ARTESYN EMBEDDED TECHNOLOGIES

Reliability Engineering
Philippines

Pass

DRV ENVIRONMENTAL TEST REPORT

Date Released	**June 23, 2017**	**Reference Number**	**RE-PH16/028B**
Model No.	**73-959-0001 (iHP9A Rack only; Rack and Module Configuration)**	**Manufacturing Site**	Laguna
Product Spec Rev	Rev.06	**Product Spec Release Date**	05-07-2015
BOM Release Date	09-16-2015	**Schematic Rev**	705-003100-0000 Rev AC
Sample Size	See page 4	**Product Rev**	DVT

	Name/s	**Signature**	**Date**
Issued by	Jonathan A. Robiñol		06/21/2017
Checked by	Ronaldo Tolentino		06/22/2017
Approved by	Jet Bautista		06/23/2017

	Team	**Name/s**
Circulation	Design Team EW-1	((EE) Ray Patrick Almeda, Rommel Cruz, Louie Cuevas (ME) Jonathan Cudal, Angelito Hatol
	Design Management	Nonoy Neri, Peter Fernandes
	Program Management	Rowenalyn Legaspi, Kathleen Lares, Dan Soliman, Peter Warren
	Reliability Engineering	Ronaldo Tolentino, Jet Bautista, Melson Torrijos

Revision Control

Revision	**Change History**	**Date**
A	First Release	02/15/2016
B	Second Release : Update Rack Only S&V verification test results and include Rack and module configuration S&V test results	06/23/2017

REPORT CONTENTS

Test Result Summary and Conclusion

TEST	DRV Result (P-Pass / F-Fail / NR-Not Required)
1.0 Mechanical	
1.1 Sinusoidal Vibration	
1.1.1 Operating Sinusoidal Vibration 1(Rack and module Configuration)	P
1.1.2 Operating Sinusoidal Vibration 2(Rack and module Configuration)	P
1.2 Random Vibration	
1.2.1 Non-operating Random Vibration (Rack only)	P
1.2.2 Operating Random vibration(Rack and module Configuration)	P
1.3 Shock	
1.3.1 Non-operating Half-sine Shock (Rack only)	P
1.3.2 Bench Handling(Rack only)	P

Test Report Conclusion	This product had completed the DRV tests as outlined in this report. Based on the test results depicted in this report, the product **passed** the DRV test.

References

1. Product Specifications: Rev. AA
2. DRV Test Plan No. QAP-1110/PH Rev. E
3. Design Derating Requirements 920-000114-0000
4. Design Reliability Verification 920-000095-0000
5. Schematic Diagram 705-003100-0000 Rev. AA
6. PCB Artwork P/N's: 509-021534-0002, 509-021677-0003, 509-021679-0003 Rev.02

SAMPLE RACK UNIT SUMMARY

Sample Unit #	Serial #	Date Code	Firmware	Product Revision
1	K368QK0009BCP	Year : 2015; Week : 40	N/A	DVT
2	K368QK000HBLP	Year : 2015; Week : 40	N/A	DVT
3	K368QK000NBLP	Year : 2015; Week : 40	N/A	DVT
4	K368R40008BRP	Year : 2016; Week : 06	N/A	DVT2
5	K368R7000ABRP	Year : 2016; Week : 09	N/A	DVT2
6	K368R7000BBRP	Year : 2016; Week : 09	N/A	DVT2
7	K368R9000JBRP	Year : 2016; Week : 11	N/A	DVT2
8	K368RA0005BTP	Year : 2016; Week : 12	N/A	DVT2
9	K368RA0007BTP	Year : 2016; Week : 12	N/A	DVT2
10	K835RK0006BXP	Year : 2016; Week : 21	N/A	PVT
11	K835RK0008BXP	Year : 2016; Week : 21	N/A	PVT
12	K835RK000BBXP	Year : 2016; Week : 21	N/A	PVT

SAMPLE MODULES UNIT SUMMARY

Sample Unit #	Serial #	Date Code	Output Voltage	Product Revision
1	K840QP000ECKP	Year : 2015; Week : 44	125V	DVT
2	K840QP000GCKP	Year : 2015; Week : 44	125V	DVT
3	K839QK001TCBP	Year : 2015; Week : 40	48V	DVT1
4	24A - Eng'g Sample	Year : 2015; Week : XX	24V	DVT
5	K840QP000HCKP	Year : 2015; Week : 44	125V	DVT
6	K840QP000JCKP	Year : 2015; Week : 44	125V	DVT

7	K839QK001NCBP	Year : 2015; Week : 40	48V	DVT1
8	24B – Eng'g Sample	Year : 2015; Week : XX	24V	DVT
9	24C_Eng'g Sample	Year : 2016; Week : XX	125V	DVT
10	24D_Eng'g Sample	Year : 2016; Week : XX	125V	DVT
11	K839R50015CRP	Year : 2016; Week : 07	48V	DVT3
12	K839R50014CRP	Year : 2016; Week : 07	48V	DVT3
13	K840R60006EEP	Year : 2016; Week : 08	125V	DVT3
14	K840R60008EEP	Year : 2016; Week : 08	125V	DVT3
15	K840R60009EEP	Year : 2016; Week : 08	125V	DVT3
16	K840R60007EEP	Year : 2016; Week : 08	125V	DVT3
17	K840R6000CEEP	Year : 2016; Week : 08	125V	DVT3
18	K840R60008EEP	Year : 2016; Week : 08	125V	DVT3
19	K839R50014CRP	Year : 2016; Week : 07	48V	DVT3
20	K839R8000ACTP	Year : 2016; Week : 10	48V	DVT3
21	K840R60009EEP	Year : 2016; Week : 08	125V	DVT3
22	K840R60007EEP	Year : 2016; Week : 08	125V	DVT3
23	K839R50015CRP	Year : 2016; Week : 07	48V	DVT3
24	K839R8000DCTP	Year : 2016; Week : 10	48V	DVT3
25	K840R90002EFP	Year : 2016; Week : 11	125V	DVT3
26	K840R70009EFP	Year : 2016; Week : 09	125V	DVT3
27	K840R80007CTP	Year : 2016; Week : 10	48V	DVT3
28	K840R80009CHP	Year : 2016; Week : 10	24V	DVT
29	K840R7000BEFP	Year : 2016; Week : 09	125V	DVT3
30	K840R7000EEFP	Year : 2016; Week : 09	125V	DVT3
31	K840R80009CTP	Year : 2016; Week : 10	48V	DVT3
32	K840R80008CHP	Year : 2016; Week : 10	24V	DVT
33	K840RM0001ETC	Year : 2016; Week : 23	125V	PILOT
34	K840RM0004ETC	Year : 2016; Week : 23	125V	PILOT

35	K839RK001VEBC	Year : 2016; Week : 21	48V	PILOT
36	K839RK001TEBC	Year : 2016; Week : 21	48V	PILOT
37	K840RQ0004EXC	Year : 2016; Week : 26	125V	PILOT
38	K840RM0002ETC	Year : 2016; Week : 23	125V	PILOT
39	K839RK0023EBC	Year : 2016; Week : 21	48V	PILOT
40	K839RK001SEBC	Year : 2016; Week : 21	48V	PILOT
41	K840RQ000CEXC	Year : 2016; Week : 26	125V	PILOT
42	K840RQ000AEXC	Year : 2016; Week : 26	125V	PILOT
43	K839RK001YEBC	Year : 2016; Week : 21	48V	PILOT
44	K838RQ0007CYP	Year : 2016; Week : 26	24V	DVT3
45	K840RQ000EEXC	Year : 2016; Week : 26	125V	PILOT
46	K840RQ000DEXC	Year : 2016; Week : 26	125V	PILOT
47	K839RK001XEBC	Year : 2016; Week : 21	48V	PILOT
48	K838RQ000BCYP	Year : 2016; Week : 26	24V	DVT3

Hi Pot Test Procedure

1. P- PE at 3400Vdc, 6 sec dwell time, 5mA max trip current, 500V/s
2. P- ISOCOM, MOD1, MOD2, MOD3, MOD4, MOD5, MOD6,MOD7, MOD8 at 3400Vdc, 6 sec dwell time, 5mA max trip current, 500V/s
3. ISOCOM - MOD1, MOD2, MOD3, MOD4, MOD5, MOD6,MOD7, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
4. MOD1 - MOD2, MOD3, MOD4, MOD5, MOD6,MOD7, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
5. MOD2 – MOD1, MOD3, MOD4, MOD5, MOD6,MOD7, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
6. MOD3 - MOD2, MOD1, MOD4, MOD5, MOD6,MOD7, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
7. MOD4 - MOD2, MOD3, MOD1, MOD5, MOD6,MOD7, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
8. MOD5 - MOD2, MOD3, MOD4, MOD1, MOD6,MOD7, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
9. MOD6 - MOD2, MOD3, MOD4, MOD5, MOD1,MOD7, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
10. MOD7 - MOD2, MOD3, MOD4, MOD5, MOD6,MOD1, MOD8 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s
11. MOD8 - MOD2, MOD3, MOD4, MOD5, MOD6,MOD7, MOD1 at 1800Vac, 6 sec dwell time, 5mA max trip current, 500V/s

TEST DETAILS

Mechanical Test

1.1 Sinusoidal Vibration

1.1.1 Operating Sinusoidal Vibration 1 (Rack and module configuration)

Reference Document		Mechanical Test Instruction 920-000096-0000 Rev.AF / MIL-STD-810G Method 528 Procedure I (Type1)		
Test Location		RE Cavite		
Test Conditions	Load	Full Load (24kW)		
	Line	480		Vac / Three Phase
		Exploratory Vibration test		
	Amplitude	0.01		in
	Frequency Range	4 to 33 (actual used **5** to 33)		Hz
	Sweep Rate	Discrete 1 Hz interval, 15 sec per interval		
		0.067		Hz/sec
		Variable Frequency test		
	PSD Profile	Frequency Range, Hz		Amplitude, Inch
		4 to 15		0.030 +/-0.006
		16 to 25		0.020 +/-0.004
		26 to 33		0.010 +/-0.002
	Sweep Rate	Discrete 1 Hz interval, 5 min per interval		
	Direction	3 mutually perpendicular axis		
	Duration of endurance test	Number of endurance test frequencies	Test time duration at each endurance test frequency	Total time
		1	2 hours	2 hours
		2	1 hour	2 hours
		3	40 minutes	2 hours
		4	40 minutes	2 hours, 40
		n>2	40 minutes	40 x n minutes
	Resonant Frequency	X – axis	No significant response prominence	
		Y – axis	No significant response prominence	
		Z – axis	No significant response prominence	
Test Sample	Serial Nos.	Rack: Sample #2 Module: Sample#1,2,3,4,5,6,7,8		
	Date Code	See page 4		

Test Equipment	Description	Model No.	Equipment No.	Calibration Due Date
	Dongling Vibration System	DA-40	N/A	N/A
	Accelerometer	Dytran 3030B5	SN: 8255	18 SEP 17
	Grid	NA	NA	NA
	DMM	HP34401A	007322	12 SEP 17
	Dielectric Analyzer	Vitrex 944i	005842	16 DEC 17
	Data Logger	Graphtec GL820	010452	12 OCT 17

	Electronic Load	CHROMA63203	010348	03 AUG 17
	Electronic Load	CHROMA63203	010999	05 OCT17
	Electronic Load	CHROMA63203	010366	28 APR 18
	Electronic Load	CHROMA63203	080389	03 AUG 17
	Electronic Load	CHROMA63203	010893	22 AUG 17
	Electronic Load	CHROMA63203	010394	03 AUG 17
	Electronic Load	CHROMA63203	010346	03 AUG 17
	Electronic Load	CHROMA63203	005814	08 DEC 17
	Functional	DVT Build Test results - With highlighted issue refer to attachment PVT Build Test results - Passed, refer to attachment		
	Mechanical	DVT Build Test results - With highlighted issue refer to attachment PVT Build Test results - Passed, refer to attachment		
	Hi-Pot Test	Passed		
Test Remarks	Based on above test results, sample product **passed** Operating Sinusoidal Vibration 1 MIL-STD-810G Method 528 Procedure I (Type1) test. See test data on Appendix.			

1.1.2 Operating Sinusoidal Vibration 2 (Rack and module configuration)

Reference Document		Mechanical Test Instruction 920-000096-0000 Rev.AF / NEBS Office Vibration Environment, Alternate Procedure		
Test Location		RE Cavite		
Test Conditions	Load	Full Load (24kW)		
	Line	480		Vac / Three Phase
	Acceleration	1		G
	Frequency Range	5-100		Hz
	Sweep Rate	0.25		Oct /min
	Sweep duration	1		Sweep / axis
	Direction	3 mutually perpendicular axis		
Test Sample	Serial Nos.	Rack: Sample #3 Modules: Sample#1,2,3,4,5,6,7,8		
	Date Code	See page 4		
Test Equipment	Description	Model No.	Equipment No.	Calibration Due Date
	Dongling Vibration System	DA-40	N/A	N/A
	Accelerometer	Dytran 3030B5	SN: 8255	18 SEP 17
	Grid	NA	NA	NA
	DMM	HP34401A	007322	12 SEP 17
	Dielectric Analyzer	Vitrex 944i	005842	16 DEC 17
	Data Logger	Graphtec GL820	010452	12 OCT 17
	Electronic Load	CHROMA63203	010348	03 AUG 17
	Electronic Load	CHROMA63203	010999	05 OCT17
	Electronic Load	CHROMA63203	010366	28 APR 18
	Electronic Load	CHROMA63203	080389	03 AUG 17
	Electronic Load	CHROMA63203	010893	22 AUG 17
	Electronic Load	CHROMA63203	010394	03 AUG 17
	Electronic Load	CHROMA63203	010346	03 AUG 17
	Electronic Load	CHROMA63203	005814	08 DEC 17
	Functional	Passed		
	Mechanical	DVT Build Test result With highlighted issue, already closed. Refer to attachment Passed		
	Hi-Pot Test	Passed		
Test Remarks	Based on above test results, sample product **passed** Operating Sinusoidal Vibration 2 NEBS Office Vibration Environment, Alternate Procedure test. See test data on Appendix.			

1.2 Random Vibration

1.2.1 Non-operating Random Vibration (Rack only)

Reference Document		Mechanical Test Instruction 920-000096-0000 Rev.AF		
Test Location		RE Cavite		
Test Conditions	Acceleration	1.87		gRMS
	Duration	30		mins
	Frequency Range	10 to 500		Hz
	Direction	Three orthogonal axes		
	PSD Profile	**Frequency**	**Slope (db/oct)**	**PSD Profile**
		10 Hz	--	0.009 g²/Hz
		200 Hz	-2.66	0.009 g²/Hz
		500 Hz	--	0.004 g²/Hz
Test Sample	Serial Nos.	Sample #1		
	Date Code	See page 4		
Test Equipment	Description	Model No.	Equipment No.	Calibration Due Date
	Dongling Vibration System	DA-40	N/A	N/A
	Accelerometer	Dytran 3030B5	SN: 8255	18 SEP 17
	Grid	NA	NA	NA
	DMM	HP34401A	007322	12 SEP 17
	Dielectric Analyzer	Vitrex 944i	005842	16 DEC 17
	Data Logger	Graphtec GL820	010452	12 OCT 17
	Electronic Load	CHROMA63203	010348	03 AUG 17
	Electronic Load	CHROMA63203	010999	05 OCT17
	Electronic Load	CHROMA63203	010366	28 APR 18
	Electronic Load	CHROMA63203	080389	03 AUG 17
	Electronic Load	CHROMA63203	010893	22 AUG 17
	Electronic Load	CHROMA63203	010394	03 AUG 17
	Electronic Load	CHROMA63203	010346	03 AUG 17
	Electronic Load	CHROMA63203	005814	08 DEC 17
	Functional	Passed		
	Mechanical	DVT Build Test results - With highlighted issues refer to attachment PVT Build Test results - Passed, refer to attachment		
	Hi-Pot Test	Passed		
Test Remarks	Based on above test results, sample product **passed** Non-Operating Random Vibration test. See test data on appendix.			

1.2.2 Operating Random Vibration (Rack and module configuration)

Reference Document		Mechanical Test Instruction 920-000096-0000 Rev.AF / IPC-9592B Class I		
Test Location		RE Cavite		
Test Conditions	Load	Full Load (24kW)		
	Line	480		Vac / Three phase
	Acceleration	0.71		gRMS
	Frequency Range	10-500		Hz
	Duration	30		min
	Direction	3 mutually perpendicular axis		
	PSD Profile	**Frequency**	**Slope (db/oct)**	**PSD (g^2/Hz)**
		10 Hz	5.938	0.000229 g^2/Hz
		30 Hz	--	0.0021 g^2/Hz
		200 Hz	-11.87	0.0021 g^2/Hz
		500 Hz	--	0.000054 g^2/Hz
Test Sample	Serial Nos.	Rack: Sample #2 Module: Sample#1,2,3,4,5,6,7,8		
	Date Code	See page 4		

Test Equipment	Description	Model No.	Equipment No.	Calibration Due Date
	Dongling Vibration System	DA-40	N/A	N/A
	Accelerometer	Dytran 3030B5	SN: 8255	18 SEP 17
	Grid	NA	NA	NA
	DMM	HP34401A	007322	12 SEP 17
	Dielectric Analyzer	Vitrex 944i	005842	16 DEC 17
	Data Logger	Graphtec GL820	010452	12 OCT 17
	Electronic Load	CHROMA63203	010348	03 AUG 17
	Electronic Load	CHROMA63203	010999	05 OCT17
	Electronic Load	CHROMA63203	010366	28 APR 18
	Electronic Load	CHROMA63203	080389	03 AUG 17
	Electronic Load	CHROMA63203	010893	22 AUG 17
	Electronic Load	CHROMA63203	010394	03 AUG 17
	Electronic Load	CHROMA63203	010346	03 AUG 17
	Electronic Load	CHROMA63203	005814	08 DEC 17
	Functional	Passed		
	Mechanical	DVT Build Test results - With highlighted issues refer to attachment PVT Build Test results - Passed, refer to attachment		
	Hi-Pot Test	Passed		
Test Remarks	Based on above test results, sample product **passed** Operating Random Vibration IPC-9592B Class I test. See test data on appendix.			

1.3 Shock Test

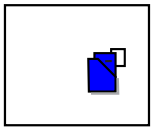
1.3.1 Non-operating Half-sine Shock (Rack only)

Reference Document		Mechanical Test Instruction 920-000096-0000 Rev.AF		
Test Location		RE Cavite		
	Acceleration	30		G
	Duration	11		msec
	Pulse	Half sine		
	No. of Shock	3 shocks on each of 6 faces		
Test Sample	Serial Nos.	Sample #1		
	Date Code	See page 4		
Test Equipment	Description	Model No.	Equipment No.	Calibration Due Date
	Dongling Vibration System	DA-40	N/A	N/A
	Accelerometer	Dytran 3030B5	SN: 8255	18 SEP 17
	Grid	NA	NA	NA
	DMM	HP34401A	007322	12 SEP 17
	Dielectric Analyzer	Vitrex 944i	005842	16 DEC 17
	Data Logger	Graphtec GL820	010452	12 OCT 17
	Electronic Load	CHROMA63203	010348	03 AUG 17
	Electronic Load	CHROMA63203	010999	05 OCT17
	Electronic Load	CHROMA63203	010366	28 APR 18
	Electronic Load	CHROMA63203	080389	03 AUG 17
	Electronic Load	CHROMA63203	010893	22 AUG 17
	Electronic Load	CHROMA63203	010394	03 AUG 17
	Electronic Load	CHROMA63203	010346	03 AUG 17
	Electronic Load	CHROMA63203	005814	08 DEC 17
	Functional	DVT Build Test results - With highlighted issues refer to attachment PVT Build Test results - Passed, refer to attachment		
	Mechanical	DVT Build Test results - With highlighted issue refer to attachment PVT Build Test results - Passed, refer to attachment		
	Hi-Pot Test	Passed		
Test Remarks	Based on above test results, sample product **passed** Non-operating Half-Sine Shock test. See test data on appendix.			

1.3.2 Bench Handling (Rack only)

Reference Document		Mechanical Test Instruction 920-000096-0000 Rev.AF / Product Specification Item 3.0 MIL-STD-810G Method 516.6 Procedure VI		
Test Location		RE Cavite		
Test Conditions	Procedure	Step 1. Following a functional and physical checkout, configure the item as it would be for servicing, e.g., with the chassis and front panel assembly removed from its enclosure. Position the test item as it would be for servicing. Generally, the test item will be non-operational during the test. Step 2. Using one edge as a pivot, lift the opposite edge of the chassis until one of the following conditions occurs (whichever occurs first). a. The lifted edge of the chassis has been raised 100 mm (4 in) above the horizontal bench top. b. The chassis forms an angle of 45º with the horizontal bench top. c. The lifted edge of the chassis is just below the point of perfect balance. Let the chassis drop back freely to the horizontal bench top. Repeat using other practical edges of the same horizontal face as pivot points, for a total of four drops. Step 3. Repeat Step 2 with the test item resting on other faces until it has been dropped for a total of four times on each face on which the test item could be placed practically during servicing. Step 4. Visually inspect the test item.		
Test Sample	Serial Nos.	Sample #12		
	Date Code	See page 4		
Test Equipment	Description	Model No.	Equipment No.	Calibration Due Date
	Bench tabe	NA	NA	NA
	Metallic Ruler	NA	NA	NA
	Grid	NA	NA	NA
	DMM	HP34401A	007322	12 SEP 17
	Dielectric Analyzer	Vitrex 944i	005842	16 DEC 17
	Data Logger	Graphtec GL820	010452	12 OCT 17
	Electronic Load	CHROMA63203	010348	03 AUG 17
	Electronic Load	CHROMA63203	010999	05 OCT17
	Electronic Load	CHROMA63203	010366	28 APR 18
	Electronic Load	CHROMA63203	080389	03 AUG 17
	Electronic Load	CHROMA63203	010893	22 AUG 17
	Electronic Load	CHROMA63203	010394	03 AUG 17
	Electronic Load	CHROMA63203	010346	03 AUG 17
	Electronic Load	CHROMA63203	005814	08 DEC 17
	Functional	No deviation before and after test		
	Mechanical	No deviation before and after test		
	Hi-Pot Test	Passed		
Test Remarks	Based on above test results, sample product **passed** Bench handling test. See test data on appendix.			

Appendix

Attachment	Revision	File Name
	Rev B	**73-959-0001 DVT Mechanical set-up.pdf**