
TEST REPORT

Additional FCC Part 90 Testing in support of the Permissive Changes to Application for
Grant of Equipment Authorisation of the P4467/S/T2 Argus® 3 Thermal Imaging Camera

FCC ID: PW9P4467-S-T2

Report Number OO611823/01 Issue 1

November 2003

Equipment: P4467/S/T2 Argus® 3 Thermal Imaging Camera

FCC ID: PW9P4467-S-T2

Specification: 47 CFR 90: 2002

Prepared for:
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Manufacturer's Representative: G Ball

Approved by:


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UKAS EMC Signatory

Dated: 17-11-03

Start of Test: 28th October 2003

Completion of Test: 29th October 2003

Report Distribution: E2V Technologies Limited Copy No. 1
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Copy No:

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on the test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with Part 2, and Part 90 of the FCC Rules. The sample tested was found to comply with the requirements defined in the applied rules



S C Hartley
Test Engineer





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**STATUS**

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Thermal Imaging Camera
APPLICANT	E2V Technologies 106 Waterhouse Lane Chelmesford Essex CM1 2QU United Kingdom
TYPE NUMBER	P4467/S/T2
MANUFACTURERS MODEL NUMBER	Argus® 3
SERIAL NUMBER	670428
TEST SPECIFICATION NUMBER	47 CFR Part 90: 2002
REGISTRATION NUMBER	Y611823
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE	Declaration of Build Status
SERIAL NUMBER	Y611823/1
DATE	29 th October 2003
DISPOSAL	Held pending disposal
REFERENCE NUMBER	N/A
DATE	N/A
START OF TEST	28 th October 2003
FINISH OF TEST	29 th October 2003
TEST ENGINEERS	S C Hartley
RELATED DOCUMENTS	ANSI C63.4 2001. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz. Public Notice DA 00-705, March 2000



INTRODUCTION

The information contained within this report is intended to show verification of compliance of the E2V Argus® 3 Thermal Imaging Camera to the requirements of FCC Specification Part 90.

The unit supplied for testing was a handheld P4467/S/T2 Argus® 3 Thermal Imaging Camera

The terminal utilizes the Microtek Electronics Inc. Minilink 2.4TA-901R module (FCC ID: JRR24TA-901R) to offer data connectivity.

This report details testing carried out in accordance with:

- 47 CFR Part 90. 210, Radiated Spurious Emissions

LOCATION OF TESTING

BABT Engineer, S C Hartley, conducted all testing at the premises BABT, Segensworth Road, Fareham, Hampshire, PO15 5RH. Radiated Emissions measurements were performed in a 3 metre Anechoic Chamber. A complete site description is on file with the FCC Laboratory Division, Registration Number: 90987. See Annex A.

TEST EQUIPMENT AND ANCILLARIES USED FOR TEST

Instrument	Manufacturer	Type No	EMC No	Cal to
Screened Enclosure	Siemens	EAC 54300	2533	TU
Turntable & Controller	HD GmbH	HD 050	2528	TU
Antenna Mast	Emco	1051	2182	TU
Antenna Mast Controller	Emco	1050	2090	TU
Test Receiver	Hewlett Packard	8542E	2286	13 Dec 03
Bilog Antenna	Chase	CBL 6143	2860	11 Apr 04
Spectrum Analyser	Rhode & Schwarz	ESIB 26	2958	05 Aug 04
Horn (1 - 18GHz)	EMCO	3115	2397	04 Jul 04
Horn (1 - 18GHz)	EMCO	3115	2297	04 Jul 04
Horn (18 – 40GHz)	Advanced Microtek	AM180HA-K-TU2	2945	20 May 04
Highpass Filter	RLL Electronics	F100-4000-S-R	1081	TU
Signal Generator	Hewlett Packard	8673B	953	08 Jun 04
Low Noise Amplifier (1 - 8GHz)	Miteq	AMF-3D-001080-18-13P	2457	TU
Low Noise Amplifier (8 - 18GHz)	Avantek	AWT 18036	1081	TU
Low Noise Amplifier (18 - 26GHz)	Avantek	AMT-26177-33	2072	TU
Attenuator 10dB	Marconi	6534/3	1494	TU
Attenuator 3dB	Hewlett Packard	8491B	15108	TU
Barometer	Diplex	-	1938	TU
Hygrometer	Rotronic	A1	INV4066	28 Nov 03

Note(s)

- 1) All items are calibrated annually except where labelled TU (Traceability Unscheduled). These items are calibrated within the test configurations using calibrated equipment.

**DESCRIPTION OF EQUIPMENT UNDER TEST**

The P4467/S/T2 Argus® 3 Thermal Imaging Camera is a hand held Thermal Imaging Camera designed to assist vision in smoke and darkness using Barium Strontium Titanate (BST) infrared detector technology. It offers connectivity utilising a Microtek Minilink 2.4TA-901R radio module.

The P4467/S/T2 Argus® 3 Thermal Imaging Camera was fitted with the Mabuchi Motor.

The equipment under test is made up of the following component parts.

Module	Vendor	Type Number	Serial Number
Argus® 3 Thermal Imaging Camera	E2V Technologies	P4467/S/T2	670428

LIST OF PERFORMED MEASUREMENTS USING THE CONFIGURATION DETAILED ABOVE

- i) Radiated Emissions



Test Case : Radiated Emissions
Test Date : 28th and 29th October 2003
Rule Parts : 90.210

SYSTEM CONFIGURATION DURING EMC TESTING

The Argus® 3 Thermal Imaging Camera incorporating the Microtek Minilink 2.4TA-910R Radio Module was powered by its own internal battery.

A communication link was established between the EUT and an Argus® 3 Receiver.

TEST PROCEDURE

Testing to the requirements of FCC Part 90, Section 90.210, Emission Limits, was carried out on the Measurement Test Facility detailed in Annex A.

In order to determine the Radiated Emission Limits, measurements of transmitter power (P) were first carried out on the top and bottom channels using a peak detector, and the results are shown in the tables of results for Transmitter Power and Transmitter Field Strength.

A preliminary profile of the Radiated Electric Field Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a semi-anechoic chamber; measurements were taken at a 3m distance. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 25GHz. The list of worst-case emissions was then confirmed or updated using the FCC listed semi-anechoic chamber. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. Emissions levels were then formally measured using a peak detector. The details of the worst-case emissions were then recorded and are presented in the tables of results for spurious emissions.

The test was performed in accordance with ANSI C63.4.

All measurements made at 3m.



RADIATED EMISSIONS

TEST RESULTS

The measurements of transmitter power, (P), on top and bottom channels are detailed in the table below.

Freq MHz	Measurement				Substitution			
	Ant Pol V/H	Ant Hgt cm	EUT Azi Deg	Raw PEAK dBm	Level into Tx Antenna dBm	Antenna Gain dB	ERP dBm	ERP mW
Bottom Channel								
2458.00	V	105	164	-22.6	11.9	7.0	18.9	77.6
Top Channel								
2474.00	V	106	166	-21.1	12.8	7.0	19.8	95.5

Table of Results for Transmitter Power (ERP)

The limit for spurious emissions in accordance with FCC 47CFR 90.210 is $43 + 10\log(P)$ down on the carrier where P is the power in Watts.

Using the measured power above the spurious limit for the bottom channel is:
 $43 + 10\log(0.0776) = 31.9\text{dB}$ down on the carrier.

Using the measured power above the spurious limit for the top channel is:
 $43 + 10\log(0.0955) = 32.8\text{dB}$ down on the carrier.

The measurements of transmitter carrier, on top and bottom channels are detailed in the table below.

Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Azi Deg	Raw PEAK dB μ V	Cable loss / Amp gain dB	Antenna Factor dB	Result Peak dB μ V/m
Bottom Channel (Channel 1)									
2458.00	1M	1M	V	105	164	28.8	4.1	28.8	117.0
Top Channel (Channel 2)									
2474.00	1M	1M	V	106	166	85.8	4.1	28.8	118.7

Table of Results for Transmitter Field Strength

Using the results obtained on the two channels the following limits were calculated:

Bottom channel 1: $117.0\text{dB}\mu\text{V/m} - 31.9\text{dB} = 85.1\text{dB}\mu\text{V/m}$

Top channel 2: $118.7\text{dB}\mu\text{V/m} - 32.8\text{dB} = 85.90\text{dB}\mu\text{V/m}$

These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following tables.



TEST RESULTS - continued

The Test was performed with the EUT transmitting on the Bottom Channel, Channel 1 (2.458GHz) and repeated with the EUT transmitting on the Top Channel, Channel 2 (2.474GHz).

The details of the worst-case emissions were then recorded and are presented in the following tables.

The test was performed in accordance with ANSI C63.4.

All measurements made at 3m.

Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Azi Deg	Raw PEAK dB μ V	Cable loss / Amp gain dB	Antenna Factor dB	Result Peak dB μ V/m	Limit Peak dB μ V/m
4499.00	1M	1M	V	108	193	57.2	-24.7	32.2	64.7	85.1
4914.00	1M	1M	V	100	181	73.4	-25.1	32.5	80.8	85.1
6959.00	1M	1M	V	100	180	61.6	-23.9	34.3	72.0	85.1
7376.00	1M	1M	V	116	200	71.1	-23.7	37.0	84.4	85.1
9833.00	1M	1M	V	105	162	60.5	-28.1	38.8	71.2	85.1
12289.00	1M	1M	V	116	164	49.8	-27.6	41.8	64.0	85.1

Table showing Spurious Emissions for the EUT Transmitting on the Bottom Channel, Channel 1 (2.458GHz)

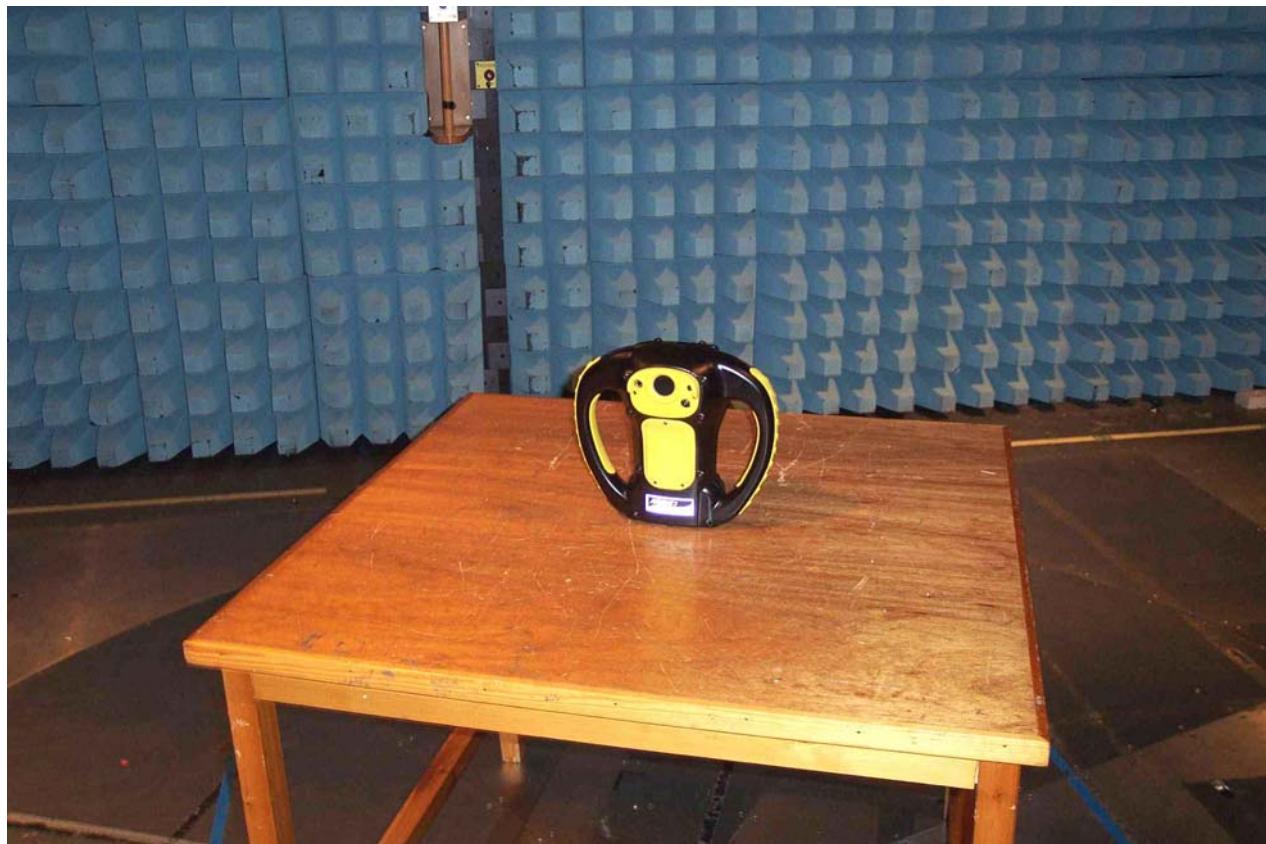
Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Azi Deg	Raw PEAK dB μ V	Cable loss / Amp gain dB	Antenna Factor dB	Result Peak dB μ V/m	Limit Peak dB μ V/m
4451.00	1M	1M	V	100	202	57.0	-24.7	32.2	64.5	85.9
4947.00	1M	1M	V	100	188	74.0	-25.1	32.5	81.4	85.9
6927.00	1M	1M	V	100	185	59.8	-23.9	34.3	70.2	85.9
9893.00	1M	1M	V	110	165	60.9	-28.1	37.5	70.3	85.9
12370.00	1M	1M	V	122	165	47.5	-27.6	41.8	61.7	85.9

Table showing Spurious Emissions for the EUT Transmitting on the Top Channel, Channel 2 (2.474GHz)



TEST SETUP PHOTOGRAPH

The photograph below shows the EUT configuration during Radiated Emission testing.



Photograph 1
Radiated Emissions Set Up



MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are: -

In the frequency range 30MHz to 1000MHz

For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard 8542E EMI Receiver: -

Frequency	$\pm 2 \times 10^{-7} \times$ Centre Frequency
Amplitude	+4.45dB (30-200MHz; 3m Measurements) -4.42dB (30-200MHz; 3m Measurements) +4.80dB (200-1000MHz; 3m Measurements) -3.81dB (200-1000MHz; 3m Measurements)

In the frequency range 1GHz to 25GHz

For Radiated Emissions measurements made with the Rhode & Schwarz ESIB26 Receiver: -

Frequency	$\pm 2 \times 10^{-7} \times$ Centre Frequency
Amplitude	± 3.4 dB



This report relates only to the actual item/items tested.

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Results of tests not yet included in our UKAS Accreditation Schedule are marked NUA
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Annex A

FCC Measurement Facility Compliance Letter

(Comprising of 1 page)



FEDERAL COMMUNICATIONS COMMISSION

**Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046**

October 18, 2002

Registration Number: 90987

**TUV Product Service Ltd
Segensworth Road
Titchfield
Fareham, Hampshire, PO15 5RH
United Kingdom
Attention: Kevan Asetts**

**Re: Measurement facility located at Titchfield
Anechoic chamber (3 meters) and 3 & 10 meter OATS
Date of Listing: October 18, 2002**

Gentlemen:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

A handwritten signature in black ink that reads 'Thomas W. Phillips'.

Thomas W Phillips
Electronics Engineer



Annex B

Photographs of the Equipment

(Comprising of 7 pages)



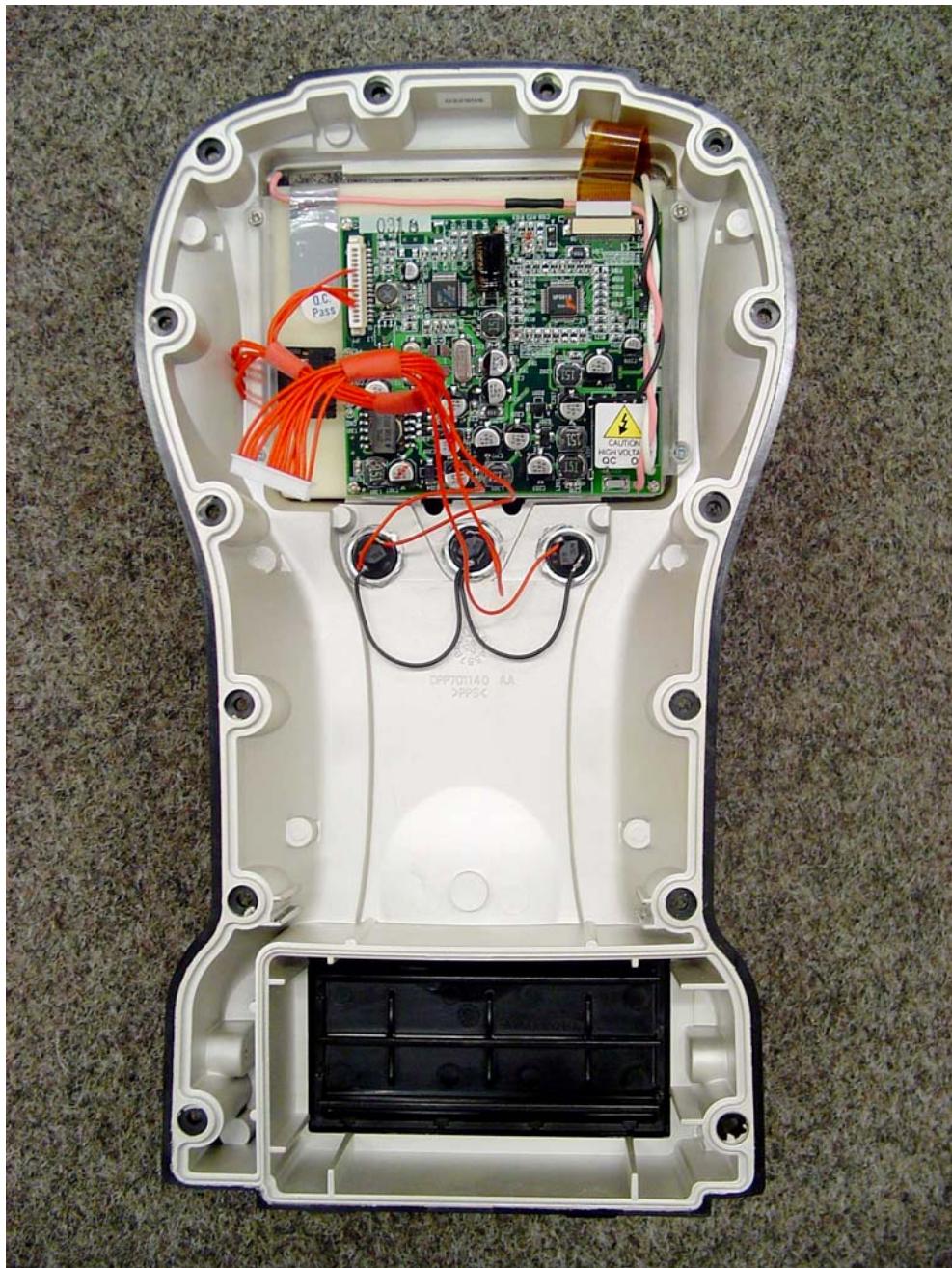
PHOTOGRAPHS OF THE EQUIPMENT



External View from Front showing Antenna



PHOTOGRAPHS OF THE EQUIPMENT



Internal View of Rear of Case



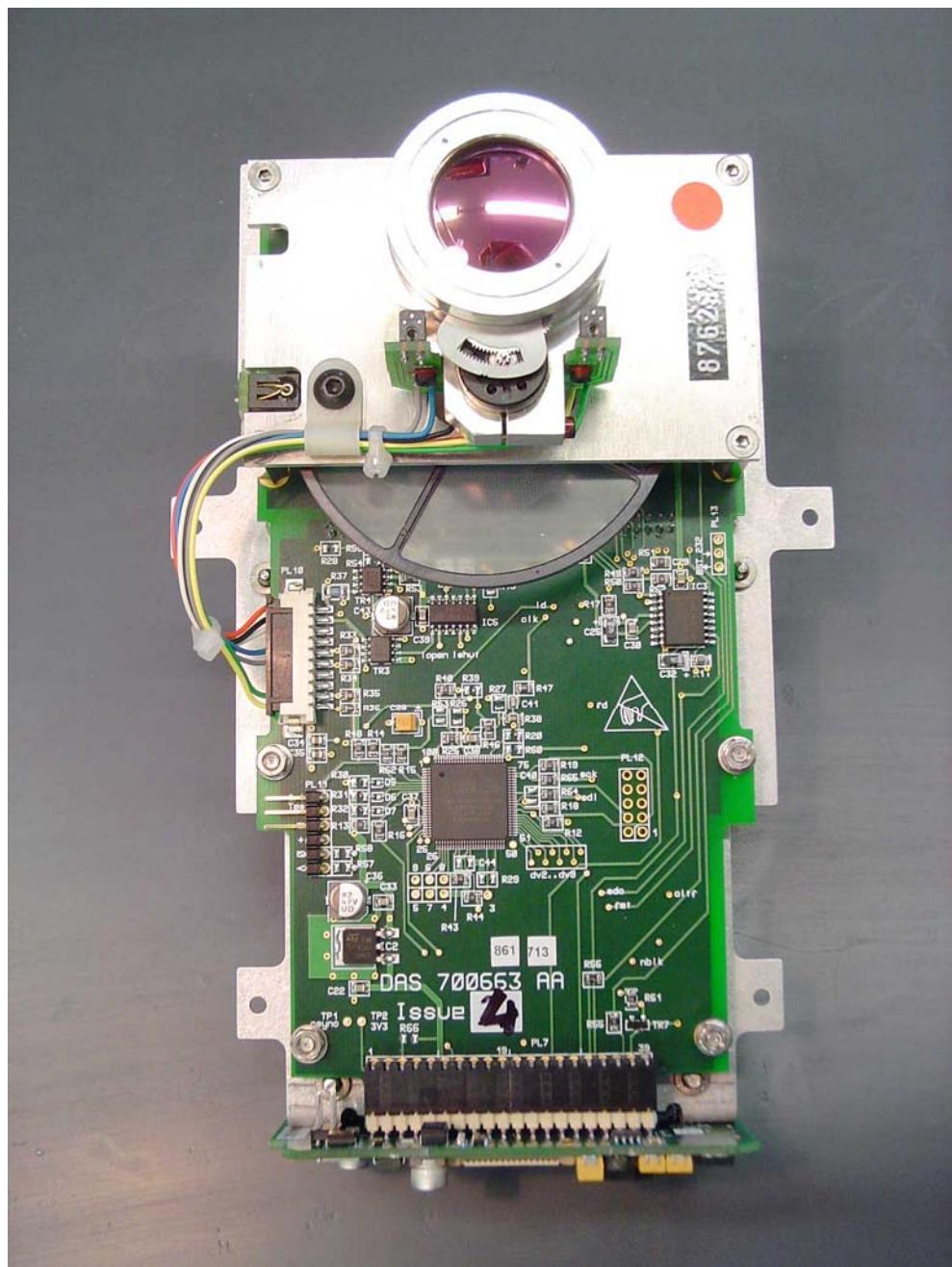
PHOTOGRAPHS OF THE EQUIPMENT



Internal View of Front of Case



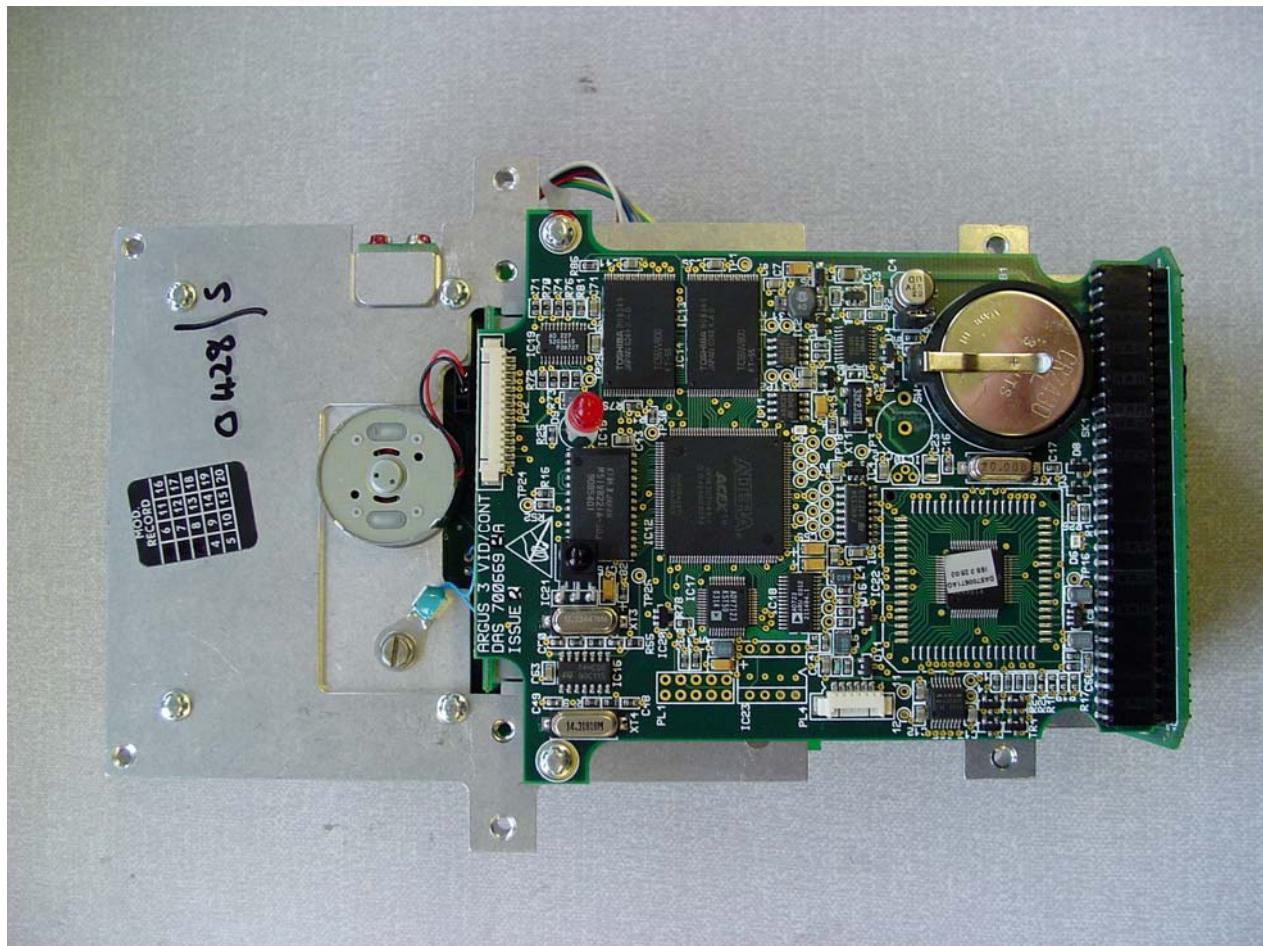
PHOTOGRAPHS OF THE EQUIPMENT



Internal Front View of Chassis



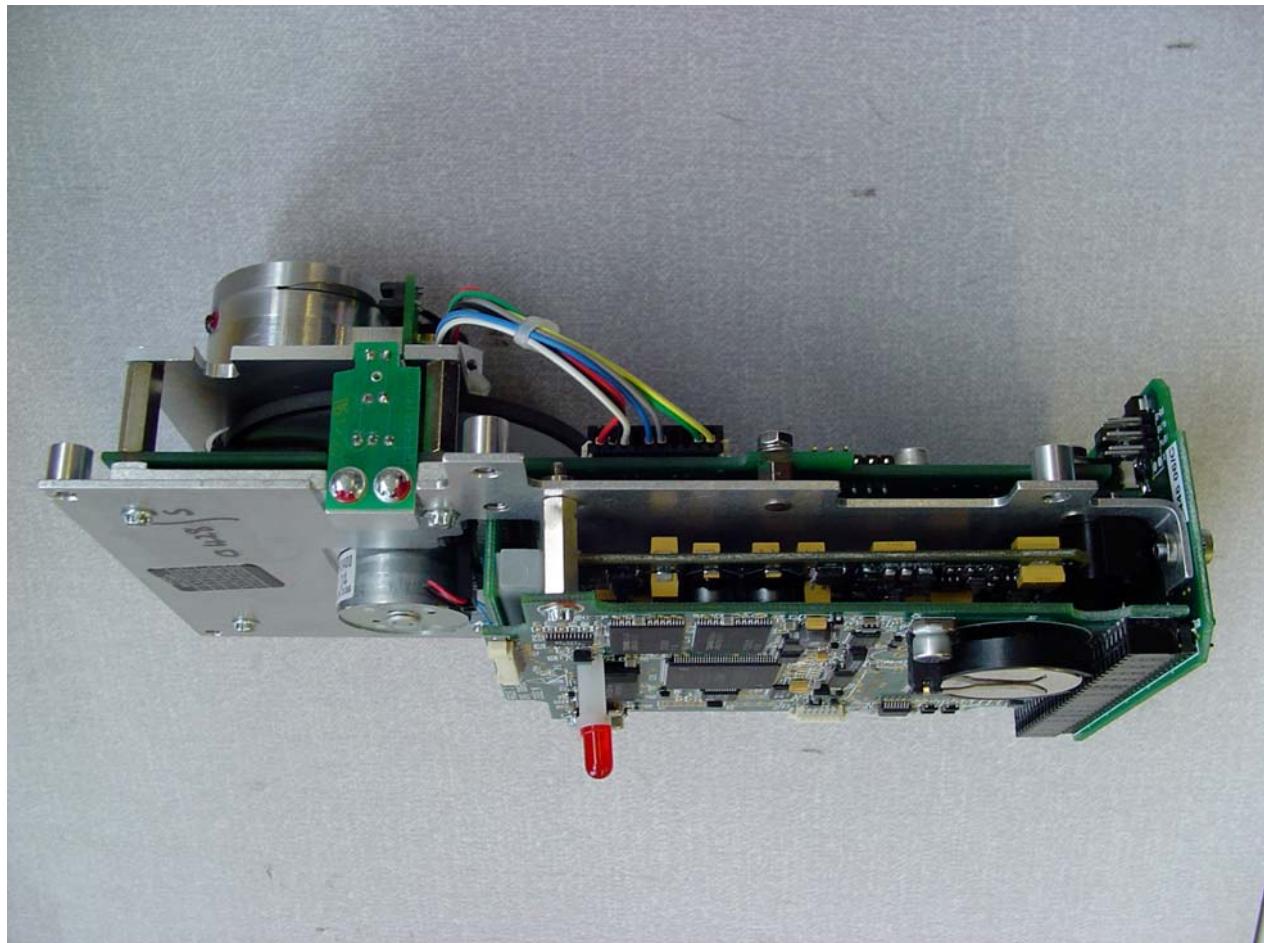
PHOTOGRAPHS OF THE EQUIPMENT



Internal Rear View of Chassis



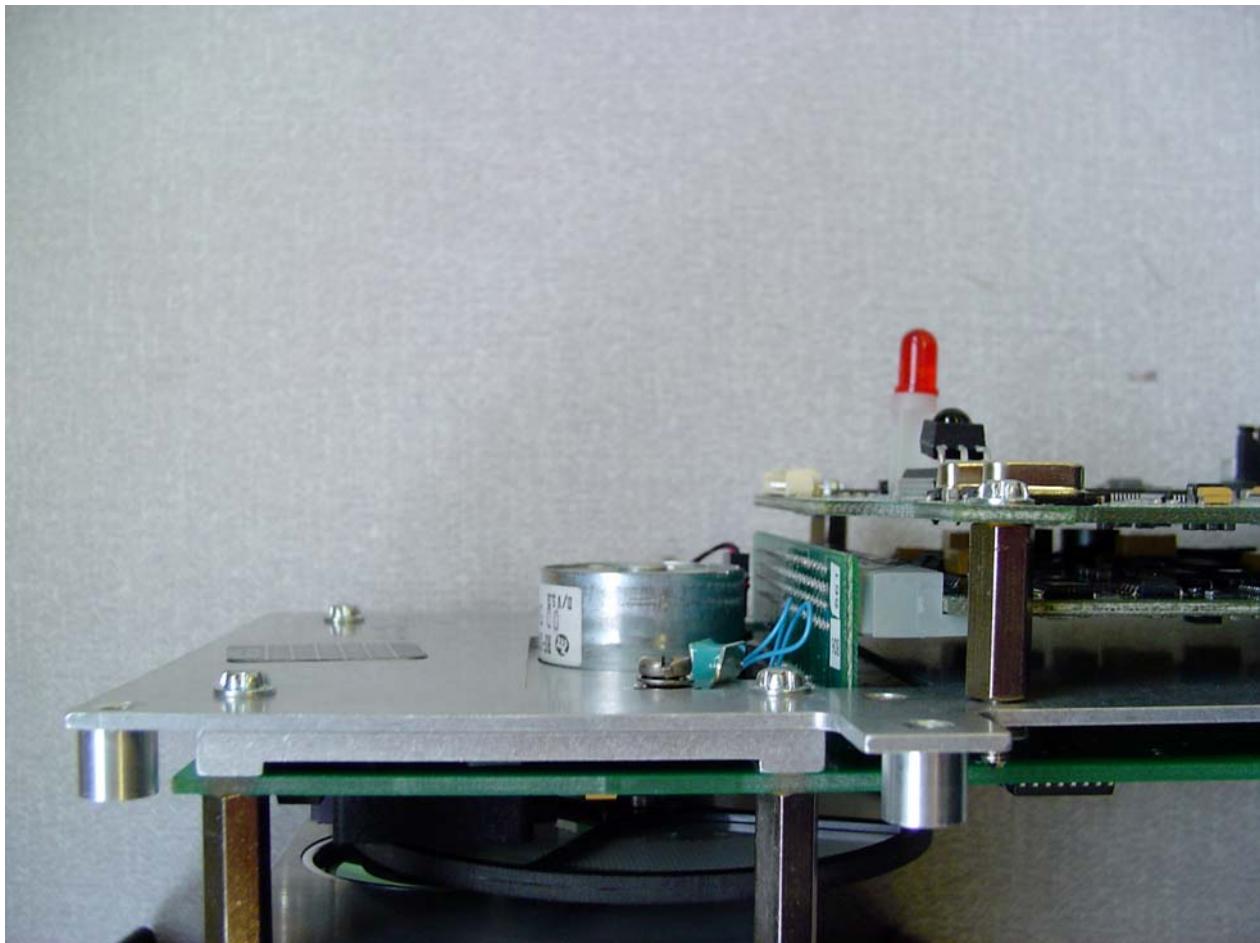
PHOTOGRAPHS OF THE EQUIPMENT



Internal Side View of Chassis



PHOTOGRAPHS OF THE EQUIPMENT



Internal View showing Mabuchi Motor