


<b>CLASS TS</b>	<b>DWG NO. 638299</b>
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REVISIONS				
REV	DESCRIPTION	CHECK	ENG	DATE
00	INITIAL BOSE VERSION			28/5/14
01	CHANGE FRQ20K LIMIT		N,M	19/11/14
03	UPDATE ATS2 AND EXCEL MACRO TO REV21B		NM	02/12/14

BOSE APPLICABLE DOCUMENTS:



<b>DOC LVL</b>	<b>DRAFTER NOTIO MAEDA @ AUBIT</b>	<b>DATE 28/05/14</b>	 FRAMINGHAM, MA 01701-9168					
3	CHECKER		DESCRIPTION  <b>TEST SPEC,CONTROLSpace LINE OUTPUT II (Zamboni project)</b>					
2	ENGINEER							
	SAFETY ENGINEER							
1	RLS TO PROD		SIZE A	FSCM 32108	CLASS TS	DWG NO. TS 638299	REV. 03	
							SHT 1 OF 23	

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# 1. Overview

## 1.1. Purpose

This document describes the manufacturing test procedure for the ControlSpace LINE OUTPUT II card (Zamboni project). This document can be applied to the card that wrote the H8 firmware by using IOCardPgm.exe.

## 1.2. Scope

### 1.2.1. Identification

This release is identified by the following configuration items:

- ControlSpace Designer 4.1\_016
- ESP Firmware espII\_v4.130.frm
- ATS-2 Test Macro Rev21b
- (720110-001S)(BSE99A1)Motherboard
- (720112-001S)(BSE98A1)DSP-HIGH-PERFORMANCE
- (720111-001S)(BSE97A1)DSP-STANDARD
- (638299-0010)(BSE51A1)LINE OUTPUT II

### 1.2.2. System Overview

This test procedure is used for production testing of ControlSpace LINE OUTPUT II card (Zamboni project :including DSP-high-performance card). This test should be performed on all LINE OUTPUT II card and each LINE OUTPUT II card shall "PASS" prior to shipping.

This test utilizes an AES3 input card in the test. This card is for the reference.  
The switcher system is Accutrex measurement switcher ( USB ).

## 1.3. Definitions and Abbreviations

### 1.3.1. Definitions

Term	Definition
ESP-00 II	ESP-00II frame with : (720110-001S)(BSE99A1)Motherboard (720111-001S)(BSE97A1)DSP-STANDARD (720112-001S)(BSE98A1)DSP-HIGH-PERFORMANCE ASTEC Power supply
Switcher	Accutrex measurement switcher : MS-101 / MS-111

### 1.3.2. Acronyms

Term	Definition
ESP	ControlSpace Engineered Sound Processor
CSD	ControlSpace Designer software
MB	ESP Motherboard
DSP-STD card	Main card with digital processing
DSP-HP card	DSP processing card with 3 DSP device
GPIO	8 control inputs and 8 control outputs.
CC-16	Zone Controller with RS485 interface
DUT	Device Under Test
INPUT II	MIC/LINE INPUT II card that has QFP AD converter.
OUTPUT II	LINE OUTPUT II card that has QFP DA converter.

### 1.4. Change History

Revision	Date	Section	Description	Changed By
A	2014/05/25	All	Initial Bose version following Pilot	Notio Maeda @ AuBit
A1	2014/11/19	6.1	Change FRQ20K min limit	Notio Maeda @ AuBit

## 2. References

### 2.1. Industry Standards

Ref #	Title	By	Rev	URL

### 2.2. Bose Corporation Documents

Ref	Title	By	Rev	URL

### 2.3. Project Documents

Ref	Title	By	Rev	URL
	Product specification			

# 3. Introduction

This OUTPUT-II card is basic analog output module that outputs analog line level from Control Space system.

## 3.1. Pre-test Programming

The following devices must be programmed prior to testing:

### 3.1.1. DSP-II card ( For reference )

This should be programmed with the latest ESP firmware before PCB assembling.

Once the firmware is programmed in the flash ROM, following update can be done with CSD software.

### 3.1.2. I OUTPUT-II card ( For shipping )

This should be programmed with the latest OUTPUT-II firmware.

OUTPUT-II can be wrote the firmware by using IOpgm.exe through Ethernet.

## 3.2. Restrictions

The MB-II , DSP-STD and DSP-HP shall be applied to this Zamboni –ESP-00II.


## 3.3. Structure of the test

This test is consisted by following tests.

- a) Audio performance test
- b) LED color test.
- c) Pass/Fail Evaluation and Test Report .

## 3.4. The files for this test

File name	Software	Notes
ESP88C_Test_Macro_Rev_21b.atsb	ATS 1.60	These files are the modules for these test.
ESP_ESP-00II_AcommandII.atsb	ATS 1.60	
ESP_GPIO-II.atsb	ATS 1.60	
ESP_INPUT-II+OUTPUT-II.atsb	ATS 1.60	
RedlineAudioPerformanceTestingModule.atsb	ATS 1.60	
RedlineMacAddressWritingModule.atsb	ATS 1.60	
RedlinePhantomTestingModule.atsb	ATS 1.60	
ControlSpace_Test_Report_form_Rev_21b.xls	Excel	
ESP-00II-TestConfiguration(V4.020).csp	CSD V4.1	

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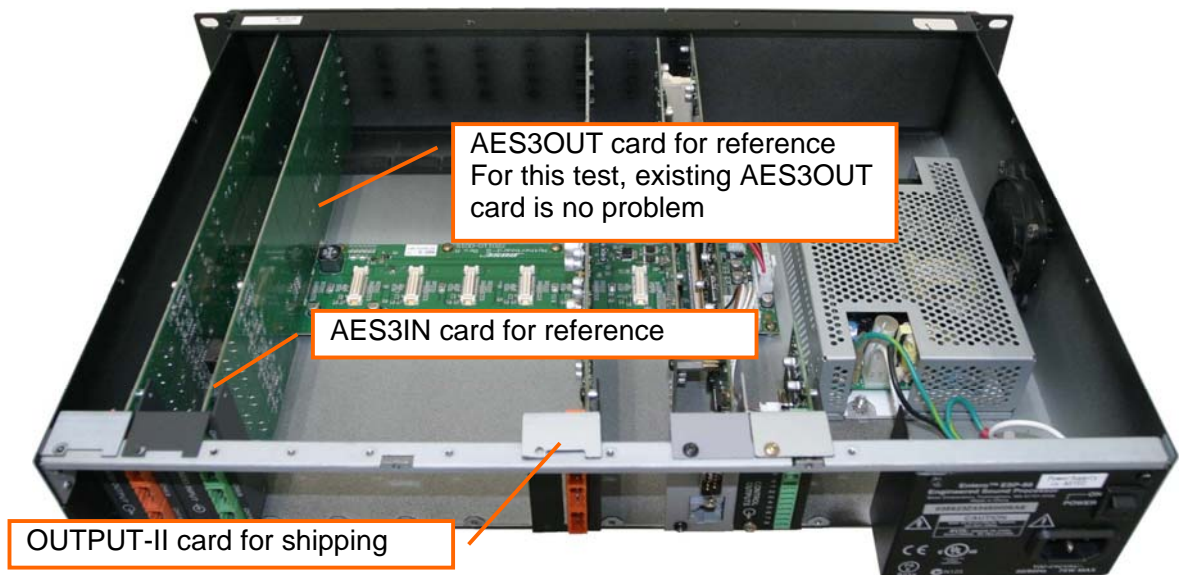
## 4. Audio performance test

This OUTPUT-II card is for the purpose of audio system. Therefore, evidence of the audio performance is required for the professional market.

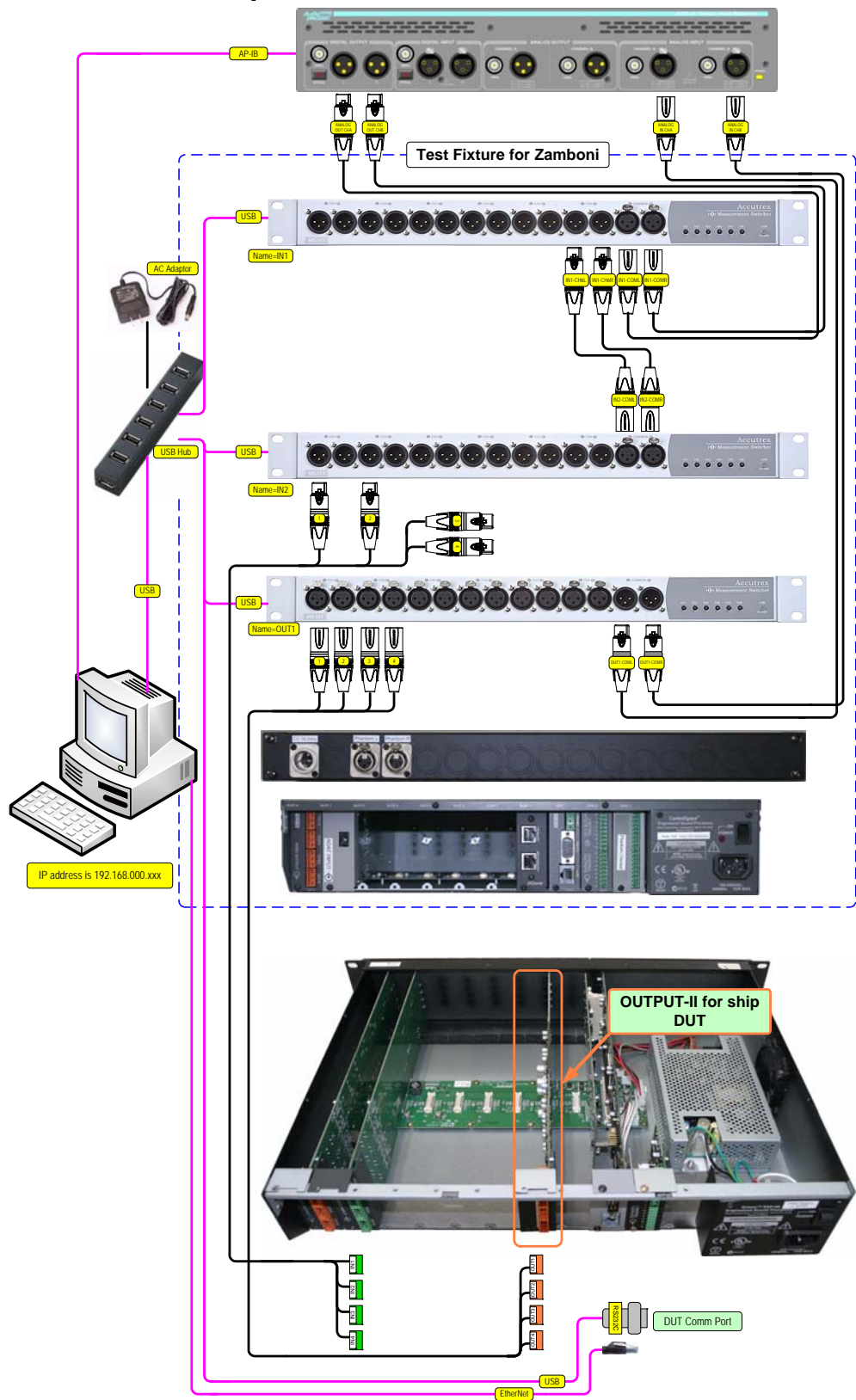
### 4.1. Equipment requirements and ESP hardware setup

These IO cards. The green marked line is the cards for shipping.  
The AES3IN and AES3OUT card is for reference.

Slot Number	Item	Note
<b>GPIO2</b>	No need	
<b>GPIO1</b>	No need	
<b>DSP*</b>	DSP-STD + DSP-HP	This DSP card is for the reference.
<b>SLOT 1</b>	No need	This slot is for the card for shipping.
<b>SLOT 2</b>	<b>OUTPUT-II(DUT)</b>	This slot is for the card for shipping.
<b>SLOT 3</b>	No need	
<b>SLOT 4</b>	No need	
<b>SLOT 5</b>	No need	
<b>SLOT 6</b>	No need	
<b>SLOT 7</b>	AES3 IN	This card is for the reference.
<b>SLOT 8</b>	(AES3 OUT)	This card is for the reference.
<b>MB</b>	MB-II	This card is for the reference.
<b>Chassis</b>	Chassis	This card is for the reference.
<b>Power Supply</b>	Chassis	T This DSP card is for the reference.



4.2. Connection of audio performance test



4.3. Upload test configuration file.

Start the Control space designer and load the configuration file.  
INPUT+OUTPUT-II\_TestConfiguration(ESP00).csp  
This file includes the other card testing.  
When the “Slot configuration” dialog will come up, check the configuration that have the card for test.

ControlSpace Designer - INPUT+OUTPUT-II\_TestConfiguration(V4.020)(ESP88).csp

File Edit View Tools System Window Help

100%

Project View ESP-88 1

Serial In  
Serial In  
GP In 1  
GP In 1

Input 1  
Input 2  
Input 3  
Input 4  
Input 5  
Input 6  
Input 7  
Input 8  
Input 9  
Input 10  
Input 11  
Input 12

Output 1  
Output 2  
Output 3  
Output 4  
Output 5  
Output 6  
Output 7  
Output 8  
Output 9  
Output 10  
Output 11  
Output 12

Serial Out  
Serial Out  
GP Out 1  
GP Out 1

Off-line "ESP-88 1": 4 DSPs Selected

Settings Transfer

Send to Devices  
(Upload design)

Get from Devices  
(Download design)

Do Nothing

Slot configuration

	Project View ESP-88	Hardware ESP-88
IP:	192.168.0.160	192.168.0.160
Slot:	4ch Mic/Line Input II	Empty
Slot4	4ch Line Output II	4ch Line Output II
Slot5	Empty	Empty
Slot6	Empty	Empty
Slot7	8ch AES3 In	8ch AES3 In
Slot8	8ch AES3 Out	8ch AES3 Out
GP Slot1	GPIO	Empty
GP Slot2	Empty	Empty

Press Continue to change hardware to match Project View ESP.  
Press Cancel to abort the upload.

Continue Cancel

ControlSpace Designer - INPUT+OUTPUT-II\_TestConfiguration(V4.020)(ESP88).csp\*

File Edit View Tools System Window Help

100%

Project View ESP-88 1

Serial In  
Serial In  
GP In 1  
GP In 1

Input 1  
Input 2  
Input 3  
Input 4  
Input 5  
Input 6  
Input 7  
Input 8  
Input 9  
Input 10  
Input 11  
Input 12

Output 1  
Output 2  
Output 3  
Output 4  
Output 5  
Output 6  
Output 7  
Output 8  
Output 9  
Output 10  
Output 11  
Output 12

Serial Out  
Serial Out  
GP Out 1  
GP Out 1

On-line "ESP-88 1": 4 DSPs Selected

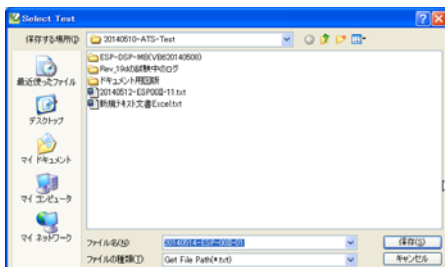
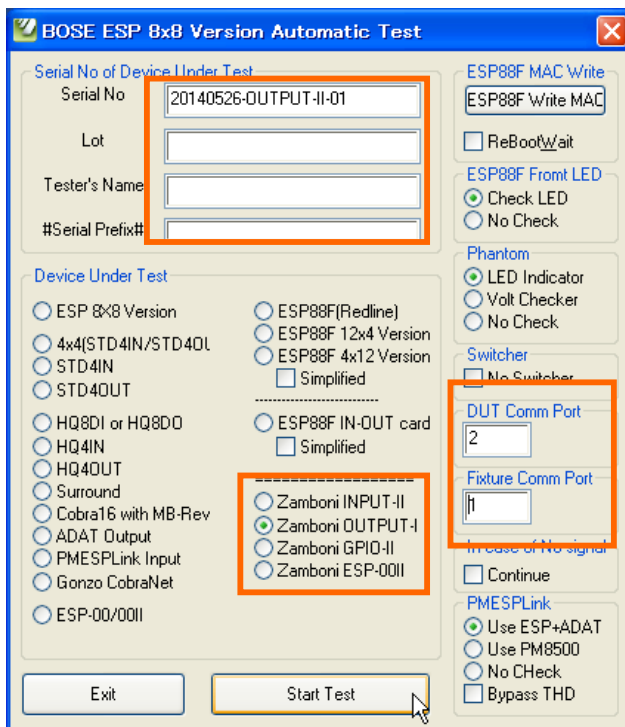
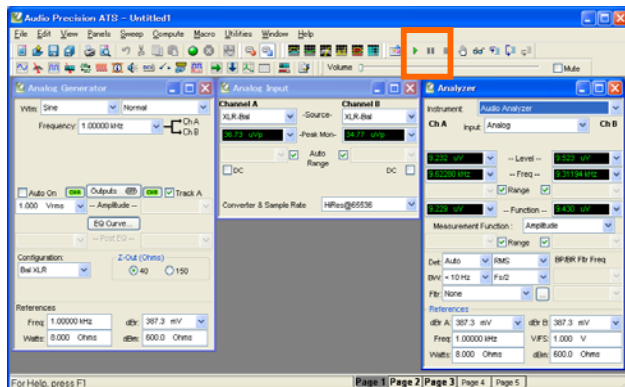


#### 4.4. Starting of audio performance test

This audio performance test is performed by ATS-2 macro.

The filename of the macro is **ESP88C\_Test\_Macro\_Rev\_21b.atsb** .

Related files also needed.



Start the Measurement Switcher software.

Start the ATS software and load the macro.

Before running this test, all equipments of the fixture power shall be turned on.

Pushing green triangle button, the macro will start.

The main dialog will come up.

Orange marked part is the function for this test.

Choose [ Zamboni OUTPUT-II ]

The [ DUT Comm Port ] and [ Fixture Comm Port ] field is for the COM port number to communicate to the OUTPUT-II for shipping ( Device Under Test ) and the ESP that in the fixture.

Choose [ Volt Checker ]

And fill the [ Serial number ] or other fields.

After filling the fields and check the DUT, push the [ Start Test ] Button.

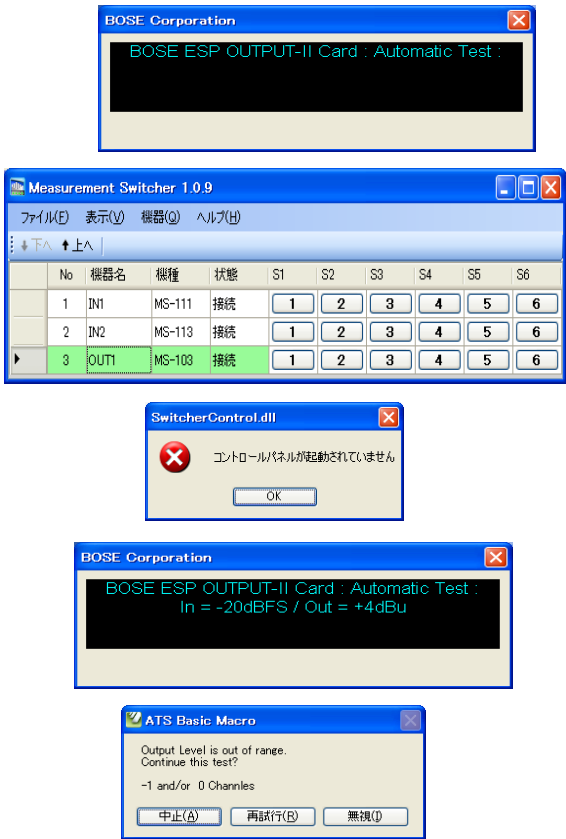
The file name dialog will come up.

The serial number is utilized for the file name. This file name will be used for the Excel macro.

Note : The [ #Serial Prefix# ] field will utilize for the beginning of the serial number for following test. For example the serial number for test is 060849Z31400001AE to 060849Z31400099AE Please input [ 060849Z314000 ] .

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4.5. Procedure of audio performance test



After starting, this dialog will come up to indicate the progress of this test.

This test needs the Accutrex measurement switcher control software.  
When the control software did not started, warning dialog will come up.

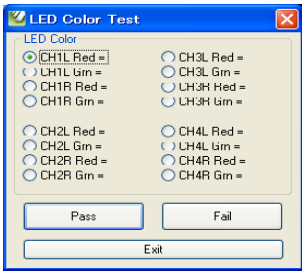
When the measured audio level is not proper, or the audio level can't detect, the ATS macro will ask how to proceed.

When [ Abort ] is chosen, this macro will return to the beginning.

When [ Retry ] is chosen, this macro will retry this channel again.

When [ Ignore ] is chosen, this error will ignored and record as failed.

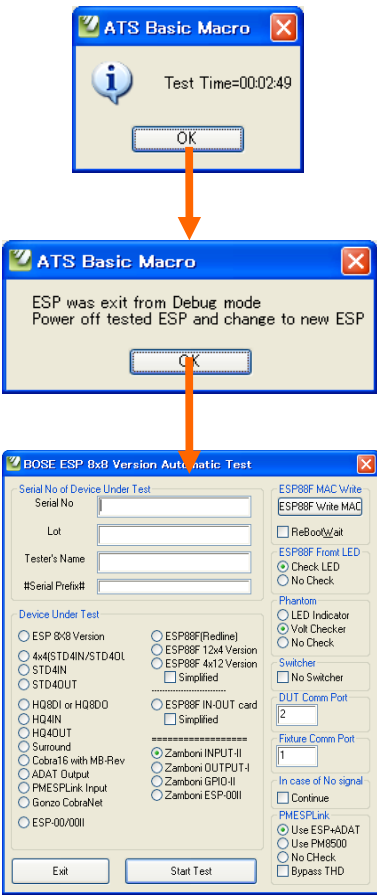
If the measured level is proper, the switcher will be controlled by ATS macro automatically.



4.6. Procedure of LED color test

When the LED color test will start, this dialog will come up.  
See the LED color on the DUT, and choose [ Pass ] or [ Fail ]

4.7. Closing test



After all testing, this macro reports the testing time.

To remove the DUT for shipping, power shall be turned off.

The 1 st dialog will come up.

Install new DUT and input new serial number, start again.

If all DUT will be tested , push [ End ] button.  
Dialog will disappear and this test will finish.

## 5. Pass/Fail Evaluation and Test Report

After retrieving the log file for the test (using the TestLogOpen macro in the ControlSpace\_Test\_Report\_form\_Rev\_21b.xls file) the, pass/fail evaluation is done automatically. Gray colored cells are not used for pass/fail detection. If the result cell indicates "FAIL", this DUT cannot be shipped.

Microsoft Excel - 20140526-OUTPUT-II-01x(FAIL).xls

ファイル(F) 編集(E) 表示(V) 挿入(I) 書式(O) ツール(T) データ(D) ウィンドウ(W) ヘルプ(H) 質問を入力してください

Arial 11 B I U

J24

	A	B	C	D	E	F	G	H	I	J	K
1	<b>BOSE®</b>										
3	Device under test										
4	Serial Number	20140526-OUTPUT-II-01									
5	Lot										
6	Date of test	2014,05,26									
7	Tester's Name										
8	This report sheet = ControlSpace_Test_Report_form_Rev_19a.xls										
9	Zamboni OUTPUT-II Card TEST	This ATS Macro ID = ESP88C Test Macro Rev 19e									
10			CH1	CH2	CH3	CH4					
11	5-8.OUT+4dBu	AMPL	4.15	4.13	4.14	4.17					
12		Nois	-93.36	-93.46	-93.49	-93.31					
13		FRQ20K	4.47	4.29	4.33	4.46					
14		FRQ20	4.11	4.08	4.10	4.13					
15		THDN	0.0014	0.0014	0.0014	0.0014					
16		19.5dBu	0.1259	0.0264	0.1255	0.0235					
17	7.LED color	Green	Pass	Pass	Pass	Pass					
18		Red	Pass	Pass	Pass	Pass					
19											
20											
21											
22											
23											
24											
25											
26	--										
27	-- Embedded text log data --										
28	D:\NMJobs\BOSE様\10\LEGO\10)プロセッサPhase4\40)Zamboniテストフィクスチャ・スイッチャー式\20140										
29											
30											
31	Zamboni OUTPUT-II Card TEST										
32	Serial No=20140526-OUTPUT-II-01										
33	Lot=										
34	Tester's Name=										

20140526-OUTPUT-II-01 /

図形の調整(R) オートシェイプ(W) コマンド NUM

<b>BOSE®</b> Framingham, MA 01701-9168	SIZE <b>A</b>	FSCM <b>32108</b>	CLASS <b>TS</b>	DWG NO. <b>TS638299</b>	SHEET <b>12 of 16</b>	REV. <b>00</b>
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# Passed Test report

Microsoft Excel - 20140526-OUTPUT-II-01(Passed).xls

ファイル(F) 編集(E) 表示(V) 挿入(I) 書式(O) ツール(T) データ(D) ウィンドウ(W) ヘルプ(H) 質問を入力してください

Arial 11 B I U

F5

1	<b>BOSE</b>										
3	Device under test										
4	Serial Number	20140526-OUTPUT-II-01									
5	Lot								Result	Passed	
6	Date of test	2014,05,26									
7	Tester's Name										
8							This report sheet = ControlSpace_Test_Report_form_Rev_19a.xls				
9	Zamboni OUTPUT-II Card TEST						This ATS Macro ID = ESP88C_Test_Macro_Rev_19e				
10			CH1	CH2	CH3	CH4					
11	5-8.OUT+4dBu	AMPL	4.15	4.13	4.14	4.17					
12		Nois	-93.36	-93.46	-93.49	-93.31					
13		FRQ20K	4.47	4.29	4.33	4.46					
14		FRQ20	4.11	4.08	4.10	4.13					
15		THDN	0.0014	0.0014	0.0014	0.0014					
16		19.5dBu	0.0259	0.0264	0.0255	0.0235					
17	7.LED color	Green	Pass	Pass	Pass	Pass					
18		Red	Pass	Pass	Pass	Pass					
19											
20											
21											
22											
23											
24											
25											
26	--										
27	-- Embedded text log data --										
28	D:\NMJobs\BOSE様\10\LEGO\1D)プロセッサPhase4\40)Zamboniテストフィクスチャ・スイッチャー式\20140										
29											
30											
31	Zamboni OUTPUT-II Card TEST										
32	Serial No=20140526-OUTPUT-II-01										
33	Lot=										
34	Tester's Name=										

20140526-OUTPUT-II-01 /

図形の調整(R) オートシェイプ(W)

コマンド NUM

## 6. Testing method and criteria

This section describes the criteria of performance test. Determining if the DUT passes on each test is done automatically by the Excel Macro.

For the INPUT-II, 8 sets of tests are performed to verify the audio paths to the ESP.

### 6.1. Audio performance

#### **OUT+4.0dBu test**

AMPL (1 kHz)

ATS-2 Setting

Item	Setting
Frequency	1kHz
Amplitude	+4dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria

Item	Upper limit	Lower limit
Level	+5.0dBu	+3.0dBu

Noise

ATS2 Setting

Item	Setting
Frequency	--
Amplitude	Off
B/W	22HZ / 22KHz LPF
Filter	"A" Weighting

Criteria

Item	Upper limit	Lower limit
Level	-90dBu	-200dBFS

FRQ20kHz

ATS2 Setting

Item	Setting
Frequency	20kHz
Amplitude	-20dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria

Item	Upper limit	Lower limit
Level	+0.75dB	-0.75dB

FRQ20Hz

ATS2 Setting

Item	Setting
Frequency	20Hz
Amplitude	-20dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria

Item	Upper limit	Lower limit
Level	+0.5dB	-0.5dB

THDN

ATS2 Setting

Item	Setting
Frequency	1kHz
Amplitude	-20dBFS
B/W	22HZ / 22KHz LPF
Filter	"A" Weighting

Criteria

Item	Upper limit	Lower limit
Function(THD+N)	0.002%	0.000%

19.5dBu

ATS2 Setting

Item	Setting
Frequency	1kHz
Amplitude	+23.5dBu
B/W	22HZ / 22KHz LPF
Filter	"A" Weighting

Criteria

Item	Upper limit	Lower limit
Function(THD+N)	0.04%	0.000%

This test is performed on channels 1 through 4.

## 6.2. LED color test

This test is detected color by human eye.

Condition	Result
Green setting	Green
Red Setting	Red

## 6.3. Overall rating

To detect the failure, this macro calculates these portion.

Meet with the criteria of each tested item.

6.1.(GV=0dB)

6.1. OUT+4.0dBu

6.2.LED color