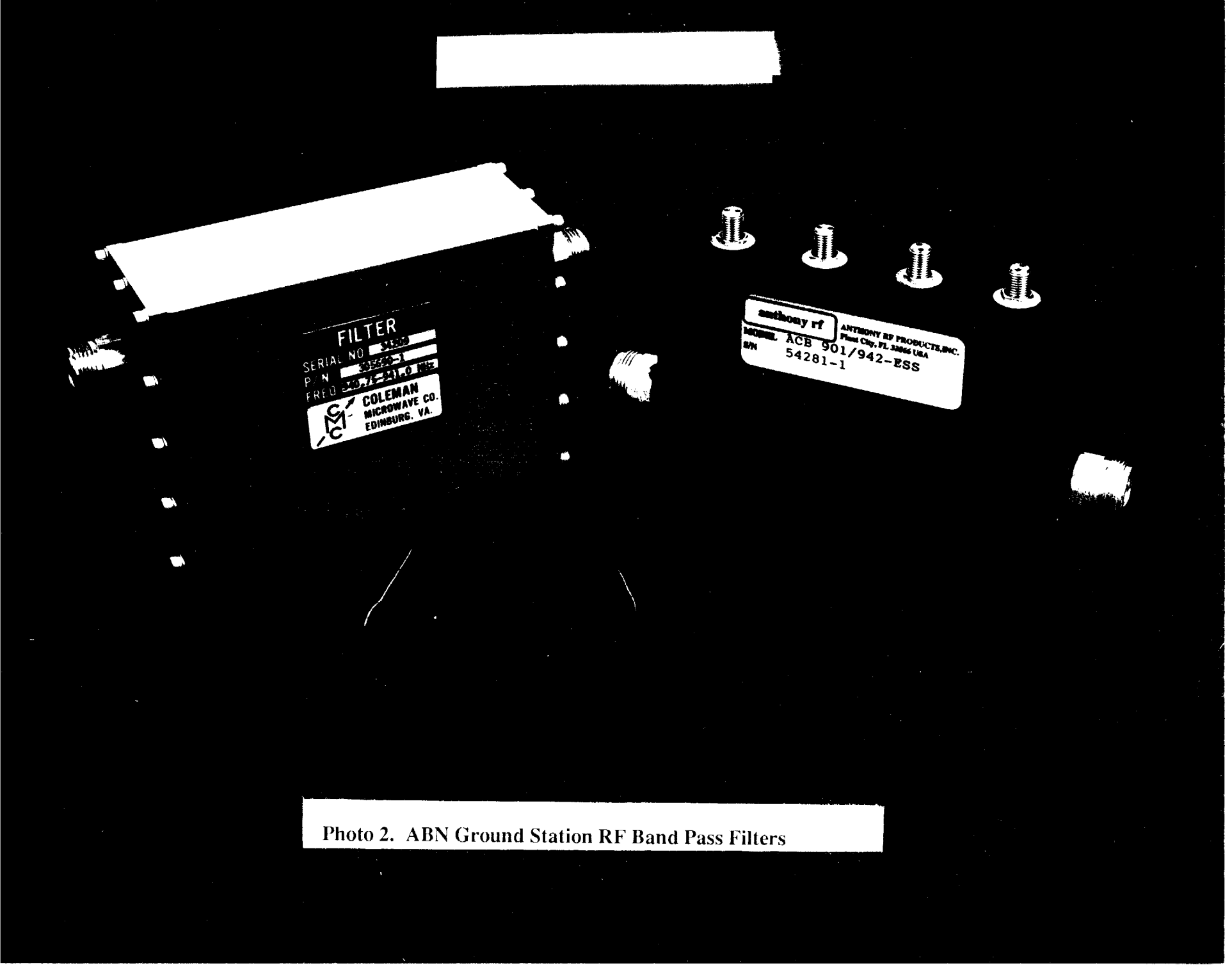


Photo 2. ABN Ground Station RF Band Pass Filters

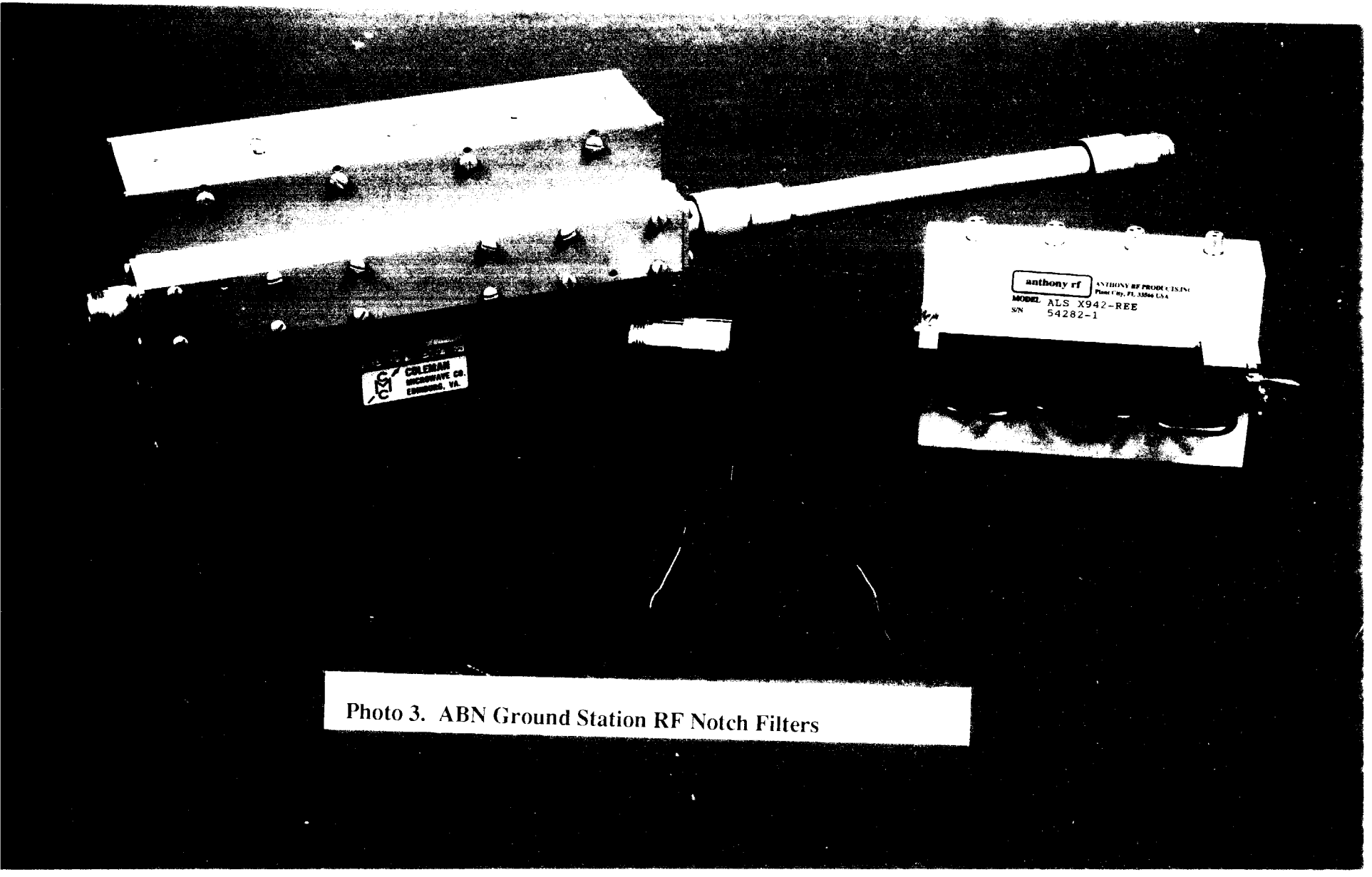


Photo 3. ABN Ground Station RF Notch Filters

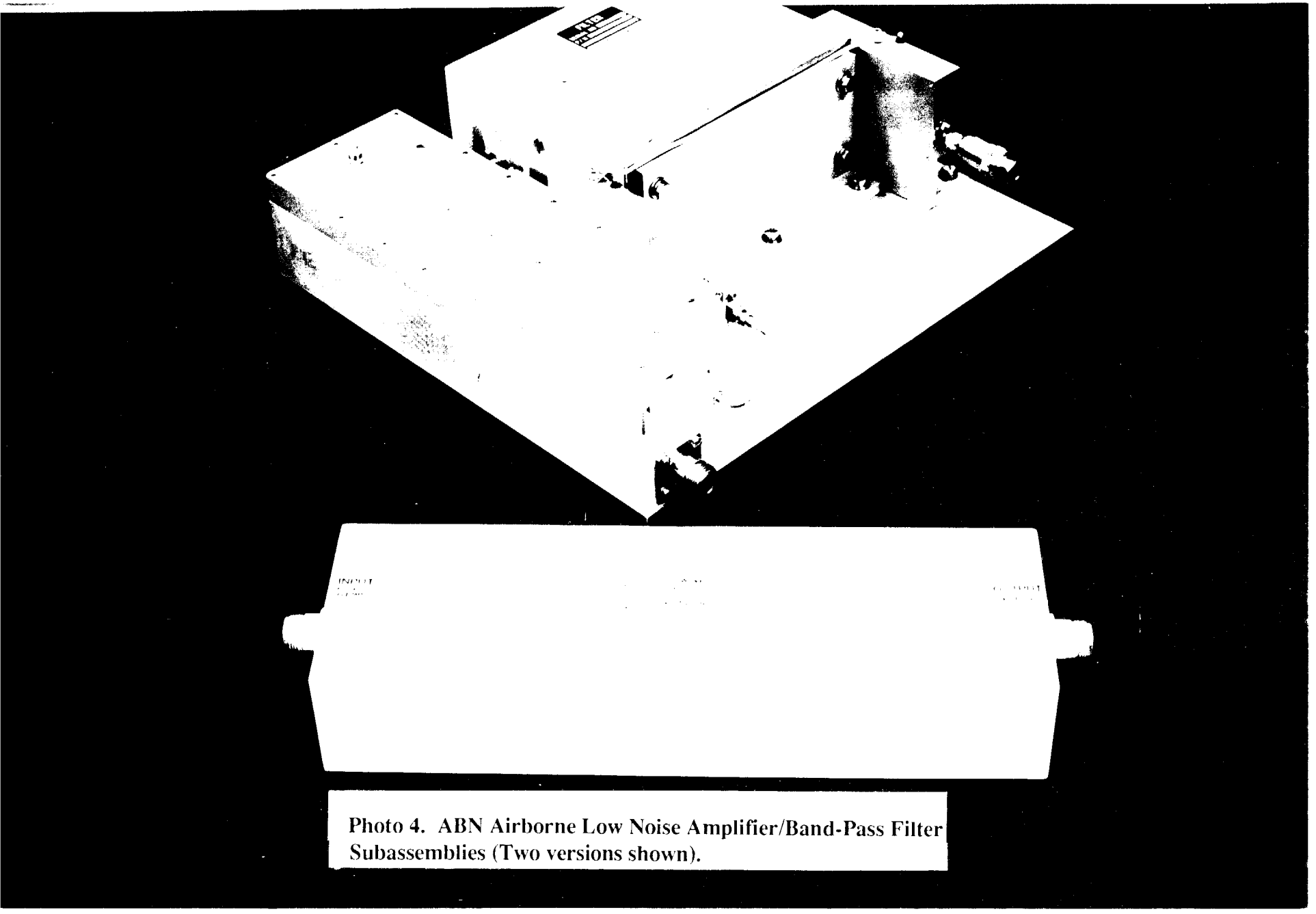


Photo 4. ABN Airborne Low Noise Amplifier/Band-Pass Filter Subassemblies (Two versions shown).

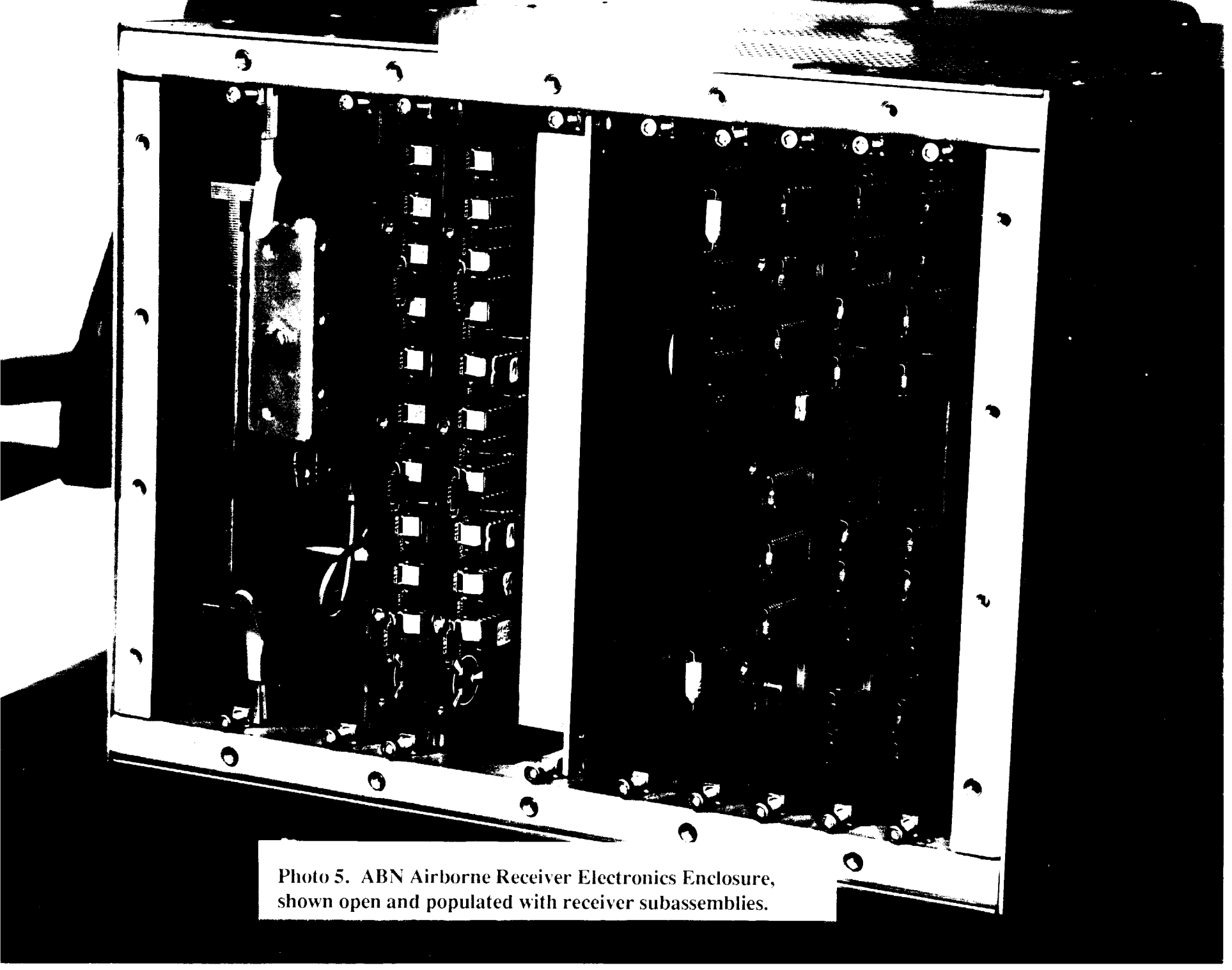


Photo 5. ABN Airborne Receiver Electronics Enclosure, shown open and populated with receiver subassemblies.

Photo 6. ABN Airborne RF Downconverter Subassembly

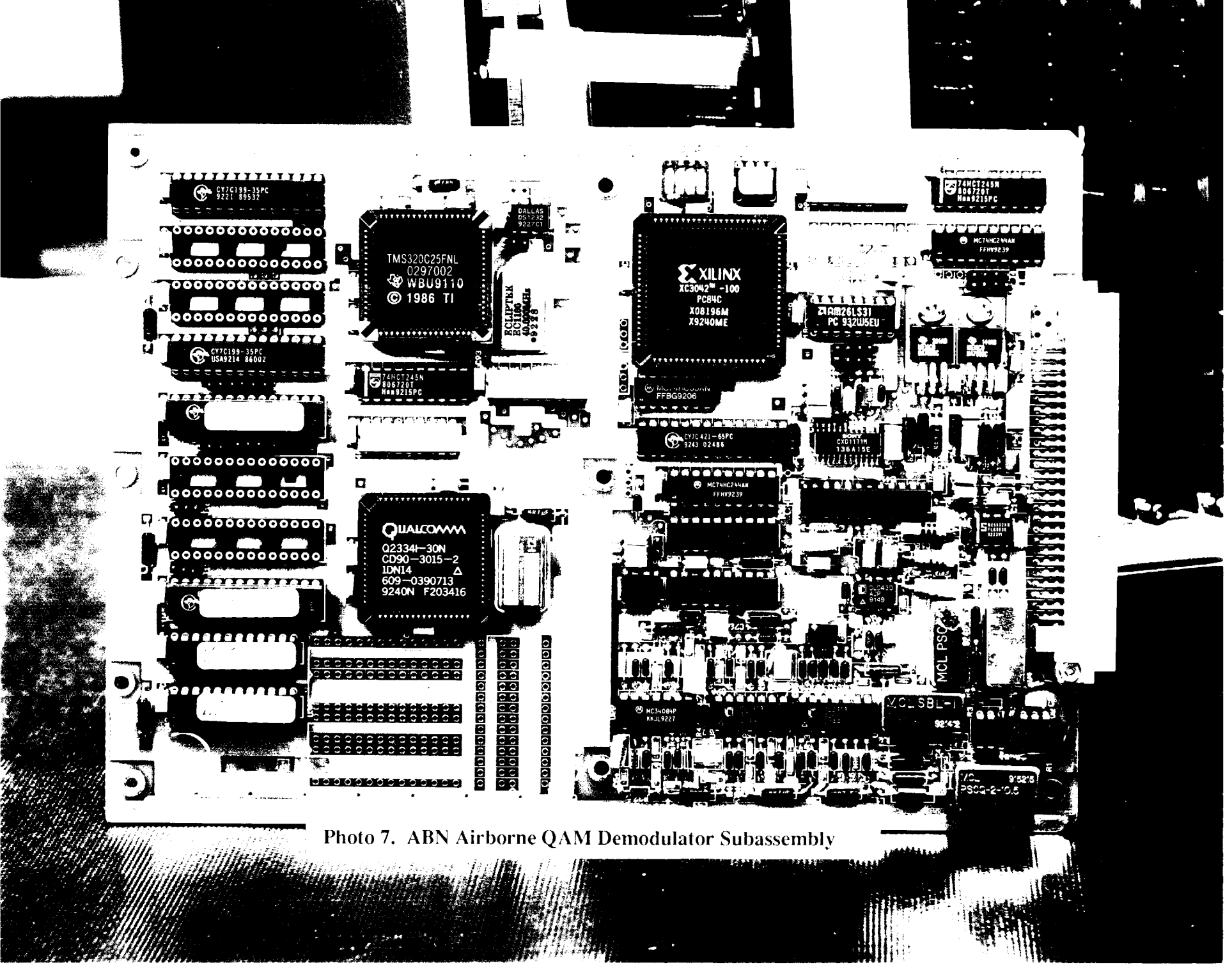


Photo 7. ABN Airborne QAM Demodulator Subassembly

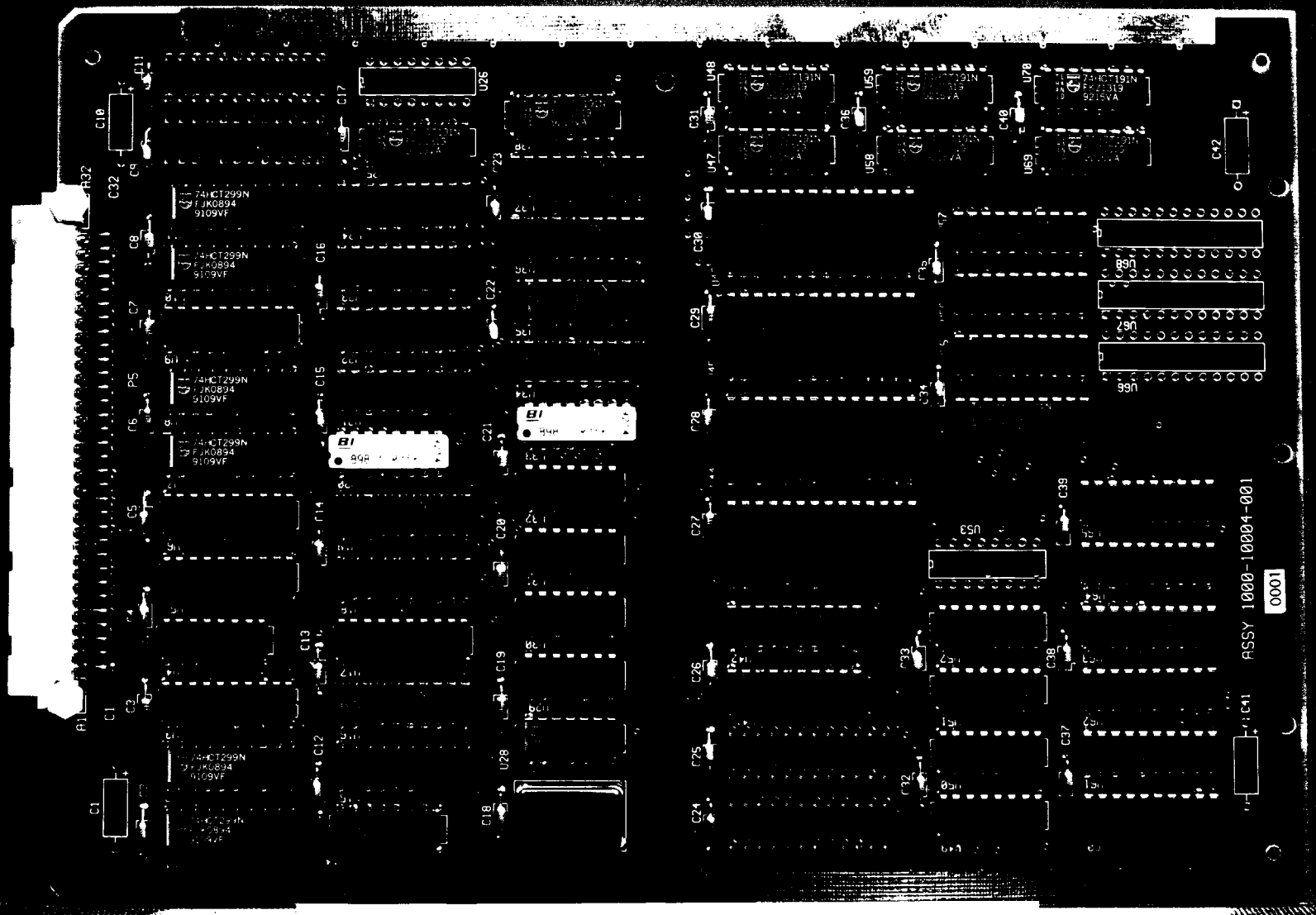
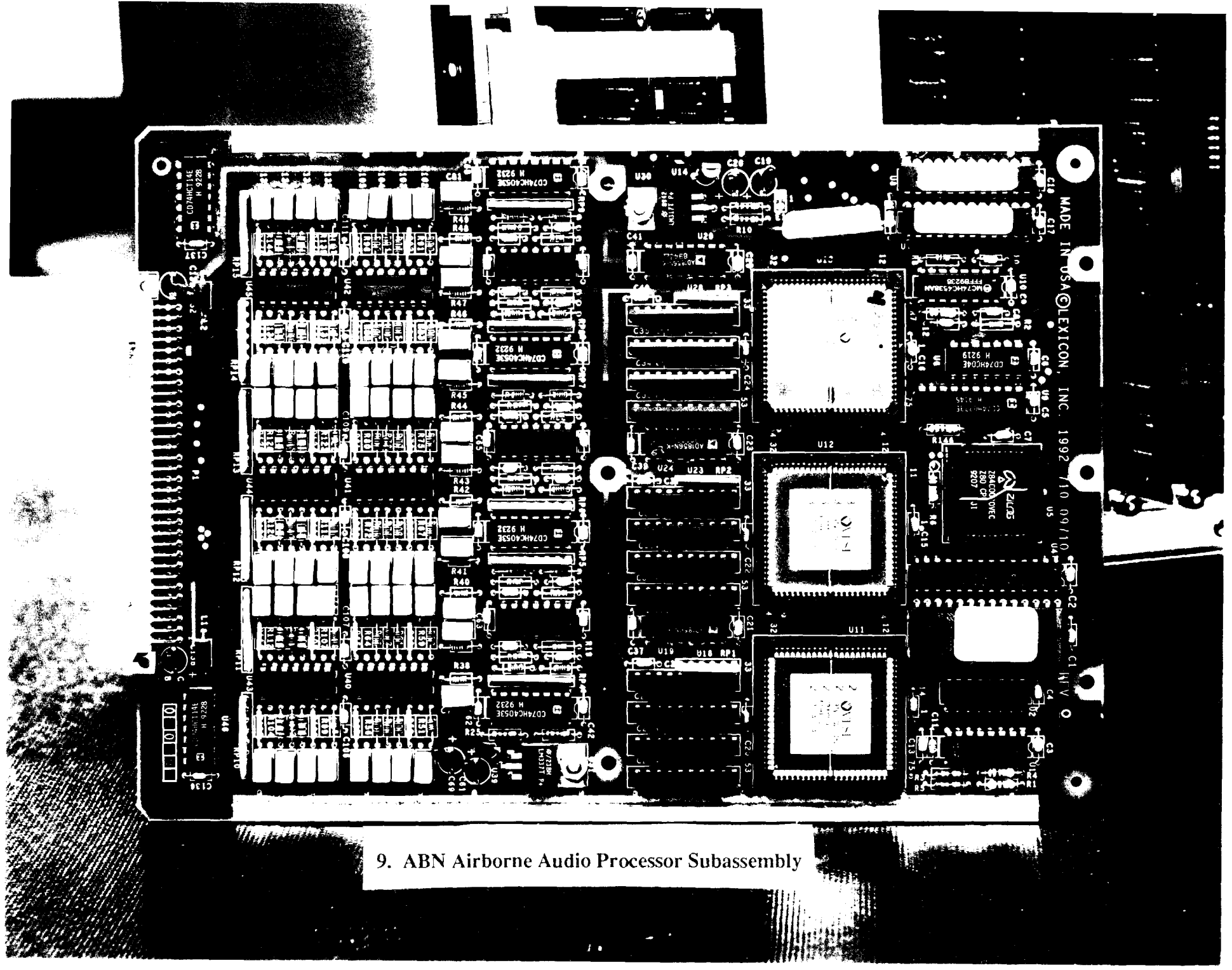


Photo 8. ABN Airborne Diversity Switch Subassembly



9. ABN Airborne Audio Processor Subassembly

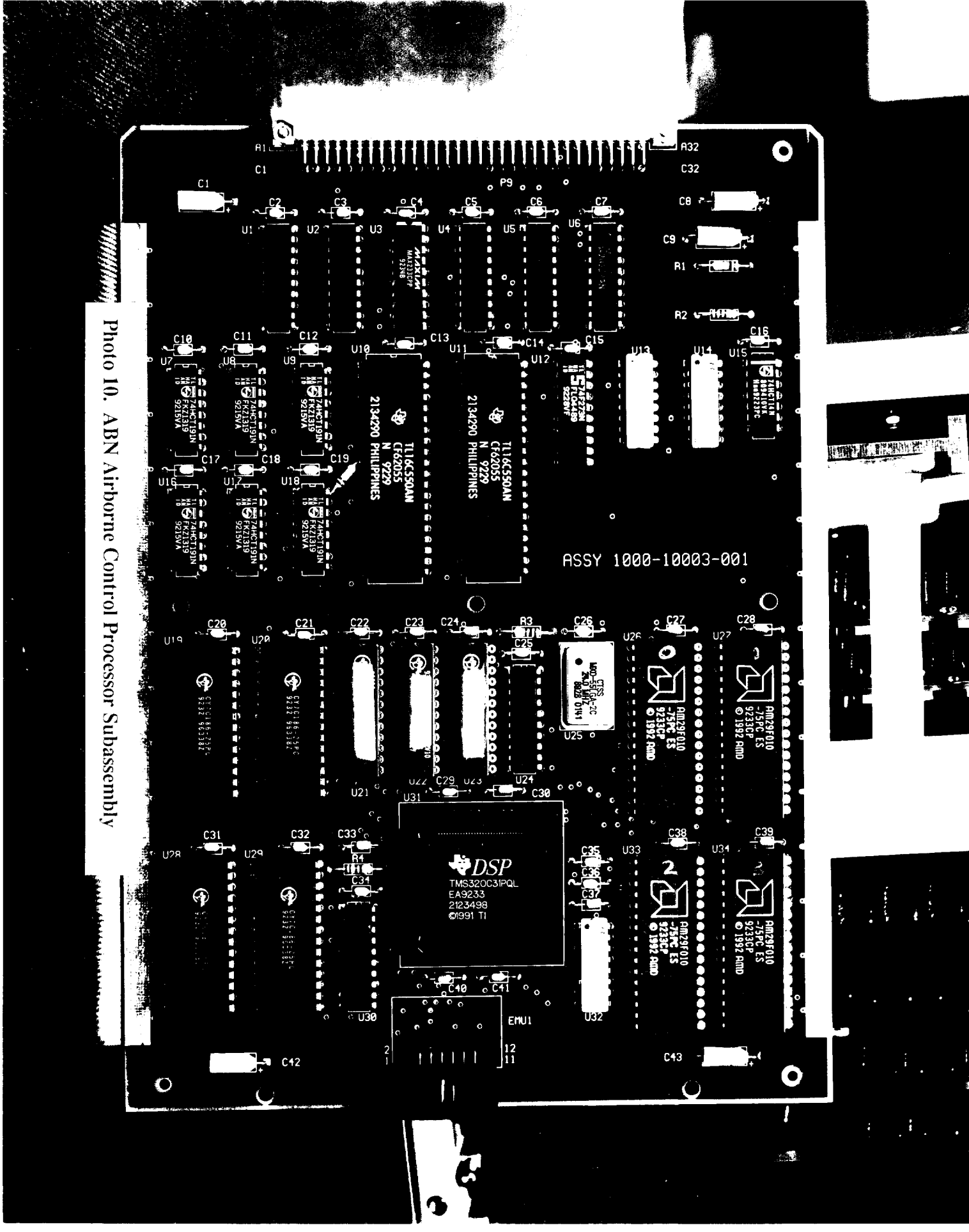


Photo 10. ABN Airborne Control Processor Subassembly

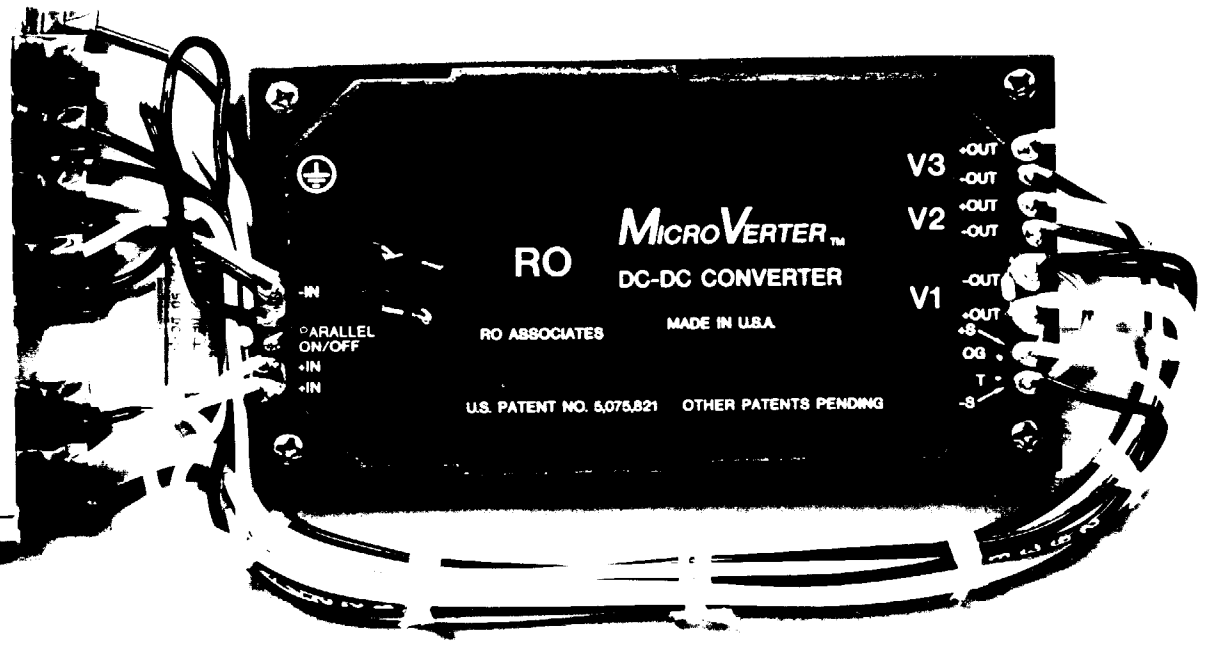


Photo 11. ABN Airborne Power Supply Module

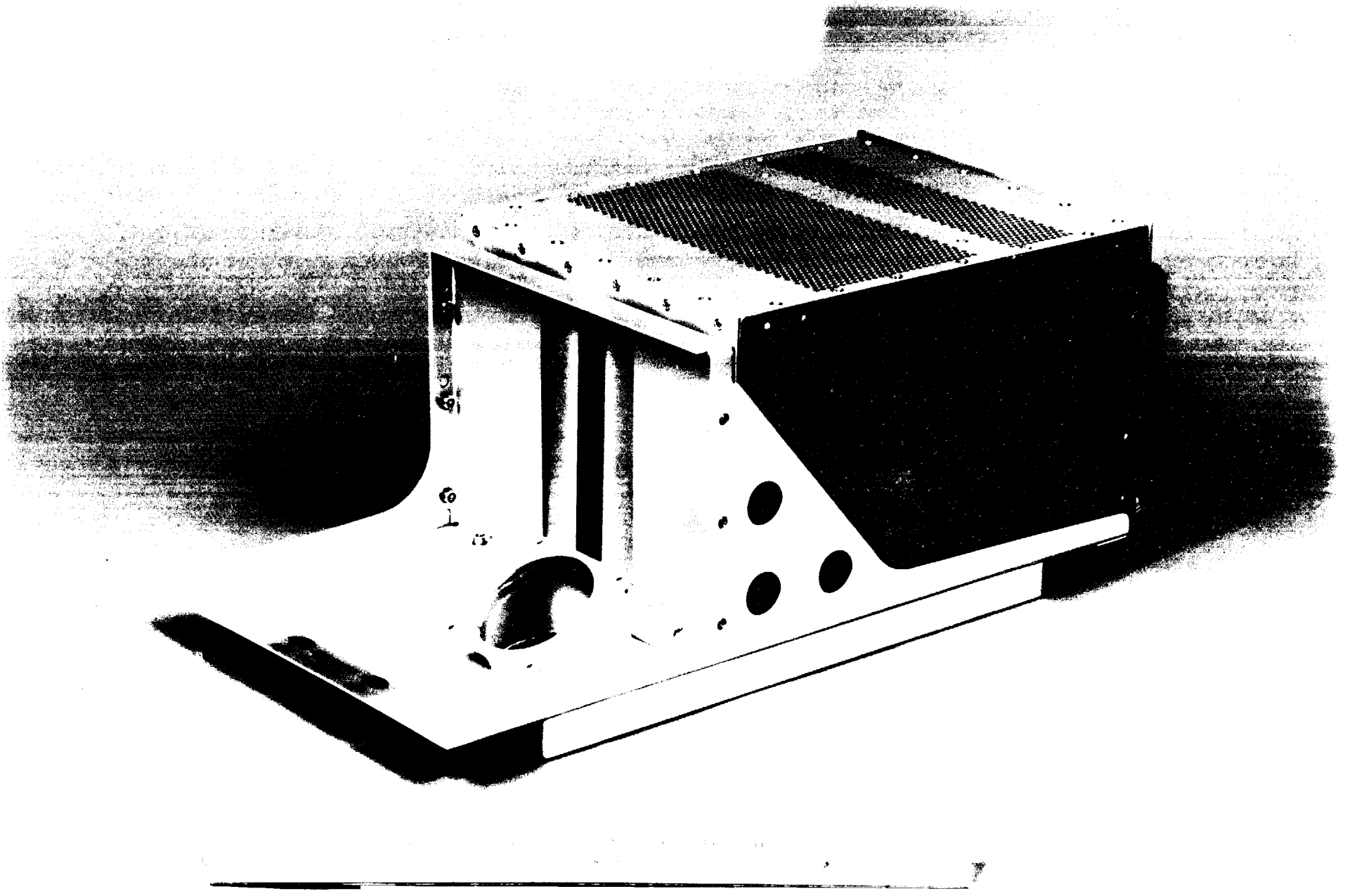


Photo 12. ABN Airborne Enclosure sitting in Aircraft Electronics Bay Tray