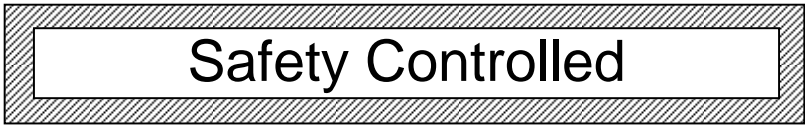


CLASS TS	DWG NO. 638301
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REVISIONS				
REV	DESCRIPTION	CHECK	ENG	DATE
00	INITIAL BOSE VERSION			18/6/14
01	CRITERIA CHANGED.		N,M	24/9/14
02	UPDATE ATS2 AND EXCEL MACRO TO REV21B		NM	02/12/14

BOSE APPLICABLE DOCUMENTS:




DOC LVL	DRAFTER NOTIO MAEDA @ AUBIT	DATE 19/07/14	 FRAMINGHAM, MA 01701-9168					
3	CHECKER		DESCRIPTION TEST SPEC,CONTROLSpace POWERMATCH AES3 INPUT (Zamboni project)					
2	ENGINEER							
	SAFETY ENGINEER							
1	RLS TO PROD		SIZE A	FSCM 32108	CLASS TS	DWG NO. TS 638301	REV. 02	
							SHT 1 OF 19	

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1. Overview

1.1. Purpose

This document describes the manufacturing test procedure for the POWERMATCH AES3 INPUT card (Zamboni project).

1.2. Scope

1.2.1. Identification

This release is identified by the following configuration items:

- ControlSpace Designer 4.1_016
- pm8500_v1.401.frm
- ATS-2 Test Macro Rev21b
- PMAES-TestConfiguration.csp
- (638301-0010)(BSE53A1)POWERMATCH AES3 INPUT

1.2.2. System Overview

This test procedure is used for production testing of POWERMATCH AES3 INPUT card (Zamboni project). This test should be performed on all POWERMATCH AES3 INPUT card and each POWERMATCH AES3 INPUT card shall "PASS" prior to shipping.

This test does not utilize an ESP test fixture and CC-16 emulator
The switcher system is Accutrex measurement switcher (USB).

1.3. Definitions and Abbreviations

1.3.1. Definitions

Term	Definition
POWERMATCH AES3 INPUT	The AES3 input card for PM-8500 that has THRU output. (PMAES3IN)
Switcher	Accutrex measurement switcher : MS-101 / MS-111

1.3.2. Acronyms

Term	Definition
PM-8500	PowerMatch PM8500N configurable professional power amplifier It is for the reference equipment.
CSD	ControlSpace Designer software
DUT	Device Under Test

1.4. Change History

Revision	Date	Section	Description	Changed By
00	2014/07/19	All	Initial Bose version following Pilot	Norio Maeda @ AuBit
01	2014/09/24	6.0	Changed criteria to meet with latest circuit parameter. (for Daisy chain)	Norio 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 POWERMATCH AES3 INPUT card is a digital 8 channels input card for PowerMatch PM8500N configurable professional power amplifier.

This card has the THRU output for daisy chained PM8500 AES3 input.

3.1. Pre-test Programming

This POWERMATCH AES3 INPUT card does not have a programmable device.
Programming is not required.

3.2. Restrictions

The PM8500 is the high watt power amplifier.

The dummy load will be heated up when the large signal will be applied.

In order to eliminate the possibility of burns,

Please place where people not to touch the dummy load.

3.3. Structure of the test

This test is consisted by following tests.

- a) AES in to Amp out audio performance test
- b) AES in to THRU out audio performance test.
- c) AES in to THRU input voltage test .

3.4. The files for this test

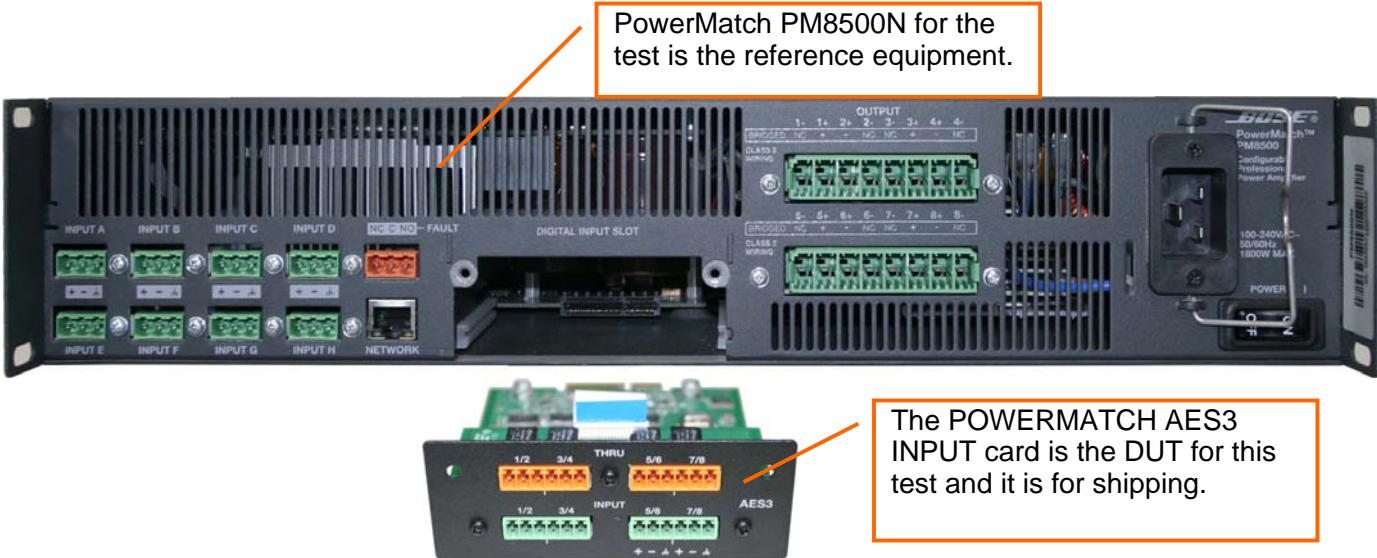
File name	Software	Notes
ESP88C_Test_Macro_Rev_21b.atsb	ATS 1.60	These files are the modules for these test.
PMAES3IN.atsb	ATS 1.60	
ESP_ESP-00II_AcommandII.atsb	ATS 1.60	
ESP_GPIO-II.atsb	ATS 1.60	
ESP_INPUT-II+OUTPUT-II.atsb	ATS 1.60	
RedlineAudioPerformanceTestingModule.atsb	ATS 1.60	
RedlineMacAddressWritingModule.atsb	ATS 1.60	
RedlinePhantomTestingModule.atsb	ATS 1.60	
ControlSpace_Test_Report_form_Rev_21b.xls	Excel	
PMAES-TestConfiguration.csp	CSD V4.1	

4. Audio performance test

This POWERMATCH AES3 INPUT 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 PM8500 hardware setup

PowerMatch PM8500N for the test is the reference equipment. It is not for shipping.
The POWERMATCH AES3 INPUT card is the DUT for this test and it is for shipping.



4.2. Dummy Load



Dummy load is the purpose of loading the power amp output. The PM8500 has 300W per channel but the 300W resistor is too big size. The dummy load for this test is consisted by 10W resistor. Therefore, power limitation is important. The power limitation can be achieved by the inside limiter setting by using CSD. This dummy load has 100mA polyswitch and 1uF capacitor in order to the protection of over current and DC offset to safe of the switcher and ATS2.

4.3. Cable between the switcher and ATS2.

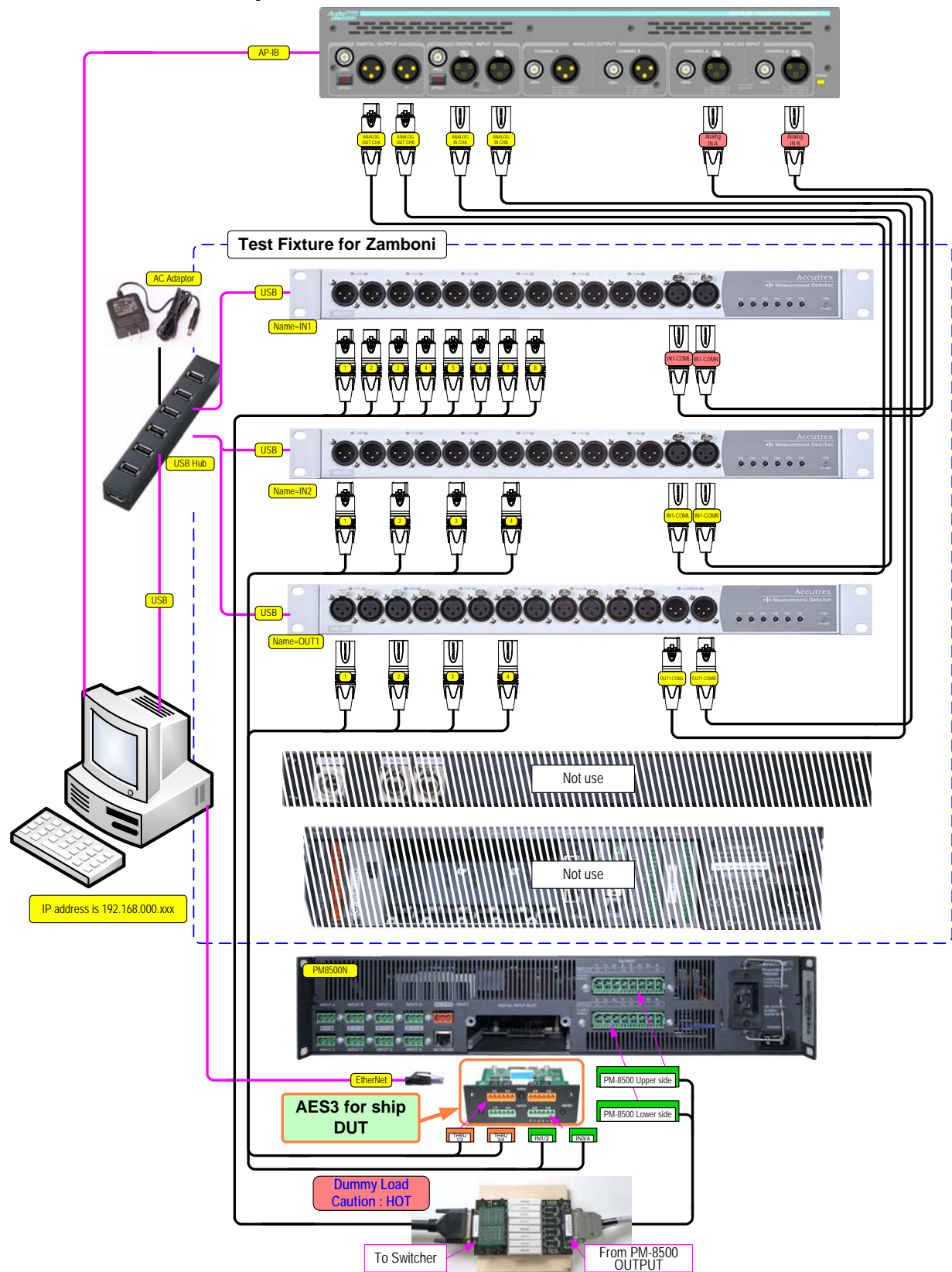
The testing fixture for this test is diversion of the ESP-00II testing system. The marking of the cable between the switcher and ATS2 is based on the ESP-00II testing. Please connect these cables according to the following connection figure.

4.4. The ESP in the fixture and CC-16 emulator.

In this test , these equipments are not utilized.

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4.5. Connection of audio performance test



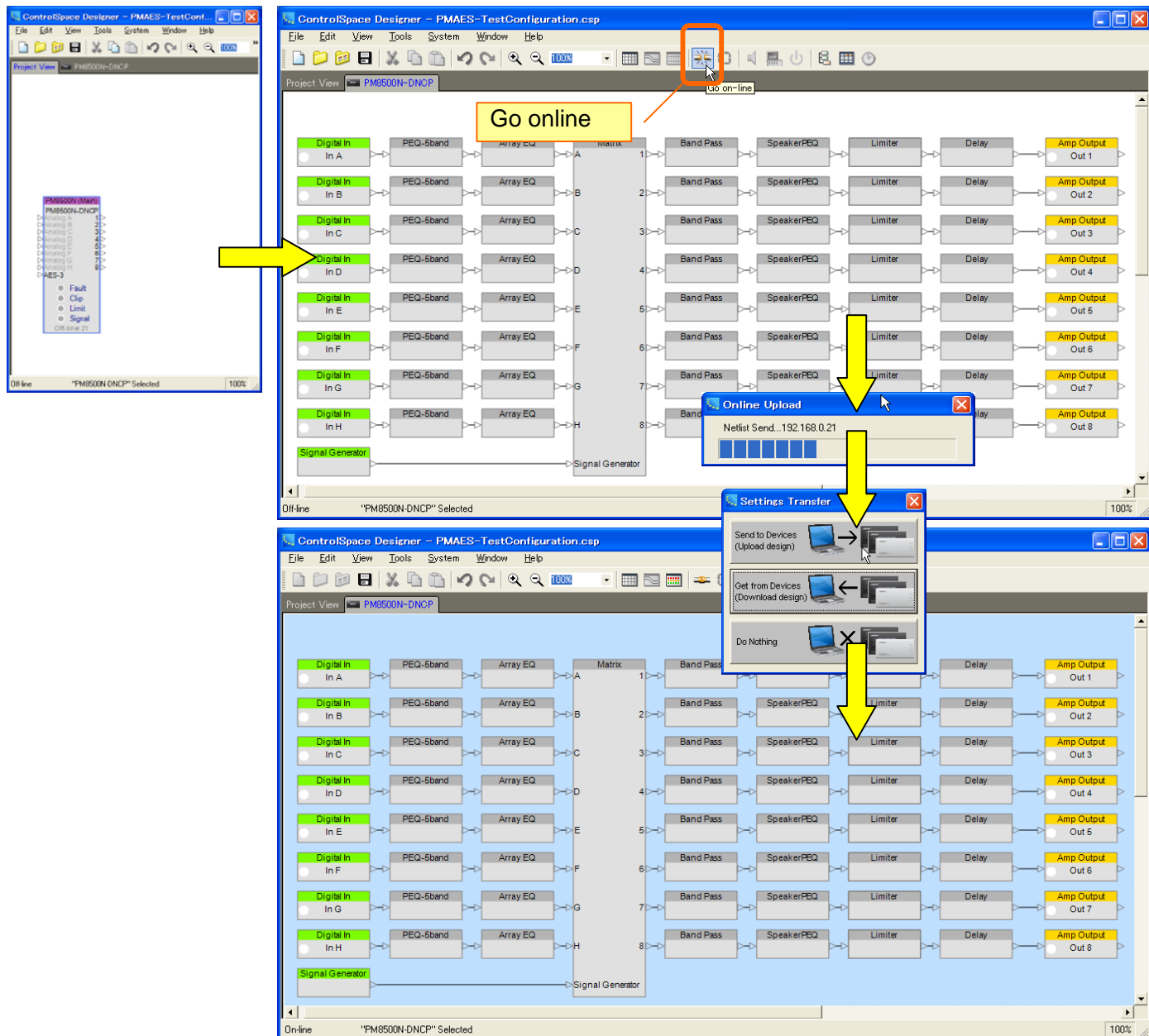
4.6. Upload test configuration file.

Start the Control space designer and load the configuration file.

PMAES-TestConfiguration.csp

This file is for this card testing.

This configuration file is consisted by one PM8500N. Push go online button to upload it.



4.7. Key points of PM8500 setting

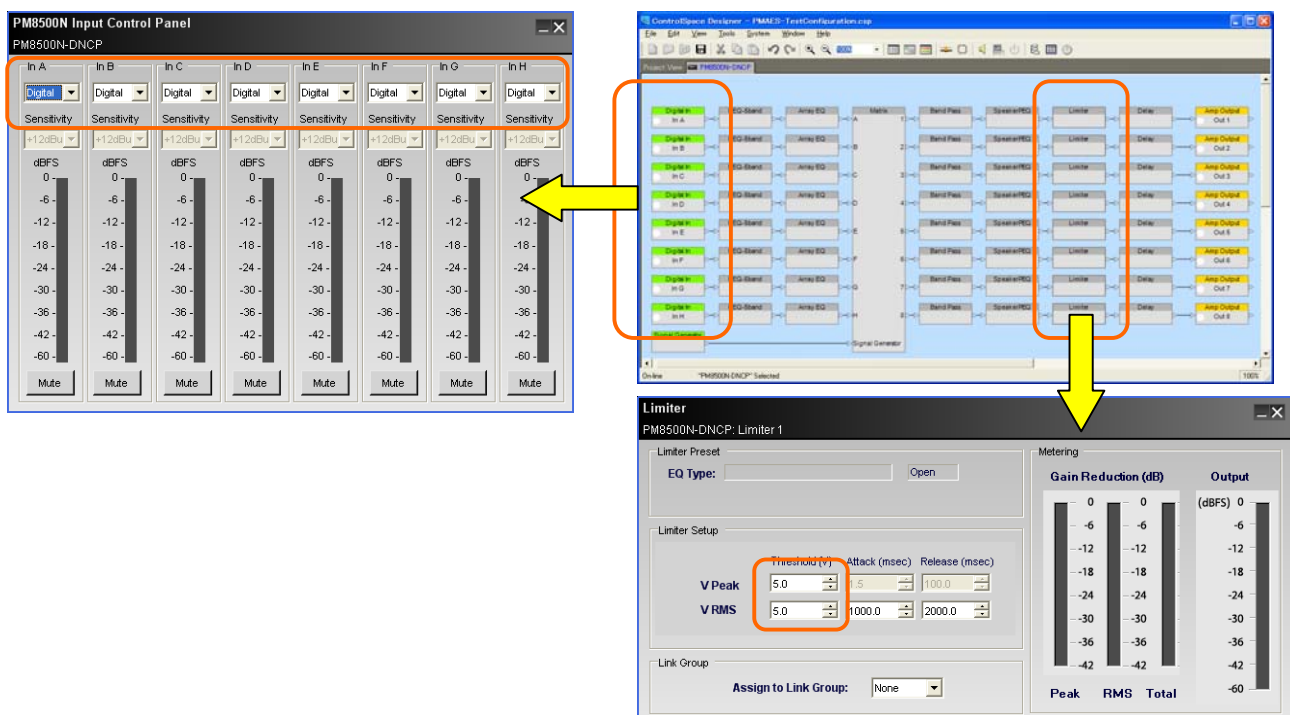
The PM8500N has many function for audio. To meet with the AES3 card testing, setting is important. These setting is included in the "PMAES-TestConfiguration.csp".
No need to modify the PM8500N setting when this csp file is used.

1. Input selection

Open the PM8500N Input Control Panel by pushing green input box.
Set all input type as Digital. This setting will choose AES3 input card.

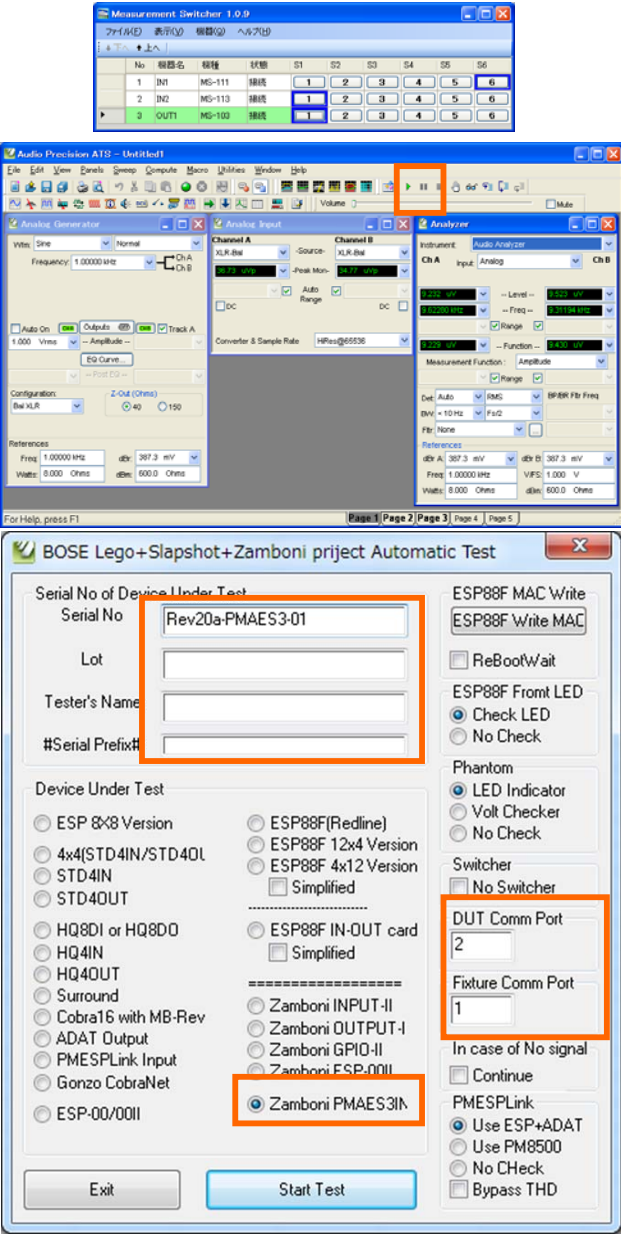
2. Limiter

Open the Limiter panel by pushing the Limiter box.
Set V Peak and V RMS to 5V. Do this setting to all channels.
This setting will limits the output voltage swing to 5V.
By this setting ,the output power will be limited to 2.5W at 10 ohm load.



4.8. 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 PMAES3IN]
- The [DUT Comm Port] and [Fixture Comm Port] field is for the COM port number/
This test does not use COM port but this field shall be settled correctly.
- 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].

4.9. AES in to Amp out 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.

This test will measure the PM8500 output through dummy load unit in analog domain. The output swing of AES3 from ATS2 is used by lower swing.

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.

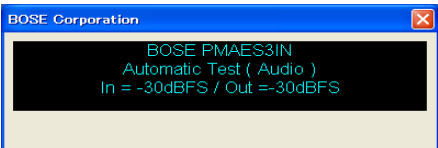
When [Retry] is chosen, this macro will retry this channel again.

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.

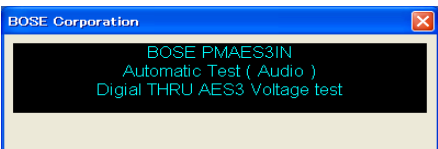
4.10. AES in to THRU out audio performance test

This test will measure the THRU output in digital domain. The output swing of AES3 from ATS2 is used by 5VPP swing.



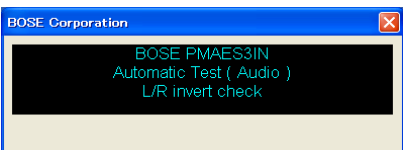
4.11. AES in to THRU input voltage test

This test will measure the THRU output AES3 signal is proper or not. The output swing of AES3 from ATS2 is used by lower swing.

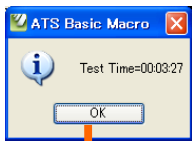


4.12. L/R invert check

This check will check that the left channel signal can be output to the left channel of PM8500 amp out. (To detect the DP1.)



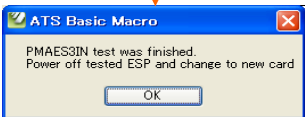
4.13. Closing test



After all testing, this macro reports the testing time.

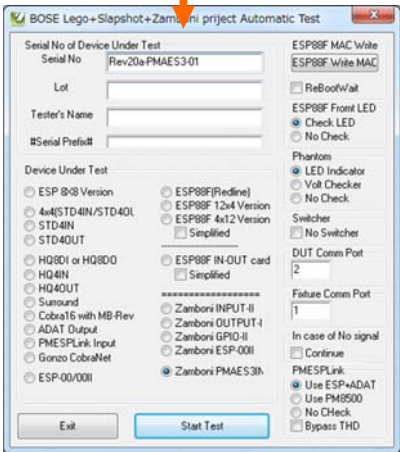
To remove the DUT for shipping, power shall be turned off.

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 - 20140620-PMAES3IN-10(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 16 B I U

I5 =IF(N8,"Passed","FAIL")

1	BOSE									
3	Device under test									
4	Serial Number	20140620-PMAES3IN-10								
5	Lot									
6	Date of test	2014,06,20								
7	Tester's Name									
8	This report sheet = ControlSpace_Test_Report_form_Rev_20.xls									
9	Zamboni PMAES3IN TEST	This ATS Macro ID = ESP88C Test Macro Rev 20								
10		CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	
11	AMP Out	AMPL	6.87	6.71	6.72	6.41	6.39	6.49	6.41	
12		Nois	-65.02	-68.26	-68.92	-68.71	-67.13	-68.97	-69.16	
13		FRQ20K	8.92	9.24	8.91	8.79	8.81	8.58	9.10	
14		FRQ20	6.47	6.51	6.53	6.52	6.21	6.18	6.29	
15		THDN	0.02463	0.01689	0.01571	0.01616	0.01891	0.01647	0.01589	
16	(AMP Out)AES3 Out Setting : = 44100. HZ / = 2. Vpp									
17										
18		CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	
19	THRU Out	AMPL	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	
20		Nois	-144.55	-144.46	-144.56	-144.52	-144.47	-144.61	-144.52	
21		FRQ20K	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	
22		FRQ20	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	
23		THDN	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	
24										
25										
26	(THRU Out)AES3 Out Setting : = 48000. HZ / = 1.5 Vpp									
27		CH1	CH2	CH3	CH4					
28	THRU Out	Rate	48000.01	48000.01	48000.01	48000.01				
29		Volt	3.57	3.63	3.64	3.55				
30		Jitter	2.46E-08	2.66E-08	2.49E-08	7.29E-09				
31										
32	LR-STATUS = Inverted. This AES3 is prototype.									
33										
34										
35										
36										
37										
38	--									
39	-- Embedded text log data --									
40	D:\NMJobs\BOSE様\10\LEGO\1D)プロセッサPhase4\24)PM-AES\05)検証\20140610-ATS_Test★\20140620-PM									
41										
42										
43	Zamboni PMAES3IN TEST									

20140620-PMAES3IN-10/

図形の調整(R) オートシェイプ(U) コマンド NUM

BOSE Framingham, MA 01701-9168	SIZE A	FSCM 32108	CLASS TS	DWG NO. TS638301	SHEET 13 of 19	REV. 01
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Passed Test report

Microsoft Excel - 20140620-PMAES3IN-11(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 16 B I U 100%										
I5 =IF(N8,"Passed","FAIL")										
	A	B	C	D	E	F	G	H	I	J
1	BOSE®									
3	Device under test									
4	Serial Number	20140620-PMAES3IN-11								
5	Lot									
6	Date of test	2014,06,20							Result	Passed
7	Tester's Name									
8	This report sheet = ControlSpace_Test_Report_form_Rev_20.xls									
9	Zamboni PMAES3IN TEST	This ATS Macro ID = ESP88C_Test Macro Rev_20								
10			CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
11	AMP Out	AMPL	6.71	6.67	6.72	6.71	6.41	6.39	6.49	6.40
12		Nois	-68.28	-65.01	-68.90	-68.69	-67.68	-68.91	-69.13	-69.03
13		FRQ20K	9.23	8.92	8.91	8.78	8.82	8.58	9.10	8.11
14		FRQ20	6.51	6.47	6.52	6.51	6.20	6.18	6.29	6.20
15		THDN	0.01681	0.02457	0.01569	0.01605	0.01871	0.01640	0.01576	0.01626
16	(AMP Out)AES3 Out Setting : = 44100. HZ / = 2. Vpp									
17										
18			CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
19	THRU Out	AMPL	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
20		Nois	-144.59	-144.47	-144.50	-144.54	-144.63	-144.41	-144.54	-144.52
21		FRQ20K	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
22		FRQ20	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
23		THDN	0.00018	0.00019	0.00018	0.00019	0.00019	0.00019	0.00018	0.00018
24										
25										
26	(THRU Out)AES3 Out Setting : = 48000. HZ / = 1.5 Vpp									
27			CH1	CH2	CH3	CH4				
28	THRU Out	Rate	48000.01	48000.01	48000.01	48000.01				
29		Volt	3.57	3.64	3.65	3.54				
30		Jitter	2.57E-08	2.72E-08	2.81E-08	2.56E-08				
31										
32	LR-STATUS = Non-Inverted									
33										
34										
35										
36										
37										
38	--									
39	-- Embedded text log data --									
40	D:\NMJobs\BOSE様(10)LEGO(1D)プロセッサPhase4(24)PM-AES(05)検証\20140610-ATS_Test★\20140620-PM									
41										
42										
43	Zamboni PMAES3IN TEST									

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.

6.1. AES in to Amp out audio performance test

AES3 -30dBFS input / FS = 44.1kHz / AES3 swing 0.2Vpp

AMPL (1 kHz)

ATS-2 Setting

Item	Setting
Frequency	1kHz
Amplitude	-30dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria (PM8500 analog output)

Item	Upper limit	Lower limit
Level	+8.5dBFS	+4.5dBFS

Noise

ATS2 Setting

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

Criteria (PM8500 analog output)

Item	Upper limit	Lower limit
Level	-60dBFS	-200dBFS

FRQ20kHz

ATS2 Setting

Item	Setting
Frequency	20kHz
Amplitude	-30dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria (PM8500 analog output)

Item	Upper limit	Lower limit
Level (1kHz relative)	+3.0dB	-0.5dB

FRQ20Hz

ATS2 Setting

Item	Setting
Frequency	20Hz
Amplitude	-30dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria (PM8500 analog output)

Item	Upper limit	Lower limit
Level (1kHz relative)	+0.5dB	-0.5dB

THDN

ATS2 Setting

Item	Setting
Frequency	1kHz
Amplitude	-30dBFS
B/W	22HZ / 22KHz LPF
Filter	"A" Weighting

Criteria (PM8500 analog output)

Item	Upper limit	Lower limit
Function(THD+N)	0.05%	0.000%

This test is performed on channels 1 through 8.

6.2. AES in to THRU out audio performance test

AES3 -30dBFS input / FS = 48.0kHz / AES3 swing 0.2Vpp

AMPL (1 kHz)

ATS-2 Setting

Item	Setting
Frequency	1kHz
Amplitude	-30dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Level	-28dBFS	-32BFS

Noise

ATS2 Setting

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

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Level	-120dBFS	-200dBFS

FRQ20kHz

ATS2 Setting

Item	Setting
Frequency	20kHz
Amplitude	-30dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Level (1kHz relative)	+0.5dB	-0.5dB

FRQ20Hz

ATS2 Setting

Item	Setting
Frequency	20Hz
Amplitude	-30dBFS
B/W	<10HZ / FS/2
Filter	None

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Level (1kHz relative)	+0.5dB	-0.5dB

THDN

ATS2 Setting

Item	Setting
Frequency	1kHz
Amplitude	-30dBFS
B/W	22HZ / 22KHz LPF
Filter	"A" Weighting

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Function(THD+N)	0.001%	0.000%

This test is performed on channels 1 through 8.

6.3. AES in to THRU input voltage test

AES3 -30dBFS input / FS = 48.0kHz / AES3 swing 0.2Vpp

Rate

ATS2 Setting

Item	Setting
Sample rate-OSR:	48.0000kHz
Voltage	0.2Vpp
Resolution	24Bits
Pre-emphasis	Off
Scale Freq by	Output Rate
Jitter Type	Off
Di Input Z	110 ohm

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Sample rate-ISR:	48001Hz	47999Hz

Volt
ATS2 Setting

Item	Setting
Sample rate-OSR:	48.0000kHz
Voltage	0.2Vpp
Resolution	24Bits
Pre-emphasis	Off
Scale Freq by	Output Rate
Jitter Type	Off
Di Input Z	110 ohm

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Voltage	4Vpp	2.5Vpp

Jitter
ATS2 Setting

Item	Setting
Sample rate-OSR:	48.0000kHz
Voltage	0.2Vpp
Resolution	24Bits
Pre-emphasis	Off
Scale Freq by	Output Rate
Jitter Type	Off
Di Input Z	110 ohm

Criteria (AES3 THRU output)

Item	Upper limit	Lower limit
Jitter	5.0 e -8 S	0S

This test is performed on channels 1 through 4 by each AES3 channel.

6.4. L/R invert check

ATS2 Setting

Item	Setting
Sample rate-OSR:	48.0000kHz
Voltage	5Vpp
Resolution	24Bits
Pre-emphasis	Off
Scale Freq by	Output Rate
Jitter Type	Off
Outputs	CHA = ON / CHB = OFF

Criteria (AES3 THRU output)

Item	Result	Pass / Fail
AMPL CHA > CHB	LR-STATUS = Non-Inverted	Passed
AMPL CHA < CHB	LR-STATUS = Inverted.	Failed
AMPL Other level	LR-STATUS = Undefined status	Failed

This test is performed on channel 1 only.