



FCC 47 CFR PART 15 SUBPART B

TEST REPORT

For

Softlogic Digital Controller

Model: BAS-2520

Trade Name: ADVANTECH

Issued for

Advantech Co., Ltd.

**No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,
Taipei 114, Taiwan, R.O.C.**

Issued by

COMPLIANCE CERTIFICATION SERVICES INC.

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1 TEST RESULT CERTIFICATION

Applicant: **Advantech Co., Ltd.**
 No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,
 Taipei 114, Taiwan, R.O.C.

Manufacturer: **Advantech Co., Ltd.**
 No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,
 Taipei 114, Taiwan, R.O.C.

Equipment Under Test: Softlogic Digital Controller

Trade Name: ADVANTECH

Model: BAS-2520

Detailed EUT Description: See Item 2 of this report

Date of Test: July 13, 2004

Applicable Standard	Class / Limit	Test Result
FCC Part 15 Subpart B	Class A	No non-compliance noted
Deviation from Applicable Standard		
According to applicant's declaration this EUT is a class A product, and to be market in industrial environment only.		

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, Subpart B and the measurement procedures were according to ANSI C63.4. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

Approved by:

Reviewed by:

Kurt Chen
 Director of Linkou Laboratory
 Compliance Certification Services Inc.

Jessie Wang
 Section Manager of Linkou Laboratory
 Compliance Certification Services Inc.



2 EUT DESCRIPTION

Product	Softlogic Digital Controller
Trade Name	ADVANTECH
Model	BAS-2520
Housing Type	Metal Case
EUT Power Rating	24VAC

I/O Port of EUT

I/O Port Type	Q'TY	TESTED WITH
1). DIO Port	2	2
2). RS232 Port	1	1
3). RS485 Port	1	1
4). IDE Port	1	1



3 TEST METHODOLOGY

3.1 EUT SYSTEM OPERATION

1. The EUT connected with I-Port Serial Device to Ethernet Gateway and power adapter (Customer Consigns).
2. The EUT connected with I/O Expansion Module be terminal during all testing.

3.2 DECISION OF FINAL TEST MODE

1. The following test mode was scanned during the preliminary test:

Mode 1

Data transmit control

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Mode 1

Then, the EUT configuration and cable configuration of the above highest emission mode was recorded for all final test items.



4 SETUP OF EQUIPMENT UNDER TEST

Setup Diagram

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

Support Equipment

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	I/O Expansion Module	BAS-2020	N/A	FCC DoC	ADVANTECH	IDE Cable: Unshielded, 0.5m DIO Cable: Unshielded, 1.8m x 2	N/A
2	I-Port Serial Device to Ethernet Gateway	ADAM-4577	N/A	FCC DoC	ADVANTECH	RS-232 Cable: Unshielded, 1.8m	Unshielded, 1.8m
3	Power Adapter	N/A	N/A	N/A	N/A	N/A	AC I/P: Unshielded, 1.8m AC O/P: Unshielded, 1m
4	DIO Cable	N/A	N/A	N/A	N/A	Unshielded, 1.8m x 3 with one core	N/A
5	RS-485 Cable	N/A	N/A	N/A	N/A	Unshielded, 0.15m	N/A

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

5 FACILITIES AND ACCREDITATIONS







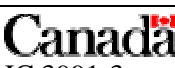
5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at CCS Taiwan Linkou Lab at No. 81-1, Lane 210, Bade Rd., 2, Luchu Hsiang, Taoyuan Hsien, Taiwan.

The measurement facilities are constructed in conformance with the requirements of CISPR 16-1, ANSI C63.4 and other equivalent standards.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

The test facilities used to perform Electromagnetic compatibility tests are registered or accredited by the organizations listed in the following table which includes the recognized scope specifically.

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP	EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS CISPR 22, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11	 Lab. Code: 200600-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 93105, 90471
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	 R-393/1066/725/879/1868 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328-2, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	 ELA 124a ELA 124b ELA 124c
Taiwan	CNLA	EN 300 328-1, EN 300 328-2, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3	 0363 ILAC MRA
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	 SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS212, Issue 1	 IC 3991-3 IC 3991-4

Note: No part of this report may be used to claim or imply product endorsement by CNLA, NVLAP or other government agency.



6 INSTRUMENT AND CALIBRATION

6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

6.2 TEST AND MEASUREMENT EQUIPMENT

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective manual.

Equipment Used for Emission Measurement

Open Area Test Site # 1				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	ADVANTEST	R3261C	71720533	N.C.R
EMI Test Receiver	R&S	ESVS10	834468/006	04/16/2005
Pre-Amplifier	Anritsu	MH648A	M18767	08/31/2004
Bilog Antenna	CHASE	CBL6112A	2309	01/30/2005
Turn Table	EMCO	2081-1.21	N/A	N.C.R
Antenna Tower	EMCO	2075-2	9707-2604	N.C.R
Controller	EMCO	2090	N/A	N.C.R
RF Switch	Anritsu	MP59B	M54367	N.C.R
Site NSA	C&C	N/A	N/A	08/15/2004

Note: The measurement uncertainty is less than +/- 3.36dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.



7 LINE CONDUCTED & RADIATED EMISSION TEST

7.1 LIMIT

Maximum permissible level of Line Conducted Emission

Frequency (MHZ)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note: The lower limit shall apply at the transition frequency.

Maximum permissible level of Radiated Emission measured at 10 meter

Frequency (MHZ)	Class A (dBuV/m)	Class B (dBuV/m)
	Quasi-peak	Quasi-peak
30 – 230	40	30
230 - 1000	47	37

Note: The lower limit shall apply at the transition frequency.

Maximum permissible level of Radiated Emission measured at 3 meter

Frequency (MHZ)	Class A (dBuV/m)		Class B (dBuV/m)	
	Average	Peak	Average	Peak
Above 1000	59.3	79.3	53.9	73.9

Note: The lower limit shall apply at the transition frequency.



7.2 TEST PROCEDURE OF LINE CONDUCTED EMISSION

Procedure of Preliminary Test

- The EUT was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per ANSI C63.4.
- All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- The test equipment EUT installed received AC power, 120VAC/60Hz, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment received power from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a EMI Test Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to the Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Receiver.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission level were recorded for reference of the final test.



Procedure of Final Test

- EUT and support equipment were set up on the test bench as per step 10 of the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the AV. limit in Q.P. mode, then the emission signal was re-checked using an AV. detector.
- The test data of the worst-case condition(s) was recorded.

Data Sample:

Freq. (MHz)	Q.P. Raw (dBuV)	Average Raw (dBuV)	Q.P. Limit (dBuV)	Average Limit (dBuV)	Q.P. Margin (dB)	Average Margin (dB)	Note
x.xx	43.95	---	73.00	60.00	-29.05	---	L1

- Freq. = Emission frequency in MHz
 Raw dBuV = Uncorrected Analyzer/Receiver reading + Insertion loss of LISN, if it > 0.5 dB
 Limit dBuV = Limit stated in standard
 Margin dB = Reading in reference to limit
 Note = Current carrying line of reading
 “---“ = The emission level complied with the Average limits, with at least 2dB margin limits, so no further recheck.

Calculation Formula

Margin (dB) = RAW (dBuV) – Limit (dBuV)



7.3 TEST PROCEDURE OF RADIATED EMISSION

Procedure of Preliminary Test

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per ANSI C63.4.
- All I/O cables were positioned to simulate typical usage as per ANSI C63.4.
- The EUT received AC power source, 120VAC/60Hz, from the outlet socket under the turntable. All support equipment received power from another socket under the turntable.
- The antenna was placed at 10 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 40GHz maximum, if any. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.



Procedure of Final Test

- EUT and support equipment were set up on the turntable as per step 8 of the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 40GHz maximum, if any. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst case condition(s) was recorded.

Data Sample:

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
xx.xx	14.00	12.20	26.20	40.00	-13.80

- Freq. = Emission frequency in MHz
- Raw Data (dBuV) = Uncorrected Analyzer / Receiver reading
- Corr. Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
- Emiss. Level (dBuV/m) = Raw reading converted to dBuV/m and CF added
- Limit (dBuV/m) = Limit stated in standard
- Margin (dB) = Reading in reference to limit
- P = Peak Reading
- Q = Quasi-peak Reading
- A = Average Reading

Calculation Formula

Margin (dB) = Emiss. Level (dBuV/m) – Limits (dBuV/m)
 Emission Level (dBuV/m) = Raw Data (dBuV) + Corr Factor (dB/m)



7.4 TEST RESULTS

Line Conducted Emission

Model: N/A

Test Mode: N/A

Temperature: N/A

Humidity: N/A

Tested by: N/A

Test Results: N/A

****Note: This EUT has not connection to AC Source direct. No applicable for this test.**



Radiated Emission (A)

Model: BAS-2520

Test Mode: Mode 1

Temperature: 30°C

Humidity: 64% RH

Detector Function: Quasi-peak.

Antenna: Vertical at 10m

Tested by: Ethan Huang

Test Results: Pass

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
110.51	22.0	11.6	33.6	40.0	-6.4
129.83	22.4	12.0	34.4	40.0	-5.6
150.31	16.2	11.0	27.2	40.0	-12.8
190.30	15.8	11.2	27.0	40.0	-13.0
200.07	14.9	10.8	25.7	40.0	-14.3
209.82	14.2	10.6	24.8	40.0	-15.2
229.35	10.9	10.9	21.8	40.0	-18.2



Radiated Emission (B)

Model: BAS-2520

Test Mode: Mode 1

Temperature: 30°C

Humidity: 64% RH

Detector Function: Quasi-peak.

Antenna: Horizontal at 10m

Tested by: Ethan Huang

Test Results: Pass

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
110.54	22.8	11.6	34.4	40.0	-5.6
129.83	25.9	12.0	37.9	40.0	-2.1
150.30	22.6	11.0	33.6	40.0	-6.4
200.09	13.6	10.8	24.4	40.0	-15.6
209.83	15.0	10.6	25.6	40.0	-14.4
230.24	15.4	11.0	26.4	47.0	-20.6
449.61	8.1	19.0	27.1	47.0	-19.9
480.09	6.3	20.3	26.6	47.0	-20.4

APPENDIX 1 - PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST

