

# EMC Technologies (NZ) Ltd

Test Report No 71016.2

Report date: 15 January 2008

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## **TEST REPORT**

### **Cabco Stand Controller**

*tested to the*

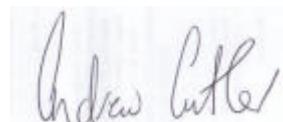
### **Code of Federal Regulations (CFR) 47**

#### **Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators**

#### **Section 15.249 – Operation in the band 2400 – 2483.5 MHz**

*for*

**Cabco Ltd**



This Test Report is issued with the authority of:

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**Andrew Cutler - General Manager**



All tests reported  
herein have been  
performed in accordance  
with the laboratory's  
scope of accreditation

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**EMC Technologies (NZ) Ltd**

Telephone: +64 9 360 0862 Fax: +64 9 360 0861

STREET ADDRESS - 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand  
POSTAL ADDRESS - PO Box 68 307, Newton, Auckland, New Zealand

E-mail: aucklab@ihug.co.nz

Web Site: [www.emctech.com.au](http://www.emctech.com.au)

# **EMC Technologies (NZ) Ltd**

Test Report No **71016.2**

Report date: 15 January 2008

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## **1. CLIENT INFORMATION**

**Company Name** Cabco Ltd

**Address** D/18 Triton Drive  
Albany

**City** Auckland

**Country** New Zealand

**Contact** Mr Brendon Haworth

## **2. DESCRIPTION OF TEST SAMPLE**

**Brand Name** Cabco

**Model Number** Stand Generation 3

**Product** Stand controller

**Manufacturer** Cabco Ltd

**Country of Origin** New Zealand

**Serial Number** Not serialised

**FCC ID** SN9-2008-STAND

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## 3. COMPLIANCE STATEMENT

The Cabco Stand Controller **complies with** 47 CFR Part 15 and in particular Sections, 15.205, 15.207, 15.209, 15.215 and 15.249 as detailed below.

<b><u>CLAUSE</u></b>	<b><u>TEST PERFORMED</u></b>	<b><u>RESULT</u></b>
15.109	Radiated emission limits	Complies
15.203	Antenna requirement	Complies
15.205	Operation in restricted bands	Complies
15.207	Conducted emissions	Complies
15.209	Radiated emissions	Complies
15.215	Additional provisions	Complies
15.249:		
(a)	Field strength of fundamental	Complies
(a)	Field strength of harmonics	Complies
(b)	Fixed, point to point operations	Not applicable
(c)	3 metre measurement distance	Noted
(d)	Spurious emission levels except harmonics	Complies
(e)	Detectors above 1000 MHz	Noted
(f)	Reference to section 15.37(d)	Noted

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## 4. TEST SAMPLE DESCRIPTION

The device tested is a CABCO stand controller which controls hired shopping karts.

The stand controller operates uses a Max Stream XB24 ZigBee Module that uses ZigBee IEEE 802.15.4 operating techniques.

The customer advises that this module is an FCC certified module however no further details have been provided

FCC Frequency Range: 2400.000 MHz – 2483.500 MHz

Transmit Frequency: 2405.000 MHz

Receive Frequencies: 2405.000 MHz

Rated RF Power (max): 1 mW (0 dBm)

Modulation Type: Offset Quadrature PSK (OQPSK)

Operating Protocol: ZigBee IEEE 802.15.4

Antenna Type: 2.4 GHz dipole

Power Supply: Internal Switch Mode Power supply

Nominal Voltage: 110.0 Vac

The module used has the ability to operate on 16 channels with a 5 MHz channel spacing in the 2400 – 2483.5 MHz band.

The customer advises that this system is to have a fixed frequency of operation, 2405 MHz, with the other 15 channels not being utilised.

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## 5. ATTESTATION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

**The client selected the test sample.**

**The report relates only to the sample tested.**

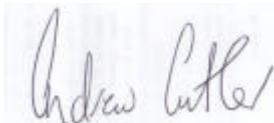
**This report does not contain corrections or erasures.**

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.



Andrew Cutler  
General Manager  
EMC Technologies NZ Ltd

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## 6. TRANSMITTER TEST RESULTS

### Section 15.203 – Antenna requirement

The transmitter in this receiver device uses a 2.4 GHz dipole antenna that is permanently attached to the transmitter inside the stand enclosure.

### Section 15.205 – Restricted bands of operation

Refer to measurements made with reference to Section 15.249 (a).

### Section 15.207 – Conducted emissions

Conducted emissions testing was carried out over the frequency range of 150 kHz to 30 MHz.

Testing for conducted emissions was carried out at the laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room.

The device was placed 0.8 m away from the artificial mains terminal network on the emissions test table which is 1 m x 1.5 m, and is 0.8 m above the screened room floor which acts as the horizontal ground plane and is 0.4 m away from the screened room wall which acts as the vertical ground plane.

Testing was carried out when the transmitter was transmitting continuously

Measurement uncertainty with a confidence interval of 95% is:

- Mains terminal tests (0.15 - 30 MHz)  $\pm$  2.2 dB

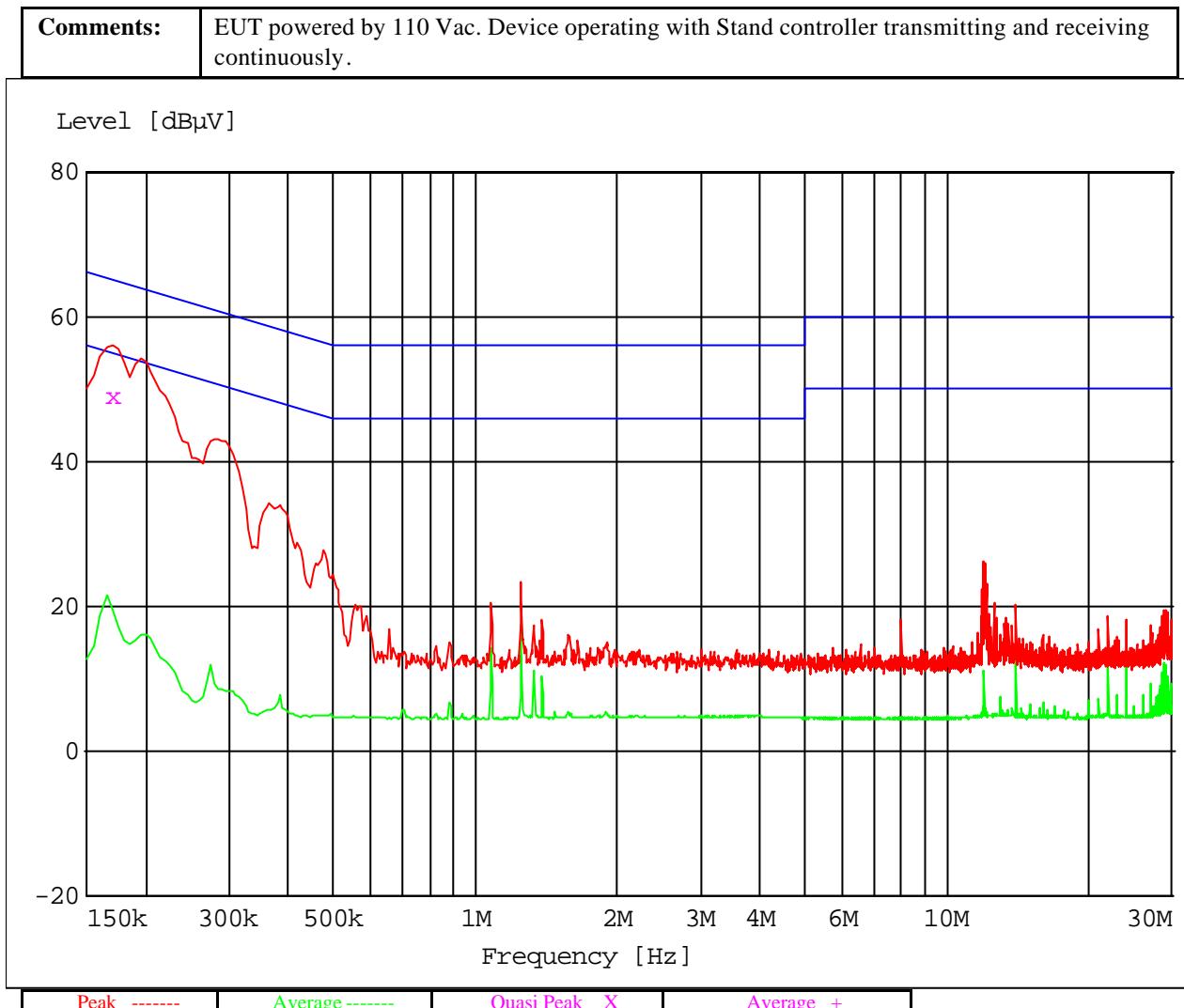
**Result:** Complies

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## Conducted emissions



### Quasi-Peak Measurements

Frequency MHz	Level dB $\mu$ V	Limit dB $\mu$ V	Margin dB	Phase	Rechecks dB $\mu$ V
0.17000	49.00	64.9	15.8	N	

### Average Measurements

Frequency MHz	Level dB $\mu$ V	Limit dB $\mu$ V	Margin dB	Phase	Rechecks dB $\mu$ V

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## Section 15.209 – Radiated emissions

In accordance with section 15.249 (d) the general emission limits specified in Section 15.209 (a) have been applied to all emissions except the transmitter harmonics.

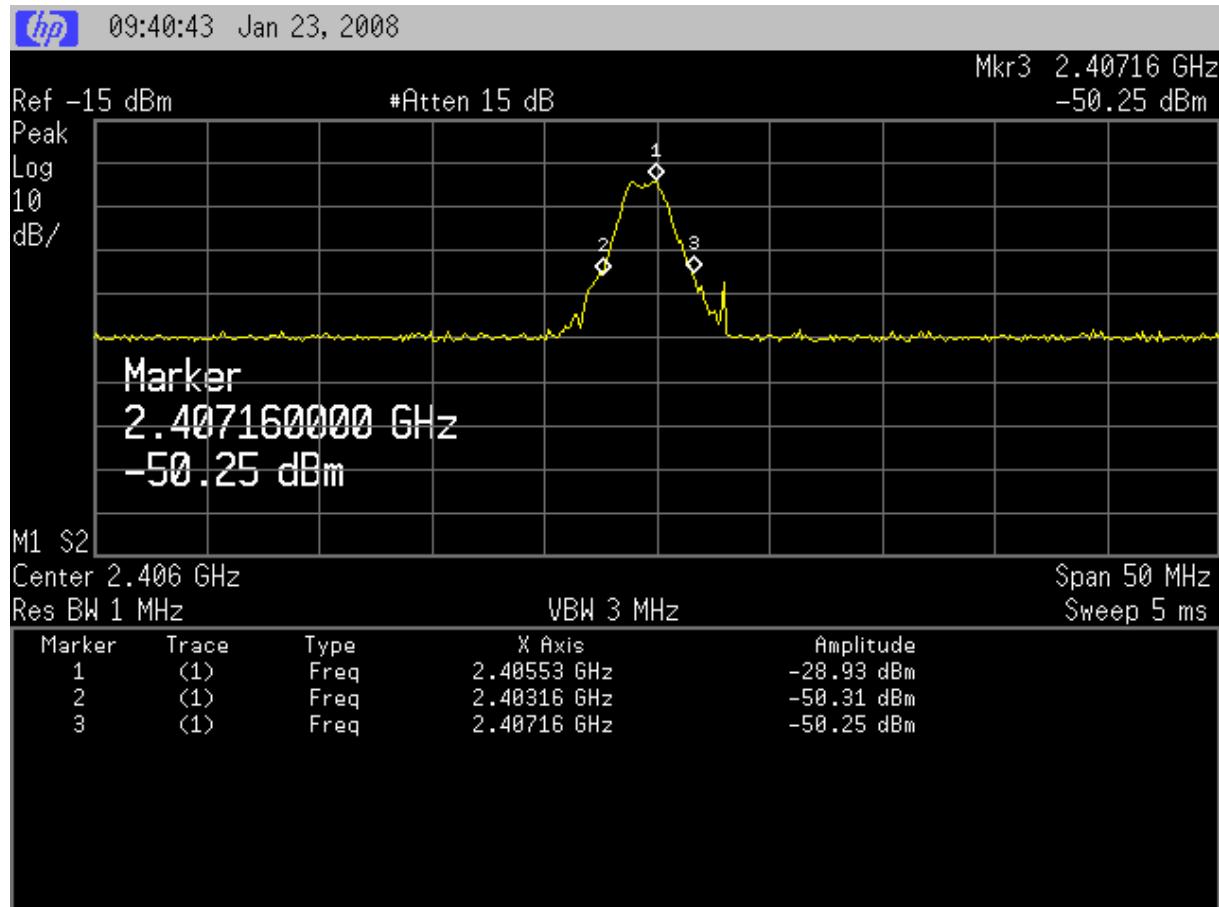
See Section 15.249 (a) for further details.

## Section 15.215 (c) – Additional provisions to the general radiated emission limitations

Spectrum mask measurements have been made at approximately 2405 MHz.

The 20 dB bandwidth has been determined to be 2403.160 MHz - 2407.160 MHz

The device operates in the 2400 – 2483.5 MHz band.



**Result:** Complies

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## Section 15.249 (a) – Field strength of the Fundamental and Harmonics

### Transmit mode

Measurements were made using peak detector with a 1 MHz resolution bandwidth with the average limit being applied.

Where the peak measurement exceeds the average limit, average and peak measurements have been carried out.

The peak limit is 20 dB above the average limit.

When an emission is located, it is positively identified and its maximum level is found by rotating the EUT, and by varying the antenna height manually to achieve the optimum readings.

The emission is measured in both vertical and horizontal antenna polarisations with no measurements were made above the 10<sup>th</sup> harmonic.

### Fundamental emission

Frequency (MHz)	Vert (dBuV/m)	Hort (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity	Detector
2405.00	93.7	88.5	94.0	0.3	Vert	Peak

Observations were made around the 2400 – 2483.5 MHz band edges but no spurious emissions were detected from the fundamental.

### Spurious emissions

Frequency (MHz)	Vert (dBuV/m)	Hort (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity	Detector
4810.000	-		54.0	-	-	Peak
7215.000	-		54.0	-	-	Peak
9620.000	-		54.0	-	-	Peak
12025.000	-		54.0	-	-	Peak
14430.000	-		54.0	-	-	Peak
16835.000	-		54.0	-	-	Peak
19240.000	-		54.0	-	-	Peak
21645.000	-		54.0	-	-	Peak
24050.000	-		54.0	-	-	Peak

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## Other emissions observed

Frequency (MHz)	Vert (dB $\mu$ V/m)	Hort (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Polarity
121.500	32.0		43.5	11.5	Vertical
243.000	39.3	45.0	46.0	1.0	Horizontal
298.100	29.1		46.0	16.9	Vertical
129.100	31.0		43.5	12.5	Vertical
321.500		38.0	46.0	8.0	Horizontal
324.000		42.0	46.0	4.0	Horizontal
329.000		38.4	46.0	7.6	Horizontal
331.778		35.0	46.0	11.0	Horizontal
334.000		39.0	46.0	7.0	Horizontal
364.500	45.7	43.0	46.0	0.3	Vertical
445.500		41.0	46.0	5.0	Horizontal
607.513		36.0	46.0	10.0	Horizontal
730.000	42.0	40.0	46.0	4.0	Vertical
744.075	39.9		46.0	6.1	Vertical
768.075	40.4		46.0	5.6	Vertical
792.078	40.3		46.0	5.7	Vertical
840.085	39.5		46.0	6.5	Vertical
850.523		30.0	46.0	16.0	Horizontal
864.085	40.6		46.0	5.4	Vertical
960.000		37.0	46.0	9.0	Horizontal

The emission level is determined in field strength by taking the following into consideration:

Level (dB $\mu$ V/m) = Receiver Reading (dB $\mu$ V) + Antenna Factor (dB) + Coax Loss (dB) – Microwave Preamplifier Gain (dB)

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests  $(30 - 18,000 \text{ MHz}) \pm 4.1 \text{ dB}$

**Result:** Complies

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## 7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref
Aerial Controller	EMCO	1090	9112-1062	RFS 3710
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612
Log Periodic Antenna	Schwarzbeck	VUSLP9111	9111-228	RFS 3702
Horn Antenna	EMCO	3115	9511-4629	E1526
Horn Antenna	EMCO	3116	2276	-
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3776
Measurement Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595
Measurement Receiver	Rohde & Schwarz	ESHS 10	828404/005	RFS 3728
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709
VHF Balun Antenna	Schwarzbeck	VHA 9103		RFS 3603
Thermal chamber	Contherm	M180F	86025	E1129
Thermometer	DSIR	RT200	35	E1409
Microwave Pre Amplifier	Hewlett Packard	8349B	2644A01659	-

## 8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was updated on January 27<sup>th</sup>, 2007.

In addition testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025:2005.

All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025: 2005.

International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with 46 accreditation bodies in 34 economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

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## 9. PHOTOGRAPHS

### Radiated Emissions Setup



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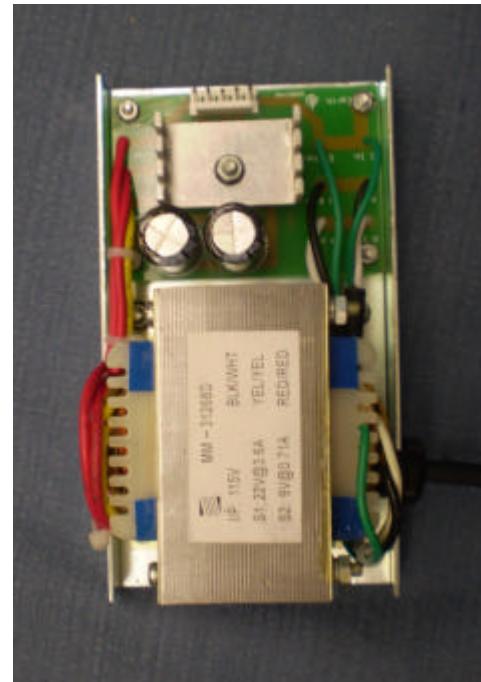
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## Conducted Emissions Setup



### Internal Views

#### 1. SMPS



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## 2. Controller



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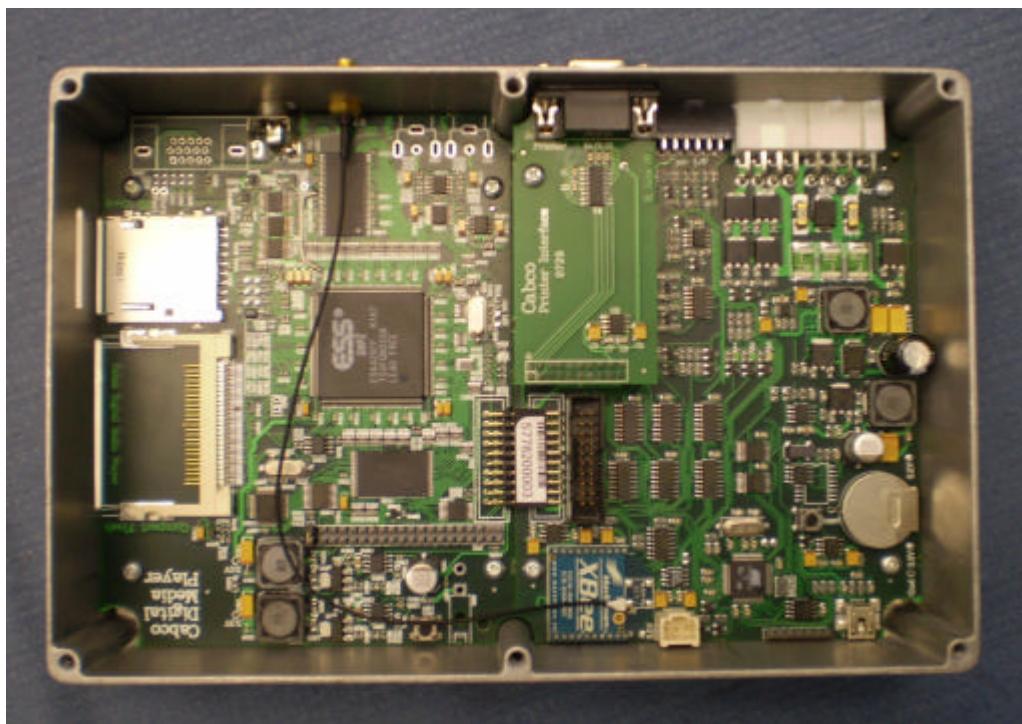
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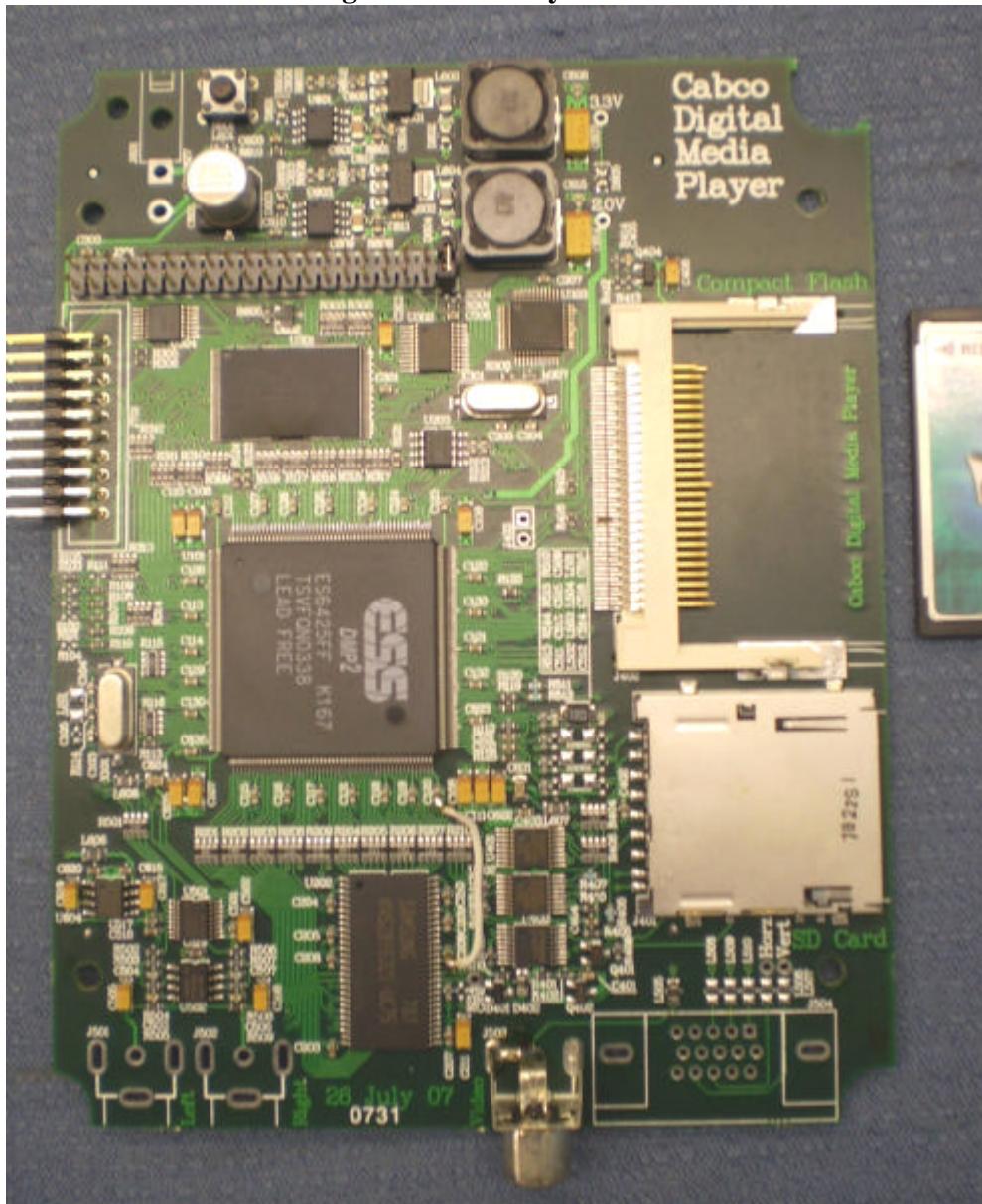
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## Digital Media Player Board



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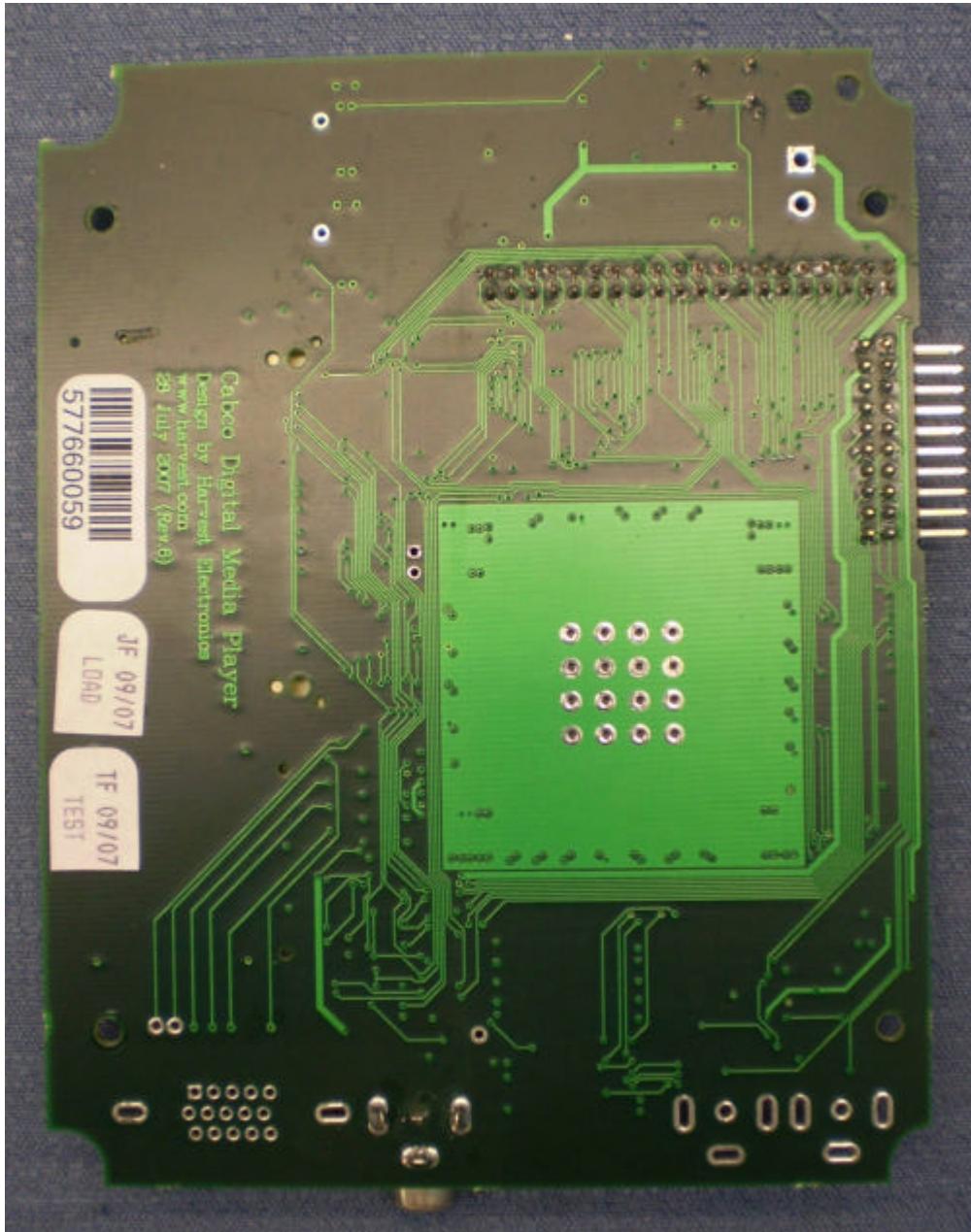
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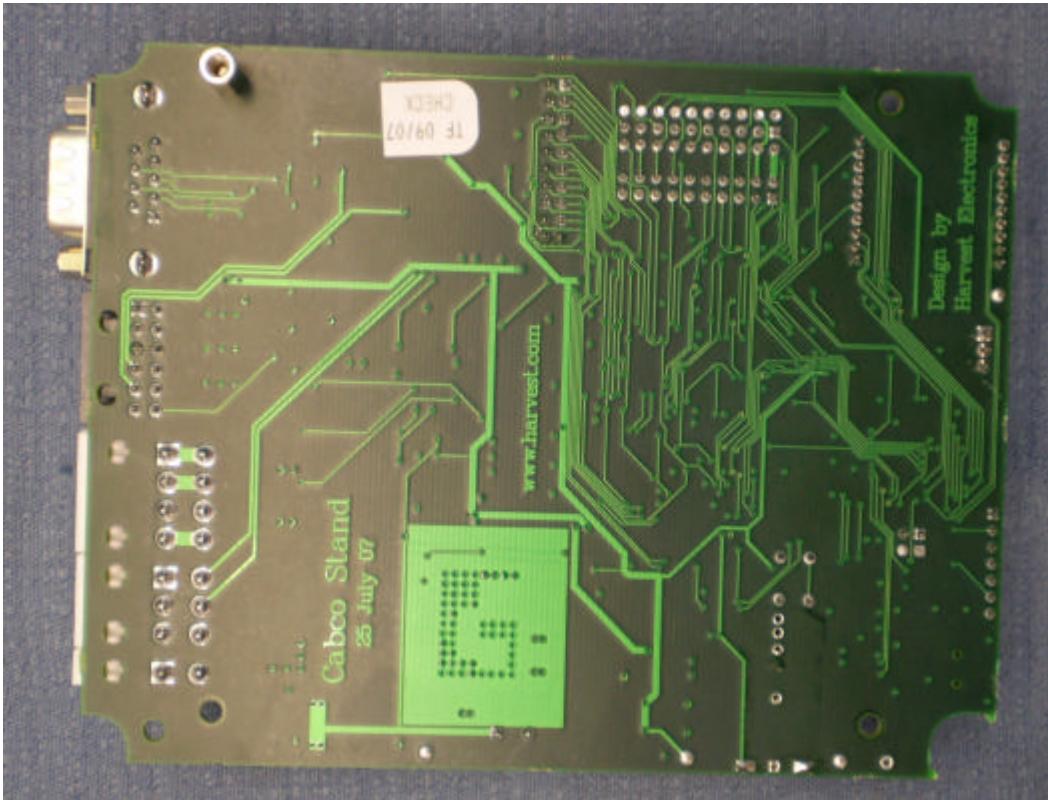
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## Stand Controller PCB



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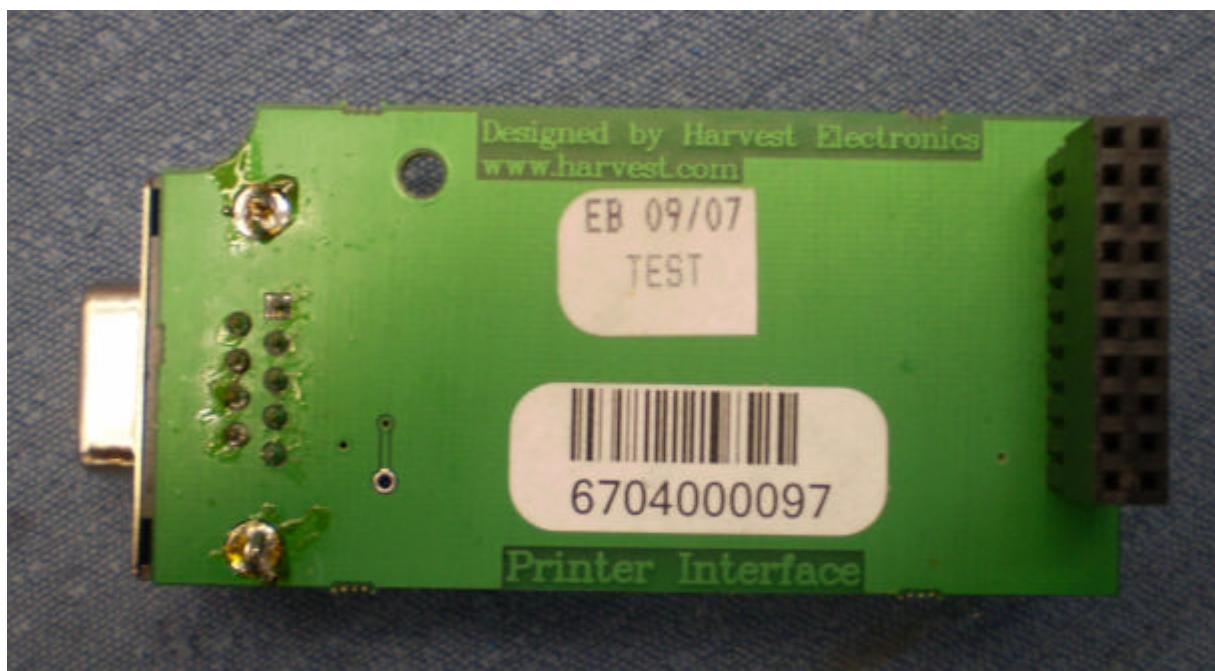
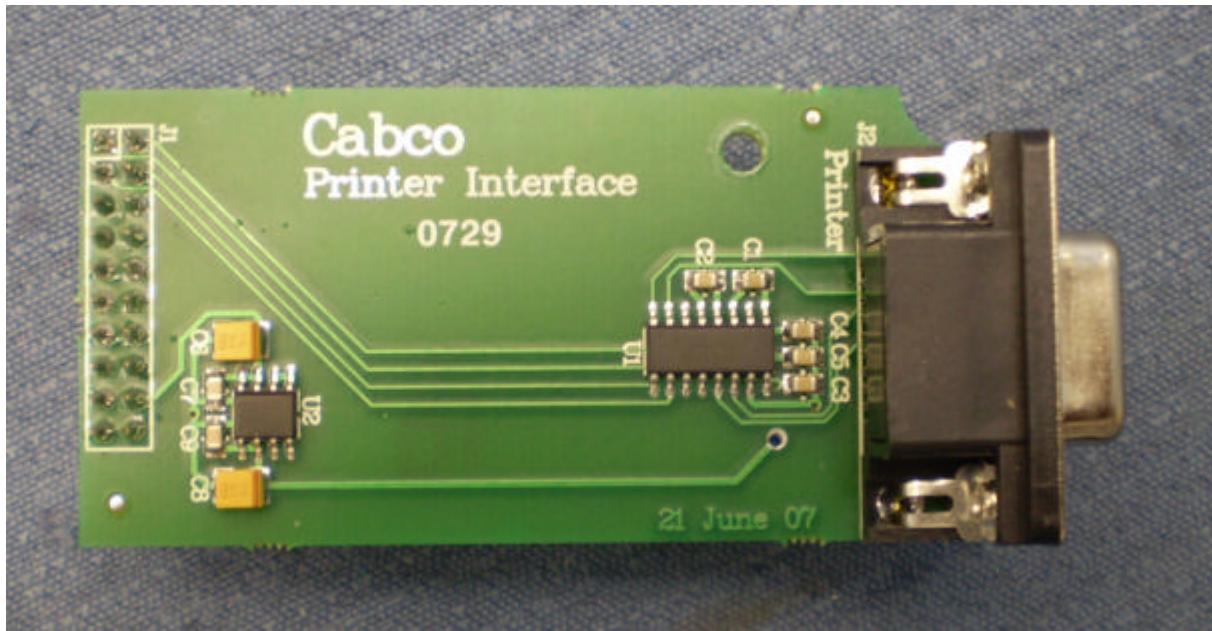
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## Printer Interface PCB



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## 3. LCD Screen



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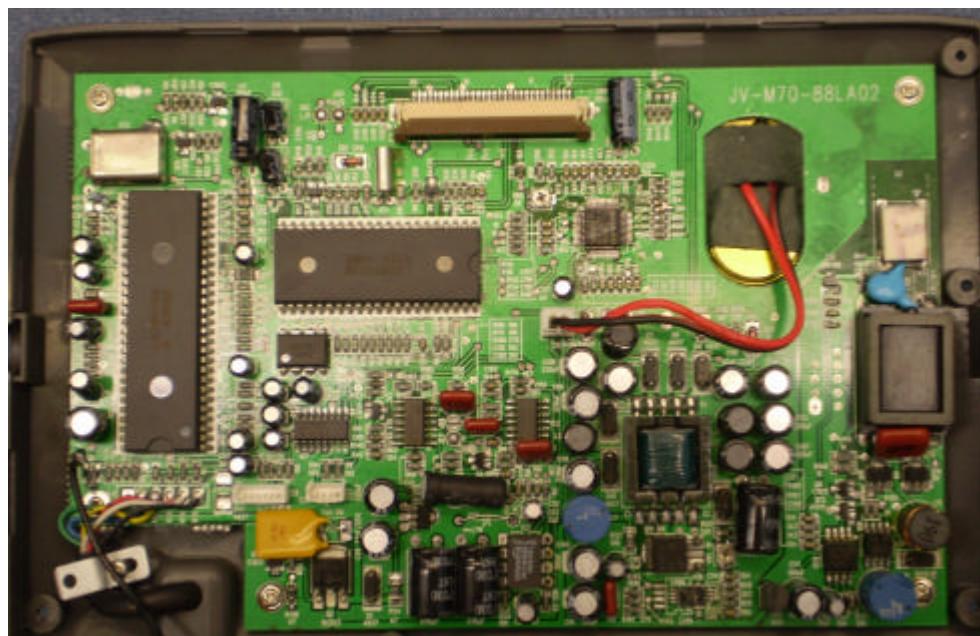
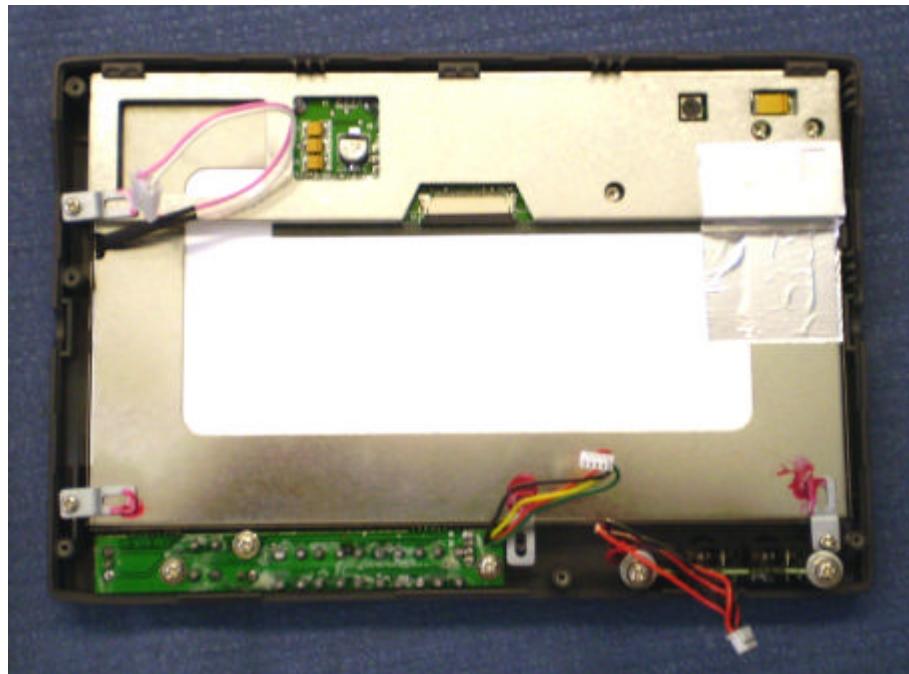
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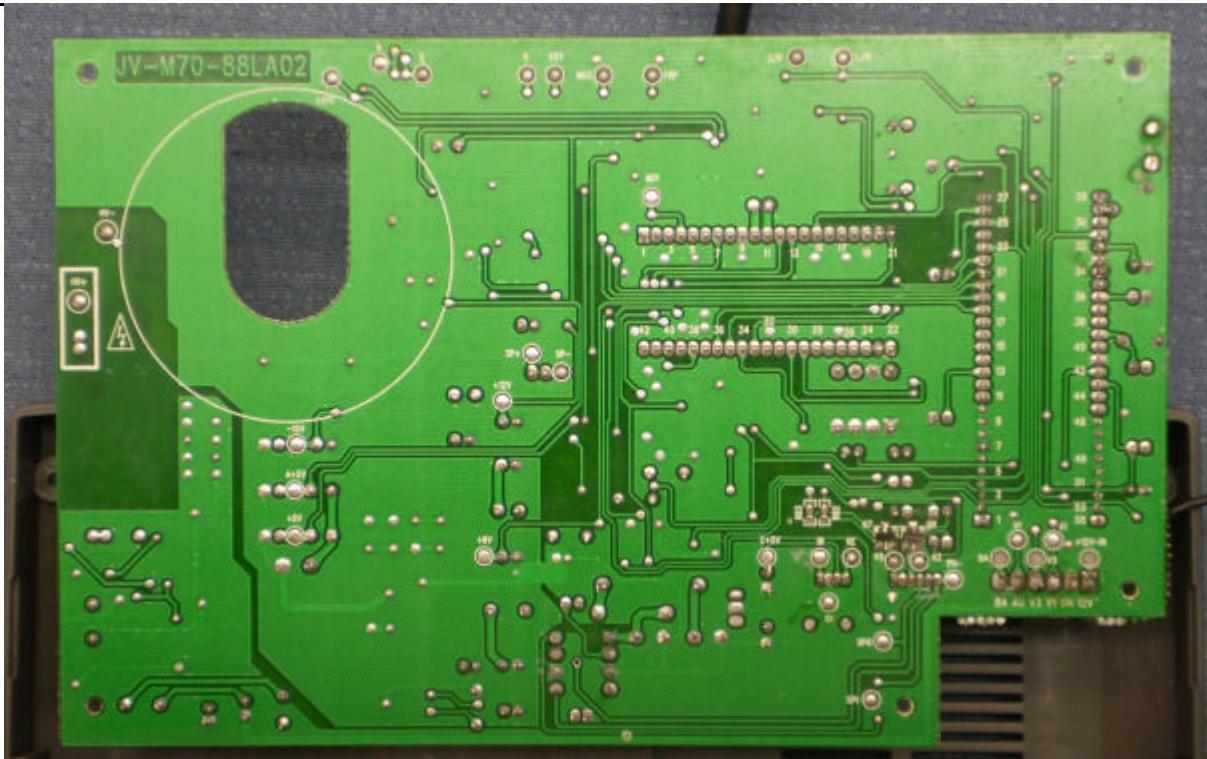
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