



DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION
OFFICE OF STATEWIDE HOSPITAL PLANNING AND DEVELOPMENT

APPLICATION FOR HCAI SPECIAL SEISMIC
CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0706

HCAI Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: MegaResistors

Manufacturer's Technical Representative: Daljeet Cheema

Mailing Address: 6290 Kestrel Road, Mississauga, ON L5T 1Z2

Telephone: (905) 908-2376

Email: dcheema@megaresistor.com

Product Information

Product Name: MegaResistor's Neutral Grounding Resistors (NGR) and High Resistance Grounding Systems (HRG)

Product Model Number(s): MegaResistor's Neutral Grounding Resistors (NGR) and High Resistance Grounding Systems (HRG)

Product Category: Power Isolation and Correction Systems

Product Sub-Category: Grounding Systems

General Description: Neutral Grounding Resistors (NGR) and High Resistance Grounding Systems (HRG) are equipment that protect power system equipment and personnel by limiting and lowering the magnitude of ground-fault currents to a predetermined value by safely dissipating the electrical energy as heat. An NGR or HRG becomes the only current path between the Neutral of power transformers or generators and Ground.

Mounting Description: Several - See Certified Product Tables and UUT Sheet

Tested Seismic Enhancements: None

Applicant Information

Applicant Company Name: Dynamic Certification Laboratories

Contact Person: Rachel Wolfe

Mailing Address: 1315 Greg Street, Suite 109, Sparks, NV 89431

Telephone: (775) 358-5085

Email: rachel.wolfe@shaketest.com

Title: 137411



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California Licensed Structural Engineer Responsible for the Engineering and Test Report(s)

Company Name: THE VMC GROUP

Name: Kenneth Tarlow California License Number: S2851

Mailing Address: 980 9th Street, 16th Floor, Sacramento, CA 95814

Telephone: (832) 627-2214 Email: ken.tarlow@thevmcgroup.com

Certification Method

☐ GR-63-Core ☒ ICC-ES AC156 ☐ IEEE 344 ☐ IEEE 693 ☐ NEBS 3
☐ Other (Please Specify): _____

Testing Laboratory

Company Name: NATIONAL TECHNICAL SYSTEMS (NTS)

Contact Person: Tom Boonarkat

Mailing Address: 7800 Highway 20 West, Huntsville AL 35806

Telephone: (256) 837-4411 Email: tom.boonarkat@nts.com

BY: Mohammad Karim

DATE: 01/05/2026



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Seismic Parameters

Certified Response Spectral Acceleration Factors: (F_p/W_p)

Horizontal (A Flx-H), $g =$ 4.00 (A Rig-H), $g =$ 2.69

Vertical (A Flx-V), $g =$ 1.67 (A Rig-V), $g =$ 0.67

S_{DS} (Design spectral response acceleration at short period, g) = 2.5 at $z/h=1$ and 0

H_f (Force amplification height factor) = 3.5 at $z/h=1.0$; 1.0 at $z/h=0$

R_u (Structure ductility reduction factor) = 1.3 at $z/h=1.0$; 1.0 at $z/h=0$

I_p (Importance factor) = 1.5

z/h (Height ratio factor) = 1

HCAI Approval (For Office Use Only) - Approval Expires on 01/05/2032

Date: 1/5/2026

Name: Mohammad Karim

Title: Supervisor, Health Facilities

Condition of Approval (if applicable): _____

OSP-0706

BY: Mohammad Karim

DATE: 01/05/2026

Special Seismic Certification
Table 1 - Certified Components



DCL Project Number: 16875-2501

Manufacturer: MegaResistors

Product Line: Neutral Grounding Resistors (NGR) and High Resistance Grounding Systems (HRG)

Certified Product Construction: Mild and Galvanized Carbon Steel

Mounting: Rigid Wall or Rigid base Mounted

Certified Seismic Levels: Sds 2.5 g at z/h=1 and 0¹

Factors for Force Amplification and Structure Ductility Reduction: H_e = 3.5 at z/h=1.0; 1.0 at z/h=0 and R_μ = 1.3 at z/h=1.0; 1.0 at z/h=0

Model Number	Unit Identification	Product Construction	Dimensions [in.]			Weight [lb.]	Mounting	Unit
			Width	Depth	Height			
Group 1 - High Resistance Grounding Systems								
HRG - ENHR=1-3R	HR1	16 Ga. Mild Steel, NEMA 3R	25.0	12.1	29.4	70.5	Rigid Wall	UUT-1, UUT-2
Group 1 - High Resistance Grounding Systems								
HRG - ENHR=2-3R	HR2	16 Ga. Mild Steel, 12 Ga. Bottom Mount Pads and Lifting Lugs, NEMA 3R	26.0	12.1	54.7	126.1	Rigid Base	UUT-3
HRG - ENHR=3-3R	HR3		22.0	16.0	66.1	128.5		Interpolated
HRG - ENHR=4-3R	HR4		26.0	18.0	80.7	200.0		UUT-4
Group 2 - Neutral Grounding Resistor Systems								
NGR - ENNG=1-3R	N1	16 Ga. Galvanized Steel, NEMA 3R	22.0	18.0	8.1	23.7	Rigid Base	UUT-5
NGR - ENNG=2-3R-L	N2		22.0	22.0	12.4	50.0		Interpolated
NGR - ENNG=2L-3R	N2L		22.0	30.8	12.4	90.0		UUT-6
Group 3 - Neutral Grounding Resistor Systems with Stacked Resistor Brackets								
NGR - CPD-0111-F-1	N6A	16 Ga. Galvanized Steel, 14 Ga. Top and 16 Ga. Louver Covers, NEMA 3R	46.0	38.0	32.3	416.0	Rigid Base	UUT-7
Group 4 - Neutral Grounding Resistor Systems with Stacked Resistor Brackets								
NGR - CPD-0141-F-1	N12	12 Ga. Galvanized Steel, 14 Ga. Top and Bottom Panels, and 16 Ga. Louver Covers, NEMA 3R	84.0	59.8	63.9	1420.0	Rigid Base	UUT-9

Note:

1. Tested Units also passed IEEE-693 High Performance Level Testing.



Special Seismic Certification

Table 2 - Certified Subcomponents - Rigid Wall Mounted

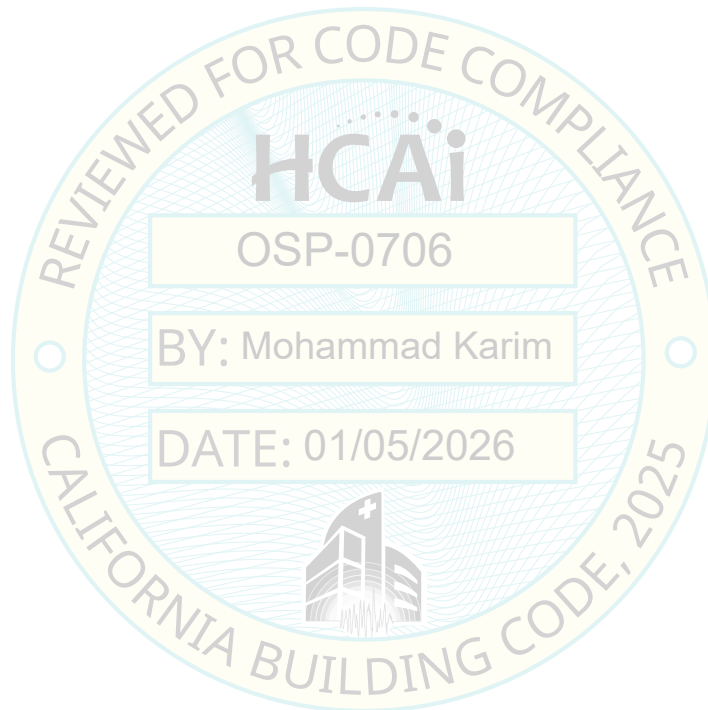


DCL Project Number: 16875-2501

Product Line: Neutral Grounding Resistors (NGR) and High Resistance Grounding Systems (HRG)

Certified Seismic Levels: Sds 2.5 g at z/h=1 and 0

Subcomponent Type	Part Number	Vendor Code	Manufacturer	Description / Display Name	Material	Weight [lb.]	Unit
Controls and Indication	SPSS=01	C2SS2-10B-10	ABB	2POS Selector Switch	Plastic	<1	UUT-1, UUT-2
	IDHO=95	SC110N	Mallory	95db Buzzer	Plastic	<1	UUT-1, UUT-2
Cooling Fan	ENCF=HR	MC19694	Multicomp	Multicomp Axial Cooling Fan	Aluminum, Plastic	1	UUT-1, UUT-2
Pulsing Contactor	SPPC=DP20C2P-1	DP20C2P-1	ABB	Definite Purpose Contactor	Plastic, Silicon Steel, Zinc-Plated Steel, Copper	<1	UUT-1
Resistor Element	REWW=XX	N/A	MegaResistors	Wirewound Resistor	Carbon Steel, Mica, Ceramic	2	UUT-1, UUT-2



Special Seismic Certification
Table 3 - Certified Subcomponents - Rigid Base Mounted



DCL Project Number: 16875-2501

Product Line: Neutral Grounding Resistors (NGR) and High Resistance Grounding Systems (HRG)

Certified Seismic Levels: Sds 2.5 g at z/h=1 and 0

Subcomponent Type	Part Number	Vendor Code	Manufacturer	Description / Display Name	Material	Weight [lb.]	Unit
Auxiliary Relay	ELAR=2NO-2NC	NF22E-13	ABB	Relay 2NO-2NC	Plastic	<1	UUT-4
	ELAR=IRBS	1SVR405660R0000		Interface Relay Base Socket for CR Relay		<1	UUT-4
	ELAR=IRCR	1SVR405622R2100		CR Type, 3C/O, 11PIN		<1	UUT-4
	ELAR=FL1F	FL1F-H12RCC		FL1F-H12RCC, 100-240 VAC/DC		<1	UUT-4
	ELAR=RJ25-120V	RJ25-CL-A120	Idec	Power Relay	Plastic	<1	UUT-4
	ELAR=RJ25-B5	RJ25-CL-A120-B5		Power Relay Base Socket		<1	UUT-4
	ELAR=R0-24VDC-1	2903361		Relay Module		<1	UUT-4
	ELAR=R1-24VDC-1	2903334		Relay Module		<1	UUT-4
Bonding Lug	TEBL=70	SLU-70	IlSCO	Fitting	Copper	<1	UUT-5 to UUT-7, UUT-9
Control Power Transformer	INPT=SP100ACP	SP100ACP	Hammond	100 VA, 60 Hz	Plastic, Resin	3	UUT-4
Control Relay	ELCR=SE701	SE-701	Littelfuse Startco	Ground-Fault Monitor	Plastic	1	UUT-4
	ELCR=SE330-00-00	SE-330		Monitoring Relay	Plastic, Aluminum	4	UUT-3
	ELCR=COM465	B95061065		COM465IP	Plastic	<1	UUT-4
	ELCR=RCM420	B94014002	Bender	RCM420		<1	UUT-4
	ELCR=RCM5490	B94053006		RCM5490		<1	UUT-4
	ELCR=NGRM500	B94013500		NGRM500		1	UUT-4
	ELCR=NGRM700	B94013700		NGRM700		1	UUT-4
	ELCO=P1-540ETH	P1-540	Automation Direct	Logic Control Client - M-T-M	Plastic	<1	UUT-4
Controls and Indication	ELCO=ILC-131ETH	2700973	Phoenix Contact	ILC 131 ETH System Controller	Plastic, Copper	<1	UUT-4
	IDLA=G120	CL-513G	Crompton Instruments	Pilot Light	Plastic	<1	UUT-4
	SPPB=10	CP1-10B-10		Push Button N/O	Plastic	<1	UUT-4
	MEAM=3P5	016-02AA-LSMT-C7-S2-MG		3 1/2" Analog Panel Meter	Plastic, Glass	<1	UUT-3
	MEVM=3P5	016-02VA-SF5F-C7-S2-MG		3 1/2" Analog Panel Meter	Plastic, Glass	<1	UUT-3
Cooling Fan	ENCF=HR	MC19694	Multicomp	Multicomp Axial Cooling Fan	Aluminum, Plastic	1	UUT-3, UUT-4
Current Transformer	INCT=20D2-5-5	20-2-005	GE	CT20-2-005	Plastic	8	UUT-4
	INCT=CS10-2P5	SE-CS10-2-5		CS10-2-5		<1	UUT-4
	INCT=ELCT5-31	ELCT5-31		100:1 CT Ratio		<1	UUT-4
	INCT=5SFT	5SFT-101	Crompton Instruments	5SFT	Plastic	<1	UUT-4
	INCT=UB-RCMS-1	B98120003	Bender	CTUB103-CTBC35	Plastic	<1	UUT-3, UUT-4
	X2	N/A	MegaResistors	Resistance Monitor Transformers	Plastic	<1	UUT-3
Disconnect Switch	SPLD=16A-SOCO	22003000	Socomec	Socomec 600V, 16A, 3P	Plastic	<1	UUT-4
Ethernet Switch	SPES=ETHSW5P	2891001	Phoenix Contact	Ethernet Switch 5 Port	Aluminum	<1	UUT-4
Fuse	SPFU=HO-D	CCP-3-30CC	Eaton	Fuse Holder Disconnecter CCP-3-30CC	Plastic	<1	UUT-4
	SPFU=HO-LF	LPSC0001	Littelfuse Startco	Fuse Holder	Plastic	<1	UUT-4
	SPFU=600V-6A	ATMR6	Mersen	Fuse	Melamine, Copper	<1	UUT-4
Heater	SPFU=HO-ME	USCC1		Fuse Holder	Plastic	<1	UUT-4
	ENHE=50W	060010-00	Stego	Enclosure Heater w/Thermostat	Plastic, Aluminum	<1	UUT-4
Input-Output Module	ELIO=24VACDC-8DI8DO	P1-16CDR	Automation Direct	I/O Module for M-T-M	Plastic	<1	UUT-3
	ELIO=24VDC-8DI	2702792	Phoenix Contact	I/O Module 8 DI	Plastic	<1	UUT-4
	ELIO=24VDC-8DO	2702793		I/O Module 8 DO		<1	UUT-4
	ELIO=4AI	2702495		I/O Module 4 AI		<1	UUT-4
Insulator	IRPS=5	N/A	MegaResistors	5kV Standoff Insulator	Porcelain	5	UUT-7
	IRPS=8P7	N/A		8.7kV Standoff Insulator		6	Interpolated
	IRPS=15	N/A		15kV Standoff Insulator		8	UUT-9
NEMA Pad	TENP=5	N/A	MegaResistors	5kV Terminal	Porcelain, Copper	5	UUT-7
	TENP=8P7	N/A		8.7kV Terminal		6	Interpolated
	TENP=15	N/A		15kV Terminal		8	UUT-9
Power Supply	ELPS=120VACDC-20W-48VA	P1-01AC	Automation Direct	Power Supply 120VAC/125VDC M-T-M	Plastic	<1	UUT-3
	ELPS=24VDC-30W	2902991	Phoenix Contact	Power Supply 24Vdc 1.25A	Polycarbonate	<1	UUT-4
	ELPS=24VDC-60W	2902992		Power Supply 24VDC 60W		<1	UUT-4
	ELPS=STEP-24V-1P75A	2868648		Power Supply 24Vdc 1.75A		<1	UUT-4
Pulsing Contactor	SPPC=24VDC-10A-NC	D2410-B	Crydom	Solid State Relay	Plastic, Aluminum	<1	UUT-4
Resistor Element	SPPC=24VDC-20A	1032919	Phoenix Contact	Solid State Contactor 600V	Plastic	<1	UUT-4
	REEM=XXA-XX	N/A	MegaResistors	Edgewound Resistor	Steel, Mica, Ceramic	10	UUT-5 to UUT-7, UUT-9
	REWW=XX	N/A		Wirewound Resistor		2	UUT-3 to UUT-7, UUT-9
Sensing Resistor	INSR=CD1000	B98039010	Bender	CD1000	Aluminum, Epoxy	1	UUT-4
	INSR=ER600VC	ER-600VC	Littelfuse Startco	ER-600VC Sensing Resistor	Aluminum, Epoxy	1	UUT-4
	X1	N/A	MegaResistors	Resistance Monitor Electronics	Aluminum, Epoxy	<1	UUT-3
	X3	N/A		Resistance Monitor Sensors		<1	UUT-3
Terminal Block	TEDI=25	11511607	ABB	DIN-Rail Terminal Block	Plastic	<1	UUT-4
	TEDI=55	11511811		DIN-Rail Terminal Block		<1	UUT-4
	TEDI=END	15NK900001R0000		DIN-Rail End Stop		<1	UUT-4
	TETB=115-T3	14002-3		Terminal Block 14002-3	Plastic	<1	UUT-5, UUT-6
	TETB=115-T2	14002-2	Eaton	Terminal Block 14002-2		<1	UUT-5, UUT-6
	TETB=SH-60-T4	Model 89-505	Ideal	Shorting Terminal Block	Plastic, Brass	<1	UUT-5, UUT-6
Touchscreen Panel	ELTO=BTP-2043W	1,050,387 Gallons	Phoenix Contact	Touchscreen Operator Panel 4"	Plastic, Glass	<1	UUT-4
Zig-Zag Transformer	ELTO=EA1-S3MLW	EA1-S3MLW-N	Automation Direct	Touchscreen Operator Panel	Plastic	<1	UUT-4
	INZZ=480V-5A	N/A	MegaResistors	480V 5A Zig-Zag Transformer	Zinc-Plated Steel, Silicon Steel, Copper	51	UUT-6
	NZZ=600V-5A	N/A		600V 5A Zig-Zag Transformer		51	UUT-6

Special Seismic Certification
Table 4 - Tested Units



DCL Project Number: 16875-2501

Manufacturer: MegaResistors

Product Line: Neutral Grounding Resistors (NGR) and High Resistance Grounding Systems (HRG)

Certified Product Construction: Mild and Galvanized Carbon Steel

Mounting: Rigid Wall or Rigid base Mounted

Certified Seismic Levels: Sds 2.5 g at z/h=1 and 0

Factors for Force Amplification and Structure Ductility Reduction: $H_s = 3.5$ at $z/h=1.0$; 1.0 at $z/h=0$ and $R_d = 1.3$ at $z/h=1.0$; 1.0 at $z/h=0$

Model Number	Product Construction	Dimensions [in.]			Weight [lb.]	Mounting	Unit
		Length	Width	Height			
Group 1 - High Resistance Grounding Systems							
HRG - ENHR=1-3R	16 Ga. Mild Steel, NEMA 3R	25.0	12.1	29.4	70.5	Rigid Wall	UUT-1
HRG - ENHR=1-3R	16 Ga. Mild Steel, NEMA 3R	25.0	12.1	29.4	70.5	Rigid Wall	UUT-2
Group 1 - High Resistance Grounding Systems							
HRG - ENHR=2-3R	16 Ga. Mild Steel, 12 Ga. Bottom Mount Pads and Lifting Lugs, NEMA 3R	26.0	12.1	54.7	126.1	Rigid Base	UUT-3
HRG - ENHR=4-3R		26.0	18.0	80.7	200.0		UUT-4
Group 2 - Neutral Grounding Resistor Systems							
NGR - ENNG=1-3R	16 Ga. Galvanized Steel, NEMA 3R	22.0	18.0	8.1	23.7	Rigid Base	UUT-5
NGR - ENNG=2L-3R		22.0	30.8	12.4	90.0		UUT-6
Group 3 - Neutral Grounding Resistor Systems with Stacked Resistor Brackets							
NGR - CPD-0111-F-1	16 Ga. Galvanized Steel, 14 Ga. Top and 16 Ga. Louver Covers, NEMA 3R	46.0	38.0	32.3	416.0	Rigid Base	UUT-7
Group 4 - Neutral Grounding Resistor Systems with Stacked Resistor Brackets							
NGR - CPD-0141-F-1	12 Ga. Galvanized Steel, 14 Ga. Top and Bottom Panels, and 16 Ga. Louver Covers, NEMA 3R	84.0	59.8	63.9	1420.0	Rigid Base	UUT-9



UNIT UNDER TEST (UUT) Summary Sheet



UUT-1

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: High Resistance Grounding Systems

Model Number: ENHR=1-3R

Product Construction Summary: 16 Ga. Mild Steel, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
70.5	12.1	25.0	29.4	N/A	N/A	N/A

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	H _r	R _μ	I _p	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was wall mounted to the NTS wall fixture using (6) 1/4" -20 stainless steel bolts.



UUT-1 overall view.



UUT-1 interior view.

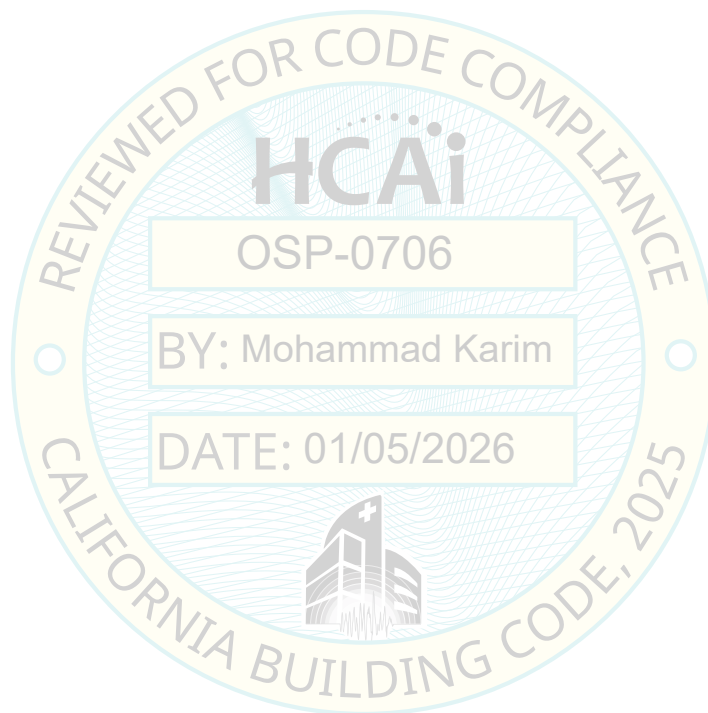
UNIT UNDER TEST (UUT) Summary Sheet



UUT-1

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Controls and Indication	SPSS=01	ABB	Plastic
Controls and Indication	IDHO=95	Mallory	Plastic
Cooling Fan	ENCF=HR	Multicomp	Aluminum, Plastic
Pulsing Contactor	SPPC=DP20C2P-1	ABB	Plastic, Silicon Steel, Zinc-Plated Steel, Copper
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic



UNIT UNDER TEST (UUT) Summary Sheet



UUT-2

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: High Resistance Grounding Systems

Model Number: ENHR=1-3R

Product Construction Summary: 16 Ga. Mild Steel, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
70.5	12.1	25.0	29.4	N/A	N/A	N/A

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	H _r	R _μ	I _p	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was wall mounted to the NTS wall fixture using (6) 1/4" -20 stainless steel bolts.



UUT-2 overall view.



UUT-2 interior view.

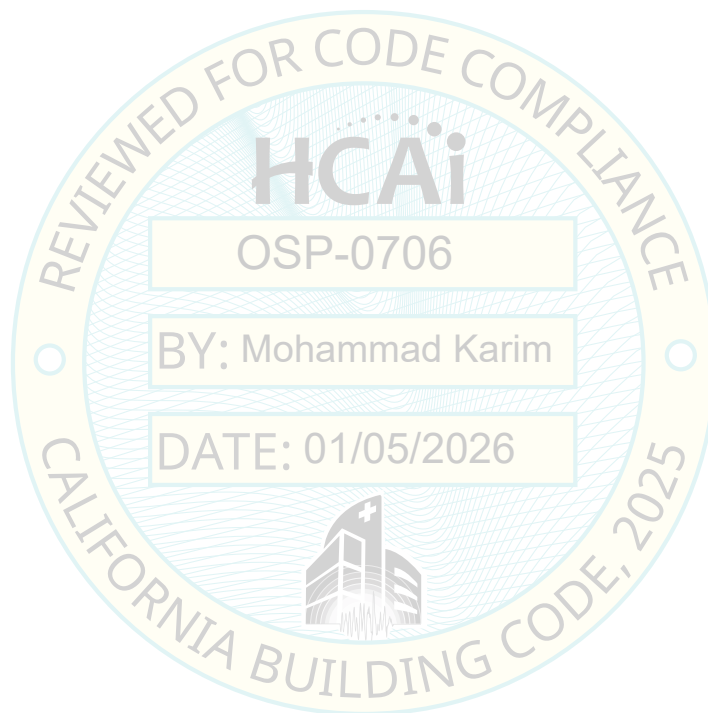
UNIT UNDER TEST (UUT) Summary Sheet



UUT-2

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Controls and Indication	SPSS=01	ABB	Plastic
Controls and Indication	IDHO=95	Mallory	Plastic
Cooling Fan	ENCF=HR	Multicomp	Aluminum, Plastic
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic



UNIT UNDER TEST (UUT) Summary Sheet



UUT-3

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: High Resistance Grounding Systems

Model Number: ENHR=2-3R

Product Construction Summary: 16 Ga. Mild Steel, 12 Ga. Bottom Mount Pads and Lifting Lugs, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
126.1	12.1	26.0	54.7	17.33	26.66	27.90

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	H _r	R _μ	I _p	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was base mounted to the NTS fixture using (6) 1/2" Grade 5 bolts.



UUT-3 overall view.



UUT-3 interior view.

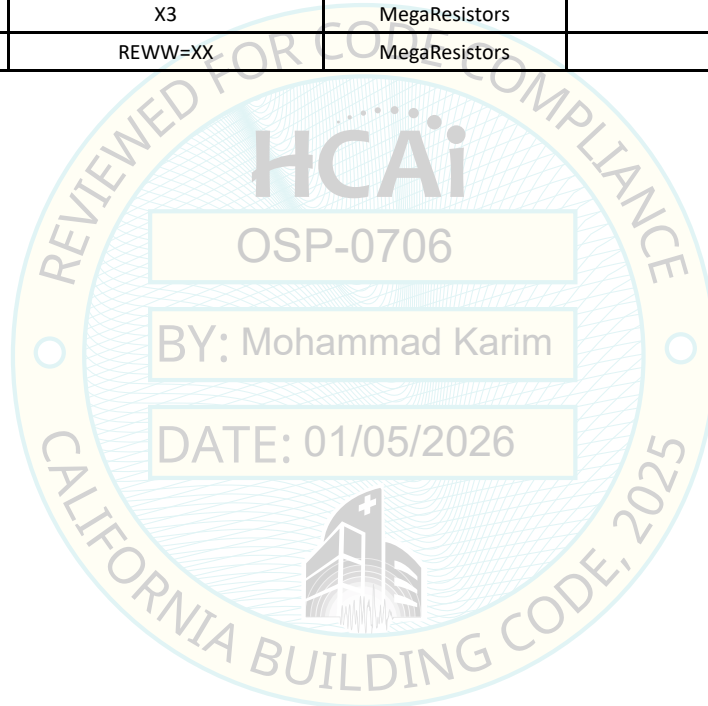
UNIT UNDER TEST (UUT) Summary Sheet



UUT-3

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Control Relay	ELCR=SE330-00-00	Littelfuse Startco	Plastic, Aluminum
Controls and Indication	MEAM=3P5	Crompton Instruments	Plastic, Glass
Controls and Indication	MEVM=3P5		Plastic, Glass
Cooling Fan	ENCF=HR	Multicomp	Aluminum, Plastic
Current Transformer	INCT=UB-RCMS-1	Bender	Plastic
Current Transformer	X2	MegaResistors	Plastic
Input-Output Module	ELIO=24VACDC-8DI8DO	Automation Direct	Plastic
Power Supply	ELPS=120VACDC-20W-48VA	Automation Direct	Plastic
Sensing Resistor	X1	MegaResistors	Aluminum, Epoxy
Sensing Resistor	X3	MegaResistors	Aluminum, Epoxy
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic



UNIT UNDER TEST (UUT) Summary Sheet



UUT-4

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: High Resistance Grounding Systems

Model Number: ENHR=4-3R

Product Construction Summary: 16 Ga. Mild Steel, 12 Ga. Bottom Mount Pads and Lifting Lugs, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
200.0	18.0	26.0	80.7	11.92	13.42	28.19

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	H _i	R _μ	I _p	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was base mounted to the NTS fixture using (6) 1/2" Grade 5 bolts.



UUT-4 overall view.



UUT-4 interior view.

UNIT UNDER TEST (UUT) Summary Sheet



UUT-4

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Auxiliary Relay	ELAR=2NO-2NC	ABB	Plastic
Auxiliary Relay	ELAR=IRBS	ABB	Plastic
Auxiliary Relay	ELAR=IRCR	ABB	Plastic
Auxiliary Relay	ELAR=FL1F	Idec	Plastic
Auxiliary Relay	ELAR=RJ2S-120V	Idec	Plastic
Auxiliary Relay	ELAR=RJ2S-BS	Idec	Plastic
Auxiliary Relay	ELAR=R0-24VDC-1	Phoenix Contact	Plastic
Auxiliary Relay	ELAR=R1-24VDC-1	Phoenix Contact	Plastic
Control Power Transformer	INPT=SP100ACP	Hammond	Plastic, Resin
Control Relay	ELCO=P1-540ETH	Automation Direct	Plastic
Control Relay	ELCR=COM465	Bender	Plastic
Control Relay	ELCR=NGRM500	Bender	Plastic
Control Relay	ELCR=NGRM700	Bender	Plastic
Control Relay	ELCR=RCM420	Bender	Plastic
Control Relay	ELCR=RCMS490	Bender	Plastic
Control Relay	ELCR=SE701	Littelfuse Startco	Plastic
Control Relay	ELCO=ILC-131ETH	Phoenix Contact	Plastic, Copper
Controls and Indication	IDLA=G120	ABB	Plastic
Controls and Indication	SPPB=10	ABB	Plastic
Cooling Fan	ENCF=HR	Multicomp	Aluminum, Plastic
Current Transformer	INCT=20D2-5-5	GE	Plastic
Current Transformer	INCT=CS10-2P5	Littelfuse Startco	Plastic
Current Transformer	INCT=ELCT5-31	Littelfuse Startco	Plastic
Current Transformer	INCT=5SFT	Crompton Instruments	Plastic
Current Transformer	INCT=UB-RCMS-1	Bender	Plastic
Disconnect Switch	SPLD=16A-SOCO	Socomec	Plastic
Disconnect Switch	SPLD=40A	ABB	Plastic
Ethernet Switch	SPES=ETHSW5P	Phoenix Contact	Aluminum
Fuse	SPFU=HO-D	Eaton	Plastic
Fuse	SPFU=HO-LF	Littelfuse Startco	Plastic
Fuse	SPFU=600V-6A	Mersen	Melamine, Copper
Fuse	SPFU=HO-ME	Mersen	Plastic
Heater	ENHE=50W	Stego	Plastic, Aluminum
Input-Output Module	ELIO=24VDC-8DI	Phoenix Contact	Plastic
Input-Output Module	ELIO=24VDC-8DO	Phoenix Contact	Plastic
Input-Output Module	ELIO=4AI	Phoenix Contact	Plastic
Power Supply	ELPS=24VDC-30W	Phoenix Contact	Polycarbonate
Power Supply	ELPS=24VDC-60W	Phoenix Contact	Polycarbonate
Power Supply	ELPS=STEP-24V-1P75A	Phoenix Contact	Polycarbonate
Pulsing Contactor	SPPC=24VDC-10A-NC	Crydom	Plastic, Aluminum
Pulsing Contactor	SPPC=24VDC-20A	Phoenix Contact	Plastic
Sensing Resistor	INSR=CD1000	Bender	Aluminum, Epoxy

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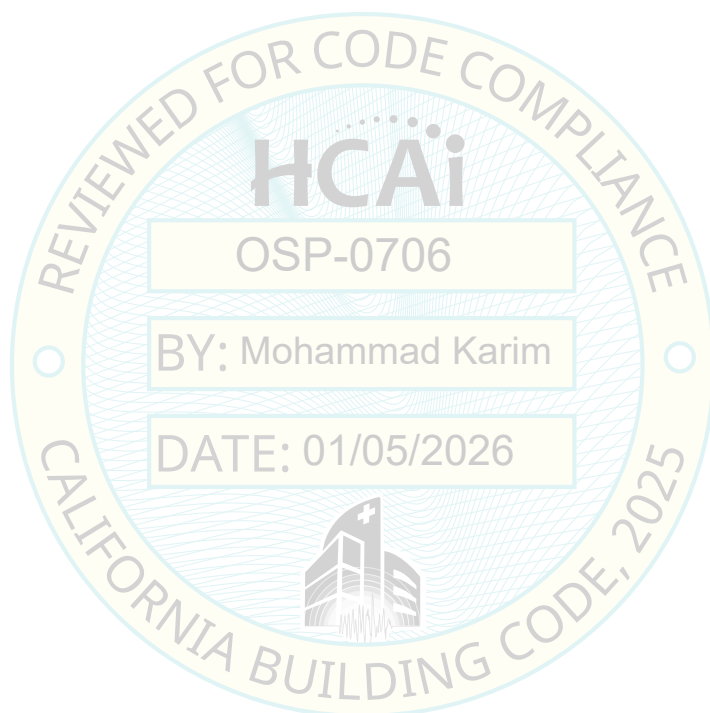
UNIT UNDER TEST (UUT) Summary Sheet



UUT-4

Options / Component Summary (continued):

Subcomponent Type	Part Number	Manufacturer	Material
Sensing Resistor	INSR=ER600VC	Littelfuse Startco	Aluminum, Epoxy
Terminal Block	TEDI=25	ABB	Plastic
Terminal Block	TEDI=55	ABB	Plastic
Terminal Block	TEDI=END	ABB	Plastic
Touchscreen Panel	ELTO=BTP-2043W	Phoenix Contact	Plastic, Glass
Touchscreen Panel	ELTO=EA1-S3MLW	Automation Direct	Plastic
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic



UNIT UNDER TEST (UUT) Summary Sheet



UUT-5

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: Neutral Grounding Resistor Systems

Model Number: ENHR=1-3R

Product Construction Summary: 16 ga. Galvanized Steel, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
23.7	18.0	22.0	8.1	11.92	9.97	19.18

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	H _r	R _μ	I _p	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was base mounted to the NTS fixture using (4) 5/16" Grade 5 bolts.

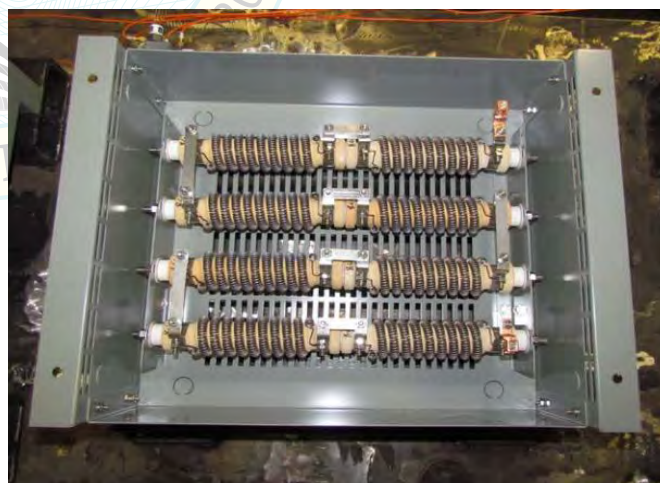
OSP-0706

BY: Mohammad Karim

DATE: 01/05/2026



UUT-5 overall view.



UUT-5 interior view.

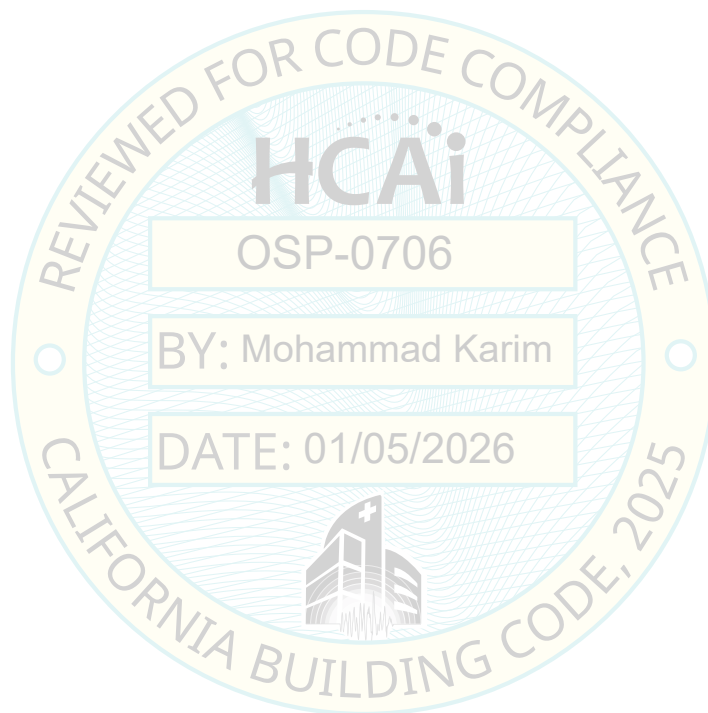
UNIT UNDER TEST (UUT) Summary Sheet



UUT-5

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Bonding Lug	TEBL=70	IlSCO	Copper
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic
Resistor Element	REEM=XXA-XX	MegaResistors	Steel, Mica, Ceramic
Terminal Block	TETB=115-T3	Eaton	Plastic
Terminal Block	TETB=115-T2	Eaton	Plastic
Terminal Block	TETB=SH-60-T4	Ideal	Plastic, Brass



UNIT UNDER TEST (UUT) Summary Sheet



UUT-6

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: Neutral Grounding Resistor Systems

Model Number: ENNG=2L-3R

Product Construction Summary: 16 ga. Galvanized Steel, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
90.0	30.8	22.0	12.4	11.92	17.70	32.66

Seismic Test Parameters

Building Code	Test Criteria	S _{ds} (g)	z/h	H _i	R _μ	I _p	A _{flx-H} (g)	A _{rig-H} (g)	A _{flx-V} (g)	A _{rig-V} (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was base mounted to the NTS fixture using (4) 3/8" Grade 5 bolts.

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DATE: 01/05/2026



UUT-6 overall view.



UUT-6 interior view.

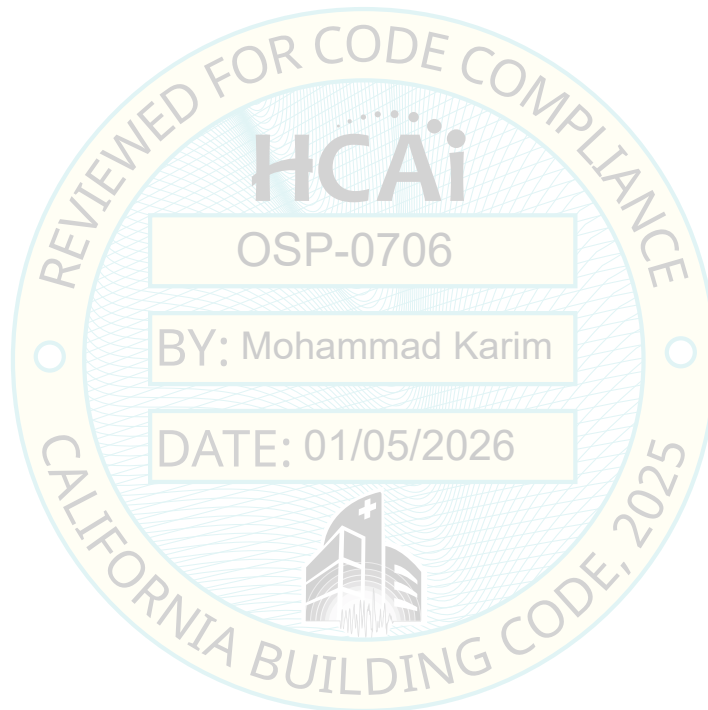
UNIT UNDER TEST (UUT) Summary Sheet



UUT-6

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Bonding Lug	TEBL=70	IlSCO	Copper
Resistor Element	REEM=XXA-XX	MegaResistors	Steel, Mica, Ceramic
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic
Terminal Block	TETB=115-T3	Eaton	Plastic
Terminal Block	TETB=115-T2	Eaton	Plastic
Terminal Block	TETB=SH-60-T4	Ideal	Plastic, Brass
Zig-Zag Transformer	INZZ=480V-5A	MegaResistors	Zinc-Plated Steel, Silicon Steel, Copper
Zig-Zag Transformer	NZZ=600V-5A	MegaResistors	Zinc-Plated Steel, Silicon Steel, Copper



UNIT UNDER TEST (UUT) Summary Sheet



UUT-7

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: Neutral Grounding Resistor System with stacked Resistor Brackets

Model Number: CPD-0111-F-1

Product Construction Summary: 16 Ga. Galvanized Steel, 14 Ga. Top and 16 Ga. Louver Covers, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
416.0	38.0	46.0	32.3	11.92	17.51	20.72

Seismic Test Parameters

Building Code	Test Criteria	S _{ds} (g)	z/h	H _i	R _μ	I _p	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was base mounted to the NTS fixture using (6) 1/2" Grade 5 bolts.

OSP-0706

BY: Mohammad Karim

DATE: 01/05/2026



UUT-7 overall view.



UUT-7 interior view.

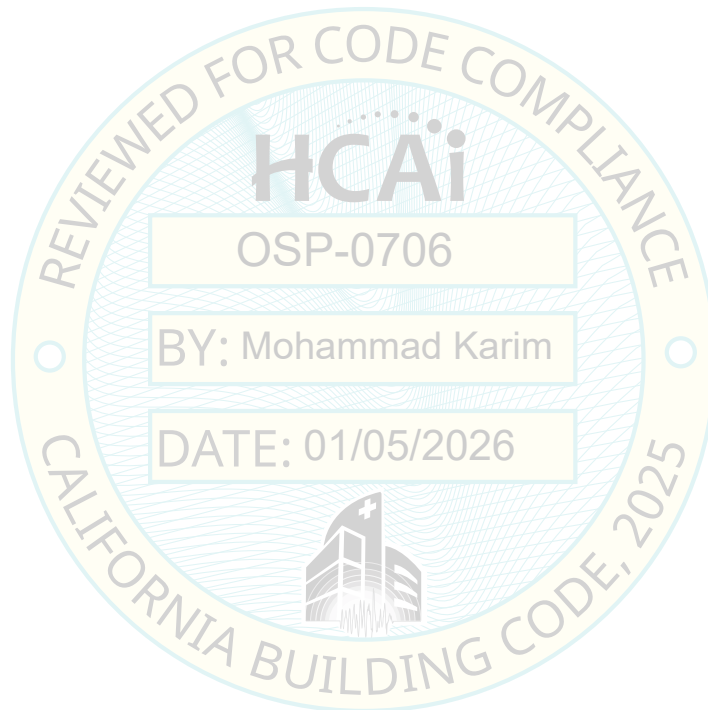
UNIT UNDER TEST (UUT) Summary Sheet



UUT-7

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Bonding Lug	TEBL=70	IlSCO	Copper
Insulator	IRPS=5	MegaResistors	Porcelain
NEMA Pad	TENP=5	MegaResistors	Porcelain, Copper
Resistor Element	REEM=XXA-XX	MegaResistors	Steel, Mica, Ceramic
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic



UNIT UNDER TEST (UUT) Summary Sheet



UUT-9

NTS Report Number: PR117621-TR-21

Test Dates: 2/26/21 - 3/4/21

Manufacturer: MegaResistors

Product Line: High Resistance Grounding Systems

Model Number: CPD-0141-F-1

Product Construction Summary: 12 ga. Galvanized Steel Top and Bottom Panels, 16 ga. Cold Formed Carbon Steel Louver Covers, NEMA 3R

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component attachment system and force-resisting systems was maintained before and after the AC 156 test.

UUT Properties

Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
1,420.0	59.8	84.0	63.9	10.54	17.89	29.50

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	H _f	R _μ	I _p	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2025	ICC-ES	2.50	1.0	3.5	1.3	1.5	4.00	2.69	N/A	N/A
	AC156-24	2.50	0.0	1.0	1.0		N/A	N/A	1.67	0.67

Unit Mounting Description:

The UUT was base mounted to the NTS fixture using (6) 1/2" Grade 5 bolts.

BY: Mohammad Karim

DATE: 01/05/2026



UUT-9 overall view.



UUT-9 interior view.

UNIT UNDER TEST (UUT) Summary Sheet



UUT-9

Options / Component Summary:

Subcomponent Type	Part Number	Manufacturer	Material
Bonding Lug	TEBL=70	IlSCO	Copper
Insulator	IRPS=15	MegaResistors	Porcelain
NEMA Pad	TENP=15	MegaResistors	Porcelain, Copper
Resistor Element	REEM=XXA-XX	MegaResistors	Steel, Mica, Ceramic
Resistor Element	REWW=XX	MegaResistors	Steel, Mica, Ceramic

